

# RF Exposure report



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

**Product Name** Notebook Computer  
**Brand Name** acer  
**Model No.** N21Q7  
**Applicant** Acer Incorporated  
8F., No. 88, Sec. 1, Xintai 5th Rd., Xizhi, New Taipei City  
22181, Taiwan (R.O.C)  
**Standards** IEEE/ANSI C95.1-1992, IEEE 1528-2013  
**FCC ID** HLZAX201D2  
**Date of Receipt** Feb. 11, 2022  
**Date of Test(s)** Mar. 01, 2022 ~ Mar. 03, 2022  
**Date of Issue** Mar. 08, 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.

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## Signed on behalf of SGS

Clerk / Ruby Ou	PM / Tom Chiang	Approved By / John Yeh
Ruby Ou	Tom Chiang	John Teh

Date: Mar. 08, 2022

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## Revision History

Report Number	Revision	Description	Issue Date	Revised By	Remark
E5/2022/20008	Rev.00	Initial creation of document	Mar. 08, 2022	Ruby Ou	

**Note:**

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

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## 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

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# 1. General Information

## 1.1 Testing Laboratory

SGS Taiwan Ltd. Central RF Lab	
No. 2, Keji 1st Rd., Guishan Township, Taoyuan County, 33383, Taiwan	
FCC Designation Number	TW0028
Tel	+886-2-2299-3279
Fax	+886-2-2298-0488
Internet	<a href="http://www.tw.sgs.com/">http://www.tw.sgs.com/</a>

## 1.2 Details of Applicant

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

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### 1.3 Description of EUT

#### General Information of Host:

Product Name	Notebook Computer	
Brand Name		
Model No.	N21Q7	
Integrated Module	Brand Name: Intel® Wi-Fi AX201 Model Name: AX201D2W	
FCC ID	HLZAX201D2	
Mode of Operation	<input checked="" type="checkbox"/> WLAN802.11 <input checked="" type="checkbox"/> Bluetooth	
Duty Cycle	WLAN802.11	Refer to page 20-23
	Bluetooth	77.2%
Supported Radios	802.11 b/g/n/ax	2.4GHz (2400.0 – 2483.5 MHz)
	802.11a/n/ac/ax	5.2GHz (5150.0 – 5350.0 MHz) 5.6GHz (5470.0 – 5725.0 MHz) 5.8GHz (5725.0 – 5850.0 MHz)
	Bluetooth 5.2	2.4GHz (2400.0 – 2483.5 MHz)

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### Notebook mode

Max. SAR (1g) (Unit: W/Kg)				
Band	Measured	Reported	Channel	Position
WLAN 802.11ac(80M) 5.6G	0.75	0.76	138	Bottom Surface

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**WLAN conducted power table:**

Chain B(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	20.00	19.99
		6	2437		21.00	20.98
		11	2462		20.00	19.98
	802.11g	1	2412	6Mbps	18.50	18.31
		6	2437		21.00	20.67
		11	2462		17.50	17.33
	802.11n20-HT0	1	2412	MCS0	17.50	17.22
		6	2437		21.00	20.67
		11	2462		16.50	16.35
	802.11ac20-VHT0	1	2412	MCS0	17.50	17.17
		6	2437		21.00	20.76
		11	2462		16.50	16.18
	802.11ax20-HE0	1	2412	MCS0	17.50	17.25
		6	2437		20.00	19.68
		11	2462		16.00	15.77
	802.11n40-HT0	3	2422	MCS0	15.50	15.22
		6	2437		17.00	16.67
		9	2452		15.00	14.83
	802.11ac40-VHT0	3	2422	MCS0	15.50	15.23
		6	2437		17.00	16.78
		9	2452		15.00	14.84
	802.11ax40-HE0	3	2422	MCS0	15.50	15.19
		6	2437		17.00	16.83
		9	2452		15.00	14.85

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Chain B(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	19.50	19.49
		40	5200		20.00	19.99
		44	5220		21.00	20.99
		48	5240		21.00	20.98
	802.11n20-HT0	36	5180	MCS0	19.00	18.84
		40	5200		20.00	19.86
		44	5220		21.00	20.86
		48	5240		21.00	20.78
	802.11ac20-VHT0	36	5180	MCS0	19.00	18.77
		40	5200		20.00	19.83
		44	5220		21.00	20.79
		48	5240		21.00	20.85
	802.11ax20-HE0	36	5180	MCS0	19.50	19.34
		40	5200		20.00	19.81
		44	5220		21.00	20.79
		48	5240		21.00	20.81
	802.11n40-HT0	38	5190	MCS0	19.00	18.99
		46	5230		21.00	20.99
	802.11ac40-VHT0	38	5190	MCS0	19.00	18.72
		46	5230		21.00	20.67
	802.11ax40-HE0	38	5190	MCS0	19.00	18.77
		46	5230		21.00	20.80
	802.11ac80-VHT0	42	5210	MCS0	18.50	18.32
	802.11ax80-HE0	42	5210	MCS0	18.00	17.69
	802.11ac160-VHT0	50	5250	MCS0	15.00	14.69
	802.11ax160-HE0	50	5250	MCS0	15.00	14.70

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Chain B(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	20.50	20.47
		56	5280		20.50	20.46
		60	5300		20.50	20.44
		64	5320		19.00	18.99
	802.11n20-HT0	52	5260	MCS0	20.50	20.21
		56	5280		20.50	20.26
		60	5300		20.50	20.23
		64	5320		18.50	18.27
	802.11ac20-VHT0	52	5260	MCS0	20.50	20.25
		56	5280		20.50	20.25
		60	5300		20.50	20.32
		64	5320		18.50	18.32
	802.11ax20-HE0	52	5260	MCS0	20.50	20.25
		56	5280		20.50	20.33
		60	5300		20.50	20.31
		64	5320		18.00	17.76
	802.11n40-HT0	54	5270	MCS0	20.50	20.48
		62	5310		17.50	17.49
	802.11ac40-VHT0	54	5270	MCS0	20.50	20.29
		62	5310		17.50	17.20
	802.11ax40-HE0	54	5270	MCS0	20.50	20.23
		62	5310		17.00	16.70
	802.11ac80-VHT0	58	5290	MCS0	18.00	17.85
	802.11ax80-HE0	58	5290	MCS0	17.50	17.22

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Chain B(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	18.50	18.34
		120	5600		18.50	18.28
		140	5700		18.50	18.18
		144	5720		18.50	18.21
	802.11n20-HT0	100	5500	MCS0	18.50	18.23
		120	5600		18.50	18.30
		140	5700		18.00	17.73
		144	5720		18.50	18.20
	802.11ac20-VHT0	100	5500	MCS0	18.50	18.34
		120	5600		18.50	18.36
		140	5700		18.00	17.85
		144	5720		18.50	18.32
	802.11ax20-HE0	100	5500	MCS0	18.50	18.22
		120	5600		18.50	18.20
		140	5700		18.00	17.73
		144	5720		18.50	18.36
	802.11n40-HT0	102	5510	MCS0	18.50	18.29
		118	5590		18.50	18.27
		134	5670		18.50	18.28
		142	5710		18.50	18.17
	802.11ac40-VHT0	102	5510	MCS0	18.50	18.19
		118	5590		18.50	18.23
		134	5670		18.50	18.31
		142	5710		18.50	18.26
	802.11ax40-HE0	102	5510	MCS0	18.50	18.34
		118	5590		18.50	18.25
		134	5670		18.50	18.29
		142	5710		18.50	18.30
	802.11ac80-VHT0	106	5530	MCS0	18.50	18.48
		122	5610		18.50	18.17
		138	5690		18.50	18.49
	802.11ax80-HE0	106	5530	MCS0	18.50	18.21
		122	5610		18.50	18.36
		138	5690		18.50	18.37
	802.11ac160-VHT0	114	5570	MCS0	15.00	14.81
	802.11ax160-HE0	114	5570	MCS0	15.50	15.35

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Chain B(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	19.00	18.69
		157	5785		19.00	18.68
		165	5825		19.00	18.79
	802.11n20-HT0	149	5745	MCS0	19.00	18.80
		157	5785		19.00	18.70
		165	5825		19.00	18.75
	802.11ac20-VHT0	149	5745	MCS0	19.00	18.71
		157	5785		19.00	18.68
		165	5825		19.00	18.63
	802.11ax20-HE0	149	5745	MCS0	19.00	18.76
		157	5785		19.00	18.76
		165	5825		19.00	18.77
	802.11n40-HT0	151	5755	MCS0	19.00	18.97
		159	5795		19.00	18.96
	802.11ac40-VHT0	151	5755	MCS0	19.00	18.78
		159	5795		19.00	18.75
	802.11ax40-HE0	151	5755	MCS0	19.00	18.76
		159	5795		19.00	18.87
	802.11ac80-VHT0	155	5775	MCS0	19.00	18.99
	802.11ax80-HE0	155	5775	MCS0	19.00	18.79

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Chain A(Aux,A)						
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
2.45GHz	802.11b	1	2412	1Mbps	19.50	19.47
		6	2437		21.00	20.99
		11	2462		19.50	19.46
	802.11g	1	2412	6Mbps	18.50	18.31
		6	2437		21.00	20.88
		11	2462		18.00	17.87
	802.11n20-HT0	1	2412	MCS0	18.50	18.30
		6	2437		21.00	20.84
		11	2462		17.50	17.25
	802.11ac20-VHT0	1	2412	MCS0	18.50	18.25
		6	2437		21.00	20.81
		11	2462		17.50	17.31
	802.11ax20-HE0	1	2412	MCS0	18.50	18.33
		6	2437		20.00	19.79
		11	2462		17.00	16.90
	802.11n40-HT0	3	2422	MCS0	17.00	16.72
		6	2437		17.00	16.74
		9	2452		15.00	14.85
	802.11ac40-VHT0	3	2422	MCS0	17.00	16.80
		6	2437		17.00	16.79
		9	2452		15.00	14.76
	802.11ax40-HE0	3	2422	MCS0	17.00	16.84
		6	2437		17.00	16.74
		9	2452		15.00	14.83

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Chain A(Aux,A)						
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	19.00	18.92
		40	5200		19.00	18.83
		44	5220		19.00	18.86
		48	5240		19.00	18.76
	802.11n20-HT0	36	5180	MCS0	19.00	18.91
		40	5200		19.00	18.91
		44	5220		19.00	18.92
		48	5240		19.00	18.85
	802.11ac20-VHT0	36	5180	MCS0	19.00	18.89
		40	5200		19.00	18.82
		44	5220		19.00	18.78
		48	5240		19.00	18.90
	802.11ax20-HE0	36	5180	MCS0	19.00	18.84
		40	5200		19.00	18.91
		44	5220		19.00	18.80
		48	5240		19.00	18.83
	802.11n40-HT0	38	5190	MCS0	19.00	18.98
		46	5230		19.00	18.99
	802.11ac40-VHT0	38	5190	MCS0	19.00	18.73
		46	5230		19.00	18.83
	802.11ax40-HE0	38	5190	MCS0	19.00	18.77
		46	5230		19.00	18.87
	802.11ac80-VHT0	42	5210	MCS0	18.50	18.31
	802.11ax80-HE0	42	5210	MCS0	18.00	17.72
	802.11ac160-VHT0	50	5250	MCS0	15.50	15.29
	802.11ax160-HE0	50	5250	MCS0	15.50	15.25

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Chain A(Aux,A)						
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	19.00	18.99
		56	5280		19.00	18.98
		60	5300		19.00	18.97
		64	5320		19.00	18.96
	802.11n20-HT0	52	5260	MCS0	19.00	18.91
		56	5280		19.00	18.90
		60	5300		19.00	18.78
		64	5320		19.00	18.86
	802.11ac20-VHT0	52	5260	MCS0	19.00	18.81
		56	5280		19.00	18.80
		60	5300		19.00	18.86
		64	5320		19.00	18.85
	802.11ax20-HE0	52	5260	MCS0	19.00	18.86
		56	5280		19.00	18.79
		60	5300		19.00	18.88
		64	5320		18.50	18.28
	802.11n40-HT0	54	5270	MCS0	19.00	18.99
		62	5310		17.50	17.49
	802.11ac40-VHT0	54	5270	MCS0	19.00	18.86
		62	5310		17.50	17.39
	802.11ax40-HE0	54	5270	MCS0	19.00	18.80
		62	5310		17.00	16.86
	802.11ac80-VHT0	58	5290	MCS0	18.00	17.77
	802.11ax80-HE0	58	5290	MCS0	18.00	17.89

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Chain A(Aux,A)						
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
5.6GHz	802.11a	100	5500	6Mbps	18.50	18.27
		120	5600		18.50	18.37
		140	5700		18.50	18.37
		144	5720		18.50	18.23
	802.11n20-HT0	100	5500	MCS0	18.50	18.37
		120	5600		18.50	18.24
		140	5700		18.50	18.40
		144	5720		18.50	18.27
	802.11ac20-VHT0	100	5500	MCS0	18.50	18.39
		120	5600		18.50	18.25
		140	5700		18.50	18.41
		144	5720		18.50	18.31
	802.11ax20-HE0	100	5500	MCS0	18.50	18.26
		120	5600		18.50	18.31
		140	5700		17.50	17.29
		144	5720		18.50	18.33
	802.11n40-HT0	102	5510	MCS0	18.50	18.34
		118	5590		18.50	18.32
		134	5670		18.50	18.39
		142	5710		18.50	18.31
	802.11ac40-VHT0	102	5510	MCS0	18.50	18.39
		118	5590		18.50	18.30
		134	5670		18.50	18.33
		142	5710		18.50	18.35
	802.11ax40-HE0	102	5510	MCS0	18.50	18.23
		118	5590		18.50	18.38
		134	5670		18.50	18.26
		142	5710		18.50	18.39
	802.11ac80-VHT0	106	5530	MCS0	18.50	18.49
		122	5610		18.50	18.28
		138	5690		18.50	18.46
	802.11ax80-HE0	106	5530	MCS0	18.00	17.84
		122	5610		18.50	18.22
		138	5690		18.50	18.40
	802.11ac160-VHT0	114	5570	MCS0	15.50	15.25
	802.11ax160-HE0	114	5570	MCS0	15.00	14.91

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Chain A(Aux,A)						
Mode	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
5.8GHz	802.11a	149	5745	6Mbps	18.50	18.33
		157	5785		18.50	18.38
		165	5825		18.50	18.40
	802.11n20-HT0	149	5745	MCS0	18.50	18.35
		157	5785		18.50	18.29
		165	5825		18.50	18.27
	802.11ac20-VHT0	149	5745	MCS0	18.50	18.36
		157	5785		18.50	18.34
		165	5825		18.50	18.41
	802.11ax20-HE0	149	5745	MCS0	18.50	18.29
		157	5785		18.50	18.37
		165	5825		18.50	18.32
	802.11n40-HT0	151	5755	MCS0	18.50	18.47
		159	5795		18.50	18.49
	802.11ac40-VHT0	151	5755	MCS0	18.50	18.25
		159	5795		18.50	18.31
	802.11ax40-HE0	151	5755	MCS0	18.50	18.23
		159	5795		18.50	18.27
	802.11ac80-VHT0	155	5775	MCS0	18.50	18.49
	802.11ax80-HE0	155	5775	MCS0	18.50	18.26

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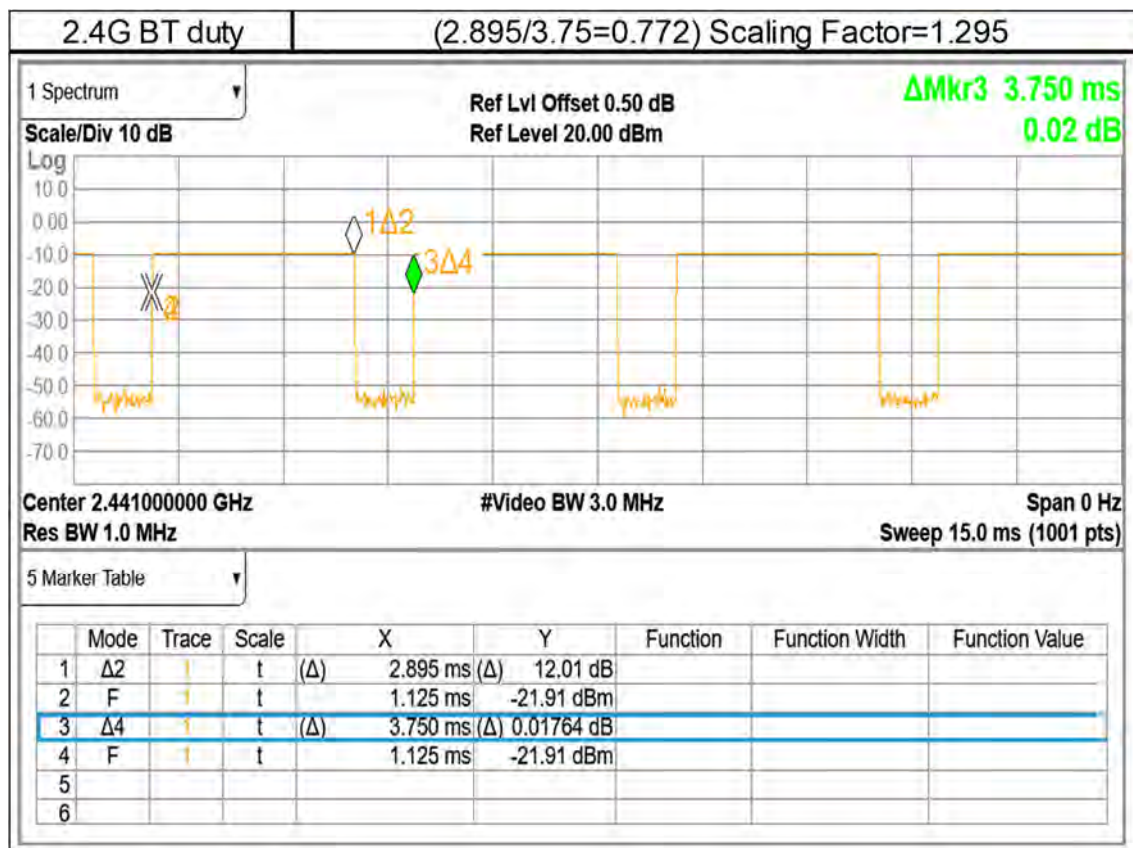
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### Bluetooth conducted power table:

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	10.50	8.82	10.00	6.89	10.00	6.91
	CH 39	2441		9.64		7.59		7.60
	CH 78	2480		10.09		7.82		7.82
Mode	Channel	Frequency (MHz)	GFSK					
			Max. Rated Avg.Power + Max. Tolerance (dBm)			Average Output Power (dBm)		
BLE_1M	CH 00	2402	8			6.10		
	CH 19	2440				6.50		
	CH 39	2480				6.65		
Mode	Channel	Frequency (MHz)	GFSK					
			Max. Rated Avg.Power + Max. Tolerance (dBm)			Average Output Power (dBm)		
BLE_2M	CH 00	2402	8			3.33		
	CH 19	2440				3.85		
	CH 39	2480				4.15		

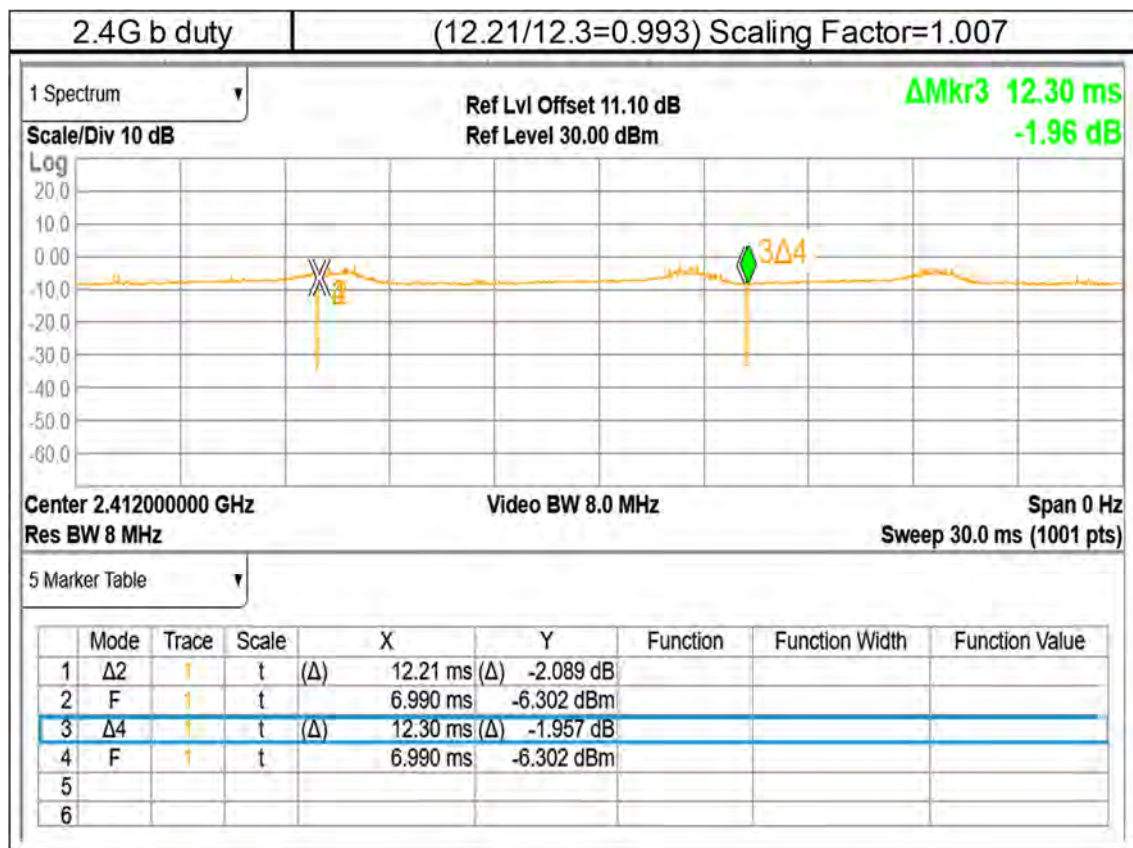
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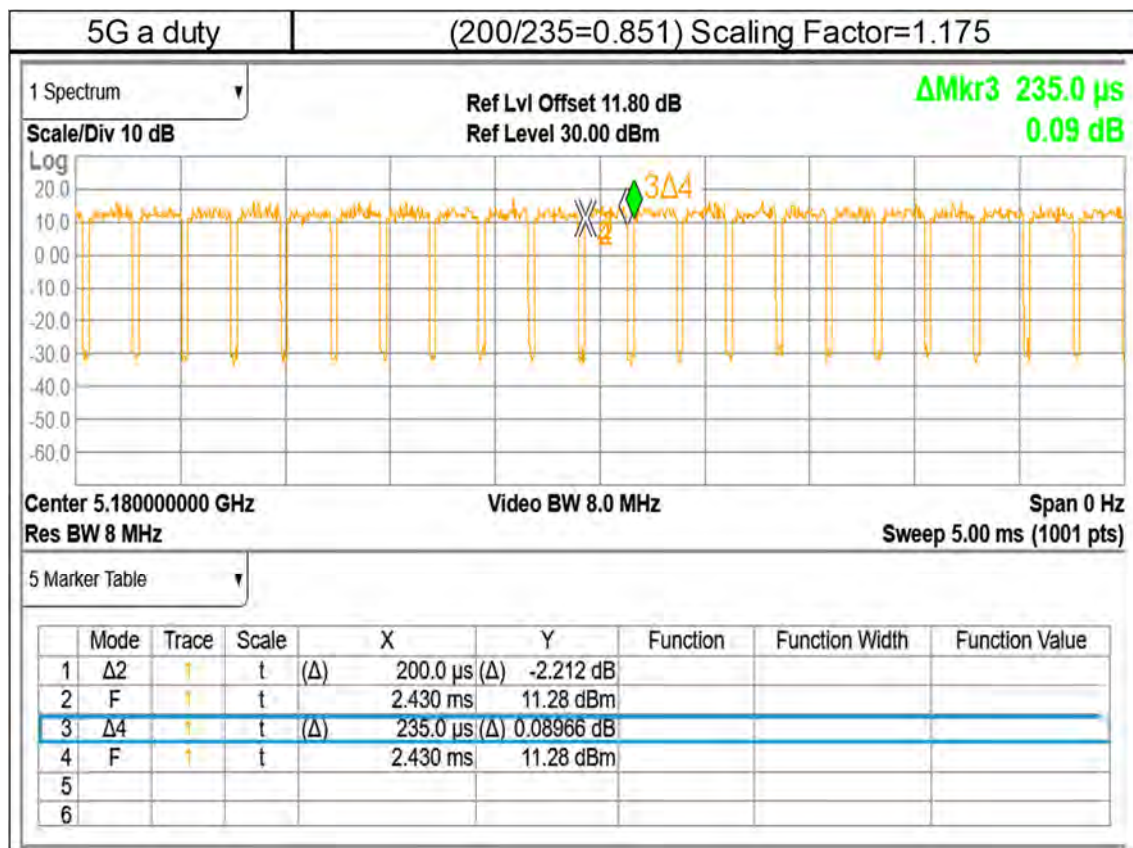
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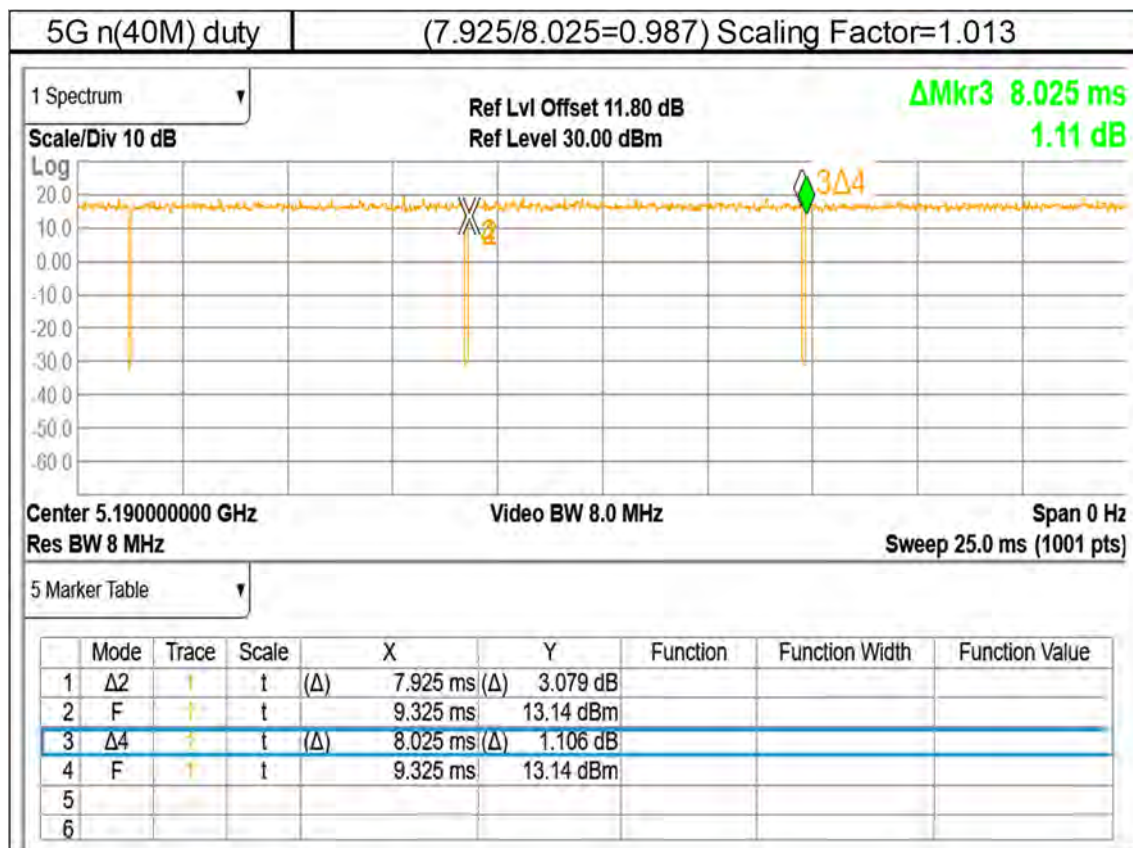
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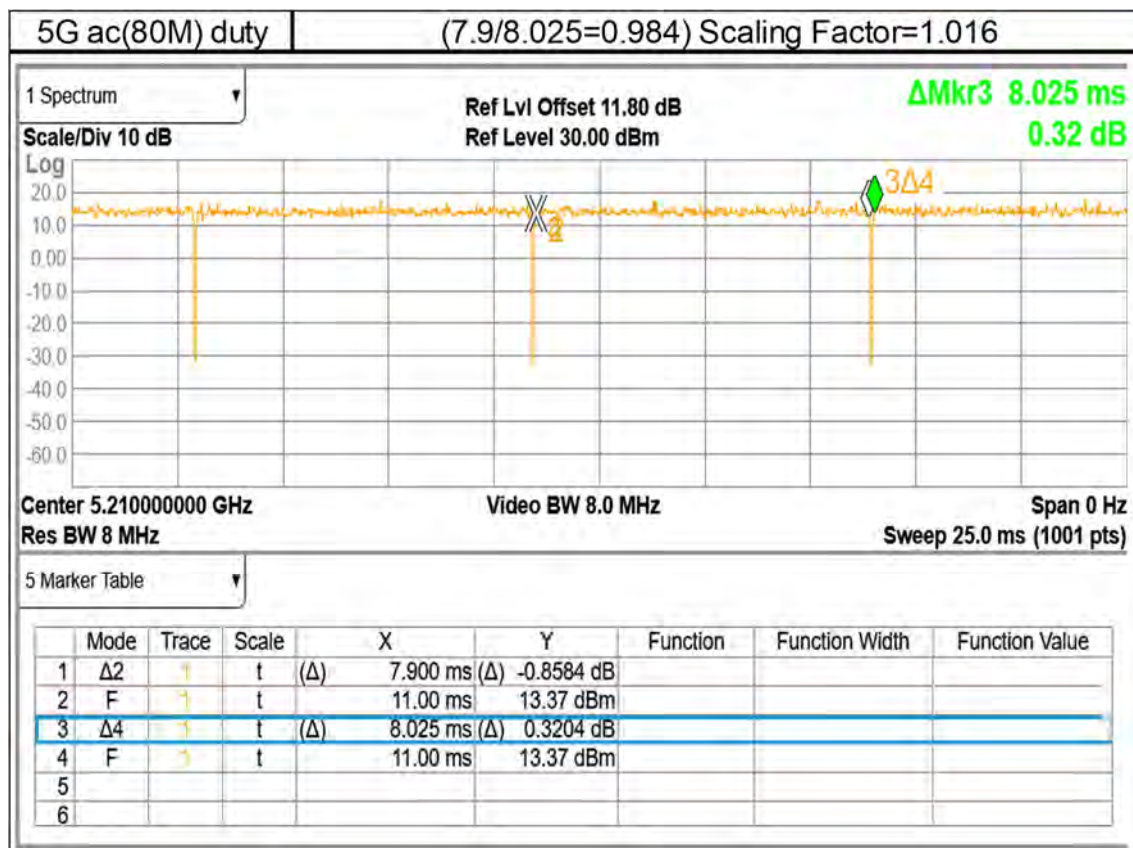
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## 1.4 Test Environment

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

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

## 1.5 Operation Description

1. 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.
2. SAR is measured using the highest measured maximum output power channel. When the reported SAR of the initial test configuration is  $> 0.8 \text{ W/kg}$ , SAR measurement is required for the subsequent next highest measured output power channel(s) in the initial test configuration until the reported SAR is  $\leq 1.2 \text{ W/kg}$  or all required channels are tested.
3. 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  $\leq 1.2 \text{ W/kg}$ , SAR is not required for subsequent test configuration.
4. Per 201904 TCBC workshops, general principles of FCC KDB Publication 248227 D01 can be applied to determine the SAR Initial Test Configurations and test reduction for 802.11ax SAR testing.
5. In applying the test guidance, the IEEE 802.11 mode with the maximum output power (out of all modes) should be considered for testing. For modes with the same maximum output power, the guidance from section 5.3.2 a) of FCC KDB Publication 248227 D01 should be applied, with 802.11ax being considered as the highest 802.11 mode for the appropriate frequency bands
6. According to KDB865664 D01, SAR measurement variability must be assessed for each frequency band. When the original highest measured SAR is  $\geq 0.8 \text{ W/kg}$ , 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  $\geq 1.45 \text{ W/kg}$  ( $\sim 10\%$  from the 1-g SAR limit)
7. The device is a clamshell laptop, and laptop SAR is measured with bottom surface of keyboard touch against the flat phantom (where the display screen opened at an angle of  $90^\circ$  to the keyboard compartment).

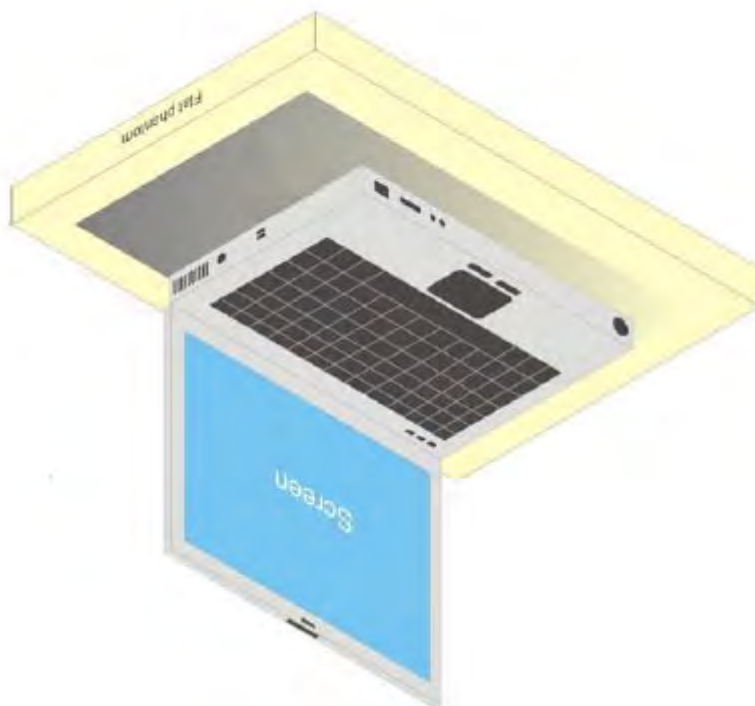
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## 1.6 EUT Testing Position

For laptop PC, according to KDB 616217 D04, SAR evaluation is required for the bottom surface of the keyboard. This EUT was tested in the base of EUT directly against the flat phantom. The required minimum test separation distance for incorporating transmitters and antennas into laptop computer display is determined with the display screen opened at an angle of 90° to the keyboard compartment.



**Illustration for Laptop Setup**

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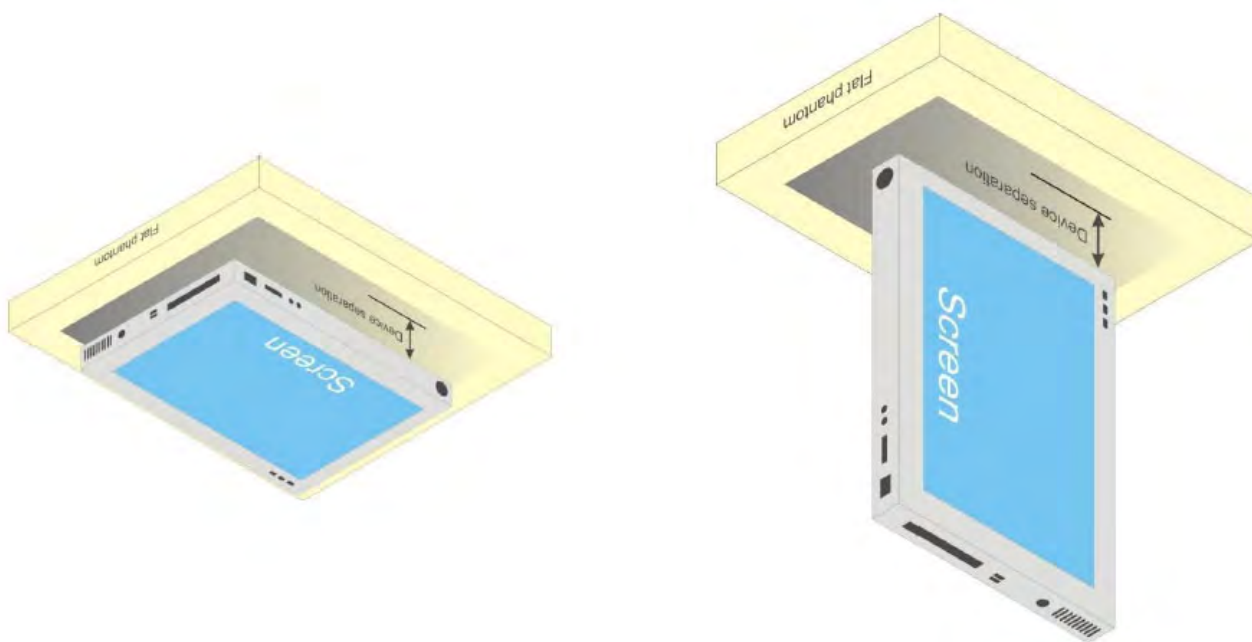
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For full-size tablet, according to KDB 616217 D04, SAR evaluation is required for back surface and edges of the devices. The back surface and edges of the tablet are tested with the tablet touching the phantom. Exposures from antennas through the front surface of the display section of a tablet are generally limited to the user's hands. Exposures to hands for typical consumer transmitters used in tablets are not expected to exceed the extremity SAR limit; therefore, SAR evaluation for the front surface of tablet display screens are generally not necessary. When voice mode is supported on a tablet and it is limited to speaker mode or headset operations only, additional SAR testing for this type of voice use is not required.



**Illustration for Tablet Setup**

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## 1.7 Evaluation Procedures

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

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

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

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

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

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

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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.

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## 1.8 Probe Calibration Procedures

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

### 1.8.1 Transfer Calibration with Temperature Probes

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

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

Whereby  $\sigma$  is the conductivity,  $\rho$  the density and  $c$  the heat capacity of the liquid.

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

1. The temperature gradient is not directly measurable but must be evaluated from temperature measurements at different time steps. Special precaution is necessary to avoid measurement errors caused by temperature gradients due to energy equalizing effects or convection currents in the liquid. Such effects cannot be completely avoided, as the measured field itself destroys the thermal equilibrium in the liquid. With a careful setup these errors can be kept small.
2. The measured volume around the temperature probe is not well defined. It is

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difficult to calculate the energy transfer from a surrounding gradient temperature field into the probe. These effects must be considered, since temperature probes are calibrated in liquid with homogeneous temperatures. There is no traceable standard for temperature rise measurements.

3. The calibration depends on the assessment of the specific density, the heat capacity and the conductivity of the medium. While the specific density and heat capacity can be measured accurately with standardized procedures ( $\sim 2\%$  for  $c$ ; much better for  $\rho$ ), there is no standard for the measurement of the conductivity. Depending on the method and liquid, the error can well exceed  $\pm 5\%$ .
4. Temperature rise measurements are not very sensitive and therefore are often performed at a higher power level than the E-field measurements. The nonlinearities in the system (e.g., power measurements, different components, etc.) must be considered.

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

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### 1.8.2 Calibration with Analytical Fields

In this method a technical setup is used in which the field can be calculated analytically from measurements of other physical magnitudes (e.g., input power). This corresponds to the standard field method for probe calibration in air; however, there is no standard defined for fields in lossy liquids.

When using calculated fields in lossy liquids for probe calibration, several points must be considered in the assessment of the uncertainty:

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

### References

- (1) N. Kuster, Q. Balzano, and J.C. Lin, Eds., *Mobile Communications Safety*, Chapman & Hall, London, 1997.
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- (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.

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## 1.9 SAR System Performance Check Results

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  $\pm 10\%$  (according to KDB865664D01) 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. 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.

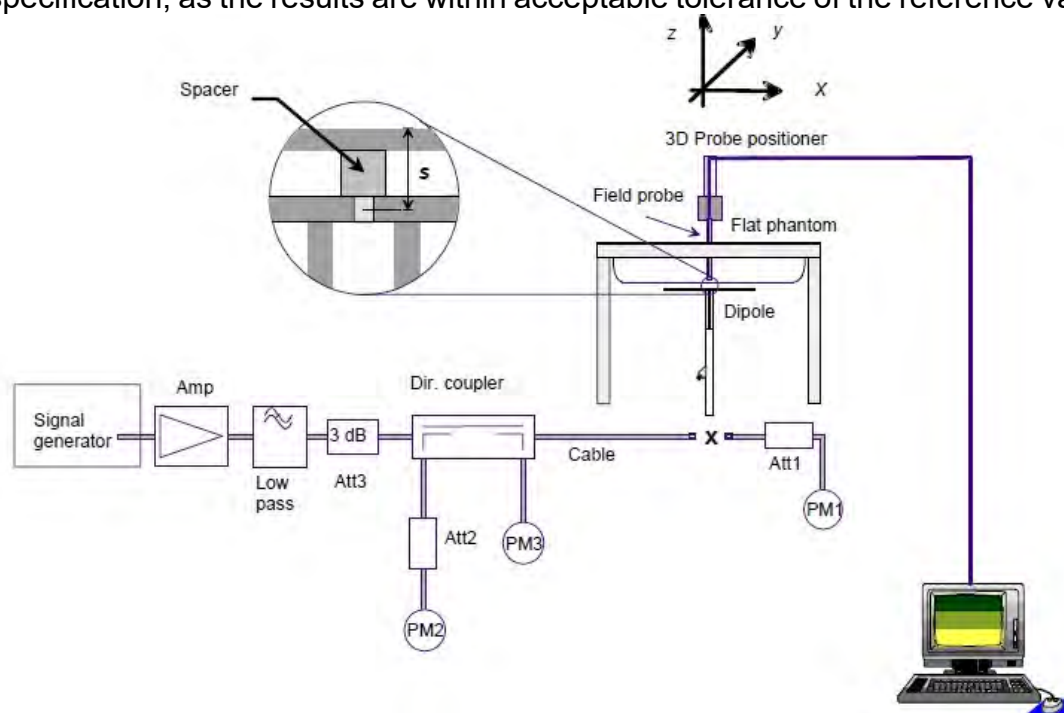


Fig. b The block diagram of system verification

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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	53.9	13.47	53.88	-0.04%	Mar. 01, 2022

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	5250	Head	81.0	8.07	80.7	-0.37%	Mar. 02, 2022
		5600	Head	84.4	8.31	83.1	-1.54%	Mar. 03, 2022
		5750	Head	81.0	8.17	81.7	0.86%	Mar. 03, 2022

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### 1.9.1 SAR Tissue Verification

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  $\pm 5\%$  of the target values.

The depth of the tissue simulant in the flat section of the phantom was  $\geq 15$  cm during all tests. (Fig. 2)

Tissue Type	Measurement Date	Measured Frequency (MHz)	Target Dielectric Constant, $\epsilon_r$	Target Conductivity, $\sigma$ (S/m)	Measured Dielectric Constant, $\epsilon_r$	Measured Conductivity, $\sigma$ (S/m)	% dev $\epsilon_r$	% dev $\sigma$
Head	Mar, 01. 2022	2402	39.285	1.757	39.810	1.789	1.34%	1.83%
		2412	39.268	1.766	39.793	1.798	1.34%	1.81%
		2437	39.223	1.788	39.748	1.820	1.34%	1.75%
		2441	39.216	1.792	39.741	1.823	1.34%	1.74%
		2450	39.200	1.800	39.725	1.831	1.34%	1.73%
		2462	39.185	1.813	39.710	1.842	1.34%	1.58%
		2480	39.162	1.827	39.687	1.858	1.34%	1.71%
	Mar, 02. 2022	5180	36.009	4.635	36.534	4.696	1.46%	1.33%
		5190	35.997	4.645	36.522	4.706	1.46%	1.33%
		5220	35.963	4.676	36.488	4.737	1.46%	1.32%
		5230	35.951	4.686	36.476	4.748	1.46%	1.32%
		5240	35.940	4.696	36.465	4.758	1.46%	1.32%
		5250	35.929	4.706	36.454	4.768	1.46%	1.32%
		5260	35.917	4.717	36.442	4.779	1.46%	1.32%
		5270	35.906	4.727	36.431	4.789	1.46%	1.32%
		5280	35.894	4.737	36.419	4.800	1.46%	1.32%
		5310	35.860	4.768	36.385	4.831	1.46%	1.32%
		5320	35.849	4.778	36.374	4.841	1.46%	1.32%
	Mar, 03. 2022	5530	35.609	4.993	36.134	5.060	1.47%	1.34%
		5600	35.529	5.065	36.054	5.132	1.48%	1.33%
		5610	35.517	5.075	36.042	5.143	1.48%	1.33%
		5690	35.426	5.157	35.951	5.225	1.48%	1.32%
		5750	35.189	5.194	35.882	5.287	1.97%	1.79%
		5755	35.351	5.224	35.876	5.293	1.49%	1.31%
		5775	35.329	5.244	35.854	5.313	1.49%	1.31%
		5795	35.306	5.265	35.831	5.334	1.49%	1.31%

Table 2. Dielectric Parameters of Tissue Simulant Fluid

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## 1.10 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 HSL2450/5250/5600/5750 MHz Additional CF for other liquids and frequencies upon request		
Frequency	10 MHz to > 6 GHz, Linearity: $\pm 0.6$ dB		
Directivity	$\pm 0.3$ dB in HSL (rotation around probe axis) $\pm 0.5$ dB in tissue material (rotation normal to probe axis)		
Dynamic Range	10 $\mu$ W/g to > 100 mW/g Linearity: $\pm 0.2$ dB (noise: typically < 1 $\mu$ W/g)		
Dimensions	Tip diameter: 2.5 mm		
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.		


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## PHANTOM

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

## DEVICE HOLDER

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

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### 1.11 Test Standards and Limits

According to FCC 47CFR §2.1093(d) The limits to be used for evaluation are based generally on criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate ("SAR") in Section 4.2 of "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz," ANSI/IEEE C95.1, By the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017.

These criteria for SAR evaluation are similar to those recommended by the National Council on Radiation Protection and Measurements (NCRP) in "Biological Effects and Exposure Criteria for Radio frequency Electromagnetic Fields," NCRP Report No. 86, Section 17.4.5. Copyright NCRP, 1986, Bethesda, Maryland 20814. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards. The criteria to be used are specified in paragraphs (d)(1) and (d)(2) of this section and shall apply for portable devices transmitting in the frequency range from 100 kHz to 6 GHz. Portable devices that transmit at frequencies above 6 GHz are to be evaluated in terms of the MPE limits specified in § 1.1310 of this chapter.

Measurements and calculations to demonstrate compliance with MPE field strength or power density limits for devices operating above 6 GHz should be made at a minimum distance of 5 cm from the radiating source.

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

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

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

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Exceptions are the hands, wrists, feet and ankles where the spatial peak SAR shall not exceed 4 W/kg, as averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube).

General Population/Uncontrolled limits apply when the general public may be exposed, or when persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or do not exercise control over their exposure.

Warning labels placed on consumer devices such as cellular telephones will not be sufficient reason to allow these devices to be evaluated subject to limits for occupational/controlled exposure in paragraph (d)(1) of this section.(Table .6)

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

Notes:

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

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## 2. Summary of Results

### 2.1 Decision rules

Reported measurement data comply with IEEE 1528-2013:

Determining compliance shall be based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

### 2.2 Summary of SAR Results

#### Notebook mode

Chain B(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)		Plot page
									Measured	Reported	
WLAN 802.11b	Bottom Surface	0	1	2412	20.00	19.99	1.007	100.23%	0.255	0.257	-
	Bottom Surface	0	6	2437	21.00	20.98	1.007	100.46%	0.348	0.352	45
	Bottom Surface	0	11	2462	20.00	19.98	1.007	100.46%	0.285	0.288	-
Chain B(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)		Plot page
									Measured	Reported	
WLAN 802.11n(40M) 5.2G	Bottom Surface	0	46	5230	21.00	20.99	1.013	100.23%	0.644	0.654	46
Chain B(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)		Plot page
									Measured	Reported	
WLAN 802.11n(40M) 5.3G	Bottom Surface	0	54	5270	20.50	20.48	1.013	100.46%	0.713	0.726	47
	Bottom Surface	0	62	5310	17.50	17.49	1.013	100.23%	0.702	0.713	-
Chain B(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)		Plot page
									Measured	Reported	
WLAN 802.11ac(80M) 5.6G	Bottom Surface	0	106	5530	18.50	18.48	1.016	100.46%	0.627	0.640	-
	Bottom Surface	0	138	5690	18.50	18.49	1.016	100.23%	0.749	0.763	48
Chain B(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)		Plot page
									Measured	Reported	
WLAN 802.11ac(80M) 5.8G	Bottom Surface	0	155	5775	19.00	18.99	1.016	100.23%	0.740	0.754	49
Chain A(Aux.A)											
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)		Plot page
									Measured	Reported	
WLAN 802.11b	Bottom Surface	0	6	2437	21.00	20.99	1.007	100.23%	0.191	0.193	50
Chain A(Aux.A)											
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)		PKot page
									Measured	Reported	
Bluetooth (GFSK)	Bottom Surface	0	0	2402	10.50	8.82	1.295	147.23%	0.013	0.025	-
	Bottom Surface	0	39	2441	10.50	9.64	1.295	121.90%	0.018	0.028	-
	Bottom Surface	0	78	2480	10.50	10.09	1.295	109.90%	0.021	0.030	51
Chain A(Aux.A)											
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)		Plot page
									Measured	Reported	
WLAN 802.11n(40M) 5.2G	Bottom Surface	0	46	5230	19.00	18.99	1.013	100.23%	0.688	0.699	52
Chain A(Aux.A)											
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)		Plot page
									Measured	Reported	
WLAN 802.11n(40M) 5.3G	Bottom Surface	0	54	5270	19.00	18.99	1.013	100.23%	0.691	0.702	53
Chain A(Aux.A)											
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)		Plot page
									Measured	Reported	
WLAN 802.11ac(80M) 5.6G	Bottom Surface	0	106	5530	18.50	18.49	1.016	100.23%	0.640	0.652	54
Chain A(Aux.A)											
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)		Plot page
									Measured	Reported	
WLAN 802.11ac(80M) 5.8G	Bottom Surface	0	155	5775	18.50	18.49	1.016	100.23%	0.723	0.736	55

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Note:

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

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.

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### 3. Simultaneous Transmission Analysis

#### Simultaneous Transmission Scenarios:

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

Note:

1. Bluetooth and WLAN Main share the same antenna path, and BT can transmit with WLAN Aux simultaneously.
2. For 2.4/5GHz WLAN Main and Aux antennas, the maximum output power of each antenna during simultaneous transmission is the same with (or 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.

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### 3.1 Estimated SAR calculation

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

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

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

### 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  $(\text{SAR1} + \text{SAR2})^{1.5}/R_i$ , rounded to two decimal digits, and must be  $\leq 0.04$  for all antenna pairs in the configuration to qualify for 1-g SAR test exclusion.

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

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

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## Simultaneous Transmission Combination

		Reported SAR					Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Exposure Position		2	3	4	5	7	2+3	4+5	2+7	4+7	4+5+7
		2.4GHz WLAN Ant Main	2.4GHz WLAN Ant Aux	5GHz WLAN Ant Main	5GHz WLAN Ant Aux	Bluetooth Ant Aux	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)
Bottom Surface	0	0.352	0.193	0.763	0.736	0.030	0.545	1.499	0.382	0.793	1.529

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## 4. Instruments List

Manufacturer	Device	Type	Serial number	Date of last calibration	Date of next calibration
SPEAG	Dosimetric E-Field Probe	EX3DV4	7509	Apr.26,2021	Apr.25,2022
SPEAG	System Validation Dipole	D2450V2	727	Apr.14,2021	Apr.13,2022
		D5GHzV2	1023	Jan.27,2022	Jan.26,2023
SPEAG	Data acquisition Electronics	DAE4	1336	Aug.20,2021	Aug.19,2022
SPEAG	Software	DASY 52 V52.10.4	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	1001	Jan.26,2022	Jan.25,2023
Agilent	Dual-directional coupler	772D	MY46151242	Aug.16.2021	Aug.15.2022
		778D	MY48220468	Aug.16.2021	Aug.15.2022
Agilent	Signal Generator	N5181A	MY50141235	May.30,2021	May.29,2022
Agilent	Power Meter	E4417A	MY51410006	Mar.23,2021	Mar.22,2022
Agilent	Power Sensor	E9301H	MY51470001	Mar.23,2021	Mar.22,2022
			MY51470002	Mar.23,2021	Mar.22,2022
TECPEL	Digital thermometer	DTM-303A	TP130074	Apr.26,2021	Apr.25,2022

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## 5. Measurements

Date: 2022/3/1

Report No. : E5/2022/20008

**WLAN 802.11b\_Body\_Bottom Surface\_CH 6\_0mm\_Main**

Communication System: WLAN; Frequency: 2437 MHz; Duty Cycle: 1:1.007

Medium parameters used:  $f = 2437$  MHz;  $\sigma = 1.82$  S/m;  $\epsilon_r = 39.748$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Ambient temperature: 22.5°C; Liquid temperature: 21.7°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(8.18, 8.18, 8.18); Calibrated: 2021/4/26
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2021/8/20
- Phantom: ELI
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Area Scan (71x111x1):** Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 0.487 W/kg

**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 11.54 V/m; Power Drift = 0.01 dB

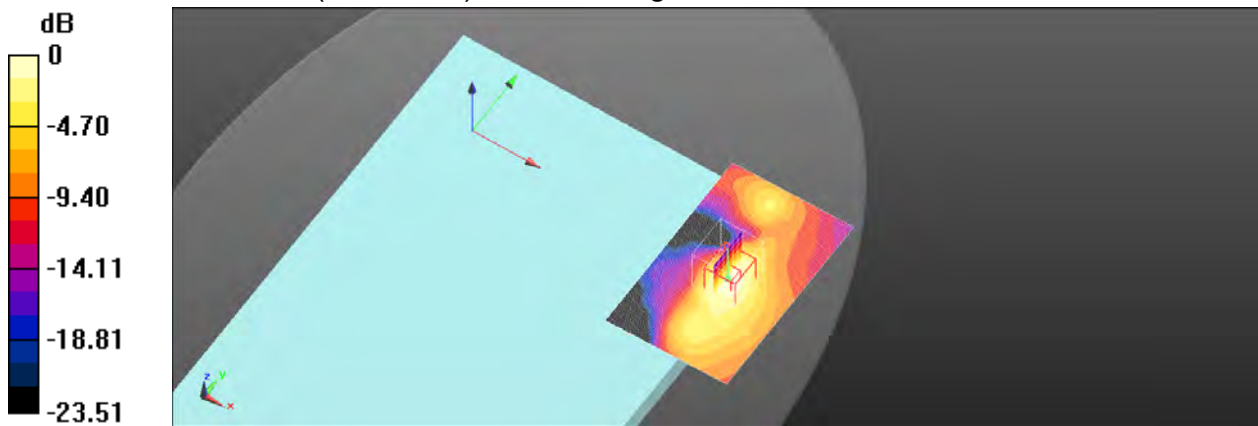
Peak SAR (extrapolated) = 0.657 W/kg

**SAR(1 g) = 0.348 W/kg; SAR(10 g) = 0.175 W/kg**

Smallest distance from peaks to all points 3 dB below = 10 mm

Ratio of SAR at M2 to SAR at M1 = 54.2%

Maximum value of SAR (measured) = 0.510 W/kg



0 dB = 0.510 W/kg = -2.92 dBW/kg

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Date: 2022/3/2

**Report No. : E5/2022/20008****WLAN 802.11n(40M) 5.2G\_Body\_Bottom Surface\_CH 46\_0mm\_Main**

Communication System: WLAN; Frequency: 5230 MHz; Duty Cycle: 1:1.013

Medium parameters used:  $f = 5230$  MHz;  $\sigma = 4.748$  S/m;  $\epsilon_r = 36.476$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Ambient temperature: 22.4°C; Liquid temperature: 21.6°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(5.7, 5.7, 5.7); Calibrated: 2021/4/26
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2021/8/20
- Phantom: ELI
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Area Scan (81x121x1):** Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 1.34 W/kg

**Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 12.32 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 2.04 W/kg

**SAR(1 g) = 0.644 W/kg; SAR(10 g) = 0.231 W/kg**

Smallest distance from peaks to all points 3 dB below = 8.6 mm

Ratio of SAR at M2 to SAR at M1 = 60%

Maximum value of SAR (measured) = 1.18 W/kg

**Zoom Scan (7x7x12)/Cube 1:** Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 12.32 V/m; Power Drift = 0.02 dB

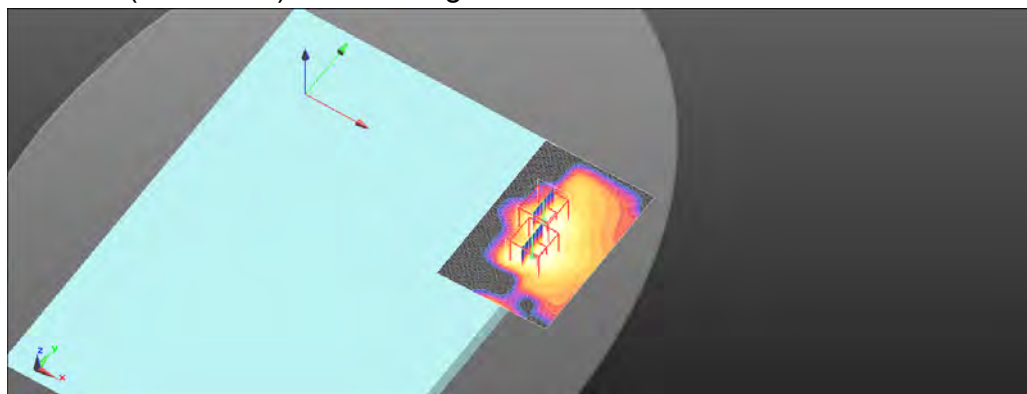
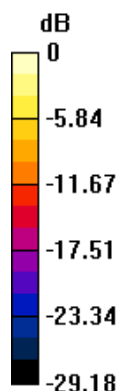
Peak SAR (extrapolated) = 1.83 W/kg

**SAR(1 g) = 0.559 W/kg; SAR(10 g) = 0.206 W/kg**

Smallest distance from peaks to all points 3 dB below = 8.6 mm

Ratio of SAR at M2 to SAR at M1 = 59.6%

Maximum value of SAR (measured) = 1.02 W/kg



0 dB = 1.02 W/kg = 0.07 dBW/kg

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Date: 2022/3/2

**Report No. : E5/2022/20008**
**WLAN 802.11n(40M) 5.3G\_Body\_Bottom Surface\_CH 54\_0mm\_Main**

Communication System: WLAN; Frequency: 5270 MHz; Duty Cycle: 1:1.013

Medium parameters used:  $f = 5270 \text{ MHz}$ ;  $\sigma = 4.789 \text{ S/m}$ ;  $\epsilon_r = 36.431$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Ambient temperature: 22.4°C; Liquid temperature: 21.6°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(5.45, 5.45, 5.45); Calibrated: 2021/4/26
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2021/8/20
- Phantom: ELI
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Area Scan (81x121x1):** Interpolated grid:  $dx=10 \text{ mm}$ ,  $dy=10 \text{ mm}$ 

Maximum value of SAR (interpolated) = 1.52 W/kg

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

Reference Value = 10.77 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 2.28 W/kg

**SAR(1 g) = 0.713 W/kg; SAR(10 g) = 0.254 W/kg**

Smallest distance from peaks to all points 3 dB below = 8.9 mm

Ratio of SAR at M2 to SAR at M1 = 59.9%

Maximum value of SAR (measured) = 1.31 W/kg

**Zoom Scan (7x7x12)/Cube 1:** Measurement grid:  $dx=4\text{mm}$ ,  $dy=4\text{mm}$ ,  $dz=2\text{mm}$ 

Reference Value = 10.77 V/m; Power Drift = 0.03 dB

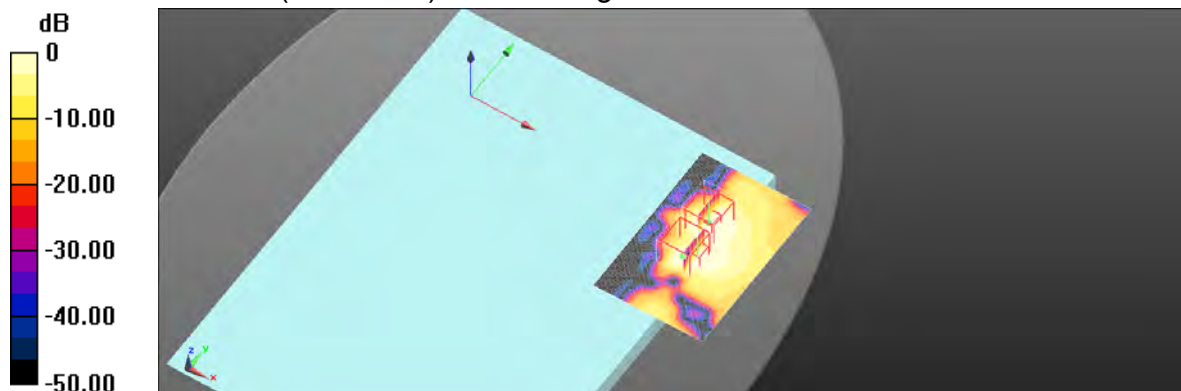
Peak SAR (extrapolated) = 1.93 W/kg

**SAR(1 g) = 0.574 W/kg; SAR(10 g) = 0.169 W/kg**

Smallest distance from peaks to all points 3 dB below = 8.8 mm

Ratio of SAR at M2 to SAR at M1 = 59.4%

Maximum value of SAR (measured) = 1.07 W/kg



0 dB = 1.07 W/kg = 0.28 dBW/kg

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Date: 2022/3/3

**Report No. : E5/2022/20008**
**WLAN 802.11ac(80M) 5.6G\_Body\_Bottom Surface\_CH 138\_0mm\_Main**

Communication System: WLAN; Frequency: 5690 MHz; Duty Cycle: 1:1.016

Medium parameters used:  $f = 5690 \text{ MHz}$ ;  $\sigma = 5.225 \text{ S/m}$ ;  $\epsilon_r = 35.951$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Ambient temperature:  $22.1^\circ\text{C}$ ; Liquid temperature:  $21.8^\circ\text{C}$ 

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(5.1, 5.1, 5.1); Calibrated: 2021/4/26
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2021/8/20
- Phantom: ELI
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Area Scan (81x121x1):** Interpolated grid:  $dx=10 \text{ mm}$ ,  $dy=10 \text{ mm}$ 

Maximum value of SAR (interpolated) =  $1.64 \text{ W/kg}$ 
**Zoom Scan (7x7x12)/Cube 0:** Measurement grid:  $dx=4\text{mm}$ ,  $dy=4\text{mm}$ ,  $dz=2\text{mm}$ 

Reference Value =  $9.56 \text{ V/m}$ ; Power Drift =  $0.04 \text{ dB}$ 

Peak SAR (extrapolated) =  $2.72 \text{ W/kg}$ 
**SAR(1 g) =  $0.749 \text{ W/kg}$ ; SAR(10 g) =  $0.262 \text{ W/kg}$** 

Smallest distance from peaks to all points 3 dB below =  $8.4 \text{ mm}$ 

Ratio of SAR at M2 to SAR at M1 =  $55.7\%$ 

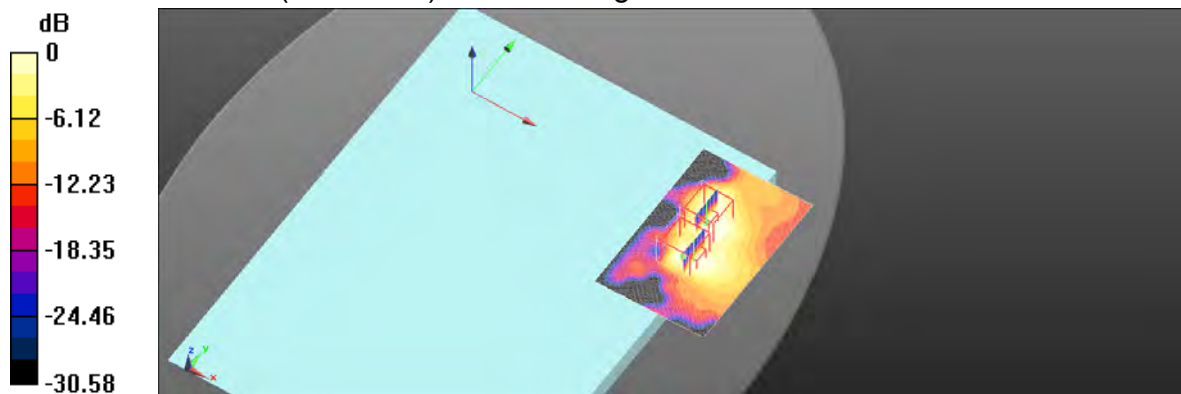
Maximum value of SAR (measured) =  $1.44 \text{ W/kg}$ 
**Zoom Scan (7x7x12)/Cube 1:** Measurement grid:  $dx=4\text{mm}$ ,  $dy=4\text{mm}$ ,  $dz=2\text{mm}$ 

Reference Value =  $9.56 \text{ V/m}$ ; Power Drift =  $0.04 \text{ dB}$ 

Peak SAR (extrapolated) =  $1.97 \text{ W/kg}$ 
**SAR(1 g) =  $0.524 \text{ W/kg}$ ; SAR(10 g) =  $0.167 \text{ W/kg}$** 

Smallest distance from peaks to all points 3 dB below =  $8.8 \text{ mm}$ 

Ratio of SAR at M2 to SAR at M1 =  $54.8\%$ 

Maximum value of SAR (measured) =  $0.965 \text{ W/kg}$ 

 $0 \text{ dB} = 0.965 \text{ W/kg} = -0.16 \text{ dBW/kg}$ 

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Date: 2022/3/3

**Report No. : E5/2022/20008**
**WLAN 802.11ac(80M) 5.8G\_Body\_Bottom Surface\_CH 155\_0mm\_Main**

Communication System: WLAN; Frequency: 5775 MHz; Duty Cycle: 1:1.016

Medium parameters used:  $f = 5775 \text{ MHz}$ ;  $\sigma = 5.313 \text{ S/m}$ ;  $\epsilon_r = 35.854$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Ambient temperature:  $22.1^\circ\text{C}$ ; Liquid temperature:  $21.8^\circ\text{C}$ 

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(5.2, 5.2, 5.2); Calibrated: 2021/4/26
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2021/8/20
- Phantom: ELI
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Area Scan (81x121x1):** Interpolated grid:  $dx=10 \text{ mm}$ ,  $dy=10 \text{ mm}$ 

Maximum value of SAR (interpolated) =  $1.63 \text{ W/kg}$ 
**Zoom Scan (7x7x12)/Cube 0:** Measurement grid:  $dx=4\text{mm}$ ,  $dy=4\text{mm}$ ,  $dz=2\text{mm}$ 

Reference Value =  $8.71 \text{ V/m}$ ; Power Drift =  $0.05 \text{ dB}$ 

Peak SAR (extrapolated) =  $2.78 \text{ W/kg}$ 
**SAR(1 g) =  $0.740 \text{ W/kg}$ ; SAR(10 g) =  $0.255 \text{ W/kg}$** 

Smallest distance from peaks to all points 3 dB below =  $7.4 \text{ mm}$ 

Ratio of SAR at M2 to SAR at M1 =  $54.5\%$ 

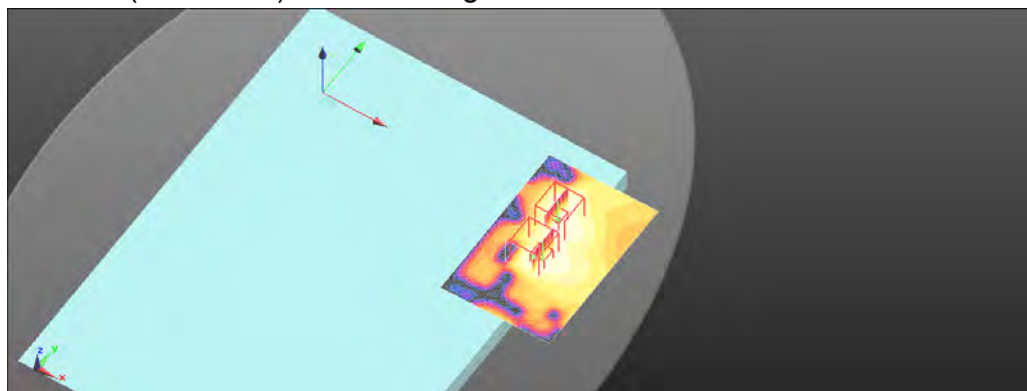
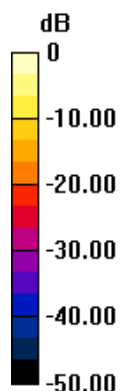
Maximum value of SAR (measured) =  $1.41 \text{ W/kg}$ 
**Zoom Scan (7x7x12)/Cube 1:** Measurement grid:  $dx=4\text{mm}$ ,  $dy=4\text{mm}$ ,  $dz=2\text{mm}$ 

Reference Value =  $8.71 \text{ V/m}$ ; Power Drift =  $0.05 \text{ dB}$ 

Peak SAR (extrapolated) =  $1.89 \text{ W/kg}$ 
**SAR(1 g) =  $0.491 \text{ W/kg}$ ; SAR(10 g) =  $0.156 \text{ W/kg}$** 

Smallest distance from peaks to all points 3 dB below =  $8 \text{ mm}$ 

Ratio of SAR at M2 to SAR at M1 =  $53.2\%$ 

Maximum value of SAR (measured) =  $0.917 \text{ W/kg}$ 

 $0 \text{ dB} = 0.917 \text{ W/kg} = -0.38 \text{ dBW/kg}$ 

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Date: 2022/3/1

**Report No. : E5/2022/20008****WLAN 802.11b\_Body\_Bottom Surface\_CH 6\_0mm\_Aux**

Communication System: WLAN; Frequency: 2437 MHz; Duty Cycle: 1:1.007

Medium parameters used:  $f = 2437 \text{ MHz}$ ;  $\sigma = 1.82 \text{ S/m}$ ;  $\epsilon_r = 39.748$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Ambient temperature: 22.5°C; Liquid temperature: 21.7°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(8.18, 8.18, 8.18); Calibrated: 2021/4/26
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2021/8/20
- Phantom: ELI
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Area Scan (71x101x1):** Interpolated grid:  $dx=12 \text{ mm}$ ,  $dy=12 \text{ mm}$ 

Maximum value of SAR (interpolated) = 0.286 W/kg

**Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$ 

Reference Value = 1.64 V/m; Power Drift = -0.04 dB

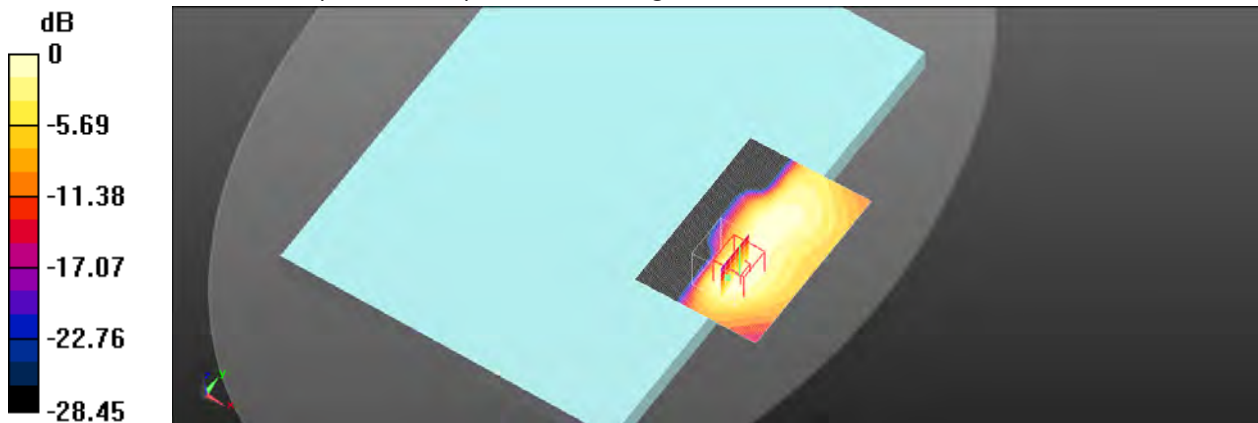
Peak SAR (extrapolated) = 0.338 W/kg

**SAR(1 g) = 0.191 W/kg; SAR(10 g) = 0.103 W/kg**

Smallest distance from peaks to all points 3 dB below = 11 mm

Ratio of SAR at M2 to SAR at M1 = 57.2%

Maximum value of SAR (measured) = 0.263 W/kg



0 dB = 0.263 W/kg = -5.80 dBW/kg

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Date: 2022/3/1

**Report No. : E5/2022/20008**
**Bluetooth(GFSK)\_Body\_Bottom Surface\_CH 78\_0mm\_Aux**

Communication System: Bluetooth; Frequency: 2480 MHz; Duty Cycle: 1:1.295

Medium parameters used:  $f = 2480 \text{ MHz}$ ;  $\sigma = 1.858 \text{ S/m}$ ;  $\epsilon_r = 39.687$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Ambient temperature: 22.5°C; Liquid temperature: 21.7°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(8.18, 8.18, 8.18); Calibrated: 2021/4/26
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2021/8/20
- Phantom: ELI
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Area Scan (71x101x1):** Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 0.0884 W/kg

**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.625 V/m; Power Drift = -0.01 dB

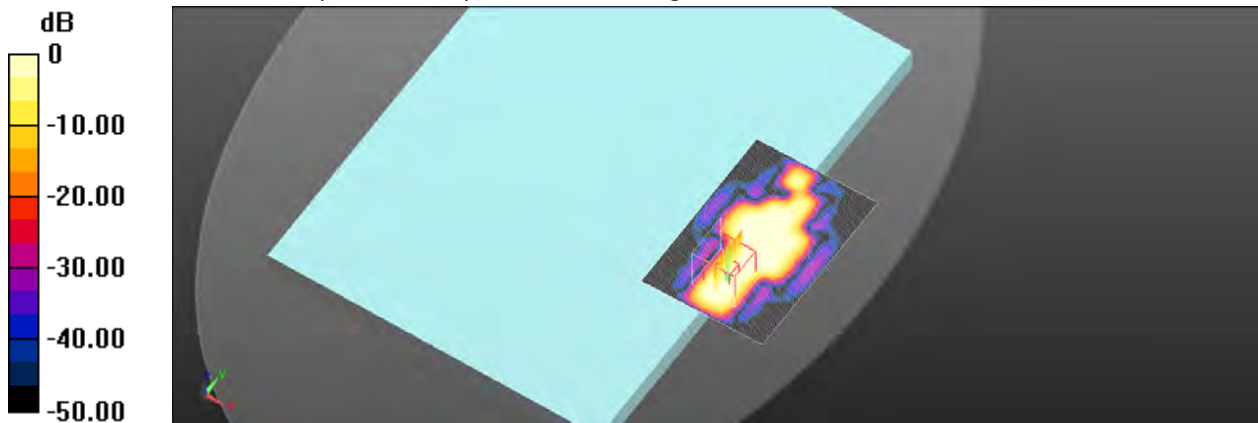
Peak SAR (extrapolated) = 0.0400 W/kg

**SAR(1 g) = 0.021 W/kg; SAR(10 g) = 0.010 W/kg**

Smallest distance from peaks to all points 3 dB below = 8.8 mm

Ratio of SAR at M2 to SAR at M1 = 50.4%

Maximum value of SAR (measured) = 0.0290 W/kg



0 dB = 0.0290 W/kg = -15.38 dBW/kg

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Date: 2022/3/2

**Report No. : E5/2022/20008**
**WLAN 802.11n(40M) 5.2G\_Body\_Bottom Surface\_CH 46\_0mm\_Aux**

Communication System: WLAN; Frequency: 5230 MHz; Duty Cycle: 1:1.013

Medium parameters used:  $f = 5230 \text{ MHz}$ ;  $\sigma = 4.748 \text{ S/m}$ ;  $\epsilon_r = 36.476$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Ambient temperature: 22.4°C; Liquid temperature: 21.6°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(5.7, 5.7, 5.7); Calibrated: 2021/4/26
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2021/8/20
- Phantom: ELI
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Area Scan (81x121x1):** Interpolated grid:  $dx=10 \text{ mm}$ ,  $dy=10 \text{ mm}$ 

Maximum value of SAR (interpolated) = 1.39 W/kg

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

Reference Value = 2.66 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 2.18 W/kg

**SAR(1 g) = 0.688 W/kg; SAR(10 g) = 0.209 W/kg**

Smallest distance from peaks to all points 3 dB below = 8.5 mm

Ratio of SAR at M2 to SAR at M1 = 59.6%

Maximum value of SAR (measured) = 1.23 W/kg

**Zoom Scan (7x7x12)/Cube 1:** Measurement grid:  $dx=4\text{mm}$ ,  $dy=4\text{mm}$ ,  $dz=2\text{mm}$ 

Reference Value = 2.66 V/m; Power Drift = -0.03 dB

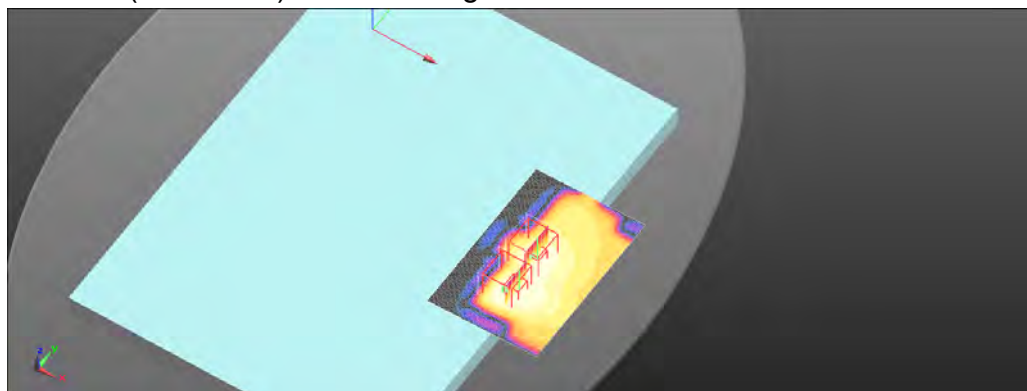
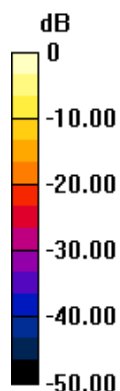
Peak SAR (extrapolated) = 1.77 W/kg

**SAR(1 g) = 0.529 W/kg; SAR(10 g) = 0.182 W/kg**

Smallest distance from peaks to all points 3 dB below = 9.3 mm

Ratio of SAR at M2 to SAR at M1 = 58.2%

Maximum value of SAR (measured) = 0.975 W/kg



0 dB = 0.975 W/kg = -0.11 dBW/kg

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Date: 2022/3/2

**Report No. : E5/2022/20008**
**WLAN 802.11n(40M) 5.3G\_Body\_Bottom Surface\_CH 54\_0mm\_Aux**

Communication System: WLAN; Frequency: 5270 MHz; Duty Cycle: 1:1.013

Medium parameters used:  $f = 5270 \text{ MHz}$ ;  $\sigma = 4.789 \text{ S/m}$ ;  $\epsilon_r = 36.431$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Ambient temperature:  $22.4^\circ\text{C}$ ; Liquid temperature:  $21.6^\circ\text{C}$ 

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(5.45, 5.45, 5.45); Calibrated: 2021/4/26
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2021/8/20
- Phantom: ELI
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Area Scan (81x121x1):** Interpolated grid:  $dx=10 \text{ mm}$ ,  $dy=10 \text{ mm}$ 

Maximum value of SAR (interpolated) =  $1.40 \text{ W/kg}$ 
**Zoom Scan (7x7x12)/Cube 0:** Measurement grid:  $dx=4\text{mm}$ ,  $dy=4\text{mm}$ ,  $dz=2\text{mm}$ 

Reference Value =  $3.14 \text{ V/m}$ ; Power Drift =  $-0.02 \text{ dB}$ 

Peak SAR (extrapolated) =  $2.21 \text{ W/kg}$ 
**SAR(1 g) =  $0.691 \text{ W/kg}$ ; SAR(10 g) =  $0.213 \text{ W/kg}$** 

Smallest distance from peaks to all points 3 dB below =  $9.1 \text{ mm}$ 

Ratio of SAR at M2 to SAR at M1 =  $60.5\%$ 

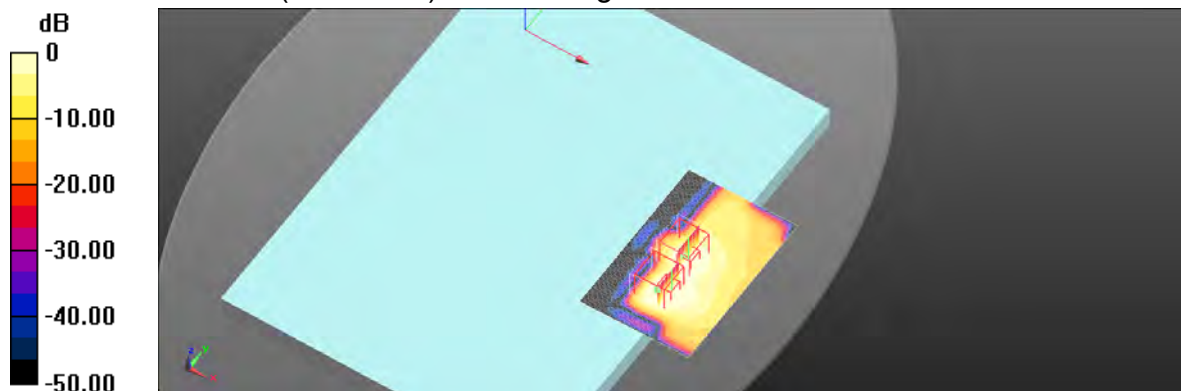
Maximum value of SAR (measured) =  $1.21 \text{ W/kg}$ 
**Zoom Scan (7x7x12)/Cube 1:** Measurement grid:  $dx=4\text{mm}$ ,  $dy=4\text{mm}$ ,  $dz=2\text{mm}$ 

Reference Value =  $3.14 \text{ V/m}$ ; Power Drift =  $-0.02 \text{ dB}$ 

Peak SAR (extrapolated) =  $2.01 \text{ W/kg}$ 
**SAR(1 g) =  $0.591 \text{ W/kg}$ ; SAR(10 g) =  $0.196 \text{ W/kg}$** 

Smallest distance from peaks to all points 3 dB below =  $9.4 \text{ mm}$ 

Ratio of SAR at M2 to SAR at M1 =  $57.8\%$ 

Maximum value of SAR (measured) =  $1.10 \text{ W/kg}$ 

 $0 \text{ dB} = 1.10 \text{ W/kg} = 0.40 \text{ dBW/kg}$ 

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Date: 2022/3/3

**Report No. : E5/2022/20008****WLAN 802.11ac(80M) 5.6G\_Body\_Bottom Surface\_CH 106\_0mm\_Aux**

Communication System: WLAN; Frequency: 5530 MHz; Duty Cycle: 1:1.016

Medium parameters used:  $f = 5530$  MHz;  $\sigma = 5.06$  S/m;  $\epsilon_r = 36.134$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Ambient temperature: 22.1°C; Liquid temperature: 21.8°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(5.1, 5.1, 5.1); Calibrated: 2021/4/26
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2021/8/20
- Phantom: ELI
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Area Scan (81x121x1):** Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 1.28 W/kg

**Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 4.91 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 2.31 W/kg

**SAR(1 g) = 0.640 W/kg; SAR(10 g) = 0.218 W/kg**

Smallest distance from peaks to all points 3 dB below = 8.9 mm

Ratio of SAR at M2 to SAR at M1 = 55.4%

Maximum value of SAR (measured) = 1.20 W/kg

**Zoom Scan (7x7x12)/Cube 1:** Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 4.91 V/m; Power Drift = -0.05 dB

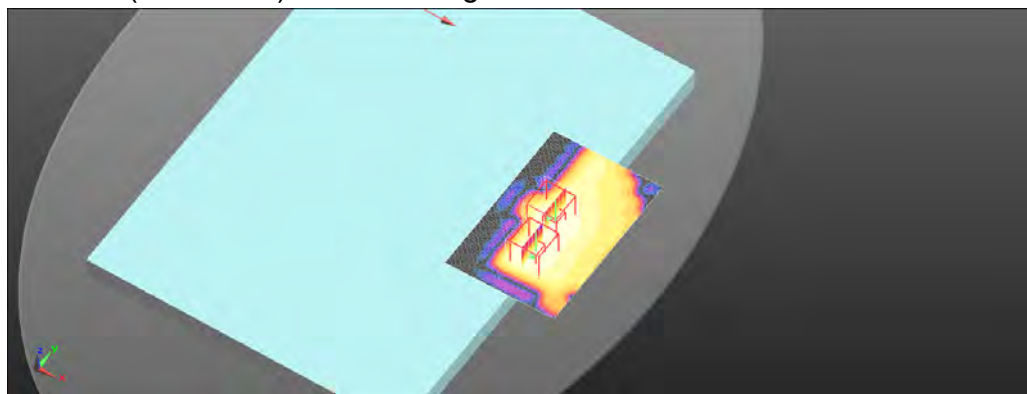
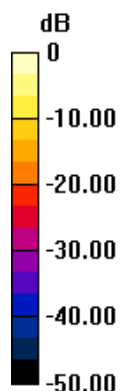
Peak SAR (extrapolated) = 1.67 W/kg

**SAR(1 g) = 0.479 W/kg; SAR(10 g) = 0.175 W/kg**

Smallest distance from peaks to all points 3 dB below = 9.3 mm

Ratio of SAR at M2 to SAR at M1 = 56.7%

Maximum value of SAR (measured) = 0.878 W/kg



0 dB = 0.878 W/kg = -0.57 dBW/kg

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Date: 2022/3/3

**Report No. : E5/2022/20008**
**WLAN 802.11ac(80M) 5.8G\_Body\_Bottom Surface\_CH 155\_0mm\_Aux**

Communication System: WLAN; Frequency: 5775 MHz; Duty Cycle: 1:1.016

Medium parameters used:  $f = 5775 \text{ MHz}$ ;  $\sigma = 5.313 \text{ S/m}$ ;  $\epsilon_r = 35.854$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Ambient temperature:  $22.1^\circ\text{C}$ ; Liquid temperature:  $21.8^\circ\text{C}$ 

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(5.2, 5.2, 5.2); Calibrated: 2021/4/26
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2021/8/20
- Phantom: ELI
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Area Scan (81x121x1):** Interpolated grid:  $dx=10 \text{ mm}$ ,  $dy=10 \text{ mm}$ 

Maximum value of SAR (interpolated) =  $1.52 \text{ W/kg}$ 
**Zoom Scan (7x7x12)/Cube 0:** Measurement grid:  $dx=4\text{mm}$ ,  $dy=4\text{mm}$ ,  $dz=2\text{mm}$ 

Reference Value =  $5.25 \text{ V/m}$ ; Power Drift =  $0.03 \text{ dB}$ 

Peak SAR (extrapolated) =  $2.74 \text{ W/kg}$ 
**SAR(1 g) =  $0.723 \text{ W/kg}$ ; SAR(10 g) =  $0.240 \text{ W/kg}$** 

Smallest distance from peaks to all points 3 dB below =  $8.2 \text{ mm}$ 

Ratio of SAR at M2 to SAR at M1 =  $53.5\%$ 

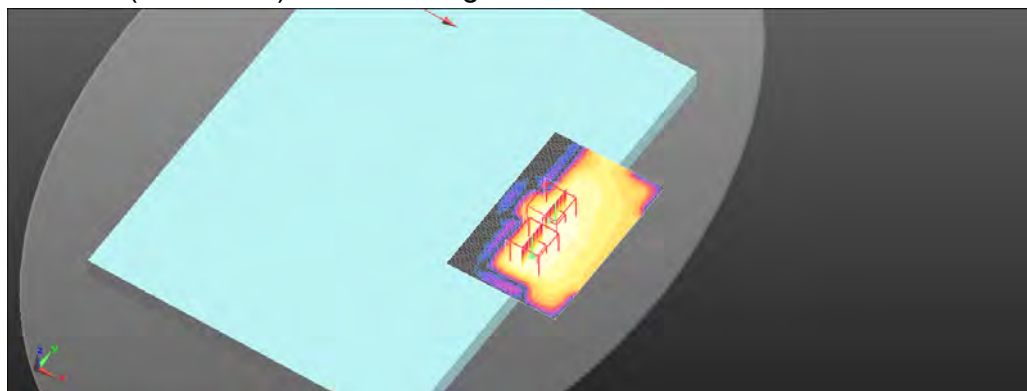
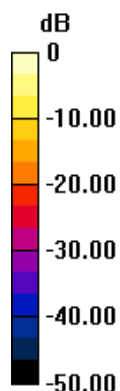
Maximum value of SAR (measured) =  $1.34 \text{ W/kg}$ 
**Zoom Scan (7x7x12)/Cube 1:** Measurement grid:  $dx=4\text{mm}$ ,  $dy=4\text{mm}$ ,  $dz=2\text{mm}$ 

Reference Value =  $5.25 \text{ V/m}$ ; Power Drift =  $0.03 \text{ dB}$ 

Peak SAR (extrapolated) =  $1.88 \text{ W/kg}$ 
**SAR(1 g) =  $0.507 \text{ W/kg}$ ; SAR(10 g) =  $0.181 \text{ W/kg}$** 

Smallest distance from peaks to all points 3 dB below =  $9.7 \text{ mm}$ 

Ratio of SAR at M2 to SAR at M1 =  $54.5\%$ 

Maximum value of SAR (measured) =  $0.948 \text{ W/kg}$ 

 $0 \text{ dB} = 0.948 \text{ W/kg} = -0.23 \text{ dBW/kg}$ 

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## 6. SAR System Performance Verification

Date: 2022/3/1

Report No. : E5/2022/20008

Dipole 2450 MHz\_SN:727

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.831$  S/m;  $\epsilon_r = 39.725$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Ambient temperature: 22.5°C; Liquid temperature: 21.7°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(8.18, 8.18, 8.18); Calibrated: 2021/4/26
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2021/8/20
- Phantom: ELI
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Area Scan (71x91x1):** Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 19.2 W/kg

**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 101.4 V/m; Power Drift = -0.01 dB

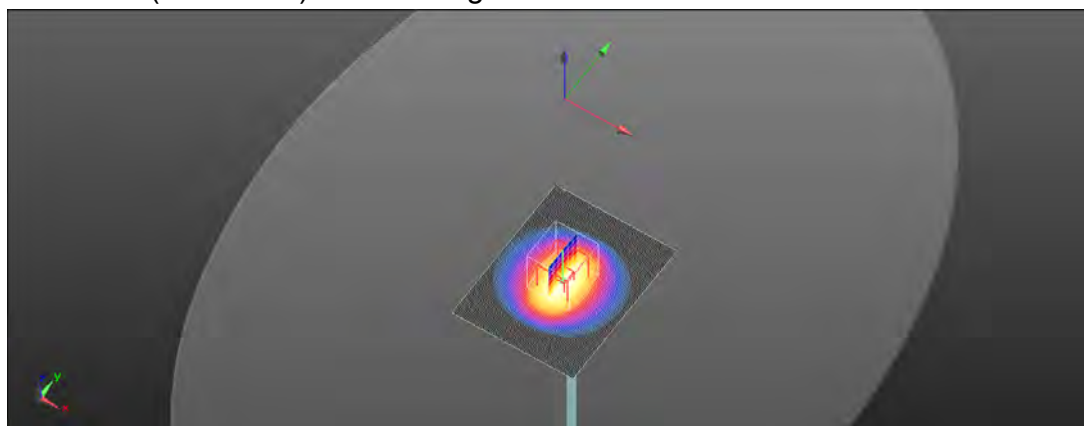
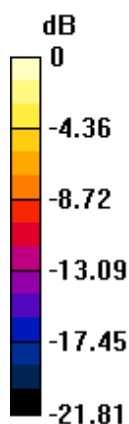
Peak SAR (extrapolated) = 24.7 W/kg

**SAR(1 g) = 13.47 W/kg; SAR(10 g) = 6.24 W/kg**

Smallest distance from peaks to all points 3 dB below = 9.2 mm

Ratio of SAR at M2 to SAR at M1 = 58.9%

Maximum value of SAR (measured) = 18.4 W/kg



0 dB = 18.4 W/kg = 12.64 dBW/kg

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Date: 2022/3/2

**Report No. : E5/2022/20008**
**Dipole 5250 MHz\_SN:1023**

Communication System: CW; Frequency: 5250 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 5250 \text{ MHz}$ ;  $\sigma = 4.768 \text{ S/m}$ ;  $\epsilon_r = 36.454$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Ambient temperature:  $22.4^\circ\text{C}$ ; Liquid temperature:  $21.6^\circ\text{C}$ 

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(5.7, 5.7, 5.7); Calibrated: 2021/4/26
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2021/8/20
- Phantom: ELI
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Area Scan (61x81x1):** Interpolated grid:  $dx=10 \text{ mm}$ ,  $dy=10 \text{ mm}$ 

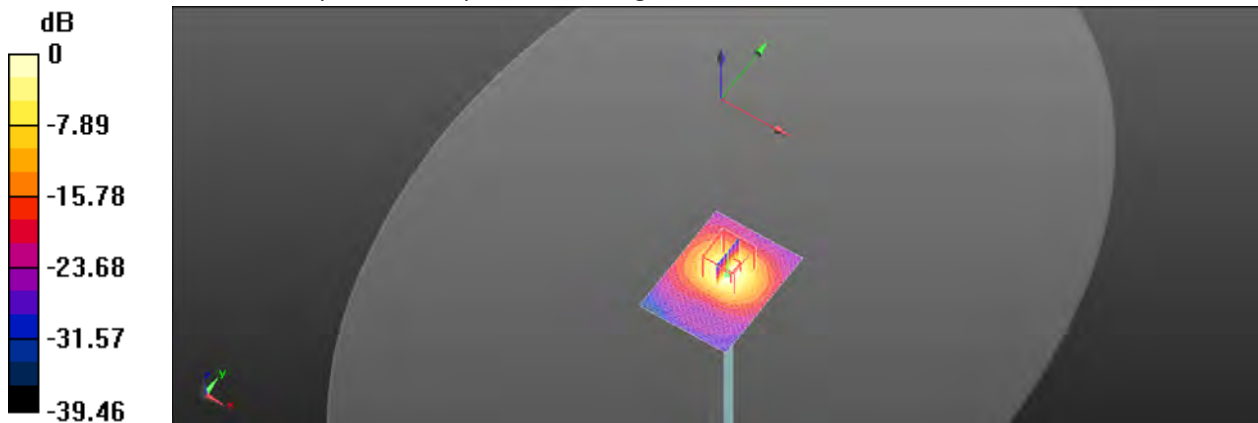
Maximum value of SAR (interpolated) =  $8.49 \text{ W/kg}$ 
**Zoom Scan (7x7x12)/Cube 0:** Measurement grid:  $dx=4\text{mm}$ ,  $dy=4\text{mm}$ ,  $dz=2\text{mm}$ 

Reference Value =  $31.22 \text{ V/m}$ ; Power Drift =  $-0.04 \text{ dB}$ 

Peak SAR (extrapolated) =  $15.2 \text{ W/kg}$ 
**SAR(1 g) =  $8.07 \text{ W/kg}$ ; SAR(10 g) =  $2.29 \text{ W/kg}$** 

Smallest distance from peaks to all points 3 dB below =  $7.2 \text{ mm}$ 

Ratio of SAR at M2 to SAR at M1 =  $56.1\%$ 

Maximum value of SAR (measured) =  $8.00 \text{ W/kg}$ 

 $0 \text{ dB} = 8.00 \text{ W/kg} = 9.03 \text{ dBW/kg}$ 

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Date: 2022/3/3

**Report No. : E5/2022/20008**
**Dipole 5600 MHz\_SN:1023**

Communication System: CW; Frequency: 5600 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 5600 \text{ MHz}$ ;  $\sigma = 5.132 \text{ S/m}$ ;  $\epsilon_r = 36.054$ ;  $\rho = 1230 \text{ kg/m}^3$ 

Phantom section: Flat Section

Ambient temperature:  $22.1^\circ\text{C}$ ; Liquid temperature:  $21.8^\circ\text{C}$ 

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(5.1, 5.1, 5.1); Calibrated: 2021/4/26
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2021/8/20
- Phantom: ELI
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Area Scan (61x81x1):** Interpolated grid:  $dx=10 \text{ mm}$ ,  $dy=10 \text{ mm}$ 

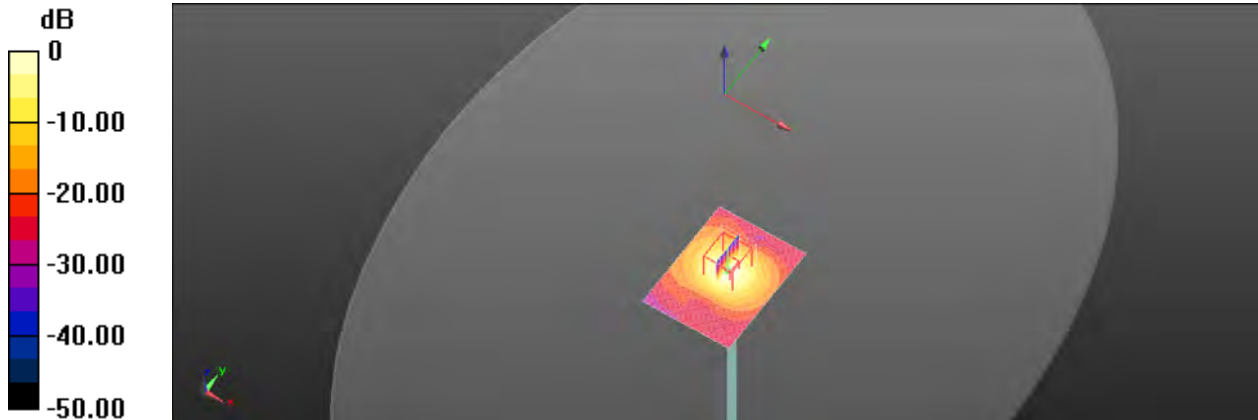
Maximum value of SAR (interpolated) =  $13.1 \text{ W/kg}$ 
**Zoom Scan (7x7x12)/Cube 0:** Measurement grid:  $dx=4\text{mm}$ ,  $dy=4\text{mm}$ ,  $dz=2\text{mm}$ 

Reference Value =  $50.29 \text{ V/m}$ ; Power Drift =  $-0.01 \text{ dB}$ 

Peak SAR (extrapolated) =  $27.1 \text{ W/kg}$ 
**SAR(1 g) =  $8.31 \text{ W/kg}$ ; SAR(10 g) =  $2.34 \text{ W/kg}$** 

Smallest distance from peaks to all points 3 dB below =  $7.4 \text{ mm}$ 

Ratio of SAR at M2 to SAR at M1 =  $57.4\%$ 

Maximum value of SAR (measured) =  $11.9 \text{ W/kg}$ 

 $0 \text{ dB} = 11.9 \text{ W/kg} = 10.77 \text{ dBW/kg}$ 

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Date: 2022/3/3

**Report No. : E5/2022/20008**
**Dipole 5750 MHz\_SN:1023**

Communication System: CW; Frequency: 5750 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 5750 \text{ MHz}$ ;  $\sigma = 5.287 \text{ S/m}$ ;  $\epsilon_r = 35.882$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Ambient temperature:  $22.1^\circ\text{C}$ ; Liquid temperature:  $21.8^\circ\text{C}$ 

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(5.2, 5.2, 5.2); Calibrated: 2021/4/26
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1336; Calibrated: 2021/8/20
- Phantom: ELI
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

**Area Scan (61x81x1):** Interpolated grid:  $dx=10 \text{ mm}$ ,  $dy=10 \text{ mm}$ 

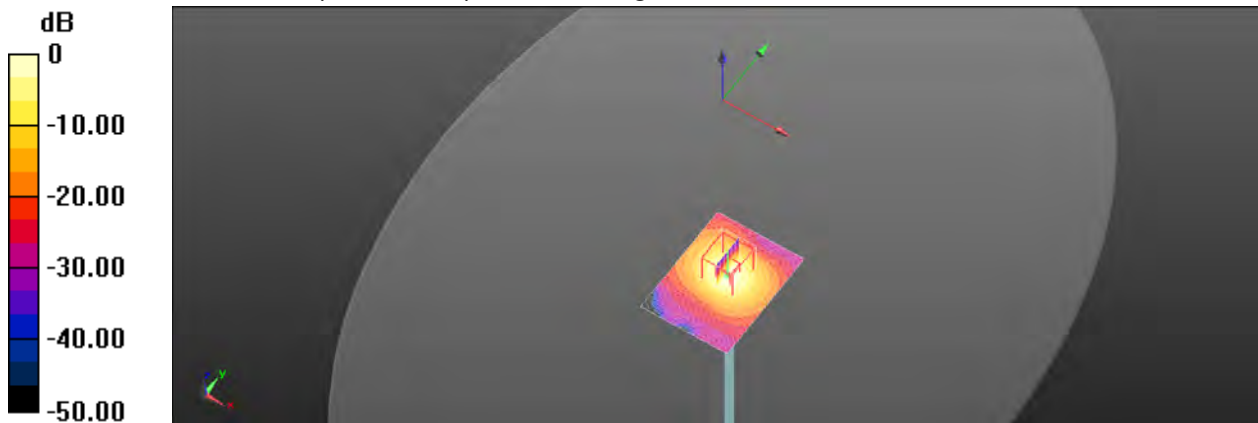
Maximum value of SAR (interpolated) =  $10.9 \text{ W/kg}$ 
**Zoom Scan (7x7x12)/Cube 0:** Measurement grid:  $dx=4\text{mm}$ ,  $dy=4\text{mm}$ ,  $dz=2\text{mm}$ 

Reference Value =  $37.64 \text{ V/m}$ ; Power Drift =  $-0.02 \text{ dB}$ 

Peak SAR (extrapolated) =  $22.1 \text{ W/kg}$ 
**SAR(1 g) =  $8.17 \text{ W/kg}$ ; SAR(10 g) =  $2.23 \text{ W/kg}$** 

Smallest distance from peaks to all points 3 dB below =  $7.4 \text{ mm}$ 

Ratio of SAR at M2 to SAR at M1 =  $50.7\%$ 

Maximum value of SAR (measured) =  $10.4 \text{ W/kg}$ 

 $0 \text{ dB} = 10.4 \text{ W/kg} = 10.16 \text{ dBW/kg}$ 

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## 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
<b>Measurement system</b>									
Probe calibration	6.55%	N	1	1	1	1	6.55%	6.55%	$\infty$
<b>Isotropy , Axial</b>	3.50%	R	$\sqrt{3}$	1.732	1	1	2.02%	2.02%	$\infty$
<b>Isotropy, Hemispherical</b>	9.60%	R	$\sqrt{3}$	1.732	1	1	5.54%	5.54%	$\infty$
Modulation Response	2.40%	R	$\sqrt{3}$	1.732	1	1	1.40%	1.40%	$\infty$
Boundary Effect	1.00%	R	$\sqrt{3}$	1.732	1	1	0.58%	0.58%	$\infty$
Linearity	4.70%	R	$\sqrt{3}$	1.732	1	1	2.71%	2.71%	$\infty$
Detection Limits	1.00%	R	$\sqrt{3}$	1.732	1	1	0.58%	0.58%	$\infty$
Readout Electronics	0.30%	N	1	1	1	1	0.30%	0.30%	$\infty$
Response time	0.80%	R	$\sqrt{3}$	1.732	1	1	0.46%	0.46%	$\infty$
Integration Time	2.60%	R	$\sqrt{3}$	1.732	1	1	1.50%	1.50%	$\infty$
<b>Measurement drift (class A evaluation)</b>	1.75%	R	$\sqrt{3}$	1.732	1	1	1.01%	1.01%	$\infty$
RF ambient condition - noise	3.00%	R	$\sqrt{3}$	1.732	1	1	1.73%	1.73%	$\infty$
RF ambient conditions - reflections	3.00%	R	$\sqrt{3}$	1.732	1	1	1.73%	1.73%	$\infty$
Probe positioner Mechanical restrictions	0.40%	R	$\sqrt{3}$	1.732	1	1	0.23%	0.23%	$\infty$
Probe Positioning with respect to phantom shell	2.90%	R	$\sqrt{3}$	1.732	1	1	1.67%	1.67%	$\infty$
Post-processing	1.00%	R	$\sqrt{3}$	1.732	1	1	0.58%	0.58%	$\infty$
Max SAR Eval	1.00%	R	$\sqrt{3}$	1.732	1	1	0.58%	0.58%	$\infty$
<b>Test Sample related</b>									
Test sample positioning	2.90%	N	1	1	1	1	2.90%	2.90%	M-1
Device Holder Uncertainty	3.60%	N	1	1	1	1	3.60%	3.60%	M-1
Drift of output power	5.00%	R	$\sqrt{3}$	1.732	1	1	2.89%	2.89%	$\infty$
<b>Phantom and Setup</b>									
Phantom Uncertainty	4.00%	R	$\sqrt{3}$	1.732	1	1	2.31%	2.31%	$\infty$
Liquid permittivity (mea.)	1.97%	N	1	1	0.64	0.43	1.26%	0.85%	M
Liquid Conductivity (mea.)	1.79%	N	1	1	0.6	0.49	1.07%	0.88%	M
Combined standard uncertainty		RSS					11.83%	11.77%	
Expant uncertainty (95% confidence interval), K=2							23.67%	23.54%	

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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
<b>Measurement system</b>									
Probe calibration	6.00%	N	1	1	1	1	6.00%	6.00%	∞
<b>Isotropy , Axial</b>	3.50%	R	$\sqrt{3}$	1.732	1	1	2.02%	2.02%	∞
<b>Isotropy, Hemispherical</b>	9.60%	R	$\sqrt{3}$	1.732	1	1	5.54%	5.54%	∞
Modulation Response	2.40%	R	$\sqrt{3}$	1.732	1	1	1.40%	1.40%	∞
Boundary Effect	1.00%	R	$\sqrt{3}$	1.732	1	1	0.58%	0.58%	∞
Linearity	4.70%	R	$\sqrt{3}$	1.732	1	1	2.71%	2.71%	∞
Detection Limits	1.00%	R	$\sqrt{3}$	1.732	1	1	0.58%	0.58%	∞
Readout Electronics	0.30%	N	1	1	1	1	0.30%	0.30%	∞
Response time	0.80%	R	$\sqrt{3}$	1.732	1	1	0.46%	0.46%	∞
Integration Time	2.60%	R	$\sqrt{3}$	1.732	1	1	1.50%	1.50%	∞
<b>Measurement drift (class A evaluation)</b>	1.75%	R	$\sqrt{3}$	1.732	1	1	1.01%	1.01%	∞
RF ambient condition - noise	3.00%	R	$\sqrt{3}$	1.732	1	1	1.73%	1.73%	∞
RF ambient conditions - reflections	3.00%	R	$\sqrt{3}$	1.732	1	1	1.73%	1.73%	∞
Probe positioner	0.40%	R	$\sqrt{3}$	1.732	1	1	0.23%	0.23%	∞
Mechanical restrictions									
Probe Positioning with respect to phantom shell	2.90%	R	$\sqrt{3}$	1.732	1	1	1.67%	1.67%	∞
Post-processing	1.00%	R	$\sqrt{3}$	1.732	1	1	0.58%	0.58%	∞
Max SAR Eval	1.00%	R	$\sqrt{3}$	1.732	1	1	0.58%	0.58%	∞
<b>Test Sample related</b>									
Test sample positioning	2.90%	N	1	1	1	1	2.90%	2.90%	M-1
Device Holder Uncertainty	3.60%	N	1	1	1	1	3.60%	3.60%	M-1
Drift of output power	5.00%	R	$\sqrt{3}$	1.732	1	1	2.89%	2.89%	∞
<b>Phantom and Setup</b>									
Phantom Uncertainty	4.00%	R	$\sqrt{3}$	1.732	1	1	2.31%	2.31%	∞
Liquid permittivity (mea.)	1.34%	N	1	1	0.64	0.43	0.86%	0.58%	M
Liquid Conductivity (mea.)	1.83%	N	1	1	0.6	0.49	1.10%	0.90%	M
Combined standard uncertainty		RSS					11.50%	11.46%	
Expant uncertainty (95% confidence interval), K=2							23.00%	22.92%	

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## Appendixes

**Refer to separated files for the following appendixes.**

**E5202220008 SAR\_Appendix A Photographs**

**E5202220008 SAR\_Appendix B DAE & Probe Cal. Certificate**

**E5202220008 SAR\_Appendix C Phantom Description & Dipole Cal. Certificate**

**- End of report -**

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