SAR TEST REPORT

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

EUT Description	Mobile Phone
Company Name	Sony Mobile Communications INC
Company Address	4-12-3 Higashi-shinagawa, Shinagawa-ku, Tokyo, 140-0002, Japan
Standards	IEEE/ANSI C95.1-1992, IEEE 1528-2013, KDB248227D01v02r02,KDB865664D01v01r04, KDB865664D02v01r02,KDB941225D01v03r01, KDB941225D06v02r01,KDB447498D01v06, KDB941225D05v02r05, KDB 648474 D04 v01r03
FCC ID	PY7-50241M
Date of Receipt	2018-10-17
Date of Test(s)	2018-10-29 to 2018-11-17
Date of Issue	2018-12-14

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.

Signed on behalf of SGS

Sr. Engineer	**Supervisor**
Jackson Li	**Simon Ling**
Date: Dec. 14, 2018	**Date: Dec. 14, 2018**

Revision History

Report Number	Revision	Description	Issue Date
ZR/2018/9002708	00	Original	2018-11-28
ZR/2018/9002708	01	Update the dipole impedance and return loss measurements for Appendix C	2018-12-14

Contents

1. General Information

1.1 Testing Laboratory

Company:	SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch E&E Lab
Address:	No. 1 Workshop, M-10, Middle section, Science & Technology Park, Shenzhen, Guangdong, China
Post code:	518057
Telephone:	+86 (0) 755 2601 2053
Fax:	+86 (0) 755 2671 0594
E-mail:	ee.shenzhen@sgs.com

1.2 Details of Applicant

Applicant:	Sony Mobile Communications INC
Address:	4-12-3 Higashi-shinagawa, Shinagawa-ku, Tokyo, 140-0002, Japan
Manufacturer:	Sony Mobile Communications INC
Address:	4-12-3 Higashi-shinagawa, Shinagawa-ku, Tokyo, 140-0002, Japan
Factory:	Dong Guan Huabel Electronic Technology Co., Ltd
Address:	No.9 Industrial Northern Road, National High-Tech Industrial Development Zone, SongShan Lake, Dong Guan City

1.3 Description of EUT

EUT Description	Mobile Phone	
FCC ID	PY7-50241M	
Hardware Version:	A	
Software Version:	A.2.20	
Mode of Operation	☒GSM ☒GPRS ☒EGPRS ☒WCDMA ☒HSDPA ☒HSUPA ☒HSPA+ ☒LTE FDD ☒WLAN802.11 a/b/g/n(20M/40M) ☒Bluetooth	
Duty Cycle	GSM	1/8.3
	GPRS (support multi class 12 max)	1/2.075 (1Dn4UP) 1/2.77 (1Dn3UP) 1/4.15 (1Dn2UP) 1/8.3 (1Dn1UP)
	LTE FDD	1:1
	WCDMA	1:1
	WLAN802.11 b	99.24%
	WLAN802.11 a	96.17%
	Bluetooth	100%
TX Frequency Range (MHz)	GSM850	824 — 849
	GSM1900	1850 — 1910
	WCDMA Band V	824 — 849
	WCDMA Band II	1850 — 1910
	LTE FDD Band 5	824 — 849
	LTE FDD Band 7	2500 — 2570
	WiFi 2.4GHz	2400 — 2462
	WiFi 5GHz	5150 — 5350
		5470 — 5850
	Bluetooth	2402 — 2480

Note: 1) For WiFi 5G, the device does not support channel 144(20M) and channel 142(40M).
2) For WiFi 5G, U-NII-2A and U-NII-2C does not support hotspot function.

TEST SUMMARY

Frequency Band	Maximum Reported SAR(W/kg)			
	Head	Body-worn	Hotspot	Product specific 10g SAR
GSM850	0.24	0.31	0.59	/
GSM1900	0.12	0.21	0.77	/
WCDMA Band II	0.16	0.36	0.73	/
WCDMA Band V	0.21	0.29	0.36	/
LTE Band 2	0.17	0.40	0.91	/
LTE Band 5	0.22	0.34	0.41	/
LTE Band 7	0.33	0.57	1.20	/
WI-FI (2.4GHz)	1.17	0.22	0.39	/
WI-FI (5GHz)	0.97	<0.10	0.13	0.32
SAR Limited(w/kg)	1.6			4
Maximum Simultaneous Transmission SAR (W/kg)				
Scenario	Head	Body-worn	Hotspot	Product specific 10g SAR
Sum SAR	1.39	0.79	1.59	0.32
SPLSR	N/A	N/A	N/A	N/A
SPLSR Limited	0.04			0.1

DUT Antenna Locations:

Please see the Appendix D for antenna locations.

The test device is a mobile phone. The display diagonal dimension is 145.6 mm and the overall diagonal dimension of this device is 165.6 mm.

According to the distance between LTE/WCDMA/GSM&WIFI&BT antennas and the sides of the EUT we can draw the conclusion that:

EUT Sides for SAR Testing						
Mode	Front	Back	Left	Right	Top	Bottom
Ant.1(Main Ant.)	Yes	Yes	Yes	Yes	No	Yes
Ant.2(WIFI&BT Ant.)	Yes	Yes	No	Yes	Yes	No

Table 1 : EUT Sides for SAR Testing

Note:

1) When the antenna-to-edge distance is greater than 2.5cm, such position does not need to be tested.

GSM - conducted power table:

GSM 850										
Burst Output Power(dBm)					Tune up	Division Factors	Frame-Average Output Power(dBm)			Tune up
Channel		128	190	251			128	190	251	
GSM(GMSK)	GSM	**33.21**	**33.19**	**33.14**	33.70	-9.19	24.02	24.00	23.95	24.51
GPRS/EGPRS (GMSK)	1 TX Slot	33.17	33.15	33.11	33.70	-9.19	23.98	23.96	23.92	24.51
	2 TX Slots	32.32	32.28	32.27	32.70	-6.18	26.14	26.10	26.09	26.52
	3 TX Slots	30.41	30.37	30.29	30.70	-4.42	25.99	25.95	25.87	26.28
	4 TX Slots	**29.36**	**29.36**	**29.28**	29.70	-3.17	26.19	26.19	26.11	**26.53**
EGPRS(8PSK)	1 TX Slot	27.33	27.42	27.41	28.00	-9.19	18.14	18.23	18.22	18.81
	2 TX Slots	26.23	26.25	26.26	27.00	-6.18	20.05	20.07	20.08	20.82
	3 TX Slots	24.13	24.17	24.19	25.00	-4.42	19.71	19.75	19.77	20.58
	4 TX Slots	23.01	23.04	23.04	24.00	-3.17	19.84	19.87	19.87	20.83
GSM 1900										
Burst Output Power(dBm)					Tune up	Division Factors	Frame-Average Output Power(dBm)			Tune up
Channel		512	661	810			512	661	810	
GSM(GMSK)	GSM	**28.53**	**28.55**	**28.51**	28.70	-9.19	19.34	19.36	19.32	19.51
GPRS/EGPRS (GMSK)	1 TX Slot	28.55	28.54	28.52	28.70	-9.19	19.36	19.35	19.33	19.51
	2 TX Slots	27.43	27.42	27.40	27.70	-6.18	21.25	21.24	21.22	21.52
	3 TX Slots	25.34	25.39	25.36	25.70	-4.42	20.92	20.97	20.94	21.28
	4 TX Slots	**24.28**	**24.31**	**24.29**	24.70	-3.17	21.11	21.14	21.12	**21.53**
EGPRS(8PSK)	1 TX Slot	26.55	26.39	26.25	27.00	-9.19	17.36	17.20	17.06	17.81
	2 TX Slots	25.33	25.13	25.01	26.00	-6.18	19.15	18.95	18.83	19.82
	3 TX Slots	23.34	23.22	23.11	24.00	-4.42	18.92	18.80	18.69	19.58
	4 TX Slots	22.33	22.12	22.06	23.00	-3.17	19.16	18.95	18.89	19.83

Note:

1）. CMU200 measures GSM peak and average output power for active timeslots. For SAR the time based average power is relevant. The difference in between depends on the duty cycle of the TDMA signal:

No. of timeslots	1	2	3	4
Duty Cycle	1:8.3	1:4.15	1:2.77	1:2.075
Time based avg. power compared to slotted avg. power	-9.19	-6.18	-4.42	-3.17

2）. The frame-averaged power is linearly proportion to the slot number configured and it is linearly scaled the maximum burst-averaged power based on time slots. The calculated method is shown as below:
Frame-averaged power = 10 x log (Burst-averaged power mW x Slot used / 8

3）. When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel must be used

WCDMA- conducted power table:

WCDMA Band II					
Average Conducted Power(dBm)					
Channel		9262	9400	9538	Tune up
WCDMA	12.2kbps RMC	**20.61**	**20.68**	**20.71**	**21.00**
	12.2kbps AMR	20.57	20.65	20.70	21.00
HSDPA	Subtest 1	18.73	18.93	18.88	20.00
	Subtest 2	18.69	18.86	18.82	20.00
	Subtest 3	18.22	18.44	18.39	18.50
	Subtest 4	18.15	18.32	18.41	18.50
HSUPA	Subtest 1	17.02	17.16	17.17	18.00
	Subtest 2	17.08	17.11	17.22	18.00
	Subtest 3	18.23	18.21	18.21	19.00
	Subtest 4	16.51	16.48	16.65	17.50
	Subtest 5	18.35	18.34	18.20	19.00
DC-HSDPA	Subtest 1	18.70	18.89	18.81	20.00
	Subtest 2	18.67	18.81	18.77	20.00
	Subtest 3	18.20	18.40	18.32	18.50
	Subtest 4	18.11	18.28	18.40	18.50
HSPA+	16QAM	17.25	17.33	17.22	18.00
WCDMA Band V					
Average Conducted Power(dBm)					
Channel		4132	4182	4233	Tune up
WCDMA	12.2kbps RMC	**23.66**	**23.57**	**23.64**	**24.00**
	12.2kbps AMR	23.65	23.55	23.58	24.00
HSDPA	Subtest 1	21.94	21.93	21.94	23.00
	Subtest 2	21.91	21.92	21.95	23.00
	Subtest 3	21.38	21.44	21.42	22.50
	Subtest 4	21.37	21.36	21.43	22.50
HSUPA	Subtest 1	19.94	19.91	19.86	21.00
	Subtest 2	19.96	19.98	19.94	21.00
	Subtest 3	20.91	20.89	20.89	22.00
	Subtest 4	19.42	19.41	19.37	20.50
	Subtest 5	20.94	20.99	20.97	22.00
DC-HSDPA	Subtest 1	21.90	21.92	21.89	23.00
	Subtest 2	21.88	21.87	21.83	23.00
	Subtest 3	21.36	21.42	21.40	22.50
	Subtest 4	21.32	21.33	21.41	22.50
HSPA+	16QAM	20.11	20.05	20.01	21.00

LTE- conducted power table:

LTE Band 2				Conducted Power(dBm)			
Bandwidth	Modulation	RB size	RB offset	Channel 18607	Channel 18900	Channel 19193	Tune up
1.4MHz	QPSK	1	0	21.29	21.35	21.50	21.70
		1	2	21.45	21.48	21.60	21.70
		1	5	21.33	21.35	21.52	21.70
		3	0	21.41	21.45	21.64	21.70
		3	2	21.46	21.49	21.63	21.70
		3	3	21.44	21.45	21.62	21.70
		6	0	20.40	20.43	20.57	20.70
	16QAM	1	0	20.69	20.69	20.68	20.70
		1	2	20.66	20.68	20.69	20.70
		1	5	20.67	20.67	20.69	20.70
		3	0	20.43	20.50	20.65	20.70
		3	2	20.43	20.48	20.67	20.70
		3	3	20.43	20.53	20.69	20.70
		6	0	19.55	19.59	19.67	19.70
Bandwidth	Modulation	RB size	RB offset	Channel 18615	Channel 18900	Channel 19185	Tune up
3MHz	QPSK	1	0	21.37	21.40	21.55	21.70
		1	7	21.49	21.49	21.64	21.70
		1	14	21.31	21.36	21.51	21.70
		8	0	20.35	20.38	20.55	20.70
		8	4	20.35	20.42	20.57	20.70
		8	7	20.37	20.40	20.55	20.70
		15	0	20.31	20.36	20.53	20.70
	16QAM	1	0	20.65	20.67	20.65	20.70
		1	7	20.68	20.68	20.67	20.70
		1	14	20.65	20.69	20.69	20.70
		8	0	19.46	19.55	19.68	19.70
		8	4	19.49	19.52	19.69	19.70
		8	7	19.44	19.52	19.68	19.70
		15	0	19.37	19.47	19.62	19.70
Bandwidth	Modulation	RB size	RB offset	Channel 18625	Channel 18900	Channel 19175	Tune up
5MHz	QPSK	1	0	21.25	21.29	21.42	21.70
		1	13	21.33	21.37	21.51	21.70
		1	24	21.23	21.26	21.46	21.70

		12	0	20.34	20.39	20.53	20.70
		12	6	20.39	20.48	20.59	20.70
		12	13	20.31	20.38	20.56	20.70
		25	0	20.32	20.39	20.54	20.70
	16QAM	1	0	20.61	20.67	20.67	20.70
		1	13	20.63	20.69	20.69	20.70
		1	24	20.62	20.61	20.68	20.70
		12	0	19.37	19.47	19.62	19.70
		12	6	19.43	19.50	19.68	19.70
		12	13	19.37	19.43	19.63	19.70
		25	0	19.39	19.46	19.62	19.70
Bandwidth	Modulation	RB size	RB offset	Channel 18650	Channel 18900	Channel 19150	Tune up
10MHz	QPSK	1	0	21.33	21.38	21.52	21.70
		1	25	21.44	21.51	21.62	21.70
		1	49	21.27	21.33	21.55	21.70
		25	0	20.40	20.42	20.62	20.70
		25	13	20.41	20.43	20.60	20.70
		25	25	20.35	20.41	20.59	20.70
		50	0	20.40	20.41	20.61	20.70
	16QAM	1	0	20.60	20.68	20.69	20.70
		1	25	20.66	20.68	20.69	20.70
		1	49	20.61	20.67	20.67	20.70
		25	0	19.41	19.48	19.68	19.70
		25	13	19.44	19.51	19.67	19.70
		25	25	19.46	19.48	19.68	19.70
		50	0	19.42	19.51	19.66	19.70
Bandwidth	Modulation	RB size	RB offset	Channel 18675	Channel 18900	Channel 19125	Tune up
15MHz	QPSK	1	0	21.32	21.32	21.42	21.70
		1	38	21.36	21.44	21.55	21.70
		1	74	21.30	21.34	21.48	21.70
		36	0	20.41	20.44	20.58	20.70
		36	18	20.38	20.44	20.62	20.70
		36	39	20.33	20.40	20.58	20.70
		75	0	20.35	20.45	20.57	20.70
	16QAM	1	0	20.67	20.62	20.67	20.70
		1	38	20.64	20.68	20.67	20.70
		1	74	20.67	20.69	20.67	20.70

		36	0	19.42	19.51	19.64	19.70
		36	18	19.42	19.48	19.66	19.70
		36	39	19.38	19.45	19.65	19.70
		75	0	19.44	19.49	19.67	19.70
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				18700	18900	19100	
20MHz	QPSK	1	0	21.28	21.27	21.36	21.70
		1	50	**21.46**	**21.48**	**21.66**	21.70
		1	99	21.26	21.24	21.43	21.70
		50	0	20.38	20.43	20.54	20.70
		50	25	20.38	20.42	**20.57**	20.70
		50	50	20.33	20.38	20.54	20.70
		100	0	20.38	20.47	**20.55**	20.70
	16QAM	1	0	20.61	20.69	20.69	20.70
		1	50	20.67	20.69	20.67	20.70
		1	99	20.57	20.65	20.68	20.70
		50	0	19.42	19.48	19.62	19.70
		50	25	19.48	19.54	19.66	19.70
		50	50	19.41	19.48	19.63	19.70
		100	0	19.42	19.50	19.60	19.70

LTE Band 5				**Conducted Power(dBm)**			
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				20407	20525	20643	
1.4MHz	QPSK	1	0	23.87	23.89	23.83	24.70
		1	2	24.03	24.03	23.97	24.70
		1	5	23.93	23.92	23.85	24.70
		3	0	24.01	24.00	23.93	24.70
		3	2	24.04	24.03	23.99	24.70
		3	3	24.01	24.02	23.98	24.70
		6	0	23.01	23.02	22.98	23.70
	16QAM	1	0	23.05	23.12	23.07	23.70
		1	2	23.18	23.34	23.14	23.70
		1	5	23.20	23.12	23.00	23.70
		3	0	22.87	22.91	22.84	23.70
		3	2	22.99	23.02	22.92	23.70
		3	3	22.97	22.98	22.86	23.70

		6	0	22.10	22.13	22.08	22.70
Bandwidth	Modulation	RB size	RB offset	Channel 20415	Channel 20525	Channel 20635	Tune up
3MHz	QPSK	1	0	23.93	23.96	23.87	24.70
		1	7	24.18	24.10	24.08	24.70
		1	14	23.99	23.98	23.88	24.70
		8	0	23.01	22.98	22.94	23.70
		8	4	23.06	23.04	22.99	23.70
		8	7	23.02	23.02	22.95	23.70
		15	0	23.01	23.01	22.97	23.70
	16QAM	1	0	23.09	23.20	23.08	23.70
		1	7	23.45	23.34	23.15	23.70
		1	14	23.16	23.15	23.09	23.70
		8	0	22.09	22.09	22.01	22.70
		8	4	22.11	22.16	22.07	22.70
		8	7	22.11	22.14	22.04	22.70
		15	0	22.05	22.06	21.99	22.70
Bandwidth	Modulation	RB size	RB offset	Channel 20425	Channel 20525	Channel 20625	Tune up
5MHz	QPSK	1	0	23.81	23.86	23.80	24.70
		1	13	24.03	23.96	23.92	24.70
		1	24	23.90	23.89	23.79	24.70
		12	0	22.96	23.02	22.97	23.70
		12	6	23.07	23.09	23.00	23.70
		12	13	23.06	23.00	22.95	23.70
		25	0	23.05	23.06	22.96	23.70
	16QAM	1	0	22.95	23.02	23.01	23.70
		1	13	23.31	23.20	23.12	23.70
		1	24	23.11	23.13	22.97	23.70
		12	0	21.98	22.05	21.96	22.70
		12	6	22.12	22.12	22.02	22.70
		12	13	22.10	22.01	21.94	22.70
		25	0	22.08	22.06	21.97	22.70
Bandwidth	Modulation	RB size	RB offset	Channel 20450	Channel 20525	Channel 20600	Tune up
10MHz	QPSK	1	0	23.88	23.93	23.92	24.70
		1	25	**24.10**	**24.03**	**23.97**	24.70
		1	49	23.95	23.95	23.88	24.70
		25	0	22.97	**23.07**	22.98	23.70

		25	13	23.06	23.06	23.02	23.70
		25	25	23.04	23.01	22.98	23.70
		50	0	23.04	23.05	23.00	23.70
	16QAM	1	0	23.02	23.16	23.21	23.70
		1	25	23.34	23.29	23.25	23.70
		1	49	23.22	23.19	23.07	23.70
		25	0	22.05	22.14	22.07	22.70
		25	13	22.09	22.10	22.08	22.70
		25	25	22.09	22.07	21.99	22.70
		50	0	22.08	22.12	22.04	22.70

LTE Band 7				Conducted Power(dBm)			
Bandwidth	Modulation	RB size	RB offset	Channel 20775	Channel 21100	Channel 21425	Tune up
5MHz	QPSK	1	0	23.05	23.06	23.14	23.70
		1	13	23.16	23.20	23.22	23.70
		1	24	23.05	23.11	23.17	23.70
		12	0	22.17	22.25	22.29	22.70
		12	6	22.26	22.28	22.34	22.70
		12	13	22.24	22.27	22.30	22.70
		25	0	22.18	22.25	22.28	22.70
	16QAM	1	0	22.42	22.48	22.56	22.70
		1	13	22.54	22.66	22.68	22.70
		1	24	22.48	22.49	22.62	22.70
		12	0	21.24	21.29	21.37	21.70
		12	6	21.28	21.34	21.41	21.70
		12	13	21.28	21.32	21.34	21.70
		25	0	21.27	21.31	21.33	21.70
Bandwidth	Modulation	RB size	RB offset	Channel 20800	Channel 21100	Channel 21400	Tune up
10MHz	QPSK	1	0	23.12	23.12	23.21	23.70
		1	25	23.24	23.27	23.36	23.70
		1	49	23.15	23.21	23.27	23.70
		25	0	22.23	22.29	22.30	22.70
		25	13	22.24	22.29	22.34	22.70
		25	25	22.30	22.24	22.33	22.70
		50	0	22.28	22.29	22.35	22.70

Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
	16QAM	1	0	22.55	22.61	22.66	22.70
		1	25	22.65	22.67	22.68	22.70
		1	49	22.67	22.63	22.63	22.70
		25	0	21.30	21.32	21.37	21.70
		25	13	21.33	21.33	21.37	21.70
		25	25	21.36	21.35	21.39	21.70
		50	0	21.34	21.35	21.38	21.70
Bandwidth	Modulation	RB size	RB offset	Channel 20825	Channel 21100	Channel 21375	Tune up
15MHz	QPSK	1	0	23.09	23.13	23.13	23.70
		1	38	23.21	23.25	23.29	23.70
		1	74	23.20	23.18	23.26	23.70
		36	0	22.23	22.27	22.31	22.70
		36	18	22.29	22.29	22.36	22.70
		36	39	22.34	22.31	22.35	22.70
		75	0	22.25	22.26	22.31	22.70
	16QAM	1	0	22.51	22.54	22.56	22.70
		1	38	22.64	22.63	22.67	22.70
		1	74	22.66	22.68	22.64	22.70
		36	0	21.26	21.31	21.35	21.70
		36	18	21.33	21.34	21.39	21.70
		36	39	21.41	21.34	21.40	21.70
		75	0	21.31	21.31	21.37	21.70
Bandwidth	Modulation	RB size	RB offset	Channel 20850	Channel 21100	Channel 21350	Tune up
20MHz	QPSK	1	0	22.95	22.95	23.05	23.70
		1	50	**23.28**	**23.29**	**23.36**	23.70
		1	99	23.07	23.17	23.18	23.70
		50	0	22.13	22.22	22.26	22.70
		50	25	22.21	22.26	**22.31**	22.70
		50	50	22.28	22.25	22.28	22.70
		100	0	22.21	22.22	**22.29**	22.70
	16QAM	1	0	22.40	22.43	22.48	22.70
		1	50	22.68	22.68	22.69	22.70
		1	99	22.60	22.62	22.61	22.70
		50	0	21.22	21.25	21.31	21.70
		50	25	21.31	21.31	21.38	21.70
		50	50	21.38	21.30	21.35	21.70
		100	0	21.30	21.29	21.33	21.70

Downlink LTE CA - conducted power table:

Configure	PCC							SCC				Power		
	LTE Band	BW (MHz)	Modulation	UL Freq. (MHz)	UL Channel	UL# RB	UL RB Offset	LTE Band	BW (MHz)	DL Freq. (MHz)	DL Channel	LTE Rel 10 Tx.Power(dBm)	LTE Rel 8 Tx.Power(dBm)	Tune-up
CA_7C	Band 7	20M	QPSK	2560	21350	1	50	Band 7	20M	2660.2	3152	23.34	23.36	23.70
CA_7A-7A	Band 7	20M	QPSK	2560	21350	1	50	Band 7	20M	2630	2850	23.32	23.36	23.70

Note: The downlink LTE CA SAR test is not required since the maximum output power for downlink LTE CA was not more than 0.25dB higher than the maximum output power for without downlink LTE CA.

WIFI 2.4G - conducted power table:

Mode	Channel	Frequency(MHz)	Data Rate(Mbps)	Tune up	Average Power (dBm)	SAR Test
802.11b	1	2412	1	19.00	18.26	Yes
	6	2437		19.00	18.66	Yes
	11	2462		19.00	18.24	Yes
802.11g	1	2412	6	16.00	15.32	No
	6	2437		16.00	15.71	No
	11	2462		16.00	15.67	No
802.11n HT20 SISO	1	2412	6.5	15.00	14.44	No
	6	2437		15.00	14.73	No
	11	2462		15.00	14.61	No
802.11n HT40 SISO	3	2422	13.5	15.00	14.34	No
	6	2437		15.00	14.58	No
	9	2452		15.00	14.89	No

WIFI 5G - conducted power table:

5GHz	mode	Channel	Frequency(MHz)	Data Rate(Mbps)	Tune up	Average Power (dBm)	SAR Test
802.11a	U-NII-1	36	5180	6	12.00	11.41	Yes
		40	5200		12.00	11.55	Yes
		44	5220		12.00	11.38	No
		48	5240		12.00	11.42	Yes
	U-NII-2A	52	5260		12.00	11.36	Yes
		56	5280		12.00	11.38	Yes
		60	5300		12.00	11.19	No
		64	5320		12.00	11.22	Yes
	U-NII-2C	100	5500		12.00	11.79	Yes
		104	5520		12.00	11.59	No

5GHz	mode	Channel	Frequency(MHz)	Data Rate(Mbps)	Tune up	Average Power (dBm)	SAR Test
		108	5540		12.00	11.56	No
		112	5560		12.00	11.85	Yes
		116	5580		12.00	11.59	No
		120	5600		12.00	11.47	No
		124	5620		12.00	11.47	No
		128	5640		12.00	11.49	No
		132	5660		12.00	11.36	No
		136	5680		12.00	11.36	No
		140	5700		12.00	11.60	Yes
	U-NII-3	149	5745		12.00	11.38	Yes
		153	5765		12.00	11.16	No
		157	5785		12.00	11.42	Yes
		161	5805		12.00	11.37	No
		165	5825		12.00	11.40	Yes

5GHz	mode	Channel	Frequency(MHz)	Data Rate(Mbps)	Tune up	Average Power (dBm)	SAR Test
802.11n-HT20	U-NII-1	36	5180	MCS0	11.00	10.53	No
		40	5200		11.00	10.48	No
		44	5220		11.00	10.51	No
		48	5240		11.00	10.53	No
	U-NII-2A	52	5260		11.00	10.56	No
		56	5280		11.00	10.50	No
		60	5300		11.00	10.45	No
		64	5320		11.00	10.49	No
	U-NII-2C	100	5500		11.00	10.32	No
		104	5520		11.00	10.52	No
		108	5540		11.00	10.59	No
		112	5560		11.00	10.72	No
		116	5580		11.00	10.72	No
		120	5600		11.00	10.65	No
		124	5620		11.00	10.34	No
		128	5640		11.00	10.42	No
		132	5660		11.00	10.20	No
		136	5680		11.00	10.15	No
		140	5700		11.00	10.01	No
	U-NII-3	149	5745		11.00	10.02	No
		153	5765		11.00	10.14	No
		157	5785		11.00	10.03	No
		161	5805		11.00	10.28	No
		165	5825		11.00	10.39	No

5GHz	mode	Channel	Frequency(MHz)	Data Rate(Mbps)	Tune up	Average Power (dBm)	SAR Test

802.11n-HT40	U-NII-1	38	5190	MCS0	11.00	10.40	No
		46	5230		11.00	10.53	No
	U-NII-2A	54	5270		11.00	10.56	No
		62	5310		11.00	10.43	No
	U-NII-2C	102	5510		11.00	10.30	No
		110	5550		11.00	10.51	No
		118	5590		11.00	10.46	No
		126	5630		11.00	10.26	No
		134	5670		11.00	10.04	No
	U-NII-3	151	5755		11.00	10.01	No
		159	5795		11.00	10.05	No

BT - conducted power table:

BT			Tune up (dBm)	Average Conducted Power(dBm)
Modulation	Channel	Frequency(MHz)		
GFSK	0	2402	9.50	8.36
	39	2441	9.50	**7.19**
	78	2480	9.50	6.46
π/4DQPSK	0	2402	9.50	6.75
	39	2441	9.50	6.62
	78	2480	9.50	4.48
8DPSK	0	2402	9.50	6.70
	39	2441	9.50	6.68
	78	2480	9.50	4.52

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 (MT8821C & CMU200), and the communication between the EUT and the tester is established by air link.

2. Measurements are performed respectively on the lowest, middle and highest channels of the operating band(s). The EUT is set to maximum power level during all tests, and at the beginning of each test the battery is fully charged.

3. During the SAR testing, the DASY 5 system checks power drift by comparing the e-field strength of one specific location measured at the beginning with that measured at the end of the SAR testing.

4. 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.

5. 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 ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel.
- When the reported SAR of a required test channel is > 1.45 W/kg, SAR is required for all three RB offset configurations for that required test channel.

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

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

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

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

d. Per Section 5.2.4, Higher order modulations

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

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

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

- Downlink LTE CA additional specification

The device supports downlink LTE Carrier Aggregation (CA) only. When carrier aggregation applies, implementation and measurement details for the following are necessary.

a) Intra-band and inter-band carrier aggregation requirements for downlink.

b) Support of contiguous and non-contiguous component carriers for intra-band aggregation.

The possible downlink LTE CA combinations supported by this device are as below tables per 3GPP TS 36.101 V13.2.1. The conducted power measurement results of downlink LTE CA are provided in Section 8.1 of this report per 3GPP TS 36.521-1 V13.0.1. The downlink LTE CA SAR test is not required since the maximum output power for downlink LTE CA was not more than 0.25dB higher than the maximum output power for without downlink LTE CA.

Intra-band contiguous CA operating bands :

E-UTRA CA Band	E-UTRA Band	Uplink (UL) operating band BS receive / UE transmit $F_{UL\ low}$ – $F_{UL\ high}$			Downlink (DL) operating band BS transmit / UE receive $F_{DL\ low}$ – $F_{DL\ high}$			Duplex Mode
CA_7	7	2500 MHz	–	2570 MHz	2620 MHz	–	2690 MHz	FDD

	E-UTRA CA configuration / Bandwidth combination set						
E-UTRA CA configuration	Uplink CA configurations (NOTE 3)	Component carriers in order of increasing carrier frequency				Maximum aggregated bandwidth [MHz]	Bandwidth combination set
		Channel bandwidths for carrier [MHz]	Channel bandwidths for carrier [MHz]	Channel bandwidths for carrier [MHz]	Channel bandwidths for carrier [MHz]		
CA_7C	NA	15	15			40	0
		20	20				
		10	20			40	1
		15	15, 20				
		20	10, 15, 20				
		15	10, 15			40	2
		20	15, 20				

NOTE 1: The CA configuration refers to an operating band and a CA bandwidth class specified in Table 5.6A-1 (the indexing letter). Absence of a CA bandwidth class for an operating band implies support of all classes.

	E-UTRA CA configuration / Bandwidth combination set						
E-UTRA CA configuration	Uplink CA configurations (NOTE 3)	Component carriers in order of increasing carrier frequency				Maximum aggregated bandwidth [MHz]	Bandwidth combination set
		Channel bandwidths for carrier [MHz]	Channel bandwidths for carrier [MHz]	Channel bandwidths for carrier [MHz]	Channel bandwidths for carrier [MHz]		
CA_7A-7A		5	15			40	0
		10	10, 15				
		15	15, 20				
		20	20			40	1
		5, 10, 15, 20	5, 10, 15, 20				
		5, 10, 15, 20	5, 10				
		10, 15, 20	10, 15, 20			40	2

NOTE 1: The CA configuration refers to an operating band and a CA bandwidth class specified in Table 5.6A-1 (the indexing letter). Absence of a CA bandwidth class for an operating band implies support of all classes.
NOTE 2: For the supported CC bandwidth combinations, the CC downlink and uplink bandwidths are equal.

Test frequencies for CA_7A-7A:

Test Frequency ID	CC-Combo / N_{RB_agg} [RB]	CC1 Note1 BW [RB]	CC1 N_{UL}	CC1 f_{UL} [MHz]	CC1 N_{DL}	CC1 f_{DL} [MHz]	Wgap [MHz]	CC2 Note1 BW [RB]	CC2 N_{UL}	CC2 f_{UL} [MHz]	CC2 N_{DL}	CC2 f_{DL} [MHz]
Max WGap	25+25	25	20775	2502.5	2775	2622.5	60	25	21425	2567.5	3425	2687.5
	25+50	25	20775	2502.5	2775	2622.5	55	50	21400	2565	3400	2685
		50	20800	2505	2800	2625	55	25	21425	2567.5	3425	2687.5
	25+75	25	20775	2502.5	2775	2622.5	50	75	21375	2562.5	3375	2682.5
		75	20825	2507.5	2825	2627.5	50	25	21425	2567.5	3425	2687.5
	50+50	50	20800	2505	2800	2625	50	50	21400	2565	3400	2685
	25+100	25	20775	2502.5	2775	2622.5	45	100	21350	2560	3350	2680
		100	20850	2510	2850	2630	45	25	21425	2567.5	3425	2687.5
	50+75	50	20800	2505	2800	2625	45	75	21375	2562.5	3375	2682.5
		75	20825	2507.5	2825	2627.5	45	50	21400	2565	3400	2685
	50+100	50	20800	2505	2800	2625	40	100	21350	2560	3350	2680
		100	20850	2510	2850	2630	40	50	21400	2565	3400	2685
	75+75	75	20825	2507.5	2825	2627.5	40	75	21375	2562.5	3375	2682.5
	75+100	75	20825	2507.5	2825	2627.5	35	100	21350	2560	3350	2680
		100	20850	2510	2850	2630	35	75	21375	2562.5	3375	2682.5
	100+100	100	20850	2510	2850	2630	30	100	21350	2560	3350	2680
Refsens2	75+100	75	21025	2527.5	3025	2647.5	15	100	21350	2560	3350	2680
	100+100	100	21000	2525	3000	2645	15	100	21350	2560	3350	2680
	25+100	25	20975	2522.5	2975	2642.5	25	100	21350	2560	3350	2680
	50+100	50	21000	2525	3000	2645	20	100	21350	2560	3350	2680

Note 1: Carriers in increasing frequency order.

Test frequencies for CA_7C:

Range	CC-Combo / N_{RB_agg} [RB]	CC1 Note1 BW [RB]	CC1 N_{UL}	CC1 f_{UL} [MHz]	CC1 N_{DL}	CC1 f_{DL} [MHz]	CC2 Note1 BW [RB]	CC2 N_{UL}	CC2 f_{UL} [MHz]	CC2 N_{DL}	CC2 f_{DL} [MHz]
Low	50+100	50	20805	2505.5	2805	2625.5	100	20949	2519.9	2949	2639.9
		100	20850	2510	2850	2630	50	20994	2524.4	2994	2644.4
	75+50	75	20825	2507.5	2825	2627.5	50	20945	2519.5	2945	2639.5
	75+75	75	20825	2507.5	2825	2627.5	75	20975	2522.5	2975	2642.5
	75+100	75	20828	2507.8	2828	2627.8	100	20999	2524.9	2999	2644.9
		100	20850	2510	2850	2630	75	21021	2527.1	3021	2647.1
	100+100	100	20850	2510	2850	2630	100	21048	2529.8	3048	2649.8
Mid	50+100	50	21006	2525.6	3006	2645.6	100	21150	2540	3150	2660
		100	21051	2530.1	3051	2650.1	50	21195	2544.5	3195	2664.5
	75+50	75	21051	2530.1	3051	2650.1	50	21171	2542.1	3171	2662.1
	75+75	75	21025	2527.5	3025	2647.5	75	21175	2542.5	3175	2662.5
	75+100	75	21003	2525.3	3003	2645.3	100	21174	2542.4	3174	2662.4
		100	21026	2527.6	3026	2647.6	75	21197	2544.7	3197	2664.7
	100+100	100	21001	2525.1	3001	2645.1	100	21199	2544.9	3199	2664.9
High	50+100	50	21206	2545.6	3206	2665.6	100	21350	2560	3350	2680
		100	21251	2550.1	3251	2670.1	50	21395	2564.5	3395	2684.5
	75+50	75	21277	2552.7	3277	2672.7	50	21397	2564.7	3397	2684.7
	75+75	75	21225	2547.5	3225	2667.5	75	21375	2562.5	3375	2682.5
	75+100	75	21179	2542.9	3179	2662.9	100	21350	2560	3350	2680
		100	21201	2545.1	3201	2665.1	75	21372	2562.2	3372	2682.2
	100+100	100	21152	2540.2	3152	2660.2	100	21350	2560	3350	2680

Note 1: Carriers in increasing frequency order.

8. WLAN

Initial Test Position SAR Test Reduction Procedure

DSSS and OFDM configurations are considered separately according to the required SAR procedures. SAR is measured in the initial test position using the 802.11 transmission mode configuration required by the DSSS procedure or initial test configuration and subsequent test configuration(s) according to the OFDM procedures. The initial test position procedure is described in the following:

1）. When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other (remaining) test positions in that exposure configuration and 802.11 transmission mode combinations within the frequency band or aggregated band. SAR is also not required for that exposure configuration in the subsequent test configuration(s).

2）. When the reported SAR of the initial test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position using subsequent highest extrapolated or estimated 1-g SAR conditions determined by area scans or next closest/smallest test separation distance and maximum RF coupling test positions based on manufacturer justification, on the highest maximum output power channel, until the reported SAR is ≤ 0.8 W/kg or all required test positions (left, right, touch, tilt or subsequent surfaces and edges) are tested.

3）. For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested. a) Additional power measurements may be required for this step, which should be limited to those necessary for identifying the subsequent highest output power channels.

Initial Test Configuration Procedures

An initial test configuration is determined for OFDM transmission modes according to the channel bandwidth, modulation and data rate combination(s) with the highest maximum output power specified for production units in each standalone and aggregated frequency band. SAR is measured using the highest measured maximum output power channel. For configurations with the same specified or measured maximum output power, additional transmission mode and test channel selection procedures are required. SAR test reduction for subsequent highest output test channels is determined according to reported SAR of the initial test configuration.

For next to the ear, hotspot mode and UMC mini-tablet exposure configurations where multiple test positions are required, the initial test position procedure is applied to minimize the number of test positions required for SAR measurement using the initial test configuration transmission mode. For fixed exposure conditions that do not have multiple SAR test positions, SAR is measured in the transmission mode determined by the initial test configuration.

When the reported SAR of the initial test configuration is > 0.8 W/kg, SAR measurement is required for subsequent next highest measured output power channel(s) in the initial test configuration until reported SAR is ≤ 1.2 W/kg or all required channels are tested.

Subsequent Test Configuration Procedure

SAR measurement requirements for the remaining 802.11 transmission mode configurations that have not been tested in the initial test configuration are determined separately for each standalone and aggregated frequency band, in each exposure condition, according to the maximum output power specified for production units. The initial test position procedure is applied to next to the ear, UMPC mini-tablet and hotspot mode configurations. When the same maximum output power is specified for multiple transmission modes, additional power measurements may be required to determine if SAR measurements are required for subsequent highest output power channels in a subsequent test configuration. The subsequent test configuration and SAR measurement procedures are described in the following.

1）. When SAR test exclusion provisions of KDB Publication 447498 are applicable and SAR measurement is not required for the initial test configuration, SAR is also not required for the next highest maximum output power transmission mode subsequent test configuration(s) in that frequency band or aggregated band and exposure configuration.

2）. When the highest reported SAR for the initial test configuration (when applicable, include subsequent highest output channels), according to the initial test position or fixed exposure position requirements, is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for that subsequent test configuration.

3）. The number of channels in the initial test configuration and subsequent test configuration can be different due to differences in channel bandwidth. When SAR measurement is required for a subsequent test configuration and the channel bandwidth is smaller than that in the initial test configuration, all channels in the subsequent test configuration that overlap with the larger bandwidth channel tested in the initial test configuration should be used to determine the highest maximum output power channel. This step requires additional power measurement to identify the highest maximum output power channel in the subsequent test configuration to determine SAR test reduction.

a) SAR should first be measured for the channel with highest measured output power in the subsequent test configuration.

b) SAR for subsequent highest measured maximum output power channels in the subsequent test configuration is required only when the reported SAR of the preceding higher maximum output power channel(s) in the subsequent test configuration is > 1.2 W/kg or until all required channels are tested. i) For channels with the same measured maximum output power, SAR should be measured using the channel closest to the center frequency of the larger channel bandwidth channel in the initial test configuration.

4）. SAR measurements for the remaining highest specified maximum output power OFDM transmission mode configurations that have not been tested in the initial test configuration (highest maximum output) or subsequent test configuration(s) (subsequent next highest maximum output power) is determined by recursively applying the subsequent test configuration procedures in this section to the remaining configurations according to the following:

a) replace “subsequent test configuration” with “next subsequent test configuration” (i.e., subsequent next highest specified maximum output power configuration)

b) replace “initial test configuration” with “all tested higher output power configurations”

2.4 GHz WiFi SAR Procedures:

Separate SAR procedures are applied to DSSS and OFDM configurations in the 2.4 GHz band to simplify DSSS test requirements. For 802.11b DSSS SAR measurements, DSSS SAR procedure applies to fixed exposure test position and initial test position procedure applies to multiple exposure test positions. When SAR measurement is required for an OFDM configuration, the initial test configuration, subsequent test configuration and initial test position procedures are applied. The SAR test exclusion requirements for 802.11g/n OFDM configurations are described in following.

802.11b DSSS SAR Test Requirements

SAR is measured for 2.4 GHz 802.11b DSSS using either a fixed test position or, when applicable, the initial test position procedure. SAR test reduction is determined according to the following:

1）. When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.

2）. When the reported SAR is > 0.8 W/kg, SAR is required for that exposure 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.

2.4 GHz 802.11g/n OFDM SAR Test Exclusion Requirements

When SAR measurement is required for 2.4 GHz 802.11g/n OFDM configurations, the measurement and test reduction procedures for OFDM are applied (section 5.3, including sub-sections). SAR is not required for the following 2.4 GHz OFDM conditions.

1）. When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration.

2）. When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

SAR Test Requirements for OFDM configurations

When SAR measurement is required for 802.11 g/n OFDM configurations, each standalone and frequency aggregated band is considered separately for SAR test reduction. In applying the initial test configuration and subsequent test configuration procedures, the 802.11 transmission configuration with the highest specified maximum output power and the channel within a test configuration with the highest measured maximum output power should be clearly distinguished to apply the procedures.

5 GHz WiFi SAR Procedures:

U-NII-1 and U-NII-2A Bands

For devices that operate in only one of the U-NII-1 and U-NII-2A bands, the normally required SAR procedures for OFDM configurations are applied. For devices that operate in both U-NII bands using the same transmitter and antenna(s), SAR test reduction is determined according to the following :

1) When the same maximum output power is specified for both bands, begin SAR measurement in U-NII-2A band by applying the OFDM SAR requirements. If the highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band for that configuration (802.11 mode and exposure condition); otherwise, both bands are tested independently for SAR.

2) When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for the band with lower maximum output power in that test configuration; otherwise, both bands are tested independently for SAR.

3) The two U-NII bands may be aggregated to support a 160 MHz channel on channel number 50. Without additional testing, the maximum output power for this is limited to the lower of the maximum output power certified for the two bands. When SAR measurement is required for at least one of the bands and the highest reported SAR adjusted by the ratio of specified maximum output power of aggregated to standalone band is > 1.2 W/kg, SAR is required for the 160 MHz channel. This procedure does not apply to an aggregated band with maximum output higher than the standalone band(s); the aggregated band must be tested independently for SAR. SAR is not required when the 160 MHz channel is operating at a reduced maximum power and also qualifies for SAR test exclusion.

U-NII-2C and U-NII-3 Bands

The frequency range covered by these bands is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. when Terminal Doppler Weather Radar (TDWR) restriction applies, all channels that operate at 5.60 – 5.65 GHz must be included to apply the SAR test reduction and measurement procedures.

When the same transmitter and antenna(s) are used for U-NII-2C band and U-NII-3 band or 5.8 GHz band of §15.247, the bands may be aggregated to enable additional channels with 20, 40 or 80 MHz bandwidth to span across the band gap, as illustrated in Appendix B. The maximum output power for the additional band gap channels is limited to the lower of those certified for the bands. Unless band gap channels are permanently disabled, they must be considered for SAR testing. The frequency range covered by these bands is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. To maintain SAR measurement accuracy and to facilitate test reduction, the channels in U-NII-2C band above 5.65 GHz may be grouped with the 5.8 GHz channels in U-NII-3 or §15.247 band to enable two SAR probe calibration frequency points to cover the bands, including the band gap channels. When band gap channels are supported and the bands are not aggregated for SAR testing, band gap channels must be considered independently in each band according to the normally required OFDM SAR measurement and probe calibration frequency points requirements.

OFDM Transmission Mode SAR Test Configuration and Channel Selection Requirements

The initial test configuration for 5 GHz OFDM transmission modes is determined by the 802.11 configuration with the highest maximum output power specified for production units, including tune-up tolerance, in each standalone and aggregated frequency band. SAR for the initial test configuration is measured using the highest maximum output power channel determined by the default power measurement procedures. When multiple configurations in a frequency band have the same specified maximum output power, the initial test configuration is determined according to the following steps applied sequentially.

1) The largest channel bandwidth configuration is selected among the multiple configurations with the same specified maximum output power.

2) If multiple configurations have the same specified maximum output power and largest channel bandwidth, the lowest order modulation among the largest channel bandwidth configurations is selected.

3) If multiple configurations have the same specified maximum output power, largest channel bandwidth and lowest order modulation, the lowest data rate configuration among these configurations is selected.

4) When multiple transmission modes (802.11a/g/n/ac) have the same specified maximum output power, largest channel bandwidth, lowest order modulation and lowest data rate, the lowest order 802.11 mode is selected; i.e., 802.11a is chosen over 802.11n then 802.11ac or 802.11g is chosen over 802.11n. After an initial test configuration is determined, if multiple test channels have the same measured maximum output power, the channel chosen for SAR measurement is determined according to the following. These channel selection procedures apply to both the initial test configuration and subsequent test configuration(s), with respect to the default power measurement procedures or additional power measurements required for further SAR test reduction. The same procedures also apply to subsequent highest output power channel(s) selection.

a) The channel closest to mid-band frequency is selected for SAR measurement.

b) For channels with equal separation from mid-band frequency; for example, high and low channels or two mid-band channels, the higher frequency (number) channel is selected for SAR measurement.

SAR Test Requirements for OFDM configurations:

When SAR measurement is required for 802.11 a/n/ac OFDM configurations, each standalone and frequency aggregated band is considered separately for SAR test reduction. When the same transmitter and antenna(s) are used for U-NII-1 and U-NII-2A bands, additional SAR test reduction applies. When band gap channels between U-NII-2C band and 5.8 GHz U-NII-3 or §15.247 band are supported, the highest maximum output power transmission mode configuration and maximum output power channel across the bands must be used to determine SAR test reduction, according to the initial test configuration and subsequent test configuration requirements. In applying the initial test configuration and subsequent test configuration procedures, the 802.11 transmission configuration with the highest specified maximum output power and the channel within a test configuration with the highest measured maximum output power should be clearly distinguished to apply the procedures.

WiFi CDD/MIMO SAR Considerations

Per KDB 248227D01v02r02, simultaneous transmission provisions in KDB Publication 447498 should be used to determine simultaneous transmission SAR test exclusion for WiFi MIMO. If the sum of 1-g SAR single transmission SAR measurement is <1.6W/kg, no additional SAR measurements for MIMO are required. Alternatively, SAR for MIMO can be measured with all antennas transmitting simultaneously at the specified maximum output power of MIMO operation.

9. According to KDB447498D01v06, testing of other required channels is not required when the reported 1-g SAR for the highest output channel is ≤ 0.8 W/kg, when the transmission band is ≤ 100MHz.

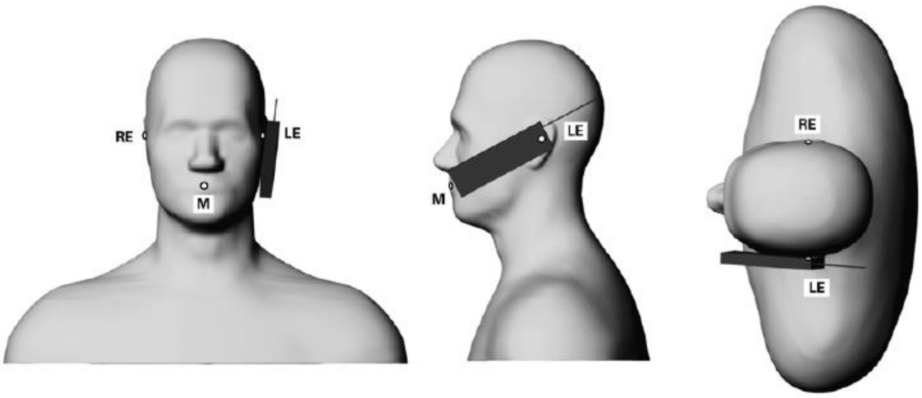
10. According to KDB865664D01v01r04, SAR measurement variability must be assessed for each frequency band. When the original highest measured SAR is ≥ 0.8 W/kg, repeated that measurement once. Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit)

11. 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)] · [√f(GHz)] ≤ 3.0 for 1-g SAR, and ≤ 7.5 for product specific 10-g SAR.

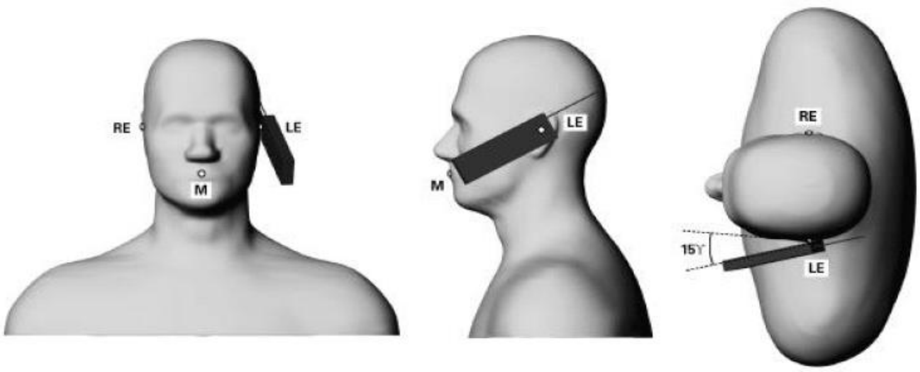
.

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.

Body SAR measurement statement

1. Body-worn exposure: 15mm
   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 cm × 5 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
   Per FCC KDB 648474D04, for smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm that provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets that support voice calls next to the ear, the device is marketed as “Phablet”.
   The UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna located at ≤ 25 mm from that surface or edge, in direct contact with a flat phantom, for Product Specific 10-g SAR according to the body-equivalent tissue dielectric parameters in KDB 865664 to address interactive hand use exposure conditions. The UMPC mini-tablet 1-g SAR at 5 mm is not required. When hotspot mode applies, Product Specific 10-g SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg; however, when power reduction applies to hotspot mode the measured SAR must be scaled to the maximum output power, including tolerance, allowed for phablet modes to compare with the 1.2 W/kg SAR test reduction threshold.

   Since the device is a phablet (overall diagonal dimension > 16.0 cm), phablet SAR procedure is required for this device.
   Due to the SAR result, only the WiFi 5G U-NII-2A and U-NII-2C bands need to test with 0mm for the Product Specific 10-g SAR, the others bands are not required.

1.7 Evaluation Procedures

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

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

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

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

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

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

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

1.8 Probe Calibration Procedures

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

1.8.1 Transfer Calibration with Temperature Probes

In lossy liquids the specific absorption rate (SAR) is related both to the electric field (E) and the temperature gradient (δT / δt) in the liquid.

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

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

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

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 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 ρ), 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].

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.

1.9 The SAR Measurement System

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

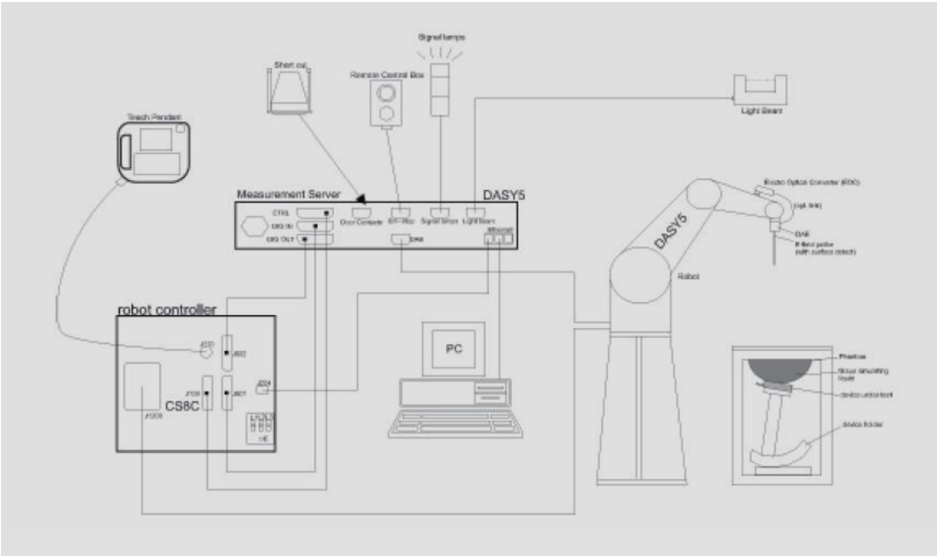


Fig. a A block diagram of the SAR measurement system

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

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.

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)
Calibration	ISO/IEC 17025 calibration service available.
Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in TSL (rotation around probe axis) ± 0.5 dB in TSL (rotation normal to probe axis)
Dynamic Range	10 µW/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 µW/g)
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields); the only probe that enables compliance testing for frequencies up to 6 GHz with precision of better 30%.
Compatibility	DASY3, DASY4, DASY52 SAR and higher, EASY4/MRI

Phantom

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

DEVICE HOLDER

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

1.11 SAR System Verification

The microwave circuit arrangement for system Check is sketched in F-12. 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% from the target SAR values. The tests were conducted on the same days as the measurement of the EUT. The obtained results from the system accuracy verification are displayed in the following table (A power level of 250mw (below 3GHz) or 100mw (3-6GHz) was input to the dipole antenna). During the tests, the ambient temperature of the laboratory was in the range 22±2°C, the relative humidity was in the range 60% and the liquid depth above the ear reference points was above 15±0.5 cm 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.

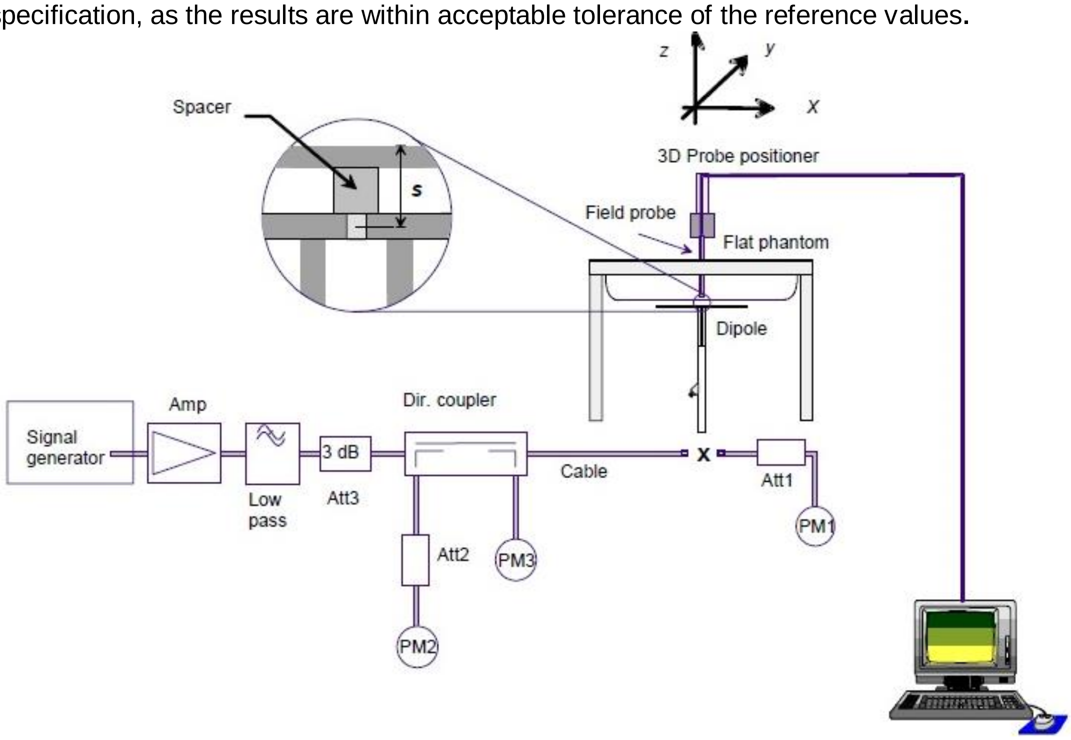


Fig. b The block diagram of system verification

Validation Kit		Measured SAR 250mW	Measured SAR 250mW	Measured SAR (normalized to 1W)	Measured SAR (normalized to 1W)	Target SAR (normalized to 1W) (±10%)	Target SAR (normalized to 1W) (±10%)	Liquid Temp. (℃)	Measured Date
		1g (W/kg)	10g (W/kg)	1g (W/kg)	10g (W/kg)	1-g(W/kg)	10-g(W/kg)		
D835V2	Head	2.27	1.53	9.08	6.12	9.59 (8.63~10.55)	6.29 (5.66~6.92)	22.1	2018/10/29
	Body	2.33	1.58	9.32	6.32	9.65 (8.69~10.62)	6.46 (5.81~7.11)	22.1	2018/10/30
D1900V2	Head	9.68	5.04	38.72	20.16	40.7 (36.63~44.77)	21.1 (18.99~23.21)	22.3	2018/11/14
	Body	11.30	5.72	45.20	22.88	41.6 (37.44~45.76)	21.4 (19.26~23.54)	22.3	2018/11/9
D2450V2	Head	13.30	6.15	53.20	24.60	53.1 (47.79~58.41)	24.9 (22.41~27.39)	22.0	2018/11/17
	Body	12.60	5.92	50.40	23.68	51.0 (45.9~56.1)	23.5 (21.15~25.85)	22.0	2018/11/17
D2600V2	Head	14.10	6.19	56.40	24.76	56.6 (50.94~62.26)	25.4 (22.86~27.94)	22.1	2018/11/13
	Body	13.10	5.94	52.40	23.76	54.2 (48.78~59.62)	24.3 (21.87~26.73)	22.1	2018/11/8
Validation Kit		**Measured SAR 100mW**	**Measured SAR 100mW**	**Measured SAR (normalized to 1W)**	**Measured SAR (normalized to 1W)**	**Target SAR (normalized to 1W) (±10%)**	**Target SAR (normalized to 1W) (±10%)**	**Liquid Temp. (℃)**	**Measured Date**
		1g (W/kg)	**10g (W/kg)**	**1g (W/kg)**	**10g (W/kg)**	**1-g(W/kg)**	**10-g(W/kg)**		
D5GHzV2	Head (5.25GHz)	7.17	2.04	71.70	20.40	76.6 (68.94~84.26)	21.9 (19.71~24.09)	22.2	2018/11/15
	Body (5.25GHz)	7.23	2.00	72.30	20.00	75.6 (68.04~83.16)	21.3 (19.17~23.43)	22.2	2018/11/16
	Head (5.6GHz)	7.74	2.18	77.40	21.80	80.4 (72.36~88.44)	22.8 (20.52~25.08)	22.2	2018/11/15
	Body (5.6GHz)	8.44	2.29	84.40	22.90	81.1 (72.99~89.21)	22.9 (20.61~25.19)	22.2	2018/11/16
	Head (5.75GHz)	8.46	2.41	84.60	24.10	80 (72~88)	22.7 (20.43~24.97)	22.2	2018/11/15
	Body (5.75GHz)	8.03	2.19	80.30	21.90	74.8 (67.32~82.28)	21 (18.9~23.1)	22.2	2018/11/16

Table 1. Results of system validation

1.12 Tissue Simulant Fluid for the Frequency Band

The dielectric properties for this Tissue Simulate Liquids were measured by using the Agilent Model 85070E Dielectric Probe in conjunction with Agilent E5071C Network Analyzer (300 KHz-8500 MHz). The Conductivity (σ) and Permittivity (ρ) are listed in bellow table. For the SAR measurement given in this report. The temperature variation of the Tissue Simulate Liquids was 22±2°C.

Tissue Type	Measured Frequency (MHz)	Target Tissue (±5%)		Measured Tissue		Liquid Temp.	Measured Date
		ε_r	σ(S/m)	ε_r	σ(S/m)	(℃)	
835 Head	835	41.5 (39.43~43.58)	0.90 (0.86~0.95)	40.849	0.886	22.1	2018/10/29
835 Body	835	55.2 (52.44~57.96)	0.97 (0.92~1.02)	54.531	1.009	22.1	2018/10/30
1900 Head	1900	40.0 (38.00~42.00)	1.40 (1.33~1.47)	40.284	1.389	22.3	2018/11/14
1900 Body	1900	53.3 (50.64~55.97)	1.52 (1.44~1.60)	53.190	1.513	22.3	2018/11/9
2450 Head	2450	39.20 (37.24~41.16)	1.80 (1.71~1.89)	39.147	1.823	22.0	2018/11/17
2450 Body	2450	52.70 (50.07~55.34)	1.95 (1.85~2.05)	53.314	1.966	22.0	2018/11/17
2600 Head	2600	39.0 (37.05~40.95)	1.96 (1.86~2.06)	38.658	1.982	22.1	2018/11/13
2600 Body	2600	52.50 (49.88~55.13)	2.16 (2.05~2.27)	52.944	2.132	22.1	2018/11/8
5250Head	5250	35.9 (34.11~37.70)	4.71 (4.47~4.95)	36.011	4.767	22.2	2018/11/15
5250 Body	5250	48.9 (46.46~51.35)	5.36 (5.09~5.63)	48.368	5.382	22.2	2018/11/16
5600 Head	5600	35.5 (33.73~37.28)	5.07 (4.82~5.32)	35.059	5.157	22.2	2018/11/15
5600 Body	5600	48.5 (46.08~50.93)	5.77 (5.48~6.06)	47.435	5.803	22.2	2018/11/16
5750 Head	5750	35.4 (33.63~37.17)	5.22 (4.96~5.48)	34.695	5.329	22.2	2018/11/15
5750 Body	5750	48.3 (45.89~50.72)	5.94 (5.64~6.24)	47.096	5.969	22.2	2018/11/16

Table 2. Dielectric Parameters of Tissue Simulant Fluid

The composition of the tissue simulating liquid:

Ingredients (% by weight)	Frequency (MHz)							
	450		700-950		1700-2000		2300-2700	
Tissue Type	**Head**	**Body**	**Head**	**Body**	**Head**	**Body**	**Head**	**Body**
Water	38.56	51.16	40.30	50.75	55.24	70.17	55.00	68.53
Salt (NaCl)	3.95	1.49	1.38	0.94	0.31	0.39	0.2	0.1
Sucrose	56.32	46.78	57.90	48.21	0	0	0	0
HEC	0.98	0.52	0.24	0	0	0	0	0
Bactericide	0.19	0.05	0.18	0.10	0	0	0	0
Tween	0	0	0	0	44.45	29.44	44.80	31.37

Salt: 99^{+}% Pure Sodium Chloride
Sucrose: 98^{+}% Pure Sucrose
Water: De-ionized, 16 MΩ^{+} resistivity
HEC: Hydroxyethyl Cellulose
Tween: Polyoxyethylene (20) sorbitan monolaurate

HSL5GHz is composed of the following ingredients:
Water: 50-65%
Mineral oil: 10-30%
Emulsifiers: 8-25%
Sodium salt: 0-1.5%

MSL5GHz is composed of the following ingredients:
Water: 64-78%
Mineral oil: 11-18%
Emulsifiers: 9-15%
Sodium salt: 2-3%

Table 3. Recipes for tissue simulating liquid

1.13 Test Standards and Limits

According to FCC 47CFR §2.1093(d) The limits to be used for evaluation are based generally on criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (“SAR”) in Section 4.2 of “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz,” ANSI/IEEE C95.1, By the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017.
These criteria for SAR evaluation are similar to those recommended by the National Council on Radiation Protection and Measurements (NCRP) in “Biological Effects and Exposure Criteria for Radio frequency Electromagnetic Fields,” NCRP Report No. 86, Section 17.4.5. Copyright NCRP, 1986, Bethesda, Maryland 20814. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards. The criteria to be used are specified in paragraphs (d)(1) and (d)(2) of this section and shall apply for portable devices transmitting in the frequency range from 100 kHz to 6 GHz. Portable devices that transmit at frequencies above 6 GHz are to be evaluated in terms of the MPE limits specified in § 1.1310 of this chapter.
Measurements and calculations to demonstrate compliance with MPE field strength or power density limits for devices operating above 6 GHz should be made at a minimum distance of 5 cm from the radiating source.

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

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

2. Limits for General Population/Uncontrolled exposure: 0.08 W/kg as averaged over the whole-body and spatial peak SAR not exceeding 1.6 W/kg as averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube).

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

Human Exposure	Uncontrolled Environment General Population	Controlled Environment Occupational
Spatial Peak SAR (Brain)	1.60 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.
2. Controlled environments are defined as locations where there is potential exposure of individuals who have knowledge of their potential exposure and can exercise control over their exposure.

2. Summary of Results

GSM 850

Test position	Test mode	Test Ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	Power Drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR (W/kg)	Liquid Temp
Head Test data										
Left cheek	GSM	190/836.6	1:8.3	0.193	0.02	33.19	33.70	1.125	0.217	22.1
Left tilted	GSM	190/836.6	1:8.3	0.116	0.08	33.19	33.70	1.125	0.130	22.1
Right cheek	GSM	190/836.6	1:8.3	0.208	0.10	33.19	33.70	1.125	0.234	22.1
Right tilted	GSM	190/836.6	1:8.3	0.126	-0.04	33.19	33.70	1.125	0.142	22.1
Right cheek	GSM	128/824.2	1:8.3	0.205	0.10	33.21	33.70	1.119	0.229	22.1
Right cheek	GSM	251/848.8	1:8.3	0.210	0.10	33.14	33.70	1.138	**0.239**	22.1
Body worn Test data (Separate 15mm)										
Front side	GSM	190/836.6	1:8.3	0.219	-0.07	33.19	33.70	1.125	0.246	22.1
Back side	GSM	190/836.6	1:8.3	0.272	-0.01	33.19	33.70	1.125	0.306	22.1
Back side	GSM	128/824.2	1:8.3	0.279	0.02	33.21	33.70	1.119	**0.312**	22.1
Back side	GSM	251/848.8	1:8.3	0.264	0.01	33.14	33.70	1.138	0.300	22.1
Hotspot Test data (Separate 10mm)										
Front side	GPRS 4TS	190/836.6	1:2.075	0.362	0.04	29.36	29.70	1.081	0.391	22.1
Back side	GPRS 4TS	190/836.6	1:2.075	0.542	-0.02	29.36	29.70	1.081	**0.586**	22.1
Left side	GPRS 4TS	190/836.6	1:2.075	0.250	0.06	29.36	29.70	1.081	0.270	22.1
Right side	GPRS 4TS	190/836.6	1:2.075	0.260	-0.05	29.36	29.70	1.081	0.281	22.1
Bottom side	GPRS 4TS	190/836.6	1:2.075	0.091	-0.01	29.36	29.70	1.081	0.098	22.1
Back side	GPRS 4TS	128/824.2	1:2.075	0.483	0.00	29.36	29.70	1.081	0.522	22.1
Back side	GPRS 4TS	251/848.8	1:2.075	0.515	0.00	29.28	29.70	1.102	0.567	22.1

GSM 1900

Test position	Test mode	Test Ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	Power Drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR (W/kg)	Liquid Temp
Head Test data										
Left cheek	GSM	661/1880	1:8.3	0.049	0.06	28.55	28.70	1.035	0.051	22.3
Left tilted	GSM	661/1880	1:8.3	0.049	0.09	28.55	28.70	1.035	0.051	22.3
Right cheek	GSM	661/1880	1:8.3	0.085	0.03	28.55	28.70	1.035	0.088	22.3
Right tilted	GSM	661/1880	1:8.3	0.029	-0.10	28.55	28.70	1.035	0.030	22.3
Right cheek	GSM	512/1850.2	1:8.3	0.059	0.08	28.53	28.70	1.040	0.062	22.3
Right cheek	GSM	810/1909.8	1:8.3	0.113	0.03	28.51	28.70	1.045	**0.118**	22.3
Body worn Test data (Separate 15mm)										
Front side	GSM	661/1880	1:8.3	0.127	0.04	28.55	28.70	1.035	0.131	22.3
Back side	GSM	661/1880	1:8.3	0.194	-0.03	28.55	28.70	1.035	0.201	22.3
Back side	GSM	512/1850.2	1:8.3	0.193	-0.12	28.53	28.70	1.040	0.201	22.3
Back side	GSM	810/1909.8	1:8.3	0.204	-0.04	28.51	28.70	1.045	**0.213**	22.3
Hotspot Test data (Separate 10mm)										
Front side	GPRS 4TS	661/1880	1:2.075	0.382	0.03	24.31	24.70	1.094	0.418	22.3
Back side	GPRS 4TS	661/1880	1:2.075	0.706	-0.15	24.31	24.70	1.094	**0.772**	22.3
Left side	GPRS 4TS	661/1880	1:2.075	0.037	-0.08	24.31	24.70	1.094	0.041	22.3
Right side	GPRS 4TS	661/1880	1:2.075	0.097	-0.08	24.31	24.70	1.094	0.106	22.3
Bottom side	GPRS 4TS	661/1880	1:2.075	0.596	0.13	24.31	24.70	1.094	0.652	22.3
Back side	GPRS 4TS	512/1850.2	1:2.075	0.635	0.12	24.28	24.70	1.102	0.699	22.3
Back side	GPRS 4TS	810/1909.8	1:2.075	0.690	0.01	24.29	24.70	1.099	0.758	22.3

WCDMA Band II

Test position	Test mode	Test Ch./Freq.	Duty Cycle	SAR (W/kg)1-g	Power Drift(dB)	Conducted Power(dBm)	Tune up Limit(dBm)	Scaled factor	Scaled SAR(W/kg)	Liquid Temp
Head Test data										
Left cheek	RMC	9400/1880	1:1	0.078	0.06	20.68	21.00	1.076	0.084	22.3
Left tilted	RMC	9400/1880	1:1	0.069	0.04	20.68	21.00	1.076	0.074	22.3
Right cheek	RMC	9400/1880	1:1	0.130	0.09	20.68	21.00	1.076	0.140	22.3
Right tilted	RMC	9400/1880	1:1	0.043	0.02	20.68	21.00	1.076	0.046	22.3
Right cheek	RMC	9262/1852.4	1:1	0.093	0.04	20.61	21.00	1.094	0.102	22.3
Right cheek	RMC	9538/1907.6	1:1	0.147	0.06	20.71	21.00	1.069	**0.157**	22.3
Body worn Test data(Separate 15mm)										
Front side	RMC	9400/1880	1:1	0.185	-0.09	20.68	21.00	1.076	0.199	22.3
Back side	RMC	9400/1880	1:1	0.331	0.04	20.68	21.00	1.076	**0.356**	22.3
Back side	RMC	9262/1852.4	1:1	0.324	-0.02	20.61	21.00	1.094	0.354	22.3
Back side	RMC	9538/1907.6	1:1	0.318	0.07	20.71	21.00	1.069	0.340	22.3
Hotspot Test data(Separate 10mm)										
Front side	RMC	9400/1880	1:1	0.387	0.02	20.68	21.00	1.076	0.417	22.3
Back side	RMC	9400/1880	1:1	0.669	-0.12	20.68	21.00	1.076	0.720	22.3
Left side	RMC	9400/1880	1:1	0.044	0.05	20.68	21.00	1.076	0.047	22.3
Right side	RMC	9400/1880	1:1	0.099	0.05	20.68	21.00	1.076	0.106	22.3
Bottom side	RMC	9400/1880	1:1	0.660	-0.05	20.68	21.00	1.076	0.710	22.3
Back side	RMC	9262/1852.4	1:1	0.671	0.02	20.61	21.00	1.094	**0.734**	22.3
Back side	RMC	9538/1907.6	1:1	0.682	0.08	20.71	21.00	1.069	0.729	22.3

WCDMA Band V

Test position	Test mode	Test Ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	Power Drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR (W/kg)	Liquid Temp
Head Test data										
Left cheek	RMC	4182/836.4	1:1	0.183	-0.07	23.57	24.00	1.104	0.202	22.1
Left tilted	RMC	4182/836.4	1:1	0.094	0.03	23.57	24.00	1.104	0.104	22.1
Right cheek	RMC	4182/836.4	1:1	0.189	-0.08	23.57	24.00	1.104	**0.209**	22.1
Right tilted	RMC	4182/836.4	1:1	0.116	-0.06	23.57	24.00	1.104	0.128	22.1
Right cheek	RMC	4132/826.4	1:1	0.187	-0.08	23.66	24.00	1.081	0.202	22.1
Right cheek	RMC	4233/846.6	1:1	0.191	-0.08	23.64	24.00	1.086	0.208	22.1
Body worn Test data (Separate 15mm)										
Front side	RMC	4182/836.4	1:1	0.203	0.01	23.57	24.00	1.104	0.224	22.1
Back side	RMC	4182/836.4	1:1	0.265	0.03	23.57	24.00	1.104	**0.293**	22.1
Back side	RMC	4132/826.4	1:1	0.231	0.04	23.66	24.00	1.081	0.250	22.1
Back side	RMC	4233/846.6	1:1	0.268	0.06	23.64	24.00	1.086	0.291	22.1
Hotspot Test data (Separate 10mm)										
Front side	RMC	4182/836.4	1:1	0.211	0.00	23.57	24.00	1.104	0.233	22.1
Back side	RMC	4182/836.4	1:1	0.325	-0.04	23.57	24.00	1.104	**0.359**	22.1
Left side	RMC	4182/836.4	1:1	0.143	0.00	23.57	24.00	1.104	0.158	22.1
Right side	RMC	4182/836.4	1:1	0.175	-0.06	23.57	24.00	1.104	0.193	22.1
Bottom side	RMC	4182/836.4	1:1	0.055	-0.06	23.57	24.00	1.104	0.060	22.1
Back side	RMC	4132/826.4	1:1	0.276	-0.03	23.66	24.00	1.081	0.298	22.1
Back side	RMC	4233/846.6	1:1	0.323	0.02	23.64	24.00	1.086	0.351	22.1

LTE Band 2

Test position	BW.	Test mode	Test Ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	Power Drift (dB)	Conducted power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR (W/kg)	Liquid Temp.
Head Test data(1RB)											
Left cheek	20	QPSK 1RB_50	19100/1900	1:1	0.096	0.06	21.66	21.70	1.009	0.097	22.3
Left tilted	20	QPSK 1RB_50	19100/1900	1:1	0.089	0.02	21.66	21.70	1.009	0.090	22.3
Right cheek	20	QPSK 1RB_50	19100/1900	1:1	0.171	0.04	21.66	21.70	1.009	**0.173**	22.3
Right tilted	20	QPSK 1RB_50	19100/1900	1:1	0.051	0.03	21.66	21.70	1.009	0.052	22.3
Right cheek	20	QPSK 1RB_50	18700/1860	1:1	0.114	0.09	21.46	21.70	1.057	0.120	22.3
Right cheek	20	QPSK 1RB_50	18900/1880	1:1	0.144	0.01	21.48	21.70	1.052	0.151	22.3
Head Test data(50%RB)											
Left cheek	20	QPSK 50RB_25	19100/1900	1:1	0.069	0.09	20.57	20.70	1.030	0.071	22.3
Left tilted	20	QPSK 50RB_25	19100/1900	1:1	0.070	0.03	20.57	20.70	1.030	0.072	22.3
Right cheek	20	QPSK 50RB_25	19100/1900	1:1	0.129	0.08	20.57	20.70	1.030	0.133	22.3
Right tilted	20	QPSK 50RB_25	19100/1900	1:1	0.037	-0.19	20.57	20.70	1.030	0.038	22.3
Body worn Test data(Separate 15mm 1RB)											
Front side	20	QPSK 1RB_50	19100/1900	1:1	0.245	0.06	21.66	21.70	1.009	0.247	22.3
Back side	20	QPSK 1RB_50	19100/1900	1:1	0.392	-0.05	21.66	21.70	1.009	**0.396**	22.3
Back side	20	QPSK 1RB_50	18700/1860	1:1	0.364	-0.05	21.46	21.70	1.057	0.385	22.3
Back side	20	QPSK 1RB_50	18900/1880	1:1	0.324	-0.12	21.48	21.70	1.052	0.341	22.3
Body worn Test data (Separate 15mm 50%RB)											
Front side	20	QPSK 50RB_25	19100/1900	1:1	0.168	0.06	20.57	20.70	1.030	0.173	22.3
Back side	20	QPSK 50RB_25	19100/1900	1:1	0.375	0.01	20.57	20.70	1.030	0.386	22.3
Hotspot Test data(Separate 10mm 1RB)											
Front side	20	QPSK 1RB_50	19100/1900	1:1	0.393	-0.01	21.66	21.70	1.009	0.397	22.3
Back side	20	QPSK 1RB_50	19100/1900	1:1	0.847	-0.06	21.66	21.70	1.009	0.855	22.3
Left side	20	QPSK 1RB_50	19100/1900	1:1	0.065	-0.04	21.66	21.70	1.009	0.066	22.3
Right side	20	QPSK 1RB_50	19100/1900	1:1	0.112	-0.05	21.66	21.70	1.009	0.113	22.3
Bottom side	20	QPSK 1RB_50	19100/1900	1:1	0.738	-0.09	21.66	21.70	1.009	0.745	22.3
Back side	20	QPSK 1RB_50	18700/1860	1:1	0.861	-0.05	21.46	21.70	1.057	**0.910**	22.3
Back side	20	QPSK 1RB_50	18900/1880	1:1	0.816	-0.03	21.48	21.70	1.052	0.858	22.3
Back side-repeat	20	QPSK 1RB_50	18700/1860	1:1	0.765	0.02	21.46	21.70	1.057	0.808	22.3
Hotspot Test data (Separate 10mm 50%RB)											
Front side	20	QPSK 50RB_25	19100/1900	1:1	0.381	-0.06	20.57	20.70	1.030	0.393	22.3
Back side	20	QPSK 50RB_25	19100/1900	1:1	0.551	0.08	20.57	20.70	1.030	0.568	22.3
Left side	20	QPSK 50RB_25	19100/1900	1:1	0.049	-0.05	20.57	20.70	1.030	0.050	22.3
Right side	20	QPSK 50RB_25	19100/1900	1:1	0.108	-0.09	20.57	20.70	1.030	0.111	22.3
Bottom side	20	QPSK 50RB_25	19100/1900	1:1	0.536	-0.08	20.57	20.70	1.030	0.552	22.3
Hotspot Test data (Separate 10mm 100%RB)											
Back side	20	QPSK 100RB_0	19100/1900	1:1	0.684	0.11	20.55	20.70	1.035	0.708	22.3

LTE Band 5

Test position	BW.	Test mode	Test Ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	Power Drift (dB)	Conducted power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR (W/kg)	Liquid Temp.
Head Test data(1RB)											
Left cheek	10	QPSK 1RB_25	20450/829	1:1	0.172	-0.09	24.10	24.70	1.148	0.197	22.1
Left tilted	10	QPSK 1RB_25	20450/829	1:1	0.099	0.05	24.10	24.70	1.148	0.114	22.1
Right cheek	10	QPSK 1RB_25	20450/829	1:1	0.185	0.05	24.10	24.70	1.148	0.212	22.1
Right tilted	10	QPSK 1RB_25	20450/829	1:1	0.110	0.01	24.10	24.70	1.148	0.126	22.1
Right cheek	10	QPSK 1RB_25	20525/836.5	1:1	0.187	0.05	24.03	24.70	1.167	0.218	22.1
Right cheek	10	QPSK 1RB_25	20600/844	1:1	0.187	0.00	23.97	24.70	1.183	0.221	22.1
Head Test data(50%RB)											
Left cheek	10	QPSK 25RB_0	20525/836.5	1:1	0.14	-0.07	23.07	23.70	1.156	0.162	22.1
Left tilted	10	QPSK 25RB_0	20525/836.5	1:1	0.084	0.04	23.07	23.70	1.156	0.097	22.1
Right cheek	10	QPSK 25RB_0	20525/836.5	1:1	0.171	0.03	23.07	23.70	1.156	0.198	22.1
Right tilted	10	QPSK 25RB_0	20525/836.5	1:1	0.091	0	23.07	23.70	1.156	0.106	22.1
Body worn Test data (Separate 15mm 1RB)											
Front side	10	QPSK 1RB_25	20450/829	1:1	0.203	0.02	24.10	24.70	1.148	0.233	22.1
Back side	10	QPSK 1RB_25	20450/829	1:1	0.267	-0.01	24.10	24.70	1.148	0.307	22.1
Back side	10	QPSK 1RB_25	20525/836.5	1:1	0.273	0.01	24.03	24.70	1.167	0.319	22.1
Back side	10	QPSK 1RB_25	20600/844	1:1	0.284	0.01	23.97	24.70	1.183	0.336	22.1
Body worn Test data (Separate 15mm 50%RB)											
Front side	10	QPSK 25RB_0	20525/836.5	1:1	0.174	-0.05	23.07	23.70	1.156	0.201	22.1
Back side	10	QPSK 25RB_0	20525/836.5	1:1	0.220	0.00	23.07	23.70	1.156	0.254	22.1
Hotspot Test data (Separate 10mm 1RB)											
Front side	10	QPSK 1RB_25	20450/829	1:1	0.201	0.00	24.10	24.70	1.148	0.231	22.1
Back side	10	QPSK 1RB_25	20450/829	1:1	0.311	0.00	24.10	24.70	1.148	0.357	22.1
Left side	10	QPSK 1RB_25	20450/829	1:1	0.161	0.02	24.10	24.70	1.148	0.185	22.1
Right side	10	QPSK 1RB_25	20450/829	1:1	0.166	0.03	24.10	24.70	1.148	0.191	22.1
Bottom side	10	QPSK 1RB_25	20450/829	1:1	0.052	0.02	24.10	24.70	1.148	0.059	22.1
Back side	10	QPSK 1RB_25	20525/836.5	1:1	0.332	0.01	24.03	24.70	1.167	0.387	22.1
Back side	10	QPSK 1RB_25	20600/844	1:1	0.349	0.02	23.97	24.70	1.183	0.413	22.1
Hotspot Test data (Separate 10mm 50%RB)											
Front side	10	QPSK 25RB_0	20525/836.5	1:1	0.174	-0.02	23.07	23.70	1.156	0.201	22.1
Back side	10	QPSK 25RB_0	20525/836.5	1:1	0.268	0.00	23.07	23.70	1.156	0.310	22.1
Left side	10	QPSK 25RB_0	20525/836.5	1:1	0.139	0.02	23.07	23.70	1.156	0.161	22.1
Right side	10	QPSK 25RB_0	20525/836.5	1:1	0.142	0.00	23.07	23.70	1.156	0.164	22.1
Bottom side	10	QPSK 25RB_0	20525/836.5	1:1	0.033	0.02	23.07	23.70	1.156	0.038	22.1

LTE Band 7

Test position	BW.	Test mode	Test Ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	Power Drift (dB)	Conducted power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR (W/kg)	Liquid Temp.
Head Test data(1RB)											
Left cheek	20	QPSK 1RB_50	21350/2560	1:1	0.302	0.03	23.36	23.70	1.081	**0.327**	22.1
Left tilted	20	QPSK 1RB_50	21350/2560	1:1	0.084	0.02	23.36	23.70	1.081	0.091	22.1
Right cheek	20	QPSK 1RB_50	21350/2560	1:1	0.216	-0.13	23.36	23.70	1.081	0.234	22.1
Right tilted	20	QPSK 1RB_50	21350/2560	1:1	0.176	-0.05	23.36	23.70	1.081	0.190	22.1
Left cheek	20	QPSK 1RB_50	20850/2510	1:1	0.280	-0.13	23.28	23.70	1.102	0.308	22.1
Left cheek	20	QPSK 1RB_50	21100/2535.5	1:1	0.291	0.06	23.29	23.70	1.099	0.320	22.1
Head Test data(50%RB)											
Left cheek	20	QPSK 50RB_25	21350/2560	1:1	0.249	-0.03	22.31	22.70	1.094	0.272	22.1
Left tilted	20	QPSK 50RB_25	21350/2560	1:1	0.068	0.00	22.31	22.70	1.094	0.075	22.1
Right cheek	20	QPSK 50RB_25	21350/2560	1:1	0.170	0.08	22.31	22.70	1.094	0.186	22.1
Right tilted	20	QPSK 50RB_25	21350/2560	1:1	0.144	0.08	22.31	22.70	1.094	0.158	22.1
Body worn Test data(Separate 15mm 1RB)											
Front side	20	QPSK 1RB_50	21350/2560	1:1	0.402	-0.02	23.36	23.70	1.081	0.435	22.1
Back side	20	QPSK 1RB_50	21350/2560	1:1	0.522	0.00	23.36	23.70	1.081	**0.565**	22.1
Back side	20	QPSK 1RB_50	20850/2510	1:1	0.455	0.12	23.28	23.70	1.102	0.501	22.1
Back side	20	QPSK 1RB_50	21100/2535.5	1:1	0.493	0.16	23.29	23.70	1.099	0.542	22.1
Body worn Test data (Separate 15mm 50%RB)											
Front side	20	QPSK 50RB_25	21350/2560	1:1	0.318	0.10	22.31	22.70	1.094	0.348	22.1
Back side	20	QPSK 50RB_25	21350/2560	1:1	0.415	0.06	22.31	22.70	1.094	0.454	22.1
Hotspot Test data(Separate 10mm 1RB)											
Front side	20	QPSK 1RB_50	21350/2560	1:1	0.813	-0.02	23.36	23.70	1.081	0.879	22.1
Front side	20	QPSK 1RB_50	20850/2510	1:1	0.769	0.13	23.28	23.70	1.102	0.847	22.1
Front side	20	QPSK 1RB_50	21100/2535.5	1:1	0.820	-0.18	23.29	23.70	1.099	0.901	22.1
Back side	20	QPSK 1RB_50	21350/2560	1:1	1.020	-0.07	23.36	23.70	1.081	1.103	22.1
Left side	20	QPSK 1RB_50	21350/2560	1:1	0.739	0.07	23.36	23.70	1.081	0.799	22.1
Right side	20	QPSK 1RB_50	21350/2560	1:1	0.149	0.14	23.36	23.70	1.081	0.161	22.1
Bottom side	20	QPSK 1RB_50	21350/2560	1:1	0.403	0.06	23.36	23.70	1.081	0.436	22.1
Back side	20	QPSK 1RB_50	20850/2510	1:1	0.897	-0.08	23.28	23.70	1.102	0.988	22.1
Back side	20	QPSK 1RB_50	21100/2535.5	1:1	1.090	0.05	23.29	23.70	1.099	**1.198**	22.1
Back side-repeat	20	QPSK 1RB_50	21100/2535.5	1:1	1.080	0.08	23.36	23.70	1.081	1.168	22.1
Hotspot Test data (Separate 10mm 50%RB)											
Front side	20	QPSK 50RB_25	21350/2560	1:1	0.719	0.16	22.31	22.70	1.094	0.787	22.1
Back side	20	QPSK 50RB_25	21350/2560	1:1	0.888	0.12	22.31	22.70	1.094	**0.971**	22.1
Left side	20	QPSK 50RB_25	21350/2560	1:1	0.592	-0.03	22.31	22.70	1.094	0.648	22.1
Right side	20	QPSK 50RB_25	21350/2560	1:1	0.118	-0.02	22.31	22.70	1.094	0.129	22.1
Bottom side	20	QPSK 50RB_25	21350/2560	1:1	0.320	0.04	22.31	22.70	1.094	0.350	22.1
Back side	20	QPSK 50RB_50	20850/2510	1:1	0.719	-0.05	22.28	22.70	1.102	0.792	22.1
Back side	20	QPSK 50RB_25	21100/2535.5	1:1	0.871	0.02	22.26	22.70	1.107	0.964	22.1
Hotspot Test data (Separate 10mm 100%RB)											
Front side	20	QPSK 100RB_0	21350/2560	1:1	0.706	0.06	22.29	22.70	1.099	0.776	22.1
Back side	20	QPSK 100RB_0	21350/2560	1:1	0.744	0.05	22.29	22.70	1.099	0.818	22.1

WiFi 2.4G

Test position	Test mode	Test Ch./Freq.	Duty Cycle	Duty Cycle Scaled factor	SAR (W/kg) 1-g	Power drift (dB)	Conducted power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR (W/kg)	Liquid Temp.
Head Test data											
Left cheek	802.11b	6/2437	99.24%	1.008	0.965	0.11	18.66	19.00	1.081	1.052	22
Left tilted	802.11b	6/2437	99.24%	1.008	1.020	-0.10	18.66	19.00	1.081	1.112	22
Right cheek	802.11b	6/2437	99.24%	1.008	0.442	-0.04	18.66	19.00	1.081	0.482	22
Right tilted	802.11b	6/2437	99.24%	1.008	0.494	0.04	18.66	19.00	1.081	0.539	22
Left cheek	802.11b	1/2412	99.24%	1.008	0.773	0.02	18.26	19.00	1.186	0.924	22
Left cheek	802.11b	11/2462	99.24%	1.008	0.886	0.11	18.24	19.00	1.191	1.064	22
Left tilted	802.11b	1/2412	99.24%	1.008	0.824	-0.04	18.26	19.00	1.186	0.985	22
Left tilted	802.11b	11/2462	99.24%	1.008	0.973	-0.01	18.24	19.00	1.191	**1.168**	22
Left tilted -Repeat	802.11b	11/2462	99.24%	1.008	0.958	-0.02	18.24	19.00	1.191	1.150	22
Body worn Test data (Separate 15mm)											
Front side	802.11b	6/2437	99.24%	1.008	0.096	0.03	18.66	19.00	1.081	0.104	22
Back side	802.11b	6/2437	99.24%	1.008	0.179	-0.02	18.66	19.00	1.081	0.195	22
Back side	802.11b	1/2412	99.24%	1.008	0.184	0.06	18.26	19.00	1.186	**0.220**	22
Back side	802.11b	11/2462	99.24%	1.008	0.160	0.06	18.24	19.00	1.191	0.192	22
Hotspot Test data (Separate 10mm)											
Front side	802.11b	6/2437	99.24%	1.008	0.184	0.07	18.66	19.00	1.081	0.201	22
Back side	802.11b	6/2437	99.24%	1.008	0.348	0.16	18.66	19.00	1.081	0.379	22
Right side	802.11b	6/2437	99.24%	1.008	0.054	0.16	18.66	19.00	1.081	0.058	22
Top side	802.11b	6/2437	99.24%	1.008	0.267	-0.08	18.66	19.00	1.081	0.291	22
Back side	802.11b	1/2412	99.24%	1.008	0.330	-0.11	18.26	19.00	1.186	**0.394**	22
Back side	802.11b	11/2462	99.24%	1.008	0.286	-0.08	18.24	19.00	1.191	0.343	22

WiFi 5G

Test position	Test mode	Test Ch./Freq.	Duty Cycle	Duty Cycle Scaled	SAR (W/kg)1-g	Power drift(dB)	Conducted power(dBm	Tune up Limit(dBm)	Scaled factor	Scaled SAR(W/kg)	Liquid Temp.
Head Test data of U-NII-2A											
Left cheek	802.11a	56/5280	96.17%	1.040	0.308	0.06	11.38	12.00	1.153	0.369	22.2
Left tilted	802.11a	56/5280	96.17%	1.040	0.247	0.05	11.38	12.00	1.153	0.296	22.2
Right cheek	802.11a	56/5280	96.17%	1.040	0.117	0.05	11.38	12.00	1.153	0.140	22.2
Right tilted	802.11a	56/5280	96.17%	1.040	0.210	0.03	11.38	12.00	1.153	0.252	22.2
Left cheek	802.11a	52/5260	96.17%	1.040	0.451	0.02	11.36	12.00	1.159	0.544	22.2
Left cheek	802.11a	60/5300	96.17%	1.040	0.516	-0.02	11.22	12.00	1.197	0.642	22.2
Head Test data of U-NII-2C											
Left cheek	802.11a	112/5560	96.17%	1.040	0.615	0.02	11.85	12.00	1.035	0.662	22.2
Left tilted	802.11a	112/5560	96.17%	1.040	0.591	0.01	11.85	12.00	1.035	0.636	22.2
Right cheek	802.11a	112/5560	96.17%	1.040	0.513	0.03	11.85	12.00	1.035	0.552	22.2
Right tilted	802.11a	112/5560	96.17%	1.040	0.416	0.03	11.85	12.00	1.035	0.448	22.2
Left cheek	802.11a	100/5500	96.17%	1.040	0.697	-0.02	11.79	12.00	1.050	0.761	22.2
Left cheek	802.11a	140/5700	96.17%	1.040	0.809	0.02	11.60	12.00	1.096	0.923	22.2
Head Test data of U-NII-3											
Left cheek	802.11a	157/5785	96.17%	1.040	0.630	0.07	11.42	12.00	1.143	0.749	22.2
Left tilted	802.11a	157/5785	96.17%	1.040	0.629	0.01	11.42	12.00	1.143	0.748	22.2
Right cheek	802.11a	157/5785	96.17%	1.040	0.496	0.04	11.42	12.00	1.143	0.590	22.2
Right tilted	802.11a	157/5785	96.17%	1.040	0.432	0.08	11.42	12.00	1.143	0.513	22.2
Left cheek	802.11a	149/5745	96.17%	1.040	0.769	-0.05	11.38	12.00	1.153	0.922	22.2
Left cheek	802.11a	165/5825	96.17%	1.040	0.812	-0.11	11.40	12.00	1.148	**0.970**	22.2
Body worn Test data of U-NII-2A (Separate 15mm)											
Front side	802.11a	56/5280	96.17%	1.040	0.015	0.00	11.38	12.00	1.153	0.017	22.2
Back side	802.11a	56/5280	96.17%	1.040	0.011	0.00	11.38	12.00	1.153	0.013	22.2
Front side	802.11a	52/5260	96.17%	1.040	0.027	0.00	11.36	12.00	1.159	0.032	22.2
Front side	802.11a	60/5300	96.17%	1.040	0.064	0.00	11.22	12.00	1.197	0.080	22.2
Body worn Test data of U-NII-2C(Separate 15mm)											
Front side	802.11a	112/5560	96.17%	1.040	0.052	0.00	11.85	12.00	1.035	0.056	22.2
Back side	802.11a	112/5560	96.17%	1.040	0.019	0.00	11.85	12.00	1.035	0.020	22.2
Front side	802.11a	100/5500	96.17%	1.040	0.058	-0.02	11.79	12.00	1.050	0.063	22.2
Front side	802.11a	140/5700	96.17%	1.040	0.063	-0.04	11.60	12.00	1.096	0.072	22.2

Body worn Test data of U-NII-3(Separate 15mm)											
Front side	802.11a	157/5785	96.17%	1.040	0.045	-0.08	11.42	12.00	1.143	0.053	22.2
Back side	802.11a	157/5785	96.17%	1.040	0.031	0.01	11.42	12.00	1.143	0.037	22.2
Front side	802.11a	149/5745	96.17%	1.040	0.067	0.05	11.38	12.00	1.153	0.080	22.2
Front side	802.11a	165/5825	96.17%	1.040	0.073	0.07	11.40	12.00	1.148	0.087	22.2
Hotspot Test data of U-NII-1(Separate 10mm)											
Front side	802.11a	40/5200	96.17%	1.040	0.088	0.06	11.55	12.00	1.109	**0.101**	22.2
Back side	802.11a	40/5200	96.17%	1.040	0.040	-0.01	11.55	12.00	1.109	0.046	22.2
Right side	802.11a	40/5200	96.17%	1.040	0.018	0.05	11.55	12.00	1.109	0.021	22.2
Top side	802.11a	40/5200	96.17%	1.040	0.025	0.06	11.55	12.00	1.109	0.029	22.2
Front side	802.11a	36/5180	96.17%	1.040	0.083	-0.07	11.41	12.00	1.146	0.099	22.2
Front side	802.11a	48/5240	96.17%	1.040	0.088	0.17	11.42	12.00	1.143	0.104	22.2
Hotspot Test data of U-NII-3(Separate 10mm)											
Front side	802.11a	157/5785	96.17%	1.040	0.110	0.09	11.42	12.00	1.143	**0.131**	22.2
Back side	802.11a	157/5785	96.17%	1.040	0.084	0.02	11.42	12.00	1.143	0.099	22.2
Right side	802.11a	157/5785	96.17%	1.040	0.017	-0.12	11.42	12.00	1.143	0.021	22.2
Top side	802.11a	157/5785	96.17%	1.040	0.059	-0.09	11.42	12.00	1.143	0.070	22.2
Front side	802.11a	149/5745	96.17%	1.040	0.103	0.05	11.38	12.00	1.153	0.124	22.2
Front side	802.11a	165/5825	96.17%	1.040	0.091	0.06	11.40	12.00	1.148	0.108	22.2
Test position	**Test mode**	**Test Ch./Freq.**	**Duty Cycle**	**Duty Cycle Scaled**	**SAR (W/kg)10-g**	**Power drift(dB)**	**Conducted power(dB**	**Tune up Limit(dBm**	**Scaled factor**	**Scaled SAR(W/kg)**	**Liquid Temp.**
Product specific 10gSAR Test data of U-NII-2A(Separate 0mm)											
Front side	802.11a	56/5280	96.17%	1.040	0.172	0.00	11.38	12.00	1.153	0.206	22.2
Back side	802.11a	56/5280	96.17%	1.040	0.085	0.00	11.38	12.00	1.153	0.102	22.2
Right side	802.11a	56/5280	96.17%	1.040	0.033	0.01	11.38	12.00	1.153	0.039	22.2
Top side	802.11a	56/5280	96.17%	1.040	0.059	-0.06	11.38	12.00	1.153	0.071	22.2
Front side	802.11a	52/5260	96.17%	1.040	0.196	0.01	11.36	12.00	1.159	0.236	22.2
Front side	802.11a	60/5300	96.17%	1.040	0.189	-0.13	11.22	12.00	1.197	0.235	22.2
Product specific 10gSAR Test data of U-NII-2C(Separate 0mm)											
Front side	802.11a	112/5560	96.17%	1.040	0.217	0.00	11.85	12.00	1.035	0.234	22.2
Back side	802.11a	112/5560	96.17%	1.040	0.169	0.00	11.85	12.00	1.035	0.182	22.2
Right side	802.11a	112/5560	96.17%	1.040	0.044	0.09	11.85	12.00	1.035	0.047	22.2
Top side	802.11a	112/5560	96.17%	1.040	0.126	0.03	11.85	12.00	1.035	0.136	22.2
Front side	802.11a	100/5500	96.17%	1.040	0.246	0.12	11.79	12.00	1.050	0.269	22.2
Front side	802.11a	140/5700	96.17%	1.040	0.277	0.05	11.60	12.00	1.096	**0.316**	22.2

3. Simultaneous Transmission Analysis

Simultaneous Transmission Scenarios:

NO.	Simultaneous Transmission Configuration	Head	Body worn	Hotspot	Product Specific 10-g (0mm)
1	GSM(Voice) + WiFi	Yes	Yes	No	Yes
2	GSM(Voice) + BT	Yes	Yes	No	Yes
3	WCDMA(Voice) + WiFi	Yes	Yes	No	Yes
4	WCDMA(Voice) + BT	Yes	Yes	No	Yes
5	GPRS / EDGE(Data) + WiFi	No	No	Yes	Yes
6	GPRS / EDGE(Data) + BT	No	No	Yes	Yes
7	WCDMA(Data) + WiFi	No	No	Yes	Yes
8	WCDMA(Data) + BT	No	No	Yes	Yes
9	LTE(Data) + WiFi	Yes	Yes	Yes	Yes
10	LTE(Data) + BT	Yes	Yes	Yes	Yes
11	BT+WIFI (They share the same antenna and cannot transmit at the same time by design.)	No	No	No	No

Note:
1) Wi-Fi and Bluetooth share the same Tx antenna and can't transmit simultaneously.
2) The device does not support DTM function.
3) * VoLTE or pre-installed VOIP applications are considered.
4) For Wi-Fi 5G, U-NII-2A (5250-5350 MHz) and U-NII-2C (5470-5725 MHz) bands does not support hotspot function.

3.2 Estimated SAR calculation

Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and Product specific 10g SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Test Exclusion Threshold condition is satisfied. These test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channel requiring evaluation, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions.

Freq. Band	Frequency (GHz)	Position	Average Power		Test Separation (mm)	Calculate Value	Exclusion Threshold	Exclusion (Y/N)
			dBm	mW				
Bluetooth	2.48	Head	9.5	9.33	5.0	2.8	3.0	Y
		Body-worn	9.5	9.33	15.0	0.9	3.0	Y
		hotspot	9.5	9.33	10.0	1.4	3.0	Y

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)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

• f(GHz) is the RF channel transmit frequency in GHz

• Power and distance are rounded to the nearest mW and mm before calculation

• The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

When the standalone SAR test exclusion is applied to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to the following to determine simultaneous transmission SAR test exclusion:

• (max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]·[√f(GHz)/x] W/kg for test separation distances ≤ 50 mm;

Where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR.

When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Estimated SAR Result

Freq. Band	Frequency (GHz)	Test Position	max. power(dBm)	Test Separation (mm)	Estimated 1g SAR (W/kg)
Bluetooth	2.48	Head	9.50	0	0.374
		Body-worn	9.50	15	0.125
		hotspot	9.50	10	0.187
		Product specific 10g SAR	9.50	0	0.150

3.2 SPLSR evaluation and analysis

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

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

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

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

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

Simultaneous Transmission Combination Scenario for head

WWAN Band	Exposure position	① MAX.WWAN SAR(W/kg)	② MAX.WLAN 2.4G SAR(W/kg)	③ MAX.WLAN 5G SAR(W/kg)	④ MAX.BT SAR(W/kg)	Summed SAR①+②	Summed SAR①+③	Summed SAR①+④	Case NO.
GSM850	Left Touch	0.217	1.064	0.970	0.374	1.281	1.187	0.591	No
	Left Tilt	0.130	1.168	0.748	0.374	1.298	0.878	0.504	No
	Right Touch	0.239	0.482	0.590	0.374	0.721	0.829	0.613	No
	Right Tilt	0.142	0.539	0.513	0.374	0.681	0.655	0.516	No
GSM1900	Left Touch	0.051	1.064	0.970	0.374	1.115	1.021	0.425	No
	Left Tilt	0.051	1.168	0.748	0.374	1.219	0.799	0.425	No
	Right Touch	0.118	0.482	0.590	0.374	0.600	0.708	0.492	No
	Right Tilt	0.030	0.539	0.513	0.374	0.569	0.543	0.404	No
WCDMA Band II	Left Touch	0.084	1.064	0.970	0.374	1.148	1.054	0.458	No
	Left Tilt	0.074	1.168	0.748	0.374	1.242	0.822	0.448	No
	Right Touch	0.157	0.482	0.590	0.374	0.639	0.747	0.531	No
	Right Tilt	0.046	0.539	0.513	0.374	0.585	0.559	0.420	No
WCDMA Band V	Left Touch	0.202	1.064	0.970	0.374	1.266	1.172	0.576	No
	Left Tilt	0.104	1.168	0.748	0.374	1.272	0.852	0.478	No
	Right Touch	0.209	0.482	0.590	0.374	0.691	0.799	0.583	No
	Right Tilt	0.128	0.539	0.513	0.374	0.667	0.641	0.502	No
LTE Band 2	Left Touch	0.097	1.064	0.970	0.374	1.161	1.067	0.471	No
	Left Tilt	0.090	1.168	0.748	0.374	1.258	0.838	0.464	No
	Right Touch	0.173	0.482	0.590	0.374	0.655	0.763	0.547	No
	Right Tilt	0.052	0.539	0.513	0.374	0.591	0.565	0.426	No
LTE Band 5	Left Touch	0.197	1.064	0.970	0.374	1.261	1.167	0.571	No
	Left Tilt	0.114	1.168	0.748	0.374	1.282	0.862	0.488	No
	Right Touch	0.221	0.482	0.590	0.374	0.703	0.811	0.595	No
	Right Tilt	0.126	0.539	0.513	0.374	0.665	0.639	0.500	No
LTE Band 7	Left Touch	0.327	1.064	0.970	0.374	**1.391**	1.297	0.701	No
	Left Tilt	0.091	1.168	0.748	0.374	1.259	0.839	0.465	No
	Right Touch	0.234	0.482	0.590	0.374	0.716	0.824	0.608	No
	Right Tilt	0.190	0.539	0.513	0.374	0.729	0.703	0.564	No

Simultaneous Transmission Combination Scenario for body worn

WWAN Band	Exposure position	① MAX.WWAN SAR(W/kg)	② MAX.WLAN 2.4G SAR(W/kg)	③ MAX.WLAN 5G SAR(W/kg)	④ MAX.BT SAR(W/kg)	Summed SAR①+②	Summed SAR①+③	Summed SAR①+④	Case NO.
GSM850	Front	0.246	0.104	0.087	0.125	0.350	0.333	0.371	No
	Back	0.312	0.220	0.037	0.125	0.532	0.349	0.437	No
GSM1900	Front	0.131	0.104	0.087	0.125	0.235	0.218	0.256	No
	Back	0.213	0.220	0.037	0.125	0.433	0.250	0.338	No
WCDMA Band II	Front	0.199	0.104	0.087	0.125	0.303	0.286	0.324	No
	Back	0.356	0.220	0.037	0.125	0.576	0.393	0.481	No
WCDMA Band V	Front	0.224	0.104	0.087	0.125	0.328	0.311	0.349	No
	Back	0.293	0.220	0.037	0.125	0.513	0.330	0.418	No
LTE Band 2	Front	0.247	0.104	0.087	0.125	0.351	0.334	0.372	No
	Back	0.396	0.220	0.037	0.125	0.616	0.433	0.521	No
LTE Band 5	Front	0.233	0.104	0.087	0.125	0.337	0.320	0.358	No
	Back	0.336	0.220	0.037	0.125	0.556	0.373	0.461	No
LTE Band 7	Front	0.435	0.104	0.087	0.125	0.539	0.522	0.560	No
	Back	0.565	0.220	0.037	0.125	**0.785**	0.602	0.690	No

Simultaneous Transmission Combination Scenario for hotspot

WWAN Band	Exposure position	① MAX.WWAN SAR(W/kg)	② MAX.WLAN 2.4G SAR(W/kg)	③ MAX.WLAN 5G SAR(W/kg)	④ MAX.BT SAR(W/kg)	Summed SAR①+②	Summed SAR①+③	Summed SAR①+④	Case NO.
GSM850	Front	0.391	0.201	0.131	0.187	0.592	0.522	0.578	No
	Back	0.586	0.394	0.099	0.187	0.980	0.685	0.773	No
	Left	0.270	0.000	0.000	0.187	0.270	0.270	0.457	No
	Right	0.281	0.058	0.021	0.187	0.339	0.302	0.468	No
	Top	0.000	0.291	0.070	0.187	0.291	0.070	0.187	No
	Bottom	0.098	0.000	0.000	0.187	0.098	0.098	0.285	No
GSM1900	Front	0.418	0.201	0.131	0.187	0.619	0.549	0.605	No
	Back	0.772	0.394	0.099	0.187	1.166	0.871	0.959	No
	Left	0.041	0.000	0.000	0.187	0.041	0.041	0.228	No
	Right	0.106	0.058	0.021	0.187	0.164	0.127	0.293	No
	Top	0.000	0.291	0.070	0.187	0.291	0.070	0.187	No
	Bottom	0.652	0.000	0.000	0.187	0.652	0.652	0.839	No
WCDMA Band II	Front	0.417	0.201	0.131	0.187	0.618	0.548	0.604	No
	Back	0.734	0.394	0.099	0.187	1.128	0.833	0.921	No
	Left	0.047	0.000	0.000	0.187	0.047	0.047	0.234	No
	Right	0.106	0.058	0.021	0.187	0.164	0.127	0.293	No
	Top	0.000	0.291	0.070	0.187	0.291	0.070	0.187	No
	Bottom	0.710	0.000	0.000	0.187	0.710	0.710	0.897	No
WCDMA Band V	Front	0.233	0.201	0.131	0.187	0.434	0.364	0.420	No
	Back	0.359	0.394	0.099	0.187	0.753	0.458	0.546	No

	Left	0.158	0.000	0.000	0.187	0.158	0.158	0.345	No
	Right	0.193	0.058	0.021	0.187	0.251	0.214	0.380	No
	Top	0.000	0.291	0.070	0.187	0.291	0.070	0.187	No
	Bottom	0.060	0.000	0.000	0.187	0.060	0.060	0.247	No
LTE Band 2	Front	0.397	0.201	0.131	0.187	0.598	0.528	0.584	No
	Back	0.910	0.394	0.099	0.187	1.304	1.009	1.097	No
	Left	0.066	0.000	0.000	0.187	0.066	0.066	0.253	No
	Right	0.113	0.058	0.021	0.187	0.171	0.134	0.300	No
	Top	0.000	0.291	0.070	0.187	0.291	0.070	0.187	No
	Bottom	0.745	0.000	0.000	0.187	0.745	0.745	0.932	No
LTE Band 5	Front	0.231	0.201	0.131	0.187	0.432	0.362	0.418	No
	Back	0.413	0.394	0.099	0.187	0.807	0.512	0.600	No
	Left	0.185	0.000	0.000	0.187	0.185	0.185	0.372	No
	Right	0.191	0.058	0.021	0.187	0.249	0.212	0.378	No
	Top	0.000	0.291	0.070	0.187	0.291	0.070	0.187	No
	Bottom	0.059	0.000	0.000	0.187	0.059	0.059	0.246	No
LTE Band 7	Front	0.901	0.201	0.131	0.187	1.102	1.032	1.088	No
	Back	1.198	0.394	0.099	0.187	**1.592**	1.297	1.385	No
	Left	0.799	0.000	0.000	0.187	0.799	0.799	0.986	No
	Right	0.161	0.058	0.021	0.187	0.219	0.182	0.348	No
	Top	0.000	0.291	0.070	0.187	0.291	0.070	0.187	No
	Bottom	0.436	0.000	0.000	0.187	0.436	0.436	0.623	No

Simultaneous Transmission Combination Scenario for Product specific 10g SAR

WWAN Band	Exposure position	① MAX.WWAN SAR(W/kg)	② MAX.WLAN 2.4G SAR(W/kg)	③ MAX.WLAN 5G SAR(W/kg)	④ MAX.BT SAR(W/kg)	Summed SAR①+②	Summed SAR①+③	Summed SAR①+④	Case NO.
WWAN Band	Front	/	/	0.316	0.150	0.000	0.316	0.150	No
	Back	/	/	0.182	0.150	0.000	0.182	0.150	No
	Left	/	/	/	0.150	0.000	0.000	0.150	No
	Right	/	/	0.047	0.150	0.000	0.047	0.150	No
	Top	/	/	0.136	0.150	0.000	0.136	0.150	No
	Bottom	/	/	/	0.150	0.000	0.000	0.150	No

4. Instruments List

Test Platform	SPEAG DASY5 Professional
Description	SAR Test System (Frequency range 300MHz-6GHz)
Software Reference	DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Hardware Reference

	Equipment	Manufacturer	Model	Serial Number	Calibration Date	Due date of calibration
☒	Twin Phantom	SPEAG	SAM 1	1912	NCR	NCR
☒	Twin Phantom	SPEAG	SAM 2	1640	NCR	NCR
☒	Twin Phantom	SPEAG	SAM 1	1283	NCR	NCR
☒	Twin Phantom	SPEAG	SAM 2	1913	NCR	NCR
☒	DAE	SPEAG	DAE4	1428	2018-01-17	2019-01-16
☒	DAE	SPEAG	DAE4	1267	2017-11-28	2018-11-27
☒	E-Field Probe	SPEAG	EX3DV4	3962	2018-01-11	2019-01-10
☒	E-Field Probe	SPEAG	EX3DV4	3789	2018-02-08	2019-02-07
☒	Validation Kits	SPEAG	D835V2	4d105	2016-12-08	2019-12-07
☒	Validation Kits	SPEAG	D1900V2	5d028	2016-12-07	2019-12-06
☒	Validation Kits	SPEAG	D2450V2	733	2016-12-07	2019-12-06
☒	Validation Kits	SPEAG	D2600V2	1125	2016-06-22	2019-06-21
☒	Validation Kits	SPEAG	D5GHzV2	1165	2016-12-13	2019-12-12
☒	Agilent Network Analyzer	Agilent	E5071C	MY46523590	2018-03-13	2019-03-12
☒	Dielectric Probe Kit	Agilent	85070E	US01440210	NCR	NCR
☒	Universal Radio Communication Tester	R&S	CMU200	123090	2018-06-21	2019-06-20
☒	Radio Communication Analyzer	Anritsu	MT8821C	6201502984	2018-05-02	2019-05-01
☒	RF Bi-Directional Coupler	Agilent	86205-60001	MY31400031	NCR	NCR
☒	Signal Generator	Agilent	N5171B	MY53050736	2018-03-13	2019-03-12
☒	Preamplifier	Mini-Circuits	ZHL-42W	15542	NCR	NCR
☒	Preamplifier	Compliance Directions Systems Inc.	AMP28-3W	073501433	NCR	NCR
☒	Power Meter	Agilent	E4416A	GB41292095	2018-03-13	2019-03-12
☒	Power Sensor	Agilent	8481H	MY41091234	2018-03-13	2019-03-12
☒	Power Sensor	R&S	NRP-Z92	100025	2018-03-13	2019-03-12
☒	Attenuator	SHX	TS2-3dB	30704	NCR	NCR

☒	Coaxial low pass filter	Mini-Circuits	VLF-2500(+)	NA	NCR	NCR
☒	Coaxial low pass filter	Microlab Fxr	LA-F13	NA	NCR	NCR
☒	50 Ω coaxial load	Mini-Circuits	KARN-50+	00850	NCR	NCR
☒	DC POWER SUPPLY	SAKO	SK1730SL5A	NA	NCR	NCR
☒	Speed reading thermometer	MingGao	T809	NA	2018-03-19	2019-03-18
☒	Humidity and Temperature Indicator	KIMTOKA	KIMTOKA	NA	2018-03-19	2019-03-18

Note: All the equipments are within the valid period when the tests are performed.

5. Measurements

Please see the Appendix B

6. SAR System Performance Verification

Please see the Appendix A

7. DAE & Probe Calibration Certificate

Please see the Appendix C

8. SAR measurement variability and uncertainty

SAR measurement variability

Per KDB865664 D01 SAR measurement 100 MHz to 6 GHz v01r04, SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. The additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.

2) When the original highest measured SAR is ⩾ 0.80 W/kg, repeat that measurement once.

3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ⩾ 1.45 W/kg (~ 10% from the 1-g SAR limit).

4) Perform a third repeated measurement only if the original, first or second repeated measurement is ⩾1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

The same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.

SAR measurement variability

Per KDB865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. The equivalent ratio (1.5/1.6) is applied to extremity and occupational exposure conditions.

- End of report -

Appendix A

Detailed System Check Results

Date: 2018-10-29

Test Laboratory: SGS-SAR Lab

System Performance Check 835 MHz Head

DUT: D835V2; Type: D835V2; Serial: 4d120

Communication System: UID 0, CW (0); Frequency: 835 MHz;Duty Cycle: 1:1

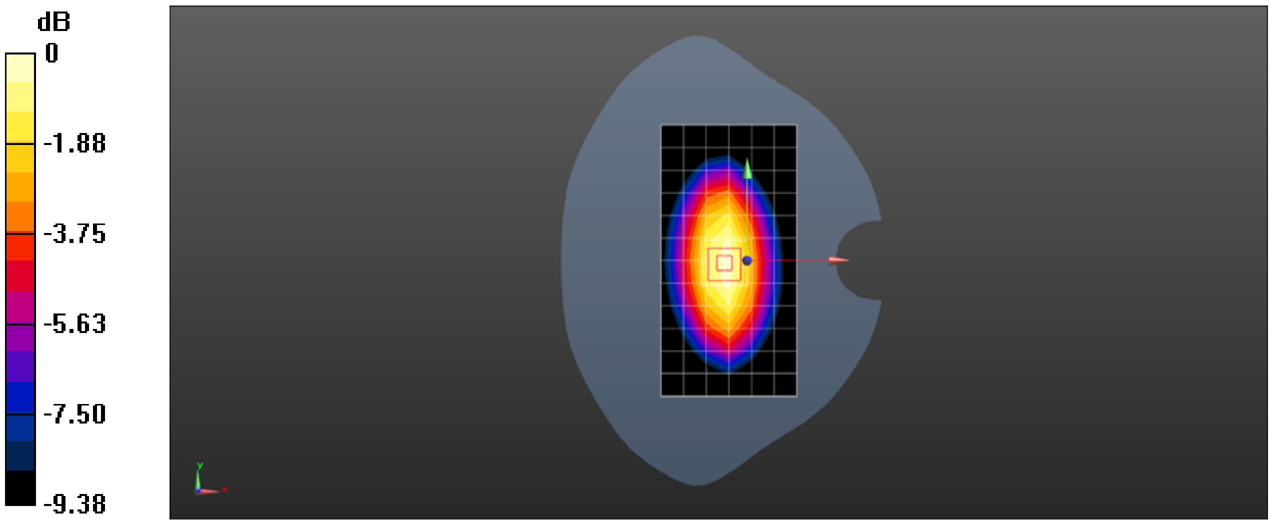
Medium: HSL835;Medium parameters used: f = 835 MHz; σ = 0.886 S/m; ε_r = 40.849; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3789; ConvF(8.66, 8.66, 8.66); Calibrated: 2018-02-08;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = -2.0, 31.0
- Electronics: DAE4 Sn1267; Calibrated: 2017-11-28
- Phantom: SAM2; Type: SAM; Serial: 1913
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=15mm, Pin=250mW/Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 2.45 W/kg

Body/d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 54.42 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 3.30 W/kg
SAR(1 g) = 2.27 W/kg; SAR(10 g) = 1.53 W/kg



0 dB = 2.45 W/kg = 3.89 dBW/kg

Date: 2018-10-30

Test Laboratory: SGS-SAR Lab

System Performance Check 835 MHz Body

DUT: D835V2; Type: D835V2; Serial: 4d120

Communication System: UID 0, CW (0); Frequency: 835 MHz;Duty Cycle: 1:1

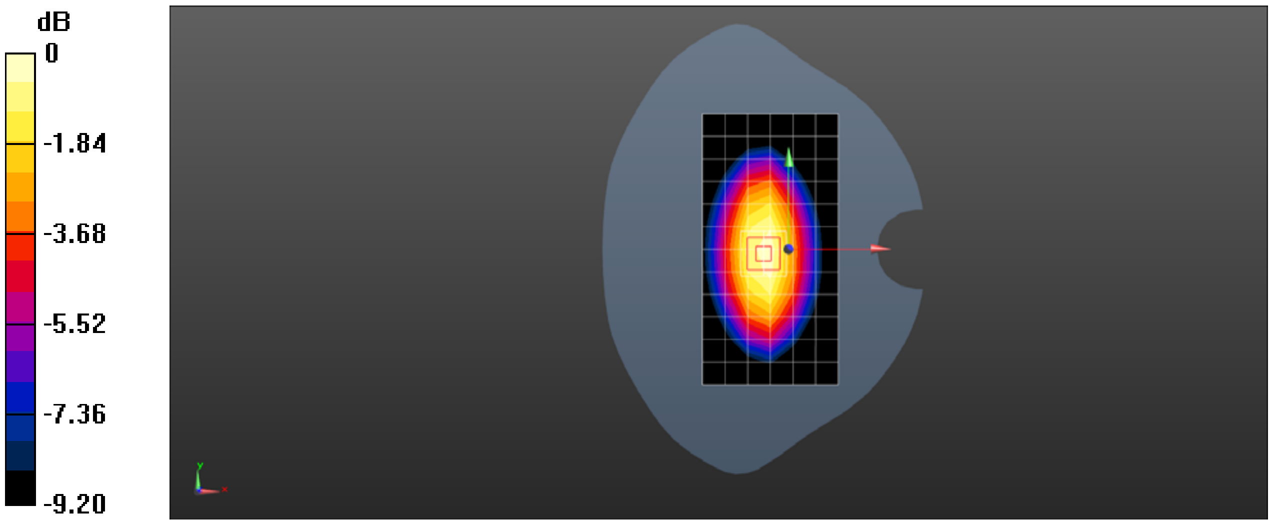
Medium: MSL835;Medium parameters used: f = 835 MHz; σ = 1.009 S/m; ε_r = 54.531; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3789; ConvF(8.84, 8.84, 8.84); Calibrated: 2018-02-08;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = -2.0, 31.0
- Electronics: DAE4 Sn1267; Calibrated: 2017-11-28
- Phantom: SAM2; Type: SAM; Serial: 1913
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=15mm, Pin=250mW/Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 2.44 W/kg

Body/d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 50.43 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 3.36 W/kg
SAR(1 g) = 2.33 W/kg; SAR(10 g) = 1.58 W/kg
Maximum value of SAR (measured) = 2.51 W/kg



0 dB = 2.51 W/kg = 4.00 dBW/kg

Date: 2018-11-14

Test Laboratory: SGS-SAR Lab

System Performance Check 1900 MHz Head

DUT: D1900V2; Type: D1900V2; Serial: 5d142

Communication System: UID 0, CW (0); Frequency: 1900 MHz;Duty Cycle: 1:1

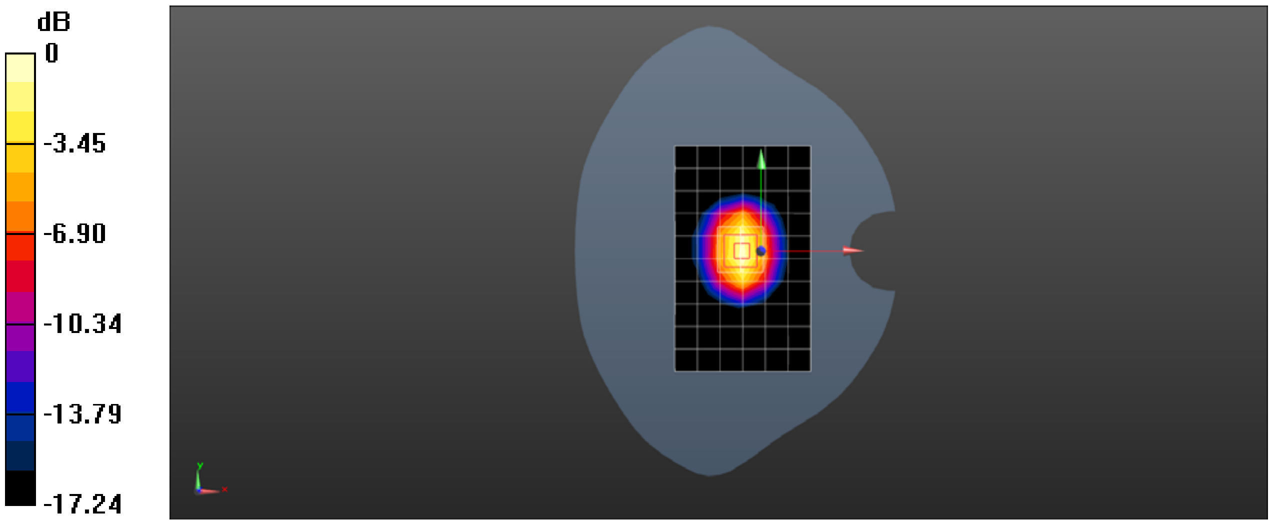
Medium: HSL1900;Medium parameters used: f = 1900 MHz; σ = 1.389 S/m; ε_r = 40.284; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3789; ConvF(7.35, 7.35, 7.35); Calibrated: 2018-02-08;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = -2.0, 31.0
- Electronics: DAE4 Sn1267; Calibrated: 2017-11-28
- Phantom: SAM2; Type: SAM; Serial: 1913
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=250mW/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 10.4 W/kg

Body/d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 85.19 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 17.8 W/kg
SAR(1 g) = 9.68 W/kg; SAR(10 g) = 5.04 W/kg
Maximum value of SAR (measured) = 11.0 W/kg



0 dB = 11.0 W/kg = 10.41 dBW/kg

Date: 2018-11-09

Test Laboratory: SGS-SAR Lab

System Performance Check 1900 MHz Body

DUT: D1900V2; Type: D1900V2; Serial: 5d142

Communication System: UID 0, CW (0); Frequency: 1900 MHz;Duty Cycle: 1:1

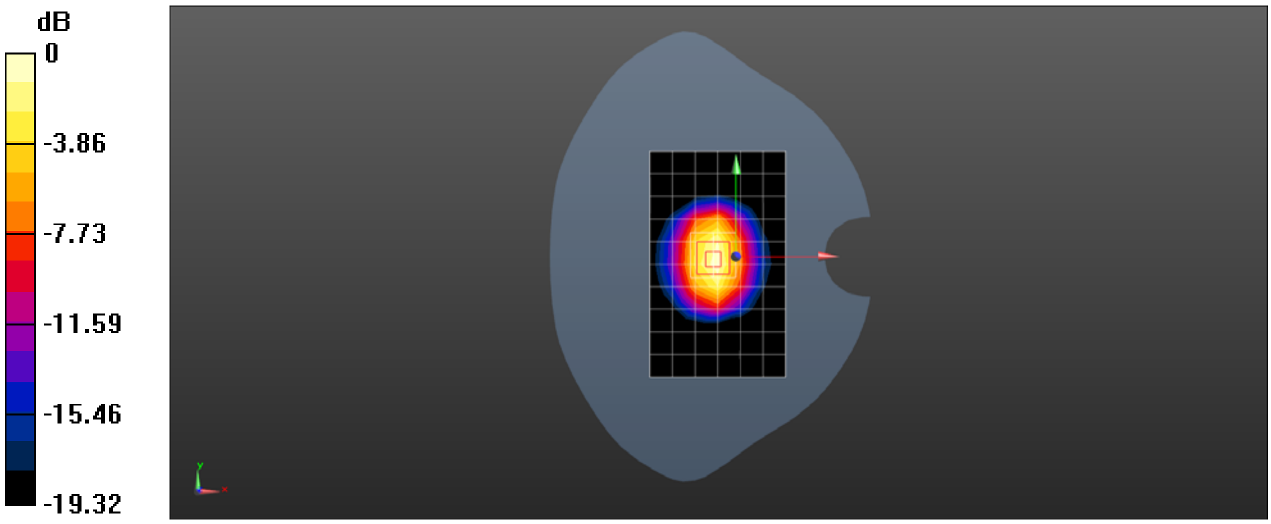
Medium: MSL1900;Medium parameters used: f = 1900 MHz; σ = 1.513 S/m; ε_r = 53.19; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(8.09, 8.09, 8.09); Calibrated: 2018-01-11;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = -2.0, 31.0
- Electronics: DAE4 Sn1428; Calibrated: 2018-01-17
- Phantom: SAM 2; Type: SAM V4.0; Serial: 1640
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=250mW/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 11.9 W/kg

Body/d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 90.97 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 22.0 W/kg
SAR(1 g) = 11.3 W/kg; SAR(10 g) = 5.72 W/kg
Maximum value of SAR (measured) = 12.6 W/kg



0 dB = 12.6 W/kg = 11.00 dBW/kg

Date: 2018-11-17

Test Laboratory: SGS-SAR Lab

System Performance Check 2450MHz Head

DUT: D2450V2; Type: D2450V2; Serial: 733

Communication System: UID 0, CW; Frequency: 2450 MHz;Duty Cycle: 1:1

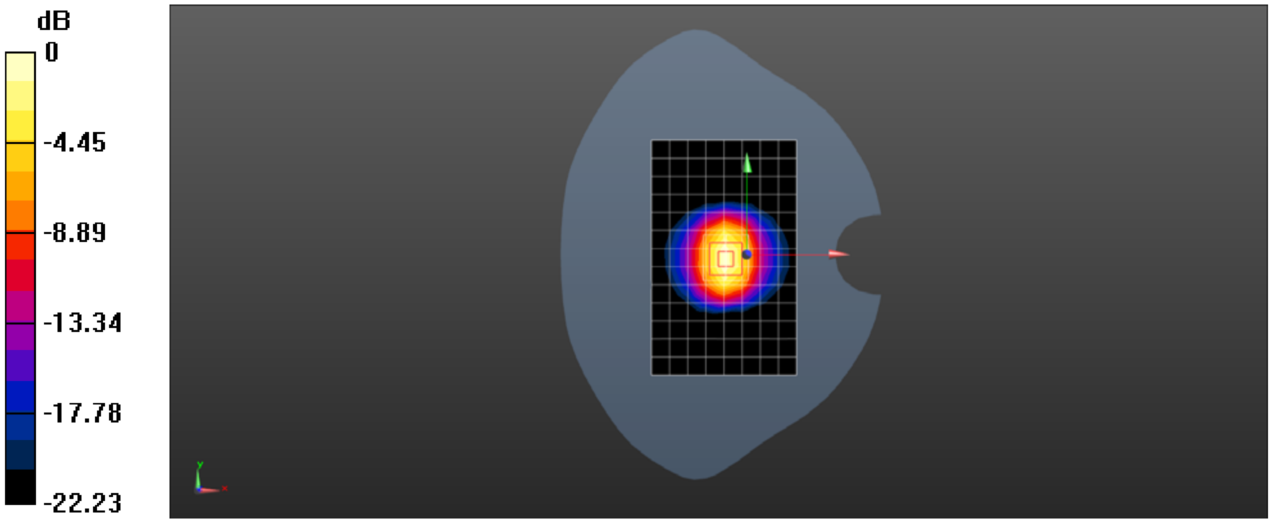
Medium: HSL2450;Medium parameters used: f = 2450 MHz; σ = 1.823 S/m; ε_r = 39.147; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3789; ConvF(7.01, 7.01, 7.01); Calibrated: 2018-02-08;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = -2.0, 31.0
- Electronics: DAE4 Sn1267; Calibrated: 2017-11-28
- Phantom: SAM2; Type: SAM; Serial: 1913
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=250mW/Area Scan (9x14x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 13.9 W/kg

Body/d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 86.57 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 27.9 W/kg
SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.15 W/kg
Maximum value of SAR (measured) = 15.2 W/kg



0 dB = 15.2 W/kg = 11.82 dBW/kg

Date: 2018-11-17

Test Laboratory: SGS-SAR Lab

System Performance Check 2450MHz Body

DUT: D2450V2; Type: D2450V2; Serial: 733

Communication System: UID 0, CW (0); Frequency: 2450 MHz;Duty Cycle: 1:1

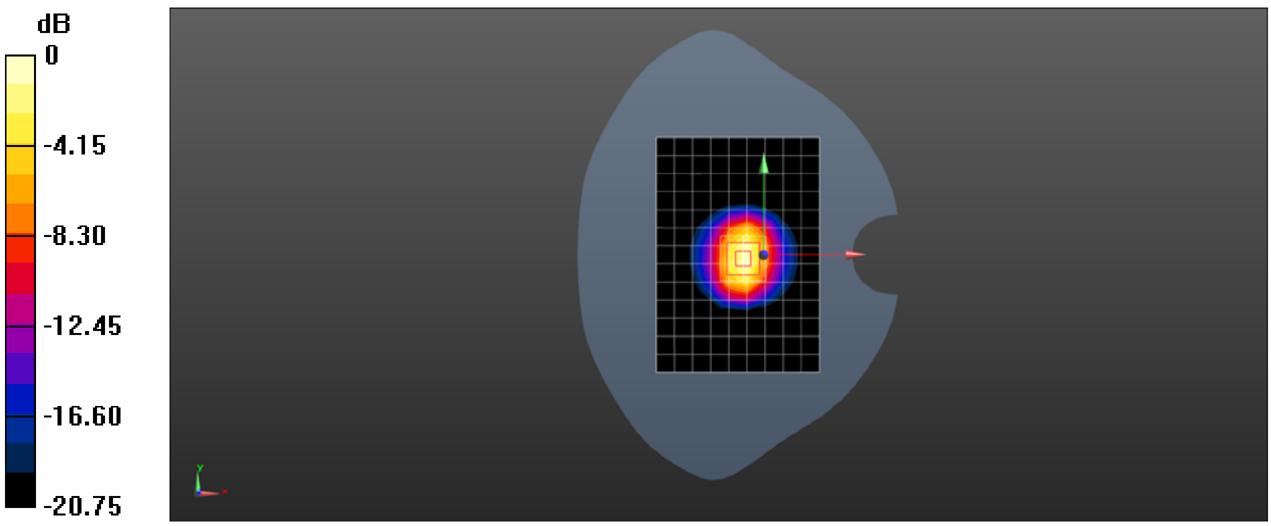
Medium: MSL2450;Medium parameters used: f = 2450 MHz; σ = 1.966 S/m; ε_r = 53.314; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3789; ConvF(7.15, 7.15, 7.15); Calibrated: 2018-02-08;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = -2.0, 31.0
- Electronics: DAE4 Sn1267; Calibrated: 2017-11-28
- Phantom: SAM 1; Type: SAM V4.0; Serial: TP-1283
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=250mW/Area Scan (10x14x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 13.4 W/kg

Body/d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 79.74 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 25.2 W/kg
SAR(1 g) = 12.6 W/kg; SAR(10 g) = 5.92 W/kg
Maximum value of SAR (measured) = 14.6 W/kg



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

Date: 2018-11-13

Test Laboratory: SGS-SAR Lab

System Performance Check 2600MHz Head

DUT:D2600V2; Type: D2600V2; Serial: 1125

Communication System: UID 0, CW (0); Frequency: 2600 MHz;Duty Cycle: 1:1

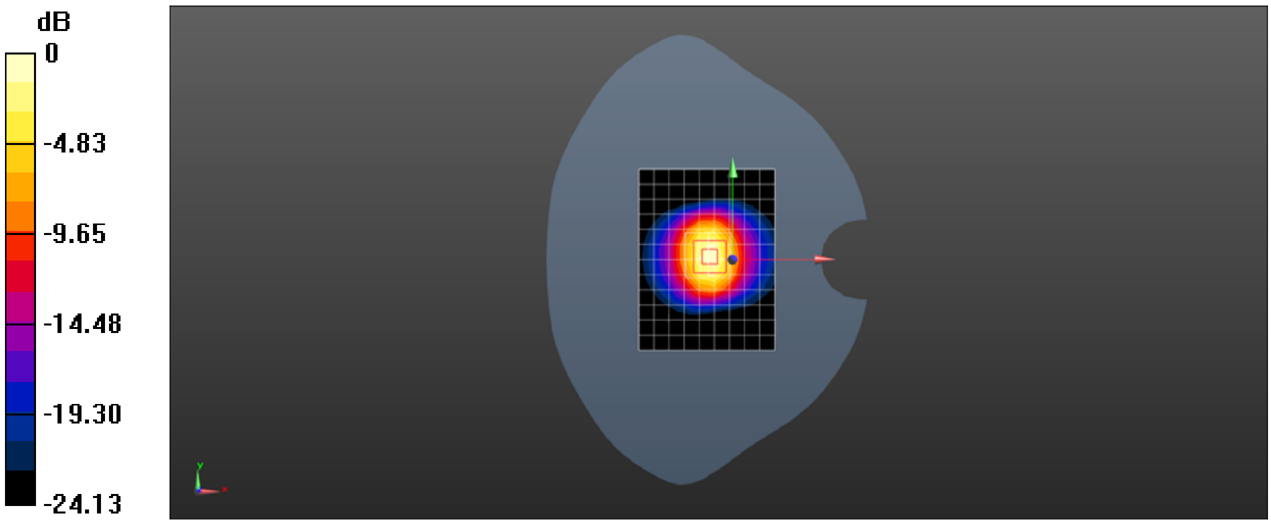
Medium: HSL2600;Medium parameters used: f = 2600 MHz; σ = 1.982 S/m; ε_r = 38.658; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(7.52, 7.52, 7.52); Calibrated: 2018-01-11;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = -2.0, 31.0
- Electronics: DAE4 Sn1428; Calibrated: 2018-01-17
- Phantom: SAM 1; Type: SAM; Serial: 1912
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=250mW/Area Scan (10x13x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 14.4 W/kg

Body/d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 88.53 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 31.6 W/kg
SAR(1 g) = 14.1 W/kg; SAR(10 g) = 6.19 W/kg
Maximum value of SAR (measured) = 16.1 W/kg



0 dB = 16.1 W/kg = 12.07 dBW/kg

Date: 2018-11-08

Test Laboratory: SGS-SAR Lab

System Performance Check 2600MHz Body

DUT: D2600V2; Type: D2600V2; Serial: 1125

Communication System: UID 0, CW (0); Frequency: 2600 MHz;Duty Cycle: 1:1

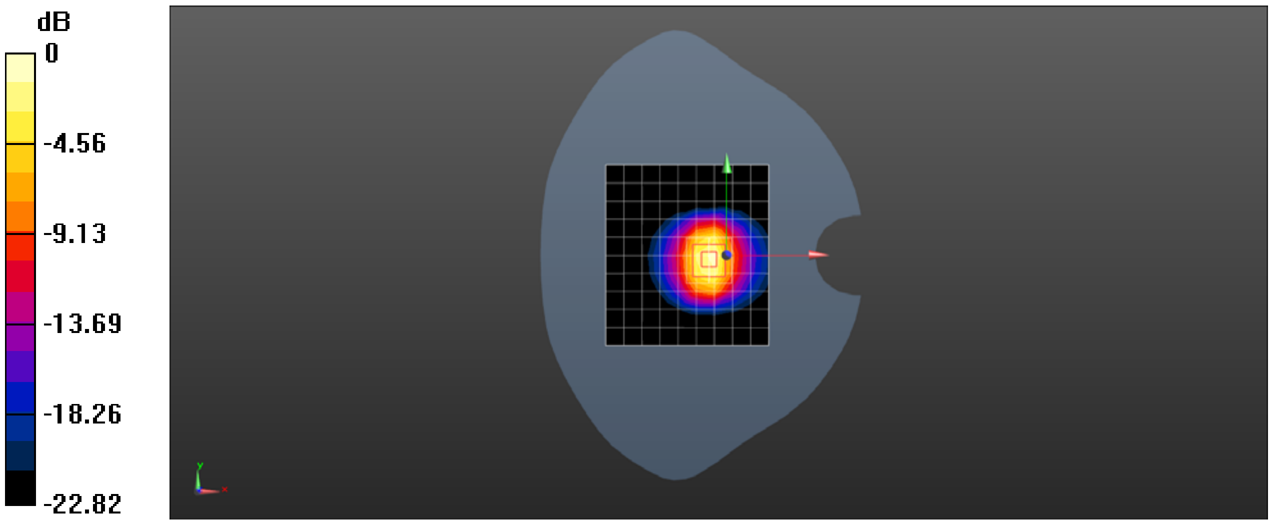
Medium: MSL2600;Medium parameters used: f = 2600 MHz; σ = 2.132 S/m; ε_r = 52.944; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3789; ConvF(7.15, 7.15, 7.15); Calibrated: 2018-02-08;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = -2.0, 31.0
- Electronics: DAE4 Sn1267; Calibrated: 2017-11-28
- Phantom: SAM 1; Type: SAM V4.0; Serial: TP-1283
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=250mW/Area Scan (10x11x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 17.2 W/kg

Body/d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 76.35 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 27.1 W/kg
SAR(1 g) = 13.1 W/kg; SAR(10 g) = 5.94 W/kg
Maximum value of SAR (measured) = 20.3 W/kg



0 dB = 20.3 W/kg = 13.07 dBW/kg

Date: 2018-11-15

Test Laboratory: SGS-SAR Lab

System Performance Check D5.25GHz Head

DUT: D5GHzV2; Type: D5GHzV2; Serial: 1165

Communication System: UID 0, CW (0); Frequency: 5250 MHz;Duty Cycle: 1:1

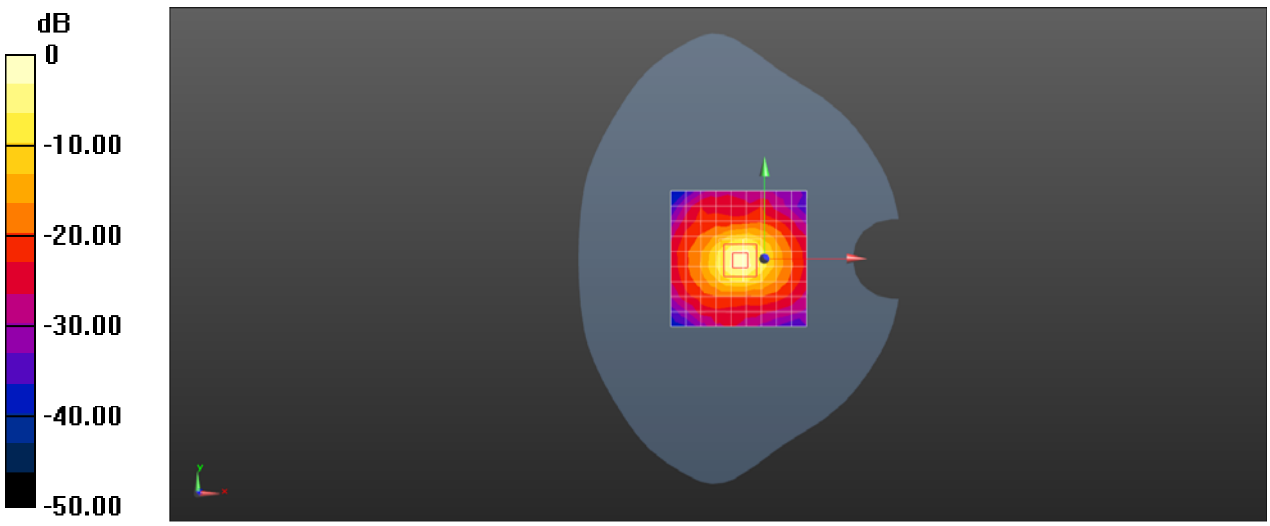
Medium: HSL5G;Medium parameters used: f = 5250 MHz; σ = 4.767 S/m; ε_r = 36.011; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(5.68, 5.68, 5.68); Calibrated: 2018-01-11;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -2.0, 23.0
- Electronics: DAE4 Sn1428; Calibrated: 2018-01-17
- Phantom: SAM 1; Type: SAM; Serial: 1912
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=100mW, f=5250 MHz/Area Scan (10x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 12.3 W/kg

Body/d=10mm, Pin=100mW, f=5250 MHz/Zoom Scan (4x4x1.4mm, graded), dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 66.58 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 29.6 W/kg
SAR(1 g) = 7.17 W/kg; SAR(10 g) = 2.04 W/kg
Maximum value of SAR (measured) = 16.9 W/kg



0 dB = 16.9 W/kg = 12.28 dBW/kg

Date: 2018-11-16

Test Laboratory: SGS-SAR Lab

System Performance Check D5.25GHz Body

DUT: D5GHzV2; Type: D5GHzV2; Serial: 1165

Communication System: UID 0, CW (0); Frequency: 5250 MHz;Duty Cycle: 1:1

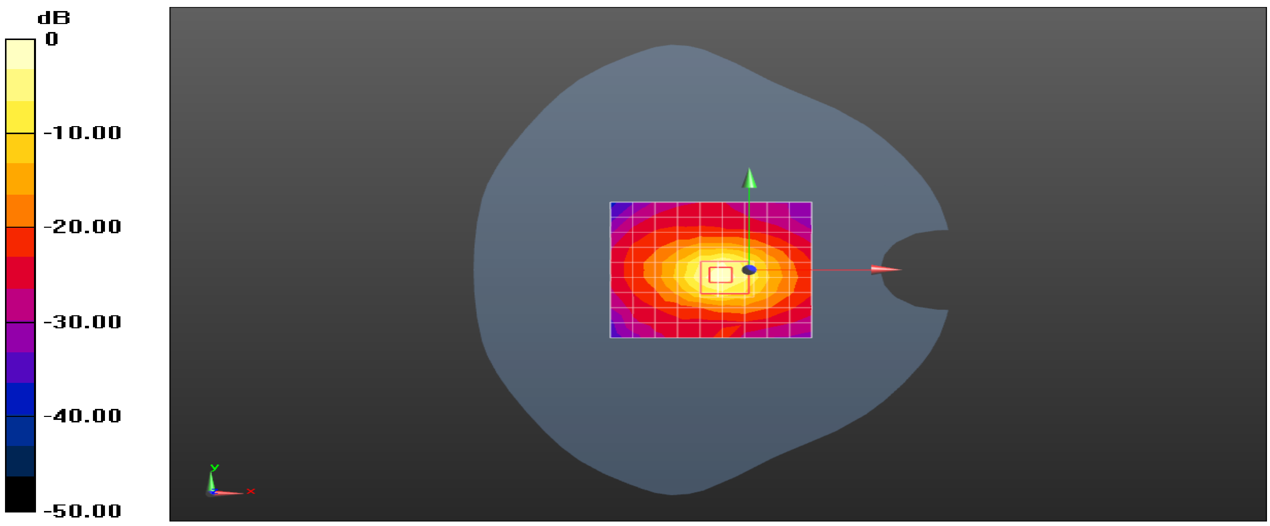
Medium: MSL5G;Medium parameters used: f = 5250 MHz; σ = 5.382 S/m; ε_r = 48.368; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(5.22, 5.22, 5.22); Calibrated: 2018-01-11;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -2.0, 23.0
- Electronics: DAE4 Sn1428; Calibrated: 2018-01-17
- Phantom: SAM 2; Type: SAM V4.0; Serial: 1640
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=100mW, f=5250 MHz/Area Scan (10x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 17.9 W/kg

Body/d=10mm, Pin=100mW, f=5250 MHz/Zoom Scan (4x4x1.4mm, graded), dist=1.4mm (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 56.22 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 32.1 W/kg
SAR(1 g) = 7.32 W/kg; SAR(10 g) = 2 W/kg
Maximum value of SAR (measured) = 18.7 W/kg



0 dB = 18.7 W/kg = 12.72 dBW/kg

Date: 2018-11-15

Test Laboratory: SGS-SAR Lab

System Performance Check D5.6GHz Head

DUT: D5GHzV2; Type: D5GHzV2; Serial: 1165

Communication System: UID 0, CW (0); Frequency: 5600 MHz;Duty Cycle: 1:1

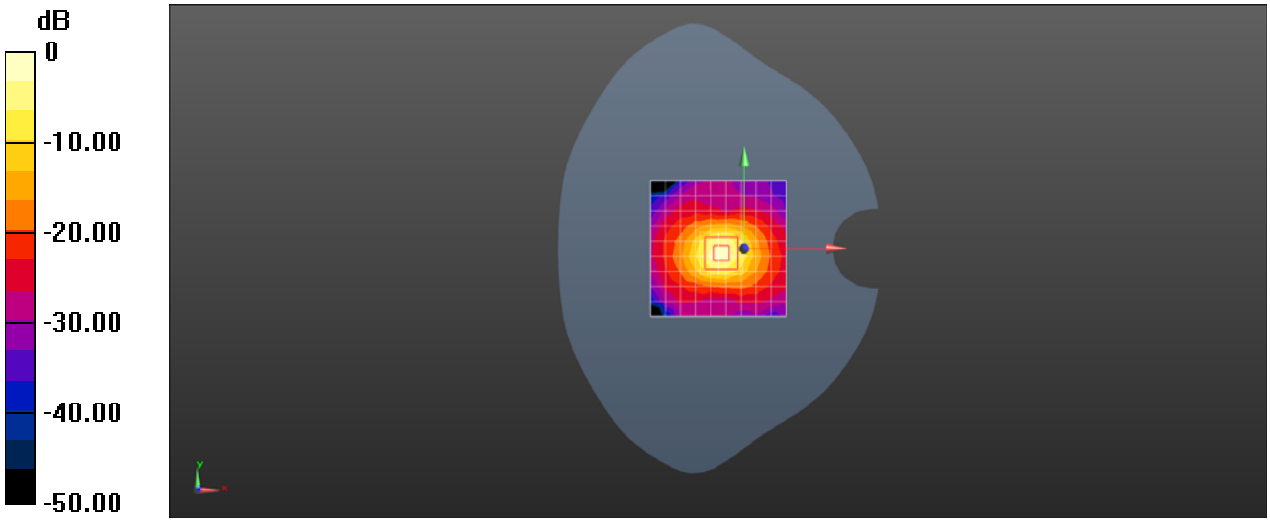
Medium: HSL5G;Medium parameters used: f = 5600 MHz; σ = 5.157 S/m; ε_r = 35.059; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(5.05, 5.05, 5.05); Calibrated: 2018-01-11;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -2.0, 23.0
- Electronics: DAE4 Sn1428; Calibrated: 2018-01-17
- Phantom: SAM 1; Type: SAM; Serial: 1912
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=100mW, f=5600 MHz/Area Scan (10x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 16.6 W/kg

Body/d=10mm, Pin=100mW, f=5600 MHz/Zoom Scan (4x4x1.4mm, graded), dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 63.24 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 35.1 W/kg
SAR(1 g) = 7.74 W/kg; SAR(10 g) = 2.18 W/kg
Maximum value of SAR (measured) = 19.4 W/kg



0 dB = 19.4 W/kg = 12.88 dBW/kg

Date: 2018-11-16

Test Laboratory: SGS-SAR Lab

System Performance Check D5.6GHz Body

DUT: D5GHzV2; Type: D5GHzV2; Serial: 1165

Communication System: UID 0, CW (0); Frequency: 5600 MHz;Duty Cycle: 1:1

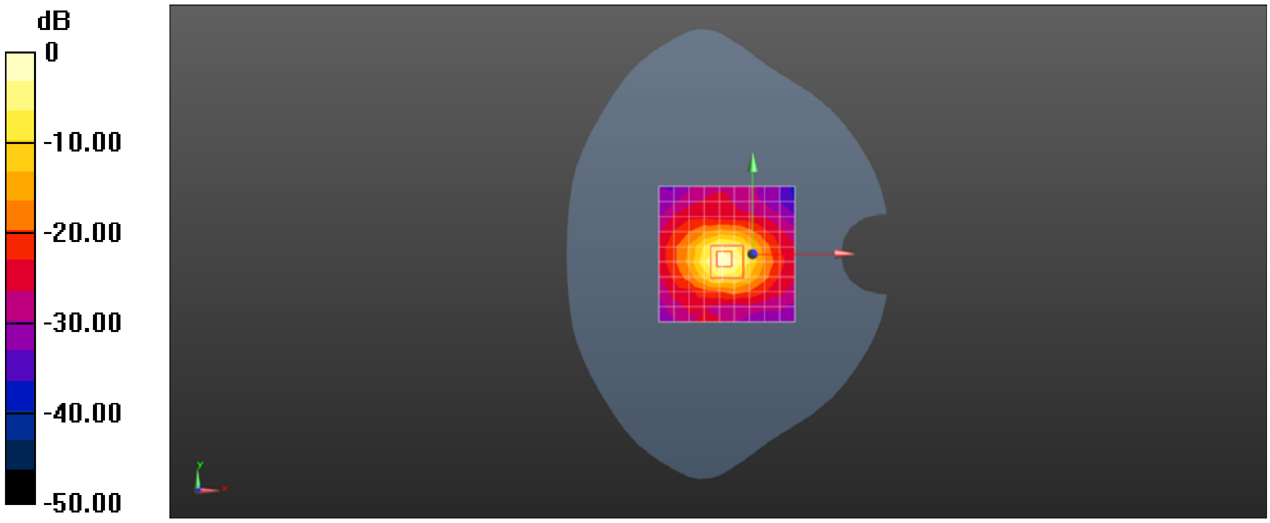
Medium: MSL5G;Medium parameters used: f = 5600 MHz; σ = 5.803 S/m; ε_r = 47.435; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(4.59, 4.59, 4.59); Calibrated: 2018-01-11;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -2.0, 23.0
- Electronics: DAE4 Sn1428; Calibrated: 2018-01-17
- Phantom: SAM 2; Type: SAM V4.0; Serial: 1640
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=100mW, f=5600 MHz/Area Scan (10x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 20.1 W/kg

Body/d=10mm, Pin=100mW, f=5600 MHz/Zoom Scan (4x4x1.4mm, graded), dist=1.4mm (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 62.96 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 40.1 W/kg
SAR(1 g) = 8.44 W/kg; SAR(10 g) = 2.29 W/kg
Maximum value of SAR (measured) = 22.4 W/kg



0 dB = 22.4 W/kg = 13.50 dBW/kg