SAR TEST REPORT

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

Equipment Under Test	Wireless Module
Brand Name	AirPrime
Model No.	HL7588
Company Name	Hong Kong AMobile Intelligent Corp. Limited Taiwan Branch
Company Address	8F.-1, No.700, Zhongzheng Rd., Zhonghe Dist., New Taipei City, 235, Taiwan
Standards	IEEE/ANSI C95.1-1992, IEEE 1528-2013, KDB865664D01v01r04,KDB865664D02v01r02, KDB941225D05v02r05,KDB447498D01v06, KDB248227D01v02r02,KDB941225D07v01r02,
FCC ID	2AQ5W-HL7588
Date of Receipt	Jan. 17, 2019
Date of Test(s)	Jan. 31, 2019 ~ Feb. 04, 2019
Date of Issue	Dec. 16, 2019

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

Remarks:

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

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

Signed on behalf of SGS

Clerk / Annie Chang	Engineer / Bond Tsai	Asst. Manager / John Yeh
Annie Chang	Bond Tsai	John Yeh

Date: Dec. 16, 2019

Revision History

Revision	Description	Issue Date
Rev.00	Initial creation of document	Mar. 28, 2019
Rev.01	Modify BT	Dec. 16, 2019

Contents

1. General Information

1.1 Testing Laboratory

SGS Taiwan Ltd. Electronics & Communication Laboratory	
1F, No. 8, Alley 15, Lane 120, Sec. 1, NeiHu Road, Neihu District, Taipei City, 11493, Taiwan	
Tel	+886-2-2299-3279
Fax	+886-2-2298-0488
Internet	http://www.tw.sgs.com/

1.2 Details of Applicant

Company Name	Hong Kong AMobile Intelligent Corp. Limited Taiwan Branch
Company Address	8F.-1, No.700, Zhongzheng Rd., Zhonghe Dist., New Taipei City, 235, Taiwan

1.3 Description of EUT

Equipment Under Test	Wireless Module			
Brand Name	AirPrime			
Model No.	HL7588			
Host Brand Name	BrainScope			
Host Model No.	GT-500BC1			
FCC ID	2AQ5W-HL7588			
Mode of Operation	☒LTE FDD ☒WLAN802.11 a/b/g/n(20M/40M) ☒Bluetooth			
Duty Cycle	LTE FDD	1		
	WLAN802.11 a/b/g/n(20M/40M)	1		
	Bluetooth	1		
TX Frequency Range (MHz)	LTE FDD Band 2	1850	–	1910
	LTE FDD Band 4	1710	–	1755
	LTE FDD Band 13	777	–	787
	WLAN802.11 b/g/n(20M)	2412	–	2462
	WLAN802.11 n(40M)	2422	–	2452
	WLAN802.11 a/n(20M) 5.2G	5180	–	5240
	WLAN802.11 n(40M) 5.2G	5190	–	5230
	WLAN802.11 a/n(20M) 5.8G	5745	–	5825
	WLAN802.11 n(40M) 5.8G	5710	–	5795
	Bluetooth	2402	–	2480
Channel Number (ARFCN)	LTE FDD Band 2	18607	–	19193
	LTE FDD Band 4	19957	–	20393
	LTE FDD Band 13	23205	–	23255

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Channel Number (ARFCN)	WLAN802.11 b/g/n(20M)	1	—	11
	WLAN802.11 n(40M)	3	—	9
	WLAN802.11 a/n(20M) 5.2G	36	—	48
	WLAN802.11 n(40M) 5.2G	38	—	46
	WLAN802.11 a/n(20M) 5.8G	149	—	165
	WLAN802.11 n(40M) 5.8G	151	—	159
	Bluetooth	0	—	78

Max. SAR (1 g) (Unit: W/Kg)				
Band	Measured	Reported	Channel	Position
LTE FDD Band 2	0.41	0.42	18700	Top side
LTE FDD Band 4	0.51	0.57	20050	Top side
LTE FDD Band 13	0.27	0.29	23230	Back side
WLAN802.11 b	0.24	0.25	6	Back side
Bluetooth	0.06	0.08	78	Back side
WLAN802.11 n(40M) 5.2G	0.30	0.31	46	Back side
WLAN802.11 n(40M) 5.8G	0.22	0.22	151	Back side

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LTE FDD Band 2 / Band 4 / Band 13 power table:

FDD Band 2								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
20	QPSK	1 RB	0	1860	18700	23.36	23.5	0
				1880	18900	22.66	23.5	0
				1900	19100	23.02	23.5	0
			50	1860	18700	22.21	23.5	0
				1880	18900	22.32	23.5	0
				1900	19100	22.77	23.5	0
			99	1860	18700	22.22	23.5	0
				1880	18900	22.22	23.5	0
				1900	19100	22.34	23.5	0
		50 RB	0	1860	18700	21.70	22.5	0-1
				1880	18900	21.67	22.5	0-1
				1900	19100	22.04	22.5	0-1
			25	1860	18700	21.55	22.5	0-1
				1880	18900	21.47	22.5	0-1
				1900	19100	21.85	22.5	0-1
			50	1860	18700	21.51	22.5	0-1
				1880	18900	21.48	22.5	0-1
				1900	19100	21.87	22.5	0-1
		100RB		1860	18700	21.72	22.5	0-1
				1880	18900	21.60	22.5	0-1
				1900	19100	22.01	22.5	0-1
	16-QAM	1 RB	0	1860	18700	21.93	22.5	0-1
				1880	18900	21.77	22.5	0-1
				1900	19100	22.24	22.5	0-1
			50	1860	18700	21.87	22.5	0-1
				1880	18900	21.86	22.5	0-1
				1900	19100	22.29	22.5	0-1
			99	1860	18700	21.79	22.5	0-1
				1880	18900	22.00	22.5	0-1
				1900	19100	21.63	22.5	0-1
		50 RB	0	1860	18700	20.91	21.5	0-2
				1880	18900	20.78	21.5	0-2
				1900	19100	21.18	21.5	0-2
			25	1860	18700	20.64	21.5	0-2
				1880	18900	20.52	21.5	0-2
				1900	19100	20.81	21.5	0-2
			50	1860	18700	20.32	21.5	0-2
				1880	18900	20.60	21.5	0-2
				1900	19100	20.74	21.5	0-2
		100RB		1860	18700	20.60	21.5	0-2
				1880	18900	20.59	21.5	0-2
				1900	19100	20.92	21.5	0-2

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FDD Band 2								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
20	64-QAM	1 RB	0	1860	18700	21.92	22.5	0-1
				1880	18900	21.76	22.5	0-1
				1900	19100	22.20	22.5	0-1
			50	1860	18700	21.80	22.5	0-1
				1880	18900	21.80	22.5	0-1
				1900	19100	22.21	22.5	0-1
			99	1860	18700	21.70	22.5	0-1
				1880	18900	21.97	22.5	0-1
				1900	19100	21.58	22.5	0-1
		50 RB	0	1860	18700	20.91	21.5	0-2
				1880	18900	20.74	21.5	0-2
				1900	19100	21.13	21.5	0-2
			25	1860	18700	20.60	21.5	0-2
				1880	18900	20.52	21.5	0-2
				1900	19100	20.78	21.5	0-2
			50	1860	18700	20.26	21.5	0-2
				1880	18900	20.56	21.5	0-2
				1900	19100	20.70	21.5	0-2
		100RB		1860	18700	20.57	21.5	0-2
				1880	18900	20.58	21.5	0-2
				1900	19100	20.91	21.5	0-2

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FDD Band 2								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
15	QPSK	1 RB	0	1857.5	18675	23.02	23.5	0
				1880	18900	22.69	23.5	0
				1902.5	19125	23.28	23.5	0
			36	1857.5	18675	22.51	23.5	0
				1880	18900	22.49	23.5	0
				1902.5	19125	22.91	23.5	0
			74	1857.5	18675	22.38	23.5	0
				1880	18900	22.53	23.5	0
				1902.5	19125	22.76	23.5	0
		36 RB	0	1857.5	18675	21.83	22.5	0-1
				1880	18900	21.69	22.5	0-1
				1902.5	19125	22.19	22.5	0-1
			18	1857.5	18675	21.63	22.5	0-1
				1880	18900	21.52	22.5	0-1
				1902.5	19125	22.01	22.5	0-1
			37	1857.5	18675	21.53	22.5	0-1
				1880	18900	21.57	22.5	0-1
				1902.5	19125	21.88	22.5	0-1
		75RB		1857.5	18675	21.66	22.5	0-1
				1880	18900	21.64	22.5	0-1
				1902.5	19125	22.05	22.5	0-1
	16-QAM	1 RB	0	1857.5	18675	22.30	22.5	0-1
				1880	18900	22.09	22.5	0-1
				1902.5	19125	22.49	22.5	0-1
			36	1857.5	18675	21.66	22.5	0-1
				1880	18900	21.68	22.5	0-1
				1902.5	19125	22.04	22.5	0-1
			74	1857.5	18675	21.70	22.5	0-1
				1880	18900	21.90	22.5	0-1
				1902.5	19125	21.98	22.5	0-1
		36 RB	0	1857.5	18675	20.79	21.5	0-2
				1880	18900	20.78	21.5	0-2
				1902.5	19125	21.17	21.5	0-2
			18	1857.5	18675	20.56	21.5	0-2
				1880	18900	20.59	21.5	0-2
				1902.5	19125	20.94	21.5	0-2
			37	1857.5	18675	20.59	21.5	0-2
				1880	18900	20.64	21.5	0-2
				1902.5	19125	20.93	21.5	0-2
		75RB		1857.5	18675	20.69	21.5	0-2
				1880	18900	20.63	21.5	0-2
				1902.5	19125	21.03	21.5	0-2

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BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
15	64-QAM	1 RB	0	1857.5	18675	22.23	22.5	0-1
				1880	18900	22.01	22.5	0-1
				1902.5	19125	22.42	22.5	0-1
			36	1857.5	18675	21.56	22.5	0-1
				1880	18900	21.67	22.5	0-1
				1902.5	19125	21.99	22.5	0-1
			74	1857.5	18675	21.60	22.5	0-1
				1880	18900	21.86	22.5	0-1
				1902.5	19125	21.89	22.5	0-1
		36 RB	0	1857.5	18675	20.78	21.5	0-2
				1880	18900	20.72	21.5	0-2
				1902.5	19125	21.07	21.5	0-2
			18	1857.5	18675	20.50	21.5	0-2
				1880	18900	20.59	21.5	0-2
				1902.5	19125	20.89	21.5	0-2
			37	1857.5	18675	20.56	21.5	0-2
				1880	18900	20.62	21.5	0-2
				1902.5	19125	20.90	21.5	0-2
		75RB		1857.5	18675	20.64	21.5	0-2
				1880	18900	20.61	21.5	0-2
				1902.5	19125	21.02	21.5	0-2

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FDD Band 2								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
10	QPSK	1 RB	0	1855	18650	22.86	23.5	0
				1880	18900	22.76	23.5	0
				1905	19150	23.20	23.5	0
			25	1855	18650	22.57	23.5	0
				1880	18900	22.47	23.5	0
				1905	19150	22.73	23.5	0
			49	1855	18650	22.47	23.5	0
				1880	18900	22.43	23.5	0
				1905	19150	22.67	23.5	0
		25 RB	0	1855	18650	21.75	22.5	0-1
				1880	18900	21.61	22.5	0-1
				1905	19150	22.00	22.5	0-1
			12	1855	18650	21.55	22.5	0-1
				1880	18900	21.51	22.5	0-1
				1905	19150	21.85	22.5	0-1
			25	1855	18650	21.45	22.5	0-1
				1880	18900	21.59	22.5	0-1
				1905	19150	21.80	22.5	0-1
		50RB		1855	18650	21.62	22.5	0-1
				1880	18900	21.61	22.5	0-1
				1905	19150	21.97	22.5	0-1
	16-QAM	1 RB	0	1855	18650	21.96	22.5	0-1
				1880	18900	22.21	22.5	0-1
				1905	19150	22.39	22.5	0-1
			25	1855	18650	22.18	22.5	0-1
				1880	18900	21.66	22.5	0-1
				1905	19150	21.97	22.5	0-1
			49	1855	18650	21.87	22.5	0-1
				1880	18900	21.73	22.5	0-1
				1905	19150	22.16	22.5	0-1
		25 RB	0	1855	18650	20.69	21.5	0-2
				1880	18900	20.61	21.5	0-2
				1905	19150	21.00	21.5	0-2
			12	1855	18650	20.60	21.5	0-2
				1880	18900	20.63	21.5	0-2
				1905	19150	20.84	21.5	0-2
			25	1855	18650	20.63	21.5	0-2
				1880	18900	20.55	21.5	0-2
				1905	19150	20.90	21.5	0-2
		50RB		1855	18650	20.59	21.5	0-2
				1880	18900	20.65	21.5	0-2
				1905	19150	20.87	21.5	0-2

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10	64-QAM	1 RB	0	1855	18650	21.95	22.5	0-1
				1880	18900	22.13	22.5	0-1
				1905	19150	22.29	22.5	0-1
			25	1855	18650	22.10	22.5	0-1
				1880	18900	21.64	22.5	0-1
				1905	19150	21.93	22.5	0-1
			49	1855	18650	21.79	22.5	0-1
				1880	18900	21.71	22.5	0-1
				1905	19150	22.10	22.5	0-1
		25 RB	0	1855	18650	20.64	21.5	0-2
				1880	18900	20.51	21.5	0-2
				1905	19150	20.91	21.5	0-2
			12	1855	18650	20.56	21.5	0-2
				1880	18900	20.56	21.5	0-2
				1905	19150	20.76	21.5	0-2
			25	1855	18650	20.60	21.5	0-2
				1880	18900	20.54	21.5	0-2
				1905	19150	20.82	21.5	0-2
		50RB		1855	18650	20.53	21.5	0-2
				1880	18900	20.63	21.5	0-2
				1905	19150	20.81	21.5	0-2

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FDD Band 2								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
5	QPSK	1 RB	0	1852.5	18625	22.63	23.5	0
				1880	18900	22.48	23.5	0
				1907.5	19175	22.82	23.5	0
			12	1852.5	18625	22.53	23.5	0
				1880	18900	22.37	23.5	0
				1907.5	19175	22.67	23.5	0
			24	1852.5	18625	22.50	23.5	0
				1880	18900	22.50	23.5	0
				1907.5	19175	22.70	23.5	0
		12 RB	0	1852.5	18625	21.73	22.5	0-1
				1880	18900	21.57	22.5	0-1
				1907.5	19175	21.94	22.5	0-1
			6	1852.5	18625	21.61	22.5	0-1
				1880	18900	21.49	22.5	0-1
				1907.5	19175	21.74	22.5	0-1
			13	1852.5	18625	21.58	22.5	0-1
				1880	18900	21.50	22.5	0-1
				1907.5	19175	21.79	22.5	0-1
		25RB		1852.5	18625	21.52	22.5	0-1
				1880	18900	21.50	22.5	0-1
				1907.5	19175	21.82	22.5	0-1
	16-QAM	1 RB	0	1852.5	18625	21.78	22.5	0-1
				1880	18900	21.88	22.5	0-1
				1907.5	19175	22.25	22.5	0-1
			12	1852.5	18625	21.79	22.5	0-1
				1880	18900	21.64	22.5	0-1
				1907.5	19175	22.46	22.5	0-1
			24	1852.5	18625	21.64	22.5	0-1
				1880	18900	21.65	22.5	0-1
				1907.5	19175	21.80	22.5	0-1
		12 RB	0	1852.5	18625	20.81	21.5	0-2
				1880	18900	20.69	21.5	0-2
				1907.5	19175	20.89	21.5	0-2
			6	1852.5	18625	20.55	21.5	0-2
				1880	18900	20.54	21.5	0-2
				1907.5	19175	20.80	21.5	0-2
			13	1852.5	18625	20.52	21.5	0-2
				1880	18900	20.60	21.5	0-2
				1907.5	19175	20.75	21.5	0-2
		25RB		1852.5	18625	20.72	21.5	0-2
				1880	18900	20.68	21.5	0-2
				1907.5	19175	20.89	21.5	0-2

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FDD Band 2								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
5	64-QAM	1 RB	0	1852.5	18625	21.73	22.5	0-1
				1880	18900	21.79	22.5	0-1
				1907.5	19175	22.22	22.5	0-1
			12	1852.5	18625	21.71	22.5	0-1
				1880	18900	21.60	22.5	0-1
				1907.5	19175	22.39	22.5	0-1
			24	1852.5	18625	21.55	22.5	0-1
				1880	18900	21.63	22.5	0-1
				1907.5	19175	21.71	22.5	0-1
		12 RB	0	1852.5	18625	20.81	21.5	0-2
				1880	18900	20.65	21.5	0-2
				1907.5	19175	20.88	21.5	0-2
			6	1852.5	18625	20.52	21.5	0-2
				1880	18900	20.49	21.5	0-2
				1907.5	19175	20.71	21.5	0-2
			13	1852.5	18625	20.48	21.5	0-2
				1880	18900	20.58	21.5	0-2
				1907.5	19175	20.73	21.5	0-2
		25RB		1852.5	18625	20.65	21.5	0-2
				1880	18900	20.59	21.5	0-2
				1907.5	19175	20.89	21.5	0-2

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FDD Band 4								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
20	QPSK	1 RB	0	1720	20050	23.02	23.5	0
				1732.5	20175	22.23	23.5	0
				1745	20300	22.52	23.5	0
			50	1720	20050	22.04	23.5	0
				1732.5	20175	21.97	23.5	0
				1745	20300	22.21	23.5	0
			99	1720	20050	22.15	23.5	0
				1732.5	20175	22.02	23.5	0
				1745	20300	22.21	23.5	0
		50 RB	0	1720	20050	21.56	22.5	0-1
				1732.5	20175	21.49	22.5	0-1
				1745	20300	21.65	22.5	0-1
			25	1720	20050	21.28	22.5	0-1
				1732.5	20175	21.31	22.5	0-1
				1745	20300	21.39	22.5	0-1
			50	1720	20050	21.26	22.5	0-1
				1732.5	20175	21.27	22.5	0-1
				1745	20300	21.37	22.5	0-1
		100RB		1720	20050	21.55	22.5	0-1
				1732.5	20175	21.44	22.5	0-1
				1745	20300	21.50	22.5	0-1
	16-QAM	1 RB	0	1720	20050	22.41	22.5	0-1
				1732.5	20175	22.11	22.5	0-1
				1745	20300	22.06	22.5	0-1
			50	1720	20050	21.65	22.5	0-1
				1732.5	20175	21.38	22.5	0-1
				1745	20300	21.61	22.5	0-1
			99	1720	20050	21.21	22.5	0-1
				1732.5	20175	21.18	22.5	0-1
				1745	20300	21.21	22.5	0-1
		50 RB	0	1720	20050	20.63	21.5	0-2
				1732.5	20175	20.53	21.5	0-2
				1745	20300	20.67	21.5	0-2
			25	1720	20050	20.27	21.5	0-2
				1732.5	20175	20.43	21.5	0-2
				1745	20300	20.44	21.5	0-2
			50	1720	20050	20.40	21.5	0-2
				1732.5	20175	20.18	21.5	0-2
				1745	20300	20.36	21.5	0-2
		100RB		1720	20050	20.44	21.5	0-2
				1732.5	20175	20.37	21.5	0-2
				1745	20300	20.57	21.5	0-2

FDD Band 4								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
20	64-QAM	1 RB	0	1720	20050	22.48	22.5	0-1
				1732.5	20175	22.09	22.5	0-1
				1745	20300	21.98	22.5	0-1
			50	1720	20050	21.56	22.5	0-1
				1732.5	20175	21.35	22.5	0-1
				1745	20300	21.56	22.5	0-1
			99	1720	20050	21.18	22.5	0-1
				1732.5	20175	21.14	22.5	0-1
				1745	20300	21.16	22.5	0-1
		50 RB	0	1720	20050	20.59	21.5	0-2
				1732.5	20175	20.46	21.5	0-2
				1745	20300	20.60	21.5	0-2
			25	1720	20050	20.26	21.5	0-2
				1732.5	20175	20.43	21.5	0-2
				1745	20300	20.39	21.5	0-2
			50	1720	20050	20.33	21.5	0-2
				1732.5	20175	20.17	21.5	0-2
				1745	20300	20.31	21.5	0-2
		100RB		1720	20050	20.34	21.5	0-2
				1732.5	20175	20.27	21.5	0-2
				1745	20300	20.48	21.5	0-2

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FDD Band 4								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
15	QPSK	1 RB	0	1717.5	20025	22.56	23.5	0
				1732.5	20175	22.58	23.5	0
				1747.5	20325	22.89	23.5	0
			36	1717.5	20025	22.27	23.5	0
				1732.5	20175	22.07	23.5	0
				1747.5	20325	22.35	23.5	0
			74	1717.5	20025	22.17	23.5	0
				1732.5	20175	22.12	23.5	0
				1747.5	20325	22.59	23.5	0
		36 RB	0	1717.5	20025	21.49	22.5	0-1
				1732.5	20175	21.52	22.5	0-1
				1747.5	20325	21.85	22.5	0-1
			18	1717.5	20025	21.36	22.5	0-1
				1732.5	20175	21.45	22.5	0-1
				1747.5	20325	21.50	22.5	0-1
			37	1717.5	20025	21.27	22.5	0-1
				1732.5	20175	21.32	22.5	0-1
				1747.5	20325	21.63	22.5	0-1
		75RB		1717.5	20025	21.37	22.5	0-1
				1732.5	20175	21.45	22.5	0-1
				1747.5	20325	21.79	22.5	0-1
	16-QAM	1 RB	0	1717.5	20025	21.90	22.5	0-1
				1732.5	20175	22.32	22.5	0-1
				1747.5	20325	22.44	22.5	0-1
			36	1717.5	20025	21.51	22.5	0-1
				1732.5	20175	21.50	22.5	0-1
				1747.5	20325	21.71	22.5	0-1
			74	1717.5	20025	21.51	22.5	0-1
				1732.5	20175	21.47	22.5	0-1
				1747.5	20325	21.94	22.5	0-1
		36 RB	0	1717.5	20025	20.52	21.5	0-2
				1732.5	20175	20.54	21.5	0-2
				1747.5	20325	20.86	21.5	0-2
			18	1717.5	20025	20.24	21.5	0-2
				1732.5	20175	20.32	21.5	0-2
				1747.5	20325	20.60	21.5	0-2
			37	1717.5	20025	20.33	21.5	0-2
				1732.5	20175	20.33	21.5	0-2
				1747.5	20325	20.62	21.5	0-2
		75RB		1717.5	20025	20.41	21.5	0-2
				1732.5	20175	20.55	21.5	0-2
				1747.5	20325	20.70	21.5	0-2

FDD Band 4								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
15	64-QAM	1 RB	0	1717.5	20025	21.82	22.5	0-1
				1732.5	20175	22.26	22.5	0-1
				1747.5	20325	22.44	22.5	0-1
			36	1717.5	20025	21.42	22.5	0-1
				1732.5	20175	21.49	22.5	0-1
				1747.5	20325	21.69	22.5	0-1
			74	1717.5	20025	21.43	22.5	0-1
				1732.5	20175	21.45	22.5	0-1
				1747.5	20325	21.93	22.5	0-1
		36 RB	0	1717.5	20025	20.51	21.5	0-2
				1732.5	20175	20.48	21.5	0-2
				1747.5	20325	20.86	21.5	0-2
			18	1717.5	20025	20.18	21.5	0-2
				1732.5	20175	20.26	21.5	0-2
				1747.5	20325	20.54	21.5	0-2
			37	1717.5	20025	20.32	21.5	0-2
				1732.5	20175	20.24	21.5	0-2
				1747.5	20325	20.59	21.5	0-2
		75RB		1717.5	20025	20.32	21.5	0-2
				1732.5	20175	20.48	21.5	0-2
				1747.5	20325	20.69	21.5	0-2

FDD Band 4								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
10	QPSK	1 RB	0	1715	20000	22.47	23.5	0
				1732.5	20175	22.41	23.5	0
				1750	20350	22.58	23.5	0
			25	1715	20000	22.24	23.5	0
				1732.5	20175	22.16	23.5	0
				1750	20350	22.46	23.5	0
			49	1715	20000	22.15	23.5	0
				1732.5	20175	22.17	23.5	0
				1750	20350	22.53	23.5	0
		25 RB	0	1715	20000	21.39	22.5	0-1
				1732.5	20175	21.37	22.5	0-1
				1750	20350	21.61	22.5	0-1
			12	1715	20000	21.24	22.5	0-1
				1732.5	20175	21.24	22.5	0-1
				1750	20350	21.57	22.5	0-1
			25	1715	20000	21.16	22.5	0-1
				1732.5	20175	21.20	22.5	0-1
				1750	20350	21.48	22.5	0-1
		50RB		1715	20000	21.32	22.5	0-1
				1732.5	20175	21.35	22.5	0-1
				1750	20350	21.52	22.5	0-1
	16-QAM	1 RB	0	1715	20000	21.99	22.5	0-1
				1732.5	20175	21.99	22.5	0-1
				1750	20350	21.95	22.5	0-1
			25	1715	20000	21.48	22.5	0-1
				1732.5	20175	21.44	22.5	0-1
				1750	20350	21.64	22.5	0-1
			49	1715	20000	21.42	22.5	0-1
				1732.5	20175	21.44	22.5	0-1
				1750	20350	21.95	22.5	0-1
		25 RB	0	1715	20000	20.41	21.5	0-2
				1732.5	20175	20.41	21.5	0-2
				1750	20350	20.67	21.5	0-2
			12	1715	20000	20.31	21.5	0-2
				1732.5	20175	20.12	21.5	0-2
				1750	20350	20.53	21.5	0-2
			25	1715	20000	20.24	21.5	0-2
				1732.5	20175	20.37	21.5	0-2
				1750	20350	20.56	21.5	0-2
		50RB		1715	20000	20.33	21.5	0-2
				1732.5	20175	20.35	21.5	0-2
				1750	20350	20.61	21.5	0-2

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FDD Band 4								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
10	64-QAM	1 RB	0	1715	20000	21.90	22.5	0-1
				1732.5	20175	21.94	22.5	0-1
				1750	20350	21.88	22.5	0-1
			25	1715	20000	21.45	22.5	0-1
				1732.5	20175	21.39	22.5	0-1
				1750	20350	21.59	22.5	0-1
			49	1715	20000	21.42	22.5	0-1
				1732.5	20175	21.35	22.5	0-1
				1750	20350	21.88	22.5	0-1
		25 RB	0	1715	20000	20.35	21.5	0-2
				1732.5	20175	20.36	21.5	0-2
				1750	20350	20.60	21.5	0-2
			12	1715	20000	20.31	21.5	0-2
				1732.5	20175	20.10	21.5	0-2
				1750	20350	20.50	21.5	0-2
			25	1715	20000	20.23	21.5	0-2
				1732.5	20175	20.35	21.5	0-2
				1750	20350	20.50	21.5	0-2
		50RB		1715	20000	20.27	21.5	0-2
				1732.5	20175	20.30	21.5	0-2
				1750	20350	20.54	21.5	0-2

FDD Band 4								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
5	QPSK	1 RB	0	1712.5	19975	22.34	23.5	0
				1732.5	20175	22.13	23.5	0
				1752.5	20375	22.37	23.5	0
			12	1712.5	19975	22.18	23.5	0
				1732.5	20175	22.08	23.5	0
				1752.5	20375	22.39	23.5	0
			24	1712.5	19975	22.22	23.5	0
				1732.5	20175	22.16	23.5	0
				1752.5	20375	22.24	23.5	0
		12 RB	0	1712.5	19975	21.35	22.5	0-1
				1732.5	20175	21.31	22.5	0-1
				1752.5	20375	21.52	22.5	0-1
			6	1712.5	19975	21.26	22.5	0-1
				1732.5	20175	21.34	22.5	0-1
				1752.5	20375	21.53	22.5	0-1
			13	1712.5	19975	21.33	22.5	0-1
				1732.5	20175	21.39	22.5	0-1
				1752.5	20375	21.52	22.5	0-1
		25RB		1712.5	19975	21.25	22.5	0-1
				1732.5	20175	21.27	22.5	0-1
				1752.5	20375	21.47	22.5	0-1
	16-QAM	1 RB	0	1712.5	19975	21.86	22.5	0-1
				1732.5	20175	21.53	22.5	0-1
				1752.5	20375	21.70	22.5	0-1
			12	1712.5	19975	21.57	22.5	0-1
				1732.5	20175	21.43	22.5	0-1
				1752.5	20375	21.73	22.5	0-1
			24	1712.5	19975	21.41	22.5	0-1
				1732.5	20175	21.57	22.5	0-1
				1752.5	20375	21.70	22.5	0-1
		12 RB	0	1712.5	19975	20.44	21.5	0-2
				1732.5	20175	20.47	21.5	0-2
				1752.5	20375	20.58	21.5	0-2
			6	1712.5	19975	20.25	21.5	0-2
				1732.5	20175	20.37	21.5	0-2
				1752.5	20375	20.56	21.5	0-2
			13	1712.5	19975	20.28	21.5	0-2
				1732.5	20175	20.31	21.5	0-2
				1752.5	20375	20.68	21.5	0-2
		25RB		1712.5	19975	20.31	21.5	0-2
				1732.5	20175	20.34	21.5	0-2
				1752.5	20375	20.59	21.5	0-2

FDD Band 4								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
5	64-QAM	1 RB	0	1712.5	19975	21.85	22.5	0-1
				1732.5	20175	21.49	22.5	0-1
				1752.5	20375	21.62	22.5	0-1
			12	1712.5	19975	21.48	22.5	0-1
				1732.5	20175	21.41	22.5	0-1
				1752.5	20375	21.68	22.5	0-1
			24	1712.5	19975	21.38	22.5	0-1
				1732.5	20175	21.54	22.5	0-1
				1752.5	20375	21.67	22.5	0-1
		12 RB	0	1712.5	19975	20.34	21.5	0-2
				1732.5	20175	20.47	21.5	0-2
				1752.5	20375	20.50	21.5	0-2
			6	1712.5	19975	20.16	21.5	0-2
				1732.5	20175	20.27	21.5	0-2
				1752.5	20375	20.52	21.5	0-2
			13	1712.5	19975	20.22	21.5	0-2
				1732.5	20175	20.27	21.5	0-2
				1752.5	20375	20.67	21.5	0-2
		25RB		1712.5	19975	20.21	21.5	0-2
				1732.5	20175	20.33	21.5	0-2
				1752.5	20375	20.56	21.5	0-2

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FDD Band 13								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
10	QPSK	1 RB	0	782	23230	21.87	22.5	0
			25	782	23230	22.12	22.5	0
			49	782	23230	21.53	22.5	0
		25 RB	0	782	23230	21.27	21.5	0-1
			12	782	23230	21.25	21.5	0-1
			25	782	23230	21.13	21.5	0-1
		50RB		782	23230	21.24	21.5	0-1
	16-QAM	1 RB	0	782	23230	21.16	21.5	0-1
			25	782	23230	21.45	21.5	0-1
			49	782	23230	21.07	21.5	0-1
		25 RB	0	782	23230	20.31	20.5	0-2
			12	782	23230	20.24	20.5	0-2
			25	782	23230	20.09	20.5	0-2
		50RB		782	23230	20.19	20.5	0-2
	64-QAM	1 RB	0	782	23230	21.06	21.5	0-1
			25	782	23230	21.49	21.5	0-1
			49	782	23230	21.06	21.5	0-1
		25 RB	0	782	23230	20.24	20.5	0-2
			12	782	23230	20.23	20.5	0-2
			25	782	23230	20.00	20.5	0-2
		50RB		782	23230	20.16	20.5	0-2

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FDD Band 13								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
5	QPSK	1 RB	0	779.5	23205	22.09	22.5	0
				782	23230	22.17	22.5	0
				784.5	23255	22.17	22.5	0
			12	779.5	23205	22.01	22.5	0
				782	23230	22.08	22.5	0
				784.5	23255	21.91	22.5	0
			24	779.5	23205	21.97	22.5	0
				782	23230	21.97	22.5	0
				784.5	23255	21.99	22.5	0
		12 RB	0	779.5	23205	21.19	21.5	0-1
				782	23230	21.14	21.5	0-1
				784.5	23255	21.14	21.5	0-1
			6	779.5	23205	21.15	21.5	0-1
				782	23230	21.23	21.5	0-1
				784.5	23255	21.17	21.5	0-1
			13	779.5	23205	21.18	21.5	0-1
				782	23230	21.18	21.5	0-1
				784.5	23255	21.05	21.5	0-1
		25RB		779.5	23205	21.13	21.5	0-1
				782	23230	21.21	21.5	0-1
				784.5	23255	21.09	21.5	0-1
	16-QAM	1 RB	0	779.5	23205	21.47	21.5	0-1
				782	23230	21.32	21.5	0-1
				784.5	23255	21.44	21.5	0-1
			12	779.5	23205	21.35	21.5	0-1
				782	23230	21.31	21.5	0-1
				784.5	23255	21.45	21.5	0-1
			24	779.5	23205	21.45	21.5	0-1
				782	23230	21.50	21.5	0-1
				784.5	23255	21.18	21.5	0-1
		12 RB	0	779.5	23205	20.36	20.5	0-2
				782	23230	20.20	20.5	0-2
				784.5	23255	20.22	20.5	0-2
			6	779.5	23205	20.19	20.5	0-2
				782	23230	20.15	20.5	0-2
				784.5	23255	20.06	20.5	0-2
			13	779.5	23205	20.08	20.5	0-2
				782	23230	20.14	20.5	0-2
				784.5	23255	20.03	20.5	0-2
		25RB		779.5	23205	20.26	20.5	0-2
				782	23230	20.05	20.5	0-2
				784.5	23255	20.10	20.5	0-2

FDD Band 13								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
5	64-QAM	1 RB	0	779.5	23205	21.49	21.5	0-1
				782	23230	21.29	21.5	0-1
				784.5	23255	21.37	21.5	0-1
			12	779.5	23205	21.35	21.5	0-1
				782	23230	21.30	21.5	0-1
				784.5	23255	21.46	21.5	0-1
			24	779.5	23205	21.41	21.5	0-1
				782	23230	21.50	21.5	0-1
				784.5	23255	21.15	21.5	0-1
		12 RB	0	779.5	23205	20.29	20.5	0-2
				782	23230	20.13	20.5	0-2
				784.5	23255	20.18	20.5	0-2
			6	779.5	23205	20.12	20.5	0-2
				782	23230	20.07	20.5	0-2
				784.5	23255	20.05	20.5	0-2
			13	779.5	23205	20.07	20.5	0-2
				782	23230	20.12	20.5	0-2
				784.5	23255	20.00	20.5	0-2
		25RB		779.5	23205	20.24	20.5	0-2
				782	23230	20.04	20.5	0-2
				784.5	23255	20.04	20.5	0-2

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WLAN

Main Antenna						
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
2450 MHz	802.11b	1	2412	1Mbps	12.00	11.97
		6	2437		12.00	11.98
		11	2462		12.00	11.89
	802.11g	1	2412	6Mbps	12.00	11.95
		6	2437		12.00	11.88
		11	2462		12.00	11.92
	802.11n20-HT0	1	2412	MCS0	12.00	11.89
		6	2437		12.00	11.93
		11	2462		12.00	11.90
	802.11n40-HT0	3	2422	MCS0	12.00	11.94
		6	2437		12.00	11.87
		9	2452		12.00	11.91

Main Antenna						
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
5.15-5.25 GHz	802.11a	36	5180	6Mbps	12.00	11.94
		44	5220		12.00	11.92
		48	5240		12.00	11.91
	802.11n20-HT0	36	5180	MCS0	12.00	11.88
		44	5220		12.00	11.92
		48	5240		12.00	11.94
	802.11n40-HT0	38	5190	MCS0	12.00	11.93
		46	5230		12.00	11.96

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Main Antenna						
Mode	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
5800 MHz	802.11a	149	5745	6Mbps	12.00	11.95
		157	5785		12.00	11.93
		165	5825		12.00	11.88
	802.11n20-HT0	149	5745	MCS0	12.00	11.91
		157	5785		12.00	11.90
		165	5825		12.00	11.94
	802.11n40-HT0	151	5755	MCS0	12.00	11.96
		159	5795		12.00	11.92

Bluetooth conducted power table:

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)			Max. Rated Avg. Power + Max. Tolerance (dBm)
			1Mbps	2Mbps	3Mbps	
BR/EDR	CH 00	2402	6.45	3.64	3.50	7.5
	CH 39	2441	7.01	4.20	4.06	
	CH 78	2480	6.53	3.70	3.56	

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)	Max. Rated Avg. Power + Max. Tolerance (dBm)
			GFSK	
LE	CH 00	2402	-1.05	2.5
	CH 19	2440	2.19	
	CH 39	2480	-1.42	

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1.4 Test Environment

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

1.5 Operation Description

For WWAN, the EUT is controlled by using a Radio Communication Tester, and the communication between the EUT and the tester is established by air link.
For WLAN, using chipset specific software to control the EUT, and makes it transmit in maximum power. The EUT is set to maximum power level during all tests, and at the beginning of each test the battery is fully charged.

WWAN / WLAN

Based on KDB941225D07v01r02, the device was tested for 1-g SAR on all surfaces and side edges with a transmitting antenna located at ≤ 25 mm from that surface or edge, at 5 mm separation from a flat phantom to determine SAR compliance.

Note:

1. 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.
2. 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

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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.

802.11b DSSS SAR Test Requirements:

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

4. 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.

802.11g/n OFDM SAR Test Exclusion Requirements:

5. SAR is not required for 802.11g/n since the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

Initial Test Configuration:

6. 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.

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

8. Since the highest reported SAR for the initial test configuration 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 subsequent test configuration.

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 ≤ 100 MHz.
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)

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1.6 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). The model EX3DV4 field probe is 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.

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 intissue simulating liquid. The probe is equipped with an optical surface detector system.
3. A 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.

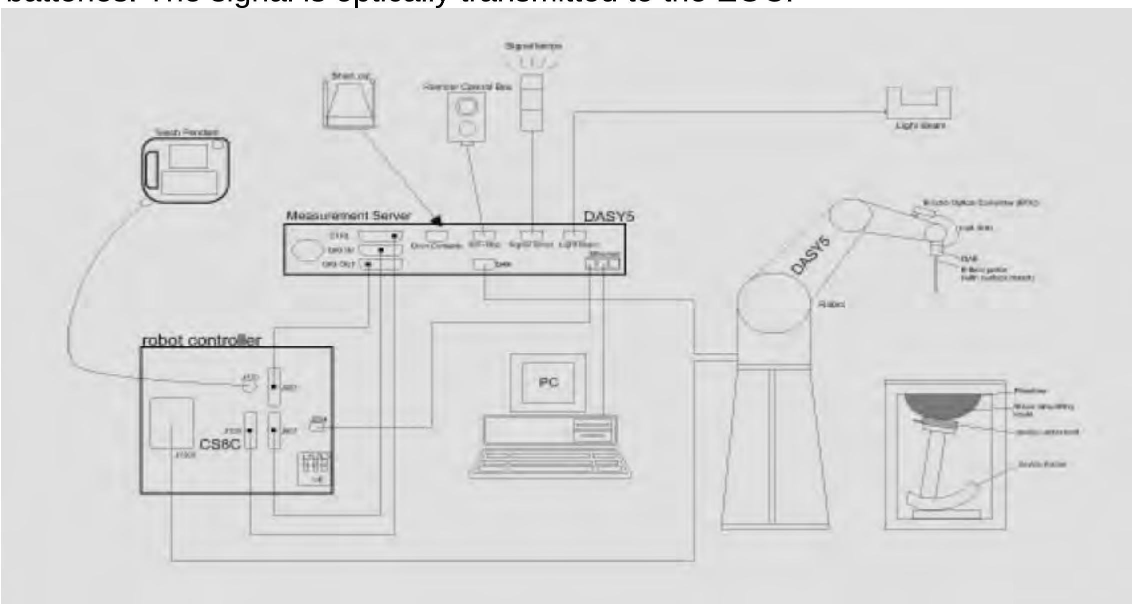

Fig. a The block diagram of SAR system

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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 Windows 7.
8. DASY 5 software.
9. Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
10. Tissue simulating liquid mixed according to the given recipes.
11. Validation dipole kits allowing to validate the proper functioning of the system.

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1.7 System Components

EX3DV4 E-Field Probe

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	Basic Broad Band Calibration in air Conversion Factors (CF) for HSL 750/1750/1900/2450/5200/5800 MHz Additional CF for other liquids and frequencies upon request
Frequency	10 MHz to > 6 GHz
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 µW/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 µW/g)
Dimensions	Tip diameter: 2.5 mm
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.

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PHANTOM

Model	ELI	
Construction	The ELI phantom is used for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.	
Shell Thickness	2 ± 0.2 mm	
Filling Volume	Approx. 30 liters	
Dimensions	Major axis: 600 mm Minor axis: 400 mm	

DEVICE HOLDER

Construction	The device holder (Supporter) for Notebook is made by POM (polyoxymethylene resin) , which is non-metal and non-conductive. The height can be adjusted to fit varies kind of notebooks.	 Device Holder

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1.8 SAR System Verification

The microwave circuit arrangement for system verification is sketched in Fig. b. The daily system accuracy verification occurs within the flat section of the SAM phantom. A SAR measurement was performed to see if the measured SAR was within +/- 10% from the target SAR values. These tests were done at 750/1750/1900/2450/5200/5800 MHz. The tests were conducted on the same days as the measurement of the DUT. The obtained results from the system accuracy verification are displayed in the table 1 (SAR values are normalized to 1W forward power delivered to the dipole). During the tests, the liquid depth above the ear reference points was ≥ 15 cm ± 5 mm (frequency ≤ 3 GHz) or ≥ 10 cm ± 5 mm (frequency > 3 G Hz) 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.

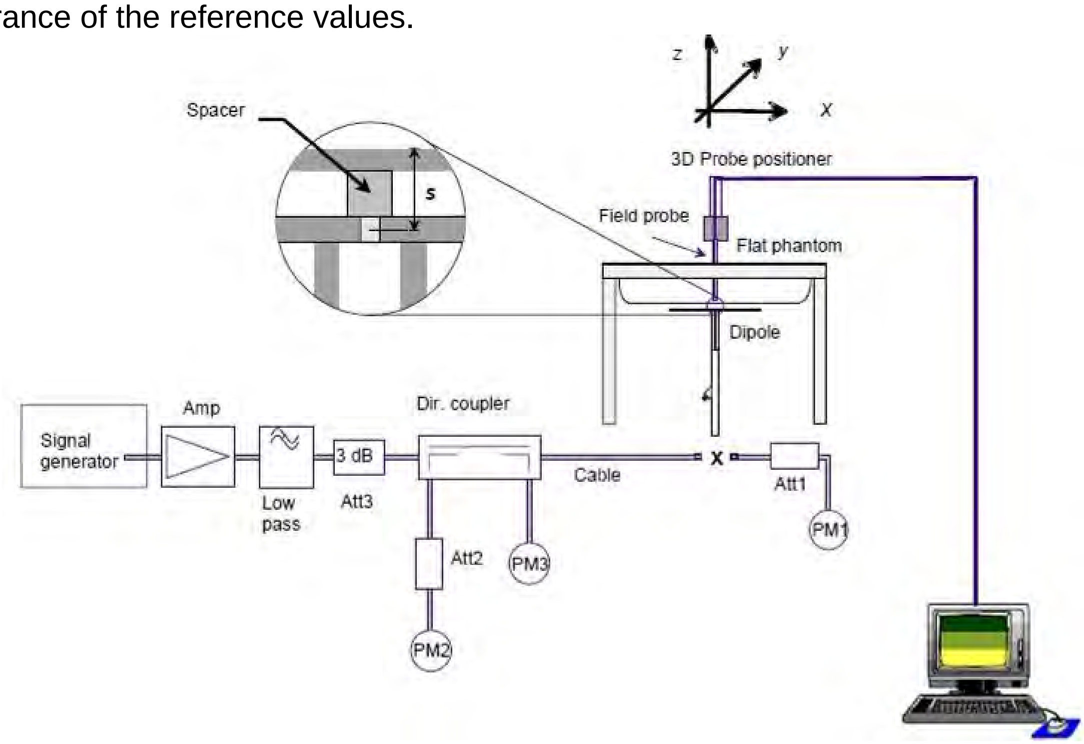

Fig. b The block diagram of system verification

Validation Kit	S/N	Frequency (MHz)		1W Target SAR-1g (mW/g)	Pin=250mW Measured SAR-1g (mW/g)	Measured SAR-1g normalized to 1W (mW/g)	Deviation (%)	Measured Date
D750V3	1015	750	Body	8.62	2.19	8.76	1.62%	Jan. 31, 2019
D1750V2	1008	1750	Body	37	9.11	36.44	-1.51%	Feb. 01, 2019
D1900V2	5d173	1900	Body	40.9	9.99	39.96	-2.30%	Feb. 01, 2019
D2450V2	727	2450	Body	50.8	12.5	50	-1.57%	Feb. 02, 2019
Validation Kit	**S/N**	**Frequency (MHz)**		**1W Target SAR-1g (mW/g)**	**Pin=100mW Measured SAR-1g (mW/g)**	**Measured SAR-1g normalized to 1W (mW/g)**	**Deviation (%)**	**Measured Date**
D5GHzV2	1040	5200	Body	75.2	7.59	75.9	0.93%	Feb. 03, 2019
		5800	Body	77.3	7.78	77.8	0.65%	Feb. 04, 2019

Table 1. Results of system verification

1.9 Tissue Simulant Fluid for the Frequency Band

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

All dielectric parameters of tissue simulates were measured within 24 hours of SAR measurements. The measured conductivity and permittivity are all within ± 5% of the target values.

The depth of the tissue simulant in the flat section of the phantom was ≥ 15 cm ± 5 mm (Frequency ≤3G) or ≥ 10 cm ± 5 mm (Frequency >3G) during all tests. (Fig. 2)

Tissue Type	Measurement Date	Measured Frequency (MHz)	Target Dielectric Constant, εr	Target Conductivity, σ (S/m)	Measured Dielectric Constant, εr	Measured Conductivity, σ (S/m)	% dev εr	% dev σ
Body	Jan, 31. 2019	750	55.531	0.963	54.899	0.947	1.14%	1.70%
		782	55.406	0.966	54.903	0.951	0.91%	1.54%
	Feb, 01. 2019	1720	53.511	1.469	54.004	1.472	-0.92%	-0.17%
		1732.5	53.478	1.477	53.971	1.486	-0.92%	-0.58%
		1745	53.445	1.485	53.942	1.488	-0.93%	-0.18%
		1750	53.432	1.488	53.923	1.493	-0.92%	-0.31%
		1860	53.300	1.520	53.798	1.525	-0.93%	-0.33%
		1880	53.300	1.520	53.795	1.525	-0.93%	-0.33%
		1900	53.300	1.520	53.794	1.527	-0.93%	-0.46%
	Feb, 02. 2019	2402	52.764	1.904	52.745	1.888	0.04%	0.85%
		2412	52.751	1.914	52.735	1.903	0.03%	0.56%
		2437	52.717	1.938	52.687	1.928	0.06%	0.49%
		2441	52.712	1.941	52.645	1.928	0.13%	0.69%
		2450	52.700	1.950	52.643	1.937	0.11%	0.67%
		2462	52.685	1.967	52.627	1.948	0.11%	0.97%
		2480	52.662	1.993	52.607	1.976	0.10%	0.83%
	Feb, 03. 2019	5190	49.028	5.288	49.298	5.316	-0.55%	-0.54%
		5200	49.014	5.299	49.294	5.328	-0.57%	-0.54%
		5230	48.974	5.334	49.274	5.359	-0.61%	-0.46%
	Feb, 04. 2019	5755	48.261	5.947	48.571	5.973	-0.64%	-0.43%
		5795	48.207	5.994	48.534	6.021	-0.68%	-0.45%
		5800	48.200	6.000	48.530	6.027	-0.68%	-0.45%

Table 2. Dielectric Parameters of Tissue Simulant Fluid

The composition of the body tissue simulating liquid:

Frequency (MHz)	Mode	Ingredient						Total amount
		DGMBE	Water	Salt	Preventol D-7	Cellulose	Sugar	
750	Body	–	631.68 g	11.72 g	1.2 g	–	600 g	1.0L(Kg)
1750	Body	300.67 g	716.56 g	4.0 g	–	–	–	1.0L(Kg)
1900	Body	300.67 g	716.56 g	4.0 g	–	–	–	1.0L(Kg)
2450	Body	301.7 g	698.3 g	–	–	–	–	1.0L(Kg)

Body Simulating Liquids for 5 GHz, Manufactured by SPEAG:

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

Table 3. Recipes for Tissue Simulating Liquid

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1.10 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

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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.

1.11 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:

1.11.1 Transfer Calibration with Temperature Probes

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

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

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

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

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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].

1.11.2 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.

1.12 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 an 10 grams of tissue (defined as a tissue volume in the shape of a cube).
2. 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.
3. 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 4.)

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.

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2. Summary of Results

2.1 Decision rules

Reported measurement data comply with IEEE 1528-2013:
Determining compliance shall be based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.2 Summary of Results

LTE FDD Band 2

Mode	Bandwidth (MHz)	Modulation	RB Size	RB start	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
												Measured	Reported	
LTE Band 2	20MHz	QPSK	1 RB	0	Front side	5	18700	1860	23.5	23.36	3.28%	0.028	0.029	-
					Back side	5	18700	1860	23.5	23.36	3.28%	0.272	0.281	-
					Top side	5	18700	1860	23.5	23.36	3.28%	0.410	0.423	55
					Top side	5	18900	1880	23.5	22.66	21.34%	0.343	0.416	-
					Top side	5	19100	1900	23.5	23.02	11.69%	0.355	0.396	-
					Bottom side	5	18700	1860	23.5	23.36	3.28%	0.040	0.041	-
					Right side	5	18700	1860	23.5	23.36	3.28%	0.242	0.250	-
					Left side	5	18700	1860	23.5	23.36	3.28%	0.019	0.019	-
			50 RB	0	Front side	5	19100	1900	22.5	22.04	11.17%	0.019	0.021	-
					Back side	5	19100	1900	22.5	22.04	11.17%	0.200	0.222	-
					Top side	5	19100	1900	22.5	22.04	11.17%	0.359	0.399	-
					Bottom side	5	19100	1900	22.5	22.04	11.17%	0.041	0.046	-
					Right side	5	19100	1900	22.5	22.04	11.17%	0.217	0.241	-
					Left side	5	19100	1900	22.5	22.04	11.17%	0.019	0.021	-
			100 RB		Front side	5	19100	1900	22.5	22.01	11.94%	0.017	0.019	-
					Back side	5	19100	1900	22.5	22.01	11.94%	0.187	0.209	-
					Top side	5	19100	1900	22.5	22.01	11.94%	0.345	0.386	-
					Bottom side	5	19100	1900	22.5	22.01	11.94%	0.038	0.043	-
					Right side	5	19100	1900	22.5	22.01	11.94%	0.213	0.238	-
					Left side	5	19100	1900	22.5	22.01	11.94%	0.018	0.020	-

LTE FDD Band 4

Mode	Bandwidth (MHz)	Modulation	RB Size	RB start	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
												Measured	Reported	
LTE Band 4	20MHz	QPSK	1 RB	0	Front side	5	20050	1720	23.5	23.02	11.69%	0.048	0.054	-
					Back side	5	20050	1720	23.5	23.02	11.69%	0.470	0.525	-
					Top side	5	20050	1720	23.5	23.02	11.69%	0.512	0.572	56
					Top side	5	20175	1732.5	23.5	22.23	33.97%	0.421	0.564	-
					Top side	5	20300	1745	23.5	22.52	25.31%	0.432	0.541	-
					Bottom side	5	20050	1720	23.5	23.02	11.69%	0.024	0.027	
					Right side	5	20050	1720	23.5	23.02	11.69%	0.106	0.118	-
					Left side	5	20050	1720	23.5	23.02	11.69%	0.013	0.015	-
			50 RB	25	Front side	5	20300	1745	22.5	21.65	21.62%	0.031	0.038	-
					Back side	5	20300	1745	22.5	21.65	21.62%	0.307	0.373	-
					Top side	5	20300	1745	22.5	21.65	21.62%	0.353	0.429	-
					Bottom side	5	20300	1745	22.5	21.65	21.62%	0.012	0.015	-
					Right side	5	20300	1745	22.5	21.65	21.62%	0.091	0.111	-
					Left side	5	20300	1745	22.5	21.65	21.62%	0.008	0.010	-
			100 RB		Front side	5	20050	1720	22.5	21.55	24.45%	0.036	0.045	-
					Back side	5	20050	1720	22.5	21.55	24.45%	0.368	0.458	-
					Top side	5	20050	1720	22.5	21.55	24.45%	0.382	0.475	-
					Bottom side	5	20050	1720	22.5	21.55	24.45%	0.020	0.025	-
					Right side	5	20050	1720	22.5	21.55	24.45%	0.079	0.098	-
					Left side	5	20050	1720	22.5	21.55	24.45%	0.009	0.011	-

LTE FDD Band 13

Mode	Bandwidth (MHz)	Modulation	RB Size	RB start	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
												Measured	Reported	
LTE Band 13	10MHz	QPSK	1 RB	0	Back side	5	23230	782	22.5	21.87	15.61%	0.251	0.290	-
				25	Front side	5	23230	782	22.5	22.12	9.14%	0.024	0.026	-
					Back side	5	23230	782	22.5	22.12	9.14%	0.267	0.291	57
					Top side	5	23230	782	22.5	22.12	9.14%	0.099	0.108	-
					Bottom side	5	23230	782	22.5	22.12	9.14%	0.007	0.008	-
					Right side	5	23230	782	22.5	22.12	9.14%	0.087	0.095	-
					Left side	5	23230	782	22.5	22.12	9.14%	0.184	0.201	-
				49	Back side	5	23230	782	22.5	21.53	25.03%	0.231	0.289	-
			25 RB	0	Front side	5	23230	782	21.5	21.27	5.44%	0.021	0.022	-
					Back side	5	23230	782	21.5	21.27	5.44%	0.232	0.245	-
					Top side	5	23230	782	21.5	21.27	5.44%	0.086	0.091	-
					Bottom side	5	23230	782	21.5	21.27	5.44%	0.007	0.007	-
					Right side	5	23230	782	21.5	21.27	5.44%	0.081	0.086	-
					Left side	5	23230	782	21.5	21.27	5.44%	0.159	0.168	-
			50 RB		Front side	5	23230	782	21.5	21.24	6.17%	0.022	0.023	-
					Back side	5	23230	782	21.5	21.24	6.17%	0.229	0.243	-
					Top side	5	23230	782	21.5	21.24	6.17%	0.085	0.090	-
					Bottom side	5	23230	782	21.5	21.24	6.17%	0.006	0.006	-
					Right side	5	23230	782	21.5	21.24	6.17%	0.075	0.079	-
					Left side	5	23230	782	21.5	21.24	6.17%	0.156	0.166	-

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WLAN Antenna

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
								Measured	Reported	
WLAN802.11 b	Front side	5	1	2412	12.00	11.98	100.46%	0.025	0.025	-
	Back side	5	1	2412	12.00	11.97	100.69%	0.229	0.231	-
	Back side	5	6	2437	12.00	11.98	100.46%	0.244	0.245	58
	Back side	5	11	2462	12.00	11.89	102.57%	0.234	0.240	-
	Top side	5	6	2437	12.00	11.98	100.46%	0.062	0.062	-
	Bottom side	5	6	2437	12.00	11.98	100.46%	0.004	0.004	-
	Right side	5	6	2437	12.00	11.98	100.46%	0.017	0.017	-
	Left side	5	6	2437	12.00	11.98	100.46%	0.026	0.026	-
Bluetooth (GFSK)	Front side	5	0	2402	7.50	7.01	112.04%	0.007	0.007	-
	Back side	5	0	2402	7.50	6.45	127.46%	0.055	0.070	-
	Back side	5	39	2441	7.50	7.01	112.04%	0.066	0.074	59
	Back side	5	78	2480	7.50	6.53	125.13%	0.061	0.076	-
	Top side	5	39	2441	7.50	7.01	112.04%	0.016	0.018	-
	Bottom side	5	39	2441	7.50	7.01	112.04%	0.001	0.001	-
	Right side	5	39	2441	7.50	7.01	112.04%	0.004	0.005	-
	Left side	5	39	2441	7.50	7.01	112.04%	0.007	0.007	-
WLAN802.11 n(40M) 5.2G	Front side	5	46	5230	12.00	11.96	100.93%	0.031	0.031	-
	Back side	5	38	5190	12.00	11.93	101.62%	0.298	0.303	-
	Back side	5	46	5230	12.00	11.96	100.93%	0.303	0.306	60
	Top side	5	46	5230	12.00	11.96	100.93%	0.052	0.052	-
	Bottom side	5	46	5230	12.00	11.96	100.93%	0.013	0.013	-
	Right side	5	46	5230	12.00	11.96	100.93%	0.017	0.017	-
	Left side	5	46	5230	12.00	11.96	100.93%	0.063	0.064	-
WLAN802.11 n(40M) 5.8G	Front side	5	151	5755	12.00	11.96	100.93%	0.024	0.024	-
	Back side	5	151	5755	12.00	11.96	100.93%	0.220	0.222	61
	Back side	5	159	5795	12.00	11.92	101.86%	0.211	0.215	-
	Top side	5	151	5755	12.00	11.96	100.93%	0.149	0.150	-
	Bottom side	5	151	5755	12.00	11.96	100.93%	0.013	0.013	-
	Right side	5	151	5755	12.00	11.96	100.93%	0.018	0.018	-
	Left side	5	151	5755	12.00	11.96	100.93%	0.171	0.173	-

Note:

$$\text{Scaling} = \frac{\text{reported SAR}}{\text{measured SAR}} = \frac{P2(mW)}{P1(mW)} = 10^{\left(\frac{P2-P1}{10}\right)(dBm)}$$

Reported SAR = measured SAR * (scaling)

Where P2 is maximum specified power, P1 is measured conducted power

2.3 Reporting statements of conformity

The conformity statement in this report is based solely on the test results, measurement uncertainty is excluded.

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3. Simultaneous Transmission Analysis

Simultaneous Transmission Scenarios:

NO.	Simultaneous Transmit Configurations	Body
1	LTE + WLAN 2.4GHz	YES
2	LTE + WLAN 5GHz	YES
3	LTE + BT	YES

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3.1 Estimated SAR calculation

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

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

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

3.2 SPLSR evaluation and analysis

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

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

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

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

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

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LTE FDD Band 2 + 2.4 GHz WLAN

No.	Conditions	Position	Distance (mm)	Max. WWAN	Max. WLAN	SAR Sum	SPLSR
1	LTE B2 + 2.4 GHz WLAN	Front side	5	0.029	0.025	0.054	ΣSAR<1.6, Not required
		Back side	5	0.281	0.245	0.526	ΣSAR<1.6, Not required
		Top side	5	0.423	0.062	0.485	ΣSAR<1.6, Not required
		Bottom side	5	0.046	0.004	0.050	ΣSAR<1.6, Not required
		Right side	5	0.250	0.017	0.267	ΣSAR<1.6, Not required
		Left side	5	0.021	0.026	0.047	ΣSAR<1.6, Not required

LTE FDD Band 4 + 2.4 GHz WLAN

No.	Conditions	Position	Distance (mm)	Max. WWAN	Max. WLAN	SAR Sum	SPLSR
2	LTE B4 + 2.4 GHz WLAN	Front side	5	0.054	0.025	0.079	ΣSAR<1.6, Not required
		Back side	5	0.525	0.245	0.770	ΣSAR<1.6, Not required
		Top side	5	0.572	0.062	0.634	ΣSAR<1.6, Not required
		Bottom side	5	0.027	0.004	0.031	ΣSAR<1.6, Not required
		Right side	5	0.118	0.017	0.135	ΣSAR<1.6, Not required
		Left side	5	0.014	0.026	0.040	ΣSAR<1.6, Not required

LTE FDD Band 13 + 2.4 GHz WLAN

No.	Conditions	Position	Distance (mm)	Max. WWAN	Max. WLAN	SAR Sum	SPLSR
3	LTE B13 + 2.4 GHz WLAN	Front side	5	0.026	0.025	0.051	ΣSAR<1.6, Not required
		Back side	5	0.291	0.245	0.536	ΣSAR<1.6, Not required
		Top side	5	0.108	0.062	0.170	ΣSAR<1.6, Not required
		Bottom side	5	0.008	0.004	0.012	ΣSAR<1.6, Not required
		Right side	5	0.095	0.017	0.112	ΣSAR<1.6, Not required
		Left side	5	0.201	0.026	0.227	ΣSAR<1.6, Not required

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LTE FDD Band 2 + 5 GHz WLAN

No.	Conditions	Position	Distance (mm)	Max. WWAN	Max. WLAN	SAR Sum	SPLSR
4	LTE B2 + 5 GHz WLAN	Front side	5	0.029	0.031	0.060	ΣSAR<1.6, Not required
		Back side	5	0.281	0.306	0.587	ΣSAR<1.6, Not required
		Top side	5	0.423	0.150	0.573	ΣSAR<1.6, Not required
		Bottom side	5	0.046	0.013	0.059	ΣSAR<1.6, Not required
		Right side	5	0.250	0.018	0.268	ΣSAR<1.6, Not required
		Left side	5	0.021	0.173	0.194	ΣSAR<1.6, Not required

LTE FDD Band 4 + 5 GHz WLAN

No.	Conditions	Position	Distance (mm)	Max. WWAN	Max. WLAN	SAR Sum	SPLSR
5	LTE B4 + 5 GHz WLAN	Front side	5	0.054	0.031	0.085	ΣSAR<1.6, Not required
		Back side	5	0.525	0.306	0.831	ΣSAR<1.6, Not required
		Top side	5	0.572	0.150	0.722	ΣSAR<1.6, Not required
		Bottom side	5	0.027	0.013	0.040	ΣSAR<1.6, Not required
		Right side	5	0.118	0.018	0.136	ΣSAR<1.6, Not required
		Left side	5	0.014	0.173	0.187	ΣSAR<1.6, Not required

LTE FDD Band 13 + 5 GHz WLAN

No.	Conditions	Position	Distance (mm)	Max. WWAN	Max. WLAN	SAR Sum	SPLSR
6	LTE B13 + 5 GHz WLAN	Front side	5	0.026	0.031	0.057	ΣSAR<1.6, Not required
		Back side	5	0.291	0.306	0.597	ΣSAR<1.6, Not required
		Top side	5	0.108	0.150	0.258	ΣSAR<1.6, Not required
		Bottom side	5	0.008	0.013	0.021	ΣSAR<1.6, Not required
		Right side	5	0.095	0.018	0.113	ΣSAR<1.6, Not required
		Left side	5	0.201	0.173	0.374	ΣSAR<1.6, Not required

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LTE FDD Band 2 + BT

No.	Conditions	Position	Distance (mm)	Max. WWAN	BT	SAR Sum	SPLSR
7	LTE B2 + BT	Front side	5	0.029	0.007	0.036	ΣSAR<1.6, Not required
		Back side	5	0.281	0.076	0.357	ΣSAR<1.6, Not required
		Top side	5	0.423	0.018	0.441	ΣSAR<1.6, Not required
		Bottom side	5	0.046	0.001	0.047	ΣSAR<1.6, Not required
		Right side	5	0.250	0.005	0.255	ΣSAR<1.6, Not required
		Left side	5	0.021	0.007	0.028	ΣSAR<1.6, Not required

LTE FDD Band 4 + BT

No.	Conditions	Position	Distance (mm)	Max. WWAN	BT	SAR Sum	SPLSR
8	LTE B4 + BT	Front side	5	0.054	0.007	0.061	ΣSAR<1.6, Not required
		Back side	5	0.525	0.076	0.601	ΣSAR<1.6, Not required
		Top side	5	0.572	0.018	0.590	ΣSAR<1.6, Not required
		Bottom side	5	0.027	0.001	0.028	ΣSAR<1.6, Not required
		Right side	5	0.118	0.005	0.123	ΣSAR<1.6, Not required
		Left side	5	0.014	0.007	0.021	ΣSAR<1.6, Not required

LTE FDD Band 13 + BT

No.	Conditions	Position	Distance (mm)	Max. WWAN	BT	SAR Sum	SPLSR
9	LTE B13 + BT	Front side	5	0.026	0.007	0.033	ΣSAR<1.6, Not required
		Back side	5	0.291	0.076	0.367	ΣSAR<1.6, Not required
		Top side	5	0.108	0.018	0.126	ΣSAR<1.6, Not required
		Bottom side	5	0.008	0.001	0.009	ΣSAR<1.6, Not required
		Right side	5	0.095	0.005	0.100	ΣSAR<1.6, Not required
		Left side	5	0.201	0.007	0.208	ΣSAR<1.6, Not required

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4. Instruments List

Manufacturer	Device	Type	Serial number	Date of last calibration	Date of next calibration
SPEAG	Dosimetric E-Field Probe	EX3DV4	7351	Dec.14,2018	Dec.13,2019
SPEAG	System Validation Dipole	D750V3	1015	Aug.23,2018	Aug.22,2019
		D1750V2	1008	Aug.30,2018	Aug.29,2019
		D1900V2	5d173	Apr.25,2018	Apr.24,2019
		D2450V2	727	Apr.24,2018	Apr.23,2019
		D5GHzV2	1040	Jun.28,2018	Jun.27,2019
SPEAG	Data acquisition Electronics	DAE4	1336	Aug.06,2018	Aug.05,2019
SPEAG	Software	DASY 52 V52.10.1	N/A	Calibration not required	Calibration not required
SPEAG	Phantom	ELI	N/A	Calibration not required	Calibration not required
Agilent	Network Analyzer	E5071C	MY46107530	Feb.26,2018	Feb.25,2019
Agilent	Dielectric Probe Kit	85070E	MY44300677	Calibration not required	Calibration not required
Agilent	Dual-directional coupler	772D	MY52180142	Jul.04,2018	Jul.03,2019
		778D	MY52180302	Jul.05,2018	Jul.04,2019
Agilent	RF Signal Generator	N5181A	MY50144143	Mar.15,2018	Mar.14,2019
Agilent	Power Meter	ML2496A	1326001	Aug.09,2018	Aug.02,2019
Agilent	Power Sensor	MA2411B	1315048	Aug.09,2018	Aug.02,2019
			1315049	Aug.09,2018	Aug.02,2019
TECPEL	Digital thermometer	DTM-303A	TP130075	Mar.09,2018	Mar.08,2019
Anritsu	Radio Communication Test	MT8820C	6201061014	Mar.14,2018	Mar.13,2019

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5. Measurements

Date: 2019/2/1

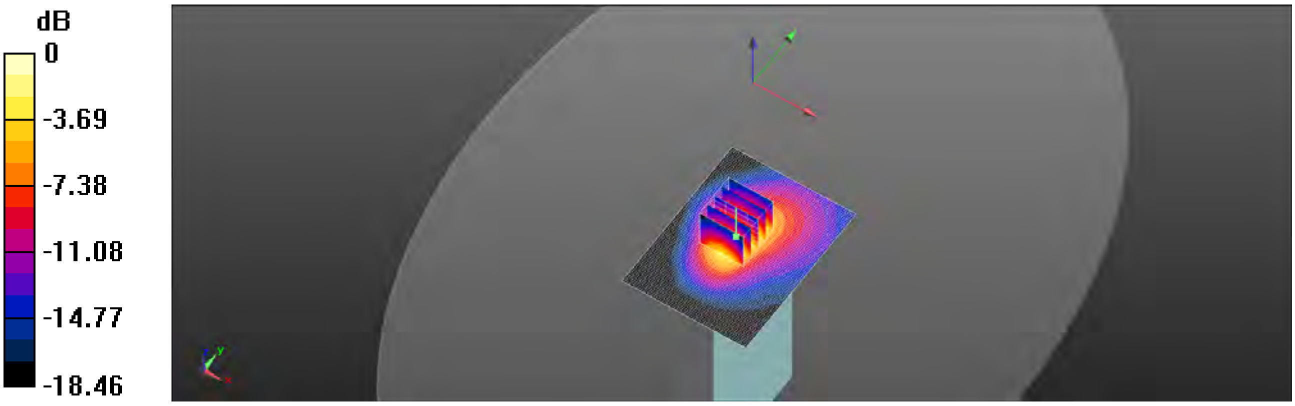
LTE Band 2 (20MHz)_Body_Top side_CH 18700_QPSK_1-0_5mm
Communication System: LTE; Frequency: 1860 MHz; Duty Cycle: 1:1
Medium parameters used: f = 1860 MHz; σ = 1.525 S/m; ε_r = 53.798; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.1°C; Liquid temperature: 21.8°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7351; ConvF(8.2, 8.2, 8.2); Calibrated: 2018/12/14
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x81x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 0.574 W/kg

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.737 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 0.722 W/kg
SAR(1 g) = 0.410 W/kg; SAR(10 g) = 0.216 W/kg
Maximum value of SAR (measured) = 0.580 W/kg



0 dB = 0.580 W/kg = -2.37 dBW/kg

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Date: 2019/2/1

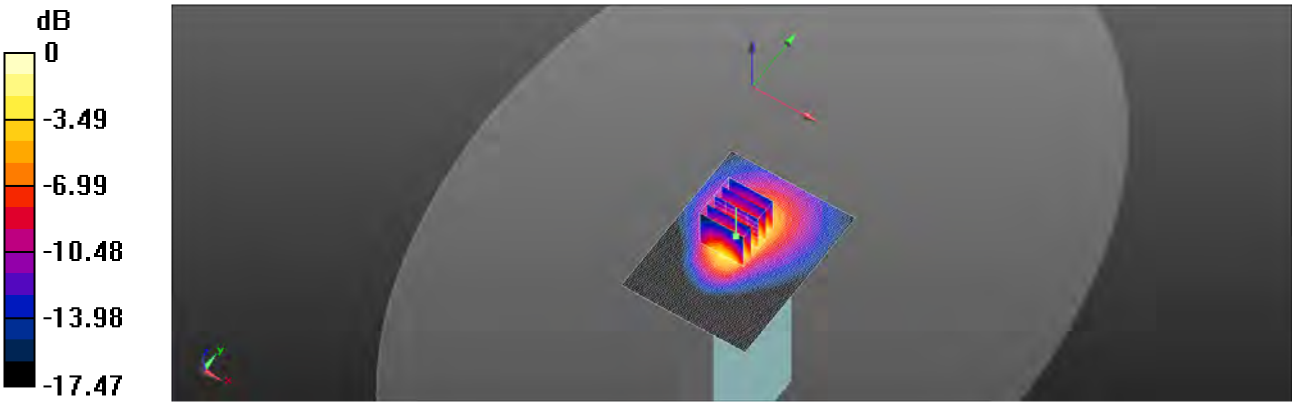
LTE Band 4 (20MHz)_Body_Top side_CH 20050_QPSK_1-0_5mm
Communication System: LTE; Frequency: 1720 MHz; Duty Cycle: 1:1
Medium parameters used: f = 1720 MHz; σ = 1.472 S/m; ε_r = 54.004; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.2°C; Liquid temperature: 21.8°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7351; ConvF(8.45, 8.45, 8.45); Calibrated: 2018/12/14
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x81x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 0.719 W/kg

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.844 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 0.902 W/kg
SAR(1 g) = 0.512 W/kg; SAR(10 g) = 0.279 W/kg
Maximum value of SAR (measured) = 0.719 W/kg



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

Date: 2019/1/31

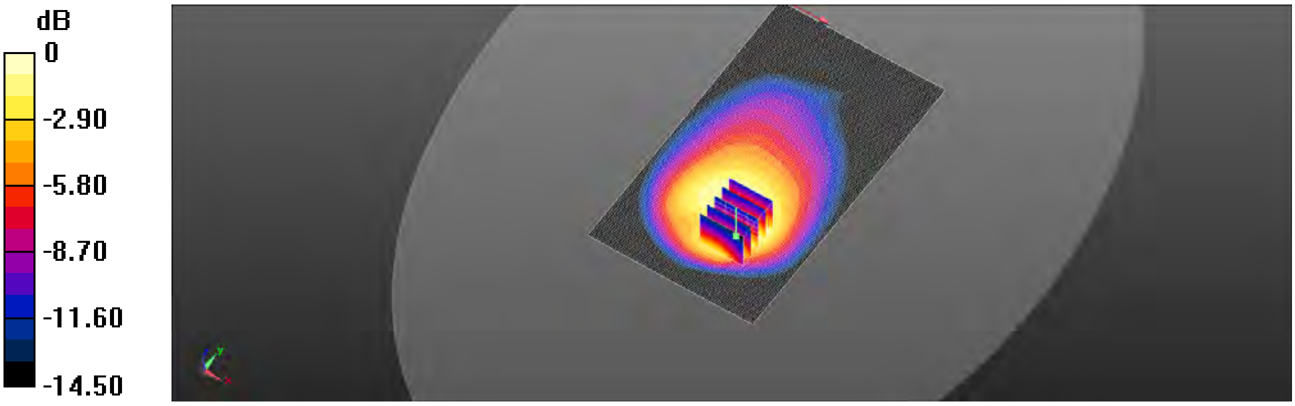
LTE Band 13 (10MHz)_Body_Back side_CH 23230_QPSK_1-25_5mm
Communication System: LTE; Frequency: 782 MHz; Duty Cycle: 1:1
Medium parameters used: f = 782 MHz; σ = 0.951 S/m; ε_r = 54.903; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.1°C; Liquid temperature: 21.6°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7351; ConvF(10.67, 10.67, 10.67); Calibrated: 2018/12/14
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (81x141x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 0.383 W/kg

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.83 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.459 W/kg
SAR(1 g) = 0.267 W/kg; SAR(10 g) = 0.160 W/kg
Maximum value of SAR (measured) = 0.357 W/kg



0 dB = 0.357 W/kg = -4.48 dBW/kg

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Date: 2019/2/2

WLAN 802.11b_Body_Back side_CH 6_5mm

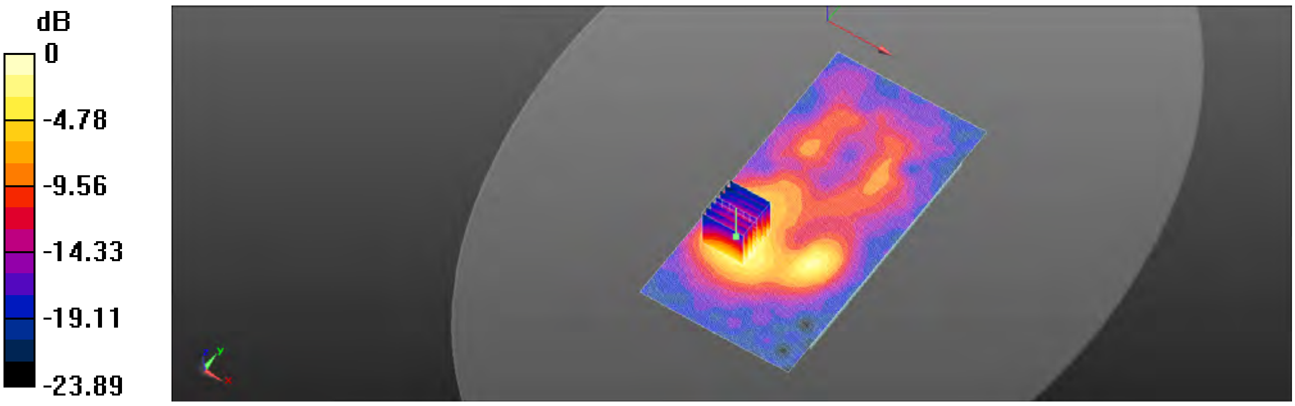
Communication System: WLAN 2.45G; Frequency: 2437 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.928 S/m; ε_r = 52.687; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.1°C; Liquid temperature: 21.8°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7351; ConvF(7.72, 7.72, 7.72); Calibrated: 2018/12/14
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (91x181x1): Interpolated grid: dx=12 mm, dy=12 mm
Maximum value of SAR (interpolated) = 0.368 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.608 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 0.482 W/kg
SAR(1 g) = 0.244 W/kg; SAR(10 g) = 0.118 W/kg
Maximum value of SAR (measured) = 0.363 W/kg



0 dB = 0.363 W/kg = -4.41 dBW/kg

Date: 2019/2/2

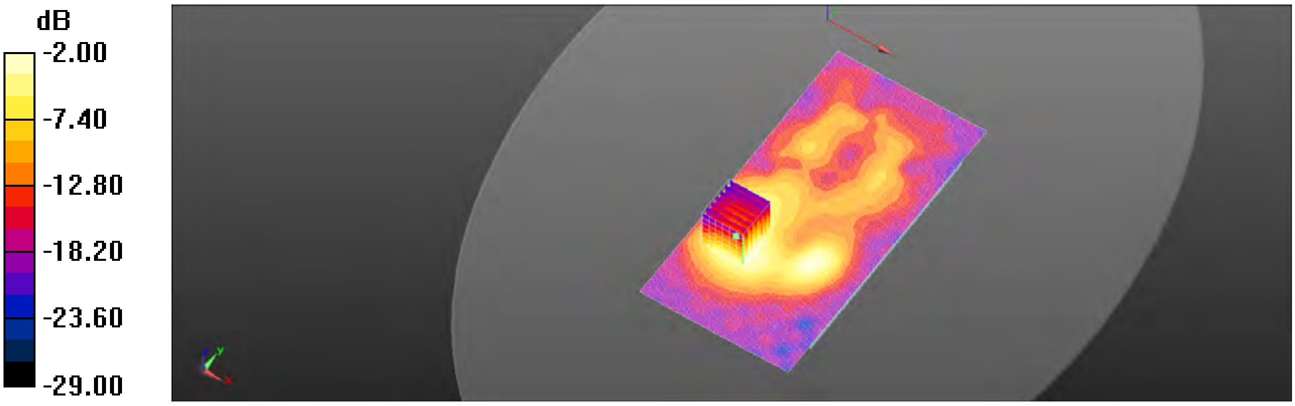
Bluetooth(GFSK)_Body_Back side_CH 39_5mm
Communication System: Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2441 MHz; σ = 1.928 S/m; ε_r = 52.645; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.1°C; Liquid temperature: 21.8°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7351; ConvF(7.72, 7.72, 7.72); Calibrated: 2018/12/14
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (91x181x1): Interpolated grid: dx=12 mm, dy=12 mm
Maximum value of SAR (interpolated) = 0.103 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.771 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.133 W/kg
SAR(1 g) = 0.066 W/kg; SAR(10 g) = 0.32 W/kg
Maximum value of SAR (measured) = 0.101 W/kg



0 dB = 0.101 W/kg = -9.44 dBW/kg

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Date: 2019/2/3

WLAN 802.11n(40M) 5.2G_Body_Back side_CH 46_5mm

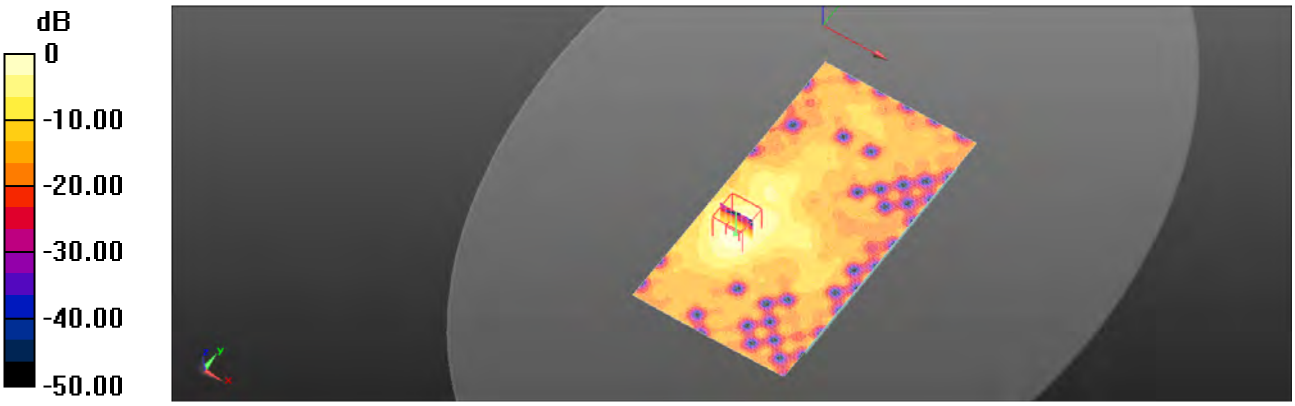
Communication System: WLAN 5G; Frequency: 5230 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5230 MHz; σ = 5.359 S/m; ε_r = 49.274; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.0°C; Liquid temperature: 21.7°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7351; ConvF(4.49, 4.49, 4.49); Calibrated: 2018/12/14
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (111x211x1): Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 0.557 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 1.410 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.15 W/kg
SAR(1 g) = 0.303 W/kg; SAR(10 g) = 0.105 W/kg
Maximum value of SAR (measured) = 0.585 W/kg



0 dB = 0.585 W/kg = -2.33 dBW/kg

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Date: 2019/2/4

WLAN 802.11n(40M) 5.8G_Body_Back side_CH 151_5mm

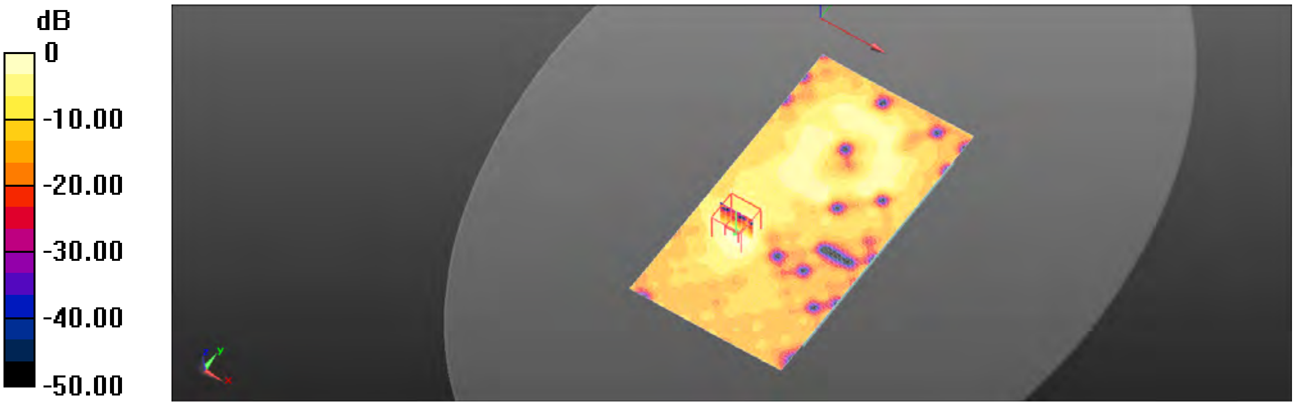
Communication System: WLAN 5G; Frequency: 5755 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5755 MHz; σ = 5.973 S/m; ε_r = 48.571; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.1°C; Liquid temperature: 21.9°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7351; ConvF(4.1, 4.1, 4.1); Calibrated: 2018/12/14
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (111x211x1): Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 0.448 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 4.956 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.00 W/kg
SAR(1 g) = 0.220 W/kg; SAR(10 g) = 0.069 W/kg
Maximum value of SAR (measured) = 0.453 W/kg



0 dB = 0.453 W/kg = -3.44 dBW/kg

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6. SAR System Performance Verification

Date: 2019/1/31

Dipole 750 MHz_SN:1015

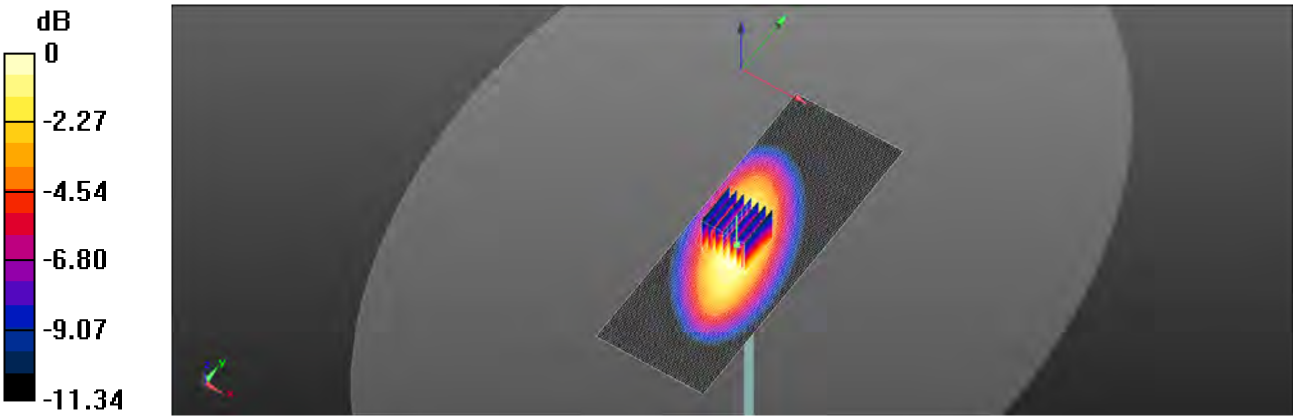
Communication System: CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium parameters used: f = 750 MHz; σ = 0.947 S/m; ε_r = 54.899; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.1°C; Liquid temperature: 21.6°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7351; ConvF(10.67, 10.67, 10.67); Calibrated: 2018/12/14
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (51x141x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 2.40 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.43 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 3.04 W/kg
SAR(1 g) = 2.19 W/kg; SAR(10 g) = 1.45 W/kg
Maximum value of SAR (measured) = 2.55 W/kg



0 dB = 2.55 W/kg = 4.07 dBW/kg

Date: 2019/2/1

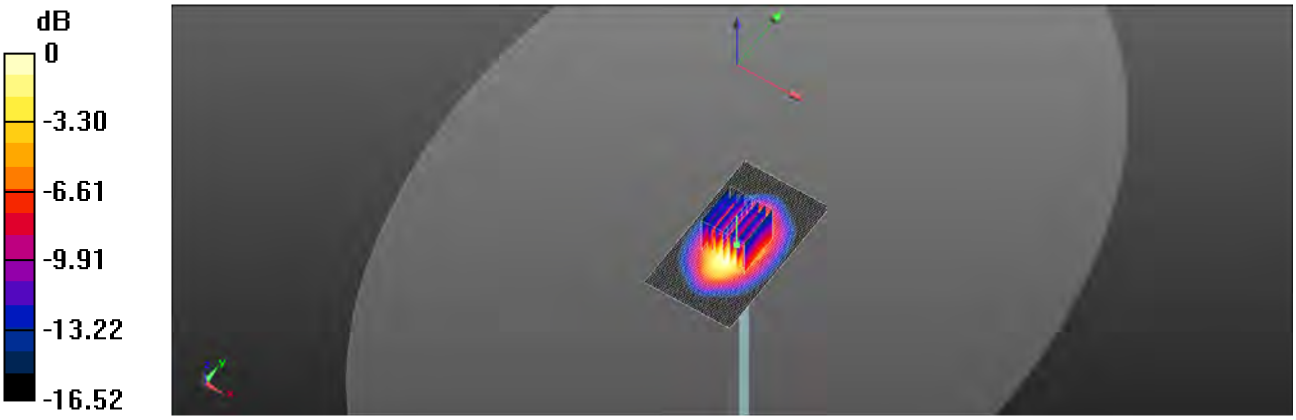
Dipole 1750 MHz_SN:1008
Communication System: CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium parameters used: f = 1750 MHz; σ = 1.493 S/m; ε_r = 53.923; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.2°C; Liquid temperature: 21.8°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7351; ConvF(8.45, 8.45, 8.45); Calibrated: 2018/12/14
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (41x71x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 13.2 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.33 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 15.7 W/kg
SAR(1 g) = 9.11 W/kg; SAR(10 g) = 4.91 W/kg
Maximum value of SAR (measured) = 12.5 W/kg



0 dB = 12.5 W/kg = 10.97 dBW/kg

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Date: 2019/2/1

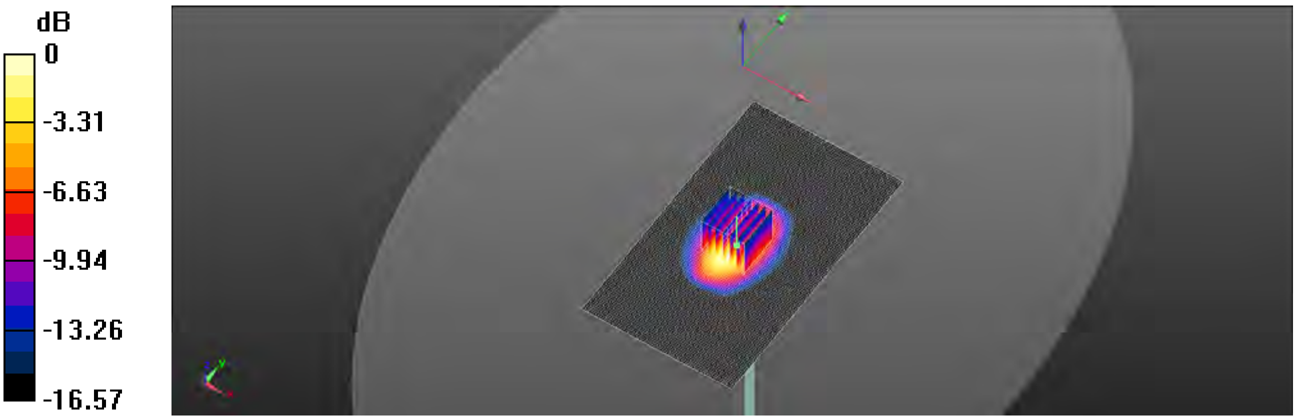
Dipole 1900 MHz_SN:5d173
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.527 S/m; ε_r = 53.794; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.1°C; Liquid temperature: 21.8°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7351; ConvF(8.2, 8.2, 8.2); Calibrated: 2018/12/14
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (71x121x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 12.7 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 90.45 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 16.0 W/kg
SAR(1 g) = 9.99 W/kg; SAR(10 g) = 5.34 W/kg
Maximum value of SAR (measured) = 13.0 W/kg



0 dB = 13.0 W/kg = 11.12 dBW/kg

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Date: 2019/2/2

Dipole 2450 MHz_SN:727

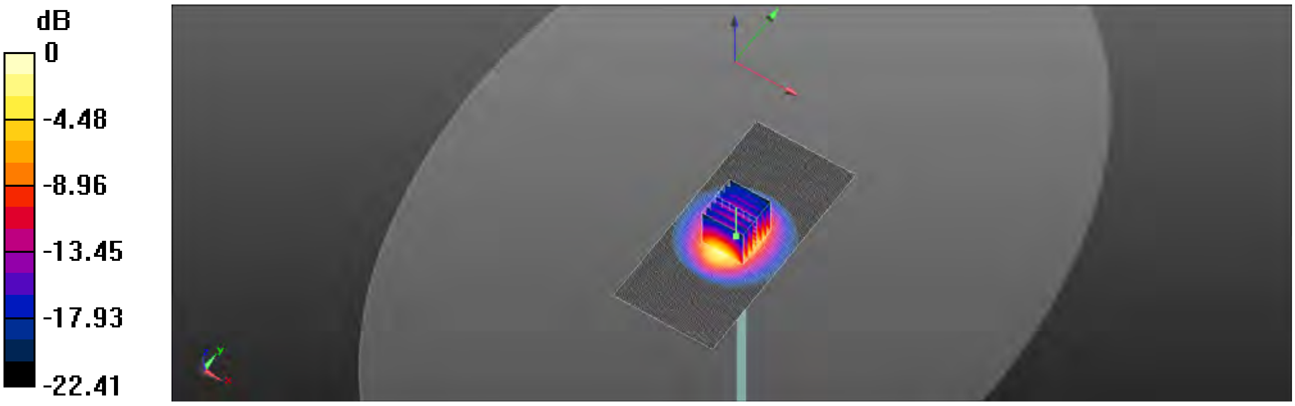
Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.937 S/m; ε_r = 52.643; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.1°C; Liquid temperature: 21.8°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7351; ConvF(7.72, 7.72, 7.72); Calibrated: 2018/12/14
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x131x1): Interpolated grid: dx=12 mm, dy=12 mm
Maximum value of SAR (interpolated) = 20.2 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 99.42 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 25.9 W/kg
SAR(1 g) = 12.5 W/kg; SAR(10 g) = 5.95 W/kg
Maximum value of SAR (measured) = 19.2 W/kg



0 dB = 19.2 W/kg = 12.83 dBW/kg

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Date: 2019/2/3

Dipole 5200 MHz_SN:1040

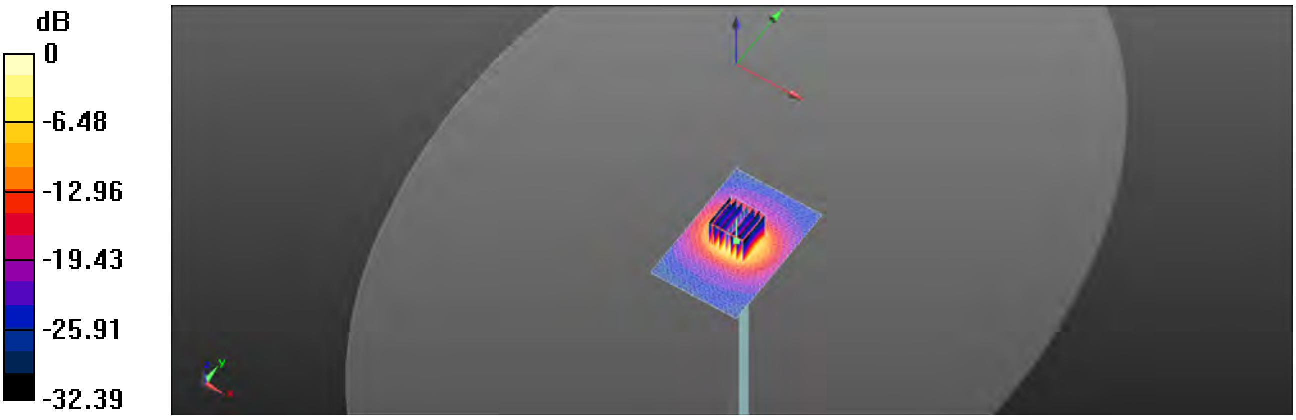
Communication System: CW; Frequency: 5200 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5200 MHz; σ = 5.328 S/m; ε_r = 49.294; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.0°C; Liquid temperature: 21.7°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7351; ConvF(4.49, 4.49, 4.49); Calibrated: 2018/12/14
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x91x1): Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 14.7 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 56.01 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 27.0 W/kg
SAR(1 g) = 7.59 W/kg; SAR(10 g) = 2.12 W/kg
Maximum value of SAR (measured) = 14.2 W/kg



0 dB = 14.2 W/kg = 11.53 dBW/kg

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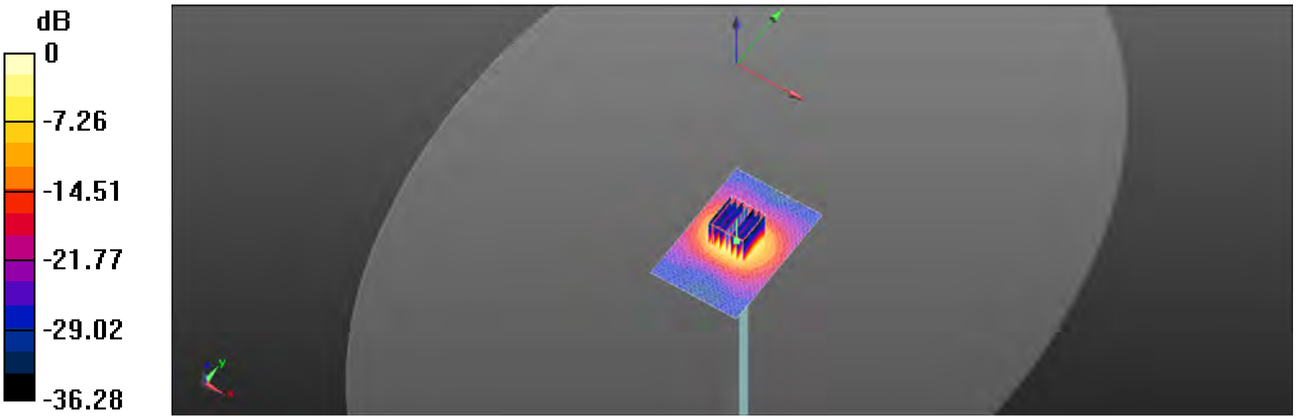
Date: 2019/2/4

Dipole 5800 MHz_SN:1040
Communication System: CW; Frequency: 5800 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5800 MHz; σ = 6.027 S/m; ε_r = 48.53; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.1°C; Liquid temperature: 21.9°C

DASY5 Configuration:
- Probe: EX3DV4 - SN7351; ConvF(4.1, 4.1, 4.1); Calibrated: 2018/12/14
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x91x1): Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 15.5 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 53.97 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 31.9 W/kg
SAR(1 g) = 7.78 W/kg; SAR(10 g) = 2.16 W/kg
Maximum value of SAR (measured) = 15.7 W/kg



0 dB = 15.7 W/kg = 11.96 dBW/kg

7. Uncertainty Budget

Measurement Uncertainty evaluation template for DUT SAR test (3-6G)

A	c	D	e		f	g	h=c * f / e	i=c * g / e	k
Source of Uncertainty	Tolerance/ Uncertainty	Probability	Div	Div Value	ci (1g)	ci (10g)	Standard uncertainty	Standard uncertainty	vi, or Veff
Measurement system									
Probe calibration	6.55%	N	1	1	1	1	6.55%	6.55%	∞
Isotropy , Axial	3.50%	R	√3	1.732	1	1	2.02%	2.02%	∞
Isotropy, Hemispherical	9.60%	R	√3	1.732	1	1	5.54%	5.54%	∞
Modulation Response	2.40%	R	√3	1.732	1	1	1.40%	1.40%	∞
Boundary Effect	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
Linearity	4.70%	R	√3	1.732	1	1	2.71%	2.71%	∞
Detection Limits	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
Readout Electronics	0.30%	N	1	1	1	1	0.30%	0.30%	∞
Response time	0.80%	R	√3	1.732	1	1	0.46%	0.46%	∞
Integration Time	2.60%	R	√3	1.732	1	1	1.50%	1.50%	∞
Measurement drift (class A evaluation)	1.75%	R	√3	1.732	1	1	1.01%	1.01%	∞
RF ambient condition - noise	3.00%	R	√3	1.732	1	1	1.73%	1.73%	∞
RF ambient conditions - reflections	3.00%	R	√3	1.732	1	1	1.73%	1.73%	∞
Probe positioner Mechanical restrictions	0.40%	R	√3	1.732	1	1	0.23%	0.23%	∞
Probe Positioning with respect to phantom	2.90%	R	√3	1.732	1	1	1.67%	1.67%	∞
Post-processing	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
Max SAR Eval	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
Test Sample related									
Test sample positioning	2.90%	N	1	1	1	1	2.90%	2.90%	M-1
Device Holder Uncertainty	3.60%	N	1	1	1	1	3.60%	3.60%	M-1
Drift of output power	5.00%	R	√3	1.732	1	1	2.89%	2.89%	∞
Phantom and Setup									
Phantom Uncertainty	4.00%	R	√3	1.732	1	1	2.31%	2.31%	∞
Liquid permittivity (mea.)	0.68%	N	1	1	0.64	0.43	0.44%	0.29%	M
Liquid Conductivity (mea.)	0.54%	N	1	1	0.6	0.49	0.32%	0.26%	M
Combined standard uncertainty		RSS					11.73%	11.71%	
Expant uncertainty (95% confidence							23.46%	23.43%	

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

A	c	D	e		f	g	h=c * f / e	i=c * g / e	k
Source of Uncertainty	Tolerance/ Uncertainty	Probability	Div	Div Value	ci (1g)	ci (10g)	Standard uncertainty	Standard uncertainty	vi, or Veff
Measurement system									
Probe calibration	6.00%	N	1	1	1	1	6.00%	6.00%	∞
Isotropy , Axial	3.50%	R	√3	1.732	1	1	2.02%	2.02%	∞
Isotropy, Hemispherical	9.60%	R	√3	1.732	1	1	5.54%	5.54%	∞
Modulation Response	2.40%	R	√3	1.732	1	1	1.40%	1.40%	∞
Boundary Effect	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
Linearity	4.70%	R	√3	1.732	1	1	2.71%	2.71%	∞
Detection Limits	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
Readout Electronics	0.30%	N	1	1	1	1	0.30%	0.30%	∞
Response time	0.80%	R	√3	1.732	1	1	0.46%	0.46%	∞
Integration Time	2.60%	R	√3	1.732	1	1	1.50%	1.50%	∞
Measurement drift (class A evaluation)	1.75%	R	√3	1.732	1	1	1.01%	1.01%	∞
RF ambient condition - noise	3.00%	R	√3	1.732	1	1	1.73%	1.73%	∞
RF ambient conditions - reflections	3.00%	R	√3	1.732	1	1	1.73%	1.73%	∞
Probe positioner Mechanical restrictions	0.40%	R	√3	1.732	1	1	0.23%	0.23%	∞
Probe Positioning with respect to phantom	2.90%	R	√3	1.732	1	1	1.67%	1.67%	∞
Post-processing	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
Max SAR Eval	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
Test Sample related									
Test sample positioning	2.90%	N	1	1	1	1	2.90%	2.90%	M-1
Device Holder Uncertainty	3.60%	N	1	1	1	1	3.60%	3.60%	M-1
Drift of output power	5.00%	R	√3	1.732	1	1	2.89%	2.89%	∞
Phantom and Setup									
Phantom Uncertainty	4.00%	R	√3	1.732	1	1	2.31%	2.31%	∞
Liquid permittivity (mea.)	1.14%	N	1	1	0.64	0.43	0.73%	0.49%	M
Liquid Conductivity (mea.)	1.70%	N	1	1	0.6	0.49	1.02%	0.83%	M
Combined standard uncertainty		RSS					11.49%	11.45%	
Expant uncertainty (95% confidence							22.97%	22.90%	

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Appendixes

Refer to separated files for the following appendixes.

E5201910031 SAR_Appendix A Photographs

E5201910031 SAR_Appendix B DAE & Probe Cal. Certificate

E5201910031 SAR_Appendix C Phantom Description & Dipole Cal. Certificate

- End of report -