

SAR TEST REPORT

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

Equipment Under Test	Tablet Computer
Marketing Name	SW5-173
Brand Name	
Model No. of Host	N15C3
Model No. of Module	7265NGW
Company Name	Acer Incorporated
Company Address	8F., No. 88, Sec. 1, Xintai 5th Rd., Xizhi, New Taipei City 22181, Taiwan (R.O.C)
Standards	IEEE /ANSI C95.1 , C95.3, IEEE 1528, KDB447498D01v05r02, KDB616217D04v01r01, KDB248227D01v02,KDB865664D01v01r03, KDB865664D02v01r01
FCC ID	HLZ7265NG
Date of Receipt	Apr. 21, 2015
Date of Test(s)	Apr. 29, 2015 ~ May. 12, 2015
Date of Issue	May. 25, 2015

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

Remarks:

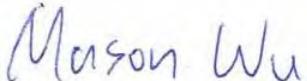
This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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Signed on behalf of SGS

Sr. Engineer

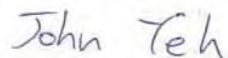
Mason Wu



Date: May. 25, 2015

Sr. Engineer

John Yeh



Date: May. 25, 2015

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Version

Report Number	Revision	Date	Memo
ES/2015/40006	00	2015/5/25	Initial creation of test report.

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

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1. General Information

1.1 Testing Laboratory

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

1.2 Details of Applicant

Company Name	Acer Incorporated
Company Address	8F., No. 88, Sec. 1, Xintai 5th Rd., Xizhi, New Taipei City 22181, Taiwan (R.O.C)

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1.3 Description of EUT

General Information of Tablet

Equipment Under Test	Tablet Computer		
Marketing Name	SW5-173		
Brand Name			
Model No. of Host	N15C3		
Model No. of Module	7265NGW		
FCC ID	HLZ7265NG		
Antenna Designation (Maximum Gain)	Main_2.4GHz: 1.19dBi, 5GHz: 2.97dBi Aux_2.4GHz: 2.98dBi, 5GHz: 2.14dBi		
Mode of Operation	<input checked="" type="checkbox"/> WLAN802.11 a/b/g/n(20M/40M)/ac(20M/40M/80M) band <input checked="" type="checkbox"/> Bluetooth		
Duty Cycle	WLAN802.11 a/b/g/n(20M/40M) / ac(20M/40M/80M)	1	
	Bluetooth	1	
TX Frequency Range (MHz)	WLAN802.11 b/g/n(20M)	2412	— 2462
	WLAN802.11 a/n(20M)/ac(20M) 5.2G	5180	— 5240
	WLAN802.11 n(40M)/ac(40M) 5.2G	5190	— 5230
	WLAN802.11 ac(80M) 5.2G	5210	
	WLAN802.11 a/n(20M)/ac(20M) 5.3G	5260	— 5320
	WLAN802.11 n(40M)/ac(40M) 5.3G	5270	— 5310
	WLAN802.11 ac(80M) 5.3G	5290	
	WLAN802.11 a/n(20M) 5.6G	5500	— 5700
	WLAN802.11 ac(20M) 5.6G	5500	— 5720
	WLAN802.11 n(40M) 5.6G	5510	— 5670
	WLAN802.11 ac(40M) 5.6G	5510	— 5710
	WLAN802.11 ac(80M) 5.6G	5530	— 5690

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TX Frequency Range (MHz)	WLAN802.11 a/n(20M)/ac(20M) 5.8G	5745	—	5825
	WLAN802.11 n(40M)/ac(40M) 5.8G	5755	—	5795
	WLAN802.11 ac(80M) 5.8G	5775		
	Bluetooth	2402	—	2480
Channel Number (ARFCN)	WLAN802.11 b/g/n(20M)	1	—	11
	WLAN802.11 a/n(20M)/ac(20M) 5.2G	36	—	48
	WLAN802.11 n(40M)/ac(40M) 5.2G	38	—	46
	WLAN802.11 ac(80M) 5.2G	42		
	WLAN802.11 a/n(20M)/ac(20M) 5.3G	52	—	64
	WLAN802.11 n(40M)/ac(40M) 5.3G	54	—	62
	WLAN802.11 ac(80M) 5.3G	58		
	WLAN802.11 a/n(20M) 5.6G	100	—	140
	WLAN802.11 ac(20M) 5.6G	100	—	144
	WLAN802.11 n(40M) 5.6G	102	—	134
	WLAN802.11 ac(40M) 5.6G	102	—	142
	WLAN802.11 ac(80M) 5.6G	106	—	138
	WLAN802.11 a/n(20M)/ac(20M) 5.8G	149	—	165
	WLAN802.11 n(40M)/ac(40M) 5.8G	151	—	159
	WLAN802.11 ac(80M) 5.8G	155		
	Bluetooth	0	—	78

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Max. SAR (1 g) (Unit: W/Kg)					
Antenna	Band	Measured	Reported	Channel	Position
Main	WLAN802.11b	1.02	1.037	11	Lap-held
	WLAN802.11a 5.2G	1.23	1.233	40	Lap-held
	WLAN802.11n (20M) 5.2G	1.32	1.332	44	Lap-held
	WLAN802.11n (40M) 5.2G	0.968	0.981	46	Lap-held
	WLAN802.11ac (20M) 5.2G	1.25	1.27	40	Lap-held
	WLAN802.11ac (40M) 5.2G	1.22	1.243	46	Lap-held
	WLAN802.11a 5.3G	1.34	1.374	52	Lap-held
	WLAN802.11n (20M) 5.3G	1.07	1.097	52	Lap-held
	WLAN802.11n (40M) 5.3G	1.27	1.318	54	Lap-held
	WLAN802.11ac (20M) 5.3G	1.48	1.501	52	Lap-held
	WLAN802.11ac (40M) 5.3G	1.36	1.395	54	Lap-held
	WLAN802.11a 5.6G	1.03	1.042	104	Lap-held
	WLAN802.11n (40M) 5.6G	1.5	1.553	134	Lap-held
	WLAN802.11ac (20M) 5.6G	1.45	1.463	104	Lap-held
	WLAN802.11ac (40M) 5.6G	1.49	1.507	110	Lap-held
	WLAN802.11ac (80M) 5.6G	1.13	1.162	138	Lap-held
	WLAN802.11a 5.8G	1.28	1.286	149	Lap-held
	WLAN802.11n (40M) 5.8G	1.32	1.363	151	Lap-held
	WLAN802.11ac (40M) 5.8G	1.44	1.463	159	Lap-held
	WLAN802.11ac (80M) 5.8G	1.04	1.089	155	Lap-held

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Max. SAR (1 g) (Unit: W/Kg)					
Antenna	Band	Measured	Reported	Channel	Position
Aux	WLAN802.11b	0.982	0.989	11	*Lap-held
	WLAN802.11a 5.2G	0.632	0.635	40	Lap-held
	WLAN802.11n (40M) 5.2G	0.881	0.899	46	Lap-held
	WLAN802.11ac (40M) 5.2G	0.881	0.92	46	Lap-held
	WLAN802.11a 5.3G	1.08	1.087	60	Lap-held
	WLAN802.11n (40M) 5.3G	0.879	0.912	54	Lap-held
	WLAN802.11ac (40M) 5.3G	0.935	0.968	54	Lap-held
	WLAN802.11n (40M) 5.6G	1.38	1.425	118	Lap-held
	WLAN802.11ac (20M) 5.6G	0.853	0.865	124	Top side
	WLAN802.11ac (40M) 5.6G	1.34	1.378	110	Lap-held
	WLAN802.11n (40M) 5.8G	0.797	0.804	159	*Lap-held

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#. WLAN802.11 a/b/g/n(20M/40M)/ ac(20M/40M/80M) conducted power table:

Main Antenna

802.11 b		Max. Rated Avg. Power + Max. Tolerance (dBm)	Average Power Output (dBm)	
CH	Frequency (MHz)		Data Rate (Mbps)	
			5.5	
1	2412	17.5	17.42	
6	2437	17.5	17.38	
11	2462	17.5	17.43	

802.11 g		Max. Rated Avg. Power + Max. Tolerance (dBm)	Average Power Output (dBm)	
CH	Frequency (MHz)		Data Rate (Mbps)	
			6	
1	2412	14	13.8	
2	2417	15.5	15.38	
6	2437	17.5	17.36	
10	2457	15.5	15.32	
11	2462	12.5	12.49	

802.11 n(20M)		Max. Rated Avg. Power + Max. Tolerance (dBm)	Average Power Output (dBm)	
CH	Frequency (MHz)		Data Rate (Mbps)	
			6.5	
1	2412	14	13.93	
2	2417	15.5	15.4	
6	2437	17.5	17.49	
10	2457	15.5	15.48	
11	2462	12.5	12.4	

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Main Antenna

802.11 n(40M)		Max. Rated Avg. Power + Max. Tolerance (dBm)	Average Power Output (dBm)	
CH	Frequency (MHz)		Data Rate (Mbps)	
			13.5	
3	2422	13.5	13.46	
4	2427	14.5	14.48	
6	2437	17.5	17.38	
8	2447	13.5	13.48	
9	2452	12.5	12.32	

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Main Antenna

802.11 a		Max. Rated Avg. Power + Max. Tolerance (dBm)	Average Power Output(dBm)	
5.2/5.3/5.6/5.8G			Data Rate (Mbps)	
CH	Frequency (MHz)		6	
36	5180	14	13.95	
40	5200	16	15.99	
44	5220	16	15.95	
48	5240	16	15.97	
52	5260	16	15.89	
56	5280	16	15.92	
60	5300	16	15.89	
64	5320	13.5	13.44	
100	5500	13.5	13.47	
104	5520	16	15.95	
108	5540	16	15.82	
112	5560	16	15.8	
116	5580	16	15.81	
120	5600	16	15.93	
124	5620	16	15.97	
128	5640	16	15.92	
132	5660	16	15.9	
136	5680	16	15.86	
140	5700	13	12.85	
149	5745	16	15.98	
153	5765	16	15.87	
157	5785	16	15.82	
161	5805	16	15.89	
165	5825	16	15.84	

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Main Antenna

802.11 n(20M)		Max. Rated Avg. Power + Max. Tolerance (dBm)	Average Power Output(dBm)	
5.2/5.3/5.6/5.8G			Data Rate (Mbps)	
CH	Frequency (MHz)		6.5	
36	5180	14	13.95	
40	5200	16	15.95	
44	5220	16	15.96	
48	5240	16	15.83	
52	5260	16	15.89	
56	5280	16	15.86	
60	5300	16	15.87	
64	5320	13.5	13.47	
100	5500	13.5	13.39	
104	5520	16	15.94	
108	5540	16	15.87	
112	5560	16	15.96	
116	5580	16	15.84	
120	5600	16	15.88	
124	5620	16	15.91	
128	5640	16	15.86	
132	5660	16	15.94	
136	5680	16	15.89	
140	5700	13	12.83	
149	5745	16	15.89	
153	5765	16	15.93	
157	5785	16	15.95	
161	5805	16	15.86	
165	5825	16	15.97	

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802.11 n(40M)		Max. Rated Avg. Power + Max. Tolerance (dBm)	Average Power Output(dBm)	
5.2/5.3/5.6/5.8G			Data Rate (Mbps)	
CH	Frequency (MHz)		13.5	
38	5190	12	11.93	
46	5230	16.5	16.44	
54	5270	16.5	16.34	
62	5310	13.5	13.35	
102	5510	13.5	13.48	
110	5550	16.5	16.4	
118	5590	16.5	16.33	
126	5630	16.5	16.47	
134	5670	16.5	16.35	
151	5755	16.5	16.36	
159	5795	16.5	16.39	

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802.11 ac(20M)		Max. Rated Avg. Power + Max. Tolerance (dBm)	Average Power Output(dBm)	
5.2/5.3/5.6/5.8G			Data Rate (Mbps)	
CH	Frequency (MHz)			
36	5180	14	13.94	
40	5200	16	15.93	
44	5220	16	15.84	
48	5240	16	15.87	
52	5260	16	15.94	
56	5280	16	15.98	
60	5300	16	15.92	
64	5320	13.5	13.43	
100	5500	13.5	13.41	
104	5520	16	15.96	
108	5540	16	15.81	
112	5560	16	15.97	
116	5580	16	15.81	
120	5600	16	15.87	
124	5620	16	15.85	
128	5640	16	15.79	
132	5660	16	15.82	
136	5680	16	15.73	
140	5700	13	12.97	
144	5720	16.5	16.33	
149	5745	16	15.81	
153	5765	16	15.83	
157	5785	16	15.79	
161	5805	16	15.84	
165	5825	16	15.93	

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802.11 ac(40M)		Max. Rated Avg. Power + Max. Tolerance (dBm)	Average Power Output(dBm)	
CH	Frequency (MHz)		Data Rate (Mbps)	
			13.5	
38	5190	12	11.93	
46	5230	16.5	16.42	
54	5270	16.5	16.39	
62	5310	13.5	13.43	
102	5510	13.5	13.43	
110	5550	16.5	16.45	
118	5590	16.5	16.41	
126	5630	16.5	16.48	
134	5670	16.5	16.45	
142	5710	16.5	16.33	
151	5755	16.5	16.48	
159	5795	16.5	16.43	

802.11 ac(80M)		Max. Rated Avg. Power + Max. Tolerance (dBm)	Average Power Output(dBm)	
CH	Frequency (MHz)		Data Rate (Mbps)	
			29.3	
42	5210	13.5	13.48	
58	5290	13.5	13.42	
106	5530	13.5	13.38	
138	5690	16	15.88	
155	5775	16	15.8	

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802.11 b		Max. Rated Avg. Power + Max. Tolerance (dBm)	Average Power Output (dBm)	
CH	Frequency (MHz)		Data Rate (Mbps)	
			5.5	
1	2412	17.5	17.43	
6	2437	17.5	17.31	
11	2462	17.5	17.47	

802.11 g		Max. Rated Avg. Power + Max. Tolerance (dBm)	Average Power Output (dBm)	
CH	Frequency (MHz)		Data Rate (Mbps)	
			6	
1	2412	14.5	14.31	
2	2417	15.5	15.48	
6	2437	17.5	17.34	
10	2457	15.5	15.39	
11	2462	12.5	12.32	

802.11 n(20M)		Max. Rated Avg. Power + Max. Tolerance (dBm)	Average Power Output (dBm)	
CH	Frequency (MHz)		Data Rate (Mbps)	
			6.5	
1	2412	14.5	14.42	
2	2417	15.5	15.32	
6	2437	17.5	17.24	
10	2457	15.5	15.26	
11	2462	12.5	12.4	

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802.11 n(40M)		Max. Rated Avg. Power + Max. Tolerance (dBm)	Average Power Output (dBm)	
CH	Frequency (MHz)		Data Rate (Mbps)	
			13.5	
3	2422	13.5	13.42	
4	2427	14.5	14.44	
6	2437	17.5	17.49	
8	2447	12.5	12.31	
9	2452	11.5	11.27	

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802.11 a		Max. Rated Avg. Power + Max. Tolerance (dBm)	Average Power Output(dBm)	
5.2/5.3/5.6/5.8G			Data Rate (Mbps)	
CH	Frequency (MHz)		6	
36	5180	14	13.93	
40	5200	16	15.98	
44	5220	16	15.93	
48	5240	16	15.87	
52	5260	16	15.81	
56	5280	16	15.83	
60	5300	16	15.97	
64	5320	13.5	13.47	
100	5500	13.5	13.36	
104	5520	16	15.82	
108	5540	16	15.98	
112	5560	16	15.95	
116	5580	16	15.86	
120	5600	16	15.74	
124	5620	16	15.83	
128	5640	16	15.87	
132	5660	16	15.96	
136	5680	16	15.98	
140	5700	13	12.82	
149	5745	16	15.93	
153	5765	16	15.91	
157	5785	16	15.96	
161	5805	16	15.83	
165	5825	16	15.89	

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802.11 n(20M)		Max. Rated Avg. Power + Max. Tolerance (dBm)	Average Power Output(dBm)	
5.2/5.3/5.6/5.8G			Data Rate (Mbps)	
CH	Frequency (MHz)		6.5	
36	5180	14	13.94	
40	5200	16	15.82	
44	5220	16	15.87	
48	5240	16	15.99	
52	5260	16	15.97	
56	5280	16	15.92	
60	5300	16	15.96	
64	5320	13.5	13.48	
100	5500	13.5	13.34	
104	5520	16	15.92	
108	5540	16	15.96	
112	5560	16	15.89	
116	5580	16	15.81	
120	5600	16	15.84	
124	5620	16	15.88	
128	5640	16	15.83	
132	5660	16	15.98	
136	5680	16	15.93	
140	5700	13	12.85	
149	5745	16	15.98	
153	5765	16	15.97	
157	5785	16	15.92	
161	5805	16	15.96	
165	5825	16	15.91	

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802.11 n(40M)		Max. Rated Avg. Power + Max. Tolerance (dBm)	Average Power Output(dBm)		
5.2/5.3/5.6/5.8G			Data Rate (Mbps)		
CH	Frequency (MHz)		13.5		
38	5190	13.5	13.42		
46	5230	16.5	16.41		
54	5270	16.5	16.34		
62	5310	13.5	13.48		
102	5510	14	13.83		
110	5550	16.5	16.33		
118	5590	16.5	16.36		
126	5630	16.5	16.39		
134	5670	16.5	16.34		
151	5755	16.5	16.38		
159	5795	16.5	16.46		

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802.11 ac(20M)		Max. Rated Avg. Power + Max. Tolerance (dBm)	Average Power Output(dBm)	
5.2/5.3/5.6/5.8G			Data Rate (Mbps)	
CH	Frequency (MHz)			
36	5180	14	13.79	
40	5200	16	15.93	
44	5220	16	15.95	
48	5240	16	15.92	
52	5260	16	15.99	
56	5280	16	15.84	
60	5300	16	15.75	
64	5320	13.5	13.32	
100	5500	13.5	13.44	
104	5520	16	15.93	
108	5540	16	15.97	
112	5560	16	15.91	
116	5580	16	15.82	
120	5600	16	15.74	
124	5620	16	15.94	
128	5640	16	15.84	
132	5660	16	15.88	
136	5680	16	15.92	
140	5700	13	12.82	
144	5720	16.5	16.32	
149	5745	16	15.91	
153	5765	16	15.87	
157	5785	16	15.97	
161	5805	16	15.89	
165	5825	16	15.81	

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Aux Antenna

802.11 ac(40M)		Max. Rated Avg. Power + Max. Tolerance (dBm)	Average Power Output(dBm)		
5.2/5.3/5.6/5.8G			Data Rate (Mbps)		
CH	Frequency (MHz)		13.5		
38	5190	13.5	13.42		
46	5230	16.5	16.31		
54	5270	16.5	16.35		
62	5310	13.5	13.45		
102	5510	14	13.91		
110	5550	16.5	16.38		
118	5590	16.5	16.37		
126	5630	16.5	16.47		
134	5670	16.5	16.35		
142	5710	16.5	16.47		
151	5755	16.5	16.47		
159	5795	16.5	16.44		

802.11 ac(80M)		Max. Rated Avg. Power + Max. Tolerance (dBm)	Average Power Output(dBm)		
5.2/5.3/5.6/5.8G			Data Rate (Mbps)		
CH	Frequency (MHz)		29.3		
42	5210	13.5	13.48		
58	5290	13.5	13.39		
106	5530	13.5	13.48		
138	5690	11.5	11.43		
155	5775	14	13.74		

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#. Bluetooth conducted power table:

Frequency (MHz)	Data Rate	Avg.	
		dBm	mW
2402	1	6.27	4.236
2441	1	7.22	5.272
2480	1	7.20	5.248
2402	2	3.20	2.089
2441	2	4.09	2.564
2480	2	4.65	2.917
2402	3	2.21	1.663
2441	3	2.95	1.972
2480	3	3.39	2.183

Frequency (MHz)	Avg. (dBm)
	BT4.0
2402	4.19
2442	5.13
2480	5.37

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1.4 Test Environment

Ambient Temperature: $22 \pm 2^\circ \text{C}$

Tissue Simulating Liquid: $22 \pm 2^\circ \text{C}$

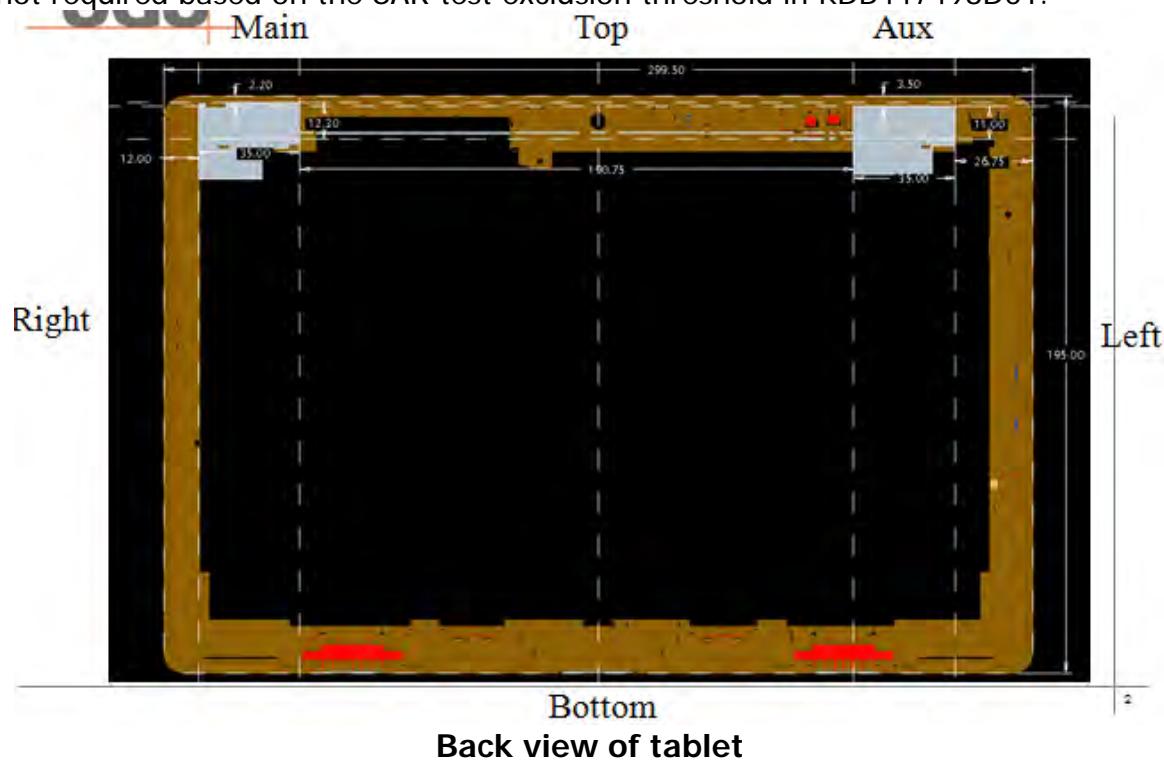
1.5 Operation Description

Use chipset specific software to control the EUT, and makes it transmit in maximum power. 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.

The device is a convertible laptop computer and it can be operated in tablet mode and laptop mode. EUT was tested in the following configurations:

Configurations: Lap-held/top/right/left sides with test distance 0mm.

Main antenna SAR test for left/bottom sides is not required based on the SAR test exclusion threshold in KDB447498D01. Aux antenna SAR test for right/bottom sides is not required based on the SAR test exclusion threshold in KDB447498D01.



Note:

802.11b DSSS SAR Test Requirements:

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1. 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.
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.

802.11g/n OFDM SAR Test Exclusion Requirements:

3. 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:

4. 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.
5. 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.
6. For Main/Aux antennas, 5.2a/n(40)/ac(40), 5.3a/n(40)/ac(40), 5.6n(40)/ac(40), 5.8n(40) are chosen to be the initial test configuration to make sure capture the worst cases.
7. For Main antenna, 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 required for that subsequent test configuration.
8. For Main antenna, 5.2n(20)/ac(20), 5.3n(20)/ac(20), 5.6a/ac(20)/ac(80), 5.8ac(40)/ac(80)/a are chosen to be the subsequent test configurations.
9. 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.
10. For Aux antenna in 5.6G, 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, 5.6 ac(20) is chosen to be the subsequent test configuration.
11. For Aux antenna in 5.2/5.3/5.8G, Since the highest reported SAR for the initial test

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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 that subsequent test configuration.

12. BT and WLAN Aux use the same antenna path and Bluetooth may transmit simultaneously with WLAN Main.
13. For 2.4/5.2/5.3/5.6/5.8GHz WLAN Main and Aux antennas, the maximum output power of each antenna during simultaneous transmission (for 802.11n/ac) is much less than that used in standalone transmission (802.11a/b/g/n/ac), so it is more conservative to use the sum of 1-g SAR provision to exclude the SAR measurement for 802.11n/ac MIMO.
14. Based on KDB447498D01,
 - (1) SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
$$\frac{\text{Max. tune up power(mW)}}{\text{Min. test separation distance(mm)}} \times \sqrt{f(\text{GHz})} \leq 3$$
When the minimum test separation distance is < 5 mm, 5mm is applied to determine SAR test exclusion.
 - (2) For test separation distances > 50 mm, and the frequency at 100 MHz to 1500MHz, the SAR test exclusion threshold is determined according to the following, and as illustrated in Appendix B of KDB447498 D01.
[(Threshold at 50mm in step1) + (test separation distance-50mm) $\times \frac{(\text{MHz})}{150}$](mW),
 - (3) For test separation distances > 50 mm, and the frequency at >1500 MHz to 6GHz, the SAR test exclusion threshold is determined according to the following, and as illustrated in Appendix B of KDB447498 D01.
[(Threshold at 50mm in step1) + (test separation distance-50mm) $\times 10$](mW),

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Mode	Max. tune-up power(dBm)	Max. tune-up power(mW)	Top side			Right side			Left side		
			Ant. to surface (mm)	Exclusion threshold	Require SAR testing?	Ant. to surface (mm)	Exclusion threshold	Require SAR testing?	Ant. to surface (mm)	over 200mm	Require SAR testing?
WLAN 2.4G_Main	17.5	55.335	less than 5	40.107	YES	12	7.353	YES	252.5	YES	NO
WLAN 5G_Main	16.5	44.463	less than 5	49.003	YES	12	8.984	YES	252.5	YES	NO
Mode	Max. tune-up power(dBm)	Max. tune-up power(mW)	Lap-held			Bottom side					
			Ant. to surface (mm)	Exclusion threshold	Require SAR testing?	Ant. to surface (mm)	Exclusion threshold	Require SAR testing?			
WLAN 2.4G_Main	17.5	55.335	less than 5	7.174	YES	167	1171.8	NO			
WLAN 5G_Main	16.5	44.463	less than 5	8.765	YES	167	1172.2	NO			
Mode	Max. tune-up power(dBm)	Max. tune-up power(mW)	Top side			Right side			Left side		
			Ant. to surface (mm)	Exclusion threshold	Require SAR testing?	Ant. to surface (mm)	Exclusion threshold	Require SAR testing?	Ant. to surface (mm)	Exclusion threshold	Require SAR testing?
WLAN 2.4G_Aux	17.5	55.847	less than 5	25.21	YES	237.75	1879.3	NO	26.75	3.299	YES
WLAN 5G_Aux	16.5	44.361	less than 5	30.802	YES	237.75	1879.7	NO	26.75	4.03	YES
Mode	Max. tune-up power(dBm)	Max. tune-up power(mW)	Lap-held			Bottom side					
			Ant. to surface (mm)	Exclusion threshold	Require SAR testing?	Ant. to surface (mm)	Exclusion threshold	Require SAR testing?			
WLAN 2.4G_Aux	17.5	55.847	less than 5	7.174	YES	168.5	1186.8	NO			
WLAN 5G_Aux	16.5	44.361	less than 5	8.765	YES	168.5	1187.2	NO			
Mode	Maximum power(dBm)	Maximum power(mW)	Top side			Right side			Left side		
			Ant. to surface (mm)	Exclusion threshold	Require SAR testing?	Ant. to surface (mm)	over 200mm	Require SAR testing?	Ant. to surface (mm)	Exclusion threshold	Require SAR testing?
BT	7.22	5.272	less than 5	1.661	NO	237.75	YES	NO	26.75	0.31	NO
Mode	Maximum power(dBm)	Maximum power(mW)	Lap-held			Bottom side					
			Ant. to surface (mm)	Exclusion threshold	Require SAR testing?	Ant. to surface (mm)	Exclusion threshold	Require SAR testing?			
BT	7.22	5.272	less than 5	1.661	YES	168.5	1185.2	NO			

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15. According to KDB447498 D01, testing of other required channels is not required when the reported 1-g SAR for the highest output channel is ≤ 0.8 W/kg, when the transmission band is ≤ 100 MHz.
16. According to KDB865664 D01, 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 $SAR = \sigma (|E|^2) / \rho$ 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:

- A standard high precision 6-axis robot (Staubli RX family) with controller, teach pendant and software. An arm extension is for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage intissue simulating liquid. The probe is equipped with an optical surface detector system.
- 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.

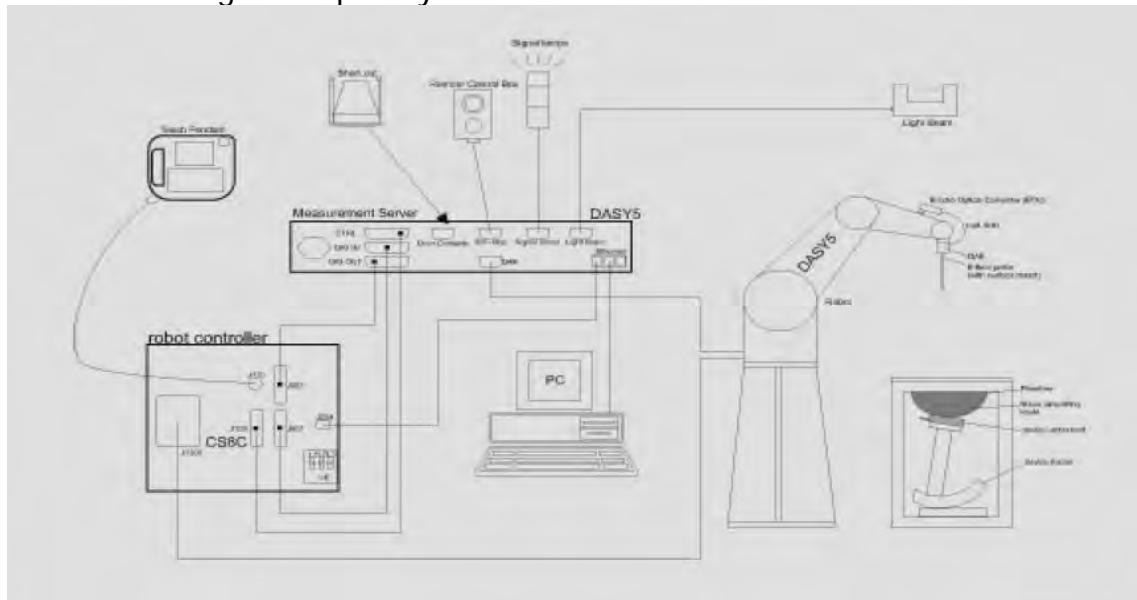


Fig. a The block diagram of SAR system

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

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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 2450/5200/5300/5600/5800 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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SAM PHANTOM V4.0C

Construction	The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-200X and IEC 62209. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points with the robot.
Shell Thickness	2 ± 0.2 mm
Filling Volume	Approx. 25 liters
Dimensions	Height: 850 mm; Length: 1000 mm; Width: 500 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 2450/5200/5300/5600/5800 MHz. The tests were conducted on the same days as the measurement of the DUT. The obtained results from the system accuracy verification are displayed in the table 1 (SAR values are normalized to 1W forward power delivered to the dipole). During the tests, the ambient temperature of the laboratory was 21.7°C, the relative humidity was 62% and the liquid depth above the ear reference points was $\geq 15 \text{ cm} \pm 5 \text{ mm}$ (frequency $\leq 3 \text{ GHz}$) or $\geq 10 \text{ cm} \pm 5 \text{ mm}$ (frequency $> 3 \text{ GHz}$) in all the cases. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values.

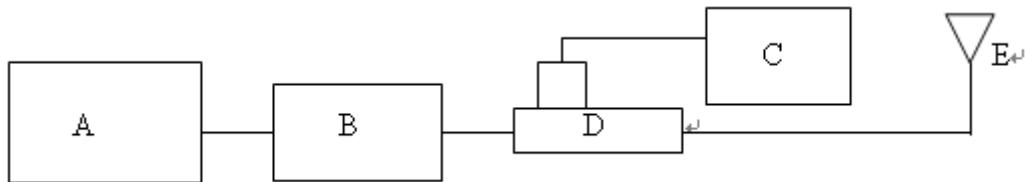
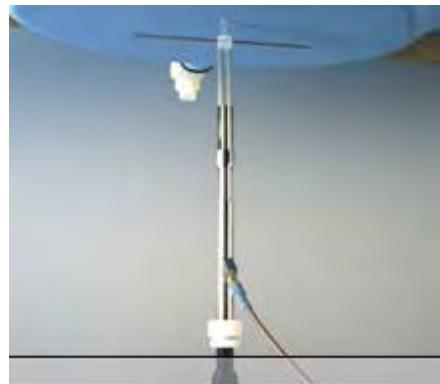


Fig. b The block diagram of system verification

- A. Signal generator
- B. Amplifier
- C. Power meter
- D. Dual directional coupling
- E. Reference dipole antenna



Photograph of the dipole Antenna

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Validation Kit	S/N	Frequency (MHz)		1W Target SAR-1g (mW/g)	Measured SAR-1g (mW/g)	Measured SAR-1g normalized to 1W (mW/g)	Deviation (%)	Measured Date
D2450V2	735	2450	Body	51.1	13.4	53.6	4.89%	Apr. 29, 2015
D5GHzV2	1023	5200	Body	73.5	7.34	73.4	-0.14%	Apr. 30, 2015
			Body	73.5	7.29	72.9	-0.82%	May. 01, 2015
		5300	Body	74.6	7.64	76.4	2.41%	May. 04, 2015
			Body	74.6	7.62	76.2	2.14%	May. 05, 2015
		5600	Body	77.9	8.28	82.8	6.29%	May. 07, 2015
			Body	77.9	8.24	82.4	5.78%	May. 08, 2015
		5800	Body	75.6	7.31	73.1	-3.31%	May. 11, 2015
			Body	75.6	7.51	75.1	-0.66%	May. 12, 2015

Table 1. Results of system validation

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1.9 Tissue Simulant Fluid for the Frequency Band

The dielectric properties for this body-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 (30 KHz-6000 MHz).

All dielectric parameters of tissue simulates were measured within 24 hours of SAR measurements. The depth of the tissue simulant in the flat section of the phantom was $\geq 15 \text{ cm} \pm 5 \text{ mm}$ (Frequency $\leq 3\text{G}$) or $\geq 10 \text{ cm} \pm 5 \text{ mm}$ (Frequency $> 3\text{G}$) during all tests. (Fig. 2)

Tissue Type	Measurement Date	Measured Frequency (MHz)	Target Dielectric Constant, ϵ_r	Target Conductivity, σ (S/m)	Measured Dielectric Constant, ϵ_r	Measured Conductivity, σ (S/m)	% dev ϵ_r	% dev σ
Body	2015/4/29	2412	52.751	1.914	52.087	1.943	1.26%	-1.53%
		2450	52.700	1.950	51.833	2.001	1.65%	-2.62%
		2462	52.685	1.967	51.762	2.015	1.75%	-2.44%
	2015/4/30	5190	49.028	5.288	49.228	5.203	-0.41%	1.60%
		5200	49.014	5.299	49.151	5.228	-0.28%	1.35%
		5220	48.987	5.323	49.095	5.255	-0.22%	1.27%
		5230	48.974	5.334	49.064	5.271	-0.18%	1.19%
		5240	48.960	5.346	49.026	5.284	-0.13%	1.16%
	2015/5/1	5190	49.028	5.288	49.168	5.206	-0.29%	1.54%
		5200	49.014	5.299	49.071	5.230	-0.12%	1.31%
		5230	48.974	5.334	49.025	5.282	-0.11%	0.98%
	2015/5/4	5260	48.933	5.369	48.996	5.343	-0.13%	0.49%
		5270	48.919	5.381	48.940	5.352	-0.04%	0.54%
		5280	48.906	5.393	48.870	5.362	0.07%	0.57%
		5300	48.879	5.416	48.834	5.375	0.09%	0.76%
		5310	48.865	5.428	48.758	5.388	0.22%	0.73%
	2015/5/5	5270	48.919	5.381	48.960	5.357	-0.08%	0.45%
		5280	48.906	5.393	48.890	5.378	0.03%	0.27%
		5300	48.879	5.416	48.814	5.389	0.13%	0.50%
		5310	48.865	5.428	48.758	5.397	0.22%	0.57%
		5510	48.594	5.661	47.813	5.498	1.61%	2.88%
	2015/5/7	5520	48.580	5.673	47.766	5.519	1.68%	2.71%
		5530	48.566	5.685	47.734	5.533	1.71%	2.67%
		5550	48.539	5.708	47.623	5.547	1.89%	2.82%
		5590	48.485	5.755	47.593	5.654	1.84%	1.75%
		5600	48.471	5.766	47.508	5.716	1.99%	0.87%
		5620	48.444	5.790	47.437	5.740	2.08%	0.86%
		5630	48.431	5.801	47.372	5.741	2.19%	1.04%
		5670	48.376	5.848	47.271	5.756	2.29%	1.58%
		5690	48.349	5.872	47.157	5.785	2.47%	1.47%
		5710	48.322	5.895	46.999	5.924	2.74%	-0.49%
		5720	48.309	5.907	46.941	5.938	2.83%	-0.53%

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Tissue Type	Measurement Date	Measured Frequency (MHz)	Target Dielectric Constant, ϵ_r	Target Conductivity, σ (S/m)	Measured Dielectric Constant, ϵ_r	Measured Conductivity, σ (S/m)	% dev ϵ_r	% dev σ
Body	2015/5/8	5550	48.539	5.708	47.643	5.556	1.85%	2.66%
		5590	48.485	5.755	47.583	5.629	1.86%	2.19%
		5600	48.471	5.766	47.538	5.683	1.93%	1.45%
		5620	48.444	5.790	47.477	5.699	2.00%	1.57%
		5630	48.431	5.801	47.422	5.725	2.08%	1.32%
		5670	48.376	5.848	47.321	5.774	2.18%	1.27%
		5710	48.322	5.895	47.035	5.902	2.66%	-0.12%
		5720	48.309	5.907	46.949	5.912	2.81%	-0.09%
	2015/5/11	5745	48.275	5.936	46.835	5.962	2.98%	-0.44%
		5755	48.261	5.947	46.786	5.973	3.06%	-0.43%
		5775	48.234	5.971	46.749	6.026	3.08%	-0.92%
		5795	48.207	5.994	46.565	6.038	3.41%	-0.73%
		5800	48.200	6.000	46.480	6.052	3.57%	-0.87%
		5825	48.166	6.029	46.435	6.115	3.59%	-1.42%
	2015/5/12	5795	48.207	5.994	46.541	5.992	3.46%	0.04%
		5800	48.200	6.000	46.479	6.029	3.57%	-0.48%

Table 2. Dielectric Parameters of Tissue Simulant Fluid

The composition of the tissue simulating liquid:

Frequency (MHz)	Mode	Ingredient						Total amount
		DGMBE	Water	Salt	Preventol D-7	Cellulose	Sugar	
2450M	Body	301.7ml	698.3ml	—	—	—	—	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 these cube measurements.

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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 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:

- 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.

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

Considering these problems, the possible accuracy of the calibration of E-field probes with temperature gradient measurements in a carefully designed setup is about $\pm 10\%$ (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 $\pm 5\%$ (RSS) when the same liquid is used for the calibration and for actual measurements and $\pm 7\text{--}9\%$ (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:

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

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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 C95.1–1992, Copyright 1992 by the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017. These criteria for SAR evaluation are similar to those recommended by the National Council on Radiation Protection and Measurements (NCRP) in "Biological Effects and Exposure Criteria for Radio frequency Electromagnetic Fields," NCRP Report No. 86, Section 17.4.5. Copyright NCRP, 1986, Bethesda, Maryland 20814. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards. The criteria to be used are specified in paragraphs (d)(1) and (d)(2) of this section and shall apply for portable devices transmitting in the frequency range from 100 kHz to 6 GHz. Portable devices that transmit at frequencies above 6 GHz are to be evaluated in terms of the MPE limits specified in § 1.1310 of this chapter. Measurements and calculations to demonstrate compliance with MPE field strength or power density limits for devices operating above 6 GHz should be made at a minimum distance of 5 cm from the radiating source.

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

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of this section. (Table 4.)

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

Table 4. RF exposure limits

Notes:

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

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2. Summary of Results

WLAN802.11 a/b/g/n(20M/40M) / ac(20M/40M/80M)

Antenna	Band	Position	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	
Main	WLAN802.11 b	Lap-held	1	2412	17.5	17.42	1.86%	0.840	0.856	-
		Lap-held	11	2462	17.5	17.43	1.62%	0.853	0.867	-
		*Lap-held	11	2462	17.5	17.43	1.62%	1.020	1.037	65
		Top side	11	2462	17.5	17.43	1.62%	0.296	0.301	-
		Right side	11	2462	17.5	17.43	1.62%	0.448	0.455	-
	WLAN802.11 a 5.2G	Lap-held	40	5200	16	15.99	0.23%	1.230	1.233	66
		Lap-held	48	5240	16	15.97	0.69%	0.887	0.893	-
		Top side	40	5200	16	15.99	0.23%	1.030	1.032	-
		Top side	48	5240	16	15.97	0.69%	0.989	0.996	-
		Right side	40	5200	16	15.99	0.23%	0.104	0.104	-
	WLAN802.11 n(20M) 5.2G	Lap-held	40	5200	16	15.95	1.16%	1.040	1.052	-
		Lap-held	44	5220	16	15.96	0.93%	1.320	1.332	67
		Lap-held	48	5240	16	15.83	3.99%	0.873	0.908	-
		*Lap-held	44	5220	16	15.96	0.93%	1.160	1.171	-
		Lap-held	38	5190	12	11.93	1.62%	0.528	0.537	-
	WLAN802.11 n(40M) 5.2G	Lap-held	46	5230	16.5	16.44	1.39%	0.968	0.981	68
		Top side	38	5190	12	11.93	1.62%	0.343	0.349	-
		Top side	46	5230	16.5	16.44	1.39%	0.796	0.807	-
		Right side	46	5230	16.5	16.44	1.39%	0.085	0.086	-
		Lap-held	40	5200	16	15.93	1.62%	1.25	1.270	69
	WLAN802.11 ac(20M) 5.2G	Lap-held	44	5220	16	15.84	3.75%	1.12	1.162	-
		Lap-held	48	5240	16	15.87	3.04%	1.17	1.206	-
		Lap-held	38	5190	12	11.93	1.62%	0.474	0.482	-
	WLAN802.11 ac(40M) 5.2G	Lap-held	46	5230	16.5	16.42	1.86%	1.22	1.243	70
		Top side	38	5190	12	11.93	1.62%	0.347	0.353	-
		Top side	46	5230	16.5	16.42	1.86%	0.986	1.004	-
		Right side	46	5230	16.5	16.42	1.86%	0.107	0.109	-

Test distance is 0mm.

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

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Antenna	Band	Position	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	
Main	WLAN802.11 a 5.3G	Lap-held	52	5260	16	15.89	2.57%	1.340	1.374	71
		Lap-held	56	5280	16	15.92	1.86%	0.959	0.977	-
		Lap-held	60	5300	16	15.89	2.57%	1.140	1.169	-
		Top side	56	5280	16	15.92	1.86%	0.757	0.771	-
		Right side	56	5280	16	15.92	1.86%	0.075	0.076	-
	WLAN802.11 n(20M) 5.3G	Lap-held	52	5260	16	15.89	2.57%	1.070	1.097	72
		Lap-held	54	5270	16.5	16.34	3.75%	1.270	1.318	73
		Lap-held	62	5310	13.5	13.35	3.51%	0.692	0.716	-
		Top side	54	5270	16.5	16.34	3.75%	0.960	0.996	-
		Top side	62	5310	13.5	13.35	3.51%	0.390	0.404	-
		Right side	54	5270	16.5	16.34	3.75%	0.089	0.092	-
	WLAN802.11 ac(20M) 5.3G	Lap-held	52	5260	16	15.94	1.39%	1.48	1.501	74
		Lap-held	56	5280	16	15.98	0.46%	1.3	1.306	-
		Lap-held	60	5300	16	15.92	1.86%	1.15	1.171	-
		*Lap-held	52	5260	16	15.94	1.39%	1.12	1.136	-
	WLAN802.11 ac(40M) 5.3G	Lap-held	54	5270	16.5	16.39	2.57%	1.36	1.395	75
		Lap-held	62	5310	13.5	13.43	1.62%	0.763	0.775	-
		Top side	54	5270	16.5	16.39	2.57%	0.954	0.978	-
		Top side	62	5310	13.5	13.43	1.62%	0.537	0.546	-
		Right side	54	5270	16.5	16.39	2.57%	0.111	0.114	-
	WLAN802.11 a 5.6G	Lap-held	104	5520	16	15.95	1.16%	1.030	1.042	76
		Lap-held	102	5510	13.5	13.48	0.46%	0.862	0.866	-
		Lap-held	110	5550	16.5	16.4	2.33%	1.2	1.228	-
		Lap-held	118	5590	16.5	16.33	3.99%	1.22	1.269	-
		Lap-held	126	5630	16.5	16.47	0.69%	1.51	1.520	77
		Lap-held	134	5670	16.5	16.35	3.51%	1.5	1.553	-
		*Lap-held	126	5630	16.5	16.47	0.69%	1.32	1.329	-
		*Lap-held	134	5670	16.5	16.35	3.51%	1.34	1.387	-
		Top side	110	5550	16.5	16.4	2.33%	0.898	0.919	-
		Top side	126	5630	16.5	16.47	0.69%	0.985	0.992	-
		Right side	126	5630	16.5	16.47	0.69%	0.101	0.102	-

Test distance is 0mm.

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

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Antenna	Band	Position	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	
Main	WLAN802.11 ac(20M) 5.6G	Lap-held	104	5520	16	15.96	0.93%	1.45	1.463	78
		Lap-held	120	5600	16	15.87	3.04%	1.42	1.463	-
		Lap-held	124	5620	16	15.85	3.51%	1.39	1.439	-
		Lap-held	144	5720	16.5	16.33	3.99%	1.25	1.300	-
	WLAN802.11 ac(40M) 5.6G	Lap-held	102	5510	13.5	13.43	1.62%	0.883	0.897	-
		Lap-held	110	5550	16.5	16.45	1.16%	1.49	1.507	79
		Lap-held	118	5590	16.5	16.41	2.09%	1.4	1.429	-
		Lap-held	126	5630	16.5	16.48	0.46%	1.46	1.467	-
		Lap-held	134	5670	16.5	16.45	1.16%	1.47	1.487	-
		Lap-held	142	5710	16.5	16.33	3.99%	1.42	1.477	-
		Top side	110	5550	16.5	16.45	1.16%	0.984	0.995	-
		Top side	126	5630	16.5	16.48	0.46%	0.933	0.937	-
		Top side	134	5670	16.5	16.45	1.16%	1.03	1.042	-
	WLAN802.11 ac(80M) 5.6G	Right side	126	5630	16.5	16.48	0.46%	0.095	0.095	-
		Lap-held	106	5530	13.5	13.38	2.80%	0.584	0.600	-
		Lap-held	138	5690	16	15.88	2.80%	1.13	1.162	80
	WLAN802.11 a 5.8G	Lap-held	149	5745	16	15.98	0.46%	1.280	1.286	81
		Lap-held	165	5825	16	15.84	3.75%	0.723	0.750	-
	WLAN802.11 n(40M) 5.8G	Lap-held	151	5755	16.5	16.36	3.28%	1.320	1.363	82
		Lap-held	159	5795	16.5	16.39	2.57%	1.000	1.026	-
		Top side	151	5755	16.5	16.36	3.28%	0.942	0.973	-
		Top side	159	5795	16.5	16.39	2.57%	0.808	0.829	-
		Right side	159	5795	16.5	16.39	2.57%	0.103	0.106	-
	WLAN802.11 ac(40M) 5.8G	Lap-held	151	5755	16.5	16.48	0.46%	1.42	1.427	-
		Lap-held	159	5795	16.5	16.43	1.62%	1.44	1.463	83
		*Lap-held	159	5795	16.5	16.43	1.62%	1.22	1.240	-
		Top side	151	5755	16.5	16.48	0.46%	0.921	0.925	-
		Top side	159	5795	16.5	16.43	1.62%	1.02	1.037	-
		Right side	151	5755	16.5	16.48	0.46%	0.136	0.137	-
	WLAN802.11 ac(80M) 5.8G	Lap-held	155	5775	16	15.80	4.71%	1.04	1.089	84

Test distance is 0mm.

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

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Antenna	Band	Position	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	
Aux	WLAN802.11 b	Lap-held	11	2462	17.5	17.47	0.69%	0.697	0.702	-
		*Lap-held	11	2462	17.5	17.47	0.69%	0.982	0.989	85
		Top side	11	2462	17.5	17.47	0.69%	0.153	0.154	-
		Left side	11	2462	17.5	17.47	0.69%	0.068	0.068	-
	WLAN802.11 a 5.2G	Lap-held	40	5200	16	15.98	0.46%	0.632	0.635	86
		Top side	40	5200	16	15.98	0.46%	0.609	0.612	-
		Left side	40	5200	16	15.98	0.46%	0.074	0.074	-
	WLAN802.11 n(40M) 5.2G	Lap-held	38	5190	13.5	13.42	1.86%	0.425	0.433	-
		Lap-held	46	5230	16.5	16.41	2.09%	0.881	0.899	87
		*Lap-held	46	5230	16.5	16.41	2.09%	0.754	0.770	-
		Top side	46	5230	16.5	16.41	2.09%	0.641	0.654	-
		Left side	46	5230	16.5	16.41	2.09%	0.093	0.095	-
	WLAN802.11 ac(40M) 5.2G	Lap-held	38	5190	13.5	13.42	1.86%	0.461	0.470	-
		Lap-held	46	5230	16.5	16.31	4.47%	0.881	0.920	88
		Top side	46	5230	16.5	16.31	4.47%	0.662	0.692	-
		Left side	46	5230	16.5	16.31	4.47%	0.082	0.086	-
	WLAN802.11 a 5.3G	Lap-held	56	5280	16	15.83	3.99%	0.972	1.011	-
		Lap-held	60	5300	16	15.97	0.69%	1.080	1.087	89
		*Lap-held	60	5300	16	15.97	0.69%	0.835	0.841	-
		Top side	56	5280	16	15.83	3.99%	0.735	0.764	-
		Top side	60	5300	16	15.97	0.69%	0.929	0.935	-
		Left side	60	5300	16	15.97	0.69%	0.181	0.182	-
	WLAN802.11 n(40M) 5.3G	Lap-held	54	5270	16.5	16.34	3.75%	0.879	0.912	90
		Lap-held	62	5310	13.5	13.48	0.46%	0.594	0.597	-
		Top side	54	5270	16.5	16.34	3.75%	0.666	0.691	-
		Left side	54	5270	16.5	16.34	3.75%	0.108	0.112	-
	WLAN802.11 ac(40M) 5.3G	Lap-held	54	5270	16.5	16.35	3.51%	0.935	0.968	91
		Lap-held	62	5310	13.5	13.45	1.16%	0.57	0.577	-
		Top side	54	5270	16.5	16.35	3.51%	0.703	0.728	-
		Left side	54	5270	16.5	16.35	3.51%	0.114	0.118	-

Test distance is 0mm.

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

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Antenna	Band	Position	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	
Aux	WLAN802.11 n(40M) 5.6G	Lap-held	118	5590	16.5	16.36	3.28%	1.38	1.425	92
		Lap-held	126	5630	16.5	16.39	2.57%	0.889	0.912	-
		Lap-held	134	5670	16.5	16.34	3.75%	0.916	0.950	-
		*Lap-held	118	5590	16.5	16.36	3.28%	1.26	1.301	-
		Top side	118	5590	16.5	16.36	3.28%	1.34	1.384	-
		Top side	126	5630	16.5	16.39	2.57%	0.836	0.857	-
		Top side	134	5670	16.5	16.34	3.75%	0.843	0.875	-
		Left side	126	5630	16.5	16.39	2.57%	0.033	0.034	-
	WLAN802.11 ac(20M) 5.6G	Lap-held	124	5620	16	15.94	1.39%	0.829	0.841	-
		Lap-held	144	5720	16.5	16.32	4.23%	0.8	0.834	-
		Top side	124	5620	16	15.94	1.39%	0.853	0.865	93
		Top side	144	5720	16.5	16.32	4.23%	0.651	0.679	-
	WLAN802.11 ac(40M) 5.6G	Lap-held	110	5550	16.5	16.38	2.80%	1.34	1.378	94
		Lap-held	118	5590	16.5	16.37	3.04%	1.28	1.319	-
		Lap-held	126	5630	16.5	16.47	0.69%	1.21	1.218	-
		Lap-held	134	5670	16.5	16.35	3.51%	1.07	1.108	-
		Lap-held	142	5710	16.5	16.47	0.69%	0.953	0.960	-
		Top side	110	5550	16.5	16.38	2.80%	1.25	1.285	-
		Top side	118	5590	16.5	16.37	3.04%	1.27	1.309	-
		Top side	126	5630	16.5	16.47	0.69%	1.2	1.208	-
		Top side	134	5670	16.5	16.35	3.51%	0.984	1.019	-
		Top side	142	5710	16.5	16.47	0.69%	0.92	0.926	-
		Left side	126	5630	16.5	16.47	0.69%	0.059	0.059	-
	WLAN802.11 n(40M) 5.8G	Lap-held	159	5795	16.50	16.46	0.93%	0.658	0.664	-
		*Lap-held	159	5795	16.50	16.46	0.93%	0.797	0.804	95
		Top side	159	5795	16.50	16.46	0.93%	0.712	0.719	-
		Left side	159	5795	16.50	16.46	0.93%	0.023	0.023	-

Test distance is 0mm.

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

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3. Simultaneous Transmission Analysis

Simultaneous Transmission Scenarios:

Simultaneous Transmit Configurations	Body
WLAN 2.4G MIMO	YES
WLAN 5G MIMO	YES
WLAN 2.4G MAIN + BT	YES
WLAN 5G MAIN + BT	YES

Note:

1. WLAN Aux and BT share the same antenna path and BT may transmit simultaneously with WLAN Main.

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3.1 Estimated SAR calculation

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

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

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

Mode / Band	frequency (GHz)	Maximum power(dBm)	Test position	test separation distance(mm)	Estimated SAR(W/kg)
Main / 2.4G	2.462	17.5	left side	larger than 20cm	0.4
Main / 5G	5.825	16.5	left side	larger than 20cm	0.4
Aux / 2.4G	2.462	17.5	right side	larger than 20cm	0.4
Aux / 5G	5.825	16.5	right side	larger than 20cm	0.4
BT / 2.4G	2.48	7.22	right side	larger than 20cm	0.4
BT / 2.4G	2.48	7.22	left side	26.75 mm	0.041
BT / 2.4G	2.48	7.22	top / lap-held	less than 5mm	0.221

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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}/R_i**, 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 R_i 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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WLAN 2.4GHz Main + WLAN 2.4GHz Aux

No.	Conditions	Exposure Condition	Position	Distance (mm)	Max. WLAN Main	Max. WLAN Aux	SAR Summation	SPLSR Analysis
1	2.4G Main + 2.4G Aux	Body	Lap-held	0	1.037	0.989	2.026	Analyzed as below
			Top side	0	0.301	0.154	0.455	Σ SAR<1.6, Not required
			Right side	0	0.455	0.4	0.855	Σ SAR<1.6, Not required
			Left side	0	0.4	0.068	0.468	Σ SAR<1.6, Not required

Conditions	Position	SAR Value (W/kg)	Coordinates (cm)			Σ SAR (W/kg)	Peak Location Separation Distance (mm)	SPLSR	Simultaneous Transmission SAR Test
			x	y	z				
802.11b CH 11	Lap-held	1.037	8.7	12.04	0.66	2.026	222.2	0.013	SPLSR<0.04, Not required
802.11b CH 11		0.989	8.3	-10.18	0.65				



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WLAN 5.2GHz Main + WLAN 5.2GHz Aux

No.	Conditions	Exposure Condition	Position	Distance (mm)	Max. WLAN Main	Max. WLAN Aux	SAR Summation	SPLSR Analysis
2	5.2G Main + 5.2G Aux	Body	Lap-held	0	1.332	0.92	2.252	Analyzed as below
			Top side	0	1.032	0.692	1.724	Analyzed as below
			Right side	0	0.109	0.4	0.509	Σ SAR<1.6, Not required
			Left side	0	0.4	0.095	0.495	Σ SAR<1.6, Not required

Conditions	Position	SAR Value (W/kg)	Coordinates (cm)			Σ SAR (W/kg)	Peak Location Separation Distance (mm)	SPLSR	Simultaneous Transmission SAR Test
			x	y	z				
802.11n (20M) CH 44	Lap-held	1.332	8.78	11.3	0.73	2.252	213.8	0.016	Σ SAR<0.04, Not required
802.11ac (40M) CH 46		0.92	8.88	-10.08	0.72				



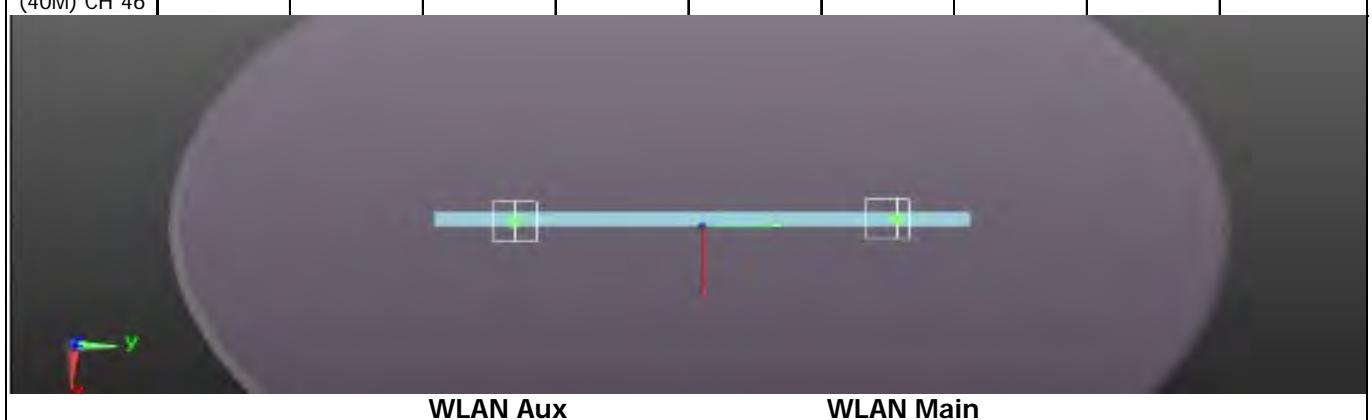
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Conditions	Position	SAR Value (W/kg)	Coordinates (cm)			Σ SAR (W/kg)	Peak Location Separation Distance (mm)	SPLSR	Simultaneous Transmission SAR Test
			x	y	z				
802.11a CH 40	Top side	1.032	-0.42	10.96	0.5	1.724	214.6	0.011	SPLSR<0.04, Not required
802.11ac (40M) CH 46		0.692	-0.3	-10.5	0.5				



WLAN Aux **WLAN Main**

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WLAN 5.3GHz Main + WLAN 5.3GHz Aux

No.	Conditions	Exposure Condition	Position	Distance (mm)	Max. WLAN Main	Max. WLAN Aux	SAR Summation	SPLSR Analysis
3	5.3G Main + 5.3G Aux	Body	Lap-held	0	1.501	1.087	2.588	Analyzed as below
			Top side	0	0.996	0.935	1.931	Analyzed as below
			Right side	0	0.114	0.4	0.514	Σ SAR<1.6, Not required
			Left side	0	0.4	0.182	0.582	Σ SAR<1.6, Not required

Conditions	Position	SAR Value (W/kg)	Coordinates (cm)			Σ SAR (W/kg)	Peak Location Separation Distance (mm)	SPLSR	Simultaneous Transmission SAR Test					
			x	y	z									
802.11ac (20M) CH 52	Lap-held	1.501	8.8	11.3	0.69	2.588	215.6	0.019	SPLSR<0.04, Not required					
802.11a CH 60		1.087	8.88	-10.26	0.69									
														
WLAN Aux WLAN Main														

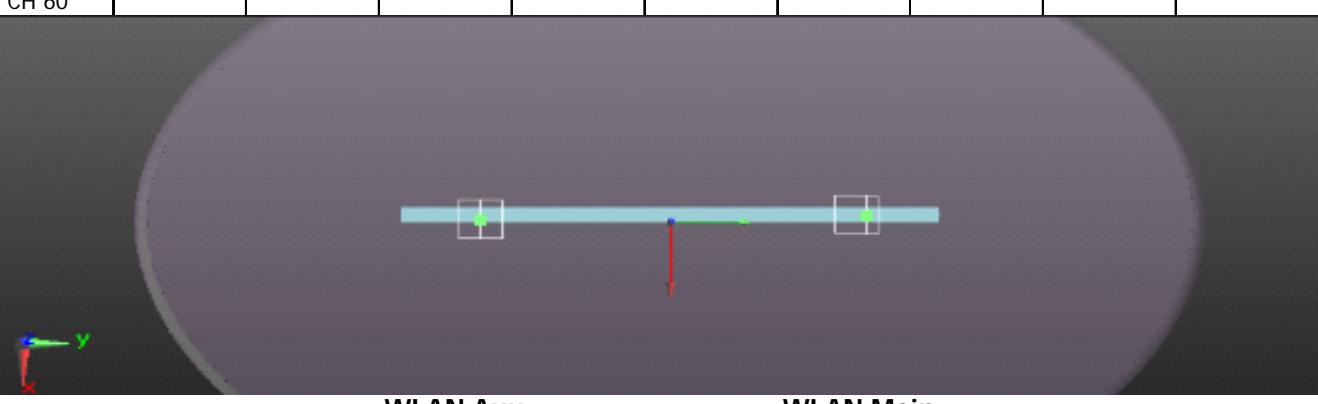
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Conditions	Position	SAR Value (W/kg)	Coordinates (cm)			Σ SAR (W/kg)	Peak Location Separation Distance (mm)	SPLSR	Simultaneous Transmission SAR Test
			x	y	z				
802.11n (40M) CH 54	Top side	0.996	-0.42	10.96	0.52	1.931	215.6	0.012	SPLSR<0.04, Not required
802.11a CH 60		0.935	-0.2	-10.6	0.5				



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WLAN 5.6GHz Main + WLAN 5.6GHz Aux

No.	Conditions	Exposure Condition	Position	Distance (mm)	Max. WLAN Main	Max. WLAN Aux	SAR Summation	SPLSR Analysis
4	5.6G Main + 5.6G Aux	Body	Lap-held	0	1.553	1.425	2.978	Analyzed as below
			Top side	0	1.042	1.384	2.426	Analyzed as below
			Right side	0	0.102	0.4	0.502	Σ SAR<1.6, Not required
			Left side	0	0.4	0.059	0.459	Σ SAR<1.6, Not required

Conditions	Position	SAR Value (W/kg)	Coordinates (cm)			Σ SAR (W/kg)	Peak Location Separation Distance (mm)	SPLSR	Simultaneous Transmission SAR Test
			x	y	z				
802.11n (40M) CH 134	Lap-held	1.553	8.76	11.22	0.7	2.978	215.6	0.024	Σ SAR<0.04, Not required
802.11n (40M) CH 118		1.425	8.6	-10.34	0.66				



WLAN Aux **WLAN Main**

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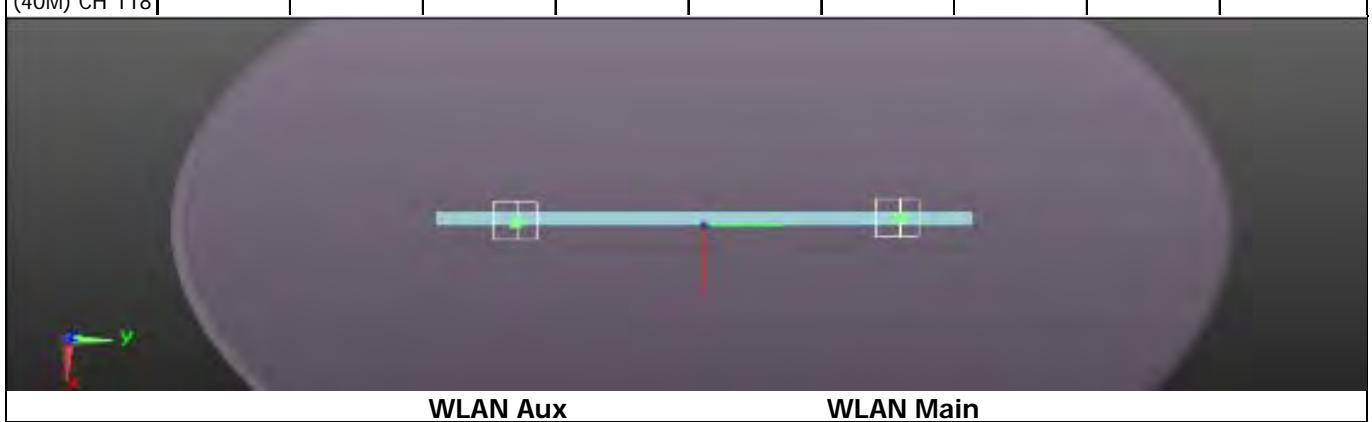
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Conditions	Position	SAR Value (W/kg)	Coordinates (cm)			Σ SAR (W/kg)	Peak Location Separation Distance (mm)	SPLSR	Simultaneous Transmission SAR Test
			x	y	z				
802.11ac (40M) CH 134	Top side	1.042	-0.42	10.96	0.5	2.426	214.8	0.018	SPLSR<0.04, Not required
802.11n (40M) CH 118		1.384	-0.22	-10.52	0.5				



WLAN Aux **WLAN Main**

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WLAN 5.8GHz Main + WLAN 5.8GHz Aux

No.	Conditions	Exposure Condition	Position	Distance (mm)	Max. WLAN Main	Max. WLAN Aux	SAR Summation	SPLSR Analysis
5	5.8G Main + 5.8G Aux	Body	Lap-held	0	1.463	0.804	2.267	Analyzed as below
			Top side	0	1.037	0.719	1.756	Analyzed as below
			Right side	0	0.137	0.4	0.537	Σ SAR<1.6, Not required
			Left side	0	0.4	0.023	0.423	Σ SAR<1.6, Not required

Conditions	Position	SAR Value (W/kg)	Coordinates (cm)			Σ SAR (W/kg)	Peak Location Separation Distance (mm)	SPLSR	Simultaneous Transmission SAR Test
			x	y	z				
802.11ac (40M) CH 159	Lap-held	1.463	8.78	11.12	0.72	2.267	213.8	0.016	SPLSR<0.04, Not required
802.11n (40M) CH 159		0.804	8.98	-10.26	0.7				



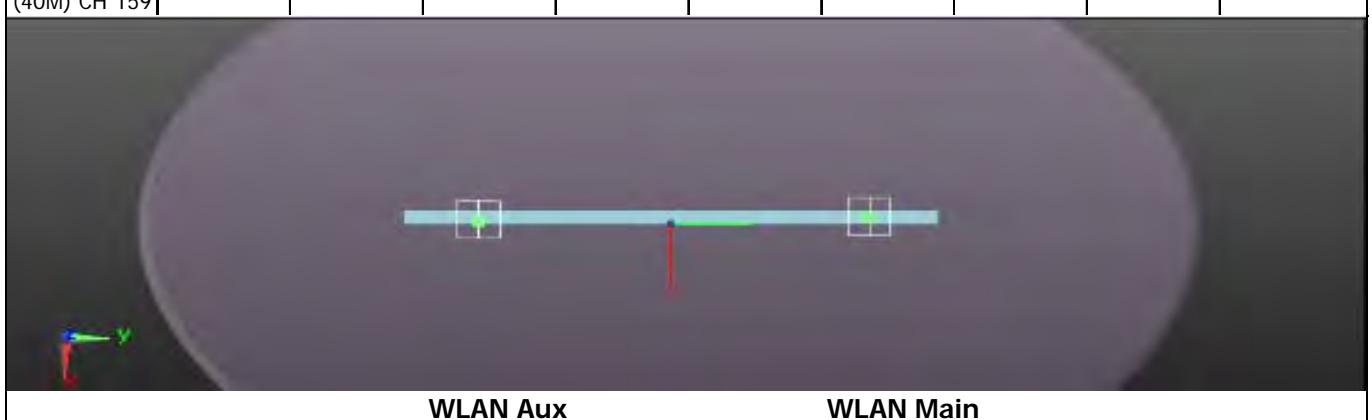
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Conditions	Position	SAR Value (W/kg)	Coordinates (cm)			Σ SAR (W/kg)	Peak Location Separation Distance (mm)	SPLSR	Simultaneous Transmission SAR Test
			x	y	z				
802.11ac (40M) CH 159	Top side	1.037	-0.42	11.1	0.52	1.756	219	0.011	SPLSR<0.04, Not required
802.11n (40M) CH 159		0.719	-0.22	-10.8	0.49				



WLAN Aux **WLAN Main**

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WLAN 2.4GHz Main + BT

No.	Conditions	Exposure Condition	Position	Distance (mm)	Max. WLAN Main	Max. BT	SAR Summation	SPLSR Analysis
6	2.4G Main + BT	Body	Lap-held	0	1.037	0.221	1.258	Σ SAR<1.6, Not required
			Top side	0	0.301	0.221	0.522	Σ SAR<1.6, Not required
			Right side	0	0.455	0.4	0.855	Σ SAR<1.6, Not required
			Left side	0	0.4	0.041	0.441	Σ SAR<1.6, Not required

WLAN 5.2GHz Main + BT

No.	Conditions	Exposure Condition	Position	Distance (mm)	Max. WLAN Main	Max. BT	SAR Summation	SPLSR Analysis
7	5.2G Main + BT	Body	Lap-held	0	1.332	0.221	1.553	Σ SAR<1.6, Not required
			Top side	0	1.032	0.221	1.253	Σ SAR<1.6, Not required
			Right side	0	0.109	0.4	0.509	Σ SAR<1.6, Not required
			Left side	0	0.4	0.041	0.441	Σ SAR<1.6, Not required

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WLAN 5.3GHz Main + BT

No.	Conditions	Exposure Condition	Position	Distance (mm)	Max. WLAN Main	Max. BT	SAR Summation	SPLSR Analysis
8	5.3G Main + BT	Body	Lap-held	0	1.501	0.221	1.722	Analyzed as below
			Top side	0	0.996	0.221	1.217	Σ SAR<1.6, Not required
			Right side	0	0.114	0.4	0.514	Σ SAR<1.6, Not required
			Left side	0	0.4	0.041	0.441	Σ SAR<1.6, Not required

Conditions	Position	SAR Value (W/kg)	Σ SAR (W/kg)	Peak Location Separation Distance (mm)	SPLSR	Simultaneous Transmission SAR Test
802.11ac (20M) CH 52	Lap-held	1.501	1.722	190.75	0.012	SPLSR<0.04, Not required
Bluetooth		0.221				

#. Since BT SAR measurement is excluded, we use the distance between WLAN Main antenna and BT antenna to represent the peak location separation distance to be the conservative condition.

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WLAN 5.6GHz Main + BT

No.	Conditions	Exposure Condition	Position	Distance (mm)	Max. WLAN Main	Max. BT	SAR Summation	SPLSR Analysis
9	5.6G Main + BT	Body	Lap-held	0	1.553	0.221	1.774	Analyzed as below
			Top side	0	1.042	0.221	1.263	Σ SAR<1.6, Not required
			Right side	0	0.102	0.4	0.502	Σ SAR<1.6, Not required
			Left side	0	0.4	0.041	0.441	Σ SAR<1.6, Not required

Conditions	Position	SAR Value (W/kg)	Σ SAR (W/kg)	Peak Location Separation Distance (mm)	SPLSR	Simultaneous Transmission SAR Test
802.11n (40M) CH 134	Lap-held	1.553	1.774	190.75	0.012	SPLSR<0.04, Not required
Bluetooth		0.221				

#. Since BT SAR measurement is excluded, we use the distance between WLAN Main antenna and BT antenna to represent the peak location separation distance to be the conservative condition.

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WLAN 5.8GHz Main + BT

No.	Conditions	Exposure Condition	Position	Distance (mm)	Max. WLAN Main	Max. BT	SAR Summation	SPLSR Analysis
10	5.8G Main + BT	Body	Lap-held	0	1.463	0.221	1.684	Analyzed as below
			Top side	0	1.037	0.221	1.258	Σ SAR<1.6, Not required
			Right side	0	0.137	0.4	0.537	Σ SAR<1.6, Not required
			Left side	0	0.4	0.041	0.441	Σ SAR<1.6, Not required

Conditions	Position	SAR Value (W/kg)	Σ SAR (W/kg)	Peak Location Separation Distance (mm)	SPLSR	Simultaneous Transmission SAR Test
802.11ac (40M) CH 159	Lap-held	1.463	1.684	190.75	0.011	SPLSR<0.04, Not required
Bluetooth		0.221				

#. Since BT SAR measurement is excluded, we use the distance between WLAN Main antenna and BT antenna to represent the peak location separation distance to be the conservative condition.

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4. Instruments List

Manufacturer	Device	Type	Serial number	Date of last calibration	Date of next calibration
Schmid & Partner Engineering AG	Dosimetric E-Field Probe	EX3DV4	3938	Jul.25,2014	Jul.24,2015
Schmid & Partner Engineering AG	System Validation Dipole	D2450V2	735	Dec.08,2014	Dec.07,2015
		D5GHzV2	1023	Jan.29,2015	Jan.28,2016
Schmid & Partner Engineering AG	Data acquisition Electronics	DAE4	1260	Aug.26,2014	Aug.25,2015
Schmid & Partner Engineering AG	Software	DASY 52 V52.8.8	N/A	Calibration not required	Calibration not required
Schmid & Partner Engineering AG	Phantom	SAM	N/A	Calibration not required	Calibration not required
Agilent	Network Analyzer	E5071C	MY46107530	Jan.27,2015	Jan.26,2016
Agilent	Dielectric Probe Kit	85070E	MY44300677	Calibration not required	Calibration not required
Agilent	Dual-directional coupler	772D	MY46151242	Jul.14,2014	Jul.13,2015
Agilent	RF Signal Generator	N5181A	MY50144143	Jun.25.2014	Jun.24.2015
Agilent	Power Meter	E4417A	MY51410006	Oct.25,2013	Oct.24,2015
Agilent	Power Sensor	E9301H	MY51470001	Dec.11,2014	Dec.10,2015
TECPYL	Digital thermometer	DTM-303A	TP103859	Oct.08,2014	Oct.07,2015

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5. Measurements

Date: 2015/4/29

WLAN802.11b_Body-worn_Lap-held_CH 11_Main_0mm_repeat SAR test at the highest SAR measurement

Communication System: WLAN(2.45G); Frequency: 2462 MHz

Medium parameters used: $f = 2462$ MHz; $\sigma = 2.015$ S/m; $\epsilon_r = 51.762$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(6.69, 6.69, 6.69); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (81x121x1): Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 1.55 W/kg

Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid:

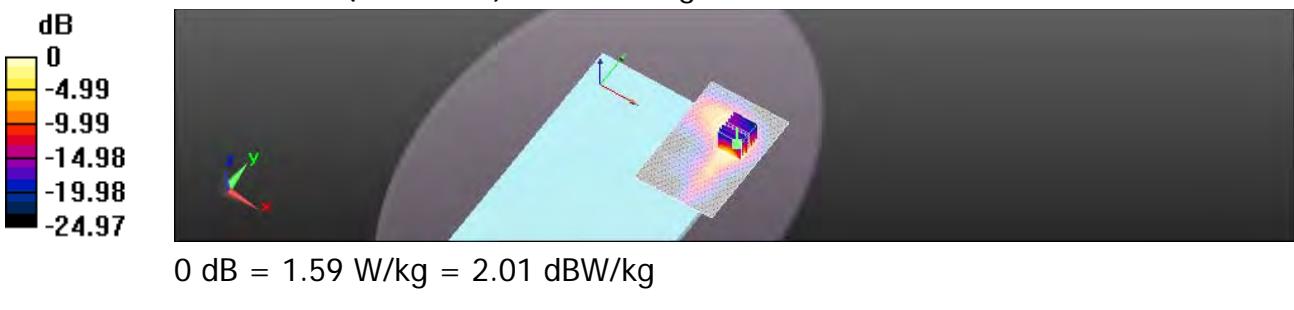
dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.7630 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 2.25 W/kg

SAR(1 g) = 1.02 W/kg; SAR(10 g) = 0.490 W/kg

Maximum value of SAR (measured) = 1.59 W/kg



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Date: 2015/4/30

WLAN802.11a 5.2G_Body-worn_Lap-held_CH 40_Main_0mm

Communication System: WLAN(5G); Frequency: 5200 MHz

Medium parameters used: $f = 5200$ MHz; $\sigma = 5.228$ S/m; $\epsilon_r = 49.151$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(4.27, 4.27, 4.27); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (91x141x1): Interpolated grid: $dx=10$ mm, $dy=10$ mm

Maximum value of SAR (interpolated) = 2.38 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

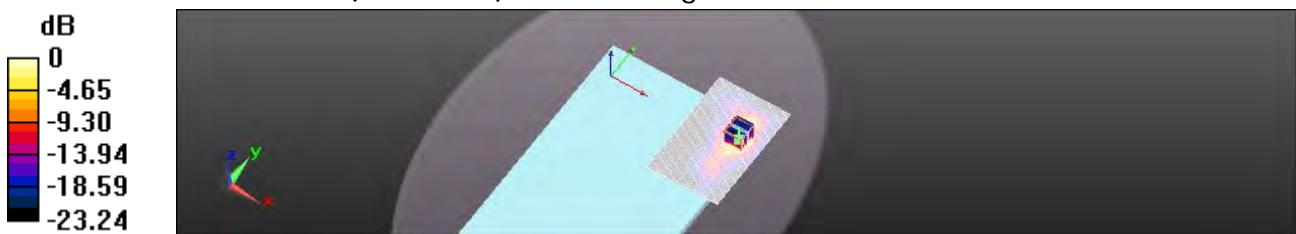
$dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 1.565 V/m; Power Drift = -0.15 dB

Peak SAR (extrapolated) = 4.72 W/kg

SAR(1 g) = 1.23 W/kg; SAR(10 g) = 0.391 W/kg

Maximum value of SAR (measured) = 2.40 W/kg



0 dB = 2.40 W/kg = 3.80 dBW/kg

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Date: 2015/4/30

WLAN802.11n 5.2G(20M)_Body-worn_Lap-held_CH 44_Main_0mm

Communication System: WLAN(5G); Frequency: 5220 MHz

Medium parameters used: $f = 5220$ MHz; $\sigma = 5.255$ S/m; $\epsilon_r = 49.095$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(4.27, 4.27, 4.27); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (91x141x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 2.61 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

dx=4mm, dy=4mm, dz=2mm

Reference Value = 1.735 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 4.83 W/kg

SAR(1 g) = 1.32 W/kg; SAR(10 g) = 0.407 W/kg

Maximum value of SAR (measured) = 2.63 W/kg



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Date: 2015/4/30

WLAN802.11n 5.2G(40M)_Body-worn_Lap-held_CH 46_Main_0mm

Communication System: WLAN(5G); Frequency: 5230 MHz

Medium parameters used: $f = 5230$ MHz; $\sigma = 5.271$ S/m; $\epsilon_r = 49.064$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(4.27, 4.27, 4.27); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (91x141x1): Interpolated grid: $dx=10$ mm, $dy=10$ mm

Maximum value of SAR (interpolated) = 1.93 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

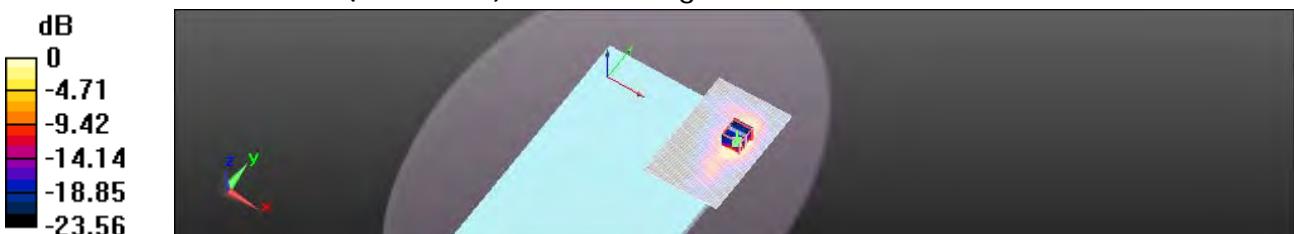
$dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 0.7720 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 3.49 W/kg

SAR(1 g) = 0.968 W/kg; SAR(10 g) = 0.309 W/kg

Maximum value of SAR (measured) = 1.88 W/kg



0 dB = 1.88 W/kg = 2.74 dBW/kg

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Date: 2015/4/30

WLAN802.11ac 5.2G(20M)_Body-worn_Lap-held_CH 40_Main_0mm

Communication System: WLAN(5G); Frequency: 5200 MHz

Medium parameters used: $f = 5200$ MHz; $\sigma = 5.228$ S/m; $\epsilon_r = 49.151$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(4.27, 4.27, 4.27); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (91x141x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 2.48 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

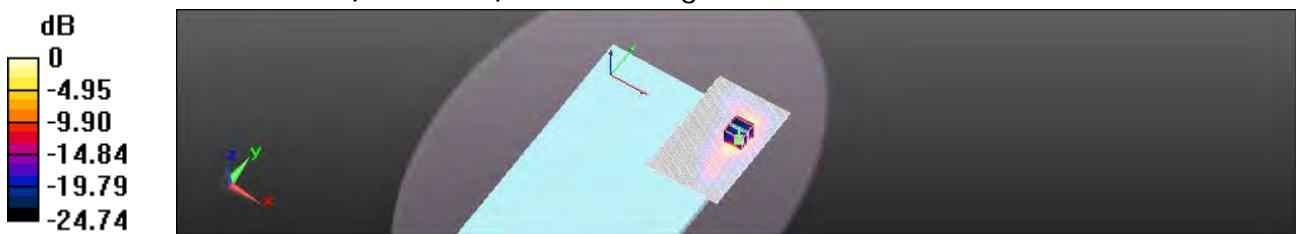
dx=4mm, dy=4mm, dz=2mm

Reference Value = 0.7400 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 4.61 W/kg

SAR(1 g) = 1.25 W/kg; SAR(10 g) = 0.383 W/kg

Maximum value of SAR (measured) = 2.47 W/kg



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Date: 2015/4/30

WLAN802.11ac 5.2G(40M)_Body-worn_Lap-held_CH 46_Main_0mm

Communication System: WLAN(5G); Frequency: 5230 MHz

Medium parameters used: $f = 5230$ MHz; $\sigma = 5.271$ S/m; $\epsilon_r = 49.064$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(4.27, 4.27, 4.27); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (91x141x1): Interpolated grid: $dx=10$ mm, $dy=10$ mm

Maximum value of SAR (interpolated) = 2.44 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

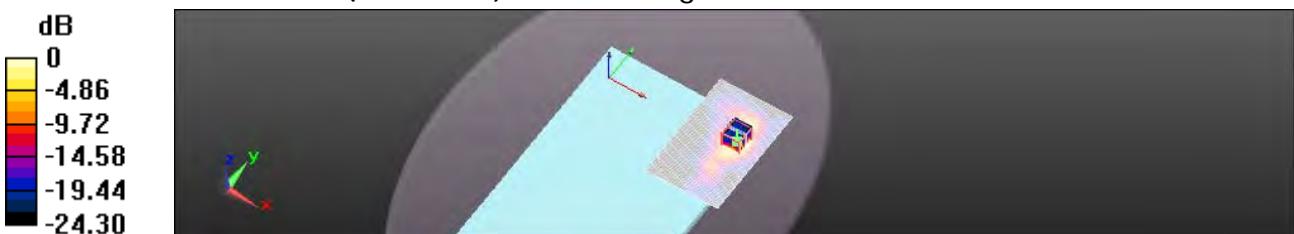
$dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 1.272 V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 4.41 W/kg

SAR(1 g) = 1.22 W/kg; SAR(10 g) = 0.385 W/kg

Maximum value of SAR (measured) = 2.36 W/kg



0 dB = 2.36 W/kg = 3.73 dBW/kg

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Date: 2015/5/4

WLAN802.11a 5.3G_Body-worn_Lap-held_CH 52_Main_0mm

Communication System: WLAN(5G); Frequency: 5260 MHz

Medium parameters used: $f = 5260$ MHz; $\sigma = 5.343$ S/m; $\epsilon_r = 48.996$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(4.11, 4.11, 4.11); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (91x141x1): Interpolated grid: $dx=10$ mm, $dy=10$ mm

Maximum value of SAR (interpolated) = 2.72 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

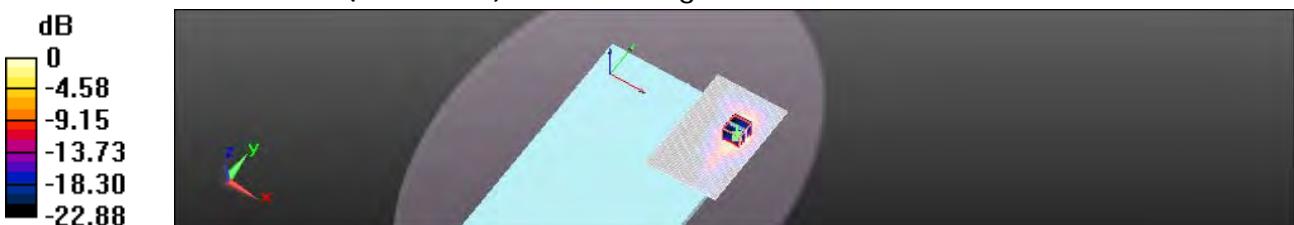
$dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 1.149 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 5.06 W/kg

SAR(1 g) = 1.34 W/kg; SAR(10 g) = 0.414 W/kg

Maximum value of SAR (measured) = 2.66 W/kg



0 dB = 2.66 W/kg = 4.25 dBW/kg

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Date: 2015/5/4

WLAN802.11n 5.3G(20M)_Body-worn_Lap-held_CH 52_Main_0mm

Communication System: WLAN(5G); Frequency: 5260 MHz

Medium parameters used: $f = 5260$ MHz; $\sigma = 5.343$ S/m; $\epsilon_r = 48.996$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(4.11, 4.11, 4.11); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (91x141x1): Interpolated grid: $dx=10$ mm, $dy=10$ mm

Maximum value of SAR (interpolated) = 2.05 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

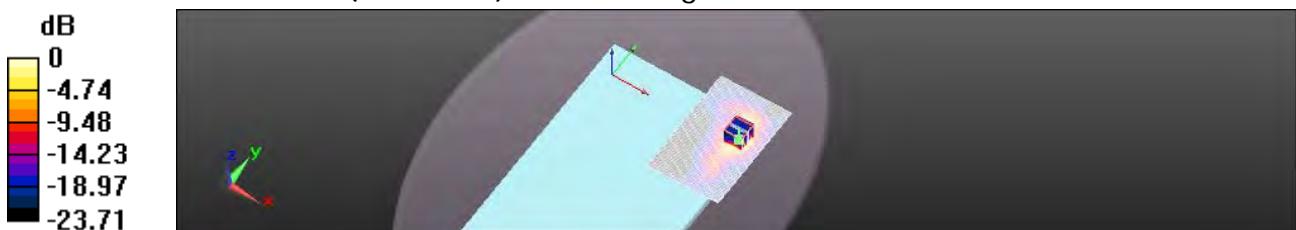
$dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 1.676 V/m; Power Drift = -0.17 dB

Peak SAR (extrapolated) = 3.93 W/kg

SAR(1 g) = 1.07 W/kg; SAR(10 g) = 0.344 W/kg

Maximum value of SAR (measured) = 2.11 W/kg



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Date: 2015/5/4

WLAN802.11n 5.3G(40M)_Body-worn_Lap-held_CH 54_Main_0mm

Communication System: WLAN(5G); Frequency: 5270 MHz

Medium parameters used: $f = 5270$ MHz; $\sigma = 5.352$ S/m; $\epsilon_r = 48.94$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(4.11, 4.11, 4.11); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (91x141x1): Interpolated grid: $dx=10$ mm, $dy=10$ mm

Maximum value of SAR (interpolated) = 2.43 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

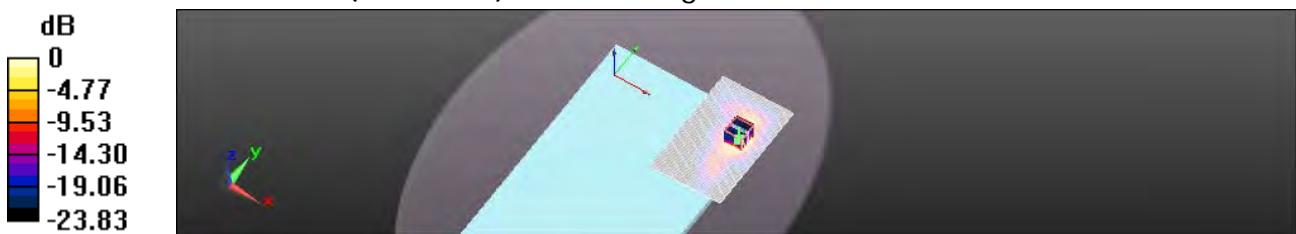
$dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 1.016 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 4.76 W/kg

SAR(1 g) = 1.27 W/kg; SAR(10 g) = 0.397 W/kg

Maximum value of SAR (measured) = 2.48 W/kg



0 dB = 2.48 W/kg = 3.94 dBW/kg

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Date: 2015/5/4

WLAN802.11ac 5.3G(20M)_Body-worn_Lap-held_CH 52_Main_0mm

Communication System: WLAN(5G); Frequency: 5260 MHz

Medium parameters used: $f = 5260$ MHz; $\sigma = 5.343$ S/m; $\epsilon_r = 48.996$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(4.11, 4.11, 4.11); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (91x141x1): Interpolated grid: $dx=10$ mm, $dy=10$ mm

Maximum value of SAR (interpolated) = 2.94 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

$dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 0.5300 V/m; Power Drift = 0.13 dB

Peak SAR (extrapolated) = 5.45 W/kg

SAR(1 g) = 1.48 W/kg; SAR(10 g) = 0.455 W/kg

Maximum value of SAR (measured) = 2.91 W/kg



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Date: 2015/5/4

WLAN802.11ac 5.3G(40M)_Body-worn_Lap-held_CH 54_Main_0mm

Communication System: WLAN(5G); Frequency: 5270 MHz

Medium parameters used: $f = 5270$ MHz; $\sigma = 5.352$ S/m; $\epsilon_r = 48.94$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(4.11, 4.11, 4.11); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (91x141x1): Interpolated grid: $dx=10$ mm, $dy=10$ mm

Maximum value of SAR (interpolated) = 2.64 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

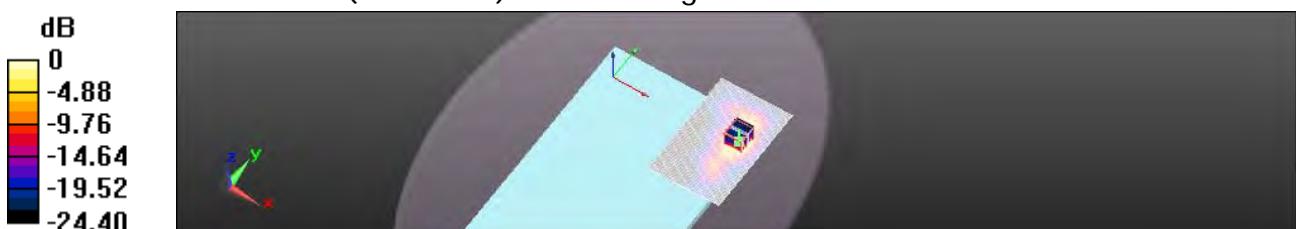
$dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 1.248 V/m; Power Drift = -0.19 dB

Peak SAR (extrapolated) = 5.10 W/kg

SAR(1 g) = 1.36 W/kg; SAR(10 g) = 0.429 W/kg

Maximum value of SAR (measured) = 2.66 W/kg



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WLAN802.11a 5.6G_Body-worn_Lap-held_CH 104_Main_0mm

Communication System: WLAN(5G); Frequency: 5520 MHz

Medium parameters used: $f = 5520$ MHz; $\sigma = 5.519$ S/m; $\epsilon_r = 47.766$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(3.7, 3.7, 3.7); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (91x141x1): Interpolated grid: $dx=10$ mm, $dy=10$ mm

Maximum value of SAR (interpolated) = 2.01 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

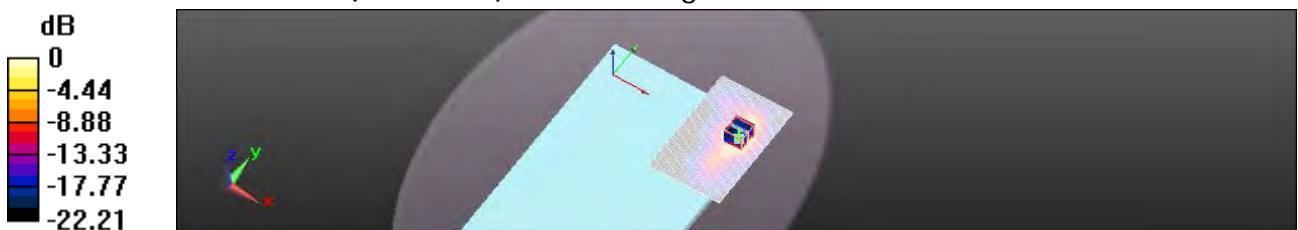
$dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 2.486 V/m; Power Drift = -0.16 dB

Peak SAR (extrapolated) = 3.95 W/kg

SAR(1 g) = 1.03 W/kg; SAR(10 g) = 0.335 W/kg

Maximum value of SAR (measured) = 2.00 W/kg



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WLAN802.11n 5.6G(40M)_Body-worn_Lap-held_CH 126_Main_0mm

Communication System: WLAN(5G); Frequency: 5630 MHz

Medium parameters used: $f = 5630$ MHz; $\sigma = 5.741$ S/m; $\epsilon_r = 47.372$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(3.7, 3.7, 3.7); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (91x141x1): Interpolated grid: $dx=10$ mm, $dy=10$ mm

Maximum value of SAR (interpolated) = 3.00 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

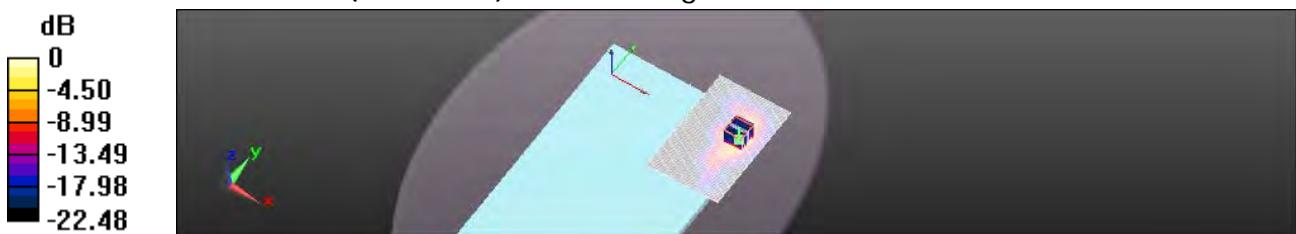
$dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 1.573 V/m; Power Drift = -0.17 dB

Peak SAR (extrapolated) = 6.06 W/kg

SAR(1 g) = 1.51 W/kg; SAR(10 g) = 0.487 W/kg

Maximum value of SAR (measured) = 3.04 W/kg



0 dB = 3.04 W/kg = 4.83 dBW/kg

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WLAN802.11ac 5.6G(20M)_Body-worn_Lap-held_CH 104_Main_Omm

Communication System: WLAN(5G); Frequency: 5520 MHz

Medium parameters used: $f = 5520$ MHz; $\sigma = 5.519$ S/m; $\epsilon_r = 47.766$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(3.7, 3.7, 3.7); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (91x141x1): Interpolated grid: $dx=10$ mm, $dy=10$ mm

Maximum value of SAR (interpolated) = 2.84 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

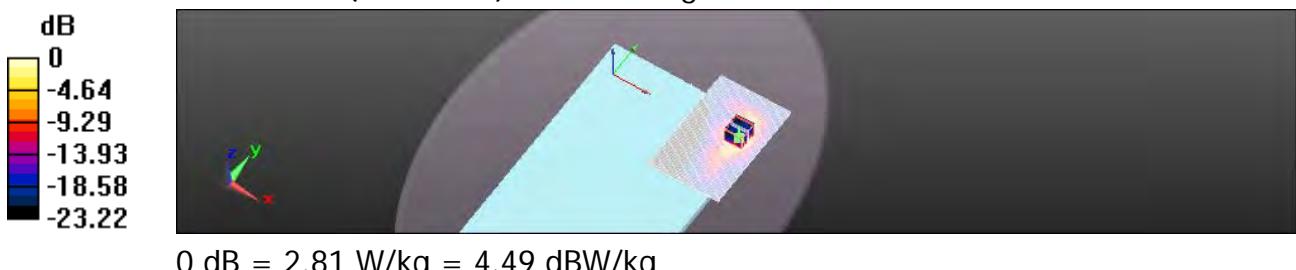
$dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 1.876 V/m; Power Drift = -0.13 dB

Peak SAR (extrapolated) = 5.58 W/kg

SAR(1 g) = 1.45 W/kg; SAR(10 g) = 0.463 W/kg

Maximum value of SAR (measured) = 2.81 W/kg



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WLAN802.11ac 5.6G(40M)_Body-worn_Lap-held_CH 110_Main_Omm

Communication System: WLAN(5G); Frequency: 5550 MHz

Medium parameters used: $f = 5550$ MHz; $\sigma = 5.547$ S/m; $\epsilon_r = 47.623$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(3.7, 3.7, 3.7); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (91x141x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 2.95 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

dx=4mm, dy=4mm, dz=2mm

Reference Value = 1.229 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 5.68 W/kg

SAR(1 g) = 1.49 W/kg; SAR(10 g) = 0.475 W/kg

Maximum value of SAR (measured) = 2.95 W/kg



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Date: 2015/5/7

WLAN802.11ac 5.6G(80M)_Body-worn_Lap-held_CH 138_Main_Omm

Communication System: WLAN(5G); Frequency: 5690 MHz

Medium parameters used: $f = 5690$ MHz; $\sigma = 5.785$ S/m; $\epsilon_r = 47.157$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(3.7, 3.7, 3.7); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (91x141x1): Interpolated grid: $dx=10$ mm, $dy=10$ mm

Maximum value of SAR (interpolated) = 2.33 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

$dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 2.832 V/m; Power Drift = -0.17 dB

Peak SAR (extrapolated) = 4.44 W/kg

SAR(1 g) = 1.13 W/kg; SAR(10 g) = 0.380 W/kg

Maximum value of SAR (measured) = 2.25 W/kg



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WLAN802.11a 5.8G_Body-worn_Lap-held_CH 149_Main_0mm

Communication System: WLAN(5G); Frequency: 5745 MHz

Medium parameters used: $f = 5745$ MHz; $\sigma = 5.962$ S/m; $\epsilon_r = 46.835$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(3.92, 3.92, 3.92); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (91x141x1): Interpolated grid: $dx=10$ mm, $dy=10$ mm

Maximum value of SAR (interpolated) = 2.61 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

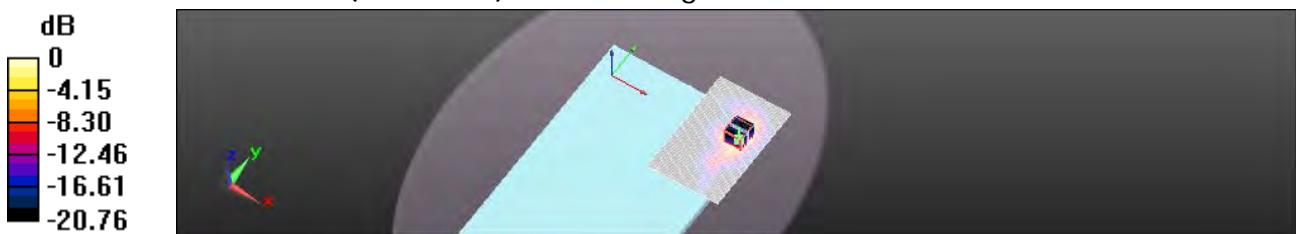
$dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 1.611 V/m; Power Drift = -0.18 dB

Peak SAR (extrapolated) = 5.12 W/kg

SAR(1 g) = 1.28 W/kg; SAR(10 g) = 0.414 W/kg

Maximum value of SAR (measured) = 2.57 W/kg



0 dB = 2.57 W/kg = 4.10 dBW/kg

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WLAN802.11n 5.8G(40M)_Body-worn_Lap-held_CH 151_Main_0mm

Communication System: WLAN(5G); Frequency: 5755 MHz

Medium parameters used: $f = 5755$ MHz; $\sigma = 5.973$ S/m; $\epsilon_r = 46.786$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(3.92, 3.92, 3.92); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (91x141x1): Interpolated grid: $dx=10$ mm, $dy=10$ mm

Maximum value of SAR (interpolated) = 2.63 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

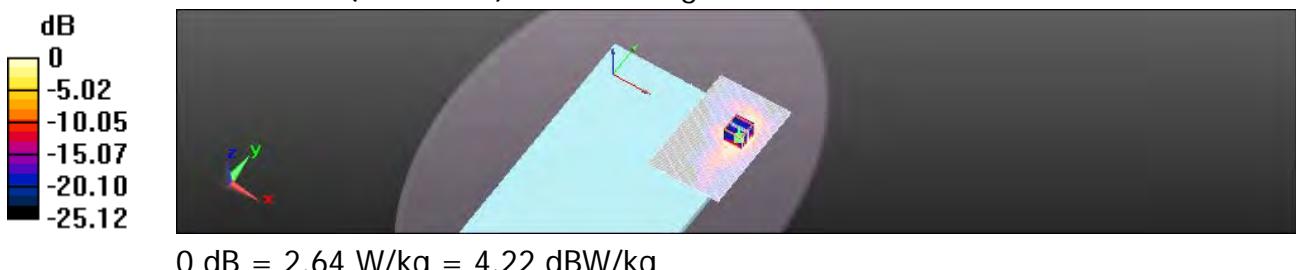
$dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 1.107 V/m; Power Drift = -0.13 dB

Peak SAR (extrapolated) = 5.37 W/kg

SAR(1 g) = 1.32 W/kg; SAR(10 g) = 0.423 W/kg

Maximum value of SAR (measured) = 2.64 W/kg



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WLAN802.11ac 5.8G(40M)_Body-worn_Lap-held_CH 159_Main_Omm

Communication System: WLAN(5G); Frequency: 5795 MHz

Medium parameters used: $f = 5795$ MHz; $\sigma = 6.038$ S/m; $\epsilon_r = 46.565$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(3.92, 3.92, 3.92); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (91x141x1): Interpolated grid: $dx=10$ mm, $dy=10$ mm

Maximum value of SAR (interpolated) = 2.88 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

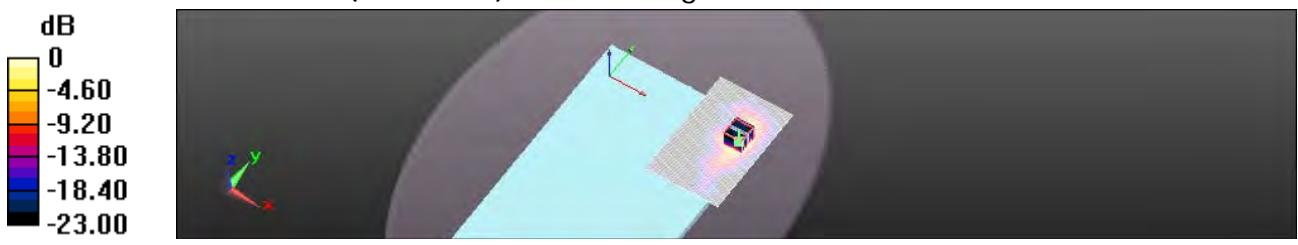
$dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 0.7720 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 5.91 W/kg

SAR(1 g) = 1.44 W/kg; SAR(10 g) = 0.461 W/kg

Maximum value of SAR (measured) = 2.87 W/kg



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Date: 2015/5/11

WLAN802.11ac 5.8G(80M)_Body-worn_Lap-held_CH 155_Main_Omm

Communication System: WLAN(5G); Frequency: 5775 MHz

Medium parameters used: $f = 5775$ MHz; $\sigma = 6.026$ S/m; $\epsilon_r = 46.749$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(3.92, 3.92, 3.92); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (91x141x1): Interpolated grid: $dx=10$ mm, $dy=10$ mm

Maximum value of SAR (interpolated) = 2.06 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

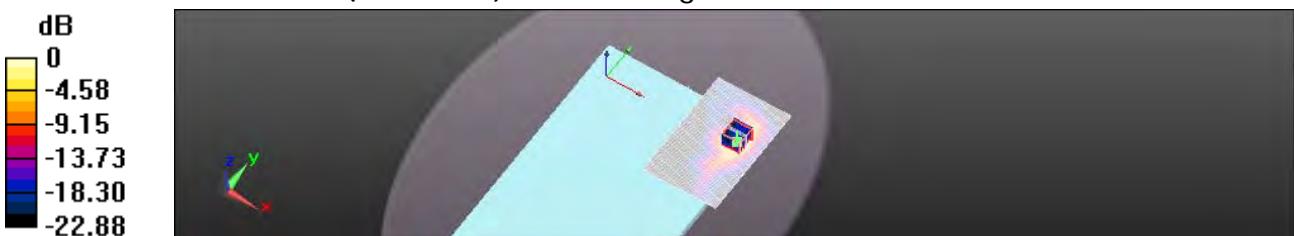
$dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 0.2500 V/m; Power Drift = 0.20 dB

Peak SAR (extrapolated) = 4.26 W/kg

SAR(1 g) = 1.04 W/kg; SAR(10 g) = 0.332 W/kg

Maximum value of SAR (measured) = 2.06 W/kg



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Date: 2015/4/29

WLAN802.11b_Body-worn_Lap-held_CH 11_Aux_0mm_repeat SAR test at the highest SAR measurement

Communication System: WLAN(2.45G); Frequency: 2462 MHz

Medium parameters used: $f = 2462$ MHz; $\sigma = 2.015$ S/m; $\epsilon_r = 51.762$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(6.69, 6.69, 6.69); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (81x121x1): Interpolated grid: $dx=12$ mm, $dy=12$ mm

Maximum value of SAR (interpolated) = 1.58 W/kg

Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid:

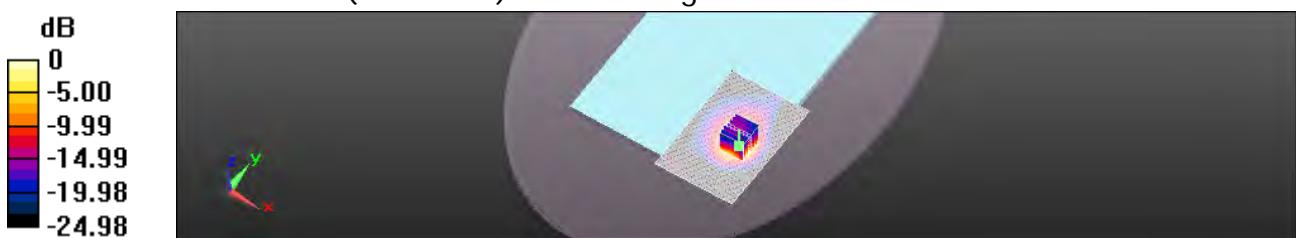
$dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 0.9210 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 2.09 W/kg

SAR(1 g) = 0.982 W/kg; SAR(10 g) = 0.457 W/kg

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



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Date: 2015/5/1

WLAN802.11a 5.2G_Body-worn_Lap-held_CH 40_Aux_0mm

Communication System: WLAN(5G); Frequency: 5200 MHz

Medium parameters used: $f = 5200$ MHz; $\sigma = 5.23$ S/m; $\epsilon_r = 49.071$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(4.27, 4.27, 4.27); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (91x141x1): Interpolated grid: $dx=10$ mm, $dy=10$ mm

Maximum value of SAR (interpolated) = 1.24 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

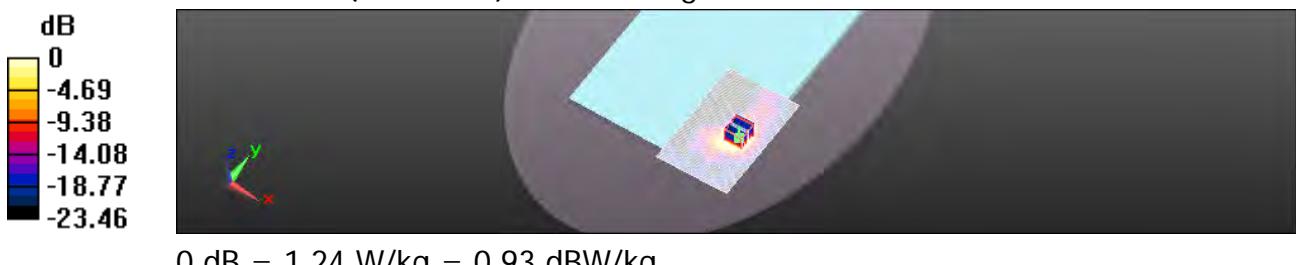
$dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 1.011 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 2.31 W/kg

SAR(1 g) = 0.632 W/kg; SAR(10 g) = 0.213 W/kg

Maximum value of SAR (measured) = 1.24 W/kg



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Date: 2015/5/1

WLAN802.11n 5.2G(40M)_Body-worn_Lap-held_CH 46_Aux_0mm

Communication System: WLAN(5G); Frequency: 5230 MHz

Medium parameters used: $f = 5230$ MHz; $\sigma = 5.282$ S/m; $\epsilon_r = 49.025$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(4.27, 4.27, 4.27); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (91x141x1): Interpolated grid: $dx=10$ mm, $dy=10$ mm

Maximum value of SAR (interpolated) = 1.81 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

$dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 1.538 V/m; Power Drift = -0.16 dB

Peak SAR (extrapolated) = 3.36 W/kg

SAR(1 g) = 0.881 W/kg; SAR(10 g) = 0.287 W/kg

Maximum value of SAR (measured) = 1.76 W/kg



0 dB = 1.76 W/kg = 2.46 dBW/kg

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Date: 2015/5/1

WLAN802.11ac 5.2G(40M)_Body-worn_Lap-held_CH 46_Aux_0mm

Communication System: WLAN(5G); Frequency: 5230 MHz

Medium parameters used: $f = 5230$ MHz; $\sigma = 5.282$ S/m; $\epsilon_r = 49.025$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(4.27, 4.27, 4.27); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (91x141x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 1.75 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

dx=4mm, dy=4mm, dz=2mm

Reference Value = 0.4290 V/m; Power Drift = 0.18 dB

Peak SAR (extrapolated) = 3.42 W/kg

SAR(1 g) = 0.881 W/kg; SAR(10 g) = 0.287 W/kg

Maximum value of SAR (measured) = 1.76 W/kg



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Date: 2015/5/5

WLAN802.11a 5.3G_Body-worn_Lap-held_CH 60_Aux_0mm

Communication System: WLAN(5G); Frequency: 5300 MHz

Medium parameters used: $f = 5300$ MHz; $\sigma = 5.389$ S/m; $\epsilon_r = 48.814$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(4.11, 4.11, 4.11); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (91x141x1): Interpolated grid: $dx=10$ mm, $dy=10$ mm

Maximum value of SAR (interpolated) = 2.15 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

$dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 1.606 V/m; Power Drift = -0.18 dB

Peak SAR (extrapolated) = 4.27 W/kg

SAR(1 g) = 1.08 W/kg; SAR(10 g) = 0.346 W/kg

Maximum value of SAR (measured) = 2.18 W/kg



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Date: 2015/5/5

WLAN802.11n 5.3G(40M)_Body-worn_Lap-held_CH 54_Aux_0mm

Communication System: WLAN(5G); Frequency: 5270 MHz

Medium parameters used: $f = 5270$ MHz; $\sigma = 5.357$ S/m; $\epsilon_r = 48.96$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(4.11, 4.11, 4.11); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (91x141x1): Interpolated grid: $dx=10$ mm, $dy=10$ mm

Maximum value of SAR (interpolated) = 1.77 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

$dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 0.7190 V/m; Power Drift = 0.15 dB

Peak SAR (extrapolated) = 3.43 W/kg

SAR(1 g) = 0.879 W/kg; SAR(10 g) = 0.284 W/kg

Maximum value of SAR (measured) = 1.77 W/kg



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Date: 2015/5/5

WLAN802.11ac 5.3G(40M)_Body-worn_Lap-held_CH 54_Aux_0mm

Communication System: WLAN(5G); Frequency: 5270 MHz

Medium parameters used: $f = 5270$ MHz; $\sigma = 5.357$ S/m; $\epsilon_r = 48.96$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(4.11, 4.11, 4.11); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (91x141x1): Interpolated grid: $dx=10$ mm, $dy=10$ mm

Maximum value of SAR (interpolated) = 1.86 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

$dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 0.1590 V/m; Power Drift = 0.17 dB

Peak SAR (extrapolated) = 3.57 W/kg

SAR(1 g) = 0.935 W/kg; SAR(10 g) = 0.303 W/kg

Maximum value of SAR (measured) = 1.86 W/kg



0 dB = 1.86 W/kg = 2.70 dBW/kg

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Date: 2015/5/8

WLAN802.11n 5.6G(40M)_Body-worn_Lap-held_CH 118_Aux_0mm

Communication System: WLAN(5G); Frequency: 5590 MHz

Medium parameters used: $f = 5590$ MHz; $\sigma = 5.629$ S/m; $\epsilon_r = 47.583$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(3.7, 3.7, 3.7); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (91x141x1): Interpolated grid: $dx=10$ mm, $dy=10$ mm

Maximum value of SAR (interpolated) = 2.59 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

$dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 0.6310 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 5.65 W/kg

SAR(1 g) = 1.38 W/kg; SAR(10 g) = 0.422 W/kg

Maximum value of SAR (measured) = 2.81 W/kg



0 dB = 2.81 W/kg = 4.49 dBW/kg

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Date: 2015/5/8

WLAN802.11ac 5.6G(20M)_Body-worn_Top side_CH 124_Aux_0mm

Communication System: WLAN(5G); Frequency: 5620 MHz

Medium parameters used: $f = 5620$ MHz; $\sigma = 5.699$ S/m; $\epsilon_r = 47.477$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(3.7, 3.7, 3.7); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (61x141x1): Interpolated grid: $dx=10$ mm, $dy=10$ mm

Maximum value of SAR (interpolated) = 1.73 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

$dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 4.135 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 3.34 W/kg

SAR(1 g) = 0.853 W/kg; SAR(10 g) = 0.269 W/kg

Maximum value of SAR (measured) = 1.72 W/kg



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Date: 2015/5/8

WLAN802.11ac 5.6G(40M)_Body-worn_Lap-held_CH 110_Aux_0mm

Communication System: WLAN(5G); Frequency: 5550 MHz

Medium parameters used: $f = 5550$ MHz; $\sigma = 5.556$ S/m; $\epsilon_r = 47.643$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(3.7, 3.7, 3.7); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (91x141x1): Interpolated grid: $dx=10$ mm, $dy=10$ mm

Maximum value of SAR (interpolated) = 2.72 W/kg

Configuration/Body/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

$dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 1.200 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 5.33 W/kg

SAR(1 g) = 1.34 W/kg; SAR(10 g) = 0.413 W/kg

Maximum value of SAR (measured) = 2.73 W/kg



0 dB = 2.73 W/kg = 4.36 dBW/kg

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Date: 2015/5/12

WLAN802.11n 5.8G(40M)_Body-worn_Lap-held_CH**159_Aux_0mm_repeated SAR test at the highest SAR measurement**

Communication System: WLAN(5G); Frequency: 5795 MHz

Medium parameters used: $f = 5795 \text{ MHz}$; $\sigma = 5.992 \text{ S/m}$; $\epsilon_r = 46.541$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(3.92, 3.92, 3.92); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (91x141x1): Interpolated grid: $dx=10 \text{ mm}$, $dy=10 \text{ mm}$

Maximum value of SAR (interpolated) = 1.63 W/kg

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

Reference Value = 1.441 V/m; Power Drift = -0.18 dB

Peak SAR (extrapolated) = 3.50 W/kg

SAR(1 g) = 0.797 W/kg; SAR(10 g) = 0.236 W/kg

Maximum value of SAR (measured) = 1.67 W/kg



0 dB = 1.67 W/kg = 2.23 dBW/kg

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6. SAR System Performance Verification

Date: 2015/4/29

Dipole 2450 MHz_SN:735_Body

Communication System: CW; Frequency: 2450 MHz

Medium parameters used: $f = 2450$ MHz; $\sigma = 2.001$ S/m; $\epsilon_r = 51.833$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(6.69, 6.69, 6.69); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Pin=250mW/Area Scan (51x81x1): Interpolated grid: $dx=12$ mm, $dy=12$ mm

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

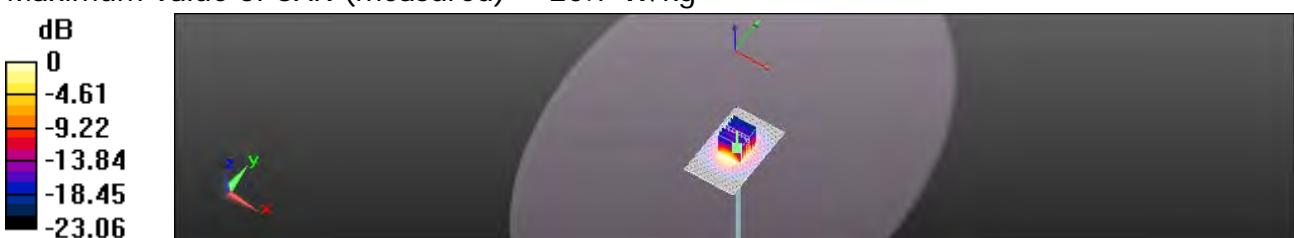
Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 101.3 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 28.6 W/kg

SAR(1 g) = 13.4 W/kg; SAR(10 g) = 6.09 W/kg

Maximum value of SAR (measured) = 20.7 W/kg



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Date: 2015/4/30

Dipole 5200 MHz_SN:1023_Body

Communication System: CW; Frequency: 5200 MHz

Medium parameters used: $f = 5200$ MHz; $\sigma = 5.228$ S/m; $\epsilon_r = 49.151$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(4.27, 4.27, 4.27); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Pin=100mW/Area Scan (61x101x1): Interpolated grid:

$dx=10$ mm, $dy=10$ mm

Maximum value of SAR (interpolated) = 15.1 W/kg

Configuration/Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement

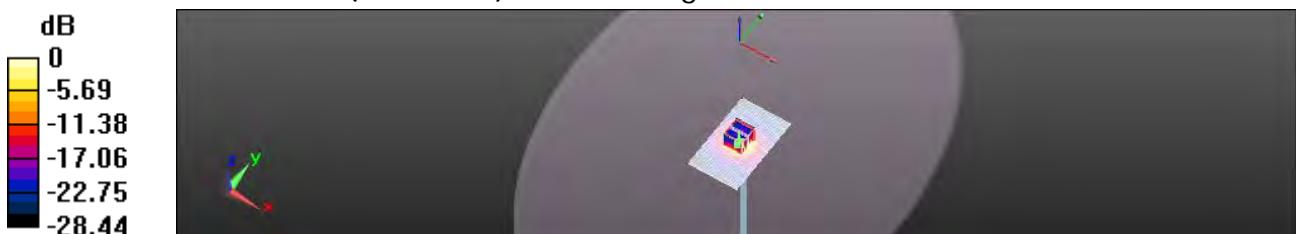
grid: $dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 57.54 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 29.4 W/kg

SAR(1 g) = 7.34 W/kg; SAR(10 g) = 2.13 W/kg

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



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

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Date: 2015/5/1

Dipole 5200 MHz_SN:1023_Body

Communication System: CW; Frequency: 5200 MHz

Medium parameters used: $f = 5200$ MHz; $\sigma = 5.23$ S/m; $\epsilon_r = 49.071$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(4.27, 4.27, 4.27); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Pin=100mW/Area Scan (61x101x1): Interpolated grid:

$dx=10$ mm, $dy=10$ mm

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

Configuration/Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement

grid: $dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 57.32 V/m; Power Drift = -0.15 dB

Peak SAR (extrapolated) = 29.3 W/kg

SAR(1 g) = 7.29 W/kg; SAR(10 g) = 2.12 W/kg

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



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Date: 2015/5/4

Dipole 5300 MHz_SN:1023_Body

Communication System: CW; Frequency: 5300 MHz

Medium parameters used: $f = 5300$ MHz; $\sigma = 5.375$ S/m; $\epsilon_r = 48.834$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(4.11, 4.11, 4.11); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Pin=100mW/Area Scan (61x101x1): Interpolated grid:

$dx=10$ mm, $dy=10$ mm

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

Configuration/Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement

grid: $dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 57.66 V/m; Power Drift = -0.12 dB

Peak SAR (extrapolated) = 31.1 W/kg

SAR(1 g) = 7.64 W/kg; SAR(10 g) = 2.2 W/kg

Maximum value of SAR (measured) = 15.8 W/kg



0 dB = 15.8 W/kg = 11.99 dBW/kg

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Date: 2015/5/5

Dipole 5300 MHz_SN:1023_Body

Communication System: CW; Frequency: 5300 MHz

Medium parameters used: $f = 5300$ MHz; $\sigma = 5.389$ S/m; $\epsilon_r = 48.814$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(4.11, 4.11, 4.11); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Pin=100mW/Area Scan (61x101x1): Interpolated grid:

$dx=10$ mm, $dy=10$ mm

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

Configuration/Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement

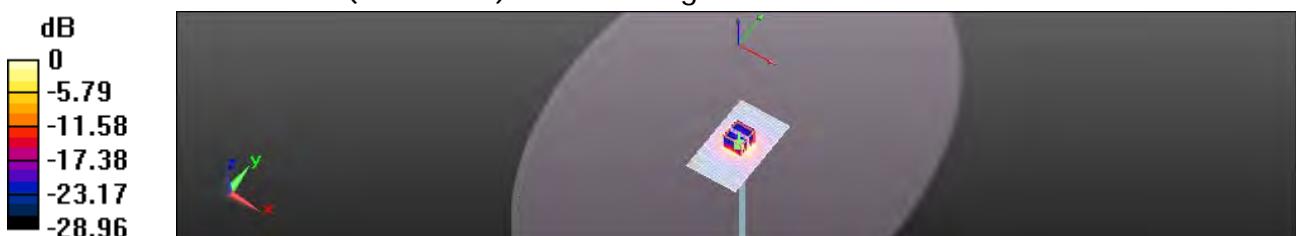
grid: $dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 57.49 V/m; Power Drift = -0.12 dB

Peak SAR (extrapolated) = 31.3 W/kg

SAR(1 g) = 7.62 W/kg; SAR(10 g) = 2.18 W/kg

Maximum value of SAR (measured) = 15.8 W/kg



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Date: 2015/5/7

Dipole 5600 MHz_SN:1023_Body

Communication System: CW; Frequency: 5600 MHz

Medium parameters used: $f = 5600$ MHz; $\sigma = 5.716$ S/m; $\epsilon_r = 47.508$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(3.7, 3.7, 3.7); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Pin=100mW/Area Scan (61x101x1): Interpolated grid:

$dx=10$ mm, $dy=10$ mm

Maximum value of SAR (interpolated) = 17.7 W/kg

Configuration/Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement

grid: $dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 59.98 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 32.7 W/kg

SAR(1 g) = 8.28 W/kg; SAR(10 g) = 2.33 W/kg

Maximum value of SAR (measured) = 17.8 W/kg



0 dB = 17.8 W/kg = 12.50 dBW/kg

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Date: 2015/5/8

Dipole 5600 MHz_SN:1023_Body

Communication System: CW; Frequency: 5600 MHz

Medium parameters used: $f = 5600$ MHz; $\sigma = 5.683$ S/m; $\epsilon_r = 47.538$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(3.7, 3.7, 3.7); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Pin=100mW/Area Scan (61x101x1): Interpolated grid:

$dx=10$ mm, $dy=10$ mm

Maximum value of SAR (interpolated) = 17.7 W/kg

Configuration/Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement

grid: $dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 59.75 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 32.5 W/kg

SAR(1 g) = 8.24 W/kg; SAR(10 g) = 2.32 W/kg

Maximum value of SAR (measured) = 17.6 W/kg



0 dB = 17.6 W/kg = 12.46 dBW/kg

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Date: 2015/5/11

Dipole 5800 MHz_SN:1023_Body

Communication System: CW; Frequency: 5800 MHz

Medium parameters used: $f = 5800$ MHz; $\sigma = 6.052$ S/m; $\epsilon_r = 46.48$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(3.92, 3.92, 3.92); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Pin=100mW/Area Scan (61x101x1): Interpolated grid:

$dx=10$ mm, $dy=10$ mm

Maximum value of SAR (interpolated) = 15.7 W/kg

Configuration/Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement

grid: $dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 55.89 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 31.0 W/kg

SAR(1 g) = 7.31 W/kg; SAR(10 g) = 2.07 W/kg

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



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

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Date: 2015/5/12

Dipole 5800 MHz_SN:1023_Body

Communication System: CW; Frequency: 5800 MHz

Medium parameters used: $f = 5800$ MHz; $\sigma = 6.029$ S/m; $\epsilon_r = 46.479$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(3.92, 3.92, 3.92); Calibrated: 2014/7/25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2014/8/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Pin=100mW/Area Scan (61x101x1): Interpolated grid:

$dx=10$ mm, $dy=10$ mm

Maximum value of SAR (interpolated) = 16.1 W/kg

Configuration/Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement

grid: $dx=4$ mm, $dy=4$ mm, $dz=2$ mm

Reference Value = 56.15 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 32.0 W/kg

SAR(1 g) = 7.51 W/kg; SAR(10 g) = 2.12 W/kg

Maximum value of SAR (measured) = 16.1 W/kg



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

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7. DAE & Probe Calibration Certificate

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Accreditation No.: SCS 108

Client SCS-TW (Auden)

Certificate No: DAE4-1260_Aug14

CALIBRATION CERTIFICATE

Object DAE4 - SD 000 D04 BM - SN: 1260

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

Calibration date: August 26, 2014

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

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

Calibration Equipment used (M&TE critical for calibration)

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

Calibrated by:	Name: Dominique Stettler	Function: Technician	Signature:
Approved by:	Fin Borchli	Deputy Technical Manager	

Issued: August 26, 2014

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Certificate No: DAE4-1260_Aug14

Page 1 of 6

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Accreditation No.: SCS 108

Glossary

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

Methods Applied and Interpretation of Parameters

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

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DC Voltage Measurement

A/D - Converter Resolution nominal
High Range: 1LSB = $6.1\mu V$, full range = $-100...+300\text{mV}$
Low Range: 1LSB = 61nV , full range = $-1...+3\text{mV}$
DASY measurement parameters: Auto Zero Time: 5 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	$405.033 \pm 0.02\% (k=2)$	$405.001 \pm 0.02\% (k=2)$	$405.579 \pm 0.02\% (k=2)$
Low Range	$3.95663 \pm 1.50\% (k=2)$	$4.01886 \pm 1.50\% (k=2)$	$4.00468 \pm 1.50\% (k=2)$

Connector Angle

Connector Angle to be used in DASY system	$84.0^\circ \pm 1^\circ$
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Appendix (Additional assessments outside the scope of SCS108)**1. DC Voltage Linearity**

High Range	Reading (µV)	Difference (µV)	Error (%)
Channel X + Input	199997.43	-0.04	-0.00
Channel X + Input	20003.49	2.49	0.01
Channel X - Input	-19998.62	2.32	-0.01
Channel Y + Input	199988.97	1.33	0.00
Channel Y + Input	20001.53	0.51	0.00
Channel Y - Input	-20000.52	0.34	-0.00
Channel Z + Input	199998.52	1.01	0.00
Channel Z + Input	19999.80	-1.11	-0.01
Channel Z - Input	-20001.65	-0.71	0.00

Low Range	Reading (µV)	Difference (µV)	Error (%)
Channel X + Input	2000.98	0.17	0.01
Channel X + Input	-201.72	0.48	0.24
Channel X - Input	-198.19	0.50	-0.25
Channel Y + Input	1999.92	-1.02	-0.05
Channel Y + Input	201.16	-0.25	-0.12
Channel Y - Input	-199.53	0.05	-0.03
Channel Z + Input	2001.06	0.16	0.01
Channel Z + Input	200.04	-1.27	-0.63
Channel Z - Input	-200.92	-1.48	0.74

2. Common mode sensitivity

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

	Common mode Input Voltage (mV)	High Range Average Reading (µV)	Low Range Average Reading (µV)
Channel X	200	1.17	-0.56
	-200	1.57	-0.48
Channel Y	200	12.66	12.37
	-200	12.46	12.07
Channel Z	200	-0.46	-0.74
	-200	-1.73	-1.53

3. Channel separation

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

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

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4. AD-Converter Values with inputs shorted

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

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

5. Input Offset MeasurementDASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input: 10MΩ

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

6. Input Offset Current

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

7. Input Resistance (Typical values for information)

	Zeroing (kΩ)	Measuring (MΩ)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

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

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

9. Power Consumption (Typical values for information)

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

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Accreditation No.: SCS 108

Client: SGS-TW (Auden)

Certificate No: EX3-3938_Jul14

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3938

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

Calibration date: July 26, 2014

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

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

Calibration Equipment used (M&T critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB4-1293874	03-Apr-14 (No. 217-01911)	Apr-16
Power sensor E4412A	MB4-1408897	03-Apr-14 (No. 217-01911)	Apr-16
Reference 3 dB Attenuator	SN: 55954 (3c)	03-Apr-14 (No. 217-01915)	Apr-16
Reference 20 dB Attenuator	SN: 56277 (20x)	03-Apr-14 (No. 217-01919)	Apr-16
Reference 30 dB Attenuator	SN: 55179 (30x)	03-Apr-14 (No. 217-01920)	Apr-16
Reference Probe E330V2	SN: 8813	30-Dec-13 (No. ES3-2013_Dec13)	Dec-14
DAE4	SN: 880	13-Dec-13 (No. DAE4-880_Dec13)	Dec-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HF 8648D	US3642U01780	4-Aug-09 (in house check: Apr-13)	in house check: Apr-16
Network Analyzer HP 8753E	US37399235	18-Oct-01 (in house check: Oct-13)	in house check: Oct-14

Calibrated by:	Name:	Function:	Signature:
	Ulrich El-Naschie	Laboratory Technician	
Approved by:	Karlis Povilas	Technical Manager	

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Issued: July 26, 2014

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

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}:** Assessed for E-field polarization $\theta = 0$ ($f \leq 800$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E²-field uncertainty inside TSL (see below ConvF).
- NORM_{(f)x,y,z} = NORM_{x,y,z} * frequency_response** (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCPx,y,z:** DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR:** PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A_{x,y,z}, B_{x,y,z}, C_{x,y,z}, D_{x,y,z}:** A, B, C, D are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters:** Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,y,z} * ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical Isotropy (3D deviation from isotropy):** in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset:** The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle:** The angle is assessed using the information gained by determining the NORMx (no uncertainty required).

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EX3DV4 – SN:3938

July 25, 2014

Probe EX3DV4

SN:3938

Manufactured: May 2, 2013
Calibrated: July 25, 2014

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

Certificate No: EX3-3938_Jul14

Page 3 of 11

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EX3DV4- SN:3938

July 25, 2014

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3938

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (μ V/(V/m)) ^A	0.52	0.59	0.34	\pm 10.1 %
DCP (mV) ^B	98.3	99.4	104.7	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB/ μ V	C	D dB	VR mV	Unc ^C (k=2)
0	CW	X	0.0	0.0	1.0	0.00	166.6	\pm 3.0 %
		Y	0.0	0.0	1.0		157.7	
		Z	0.0	0.0	1.0		153.7	

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

^A The uncertainties of NormX,Y,Z do not affect the E²-field uncertainty inside TSL (see Pages 5 and 6).

^B Numerical linearization parameter: uncertainty not required.

^C Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

EX3DV4-SN:3938

July 25, 2014

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3938**Calibration Parameter Determined in Head Tissue Simulating Media**

f (MHz) ^a	Relative Permittivity ^b	Conductivity (S/m) ^c	ConvF X	ConvF Y	ConvF Z	Alpha ^d	Depth ^e (mm)	Unct. (k=2)
835	41.5	0.90	9.41	9.41	9.41	0.80	0.50	± 12.0 %
900	41.5	0.97	9.26	9.26	9.26	0.61	0.68	± 12.0 %
1750	40.1	1.37	7.91	7.91	7.91	0.59	0.66	± 12.0 %
1900	40.0	1.40	7.65	7.65	7.65	0.54	0.72	± 12.0 %
2000	40.0	1.40	7.66	7.66	7.66	0.80	0.59	± 12.0 %
2450	39.2	1.80	6.97	6.97	6.97	0.41	0.78	± 12.0 %
2600	39.0	1.96	6.83	6.83	6.83	0.38	0.86	± 12.0 %
5200	36.0	4.86	4.95	4.95	4.95	0.40	1.80	± 13.1 %
5300	35.9	4.76	4.74	4.74	4.74	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.47	4.47	4.47	0.40	1.80	± 13.1 %
5800	35.3	5.27	4.49	4.49	4.49	0.40	1.80	± 13.1 %

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

^b At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^c Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

EX3DV4—SN:3938

July 25, 2014

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3938**Calibration Parameter Determined in Body Tissue Simulating Media**

f (MHz) ^a	Relative Permittivity ^b	Conductivity (S/m) ^c	ConvF X	ConvF Y	ConvF Z	Alpha ^d	Depth ^e (mm)	Unc. (k=2)
835	55.2	0.97	9.35	9.35	9.35	0.80	0.60	± 12.0 %
900	55.0	1.05	9.24	9.24	9.24	0.80	0.50	± 12.0 %
1750	53.4	1.49	7.36	7.36	7.36	0.80	0.62	± 12.0 %
1900	53.3	1.52	7.03	7.03	7.03	0.44	0.83	± 12.0 %
2000	53.3	1.52	7.21	7.21	7.21	0.30	0.97	± 12.0 %
2450	52.7	1.95	6.69	6.69	6.69	0.75	0.57	± 12.0 %
2600	52.5	2.16	6.57	6.57	6.57	0.80	0.50	± 12.0 %
5200	49.0	5.30	4.27	4.27	4.27	0.45	1.90	± 13.1 %
5300	48.9	5.42	4.11	4.11	4.11	0.45	1.90	± 13.1 %
5600	48.5	5.77	3.70	3.70	3.70	0.50	1.90	± 13.1 %
5800	48.2	6.00	3.92	3.92	3.92	0.50	1.90	± 13.1 %

^a Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 55 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

^b At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^c Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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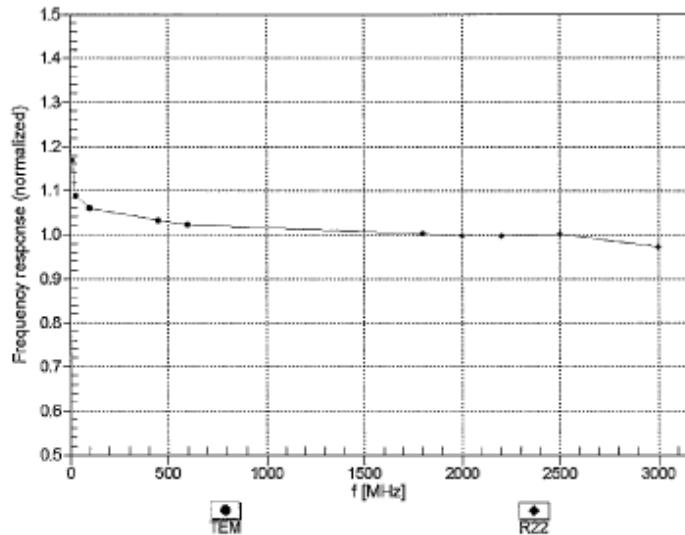
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EX3DV4-SN:3838

July 25, 2014

Frequency Response of E-Field
(TEM-Cell:ifl110 EXX, Waveguide: R22)Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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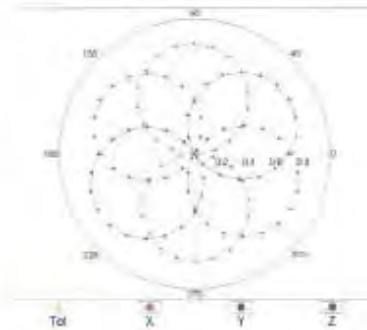
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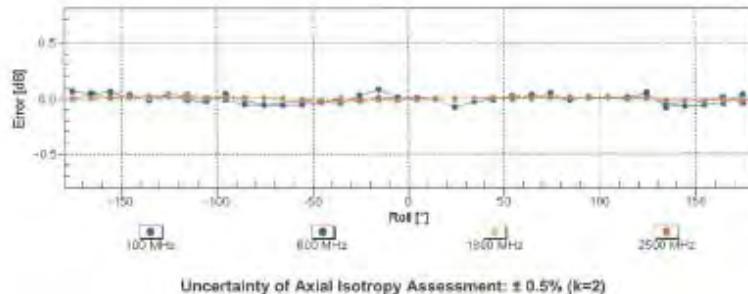
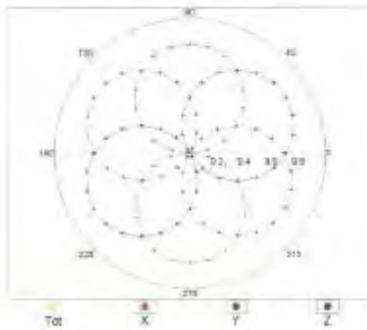
July 25, 2014

Receiving Pattern (ϕ), $\theta = 0^\circ$

f=600 MHz, TEM



f=1800 MHz, R22



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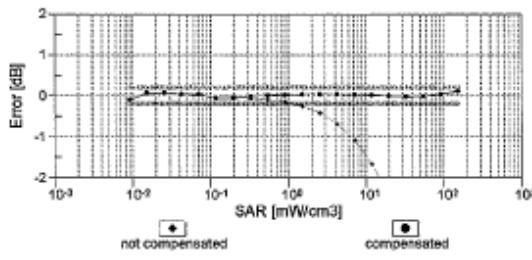
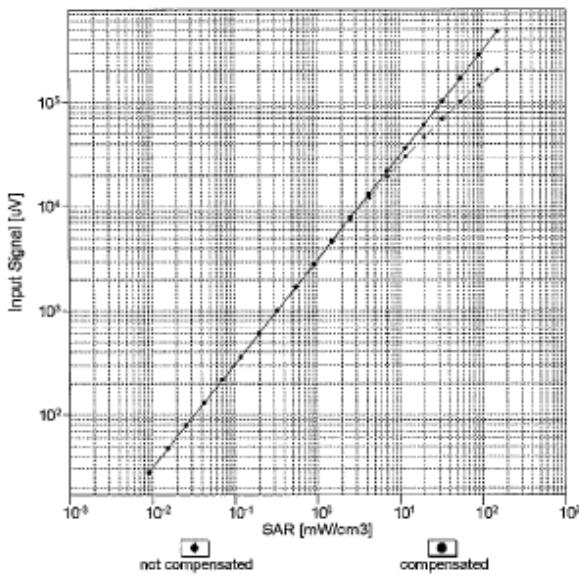
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Dynamic Range f(SAR_{head})
(TEM cell, f_{eval}= 1900 MHz)

Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

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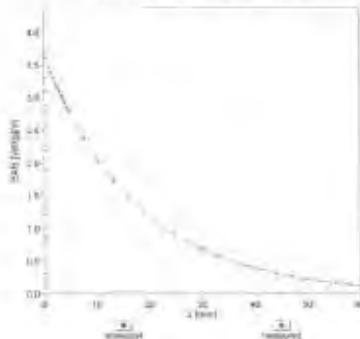
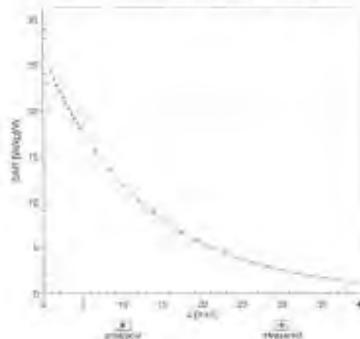
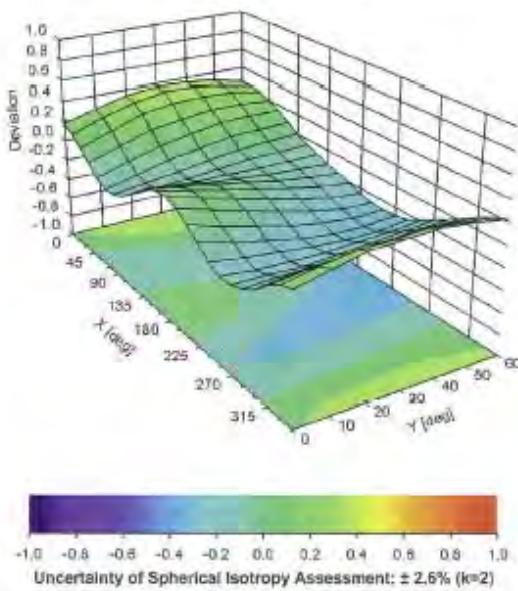
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EX3DW4-SN-3938

July 25, 2014

Conversion Factor Assessment $f = 900 \text{ MHz}, \text{WGLS R9 (H_convF)}$  $f = 1750 \text{ MHz}, \text{WGLS R22 (H_convF)}$ **Deviation from Isotropy in Liquid**
Error (θ, δ), $f = 900 \text{ MHz}$ Uncertainty of Spherical Isotropy Assessment: $\pm 2.6\% (k=2)$

Certificate No: EX3-3938_Jul14

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EX3DV4- SN:3938

July 25, 2014

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3938

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-25.5
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

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8. Uncertainty Budget

 Measurement Uncertainty evaluation template for DUT SAR test
 IEEE 1528

A	c	D	e	f	g	$h=c * f / e$	$i=c * g / e$	k
Source of Uncertainty	Tolerance/ Uncertainty	Probability Distribution	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% ∞
<i>Isotropy, Axial</i>	3.50%	R	$\sqrt{3}$	1.732	1	1	2.02%	2.02% ∞
<i>Isotropy, Hemispherical</i>	9.60%	R	$\sqrt{3}$	1.732	1	1	5.54%	5.54% ∞
Boundary Effect	1.00%	R	$\sqrt{3}$	1.732	1	1	0.58%	0.58% ∞
Linearity	4.70%	R	$\sqrt{3}$	1.732	1	1	2.71%	2.71% ∞
Detection Limits	1.00%	R	$\sqrt{3}$	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	$\sqrt{3}$	1.732	1	1	0.46%	0.46% ∞
Integration Time	2.60%	R	$\sqrt{3}$	1.732	1	1	1.50%	1.50% ∞
<i>Measurement drift (class A evaluation)</i>	1.75%	R	$\sqrt{3}$	1.732	1	1	1.01%	1.01% ∞
RF ambient condition - noise	3.00%	R	$\sqrt{3}$	1.732	1	1	1.73%	1.73% ∞
RF ambient conditions - reflections	3.00%	R	$\sqrt{3}$	1.732	1	1	1.73%	1.73% ∞
Probe positioner Mechanical restrictions	0.40%	R	$\sqrt{3}$	1.732	1	1	0.23%	0.23% ∞
Probe Positioning with respect to phantom shell	2.90%	R	$\sqrt{3}$	1.732	1	1	1.67%	1.67% ∞
Post-processing	1.00%	R	$\sqrt{3}$	1.732	1	1	0.58%	0.58% ∞
Max SAR Eval	1.00%	R	$\sqrt{3}$	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	$\sqrt{3}$	1.732	1	1	2.89%	2.89% ∞
Phantom and Setup								
Phantom Uncertainty	4.00%	R	$\sqrt{3}$	1.732	1	1	2.31%	2.31% ∞
Deviation from reference liquid target ϵ 'r(Body)	0.77%	N	1	1	0.64	0.43	0.49%	0.33% M
Deviation from reference liquid target σ (Body)	3.31%	N	1	1	0.6	0.49	1.99%	1.62% M
Liquid conductivity σ – temperature uncertainty	2.60%	R	$\sqrt{3}$	1.732	0.78	0.71	1.17%	1.07% ∞
Liquid permittivity ϵ – temperature uncertainty	1.80%	R	$\sqrt{3}$	1.732	0.23	0.26	0.24%	0.27% ∞
Combined standard uncertainty		RSS					11.81%	11.74%
Expan uncertainty (95% confidence interval), K=2							23.62%	23.48%

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9. Phantom Description

Schmid & Partner Engineering AG

s p e a cZeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 1 245 9700, Fax +41 1 245 9779
Info@speag.com, http://www.speag.com**Certificate of Conformity / First Article Inspection**

Item	SAM Twin Phantom V4.0
Type No	QD 000 P40 C
Series No	TP-1150 and higher
Manufacturer	SPEAG Zeughausstrasse 43 CH-8004 Zürich Switzerland

Tests

The series production process used allows the limitation to test of first articles.
Complete tests were made on the pre-series Type No. QD 000 P40 AA, Serial No. TP-1001 and on the series first article Type No. QD 000 P40 BA, Serial No. TP-1006. Certain parameters have been retested using further series items (called samples) or are tested at each item.

Test	Requirement	Details	Units tested
Dimensions	Compliant with the geometry according to the CAD model.	IT'IS CAD File (*)	First article, Samples
Material thickness of shell	Compliant with the requirements according to the standards	2mm +/- 0.2mm in flat and specific areas of head section	First article, Samples, TP-1314 fl.
Material thickness at ERP	Compliant with the requirements according to the standards	8mm +/- 0.2mm at ERP	First article, All items
Material parameters	Dielectric parameters for required frequencies	300 MHz – 6 GHz: Relative permittivity < 5, Loss tangent < 0.05	Material samples
Material resistivity	The material has been tested to be compatible with the liquids defined in the standards if handled and cleaned according to the instructions. Observe technical Note for material compatibility.	DEGMME based simulating liquids	Pre-series, First article, Material samples
Sagging	Compliant with the requirements according to the standards. Sagging of the flat section when filled with tissue simulating liquid.	< 1% typical < 0.8% if filled with 155mm of HSL900 and without DUT below	Prototypes, Sample testing

Standards

- [1] CENELEC EN 50361
- [2] IEEE Std 1528-2003
- [3] IEC 62209 Part 1
- [4] FCC OET Bulletin 85, Supplement C, Edition 01-01

(*) The IT'IS CAD file is derived from [2] and is also within the tolerance requirements of the shapes of the other documents.

Conformity

Based on the sample tests above, we certify that this item is in compliance with the uncertainty requirements of SAR measurements specified in standards [1] to [4].

Date

07.07.2005

s p e a c

Signature / Stamp

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Info@speag.com, http://www.speag.com

Doc No. 841 - QD 000 P40 C - F

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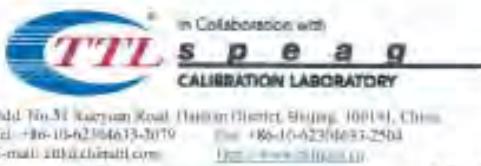
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10. System Validation from Original Equipment Supplier



Client	Auden	Certificate No:	Z14-97161
CALIBRATION CERTIFICATE			
Object:	D2450V2 - SN: 735		
Calibration Procedure(s):	TMC-OS-E-02-194 Calibration Procedures for dipole validation kits		
Calibration date:	December 8, 2014		
This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.			
All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)°C and humidity<70%.			
Calibration Equipment used (M&TE critical for calibration)			
Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	01-Jul-14 (CTTL, No.J14X02146)	Jun-15
Power sensor NRP-Z91	101547	01-Jul-14 (CTTL, No.J14X02146)	Jun-15
Reference Probe EX3DV4	SN 3617	28-Aug-14(SPEAG, No. EX3-3617_Aug14)	Aug-15
DAE4	SN 549	27-Oct-14(CTTL-SPEAG, No. Z14-97133)	Oct-15
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
SignalGenerator MG3700A	6201052806	01-Jul-14 (CTTL, No.J14X02145)	Jun-15
Network Analyzer E5071C	MY46110673	15-Feb-14 (TMC, No.JZ14-781)	Feb-15
Calibrated by:	Name: Zhao Jing	Function: SAR Test Engineer	Signature:
Reviewed by:	Name: Qi Dianyuan	Function: SAR Project Leader	Signature:
Approved by:	Name: Lu Bingsong	Function: Deputy Director of the laboratory	Signature:
Issued: December 10, 2014			
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			

**Glossary:**

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

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques". June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) For hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)". February 2005
- KD98855884, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:* SAR measured at the stated antenna input power.
- SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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



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Measurement Conditions

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

DASY Version	DASY52	52.8.9.1222
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 510	
Distance Dipole Center - TSL	10 mm	With Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz \pm 1 MHz	

Head TSL parameters

The following parameters and calculations were applied

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 \pm 0.2) °C	39.4 \pm 6 %	1.82 mho/m \pm 6 %
Head TSL temperature change during test	<1.0 °C	—	—

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	12.6 mW/g
SAR for nominal Head TSL parameters	normalized to 1WV	54.2 mW/g \pm 20.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	8.4 mW/g
SAR for nominal Head TSL parameters	normalized to 1WV	28.6 mW/g \pm 20.4 % (k=2)

Body TSL parameters

The following parameters and calculations were applied

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 \pm 0.2) °C	53.3 \pm 6 %	1.84 mho/m \pm 6 %
Body TSL temperature change during test	<1.0 °C	—	—

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.7 mW/g
SAR for nominal Body TSL parameters	normalized to 1WV	51.1 mW/g \pm 20.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	8.36 mW/g
SAR for nominal Body TSL parameters	normalized to 1WV	23.6 mW/g \pm 20.4 % (k=2)

Certificate No: 214-07761

Page 1 of 8

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point:	54.4Ω + 5.58jΩ
Return Loss:	-23.4dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point:	50.3Ω + 5.4Ωj
Return Loss:	-23.8dB

General Antenna Parameters and Design

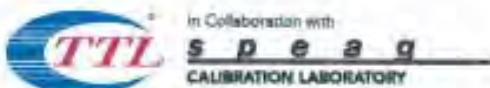
Electrical Delay (one direction)	1.014 ns
----------------------------------	----------

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

The dipole is made of standard semi rigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard. No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by SPEAG



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DASY5 Validation Report for Head TSL

Date: 08/12/2014

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 735

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

Medium parameters used: $\epsilon = 1.816$ S/m; $\kappa = 39.36$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(7.19, 7.19, 7.19); Calibrated: 2014-08-28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn54V; Calibrated: 2014-10-27
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (733)

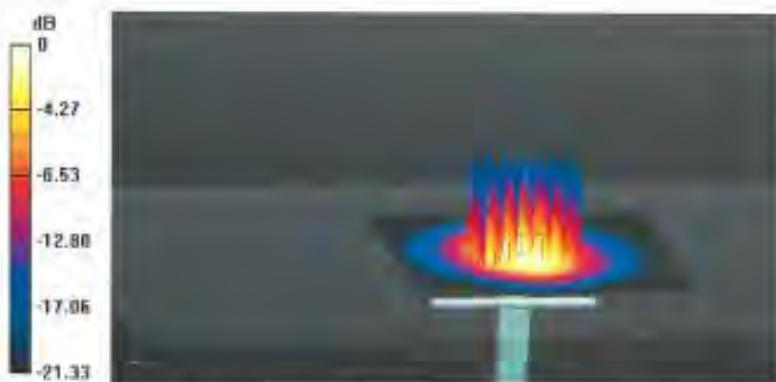
**System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW,
dist=2.0mm (EX-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:
dx=5mm, dy=5mm, dz=5mm**

Reference Value = 106.8 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 27.2 W/kg

SAR(1 g) = 13.6 W/kg; SAR(10 g) = 6.4 W/kg

Maximum value of SAR (measured) = 20.6 W/kg



Certificate No: 214497161

Page 1 of 1

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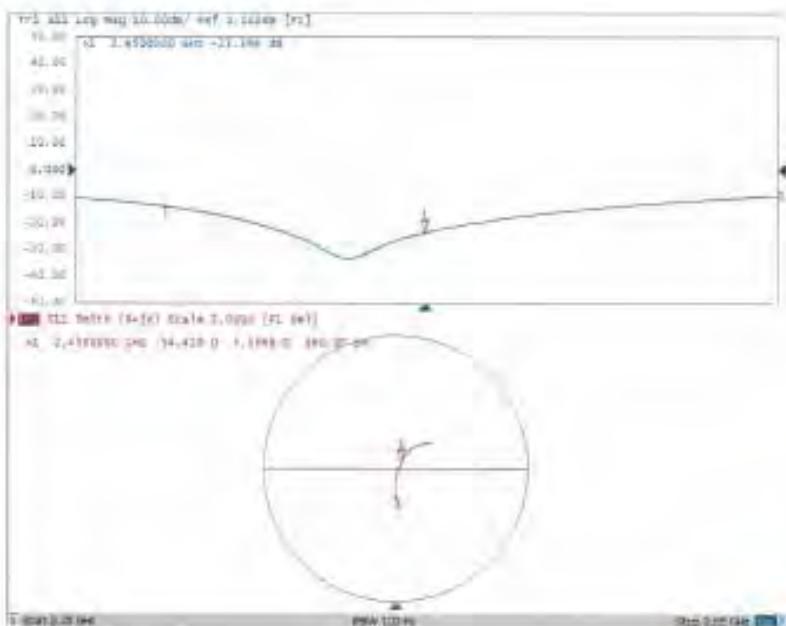
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Impedance Measurement Plot for Head TSL



Certificate No. Z14-97161

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DASY5 Validation Report for Body TSL

Date: 08/12/2014

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 735

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

Medium parameters used: $\epsilon = 2450 \text{ MHz}$; $\sigma = 1.935 \text{ S/m}$; $\kappa = 53.27$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Center Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(7.31, 7.31, 7.31); Calibrated: 2014-08-28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn549; Calibrated: 2014-10-27
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (733)

System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW,

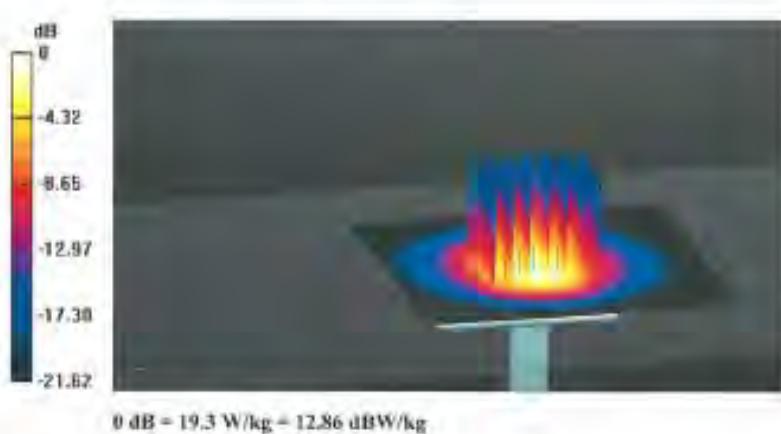
dist=2.0mm (EX-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube: 0; Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 99.98 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 26.0 W/kg

SAR(1 g) = 12.7 W/kg; SAR(10 g) = 5.88 W/kg

Maximum value of SAR (measured) = 19.3 W/kg



Certificate No: Z14-97161

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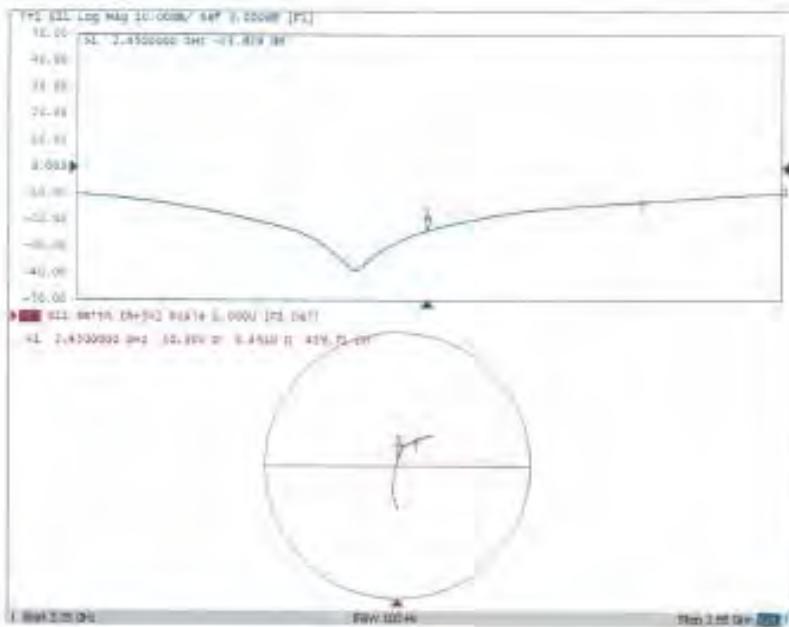
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Impedance Measurement Plot for Body TSL

Certificate No: Z14-97161

Page 8 of 8

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The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Client SGS-TW (Auden)

Certificate No: D5GHzV2-1023_Jan15

CALIBRATION CERTIFICATE

Object D5GHzV2 - SN:1023
Calibration procedure(s) QA.CAL-22.v2
Calibration procedure for dipole validation kits between 3-6 GHz
Calibration date January 29, 2015

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480734	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	US37292783	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	MY41052317	07-Oct-14 (No. 217-02021)	Oct-15
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 8147 2 / 05327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe EX300V4	SN: 3503	30-Dec-14 (No. EX3-3503_Dec14)	Dec-15
DAE4	SN: 801	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15
Secondary Standards	ID #	Check Date (In house)	Scheduled Check
RF generator R8.5 SMT 06	100005	04-Aug-14 (In house check Oct-13)	In house check: Oct-15
Network Analyzer HP 8753E	US37090500 S4206	19-Oct-01 (In house check Oct-14)	In house check: Oct-15

Calibrated by:	Name: Michael Weber	Function: Laboratory Technician	Signature:
Approved by:	Karla Polković	Technical Manager	

Issued: January 29, 2015

Certificate No: D5GHzV2-1023_Jan15

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Glossary:

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

Calibration is Performed According to the Following Standards:

- IEC 62209-2, "Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation, and Procedures", Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for including accessories and multiple transmitters", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"
- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:* SAR measured at the stated antenna input power.
- SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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

Measurement Conditions

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

DASY Version	DASY5	V52.6.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center -TSL	10 mm	with Spacer
Zoom Scan Resolution	$dx, dy = 4.0 \text{ mm}, dz = 1.4 \text{ mm}$	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz $\pm 1 \text{ MHz}$ 5300 MHz $\pm 1 \text{ MHz}$ 5600 MHz $\pm 1 \text{ MHz}$ 5800 MHz $\pm 1 \text{ MHz}$	

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.3 $\pm 0 \text{ %}$	4.56 mho/m $\pm 5 \text{ %}$
Head TSL temperature change during test	< 0.5 °C	—	—

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.78 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	77.9 W/kg $\pm 19.9 \text{ %} (k=2)$

SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.78 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.2 W/kg $\pm 19.5 \text{ %} (k=2)$

Head TSL parameters at 5300 MHz

The following parameters and calculations were applied

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.78 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.1 ± 6 %	4.66 mho/m ± 6 %
Head TSL temperature change during test	<0.5 °C	—	—

SAR result with Head TSL at 5300 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.17 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	81.7 W / kg ± 19.9 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.34 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.4 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.7 ± 6 %	4.97 mho/m ± 6 %
Head TSL temperature change during test	<0.5 °C	—	—

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.14 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	81.4 W/kg ± 19.9 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.31 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.1 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied:

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.4 ± 6 %	5.18 mho/m ± 6 %
Head TSL temperature change during test	<0.5 °C	—	—

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.82 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	78.2 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.23 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.3 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	49.4 ± 8 %	5.42 mho/m ± 8 %
Body TSL temperature change during test	< 0.5 °C	—	—

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.33 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	73.5 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	
SAR measured	100 mW input power	2.04 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.5 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.42 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	49.2 ± 8 %	5.55 mho/m ± 8 %
Body TSL temperature change during test	< 0.5 °C	—	—

SAR result with Body TSL at 5300 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.45 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	74.6 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	
SAR measured	100 mW input power	2.07 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.8 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied:

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	48.7 ± 6 %	5.86 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	—	—

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.77 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	77.5 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	
SAR measured	100 mW input power	2.15 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.6 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5800 MHz

The following parameters and calculations were applied:

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	48.4 ± 6 %	6.25 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	—	—

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.54 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	75.5 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	
SAR measured	100 mW input power	2.07 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.7 W/kg ± 19.5 % (k=2)

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Appendix (Additional assessments outside the scope of SCS0108)**Antenna Parameters with Head TSL at 5200 MHz**

Impedance, transformed to feed point	49.2 Ω - 8.5 $\mu\Omega$
Return Loss	-21.4 dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	51.0 Ω - 3.8 $\mu\Omega$
Return Loss	-26.2 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	53.4 Ω - 2.7 $\mu\Omega$
Return Loss	-27.5 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	55.6 Ω + 1.0 $\mu\Omega$
Return Loss	-25.4 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	49.0 Ω - 7.1 $\mu\Omega$
Return Loss	-22.8 dB

Antenna Parameters with Body TSL at 5300 MHz

Impedance, transformed to feed point	51.5 Ω - 2.2 $\mu\Omega$
Return Loss	-31.7 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	54.0 Ω - 1.5 $\mu\Omega$
Return Loss	-26.8 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	55.6 Ω + 2.8 jΩ
Return Loss	-24.5 dB

General Antenna Parameters and Design

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

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

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	February 05, 2004

DASY5 Validation Report for Head TSL

Date: 28/01/2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN:1023

Communication System: UJD 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz

Medium parameters used: $f = 5200 \text{ MHz}$; $\sigma = 4.56 \text{ S/m}$; $\epsilon_r = 36.3$; $\rho = 1000 \text{ kg/m}^3$. Medium parameters used: $f = 5300 \text{ MHz}$; $\sigma = 4.66 \text{ S/m}$; $\epsilon_r = 36.1$; $\rho = 1000 \text{ kg/m}^3$. Medium parameters used: $f = 5600 \text{ MHz}$; $\sigma = 4.97 \text{ S/m}$; $\epsilon_r = 35.7$; $\rho = 1000 \text{ kg/m}^3$. Medium parameters used: $f = 5800 \text{ MHz}$; $\sigma = 5.18 \text{ S/m}$; $\epsilon_r = 35.4$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.51, 5.51, 5.51); Calibrated: 30.12.2014, ConvF(5.21, 5.21, 5.21); Calibrated: 30.12.2014, ConvF(4.92, 4.92, 4.92); Calibrated: 30.12.2014, ConvF(4.9, 4.9, 4.9); Calibrated: 30.12.2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4-Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Head Tissue/Power=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:

Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 64.14 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 28.3 W/kg

SAR(1 g) = 7.78 W/kg; SAR(10 g) = 2.22 W/kg

Maximum value of SAR (measured) = 17.8 W/kg

Dipole Calibration for Head Tissue/Power=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:

Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 65.47 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 30.7 W/kg

SAR(1 g) = 8.17 W/kg; SAR(10 g) = 2.34 W/kg

Maximum value of SAR (measured) = 18.6 W/kg

Dipole Calibration for Head Tissue/Power=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:

Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

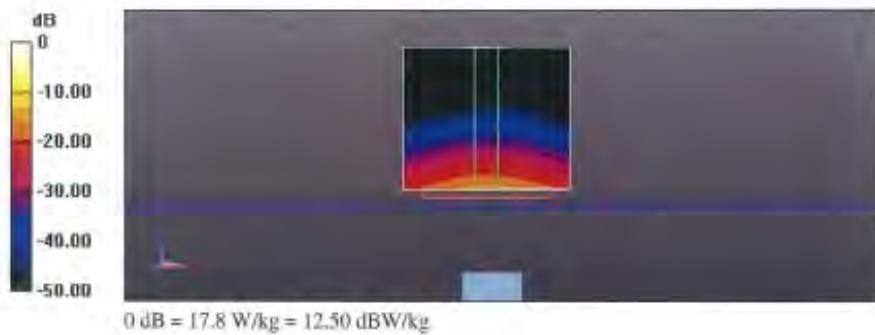
Reference Value = 63.68 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 32.2 W/kg

SAR(1 g) = 8.14 W/kg; SAR(10 g) = 2.31 W/kg

Maximum value of SAR (measured) = 18.9 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 61.76 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 32.0 W/kg
SAR(1 g) = 7.82 W/kg; SAR(10 g) = 2.23 W/kg
Maximum value of SAR (measured) = 18.4 W/kg



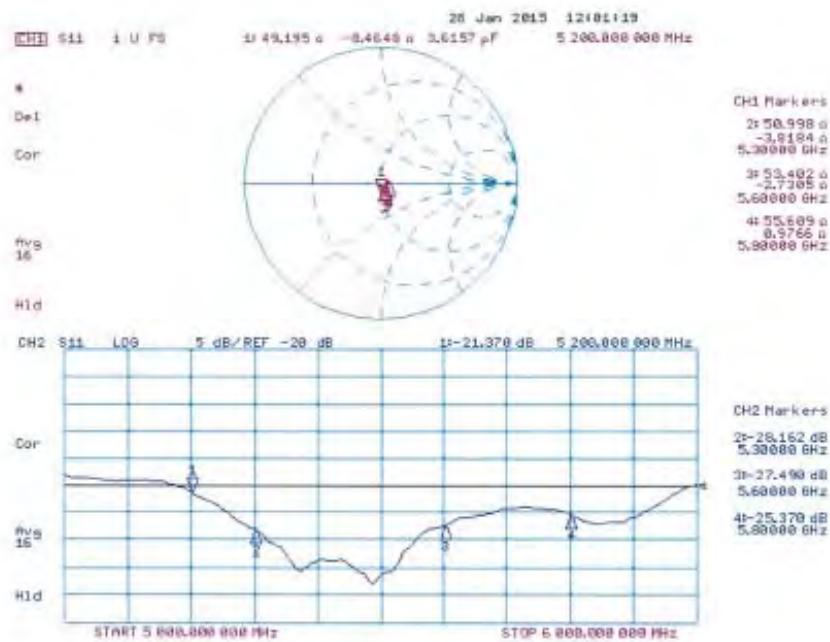
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Impedance Measurement Plot for Head TSL



Certificate No: D5GHzV2-1023_Jan15

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DASY5 Validation Report for Body TSL

Date: 29.01.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN:1023

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz

Medium parameters used: $f = 5200 \text{ MHz}$; $\sigma = 3.42 \text{ S/m}$; $\epsilon_r = 49.4$; $\rho = 1000 \text{ kg/m}^3$. Medium parameters used: $f = 5300 \text{ MHz}$; $\sigma = 5.55 \text{ S/m}$; $\epsilon_r = 49.2$; $\rho = 1000 \text{ kg/m}^3$. Medium parameters used: $f = 5600 \text{ MHz}$; $\sigma = 5.96 \text{ S/m}$; $\epsilon_r = 48.7$; $\rho = 1000 \text{ kg/m}^3$. Medium parameters used: $f = 5800 \text{ MHz}$; $\sigma = 6.25 \text{ S/m}$; $\epsilon_r = 48.4$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.95, 4.95, 4.95); Calibrated: 30.12.2014, ConvF(4.78, 4.78, 4.78); Calibrated: 30.12.2014, ConvF(4.35, 4.35, 4.35); Calibrated: 30.12.2014, ConvF(4.32, 4.32, 4.32); Calibrated: 30.12.2014
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4-Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8 (1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$

Reference Value = 57.97 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 28.6 W/kg

SAR(1 g) = 7.33 W/kg; SAR(10 g) = 2.04 W/kg

Maximum value of SAR (measured) = 17.3 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$

Reference Value = 57.58 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 30.0 W/kg

SAR(1 g) = 7.45 W/kg; SAR(10 g) = 2.07 W/kg

Maximum value of SAR (measured) = 17.8 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$

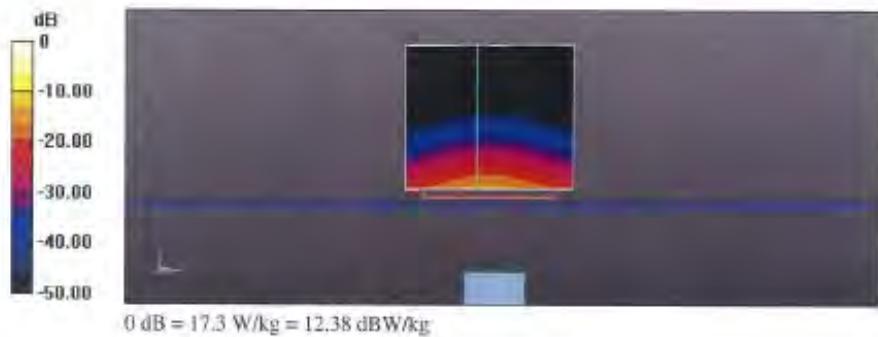
Reference Value = 56.88 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 34.4 W/kg

SAR(1 g) = 7.77 W/kg; SAR(10 g) = 2.15 W/kg

Maximum value of SAR (measured) = 19.3 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 55.10 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 35.2 W/kg
SAR(1 g) = 7.54 W/kg; SAR(10 g) = 2.07 W/kg
Maximum value of SAR (measured) = 19.1 W/kg

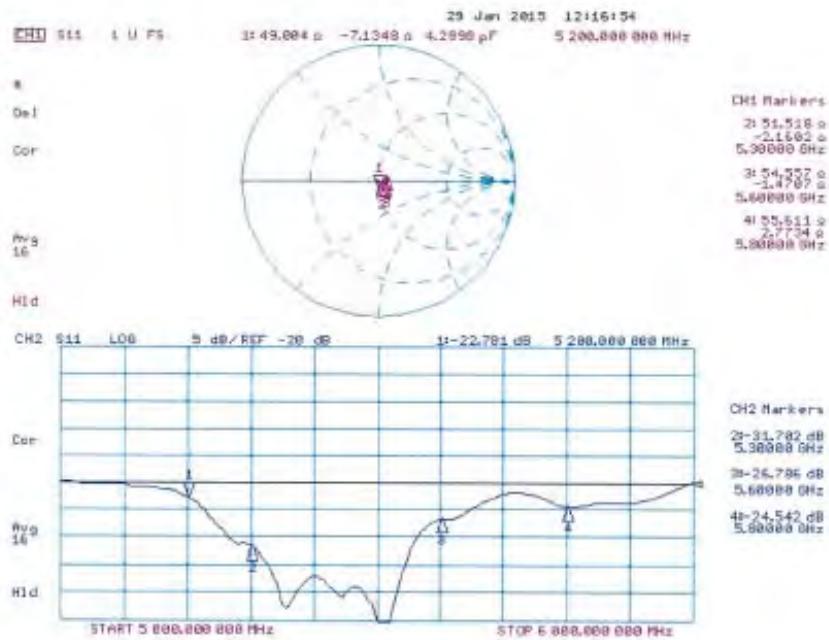


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Impedance Measurement Plot for Body TSL**- End of 1st part of report -**

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