SAR TEST REPORT

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

Equipment Under Test	PDA Phone
Brand Name	Sony
Type No.	PM-0732-BV
Company Name	Sony Mobile Communications AB
Company Address	Nya Vattentornet 22188 Lund/Sweden
Standards	OET 65 supplement C, IEEE /ANSI C95.1 , C95.3, IEEE 1528,
FCC ID	PY7PM-0732
Date of Receipt	Jan. 29,2014
Date of Test(s)	Feb. 24, 2014 ~ Feb. 28, 2014
Date of Issue	Apr. 23, 2014

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

Remarks:

This report details the results of the testing carried out on two 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

Sr. Engineer	**Asst. Manager**
Pin Chu	**Kelly Tsai**
Date: Apr. 23, 2014	**Date: Apr. 23, 2014**

Version

Report Number	Revision	Description	Issue Date
EN/2013/10009	00	Initial Version	Apr. 23, 2014

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

Contents

1. General Information

1.1 Testing Laboratory

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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	PDA Phone					
Brand Name	Sony					
Type No.	PM-0732-BV					
HW Version	A					
SW Version	18.2.A.0.9					
Serial No.	WWAN: YT910MGRPM / WLAN: YT910MGTV3					
IMEI Code	WWAN: 004402146985092 / WLAN: 004402146984996					
FCC ID	PY7PM-0732					
Mode of Operation	☒GSM	☒GPRS	☒EDGE	☒WCDMA	☒HSDPA	
	☒HSUPA	☒Bluetooth	☒WLAN802.11a/b/g/n(20M/40M)			
Duty Cycle	GSM	1/8.3				
	GPRS (Multislot class:33 Max 4 Uplink Slots)	1/2 (1Dn4UP) 1/2.76 (1Dn3UP) 1/4.1 (1Dn2UP) 1/8.3 (1Dn1UP)				
	EDGE (Multislot class:33 Max 4 Uplink Slots)	1/2 (1Dn4UP) 1/2.76 (1Dn3UP) 1/4.1 (1Dn2UP) 1/8.3 (1Dn1UP)				
	WCDMA	1				
	WLAN 802.11 a/b/g/n(20M/40M)	1				
	Bluetooth	1				
TX Frequency Range (MHz)	GSM850	824.2	—	848.8		
	GSM1900	1850.2	—	1909.8		
	WCDMA Band II	1852.4	—	1907.6		
	WCDMA Band V	826.4	—	846.6		
	WLAN 802.11 b/g/n(20M)	2412	—	2462		
	WLAN802.11 a 5.2G	5180	—	5240		
	WLAN802.11 a 5.3G	5260	—	5320		

TX Frequency Range (MHz)	WLAN802.11 a 5.5G	5500	—	5700
	WLAN802.11 a 5.8G	5745	—	5825
	WLAN802.11 n (20M) 5.2G	5180	—	5240
	WLAN802.11 n (20M) 5.3G	5260	—	5320
	WLAN802.11 n (20M) 5.5G	5500	—	5700
	WLAN802.11 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
Channel Number (ARFCN)	GSM850	128	—	251
	GSM1900	512	—	810
	WCDMA Band II	9262	—	9538
	WCDMA Band V	4132	—	4233
	WLAN 802.11 b/g/n(20M)	1	—	11
	WLAN802.11 a 5.2G	36	—	48
	WLAN802.11 a 5.3G	52	—	64
	WLAN802.11 a 5.5G	100	—	140
	WLAN802.11 a 5.8G	149	—	165
	WLAN802.11 n (20M) 5.2G	36	—	48
	WLAN802.11 n (20M) 5.3G	52	—	64
	WLAN802.11 n (20M) 5.5G	100	—	140
	WLAN802.11 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) 5.5G	102	—	134
	WLAN802.11 n (40M) 5.8G	151	—	159
	Bluetooth	0	—	78

Max. SAR (1 g) (Unit: W/Kg)				
Mode	Band	Measured	Reported	Position / Channel
Head	GSM 850	0.390	0.480	☐Left ☒Right ☒Cheek ☐Tilt 251 Channel
	GSM 1900	0.278	0.312	☐Left ☒Right ☒Cheek ☐Tilt 512 Channel
	WCDMA Band II	0.186	0.200	☐Left ☒Right ☒Cheek ☐Tilt 9400 Channel
	WCDMA Band V	0.402	0.452	☐Left ☒Right ☒Cheek ☐Tilt 4183 Channel - with Memory card
	WLAN802.11 b	0.168	0.169	☒Left ☐Right ☒Cheek ☐Tilt 1 Channel - with Memory card
	WLAN802.11 a 5.2G	0.021	0.021	☒Left ☐Right ☒Cheek ☐Tilt 48 Channel
	WLAN802.11 a 5.3G	0.018	0.018	☒Left ☐Right ☒Cheek ☐Tilt 64 Channel
	WLAN802.11 a 5.6G	0.09	0.090	☒Left ☐Right ☒Cheek ☐Tilt 136 Channel
	WLAN802.11 a 5.8G	0.023	0.023	☒Left ☐Right ☒Cheek ☐Tilt 149 Channel

Max. SAR (1 g) (Unit: W/Kg)				
Mode	Band	Measured	Reported	Position / Channel
Body worn (speech mode)	GSM 850	0.330	0.406	☒Front ☐Back 251 Channel -With headset
	GSM 1900	0.961	1.078	☒Front ☐Back 512 Channel -With headset
	WCDMA Band II	1.11	1.131	☒Front ☐Back 9262 Channel -With headset (repeat with worse case)
	WCDMA Band V	0.314	0.352	☒Front ☐Back 4233 Channel -With headset
	WLAN802.11 a 5.2G	0.00882	0.009	☐Front ☒Back 48 Channel
	WLAN802.11 a 5.3G	0.014	0.014	☐Front ☒Back 64 Channel
	WLAN802.11 a 5.6G	0.843	0.847	☐Front ☒Back 136 Channel - with Memory card (repeat with worse case)
	WLAN802.11 a 5.8G	0.236	0.237	☐Front ☒Back 149 Channel

Max. SAR (1 g) (Unit: W/Kg)				
Mode	Band	Measured	Reported	Position / Channel
Hotspot mode	GPRS 850 1Dn4UP	0.423	0.475	☒Front ☐Back ☐Bottom ☐Right ☐Left 251 Channel
	GPRS 1900 1Dn4UP	1.030	1.104	☐Front ☐Back ☒Bottom ☐Right ☐Left 512 Channel (repeat with worse case)
	WCDMA Band II	0.962	1.089	☐Front ☐Back ☒Bottom ☐Right ☐Left 9262 Channel
	WCDMA Band V	0.439	0.494	☒Front ☐Back ☐Bottom ☐Right ☐Left 4183 Channel
	WLAN802.11 b	0.102	0.103	☐Front ☒Back ☐Top ☐Right ☐Left 1 Channel

Max. SAR (10 g) (Unit: W/Kg)				
Mode	Band	Measured	Reported	Position / Channel
Hand	GPRS 1900	1.12	1.173	☒Front ☐Back ☐Bottom ☐Right ☐Left 661 Channel
	WCDMA Band II	1.26	1.382	☒Front ☐Back ☐Bottom ☐Right ☐Left 9400 Channel

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	Left cheek	0.382	0.169	0.551	-	-
GPRS 850 (1Dn4UP)	Hotspot	Front	0.475	0.045	0.520	-	-
GSM 1900	Head	Right cheek	0.312	0.043	0.355	-	-
GPRS 1900 (1Dn4UP)	Hotspot	Front	0.702	0.045	0.747	-	-
WCDMA Band II	Head	Left cheek	0.098	0.169	0.267	-	-
	Hotspot	Front	0.75	0.045	0.795	-	-
WCDMA Band V	Head	Left cheek	0.403	0.169	0.572	-	-
	Hotspot	Front	0.494	0.045	0.539	-	-

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	0.48	0.003	0.483	-	-
	Body-	Back	0.286	0.237	0.523	-	-
GSM 1900	Head	RE cheek	0.312	0.003	0.315	-	-
	Body-	Back	0.993	0.237	1.23	-	-
WCDMA Band II	Head	RE cheek	0.2	0.003	0.203	-	-
	Body-	Front	1.131	0.003	1.134	-	-
WCDMA Band V	Head	RE cheek	0.452	0.003	0.455	-	-
	Body-	Back	0.34	0.237	0.577	-	-

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	0.48	0.026	0.506	-	-
	Body-	Back	0.286	0.847	1.133	-	-
GSM 1900	Head	RE cheek	0.312	0.026	0.338	-	-
	Body-	Back	0.993	0.847	**1.84**	137.3	0.018
WCDMA Band II	Head	RE cheek	0.2	0.026	0.226	-	-
	Body-	Back	0.823	0.847	**1.67**	134.4	0.016
WCDMA Band V	Head	LE cheek	0.403	0.09	0.493	-	-
	Body-	Back	0.34	0.847	1.187	-	-
Note: We calculate the peak location separation ratio of simultaneous transmitting antenna pair, the SPLSR value is less than 0.04. According to KDB447498 D01v05 simultaneous transmission SAR evaluation is not required.							

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-	Front	0.406	0.051	0.457	-	-
GPRS 850 (1Dn4UP)	Hotspot	Front	0.475	0.077	0.552	-	-
GSM 1900	Body-	Front	1.078	0.051	1.129	-	-
GPRS 1900	Hotspot	Front	0.702	0.077	0.779	-	-
WCDMA Band II	Body-	Front	1.131	0.051	1.182	-	-
	Hotspot	Front	0.75	0.077	0.827	-	-
WCDMA Band V	Body-	Front	0.352	0.051	0.403	-	-
	Hotspot	Front	0.494	0.077	0.571	-	-

reported SAR WWAN and WLAN DTS 2.4GHz, ΣSAR(10g) evaluation					
Frequency band	Position		reported SAR / W/kg		ΣSAR(10g)
			WWAN	WLAN	<4W/kg
GPRS 1900	Hand	Front	1.173	1.038	2.211
WCDMA Band II	Hand	Front	1.382	1.038	2.42

reported SAR WWAN and Bluetooth, ΣSAR(10g) evaluation					
Frequency band	Position		reported SAR / W/kg		ΣSAR(10g)
			WWAN	Bluetooth	<4W/kg
GPRS 1900	Hand	Front	1.173	0.061	1.234
WCDMA Band II	Hand	Front	1.382	0.061	1.443

#. Conducted power table:

There is power reduction for GPRS/EGPRS 1900 and WCDMA Band II mode (hotspot on).

There is no power reduction for GPRS/EGPRS 850, WCDMA Band V and WLAN mode

#. GSM/GPRS/EDGE/DTM 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	32.80	23.77
	836.6	190	33.5	32.70	23.67
	848.8	251	33.5	32.60	23.57
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	28.5	28
			1Dn1UP	1Dn2UP	1Dn3UP	1Dn4UP
EUT mode	Frequency (MHz)	CH	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)
GPRS 850 (GMSK)	824.2	128	32.80	29.40	27.90	27.60
	836.6	190	32.80	29.30	27.90	27.60
	848.8	251	32.60	29.40	27.90	27.50
Source-based time average power						
GPRS 850 (GMSK)	824.2	128	23.77	23.38	23.64	24.59
	836.6	190	23.77	23.28	23.64	24.59
	848.8	251	23.57	23.38	23.64	24.49
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)			27	26	26	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	26.30	25.20	25.20	24.30
	836.6	190	26.20	25.20	25.20	24.30
	848.8	251	26.20	25.20	25.20	24.30
Source-based time average power						
EDGE 850 (MCS 5)	824.2	128	17.27	19.18	20.94	21.29
	836.6	190	17.17	19.18	20.94	21.29
	848.8	251	17.17	19.18	20.94	21.29
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)			33.5	30	28.5	28
			1Dn1UP	1Dn2UP	1Dn3UP	1Dn4UP
EUT mode	Frequency (MHz)	CH	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)
EDGE 850 (MCS 4)	824.2	128	32.70	29.40	28.00	27.60
	836.6	190	32.70	29.50	27.90	27.50
	848.8	251	32.60	29.40	28.00	27.60
Source-based time average power						
EDGE 850 (MCS 4)	824.2	128	23.67	23.38	23.74	24.59
	836.6	190	23.67	23.48	23.64	24.49
	848.8	251	23.57	23.38	23.74	24.59
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)			27	26	26	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	26.30	25.20	25.20	24.40
	836.6	190	26.30	25.20	25.20	24.30
	848.8	251	26.30	25.20	25.20	24.40
Source-based time average power						
EDGE 850 (MCS 9)	824.2	128	17.27	19.18	20.94	21.39
	836.6	190	17.27	19.18	20.94	21.29
	848.8	251	17.27	19.18	20.94	21.39
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)			29.5	28
			1Dn2UP	1Dn3UP
EUT mode	Frequency (MHz)	CH	Avg. (dBm)	Avg. (dBm)
GSM+GPRS 850 (DTM)	824.2	128	29.50	27.90
	836.6	190	29.50	28.00
	848.8	251	29.50	28.00
Source-based time average power				
GSM+GPRS 850 (DTM)	824.2	128	23.48	23.64
	836.6	190	23.48	23.74
	848.8	251	23.48	23.74
The division factor compared to the number of TX time slot				
Division factor			2 TX time slot	3 TX time slot
			-6.02	-4.26

Burst average power				
Max. Rated Avg. Power + Max. Tolerance (dBm)			25.5	25.5
			1Dn2UP	1Dn3UP
EUT mode	Frequency (MHz)	CH	Avg. (dBm)	Avg. (dBm)
GSM+EDGE 850 (DTM)	824.2	128	25.30	25.10
	836.6	190	25.30	25.20
	848.8	251	25.30	25.20
Source-based time average power				
GSM+EDGE 850 (DTM)	824.2	128	19.28	20.84
	836.6	190	19.28	20.94
	848.8	251	19.28	20.94
The division factor compared to the number of TX time slot				
Division factor			2 TX time slot	3 TX time slot
			-6.02	-4.26

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 1900 (GMSK)	1850.2	512	31	30.50	21.47
	1880	661	31	30.50	21.47
	1909.8	810	31	30.40	21.37
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)			31	29	28	27.5
			1Dn1UP	1Dn2UP	1Dn3UP	1Dn4UP
EUT mode	Frequency (MHz)	CH	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)
GPRS 1900 (GMSK)	1850.2	512	30.50	28.60	27.60	27.30
	1880	661	30.50	28.60	27.60	27.30
	1909.8	810	30.40	28.40	27.50	27.30
Source-based time average power						
GPRS 1900 (GMSK)	1850.2	512	21.47	22.58	23.34	24.29
	1880	661	21.47	22.58	23.34	24.29
	1909.8	810	21.37	22.38	23.24	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)			26	26	26	25
			1Dn1UP	1Dn2UP	1Dn3UP	1Dn4UP
EUT mode	Frequency (MHz)	CH	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)
EDGE 1900 (MCS 5)	1850.2	512	25.40	25.00	25.00	24.50
	1880	661	25.20	25.00	25.00	24.20
	1909.8	810	25.10	25.00	25.00	24.20
Source-based time average power						
EDGE 1900 (MCS 5)	1850.2	512	16.37	18.98	20.74	21.49
	1880	661	16.17	18.98	20.74	21.19
	1909.8	810	16.07	18.98	20.74	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

Burst average power						
Max. Rated Avg. Power + Max. Tolerance (dBm)			31	29	28	27.5
			1Dn1UP	1Dn2UP	1Dn3UP	1Dn4UP
EUT mode	Frequency (MHz)	CH	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)
EDGE 1900 (MCS 4)	1850.2	512	30.40	28.50	27.60	27.30
	1880	661	30.50	28.50	27.60	27.30
	1909.8	810	30.40	28.50	27.40	27.20
Source-based time average power						
EDGE 1900 (MCS 4)	1850.2	512	21.37	22.48	23.34	24.29
	1880	661	21.47	22.48	23.34	24.29
	1909.8	810	21.37	22.48	23.14	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

Burst average power						
Max. Rated Avg. Power + Max. Tolerance (dBm)			26	26	26	25
			1Dn1UP	1Dn2UP	1Dn3UP	1Dn4UP
EUT mode	Frequency (MHz)	CH	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)
EDGE 1900 (MCS 9)	1850.2	512	25.30	25.20	25.20	24.50
	1880	661	25.20	25.00	25.00	24.30
	1909.8	810	25.00	25.00	25.00	24.30
Source-based time average power						
EDGE 1900 (MCS 9)	1850.2	512	16.27	19.18	20.94	21.49
	1880	661	16.17	18.98	20.74	21.29
	1909.8	810	15.97	18.98	20.74	21.29
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)			29	28
			1Dn2UP	1Dn3UP
EUT mode	Frequency (MHz)	CH	Avg. (dBm)	Avg. (dBm)
GSM+GPRS 1900 (DTM)	1850.2	512	28.70	27.50
	1880	661	28.60	27.40
	1909.8	810	28.40	27.40
Source-based time average power				
GSM+GPRS 1900 (DTM)	1850.2	512	22.68	23.24
	1880	661	22.58	23.14
	1909.8	810	22.38	23.14
The division factor compared to the number of TX time slot				
Division factor			2 TX time slot	3 TX time slot
			-6.02	-4.26

Burst average power				
Max. Rated Avg. Power + Max. Tolerance (dBm)			26	26
			1Dn2UP	1Dn3UP
EUT mode	Frequency (MHz)	CH	Avg. (dBm)	Avg. (dBm)
GSM+EDGE 1900 (DTM)	1850.2	512	25.30	25.00
	1880	661	25.00	25.00
	1909.8	810	25.00	25.00
Source-based time average power				
GSM+EDGE 1900 (DTM)	1850.2	512	19.28	20.74
	1880	661	18.98	20.74
	1909.8	810	18.98	20.74
The division factor compared to the number of TX time slot				
Division factor			2 TX time slot	3 TX time slot
			-6.02	-4.26

GPRS/EGPRS/DTM 1900 Hotspot on (Reduced) conducted power table:

Burst average power						
Max. Rated Avg. Power + Max. Tolerance (dBm)			26	23	21.5	21
			1Dn1UP	1Dn2UP	1Dn3UP	1Dn4UP
EUT mode	Frequency (MHz)	CH	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)
GPRS 1900 (GMSK)	1850.2	512	25.70	22.80	21.30	20.70
	1880	661	25.70	22.70	21.20	20.80
	1909.8	810	25.70	22.70	21.20	20.70
Source-based time average power						
GPRS 1900 (GMSK)	1850.2	512	16.67	16.78	17.04	17.69
	1880	661	16.67	16.68	16.94	17.79
	1909.8	810	16.67	16.68	16.94	17.69
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)			23	20	20	20
			1Dn1UP	1Dn2UP	1Dn3UP	1Dn4UP
EUT mode	Frequency (MHz)	CH	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)
EDGE 1900 (MCS 5)	1850.2	512	22.90	19.80	20.00	19.60
	1880	661	22.80	19.90	19.90	19.50
	1909.8	810	22.70	19.80	19.80	19.50
Source-based time average power						
EDGE 1900 (MCS 5)	1850.2	512	13.87	13.78	15.74	16.59
	1880	661	13.77	13.88	15.64	16.49
	1909.8	810	13.67	13.78	15.54	16.49
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)			26	23	21.5	21
			1Dn1UP	1Dn2UP	1Dn3UP	1Dn4UP
EUT mode	Frequency (MHz)	CH	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)
EDGE 1900 (MCS 4)	1850.2	512	25.60	22.80	21.30	20.80
	1880	661	25.60	22.70	21.10	20.80
	1909.8	810	25.70	22.70	21.10	20.70
Source-based time average power						
EDGE 1900 (MCS 4)	1850.2	512	16.57	16.78	17.04	17.79
	1880	661	16.57	16.68	16.84	17.79
	1909.8	810	16.67	16.68	16.84	17.69
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)			23	20	20	20
			1Dn1UP	1Dn2UP	1Dn3UP	1Dn4UP
EUT mode	Frequency (MHz)	CH	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)
EDGE 1900 (MCS 9)	1850.2	512	22.90	19.90	20.00	19.50
	1880	661	22.70	19.80	19.90	19.60
	1909.8	810	22.70	19.80	19.80	19.50
Source-based time average power						
EDGE 1900 (MCS 9)	1850.2	512	13.87	13.88	15.74	16.49
	1880	661	13.67	13.78	15.64	16.59
	1909.8	810	13.67	13.78	15.54	16.49
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)			23	21.5
			1Dn2UP	1Dn3UP
EUT mode	Frequency (MHz)	CH	Avg. (dBm)	Avg. (dBm)
GSM+GPRS 1900 (DTM)	1850.2	512	22.80	21.40
	1880	661	22.80	21.20
	1909.8	810	22.80	21.20
Source-based time average power				
GSM+GPRS 1900 (DTM)	1850.2	512	16.78	17.14
	1880	661	16.78	16.94
	1909.8	810	16.78	16.94
The division factor compared to the number of TX time slot				
Division factor			2 TX time slot	3 TX time slot
			-6.02	-4.26

Burst average power				
Max. Rated Avg. Power + Max. Tolerance (dBm)			20	20
			1Dn2UP	1Dn3UP
EUT mode	Frequency (MHz)	CH	Avg. (dBm)	Avg. (dBm)
GSM+EDGE 1900 (DTM)	1850.2	512	19.80	19.80
	1880	661	19.70	19.80
	1909.8	810	19.70	19.70
Source-based time average power				
GSM+EDGE 1900 (DTM)	1850.2	512	13.78	15.54
	1880	661	13.68	15.54
	1909.8	810	13.68	15.44
The division factor compared to the number of TX time slot				
Division factor			2 TX time slot	3 TX time slot
			-6.02	-4.26

#. WCDMA Band II / 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 Rel 7	9262	22.5	22.42	22.50	22.30	22.19	22.26	22.34	20.31	21.32	20.44	22.15	22.35	20.33	21.32	20.44	22.15
	9400	22.5	22.18	22.07	22.04	21.51	21.52	22.16	20.21	21.16	20.26	22.00	22.15	20.19	21.14	20.23	22.00
	9538	22.5	22.12	21.98	21.97	21.31	21.43	22.06	20.04	21.08	20.08	21.91	22.07	20.06	21.08	20.10	21.93
WCDMA Band V Rel 7	4132	24.5	23.92	23.71	23.85	23.04	23.09	23.88	21.90	22.88	21.95	23.70	23.89	21.92	22.87	21.95	23.70
	4183	24.5	23.99	23.85	23.88	23.23	23.27	23.92	21.93	22.91	21.99	23.68	23.91	21.93	22.91	21.99	23.68
	4233	24.5	24.00	24.12	23.87	23.75	23.81	23.92	21.88	22.92	21.94	23.73	23.91	21.88	22.90	21.94	23.73

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	$\beta_{ed}1$: 47/15 $\beta_{ed}2$: 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

WCDMA Band II / HSDPA / HSUPA/ HSPA+_Hotspot on (Reduced) 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 Rel 7	9262	18	17.46	17.63	17.34	17.32	17.39	17.38	15.35	16.36	15.48	17.19	17.39	15.37	16.36	15.48	17.19
	9400	18	17.6	17.49	17.46	16.93	16.94	17.58	15.63	16.58	15.68	17.42	17.57	15.61	16.56	15.65	17.42
	9538	18	17.58	17.44	17.43	16.77	16.89	17.52	15.50	16.54	15.54	17.37	17.53	15.52	16.54	15.56	17.39

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

802.11b		Max. Rated Avg. Power + Max. Tolerance	Average Power Output (dBm)			
CH	Frequency (MHz)		Data Rate (Mbps)			
			1	2	5.5	11
1	2412	18.00	17.97	17.86	17.77	17.67
6	2437	18.00	17.95	17.88	17.76	17.66
11	2462	18.00	17.94	17.88	17.84	17.77

802.11g		Max. Rated Avg. Power + Max. Tolerance	Average Power Output(dBm)							
CH	Frequency (MHz)		Data Rate (Mbps)							
			6	9	12	18	24	36	48	54
1	2412	12.00	11.88	11.76	11.70	11.64	11.57	11.43	11.36	11.29
6	2437	15.00	14.98	14.90	14.79	14.68	14.64	14.60	14.47	14.46
11	2462	13.00	12.90	12.89	12.81	12.76	12.73	12.66	12.54	12.49

802.11n (20M)		Max. Rated Avg. Power + Max. Tolerance	Average Power Output(dBm)							
CH	Frequency (MHz)		Data Rate (Mbps)							
			mcs0	mcs1	mcs2	mcs3	mcs4	mcs5	mcs6	mcs7
1	2412	12.00	11.94	11.89	11.80	11.71	11.64	11.57	11.54	11.41
6	2437	13.00	12.99	12.87	12.74	12.68	12.66	12.62	12.58	12.55
11	2462	11.00	10.88	10.75	10.63	10.58	10.46	10.35	10.27	10.19

802.11a 5.2G/5.3/5.5G/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	13.78	13.64	13.52	13.38	13.30	13.26	13.13	13.04
40	5200	14.00	13.81	13.77	13.75	13.69	13.60	13.46	13.43	13.40
44	5220	14.00	13.86	13.74	13.66	13.54	13.53	13.40	13.38	13.34
48	5240	14.00	13.99	13.98	13.89	13.82	13.69	13.55	13.53	13.49
52	5260	14.00	13.97	13.87	13.76	13.69	13.66	13.56	13.46	13.39
56	5280	14.00	13.99	13.89	13.81	13.72	13.67	13.57	13.55	13.48
60	5300	14.00	13.98	13.97	13.87	13.81	13.77	13.72	13.71	13.63
64	5320	14.00	13.99	13.91	13.88	13.76	13.74	13.68	13.57	13.48
100	5500	14.00	13.97	13.96	13.94	13.89	13.81	13.80	13.75	13.64
104	5520	14.00	13.99	13.98	13.94	13.82	13.69	13.60	13.50	13.47
108	5540	14.00	13.97	13.87	13.84	13.81	13.73	13.66	13.60	13.58
112	5560	14.00	13.98	13.91	13.85	13.80	13.75	13.71	13.68	13.63
116	5580	14.00	13.95	13.87	13.81	13.74	13.73	13.68	13.61	13.56
132	5660	14.00	13.81	13.77	13.74	13.68	13.62	13.56	13.48	13.43
136	5680	14.00	13.98	13.90	13.88	13.81	13.75	13.72	13.67	13.56
140	5700	11.00	10.97	10.87	10.75	10.62	10.52	10.41	10.38	10.25
149	5745	14.00	13.98	13.86	13.78	13.68	13.58	13.49	13.39	13.31
153	5765	14.00	13.98	13.90	13.80	13.68	13.56	13.50	13.36	13.31
157	5785	14.00	13.99	13.97	13.95	13.88	13.85	13.75	13.66	13.64
161	5805	14.00	13.97	13.85	13.78	13.72	13.71	13.70	13.56	13.54
165	5825	14.00	13.91	13.89	13.75	13.64	13.52	13.48	13.43	13.35

802.11n(20M) 5.2G/5.3G/5.5G/5.8		Max. Rated Avg. Power + Max. Tolerance (dBm)	Average Power (dBm)							
CH	Frequency (MHz)		Data Rate (Mbps)							
			mcs0	mcs1	mcs2	mcs3	mcs4	mcs5	mcs6	mcs7
36	5180	11.50	11.43	11.38	11.30	11.18	11.05	10.93	10.84	10.75
40	5200	11.50	11.47	11.34	11.22	11.09	11.04	10.90	10.86	10.76
44	5220	11.50	11.45	11.39	11.26	11.18	11.13	11.10	11.01	10.99
48	5240	11.50	11.48	11.34	11.24	11.10	10.96	10.90	10.81	10.69
52	5260	11.50	11.46	11.39	11.25	11.20	11.10	10.99	10.85	10.82
56	5280	11.50	11.47	11.34	11.28	11.20	11.14	11.00	10.96	10.83
60	5300	11.50	11.39	11.28	11.19	11.10	10.97	10.86	10.72	10.71
64	5320	11.50	11.46	11.32	11.26	11.17	11.13	11.05	10.98	10.87
100	5500	11.50	11.30	11.23	11.12	11.04	11.02	10.96	10.87	10.79
104	5520	11.50	11.41	11.31	11.28	11.24	11.10	11.00	10.92	10.81
108	5540	11.50	11.46	11.44	11.30	11.22	11.17	11.07	11.04	11.02
112	5560	11.50	11.47	11.38	11.37	11.29	11.21	11.18	11.10	10.98
116	5580	11.50	11.42	11.27	11.17	11.03	11.00	10.96	10.85	10.83
132	5660	11.50	11.33	11.26	11.24	11.11	11.01	10.95	10.89	10.85
136	5680	11.50	11.38	11.26	11.21	11.08	11.03	10.96	10.94	10.88
140	5700	8.50	8.46	8.40	8.31	8.25	8.19	8.11	8.05	7.97
149	5745	11.50	11.45	11.36	11.22	11.10	11.07	11.03	11.00	10.91
153	5765	11.50	11.35	11.41	11.31	11.27	11.22	11.16	11.03	10.90
157	5785	11.50	11.48	11.44	11.38	11.36	11.24	11.20	11.10	11.03
161	5805	11.50	11.47	11.37	11.23	11.13	11.05	10.96	10.93	10.79
165	5825	11.50	11.45	11.32	11.25	11.13	11.09	11.08	11.02	10.93

802.11n(40M) 5.2G/5.3G/5.5G/5.8		Max. Rated Avg. Power + Max. Tolerance (dBm)	Average Power (dBm)							
CH	Frequency (MHz)		Data Rate (Mbps)							
			mcs0	mcs1	mcs2	mcs3	mcs4	mcs5	mcs6	mcs7
38	5190	10.50	10.48	10.40	10.35	10.30	10.20	10.07	10.04	10.02
46	5230	10.50	10.39	10.27	10.17	10.10	10.04	10.00	9.92	9.88
54	5270	10.50	10.49	10.37	10.32	10.28	10.17	10.16	10.12	10.03
62	5310	10.50	10.48	10.36	10.29	10.18	10.11	10.09	9.97	9.92
102	5510	10.50	10.38	10.31	10.27	10.22	10.16	10.09	10.03	9.96
110	5550	10.50	10.49	10.47	10.41	10.39	10.38	10.37	10.23	10.12
118	5590	10.50	10.49	10.42	10.29	10.26	10.21	10.18	10.13	10.05
134	5670	10.50	10.42	10.32	10.26	10.14	10.10	10.04	9.92	9.84
151	5755	10.50	10.44	10.44	10.31	10.28	10.24	10.12	10.05	9.95
159	5795	10.50	10.49	10.43	10.33	10.19	10.11	9.97	9.96	9.83

#. Bluetooth conducted power table:

Frequency (MHz)	Avg (dBm)		
	1M	2M	3M
2402	5.24	3.8	3.81
2441	5.66	4.3	4.24
2480	3.71	2.26	2.27

Frequency (MHz)	Avg (dBm)
	BT4.0
2402	-8.73
2442	-8.02
2480	-8.72

1.4 Test Environment

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

1.5 Operation Description

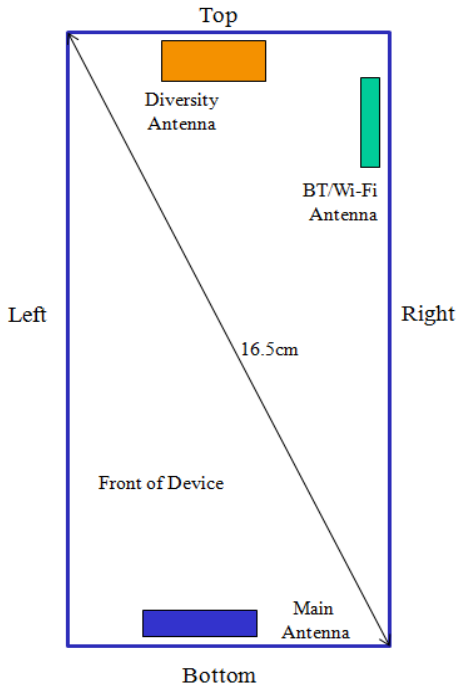
General:

1. The EUT is controlled by using a Radio Communication Tester (R&S CMU200), and 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 speech mode SAR (with headset) by separating the EUT and the phantom **15mm** distance when performing GSM850, GSM1900, WCDMA Band II and WCDMA Band V. (Both front side & back side)
   Testing body-worn SAR by separating the EUT and the phantom **15mm** distance when performing WiFi 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 941225 D06v01** (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.

For WiFi 2.4G (15mm separation): the testing device support mobile hotspot function, the separation distance is **10mm (No need to perform SAR testing with Body worn accessory (15mm separation distance) due to the hotspot mode(10mm separation distance) is more conservative than Body worn accessory mode.).**

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. (WWAN antenna to edge distance >25mm_ No SAR measurement is necessary for this configuration)
(6) Left side. (WLAN antenna to edge distance >25mm_ No SAR measurement is necessary for this configuration)



7. According to **KDB447498 D01v05** – 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 = 5.66 dBm)**
   When SAR evaluation is not required to be measured, per FCC KDB447498 D01v05, 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	5.66	15	0.051
Bluetooth	2441	5.66	10	0.077

Mode	Frequency (MHz)	Maximum Power (dBm)	Separation Distance (Body) (mm)	Estimated SAR 10g (Hand) (W/kg)
WiFi b	2412	17.97	5	1.038
Bluetooth	2441	5.66	5	0.061

8. According to **KDB248227 D01v01**-SAR is not required for 802.11 g/HT20/HT40 channels when the maximum average output power is higher than that measured on the corresponding 802.11b channels but increase less than 1/4 dB.
9. According to FCC KDB248227 and October 10, 2012 TCB Workshop, SAR is not required for 802.11 n(20M)/n(40M) channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11a channels.

10. Using **KDB941225 D01v02** to exclude SAR test requirements for HSPA modes due to the maximum average output power of HSPA active is higher than that measured without HSPA using 12.2kbps RMC but increase less than 1/4 dB.
11. Per **KDB 648474 D04v01**, the device is considered a "phablet' since its overall diagonal distance is greater than 160mm. Therefore hand SAR tests are required when 1g hotspot SAR scaled up to the maximum output power tolerances is >1.2W/kg. Hand SAR test distance is 0mm.
    Response to Inquiry to FCC (Tracking Number 601846):
    As stated in FCC KDB Publication 648474, "When hotspot mode applies, 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg; however, when power reduction applies to hotspot mode the measured SAR must be scaled to the maximum output power, including tolerance, allowed for phablet modes to compare with the 1.2 W/kg SAR test reduction threshold." Hence, if employing power reduction, you should scale to the maximum output power including tolerance for comparison. If the 1-g reported SAR > 1.2 W/kg; then 10-g extremity SAR is required. **If the device has power reduction in hotspot mode and 10-g extremity SAR is required, the power reduction should be used during those SAR tests.** After completing the tests, scaling for reported SAR and simultaneous transmission considerations may be necessary

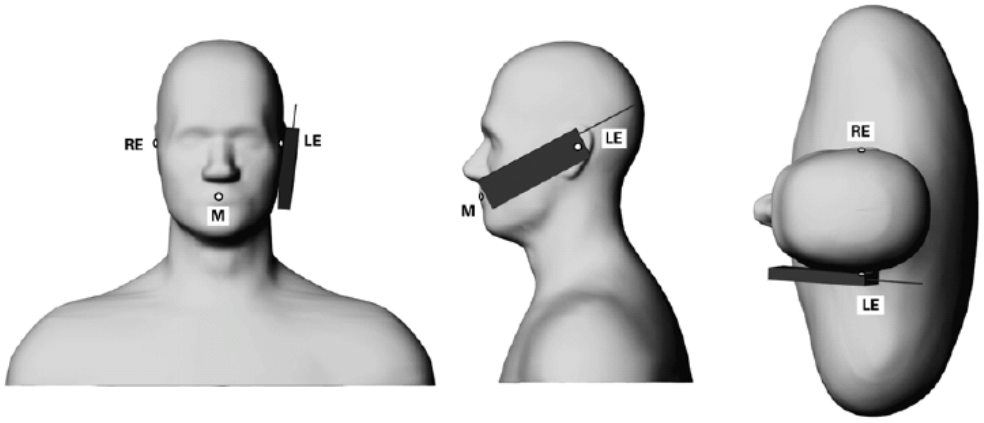
Additional configuration (Head):

12. For highest SAR configuration in this band repeated with external Memory card inside.

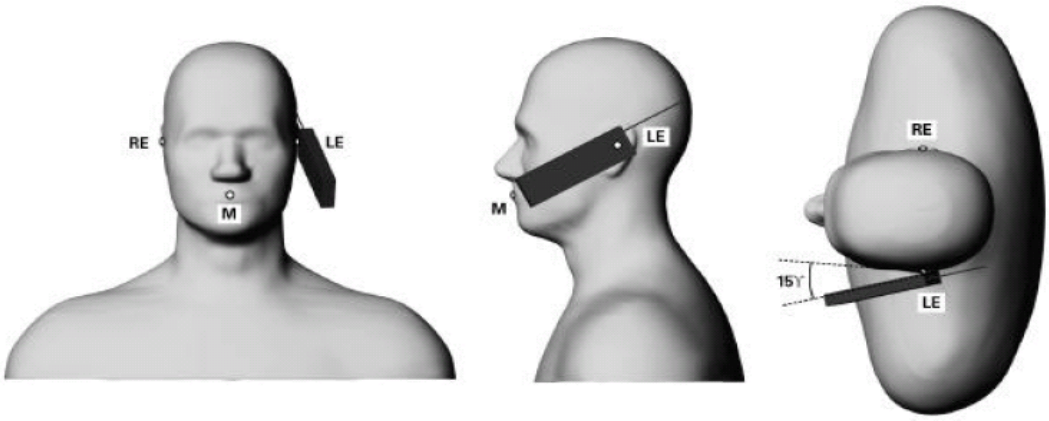
Additional configuration (Body):

13. For highest SAR configuration in this band repeated with external Memory card inside.
14. For highest SAR configuration in this band repeated with Headset (MH410C).

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.

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.

- 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.

- 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.

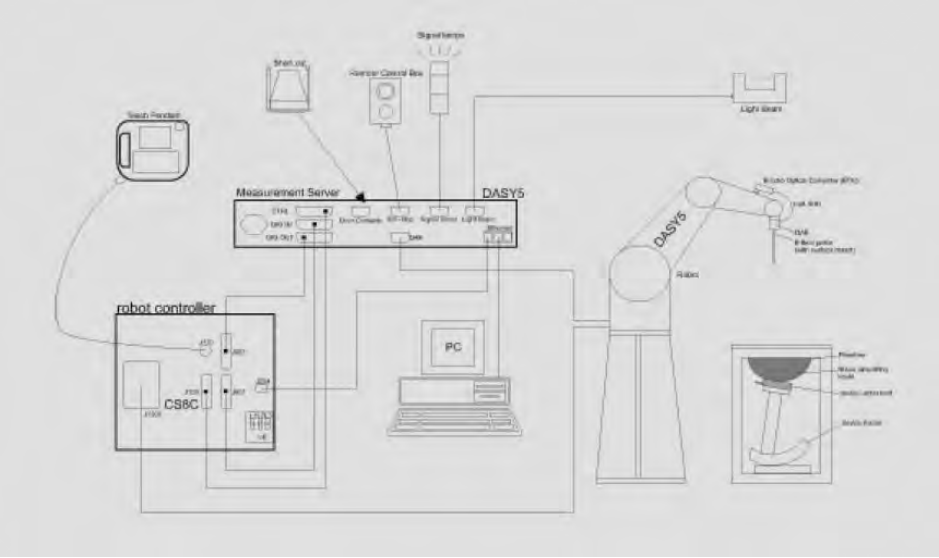


Fig. a A block diagram of the SAR measurement system

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.
- 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 Windows7
- 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.

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 HSL835/1900/2450/5200/5300/5600/5800MHz 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%.	

SAM PHANTOM V4.0C

Construction:	The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-200X, CENELEC 50361 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

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 850/1900/2450/5200/5300/5600/5800 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.

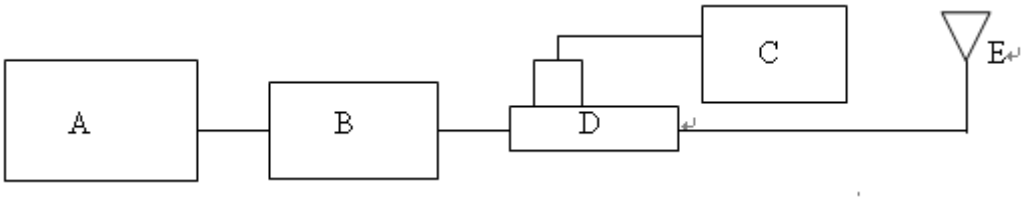


Fig. b The block diagram of system verification

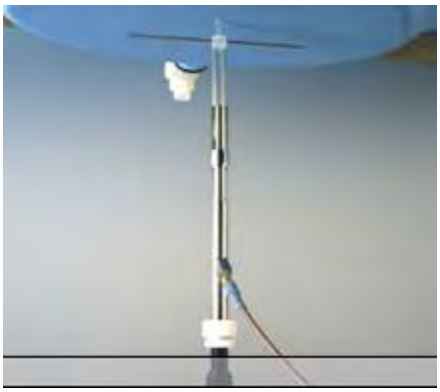
A. Signal Generator

B. Amplifier

C. Power Sensor

D. Dual Directional Coupling

E. Reference Dipole Antenna



Photograph of the Dipole Antenna

Validation Kit	S/N	Frequency (MHz)		Target SAR (1g) (Pin=250mW) (mW/g)	Measured SAR (1g)(mW/g)	Deviation (%)	Measured Date
D835V2	4d156	835	Head	2.48	2.51	-1.21%	Feb 24,2014
			Body	2.46	2.49	-1.22%	Feb 25,2014
D1900V2	5d173	1900	Head	9.82	10	-1.83%	Feb 24,2014
			Body	10.1	10.1	0.00%	Feb 26,2014
D2450V2	912	2450	Head	13.5	13.9	-2.96%	Feb 27,2014
			Body	13.2	13.3	-0.76%	Feb 28,2014
D5GHzV2	1104	5200	Head	8.27	8.13	1.69%	Feb 27,2014
			Body	7.64	7.49	1.96%	Feb 28,2014
D5GHzV2	1104	5300	Head	8.51	8.47	0.47%	Feb 27,2014
			Body	7.77	7.71	0.77%	Feb 28,2014
D5GHzV2	1104	5600	Head	8.62	8.52	1.16%	Feb 27,2014
			Body	8.25	8.26	-0.12%	Feb 28,2014
D5GHzV2	1104	5800	Head	8.09	7.98	1.36%	Feb 27,2014
			Body	7.6	7.56	0.53%	Feb 28,2014

Table 1. System validation (follow manufacture target value)

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)

Measured Frequency (MHz)	Tissue Type	Target Dielectric Constant, εr	Target Conductivity, σ (S/m)	Measured Dielectric Constant, εr	Measured Conductivity, σ (S/m)	% dev εr	% dev σ	Measurement Date
824.2	Head	41.556	0.889	41.941	0.873	-0.93%	1.80%	Feb 24,2014
826.4		41.545	0.899	41.911	0.875	-0.88%	2.67%	
835		41.500	0.900	41.796	0.884	-0.71%	1.78%	
836.6		41.500	0.902	41.77	0.886	-0.65%	1.77%	
846.6		41.500	0.912	41.642	0.895	-0.34%	1.86%	
848.8		41.500	0.915	41.616	0.897	-0.28%	1.97%	
824.2	Body	55.242	0.969	53.658	0.995	2.87%	-2.68%	Feb 25,2014
826.4		55.234	0.969	53.639	0.997	2.89%	-2.89%	
835		55.200	0.970	53.571	1.006	2.95%	-3.71%	
836.6		55.195	0.972	53.555	1.008	2.97%	-3.70%	
846.6		55.164	0.984	53.476	1.019	3.06%	-3.56%	
848.8		55.158	0.987	53.459	1.021	3.08%	-3.44%	

Measured Frequency (MHz)	Tissue Type	Target Dielectric Constant, εr	Target Conductivity, σ (S/m)	Measured Dielectric Constant, εr	Measured Conductivity, σ (S/m)	% dev εr	% dev σ	Measurement Date
1850.2	Head	40.000	1.400	39.132	1.333	2.17%	4.79%	Feb 24,2014
1852.4		40.000	1.400	39.122	1.335	2.20%	4.64%	
1880		40.000	1.400	39.018	1.361	2.46%	2.79%	
1900		40.000	1.400	38.931	1.38	2.67%	1.43%	
1907.6		40.000	1.400	38.895	1.387	2.76%	0.93%	
1909.8		40.000	1.400	38.888	1.39	2.78%	0.71%	
1850.2	Body	53.300	1.520	54.237	1.477	-1.76%	2.83%	Feb 26,2014
1852.4		53.300	1.520	54.229	1.48	-1.74%	2.63%	
1880		53.300	1.520	54.15	1.511	-1.59%	0.59%	
1900		53.300	1.520	54.078	1.533	-1.46%	-0.86%	
1907.6		53.300	1.520	54.051	1.542	-1.41%	-1.45%	
1909.8		53.300	1.520	54.045	1.545	-1.40%	-1.64%	
2412	Head	39.268	1.766	39.683	1.813	-1.06%	-2.65%	Feb 27,2014
2450		39.200	1.800	39.536	1.859	-0.86%	-3.28%	
2437		39.223	1.788	39.579	1.843	-0.91%	-3.05%	
2462		39.185	1.813	39.491	1.874	-0.78%	-3.36%	
2412	Body	52.751	1.914	51.182	1.926	2.97%	-0.64%	Feb 28,2014
2437		52.717	1.938	51.129	1.963	3.01%	-1.31%	
2450		52.700	1.950	51.11	1.98	3.02%	-1.54%	
2462		52.685	1.967	51.07	1.995	3.06%	-1.42%	

Measured Frequency (MHz)	Tissue Type	Target Dielectric Constant, εr	Target Conductivity, σ (S/m)	Measured Dielectric Constant, εr	Measured Conductivity, σ (S/m)	% dev εr	% dev σ	Measurement Date
5200	Head	35.986	4.655	36.09	4.613	-0.29%	0.90%	Feb 27,2014
5240		35.940	4.696	36.089	4.664	-0.41%	0.68%	
5280		35.894	4.737	35.907	4.7	-0.04%	0.78%	
5300		35.871	4.758	35.843	4.727	0.08%	0.65%	
5320		35.849	4.778	35.813	4.764	0.10%	0.29%	
5520		35.620	4.983	35.301	4.988	0.90%	-0.10%	
5560		35.574	5.024	35.274	5.033	0.84%	-0.18%	
5600		35.529	5.065	35.159	5.077	1.04%	-0.24%	
5680		35.437	5.147	35.001	5.177	1.23%	-0.58%	
5745		35.363	5.214	34.813	5.247	1.56%	-0.63%	
5785		35.317	5.255	34.744	5.3	1.62%	-0.86%	
5800		35.300	5.270	34.718	5.311	1.65%	-0.78%	
5805		35.294	5.275	34.695	5.136	1.70%	2.64%	
5200	Body	49.014	5.299	48.421	5.169	1.21%	2.45%	Feb 28,2014
5240		48.960	5.346	48.316	5.233	1.32%	2.11%	
5280		48.906	5.393	48.207	5.292	1.43%	1.87%	
5300		48.879	5.416	48.155	5.315	1.48%	1.86%	
5320		48.851	5.439	48.09	5.531	1.56%	-1.68%	
5520		48.580	5.673	47.566	5.641	2.09%	0.56%	
5560		48.526	5.720	47.476	5.701	2.16%	0.33%	
5600		48.471	5.766	47.389	5.755	2.23%	0.19%	
5680		48.363	5.860	47.184	5.879	2.44%	-0.32%	
5745		48.275	5.936	47.016	5.972	2.61%	-0.61%	
5785		48.220	5.982	46.926	6.033	2.68%	-0.85%	
5800		48.200	6.000	46.896	6.047	2.71%	-0.78%	
5805		48.193	6.006	46.876	6.055	2.73%	-0.82%	

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)
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)

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

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.

(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.

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	
GSM (Head)	RE Cheek	-	128	824.2	33.5	32.8	17.49%	0.281	0.330	-
	RE Cheek	-	190	836.6	33.5	32.7	20.23%	0.335	0.403	-
	RE Cheek	-	251	848.8	33.5	32.6	23.03%	0.39	0.480	P.71
	RE Tilt	-	190	836.6	33.5	32.7	20.23%	0.17	0.204	-
	LE Cheek	-	190	836.6	33.5	32.7	20.23%	0.318	0.382	-
	LE Tilt	-	190	836.6	33.5	32.7	20.23%	0.176	0.212	-
GSM+GPRS DTM_3UP (Head)	RE Cheek	-	128	824.2	28	27.9	2.33%	0.317	0.324	-
	RE Cheek	-	190	836.6	28	28	0.00%	0.334	0.334	-
	RE Cheek	-	251	848.8	28	28	0.00%	0.369	0.369	-
	RE Tilt	-	190	836.6	28	28	0.00%	0.175	0.175	-
	LE Cheek	-	190	836.6	28	28	0.00%	0.311	0.311	-
	LE Tilt	-	190	836.6	28	28	0.00%	0.157	0.157	-
GSM (Body-worn speech mode)	Front side	15mm	128	824.2	33.5	32.8	17.49%	0.203	0.239	-
	Front side	15mm	190	836.6	33.5	32.7	20.23%	0.266	0.320	-
	Front side	15mm	251	848.8	33.5	32.6	23.03%	0.33	0.406	P.72
	Back side	15mm	190	836.6	33.5	32.7	20.23%	0.238	0.286	-
GSM+GPRS DTM_3UP (Body-worn speech mode)	Front side	15mm	128	824.2	28	27.9	2.33%	0.267	0.273	-
	Front side	15mm	190	836.6	28	28	0.00%	0.286	0.286	-
	Front side	15mm	251	848.8	28	28	0.00%	0.302	0.302	-
	Back side	15mm	190	836.6	28	28	0.00%	0.271	0.271	-
GPRS (Hotspot) (1Dn4UP)	Front side	10mm	128	824.2	28	27.6	9.65%	0.349	0.383	-
	Front side	10mm	190	836.6	28	27.6	9.65%	0.411	0.451	-
	Front side	10mm	251	848.8	28	27.5	12.20%	0.423	0.475	P.73
	Back side	10mm	190	836.6	28	27.6	9.65%	0.362	0.397	-
	Bottom side	10mm	190	836.6	28	27.6	9.65%	0.109	0.120	-
	Left side	10mm	190	836.6	28	27.6	9.65%	0.38	0.417	-

Using KDB941225 D03v01 and KDB941225 D04v01 to exclude SAR test requirements for EDGE modes due to the source-based time-averaged output power for EDGE mode is lower than that in the GPRS mode.

According to KDB447498 D01v05 the 1-g SAR for the highest output channel is less than 0.8 W/kg, where the transmission band corresponding to all channels is ≤ 100 MHz, testing for the other channels is not required.

GSM 1900 MHz

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max.	Measured Avg. Power	Scaling	Averaged SAR over 1g		Plot page
								Measured	Reported	
GSM (Head)	RE Cheek	-	512	1850	31	30.5	12.20%	0.16	0.180	-
	RE Cheek	-	661	1880	31	30.5	12.20%	0.155	0.174	-
	RE Cheek	-	810	1910	31	30.4	14.82%	0.149	0.171	-
	RE Tilt	-	661	1880	31	30.5	12.20%	0.033	0.037	-
	LE Cheek	-	661	1880	31	30.5	12.20%	0.077	0.086	-
	LE Tilt	-	661	1880	31	30.5	12.20%	0.048	0.054	-
GSM+GPRS DTM_3up (Head)	RE Cheek	-	512	1850	28	27.5	12.20%	0.278	0.312	P.74
	RE Cheek	-	661	1880	28	27.4	14.82%	0.223	0.256	-
	RE Cheek	-	810	1910	28	27.4	14.82%	0.215	0.247	-
	RE Tilt	-	661	1880	28	27.4	14.82%	0.04	0.046	-
	LE Cheek	-	661	1880	28	27.4	14.82%	0.111	0.127	-
	LE Tilt	-	661	1880	28	27.4	14.82%	0.065	0.075	-
GSM (Body-worn speech mode)	Front side	15mm	512	1850	31	30.5	12.20%	0.888	0.996	-
	Front side	15mm	661	1880	31	30.5	12.20%	0.758	0.850	-
	Front side	15mm	810	1910	31	30.4	14.82%	0.655	0.752	-
	Back side	15mm	661	1880	31	30.5	12.20%	0.599	0.672	-
GSM+GPRS DTM_3up (Body-worn speech mode)	Front side	15mm	512	1850	28	27.5	12.20%	0.961	1.078	P.75
	Front side	15mm	661	1880	28	27.4	14.82%	0.93	1.068	-
	Front side	15mm	810	1910	28	27.4	14.82%	0.599	0.688	-
	Front side*	15mm	512	1850	28	27.5	12.20%	0.894	1.003	-
	Back side	15mm	512	1850	28	27.5	12.20%	0.885	0.993	-
	Back side	15mm	661	1880	28	27.4	14.82%	0.803	0.922	-
	Back side	15mm	810	1910	28	27.4	14.82%	0.655	0.752	-
GPRS (Hotspot) (1Dn4UP)	Front side	10mm	661	1880	21	20.8	4.71%	0.67	0.702	-
	Back side	10mm	661	1880	21	20.8	4.71%	0.523	0.548	-
	Bottom side	10mm	512	1850	21	20.7	7.15%	1.02	1.093	-
	Bottom side	10mm	661	1880	21	20.8	4.71%	0.979	1.025	-
	Bottom side	10mm	810	1910	21	20.7	7.15%	0.768	0.823	-
	Bottom side*	10mm	512	1850	21	20.7	7.15%	1.03	1.104	P.76
	Bottom side -With Mwmory card	10mm	512	1850	21	20.7	7.15%	1.02	1.093	-
	Bottom side -With headset	10mm	512	1850	21	20.7	7.15%	0.997	1.068	-
	Left side	10mm	661	1880	21	20.8	4.71%	0.022	0.023	-

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

Using KDB941225 D03v01 and KDB941225 D04v01 to exclude SAR test requirements for

EDGE modes due to the source-based time-averaged output power for EDGE mode is lower than that in the GPRS mode.

According to KDB447498 D01v05 the 1-g SAR for the highest output channel is less than 0.8 W/kg, where the transmission band corresponding to all channels is ≤ 100 MHz, testing for the other channels is not required.

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 10g (W/kg)		Plot page
								Measured	Reported	
GPRS (Hand) (1Dn4UP)	Front side	0mm	661	1880	21	20.8	4.71%	1.12	1.173	P.78
	Back side	0mm	661	1850.2	21	20.8	4.71%	0.952	0.997	-
	Bottom side	0mm	512	1850.2	21	20.7	7.15%	0.7	0.750	-
	Bottom side	0mm	661	1880	21	20.8	4.71%	0.619	0.648	-
	Bottom side	0mm	810	1909.8	21	20.7	7.15%	0.602	0.645	-

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	-	9262	1852.4	22.5	22.42	1.86%	0.19	0.194	-
	RE Cheek	-	9400	1880	22.5	22.18	7.65%	0.186	0.200	P.79
	RE Cheek	-	9538	1907.6	22.5	22.12	9.14%	0.182	0.199	-
	RE Tilt	-	9400	1880	22.5	22.18	7.65%	0.038	0.041	-
	LE Cheek	-	9400	1880	22.5	22.18	7.65%	0.091	0.098	-
	LE Tilt	-	9400	1880	22.5	22.18	7.65%	0.062	0.067	-
R99 (Body-worn speech mode)	Front side	15mm	9262	1852.4	22.5	22.42	1.86%	1.06	1.080	-
	Front side	15mm	9400	1880	22.5	22.18	7.65%	0.986	1.061	-
	Front side	15mm	9538	1907.6	22.5	22.12	9.14%	0.852	0.930	-
	Front side*	15mm	9262	1852.4	22.5	22.42	1.86%	1.11	1.131	P.80
	Back side	15mm	9262	1852.4	22.5	22.42	1.86%	0.8	0.815	-
	Back side	15mm	9400	1880	22.5	22.18	7.65%	0.765	0.823	-
	Back side	15mm	9538	1907.6	22.5	22.12	9.14%	0.731	0.798	-
R99 (Hotspot)	Front side	10mm	9400	1880	18	17.60	9.65%	0.684	0.750	-
	Back side	10mm	9400	1880	18	17.60	9.65%	0.5	0.548	-
	Bottom side	10mm	9262	1852.4	18	17.46	13.24%	0.962	1.089	P.81
	Bottom side	10mm	9400	1880	18	17.60	9.65%	0.94	1.031	-
	Bottom side	10mm	9538	1907.6	18	17.58	10.15%	0.927	1.021	-
	Bottom	10mm	9262	1852.4	18	17.46	13.24%	0.959	1.086	-
	Left side	10mm	9400	1880	18	17.60	9.65%	0.028	0.031	-

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

Using KDB941225 D01v02 to exclude SAR test requirements for HSPA modes due to the maximum average output power of HSPA active is higher than that measured without HSPA using 12.2kbps RMC but increase less than 1/4 dB.

According to KDB447498 D01v05 the 1-g SAR for the highest output channel is less than 0.8 W/kg, where the transmission band corresponding to all channels is ≤ 100 MHz, testing for the other channels is not required.

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 10g (W/kg)		Plot page
								Measured	Reported	
R99 (Hand)	Front side	0mm	9400	1880	18	17.6	9.65%	1.26	1.382	P.82
	Back side	0mm	9400	1880	18	17.6	9.65%	0.806	0.884	-
	Bottom side	0mm	9262	1852.4	18	17.46	13.24%	0.884	1.001	-
	Bottom side	0mm	9400	1880	18	17.6	9.65%	0.899	0.986	-
	Bottom side	0mm	9538	1907.6	18	17.58	10.15%	0.86	0.947	-

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	23.92	14.29%	0.349	0.399	-
	RE Cheek	-	4183	836.6	24.5	23.99	12.46%	0.398	0.448	-
	RE Cheek	-	4233	846.6	24.5	24.00	12.20%	0.381	0.427	-
	RE Cheek -With Mwmory card	-	4183	836.6	24.5	23.99	12.46%	0.402	0.452	P.83
	RE Tilt	-	4183	836.6	24.5	23.99	12.46%	0.212	0.238	-
	LE Cheek	-	4183	836.6	24.5	23.99	12.46%	0.358	0.403	-
	LE Tilt	-	4183	836.6	24.5	23.99	12.46%	0.186	0.209	-
R99 (Body-worn speech mode)	Front side	15mm	4132	826.4	24.5	23.92	14.29%	0.26	0.297	-
	Front side	15mm	4183	836.6	24.5	23.99	12.46%	0.313	0.352	-
	Front side	15mm	4233	846.6	24.5	24.00	12.20%	0.314	0.352	P.84
	Back side	15mm	4183	836.6	24.5	23.99	12.46%	0.302	0.340	-
R99 (Hotspot)	Front side	10mm	4132	826.4	24.5	23.92	14.29%	0.388	0.443	-
	Front side	10mm	4183	836.6	24.5	23.99	12.46%	0.439	0.494	P.85
	Front side	10mm	4233	846.6	24.5	24.00	12.20%	0.43	0.482	-
	Back side	10mm	4183	836.6	24.5	23.99	12.46%	0.374	0.421	-
	Bottom side	10mm	4183	836.6	24.5	23.99	12.46%	0.13	0.146	-
	Left side	10mm	4183	836.6	24.5	23.99	12.46%	0.388	0.436	-

Using KDB941225 D01v02 to exclude SAR test requirements for HSPA modes due to the maximum average output power of HSPA active is higher than that measured without HSPA using 12.2kbps RMC but increase less than 1/4 dB.

According to KDB447498 D01v05 the 1-g SAR for the highest output channel is less than 0.8 W/kg, where the transmission band corresponding to all channels is ≤ 100 MHz, testing for the other channels is not required.

WLAN802.11 b

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	-	1	2412	18	17.97	0.69%	0.043	0.043	-
	RE Tilt	-	1	2412	18	17.97	0.69%	0.034	0.034	-
	LE Cheek	-	1	2412	18	17.97	0.69%	0.121	0.122	-
	LE Cheek	-	6	2437	18	17.95	1.16%	0.032	0.032	-
	LE Cheek	-	11	2462	18	17.94	1.39%	0.014	0.014	-
	LE Cheek -with Memory card	-	1	2412	18	17.97	0.69%	0.168	0.169	P.86
	LE Tilt	-	1	2412	18	17.95	1.16%	0.074	0.075	-
Hotspot	Front side	10mm	1	2412	18	17.97	0.69%	0.045	0.045	-
	Back side	10mm	1	2412	18	17.97	0.69%	0.102	0.103	P.87
	Back side	10mm	6	2437	18	17.95	1.16%	0.029	0.029	-
	Back side	10mm	11	2462	18	17.94	1.39%	0.018	0.018	-
	Top side	10mm	1	2412	18	17.97	0.69%	0.028	0.028	-
	Right side	10mm	1	2412	18	17.97	0.69%	0.069	0.069	-

Using KDB248227 D01v01-SAR is not required for 802.11 g/HT20 channels when the maximum average output power is higher than that measured on the corresponding 802.11b channels but increase less than 1/4 dB.

According to KDB447498 D01v05 the 1-g SAR for the highest output channel is less than 0.8 W/kg, where the transmission band corresponding to all channels is ≤ 100 MHz, testing for the other channels is not required.

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	13.99	0.23%	0.00533	0.005	-
	RE Tilt	-	48	5240	14	13.99	0.23%	0.00007	0.00007	-
	LE Cheek	-	40	5200	14	13.81	4.47%	0.011	0.011	-
	LE Cheek	-	48	5240	14	13.99	0.23%	0.021	0.021	P.88
	LE Tilt	-	48	5240	14	13.99	0.23%	0.00516	0.005	-
Body Worn	Front side	15mm	48	5240	14	13.99	0.23%	0.00000838	0.000008	-
	Back side	15mm	40	5200	14	13.81	4.47%	0.00792	0.008	-
	Back side	15mm	48	5240	14	13.99	0.23%	0.00882	0.009	P.89

As per KDB248227 D01v01, when SAR at default channel where maximum power occurs is less than 0.8W/kg, SAR tests on other default channel is option.

As per KDB248227 D01v01, when the maximum average output channel in each frequency band is not include in the "default test channels", the maximum channel should be tested instead of an adjacent "default test channels".

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	-	64	5320	14	13.99	0.23%	0.0000263	0.00003	-
	RE Tilt	-	64	5320	14	13.99	0.23%	0.00000126	0.000001	-
	LE Cheek	-	56	5280	14	13.99	0.23%	0.013	0.013	-
	LE Cheek	-	64	5320	14	13.99	0.23%	0.018	0.018	P.90
	LE Tilt	-	64	5320	14	13.99	0.23%	0.00618	0.006	-
Body Worn	Front side	15mm	64	5320	14	13.99	0.23%	0.00000667	0.000007	-
	Back side	15mm	56	5280	14	13.99	0.23%	0.013	0.013	-
	Back side	15mm	64	5320	14	13.99	0.23%	0.014	0.014	P.91

As per KDB248227 D01v01, when SAR at default channel where maximum power occurs is less than 0.8W/kg, SAR tests on other default channel is option.

As per KDB248227 D01v01, when the maximum average output channel in each frequency band is not include in the "default test channels", the maximum channel should be tested instead of an adjacent "default test channels".

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	-	104	5520	14	13.99	0.23%	0.026	0.026	-
	RE Tilt	-	104	5520	14	13.99	0.23%	0.00955	0.010	-
	RE Cheek	-	104	5520	14	13.99	0.23%	0.048	0.048	-
	LE Cheek	-	112	5560	14	13.98	0.46%	0.069	0.069	-
	LE Cheek	-	136	5680	14	13.98	0.46%	0.09	0.090	P.92
	LE Tilt	-	104	5520	14	13.99	0.23%	0.013	0.013	-
Body Worn	Front side	-	104	5520	14	13.99	0.23%	0.015	0.015	-
	Back side	-	104	5520	14	13.99	0.23%	0.199	0.199	-
	Back side	-	112	5560	14	13.98	0.46%	0.356	0.358	-
	Back side	-	136	5680	14	13.98	0.46%	0.747	0.750	-
	Back side -with Memory card	-	136	5680	14	13.98	0.46%	0.842	0.846	-
	Back side -with Memory card*	-	136	5680	14	13.98	0.46%	0.843	0.847	P.93
	Back side -with headset	-	136	5680	14	13.98	0.46%	0.743	0.746	-

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

As per KDB248227 D01v01, when SAR at default channel where maximum power occurs is less than 0.4W/kg, SAR tests on other default channel is option.

As per KDB248227 D01v01, when the maximum average output channel in each frequency band is not include in the "default test channels", the maximum channel should be tested instead of an adjacent "default test channels".

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	13.99	0.23%	0.0031	0.003	-
	RE Tilt	-	157	5785	14	13.99	0.23%	0.01	0.010	-
	LE Cheek	-	149	5745	14	13.98	0.46%	0.023	0.023	P.94
	LE Cheek	-	157	5785	14	13.99	0.23%	0.016	0.016	-
	LE Cheek	-	161	5805	14	13.97	0.69%	0.014	0.014	-
	LE Tilt	-	157	5785	14	13.99	0.23%	0.00505	0.005	-
Body worn	Front side	15mm	157	5785	14	13.99	0.23%	0.00253	0.003	-
	Back side	15mm	149	5785	14	13.99	0.23%	0.236	0.237	P.95
	Back side	15mm	157	5745	14	13.98	0.46%	0.107	0.107	-
	Back side	15mm	161	5785	14	13.97	0.69%	0.117	0.118	-

As per KDB248227 D01v01, when SAR at default channel where maximum power occurs is less than 0.8W/kg, SAR tests on other default channel is option.

As per KDB248227 D01v01, when the maximum average output channel in each frequency band is not include in the "default test channels", the maximum channel should be tested instead of an adjacent "default test channels".

3. Simultaneous Tramsmission Analysis

Simultaneous Tramsmission Scenarios:

Simultaneous Transmit Configurations	Head	Body-Worn	Hot Spot	Hand
GSM850/1900 Voice + 2.4GHz Wi-Fi	Yes	No	No	No
UMTS B2/B5 Voice + 2.4GHz Wi-Fi	Yes	No	No	No
GSM850/1900 Voice + 5GHz Wi-Fi	Yes	Yes	No	No
UMTS B2/B5 Voice + 5GHz Wi-Fi	Yes	Yes	No	No
GPRS850/1900 Data + 2.4GHz Wi-Fi	No	No	Yes	Yes
UMTS B2/B5 Data + 2.4GHz Wi-Fi	No	No	Yes	Yes
GSM850/1900 Voice + 2.4GHz Bluetooth	No	Yes	No	No
GPRS850/1900 Data + 2.4GHz Bluetooth	No	No	Yes	Yes
UMTS B2/B5 Data + 2.4GHz Bluetooth	No	Yes	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

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	Right cheek	0.48	0.043	0.523	-	-
		Right tilt	0.204	0.034	0.238	-	-
		Left cheek	0.382	0.169	0.551	-	-
		Left tilt	0.212	0.075	0.287	-	-
GPRS 850 (1Dn4UP)	Hotspot	Front	0.475	0.045	0.520	-	-
		Back	0.397	0.103	0.500	-	-
		Top	-	0.028	-	-	-
		Bottom	0.12	-	-	-	-
		Right	-	0.069	-	-	-
		Left	0.417	-	-	-	-
GSM 1900	Head	Right cheek	0.312	0.043	0.355	-	-
		Right tilt	0.046	0.034	0.080	-	-
		Left cheek	0.127	0.169	0.296	-	-
		Left tilt	0.075	0.075	0.150	-	-
GPRS 1900 (1Dn4UP)	Hotspot	Front	0.702	0.045	0.747	-	-
		Back	0.548	0.103	0.651	-	-
		Top	-	0.028	-	-	-
		Bottom	1.104	-	-	-	-
		Right	-	0.069	-	-	-
		Left	0.023	-	-	-	-

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	Right cheek	0.2	0.043	0.243	-	-
		Right tilt	0.041	0.034	0.075	-	-
		Left cheek	0.098	0.169	0.267	-	-
		Left tilt	0.067	0.075	0.142	-	-
	Hotspot	Front	0.75	0.045	0.795	-	-
		Back	0.548	0.103	0.651	-	-
		Top	-	0.028	-	-	-
		Bottom	1.089	-	-	-	-
		Right	-	0.069	-	-	-
		Left	0.031	-	-	-	-
WCDMA Band V	Head	Right cheek	0.452	0.043	0.495	-	-
		Right tilt	0.238	0.034	0.272	-	-
		Left cheek	0.403	0.169	0.572	-	-
		Left tilt	0.209	0.075	0.284	-	-
	Hotspot	Front	0.494	0.045	0.539	-	-
		Back	0.421	0.103	0.524	-	-
		Top	-	0.028	-	-	-
		Bottom	0.146	-	-	-	-
		Right	-	0.069	-	-	-
		Left	0.436	-	-	-	-

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	0.48	0.003	0.483	-	-
		RE tilt	0.204	0.01	0.214	-	-
		LE cheek	0.382	0.023	0.405	-	-
		LE tilt	0.212	0.005	0.217	-	-
	Body-Worn	Front	0.406	0.003	0.409	-	-
		Back	0.286	0.237	0.523	-	-
GSM 1900	Head	RE cheek	0.312	0.003	0.315	-	-
		RE tilt	0.046	0.01	0.056	-	-
		LE cheek	0.127	0.023	0.15	-	-
		LE tilt	0.075	0.005	0.08	-	-
	Body-Worn	Front	1.078	0.003	1.081	-	-
		Back	0.993	0.237	1.23	-	-
WCDMA Band II	Head	RE cheek	0.2	0.003	0.203	-	-
		RE tilt	0.041	0.01	0.051	-	-
		LE cheek	0.098	0.023	0.121	-	-
		LE tilt	0.067	0.005	0.072	-	-
	Body-Worn	Front	1.131	0.003	1.134	-	-
		Back	0.823	0.237	1.06	-	-
WCDMA Band V	Head	RE cheek	0.452	0.003	0.455	-	-
		RE tilt	0.238	0.01	0.248	-	-
		LE cheek	0.403	0.023	0.426	-	-
		LE tilt	0.209	0.005	0.214	-	-
	Body-Worn	Front	0.352	0.003	0.355	-	-
		Back	0.34	0.237	0.577	-	-

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	0.48	0.026	0.506	-	-
		RE tilt	0.204	0.01	0.214	-	-
		LE cheek	0.382	0.09	0.472	-	-
		LE tilt	0.212	0.013	0.225	-	-
	Body-Worn	Front	0.406	0.015	0.421	-	-
		Back	0.286	0.847	1.133	-	-
GSM 1900	Head	RE cheek	0.312	0.026	0.338	-	-
		RE tilt	0.046	0.01	0.056	-	-
		LE cheek	0.127	0.09	0.217	-	-
		LE tilt	0.075	0.013	0.088	-	-
	Body-Worn	Front	1.078	0.015	1.093	-	-
		Back	0.993	0.847	**1.84**	137.3	0.018
WCDMA Band II	Head	RE cheek	0.2	0.026	0.226	-	-
		RE tilt	0.041	0.01	0.051	-	-
		LE cheek	0.098	0.09	0.188	-	-
		LE tilt	0.067	0.013	0.08	-	-
	Body-Worn	Front	1.131	0.015	1.146	-	-
		Back	0.823	0.847	**1.67**	134.4	0.016
WCDMA Band V	Head	RE cheek	0.452	0.026	0.478	-	-
		RE tilt	0.238	0.01	0.248	-	-
		LE cheek	0.403	0.09	0.493	-	-
		LE tilt	0.209	0.013	0.222	-	-
	Body-Worn	Front	0.352	0.015	0.367	-	-
		Back	0.34	0.847	1.187	-	-

Note:
We calculate the peak location separation ratio of simultaneous transmitting antenna pair, the SPLSR value is less than 0.04. According to KDB447498 D01v05 simultaneous transmission SAR evaluation is not required.

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	0.406	0.051	0.457	-	-
		Back	0.286	0.051	0.337	-	-
GPRS 850 (1Dn4UP)	Hotspot	Front	0.475	0.077	0.552	-	-
		Back	0.397	0.077	0.474	-	-
		Top	-	0.077	-	-	-
		Bottom	0.12	-	-	-	-
		Right	-	0.077	-	-	-
		Left	0.417	-	-	-	-
GSM 1900	Body-Worn	Front	1.078	0.051	1.129	-	-
		Back	0.993	0.051	1.044	-	-
GPRS 1900 (1Dn4UP)	Hotspot	Front	0.702	0.077	0.779	-	-
		Back	0.523	0.077	0.6	-	-
		Top	-	0.077	-	-	-
		Bottom	1.104	-	-	-	-
		Right	-	0.077	-	-	-
		Left	0.022	-	-	-	-
WCDMA Band II	Body-Worn	Front	1.131	0.051	1.182	-	-
		Back	0.823	0.051	0.874	-	-
	Hotspot	Front	0.75	0.077	0.827	-	-
		Back	0.548	0.077	0.625	-	-
		Top	-	0.077	-	-	-
		Bottom	1.089	-	-	-	-
		Right	-	0.077	-	-	-
		Left	0.031	-	-	-	-
WCDMA Band V	Body-Worn	Front	0.352	0.051	0.403	-	-
		Back	0.34	0.051	0.391	-	-
	Hotspot	Front	0.494	0.077	0.571	-	-
		Back	0.421	0.077	0.498	-	-
		Top	-	0.077	-	-	-
		Bottom	0.146	-	-	-	-
		Right	-	0.077	-	-	-
		Left	0.436	-	-	-	-

reported SAR WWAN and WLAN DTS 2.4GHz, ΣSAR(10g) evaluation					
Frequency band	Position		reported SAR / W/kg		ΣSAR(10g)
			WWAN	WLAN	<4W/kg
GPRS 1900 (1Dn4UP)	Hand	Front	1.173	1.038	2.211
		Back	0.997	1.038	2.035
		Top	-	1.038	-
		Bottom	0.75	-	-
		Right	-	1.038	-
		Left	-	-	-
WCDMA Band II	Hand	Front	1.382	1.038	2.42
		Back	0.884	1.038	1.922
		Top	-	1.038	-
		Bottom	1.001	-	-
		Right	-	1.038	-
		Left	-	-	-

reported SAR WWAN and Bluetooth, ΣSAR(10g) evaluation					
Frequency band	Position		reported SAR / W/kg		ΣSAR(10g)
			WWAN	Bluetooth	<4W/kg
GPRS 1900 (1Dn4UP)	Hand	Front	1.173	0.061	1.234
		Back	0.997	0.061	1.058
		Top	-	0.061	-
		Bottom	0.75	-	-
		Right	-	0.061	-
		Left	-	-	-
WCDMA Band II	Hand	Front	1.382	0.061	1.443
		Back	0.884	0.061	0.945
		Top	-	0.061	-
		Bottom	1.001	-	-
		Right	-	0.061	-
		Left	-	-	-

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	3770	Apr.30,2013	Apr.29,2014
835/1900/2450/5200 /5G System Validation Dipole	Schmid & Partner Engineering AG	D835V2	4d156	Jun.06,2013	Jun.05,2014
		D1900V2	5d173	Jun.10,2013	Jun.09,2014
		D2450V2	912	Jun.07,2013	Jun.06,2014
		D5GHzV2	1104	May.07,2013	May.06,2014
Data acquisition Electronics	Schmid & Partner Engineering AG	DAE4	856	May.23,2013	May.22,2014
Software	Schmid & Partner Engineering AG	DASY 52 V52.8.7	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	MY46108212	Apr.01,2013	Mar.31,2014
Dielectric Probe Kit	Agilent	85070E	MY44300677	Calibration not required	Calibration not required
Dual-directional coupler	Agilent	772D	MY46151242	Jul.04,2013	Jul.03,2014
		778D	MY48220468	Mar.29,2013	Mar.28,2014
RF Signal Generator	Agilent	N5181A	MY50141235	Dec.14,2013	Dec.13,2016
Power Meter	Agilent	E4417A	MY51410006	Oct.25,2013	Oct.24,2015
Power Sensor	Agilent	E9301H	MY51470001	Dec.16,2013	Dec.15,2014
Radio Communication Test	R&S	CMU200	113505	May.14,2013	May.13,2014
TECPEL	Digital thermometer	DTM-303A	TP130074	Mar.20,2014	Mar.19,2015

Device	Manufacturer	Type	Serial number	Date of last calibration	Date of next calibration
Power Meter	Anritsu	ML2487A	6K00003260	May 30,2013	May 29,2014
Power Meter	Anritsu	ML2495A	1005007	Jan.13,2014	Jan.12,2015
Power Sensor	Anritsu	MA2490A	32910	May 30,2013	May 29,2014
Power Sensor	Anritsu	MA2411B	917032	Jan.13,2014	Jan.12,2015
Spectrum Analyzer	Agilent	E4446A	MY51100003	May 30,2013	May 29,2014
Spectrum Analyzer	Agilent	E4440A	MY45304525	Mar.05,2014	Mar.04,2015

5. Measurements

Date: 2/24/2014

GSM 850_Head_RE Cheek_CH 251

Communication System: GSM ; Frequency: 848.8 MHz

Medium parameters used: f = 849 MHz; σ = 0.897 S/m; ε_r = 41.616; ρ = 1000 kg/m^3

Phantom section: Right Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(9.83, 9.83, 9.83); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2; Type: SAM;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/RE Cheek/Area Scan (71x131x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.444 W/kg

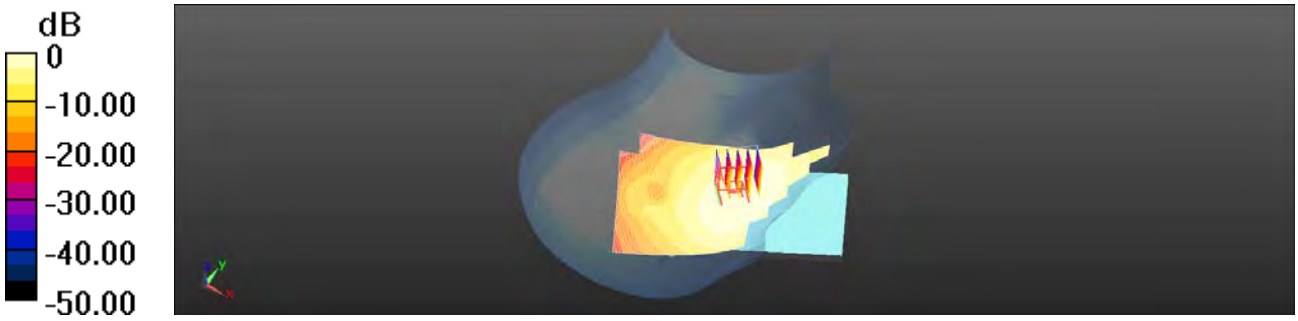
Configuration/RE Cheek/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.972 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 0.491 W/kg

SAR(1 g) = 0.390 W/kg; SAR(10 g) = 0.300 W/kg

Maximum value of SAR (measured) = 0.443 W/kg



0 dB = 0.444 W/kg = -3.52 dBW/kg

Date: 2/25/2014

GPRS 850_Speech mode_Front side_CH 251

Communication System: GSM ; Frequency: 848.8 MHz

Medium parameters used: f = 849 MHz; σ = 1.021 S/m; ε_r = 53.459; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(9.62, 9.62, 9.62); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2; Type: SAM;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/Speech mode/Area Scan (71x131x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.398 W/kg

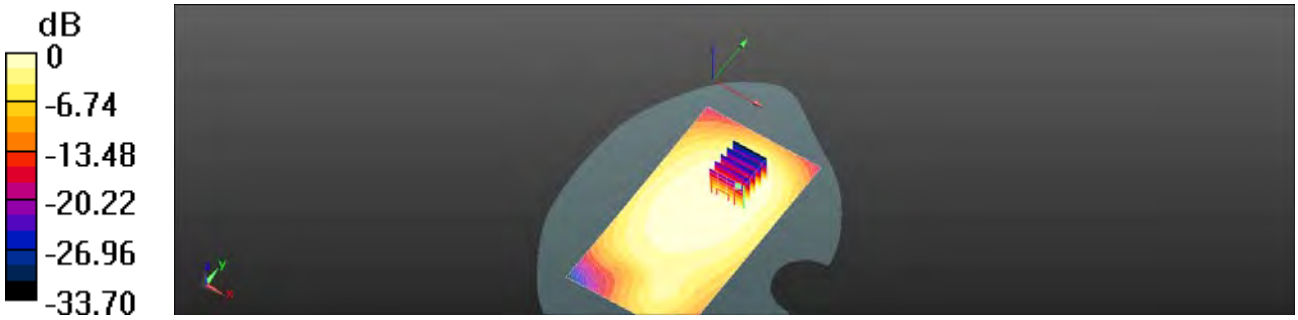
Configuration/Speech mode/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 18.451 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 0.466 W/kg

SAR(1 g) = 0.330 W/kg; SAR(10 g) = 0.239 W/kg

Maximum value of SAR (measured) = 0.391 W/kg



0 dB = 0.398 W/kg = -4.00 dBW/kg

Date: 2/25/2014

GPRS 850_Hotspot_Front side_CH 251

Communication System: GPRS(1Dn4UP); Frequency: 848.8 MHz

Medium parameters used: f = 849 MHz; σ = 1.021 S/m; ε_r = 53.459; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(9.62, 9.62, 9.62); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2; Type: SAM;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/Hotspot/Area Scan (71x131x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.562 W/kg

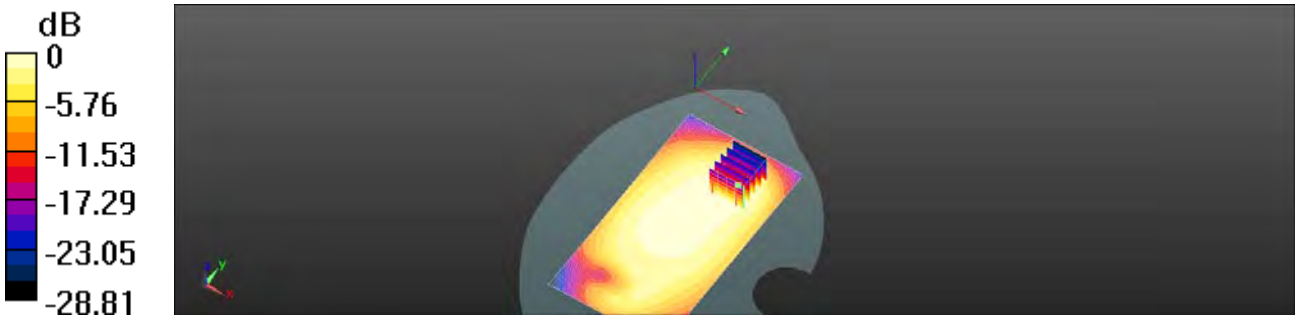
Configuration/Hotspot/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 20.800 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 0.686 W/kg

SAR(1 g) = 0.423 W/kg; SAR(10 g) = 0.276 W/kg

Maximum value of SAR (measured) = 0.557 W/kg



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

Date: 2/24/2014

GSM 1900_Head_RE Cheek_CH 512_DTM

Communication System: GSM ; Frequency: 1850.2 MHz

Medium parameters used: f = 1850.2 MHz; σ = 1.333 S/m; ε_r = 39.132; ρ = 1000 kg/m^3

Phantom section: Right Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.98, 7.98, 7.98); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2; Type: SAM;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/RE Cheek/Area Scan (71x131x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.389 W/kg

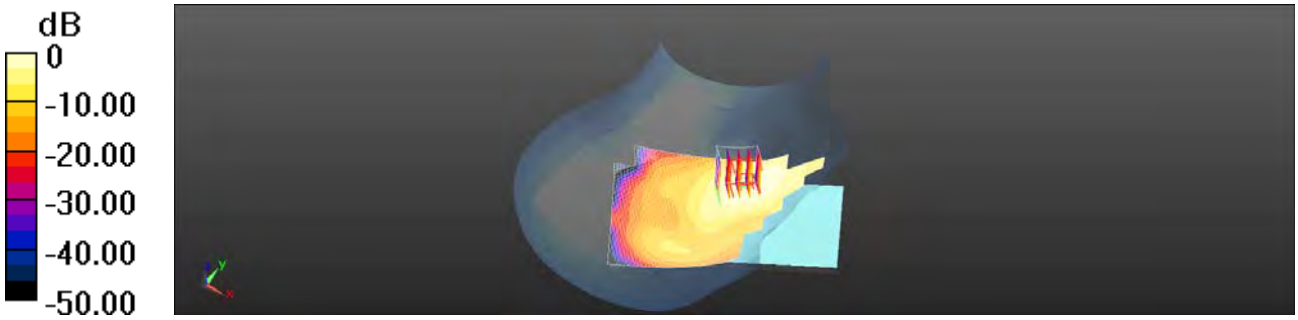
Configuration/RE Cheek/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 3.107 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.430 W/kg

SAR(1 g) = 0.278 W/kg; SAR(10 g) = 0.173 W/kg

Maximum value of SAR (measured) = 0.358 W/kg



0 dB = 0.389 W/kg = -4.10 dBW/kg

Date: 2/26/2014

GSM 1900_Speech mode_Front side_CH 512_DTM

Communication System: GSM ; Frequency: 1850.2 MHz

Medium parameters used: f= 1850.2 MHz; σ = 1.477 S/m; ε_r = 54.237; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.63, 7.63, 7.63); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2; Type: SAM;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/Speech mode/Area Scan (71x131x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 1.28 W/kg

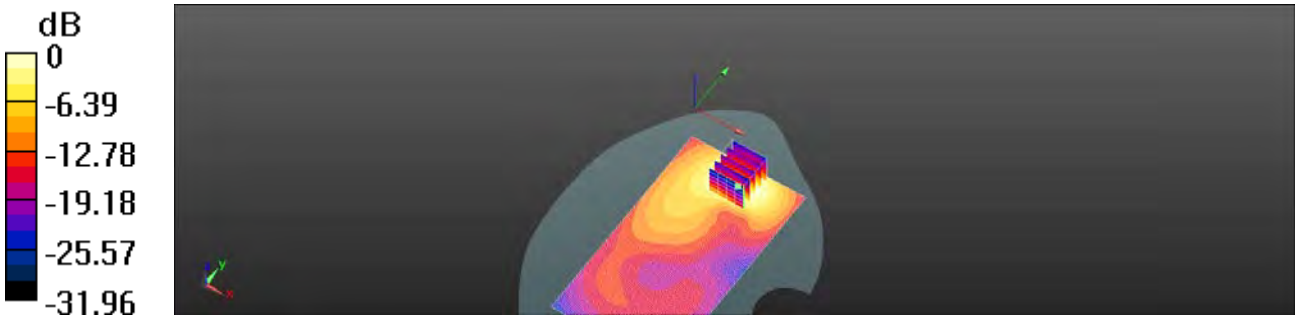
Configuration/Speech mode/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.669 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 1.58 W/kg

SAR(1 g) = 0.961 W/kg; SAR(10 g) = 0.548 W/kg

Maximum value of SAR (measured) = 1.29 W/kg



0 dB = 1.28 W/kg = 1.06 dBW/kg

Date: 2/26/2014

GPRS 1900_Hotspot_Bottom side_CH 512_repeat sar test at the highest sar measurement

Communication System: GPRS(1Dn4UP); Frequency: 1850.2 MHz

Medium parameters used: f = 1850.2 MHz; σ = 1.477 S/m; ε_r = 54.237; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.63, 7.63, 7.63); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2; Type: SAM;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/Hotspot/Area Scan (51x71x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 1.57 W/kg

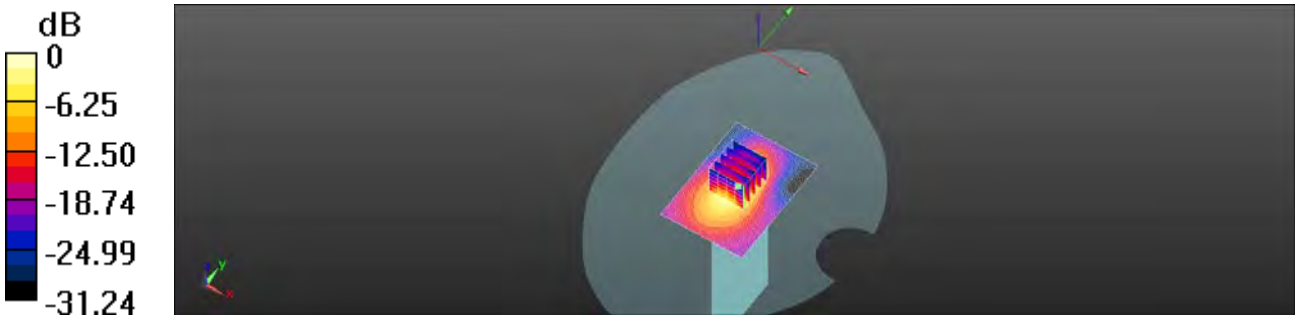
Configuration/Hotspot/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 26.163 V/m; Power Drift = 0.04 dB

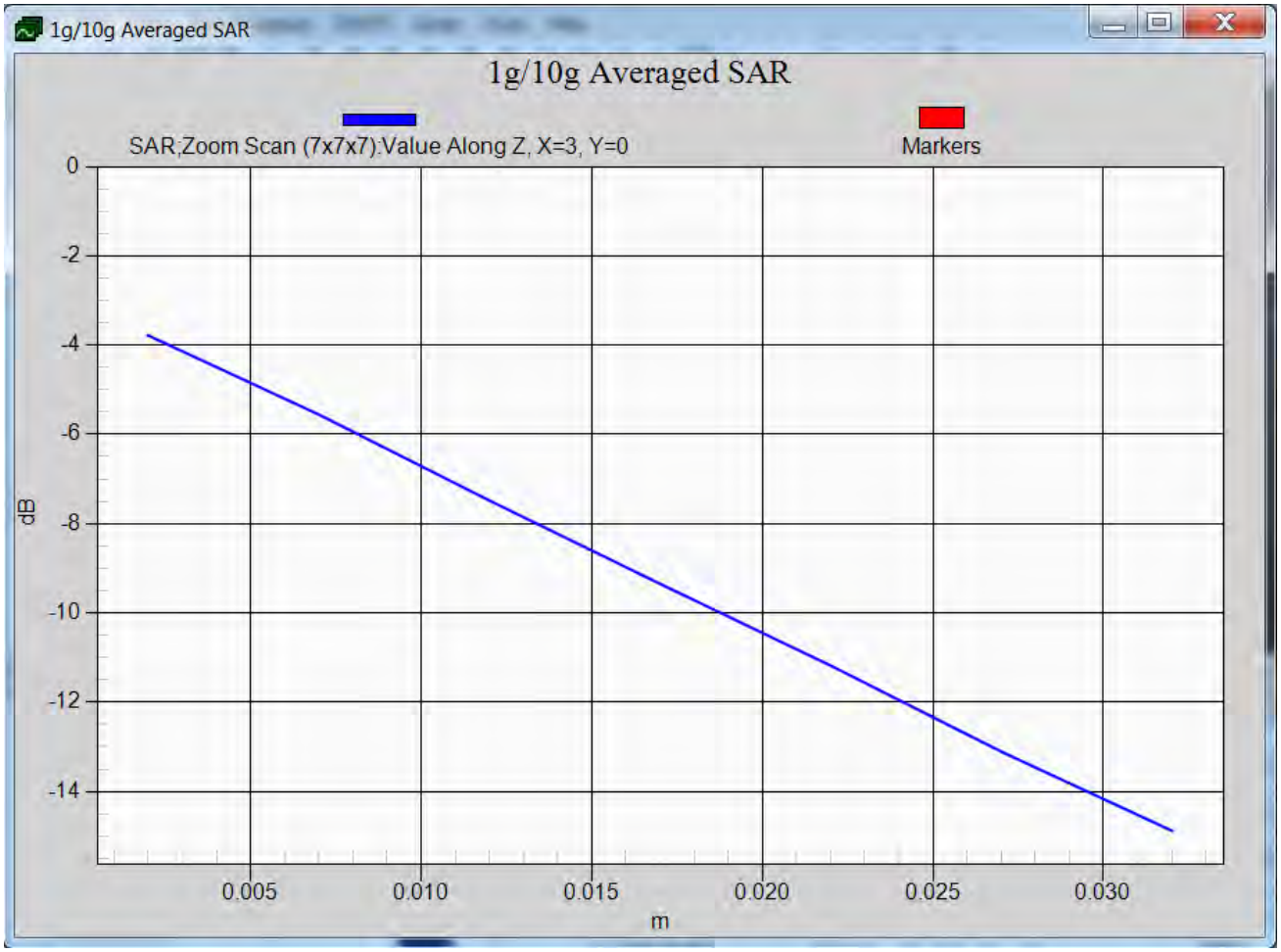
Peak SAR (extrapolated) = 1.81 W/kg

SAR(1 g) = 1.03 W/kg; SAR(10 g) = 0.523 W/kg

Maximum value of SAR (measured) = 1.45 W/kg



0 dB = 1.57 W/kg = 1.95 dBW/kg



Date: 2/26/2014

GPRS 1900_Hand_Front side_CH 661

Communication System: GPRS(1Dn4UP); Frequency: 1880 MHz

Medium parameters used: f = 1880 MHz; σ = 1.511 S/m; ε_r = 54.15; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.63, 7.63, 7.63); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2; Type: SAM;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/Hand/Area Scan (71x131x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 4.10 W/kg

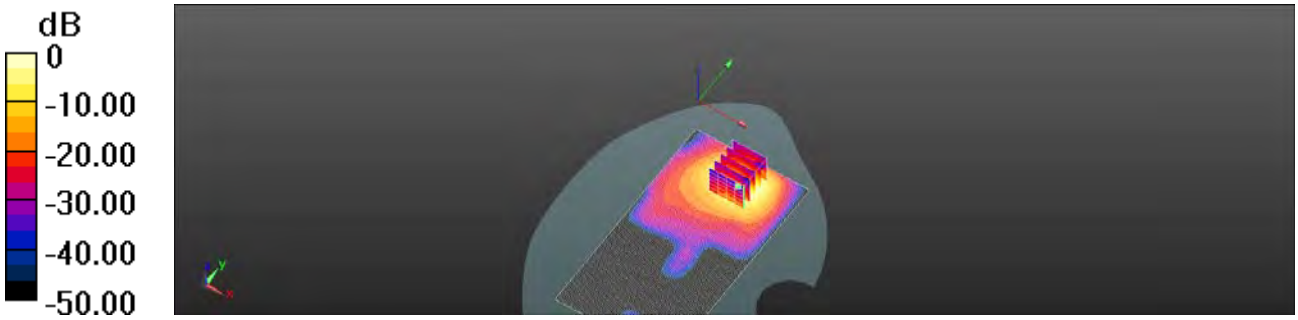
Configuration/Hand/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0.180 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 5.88 W/kg

SAR(1 g) = 2.6 W/kg; SAR(10 g) = 1.12 W/kg

Maximum value of SAR (measured) = 4.10 W/kg



0 dB = 4.10 W/kg = 6.13 dBW/kg

Date: 2/24/2014

WCDMA Band 2_Head_RE Cheek_CH 9400

Communication System: WCDMA; Frequency: 1880 MHz

Medium parameters used: f = 1880 MHz; σ = 1.361 S/m; ε_r = 39.018; ρ = 1000 kg/m^3

Phantom section: Right Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.98, 7.98, 7.98); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2; Type: SAM;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/RE Cheek/Area Scan (71x131x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.258 W/kg

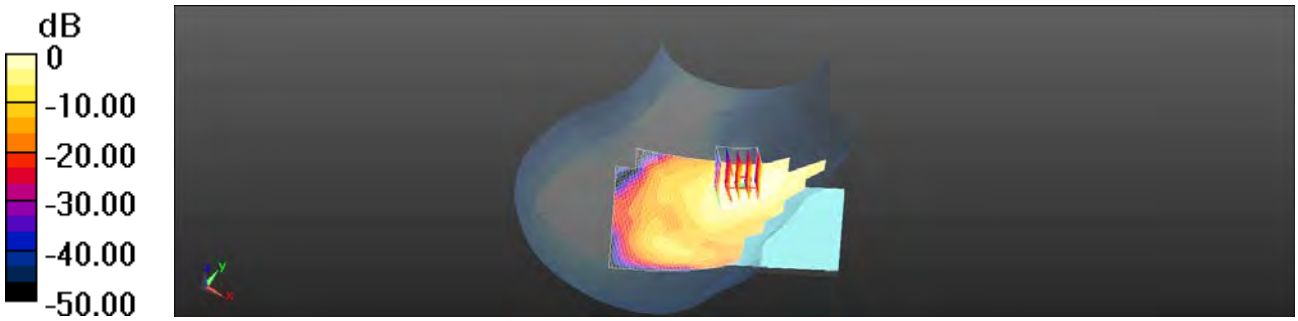
Configuration/RE Cheek/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 3.269 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 0.282 W/kg

SAR(1 g) = 0.186 W/kg; SAR(10 g) = 0.115 W/kg

Maximum value of SAR (measured) = 0.235 W/kg



0 dB = 0.258 W/kg = -5.88 dBW/kg

Date: 2/26/2014

WCDMA Band 2_Speech mode _Front side_CH 9262_repeat sar test at the highest sar measurement

Communication System: WCDMA ; Frequency: 1852.4 MHz

Medium parameters used: f= 1852.4 MHz; σ = 1.48 S/m; ε_r = 54.229; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.63, 7.63, 7.63); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2; Type: SAM;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/Speech mode/Area Scan (71x131x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 1.50 W/kg

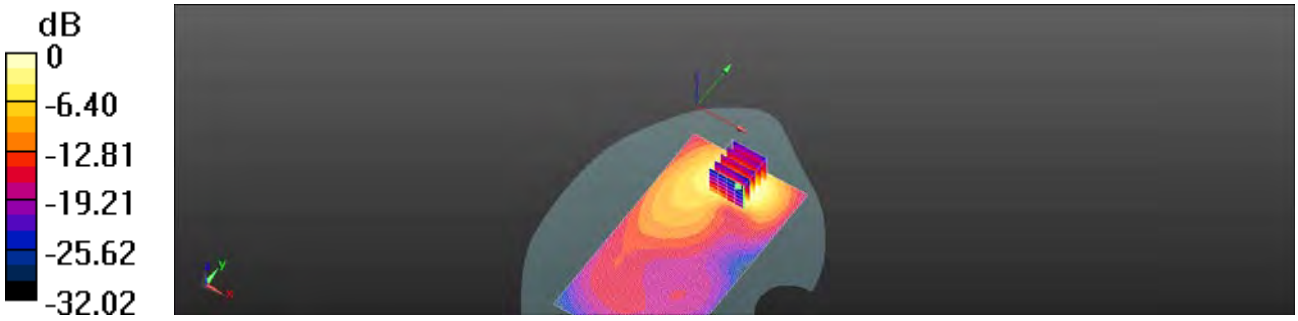
Configuration/Speech mode/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.354 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 1.80 W/kg

SAR(1 g) = 1.11 W/kg; SAR(10 g) = 0.621 W/kg

Maximum value of SAR (measured) = 1.48 W/kg



0 dB = 1.50 W/kg = 1.77 dBW/kg

Date: 2/26/2014

WCDMA Band 2_Hotspot_Bottom side_CH 9262

Communication System: WCDMA; Frequency: 1852.4 MHz

Medium parameters used: f = 1852.4 MHz; σ = 1.48 S/m; ε_r = 54.229; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.63, 7.63, 7.63); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2; Type: SAM;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/Hotspot/Area Scan (51x71x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 1.50 W/kg

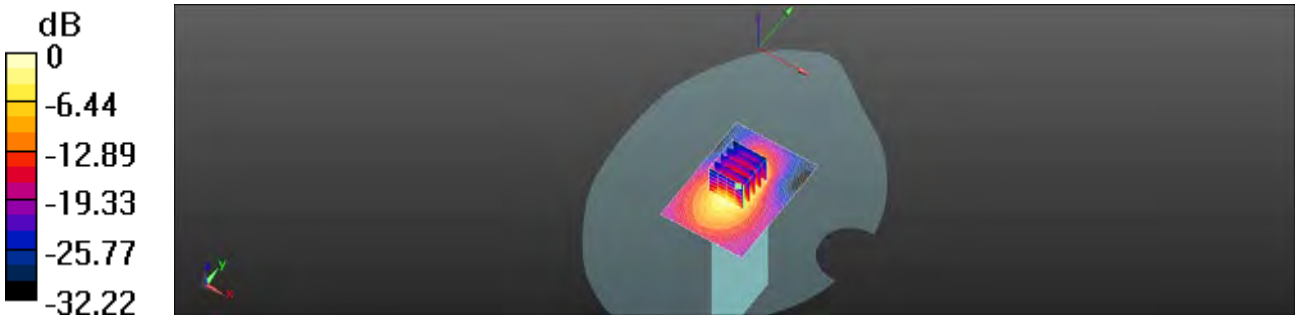
Configuration/Hotspot/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 26.416 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 1.73 W/kg

SAR(1 g) = 0.962 W/kg; SAR(10 g) = 0.494 W/kg

Maximum value of SAR (measured) = 1.38 W/kg



0 dB = 1.50 W/kg = 1.76 dBW/kg

Date: 2/26/2014

WCDMA Band 2_Hand_Front side_CH 9400

Communication System: WCDMA; Frequency: 1880 MHz

Medium parameters used: f = 1880 MHz; σ = 1.511 S/m; ε_r = 54.15; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.63, 7.63, 7.63); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2; Type: SAM;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/Hand/Area Scan (71x131x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 4.34 W/kg

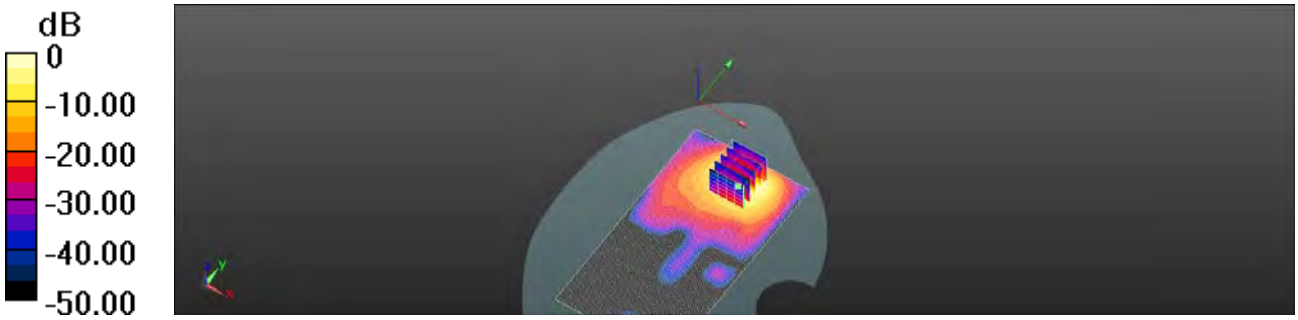
Configuration/Hand/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0.403 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 6.57 W/kg

SAR(1 g) = 2.92 W/kg; SAR(10 g) = 1.26 W/kg

Maximum value of SAR (measured) = 4.32 W/kg



0 dB = 4.34 W/kg = 6.37 dBW/kg

Date: 2/24/2014

WCDMA Band 5_Head_RE Cheek_CH 4183_repeated with external Memory card inside

Communication System: WCDMA; Frequency: 836.6 MHz

Medium parameters used: f = 837 MHz; σ = 0.886 S/m; ε_r = 41.77; ρ = 1000 kg/m^3

Phantom section: Right Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(9.83, 9.83, 9.83); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2; Type: SAM;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/RE Cheek/Area Scan (71x131x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.465 W/kg

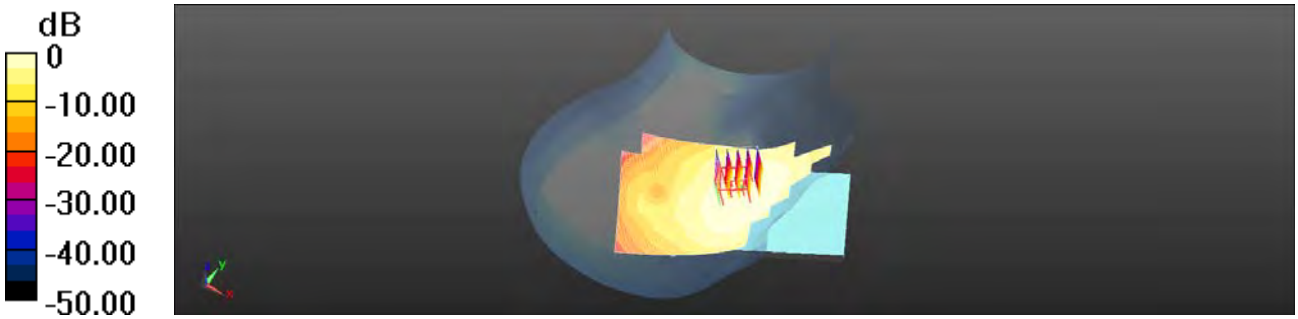
Configuration/RE Cheek/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.195 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 0.508 W/kg

SAR(1 g) = 0.402 W/kg; SAR(10 g) = 0.311 W/kg

Maximum value of SAR (measured) = 0.459 W/kg



0 dB = 0.465 W/kg = -3.33 dBW/kg

Date: 2/25/2014

WCDMA Band 5_Speech mode_Front side_CH 4233

Communication System: WCDMA ; Frequency: 846.6 MHz

Medium parameters used: f = 847 MHz; σ = 1.019 S/m; ε_r = 53.476; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(9.62, 9.62, 9.62); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2; Type: SAM;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/Speech mode/Area Scan (71x131x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.381 W/kg

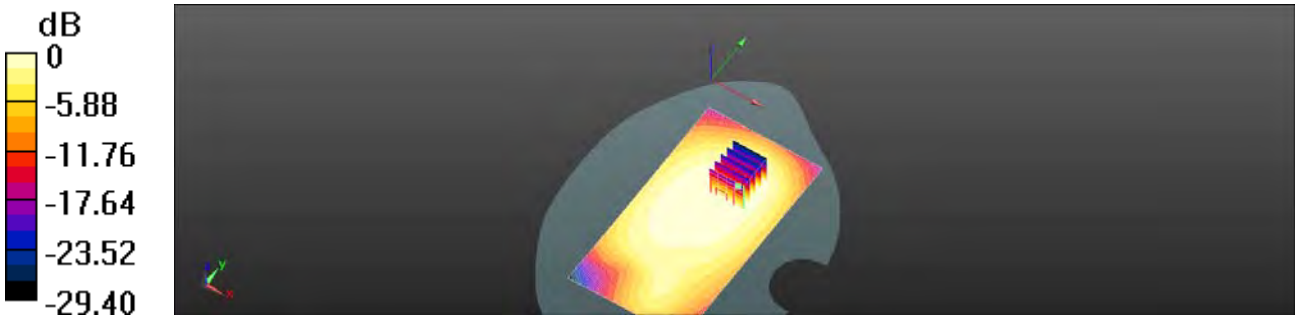
Configuration/Speech mode/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 18.105 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.437 W/kg

SAR(1 g) = 0.314 W/kg; SAR(10 g) = 0.227 W/kg

Maximum value of SAR (measured) = 0.373 W/kg



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

Date: 2/25/2014

WCDMA Band 5_Hotspot_Front side_CH 4183

Communication System: WCDMA; Frequency: 836.6 MHz

Medium parameters used: f = 837 MHz; σ = 1.008 S/m; ε_r = 53.555; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(9.62, 9.62, 9.62); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2; Type: SAM;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/Hotspot/Area Scan (71x131x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.610 W/kg

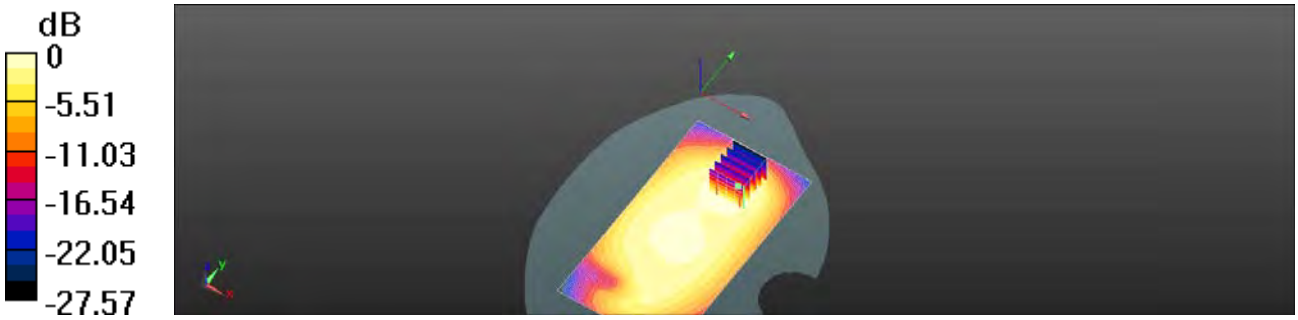
Configuration/Hotspot/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 21.037 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.723 W/kg

SAR(1 g) = 0.439 W/kg; SAR(10 g) = 0.280 W/kg

Maximum value of SAR (measured) = 0.578 W/kg



0 dB = 0.610 W/kg = -2.14 dBW/kg

Date: 2/27/2014

WLAN802.11b_Head_LE Cheek_CH 1_repeated with external Memory card inside

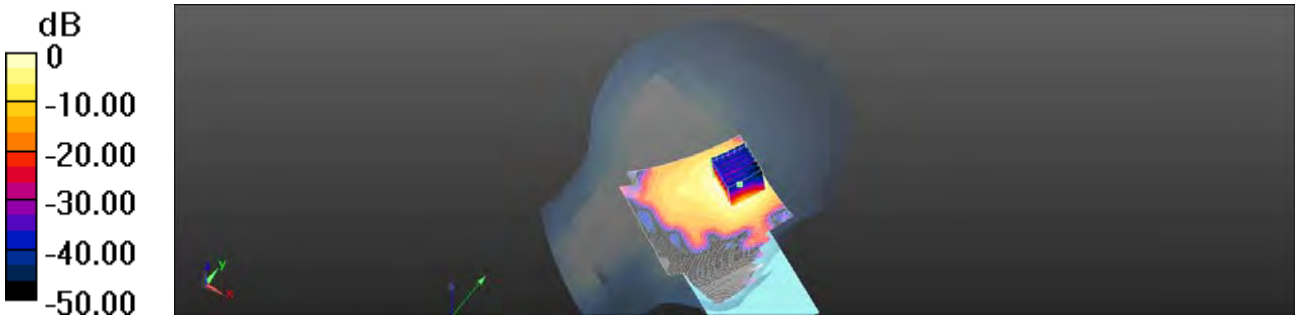
Communication System: WLAN802.11 b & g & n(20M)(40M) ; Frequency: 2412 MHz
Medium parameters used: f = 2412 MHz; σ = 1.813 S/m; ε_r = 39.683; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.12, 7.12, 7.12); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2; Type: SAM;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/LE Cheek/Area Scan (91x161x1): Interpolated grid: dx=12 mm, dy=12 mm
Maximum value of SAR (interpolated) = 0.238 W/kg

Configuration/LE Cheek/Zoom Scan (7x7x7) (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.533 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.395 W/kg
SAR(1 g) = 0.168 W/kg; SAR(10 g) = 0.080 W/kg
Maximum value of SAR (measured) = 0.268 W/kg



0 dB = 0.238 W/kg = -6.23 dBW/kg

Date: 2/28/2014

WLAN802.11b_Hotspot_Back side_CH 1

Communication System: WLAN802.11 b & g & n(20M)(40M); Frequency: 2412 MHz

Medium parameters used: f = 2412 MHz; σ = 1.926 S/m; ε_r = 51.182; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.21, 7.21, 7.21); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2; Type: SAM;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/Hotspot/Area Scan (111x161x1): Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 0.156 W/kg

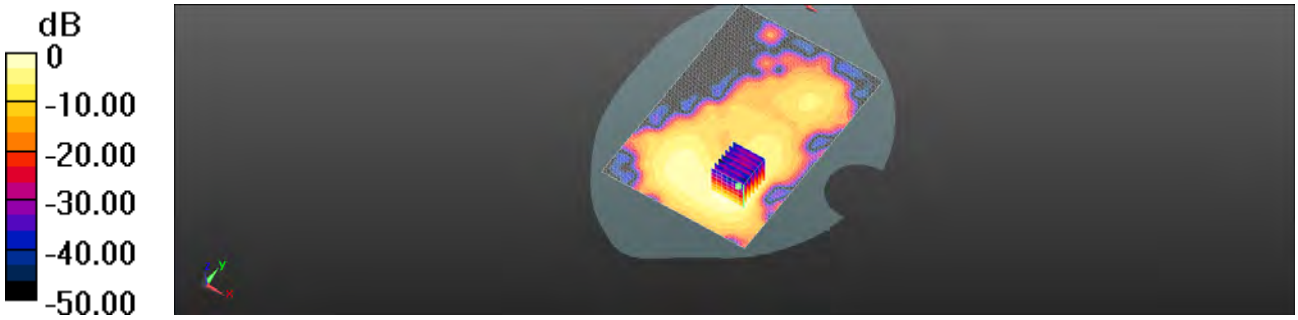
Configuration/Hotspot/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 2.507 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.223 W/kg

SAR(1 g) = 0.102 W/kg; SAR(10 g) = 0.048 W/kg

Maximum value of SAR (measured) = 0.155 W/kg



0 dB = 0.156 W/kg = -8.06 dBW/kg

Date: 2/27/2014

WLAN802.11a 5.2G_Head_LE Cheek_CH 48

Communication System: WLAN 802.11n/a(5G) FCC ; Frequency: 5240 MHz

Medium parameters used: f = 5240 MHz; σ = 4.664 S/m; ε_r = 36.089; ρ = 1000 kg/m^3

Phantom section: Left Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(5.15, 5.15, 5.15); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2; Type: SAM;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/LE Cheek/Area Scan (121x191x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 0.0728 W/kg

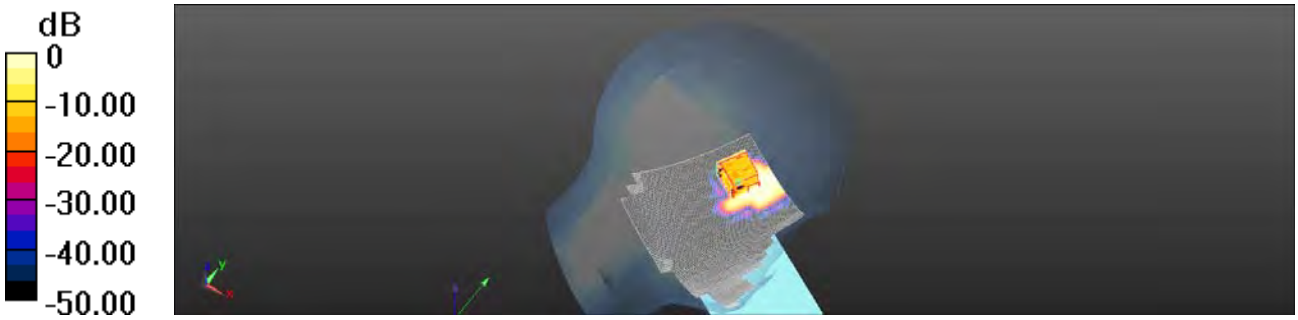
Configuration/LE Cheek/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 0.2482 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.0710 W/kg

SAR(1 g) = 0.021 W/kg; SAR(10 g) = 0.00574 W/kg

Maximum value of SAR (measured) = 0.0425 W/kg



0 dB = 0.0425 W/kg = -13.72 dBW/kg

Date: 2/28/2014

WLAN802.11a 5.2G_Body-worn_Back side_CH 48

Communication System: WLAN 802.11n/a(5G) FCC ; Frequency: 5240 MHz

Medium parameters used: f = 5240 MHz; σ = 5.233 S/m; ε_r = 48.316; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(4.71, 4.71, 4.71); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2; Type: SAM;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/Body-worn/Area Scan (121x201x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 0.0202 W/kg

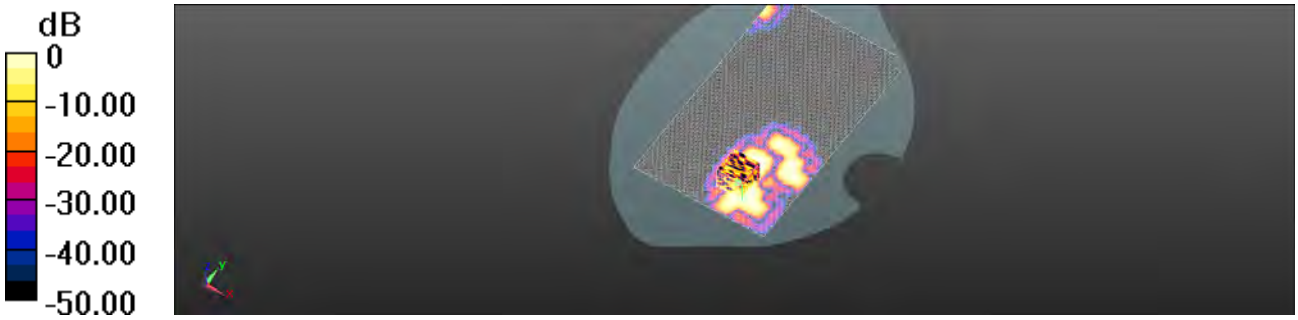
Configuration/Body-worn/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 0.725 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 0.118 W/kg

SAR(1 g) = 0.00882 W/kg; SAR(10 g) = 0.00208 W/kg

Maximum value of SAR (measured) = 0.0176 W/kg



0 dB = 0.0176 W/kg = -17.54 dBW/kg

Date: 2/27/2014

WLAN802.11a 5.3G_Head_LE Cheek_CH 64

Communication System: WLAN 802.11n/a(5G) FCC ; Frequency: 5320 MHz

Medium parameters used: f = 5320 MHz; σ = 4.764 S/m; ε_r = 35.813; ρ = 1000 kg/m^3

Phantom section: Left Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(4.95, 4.95, 4.95); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2; Type: SAM;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/LE Cheek/Area Scan (121x191x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 0.103 W/kg

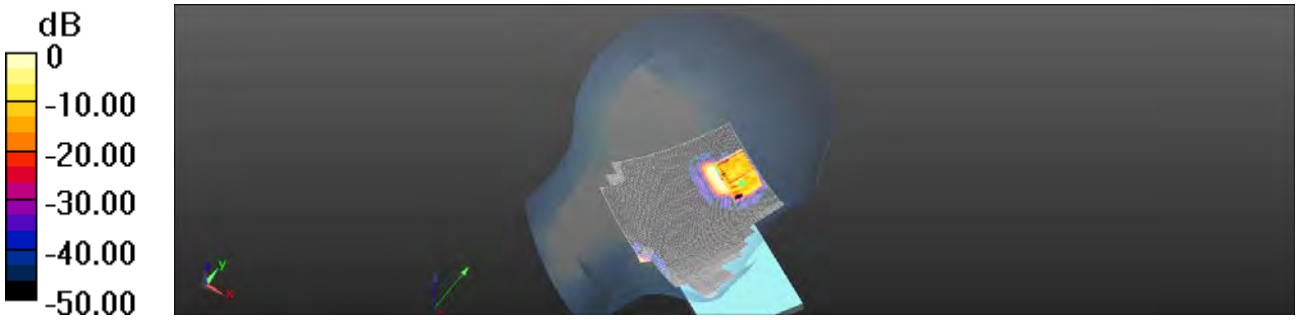
Configuration/LE Cheek/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 1.061 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.0700 W/kg

SAR(1 g) = 0.018 W/kg; SAR(10 g) = 0.00647 W/kg

Maximum value of SAR (measured) = 0.0358 W/kg



0 dB = 0.0358 W/kg = -14.46 dBW/kg

Date: 2/28/2014

WLAN802.11a 5.3G_Body-worn_Back side_CH 64

Communication System: WLAN 802.11n/a(5G) FCC ; Frequency: 5320 MHz

Medium parameters used: f = 5320 MHz; σ = 5.351 S/m; ε_r = 48.09; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(4.42, 4.42, 4.42); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2; Type: SAM;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/Body-worn/Area Scan (121x201x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 0.0291 W/kg

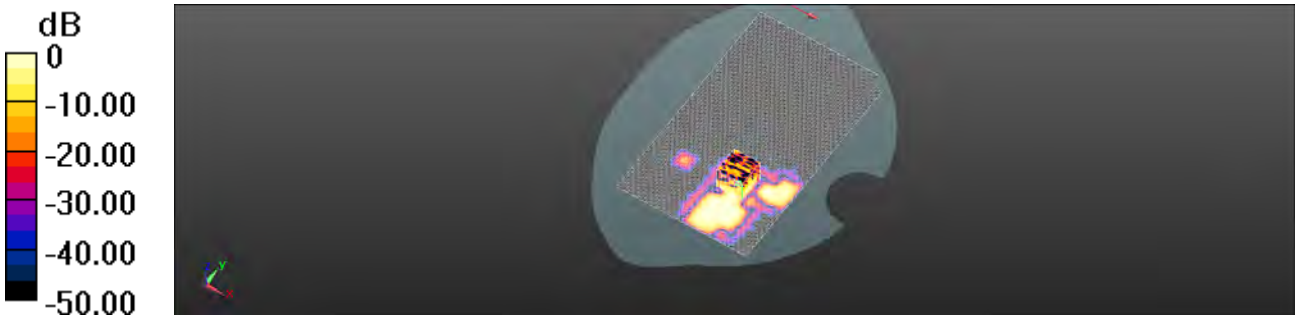
Configuration/Body-worn/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 0.906 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 0.0370 W/kg

SAR(1 g) = 0.014 W/kg; SAR(10 g) = 0.00495 W/kg

Maximum value of SAR (measured) = 0.0288 W/kg



0 dB = 0.0288 W/kg = -15.41 dBW/kg

Date: 2/27/2014

WLAN802.11a 5.6G_Head_LE Cheek_CH 136

Communication System: WLAN 802.11n/a(5G) FCC; Frequency: 5680 MHz

Medium parameters used: f = 5680 MHz; σ = 5.177 S/m; ε_r = 35.001; ρ = 1000 kg/m^3

Phantom section: Left Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(4.49, 4.49, 4.49); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2; Type: SAM;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/LE Cheek/Area Scan (121x191x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 0.164 W/kg

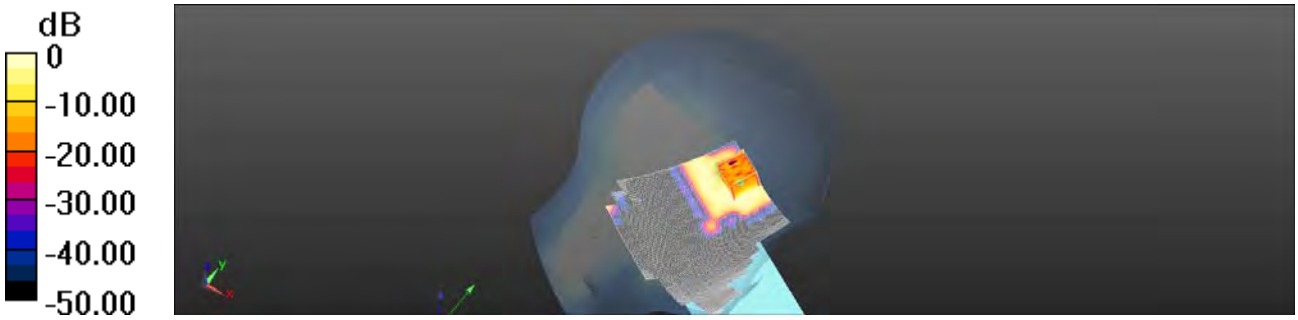
Configuration/LE Cheek/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 1.198 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 0.332 W/kg

SAR(1 g) = 0.090 W/kg; SAR(10 g) = 0.030 W/kg

Maximum value of SAR (measured) = 0.165 W/kg



0 dB = 0.165 W/kg = -7.83 dBW/kg

Date: 2/28/2014

WLAN802.11a 5.6G_Body-worn_Back side_CH 136_repeated with external Memory card inside_repeat sar test at the highest sar measurement

Communication System: WLAN 802.11n/a(5G) FCC ; Frequency: 5680 MHz

Medium parameters used: f = 5680 MHz; σ = 5.879 S/m; εr = 47.184; ρ = 1000 kg/m3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(4.01, 4.01, 4.01); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2; Type: SAM;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/Body-worn/Area Scan (121x201x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 1.47 W/kg

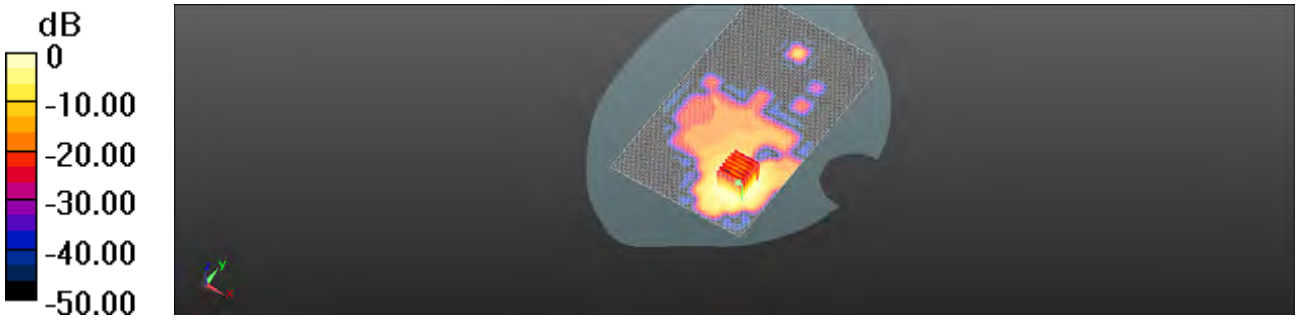
Configuration/Body-worn/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 2.043 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 2.57 W/kg

SAR(1 g) = 0.843 W/kg; SAR(10 g) = 0.310 W/kg

Maximum value of SAR (measured) = 1.47 W/kg



0 dB = 1.47 W/kg = 1.67 dBW/kg

Date: 2/27/2014

WLAN802.11a 5.8G_Head_LE Cheek_CH 149

Communication System: WLAN 802.11n/a(5G) FCC ; Frequency: 5745 MHz

Medium parameters used: f = 5745 MHz; σ = 5.247 S/m; ε_r = 34.813; ρ = 1000 kg/m^3

Phantom section: Left Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(4.66, 4.66, 4.66); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2; Type: SAM;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/LE Cheek/Area Scan (121x191x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 0.125 W/kg

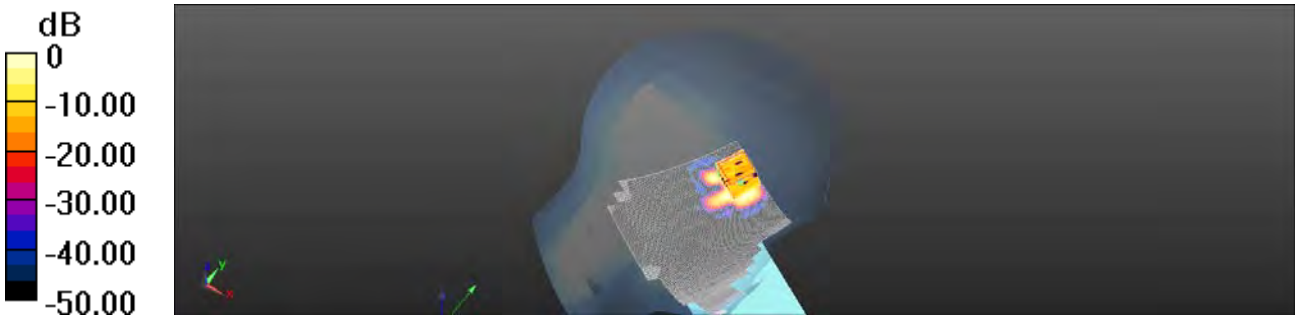
Configuration/LE Cheek/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 1.214 V/m; Power Drift = -0.11 dB

Peak SAR (extrapolated) = 0.143 W/kg

SAR(1 g) = 0.023 W/kg; SAR(10 g) = 0.00684 W/kg

Maximum value of SAR (measured) = 0.0570 W/kg



0 dB = 0.0570 W/kg = -12.44 dBW/kg

Date: 2/28/2014

WLAN802.11a 5.8G_Body-worn_Back side_CH 149

Communication System: WLAN 802.11n/a(5G) FCC ; Frequency: 5745 MHz

Medium parameters used: f = 5745 MHz; σ = 5.972 S/m; ε_r = 47.016; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(4.29, 4.29, 4.29); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2; Type: SAM;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/Body-worn/Area Scan (121x201x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 0.420 W/kg

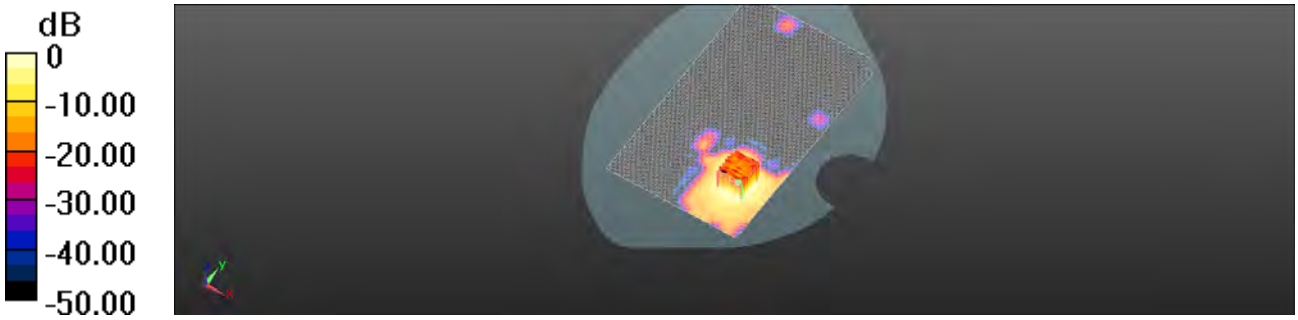
Configuration/Body-worn/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 0.721 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.784 W/kg

SAR(1 g) = 0.236 W/kg; SAR(10 g) = 0.083 W/kg

Maximum value of SAR (measured) = 0.427 W/kg



0 dB = 0.427 W/kg = -3.70 dBW/kg

6. System Verification

Date: 2/24/2014

Dipole 835 MHz_SN:4d156_Head

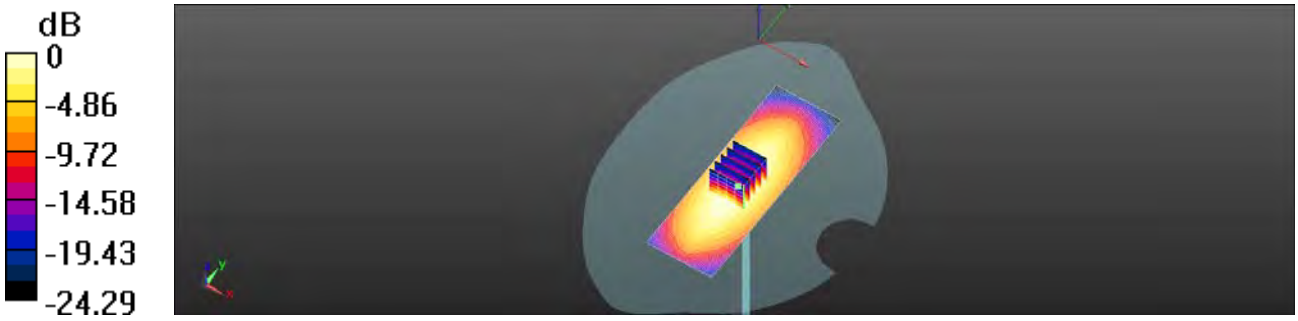
Communication System: CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.884 S/m; ε_r = 41.796; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(9.83, 9.83, 9.83); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/d=15mm, Pin=250mW, dist=2mm: Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 3.30 W/kg

Configuration/d=15mm, Pin=250mW, dist=2mm: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 61.856 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.98 W/kg
SAR(1 g) = 2.51 W/kg; SAR(10 g) = 1.62 W/kg
Maximum value of SAR (measured) = 3.33 W/kg



0 dB = 3.30 W/kg = 5.19 dBW/kg

Date: 2/25/2014

Dipole 835 MHz_SN:4d156_Body

Communication System: CW; Frequency: 835 MHz

Medium parameters used: f = 835 MHz; σ = 1.006 S/m; ε_r = 53.571; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(9.62, 9.62, 9.62); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/d=15mm, Pin=250mW, dist=2mm: Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 3.15 W/kg

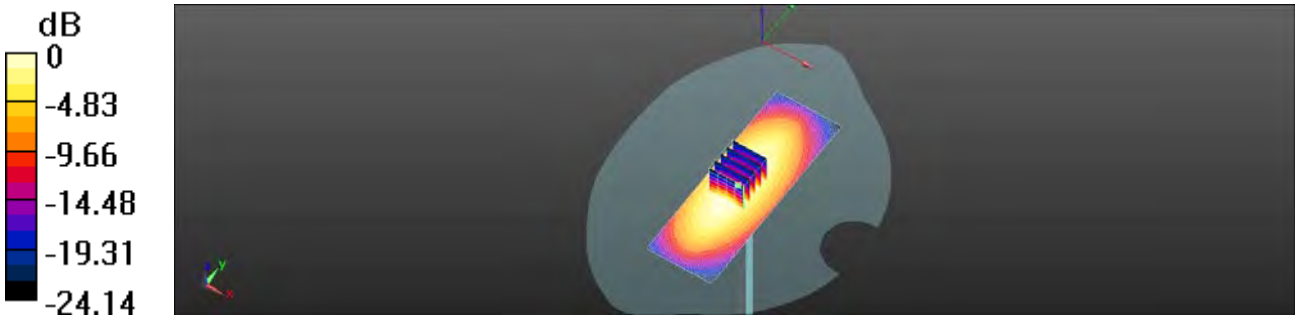
Configuration/d=15mm, Pin=250mW, dist=2mm: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.281 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 3.83 W/kg

SAR(1 g) = 2.49 W/kg; SAR(10 g) = 1.61 W/kg

Maximum value of SAR (measured) = 3.21 W/kg



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

Date: 2/24/2014

Dipole 1900 MHz_SN:5d173_Head

Communication System: CW; Frequency: 1900 MHz

Medium parameters used: f = 1900 MHz; σ = 1.38 S/m; ε_r = 38.931; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.98, 7.98, 7.98); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/d=10mm, Pin=250mW, dist=2mm: Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 15.4 W/kg

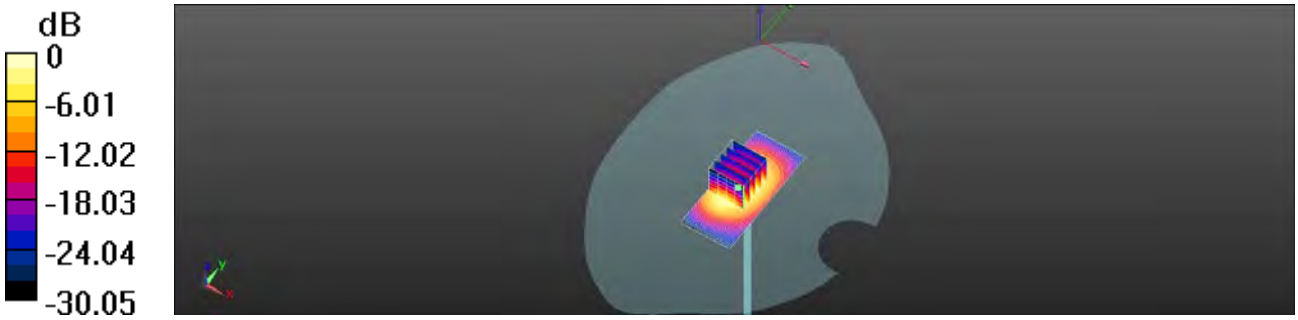
Configuration/d=10mm, Pin=250mW, dist=2mm: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 104.4 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 19.2 W/kg

SAR(1 g) = 10 W/kg; SAR(10 g) = 5.11 W/kg

Maximum value of SAR (measured) = 11.2 W/kg



0 dB = 15.4 W/kg = 11.88 dBW/kg

Date: 2/26/2014

Dipole 1900 MHz_SN:5d173_Body

Communication System: CW; Frequency: 1900 MHz

Medium parameters used: f = 1900 MHz; σ = 1.533 S/m; ε_r = 54.078; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.63, 7.63, 7.63); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/d=10mm, Pin=250mW, dist=2mm: Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 15.3 W/kg

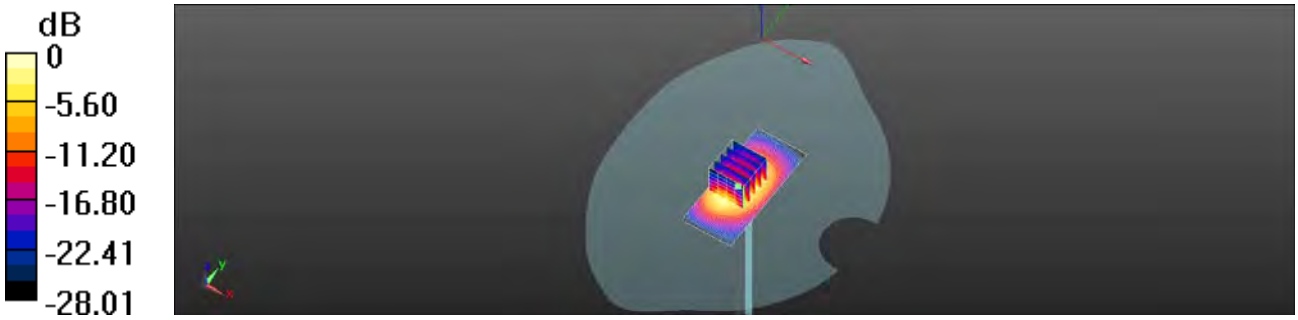
Configuration/d=10mm, Pin=250mW, dist=2mm: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 97.668 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 18.0 W/kg

SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.27 W/kg

Maximum value of SAR (measured) = 14.5 W/kg



0 dB = 15.3 W/kg = 11.83 dBW/kg

Date: 2/27/2014

Dipole 2450 MHz_SN:912_Head

Communication System: CW; Frequency: 2450 MHz

Medium parameters used: f = 2450 MHz; σ = 1.859 S/m; ε_r = 39.536; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.12, 7.12, 7.12); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/d=10mm, Pin=250mW, dist=2mm: Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 22.0 W/kg

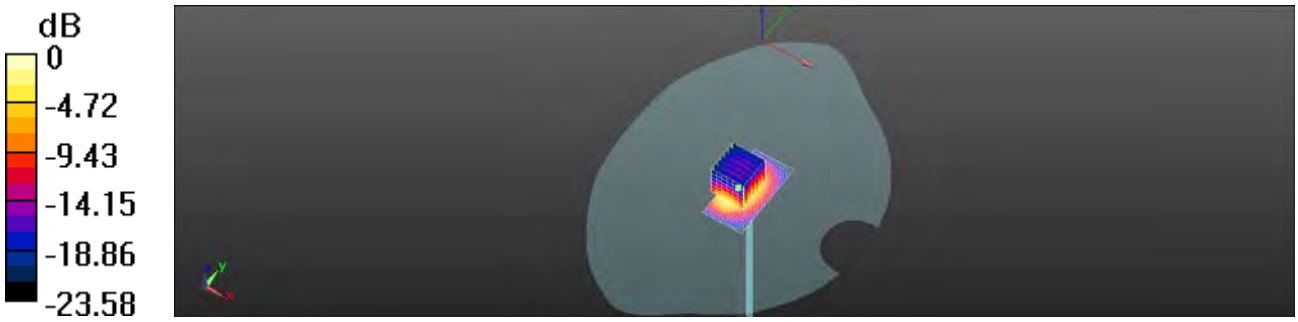
Configuration/d=10mm, Pin=250mW, dist=2mm: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 107.8 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 30.5 W/kg

SAR(1 g) = 13.9 W/kg; SAR(10 g) = 6.24 W/kg

Maximum value of SAR (measured) = 21.7 W/kg



0 dB = 22.0 W/kg = 13.42 dBW/kg

Date: 2/28/2014

Dipole 2450 MHz_SN:912_Body

Communication System: CW; Frequency: 2450 MHz

Medium parameters used: f = 2450 MHz; σ = 1.98 S/m; ε_r = 51.11; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.21, 7.21, 7.21); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/d=10mm, Pin=250mW, dist=2mm: Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 21.1 W/kg

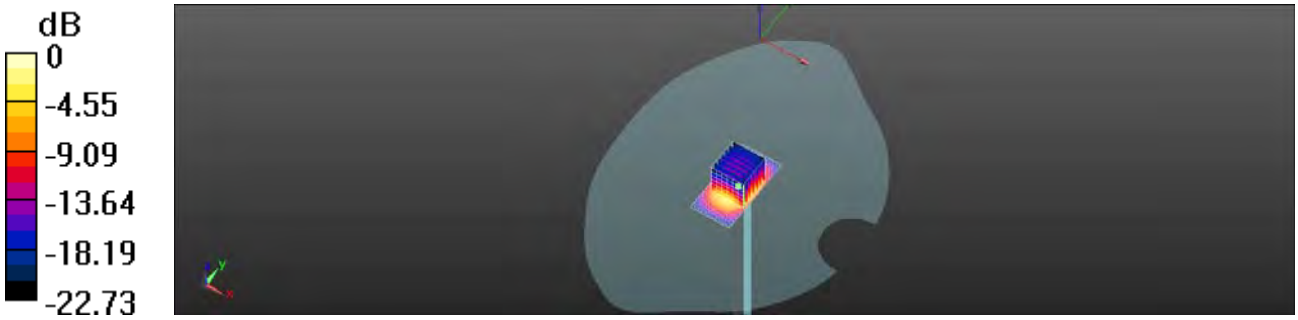
Configuration/d=10mm, Pin=250mW, dist=2mm: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 100.5 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 28.8 W/kg

SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.05 W/kg

Maximum value of SAR (measured) = 20.9 W/kg



0 dB = 21.1 W/kg = 13.25 dBW/kg

Date: 2/27/2014

Dipole 5200 MHz_SN:1104_Head

Communication System: CW; Frequency: 5200 MHz

Medium parameters used: f = 5200 MHz; σ = 4.613 S/m; ε_r = 36.09; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(5.15, 5.15, 5.15); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/d=10mm, Pin=100mW, dist=2mm: Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 16.5 W/kg

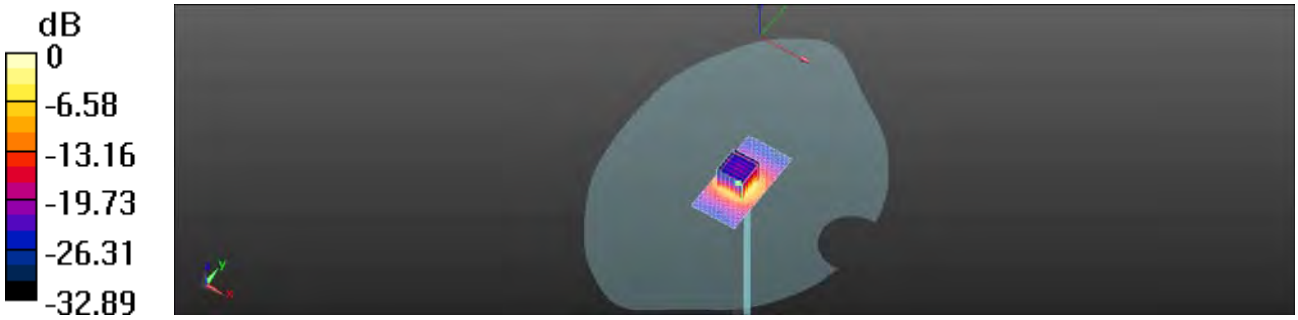
Configuration/d=10mm, Pin=100mW, dist=2mm: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 61.637 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 28.6 W/kg

SAR(1 g) = 8.13 W/kg; SAR(10 g) = 2.43 W/kg

Maximum value of SAR (measured) = 16.3 W/kg



0 dB = 16.3 W/kg = 12.12 dBW/kg

Date: 2/28/2014

Dipole 5200 MHz_SN:1104_Body

Communication System: CW; Frequency: 5200 MHz

Medium parameters used: f = 5200 MHz; σ = 5.169 S/m; ε_r = 48.421; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(4.71, 4.71, 4.71); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/d=10mm, Pin=100mW, dist=2mm: Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 14.6 W/kg

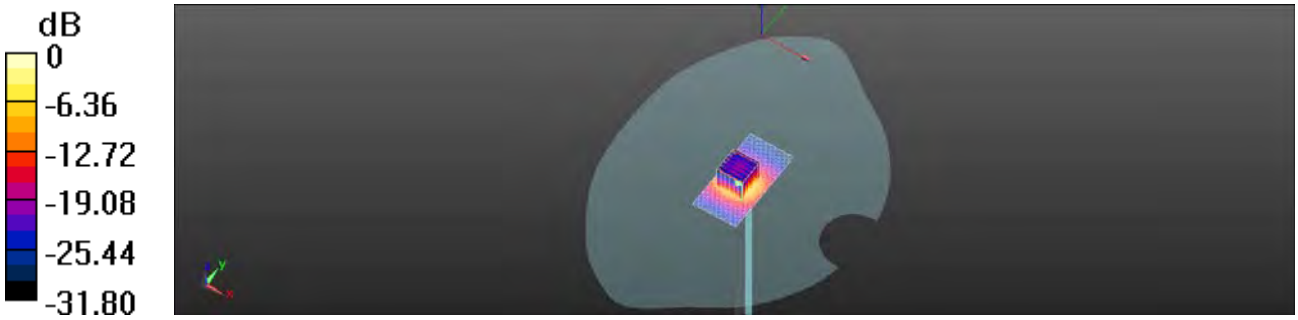
Configuration/d=10mm, Pin=100mW, dist=2mm: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 51.059 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 26.3 W/kg

SAR(1 g) = 7.49 W/kg; SAR(10 g) = 2.22 W/kg

Maximum value of SAR (measured) = 14.6 W/kg



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

Date: 2/27/2014

Dipole 5300 MHz_SN:1104_Head

Communication System: CW; Frequency: 5300 MHz

Medium parameters used: f = 5300 MHz; σ = 4.727 S/m; ε_r = 35.843; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(4.95, 4.95, 4.95); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/d=10mm, Pin=100mW, dist=2mm: Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 17.0 W/kg

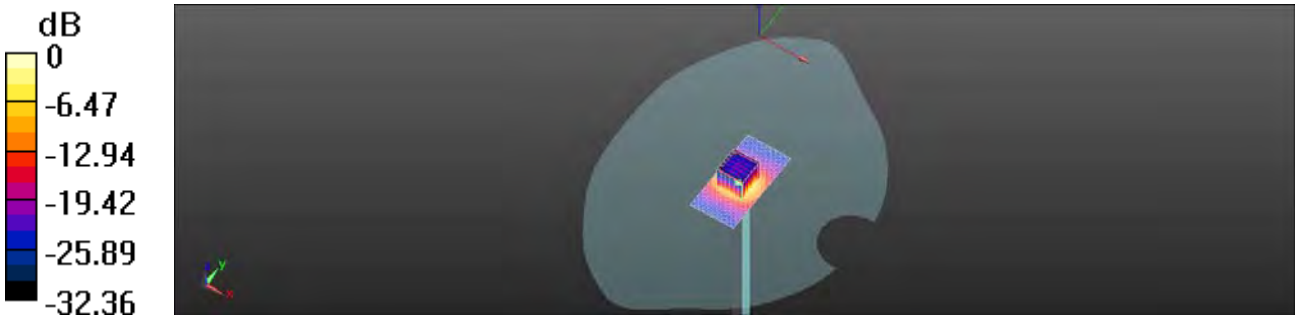
Configuration/d=10mm, Pin=100mW, dist=2mm: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 63.261 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 30.3 W/kg

SAR(1 g) = 8.47 W/kg; SAR(10 g) = 2.52 W/kg

Maximum value of SAR (measured) = 16.8 W/kg



0 dB = 16.8 W/kg = 12.25 dBW/kg

Date: 2/28/2014

Dipole 5300 MHz_SN:1104_Body

Communication System: CW; Frequency: 5300 MHz

Medium parameters used: f = 5300 MHz; σ = 5.315 S/m; ε_r = 48.155; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(4.42, 4.42, 4.42); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/d=10mm, Pin=100mW, dist=2mm: Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 15.6 W/kg

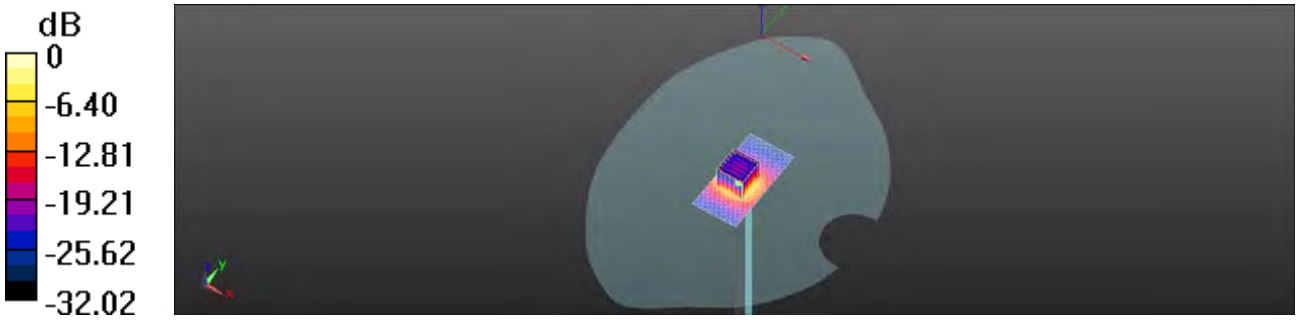
Configuration/d=10mm, Pin=100mW, dist=2mm: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 52.630 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 26.6 W/kg

SAR(1 g) = 7.71 W/kg; SAR(10 g) = 2.24 W/kg

Maximum value of SAR (measured) = 15.0 W/kg



0 dB = 15.0 W/kg = 11.76 dBW/kg

Date: 2/27/2014

Dipole 5600 MHz_SN:1104_Head

Communication System: CW; Frequency: 5600 MHz

Medium parameters used: f = 5600 MHz; σ = 5.077 S/m; ε_r = 35.159; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(4.49, 4.49, 4.49); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/d=10mm, Pin=100mW, dist=2mm: Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 17.4 W/kg

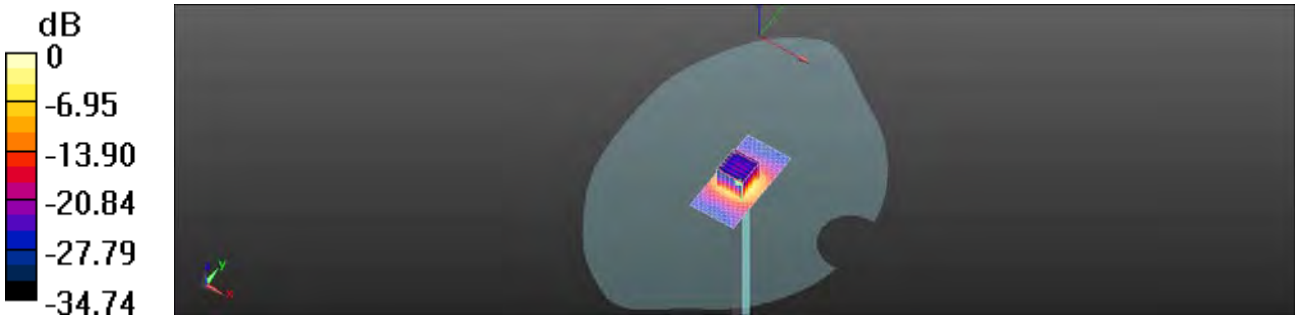
Configuration/d=10mm, Pin=100mW, dist=2mm: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 62.122 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 30.7 W/kg

SAR(1 g) = 8.52 W/kg; SAR(10 g) = 2.5 W/kg

Maximum value of SAR (measured) = 17.1 W/kg



0 dB = 17.1 W/kg = 12.33 dBW/kg

Date: 2/28/2014

Dipole 5600 MHz_SN:1104_Body

Communication System: CW; Frequency: 5600 MHz

Medium parameters used: f = 5600 MHz; σ = 5.755 S/m; ε_r = 47.389; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(4.01, 4.01, 4.01); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/d=10mm, Pin=100mW, dist=2mm: Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 16.9 W/kg

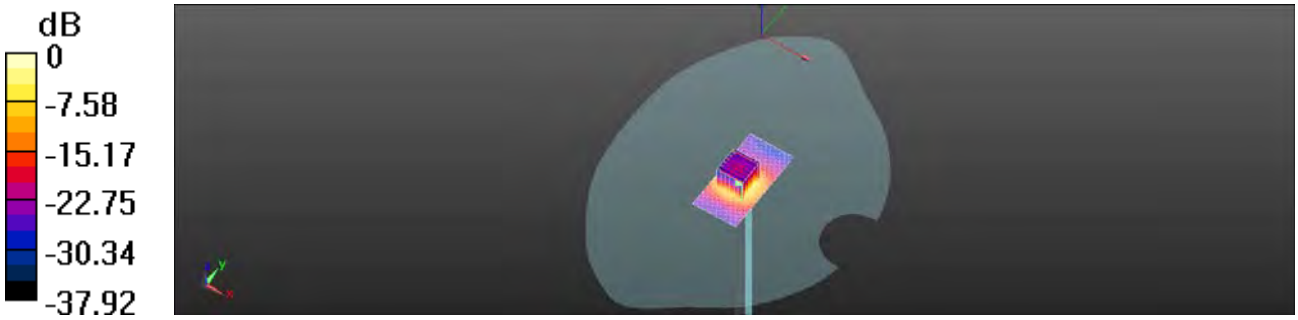
Configuration/d=10mm, Pin=100mW, dist=2mm: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 51.978 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 30.0 W/kg

SAR(1 g) = 8.26 W/kg; SAR(10 g) = 2.35 W/kg

Maximum value of SAR (measured) = 16.2 W/kg



0 dB = 16.2 W/kg = 12.10 dBW/kg

Date: 2/27/2014

Dipole 5800 MHz_SN:1104_Head

Communication System: CW; Frequency: 5800 MHz

Medium parameters used: f = 5800 MHz; σ = 5.311 S/m; ε_r = 34.718; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(4.66, 4.66, 4.66); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/d=10mm, Pin=100mW, dist=2mm: Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 16.0 W/kg

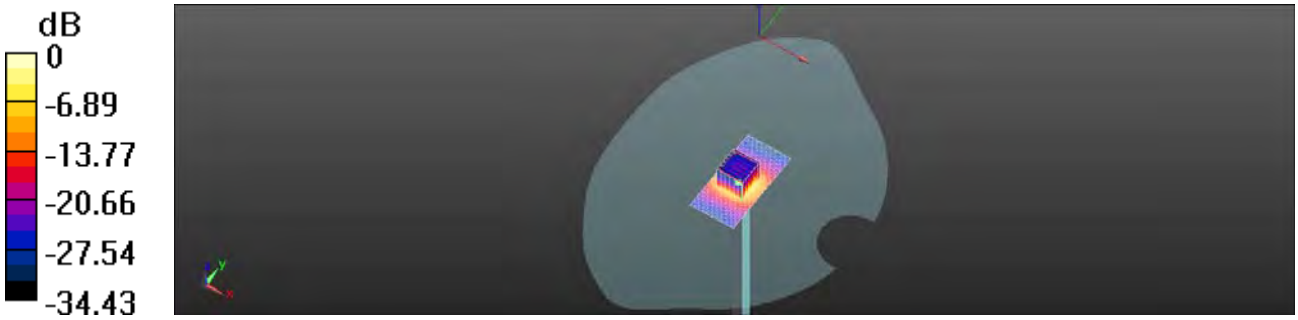
Configuration/d=10mm, Pin=100mW, dist=2mm: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 58.172 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 29.4 W/kg

SAR(1 g) = 7.98 W/kg; SAR(10 g) = 2.28 W/kg

Maximum value of SAR (measured) = 15.6 W/kg



0 dB = 15.6 W/kg = 11.93 dBW/kg

Date: 2/28/2014

Dipole 5800 MHz_SN:1104_Body

Communication System: CW; Frequency: 5800 MHz

Medium parameters used: f = 5800 MHz; σ = 6.047 S/m; ε_r = 46.896; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3770; ConvF(4.29, 4.29, 4.29); Calibrated: 4/30/2013;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/23/2013
- Phantom: SAM2
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/d=10mm, Pin=100mW, dist=2mm: Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 15.6 W/kg

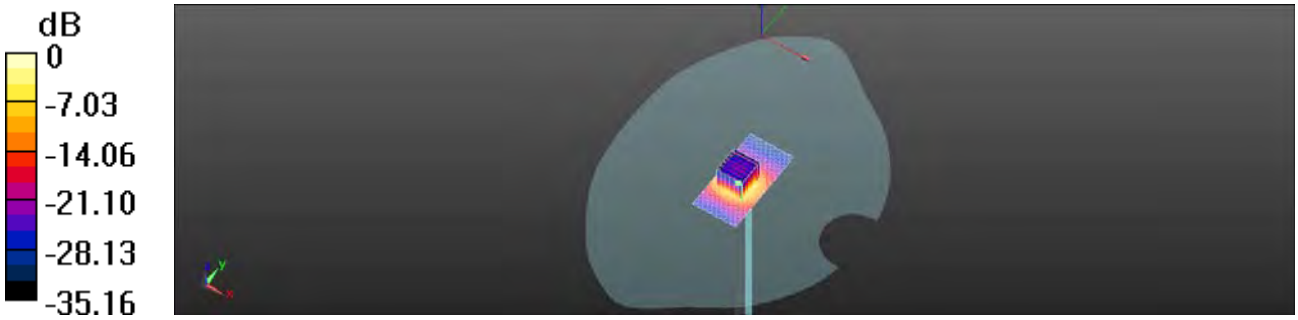
Configuration/d=10mm, Pin=100mW, dist=2mm: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 48.204 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 27.4 W/kg

SAR(1 g) = 7.56 W/kg; SAR(10 g) = 2.11 W/kg

Maximum value of SAR (measured) = 14.7 W/kg



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

7. DAE & Probe Calibration Certificate

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Client SGS-TW (Auden)

Certificate No: DAE4-856_May13

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: May 23, 2013

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	02-Oct-12 (No:12728)	Oct-13
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Auto DAE Calibration Unit	SE UWS 053 AA 1001	07-Jan-13 (in house check)	In house check: Jan-14
Calibrator Box V2.1	SE UMS 006 AA 1002	07-Jan-13 (in house check)	In house check: Jan-14

	Name	Function	Signature
Calibrated by:	Eric Hainfeld	Technician	
Approved by:	Fin Bomholt	Deputy Technical Manager	

Issued: May 23, 2013

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Certificate No: DAE4-856_May13 Page 1 of 5

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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.

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	403.416 ± 0.02% (k=2)	404.540 ± 0.02% (k=2)	403.867 ± 0.02% (k=2)
Low Range	3.97422 ± 1.50% (k=2)	3.97703 ± 1.50% (k=2)	3.97733 ± 1.50% (k=2)

Connector Angle

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

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Appendix

1. DC Voltage Linearity

High Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	199987.92	-6.55	-0.00
Channel X	+ Input	19997.24	-3.32	-0.02
Channel X	- Input	-19998.80	1.29	-0.01
Channel Y	+ Input	199992.46	-2.23	-0.00
Channel Y	+ Input	19997.79	-2.80	-0.01
Channel Y	- Input	-19998.99	1.02	-0.01
Channel Z	+ Input	199989.59	-5.43	-0.00
Channel Z	+ Input	19995.44	-5.08	-0.03
Channel Z	- Input	-20001.02	-0.96	0.00

Low Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	2001.12	0.11	0.01
Channel X	+ Input	202.01	0.43	0.21
Channel X	- Input	-199.13	-0.70	0.35
Channel Y	+ Input	2001.13	0.10	0.00
Channel Y	+ Input	200.48	-1.04	-0.52
Channel Y	- Input	-199.06	-0.54	0.27
Channel Z	+ Input	2001.11	0.21	0.01
Channel Z	+ Input	200.59	-0.87	-0.43
Channel Z	- Input	-199.44	-0.99	0.50

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	-15.25	-16.64
	- 200	18.50	16.42
Channel Y	200	-1.88	-1.90
	- 200	1.30	0.86
Channel Z	200	10.99	10.38
	- 200	-13.49	-12.90

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	-	2.15	-3.07
Channel Y	200	7.09	-	3.02
Channel Z	200	8.11	5.37	-

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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	16270	16836
Channel Y	15934	16230
Channel Z	15862	15687

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	0.87	-0.19	2.70	0.40
Channel Y	-0.41	-1.96	0.66	0.46
Channel Z	-0.75	-1.60	0.05	0.32

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

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Accreditation No.: SCS 108

Client SGS-TW (Auden)

Certificate No: EX3-3770_Apr13

CALIBRATION CERTIFICATE

Object EX3DV4 - SN:3770

Calibration procedure(s) QA CAL-01.v8, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v4
Calibration procedure for dosimetric E-field probes

Calibration date: April 30, 2013

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	28-Dec-12 (No. ES3-3013_Dec12)	Dec-13
DAE4	SN: 660	31-Jan-13 (No. DAE4-660_Jan13)	Jan-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-15
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Israa El-Naiouq	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: May 1, 2013

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Certificate No: EX3-3770_Apr13 Page 1 of 11

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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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
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.

Probe EX3DV4

SN:3770

Manufactured: July 6, 2010
Calibrated: April 30, 2013

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

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	0.60	0.41	± 10.1 %
DCP (mV)[B]	106.9	96.2	103.0	

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	125.8	±2.5 %
		Y	0.0	0.0	1.0		129.7	
		Z	0.0	0.0	1.0		142.2	

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.

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	Depth (mm)	Unct. (k=2)
750	41.9	0.89	10.28	10.28	10.28	0.74	0.65	± 12.0 %
835	41.5	0.90	9.83	9.83	9.83	0.77	0.60	± 12.0 %
900	41.5	0.97	9.89	9.89	9.89	0.78	0.55	± 12.0 %
1750	40.1	1.37	8.29	8.29	8.29	0.72	0.65	± 12.0 %
1900	40.0	1.40	7.98	7.98	7.98	0.44	0.83	± 12.0 %
2000	40.0	1.40	7.94	7.94	7.94	0.45	0.79	± 12.0 %
2300	39.5	1.67	7.48	7.48	7.48	0.45	0.78	± 12.0 %
2450	39.2	1.80	7.12	7.12	7.12	0.33	0.99	± 12.0 %
5200	36.0	4.66	5.15	5.15	5.15	0.40	1.80	± 13.1 %
5300	35.9	4.76	4.95	4.95	4.95	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.49	4.49	4.49	0.45	1.80	± 13.1 %
5800	35.3	5.27	4.66	4.66	4.66	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.

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DASY/EASY - Parameters of Probe: EX3DV4 - SN:3770

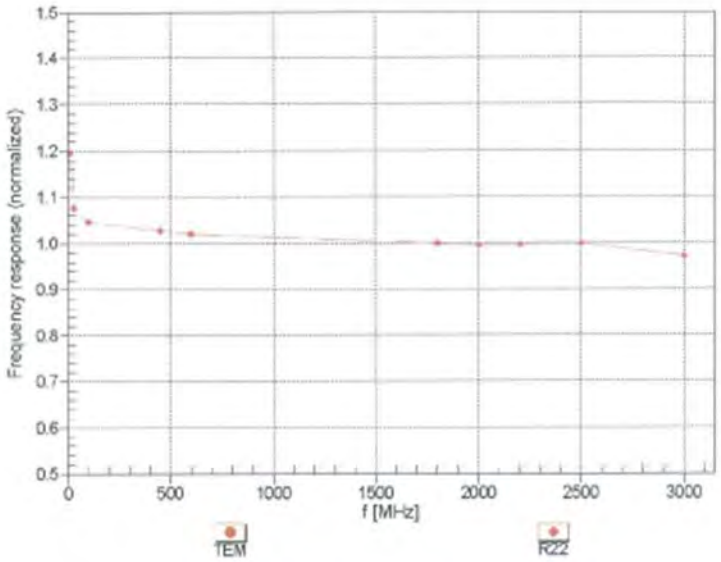
Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	9.74	9.74	9.74	0.47	0.84	± 12.0 %
835	55.2	0.97	9.62	9.62	9.62	0.62	0.69	± 12.0 %
900	55.0	1.05	9.50	9.50	9.50	0.35	0.97	± 12.0 %
1750	53.4	1.49	7.85	7.85	7.85	0.39	0.88	± 12.0 %
1900	53.3	1.52	7.63	7.63	7.63	0.27	1.08	± 12.0 %
2000	53.3	1.52	7.72	7.72	7.72	0.27	1.17	± 12.0 %
2300	52.9	1.81	7.36	7.36	7.36	0.50	0.78	± 12.0 %
2450	52.7	1.95	7.21	7.21	7.21	0.58	0.68	± 12.0 %
5200	49.0	5.30	4.71	4.71	4.71	0.40	1.90	± 13.1 %
5300	48.9	5.42	4.42	4.42	4.42	0.45	1.90	± 13.1 %
5600	48.5	5.77	4.01	4.01	4.01	0.45	1.90	± 13.1 %
5800	48.2	6.00	4.29	4.29	4.29	0.50	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.

EX3DV4– SN:3770 April 30, 2013

Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

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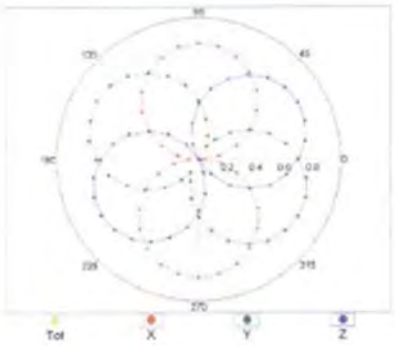
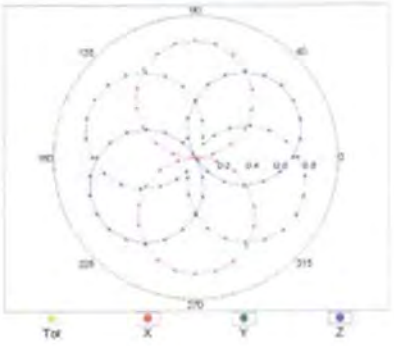
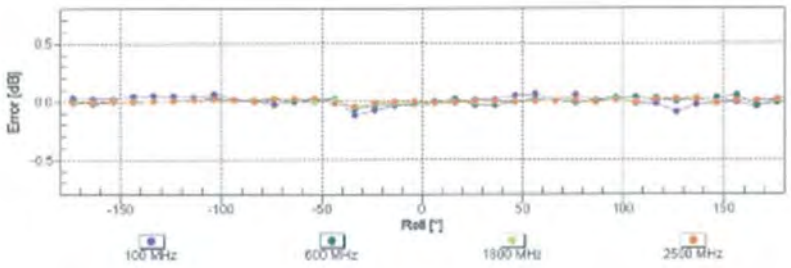
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



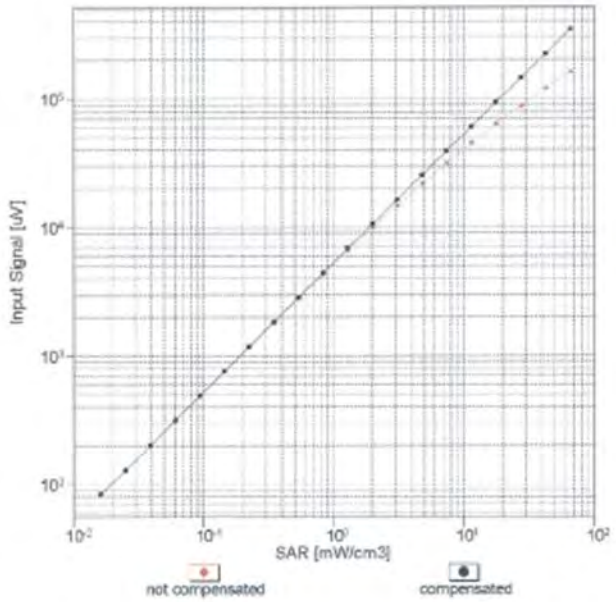
f=1800 MHz,R22

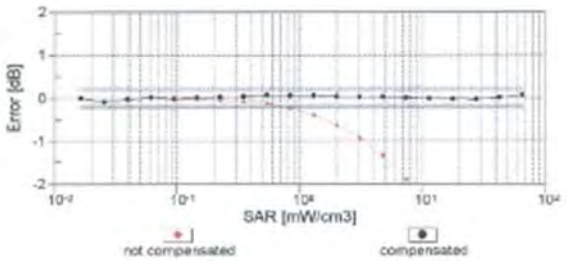




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})
(TEM cell , f = 900 MHz)

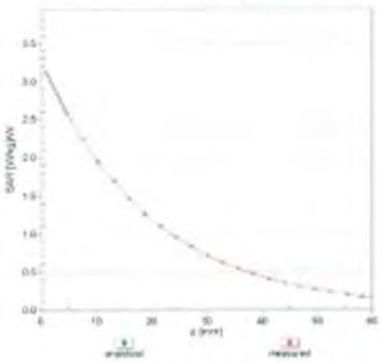




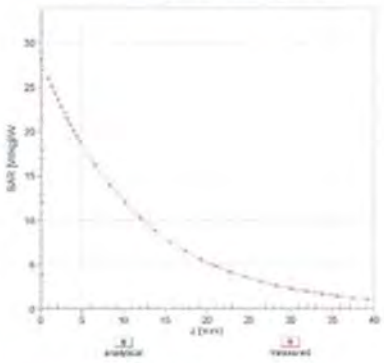
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

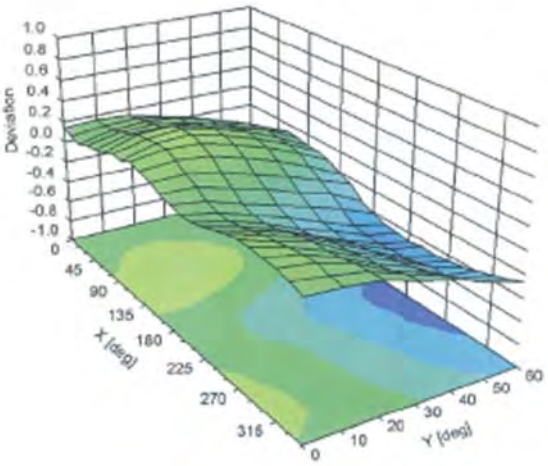


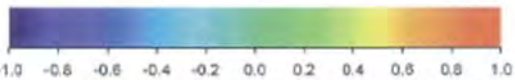
f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3770

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-33.7
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

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 Distributioin	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	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	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.) Max at 850 band	3.08%	N	1	0.64	0.43	1.97%	1.32%	M
Liquid permitivity(meas.) Max at 850 band	3.71%	N	1	0.6	0.49	2.23%	1.82%	M
Combined standard uncertainty		RSS				11.95%	11.79%	
Expant uncertainty (95% confidence interval), K=2						23.89%	23.57%	

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 < 0.5% 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
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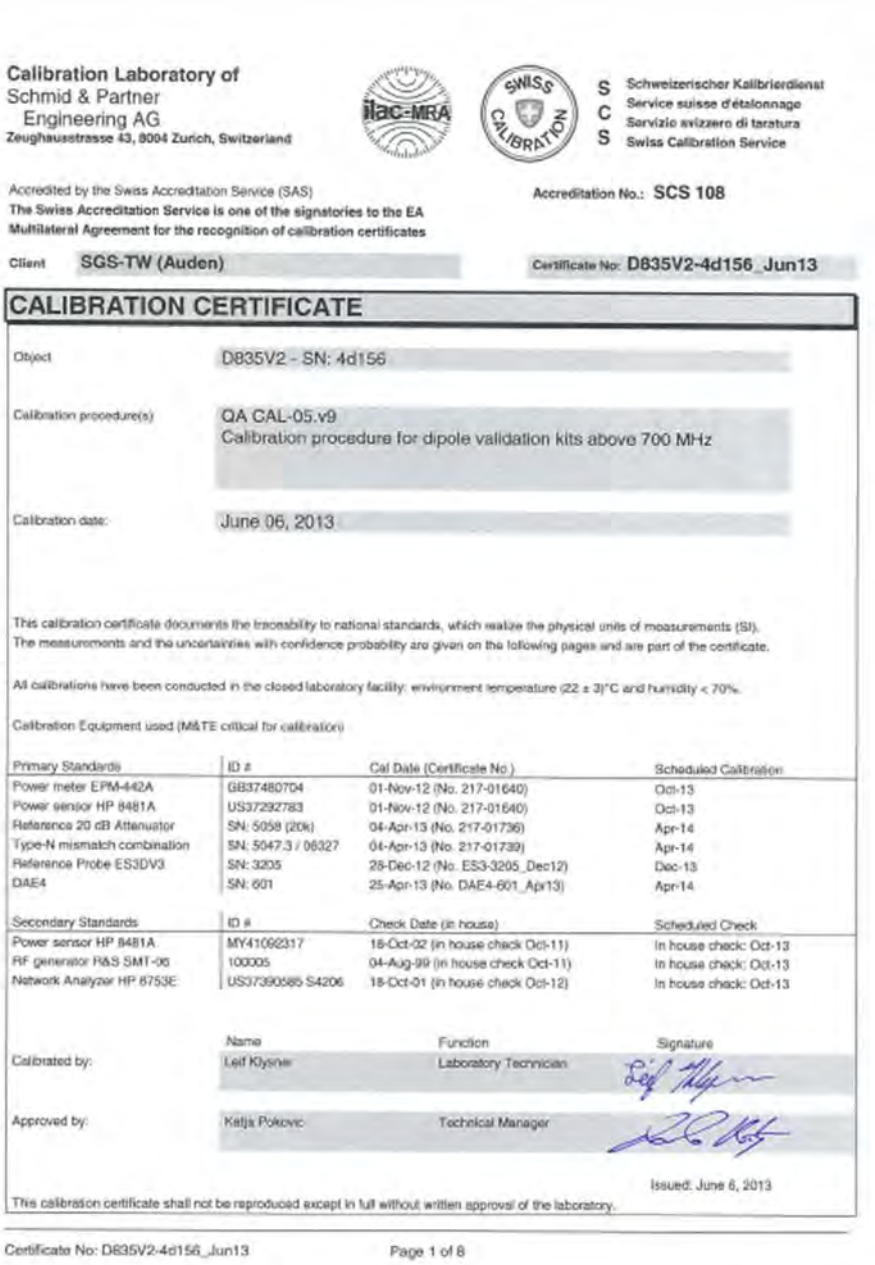
info@speag.com, http://www.speag.com

Doc No 881 – QD 000 P40 C – F Page 1 (1)

10. System Validation from Original Equipment Supplier



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S Swiss Calibration Service

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Accreditation No.: SCS 108

Client SGS-TW (Auden)

Certificate No: D835V2-4d156_Jun13

CALIBRATION CERTIFICATE

Object D835V2 - SN: 4d156

Calibration procedure(s) QA CAL-05.v9
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: June 06, 2013

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	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
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	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Leif Klysner	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: June 6, 2013

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Certificate No: D835V2-4d156_Jun13 Page 1 of 8

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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 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
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) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

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%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.6
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	40.4 ± 6 %	0.94 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.48 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.54 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.60 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.21 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	54.5 ± 6 %	1.00 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	---	---

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.46 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.59 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.60 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.27 W/kg ± 16.5 % (k=2)**

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.0 Ω - 2.4 jΩ
Return Loss	- 30.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.4 Ω - 4.6 jΩ
Return Loss	- 25.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.430 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 28, 2012

DASY5 Validation Report for Head TSL

Date: 06.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

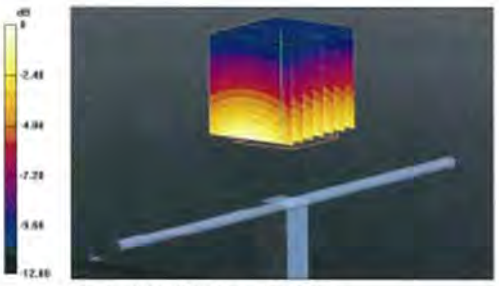
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d156

Communication System: UID 0 - CW ; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.94 S/m; ε_r = 40.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.05, 6.05, 6.05); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

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 = 57.269 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 3.78 W/kg
SAR(1 g) = 2.48 W/kg; SAR(10 g) = 1.6 W/kg
Maximum value of SAR (measured) = 2.92 W/kg



0 dB = 2.92 W/kg = 4.65 dBW/kg

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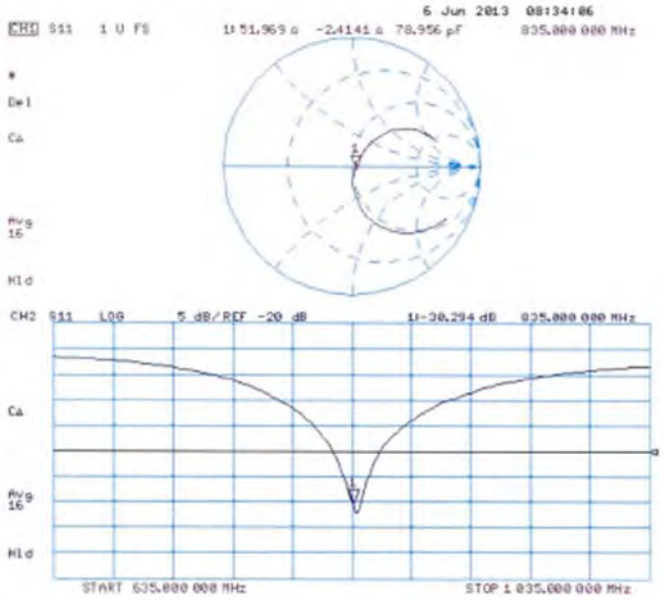
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL

Date: 05.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

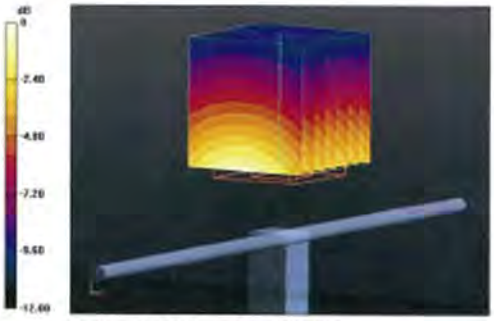
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d156

Communication System: UID 0 - CW ; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 1 S/m; ε_r = 54.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.04, 6.04, 6.04); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

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 = 55.321 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 3.64 W/kg
SAR(1 g) = 2.46 W/kg; SAR(10 g) = 1.6 W/kg
Maximum value of SAR (measured) = 2.87 W/kg



0 dB = 2.87 W/kg = 4.58 dBW/kg

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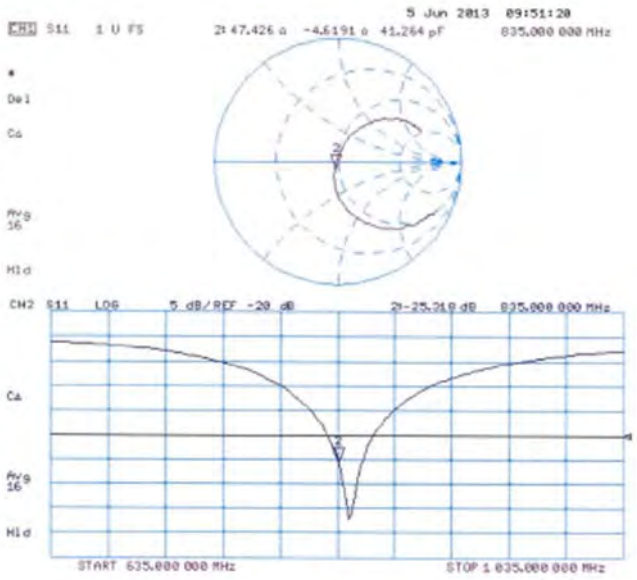
Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 108

Client SGS-TW (Auden)

Certificate No: D1900V2-5d173_Jun13

CALIBRATION CERTIFICATE

Object D1900V2 - SN: 5d173

Calibration procedure(s) QA CAL-05.v9
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: June 10, 2013

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	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
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	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: June 11, 2013

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Certificate No: D1900V2-5d173_Jun13 Page 1 of 8

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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 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
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) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

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%.

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	39.3 ± 6 %	1.34 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.82 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**40.2 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.17 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**21.0 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	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.7 ± 6 %	1.50 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	---	---

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.1 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**40.8 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.42 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.8 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.2 Ω + 5.4 jΩ
Return Loss	- 24.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.3 Ω + 5.8 jΩ
Return Loss	- 23.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.200 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	June 08, 2012

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DASY5 Validation Report for Head TSL

Date: 10.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

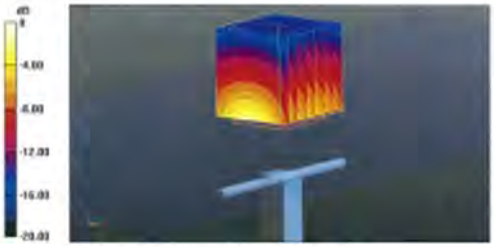
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d173

Communication System: UID 0 - CW ; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.34 S/m; ε_r = 39.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.98, 4.98, 4.98); Calibrated: 28.12.2012;
- 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 = 96.647 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 17.8 W/kg
SAR(1 g) = 9.82 W/kg; SAR(10 g) = 5.17 W/kg
Maximum value of SAR (measured) = 12.2 W/kg



0 dB = 12.2 W/kg = 10.86 dBW/kg

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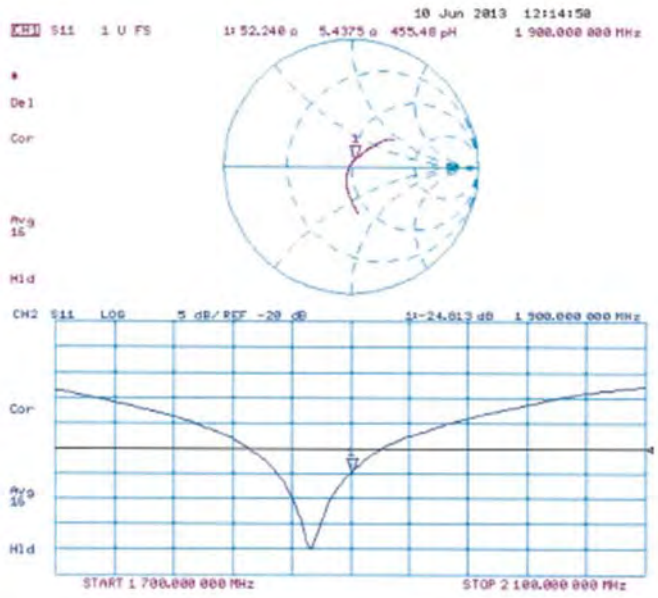
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL

Date: 10.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

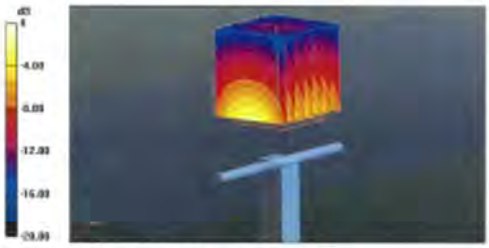
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d173

Communication System: UID 0 - CW ; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.5 S/m; ε_r = 53.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

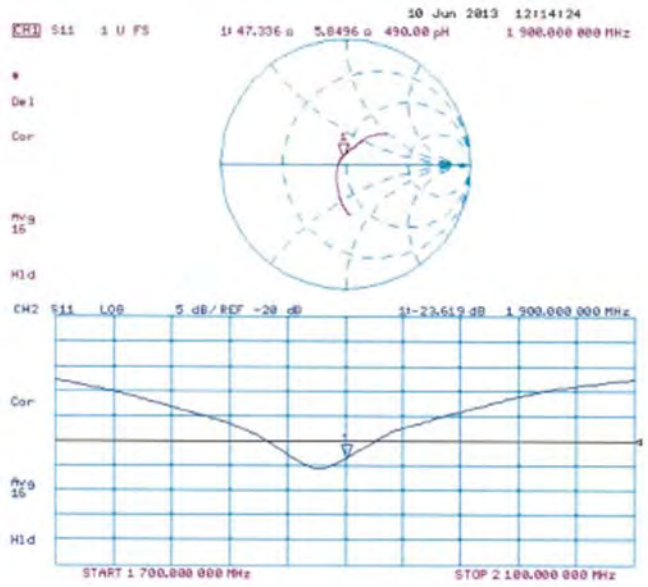
- Probe: ES3DV3 - SN3205; ConvF(4.6, 4.6, 4.6); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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 = 96.647 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 17.3 W/kg
SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.42 W/kg
Maximum value of SAR (measured) = 12.8 W/kg



0 dB = 12.8 W/kg = 11.07 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 108

Client SGS-TW (Auden)

Certificate No: D2450V2-912_Jun13

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 912
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	June 07, 2013

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	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01738)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Leif Klysner	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: June 7, 2013

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Certificate No: D2450V2-912_Jun13 Page 1 of 8

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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 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
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) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

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%.

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	37.8 ± 6 %	1.81 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	—	—

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.5 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**53.4 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.25 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.8 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	50.9 ± 6 %	2.02 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	—	—

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.2 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**51.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.06 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**24.0 W/kg ± 16.5 % (k=2)**

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	55.6 Ω + 1.3 jΩ
Return Loss	- 25.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.8 Ω + 2.9 jΩ
Return Loss	- 30.6 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 19, 2012

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DASY5 Validation Report for Head TSL

Date: 07.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

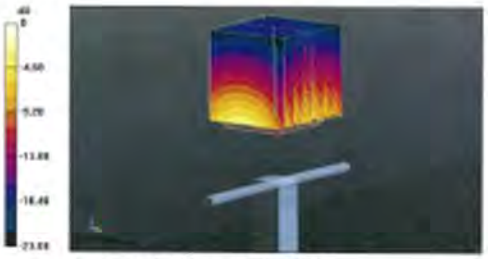
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 912

Communication System: UID 0 - CW ; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.81 S/m; ε_r = 37.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.52, 4.52, 4.52); Calibrated: 28.12.2012;
- 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)

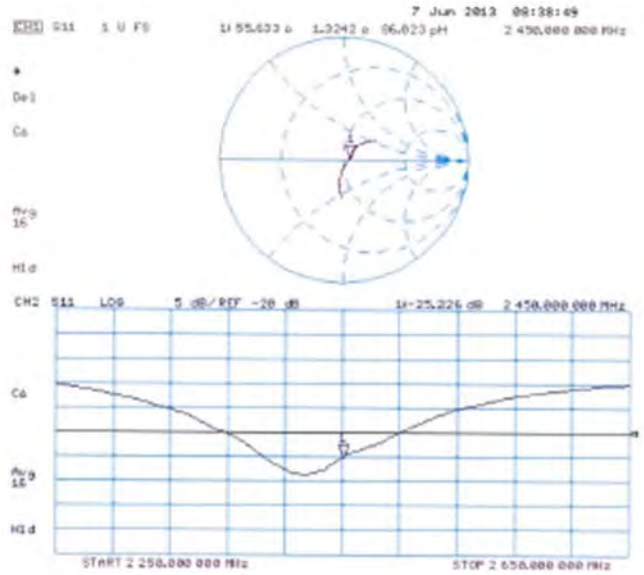
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.115 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 28.2 W/kg
SAR(1 g) = 13.5 W/kg; SAR(10 g) = 6.25 W/kg
Maximum value of SAR (measured) = 17.1 W/kg



0 dB = 17.1 W/kg = 12.33 dBW/kg

Certificate No: D2450V2-912_Jun13 Page 5 of 8

Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL

Date: 07.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

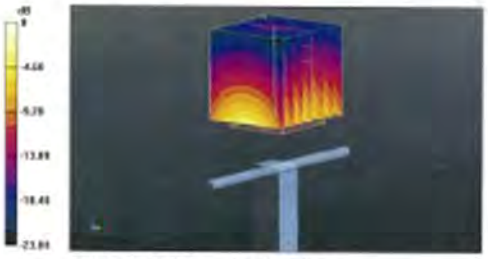
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 912

Communication System: UID 0 - CW ; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.02 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:

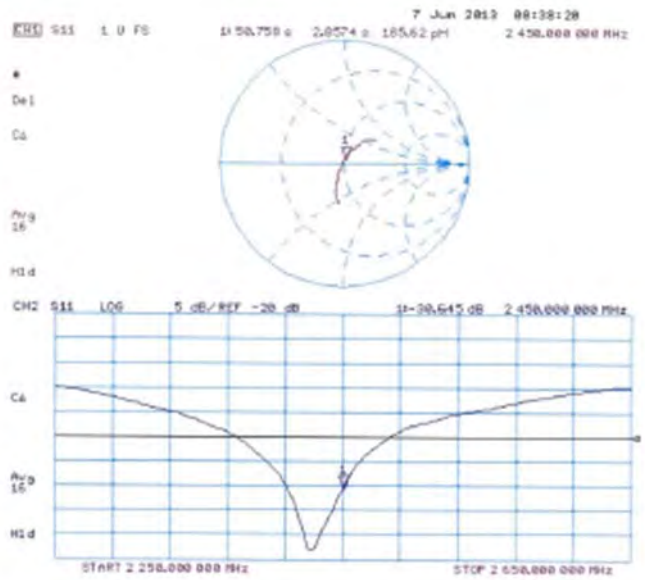
- Probe: ES3DV3 - SN3205; ConvF(4.42, 4.42, 4.42); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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 = 95.115 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 27.8 W/kg
SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.08 W/kg
Maximum value of SAR (measured) = 17.2 W/kg



0 dB = 17.2 W/kg = 12.36 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 108

Client SGS-TW (Auden)

Certificate No: D5GHzV2-1104_May13

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: May 07, 2013

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	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
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 EX3DV4	SN: 3503	28-Dec-12 (No. EX3-3503_Dec12)	Dec-13
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

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

Issued: May 7, 2013

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Certificate No: D5GHzV2-1104_May13 Page 1 of 15

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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) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

c) 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%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.6
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	34.7 ± 6 %	4.58 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	8.27 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**82.0 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.36 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.4 W/kg ± 19.5 % (k=2)**

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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	34.5 ± 6 %	4.68 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	---	---

SAR result with Head TSL at 5300 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.51 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**84.4 W / kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.44 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.1 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	34.1 ± 6 %	4.96 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	---	---

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.62 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**85.4 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.45 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.2 W/kg ± 19.5 % (k=2)**

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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	33.8 ± 6 %	5.17 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	---	---

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.09 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**80.1 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.30 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.7 W/kg ± 19.5 % (k=2)**

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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	46.9 ± 6 %	5.43 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	---	---

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.64 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**75.8 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.2 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 %	5.56 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	---	---

SAR result with Body TSL at 5300 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.77 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**77.1 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.17 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.5 W/kg ± 19.5 % (k=2)**

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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	46.2 ± 6 %	5.94 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	---	---

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	8.25 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**81.8 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.29 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	45.9 ± 6 %	6.22 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	---	---

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.60 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**75.4 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.10 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.8 W/kg ± 19.5 % (k=2)**

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Appendix

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	52.6 Ω - 9.7 jΩ
Return Loss	- 20.2 dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	52.6 Ω - 2.8 jΩ
Return Loss	- 28.6 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	57.2 Ω - 5.1 jΩ
Return Loss	- 21.7 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	55.5 Ω - 1.0 jΩ
Return Loss	- 25.5 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	53.1 Ω - 8.0 jΩ
Return Loss	- 21.7 dB

Antenna Parameters with Body TSL at 5300 MHz

Impedance, transformed to feed point	51.9 Ω - 2.0 jΩ
Return Loss	- 31.4 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	58.7 Ω - 3.7 jΩ
Return Loss	- 21.2 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	56.0 Ω + 1.5 jΩ
Return Loss	- 24.7 dB

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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

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DASY5 Validation Report for Head TSL

Date: 07.05.2013

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 = 4.58 S/m; ε_r = 34.7; ρ = 1000 kg/m^3 , Medium parameters used: f = 5300 MHz; σ = 4.68 S/m; ε_r = 34.5; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 4.96 S/m; ε_r = 34.1; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 5.17 S/m; ε_r = 33.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.41, 5.41, 5.41); Calibrated: 28.12.2012, ConvF(5.1, 5.1, 5.1); Calibrated: 28.12.2012, ConvF(4.76, 4.76, 4.76); Calibrated: 28.12.2012, ConvF(4.81, 4.81, 4.81); Calibrated: 28.12.2012;
- 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 52.8.6(1115); SEMCAD X 14.6.9(7117)

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 = 65.914 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 31.2 W/kg
SAR(1 g) = 8.27 W/kg; SAR(10 g) = 2.36 W/kg
Maximum value of SAR (measured) = 19.3 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 = 66.338 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 32.5 W/kg
SAR(1 g) = 8.51 W/kg; SAR(10 g) = 2.44 W/kg
Maximum value of SAR (measured) = 20.0 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 = 65.836 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 34.4 W/kg
SAR(1 g) = 8.62 W/kg; SAR(10 g) = 2.45 W/kg
Maximum value of SAR (measured) = 20.7 W/kg

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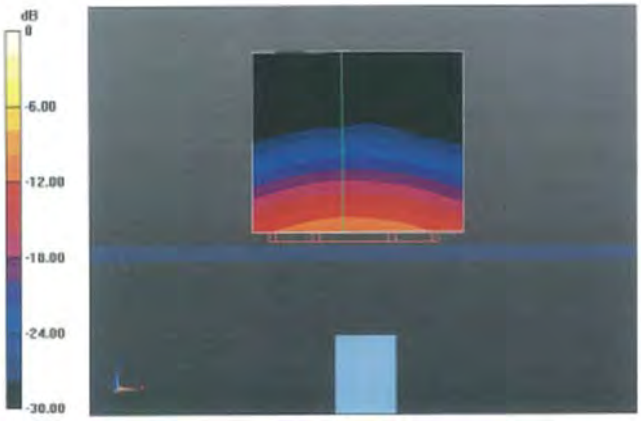
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz 2/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 62.381 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 33.9 W/kg
SAR(1 g) = 8.09 W/kg; SAR(10 g) = 2.3 W/kg
Maximum value of SAR (measured) = 19.8 W/kg



0 dB = 19.8 W/kg = 12.97 dBW/kg

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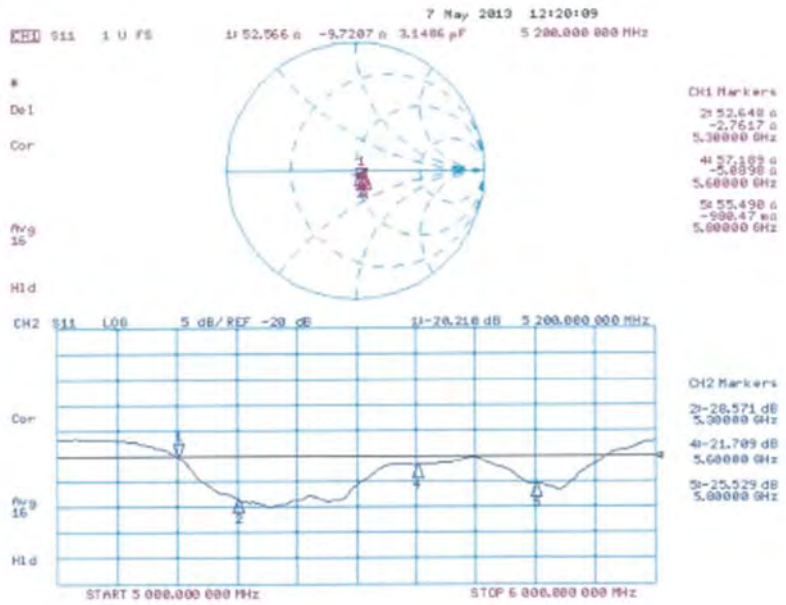
Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 06.05.2013

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 = 5.43 S/m; ε_r = 46.9; ρ = 1000 kg/m^3 , Medium parameters used: f = 5300 MHz; σ = 5.56 S/m; ε_r = 46.8; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 5.94 S/m; ε_r = 46.2; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 6.22 S/m; ε_r = 45.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

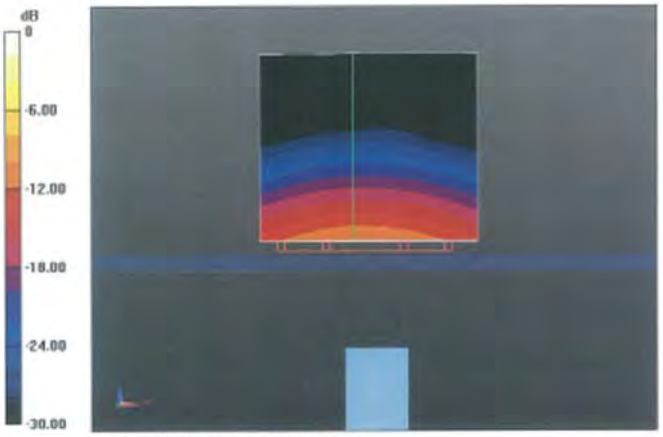
- Probe: EX3DV4 - SN3503; ConvF(4.91, 4.91, 4.91); Calibrated: 28.12.2012, ConvF(4.67, 4.67, 4.67); Calibrated: 28.12.2012, ConvF(4.22, 4.22, 4.22); Calibrated: 28.12.2012, ConvF(4.38, 4.38, 4.38); Calibrated: 28.12.2012;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

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 = 59.375 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 30.1 W/kg
SAR(1 g) = 7.64 W/kg; SAR(10 g) = 2.14 W/kg
Maximum value of SAR (measured) = 18.0 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 = 59.419 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 31.4 W/kg
SAR(1 g) = 7.77 W/kg; SAR(10 g) = 2.17 W/kg
Maximum value of SAR (measured) = 18.5 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 = 59.408 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 36.4 W/kg
SAR(1 g) = 8.25 W/kg; SAR(10 g) = 2.29 W/kg
Maximum value of SAR (measured) = 20.3 W/kg

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 = 56.084 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 35.3 W/kg
SAR(1 g) = 7.6 W/kg; SAR(10 g) = 2.1 W/kg
Maximum value of SAR (measured) = 18.9 W/kg



0 dB = 18.9 W/kg = 12.76 dBW/kg

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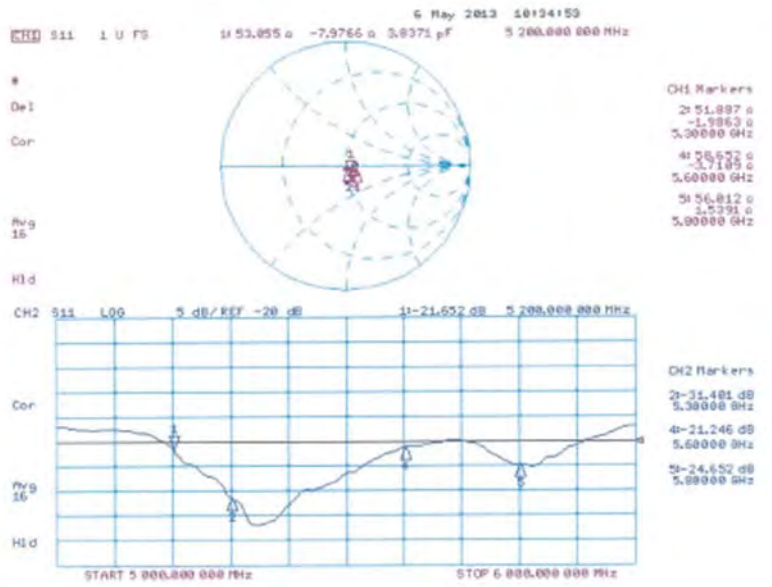
Impedance Measurement Plot for Body TSL



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End of 1st part of report