SAR TEST REPORT

The following samples were submitted and identified on behalf of the client as:

Equipment Under Test	Mobile Phone
Brand Name	Sony
Type No.	PM-0854-BV
Company Name	Sony Mobile Communications AB
Company Address	Nya Vattentornet 22188 Lund/SWEDEN
Standards	IEEE /ANSI C95.1, C95.3, IEEE 1528, KDB447498D01v05r02, KDB248227D01v01r02,KDB941225D01v03, KDB941225D05v02r03,KDB941225D06v02,KDB865664D01v01r03, KDB865664D02v01r01, KDB648474D04v01r02.
FCC ID	PY7-PM0854
Date of Receipt	Nov. 06 , 2014
Date of Test(s)	Nov. 17, 2014 ~ Dec. 08, 2014
Date of Issue	Jan. 16, 2015

In the configuration tested, the EUT complied with the standards specified above.

Remarks:

This report details the results of the testing carried out on three samples, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS Taiwan Electronic & Communication Laboratory or testing done by SGS Taiwan Electronic & Communication Laboratory in connection with distribution or use of the product described in this report must be approved by SGS Taiwan Electronic & Communication Laboratory in writing.

Signed on behalf of SGS

Engineer	**Supervisor**
Sam Kuo	**Ricky Huang**
Date: Jan. 16, 2015	**Date: Jan. 16, 2015**

Version

Report Number	Revision	Description	Issue Date
E5/2014/B0008	00	Initial Version	Jan. 10, 2015
E5/2014/B0008	01	1st modification	Jan. 16, 2015

This test report contains a reference to the previous version test report that it replaces.

Contents

1. General Information 4
   1.1 Testing Laboratory 4
   1.2 Details of Applicant 4
   1.3 Description of EUT 5
   1.4 Test Environment 51
   1.5 Operation Description 51
   1.6 Positioning Procedure 56
   1.7 Evaluation Procedures 57
   1.8 Probe Calibration Procedures 59
   1.9 The SAR Measurement System 62
   1.10 System Components 64
   1.11 SAR System Verification 66
   1.12 Tissue Simulant Fluid for the Frequency Band 68
   1.13 Test Standards and Limits 72
2. Summary of Results 74
3. Simultaneous Transmission Analysis 91
4. Instruments List 106
5. Measurements 108
6. System Verification 145
7. DAE & Probe Calibration Certificate 169
8. Uncertainty Budget 233
9. Phantom Description 234
10. System Validation from Original Equipment Supplier 235

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

1. General Information

1.1 Testing Laboratory

SGS Taiwan Ltd. Electronics & Communication Laboratory	
No.134, Wu Kung Road, New Taipei Industrial Park	
Wuku District, New Taipei City, Taiwan	
Tel	+886-2-2299-3279
Fax	+886-2-2298-0488
Internet	http://www.tw.sgs.com/

1.2 Details of Applicant

Company Name	Sony Mobile Communications AB
Company Address	Nya Vattentornet 22188 Lund/SWEDEN

1.3 Description of EUT

EUT Name	Mobile Phone	
Brand Name	Sony	
Type No.	PM-0854-BV	
HW Version	A	
SW Version	25.0.A.0.33	
Serial No.	2G/3G: ZH8005Y2UR LTE: ZH8005XVW4 WLAN: ZH8005YAB8	
IMEI Code	2G/3G: 004402453545489 LTE: 004402453548541 WLAN: 004402453545687	
FCC ID	PY7-PM0854	
Mode of Operation	☒GSM ☒GPRS ☒EDGE ☒WCDMA ☒HSDPA ☒HSUPA ☒HSPA+ ☒LTE FDD ☒WLAN802.11 a/b/g/n (20M/40M) ☒Bluetooth	
Duty Cycle	GSM	1/8.3
	GPRS (support multi class 12 max)	1/2 (1Dn4UP) 1/2.76 (1Dn3UP) 1/4.1 (1Dn2UP) 1/8.3 (1Dn1UP)
	EDGE (support multi class 12 max)	1/2 (1Dn4UP) 1/2.76 (1Dn3UP) 1/4.1 (1Dn2UP) 1/8.3 (1Dn1UP)
	WCDMA	1
	LTE	1
	WLAN 802.11 a/b/g/n(20M/40M)	1
	Bluetooth	1

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

TX Frequency Range (MHz)	GSM850	824.2	—	848.8
	GSM1900	1850.2	—	1909.8
	WCDMA Band II	1852.4	—	1907.6
	WCDMA Band IV	1712.4	—	1752.6
	WCDMA Band V	826.4	—	846.6
	LTE FDD Band II	1850	—	1910
	LTE FDD Band IV	1710	—	1755
	LTE FDD Band V	824	—	849
	LTE FDD Band VII	2500	—	2570
	WLAN 802.11 b/g/n(20M)	2412	—	2462
	WLAN 802.11 n(40M)	2422	—	2452
	WLAN802.11 a/n(20M) 5.2G	5180	—	5240
	WLAN802.11 a/n(20M) 5.3G	5260	—	5320
	WLAN802.11 a/n(20M) 5.5G	5500	—	5700
	WLAN802.11 a/n(20M) 5.8G	5745	—	5825
	WLAN802.11 n(40M) 5.2G	5190	—	5230
	WLAN802.11 n(40M) 5.3G	5270	—	5310
	WLAN802.11 n(40M) 5.5G	5510	—	5670
	WLAN802.11 n(40M) 5.8G	5755	—	5795
	Bluetooth	2402	—	2480

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Channel Number (ARFCN)	GSM850	128	—	251
	GSM1900	512	—	810
	WCDMA Band II	9262	—	9538
	WCDMA Band IV	1312	—	1513
	WCDMA Band V	4132	—	4233
	LTE FDD Band II	18607	—	19193
	LTE FDD Band IV	19957	—	20393
	LTE FDD Band V	20407	—	20643
	LTE FDD Band VII	20775	—	21425
	WLAN 802.11 b/g/n(20M)	1	—	11
	WLAN 802.11 n(40M)	3	—	9
	WLAN802.11 a/n(20M) 5.2G	36	—	48
	WLAN802.11 a/n(20M) 5.3G	52	—	64
	WLAN802.11 a/n(20M)5.6G	100	—	140
	WLAN802.11 a/n(20M)5.8G	149	—	165
	WLAN802.11 n(40M) 5.2G	38	—	46
	WLAN802.11 n(40M) 5.3G	54	—	62
	WLAN802.11 n(40M) 5.6G	102	—	134
	WLAN802.11 n(40M) 5.8G	151	—	159
	Bluetooth	0	—	78

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Max. SAR (1 g) (Unit: W/Kg)				
Mode	Band	Measured	Reported	Position / Channel
Head	GSM 850	0.387	0.424	☒Left ☐Right ☒Cheek ☐Tilt 128 Channel
	GSM 1900	0.147	0.147	☒Left ☐Right ☒Cheek ☐Tilt 810 Channel
	WCDMA Band II	0.228	0.234	☒Left ☐Right ☒Cheek ☐Tilt 9538 Channel
	WCDMA Band IV	0.519	0.519	☒Left ☐Right ☒Cheek ☐Tilt 1312 Channel
	WCDMA Band V	0.355	0.392	☒Left ☐Right ☒Cheek ☐Tilt 4233 Channel
	LTE FDD Band II	0.429	0.432	☒Left ☐Right ☒Cheek ☐Tilt 19100 Channel
	LTE FDD Band IV	0.38	0.388	☒Left ☐Right ☒Cheek ☐Tilt 20050 Channel
	LTE FDD Band V	0.373	0.444	☒Left ☐Right ☒Cheek ☐Tilt 20525 Channel
	LTE FDD Band VII	0.38	0.382	☒Left ☐Right ☒Cheek ☐Tilt 21100 Channel

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Max. SAR (1 g) (Unit: W/Kg)				
Mode	Band	Measured	Reported	Position / Channel
Head	WLAN802.11 b	0.786	0.797	☐Left ☒Right ☒Cheek ☐Tilt 11 Channel
	WLAN802.11a 5.2G	0.158	0.161	☐Left ☒Right ☐Cheek ☒Tilt 48 Channel
	WLAN802.11a 5.3G	0.17	0.171	☐Left ☒Right ☒Cheek ☐Tilt 60 Channel
	WLAN802.11a 5.6G	0.423	0.424	☐Left ☒Right ☒Cheek ☐Tilt 140 Channel
	WLAN802.11a 5.8G	0.478	0.507	☐Left ☒Right ☐Cheek ☒Tilt 161 Channel

Max. SAR (1 g) (Unit: W/Kg)				
Mode	Band	Measured	Reported	Position / Channel
Body worn (speech mode)	GSM 850	0.29	0.318	☐Front ☒Back 128 Channel
	GSM 1900	0.47	0.47	☐Front ☒Back 810 Channel
	WCDMA Band II	0.817	0.84	☐Front ☒Back 9538 Channel -repeat with worse case
	WCDMA Band IV	0.689	0.689	☐Front ☒Back 1312 Channel
	WCDMA Band V	0.288	0.318	☐Front ☒Back 4233 Channel
	LTE FDD Band II	0.804	0.81	☐Front ☒Back 19100 Channel
	LTE FDD Band IV	0.559	0.571	☐Front ☒Back 20050 Channel
	LTE FDD Band V	0.517	0.541	☐Front ☒Back 20600 Channel
	LTE FDD Band VII	0.489	0.507	☐Front ☒Back 20850 Channel
	WLAN802.11a 5.2G	0.339	0.353	☐Front ☒Back 40 Channel
	WLAN802.11a 5.3G	0.316	0.317	☐Front ☒Back 60 Channel
	WLAN802.11a 5.6G	0.402	0.408	☐Front ☒Back 132 Channel
	WLAN802.11a 5.8G	0.369	0.392	☐Front ☒Back 161 Channel

Max. SAR (1 g) (Unit: W/Kg)				
Mode	Band	Measured	Reported	Position / Channel
Hotspot mode	GPRS 850 (1Dn1UP)	0.638	0.7	☐Front ☒Back ☐Bottom ☐Right ☐Left 128 Channel
	GPRS 1900 (1Dn1UP)	0.898	0.898	☐Front ☐Back ☒Bottom ☐Right ☐Left 810 Channel
	WCDMA Band II	0.87	1.02	☐Front ☐Back ☒Bottom ☐Right ☐Left 9538 Channel
	WCDMA Band IV	0.947	1.192	☐Front ☐Back ☒Bottom ☐Right ☐Left 1513 Channel
	WCDMA Band V	0.758	0.837	☐Front ☒Back ☐Bottom ☐Right ☐Left 4233 Channel
	LTE FDD Band II	0.919	1.01	☐Front ☐Back ☒Bottom ☐Right ☐Left 18700 Channel
	LTE FDD Band IV	1.28	1.307	☐Front ☐Back ☒Bottom ☐Right ☐Left 20050 Channel
	LTE FDD Band V	0.716	0.762	☐Front ☒Back ☐Bottom ☐Right ☐Left 20525 Channel

Max. SAR (1 g) (Unit: W/Kg)				
Mode	Band	Measured	Reported	Position / Channel
Hotspot mode	LTE FDD Band VII	1	1.038	☐Front ☐Back ☒Bottom ☐Right ☐Left 20850 Channel
	WLAN802.11b	0.679	0.688	☐Front ☒Back ☐Bottom ☐Right ☐Left 11 Channel

#. Conducted power table:

GSM / GPRS / EDGE conducted power table:

EUT mode	Frequency (MHz)	CH	Max. Rated Avg. Power + Max. Tolerance (dBm)	Burst average power	Source-based time average power
				Avg.(dBm)	Avg.(dBm)
GSM 850 (GMSK)	824.2	128	33.5	33.10	24.07
	836.6	190	33.5	33.20	24.17
	848.8	251	33.5	33.50	24.47
The division factor compared to the number of TX time slot					
Division factor				1 TX time slot	
				-9.03	

Burst average power						
Max. Rated Avg. Power + Max. Tolerance (dBm)			33.5	30.5	28.5	27.5
			1Dn1UP	1Dn2UP	1Dn3UP	1Dn4UP
EUT mode	Frequency (MHz)	CH	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)
GPRS 850 (GMSK)	824.2	128	33.10	29.50	27.80	26.90
	836.6	190	33.20	29.50	27.90	27.10
	848.8	251	33.50	29.70	28.10	27.30
Source-based time average power						
GPRS 850 (GMSK)	824.2	128	24.07	23.48	23.54	23.89
	836.6	190	24.17	23.48	23.64	24.09
	848.8	251	24.47	23.68	23.84	24.29
The division factor compared to the number of TX time slot						
Division factor			1 TX time slot	2 TX time slot	3 TX time slot	4 TX time slot
			-9.03	-6.02	-4.26	-3.01

Burst average power						
Max. Rated Avg. Power + Max. Tolerance (dBm)			28	25.5	25	25
			1Dn1UP	1Dn2UP	1Dn3UP	1Dn4UP
EUT mode	Frequency (MHz)	CH	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)
EDGE 850 (MCS 5)	824.2	128	27.90	24.90	24.50	24.50
	836.6	190	27.90	25.00	24.50	24.50
	848.8	251	28.00	25.10	24.60	24.60
Source-based time average power						
EDGE 850 (MCS 5)	824.2	128	18.87	18.88	20.24	21.49
	836.6	190	18.87	18.98	20.24	21.49
	848.8	251	18.97	19.08	20.34	21.59
The division factor compared to the number of TX time slot						
Division factor			1 TX time slot	2 TX time slot	3 TX time slot	4 TX time slot
			-9.03	-6.02	-4.26	-3.01

Burst average power						
Max. Rated Avg. Power + Max. Tolerance (dBm)			33.5	30.5	28.5	27.5
			1Dn1UP	1Dn2UP	1Dn3UP	1Dn4UP
EUT mode	Frequency (MHz)	CH	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)
EDGE 850 (MCS 4)	824.2	128	33.00	29.50	27.70	26.90
	836.6	190	33.10	29.50	27.80	27.00
	848.8	251	33.30	29.60	28.00	27.20
Source-based time average power						
EDGE 850 (MCS 4)	824.2	128	23.97	23.48	23.44	23.89
	836.6	190	24.07	23.48	23.54	23.99
	848.8	251	24.27	23.58	23.74	24.19
The division factor compared to the number of TX time slot						
Division factor			1 TX time slot	2 TX time slot	3 TX time slot	4 TX time slot
			-9.03	-6.02	-4.26	-3.01

SGS Taiwan Ltd. 台灣檢驗科技股份有限公司
No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Burst average power						
Max. Rated Avg. Power + Max. Tolerance (dBm)			28	25.5	25	25
			1Dn1UP	1Dn2UP	1Dn3UP	1Dn4UP
EUT mode	Frequency (MHz)	CH	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)
EDGE 850 (MCS 9)	824.2	128	27.80	24.90	24.50	24.50
	836.6	190	27.90	24.90	24.50	24.50
	848.8	251	28.00	25.10	24.60	24.60
Source-based time average power						
EDGE 850 (MCS 9)	824.2	128	18.77	18.88	20.24	21.49
	836.6	190	18.87	18.88	20.24	21.49
	848.8	251	18.97	19.08	20.34	21.59
The division factor compared to the number of TX time slot						
Division factor			1 TX time slot	2 TX time slot	3 TX time slot	4 TX time slot
			-9.03	-6.02	-4.26	-3.01

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

EUT mode	Frequency (MHz)	CH	Max. Rated Avg. Power + Max. Tolerance (dBm)	Burst average power Avg.(dBm)	Source-based time average power Avg.(dBm)
GSM 1900 (GMSK)	1850.2	512	30.5	30.30	21.27
	1880	661	30.5	30.30	21.27
	1909.8	810	30.5	30.50	21.47
The division factor compared to the number of TX time slot					
Division factor				1 TX time slot	
				-9.03	

Burst average power						
Max. Rated Avg. Power + Max. Tolerance (dBm)			30.5	27	25	24.5
			1Dn1UP	1Dn2UP	1Dn3UP	1Dn4UP
EUT mode	Frequency (MHz)	CH	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)
GPRS 1900 (GMSK)	1850.2	512	30.30	26.50	24.70	24.00
	1880	661	30.30	26.50	24.70	23.90
	1909.8	810	30.50	26.60	24.80	24.20
Source-based time average power						
GPRS 1900 (GMSK)	1850.2	512	21.27	20.48	20.44	20.99
	1880	661	21.27	20.48	20.44	20.89
	1909.8	810	21.47	20.58	20.54	21.19
The division factor compared to the number of TX time slot						
Division factor			1 TX time slot	2 TX time slot	3 TX time slot	4 TX time slot
			-9.03	-6.02	-4.26	-3.01

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Burst average power						
Max. Rated Avg. Power + Max. Tolerance (dBm)			27.5	24.5	23.5	22.5
			1Dn1UP	1Dn2UP	1Dn3UP	1Dn4UP
EUT mode	Frequency (MHz)	CH	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)
EDGE 1900 (MCS 5)	1850.2	512	27.00	24.20	22.50	21.50
	1880	661	27.00	24.00	22.50	21.50
	1909.8	810	27.00	24.10	22.50	21.50
Source-based time average power						
EDGE 1900 (MCS 5)	1850.2	512	17.97	18.18	18.24	18.49
	1880	661	17.97	17.98	18.24	18.49
	1909.8	810	17.97	18.08	18.24	18.49
The division factor compared to the number of TX time slot						
Division factor			1 TX time slot	2 TX time slot	3 TX time slot	4 TX time slot
			-9.03	-6.02	-4.26	-3.01

Burst average power						
Max. Rated Avg. Power + Max. Tolerance (dBm)			30.5	27	25	24.5
			1Dn1UP	1Dn2UP	1Dn3UP	1Dn4UP
EUT mode	Frequency (MHz)	CH	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)
EDGE 1900 (MCS 4)	1850.2	512	30.30	26.40	24.50	24.00
	1880	661	30.30	26.30	24.50	23.90
	1909.8	810	30.50	26.60	24.70	24.10
Source-based time average power						
EDGE 1900 (MCS 4)	1850.2	512	21.27	20.38	20.24	20.99
	1880	661	21.27	20.28	20.24	20.89
	1909.8	810	21.47	20.58	20.44	21.09
The division factor compared to the number of TX time slot						
Division factor			1 TX time slot	2 TX time slot	3 TX time slot	4 TX time slot
			-9.03	-6.02	-4.26	-3.01

Burst average power						
Max. Rated Avg. Power + Max. Tolerance (dBm)			27.5	24.5	23.5	22.5
			1Dn1UP	1Dn2UP	1Dn3UP	1Dn4UP
EUT mode	Frequency (MHz)	CH	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)
EDGE 1900 (MCS 9)	1850.2	512	27.00	24.10	22.50	21.50
	1880	661	26.90	24.00	22.50	21.50
	1909.8	810	26.90	24.00	22.50	21.50
Source-based time average power						
EDGE 1900 (MCS 9)	1850.2	512	17.97	18.08	18.24	18.49
	1880	661	17.87	17.98	18.24	18.49
	1909.8	810	17.87	17.98	18.24	18.49
The division factor compared to the number of TX time slot						
Division factor			1 TX time slot	2 TX time slot	3 TX time slot	4 TX time slot
			-9.03	-6.02	-4.26	-3.01

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

WCDMA Band II / Band IV / Band V - HSDPA / HSUPA / HSPA+ conducted power table:

Band	CH	Max. Rated Avg. Power + Max. Tolerance (dBm)	Rel99 AV (dBm)	HSDPA mode AV(dBm)				HSUPA mode AV(dBm)					HSPA+ mode AV(dBm)				
				SUB-1	SUB-2	SUB-3	SUB-4	SUB-1	SUB-2	SUB-3	SUB-4	SUB-5	SUB-1	SUB-2	SUB-3	SUB-4	SUB-5
WCDMA Band II	9262	24.5	24.48	23.42	23.36	22.94	23.01	24.40	22.45	23.46	22.58	23.02	24.41	22.39	23.38	22.50	24.21
	9400	24.5	24.50	23.11	23.36	22.66	22.67	24.48	22.55	23.5	22.6	22.90	24.47	22.51	23.46	22.55	24.32
	9538	24.5	24.38	22.83	23.23	22.3	22.42	24.32	22.36	23.4	22.4	22.85	24.33	22.32	23.34	22.36	24.19
WCDMA Band IV	1312	24.5	24.50	23.42	23.38	22.94	23.01	24.42	22.47	23.48	22.6	23.46	24.13	22.23	23.17	22.34	23.15
	1412	24.5	24.48	23.28	23.34	22.83	22.84	24.46	22.53	23.48	22.58	23.55	24.19	22.33	23.28	22.35	23.28
	1513	24.5	24.47	23.21	23.32	22.68	22.8	24.41	22.45	23.49	22.49	23.46	24.09	22.21	23.15	22.25	23.21
WCDMA Band V	4132	24.5	24.44	23.29	23.37	22.83	22.88	24.40	22.46	23.44	22.51	23.30	24.41	22.44	23.39	22.47	24.22
	4183	24.5	24.20	23.12	23.09	22.64	22.68	24.13	22.21	23.19	22.27	23.14	24.12	22.14	23.12	22.20	23.89
	4233	24.5	24.07	22.78	23.01	22.29	22.35	23.99	22.03	23.07	22.11	22.77	23.98	21.95	22.97	22.01	23.80

WCDMA Band II / Band IV - HSDPA / HSUPA / HSPA+ conducted power table (Reduced power):

Band	CH	Max. Rated Avg. Power + Max. Tolerance (dBm)	Rel99 AV (dBm)	HSDPA mode AV(dBm)				HSUPA mode AV(dBm)					HSPA+ mode AV(dBm)				
				SUB-1	SUB-2	SUB-3	SUB-4	SUB-1	SUB-2	SUB-3	SUB-4	SUB-5	SUB-1	SUB-2	SUB-3	SUB-4	SUB-5
WCDMA Band II	9262	22	21.57	21.54	21.45	21.06	21.13	21.49	19.54	20.55	19.67	21.52	21.50	19.48	20.47	19.59	21.30
	9400	22	21.53	21.51	21.39	21.06	21.07	21.51	19.58	20.53	19.63	21.45	21.50	19.54	20.49	19.58	21.35
	9538	22	21.31	21.29	21.16	20.76	20.88	21.25	19.29	20.33	19.33	21.26	21.26	19.25	20.27	19.29	21.12
WCDMA Band IV	1312	22.5	21.48	21.46	21.36	21.34	21.34	21.40	19.45	20.46	19.58	21.43	21.45	19.48	20.43	19.51	21.26
	1412	22.5	21.56	21.53	21.42	21.08	21.09	21.54	19.61	20.56	19.66	21.50	21.48	19.50	20.48	19.56	21.25
	1513	22.5	21.50	21.48	21.35	20.95	21.07	21.44	19.48	20.52	19.52	21.45	21.41	19.38	20.40	19.44	21.23

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

HSDPA

SUB-TEST	β_c	β_d	β_d *(SF)*	β_c/β_d	β_{HS} *(Note1, Note 2)*	CM (dB) *(Note 3)*	MPR (dB) *(Note 3)*
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15	15/15	64	12/15	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

HSUPA

SUB-TEST	β_c	β_d	β_d *(SF)*	β_c/β_d	β_{HS} *(Note1)*	β_{ec}	β_{ed} *(Note 5) (Note 6)*	β_{ed} *(SF)*	β_{ed} *(Codes)*	CM *(dB) (Note 2)*	MPR *(dB) (Note 2)*	*AG Index (Note 6)*	*E-TFCI*
1	11/15	15/15	64	11/15	22/15	209/225	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed}1: 47/15 β_{ed}2: 47/15	4 4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15	15/15	64	15/15	30/15	24/15	134/15	4	1	1.0	0.0	21	81

LTE FDD Band II / Band IV / Band V / Band VII power table:

FDD Band 2								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
20	QPSK	1 RB	0	1860	18700	24.25	24.5	0
				1880	18900	24.14	24.5	0
				1900	19100	24.26	24.5	0
			50	1860	18700	24.20	24.5	0
				1880	18900	24.19	24.5	0
				1900	19100	24.29	24.5	0
			99	1860	18700	24.27	24.5	0
				1880	18900	24.37	24.5	0
				1900	19100	24.47	24.5	0
		50 RB	0	1860	18700	23.33	24	0-1
				1880	18900	23.34	24	0-1
				1900	19100	23.42	24	0-1
			25	1860	18700	23.35	24	0-1
				1880	18900	23.38	24	0-1
				1900	19100	23.50	24	0-1
			50	1860	18700	23.34	24	0-1
				1880	18900	23.42	24	0-1
				1900	19100	23.69	24	0-1
		100RB		1860	18700	23.35	24	0-1
				1880	18900	23.36	24	0-1
				1900	19100	23.44	24	0-1
	16-QAM	1 RB	0	1860	18700	23.24	24	0-1
				1880	18900	23.74	24	0-1
				1900	19100	23.76	24	0-1
			50	1860	18700	23.39	24	0-1
				1880	18900	23.73	24	0-1
				1900	19100	23.33	24	0-1
			99	1860	18700	23.77	24	0-1
				1880	18900	23.72	24	0-1
				1900	19100	23.86	24	0-1
		50 RB	0	1860	18700	22.35	23	0-2
				1880	18900	22.44	23	0-2
				1900	19100	22.42	23	0-2
			25	1860	18700	22.38	23	0-2
				1880	18900	22.38	23	0-2
				1900	19100	22.49	23	0-2
			50	1860	18700	22.35	23	0-2
				1880	18900	22.49	23	0-2
				1900	19100	22.63	23	0-2
		100RB		1860	18700	22.37	23	0-2
				1880	18900	22.35	23	0-2
				1900	19100	22.48	23	0-2

FDD Band 2								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
15	QPSK	1 RB	0	1857.5	18675	24.18	24.5	0
				1880	18900	24.18	24.5	0
				1902.5	19125	24.21	24.5	0
			36	1857.5	18675	24.18	24.5	0
				1880	18900	24.25	24.5	0
				1902.5	19125	24.25	24.5	0
			74	1857.5	18675	24.19	24.5	0
				1880	18900	24.27	24.5	0
				1902.5	19125	24.41	24.5	0
		36 RB	0	1857.5	18675	23.37	24	0-1
				1880	18900	23.31	24	0-1
				1902.5	19125	23.46	24	0-1
			18	1857.5	18675	23.32	24	0-1
				1880	18900	23.35	24	0-1
				1902.5	19125	23.54	24	0-1
			37	1857.5	18675	23.34	24	0-1
				1880	18900	23.43	24	0-1
				1902.5	19125	23.62	24	0-1
		75RB		1857.5	18675	23.28	24	0-1
				1880	18900	23.35	24	0-1
				1902.5	19125	23.47	24	0-1
	16-QAM	1 RB	0	1857.5	18675	23.28	24	0-1
				1880	18900	23.63	24	0-1
				1902.5	19125	23.24	24	0-1
			36	1857.5	18675	23.35	24	0-1
				1880	18900	23.47	24	0-1
				1902.5	19125	23.44	24	0-1
			74	1857.5	18675	23.80	24	0-1
				1880	18900	23.46	24	0-1
				1902.5	19125	23.27	24	0-1
		36 RB	0	1857.5	18675	22.37	23	0-2
				1880	18900	22.36	23	0-2
				1902.5	19125	22.52	23	0-2
			18	1857.5	18675	22.41	23	0-2
				1880	18900	22.41	23	0-2
				1902.5	19125	22.56	23	0-2
			37	1857.5	18675	22.42	23	0-2
				1880	18900	22.47	23	0-2
				1902.5	19125	22.63	23	0-2
		75RB		1857.5	18675	22.41	23	0-2
				1880	18900	22.38	23	0-2
				1902.5	19125	22.55	23	0-2

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

FDD Band 2								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
10	QPSK	1 RB	0	1855	18650	24.06	24.5	0
				1880	18900	24.22	24.5	0
				1905	19150	24.38	24.5	0
			25	1855	18650	24.30	24.5	0
				1880	18900	24.21	24.5	0
				1905	19150	24.36	24.5	0
			49	1855	18650	24.16	24.5	0
				1880	18900	24.19	24.5	0
				1905	19150	24.43	24.5	0
		25 RB	0	1855	18650	23.28	24	0-1
				1880	18900	23.32	24	0-1
				1905	19150	23.46	24	0-1
			12	1855	18650	23.26	24	0-1
				1880	18900	23.33	24	0-1
				1905	19150	23.53	24	0-1
			25	1855	18650	23.25	24	0-1
				1880	18900	23.32	24	0-1
				1905	19150	23.59	24	0-1
		50RB		1855	18650	23.33	24	0-1
				1880	18900	23.35	24	0-1
				1905	19150	23.54	24	0-1
	16-QAM	1 RB	0	1855	18650	23.32	24	0-1
				1880	18900	23.27	24	0-1
				1905	19150	23.50	24	0-1
			25	1855	18650	23.25	24	0-1
				1880	18900	23.44	24	0-1
				1905	19150	23.62	24	0-1
			49	1855	18650	23.40	24	0-1
				1880	18900	23.40	24	0-1
				1905	19150	23.47	24	0-1
		25 RB	0	1855	18650	22.38	23	0-2
				1880	18900	22.38	23	0-2
				1905	19150	22.47	23	0-2
			12	1855	18650	22.37	23	0-2
				1880	18900	22.40	23	0-2
				1905	19150	22.48	23	0-2
			25	1855	18650	22.28	23	0-2
				1880	18900	22.31	23	0-2
				1905	19150	22.58	23	0-2
		50RB		1855	18650	22.38	23	0-2
				1880	18900	22.42	23	0-2
				1905	19150	22.52	23	0-2

FDD Band 2								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
5	QPSK	1 RB	0	1852.5	18625	23.93	24.5	0
				1880	18900	23.93	24.5	0
				1907.5	19175	24.17	24.5	0
			12	1852.5	18625	24.04	24.5	0
				1880	18900	24.13	24.5	0
				1907.5	19175	24.18	24.5	0
			24	1852.5	18625	24.00	24.5	0
				1880	18900	23.93	24.5	0
				1907.5	19175	24.27	24.5	0
		12 RB	0	1852.5	18625	23.09	24	0-1
				1880	18900	23.09	24	0-1
				1907.5	19175	23.41	24	0-1
			6	1852.5	18625	23.08	24	0-1
				1880	18900	23.13	24	0-1
				1907.5	19175	23.38	24	0-1
			13	1852.5	18625	23.05	24	0-1
				1880	18900	23.17	24	0-1
				1907.5	19175	23.33	24	0-1
		25RB		1852.5	18625	23.05	24	0-1
				1880	18900	23.10	24	0-1
				1907.5	19175	23.32	24	0-1
	16-QAM	1 RB	0	1852.5	18625	23.08	24	0-1
				1880	18900	23.57	24	0-1
				1907.5	19175	23.70	24	0-1
			12	1852.5	18625	23.14	24	0-1
				1880	18900	23.43	24	0-1
				1907.5	19175	23.53	24	0-1
			24	1852.5	18625	23.11	24	0-1
				1880	18900	23.07	24	0-1
				1907.5	19175	23.07	24	0-1
		12 RB	0	1852.5	18625	22.15	23	0-2
				1880	18900	22.25	23	0-2
				1907.5	19175	22.37	23	0-2
			6	1852.5	18625	22.05	23	0-2
				1880	18900	22.22	23	0-2
				1907.5	19175	22.40	23	0-2
			13	1852.5	18625	22.11	23	0-2
				1880	18900	22.26	23	0-2
				1907.5	19175	22.29	23	0-2
		25RB		1852.5	18625	22.12	23	0-2
				1880	18900	22.19	23	0-2
				1907.5	19175	22.33	23	0-2

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

FDD Band 2								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
3	QPSK	1 RB	0	1851.5	18615	24.13	24.5	0
				1880	18900	24.18	24.5	0
				1908.5	19185	24.35	24.5	0
			7	1851.5	18615	24.12	24.5	0
				1880	18900	24.25	24.5	0
				1908.5	19185	24.37	24.5	0
			14	1851.5	18615	24.18	24.5	0
				1880	18900	24.09	24.5	0
				1908.5	19185	24.34	24.5	0
		8 RB	0	1851.5	18615	23.22	24	0-1
				1880	18900	23.31	24	0-1
				1908.5	19185	23.55	24	0-1
			4	1851.5	18615	23.27	24	0-1
				1880	18900	23.31	24	0-1
				1908.5	19185	23.51	24	0-1
			7	1851.5	18615	23.25	24	0-1
				1880	18900	23.33	24	0-1
				1908.5	19185	23.53	24	0-1
		15RB		1851.5	18615	23.31	24	0-1
				1880	18900	23.39	24	0-1
				1908.5	19185	23.47	24	0-1
	16-QAM	1 RB	0	1851.5	18615	23.28	24	0-1
				1880	18900	23.29	24	0-1
				1908.5	19185	23.22	24	0-1
			7	1851.5	18615	23.24	24	0-1
				1880	18900	23.59	24	0-1
				1908.5	19185	23.43	24	0-1
			14	1851.5	18615	23.40	24	0-1
				1880	18900	23.68	24	0-1
				1908.5	19185	23.38	24	0-1
		8 RB	0	1851.5	18615	22.35	23	0-2
				1880	18900	22.36	23	0-2
				1908.5	19185	22.62	23	0-2
			4	1851.5	18615	22.34	23	0-2
				1880	18900	22.35	23	0-2
				1908.5	19185	22.49	23	0-2
			7	1851.5	18615	22.39	23	0-2
				1880	18900	22.42	23	0-2
				1908.5	19185	22.49	23	0-2
		15RB		1851.5	18615	22.39	23	0-2
				1880	18900	22.41	23	0-2
				1908.5	19185	22.41	23	0-2

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

FDD Band 2								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
1.4	QPSK	1 RB	0	1850.7	18607	24.15	24.5	0
				1880	18900	24.18	24.5	0
				1909.3	19193	24.29	24.5	0
			2	1850.7	18607	24.24	24.5	0
				1880	18900	24.30	24.5	0
				1909.3	19193	24.28	24.5	0
			5	1850.7	18607	24.03	24.5	0
				1880	18900	24.18	24.5	0
				1909.3	19193	24.43	24.5	0
		3 RB	0	1850.7	18607	23.28	24	0-1
				1880	18900	23.31	24	0-1
				1909.3	19193	23.34	24	0-1
			2	1850.7	18607	23.21	24	0-1
				1880	18900	23.26	24	0-1
				1909.3	19193	23.43	24	0-1
			3	1850.7	18607	23.29	24	0-1
				1880	18900	23.28	24	0-1
				1909.3	19193	23.51	24	0-1
		6RB		1850.7	18607	23.29	24	0-1
				1880	18900	23.33	24	0-1
				1909.3	19193	23.52	24	0-1
	16-QAM	1 RB	0	1850.7	18607	23.34	24	0-1
				1880	18900	23.45	24	0-1
				1909.3	19193	23.59	24	0-1
			2	1850.7	18607	23.26	24	0-1
				1880	18900	23.71	24	0-1
				1909.3	19193	23.57	24	0-1
			5	1850.7	18607	23.61	24	0-1
				1880	18900	23.24	24	0-1
				1909.3	19193	23.72	24	0-1
		3 RB	0	1850.7	18607	22.24	23	0-2
				1880	18900	22.27	23	0-2
				1909.3	19193	22.44	23	0-2
			2	1850.7	18607	22.28	23	0-2
				1880	18900	22.31	23	0-2
				1909.3	19193	22.38	23	0-2
			3	1850.7	18607	22.31	23	0-2
				1880	18900	22.37	23	0-2
				1909.3	19193	22.43	23	0-2
		6RB		1850.7	18607	22.46	23	0-2
				1880	18900	22.39	23	0-2
				1909.3	19193	22.45	23	0-2

FDD Band 2 Reduction Power								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
20	QPSK	1 RB	0	1860	18700	21.67	22	0
				1880	18900	21.66	22	0
				1900	19100	21.64	22	0
			50	1860	18700	21.69	22	0
				1880	18900	21.57	22	0
				1900	19100	21.81	22	0
			99	1860	18700	21.71	22	0
				1880	18900	21.67	22	0
				1900	19100	21.92	22	0
		50 RB	0	1860	18700	21.50	22	0-1
				1880	18900	21.63	22	0-1
				1900	19100	21.83	22	0-1
			25	1860	18700	21.55	22	0-1
				1880	18900	21.65	22	0-1
				1900	19100	21.90	22	0-1
			50	1860	18700	21.66	22	0-1
				1880	18900	21.69	22	0-1
				1900	19100	21.96	22	0-1
		100RB		1860	18700	21.59	22	0-1
				1880	18900	21.65	22	0-1
				1900	19100	21.84	22	0-1
	16-QAM	1 RB	0	1860	18700	21.57	22	0-1
				1880	18900	21.61	22	0-1
				1900	19100	21.54	22	0-1
			50	1860	18700	21.62	22	0-1
				1880	18900	21.52	22	0-1
				1900	19100	21.76	22	0-1
			99	1860	18700	21.64	22	0-1
				1880	18900	21.55	22	0-1
				1900	19100	21.73	22	0-1
		50 RB	0	1860	18700	21.49	22	0-2
				1880	18900	21.47	22	0-2
				1900	19100	21.61	22	0-2
			25	1860	18700	21.53	22	0-2
				1880	18900	21.47	22	0-2
				1900	19100	21.71	22	0-2
			50	1860	18700	21.52	22	0-2
				1880	18900	21.49	22	0-2
				1900	19100	21.74	22	0-2
		100RB		1860	18700	21.49	22	0-2
				1880	18900	21.46	22	0-2
				1900	19100	21.59	22	0-2

FDD Band 2 Reduction Power								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
15	QPSK	1 RB	0	1857.5	18675	21.56	22	0
				1880	18900	21.49	22	0
				1902.5	19125	21.63	22	0
			36	1857.5	18675	21.52	22	0
				1880	18900	21.50	22	0
				1902.5	19125	21.76	22	0
			74	1857.5	18675	21.54	22	0
				1880	18900	21.56	22	0
				1902.5	19125	21.82	22	0
		36 RB	0	1857.5	18675	21.52	22	0-1
				1880	18900	21.50	22	0-1
				1902.5	19125	21.78	22	0-1
			18	1857.5	18675	21.52	22	0-1
				1880	18900	21.57	22	0-1
				1902.5	19125	21.84	22	0-1
			37	1857.5	18675	21.51	22	0-1
				1880	18900	21.58	22	0-1
				1902.5	19125	21.87	22	0-1
		75RB		1857.5	18675	21.57	22	0-1
				1880	18900	21.48	22	0-1
				1902.5	19125	21.73	22	0-1
	16-QAM	1 RB	0	1857.5	18675	21.63	22	0-1
				1880	18900	21.51	22	0-1
				1902.5	19125	21.58	22	0-1
			36	1857.5	18675	21.67	22	0-1
				1880	18900	21.47	22	0-1
				1902.5	19125	21.76	22	0-1
			74	1857.5	18675	21.71	22	0-1
				1880	18900	21.50	22	0-1
				1902.5	19125	21.69	22	0-1
		36 RB	0	1857.5	18675	21.42	22	0-2
				1880	18900	21.37	22	0-2
				1902.5	19125	21.58	22	0-2
			18	1857.5	18675	21.44	22	0-2
				1880	18900	21.41	22	0-2
				1902.5	19125	21.68	22	0-2
			37	1857.5	18675	21.44	22	0-2
				1880	18900	21.40	22	0-2
				1902.5	19125	21.70	22	0-2
		75RB		1857.5	18675	21.47	22	0-2
				1880	18900	21.32	22	0-2
				1902.5	19125	21.57	22	0-2

FDD Band 2 Reduction Power								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
10	QPSK	1 RB	0	1855	18650	21.51	22	0
				1880	18900	21.52	22	0
				1905	19150	21.68	22	0
			25	1855	18650	21.51	22	0
				1880	18900	21.54	22	0
				1905	19150	21.84	22	0
			49	1855	18650	21.48	22	0
				1880	18900	21.55	22	0
				1905	19150	21.77	22	0
		25 RB	0	1855	18650	21.47	22	0-1
				1880	18900	21.49	22	0-1
				1905	19150	21.81	22	0-1
			12	1855	18650	21.47	22	0-1
				1880	18900	21.50	22	0-1
				1905	19150	21.84	22	0-1
			25	1855	18650	21.47	22	0-1
				1880	18900	21.50	22	0-1
				1905	19150	21.81	22	0-1
		50RB		1855	18650	21.67	22	0-1
				1880	18900	21.76	22	0-1
				1905	19150	21.89	22	0-1
	16-QAM	1 RB	0	1855	18650	21.20	22	0-1
				1880	18900	21.24	22	0-1
				1905	19150	21.58	22	0-1
			25	1855	18650	21.21	22	0-1
				1880	18900	21.25	22	0-1
				1905	19150	21.68	22	0-1
			49	1855	18650	21.23	22	0-1
				1880	18900	21.22	22	0-1
				1905	19150	21.56	22	0-1
		25 RB	0	1855	18650	21.34	22	0-2
				1880	18900	21.35	22	0-2
				1905	19150	21.64	22	0-2
			12	1855	18650	21.35	22	0-2
				1880	18900	21.36	22	0-2
				1905	19150	21.66	22	0-2
			25	1855	18650	21.36	22	0-2
				1880	18900	21.35	22	0-2
				1905	19150	21.60	22	0-2
		50RB		1855	18650	21.57	22	0-2
				1880	18900	21.60	22	0-2
				1905	19150	21.59	22	0-2

FDD Band 2 Reduction Power								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
5	QPSK	1 RB	0	1852.5	18625	21.44	22	0
				1880	18900	21.44	22	0
				1907.5	19175	21.55	22	0
			12	1852.5	18625	21.45	22	0
				1880	18900	21.49	22	0
				1907.5	19175	21.77	22	0
			24	1852.5	18625	21.39	22	0
				1880	18900	21.46	22	0
				1907.5	19175	21.72	22	0
		12 RB	0	1852.5	18625	21.48	22	0-1
				1880	18900	21.50	22	0-1
				1907.5	19175	21.80	22	0-1
			6	1852.5	18625	21.49	22	0-1
				1880	18900	21.53	22	0-1
				1907.5	19175	21.83	22	0-1
			13	1852.5	18625	21.48	22	0-1
				1880	18900	21.52	22	0-1
				1907.5	19175	21.78	22	0-1
		25RB		1852.5	18625	21.59	22	0-1
				1880	18900	21.65	22	0-1
				1907.5	19175	21.92	22	0-1
	16-QAM	1 RB	0	1852.5	18625	21.56	22	0-1
				1880	18900	21.59	22	0-1
				1907.5	19175	21.87	22	0-1
			12	1852.5	18625	21.59	22	0-1
				1880	18900	21.61	22	0-1
				1907.5	19175	21.82	22	0-1
			24	1852.5	18625	21.56	22	0-1
				1880	18900	21.53	22	0-1
				1907.5	19175	21.72	22	0-1
		12 RB	0	1852.5	18625	21.38	22	0-2
				1880	18900	21.40	22	0-2
				1907.5	19175	21.64	22	0-2
			6	1852.5	18625	21.41	22	0-2
				1880	18900	21.42	22	0-2
				1907.5	19175	21.61	22	0-2
			13	1852.5	18625	21.40	22	0-2
				1880	18900	21.43	22	0-2
				1907.5	19175	21.54	22	0-2
		25RB		1852.5	18625	21.44	22	0-2
				1880	18900	21.47	22	0-2
				1907.5	19175	21.57	22	0-2

FDD Band 2 Reduction Power								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
3	QPSK	1 RB	0	1851.5	18615	21.30	22	0
				1880	18900	21.33	22	0
				1908.5	19185	21.68	22	0
			7	1851.5	18615	21.38	22	0
				1880	18900	21.45	22	0
				1908.5	19185	21.76	22	0
			14	1851.5	18615	21.40	22	0
				1880	18900	21.70	22	0
				1908.5	19185	21.30	22	0
		8 RB	0	1851.5	18615	21.52	22	0-1
				1880	18900	21.57	22	0-1
				1908.5	19185	21.83	22	0-1
			4	1851.5	18615	21.52	22	0-1
				1880	18900	21.56	22	0-1
				1908.5	19185	21.83	22	0-1
			7	1851.5	18615	21.52	22	0-1
				1880	18900	21.54	22	0-1
				1908.5	19185	21.80	22	0-1
		15RB		1851.5	18615	21.51	22	0-1
				1880	18900	21.55	22	0-1
				1908.5	19185	21.82	22	0-1
	16-QAM	1 RB	0	1851.5	18615	21.35	22	0-1
				1880	18900	21.39	22	0-1
				1908.5	19185	21.69	22	0-1
			7	1851.5	18615	21.42	22	0-1
				1880	18900	21.52	22	0-1
				1908.5	19185	21.73	22	0-1
			14	1851.5	18615	21.36	22	0-1
				1880	18900	21.41	22	0-1
				1908.5	19185	21.64	22	0-1
		8 RB	0	1851.5	18615	21.39	22	0-2
				1880	18900	21.31	22	0-2
				1908.5	19185	21.56	22	0-2
			4	1851.5	18615	21.40	22	0-2
				1880	18900	21.42	22	0-2
				1908.5	19185	21.54	22	0-2
			7	1851.5	18615	21.40	22	0-2
				1880	18900	21.40	22	0-2
				1908.5	19185	21.53	22	0-2
		15RB		1851.5	18615	21.32	22	0-2
				1880	18900	21.42	22	0-2
				1908.5	19185	21.60	22	0-2

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

FDD Band 2 Reduction Power								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
1.4	QPSK	1 RB	0	1850.7	18607	21.39	22	0
				1880	18900	21.45	22	0
				1909.3	19193	21.72	22	0
			2	1850.7	18607	21.48	22	0
				1880	18900	21.53	22	0
				1909.3	19193	21.79	22	0
			5	1850.7	18607	21.40	22	0
				1880	18900	21.49	22	0
				1909.3	19193	21.73	22	0
		3 RB	0	1850.7	18607	21.54	22	0-1
				1880	18900	21.50	22	0-1
				1909.3	19193	21.73	22	0-1
			2	1850.7	18607	21.46	22	0-1
				1880	18900	21.50	22	0-1
				1909.3	19193	21.73	22	0-1
			3	1850.7	18607	21.50	22	0-1
				1880	18900	21.53	22	0-1
				1909.3	19193	21.73	22	0-1
		6RB		1850.7	18607	21.55	22	0-1
				1880	18900	21.60	22	0-1
				1909.3	19193	21.85	22	0-1
	16-QAM	1 RB	0	1850.7	18607	21.63	22	0-1
				1880	18900	21.66	22	0-1
				1909.3	19193	21.61	22	0-1
			2	1850.7	18607	21.72	22	0-1
				1880	18900	21.61	22	0-1
				1909.3	19193	21.64	22	0-1
			5	1850.7	18607	21.67	22	0-1
				1880	18900	21.63	22	0-1
				1909.3	19193	21.80	22	0-1
		3 RB	0	1850.7	18607	21.38	22	0-2
				1880	18900	21.41	22	0-2
				1909.3	19193	21.58	22	0-2
			2	1850.7	18607	21.34	22	0-2
				1880	18900	21.40	22	0-2
				1909.3	19193	21.58	22	0-2
			3	1850.7	18607	21.38	22	0-2
				1880	18900	21.43	22	0-2
				1909.3	19193	21.56	22	0-2
		6RB		1850.7	18607	21.43	22	0-2
				1880	18900	21.46	22	0-2
				1909.3	19193	21.59	22	0-2

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

FDD Band 4								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
20	QPSK	1 RB	0	1720	20050	24.40	24.5	0
				1732.5	20175	24.34	24.5	0
				1745	20300	24.38	24.5	0
			50	1720	20050	24.41	24.5	0
				1732.5	20175	24.39	24.5	0
				1745	20300	24.25	24.5	0
			99	1720	20050	24.27	24.5	0
				1732.5	20175	24.29	24.5	0
				1745	20300	24.19	24.5	0
		50 RB	0	1720	20050	23.52	24	0-1
				1732.5	20175	23.43	24	0-1
				1745	20300	23.55	24	0-1
			25	1720	20050	23.45	24	0-1
				1732.5	20175	23.47	24	0-1
				1745	20300	23.40	24	0-1
			50	1720	20050	23.44	24	0-1
				1732.5	20175	23.54	24	0-1
				1745	20300	23.53	24	0-1
		100RB		1720	20050	23.40	24	0-1
				1732.5	20175	23.44	24	0-1
				1745	20300	23.46	24	0-1
	16-QAM	1 RB	0	1720	20050	23.67	24	0-1
				1732.5	20175	23.67	24	0-1
				1745	20300	23.58	24	0-1
			50	1720	20050	23.51	24	0-1
				1732.5	20175	23.79	24	0-1
				1745	20300	23.54	24	0-1
			99	1720	20050	23.59	24	0-1
				1732.5	20175	23.48	24	0-1
				1745	20300	23.47	24	0-1
		50 RB	0	1720	20050	22.52	23	0-2
				1732.5	20175	22.53	23	0-2
				1745	20300	22.45	23	0-2
			25	1720	20050	22.48	23	0-2
				1732.5	20175	22.44	23	0-2
				1745	20300	22.49	23	0-2
			50	1720	20050	22.49	23	0-2
				1732.5	20175	22.47	23	0-2
				1745	20300	22.43	23	0-2
		100RB		1720	20050	22.43	23	0-2
				1732.5	20175	22.48	23	0-2
				1745	20300	22.44	23	0-2

FDD Band 4								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
15	QPSK	1 RB	0	1717.5	20025	24.44	24.5	0
				1732.5	20175	24.29	24.5	0
				1747.5	20325	24.25	24.5	0
			36	1717.5	20025	24.26	24.5	0
				1732.5	20175	24.21	24.5	0
				1747.5	20325	24.24	24.5	0
			74	1717.5	20025	24.24	24.5	0
				1732.5	20175	24.17	24.5	0
				1747.5	20325	24.18	24.5	0
		36 RB	0	1717.5	20025	23.55	24	0-1
				1732.5	20175	23.43	24	0-1
				1747.5	20325	23.37	24	0-1
			18	1717.5	20025	23.49	24	0-1
				1732.5	20175	23.41	24	0-1
				1747.5	20325	23.37	24	0-1
			37	1717.5	20025	23.43	24	0-1
				1732.5	20175	23.42	24	0-1
				1747.5	20325	23.37	24	0-1
		75RB		1717.5	20025	23.51	24	0-1
				1732.5	20175	23.43	24	0-1
				1747.5	20325	23.34	24	0-1
	16-QAM	1 RB	0	1717.5	20025	23.55	24	0-1
				1732.5	20175	23.73	24	0-1
				1747.5	20325	23.23	24	0-1
			36	1717.5	20025	23.25	24	0-1
				1732.5	20175	23.76	24	0-1
				1747.5	20325	23.51	24	0-1
			74	1717.5	20025	23.18	24	0-1
				1732.5	20175	23.45	24	0-1
				1747.5	20325	23.25	24	0-1
		36 RB	0	1717.5	20025	22.57	23	0-2
				1732.5	20175	22.43	23	0-2
				1747.5	20325	22.45	23	0-2
			18	1717.5	20025	22.48	23	0-2
				1732.5	20175	22.47	23	0-2
				1747.5	20325	22.38	23	0-2
			37	1717.5	20025	22.44	23	0-2
				1732.5	20175	22.45	23	0-2
				1747.5	20325	22.43	23	0-2
		75RB		1717.5	20025	22.46	23	0-2
				1732.5	20175	22.46	23	0-2
				1747.5	20325	22.46	23	0-2

FDD Band 4								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
10	QPSK	1 RB	0	1715	20000	24.40	24.5	0
				1732.5	20175	24.14	24.5	0
				1750	20350	24.23	24.5	0
			25	1715	20000	24.24	24.5	0
				1732.5	20175	24.35	24.5	0
				1750	20350	24.27	24.5	0
			49	1715	20000	24.33	24.5	0
				1732.5	20175	24.15	24.5	0
				1750	20350	24.17	24.5	0
		25 RB	0	1715	20000	23.48	24	0-1
				1732.5	20175	23.40	24	0-1
				1750	20350	23.32	24	0-1
			12	1715	20000	23.46	24	0-1
				1732.5	20175	23.34	24	0-1
				1750	20350	23.30	24	0-1
			25	1715	20000	23.40	24	0-1
				1732.5	20175	23.35	24	0-1
				1750	20350	23.29	24	0-1
		50RB		1715	20000	23.39	24	0-1
				1732.5	20175	23.36	24	0-1
				1750	20350	23.33	24	0-1
	16-QAM	1 RB	0	1715	20000	23.64	24	0-1
				1732.5	20175	23.75	24	0-1
				1750	20350	23.26	24	0-1
			25	1715	20000	23.48	24	0-1
				1732.5	20175	23.66	24	0-1
				1750	20350	23.44	24	0-1
			49	1715	20000	23.45	24	0-1
				1732.5	20175	23.26	24	0-1
				1750	20350	23.31	24	0-1
		25 RB	0	1715	20000	22.52	23	0-2
				1732.5	20175	22.48	23	0-2
				1750	20350	22.37	23	0-2
			12	1715	20000	22.49	23	0-2
				1732.5	20175	22.42	23	0-2
				1750	20350	22.31	23	0-2
			25	1715	20000	22.47	23	0-2
				1732.5	20175	22.41	23	0-2
				1750	20350	22.25	23	0-2
		50RB		1715	20000	22.46	23	0-2
				1732.5	20175	22.45	23	0-2
				1750	20350	22.36	23	0-2

FDD Band 4								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
5	QPSK	1 RB	0	1712.5	19975	24.34	24.5	0
				1732.5	20175	24.30	24.5	0
				1752.5	20375	24.29	24.5	0
			12	1712.5	19975	24.12	24.5	0
				1732.5	20175	24.25	24.5	0
				1752.5	20375	24.15	24.5	0
			24	1712.5	19975	24.28	24.5	0
				1732.5	20175	24.11	24.5	0
				1752.5	20375	24.13	24.5	0
		12 RB	0	1712.5	19975	23.54	24	0-1
				1732.5	20175	23.37	24	0-1
				1752.5	20375	23.37	24	0-1
			6	1712.5	19975	23.53	24	0-1
				1732.5	20175	23.37	24	0-1
				1752.5	20375	23.33	24	0-1
			13	1712.5	19975	23.52	24	0-1
				1732.5	20175	23.36	24	0-1
				1752.5	20375	23.32	24	0-1
		25RB		1712.5	19975	23.47	24	0-1
				1732.5	20175	23.31	24	0-1
				1752.5	20375	23.28	24	0-1
	16-QAM	1 RB	0	1712.5	19975	23.69	24	0-1
				1732.5	20175	23.73	24	0-1
				1752.5	20375	23.51	24	0-1
			12	1712.5	19975	23.56	24	0-1
				1732.5	20175	23.29	24	0-1
				1752.5	20375	23.44	24	0-1
			24	1712.5	19975	23.81	24	0-1
				1732.5	20175	23.77	24	0-1
				1752.5	20375	23.27	24	0-1
		12 RB	0	1712.5	19975	22.58	23	0-2
				1732.5	20175	22.34	23	0-2
				1752.5	20375	22.47	23	0-2
			6	1712.5	19975	22.54	23	0-2
				1732.5	20175	22.47	23	0-2
				1752.5	20375	22.39	23	0-2
			13	1712.5	19975	22.59	23	0-2
				1732.5	20175	22.46	23	0-2
				1752.5	20375	22.28	23	0-2
		25RB		1712.5	19975	22.52	23	0-2
				1732.5	20175	22.28	23	0-2
				1752.5	20375	22.37	23	0-2

FDD Band 4								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
3	QPSK	1 RB	0	1711.5	19965	24.37	24.5	0
				1732.5	20175	24.08	24.5	0
				1753.5	20385	24.14	24.5	0
			7	1711.5	19965	24.21	24.5	0
				1732.5	20175	24.23	24.5	0
				1753.5	20385	24.20	24.5	0
			14	1711.5	19965	24.27	24.5	0
				1732.5	20175	24.22	24.5	0
				1753.5	20385	24.09	24.5	0
		8 RB	0	1711.5	19965	23.52	24	0-1
				1732.5	20175	23.36	24	0-1
				1753.5	20385	23.33	24	0-1
			4	1711.5	19965	23.50	24	0-1
				1732.5	20175	23.36	24	0-1
				1753.5	20385	23.30	24	0-1
			7	1711.5	19965	23.49	24	0-1
				1732.5	20175	23.34	24	0-1
				1753.5	20385	23.29	24	0-1
		15RB		1711.5	19965	23.50	24	0-1
				1732.5	20175	23.35	24	0-1
				1753.5	20385	23.33	24	0-1
	16-QAM	1 RB	0	1711.5	19965	23.70	24	0-1
				1732.5	20175	23.65	24	0-1
				1753.5	20385	23.37	24	0-1
			7	1711.5	19965	23.94	24	0-1
				1732.5	20175	23.32	24	0-1
				1753.5	20385	23.58	24	0-1
			14	1711.5	19965	23.33	24	0-1
				1732.5	20175	23.52	24	0-1
				1753.5	20385	23.29	24	0-1
		8 RB	0	1711.5	19965	22.59	23	0-2
				1732.5	20175	22.51	23	0-2
				1753.5	20385	22.46	23	0-2
			4	1711.5	19965	22.55	23	0-2
				1732.5	20175	22.51	23	0-2
				1753.5	20385	22.36	23	0-2
			7	1711.5	19965	22.53	23	0-2
				1732.5	20175	22.39	23	0-2
				1753.5	20385	22.36	23	0-2
		15RB		1711.5	19965	22.50	23	0-2
				1732.5	20175	22.53	23	0-2
				1753.5	20385	22.28	23	0-2

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

FDD Band 4

BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
1.4	QPSK	1 RB	0	1710.7	19957	24.35	24.5	0
				1732.5	20175	24.18	24.5	0
				1754.3	20393	24.15	24.5	0
			2	1710.7	19957	24.21	24.5	0
				1732.5	20175	24.23	24.5	0
				1754.3	20393	24.19	24.5	0
			5	1710.7	19957	24.26	24.5	0
				1732.5	20175	24.27	24.5	0
				1754.3	20393	24.27	24.5	0
		3 RB	0	1710.7	19957	23.46	24	0-1
				1732.5	20175	23.31	24	0-1
				1754.3	20393	23.29	24	0-1
			2	1710.7	19957	23.27	24	0-1
				1732.5	20175	23.31	24	0-1
				1754.3	20393	23.26	24	0-1
			3	1710.7	19957	23.38	24	0-1
				1732.5	20175	23.31	24	0-1
				1754.3	20393	23.29	24	0-1
		6RB		1710.7	19957	23.44	24	0-1
				1732.5	20175	23.36	24	0-1
				1754.3	20393	23.29	24	0-1
	16-QAM	1 RB	0	1710.7	19957	23.51	24	0-1
				1732.5	20175	23.71	24	0-1
				1754.3	20393	23.36	24	0-1
			2	1710.7	19957	23.44	24	0-1
				1732.5	20175	23.50	24	0-1
				1754.3	20393	23.58	24	0-1
			5	1710.7	19957	23.26	24	0-1
				1732.5	20175	23.36	24	0-1
				1754.3	20393	23.25	24	0-1
		3 RB	0	1710.7	19957	22.43	23	0-2
				1732.5	20175	22.44	23	0-2
				1754.3	20393	22.36	23	0-2
			2	1710.7	19957	22.32	23	0-2
				1732.5	20175	22.35	23	0-2
				1754.3	20393	22.28	23	0-2
			3	1710.7	19957	22.52	23	0-2
				1732.5	20175	22.28	23	0-2
				1754.3	20393	22.33	23	0-2
		6RB		1710.7	19957	22.47	23	0-2
				1732.5	20175	22.58	23	0-2
				1754.3	20393	22.37	23	0-2

FDD Band 5								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
10	QPSK	1 RB	0	829	20450	24.36	24.5	0
				836.5	20525	24.22	24.5	0
				844	20600	24.16	24.5	0
			25	829	20450	24.22	24.5	0
				836.5	20525	24.23	24.5	0
				844	20600	24.30	24.5	0
			49	829	20450	24.25	24.5	0
				836.5	20525	24.21	24.5	0
				844	20600	24.24	24.5	0
		25 RB	0	829	20450	23.38	24	0-1
				836.5	20525	23.25	24	0-1
				844	20600	23.27	24	0-1
			12	829	20450	23.37	24	0-1
				836.5	20525	23.27	24	0-1
				844	20600	23.40	24	0-1
			25	829	20450	23.34	24	0-1
				836.5	20525	23.29	24	0-1
				844	20600	23.41	24	0-1
		50RB		829	20450	23.38	24	0-1
				836.5	20525	23.24	24	0-1
				844	20600	23.41	24	0-1
	16-QAM	1 RB	0	829	20450	23.88	24	0-1
				836.5	20525	23.58	24	0-1
				844	20600	23.43	24	0-1
			25	829	20450	23.59	24	0-1
				836.5	20525	23.25	24	0-1
				844	20600	23.58	24	0-1
			49	829	20450	23.46	24	0-1
				836.5	20525	23.48	24	0-1
				844	20600	23.77	24	0-1
		25 RB	0	829	20450	22.47	23	0-2
				836.5	20525	22.34	23	0-2
				844	20600	22.54	23	0-2
			12	829	20450	22.47	23	0-2
				836.5	20525	22.34	23	0-2
				844	20600	22.58	23	0-2
			25	829	20450	22.42	23	0-2
				836.5	20525	22.46	23	0-2
				844	20600	22.51	23	0-2
		50RB		829	20450	22.44	23	0-2
				836.5	20525	22.38	23	0-2
				844	20600	22.48	23	0-2

FDD Band 5								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
5	QPSK	1 RB	0	826.5	20425	24.36	24.5	0
				836.5	20525	24.18	24.5	0
				846.5	20625	24.17	24.5	0
			12	826.5	20425	24.19	24.5	0
				836.5	20525	24.12	24.5	0
				846.5	20625	24.29	24.5	0
			24	826.5	20425	24.28	24.5	0
				836.5	20525	24.14	24.5	0
				846.5	20625	24.11	24.5	0
		12 RB	0	826.5	20425	23.42	24	0-1
				836.5	20525	23.21	24	0-1
				846.5	20625	23.23	24	0-1
			6	826.5	20425	23.31	24	0-1
				836.5	20525	23.26	24	0-1
				846.5	20625	23.39	24	0-1
			13	826.5	20425	23.32	24	0-1
				836.5	20525	23.28	24	0-1
				846.5	20625	23.40	24	0-1
		25RB		826.5	20425	23.31	24	0-1
				836.5	20525	23.19	24	0-1
				846.5	20625	23.38	24	0-1
	16-QAM	1 RB	0	826.5	20425	23.34	24	0-1
				836.5	20525	23.40	24	0-1
				846.5	20625	23.46	24	0-1
			12	826.5	20425	23.65	24	0-1
				836.5	20525	23.28	24	0-1
				846.5	20625	23.66	24	0-1
			24	826.5	20425	23.49	24	0-1
				836.5	20525	23.35	24	0-1
				846.5	20625	23.71	24	0-1
		12 RB	0	826.5	20425	22.42	23	0-2
				836.5	20525	22.30	23	0-2
				846.5	20625	22.54	23	0-2
			6	826.5	20425	22.47	23	0-2
				836.5	20525	22.32	23	0-2
				846.5	20625	22.56	23	0-2
			13	826.5	20425	22.41	23	0-2
				836.5	20525	22.37	23	0-2
				846.5	20625	22.50	23	0-2
		25RB		826.5	20425	22.41	23	0-2
				836.5	20525	22.30	23	0-2
				846.5	20625	22.45	23	0-2

FDD Band 5								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
3	QPSK	1 RB	0	825.5	20415	24.27	24.5	0
				836.5	20525	24.08	24.5	0
				847.5	20635	24.15	24.5	0
			7	825.5	20415	23.24	24.5	0
				836.5	20525	24.07	24.5	0
				847.5	20635	24.18	24.5	0
			14	825.5	20415	24.22	24.5	0
				836.5	20525	24.15	24.5	0
				847.5	20635	24.06	24.5	0
		8 RB	0	825.5	20415	23.34	24	0-1
				836.5	20525	23.24	24	0-1
				847.5	20635	23.25	24	0-1
			4	825.5	20415	23.36	24	0-1
				836.5	20525	23.24	24	0-1
				847.5	20635	23.36	24	0-1
			7	825.5	20415	23.36	24	0-1
				836.5	20525	23.23	24	0-1
				847.5	20635	23.35	24	0-1
		15RB		825.5	20415	23.41	24	0-1
				836.5	20525	23.20	24	0-1
				847.5	20635	23.39	24	0-1
	16-QAM	1 RB	0	825.5	20415	23.29	24	0-1
				836.5	20525	23.53	24	0-1
				847.5	20635	23.46	24	0-1
			7	825.5	20415	23.51	24	0-1
				836.5	20525	23.06	24	0-1
				847.5	20635	23.51	24	0-1
			14	825.5	20415	23.61	24	0-1
				836.5	20525	23.52	24	0-1
				847.5	20635	23.10	24	0-1
		8 RB	0	825.5	20415	22.58	23	0-2
				836.5	20525	22.31	23	0-2
				847.5	20635	22.52	23	0-2
			4	825.5	20415	22.58	23	0-2
				836.5	20525	22.36	23	0-2
				847.5	20635	22.47	23	0-2
			7	825.5	20415	22.52	23	0-2
				836.5	20525	22.45	23	0-2
				847.5	20635	22.55	23	0-2
		15RB		825.5	20415	22.54	23	0-2
				836.5	20525	22.27	23	0-2
				847.5	20635	22.45	23	0-2

FDD Band 5								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
1.4	QPSK	1 RB	0	824.7	20407	24.19	24.5	0
				836.5	20525	24.06	24.5	0
				848.3	20643	24.15	24.5	0
			2	824.7	20407	24.29	24.5	0
				836.5	20525	24.14	24.5	0
				848.3	20643	24.35	24.5	0
			5	824.7	20407	24.21	24.5	0
				836.5	20525	24.13	24.5	0
				848.3	20643	24.14	24.5	0
		3 RB	0	824.7	20407	23.30	24	0-1
				836.5	20525	23.21	24	0-1
				848.3	20643	23.32	24	0-1
			2	824.7	20407	23.29	24	0-1
				836.5	20525	23.13	24	0-1
				848.3	20643	23.23	24	0-1
			3	824.7	20407	23.23	24	0-1
				836.5	20525	23.19	24	0-1
				848.3	20643	23.36	24	0-1
		6RB		824.7	20407	23.33	24	0-1
				836.5	20525	23.18	24	0-1
				848.3	20643	23.39	24	0-1
	16-QAM	1 RB	0	824.7	20407	23.46	24	0-1
				836.5	20525	23.60	24	0-1
				848.3	20643	23.19	24	0-1
			2	824.7	20407	23.76	24	0-1
				836.5	20525	23.38	24	0-1
				848.3	20643	23.79	24	0-1
			5	824.7	20407	23.13	24	0-1
				836.5	20525	23.43	24	0-1
				848.3	20643	23.47	24	0-1
		3 RB	0	824.7	20407	22.35	23	0-2
				836.5	20525	22.33	23	0-2
				848.3	20643	22.39	23	0-2
			2	824.7	20407	22.31	23	0-2
				836.5	20525	22.17	23	0-2
				848.3	20643	22.31	23	0-2
			3	824.7	20407	22.45	23	0-2
				836.5	20525	22.16	23	0-2
				848.3	20643	22.37	23	0-2
		6RB		824.7	20407	22.39	23	0-2
				836.5	20525	22.47	23	0-2
				848.3	20643	22.49	23	0-2

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

FDD Band 7								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
20	QPSK	1 RB	0	2510	20850	22.01	22.3	0
				2535	21100	21.97	22.3	0
				2560	21350	22.09	22.3	0
			50	2510	20850	22.03	22.3	0
				2535	21100	22.06	22.3	0
				2560	21350	22.16	22.3	0
			99	2510	20850	22.14	22.3	0
				2535	21100	22.28	22.3	0
				2560	21350	22.27	22.3	0
		50 RB	0	2510	20850	21.03	22	0-1
				2535	21100	21.12	22	0-1
				2560	21350	21.26	22	0-1
			25	2510	20850	21.02	22	0-1
				2535	21100	21.13	22	0-1
				2560	21350	21.26	22	0-1
			50	2510	20850	21.14	22	0-1
				2535	21100	21.23	22	0-1
				2560	21350	21.32	22	0-1
		100RB		2510	20850	21.02	22	0-1
				2535	21100	21.17	22	0-1
				2560	21350	21.24	22	0-1
	16-QAM	1 RB	0	2510	20850	21.22	22	0-1
				2535	21100	21.02	22	0-1
				2560	21350	21.06	22	0-1
			50	2510	20850	21.19	22	0-1
				2535	21100	21.10	22	0-1
				2560	21350	21.02	22	0-1
			99	2510	20850	21.34	22	0-1
				2535	21100	21.28	22	0-1
				2560	21350	21.25	22	0-1
		50 RB	0	2510	20850	20.01	21	0-2
				2535	21100	20.21	21	0-2
				2560	21350	20.18	21	0-2
			25	2510	20850	20.08	21	0-2
				2535	21100	20.23	21	0-2
				2560	21350	20.33	21	0-2
			50	2510	20850	20.15	21	0-2
				2535	21100	20.30	21	0-2
				2560	21350	20.36	21	0-2
		100RB		2510	20850	20.10	21	0-2
				2535	21100	20.16	21	0-2
				2560	21350	20.20	21	0-2

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

FDD Band 7								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
15	QPSK	1 RB	0	2507.5	20825	21.99	22.3	0
				2535	21100	22.00	22.3	0
				2562.5	21375	22.09	22.3	0
			36	2507.5	20825	21.99	22.3	0
				2535	21100	22.12	22.3	0
				2562.5	21375	22.17	22.3	0
			74	2507.5	20825	22.06	22.3	0
				2535	21100	22.23	22.3	0
				2562.5	21375	22.26	22.3	0
		36 RB	0	2507.5	20825	21.04	22	0-1
				2535	21100	21.15	22	0-1
				2562.5	21375	21.29	22	0-1
			18	2507.5	20825	21.07	22	0-1
				2535	21100	21.18	22	0-1
				2562.5	21375	21.24	22	0-1
			37	2507.5	20825	21.18	22	0-1
				2535	21100	21.27	22	0-1
				2562.5	21375	21.31	22	0-1
		75RB		2507.5	20825	21.08	22	0-1
				2535	21100	21.20	22	0-1
				2562.5	21375	21.26	22	0-1
	16-QAM	1 RB	0	2507.5	20825	21.19	22	0-1
				2535	21100	21.20	22	0-1
				2562.5	21375	21.49	22	0-1
			36	2507.5	20825	21.17	22	0-1
				2535	21100	21.33	22	0-1
				2562.5	21375	21.59	22	0-1
			74	2507.5	20825	21.21	22	0-1
				2535	21100	21.30	22	0-1
				2562.5	21375	21.71	22	0-1
		36 RB	0	2507.5	20825	20.03	21	0-2
				2535	21100	20.11	21	0-2
				2562.5	21375	20.13	21	0-2
			18	2507.5	20825	20.02	21	0-2
				2535	21100	20.16	21	0-2
				2562.5	21375	20.13	21	0-2
			37	2507.5	20825	20.07	21	0-2
				2535	21100	20.21	21	0-2
				2562.5	21375	20.23	21	0-2
		75RB		2507.5	20825	20.04	21	0-2
				2535	21100	20.17	21	0-2
				2562.5	21375	20.15	21	0-2

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

FDD Band 7

BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
10	QPSK	1 RB	0	2505	20800	21.82	22.3	0
				2535	21100	21.98	22.3	0
				2565	21400	22.16	22.3	0
			25	2505	20800	21.81	22.3	0
				2535	21100	21.99	22.3	0
				2565	21400	22.19	22.3	0
			49	2505	20800	21.87	22.3	0
				2535	21100	22.09	22.3	0
				2565	21400	22.25	22.3	0
		25 RB	0	2505	20800	21.03	22	0-1
				2535	21100	21.14	22	0-1
				2565	21400	21.20	22	0-1
			12	2505	20800	21.05	22	0-1
				2535	21100	21.14	22	0-1
				2565	21400	21.20	22	0-1
			25	2505	20800	21.04	22	0-1
				2535	21100	21.17	22	0-1
				2565	21400	21.14	22	0-1
		50RB		2505	20800	21.02	22	0-1
				2535	21100	21.16	22	0-1
				2565	21400	21.22	22	0-1
	16-QAM	1 RB	0	2505	20800	21.21	22	0-1
				2535	21100	21.50	22	0-1
				2565	21400	21.43	22	0-1
			25	2505	20800	21.15	22	0-1
				2535	21100	21.53	22	0-1
				2565	21400	21.49	22	0-1
			49	2505	20800	21.20	22	0-1
				2535	21100	21.60	22	0-1
				2565	21400	21.54	22	0-1
		25 RB	0	2505	20800	20.04	21	0-2
				2535	21100	20.08	21	0-2
				2565	21400	20.08	21	0-2
			12	2505	20800	20.03	21	0-2
				2535	21100	20.07	21	0-2
				2565	21400	20.07	21	0-2
			25	2505	20800	20.02	21	0-2
				2535	21100	20.12	21	0-2
				2565	21400	20.12	21	0-2
		50RB		2505	20800	20.00	21	0-2
				2535	21100	20.14	21	0-2
				2565	21400	20.11	21	0-2

FDD Band 7

BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
5	QPSK	1 RB	0	2502.5	20775	21.93	22.3	0
				2535	21100	22.04	22.3	0
				2567.5	21425	22.12	22.3	0
			12	2502.5	20775	22.01	22.3	0
				2535	21100	22.12	22.3	0
				2567.5	21425	22.24	22.3	0
			24	2502.5	20775	21.89	22.3	0
				2535	21100	22.05	22.3	0
				2567.5	21425	22.11	22.3	0
		12 RB	0	2502.5	20775	21.07	22	0-1
				2535	21100	21.18	22	0-1
				2567.5	21425	21.25	22	0-1
			6	2502.5	20775	21.12	22	0-1
				2535	21100	21.16	22	0-1
				2567.5	21425	21.26	22	0-1
			13	2502.5	20775	21.06	22	0-1
				2535	21100	21.19	22	0-1
				2567.5	21425	21.28	22	0-1
		25RB		2502.5	20775	21.03	22	0-1
				2535	21100	21.15	22	0-1
				2567.5	21425	21.23	22	0-1
	16-QAM	1 RB	0	2502.5	20775	21.18	22	0-1
				2535	21100	21.24	22	0-1
				2567.5	21425	21.30	22	0-1
			12	2502.5	20775	21.27	22	0-1
				2535	21100	21.25	22	0-1
				2567.5	21425	21.35	22	0-1
			24	2502.5	20775	21.07	22	0-1
				2535	21100	21.26	22	0-1
				2567.5	21425	21.27	22	0-1
		12 RB	0	2502.5	20775	20.07	21	0-2
				2535	21100	20.17	21	0-2
				2567.5	21425	20.24	21	0-2
			6	2502.5	20775	20.06	21	0-2
				2535	21100	20.17	21	0-2
				2567.5	21425	20.26	21	0-2
			13	2502.5	20775	20.08	21	0-2
				2535	21100	20.19	21	0-2
				2567.5	21425	20.23	21	0-2
		25RB		2502.5	20775	20.01	21	0-2
				2535	21100	20.07	21	0-2
				2567.5	21425	20.24	21	0-2

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

#. **WLAN802.11 a/b/g/n (20M/40M) conducted power table:**

802.11b		Max. Rated Avg. Power + Max. Tolerance (dBm)	Average Power Output (dBm)			
			Data Rate (Mbps)			
CH	Frequency (MHz)		1	2	5.5	11
1	2412	16.00	15.99	15.87	15.76	15.66
6	2437	16.00	15.87	15.77	15.65	15.51
11	2462	16.00	15.94	15.87	15.79	15.65

802.11g		Max. Rated Avg. Power + Max. Tolerance (dBm)	Average Power Output(dBm)							
			Data Rate (Mbps)							
CH	Frequency (MHz)		6	9	12	18	24	36	48	54
1	2412	15.00	14.74	14.68	14.61	14.54	14.33	14.21	14.17	14.11
6	2437	15.00	14.78	14.62	14.55	14.41	14.32	14.27	14.07	14.00
11	2462	15.00	14.82	14.72	14.64	14.53	14.41	14.36	14.22	14.12

802.11n (20M)		Max. Rated Avg. Power + Max. Tolerance (dBm)	Average Power Output(dBm)							
			Data Rate (Mbps)							
CH	Frequency (MHz)		6.5	13	19.5	26	39	52	58.5	65
1	2412	11.50	11.20	11.14	11.09	11.01	10.92	10.84	10.74	10.62
6	2437	11.50	11.12	11.04	10.98	10.91	10.82	10.72	10.64	10.55
11	2462	11.50	11.14	11.09	10.95	10.84	10.78	10.72	10.62	10.58

802.11n (40M)		Max. Rated Avg. Power + Max. Tolerance (dBm)	Average Power Output(dBm)							
			Data Rate (Mbps)							
CH	Frequency (MHz)		13.5	27	40.5	54	81	108	121.5	135
3	2422	11.50	11.31	11.08	10.92	10.84	10.73	10.63	10.57	10.51
6	2437	11.50	11.40	11.33	11.20	11.14	11.07	11.01	10.94	10.85
9	2452	11.50	11.48	11.35	11.21	11.08	11.00	10.95	10.85	10.64

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

802.11a 5.2G/5.3G/5.6G/5.8G		Max. Rated Avg. Power + Max. Tolerance (dBm)	Average Power (dBm)							
CH	Frequency (MHz)		Data Rate (Mbps)							
			6	9	12	18	24	36	48	54
36	5180	14.00	13.77	13.62	13.54	13.41	13.34	13.28	13.18	13.07
40	5200	14.00	13.82	13.72	13.61	13.57	13.42	13.39	13.32	13.27
44	5220	14.00	13.87	13.75	13.70	13.64	13.54	13.48	13.42	13.37
48	5240	14.00	13.93	13.88	13.72	13.62	13.51	13.41	13.38	13.21
52	5260	14.00	13.99	13.84	13.75	13.62	13.54	13.43	13.31	13.28
56	5280	14.00	13.95	13.87	13.81	13.74	13.54	13.42	13.36	13.28
60	5300	14.00	13.98	13.85	13.81	13.64	13.58	13.50	13.47	13.32
64	5320	14.00	13.67	13.52	13.44	13.36	13.27	13.18	13.07	13.02
100	5500	14.00	13.87	13.76	13.61	13.54	13.41	13.27	13.18	13.08
104	5520	14.00	13.86	13.75	13.66	13.54	13.43	13.31	13.25	13.15
108	5540	14.00	13.88	13.81	13.72	13.61	13.52	13.41	13.34	13.24
112	5560	14.00	13.68	13.54	13.44	13.35	13.26	13.22	13.15	13.04
116	5580	14.00	13.82	13.72	13.64	13.51	13.48	13.22	13.17	13.05
132	5660	14.00	13.94	13.88	13.74	13.64	13.53	13.48	13.34	13.25
136	5680	14.00	13.65	13.61	13.52	13.42	13.34	13.27	13.15	13.02
140	5700	14.00	13.99	13.85	13.72	13.61	13.54	13.42	13.34	13.28
149	5745	14.00	13.77	13.62	13.54	13.42	13.34	13.27	13.18	13.14
153	5765	14.00	13.82	13.71	13.61	13.54	13.42	13.37	13.32	13.24
157	5785	14.00	13.83	13.72	13.67	13.55	13.41	13.38	13.24	13.12
161	5805	14.00	13.74	13.66	13.54	13.48	13.37	13.27	13.15	13.03
165	5825	14.00	13.72	13.61	13.54	13.42	13.31	13.21	13.17	13.08

802.11n(20M) 5.2G/5.3G/5.6G/5.8G		Max. Rated Avg. Power + Max. Tolerance (dBm)	Average Power (dBm)							
			Data Rate (Mbps)							
CH	Frequency (MHz)		6.5	13	19.5	26	39	52	58.5	65
36	5180	13.00	12.86	12.75	12.62	12.54	12.41	12.34	12.26	12.15
40	5200	13.00	12.47	12.42	12.34	12.28	12.23	12.18	12.14	12.02
44	5220	13.00	12.73	12.62	12.54	12.42	12.37	12.25	12.17	12.08
48	5240	13.00	12.44	12.38	12.33	12.27	12.22	12.19	12.12	12.01
52	5260	13.00	12.86	12.75	12.62	12.52	12.42	12.34	12.28	12.17
56	5280	13.00	12.52	12.48	12.45	12.31	12.26	12.22	12.12	12.02
60	5300	13.00	12.99	12.84	12.72	12.67	12.50	12.42	12.31	12.25
64	5320	13.00	12.60	12.52	12.41	12.37	12.21	12.17	12.12	12.04
100	5500	13.00	12.86	12.81	12.72	12.61	12.52	12.41	12.34	12.28
104	5520	13.00	12.83	12.72	12.61	12.57	12.42	12.32	12.18	12.08
108	5540	13.00	12.91	12.85	12.75	12.64	12.52	12.46	12.34	12.25
112	5560	13.00	12.74	12.64	12.52	12.41	12.34	12.28	12.18	12.08
116	5580	13.00	12.54	12.44	12.38	12.32	12.25	12.16	12.12	12.05
132	5660	13.00	12.97	12.82	12.73	12.62	12.54	12.42	12.37	12.24
136	5680	13.00	12.96	12.82	12.74	12.61	12.57	12.40	12.33	12.25
140	5700	13.00	12.58	12.52	12.44	12.34	12.28	12.25	12.17	12.09
149	5745	13.00	12.60	12.54	12.42	12.39	12.29	12.18	12.09	12.01
153	5765	13.00	12.76	12.65	12.60	12.52	12.41	12.34	12.28	12.18
157	5785	13.00	12.78	12.62	12.53	12.44	12.35	12.28	12.24	12.16
161	5805	13.00	12.83	12.64	12.55	12.41	12.37	12.31	12.27	12.18
165	5825	13.00	12.66	12.61	12.59	12.45	12.31	12.25	12.12	12.05

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

802.11n(40M) 5.2G/5.3G/5.6G/5.8G		Max. Rated Avg. Power + Max. Tolerance (dBm)	Average Power (dBm)							
			Data Rate (Mbps)							
CH	Frequency (MHz)		13.5	27	40.5	54	81	108	121.5	135
38	5190	10.50	10.25	10.17	10.11	10.05	9.98	9.85	9.77	9.68
46	5230	12.00	11.77	11.65	11.57	11.45	11.36	11.21	11.18	11.11
54	5270	12.00	11.74	11.65	11.54	11.42	11.32	11.24	11.16	11.06
62	5310	11.50	11.40	11.32	11.29	11.22	11.13	11.02	10.94	10.86
102	5510	11.50	11.30	11.21	11.15	11.07	10.96	10.81	10.76	10.69
110	5550	12.00	11.79	11.70	11.61	11.52	11.44	11.36	11.28	11.19
134	5670	12.00	11.87	11.79	11.65	11.52	11.43	11.33	11.21	11.18
151	5755	12.00	11.99	11.91	11.82	11.73	11.66	11.58	11.51	11.40
159	5795	12.00	11.76	11.68	11.57	11.44	11.36	11.28	11.16	11.09

#. Bluetooth conducted power table:

Frequency (MHz)	Peak (dBm)		
	BR-DH5	ER-2DH5	ER-3DH5
2402	3.50	3.13	3.24
2441	5.38	4.74	4.80
2480	4.42	3.80	3.90

Frequency (MHz)	Avg. (dBm)
	BT4.0
2402	-6
2442	-3.86
2480	-5.21

1.4 Test Environment

Ambient Temperature : 22±2° C
Tissue Simulating Liquid: 22±2° C

1.5 Operation Description

General:

1. The EUT is controlled by using a Radio Communication Tester (R&S CMU200 and Antrisu MT8820C), and the communication between the EUT and the tester is established by air link.
2. Measurements are performed respectively on the lowest, middle and highest channels of the operating band(s). The EUT is set to maximum power level during all tests, and at the beginning of each test the battery is fully charged.
3. During the SAR testing, the DASY 5 system checks power drift by comparing the e-field strength of one specific location measured at the beginning with that measured at the end of the SAR testing.
4. Testing head SAR at lowest, middle and highest channel for all bands with Left Tilt /Left Cheek/Right Tilt/Right Cheek conditions.
5. Testing body-worn SAR by separating the EUT and the phantom **15mm** distance when performing GSM850/1900, WCDMA Band II/IV/V, LTE Band 2/4/5/7 and WLAN 5G. (Both front side & back side)
6. Testing hotspot mode SAR by separating the EUT and the phantom **10mm** distance.
   #. The SAR testing for portable devices with wireless router capability is refered as test guidance of **KDB 941225D06v02** (SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities).
   #. The following procedures are applicable when the overall device length and width are ≥9 cm x 5 cm respectively. A test separation of 10 mm is required. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25 mm from that surface or edge, for the data modes, wireless technologies and frequency bands supporting hotspot mode.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

For WLAN 2.4G (15mm separation): the testing device support mobile hotspot function, the separation distance is **10mm {No need to perform body-worn SAR testing due to the hotspot mode(10mm separation distance) is more conservative than body-worn mode (15mm separation distance).}**

Test configurations:

(1) Front side
(2) Back side
(3) Top side.(WWAN antenna to edge distance >25mm_ No SAR measurement is necessary for this configuration)
(4) Bottom side. (WLAN antenna to edge distance >25mm_ No SAR measurement is necessary for this configuration)
(5) Right side. (WLAN antenna to edge distance >25mm_ No SAR measurement is necessary for this configuration)
(6) Left side.

7. According to **KDB447498D01v05r02** – The 1-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances≤ 50 mm are determined by: [(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR, SAR evaluation is not required. **(Max power of Bluetooth = 5.38 dBm)**
When SAR evaluation is not required to be measured, per FCC KDB447498D01v05r02, the following equation must be used to estimate the 1g SAR for simultaneous transmission assessment involving that transmitter.
Estimated SAR = [√f(GHz)/7.5] · [(max. power of channel, mW)/(min. test separation distance, mm)]
Estimated 10g SAR = [√f(GHz)/18.75] · [(max. power of channel, mW)/(min. test separation distance, mm)]

Mode	Frequency (MHz)	Maximum Power (dBm)	Separation Distance (Body) (mm)	Estimated SAR 1g (Body) (W/kg)
Bluetooth	2441	5.38	15	0.048
Bluetooth	2441	5.38	10	0.072

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

8. The SAR measurement for EDGE mode is not required since the source-based time-averaged power for EDGE mode is lower than that for GPRS mode.
9. The SAR measurement is not required for HSPA since its maximum output power is less than ¼ dB higher than RMC without HSPA.
10. The SAR measurement is not required for HSPA+ since its maximum output power is less than ¼ dB higher than RMC without HSPA+.
11. LTE modes test according to **KDB 941225D05v02r03.**

    a. Per Section 5.2.1, the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation.
    - Using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
    - When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel.
    - When the reported SAR of a required test channel is > 1.45 W/kg, SAR is required for all three RB offset configurations for that required test channel.

    b. Per Section 5.2.2, the largest channel bandwidth and measure SAR for QPSK with 50% RB allocation
    - The procedures required for 1 RB allocation in 5.2.1 are applied to measure the SAR for QPSK with 50% RB allocation.

    c. Per Section 5.2.3, the largest channel bandwidth and measure SAR for QPSK with 100% RB allocation
    - For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation in 5.2.1 and 5.2.2 are ≤ 0.8 W/kg.
    - Otherwise, SAR is measured for the highest output power channel and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.

    d. Per Section 5.2.4, Higher order modulations
    - For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK

procedures in sections 5.2.1, 5.2.2 and 5.2.3 to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg.

e. Per Section 5.3, other channel bandwidth standalone SAR test requirements

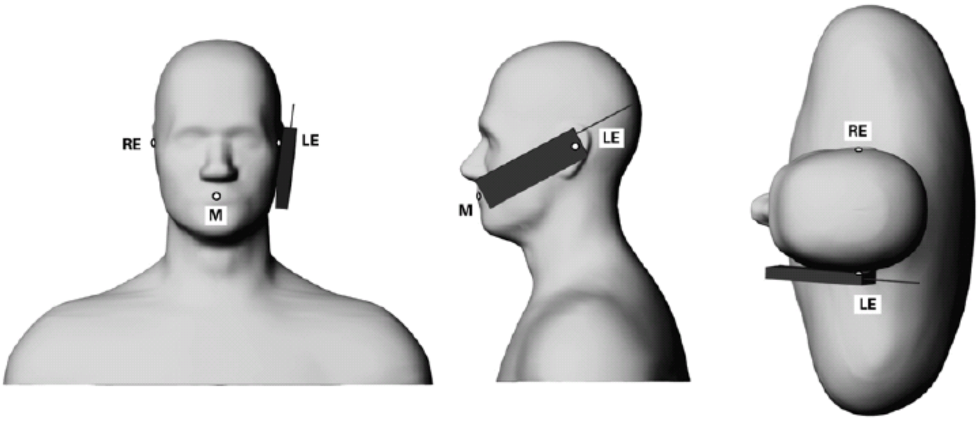
- For the other channel bandwidths used by the device in a frequency band, apply all the procedures required for the largest channel bandwidth in section 5.2 to determine the channels and RB configurations that need SAR testing and only measure SAR when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is > ½ dB higher than the equivalent channel configurations in the largest channel bandwidth configuration or the reported SAR of a configuration for the largest channel bandwidth is > 1.45 W/kg.
- The equivalent channel configuration for the RB allocation, RB offset and modulation etc. is determined for the smaller channel bandwidth according to the same number of RB allocated in the largest channel bandwidth.

12. The SAR measurement is not required for 802.11g/n since its maximum output power is less than 1/4 dB higher than 802.11b.
13. The SAR measurement is not required for 802.11n since its maximum output power is less than 1/4 dB higher than 802.11a.
14. The highest body SAR configuration is repeated with a headset attached.
15. According to KDB447498D01v05r02, testing of other required channels is not required when the reported 1-g SAR for the highest output channel is ≤ 0.8 W/kg, when the transmission band is ≤ 100 MHz.
16. According to KDB447498D01v05r02, testing of other required channels is not required when the reported 1-g SAR for the highest output channel is ≤ 0.6 W/kg, when the transmission band is between 100 MHz and 200MHz.
17. According to KDB447498 D01v05r02, testing of other required channels is not required when the reported 1-g SAR for the highest output channel is ≤ 0.4 W/kg, when the transmission band is ≥ 200MHz.

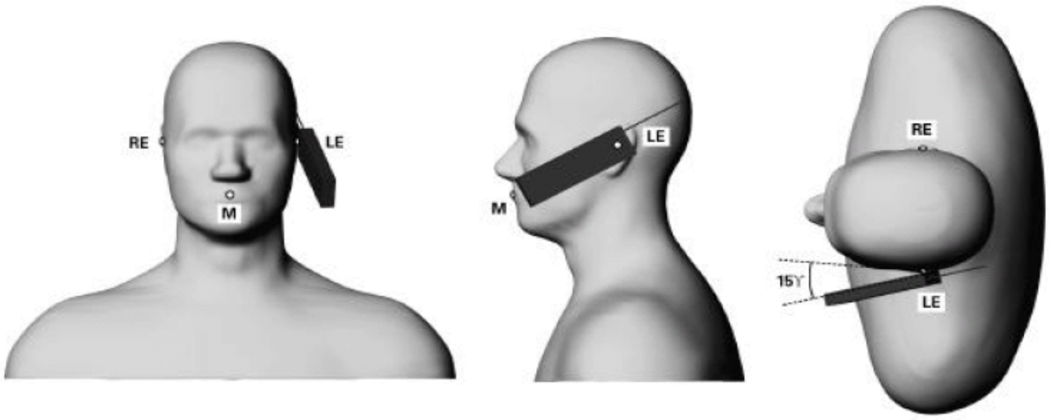
18. According to KDB865664D01v01r03, SAR measurement variability must be assessed for each frequency band. When the original highest measured SAR is ≥ 0.8 W/kg, repeated that measurement once. Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit)

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

1.6 Positioning Procedure



Phone position 1, “cheek” or “touch” position. The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning.



Phone position 2, “tilted position.” The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning.

Cheek/Touch Position:

The handset was brought toward the mouth of the head phantom by pivoting against the ear reference point until any point of the mouthpiece or keypad touched the phantom.

Ear/Tilt Position:

With the phone aligned in the Cheek/Touch position, the handset was tilted away from the mouth with respect to the test device reference point by 15 degrees.

1.7 Evaluation Procedures

The entire evaluation of the spatial peak values is performed within the Post-processing engine (SEMCAD). The system always gives the maximum values for the 1 g and 10 g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

1. The extraction of the measured data (grid and values) from the Zoom Scan.
2. The calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters).
3. The generation of a high-resolution mesh within the measured volume.
4. The interpolation of all measured values from the measurement grid to the high-resolution grid.
5. The extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface.
6. The calculation of the averaged SAR within masses of 1g and 10g.

The probe is calibrated at the center of the dipole sensors that is located 1 to 2.7mm away from the probe tip. During measurements, the probe stops shortly above the phantom surface, depending on the probe and the surface detecting system. Both distances are included as parameters in the probe configuration file. The software always knows exactly how far away the measured point is from the surface. As the probe cannot directly measure at the surface, the values between the deepest measured point and the surface must be extrapolated. The angle between the probe axis and the surface normal line is less than 30 degree.

In the Area Scan, the gradient of the interpolation function is evaluated to find all the extreme of the SAR distribution. The uncertainty on the locations of the extreme is less than 1/20 of the grid size. Only local maximum within –2 dB of the global maximum are searched and passed for the Cube Scan measurement. In the Cube Scan, the interpolation function is used to extrapolate the Peak SAR from the lowest measurement points to the inner phantom surface (the extrapolation distance). The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5mm.

The maximum search is automatically performed after each area scan measurement. It is based on splines in two or three dimensions. The procedure can find the maximum for most SAR distributions even with relatively large grid spacing. After the area scanning measurement, the probe is automatically moved to a position at the interpolated maximum. The following scan can directly use this position for reference, e.g., for a finer resolution grid or the cube evaluations. The 1g and 10g peak evaluations are only available for the predefined cube 7x7x7 scans.

The routines are verified and optimized for the grid dimensions used in these cube measurements. The measured volume of 30x30x30mm contains about 30g of tissue. The first procedure is an extrapolation (incl. Boundary correction) to get the points between the lowest measured plane and the surface. The next step uses 3D interpolation to get all points within the measured volume. In the last step, a 1g cube is placed numerically into the volume and its averaged SAR is calculated. This cube is the moved around until the highest averaged SAR is found.

If the highest SAR is found at the edge of the measured volume, the system will issue a warning: higher SAR values might be found outside of the measured volume. In that case the cube measurement can be repeated, using the new interpolated maximum as the center.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

1.8 Probe Calibration Procedures

For the calibration of E-field probes in lossy liquids, an electric field with an accurately known field strength must be produced within the measured liquid. For standardization purposes it would be desirable if all measurements which are necessary to assess the correct field strength would be traceable to standardized measurement procedures. In the following two different calibration techniques are summarized:

1.8.1 Transfer Calibration with Temperature Probes

In lossy liquids the specific absorption rate (SAR) is related both to the electric field (E) and the temperature gradient ($\delta T / \delta t$) in the liquid.

$$SAR = \frac{\sigma}{\rho}|E|^2 = c\frac{\delta T}{\delta t}$$

Whereby σ is the conductivity, ρ the density and c the heat capacity of the liquid.

Hence, the electric field in lossy liquid can be measured indirectly by measuring the temperature gradient in the liquid. Non-disturbing temperature probes (optical probes or thermistor probes with resistive lines) with high spatial resolution (<1-2 mm) and fast reaction time (<1 s) are available and can be easily calibrated with high precision [1]. The setup and the exciting source have no influence on the calibration; only the relative positioning uncertainties of the standard temperature probe and the E-field probe to be calibrated must be considered. However, several problems limit the available accuracy of probe calibrations with temperature probes:

- The temperature gradient is not directly measurable but must be evaluated from temperature measurements at different time steps. Special precaution is necessary to avoid measurement errors caused by temperature gradients due to energy equalizing effects or convection currents in the liquid. Such effects cannot be completely avoided, as the measured field itself destroys the thermal equilibrium in the liquid. With a careful setup these errors can be kept small.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

- The measured volume around the temperature probe is not well defined. It is difficult to calculate the energy transfer from a surrounding gradient temperature field into the probe. These effects must be considered, since temperature probes are calibrated in liquid with homogeneous temperatures. There is no traceable standard for temperature rise measurements.
- The calibration depends on the assessment of the specific density, the heat capacity and the conductivity of the medium. While the specific density and heat capacity can be measured accurately with standardized procedures (~ 2% for c; much better for ρ), there is no standard for the measurement of the conductivity. Depending on the method and liquid, the error can well exceed ±5%.
- Temperature rise measurements are not very sensitive and therefore are often performed at a higher power level than the E-field measurements. The nonlinearities in the system (e.g., power measurements, different components, etc.) must be considered.

Considering these problems, the possible accuracy of the calibration of E-field probes with temperature gradient measurements in a carefully designed setup is about ±10% (RSS) [2]. Recently, a setup which is a combination of the waveguide techniques and the thermal measurements was presented in [3]. The estimated uncertainty of the setup is ±5% (RSS) when the same liquid is used for the calibration and for actual measurements and ±7-9% (RSS) when not, which is in good agreement with the estimates given in [2].

1.8.2 Calibration with Analytical Fields

In this method a technical setup is used in which the field can be calculated analytically from measurements of other physical magnitudes (e.g., input power). This corresponds to the standard field method for probe calibration in air; however, there is no standard defined for fields in lossy liquids.

When using calculated fields in lossy liquids for probe calibration, several points must be considered in the assessment of the uncertainty:

- The setup must enable accurate determination of the incident power.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

- The accuracy of the calculated field strength will depend on the assessment of the dielectric parameters of the liquid.
- Due to the small wavelength in liquids with high permittivity, even small setups might be above the resonant cutoff frequencies. The field distribution in the setup must be carefully checked for conformity with the theoretical field distribution.

References

[1] N. Kuster, Q. Balzano, and J.C. Lin, Eds., *Mobile Communications Safety*, Chapman & Hall, London, 1997.

[2] K. Meier, M. Burkhardt, T. Schmid, and N. Kuster, \Broadband calibration of E-field probes in lossy media", *IEEE Transactions on Microwave Theory and Techniques*, vol. 44, no. 10, pp. 1954{1962, Oct. 1996.

[3] K. Jokela, P. Hyysalo, and L. Puranen, \Calibration of specific absorption rate (SAR) probes in waveguide at 900 MHz", *IEEE Transactions on Instrumentation and Measurements*, vol. 47, no. 2, pp. 432{438, Apr. 1998.

1.9 The SAR Measurement System

A block diagram of the SAR measurement system is given in Fig. a. This SAR measurement system uses a Computer-controlled 3-D stepper motor system (SPEAG DASY 5 professional system). Model EX3DV4 field probes are used to determine the internal electric fields. The SAR can be obtained from the equation SAR= σ ($|Ei|^2$)/ ρ where σ and ρ are the conductivity and mass density of the tissue-simulant.

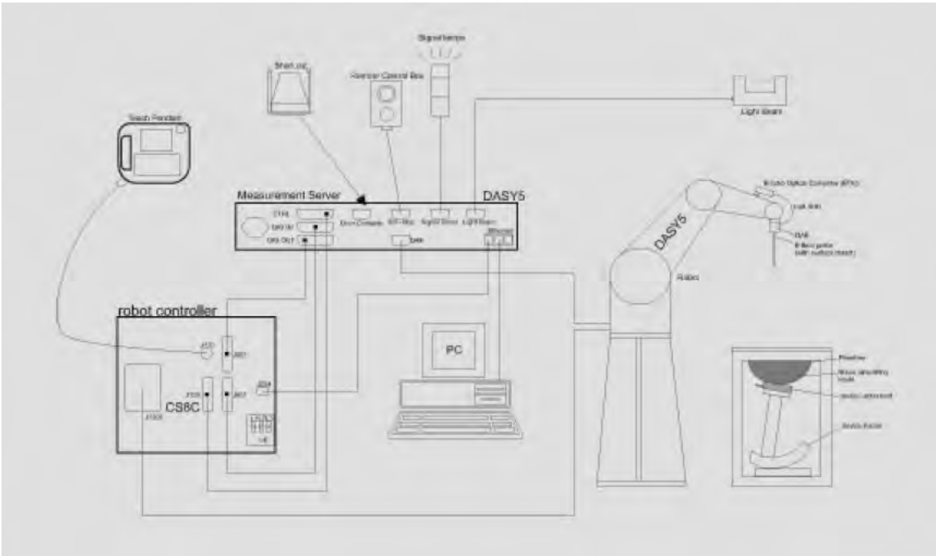


Fig. a A block diagram of the SAR measurement system

The DASY 5 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (Staubli RX family) with controller, teach pendant and software. An arm extension is for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- Data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

- The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 7
- DASY 5 software.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing to validate the proper functioning of the system.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

1.10 System Components

EX3DV4 E-Field Probe

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Calibration	Basic Broad Band Calibration in air Conversion Factors (CF) for HSL 835/1750/1900/2450/2600/5200/5300/ 5600/5800 MHz Additional CF for other liquids and frequencies upon request	
Frequency	10 MHz to > 6 GHz, Linearity: ± 0.6 dB	
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)	
Dynamic Range	10 µW/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 µW/g)	
Dimensions	Tip diameter: 2.5 mm	
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.	

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

SAM PHANTOM V4.0C

Construction:	The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-200X and IEC 62209. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points with the robot.	
Shell Thickness:	2 ± 0.2 mm	
Filling Volume:	Approx. 25 liters	
Dimensions:	Height: 210 mm; Length: 1000 mm; Width: 500 mm	

DEVICE HOLDER

Construction	In combination with the Twin SAM Phantom V4.0/V4.0C or Twin SAM, the Mounting Device (made from POM) enables the rotation of the mounted transmitter in spherical coordinates, whereby the rotation point is the ear opening. The devices can be easily and accurately positioned according to IEC, IEEE, CENELEC, FCC or other specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).	 Device Holder

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

1.11 SAR System Verification

The microwave circuit arrangement for system verification is sketched in Fig. b. The daily system accuracy verification occurs within the flat section of the SAM phantom. A SAR measurement was performed to see if the measured SAR was within +/- 10% (according to KDB865664 D01) from the target SAR values.

These tests were done at 835/1750/1900/2450/2600/5200/5300/5600/5800 MHz. The tests were conducted on the same days as the measurement of the DUT. The obtained results from the system accuracy verification are displayed in the table 1. During the tests, the ambient temperature of the laboratory was 21.7°C, the relative humidity was 62% and the liquid depth above the ear reference points was above 15 cm (≤3G) or 10 cm (>3G) in all the cases. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values.

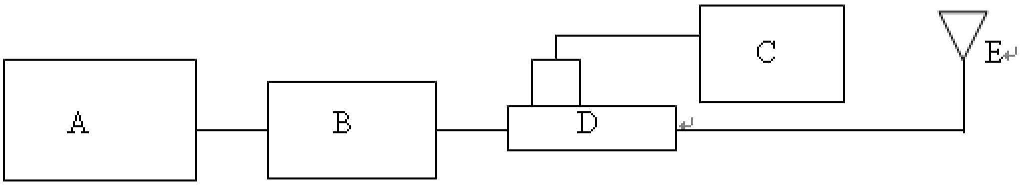
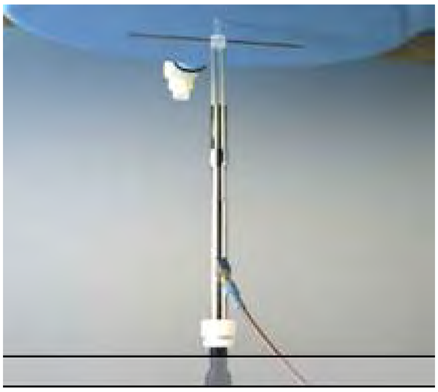


Fig. b The block diagram of system verification

A. Signal Generator
B. Amplifier
C. Power Sensor
D. Dual Directional Coupling
E. Reference Dipole Antenna



Photograph of the Dipole Antenna

SGS Taiwan Ltd.
台灣檢驗科技股份有限公司
No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Validation Kit	S/N	Frequency (MHz)		Target SAR (1g) (Pin=250mW) (mW/g)	Measured SAR (1g)(mW/g)	Deviation (%)	Measured Date
D835V2	4d063	835	Head	2.38	2.35	1.26%	Nov. 17, 2014
				2.38	2.44	-2.52%	Dec. 04, 2014
			Body	2.41	2.41	0.00%	Nov. 17, 2014
				2.41	2.47	-2.49%	Dec. 05, 2014
D1750V2	1008	1750	Head	9.26	8.96	3.24%	Nov. 18, 2014
				9.26	9.22	0.43%	Dec. 02, 2014
			Body	9.44	9.34	1.06%	Nov. 18, 2014
				9.44	9.26	1.91%	Dec. 03, 2014
D1900V2	5d027	1900	Head	9.71	9.4	3.19%	Nov. 19, 2014
				9.71	9.95	-2.47%	Nov. 20, 2014
			Body	9.87	10.1	-2.33%	Nov. 19, 2014
				9.87	10.1	-2.33%	Dec. 01, 2014
D2450V2	727	2450	Head	13.1	13.4	-2.29%	Nov. 23, 2014
			Body	12.8	13.1	-2.34%	
D2600V2	1005	2600	Head	14.7	14.8	-0.68%	Dec. 06, 2014
			Body	14.3	14.2	0.70%	Dec. 08, 2014
D5GHzV2	1104	5200	Head	8.02	7.94	1.00%	Nov. 20, 2014
			Body	7.69	7.51	2.34%	Nov. 22, 2014
		5300	Head	8.45	8.66	-2.49%	Nov. 21, 2014
			Body	7.84	7.88	-0.51%	Nov. 22, 2014
		5600	Head	8.31	8.47	-1.93%	Nov. 20, 2014
			Body	8.21	8.17	0.49%	Nov. 22, 2014
		5800	Head	7.95	7.96	-0.13%	Nov. 21, 2014
			Body	7.73	7.56	2.20%	Nov. 22, 2014

Table 1. System validation (follow manufacture target value)

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

1.12 Tissue Simulant Fluid for the Frequency Band

The dielectric properties for this Head-simulant fluid were measured by using the Agilent Model 85070E Dielectric Probe (rates frequency band 200 MHz to 20 GHz) in conjuncation with Network Analyzer.

All dielectric parameters of tissue simulates were measured within 24 hours of SAR measurements. The depth of the tissue simulant in the flat section of the phantom was at least 15 cm (≤3G) or 10 cm (>3G) during all tests. (Appendix Fig. 2)

Tissue Type	Measured Frequency (MHz)	Target Dielectric Constant, εr	Target Conductivity, σ (S/m)	Measured Dielectric Constant, εr	Measured Conductivity, σ (S/m)	% dev εr	% dev σ	Measurement Date
Head	824.2	41.556	0.899	41.276	0.872	0.67%	3.02%	Nov.17, 2014
	826.4	41.545	0.899	41.250	0.874	0.71%	2.78%	
	835	41.500	0.900	41.143	0.883	0.86%	1.89%	
	836.6	41.500	0.902	41.119	0.885	0.92%	1.88%	
	846.6	41.500	0.912	40.990	0.894	1.23%	1.97%	
	848.8	41.500	0.915	40.965	0.896	1.29%	2.08%	
Body	824.2	55.242	0.969	52.977	1.001	4.10%	-3.29%	Nov.17, 2014
	826.4	55.234	0.969	52.958	1.004	4.12%	-3.61%	
	835	55.2	0.97	52.883	1.013	4.20%	-4.43%	
	836.6	55.195	0.972	52.864	1.015	4.22%	-4.42%	
	846.6	55.164	0.984	52.778	1.025	4.33%	-4.17%	
	848.8	55.158	0.987	52.759	1.027	4.35%	-4.05%	
Head	829	41.531	0.9	40.238	0.887	3.11%	1.44%	Dec. 04, 2014
	835	41.500	0.9	40.231	0.893	3.06%	0.78%	
	836.5	41.500	0.902	40.227	0.896	3.07%	0.67%	
	844	41.500	0.91	40.219	0.903	3.09%	0.77%	
Body	829	55.223	0.97	54.161	0.962	1.92%	0.82%	Dec. 05, 2014
	835	55.2	0.97	54.153	0.97	1.90%	0.00%	
	836.5	55.195	0.972	54.149	0.973	1.90%	-0.10%	
	844	55.172	0.981	54.002	0.992	2.12%	-1.12%	
Head	1712.4	40.138	1.349	39.596	1.343	1.35%	0.44%	Nov. 18, 2014
	1732.4	40.107	1.361	39.609	1.364	1.24%	-0.22%	
	1750	40.079	1.371	39.577	1.377	1.25%	-0.44%	
	1752.6	40.075	1.373	39.561	1.379	1.28%	-0.44%	
Body	1712.4	53.531	1.465	54.495	1.431	-1.80%	2.32%	
	1732.4	53.478	1.477	54.462	1.446	-1.84%	2.10%	
	1750	53.432	1.488	54.398	1.458	-1.81%	2.02%	
	1752.6	53.425	1.49	54.383	1.461	-1.79%	1.95%	

Tissue Type	Measured Frequency (MHz)	Target Dielectric Constant, εr	Target Conductivity, σ (S/m)	Measured Dielectric Constant, εr	Measured Conductivity, σ (S/m)	% dev εr	% dev σ	Measurement Date
Head	1720	40.126	1.354	40.523	1.294	-0.99%	4.43%	Dec. 02, 2014
	1732.5	40.107	1.361	40.392	1.306	-0.71%	4.04%	
	1745	40.187	1.368	40.211	1.314	-0.06%	3.95%	
	1750	40.079	1.371	40.155	1.321	-0.19%	3.65%	
Body	1720	53.511	1.469	54.922	1.448	-2.64%	1.43%	Dec. 03, 2014
	1732.5	53.478	1.477	54.757	1.457	-2.39%	1.35%	
	1745	53.445	1.485	54.533	1.469	-2.04%	1.08%	
	1750	53.432	1.488	54.458	1.476	-1.92%	0.81%	
Head	1850.2	40.000	1.400	39.758	1.358	0.60%	3.00%	Nov. 19, 2014
	1852.4	40.000	1.400	39.748	1.340	0.63%	4.29%	
	1880	40.000	1.400	39.651	1.368	0.87%	2.29%	
	1900	40.000	1.400	39.567	1.388	1.08%	0.86%	
	1907.6	40.000	1.400	39.538	1.396	1.16%	0.29%	
	1909.8	40.000	1.400	39.531	1.398	1.17%	0.14%	
Body	1850.2	53.300	1.520	51.913	1.450	2.60%	4.61%	
	1852.4	53.300	1.520	51.902	1.459	2.62%	4.01%	
	1880	53.300	1.520	51.735	1.468	2.94%	3.42%	
	1900	53.300	1.520	51.639	1.492	3.12%	1.84%	
	1907.6	53.300	1.520	51.621	1.503	3.15%	1.12%	
	1909.8	53.300	1.520	51.618	1.505	3.16%	0.99%	
Head	1860	40.000	1.400	39.406	1.419	1.49%	-1.36%	Nov. 20, 2014
	1880	40.000	1.400	39.349	1.424	1.63%	-1.71%	
	1900	40.000	1.400	39.256	1.432	1.86%	-2.29%	
Body	1860	53.300	1.520	54.016	1.492	-1.34%	1.84%	Dec. 01, 2014
	1880	53.300	1.520	53.769	1.527	-0.88%	-0.46%	
	1900	53.300	1.520	53.523	1.549	-0.42%	-1.91%	
Head	2412	39.268	1.766	39.3	1.779	-0.08%	-0.74%	Nov. 23, 2014
	2437	39.223	1.788	39.231	1.808	-0.02%	-1.12%	
	2450	39.200	1.800	39.185	1.823	0.04%	-1.28%	
	2462	39.185	1.813	39.117	1.836	0.17%	-1.27%	
Body	2412	52.751	1.914	50.237	1.992	4.77%	-4.08%	
	2437	52.717	1.938	50.142	2.027	4.88%	-4.59%	
	2450	52.700	1.950	50.104	2.045	4.93%	-4.87%	
	2462	52.685	1.967	50.06	2.063	4.98%	-4.88%	

Tissue Type	Measured Frequency (MHz)	Target Dielectric Constant, εr	Target Conductivity, σ (S/m)	Measured Dielectric Constant, εr	Measured Conductivity, σ (S/m)	% dev εr	% dev σ	Measurement Date
Head	2510	39.124	1.865	41.058	1.812	-4.94%	2.84%	Dec. 06, 2014
	2535	39.092	1.893	41.027	1.827	-4.95%	3.49%	
	2560	39.060	1.920	40.809	1.848	-4.48%	3.75%	
	2600	39.009	1.964	40.522	1.886	-3.88%	3.97%	
Body	2510	52.624	2.035	53.492	1.976	-1.65%	2.90%	Dec. 08, 2014
	2535	52.592	2.071	53.211	2.019	-1.18%	2.51%	
	2560	52.560	2.106	53.008	2.062	-0.85%	2.09%	
	2600	52.509	2.163	52.776	2.11	-0.51%	2.45%	
Head	5200	35.986	4.655	36.085	4.615	-0.28%	0.86%	Nov. 20, 2014
	5240	35.940	4.696	36.083	4.666	-0.40%	0.64%	
	5540	35.597	5.004	35.299	5.015	0.84%	-0.23%	
	5600	35.529	5.065	35.154	5.078	1.05%	-0.26%	
	5660	35.460	5.127	35.047	5.151	1.16%	-0.48%	
	5700	35.414	5.168	34.941	5.193	1.34%	-0.48%	
	5260	35.917	4.717	36.013	4.675	-0.27%	0.89%	Nov. 21, 2014
	5300	35.871	4.758	35.839	4.728	0.09%	0.62%	
	5765	35.340	5.234	34.773	5.274	1.60%	-0.76%	
	5785	35.317	5.255	34.739	5.302	1.64%	-0.89%	
	5800	35.300	5.270	34.714	5.312	1.66%	-0.80%	
	5805	35.294	5.275	34.689	5.317	1.71%	-0.79%	
Body	5200	49.014	5.299	48.522	5.337	1.00%	-0.71%	Nov. 22, 2014
	5240	48.960	5.346	48.343	5.351	1.26%	-0.09%	
	5260	48.933	5.369	48.196	5.408	1.51%	-0.72%	
	5300	48.879	5.416	47.787	5.474	2.23%	-1.07%	
	5540	48.553	5.696	47.094	5.821	3.00%	-2.19%	
	5600	48.471	5.766	47.056	5.911	2.92%	-2.51%	
	5660	48.390	5.837	46.833	6.004	3.22%	-2.87%	
	5700	48.336	5.883	46.798	6.027	3.18%	-2.44%	
	5765	48.248	5.959	46.666	6.143	3.28%	-3.09%	
	5785	48.220	5.982	46.545	6.174	3.47%	-3.20%	
	5800	48.200	6.000	46.450	6.190	3.63%	-3.17%	
	5805	48.193	6.006	46.422	6.193	3.68%	-3.12%	

Table 2. Dielectric Parameters of Tissue Simulant Fluid

The composition of the brain tissue simulating liquid:

Frequency (MHz)	Mode	Ingredient						Total amount
		DGMBE	Water	Salt	Preventol D-7	Cellulose	Sugar	
850	Head	—	532.98 g	18.3 g	2.4 g	3.2 g	766 g	1.3L(Kg)
	Body	—	631.68 g	11.72 g	1.2 g	—	600 g	1.0L(Kg)
1750	Head	444.52 g	552.42 g	3.06 g	—	—	—	1.0L(Kg)
	Body	300.67 g	716.56 g	4.0 g	—	—	—	1.0L(Kg)
1900	Head	444.52 g	552.42 g	3.06 g	—	—	—	1.0L(Kg)
	Body	300.67 g	716.56 g	4.0 g	—	—	—	1.0L(Kg)
2450	Head	550ml	450ml	—	—	—	—	1.0L(Kg)
	Body	301.7ml	698.3ml	—	—	—	—	1.0L(Kg)
2600	Head	550ml	450ml	—	—	—	—	1.0L(Kg)
	Body	301.7ml	698.3ml	—	—	—	—	1.0L(Kg)

Simulating Liquids for 5 GHz, Manufactured by SPEAG:

Ingredients	Water	Esters, Emulsifiers, Inhibitors	Sodium and Salt
(% by weight)	60-80	20-40	0-1.5

Table 3. Recipes for tissue simulating liquid

SGS Taiwan Ltd. 台灣檢驗科技股份有限公司
No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

1.13 Test Standards and Limits

According to FCC 47CFR §2.1093(d) The limits to be used for evaluation are based generally on criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (“SAR”) in Section 4.2 of “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz,” ANSI/IEEE C95.1–1992, Copyright 1992 by the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017.

These criteria for SAR evaluation are similar to those recommended by the National Council on Radiation Protection and Measurements (NCRP) in “Biological Effects and Exposure Criteria for Radio frequency Electromagnetic Fields,” NCRP Report No. 86, Section 17.4.5. Copyright NCRP, 1986, Bethesda, Maryland 20814. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards. The criteria to be used are specified in paragraphs (d)(1) and (d)(2) of this section and shall apply for portable devices transmitting in the frequency range from 100 kHz to 6 GHz. Portable devices that transmit at frequencies above 6 GHz are to be evaluated in terms of the MPE limits specified in § 1.1310 of this chapter.

Measurements and calculations to demonstrate compliance with MPE field strength or power density limits for devices operating above 6 GHz should be made at a minimum distance of 5 cm from the radiating source.

(1) Limits for Occupational/Controlled exposure: 0.4 W/kg as averaged over the whole-body and spatial peak SAR not exceeding 8 W/kg as averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the hands, wrists, feet and ankles where the spatial peak SAR shall not exceed 20 W/kg, as averaged over a 10 grams of tissue (defined as a tissue volume in the shape of a cube).

Occupational/Controlled limits apply when persons are exposed as a consequence of their employment provided these persons are fully aware of and exercise control over their exposure. Awareness of exposure can be accomplished by use of warning labels or by specific training or education through appropriate means, such as an RF safety program in a work environment.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

(2) Limits for General Population/Uncontrolled exposure: 0.08 W/kg as averaged over the whole-body and spatial peak SAR not exceeding 1.6 W/kg as averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube).
Exceptions are the hands, wrists, feet and ankles where the spatial peak SAR shall not exceed 4 W/kg, as averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube).
General Population/Uncontrolled limits apply when the general public may be exposed, or when persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or do not exercise control over their exposure.
Warning labels placed on consumer devices such as cellular telephones will not be sufficient reason to allow these devices to be evaluated subject to limits for occupational/controlled exposure in paragraph (d)(1) of this section.(Table .6)

Human Exposure	Uncontrolled Environment General Population	Controlled Environment Occupational
Spatial Peak SAR (Brain)	1.60 m W/g	8.00 m W/g
Spatial Average SAR (Whole Body)	0.08 m W/g	0.40 m W/g
Spatial Peak SAR (Hands/Feet/Ankle/Wrist)	4.00 m W/g	20.00 m W/g

Table 4. RF exposure limits

Notes:
1. Uncontrolled environments are defined as locations where there is potential exposure of individuals who have no knowledge or control of their potential exposure.
2. Controlled environments are defined as locations where there is potential exposure of individuals who have knowledge of their potential exposure and can exercise control over their exposure.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

2. Summary of Results

GSM 850 MHz

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
								Measured	Reported	
GSM850 (GMSK) (Head)	Re Cheek	-	251	848.8	33.50	33.50	0.00%	0.265	0.265	-
	Re Tilt	-	251	848.8	33.50	33.50	0.00%	0.184	0.184	-
	Le Cheek	-	128	824.2	33.50	33.10	9.65%	0.387	0.424	108
	Le Cheek	-	190	836.6	33.50	33.20	7.15%	0.341	0.365	-
	Le Cheek	-	251	848.8	33.50	33.50	0.00%	0.311	0.311	-
	Le Tilt	-	251	848.8	33.50	33.50	0.00%	0.176	0.176	-
GSM850 (GMSK) (Speech mode)	Front side	15mm	251	848.8	33.50	33.50	0.00%	0.146	0.146	-
	Back side	15mm	128	824.2	33.50	33.10	9.65%	0.29	0.318	109
	Back side	15mm	190	836.6	33.50	33.20	7.15%	0.261	0.280	-
	Back side	15mm	251	848.8	33.50	33.50	0.00%	0.236	0.236	-
GPRS850 (GMSK) (Hotspot)	Front side	10mm	251	848.8	33.50	33.50	0.00%	0.337	0.337	-
	Back side	10mm	128	824.2	33.50	33.10	9.65%	0.638	0.700	110
	Back side	10mm	190	836.6	33.50	33.20	7.15%	0.588	0.630	-
	Back side	10mm	251	848.8	33.50	33.50	0.00%	0.54	0.540	-
	Bottom side	10mm	251	848.8	33.50	33.50	0.00%	0.182	0.182	-
	Right side	10mm	251	848.8	33.50	33.50	0.00%	0.28	0.280	-
	Left side	10mm	251	848.8	33.50	33.50	0.00%	0.478	0.478	-

GSM 1900 MHz

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
								Measured	Reported	
GSM1900 (GMSK) (Head)	Re Cheek	-	810	1909.8	30.50	30.50	0.00%	0.09	0.090	-
	Re Tilt	-	810	1909.8	30.50	30.50	0.00%	0.048	0.048	-
	Le Cheek	-	512	1850.2	30.50	30.30	4.71%	0.089	0.093	-
	Le Cheek	-	661	1880	30.50	30.30	4.71%	0.122	0.128	-
	Le Cheek	-	810	1909.8	30.50	30.50	0.00%	0.147	0.147	111
	Le Tilt	-	810	1909.8	30.50	30.50	0.00%	0.052	0.052	-
GSM1900 (GMSK) (Speech mode)	Front side	15mm	810	1909.8	30.50	30.50	0.00%	0.304	0.304	-
	Back side	15mm	512	1850.2	30.50	30.30	4.71%	0.356	0.373	-
	Back side	15mm	661	1880	30.50	30.30	4.71%	0.389	0.407	-
	Back side	15mm	810	1909.8	30.50	30.50	0.00%	0.47	0.470	112
GPRS1900 (GMSK) (Hotspot)	Front side	10mm	810	1909.8	30.50	30.50	0.00%	0.432	0.432	-
	Back side	10mm	810	1909.8	30.50	30.50	0.00%	0.711	0.711	-
	Bottom side	10mm	512	1850.2	30.50	30.30	4.71%	0.74	0.775	-
	Bottom side	10mm	661	1880	30.50	30.30	4.71%	0.791	0.828	-
	Bottom side	10mm	810	1909.8	30.50	30.50	0.00%	0.898	0.898	113
	*Bottom side	10mm	810	1909.8	30.50	30.50	0.00%	0.889	0.889	-
	Right side	10mm	810	1909.8	30.50	30.50	0.00%	0.11	0.110	-
	Left side	10mm	810	1909.8	30.50	30.50	0.00%	0.124	0.124	-

WCDMA Band II

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
								Measured	Reported	
R99 (Head)	RE Cheek	-	9400	1880	24.5	24.50	0.00%	0.159	0.159	-
	RE Tilt	-	9400	1880	24.5	24.50	0.00%	0.098	0.098	-
	LE Cheek	-	9262	1852.4	24.5	24.48	0.46%	0.151	0.152	-
	LE Cheek	-	9400	1880	24.5	24.50	0.00%	0.192	0.192	-
	LE Cheek	-	9538	1907.6	24.5	24.38	2.80%	0.228	0.234	114
	LE Tilt	-	9400	1880	24.5	24.50	0.00%	0.082	0.082	-
Body-worn (speech mode)	Front side	15mm	9400	1880	24.5	24.50	0.00%	0.468	0.468	-
	Back side	15mm	9262	1852.4	24.5	24.48	0.46%	0.733	0.736	-
	Back side	15mm	9400	1880	24.5	24.50	0.00%	0.784	0.784	-
	Back side	15mm	9538	1907.6	24.5	24.38	2.80%	0.792	0.814	-
	Back side*	15mm	9538	1907.6	24.5	24.38	2.80%	0.817	0.840	115
Hotspot	Front side	10mm	9262	1852.4	22	21.57	10.41%	0.48	0.530	-
	Back side	10mm	9262	1852.4	22	21.57	10.41%	0.773	0.853	-
	Back side	10mm	9400	1880	22	21.53	11.43%	0.864	0.963	-
	Back side	10mm	9538	1907.6	22	21.31	17.22%	0.844	0.989	-
	Bottom side	10mm	9262	1852.4	22	21.57	10.41%	0.918	1.014	116
	Bottom side	10mm	9400	1880	22	21.53	11.43%	0.907	1.011	-
	Bottom side	10mm	9538	1907.6	22	21.31	17.22%	0.87	1.020	-
	Bottom side*	10mm	9538	1907.6	22	21.31	17.22%	0.867	1.016	-
	Right side	10mm	9262	1852.4	22	21.57	10.41%	0.071	0.078	-
	Left side	10mm	9262	1852.4	22	21.57	10.41%	0.113	0.125	-

* - repeated at the highest SAR measurement according to the KDB 865664 D01v01

SGS Taiwan Ltd.
台灣檢驗科技股份有限公司
No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

WCDMA Band IV

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
								Measured	Reported	
R99 (Head)	RE Cheek	-	1312	1712.4	24.5	24.50	0.00%	0.41	0.410	-
	RE Tilt	-	1312	1712.4	24.5	24.50	0.00%	0.109	0.109	-
	LE Cheek	-	1312	1712.4	24.5	24.50	0.00%	0.519	0.519	117
	LE Cheek	-	1412	1732.4	24.5	24.48	0.46%	0.456	0.458	-
	LE Cheek	-	1513	1752.6	24.5	24.47	0.69%	0.428	0.431	-
	LE Tilt	-	1312	1712.4	24.5	24.50	0.00%	0.081	0.081	-
Body-worn (speech mode)	Front side	15mm	1312	1712.4	24.5	24.50	0.00%	0.635	0.635	-
	Back side	15mm	1312	1712.4	24.5	24.50	0.00%	0.689	0.689	118
	Back side	15mm	1412	1732.4	24.5	24.48	0.46%	0.611	0.614	-
	Back side	15mm	1513	1752.6	24.5	24.47	0.69%	0.665	0.670	-
Hotspot	Front side	10mm	1412	1732.4	22.5	21.56	24.17%	0.6	0.745	-
	Back side	10mm	1412	1732.4	22.5	21.56	24.17%	0.615	0.764	-
	Bottom side	10mm	1312	1712.4	22.5	21.48	26.47%	0.787	0.995	-
	Bottom side	10mm	1412	1732.4	22.5	21.56	24.17%	0.879	1.091	-
	Bottom side	10mm	1513	1752.6	22.5	21.50	25.89%	0.947	1.192	119
	Bottom side*	10mm	1513	1752.6	22.5	21.50	25.89%	0.946	1.191	-
	Right side	10mm	1412	1732.4	22.5	21.56	24.17%	0.154	0.191	-
	Left side	10mm	1412	1732.4	22.5	21.56	24.17%	0.141	0.175	-

WCDMA Band V

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
								Measured	Reported	
R99 (Head)	RE Cheek	-	4132	826.4	24.5	24.44	1.39%	0.306	0.310	-
	RE Tilt	-	4132	826.4	24.5	24.44	1.39%	0.205	0.208	-
	LE Cheek	-	4132	826.4	24.5	24.44	1.39%	0.372	0.377	120
	LE Cheek	-	4183	836.6	24.5	24.20	7.15%	0.349	0.374	-
	LE Cheek	-	4233	846.6	24.5	24.07	10.41%	0.355	0.392	-
	LE Tilt	-	4132	826.4	24.5	24.44	1.39%	0.21	0.213	-
Body-worn (speech mode)	Front side	15mm	4132	826.4	24.5	24.44	1.39%	0.235	0.238	-
	Back side	15mm	4132	826.4	24.5	24.44	1.39%	0.294	0.298	121
	Back side	15mm	4183	836.6	24.5	24.20	7.15%	0.282	0.302	-
	Back side	15mm	4233	846.6	24.5	24.07	10.41%	0.288	0.318	-
Hotspot	Front side	10mm	4132	826.4	24.5	24.44	1.39%	0.49	0.497	-
	Back side	10mm	4132	826.4	24.5	24.44	1.39%	0.796	0.807	122
	Back side	10mm	4183	836.6	24.5	24.20	7.15%	0.729	0.781	-
	Back side	10mm	4233	846.6	24.5	24.07	10.41%	0.758	0.837	-
	Bottom side	10mm	4132	826.4	24.5	24.44	1.39%	0.201	0.204	-
	Right side	10mm	4132	826.4	24.5	24.44	1.39%	0.34	0.345	-
	Left side	10mm	4132	826.4	24.5	24.44	1.39%	0.545	0.553	-

LTE FDD Band II

Mode	Bandwidth (MHz)	Modulation	RB Size	RB start	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
												Measured	Reported	
LTE Band 2 (Head)	20MHz	QPSK	1 RB	99	RE Cheek	-	19100	1900	24.5	24.47	0.69%	0.381	0.384	-
					RE Tilt	-	19100	1900	24.5	24.47	0.69%	0.117	0.118	-
					LE Cheek	-	18700	1860	24.5	24.27	5.44%	0.384	0.405	-
					LE Cheek	-	18900	1880	24.5	24.37	3.04%	0.415	0.428	-
					LE Cheek	-	19100	1900	24.5	24.47	0.69%	0.429	0.432	123
					LE Tilt	-	19100	1900	24.5	24.47	0.69%	0.081	0.082	-
			50 RB	50	RE Cheek	-	19100	1900	24	23.69	7.40%	0.315	0.338	-
					RE Tilt	-	19100	1900	24	23.69	7.40%	0.095	0.102	-
					LE Cheek	-	19100	1900	24	23.69	7.40%	0.359	0.386	-
					LE Tilt	-	19100	1900	24	23.69	7.40%	0.066	0.071	-
			100 RB		RE Cheek	-	19100	1900	24	23.44	13.76%	0.311	0.354	-
					RE Tilt	-	19100	1900	24	23.44	13.76%	0.091	0.104	-
					LE Cheek	-	19100	1900	24	23.44	13.76%	0.356	0.405	-
					LE Tilt	-	19100	1900	24	23.44	13.76%	0.064	0.073	-
LTE Band 2 (Body-Worn)	20MHz	QPSK	1 RB	99	Front side	15mm	19100	1900	24.5	24.47	0.69%	0.434	0.437	-
					Back side	15mm	18700	1860	24.5	24.27	5.44%	0.738	0.778	-
					Back side	15mm	18900	1880	24.5	24.37	3.04%	0.758	0.781	-
					Back side	15mm	19100	1900	24.5	24.47	0.69%	0.804	0.810	124
			50 RB	50	Front side	15mm	19100	1900	24	23.69	7.40%	0.346	0.372	-
					Back side	15mm	19100	1900	24	23.69	7.40%	0.644	0.692	-
			100 RB		Front side	15mm	19100	1900	24	23.44	13.76%	0.327	0.372	-
					Back side	15mm	19100	1900	24	23.44	13.76%	0.643	0.731	-

Mode	Bandwidth (MHz)	Modulation	RB Size	RB start	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
												Measured	Reported	
LTE Band 2 (Hotspot)	20MHz	QPSK	1 RB	99	Front side	10mm	19100	1900	22	21.92	1.86%	0.426	0.434	-
					Back side	10mm	18700	1860	22	21.71	6.91%	0.707	0.756	-
					Back side	10mm	18900	1880	22	21.67	7.89%	0.747	0.806	-
					Back side	10mm	19100	1900	22	21.92	1.86%	0.786	0.801	-
					Bottom side	10mm	18700	1860	22	21.71	6.91%	0.874	0.934	-
					Bottom side	10mm	18900	1880	22	21.67	7.89%	0.859	0.927	-
					Bottom side	10mm	19100	1900	22	21.92	1.86%	0.899	0.916	-
					Right side	10mm	19100	1900	22	21.92	1.86%	0.086	0.088	-
					Left side	10mm	19100	1900	22	21.92	1.86%	0.091	0.093	-
			50 RB	50	Front side	10mm	19100	1900	22	21.96	0.93%	0.445	0.449	-
					Back side	10mm	18700	1860	22	21.66	8.14%	0.715	0.773	-
					Back side	10mm	18900	1880	22	21.69	7.40%	0.771	0.828	-
					Back side	10mm	19100	1900	22	21.96	0.93%	0.83	0.838	-
					Bottom side	10mm	18700	1860	22	21.66	8.14%	0.916	0.991	-
					Bottom side	10mm	18900	1880	22	21.69	7.40%	0.897	0.963	-
					Bottom side	10mm	19100	1900	22	21.96	0.93%	0.949	0.958	125
					Bottom side*	10mm	19100	1900	22	21.96	0.93%	0.949	0.958	-
					Right side	10mm	19100	1900	22	21.96	0.93%	0.089	0.090	-
					Left side	10mm	19100	1900	22	21.96	0.93%	0.096	0.097	-
			100 RB		Front side	10mm	19100	1900	22	21.84	3.75%	0.432	0.448	-
					Back side	10mm	18700	1860	22	21.59	9.90%	0.715	0.786	-
					Back side	10mm	18900	1880	22	21.65	8.39%	0.758	0.822	-
					Back side	10mm	19100	1900	22	21.84	3.75%	0.805	0.835	-
					Bottom side	10mm	18700	1860	22	21.59	9.90%	0.919	1.010	-
					Bottom side	10mm	18900	1880	22	21.65	8.39%	0.889	0.964	-
					Bottom side	10mm	19100	1900	22	21.84	3.75%	0.931	0.966	-
					Right side	10mm	19100	1900	22	21.84	3.75%	0.09	0.093	-
					Left side	10mm	19100	1900	22	21.84	3.75%	0.095	0.099	-

* - repeated at the highest SAR measurement according to the FCC KDB 865664 D01v01

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

LTE FDD Band IV

Mode	Bandwidth (MHz)	Modulation	RB Size	RB start	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
												Measured	Reported	
LTE Band 4 (Head)	20MHz	QPSK	1 RB	50	RE Cheek	-	20050	1720	24.5	24.41	2.09%	0.311	0.318	-
				50	RE Tilt	-	20050	1720	24.5	24.41	2.09%	0.102	0.104	-
				0	LE Cheek	-	20300	1745	24.5	24.38	2.80%	0.328	0.337	-
				50	LE Cheek	-	20050	1720	24.5	24.41	2.09%	0.38	0.388	126
				50	LE Cheek	-	20175	1732.5	24.5	24.39	2.57%	0.328	0.336	-
				50	LE Tilt	-	20050	1720	24.5	24.41	2.09%	0.043	0.044	-
			50 RB	0	RE Cheek	-	20300	1745	24	23.55	10.92%	0.253	0.281	-
					RE Tilt	-	20300	1745	24	23.55	10.92%	0.097	0.108	-
					LE Cheek	-	20300	1745	24	23.55	10.92%	0.285	0.316	-
					LE Tilt	-	20300	1745	24	23.55	10.92%	0.037	0.041	-
			100 RB		RE Cheek	-	20300	1745	24	23.46	13.24%	0.24	0.272	-
					RE Tilt	-	20300	1745	24	23.46	13.24%	0.095	0.108	-
					LE Cheek	-	20300	1745	24	23.46	13.24%	0.308	0.349	-
					LE Tilt	-	20300	1745	24	23.46	13.24%	0.038	0.043	-
LTE Band 4 (Body-Worn)	20MHz	QPSK	1 RB	50	Front side	15mm	20050	1720	24.5	24.41	2.09%	0.298	0.304	-
				0	Back side	15mm	20300	1745	24.5	24.38	2.80%	0.461	0.474	-
				50	Back side	15mm	20050	1720	24.5	24.41	2.09%	0.559	0.571	127
				50	Back side	15mm	20175	1732.5	24.5	24.39	2.57%	0.464	0.476	-
			50 RB	0	Front side	15mm	20300	1745	24	23.55	10.92%	0.142	0.158	-
					Back side	15mm	20300	1745	24	23.55	10.92%	0.47	0.521	-
			100 RB		Front side	15mm	20300	1745	24	23.46	13.24%	0.147	0.166	-
					Back side	15mm	20300	1745	24	23.46	13.24%	0.466	0.528	-

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Mode	Bandwidth (MHz)	Modulation	RB Size	RB start	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
												Measured	Reported	
LTE Band 4 (Hotspot)	20MHz	QPSK	1 RB	50	Front side	10mm	20050	1720	24.5	24.41	2.09%	0.562	0.574	-
				0	Back side	10mm	20300	1745	24.5	24.38	2.80%	0.891	0.916	-
				50	Back side	10mm	20050	1720	24.5	24.41	2.09%	0.964	0.984	-
				50	Back side	10mm	20175	1732.5	24.5	24.39	2.57%	0.87	0.892	-
				0	Bottom side	10mm	20300	1745	24.5	24.38	2.80%	1.15	1.182	-
				50	Bottom side	10mm	20050	1720	24.5	24.41	2.09%	1.28	1.307	128
				50	Bottom side	10mm	20175	1732.5	24.5	24.39	2.57%	1.1	1.128	-
				50	Bottom side*	10mm	20050	1720	24.5	24.41	2.09%	1.27	1.297	-
				50	Bottom side -with headset	10mm	20050	1720	24.5	24.41	2.09%	1.07	1.092	-
				50	Right side	10mm	20050	1720	24.5	24.41	2.09%	0.226	0.231	-
				50	Left side	10mm	20050	1720	24.5	24.41	2.09%	0.248	0.253	-
			50 RB	0	Front side	10mm	20300	1745	24	23.55	10.92%	0.337	0.374	-
					Back side	10mm	20050	1720	24	23.52	11.69%	0.792	0.885	-
					Back side	10mm	20300	1745	24	23.55	10.92%	0.74	0.821	-
					Bottom side	10mm	20050	1720	24	23.52	11.69%	1.04	1.162	-
					Bottom side	10mm	20300	1745	24	23.55	10.92%	1.09	1.209	-
					Right side	10mm	20300	1745	24	23.55	10.92%	0.203	0.225	-
					Left side	10mm	20300	1745	24	23.55	10.92%	0.194	0.215	-
				50	Back side	10mm	20175	1732.5	24	23.54	11.17%	0.733	0.815	-
					Bottom side	10mm	20175	1732.5	24	23.54	11.17%	1.09	1.212	-
			100 RB		Front side	10mm	20300	1745	24	23.46	13.24%	0.335	0.379	-
					Back side	10mm	20050	1720	24	23.4	14.82%	0.7	0.804	-
					Back side	10mm	20175	1732.5	24	23.44	13.76%	0.774	0.881	-
					Back side	10mm	20300	1745	24	23.46	13.24%	0.743	0.841	-
					Bottom side	10mm	20050	1720	24	23.4	14.82%	1.03	1.183	-
					Bottom side	10mm	20175	1732.5	24	23.44	13.76%	1.09	1.240	-
					Bottom side	10mm	20300	1745	24	23.46	13.24%	1.1	1.246	-
					Right side	10mm	20300	1745	24	23.46	13.24%	0.194	0.220	-
					Left side	10mm	20300	1745	24	23.46	13.24%	0.191	0.216	-

* - repeated at the highest SAR measurement according to the FCC KDB 865664 D01v01

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

LTE FDD Band V

Mode	Bandwidth (MHz)	Modulation	RB Size	RB start	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
												Measured	Reported	
LTE Band 5 (Head)	10MHz	QPSK	1 RB	0	RE Cheek	-	20450	829	24.5	24.36	3.28%	0.338	0.349	-
					RE Tilt	-	20450	829	24.5	24.36	3.28%	0.234	0.242	-
					LE Cheek	-	20450	829	24.5	24.36	3.28%	0.418	0.432	129
					LE Tilt	-	20450	829	24.5	24.36	3.28%	0.231	0.239	-
			25 RB	25	RE Cheek	-	20600	844	24	23.41	14.55%	0.254	0.291	-
					RE Tilt	-	20600	844	24	23.41	14.55%	0.176	0.202	-
					LE Cheek	-	20600	844	24	23.41	14.55%	0.302	0.346	-
					LE Tilt	-	20600	844	24	23.41	14.55%	0.2	0.229	-
			50 RB		RE Cheek	-	20600	844	24	23.41	14.55%	0.31	0.355	-
					RE Tilt	-	20600	844	24	23.41	14.55%	0.21	0.241	-
					LE Cheek	-	20450	829	24	23.38	15.35%	0.372	0.429	-
					LE Cheek	-	20525	836.5	24	23.24	19.12%	0.373	0.444	-
					LE Cheek	-	20600	844	24	23.41	14.55%	0.379	0.434	-
					LE Tilt	-	20600	844	24	23.41	14.55%	0.199	0.228	-
LTE Band 5 (Body-Worn)	10MHz	QPSK	1 RB	0	Front side	15mm	20450	829	24.5	24.36	3.28%	0.351	0.362	-
				0	Back side	15mm	20450	829	24.5	24.36	3.28%	0.494	0.510	-
				25	Back side	15mm	20525	836.5	24.5	24.23	6.41%	0.47	0.500	-
				25	Back side	15mm	20600	844	24.5	24.3	4.71%	0.517	0.541	130
			25 RB	25	Front side	15mm	20600	844	24	23.41	14.55%	0.263	0.301	-
					Back side	15mm	20600	844	24	23.41	14.55%	0.363	0.416	-
			50 RB		Front side	15mm	20600	844	24	23.41	14.55%	0.328	0.376	-
					Back side	15mm	20600	844	24	23.41	14.55%	0.443	0.507	-
LTE Band 5 (Hotspot)	10MHz	QPSK	1 RB	0	Front side	10mm	20450	829	24.5	24.36	3.28%	0.414	0.428	-
				0	Back side	10mm	20450	829	24.5	24.36	3.28%	0.645	0.666	-
				25	Back side	10mm	20525	836.5	24.5	24.23	6.41%	0.716	0.762	131
				25	Back side	10mm	20600	844	24.5	24.3	4.71%	0.627	0.657	-
				0	Bottom side	10mm	20450	829	24.5	24.36	3.28%	0.194	0.200	-
				0	Right side	10mm	20450	829	24.5	24.36	3.28%	0.241	0.249	-
				0	Left side	10mm	20450	829	24.5	24.36	3.28%	0.311	0.321	-
			25 RB	25	Front side	10mm	20600	844	24	23.41	14.55%	0.342	0.392	-
					Back side	10mm	20600	844	24	23.41	14.55%	0.465	0.533	-
					Bottom side	10mm	20600	844	24	23.41	14.55%	0.138	0.158	-
					Right side	10mm	20600	844	24	23.41	14.55%	0.215	0.246	-
					Left side	10mm	20600	844	24	23.41	14.55%	0.225	0.258	-
			50 RB		Front side	10mm	20600	844	24	23.41	14.55%	0.378	0.433	-
					Back side	10mm	20600	844	24	23.41	14.55%	0.571	0.654	-
					Bottom side	10mm	20600	844	24	23.41	14.55%	0.161	0.184	-
					Right side	10mm	20600	844	24	23.41	14.55%	0.233	0.267	-
					Left side	10mm	20600	844	24	23.41	14.55%	0.228	0.261	-

* - repeated at the highest SAR measurement according to the FCC KDB 865664 D01v01

LTE FDD Band VII

Mode	Bandwidth (MHz)	Modulation	RB Size	RB start	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
												Measured	Reported	
LTE Band 7 (Head)	20MHz	QPSK	1 RB	99	RE Cheek	-	21100	2535	22.3	22.28	0.46%	0.294	0.295	-
					RE Tilt	-	21100	2535	22.3	22.28	0.46%	0.106	0.106	-
					LE Cheek	-	20850	2510	22.3	22.14	3.75%	0.325	0.337	-
					LE Cheek	-	21100	2535	22.3	22.28	0.46%	0.38	0.382	132
					LE Cheek	-	21350	2560	22.3	22.27	0.69%	0.328	0.330	-
					LE Tilt	-	21100	2535	22.3	22.28	0.46%	0.072	0.072	-
			50 RB	50	RE Cheek	-	21350	2560	22	21.32	16.95%	0.234	0.274	-
					RE Tilt	-	21350	2560	22	21.32	16.95%	0.088	0.103	-
					LE Cheek	-	21350	2560	22	21.32	16.95%	0.288	0.337	-
					LE Tilt	-	21350	2560	22	21.32	16.95%	0.054	0.063	-
			100 RB		RE Cheek	-	21350	2560	22	21.24	19.12%	0.232	0.276	-
					RE Tilt	-	21350	2560	22	21.24	19.12%	0.086	0.102	-
					LE Cheek	-	21350	2560	22	21.24	19.12%	0.294	0.350	-
					LE Tilt	-	21350	2560	22	21.24	19.12%	0.054	0.064	-
LTE Band 7 (Body-Worn)	20MHz	QPSK	1 RB	99	Front side	15mm	21100	2535	22.3	22.28	0.46%	0.279	0.280	-
					Back side	15mm	20850	2510	22.3	22.14	3.75%	0.489	0.507	-
					Back side	15mm	21100	2535	22.3	22.28	0.46%	0.497	0.499	133
					Back side	15mm	21350	2560	22.3	22.27	0.69%	0.459	0.462	-
			50 RB	50	Front side	15mm	21350	2560	22	21.32	16.95%	0.233	0.272	-
					Back side	15mm	21350	2560	22	21.32	16.95%	0.384	0.449	-
			100 RB		Front side	15mm	21350	2560	22	21.24	19.12%	0.235	0.280	-
					Back side	15mm	21350	2560	22	21.24	19.12%	0.386	0.460	-

Mode	Bandwidth (MHz)	Modulation	RB Size	RB start	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
												Measured	Reported	
LTE Band 7 (Hotspot)	20MHz	QPSK	1 RB	99	Front side	10mm	21100	2535	22.3	22.28	0.46%	0.537	0.539	-
					Back side	10mm	20850	2510	22.3	22.14	3.75%	0.971	1.007	-
					Back side	10mm	21100	2535	22.3	22.28	0.46%	1.01	1.015	-
					Back side	10mm	21350	2560	22.3	22.27	0.69%	0.932	0.938	-
					Bottom side	10mm	20850	2510	22.3	22.14	3.75%	1	1.038	-
					Bottom side	10mm	21100	2535	22.3	22.28	0.46%	1.02	1.025	134
					Bottom side	10mm	21350	2560	22.3	22.27	0.69%	0.922	0.928	-
					Bottom side*	10mm	21100	2535	22.3	22.28	0.46%	1.02	1.025	-
					Right side	10mm	21100	2535	22.3	22.28	0.46%	0.159	0.160	-
					Left side	10mm	21100	2535	22.3	22.28	0.46%	0.142	0.143	-
			50 RB	50	Front side	10mm	21350	2560	22	21.32	16.95%	0.431	0.504	-
					Back side	10mm	20850	2510	22	21.14	21.90%	0.777	0.947	-
					Back side	10mm	21100	2535	22	21.23	19.40%	0.798	0.953	-
					Back side	10mm	21350	2560	22	21.32	16.95%	0.772	0.903	-
					Bottom side	10mm	20850	2510	22	21.14	21.90%	0.822	1.002	-
					Bottom side	10mm	21100	2535	22	21.23	19.40%	0.819	0.978	-
					Bottom side	10mm	21350	2560	22	21.32	16.95%	0.76	0.889	-
					Right side	10mm	21350	2560	22	21.32	16.95%	0.131	0.153	-
					Left side	10mm	21350	2560	22	21.32	16.95%	0.111	0.130	-
			100 RB		Front side	10mm	21350	2560	22	21.24	19.12%	0.433	0.516	-
					Back side	10mm	20850	2510	22	21.02	25.31%	0.775	0.971	-
					Back side	10mm	21100	2535	22	21.17	21.06%	0.798	0.966	-
					Back side	10mm	21350	2560	22	21.24	19.12%	0.768	0.915	-
					Bottom side	10mm	20850	2510	22	21.02	25.31%	0.819	1.026	-
					Bottom side	10mm	21100	2535	22	21.17	21.06%	0.83	1.005	-
					Bottom side	10mm	21350	2560	22	21.24	19.12%	0.771	0.918	-
					Right side	10mm	21350	2560	22	21.24	19.12%	0.133	0.158	-
					Left side	10mm	21350	2560	22	21.24	19.12%	0.102	0.122	-

* - repeated at the highest SAR measurement according to the FCC KDB 865664 D01v01

SGS Taiwan Ltd.
台灣檢驗科技股份有限公司
No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

WLAN802.11 b

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max.	Measured Avg. Power	Scaling	Averaged SAR over 1g (W/kg)		Plot page
								Measured	Reported	
Head	RE Cheek	-	1	2412	16.00	15.99	0.23%	0.422	0.423	-
	RE Cheek	-	6	2437	16.00	15.87	3.04%	0.64	0.659	-
	RE Cheek	-	11	2462	16.00	15.94	1.39%	0.786	0.797	135
	RE Tilt	-	1	2412	16.00	15.99	0.23%	0.283	0.284	-
	LE Cheek	-	1	2412	16.00	15.99	0.23%	0.193	0.193	-
	LE Tilt	-	1	2412	16.00	15.99	0.23%	0.138	0.138	-
Hotspot	Front side	10mm	1	2412	16.00	15.99	0.23%	0.12	0.120	-
	Back side	10mm	1	2412	16.00	15.99	0.23%	0.447	0.448	-
	Back side	10mm	6	2437	16.00	15.87	3.04%	0.529	0.545	-
	Back side	10mm	11	2462	16.00	15.94	1.39%	0.679	0.688	136
	Top side	10mm	1	2412	16.00	15.99	0.23%	0.049	0.049	-
	Left side	10mm	1	2412	16.00	15.99	0.23%	0.182	0.182	-

WLAN802.11 a 5.2G

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
								Measured	Reported	
Head	RE Cheek	-	48	5240	14.00	13.93	1.62%	0.126	0.128	-
	RE Tilt	-	40	5200	14.00	13.82	4.23%	0.154	0.161	-
	RE Tilt	-	48	5240	14.00	13.93	1.62%	0.158	0.161	137
	LE Cheek	-	48	5240	14.00	13.93	1.62%	0.138	0.140	-
	LE Tilt	-	48	5240	14.00	13.93	1.62%	0.139	0.141	-
Body-worn	Front side	15mm	48	5240	14.00	13.93	1.62%	0.039	0.040	-
	Back side	15mm	40	5200	14.00	13.82	4.23%	0.339	0.353	138
	Back side	15mm	48	5240	14.00	13.93	1.62%	0.305	0.310	-

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

WLAN802.11 a 5.3G

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
								Measured	Reported	
Head	RE Cheek	-	52	5260	14.00	13.99	0.23%	0.135	0.135	-
	RE Cheek	-	60	5300	14.00	13.98	0.46%	0.17	0.171	139
	RE Tilt	-	52	5260	14.00	13.99	0.23%	0.134	0.134	-
	LE Cheek	-	52	5260	14.00	13.99	0.23%	0.133	0.133	-
	LE Tilt	-	52	5260	14.00	13.99	0.23%	0.119	0.119	-
Body-worn	Front side	15mm	52	5260	14.00	13.99	0.23%	0.031	0.031	-
	Back side	15mm	52	5260	14.00	13.99	0.23%	0.306	0.307	-
	Back side	15mm	60	5300	14.00	13.98	0.46%	0.316	0.317	140

WLAN802.11 a 5.6G

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
								Measured	Reported	
Head	RE Cheek	-	108	5540	14.00	13.88	2.80%	0.293	0.301	-
	RE Cheek	-	132	5660	14.00	13.94	1.39%	0.354	0.359	-
	RE Cheek	-	140	5700	14.00	13.99	0.23%	0.423	0.424	141
	RE Tilt	-	140	5700	14.00	13.99	0.23%	0.388	0.389	-
	LE Cheek	-	140	5700	14.00	13.99	0.23%	0.287	0.288	-
	LE Tilt	-	140	5700	14.00	13.99	0.23%	0.282	0.283	-
Body-worn	Front side	15mm	140	5700	14.00	13.99	0.23%	0.05	0.050	-
	Back side	15mm	108	5540	14.00	13.88	2.80%	0.367	0.377	-
	Back side	15mm	132	5660	14.00	13.94	1.39%	0.402	0.408	142
	Back side	15mm	140	5700	14.00	13.99	0.23%	0.382	0.383	-

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

WLAN802.11 a 5.8G

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
								Measured	Reported	
Head	RE Cheek	-	157	5785	14.00	13.83	3.99%	0.463	0.481	-
	RE Tilt	-	153	5765	14.00	13.82	4.23%	0.455	0.474	-
	RE Tilt	-	157	5785	14.00	13.83	3.99%	0.471	0.490	-
	RE Tilt	-	161	5805	14.00	13.74	6.17%	0.478	0.507	143
	LE Cheek	-	157	5785	14.00	13.83	3.99%	0.308	0.320	-
	LE Tilt	-	157	5785	14.00	13.83	3.99%	0.333	0.346	-
Body-worn	Front side	15mm	157	5785	14.00	13.83	3.99%	0.066	0.069	-
	Back side	15mm	153	5765	14.00	13.82	4.23%	0.363	0.378	-
	Back side	15mm	157	5785	14.00	13.83	3.99%	0.343	0.357	-
	Back side	15mm	161	5805	14.00	13.74	6.17%	0.369	0.392	144

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

3. Simultaneous Transmission Analysis

Simultaneous Transmission Scenarios:

Simultaneous Transmit Configurations	Head	Body-Worn	Hotspot
GSM850/1900 + 2.4GHz Wi-Fi	Yes	No	No
GPRS850/1900 + 2.4GHz Wi-Fi	No	No	Yes
UMTS B2/4/5 + 2.4GHz Wi-Fi	Yes	No	Yes
LTE FDD B2/4/5/7 + 2.4GHz Wi-Fi	Yes	No	Yes
GSM850/1900 + 5GHz Wi-Fi	Yes	Yes	No
GPRS850/1900 + 5GHz Wi-Fi	No	No	No
UMTS B2/4/5 + 5GHz Wi-Fi	Yes	Yes	No
LTE FDD B2/4/5/7 + 5GHz Wi-Fi	Yes	Yes	No
GSM850/1900 + Bluetooth	No	Yes	No
GPRS850/1900 + Bluetooth	No	No	Yes
UMTS B2/4/5 + Bluetooth	No	Yes	Yes
LTE FDD B2/4/5/7 + Bluetooth	No	Yes	Yes

Notes:

1. GSM & WCDMA & LTE share the same antenna path and cannot transmit simultaneously
2. Bluetooth, 5GHz WiFi, and 2.4GHz WiFi share the same antenna path and cannot transmit simultaneously.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

3.1 Estimated SAR calculation

According to KDB447498 D01v05 – When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:

$$\text{Estimated SAR} = \frac{\text{Max.tune up power(mW)}}{\text{Min.test separation distance(mm)}} \times \frac{\sqrt{f(GHz)}}{7.5}$$

If the minimum test separation distance is < 5mm, a distance of 5mm is used for estimated SAR calculation. When the test separation distance is >50mm, the 0.4W/kg is used for SAR-1g.

3.2 SPLSR evaluation and analysis

Per KDB447498D01, when the sum of SAR is larger than the limit, SAR test exclusion is determined by the SAR sum to peak location separation ratio(SPLSR).

The simultaneous transmitting antennas in each operating mode and exposure condition combination must be considered one pair at a time to determine the SAR to peak location separation ratio to qualify for test exclusion.

The ratio is determined by **(SAR1 + SAR2)^1.5/Ri**, rounded to two decimal digits, and must be **≤ 0.04** for all antenna pairs in the configuration to qualify for 1-g SAR test exclusion.

SAR1 and SAR2 are the highest reported or estimated SAR for each antenna in the pair, and Ri is the separation distance between the peak SAR locations for the antenna pair in mm.

When standalone test exclusion applies, SAR is estimated; the peak location is assumed to be at the feed-point or geometric center of the antenna.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Simultaneous Transmission Combination

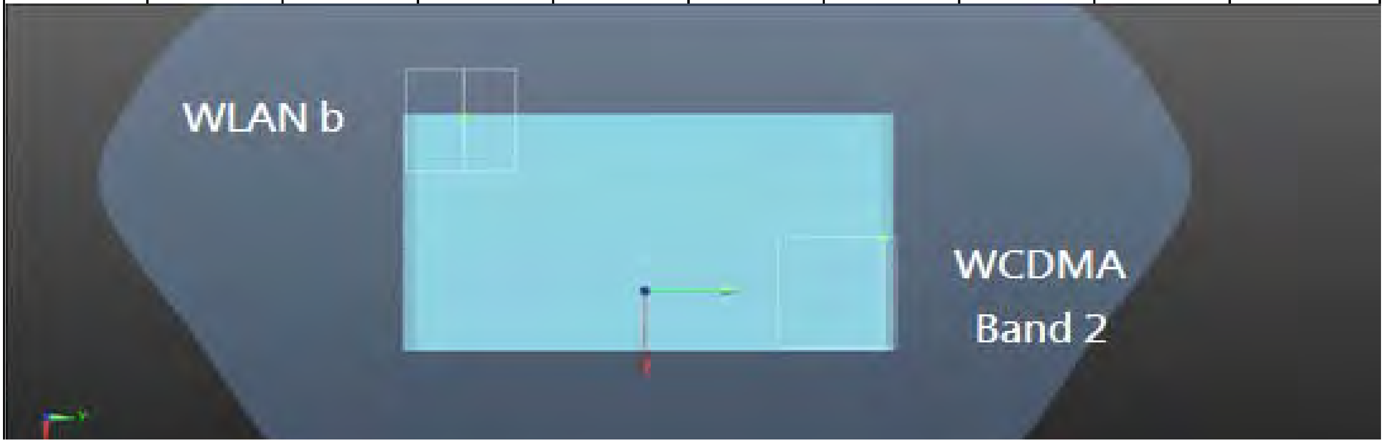
reported SAR WWAN and WLAN DTS 2.4GHz, ΣSAR evaluation							
Frequency band	Position		reported SAR / W/kg		ΣSAR	Calculated distance (mm)	SPLSR (≦0.04)
			WWAN	WLAN	<1.6W/kg		
GSM 850	Head	RE cheek	0.265	0.797	1.062	-	-
		RE tilt	0.184	0.284	0.468	-	-
		LE cheek	0.424	0.193	0.617	-	-
		LE tilt	0.176	0.138	0.314	-	-
GPRS 850 (1Dn1UP)	Hotspot	Front	0.337	0.120	0.457	-	-
		Back	0.7	0.688	1.388	-	-
		Top	-	0.049	-	-	-
		Bottom	0.182	-	-	-	-
		Right	0.28	-	-	-	-
		Left	0.478	0.182	0.660	-	-
GSM 1900	Head	RE cheek	0.09	0.797	0.887	-	-
		RE tilt	0.048	0.284	0.332	-	-
		LE cheek	0.147	0.193	0.340	-	-
		LE tilt	0.052	0.138	0.190	-	-
GPRS 1900 (1Dn1UP)	Hotspot	Front	0.432	0.120	0.552	-	-
		Back	0.711	0.688	1.399	-	-
		Top	-	0.049	-	-	-
		Bottom	0.898	-	-	-	-
		Right	0.11	-	-	-	-
		Left	0.124	0.182	0.306	-	-

SGS Taiwan Ltd. 台灣檢驗科技股份有限公司
No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

reported SAR WWAN and WLAN DTS 2.4GHz, ΣSAR evaluation							
Frequency band	Position		reported SAR / W/kg		ΣSAR	Calculated distance (mm)	SPLSR (≦0.04)
			WWAN	WLAN	<1.6W/kg		
WCDMA Band II	Head	RE cheek	0.159	0.797	0.956	-	-
		RE tilt	0.098	0.284	0.382	-	-
		LE cheek	0.234	0.193	0.427	-	-
		LE tilt	0.082	0.138	0.220	-	-
	Hotspot	Front	0.53	0.120	0.650	-	-
		Back	0.989	0.688	**1.677**	120	0.018
		Top	-	0.049	-	-	-
		Bottom	1.02	-	-	-	-
		Right	0.078	-	-	-	-
		Left	0.125	0.182	0.307	-	-
WCDMA Band IV	Head	RE cheek	0.41	0.797	1.207	-	-
		RE tilt	0.109	0.284	0.393	-	-
		LE cheek	0.519	0.193	0.712	-	-
		LE tilt	0.081	0.138	0.219	-	-
	Hotspot	Front	0.745	0.120	0.865	-	-
		Back	0.764	0.688	1.452	-	-
		Top	-	0.049	-	-	-
		Bottom	1.192	-	-	-	-
		Right	0.191	-	-	-	-
		Left	0.175	0.182	0.357	-	-
WCDMA Band V	Head	RE cheek	0.31	0.797	1.107	-	-
		RE tilt	0.208	0.284	0.492	-	-
		LE cheek	0.392	0.193	0.585	-	-
		LE tilt	0.213	0.138	0.351	-	-
	Hotspot	Front	0.497	0.120	0.617	-	-
		Back	0.837	0.688	1.525	-	-
		Top	-	0.049	-	-	-
		Bottom	0.204	-	-	-	-
		Right	0.345	-	-	-	-
		Left	0.553	0.182	0.735	-	-

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Conditions	Position	SAR Value (W/kg)	Coordinates (cm)			ΣSAR (W/kg)	Peak Location Separation Distance (mm)	SPLSR	Simultaneous Transmission SAR Test
			x	y	z				
WCDMA B2 CH 9538	Back side	0.989	0.15	6.53	-0.05	1.677	120	0.018	SPLSR<0.04, Not required
802.11b CH 11		0.688	-3.36	-4.94	-0.09				

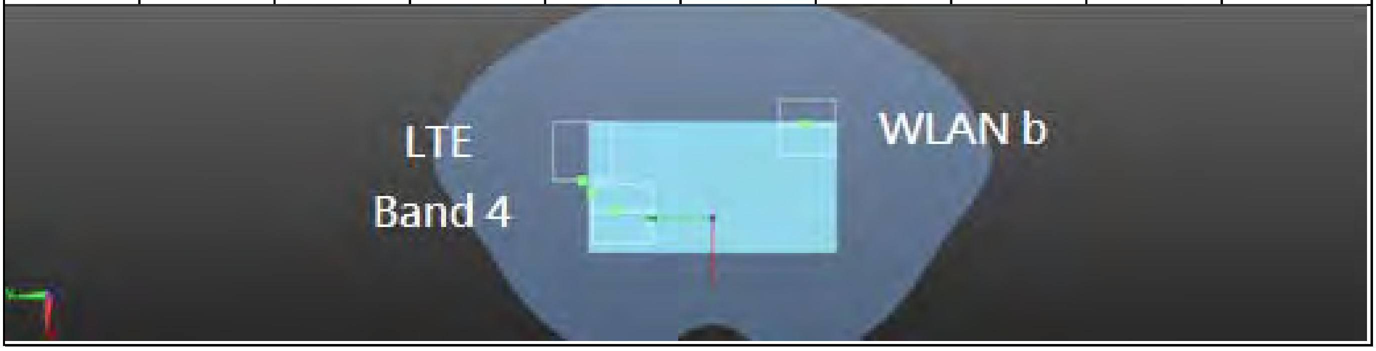


SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

reported SAR WWAN and WLAN DTS 2.4GHz, ΣSAR evaluation							
Frequency band	Position		reported SAR / W/kg		ΣSAR	Calculated distance (mm)	SPLSR (≦0.04)
			WWAN	WLAN	<1.6W/kg		
LTE FDD Band 2	Head	RE cheek	0.384	0.797	1.181	-	-
		RE tilt	0.118	0.284	0.402	-	-
		LE cheek	0.432	0.193	0.625	-	-
		LE tilt	0.082	0.138	0.220	-	-
	Hotspot	Front	0.449	0.120	0.569	-	-
		Back	0.838	0.688	1.526	-	-
		Top	-	0.049	-	-	-
		Bottom	1.01	-	-	-	-
		Right	0.093	-	-	-	-
		Left	0.099	0.182	0.281	-	-
LTE FDD Band 4	Head	RE cheek	0.318	0.797	1.115	-	-
		RE tilt	0.108	0.284	0.392	-	-
		LE cheek	0.388	0.193	0.581	-	-
		LE tilt	0.044	0.138	0.182	-	-
	Hotspot	Front	0.574	0.120	0.694	-	-
		Back	0.984	0.688	**1.672**	113	0.019
		Top	-	0.049	-	-	-
		Bottom	1.307	-	-	-	-
		Right	0.231	-	-	-	-
		Left	0.253	0.182	0.435	-	-
LTE FDD Band 5	Head	RE cheek	0.355	0.797	1.152	-	-
		RE tilt	0.242	0.284	0.526	-	-
		LE cheek	0.444	0.193	0.637	-	-
		LE tilt	0.239	0.138	0.377	-	-
	Hotspot	Front	0.433	0.120	0.553	-	-
		Back	0.762	0.688	1.450	-	-
		Top	-	0.049	-	-	-
		Bottom	0.2	-	-	-	-
		Right	0.267	-	-	-	-
		Left	0.321	0.182	0.503	-	-

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Conditions	Position	SAR Value (W/kg)	Coordinates (cm)			ΣSAR (W/kg)	Peak Location Separation Distance (mm)	SPLSR	Simultaneous Transmission SAR Test
			x	y	z				
LTE Band 4 CH 20050	Back side	0.984	1.34	5.33	-0.02	1.672	113	0.019	SPLSR<0.04, Not required
802.11b CH 11		0.688	-3.36	-4.94	-0.09				



SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

reported SAR WWAN and WLAN DTS 2.4GHz, ΣSAR evaluation							
Frequency band	Position		reported SAR / W/kg		ΣSAR	Calculated distance (mm)	SPLSR (≦0.04)
			WWAN	WLAN	<1.6W/kg		
LTE FDD Band 7	Head	RE cheek	0.295	0.797	1.092	-	-
		RE tilt	0.106	0.284	0.390	-	-
		LE cheek	0.382	0.193	0.575	-	-
		LE tilt	0.072	0.138	0.210	-	-
	Hotspot	Front	0.539	0.120	0.659	-	-
		Back	1.015	0.688	**1.703**	112.4	0.020
		Top	-	0.049	-	-	-
		Bottom	1.038	-	-	-	-
		Right	0.160	-	-	-	-
		Left	0.143	0.182	0.325	-	-

Conditions	Position	SAR Value (W/kg)	Coordinates (cm)			ΣSAR (W/kg)	Peak Location Separation Distance (mm)	SPLSR	Simultaneous Transmission SAR Test
			x	y	z				
LTE Band 7 CH 21100	Back side	1.015	-0.62	5.96	-0.04	1.703	112.4	0.020	SPLSR<0.04, Not required
802.11b CH 11		0.688	-3.36	-4.94	-0.09				

reported SAR WWAN and WLAN DTS 5.8 GHz, ΣSAR evaluation							
Frequency band	Position		reported SAR / W/kg		ΣSAR	Calculated distance (mm)	SPLSR (≦0.04)
			WWAN	WLAN	<1.6W/kg		
GSM 850	Head	RE cheek	0.265	0.481	0.746	-	-
		RE tilt	0.184	0.507	0.691	-	-
		LE cheek	0.424	0.32	0.744	-	-
		LE tilt	0.176	0.346	0.522	-	-
	Body-Worn	Front	0.146	0.069	0.215	-	-
		Back	0.318	0.392	0.71	-	-
GSM 1900	Head	RE cheek	0.09	0.481	0.571	-	-
		RE tilt	0.048	0.507	0.555	-	-
		LE cheek	0.147	0.32	0.467	-	-
		LE tilt	0.052	0.346	0.398	-	-
	Body-Worn	Front	0.304	0.069	0.373	-	-
		Back	0.47	0.392	0.862	-	-
WCDMA Band II	Head	RE cheek	0.159	0.481	0.64	-	-
		RE tilt	0.098	0.507	0.605	-	-
		LE cheek	0.234	0.32	0.554	-	-
		LE tilt	0.082	0.346	0.428	-	-
	Body-Worn	Front	0.468	0.069	0.537	-	-
		Back	0.84	0.392	1.232	-	-
WCDMA Band IV	Head	RE cheek	0.41	0.481	0.891	-	-
		RE tilt	0.109	0.507	0.616	-	-
		LE cheek	0.519	0.32	0.839	-	-
		LE tilt	0.081	0.346	0.427	-	-
	Body-Worn	Front	0.635	0.069	0.704	-	-
		Back	0.689	0.392	1.081	-	-
WCDMA Band V	Head	RE cheek	0.31	0.481	0.791	-	-
		RE tilt	0.208	0.507	0.715	-	-
		LE cheek	0.392	0.32	0.712	-	-
		LE tilt	0.213	0.346	0.559	-	-
	Body-Worn	Front	0.238	0.069	0.307	-	-
		Back	0.318	0.392	0.71	-	-

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

reported SAR WWAN and WLAN DTS 5.8 GHz, ΣSAR evaluation							
Frequency band	Position		reported SAR / W/kg		ΣSAR	Calculated distance (mm)	SPLSR (≦0.04)
			WWAN	WLAN	<1.6W/kg		
LTE FDD Band 2	Head	RE cheek	0.384	0.481	0.865	-	-
		RE tilt	0.118	0.507	0.625	-	-
		LE cheek	0.432	0.32	0.752	-	-
		LE tilt	0.082	0.346	0.428	-	-
	Body-Worn	Front	0.437	0.069	0.506	-	-
		Back	0.81	0.392	1.202	-	-
LTE FDD Band 4	Head	RE cheek	0.318	0.481	0.799	-	-
		RE tilt	0.108	0.507	0.615	-	-
		LE cheek	0.388	0.32	0.708	-	-
		LE tilt	0.044	0.346	0.39	-	-
	Body-Worn	Front	0.304	0.069	0.373	-	-
		Back	0.571	0.392	0.963	-	-
LTE FDD Band 5	Head	RE cheek	0.355	0.481	0.836	-	-
		RE tilt	0.242	0.507	0.749	-	-
		LE cheek	0.444	0.32	0.764	-	-
		LE tilt	0.239	0.346	0.585	-	-
	Body-Worn	Front	0.376	0.069	0.445	-	-
		Back	0.541	0.392	0.933	-	-
LTE FDD Band 7	Head	RE cheek	0.295	0.481	0.776	-	-
		RE tilt	0.106	0.507	0.613	-	-
		LE cheek	0.382	0.32	0.702	-	-
		LE tilt	0.072	0.346	0.418	-	-
	Body-Worn	Front	0.28	0.069	0.349	-	-
		Back	0.507	0.392	0.899	-	-

reported SAR WWAN and WLAN DTS 5 GHz, ΣSAR evaluation							
Frequency band	Position		reported SAR / W/kg		ΣSAR	Calculated distance (mm)	SPLSR (≦0.04)
			WWAN	WLAN	<1.6W/kg		
GSM 850	Head	RE cheek	0.265	0.424	0.689	-	-
		RE tilt	0.184	0.389	0.573	-	-
		LE cheek	0.424	0.288	0.712	-	-
		LE tilt	0.176	0.283	0.459	-	-
	Body-Worn	Front	0.146	0.05	0.196	-	-
		Back	0.318	0.408	0.726	-	-
GSM 1900	Head	RE cheek	0.09	0.424	0.514	-	-
		RE tilt	0.048	0.389	0.437	-	-
		LE cheek	0.147	0.288	0.435	-	-
		LE tilt	0.052	0.283	0.335	-	-
	Body-Worn	Front	0.304	0.05	0.354	-	-
		Back	0.47	0.408	0.878	-	-
WCDMA Band II	Head	RE cheek	0.159	0.424	0.583	-	-
		RE tilt	0.098	0.389	0.487	-	-
		LE cheek	0.234	0.288	0.522	-	-
		LE tilt	0.082	0.283	0.365	-	-
	Body-Worn	Front	0.468	0.05	0.518	-	-
		Back	0.84	0.408	1.248	-	-
WCDMA Band IV	Head	RE cheek	0.41	0.424	0.834	-	-
		RE tilt	0.109	0.389	0.498	-	-
		LE cheek	0.519	0.288	0.807	-	-
		LE tilt	0.081	0.283	0.364	-	-
	Body-Worn	Front	0.635	0.05	0.685	-	-
		Back	0.689	0.408	1.097	-	-
WCDMA Band V	Head	RE cheek	0.31	0.424	0.734	-	-
		RE tilt	0.208	0.389	0.597	-	-
		LE cheek	0.392	0.288	0.68	-	-
		LE tilt	0.213	0.283	0.496	-	-
	Body-Worn	Front	0.238	0.05	0.288	-	-
		Back	0.318	0.408	0.726	-	-

SGS Taiwan Ltd.
台灣檢驗科技股份有限公司
No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

reported SAR WWAN and WLAN DTS 5 GHz, ΣSAR evaluation							
Frequency band	Position		reported SAR / W/kg		ΣSAR	Calculated distance (mm)	SPLSR (≦0.04)
			WWAN	WLAN	<1.6W/kg		
LTE FDD Band 2	Head	RE cheek	0.384	0.424	0.808	-	-
		RE tilt	0.118	0.389	0.507	-	-
		LE cheek	0.432	0.288	0.72	-	-
		LE tilt	0.082	0.283	0.365	-	-
	Body-Worn	Front	0.437	0.05	0.487	-	-
		Back	0.81	0.408	1.218	-	-
LTE FDD Band 4	Head	RE cheek	0.318	0.424	0.742	-	-
		RE tilt	0.108	0.389	0.497	-	-
		LE cheek	0.388	0.288	0.676	-	-
		LE tilt	0.044	0.283	0.327	-	-
	Body-Worn	Front	0.304	0.05	0.354	-	-
		Back	0.571	0.408	0.979	-	-
LTE FDD Band 5	Head	RE cheek	0.355	0.424	0.779	-	-
		RE tilt	0.242	0.389	0.631	-	-
		LE cheek	0.444	0.288	0.732	-	-
		LE tilt	0.239	0.283	0.522	-	-
	Body-Worn	Front	0.376	0.05	0.426	-	-
		Back	0.541	0.408	0.949	-	-
LTE FDD Band 7	Head	RE cheek	0.295	0.424	0.719	-	-
		RE tilt	0.106	0.389	0.495	-	-
		LE cheek	0.382	0.288	0.67	-	-
		LE tilt	0.072	0.283	0.355	-	-
	Body-Worn	Front	0.28	0.05	0.33	-	-
		Back	0.507	0.408	0.915	-	-

SGS Taiwan Ltd.
台灣檢驗科技股份有限公司
No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

reported SAR WWAN and Bluetooth, ΣSAR evaluation							
Frequency band	Position		reported SAR / W/kg		ΣSAR	Calculated distance (mm)	SPLSR (≦0.04)
			WWAN	Bluetooth	<1.6W/kg		
GSM 850	Body-Worn	Front	0.146	0.048	0.194	-	-
		Back	0.318	0.048	0.366	-	-
GPRS 850 (1Dn4UP)	Hotspot	Front	0.337	0.072	0.409	-	-
		Back	0.7	0.072	0.772	-	-
		Top	-	0.072	-	-	-
		Bottom	0.182	0.072	0.254	-	-
		Right	0.28	0.072	0.352	-	-
		Left	0.478	0.072	0.55	-	-
GSM 1900	Body-Worn	Front	0.304	0.048	0.352	-	-
		Back	0.47	0.048	0.518	-	-
GPRS 1900 (1Dn4UP)	Hotspot	Front	0.432	0.072	0.504	-	-
		Back	0.711	0.072	0.783	-	-
		Top	-	0.072	-	-	-
		Bottom	0.898	0.072	0.97	-	-
		Right	0.11	0.072	0.182	-	-
		Left	0.124	0.072	0.196	-	-
WCDMA Band II	Body-Worn	Front	0.468	0.048	0.516	-	-
		Back	0.84	0.048	0.888	-	-
	Hotspot	Front	0.53	0.072	0.602	-	-
		Back	0.989	0.072	1.061	-	-
		Top	-	0.072	-	-	-
		Bottom	1.02	0.072	1.092	-	-
		Right	0.078	0.072	0.15	-	-
		Left	0.125	0.072	0.197	-	-

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

reported SAR WWAN and Bluetooth, ΣSAR evaluation							
Frequency band	Position		reported SAR / W/kg		ΣSAR	Calculated distance (mm)	SPLSR (≦0.04)
			WWAN	Bluetooth	<1.6W/kg		
WCDMA Band IV	Body-Worn	Front	0.635	0.048	0.683	-	-
		Back	0.689	0.048	0.737	-	-
	Hotspot	Front	0.745	0.072	0.817	-	-
		Back	0.764	0.072	0.836	-	-
		Top	-	0.072	-	-	-
		Bottom	1.192	0.072	1.264	-	-
		Right	0.191	0.072	0.263	-	-
		Left	0.175	0.072	0.247	-	-
WCDMA Band V	Body-Worn	Front	0.238	0.048	0.286	-	-
		Back	0.318	0.048	0.366	-	-
	Hotspot	Front	0.497	0.072	0.569	-	-
		Back	0.837	0.072	0.909	-	-
		Top	-	0.072	-	-	-
		Bottom	0.204	0.072	0.276	-	-
		Right	0.345	0.072	0.417	-	-
		Left	0.553	0.072	0.625	-	-
LTE FDD Band 2	Body-Worn	Front	0.437	0.048	0.485	-	-
		Back	0.81	0.048	0.858	-	-
	Hotspot	Front	0.449	0.072	0.521	-	-
		Back	0.838	0.072	0.91	-	-
		Top	-	0.072	-	-	-
		Bottom	1.01	0.072	1.082	-	-
		Right	0.093	0.072	0.165	-	-
		Left	0.099	0.072	0.171	-	-

SGS Taiwan Ltd.
台灣檢驗科技股份有限公司
No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

reported SAR WWAN and Bluetooth, ΣSAR evaluation							
Frequency band	Position		reported SAR / W/kg		ΣSAR	Calculated distance (mm)	SPLSR (≦0.04)
			WWAN	Bluetooth	<1.6W/kg		
LTE FDD Band 4	Body-Worn	Front	0.304	0.048	0.352	-	-
		Back	0.571	0.048	0.619	-	-
	Hotspot	Front	0.574	0.072	0.646	-	-
		Back	0.984	0.072	1.056	-	-
		Top	-	0.072	-	-	-
		Bottom	1.307	0.072	1.379	-	-
		Right	0.231	0.072	0.303	-	-
		Left	0.253	0.072	0.325	-	-
LTE FDD Band 5	Body-Worn	Front	0.376	0.048	0.424	-	-
		Back	0.541	0.048	0.589	-	-
	Hotspot	Front	0.433	0.072	0.505	-	-
		Back	0.762	0.072	0.834	-	-
		Top	-	0.072	-	-	-
		Bottom	0.2	0.072	0.272	-	-
		Right	0.267	0.072	0.339	-	-
		Left	0.321	0.072	0.393	-	-
LTE FDD Band 7	Body-Worn	Front	0.28	0.048	0.328	-	-
		Back	0.507	0.048	0.555	-	-
	Hotspot	Front	0.539	0.072	0.611	-	-
		Back	1.015	0.072	1.087	-	-
		Top	-	0.072	-	-	-
		Bottom	1.038	0.072	1.11	-	-
		Right	0.160	0.072	0.232	-	-
		Left	0.143	0.072	0.215	-	-

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

4. Instruments List

Device	Manufacturer	Type	Serial number	Date of last calibration	Date of next calibration
Dosimetric E-Field Probe	Schmid & Partner Engineering AG	EX3DV4	3923	Aug.28,2014	Aug.27,2015
			3831	Jan.31,2014	Jan.30,2015
			3938	Jul.25,2014	Jul.24,2015
			3770	Apr.24,2014	Apr.23,2015
System Validation Dipole	Schmid & Partner Engineering AG	D835V2	4d063	Aug.28,2014	Aug.27,2015
		D1750V2	1008	Aug.28,2014	Aug.27,2015
		D1900V2	5d027	Apr.23,2014	Apr.22,2015
		D2450V2	727	Apr.23,2014	Apr.22,2015
		D2600V2	1005	Jan.28,2014	Jan.27,2015
		D5GHzV2	1104	Apr.16,2014	Apr.15,2015
Data acquisition Electronics	Schmid & Partner Engineering AG	DAE4	1260	Aug.26,2014	Aug.25,2015
			915	Jun.18,2014	Jun.17,2015
			856	Aug.27,2014	Aug.26,2015
			1374	Nov.18,2014	Nov.17,2015
Software	Schmid & Partner Engineering AG	DASY 52 V52.8.8	N/A	Calibration not required	Calibration not required
Phantom	Schmid & Partner Engineering AG	SAM	N/A	Calibration not required	Calibration not required
Network Analyzer	Agilent	E5071C	MY46107530	Feb.14,2014	Feb.13,2015
Dielectric Probe Kit	Agilent	85070E	MY44300677	Calibration not required	Calibration not required
Dual-directional coupler	Agilent	772D	MY46151242	Jul.14,2014	Jul.13,2015
		778D	MY48220468	Apr.01,2014	Mar.31,2015
RF Signal Generator	Agilent	N5181A	MY50141235	Dec.14,2013	Dec.13,2016
Power Meter	Agilent	E4417A	MY52240003	Apr.30,2014	Apr.29,2015
Power Sensor	Agilent	E9301H	MY52200004	Apr.30,2014	Apr.29,2015

Device	Manufacturer	Type	Serial number	Date of last calibration	Date of next calibration
Radio Communication Test	R&S	CMU200	122498	Aug.14,2014	Aug.13,2015
Radio Communication Test	Anritsu	MT8820C	6201061014	Aug.06,2014	Aug.05,2015
TECPEL	Digital thermometer	DTM-303A	TP130074	Mar.20,2014	Mar.19,2015

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

5. Measurements

Date: 2014/11/17

GSM 850_Head_Le Cheek_CH 128

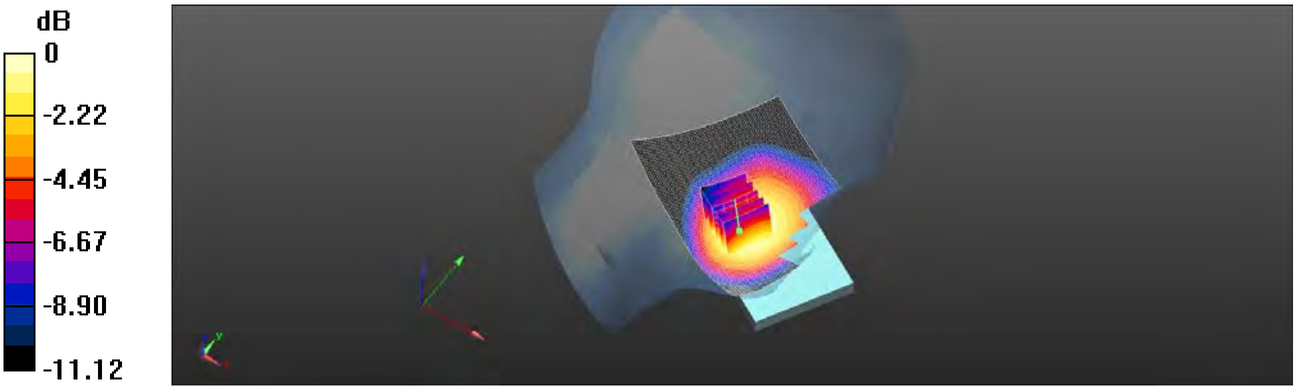
Communication System: GSM Frequency: 824.2 MHz, Duty factor: 1:8.3
Medium parameters used: f = 824.2 MHz; σ = 0.872 S/m; ε_r = 41.276; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3831; ConvF(9.14, 9.14, 9.14); Calibrated: 2014/1/31;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn915; Calibrated: 2014/6/18
- Phantom: Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Head/Area Scan (71x111x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 0.460 W/kg

Configuration/Head/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.938 V/m; Power Drift = -0.14 dB
Peak SAR (extrapolated) = 0.498 W/kg
SAR(1 g) = 0.387 W/kg; SAR(10 g) = 0.286 W/kg
Maximum value of SAR (measured) = 0.448 W/kg



0 dB = 0.448 W/kg = -3.49 dBW/kg

Date: 2014/11/17

GSM 850_Speech mode_Back side_CH 128_15mm

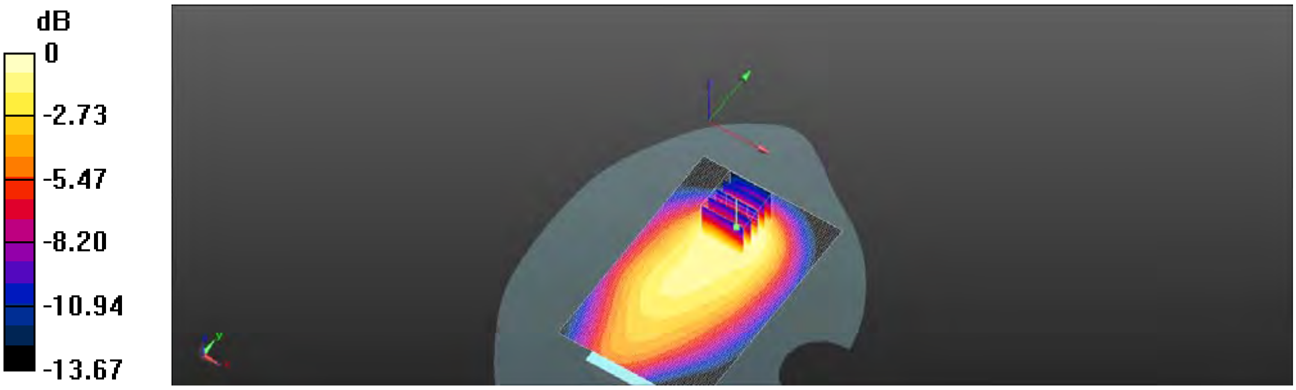
Communication System: GSM Frequency: 824.2 MHz, Duty factor: 1:8.3
Medium parameters used: f = 824.2 MHz; σ = 1.001 S/m; ε_r = 52.977; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3831; ConvF(9.03, 9.03, 9.03); Calibrated: 2014/1/31;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn915; Calibrated: 2014/6/18
- Phantom: Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (71x111x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 0.400 W/kg

Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.80 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.459 W/kg
SAR(1 g) = 0.290 W/kg; SAR(10 g) = 0.183 W/kg
Maximum value of SAR (measured) = 0.381 W/kg



0 dB = 0.381 W/kg = -4.19 dBW/kg

SGS Taiwan Ltd. 台灣檢驗科技股份有限公司 No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Date: 2014/11/17

GPRS 850_Hotspot mode_Back side_CH 128_10mm

Communication System: GPRS (1Dn1Up) Frequency: 824.2 MHz, Duty factor: 1:8.3
Medium parameters used: f = 824.2 MHz; σ = 1.001 S/m; ε_r = 52.977; ρ = 1000 kg/m^3
Phantom section: Flat Section

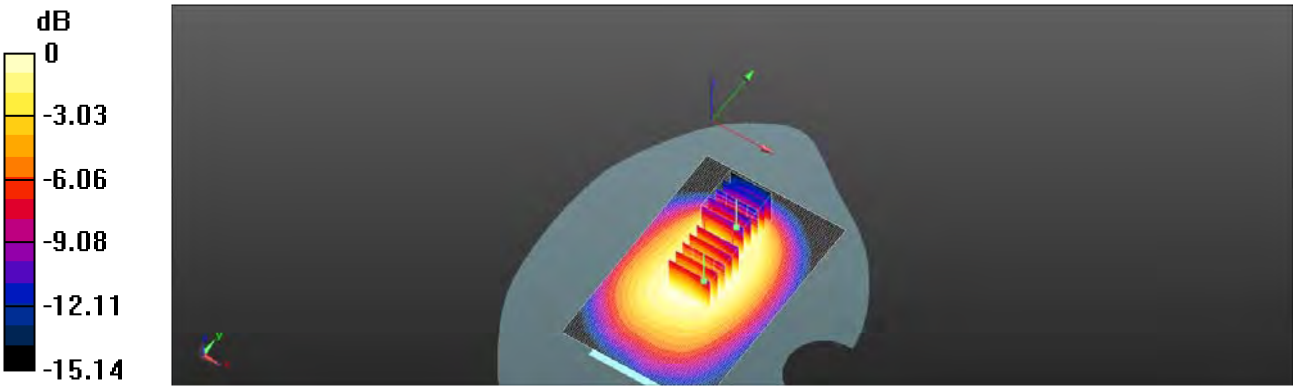
DASY5 Configuration:

- Probe: EX3DV4 - SN3831; ConvF(9.03, 9.03, 9.03); Calibrated: 2014/1/31;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn915; Calibrated: 2014/6/18
- Phantom: Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (71x111x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 0.741 W/kg

Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 26.43 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 0.819 W/kg
SAR(1 g) = 0.638 W/kg; SAR(10 g) = 0.473 W/kg
Maximum value of SAR (measured) = 0.737 W/kg

Configuration/Body/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 26.43 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 0.946 W/kg
SAR(1 g) = 0.578 W/kg; SAR(10 g) = 0.361 W/kg
Maximum value of SAR (measured) = 0.756 W/kg



0 dB = 0.756 W/kg = -1.21 dBW/kg

GSM 1900_Head_Le Cheek_CH 810

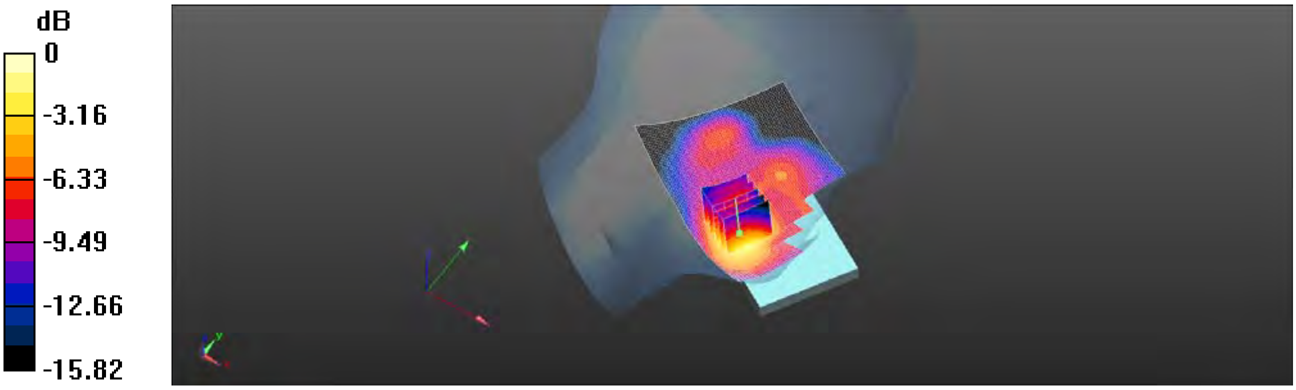
Communication System: GSM Frequency: 1909.8 MHz, Duty factor: 1:8.3
Medium parameters used: f = 1910 MHz; σ = 1.398 S/m; ε_r = 39.531; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3831; ConvF(7.79, 7.79, 7.79); Calibrated: 2014/1/31;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn915; Calibrated: 2014/6/18
- Phantom: Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Head/Area Scan (71x111x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 0.184 W/kg

Configuration/Head/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.042 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 0.219 W/kg
SAR(1 g) = 0.147 W/kg; SAR(10 g) = 0.091 W/kg
Maximum value of SAR (measured) = 0.183 W/kg



0 dB = 0.183 W/kg = -7.38 dBW/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Date: 2014/11/19

GSM 1900_Speech mode_Back side_CH 810_15mm

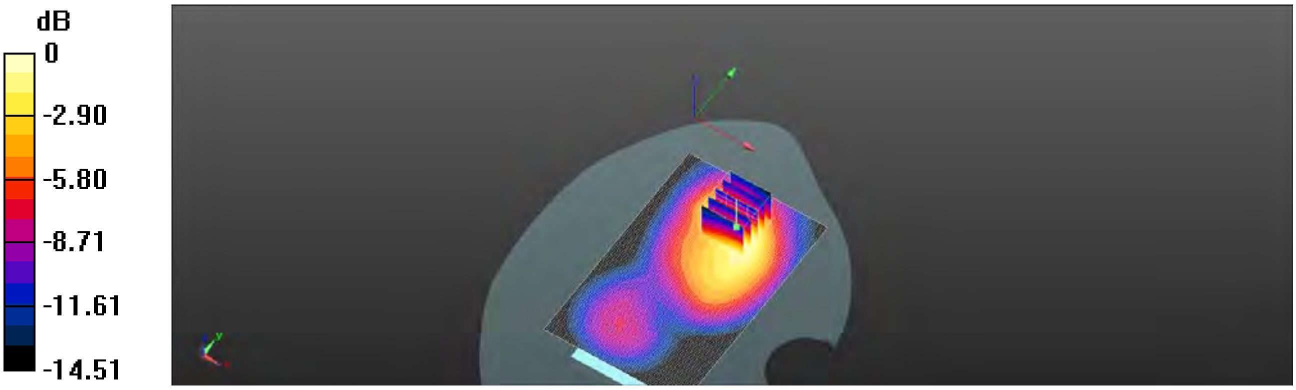
Communication System: GSM Frequency: 1909.8 MHz, Duty factor: 1:8.3
Medium parameters used: f = 1910 MHz; σ = 1.505 S/m; ε_r = 51.618; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3831; ConvF(7.19, 7.19, 7.19); Calibrated: 2014/1/31;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn915; Calibrated: 2014/6/18
- Phantom: Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (71x111x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 0.613 W/kg

Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.986 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 0.721 W/kg
SAR(1 g) = 0.470 W/kg; SAR(10 g) = 0.283 W/kg
Maximum value of SAR (measured) = 0.606 W/kg



0 dB = 0.606 W/kg = -2.18 dBW/kg

Date: 2014/11/19

GPRS 1900_Hotspot mode_Bottom side_CH 810_10mm

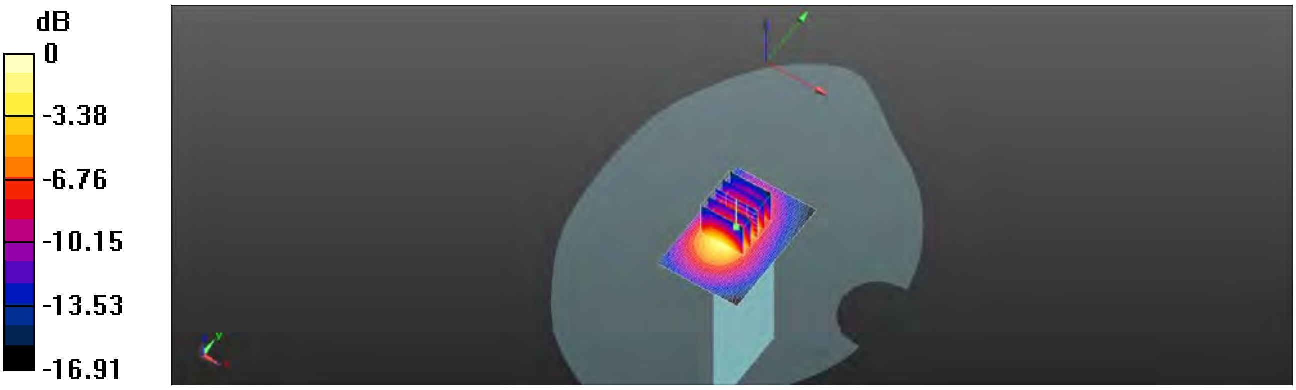
Communication System: GPRS (1Dn1Up) Frequency: 1909.8 MHz, Duty factor: 1:8.3
Medium parameters used: f = 1910 MHz; σ = 1.505 S/m; ε_r = 51.618; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3831; ConvF(7.19, 7.19, 7.19); Calibrated: 2014/1/31;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn915; Calibrated: 2014/6/18
- Phantom: Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (41x61x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 1.22 W/kg

Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.13 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 1.48 W/kg
SAR(1 g) = 0.898 W/kg; SAR(10 g) = 0.485 W/kg
Maximum value of SAR (measured) = 1.22 W/kg



0 dB = 1.22 W/kg = 0.86 dBW/kg

Date: 2014/11/19

WCDMA Band 2_Head_Le Cheek_CH 9538

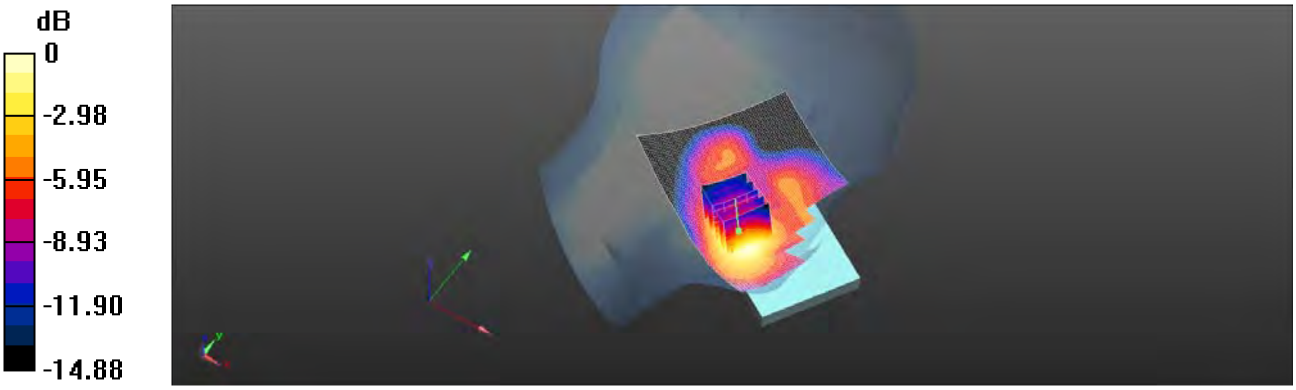
Communication System: WCDMA Frequency: 1907.6 MHz, Duty factor: 1:1
Medium parameters used: f = 1908 MHz; σ = 1.396 S/m; ε_r = 39.538; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3831; ConvF(7.79, 7.79, 7.79); Calibrated: 2014/1/31;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn915; Calibrated: 2014/6/18
- Phantom: Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Head/Area Scan (71x111x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 0.290 W/kg

Configuration/Head/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.050 V/m; Power Drift = -0.18 dB
Peak SAR (extrapolated) = 0.352 W/kg
SAR(1 g) = 0.228 W/kg; SAR(10 g) = 0.139 W/kg
Maximum value of SAR (measured) = 0.281 W/kg



0 dB = 0.281 W/kg = -5.51 dBW/kg

WCDMA Band 2_Speech mode_Back side_CH 9538_repeat SAR test at the highest SAR measurement_15mm

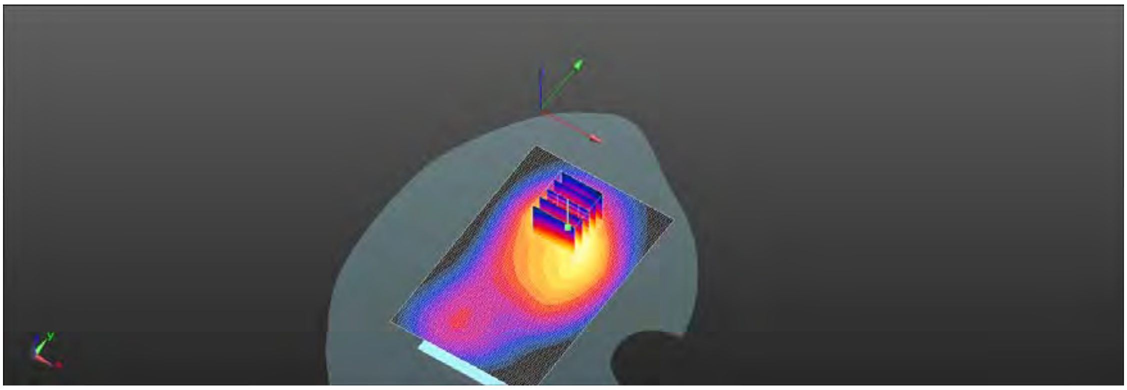
Communication System: WCDMA Frequency: 1907.6 MHz, Duty factor: 1:1
Medium parameters used: f = 1908 MHz; σ = 1.503 S/m; ε_r = 51.621; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3831; ConvF(7.19, 7.19, 7.19); Calibrated: 2014/1/31;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn915; Calibrated: 2014/6/18
- Phantom: Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (71x111x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 1.05 W/kg

Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.71 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 1.27 W/kg
SAR(1 g) = 0.817 W/kg; SAR(10 g) = 0.489 W/kg
Maximum value of SAR (measured) = 1.07 W/kg



0 dB = 1.07 W/kg = 0.29 dBW/kg

Date: 2014/11/19

WCDMA Band 2_Hotspot mode_Bottom side_CH 9262_10mm

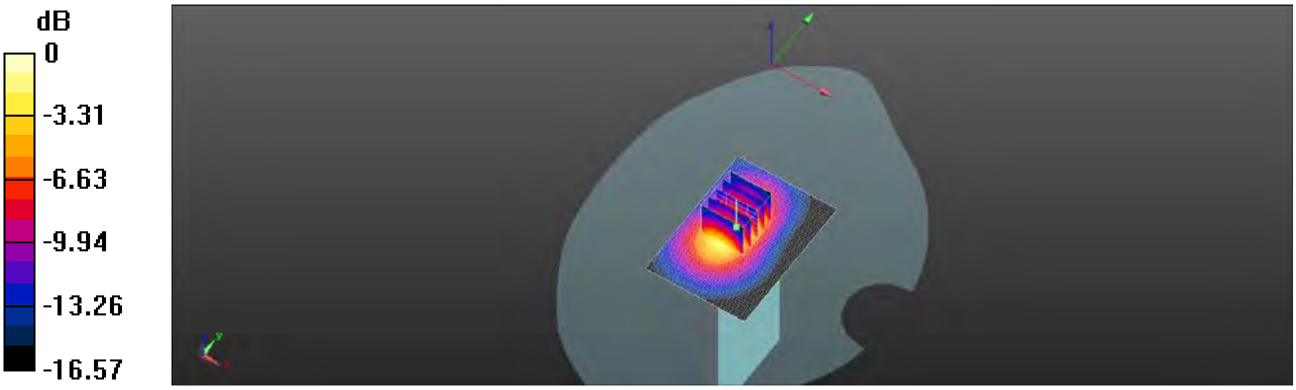
Communication System: WCDMA Frequency: 1852.4 MHz, Duty factor: 1:1
Medium parameters used: f = 1852.4 MHz; σ = 1.459 S/m; ε_r = 51.902; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3831; ConvF(7.19, 7.19, 7.19); Calibrated: 2014/1/31;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn915; Calibrated: 2014/6/18
- Phantom: Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (51x71x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 1.27 W/kg

Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.70 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 1.50 W/kg
SAR(1 g) = 0.918 W/kg; SAR(10 g) = 0.498 W/kg
Maximum value of SAR (measured) = 1.26 W/kg



0 dB = 1.26 W/kg = 1.00 dBW/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

WCDMA Band 4_Head_Le Cheek_CH 1312

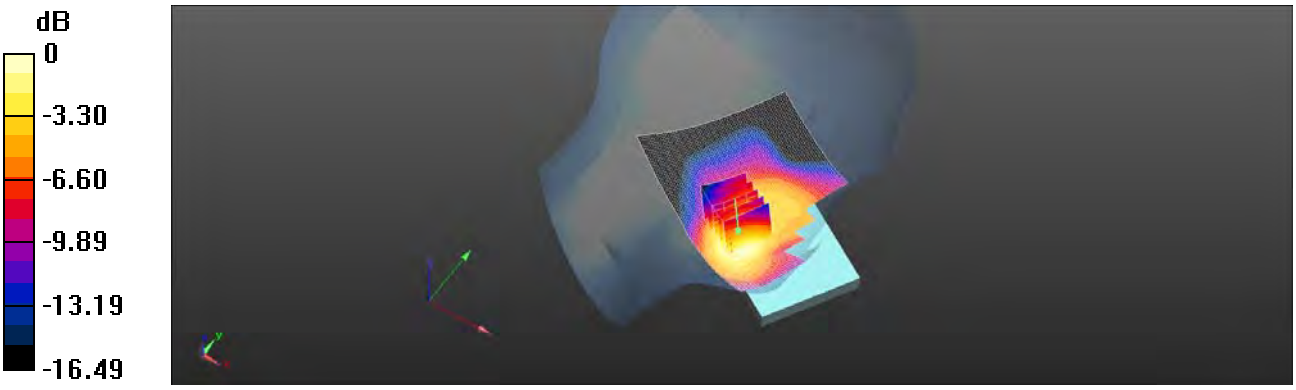
Communication System: WCDMA Frequency: 1712.4 MHz, Duty factor: 1:1
Medium parameters used: f = 1712.4 MHz; σ = 1.343 S/m; ε_r = 39.596; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3831; ConvF(8, 8, 8); Calibrated: 2014/1/31;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn915; Calibrated: 2014/6/18
- Phantom: Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Head/Area Scan (71x111x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 0.649 W/kg

Configuration/Head/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.064 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.749 W/kg
SAR(1 g) = 0.519 W/kg; SAR(10 g) = 0.338 W/kg
Maximum value of SAR (measured) = 0.613 W/kg



0 dB = 0.613 W/kg = -2.13 dBW/kg

WCDMA Band 4_Speech mode_Back side_CH 1312_15mm

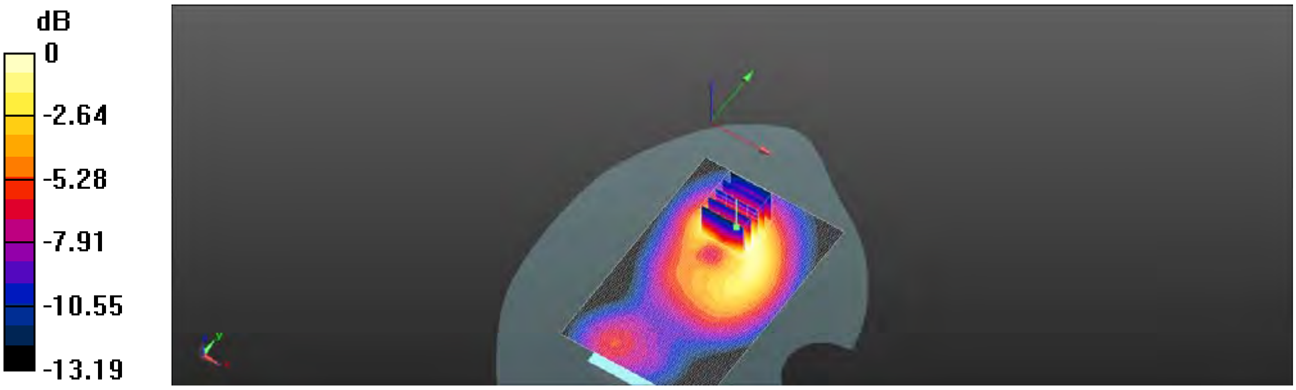
Communication System: WCDMA Frequency: 1712.4 MHz, Duty factor: 1:1
Medium parameters used: f = 1712.4 MHz; σ = 1.431 S/m; ε_r = 54.495; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3831; ConvF(7.63, 7.63, 7.63); Calibrated: 2014/1/31;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn915; Calibrated: 2014/6/18
- Phantom: Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (71x111x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 0.830 W/kg

Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.50 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 1.02 W/kg
SAR(1 g) = 0.689 W/kg; SAR(10 g) = 0.427 W/kg
Maximum value of SAR (measured) = 0.875 W/kg



0 dB = 0.875 W/kg = -0.58 dBW/kg

Date: 2014/11/18

WCDMA Band 4_Hotspot mode_Bottom side_CH 1513_10mm

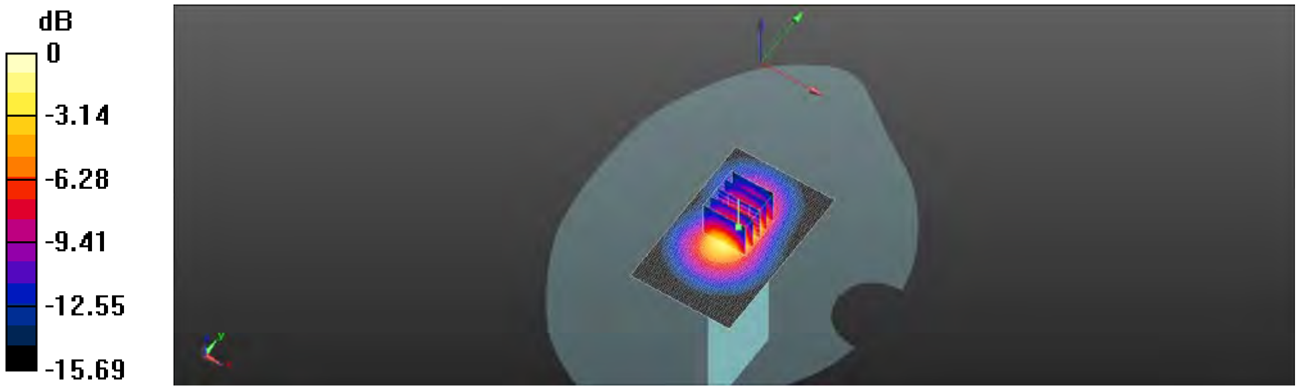
Communication System: WCDMA Frequency: 1752.6 MHz, Duty factor: 1:1
Medium parameters used: f = 1753 MHz; σ = 1.461 S/m; ε_r = 54.383; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3831; ConvF(7.63, 7.63, 7.63); Calibrated: 2014/1/31;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn915; Calibrated: 2014/6/18
- Phantom: Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (51x81x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 1.33 W/kg

Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.84 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 1.52 W/kg
SAR(1 g) = 0.947 W/kg; SAR(10 g) = 0.517 W/kg
Maximum value of SAR (measured) = 1.29 W/kg



0 dB = 1.29 W/kg = 1.11 dBW/kg

Date: 2014/11/17

WCDMA Band 5_Head_Le Cheek_CH 4132

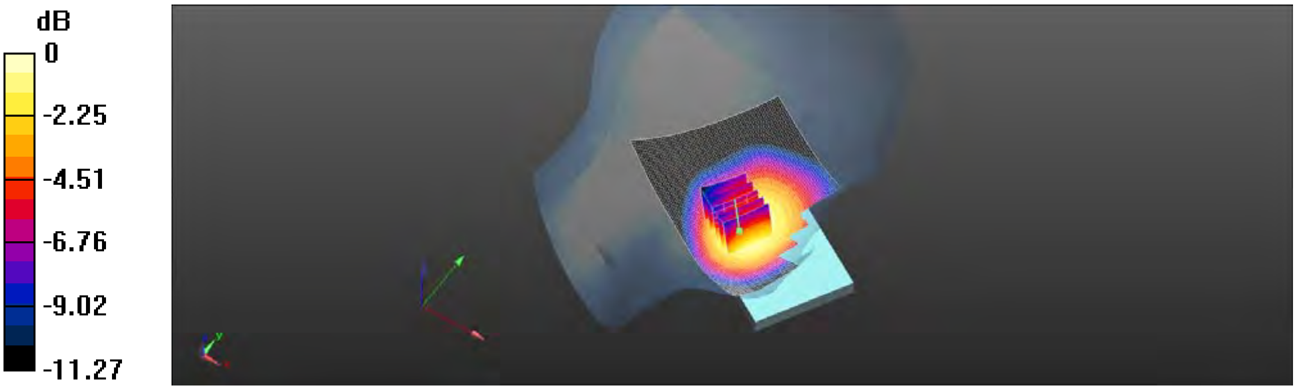
Communication System: WCDMA Frequency: 826.4 MHz, Duty factor: 1:1
Medium parameters used: f = 826.4 MHz; σ = 0.874 S/m; ε_r = 41.25; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3831; ConvF(9.14, 9.14, 9.14); Calibrated: 2014/1/31;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn915; Calibrated: 2014/6/18
- Phantom: Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Head/Area Scan (71x111x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 0.443 W/kg

Configuration/Head/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.960 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 0.486 W/kg
SAR(1 g) = 0.372 W/kg; SAR(10 g) = 0.273 W/kg
Maximum value of SAR (measured) = 0.435 W/kg



0 dB = 0.435 W/kg = -3.62 dBW/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Date: 2014/11/17

WCDMA Band 5_Speech mode_Back side_CH 4132_15mm

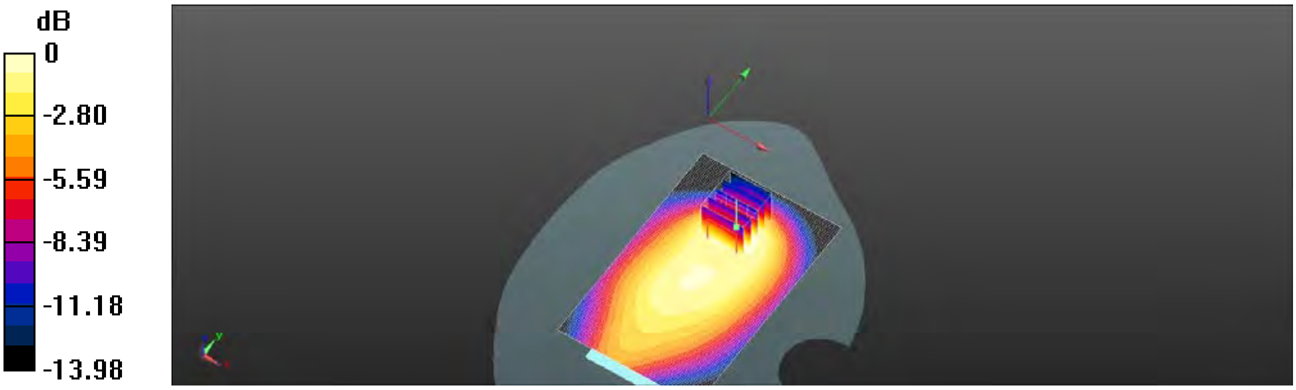
Communication System: WCDMA Frequency: 826.4 MHz, Duty factor: 1:1
Medium parameters used: f = 826.4 MHz; σ = 1.004 S/m; ε_r = 52.958; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3831; ConvF(9.03, 9.03, 9.03); Calibrated: 2014/1/31;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn915; Calibrated: 2014/6/18
- Phantom: Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (71x111x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 0.393 W/kg

Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 17.63 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.461 W/kg
SAR(1 g) = 0.294 W/kg; SAR(10 g) = 0.190 W/kg
Maximum value of SAR (measured) = 0.382 W/kg



0 dB = 0.382 W/kg = -4.18 dBW/kg

Date: 2014/11/17

WCDMA Band 5_Hotspot mode_Back side_CH 4132_10mm

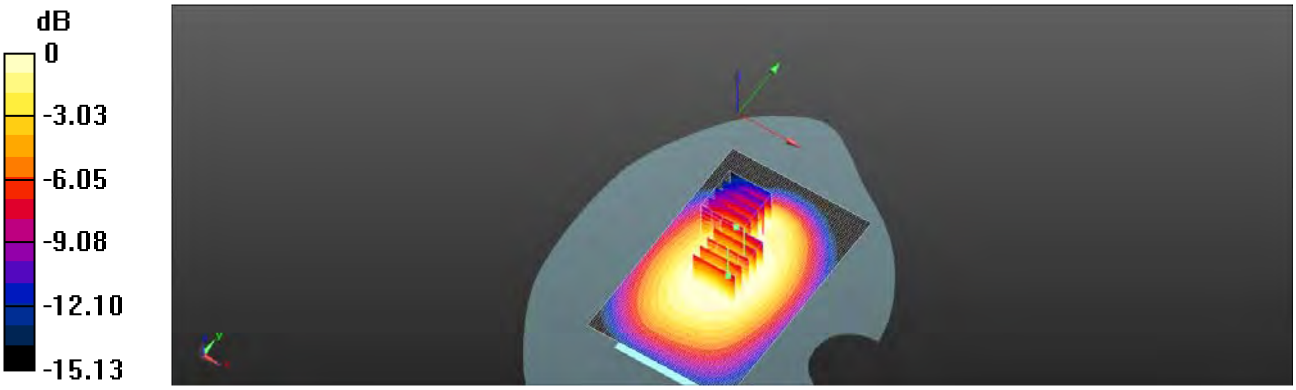
Communication System: WCDMA Frequency: 826.4 MHz, Duty factor: 1:1
Medium parameters used: f = 826.4 MHz; σ = 1.004 S/m; ε_r = 52.958; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3831; ConvF(9.03, 9.03, 9.03); Calibrated: 2014/1/31;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn915; Calibrated: 2014/6/18
- Phantom: Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (71x111x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 0.930 W/kg

Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 29.90 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 1.03 W/kg
SAR(1 g) = 0.796 W/kg; SAR(10 g) = 0.587 W/kg
Maximum value of SAR (measured) = 0.929 W/kg
Configuration/Body/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 29.90 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.905 W/kg
SAR(1 g) = 0.608 W/kg; SAR(10 g) = 0.414 W/kg
Maximum value of SAR (measured) = 0.804 W/kg



0 dB = 0.804 W/kg = -0.95 dBW/kg

Date: 2014/11/20

LTE Band 2 (20MHz)_Head_Le Cheek_CH 19100_QPSK_1-99

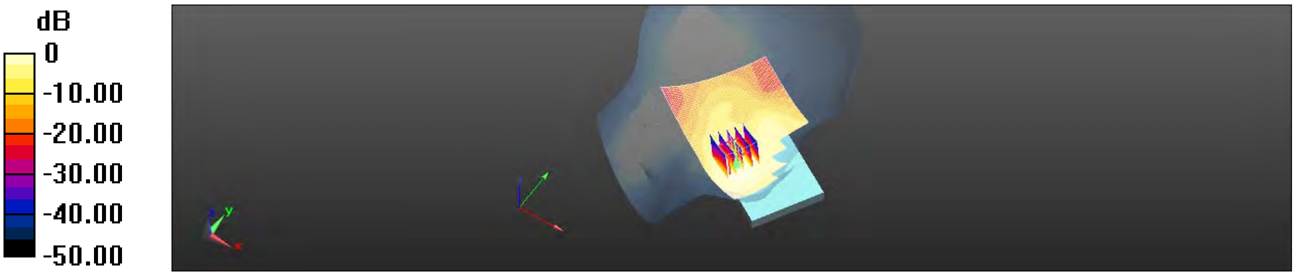
Communication System: LTE; Frequency: 1900 MHz, Duty factor: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.432 S/m; εr = 39.256; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(7.65, 7.65, 7.65); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1374; Calibrated: 2014/11/18
- Phantom: Head
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Head/Area Scan (71x111x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 0.579 W/kg

Configuration/Head/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.023 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 0.683 W/kg
SAR(1 g) = 0.429 W/kg; SAR(10 g) = 0.257 W/kg
Maximum value of SAR (measured) = 0.551 W/kg



0 dB = 0.579 W/kg = -2.37 dBW/kg

Date: 2014/12/1

LTE Band 2 (20MHz)_Body-worn_Back side_CH 19100_QPSK_1-99_15mm

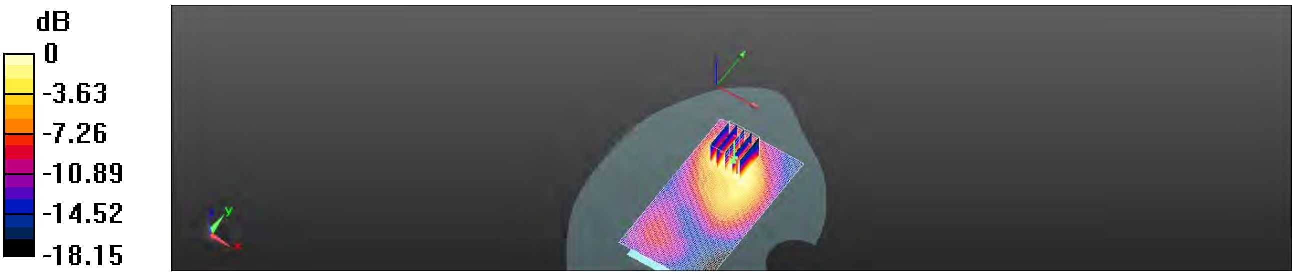
Communication System: LTE; Frequency: 1900 MHz, Duty factor: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.549 S/m; ε_r = 53.523; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(7.03, 7.03, 7.03); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1374; Calibrated: 2014/11/18
- Phantom: Head
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Head/Area Scan (61x111x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 1.10 W/kg

Configuration/Head/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.789 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.30 W/kg
SAR(1 g) = 0.804 W/kg; SAR(10 g) = 0.441 W/kg
Maximum value of SAR (measured) = 1.09 W/kg



0 dB = 1.10 W/kg = 0.41 dBW/kg

LTE Band 2 (20MHz) reduced_Hotspot_Bottom side_CH 19100_QPSK_50-50_10mm

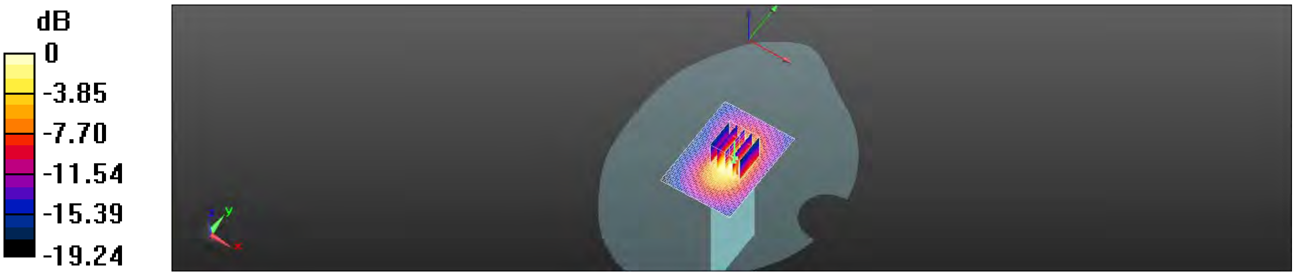
Communication System: LTE; Frequency: 1900 MHz, Duty factor: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.549 S/m; ε_r = 53.523; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(7.03, 7.03, 7.03); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1374; Calibrated: 2014/11/18
- Phantom: Head
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Head/Area Scan (51x71x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 1.35 W/kg

Configuration/Head/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.84 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 1.60 W/kg
SAR(1 g) = 0.949 W/kg; SAR(10 g) = 0.501 W/kg
Maximum value of SAR (measured) = 1.32 W/kg



0 dB = 1.35 W/kg = 1.30 dBW/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Date: 2014/12/2

LTE Band 4 (20MHz)_Head_Le Cheek_CH 20050_QPSK_1-50

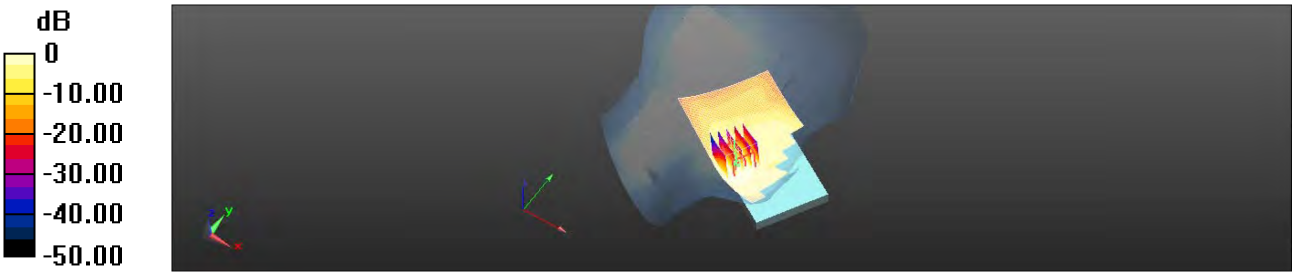
Communication System: LTE; Frequency: 1720 MHz, Duty factor: 1:1
Medium parameters used: f = 1720 MHz; σ = 1.294 S/m; εr = 40.523; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(7.91, 7.91, 7.91); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1374; Calibrated: 2014/11/18
- Phantom: Head
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Head/Area Scan (61x101x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 0.523 W/kg

Configuration/Head/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.441 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.571 W/kg
SAR(1 g) = 0.380 W/kg; SAR(10 g) = 0.239 W/kg
Maximum value of SAR (measured) = 0.484 W/kg



0 dB = 0.523 W/kg = -2.81 dBW/kg

Date: 2014/12/3

LTE Band 4 (20MHz)_Body-worn_Back side_CH 20050_QPSK_1-50_15mm

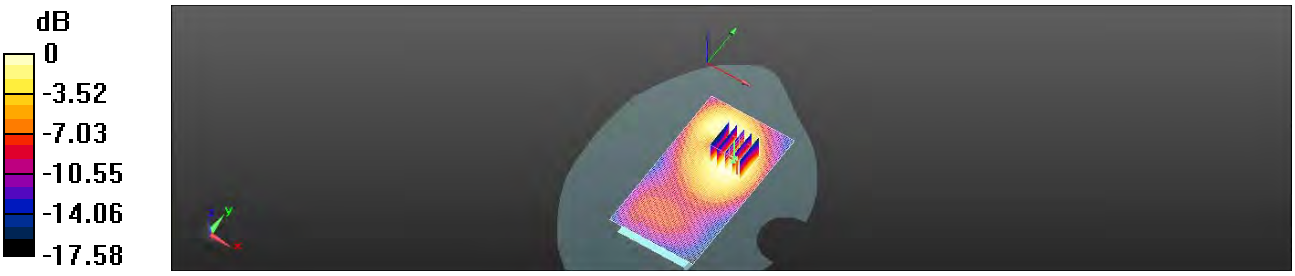
Communication System: LTE; Frequency: 1720 MHz, Duty factor: 1:1
Medium parameters used: f = 1720 MHz; σ = 1.448 S/m; εr = 54.922; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(7.36, 7.36, 7.36); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1374; Calibrated: 2014/11/18
- Phantom: Head
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Head/Area Scan (61x111x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 0.736 W/kg

Configuration/Head/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.13 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 0.874 W/kg
SAR(1 g) = 0.559 W/kg; SAR(10 g) = 0.346 W/kg
Maximum value of SAR (measured) = 0.723 W/kg



0 dB = 0.736 W/kg = -1.33 dBW/kg

Date: 2014/12/3

LTE Band 4 (20MHz)_Hotspot_Bottom side_CH 20050_QPSK_1-50_10mm

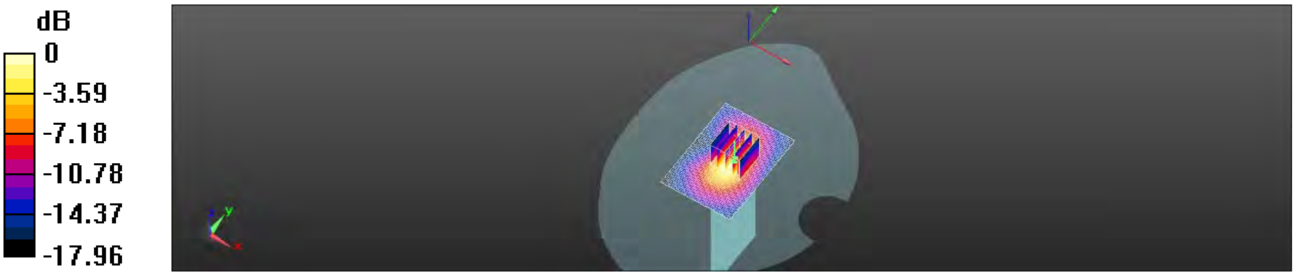
Communication System: LTE; Frequency: 1720 MHz, Duty factor: 1:1
Medium parameters used: f = 1720 MHz; σ = 1.448 S/m; εr = 54.922; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(7.36, 7.36, 7.36); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1374; Calibrated: 2014/11/18
- Phantom: Head
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Head/Area Scan (51x71x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 1.83 W/kg

Configuration/Head/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 33.57 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 2.16 W/kg
SAR(1 g) = 1.28 W/kg; SAR(10 g) = 0.682 W/kg
Maximum value of SAR (measured) = 1.77 W/kg



0 dB = 1.83 W/kg = 2.62 dBW/kg

Date: 2014/12/4

LTE Band 5 (10MHz)_Head_Le Cheek_CH 20450_QPSK_1-0

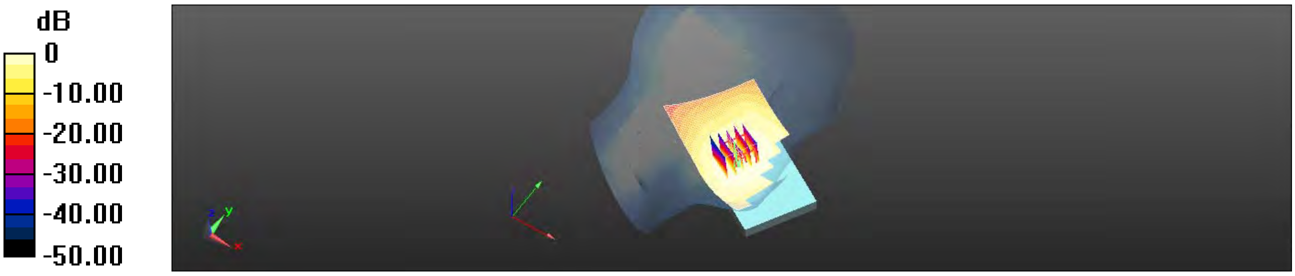
Communication System: LTE; Frequency: 829 MHz, Duty factor: 1:1
Medium parameters used: f = 829 MHz; σ = 0.887 S/m; εr = 40.238; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(9.41, 9.41, 9.41); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1374; Calibrated: 2014/11/18
- Phantom: Head
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Head/Area Scan (61x101x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 0.491 W/kg

Configuration/Head/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.390 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 0.542 W/kg
SAR(1 g) = 0.418 W/kg; SAR(10 g) = 0.315 W/kg
Maximum value of SAR (measured) = 0.484 W/kg



0 dB = 0.491 W/kg = -3.09 dBW/kg

Date: 2014/12/5

LTE Band 5 (10MHz)_Body-worn_Back side_CH 20600_QPSK_1-25_15mm

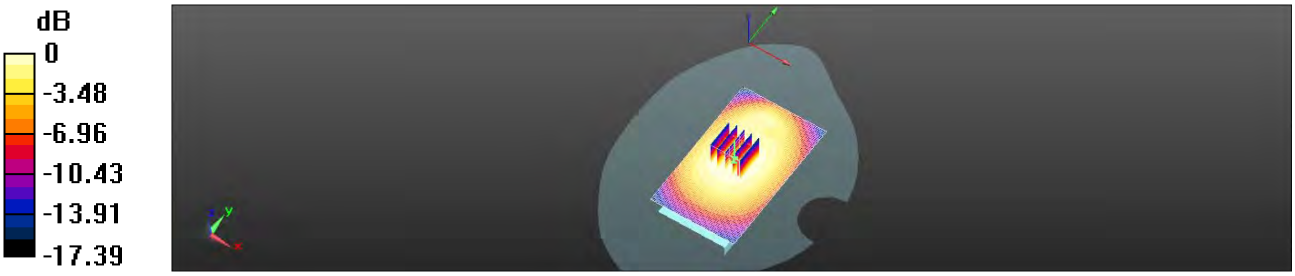
Communication System: LTE; Frequency: 844 MHz, Duty factor: 1:1
Medium parameters used: f = 844 MHz; σ = 0.992 S/m; εr = 54.002; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(9.35, 9.35, 9.35); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1374; Calibrated: 2014/11/18
- Phantom: Head
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Head/Area Scan (61x101x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 0.594 W/kg

Configuration/Head/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.83 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.659 W/kg
SAR(1 g) = 0.517 W/kg; SAR(10 g) = 0.391 W/kg
Maximum value of SAR (measured) = 0.598 W/kg



0 dB = 0.594 W/kg = -2.26 dBW/kg

Date: 2014/12/5

LTE Band 5 (10MHz)_Hotspot_Back side_CH 20525_QPSK_1-25_10mm

Communication System: LTE; Frequency: 836.5 MHz, Duty factor: 1:1
Medium parameters used: f = 836.5 MHz; σ = 0.973 S/m; εr = 54.149; ρ = 1000 kg/m^3
Phantom section: Flat Section

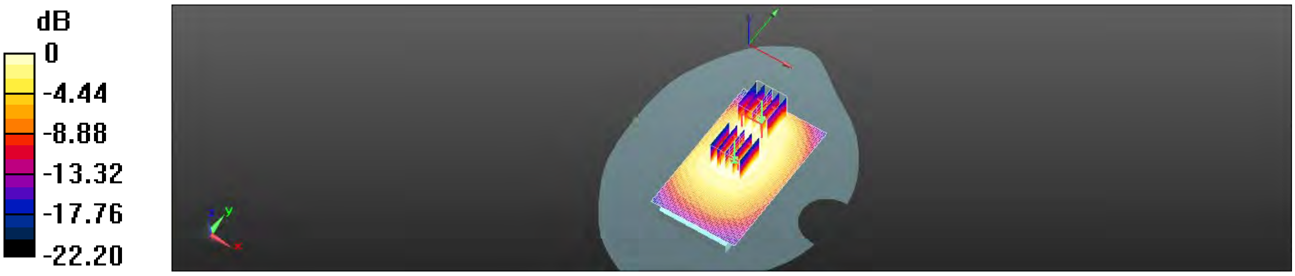
DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(9.35, 9.35, 9.35); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1374; Calibrated: 2014/11/18
- Phantom: Head
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Head/Area Scan (61x101x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 0.825 W/kg

Configuration/Head/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 26.38 V/m; Power Drift = 0.17 dB
Peak SAR (extrapolated) = 0.829 W/kg
SAR(1 g) = 0.519 W/kg; SAR(10 g) = 0.328 W/kg
Maximum value of SAR (measured) = 0.665 W/kg

Configuration/Head/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 26.38 V/m; Power Drift = 0.17 dB
Peak SAR (extrapolated) = 0.919 W/kg
SAR(1 g) = 0.716 W/kg; SAR(10 g) = 0.534 W/kg
Maximum value of SAR (measured) = 0.826 W/kg



0 dB = 0.825 W/kg = -0.84 dBW/kg

LTE Band 7 (20MHz)_Head_Le Cheek_CH 21100_QPSK_1-99

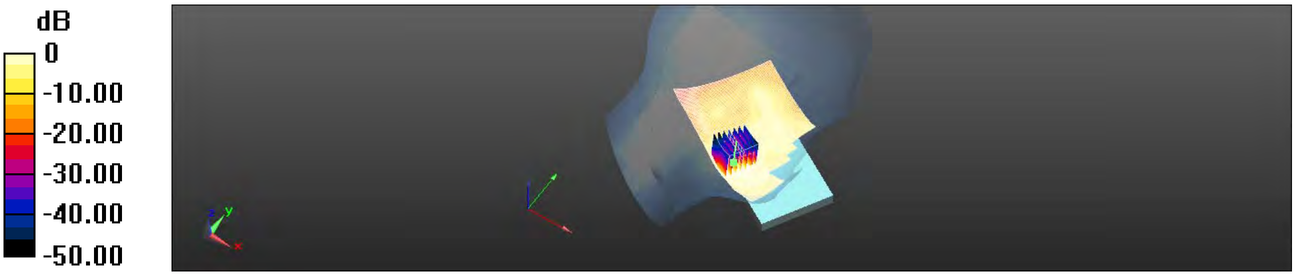
Communication System: LTE; Frequency: 2535 MHz, Duty factor: 1:1
Medium parameters used: f = 2535 MHz; σ = 1.827 S/m; εr = 41.027; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(6.83, 6.83, 6.83); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1374; Calibrated: 2014/11/18
- Phantom: Head
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Head/Area Scan (81x141x1): Interpolated grid: dx=12 mm, dy=12 mm
Maximum value of SAR (interpolated) = 0.562 W/kg

Configuration/Head/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.968 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 0.685 W/kg
SAR(1 g) = 0.380 W/kg; SAR(10 g) = 0.200 W/kg
Maximum value of SAR (measured) = 0.531 W/kg



0 dB = 0.562 W/kg = -2.50 dBW/kg

Date: 2014/12/8

LTE Band 7 (20MHz)_Body-worn_Back side_CH 21100_QPSK_1-99_15mm

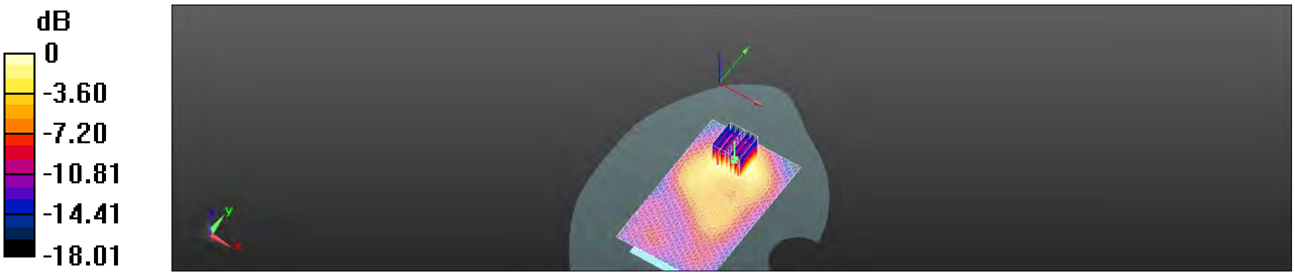
Communication System: LTE; Frequency: 2535 MHz, Duty factor: 1:1
Medium parameters used: f = 2535 MHz; σ = 2.019 S/m; εr = 53.211; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(6.57, 6.57, 6.57); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1374; Calibrated: 2014/11/18
- Phantom: Head
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Head/Area Scan (81x131x1): Interpolated grid: dx=12 mm, dy=12 mm
Maximum value of SAR (interpolated) = 0.719 W/kg

Configuration/Head/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.727 V/m; Power Drift = -0.14 dB
Peak SAR (extrapolated) = 0.941 W/kg
SAR(1 g) = 0.497 W/kg; SAR(10 g) = 0.262 W/kg
Maximum value of SAR (measured) = 0.712 W/kg



0 dB = 0.719 W/kg = -1.43 dBW/kg

Date: 2014/12/8

LTE Band 7 (20MHz)_Hotspot_Bottom side_CH 21100_QPSK_1-99_10mm

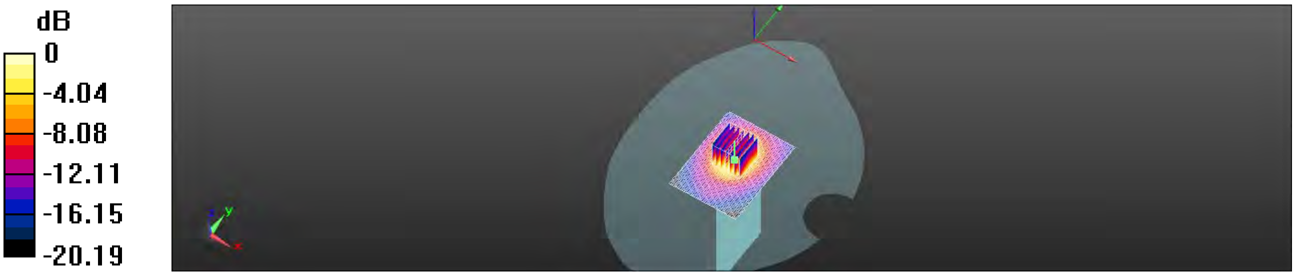
Communication System: LTE; Frequency: 2535 MHz, Duty factor: 1:1
Medium parameters used: f = 2535 MHz; σ = 2.019 S/m; εr = 53.211; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(6.57, 6.57, 6.57); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1374; Calibrated: 2014/11/18
- Phantom: Head
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Head/Area Scan (61x81x1): Interpolated grid: dx=12 mm, dy=12 mm
Maximum value of SAR (interpolated) = 1.56 W/kg

Configuration/Head/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 23.85 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 2.03 W/kg
SAR(1 g) = 1.02 W/kg; SAR(10 g) = 0.502 W/kg
Maximum value of SAR (measured) = 1.50 W/kg



0 dB = 1.56 W/kg = 1.93 dBW/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

WLAN802.11b_Head_RE Cheek_CH 11

Communication System: WLAN802.11 b & g & n(20M)(40M) ; Frequency: 2462 MHz
, Duty factor: 1:1

Medium parameters used: f = 2462 MHz; σ = 1.836 S/m; ε_r = 39.117; ρ = 1000 kg/m^3

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(6.97, 6.97, 6.97); Calibrated: 4/24/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 8/27/2014
- Phantom:Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/RE Cheek/Area Scan (91x141x1): Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 1.30 W/kg

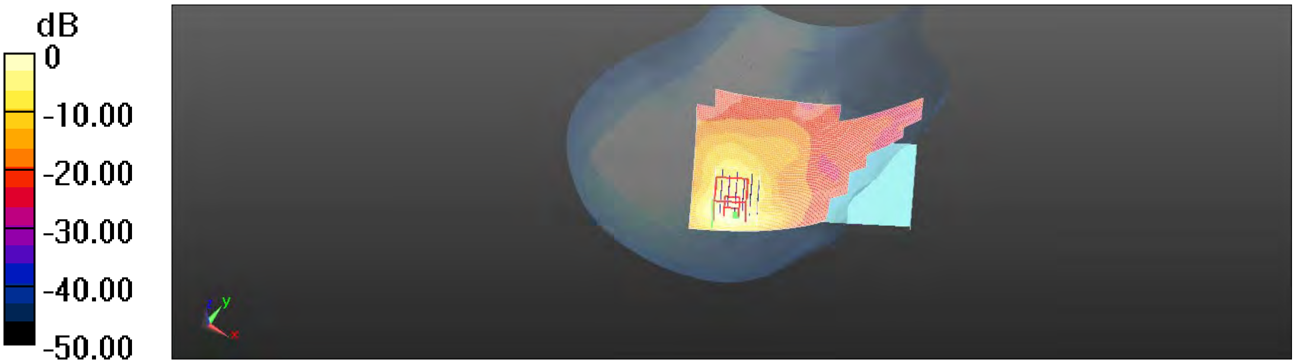
Configuration/RE Cheek/Zoom Scan (7x7x7) /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 10.15 V/m; Power Drift = 0.16 dB

Peak SAR (extrapolated) = 1.78 W/kg

SAR(1 g) = 0.786 W/kg; SAR(10 g) = 0.356 W/kg

Maximum value of SAR (measured) = 1.20 W/kg



0 dB = 1.30 W/kg = 1.15 dBW/kg

Date: 2014/11/23

WLAN802.11b_Hotspot_Back side_CH 11_10mm

Communication System: WLAN802.11 b & g & n(20M)(40M) ; Frequency: 2462 MHz , Duty factor: 1:1

Medium parameters used: f = 2462 MHz; σ = 2.063 S/m; ε_r = 50.06; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.15, 7.15, 7.15); Calibrated: 4/24/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 8/27/2014
- Phantom:Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Hotspot/Area Scan (91x151x1): Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 1.13 W/kg

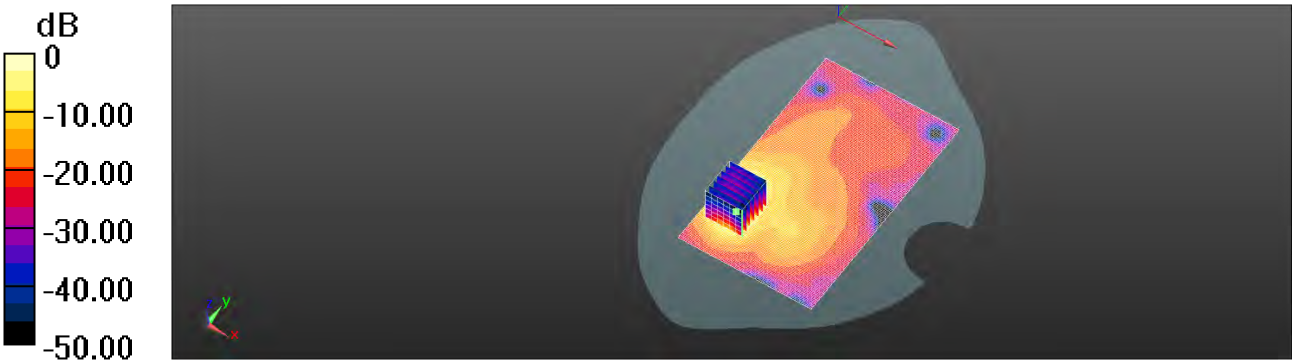
Configuration/Hotspot/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.208 V/m; Power Drift = 0.15 dB

Peak SAR (extrapolated) = 1.53 W/kg

SAR(1 g) = 0.679 W/kg; SAR(10 g) = 0.294 W/kg

Maximum value of SAR (measured) = 1.07 W/kg



0 dB = 1.13 W/kg = 0.53 dBW/kg

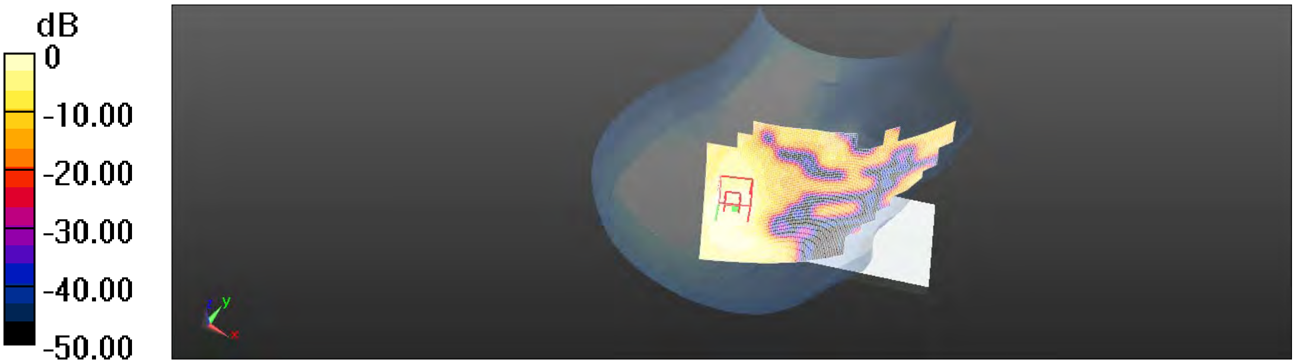
WLAN802.11a5.2G_Head_RE Tilt_CH 48

Communication System: WLAN 802.11n/a(5G) FCC ; Frequency: 5240 MHz,
Duty factor: 1:1
Medium parameters used: f = 5240 MHz; σ = 4.666 S/m; ε_r = 36.083; ρ = 1000 kg/m^3
Phantom section: Right Section
DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(5.25, 5.25, 5.25); Calibrated: 4/24/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 8/27/2014
- Phantom: Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/RE Tilt/Area Scan (111x181x1): Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 0.270 W/kg

Configuration/RE Tilt/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 5.017 V/m; Power Drift = 0.18 dB
Peak SAR (extrapolated) = 0.523 W/kg
SAR(1 g) = 0.158 W/kg; SAR(10 g) = 0.066 W/kg
Maximum value of SAR (measured) = 0.282 W/kg



0 dB = 0.270 W/kg = -5.68 dBW/kg

SGS Taiwan Ltd. 台灣檢驗科技股份有限公司
No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Date: 2014/11/22

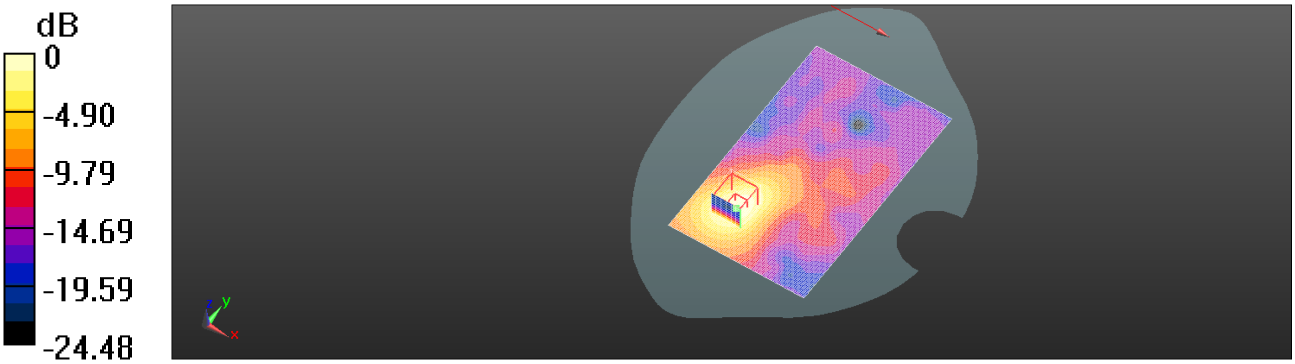
WLAN802.11a5.2G_Body-worn_Back side_CH 40_15mm

Communication System: WLAN 802.11n/a(5G) FCC ; Frequency: 5200 MHz
, Duty factor: 1:1
Medium parameters used: f = 5200 MHz; σ = 5.337 S/m; ε_r = 48.522; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(4.56, 4.56, 4.56); Calibrated: 4/24/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 8/27/2014
- Phantom: Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (111x181x1): Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 0.606 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 3.644 V/m; Power Drift = 0.17 dB
Peak SAR (extrapolated) = 1.16 W/kg
SAR(1 g) = 0.339 W/kg; SAR(10 g) = 0.147 W/kg
Maximum value of SAR (measured) = 0.598 W/kg



0 dB = 0.606 W/kg = -2.18 dBW/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

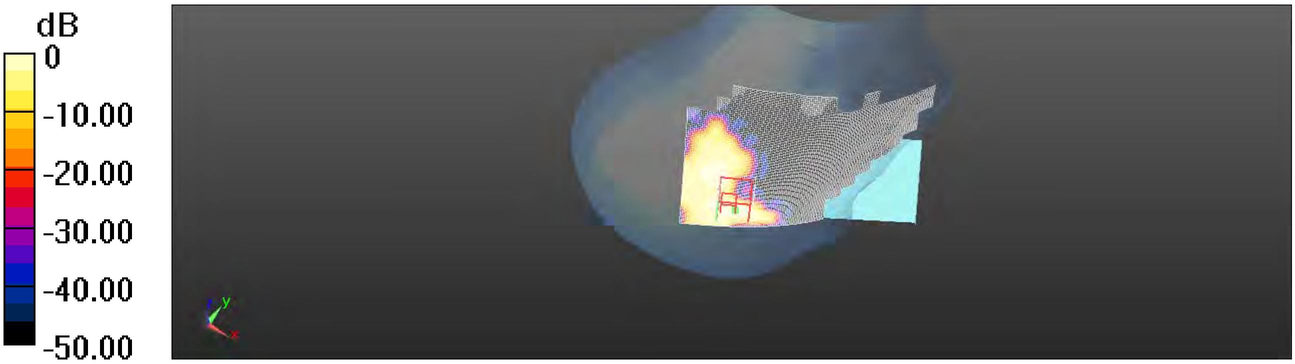
WLAN802.11a5.3G_Head_RE Cheek_CH 60

Communication System: WLAN 802.11n/a(5G) FCC ; Frequency: 5300 MHz,
Duty factor: 1:1
Medium parameters used: f = 5300 MHz; σ = 4.728 S/m; ε_r = 35.839; ρ = 1000 kg/m^3
Phantom section: Right Section
DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(5.07, 5.07, 5.07); Calibrated: 4/24/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 8/27/2014
- Phantom: Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/RE Cheek/Area Scan (111x181x1): Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 0.339 W/kg

Configuration/RE Cheek/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 4.240 V/m; Power Drift =0.19 dB
Peak SAR (extrapolated) = 0.672 W/kg
SAR(1 g) = 0.170 W/kg; SAR(10 g) = 0.076 W/kg
Maximum value of SAR (measured) = 0.304 W/kg



0 dB = 0.339 W/kg = -4.70 dBW/kg

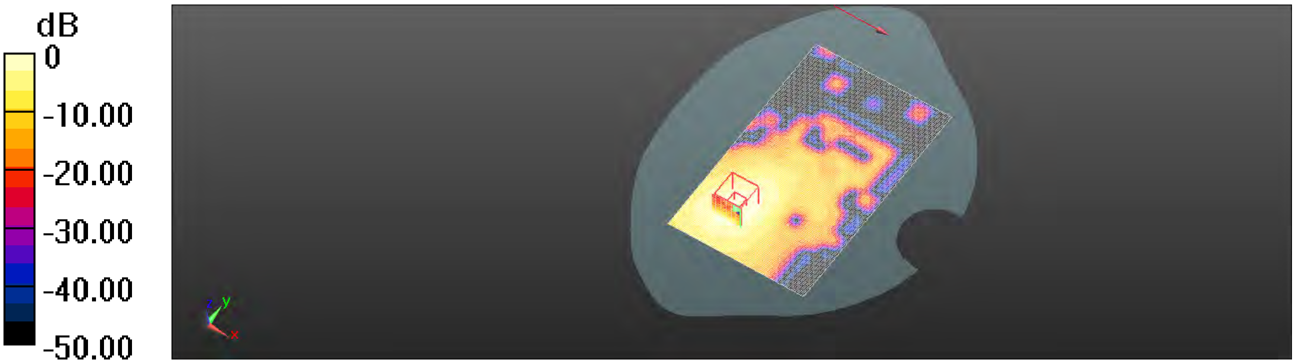
WLAN802.11a5.3G_Body-worn_Back side_CH 60_15mm

Communication System: WLAN 802.11n/a(5G) FCC ; Frequency: 5300 MHz
, Duty factor: 1:1
Medium parameters used: f = 5300 MHz; σ = 5.474 S/m; ε_r = 47.787; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(4.38, 4.38, 4.38); Calibrated: 4/24/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 8/27/2014
- Phantom: Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (111x181x1): Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 0.574 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 3.168 V/m; Power Drift = 0.18 dB
Peak SAR (extrapolated) = 1.14 W/kg
SAR(1 g) = 0.316 W/kg; SAR(10 g) = 0.126 W/kg
Maximum value of SAR (measured) = 0.576 W/kg



0 dB = 0.574 W/kg = -2.41 dBW/kg

Date: 2014/11/20

WLAN802.11a5.6G_Head_RE Cheek_CH 140

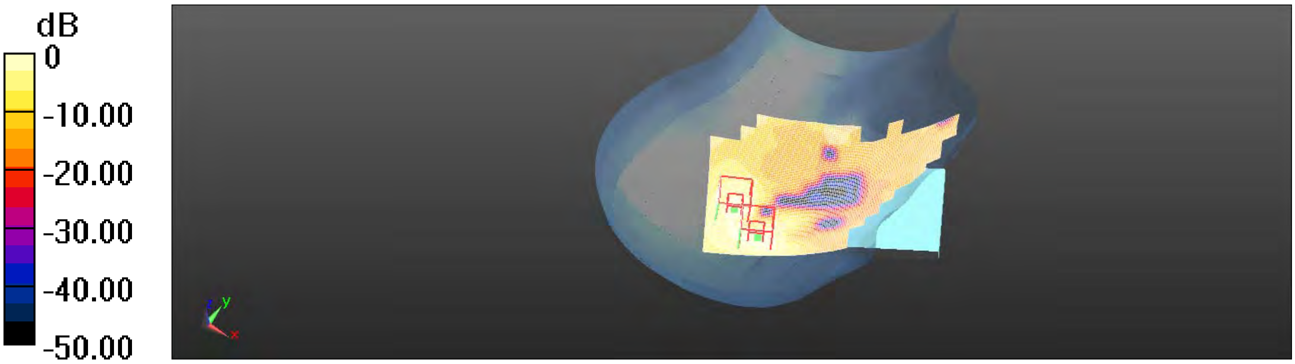
Communication System: WLAN 802.11n/a(5G) FCC ; Frequency: 5700 MHz
, Duty factor: 1:1
Medium parameters used: f = 5700 MHz; σ = 5.193 S/m; ε_r = 34.941; ρ = 1000 kg/m^3
Phantom section: Right Section
DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(4.48, 4.48, 4.48); Calibrated: 4/24/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 8/27/2014
- Phantom: Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/RE Cheek/Area Scan (111x181x1): Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 0.768 W/kg

Configuration/RE Cheek/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 5.421 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 1.78 W/kg
SAR(1 g) = 0.423 W/kg; SAR(10 g) = 0.159 W/kg
Maximum value of SAR (measured) = 0.804 W/kg

Configuration/RE Cheek/Zoom Scan (7x7x12)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 5.421 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 1.86 W/kg
SAR(1 g) = 0.361 W/kg; SAR(10 g) = 0.128 W/kg
Maximum value of SAR (measured) = 0.738 W/kg



0 dB = 0.768 W/kg = -1.15 dBW/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

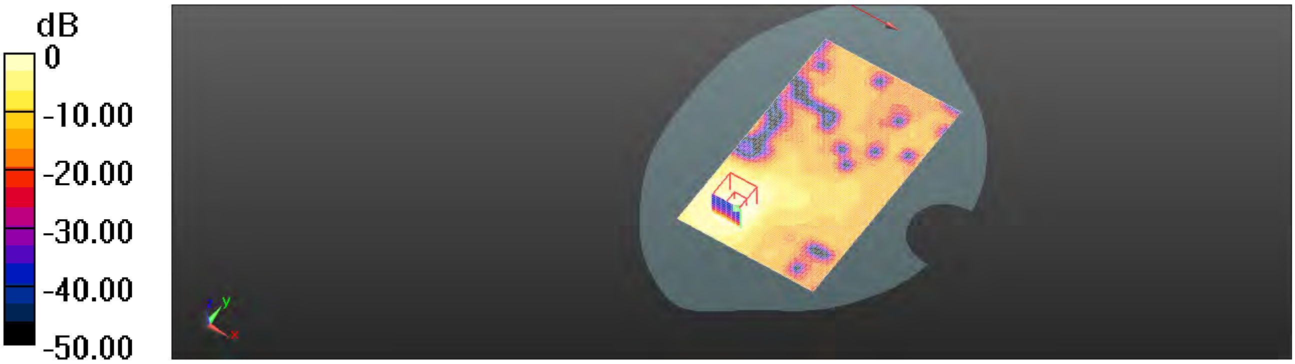
WLAN802.11a5.6G_Body-worn_Back side_CH 132_15mm

Communication System: WLAN 802.11n/a(5G) FCC ; Frequency: 5660 MHz
, Duty factor: 1:1
Medium parameters used: f = 5660 MHz; σ = 6.004 S/m; ε_r = 46.833; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(3.76, 3.76, 3.76); Calibrated: 4/24/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 8/27/2014
- Phantom: Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (111x181x1): Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 0.766 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 2.921 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 1.59 W/kg
SAR(1 g) = 0.402 W/kg; SAR(10 g) = 0.163 W/kg
Maximum value of SAR (measured) = 0.750 W/kg



0 dB = 0.766 W/kg = -1.16 dBW/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

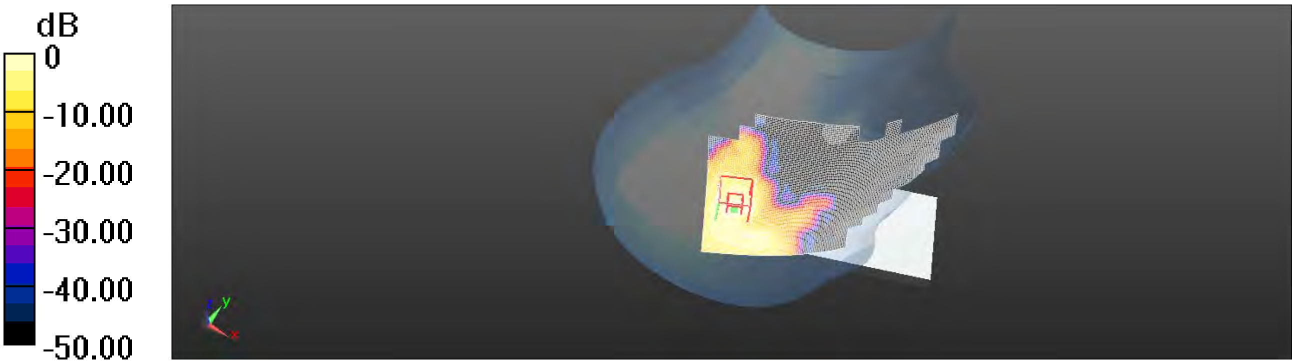
WLAN802.11a5.8G_Head_RE Tilt_CH 161

Communication System: WLAN 802.11n/a(5G) FCC ; Frequency: 5805 MHz
, Duty factor: 1:1
Medium parameters used: f = 5805 MHz; σ = 5.317 S/m; ε_r = 34.689; ρ = 1000 kg/m^3
Phantom section: Right Section
DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(4.65, 4.65, 4.65); Calibrated: 4/24/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 8/27/2014
- Phantom: Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/RE Tilt/Area Scan (111x181x1): Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 0.946 W/kg

Configuration/RE Tilt/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 5.390 V/m; Power Drift = -0.14 dB
Peak SAR (extrapolated) = 2.30 W/kg
SAR(1 g) = 0.478 W/kg; SAR(10 g) = 0.133 W/kg
Maximum value of SAR (measured) = 1.05 W/kg



0 dB = 0.946 W/kg = -0.24 dBW/kg

Date: 2014/11/22

WLAN802.11a5.8G_Body-worn_Back side_CH 161_15mm

Communication System: WLAN 802.11n/a(5G) FCC ; Frequency: 5805 MHz
, Duty factor: 1:1

Medium parameters used: f = 5805 MHz; σ = 6.193 S/m; ε_r = 46.422; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(4.13, 4.13, 4.13); Calibrated: 4/24/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 8/27/2014
- Phantom: Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (111x181x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 0.702 W/kg

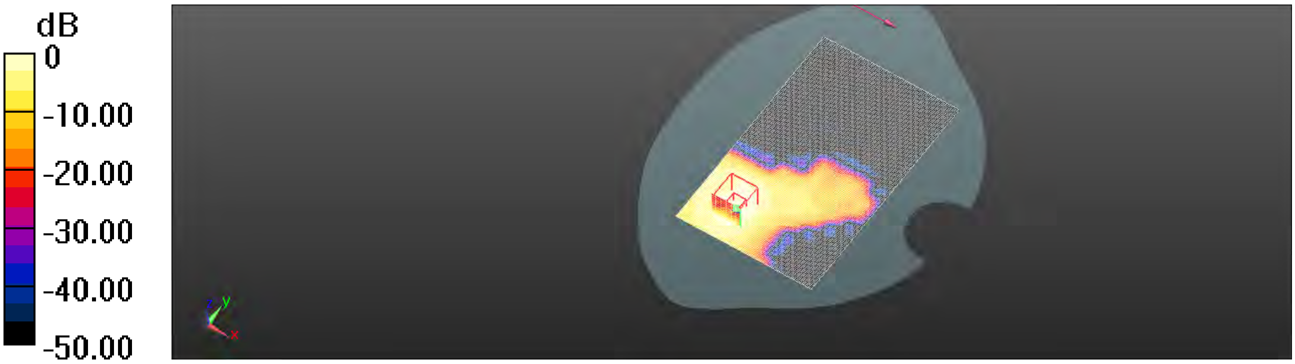
Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 1.906 V/m; Power Drift = 0.13 dB

Peak SAR (extrapolated) = 1.59 W/kg

SAR(1 g) = 0.369 W/kg; SAR(10 g) = 0.138 W/kg

Maximum value of SAR (measured) = 0.713 W/kg



0 dB = 0.702 W/kg = -1.54 dBW/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

6. System Verification

Date: 2014/11/17

Dipole 835 MHz_SN:4d063_Head

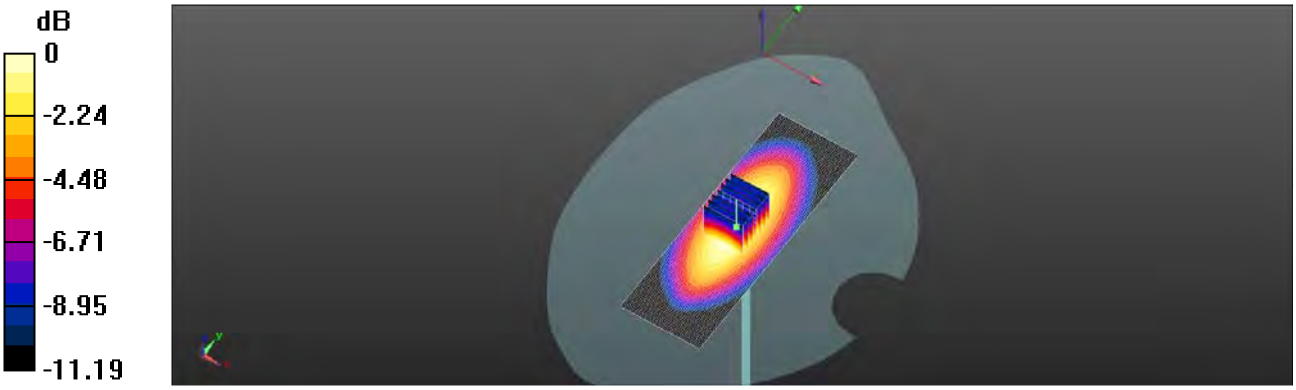
Communication System: CW; Frequency: 835 MHz, Duty factor: 1:1
Medium parameters used: f = 835 MHz; σ = 0.883 S/m; ε_r = 41.143; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3831; ConvF(9.14, 9.14, 9.14); Calibrated: 2014/1/31;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn915; Calibrated: 2014/6/18
- Phantom: Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Pin=250mW/Area Scan (41x121x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 3.62 W/kg

Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 65.07 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 4.32 W/kg
SAR(1 g) = 2.35 W/kg; SAR(10 g) = 1.53 W/kg
Maximum value of SAR (measured) = 3.64 W/kg



0 dB = 3.64 W/kg = 5.61 dBW/kg

Date: 2014/12/4

Dipole 835 MHz_SN:4d063_Head

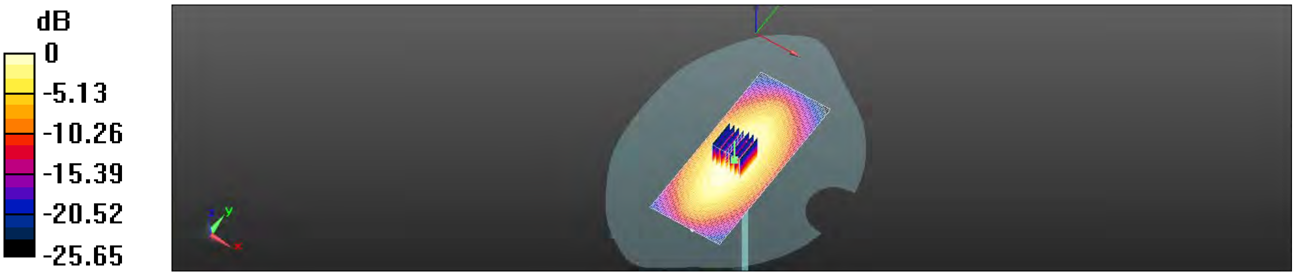
Communication System: CW; Frequency: 835 MHz, Duty factor: 1:1
Medium parameters used: f = 835 MHz; σ = 0.893 S/m; ε_r = 40.231; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(9.41, 9.41, 9.41); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1374; Calibrated: 2014/11/18
- Phantom: Head
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Pin=250mW/Area Scan (51x121x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 3.06 W/kg

Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 59.23 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.69 W/kg
SAR(1 g) = 2.44 W/kg; SAR(10 g) = 1.6 W/kg
Maximum value of SAR (measured) = 3.09 W/kg



0 dB = 3.06 W/kg = 4.86 dBW/kg

Date: 2014/11/17

Dipole 835 MHz_SN:4d063_Body

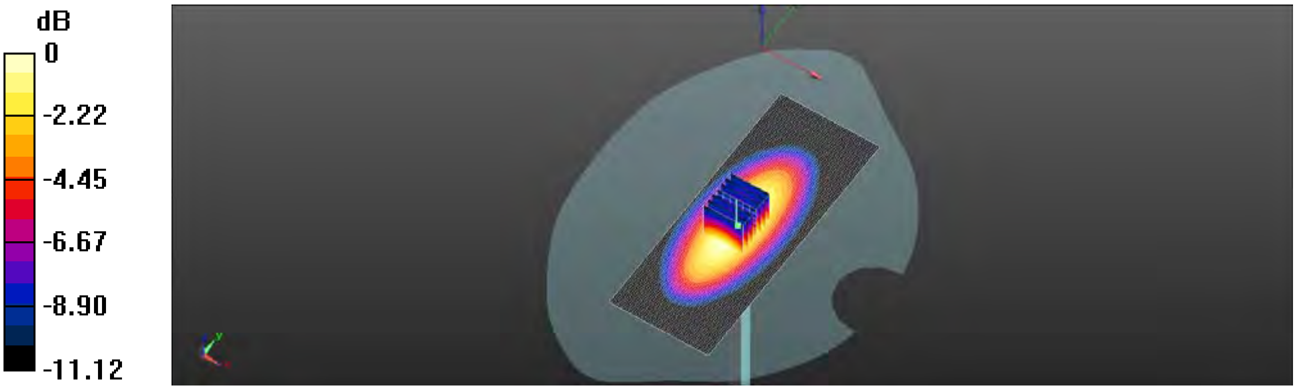
Communication System: CW; Frequency: 835 MHz, Duty factor: 1:1
Medium parameters used: f = 835 MHz; σ = 1.013 S/m; ε_r = 52.883; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3831; ConvF(9.03, 9.03, 9.03); Calibrated: 2014/1/31;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn915; Calibrated: 2014/6/18
- Phantom: Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Pin=250mW/Area Scan (51x131x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 3.15 W/kg

Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.87 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 3.81 W/kg
SAR(1 g) = 2.41 W/kg; SAR(10 g) = 1.62 W/kg
Maximum value of SAR (measured) = 3.22 W/kg



0 dB = 3.22 W/kg = 5.08 dBW/kg

Date: 2014/12/5

Dipole 835 MHz_SN:4d063_Body

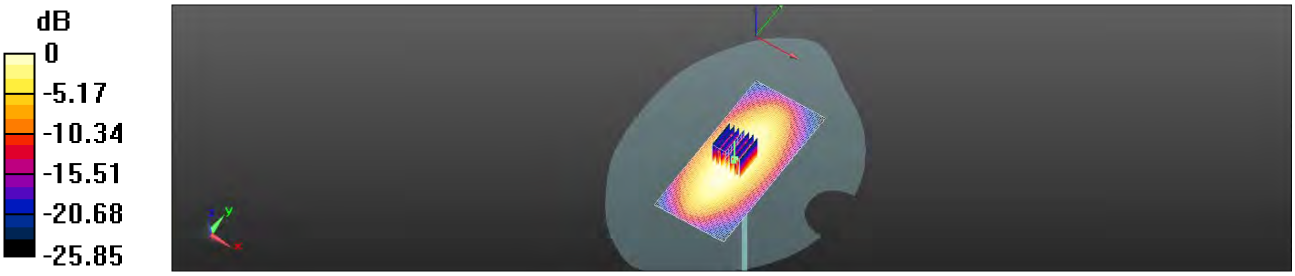
Communication System: CW; Frequency: 835 MHz, Duty factor: 1:1
Medium parameters used: f = 835 MHz; σ = 0.97 S/m; ε_r = 54.153; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(9.35, 9.35, 9.35); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1374; Calibrated: 2014/11/18
- Phantom: Head
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Pin=250mW/Area Scan (51x111x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 3.15 W/kg

Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.70 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 3.73 W/kg
SAR(1 g) = 2.47 W/kg; SAR(10 g) = 1.61 W/kg
Maximum value of SAR (measured) = 3.15 W/kg



0 dB = 3.15 W/kg = 4.98 dBW/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Date: 2014/11/18

Dipole 1750 MHz_SN:1008_Head

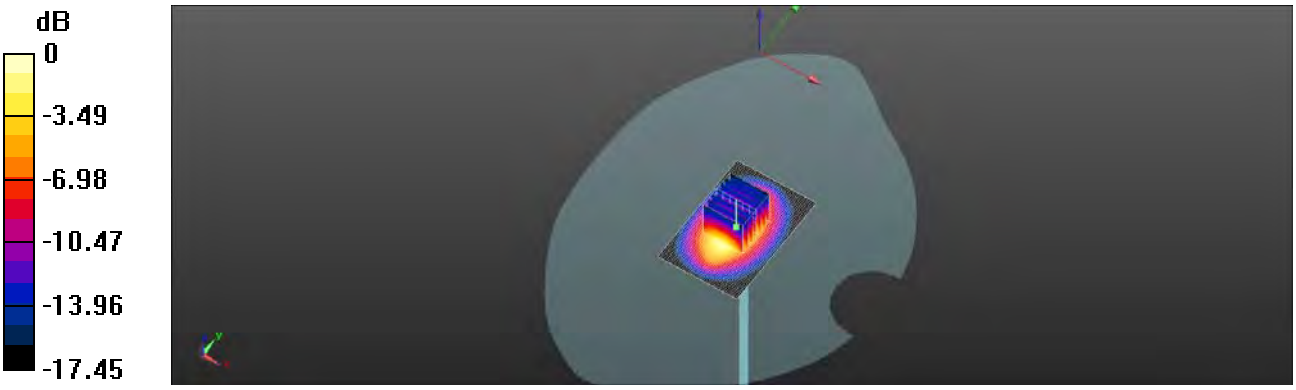
Communication System: CW; Frequency: 1750 MHz, Duty factor: 1:1
Medium parameters used: f = 1750 MHz; σ = 1.377 S/m; ε_r = 39.577; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3831; ConvF(8, 8, 8); Calibrated: 2014/1/31;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn915; Calibrated: 2014/6/18
- Phantom: Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Pin=250mW/Area Scan (41x61x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 13.0 W/kg

Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 97.42 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 16.7 W/kg
SAR(1 g) = 8.96 W/kg; SAR(10 g) = 4.69 W/kg
Maximum value of SAR (measured) = 12.9 W/kg



0 dB = 12.9 W/kg = 11.11 dBW/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Date: 2014/12/2

Dipole 1750 MHz_SN:1008_Head

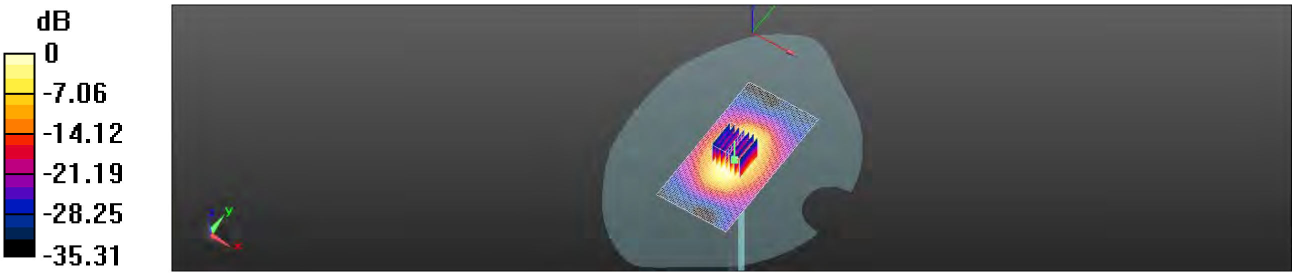
Communication System: CW; Frequency: 1750 MHz, Duty factor: 1:1
Medium parameters used: f = 1750 MHz; σ = 1.321 S/m; ε_r = 40.155; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(7.91, 7.91, 7.91); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1374; Calibrated: 2014/11/18
- Phantom: Head
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Pin=250mW/Area Scan (51x101x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 14.2 W/kg

Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 102.2 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 16.8 W/kg
SAR(1 g) = 9.22 W/kg; SAR(10 g) = 4.89 W/kg
Maximum value of SAR (measured) = 13.1 W/kg



0 dB = 14.2 W/kg = 11.52 dBW/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Date: 2014/11/18

Dipole 1750 MHz_SN:1008_Body

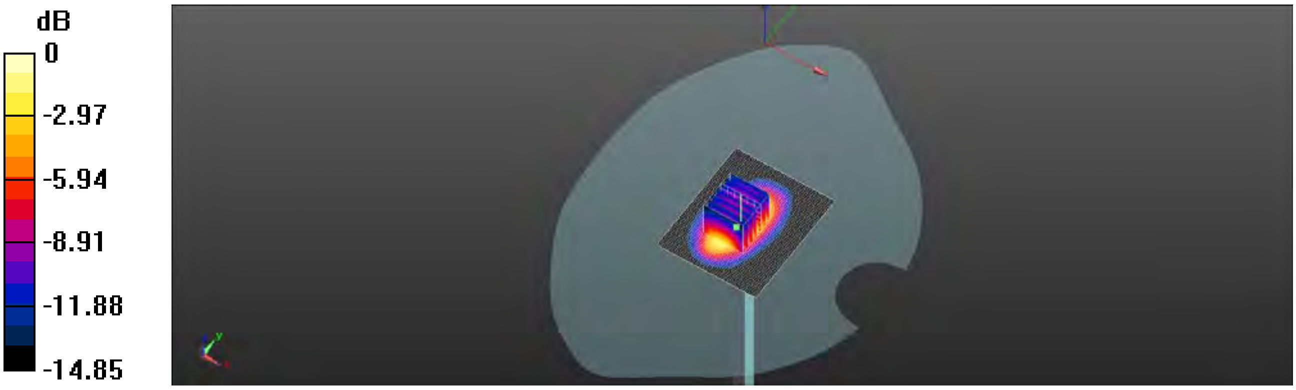
Communication System: CW; Frequency: 1750 MHz, Duty factor: 1:1
Medium parameters used: f = 1750 MHz; σ = 1.458 S/m; ε_r = 54.398; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3831; ConvF(7.63, 7.63, 7.63); Calibrated: 2014/1/31;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn915; Calibrated: 2014/6/18
- Phantom: Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Pin=250mW/Area Scan (51x61x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 13.8 W/kg

Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.57 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 15.6 W/kg
SAR(1 g) = 9.34 W/kg; SAR(10 g) = 5.22 W/kg
Maximum value of SAR (measured) = 12.7 W/kg



0 dB = 12.7 W/kg = 11.04 dBW/kg

Date: 2014/12/3

Dipole 1750 MHz_SN:1008_Body

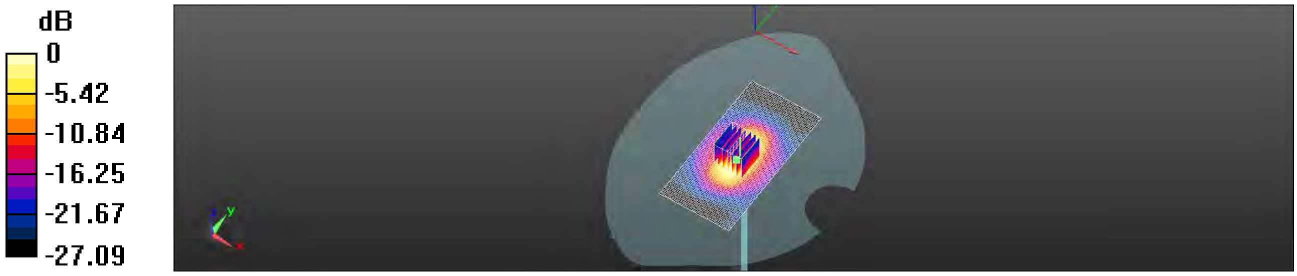
Communication System: CW; Frequency: 1750 MHz, Duty factor: 1:1
Medium parameters used: f = 1750 MHz; σ = 1.476 S/m; ε_r = 54.458; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(7.36, 7.36, 7.36); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1374; Calibrated: 2014/11/18
- Phantom: Head
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Pin=250mW/Area Scan (51x101x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 14.9 W/kg

Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 92.81 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 15.8 W/kg
SAR(1 g) = 9.26 W/kg; SAR(10 g) = 4.98 W/kg
Maximum value of SAR (measured) = 12.7 W/kg



0 dB = 14.9 W/kg = 11.73 dBW/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Dipole 1900 MHz_SN:5d027_Head

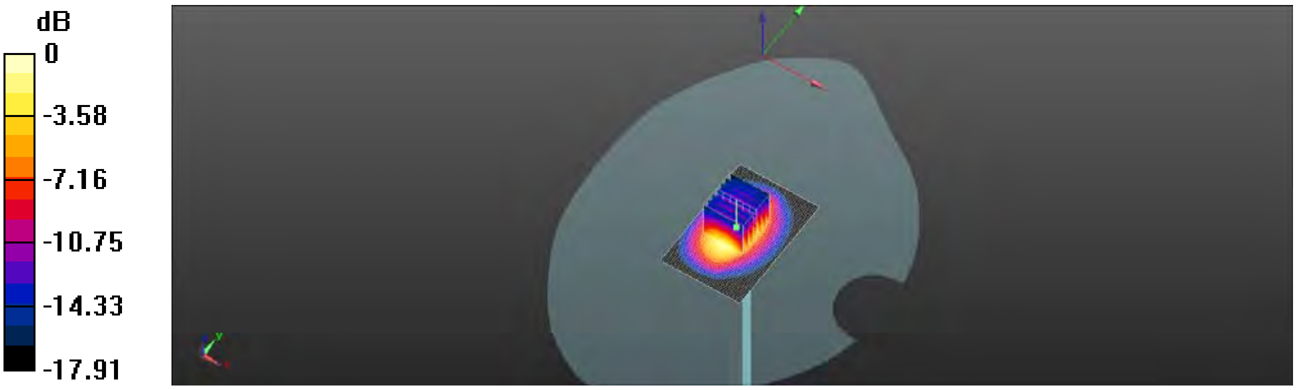
Communication System: CW; Frequency: 1900 MHz, Duty factor: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.388 S/m; ε_r = 39.567; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3831; ConvF(7.79, 7.79, 7.79); Calibrated: 2014/1/31;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn915; Calibrated: 2014/6/18
- Phantom: Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Pin=250mW/Area Scan (41x61x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 13.5 W/kg

Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.96 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 17.2 W/kg
SAR(1 g) = 9.4 W/kg; SAR(10 g) = 4.97 W/kg
Maximum value of SAR (measured) = 13.2 W/kg



0 dB = 13.2 W/kg = 11.21 dBW/kg

Dipole 1900 MHz_SN:5d027_Head

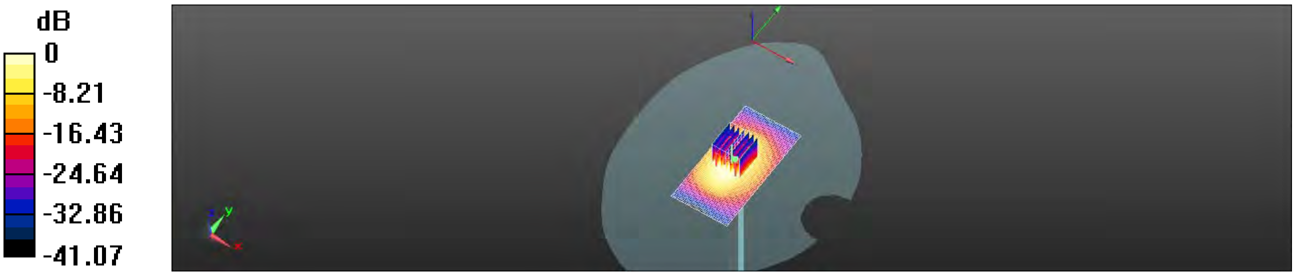
Communication System: CW; Frequency: 1900 MHz, Duty factor: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.432 S/m; ε_r = 39.256; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3923; ConvF(8.42, 8.42, 8.42); Calibrated: 2014/8/28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Head
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Pin=250mW/Area Scan (41x81x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 14.7 W/kg

Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 97.131 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 19.3 W/kg
SAR(1 g) = 9.95 W/kg; SAR(10 g) = 5.17 W/kg
Maximum value of SAR (measured) = 14.8 W/kg



0 dB = 14.7 W/kg = 11.67 dBW/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Dipole 1900 MHz_SN:5d027_Body

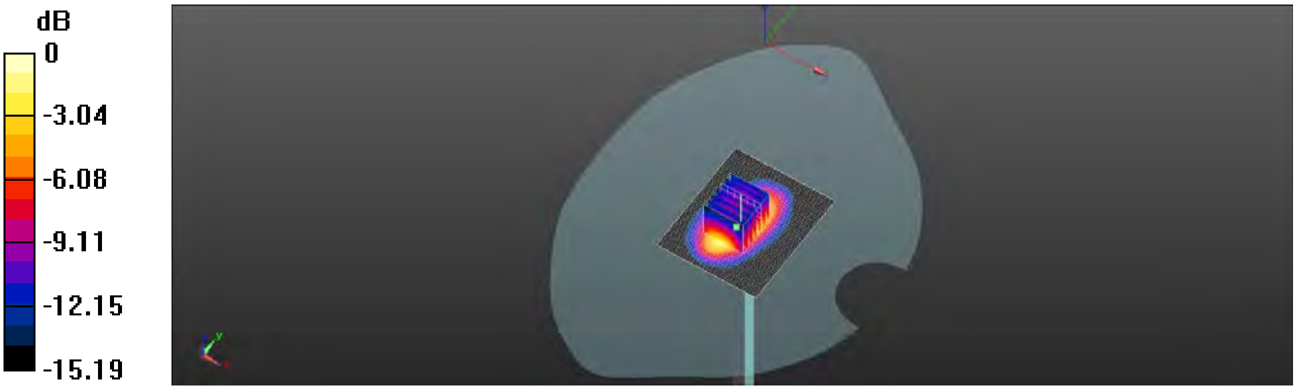
Communication System: CW; Frequency: 1900 MHz, Duty factor: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.492 S/m; ε_r = 51.639; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3831; ConvF(7.19, 7.19, 7.19); Calibrated: 2014/1/31;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn915; Calibrated: 2014/6/18
- Phantom: Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Pin=250mW/Area Scan (51x61x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 15.0 W/kg

Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 98.47 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 17.1 W/kg
SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.42 W/kg
Maximum value of SAR (measured) = 13.9 W/kg



0 dB = 13.9 W/kg = 11.43 dBW/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Date: 2014/12/1

Dipole 1900 MHz_SN:5d027_Body

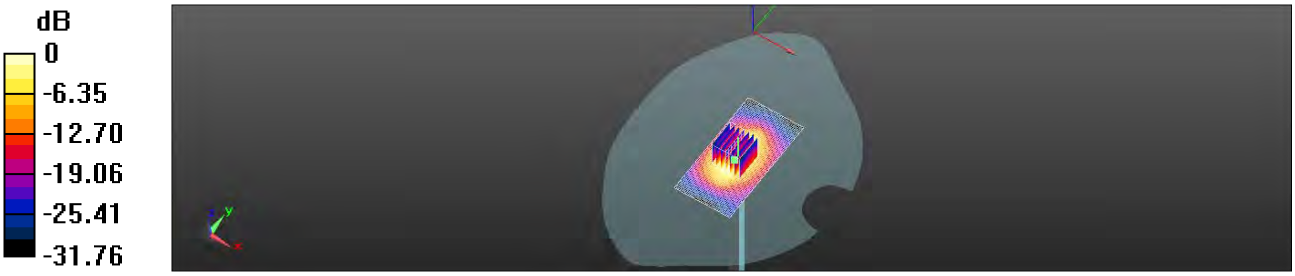
Communication System: CW; Frequency: 1900 MHz, Duty factor: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.549 S/m; ε_r = 53.523; ρ = 1000 g/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(7.03, 7.03, 7.03); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1374; Calibrated: 2014/11/18
- Phantom: Head
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Pin=250mW/Area Scan (41x81x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 14.6 W/kg

Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.00 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 17.9 W/kg
SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.28 W/kg
Maximum value of SAR (measured) = 14.4 W/kg



0 dB = 14.6 W/kg = 11.64 dBW/kg

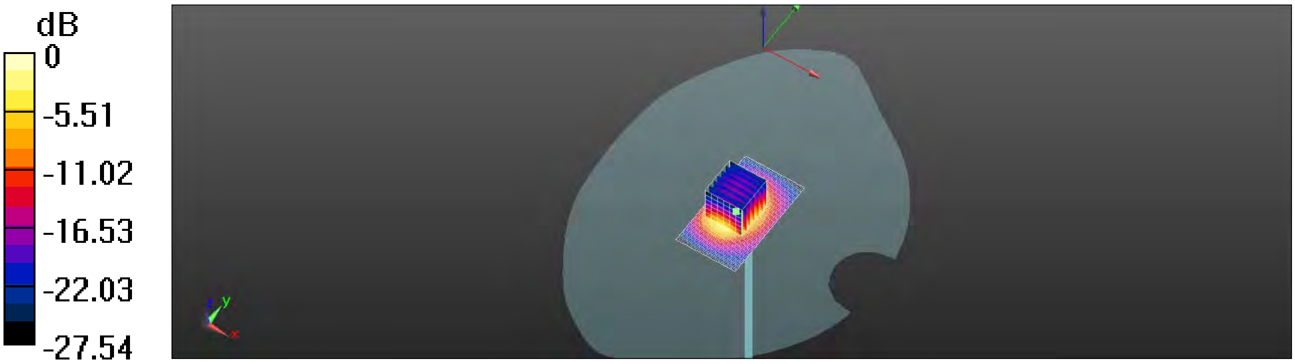
Dipole 2450 MHz_SN:727_Head
Communication System: CW; Frequency: 2450 MHz, Duty factor: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.823 S/m; ε_r = 39.185; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(6.97, 6.97, 6.97); Calibrated: 4/24/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 8/27/2014
- Phantom:Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/d=10mm, Pin=250mW, dist=2mm: Interpolated grid: dx=12 mm, dy=12 mm
Maximum value of SAR (interpolated) = 22.3 W/kg

Configuration/d=10mm, Pin=250mW, dist=2mm /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 98.77 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 29.0 W/kg
SAR(1 g) = 13.4 W/kg; SAR(10 g) = 6.02 W/kg
Maximum value of SAR (measured) = 20.9 W/kg



0 dB = 22.3 W/kg = 13.47 dBW/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Date: 2014/11/23

Dipole 2450 MHz_SN:727_Body

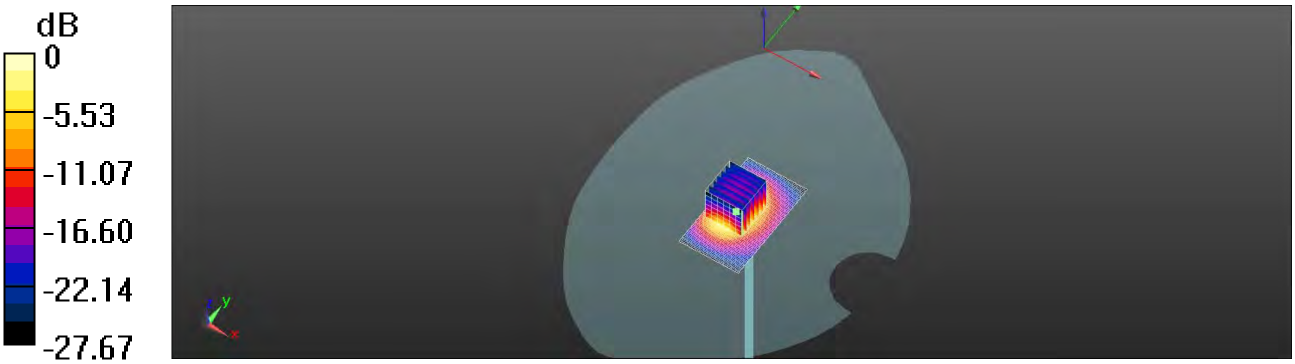
Communication System: CW; Frequency: 2450 MHz, Duty factor: 1:1
Medium parameters used: f = 2450 MHz; σ = 2.045 S/m; ε_r = 50.104; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.15, 7.15, 7.15); Calibrated: 4/24/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 8/27/2014
- Phantom:Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/d=10mm, Pin=250mW, dist=2mm: Interpolated grid: dx=12 mm, dy=12 mm
Maximum value of SAR (interpolated) = 23.8 W/kg

Configuration/d=10mm, Pin=250mW, dist=2mm /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.07 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 30.7 W/kg
SAR(1 g) = 13.1 W/kg; SAR(10 g) = 5.85 W/kg
Maximum value of SAR (measured) = 22.3 W/kg



0 dB = 23.8 W/kg = 13.76 dBW/kg

Date: 2014/12/6

Dipole 2600 MHz_SN:1005_Head

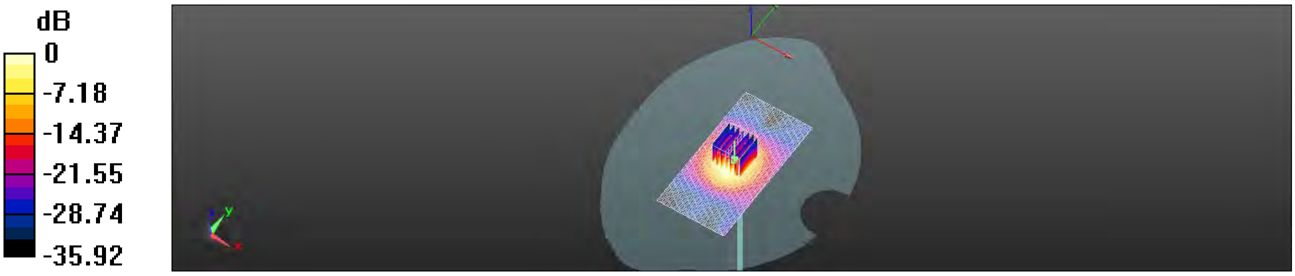
Communication System: CW; Frequency: 2600 MHz, Duty factor: 1:1
Medium parameters used: f = 2600 MHz; σ = 1.886 S/m; ε_r = 40.522; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(6.83, 6.83, 6.83); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1374; Calibrated: 2014/11/18
- Phantom: Head
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Pin=250mW/Area Scan (61x121x1): Interpolated grid: dx=12 mm, dy=12 mm
Maximum value of SAR (interpolated) = 23.4 W/kg

Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 98.13 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 33.3 W/kg
SAR(1 g) = 14.8 W/kg; SAR(10 g) = 6.42 W/kg
Maximum value of SAR (measured) = 23.3 W/kg



0 dB = 23.4 W/kg = 13.69 dBW/kg

SGS Taiwan Ltd. 台灣檢驗科技股份有限公司
No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Date: 2014/12/8

Dipole 2600 MHz_SN:1005_Body

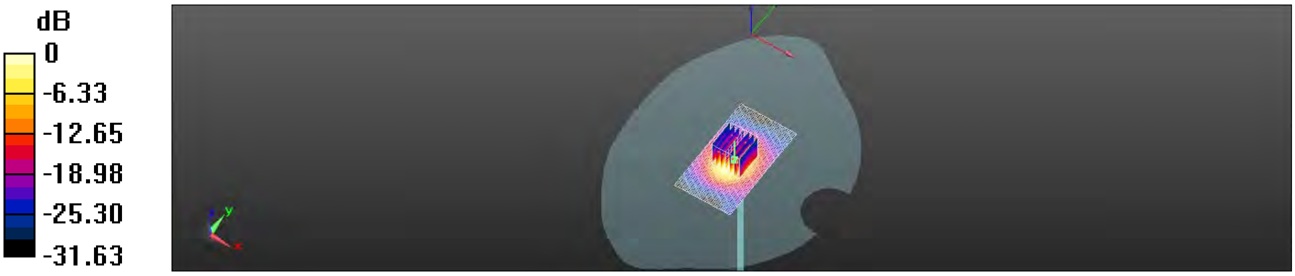
Communication System: CW; Frequency: 2600 MHz, Duty factor: 1:1
Medium parameters used: f = 2600 MHz; σ = 2.11 S/m; ε_r = 52.776; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(6.57, 6.57, 6.57); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1374; Calibrated: 2014/11/18
- Phantom: Head
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Pin=250mW/Area Scan (51x91x1): Interpolated grid: dx=12 mm, dy=12 mm
Maximum value of SAR (interpolated) = 24.8 W/kg

Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 102.0 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 31.0 W/kg
SAR(1 g) = 14.2 W/kg; SAR(10 g) = 6.24 W/kg
Maximum value of SAR (measured) = 22.4 W/kg



0 dB = 24.8 W/kg = 13.94 dBW/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Date: 2014/11/20

Dipole 5200 MHz_SN:1104_Head

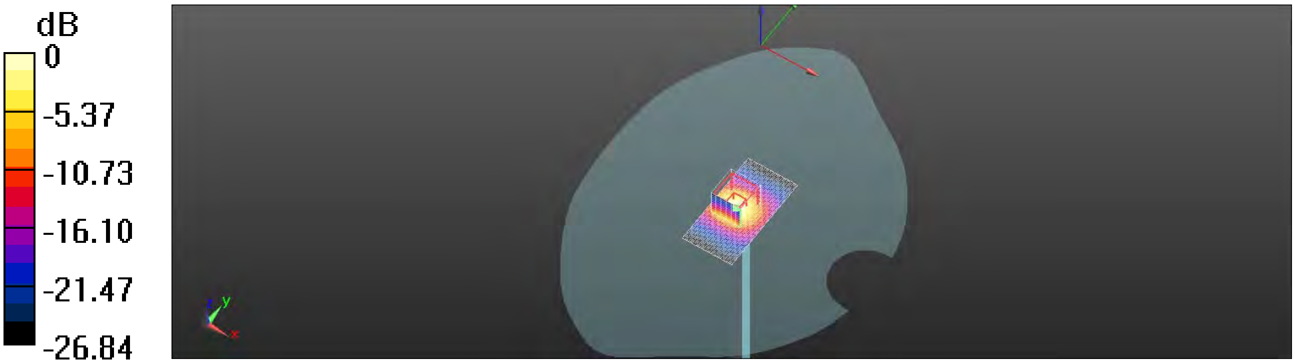
Communication System: CW; Frequency: 5200 MHz, Duty factor: 1:1
Medium parameters used: f = 5200 MHz; σ = 4.615 S/m; ε_r = 36.085; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(5.25, 5.25, 5.25); Calibrated: 4/24/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 8/27/2014
- Phantom:Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/d=10mm, Pin=100mW, dist=2mm: Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 18.5 W/kg

Configuration/d=10mm, Pin=100mW, dist=2mm /Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 58.62 V/m; Power Drift = 0.19 dB
Peak SAR (extrapolated) = 37.6 W/kg
SAR(1 g) = 7.94 W/kg; SAR(10 g) = 2.23 W/kg
Maximum value of SAR (measured) = 18.4 W/kg



0 dB = 18.5 W/kg = 12.76 dBW/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Date: 2014/11/22

Dipole 5200 MHz_SN:1104_Body

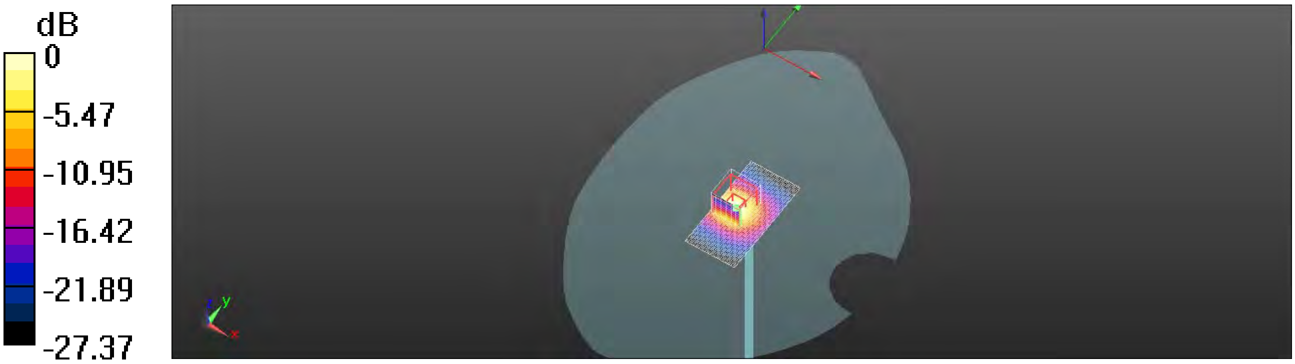
Communication System: CW; Frequency: 5200 MHz, Duty factor: 1:1
Medium parameters used: f = 5200 MHz; σ = 5.337 S/m; ε_r = 48.522; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(4.56, 4.56, 4.56); Calibrated: 4/24/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 8/27/2014
- Phantom:Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/d=10mm, Pin=100mW, dist=2mm: Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 19.2 W/kg

Configuration/d=10mm, Pin=100mW, dist=2mm /Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 47.19 V/m; Power Drift = -0.16 dB
Peak SAR (extrapolated) = 39.8 W/kg
SAR(1 g) = 7.51 W/kg; SAR(10 g) = 2.06 W/kg
Maximum value of SAR (measured) = 15.3 W/kg



0 dB = 19.4 W/kg = 12.92 dBW/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Date: 2014/11/21

Dipole 5300 MHz_SN:1104_Head

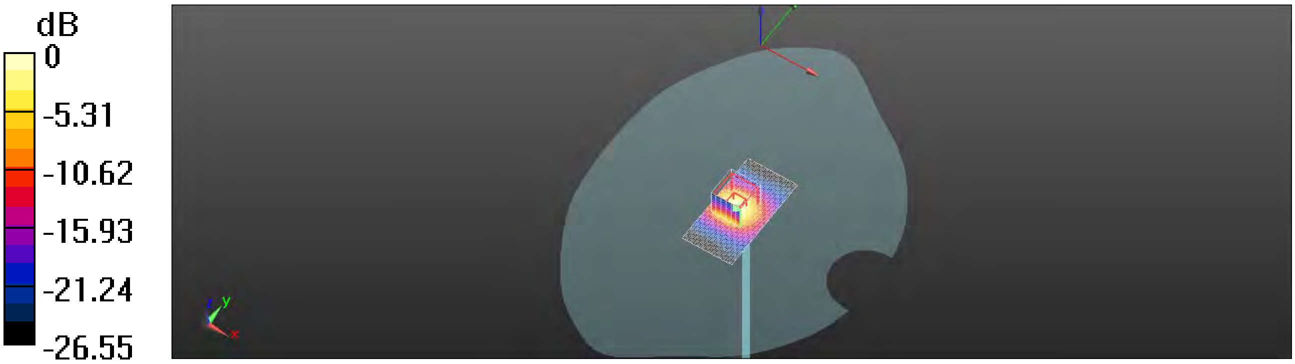
Communication System: CW; Frequency: 5300 MHz, Duty factor: 1:1
Medium parameters used: f = 5300 MHz; σ = 4.728 S/m; ε_r = 35.839; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(5.07, 5.07, 5.07); Calibrated: 4/24/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 8/27/2014
- Phantom:Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/d=10mm, Pin=100mW, dist=2mm: Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 17.4 W/kg

Configuration/d=10mm, Pin=100mW, dist=2mm /Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 58.38 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 35.8 W/kg
SAR(1 g) = 8.66 W/kg; SAR(10 g) = 2.47 W/kg
Maximum value of SAR (measured) = 18.1 W/kg



0 dB = 18.4 W/kg = 12.40 dBW/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Dipole 5300 MHz_SN:1104_Body

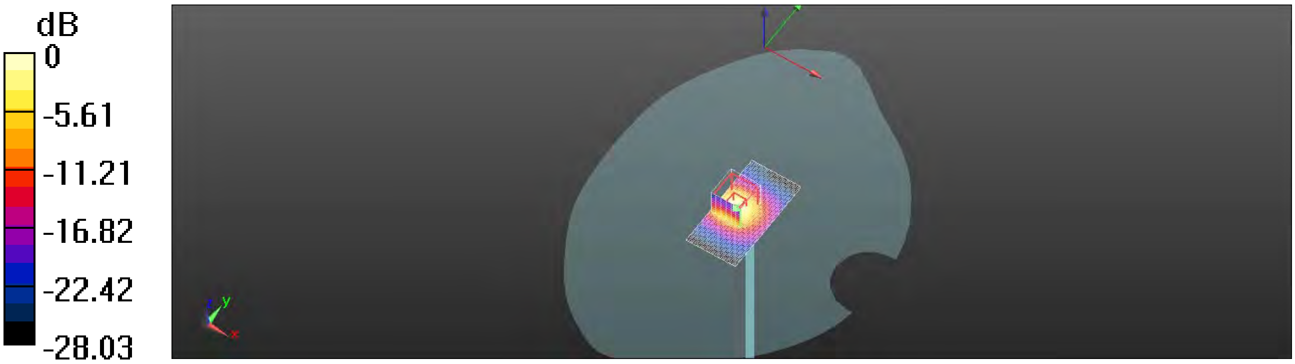
Communication System: CW; Frequency: 5300 MHz, Duty factor: 1:1
Medium parameters used: f = 5300 MHz; σ = 5.474 S/m; ε_r = 47.787; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(4.38, 4.38, 4.38); Calibrated: 4/24/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 8/27/2014
- Phantom:Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/d=10mm, Pin=100mW, dist=2mm: Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 17.5 W/kg

Configuration/d=10mm, Pin=100mW, dist=2mm/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 44.32 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 39.4 W/kg
SAR(1 g) = 7.88 W/kg; SAR(10 g) = 2.22 W/kg
Maximum value of SAR (measured) = 16.9 W/kg



0 dB = 18.5 W/kg = 12.47 dBW/kg

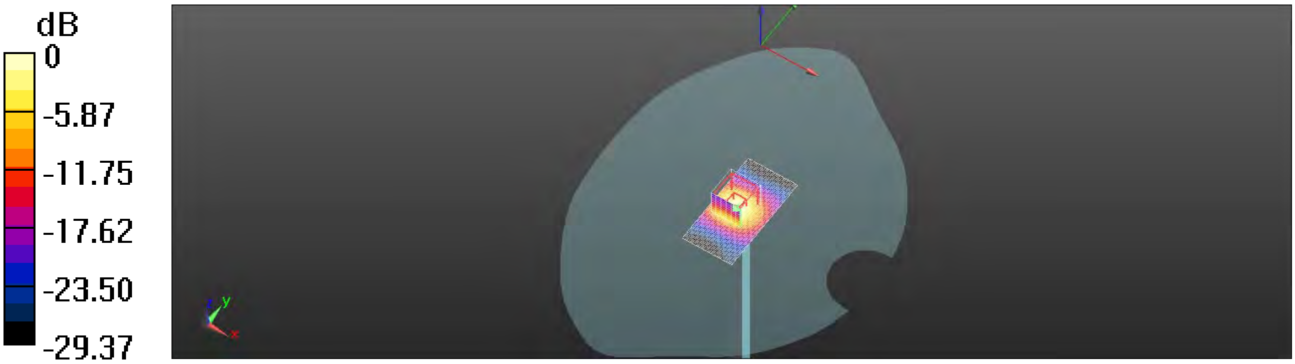
Dipole 5600 MHz_SN:1104_Head
Communication System: CW; Frequency: 5600 MHz, Duty factor: 1:1
Medium parameters used: f = 5600 MHz; σ = 5.078 S/m; ε_r = 35.154; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(4.48, 4.48, 4.48); Calibrated: 4/24/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 8/27/2014
- Phantom:Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/d=10mm, Pin=100mW, dist=2mm: Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 18.7 W/kg

Configuration/d=10mm, Pin=100mW, dist=2mm /Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 59.23 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 37.8 W/kg
SAR(1 g) = 8.47 W/kg; SAR(10 g) = 2.42 W/kg
Maximum value of SAR (measured) = 18.1 W/kg



0 dB = 18.7 W/kg = 12.53 dBW/kg

Date: 2014/11/22

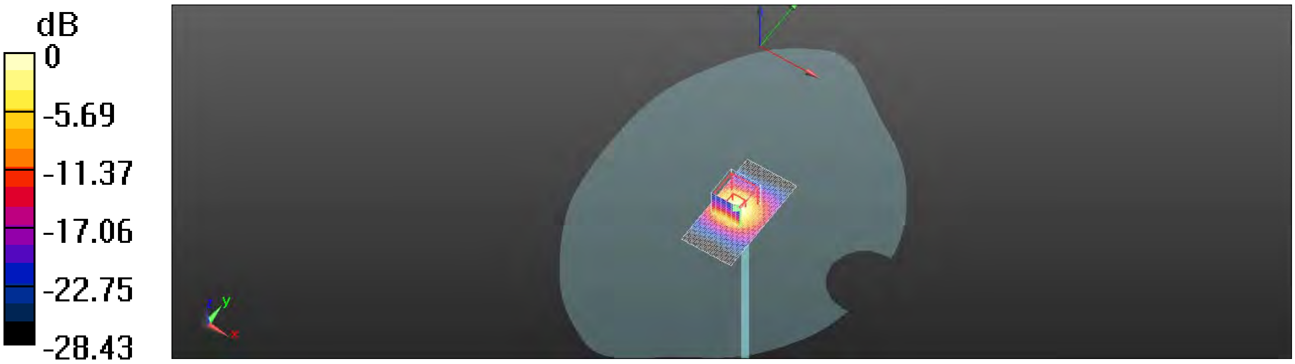
Dipole 5600 MHz_SN:1104_Body
Communication System: CW; Frequency: 5600 MHz, Duty factor: 1:1
Medium parameters used: f = 5600 MHz; σ = 5.911 S/m; ε_r = 47.056; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(3.76, 3.76, 3.76); Calibrated: 4/24/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 8/27/2014
- Phantom:Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/d=10mm, Pin=100mW, dist=2mm: Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 16.5 W/kg

Configuration/d=10mm, Pin=100mW, dist=2mm/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 53.13 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 39 W/kg
SAR(1 g) = 8.17 W/kg; SAR(10 g) = 2.15 W/kg
Maximum value of SAR (measured) = 18.2 W/kg



0 dB = 18.2 W/kg = 12.49 dBW/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Date: 2014/11/21

Dipole 5800 MHz_SN:1104_Head

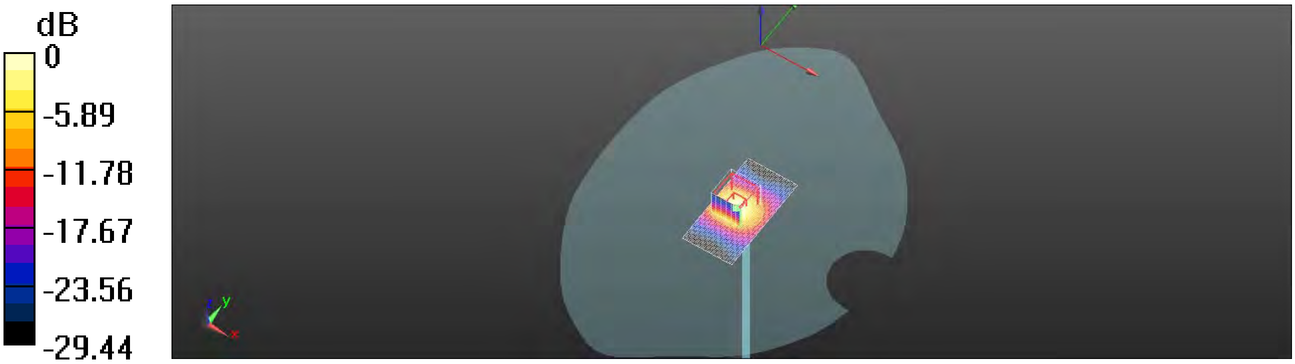
Communication System: CW; Frequency: 5800 MHz, Duty factor: 1:1
Medium parameters used: f = 5800 MHz; σ = 5.312 S/m; ε_r = 34.714; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(4.65, 4.65, 4.65); Calibrated: 4/24/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 8/27/2014
- Phantom:Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/d=10mm, Pin=100mW, dist=2mm: Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 18.8 W/kg

Configuration/d=10mm, Pin=100mW, dist=2mm /Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 59.30 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 38.6 W/kg
SAR(1 g) = 7.96 W/kg; SAR(10 g) = 2.26 W/kg
Maximum value of SAR (measured) = 18.7 W/kg



0 dB = 19.8 W/kg = 12.40 dBW/kg

Date: 2014/11/22

Dipole 5800 MHz_SN:1104_Body

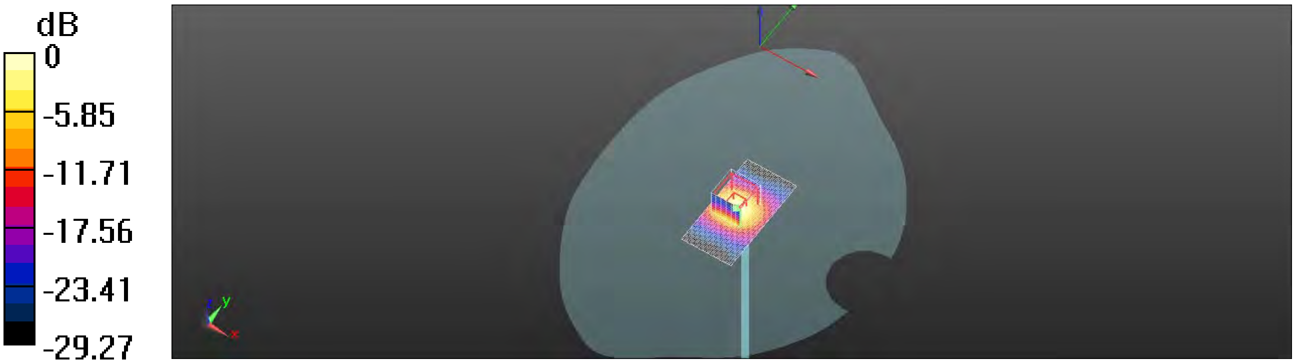
Communication System: CW; Frequency: 5800 MHz, Duty factor: 1:1
Medium parameters used: f = 5800 MHz; σ = 6.19 S/m; ε_r = 46.45; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(4.13, 4.13, 4.13); Calibrated: 4/24/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 8/27/2014
- Phantom:Head;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/d=10mm, Pin=100mW, dist=2mm: Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 17.9 W/kg

Configuration/d=10mm, Pin=100mW, dist=2mm/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 54.27 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 39.3 W/kg
SAR(1 g) = 7.56 W/kg; SAR(10 g) = 2.32 W/kg
Maximum value of SAR (measured) = 16.9 W/kg



0 dB = 18.3 W/kg = 12.63 dBW/kg

7. DAE & Probe Calibration Certificate

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client: SGS-TW (Auden)

Certificate No: DAE4-1260_Aug14

CALIBRATION CERTIFICATE

Object: DAE4 - SD 000 D04 BM - SN: 1260

Calibration procedure(s): QA CAL-06.v26
Calibration procedure for the data acquisition electronics (DAE)

Calibration date: August 26, 2014

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	01-Oct-13 (No:13976)	Oct-14

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Auto DAE Calibration Unit	SE UWS 053 AA 1001	07-Jan-14 (in house check)	In house check: Jan-15
Calibrator Box V2.1	SE UMS 006 AA 1002	07-Jan-14 (in house check)	In house check: Jan-15

	Name	Function	Signature
Calibrated by:	Dominique Steffen	Technician	
Approved by:	Fin Bomholt	Deputy Technical Manager	

Issued: August 26, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: DAE4-1260_Aug14 Page 1 of 5

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle:* The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
    - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
    - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
    - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
    - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
    - *Input Offset Measurement:* Output voltage and statistical results over a large number of zero voltage measurements.
    - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
    - *Input resistance:* Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
    - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
    - *Power consumption:* Typical value for information. Supply currents in various operating modes.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1μV , full range = -100...+300 mV

Low Range: 1LSB = 61nV , full range = -1.......+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	406.033 ± 0.02% (k=2)	405.001 ± 0.02% (k=2)	406.579 ± 0.02% (k=2)
Low Range	3.95663 ± 1.50% (k=2)	4.01886 ± 1.50% (k=2)	4.00468 ± 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	84.0 ° ± 1 °

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Appendix (Additional assessments outside the scope of SCS108)

1. DC Voltage Linearity

High Range		Reading (µV)	Difference (µV)	Error (%)
Channel X	+ Input	199997.43	-0.04	-0.00
Channel X	+ Input	20003.49	2.49	0.01
Channel X	- Input	-19998.62	2.32	-0.01
Channel Y	+ Input	199998.97	1.33	0.00
Channel Y	+ Input	20001.53	0.51	0.00
Channel Y	- Input	-20000.52	0.34	-0.00
Channel Z	+ Input	199998.52	1.01	0.00
Channel Z	+ Input	19999.80	-1.11	-0.01
Channel Z	- Input	-20001.65	-0.71	0.00

Low Range		Reading (µV)	Difference (µV)	Error (%)
Channel X	+ Input	2000.38	0.17	0.01
Channel X	+ Input	201.72	0.48	0.24
Channel X	- Input	-198.19	0.50	-0.25
Channel Y	+ Input	1999.92	-1.02	-0.05
Channel Y	+ Input	201.16	-0.25	-0.12
Channel Y	- Input	-198.53	0.05	-0.03
Channel Z	+ Input	2001.06	0.16	0.01
Channel Z	+ Input	200.04	-1.27	-0.63
Channel Z	- Input	-200.02	-1.46	0.74

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (µV)	Low Range Average Reading (µV)
Channel X	200	1.17	-0.56
	- 200	1.57	-0.48
Channel Y	200	12.66	12.37
	200	13.46	-12.07
Channel Z	200	-0.46	-0.74
	- 200	-1.73	-1.63

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (µV)	Channel Y (µV)	Channel Z (µV)
Channel X	200	-	5.89	-2.24
Channel Y	200	9.64	-	7.42
Channel Z	200	9.68	7.16	-

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec, Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	15914	14950
Channel Y	15817	16075
Channel Z	16045	16582

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	0.26	-0.78	1.42	0.43
Channel Y	-0.44	-1.36	0.61	0.43
Channel Z	-1.66	-2.60	-0.69	0.44

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	-0.01	-8	-9

Certificate No: DAE4-1260_Aug14 Page 5 of 5

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

ilac-MRA

SWISS CALIBRATION

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **Auden**

Certificate No: **DAE4-915_Jun14**

CALIBRATION CERTIFICATE

Object: DAE4 - SD 000 D04 BK - SN: 915

Calibration procedure(s): QA CAL-06.v26
Calibration procedure for the data acquisition electronics (DAE)

Calibration date: June 16, 2014

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	01-Oct-13 (No:13976)	Oct-14
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Auto DAE Calibration Unit	SE UWS 053 AA 1001	07-Jan-14 (in house check)	In house check: Jan-15
Calibrator Box V2.1	SE UMS 006 AA 1002	07-Jan-14 (in house check)	In house check: Jan-15

	Name	Function	Signature
Calibrated by:	Dominique Steffen	Technician	
Approved by:	Fin Bomholt	Deputy Technical Manager	

Issued: June 16, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle*: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
    - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
    - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
    - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
    - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
    - *Input Offset Measurement*: Output voltage and statistical results over a large number of zero voltage measurements.
    - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
    - *Input resistance:* Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
    - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
    - *Power consumption:* Typical value for information. Supply currents in various operating modes.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1µV , full range = -100...+300 mV

Low Range: 1LSB = 61nV , full range = -1.......+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	404.307 ± 0.02% (k=2)	404.432 ± 0.02% (k=2)	404.778 ± 0.02% (k=2)
Low Range	3.97786 ± 1.50% (k=2)	4.00889 ± 1.50% (k=2)	3.98763 ± 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	115.0 ° ± 1 °

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Appendix (Additional assessments outside the scope of SCS108)

1. DC Voltage Linearity

High Range		Reading (µV)	Difference (µV)	Error (%)
Channel X	+ Input	199998.08	1.14	0.00
Channel X	+ Input	20000.26	-0.79	-0.00
Channel X	- Input	-19999.34	1.47	-0.01
Channel Y	+ Input	200000.17	3.04	0.00
Channel Y	+ Input	19999.35	-1.60	-0.01
Channel Y	- Input	-20000.40	0.40	-0.00
Channel Z	+ Input	199996.89	-0.05	-0.00
Channel Z	+ Input	19999.67	-1.07	-0.01
Channel Z	- Input	-20001.83	-0.82	0.00

Low Range		Reading (µV)	Difference (µV)	Error (%)
Channel X	+ Input	2000.78	-0.15	-0.01
Channel X	+ Input	201.37	-0.01	-0.00
Channel X	- Input	-198.71	-0.07	0.04
Channel Y	+ Input	2001.08	0.23	0.01
Channel Y	+ Input	201.11	-0.04	-0.02
Channel Y	- Input	-198.95	-0.16	0.08
Channel Z	+ Input	2000.69	-0.17	-0.01
Channel Z	+ Input	200.66	-0.48	-0.24
Channel Z	- Input	-200.04	-1.33	0.67

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (µV)	Low Range Average Reading (µV)
Channel X	200	-15.73	-17.62
	- 200	17.95	16.40
Channel Y	200	-5.63	-5.61
	- 200	4.75	4.70
Channel Z	200	-0.98	-1.03
	- 200	-0.88	-0.86

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (µV)	Channel Y (µV)	Channel Z (µV)
Channel X	200	-	4.09	-3.56
Channel Y	200	7.89	-	5.02
Channel Z	200	8.61	6.69	-

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	16112	13093
Channel Y	15985	14777
Channel Z	15881	15729

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	0.08	-1.17	1.32	0.43
Channel Y	-0.58	-1.57	0.70	0.47
Channel Z	-0.51	-1.47	1.80	0.44

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	-0.01	-8	-9

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

ilac-MRA | SWISS CALIBRATION

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client **SGS - TW (Auden)**

Certificate No: **DAE4-856_Aug14**

CALIBRATION CERTIFICATE

Object	DAE4 - SD 000 D04 BM - SN: 856
Calibration procedure(s)	QA CAL-06.v26 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	August 27, 2014

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	01-Oct-13 (No:13976)	Oct-14
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Auto DAE Calibration Unit	SE UWS 053 AA 1001	07-Jan-14 (in house check)	In house check: Jan-15
Calibrator Box V2.1	SE UMS 006 AA 1002	07-Jan-14 (in house check)	In house check: Jan-15

	Name	Function	Signature
Calibrated by:	Dominique Steffen	Technician	
Approved by:	Fin Bomholt	Deputy Technical Manager	

Issued: August 27, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: DAE4-856_Aug14 Page 1 of 5

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle:* The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
  - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
  - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
  - *Input Offset Measurement:* Output voltage and statistical results over a large number of zero voltage measurements.
  - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - *Input resistance:* Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
  - *Power consumption:* Typical value for information. Supply currents in various operating modes.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1μV , full range = -100...+300 mV

Low Range: 1LSB = 61nV , full range = -1.......+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	403.468 ± 0.02% (k=2)	404.581 ± 0.02% (k=2)	403.903 ± 0.02% (k=2)
Low Range	3.97681 ± 1.50% (k=2)	3.97783 ± 1.50% (k=2)	3.97815 ± 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	52.5 ° ± 1 °

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Appendix (Additional assessments outside the scope of SCS108)

1. DC Voltage Linearity

High Range		Reading (µV)	Difference (µV)	Error (%)
Channel X	+ Input	199998.33	0.84	0.00
Channel X	+ Input	19998.90	-2.25	-0.01
Channel X	- Input	-20000.45	0.34	-0.00
Channel Y	+ Input	199998.95	0.96	0.00
Channel Y	+ Input	19997.51	-3.82	-0.02
Channel Y	- Input	-20000.77	0.07	-0.00
Channel Z	+ Input	199997.26	-0.19	-0.00
Channel Z	+ Input	19997.65	-3.57	-0.02
Channel Z	- Input	-20002.47	1.55	0.01

Low Range		Reading (µV)	Difference (µV)	Error (%)
Channel X	+ Input	2001.05	-0.09	-0.00
Channel X	+ Input	202.34	0.80	0.40
Channel X	- Input	-198.21	0.26	-0.13
Channel Y	+ Input	2001.39	0.26	0.01
Channel Y	+ Input	201.08	-0.36	-0.18
Channel Y	- Input	-199.24	-0.78	0.39
Channel Z	+ Input	2000.92	-0.18	-0.01
Channel Z	+ Input	200.26	-1.22	-0.60
Channel Z	- Input	-198.91	-1.47	0.74

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (µV)	Low Range Average Reading (µV)
Channel X	200	-14.76	-16.42
	- 200	17.19	15.88
Channel Y	200	-2.17	-2.25
	- 200	0.39	0.01
Channel Z	200	10.27	10.05
	- 200	-13.06	-13.03

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (µV)	Channel Y (µV)	Channel Z (µV)
Channel X	200	-	2.41	-1.15
Channel Y	200	7.99	-	3.07
Channel Z	200	8.65	5.24	-

Certificate No: DAE4-858_Aug14 Page 4 of 5

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	16226	16620
Channel Y	15942	16803
Channel Z	15875	16811

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	0.72	-0.77	1.89	0.38
Channel Y	-0.24	-1.87	1.49	0.42
Channel Z	-0.98	-2.01	0.07	0.40

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	-0.01	-8	-9

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **SGS-TW (Auden)**

Certificate No: **DAE4-1374_Nov14**

CALIBRATION CERTIFICATE

Object	DAE4 - SD 000 D04 BM - SN: 1374
Calibration procedure(s)	QA CAL-06.v28 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	November 18, 2014

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	03-Oct-14 (No:15573)	Oct-15

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Auto DAE Calibration Unit	SE UWS 053 AA 1001	07-Jan-14 (in house check)	In house check: Jan-15
Calibrator Box V2.1	SE UMS 006 AA 1002	07-Jan-14 (in house check)	In house check: Jan-15

	Name	Function	Signature
Calibrated by:	Dominique Steffen	Technician	
Approved by:	Fin Bomholt	Deputy Technical Manager	

Issued: November 18, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: DAE4-1374_Nov14 Page 1 of 5

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle:* The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
  - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
  - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
  - *Input Offset Measurement:* Output voltage and statistical results over a large number of zero voltage measurements.
  - *Input Offset Current:* Typical value for information: Maximum channel input offset current, not considering the input resistance.
  - *Input resistance:* Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
  - *Power consumption:* Typical value for information. Supply currents in various operating modes.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1μV , full range = -100...+300 mV

Low Range: 1LSB = 61nV , full range = -1.......+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	405.035 ± 0.02% (k=2)	405.315 ± 0.02% (k=2)	404.974 ± 0.02% (k=2)
Low Range	3.99839 ± 1.50% (k=2)	4.01042 ± 1.50% (k=2)	3.94307 ± 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	245.5 ° ± 1 °

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Appendix (Additional assessments outside the scope of SCS108)

1. DC Voltage Linearity

High Range		Reading (µV)	Difference (µV)	Error (%)
Channel X	+ Input	200030.74	-5.53	-0.00
Channel X	+ Input	20004.82	1.02	0.01
Channel X	- Input	-20002.76	2.80	-0.01
Channel Y	+ Input	200031.50	-4.36	-0.00
Channel Y	+ Input	20003.22	-0.50	-0.00
Channel Y	- Input	-20005.15	0.53	-0.00
Channel Z	+ Input	200033.38	-2.72	-0.00
Channel Z	+ Input	20001.26	-2.46	-0.01
Channel Z	- Input	-20005.91	-0.24	0.00

Low Range		Reading (µV)	Difference (µV)	Error (%)
Channel X	+ Input	2000.14	-0.27	-0.01
Channel X	+ Input	201.07	0.50	0.25
Channel X	- Input	-199.21	0.28	-0.14
Channel Y	+ Input	1999.83	-0.48	-0.02
Channel Y	+ Input	199.63	-0.73	-0.36
Channel Y	- Input	-200.60	-1.02	0.51
Channel Z	+ Input	2001.36	1.13	0.06
Channel Z	+ Input	199.82	-0.58	-0.29
Channel Z	- Input	-201.49	-1.84	0.92

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (µV)	Low Range Average Reading (µV)
Channel X	200	18.42	16.65
	-200	-15.63	-17.40
Channel Y	200	-5.00	-5.33
	-200	4.04	3.44
Channel Z	200	-0.12	-0.30
	-200	-3.07	-3.01

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (µV)	Channel Y (µV)	Channel Z (µV)
Channel X	200	-	6.99	1.89
Channel Y	200	10.04	-	6.03
Channel Z	200	9.45	7.00	-

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec, Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	15851	16263
Channel Y	15925	16669
Channel Z	15301	15199

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	-0.50	-1.55	0.57	0.45
Channel Y	0.21	-1.30	1.15	0.49
Channel Z	-1.60	-2.85	0.25	0.57

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	-0.01	-8	-9

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **SGS-TW (Auden)**

Certificate No: **EX3-3923_Aug14**

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3923

Calibration procedure(s): QA CAL-01.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

Calibration date: August 28, 2014

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	03-Apr-14 (No. 217-01911)	Apr-15
Power sensor E4412A	MY41498087	03-Apr-14 (No. 217-01911)	Apr-15
Reference 3 dB Attenuator	SN: S5054 (3c)	03-Apr-14 (No. 217-01915)	Apr-15
Reference 20 dB Attenuator	SN: S5277 (20x)	03-Apr-14 (No. 217-01919)	Apr-15
Reference 30 dB Attenuator	SN: S5129 (30b)	03-Apr-14 (No. 217-01920)	Apr-15
Reference Probe ES3DV2	SN: 3013	30-Dec-13 (No. ES3-3013_Dec13)	Dec-14
DAE4	SN: 660	13-Dec-13 (No. DAE4-660_Dec13)	Dec-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

	Name	Function	Signature
Calibrated by:	Israe El-Naouq	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: August 28, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: EX3-3923_Aug14 Page 1 of 11

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013

b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy):* in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset:* The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle:* The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Probe EX3DV4

SN:3923

Manufactured: March 8, 2013
Calibrated: August 28, 2014

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3923

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.58	0.48	0.47	± 10.1 %
DCP (mV)[B]	99.2	102.2	102.3	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	132.9	±3.0 %
		Y	0.0	0.0	1.0		134.8	
		Z	0.0	0.0	1.0		135.0	

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3923

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	41.9	0.89	10.91	10.91	10.91	0.25	1.16	± 12.0 %
835	41.5	0.90	10.48	10.48	10.48	0.27	1.07	± 12.0 %
900	41.5	0.97	10.26	10.26	10.26	0.17	1.53	± 12.0 %
1750	40.1	1.37	8.72	8.72	8.72	0.75	0.57	± 12.0 %
1900	40.0	1.40	8.42	8.42	8.42	0.45	0.77	± 12.0 %
2000	40.0	1.40	8.46	8.46	8.46	0.67	0.63	± 12.0 %
2300	39.5	1.67	8.02	8.02	8.02	0.35	0.86	± 12.0 %
2450	39.2	1.80	7.66	7.66	7.66	0.33	0.87	± 12.0 %
2600	39.0	1.96	7.41	7.41	7.41	0.35	0.86	± 12.0 %
5200	36.0	4.66	5.17	5.17	5.17	0.35	1.80	± 13.1 %
5300	35.9	4.76	4.99	4.99	4.99	0.35	1.80	± 13.1 %
5600	35.5	5.07	4.71	4.71	4.71	0.40	1.80	± 13.1 %
5800	35.3	5.27	4.67	4.67	4.67	0.40	1.80	± 13.1 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3923

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	55.5	0.96	10.29	10.29	10.29	0.30	1.04	± 12.0 %
835	55.2	0.97	10.32	10.32	10.32	0.55	0.78	± 12.0 %
900	55.0	1.05	10.04	10.04	10.04	0.44	0.88	± 12.0 %
1750	53.4	1.49	8.30	8.30	8.30	0.39	0.85	± 12.0 %
1900	53.3	1.52	8.03	8.03	8.03	0.30	0.95	± 12.0 %
2000	53.3	1.52	8.16	8.16	8.16	0.23	1.16	± 12.0 %
2300	52.9	1.81	7.76	7.76	7.76	0.44	0.77	± 12.0 %
2450	52.7	1.95	7.56	7.56	7.56	0.80	0.50	± 12.0 %
2600	52.5	2.16	7.36	7.36	7.36	0.80	0.50	± 12.0 %
5200	49.0	5.30	4.71	4.71	4.71	0.35	1.90	± 13.1 %
5300	48.9	5.42	4.58	4.58	4.58	0.35	1.90	± 13.1 %
5600	48.5	5.77	4.09	4.09	4.09	0.40	1.90	± 13.1 %
5800	48.2	6.00	4.33	4.33	4.33	0.40	1.90	± 13.1 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

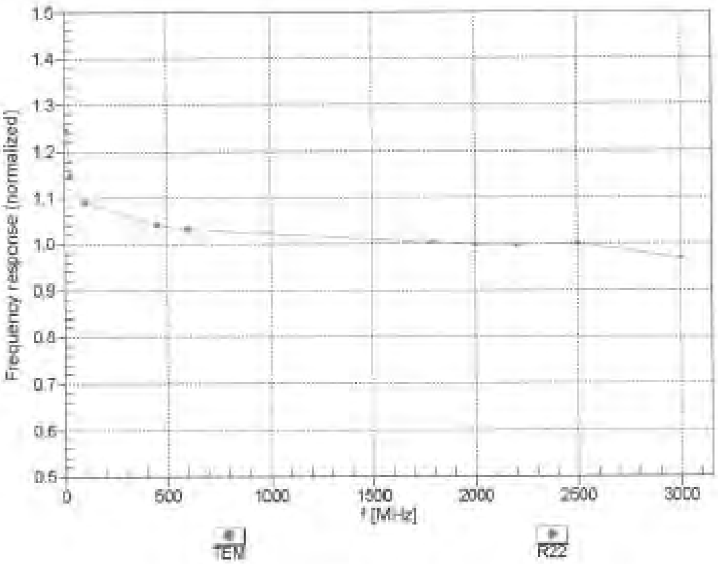
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

EX3DV4– SN:3923 August 28, 2014

Frequency Response of E-Field

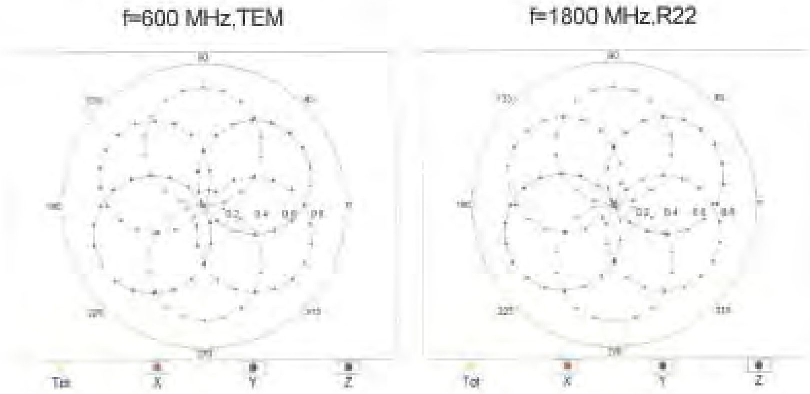
(TEM-Cell:ifi110 EXX, Waveguide: R22)

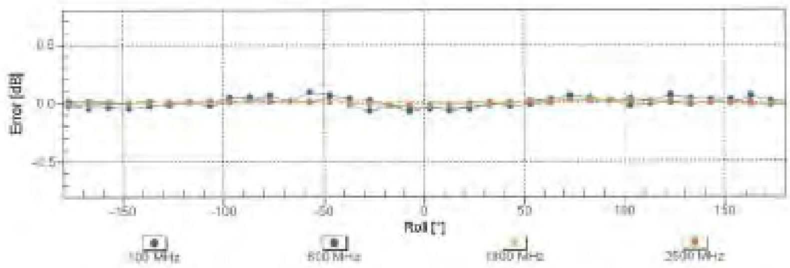


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Receiving Pattern (ϕ), $\vartheta = 0°$





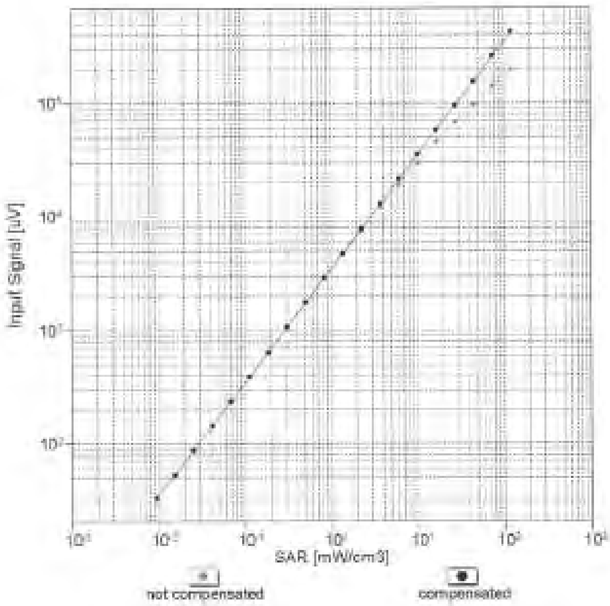
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

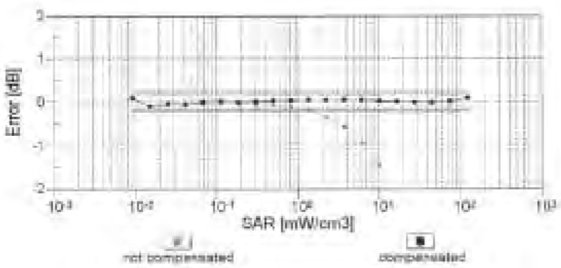
SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

EX3DV4– SN:3923

August 28, 2014

Dynamic Range f(SAR$_{head}$)
(TEM cell , f_{eval}= 1900 MHz)





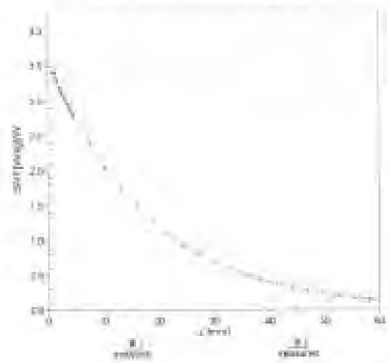
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

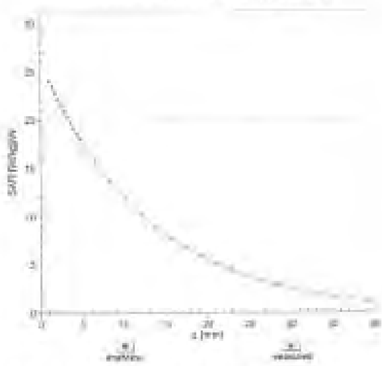
EX3DV4– SN:3923 August 29, 2014

Conversion Factor Assessment

f = 900 MHz,WGLS R9 (H_convF)

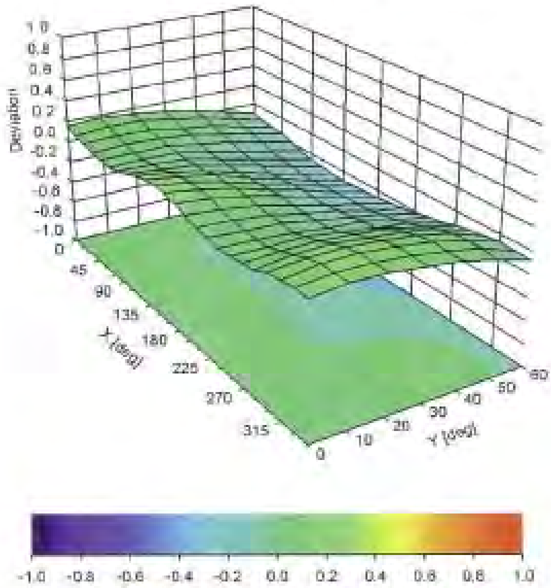


f = 1750 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

Certificate No: EX3-3923_Aug14 Page 10 of 11

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3923

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-57
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **SGS-TW (Auden)**

Certificate No: **EX3-3831_Jan14**

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3831
Calibration procedure(s)	QA CAL-01.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6 Calibration procedure for dosimetric E-field probes
Calibration date:	January 31, 2014

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498087	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-13 (No. 217-01735)	Apr-14
Reference 30 dB Attenuator	SN: S5129 (30b)	04-Apr-13 (No. 217-01738)	Apr-14
Reference Probe ES3DV2	SN: 3013	30-Dec-13 (No. ES3-3013_Dec13)	Dec-14
DAE4	SN: 660	13-Dec-13 (No. DAE4-660_Dec13)	Dec-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

	Name	Function	Signature
Calibrated by:	Imad El-Naouq	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: January 31, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: EX3-3831_Jan14 Page 1 of 11

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy):* in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset:* The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle:* The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Probe EX3DV4

SN:3831

Manufactured: September 6, 2011
Calibrated: January 31, 2014

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3831

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (µV/(V/m)^2)[A]	0.45	0.42	0.43	± 10.1 %
DCP (mV)[B]	102.4	100.1	97.7	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√µV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	153.1	±3.0 %
		Y	0.0	0.0	1.0		146.3	
		Z	0.0	0.0	1.0		154.8	

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3831

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	41.9	0.89	9.59	9.59	9.59	0.74	0.64	± 12.0 %
835	41.5	0.90	9.14	9.14	9.14	0.22	1.36	± 12.0 %
900	41.5	0.97	9.17	9.17	9.17	0.28	0.96	± 12.0 %
1750	40.1	1.37	8.00	8.00	8.00	0.26	0.99	± 12.0 %
1900	40.0	1.40	7.79	7.79	7.79	0.60	0.65	± 12.0 %
2000	40.0	1.40	7.71	7.71	7.71	0.39	0.79	± 12.0 %
2300	39.5	1.67	7.35	7.35	7.35	0.43	0.76	± 12.0 %
2450	39.2	1.80	6.99	6.99	6.99	0.37	0.85	± 12.0 %
2600	39.0	1.96	6.62	6.62	6.62	0.38	0.87	± 12.0 %
5200	36.0	4.66	4.67	4.67	4.67	0.35	1.80	± 13.1 %
5300	35.9	4.76	4.41	4.41	4.41	0.40	1.80	± 13.1 %
5600	35.5	5.07	3.99	3.99	3.99	0.50	1.80	± 13.1 %
5800	35.3	5.27	4.12	4.12	4.12	0.45	1.80	± 13.1 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3831

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	55.5	0.96	9.10	9.10	9.10	0.50	0.80	± 12.0 %
835	55.2	0.97	9.03	9.03	9.03	0.28	1.15	± 12.0 %
900	55.0	1.05	8.84	8.84	8.84	0.29	1.08	± 12.0 %
1750	53.4	1.49	7.63	7.63	7.63	0.26	1.16	± 12.0 %
1900	53.3	1.52	7.19	7.19	7.19	0.32	1.01	± 12.0 %
2000	53.3	1.52	7.17	7.17	7.17	0.44	0.83	± 12.0 %
2300	52.9	1.81	6.90	6.90	6.90	0.52	0.76	± 12.0 %
2450	52.7	1.95	6.68	6.68	6.68	0.80	0.56	± 12.0 %
2600	52.5	2.16	6.50	6.50	6.50	0.80	0.50	± 12.0 %
5200	49.0	5.30	4.08	4.08	4.08	0.50	1.90	± 13.1 %
5300	48.9	5.42	3.87	3.87	3.87	0.50	1.90	± 13.1 %
5600	48.5	5.77	3.36	3.36	3.36	0.60	1.90	± 13.1 %
5800	48.2	6.00	3.78	3.78	3.78	0.55	1.90	± 13.1 %

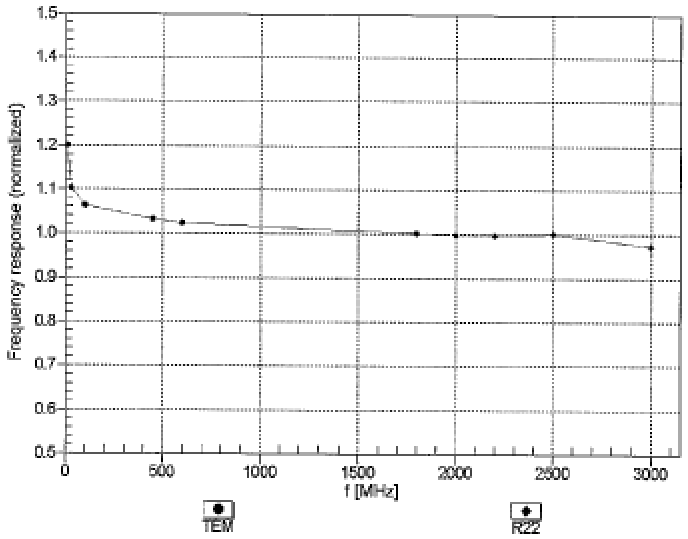
[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

EX3DV4– SN:3831 January 31, 2014

Frequency Response of E-Field

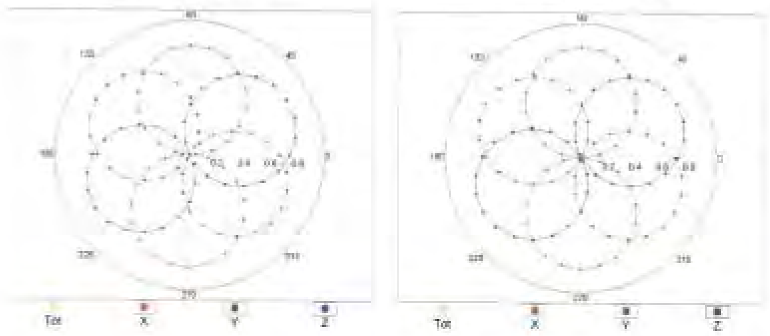
(TEM-Cell:ifi110 EXX, Waveguide: R22)

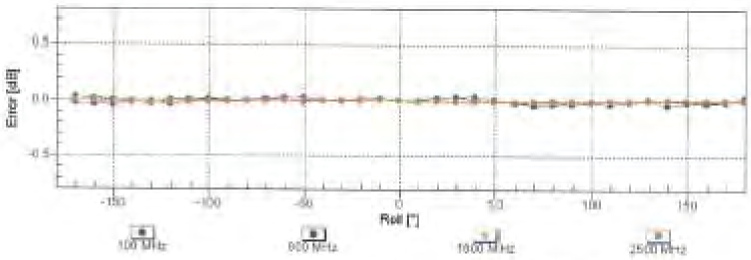


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Receiving Pattern (ϕ), $\vartheta = 0°$





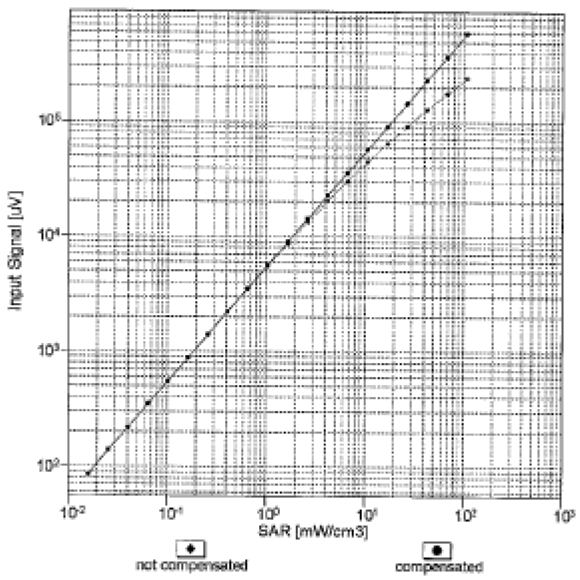
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

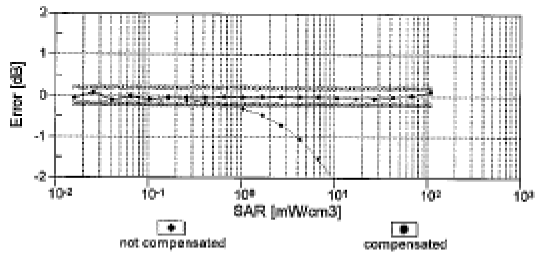
SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

EX3DV4– SN:3831 January 31, 2014

Dynamic Range f(SAR$_{head}$)

(TEM cell , f = 900 MHz)

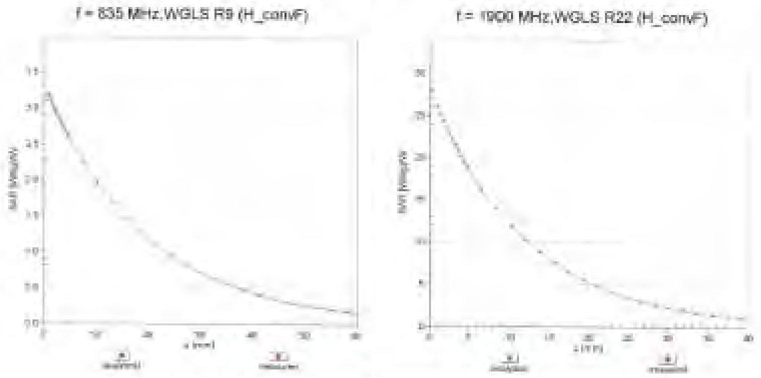




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

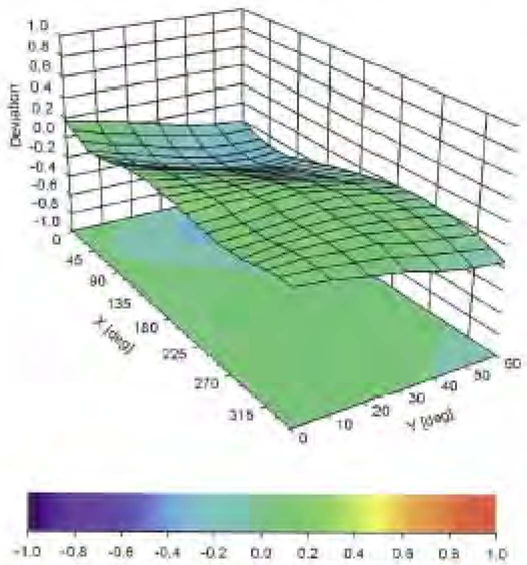
SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3831

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-20.6
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **SGS-TW (Auden)**

Certificate No: **EX3-3938_Jul14**

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3938

Calibration procedure(s): QA CAL-01.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

Calibration date: July 25, 2014

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	03-Apr-14 (No. 217-01911)	Apr-15
Power sensor E4412A	MY41498087	03-Apr-14 (No. 217-01911)	Apr-15
Reference 3 dB Attenuator	SN: S5054 (3c)	03-Apr-14 (No. 217-01915)	Apr-15
Reference 20 dB Attenuator	SN: S5277 (20x)	03-Apr-14 (No. 217-01919)	Apr-15
Reference 30 dB Attenuator	SN: S5129 (30b)	03-Apr-14 (No. 217-01920)	Apr-15
Reference Probe ES3DV2	SN: 3013	30-Dec-13 (No. ES3-3013_Dec13)	Dec-14
DAE4	SN: 660	13-Dec-13 (No. DAE4-660_Dec13)	Dec-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

	Name	Function	Signature
Calibrated by:	Israe El-Naouq	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: July 28, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: EX3-3938_Jul14 Page 1 of 11

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS) Accreditation No.: **SCS 108**
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Probe EX3DV4

SN:3938

Manufactured: May 2, 2013
Calibrated: July 25, 2014

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3938

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.52	0.59	0.34	± 10.1 %
DCP (mV)[B]	98.3	99.4	104.7	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	166.6	±3.0 %
		Y	0.0	0.0	1.0		157.7	
		Z	0.0	0.0	1.0		153.7	

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3938

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
835	41.5	0.90	9.41	9.41	9.41	0.80	0.50	± 12.0 %
900	41.5	0.97	9.26	9.26	9.26	0.61	0.68	± 12.0 %
1750	40.1	1.37	7.91	7.91	7.91	0.59	0.66	± 12.0 %
1900	40.0	1.40	7.65	7.65	7.65	0.54	0.72	± 12.0 %
2000	40.0	1.40	7.66	7.66	7.66	0.80	0.59	± 12.0 %
2450	39.2	1.80	6.97	6.97	6.97	0.41	0.78	± 12.0 %
2600	39.0	1.96	6.83	6.83	6.83	0.38	0.86	± 12.0 %
5200	36.0	4.66	4.95	4.95	4.95	0.40	1.80	± 13.1 %
5300	35.9	4.76	4.74	4.74	4.74	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.47	4.47	4.47	0.40	1.80	± 13.1 %
5800	35.3	5.27	4.49	4.49	4.49	0.40	1.80	± 13.1 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3938

Calibration Parameter Determined in Body Tissue Simulating Media

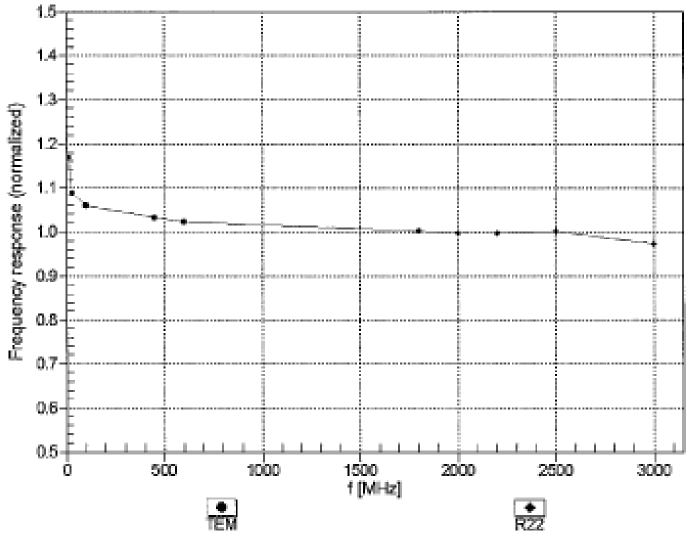
f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
835	55.2	0.97	9.35	9.35	9.35	0.80	0.60	± 12.0 %
900	55.0	1.05	9.24	9.24	9.24	0.80	0.50	± 12.0 %
1750	53.4	1.49	7.36	7.36	7.36	0.80	0.62	± 12.0 %
1900	53.3	1.52	7.03	7.03	7.03	0.44	0.83	± 12.0 %
2000	53.3	1.52	7.21	7.21	7.21	0.30	0.97	± 12.0 %
2450	52.7	1.95	6.69	6.69	6.69	0.75	0.57	± 12.0 %
2600	52.5	2.16	6.57	6.57	6.57	0.80	0.50	± 12.0 %
5200	49.0	5.30	4.27	4.27	4.27	0.45	1.90	± 13.1 %
5300	48.9	5.42	4.11	4.11	4.11	0.45	1.90	± 13.1 %
5600	48.5	5.77	3.70	3.70	3.70	0.50	1.90	± 13.1 %
5800	48.2	6.00	3.92	3.92	3.92	0.50	1.90	± 13.1 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)

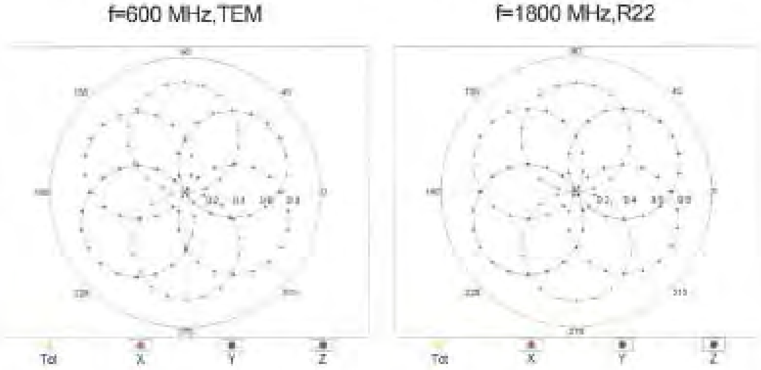


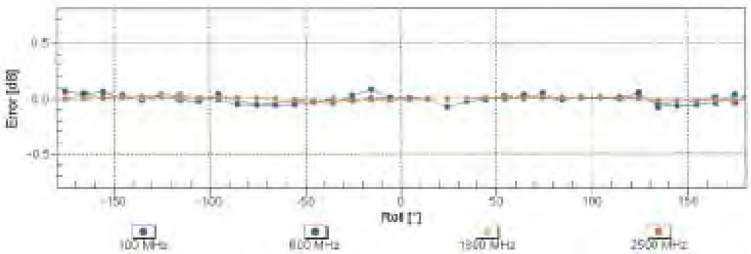
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

EX3DV4– SN:3938 July 25, 2014

Receiving Pattern (ϕ), ϑ = 0°





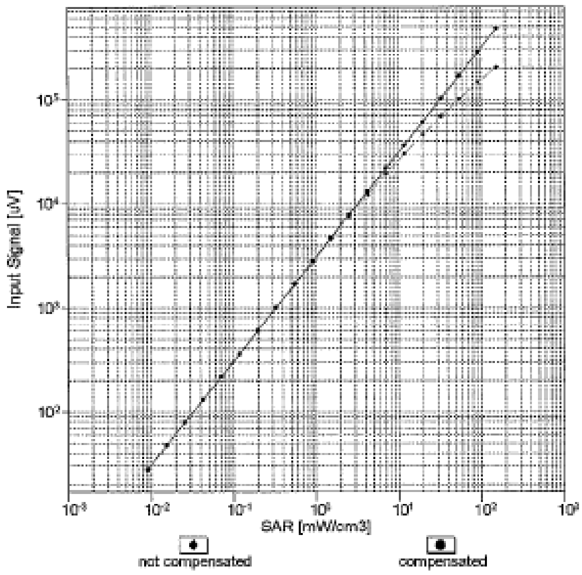
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

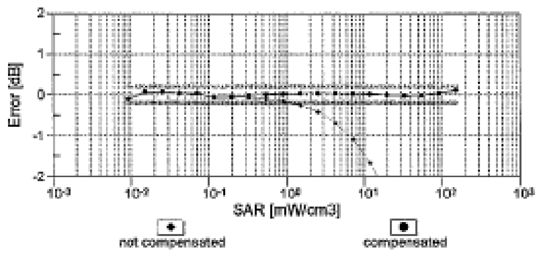
SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

EX3DV4– SN:3938 July 25, 2014

Dynamic Range f(SAR$_{head}$)

(TEM cell , f_{eval}= 1900 MHz)



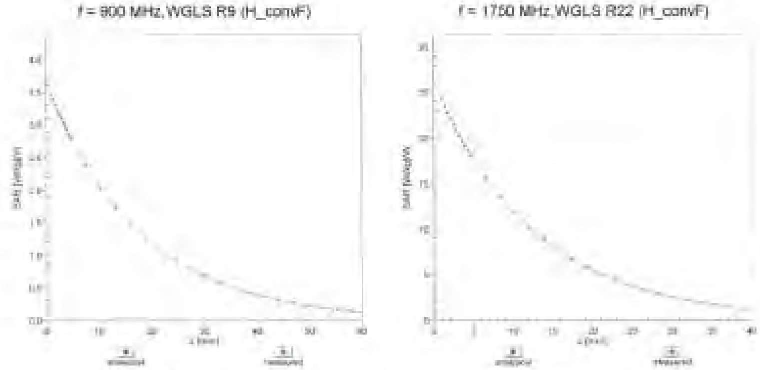


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

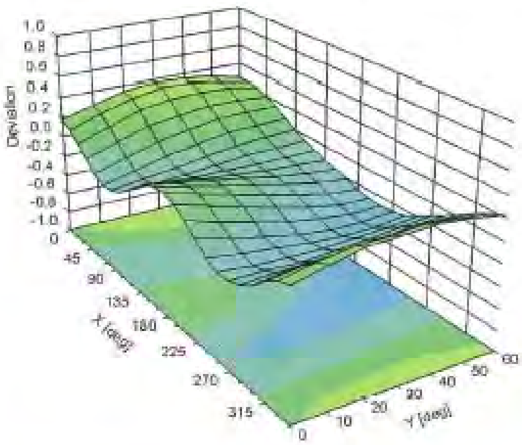
EX3DV4– SN:3938 July 25, 2014

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (φ, θ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

Certificate No: EX3-3938_Jul14 Page 10 of 11

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3938

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-25.5
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client SGS-TW (Auden)

Certificate No: EX3-3770_Apr14

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3770

Calibration procedure(s): QA CAL-01.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

Calibration date: April 24, 2014

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	03-Apr-14 (No. 217-01911)	Apr-15
Power sensor E4412A	MY41498087	03-Apr-14 (No. 217-01911)	Apr-15
Reference 3 dB Attenuator	SN: S5054 (3c)	03-Apr-14 (No. 217-01915)	Apr-15
Reference 20 dB Attenuator	SN: S5277 (20x)	03-Apr-14 (No. 217-01919)	Apr-15
Reference 30 dB Attenuator	SN: S5129 (30b)	03-Apr-14 (No. 217-01920)	Apr-15
Reference Probe ES3DV2	SN: 3013	30-Dec-13 (No. ES3-3013_Dec13)	Dec-14
DAE4	SN: 660	13-Dec-13 (No. DAE4-660_Dec13)	Dec-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 24, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: EX3-3770_Apr14 Page 1 of 11

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset:* The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Probe EX3DV4

SN:3770

Manufactured: July 6, 2010
Calibrated: April 24, 2014

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3770

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (µV/(V/m)^2)[A]	0.31	0.61	0.40	± 10.1 %
DCP (mV)[B]	104.0	96.9	102.5	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√µV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	141.8	±3.5 %
		Y	0.0	0.0	1.0		132.9	
		Z	0.0	0.0	1.0		135.7	

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3770

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	41.9	0.89	9.70	9.70	9.70	0.27	1.09	± 12.0 %
835	41.5	0.90	9.32	9.32	9.32	0.52	0.77	± 12.0 %
900	41.5	0.97	9.16	9.16	9.16	0.14	1.68	± 12.0 %
1750	40.1	1.37	8.08	8.08	8.08	0.28	0.92	± 12.0 %
1900	40.0	1.40	7.79	7.79	7.79	0.36	0.81	± 12.0 %
2000	40.0	1.40	7.75	7.75	7.75	0.40	0.78	± 12.0 %
2300	39.5	1.67	7.35	7.35	7.35	0.26	0.95	± 12.0 %
2450	39.2	1.80	6.97	6.97	6.97	0.35	0.82	± 12.0 %
2600	39.0	1.96	6.73	6.73	6.73	0.45	0.73	± 12.0 %
5200	36.0	4.66	5.25	5.25	5.25	0.35	1.80	± 13.1 %
5300	35.9	4.76	5.07	5.07	5.07	0.35	1.80	± 13.1 %
5600	35.5	5.07	4.48	4.48	4.48	0.45	1.80	± 13.1 %
5800	35.3	5.27	4.65	4.65	4.65	0.45	1.80	± 13.1 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3770

Calibration Parameter Determined in Body Tissue Simulating Media

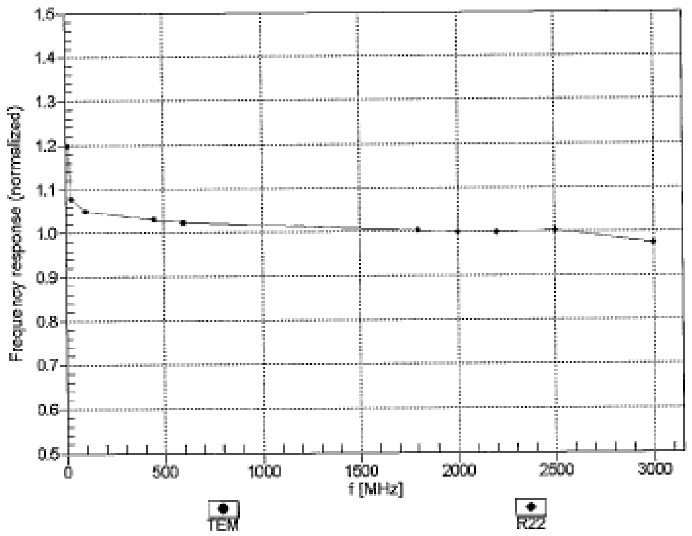
f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	55.5	0.96	9.54	9.54	9.54	0.53	0.79	± 12.0 %
835	55.2	0.97	9.40	9.40	9.40	0.19	1.60	± 12.0 %
900	55.0	1.05	9.23	9.23	9.23	0.27	1.20	± 12.0 %
1750	53.4	1.49	7.79	7.79	7.79	0.37	0.87	± 12.0 %
1900	53.3	1.52	7.51	7.51	7.51	0.47	0.78	± 12.0 %
2000	53.3	1.52	7.59	7.59	7.59	0.61	0.69	± 12.0 %
2300	52.9	1.81	7.27	7.27	7.27	0.60	0.69	± 12.0 %
2450	52.7	1.95	7.15	7.15	7.15	0.52	0.72	± 12.0 %
2600	52.5	2.16	6.90	6.90	6.90	0.80	0.50	± 12.0 %
5200	49.0	5.30	4.56	4.56	4.56	0.50	1.90	± 13.1 %
5300	48.9	5.42	4.38	4.38	4.38	0.50	1.90	± 13.1 %
5600	48.5	5.77	3.76	3.76	3.76	0.55	1.90	± 13.1 %
5800	48.2	6.00	4.13	4.13	4.13	0.55	1.90	± 13.1 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

EX3DV4– SN:3770 April 24, 2014

Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)

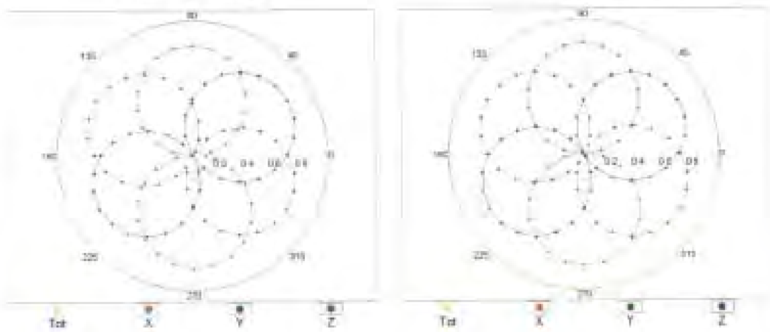


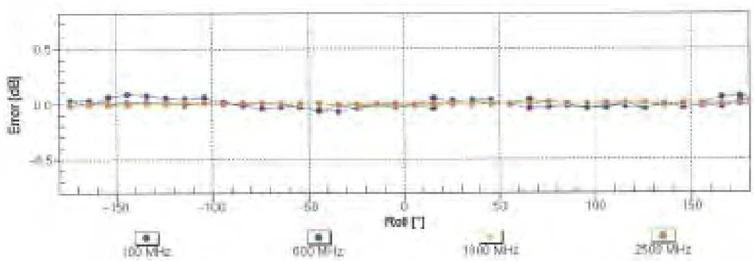
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM f=1800 MHz,R22



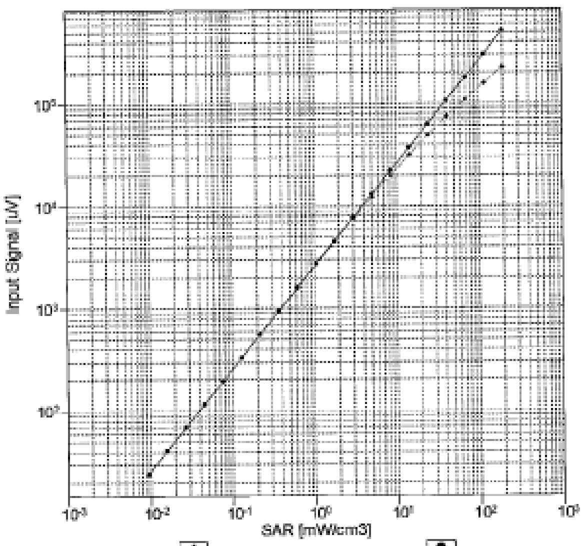


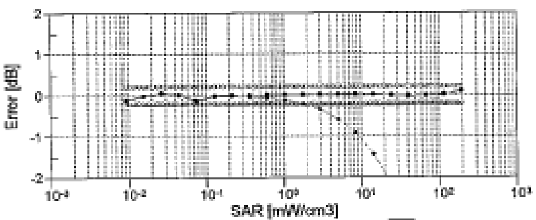
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Dynamic Range f(SAR$_{head}$)

(TEM cell , f$_{eval}$= 1900 MHz)

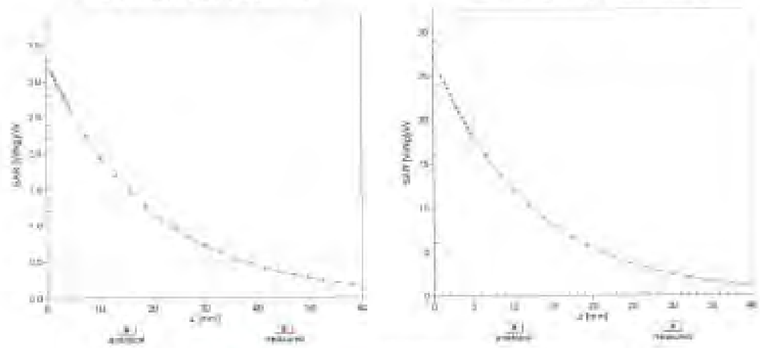




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

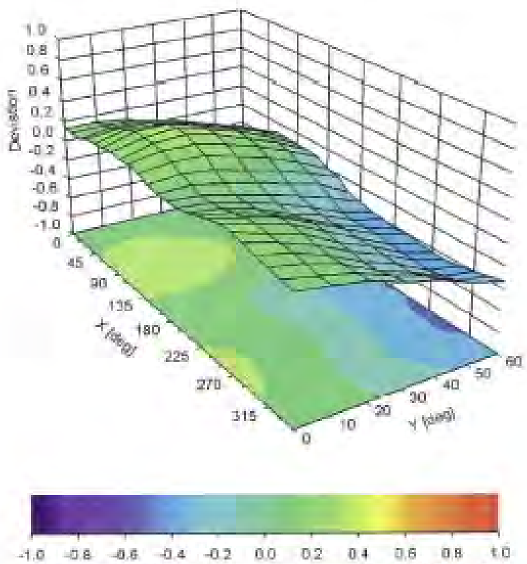
SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3770

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-34.3
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

8. Uncertainty Budget

Measurement Uncertainty evaluation template for DUT SAR test
IEEE 1528

A	c	D	e	f	g	h=c * f / e	i=c * g / e	k
Source of Uncertainty	Tolerance/ Uncertainty %	Probability Distribuitoin	Div	ci (1g)	ci (10g)	Standard uncertainty	Standard uncertainty	vi, or Veff
Measurement system								
Probe calibration(under 6Ghz)	6.55%	N	1	1	1	6.55%	6.55%	∞
Isotropy , Axial	3.50%	R	√3	1	1	2.02%	2.02%	∞
Isotropy, Hemispherical	9.60%	R	√3	1	1	5.54%	5.54%	∞
Boundary Effect	1.00%	R	√3	1	1	0.58%	0.58%	∞
Linearity	4.70%	R	√3	1	1	2.71%	2.71%	∞
Detection Limits	1.00%	R	√3	1	1	0.58%	0.58%	∞
Readout Electronics	0.30%	N	1	1	1	0.30%	0.30%	∞
Response time	0.80%	R	√3	1	1	0.46%	0.46%	∞
Integration Time	2.60%	R	√3	1	1	1.50%	1.50%	∞
Measurement drift (class A evaluation)	1.75%	R	√3	1	1	1.01%	1.01%	∞
RF ambient condition - noise	3.00%	R	√3	1	1	1.73%	1.73%	∞
RF ambient conditions - reflections	3.00%	R	√3	1	1	1.73%	1.73%	∞
Probe positioner Mechanical restrictions	0.40%	R	√3	1	1	0.23%	0.23%	∞
Probe Positioning with respect to phantom shell	2.90%	R	√3	1	1	1.67%	1.67%	∞
Post-processing	1.00%	R	√3	1	1	0.58%	0.58%	∞
Max SAR Eval	1.00%	R	√3	1	1	0.58%	0.58%	∞
Test Sample related								
Test sample positioning	2.90%	N	1	1	1	2.90%	2.90%	M-1
Device Holder Uncertainty	3.60%	N	1	1	1	3.60%	3.60%	M-1
Drift of output power	5.00%	R	√3	1	1	2.89%	2.89%	∞
Phantom and Setup								
Phantom Uncertainty	4.00%	R	√3	1	1	2.31%	2.31%	∞
Liquid conductivity(meas.)	4.88%	N	1	0.64	0.43	3.12%	2.10%	M
Liquid permitivity(meas.)	4.98%	N	1	0.6	0.49	2.99%	2.44%	M
Combined standard uncertainty		RSS				12.35%	12.01%	
Expant uncertainty (95% confidence interval), K=2						24.70%	24.02%	

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

9. Phantom Description

Schmid & Partner Engineering AG
s p e a g
Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

Certificate of Conformity / First Article Inspection

Item	SAM Twin Phantom V4.0
Type No	QD 000 P40 C
Series No	TP-1150 and higher
Manufacturer	SPEAG Zeughausstrasse 43 CH-8004 Zürich Switzerland

Tests
The series production process used allows the limitation to test of first articles.
Complete tests were made on the pre-series Type No. QD 000 P40 AA, Serial No. TP-1001 and on the series first article Type No. QD 000 P40 BA, Serial No. TP-1006. Certain parameters have been retested using further series items (called samples) or are tested at each item.

Test	Requirement	Details	Units tested
Dimensions	Compliant with the geometry according to the CAD model.	IT'IS CAD File (*)	First article, Samples
Material thickness of shell	Compliant with the requirements according to the standards	2mm +/- 0.2mm in flat and specific areas of head section	First article, Samples, TP-1314 ff.
Material thickness at ERP	Compliant with the requirements according to the standards	6mm +/- 0.2mm at ERP	First article, All items
Material parameters	Dielectric parameters for required frequencies	300 MHz – 6 GHz: Relative permittivity < 5, Loss tangent < 0.05	Material samples
Material resistivity	The material has been tested to be compatible with the liquids defined in the standards if handled and cleaned according to the instructions. Observe technical Note for material compatibility.	DEGMBE based simulating liquids	Pre-series, First article, Material samples
Sagging	Compliant with the requirements according to the standards. Sagging of the flat section when filled with tissue simulating liquid.	< 1% typical < 0.8% if filled with 155mm of HSL900 and without DUT below	Prototypes, Sample testing

Standards
[1] CENELEC EN 50361
[2] IEEE Std 1528-2003
[3] IEC 62209 Part I
[4] FCC OET Bulletin 65, Supplement C, Edition 01-01
(*) The IT'IS CAD file is derived from [2] and is also within the tolerance requirements of the shapes of the other documents.

Conformity
Based on the sample tests above, we certify that this item is in compliance with the uncertainty requirements of SAR measurements specified in standards [1] to [4].

Date 07.07.2005

Signature / Stamp

s p e a g
Schmid & Partner Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

Doc No 881 – QD 000 P40 C – F   Page 1 (1)

10. System Validation from Original Equipment Supplier

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

ilac-MRA   SWISS CALIBRATION

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **SGS-TW (Auden)**

Certificate No: **D835V2-4d063_Aug14**

CALIBRATION CERTIFICATE

Object: D835V2 - SN: 4d063

Calibration procedure(s): QA CAL-05.v9
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: August 28, 2014

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	M.Weber
Approved by:	Katja Pokovic	Technical Manager	

Issued: August 28, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: D835V2-4d063_Aug14   Page 1 of 8

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	42.0 ± 6 %	0.94 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.24 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.55 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.05 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	55.2 ± 6 %	1.01 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.41 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.35 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.59 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.21 W/kg ± 16.5 % (k=2)**

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Appendix (Additional assessments outside the scope of SCS108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.7 Ω - 3.6 jΩ
Return Loss	- 28.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.1 Ω - 5.8 jΩ
Return Loss	- 23.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.391 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	November 27, 2006

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

DASY5 Validation Report for Head TSL

Date: 28.08.2014

Test Laboratory: SPEAG, Zurich, Switzerland

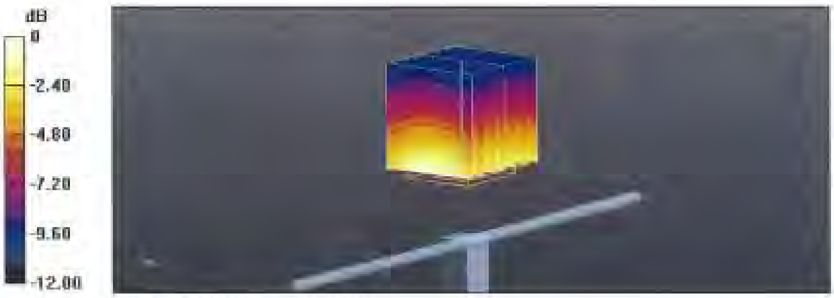
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d063

Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.94 S/m; ε_r = 42; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.22, 6.22, 6.22); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

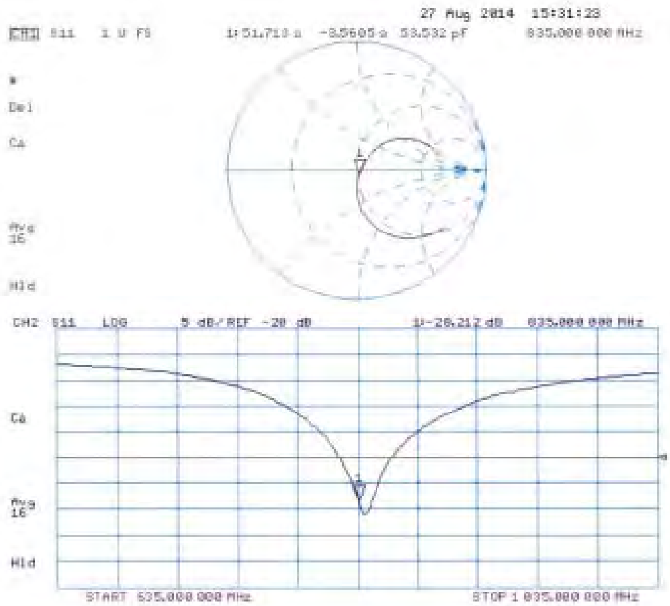
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.23 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 3.53 W/kg
SAR(1 g) = 2.38 W/kg; SAR(10 g) = 1.55 W/kg
Maximum value of SAR (measured) = 2.78 W/kg



0 dB = 2.78 W/kg = 4.44 dBW/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Impedance Measurement Plot for Head TSL



SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

DASY5 Validation Report for Body TSL

Date: 27.08.2014

Test Laboratory: SPEAG, Zurich, Switzerland

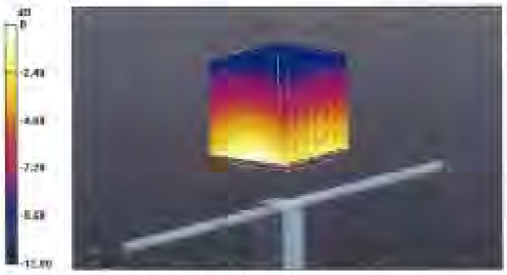
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d063

Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 1.01 S/m; ε_r = 55.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.09, 6.09, 6.09); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

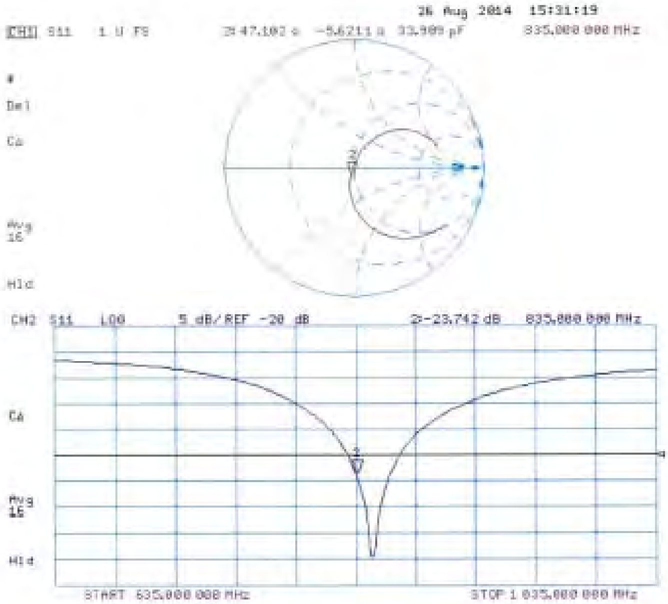
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 54.65 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 3.53 W/kg
SAR(1 g) = 2.41 W/kg; SAR(10 g) = 1.59 W/kg
Maximum value of SAR (measured) = 2.80 W/kg



0 dB = 2.80 W/kg = 4.47 dBW/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Impedance Measurement Plot for Body TSL



SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S **Schweizerischer Kalibrierdienst**
C **Service suisse d'étalonnage**
S **Servizio svizzero di taratura**
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client **SGS-TW (Auden)**

Certificate No: D1750V2-1008_Aug14

CALIBRATION CERTIFICATE

Object	D1750V2 - SN: 1008
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	August 28, 2014

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: August 28, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: D1750V2-1008_Aug14 Page 1 of 8

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.2 ± 6 %	1.37 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.26 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**36.9 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.91 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**19.6 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.4	1.49 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.0 ± 6 %	1.49 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.44 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**37.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.07 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.2 W/kg ± 16.5 % (k=2)**

SGS Taiwan Ltd. 台灣檢驗科技股份有限公司
No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Appendix (Additional assessments outside the scope of SCS108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.4 Ω + 0.3 jΩ
Return Loss	- 46.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.4 Ω + 0.3 jΩ
Return Loss	- 26.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.222 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	February 11, 2009

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

DASY5 Validation Report for Head TSL

Date: 28.08.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1008

Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.37 S/m; ε_r = 39.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.23, 5.23, 5.23); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

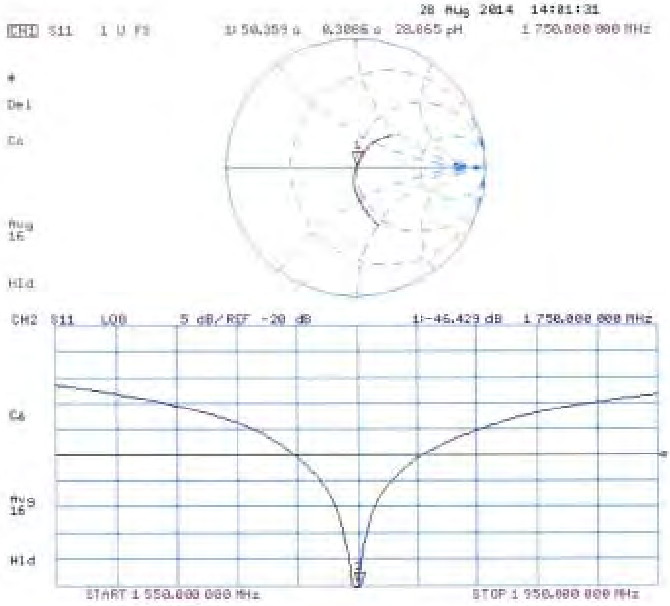
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.53 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 16.7 W/kg
SAR(1 g) = 9.26 W/kg; SAR(10 g) = 4.91 W/kg
Maximum value of SAR (measured) = 11.6 W/kg

0 dB = 11.6 W/kg = 10.64 dBW/kg

Certificate No: D1750V2-1008_Aug14 Page 6 of 8

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Impedance Measurement Plot for Head TSL



SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

DASY5 Validation Report for Body TSL

Date: 28.08.2014

Test Laboratory: SPEAG, Zurich, Switzerland

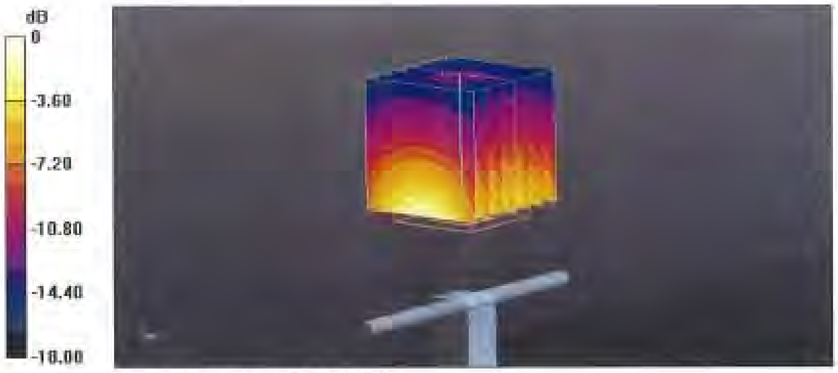
DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1008

Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.49 S/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.89, 4.89, 4.89); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 93.44 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 16.3 W/kg
SAR(1 g) = 9.44 W/kg; SAR(10 g) = 5.07 W/kg
Maximum value of SAR (measured) = 11.9 W/kg

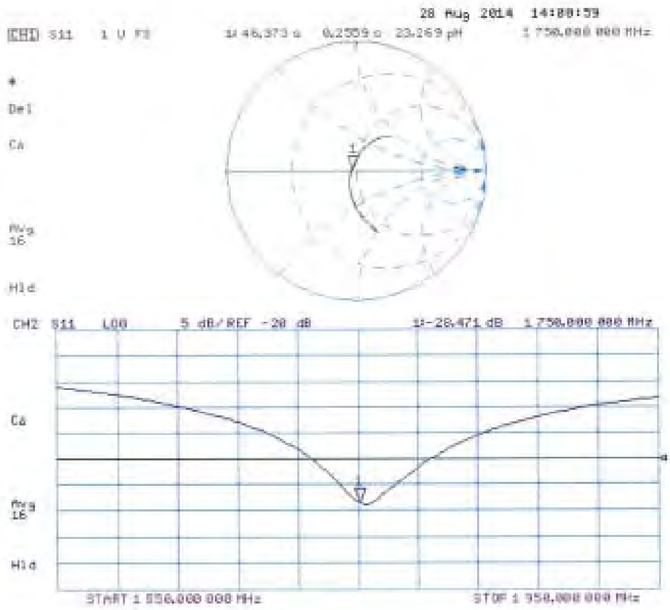


0 dB = 11.9 W/kg = 10.76 dBW/kg

Certificate No: D1750V2-1008_Aug14 Page 7 of 8

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Impedance Measurement Plot for Body TSL



SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **SGS-TW (Auden)**

Certificate No: **D1900V2-5d027_Apr14**

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d027
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	April 23, 2014

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 23, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: D1900V2-5d027_Apr14 Page 1 of 8

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.1 ± 6 %	1.36 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.71 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**39.3 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.10 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**20.6 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.4 ± 6 %	1.52 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.87 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**39.3 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.22 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.8 W/kg ± 16.5 % (k=2)**

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.5 Ω + 6.8 jΩ
Return Loss	- 23.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.3 Ω + 2.8 jΩ
Return Loss	- 26.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.199 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	December 17, 2002

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

DASY5 Validation Report for Head TSL

Date: 23.04.2014

Test Laboratory: SPEAG, Zurich, Switzerland

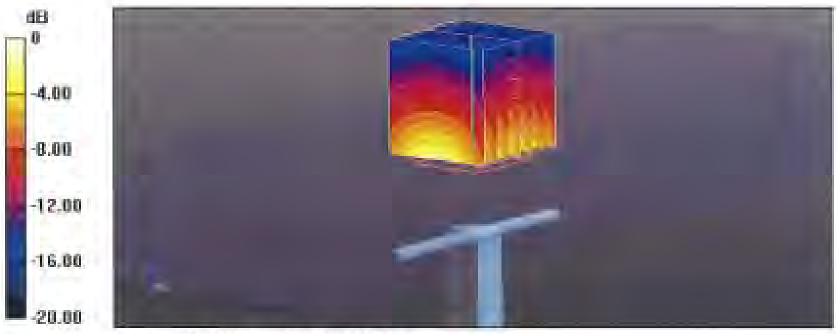
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d027

Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.36 S/m; ε_r = 39.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.06, 5.06, 5.06); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

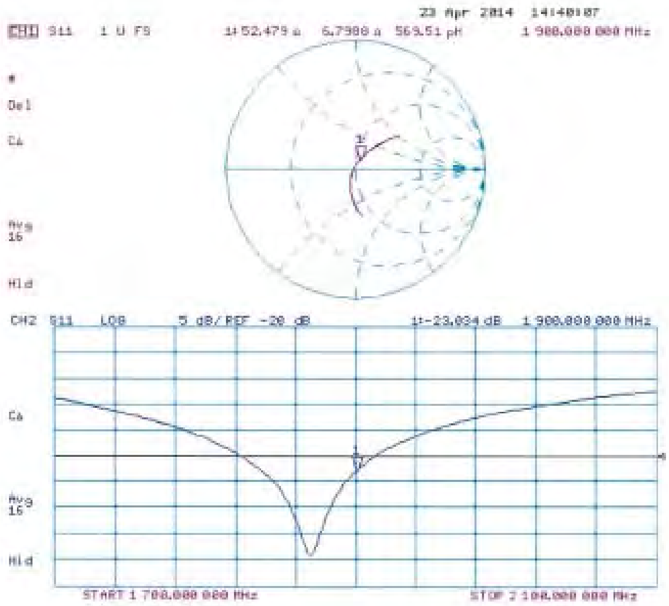
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 97.825 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 17.8 W/kg
SAR(1 g) = 9.71 W/kg; SAR(10 g) = 5.1 W/kg
Maximum value of SAR (measured) = 12.3 W/kg



0 dB = 12.3 W/kg = 10.90 dBW/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Impedance Measurement Plot for Head TSL



Certificate No: D1900V2-5d027_Apr14   Page 6 of 8

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

DASY5 Validation Report for Body TSL

Date: 22.04.2014

Test Laboratory: SPEAG, Zurich, Switzerland

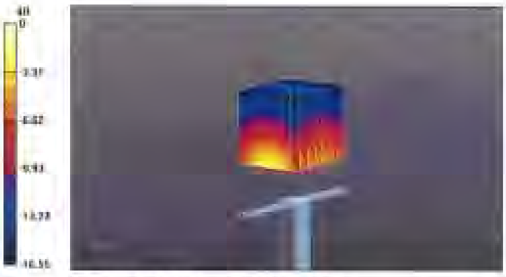
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d027

Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.52 S/m; ε_r = 52.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.76, 4.76, 4.76); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm 2/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.526 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 17.2 W/kg
SAR(1 g) = 9.87 W/kg; SAR(10 g) = 5.22 W/kg
Maximum value of SAR (measured) = 12.5 W/kg

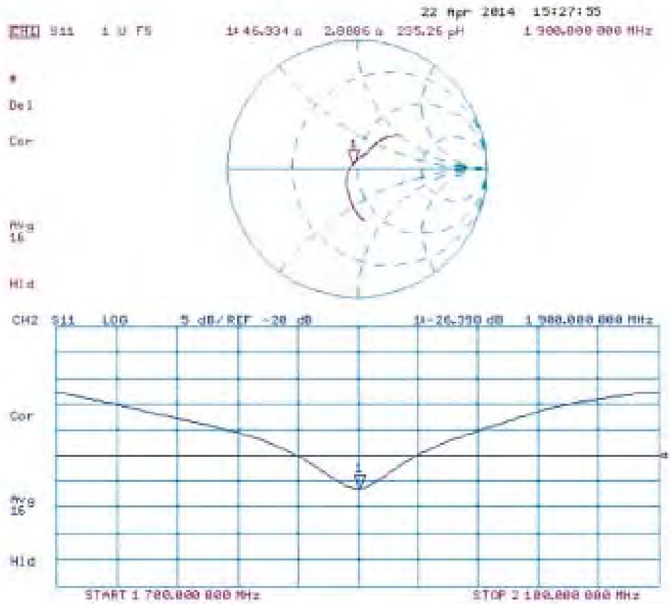


0 dB = 12.5 W/kg = 10.97 dBW/kg

Certificate No: D1900V2-5d027_Apr14 Page 7 of 8

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Impedance Measurement Plot for Body TSL



SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **SGS-TW (Auden)**

Certificate No: **D2450V2-727_Apr14**

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 727
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	April 23, 2014

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

	Name	Function	Signature
Calibrated by	Jeton Kastrati	Laboratory Technician	
Approved by	Katja Pokovic	Technical Manager	

Issued: April 23, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: D2450V2-727_Apr14 Page 1 of 8

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.2 ± 6 %	1.81 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.1 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**52.0 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.09 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.2 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	50.6 ± 6 %	2.01 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.8 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**50.0 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.90 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**23.3 W/kg ± 16.5 % (k=2)**

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.6 Ω + 1.9 jΩ
Return Loss	- 26.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	51.1 Ω + 3.5 jΩ
Return Loss	- 28.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.146 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	January 09, 2003

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

DASY5 Validation Report for Head TSL

Date: 23.04.2014

Test Laboratory: SPEAG, Zurich, Switzerland

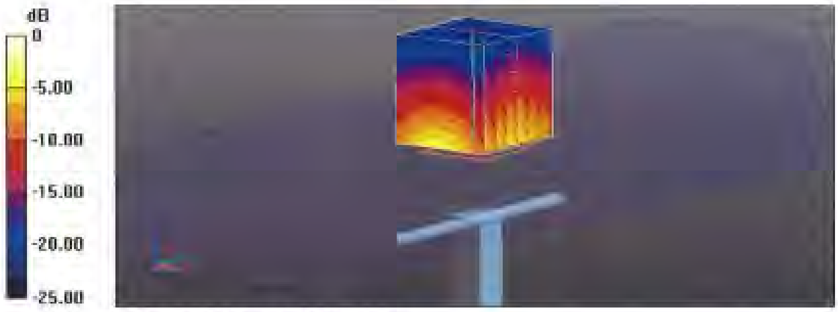
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 727

Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.81 S/m; ε_r = 38.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.53, 4.53, 4.53); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

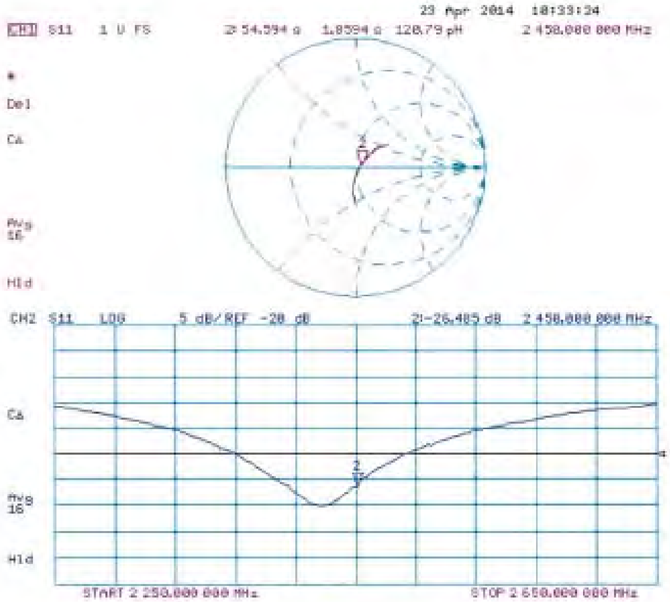
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 100.01 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 27.0 W/kg
SAR(1 g) = 13.1 W/kg; SAR(10 g) = 6.09 W/kg
Maximum value of SAR (measured) = 17.1 W/kg



0 dB = 17.1 W/kg = 12.33 dBW/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Impedance Measurement Plot for Head TSL



SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

DASY5 Validation Report for Body TSL

Date: 23.04.2014

Test Laboratory: SPEAG, Zurich, Switzerland

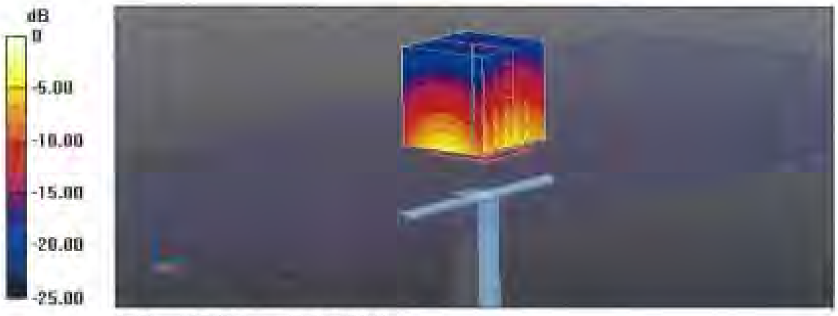
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 727

Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.01 S/m; ε_r = 50.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.35, 4.35, 4.35); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

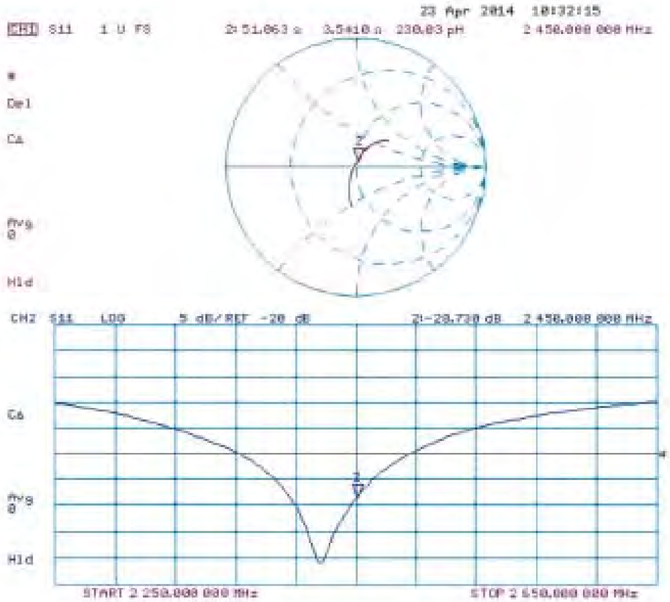
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.356 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 26.9 W/kg
SAR(1 g) = 12.8 W/kg; SAR(10 g) = 5.9 W/kg
Maximum value of SAR (measured) = 16.7 W/kg



0 dB = 16.7 W/kg = 12.23 dBW/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Impedance Measurement Plot for Body TSL



Certificate No: D2450V2-727_Apr14 Page 8 of 8

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **SGS-TW (Auden)**

Certificate No: **D2600V2-1005_Jan14**

CALIBRATION CERTIFICATE

Object	D2600V2 - SN: 1005
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	January 28, 2014

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: January 28, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: D2600V2-1005_Jan14 Page 1 of 8

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2600 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.2 ± 6 %	2.02 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	14.7 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**57.7 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.57 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**26.0 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	52.5	2.16 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	50.9 ± 6 %	2.21 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	14.3 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**56.2 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.33 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**25.1 W/kg ± 16.5 % (k=2)**

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.1 Ω - 3.2 jΩ
Return Loss	- 30.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.5 Ω - 2.6 jΩ
Return Loss	- 26.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.155 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	December 23, 2006

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

DASY5 Validation Report for Head TSL

Date: 28.01.2014

Test Laboratory: SPEAG, Zurich, Switzerland

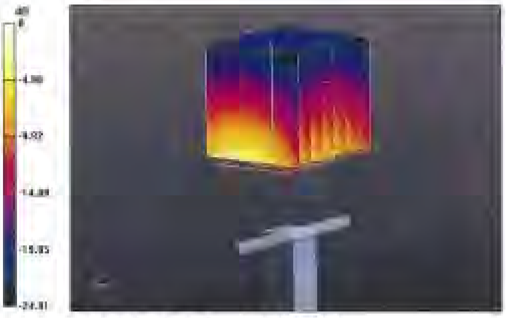
DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1005

Communication System: UID 0 - CW; Frequency: 2600 MHz
Medium parameters used: f = 2600 MHz; σ = 2.02 S/m; ε_r = 38.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.46, 4.46, 4.46); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 98.590 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 31.3 W/kg
SAR(1 g) = 14.7 W/kg; SAR(10 g) = 6.57 W/kg
Maximum value of SAR (measured) = 19.3 W/kg

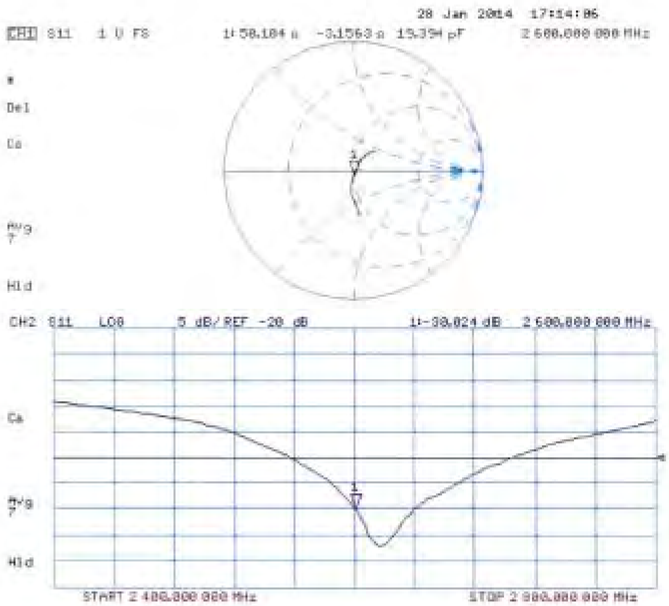


0 dB = 19.3 W/kg = 12.86 dBW/kg

Certificate No: D2600V2-1005_Jan14 Page 5 of 8

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Impedance Measurement Plot for Head TSL



SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

DASY5 Validation Report for Body TSL

Date: 28.01.2014

Test Laboratory: SPEAG, Zurich, Switzerland

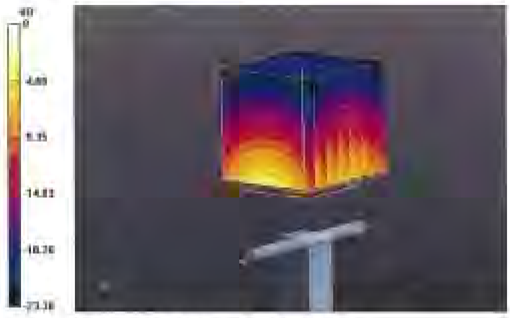
DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1005

Communication System: UID 0 - CW; Frequency: 2600 MHz
Medium parameters used: f = 2600 MHz; σ = 2.21 S/m; ε_r = 50.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.24, 4.24, 4.24); Calibrated: 30.12.2013
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.624 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 30.8 W/kg
SAR(1 g) = 14.3 W/kg; SAR(10 g) = 6.33 W/kg
Maximum value of SAR (measured) = 19.3 W/kg

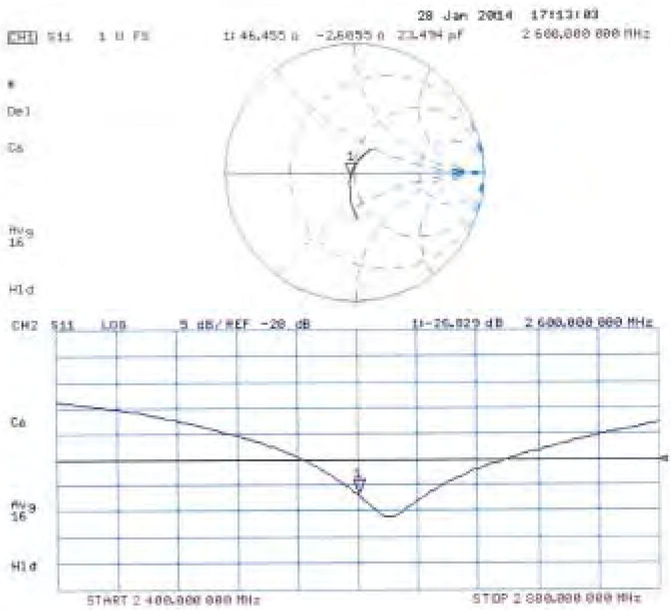


0 dB = 19.3 W/kg = 12.86 dBW/kg

Certificate No: D2600V2-1005_Jan14 Page 7 of 8

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Impedance Measurement Plot for Body TSL



SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **SGS-TW (Auden)**

Certificate No: **D5GHzV2-1104_Apr14**

CALIBRATION CERTIFICATE

Object	D5GHzV2 - SN: 1104
Calibration procedure(s)	QA CAL-22.v2 Calibration procedure for dipole validation kits between 3-6 GHz
Calibration date:	April 16, 2014

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe EX3DV4	SN: 3503	30-Dec-13 (No. EX3-3503_Dec13)	Dec-14
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 17, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: D5GHzV2-1104_Apr14 Page 1 of 15

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEC 62209-2, "Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation, and Procedures"; Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for including accessories and multiple transmitters", March 2010
b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"
c) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz ± 1 MHz 5300 MHz ± 1 MHz 5600 MHz ± 1 MHz 5800 MHz ± 1 MHz	

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.8 ± 6 %	4.43 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.02 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**80.0 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.29 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.8 W/kg ± 19.5 % (k=2)**

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Head TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.76 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.7 ± 6 %	4.54 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5300 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.45 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**84.3 W / kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.41 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.0 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.3 ± 6 %	4.83 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.31 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**82.8 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.36 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.5 W/kg ± 19.5 % (k=2)**

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.0 ± 6 %	5.03 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.95 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**79.2 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.26 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.5 W/kg ± 19.5 % (k=2)**

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.0 ± 6 %	5.44 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.69 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**76.3 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.15 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.3 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.42 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.8 ± 6 %	5.57 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5300 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.84 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**77.8 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.19 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.7 W/kg ± 19.5 % (k=2)**

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.3 ± 6 %	5.96 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	8.21 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**81.4 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.28 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**22.6 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.0 ± 6 %	6.23 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.73 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**76.7 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.13 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.1 W/kg ± 19.5 % (k=2)**

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Appendix

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	48.2 Ω - 4.8 jΩ
Return Loss	- 25.6 dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	48.5 Ω - 7.6 jΩ
Return Loss	- 22.2 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	53.9 Ω + 0.5 jΩ
Return Loss	- 28.5 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	58.3 Ω - 4.4 jΩ
Return Loss	- 21.2 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	52.6 Ω - 9.2 jΩ
Return Loss	- 20.6 dB

Antenna Parameters with Body TSL at 5300 MHz

Impedance, transformed to feed point	53.3 Ω - 1.8 jΩ
Return Loss	- 28.7 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	58.7 Ω - 5.2 jΩ
Return Loss	- 20.6 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	57.0 Ω + 2.2 jΩ
Return Loss	- 23.3 dB

SGS Taiwan Ltd. 台灣檢驗科技股份有限公司
No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

General Antenna Parameters and Design

Electrical Delay (one direction)	1.207 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	September 24, 2010

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

DASY5 Validation Report for Head TSL

Date: 16.04.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1104

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 4.43 S/m; ε_r = 35.8; ρ = 1000 kg/m^3 , Medium parameters used: f = 5300 MHz; σ = 4.54 S/m; ε_r = 35.7; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 4.83 S/m; ε_r = 35.3; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 5.03 S/m; ε_r = 35; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.52, 5.52, 5.52); Calibrated: 30.12.2013, ConvF(5.2, 5.2, 5.2); Calibrated: 30.12.2013, ConvF(4.86, 4.86, 4.86); Calibrated: 30.12.2013, ConvF(4.91, 4.91, 4.91); Calibrated: 30.12.2013;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

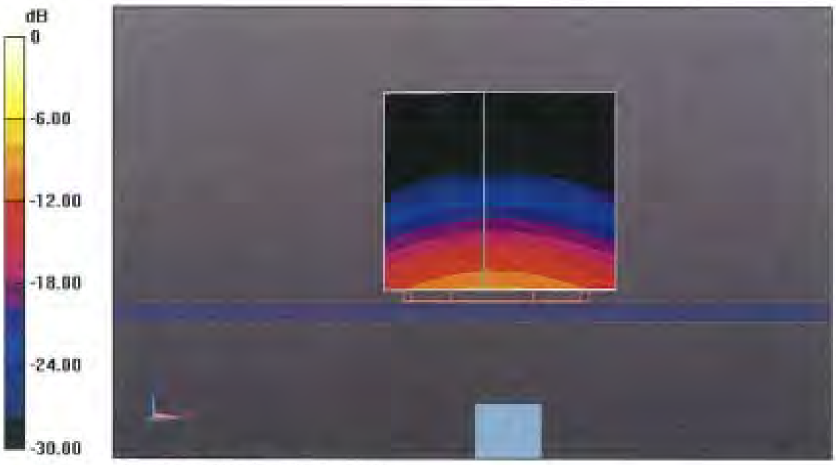
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 66.950 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 29.4 W/kg
SAR(1 g) = 8.02 W/kg; SAR(10 g) = 2.29 W/kg
Maximum value of SAR (measured) = 18.2 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 66.460 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 32.1 W/kg
SAR(1 g) = 8.45 W/kg; SAR(10 g) = 2.41 W/kg
Maximum value of SAR (measured) = 19.4 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 64.602 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 33.3 W/kg
SAR(1 g) = 8.31 W/kg; SAR(10 g) = 2.36 W/kg
Maximum value of SAR (measured) = 19.7 W/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

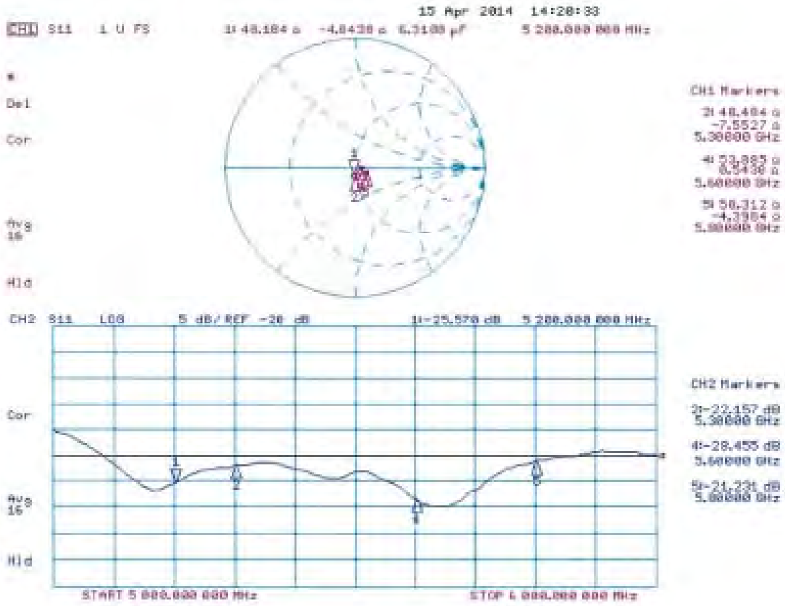
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 62.293 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 33.5 W/kg
SAR(1 g) = 7.95 W/kg; SAR(10 g) = 2.26 W/kg
Maximum value of SAR (measured) = 19.1 W/kg



0 dB = 19.1 W/kg = 12.81 dBW/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Impedance Measurement Plot for Head TSL



Certificate No: D5GHzV2-1104_Apr14 Page 12 of 15

DASY5 Validation Report for Body TSL

Date: 15.04.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1104

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 5.44 S/m; ε_r = 47; ρ = 1000 kg/m^3 , Medium parameters used: f = 5300 MHz; σ = 5.57 S/m; ε_r = 46.8; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 5.96 S/m; ε_r = 46.3; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 6.23 S/m; ε_r = 46; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.01, 5.01, 5.01); Calibrated: 30.12.2013, ConvF(4.76, 4.76, 4.76); Calibrated: 30.12.2013, ConvF(4.3, 4.3, 4.3); Calibrated: 30.12.2013, ConvF(4.47, 4.47, 4.47); Calibrated: 30.12.2013;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

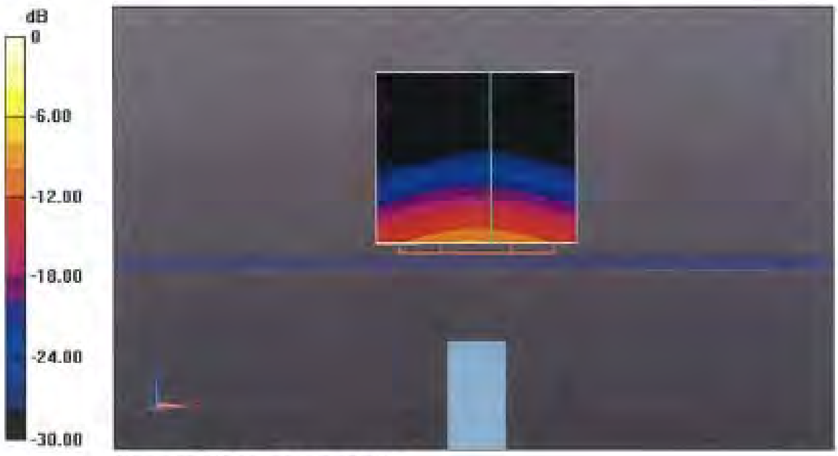
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 59.628 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 30.7 W/kg
SAR(1 g) = 7.69 W/kg; SAR(10 g) = 2.15 W/kg
Maximum value of SAR (measured) = 18.2 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 59.482 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 32.5 W/kg
SAR(1 g) = 7.84 W/kg; SAR(10 g) = 2.19 W/kg
Maximum value of SAR (measured) = 18.7 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.886 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 36.9 W/kg
SAR(1 g) = 8.21 W/kg; SAR(10 g) = 2.28 W/kg
Maximum value of SAR (measured) = 20.1 W/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

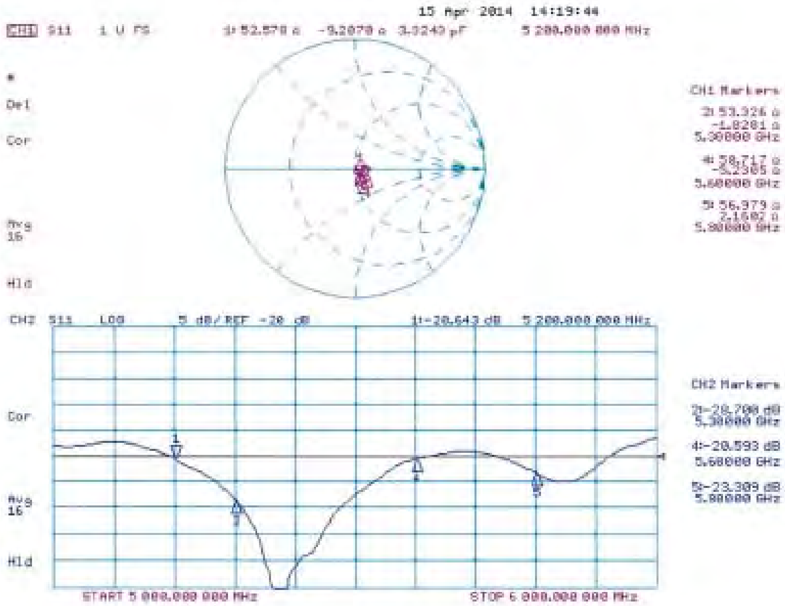
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 56.160 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 36.8 W/kg
SAR(1 g) = 7.73 W/kg; SAR(10 g) = 2.13 W/kg
Maximum value of SAR (measured) = 19.4 W/kg



0 dB = 19.4 W/kg = 12.88 dBW/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Impedance Measurement Plot for Body TSL



End of 1st part of report

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group