SAR TEST REPORT

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

Product Type	2TX 11ax (WiFi6) + BLE Combo Card
Trade Name	MediaTek
Model Number	MT7921
Company Name	ASUSTeK COMPUTER INC.
Company Address	1F., No. 15, Lide Rd., Beitou Dist., Taipei City 112, Taiwan
Standards	IEEE/ANSI C95.1-1992, IEEE 1528-2013
FCC ID	RAS-MT7921
Date of Receipt	Apr. 14, 2022
Date of Test(s)	Jun 22, 2022 ~ Jun 24, 2022
Date of Issue	Jul. 07, 2022

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 Ltd. Central RF Lab or testing done by SGS Taiwan Ltd. Central RF Lab in connection with distribution or use of the product described in this report must be approved by SGS Taiwan Ltd. Central RF Lab in writing.

Signed on behalf of SGS

Clerk / Kimmy Chiou	PM / Jasper Wang	Asst. Manager / John Yeh
Kimmy Chiou	Jasper Wang	John Yeh

Date: Jul. 07, 2022

Revision History

Report Number	Revision	Description	Issue Date	Revised By	Remark
TESA2204000040EN	Rev.00	Initial creation of document	Jun. 08, 2022	Kimmy Chiou	*
TESA2204000040EN	Rev.01	Modify the host model name	Jun. 23, 2022	Kimmy Chiou	*
TESA2204000040EN	Rev.02	Modify comment	Jul. 07, 2022	Kimmy Chiou	

Note:

1. The mark " * " is the revised version of the report due to comments submitted by the certification.

0. Guidance applied

The SAR testing method and procedure for this device is in accordance with the following standards:
IEEE/ANSI C95.1-1992
IEEE 1528-2013
KDB248227D01v02r02
KDB865664D01v01r04
KDB865664D02v01r02
KDB447498D01v06
KDB616217D04v01r02

Contents

1. General Information

1.1 Testing Laboratory

Laboratory	Test Site Address	Test Site Name	FCC Designation number	IC CAB identifier
SGS Taiwan Ltd. Central RF Lab. (TAF code 3702)	1F, No. 8, Alley 15, Lane 120, Sec. 1, NeiHu Road, Neihu District, Taipei City, 11493, Taiwan.	SAR 2	TW0029	TW3702
		SAR 6		
	No. 2, Keji 1st Rd., Guishan Township, Taoyuan County, 33383, Taiwan	SAR 1	TW0028	
		SAR 4		
	No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan	SAR 3	TW0027	
		SAR 7		
Note: Test site name is remarked on the equipment list in each section of this report as an indication where measurements occurred in specific test site and address.				

1.2 Details of Applicant

Company Name	ASUSTeK COMPUTER INC.
Company Address	1F., No. 15, Lide Rd., Beitou Dist., Taipei City 112, Taiwan

1.3 Description of EUT

Product Type	2TX 11ax (WiFi6) + BLE Combo Card	
Trade Name	MediaTek	
Model Number	MT7921	
FCC ID	RAS-MT7921	
Host Information	Product Type: Expertbook Trade Name: ASUS Model Name: B5402CB Family Model No.: B5402CBA All models are electrically identical, different model names are for marketing purpose.	
Mode of Operation	☒WLAN802.11 ☒Bluetooth	
Duty Cycle	WLAN802.11	Refer to page 19-20
	Bluetooth	76.8%
Tx Frequency Bands (MHz)	WLAN	2412 ~ 2472, 5180 ~ 5240, 5260 ~ 5320, 5500 ~ 5720, 5745 ~ 5825
	Bluetooth	2402 ~ 2480

Summary of Maximum SAR Value:

Summary of Maximum SAR	
Mode	Highest SAR 1g Body (W/kg)
Bluetooth(GFSK)	0.12
2.4G WLAN	0.72
5.2G WLAN	1.08
5.3G WLAN	1.12
5.6G WLAN	1.04
5.8G WLAN	1.1

Antenna Information

Vendor	High-tek									
Type	PIFA									
Antenna	Main					Aux				
Part Number	DC33002R600(0ACCN022001N)					DC33002R610(0ACCN022002N)				
Frequency(MHz)	2400~2500	5150~5250	5250~5350	5470~5725	5725~5850	2400~2500	5150~5250	5250~5350	5470~5725	5725~5850
Gain (dBi)	1.81	3.16	3.16	3.91	4.21	2.69	3.13	3.11	4.14	4.22

Vendor	Pulse									
Type	PIFA									
Antenna	Main					Aux				
Part Number	DC33002R500 (TZ2381D)					DC33002R510 (TZ2381E)				
Frequency(MHz)	2400~2500	5150~5250	5250~5350	5470~5725	5725~5850	2400~2500	5150~5250	5250~5350	5470~5725	5725~5850
Gain (dBi)	1.07	2.81	2.81	3.70	3.77	2.59	2.96	3	3.86	3.86

Conducted power table:

Main						
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
2.45GHz	802.11b	1	2412	1Mbps	16.50	16.41
		6	2437		16.50	16.47
		11	2462		16.50	16.12
	802.11g	1	2412	6Mbps	16.50	16.01
		6	2437		16.50	15.95
		11	2462		16.50	15.98
	802.11n20-HT0	1	2412	MCS0	16.50	15.96
		6	2437		16.50	15.84
		11	2462		16.50	15.83
	802.11ac20-VHT0	1	2412	MCS0	16.50	15.88
		6	2437		16.50	15.92
		11	2462		16.50	15.90
	802.11ax20-HE0	1	2412	MCS0	16.50	15.94
		6	2437		16.50	15.98
		11	2462		16.50	15.94
	802.11n40-HT0	3	2422	MCS0	15.00	14.41
		6	2437		16.00	15.38
		9	2452		15.00	14.40
	802.11ac40-VHT0	3	2422	MCS0	15.00	14.32
		6	2437		16.00	15.34
		9	2452		15.00	14.38
	802.11ax40-HE0	3	2422	MCS0	15.00	14.37
		6	2437		16.00	15.33
		9	2452		15.00	14.49

Main						
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	11.50	11.10
		40	5200		11.50	11.10
		44	5220		11.50	11.19
		48	5240		11.50	11.22
	802.11n20-HT0	36	5180	MCS0	11.50	11.24
		40	5200		11.50	11.21
		44	5220		11.50	11.29
		48	5240		11.50	11.24
	802.11ac20-VHT0	36	5180	MCS0	11.50	11.16
		40	5200		11.50	11.27
		44	5220		11.50	11.13
		48	5240		11.50	11.18
	802.11ax20-HE0	36	5180	MCS0	11.50	11.19
		40	5200		11.50	11.17
		44	5220		11.50	11.20
		48	5240		11.50	11.27
	802.11n40-HT0	38	5190	MCS0	11.50	11.49
		46	5230		11.50	11.47
	802.11ac40-VHT0	38	5190	MCS0	11.50	11.14
		46	5230		11.50	11.18
	802.11ax40-HE0	38	5190	MCS0	11.50	11.13
		46	5230		11.50	11.17
	802.11ac80-VHT0	42	5210	MCS0	11.50	11.37
	802.11ax80-HE0	42	5210	MCS0	11.50	11.14

Main						
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	12.00	11.61
		56	5280		12.00	11.60
		60	5300		12.00	11.75
		64	5320		12.00	11.78
	802.11n20-HT0	52	5260	MCS0	12.00	11.63
		56	5280		12.00	11.78
		60	5300		12.00	11.60
		64	5320		12.00	11.68
	802.11ac20-VHT0	52	5260	MCS0	12.00	11.72
		56	5280		12.00	11.65
		60	5300		12.00	11.71
		64	5320		12.00	11.62
	802.11ax20-HE0	52	5260	MCS0	12.00	11.70
		56	5280		12.00	11.78
		60	5300		12.00	11.60
		64	5320		12.00	11.61
	802.11n40-HT0	54	5270	MCS0	12.00	11.69
		62	5310		12.00	11.63
	802.11ax40-HE0	54	5270	MCS0	12.00	11.60
		62	5310		12.00	11.62
	802.11ac80-VHT0	58	5290	MCS0	12.00	11.78
	802.11ax80-HE0	58	5290	MCS0	12.00	11.64

Main						
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
5.6GHz	802.11a	100	5500	6Mbps	9.00	8.75
		120	5600		9.00	8.71
		140	5700		9.00	8.73
		144	5720		9.00	8.66
	802.11n20-HT0	100	5500	MCS0	9.00	8.73
		120	5600		9.00	8.71
		140	5700		9.00	8.79
		144	5720		9.00	8.80
	802.11ac20-VHT0	100	5500	MCS0	9.00	8.75
		120	5600		9.00	8.75
		140	5700		9.00	8.68
		144	5720		9.00	8.68
	802.11ax20-HE0	100	5500	MCS0	9.00	8.79
		120	5600		9.00	8.65
		140	5700		9.00	8.66
		144	5720		9.00	8.80
	802.11n40-HT0	102	5510	MCS0	9.00	8.65
		118	5590		9.00	8.65
		134	5670		9.00	8.70
		142	5710		9.00	8.61
	802.11ac40-VHT0	102	5510	MCS0	9.00	8.67
		118	5590		9.00	8.65
		134	5670		9.00	8.68
		142	5710		9.00	8.61
	802.11ax40-HE0	102	5510	MCS0	9.00	8.61
		118	5590		9.00	8.79
		134	5670		9.00	8.76
		142	5710		9.00	8.72
	802.11ac80-VHT0	106	5530	MCS0	9.00	8.74
		122	5610		9.00	8.66
		138	5690		9.00	8.96
	802.11ax80-HE0	106	5530	MCS0	9.00	8.70
		122	5610		9.00	8.68
		138	5690		9.00	8.69

Main						
Mode	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
5.8GHz	802.11a	149	5745	6Mbps	8.00	7.79
		157	5785		8.00	7.76
		165	5825		8.00	7.66
	802.11n20-HT0	149	5745	MCS0	8.00	7.67
		157	5785		8.00	7.64
		165	5825		8.00	7.61
	802.11ac20-VHT0	149	5745	MCS0	8.00	7.67
		157	5785		8.00	7.73
		165	5825		8.00	7.79
	802.11ax20-HE0	149	5745	MCS0	8.00	7.80
		157	5785		8.00	7.61
		165	5825		8.00	7.61
	802.11n40-HT0	151	5755	MCS0	8.00	7.98
		159	5795		8.00	7.93
	802.11ac40-VHT0	151	5755	MCS0	8.00	7.67
		159	5795		8.00	7.70
	802.11ax40-HE0	151	5755	MCS0	8.00	7.70
		159	5795		8.00	7.68
	802.11ac80-VHT0	155	5775	MCS0	8.00	7.71
	802.11ax80-HE0	155	5775	MCS0	8.00	7.67

Aux						
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
2.45GHz	802.11b	1	2412	1Mbps	16.50	16.33
		6	2437		16.50	16.23
		11	2462		16.50	16.28
	802.11g	1	2412	6Mbps	16.50	15.88
		6	2437		16.50	15.98
		11	2462		16.50	15.91
	802.11n20-HT0	1	2412	MCS0	16.50	16.00
		6	2437		16.50	15.84
		11	2462		16.50	15.94
	802.11ac20-VHT0	1	2412	MCS0	16.50	16.00
		6	2437		16.50	15.99
		11	2462		16.50	15.90
	802.11ax20-HE0	1	2412	MCS0	16.50	15.86
		6	2437		16.50	15.85
		11	2462		16.50	15.94
	802.11n40-HT0	3	2422	MCS0	15.00	14.35
		6	2437		16.00	15.35
		9	2452		15.00	14.50
	802.11ac40-VHT0	3	2422	MCS0	15.00	14.38
		6	2437		16.00	15.51
		9	2452		15.00	14.36
	802.11ax40-HE0	3	2422	MCS0	15.00	14.49
		6	2437		16.00	15.51
		9	2452		15.00	14.36

Aux						
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	14.00	13.51
		40	5200		14.00	13.41
		44	5220		14.00	13.46
		48	5240		14.00	13.44
	802.11n20-HT0	36	5180	MCS0	14.00	13.40
		40	5200		14.00	13.35
		44	5220		14.00	13.49
		48	5240		14.00	13.38
	802.11ac20-VHT0	36	5180	MCS0	14.00	13.39
		40	5200		14.00	13.50
		44	5220		14.00	13.43
		48	5240		14.00	13.42
	802.11ax20-HE0	36	5180	MCS0	14.00	13.44
		40	5200		14.00	13.41
		44	5220		14.00	13.47
		48	5240		14.00	13.41
	802.11n40-HT0	38	5190	MCS0	14.00	13.50
		46	5230		14.00	13.40
	802.11ac40-VHT0	38	5190	MCS0	14.00	13.40
		46	5230		14.00	13.36
	802.11ax40-HE0	38	5190	MCS0	14.00	13.50
		46	5230		14.00	13.45
	802.11ac80-VHT0	42	5210	MCS0	14.00	13.95
	802.11ax80-HE0	42	5210	MCS0	14.00	13.34

Aux						
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	14.00	13.45
		56	5280		14.00	13.43
		60	5300		14.00	13.34
		64	5320		14.00	13.43
	802.11n20-HT0	52	5260	MCS0	14.00	13.47
		56	5280		14.00	13.33
		60	5300		14.00	13.34
		64	5320		14.00	13.34
	802.11ac20-VHT0	52	5260	MCS0	14.00	13.41
		56	5280		14.00	13.44
		60	5300		14.00	13.49
		64	5320		14.00	13.34
	802.11ax20-HE0	52	5260	MCS0	14.00	13.51
		56	5280		14.00	13.42
		60	5300		14.00	13.33
		64	5320		14.00	13.37
	802.11n40-HT0	54	5270	MCS0	14.00	13.39
		62	5310		14.00	13.33
	802.11ax40-HE0	54	5270	MCS0	14.00	13.41
		62	5310		14.00	13.47
	802.11ac80-VHT0	58	5290	MCS0	14.00	13.78
	802.11ax80-HE0	58	5290	MCS0	14.00	13.42

Aux						
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
5.6GHz	802.11a	100	5500	6Mbps	15.00	14.38
		120	5600		15.00	14.40
		140	5700		15.00	14.38
		144	5720		15.00	14.34
	802.11n20-HT0	100	5500	MCS0	15.00	14.46
		120	5600		15.00	14.47
		140	5700		15.00	14.38
		144	5720		15.00	14.45
	802.11ac20-VHT0	100	5500	MCS0	15.00	14.38
		120	5600		15.00	14.39
		140	5700		15.00	14.40
		144	5720		15.00	14.37
	802.11ax20-HE0	100	5500	MCS0	15.00	14.45
		120	5600		15.00	14.48
		140	5700		15.00	14.41
		144	5720		15.00	14.42
	802.11n40-HT0	102	5510	MCS0	15.00	14.52
		118	5590		15.00	14.48
		134	5670		15.00	14.36
		142	5710		15.00	14.50
	802.11ac40-VHT0	102	5510	MCS0	15.00	14.46
		118	5590		15.00	14.35
		134	5670		15.00	14.35
		142	5710		15.00	14.46
	802.11ax40-HE0	102	5510	MCS0	15.00	14.49
		118	5590		15.00	14.42
		134	5670		15.00	14.39
		142	5710		15.00	14.41
	802.11ac80-VHT0	106	5530	MCS0	14.50	14.42
		122	5610		15.00	14.87
		138	5690		15.00	14.96
	802.11ax80-HE0	106	5530	MCS0	14.50	14.25
		122	5610		15.00	14.76
		138	5690		15.00	14.81

Aux						
Mode	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
5.8GHz	802.11a	149	5745	6Mbps	15.50	14.93
		157	5785		15.50	14.98
		165	5825		15.50	14.95
	802.11n20-HT0	149	5745	MCS0	15.50	14.84
		157	5785		15.50	14.96
		165	5825		15.50	14.95
	802.11ac20-VHT0	149	5745	MCS0	15.50	14.99
		157	5785		15.50	14.97
		165	5825		15.50	14.99
	802.11ax20-HE0	149	5745	MCS0	15.50	14.84
		157	5785		15.50	14.92
		165	5825		15.50	15.01
	802.11n40-HT0	151	5755	MCS0	15.50	15.45
		159	5795		15.50	15.42
	802.11ac40-VHT0	151	5755	MCS0	15.50	15.02
		159	5795		15.50	14.87
	802.11ax40-HE0	151	5755	MCS0	15.50	14.83
		159	5795		15.50	14.88
	802.11ac80-VHT0	155	5775	MCS0	15.50	15.46
	802.11ax80-HE0	155	5775	MCS0	15.50	14.83

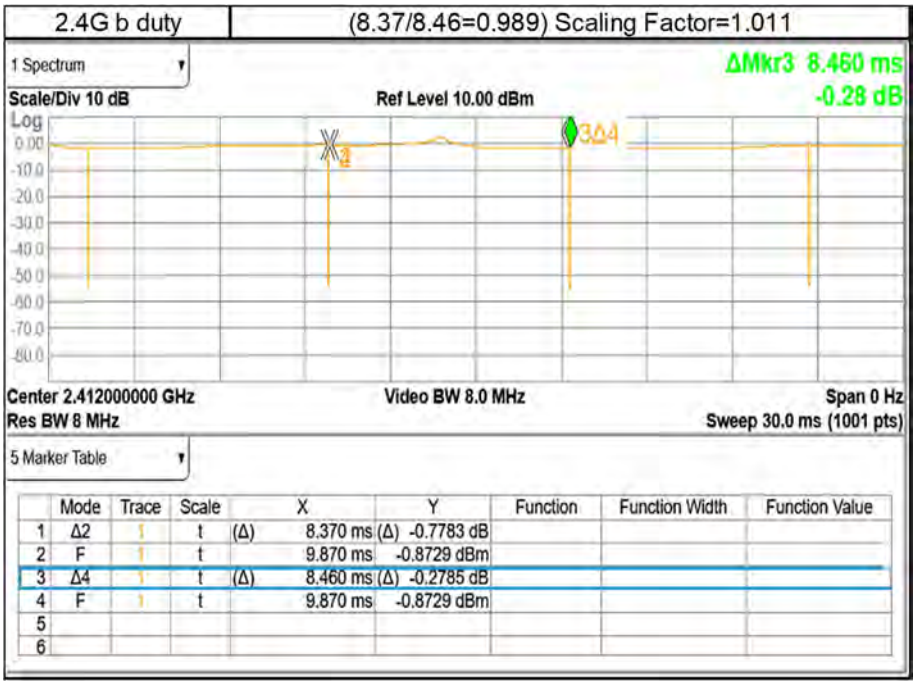
Bluetooth conducted power table:

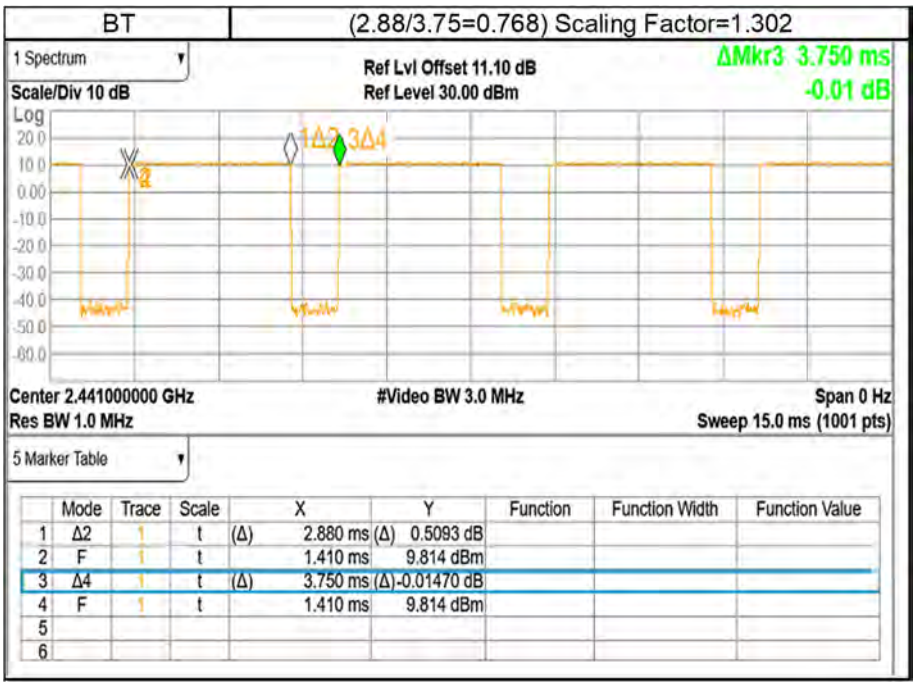
Mode	Channel	Frequency (MHz)	1Mbps		2Mbps		3Mbps	
			Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
BR/EDR	CH 00	2402	11.50	10.74	8.50	8.12	8.50	8.14
	CH 39	2441		10.67		7.93		7.92
	CH 78	2480		10.47		7.88		7.87

Mode	Channel	Frequency (MHz)	GFSK	
			Max. Rated Avg.Power + Max. Tolerance (dBm)	Average Output Power (dBm)
BLE_1M	CH 00	2402	11.5	11.46
	CH 19	2440		11.37
	CH 39	2480		11.18

Mode	Channel	Frequency (MHz)	GFSK	
			Max. Rated Avg.Power + Max. Tolerance (dBm)	Average Output Power (dBm)
BLE_2M	CH 00	2402	11.5	11.43
	CH 19	2440		11.27
	CH 39	2480		11.09

Duty Cycle:

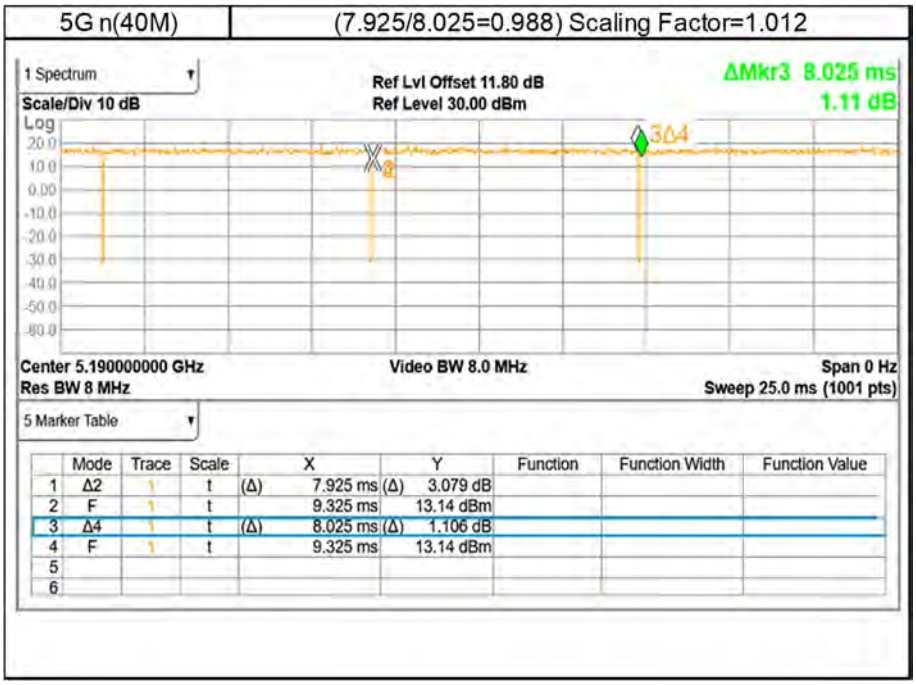




5G ac(80M)	(7.9/8.025=0.984) Scaling Factor=1.016

	Mode	Trace	Scale	X	Y	Function	Function Width	Function Value
1	Δ2	1	t	(Δ) 7.900 ms	(Δ) -0.8584 dB			
2	F	1	t	11.00 ms	13.37 dBm			
3	Δ4	1	t	(Δ) 8.025 ms	(Δ) 0.3204 dB			
4	F	1	t	11.00 ms	13.37 dBm			
5								
6								

5G n(40M)	(7.925/8.025=0.988) Scaling Factor=1.012



	Mode	Trace	Scale	X	Y	Function	Function Width	Function Value
1	Δ2	1	t	(Δ) 7.925 ms	(Δ) 3.079 dB			
2	F	1	t	9.325 ms	13.14 dBm			
3	Δ4	1	t	(Δ) 8.025 ms	(Δ) 1.106 dB			
4	F	1	t	9.325 ms	13.14 dBm			
5								
6								

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.

Laptop mode

SAR is measured with display screen open at 90 degree and bottom side/front edge of keyboard touch against the flat phantom.

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.

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. 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.
8. 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.

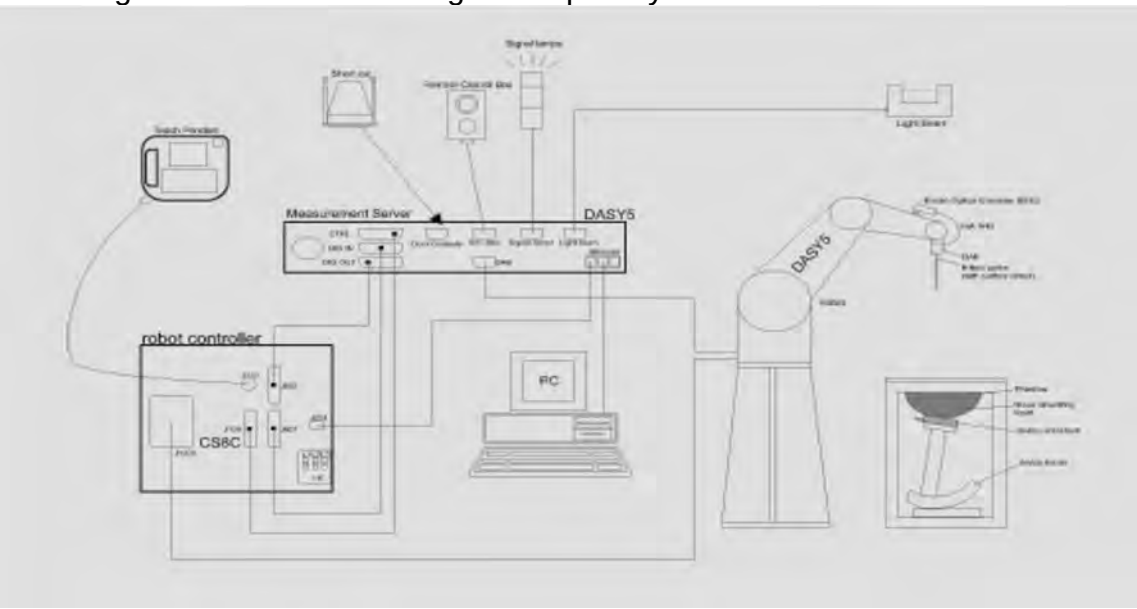


Fig. a The block diagram of SAR system

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.

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 2450/5250/5600/5750 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%.

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

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 2450/5250/5600/5750 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 above 15 cm in all the cases. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values.

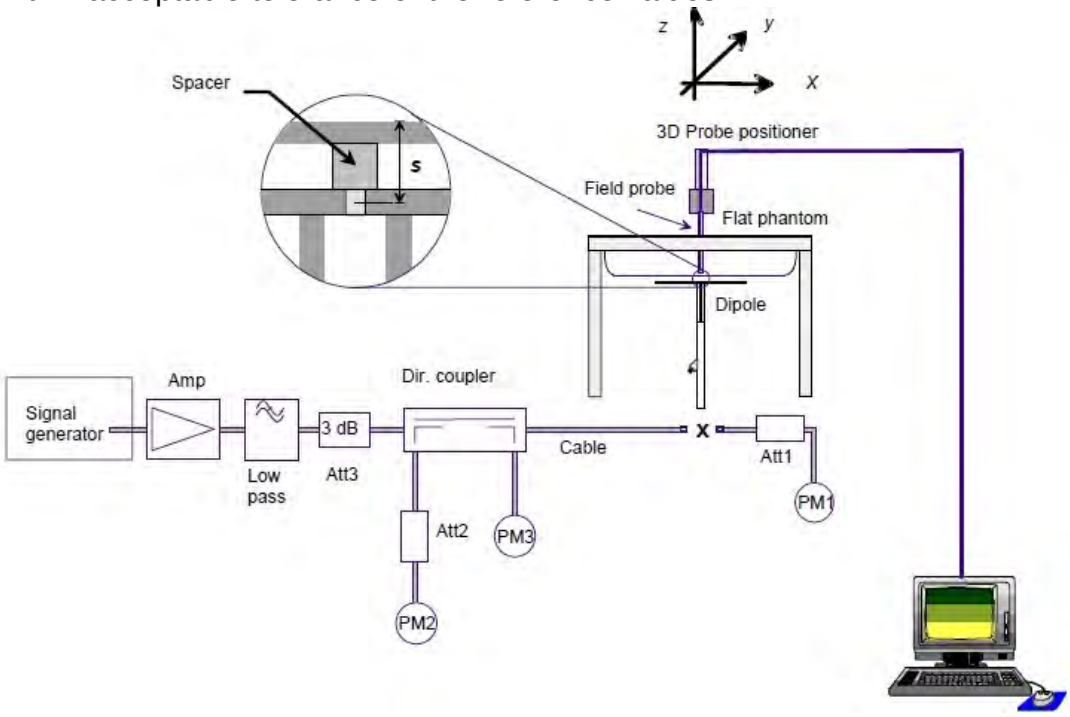


Fig. b The block diagram of system verification

Validation Kit	S/N	Frequency (MHz)	1W Target 1g-SAR (W/kg)	pin=250mW Measured 1g-SAR (W/kg)	Normalized to 1W 1g-SAR (W/kg)	Deviation (%)	Limit	Measurement Date
D2450V2	727	2450	52.8	12.9	51.6	-2.27	± 10%	Jun.22,2022

Validation Kit	S/N	Frequency (MHz)	1W Target 1g-SAR (W/kg)	pin=100mW Measured 1g-SAR (W/kg)	Normalized to 1W 1g-SAR (W/kg)	Deviation (%)	Limit	Measurement Date
D5GHzV2	1023	5250	81	8.15	81.5	0.62	± 10%	Jun.23,2022
D5GHzV2	1023	5600	84.4	8.18	81.8	-3.08	± 10%	Jun.24,2022
D5GHzV2	1023	5750	81	8.11	81.1	0.12	± 10%	Jun.24,2022

Table 1. Results of system validation

1.9 Tissue Simulant Fluid for the Frequency Band

The dielectric properties for this Head-simulant fluid were measured by using the SPEAG Dielectric Assessment Kit (DAKS-3.5)
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 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	Jun. 22, 2022	2402	39.285	1.757	38.945	1.751	-0.87%	-0.36%
		2412	39.268	1.766	38.927	1.759	-0.87%	-0.38%
		2437	39.223	1.788	38.883	1.781	-0.87%	-0.43%
		2442	39.214	1.793	38.874	1.785	-0.87%	-0.44%
		2450	39.200	1.800	38.859	1.792	-0.87%	-0.45%
		2462	39.185	1.813	38.844	1.802	-0.87%	-0.59%
		2480	39.162	1.827	38.821	1.818	-0.87%	-0.46%
	Jun. 23, 2022	5190	35.997	4.645	35.657	4.597	-0.95%	-1.02%
		5210	35.974	4.665	35.634	4.618	-0.95%	-1.02%
		5250	35.929	4.706	35.588	4.658	-0.95%	-1.02%
		5270	35.906	4.727	35.565	4.679	-0.95%	-1.02%
		5290	35.883	4.747	35.542	4.699	-0.95%	-1.02%
		5310	35.860	4.768	35.519	4.719	-0.95%	-1.01%
	Jun. 24, 2022	5600	35.529	5.065	35.188	5.015	-0.96%	-0.99%
		5690	35.426	5.157	35.085	5.106	-0.96%	-1.00%
		5750	35.357	5.218	35.017	5.167	-0.96%	-0.97%
		5755	35.351	5.224	35.011	5.172	-0.96%	-1.00%
		5775	35.329	5.244	34.988	5.192	-0.96%	-1.00%

Table 2. Dielectric Parameters of Tissue Simulant Fluid

The composition of the brain tissue simulating liquid is:

Simulating Liquids for 600 MHz -10 GHz, Manufactured by SPEAG:

Broad-band head tissue simulating liquids	SPEAG Product	Frequency range (MHz)	Main Ingredients
	HBBL600-10000V6	600 - 10000	Water, Oil

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

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:

- 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

High-Tek

Main

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Duty cycle scaling	Power scaling	Averaged SAR over 1g (W/kg)		ID
									Measured	Reported	
WLAN 802.11b	Bottom Surface	0	1	2412	16.50	16.41	1.011	102.09%	0.611	0.631	-
WLAN 802.11b	Bottom Surface	0	6	2437	16.50	16.47	1.011	100.69%	0.622	0.633	001
WLAN 802.11b	Bottom Surface	0	11	2462	16.50	16.12	1.011	109.14%	0.525	0.579	-
WLAN 802.11b	Front Edge	0	6	2437	16.50	16.47	1.011	100.69%	0.464	0.472	-

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Duty cycle scaling	Power scaling	Averaged SAR over 1g (W/kg)		ID
									Measured	Reported	
WLAN 802.11n(40M) 5.2G	Front Edge	0	38	5190	11.50	11.49	1.012	100.23%	0.869	0.881	-
WLAN 802.11n(40M) 5.2G	Front Edge*	0	38	5190	11.50	11.49	1.012	100.23%	0.831	0.843	
WLAN 802.11n(40M) 5.2G	Front Edge	0	46	5230	11.50	11.47	1.012	100.69%	0.823	0.839	-
WLAN 802.11ac(80M) 5.2G	Bottom Surface	0	42	5210	11.50	11.37	1.016	103.04%	0.213	0.223	-
WLAN 802.11ac(80M) 5.2G	Front Edge	0	42	5210	11.50	11.37	1.016	103.04%	0.926	0.969	002
WLAN 802.11ac(80M) 5.2G	Front Edge*	0	42	5210	11.50	11.37	1.012	103.04%	0.911	0.950	-

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Duty cycle scaling	Power scaling	Averaged SAR over 1g (W/kg)		ID
									Measured	Reported	
WLAN 802.11n(40M) 5.3G	Front Edge	0	54	5270	12.00	11.69	1.012	107.40%	0.772	0.839	-
WLAN 802.11n(40M) 5.3G	Front Edge	0	62	5310	12.00	11.63	1.012	108.89%	0.736	0.811	-
WLAN 802.11ac(80M) 5.3G	Bottom Surface	0	58	5290	12.00	11.78	1.016	105.20%	0.235	0.251	-
WLAN 802.11ac(80M) 5.3G	Front Edge	0	58	5290	12.00	11.78	1.016	105.20%	0.998	1.067	003
WLAN 802.11ac(80M) 5.3G	Front Edge*	0	58	5290	12.00	11.78	1.016	105.20%	0.941	1.006	

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Duty cycle scaling	Power scaling	Averaged SAR over 1g (W/kg)		ID
									Measured	Reported	
WLAN 802.11ac(80M) 5.6G	Bottom Surface	0	138	5690	9.00	8.96	1.016	100.93%	0.211	0.216	-
WLAN 802.11ac(80M) 5.6G	Front Edge	0	106	5530	9.00	8.74	1.016	106.17%	0.945	1.019	-
WLAN 802.11ac(80M) 5.6G	Front Edge	0	122	5610	9.00	8.66	1.016	108.14%	0.917	1.008	-
WLAN 802.11ac(80M) 5.6G	Front Edge	0	138	5690	9.00	8.96	1.016	100.93%	1.010	1.036	004
WLAN 802.11ac(80M) 5.6G	Front Edge*	0	138	5690	9.00	8.96	1.016	100.93%	0.988	1.013	-

Mode	Position	Distance (mm)		Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Duty cycle scaling	Power scaling	Averaged SAR over 1g (W/kg)		ID
									Measured	Reported	
WLAN 802.11n(40M) 5.8G	Front Edge	0	151	5755	8.00	7.98	1.012	100.46%	0.941	0.957	-
WLAN 802.11n(40M) 5.8G	Front Edge*	0	151	5755	8.00	7.98	1.012	100.46%	0.926	0.941	
WLAN 802.11n(40M) 5.8G	Front Edge	0	159	5795	8.00	7.93	1.012	101.62%	0.903	0.929	-
WLAN 802.11ac(80M) 5.8G	Bottom Surface	0	155	5775	8.00	7.71	1.016	106.91%	0.208	0.226	-
WLAN 802.11ac(80M) 5.8G	Front Edge	0	155	5775	8.00	7.71	1.016	106.91%	0.966	1.049	005
WLAN 802.11ac(80M) 5.8G	Front Edge*	0	155	5775	8.00	7.71	1.016	106.91%	0.938	1.019	-

Aux

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Duty cycle scaling	Power scaling	Averaged SAR over 1g (W/kg)		ID
									Measured	Reported	
WLAN 802.11b	Bottom Surface	0	1	2412	16.50	16.33	1.011	103.99%	0.231	0.243	-
WLAN 802.11b	Front Edge	0	6	2437	16.50	16.23	1.011	106.41%	0.611	0.657	-
WLAN 802.11b	Front Edge	0	11	2462	16.50	16.28	1.011	105.20%	0.624	0.664	-
WLAN 802.11b	Front Edge	0	1	2412	16.50	16.33	1.011	103.99%	0.689	0.724	006

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Duty cycle scaling	Power scaling	Averaged SAR over 1g (W/kg)		ID
									Measured	Reported	
Bluetooth(GFSK)	Bottom Surface	0	0	2402	11.50	10.74	1.302	119.12%	0.014	0.022	-
Bluetooth(GFSK)	Front Edge	0	0	2402	11.50	10.74	1.302	119.12%	0.074	0.115	007

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Duty cycle scaling	Power scaling	Averaged SAR over 1g (W/kg)		ID
									Measured	Reported	
WLAN 802.11ac(80M) 5.2G	Bottom Surface	0	42	5210	14.00	13.95	1.016	101.16%	0.177	0.182	-
WLAN 802.11ac(80M) 5.2G	Front Edge	0	42	5210	14.00	13.95	1.016	101.16%	0.718	0.738	008

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Duty cycle scaling	Power scaling	Averaged SAR over 1g (W/kg)		ID
									Measured	Reported	
WLAN 802.11ac(80M) 5.3G	Bottom Surface	0	58	5290	14.00	13.78	1.016	105.20%	0.171	0.183	-
WLAN 802.11ac(80M) 5.3G	Front Edge	0	58	5290	14.00	13.78	1.016	105.20%	0.562	0.601	009

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Duty cycle scaling	Power scaling	Averaged SAR over 1g (W/kg)		ID
									Measured	Reported	
WLAN 802.11ac(80M) 5.6G	Bottom Surface	0	138	5690	15.00	14.96	1.016	100.93%	0.206	0.211	-
WLAN 802.11ac(80M) 5.6G	Front Edge	0	138	5690	15.00	14.96	1.016	100.93%	0.740	0.759	010

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Duty cycle scaling	Power scaling	Averaged SAR over 1g (W/kg)		ID
									Measured	Reported	
WLAN 802.11ac(80M) 5.8G	Bottom Surface	0	155	5775	15.50	15.46	1.016	100.93%	0.212	0.217	-
WLAN 802.11ac(80M) 5.8G	Front Edge	0	155	5775	15.50	15.46	1.016	100.93%	0.590	0.605	011

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

Pulse

Main

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Duty cycle scaling	Power scaling	Averaged SAR over 1g (W/kg)		ID
									Measured	Reported	
WLAN 802.11b	Bottom Surface	0	6	2437	16.50	16.47	1.011	100.69%	0.325	0.331	-
WLAN 802.11b	Front Edge	0	6	2437	16.50	16.47	1.011	100.69%	0.440	0.448	012

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Duty cycle scaling	Power scaling	Averaged SAR over 1g (W/kg)		ID
									Measured	Reported	
WLAN 802.11n(40M) 5.2G	Front Edge	0	38	5190	11.50	11.49	1.012	100.23%	0.928	0.941	-
WLAN 802.11n(40M) 5.2G	Front Edge*	0	38	5190	11.50	11.49	1.012	100.23%	0.889	0.902	
WLAN 802.11n(40M) 5.2G	Front Edge	0	46	5230	11.50	11.47	1.012	100.69%	0.903	0.920	-
WLAN 802.11ac(80M) 5.2G	Bottom Surface	0	42	5210	11.50	11.37	1.016	103.04%	0.316	0.331	-
WLAN 802.11ac(80M) 5.2G	Front Edge	0	42	5210	11.50	11.37	1.016	103.04%	1.030	1.078	013
WLAN 802.11ac(80M) 5.2G	Front Edge*	0	42	5210	11.50	11.37	1.016	103.04%	0.965	1.010	-

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Duty cycle scaling	Power scaling	Averaged SAR over 1g (W/kg)		ID
									Measured	Reported	
WLAN 802.11n(40M) 5.3G	Front Edge	0	54	5270	12.00	11.69	1.012	107.40%	0.907	0.986	-
WLAN 802.11n(40M) 5.3G	Front Edge*	0	54	5270	12.00	11.69	1.012	107.40%	0.879	0.955	
WLAN 802.11n(40M) 5.3G	Front Edge	0	62	5310	12.00	11.63	1.012	108.89%	0.845	0.931	-
WLAN 802.11ac(80M) 5.3G	Bottom Surface	0	58	5290	12.00	11.78	1.016	105.20%	0.289	0.309	-
WLAN 802.11ac(80M) 5.3G	Front Edge	0	58	5290	12.00	11.78	1.016	105.20%	1.050	1.122	014
WLAN 802.11ac(80M) 5.3G	Front Edge*	0	58	5290	12.00	11.78	1.016	105.20%	0.981	1.048	

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Duty cycle scaling	Power scaling	Averaged SAR over 1g (W/kg)		ID
									Measured	Reported	
WLAN 802.11ac(80M) 5.6G	Bottom Surface	0	138	5690	9.00	8.96	1.016	100.93%	0.150	0.154	-
WLAN 802.11ac(80M) 5.6G	Front Edge	0	106	5530	9.00	8.74	1.016	106.17%	0.699	0.754	-
WLAN 802.11ac(80M) 5.6G	Front Edge	0	122	5610	9.00	8.66	1.016	108.14%	0.873	0.959	-
WLAN 802.11ac(80M) 5.6G	Front Edge	0	138	5690	9.00	8.96	1.016	100.93%	0.981	1.006	015
WLAN 802.11ac(80M) 5.6G	Front Edge*	0	138	5690	9.00	8.96	1.016	100.93%	0.977	1.002	-

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Duty cycle scaling	Power scaling	Averaged SAR over 1g (W/kg)		ID
									Measured	Reported	
WLAN 802.11n(40M) 5.8G	Front Edge	0	151	5755	8.00	7.98	1.012	100.46%	0.697	0.709	-
WLAN 802.11ac(80M) 5.8G	Bottom Surface	0	155	5775	8.00	7.71	1.016	106.91%	0.117	0.127	-
WLAN 802.11ac(80M) 5.8G	Front Edge	0	155	5775	8.00	7.71	1.016	106.91%	0.967	1.050	016
WLAN 802.11ac(80M) 5.8G	Front Edge*	0	155	5775	8.00	7.71	1.016	106.91%	0.914	0.993	

Aux

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Duty cycle scaling	Power scaling	Averaged SAR over 1g (W/kg)		ID
									Measured	Reported	
WLAN 802.11b	Bottom Surface	0	1	2412	16.50	16.33	1.011	103.99%	0.156	0.164	-
WLAN 802.11b	Front Edge	0	1	2412	16.50	16.33	1.011	103.99%	0.668	0.702	017
WLAN 802.11b	Front Edge	0	6	2437	16.50	16.23	1.011	106.41%	0.615	0.662	-
WLAN 802.11b	Front Edge	0	11	2462	16.50	16.28	1.011	105.20%	0.633	0.673	-

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Duty cycle scaling	Power scaling	Averaged SAR over 1g (W/kg)		ID
									Measured	Reported	
Bluetooth(GFSK)	Bottom Surface	0	0	2402	11.50	10.74	1.302	119.12%	0.028	0.043	-
Bluetooth(GFSK)	Front Edge	0	0	2402	11.50	10.74	1.302	119.12%	0.077	0.119	018

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Duty cycle scaling	Power scaling	Averaged SAR over 1g (W/kg)		ID
									Measured	Reported	
WLAN 802.11ac(80M) 5.2G	Bottom Surface	0	42	5210	14.00	13.95	1.016	101.16%	0.157	0.161	-
WLAN 802.11ac(80M) 5.2G	Front Edge	0	42	5210	14.00	13.95	1.016	101.16%	0.623	0.640	019

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Duty cycle scaling	Power scaling	Averaged SAR over 1g (W/kg)		ID
									Measured	Reported	
WLAN 802.11ac(80M) 5.3G	Bottom Surface	0	58	5290	14.00	13.78	1.016	105.20%	0.100	0.107	-
WLAN 802.11ac(80M) 5.3G	Front Edge	0	58	5290	14.00	13.78	1.016	105.20%	0.276	0.295	020

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Duty cycle scaling	Power scaling	Averaged SAR over 1g (W/kg)		ID
									Measured	Reported	
WLAN 802.11ac(80M) 5.6G	Bottom Surface	0	138	5690	15.00	14.96	1.016	100.93%	0.191	0.196	-
WLAN 802.11ac(80M) 5.6G	Front Edge	0	138	5690	15.00	14.96	1.016	100.93%	0.607	0.622	021

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Duty cycle scaling	Power scaling	Averaged SAR over 1g (W/kg)		ID
									Measured	Reported	
WLAN 802.11n(40M) 5.8G	Front Edge	0	151	5755	15.50	15.45	1.012	101.16%	1.070	1.095	022
WLAN 802.11n(40M) 5.8G	Front Edge*	0	151	5755	15.50	15.45	1.012	101.16%	0.978	1.001	-
WLAN 802.11n(40M) 5.8G	Front Edge	0	159	5795	15.50	15.42	1.012	101.86%	1.020	1.051	-
WLAN 802.11ac(80M) 5.8G	Bottom Surface	0	155	5775	15.50	15.46	1.016	100.93%	0.248	0.254	-
WLAN 802.11ac(80M) 5.8G	Front Edge	0	155	5775	15.50	15.46	1.02	100.93%	0.989	1.014	-
WLAN 802.11ac(80M) 5.8G	Front Edge*	0	155	5775	15.50	15.46	1.02	100.93%	0.951	0.975	-

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

Note:

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

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.

3. Simultaneous Transmission Analysis

Simultaneous Transmission Scenarios:

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

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.

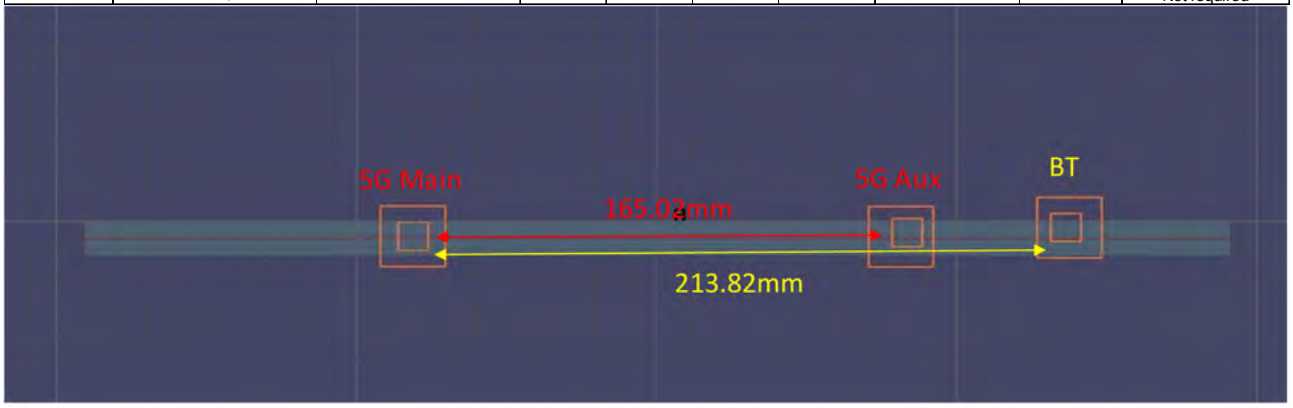
SAR1 and SAR2 are the highest reported or estimated SAR for each antenna in the pair, and Ri is the separation distance between the peak SAR locations for the antenna pair in mm.

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.

High-tek

Exposure Position		Reported SAR 1	2	3	4	5	Scenario1 1+2	Scenario2 1+5	Scenario3 1+2+5	Scenario4 3+4	Scenario5 3+5	Scenario6 3+4+5
		2.4GHz WLAN Main	2.4GHz WLAN Aux	5GHz WLAN Main	5GHz WLAN Aux	Bluetooth Aux	Summed	Summed	Summed	Summed	Summed	Summed
		1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)
Bottom Surface	0	0.633	0.243	0.251	0.217	0.022	**0.876**	**0.655**	**0.898**	**0.468**	**0.273**	**0.490**
Front Edge	0	0.472	0.724	1.067	0.759	0.115	**1.196**	**0.587**	**1.311**	1.826	**1.182**	1.941

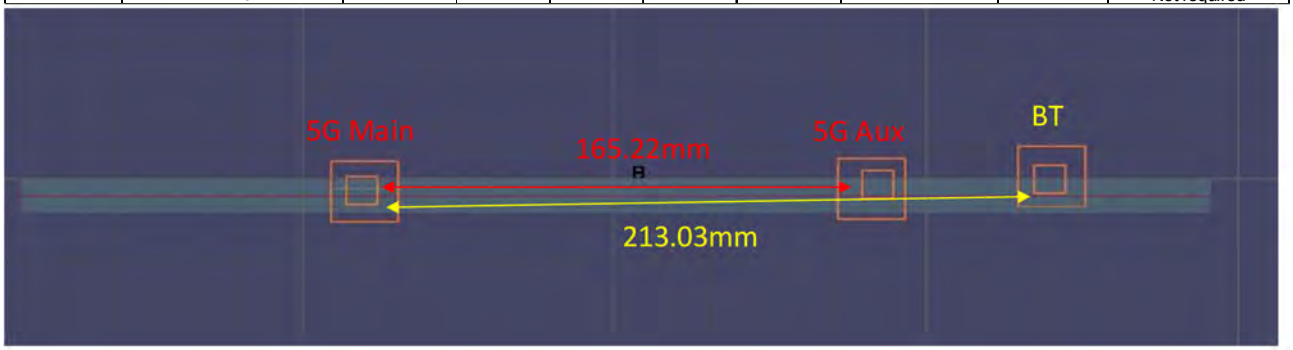
Scenario:3+4+5									
Position	Conditions	SAR Value (W/kg)	Coordinates (mm)			ΣSAR (W/kg)	Peak Location Separation Distance (mm)	SPLSR	Simultaneous Transmission SAR Test
			x	y	z				
Front Edge	WLAN 5G Main	1.067	-5.20	80.80	-177.00	-	-	-	-
	WLAN5G Aux + BT Aux	0.874	-2.80	-84.20	-177.00	1.941	165.02	0.016	SPLSR ≤ 0.04, Not required



Pulse

Exposure Position		Reported SAR					Scenario1	Scenario2	Scenario3	Scenario4	Scenario5	Scenario6
		1	2	3	4	5	1+2	1+5	1+2+5	3+4	3+5	3+4+5
		2.4GHz WLAN Main	2.4GHz WLAN Aux	5GHz WLAN Main	5GHz WLAN Aux	Bluetooth Aux	Summed	Summed	Summed	Summed	Summed	Summed
		1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)
Bottom Surface	0	0.331	0.164	0.331	0.254	0.043	**0.495**	**0.374**	**0.538**	**0.585**	**0.374**	**0.628**
Front Edge	0	0.448	0.702	1.122	1.095	0.119	**1.150**	**0.567**	**1.269**	2.217	**1.241**	2.336

Scenario:3+4+5									
Position	Conditions	SAR Value (W/kg)	Coordinates (mm)			ΣSAR (W/kg)	Peak Location Separation Distance (mm)	SPLSR	Simultaneous Transmission SAR Test
			x	y	z				
Front Edge	WLAN 5G Main	1.122	-3.60	80.00	-177.00	-	-	-	-
	WLAN5G Aux + BT Aux	1.214	-0.80	-85.20	-177.00	2.336	165.22	0.022	SPLSR ≤ 0.04, Not required



4. Instruments List

SAR Test Site: SAR_4					
Manufacturer	**Device**	**Type**	**Serial number**	**Date of last calibration**	**Date of next calibration**
SPEAG	Dosimetric E-Field Probe	EX3DV4	7712	Mar/21/2022	Mar/20/2023
SPEAG	System Validation Dipole	D2450V2	727	Apr/25/2022	Apr/24/2023
SPEAG	System Validation Dipole	D5GHzV2	1023	Jan/27/2022	Jan/26/2023
SPEAG	Data acquisition Electronics	DAE4	1719	Mar/25/2022	Mar/24/2023
SPEAG	Software	DASY 8 V16.0.2.83	N/A	Calibration not required	Calibration not required
SPEAG	Phantom	ELI	N/A	Calibration not required	Calibration not required
SPEAG	Dielectric Assessment Kit	DAKS-3.5	1053	Feb/28/2022	Feb/27/2023
Agilent	Dual-directional coupler	778D	MY48220468	Aug/16/2021	Aug/15/2022
Agilent	Dual-directional coupler	772D	MY46151242	Aug/16/2021	Aug/15/2022
Agilent	MXG Analog Signal Generator	N5181A	MY50145142	Dec/23/2021	Dec/22/2022
EMCI	Amplifier	ZHL-42	980189	Calibration not required	Calibration not required
EMCI	Amplifier	ZVE-8G	980190	Calibration not required	Calibration not required
Anritsu	Power Meter	ML2496A	1337004	Oct/08/2021	Oct/07/2022
Anritsu	Power Sensor	MA2411B	1306052	Oct/08/2021	Oct/07/2022
R&S	Power Sensor	NRP18S	101973	Jan/22/2022	Jan/21/2023
LKM	Digital thermometer	DTM3000	EC14010603	Nov/09/2021	Nov/08/2022
TECPEL	Digital thermometer	DTM-303A	TP130077	Oct/28/2021	Oct/27/2022

5. Measurements

ID: 001
Report No. : TESA2204000040EN
Measurement Report for ASUS B5402(NB), WLAN 802.11b_Body_ Bottom Surface_CH 6_0mm_Main
Ambient temperature: 22.5°C; Liquid temperature: 22°C

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	Bottom Surface, 0.00	2437.0, 6	8.16	1.781	38.883

Hardware Setup

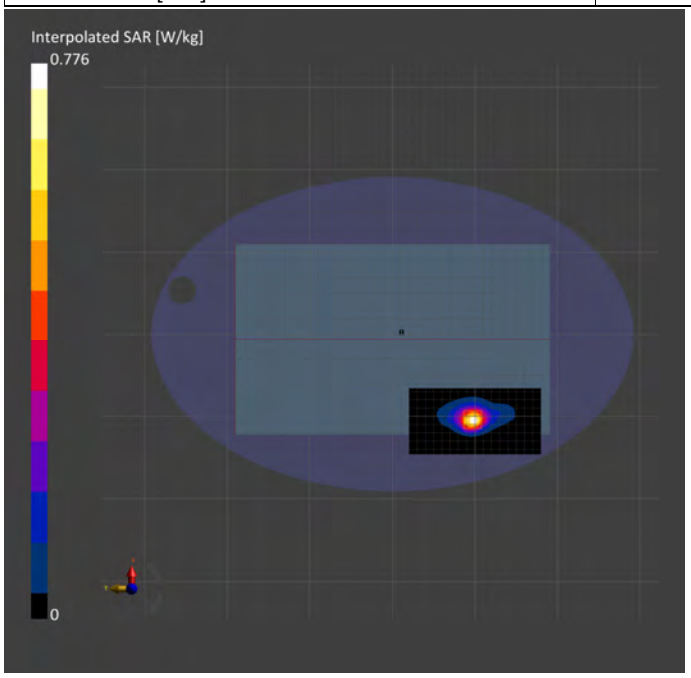
Phantom	Probe, Calibration Date	DAE, Calibration Date
ELI	EX3DV4 - SN7712, 2022-03-21	DAE4 Sn1719, 2022-03-25

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	84.0 x 156.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	12.0 x 12.0	5.0 x 5.0 x 5.0
Sensor Surface [mm]	3.0	1.4

Measurement Results

	Area Scan	Zoom Scan
Date	2022-06-22	2022-06-22
psSAR1g [W/kg]	0.576	0.622
psSAR8g [W/kg]	0.295	0.306
psSAR10g [W/kg]	0.267	0.277
Power Drift [dB]	0.02	0.01
M2/M1 [%]		54.1
Dist 3dB Peak [mm]		8.5



ID: 002
Report No. : TESA2204000040EN
Measurement Report for ASUS B5402(NB), WLAN 802.11ac(80M) 5.2G_Body_Front Edge_CH 42_0mm_Main
Ambient temperature: 22.2°C; Liquid temperature: 21.8°C

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	Front Edge, 0.00	5210.0, 42	5.94	4.618	35.634

Hardware Setup

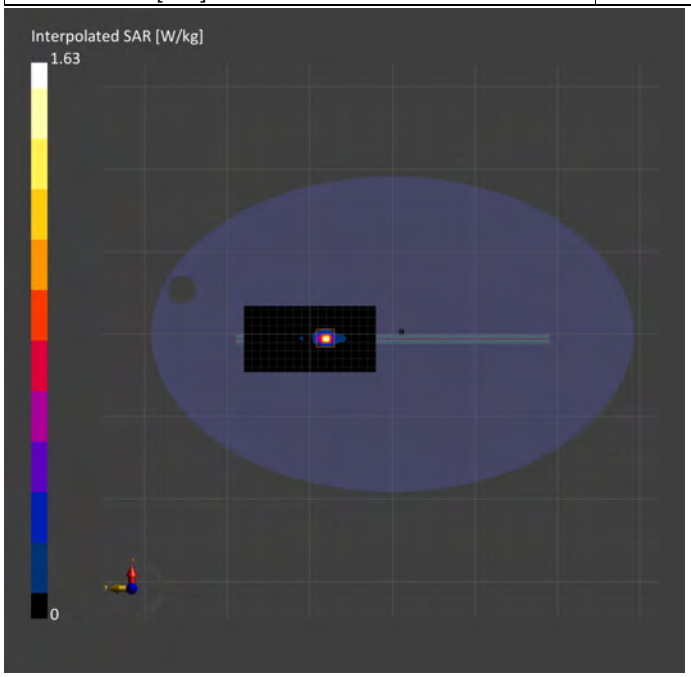
Phantom	Probe, Calibration Date	DAE, Calibration Date
ELI	EX3DV4 - SN7712, 2022-03-21	DAE4 Sn1719, 2022-03-25

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 160.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4

Measurement Results

	Area Scan	Zoom Scan
Date	2022-06-23	2022-06-23
psSAR1g [W/kg]	0.858	0.926
psSAR8g [W/kg]	0.234	0.247
psSAR10g [W/kg]	0.197	0.205
Power Drift [dB]	-0.04	0.03
M2/M1 [%]		58.6
Dist 3dB Peak [mm]		5.8



ID: 003
Report No. : TESA2204000040EN
Measurement Report for ASUS B5402(NB), WLAN 802.11ac(80M) 5.3G_Body_Front Edge_CH 58_0mm_Main
Ambient temperature: 22.2°C; Liquid temperature: 21.8°C

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	Front Edge, 0.00	5290.0, 58	5.94	4.699	35.542

Hardware Setup

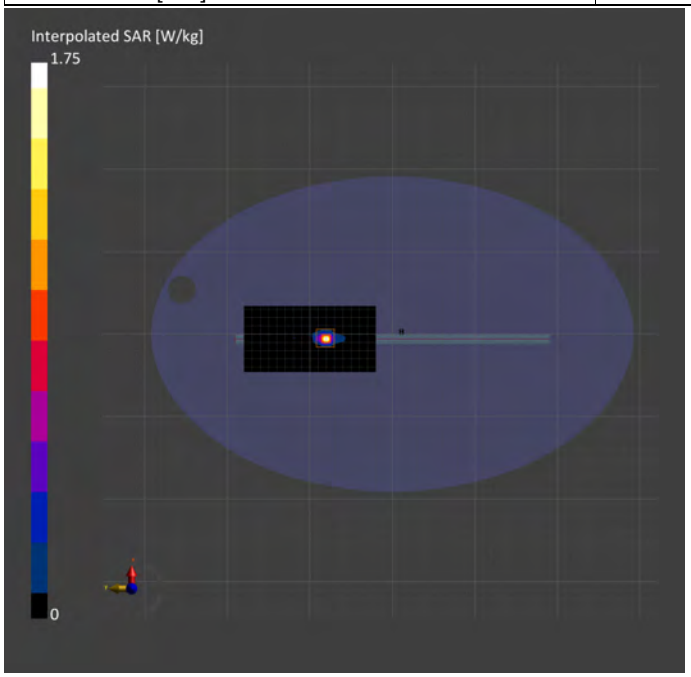
Phantom	Probe, Calibration Date	DAE, Calibration Date
ELI	EX3DV4 - SN7712, 2022-03-21	DAE4 Sn1719, 2022-03-25

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 160.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4

Measurement Results

	Area Scan	Zoom Scan
Date	2022-06-23	2022-06-23
psSAR1g [W/kg]	0.912	0.998
psSAR8g [W/kg]	0.245	0.265
psSAR10g [W/kg]	0.206	0.221
Power Drift [dB]	-0.04	0.02
M2/M1 [%]		57.7
Dist 3dB Peak [mm]		10.7



ID: 004
Report No. : TESA2204000040EN
Measurement Report for ASUS B5402(NB), WLAN 802.11ac(80M) 5.6G_Body_Front Edge_CH 138_0mm_Main
Ambient temperature: 22.1°C; Liquid temperature: 21.7°C

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	Front Edge, 0.00	5690.0, 138	5.45	5.106	35.085

Hardware Setup

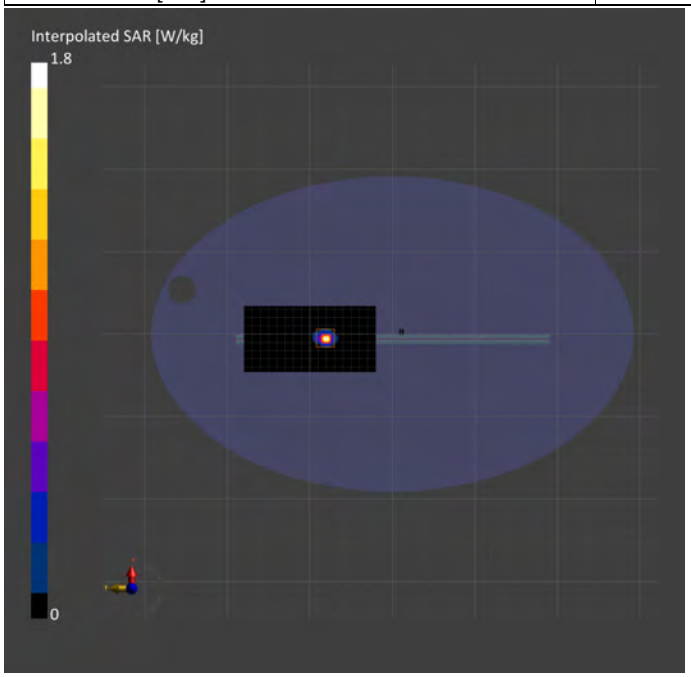
Phantom	Probe, Calibration Date	DAE, Calibration Date
ELI	EX3DV4 - SN7712, 2022-03-21	DAE4 Sn1719, 2022-03-25

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 160.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4

Measurement Results

	Area Scan	Zoom Scan
Date	2022-06-24	2022-06-24
psSAR1g [W/kg]	0.942	1.01
psSAR8g [W/kg]	0.246	0.258
psSAR10g [W/kg]	0.206	0.214
Power Drift [dB]	-0.02	0.05
M2/M1 [%]		55.7
Dist 3dB Peak [mm]		9.8



ID: 005
Report No. : TESA2204000040EN
Measurement Report for ASUS B5402(NB), WLAN 802.11ac(80M) 5.8G_Body_Front Edge_CH 155_0mm_Main
Ambient temperature: 22.1°C; Liquid temperature: 21.7°C

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	Front Edge, 0.00	5775.0, 155	5.45	5.192	34.988

Hardware Setup

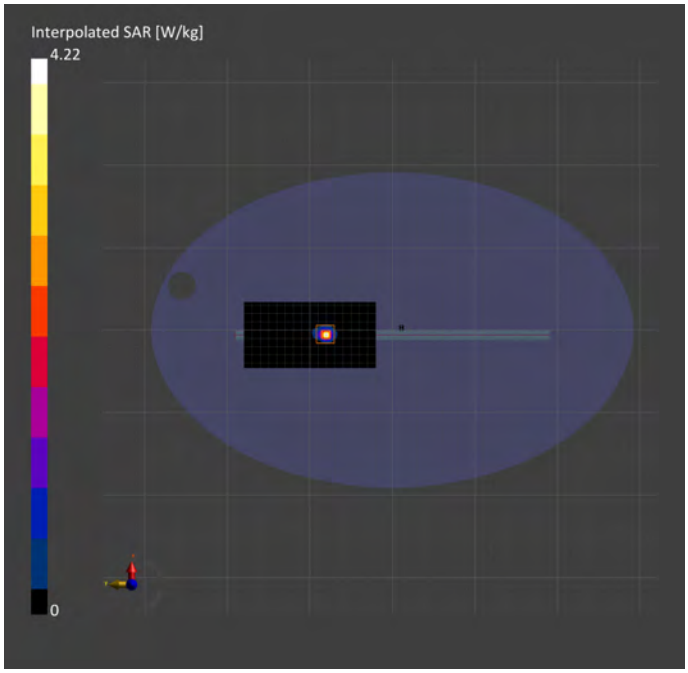
Phantom	Probe, Calibration Date	DAE, Calibration Date
ELI	EX3DV4 - SN7712, 2022-03-21	DAE4 Sn1719, 2022-03-25

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 160.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4

Measurement Results

	Area Scan	Zoom Scan
Date	2022-06-24	2022-06-24
psSAR1g [W/kg]	0.898	0.966
psSAR8g [W/kg]	0.232	0.247
psSAR10g [W/kg]	0.195	0.205
Power Drift [dB]	-0.02	0.03
M2/M1 [%]		55.3
Dist 3dB Peak [mm]		8.1



ID: 006
Report No. : TESA2204000040EN
Measurement Report for ASUS B5402(NB), WLAN 802.11b_Body_Front Edge_CH 1_0mm_Aux
Ambient temperature: 22.5°C; Liquid temperature: 22°C

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	Front Edge, 0.00	2412.0, 1	8.16	1.759	38.927

Hardware Setup

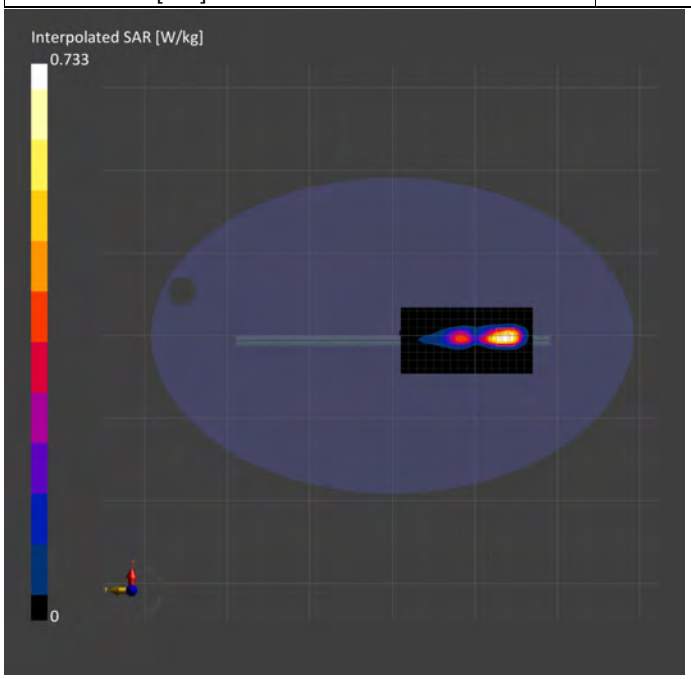
Phantom	Probe, Calibration Date	DAE, Calibration Date
ELI	EX3DV4 - SN7712, 2022-03-21	DAE4 Sn1719, 2022-03-25

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 160.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	12.0 x 12.0	5.0 x 5.0 x 5.0
Sensor Surface [mm]	3.0	1.4

Measurement Results

	Area Scan	Zoom Scan
Date	2022-06-22	2022-06-22
psSAR1g [W/kg]	0.576	0.689
psSAR8g [W/kg]	0.299	0.330
psSAR10g [W/kg]	0.269	0.297
Power Drift [dB]	-0.03	-0.05
M2/M1 [%]		54.1
Dist 3dB Peak [mm]		6.0



ID: 007
Report No. : TESA2204000040EN
Measurement Report for ASUS B5402(NB), Bluetooth(GFSK)_Body_Front Edge_CH 0_0mm_Aux
Ambient temperature: 22.5°C; Liquid temperature: 22°C

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	Front Edge, 0.00	2402.0, 0	8.16	1.751	38.945

Hardware Setup

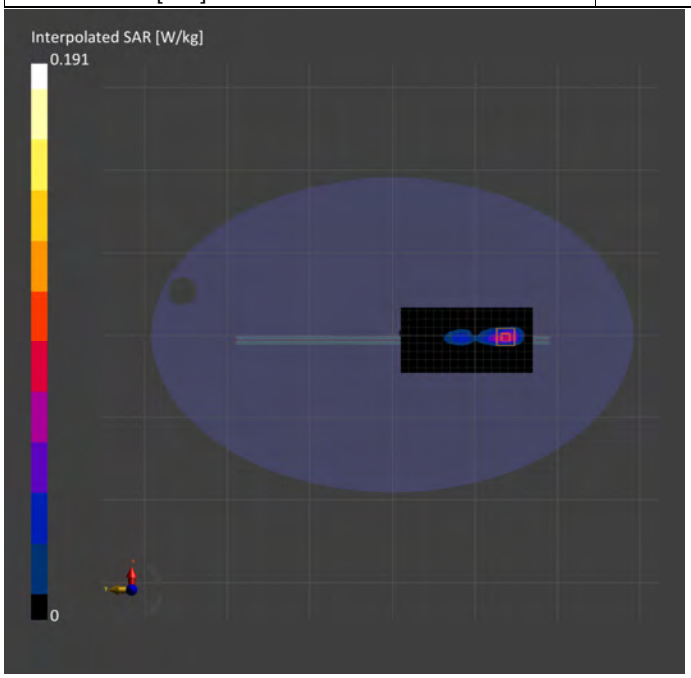
Phantom	Probe, Calibration Date	DAE, Calibration Date
ELI	EX3DV4 - SN7712, 2022-03-21	DAE4 Sn1719, 2022-03-25

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 160.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	12.0 x 12.0	5.0 x 5.0 x 5.0
Sensor Surface [mm]	3.0	1.4

Measurement Results

	Area Scan	Zoom Scan
Date	2022-06-22	2022-06-22
psSAR1g [W/kg]	0.063	0.074
psSAR8g [W/kg]	0.033	0.035
psSAR10g [W/kg]	0.029	0.031
Power Drift [dB]	-0.05	0.04
M2/M1 [%]		53.7
Dist 3dB Peak [mm]		5.0



ID: 008
Report No. : TESA2204000040EN
Measurement Report for ASUS B5402(NB), WLAN 802.11ac(80M) 5.2G_Body_Front Edge_CH 42_0mm_Aux
Ambient temperature: 22.2°C; Liquid temperature: 21.8°C

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	Front Edge, 0.00	5210.0, 42	5.94	4.618	35.634

Hardware Setup

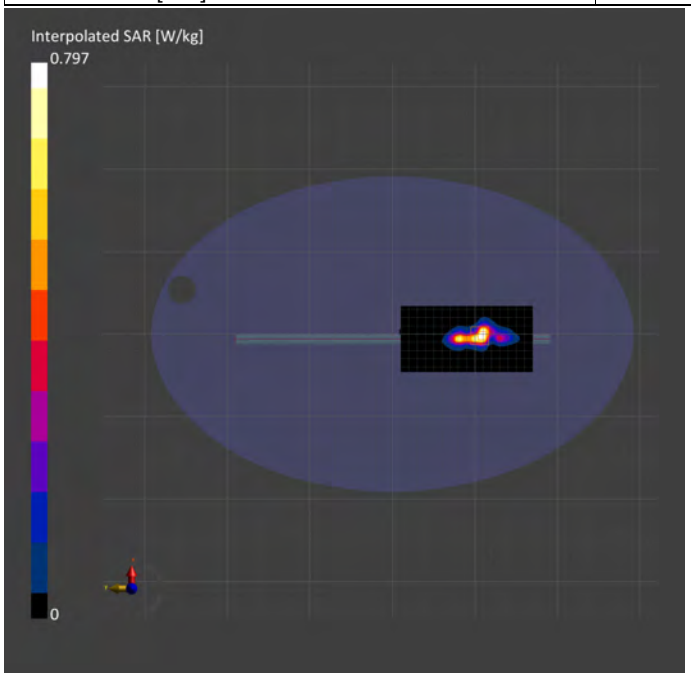
Phantom	Probe, Calibration Date	DAE, Calibration Date
ELI	EX3DV4 - SN7712, 2022-03-21	DAE4 Sn1719, 2022-03-25

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 160.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4

Measurement Results

	Area Scan	Zoom Scan
Date	2022-06-23	2022-06-23
psSAR1g [W/kg]	0.570	0.718
psSAR8g [W/kg]	0.219	0.159
psSAR10g [W/kg]	0.192	0.135
Power Drift [dB]	0.02	0.03
M2/M1 [%]		56.0
Dist 3dB Peak [mm]		7.0



ID: 009
Report No. : TESA2204000040EN
Measurement Report for ASUS B5402(NB), WLAN 802.11ac(80M) 5.3G_Body_Front Edge_CH 58_0mm_Aux
Ambient temperature: 22.2°C; Liquid temperature: 21.8°C

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	Front Edge, 0.00	5290.0, 58	5.94	4.699	35.542

Hardware Setup

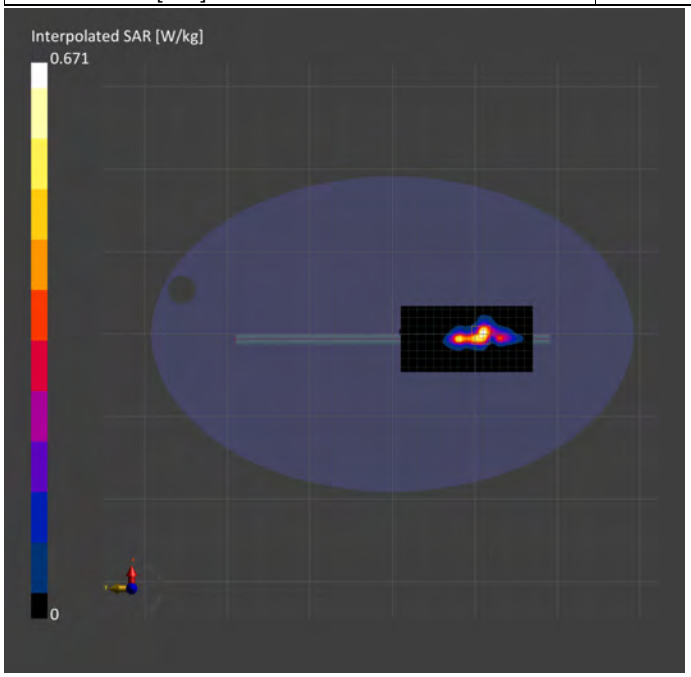
Phantom	Probe, Calibration Date	DAE, Calibration Date
ELI	EX3DV4 - SN7712, 2022-03-21	DAE4 Sn1719, 2022-03-25

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 160.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4

Measurement Results

	Area Scan	Zoom Scan
Date	2022-06-23	2022-06-23
psSAR1g [W/kg]	0.448	0.562
psSAR8g [W/kg]	0.173	0.126
psSAR10g [W/kg]	0.152	0.106
Power Drift [dB]	-0.01	0.02
M2/M1 [%]		55.7
Dist 3dB Peak [mm]		7.6



ID: 010
Report No. : TESA2204000040EN
Measurement Report for ASUS B5402(NB), WLAN 802.11ac(80M) 5.6G_Body_Front Edge_CH 138_0mm_Aux
Ambient temperature: 22.1°C; Liquid temperature: 21.7°C

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	Front Edge, 0.00	5690.0, 138	5.45	5.106	35.085

Hardware Setup

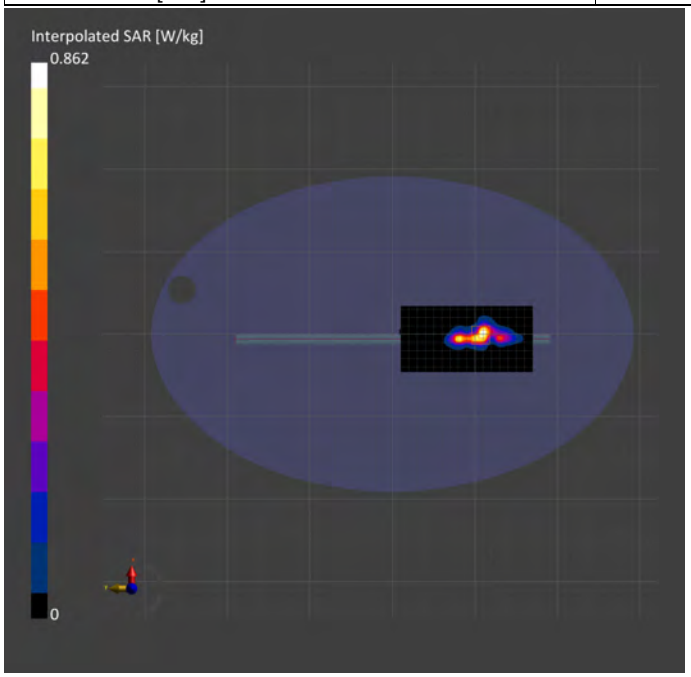
Phantom	Probe, Calibration Date	DAE, Calibration Date
ELI	EX3DV4 - SN7712, 2022-03-21	DAE4 Sn1719, 2022-03-25

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 160.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4

Measurement Results

	Area Scan	Zoom Scan
Date	2022-06-24	2022-06-24
psSAR1g [W/kg]	0.582	0.740
psSAR8g [W/kg]	0.220	0.164
psSAR10g [W/kg]	0.193	0.138
Power Drift [dB]	-0.01	0.03
M2/M1 [%]		56.1
Dist 3dB Peak [mm]		7.5



ID: 011
Report No. : TESA2204000040EN
Measurement Report for ASUS B5402(NB), WLAN 802.11ac(80M) 5.8G_Body_Front Edge_CH 155_0mm_Aux
Ambient temperature: 22.1°C; Liquid temperature: 21.7°C

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	Front Edge, 0.00	5775.0, 155	5.45	5.192	34.988

Hardware Setup

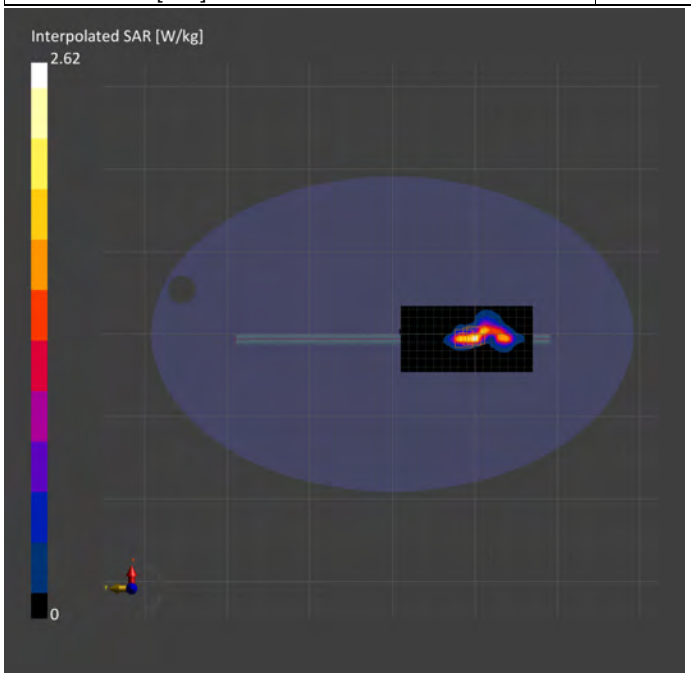
Phantom	Probe, Calibration Date	DAE, Calibration Date
ELI	EX3DV4 - SN7712, 2022-03-21	DAE4 Sn1719, 2022-03-25

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 160.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4

Measurement Results

	Area Scan	Zoom Scan
Date	2022-06-24	2022-06-24
psSAR1g [W/kg]	0.529	0.590
psSAR8g [W/kg]	0.187	0.176
psSAR10g [W/kg]	0.166	0.151
Power Drift [dB]	0.02	0.03
M2/M1 [%]		51.9
Dist 3dB Peak [mm]		5.3



ID: 012
Report No. : TESA2204000040EN
Measurement Report for ASUS B5402(NB), WLAN 802.11b_Body_Front Edge_CH 6_0mm_Main
Ambient temperature: 22.5°C; Liquid temperature: 22°C

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	Front Edge, 0.00	2437.0, 6	8.16	1.781	38.883

Hardware Setup

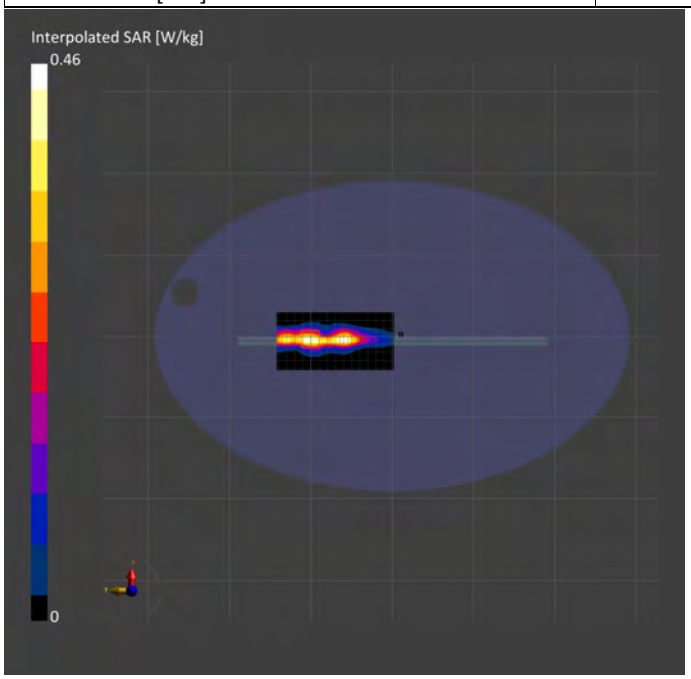
Phantom	Probe, Calibration Date	DAE, Calibration Date
ELI	EX3DV4 - SN7712, 2022-03-21	DAE4 Sn1719, 2022-03-25

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	72.0 x 144.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	12.0 x 12.0	5.0 x 5.0 x 5.0
Sensor Surface [mm]	3.0	1.4

Measurement Results

	Area Scan	Zoom Scan
Date	2022-06-22	2022-06-22
psSAR1g [W/kg]	0.353	0.440
psSAR8g [W/kg]	0.183	0.203
psSAR10g [W/kg]	0.167	0.182
Power Drift [dB]	0.02	0.04
M2/M1 [%]		59.4
Dist 3dB Peak [mm]		7.0



ID: 013
Report No. : TESA2204000040EN
Measurement Report for ASUS B5402(NB), WLAN 802.11ac(80M) 5.2G_Body_Front Edge_CH 42_0mm_Main
Ambient temperature: 22.2°C; Liquid temperature: 21.8°C

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	Front Edge, 0.00	5210.0, 42	5.94	4.618	35.634

Hardware Setup

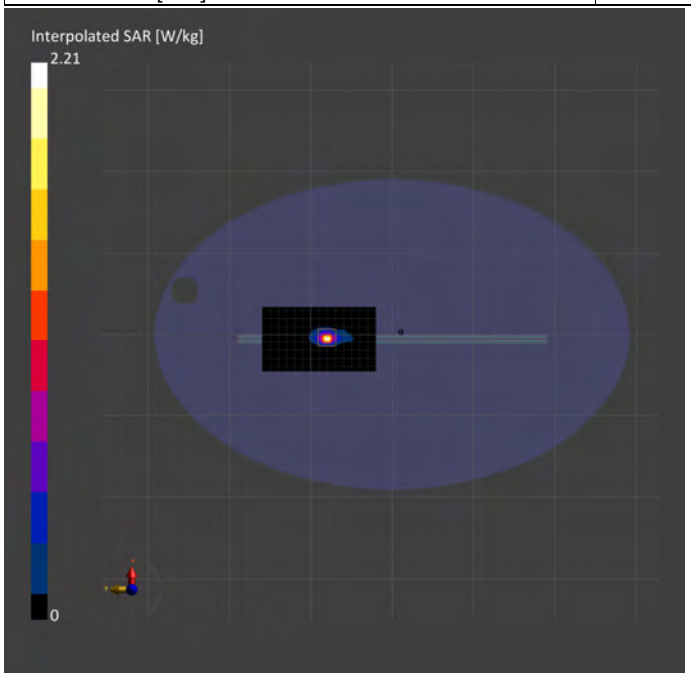
Phantom	Probe, Calibration Date	DAE, Calibration Date
ELI	EX3DV4 - SN7712, 2022-03-21	DAE4 Sn1719, 2022-03-25

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 140.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4

Measurement Results

	Area Scan	Zoom Scan
Date	2022-06-23	2022-06-23
psSAR1g [W/kg]	0.893	1.03
psSAR8g [W/kg]	0.267	0.298
psSAR10g [W/kg]	0.228	0.252
Power Drift [dB]	-0.02	-0.04
M2/M1 [%]		54.0
Dist 3dB Peak [mm]		11.5



ID: 014
Report No. : TESA2204000040EN
Measurement Report for ASUS B5402(NB), WLAN 802.11ac(80M) 5.3G_Body_Front Edge_CH 58_0mm_Main
Ambient temperature: 22.2°C; Liquid temperature: 21.8°C

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	Front Edge, 0.00	5290.0, 58	5.94	4.699	35.542

Hardware Setup

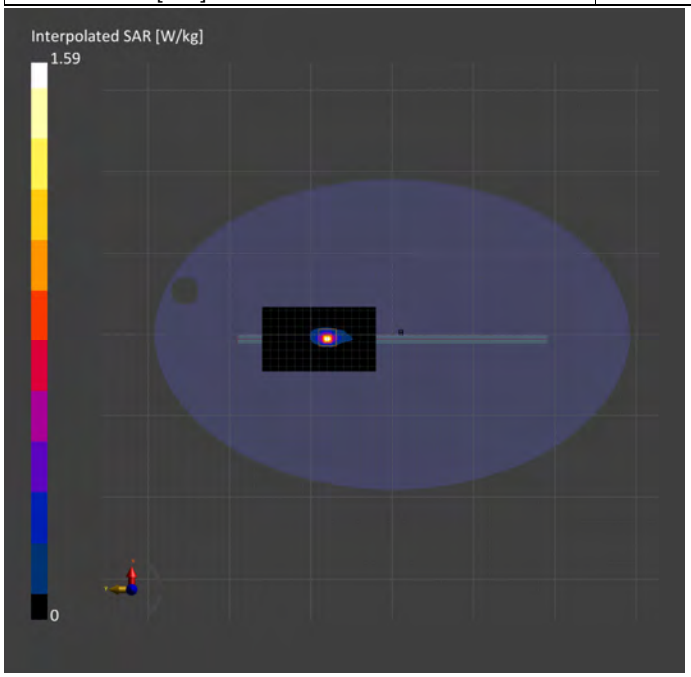
Phantom	Probe, Calibration Date	DAE, Calibration Date
ELI	EX3DV4 - SN7712, 2022-03-21	DAE4 Sn1719, 2022-03-25

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 140.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4

Measurement Results

	Area Scan	Zoom Scan
Date	2022-06-23	2022-06-23
psSAR1g [W/kg]	0.876	1.05
psSAR8g [W/kg]	0.261	0.304
psSAR10g [W/kg]	0.222	0.256
Power Drift [dB]	-0.03	-0.04
M2/M1 [%]		54.1
Dist 3dB Peak [mm]		11.4



ID: 015
Report No. : TESA2204000040EN
Measurement Report for ASUS B5402(NB), WLAN 802.11ac(80M) 5.6G_Body_Front Edge_CH 138_0mm_Main
Ambient temperature: 22.1°C; Liquid temperature: 21.7°C

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	Front Edge, 0.00	5690.0, 138	5.45	5.106	35.085

Hardware Setup

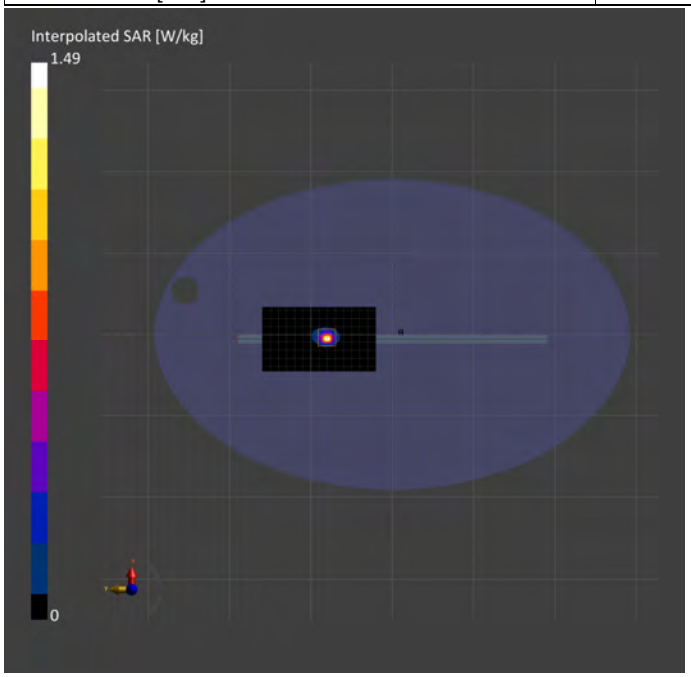
Phantom	Probe, Calibration Date	DAE, Calibration Date
ELI	EX3DV4 - SN7712, 2022-03-21	DAE4 Sn1719, 2022-03-25

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 140.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4

Measurement Results

	Area Scan	Zoom Scan
Date	2022-06-24	2022-06-24
psSAR1g [W/kg]	0.827	0.981
psSAR8g [W/kg]	0.235	0.271
psSAR10g [W/kg]	0.199	0.226
Power Drift [dB]	0.03	0.01
M2/M1 [%]		51.5
Dist 3dB Peak [mm]		9.1



ID: 016
Report No. : TESA2204000040EN
Measurement Report for ASUS B5402(NB), WLAN 802.11ac(80M) 5.8G_Body_Front Edge_CH 155_0mm_Main
Ambient temperature: 22.1°C; Liquid temperature: 21.7°C

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	Front Edge, 0.00	5775.0, 155	5.45	5.192	34.988

Hardware Setup

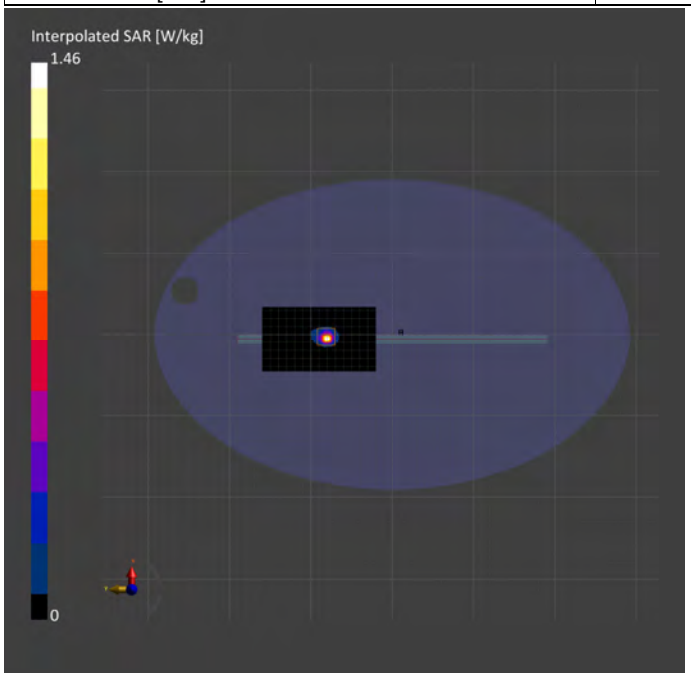
Phantom	Probe, Calibration Date	DAE, Calibration Date
ELI	EX3DV4 - SN7712, 2022-03-21	DAE4 Sn1719, 2022-03-25

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 140.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4

Measurement Results

	Area Scan	Zoom Scan
Date	2022-06-24	2022-06-24
psSAR1g [W/kg]	0.818	0.967
psSAR8g [W/kg]	0.233	0.266
psSAR10g [W/kg]	0.198	0.222
Power Drift [dB]	0.04	0.01
M2/M1 [%]		50.9
Dist 3dB Peak [mm]		8.4



ID: 017
Report No. : TESA2204000040EN
Measurement Report for ASUS B5402(NB), WLAN 802.11b_Body_Front Edge_CH 1_0mm_Aux
Ambient temperature: 22.5°C; Liquid temperature: 22°C

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	Front Edge, 0.00	2412.0, 1	8.16	1.759	38.927

Hardware Setup

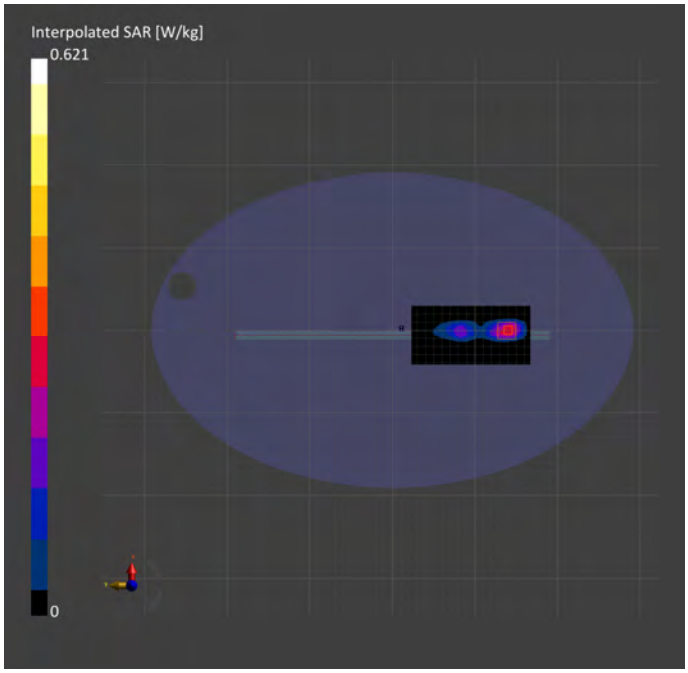
Phantom	Probe, Calibration Date	DAE, Calibration Date
ELI	EX3DV4 - SN7712, 2022-03-21	DAE4 Sn1719, 2022-03-25

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	72.0 x 144.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	12.0 x 12.0	5.0 x 5.0 x 5.0
Sensor Surface [mm]	3.0	1.4

Measurement Results

	Area Scan	Zoom Scan
Date	2022-06-22	2022-06-22
psSAR1g [W/kg]	0.502	0.668
psSAR8g [W/kg]	0.268	0.320
psSAR10g [W/kg]	0.242	0.287
Power Drift [dB]	-0.01	-0.06
M2/M1 [%]		66.2
Dist 3dB Peak [mm]		7.0



ID: 018
Report No. : TESA2204000040EN
Measurement Report for ASUS B5402(NB), Bluetooth(GFSK)_Body_Front Edge_CH 0_0mm_Aux
Ambient temperature: 22.5°C; Liquid temperature: 22°C

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	Front Edge, 0.00	2402.0, 0	8.16	1.751	38.945

Hardware Setup

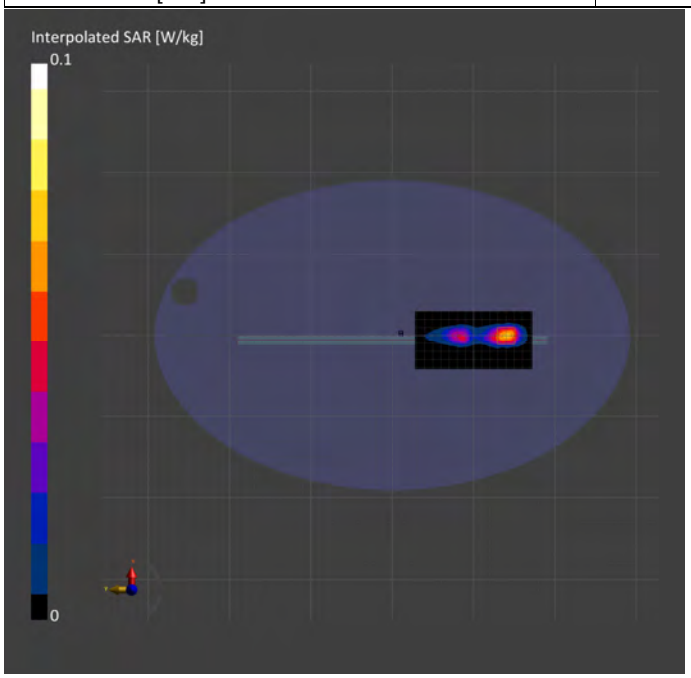
Phantom	Probe, Calibration Date	DAE, Calibration Date
ELI	EX3DV4 - SN7712, 2022-03-21	DAE4 Sn1719, 2022-03-25

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	72.0 x 144.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	12.0 x 12.0	5.0 x 5.0 x 5.0
Sensor Surface [mm]	3.0	1.4

Measurement Results

	Area Scan	Zoom Scan
Date	2022-06-22	2022-06-22
psSAR1g [W/kg]	0.057	0.077
psSAR8g [W/kg]	0.031	0.037
psSAR10g [W/kg]	0.028	0.034
Power Drift [dB]	-0.06	0.01
M2/M1 [%]		69.1
Dist 3dB Peak [mm]		5.1



ID: 019
Report No. : TESA2204000040EN
Measurement Report for ASUS B5402(NB), WLAN 802.11ac(80M) 5.2G_Body_Front Edge_CH 42_0mm_Aux
Ambient temperature: 22.2°C; Liquid temperature: 21.8°C

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	Front Edge, 0.00	5210.0, 42	5.94	4.618	35.634

Hardware Setup

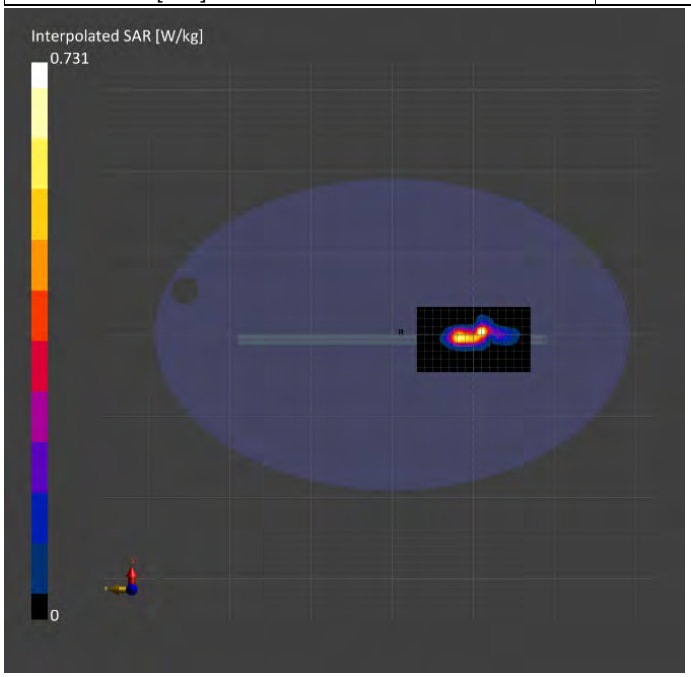
Phantom	Probe, Calibration Date	DAE, Calibration Date
ELI	EX3DV4 - SN7712, 2022-03-21	DAE4 Sn1719, 2022-03-25

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 140.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4

Measurement Results

	Area Scan	Zoom Scan
Date	2022-06-23	2022-06-23
psSAR1g [W/kg]	0.451	0.623
psSAR8g [W/kg]	0.182	0.207
psSAR10g [W/kg]	0.161	0.178
Power Drift [dB]	0.04	-0.01
M2/M1 [%]		55.9
Dist 3dB Peak [mm]		7.2



ID: 020
Report No. : TESA2204000040EN
Measurement Report for ASUS B5402(NB), WLAN 802.11ac(80M) 5.3G_Body_Front Edge_CH 58_0mm_Aux
Ambient temperature: 22.2°C; Liquid temperature: 21.8°C

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	Front Edge, 0.00	5290.0, 58	5.94	4.699	35.542

Hardware Setup

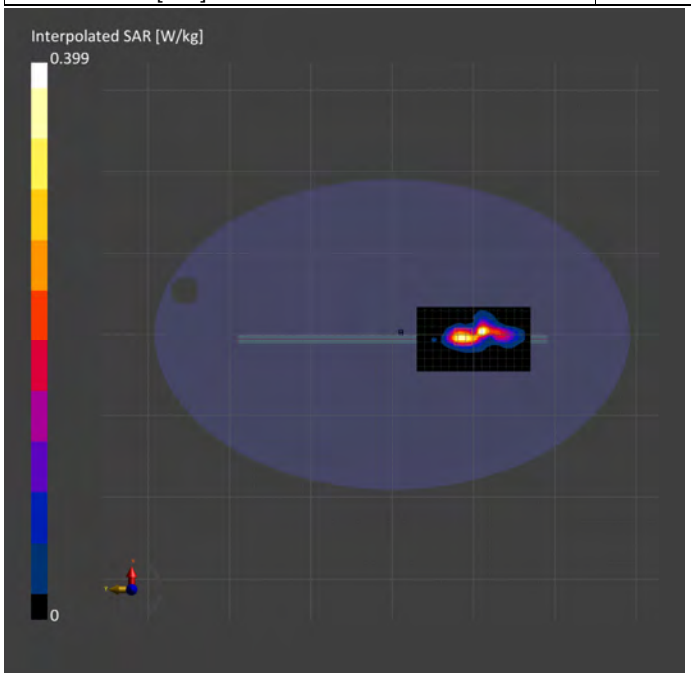
Phantom	Probe, Calibration Date	DAE, Calibration Date
ELI	EX3DV4 - SN7712, 2022-03-21	DAE4 Sn1719, 2022-03-25

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 140.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4

Measurement Results

	Area Scan	Zoom Scan
Date	2022-06-23	2022-06-23
psSAR1g [W/kg]	0.263	0.276
psSAR8g [W/kg]	0.107	0.103
psSAR10g [W/kg]	0.095	0.092
Power Drift [dB]	-0.04	-0.01
M2/M1 [%]		59.2
Dist 3dB Peak [mm]		7.4



ID: 021
Report No. : TESA2204000040EN
Measurement Report for ASUS B5402(NB), WLAN 802.11ac(80M) 5.6G_Body_Front Edge_CH 138_0mm_Aux
Ambient temperature: 22.1°C; Liquid temperature: 21.7°C

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	Front Edge, 0.00	5690.0, 138	5.45	5.106	35.085

Hardware Setup

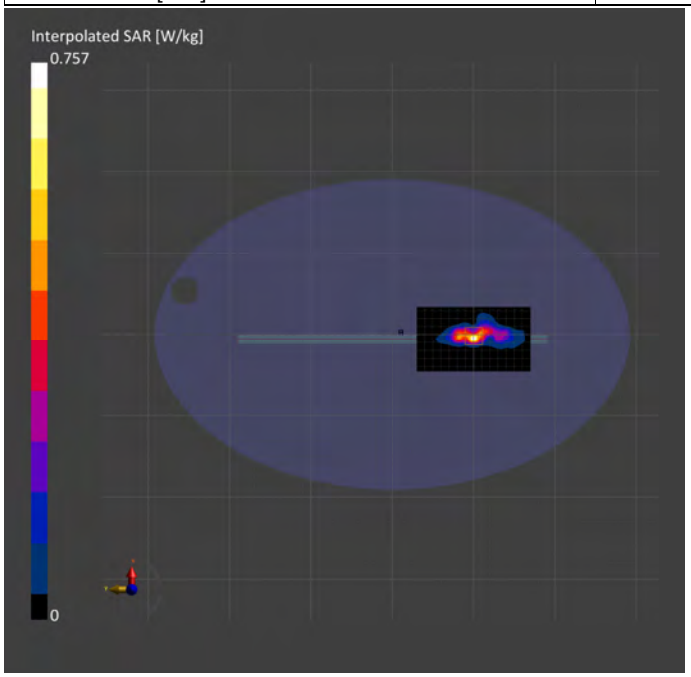
Phantom	Probe, Calibration Date	DAE, Calibration Date
ELI	EX3DV4 - SN7712, 2022-03-21	DAE4 Sn1719, 2022-03-25

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 140.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4

Measurement Results

	Area Scan	Zoom Scan
Date	2022-06-24	2022-06-24
psSAR1g [W/kg]	0.461	0.607
psSAR8g [W/kg]	0.170	0.203
psSAR10g [W/kg]	0.150	0.178
Power Drift [dB]	0.03	0.05
M2/M1 [%]		62.3
Dist 3dB Peak [mm]		7.8



ID: 022
Report No. : TESA2204000040EN
Measurement Report for ASUS B5402(NB), WLAN 802.11n(40M) 5.8G_Body_Front Edge_CH 151_0mm_Aux
Ambient temperature: 22.1°C; Liquid temperature: 21.7°C

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	Front Edge, 0.00	5755.0, 151	5.45	5.172	35.011

Hardware Setup

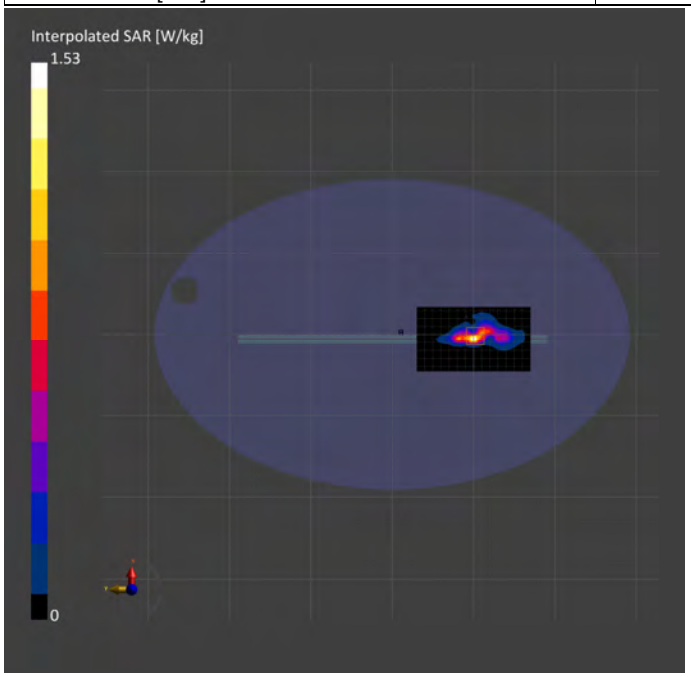
Phantom	Probe, Calibration Date	DAE, Calibration Date
ELI	EX3DV4 - SN7712, 2022-03-21	DAE4 Sn1719, 2022-03-25

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 140.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4

Measurement Results

	Area Scan	Zoom Scan
Date	2022-06-24	2022-06-24
psSAR1g [W/kg]	0.911	1.07
psSAR8g [W/kg]	0.321	0.359
psSAR10g [W/kg]	0.284	0.314
Power Drift [dB]	-0.05	-0.02
M2/M1 [%]		59.1
Dist 3dB Peak [mm]		10.1



6. SAR System Performance Verification

Report No. : TESA2204000040EN
Measurement Report for Device, FRONT, D2450,
CW, Channel 2450 (2450.0 MHz) , SN:727
Ambient temperature: 22.5°C; Liquid temperature: 22°C

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	FRONT, 10.00	8.16	1.792	38.859

Hardware Setup

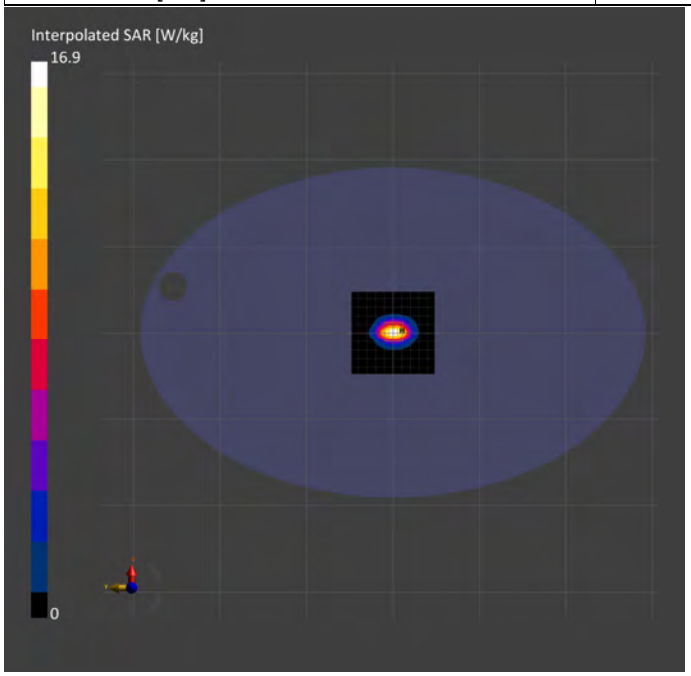
Phantom	Probe, Calibration Date	DAE, Calibration Date
ELI	EX3DV4 - SN7712, 2022-03-21	DAE4 Sn1719, 2022-03-25

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	96.0 x 96.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	12.0 x 12.0	5.0 x 5.0 x 5.0
Sensor Surface [mm]	3.0	1.4

Measurement Results

	Area Scan	Zoom Scan
Date	2022-06-22	2022-06-22
psSAR1g [W/kg]	12.8	12.9
psSAR8g [W/kg]	6.51	6.64
psSAR10g [W/kg]	5.88	6.02
Power Drift [dB]	-0.01	-0.02
M2/M1 [%]		59.6
Dist 3dB Peak [mm]		9.0



Report No. : TESA2204000040EN
Measurement Report for Device, FRONT, D5GHz, CW, Channel 5250 (5250.0 MHz) , SN:1023
Ambient temperature: 22.2°C; Liquid temperature: 21.8°C

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	FRONT, 10.00	5.94	4.658	35.588

Hardware Setup

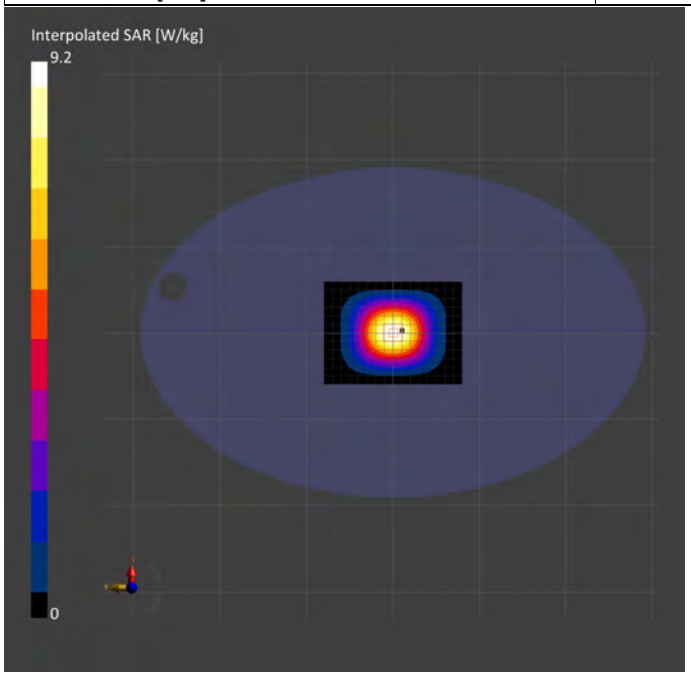
Phantom	Probe, Calibration Date	DAE, Calibration Date
ELI	EX3DV4 - SN7712, 2022-03-21	DAE4 Sn1719, 2022-03-25

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 160.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4

Measurement Results

	Area Scan	Zoom Scan
Date	2022-06-23	2022-06-23
psSAR1g [W/kg]	6.01	8.15
psSAR8g [W/kg]	2.74	3.05
psSAR10g [W/kg]	2.35	2.81
Power Drift [dB]	-0.03	-0.04
M2/M1 [%]		55.0
Dist 3dB Peak [mm]		7.4



Report No. : TESA2204000040EN
Measurement Report for Device, FRONT, D5GHz, CW, Channel 5600 (5600.0 MHz) , SN:1023
Ambient temperature: 22.1°C; Liquid temperature: 21.7°C

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	FRONT, 10.00	5.29	5.015	35.188

Hardware Setup

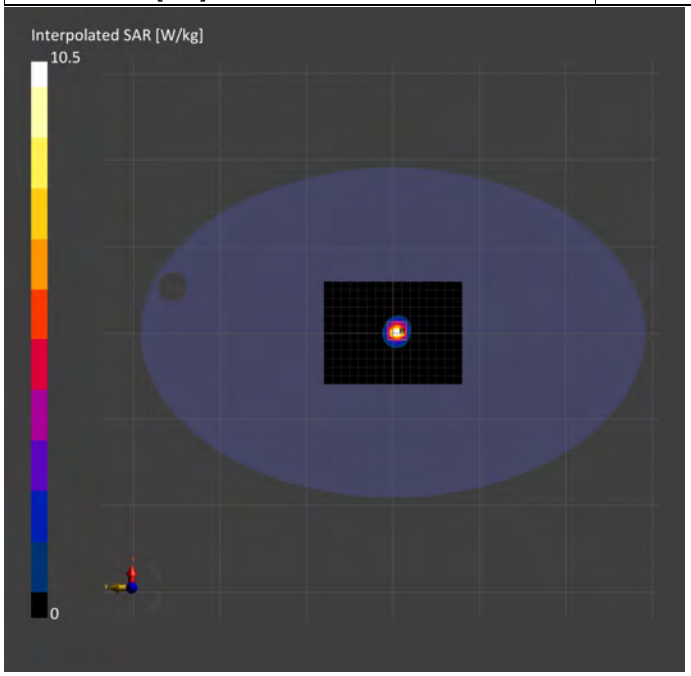
Phantom	Probe, Calibration Date	DAE, Calibration Date
ELI	EX3DV4 - SN7712, 2022-03-21	DAE4 Sn1719, 2022-03-25

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 160.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4

Measurement Results

	Area Scan	Zoom Scan
Date	2022-06-24	2022-06-24
psSAR1g [W/kg]	7.52	8.18
psSAR8g [W/kg]	2.67	2.73
psSAR10g [W/kg]	2.30	2.35
Power Drift [dB]	-0.03	-0.02
M2/M1 [%]		51.7
Dist 3dB Peak [mm]		7.5



Report No. : TESA2204000040EN
Measurement Report for Device, FRONT, D5GHz, CW, Channel 5750 (5750.0 MHz) , SN:1023
Ambient temperature: 22.1°C; Liquid temperature: 21.7°C

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	FRONT, 10.00	5.45	5.167	35.017

Hardware Setup

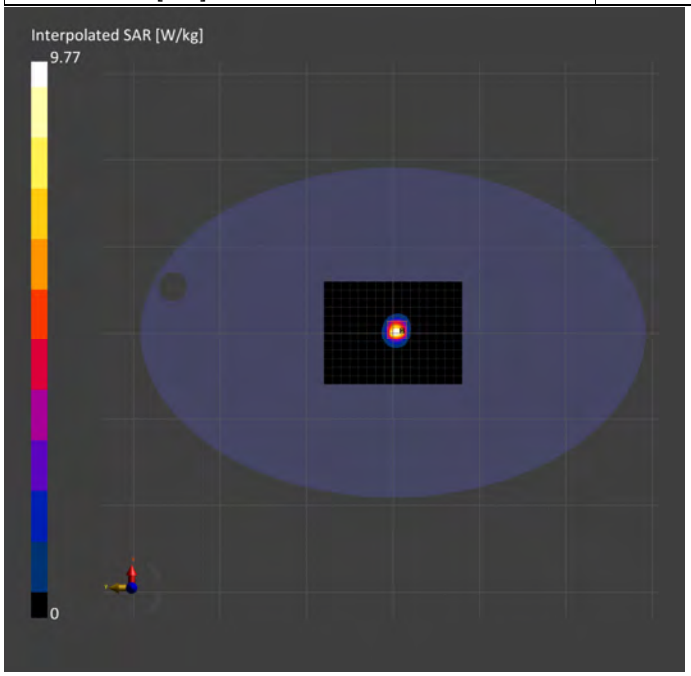
Phantom	Probe, Calibration Date	DAE, Calibration Date
ELI	EX3DV4 - SN7712, 2022-03-21	DAE4 Sn1719, 2022-03-25

Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 160.0	24.0 x 24.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 2.0
Sensor Surface [mm]	3.0	1.4

Measurement Results

	Area Scan	Zoom Scan
Date	2022-06-24	2022-06-24
psSAR1g [W/kg]	7.00	8.11
psSAR8g [W/kg]	2.53	2.71
psSAR10g [W/kg]	2.19	2.33
Power Drift [dB]	0.06	0.04
M2/M1 [%]		50.5
Dist 3dB Peak [mm]		7.5



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.)	0.96%	N	1	1	0.64	0.43	0.61%	0.41%	M
Liquid Conductivity (mea.)	1.02%	N	1	1	0.6	0.49	0.61%	0.50%	M
Combined standard uncertainty		RSS					11.75%	11.72%	
Expant uncertainty (95% confidence interval), K=2							23.50%	23.45%	

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.)	0.87%	N	1	1	0.64	0.43	0.56%	0.37%	M
Liquid Conductivity (mea.)	0.59%	N	1	1	0.6	0.49	0.35%	0.29%	M
Combined standard uncertainty		RSS					11.44%	11.42%	
Expant uncertainty (95% confidence interval), K=2							22.87%	22.84%	

Appendixes

Refer to separated files for the following appendixes.

TESA2204000040EN SAR_Appendix A Photographs

TESA2204000040EN SAR_Appendix B DAE & Probe Cal. Certificate

TESA2204000040EN SAR_Appendix C Phantom Description & Dipole Cal. Certificate

- End of report -