SAR Compliace Test Report

APPLICANT NAME & ADDRESS :

EZDS Co., LTD.

Suite 1405, A Tower, 11 Beobwon-ro 11-gil,

Songpa-gu Seoul,South Korea

DATA & LOCATION OF TESTING

Dates of testing : 2021-08-04 ~ 2021-08-06

Test Site : 140-16 Eongmalli-ro, Majang-myeon, Icheon-si, Gyeonggi-do, Korea

Test Device :

FCC ID : 2A2JFZENITHZ5

MODEL : ZENITH Z5

APPLICANT : EZDS Co., LTD.

Test Report No. : ESTSFC2108-001

FCC Rule Part(s) : FCC 47 CFR § 2.1093, IEEE STD 1528- 2013

Applicant Type : Certification

Rule Part(s) : Published RF exposure KDB procedures (IEEE Std 1528-2013)

o 248227 D01 802.11 Wi-Fi SAR v02r02

o 447498 D01 General RF Exposure Guidance v06

o 447498 D03 Supplement C Cross-Reference v01

o 616217 D04 SAR for laptop and tablets v01r02

o 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04

o 865664 D02 RF Exposure Reporting v01r02

Number of page : 137

Test results : The Tested device complies with the requirements in respect of all parameters subject to the test. The test results and statements relate only to the items tested. The test report shall not be reproduced recept in full, without written approval of the laboratory.

Date and Signatures : 2021-08-25

Report Prepared By : Engineer / Sun-Duk Hong (Signature)

Engineering Manager / In-Ki Hong (Signature)

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1. SUMMARY FOR TEST REPORT

FCC ID	2A2JFZENITHZ5
Date of test	2020-08-04 ~ 2021-08-06
Measurement performed by	Sun-Duk Hong
Technical Reviewer	In-Ki Hong
EUT Type	Automotive Diagnostic Scan tool
Frequency	Bluetooth : 2402 ~ 2480 MHz 802.11b/g/n20 : 2412 ~ 2462 MHz 802.11a/n20/n40/ac80 : 5180 ~ 5240 MHz, 5260 ~ 5320 MHz, 5500~5720 MHz 5745~5825 MHz
Duty Cycle	>98%
Battery Type	3.85 V (BATTERY)

1.1 Limb Configuration

Max. SAR Measurement

Mode	Body/EUT Position	Freq (MHz)	Ch	Tune-up Limit (dBm)	Avg Power (dBm)	Tune-up Scalling Factor	Duty Cycle Scalling Factor	Power Drift (dB)	Dist (mm)	10g SAR (W/Kg)	Scaled SAR (mW/g)
2.4G BLUETOOTH	FRONT	2 441	38	9.00	8.43	1.140	1.020	-0.030	0	0.012	0.012
	REAR							0.110	0	0.007	0.007
	LEFT							0.030	0	0.012	**0.012**
	BOTTOM							-0.060	0	0.009	0.010
	LEFT	2 402.0	0	8.00	7.81	1.045	1.020	0.080	0	0.011	0.012
	LEFT	2 480.0	78	6.00	5.85	1.035	1.020	0.110	0	0.010	0.011
2.4G 802.11b	FRONT	2 437.0	6	15.00	14.94	1.014	1.020	0.010	0	0.172	0.178
	REAR							-0.070	0	0.125	0.129
	LEFT							-0.060	0	0.210	**0.217**
	BOTTOM							0.050	0	0.135	0.140
	LEFT	2 412.0	1	15.00	14.88	1.028	1.020	-0.060	0	0.170	0.178
	LEFT	2 462.0	11	15.00	14.86	1.033	1.020	0.010	0	0.175	0.184
5.2G 802.11a	FRONT	5 200.0	40	15.00	13.92	1.282	1.020	-0.050	0	0.065	0.069
	REAR							0.040	0	0.082	0.085
	LEFT							0.010	0	0.104	0.108
	BOTTOM							-0.070	0	0.057	0.059
	LEFT	5 180.0	36	15.00	13.67	1.358	1.020	0.020	0	0.112	0.155
	LEFT	5 240.0	48	15.00	14.13	1.222	1.020	-0.070	0	0.094	0.117
5.3G 802.11a	FRONT	5 280.0	56	15.00	14.18	1.208	1.020	-0.060	0	0.080	0.083
	REAR							-0.020	0	0.120	0.124
	LEFT							0.100	0	0.121	0.125
	BOTTOM							0.020	0	0.065	0.067
	LEFT	5 260.0	52	15.00	14.12	1.225	1.020	-0.010	0	0.117	0.146
	LEFT	5 320.0	64	15.00	14.20	1.202	1.020	-0.020	0	0.121	0.148
5.6G 802.11a	FRONT	5 600.0	120	13.00	12.85	1.035	1.020	-0.017	0	0.115	0.121
	REAR							-0.110	0	0.147	0.152
	LEFT							0.120	0	0.164	**0.170**
	BOTTOM							0.030	0	0.096	0.099
	LEFT	5 500.0	100	13.00	12.97	1.007	1.020	0.030	0	0.149	0.153
	LEFT	5 700.0	140	13.00	12.86	1.033	1.020	0.080	0	0.133	0.140
5.8G 802.11a	FRONT	5 785.0	157	12.00	12.15	0.966	1.020	0.050	0	0.088	0.091
	REAR							-0.010	0	0.119	0.123
	LEFT							-0.060	0	0.149	**0.154**
	BOTTOM							-0.010	0	0.116	0.120
	LEFT	5 745.0	149	12.00	12.08	0.982	1.020	-0.020	0	0.145	0.145
	LEFT	5 825.0	165	12.00	11.96	1.009	1.020	0.110	0	0.149	0.153

Highest Simultaneous SAR Summary

BAND	Limb		Dist	Highest Scaled 10g(W/kg)
BLUETOOTH + WIFI 5 GHz	0.012	0.170	0	0.182
WIFI 2.4 GHz + WIFI 5 GHz	0.217	0.170	0	0.387

1.2 Measurement Uncertainty

Combine Standard Uncertainty	± 11.31 (k=2)
Extended Standard Uncertainty	± 22.61 (k=2 , 95% CONFIDENCE LEVEL)

1.3.1 WIFI Conducted Power

	MODE	Channel	Freq (MHz)	AVG Power (dBm)
2.4GHz WLAN	802.11b	1	2 412.0	14.88
		6	2 437.0	14.94
		11	2 462.0	14.86
	802.11g	1	2 412.0	14.88
		6	2 437.0	14.91
		11	2 462.0	14.90
	802.11nHT20	1	2 412.0	12.92
		6	2 437.0	12.88
		11	2 462.0	12.82

	MODE	Channel	Freq (MHz)	AVG Power (dBm)
5.2GHz WLAN	802.11a	36	5 180.0	13.67
		40	5 200.0	13.92
		48	5 240.0	14.13
	802.11n HT20	36	5 180.0	12.98
		40	5 200.0	12.80
		48	5 240.0	12.90
	802.11n HT40	38	5 190.0	11.90
		46	5 230.0	11.89
	802.11ac VHT20	36	5 180.0	11.98
		40	5 200.0	11.92
		48	5 240.0	11.90
	802.11ac VHT40	38	5 190.0	11.88
		46	5 230.0	11.98
	802.11ac VHT80	42	5 210.0	11.92

	MODE	Channel	Freq (MHz)	AVG Power (dBm)
5.3GHz WLAN	802.11a	52	5 260.0	14.12
		56	5 280.0	14.18
		64	5 320.0	14.20
	802.11n HT20	52	5 260.0	12.89
		56	5 280.0	12.86
		64	5 320.0	12.93
	802.11n HT40	54	5 270.0	11.87
		62	5 310.0	11.93
	802.11ac VHT20	52	5 260.0	11.87
		56	5 280.0	11.86
		64	5 320.0	11.82
	802.11ac VHT40	54	5 270.0	11.92
		62	5 310.0	11.91
	802.11ac VHT80	58	5 290.0	11.97

	MODE	Channel	Freq (MHz)	AVG Power (dBm)
5.6GHz WLAN	802.11a	100	5 500.0	12.97
		120	5 600.0	12.85
		140	5 700.0	12.86
	802.11n HT20	100	5 500.0	12.88
		120	5 600.0	12.89
		140	5 700.0	12.92
	802.11n HT40	102	5 510.0	12.95
		118	5 590.0	12.96
		134	5 670.0	12.89
	802.11ac VHT20	100	5 500.0	12.92
		116	5 580.0	12.95
		140	5 700.0	12.92
	802.11ac VHT40	102	5 510.0	12.83
		118	5 590.0	12.84
		134	5 670.0	12.88
	802.11ac VHT80	106	5 530.0	12.89
		122	5 610.0	12.95

	MODE	Channel	Freq (MHz)	AVG Power (dBm)
5.8GHz WLAN	802.11a	149	5 745.0	12.08
		157	5 785.0	12.15
		165	5 825.0	11.96
	802.11n HT20	149	5 745.0	11.90
		157	5 785.0	11.85
		165	5 825.0	11.84
	802.11n HT40	151	5 755.0	11.92
		159	5 795.0	11.90
	802.11ac VHT20	149	5 745.0	11.98
		157	5 785.0	11.92
		165	5 825.0	11.91
	802.11ac VHT40	151	5 755.0	11.87
		159	5 795.0	11.93
	802.11ac VHT80	155	5 775.0	11.90

1.3.2 BLUETOOTH Conducted Power

	MODE	Channel	Freq (MHz)	AVG Power (dBm)
BLUETOOTH	BDR	0	2 402.0	7.81
		38	2 441.0	8.43
		79	2 480.0	5.85
	EDR	0	2 402.0	4.99
		38	2 441.0	6.01
		79	2 480.0	3.03
	LE	0	2 402.0	-2.59
		19	2 440.0	-1.70
		39	2 480.0	-1.92

2. DESCRIPTION OF THE DEVICE UNDER TEST

The FCC rules for evaluating portable devices for RF exposure compliance are contained in 47 CFR §2.1093. For purposes of RF exposure evaluation, a portable device is defined as a transmitting device designed to be used with any part of its radiating structure in direct contact with the user's body or within 20 cm of the body of a user or bystanders under normal operating conditions. This category of devices would include hand-held that incorporate the radiating antenna into the hand-piece and wireless transmitters that are carried next to the body. Portable sevices are evaluated with respect to SAR limits for RF exposure. The applicable SAR limit for portable transmitters used by consumers is 1.6 W/kg, which is averaged over any one gram of tissue defined as a tissue volume in the shape of a cube.

2.1 Antenna Description

Type	PiFA Antenna ,PCB Antenna
Location	the type of the device (Fig. 4.5)

2.2 Device Description

Serial numbers	NONE
Exposure environment	Uncontrolled exposure
Device category	Handheld devices
Mode(s) of Operation	802.11b/g/n/ac
Modulation Mode(s)	DSSS,OFDM
Duty Cycle	>98%
test signal method	□ Base station simulator ■ Internal test code

3. TEST CONDITIONS

3.1 Ambient Conditions

Ambient Temperature (˚C)	(21 ~ 22)
Tissue simulating liquid temperature (˚C)	(21 ~ 22)
Humidity (% R.H.)	(48 ~ 52)

3.2 RF Characteristics of The Test Site

This measurement were performed in a fully enclosed RF Shielded environment

3.3 Test Signal, Frequencies, And Output Power

The Mobile Computer was placed into simulated call mode

In all operation bands the measurements were performed on lowest, middle and highest channels.

The Mobile Computer was placed into simulated call mode was set to maximum power level during the all tests and at the beginning of the each test the battery was fully charged.

DASY4 system measures power drift during SAR testing by comparing e-field in the same location at the beginning and at the end of measurement. These records were used to monitor stability of power output.

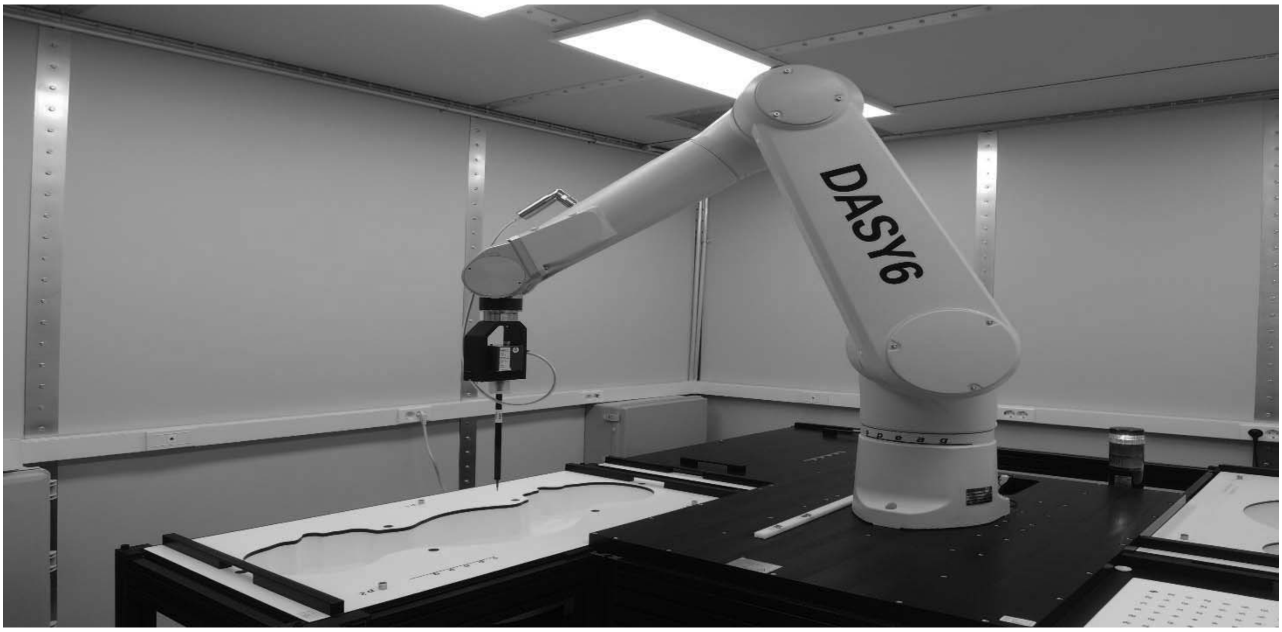


Fig. 4.1 SAR Measurement System

4. DESCRIPTION OF THE TEST EQUIPMENT

An SAR measurement system usually consists of a small diameter isotropic electric field probe, a multiple axis probe positioning system, a test device holder, one or more phantom models, the field probe instrumentation, a computer and other electronic equipment for controlling the probe and making the measurements. Other supporting equipment, such as a network analyzer, power meters and RF signal generators, are also required to measure the dielectric parameters of the simulated tissue media and to verify the measurement accuracy of the SAR system.

4.1 Test System Specifications

Test Equipment	Model	Serial Number	Last Cal. Date
DAE	DAE4	551	2021-01-24
DAE	DAE4	1630	2020-08-11
E-Field Probe	ES3DV3	3123	2021-01-27
E-Field Probe	EX4DV4	3882	2020-11-27
Dipole Antenna	D2450V2	741	2021-01-29
Dipole Antenna	D5GHzV2	1137	2020-11-25
Network analyzer	E5071B	JP1KK00256	2020-12-03
Signal generator	SMBV100A	256663	2020-12-01
RF Power meter	EPM-442A	GB37170412	2020-12-02
Power Sensor	8481A	3318A96476	2020-12-02
Power Sensor	8481A	2702A59566	2020-12-02
Dielectric Probe	85070D	US01440154	-
Power Amplifier	BBS3Q7ECK	1026	2020-12-02
Power Amplifier	BBS3K8CEM	1002	2020-12-02
LP Filter 3.0GHz	LA-30N	0301	2020-12-02
LP Filter 6.0GHz	LA-60N	40059	2020-12-02
Attenuator	50FH-010-5	74868	2020-12-01
Attenuator	8491B	21828	2020-12-02
Dual Directional Coupler	772D	3736A22424	2020-12-01
Dual Directional Coupler	778D	17575	2020-12-01

4.2 SAR Measurement Setup

Measurement are performed using the DASY4 dosimetric assessment system. The DASY4 is made by Schmid & Partner Engineering AG(SPEAG) in Zurich, Switzerland and consists of high precision robotics system (Staubli), robot controller, Pentium IV computer, near-field probe, probe alignment sensor, and the SAM twin phantom containing the brain equivalent material. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field(EMF) (see Fig. 5.1) A cell controller system contains the power supply, robot controller, teach pendant(Joystick), and a remote control used to drive the robot motors. The pc consists of the Intel Pentium IV 2.4 GHz computer with WindowsXP system and SAR measurement Software DASY4, A/D interface card, monitor, mouse, and keyboard. The Staubli Robot data acquisition electronic (DAE) circuit that performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc.

Is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC plug-in card.

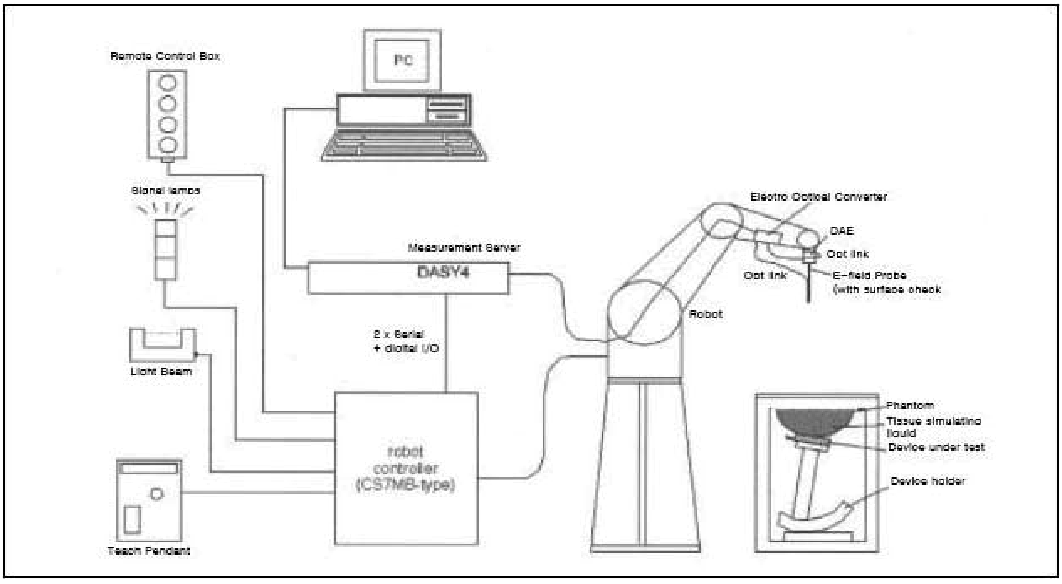


Fig. 4.1 SAR Measurement System Setup

The DAE4 consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gainswitching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the Ethernet Card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer. The system is described in detail in.

4.3 E-Field Probe System

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG).The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

<ES3DV3 Probe>

Construction	Symmetric design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz – 4 GHz; Linearity: ±0.2 dB (30 MHz – 4 GHz)	
Directivity	±0.2 dB in TSL (rotation around probe axis) ±0.3 dB in TSL (rotation normal to probe axis)	
Dynamic Range	5 μW/g – >100 mW/g; Linearity: ±0.2 dB	
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 3.9 mm (body: 12 mm) Distance from probe tip to dipole centers: 3.0 mm	

<EX3DV4 Probe>

Construction	Symmetric design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz – >6 GHz Linearity: ±0.2 dB (30 MHz – 6 GHz)	
Directivity	±0.3 dB in TSL (rotation around probe axis) ±0.5 dB in TSL (rotation normal to probe axis)	
Dynamic Range	10 μW/g – >100 mW/g Linearity: ±0.2 dB (noise: typically <1 μW/g)	
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 2.5 mm (body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm	

4.4 Phantom & Equivalent Tissues

SAM Phantom

The SAM Twin Phantom V4.0 is constructed of the fiberglass shell integrated in a wooden table. The shape of the shell is based on data from an anatomical study designed to determine the maximum exposure in at least 90% of all users. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents the evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot.

Head & Muscle simulation Mixture Characterization

The brain and muscle mixtures consist of a viscous gel using hydroxethlcellullose(HEC) gelling agent and saline solution (see Fig 5.3). Preservation with a bactericide is added and visual inspection is made to make sure air bubbles are not trapped during the mixing process. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the desired tissue. The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 have been specified in IEEE1528(2013) are derived from the issue dielectric parameters computed from the 4-Cole-Cole equations The mixture characterizations used for the brain and muscle tissue simulation liquids are according to the data by C. Gabriel and G. Hartagrove. (see Fig. 5.3)

Frequency	Head		Body	
(MHz)	εr	σ (S/m)	εr	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.9	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800-2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

Fig.4.3 Head and body tissue parameters by the IEEE SCC-34/SC-2 in P1528

Ingredients (% by weight)	750		835		900		1 900		2 000		2 450		5 000	
Tissue Type	**Head**	**Body**	**Head**	**Body**	**Head**	**Body**	**Head**	**Body**	**Head**	**Body**	**Head**	**Body**	**Head**	**Body**
Bactericide	0.2	0.2	0.2	0.2	0.2	0.2	-	-	-	-	-	-	-	-
DGBE	-	-	-	-	-	-	44.5	29.5	44.5	30	45	31.4	-	-
HEC	0.2	0.2	0.2	0.2	0.2	0.2	-	-	-	-	-	-	-	-
Salt(NaCl)	1.5	0.8	1.5	0.9	1.4	0.9	0.2	0.3	0.1	0.2	0.1	0.1	-	-
Suucrose	56	48.8	57	48.5	58	48.2	-	-	-	-	-	-	-	-
Triton X-100	-	-	-	-	-	-	-	-	-	-	-	-	17.2	10.7
Water	42.1	50	41.1	50.2	40.2	50.5	55.3	70.2	55.4	69.8	54.9	68.5	65.5	78.6
Diethylene Glycol Monohexylether	-	-	-	-	-	-	-	-	-	-	-	-	17.3	10.7

Fig. 4.4 Composition of the Tissue Equivalent Matter

Device Holder for Transmitters

In combination with the SAM Twin Phantom V4.0, the Mounting Device enables the rotation of the accurately, and repeatably be positioned according to the FCC specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

Note : A simulating human hand is not used due to the complex anatomical and geometrical structure of the hand that may produce infinite number of configurations [12]. To produce the worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.

4.5 Transmitting antenna information

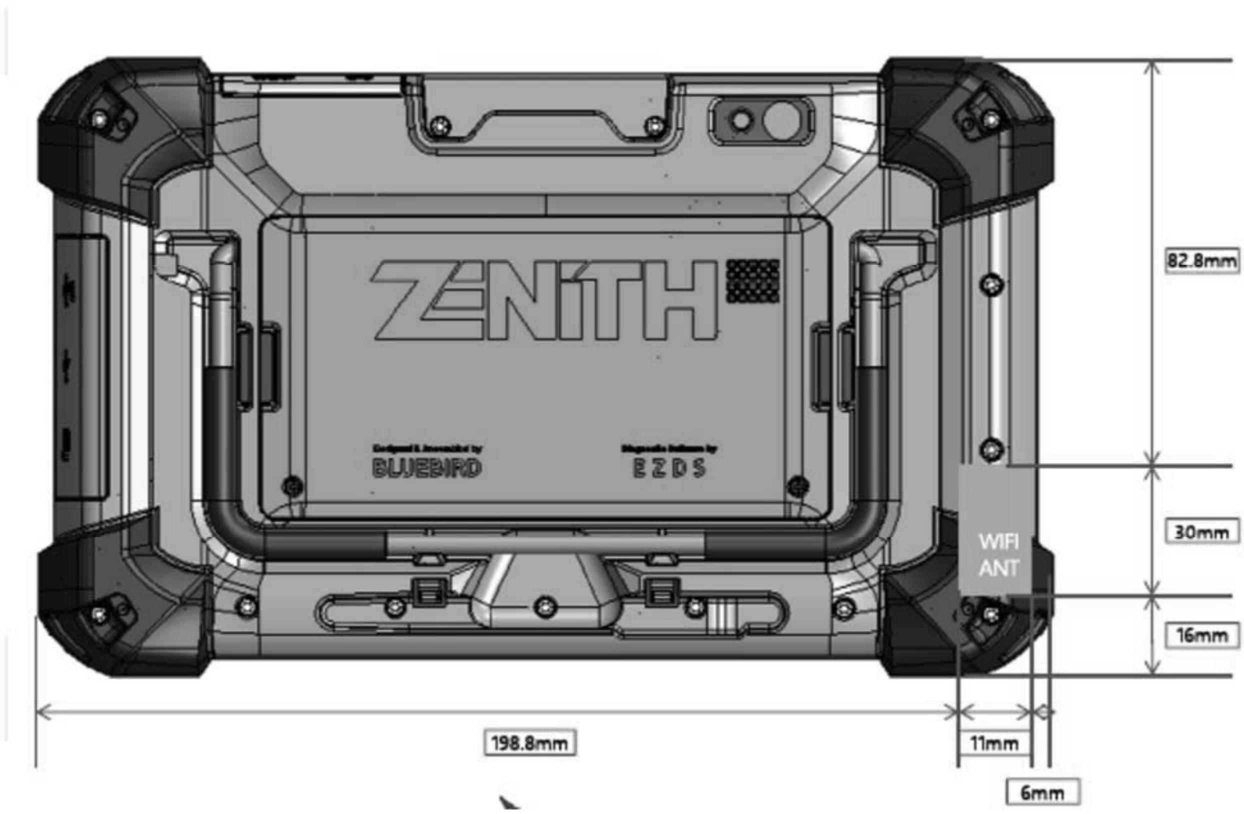


Fig. 4.5 Antenna information

DISTANCE OF SAR TEST FOR BODY

ANTENNA	Front	Rear	Left Edge	Right Edge	Top Edge	Bottom Edge
WIFI	YES	YES	YES	NO	NO	YES

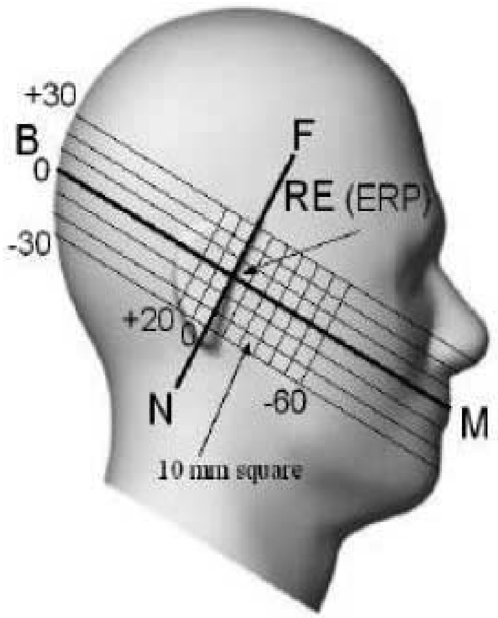
Note: According to KDB941225 antenna-to-edge>2.5cm, SAR is not required.

5. DESCRIPTION OF THE TEST PROCEDURE

5.1 Definition of Reference Point

5.1.1 EAR Reference point

The point “M” is the reference point for the center of the mouth, “ERP” is the ear reference point. The ERP are 15mm posterior to the entrance to the ear canal(EEC) along the B-M line (Back-Mouth), as shown is figure 6.1. The plane passing through the two ear canals and M is defined as the Reference Plane. The line N-F (Neck-Front) is perpendicular to the reference plane and passing through the ERP is called the Reference Pivoting Line (see Figure 6.1) B-M is perpendicular to the N-F line. Both N-F and B-M lines are marked on the external phantom shell to facilitate handset positioning [5].



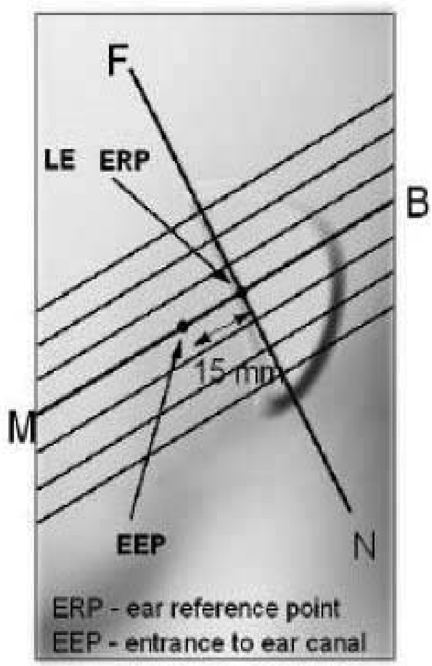


Figure 5.1 Close-up side view of ERP

5.1.2 Handset Reference Points

Two imaginary lines on the handset were established: the vertical centerline and the horizontal line. The test device was placed in a normal operating position with the “test device reference point” located along the “vertical centerline” on the front of the device aligned to the “ear reference point” (see Fig. 6.2). The “test device reference point” was than located at the same level as the center of the ear reference point. The test device was positioned so that the “vertical centerline” was bisecting the front surface of the handset at it’s top and bottom edges, positioning the “ear reference point” on the outer surface of the both the left and right head phantoms on the ear reference point” on the outer surface of the both the left and right head phantoms on the ear reference point.

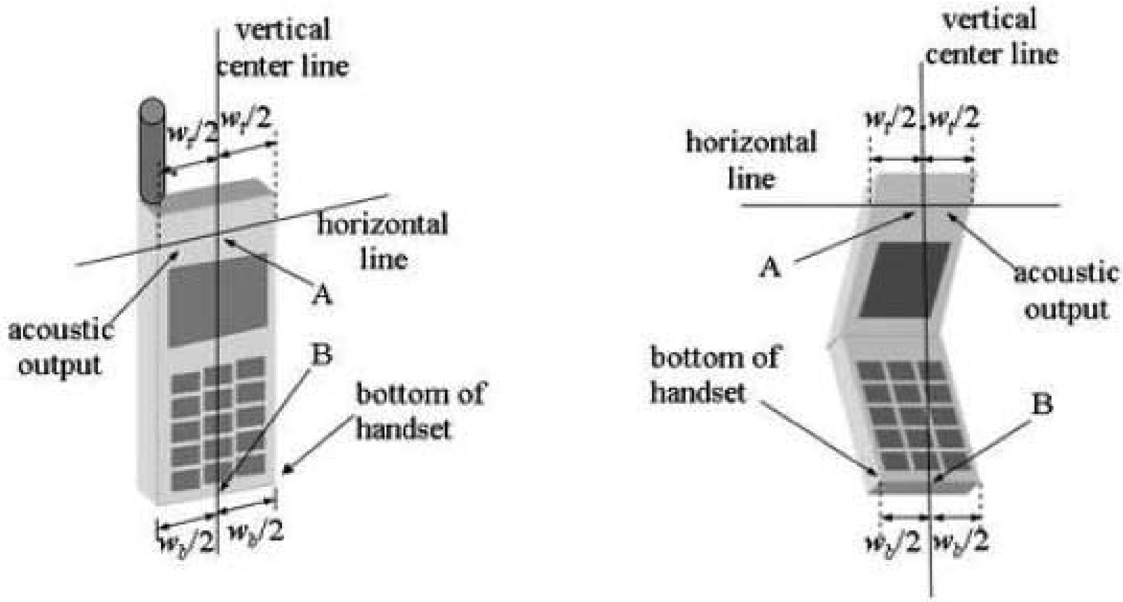


Figure 5.2 Handset Vertical Center & Horizontal Line Reference Points

5.2 Test Configuration Positions

Positioning for Cheek/Touch

1) Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece, open the cover . (If the phone can also be used with the cover closed both configurations must be tested.)

2) Define two imaginary lines on the handset: the vertical centerline and the horizontal line. The vertical centerline passes through two points on the front side of the handset: the midpoint of the width wt of the handset at the level of the acoustic output (point A on Figures 6.2), and the midpoint of the width wb of the bottom of the handset (point B). The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output (see Figure 6.2). The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output. However, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not ecessarily parallel to the front face of the handset (see Figure 6.2), especially for clamshell handsets, handsets with lip pieces, and other irregularly- shaped handsets.

3) Position the handset close to the surface of the phantom touch that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 6.3), such that the plane defined by the vertical center line and the horizontal line of the phone is approximately parallel to the sagittal plane of the phantom.

4) Translate the handset towards the phantom along the line passing through RE and LE until the handset touches the ear.

5) While maintaining the handset in this plane, rotate it around the LE-RE line until the vertical centerline is in the plane normal to MB-NF including the line MB (called the reference plane).

6) Rotate the phone around the vertical centerline until the phone (horizontal line) is symmetrical with respect to the line NF.

7) While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE, and maintaining the phone contact with the ear, rotate the handset about the line NF until any point on the handset is in contact with a phantom point

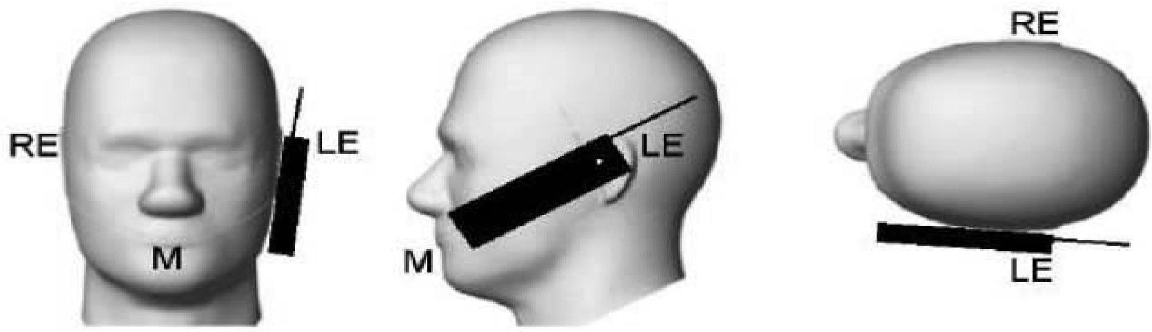


Figure 5.3 “Cheek” or “Touch” Position.

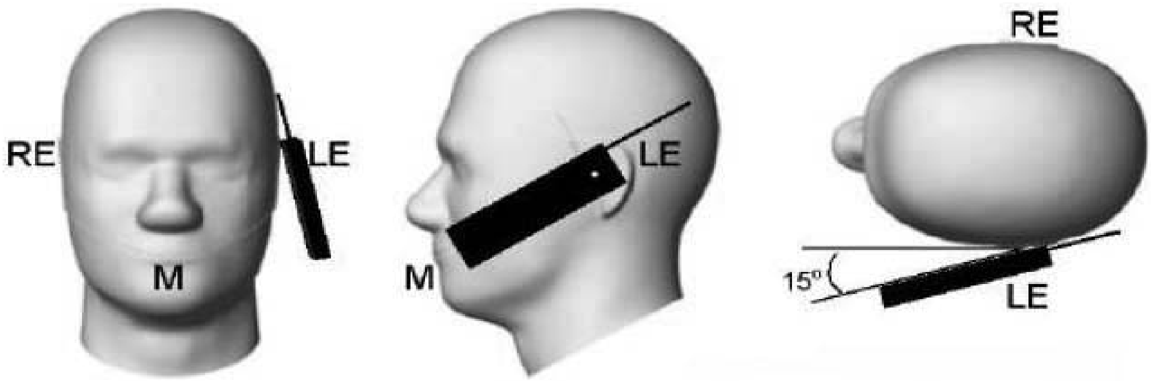


Figure 5.3 “Tilted” Position.

Positioning for Ear / 15˚ Tilted

1) Repeat steps 1 to 7 of 6.2(Positioning for Cheek/Touch) to place the device in the “cheek position.”
2) While maintaining the orientation of the phone retract the phone parallel to the reference plane far enough to enable a rotation of the phone by 15 degree.
3) Rotate the phone around the horizontal line by 15 degree.
4) While maintaining the orientation of the phone, move the phone parallel to the reference plane until any part of the phone touches the head. (In this position, point A will be located on the line RE-LE). The tilted position is obtained when the contact is on the pinna. If the contact is at any location other than the pinna, the angle of the phone shall be reduced. The tilted position is obtained if any part of the phone is in contact of the ear as well as a second part of the phone is contact with the head.

Body Holder / Belt Clip Configurations

Body-worn operation configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration. A device with a headset output is tested with a headset connected to the device. Body dielectric parameters are used. Accessories for Body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are supplied with the device, the device is tested with each accessory that contains a unique metallic component. If multiple accessories share an identical metallic component (i.e. the same metallic belt-clip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested. Body-worn accessories may not always be supplied of available as options for some devices intended to be authorized for body-worn use. In this case, a test configuration where a separation distance between the back of the device and the flat phantom is used. All test position spacings are documented. Transmitters that are designed to operate in front of a person’s face, as in push-to-talk configurations, are tested for SAR compliance is tested with the accessory(ies), including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration. In all case SAR measurements are performed to investigate the worst case positioning. Worst-case positioning is then documented and used to perform Body SAR testing. In order for users to be aware of the body-worn operation requirements for meeting RF exposure compliance, operation instructing instructions and cautions statements are included in the user’s manual.

5.3 Scan Procedures

First coarse scans are used for quick determination of the field distribution. Nest cube scan, 5x5x7 points; spacing between each point 5x5x5 mm, is performed around the highest E-field value to determine the averaged SAR-distribution over 1g.

5.4 SAR Averaging Methods

The maximum SAR value is averaged over its volume using interpolation and extrapolation. The interpolation of the points is done with a 3d-Spline. The 3d-Spline is composed of three one-dimensional splines with the “Not a Knot” ?condition [W.Gander, Computerma-thematik, p. 141-150](x, y and z directions) [Numerical Recipes in C, Second Edition, p 123]. The extrapolation is based on least square algorithm [W.Gander, Computermathematik, p.168-180]. Through the points in the first 30 mm in all z-axis, polynomials of order four are calculated. This polynomial is then used to evaluate the points between the surface and the probe tip. The points calculated from the surface, have a distance of 1mm from one another.

6. MEASUREMENT UNCERTAINTY

According to CENELEC [17], typical worst-case uncertainty of field measurements is 5 dB. For well-defined modulation characteristics the uncertainty can be reduced to 3 dB.

ERROR Description	Uncertainty value ±%	Probability Distribution	Divisor	ci 1 10g	Standard unc. (10g)	vi or Veff
MEASUREMENT SYSTEM						
Probe Calibration	6	N	1	1	6.00	∞
Axial Isotropy	4.7	R	√3	1	2.71	∞
Spherical Isotropy	9.6	R	√3	1	5.54	∞
Probe Linearity	4.7	R	√3	1	2.71	∞
Detection Limit	1	R	√3	1	0.58	∞
Boundary Effects	1	R	√3	1	0.58	∞
Response Time	0.8	R	√3	1	0.46	∞
RF Ambient Conditions	3	R	√3	1	1.73	∞
Readout Electronics	0.3	N	1	1	0.30	∞
Integration Time	2.6	R	√3	1	1.50	∞
Probe Positioner	0.4	R	√3	1	0.23	∞
Probe Positioning	2.9	R	√3	1	1.67	∞
Maximum SAR evaluation	1	R	√3	1	0.58	∞
Test Sample Related						
Test Sample Positioning	1.74	N	1	1	1.74	M-1
Device Holder Uncertainty	3.6	N	1	1	3.60	M-1
Output Power Validation - SAR drift measurement	5	R	√3	1	2.89	∞
Phantom and Tissue Parameters						
Phantom Uncertainty (shape and thickness tolerances)	4	R	√3	1	2.31	∞
SAR Correction	5	N	1	1	5.00	∞
Liquid Conductivity - measurement uncertainty	2.5	N	1	0.43	1.08	M
Liquid Conductivity - temperature uncertainty	5	R	√3	0.43	1.24	∞
Liquid Permittivity - measurement uncertainty	2.5	N	1	0.49	1.23	M
Liquid Permittivity - temperature uncertainty	5	R	√3	0.49	1.41	∞
Combined Standard Uncertainty					±11.31 %	330
Coverage Factor for 95%				*K = 2*		
Expanded Standard Uncertainty					± 22.61 %	

7. SYSTEM VERIFICATION

Tissue Verification

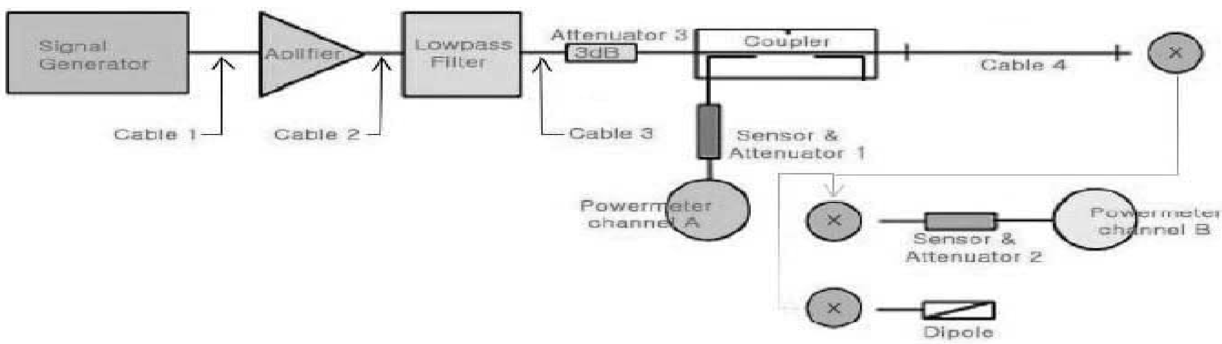
7.1 Simulated Tissue Verification

MEASURED TISSUE PARAMETERS								
DATE	Tissue Type	Freq (MHz)	Measured		TARGET		% Dev σ	% Dev ε
			Conductivity, σ (S/m)	Dielectric Constant, ε	Conductivity, σ (S/m)	Dielectric Constant, ε		
2021/8/4	BODY	2 402.0	52.002	1.87	52.74	1.92	−1.40	−2.60
		2 441.0	51.828	1.92	52.71	1.94	−1.67	−1.13
		2 480.0	51.713	1.96	52.66	1.99	−1.80	−1.31
2021/8/4		2 412.0	52.750	1.91	51.94	1.89	1.55	1.33
		2 437.0	52.710	1.94	51.82	1.91	1.71	1.41
		2 462.0	52.690	1.96	51.75	1.94	1.83	0.82
2021/8/5		5 180.0	48.940	5.28	49.63	5.18	−1.39	1.93
		5 200.0	48.900	5.30	49.49	5.31	−1.19	−0.15
		5 240.0	48.900	5.32	49.38	5.25	−0.96	1.26
2021/8/5		5 260.0	48.880	5.37	49.88	5.27	−2.00	1.94
		5 280.0	48.480	5.39	49.11	5.32	−1.28	1.26
		5 320.0	48.860	5.44	49.62	5.35	−1.54	1.64
2021/8/6		5 500.0	50.056	5.58	48.60	5.65	3.00	−1.29
		5 600.0	49.309	5.68	48.50	5.77	1.67	−1.49
		5 700.0	49.243	5.83	48.37	5.88	1.80	−0.87
2021/8/6		5 745.0	49.949	5.89	48.31	5.93	3.39	−0.73
		5 785.0	49.667	5.89	48.26	5.97	2.92	−1.32
		5 825.0	49.684	5.89	48.20	6.00	3.08	−1.87

Table 7.2 System Validation

SYSTEM DIPOLE VALIDATION TARGET & MEASURED						
Tissue	**System Validation Kit:**	**Forward Power (W)**	**Targeted SAR 1g (mW/g)**	**Measured SAR 1g (mW/g)**	**Deviation (%)**	**Test Date**
2 450 MHz BODY	D2450V2(S/N:741)	1.0	51.00	51.20	0.39	2021-08-04
5 200 MHz BODY	D5GHzV2(S/N:1137)	1.0	73.90	78.40	6.09	2021-08-05
5 500 MHz BODY	D5GHzV2(S/N:1137)	1.0	80.70	82.40	2.11	2021-08-06
5 800 MHz BODY	D5GHzV2(S/N:1137)	1.0	75.50	74.80	-0.93	2021-08-06

SYSTEM DIPOLE VALIDATION TARGET & MEASURED						
Tissue	**System Validation Kit:**	**Forward Power (W)**	**Targeted SAR 10g (mW/g)**	**Measured SAR 10g (mW/g)**	**Deviation (%)**	**Test Date**
2 450 MHz BODY	D2450V2(S/N:741)	1.0	23.90	23.64	-1.09	2021-08-04
5 200 MHz BODY	D5GHzV2(S/N:1137)	1.0	20.90	22.20	6.22	2021-08-05
5 500 MHz BODY	D5GHzV2(S/N:1137)	1.0	22.30	23.44	5.11	2021-08-06
5 800 MHz BODY	D5GHzV2(S/N:1137)	1.0	20.90	22.00	5.26	2021-08-06

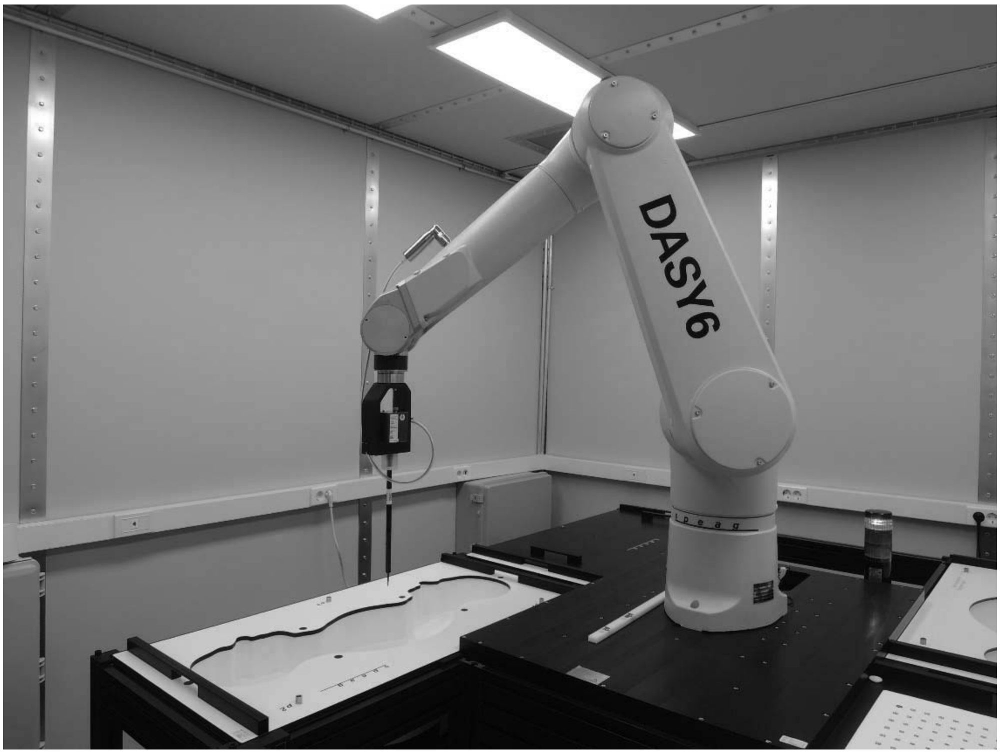


8. RESULTS

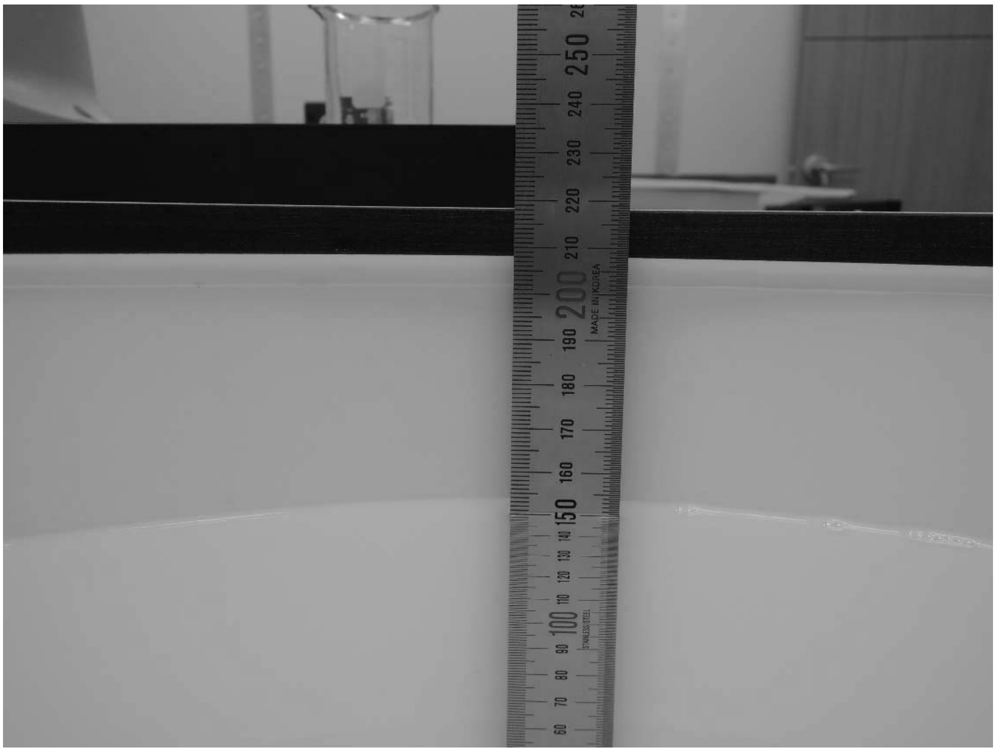
IEEE STD 1528- 2013 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										4.0 W/kg (W/kg) averaged over 10 gram	
Mode	**Body/EUT Position**	**Freq (MHz)**	**Ch**	**Tune-up Limit (dBm)**	**Avg Power (dBm)**	**Tune-up Scalling Factor**	**Duty Cycle Scalling Factor**	**Power Drift (dB)**	**Dist (mm)**	**10g SAR (W/Kg)**	**Scaled SAR (mW/g)**
2.4G BLUETOOTH	FRONT	2 441	38	9.00	8.43	1.140	1.020	-0.030	0	0.012	0.012
	REAR							0.110	0	0.007	0.007
	LEFT							0.030	0	0.012	**0.012**
	BOTTOM							-0.060	0	0.009	0.010
	LEFT	2 402.0	0	8.00	7.81	1.045	1.020	0.080	0	0.011	0.012
	LEFT	2 480.0	78	6.00	5.85	1.035	1.020	0.110	0	0.010	0.011
2.4G 802.11b	FRONT	2 437.0	6	15.00	14.94	1.014	1.020	0.010	0	0.172	0.178
	REAR							-0.070	0	0.125	0.129
	LEFT							-0.060	0	0.210	**0.217**
	BOTTOM							0.050	0	0.135	0.140
	LEFT	2 412.0	1	15.00	14.88	1.028	1.020	-0.060	0	0.170	0.178
	LEFT	2 462.0	11	15.00	14.86	1.033	1.020	0.010	0	0.175	0.184
5.2G 802.11a	FRONT	5 200.0	40	15.00	13.92	1.282	1.020	-0.050	0	0.065	0.069
	REAR							0.040	0	0.082	0.085
	LEFT							0.010	0	0.104	0.108
	BOTTOM							-0.070	0	0.057	0.059
	LEFT	5 180.0	36	15.00	13.67	1.358	1.020	0.020	0	0.112	0.155
	LEFT	5 240.0	48	15.00	14.13	1.222	1.020	-0.070	0	0.094	0.117
5.3G 802.11a	FRONT	5 280.0	56	15.00	14.18	1.208	1.020	-0.060	0	0.080	0.083
	REAR							-0.020	0	0.120	0.124
	LEFT							0.100	0	0.121	0.125
	BOTTOM							0.020	0	0.065	0.067
	LEFT	5 260.0	52	15.00	14.12	1.225	1.020	-0.010	0	0.117	0.146
	LEFT	5 320.0	64	15.00	14.20	1.202	1.020	-0.020	0	0.121	0.148
5.6G 802.11a	FRONT	5 600.0	120	13.00	12.85	1.035	1.020	-0.017	0	0.115	0.121
	REAR							-0.110	0	0.147	0.152
	LEFT							0.120	0	0.164	**0.170**
	BOTTOM							0.030	0	0.096	0.099
	LEFT	5 500.0	100	13.00	12.97	1.007	1.020	0.030	0	0.149	0.153
	LEFT	5 700.0	140	13.00	12.86	1.033	1.020	0.080	0	0.133	0.140
5.8G 802.11a	FRONT	5 785.0	157	12.00	12.15	0.966	1.020	0.050	0	0.088	0.091
	REAR							-0.010	0	0.119	0.123
	LEFT							-0.060	0	0.149	**0.154**
	BOTTOM							-0.010	0	0.116	0.120
	LEFT	5 745.0	149	12.00	12.08	0.982	1.020	-0.020	0	0.145	0.145
	LEFT	5 825.0	165	12.00	11.96	1.009	1.020	0.110	0	0.149	0.153

APPENDIX A : Validation Test Data

Dipole Validation



Liquid depth



Date: 8/4/2021

Test Laboratory: Estech

2450_VALIDATION

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

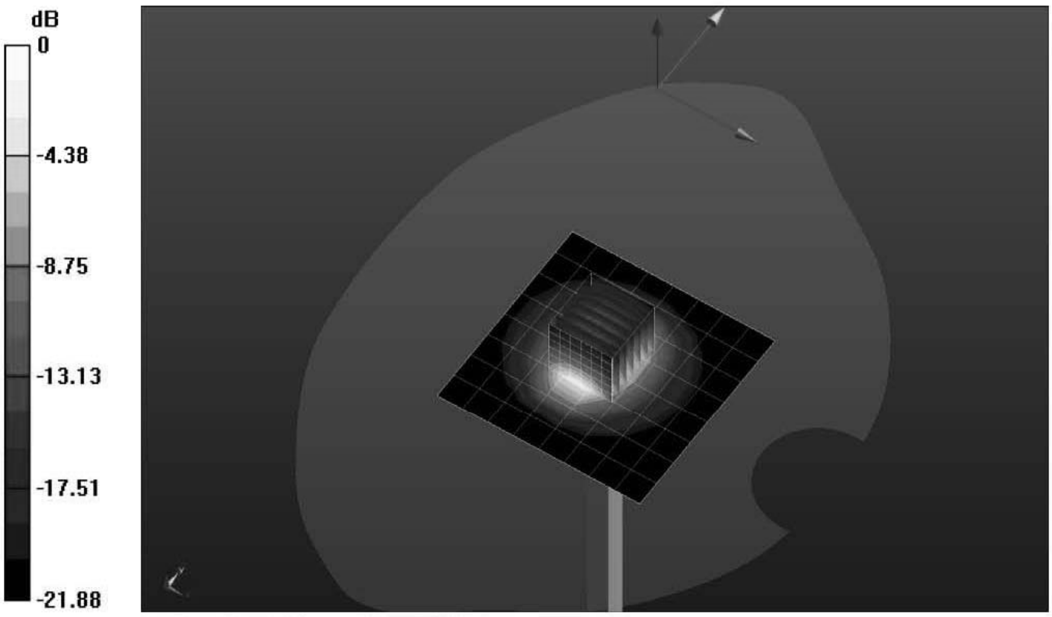
Communication System: UID 0, CW (0); Communication System Band: D2450 (2450.0 MHz); Frequency: 2450 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 2450 MHz; $\sigma = 1.93$ S/m; $\varepsilon_r = 51.781$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.37, 4.37, 4.37) @ 2450 MHz; Calibrated: 1/27/2021
- Modulation Compensation:
- Sensor-Surface: 3mm (Mechanical Surface Detection), z = -3.0, 32.0
- Electronics: DAE4 Sn1630; Calibrated: 8/11/2020
- Phantom: Twin-SAM V8.0 (20deg probe tilt); Type: QD 000 P41 Ax; Serial: xxxx
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Area Scan (9x9x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 14.4 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 61.46 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 27.0 W/kg
SAR(1 g) = 12.8 W/kg; SAR(10 g) = 5.91 W/kg
Maximum value of SAR (measured) = 17.0 W/kg



0 dB = 17.0 W/kg = 12.30 dBW/kg

Date: 8/5/2021

Test Laboratory: Estech

5200_VALIDATION

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:xxx

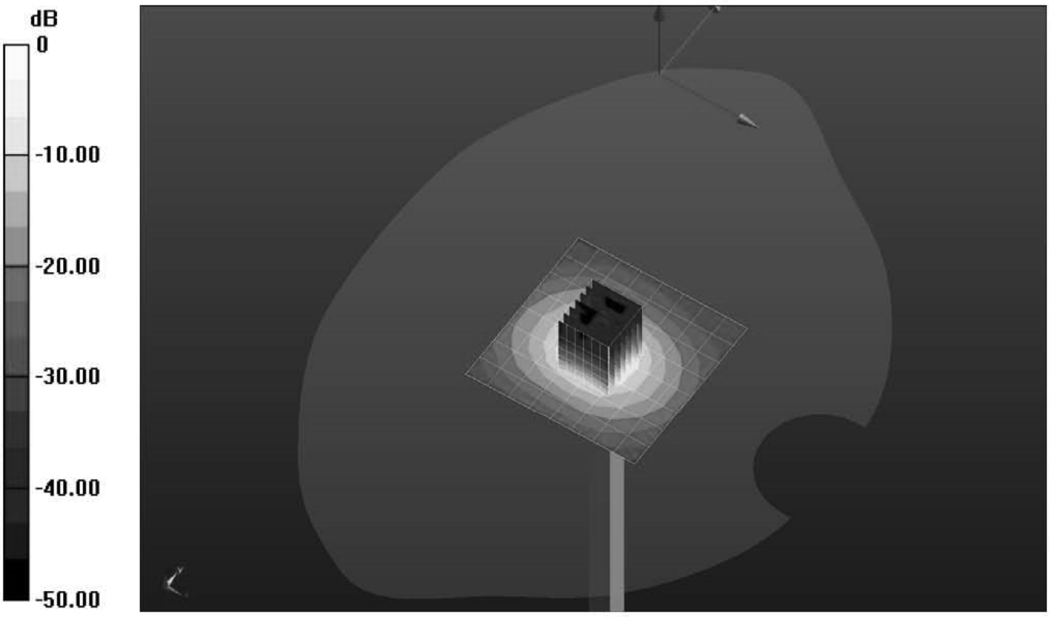
Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5200 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used (interpolated): f = 5200 MHz; σ = 5.183 S/m; ε_r = 49.176; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: EX3DV4 - SN3882; ConvF(4.2, 4.2, 4.2) @ 5200 MHz; Calibrated: 11/27/2020
- Modulation Compensation:
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -4.0, 31.0
- Electronics: DAE4 Sn551; Calibrated: 1/21/2021
- Phantom: Twin-SAM V8.0 (20deg probe tilt); Type: QD 000 P41 Ax; Serial: xxxx
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Area Scan (9x9x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 39.4 W/kg

Zoom Scan (7x7x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 100.5 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 71.8 W/kg
SAR(1 g) = 19.6 W/kg; SAR(10 g) = 5.55 W/kg
Maximum value of SAR (measured) = 46.5 W/kg



0 dB = 46.5 W/kg = 16.67 dBW/kg

Date: 8/6/2021

Test Laboratory: Estech

5500_VALIDATION

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:xxx

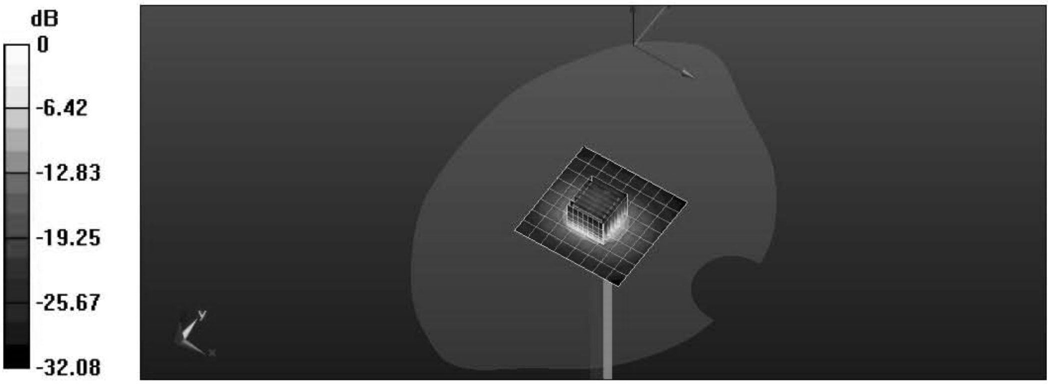
Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5500 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 5500 MHz; σ = 5.653 S/m; ε_r = 50.056; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: EX3DV4 - SN3882; ConvF(3.76, 3.76, 3.76) @ 5500 MHz; Calibrated: 11/27/2020
- Modulation Compensation:
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -4.0, 31.0
- Electronics: DAE4 Sn551; Calibrated: 1/21/2021
- Phantom: Twin-SAM V8.0 (20deg probe tilt); Type: QD 000 P41 Ax; Serial: xxxx
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Area Scan (9x9x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 53.3 W/kg

Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 98.13 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 98.7 W/kg
SAR(1 g) = 20.6 W/kg; SAR(10 g) = 5.86 W/kg
Maximum value of SAR (measured) = 62.6 W/kg



0 dB = 53.3 W/kg = 17.27 dBW/kg

Date: 8/6/2021

Test Laboratory: Estech

5800_VALIDATION

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:xxx

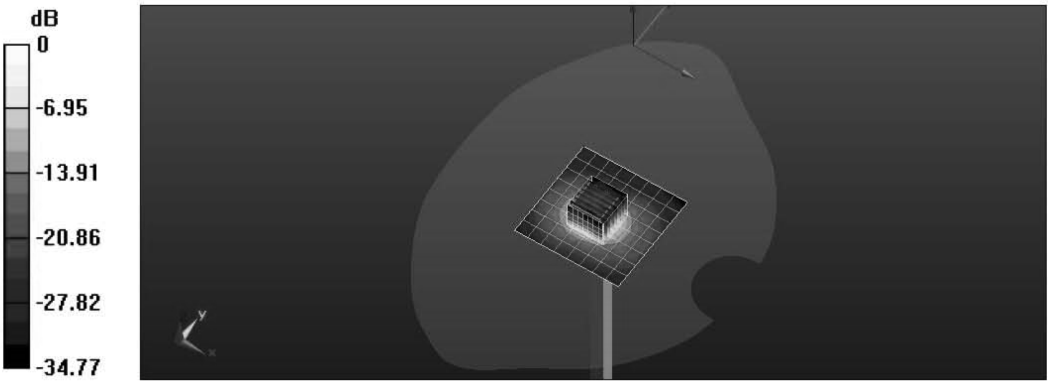
Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5800 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used (interpolated): f = 5800 MHz; σ = 6.043 S/m; ε_r = 49.918; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: EX3DV4 - SN3882; ConvF(3.82, 3.82, 3.82) @ 5800 MHz; Calibrated: 11/27/2020
- Modulation Compensation:
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -4.0, 31.0
- Electronics: DAE4 Sn551; Calibrated: 1/21/2021
- Phantom: Twin-SAM V8.0 (20deg probe tilt); Type: QD 000 P41 Ax; Serial: xxxx
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Area Scan (9x9x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 49.5 W/kg

Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 89.88 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 92.5 W/kg
SAR(1 g) = 18.7 W/kg; SAR(10 g) = 5.5 W/kg
Maximum value of SAR (measured) = 56.0 W/kg



0 dB = 49.5 W/kg = 16.94 dBW/kg

APPENDIX B : SAR Test Data

Date: 8/4/2021

Test Laboratory: Estech

ZENITH Z5 2.4GHz BLUETOOTH EDR FRONT ANT1

DUT: ZENITH Z5; Type: Not Specified; Serial: Not Specified

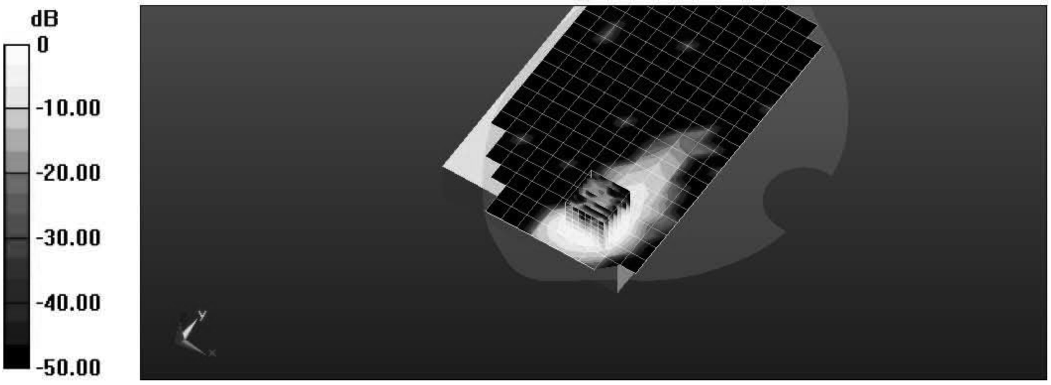
Communication System: UID 0, 2.4 GHz (0); Communication System Band: 2.4 GHz; Frequency: 2441 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used (interpolated): f = 2441 MHz; σ = 1.918 S/m; ε_r = 51.828; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.37, 4.37, 4.37) @ 2441 MHz; Calibrated: 1/27/2021
- Modulation Compensation:
- Sensor-Surface: 3mm (Mechanical Surface Detection), z = -8.0, 32.0
- Electronics: DAE4 Sn1630; Calibrated: 8/11/2020
- Phantom: Twin-SAM V8.0 (20deg probe tilt); Type: QD 000 P41 Ax; Serial: xxxx
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Area Scan (15x22x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 0.0289 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.980 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.0530 W/kg
SAR(1 g) = 0.024 W/kg; SAR(10 g) = 0.012 W/kg
Maximum value of SAR (measured) = 0.0321 W/kg



0 dB = 0.0289 W/kg = -15.39 dBW/kg

Date: 8/4/2021

Test Laboratory: Estech

ZENITH Z5 2.4GHz BLUETOOTH EDR REAR ANT1

DUT: ZENITH Z5; Type: Not Specified; Serial: Not Specified

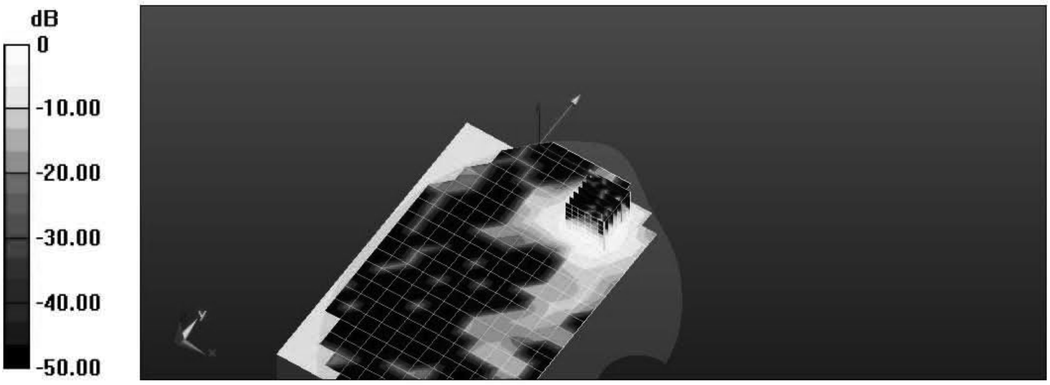
Communication System: UID 0, 2.4 GHz (0); Communication System Band: 2.4 GHz; Frequency: 2441 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used (interpolated): f = 2441 MHz; σ = 1.918 S/m; ε_r = 51.828; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.37, 4.37, 4.37) @ 2441 MHz; Calibrated: 1/27/2021
- Modulation Compensation:
- Sensor-Surface: 3mm (Mechanical Surface Detection), z = -8.0, 32.0
- Electronics: DAE4 Sn1630; Calibrated: 8/11/2020
- Phantom: Twin-SAM V8.0 (20deg probe tilt); Type: QD 000 P41 Ax; Serial: xxxx
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Area Scan (15x22x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 0.0180 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.674 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 0.0270 W/kg
SAR(1 g) = 0.014 W/kg; SAR(10 g) = 0.00669 W/kg
Maximum value of SAR (measured) = 0.0189 W/kg



0 dB = 0.0180 W/kg = -17.44 dBW/kg

Date: 8/4/2021

Test Laboratory: Estech

ZENITH Z5 2.4GHz BLUETOOTH EDR LEFT ANT1

DUT: ZENITH Z5; Type: Not Specified; Serial: Not Specified

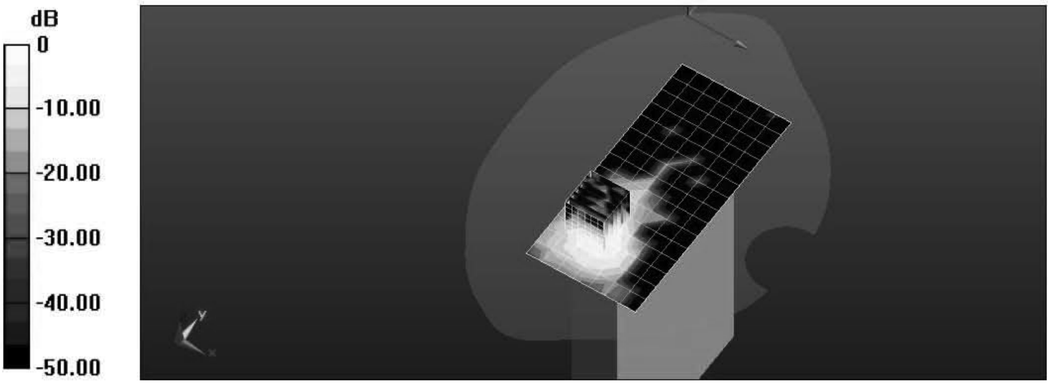
Communication System: UID 0, 2.4 GHz (0); Communication System Band: 2.4 GHz; Frequency: 2441 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used (interpolated): f = 2441 MHz; σ = 1.918 S/m; ε_r = 51.828; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.37, 4.37, 4.37) @ 2441 MHz; Calibrated: 1/27/2021
- Modulation Compensation:
- Sensor-Surface: 3mm (Mechanical Surface Detection), z = -8.0, 32.0
- Electronics: DAE4 Sn1630; Calibrated: 8/11/2020
- Phantom: Twin-SAM V8.0 (20deg probe tilt); Type: QD 000 P41 Ax; Serial: xxxx
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Area Scan (8x16x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 0.0345 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.118 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.0570 W/kg
SAR(1 g) = 0.028 W/kg; SAR(10 g) = 0.012 W/kg
Maximum value of SAR (measured) = 0.0379 W/kg



0 dB = 0.0345 W/kg = -14.62 dBW/kg

Date: 8/4/2021

Test Laboratory: Estech

ZENITH Z5 2.4GHz BLUETOOTH EDR BOTTOM ANT1

DUT: ZENITH Z5; Type: Not Specified; Serial: Not Specified

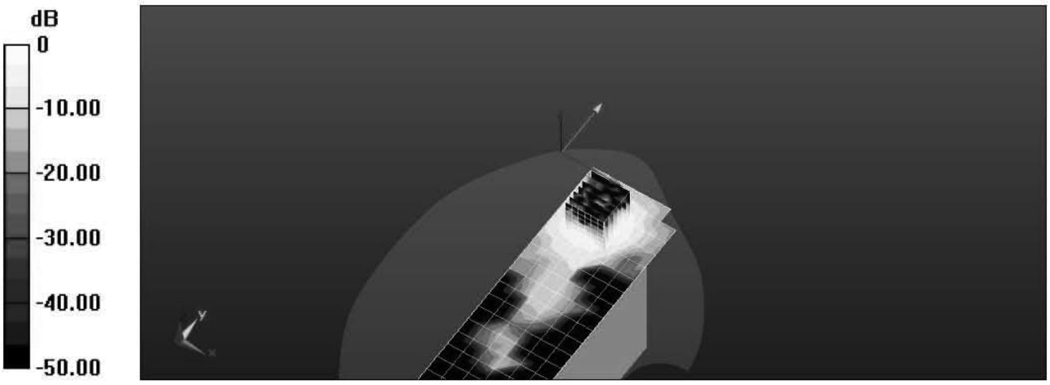
Communication System: UID 0, 2.4 GHz (0); Communication System Band: 2.4 GHz; Frequency: 2441 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used (interpolated): f = 2441 MHz; σ = 1.918 S/m; ε_r = 51.828; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.37, 4.37, 4.37) @ 2441 MHz; Calibrated: 1/27/2021
- Modulation Compensation:
- Sensor-Surface: 3mm (Mechanical Surface Detection), z = -8.0, 32.0
- Electronics: DAE4 Sn1630; Calibrated: 8/11/2020
- Phantom: Twin-SAM V8.0 (20deg probe tilt); Type: QD 000 P41 Ax; Serial: xxxx
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Area Scan (7x22x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 0.0254 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.123 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 0.0410 W/kg
SAR(1 g) = 0.021 W/kg; SAR(10 g) = 0.00937 W/kg
Maximum value of SAR (measured) = 0.0269 W/kg



0 dB = 0.0254 W/kg = -15.96 dBW/kg

Date: 8/4/2021

Test Laboratory: Estech

ZENITH Z5 2.4GHz BLUETOOTH EDR LEFT ANT1 LOW

DUT: ZENITH Z5; Type: Not Specified; Serial: Not Specified

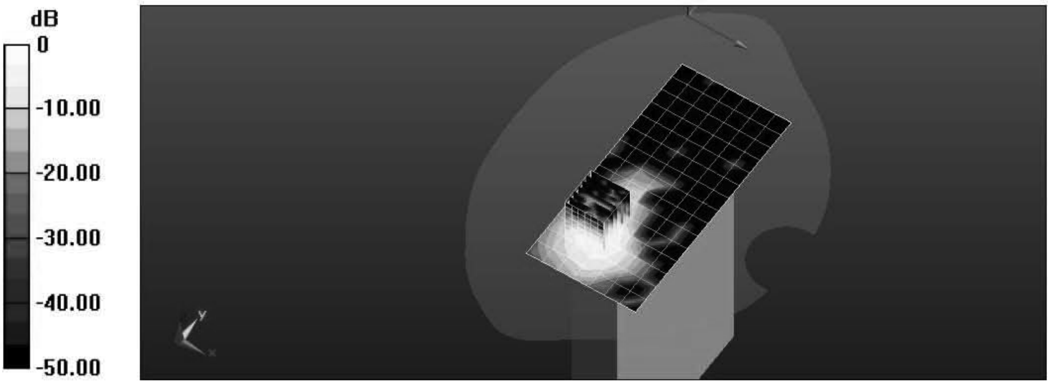
Communication System: UID 0, 2.4 GHz (0); Communication System Band: 2.4 GHz; Frequency: 2402 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 2402 MHz; σ = 1.87 S/m; ε_r = 52.002; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.37, 4.37, 4.37) @ 2402 MHz; Calibrated: 1/27/2021
- Modulation Compensation:
- Sensor-Surface: 3mm (Mechanical Surface Detection), z = -8.0, 32.0
- Electronics: DAE4 Sn1630; Calibrated: 8/11/2020
- Phantom: Twin-SAM V8.0 (20deg probe tilt); Type: QD 000 P41 Ax; Serial: xxxx
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Area Scan (8x16x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 0.0332 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.060 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 0.0560 W/kg
SAR(1 g) = 0.027 W/kg; SAR(10 g) = 0.011 W/kg
Maximum value of SAR (measured) = 0.0365 W/kg



0 dB = 0.0332 W/kg = -14.79 dBW/kg

Date: 8/4/2021

Test Laboratory: Estech

ZENITH Z5 2.4GHz BLUETOOTH EDR LEFT ANT1 HIGH

DUT: ZENITH Z5; Type: Not Specified; Serial: Not Specified

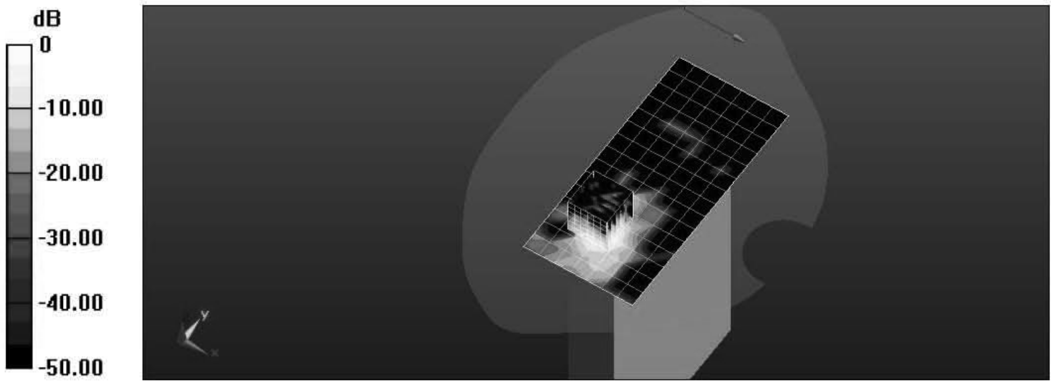
Communication System: UID 0, 2.4 GHz (0); Communication System Band: 2.4 GHz; Frequency: 2480 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 2480 MHz; σ = 1.964 S/m; ε_r = 51.713; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.37, 4.37, 4.37) @ 2480 MHz; Calibrated: 1/27/2021
- Modulation Compensation:
- Sensor-Surface: 3mm (Mechanical Surface Detection), z = -8.0, 32.0
- Electronics: DAE4 Sn1630; Calibrated: 8/11/2020
- Phantom: Twin-SAM V8.0 (20deg probe tilt); Type: QD 000 P41 Ax; Serial: xxxx
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Area Scan (8x16x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 0.0339 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.660 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 0.0560 W/kg
SAR(1 g) = 0.027 W/kg; SAR(10 g) = 0.00999 W/kg
Maximum value of SAR (measured) = 0.0355 W/kg



0 dB = 0.0339 W/kg = -14.70 dBW/kg

Date: 8/4/2021

Test Laboratory: Estech

ZENITH Z5 2.4GHz 802.11b FRONT ANT1

DUT: ZENITH Z5; Type: Not Specified; Serial: Not Specified

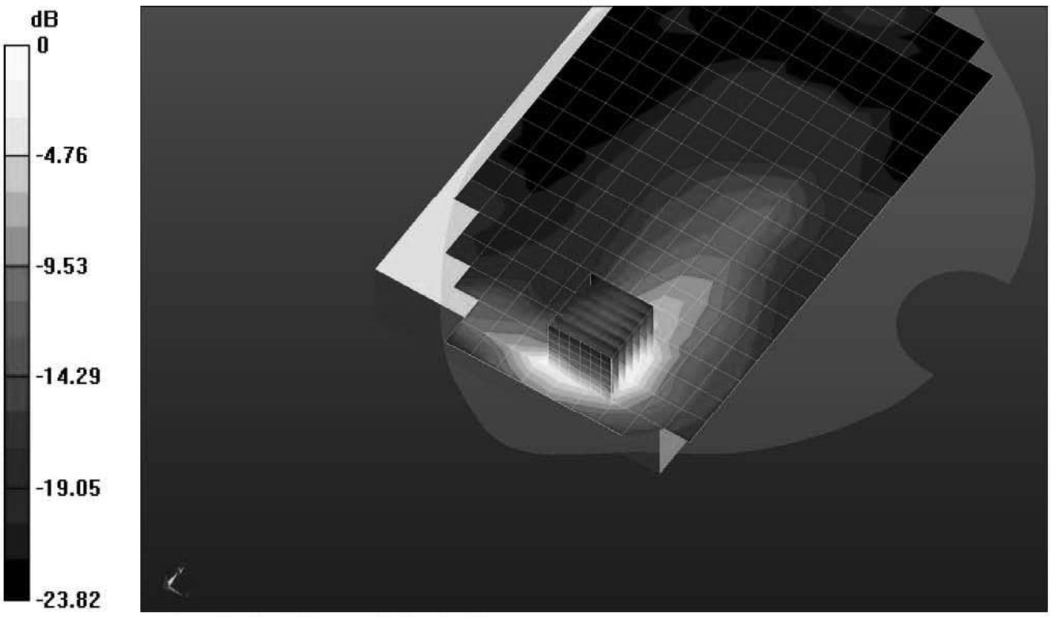
Communication System: UID 0, 2.4 GHz (0); Communication System Band: 2.4 GHz; Frequency: 2437 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.913 S/m; ε_r = 51.823; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.37, 4.37, 4.37) @ 2437 MHz; Calibrated: 1/27/2021
- Modulation Compensation:
- Sensor-Surface: 3mm (Mechanical Surface Detection), z = -8.0, 32.0
- Electronics: DAE4 Sn1630; Calibrated: 8/11/2020
- Phantom: Twin-SAM V8.0 (20deg probe tilt); Type: QD 000 P41 Ax; Serial: xxxx
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Area Scan (15x22x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 0.424 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.128 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.679 W/kg
SAR(1 g) = 0.340 W/kg; SAR(10 g) = 0.172 W/kg
Maximum value of SAR (measured) = 0.429 W/kg



0 dB = 0.429 W/kg = -3.68 dBW/kg

Date: 8/4/2021

Test Laboratory: Estech

ZENITH Z5 2.4GHz 802.11b REAR ANT1

DUT: ZENITH Z5; Type: Not Specified; Serial: Not Specified

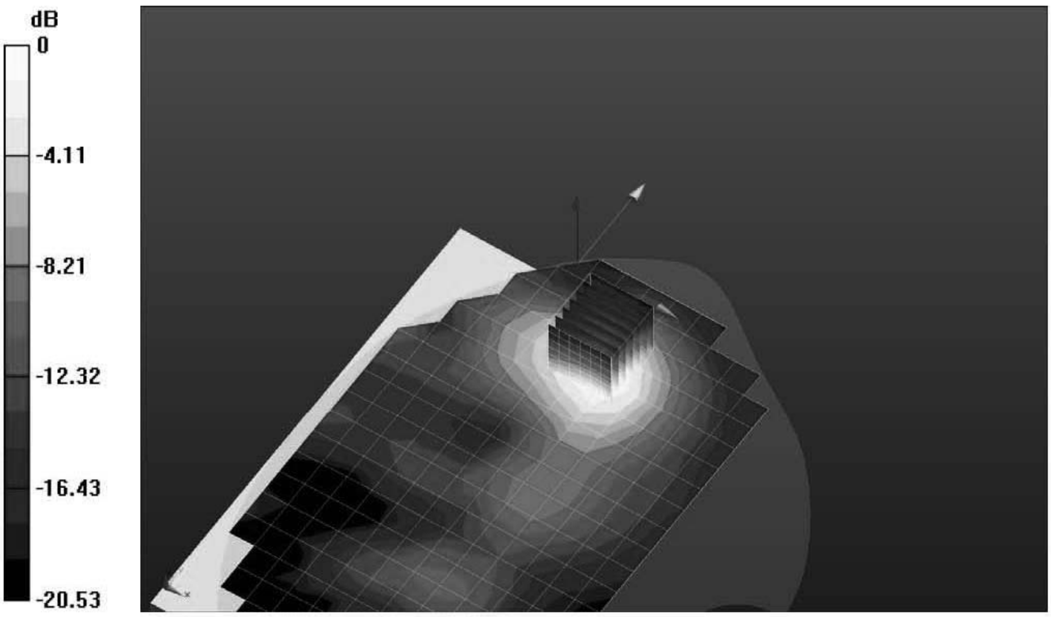
Communication System: UID 0, 2.4 GHz (0); Communication System Band: 2.4 GHz; Frequency: 2437 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.913 S/m; ε_r = 51.823; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.37, 4.37, 4.37) @ 2437 MHz; Calibrated: 1/27/2021
- Modulation Compensation:
- Sensor-Surface: 3mm (Mechanical Surface Detection), z = -8.0, 32.0
- Electronics: DAE4 Sn1630; Calibrated: 8/11/2020
- Phantom: Twin-SAM V8.0 (20deg probe tilt); Type: QD 000 P41 Ax; Serial: xxxx
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Area Scan (15x22x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 0.271 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 11.41 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.452 W/kg
SAR(1 g) = 0.236 W/kg; SAR(10 g) = 0.125 W/kg
Maximum value of SAR (measured) = 0.295 W/kg



0 dB = 0.295 W/kg = -5.30 dBW/kg

Date: 8/4/2021

Test Laboratory: Estech

ZENITH Z5 2.4GHz 802.11b LEFT ANT1

DUT: ZENITH Z5; Type: Not Specified; Serial: Not Specified

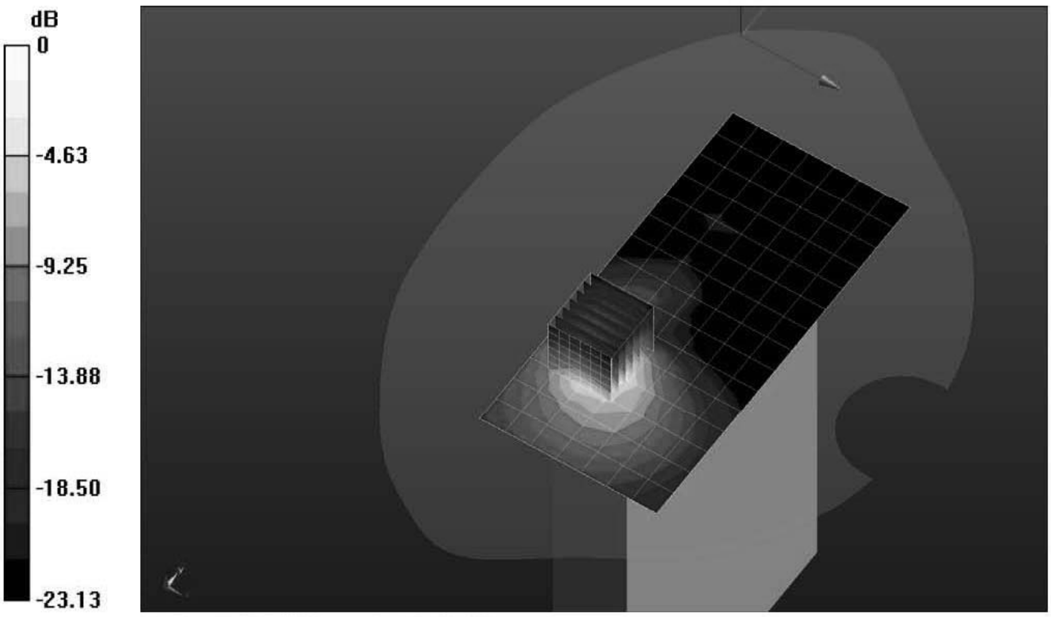
Communication System: UID 0, 2.4 GHz (0); Communication System Band: 2.4 GHz; Frequency: 2437 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.913 S/m; ε_r = 51.823; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.37, 4.37, 4.37) @ 2437 MHz; Calibrated: 1/27/2021
- Modulation Compensation:
- Sensor-Surface: 3mm (Mechanical Surface Detection), z = -8.0, 32.0
- Electronics: DAE4 Sn1630; Calibrated: 8/11/2020
- Phantom: Twin-SAM V8.0 (20deg probe tilt); Type: QD 000 P41 Ax; Serial: xxxx
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Area Scan (8x16x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 0.657 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 19.39 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 1.12 W/kg
SAR(1 g) = 0.491 W/kg; SAR(10 g) = 0.210 W/kg
Maximum value of SAR (measured) = 0.671 W/kg



0 dB = 0.671 W/kg = -1.73 dBW/kg

Date: 8/4/2021

Test Laboratory: Estech

ZENITH Z5 2.4GHz 802.11b BOTTOM ANT1

DUT: ZENITH Z5; Type: Not Specified; Serial: Not Specified

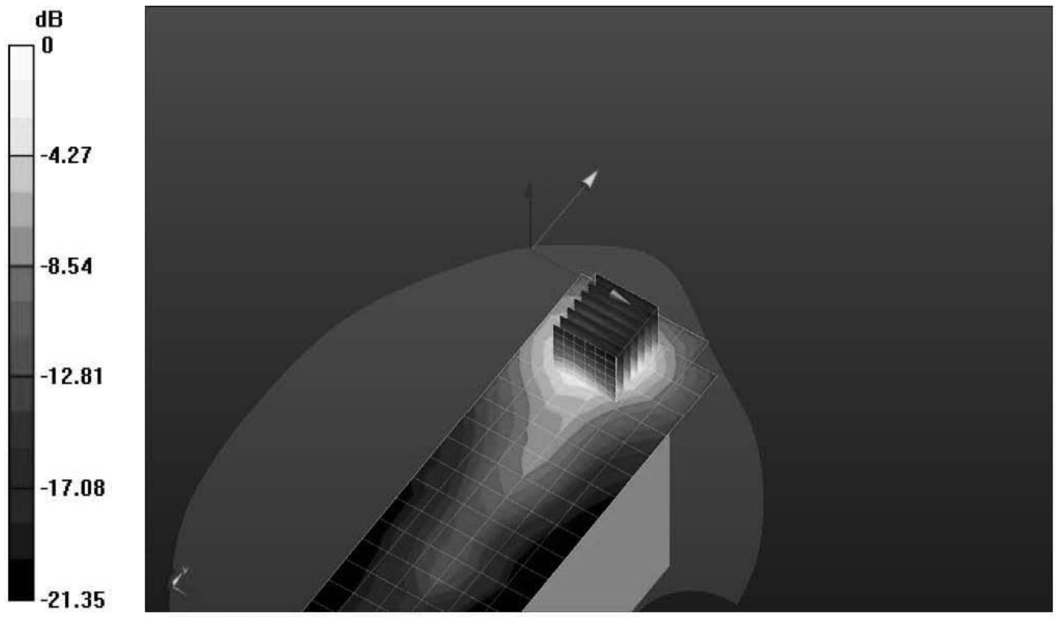
Communication System: UID 0, 2.4 GHz (0); Communication System Band: 2.4 GHz; Frequency: 2437 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.913 S/m; ε_r = 51.823; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.37, 4.37, 4.37) @ 2437 MHz; Calibrated: 1/27/2021
- Modulation Compensation:
- Sensor-Surface: 3mm (Mechanical Surface Detection), z = -8.0, 32.0
- Electronics: DAE4 Sn1630; Calibrated: 8/11/2020
- Phantom: Twin-SAM V8.0 (20deg probe tilt); Type: QD 000 P41 Ax; Serial: xxxx
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Area Scan (7x22x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 0.277 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.999 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 0.540 W/kg
SAR(1 g) = 0.273 W/kg; SAR(10 g) = 0.135 W/kg
Maximum value of SAR (measured) = 0.351 W/kg



0 dB = 0.351 W/kg = -4.55 dBW/kg

Date: 8/4/2021

Test Laboratory: Estech

ZENITH Z5 2.4GHz 802.11b LEFT ANT1 LOW

DUT: ZENITH Z5; Type: Not Specified; Serial: Not Specified

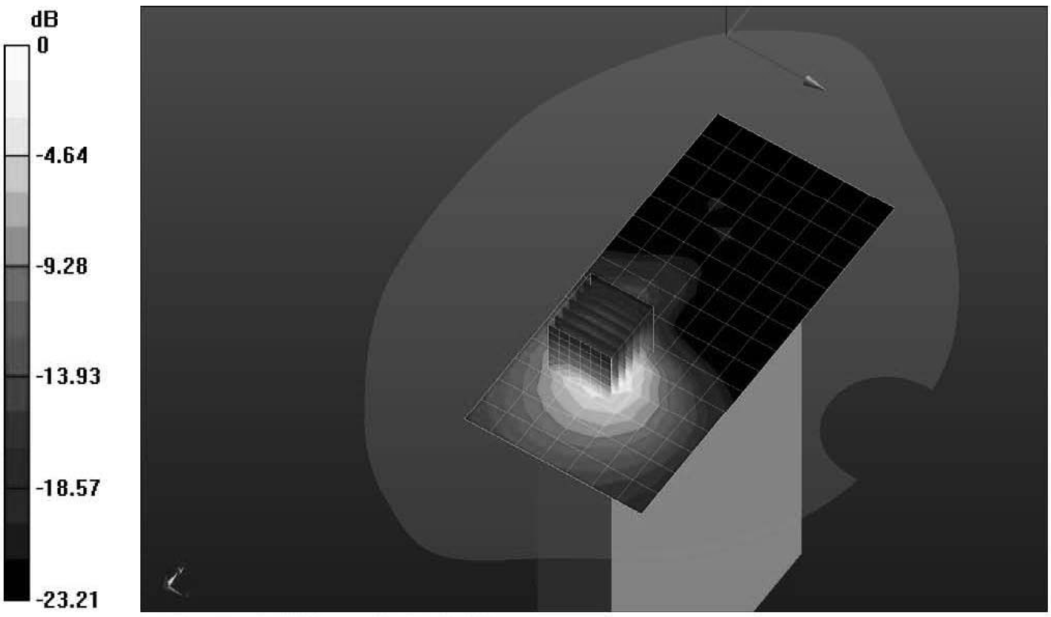
Communication System: UID 0, 2.4 GHz (0); Communication System Band: 2.4 GHz; Frequency: 2412 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 2412 MHz; σ = 1.885 S/m; ε_r = 51.944; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.37, 4.37, 4.37) @ 2412 MHz; Calibrated: 1/27/2021
- Modulation Compensation:
- Sensor-Surface: 3mm (Mechanical Surface Detection), z = -8.0, 32.0
- Electronics: DAE4 Sn1630; Calibrated: 8/11/2020
- Phantom: Twin-SAM V8.0 (20deg probe tilt); Type: QD 000 P41 Ax; Serial: xxxx
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Area Scan (8x16x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 0.381 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 14.95 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 0.857 W/kg
SAR(1 g) = 0.380 W/kg; SAR(10 g) = 0.170 W/kg
Maximum value of SAR (measured) = 0.512 W/kg



0 dB = 0.512 W/kg = -2.91 dBW/kg

Date: 8/4/2021

Test Laboratory: Estech

ZENITH Z5 2.4GHz 802.11b LEFT ANT1 HIGH

DUT: ZENITH Z5; Type: Not Specified; Serial: Not Specified

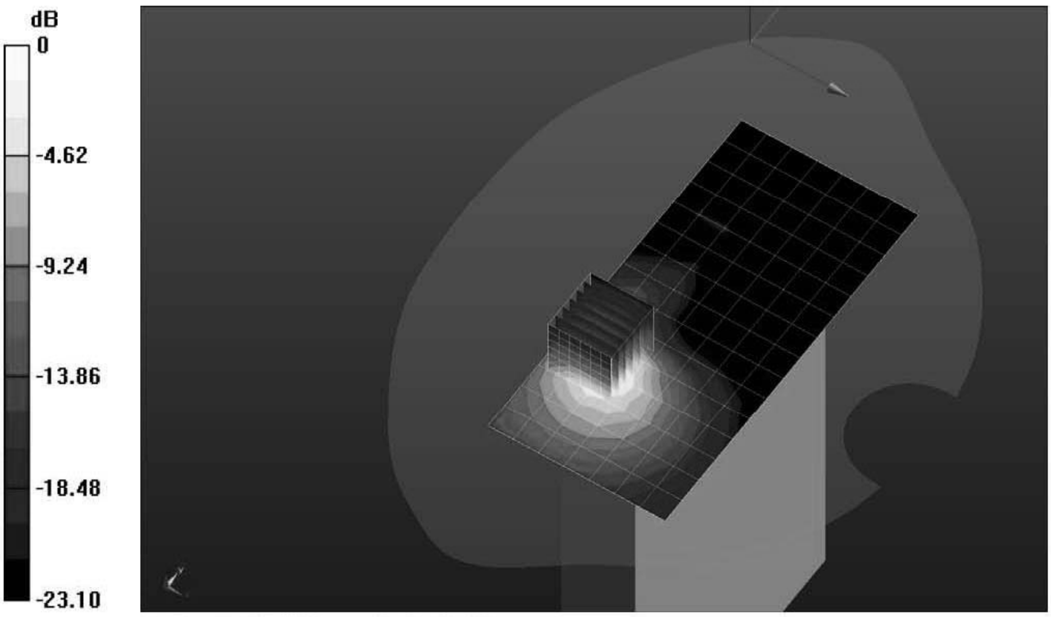
Communication System: UID 0, 2.4 GHz (0); Communication System Band: 2.4 GHz; Frequency: 2462 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 2462 MHz; σ = 1.944 S/m; ε_r = 51.745; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.37, 4.37, 4.37) @ 2462 MHz; Calibrated: 1/27/2021
- Modulation Compensation:
- Sensor-Surface: 3mm (Mechanical Surface Detection), z = -8.0, 32.0
- Electronics: DAE4 Sn1630; Calibrated: 8/11/2020
- Phantom: Twin-SAM V8.0 (20deg probe tilt); Type: QD 000 P41 Ax; Serial: xxxx
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Area Scan (8x16x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 0.466 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 16.07 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.882 W/kg
SAR(1 g) = 0.391 W/kg; SAR(10 g) = 0.175 W/kg
Maximum value of SAR (measured) = 0.531 W/kg



0 dB = 0.531 W/kg = -2.75 dBW/kg

Date: 8/5/2021

Test Laboratory: Estech

ZENITH Z5 5.2GHz 802.11a FRONT ANT1

DUT: ZENITH Z5; Type: Not Specified; Serial: Not Specified

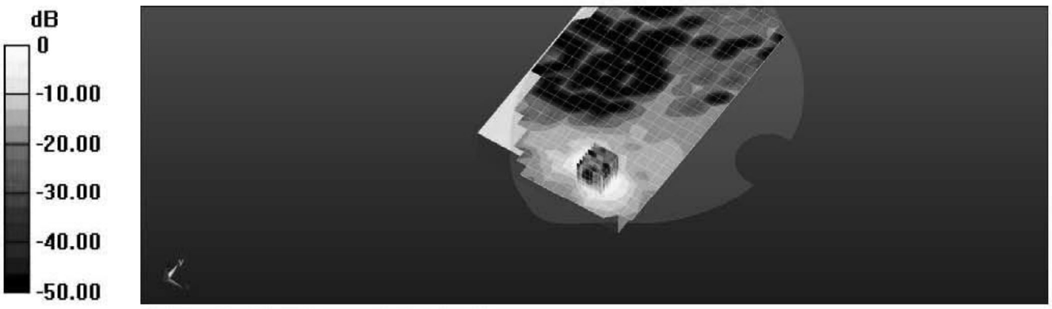
Communication System: UID 0, 5 GHz WLAN (0); Communication System Band: 5 GHz WLAN; Frequency: 5200 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 5200 MHz; σ = 5.308 S/m; ε_r = 49.409; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: EX3DV4 - SN3882; ConvF(4.2, 4.2, 4.2) @ 5200 MHz; Calibrated: 11/27/2020
- Modulation Compensation:
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -9.0, 31.0
- Electronics: DAE4 Sn551; Calibrated: 1/21/2021
- Phantom: Twin-SAM V8.0 (20deg probe tilt); Type: QD 000 P41 Ax; Serial: xxxx
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Area Scan (18x26x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.460 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 9.131 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 0.782 W/kg
SAR(1 g) = 0.208 W/kg; SAR(10 g) = 0.065 W/kg
Maximum value of SAR (measured) = 0.484 W/kg



0 dB = 0.484 W/kg = -3.15 dBW/kg

Date: 8/5/2021

Test Laboratory: Estech

ZENITH Z5 5.2GHz 802.11a REAR ANT1

DUT: ZENITH Z5; Type: Not Specified; Serial: Not Specified

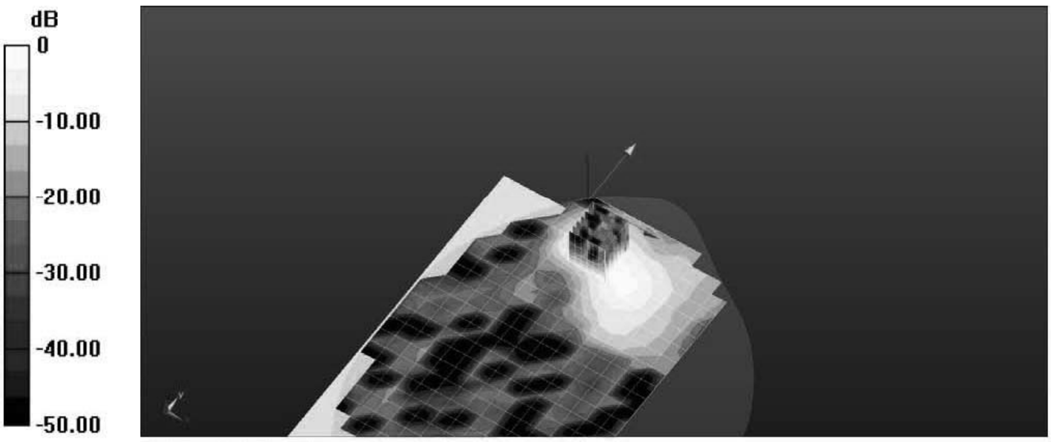
Communication System: UID 0, 5 GHz WLAN (0); Communication System Band: 5 GHz WLAN; Frequency: 5200 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 5200 MHz; σ = 5.308 S/m; ε_r = 49.409; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: EX3DV4 - SN3882; ConvF(4.2, 4.2, 4.2) @ 5200 MHz; Calibrated: 11/27/2020
- Modulation Compensation:
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -9.0, 31.0
- Electronics: DAE4 Sn551; Calibrated: 1/21/2021
- Phantom: Twin-SAM V8.0 (20deg probe tilt); Type: QD 000 P41 Ax; Serial: xxxx
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Area Scan (18x26x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.546 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 9.399 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 0.831 W/kg
SAR(1 g) = 0.237 W/kg; SAR(10 g) = 0.082 W/kg
Maximum value of SAR (measured) = 0.544 W/kg



0 dB = 0.544 W/kg = -2.64 dBW/kg

Date: 8/5/2021

Test Laboratory: Estech

ZENITH Z5 5.2GHz 802.11a LEFT ANT1

DUT: ZENITH Z5; Type: Not Specified; Serial: Not Specified

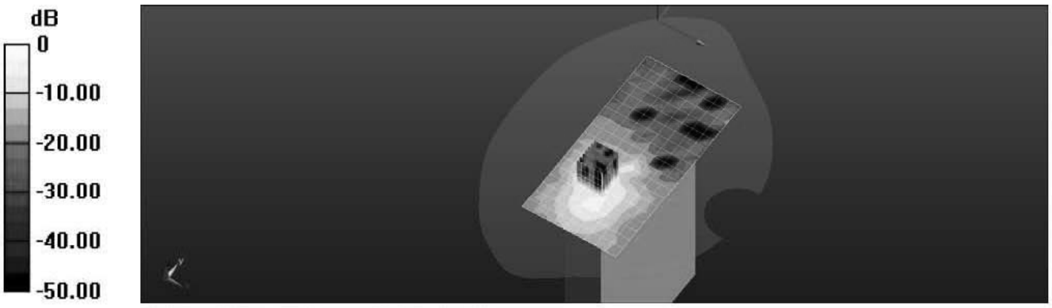
Communication System: UID 0, 5 GHz WLAN (0); Communication System Band: 5 GHz WLAN; Frequency: 5200 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 5200 MHz; σ = 5.308 S/m; ε_r = 49.409; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: EX3DV4 - SN3882; ConvF(4.2, 4.2, 4.2) @ 5200 MHz; Calibrated: 11/27/2020
- Modulation Compensation:
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -9.0, 31.0
- Electronics: DAE4 Sn551; Calibrated: 1/21/2021
- Phantom: Twin-SAM V8.0 (20deg probe tilt); Type: QD 000 P41 Ax; Serial: xxxx
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Area Scan (10x19x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.720 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 6.524 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 1.33 W/kg
SAR(1 g) = 0.363 W/kg; SAR(10 g) = 0.104 W/kg
Maximum value of SAR (measured) = 0.838 W/kg



0 dB = 0.838 W/kg = -0.77 dBW/kg

Date: 8/5/2021

Test Laboratory: Estech

ZENITH Z5 5.2GHz 802.11a BOTTOM ANT1

DUT: ZENITH Z5; Type: Not Specified; Serial: Not Specified

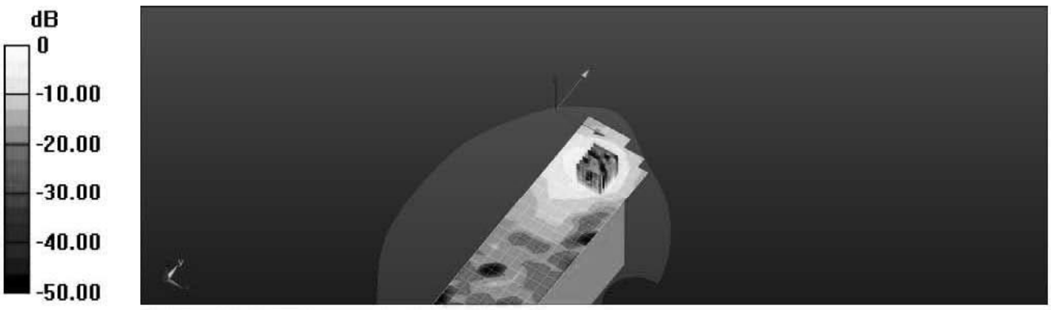
Communication System: UID 0, 5 GHz WLAN (0); Communication System Band: 5 GHz WLAN; Frequency: 5200 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 5200 MHz; σ = 5.308 S/m; ε_r = 49.409; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: EX3DV4 - SN3882; ConvF(4.2, 4.2, 4.2) @ 5200 MHz; Calibrated: 11/27/2020
- Modulation Compensation:
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -9.0, 31.0
- Electronics: DAE4 Sn551; Calibrated: 1/21/2021
- Phantom: Twin-SAM V8.0 (20deg probe tilt); Type: QD 000 P41 Ax; Serial: xxxx
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Area Scan (8x27x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.371 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 6.690 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.607 W/kg
SAR(1 g) = 0.173 W/kg; SAR(10 g) = 0.057 W/kg
Maximum value of SAR (measured) = 0.386 W/kg



0 dB = 0.386 W/kg = -4.13 dBW/kg