SAR TEST REPORT

Testing Laboratory 3702

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

Equipment Under Test	Clover Flex
Brand Name	clover
Model No.	C403
Company Name	Quanta Computer Inc.
Company Address	No. 188, Wenhua 2nd Road, Guishan District, Taoyuan City 33377, Taiwan
Standards	IEEE/ANSI C95.1-1992, IEEE 1528-2013
FCC ID	HFS-C403W
Date of Receipt	May 10, 2021
Date of Test(s)	Jun. 18, 2021 ~ Jun. 19, 2021
Date of Issue	Jul. 08, 2021

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	**Engineer / Bond Tsai**	**Asst. Manager / John Yeh**
Kimmy Chiou	Bond Tsai	John Yeh

Date: Jul. 08, 2021

Revision History

Report Number	Revision	Description	Issue Date
E5/2021/50006	Rev.00	Initial creation of document	Jul. 08, 2021

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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

Contents

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1. General Information

1.1 Testing Laboratory

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1.2 Details of Applicant

Company Name	Quanta Computer Inc.
Company Address	No. 188, Wenhua 2nd Road, Guishan District, Taoyuan City 33377, Taiwan

1.3 Description of EUT

Equipment Under Test	Clover Flex	
Brand Name	clover	
Model No.	C403	
FCC ID	HFS-C403W	
	☒WLAN802.11 a/b/g/n(20M/40M)/ac(20M/40M/80M) ☒Bluetooth	
	WLAN802.11 a/b/g/n(20M/40M)/ac(20M/40M/80M)	Refer to page 13-14
	Bluetooth	76.8%
	WLAN802.11 b/g/n(20M)	2412 – 2462
	WLAN802.11 n(40M)	2422 – 2452
	WLAN802.11 a/n(20M)/ac(20M) 5.2G	5180 – 5240
	WLAN802.11 n(40M)/ac(40M) 5.2G	5190 – 5230
	WLAN802.11 ac(80M) 5.2G	5210
	WLAN802.11 a/n(20M)/ac(20M) 5.3G	5260 – 5320
	WLAN802.11 n(40M)/ac(40M) 5.3G	5270 – 5310
	WLAN802.11 ac(80M) 5.3G	5290
	WLAN802.11 a/n/ac(20M) 5.6G	5500 – 5720
	WLAN802.11 n/ac(40M) 5.6G	5510 – 5710
	WLAN802.11 ac(80M) 5.6G	5530 – 5690
	WLAN802.11 a/n(20M)/ac(20M) 5.8G	5745 – 5825

TX Frequency Range (MHz)	WLAN802.11 n(40M)/ac(40M) 5.8G	5755	—	5795
	WLAN802.11 ac(80M) 5.8G	5775		
	Bluetooth	2402	—	2480
	WLAN802.11 b/g/n(20M)	1	—	11
	WLAN802.11 n(40M)	3	—	9
	WLAN802.11 a/n(20M)/ac(20M) 5.2G	36	—	48
	WLAN802.11 n(40M)/ac(40M) 5.2G	38	—	46
	WLAN802.11 ac(80M) 5.2G	42		
	WLAN802.11 a/n(20M)/ac(20M) 5.3G	52	—	64
	WLAN802.11 n(40M)/ac(40M) 5.3G	54	—	62
	WLAN802.11 ac(80M) 5.3G	58		
	WLAN802.11 a/n/ac(20M) 5.6G	100	—	144
	WLAN802.11 n/ac(40M) 5.6G	102	—	142
	WLAN802.11 ac(80M) 5.6G	106	—	138
	WLAN802.11 a/n(20M)/ac(20M) 5.8G	149	—	165
	WLAN802.11 n(40M)/ac(40M) 5.8G	151	—	159
	WLAN802.11 ac(80M) 5.8G	155		
	Bluetooth	0	—	78

Max. SAR (1g) (Unit: W/Kg)					
Mode	Band	Measured	Reported	Channel	Position
Body	WLAN 802.11b	0.14	0.15	1	Top side
	Bluetooth(GFSK)	0.02	0.02	78	Top side
	WLAN 802.11n(20M) 5.2G	1.02	1.03	48	Top side
	WLAN 802.11n(20M) 5.3G	1.06	1.13	64	Top side
	WLAN 802.11n(20M) 5.6G	1.05	1.09	116	Top side
	WLAN 802.11n(20M) 5.8G	1.12	1.13	157	Top side

Max. SAR (10g) (Unit: W/Kg)					
Mode	Band	Measured	Reported	Channel	Position
Product specific 10-g SAR	WLAN 802.11b	0.34	0.36	1	Top side
	Bluetooth(GFSK)	0.04	0.05	78	Top side
	WLAN 802.11n(20M) 5.2G	0.94	0.95	48	Top side
	WLAN 802.11n(20M) 5.3G	0.79	0.84	64	Top side
	WLAN 802.11n(20M) 5.6G	1.07	1.11	116	Top side
	WLAN 802.11n(20M) 5.8G	1.24	1.25	157	Top side

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

WiFi Antenna						
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
2450 MHz	802.11b	1	2412	1Mbps	17.50	17.26
		6	2437		17.50	17.24
		11	2462		17.50	17.19
	802.11g	1	2412	6Mbps	16.50	16.26
		6	2437		16.50	16.25
		11	2462		16.50	16.28
	802.11n20-HT0	1	2412	MCS0	17.00	16.68
		6	2437		17.00	16.66
		11	2462		17.00	16.64
	802.11n40-HT0	3	2422	MCS0	14.50	14.19
		6	2437		16.00	15.85
		9	2452		16.00	15.88

WiFi Antenna						
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
5.15-5.25 GHz	802.11a	36	5180	6Mbps	16.50	16.34
		44	5220		16.50	16.48
		48	5240		16.50	16.24
	802.11n20-HT0	36	5180	MCS0	17.50	17.25
		44	5220		17.50	17.47
		48	5240		17.50	17.49
	802.11ac20-VHT0	36	5180	MCS0	17.50	17.14
		44	5220		17.50	17.39
		48	5240		17.50	17.41
	802.11n40-HT0	38	5190	MCS0	15.00	14.86
		46	5230		16.50	16.48
	802.11ac40-VHT0	38	5190	MCS0	15.00	14.80
		46	5230		16.50	16.42
	802.11ac80-VHT0	42	5210	MCS0	15.00	14.68

WiFi Antenna						
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
5.25-5.35 GHz	802.11a	52	5260	6Mbps	16.50	16.33
		60	5300		16.50	16.29
		64	5320		16.50	16.33
	802.11n20-HT0	52	5260	MCS0	17.50	17.14
		60	5300		17.50	17.15
		64	5320		17.50	17.25
	802.11ac20-VHT0	52	5260	MCS0	17.50	17.04
		60	5300		17.50	17.06
		64	5320		17.50	17.17
	802.11n40-HT0	54	5270	MCS0	16.50	16.21
		62	5310		12.50	12.16
	802.11ac40-VHT0	54	5270	MCS0	16.50	16.14
		62	5310		12.50	12.13
	802.11ac80-VHT0	58	5290	MCS0	11.00	10.63

WiFi Antenna						
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
5600 MHz	802.11a	100	5500	6Mbps	16.50	16.33
		116	5580		16.50	16.47
		140	5700		16.50	16.49
		144	5720		16.50	16.48
	802.11n20-HT0	100	5500	MCS0	13.00	12.65
		116	5580		17.50	17.34
		140	5700		16.50	16.47
		144	5720		17.50	17.21
	802.11ac20-VHT0	100	5500	MCS0	13.00	12.60
		116	5580		17.50	17.27
		140	5700		16.50	16.42
		144	5720		17.50	17.13
	802.11n40-HT0	102	5510	MCS0	13.50	13.30
		110	5550		16.50	16.23
		134	5670		16.50	16.49
		142	5710		16.50	16.18
	802.11ac40-VHT0	102	5510	MCS0	13.50	13.25
		110	5550		16.50	16.12
		134	5670		16.50	16.46
		142	5710		16.50	16.11
	802.11ac80-VHT0	106	5530	MCS0	14.00	13.76
		122	5610		15.50	15.27
		138	5690		15.50	15.18

WiFi Antenna						
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
5800 MHz	802.11a	149	5745	6Mbps	16.50	16.46
		157	5785		16.50	16.49
		165	5825		16.50	16.45
	802.11n20-HT0	149	5745	MCS0	17.50	17.18
		157	5785		17.50	17.47
		165	5825		17.50	17.11
	802.11ac20-VHT0	149	5745	MCS0	17.50	17.04
		157	5785		17.50	17.38
		165	5825		17.50	17.04
	802.11n40-HT0	151	5755	MCS0	16.50	16.33
		159	5795		16.50	16.37
	802.11ac40-VHT0	151	5755	MCS0	16.50	16.24
		159	5795		16.50	16.33
	802.11ac80-VHT0	155	5775	MCS0	15.50	15.24

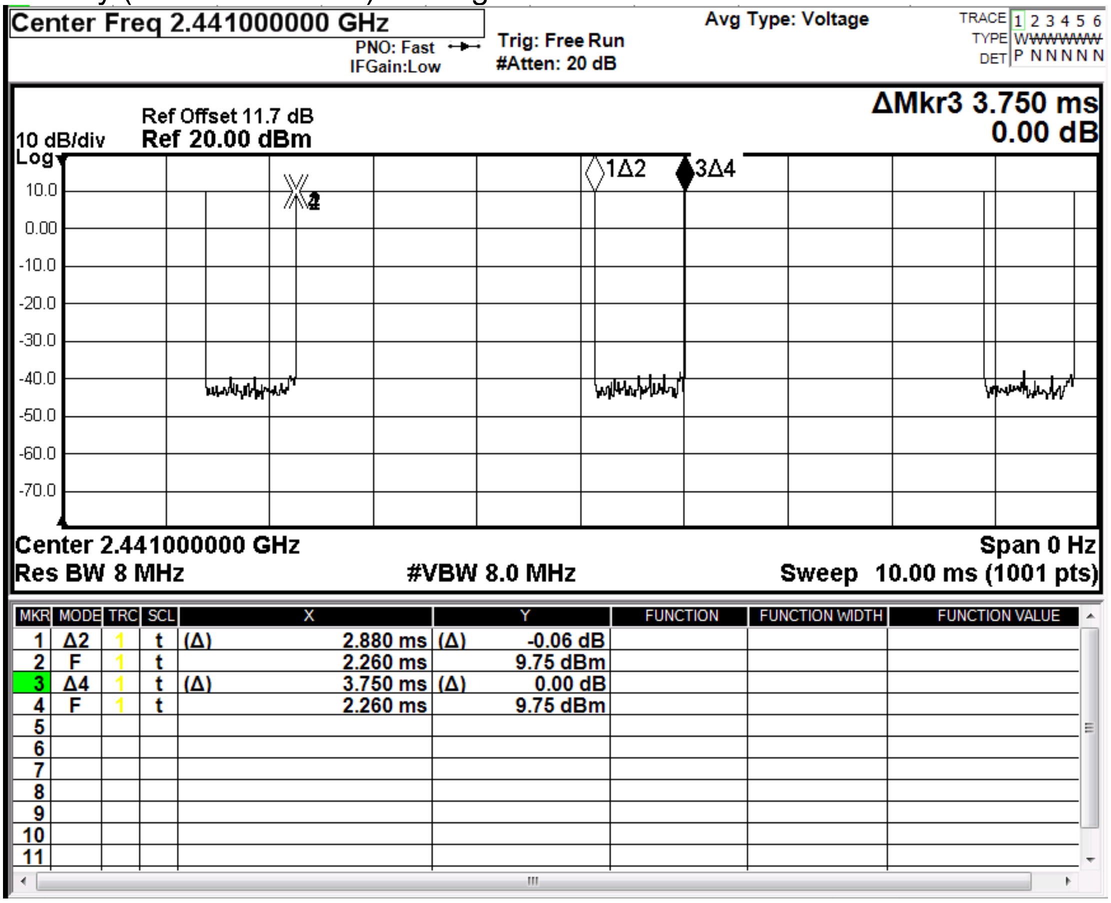
Bluetooth conducted power table:

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	7.00	6.84	4.50	3.65	4.50	3.64
	CH 39	2441	6.50	6.49	4.50	3.16	4.50	3.16
	CH 78	2480	7.50	7.02	4.50	4.04	4.50	4.09

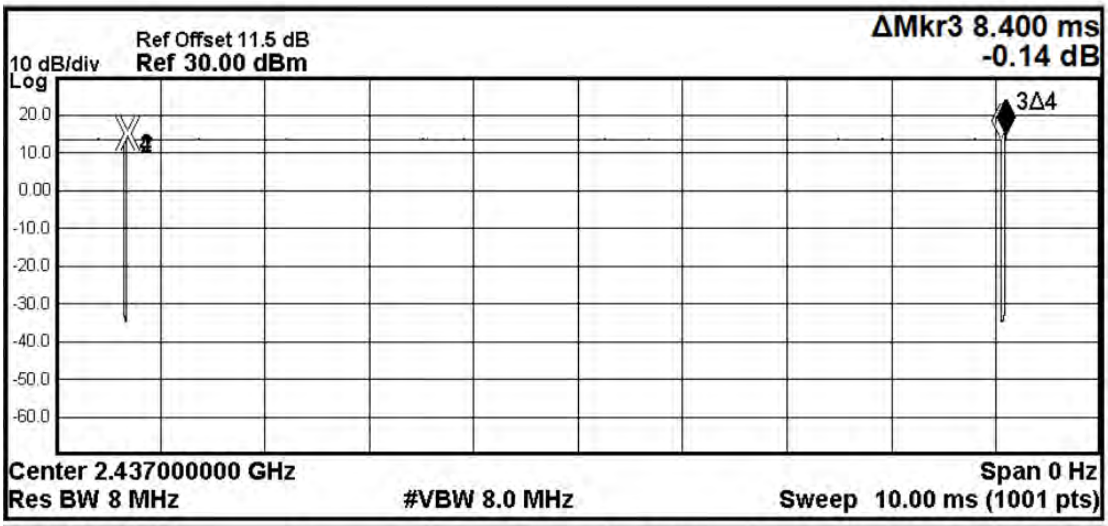
Mode	Channel	Frequency (MHz)	GFSK	
			Max. Rated Avg. Power + Max. Tolerance (dBm)	Average Output Power (dBm)
LE 1M	CH 00	2402	1	0.98
	CH 19	2440	1.5	1.07
	CH 39	2480	1.5	1.11

Mode	Channel	Frequency (MHz)	GFSK	
			Max. Rated Avg. Power + Max. Tolerance (dBm)	Average Output Power (dBm)
LE 2M	CH 00	2402	1.5	1.15
	CH 19	2440	1.5	1.11
	CH 39	2480	1.5	1.28

BT duty (2.88/3.75=0.768) Scaling Factor=1.302



2.4G b duty (8.36/8.40=0.995) Scaling Factor=1.005



MKR	MODE	TRC	SCL	X		Y		FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	Δ2	1	t	(Δ)	8.360 ms	(Δ)	-1.25 dB			
2	F	1	t		690.0 µs		14.75 dBm			
3	Δ4	1	t	(Δ)	8.400 ms	(Δ)	-0.14 dB			
4	F	1	t		690.0 µs		14.75 dBm			
5										
6										
7										
8										
9										
10										
11										

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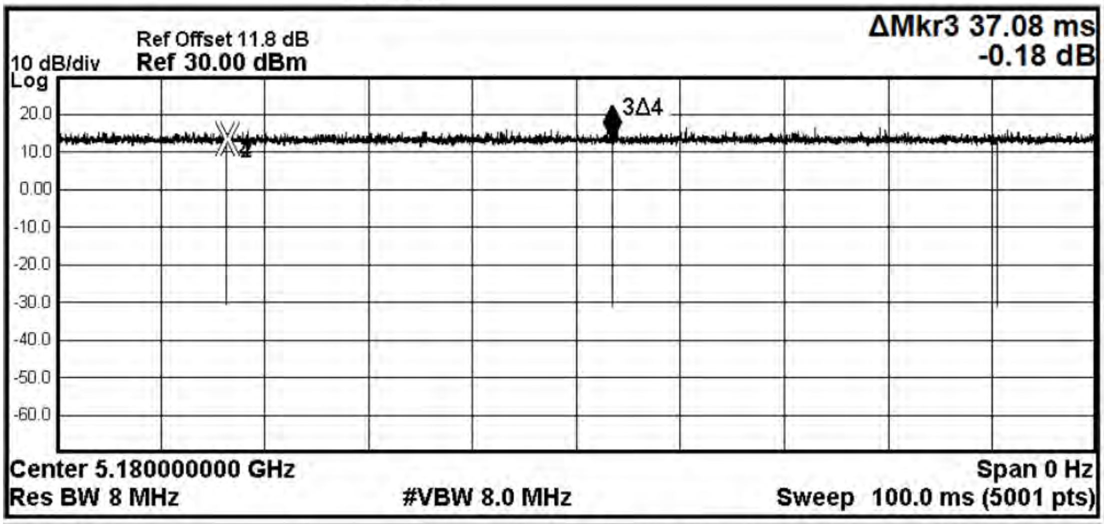
5G n(20M) duty (37.02/37.08=0.998) Scaling Factor=1.002



MKR	MODE	TRC	SCL	X		Y		FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	Δ2	1	t	(Δ)	37.02 ms	(Δ)	-0.32 dB			
2	F	1	t		16.38 ms		13.21 dBm			
3	Δ4	1	t	(Δ)	37.08 ms	(Δ)	-0.18 dB			
4	F	1	t		16.38 ms		13.21 dBm			
5										
6										
7										
8										
9										
10										
11										

1.4 Test Environment

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

1.5 Operation Description

For WLAN, using chipset specific software to control the EUT, and makes it transmit in maximum power. The EUT is set to maximum power level during all tests, and at the beginning of each test the battery is fully charged.

Per FCC guidance, the device was tested as below.

Body SAR

Test it on all surfaces/edges with a transmitting antenna located at 25 mm from that surface/edge, at 10 mm test separation distance.

Extremity SAR

Test it on all surfaces/edges with a transmitting antenna located at 25 mm from that surface/edge, at 0 mm test separation distance.

All SAR test was measured with silicone sleeve attached.

Note:

1. During the SAR testing, the DASY 5 system checks power drift by comparing the e-field strength of one specific location measured at the beginning with that measured at the end of the SAR testing.

802.11b DSSS SAR Test Requirements:

2. 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.

3. 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:

4. 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:

5. 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.
6. 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.
7. When the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is > 1.2 W/kg, SAR is required for subsequent test configuration.
8. According to KDB447498D01v06, testing of other required channels is not required when the reported 1-g SAR for the highest output channel is ≤ 0.8 W/kg, when the transmission band is ≤ 100 MHz.
9. According to KDB865664D01v01r04, SAR measurement variability must be assessed for each frequency band. When the original highest measured SAR is ≥ 0.8 W/kg, repeated that measurement once. Perform a second repeated

measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit)

1.6 The SAR Measurement System

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

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

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

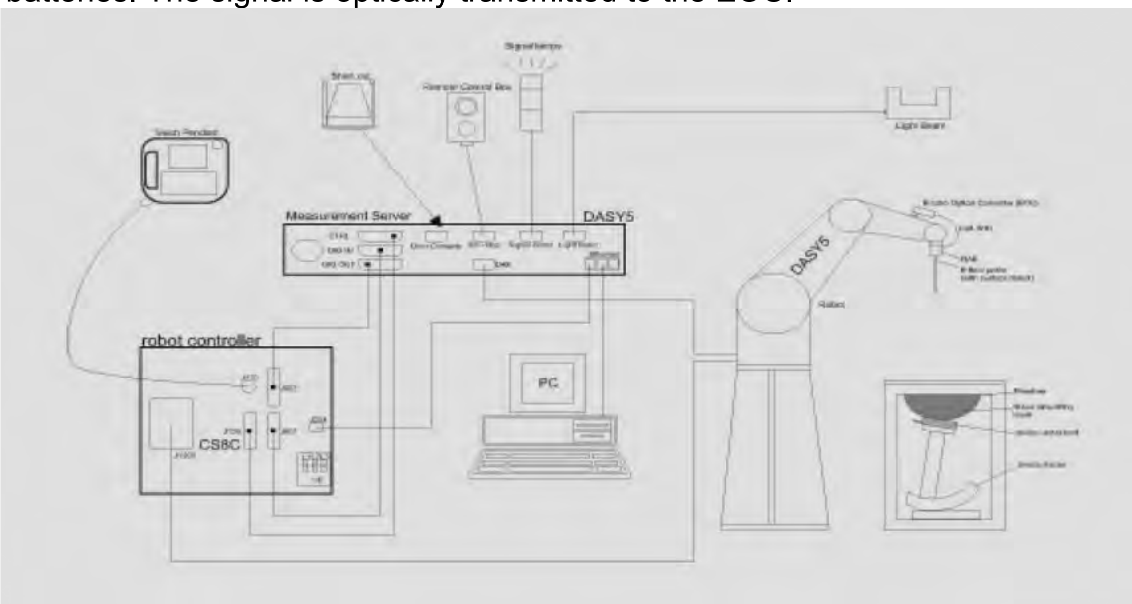


Fig. a The block diagram of SAR system

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4. The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.
5. The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
6. A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
7. A computer operating Windows 7.
8. DASY 5 software.
9. Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
10. The device holder for handheld mobile phones.
11. Tissue simulating liquid mixed according to the given recipes.
13. 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 2450/5200/5300/5600/5800 MHz Additional CF for other liquids and frequencies upon request	
Frequency	10 MHz to > 6 GHz	
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)	
Dynamic Range	10 μW/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 μW/g)	
Dimensions	Tip diameter: 2.5 mm	
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.	

PHANTOM

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

DEVICE HOLDER

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

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1.8 SAR System Verification

The microwave circuit arrangement for system verification is sketched in Fig. b. The daily system accuracy verification occurs within the flat section of the SAM phantom. A SAR measurement was performed to see if the measured SAR was within +/- 10% from the target SAR values. These tests were done at 2450/5200/5300/5600/5800MHz. The tests were conducted on the same days as the measurement of the DUT. The obtained results from the system accuracy verification are displayed in the table 1 (SAR values are normalized to 1W forward power delivered to the dipole). During the tests, the ambient temperature of the laboratory was 21.7°C, the relative humidity was 62% and the liquid depth above the ear reference points was ≥ 15 cm ± 5 mm (frequency ≤ 3 GHz) or ≥ 10 cm ± 5 mm (frequency > 3 G Hz) in all the cases. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values.

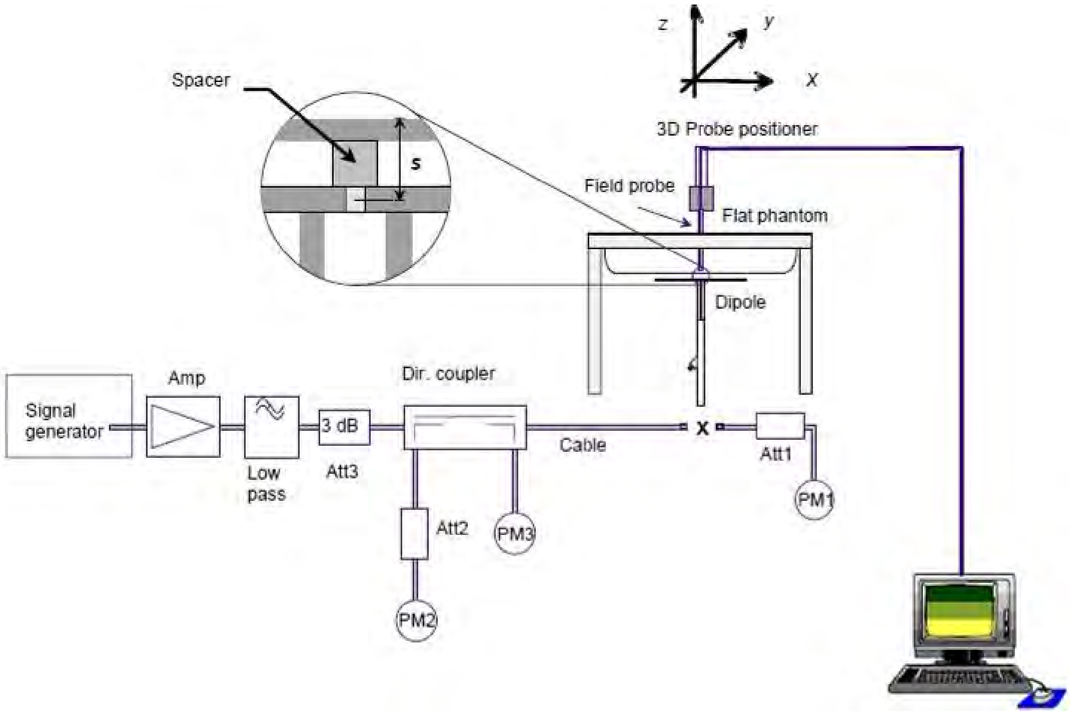

Fig. b The block diagram of system verification

Validation Kit	S/N	Frequency (MHz)		1W Target SAR-1g (mW/g)	pin=250mW Measured SAR-1g (mW/g)	Measured SAR-1g normalized to 1W (mW/g)	Deviation (%)	Measured Date
D2450V2	727	2450	Head	53.9	13.60	54.4	0.93%	Jun. 18, 2021
Validation Kit	S/N	Frequency (MHz)		1W Target SAR-1g (mW/g)	Pin=100mW Measured SAR-1g (mW/g)	Measured SAR-1g normalized to 1W (mW/g)	Deviation (%)	Measured Date
D5GHzV2	1023	5200	Head	77.9	7.55	75.5	-3.08%	Jun. 18, 2021
		5300	Head	80.4	7.93	79.3	-1.37%	Jun. 18, 2021
		5600	Head	83.9	8.24	82.4	-1.79%	Jun. 19, 2021
		5800	Head	80.9	8.08	80.8	-0.12%	Jun. 19, 2021

Validation Kit	S/N	Frequency (MHz)		1W Target SAR-10g (mW/g)	pin=250mW Measured SAR-10g (mW/g)	Measured SAR-10g normalized to 1W (mW/g)	Deviation (%)	Measured Date
D2450V2	727	2450	Head	24.90	6.13	24.52	-1.53%	Jun. 18, 2021
Validation Kit	S/N	Frequency (MHz)		1W Target SAR-10g (mW/g)	Pin=100mW Measured SAR-10g (mW/g)	Measured SAR-10g normalized to 1W (mW/g)	Deviation (%)	Measured Date
D5GHzV2	1023	5200	Head	22.2	2.15	21.5	-3.15%	Jun. 18, 2021
		5300	Head	22.8	2.23	22.3	-2.19%	Jun. 18, 2021
		5600	Head	23.6	2.39	23.9	1.27%	Jun. 19, 2021
		5800	Head	22.6	2.27	22.7	0.44%	Jun. 19, 2021

Table 1. Results of system verification

1.9 Tissue Simulant Fluid for the Frequency Band

The dielectric properties for this Head-simulant fluid were measured by using the 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.

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. 18, 2021	2412	39.268	1.766	39.128	1.771	-0.36%	0.28%
		2450	39.200	1.800	39.060	1.804	-0.36%	0.21%
		2480	39.162	1.827	39.022	1.830	-0.36%	0.20%
	Jun. 18, 2021	5200	35.986	4.655	35.846	4.636	-0.39%	-0.41%
		5220	35.963	4.676	35.823	4.656	-0.39%	-0.41%
		5240	35.940	4.696	35.800	4.677	-0.39%	-0.41%
	Jun. 18, 2021	5300	35.871	4.758	35.731	4.738	-0.39%	-0.41%
		5320	35.849	4.778	35.709	4.759	-0.39%	-0.41%
	Jun. 19, 2021	5580	35.551	5.045	35.411	5.025	-0.39%	-0.39%
		5600	35.529	5.065	35.389	5.045	-0.39%	-0.39%
		5700	35.414	5.168	35.274	5.147	-0.40%	-0.40%
	Jun. 19, 2021	5745	35.363	5.214	35.223	5.193	-0.40%	-0.40%
		5785	35.317	5.255	35.177	5.234	-0.40%	-0.40%
		5800	35.300	5.270	35.160	5.249	-0.40%	-0.40%

Table 2. Dielectric Parameters of Tissue Simulant Fluid

The composition of the head tissue simulating liquid:

Frequency (MHz)	Mode	Ingredient						Total amount
		DGMBE	Water	Salt	Preventol D-7	Cellulose	Sugar	
2450	Head	550ml	450ml	—	—	—	—	1.0L(Kg)

Simulating Liquids for 5 GHz, Manufactured by SPEAG:

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

Table 3. Recipes for Tissue Simulating Liquid

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1.10 Evaluation Procedures

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

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

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

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

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

The measured volume of 30x30x30mm contains about 30g of tissue.
The first procedure is an extrapolation (incl. Boundary correction) to get the points between the lowest measured plane and the surface. The next step uses 3D interpolation to get all points within the measured volume. In the last step, a 1g cube is placed numerically into the volume and its averaged SAR is calculated. This cube is the moved around until the highest averaged SAR is found. If the highest SAR is found at the edge of the measured volume, the system will issue a warning: higher SAR values might be found outside of the measured volume. In that case the cube measurement can be repeated, using the new interpolated maximum as the center.

1.11 Probe Calibration Procedures

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

1.11.1 Transfer Calibration with Temperature Probes

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

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

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

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

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

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

1.11.2 Calibration with Analytical Fields

In this method a technical setup is used in which the field can be calculated analytically from measurements of other physical magnitudes (e.g., input power). This corresponds to the standard field method for probe calibration in air; however, there is no standard defined for fields in lossy liquids.
When using calculated fields in lossy liquids for probe calibration, several points must be considered in the assessment of the uncertainty:
1. The setup must enable accurate determination of the incident power.
2. The accuracy of the calculated field strength will depend on the

assessment of the dielectric parameters of the liquid.

3. Due to the small wavelength in liquids with high permittivity, even small setups might be above the resonant cutoff frequencies. The field distribution in the setup must be carefully checked for conformity with the theoretical field distribution.

References

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

1.12 Test Standards and Limits

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

1. Limits for Occupational/Controlled exposure: 0.4 W/kg as averaged over the whole-body and spatial peak SAR not exceeding 8 W/kg as averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the hands, wrists, feet and ankles where the spatial peak SAR shall not exceed 20 W/kg, as averaged over an 10 grams of tissue (defined as a tissue volume in the shape of a cube).
2. Occupational/Controlled limits apply when persons are exposed as a consequence of their employment provided these persons are fully aware of and exercise control over their exposure. Awareness of exposure can be accomplished by use of warning labels or by specific training or education through appropriate means, such as an RF safety program in a work environment.
3. Limits for General Population/Uncontrolled exposure: 0.08 W/kg as averaged over the whole-body and spatial peak SAR not exceeding 1.6 W/kg as averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the hands, wrists, feet and ankles where the

spatial peak SAR shall not exceed 4 W/kg, as averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). General Population/Uncontrolled limits apply when the general public may be exposed, or when persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or do not exercise control over their exposure. Warning labels placed on consumer devices such as cellular telephones will not be sufficient reason to allow these devices to be evaluated subject to limits for occupational/controlled exposure in paragraph (d)(1) of this section. (Table 4.)

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

Table 4. RF exposure limits

Notes:

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

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2. Summary of Results

2.1 Decision rules

Reported measurement data comply with IEEE 1528-2013:

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

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2.2 Summary of Results

Body

	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	
Body	WLAN 802.11b	Front side	10	1	2412	17.50	17.26	1.005	105.74%	0.069	0.073	-
		Back side	10	1	2412	17.50	17.26	1.005	105.74%	0.001	0.001	-
		Back curve side	10	1	2412	17.50	17.26	1.005	105.74%	0.001	0.001	-
		Top side	10	1	2412	17.50	17.26	1.005	105.74%	0.143	0.152	39
		Bottom side	10	1	2412	17.50	17.26	1.005	105.74%	0.001	0.001	-
		Right side	10	1	2412	17.50	17.26	1.005	105.74%	0.001	0.001	-
		Left side	10	1	2412	17.50	17.26	1.005	105.74%	0.045	0.048	-
	Bluetooth(GFSK)	Front side	10	78	2480	7.50	7.02	1.302	111.81%	0.007	0.011	-
		Back side	10	78	2480	7.50	7.02	1.302	111.81%	0.001	0.001	-
		Back curve side	10	78	2480	7.50	7.02	1.302	111.81%	0.001	0.001	-
		Top side	10	78	2480	7.50	7.02	1.302	111.81%	0.015	0.021	40
		Bottom side	10	78	2480	7.50	7.02	1.302	111.81%	0.001	0.001	-
		Right side	10	78	2480	7.50	7.02	1.302	111.81%	0.001	0.001	-
		Left side	10	78	2480	7.50	7.02	1.302	111.81%	0.005	0.007	-
	WLAN 802.11n(20) 5.2G	Front side	10	48	5240	17.50	17.49	1.002	100.28%	0.303	0.304	-
		Back side	10	48	5240	17.50	17.49	1.002	100.28%	0.087	0.087	-
		Back curve side	10	48	5240	17.50	17.49	1.002	100.28%	0.080	0.080	-
		Top side	10	44	5220	17.50	17.47	1.002	100.69%	0.939	0.947	-
		Top side	10	48	5240	17.50	17.49	1.002	100.28%	1.020	1.025	41
		Top side*	10	48	5240	17.50	17.49	1.002	100.28%	1.010	1.015	-
		Bottom side	10	48	5240	17.50	17.49	1.002	100.28%	0.046	0.046	-
		Right side	10	48	5240	17.50	17.49	1.002	100.28%	0.050	0.050	-
		Left side	10	48	5240	17.50	17.49	1.002	100.28%	0.278	0.279	-
	WLAN 802.11n(20) 5.3G	Front side	10	64	5320	17.50	17.25	1.002	105.98%	0.326	0.346	-
		Back side	10	64	5320	17.50	17.25	1.002	105.98%	0.094	0.100	-
		Back curve side	10	64	5320	17.50	17.25	1.002	105.98%	0.086	0.091	-
		Top side	10	60	5300	17.50	17.15	1.002	108.39%	1.020	1.108	-
		Top side	10	64	5320	17.50	17.25	1.002	105.98%	1.060	1.126	42
		Top side*	10	64	5320	17.50	17.25	1.002	105.98%	1.030	1.094	-
		Bottom side	10	64	5320	17.50	17.25	1.002	105.98%	0.049	0.052	-
		Right side	10	64	5320	17.50	17.25	1.002	105.98%	0.054	0.057	-
		Left side	10	64	5320	17.50	17.25	1.002	105.98%	0.297	0.315	-
	WLAN 802.11n(20) 5.6G	Front side	10	116	5580	17.50	17.34	1.002	103.81%	0.315	0.328	-
		Back side	10	116	5580	17.50	17.34	1.002	103.81%	0.090	0.094	-
		Back curve side	10	116	5580	17.50	17.34	1.002	103.81%	0.083	0.086	-
		Top side	10	116	5580	17.50	17.34	1.002	103.81%	1.050	1.092	43
		Top side*	10	116	5580	17.50	17.34	1.002	103.81%	1.010	1.051	-
		Top side	10	144	5720	17.50	17.21	1.002	106.96%	1.010	1.082	-
		Bottom side	10	116	5580	17.50	17.34	1.002	103.81%	0.047	0.049	-
		Right side	10	116	5580	17.50	17.34	1.002	103.81%	0.052	0.054	-
		Left side	10	116	5580	17.50	17.34	1.002	103.81%	0.286	0.297	-
	WLAN 802.11n(20) 5.8G	Front side	10	157	5785	17.50	17.47	1.002	100.75%	0.365	0.368	-
		Back side	10	157	5785	17.50	17.47	1.002	100.75%	0.105	0.106	-
		Back curve side	10	157	5785	17.50	17.47	1.002	100.75%	0.096	0.097	-
		Top side	10	157	5785	17.50	17.47	1.002	100.75%	1.120	1.131	44
		Top side*	10	157	5785	17.50	17.47	1.002	100.75%	1.040	1.050	-
		Top side	10	149	5745	17.50	17.18	1.002	107.65%	1.040	1.122	-
		Bottom side	10	157	5785	17.50	17.47	1.002	100.75%	0.056	0.057	-
		Right side	10	157	5785	17.50	17.47	1.002	100.75%	0.061	0.062	-
		Left side	10	157	5785	17.50	17.47	1.002	100.75%	0.338	0.341	-

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Product specific 10-g SAR

	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 10g (W/kg)		Plot page
										Measured	Reported	
Product specific 10-g SAR	WLAN 802.11b	Front side	0	1	2412	17.50	17.26	1.005	105.74%	0.178	0.189	-
		Back side	0	1	2412	17.50	17.26	1.005	105.74%	0.028	0.030	-
		Back curve side	0	1	2412	17.50	17.26	1.005	105.74%	0.001	0.001	-
		Top side	0	1	2412	17.50	17.26	1.005	105.74%	0.337	0.358	45
		Bottom side	0	1	2412	17.50	17.26	1.005	105.74%	0.001	0.001	-
		Right side	0	1	2412	17.50	17.26	1.005	105.74%	0.064	0.068	-
		Left side	0	1	2412	17.50	17.26	1.005	105.74%	0.080	0.085	-
	Bluetooth(GFSK)	Front side	0	78	2480	7.50	7.02	1.302	111.81%	0.019	0.028	-
		Back side	0	78	2480	7.50	7.02	1.302	111.81%	0.003	0.004	-
		Back curve side	0	78	2480	7.50	7.02	1.302	111.81%	0.000	0.000	-
		Top side	0	78	2480	7.50	7.02	1.302	111.81%	0.037	0.053	46
		Bottom side	0	78	2480	7.50	7.02	1.302	111.81%	0.001	0.001	-
		Right side	0	78	2480	7.50	7.02	1.302	111.81%	0.007	0.010	-
		Left side	0	78	2480	7.50	7.02	1.302	111.81%	0.009	0.013	-
	WLAN 802.11n(20) 5.2G	Front side	0	48	5240	17.50	17.49	1.002	100.28%	0.279	0.280	-
		Back side	0	48	5240	17.50	17.49	1.002	100.28%	0.046	0.046	-
		Back curve side	0	48	5240	17.50	17.49	1.002	100.28%	0.030	0.030	-
		Top side	0	48	5240	17.50	17.49	1.002	100.28%	0.943	0.948	47
		Bottom side	0	48	5240	17.50	17.49	1.002	100.28%	0.015	0.015	-
		Right side	0	48	5240	17.50	17.49	1.002	100.28%	0.027	0.027	-
		Left side	0	48	5240	17.50	17.49	1.002	100.28%	0.346	0.348	-
	WLAN 802.11n(20) 5.3G	Front side	0	64	5320	17.50	17.25	1.002	105.98%	0.229	0.243	-
		Back side	0	64	5320	17.50	17.25	1.002	105.98%	0.038	0.040	-
		Back curve side	0	64	5320	17.50	17.25	1.002	105.98%	0.024	0.025	-
		Top side	0	64	5320	17.50	17.25	1.002	105.98%	0.788	0.837	48
		Bottom side	0	64	5320	17.50	17.25	1.002	105.98%	0.013	0.014	-
		Right side	0	64	5320	17.50	17.25	1.002	105.98%	0.022	0.023	-
		Left side	0	64	5320	17.50	17.25	1.002	105.98%	0.285	0.303	-
	WLAN 802.11n(20) 5.6G	Front side	0	116	5580	17.50	17.34	1.002	103.81%	0.306	0.318	-
		Back side	0	116	5580	17.50	17.34	1.002	103.81%	0.050	0.052	-
		Back curve side	0	116	5580	17.50	17.34	1.002	103.81%	0.033	0.034	-
		Top side	0	116	5580	17.50	17.34	1.002	103.81%	1.070	1.113	49
		Bottom side	0	116	5580	17.50	17.34	1.002	103.81%	0.017	0.018	-
		Right side	0	116	5580	17.50	17.34	1.002	103.81%	0.029	0.030	-
		Left side	0	116	5580	17.50	17.34	1.002	103.81%	0.377	0.392	-
	WLAN 802.11n(20) 5.8G	Front side	0	157	5785	17.50	17.47	1.002	100.75%	0.374	0.378	-
		Back side	0	157	5785	17.50	17.47	1.002	100.75%	0.062	0.063	-
		Back curve side	0	157	5785	17.50	17.47	1.002	100.75%	0.040	0.040	-
		Top side	0	157	5785	17.50	17.47	1.002	100.75%	1.240	1.252	50
		Bottom side	0	157	5785	17.50	17.47	1.002	100.75%	0.019	0.019	-
		Right side	0	157	5785	17.50	17.47	1.002	100.75%	0.032	0.032	-
		Left side	0	157	5785	17.50	17.47	1.002	100.75%	0.417	0.421	-

Note:

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

Reported SAR = measured SAR * (scaling)

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

2.3 Reporting statements of conformity

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

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3. Simultaneous Transmission Analysis

Simultaneous Transmission Scenarios:

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

Note :
1) LTE and WLAN can't transmit simultaneously.
2) Bluetooth and WLAN share the same antenna path.
3) Bluetooth can transmit with WLAN simultaneously.

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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 **(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.

The simultaneous Transmission conditions (Body)						
Exposure position 1g(W/kg)	1	2	3	Scenario 1	Scenario 2	SPLSR
	WLAN 2.4GHz	WLAN 5GHz	BT	1+3 Sum	2+3 Sum	
Front side	0.073	0.368	0.011	0.084	0.379	ΣSAR<1.6, Not required
Back side	0.001	0.106	0.001	0.003	0.107	ΣSAR<1.6, Not required
Back Curve side	0.001	0.097	0.001	0.003	0.098	ΣSAR<1.6, Not required
Top side	0.152	1.131	0.021	0.173	1.152	ΣSAR<1.6, Not required
Bottom side	0.001	0.057	0.001	0.003	0.058	ΣSAR<1.6, Not required
Right side	0.001	0.062	0.001	0.003	0.063	ΣSAR<1.6, Not required
Left side	0.048	0.341	0.007	0.055	0.349	ΣSAR<1.6, Not required

The simultaneous Transmission conditions (Product specific 10-g SAR)						
Exposure position 1g(W/kg)	1	2	3	Scenario 1	Scenario 2	SPLSR
	WLAN 2.4GHz	WLAN 5GHz	BT	1+3 Sum	2+3 Sum	
Front side	0.189	0.378	0.028	0.217	0.405	ΣSAR<4, Not required
Back side	0.030	0.063	0.004	0.034	0.067	ΣSAR<4, Not required
Back Curve side	0.001	0.040	0.000	0.001	0.040	ΣSAR<4, Not required
Top side	0.358	1.252	0.053	0.412	1.305	ΣSAR<4, Not required
Bottom side	0.001	0.019	0.001	0.003	0.021	ΣSAR<4, Not required
Right side	0.068	0.032	0.010	0.078	0.042	ΣSAR<4, Not required
Left side	0.085	0.421	0.013	0.098	0.434	ΣSAR<4, Not required

4. Instruments List

Manufacturer	Device	Type	Serial number	Date of last calibration	Date of next calibration
SPEAG	Dosimetric E-Field Probe	EX3DV4	3938	Feb.22,2021	Feb.21,2022
SPEAG	System Validation Dipole	D2450V2	727	Apr.14,2021	Apr.13,2022
		D5GHzV2	1023	Jan.26,2021	Jan.25,2022
SPEAG	Data acquisition Electronics	DAE4	547	Mar.22,2021	Mar.21,2022
SPEAG	Software	DASY 52 4.7.80	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.17,2021	Feb.16,2022
Agilent	Dual-directional coupler	772D	MY46151242	Aug.17,2020	Aug.16,2021
		778D	MY48220468	Aug.17,2020	Aug.16,2021
Agilent	Signal Generator	N5181A	MY50145142	Dec.27,2020	Dec.26,2021
Agilent	Power Meter	E4417A	MY52200004	Oct.18,2020	Oct.17,2021
Agilent	Power Sensor	E9301H	MY52240003	Oct.18,2020	Oct.17,2021
			MY52200003	Oct.18,2020	Oct.17,2021
TECPEL	Digital thermometer	DTM-303A	TP130075	Sep.30.2020	Sep.29.2021

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5. Measurements

Date: 2021/6/18

Report No. :E5/2021/50006

WLAN 802.11b_Body_Top side_CH 1_10mm

Communication System: WLAN; Frequency: 2412 MHz; Duty Cycle: 1:0.995

Medium parameters used: f = 2412 MHz; σ = 1.771 S/m; ε_r = 39.128; ρ = 1000 kg/m^3

Phantom section: Flat Section

Ambient temperature: 22.2°C; Liquid temperature: 21.5°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(7.46, 7.46, 7.46) ; Calibrated: 2021/2/22
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2021/3/22
- Phantom: ELI
- DASY52 4.7.80(0); SEMCAD X 14.6.14(7483)

Area Scan (81x101x1): Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 0.199 W/kg

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

Reference Value = 7.494 V/m; Power Drift = 0.02 dB

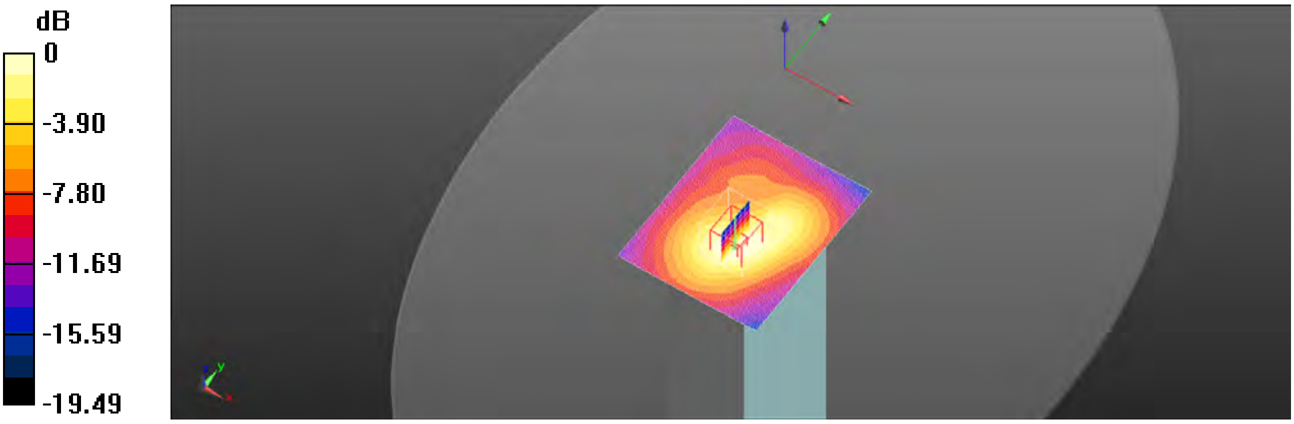
Peak SAR (extrapolated) = 0.267 W/kg

SAR(1 g) = 0.143 W/kg; SAR(10 g) = 0.077 W/kg

Smallest distance from peaks to all points 3 dB below = 14.9 mm

Ratio of SAR at M2 to SAR at M1 = 52.7%

Maximum value of SAR (measured) = 0.204 W/kg



0 dB = 0.204 W/kg = -6.91 dBW/kg

Date: 2021/6/18

Report No. :E5/2021/50006

Bluetooth(GFSK)_Body_Top side_CH 78_10mm

Communication System: Bluetooth; Frequency: 2480 MHz; Duty Cycle: 1:0.768

Medium parameters used: f = 2480 MHz; σ = 1.83 S/m; ε_r = 39.022; ρ = 1000 kg/m^3

Phantom section: Flat Section

Ambient temperature: 22.2°C; Liquid temperature: 21.5°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(7.46, 7.46, 7.46); Calibrated: 2021/2/22
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2021/3/22
- Phantom: ELI
- DASY52 4.7.80(0); SEMCAD X 14.6.14(7483)

Area Scan (81x101x1): Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 0.0203 W/kg

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

Reference Value = 2.093 V/m; Power Drift = -0.02 dB

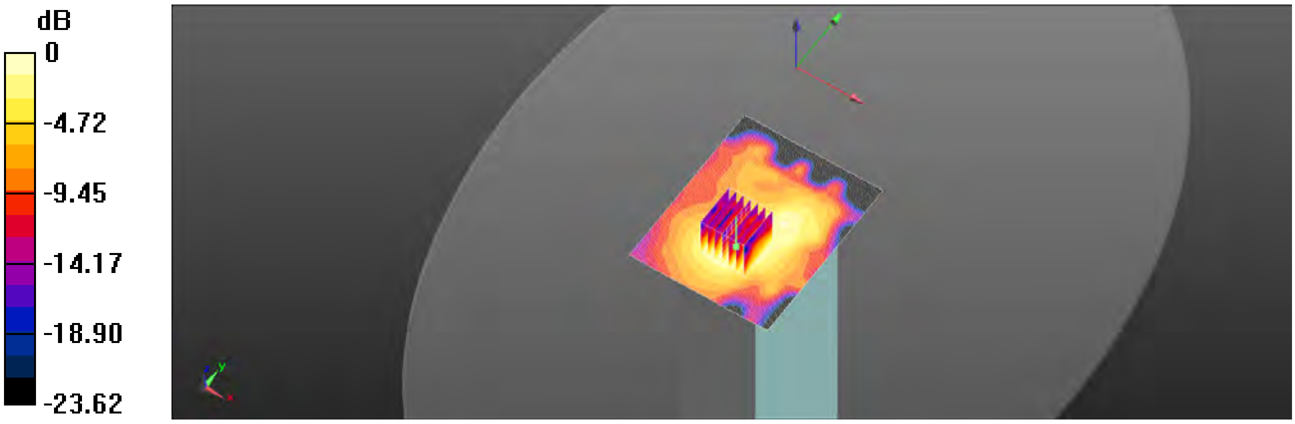
Peak SAR (extrapolated) = 0.0300 W/kg

SAR(1 g) = 0.015 W/kg; SAR(10 g) = 0.00764 W/kg

Smallest distance from peaks to all points 3 dB below = 7.7 mm

Ratio of SAR at M2 to SAR at M1 = 57.5%

Maximum value of SAR (measured) = 0.0212 W/kg



0 dB = 0.0212 W/kg = -16.74 dBW/kg

Date: 2021/6/18

Report No. :E5/2021/50006

WLAN 802.11n(20M) 5.2G_body_Top side_CH 48_10mm

Communication System: WLAN; Frequency: 5240 MHz; Duty Cycle: 1:0.998

Medium parameters used: f = 5240 MHz; σ = 4.677 S/m; ε_r = 35.8; ρ = 1000 kg/m^3

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(5.05, 5.05, 5.05); Calibrated: 2021/2/22
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2021/3/22
- Phantom: ELI
- DASY52 4.7.80(0); SEMCAD X 14.6.14(7483)

Area Scan (91x121x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 1.82 W/kg

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

Reference Value = 4.790 V/m; Power Drift = 0.03 dB

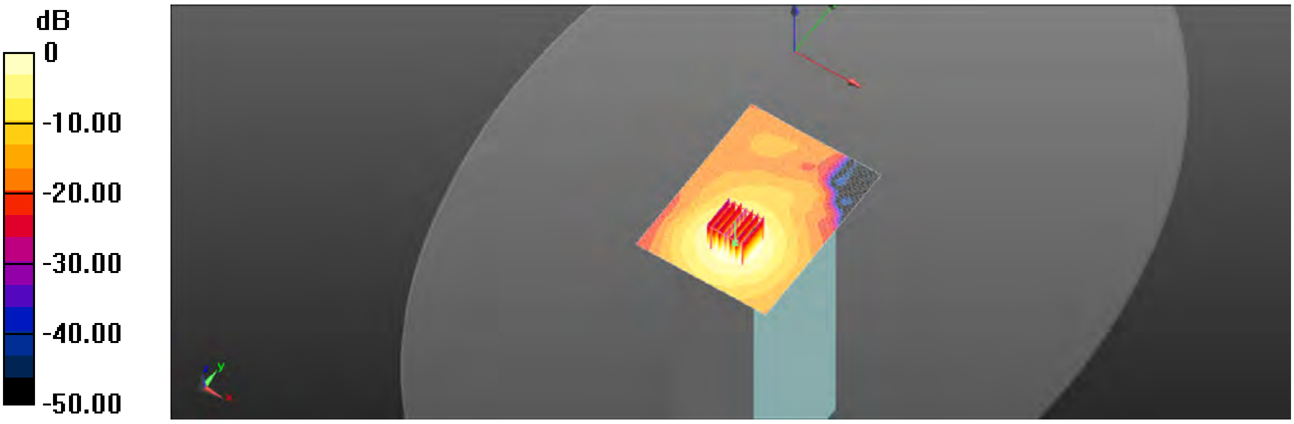
Peak SAR (extrapolated) = 3.41 W/kg

SAR(1 g) = 1.02 W/kg; SAR(10 g) = 0.410 W/kg

Smallest distance from peaks to all points 3 dB below = 14 mm

Ratio of SAR at M2 to SAR at M1 = 56.9%

Maximum value of SAR (measured) = 1.83 W/kg



0 dB = 1.83 W/kg = 2.63 dBW/kg

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Date: 2021/6/18

Report No. :E5/2021/50006

WLAN 802.11n(20M) 5.3G_body_Top side_CH 64_10mm

Communication System: WLAN; Frequency: 5320 MHz; Duty Cycle: 1:0.998

Medium parameters used: f = 5320 MHz; σ = 4.759 S/m; ε_r = 35.709; ρ = 1000 kg/m^3

Phantom section: Flat Section

Ambient temperature: 22.4°C; Liquid temperature: 21.7°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(5.05, 5.05, 5.05) ; Calibrated: 2021/2/22
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2021/3/22
- Phantom: ELI
- DASY52 4.7.80(0); SEMCAD X 14.6.14(7483)

Area Scan (91x121x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 1.89 W/kg

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

Reference Value = 4.979 V/m; Power Drift = 0.01 dB

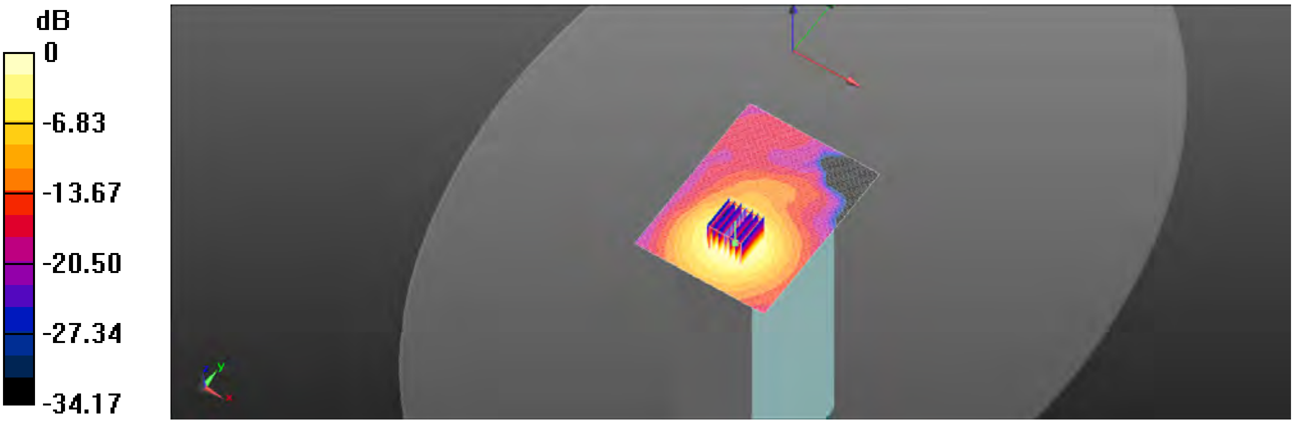
Peak SAR (extrapolated) = 3.67 W/kg

SAR(1 g) = 1.06 W/kg; SAR(10 g) = 0.422 W/kg

Smallest distance from peaks to all points 3 dB below = 13.8 mm

Ratio of SAR at M2 to SAR at M1 = 55.9%

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



0 dB = 1.93 W/kg = 2.86 dBW/kg

Date: 2021/6/19

Report No. :E5/2021/0006

WLAN 802.11n(20M) 5.6G_body_Top side_CH 116_10mm

Communication System: WLAN; Frequency: 5580 MHz; Duty Cycle: 1:0.998

Medium parameters used: f = 5580 MHz; σ = 5.025 S/m; ε_r = 35.411; ρ = 1000 kg/m^3

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(4.66, 4.66, 4.66); Calibrated: 2021/2/22
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2021/3/22
- Phantom: ELI
- DASY52 4.7.80(0); SEMCAD X 14.6.14(7483)

Area Scan (91x121x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 1.92 W/kg

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

Reference Value = 5.859 V/m; Power Drift = 0.03 dB

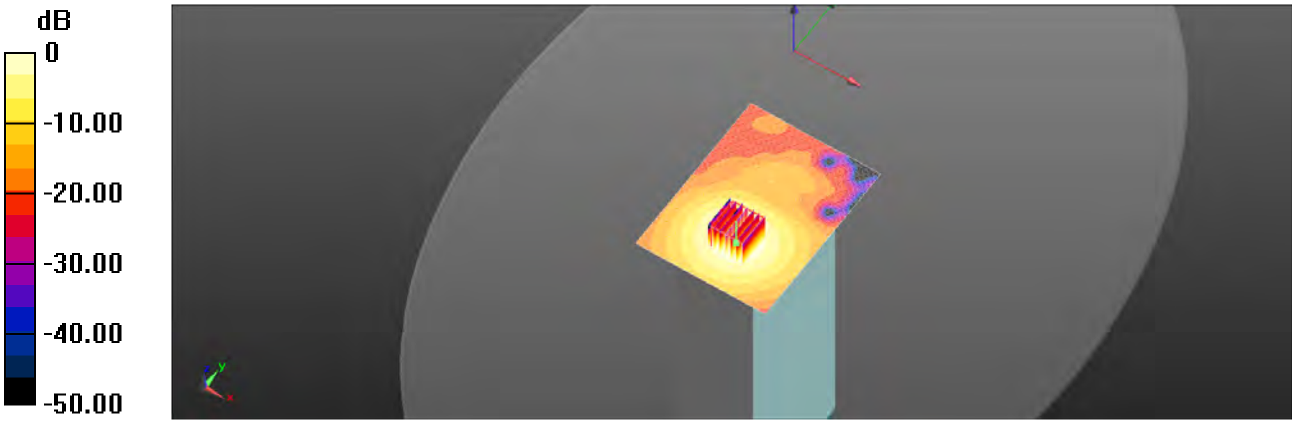
Peak SAR (extrapolated) = 3.76 W/kg

SAR(1 g) = 1.05 W/kg; SAR(10 g) = 0.422 W/kg

Smallest distance from peaks to all points 3 dB below = 13.7 mm

Ratio of SAR at M2 to SAR at M1 = 53.6%

Maximum value of SAR (measured) = 1.90 W/kg



0 dB = 1.90 W/kg = 2.79 dBW/kg

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Date: 2021/6/19

Report No. :E5/2021/50006

WLAN 802.11n(20M) 5.8G_body_Top side_CH 157_10mm

Communication System: WLAN; Frequency: 5785 MHz; Duty Cycle: 1:0.998

Medium parameters used: f = 5785 MHz; σ = 5.234 S/m; ε_r = 35.177; ρ = 1000 kg/m^3

Phantom section: Flat Section

Ambient temperature: 22.3°C; Liquid temperature: 21.5°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(4.7, 4.7, 4.7); Calibrated: 2021/2/22
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2021/3/22
- Phantom: ELI
- DASY52 4.7.80(0); SEMCAD X 14.6.14(7483)

Area Scan (91x121x1): Interpolated grid: dx=10 mm, dy=10 mm

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

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

Reference Value = 6.554 V/m; Power Drift = 0.04 dB

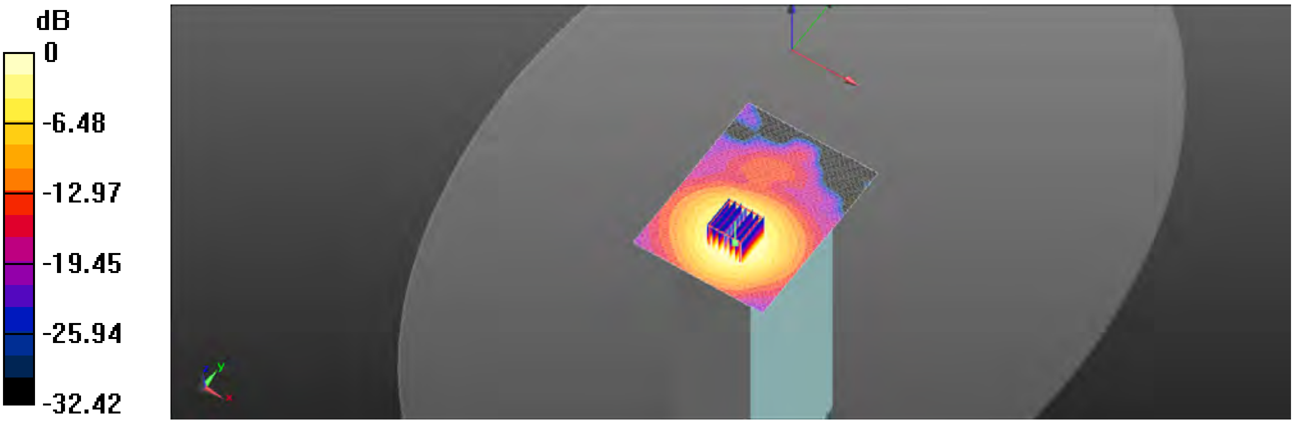
Peak SAR (extrapolated) = 4.22 W/kg

SAR(1 g) = 1.12 W/kg; SAR(10 g) = 0.449 W/kg

Smallest distance from peaks to all points 3 dB below = 13.6 mm

Ratio of SAR at M2 to SAR at M1 = 52.4%

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



0 dB = 2.05 W/kg = 3.12 dBW/kg

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Date: 2021/6/18

Report No. :E5/2021/50006

WLAN 802.11b_product specific 10g_Top side_CH 1_0mm

Communication System: WLAN; Frequency: 2412 MHz; Duty Cycle: 1:0.995

Medium parameters used: f = 2412 MHz; σ = 1.771 S/m; ε_r = 39.128; ρ = 1000 kg/m^3

Phantom section: Flat Section

Ambient temperature: 22.2°C; Liquid temperature: 21.5°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(7.46, 7.46, 7.46); Calibrated: 2021/2/22
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2021/3/22
- Phantom: ELI
- DASY52 4.7.80(0); SEMCAD X 14.6.14(7483)

Area Scan (81x101x1): Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 1.09 W/kg

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

Reference Value = 10.57 V/m; Power Drift = 0.05 dB

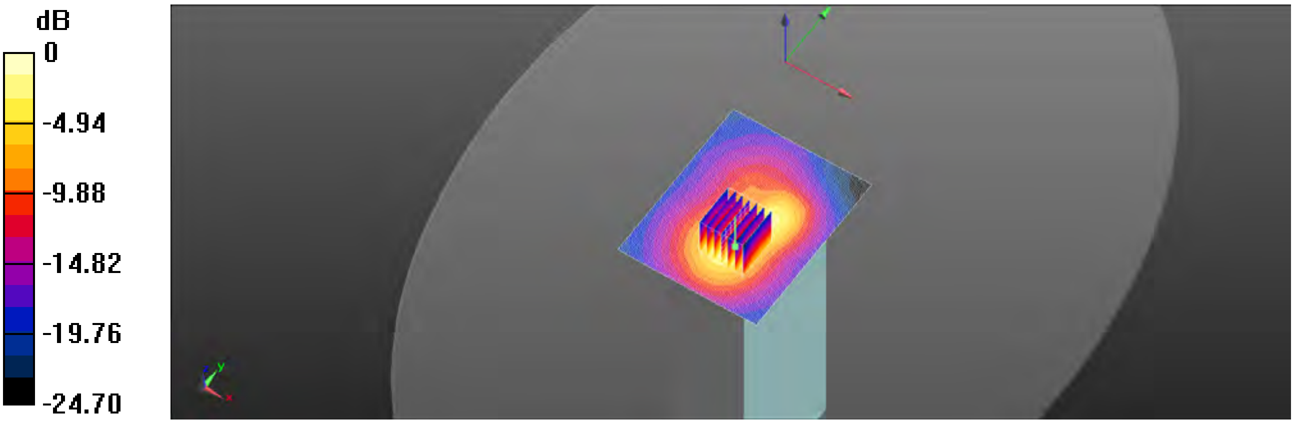
Peak SAR (extrapolated) = 1.52 W/kg

SAR(1 g) = 0.741 W/kg; SAR(10 g) = 0.337 W/kg

Smallest distance from peaks to all points 3 dB below = 10.5 mm

Ratio of SAR at M2 to SAR at M1 = 55.6%

Maximum value of SAR (measured) = 1.13 W/kg



0 dB = 1.13 W/kg = 0.54 dBW/kg

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Date: 2021/6/18

Report No. :E5/2021/50006

Bluetooth(GFSK)_product specific 10g_Top side_CH 78_0mm

Communication System: Bluetooth; Frequency: 2480 MHz; Duty Cycle: 1:0.768

Medium parameters used: f = 2480 MHz; σ = 1.83 S/m; ε_r = 39.022; ρ = 1000 kg/m^3

Phantom section: Flat Section

Ambient temperature: 22.2°C; Liquid temperature: 21.5°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(7.46, 7.46, 7.46); Calibrated: 2021/2/22
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2021/3/22
- Phantom: ELI
- DASY52 4.7.80(0); SEMCAD X 14.6.14(7483)

Area Scan (81x101x1): Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 0.116 W/kg

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

Reference Value = 2.564 V/m; Power Drift = 0.02 dB

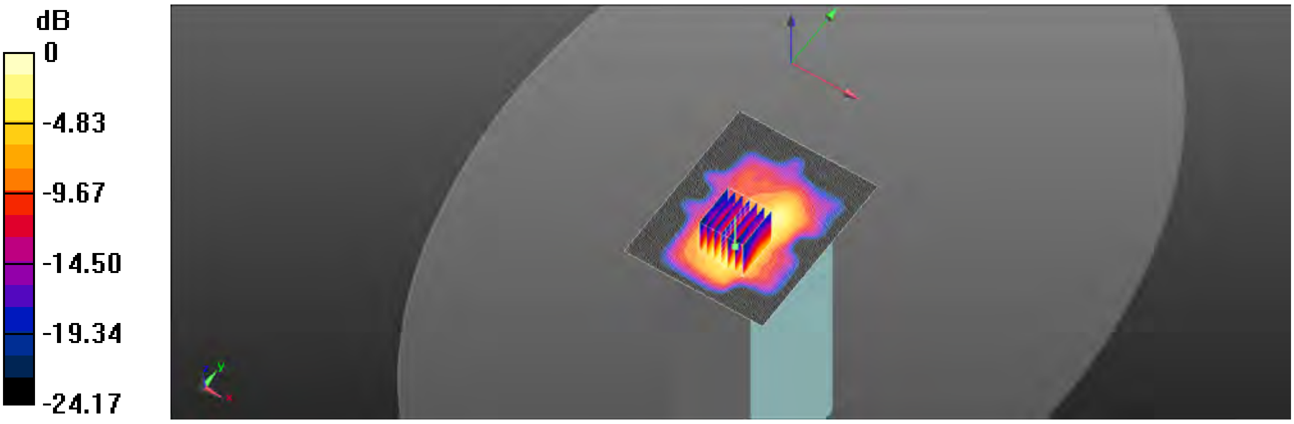
Peak SAR (extrapolated) = 0.178 W/kg

SAR(1 g) = 0.083 W/kg; SAR(10 g) = 0.037 W/kg

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

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

Maximum value of SAR (measured) = 0.125 W/kg



0 dB = 0.125 W/kg = -9.02 dBW/kg

Date: 2021/6/18

Report No. :E5/2021/50006

WLAN 802.11n(20M) 5.2G_product specific 10g_Top side_CH 48_0mm

Communication System: WLAN; Frequency: 5240 MHz; Duty Cycle: 1:0.998

Medium parameters used: f = 5240 MHz; σ = 4.677 S/m; ε_r = 35.8; ρ = 1000 kg/m^3

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(5.05, 5.05, 5.05); Calibrated: 2021/2/22
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2021/3/22
- Phantom: ELI
- DASY52 4.7.80(0); SEMCAD X 14.6.14(7483)

Area Scan (91x121x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 5.92 W/kg

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

Reference Value = 7.065 V/m; Power Drift = -0.04 dB

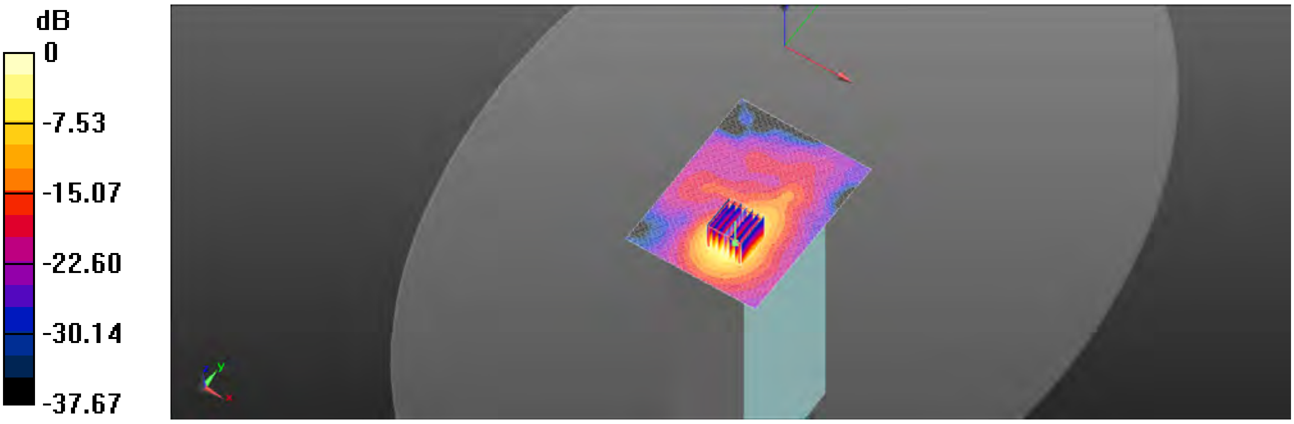
Peak SAR (extrapolated) = 11.6 W/kg

SAR(1 g) = 3.06 W/kg; SAR(10 g) = 0.943 W/kg

Smallest distance from peaks to all points 3 dB below = 7.2 mm

Ratio of SAR at M2 to SAR at M1 = 56.6%

Maximum value of SAR (measured) = 6.17 W/kg



0 dB = 6.17 W/kg = 7.91 dBW/kg

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Date: 2021/6/18

Report No. :E5/2021/50006

WLAN 802.11n(20M) 5.3G_product specific 10g_CH 64_0mm

Communication System: WLAN; Frequency: 5320 MHz; Duty Cycle: 1:0.998

Medium parameters used: f = 5320 MHz; σ = 4.759 S/m; ε_r = 35.709; ρ = 1000 kg/m^3

Phantom section: Flat Section

Ambient temperature: 22.4°C; Liquid temperature: 21.7°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(5.05, 5.05, 5.05); Calibrated: 2021/2/22
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2021/3/22
- Phantom: ELI
- DASY52 4.7.80(0); SEMCAD X 14.6.14(7483)

Area Scan (91x121x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 5.23 W/kg

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

Reference Value = 4.780 V/m; Power Drift = 0.01 dB

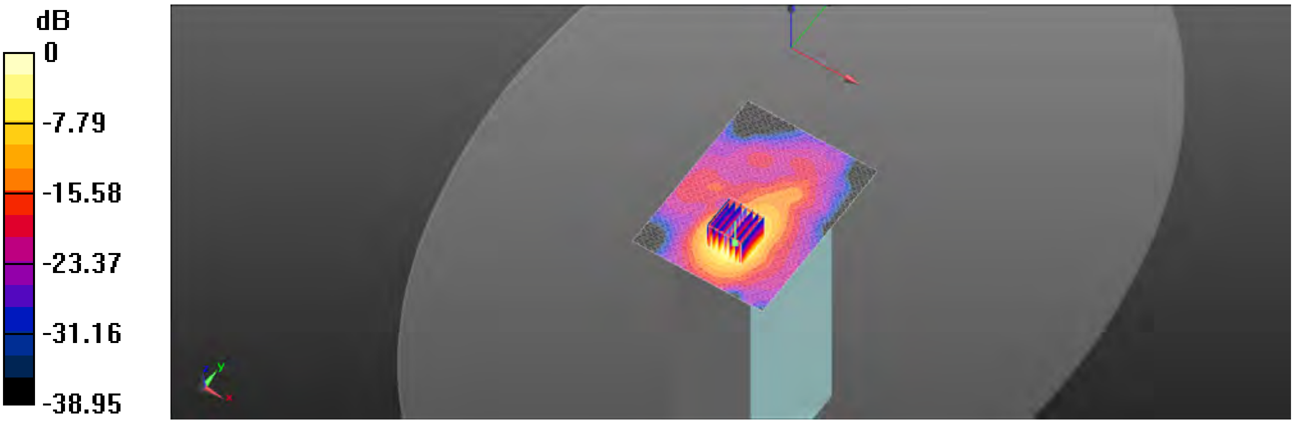
Peak SAR (extrapolated) = 10.9 W/kg

SAR(1 g) = 2.61 W/kg; SAR(10 g) = 0.788 W/kg

Smallest distance from peaks to all points 3 dB below = 6.5 mm

Ratio of SAR at M2 to SAR at M1 = 55%

Maximum value of SAR (measured) = 5.30 W/kg



0 dB = 5.30 W/kg = 7.25 dBW/kg

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Report No. :E5/2021/50006

WLAN 802.11n(20M) 5.6G_product specific 10g_CH 116_0mm

Communication System: WLAN; Frequency: 5580 MHz; Duty Cycle: 1:0.998

Medium parameters used: f = 5580 MHz; σ = 5.025 S/m; ε_r = 35.411; ρ = 1000 kg/m^3

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(4.66, 4.66, 4.66); Calibrated: 2021/2/22
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2021/3/22
- Phantom: ELI
- DASY52 4.7.80(0); SEMCAD X 14.6.14(7483)

Area Scan (91x121x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 7.40 W/kg

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

Reference Value = 6.208 V/m; Power Drift = -0.06 dB

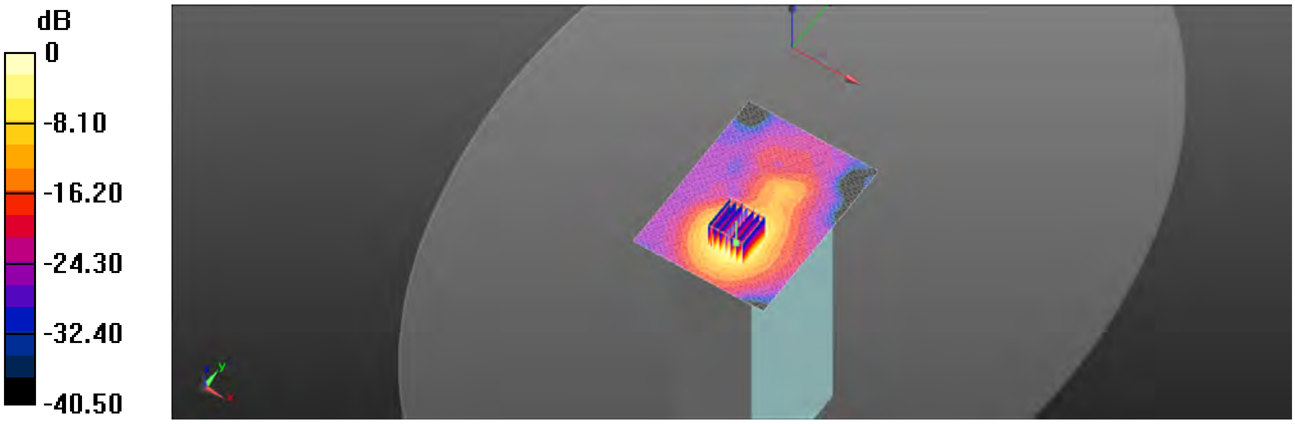
Peak SAR (extrapolated) = 15.7 W/kg

SAR(1 g) = 3.54 W/kg; SAR(10 g) = 1.07 W/kg

Smallest distance from peaks to all points 3 dB below = 7.2 mm

Ratio of SAR at M2 to SAR at M1 = 54.9%

Maximum value of SAR (measured) = 7.33 W/kg



0 dB = 7.33 W/kg = 8.65 dBW/kg

Date: 2021/6/19

Report No. :E5/2021/50006

WLAN 802.11n(20M) 5.8G_product specific 10g_body_CH 157_0mm

Communication System: WLAN; Frequency: 5785 MHz; Duty Cycle: 1:0.998

Medium parameters used: f = 5785 MHz; σ = 5.234 S/m; ε_r = 35.177; ρ = 1000 kg/m^3

Phantom section: Flat Section

Ambient temperature: 22.3°C; Liquid temperature: 21.5°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(4.7, 4.7, 4.7); Calibrated: 2021/2/22
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2021/3/22
- Phantom: ELI
- DASY52 4.7.80(0); SEMCAD X 14.6.14(7483)

Area Scan (71x111x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 8.46 W/kg

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

Reference Value = 7.308 V/m; Power Drift = 0.02 dB

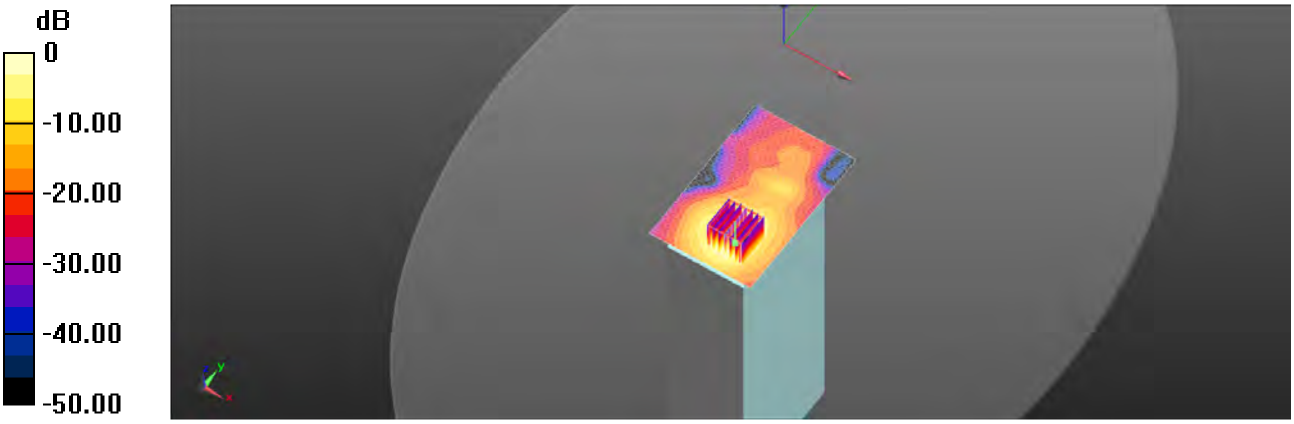
Peak SAR (extrapolated) = 20.4 W/kg

SAR(1 g) = 4.2 W/kg; SAR(10 g) = 1.24 W/kg

Smallest distance from peaks to all points 3 dB below = 7.1 mm

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

Maximum value of SAR (measured) = 8.96 W/kg



0 dB = 8.96 W/kg = 9.53 dBW/kg

6. SAR System Performance Verification

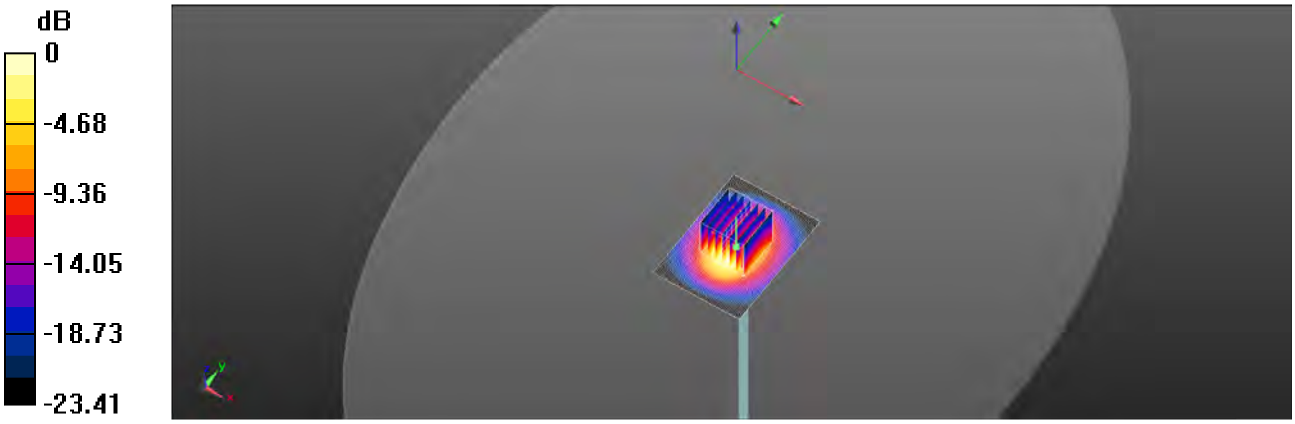
Date: 2021/6/18

Report No. :E5/2021/50006
Dipole 2450 MHz_SN:727
Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.804 S/m; ε_r = 39.06; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.2°C; Liquid temperature: 21.5°C
DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(7.46, 7.46, 7.46) ; Calibrated: 2021/2/22
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2021/3/22
- Phantom: ELI
- DASY52 4.7.80(0); SEMCAD X 14.6.14(7483)

Area Scan (51x71x1): Interpolated grid: dx=12 mm, dy=12 mm
Maximum value of SAR (interpolated) = 23.6 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 107.9 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 29.6 W/kg
SAR(1 g) = 13.6 W/kg; SAR(10 g) = 6.13 W/kg
Smallest distance from peaks to all points 3 dB below = 9 mm
Ratio of SAR at M2 to SAR at M1 = 55.8%
Maximum value of SAR (measured) = 21.4 W/kg



0 dB = 21.4 W/kg = 13.30 dBW/kg

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Date: 2021/6/18

Report No. :E5/2021/50006

Dipole 5200 MHz_SN:1023

Communication System: CW; Frequency: 5200 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5200 MHz; σ = 4.636 S/m; ε_r = 35.846; ρ = 1000 kg/m^3

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(5.05, 5.05, 5.05) ; Calibrated: 2021/2/22
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2021/3/22
- Phantom: ELI
- DASY52 4.7.80(0); SEMCAD X 14.6.14(7483)

Area Scan (61x81x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 15.9 W/kg

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

Reference Value = 63.61 V/m; Power Drift = -0.02 dB

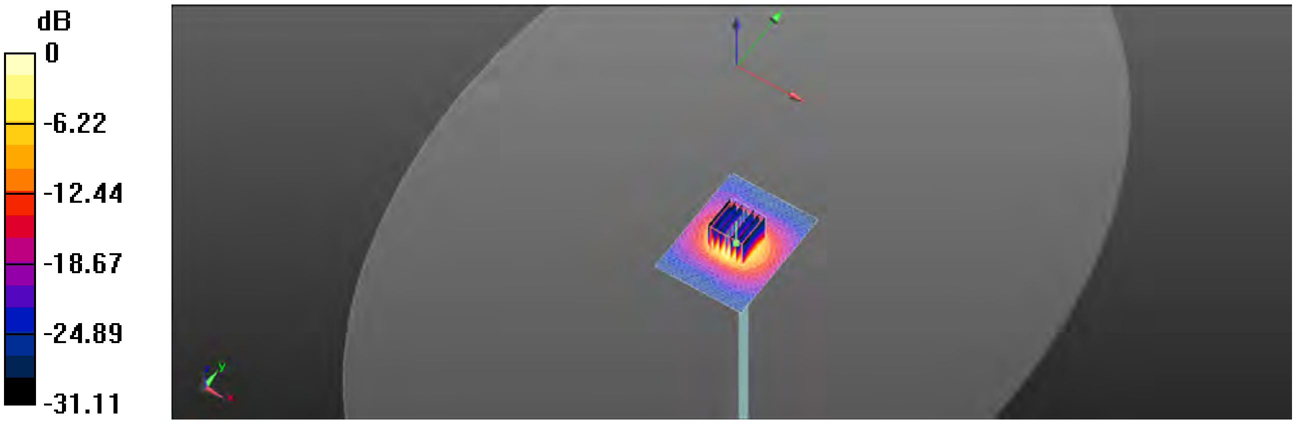
Peak SAR (extrapolated) = 33.2 W/kg

SAR(1 g) = 7.55 W/kg; SAR(10 g) = 2.15 W/kg

Smallest distance from peaks to all points 3 dB below = 8.3 mm

Ratio of SAR at M2 to SAR at M1 = 62.2%

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



0 dB = 16.0 W/kg = 12.04 dBW/kg

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Date: 2021/6/18

Report No. :E5/2021/50006

Dipole 5300 MHz_SN:1023

Communication System: CW; Frequency: 5300 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5300 MHz; σ = 4.738 S/m; ε_r = 35.731; ρ = 1000 kg/m^3

Phantom section: Flat Section

Ambient temperature: 22.4°C; Liquid temperature: 21.7°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(5.05, 5.05, 5.05) ; Calibrated: 2021/2/22
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2021/3/22
- Phantom: ELI
- DASY52 4.7.80(0); SEMCAD X 14.6.14(7483)

Area Scan (61x81x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 16.8 W/kg

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

Reference Value = 64.00 V/m; Power Drift = -0.04 dB

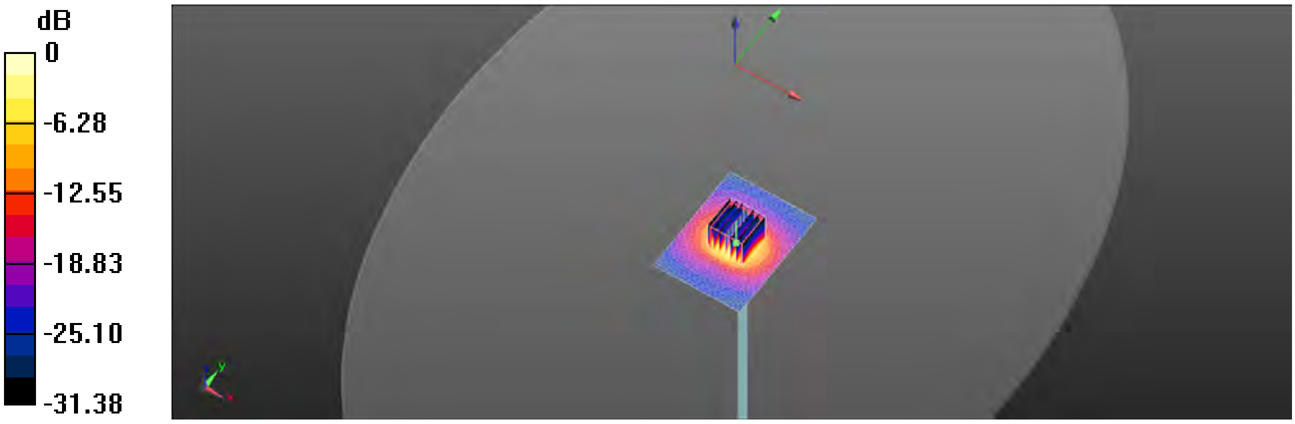
Peak SAR (extrapolated) = 35.5 W/kg

SAR(1 g) = 7.93 W/kg; SAR(10 g) = 2.23 W/kg

Smallest distance from peaks to all points 3 dB below = 9.6 mm

Ratio of SAR at M2 to SAR at M1 = 56.5%

Maximum value of SAR (measured) = 16.8 W/kg



0 dB = 16.8 W/kg = 12.25 dBW/kg

Date: 2021/6/19

Report No. :E5/2021/50006

Dipole 5600 MHz_SN:1023

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

Medium parameters used: f = 5600 MHz; σ = 5.045 S/m; ε_r = 35.389; ρ = 1000 kg/m^3

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(4.66, 4.66, 4.66) ; Calibrated: 2021/2/22
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2021/3/22
- Phantom: ELI
- DASY52 4.7.80(0); SEMCAD X 14.6.14(7483)

Area Scan (61x81x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 17.5 W/kg

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

Reference Value = 63.80 V/m; Power Drift = 0.03 dB

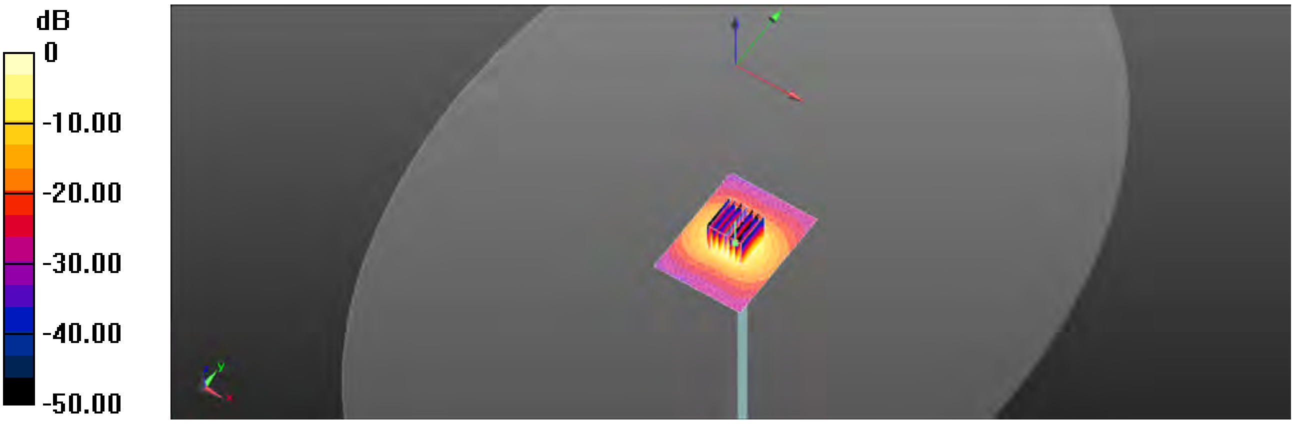
Peak SAR (extrapolated) = 38.6 W/kg

SAR(1 g) = 8.24 W/kg; SAR(10 g) = 2.39 W/kg

Smallest distance from peaks to all points 3 dB below = 7.1 mm

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

Maximum value of SAR (measured) = 17.4 W/kg



0 dB = 17.4 W/kg = 12.41 dBW/kg

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Date: 2021/6/19

Report No. :E5/2021/50006

Dipole 5800 MHz_SN:1023

Communication System: CW; Frequency: 5800 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5800 MHz; σ = 5.249 S/m; ε_r = 35.16; ρ = 1000 kg/m^3

Phantom section: Flat Section

Ambient temperature: 22.3°C; Liquid temperature: 21.5°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3938; ConvF(4.7, 4.7, 4.7) ; Calibrated: 2021/2/22
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2021/3/22
- Phantom: ELI
- DASY52 4.7.80(0); SEMCAD X 14.6.14(7483)

Area Scan (61x81x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 17.5 W/kg

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

Reference Value = 62.32 V/m; Power Drift = -0.04 dB

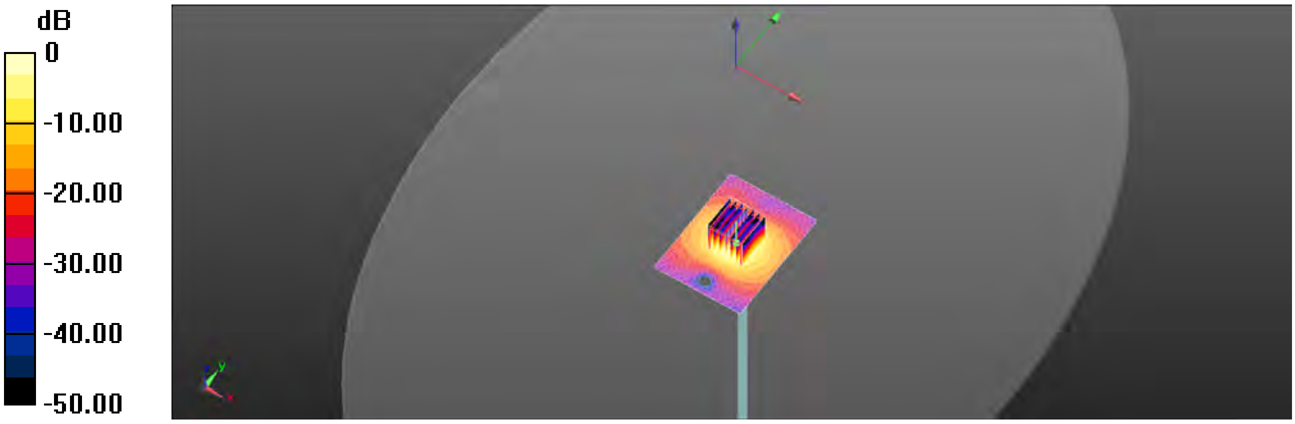
Peak SAR (extrapolated) = 40.9 W/kg

SAR(1 g) = 8.08 W/kg; SAR(10 g) = 2.27 W/kg

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

Ratio of SAR at M2 to SAR at M1 = 66.8%

Maximum value of SAR (measured) = 17.5 W/kg



0 dB = 17.5 W/kg = 12.43 dBW/kg

7. Uncertainty Budget

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

A	c	D	e		f	g	h=c * f / e	i=c * g / e	k
Source of Uncertainty	Tolerance/ Uncertainty	Probability Distributio	Div	Div Value	ci (1g)	ci (10g)	Standard uncertainty	Standard uncertainty	vi, or Veff
Measurement system									
Probe calibration	6.55%	N	1	1	1	1	6.55%	6.55%	∞
Isotropy , Axial	3.50%	R	√3	1.732	1	1	2.02%	2.02%	∞
Isotropy, Hemispherical	9.60%	R	√3	1.732	1	1	5.54%	5.54%	∞
Modulation Response	2.40%	R	√3	1.732	1	1	1.40%	1.40%	∞
Boundary Effect	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
Linearity	4.70%	R	√3	1.732	1	1	2.71%	2.71%	∞
Detection Limits	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
Readout Electronics	0.30%	N	1	1	1	1	0.30%	0.30%	∞
Response time	0.80%	R	√3	1.732	1	1	0.46%	0.46%	∞
Integration Time	2.60%	R	√3	1.732	1	1	1.50%	1.50%	∞
Measurement drift (class A evaluation)	1.75%	R	√3	1.732	1	1	1.01%	1.01%	∞
RF ambient condition - noise	3.00%	R	√3	1.732	1	1	1.73%	1.73%	∞
RF ambient conditions - reflections	3.00%	R	√3	1.732	1	1	1.73%	1.73%	∞
Probe positioner Mechanical restrictions	0.40%	R	√3	1.732	1	1	0.23%	0.23%	∞
Probe Positioning with respect to phantom shell	2.90%	R	√3	1.732	1	1	1.67%	1.67%	∞
Post-processing	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
Max SAR Eval	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
Test Sample related									
Test sample positioning	2.90%	N	1	1	1	1	2.90%	2.90%	M-1
Device Holder Uncertainty	3.60%	N	1	1	1	1	3.60%	3.60%	M-1
Drift of output power	5.00%	R	√3	1.732	1	1	2.89%	2.89%	∞
Phantom and Setup									
Phantom Uncertainty	4.00%	R	√3	1.732	1	1	2.31%	2.31%	∞
Liquid permittivity (mea.)	0.40%	N	1	1	0.64	0.43	0.26%	0.17%	M
Liquid Conductivity (mea.)	0.41%	N	1	1	0.6	0.49	0.25%	0.20%	M
Combined standard uncertainty		RSS					11.72%	11.71%	
Expant uncertainty (95% confidence interval), K=2							23.44%	23.42%	

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.)	0.36%	N	1	1	0.64	0.43	0.23%	0.15%	M
Liquid Conductivity (mea.)	0.28%	N	1	1	0.6	0.49	0.17%	0.14%	M
Combined standard uncertainty		RSS					11.42%	11.41%	
Expant uncertainty (95% confidence interval), K=2							22.84%	22.82%	

Appendixes

Refer to separated files for the following appendixes.

E5202150006 SAR_Appendix A Photographs

E5202150006 SAR_Appendix B DAE & Probe Cal. Certificate

E5202150006 SAR_Appendix C Phantom Description & Dipole Cal. Certificate

- End of Report -

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