

# SAR TEST REPORT



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

Equipment Under Test	Smart Phone
Company Name	Sharp Corporation, IoT Communication B.U.
Company Address	2-13-1, Hachihonmatsu-Iida, Higashi-hiroshima-shi,Hiroshima 739-0192, Japan
Standards	IEEE/ANSI C95.1-1992, IEEE 1528-2013,
	KDB248227D01v02r02,KDB865664D01v01r04,
	KDB865664D02v01r02,KDB941225D01v03r01,
	KDB941225D06v02r01,KDB447498D01v06,
	KDB648474D04v01r03, KDB941225D05v02r05
FCC ID	APYHRO00252
Date of Receipt	Aug. 10, 2017
Date of Test(s)	Aug. 18, 2017 ~ Sep. 15, 2017
Date of Issue	Sep. 18, 2017
In the configuration tested, the EL	IT complied with the standards specified above

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

#### **Remarks:**

This report details the results of the testing carried out on one sample, 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

Supervisor

Matt Kuo Matt Kuo

Date: Sep. 18. 2017

John Teh

John Yeh Date: Sep. 18, 2017

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Highest SAR Summary					
Equipment class	Frequency Band	Head (Separation 0mm)	Body-worn (Separation 10mm)	Hotspot (Separation 10mm)	Highest Simultaneous Transmission 1g SAR(W/Kg)
		1g SAR(W/Kg)			
Licensed	GSM1900	0.55	0.69	0.69	0.87
DTS	2.4GHz WLAN	0.11	0.18	0.18	0.07
Date of Testing 2017/8/18~2017/9/1					

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Report No. : E5/2017/80011 Page : 3 of 139

### **Revision History**

Report Number	Revision	Description	Issue Date
E5/2017/80011	Rev.00	Initial creation of document	Sep. 13, 2017
E5/2017/80011	Rev.01	1 <sup>st</sup> modification	Sep. 18, 2017

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## Contents

1. General Information	5
1.1 Testing Laboratory	5
1.2 Details of Applicant	5
1.3 Description of EUT	6
1.4 Test Environment	
1.5 Operation Description	
1.6 Positioning Procedure	
1.7 Evaluation Procedures	
1.8 Probe Calibration Procedures	30
1.9 The SAR Measurement System	33
1.10 System Components	35
1.11 SAR System Verification	37
1.12 Tissue Simulant Fluid for the Frequency Band	39
1.13 Test Standards and Limits	42
2. Summary of Results	44
3. Simultaneous Transmission Analysis	49
3.1 Estimated SAR calculation	50
3.2 SPLSR evaluation and analysis	50
4. Instruments List	55
5. Measurements	
6. SAR System Performance Verification	
7. DAE & Probe Calibration Certificate	
8. Uncertainty Budget	
9. Phantom Description	
10. System Validation from Original Equipment Supplier	

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### **1. General Information**

#### 1.1 Testing Laboratory

SGS Taiwan Ltd. Electronics & Communication Laboratory			
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Tel	+886-2-2299-3279		
Fax	+886-2-2298-0488		
Internet	http://www.tw.sgs.com/		

#### **1.2 Details of Applicant**

Company Name Sharp Corporation, IoT Communication B.U.	
1 mpony / adroce	2-13-1, Hachihonmatsu-Iida, Higashi-hiroshima-shi,Hiroshima 739-0192, Japan

#### 1.2.1 Details of Manufacturer

Company Name	Sharp Corporation
Company Address	1 Takumi-cho, Sakai-ku, Sakai-Shi, Osaka 590-8522,Japan

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#### 1.3 Description of EUT

EUT Name	Smart Phone					
FCC ID	APYHRO00252					
				4		
Mode of Operation	⊠HSDPA	⊠HSUPA				
	LTE FDD	Bluetooth	WLAN8	02.11 b/g	/n(20N	1)
	GSM (DTM multi cl	ass B)			1/8.3	
Duty Cycle	GPRS (support multi class 12 max)		1/2 (1Dn4UP) 1/2.76 (1Dn3UP) 1/4.1 (1Dn2UP) 1/8.3 (1Dn1UP)		3UP) 2UP)	
	LTE FDD				1	
	WCDMA				1	
	WLAN802.11 b/g/n(20M)				1	
	Bluetooth				1	
	GSM850			824	—	849
	GSM1900			1850	_	1910
TX Frequency	WCDMA Band V			824	—	849
Range	LTE FDD Bar	nd 5		824	_	849
(MHz)	LTE FDD Bar	nd 17		704	—	716
	WLAN802.11 b/g/n(20M)			2412	_	2462
	Bluetooth			2402		2480

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Report No. : E5/2017/80011 Page : 7 of 139

	GSM850	128	—	251
	GSM1900	512	—	810
	WCDMA Band V	4132	—	4233
Channel Number (ARFCN)	LTE FDD Band 5	20407	—	20643
· /	LTE FDD Band 17	23755	_	23825
	WLAN802.11 b/g/n(20M)	1	—	11
	Bluetooth	0	_	78

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Max. SAR (1-g) (Unit: W/Kg)						
Mode	Band	Measured	Reported	Position / Channel		
	GSM 850	0.15	0.20	□Left ⊠Right ⊠Cheek □Tilt <u>251</u> Channel		
Head	GSM 1900	0.42	0.55	⊠Left		
	WCDMA Band V	0.10	0.11	☐Left ⊠Right ⊠Cheek ☐Tilt <u>4183</u> Channel		
	LTE FDD Band 5	0.07	0.08	☐Left ⊠Right ⊠Cheek ☐Tilt <u>20525</u> Channel		
	LTE FDD Band 17	0.02	0.02	☐Left ⊠Right ⊠Cheek ☐Tilt <u>23790</u> Channel		
	WLAN802.11 b	0.11	0.11	⊠Left ☐Right ⊠Cheek ☐Tilt <u>1</u> Channel		

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Max. SAR (1-g) (Unit: W/Kg)					
Mode	Band	Measured	Reported	Position / Channel	
	GSM 850	0.36	0.47	☐Front ⊠Back <u>251</u> Channel	
Body-worn	GSM 1900	0.53	0.69	☐Front ⊠Back <u>512</u> Channel	
	WCDMA Band V	0.28	0.30	☐Front ⊠Back <u>4183</u> Channel	
	LTE FDD Band 5	0.28	0.31	☐Front ⊠Back 20525 Channel	
	LTE FDD Band 17	0.07	0.08	☐Front ⊠Back <u>23790</u> Channel	
	WLAN802.11 b	0.18	0.18	☐Front ⊠Back <u>1</u> Channel	

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Max. SAR (1-g) (Unit: W/Kg)					
Mode	Band	Measured	Reported	Position / Channel	
	GPRS 850 (1Dn4UP)	0.40	0.51	☐Front ⊠Back ☐Bottom ☐Right ☐Left <u>128</u> Channel	
Hotspot mode	GPRS 1900 (1Dn4UP)	0.55	0.69	☐Front ☐Back ☐Bottom ☐Right ☐Left <u>512</u> Channel	
	WCDMA Band V	0.28	0.30	☐Front ⊠Back ☐Top ☐Right ☐Left <u>4183</u> Channel	
	LTE FDD Band 5	0.28	0.31	☐Front ⊠Back ☐Bottom ☐Right ☐Left <u>20525</u> Channel	
	LTE FDD Band 17	0.07	0.08	☐Front ⊠Back ☐Top ☐Right ☐Left <u>23790</u> Channel	
	WLAN802.11 b	0.18	0.18	☐Front ⊠Back ☐Top ☐Right ☐Left 1_Channel	

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#### GSM 850 - conducted power table:

EUT mode	Frequency	СН	Max. Rated Avg.	Burst average power	Source-based time average power		
	(MHz)		Power + Max.	Avg. (dBm)	Avg. (dBm)		
0014050	824.2	128	33.6	32.30	23.27		
GSM850 (GMSK)	836.6	190	33.6	32.33	23.30		
	848.8	251	33.6	32.40	23.37		
	The divisior	n factor com	pared to the	e number of TX tin	ne slot		
	Divisio	n factor	1 TX time slot				
	DIVISIO	TIACIUI		-9.03			

#### GPRS 850 - conducted power table:

			Burst avera	age power		
	ted Avg. Pow olerance (dBr		33.6	31.2	29.5	28.4
			1Dn1UP	1Dn2UP	1Dn3UP	1Dn4UP
EUT mode	Frequency (MHz)	СН	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)
GPRS	824.2	128	32.30	30.15	28.33	27.37
850	836.6	190	32.33	30.05	28.22	27.22
050	848.8	251	32.40	30.04	28.30	27.35
		Sc	ource-based tim	e average powe	er	
GPRS	824.2	128	23.27	24.13	24.07	24.36
850	836.6	190	23.30	24.03	23.96	24.21
050	848.8	251	23.37	24.02	24.04	24.34
	The div	ision fa	actor compared			
Div	ision factor		1 TX time slot -9.03	2 TX time slot -6.02	3 TX time slot -4.26	4 TX time slot -3.01

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#### GSM 1900 - conducted power table:

EUT mode	Frequency (MHz)	СН	Max. Rated Avg.	Burst average power	Source-based time average power		
	(IVITIZ)		Power + Max.	Avg. (dBm)	Avg. (dBm)		
0014000	1850.2	512	30.7	29.54	20.51		
GSM1900 (GMSK)	1800	661	30.7	29.52	20.49		
	1909.8	810	30.7	29.45	20.42		
	The divisior	n factor com	npared to the	e number of TX tir	ne slot		
	Divisio	a factor	1 TX time slot				
	DIVISIO	Πασισι		-9.03			

#### GPRS 1900 - conducted power table:

		-	Burst avera	age power		
	ted Avg. Powe olerance (dBr		30.7	28.2	26.5	25.5
			1Dn1UP	1Dn2UP	1Dn3UP	1Dn4UP
EUT mode	Frequency (MHz)	СН	Avg. (dBm)	A∨g. (dBm)	Avg. (dBm)	Avg. (dBm)
GPRS	1850.2	512	29.54	27.19	25.52	24.50
1900	1880	661	29.52	27.14	25.45	24.42
1900	1909.8	810	29.45	27.17	25.46	24.41
		Sc	ource-based tim	e average powe	er	
GPRS	1850.2	512	20.51	21.17	21.26	21.49
1900	1880	661	20.49	21.12	21.19	21.41
1900	1909.8	810	20.42	21.15	21.20	21.40
	The div	ision fa	actor compared	to the number of	of TX time slot	
Div	ision factor			2 TX time slot		
			-9.03	-6.02	-4.26	-3.01

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	Band	\ \	WCDMA \	/	
	TX Channel	annel 4132 4183 423		4233	
Fr	equency (MHz)	826.4	836.6	846.6	
Max. Rated Avg.	Power+Max. Tolerance (dBm)		24.20		
3GPP Rel 99	RMC 12.2Kbps	23.54	23.96	23.95	
	HSDPA Subtest-1	22.68	22.92	22.74	
3GPP Rel 5	HSDPA Subtest-2	22.14	22.39	22.22	
JULL VELD	HSDPA Subtest-3	22.13	22.38	22.20	
	HSDPA Subtest-4	22.12	22.36	22.20	
	HSUPA Subtest-1	22.72	22.63	22.64	
	HSUPA Subtest-2	21.46	21.26	21.42	
3GPP Rel 6	HSUPA Subtest-3	21.27	21.38	21.22	
	HSUPA Subtest-4	21.87	22.00	21.61	
	HSUPA Subtest-5	22.50	22.80	22.60	

#### Subtests for WCDMA Release 5 HSDPA

SUB-TEST	β <sub>c</sub>	$\beta_d$	β <sub>d</sub> (SF)	β <sub>c</sub> /β <sub>d</sub>	β <sub>HS</sub> (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

#### Subtests for WCDMA Release 6 HSUPA

SUB-TEST	βο	βd	β₀ (SF)	β <sub>o</sub> /β <sub>d</sub>	β <sub>HS</sub> (Note1)	β <sub>ec</sub>	β <sub>ed</sub> (Note 5) (Note 6)	β <sub>ed</sub> (SF)	β <sub>ed</sub> (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 6)	E-TFCI
1	11/15	15/15	64	11/15	22/15	209/225	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β <sub>ed</sub> 1: 47/15 β <sub>ed</sub> 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

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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			•	FDD Band 5				
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
				829	20450	23.05	24.2	0
			0	836.5	20525	23.24	24.2	0
				844	20600	23.26	24.2	0
				829	20450	23.39	24.2	0
		1 RB	25	836.5	20525	23.77	24.2	0
				844	20600	23.55	24.2	0
				829	20450	23.19	24.2	0
			49	836.5	20525	23.39	24.2	0
				844	20600	23.24	24.2	0
			0	829	20450	22.65	23.2	0-1
	QPSK			836.5	20525	22.74	23.2	0-1
		25 RB		844	20600	22.70	23.2	0-1
			12	829	20450	22.70	23.2	0-1
				836.5	20525	22.80	23.2	0-1
				844	20600	22.66	23.2	0-1
				829	20450	22.58	23.2	0-1
		25	836.5	20525	22.65	23.2	0-1	
				844	20600	22.61	23.2	0-1
				829	20450	22.57	23.2	0-1
		50	RB	836.5	20525	22.72	23.2	0-1
10				844	20600	22.62	23.2	0-1
10			0	829	20450	22.23	23.2	0-1
				836.5	20525	22.13	23.2	0-1
				844	20600	22.13	23.2	0-1
			25	829	20450	23.01	23.2	0-1
		1 RB		836.5	20525	22.82	23.2	0-1
				844	20600	22.14	23.2	0-1
				829	20450	21.79	23.2	0-1
			49	836.5	20525	22.35	23.2	0-1
				844	20600	22.39	23.2	0-1
				829	20450	21.58	22.2	0-2
	16-QAM		0	836.5	20525	21.56	22.2	0-2
				844	20600	21.57	22.2	0-2
				829	20450	22.00	22.2	0-2
		25 RB	12	836.5	20525	21.74	22.2	0-2
				844	20600	21.51	22.2	0-2
				829	20450	21.52	22.2	0-2
			25	836.5	20525	21.64	22.2	0-2
				844	20600	21.48	22.2	0-2
				829	20450	21.53	22.2	0-2
		500	)RB	836.5	20525	21.74	22.2	0-2
				844	20600	21.53	22.2	0-2

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				FDD Band 5				
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
				826.5	20425	22.99	24.2	0
			0	836.5	20525	23.36	24.2	0
				846.5	20625	23.18	24.2	0
				826.5	20425	23.58	24.2	0
		1 RB	12	836.5	20525	23.74	24.2	0
				846.5	20625	23.76	24.2	0
				826.5	20425	23.20	24.2	0
			24	836.5	20525	23.49	24.2	0
				846.5	20625	23.47	24.2	0
				826.5	20425	22.56	23.2	0-1
	QPSK		0	836.5	20525	22.66	23.2	0-1
				846.5	20625	22.51	23.2	0-1
			6	826.5	20425	22.66	23.2	0-1
		12 RB		836.5	20525	22.79	23.2	0-1
				846.5	20625	22.67	23.2	0-1
				826.5	20425	22.60	23.2	0-1
			13	836.5	20525	22.56	23.2	0-1
				846.5	20625	22.66	23.2	0-1
				826.5	20425	22.60	23.2	0-1
		25	RB	836.5	20525	22.78	23.2	0-1
5			-	846.5	20625	22.67	23.2	0-1
Ũ			0	826.5	20425	21.83	23.2	0-1
				836.5	20525	22.50	23.2	0-1
				846.5	20625	22.40	23.2	0-1
			12	826.5	20425	22.22	23.2	0-1
		1 RB		836.5	20525	22.80	23.2	0-1
				846.5	20625	22.04	23.2	0-1
				826.5	20425	22.79	23.2	0-1
			24	836.5	20525	22.55	23.2	0-1
				846.5	20625	22.87	23.2	0-1
				826.5	20425	21.47	22.2	0-2
	16-QAM		0	836.5	20525	21.63	22.2	0-2
				846.5	20625	21.51	22.2	0-2
				826.5	20425	21.75	22.2	0-2
		12 RB	6	836.5	20525	21.79	22.2	0-2
			846.5	20625	21.74	22.2	0-2	
			4.5	826.5	20425	21.66	22.2	0-2
			13	836.5	20525	21.58	22.2	0-2
				846.5	20625	21.61	22.2	0-2
			<b>D</b> D	826.5	20425	21.71	22.2	0-2
		25	RB	836.5	20525	21.69	22.2	0-2
				846.5	20625	21.63	22.2	0-2

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BW(Mhz)         Modulation         RB Size         RB Offset         Image: Prequency (MHz)         Channel         Conducted power (dBm) (					FDD Band 5				
3 3 4 1 RB 1 R	BW(Mhz)	Modulation	RB Size	RB Offset		Channel		Power + Max. Tolerance	MPR Allowed per 3GPP(dB)
3 3 3 4 4 4 4 4 4 4 4 4 4 4 4 4					825.5	20415	23.38	24.2	0
3 1 RB 1 RB				0	836.5	20525	23.54	24.2	0
3 1 RB 1 RB 1 RB 1 RB 1 RB 7 8 8.6.5 2 0525 2 3.77 2 4.2 0 8 47.5 2 0635 2 3.57 2 4.2 0 8 25.5 2 0415 2 2.68 2 3.5 2 4.2 0 8 47.5 2 0635 2 3.62 2 4.2 0 8 47.5 2 0635 2 2.79 2 3.2 0 -1 8 36.5 2 0525 2 2.79 2 3.2 0 -1 8 36.5 2 0525 2 2.79 2 3.2 0 -1 8 47.5 2 0635 2 2.79 2 3.2 0 -1 8 7 8 25.5 2 0415 2 2.69 2 2.79 2 3.2 0 -1 8 7 8 7 8 8 B 4 8 RB 4 8 RB 4 8 RB 7 8 8 RB 7 8 RB 7 8 RB 7 8 8 RB 7 8 RB 7 7 8 RB 7 8 RB 7 7 8 RB 7 7 8 RB 7 8 RB 7 8 RB 7 8 RB 7 7 8 RB 7 7 8 RB 7 8					847.5	20635	23.45	24.2	0
3 3 3 4 4 4 4 4 4 4 4 4 4 4 4 4					825.5	20415	23.32	24.2	0
3 3 4 4 4 4 4 4 4 4 4 4 4 4 4			1 RB	7	836.5	20525	23.77	24.2	0
3 A PSK					847.5	20635	23.67	24.2	0
3 3 3 3 3 3 3 3 3 3 3 3 3 3					825.5	20415	23.35	24.2	0
3 3 3 A PSK A RB A B RB A C C COS25 C				14	836.5	20525	23.56	24.2	0
3 3 3 4 16-QAM 16-QAM 16-QAM 16-QAM 3 RB 4 0 0 8 RB 0 0 8 RB 0 0 8 RB 0 0 8 RB 0 0 8 RB 0 0 8 RB 0 0 8 RB 0 0 8 RB 16-QAM 16-QAA 16-QAA 16-QAA 16-QAA 16-QAA 16-QAA 16-QAA 16-QAA 1					847.5	20635	23.62	24.2	0
3 3 3 3 3 3 3 3 3 3 3 3 3 3					825.5	20415	22.68	23.2	0-1
3 3 3 3 4 8 RB 4 8 RB 4 8 8 RB 4 8 8 8 8 8 8 8 8 8 8 8 8 8		QPSK		0					0-1
3 3 3 4 8 RB 4 8 RB 4 8 8 RB 4 8 8 8 8 8 8 8 8 8 8 8 8 8					847.5	20635	22.79		0-1
3 3 3 3 4 16-QAM 16-QAM 16-QAM 16-QAM 3 3 3 4 16-QAM 17-20-20 17-20				4					0-1
3 3 3 3 3 3 3 3 3 3 3 3 3 3			8 RB						0-1
3         7         836.5         20525         22.58         23.2         0.1           15RB         825.5         20415         22.63         23.2         0.1           15RB         836.5         20525         22.68         23.2         0.1           847.5         20635         22.67         23.2         0.1           886.5         20525         22.68         23.2         0.1           847.5         20635         22.72         23.2         0.1           847.5         20635         22.72         23.2         0.1           847.5         20635         23.15         23.2         0.1           847.5         20635         23.15         23.2         0.1           847.5         20635         23.15         23.2         0.1           847.5         20635         23.00         23.2         0.1      847.5         20635         22.83         23.2         0.1      14         836.5         20525         23.00         23.2         0.1      14         836.5         20525         22.31         23.2         0.1      847.5         20635         21.79         22.2         0.2								23.2	0-1
3 3 3 3 3 3 3 3 3 3 3 3 3 3						20415	22.69		0-1
3 3 3 15RB $\frac{825.5}{20415}$ $\frac{22.63}{22.68}$ $\frac{23.2}{23.2}$ $0.1$ $\frac{836.5}{20525}$ $\frac{22.68}{22.72}$ $\frac{23.2}{23.2}$ $0.1$ $\frac{847.5}{20635}$ $\frac{22.72}{23.2}$ $\frac{23.2}{0.1}$ $\frac{825.5}{20415}$ $\frac{22.90}{23.2}$ $\frac{23.2}{0.1}$ $\frac{825.5}{20415}$ $\frac{22.90}{23.2}$ $\frac{23.2}{0.1}$ $\frac{847.5}{20635}$ $\frac{23.15}{23.15}$ $\frac{23.2}{23.2}$ $0.1$ $\frac{847.5}{20635}$ $\frac{20525}{23.15}$ $\frac{23.2}{23.2}$ $0.1$ $\frac{825.5}{20415}$ $\frac{22.83}{23.2}$ $\frac{23.2}{0.1}$ $\frac{825.5}{20415}$ $\frac{22.83}{22.28}$ $\frac{23.2}{23.2}$ $0.1$ $\frac{825.5}{20415}$ $\frac{22.97}{23.2}$ $0.1$ $\frac{825.5}{20415}$ $\frac{22.97}{22.31}$ $\frac{23.2}{0.1}$ $\frac{14}{836.5}$ $\frac{20525}{20525}$ $\frac{22.31}{23.1}$ $\frac{23.2}{0.1}$ $\frac{847.5}{20635}$ $\frac{20525}{21.79}$ $\frac{22.2}{20.2}$ $0.2$ $\frac{847.5}{20635}$ $\frac{21.79}{21.29}$ $\frac{22.2}{0.2}$ $\frac{247.5}{20635}$ $\frac{21.79}{22.2}$ $0.2$ $\frac{247.5}{20635}$ $\frac{21.79}{22.2}$ $0.2$ $\frac{247.5}{20635}$ $\frac{21.79}{22.2}$ $0.2$ $\frac{247.5}{20635}$ $\frac{21.79}{22.2}$ $0.2$ $\frac{247.5}{20635}$ $\frac{21.79}{22.2}$ $0.2$ $\frac{247.5}{20635}$ $\frac{21.77}{22.2}$ $0.2$ $\frac{247.5}{20635}$ $\frac{21.78}{21.78}$ $\frac{22.2}{20.2}$ $0.2$ $\frac{247.5}{20635}$ $\frac{21.78}{21.78}$ $\frac{22.2}{20.2}$ $0.2$ $\frac{247.5}{20635}$ $\frac{21.78}{21.25}$ $\frac{22.2}{20.22}$ $0.2$ $\frac{247.5}{20635}$ $\frac{21.95}{21.78}$ $\frac{22.2}{20.22}$ $0.2$ $\frac{247.5}{20635}$ $\frac{21.75}{21.78}$ $\frac{22.2}{20.22}$ $0.2$ $\frac{247.5}{20635}$ $\frac{21.75}{21.78}$ $\frac{22.2}{20.22}$ $0.2$ $\frac{247.5}{20635}$ $\frac{21.95}{21.78}$ $\frac{22.2}{20.22}$ $0.2$ $\frac{247.5}{20635}$ $\frac{21.75}{21.78}$ $\frac{22.2}{20.22}$ $0.2$ $\frac{247.5}{20635}$ $\frac{21.75}{21.78}$ $\frac{22.2}{20.22}$ $0.2$ $\frac{247.5}{$				7					0-1
3 3 3 15RB 15RB 836.5 20525 22.68 23.2 0.1 847.5 20635 22.72 23.2 0.1 847.5 20635 22.72 23.2 0.1 825.5 20415 22.90 23.2 0.1 836.5 20525 23.18 23.2 0.1 847.5 20635 23.15 23.2 0.1 847.5 20635 22.28 23.2 0.1 847.5 20635 22.28 23.2 0.1 847.5 20635 22.28 23.2 0.1 847.5 20635 22.28 23.2 0.1 847.5 20635 22.75 23.2 0.1 847.5 20635 22.75 23.2 0.1 847.5 20635 22.75 23.2 0.1 847.5 20635 22.75 23.2 0.1 847.5 20635 21.79 22.2 0.2 847.5 20635 21.69 22.2 0.2 847.5 20635 21.69 22.2 0.2 847.5 20635 21.69 22.2 0.2 847.5 20635 21.77 22.2 0.2 847.5 20635 21.78 22.2 0.2 847.5 20635 21.78 22.2 0.2 847.5 20635 21.78 22.2 0.2 847.5 20635 21.95 22.2 0.2 21.78 22.2 0.2 847.5 20635 21.95 22.2 0.2 21.95 22.2 0.2 21.95 22.2 0.2 21.95 22.2 0.2 21.95 22.2 0.2 21.95 22.2 0.2  2									0-1
3 3 847.5 20635 22.72 23.2 0-1 847.5 20635 22.72 23.2 0-1 825.5 20415 22.90 23.2 0-1 836.5 20525 23.18 23.2 0-1 847.5 20635 23.15 23.2 0-1 847.5 20635 23.15 23.2 0-1 847.5 20635 22.28 23.2 0-1 847.5 20635 22.28 23.2 0-1 847.5 20635 22.28 23.2 0-1 847.5 20635 22.28 23.2 0-1 847.5 20635 22.75 23.2 0-1 847.5 20635 22.75 23.2 0-1 847.5 20635 22.75 23.2 0-1 847.5 20635 22.75 23.2 0-1 847.5 20635 21.79 22.2 0-2 847.5 20635 21.69 22.2 0-2 847.5 20635 21.69 22.2 0-2 847.5 20635 21.69 22.2 0-2 847.5 20635 21.77 22.2 0-2 847.5 20635 21.78 22.2 0-2 847.5 20635 21.95 22.2									0-1
3         0         825.5         20415         22.90         23.2         0-1           836.5         20525         23.18         23.2         0-1           847.5         20635         23.15         23.2         0-1           847.5         20635         23.15         23.2         0-1           847.5         20635         23.15         23.2         0-1           847.5         20635         22.83         23.2         0-1           847.5         20635         22.28         23.2         0-1           847.5         20635         22.28         23.2         0-1           847.5         20635         22.28         23.2         0-1           847.5         20635         22.28         23.2         0-1           847.5         20635         22.17         23.2         0-1           847.5         20635         22.75         23.2         0-1           847.5         20635         21.79         22.2         0-2           847.5         20635         21.79         22.2         0-2           847.5         20635         21.74         22.2         0-2           847.5         <			15	RB					0-1
$1 \text{RB} = \begin{bmatrix} 0 & \frac{836.5}{20525} & \frac{23.18}{23.15} & \frac{23.2}{23.2} & 0.1 \\ 847.5 & 20635 & \frac{23.15}{22.83} & \frac{23.2}{23.2} & 0.1 \\ 847.5 & 20635 & \frac{22.28}{23.2} & \frac{23.2}{2.28} & 0.1 \\ 847.5 & 20635 & \frac{22.28}{22.28} & \frac{23.2}{23.2} & 0.1 \\ 847.5 & 20635 & \frac{22.28}{22.31} & \frac{23.2}{23.2} & 0.1 \\ 847.5 & 20635 & \frac{22.27}{23.2} & 0.1 \\ 847.5 & 20635 & \frac{22.75}{22.31} & \frac{23.2}{23.2} & 0.1 \\ 847.5 & 20635 & \frac{22.75}{22.31} & \frac{23.2}{23.2} & 0.1 \\ 847.5 & 20635 & \frac{22.75}{22.31} & \frac{23.2}{23.2} & 0.1 \\ 847.5 & 20635 & \frac{22.75}{21.79} & \frac{22.2}{2.2} & 0.2 \\ 847.5 & 20635 & \frac{21.69}{21.73} & \frac{22.2}{2.2} & 0.2 \\ 847.5 & 20635 & \frac{21.79}{21.73} & \frac{22.2}{2.2} & 0.2 \\ 847.5 & 20635 & \frac{21.77}{21.2} & 0.2 \\ 847.5 & 20635 & \frac{21.77}{21.78} & \frac{22.2}{22.2} & 0.2 \\ 847.5 & 20635 & \frac{21.77}{21.78} & \frac{22.2}{22.2} & 0.2 \\ 847.5 & 20635 & \frac{21.78}{21.78} & \frac{22.2}{22.2} & 0.2 \\ 847.5 & 20635 & \frac{21.78}{21.78} & \frac{22.2}{22.2} & 0.2 \\ 847.5 & 20635 & \frac{21.78}{21.78} & \frac{22.2}{22.2} & 0.2 \\ 847.5 & 20635 & \frac{21.95}{21.78} & \frac{22.2}{22.2} & 0.2 \\ 847.5 & 20635 & \frac{21.95}{21.78} & \frac{22.2}{22.2} & 0.2 \\ 847.5 & 20635 & \frac{21.95}{21.78} & \frac{22.2}{22.2} & 0.2 \\ 847.5 & 20635 & \frac{21.95}{21.78} & \frac{22.2}{22.2} & 0.2 \\ 847.5 & 20635 & \frac{21.95}{21.78} & \frac{22.2}{22.2} & 0.2 \\ 847.5 & 20635 & \frac{21.95}{21.95} & \frac{22.2}{22.2} & 0.2 \\ 847.5 & 20635 & \frac{21.95}{21.95} & \frac{22.2}{22.2} & 0.2 \\ 847.5 & 20635 & \frac{21.95}{21.95} & \frac{22.2}{22.2} & 0.2 \\ 847.5 & 20635 & \frac{21.95}{21.95} & \frac{22.2}{22.2} & 0.2 \\ 847.5 & 20635 & \frac{21.95}{21.95} & \frac{22.2}{22.2} & 0.2 \\ 847.5 & 20635 & \frac{21.95}{21.95} & \frac{22.2}{22.2} & 0.2 \\ 847.5 & 20635 & \frac{21.95}{21.95} & \frac{22.2}{22.2} & 0.2 \\ 847.5 & 20635 & \frac{21.95}{21.95} & \frac{22.2}{22.2} & 0.2 \\ 847.5 & 20635 & \frac{21.95}{21.95} & \frac{22.2}{22.2} & 0.2 \\ 847.5 & 20635 & \frac{21.95}{21.95} & \frac{22.2}{22.2} & 0.2 \\ 847.5 & 20635 & \frac{21.95}{21.95} & \frac{22.2}{22.2} & 0.2 \\ 847.5 & 20635 & \frac{21.95}{21.95} & \frac{22.2}{21.95} & 0.2 \\ 847.5 & 20635 & \frac{21.95}{21.95} & \frac{22.2}{21.95} & 0.2 \\ 847.5 & 20635 & \frac{21.95}{21.95} & \frac{21.95}{21.$	3								
1 RB         847.5         20635         23.15         23.2         0-1           1 RB         7         825.5         20415         22.83         23.2         0-1           836.5         20525         23.00         23.2         0-1           847.5         20635         22.28         23.2         0-1           847.5         20635         22.28         23.2         0-1           847.5         20635         22.28         23.2         0-1           847.5         20635         22.28         23.2         0-1           14         836.5         20525         22.31         23.2         0-1           14         836.5         20525         22.31         23.2         0-1           847.5         20635         22.75         23.2         0-1           847.5         20635         22.75         23.2         0-1           847.5         20635         22.75         23.2         0-1           847.5         20635         21.79         22.2         0-2           847.5         20635         21.79         22.2         0-2           847.5         20635         21.74         22.2									0-1
1 RB         7         825.5         20415         22.83         23.2         0-1           836.5         20525         23.00         23.2         0-1           847.5         20635         22.28         23.2         0-1           847.5         20635         22.28         23.2         0-1           14         825.5         20415         22.97         23.2         0-1           14         836.5         20525         22.31         23.2         0-1           14         836.5         20525         22.31         23.2         0-1           16-QAM         0         825.5         20415         21.79         22.2         0-2           8 RB         0         836.5         20525         21.79         22.2         0-2           847.5         20635         21.79         22.2         0-2           847.5         20635         21.74         22.2         0-2           847.5         20635         21.74         22.2         0-2           847.5         20635         21.77         22.2         0-2           847.5         20635         21.78         22.2         0-2           847.									0-1
1 RB         7         836.5         20525         23.00         23.2         0-1           847.5         20635         22.28         23.2         0-1           14         825.5         20415         22.97         23.2         0-1           14         836.5         20525         22.31         23.2         0-1           14         836.5         20525         22.31         23.2         0-1           14         836.5         20525         22.31         23.2         0-1           885.5         20635         22.75         23.2         0-1           847.5         20635         22.75         23.2         0-1           885.5         20415         21.79         22.2         0-2           847.5         20635         21.69         22.2         0-2           847.5         20635         21.73         22.2         0-2           847.5         20635         21.74         22.2         0-2           847.5         20635         21.77         22.2         0-2           847.5         20635         21.77         22.2         0-2           847.5         20635         21.78 <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0-1</td></td<>									0-1
16-QAM         8 RB         4         847.5         20635         22.28         23.2         0-1           14         836.5         20415         22.97         23.2         0-1           14         836.5         20525         22.31         23.2         0-1           847.5         20635         22.75         23.2         0-1           847.5         20635         22.75         23.2         0-1           847.5         20635         22.75         23.2         0-1           847.5         20635         22.75         23.2         0-1           847.5         20635         21.79         22.2         0-2           847.5         20635         21.69         22.2         0-2           847.5         20635         21.69         22.2         0-2           847.5         20635         21.74         22.2         0-2           847.5         20635         21.77         22.2         0-2           847.5         20635         21.74         22.2         0-2           847.5         20635         21.77         22.2         0-2           847.5         20635         21.78         22.2									
16-QAM         8         8         8         20         20         21.7         23.2         0.1           16-QAM         0         8         8         20525         22.31         23.2         0.1           16-QAM         0         8         8         20525         22.31         23.2         0.1           16-QAM         0         8         8         20525         21.79         22.2         0.2           8         7         8         20635         21.79         22.2         0.2           8         8         8         8         20635         21.69         22.2         0.2           8         7         8         8         20525         21.74         22.2         0.2           8         8         4         8         8         20525         21.74         22.2         0.2           8         7         8         20.55         20415         21.73         22.2         0.2           8         8         7         8         20.55         21.74         22.2         0.2           8         8         7         8         20.55         21.78         22.2 <td< td=""><td></td><td></td><td>1 RB</td><td></td><td></td><td></td><td></td><td></td></td<>			1 RB						
16-QAM         14         836.5         20525         22.31         23.2         0-1           16-QAM         0         847.5         20635         22.75         23.2         0-1           16-QAM         0         836.5         20525         21.79         22.2         0-2           8RB         4         825.5         20415         21.79         22.2         0-2           847.5         20635         21.69         22.2         0-2           847.5         20635         21.73         22.2         0-2           847.5         20635         21.73         22.2         0-2           847.5         20635         21.74         22.2         0-2           847.5         20635         21.74         22.2         0-2           847.5         20635         21.77         22.2         0-2           847.5         20635         21.77         22.2         0-2           847.5         20635         21.78         22.2         0-2           847.5         20635         21.78         22.2         0-2           847.5         20635         21.95         22.2         0-2           847.5									
16-QAM         847.5         20635         22.75         23.2         0-1           16-QAM         0         825.5         20415         21.79         22.2         0-2           886.5         20525         21.79         22.2         0-2           847.5         20635         21.69         22.2         0-2           887.5         20635         21.69         22.2         0-2           887.5         20635         21.73         22.2         0-2           887.5         20635         21.69         22.2         0-2           887.5         20635         21.73         22.2         0-2           887.5         20635         21.74         22.2         0-2           847.5         20635         21.77         22.2         0-2           847.5         20635         21.74         22.2         0-2           847.5         20635         21.77         22.2         0-2           7         836.5         20525         21.78         22.2         0-2           847.5         20635         21.95         22.2         0-2           847.5         20635         21.95         22.2         0-2									0-1
16-QAM         8         8         25.5         20415         21.79         22.2         0.2           8         RB         0         8         36.5         20525         21.79         22.2         0.2           8         RB         4         8         85.5         20635         21.69         22.2         0.2           8         RB         4         8         8         20525         21.74         22.2         0.2           8         8         8         8         8         20525         21.74         22.2         0.2           8         8         8         8         8         8         20525         21.74         22.2         0.2           8         7         8         86.5         20525         21.74         22.2         0.2           7         8         86.5         20635         21.78         22.2         0.2           8         7         8         86.5         20525         21.78         22.2         0.2           8         7         8         20635         21.95         22.2         0.2           8         7         8         20635         2				14					
16-QAM         0         836.5         20525         21.79         22.2         0-2           847.5         20635         21.69         22.2         0-2           887.5         20635         21.69         22.2         0-2           887.5         20415         21.73         22.2         0-2           886.5         20525         21.74         22.2         0-2           847.5         20635         21.74         22.2         0-2           847.5         20635         21.74         22.2         0-2           847.5         20635         21.77         22.2         0-2           847.5         20635         21.78         22.2         0-2           836.5         20525         21.78         22.2         0-2           847.5         20635         21.78         22.2         0-2           847.5         20635         21.95         22.2         0-2									
8 RB         4         825.5         20635         21.69         22.2         0-2           8 RB         4         836.5         20525         21.74         22.2         0-2           8 RB         7         836.5         20525         21.78         22.2         0-2           7         836.5         20525         21.78         22.2         0-2           8 RF.5         20635         21.95         22.2         0-2		16 0 4 14		0					
8 RB         4         825.5         20415         21.73         22.2         0-2           8 RB         4         836.5         20525         21.74         22.2         0-2           847.5         20635         21.77         22.2         0-2           847.5         20635         21.77         22.2         0-2           886.5         20525         21.78         22.2         0-2           886.5         20525         21.78         22.2         0-2           886.5         20525         21.78         22.2         0-2           847.5         20635         21.95         22.2         0-2				U					
8 RB         4         836.5         20525         21.74         22.2         0-2           847.5         20635         21.77         22.2         0-2           847.5         20635         21.77         22.2         0-2           7         836.5         20525         21.78         22.2         0-2           847.5         20635         21.78         22.2         0-2           847.5         20635         21.95         22.2         0-2									
847.5         20635         21.77         22.2         0-2           825.5         20415         21.78         22.2         0-2           7         836.5         20525         21.78         22.2         0-2           847.5         20635         21.78         22.2         0-2           7         836.5         20525         21.78         22.2         0-2           847.5         20635         21.95         22.2         0-2			8 P P	Л					
825.5         20415         21.78         22.2         0-2           7         836.5         20525         21.78         22.2         0-2           847.5         20635         21.95         22.2         0-2		8 RB	4						
7         836.5         20525         21.78         22.2         0-2           847.5         20635         21.95         22.2         0-2									
847.5 20635 21.95 22.2 0-2				7					
				'					
				1					0-2
			15	RB					0-2
			15		-				0-2

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				FDD Band 5				
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
				824.7	20407	23.54	24.2	0
			0	836.5	20525	23.51	24.2	0
				848.3	20643	23.58	24.2	0
				824.7	20407	23.56	24.2	0
		1 RB	2	836.5	20525	23.60	24.2	0
				848.3	20643	23.55	24.2	0
				824.7	20407	23.56	24.2	0
			5	836.5	20525	23.57	24.2	0
				848.3	20643	23.61	24.2	0
				824.7	20407	23.66	24.2	0
	QPSK		0	836.5	20525	23.75	24.2	0
				848.3	20643	23.70	24.2	0
				824.7	20407	23.66	24.2	0
		3 RB	2	836.5	20525	23.64	24.2	0
				848.3	20643	23.70	24.2	0
			3	824.7	20407	23.63	24.2	0
				836.5	20525	23.57	24.2	0
				848.3	20643	23.66	24.2	0
		6RB		824.7	20407	22.57	23.2	0-1
				836.5	20525	22.52	23.2	0-1
1.4			•	848.3	20643	22.70	23.2	0-1
			0	824.7	20407	22.24	23.2	0-1
				836.5	20525	22.53	23.2	0-1
				848.3	20643	22.04	23.2	0-1
				824.7	20407	22.70	23.2	0-1
		1 RB		836.5	20525	23.11	23.2	0-1
				848.3	20643	22.24	23.2	0-1
			5	824.7	20407	23.18	23.2	0-1
				836.5	20525	22.76	23.2	0-1
				848.3	20643	23.17	23.2	0-1
	16.0414			824.7	20407	22.77	23.2	0-1
	16-QAM		0	836.5	20525	22.62	23.2	0-1
				848.3	20643	22.40	23.2	0-1
		2 00	<u>_</u>	824.7	20407	22.42	23.2	0-1
		3 RB	2	836.5	20525	22.96	23.2	0-1
				848.3 824.7	20643 20407	22.46	23.2	0-1
			3	824.7		22.60	23.2	0-1
			3	836.5	20525	22.60	23.2	0-1
			1	848.3 824.7	20643 20407	22.16 21.52	23.2 22.2	0-1 0-2
		61	RB	824.7 836.5			22.2	
		Or		836.5	20525	21.71		0-2
				848.3	20643	21.70	22.2	0-2

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LTE FDD Band 17 - conducted	power table:
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			•	FDD Band 17				
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
				709	23780	23.45	24.2	0
			0	710	23790	23.20	24.2	0
				711	23800	23.12	24.2	0
				709	23780	23.52	24.2	0
		1 RB	25	710	23790	23.84	24.2	0
				711	23800	23.52	24.2	0
				709	23780	23.45	24.2	0
			49	710	23790	23.30	24.2	0
				711	23800	23.21	24.2	0
				709	23780	22.76	23.2	0-1
	QPSK		0	710	23790	22.66	23.2	0-1
				711	23800	22.57	23.2	0-1
				709	23780	22.78	23.2	0-1
		25 RB	12	710	23790	22.61	23.2	0-1
				711	23800	22.69	23.2	0-1
			25	709	23780	22.68	23.2	0-1
				710	23790	22.60	23.2	0-1
				711	23800	22.54	23.2	0-1
		50RB		709	23780	22.67	23.2	0-1
				710	23790	22.63	23.2	0-1
10				711	23800	22.53	23.2	0-1
10			0	709	23780	21.84	23.2	0-1
				710	23790	22.02	23.2	0-1
				711	23800	21.54	23.2	0-1
			25	709	23780	22.35	23.2	0-1
		1 RB		710	23790	22.28	23.2	0-1
				711	23800	22.32	23.2	0-1
				709	23780	22.21	23.2	0-1
			49	710	23790	21.69	23.2	0-1
				711	23800	21.72	23.2	0-1
				709	23780	21.81	22.2	0-2
	16-QAM		0	710	23790	21.66	22.2	0-2
				711	23800	21.52	22.2	0-2
				709	23780	21.55	22.2	0-2
		25 RB	12	710	23790	21.69	22.2	0-2
				711	23800	21.64	22.2	0-2
				709	23780	21.76	22.2	0-2
			25	710	23790	21.71	22.2	0-2
				711	23800	21.50	22.2	0-2
				709	23780	21.74	22.2	0-2
		500	)RB	710	23790	21.74	22.2	0-2
				711	23800	21.59	22.2	0-2

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				FDD Band 17				
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
				706.5	23755	22.96	24.2	0
			0	710	23790	23.49	24.2	0
				713.5	23825	23.17	24.2	0
				706.5	23755	23.45	24.2	0
		1 RB	12	710	23790	23.63	24.2	0
				713.5	23825	23.41	24.2	0
				706.5	23755	23.34	24.2	0
			24	710	23790	23.16	24.2	0
				713.5	23825	23.28	24.2	0
				706.5	23755	22.55	23.2	0-1
	QPSK		0	710	23790	22.51	23.2	0-1
				713.5	23825	22.47	23.2	0-1
				706.5	23755	22.55	23.2	0-1
		12 RB	6	710	23790	22.58	23.2	0-1
				713.5	23825	22.57	23.2	0-1
			13	706.5	23755	22.59	23.2	0-1
				710	23790	22.47	23.2	0-1
				713.5	23825	22.50	23.2	0-1
		25RB		706.5	23755	22.56	23.2	0-1
				710	23790	22.59	23.2	0-1
5				713.5	23825	22.49	23.2	0-1
0			0	706.5	23755	21.59	23.2	0-1
				710	23790	22.20	23.2	0-1
				713.5	23825	22.47	23.2	0-1
			12	706.5	23755	22.18	23.2	0-1
		1 RB		710	23790	22.04	23.2	0-1
				713.5	23825	22.55	23.2	0-1
				706.5	23755	22.47	23.2	0-1
			24	710	23790	22.30	23.2	0-1
				713.5	23825	22.18	23.2	0-1
				706.5	23755	21.37	22.2	0-2
	16-QAM		0	710	23790	21.43	22.2	0-2
				713.5	23825	21.41	22.2	0-2
		(a ==	_	706.5	23755	21.38	22.2	0-2
		12 RB	6	710	23790	21.54	22.2	0-2
				713.5	23825	21.37	22.2	0-2
			40	706.5	23755	21.44	22.2	0-2
			13	710	23790	21.49	22.2	0-2
				713.5	23825	21.52	22.2	0-2
				706.5	23755	21.49	22.2	0-2
		25	RB	710 713.5	23790	21.57	22.2	0-2
					23825	21.44	22.2	0-2

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Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max.	Average power (dBm)
		1	2412		14.00	13.97
	802.11b	6	2437	1Mbps	14.00	13.91
		11	2462		14.00	13.81
		1	2412		12.00	11.76
2450 MHz	802.11g	6	2437	6Mbps	12.00	11.86
		11	2462		12.00	11.93
		1	2412		12.00	11.88
	802.11n-HT20	6	2437	MCS0	12.00	11.91
		11	2462		12.00	11.91

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

#### Bluetooth conducted power table:

Mada	Channel	Frequency	Average	Max. Rated Avg.			
Mode	Channel	(MHz)	1Mbps	2Mbps	3Mbps	Power + Max. Tolerance	
	CH 00	2402	3.83	2.40	2.39		
BR/EDR	CH 39	2441	3.00	1.47	1.47	7.3	
	CH 78	2480	2.61	1.17	1.18		

		Frequency (MHz)	Average Output Power (dBm)	Max. Rated
Mode	Channel		Average Odiput Power (dBill)	Avg.
Mode	Channel		GFSK	Power + Max.
			GFSK	Tolerance
	CH 00	2402	4.90	
LE	CH 19 2440		4.16	7.3
	CH 39	2480	3.79	

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#### **1.4 Test Environment**

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

#### **1.5 Operation Description**

- 1. The EUT is controlled by using a Radio Communication Tester (MT8820C), and the communication between the EUT and the tester is established by air link.
- 2. Measurements are performed respectively on the lowest, middle and highest channels of the operating band(s). The EUT is set to maximum power level during all tests, and at the beginning of each test the battery is fully charged.
- 3. During the SAR testing, the DASY 5 system checks power drift by comparing the e-field strength of one specific location measured at the beginning with that measured at the end of the SAR testing.
- 4. SAR test reduction for GPRS mode is determined by the source-based time-averaged output power. The data mode with highest specified time-averaged output power should be tested for SAR compliance.
- The 3G SAR test reduction procedure is applied to HSDPA with 12.2 kbps RMC as the primary mode. Since the maximum output power in a secondary mode (HSDPA) is ≤ ¼ dB higher than the primary mode (WCDMA), SAR measurement is not required for the secondary mode (HSDPA).
- 6. The 3G SAR test reduction procedure is applied to HSPA (HSUPA/HSDPA with RMC) with 12.2 kbps RMC as the primary mode. Since the maximum output power in a secondary mode (HSPA) is ≤ ¼ dB higher than the primary mode (WCDMA), SAR measurement is not required for the secondary mode (HSPA).
- 7. LTE modes test according to **KDB 941225D05v02r05**.

a. Per Section 5.2.1, the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation.

• Using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.

• When the reported SAR is  $\leq$  0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation;

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otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel.

• When the reported SAR of a required test channel is > 1.45 W/kg, SAR is required for all three RB offset configurations for that required test channel.

b. Per Section 5.2.2, the largest channel bandwidth and measure SAR for QPSK with 50% RB allocation

• The procedures required for 1 RB allocation in 5.2.1 are applied to measure the SAR for QPSK with 50% RB allocation.

c. Per Section 5.2.3, the largest channel bandwidth and measure SAR for QPSK with 100% RB allocation

• For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation in 5.2.1 and 5.2.2 are ≤ 0.8 W/kg.

• Otherwise, SAR is measured for the highest output power channel and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.

d. Per Section 5.2.4, Higher order modulations

• For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in sections 5.2.1, 5.2.2 and 5.2.3 to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg.

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

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

#### WLAN

802.11b DSSS SAR Test Requirements:

8. SAR is measured for 2.4 GHz 802.11b DSSS mode using the highest measured maximum output power channel, when the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no

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further SAR testing is required for 802.11b DSSS in that exposure configuration.

When the reported SAR is > 0.8 W/kg, SAR is required for that exposure 9. configuration using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

802.11g/n OFDM SAR Test Exclusion Requirements:

- 10. SAR is not required for 802.11g/n since the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg. Other
- 11. BT and WLAN use the same antenna path and Bluetooth can't transmit simultaneously with WLAN.
- 12. According to KDB447498D01v06, testing of other required channels is not required when the reported 1-g SAR for the highest output channel is  $\leq$  0.8 W/kg, when the transmission band is  $\leq$  100MHz.
- 13. According to KDB865664D01v01r04, SAR measurement variability must be assessed for each frequency band. When the original highest measured SAR is  $\geq$ 0.8 W/kg, repeated that measurement once. Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is  $\geq$  1.45 W/kg (~ 10% from the 1-g SAR limit)
- 14. According to KDB447498D01v06 The 1-g and 10-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)]  $\cdot \left[\sqrt{f(GHz)}\right] \le 3.0$  for 1-g SAR, and  $\le 7.5$  for product specific 10-g SAR.

Mode	Position	Max. Power (dBm)	f(GHz)	Calculation	SAR exclusion threshold	SAR test exclusion
BT	Body-worn	7.3	2.48	0.846	3	yes
BT	Head	7.3	2.48	1.691	3	yes

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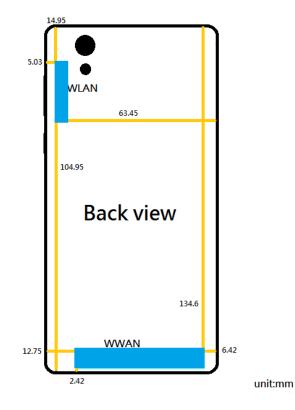
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Report No. : E5/2017/80011 Page : 24 of 139



The location of the antennas (Back View)

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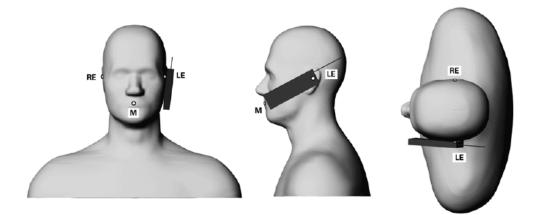
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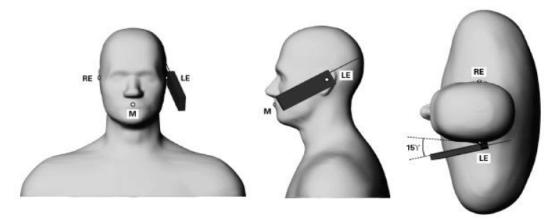
Report No. : E5/2017/80011 Page : 25 of 139

#### **1.6 Positioning Procedure**

Head SAR measurement statement



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.

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#### **Body SAR measurement statement**

1. Body-worn exposure: 10mm

Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in KDB Publication 447498 D01 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. When the same wireless transmission configuration is used for testing body-worn accessory and hotspot mode SAR, respectively, in voice and data mode, SAR results for the most conservative test separation distance configuration may be used to support both SAR conditions. When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for the body-worn accessory with a headset attached to the handset.

2. Hotspot exposure: 10mm

A test separation distance of 10 mm is required between the phantom and all surfaces and edges with a transmitting antenna located within 25 mm from that surface or edge when the form factor of a handset is larger than  $9 \text{ cm} \times 5 \text{ cm}$ ,

Test configurations of WWAN:

- (1) Front side
- (2) Back side
- (3) Bottom side
- (4) Right side
- (5) Left side

Test configurations of WLAN:

- (1) Front side
- (2) Back side
- (3) Top side
- (4) Right side
- 3. Phablet SAR test consideration

Since the device is not a phablet (overall diagonal dimension < 16.0 cm), phablet SAR procedure is not required for this device.

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4. Based on KDB941225D06v02r01, the hotspot mode and body-worn accessory SAR test configurations may overlap for handsets. When the same wireless mode transmission configurations for voice and data are required for SAR measurements, the more conservative configuration with a smaller separation distance should be tested for the overlapping SAR configurations. For WCDMA /LTE/WLAN, since the maximum power is the same between body-worn and hotspot mode, and the test distance of hotspot mode is the same with that of body-worn mode, hotspot mode SAR is used to support body-worn SAR. For GSM850/1900, since the wireless mode transmission configurations is different between body-worn and hotspot mode, body-worn SAR is performed.

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#### **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

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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.

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#### **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.

$$SAR = C \frac{\delta T}{\delta t}$$

Whereby  $\sigma$  is the conductivity,  $\rho$  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:

1. 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

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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.

- 2. 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.
- 3. 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  $\rho$ ), there is no standard for the measurement of the conductivity. Depending on the method and liquid, the error can well exceed ±5%.
- 4. 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].

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Report No. : E5/2017/80011 Page: 32 of 139



#### **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:

- 1. The setup must enable accurate determination of the incident power.
- 2. The accuracy of the calculated field strength will depend on the assessment of the dielectric parameters of the liquid.
- 3. 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.

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Report No. : E5/2017/80011 Page : 33 of 139

#### 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=  $\sigma$  (|Ei|2)/ $\rho$  where  $\sigma$  and  $\rho$  are the conductivity and mass density of the tissue-simulant.

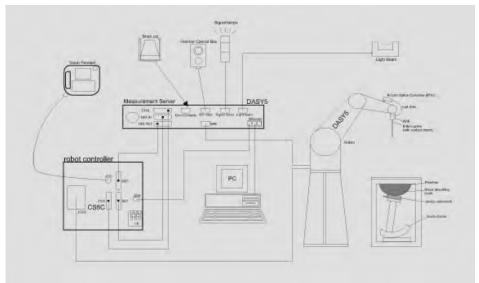


Fig. a A block diagram of the SAR measurement system

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

- 1. 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).
- 2. 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.
- 3. 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.
- 4. 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.
- 5. 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.
- 6. A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- 7. A computer operating Windows7
- 8. DASY 5 software.
- 9. Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- 10. The SAM twin phantom enabling testing left-hand and right-hand usage.
- 11. The device holder for handheld mobile phones.
- 12. Tissue simulating liquid mixed according to the given recipes.
- 13. Validation dipole kits allowing to validate the proper functioning of the system.

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#### **1.10 System Components**

#### EX3DV4 E-Field Probe

Symmetrical design with triangular core				
Built-in shielding against static charges				
PEEK enclosure material (resistant to				
organic solvents, e.g., DGBE)				
Basic Broad Band Calibration in air				
Conversion Factors (CF) for HSL750/835/				
1900/2450 MHz Additional CF for other				
liquids and frequencies upon request				
10 MHz to > 6 GHz, Linearity: $\pm$ 0.6 dB				
$\pm$ 0.3 dB in HSL (rotation around probe axis)				
± 0.5 dB in tissue material (rotation normal to probe axis)				
10 μW/g to > 100 mW/g				
Linearity: $\pm$ 0.2 dB (noise: typically < 1 $\mu$ W/g)				
Tip diameter: 2.5 mm				
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%.				

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#### **SAM PHANTOM V4.0C**

Construction:	The shell corresponds to the	specifications of the Specific						
	Anthropomorphic Mannequin (SAM	Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528						
	and IEC 62209.							
	It enables the dosimetric evaluat	ion of left and right hand phone						
	usage as well as body mounted us	sage at the flat phantom region. A						
	cover prevents evaporation of the	liquid. Reference markings on the						
	phantom allow the complete se	etup of all predefined phantom						
	positions and measurement grids	by manually teaching three points						
	with the robot.							
Shell	2 ± 0.2 mm							
Thickness:		The second						
Filling	Approx. 25 liters							
Volume:								
Dimensions:	Height: 850 mm;							
	Length: 1000 mm;							
	Width: 500 mm							
	1							

#### **DEVICE HOLDER**

Construction	In combination with the Twin SAM Phantom	14
	V4.0/V4.0C or Twin SAM, the Mounting	A DECISION OF
	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	Device Holder
	(left head, right head, flat phantom).	

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#### 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 KDB865664D01) from the target SAR values.

These tests were done at 750/835/1900/2450 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 liquid depth above the ear reference points was above 15 cm ( $\leq$ 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.

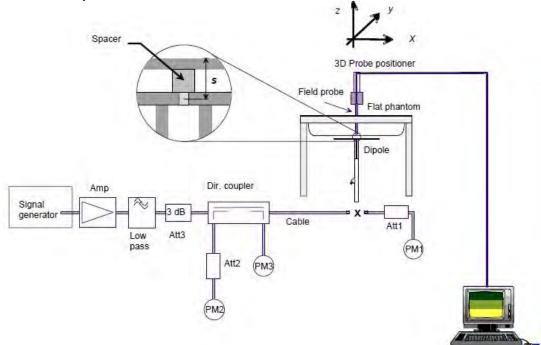


Fig. b The block diagram of system verification

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Validation Kit	S/N	Frequ (MF	-	1W Target SAR-1g (mW/g)	Measured SAR-1g (mW/g)	Measured SAR-1g normalized to 1W (mW/g)	Deviation (%)	Measured Date								
D750V3	1078	750	Head	8.39	2.13	8.52	1.55%	Aug. 25, 2017								
D730V3	1070	750	Body	8.67	2.28	9.12	5.19%	Aug. 22, 2017								
D835V2	4d120	835	Head	9.5	2.43	9.72	2.32%	Aug. 24, 2017								
D03372	40120	000	Body	9.68	2.47	9.88	2.07%	Aug. 21, 2017								
D1900V2	5d173	1900	Head	40.7	9.92	39.68	-2.51%	Aug. 23, 2017								
D1900V2	50175	1900	Body	40.2	9.90	39.60	-1.49%	Aug. 18, 2017								
D2450V2	727 24	0\/2 727	27 2450	Head	52.2	13.50	54.00	3.45%	Aug. 31, 2017							
D2430V2	121	2450		2450	2450	2450	2450	2450	2450	2450	2450	Body	50.6	12.50	50.00	-1.19%

Validation Kit	S/N	Frequ (MF	-	1W Target SAR-1g (mW/g)	Measured SAR-1g (mW/g)	Measured SAR-1g normalized to 1W (mW/g)	Deviation (%)	Measured Date
D835V2	4d120	835	Body	9.68	2.50	10.00	3.31%	Sep. 15, 2017
D1900V2	5d173	1900	Body	40.2	9.90	39.60	-1.49%	Sep. 15, 2017
D2450V2	727	2450	Body	50.6	12.50	50.00	-1.19%	Sep. 15, 2017

Table 1. Results of system validation

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#### **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 conjunction 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 ( $\leq$ 3G) or 10 cm (>3G) during all tests. (Appendix Fig. 2)

Tissue Type	Measurement Date	Measured Frequency (MHz)	Target Dielectric Constant, εr	Target Conductivity, σ (S/m)	Measured Dielectric Constant, εr	Measured Conductivity, σ (S/m)	% dev ɛr	% dev σ
		704	42.181	0.890	41.740	0.879	1.04%	1.21%
		707.5	42.162	0.890	41.720	0.882	1.05%	0.91%
	Aug, 25. 2017	709	42.155	0.890	41.709	0.885	1.06%	0.58%
	Aug, 25. 2017	710	42.149	0.890	41.700	0.888	1.07%	0.25%
		711	42.144	0.890	41.691	0.888	1.08%	0.26%
		750	41.942	0.893	41.485	0.895	1.09%	-0.18%
		824.2	41.556	0.899	40.120	0.865	3.46%	3.80%
		826.4	41.545	0.899	40.117	0.865	3.44%	3.82%
	Aug, 24. 2017	829	41.531	0.900	40.113	0.867	3.41%	3.62%
		835	41.500	0.900	40.106	0.867	3.36%	3.67%
		836.5	41.500	0.902	40.105	0.869	3.36%	3.62%
Head		836.6	41.500	0.902	40.105	0.869	3.36%	3.63%
		844	41.500	0.910	40.098	0.877	3.38%	3.59%
		846.6	41.500	0.912	40.096	0.879	3.38%	3.67%
		848.8	41.500	0.915	40.094	0.882	3.39%	3.59%
		1850.2	40.000	1.400	39.486	1.396	1.29%	0.29%
	Aug, 23. 2017	1880	40.000	1.400	39.456	1.411	1.36%	-0.79%
	Aug, 23. 2017	1900	40.000	1.400	39.436	1.421	1.41%	-1.50%
		1909.8	40.000	1.400	39.425	1.426	1.44%	-1.86%
		2412	39.268	1.766	39.294	1.792	-0.07%	-1.47%
	Aug, 31. 2017	2437	39.223	1.788	39.253	1.814	-0.08%	-1.43%
	Auy, 31. 2017	2450	39.200	1.800	39.235	1.826	-0.09%	-1.44%
		2462	39.185	1.813	39.222	1.839	-0.10%	-1.43%

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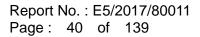
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Tissue Type	Measurement Date	Measured Frequency (MHz)	Target Dielectric Constant, εr	Target Conductivity, σ (S/m)	Measured Dielectric Constant, εr	Measured Conductivity, σ (S/m)	% dev ɛr	% dev σ
		704	55.710	0.960	54.145	0.947	2.81%	1.33%
		707.5	55.697	0.960	54.136	0.950	2.80%	1.05%
	Aug, 22. 2017	709	55.691	0.960	54.130	0.951	2.80%	0.96%
	Aug, 22. 2017	710	55.687	0.960	54.117	0.952	2.82%	0.86%
		711	55.683	0.960	54.110	0.953	2.83%	0.76%
		750	55.531	0.963	53.956	0.969	2.84%	-0.58%
		824.2	55.242	0.969	54.851	0.954	0.71%	1.56%
		826.4	55.234	0.969	54.846	0.954	0.70%	1.58%
		829	55.223	0.970	54.835	0.955	0.70%	1.50%
	Aug, 21. 2017	835	55.200	0.970	54.817	0.955	0.69%	1.55%
		836.5	55.195	0.972	54.812	0.957	0.69%	1.53%
Body		836.6	55.195	0.972	54.812	0.957	0.69%	1.54%
		844	55.172	0.981	54.795	0.966	0.68%	1.54%
		846.6	55.164	0.984	54.787	0.969	0.68%	1.55%
		848.8	55.158	0.987	54.786	0.972	0.67%	1.52%
		1850.2	53.300	1.520	54.201	1.518	-1.69%	0.13%
	Aug, 18. 2017	1880	53.300	1.520	54.177	1.533	-1.65%	-0.86%
	Aug, 10. 2017	1900	53.300	1.520	54.158	1.543	-1.61%	-1.51%
		1909.8	53.300	1.520	54.149	1.548	-1.59%	-1.84%
		2412	52.751	1.914	52.209	1.919	1.03%	-0.28%
	Can 01 0017	2437	52.717	1.938	52.171	1.942	1.04%	-0.23%
	Sep, 01. 2017	2450	52.700	1.950	52.149	1.954	1.05%	-0.21%
		2462	52.685	1.967	52.128	1.971	1.06%	-0.20%

Tissue Type	Measurement Date	Measured Frequency (MHz)	Target Dielectric Constant, εr	Target Conductivity, σ (S/m)	Measured Dielectric Constant, εr	Measured Conductivity, σ (S/m)	% dev ɛr	% dev σ
		824.2	55.242	0.969	55.277	0.980	-0.06%	-1.12%
	Sep 15 2017	835	55.200	0.970	55.243	0.981	-0.08%	-1.13%
	Sep, 15. 2017	836.6	55.195	0.972	55.238	0.983	-0.08%	-1.13%
		848.8	55.158	0.987	55.212	0.998	-0.10%	-1.12%
		1850.2	53.300	1.520	53.824	1.487	-0.98%	2.17%
Body	Sep, 15. 2017	1880	53.300	1.520	53.800	1.502	-0.94%	1.18%
Douy	Sep, 13. 2017	1900	53.300	1.520	53.781	1.512	-0.90%	0.53%
		1909.8	53.300	1.520	53.772	1.517	-0.89%	0.20%
		2412	52.751	1.914	52.673	1.935	0.15%	-1.11%
	Sep, 15. 2017	2437	52.717	1.938	52.635	1.958	0.16%	-1.05%
	Sep, 15. 2017	2450	52.700	1.950	52.613	1.970	0.17%	-1.03%
		2462	52.685	1.967	52.592	1.987	0.18%	-1.02%

Table 2. Dielectric Parameters of Tissue Simulant Fluid

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				Ingre	dient			Tatal
Frequency (MHz)	Mode	DGMBE	Water	Salt	Preventol D-7	Cellulose	Sugar	Total amount
750	Head		532.98 g	18.3 g	2.4 g	3.2 g	766 g	1.3L(Kg)
750	Body		631.68 g	11.72 g	1.2 g		600 g	1.0L(Kg)
050	Head		532.98 g	18.3 g	2.4 g	3.2 g	766 g	1.3L(Kg)
850	Body		631.68 g	11.72 g	1.2 g		600 g	1.0L(Kg)
1000	Head	444.52 g	552.42 g	3.06 g			—	1.0L(Kg)
1900	Body	300.67 g	716.56 g	4.0 g			_	1.0L(Kg)
0450	Head	550ml	450ml	_			_	1.0L(Kg)
2450	2450 Body		698.3ml	—	_	—	—	1.0L(Kg)

The composition of the tissue simulating liquid:

Table 3. Recipes for tissue simulating liquid

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#### 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, 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 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.

 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).

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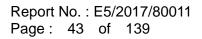
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Exceptions are the hands, wrists, feet and ankles where the spatial peak SAR shall not exceed 4 W/kg, as averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube).

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 W/kg	8.00 W/kg
Spatial Average SAR (Whole Body)	0.08 W/kg	0.40 W/kg
Spatial Peak SAR (Hands/Feet/Ankle/Wrist)	4.00 W/kg	20.00 W/kg

#### 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.
- 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.

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# 2. Summary of Results

#### **GSM 850**

Mode	Position	Distanc e (mm)	CH Freq. (MHz)		Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power	Scaling	1	SAR over g ⁄kg)	Plot page
		()				(dBm)		Measured	Reported	
	Re Cheek	-	251	848.8	33.6	32.40	31.83%	0.15	0.20	56
Head	Re Tilt	-	251	848.8	33.6	32.40	31.83%	0.06	0.08	-
(GSM)	Le Cheek	-	251	848.8	33.6	32.40	31.83%	0.12	0.16	-
	Le Tilt	-	251	848.8	33.6	32.40	31.83%	0.07	0.09	-
Body-worn	Front side	10	251	848.8	33.6	32.40	31.83%	0.24	0.32	-
(GSM)	Back side	10	251	848.8	33.6	32.40	31.83%	0.36	0.47	57
	Front side	10	128	824.2	28.4	27.37	26.77%	0.25	0.32	-
Hotspot	Back side	10	128	824.2	28.4	27.37	26.77%	0.40	0.51	58
(GPRS)	Bottom side	10	128	824.2	28.4	27.37	26.77%	0.05	0.06	-
<1Dn4Up>	Right side	10	128	824.2	28.4	27.37	26.77%	0.19	0.24	-
	Left side	10	128	824.2	28.4	27.37	26.77%	0.15	0.19	-

#### **GSM 1900**

Mode	Position	Distanc e (mm)	CH Freq. (MHz)		Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power	Scaling	1	SAR over g /kg)	Plot page
		()				(dBm)		Measured	Reported	
	Re Cheek	-	512	1850.2	30.70	29.54	30.62%	0.18	0.24	-
Head	Re Tilt	-	512	1850.2	30.70	29.54	30.62%	0.06	0.08	-
(GSM)	Le Cheek	-	512	1850.2	30.70	29.54	30.62%	0.42	0.55	59
	Le Tilt	-	512	1850.2	30.70	29.54	30.62%	0.10	0.13	-
Body-worn	Front side	10	512	1850.2	30.70	29.54	30.62%	0.42	0.55	-
(GSM)	Back side	10	512	1850.2	30.70	29.54	30.62%	0.53	0.69	60
	Front side	10	512	1850.2	25.50	24.50	25.89%	0.53	0.67	-
Hotspot	Back side	10	512	1850.2	25.50	24.50	25.89%	0.55	0.69	61
(GPRS)	Bottom side	10	512	1850.2	25.50	24.50	25.89%	0.15	0.19	-
<1Dn4Up>	Right side	10	512	1850.2	25.50	24.50	25.89%	0.25	0.31	-
	Left side	10	512	1850.2	25.50	24.50	25.89%	0.24	0.30	-

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Report No. : E5/2017/80011 Page : 45 of 139

Mode	Position	Distanc e (mm)	СН	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power	Scaling	<u> </u>	SAR over g /kg)	Plot page
		()				(dBm)		Measured	Reported	
	RE Cheek	-	4183	836.6	24.2	23.96	5.68%	0.10	0.11	62
Head	RE Tilt	-	4183	836.6	24.2	23.96	5.68%	0.08	0.08	-
Tieau	LE Cheek	-	4183	836.6	24.2	23.96	5.68%	0.10	0.11	-
	LE Tilt	-	4183	836.6	24.2	23.96	5.68%	0.06	0.06	-
Body-worn	Front side	10	4183	836.6	24.2	23.96	5.68%	0.18	0.19	-
Body-worn	Back side	10	4183	836.6	24.2	23.96	5.68%	0.28	0.30	63
	Front side	10	4183	836.6	24.2	23.96	5.68%	0.18	0.19	-
	Back side	10	4183	836.6	24.2	23.96	5.68%	0.28	0.30	63
Hotspot	Bottom side	10	4183	836.6	24.2	23.96	5.68%	0.07	0.07	-
	Right side	10	4183	836.6	24.2	23.96	5.68%	0.11	0.12	-
	Left side	10	4183	836.6	24.2	23.96	5.68%	0.10	0.11	-

#### WCDMA Band V – RMC 12.2Kbps

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#### LTE FDD Band 5

Mode	Bandwidth	Modulatior	RB Size	RB start	Position	Distance (mm)	СН	Freq.	Max. Rated Avg. Power +	Measure d Avg.	Scaling		SAR over V/kg)	Plot
	(MHz)				DE Obach			(MHz)	Max. Toleranc e (dBm)	Power (dBm)		Measured	Reported	page
					RE Cheek	-	20525	836.5	24.2	23.77	10.41%	0.07	0.08	64
			1 RB	25	RE Tilt	-	20525	836.5	24.2	23.77	10.41%	0.04	0.04	-
			TRB	20	LE Cheek	-	20525	836.5	24.2	23.77	10.41%	0.07	0.08	-
					LE Tilt	-	20525	836.5	24.2	23.77	10.41%	0.06	0.07	-
					RE Cheek	-	20525	836.5	23.2	22.80	9.65%	0.06	0.07	-
Head	10MHz	QPSK	25 RB	12	RE Tilt	-	20525	836.5	23.2	22.80	9.65%	0.03	0.03	-
, iouu		Q. 0.1	20112		LE Cheek	-	20525	836.5	23.2	22.80	9.65%	0.06	0.07	-
					LE Tilt	-	20525	836.5	23.2	22.80	9.65%	0.05	0.05	-
					RE Cheek	-	20525	836.5	23.2	22.72	11.69%	0.06	0.07	-
		50	RB	RE Tilt	-	20525	836.5	23.2	22.72	11.69%	0.03	0.03	-	
					LE Cheek	-	20525	836.5	23.2	22.72	11.69%	0.06	0.07	-
					LE Tilt	-	20525	836.5	23.2	22.72	11.69%	0.04	0.04	-
			1 RB	25	Front side	10	20525	836.5	24.2	23.77	10.41%	0.17	0.19	-
			110	20	Back side	10	20525	836.5	24.2	23.77	10.41%	0.28	0.31	65
Body-worn	10MHz		QPSK 25 RB	12	Front side	10	20525	836.5	23.2	22.80	9.65%	0.14	0.15	-
Douy worm	1011112	GI OIX		12	Back side	10	20525	836.5	23.2	22.80	9.65%	0.25	0.27	-
			50	RB	Front side	10	20525	836.5	23.2	22.72	11.69%	0.14	0.16	-
			00	ND	Back side	10	20525	836.5	23.2	22.72	11.69%	0.24	0.27	-
					Front side	10	20525	836.5	24.2	23.77	10.41%	0.17	0.19	-
					Back side	10	20525	836.5	24.2	23.77	10.41%	0.28	0.31	65
			1 RB	25	Bottom side	10	20525	836.5	24.2	23.77	10.41%	0.07	0.08	-
					Right side	10	20525	836.5	24.2	23.77	10.41%	0.07	0.08	-
					Left side	10	20525	836.5	24.2	23.77	10.41%	0.08	0.09	-
					Front side	10	20525	836.5	23.2	22.80	9.65%	0.14	0.15	-
					Back side	10	20525	836.5	23.2	22.80	9.65%	0.25	0.27	-
Hotspot	10MHz	QPSK	25 RB	12	Bottom side	10	20525	836.5	23.2	22.80	9.65%	0.06	0.07	-
					Right side	10	20525	836.5	23.2	22.80	9.65%	0.06	0.07	-
					Left side	10	20525	836.5	23.2	22.80	9.65%	0.06	0.07	-
					Front side	10	20525	836.5	23.2	22.72	11.69%	0.14	0.16	-
					Back side	10	20525	836.5	23.2	22.72	11.69%	0.24	0.27	-
			50	RB	Bottom side	10	20525	836.5	23.2	22.72	11.69%	0.05	0.06	-
					Right side	10	20525	836.5	23.2	22.72	11.69%	0.06	0.07	-
					Left side	10	20525	836.5	23.2	22.72	11.69%	0.06	0.07	-

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#### LTE FDD Band 17

Mode	Bandwidth (MHz)	Modulatior	RB Size	RB start	Position	Distance (mm)	СН	Freq. (MHz)	Max. Rated Avg. Power + Max. Toleranc e (dBm)	Measure d Avg. Power (dBm)	Scaling	1g (V	SAR over V/kg) Reported	Plot page
					RE Cheek	-	23790	710	24.2	23.84	8.64%	0.02	0.02	66
				·	RE Tilt	-	23790	710	24.2	23.84	8.64%	0.02	0.02	
			1 RB	25	LE Cheek	-	23790	710	24.2	23.84	8.64%	0.01	0.01	-
				·	LE Tilt	-	23790	710	24.2	23.84	8.64%	0.01	0.01	-
					RE Cheek	-	23780	709	23.2	22.78	10.15%	0.02	0.02	-
					RE Tilt	-	23780	709	23.2	22.78	10.15%	0.01	0.01	-
Head	10MHz	QPSK	25 RB	12	LE Cheek	-	23780	709	23.2	22.78	10.15%	0.02	0.02	-
					LE Tilt	-	23780	709	23.2	22.78	10.15%	0.01	0.01	-
					RE Cheek	-	23780	709	23.2	22.67	12.98%	0.02	0.02	-
		50		RE Tilt	-	23780	709	23.2	22.67	12.98%	0.01	0.01	-	
			50	кв	LE Cheek	-	23780	709	23.2	22.67	12.98%	0.02	0.02	-
					LE Tilt	-	23780	709	23.2	22.67	12.98%	0.01	0.01	-
		MHz OPSK	1 RB	25	Front side	10	23790	710	24.2	23.84	8.64%	0.04	0.04	-
			IND	25	Back side	10	23790	710	24.2	23.84	8.64%	0.07	0.08	67
Body-worn	10MHz		QPSK 25 RB	12	Front side	10	23780	709	23.2	22.78	10.15%	0.03	0.03	-
Body-worn	TOIVITIZ	Gron	QPSK 25 RB	12	Back side	10	23780	709	23.2	22.78	10.15%	0.07	0.08	-
			50	RB	Front side	10	23780	709	23.2	22.67	12.98%	0.03	0.03	-
			50	КD	Back side	10	23780	709	23.2	22.67	12.98%	0.07	0.08	-
					Front side	10	23790	710	24.2	23.84	8.64%	0.04	0.04	-
					Back side	10	23790	710	24.2	23.84	8.64%	0.07	0.08	67
			1 RB	25	Bottom side	10	23790	710	24.2	23.84	8.64%	0.00	0.00	-
					Right side	10	23790	710	24.2	23.84	8.64%	0.01	0.01	-
					Left side	10	23790	710	24.2	23.84	8.64%	0.02	0.02	-
					Front side	10	23780	709	23.2	22.78	10.15%	0.03	0.03	-
					Back side	10	23780	709	23.2	22.78	10.15%	0.07	0.08	-
Hotspot	10MHz	QPSK	25 RB	12	Bottom side	10	23780	709	23.2	22.78	10.15%	0.00	0.00	-
					Right side	10	23780	709	23.2	22.78	10.15%	0.01	0.01	-
					Left side	10	23780	709	23.2	22.78	10.15%	0.02	0.02	-
1				ļ	Front side	10	23780	709	23.2	22.67	12.98%	0.03	0.03	-
1					Back side	10	23780	709	23.2	22.67	12.98%	0.07	0.08	-
			50	RB	Bottom side	10	23780	709	23.2	22.67	12.98%	0.00	0.00	-
				ļ	Right side	10	23780	709	23.2	22.67	12.98%	0.01	0.01	-
					Left side	10	23780	709	23.2	22.67	12.98%	0.02	0.02	-

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#### WiFi 2.4GHz - WLAN802.11b

Mode	Position	Distance (mm) CH	СН	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	l Scaling	Averaged SAR over 1g (W/kg)		Plot page
				· · ·				Measured	Reported	
	RE Cheek	-	1	2412	14	13.97	0.69%	0.03	0.03	-
Head	RE Tilt	-	1	2412	14	13.97	0.69%	0.02	0.02	-
пеац	LE Cheek	-	1	2412	14	13.97	0.69%	0.11	0.11	68
	LE Tilt	-	1	2412	14	13.97	0.69%	0.05	0.05	-
Body-	Front side	10	1	2412	14	13.97	0.69%	0.04	0.04	-
worn	Back side	10	1	2412	14	13.97	0.69%	0.18	0.18	69
	Front side	10	1	2412	14	13.97	0.69%	0.04	0.04	-
Hotopot	Back side	10	1	2412	14	13.97	0.69%	0.18	0.18	69
Hotspot	Top side	10	1	2412	14	13.97	0.69%	0.01	0.01	-
	Right side	10	1	2412	14	13.97	0.69%	0.09	0.09	-

Note:

Scaling = 
$$\frac{reported SAR}{measured SAR} = \frac{PS(mW)}{P1(mW)} = 10^{\left(\frac{P_0 - P_1}{10}\right)(dPm)}$$

Reported SAR = measured SAR \* (scaling) Where P2 is maximum specified power, P1 is measured conducted power

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# 3. Simultaneous Transmission Analysis

Simultaneous Transmit Configurations	Head	Body-Worn	Hotspot
GSM + 2.4GHz Wi-Fi	Yes	Yes	No
GPRS + 2.4GHz Wi-Fi	No	No	Yes
WCDMA + 2.4GHz Wi-Fi	Yes	Yes	Yes
LTE + 2.4GHz Wi-Fi	Yes	Yes	Yes
GSM + BT	Yes	Yes	No
GPRS + BT	No	Yes	No
WCDMA + BT	Yes	Yes	No
LTE + BT	Yes	Yes	No

#### Simultaneous Transmission Scenarios:

Note:

1. The device does not support DTM function. Body-worn accessory testing is typically associated with voice operations. Therefore, GSM voice was evaluated for body-worn SAR.

2. Based on KDB447498D01 note 36, when SAR test exclusion is allowed by other published RF exposure KDB procedures, such as the 2.5 cm hotspot mode SAR test exclusion for an edge or surface, then estimated SAR is not required to determine simultaneous SAR test exclusion.

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#### 3.1 Estimated SAR calculation

According to KDB447498 D01v06 - When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:

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

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

Mode	Position	Max. Power (dBm)	f(GHz)	Distance (mm)	х	Estimated SAR
BT	Body-worn	7.3	2.48	10	7.5	0.113 (1g)
BT	Head	7.3	2.48	≦5	7.5	0.226 (1g)

#### 3.2 SPLSR evaluation and analysis

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

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

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

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

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

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reported SAR WWAN and WLAN 2.4GHz, ΣSAR evaluation								
Frequency		.,.	reported S	ΣSAR				
band	Position		WWAN	WLAN	<1.6W/kg			
GSM 850		Right cheek	0.20	0.03	0.23			
	Head	Right tilt	0.08	0.02	0.10			
0.0101 0.00	Tieau	Left cheek	0.16	0.11	0.27			
		Left tilt	0.09	0.05	0.14			
		Front	0.32	0.04	0.36			
		Back	0.51	0.18	0.69			
GPRS 850	Hotspot	Тор	-	0.01	-			
(1Dn4UP)	Потэрог	Bottom	0.06	-	-			
		Right	0.24	0.09	0.33			
		Left	0.19	-	-			
	Head	Right cheek	0.24	0.03	0.27			
GSM 1900		Right tilt	0.08	0.02	0.10			
		Left cheek	0.55	0.11	0.66			
		Left tilt	0.13	0.05	0.18			
	Hotspot	Front side	0.67	0.04	0.71			
		Back side	0.69	0.18	0.87			
GPRS 1900		Top side	-	0.01	-			
(1Dn4UP)		Bottom side	0.19	-	-			
		Right side	0.31	0.09	0.40			
		Left side	0.30	-	-			
		Right cheek	0.11	0.03	0.14			
	Head	Right tilt	0.08	0.02	0.10			
	Tieau	Left cheek	0.11	0.11	0.22			
		Left tilt	0.06	0.05	0.11			
WCDMA		Front side	0.19	0.04	0.23			
Band V		Back side	0.30	0.18	0.48			
		Top side	-	0.01	-			
	Hotspot	Bottom side	0.07	-	-			
		Right side	0.12	0.09	0.21			
		Left side	0.11	-	-			

#### Simultaneous Transmission Combination

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reported SAR WWAN and WLAN 2.4GHz, ΣSAR evaluation							
Frequency	D	acition	reported S	ΣSAR			
band	Position		WWAN	WLAN	<1.6W/kg		
		Right cheek	0.08	0.03	0.11		
	Head	Right tilt	0.04	0.02	0.06		
	neau	Left cheek	0.08	0.11	0.19		
		Left tilt	0.07	0.05	0.12		
LTE FDD		Front side	0.19	0.04	0.23		
Band 5	Hotspot	Back side	0.31	0.18	0.49		
		Top side	-	0.01	-		
		Bottom side	0.08	-	-		
		Right side	0.08	0.09	0.17		
		Left side	0.09	-	-		
	Head	Right cheek	0.02	0.03	0.05		
		Right tilt		0.02	0.03		
		Left cheek	0.02	0.11	0.13		
		Left tilt	0.01	0.05	0.06		
LTE FDD		Front side	0.04	0.04	0.08		
Band 17		Back side	0.08	0.18	0.26		
	Hotopot	Top side	-	0.01	-		
	HUISPOL	Hotspot Bottom side		-	-		
		Right side	0.01	0.09	0.10		
		Left side		0.02	-	-	

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reported SAR WWAN and Bluetooth, $\Sigma$ SAR evaluation							
Frequency	_			SAR / W/kg	ΣSAR		
band	Po	sition	WWAN	Bluetooth	<1.6W/kg		
		Right cheek	0.20	0.23	0.43		
GSM 850	Head	Right tilt	0.08	0.23	0.31		
G3W 030	Heau	Left cheek	0.16	0.23	0.39		
		Left tilt	0.09	0.23	0.32		
		Right cheek	0.24	0.23	0.47		
GSM 1900	Head	Right tilt	0.08	0.23	0.31		
G3W 1900	neau	Left cheek	0.55 0.23	0.78			
		Left tilt	0.13	0.23	0.36		
		Right cheek	0.11	0.23	0.34		
WCDMA	Head	Right tilt	0.08	0.23	0.31		
Band V	neau	Left cheek	0.11	0.23	0.34		
		Left tilt	0.06	0.23	0.29		
		Right cheek	0.08	0.23	0.31		
LTE FDD Band 5	Head	Right tilt	0.04	0.23	0.27		
LTE FDD Banu 5	neau	Left cheek	0.08	0.23	0.31		
		Left tilt	0.07	0.23	0.30		
		Right cheek	0.02	0.23	0.25		
LTE FDD Band 17	Head	Right tilt	0.01	0.23	0.24		
	neau	Left cheek	0.02	0.23	0.25		
		Left tilt	0.01	0.23	0.24		

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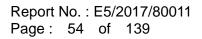
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reported SAR WWAN and Bluetooth, ΣSAR evaluation								
Frequency	_	reported SAR / W/kg		ΣSAR				
band	Pos	ition	WWAN	Bluetooth	<1.6W/kg			
GSM 850	Body-worn	Front	0.32	0.11	0.43			
<b>G</b> SIM 650	Douy-worn	Back	0.47	0.11	0.58			
GSM 1900	Body-worn	Front	0.55	0.11	0.66			
GSIM 1900		Back	0.69	0.11	0.80			
WCDMA	Rody worn	Front	0.19	0.11	0.30			
Band V	Body-worn	Back	0.30	0.11	0.41			
LTE FDD Band 5	Dealers	Front	0.19	0.11	0.30			
LTE FDD Ballu 5	Body-worn	Back	0.31	0.11	0.42			
LTE FDD Band 17	Body-worn	Front	0.04	0.11	0.15			
	Douy-worn	Back	0.08	0.11	0.19			

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Report No. : E5/2017/80011 Page : 55 of 139

# 4. Instruments List

Manufacturer	Device	Туре	Serial number	Date of last calibration	Date of next calibration
SPEAG	Dosimetric E-Field	EX3DV4	3831	Jan.23,2017	Jan.22,2018
	Probe		7466	Jul.04,2017	Jul.03,2018
		D750V3	1078	Jun.20,2017	Jun.19,2018
SPEAG	System Validation	D835V2	4d120	Jul.03,2017	Jul.02,2018
SPEAG	Dipole	D1900V2	5d173	May.31,2017	May.30,2018
		D2450V2	727	Apr.21,2017	Apr.20,2018
SPEAG	Data acquisition Electronics	DAE4	1336	Nov.22,2016	Nov.21,2017
SPEAG	Software	DASY 52 V52.8.8	N/A	Calibration not required	Calibration not required
SPEAG	Phantom	SAM	N/A	Calibration not required	Calibration not required
Network Analyzer	Agilent	E5071C	MY46107530	Jan.20,2017	Jan.19,2018
Agilent	Dielectric Probe Kit	85070E	MY44300677	Calibration not required	Calibration not required
Agilopt	Dual-directional	772D	MY52180142	Apr.13,2017	Apr.12,2018
Agilent	coupler	778D	MY52180302 Apr.13,2017		Apr.12,2018
Agilent	RF Signal Generator	N5181A	MY50144143	Mar.01,2017	Feb.28,2018
Agilent	Power Meter	E4417A	MY51410006	Jan.20,2017	Jan.19,2018
Agilopt	Dowor Sonoor	E9301H	MY51470001	Jan.20,2017	Jan.19,2018
Agilent	Power Sensor	E9301H	MY51470002	Jan.20,2017	Jan.19,2018
TECPEL	Digital thermometer	DTM-303A	TP130077	Mar.17,2017	Mar.16,2018
Anritsu	Radio Communication Test	MT8820C	6201061049	Apr.08,2017	Apr.07,2018

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# 5. Measurements

Date: 2017/8/24

## GSM 850\_Head\_Re Cheek\_CH 251

Communication System: GSM; Frequency: 848.8 MHz; Duty Cycle: 1:8.3 Medium parameters used: f = 849 MHz;  $\sigma$  = 0.882 S/m;  $\epsilon_r$  = 40.094;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Right Section Ambient temperature: 22.6°C; Liquid temperature: 22.4°C

**DASY5** Configuration:

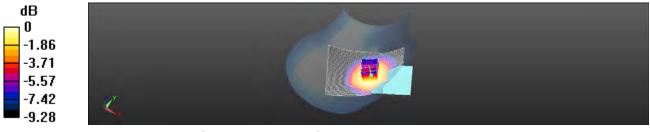
- Probe: EX3DV4 SN7466; ConvF(10.2, 10.2, 10.2); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2016/11/22
- Phantom: Head
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

**Configuration/Head/Area Scan (71x121x1):** Interpolated grid: dx=15 mm, dy=15 mm

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

### Configuration/Head/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm,

dy=8mm, dz=5mm Reference Value = 3.056 V/m; Power Drift = -0.01 dB Peak SAR (extrapolated) = 0.178 W/kg SAR(1 g) = 0.145 W/kg; SAR(10 g) = 0.110 W/kg Maximum value of SAR (measured) = 0.164 W/kg



0 dB = 0.164 W/kg = -7.85 dBW/kg

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## GSM 850\_Body-worn\_Back side\_CH 251\_10mm

Communication System: GSM; Frequency: 848.8 MHz; Duty Cycle: 1:8.3 Medium parameters used: f = 849 MHz;  $\sigma$  = 0.972 S/m;  $\epsilon_r$  = 54.786;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 22.5°C; Liquid temperature: 22.2°C

#### DASY5 Configuration:

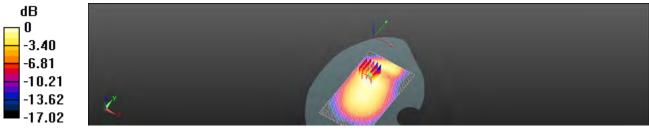
- Probe: EX3DV4 SN7466; ConvF(10.24, 10.24, 10.24); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2016/11/22
- Phantom: Head
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

# **Configuration/Head/Area Scan (71x121x1):** Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.440 W/kg

### Configuration/Head/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm,

dy=8mm, dz=5mm Reference Value = 12.94 V/m; Power Drift = 0.17 dB Peak SAR (extrapolated) = 0.555 W/kg SAR(1 g) = 0.355 W/kg; SAR(10 g) = 0.234 W/kg Maximum value of SAR (measured) = 0.438 W/kg



0 dB = 0.438 W/kg = -3.58 dBW/kg

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## GPRS 850\_Hotspot\_Back side\_CH 128\_10mm

Communication System: GPRS (1Dn4Up); Frequency: 824.2 MHz; Duty Cycle: 1:2 Medium parameters used: f = 824.2 MHz;  $\sigma$  = 0.954 S/m;  $\epsilon_r$  = 54.851;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 22.5°C; Liquid temperature: 22.2°C

**DASY5** Configuration:

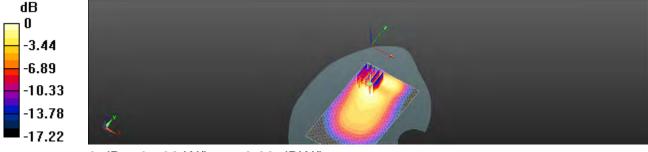
- Probe: EX3DV4 SN7466; ConvF(10.24, 10.24, 10.24); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2016/11/22
- Phantom: Head
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

**Configuration/Head/Area Scan (71x121x1):** Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.516 W/kg

### Configuration/Head/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm,

dy=8mm, dz=5mm Reference Value = 15.11 V/m; Power Drift = 0.03 dB Peak SAR (extrapolated) = 0.664 W/kg SAR(1 g) = 0.397 W/kg; SAR(10 g) = 0.283 W/kg Maximum value of SAR (measured) = 0.502 W/kg



0 dB = 0.502 W/kg = -2.99 dBW/kg

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### GSM 1900\_Head\_Le Cheek\_CH 512

Communication System: GSM; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3 Medium parameters used: f = 1850.2 MHz;  $\sigma$  = 1.396 S/m;  $\epsilon_r$  = 39.486;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Left Section Ambient temperature: 22.8°C; Liquid temperature: 22.0°C

#### DASY5 Configuration:

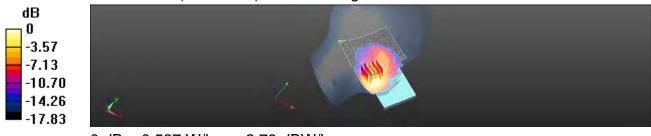
- Probe: EX3DV4 SN7466; ConvF(8.52, 8.52, 8.52); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2016/11/22
- Phantom: Head
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

**Configuration/Head/Area Scan (71x121x1):** Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.525 W/kg

#### Configuration/Head/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm,

dy=8mm, dz=5mm Reference Value = 3.786 V/m; Power Drift = -0.12 dB Peak SAR (extrapolated) = 0.607 W/kg SAR(1 g) = 0.417 W/kg; SAR(10 g) = 0.268 W/kg Maximum value of SAR (measured) = 0.527 W/kg



0 dB = 0.527 W/kg = -2.79 dBW/kg

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## GSM 1900\_Body-worn\_Back side\_CH 512\_10mm

Communication System: GSM; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3 Medium parameters used: f = 1850.2 MHz;  $\sigma$  = 1.518 S/m;  $\epsilon_r$  = 54.201;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 22.4°C; Liquid temperature: 22.1°C

DASY5 Configuration:

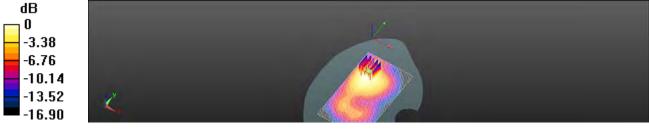
- Probe: EX3DV4 SN7466; ConvF(8.14, 8.14, 8.14); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2016/11/22
- Phantom: Head
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

**Configuration/Head/Area Scan (71x121x1):** Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.735 W/kg

### Configuration/Head/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm,

dy=8mm, dz=5mm Reference Value = 9.656 V/m; Power Drift = 0.12 dB Peak SAR (extrapolated) = 0.831 W/kg SAR(1 g) = 0.530 W/kg; SAR(10 g) = 0.326 W/kg Maximum value of SAR (measured) = 0.687 W/kg



0 dB = 0.687 W/kg = -1.63 dBW/kg

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## GPRS 1900\_Hotspot\_Back side\_CH 512\_10mm

Communication System: GPRS (1Dn4Up); Frequency: 1850.2 MHz; Duty Cycle: 1:2 Medium parameters used: f = 1850.2 MHz;  $\sigma$  = 1.518 S/m;  $\epsilon_r$  = 54.201;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 22.4°C; Liquid temperature: 22.1°C

DASY5 Configuration:

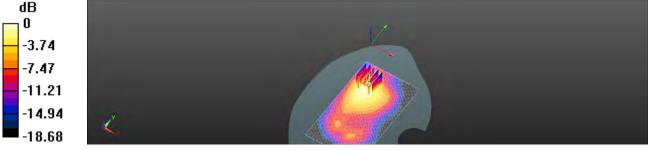
- Probe: EX3DV4 SN7466; ConvF(8.14, 8.14, 8.14); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2016/11/22
- Phantom: Head
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

**Configuration/Head/Area Scan (71x121x1):** Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.774 W/kg

### Configuration/Head/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm,

dy=8mm, dz=5mm Reference Value = 10.04 V/m; Power Drift = -0.19 dB Peak SAR (extrapolated) = 0.892 W/kg SAR(1 g) = 0.552 W/kg; SAR(10 g) = 0.333 W/kg Maximum value of SAR (measured) = 0.724 W/kg dB



0 dB = 0.724 W/kg = -1.40 dBW/kg

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# WCDMA Band V\_Head\_Re Cheek\_CH 4183

Communication System: WCDMA; Frequency: 836.6 MHz; Duty Cycle: 1:1 Medium parameters used: f = 837 MHz;  $\sigma$  = 0.869 S/m;  $\epsilon_r$  = 40.105;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Right Section Ambient temperature: 22.6°C; Liquid temperature: 22.4°C

DASY5 Configuration:

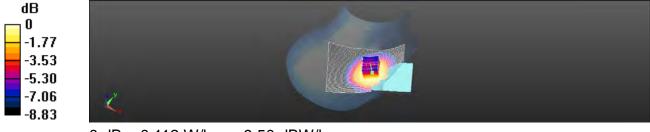
- Probe: EX3DV4 SN7466; ConvF(10.2, 10.2, 10.2); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2016/11/22
- Phantom: Head
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

**Configuration/Head/Area Scan (71x121x1):** Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.112 W/kg

### Configuration/Head/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm,

dy=8mm, dz=5mm Reference Value = 2.637 V/m; Power Drift = -0.14 dB Peak SAR (extrapolated) = 0.122 W/kg SAR(1 g) = 0.100 W/kg; SAR(10 g) = 0.077 W/kg Maximum value of SAR (measured) = 0.112 W/kg



0 dB = 0.112 W/kg = -9.50 dBW/kg

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# WCDMA Band V\_Hotspot\_Back side\_CH 4183\_10mm

Communication System: WCDMA; Frequency: 836.6 MHz; Duty Cycle: 1:1 Medium parameters used: f = 837 MHz;  $\sigma$  = 0.957 S/m;  $\epsilon_r$  = 54.812;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 22.5°C; Liquid temperature: 22.2°C

DASY5 Configuration:

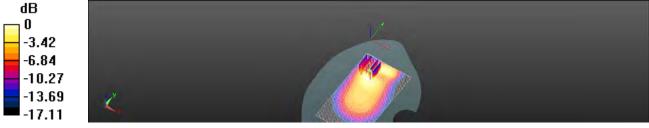
- Probe: EX3DV4 SN7466; ConvF(10.24, 10.24, 10.24); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2016/11/22
- Phantom: Head
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

**Configuration/Head/Area Scan (71x121x1):** Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.380 W/kg

### Configuration/Head/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm,

dy=8mm, dz=5mm Reference Value = 12.31 V/m; Power Drift = -0.03 dB Peak SAR (extrapolated) = 0.496 W/kg SAR(1 g) = 0.277 W/kg; SAR(10 g) = 0.161 W/kg Maximum value of SAR (measured) = 0.368 W/kg



0 dB = 0.368 W/kg = -4.34 dBW/kg

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# LTE Band 5 (10MHz)\_Head\_Re Cheek\_CH 20525\_QPSK\_1-25

Communication System: LTE; Frequency: 836.5 MHz; Duty Cycle: 1:1 Medium parameters used: f = 836.5 MHz;  $\sigma$  = 0.869 S/m;  $\epsilon_r$  = 40.105;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Right Section Ambient temperature: 22.6°C; Liquid temperature: 22.4°C

DASY5 Configuration:

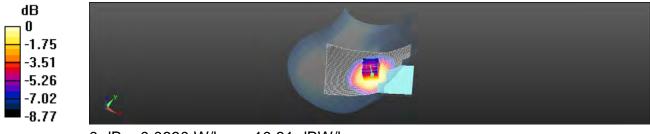
- Probe: EX3DV4 SN7466; ConvF(10.2, 10.2, 10.2); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2016/11/22
- Phantom: Head
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

**Configuration/Head/Area Scan (71x121x1):** Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.0840 W/kg

### Configuration/Head/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm,

dy=8mm, dz=5mm Reference Value = 1.915 V/m; Power Drift = 0.11 dB Peak SAR (extrapolated) = 0.0900 W/kg SAR(1 g) = 0.074 W/kg; SAR(10 g) = 0.057 W/kg Maximum value of SAR (measured) = 0.0830 W/kg



0 dB = 0.0830 W/kg = -10.81 dBW/kg

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# LTE Band 5 (10MHz)\_Hotspot\_Back side\_CH 20525\_QPSK 1-25\_10mm

Communication System: LTE; Frequency: 836.5 MHz; Duty Cycle: 1:1 Medium parameters used: f = 836.5 MHz;  $\sigma$  = 0.957 S/m;  $\epsilon_r$  = 54.812;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 22.5°C; Liquid temperature: 22.2°C

DASY5 Configuration:

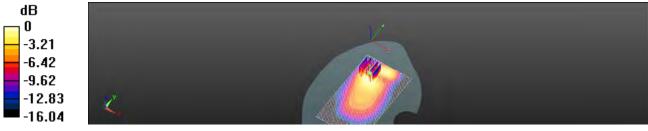
- Probe: EX3DV4 SN7466; ConvF(10.24, 10.24, 10.24); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2016/11/22
- Phantom: Head
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

**Configuration/Head/Area Scan (71x121x1):** Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.365 W/kg

#### Configuration/Head/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm,

dy=8mm, dz=5mm Reference Value = 11.16 V/m; Power Drift = 0.07 dB Peak SAR (extrapolated) = 0.488 W/kg SAR(1 g) = 0.281 W/kg; SAR(10 g) = 0.164 W/kg Maximum value of SAR (measured) = 0.375 W/kg



0 dB = 0.375 W/kg = -4.26 dBW/kg

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# LTE Band 17 (10MHz)\_Head\_Re Cheek\_CH 23790\_QPSK\_1-25

Communication System: LTE; Frequency: 710 MHz; Duty Cycle: 1:1 Medium parameters used: f = 710 MHz;  $\sigma$  = 0.888 S/m;  $\epsilon_r$  = 41.7;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Right Section Ambient temperature: 22.9°C; Liquid temperature: 22.5°C

DASY5 Configuration:

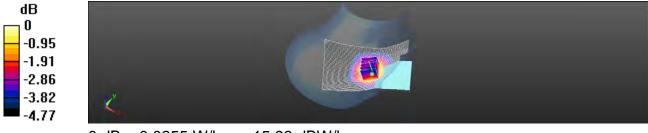
- Probe: EX3DV4 SN3831; ConvF(9.63, 9.63, 9.63); Calibrated: 2017/1/23;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2016/11/22
- Phantom: Head
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

**Configuration/Head/Area Scan (71x121x1):** Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.0250 W/kg

### Configuration/Head/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm,

dy=8mm, dz=5mm Reference Value = 2.400 V/m; Power Drift = 0.12 dB Peak SAR (extrapolated) = 0.0270 W/kg SAR(1 g) = 0.023 W/kg; SAR(10 g) = 0.019 W/kg Maximum value of SAR (measured) = 0.0255 W/kg



0 dB = 0.0255 W/kg = -15.93 dBW/kg

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# LTE Band 17 (10MHz)\_Hotspot\_Back side\_CH 23790\_QPSK 1-25\_10mm

Communication System: LTE; Frequency: 710 MHz; Duty Cycle: 1:1 Medium parameters used: f = 710 MHz;  $\sigma$  = 0.952 S/m;  $\epsilon_r$  = 54.117;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 22.7°C; Liquid temperature: 22.3°C

DASY5 Configuration:

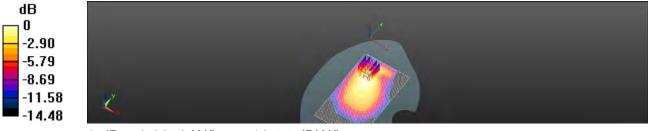
- Probe: EX3DV4 SN3831; ConvF(9.59, 9.59, 9.59); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2016/11/22
- Phantom: Head
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

**Configuration/Head/Area Scan (71x121x1):** Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.0902 W/kg

### Configuration/Head/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm,

dy=8mm, dz=5mm Reference Value = 7.411 V/m; Power Drift = 0.15 dB Peak SAR (extrapolated) = 0.108 W/kg SAR(1 g) = 0.071 W/kg; SAR(10 g) = 0.046 W/kg Maximum value of SAR (measured) = 0.0876 W/kg



0 dB = 0.0876 W/kg = -10.57 dBW/kg

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# WLAN 802.11b\_Head\_Le Cheek\_CH 1

Communication System: WLAN(2.4G); Frequency: 2412 MHz; Duty Cycle: 1:1 Medium parameters used: f = 2412 MHz;  $\sigma$  = 1.792 S/m;  $\epsilon_r$  = 39.294;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Left Section Ambient temperature: 22.5°C; Liquid temperature: 22.5°C

#### DASY5 Configuration:

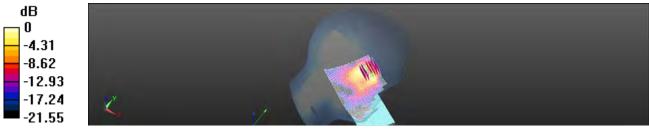
- Probe: EX3DV4 SN7466; ConvF(7.81, 7.81, 7.81); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2016/11/22
- Phantom: Head
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

# **Configuration/Head/Area Scan (81x151x1):** Interpolated grid: dx=12 mm, dy=12 mm

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

### Configuration/Head/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm,

dy=5mm, dz=5mm Reference Value = 2.844 V/m; Power Drift = 0.08 dB Peak SAR (extrapolated) = 0.257 W/kg SAR(1 g) = 0.110 W/kg; SAR(10 g) = 0.051 W/kg Maximum value of SAR (measured) = 0.168 W/kg



0 dB = 0.168 W/kg = -7.74 dBW/kg

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# WLAN 802.11b\_Hotspot\_Back side\_CH 1\_10mm

Communication System: WLAN(2.4G); Frequency: 2412 MHz; Duty Cycle: 1:1 Medium parameters used: f = 2412 MHz;  $\sigma$  = 1.919 S/m;  $\epsilon_r$  = 52.209;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 22.1°C; Liquid temperature: 21.8°C

#### DASY5 Configuration:

- Probe: EX3DV4 SN7466; ConvF(7.81, 7.81, 7.81); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2016/11/22
- Phantom: Head
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

# **Configuration/Head/Area Scan (81x151x1):** Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 0.278 W/kg

### Configuration/Head/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm,

```
dy=5mm, dz=5mm

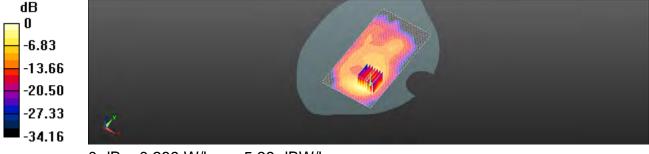
Reference Value = 3.526 V/m; Power Drift = -0.16 dB

Peak SAR (extrapolated) = 0.397 W/kg

SAR(1 g) = 0.181 W/kg; SAR(10 g) = 0.074 W/kg

Maximum value of SAR (measured) = 0.289 W/kg

dB
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0 dB = 0.289 W/kg = -5.39 dBW/kg

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# 6. SAR System Performance Verification

Date: 2017/8/25

# Dipole 750 MHz\_SN:1078\_Head

Communication System: CW; Frequency: 750 MHz; Duty Cycle: 1:1 Medium parameters used: f = 750 MHz;  $\sigma$  = 0.895 S/m;  $\epsilon_r$  = 41.485;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 22.9°C; Liquid temperature: 22.5°C

DASY5 Configuration:

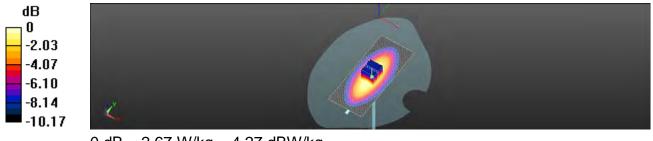
- Probe: EX3DV4 SN3831; ConvF(9.63, 9.63, 9.63); Calibrated: 2017/1/23;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2016/11/22
- Phantom: Head
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

**Configuration/Pin=250mW/Area Scan (51x121x1):** Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 2.60 W/kg

#### Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid:

dx=5mm, dy=5mm, dz=5mm Reference Value = 56.44 V/m; Power Drift = -0.10 dB Peak SAR (extrapolated) = 3.11 W/kg SAR(1 g) = 2.13 W/kg; SAR(10 g) = 1.41 W/kg Maximum value of SAR (measured) = 2.67 W/kg



0 dB = 2.67 W/kg = 4.27 dBW/kg

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## Dipole 750 MHz\_SN:1078\_Body

Communication System: CW; Frequency: 750 MHz; Duty Cycle: 1:1 Medium parameters used: f = 750 MHz;  $\sigma$  = 0.969 S/m;  $\epsilon_r$  = 53.956;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 22.7°C; Liquid temperature: 22.3°C

#### DASY5 Configuration:

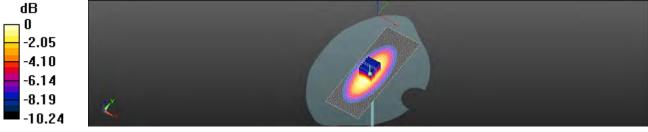
- Probe: EX3DV4 SN3831; ConvF(9.59, 9.59, 9.59); Calibrated: 2017/1/23;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2016/11/22
- Phantom: Head
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

# **Configuration/Pin=250mW/Area Scan (51x141x1):** Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 2.82 W/kg

### Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid:

dx=5mm, dy=5mm, dz=5mm Reference Value = 55.72 V/m; Power Drift = -0.01 dB Peak SAR (extrapolated) = 3.38 W/kg SAR(1 g) = 2.28 W/kg; SAR(10 g) = 1.5 W/kg Maximum value of SAR (measured) = 2.88 W/kg



0 dB = 2.88 W/kg = 4.59 dBW/kg

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## Dipole 835 MHz\_SN:4d120\_Head

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1 Medium parameters used: f = 835 MHz;  $\sigma$  = 0.867 S/m;  $\epsilon_r$  = 40.106;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 22.6°C; Liquid temperature: 22.4°C

#### DASY5 Configuration:

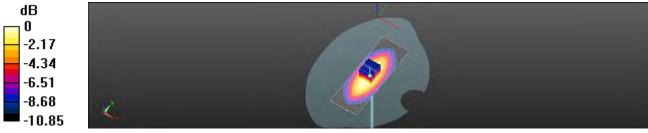
- Probe: EX3DV4 SN7466; ConvF(10.2, 10.2, 10.2); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2016/11/22
- Phantom: Head
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

# **Configuration/Pin=250mW/Area Scan (41x121x1):** Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 3.06 W/kg

### Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid:

dx=5mm, dy=5mm, dz=5mm Reference Value = 60.89 V/m; Power Drift = -0.07 dB Peak SAR (extrapolated) = 3.62 W/kg SAR(1 g) = 2.43 W/kg; SAR(10 g) = 1.58 W/kg Maximum value of SAR (measured) = 3.08 W/kg



0 dB = 3.08 W/kg = 4.89 dBW/kg

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## Dipole 835 MHz\_SN:4d120\_Body

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1 Medium parameters used: f = 835 MHz;  $\sigma$  = 0.955 S/m;  $\epsilon_r$  = 54.817;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 22.5°C; Liquid temperature: 22.2°C

## DASY5 Configuration:

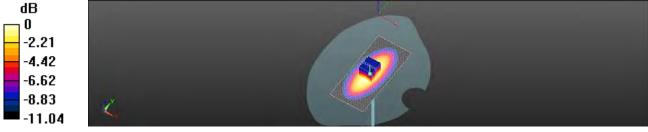
- Probe: EX3DV4 SN7466; ConvF(10.24, 10.24, 10.24); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2016/11/22
- Phantom: Head
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

# **Configuration/Pin=250mW/Area Scan (51x111x1):** Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 3.10 W/kg

## Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid:

dx=5mm, dy=5mm, dz=5mm Reference Value = 57.26 V/m; Power Drift = -0.01 dB Peak SAR (extrapolated) = 3.71 W/kg SAR(1 g) = 2.47 W/kg; SAR(10 g) = 1.6 W/kg Maximum value of SAR (measured) = 3.14 W/kg



0 dB = 3.14 W/kg = 4.98 dBW/kg

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## Dipole 1900 MHz\_SN:5d173\_Head

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1 Medium parameters used: f = 1900 MHz;  $\sigma$  = 1.421 S/m;  $\epsilon_r$  = 39.436;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 22.8°C; Liquid temperature: 22.0°C

## DASY5 Configuration:

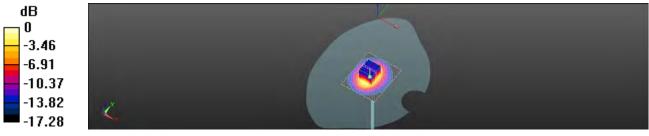
- Probe: EX3DV4 SN7466; ConvF(8.52, 8.52, 8.52); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2016/11/22
- Phantom: Head
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

## **Configuration/Pin=250mW/Area Scan (51x61x1):** Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 13.7 W/kg

## Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid:

dx=5mm, dy=5mm, dz=5mm Reference Value = 100.8 V/m; Power Drift = -0.01 dB Peak SAR (extrapolated) = 17.0 W/kg SAR(1 g) = 9.92 W/kg; SAR(10 g) = 5.26 W/kg Maximum value of SAR (measured) = 13.4 W/kg



0 dB = 13.4 W/kg = 11.27 dBW/kg

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## Dipole 1900 MHz\_SN:5d173\_Body

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1 Medium parameters used: f = 1900 MHz;  $\sigma$  = 1.543 S/m;  $\epsilon_r$  = 54.158;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 22.4°C; Liquid temperature: 22.1°C

## DASY5 Configuration:

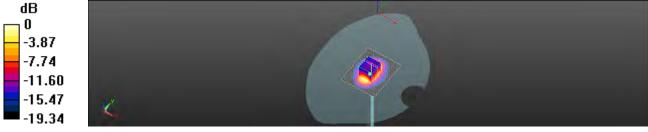
- Probe: EX3DV4 SN7466; ConvF(8.14, 8.14, 8.14); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2016/11/22
- Phantom: Head
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

# **Configuration/Pin=250mW/Area Scan (51x61x1):** Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 14.9 W/kg

## Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid:

dx=5mm, dy=5mm, dz=5mm Reference Value = 96.87 V/m; Power Drift = 0.01 dB Peak SAR (extrapolated) = 18.2 W/kg SAR(1 g) = 9.9 W/kg; SAR(10 g) = 5.18 W/kg Maximum value of SAR (measured) = 14.2 W/kg



0 dB = 14.2 W/kg = 11.51 dBW/kg

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## Dipole 2450 MHz\_SN:727\_Head

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1 Medium parameters used: f = 2450 MHz;  $\sigma$  = 1.826 S/m;  $\epsilon_r$  = 39.235;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 22.5°C; Liquid temperature: 22.5°C

## DASY5 Configuration:

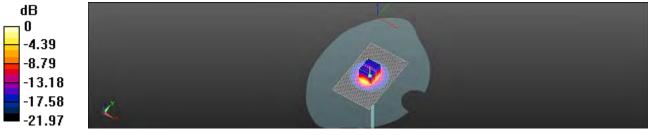
- Probe: EX3DV4 SN7466; ConvF(7.81, 7.81, 7.81); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2016/11/22
- Phantom: Head
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

## **Configuration/Pin=250mW/Area Scan (71x111x1):** Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 21.4 W/kg

## Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid:

dx=5mm, dy=5mm, dz=5mm Reference Value = 106.4 V/m; Power Drift = 0.10 dB Peak SAR (extrapolated) = 27.5 W/kg SAR(1 g) = 13.5 W/kg; SAR(10 g) = 6.25 W/kg Maximum value of SAR (measured) = 20.5 W/kg



0 dB = 20.5 W/kg = 13.13 dBW/kg

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## Dipole 2450 MHz\_SN:727\_Body

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1 Medium parameters used: f = 2450 MHz;  $\sigma$  = 1.954 S/m;  $\epsilon_r$  = 52.149;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 22.1°C; Liquid temperature: 21.8°C

## DASY5 Configuration:

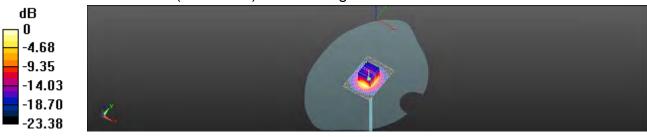
- Probe: EX3DV4 SN7466; ConvF(7.94, 7.94, 7.94); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2016/11/22
- Phantom: Head
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

## **Configuration/Pin=250mW/Area Scan (51x71x1):** Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 19.8 W/kg

## Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid:

dx=5mm, dy=5mm, dz=5mm Reference Value = 96.79 V/m; Power Drift = -0.00 dB Peak SAR (extrapolated) = 26.0 W/kg SAR(1 g) = 12.5 W/kg; SAR(10 g) = 5.95 W/kg Maximum value of SAR (measured) = 19.0 W/kg



0 dB = 19.0 W/kg = 12.79 dBW/kg

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## Dipole 835 MHz\_SN:4d120\_Body

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1 Medium parameters used: f = 835 MHz;  $\sigma$  = 0.981 S/m;  $\epsilon_r$  = 55.243;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 22.1°C; Liquid temperature: 21.8°C

## DASY5 Configuration:

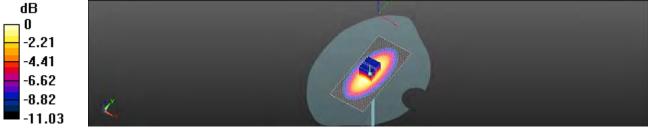
- Probe: EX3DV4 SN7466; ConvF(10.24, 10.24, 10.24); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2016/11/22
- Phantom: Head
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

## **Configuration/Pin=250mW/Area Scan (51x111x1):** Interpolated grid: dx=15 mm, dy=15 mm

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

## Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid:

dx=5mm, dy=5mm, dz=5mm Reference Value = 57.70 V/m; Power Drift = -0.02 dB Peak SAR (extrapolated) = 3.75 W/kg SAR(1 g) = 2.5 W/kg; SAR(10 g) = 1.62 W/kg Maximum value of SAR (measured) = 3.18 W/kg



0 dB = 3.18 W/kg = 5.03 dBW/kg

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f (886-2) 2298-0488



## Dipole 1900 MHz\_SN:5d173\_Body

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1 Medium parameters used: f = 1900 MHz;  $\sigma$  = 1.512 S/m;  $\epsilon_r$  = 53.781;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 22.1°C; Liquid temperature: 22.1°C

## DASY5 Configuration:

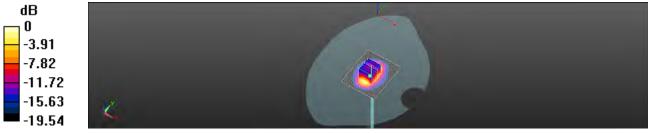
- Probe: EX3DV4 SN7466; ConvF(8.14, 8.14, 8.14); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2016/11/22
- Phantom: Head
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

## **Configuration/Pin=250mW/Area Scan (51x61x1):** Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 14.8 W/kg

## Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid:

dx=5mm, dy=5mm, dz=5mm Reference Value = 97.08 V/m; Power Drift = -0.01 dB Peak SAR (extrapolated) = 18.3 W/kg SAR(1 g) = 9.9 W/kg; SAR(10 g) = 5.08 W/kg Maximum value of SAR (measured) = 14.2 W/kg



0 dB = 14.2 W/kg = 11.51 dBW/kg

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## Dipole 2450 MHz\_SN:727\_Body

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1 Medium parameters used: f = 2450 MHz;  $\sigma$  = 1.97 S/m;  $\epsilon_r$  = 52.613;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 22.1°C; Liquid temperature: 22.0°C

## DASY5 Configuration:

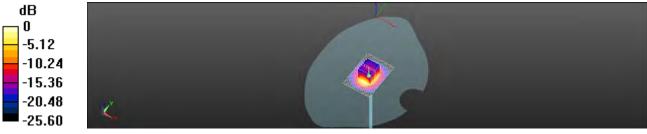
- Probe: EX3DV4 SN7466; ConvF(7.94, 7.94, 7.94); Calibrated: 2017/7/5;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2016/11/22
- Phantom: Head
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

## **Configuration/Pin=250mW/Area Scan (51x71x1):** Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 20.2 W/kg

## Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid:

dx=5mm, dy=5mm, dz=5mm Reference Value = 97.74 V/m; Power Drift = -0.04 dB Peak SAR (extrapolated) = 26.4 W/kg SAR(1 g) = 12.5 W/kg; SAR(10 g) = 5.74 W/kg Maximum value of SAR (measured) = 19.3 W/kg



0 dB = 19.3 W/kg = 12.86 dBW/kg

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## 7. DAE & Probe Calibration Certificate

e Swiss Accreditation Servic	ation Service (SAS) e is one of the signatories		lo.: SCS 0108
iultilateral Agreement for the r			
ilient SGS - TW (Auc		Certificate No:	DAE4-1336_Nov16
CALIBRATION	CERTIFICATE		
Object	DAE4 - SD 000 D	04 BM - SN: 1336	
Calibestion procedure(s)	QA CAL-06.v29 Calibration proces	lure for the data acquisition electr	ronics (DAE)
Calbration date:	November 22, 20	6	
The measurements and the unce All calibrations have been condu	ertainties with confidence pro	nal standards, which realize the physical una bability are given on the following pages and reacity: environment temperature (22 + 3)°C	are part of the certificate.
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The measurements and the unor All calibrations have been condu Calibration Equipment used (M8 Primary Standards Kethiley Mutimeter Type 2001 Secondary Standards Auto DAE Calibration Unit Calibrator Box V2.1	ertanties with confidence pro- cted in the closed laboratory TE critical for calibration) ID # SN: 0610278 ID # ID # SE UW/S 063 AA 1001 SE UW/S 066 AA 1002 Name Adman Gaming	publicity are given on the following pages and tacility: environment temperature (22 + 3)°C Cal Date (Certricate No.) 09-Sep-16 (No.19065) Check Date (In house) 05-Jan-16 (In house Creck) 06-Jan-16 (In house Creck) D6-Jan-16 (In house check) Function Technician	are part of the certificate. and humidity < 70%. Scheduled Calbration Sep-17 Schedured Cheps In house check: Jan-17 In house check: Jan-17 Signature A SAM

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Calibration Laboratory of Schmid & Partner Engineering AG Zeugheusstrasse 43, 6004 Zurich, Switzerland



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Accerditation No.1 SCS 0108

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

#### Glossary

DAE Connector angle

data acquisition electronics 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 ۰. 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 vollage.
  - 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

Dentificate No/ DAE4-1335\_Nov16

Page 2 of 5

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### DC Voltage Measurement

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	AUD	- Come	arter i	Respi	afirm	acenia	al

High Range:	1LSB-	6.1µV	= agrun Ilut	-100. +300 mV
Low Range	ILSE =	61nV	full minge =	-1+3mV
DASY measurement (	sammenere. Aut	o Zero Time: :	3 sec: Measuring	time: 3 sec

Calibration Factors	X	Υ	Z
High Range	403.332 ± 0.02% (k=2)	403.635 ± 0.02% (k=2)	403.121 ± 0.02% (k=2)
Low Range	3.95216 ± 1.50% (k=2)	3.98718±1.50% (k=2)	3.99680 ± 1.50% (k=2)

**Connector Angle** 

Connector Angle to be used in DASY system	122.0 *±1*
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Certificate No: DAE4-1338\_Nov16

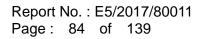
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#### Appendix (Additional assessments outside the scope of SCS0108)

### 1. DC Voltage Linearity

High Range	Reading (µV)	Difference (µV)	Error (%)
Channel X + Input	199996.24	0.16	0.00
Channel X + Input	20001.25	-0.04	-0.00
Channel X - Input	-19999.81	1.35	-0.01
Channel Y + Input	199994.04	-1.8B	-6.00
Channel Y + Input	20000.69	-0.82	+0.00
Channel Y - Input	-20002.64	-1.77	0.01
Channel Z + Input	199997.44	1.49	0.00
Channel Z + Input	19999.78	-1.82	-0,01
Channel Z + Input	-20003.24	-2.19	0.01

Low Range	Reading (µV)	Difference (µV)	Ervor (%)
Channel X + Input	2001.87	0.66	0.03
Channel X + Input	201.39	-0.11	-0.06
Channel X - Input	-198.27	0.04	-0.02
Channel Y + Input	2001.34	-0,04	-0.00
Channel Y + Input	201.35	-0.36	-0.18
Channel Y - Input	-198.77	-0.62	0.31
Channel Z + Input	2001.30	0,10	10,0
Channel Z + Input	200.72	-0,71	+0.35
Channel Z - Input	-199.12	-0.78	0.39

#### 2. Common mode sensitivity

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

	Common mode Input Voltage (mV)	High Renge Average Reading (µV)	Low Range Average Reading (µV)
Channel X	200	5.23	3.90
	: 200	-3.72	-5.31
Channel Y	200	-4.23	-3,73
	-200	2.71	2.31
Channel Z	500	20.93	21,36
-	- 200	-23.91	-24.44

#### 3. Channel separation

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

	Input Voltage (mV)	Channel X (µV)	Channel Y (µV)	Channel Z (µV)
Channel X	200	e - 11	6.47	+1.27
Channel Y	200	7.97	-	6.72
Channel Z	200	7.94	5,95	1 A.

Certificate No: DAE4-1336\_Nov1E

Page 4 of 5

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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	15660	15881
Channel Y	15906	15597
Channel Z	(5853	15173

#### 5. Input Offset Measurement

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

- C.	Average (µV)	min. Offset (µV)	max. Offset (µV)	Std. Deviation (µV)
Channel X	-0.26	+1.07	0.37	0.38
Channel Y	-0.22	-0.92	0.62	0.34
Channel Z	-0.97	-1.73	0.29	0.36

#### 6. Input Offset Current

Nominal Input circuitry offset current on all channels <251A

#### 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 (- Vec)	-0.01	-8	-9

Cartificate No: DAE4-1936\_Nov16

Page 5 of 5

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台灣檢驗科技股份有限公司 t (886-2) 2299-3279

f (886-2) 2298-0488



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	eny	Certificate No: E	EX3-3831 Jan17
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Power make NRP Power sector NRP-Z01	SN: 164778	06-Apr-16 (No: 217-022884/2289)	Acr-17
Tower mean NRP Power seman NRP-291 Power sensor NRP-291	SN: 164778 SN: 183244	06-Apr-18 (No. 217-02288/02289) 06-Apr-18 (No. 217-02288)	Apr-17 Apr-17 Apr-17 Apr-17
Power meiar NRP Power seinaar NRP-201 Power seinaar NRP-201 Reference 20 die Amanuarior	5AL 104778 SNI 103244 SNI 103245	06-Apr-16 (No. 217-02289/02289) 06-Aur-10 (No. 217-02288) 06-Apr-16 (No. 217-02288)	Apr-17 Apr-17 Apr-17
Power mains NRP Power sensor NRP-201 Power sensor NRP-201 Reference 20 dB Attenuator Reference 20 dB Attenuator Reference Proce ES30V2	SN: 104778 SN: 103244 SN: 103245 SN: SS277 (20x)	06-Apr-16 (No. 217-022880:2289) 06-Apr-16 (No. 217-02288) 06-Apr-16 (No. 217-02288) 08-Apr-16 (No. 217-02289) 05-Apr-16 (No. 217-02283)	Apr-17 Apr-17 Apr-17 Apr-17
Power mains NRP Power sensor NRP-201 Power sensor NRP-201 Reference 20 dB Attenuator Reference 20 dB Attenuator Reference Proce ES30V2	8NL 10477E SNI 103244 SNI 103245 SNI 55277 (20x) SNI 3013 SNI 560	06-Apr-18 (No; 217-02788/02289)           06-Apr-18 (No; 217-02289)           06-Apr-16 (No; 217-02289)           05-Apr-16 (No; 217-02289)           05-Apr-16 (No; 217-02289)           01-Dec-16 (No; E53-3013_Dec16)           7-Dec-16 (No; DAE4-860_Dec16)	Apr/17 Apr/17 Apr/17 Apr/17 Dac-17 Dac-17 Dec-17
Power media NRP Power wersch NRP-201 Power sensor NRP-201 Reference 20 dB Alliumunkor Reference Probe ES30V2 DAE4 Secondary Standards	5N: 104778 5N: 103244 SN: 103245 SN: 55277 (20x) SN: 3013 SN: 560 HD	06-Apr-18 (No; 217-027880:2289)           06-Apr-18 (No; 217-02788)           06-Apr-16 (No; 217-02288)           05-Apr-16 (No; 217-02288)           11-Dec-16 (No; 217-02283)           21-Dec-16 (No; E53-3013_Doc16)           7-Dec-16 (No; DAE4-860_Dec-16)           Check Date (m Polices)	April7 April7 April7 April7 Dec-17 Dec-17 Dec-17 Schedulett Oteck
Power melai NBP Power seinaut NRP-201 Power server NRP-201 Reference 20 BA Annu-afor Reference 20 BA Annu-afor Reference 20 BA Annu-afor Reference 20 BA Annu-afor Power melai E4419B	8N: 104778 SN: 103244 SN: 103245 SN: 58277 (20x) SN: 3013 SN: 560 ID SN: GB/at293874	06-Apr-16 (No; 217-0278802289)           06-Apr-16 (No; 217-02788)           06-Apr-16 (No; 217-02789)           05-Apr-16 (No; 217-02789)           05-Apr-16 (No; 217-02789)           11-Dec-16 (No; E53-3013; Doc16)           7-Dec-16 (No; E53-3013; Doc16)           7-Dec-16 (No; DAE4-860; Dec16)           Dhaba Data (In Police)           Dhaba Data (In Police)           05-Apr-16 (In Datasecheck Jun-16)	April7 April7 April7 Dec-17 Dec-17 Dec-17 Schedulett Dieck In Insue check: Jun-18
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Power minist NRP Power senser NRP-201 Power senser NRP-201 Reference 20 dB Alternation Retaining Printe ESSOV2 DAE4 Secondary Standards Power meter E44198 Power sensor E4412A Power sensor E4412A	8NE 104778 SNI 103244 SNI 103245 SNI 003245 SNI 3033 SNI 860 ID SNI 660 SNI 660 SNI 660 SNI 660 SNI 66445283874 SNI 005110210	16-Apr-16 (No. 217-027880:0289)           06-Apr-16 (No. 217-02280)           06-Apr-16 (No. 217-02280)           05-Apr-16 (No. 217-02280)           01-Apr-16 (No. 217-02280)           01-Apr-16 (No. 217-02280)           01-Apr-16 (No. 553-2013, Doc16)           7-Dec.16 (No. 553-2013, Doc16)           Physics, Date (In Police)           Dh-Apr-16 (In Date Check Jun-10)           DF-Apr-16 (In Notise Check Jun-10)           DF-Apr-16 (In Notise Check Jun-10)           DF-Apr-16 (In Notise Check Jun-10)	Apr-17 Apr-17 Apr-17 Dec-17 Dec-17 Dec-17 Schedulett Dreck In Insule check: Jun-18 In Insule check: Jun-18 In Insule check, Jun-18
Power meter NRP Power sector NRP-201 Power sensor NRP-201 Reference 20 68 Association Reference 20 68 Association Reference 20 68 Association Power meter E44198 Power meter E44198 Power sensor E4412A RF generation H4 86485	SN: 104778 SN: 103244 SN: 103245 SN: 50277 (20x) SN: 500 ID ISN: 680412x3874 SN: 04412x3874 SN: 04412x3874 SN: 04412x3874 SN: 10504210710	06-Apr-16 (No; 217-02380(2289)           06-Apr-16 (No; 217-02380)           06-Apr-16 (No; 217-02280)           05-Apr-16 (No; 217-02280)           11-Dec-16 (No; 217-02280)           21-Dec-16 (No; 217-02280)           21-Dec-16 (No; 217-02280)           21-Dec-16 (No; 200-0280)           20-Apr-16 (n house check Jun-16)           26-Apr-16 (n house check Jun-16)	April7 April7 April7 Dec-17 Dec-17 Dec-17 Schedulett Dreck In house thest: Jun-18 In house thest: Jun-18 In house thest: Jun-18 In house thest: Jun-18
Power meter NRP Power sector NRP-201 Power sensor NRP-201 Reference 20 68 Association Reference 20 68 Association Reference 20 68 Association Power meter E44198 Power meter E44198 Power sensor E4412A RF generation H4 86485	8NE 104778 SNI 103244 SNI 103245 SNI 003245 SNI 3033 SNI 860 ID SNI 660 SNI 660 SNI 660 SNI 660 SNI 66445283874 SNI 005110210	16-Apr-16 (No. 217-027880:0289)           06-Apr-16 (No. 217-02280)           06-Apr-16 (No. 217-02280)           05-Apr-16 (No. 217-02280)           01-Apr-16 (No. 217-02280)           01-Apr-16 (No. 217-02280)           01-Apr-16 (No. 553-2013, Doc16)           7-Dec.16 (No. 553-2013, Doc16)           Physics, Date (In Police)           Dh-Apr-16 (In Date Check Jun-10)           DF-Apr-16 (In Notise Check Jun-10)           DF-Apr-16 (In Notise Check Jun-10)           DF-Apr-16 (In Notise Check Jun-10)	Apr-17 Apr-17 Apr-17 Dec-17 Dec-17 Dec-17 Schedulett Dreck In Insule check: Jun-18 In Insule check: Jun-18 In Insule check, Jun-18
Power mean NRP Power wichair NRP-201 Power sensor NRP-201 Reference 20 GB Associator Reference 20 GB Associator Power Sensor E4012A Power meter E4419B Power sensor E4012A Power sensor E4012A Power sensor E4012A Re generation H9 88485	SN: 104778 SN: 103244 SN: 103245 SN: 50277 (20x) SN: 500 ID ISN: 680412x3874 SN: 04412x3874 SN: 04412x3874 SN: 04412x3874 SN: 105042101700	06-Apr-16 (No; 217-0228802289)           06-Apr-16 (No; 217-02280)           06-Apr-16 (No; 217-02280)           05-Apr-16 (No; 217-02280)           11-Dec-16 (No; 217-02280)           21-Dec-16 (No; 217-02280)           21-Dec-16 (No; 217-02280)           21-Dec-16 (No; 200-0280)           20-Apr-16 (n house check Jun-16)           26-Apr-16 (n house check Jun-16)	April7 April7 April7 Dec-17 Dec-17 Dec-17 Dec-17 Schedulett Dreck In house thest: Jun-18 In house thest: Jun-18 In house thest: Jun-18 In house thest: Jun-18
Power meter NRP Power sector NRP-201 Power service NRP-201 Rotarence NRP-201 Rotarence Prince E830V2 DAE4 Secondary Standards Power meter E4410B Power service E4412A RF generator H4 8648C Network Analyzar HP \$753E	SN: 104778           SN: 103244           SN: 103245           SN: 55277 (20x)           SN: 560           ID           SN: 660           ID           SN: 660           SN: 600132874           SN: 000110210           SN: 000110210           SN: 05042007390585	16-Apr-16 (No. 217-02788/02289)           06-Apr-16 (No. 217-02289)           06-Apr-16 (No. 217-02289)           05-Apr-16 (No. 217-02289)           06-Apr-16 (No. 217-02289)           07-Apr-16 (No. 217-02289)           08-Apr-16 (No. 217-02289)           09-Apr-16 (No. 2014-000, 2014)           09-Apr-16 (No. 2014-000, 2014)           09-Apr-16 (No. 2014-000, 2014)           09-Apr-16 (No. 2014, 2014)           09-Apr-16 (No. 2014, 2014)	Apr-17 Apr-17 Apr-17 Dec-17 De
Power meller NRP Power seiner NRP-201 Power seiner NRP-201 Richerono 20 die Anienaufor Richerono 20 die Anienaufor Richerona Probe E6309/2 DAE4 Seconderv SteriCards Power meter E4410B Power seinsch E4410B Power seinsch E4412A RF ginterutor H4 8648C Netwick Analyzar HP \$753E	SN: 104778 SN: 103244 SN: 103245 SN: 50277 (20x) SN: 500 ID SN: 6841583874 SN: MY41698081 SN: 105019210 SN: 105019210 SN: 105019210 SN: 10507290585	06-Apr-16 (No; 217-02380(2289)           06-Apr-16 (No; 217-02280)           06-Apr-16 (No; 217-02280)           01-Apr-16 (No; 217-02280)           21-Dec-16 (No; 200-0280)           04-Apr-16 (no basise check lum-16)           04-Apr-16 (no basise check lum-16)           04-Apr-16 (no basise check lum-16)           18-Oct.01 (In hysee check luc-16)           Function	Apr-17 Apr-17 Apr-17 Dec-17 De
Power meter (E4419B Power sensor E4412A Power sensor E4412A RF generator HP 8648C	SN: 104778           SN: 103245           SN: 103245           SN: 55277 (20x)           SN: 560           ID           SN: 660           ID           SN: 660           SN: 660           ID           SN: 660           SN: 600           ID           SN: 60010210           SN: 000110210	16-Apr-16 (No. 217-027880(2289)           06-Apr-16 (No. 217-027880(2289)           06-Apr-16 (No. 217-02280)           05-Apr-16 (No. 204-800)           05-Apr-16 (No. 204-800)           05-Apr-16 (No. 204-800)           06-Apr-16 (No. 204-800)           07-800           08-Apr-10 (No. 204-800)           18-001.01 (Its house check 205-100)           Function           Lisponeon// Technician	Apr-17 Apr-17 Apr-17 Dec-17 De
Power mailed NBP Power server NRP-201 Power server NRP-201 Reference 20 dB Amenautor Reference 20 dB Amenautor Power server 144 Power server 144 Power server 144 Power server 144 RE generator HP 86455 Network Analyzar HP 97535 Celebratist Dy	SN: 104778 SN: 103244 SN: 103245 SN: 50277 (20x) SN: 500 ID SN: 6841583874 SN: MY41698081 SN: 105019210 SN: 105019210 SN: 105019210 SN: 10507290585	06-Apr-16 (No; 217-02380(2289)           06-Apr-16 (No; 217-02280)           06-Apr-16 (No; 217-02280)           01-Apr-16 (No; 217-02280)           21-Dec-16 (No; 200-0280)           04-Apr-16 (no basise check lum-16)           04-Apr-16 (no basise check lum-16)           04-Apr-16 (no basise check lum-16)           18-Oct.01 (In hysee check luc-16)           Function	Apr-17 Apr-17 Apr-17 Dec-17 De
Power meller NRP Power seiner NRP-201 Power seiner NRP-201 Richerono 20 die Anienaufor Richerono 20 die Anienaufor Richerona Probe E6309/2 DAE4 Seconderv SteriCards Power meter E4410B Power seinsch E4410B Power seinsch E4412A RF ginterutor H4 8648C Netwick Analyzar HP \$753E	SN: 104778           SN: 103245           SN: 103245           SN: 55277 (20x)           SN: 560           ID           SN: 660           ID           SN: 660           SN: 660           ID           SN: 660           SN: 600           ID           SN: 60010210           SN: 000110210	16-Apr-16 (No. 217-027880(2289)           06-Apr-16 (No. 217-027880(2289)           06-Apr-16 (No. 217-02280)           05-Apr-16 (No. 204-800)           05-Apr-16 (No. 204-800)           05-Apr-16 (No. 204-800)           06-Apr-16 (No. 204-800)           07-800           08-Apr-10 (No. 204-800)           18-001.01 (Its house check 205-100)           Function           Lisponeon// Technician	Apr-17 Apr-17 Apr-17 Dec-17 Dec-17 Dec-17 Dec-17 Dec-17 Schedulett Dheck In house check: Jun-18 In house check: Jun-18

Certificate No: EX3-3831\_Jan17

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Rage # // 11

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### Report No. : E5/2017/80011 Page: 87 of 139



**Calibration Laboratory of** Schmid & Partner Engineering AG migheusstrappe 43, 4004 Zurich, Sentenland



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Adventibution No. SCS 0108

Accessized by the Swar Accestrator Service (BAS) The Swias Accreditation Service to one of the signatories to the LA Multilateral Agreement for the Acagolition of calibration certificates.

#### Close

Glospary.	
TSL.	tissue symulating liquid
NORMX, y.z	sansbrity in free space
ConvE	sensitivity in TSI, / NORMa, 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 w	a relation cristian action areas
Polarization 8	s relation amaind an axis that is in the plant normal is probe sals (a) measurement center),
	i.e., 9 – 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system
	TSL NORMX.y.z ConvF DCP CF A, B, C, D Polarization in Polarization (i)

#### Calibration is Performed According to the Following Standards:

- Ibration is Performed According to the Following Standards:
  IEEE Stid 1528-2013, 'IEEE Recommended Precise for Determining the Peak Spatial Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques', June 2013.
  IEC 42209-1, 'Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used inclose proximity to the air (hequency mings of 300 MHz to 2 OHz)'', February 2005.
  IEC 42209-2, 'Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used inclose proximity to the air (hequency mings of 300 MHz to 2 OHz)'', February 2005.
  IEC 42209-2, 'Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 5 GHz)'', March 2010.
  MDB 355654, 'SAR Measurement Requirements for 100 MHz to 6 GHz''.

#### Mothods Applied and Interpretation of Parameters:

- NORMX, y, z: Assessed for E-field potenzation () = 0 (f ± 900 MHz in TEM-cell, t > 1800 MHz; R22 waveguide) NORMX, y, z are only intermediate values, i.e., the uncertainties of NORMX, y, z does not affect the E<sup>2</sup> field uncertainty inside TSL isse below ConvF).
- uncertainty inside TSL take boltow Conv / . NORM(0x,y,z = NORMA,y,z \* frequency response (see Frequency Response Charl). 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 DGPx,y,z: DCP are numerical linearization parameters assessed based on the data of power sweep with CW
- equal (no incertainty required). DCP does not depend on frequency nor media PVP: PAR is the Peak = Avmage Ratio that is not calibrated but determined based on the signal.
- tharacteristics
- characteristics *As*, *y*, *z*, *Bx*, *y*, *z*, *Dx*, *y*, *z*, *Y*, *Bx*, *y*, *z*, *A*, *B*, *G*, *D* are normalized on parameters appeared based based on the data of power sweep for specific incidulation highal. The parameters on not depend on frequency nor-modia. VR is the multitum calibration range symposed in RMS votings across the diode. *ConvF* and *Boundary Effect Parameters*: Assessed in flat phantom using Effold for Temperature Transfer *ConvF* and *Boundary Effect Parameters*: Assessed in flat phantom using Effold for Temperature (2004)
- uonve and accirclery check enables reserved in the profilem using enables the temperature transfer stonaget for ( ± 800 MHz) end inside wave, une using analytical field distributions based on opwer measuroments for ( ± 800 MHz). The same setups are used for assessment of the parameters applied for boundary componentian (atoba, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe ecouracy close to the boundary. The sensitivity in 151, corresponder is NORMacy, z \* ConvY whereby the uncertainty corresponde to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity Wom ± 50 MHz to ± 100 MHz. MHz.
- Spherical isolropy (3D deviation from isolropy): In a hold of low gradients realized using a flat phentom exposed by a patch antenna
- Sensor Offset: The sensor offset corresponds to the offset of virtual measurement center from the probe lip (on probe axis). No tolerance required
- Connector Angle: The angle is assessed using the information gained by determining the NORMir (no Uncertainty required)

-Certilicate No: EX3-3831\_Jan11

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Finne 2 of 11

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Report No. : E5/2017/80011 Page : 88 of 139

EX30V4 - SN 3634

anuary 23-2017

# Probe EX3DV4

## SN:3831

Manufactured: Calibrated:

September 6, 2011 January 23, 2017

(Noise non-compatible with DASY2 systems)

Centilisere No. EK3-3831 Jan17

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Page 3 of

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EX30V4- SN:3631

January 25 2017

### DASY/EASY - Parameters of Probe: EX3DV4 - SN:3831

	Sensor X	Sensor Y	Sensor Z	Une (k=2
Norm (uV/(V/m) <sup>2</sup> ) <sup>n</sup>	0.43	0.41	0.42	# 107.1 %
DCP (mV)"	101.7	102.0	100.6	

#### Modulation Calibration Parameters

rnio.	Communication System Name		A ttB	B dBõV	c	D dS	VR mV	Unc" (k=2)
0 EW	EW	x	0.0	0.0	1.0	0.00	149,3	47.2 %
		Y.	0.0	0.0	1.0		138,4	
-		2	8.0	0.0	1.0		142.6	-

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 85%.

This constrainties of Norm X.Y.Z no met offer, live E-Ded uncertainty mone TCL (well Pages E and B). Numerical theorization parameter ancastrative provided in the constraints applying included addresses and to expresses the ten incursion the constrainty is obtaining using the max, consistent from I rear resistance applying included addresses and to expresses the ten incursion the field volum

-Certilicate No: EX3-3831\_Jan1/

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EX30VM- SN 3631

January 23, 3017

f (MHz) =	Relative Permittivity	Conductivity (S/m)/	Convil X	ConvF Y	ConvF.Z.	Alpisa <sup>10</sup>	Depth <sup>G</sup> (mm)	Unc (k=2)
750	41.9	0.89	9.63	£8,6	9.63	0,57	0.80	± 42.0 %
835	41.5	0.90	9.15	9,15	9.15	0.53	0.21	± 12.0 %
900	41.5	0.97	9.08	9.08	9,08	0.42	0,96	± 12.0 %
1450	40.5	1,20	8.41	8.41	8.41	0.35	0.80	1 12,0 %
1760	40.3	1.32	8.17	8.17	8,17	0.32	0.90	± 12.0 %
1900	40,0	1.40	7.86	7.85	7.86	0.39	0.80	± 12.0 %
2000	40.0	1.40	7.80	7,80	7.80	0.35	0.80	3 12.0 %
2300	39.5	1.87	7.59	7.59	7.69	0.26	1.02	±12.0 %
2450	39.2	1.80	7.21	7,21	7.21	0.40	D.80	± 12.0.3
2600	39.0	1,96	69.9	8.99	6,99	D.38	0,80	£12.05
3500	37.9	2.91	6.55	8.55	6,55	0.30	1.20	£13,7 4
5200	36.0	4.66	5.02	5.02	5.02	0,30	1.80	=131.9
5300	35.9	4.76	4.70	4.70	-4.70	0.35	1.80	±1319
5600	35.5	6.07	4.51	4.59	4.51	0.40	1.80	±18.1 %
5800	35.3	6.27	4,45	4.46	4,48	0.40	1.80	± 13:1 5

### DASY/EASY - Parameters of Probe: EX3DV4 - SN:3831

<sup>1</sup> Frequency validity playe 300 M/H is of a 110 MHz only applies for DASY v4.4 and higher (van Page 2) ease it is restricted to ± 50 MHz. The innertiantly is the RSS of the Cover European restriction is a 100 MHz to 100 MHz only applies for DASY v4.4 and higher (van Page 2) ease it is restricted to ± 50 MHz. The innertiantly is the RSS of the Cover European restriction of 100 Hz 128.1 (50 and 2) 20 MHz respectively. Adding the second validity and the innertiant is the intertext of 20 MHz appendix a 100 MHz for Cover 2 appendix of 100 Hz 128.1 (50 and 2) MHz respectively. Adding 50 GHz respectively, which is a 100 MHz for Cover 2 appendix of 100 Hz 128.1 (50 and 2) MHz respectively. Advance 5 GHz respectively, advance 5 GHz respectively, advance 5 GHz respectively. Advance 5 GHz respectively, advance 5 GHz respectively, advance 5 GHz respectively, advance 5 GHz respectively. Advance 5 GHz respectively, advance

Clartificate No: EX3-3631\_stm11

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Page 5 of #11

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EX0074-SN 3831

Jammary 23, 2017

(MHz) <	Relative Permittivity	Conductivity (S/m)	ConvP X	ConvFY	ConvF Z	Alpha	Depth C (min)	Unc (k=2)
750	55,5	0.96	9.59	9.69	9,59	0.46	0.80	±12.0 %
835	55.2	0.97	9.25	9.25	9.25	0.48	0.80	±12.0 %
900	35-0	1,05	0,15	B.15	9.15	8.35	0.80	±12.0 %
1750	53.4	1.49	7.78	7.78	7.78	0.36	0.80	1 12.0 %
1900	55.3	1,52	7.63	7.53	7.53	0.38	0,80	1 12.0 %
2000	63.3	1.52	7.66	7.66	7.66	0,32	0.80	± 12.0 %
2300	52.9	181	7.32	7.32	7.32	0.29	1.00	± 12.0 %
2450	52.7	1.95	7.30	7.30	7.30	0.33	0.80	± 12.0 %
2800	52.5	2.16	7.05	7.05	7.05	0.30	0.80	± 12.0.1
5200	49,0	5.30	4.47	4.47	4.87	0.40	1.90	±13.1 5
5380	48.9	5.42	4.21	4.21	4.21	0.45	1,90	= 13.1 9
5600	48.5	5,77	3.67	3,67	3.67	0.60	1.90	# 13.1 1
5800	48.2	6.00	3.47	3.87	3,87	0.50	1.90	±13.19

### DASY/EASY - Parameters of Probe: EX3DV4 - SN:3831

Frequency validity across 300 MHz of ± 100 MHz only arguine for DASY which and higher (see Page 2), size if a restricted to ± 50 MHz. The anisotrativity is the FSS of the Crime' orientativity at calibration frem, entry and the accentancy for the induced inspansey band. Frequency when backer 300 MHz (= ± 10, 2%, 40, 30) and 10 MHz the Crime' service and the accentancy for the induced inspansey band. Frequency and/or service and the instantiation of the the Crime' service and the accentancy for the induced inspansey band. Frequency addet son the instantiation of the the Crime' service and the instantiation of the induced inspanse backer 30 MHz. The measured is a service and the instantiation of the instantiation is a service and the instantiation backer 30 MHz. The instantiation is applied to measured SAR values. At trequencies around 10Hz, the values of the operative is and by its estimated to ± 50%. The anisotrative is the RSE of the Cower uncertainty for induced trape frame parameters is and the instantiation due to the boundary affect attact and aways leng than a down and trape frame parameters is and anisotration between 340 GHz at any due area target interval aways leng them is 1% for inequality backer 3 GHz and target \$2% for theorem and between 340 GHz at any due area target interval down the frame target interval and the anisotration of GHz and target \$2% for theorem as 340 Detween 340 GHz at any due area target interval down the boundary.

Certificate No: EX3-3831\_uam1

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Page 0 of 11

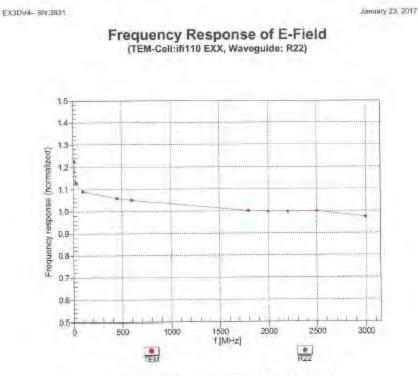
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Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)



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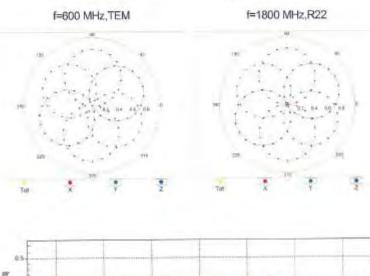
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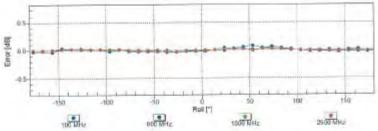
Report No. : E5/2017/80011 Page : 93 of 139

EX3DV4- SN:3831

January 23, 2017



Receiving Pattern (\$), 9 = 0°



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

Cartificate No: EX3-3831\_Jan17

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Page 8 of 11

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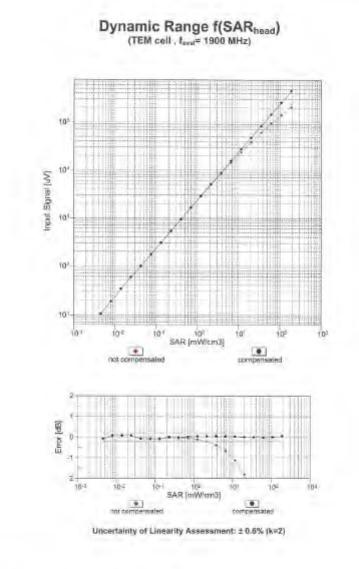
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Report No. : E5/2017/80011 Page : 94 of 139

EX30V4- SN:3831

Manuary 23, 2017



Centificate No. EX3-3831\_Jan17

Page Ball 1

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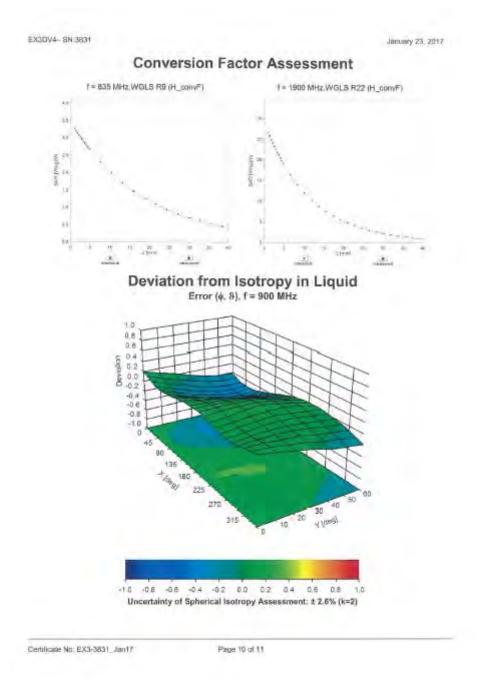
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Report No. : E5/2017/80011 Page : 95 of 139





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EKIDV4-SN 3831

January 25, 2017

### DASY/EASY - Parameters of Probe: EX3DV4 - SN:3831

#### Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (*)	-16.3
Mechanical Surface Datection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diemeter	10 mm
Tip Length	3 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	7 mm
Probe Tip to Sensor Z Calibration Point	Tim
Recommended Measurement Distance Irom Surface	1.4 mm

Certificate No: EX3-3831 Jan17

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Page 11 cf 11

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corected by the Swiss Accredit he Swise Accreditation Servic utiliateral Agreement for the	of is one of the signatories t	to the EA	editation No.: SCS 0108
SGS-TW (Aud	ണ)	Centificate No.	EX3-7466 Jul17
ALIBRATION	CERTIFICATE		
literi	EX3DIV4 - SN:746	6	
Calibration (rotaciona)s)	and the second sec	CAL-14.v4. QA CAL-23.v5. QA are for dosimetric E-field probes	CAL-25.v6
autorities calle	July 4, 2017		
Al calibrations have been cond	ucted in the blosed laboratory	facility: unvice strength to the positive (22 $\pm$ 3)*C $\mu$	nd humkoly < 70%
Calibration Equipment used (M	STE ontical for calibration)		
Calibration Equipment used (Mi Primary Stancards	STE onlical for calibration)	Gal Data (Centrolie No.)	Scheduled Calification
allbration Equipment used (Mi Primary Stendarde Power meter NRP	TE onlical for calibration)	Gal Duta (Centificate No.) 04-Apr-17 (No. 217-02521/02522)	Scheduled Calification Apr-18
allbradon Equipment used (Mi 'nimary Stencarde 'nimary Internation 'nimer sensor NRP-291	TE ortical for calibration) 10 SN: 104778 SN: 105244	Саl Date (Certificale No.) 04-Арг-17 (No. 217-0252/00522) 04-Арг-17 (No. 217-02521)	Scheduled Calification Apr-18 Apr-18
Gelbration Equipment used (MB Primary Stendardie Power moter NRP Power sensor NRP-291 Power sensor NRP-291	ID SN: 104778 SN: 104778 SN: 103244 SN: 103245	Gel Date (Certificale No.) 04-Apr-17 (No. 217-02921/02922) 04-Apr-17 (No. 217-02923) 04-Apr-17 (No. 217-02925)	Scheduled Calibration Apr-18 Apr-18 Apr-18
althration Equipment used (M Primary Standards Power mitter NSP Power sensor NRP-291 Power sensor NRP-291 Reference 20 dB Attenuator	ID SN: 104778 SN: 104778 SN: 105244 SN: 58277 (20k)	Gal Data (Centrolie No.) 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02525) 07-Apr-17 (No. 217-02528)	Scheduled Calibration Apr-18 Apr-18 Apr-18 Apr-18
Calibration Equipment used (MP Primary Standards Prover meter NSP Prover sensor NRP-291 Power sensor NRP-291 Reference 20 dB Attenuator Reference 20 dB Attenuator	ID SN: 104778 SN: 104778 SN: 103244 SN: 103245	Gel Date (Certificale No.) 04-Apr-17 (No. 217-02921/02922) 04-Apr-17 (No. 217-02923) 04-Apr-17 (No. 217-02925)	Scheduled Calibration Apr-18 Apr-18 Apr-18
Celbration Equipment used (Mi Primary Sternande Power moter NRP Power sentor NRP-291 Power sentor NRP-291 Reference 20 dB-Atteruator Reference Phobe EB3DV2 DAE4	ID SN: 104778 SN: 104778 SN: 103244 SN: 103245 SN: 55277 (20k) SN: 55277 (20k) SN: 660	Gel Date (Certificale No.) 04-Apr-17 (No. 217-0252100522) 04-Apr-17 (No. 217-02523) 04-Apr-17 (No. 217-02525) 07-Apr-17 (No. 217-02525) 21-Dec-16 (No. ES3-3013, Dec16) 7-Dec-16 (No. DAE4-660, Dec16)	Scheduled Califiretion Apr:18 Apr:18 Apr:18 Dec-17 Dec-17
Calibration Equipment used (Mi Primary Standards Power sensor NRP-291 Power sensor NRP-291 Reference 20 dB Attenuator Reference Phobe EB3DV2 DAE4 Secondary Standards	ID SN: 104778 SN: 104778 SN: 103244 SN: 103245 SN: 50277 (20x) SN: 30/10 SN: 660 83	Cal Date (Centificate No.) 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02523) 04-Apr-17 (No. 217-02525) 07-Apr-17 (No. 217-02528) 21-Dep-16 (No. ES3-3013, Dec16) 7-Dan-16 (No. DAE4-052, Dec16) Chees Data (in house)	Scheduled Calibration Apr-18 Apr-18 Apr-18 Dec-17 Dec-17 Scheduled Dheck
Calibration Equipment used (Mi Primary Standards Prover sensor NRP-291 Power sensor NRP-291 Reference 20 dB Attenuato) Reference 20 dB Attenuato) Reference 20 dB Attenuato) Reference 20 dB Attenuato) Secondary Standards Powar meter E44198	ID SN: 104778 SN: 104778 SN: 104778 SN: 103245 SN: 103245 SN: 58277 (20k) SN: 58277 (20k) SN: 581277 (20k) SN: 5841250674	Cal Data (Centificate No.) D4-Apr-17 (No. 217-02521002522) D4-Apr-17 (No. 217-025251) 04-Apr-17 (No. 217-02525) 07-Apr-17 (No. 217-02525) 17-Apr-16 (No. ES3-3013, Dec16) 7-Dan-16 (No. ES3-3013, Dec16) 7-Dan-16 (No. DAE4-692, Dec16) Check, Data (in house) Ob-Apr-16 (in house)	Scheduled Califiretion Apr:18 Apr:18 Apr:18 Dec-17 Dec-17
Celibration Equipment used (Mi Primory Sternande Power meter NRP Power sensor NRP-291 Power sensor NRP-291 Reference 20 dB Attenuator Reference Probe E330V2 DAE4 Secondary Standards Power sensor E44198 Power sensor E4412A	ID         SN: 104776           SN: 105744         SN: 105244           SN: 105245         SN: 50277 (20k)           SN: 50277 (20k)         SN: 5060           SN: 50277 (20k)         SN: 50277 (20k)	Cal Data (Certificain No.) 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02525) 07-Apr-17 (No. 217-02525) 07-Apr-17 (No. 217-02525) 07-Apr-17 (No. 253-3013, Dec16) 7-Dan-16 (No. CAE-4-602, Dec16) Cheeb, Data (In house) Cheeb, Data (In house) Ch-Apr-16 (In house check dan-16) C6-Apr-18 (In house check dan-16)	Scheduled Calimetion Apr-18 Apr-18 Apr-18 Apr-18 Dec-17 Dec-17 Scheduled Check Imbause check, Jun-18
Albration Equipment used (Mi Primary Steroardie Power meter NRP Power sensor NRP-291 Power sensor NRP-291 Reference 20 dB Attenuator Reference Probe EB3DV2 DAE4 Secondary Standards Power sensor E4412A Power sensor E4412A	ID SN: 104778 SN: 104778 SN: 104778 SN: 103245 SN: 103245 SN: 58277 (20k) SN: 58277 (20k) SN: 581277 (20k) SN: 5841250674	Cal Data (Centificate No.) D4-Apr-17 (No. 217-02521002522) D4-Apr-17 (No. 217-025251) 04-Apr-17 (No. 217-02525) 07-Apr-17 (No. 217-02525) 17-Apr-16 (No. ES3-3013, Dec16) 7-Dan-16 (No. ES3-3013, Dec16) 7-Dan-16 (No. DAE4-692, Dec16) Check, Data (in house) Ob-Apr-16 (in house)	Scheduled Calibration Apr-18 Apr-18 Apr-18 Dar-17 Dec-17 Scheduled Chock In house check, Jun-18 In house check, Jun-18
Calibration Equipment used (Mi Primary Standards Power sensor NRP-291 Power sensor NRP-291 Reference 20 dB Attenuator Reference Probe E83DV2 DAE4 Secondary Standards Power isercor E4412A Power sensor E4412A RF generator HP 58480	ID         ID           SN: 104778         SN: 105244           SN: 105244         SN: 105244           SN: 105245         SN: 50277 (20k)           SN: 80277 (20k)         SN: 80278           SN: 660         SN: 5624250674           SN: 10520674         SN: 10520674           SN: 000110216         SN: 000110216	Cel Date (Certificate No.) 04-Apr-17 (No. 217-0392100522) 04-Apr-17 (No. 217-03523) 04-Apr-17 (No. 217-03525) 07-Apr-17 (No. 217-03528) 21-Dep-16 (No. 253-3013, Dec16) 7-Dep-16 (No. 204-4-660, Dec16) Check Date (in Nouse check data-16) 06-Apr-18 (in Nouse check data-16) 06-Apr-18 (in Nouse check data-16) 06-Apr-19 (in Nouse check data-16)	Scheduled Califiration Apr-18 Apr-18 Apr-18 Dec-17 Dec-17 Scheduled Check In Noise check Jun-18 In Noise check Jun-18 In Noise check Jun-18
Calibration Equipment used (Mi Primary Standards Power sensor NRP-291 Power sensor NRP-291 Reference 20 dB Attenuator Reference Probe E830V2 DAE4 Secondary Standards Power sensor E4412A Power sensor E4412A Power sensor E4412A RF generator HP 58480	ID         ID           SN: 104778         SN: 105244           SN: 105244         SN: 105244           SN: 105245         SN: 50277 (20k)           SN: 50277 (20k)         SN: 50277 (20k)           SN: 660         SN: 50277 (20k)           SN: 660         SN: 660           SN: 660         SN: 660           SN: 660         SN: 660           SN: 660         SN: 660/1250674           SN: 000110216         SN: 00542001700           SN: 00542001700         SN: 00542001700	Cal Data (Certificate No.)           04-Apr-17 (No. 217-0252/00522)           04-Apr-17 (No. 217-02523)           04-Apr-17 (No. 217-02525)           07-Apr-17 (No. 217-02525)           07-Apr-17 (No. 217-02525)           07-Apr-17 (No. 217-02525)           07-Apr-16 (No. 253-3013, Dec16)           7-Den-16 (No. CAE4-660, Dec16)           Check Data (in house)           Ob-Apr-16 (in Losse check dan-16)           C6-Apr-18 (in house check dan-16)           06-Apr-18 (in house check dan-16)           06-Apr-19 (in house check dan-16)           06-Apr-19 (in house check dan-16)           06-Apr-19 (in house check dan-16)           18-Cor-01 (in house check Od-16)	Scheduled Calification Apr:18 Apr:18 Apr:18 Dec-17 Dec-17 Dec-17 Scheduled Dhock In house check Jun-18 In house check Jun-18
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Calibration Equipment used (Mi Primary Standards Power minter NRP Power sensor NRP-291 Reference 20 dB Attenuator Reference Probe EB30V2 DAE4 Secondary Standards Power sensor E44196 Power sensor E44196 Power sensor E44196 Power sensor E44196 Power sensor E44196 Reference HP 88480 Network Analyzar HP 8753E	ID           SN: 104778           SN: 105244           SN: 10245           SN: 10245           SN: 10246           SN: 10245           SN: 10245           SN: 10246           SN: 10246           SN: 10246           SN: 10246           SN: 10245           SN: 10245           SN: 10246           SN: 10246           SN: 0010210           SN: 1034200100	Gal Data (Certificatin No.)           D4-Apr-17 (No. 217-0252/102522)           D4-Apr-17 (No. 217-02525)           D7-Apr-17 (No. 217-02525)           D7-Apr-17 (No. 217-02525)           D7-Apr-17 (No. 217-02525)           D7-Apr-17 (No. 217-02526)           D7-Apr-17 (No. 217-02526)           D7-Apr-16 (No. DAE4-050; Dec16)           7-Dan-16 (No. DAE4-050; Dec16)           Check Data (in house)           Ob-Apr-16 (n house check dun-16)           Ob-Apr-16 (n house check dun-16)           O4-Apr-19 (n house check dun-16)           D4-Apr-19 (n house check dun-16)	Scheduled Calification Apr:18 Apr:18 Apr:18 Dec-17 Dec-17 Dec-17 Scheduled Dhock In house check Jun-18 In house check Jun-18
Calibration Equipment used (Mi Primary Standards Power minter NRP Power sensor NRP-291 Reference 20 dB Attenuator Reference Probe EB30V2 DAE4 Secondary Standards Power sensor E44196 Power sensor E44196 Power sensor E44196 Power sensor E44196 Power sensor E44196 Reference HP 88480 Network Analyzar HP 8753E	ID           SN: 104778           SN: 105244           SN: 10245           SN: 10245           SN: 10246           SN: 10245           SN: 10245           SN: 10246           SN: 10246           SN: 10246           SN: 10246           SN: 10245           SN: 10245           SN: 10246           SN: 10246           SN: 0010210           SN: 1034200100	Gal Data (Certificatin No.)           D4-Apr-17 (No. 217-0252/102522)           D4-Apr-17 (No. 217-02525)           D7-Apr-17 (No. 217-02525)           D7-Apr-17 (No. 217-02525)           D7-Apr-17 (No. 217-02525)           D7-Apr-17 (No. 217-02526)           D7-Apr-17 (No. 217-02526)           D7-Apr-16 (No. DAE4-050; Dec16)           7-Dan-16 (No. DAE4-050; Dec16)           Check Data (in house)           Ob-Apr-16 (n house check dun-16)           Ob-Apr-16 (n house check dun-16)           O4-Apr-19 (n house check dun-16)           D4-Apr-19 (n house check dun-16)	Scheduled Calibration Apr-18 Apr-18 Apr-18 Dec-17 Dec-17 Dec-17 Dec-17 In house check Jun-18 In house check Jun-18
Calibration Equipment used (Mi Primary Standards Power moter NRP-291 Power sensor NRP-291 Power sensor NRP-291 Reference Probe E83DV2 DAE4 Secondary Glanderds Power sensor E4419A Power sensor E4419A Rf. genesitor HP 82490 Network Analyzer HP 8253E Calibratied by:	ATE ontical for calibration) 10 Six 104778 Six 105244 Six 105245 Six 50277 (20k) Six 50277 (20k) Six 660 Six 660 Six 660 Six 660 Six 660 Six 660 Six 660 Six 660 Six 660 Six 60010210 Six 60010210 Six 60010210 Six 60010210 Six 60010210 Six 60010210 Six 60010210 Six 60010210 Six 60010210	Cal Data (Certificale No.)           04-Apr-17 (No. 217-0252/00522)           04-Apr-17 (No. 217-02525)           07-Apr-17 (No. 217-02525)           07-Apr-17 (No. 217-02525)           07-Apr-17 (No. 217-02525)           07-Apr-17 (No. 217-02525)           07-Apr-16 (No. CAS-3-013, Dec18)           7-Den-16 (No. CAS-4-060, Dec16)           Cheen Bala (in house)           Ob-Apr-18 (in house)           Ob-Apr-18 (in house)           Ob-Apr-18 (in house)           Ob-Apr-18 (in house)           Ob-Apr-19 (in house)           Ob-Apr-18 (in house)           Ob-Apr-19 (in house)           DB-Apr-19 (in house)	Schequied Carifiretion Apr-18 Apr-18 Apr-18 Dec-17 Dec-17 Dec-17 Dec-17 In house check Jun-18 In house check Jun-18

Germann No: EX3-7486 Jul17

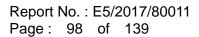
Page 1 of 11

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**Calibration Laboratory of** Schmid & Partner Engineering AG aughausenisse 43, 8054 Zunch, Bwitzerle Ż



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Accorditation No.: SCS 0108

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

#### Glossarv

Call Carrier 1-	
TSL	lissue simulating liquid
NORMs, y.z	sereitvity in free space
CONVE	sensitivity in TSL / NORMx, y.z.
DCP	diade compression point
CF.	crest factor (1/duty_cycle) of the RF signal
W.B.C.D	modulation dependent linearization parameters
Polarization o	protation around probe axis
Polarization 8	It rotation around an axis that is in the plane normal to probe axis (at measurement center).
	a = 0 is normal to ombe axis

information used in DASY system to align probe sensor X to the robot coordinate system Connector Angle

- Calibration is Performed According to the Following Standards: IEEE 6td 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement

  - Absorption Rate (SAR) in the Human Head from Vereness Communications Exercise Exercise Techniques', June 2013 Techniques', June 2013 b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-heid and body-mounied devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016 c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for weekes communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010 d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

#### Methods Applied and Interpretation of Parameters:

- NORMx, y, z: Assessed for E-field polarization  $\theta = 0$  (f  $\leq 900$  MHz in TEM-cell, f > 1800 MHz, R22 waveguide). NORMx, y, z are only intermediate values, i.e., the uncartainties of NORMx, y, z does not affect the E<sup>1</sup>-field uncartainty inside TSL (see below ConvP).
- 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 ConvE
- DCPx, y, z. DCP are numerical linearization parameters assassed 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
- As, y.z; Ex, y.z; Cx, y.z; Dx, y.z; VRs, 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 ( < 800 MHz) and inside waveguide using analytical field distributions based on powe stantiate for 1 > 600 MHz. The same setups are used for assessment of the parameters applied for locundary companisation (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 NORMs, y, z \* ConvF whereby the uncertainty corresponds to that given for CarvF. A hequency depandent ConvF is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical (sotropy (3D deviation from isotropy): in a field of low gradients realized using a fial phantom
- exposed by a patch antenna. Sensor Offset. The sensor offset corresponds to the offset of virtual measurement center from the probe to (on probe axis). No tolerance required.
- Consector Angle: The angle is assessed using the information gained by determining the NORMx (no ٠ uncertainty required).

Certificate No: EX3-7466\_Jul/17

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Page 2 of 11

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Report No. : E5/2017/80011 Page : 99 of 139

EX3DV4 - SN:7466

July 4, 2017

# Probe EX3DV4

## SN:7466

Manufactured: Calibrated: October 25, 2016 July 4, 2017

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

Certificate No: EX3-7466\_Jul17

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Page 3 of 11

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EX3DV4- SN:7466

July 4, 2017

#### DASY/EASY - Parameters of Probe: EX3DV4 - SN:7466

#### **Basic Calibration Parameters**

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (µV/(V/m) <sup>2</sup> ) <sup>6</sup>	0.46	0.40	0.63	± 10.1 %
DCP (mV) <sup>a</sup>	96.7	100.3	93.7	

#### Modulation Calibration Parameters

UID	Communication System Name		A	B	С	D	VR	Unc
			dB	dBõV		dB	mV	(k=2)
0	CW	X	0.0	0.0	1.0	0.00	145.9	±3.0 %
		Y	0.0	0.0	1.0		148.6	
		Z	0.0	0.0	1.0		130.0	

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

<sup>A</sup> The uncertainties of Norm X,Y,Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Pages 5 and 6). <sup>9</sup> Numerical linearization parameter: uncertainty not required. <sup>9</sup> Uncertainty is determined using the max, deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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Page 4 of 11

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EX3DV4-- SN:7466

July 4, 2017

f (MHz) <sup>c</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha <sup>G</sup>	Depth <sup>13</sup> (mm)	Unc (k=2)
835	41.5	0.90	10.20	10.20	10.20	0.60	0.84	± 12.0
900	41.5	0.97	9.95	9.95	9.95	0.42	0.94	± 12.0
1750	40.1	1.37	8.84	.8.84	8.84	0.34	0.80	± 12.0
1900	40.0	1.40	8.52	8.52	8.52	0.35	0.80	± 12.0
2000	40.0	1.40	8.47	8.47	8.47	0.35	0.80	± 12.0
2450	39.2	1.80	7.81	7.81	7.81	0.35	0.99	± 12.0
2600	39.0	1.96	7.58	7.58	7.58	0.37	0.95	± 12.0
5200	36.0	4.66	5.81	5.81	5.81	0.35	1.80	± 13.1
5300	35.9	4.76	5.56	5.56	5.56	0.35	1.80	± 13.1
5600	35.5	6.07	4.98	4.98	4.98	0.40	1.80	±13.1
5800	35.3	5.27	5.17	5.17	5.17	0.40	1.80	±13.1

### DASY/EASY - Parameters of Probe: EX3DV4 - SN:7466

<sup>D</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v1.4 and higher (see Page 2), else il is restricted to ± 50 MHz. The uncertainty is the RSS of the Conv<sup>P</sup> uncertainty is calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvP assessments at 30, 64, 120, 150 and 220 MHz respectively. Above 5 GHz frequency validity use extended to ± 50 MHz. The uncertainty for indicated frequency band. Frequency validity calibration frequency and the uncertainty for the indicated frequency band. Frequency validity calibration frequency and the uncertainty for the indicated frequency band. Frequency validity calibration at 10 MHz. \* At frequencies below 3 GHz, the validity of tissue parameters (s and e) can be relaxed to ± 10% if figuid componention formula is applied to measured SAR values. Af frequencies to the validity of tissue parameters (s and e) is restricted to ± 5%. The uncertainty for indicated toget tissue parameters. \* At frequencies below a GHz, the validity of tissue parameters (s and e) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters. \* At frequencies below a GHz, the validity of tissue parameters. \* At the remaining deviation due to the boundary effect after compensation is advays lass than 15% for frequencies below 3 GHz and below a 2% for frequencies belows 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

Certificate No: EX3-7466\_Jul17

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Page 5 of 11

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EX3DV4- SN:7466

July 4, 2017

#### Calibration Parameter Determined in Body Tissue Simulating Media Relative Conductivity (S/m) Depth Unc Permittivity f (MHz) <sup>C</sup> Alpha<sup>6</sup> ConvF X ConvF Y ConvF Z (mm) (k=2) 10.24 10.24 835 55.2 0.9710.24 0.39 0.96± 12.0 % 900 55.0 1.05 10.06 10.08 10.06 0.34 1.01 ± 12.0 % 1750 53.4 1.49 8.52 8,52 8.52 0.39 0.87 ± 12.0 % 1900 53.3 1.52 8.14 8.14 8.14 0.34 0.91 ± 12.0 % 2000 53.3 1.52 8.30 8.30 8.30 0.33 0.94 ± 12.0 % 7.94 7.94 7.94 0.28 1.10 ± 12.0 % 2450 52.7 1.95 7.66 0.27 2600 52.5 2.16 7.66 7.66 1.15 ± 12.0 % 49.0 5.30 5.20 5.20 5.20 0.40 1.90 ± 13.1 % 5200 5300 48.9 5.42 5.10 5.10 5.10 0.40 1.90 ± 13.1 % 4.27 4.27 0.50 4.27 1.90 ± 13.1 % 5600 48.5 5.77 48.2 6.00 4.48 4.48 4.48 0.50 1.90 ± 13.1 % 5800

### DASY/EASY - Parameters of Probe: EX3DV4 - SN:7466

<sup>C</sup> Frequency validity above 360 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity use extended to ± 10 MHz. In the extended to ± 10 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity contact to ± 10 MHz. In the extended to ± 10% if liquid componention formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (is and o) can be relaxed to ± 10% if liquid componention formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (is and o) can be relaxed to ± 10% if liquid componention formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (is and o) can be relaxed to ± 10% if liquid componention formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (is and o) is restricted to ± 6%. The uncertainty is the RSS of the ConvF uncertainty in the convF uncertainty in indicated torget to these parameters.

Certificate No: EX3-7466\_Jul17

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Page 6 of 11

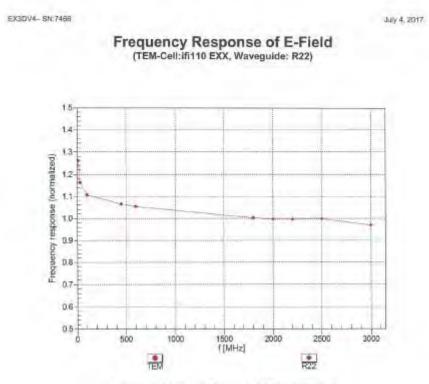
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Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Cartificate No: EX3-7466\_Jul17

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Page 7 of 11

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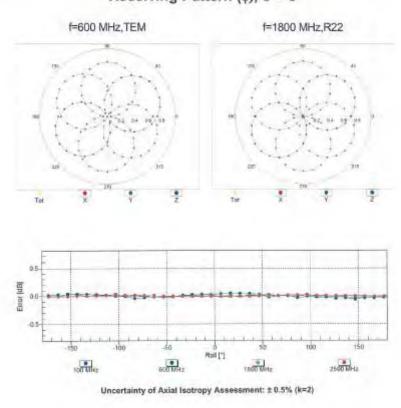
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EX3DV4-SN:7466

July 4, 2017



Receiving Pattern (\$), 9 = 0°

Continente No: EX3-7468\_Jul17

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Page 8 of 11

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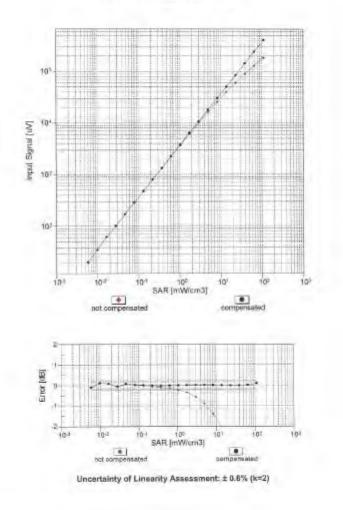


Report No. : E5/2017/80011 Page : 105 of 139

EX3DV4-SN:7466

AJV-4, 2017.

#### Dynamic Range f(SAR<sub>head</sub>) (TEM cell , f<sub>eval</sub>= 1900 MHz)



Certificate No: EX3-7466\_Jun7

Page 9 of 11

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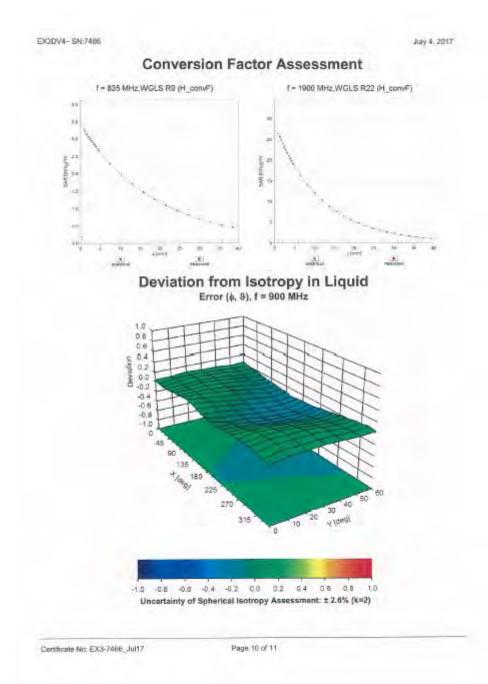
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EX3DV4-- SN:7466

July 4, 2017

### DASY/EASY - Parameters of Probe: EX3DV4 - SN:7466

#### Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-3.3
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

Certificate No: EX3-7466\_Jul17

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Page 11 of 11

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## 8. Uncertainty Budget

Measurement Uncertainty evaluation template for DUT SAR test (0.3-3G)

A	с	D	е		f	g	h=c * f / e	i=c * g / e	k
Source of Uncertainty	Tolerance/ Uncertainty	Probabilit y	Div	Div Value	ci (1g)	ci (10g)	Standard uncertainty	Standard uncertainty	vi, or Veff
Measurement system									
Probe calibration	6.00%	N	1	1	1	1	6.00%	6.00%	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Isotropy , Axial	3.50%	R	√3	1.732	1	1	2.02%	2.02%	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
lsotropy, Hemispherical	9.60%	R	√3	1.732	1	1	5.54%	5.54%	$\infty$
Modulation Response	2.40%	R	√3	1.732	1	1	1.40%	1.40%	~
Boundary Effect	1.00%	R	√3	1.732	1	1	0.58%	0.58%	$\infty$
Linearity	4.70%	R	√3	1.732	1	1	2.71%	2.71%	~
Detection Limits	1.00%	R	√3	1.732	1	1	0.58%	0.58%	~
Readout Electronics	0.30%	N	1	1	1	1	0.30%	0.30%	~
Response time	0.80%	R	√3	1.732	1	1	0.46%	0.46%	~
Integration Time	2.60%	R	√3	1.732	1	1	1.50%	1.50%	~
Measurement drift (class A evaluation)	1.75%	R	√3	1.732	1	1	1.01%	1.01%	8
RF ambient condition -	3.00%	R	√3	1.732	1	1	1.73%	1.73%	8
RF ambient conditions - reflections	3.00%	R	√3	1.732	1	1	1.73%	1.73%	~
Probe positioner Mechanical restrictions	0.40%	R	√3	1.732	1	1	0.23%	0.23%	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Probe Positioning with respect to phantom	2.90%	R	√3	1.732	1	1	1.67%	1.67%	8
Post-processing	1.00%	R	√3	1.732	1	1	0.58%	0.58%	8
Max SAR Eval	1.00%	R	√3	1.732	1	1	0.58%	0.58%	~
Test Sample related									
Test sample positioning	2.90%	N	1	1	1	1	2.90%	2.90%	M-1
Device Holder Uncertainty	3.60%	N	1	1	1	1	3.60%	3.60%	M-1
Drift of output power	5.00%	R	√3	1.732	1	1	2.89%	2.89%	~
Phantom and Setup									
Phantom Uncertainty	4.00%	R	√3	1.732	1	1	2.31%	2.31%	∞
Liquid permittivity (mea.)	3.46%	N	1	1	0.64	0.43	2.21%	1.49%	М
Liquid Conductivity (mea.)	3.82%	N	1	1	0.6	0.49	2.29%	1.87%	М
Combined standard uncertainty		RSS					11.85%	11.66%	
Expant uncertainty (95% confidence							23.71%	23.31%	

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# 9. Phantom Description

Schmid & Panner Engineering AG

Zoughaupstream 43, 8004 Zurich, Switzerlan Phone +41 1 245 9700, Fax +41 1 245 9779 Info@apag.com, http://www.space.com

Certificate of Conformity / First Article Inspection

item	SAM Twin Phentom V4.0	
Type No .	QD 000 P40 C	
Series No	TP-1150 and higher	_
Manufacturer	SPEAG Zeughausstrasse 43 GH-8004 Z0rich Switzerland	

Tests The series production process used allows line imitation to test of first articles.

Complete tests were made on the pre-series Type No. OD 000 P40 AA. Serial No. TP-1001 and on the sories first article Type No. OD 000 P40 BA. Serial No. TP-1006. Certain parameters have been releated 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.	(T'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 Mequancias	300 MHz - 0 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
Segging	Compliant with the requirements according to the standards. Sagging of the flat section when filled with flassue simulating liquid	< 1% typical < 0.8% if slied 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

1234

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 Signature / Stamp	07.07.2006	Solphit & Pagany Englines Ing AG Solphit & Pagany Englines Ing AG Strategy and Add Solphits and Add Solphits Phone adjuster Strategy and Solphits and Sol Into Pagang.com. http://www.aparg.com
Doo He MIT - 00 000 MAD C - *		Page 1(1)

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# **10. System Validation from Original Equipment Supplier**

Engineering AG sughausstrasse 43, 8004 Zuric	ry of		S Schweizerlscher Kälibrierdianat Service suisse d'étalonnage Servicio svizzero di tentora S Swiss Calibration Service
locredialist by the Swits Accredits The Swits Accreditation Service fulfillateral Agreement for the n	e is one of the signatoria	is to the EA	Accreditation No.: SCS 0108
Auden Auden		Cartificaia	No: D750V3-1078_Jun17
CALIBRATION O	CERTIFICATI	E	
Object	D750V3 - SN-10	78	
Calibration procedure(s)	QA CAL-05.v9 Calibration proce	adure for dipole validation kits a	bove 700 MHz
Cadoration date:	June 20, 2017		
		tong slandards, which reside The physical	
Vi calbritions have been ocreau Calibrition Equipment yaed (NMS	cled in the closed laborato TE critical for calibration)	arobalonity are given on the following pages ny faoliny: environment temperaturp (22 = 3	
All collarations have been operation Calibration Equipment used (MS Primary Standards	ched in the closed haborsto TE collocal for calibration)   ID #	ny faoliny: environment temperature (22 = 3 Cai Date (Centicate No.)	IPD and humidity + 70%. Schoolwood Calipitation
Calibration Equipment ward (M& Primery Standards Power there NRP	Cled in the observations TE ontical for calibrations ID # SNL 104778	ny faoliny: environment temperature (22 = 3 Cal Date (Certificate No.) 04-4pr 17 (No. 217-0252102522)	I)*D and humidity = 70%. Schedured Carotation Apr-16
NI calibrations have been operau Calibration Equipment yaad (MS Primary Standards Power mater NITI: Power sensor NITI: Power sensor NITI:	Clief in the closed laboration TE inflication calibration ID # SN: 104778 SN: 103244	ny faoliny: environment temperature (22 ± 3 Gai Date (Certificate No.) 04-April 7 (No. 211-02521 00522) 04-April 7 (No. 211-02521)	)/10 and humidity + 70%. Schoolured Carlotation Apr-10 Apr-18
All calibrations have been operation Calibration Equipment used (MS Primary Standards Power stream NRP-291 Power sensor NRP-291	Cled in the closed laboration TE ontical for calibration ID # SN: 103244 SN: 103245	Cal Date (Certificate No.) 04-April 7 (No. 211-02521(05522) 04-April 7 (No. 211-02521(05522) 04-April 7 (No. 211-02522) 04-April 7 (No. 211-02522)	Schoolured Casolation Age-16 Age-18 Age-18
All collarations have been conduct Calibration Equipment used (Mis Primary Standards Power trater NIPP Power sensor NIPP-291 Power sensor NIPP-291 Reference 20 dB Attenuator	Elect in the closed laboration TE critical for calibration( D # SN: 104778 SN: 103245 SN: 103245 SN: 5058 (20k)	Cai Date (Certificate No.) 04-Apr-17 (Mo. 217-02521 04-Apr-17 (Mo. 217-02521 04-Apr-17 (No. 217-02521 04-Apr-17 (No. 217-02521) 07-Apr-17 (No. 217-02529)	Schoolword Calibration Apr-16 Apr-18 Apr-18 Apr-18
All calibrations have been operau Calibration Equipment used (MS Primary Standards Power mater NIPP Power sensor NIRP-291 Power sensor NIRP-291 Reference 20 AB Attenuator Type-N mismajch combination	Cled in the closed laboration TE ontical for calibration ID # SN: 103244 SN: 103245	Cal Date (Certificate No.) 04-April 7 (No. 217-02521 02522) 04-April 7 (No. 217-02521 02522) 04-April 7 (No. 217-03521) 04-April 7 (No. 217-03521) 07-April 7 (No. 217-02529) 07-April 7 (No. 217-02529)	Schedured Calebration Apr: 16 Apr: 18 Apr: 18 Apr: 18 Apr: 18 Apr: 18
All celebrations have been conclu Calibration Equipment just (MS Primary Standards Power states NITP: Power	Bits         Control of the contro	Cai Date (Certificate No.) 04-Apr-17 (Mo. 217-02521 04-Apr-17 (Mo. 217-02521 04-Apr-17 (No. 217-02521 04-Apr-17 (No. 217-02521) 07-Apr-17 (No. 217-02529)	Schoolword Calibration Apr-16 Apr-18 Apr-18 Apr-18
All calibrations have been operative Calibration Equipment used (Ma Primary Standards Power steller NIRP Power steller NIRP-291 Power steller NIRP-291 Power steller NIRP-291 Reference 20 dB Attenuator Type-Nimismajch combination Reference Probe EX3DV4 OAE4	Cled in the closed laboration           ID #           SN: 104778           SN: 103245           SN: 103245           SN: 5058 (20k)           SN: 5047.2 / 08327           SN: 5041	Cai Date (Certificate No.) 04-Apr-17 (Ma. 211-02521/02522) 04-Apr-17 (Ma. 211-02521/02522) 04-Apr-17 (Ma. 211-02521) 04-Apr-17 (Ma. 211-02522) 07-Apr-17 (Ma. 211-02529) 07-Apr-17 (Ma. 217-02529) 31-May-17 (Ma. 213-0369, May17) 28-Mar-17 (Ma. DAE-6-601, Mar17)	Schoolwood Calibration Apr-10 Apr-10 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 May-10 May-10 Mar-10
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Calibration Laboratory of Schmid & Partner Engineering AG Zeugheusstrasse 43, 8004 Zurich, Switzenland



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Accreditation No.: SCS 0108

Accredited by the Swits Accreditation Service (SAS)

The Swise Accreditation Service is one of the signatories to the EA Multifuteral Agreement for the recognition of collocation certificates Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

#### Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)". July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

#### Additional Documentation:

e) 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%.

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#### Measurement Conditions

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

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz ± 1 MHz	

#### Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.2 ± 6 %	0.91 mha/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

#### SAR result with Head TSL

SAR averaged over 1 cm <sup>2</sup> (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.14 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.39 W/kg ± 17.0 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL SAR measured	condition 250 mW input power	1.39 W/kg

#### Body TSL parameters

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.8 ± 6 %	0.97 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

#### SAR result with Body TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.19 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	8.67 W/kg ± 17.0 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL SAR measured	condition 250 mW input power	1.44 W/kg

Certificate No: D750V3-1078\_Jun17

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Page 3 of 8

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### Appendix (Additional assessments outside the scope of SCS 0108)

#### Antenna Parameters with Head TSL

Impedance, transformed to feed point	55.5 Ω + 0.0 jΩ
Return Loss	- 25.6 dB

#### Antenna Parameters with Body TSL

Impedance, transformed to feed point	51.0 Ω - 2.5 jΩ
Return Loss	- 31.5 dB

#### General Antenna Parameters and Design

Electrical Delay (one direction)	1.034 ms
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The clipple is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipple. The antenna is therefore short-circuited for DC-signals. On some of the dipples, small end caps are added to the dipple arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

#### Additional EUT Data

Manufactured by	SPEAG
Manufactured on	November 15, 2012

Certificate No: D750V3-1078\_Jun17

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Page 4 of 8

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Date: 20.06.2017

### **DASY5 Validation Report for Head TSL**

Test Laboratory: SPEAG, Zurich, Switzerland

#### DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1078

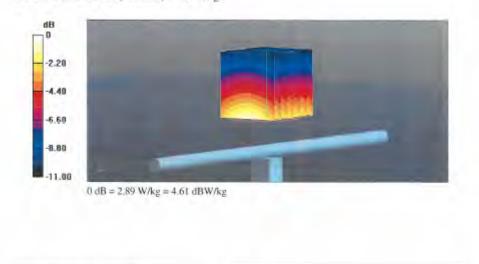
Communication System: UID 0 - CW; Frequency: 750 MHz Medium parameters used: f = 750 MHz;  $\sigma$  = 0.91 S/m;  $s_e$  = 41.2;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(10.49, 10.49, 10.49); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- · Electronics: DAE4 Sn601; Calibrated: 28,03.2017
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA: Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

#### 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 = 59.13 V/m; Power Drift = -0.00 dB Peak SAR (extrapolated) = 3.27 W/kg SAR(1 g) = 2.14 W/kg; SAR(10 g) = 1.39 W/kg Maximum value of SAR (measured) = 2.89 W/kg



Certificate No: D750V3-1078\_Jun17

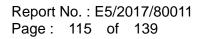
Page 5 of 8

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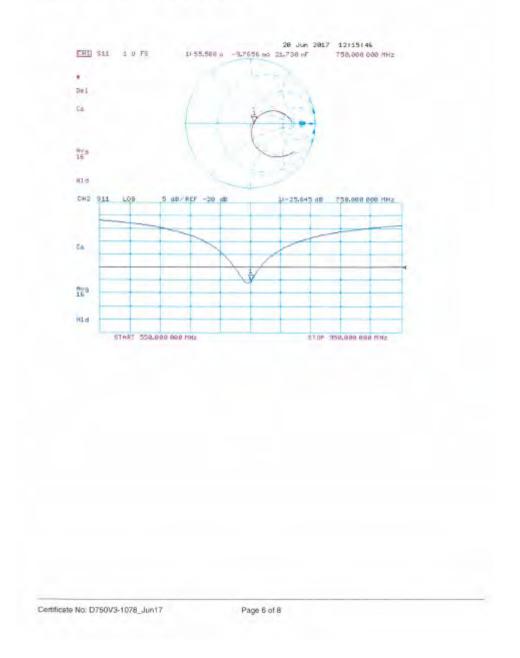
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#### Impedance Measurement Plot for Head TSL



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Member of SGS Group



Date: 20.06.2017

#### DASY5 Validation Report for Body TSL

Test Laboratory: SPEAG, Zurich, Switzerland

#### DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1078

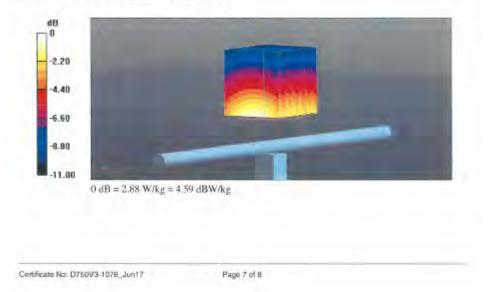
Communication System: UID 0 – CW; Frequency: 750 MHz Medium parameters used: f = 750 MHz;  $\sigma$  = 0.97 S/m;  $\epsilon_r$  = 54.8;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Measurement Standard; DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(10.35, 10.35, 10.35); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- · Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

#### 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 = 57.36 V/m; Power Drift = -0.01 dB Peak SAR (extrapolated) = 3.29 W/kg SAR(1 g) = 2.19 W/kg; SAR(10 g) = 1.44 W/kg Maximum value of SAR (measured) = 2.88 W/kg



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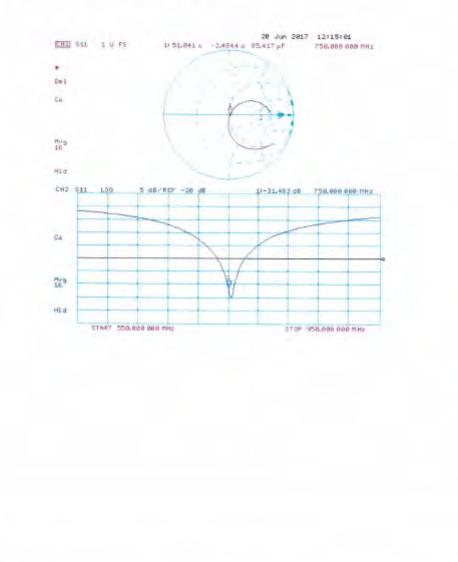
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Report No. : E5/2017/80011 Page : 117 of 139



SGS



Certificate No: D750V3-1078\_Jun17

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Page 8 of 8

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credited by the Swiss Accredita te Swiss Accreditation Service utiliateral Agreement for the m	e is one of the signatories	s to the EA	creditation No.: SCS 0108
Auden	EDTIFICATE		: D835V2-4d120_Jul17
ALIBRATION			
Ditect	D835V2 - SN:4d1	120	
Calibuation proceedure(s)	QA CAL-05.v9 Calibration proce	dure for dipole validation kits abo	ve 700 MHz
Calibration dele:	July 03, 2017		
		ry lacity environment temperature (22 ± 3)*(	d are cart of the centrole.
Calibration Equipment used (MS		Cal Date (Certificate No.)	C and humidity= 70%. Scheduled Cathorition
Calibration Equipment used (M8 Primary Standards Power motor NPP	TE critical for calibration) ID # SN: 104778	Cal Date (Centificate No.) 04-Api 17 (No. 217:02521/02522)	C and humidity = 70%. Scheduled Calibration Apr-18
Calibration Equipment used (M& Primary Standards Powor motor (NPP Power sensor NRP-291	TE critical for calibration (D.H SN: 104778 SN: 104278 SN: 103244	Cal Date (Certificate No.) 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521)	2 and humidity = 70%. Scheduled Calibration Apr-18 Apr-16
Calibration Equipment used (M& Primary Blandants Powor motor NPP Power Sensor NPP-291 Power Sensor NPP-291	TE ontical for cantration (D # SN: 104778 SN: 103244 SN: 103245	Cai Date (Certificate No.) 04-Apr.17 (No. 217:02521/02522) 04-Apr.17 (No. 217:02551) 04-Apr.17 (No. 217:02552)	2 and humidity = 70%. Scheduled Calibration Apr-18 Apr-16 Apr-18
Calibration Equipment used (M& Primary Standards Power meter NRP-ZS1 Power sensor NRP-ZS1 Power sensor NRP-ZS1 Reference 20 dB Attenuator	TE britical for calification ID # SN: 104778 SN: 103244 SN: 103245 SN: 5056 (20k)	Cai Dare (Cenificate No.) 04-April 7 (No. 217:02521/02522) 04-April 7 (No. 217:02521) 04-April 7 (No. 217:02522) 07-April 7 (No. 217:02528)	Scheduled Calibration Apr-18 Apr-18 Apr-18 Apr-18 Apr-18
Calibration Equipment used (WS Primary Standards Power motor NRP Power sensor NRP-291 Power sensor NRP-291 Reference 20 dB Arterustor Type-N mismatch combination	TE britical for calibration) (D # SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047 2 / 08327	Cal Date (Cenificate No.) 04-Api-17 (No. 217-02521/02522) 04-Api-17 (No. 217-02521) 04-Api-17 (No. 217-02521) 07-Api-17 (No. 217-02528) 07-Api-17 (No. 217-02528)	Send humidity = 70%. Scheduled Calibration Apr-18 Apr-16 Apr-18 Apr-18 Apr-18 Apr-18
Calibration Equipment used (M& Primary Blandards Rewor motor NRP Power sensor NRP-291 Power sensor NRP-291 Reference 20 08 Antervation Type-N mismatch combination Reference Probe EX30V4	TE britical for calibrationy ID # SN: 104778 SN: 103244 SN: 103245 SN: 5056 (20k) SN: 5647 2. (08327 SN: 7348	Cal Date (Certificate No.) 04-Ap-17 (No. 217-02521/02522) 04-Ap-17 (No. 217-02521) 04-Ap-17 (No. 217-02522) 07-Ap-17 (No. 217-02528) 07-Ap-17 (No. 217-02528) 03-May-17 (No. EX3-7349_May17)	Sand humidity= 70%. Scheduled Calibration Apr-18 Apr-18 Apr-18 Apr-18
Calibration Equipment used (M& Primary Blandaints Power sensor NRP- Power sensor NRP-291 Power sensor NRP-291 Reference 20 dB Attension Type-N mismatch combination Reference Probe EX30V4 OAE4	TE britical for calification) ID # SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047 2 (06327 SN: 7348 SN: 501	Cai Date (Certificate No.) 04-Apr.17 (No. 217:0252102522) 04-Apr.17 (No. 217:02521) 04-Apr.17 (No. 217:02522) 07-Apr.17 (No. 217:02522) 07-Apr.17 (No. 217:02522) 07-Apr.17 (No. 217:02529) 31-May-17 (No. EX3:7349; May17) 28-Mar-17 (No. DAE4-601; Mar17)	Send humidity = 70%. Scheduled Calibration Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 May-10 Mar-13
Calibration Equipment used (M& Primary Standords Rewor motor (NRP-251 Power sensor NRP-251 Power sensor NRP-251 Reference 20 dB Atterwator Type-N mismich combination Reference Probe EXCEVE DAE4 Secondary Standards	TE britical for calibrationy (D # SN: 104778) SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047 2 / 06527 SN: 7348 SN: 601	Cal Date (Cenificato No.) 04-Api-17 (No. 217-02521/02522) 04-Api-17 (No. 217-02521) 04-Api-17 (No. 217-02521) 07-Api-17 (No. 217-02528) 07-Api-17 (No. 217-02528) 07-Api-17 (No. 217-02528) 31-May-17 (No. EX3-7349, May17) 28-Mai-17 (No. DA54-601_Mar17) Check Date (in house)	C and humidity = 70%. Scheduled Calibration Apr-18 Apr-16 Apr-18 Apr-18 Apr-18 May-10 Mar-18 Scheduled Check
Calibration Equipment used (MS Primary Blandards Power wetsor NRP-291 Power sensor NRP-291 Power sensor NRP-291 Reference 20 dB Atternator Type-N mismach combination Reference Proba EX3DVa DAE4 Secondary Stantlands Power mistor EPM-442A	TE britical for calibrationy ID # SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5647 2 / 06327 SN: 7348 SN: 7348 SN: 501 ID # SN: GB37490704	Cal Date (Centificatio No.) 04-April 7 (No. 217/02521/02522) 04-April 7 (No. 217/02521) 04-April 7 (No. 217/02522) 07-April 7 (No. 217/02528) 07-April 7 (No. 217/02528) 31-May-17 (No. EX3-7349, May17) 28-Mar-17 (No. DAE4-601, Mar17) Check Date (in house) 07-Oci-15 (in house check Oct-16)	Scheduled Calibration Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 May-10 Mas-18 Scheduled Check In house check: Cot-18
Calibration Equipment used (MS Primary Standards Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Allerustor Type-N mismatch combination Reference Proble EX307V4 DAE4 Secondary Standards Power meter ERM-442A Power meter ERM-442A	TE britical for cambostiony ID # SN: 104778 SN: 103244 SN: 103245 SN: 50472 (2k) SN: 50472 (2k) SN: 50472 (2k) ID # ID # SN: GB37490704 SN: US37292783	Cai Date (Certificate No.) 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02523) 04-Apr-17 (No. 217-02523) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02529) 31-May-17 (No. DAE4-601_Mar(17) 28-Mar-17 (No. DAE4-601_Mar(17) Check Date (in house) 07-0ct-15 (in house check Oct-16) 07-0ct-15 (in house check Oct-16)	C and humidity= 70%. Scheduled Calibration Apr-18 Apr-16 Apr-18 Apr-18 Apr-18 May-10 Mar-18 Scheduled Check
Calibration Equipment used (MS Primary Standards Power sensor NRP-291 Power sensor NRP-291 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX30Ve OAE4 Secondary Standards Power metor EPM-442A Power sensor HP 8481A Power sensor HP 8481A	TE britical for calificationy ID # SN: 104776 SN: 103244 SN: 103245 SN: 5047 2 / 06327 SN: 5047 2 / 06327 SN: 5047 2 / 06327 SN: 601 ID # SN: 6037490704 SN: US37282785 SN: WY41002317	Cai Date (Certificate No.) 04-Apr.17 (No. 217-02521/02502) 04-Apr.17 (No. 217-02521) 04-Apr.17 (No. 217-02522) 07-Apr.17 (No. 217-02522) 07-Apr.17 (No. 217-02528) 07-Apr.17 (No. 217-02528) 07-Apr.17 (No. 217-02528) 31-Majr.17 (No. 217-02528) 31-Majr.17 (No. 217-02528) 31-Majr.17 (No. 217-02528) 07-Apr.17 (No. 217-02528) 07-Oct.15 (In house check Oct.16) 07-Oct.15 (In house check Oct.16) 07-Oct.15 (In house check Oct.16)	Scheduled Cathostion Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 May-10 Mar-18 Scheduled Check In house check: Cet-18 In house check: Cet-18
Calibration Equipment used (MS Primary Blandards Power wetsor NRP-291 Power sensor NRP-291 Power sensor NRP-291 Reference 20 dB Atternator Type-N mismach combination Reference Proba EX3DVa DAE4 Secondary Stantlands Power mistor EPM-442A	TE britical for cambostiony ID # SN: 104778 SN: 103244 SN: 103245 SN: 50472 (2k) SN: 50472 (2k) SN: 50472 (2k) ID # ID # SN: GB37490704 SN: US37292783	Cai Date (Certificate No.) 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02523) 04-Apr-17 (No. 217-02523) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02529) 31-May-17 (No. DAE4-601_Mar(17) 28-Mar-17 (No. DAE4-601_Mar(17) Check Date (in house) 07-0ct-15 (in house check Oct-16) 07-0ct-15 (in house check Oct-16)	Send humidity = 70%. Scheduled Calibration Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 May-10 Mar-18 Scheduled Check In house check: Cet-18 In house check: Cet-18 In house check: Cet-18
Calibration Equipment used (M8 Primary Blandards Power sensor NRP-291 Power sensor NRP-291 Power sensor NRP-291 Reference 20 dB Atternation Type-N mismoch combination Reference Probe EX3DVe DAE4 Secondary Standards Power meter EPM-442A Power sensor HP 6481A Power sensor HP 6481A R generation B&S SMT-06	TE britical for cambostiony ID # SN: 103244 SN: 103244 SN: 103245 SN: 50472 (x) SN: 50472 (x) SN: 50472 (x) SN: G837490704 SN: G837490704 SN: G837490704 SN: US37292783 SN: MY41002317 SN: 109872 SN: US37390585	Cai Date (Certificate No.) O4-Apr-17 (No. 217-02521/02522) O4-Apr-17 (No. 217-02521) O4-Apr-17 (No. 217-02522) O7-Apr-17 (No. 217-02528) O7-Apr-17 (No. 217-02528) O7-Apr-17 (No. 217-02528) O1-Apr-17 (No. 217-02528) O1-Apr-17 (No. 217-02528) O1-Apr-17 (No. 217-02528) O1-Apr-17 (No. 217-02528) O1-Apr-17 (No. 217-02528) O1-Oct-15 (In house check Oct-16) O1-Oct-15 (In house check Oct-16) O1-Oct-15 (In house check Oct-16) O2-Oct-15 (In house check Oct-16) O2-Oct-01 (In house check Oct-16)	Send humidity = 70%. Scheduled Calibration Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 May-10 Max-18 Scheduled Check In house check: Cet-18 In house check: Cet-18
Calibration Equipment used (MS Primary Standards Power sensor NRP-291 Power sensor NRP-291 Reterence 20 dS Anterusitor Type-N mismatch combination Reterence Proble EX307Va DAE4 Secondary Standards Power metor EPM-442A Power sensor HP 8481A Power sensor HP 8481A Regenerator R&S SMIF-06 Network Analyzer HP 8753E	TE britical for calification) ID # SN: 104776 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047 2 / 06527 SN: 507 SN: 501 ID # SN: 6837490704 SN: US37292785 SN: MV41002317 SN: 105872 SN: 105873	Cai Date (Certificate No.) 04-April 7 (No. 217-025221/02522) 04-April 7 (No. 217-02522) 04-April 7 (No. 217-02522) 07-April 7 (No. 217-02528) 07-April 7 (No. 217-025	C and humidity = 70%. Scheduled Calibration Apr-18 Apr-16 Apr-18 Apr-18 Apr-18 May-10 Mar-18 Scheduled Check In house check: Cet-18 In house check: Cet-18 In house check: Cet-18 In house check: Cet-18
Calibration Equipment used (M8 Primary Blandards Power sensor NRP-291 Power sensor NRP-291 Power sensor NRP-291 Reference 20 dB Atternation Type-N mismoch combination Reference Probe EX3DVe DAE4 Secondary Standards Power meter EPM-442A Power sensor HP 6481A Power sensor HP 6481A R generation B&S SMT-06	TE britical for cambostiony ID # SN: 103244 SN: 103244 SN: 103245 SN: 50472 (x) SN: 50472 (x) SN: 50472 (x) SN: G837490704 SN: G837490704 SN: G837490704 SN: US37292783 SN: MY41002317 SN: 109872 SN: US37390585	Cai Date (Certificate No.) O4-Apr-17 (No. 217-02521/02522) O4-Apr-17 (No. 217-02521) O4-Apr-17 (No. 217-02522) O7-Apr-17 (No. 217-02528) O7-Apr-17 (No. 217-02528) O7-Apr-17 (No. 217-02528) O1-Apr-17 (No. 217-02528) O1-Apr-17 (No. 217-02528) O1-Apr-17 (No. 217-02528) O1-Apr-17 (No. 217-02528) O1-Apr-17 (No. 217-02528) O1-Oct-15 (In house check Oct-16) O1-Oct-15 (In house check Oct-16) O1-Oct-15 (In house check Oct-16) O2-Oct-15 (In house check Oct-16) O2-Oct-01 (In house check Oct-16)	Send humidity = 70%. Scheduled Calibration Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 May-10 Max-18 Scheduled Check In house check: Cet-18 In house check: Cet-18
Calibration Equipment used (MS Primary Standards Power meter NRP Power sensor NRP-291 Reference 20 dB Anterusitor Type-N mismatch combination Reference Probe EX30746 DAE4 Secondary Standards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A Regenerator R&S SMIF-06 Network Analyzer HP 8753E	TE britical for calification) ID # SN: 104776 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047 2 / 06527 SN: 507 SN: 501 ID # SN: 6837490704 SN: US37292785 SN: MV41002317 SN: 105872 SN: 105873	Cai Date (Certificate No.) 04-April 7 (No. 217-025221/02522) 04-April 7 (No. 217-02522) 04-April 7 (No. 217-02522) 07-April 7 (No. 217-02528) 07-April 7 (No. 217-025	Send humidity= 70%. Scheduled Cathostion Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Scheduled Check In house check: Cot-18 In house check: Cot-17
Calibration Equipment used (MS Primary Standards Power meter NRP Power sensor NRP-291 Power sensor NRP-291 Reference 20 (B Allerwalter Type-N mismach combination Reference Probe EX3DV4 DAE4 Secondary Stantlands Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMF-06 Network Analyzer HP 8753E Calibrated by:	TE britical for earthestory 10 # SN: 103244 SN: 103245 SN: 5058 (20k) SN: 504 (20k) SN: 504 (20k) SN: 504 (20k) SN: 501 10 # SN: GB37490704 SN: US37282785 SN: MV41002317 SN: 106872 SN: US3730585 Name Jeton Kastiadi	Cai Date (Certificatio No.) 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02523) 04-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-0258) 07-Apr-17 (No. 217-0258) 07-Apr-17 (No. 217-0258) 07-Apr-17 (No. 217-0258) 07-Apr-17 (No. 217-0258) 07-Apr-17 (No. 217-0258) 07-Apr-17 (No. 217-0258) 07-Apr-18 (No. 217-0	Send humidity = 70%. Scheduled Calibration Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 May-10 Max-18 Scheduled Check In house check: Cet-18 In house check: Cet-18

Certificate No: D835V2-4d120, Jul 17

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Page 1 ol 8

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Calibration Laboratory of Schmid & Partner Engineering AG

Zeughnusstrasse 43, 8004 Zurich, Switzerland



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Accreditation No.: SCS 0105

Accludied by the Swist Accrediation Service (SAS)

The Swiss Accreditation Service is one of the signification to the EA Municaural Agreement for the recognition of salibration certificates

### Glossary:

TSL lissue simulating liquid ConvF sensitivity in TSL / NORM x,y,z N/A not applicable or not measured

#### Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 8 GHz"

#### Additional Documentation:

e) 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 conter 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 tilled 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%.

Contributio No. 1383575-4d120\_0017

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Page 2 of 6

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#### Measurement Conditions

DASY system configuration	m, as far as not given on page *	l
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DASY Version	DASYS	V52.10.0
Extrapolation	Advanced Extrapolation	100 B 100 B 100 B
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	41.0 = 6 %	0.93 mha/m ± 6 %
Head TSL temperature change during test	<0.5 °C	-	2000

#### SAR result with Head TSL

SAR averaged over 1 cm <sup>4</sup> (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.44.W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.50 W/kg ± 17.0 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL SAR measured	condition 250 mW input power	1,58 W/kg

#### **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	54.7 ± 8 %	1,00 mba/m ± 8 %
Body TSL temperature change during test	< 0.5 °C	-	

#### SAR result with Body TSI

SAR averaged over 1 cm <sup>4</sup> (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.48 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	9.68 W/kg ± 17.0 % (k=2)
and a finitial party for printing the		
SAR averaged over 10 cm <sup>4</sup> (10 g) of Body TSL SAR measured	condition 250 mW input power-	1.62 W/Kg

Certificate No: D635V2-4d120\_Jult7

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Page 3 of 8

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Appendix (Additional assessments outside the scope of SCS 0108)

#### Antenna Parameters with Head TSL

Impetiance, transformed to feed point	51.2 0 - 2 3 (0
Return Loss	+37.7 dB

#### Antenna Parameters with Body TSL

Impedance, transformed to feed point	相30-47回	
Return Loss	-25,9 dB	

#### General Antenna Parameters and Design

Electrical Delay (one direction)	1.397 ms	
The second second second second		

After long term use with 100W radiated power, only a slight warming of the oppior inser the lendbow dark be measured

The dipole is made of standard semingid coaxial cable. The center conductor of the leading line is directly connected in the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small and 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 cipole length is still according to the Stendard.

No excessive force must be applied to the cipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

#### Additional EUT Data

Manufactured by	SPEAG
Manufactured on	Juna 29, 2010

Certilicate Nor DE35V2-4d120\_3/17

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Page 4 pl 8

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Date: 03.07.2017

#### **DASY5 Validation Report for Head TSL**

Test Laboratory: SPEAG, Zurich, Switzerland

### DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d120

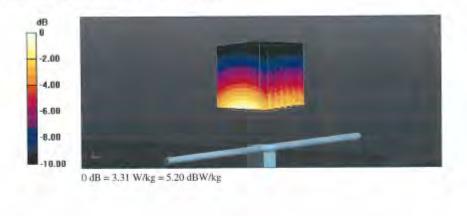
Communication System: UID 0 - CW; Frequency: 835 MHz Medium parameters used: f = 835 MHz;  $\sigma = 0.93$  S/m;  $r_r = 41$ ; p = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(10.07, 10.07, 10.07), Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 4.9 (front); Type; QD 00L P49 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

### 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 = 62.12 V/m; Power Drift = 0.01 dB Peak SAR (extrapolated) = 3.77 W/kg SAR(1 g) = 2.44 W/kg; SAR(10 g) = 1.58 W/kg Maximum value of SAR (measured) = 3.31 W/kg



Certificate No: D835V2-4d120\_Jul17

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Page 5 of 8

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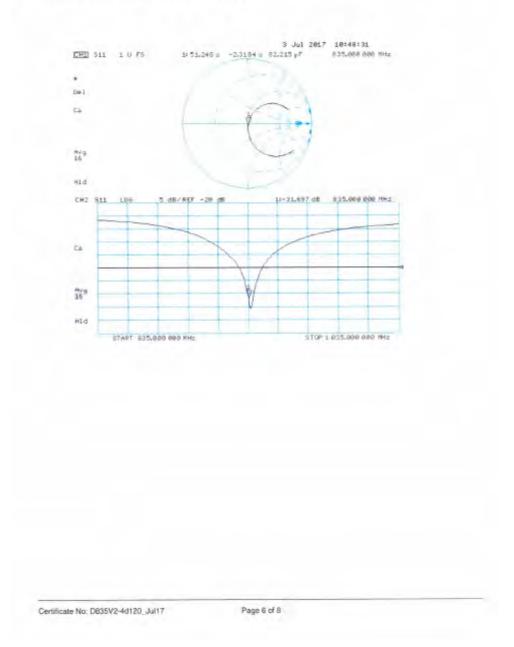
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Report No. : E5/2017/80011 Page : 123 of 139



#### Impedance Measurement Plot for Head TSL

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Date: 03.07.2017

#### **DASY5 Validation Report for Body TSL**

Test Laboratory: SPEAG, Zurich, Switzerland

### DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d120

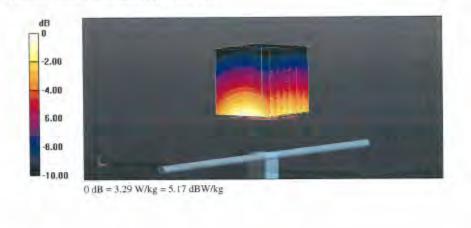
Communication System: UID 0 - CW; Frequency: 835 MHz Medium parameters used: f = 835 MHz;  $\sigma = 1$  S/m;  $\epsilon_r = 54.7$ ;  $\rho = 1000$  kg/m<sup>3</sup> Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(10.2, 10.2, 10.2); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

## 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 = 60.53 V/m; Power Drift = -0.08 dB Peak SAR (extrapolated) = 3.75 W/kg SAR(1 g) = 2.48 W/kg; SAR(10 g) = 1.62 W/kg Maximum value of SAR (measured) = 3.29 W/kg



Certificate No: D835V2-4d120\_Jul17

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Page 7 of 8

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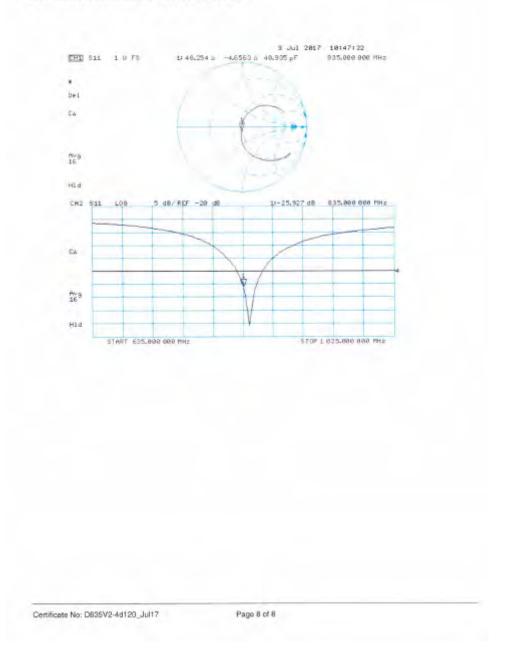
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#### Impedance Measurement Plot for Body TSL



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albimon procedure(s)	QA CAL-05.v9 Calibration proce	dure for dipole validation kits abo	ve 700 MHz
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Certificate No: D1900V2-5d173\_May17

Page 1 of I

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Calibration Laboratory of Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurinh, Rwitzminnd



Schweizenscher Kallbriertli Service suisse d'étalonnage Servizio aviazoro di taratu/a Swiss Calibration Service

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Accreditation No.: SCS 0108

Accredited by the Swiss Accredition Service (SAS)

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tissue simulating liquid TSL sensitivity in TSL / NORM x,y,z ConvF not applicable or not measured N/A

#### Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)\*, February 2005
- c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

#### Additional Documentation:

e) 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 dipolo 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%.

Centricate No: D1900V2-5d173\_May17

Page 2 al B

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### **Measurement Conditions**

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

DASY Version	DASY5	V52,10,0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phanlom	
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.

the second se	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 milia/m
Measured Head TSL parameters	(22.0 ± 0.2) "C	413≈6%	1.40 mho/m ±.6 %
Head TSL temperature change during test	< 0.5 °C	- Contraction of the	

#### SAR result with Head TSL

SAR averaged over 1 cm <sup>2</sup> (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	10.1 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	40.7 W/kg ± 17.0 % (k=2)
SAR everaged over 10 cm <sup>2</sup> (10 g) of Head TSL	condition	
SAR everaged over 10 cm <sup>2</sup> (10 g) of Head TSL SAR measured	condition 250 mW input power	5.26 W/kg

#### **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	54,2±6%	1.51 mha/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		· · · · · · · · · · · · · · · · · · ·

#### SAR result with Body TSL

SAR averaged over 1 cm <sup>2</sup> (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	e.ae Wikg
SAR for nominal Body TSL parameters	normalized to 1W	40.2 W/kg ± 17.0 % (k=2)
SAR averaged over 10 cm <sup>2</sup> (10 g) of Body TSL	condition	
SAR averaged over 10 cm <sup>2</sup> (10 g) of Body TSL SAR measured	condition 250 mW input power	5,30 W/kg

Certificate No. D1900V2-5d173\_May17

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Page 3 of 8

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#### Appendix (Additional assessments outside the scope of SCS 0108)

#### Antenna Parameters with Head TSL

Impedance, transformed to food point	51.3 Ω + 4.9 jΩ
Return Loss	- 26.1 dB

### Antenna Parameters with Body TSL

Impedance, transformed to find point	47,5 IQ + 6,0 jQ
Return Loss	- 23.5 dB

#### General Antenna Parameters and Design

Electrical Delay (one direction)	1.199 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small and 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 feedbolni may be damaged.

#### Additional EUT Data

Manufactured by	SPEAG
Manufactured on	June 06, 2012

Carthicate No: D1900V2-50173\_May17

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Page 4 01 8

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Date: 31.05.2017

#### DASY5 Validation Report for Head TSL

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;  $\sigma$  = 1.4 S/m;  $\epsilon_e$  = 41.3;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7460; ConvF(7.98, 7.98, 7.98); Calibrated: 19.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

### 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 = 107.7 V/m; Power Drift = 0.03 dB Peak SAR (extrapolated) = 18.9 W/kg SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.26 W/kg Maximum value of SAR (measured) = 15.3 W/kg



Certificate No. D1900V2-50173\_May17

Page 5 of 8

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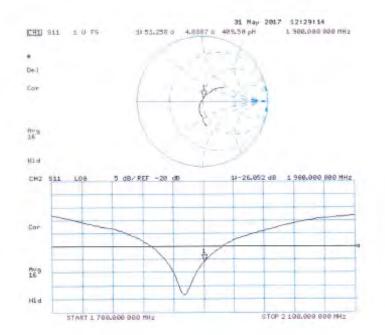
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### Impedance Measurement Plot for Head TSL



Certificate No: D1900V2-5d173\_May17

Page 6 of 8

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#### DASY5 Validation Report for Body TSL

Date: 31.05.2017

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;  $\sigma$  = 1.51 S/m;  $e_r$  = 54.2;  $\rho$  = 1000 kg/m<sup>2</sup> Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7460; ConvF(7.82, 7.82, 7.82); Calibrated: 19.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (back); Type; QD 000 P50 AA; Scrial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

## 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 = 102.9 V/m; Power Drift = -0.08 dB Peak SAR (extrapolated) = 17.5 W/kg SAR(1 g) = 9.98 W/kg; SAR(10 g) = 5.3 W/kg Maximum value of SAR (measured) = 14.3 W/kg



Certificate No: D1900V2-5d173\_May17

Page 7 of 8

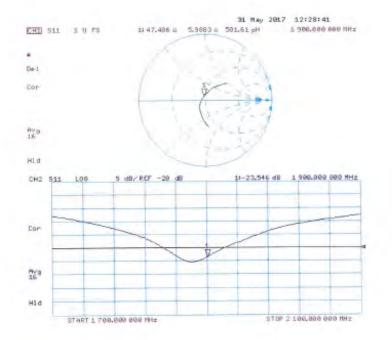
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### Impedance Measurement Plot for Body TSL



Certificate No: D1900V2-5d173\_May17

Page 8 of 8

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ccredited by the Swiss Accreditation Swiss Accreditation Service ultilateral Agreement for the re	is one of the signatorie	s to the EA	creditation No.: SCS 0108
lient SGS -TW (Aude	en)	Certificate No	: D2450V2-727_Apr17
CALIBRATION C	ERTIFICATE		
Object	D2450V2 - SN: 7	27	
Calibration procedure(s)	QA CAL-05.v9	al an	700 141
	Calibration proce	dure for dipole validation kits abo	we 700 MHz
Calibration date:	April 21, 2017		
This calibration certificate docum	ents the traceability to nat	ional standards, which realize the physical un	its of measurements (SI).
		robability are given on the following pages an	
All calibrations have been conduc	ted in the closed laborato	ry facility: environment temperature (22 $\pm$ 3)%	C and humidity < 70%.
All calibrations have been conduc	cted in the closed laborato	ry facility: environment temperature (22 $\pm$ 3) $^{\rm v}$	C and humidity < 70%.
		ry facility: environment temperature (22 $\pm$ 3)*(	3 and humidity < 70%.
		ry facility: environment temperature $(22 \pm 3)^{\circ}$	3 and humidity < 70%.
All calibrations have been conduc Calibration Equipment used (M& Primary Standards		ry facility: environment temperature (22 ± 3)% Cal Date (Certificate No.)	C and humidity < 70%. Scheduled Calibration
Calibration Equipment used (M& Primary Standards Power meter NRP	TE critical for calibration)	Cal Date (Certificate No.) 04-Apr-17 (No. 217-02521/02522)	Scheduled Calibration Apr-18
Calibration Equipment used (M& Primary Standards Power meter NRP Power sensor NRP-Z91	TE critical for calibration) 1D # SN: 104778 SN: 103244	Cal Date (Certificate No.) 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521)	Scheduled Calibration Apr-18 Apr-18
Calibration Equipment used (M& Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91	TE critical for calibration) 1D # SN: 104778 SN: 103244 SN: 103245	Cal Date (Certificate No.) 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522)	Scheduled Calibration Apr-18 Apr-18 Apr-18
Calibration Equipment used (M&T Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator	TE critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k)	Cal Date (Certificate No.) 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02528)	Scheduled Calibration Apr-18 Apr-18 Apr-18 Apr-18
Calibration Equipment used (M& Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination	TE critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047.2 / 06327	Cal Date (Certificate No.) 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02529)	Scheduled Calibration Apr-18 Apr-18 Apr-18 Apr-18 Apr-18
Calibration Equipment used (M& Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4	TE critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047.2 / 06327 SN: 7349	Cal Date (Certificate No.) 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02529) 31-Dec-16 (No. EX3-7349_Dec16)	Scheduled Calibration Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Dec-17
Calibration Equipment used (M& Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4	TE critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047.2 / 06327	Cal Date (Certificate No.) 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02529)	Scheduled Calibration Apr-18 Apr-18 Apr-18 Apr-18 Apr-18
Calibration Equipment used (M& Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination	TE critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047.2 / 06327 SN: 7349	Cal Date (Certificate No.) 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02529) 31-Dec-16 (No. EX3-7349_Dec16)	Scheduled Calibration Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Dec-17
Calibration Equipment used (M& Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4	TE critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047.2 / 06327 SN: 5047.2 / 06327 SN: 7349 SN: 601	Cal Date (Certificate No.) 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02528) 31-Dec-16 (No. EX3-7349_Dec16) 28-Mar-17 (No. DAE4-801_Mar17)	Scheduled Calibration Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Dec-17 Mar-18
Calibration Equipment used (M&T Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards	TE critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047.2 / 06327 SN: 7349 SN: 601 ID #	Cal Date (Certificate No.) 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02529) 31-Dec-16 (No. EX3-7349_Dec16) 28-Mar-17 (No. DAE4-601_Mar17) Check Date (in house)	Scheduled Calibration Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Dec-17 Mar-18 Scheduled Check
Calibration Equipment used (M&' Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter EPM-442A	TE critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5057.2 / 06327 SN: 7349 SN: 601 ID # SN: GB37480704	Cal Date (Certificate No.)           04-Apr-17 (No. 217-02521/02522)           04-Apr-17 (No. 217-02521)           04-Apr-17 (No. 217-02522)           07-Apr-17 (No. 217-02528)           07-Apr-17 (No. 217-02529)           31-Dec-16 (No. EX3-7349_Dec16)           28-Mar-17 (No. DAE4-601_Mar17)           Check Date (in house)           07-Opt-15 (in house check Oct-16)	Scheduled Calibration Apr-18 Apr-18 Apr-18 Apr-18 Dec-17 Mar-18 Scheduled Check In house check: Oct-18
Calibration Equipment used (M& Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter EPM-442A Power sensor HP 8481A	TE critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5058 (20k) SN: 5047.2 / 06327 SN: 7349 SN: 601 ID # SN: GB37480704 SN: US37292783	Cal Date (Certificate No.)           04-Apr-17 (No. 217-02521/02522)           04-Apr-17 (No. 217-02521)           04-Apr-17 (No. 217-02522)           07-Apr-17 (No. 217-02528)           07-Apr-17 (No. 217-02529)           31-Dec-16 (No. EX3-7349_Dec16)           28-Mar-17 (No. DAE4-601_Mar17)           Check Date (in house)           07-Oct-15 (in house check Oct-16)           07-Oct-15 (in house check Oct-16)	Scheduled Calibration Apr-18 Apr-18 Apr-18 Apr-18 Dec-17 Mar-18 Scheduled Check In house check: Oct-18 In house check: Oct-18
Calibration Equipment used (M& Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A	TE critical for calibration) 1D # SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047.2 (06327 SN: 5047.2 (06327 SN: 601 ID # SN: 601 ID # SN: 6837480704 SN: US37292783 SN: MY41092317	Cal Date (Certificate No.)           04-Apr-17 (No. 217-02521/02522)           04-Apr-17 (No. 217-02521)           04-Apr-17 (No. 217-02522)           07-Apr-17 (No. 217-02528)           07-Apr-17 (No. 217-02529)           31-Dec-16 (No. EX3-7349_Dec16)           28-Mar-17 (No. DAE4-601_Mar17)           Check Date (in house)           07-Oct-15 (in house check Oct-16)           07-Oct-15 (in house check Oct-16)           07-Oct-15 (in house check Oct-16)	Scheduled Calibration Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Dec-17 Mar-18 Scheduled Check In house check: Oct-18 In house check: Oct-18 In house check: Oct-18
Calibration Equipment used (M&T Primary Standards Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter EPM-442A Power sensor HP 8481A RF generator R&S SMT-06	TE critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 50547.2 / 06327 SN: 7349 SN: 601 ID # SN: GB37480704 SN: US37292783 SN: 100972 SN: 100972 SN: US37390585	Cal Date (Certificate No.)           04-Apr-17 (No. 217-02521/02522)           04-Apr-17 (No. 217-02521)           04-Apr-17 (No. 217-02522)           07-Apr-17 (No. 217-02528)           07-Apr-17 (No. 217-02529)           31-Dec-16 (No. EX3-7349_Dec16)           28-Mar-17 (No. DAE4-601_Mar17)           Check Date (in house)           07-Oct-15 (in house check Oct-16)           07-Oct-15 (in house check Oct-16)           15-Jun-15 (in house check Oct-16)           18-Oct-01 (in house check Oct-16)	Scheduled Calibration Apr-18 Apr-18 Apr-18 Apr-18 Dec-17 Mar-18 Scheduled Check In house check: Oct-18 In house check: Oct-18
Calibration Equipment used (M& Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer HP 8753E	TE critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047.2 (k) SN: 601 ID # SN: GB37480704 SN: US37292783 SN: 100972 SN: US37390585 Name	Cal Date (Certificate No.) 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. DAE4-601_Mar17) Check Date (in house) 07-Oct-15 (in house check Oct-16) 07-Oct-15 (in house check Oct-16) 15-Jun-15 (in house check Oct-16) 15-Jun-15 (in house check Oct-16) 18-Oct-01 (in house check Oct-16) 18-Oct-01 (in house check Oct-16)	Scheduled Calibration Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Dec-17 Mar-18 Scheduled Check In house check: Oct-18 In house check: Oct-18 In house check: Oct-18 In house check: Oct-18 In house check: Oct-18
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Calibration Equipment used (M& Primary Standards Power meter NRP Power sensor NRP-291 Power sensor NRP-291 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer HP 8753E Calibrated by:	TE critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5058 (20k) SN: 5047.2 / 06327 SN: 7349 SN: 601 ID # SN: GB37480704 SN: US37290783 SN: WY41092317 SN: 100972 SN: US37390585 Name Michael Weber	Cal Date (Certificate No.) 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02529) 31-Dec-16 (No. EX3-7349_Dec16) 28-Mar-17 (No. DAE4-601_Mart7) Check Date (In house) 07-Oct-15 (In house check Oct-16) 07-Oct-15 (In house check Oct-16) 15-Jun-15 (In house check Oct-16) 15-Jun-15 (In house check Oct-16) 15-Jun-15 (In house check Oct-16) 18-Oct-01 (In house check Oct-16)	Scheduled Calibration Apr-18 Apr-18 Apr-18 Apr-18 Dec-17 Mar-18 Scheduled Check In house check: Oct-18 In house check: Oct-18

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Page 1 of 8

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



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

Accreditation No.: SCS 0108

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### Glossary:

TSL tissue simulating liquid ConvF sensitivity in TSL / NORM x,y,z N/A not applicable or not measured

#### Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

#### Additional Documentation:

e) 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%.

Certificate No: D2450V2-727\_Apr17

Page 2 of 8

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台灣檢驗科技股份有限公司 t (886-2) 2299-3279



#### Measurement Conditions

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

DASY Version	DASY5	V52.10.0
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	37.7 ± 6 %	1.87 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

#### SAR result with Head TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.4 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	52.2 W/kg ± 17.0 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL SAR measured	condition 250 mW input power	6.18 W/kg

#### **Body TSL parameters**

	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	52.5 ± 6 %	2.03 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

### SAR result with Body TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.9 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	50.6 W/kg ± 17.0 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL SAR measured	condition 250 mW input power	6.01 W/kg

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Page 3 of 8

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#### Appendix (Additional assessments outside the scope of SCS 0108)

#### Antenna Parameters with Head TSL

Impedance, transformed to feed point	56.3 Ω + 2.1 jΩ
Return Loss	- 24.0 dB

#### Antenna Parameters with Body TSL

Impedance, transformed to feed point	51.1 Ω + 4.1 jΩ
Return Loss	- 27.5 dB

#### **General Antenna Parameters and Design**

	Electrical Delay (one direction)	1.148 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

#### Additional EUT Data

Manufactured by	SPEAG
Manufactured on	January 09, 2003

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Page 4 of 8

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#### **DASY5 Validation Report for Head TSL**

Date: 21.04,2017

Test Laboratory: SPEAG, Zurich, Switzerland

#### DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 727

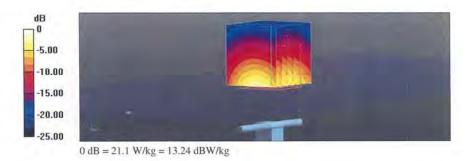
Communication System: UID 0 - CW; Frequency: 2450 MHz Medium parameters used: f = 2450 MHz;  $\sigma = 1.87$  S/m;  $\epsilon_r = 37.7$ ;  $\rho = 1000$  kg/m<sup>3</sup> Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(7.72, 7.72, 7.72); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1442); SEMCAD X 14.6.10(7413)

## 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 = 109.8 V/m; Power Drift = -0.06 dB Peak SAR (extrapolated) = 27.3 W/kg SAR(1 g) = 13.4 W/kg; SAR(10 g) = 6.18 W/kg Maximum value of SAR (measured) = 21.1 W/kg



Certificate No: D2450V2-727\_Apr17

Page 5 of 8

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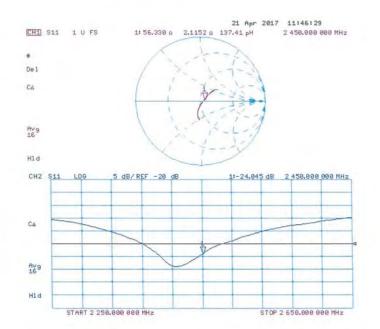
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#### Impedance Measurement Plot for Head TSL



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Page 6 of 8

# - End of 1<sup>st</sup> part of report -

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