SAR TEST REPORT

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

Product Name	Notebook Computer
Marketing Name	CP311-2H(N)
Brand Name	acer
Model No.	N17Q8
Prepared for	Acer Incorporated 8F., No. 88, Sec. 1, Xintai 5th Rd., Xizhi, New Taipei City 22181, Taiwan
Standards	IEEE/ANSI C95.1-1992, IEEE 1528-2013, KDB248227D01v02r02,KDB865664D01v01r04, KDB865664D02v01r02,KDB447498D01v06, KDB616217D04v01r02,
FCC ID	HLZ9560NG
Date of Receipt	Jul. 01, 2019
Date of Test(s)	Jul. 25, 2019 ~ Jul. 31, 2019
Date of Issue	Aug. 07, 2019

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

Remarks:

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

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

Signed on behalf of SGS

Clerk / Ruby Ou	Engineer / Bond Tsai	Asst. Manager / John Yeh
Ruby Ou	Bond Tsai	John Yeh

Date: Aug. 07, 2019

Revision History

Report Number	Revision	Description	Issue Date
EN/2019/70005	Rev.00	Initial creation of document	Aug. 07, 2019

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Contents

1. General Information

1.1 Testing Laboratory

SGS Taiwan Ltd. Electronics & Communication Laboratory	
1F, No. 8, Alley 15, Lane 120, Sec. 1, NeiHu Rd., NeiHu Dist., Taipei City, Taiwan, 11493.	
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

1.3 Description of EUT

General Information of Host:

Equipment Under Test	Notebook Computer	
Marketing Name	CP311-2H(N)	
Brand Name	acer	
Model No.	N17Q8	
Integrated Module	Brand Name : Intel Model Name : 9560NGW	
FCC ID	HLZ9560NG	
Mode of Operation	☒WLAN802.11 a/b/g/n(20M/40M)/ac(20M/40M/80M/160M) ☒Bluetooth	
Duty Cycle	WLAN802.11 a/b/g/n(20M/40M)/ ac(20M/40M/80M/160M)	1
	Bluetooth	1
TX Frequency Range (MHz)	WLAN802.11 b/g/n(20M)	2412 — 2472
	WLAN802.11 n(40M)	2422 — 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 ac(160M) 5.2G	5250
	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/ac(20M) 5.6G	5500 — 5720
	WLAN802.11 n/ac(40M) 5.6G	5510 — 5710
	WLAN802.11 ac(80M) 5.6G	5530 — 5690
	WLAN802.11 ac(160M) 5.6G	5570
	WLAN802.11 a/n(20M)/ac(20M) 5.8G	5745 — 5825

TX Frequency Range (MHz)	WLAN802.11 n(40M)/ac(40M) 5.8G	5710	—	5795
	WLAN802.11 ac(80M) 5.8G		5775	
	Bluetooth	2402	—	2480
Channel Number (ARFCN)	WLAN802.11 b/g/n(20M)	1	—	13
	WLAN802.11 n(40M)	3	—	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 ac(160M) 5.2G		50	
	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/ac(20M) 5.6G	100	—	144
	WLAN802.11 n/ac(40M) 5.6G	102	—	142
	WLAN802.11 ac(80M) 5.6G	106	—	138
	WLAN802.11 ac(160M) 5.6G		114	
	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

Max. SAR (1g) (Unit: W/Kg)					
Antenna	Band	Measured	Reported	Channel	Position
Main	WLAN 802.11b	0.43	0.43	10	Top side
	WLAN 802.11a 5.2G	0.88	0.89	44	Top side
	WLAN 802.11n(40M) 5.2G	0.94	0.96	46	Top side
	WLAN 802.11a 5.3G	0.97	0.97	56	Top side
	WLAN 802.11n(40M) 5.3G	1.01	1.01	54	Top side
	WLAN 802.11n(40M) 5.6G	1.05	1.05	110	Top side
	WLAN 802.11ac(80M) 5.6G	1.08	1.08	138	Top side
	WLAN 802.11a 5.8G	1.17	1.17	157	Top side
	WLAN 802.11n(40M) 5.8G	1.17	1.17	159	Top side
Aux	WLAN802.11b	0.32	0.32	6	Top side
	Bluetooth(GFSK)	0.02	0.03	78	Top side
	WLAN 802.11n(40M) 5.2G	0.56	0.56	46	Top side
	WLAN 802.11n(40M) 5.3G	0.55	0.56	54	Top side
	WLAN 802.11ac(80M) 5.6G	0.49	0.50	138	Top side
	WLAN 802.11ac(80M) 5.8G	0.53	0.54	155	Top side

WLAN802.11 a/b/g/n(20M/40M)/ac(20M/40M/80M/160M) conducted power table:

Band \ Antenna	SISO		MIMO
	Chain 0	Chain 1	Chain0+1
WLAN802.11b	V	V	-
WLAN802.11g	V	V	-
WLAN802.11n(20M)	V	V	V
WLAN802.11n(40M)	V	V	V
WLAN802.11a	V	V	-
WLAN802.11n(20M) 5G	V	V	V
WLAN802.11n(40M) 5G	V	V	V
WLAN802.11ac(20M) 5G	V	V	V
WLAN802.11ac(40M) 5G	V	V	V
WLAN802.11ac(80M) 5G	V	V	V
WLAN802.11ac(160M) 5G	V	V	V

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Main (Chain 0)

Main Antenna						
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
2450 MHz	802.11b	1	2412	1Mbps	19.00	18.91
		2	2417		20.00	19.97
		6	2437		20.00	19.99
		10	2457		20.00	19.98
		11	2462		19.00	18.93
		12	2467		18.00	17.88
		13	2472		14.50	14.37
	802.11g	1	2412	6Mbps	15.50	15.42
		2	2417		18.00	17.88
		6	2437		20.00	19.93
		10	2457		18.00	17.93
		11	2462		16.00	15.92
		12	2467		12.50	12.41
		13	2472		-7.00	-7.11
	802.11n20-HT0	1	2412	MCS0	15.50	15.47
		2	2417		18.00	17.90
		6	2437		20.00	19.89
		10	2457		18.00	17.96
		11	2462		16.00	15.94
		12	2467		12.50	12.43
		13	2472		-7.00	-7.03
	802.11n40-HT0	3	2422	MCS0	14.00	13.90
		4	2427		15.50	15.47
		6	2437		15.50	15.42
		8	2447		15.50	15.45
		9	2452		13.50	13.46
		10	2457		10.00	9.89
		11	2462		3.00	2.87

Main Antenna						
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
5.15-5.25 GHz	802.11a	36	5180	6Mbps	18.00	17.96
		40	5200		18.00	17.95
		44	5220		18.00	17.99
		48	5240		18.00	17.93
	802.11n20-HT0	36	5180	MCS0	18.00	17.93
		40	5200		18.00	17.91
		44	5220		18.00	17.90
		48	5240		18.00	17.95
	802.11ac20-VHT0	36	5180	MCS0	18.00	17.92
		40	5200		18.00	17.87
		44	5220		18.00	17.94
		48	5240		18.00	17.90
	802.11n40-HT0	38	5190	MCS0	17.50	17.45
		46	5230		18.00	17.93
	802.11ac40-VHT0	38	5190	MCS0	17.50	17.40
		46	5230		18.00	17.93
	802.11ac80-VHT0	42	5210	MCS0	17.00	16.88
	802.11ac160-VHT0	50	5250	MCS0	13.00	12.97

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Main Antenna						
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
5.25-5.35 GHz	802.11a	52	5260	6Mbps	18.00	17.91
		56	5280		18.00	17.99
		60	5300		18.00	17.92
		64	5320		16.00	15.94
	802.11n20-HT0	52	5260	MCS0	18.00	17.92
		56	5280		18.00	17.95
		60	5300		18.00	17.90
		64	5320		16.00	15.93
	802.11ac20-VHT0	52	5260	MCS0	18.00	17.92
		56	5280		18.00	17.95
		60	5300		18.00	17.90
		64	5320		16.00	15.96
	802.11n40-HT0	54	5270	MCS0	18.00	17.99
		62	5310		14.00	13.95
	802.11ac40-VHT0	54	5270	MCS0	18.00	17.92
		62	5310		14.00	13.89
	802.11ac80-VHT0	58	5290	MCS0	15.00	14.98

Main Antenna						
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
5600 MHz	802.11a	100	5500	6Mbps	17.50	17.41
		116	5580		17.50	17.39
		120	5600		17.50	17.40
		124	5620		17.50	17.43
		128	5640		17.50	17.40
		140	5700		17.50	17.44
	802.11n20-HT0	100	5500	MCS0	17.50	17.39
		116	5580		17.50	17.42
		120	5600		17.50	17.40
		124	5620		17.50	17.45
		128	5640		17.50	17.42
		140	5700		17.50	17.44
	802.11ac20-VHT0	100	5500	MCS0	17.50	17.43
		116	5580		17.50	17.45
		120	5600		17.50	17.37
		124	5620		17.50	17.40
		136	5680		17.50	17.41
		140	5700		17.50	17.39
		144	5720		17.50	17.45
	802.11n40-HT0	102	5510	MCS0	16.00	15.93
		110	5550		17.50	17.49
		118	5590		17.50	17.40
		126	5630		17.50	17.38
		134	5670		17.50	17.48
	802.11ac40-VHT0	102	5510	MCS0	16.00	15.92
		110	5550		17.50	17.40
		118	5590		17.50	17.37
		126	5630		17.50	17.40
		134	5670		17.50	17.45
		142	5710		17.50	17.40
	802.11ac80-VHT0	106	5530	MCS0	16.50	16.49
		122	5610		17.50	17.38
		138	5690		17.50	17.49
	802.11ac160-VHT0	114	5570	MCS0	14.50	14.45

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Main Antenna						
Mode	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
5800 MHz	802.11a	149	5745	6Mbps	18.50	18.48
		157	5785		18.50	18.49
		165	5825		18.50	18.43
	802.11n20-HT0	149	5745	MCS0	18.50	18.40
		157	5785		18.50	18.33
		165	5825		18.50	18.40
	802.11ac20-VHT0	149	5745	MCS0	18.50	18.34
		157	5785		18.50	18.39
		165	5825		18.50	18.37
	802.11n40-HT0	151	5755	MCS0	18.00	17.91
		159	5795		18.50	18.49
	802.11ac40-VHT0	151	5755	MCS0	18.00	17.88
		159	5795		18.50	18.40
	802.11ac80-VHT0	155	5775	MCS0	18.00	17.84

Aux (Chain 1)

Aux Antenna						
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
2450 MHz	802.11b	1	2412	1Mbps	19.00	18.96
		2	2417		20.00	19.98
		6	2437		20.00	19.99
		10	2457		20.00	19.97
		11	2462		19.00	18.94
		12	2467		18.00	17.88
		13	2472		14.50	14.37
	802.11g	1	2412	6Mbps	15.50	15.42
		2	2417		17.00	16.93
		6	2437		20.00	19.94
		10	2457		18.00	17.88
		11	2462		15.50	15.46
		12	2467		13.00	12.94
		13	2472		-6.50	-6.56
	802.11n20-HT0	1	2412	MCS0	15.50	15.42
		2	2417		17.00	16.98
		6	2437		20.00	19.91
		10	2457		18.00	17.96
		11	2462		15.50	15.43
		12	2467		13.00	12.95
		13	2472		-6.50	-6.57
	802.11n40-HT0	3	2422	MCS0	14.50	14.47
		4	2427		15.50	15.40
		6	2437		15.50	15.42
		8	2447		15.50	15.46
		9	2452		14.00	13.94
		10	2457		10.50	10.45
		11	2462		2.50	2.48

Aux Antenna						
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
5.15-5.25 GHz	802.11a	36	5180	6Mbps	18.00	17.98
		40	5200		18.00	17.91
		44	5220		18.00	17.96
		48	5240		18.00	17.92
	802.11n20-HT0	36	5180	MCS0	18.00	17.89
		40	5200		18.00	17.92
		44	5220		18.00	17.90
		48	5240		18.00	17.93
	802.11ac20-VHT0	36	5180	MCS0	18.00	17.92
		40	5200		18.00	17.84
		44	5220		18.00	17.96
		48	5240		18.00	17.87
	802.11n40-HT0	38	5190	MCS0	17.50	17.42
		46	5230		18.00	17.99
	802.11ac40-VHT0	38	5190	MCS0	17.50	17.41
		46	5230		18.00	17.90
	802.11ac80-VHT0	42	5210	MCS0	15.00	14.84
	802.11ac160-VHT0	50	5250	MCS0	13.00	12.91

Aux Antenna						
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
5.25-5.35 GHz	802.11a	52	5260	6Mbps	18.00	17.99
		56	5280		18.00	17.97
		60	5300		18.00	17.98
		64	5320		15.50	15.42
	802.11n20-HT0	52	5260	MCS0	18.00	17.85
		56	5280		18.00	17.91
		60	5300		18.00	17.87
		64	5320		15.50	15.40
	802.11ac20-VHT0	52	5260	MCS0	18.00	17.91
		56	5280		18.00	17.84
		60	5300		18.00	17.88
		64	5320		15.50	15.42
	802.11n40-HT0	54	5270	MCS0	18.00	17.99
		62	5310		14.00	13.89
	802.11ac40-VHT0	54	5270	MCS0	18.00	17.90
		62	5310		14.00	13.87
	802.11ac80-VHT0	58	5290	MCS0	15.00	14.92

Aux Antenna						
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
5600 MHz	802.11a	100	5500	6Mbps	17.50	17.42
		116	5580		17.50	17.39
		120	5600		17.50	17.45
		124	5620		17.50	17.42
		128	5640		17.50	17.39
		140	5700		17.50	17.39
	802.11n20-HT0	100	5500	MCS0	17.50	17.41
		116	5580		17.50	17.38
		120	5600		17.50	17.45
		124	5620		17.50	17.42
		128	5640		17.50	17.35
		140	5700		17.50	17.40
	802.11ac20-VHT0	100	5500	MCS0	17.50	17.44
		116	5580		17.50	17.37
		120	5600		17.50	17.35
		124	5620		17.50	17.44
		136	5680		17.50	17.40
		140	5700		17.50	17.43
		144	5720		17.50	17.39
	802.11n40-HT0	102	5510	MCS0	16.50	16.42
		110	5550		17.50	17.47
		118	5590		17.50	17.40
		126	5630		17.50	17.37
		134	5670		17.50	17.49
	802.11ac40-VHT0	102	5510	MCS0	16.50	16.44
		110	5550		17.50	17.36
		118	5590		17.50	17.39
		126	5630		17.50	17.43
		134	5670		17.50	17.40
		142	5710		17.50	17.42
	802.11ac80-VHT0	106	5530	MCS0	17.00	16.96
		122	5610		17.50	17.39
		138	5690		17.50	17.44
	802.11ac160-VHT0	114	5570	MCS0	14.50	14.40

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Aux Antenna						
Mode	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
5800 MHz	802.11a	149	5745	6Mbps	18.50	18.43
		157	5785		18.50	18.40
		165	5825		18.50	18.42
	802.11n20-HT0	149	5745	MCS0	18.50	18.40
		157	5785		18.50	18.43
		165	5825		18.50	18.40
	802.11ac20-VHT0	149	5745	MCS0	18.50	18.38
		157	5785		18.50	18.43
		165	5825		18.50	18.39
	802.11n40-HT0	151	5755	MCS0	18.50	18.47
		159	5795		18.50	18.49
	802.11ac40-VHT0	151	5755	MCS0	18.50	18.40
		159	5795		18.50	18.42
	802.11ac80-VHT0	155	5775	MCS0	18.50	18.43

Bluetooth conducted power table:

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)					
			Max. Rated Avg. Power + Max. Tolerance (dBm)	1Mbps	Max. Rated Avg. Power + Max. Tolerance (dBm)	2Mbps	Max. Rated Avg. Power + Max. Tolerance (dBm)	3Mbps
BR/EDR	CH 00	2402	11.50	8.76	11.00	6.71	11.00	6.72
	CH 39	2441		9.27		7.25		7.26
	CH 78	2480		9.81		7.79		7.80

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)	Max. Rated Avg. Power + Max. Tolerance (dBm)
			GFSK	
LE	CH 00	2402	7.83	9
	CH 20	2442	8.67	
	CH 39	2480	8.99	

1.4 Test Environment

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

Tablet mode

Backside/edges touch against the flat phantom

Laptop mode

SAR measurement for Laptop mode is not required since the distance between antenna and user is > 20cm.

Note:

802.11b DSSS SAR Test Requirements:

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.

SGS Taiwan Ltd. | No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 | t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

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. Since the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for subsequent test configuration.

7. BT and WLAN Aux use the same antenna path, but they can't transmit at the same time.
8. 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.
9. 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)

1.6 The SAR Measurement System

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

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

1. A standard high precision 6-axis robot (Staubli RX family) with controller, teach pendant and software. An arm extension is for accommodating the data acquisition electronics (DAE).
2. A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage intissue simulating liquid. The probe is equipped with an optical surface detector system.
3. A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.

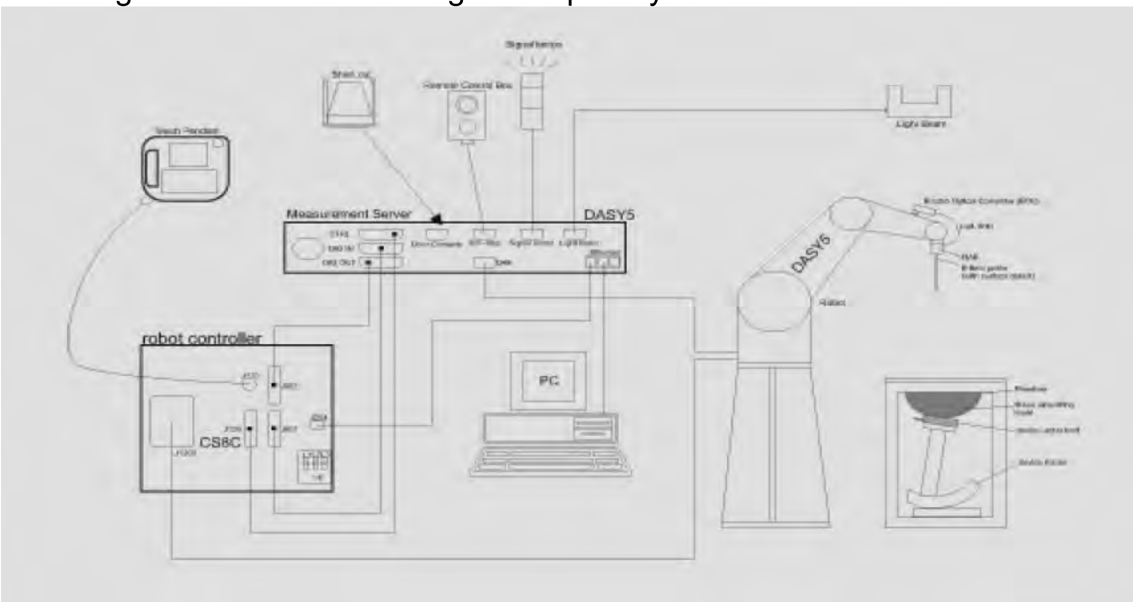


Fig. a The block diagram of SAR system

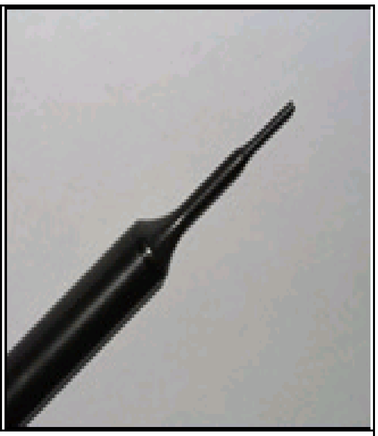
SGS Taiwan Ltd. | No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 | t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

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

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

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%.	

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

PHANTOM

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

DEVICE HOLDER

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

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

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 liquid depth above the ear reference points was ≥ 15 cm ± 5 mm (frequency ≤ 3 GHz) or ≥ 10 cm ± 5 mm (frequency > 3 G Hz) in all the cases. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values.

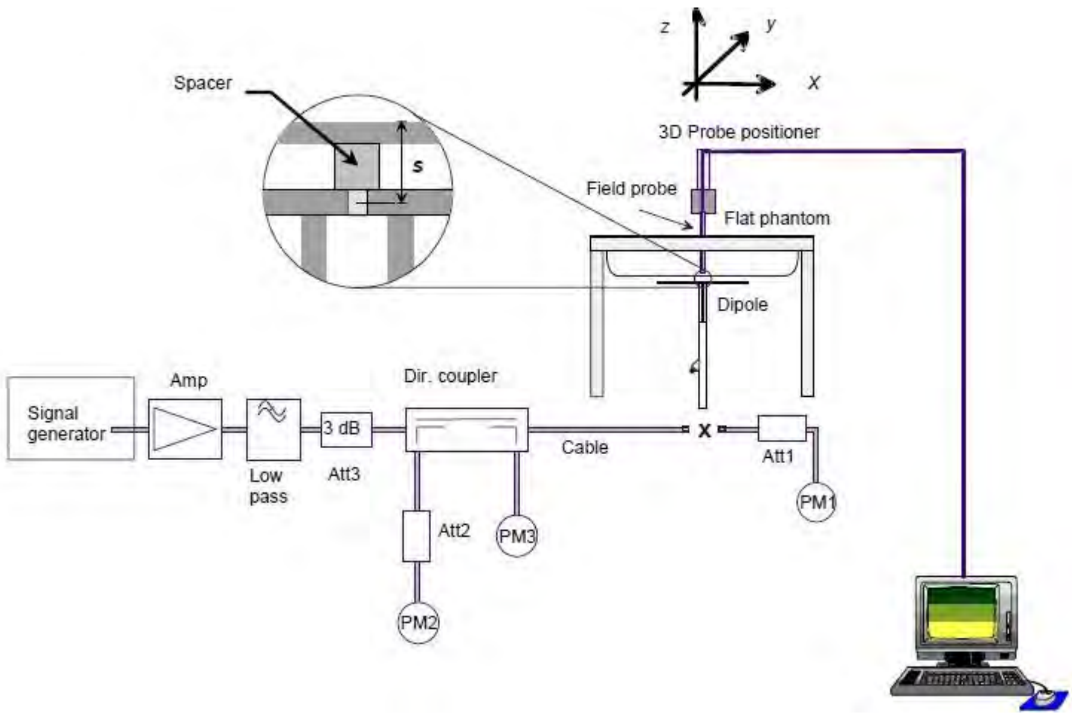


Fig. b The block diagram of system verification

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Validation Kit	S/N	Frequency (MHz)		1W Target SAR-1g (mW/g)	pin=250mW Measured SAR-1g (mW/g)	Measured SAR-1g normalized to 1W (mW/g)	Deviation (%)	Measured Date
D2450V2	727	2450	Head	53	13.40	53.6	1.13%	Jul. 25, 2019
Validation Kit	S/N	Frequency (MHz)		1W Target SAR-1g (mW/g)	Pin=100mW Measured SAR-1g (mW/g)	Measured SAR-1g normalized to 1W (mW/g)	Deviation (%)	Measured Date
D5GHzV2	1023	5200	Head	79.2	7.92	79.2	0.00%	Jul. 26, 2019
		5300	Head	82.6	8.22	82.2	-0.48%	Jul. 29, 2019
		5600	Head	85.7	8.58	85.8	0.12%	Jul. 30, 2019
		5800	Head	80.4	8.09	80.9	0.62%	Jul. 31, 2019

Table 1. Results of system verification

1.19 Tissue Simulant Fluid for the Frequency Band

The dielectric properties for this Head-simulant fluid were measured by using the Agilent Model 85070E Dielectric Probe (rates frequency band 200 MHz to 20 GHz) in conjunction with Network Analyzer.
All dielectric parameters of tissue simulates were measured within 24 hours of SAR measurements. The measured conductivity and permittivity are all within ± 5% of the target values.
The depth of the tissue simulant in the flat section of the phantom was ≥ 15 cm ± 5 mm (Frequency ≤3G) or ≥ 10 cm ± 5 mm (Frequency >3G) during all tests. (Fig. 2)

Tissue Type	Measurement Date	Measured Frequency (MHz)	Target Dielectric Constant, εr	Target Conductivity, σ (S/m)	Measured Dielectric Constant, εr	Measured Conductivity, σ (S/m)	% dev εr	% dev σ
Head	Jul, 25. 2019	2402	39.285	1.757	39.164	1.742	-0.31%	-0.87%
		2417	39.259	1.771	39.141	1.755	-0.30%	-0.88%
		2437	39.223	1.788	39.105	1.772	-0.30%	-0.92%
		2441	39.216	1.792	39.087	1.775	-0.33%	-0.95%
		2450	39.200	1.800	39.085	1.784	-0.29%	-0.89%
		2457	39.191	1.808	39.067	1.792	-0.32%	-0.87%
		2480	39.162	1.827	39.044	1.810	-0.30%	-0.91%
	Jul, 26. 2019	5180	36.009	4.635	36.487	4.571	1.33%	-1.37%
		5200	35.986	4.655	36.472	4.591	1.35%	-1.37%
		5220	35.963	4.676	36.438	4.608	1.32%	-1.44%
		5230	35.951	4.686	36.415	4.622	1.29%	-1.36%
		5240	35.940	4.696	36.404	4.628	1.29%	-1.45%
	Jul, 29. 2019	5260	35.917	4.717	36.211	4.664	0.82%	-1.11%
		5270	35.906	4.727	36.208	4.676	0.84%	-1.07%
		5280	35.894	4.737	36.181	4.686	0.80%	-1.08%
		5300	35.871	4.758	36.158	4.705	0.80%	-1.10%
		5320	35.849	4.778	36.150	4.726	0.84%	-1.09%
	Jul, 30. 2019	5550	35.586	5.014	35.956	4.952	1.04%	-1.23%
		5600	35.529	5.065	35.897	5.005	1.04%	-1.18%
		5670	35.449	5.137	35.887	5.076	1.24%	-1.18%
		5690	35.426	5.157	35.871	5.094	1.26%	-1.23%
	Jul, 31. 2019	5745	35.363	5.214	35.846	5.129	1.37%	-1.62%
		5755	35.351	5.224	35.843	5.139	1.39%	-1.62%
		5775	35.329	5.244	35.841	5.159	1.45%	-1.63%
		5785	35.317	5.255	35.840	5.172	1.48%	-1.57%
		5795	35.306	5.265	35.807	5.178	1.42%	-1.65%
		5800	35.300	5.270	35.794	5.184	1.40%	-1.63%
		5825	35.271	5.296	35.793	5.212	1.48%	-1.58%

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	
2450	Head	550ml	450ml	—	—	—	—	1.0L(Kg)

Simulating Liquids for 5 GHz, Manufactured by SPEAG:

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

Table 3. Recipes for Tissue Simulating Liquid

1.10 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.

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

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

interpolation to get all points within the measured volume. In the last step, a 1g cube is placed numerically into the volume and its averaged SAR is calculated. This cube is the moved around until the highest averaged SAR is found. If the highest SAR is found at the edge of the measured volume, the system will issue a warning: higher SAR values might be found outside of the measured volume. In that case the cube measurement can be repeated, using the new interpolated maximum as the center.

1.11 Probe Calibration Procedures

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

1.11.1 Transfer Calibration with Temperature Probes

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

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

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:

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

- The temperature gradient is not directly measurable but must be evaluated from temperature measurements at different time steps. Special precaution is necessary to avoid measurement errors caused by temperature gradients due to energy equalizing effects or convection currents in the liquid. Such effects cannot be completely avoided, as the measured field itself destroys the thermal equilibrium in the liquid. With a careful setup these errors can be kept small.
- The measured volume around the temperature probe is not well defined. It is difficult to calculate the energy transfer from a surrounding gradient temperature field into the probe. These effects must be considered, since temperature probes are calibrated in liquid with homogeneous temperatures. There is no traceable standard for temperature rise measurements.
- The calibration depends on the assessment of the specific density, the heat capacity and the conductivity of the medium. While the specific density and heat capacity can be measured accurately with standardized procedures (~ 2% for c; much better for ρ) , there is no standard for the measurement of the conductivity. Depending on the method and liquid, the error can well exceed ±5%.
- Temperature rise measurements are not very sensitive and therefore are often performed at a higher power level than the E-field measurements. The nonlinearities in the system (e.g., power measurements, different components, etc.) must be considered.

Considering these problems, the possible accuracy of the calibration of E-field probes with temperature gradient measurements in a carefully designed setup is about ±10% (RSS) [2]. Recently, a setup which is a combination of the waveguide techniques and the thermal measurements was presented in [3]. The estimated uncertainty of the setup is ±5% (RSS) when the same liquid is used for the calibration and for actual measurements and ±7-9% (RSS) when not, which is in good agreement with the estimates given in [2].

1.11.2 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.

References

1. N. Kuster, Q. Balzano, and J.C. Lin, Eds., *Mobile Communications Safety*, Chapman & Hall, London, 1997.
2. K. Meier, M. Burkhardt, T. Schmid, and N. Kuster, \Broadband calibration of E-field probes in lossy media", *IEEE Transactions on Microwave Theory and Techniques*, vol. 44, no. 10, pp. 1954{1962, Oct. 1996.
3. K. Jokela, P. Hyysalo, and L. Puranen, \Calibration of specific absorption rate (SAR) probes in waveguide at 900 MHz", *IEEE Transactions on Instrumentation and Measurements*, vol. 47, no. 2, pp. 432{438, Apr. 1998.

1.12 Test Standards and Limits

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

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

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

(3) Limits for General Population/Uncontrolled exposure: 0.08 W/kg as averaged over the whole-body and spatial peak SAR not exceeding 1.6 W/kg as averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the hands, wrists, feet and ankles where the spatial peak SAR shall not exceed 4 W/kg, as averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). General Population/Uncontrolled limits apply when the general public may be exposed, or when persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or do not

exercise control over their exposure. Warning labels placed on consumer devices such as cellular telephones will not be sufficient reason to allow these devices to be evaluated subject to limits for occupational/controlled exposure in paragraph (d)(1) of this section. (Table 4.)

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

Table 4. RF exposure limits

Notes:

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

2. Summary of Results

2.1 Decision rules

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

2.2 Summary of Results

Main Antenna

Antenna	Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
									Measured	Reported	
Main	WLAN 802.11b	Back side	0	6	2437	20.00	19.99	100.23%	0.159	0.159	-
		Top side	0	2	2417	20.00	19.97	100.69%	0.377	0.380	-
		Top side	0	6	2437	20.00	19.99	100.23%	0.406	0.407	-
		Top side	0	10	2457	20.00	19.98	100.46%	0.428	0.430	44
		Bottom side	0	6	2437	20.00	19.99	100.23%	0.007	0.007	-
		Right side	0	6	2437	20.00	19.99	100.23%	0.068	0.068	-
		Left side	0	6	2437	20.00	19.99	100.23%	0.023	0.023	-
	WLAN 802.11a 5.2G	Back side	0	44	5220	18.00	17.99	100.23%	0.305	0.306	-
		Top side	0	36	5180	18.00	17.96	100.93%	0.700	0.706	-
		Top side	0	44	5220	18.00	17.99	100.23%	0.884	0.886	45
		Top side*	0	44	5220	18.00	17.99	100.23%	0.866	0.868	-
		Bottom side	0	44	5220	18.00	17.99	100.23%	0.031	0.031	-
		Right side	0	44	5220	18.00	17.99	100.23%	0.099	0.099	-
		Left side	0	44	5220	18.00	17.99	100.23%	0.001	0.001	-
	WLAN 802.11n(40M) 5.2G	Back side	0	46	5230	18.00	17.93	101.62%	0.325	0.330	-
		Top side	0	46	5230	18.00	17.93	101.62%	0.942	0.957	46
		Top side*	0	46	5230	18.00	17.93	101.62%	0.922	0.937	-
		Bottom side	0	46	5230	18.00	17.93	101.62%	0.033	0.034	-
		Right side	0	46	5230	18.00	17.93	101.62%	0.106	0.108	-
		Left side	0	46	5230	18.00	17.93	101.62%	0.001	0.001	-
	WLAN 802.11a 5.3G	Back side	0	56	5280	18.00	17.99	100.23%	0.333	0.334	-
		Top side	0	56	5280	18.00	17.99	100.23%	0.966	0.968	47
		Top side*	0	56	5280	18.00	17.99	100.23%	0.945	0.947	-
		Top side	0	60	5300	18.00	17.92	101.86%	0.947	0.965	-
		Bottom side	0	56	5280	18.00	17.99	100.23%	0.034	0.034	-
		Right side	0	56	5280	18.00	17.99	100.23%	0.109	0.109	-
		Left side	0	56	5280	18.00	17.99	100.23%	0.001	0.001	-
	WLAN 802.11n(40M) 5.3G	Back side	0	54	5270	18.00	17.99	100.23%	0.339	0.340	-
		Top side	0	54	5270	18.00	17.99	100.23%	1.010	1.012	48
		Top side*	0	54	5270	18.00	17.99	100.23%	0.993	0.995	-
		Bottom side	0	54	5270	18.00	17.99	100.23%	0.035	0.035	-
		Right side	0	54	5270	18.00	17.99	100.23%	0.105	0.105	-
		Left side	0	54	5270	18.00	17.99	100.23%	0.001	0.001	-
	WLAN 802.11n(40M) 5.6G	Back side	0	110	5550	17.50	17.49	100.23%	0.362	0.363	-
		Top side	0	110	5550	17.50	17.49	100.23%	1.050	1.052	49
		Top side*	0	110	5550	17.50	17.49	100.23%	1.030	1.032	-
		Top side	0	134	5670	17.50	17.48	100.46%	1.020	1.025	-
		Bottom side	0	110	5550	17.50	17.49	100.23%	0.037	0.037	-
		Right side	0	110	5550	17.50	17.49	100.23%	0.118	0.118	-
		Left side	0	110	5550	17.50	17.49	100.23%	0.001	0.001	-

* - repeated at the highest SAR measurement according to the KDB 865664 D01

Antenna	Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
									Measured	Reported	
Main	WLAN 802.11ac(80M) 5.6G	Back side	0	138	5690	17.50	17.49	100.23%	0.309	0.310	-
		Top side	0	138	5690	17.50	17.49	100.23%	1.080	1.082	50
		Top side*	0	138	5690	17.50	17.49	100.23%	1.070	1.072	-
		Bottom side	0	138	5690	17.50	17.49	100.23%	0.038	0.038	-
		Right side	0	138	5690	17.50	17.49	100.23%	0.108	0.108	-
		Left side	0	138	5690	17.50	17.49	100.23%	0.001	0.001	-
	WLAN 802.11a 5.8G	Back side	0	157	5785	18.50	18.49	100.23%	0.404	0.405	-
		Top side	0	149	5745	18.50	18.48	100.46%	1.150	1.155	-
		Top side	0	157	5785	18.50	18.49	100.23%	1.170	1.173	51
		Top side*	0	157	5785	18.50	18.49	100.23%	1.160	1.163	-
		Top side	0	165	5825	18.50	18.43	101.62%	1.090	1.108	-
		Bottom side	0	157	5785	18.50	18.49	100.23%	0.041	0.041	-
		Right side	0	157	5785	18.50	18.49	100.23%	0.132	0.132	-
		Left side	0	157	5785	18.50	18.49	100.23%	0.002	0.002	-
	WLAN 802.11n(40M) 5.8G	Back side	0	159	5795	18.50	18.49	100.23%	0.371	0.372	-
		Top side	0	151	5755	18.00	17.91	102.09%	1.020	1.041	-
		Top side	0	159	5795	18.50	18.49	100.23%	1.170	1.173	52
		Top side*	0	159	5795	18.50	18.49	100.23%	1.160	1.163	-
		Bottom side	0	159	5795	18.50	18.49	100.23%	0.044	0.044	-
		Right side	0	159	5795	18.50	18.49	100.23%	0.255	0.256	-
		Left side	0	159	5795	18.50	18.49	100.23%	0.002	0.002	-

* - repeated at the highest SAR measurement according to the KDB 865664 D01

Aux Antenna

Antenna	Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
									Measured	Reported	
Aux	WLAN 802.11b	Back side	0	6	2437	20.00	19.99	100.23%	0.179	0.179	-
		Top side	0	6	2437	20.00	19.99	100.23%	0.320	0.321	53
		Bottom side	0	6	2437	20.00	19.99	100.23%	0.007	0.007	-
		Right side	0	6	2437	20.00	19.99	100.23%	0.023	0.023	-
		Left side	0	6	2437	20.00	19.99	100.23%	0.019	0.019	-
	Bluetooth (GFSK)	Back side	0	78	2480	11.50	9.81	147.57%	0.012	0.018	-
		Top side	0	78	2480	11.50	9.81	147.57%	0.022	0.032	54
		Bottom side	0	78	2480	11.50	9.81	147.57%	0.001	0.001	-
		Right side	0	78	2480	11.50	9.81	147.57%	0.002	0.002	-
		Left side	0	78	2480	11.50	9.81	147.57%	0.001	0.002	-
	WLAN 802.11n(40M) 5.2G	Back side	0	46	5230	18.00	17.99	100.23%	0.271	0.272	-
		Top side	0	46	5230	18.00	17.99	100.23%	0.556	0.557	55
		Bottom side	0	46	5230	18.00	17.99	100.23%	0.002	0.002	-
		Right side	0	46	5230	18.00	17.99	100.23%	0.002	0.002	-
		Left side	0	46	5230	18.00	17.99	100.23%	0.053	0.053	-
	WLAN 802.11n(40M) 5.3G	Back side	0	54	5270	18.00	17.99	100.23%	0.293	0.294	-
		Top side	0	54	5270	18.00	17.99	100.23%	0.554	0.555	56
		Bottom side	0	54	5270	18.00	17.99	100.23%	0.002	0.002	-
		Right side	0	54	5270	18.00	17.99	100.23%	0.002	0.002	-
		Left side	0	54	5270	18.00	17.99	100.23%	0.054	0.054	-
	WLAN 802.11ac(80M) 5.6G	Back side	0	138	5690	17.50	17.44	101.39%	0.328	0.333	-
		Top side	0	138	5690	17.50	17.44	101.39%	0.489	0.496	57
		Bottom side	0	138	5690	17.50	17.44	101.39%	0.002	0.002	-
		Right side	0	138	5690	17.50	17.44	101.39%	0.001	0.001	-
		Left side	0	138	5690	17.50	17.44	101.39%	0.047	0.048	-
	WLAN 802.11ac(80M) 5.8G	Back side	0	155	5775	18.50	18.43	101.62%	0.392	0.398	-
		Top side	0	155	5775	18.50	18.43	101.62%	0.532	0.541	58
		Bottom side	0	155	5775	18.50	18.43	101.62%	0.002	0.002	-
		Right side	0	155	5775	18.50	18.43	101.62%	0.001	0.001	-
		Left side	0	155	5775	18.50	18.43	101.62%	0.064	0.065	-

Note:

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

Reported SAR = measured SAR * (scaling)

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

2.3 Reporting statements of conformity

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

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

3. Simultaneous Transmission Analysis

Simultaneous Transmission Scenarios:

Simultaneous Transmit Configurations	Body
2.4GHz WLAN MIMO	Yes
5GHz WLAN MIMO	Yes
BT + 2.4GHz WLAN Main	Yes
BT + 5GHz WLAN Main	Yes

Note:
1. Bluetooth and WLAN Aux share the same antenna path, and BT can transmit with WLAN Main simultaneously.
2. For 2.4/5GHz WLAN Main and Aux antennas, the maximum output power of each antenna during simultaneous transmission is less than that used in standalone transmission, and we used the sum of 1-g SAR provision in KDB447498D01 to exclude the simultaneous transmitted SAR measurement.

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

3.1 Estimated SAR calculation

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

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

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

3.2 SPLSR evaluation and analysis

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

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

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

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

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

SGS Taiwan Ltd. 台灣檢驗科技股份有限公司
No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

2.4 GHz WLAN MIMO

No.	Conditions	Position	Main	Aux	SAR Sum	SPLSR
1	2.4 GHz WLAN MIMO	Back side	0.159	0.179	0.338	ΣSAR<1.6, Not required
		Top side	0.430	0.321	0.751	ΣSAR<1.6, Not required
		Bottom side	0.007	0.007	0.014	ΣSAR<1.6, Not required
		Right side	0.068	0.023	0.091	ΣSAR<1.6, Not required
		Left side	0.023	0.019	0.042	ΣSAR<1.6, Not required

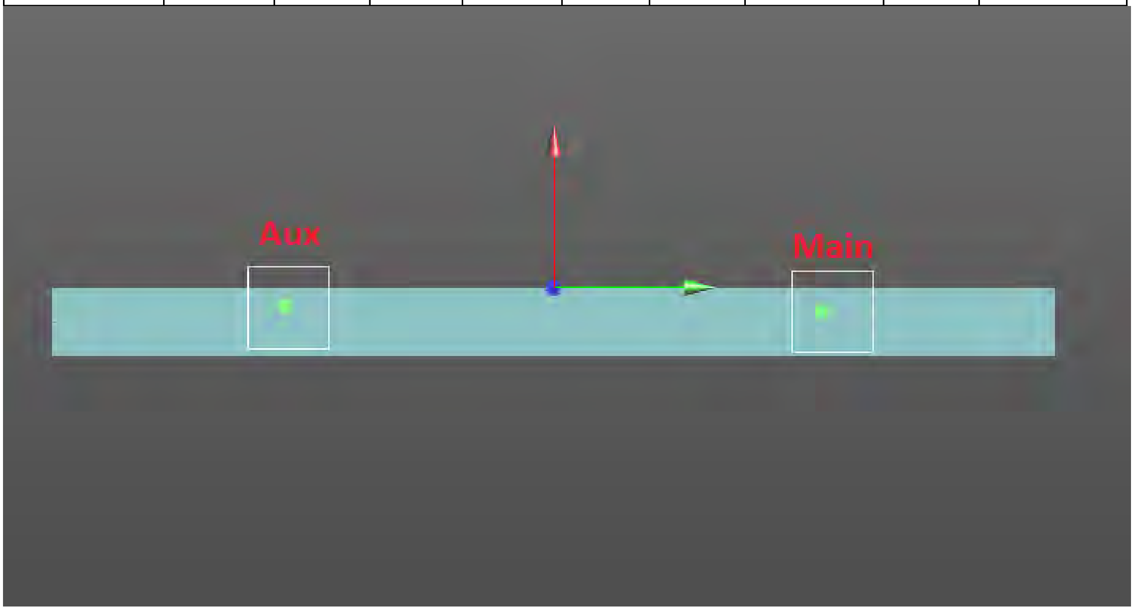
SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

5 GHz WLAN MIMO

No.	Conditions	Position	Main	Aux	SAR Sum	SPLSR
2	5 GHz WLAN MIMO	Back side	0.405	0.398	0.803	ΣSAR<1.6, Not required
		Top side	1.173	0.557	**1.730**	Analyzed as below
		Bottom side	0.044	0.002	0.046	ΣSAR<1.6, Not required
		Right side	0.256	0.002	0.258	ΣSAR<1.6, Not required
		Left side	0.002	0.065	0.067	ΣSAR<1.6, Not required

5 GHz WLAN MIMO

Conditions	Position	SAR Value (W/kg)	Coordinates (cm)			ΣSAR (W/kg)	Peak Location Separation Distance (mm)	SPLSR	Simultaneous Transmission SAR Test
			x	y	z				
WLAN Main	Top side	1.173	-0.70	7.88	-0.43	1.730	157.61	0.014	SPLSR<0.04, Not required
WLAN Aux		0.557	-0.52	-7.88	-0.43				



BT+ 2.4GHz WLAN Main

No.	Conditions	Position	Main	BT	SAR Sum	SPLSR
3	2.4 GHz WLAN Main + BT	Back side	0.159	0.018	0.177	ΣSAR<1.6, Not required
		Top side	0.430	0.032	0.462	ΣSAR<1.6, Not required
		Bottom side	0.007	0.001	0.008	ΣSAR<1.6, Not required
		Right side	0.068	0.002	0.070	ΣSAR<1.6, Not required
		Left side	0.023	0.002	0.025	ΣSAR<1.6, Not required

BT+ 5GHz WLAN Main

No.	Conditions	Position	Main	BT	SAR Sum	SPLSR
4	5 GHz WLAN Main + BT	Back side	0.405	0.018	0.423	ΣSAR<1.6, Not required
		Top side	1.173	0.032	1.205	ΣSAR<1.6, Not required
		Bottom side	0.044	0.001	0.045	ΣSAR<1.6, Not required
		Right side	0.256	0.002	0.258	ΣSAR<1.6, Not required
		Left side	0.002	0.002	0.004	ΣSAR<1.6, Not required

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

4. Instruments List

Manufacturer	Device	Type	Serial number	Date of last calibration	Date of next calibration
SPEAG	Dosimetric E-Field Probe	EX3DV4	7509	Mar.25,2019	Mar.24,2020
SPEAG	System Validation Dipole	D2450V2	727	Apr.24,2019	Apr.23,2020
		D5GHzV2	1023	Jan.30,2019	Jan.29,2020
SPEAG	Data acquisition Electronics	DAE4	1336	Aug.06,2018	Aug.05,2019
SPEAG	Software	DASY 52 52.10.1	N/A	Calibration not required	Calibration not required
SPEAG	Phantom	ELI	N/A	Calibration not required	Calibration not required
Agilent	Network Analyzer	E5071C	MY46107530	Feb.23,2019	Feb.22,2020
Agilent	Dielectric Probe Kit	85070E	MY44300677	Calibration not required	Calibration not required
Agilent	Dual-directional coupler	772D	MY46151242	Aug.28,2018	Aug.27,2019
		778D	MY48220468	Aug.28,2018	Aug.27,2019
Agilent	Signal Generator	N5181A	MY50141235	Apr.22,2019	Apr.21,2020
Agilent	Power Meter	ML2496A	1326001	Aug.09,2018	Aug.02,2019
Agilent	Power Sensor	MA2411B	1315048	Aug.09,2018	Aug.02,2019
			1315049	Aug.09,2018	Aug.02,2019
Changzhou Xinwang	Digital thermometer	DTM-303A	TP130074	Mar.26,2019	Mar.25,2020

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

5. Measurements

Date: 2019/7/25

WLAN 802.11b_Body_Top side_CH 10_0mm_Main

Communication System: WLAN 2.45G; Frequency: 2457 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2457 MHz; σ = 1.792 S/m; ε_r = 39.067; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.1°C; Liquid temperature: 21.3°C

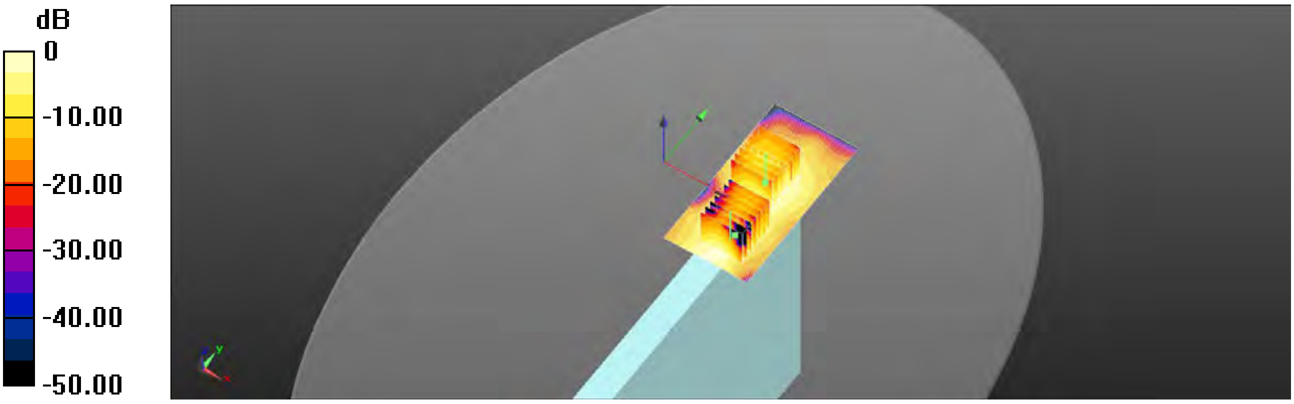
DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(7.79, 7.79, 7.79); Calibrated: 2019/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (51x101x1): Interpolated grid: dx=12 mm, dy=12 mm
Maximum value of SAR (interpolated) = 0.670 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.986 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.675 W/kg
SAR(1 g) = 0.428 W/kg; SAR(10 g) = 0.222 W/kg
Maximum value of SAR (measured) = 0.574 W/kg

Zoom Scan (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.986 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.702 W/kg
SAR(1 g) = 0.315 W/kg; SAR(10 g) = 0.139 W/kg
Maximum value of SAR (measured) = 0.517 W/kg



0 dB = 0.517 W/kg = -2.86 dBW/kg

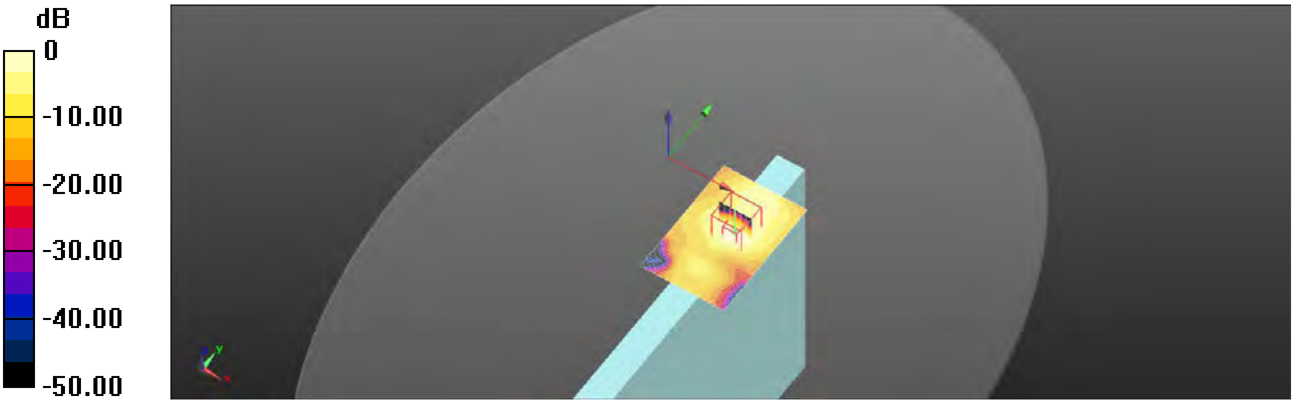
Date: 2019/7/26

WLAN 802.11a 5.2G_Body_Top side_CH 44_0mm_Main
Communication System: WLAN 5G; Frequency: 5220 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5220 MHz; σ = 4.608 S/m; ε_r = 36.438; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.6°C; Liquid temperature: 21.8°C

DASY5 Configuration:
- Probe: EX3DV4 - SN7509; ConvF(5.46, 5.46, 5.46); Calibrated: 2019/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x91x1): Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 1.72 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 3.342 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 2.78 W/kg
SAR(1 g) = 0.884 W/kg; SAR(10 g) = 0.294 W/kg
Maximum value of SAR (measured) = 1.75 W/kg



0 dB = 1.75 W/kg = 2.44 dBW/kg

Date: 2019/7/26

WLAN 802.11n(40M) 5.2G_Body_Top side_CH 46_0mm_Main

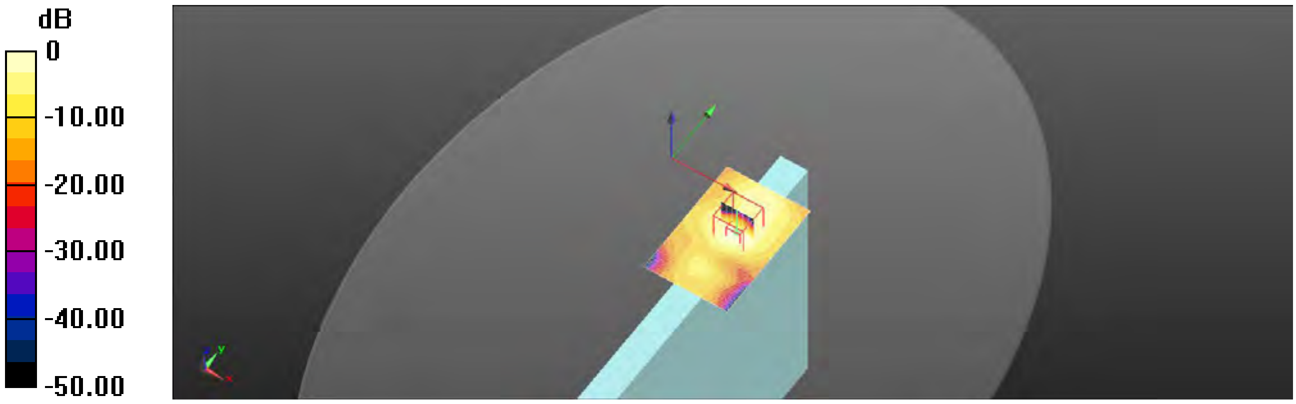
Communication System: WLAN 5G; Frequency: 5230 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5230 MHz; σ = 4.622 S/m; ε_r = 36.415; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.6°C; Liquid temperature: 21.8°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(5.46, 5.46, 5.46); Calibrated: 2019/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x91x1): Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 1.86 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 3.258 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 3.10 W/kg
SAR(1 g) = 0.942 W/kg; SAR(10 g) = 0.304 W/kg
Maximum value of SAR (measured) = 1.87 W/kg



0 dB = 1.87 W/kg = 2.73 dBW/kg

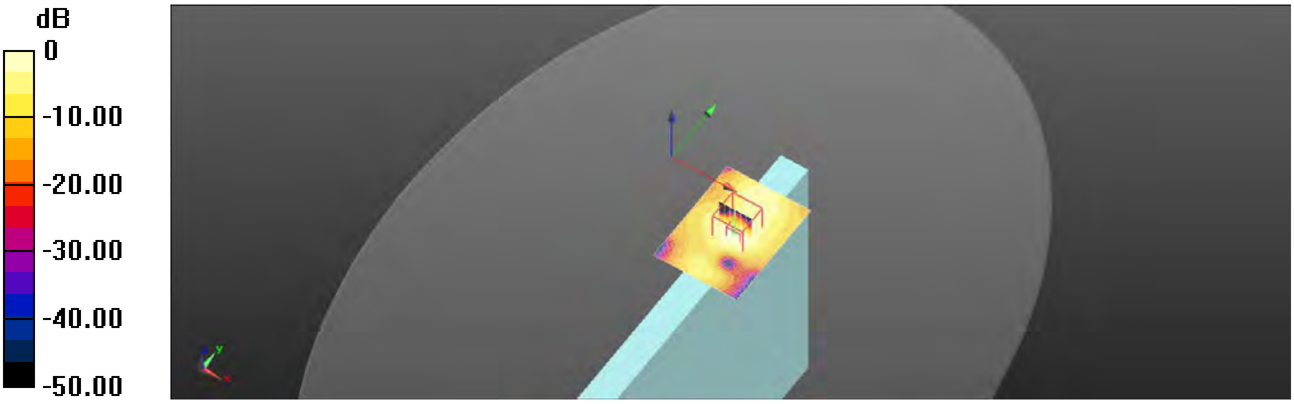
Date: 2019/7/29

WLAN 802.11a 5.3G_Body_Top side_CH 56_0mm_Main
Communication System: WLAN 5G; Frequency: 5280 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5280 MHz; σ = 4.686 S/m; ε_r = 36.181; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.1°C; Liquid temperature: 21.4°C

DASY5 Configuration:
- Probe: EX3DV4 - SN7509; ConvF(5.2, 5.2, 5.2); Calibrated: 2019/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x81x1): Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 2.01 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 3.023 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 3.06 W/kg
SAR(1 g) = 0.966 W/kg; SAR(10 g) = 0.310 W/kg
Maximum value of SAR (measured) = 1.83 W/kg



0 dB = 1.83 W/kg = 2.62 dBW/kg

Date: 2019/7/29

WLAN 802.11n(40M) 5.3G_Body_Top side_CH 54_0mm_Main

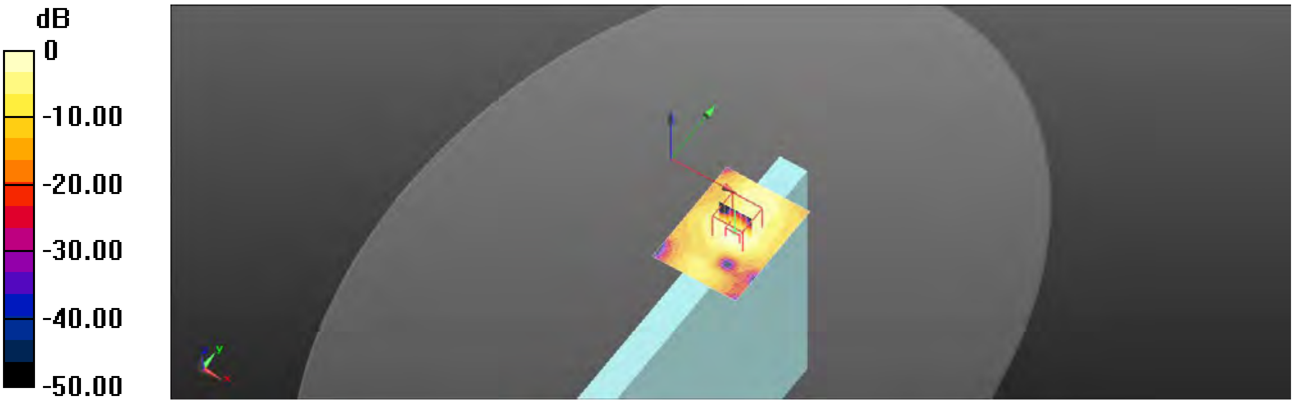
Communication System: WLAN 5G; Frequency: 5270 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5270 MHz; σ = 4.676 S/m; ε_r = 36.208; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.1°C; Liquid temperature: 21.4°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(5.2, 5.2, 5.2); Calibrated: 2019/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x81x1): Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 2.06 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 2.768 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 3.28 W/kg
SAR(1 g) = 1.01 W/kg; SAR(10 g) = 0.323 W/kg
Maximum value of SAR (measured) = 1.98 W/kg



0 dB = 1.98 W/kg = 2.96 dBW/kg

Date: 2019/7/30

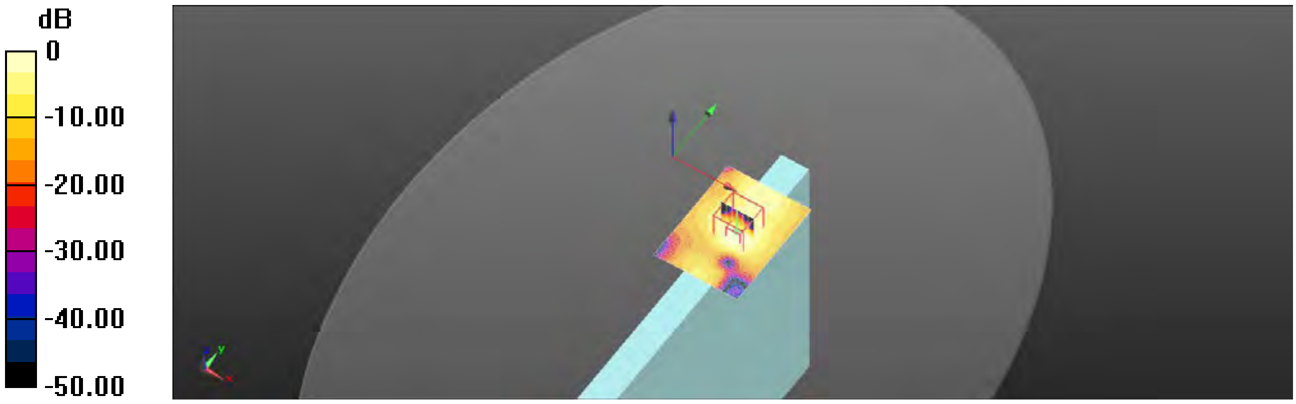
WLAN 802.11n(40M) 5.6G_Body_Top side_CH 110_0mm_Main
Communication System: WLAN 5G; Frequency: 5550 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5550 MHz; σ = 4.952 S/m; ε_r = 35.956; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.5°C; Liquid temperature: 21.8°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(4.77, 4.77, 4.77); Calibrated: 2019/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x81x1): Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 2.20 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 2.707 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 3.47 W/kg
SAR(1 g) = 1.05 W/kg; SAR(10 g) = 0.324 W/kg
Maximum value of SAR (measured) = 2.14 W/kg



0 dB = 2.14 W/kg = 3.30 dBW/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Date: 2019/7/30

WLAN 802.11ac(80M) 5.6G_Body_Top side_CH 138_0mm_Main

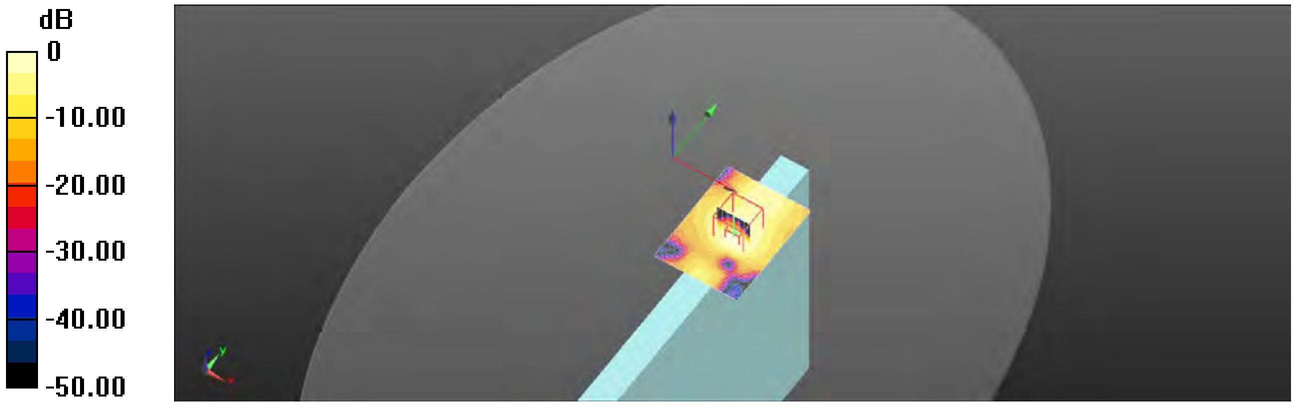
Communication System: WLAN 5G; Frequency: 5690 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5690 MHz; σ = 5.094 S/m; ε_r = 35.871; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.5°C; Liquid temperature: 21.8°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(4.77, 4.77, 4.77); Calibrated: 2019/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x81x1): Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 2.26 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 2.246 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 3.88 W/kg
SAR(1 g) = 1.08 W/kg; SAR(10 g) = 0.343 W/kg
Maximum value of SAR (measured) = 2.19 W/kg



0 dB = 2.19 W/kg = 3.41 dBW/kg

Date: 2019/7/31

WLAN 802.11a 5.8G_Body_Top side_CH 157_0mm_Main

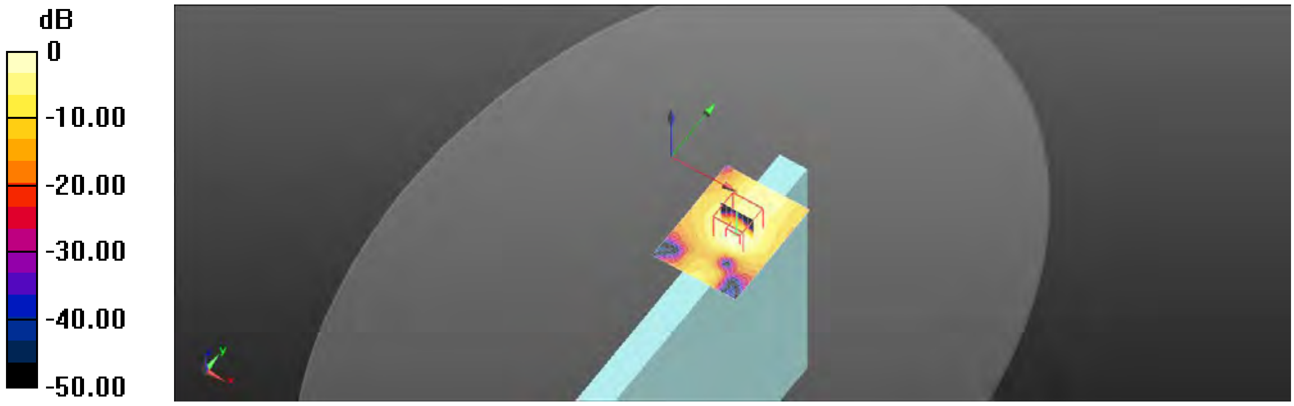
Communication System: WLAN 5G; Frequency: 5785 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5785 MHz; σ = 5.172 S/m; ε_r = 35.84; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.1°C; Liquid temperature: 21.2°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(4.94, 4.94, 4.94); Calibrated: 2019/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x81x1): Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 2.42 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 2.750 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 3.92 W/kg
SAR(1 g) = 1.17 W/kg; SAR(10 g) = 0.374 W/kg
Maximum value of SAR (measured) = 2.45 W/kg



0 dB = 2.45 W/kg = 3.88 dBW/kg

Date: 2019/7/31

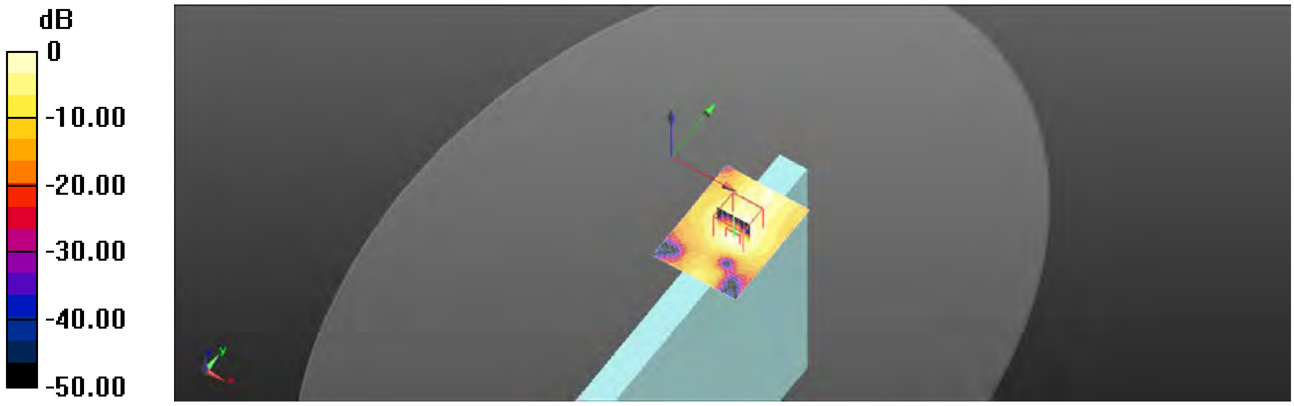
WLAN 802.11n(40M) 5.8G_Body_Top side_CH 159_0mm_Main
Communication System: WLAN 5G; Frequency: 5795 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5795 MHz; σ = 5.178 S/m; ε_r = 35.807; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.1°C; Liquid temperature: 21.2°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(4.94, 4.94, 4.94); Calibrated: 2019/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x81x1): Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 2.40 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 2.970 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 3.95 W/kg
SAR(1 g) = 1.17 W/kg; SAR(10 g) = 0.378 W/kg
Maximum value of SAR (measured) = 2.30 W/kg



0 dB = 2.30 W/kg = 3.62 dBW/kg

Date: 2019/7/25

WLAN 802.11b_Body_Top side_CH 6_0mm_Aux

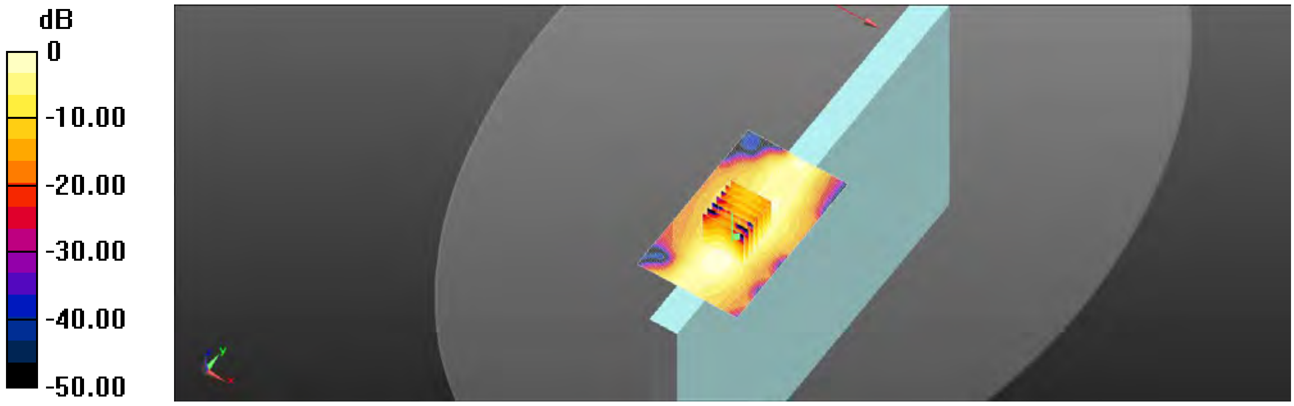
Communication System: WLAN 2.45G; Frequency: 2437 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.772 S/m; ε_r = 39.105; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.1°C; Liquid temperature: 21.3°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(7.79, 7.79, 7.79); Calibrated: 2019/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x101x1): Interpolated grid: dx=12 mm, dy=12 mm
Maximum value of SAR (interpolated) = 0.481 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.895 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 0.714 W/kg
SAR(1 g) = 0.320 W/kg; SAR(10 g) = 0.163 W/kg
Maximum value of SAR (measured) = 0.505 W/kg



0 dB = 0.505 W/kg = -2.97 dBW/kg

Date: 2019/7/25

Bluetooth(GFSK)_Body_Top side_CH 78_0mm_Aux

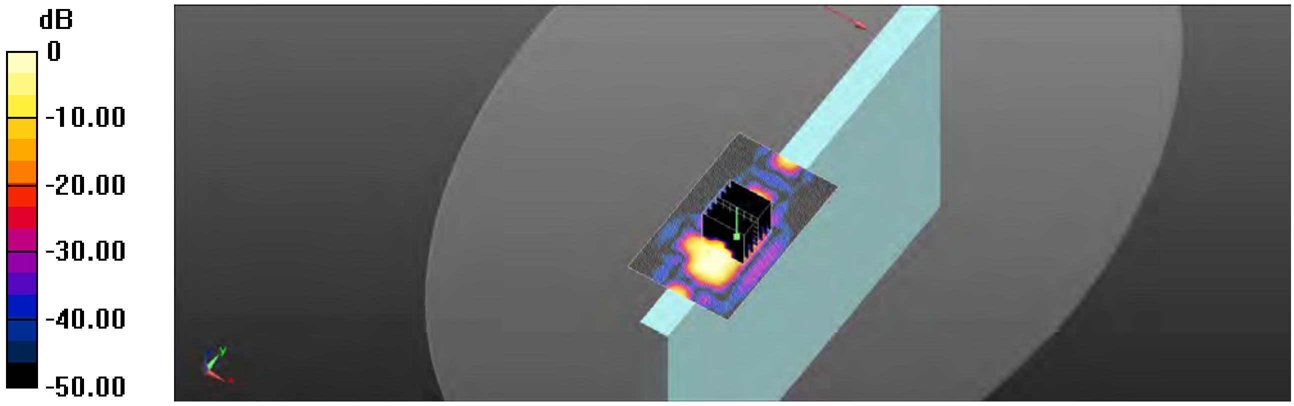
Communication System: Bluetooth; Frequency: 2480 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2480 MHz; σ = 1.81 S/m; ε_r = 39.044; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.1°C; Liquid temperature: 21.3°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(7.79, 7.79, 7.79); Calibrated: 2019/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x101x1): Interpolated grid: dx=12 mm, dy=12 mm
Maximum value of SAR (interpolated) = 0.103 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0.7030 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.0490 W/kg
SAR(1 g) = 0.022 W/kg; SAR(10 g) = 0.00651 W/kg
Maximum value of SAR (measured) = 0.0362 W/kg



0 dB = 0.0362 W/kg = -14.41 dBW/kg

Date: 2019/7/26

WLAN 802.11n(40M) 5.2G_Body_Top side_CH 46_0mm_Aux

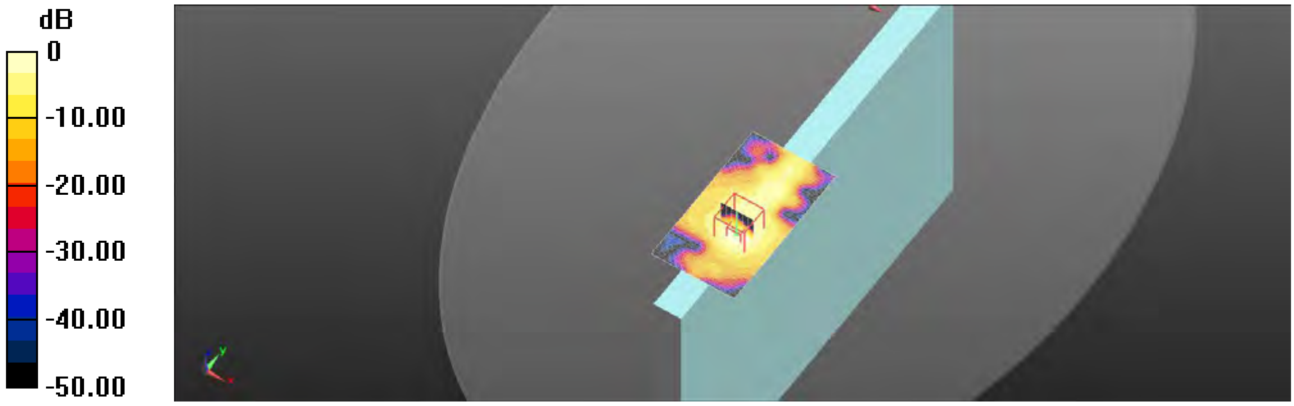
Communication System: WLAN 5G; Frequency: 5230 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5230 MHz; σ = 4.622 S/m; ε_r = 36.415; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.6°C; Liquid temperature: 21.8°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(5.46, 5.46, 5.46); Calibrated: 2019/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x111x1): Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 1.06 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 4.594 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.81 W/kg
SAR(1 g) = 0.556 W/kg; SAR(10 g) = 0.168 W/kg
Maximum value of SAR (measured) = 1.14 W/kg



0 dB = 1.14 W/kg = 0.55 dBW/kg

Date: 2019/7/29

WLAN 802.11n(40M) 5.3G_Body_Top side_CH 54_0mm_Aux

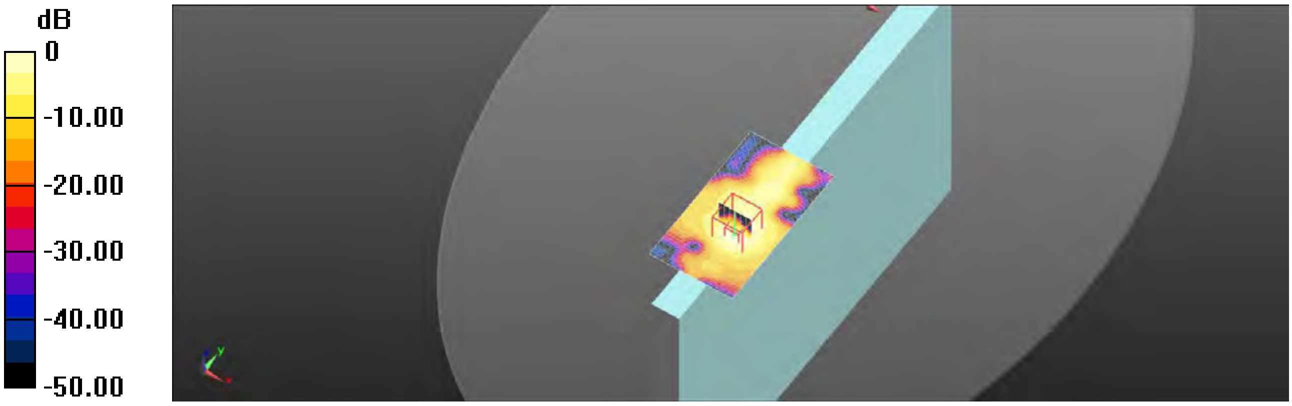
Communication System: WLAN 5G; Frequency: 5270 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5270 MHz; σ = 4.676 S/m; ε_r = 36.208; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.1°C; Liquid temperature: 21.4°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(5.2, 5.2, 5.2); Calibrated: 2019/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x111x1): Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 1.08 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 4.668 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 1.70 W/kg
SAR(1 g) = 0.554 W/kg; SAR(10 g) = 0.173 W/kg
Maximum value of SAR (measured) = 1.15 W/kg



0 dB = 1.15 W/kg = 0.60 dBW/kg

Date: 2019/7/30

WLAN 802.11ac(80M) 5.6G_Body_Top side_CH 138_0mm_Aux

Communication System: WLAN 5G; Frequency: 5690 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5690 MHz; σ = 5.094 S/m; ε_r = 35.871; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.5°C; Liquid temperature: 21.8°C

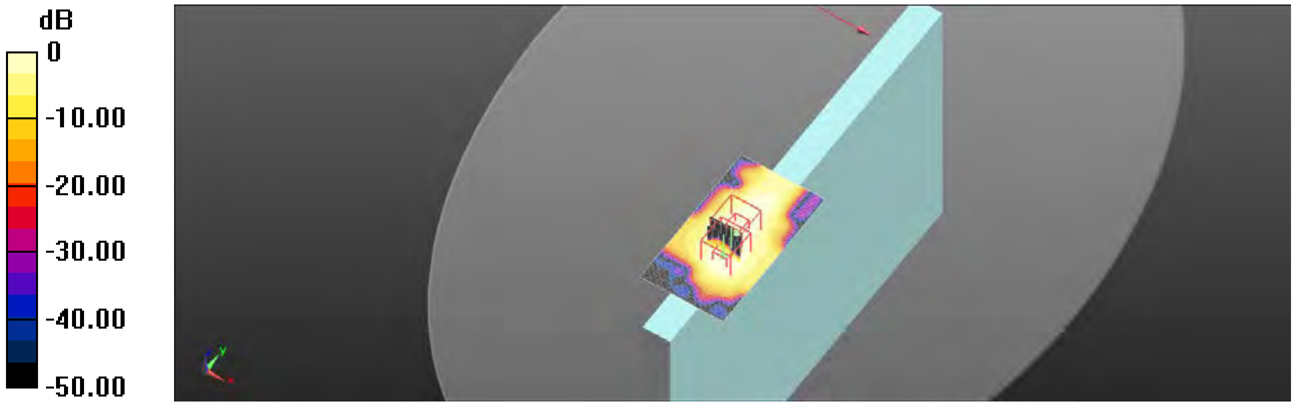
DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(4.77, 4.77, 4.77); Calibrated: 2019/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x111x1): Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 0.949 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 3.638 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 1.66 W/kg
SAR(1 g) = 0.489 W/kg; SAR(10 g) = 0.145 W/kg
Maximum value of SAR (measured) = 1.02 W/kg

Zoom Scan (7x7x12)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 3.638 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 1.16 W/kg
SAR(1 g) = 0.320 W/kg; SAR(10 g) = 0.123 W/kg
Maximum value of SAR (measured) = 0.684 W/kg



0 dB = 0.684 W/kg = -1.65 dBW/kg

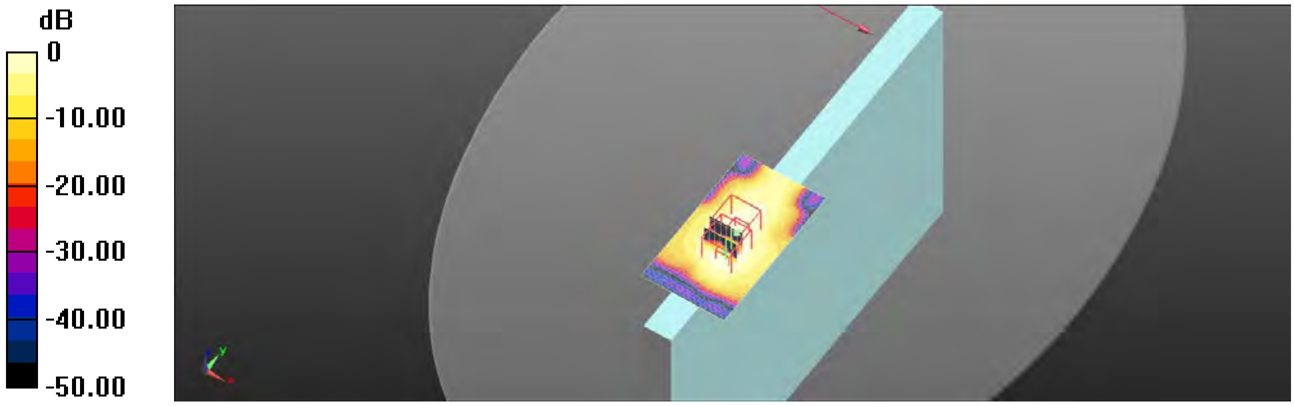
Date: 2019/7/31

WLAN 802.11ac(80M) 5.8G_Body_Top side_CH 155_0mm_Aux
Communication System: WLAN 5G; Frequency: 5775 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5775 MHz; σ = 5.159 S/m; ε_r = 35.841; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.1°C; Liquid temperature: 21.2°C

DASY5 Configuration:
- Probe: EX3DV4 - SN7509; ConvF(4.94, 4.94, 4.94); Calibrated: 2019/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x111x1): Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 1.00 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 3.851 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 1.83 W/kg
SAR(1 g) = 0.532 W/kg; SAR(10 g) = 0.172 W/kg
Maximum value of SAR (measured) = 1.06 W/kg
Zoom Scan (7x7x12)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 3.851 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 1.58 W/kg
SAR(1 g) = 0.393 W/kg; SAR(10 g) = 0.155 W/kg
Maximum value of SAR (measured) = 0.875 W/kg



0 dB = 0.875 W/kg = -0.58 dBW/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路 134 號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

6. SAR System Performance Verification

Date: 2019/7/25

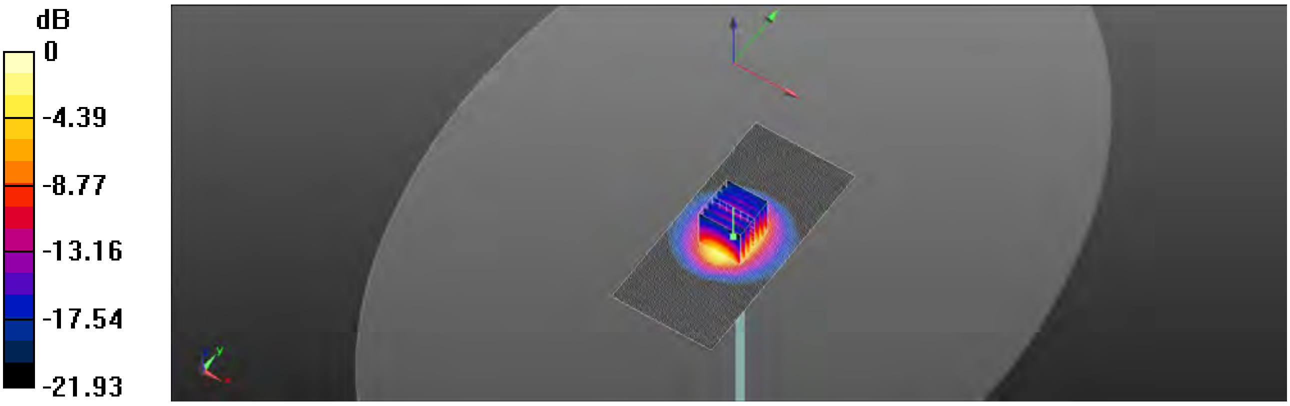
Dipole 2450 MHz_SN:727
Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.784 S/m; ε_r = 39.085; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.1°C; Liquid temperature: 21.3°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(7.79, 7.79, 7.79); Calibrated: 2019/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x131x1): Interpolated grid: dx=12 mm, dy=12 mm
Maximum value of SAR (interpolated) = 22.8 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 108.1 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 29.0 W/kg
SAR(1 g) = 13.4 W/kg; SAR(10 g) = 6.25 W/kg
Maximum value of SAR (measured) = 21.5 W/kg



0 dB = 21.5 W/kg = 13.32 dBW/kg

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路 134 號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Date: 2019/7/26

Dipole 5200 MHz_SN:1023

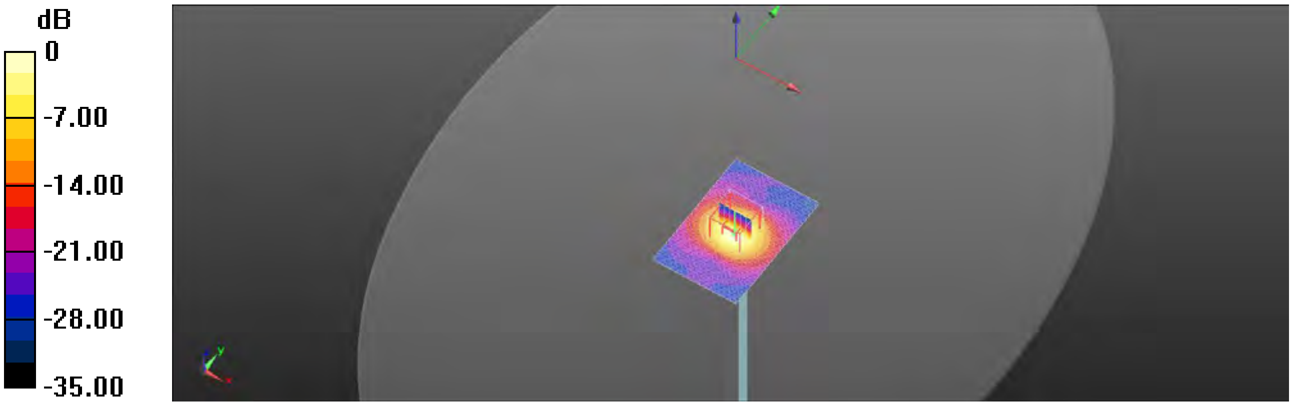
Communication System: CW; Frequency: 5200 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5200 MHz; σ = 4.591 S/m; ε_r = 36.472; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.6°C; Liquid temperature: 21.8°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(5.46, 5.46, 5.46); Calibrated: 2019/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x91x1): Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 18.7 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 67.85 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 33.3 W/kg
SAR(1 g) = 7.92 W/kg; SAR(10 g) = 2.23 W/kg
Maximum value of SAR (measured) = 18.8 W/kg



0 dB = 18.8 W/kg = 12.74 dBW/kg

Date: 2019/7/29

Dipole 5300 MHz_SN:1023

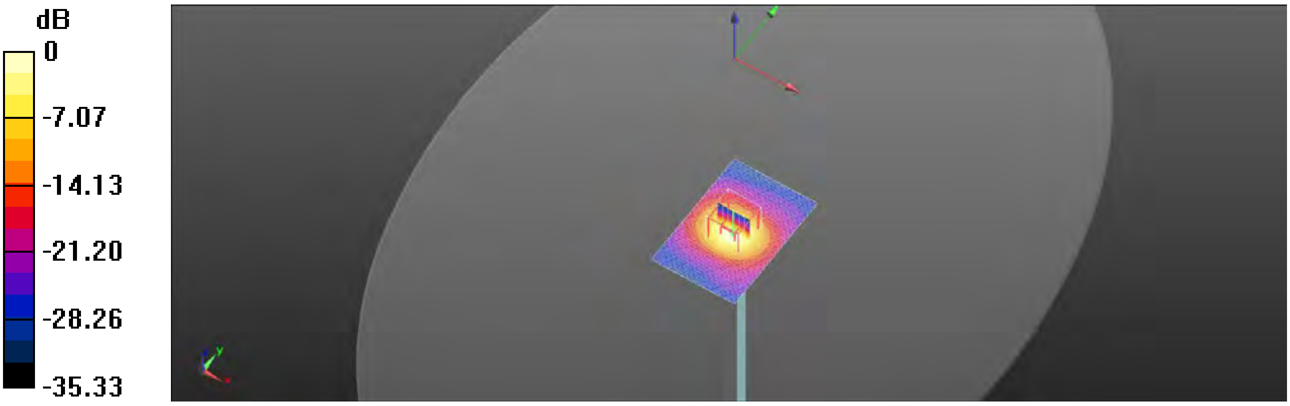
Communication System: CW; Frequency: 5300 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5300 MHz; σ = 4.705 S/m; ε_r = 36.158; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.1°C; Liquid temperature: 21.4°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(5.2, 5.2, 5.2); Calibrated: 2019/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x91x1): Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 17.6 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 63.58 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 34.4 W/kg
SAR(1 g) = 8.22 W/kg; SAR(10 g) = 2.31 W/kg
Maximum value of SAR (measured) = 17.1 W/kg



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

Date: 2019/7/30

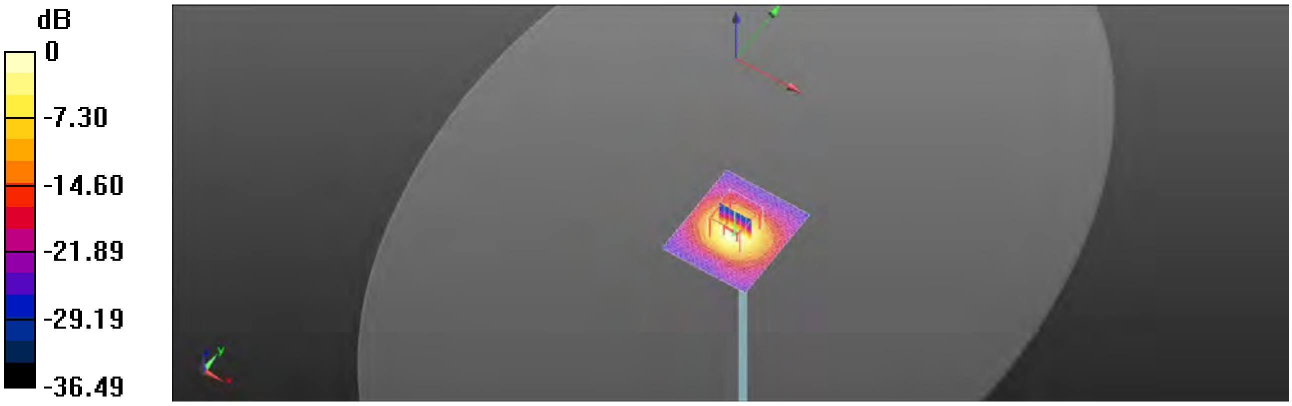
Dipole 5600 MHz_SN:1023
Communication System: CW; Frequency: 5600 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5600 MHz; σ = 5.005 S/m; ε_r = 35.897; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.5°C; Liquid temperature: 21.8°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(4.77, 4.77, 4.77); Calibrated: 2019/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x71x1): Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 18.3 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 63.58 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 35.4 W/kg
SAR(1 g) = 8.58 W/kg; SAR(10 g) = 2.41 W/kg
Maximum value of SAR (measured) = 17.6 W/kg



0 dB = 17.6 W/kg = 12.45 dBW/kg

Date: 2019/7/31

Dipole 5800 MHz_SN:1023

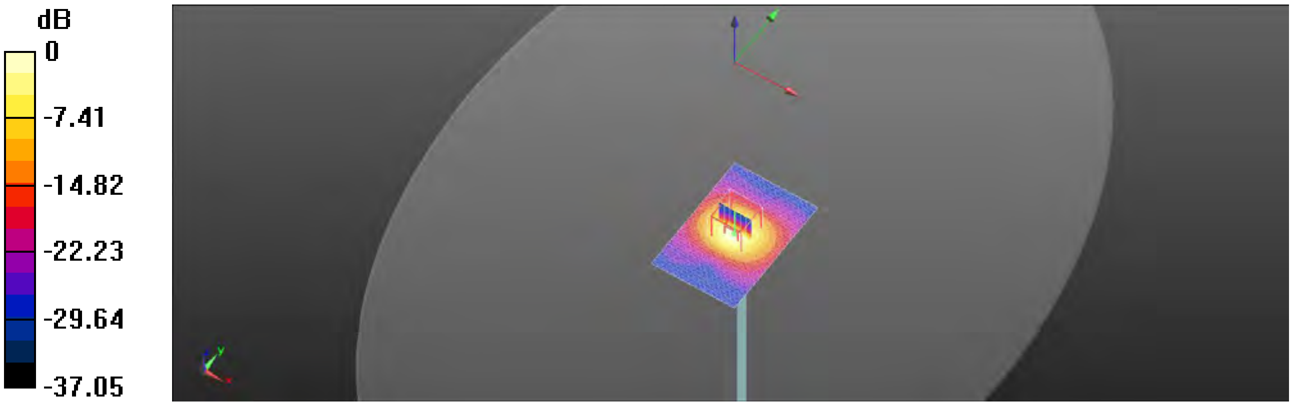
Communication System: CW; Frequency: 5800 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5800 MHz; σ = 5.184 S/m; ε_r = 35.794; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.1°C; Liquid temperature: 21.2°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(4.94, 4.94, 4.94); Calibrated: 2019/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2018/8/6
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x91x1): Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 17.3 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 58.73 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 38.6 W/kg
SAR(1 g) = 8.09 W/kg; SAR(10 g) = 2.24W/kg
Maximum value of SAR (measured) = 16.7 W/kg



0 dB = 16.7 W/kg = 12.24 dBW/kg

7. Uncertainty Budget

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

A	c	D	e		f	g	h=c * f / e	i=c * g / e	k
Source of Uncertainty	Tolerance/ Uncertainty	Probability Distributio	Div	Div Value	ci (1g)	ci (10g)	Standard uncertainty	Standard uncertainty	vi, or Veff
Measurement system									
Probe calibration	6.55%	N	1	1	1	1	6.55%	6.55%	∞
Isotropy , Axial	3.50%	R	√3	1.732	1	1	2.02%	2.02%	∞
Isotropy, Hemispherical	9.60%	R	√3	1.732	1	1	5.54%	5.54%	∞
Modulation Response	2.40%	R	√3	1.732	1	1	1.40%	1.40%	∞
Boundary Effect	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
Linearity	4.70%	R	√3	1.732	1	1	2.71%	2.71%	∞
Detection Limits	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
Readout Electronics	0.30%	N	1	1	1	1	0.30%	0.30%	∞
Response time	0.80%	R	√3	1.732	1	1	0.46%	0.46%	∞
Integration Time	2.60%	R	√3	1.732	1	1	1.50%	1.50%	∞
Measurement drift (class A evaluation)	1.75%	R	√3	1.732	1	1	1.01%	1.01%	∞
RF ambient condition - noise	3.00%	R	√3	1.732	1	1	1.73%	1.73%	∞
RF ambient conditions - reflections	3.00%	R	√3	1.732	1	1	1.73%	1.73%	∞
Probe positioner Mechanical restrictions	0.40%	R	√3	1.732	1	1	0.23%	0.23%	∞
Probe Positioning with respect to phantom shell	2.90%	R	√3	1.732	1	1	1.67%	1.67%	∞
Post-processing	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
Max SAR Eval	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
Test Sample related									
Test sample positioning	2.90%	N	1	1	1	1	2.90%	2.90%	M-1
Device Holder Uncertainty	3.60%	N	1	1	1	1	3.60%	3.60%	M-1
Drift of output power	5.00%	R	√3	1.732	1	1	2.89%	2.89%	∞
Phantom and Setup									
Phantom Uncertainty	4.00%	R	√3	1.732	1	1	2.31%	2.31%	∞
Liquid permittivity (mea.)	1.48%	N	1	1	0.64	0.43	0.95%	0.64%	M
Liquid Conductivity (mea.)	1.65%	N	1	1	0.6	0.49	0.99%	0.81%	M
Combined standard uncertainty		RSS					11.80%	11.75%	
Expant uncertainty (95% confidence interval), K=2							23.59%	23.50%	

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

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

A	c	D	e		f	g	h=c * f / e	i=c * g / e	k
Source of Uncertainty	Tolerance/ Uncertainty	Probability Distributio	Div	Div Value	ci (1g)	ci (10g)	Standard uncertainty	Standard uncertainty	vi, or Veff
Measurement system									
Probe calibration	6.00%	N	1	1	1	1	6.00%	6.00%	∞
Isotropy , Axial	3.50%	R	√3	1.732	1	1	2.02%	2.02%	∞
Isotropy, Hemispherical	9.60%	R	√3	1.732	1	1	5.54%	5.54%	∞
Modulation Response	2.40%	R	√3	1.732	1	1	1.40%	1.40%	∞
Boundary Effect	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
Linearity	4.70%	R	√3	1.732	1	1	2.71%	2.71%	∞
Detection Limits	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
Readout Electronics	0.30%	N	1	1	1	1	0.30%	0.30%	∞
Response time	0.80%	R	√3	1.732	1	1	0.46%	0.46%	∞
Integration Time	2.60%	R	√3	1.732	1	1	1.50%	1.50%	∞
Measurement drift (class A evaluation)	1.75%	R	√3	1.732	1	1	1.01%	1.01%	∞
RF ambient condition - noise	3.00%	R	√3	1.732	1	1	1.73%	1.73%	∞
RF ambient conditions - reflections	3.00%	R	√3	1.732	1	1	1.73%	1.73%	∞
Probe positioner Mechanical restrictions	0.40%	R	√3	1.732	1	1	0.23%	0.23%	∞
Probe Positioning with respect to phantom shell	2.90%	R	√3	1.732	1	1	1.67%	1.67%	∞
Post-processing	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
Max SAR Eval	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
Test Sample related									
Test sample positioning	2.90%	N	1	1	1	1	2.90%	2.90%	M-1
Device Holder Uncertainty	3.60%	N	1	1	1	1	3.60%	3.60%	M-1
Drift of output power	5.00%	R	√3	1.732	1	1	2.89%	2.89%	∞
Phantom and Setup									
Phantom Uncertainty	4.00%	R	√3	1.732	1	1	2.31%	2.31%	∞
Liquid permittivity (mea.)	0.33%	N	1	1	0.64	0.43	0.21%	0.14%	M
Liquid Conductivity (mea.)	0.95%	N	1	1	0.6	0.49	0.57%	0.47%	M
Combined standard uncertainty		RSS					11.43%	11.42%	
Expant uncertainty (95% confidence interval), K=2							22.87%	22.84%	

Appendixes

Refer to separated files for the following appendixes.

EN201970005 SAR_Appendix A Photographs

EN201970005 SAR_Appendix B DAE & Probe Cal. Certificate

EN201970005 SAR_Appendix C Phantom Description & Dipole Cal. Certificate

- End of report -

SGS Taiwan Ltd. No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group