SAR TEST REPORT

Applicant	Smawave Technology Co. ,Ltd
FCC ID	2AU8HSMC411-A
Product	LTE-A Hotspot
Brand	Smawave
Model	SMC411-a
Report No.	R2011A0794-S1V2
Issue Date	December 31, 2020

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **IEEE 1528- 2013, ANSI C95.1: 1992, IEEE C95.1: 1991.** The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Yu Wang Guangchang Fan

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Version	Revision description	Issue Date
Rev.0	/	December 28, 2020
Rev.1	Update data for WiFi 2.4G and WiFi 5G.	December 29, 2020
Rev.2	Update information in page 8.	December 31, 2020
Note: This revised report (Report No. R2011A0794-S1V2) supersedes and replaces the previously issued report (Report No. R2011A0794-S1V1). Please discard or destroy the previously issued report and dispose of it accordingly.		

1 Test Laboratory

1.1 Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein .Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

1.2 Test facility

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform measurements.

A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform measurement.

1.3 Testing Location

Company:	TA Technology (Shanghai) Co., Ltd.
Address:	No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China
City:	Shanghai
Post code:	201201
Country:	P. R. China
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1.4 Laboratory Environment

Temperature	Min. = 18°C, Max. = 25 °C
Relative humidity	Min. = 30%, Max. = 70%
Ground system resistance	< 0.5 Ω
Ambient noise is checked and found very low and in compliance with requirement of standards. Reflection of surrounding objects is minimized and in compliance with requirement of standards.	

2 Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for the EUT are as follows:

Table 1: Highest Reported SAR

Mode	Highest Reported SAR (W/kg)
	1g SAR Body-worn Separation 5mm
LTE TDD 38	0.398
LTE TDD 40	0.378
LTE TDD 41	0.447
LTE TDD 42	0.780
LTE TDD 43	0.630
LTE TDD 48	0.606
Wi-Fi (2.4G)	0.866
Wi-Fi (5G)	1.499
Date of Testing: December 16, 2020 ~ December 19, 2020 and December 28, 2020	
Date of Sample Received: November 18, 2020	
Note: 1. The device is in compliance with SAR for Uncontrolled Environment /General Population exposure limits (1.6 W/kg) specified in ANSI C95.1: 1992/IEEE C95.1: 1991, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013. 2.All indications of Pass/Fail in this report are opinions expressed by TA Technology (Shanghai) Co., Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only.	

Table 2: Highest Simultaneous Transmission SAR

Exposure Configuration	1g SAR Body-worn (Separation 5mm)
Highest Simultaneous Transmission SAR (W/kg)	1.589
Note: The detail for simultaneous transmission consideration is described in chapter 10.2.	

3 Description of Equipment under Test

Client Information

Applicant	Smawave Technology Co. ,Ltd
Applicant address	3/F, Building 8, 1001 North Qinzhou Road，Xuhui District, Shanghai, China
Manufacturer	Smawave Technology Co. ,Ltd
Manufacturer address	3/F, Building 8, 1001 North Qinzhou Road，Xuhui District, Shanghai, China

General Technologies

Application Purpose	Original Grant	
EUT Stage	Identical Prototype	
Model	SMC411-a	
IMEI	862165040847046	
Hardware Version	V1.0	
Software Version	SG628_V1.0.4	
Antenna Type	PCB Antenna	
Antenna Working Conditions	Antenna	Working conditions
	ANT 0	LTE Band 38/41/42/43/48 TX
	ANT 1	LTE RX
	ANT 2	LTE Band 40 TX, other band RX
	ANT 3	LTE RX
	ANT_WLAN1	WIFI2.4G/5G TX & RX
	ANT_WLAN0	WIFI2.4G/5G TX & RX
Device Class	B	
Power Class	LTE TDD 38/40/41/42/43/48: 3	
Power Level	LTE TDD 38/40/41/42/43/48: max power	
EUT Accessory		
Battery	Manufacturer: HUIZHOU DXDRAGON INC. Model: BTE-4001 Output: 3.8V 4000mAh	
USB Cable	Manufacturer: Chengdu Jingyue Kaibo Electronics Co., Ltd Model:SJM001	
Note: The EUT is sent from the applicant to TA and the information of the EUT is declared by the applicant.		

Wireless Technology and Frequency Range

Wireless Technology		Modulation	Operating mode	Tx (MHz)
LTE	TDD 38	QPSK, 16QAM, 64QAM	Rel.12 /Category 12	2570 - 2620
	TDD 40			2300 - 2400
	TDD 41			2496 - 2690
	TDD 42			3400 - 3600
	TDD 43			3600 - 3800
	TDD 48			3550 - 3700
	Does this device support Carrier Aggregation (CA) ☐Yes ☒No			
	Does this device support SV-LTE (1xRTT-LTE)? ☐Yes ☒No			
Wi-Fi	2.4G	DSSS, OFDM	802.11b/g/n HT20	2412 ~ 2462
		OFDM	802.11n HT40	2422 ~ 2452
	5G	OFDM	802.11a/n HT20/ HT40/ ac VHT20/ VHT40/ VHT80	5150 ~ 5250 5725 ~ 5850
	Does this device support MIMO ☒Yes(2TX, 2RX) ☐No			

4 Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE 1528- 2013, ANSI C95.1: 1992, IEEE C95.1: 1991, the following FCC Published RF exposure KDB procedures:

IEC 62209-1

Reference Standards

KDB 447498 D01 General RF Exposure Guidance v06
KDB 648474 D04 Handset SAR v01r03
KDB 690783 D01 SAR Listings on Grants v01r03
KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
KDB 865664 D02 RF Exposure Reporting v01r02
KDB 941225 D05 SAR for LTE Devices v02r05
KDB 941225 D05A LTE Rel.10 KDB Inquiry Sheet v01r02

5 Operational Conditions during Test

5.1 Test Positions

5.1.1 Body Worn Configuration

Body-worn operating configurations should be tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations.

Per FCC KDB Publication 648474 D04, Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB Publication 447498 D01 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

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 tested with the device with each accessory. 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 or available as options for some devices intended to be authorized for body-worn use. In this case, a test configuration with a separation distance between the back of the device and the flat phantom is used. Test position spacing was 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 with the front of the device positioned to face the flat phantom in head fluid. For devices that are carried next to the body such as a shoulder, waist or chest-worn transmitters, SAR compliance is tested with the accessories, including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration.

5.2 Measurement Variability

Per FCC KDB Publication 865664 D01, SAR measurement variability was assessed for each frequency band, which was determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media were required for SAR measurements in a frequency band, the variability measurement procedures were applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. These additional measurements were repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device was returned to ambient conditions (normal room temperature) with the battery fully charged before it was re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

SAR Measurement Variability was assessed using the following procedures for each frequency band:
1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.
2) A second repeated measurement was preformed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
3) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.
4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg

The same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.

5.3 Test Configuration

5.3.1 LTE Test Configuration

LTE modes were tested according to FCC KDB 941225 D05 publication. Please see notes after the tabulated SAR data for required test configurations. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR. The R&S CMW500 was used for LTE output power measurements and SAR testing. Max power control was used so the UE transmits with maximum output power during SAR testing. SAR must be measured with the maximum TTI (transmit time interval) supported by the device in each LTE configuration.

A) Spectrum Plots for RB Configurations

A properly configured base station simulator was used for SAR tests and power measurements. Therefore, spectrum plots for RB configurations were not required to be included in this report.

B) MPR

MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.

C) A-MPR

A-MPR (Additional MPR) has been disabled for all SAR tests by setting NS=01 on the base station simulator.

D) Largest channel bandwidth standalone SAR test requirements

1) QPSK with 1 RB allocation

Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel. When the reported SAR of a required test channel is > 1.45 W/kg, SAR is required for all three RB offset configurations for that required test channel.

2) QPSK with 50% RB allocation

The procedures required for 1 RB allocation in 1) are applied to measure the SAR for QPSK with 50% RB allocation.

3) QPSK with 100% RB allocation

For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100% RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation in 1) and 2) are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.

4) Higher order modulations

For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in above sections to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same

configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg.

E) Other channel bandwidth standalone SAR test requirements

For the other channel bandwidths used by the device in a frequency band, apply all the procedures required for the largest channel bandwidth in section A) to determine the channels and RB configurations that need SAR testing and only measure SAR when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is > ½ dB higher than the equivalent channel configurations in the largest channel bandwidth configuration or the reported SAR of a configuration for the largest channel bandwidth is > 1.45 W/kg.

5.3.2 Additional requirements for TDD LTE specification

For Time-Division Duplex (TDD) systems, SAR must be tested using a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by the defined 3GPP LTE TDD configurations.

TDD LTE Band supports 3GPP TS 36.211 section 4.2 for Type 2 Frame Structure and Table: Uplink-downlink configurations for uplink-downlink configurations and Table: Configuration of special subframe (lengths of DwPTS/GP/UpPTS) for Special subframe configurations.

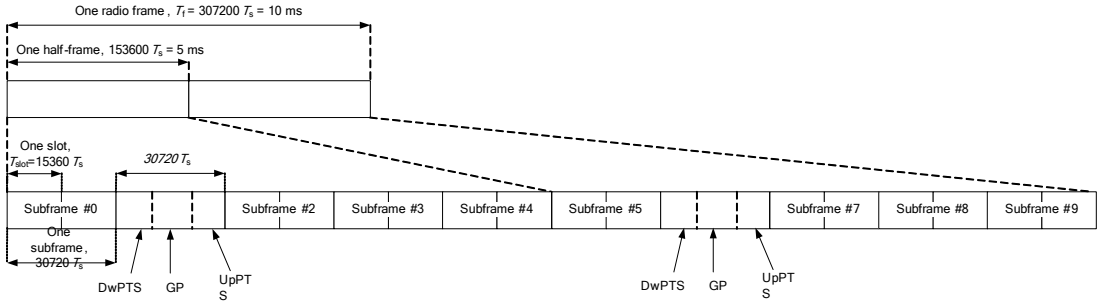


Figure 1: Frame structure type 2

Table 3: Configuration of special subframe (lengths of DwPTS/GP/UpPTS)

Special subframe configuration	Normal cyclic prefix in downlink			Extended cyclic prefix in downlink		
	DwPTS	UpPTS		DwPTS	UpPTS	
		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink
0	$6592 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$	$7680 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$
1	$19760 \cdot T_s$			$20480 \cdot T_s$		
2	$21952 \cdot T_s$			$23040 \cdot T_s$		
3	$24144 \cdot T_s$			$25600 \cdot T_s$		
4	$26336 \cdot T_s$			$7680 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$
5	$6592 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$	$20480 \cdot T_s$		
6	$19760 \cdot T_s$			$23040 \cdot T_s$		
7	$21952 \cdot T_s$			$12800 \cdot T_s$		
8	$24144 \cdot T_s$			-	-	-
9	$13168 \cdot T_s$			-	-	-

Table 4: Uplink-downlink configurations

Uplink-downlink configuration	Downlink-to-Uplink Switch-point periodicity	Subframe number									
		0	1	2	3	4	5	6	7	8	9
0	5 ms	D	S	U	U	U	D	S	U	U	U
1	5 ms	D	S	U	U	D	D	S	U	U	D
2	5 ms	D	S	U	D	D	D	S	U	D	D
3	10 ms	D	S	U	U	U	D	D	D	D	D
4	10 ms	D	S	U	U	D	D	D	D	D	D
5	10 ms	D	S	U	D	D	D	D	D	D	D
6	5 ms	D	S	U	U	U	D	S	U	U	D

According to Figure 1, one radio frame is configured by 10 subframes, which consist of Uplink-subframe, Downlink-subframe and Special subframe. For TDD-LTE, the Duty Cycle should be calculated on Uplink-subframes and Special subframes, due to Special subframe containing both Uplink transmissions. So for one radio frame, Duty Cycle can be calculated with formula as below. The count of Uplink subframes are according to Table: Uplink-downlink configurations:

Duty cycle = (30720Ts*Ups + Uplink Component*Specials)/(307200Ts)

About the uplink component of Special subframes, we can figure out by Table: Configuration of special subframe (lengths of DwPTS/GP/UpPTS):

Uplink Component = UpPTS

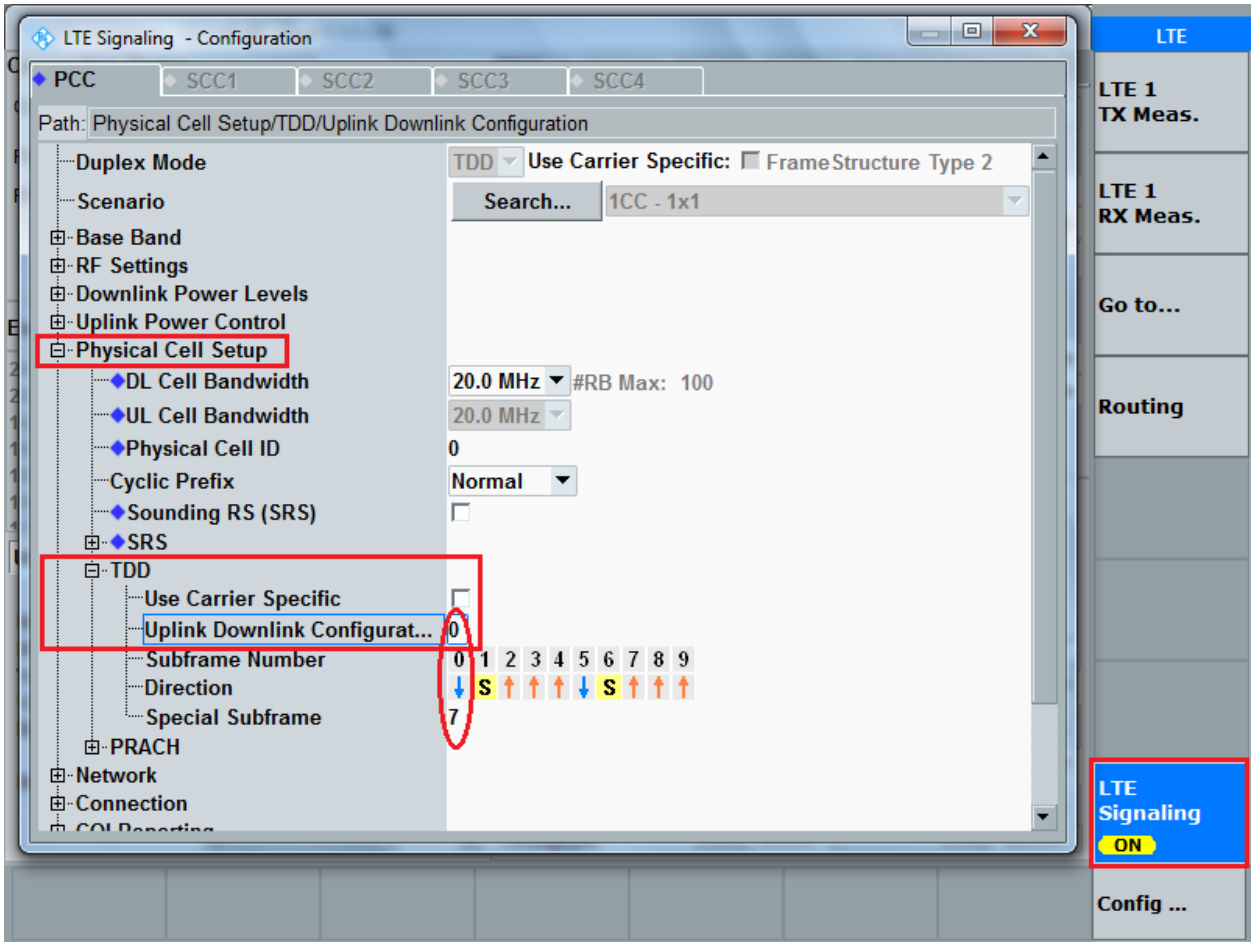
In conclusion, for the TDD LTE Band, Duty Cycle can be calculated with formula as below. All these sets are ok when we test, or we can set as below.

Duty cycle = [(30720Ts*Ups) + UpPTS *Specials]/(307200Ts)

And we can get different Duty cycles under different configurations:

Uplink-downlink configuration	Subframe number			Configuration of special subframe							
				Normal cyclic prefix in downlink				Extended cyclic prefix in downlink			
				Normal cyclic prefix in uplink		Extended cyclic prefix in uplink		Normal cyclic prefix in uplink		Extended cyclic prefix in uplink	
	D	S	U	configuration 0~4	configuration 5~9	configuration 0~4	configuration 5~9	configuration 0~3	configuration 4~7	configuration 0~3	configuration 4~7
0	2	2	6	61.43%	62.85%	61.67%	63.33%	61.43%	62.85%	61.67%	63.33%
1	4	2	4	41.43%	42.85%	41.67%	43.33%	41.43%	42.85%	41.67%	43.33%
2	6	2	2	21.43%	22.85%	21.67%	23.33%	21.43%	22.85%	21.67%	23.33%
3	6	1	3	30.71%	31.43%	30.83%	31.67%	30.71%	31.43%	30.83%	31.67%
4	7	1	2	20.71%	21.43%	20.83%	21.67%	20.71%	21.43%	20.83%	21.67%
5	8	1	1	10.71%	11.43%	10.83%	11.67%	10.71%	11.43%	10.83%	11.67%
6	3	2	5	51.43%	52.85%	51.67%	53.33%	51.43%	52.85%	51.67%	53.33%

SAR test Plan: For TDD LTE, SAR should be tested with the highest transmission duty factor (63.33%) using Uplink-downlink configuration 0 and Special subframe configuration 7 for Frame structure type



5.3.3 Wi-Fi Test Configuration

SAR test reduction for 802.11 Wi-Fi transmission mode configurations are considered separately for DSSS and OFDM. An initial test position is determined to reduce the number of tests required for certain exposure configurations with multiple test positions. An initial test configuration is determined for each frequency band and aggregated band according to maximum output power, channel bandwidth, wireless mode configurations and other operating parameters to streamline the measurement requirements. For 2.4 GHz DSSS, either the initial test position or DSSS procedure is applied to reduce the number of SAR tests; These are mutually exclusive. For OFDM, an initial test position is only applicable to next to the ear, UMPC mini-tablet and hotspot mode configurations, which is tested using the initial test configuration to facilitate test reduction. For other exposure conditions with a fixed test position, SAR test reduction is determined using only the initial test configuration.

The multiple test positions require SAR measurements in head, hotspot mode or UMPC mini-tablet configurations may be reduced according to the highest reported SAR determined using the *initial test position(s)* by applying the DSSS or OFDM SAR measurement procedures in the required wireless mode test configuration(s). The *initial test position(s)* is measured using the highest measured maximum output power channel in the required wireless mode test configuration(s). When the *reported* SAR for the *initial test position* is:

- ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and wireless mode combination within the frequency band or aggregated band. DSSS and OFDM configurations are considered separately according to the required SAR procedures.
- 0.4 W/kg, SAR is repeated using the same wireless mode test configuration tested in the *initial test position* to measure the subsequent next closet/smallest test separation distance and maximum coupling test position, on the highest maximum output power channel, until the *reported* SAR is ≤ 0.8 W/kg or all required test positions are tested.
    - ✧ For subsequent test positions with equivalent test separation distance or when exposure is dominated by coupling conditions, the position for maximum coupling condition should be tested.
    - ✧ When it is unclear, all equivalent conditions must be tested.
- For all positions/configurations tested using the *initial test position* and subsequent test positions, when the *reported* SAR is > 0.8 W/kg, measure the SAR for these positions/configurations on the subsequent next highest measured output power channel(s) until the *reported* SAR is ≤ 1.2 W/kg or all required test channels are considered.
    - ✧ The additional power measurements required for this step should be limited to those necessary for identifying subsequent highest output power channels to apply the test reduction.

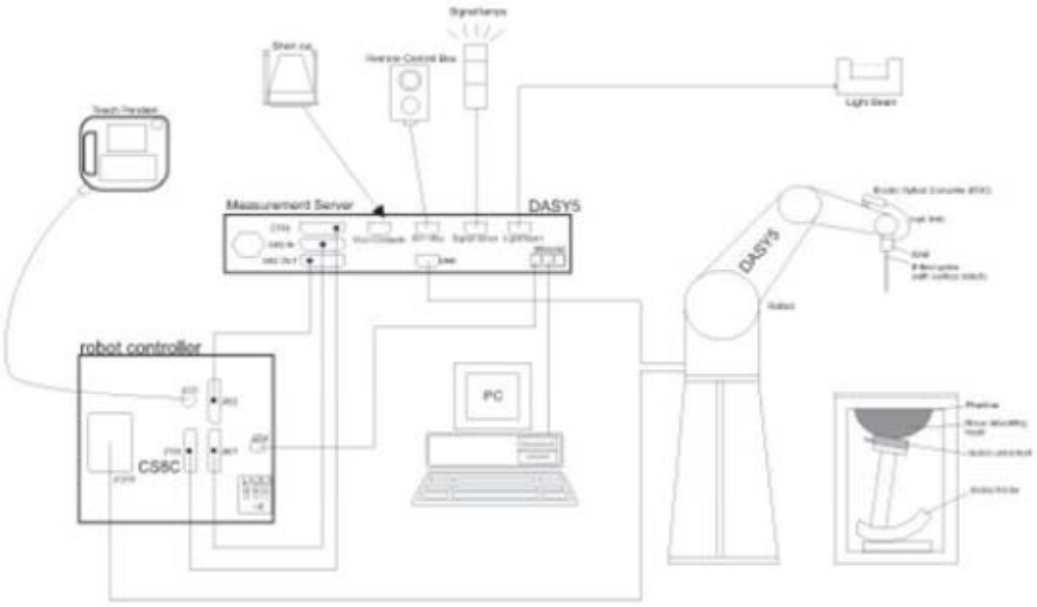
To determine the initial test position, Area Scans were performed to determine the position with the Maximum Value of SAR (measured). The position that produced the highest Maximum Value of SAR is considered the worst case position; thus used as the initial test position.

A Wi-Fi device must be configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools for SAR measurement.

6 SAR Measurements System Configuration

6.1 SAR Measurement Set-up

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



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- 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.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- 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.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

6.2 DASY5 E-field Probe System

The SAR measurements were conducted with the dosimetric probe EX3DV4 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

EX3DV4 Probe Specification

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available
Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 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: ± 0.2dB (noise: typically < 1 μW/g)
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 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%.

E-field Probe Calibration

Each probe is calibrated according to a dosimetric assessment procedure with accuracy better than ± 10%. The spherical isotropy was evaluated and found to be better than ± 0.25dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies bellow 1 GHz, and in a wave guide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The measured free space E-field in the medium correlates to temperature rise in a dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

$$SAR=C\Delta T/\Delta t$$

Where: Δt = Exposure time (30 seconds),

C = Heat capacity of tissue (brain or muscle),

ΔT = Temperature increase due to RF exposure.

Or

$$SAR=|E|^2\sigma/\rho$$

Where: σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m^3).

6.3 SAR Measurement Procedure

Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.
Area scan parameters extracted from FCC KDB 865664 D01 SAR measurement 100 MHz to 6 GHz.

<table>
<tr><td></td><td>≤3 GHz</td><td>> 3 GHz</td></tr>
<tr><td>Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5 ± 1 mm</td><td>½·δ·ln(2) ± 0.5 mm</td></tr>
<tr><td>Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30° ± 1°</td><td>20° ± 1°</td></tr>
<tr><td rowspan="2">Maximum area scan spatial resolution: ΔxArea, ΔyArea</td><td>≤ 2 GHz: ≤ 15 mm
2 – 3 GHz: ≤ 12 mm</td><td>3 – 4 GHz: ≤ 12 mm
4 – 6 GHz: ≤ 10 mm</td></tr>
<tr><td colspan="2">When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.</td></tr>
</table>

Zoom Scan

Zoom scans are used assess the peak spatial SAR values within a cubic averaging volume containing 1 gram and 10 gram of simulated tissue. The zoom scan measures points (refer to table below) within a cube shoes base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the zoom scan evaluates the averaged SAR for 1 gram and 10 gram and displays these values next to the job's label.

Zoom scan parameters extracted from FCC KDB 865664 D01 SAR measurement 100 MHz to 6 GHz.

<table>
<tr><td colspan="3"></td><td>≤3GHz</td><td>> 3 GHz</td></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: $\triangle x_{zoom} \triangle y_{zoom}$</td><td>≤2GHz: ≤8mm
2 – 3GHz: ≤5mm*</td><td>3 – 4GHz: ≤5mm*
4 – 6GHz: ≤4mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">Uniform grid: $\triangle z_{zoom}(n)$</td><td>≤5mm</td><td>3 – 4GHz: ≤4mm
4 – 5GHz: ≤3mm
5 – 6GHz: ≤2mm</td></tr>
<tr><td rowspan="2">Graded grid</td><td>$\triangle z_{zoom}(1)$: between 1st two points closest to phantom surface</td><td>≤4mm</td><td>3 – 4GHz: ≤3mm
4 – 5GHz: ≤2.5mm
5 – 6GHz: ≤2mm</td></tr>
<tr><td>$\triangle z_{zoom}(n>1)$: between subsequent points</td><td colspan="2">≤1.5•$\triangle z_{zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">X, y, z</td><td>≥30mm</td><td>3 – 4GHz: ≥28mm
4 – 5GHz: ≥25mm
5 – 6GHz: ≥22mm</td></tr>
<tr><td colspan="5">Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.
* When zoom scan is required and the <u>reported</u> SAR from the area scan based 1-g SAR estimation procedures of KDB 447498 is ≤ 1.4W/kg, ≤8mm, ≤7mm and ≤5mm zoom scan resolution may be applied, respectively, for 2GHz to 3GHz, 3GHz to 4GHz and 4GHz to 6GHz.</td></tr>
</table>

Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drifts more than 5%, the SAR will be retested.

7 Main Test Equipment

Name of Equipment	Manufacturer	Type/Model	Serial Number	Last Cal.	Cal. Due Date
Network analyzer	Agilent	E5071B	MY42404014	2020-05-17	2021-05-16
Dielectric Probe Kit	HP	85070E	US44020115	2020-05-17	2021-05-16
Power meter	Agilent	E4417A	GB41291714	2020-05-17	2021-05-16
Power sensor	Agilent	N8481H	MY50350004	2020-05-17	2021-05-16
Power sensor	Agilent	E9327A	US40441622	2020-05-17	2021-05-16
Dual directional coupler	Agilent	777D	50146	/	/
Dual directional coupler	UCL	UCL-DDC056G-S	20010600118	/	/
Amplifier	INDEXSAR	IXA-020	0401	2020-05-17	2021-05-16
Wireless communication tester	Anritsu	MT8820C	6201342015	2020-05-17	2021-05-16
Wideband radio communication tester	R&S	CMW 500	113645	2020-05-17	2021-05-16
E-field Probe	SPEAG	EX3DV4	3677	2020-07-06	2021-07-05
DAE	SPEAG	DAE4	1291	2020-02-24	2021-02-23
Validation Kit 2300MHz	SPEAG	D2300V2	1021	2018-11-01	2021-10-31
Validation Kit 2450MHz	SPEAG	D2450V2	786	2020-08-27	2023-08-26
Validation Kit 2600MHz	SPEAG	D2600V2	1025	2018-05-02	2021-05-01
Validation Kit 3500MHz	SPEAG	D3500V2	1083	2019-09-20	2022-09-19
Validation Kit 3700MHz	SPEAG	D3700V2	1048	2019-09-20	2022-09-19
Validation Kit 5GHz	SPEAG	D5GHzV2	1151	2020-02-27	2023-02-26
Temperature Probe	Tianjin jinming	JM222	381	2020-05-25	2021-05-24
Hygrothermograph	Anymetr	HTC-1	TY2020A043	2020-05-19	2021-05-18
Twin SAM Phantom	Speag	SAM1	1534	/	/
Software for Test	Speag	DASY52	/	/	/
Softwarefor Tissue	Agilent	85070	/	/	/

8 Tissue Dielectric Parameter Measurements & System Verification

8.1 Tissue Verification

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized. The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 24 hours of use; or earlier if the dielectric parameters can become out of tolerance.

Target values

Frequency (MHz)	Water (%)	Salt (%)	Sugar (%)	Glycol (%)	Preventol (%)	Cellulose (%)	ε_r	σ(s/m)
2300	55.242	0.306	0	44.452	0	0	39.5	1.67
2450	62.7	0.5	0	36.8	0	0	39.2	1.80
2600	55.242	0.306	0	44.452	0	0	39.0	1.96
3500	71.88	0.16	0	36.40	0	0	37.4	2.81
3700	71.88	0.16	0	36.40	0	0	37.7	3.12

Frequency (MHz)	Water (%)	Diethylenglycol monohexylether	Triton X-100	ε_r	σ(s/m)
5250	65.53	17.24	17.23	35.9	4.71
5750	65.53	17.24	17.23	35.4	5.22

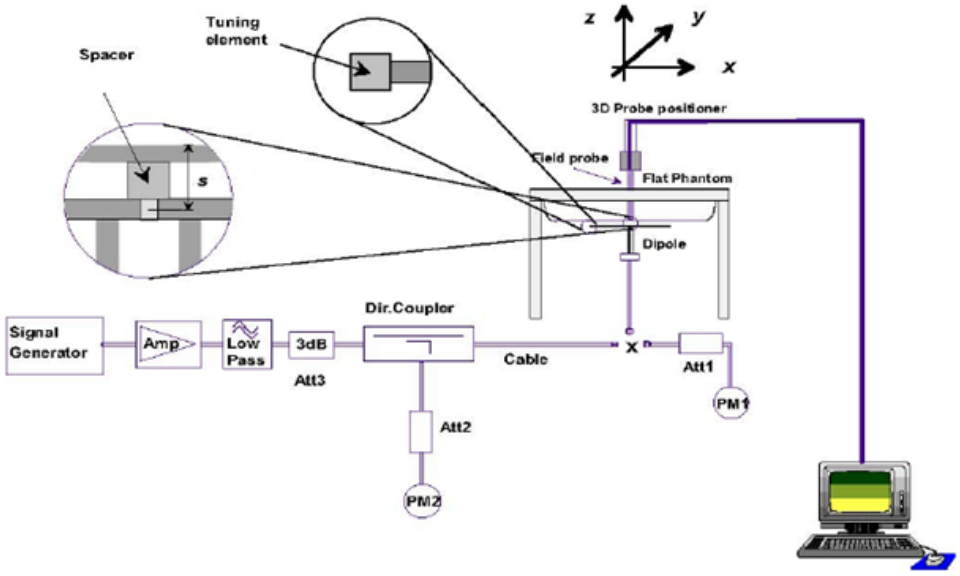
Measurements results

Frequency (MHz)	Test Date	Temp ℃	Measured Dielectric Parameters		Target Dielectric Parameters		Limit (Within ±5%)	
			ε_r	σ(s/m)	ε_r	σ(s/m)	Dev ε_r(%)	Dev σ(%)
2300	12/16/2020	21.5	40.0	1.65	39.5	1.67	1.27	-1.20
2450	12/28/2020	21.5	38.6	1.81	39.2	1.80	-1.53	0.56
2600	12/16/2020	21.5	38.2	2.01	39.0	1.96	-2.05	2.55
3500	12/18/2020	21.5	37.3	2.82	37.4	2.81	-0.27	0.36
3700	12/19/2020	21.5	37.9	3.03	37.7	3.12	0.53	-2.88
5250	12/28/2020	21.5	35.5	4.80	35.9	4.71	-1.11	1.91
5750	12/28/2020	21.5	34.9	5.21	35.4	5.22	-1.41	-0.19
Note: The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm for measurements > 3 GHz.								

8.2 System Performance Check

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulates were measured using the dielectric probe kit and the network analyzer. A system check measurement for every day was made following the determination of the dielectric parameters of the Tissue simulates, using the dipole validation kit. The dipole antenna was placed under the flat section of the twin SAM phantom.

System check is performed regularly on all frequency bands where tests are performed with the DASY system.



Picture 1System Performance Check setup

Picture 2 Setup Photo

Justification for Extended SAR Dipole Calibrations

Usage of SAR dipoles calibrated less than 3 years ago but more than 1 year ago were confirmed in maintaining return loss (< - 20 dB, within 20% of prior calibration) and impedance (within 5 ohm from prior calibration) requirements per extended calibrations in KDB 865664 D01:

Dipole		Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	ΔΩ
Dipole D2600V2 SN: 1025	Head Liquid	5/2/2018	-22.0	/	48.1	/
		5/1/2019	-22.5	-2.2	48.7	-0.6

System Check results

Frequency (MHz)	Test Date	Temp ℃	250mW /100mW Measured SAR_{1g} (W/kg)	1W Normalized SAR_{1g} (W/kg)	1W Target SAR_{1g} (W/kg)	Δ % (Limit ±10%)	Plot No.
2300	12/16/2020	21.5	12.60	50.40	49.50	1.82	1
2450	12/28/2020	21.5	13.70	54.80	52.30	4.78	2
2600	12/16/2020	21.5	13.90	55.60	54.10	2.77	3
3500	12/18/2020	21.5	6.57	65.70	67.10	-2.09	4
3700	12/19/2020	21.5	6.83	68.30	67.20	1.64	5
5250	12/28/2020	21.5	7.87	78.70	78.00	0.90	6
5750	12/28/2020	21.5	7.66	76.60	77.40	-1.03	7
Note: Target Values used derive from the calibration certificate Data Storage and Evaluation.							

8.3 SAR System Validation

Per FCC KDB 865664 D02v01, SAR system verification is required to confirm measurement accuracy. The SAR systems (including SAR probes, system components and software versions) used for this device were validated against its performance specifications prior to the SAR measurements. Reference dipoles are used with the required tissue-equivalent media for system validation, according to the procedures outlined in FCC KDB 865664 D01 and IEEE 1528-2013. Since SAR probe calibrations are frequency dependent, each probe calibration point must be validated at a frequency within the valid frequency range of the probe calibration point, using the system that normally operates with the probe for routine SAR measurements and according to the required tissue-equivalent media.

A tabulated summary of the system validation status, measurement frequencies, SAR probes, calibrated signal type(s) and tissue dielectric parameters has been included.

Frequency [MHz]	Date	Probe SN	Probe Type	Probe Cal Point		PERM (Er)	COND (Σ)	CW Validation			Mod. Validation		
								Sensitivity	Probe Linearity	Probe Isotropy	Mod. Type	Duty Factor	PAR
750	7/6/2020	3677	EX3DV4	750	Head	42.81	0.85	PASS	PASS	PASS	FDD	PASS	N/A
835	7/6/2020	3677	EX3DV4	835	Head	42.22	0.90	PASS	PASS	PASS	GMSK	PASS	N/A
1750	7/6/2020	3677	EX3DV4	1750	Head	39.91	1.32	PASS	PASS	PASS	NA	N/A	N/A
1900	7/6/2020	3677	EX3DV4	1900	Head	39.43	1.42	PASS	PASS	PASS	GMSK	PASS	N/A
2450	7/6/2020	3677	EX3DV4	2450	Head	38.19	1.83	PASS	PASS	PASS	OFDM	PASS	PASS
2600	7/6/2020	3677	EX3DV4	2600	Head	37.60	1.99	PASS	PASS	PASS	TDD	PASS	N/A
5250	7/6/2020	3677	EX3DV4	5250	Head	35.36	4.83	PASS	PASS	PASS	OFDM	N/A	PASS
5600	7/6/2020	3677	EX3DV4	5600	Head	34.43	5.29	PASS	PASS	PASS	OFDM	N/A	PASS
5750	7/6/2020	3677	EX3DV4	5750	Head	34.07	5.47	PASS	PASS	PASS	OFDM	N/A	PASS

NOTE: While the probes have been calibrated for both CW and modulated signals, all measurements were performed using communication systems calibrated for CW signals only. Modulations in the table above represent test configurations for which the measurement system has been validated per FCC KDB Publication 865664D01v01 for scenarios when CW probe calibrations are used with other signal types. SAR systems were validated for modulated signals with a periodic duty cycle, such as GMSK, or with a high peak to average ratio (>5dB), such as OFDM according to KDB 865664.

9 Normal and Maximum Output Power

KDB 447498 D01 at the maximum rated output power and within the tune-up tolerance range specified for the product, but not more than 2 dB lower than the maximum tune-up tolerance limit.

9.1 LTE Mode

UE Power Class: 3 (23 +/- 2dBm). The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS36.101.

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3

Modulation	Channel bandwidth / Transmission bandwidth (N_{RB})						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3

LTE TDD Band 38				Conducted Power(dBm)			Tune-up Limit
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			
				37775/2572.5	38000/2595	38225/2617.5	
5MHz	QPSK	1	0	21.37	21.04	20.99	22.00
		1	13	20.67	20.70	21.08	22.00
		1	24	21.18	21.28	21.33	22.00
		12	0	20.27	19.78	20.12	21.00
		12	6	19.64	19.65	20.09	21.00
		12	13	20.02	20.07	20.28	21.00
		25	0	19.78	19.97	20.26	21.00
	16QAM	1	0	19.79	19.93	20.04	21.00
		1	13	19.77	19.68	19.75	21.00
		1	24	20.61	20.47	20.55	21.00
		12	0	18.87	18.70	18.81	20.00
		12	6	18.72	18.58	18.68	20.00
		12	13	19.17	19.01	19.12	20.00
		25	0	19.86	19.81	19.86	20.00
	64QAM	1	0	20.17	19.61	20.50	21.00
		1	13	20.48	20.37	20.47	21.00
		1	24	20.06	19.90	19.97	21.00
		12	0	18.80	18.62	18.78	20.00
		12	6	18.71	18.50	18.64	20.00

		12	13	19.03	18.90	18.99	20.00
		25	0	18.99	18.88	18.96	20.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				37800/2575	38000/2595	38200/2615	
10MHz	QPSK	1	0	21.39	21.05	21.02	22.00
		1	25	20.70	20.75	21.12	22.00
		1	49	21.20	21.32	21.36	22.00
		25	0	20.30	19.83	20.16	21.00
		25	13	19.67	19.70	20.13	21.00
		25	25	20.04	20.11	20.33	21.00
		50	0	19.82	19.99	20.30	21.00
	16QAM	1	0	19.81	19.96	20.06	21.00
		1	25	19.80	19.72	19.78	21.00
		1	49	20.64	20.49	20.58	21.00
		25	0	18.90	18.75	18.85	20.00
		25	13	18.74	18.62	18.71	20.00
		25	25	19.20	19.06	19.16	20.00
		50	0	19.89	19.86	19.90	20.00
	64QAM	1	0	20.19	19.60	20.52	21.00
		1	25	20.51	20.37	20.50	21.00
		1	49	20.05	19.92	20.00	21.00
		25	0	18.83	18.67	18.78	20.00
		25	13	18.73	18.54	18.67	20.00
		25	25	19.06	18.95	19.03	20.00
		50	0	19.02	18.93	19.00	20.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				37825/2577.5	38000/2595	38175/2612.5	
15MHz	QPSK	1	0	21.38	21.01	21.00	22.00
		1	38	20.68	20.74	21.09	22.00
		1	74	21.17	21.27	21.32	22.00
		36	0	20.28	19.79	20.13	21.00
		36	18	19.64	19.65	20.09	21.00
		36	39	20.01	20.08	20.29	21.00
		75	0	19.80	19.95	20.25	21.00
	16QAM	1	0	19.76	19.94	20.04	21.00
		1	38	19.78	19.69	19.76	21.00
		1	74	20.61	20.45	20.55	21.00
		36	0	18.87	18.73	18.82	20.00
		36	18	18.71	18.57	18.67	20.00
		36	39	19.18	19.02	19.13	20.00
		75	0	19.86	19.81	19.86	20.00
	64QAM	1	0	20.14	19.58	20.50	21.00
		1	38	20.49	20.34	20.48	21.00

		1	74	20.06	19.91	20.01	21.00
		36	0	18.82	18.69	18.79	20.00
		36	18	18.71	18.51	18.66	20.00
		36	39	19.04	18.91	19.00	20.00
		75	0	18.99	18.88	18.96	20.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				37850/2580	38000/2595	38150/2610	
20MHz	QPSK	1	0	**21.35**	20.97	20.97	22.00
		1	50	20.67	20.70	21.07	22.00
		1	99	21.15	**21.26**	**21.29**	22.00
		50	0	**20.25**	19.74	20.09	21.00
		50	25	19.62	19.61	20.06	21.00
		50	50	19.98	**20.03**	**20.25**	21.00
		100	0	19.77	19.90	**20.21**	21.00
	16QAM	1	0	20.04	19.90	19.99	21.00
		1	50	19.74	19.67	19.72	21.00
		1	99	20.59	20.42	20.53	21.00
		50	0	18.84	18.69	18.79	20.00
		50	25	18.68	18.55	18.64	20.00
		50	50	19.15	18.97	19.09	20.00
		100	0	19.84	19.77	19.83	20.00
	64QAM	1	0	20.12	19.54	20.45	21.00
		1	50	20.45	20.32	20.44	21.00
		1	99	20.00	19.85	19.95	21.00
		50	0	18.77	18.61	18.72	20.00
		50	25	18.67	18.47	18.60	20.00
		50	50	19.01	18.86	18.96	20.00
		100	0	18.97	18.84	18.93	20.00

LTE TDD Band 40				Conducted Power(dBm)			Tune-up Limit
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			
				38675/2302.5	39150/2350	39625/2397.5	
5MHz	QPSK	1	0	22.07	21.59	21.74	22.50
		1	13	21.74	21.24	21.57	22.50
		1	24	22.08	21.59	21.88	22.50
		12	0	21.12	20.58	20.74	21.50
		12	6	20.91	20.49	20.76	21.50
		12	13	21.14	20.46	20.98	21.50
		25	0	21.01	20.63	20.87	21.50
	16QAM	1	0	20.32	20.70	20.56	21.50
		1	13	20.34	20.38	20.32	21.50
		1	24	20.72	20.83	20.63	21.50
		12	0	19.68	19.79	19.61	20.50

		12	6	19.52	19.61	19.46	20.50
		12	13	19.53	19.67	19.44	20.50
		25	0	19.45	19.57	19.44	20.50
	64QAM	1	0	20.40	20.53	20.62	21.50
		1	13	20.40	20.50	20.31	21.50
		1	24	20.73	20.83	20.66	21.50
		12	0	19.86	20.01	19.80	20.50
		12	6	19.79	19.91	19.70	20.50
		12	13	19.94	20.06	19.88	20.50
		25	0	19.82	19.94	19.77	20.50

Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				38700/2305	39150/2350	39600/2395	
10MHz	QPSK	1	0	22.04	21.55	21.71	22.50
		1	25	21.73	21.20	21.55	22.50
		1	49	**22.06**	**21.58**	**21.85**	22.50
		25	0	21.09	**20.53**	20.70	21.50
		25	13	20.89	20.45	20.73	21.50
		25	25	**21.11**	20.41	**20.94**	21.50
		50	0	**20.98**	20.58	20.83	21.50
	16QAM	1	0	20.58	20.66	20.51	21.50
		1	25	20.30	20.36	20.28	21.50
		1	49	20.70	20.80	20.61	21.50
		25	0	19.65	19.75	19.58	20.50
		25	13	19.49	19.59	19.43	20.50
		25	25	19.50	19.62	19.40	20.50
		50	0	19.43	19.53	19.41	20.50
	64QAM	50	0	19.43	19.53	19.41	20.50
		1	0	20.38	20.49	20.57	21.50
		1	25	20.36	20.48	20.27	21.50
		1	49	20.67	20.77	20.60	21.50
		25	0	19.81	19.93	19.73	20.50
		25	13	19.75	19.87	19.64	20.50
		25	25	19.91	20.01	19.84	20.50
		50	0	19.80	19.90	19.74	20.50

LTE TDD Band 41				Conducted Power(dBm)					Tune-up Limit
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)					
				39675 /2498.5	40148 /2545.8	40620 /2593	41093 /2640.3	41565 /2687.5	
5MHz	QPSK	1	0	20.95	21.84	21.07	21.82	21.75	22.50
		1	13	21.33	21.33	20.69	21.74	21.34	22.50
		1	24	21.92	21.45	21.36	21.87	21.57	22.50
		12	0	20.13	20.66	19.84	20.81	20.89	21.50
		12	6	20.33	20.36	19.70	20.77	20.36	21.50
		12	13	20.53	20.49	20.12	20.77	20.50	21.50
		25	0	20.33	20.56	19.98	20.92	20.59	21.50
	16QAM	1	0	20.06	20.33	20.15	19.79	20.17	21.50
		1	13	20.04	20.04	19.97	19.77	19.98	21.50
		1	24	20.57	20.64	20.40	20.26	20.48	21.50
		12	0	19.08	19.12	18.92	18.77	18.87	20.50
		12	6	18.98	19.01	18.85	19.09	18.80	20.50
		12	13	19.38	19.46	19.21	18.99	19.10	20.50
		25	0	19.13	19.21	19.07	18.79	18.95	20.50
	64QAM	1	0	20.02	20.08	20.16	19.61	19.73	21.50
		1	13	19.98	20.08	19.80	19.57	19.70	21.50
		1	24	20.62	20.65	20.43	20.22	20.33	21.50
		12	0	18.95	18.99	18.82	18.56	18.74	20.50
		12	6	18.89	18.94	18.69	18.68	18.65	20.50
		12	13	19.22	19.30	19.08	18.82	19.05	20.50
		25	0	19.12	19.18	19.00	18.74	18.97	20.50
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)					Tune-up Limit
				39700 /2501	40160 /2547	40620 /2593	41080 /2639	41540 /2685	
10MHz	QPSK	1	0	20.97	21.85	21.10	21.84	21.76	22.50
		1	25	21.36	21.38	20.73	21.77	21.39	22.50
		1	49	21.94	21.49	21.39	21.89	21.61	22.50
		25	0	20.16	20.71	19.88	20.84	20.94	21.50
		25	13	20.36	20.41	19.74	20.80	20.41	21.50
		25	25	20.55	20.53	20.17	20.79	20.54	21.50
		50	0	20.37	20.58	20.02	20.96	20.61	21.50
	16QAM	1	0	20.08	20.36	20.17	19.81	20.20	21.50
		1	25	20.07	20.08	20.00	19.80	20.02	21.50
		1	49	20.60	20.66	20.43	20.29	20.50	21.50
		25	0	19.11	19.17	18.96	18.80	18.92	20.50
		25	13	19.00	19.05	18.88	19.11	18.84	20.50
		25	25	19.41	19.51	19.25	19.02	19.15	20.50
		50	0	19.16	19.26	19.11	18.82	19.00	20.50

	64QAM	1	0	20.04	20.07	20.18	19.63	19.72	21.50
		1	25	20.01	20.08	19.83	19.60	19.70	21.50
		1	49	20.61	20.67	20.46	20.21	20.35	21.50
		25	0	18.98	19.04	18.82	18.59	18.79	20.50
		25	13	18.91	18.98	18.72	18.70	18.69	20.50
		25	25	19.25	19.35	19.12	18.85	19.10	20.50
		50	0	19.15	19.23	19.04	18.77	19.02	20.50
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)					Tune-up Limit
				39725 /2503.5	40173 /2548.3	40620 /2593	41068 /2637.8	41515 /2682.5	
15MHz	QPSK	1	0	20.96	21.81	21.08	21.83	21.72	22.50
		1	38	21.34	21.37	20.70	21.75	21.38	22.50
		1	74	21.91	21.44	21.35	21.86	21.56	22.50
		36	0	20.14	20.67	19.85	20.82	20.90	21.50
		36	18	20.33	20.36	19.70	20.77	20.36	21.50
		36	39	20.52	20.50	20.13	20.76	20.51	21.50
		75	0	20.35	20.54	19.97	20.94	20.57	21.50
	16QAM	1	0	20.03	20.34	20.15	19.76	20.18	21.50
		1	38	20.05	20.05	19.98	19.78	19.99	21.50
		1	74	20.57	20.62	20.40	20.26	20.46	21.50
		36	0	19.08	19.15	18.93	18.77	18.90	20.50
		36	18	18.97	19.00	18.84	19.08	18.79	20.50
		36	39	19.39	19.47	19.22	19.00	19.11	20.50
		75	0	19.13	19.21	19.07	18.79	18.95	20.50
	64QAM	1	0	19.99	20.05	20.16	19.58	19.70	21.50
		1	38	19.99	20.05	19.81	19.58	19.67	21.50
		1	74	20.62	20.66	20.47	20.22	20.34	21.50
		36	0	18.97	19.06	18.83	18.58	18.81	20.50
		36	18	18.89	18.95	18.71	18.68	18.66	20.50
		36	39	19.23	19.31	19.09	18.83	19.06	20.50
		75	0	19.12	19.18	19.00	18.74	18.97	20.50
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)					Tune-up Limit
				39750 /2506	40185 /2549.5	40620 /2593	41055 /2636.5	41490 /2680	
20MHz	QPSK	1	0	20.93	**21.77**	21.05	21.80	**21.68**	22.50
		1	50	21.33	21.33	20.68	21.74	21.34	22.50
		1	99	**21.89**	21.43	**21.32**	**21.84**	21.55	22.50
		50	0	20.11	**20.62**	19.81	**20.79**	**20.85**	21.50
		50	25	20.31	20.32	19.67	20.75	20.32	21.50
		50	50	**20.49**	20.45	**20.09**	20.73	20.46	21.50
		100	0	20.32	20.49	19.93	**20.91**	20.52	21.50
	16QAM	1	0	20.24	20.30	20.10	19.94	20.14	21.50
		1	50	20.01	20.03	19.94	19.74	19.97	21.50

		1	99	20.55	20.59	20.38	20.24	20.43	21.50
		50	0	19.05	19.11	18.90	18.74	18.86	20.50
		50	25	18.94	18.98	18.81	19.05	18.77	20.50
		50	50	19.36	19.42	19.18	18.97	19.06	20.50
		100	0	19.11	19.17	19.04	18.77	18.91	20.50
	64QAM	1	0	19.97	20.01	20.11	19.56	19.66	21.50
		1	50	19.95	20.03	19.77	19.54	19.65	21.50
		1	99	20.56	20.60	20.41	20.16	20.28	21.50
		50	0	18.92	18.98	18.76	18.53	18.73	20.50
		50	25	18.85	18.91	18.65	18.64	18.62	20.50
		50	50	19.20	19.26	19.05	18.80	19.01	20.50
		100	0	19.10	19.14	18.97	18.72	18.93	20.50

LTE TDD Band 42				Conducted Power(dBm)			Tune-up Limit
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			
				41615/3402.5	42590/3500	43565/3597.5	
5MHz	QPSK	1	0	20.46	21.47	20.87	22.00
		1	13	20.60	20.98	20.94	22.00
		1	24	20.80	21.25	21.52	22.00
		12	0	19.62	20.24	20.03	21.00
		12	6	19.70	20.12	19.95	21.00
		12	13	19.86	20.05	20.24	21.00
		25	0	19.65	20.17	20.07	21.00
	16QAM	1	0	20.11	20.03	20.01	21.00
		1	13	20.09	20.05	20.04	21.00
		1	24	20.42	20.39	20.31	21.00
		12	0	19.17	19.10	19.06	20.00
		12	6	18.92	18.87	18.83	20.00
		12	13	19.35	19.31	19.24	20.00
		25	0	19.15	19.16	19.10	20.00
	64QAM	1	0	19.99	19.94	19.81	21.00
		1	13	19.95	19.91	19.83	21.00
		1	24	20.25	20.19	20.11	21.00
		12	0	19.14	19.07	19.06	20.00
		12	6	18.94	18.86	18.81	20.00
		12	13	19.28	19.25	19.19	20.00
		25	0	19.23	19.21	19.15	20.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				41640/3405	42590/3500	43540/3595	
10MHz	QPSK	1	0	20.48	21.48	20.90	22.00
		1	25	20.63	21.03	20.98	22.00
		1	49	20.82	21.29	21.55	22.00

		25	0	19.65	20.29	20.07	21.00
		25	13	19.73	20.17	19.99	21.00
		25	25	19.88	20.09	20.29	21.00
		50	0	19.69	20.19	20.11	21.00
	16QAM	1	0	20.13	20.06	20.03	21.00
		1	25	20.12	20.09	20.07	21.00
		1	49	20.45	20.41	20.34	21.00
		25	0	19.20	19.15	19.10	20.00
		25	13	18.94	18.91	18.86	20.00
		25	25	19.38	19.36	19.28	20.00
		50	0	19.18	19.21	19.14	20.00
	64QAM	1	0	20.01	19.93	19.83	21.00
		1	25	19.98	19.91	19.86	21.00
		1	49	20.24	20.21	20.14	21.00
		25	0	19.17	19.12	19.06	20.00
		25	13	18.96	18.90	18.84	20.00
		25	25	19.31	19.30	19.23	20.00
		50	0	19.26	19.26	19.19	20.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				41665/3407.5	42590/3500	43515/3592.5	
15MHz	QPSK	1	0	20.47	21.44	20.88	22.00
		1	38	20.61	21.02	20.95	22.00
		1	74	20.79	21.24	21.51	22.00
		36	0	19.63	20.25	20.04	21.00
		36	18	19.70	20.12	19.95	21.00
		36	39	19.85	20.06	20.25	21.00
		75	0	19.67	20.15	20.06	21.00
	16QAM	1	0	20.08	20.04	20.01	21.00
		1	38	20.10	20.06	20.05	21.00
		1	74	20.42	20.37	20.31	21.00
		36	0	19.17	19.13	19.07	20.00
		36	18	18.91	18.86	18.82	20.00
		36	39	19.36	19.32	19.25	20.00
		75	0	19.15	19.16	19.10	20.00
	64QAM	1	0	19.96	19.91	19.81	21.00
		1	38	19.96	19.88	19.84	21.00
		1	74	20.25	20.20	20.15	21.00
		36	0	19.16	19.14	19.07	20.00
		36	18	18.94	18.87	18.83	20.00
		36	39	19.29	19.26	19.20	20.00
		75	0	19.23	19.21	19.15	20.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				41690/3410	42590/3500	43490/3590	

20MHz	QPSK	1	0	20.44	**21.40**	20.85	22.00
		1	50	20.60	20.98	20.93	22.00
		1	99	**20.77**	21.23	**21.48**	22.00
		50	0	19.60	**20.20**	20.00	21.00
		50	25	19.68	20.08	19.92	21.00
		50	50	**19.82**	20.01	**20.21**	21.00
		100	0	19.64	**20.10**	20.02	21.00
	16QAM	1	0	20.05	20.00	19.96	21.00
		1	50	20.06	20.04	20.01	21.00
		1	99	20.40	20.34	20.29	21.00
		50	0	19.14	19.09	19.04	20.00
		50	25	18.88	18.84	18.79	20.00
		50	50	19.33	19.27	19.21	20.00
		100	0	19.13	19.12	19.07	20.00
	64QAM	1	0	19.94	19.87	19.76	21.00
		1	50	19.92	19.86	19.80	21.00
		1	99	20.19	20.14	20.09	21.00
		50	0	19.11	19.06	19.00	20.00
		50	25	18.90	18.83	18.77	20.00
		50	50	19.26	19.21	19.16	20.00
		100	0	19.21	19.17	19.12	20.00

LTE TDD Band 43				Conducted Power(dBm)			Tune-up Limit
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			
				43615/3602.5	44590/3700	45565/3797.5	
5MHz	QPSK	1	0	21.35	20.84	21.04	22.00
		1	13	21.38	20.73	20.74	22.00
		1	24	21.35	21.03	21.11	22.00
		12	0	20.57	19.87	19.90	21.00
		12	6	20.44	20.02	19.87	21.00
		12	13	20.41	20.10	19.85	21.00
		25	0	20.54	19.98	19.94	21.00
	16QAM	1	0	20.18	19.87	19.94	21.00
		1	13	20.16	20.05	20.09	21.00
		1	24	20.51	20.33	20.36	21.00
		12	0	19.33	19.09	19.15	20.00
		12	6	19.41	19.22	19.27	20.00
		12	13	19.50	19.31	19.36	20.00
		25	0	19.27	19.16	19.16	20.00
	64QAM	1	0	20.24	19.90	20.15	21.00
		1	13	20.24	20.07	20.11	21.00
		1	24	20.53	20.33	20.35	21.00

		12	0	19.28	19.08	19.18	20.00
		12	6	19.49	19.23	19.31	20.00
		12	13	19.51	19.31	19.35	20.00
		25	0	19.38	19.22	19.25	20.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				43640/3605	44590/3700	45540/3795	
10MHz	QPSK	1	0	21.37	20.85	21.07	22.00
		1	25	21.41	20.78	20.78	22.00
		1	49	21.37	21.07	21.14	22.00
		25	0	20.60	19.92	19.94	21.00
		25	13	20.47	20.07	19.91	21.00
		25	25	20.43	20.14	19.90	21.00
		50	0	20.58	20.00	19.98	21.00
	16QAM	1	0	20.20	19.90	19.96	21.00
		1	25	20.19	20.09	20.12	21.00
		1	49	20.54	20.35	20.39	21.00
		25	0	19.36	19.14	19.19	20.00
		25	13	19.43	19.26	19.30	20.00
		25	25	19.53	19.36	19.40	20.00
		50	0	19.30	19.21	19.20	20.00
	64QAM	1	0	20.26	19.89	20.17	21.00
		1	25	20.27	20.07	20.14	21.00
		1	49	20.52	20.35	20.38	21.00
		25	0	19.31	19.13	19.18	20.00
		25	13	19.51	19.27	19.34	20.00
		25	25	19.54	19.36	19.39	20.00
		50	0	19.41	19.27	19.29	20.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				43665/3607.5	44590/3700	45515/3792.5	
15MHz	QPSK	1	0	21.36	20.81	21.05	22.00
		1	38	21.39	20.77	20.75	22.00
		1	74	21.34	21.02	21.10	22.00
		36	0	20.58	19.88	19.91	21.00
		36	18	20.44	20.02	19.87	21.00
		36	39	20.40	20.11	19.86	21.00
		75	0	20.56	19.96	19.93	21.00
	16QAM	1	0	20.15	19.88	19.94	21.00
		1	38	20.17	20.06	20.10	21.00
		1	74	20.51	20.31	20.36	21.00
		36	0	19.33	19.12	19.16	20.00
		36	18	19.40	19.21	19.26	20.00
		36	39	19.51	19.32	19.37	20.00
		75	0	19.27	19.16	19.16	20.00

	64QAM	1	0	20.21	19.87	20.15	21.00
		1	38	20.25	20.04	20.12	21.00
		1	74	20.53	20.34	20.39	21.00
		36	0	19.30	19.15	19.19	20.00
		36	18	19.49	19.24	19.33	20.00
		36	39	19.52	19.32	19.36	20.00
		75	0	19.38	19.22	19.25	20.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				43690/3610	44590/3700	45490/3790	
20MHz	QPSK	1	0	21.33	20.77	21.02	22.00
		1	50	**21.38**	20.73	20.73	22.00
		1	99	21.32	**21.01**	**21.07**	22.00
		50	0	**20.55**	19.83	**19.87**	21.00
		50	25	20.42	19.98	19.84	21.00
		50	50	20.37	**20.06**	19.82	21.00
		100	0	**20.53**	19.91	19.89	21.00
	16QAM	1	0	20.06	19.84	19.89	21.00
		1	50	20.13	20.04	20.06	21.00
		1	99	20.49	20.28	20.34	21.00
		50	0	19.30	19.08	19.13	20.00
		50	25	19.37	19.19	19.23	20.00
		50	50	19.48	19.27	19.33	20.00
		100	0	19.25	19.12	19.13	20.00
	64QAM	1	0	20.19	19.83	20.10	21.00
		1	50	20.21	20.02	20.08	21.00
		1	99	20.47	20.28	20.33	21.00
		50	0	19.25	19.07	19.12	20.00
		50	25	19.45	19.20	19.27	20.00
		50	50	19.49	19.27	19.32	20.00
		100	0	19.36	19.18	19.22	20.00

LTE TDD Band 48				Conducted Power(dBm)			Tune-up Limit
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			
				56265/3652.5	56490/3675	56715/3697.5	
5MHz	QPSK	1	0	21.72	21.67	21.43	22.00
		1	13	21.29	21.02	21.07	22.00
		1	24	21.58	21.51	21.56	22.00
		12	0	20.26	20.11	20.00	21.00
		12	6	20.23	20.06	20.07	21.00
		12	13	20.21	20.09	20.24	21.00
		25	0	20.27	20.09	20.08	21.00
	16QAM	1	0	20.42	20.42	20.49	21.00

		1	13	20.40	20.27	20.74	21.00
		1	24	20.14	20.22	20.55	21.00
		12	0	19.63	19.53	19.43	20.00
		12	6	19.72	19.50	19.50	20.00
		12	13	19.56	19.55	19.68	20.00
		25	0	19.70	19.47	19.43	20.00
	64QAM	1	0	20.41	20.13	20.17	21.00
		1	13	20.13	19.98	20.41	21.00
		1	24	19.93	19.90	20.24	21.00
		12	0	19.35	19.21	19.15	20.00
		12	6	19.33	19.25	19.15	20.00
		12	13	19.24	19.18	19.32	20.00
		25	0	19.38	19.09	19.05	20.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				56290/3655	56490/3675	56690/3695	
10MHz	QPSK	1	0	21.74	21.68	21.46	22.00
		1	38	21.32	21.07	21.11	22.00
		1	74	21.60	21.55	21.59	22.00
		36	0	20.29	20.16	20.04	21.00
		36	18	20.26	20.11	20.11	21.00
		36	39	20.23	20.13	20.29	21.00
		75	0	20.31	20.11	20.12	21.00
	16QAM	1	0	20.44	20.45	20.51	21.00
		1	38	20.43	20.31	20.77	21.00
		1	74	20.17	20.24	20.58	21.00
		36	0	19.66	19.58	19.47	20.00
		36	18	19.74	19.54	19.53	20.00
		36	39	19.59	19.60	19.72	20.00
		75	0	19.73	19.52	19.47	20.00
	64QAM	1	0	20.43	20.12	20.19	21.00
		1	38	20.16	19.98	20.44	21.00
		1	74	19.92	19.92	20.27	21.00
		36	0	19.38	19.26	19.15	20.00
		36	18	19.35	19.29	19.18	20.00
		36	39	19.27	19.23	19.36	20.00
		75	0	19.41	19.14	19.09	20.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				56315/36.57.5	56490/3675	56665/3692.5	
15MHz	QPSK	1	0	21.73	21.64	21.44	22.00
		1	50	21.30	21.06	21.08	22.00
		1	99	21.57	21.50	21.55	22.00
		50	0	20.27	20.12	20.01	21.00
		50	25	20.23	20.06	20.07	21.00

		50	50	20.20	20.10	20.25	21.00
		100	0	20.29	20.07	20.07	21.00
	16QAM	1	0	20.39	20.43	20.49	21.00
		1	50	20.41	20.28	20.75	21.00
		1	99	20.14	20.20	20.55	21.00
		50	0	19.63	19.56	19.44	20.00
		50	25	19.71	19.49	19.49	20.00
		50	50	19.57	19.56	19.69	20.00
		100	0	19.70	19.47	19.43	20.00
	64QAM	1	0	20.38	20.10	20.17	21.00
		1	50	20.14	19.95	20.42	21.00
		1	99	19.93	19.91	20.28	21.00
		50	0	19.37	19.28	19.16	20.00
		50	25	19.33	19.26	19.17	20.00
		50	50	19.25	19.19	19.33	20.00
		100	0	19.38	19.09	19.05	20.00

Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				56340/3660	56490/3675	56640/3690	
20MHz	QPSK	1	0	**21.70**	**21.60**	21.41	22.00
		1	50	21.29	21.02	21.06	22.00
		1	99	21.55	21.49	**21.52**	22.00
		50	0	**20.24**	**20.07**	19.97	21.00
		50	25	20.21	20.02	20.04	21.00
		50	50	20.17	20.05	**20.21**	21.00
		100	0	**20.26**	20.02	20.03	21.00
	16QAM	1	0	20.35	20.39	20.44	21.00
		1	50	20.37	20.26	20.71	21.00
		1	99	20.12	20.17	20.53	21.00
		50	0	19.60	19.52	19.41	20.00
		50	25	19.68	19.47	19.46	20.00
		50	50	19.54	19.51	19.65	20.00
		100	0	19.68	19.43	19.40	20.00
	64QAM	1	0	20.36	20.06	20.12	21.00
		1	50	20.10	19.93	20.38	21.00
		1	99	19.87	19.85	20.22	21.00
		50	0	19.32	19.20	19.09	20.00
		50	25	19.29	19.22	19.11	20.00
		50	50	19.22	19.14	19.29	20.00
		100	0	19.36	19.05	19.02	20.00

9.2 WLAN Mode

Wi-Fi 2.4G(Ant 1) / Mode	Channel /Frequency(MHz)	Maximum Output Power (dBm)	
		Tune-up	Meas.
802.11b (1M)	1/2412	18.50	**18.14**
	6/2437	18.50	16.54
	11/2462	17.00	15.02
802.11g (6M)	1/2412	13.50	13.28
	6/2437	13.50	11.78
	11/2462	12.00	10.06
802.11n-HT20 (MCS0)	1/2412	13.50	13.28
	6/2437	13.50	11.95
	11/2462	11.00	9.12
802.11n-HT40 (MCS0)	3/2422	10.00	9.52
	6/2437	10.00	8.53
	9/2452	7.00	5.40
Note: Initial test configuration is 802.11b mode.			

Wi-Fi 2.4G(Ant 2) / Mode	Channel /Frequency(MHz)	Maximum Output Power (dBm)	
		Tune-up	Meas.
802.11b (1M)	1/2412	18.50	**18.45**
	6/2437	18.50	16.92
	11/2462	16.50	14.53
802.11g (6M)	1/2412	13.50	13.02
	6/2437	13.50	12.21
	11/2462	11.50	9.90
802.11n-HT20 (MCS0)	1/2412	13.50	13.33
	6/2437	13.50	13.24
	11/2462	10.50	8.78
802.11n-HT40 (MCS0)	3/2422	11.00	10.42
	6/2437	11.00	9.70
	9/2452	8.00	6.07
Note: Initial test configuration is 802.11b mode.			

Wi-Fi 2.4G(MIMO) / Mode	Channel /Frequency(MHz)	Maximum Output Power (dBm)			
		Tune-up	Meas.	Ant 1	Ant 2
802.11b (1M)	1/2412	18.50	**17.91**	15.07	14.72
	6/2437	18.50	16.81	12.90	14.54
	11/2462	18.50	17.02	14.23	13.77
802.11g (6M)	1/2412	14.00	13.77	10.74	10.08
	6/2437	14.00	12.30	8.05	9.70
	11/2462	14.00	12.50	9.32	8.97
802.11n-HT20 (MCS0)	1/2412	14.50	14.19	11.04	10.89
	6/2437	14.50	12.53	8.08	9.98
	11/2462	13.00	11.34	8.19	7.68
802.11n-HT40 (MCS0)	3/2422	13.00	12.71	8.37	9.45
	6/2437	13.00	11.96	7.71	8.62
	9/2452	10.00	8.97	4.88	5.49
Note: Initial test configuration is 802.11b mode.					

Wi-Fi 5G U-NII-1 (Ant 1) Mode	Channel /Frequency(MHz)	Maximum Output Power (dBm)	
		Tune-up	Meas.
802.11a (6M)	36/5180	15.50	13.71
	40/5200	15.50	13.75
	48/5240	15.50	15.20
802.11n-HT20 (MCS0)	36/5180	14.00	12.32
	40/5200	14.00	12.68
	48/5240	14.00	13.51
802.11n-HT40 (MCS0)	38/5190	14.00	12.24
	46/5230	14.00	13.16
802.11ac-VHT20 (MCS0)	36/5180	16.00	14.42
	40/5200	16.00	14.37
	48/5240	16.00	15.93
802.11ac-VHT40 (MCS0)	38/5190	16.00	14.52
	46/5230	16.00	**15.96**
802.11ac-VHT80 (MCS0)	42/5210	14.00	12.78
Note. Initial test configuration is 802.11ac-VHT40 mode, since the highest maximum output power.			

Wi-Fi 5G U-NII-1 (MIMO) Mode	Channel /Frequency(MHz)	Maximum Output Power (dBm)			
		Tune-up	Meas.	Ant 1	Ant 2
802.11a(6M)	36/5180	17.00	15.54	10.63	11.32
	40/5200	17.00	15.05	10.57	10.42
	48/5240	17.00	16.69	12.04	12.23
802.11nHT20(MCS0)	36/5180	16.00	14.47	11.14	11.47
	40/5200	16.50	14.73	10.83	12.21
	48/5240	16.50	16.34	13.61	12.72
802.11nHT40(MCS0)	38/5190	17.00	16.14	12.07	13.22
	46/5230	17.00	16.27	13.26	12.32
802.11ac-VHT20(MCS0)	36/5180	16.50	14.80	11.54	11.71
	40/5200	16.50	14.88	11.37	12.02
	48/5240	16.50	16.04	12.70	13.04
802.11ac-VHT40(MCS0)	38/5190	17.00	15.70	12.18	12.25
	46/5230	17.00	**16.70**	13.41	13.01
802.11ac-VHT80(MCS0)	42/5210	17.00	15.45	12.71	11.78
Note. Initial test configuration is 802.11ac-VHT40 mode, since the highest maximum output power.					

Wi-Fi 5G U-NII-3 (Ant 1) Mode	Channel /Frequency(MHz)	Maximum Output Power (dBm)	
		Tune-up	Meas.
802.11a(6M)	149/5745	19.00	17.70
	157/5785	19.00	18.42
	165/5825	19.00	18.34
802.11nHT20(MCS0)	149/5745	17.00	15.74
	157/5785	17.00	15.63
	165/5825	17.00	16.08
802.11nHT40(MCS0)	151/5755	16.50	15.86
	159/5795	16.50	14.62
802.11ac-VHT20(MCS0)	149/5745	19.50	18.64
	157/5785	19.50	18.97
	165/5825	19.50	**19.07**
802.11ac-VHT40(MCS0)	151/5755	19.00	18.95
	159/5795	17.50	15.74
802.11ac-VHT80(MCS0)	155/5775	15.00	13.88
Note. Initial test configuration is 802.11ac-VHT20 mode, since the highest maximum output power.			

Wi-Fi 5G U-NII-3 (MIMO) Mode	Channel /Frequency(MHz)	Maximum Output Power (dBm)			
		Tune-up	Meas.	Ant 1	Ant 2
802.11a(6M)	149/5745	20.00	19.06	14.28	14.72
	157/5785	20.00	**19.55**	14.61	15.34
	165/5825	20.00	19.35	14.53	15.05
802.11nHT20(MCS0)	149/5745	20.00	18.31	15.47	14.81
	157/5785	20.00	18.50	15.72	14.93
	165/5825	20.00	18.91	16.01	15.47
802.11nHT40(MCS0)	151/5755	19.50	19.10	15.94	15.34
	159/5795	19.50	17.86	14.76	14.02
802.11ac-VHT20(MCS0)	149/5745	20.00	18.48	15.53	15.08
	157/5785	20.00	19.10	16.11	15.74
	165/5825	20.00	19.29	16.21	16.02
802.11ac-VHT40(MCS0)	151/5755	19.50	19.39	16.35	15.42
	159/5795	19.50	17.87	15.42	13.34
802.11ac-VHT80(MCS0)	155/5775	19.00	17.36	13.87	14.46
Note. Initial test configuration is 802.11a mode, since the highest maximum output power.					

10 Measured and Reported (Scaled) SAR Results

10.1 Measured SAR Results

Note: Per FCC KDB 447498 D01,for each exposure position, testing of other requised channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:
1.a) ≤0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100MHz
b) ≤0.6 W/kg or 1.5 W/kg, for1-g or 10-g respectively, when the transmission band is between 100 MHz and 200MHz.
c) ≤ 0.4 W/kg or 1.0Wkg, for 1-g or 10-g respectively, when the transmission band is ≥ 200MHz.
2.When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.

Table 5: LTE Band 38 (20MHz)

Test Position	Cover Type	Duty Cycle	RB allocation	RB offset	Channel/ Frequency (MHz)	Tune-up (dBm)	Measured power (dBm)	Limit of SAR 1.6 W/kg (mW/g)				Plot No.
								Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR1g	
Body-worn SAR (QPSK, Distance 5mm)												
Back Side	standard	1:1.58	1	0	37850/2580	22.00	21.35	0.343	-0.180	1.16	0.398	8
Front Side	standard	1:1.58	1	0	37850/2580	22.00	21.35	0.298	0.010	1.16	0.346	/
Left Edge	standard	1:1.58	1	0	37850/2580	22.00	21.35	0.166	-0.090	1.16	0.193	/
Right Edge	standard	1:1.58	1	0	37850/2580	22.00	21.35	0.046	0.024	1.16	0.053	/
Top Edge	standard	1:1.58	1	0	37850/2580	22.00	21.35	0.013	0.060	1.16	0.015	/
Bottom Edge	standard	1:1.58	1	0	37850/2580	22.00	21.35	0.326	0.035	1.16	0.379	/
Back Side	standard	1:1.58	50%	0	37850/2580	21.00	20.25	0.302	-0.070	1.19	0.359	/
Front Side	standard	1:1.58	50%	0	37850/2580	21.00	20.25	0.235	0.021	1.19	0.279	/
Left Edge	standard	1:1.58	50%	0	37850/2580	21.00	20.25	0.145	0.068	1.19	0.172	/
Right Edge	standard	1:1.58	50%	0	37850/2580	21.00	20.25	0.035	0.042	1.19	0.042	/
Top Edge	standard	1:1.58	50%	0	37850/2580	21.00	20.25	0.022	-0.055	1.19	0.026	/
Bottom Edge	standard	1:1.58	50%	0	37850/2580	21.00	20.25	0.234	0.031	1.19	0.278	/

Note: 1.The value with blue color is the maximum SAR Value of each test band.
2.For QPSK with 100% RB allocation, SAR is required when and the highest reported SAR for 1 RB and 50% RB allocation in are≥ 50% limit(1g).

Table 6: LTE Band 40 (20MHz)

Test Position	Cover Type	Duty Cycle	RB allocation	RB offset	Channel/ Frequency (MHz)	Tune-up (dBm)	Measured power (dBm)	Limit of SAR 1.6 W/kg (mW/g)				Plot No.
								Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR1g	
Body-worn SAR (QPSK, Distance 5mm)												
Back Side	standard	1:1.58	1	49	38750/2310	22.50	22.06	0.342	0.057	1.11	0.378	9
Front Side	standard	1:1.58	1	49	38750/2310	22.50	22.06	0.224	0.016	1.11	0.248	/
Left Edge	standard	1:1.58	1	49	38750/2310	22.50	22.06	0.176	-0.080	1.11	0.195	/
Right Edge	standard	1:1.58	1	49	38750/2310	22.50	22.06	0.079	0.022	1.11	0.087	/
Top Edge	standard	1:1.58	1	49	38750/2310	22.50	22.06	0.318	0.040	1.11	0.352	/
Bottom Edge	standard	1:1.58	1	49	38750/2310	22.50	22.06	0.044	-0.038	1.11	0.049	/
Back Side	standard	1:1.58	50%	25	38750/2310	21.50	21.11	0.268	0.011	1.09	0.293	/
Front Side	standard	1:1.58	50%	25	38750/2310	21.50	21.11	0.231	0.027	1.09	0.253	/
Left Edge	standard	1:1.58	50%	25	38750/2310	21.50	21.11	0.126	0.013	1.09	0.138	/
Right Edge	standard	1:1.58	50%	25	38750/2310	21.50	21.11	0.041	0.160	1.09	0.045	/
Top Edge	standard	1:1.58	50%	25	38750/2310	21.50	21.11	0.276	0.120	1.09	0.302	/
Bottom Edge	standard	1:1.58	50%	25	38750/2310	21.50	21.11	0.035	-0.090	1.09	0.038	/

Note: 1.The value with blue color is the maximum SAR Value of each test band.

2.For QPSK with 100% RB allocation, SAR is required when and the highest reported SAR for 1 RB and 50% RB allocation in are≥ 50% limit(1g).

Table 7: LTE Band 41 (20MHz)

Test Position	Cover Type	Duty Cycle	RB allocation	RB offset	Channel/ Frequency (MHz)	Tune-up (dBm)	Measured power (dBm)	Limit of SAR 1.6 W/kg (mW/g)				Plot No.
								Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR1g	
Body-worn SAR (QPSK, Distance 5mm)												
Back Side	standard	1:1.58	1	99	39750/2506	22.50	21.89	0.207	0.020	1.15	0.238	/
Front Side	standard	1:1.58	1	99	39750/2506	22.50	21.89	0.228	-0.089	1.15	0.262	/
Left Edge	standard	1:1.58	1	99	39750/2506	22.50	21.89	0.119	0.010	1.15	0.137	/
Right Edge	standard	1:1.58	1	99	39750/2506	22.50	21.89	0.048	0.032	1.15	0.055	/
Top Edge	standard	1:1.58	1	99	39750/2506	22.50	21.89	0.021	0.046	1.15	0.024	/
Bottom Edge	standard	1:1.58	1	99	39750/2506	22.50	21.89	0.174	0.015	1.15	0.200	/
Back Side	standard	1:1.58	50%	0	41490/2680	21.50	20.85	0.385	0.041	1.16	0.447	10
Front Side	standard	1:1.58	50%	0	41490/2680	21.50	20.85	0.328	-0.027	1.16	0.381	/
Left Edge	standard	1:1.58	50%	0	41490/2680	21.50	20.85	0.178	0.015	1.16	0.207	/
Right Edge	standard	1:1.58	50%	0	41490/2680	21.50	20.85	0.038	0.024	1.16	0.044	/
Top Edge	standard	1:1.58	50%	0	41490/2680	21.50	20.85	0.001	0.050	1.16	0.001	/
Bottom Edge	standard	1:1.58	50%	0	41490/2680	21.50	20.85	0.312	0.061	1.16	0.362	/

Note: 1.The value with blue color is the maximum SAR Value of each test band.

2.For QPSK with 100% RB allocation, SAR is required when and the highest reported SAR for 1 RB and 50% RB allocation in are≥ 50% limit(1g).

Table 8: LTE Band 42 (20MHz)

Test Position	Cover Type	Duty Cycle	RB allocation	RB offset	Channel/ Frequency (MHz)	Tune-up (dBm)	Measured power (dBm)	Limit of SAR 1.6 W/kg (mW/g)				Plot No.
								Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR1g	
Body-worn SAR (QPSK, Distance 5mm)												
Back Side	standard	1:1.58	1	99	43490/3590	22.00	21.48	0.361	0.010	1.13	0.407	/
Front Side	standard	1:1.58	1	99	43490/3590	22.00	21.48	0.388	-0.060	1.13	0.437	/
Left Edge	standard	1:1.58	1	99	43490/3590	22.00	21.48	0.227	-0.028	1.13	0.256	/
Right Edge	standard	1:1.58	1	99	43490/3590	22.00	21.48	0.073	0.019	1.13	0.082	/
Top Edge	standard	1:1.58	1	99	43490/3590	22.00	21.48	0.032	0.027	1.13	0.036	/
Bottom Edge	standard	1:1.58	1	99	43490/3590	22.00	21.48	0.660	0.180	1.13	0.744	11
Back Side	standard	1:1.58	50%	50	43490/3590	21.00	20.21	0.317	-0.030	1.20	0.380	/
Front Side	standard	1:1.58	50%	50	43490/3590	21.00	20.21	0.459	0.015	1.20	0.551	/
Left Edge	standard	1:1.58	50%	50	43490/3590	21.00	20.21	0.059	0.024	1.20	0.071	/
Right Edge	standard	1:1.58	50%	50	43490/3590	21.00	20.21	0.075	-0.140	1.20	0.090	/
Top Edge	standard	1:1.58	50%	50	43490/3590	21.00	20.21	0.045	0.035	1.20	0.054	/
Bottom Edge	standard	1:1.58	50%	50	43490/3590	21.00	20.21	0.650	0.130	1.20	0.780	/

Note: 1.The value with blue color is the maximum SAR Value of each test band.

2.For QPSK with 100% RB allocation, SAR is required when and the highest reported SAR for 1 RB and 50% RB allocation in are≥ 50% limit(1g).

Table 9: LTE Band 43 (20MHz)

Test Position	Cover Type	Duty Cycle	RB allocation	RB offset	Channel/ Frequency (MHz)	Tune-up (dBm)	Measured power (dBm)	Limit of SAR 1.6 W/kg (mW/g)				Plot No.
								Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR1g	
Body-worn SAR (QPSK, Distance 5mm)												
Back Side	standard	1:1.58	1	50	43690/3610	22.00	21.38	0.232	0.040	1.15	0.268	/
Front Side	standard	1:1.58	1	50	43690/3610	22.00	21.38	0.364	-0.032	1.15	0.420	/
Left Edge	standard	1:1.58	1	50	43690/3610	22.00	21.38	0.154	0.016	1.15	0.178	/
Right Edge	standard	1:1.58	1	50	43690/3610	22.00	21.38	0.041	0.019	1.15	0.047	/
Top Edge	standard	1:1.58	1	50	43690/3610	22.00	21.38	0.027	-0.040	1.15	0.031	/
Bottom Edge	standard	1:1.58	1	50	43690/3610	22.00	21.38	0.546	0.021	1.15	0.630	12
Back Side	standard	1:1.58	50%	0	43690/3610	21.00	20.55	0.332	0.070	1.11	0.368	/
Front Side	standard	1:1.58	50%	0	43690/3610	21.00	20.55	0.441	0.011	1.11	0.489	/
Left Edge	standard	1:1.58	50%	0	43690/3610	21.00	20.55	0.327	-0.021	1.11	0.363	/
Right Edge	standard	1:1.58	50%	0	43690/3610	21.00	20.55	0.079	0.085	1.11	0.088	/
Top Edge	standard	1:1.58	50%	0	43690/3610	21.00	20.55	0.044	-0.049	1.11	0.049	/
Bottom Edge	standard	1:1.58	50%	0	43690/3610	21.00	20.55	0.451	0.140	1.11	0.500	/

Note: 1.The value with blue color is the maximum SAR Value of each test band.

2.For QPSK with 100% RB allocation, SAR is required when and the highest reported SAR for 1 RB and 50% RB allocation in are≥ 50% limit(1g).

Table 10: LTE Band 48 (20MHz)

Test Position	Cover Type	Duty Cycle	RB allocation	RB offset	Channel/ Frequency (MHz)	Tune-up (dBm)	Measured power (dBm)	Limit of SAR 1.6 W/kg (mW/g)				Plot No.
								Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR1g	
Body-worn SAR (QPSK, Distance 5mm)												
Back Side	standard	1:1.58	1	0	56340/3660	22.00	21.70	0.299	-0.010	1.07	0.320	/
Front Side	standard	1:1.58	1	0	56340/3660	22.00	21.70	0.473	0.046	1.07	0.507	/
Left Edge	standard	1:1.58	1	0	56340/3660	22.00	21.70	0.075	0.030	1.07	0.080	/
Right Edge	standard	1:1.58	1	0	56340/3660	22.00	21.70	0.045	-0.050	1.07	0.048	/
Top Edge	standard	1:1.58	1	0	56340/3660	22.00	21.70	0.036	0.028	1.07	0.039	/
Bottom Edge	standard	1:1.58	1	0	56340/3660	22.00	21.70	0.566	0.062	1.07	0.606	13
Back Side	standard	1:1.58	50%	0	56340/3660	21.00	20.24	0.241	0.090	1.19	0.287	/
Front Side	standard	1:1.58	50%	0	56340/3660	21.00	20.24	0.304	0.011	1.19	0.362	/
Left Edge	standard	1:1.58	50%	0	56340/3660	21.00	20.24	0.138	0.027	1.19	0.164	/
Right Edge	standard	1:1.58	50%	0	56340/3660	21.00	20.24	0.042	-0.038	1.19	0.050	/
Top Edge	standard	1:1.58	50%	0	56340/3660	21.00	20.24	0.041	0.061	1.19	0.049	/
Bottom Edge	standard	1:1.58	50%	0	56340/3660	21.00	20.24	0.447	0.050	1.19	0.532	/

Note: 1.The value with blue color is the maximum SAR Value of each test band.

2.For QPSK with 100% RB allocation, SAR is required when and the highest reported SAR for 1 RB and 50% RB allocation in are≥ 50% limit(1g).

Table 11: Wi-Fi (2.4G, Antenna 1)

Test Position	Cover Type	Mode	Duty Cycle	Channel/ Frequency (MHz)	Tune-up dBm)	Measured power (dBm)	Limit of SAR 1.6 W/kg (mW/g)				Plot No.
							Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR 1g	
Body-worn SAR (Distance 5mm)											
Back Side	standard	802.11b	99.0%	1/2412	18.50	18.14	0.509	0.013	1.10	0.559	/
Front Side	standard	802.11b	99.0%	1/2412	18.50	18.14	0.143	0.056	1.10	0.157	/
Left Edge	standard	802.11b	99.0%	1/2412	18.50	18.14	0.039	-0.020	1.10	0.043	/
Right Edge	standard	802.11b	99.0%	1/2412	18.50	18.14	0.719	-0.030	1.10	0.789	14
	standard	802.11b	99.0%	6/2437	18.50	16.54	0.546	0.027	1.59	0.866	/
	standard	802.11b	99.0%	11/2462	17.00	15.02	0.392	-0.010	1.59	0.625	/
Top Edge	standard	802.11b	99.0%	1/2412	18.50	18.14	0.061	0.047	1.10	0.067	/
Bottom Edge	standard	802.11b	99.0%	1/2412	18.50	18.14	0.064	0.089	1.10	0.070	/
Note: 1. The value with blue color is the maximum SAR Value of each test band.											

MAX Adjusted SAR							
Mode	Test Position	Channel/ Frequency (MHz)	MAX Reported SAR_{1g} (W/kg)	802.11b Tune-up limit (dBm)	Tune-up limit (dBm)	Scaling Factor	Adjusted SAR_{1g} (W/kg)
802.11g	Right Edge	6/2437	0.866	18.50	13.50	0.32	0.277
802.11n HT20	Right Edge	6/2437	0.866	18.50	13.50	0.32	0.277
802.11n HT40	Right Edge	6/2437	0.866	18.50	10.00	0.14	0.124
Note: SAR is not required for OFDM when 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.							

Table 12: Wi-Fi (2.4G, Antenna 2)

Test Position	Cover Type	Mode	Duty Cycle	Channel/ Frequency (MHz)	Tune-up dBm)	Measured power (dBm)	Limit of SAR 1.6 W/kg (mW/g)				Plot No.
							Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR 1g	
Body-worn SAR (Distance 5mm)											
Back Side	standard	802.11b	99.0%	1/2412	18.50	18.45	0.541	0.020	1.02	0.553	15
Front Side	standard	802.11b	99.0%	1/2412	18.50	18.45	0.261	-0.013	1.02	0.267	/
Left Edge	standard	802.11b	99.0%	1/2412	18.50	18.45	0.374	0.067	1.02	0.382	/
Right Edge	standard	802.11b	99.0%	1/2412	18.50	18.45	0.105	0.015	1.02	0.107	/
Top Edge	standard	802.11b	99.0%	1/2412	18.50	18.45	0.116	0.000	1.02	0.119	/
Bottom Edge	standard	802.11b	99.0%	1/2412	18.50	18.45	0.090	0.026	1.02	0.092	/
Note: 1. The value with blue color is the maximum SAR Value of each test band.											

MAX Adjusted SAR							
Mode	Test Position	Channel/ Frequency (MHz)	MAX Reported SAR_{1g} (W/kg)	802.11b Tune-up limit (dBm)	Tune-up limit (dBm)	Scaling Factor	Adjusted SAR_{1g} (W/kg)
802.11g	Back Side	1/2412	0.553	18.50	13.50	0.32	0.177
802.11n HT20	Back Side	1/2412	0.553	18.50	13.50	0.32	0.177
802.11n HT40	Back Side	1/2412	0.553	18.50	11.00	0.18	0.099
Note: SAR is not required for OFDM when 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.							

Table 13: Wi-Fi (5G,U-NII-1, Antenna 1)

Test Position	Cover Type	Mode	Duty Cycle	Channel/ Frequency (MHz)	Tune-up dBm)	Measured power (dBm)	Limit of SAR 1.6 W/kg (mW/g)				Plot No.
							Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR 1g	
Body-worn SAR (Distance 5mm)											
Back Side	standard	802.11ac-VHT40	90.0%	46/5230	16.00	15.96	0.323	0.052	1.12	0.362	/
Front Side	standard	802.11ac-VHT40	90.0%	46/5230	16.00	15.96	0.151	0.036	1.12	0.169	/
Left Edge	standard	802.11ac-VHT40	90.0%	46/5230	16.00	15.96	0.077	0.010	1.12	0.086	/
Right Edge	standard	802.11ac-VHT40	90.0%	38/5190	16.00	14.52	0.692	-0.030	1.56	1.081	/
	standard	802.11ac-VHT40	90.0%	46/5230	16.00	15.96	0.846	-0.106	1.12	0.949	16
Top Edge	standard	802.11ac-VHT40	90.0%	46/5230	16.00	15.96	0.061	0.035	1.12	0.068	/
Bottom Edge	standard	802.11ac-VHT40	90.0%	46/5230	16.00	15.96	0.062	-0.060	1.12	0.070	/
Right Edge	Repeated	802.11ac-VHT40	90.0%	46/5230	16.00	15.96	0.837	0.020	1.12	0.939	/
Note: 1. The value with blue color is the maximum SAR Value of each test band.											

Measurement Variability				
Test Position	Channel/ Frequency(MHz)	MAX Measured SAR_{1g} (W/kg)	1st Repeated SAR_{1g} (W/kg)	Ratio
Right Edge	46/5230	0.846	0.837	1.01
Note: 1) A second repeated measurement was preformed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit). 2) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.				

Table 14: Wi-Fi (5G,U-NII-1, MIMO)

Test Position	Cover Type	Mode	Duty Cycle	Channel/ Frequency (MHz)	Tune-up dBm)	Measured power (dBm)	Limit of SAR 1.6 W/kg (mW/g)				Plot No.
							Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR 1g	
Body-worn SAR (Distance 5mm)											
Back Side	standard	802.11ac-VHT40	90.0%	46/5230	17.00	16.70	0.275	0.010	1.19	0.328	/
Front Side	standard	802.11ac-VHT40	90.0%	46/5230	17.00	16.70	0.076	0.032	1.19	0.091	/
Left Edge	standard	802.11ac-VHT40	90.0%	46/5230	17.00	16.70	0.392	-0.080	1.19	0.467	/
Right Edge	standard	802.11ac-VHT40	90.0%	46/5230	17.00	16.70	0.566	-0.107	1.19	0.674	17
Top Edge	standard	802.11ac-VHT40	90.0%	46/5230	17.00	16.70	0.349	0.015	1.19	0.416	/
Bottom Edge	standard	802.11ac-VHT40	90.0%	46/5230	17.00	16.70	0.109	0.027	1.19	0.130	/
Note: 1. The value with blue color is the maximum SAR Value of each test band.											

Table 15: Wi-Fi (5G,U-NII-3, Antenna 1)

Test Position	Cover Type	Mode	Duty Cycle	Channel/ Frequency (MHz)	Tune-up dBm)	Measured power (dBm)	Limit of SAR 1.6 W/kg (mW/g)				Plot No.
							Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR 1g	
Body-worn SAR (Distance 5mm)											
Back Side	standard	802.11ac-VHT20	96.0%	165/5825	19.50	19.07	0.348	-0.032	1.15	0.400	/
Front Side	standard	802.11ac-VHT20	96.0%	165/5825	19.50	19.07	0.319	0.140	1.15	0.367	/
Left Edge	standard	802.11ac-VHT20	96.0%	165/5825	19.50	19.07	0.262	-0.050	1.15	0.301	/
Right Edge	standard	802.11ac-VHT20	96.0%	149/5745	19.50	18.64	0.985	0.013	1.27	1.251	/
	standard	802.11ac-VHT20	96.0%	157/5785	19.50	18.97	1.030	-0.040	1.18	1.212	/
	standard	802.11ac-VHT20	96.0%	165/5825	19.50	19.07	1.260	0.022	1.15	1.449	18
Top Edge	standard	802.11ac-VHT20	96.0%	165/5825	19.50	19.07	0.262	0.035	1.15	0.301	/
Bottom Edge	standard	802.11ac-VHT20	96.0%	165/5825	19.50	19.07	0.158	0.076	1.15	0.182	/
Right Edge	Repeated	802.11ac-VHT20	96.0%	165/5825	19.50	19.07	1.210	-0.027	1.15	1.392	/
Note: 1. The value with blue color is the maximum SAR Value of each test band.											

Measurement Variability				
Test Position	Channel/ Frequency(MHz)	MAX Measured SAR_{1g} (W/kg)	1st Repeated SAR_{1g} (W/kg)	Ratio
Right Edge	165/5825	1.260	1.210	1.04
Note: 1) A second repeated measurement was preformed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit). 2) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.				

Table 16: Wi-Fi (5G,U-NII-3, MIMO)

Test Position	Cover Type	Mode	Duty Cycle	Channel/ Frequency (MHz)	Tune-up dBm)	Measured power (dBm)	Limit of SAR 1.6 W/kg (mW/g)				Plot No.
							Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR 1g	
Body-worn SAR (Distance 5mm)											
Back Side	standard	802.11a	70.0%	157/5785	20.00	19.55	0.368	0.020	1.59	0.584	/
Front Side	standard	802.11a	70.0%	157/5785	20.00	19.55	0.166	0.041	1.59	0.263	/
Left Edge	standard	802.11a	70.0%	149/5745	20.00	19.06	0.638	-0.080	1.77	1.131	/
	standard	802.11a	70.0%	157/5785	20.00	19.55	0.642	-0.100	1.59	1.018	/
	standard	802.11a	70.0%	165/5825	20.00	19.35	0.596	0.034	1.66	0.988	/
Right Edge	standard	802.11a	70.0%	149/5745	20.00	19.06	0.814	0.024	1.77	1.443	/
	standard	802.11a	70.0%	157/5785	20.00	19.55	0.938	-0.050	1.59	1.488	/
	standard	802.11a	70.0%	165/5825	20.00	19.35	0.889	0.090	1.66	1.474	/
Top Edge	standard	802.11a	70.0%	157/5785	20.00	19.55	0.483	0.037	1.59	0.766	/
Bottom Edge	standard	802.11a	70.0%	157/5785	20.00	19.55	0.142	0.010	1.59	0.225	/
Right Edge	Repeated	802.11a	70.0%	157/5785	20.00	19.55	0.945	0.062	1.59	1.499	19
Note: 1. The value with blue color is the maximum SAR Value of each test band.											

Measurement Variability				
Test Position	Channel/ Frequency(MHz)	MAX Measured SAR_{1g} (W/kg)	1st Repeated SAR_{1g} (W/kg)	Ratio
Right Edge	157/5785	0.938	0.945	1.01
Note: 1) A second repeated measurement was preformed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit). 2) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.				

10.2 Simultaneous Transmission Analysis

Simultaneous Transmission Configurations	Body-worn
LTE + Wi-Fi 2.4GHz	Yes
LTE + Wi-Fi 5GHz	Yes
Note: 1. Wi-Fi 2.4G antenna and Wi-Fi 5G antenna can't transmit simultaneously.	

General Note:

1. The Scaled SAR summation is calculated based on the same configuration and test position.
2. Per KDB 447498 D01, simultaneous transmission SAR is compliant if,

i) Scalar SAR summation < 1.6W/kg, simultaneously transmission SAR measurement is not necessary.

ii) SPLSR = (SAR1 + SAR2)^1.5 / (min. separation distance, mm), and the peak separation distance is determined from the square root of $[(x1-x2)^2 + (y1-y2)^2 + (z1-z2)^2]$, where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.

iii) If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary.

The maximum SAR_{1g} Value for LTE Antenna

SAR_{1g}(W/kg) / Test Position		LTE TDD 38	LTE TDD 40	LTE TDD 41	LTE TDD 42	LTE TDD 43	LTE TDD 48	MAX. SAR_{1g}
Body worn	Back Side	0.398	0.378	0.447	0.407	0.368	0.320	0.447
	Front Side	0.346	0.253	0.381	0.551	0.489	0.507	0.551
	Left Edge	0.193	0.195	0.207	0.256	0.363	0.164	0.363
	Right Edge	0.053	0.087	0.055	0.090	0.088	0.050	0.090
	Top Edge	0.026	0.352	0.024	0.054	0.049	0.049	0.352
	Bottom Edge	0.379	0.049	0.362	0.780	0.630	0.606	0.780

The maximum SAR_{1g} Value for WiFi Antenna

SAR_{1g}(W/kg) / Test Position		Wi-Fi 2.4G			Wi-Fi 5G						
		Ant1	Ant2	MIMO	U-NII-1			U-NII-3			Final Max.
					Ant1	MIMO	Max.	Ant1	MIMO	Max.	
Body worn	Back Side	0.559	0.553	1.112	0.362	0.328	0.362	0.400	0.584	0.584	0.584
	Front Side	0.157	0.267	0.424	0.169	0.091	0.169	0.367	0.263	0.367	0.367
	Left Edge	0.043	0.382	0.425	0.086	0.467	0.467	0.301	1.131	1.131	1.131
	Right Edge	0.866	0.107	0.973	1.081	0.674	1.081	1.449	1.499	1.499	1.499
	Top Edge	0.067	0.119	0.186	0.068	0.416	0.416	0.301	0.766	0.766	0.766
	Bottom Edge	0.070	0.092	0.162	0.070	0.130	0.130	0.182	0.225	0.225	0.225

About Wi-Fi 2.4G Antenna and LTE Antenna

SAR_{1g} (W/kg) / Test Position		LTE Antenna	Wi-Fi 2.4G Antenna	MAX. ΣSAR_{1g}
Body worn	Back Side	0.447	1.112	1.559
	Front Side	0.551	0.424	0.975
	Left Edge	0.363	0.425	0.788
	Right Edge	0.090	0.973	1.063
	Top Edge	0.352	0.186	0.538
	Bottom Edge	0.780	0.162	0.942

Note: 1.The value with blue color is the maximum ΣSAR_{1g} Value.
2.MAX. ΣSAR_{1g} =Unlicensed SAR_{MAX} +Licensed SAR_{MAX}

MAX. ΣSAR_{1g} = 1.559W/kg<1.6W/kg, so the Simultaneous transimition SAR with volum scan are not required for Wi-Fi 2.4G Antenna and LTE Antenna.

About Wi-Fi 5G Antenna and LTE Antenna

Test Position \ SAR_{1g} (W/kg)		LTE Antenna	Wi-Fi 5G Antenna	MAX. ΣSAR_{1g}
Body worn	Back Side	0.447	0.584	1.031
	Front Side	0.551	0.367	0.918
	Left Edge	0.363	1.131	1.494
	Right Edge	0.090	1.499	1.589
	Top Edge	0.352	0.766	1.118
	Bottom Edge	0.780	0.225	1.005
Note: 1.The value with blue color is the maximum ΣSAR_{1g} Value. 2.MAX. ΣSAR_{1g} =Unlicensed SAR_{MAX} +Licensed SAR_{MAX}				

MAX. ΣSAR_{1g} = 1.589W/kg<1.6W/kg, so the Simultaneous transimition SAR with volum scan are not required for Wi-Fi 5G Antenna and LTE Antenna.

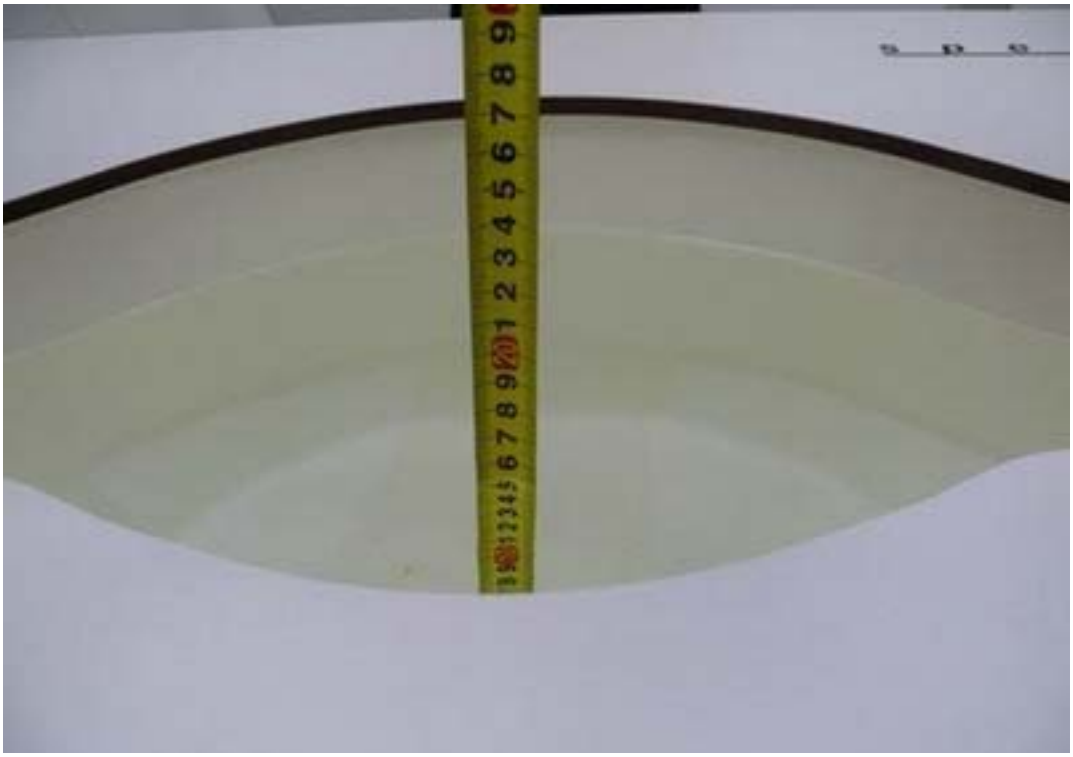
11 Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528- 2013 is not required in SAR reports submitted for equipment approval.

ANNEX A: Test Layout

Tissue Simulating Liquids

For the measurement of the field distribution inside the flat phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For Head and Body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Picture 3.



Picture 3: Liquid depth in the flat Phantom

ANNEX B: System Check Results

Plot 1 System Performance Check at 2300 MHz TSL

DUT: Dipole 2300 MHz; Type: D2300V2; Serial: D2300V2

Date: 12/16/2020

Communication System: CW Frequency: 2300 MHz;Duty Cycle: 1:1

Medium parameters used: f = 2300 MHz; σ = 1.65 S/m; ε_r = 40.0; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.69, 7.69, 7.69); Calibrated: 7/6/2020;

Electronics: DAE4 SN1291; Calibrated: 2/24/2020

Phantom: SAM 2; Type: SAM;

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

d=10mm, Pin=250mW/Area Scan (6x10x1): Measurement grid: dx=12mm, dy=12mm

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

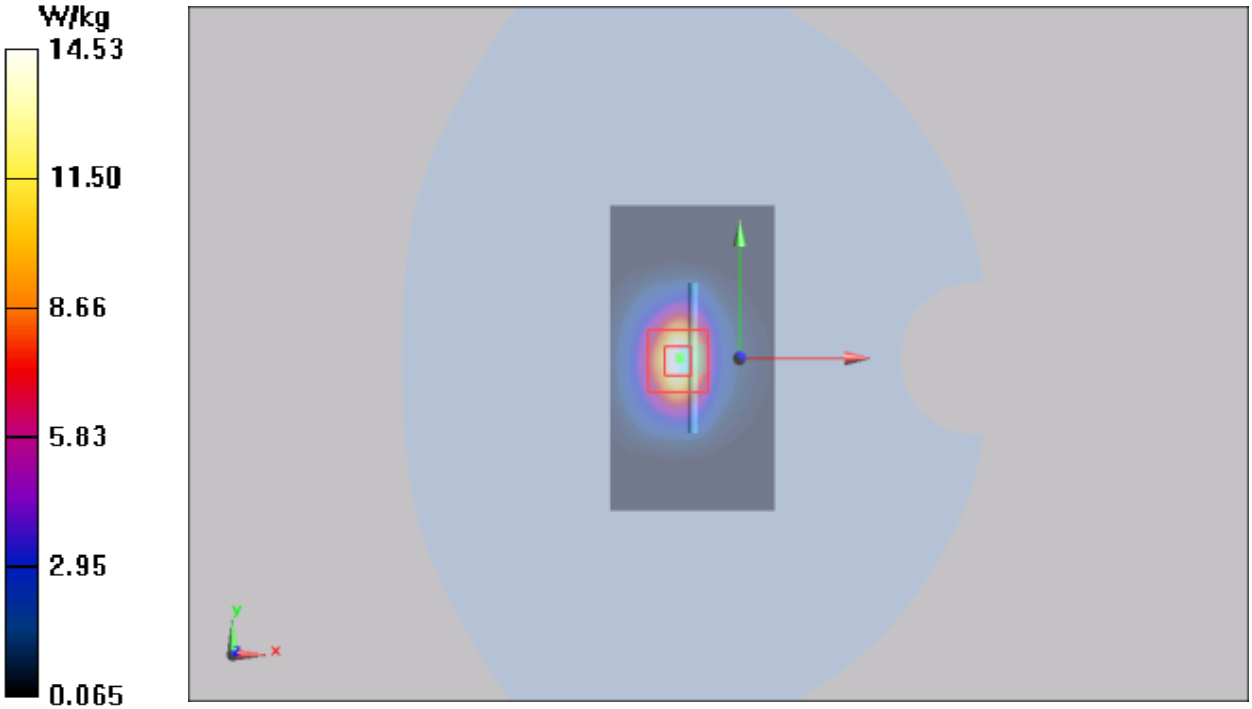
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 85.188 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 26.4 W/kg

SAR(1 g) = 12.6 W/kg; SAR(10 g) = 5.80 W/kg

Maximum value of SAR (measured) = 14.53 W/kg



Plot 2 System Performance Check at 2450 MHz TSL

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2

Date: 12/28/2020

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

Medium parameters used: f = 2450 MHz; σ = 1.81 S/m; ε_r = 38.6; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.54, 7.54, 7.54); Calibrated: 7/6/2020;

Electronics: DAE4 SN1291; Calibrated: 2/24/2020

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

d=10mm, Pin=250mW/Area Scan (4x7x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 18.2 mW/g

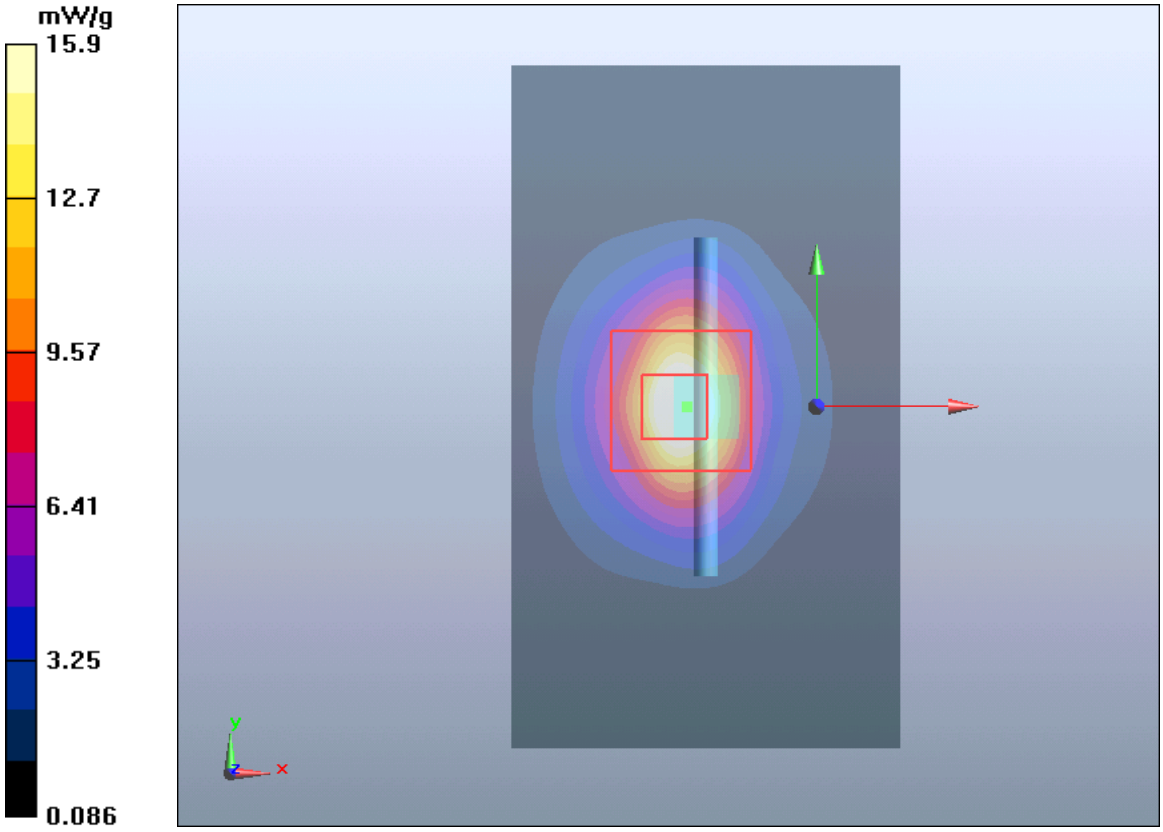
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 88.8 V/m; Power Drift = 0.075 dB

Peak SAR (extrapolated) = 30 W/kg

SAR(1 g) = 13.7 mW/g; SAR(10 g) = 6.22 mW/g

Maximum value of SAR (measured) = 15.9 mW/g



Plot 3 System Performance Check at 2600 MHz TSL

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2

Date: 12/16/2020

Communication System: CW; Frequency: 2600 MHz

Medium parameters used: f = 2600 MHz; σ = 2.01 S/m; ε_r = 38.2; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.26, 7.26, 7.26); Calibrated: 7/6/2020;

Electronics: DAE4 SN1291; Calibrated: 2/24/2020

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

d=10mm, Pin=250mW/Area Scan (4x7x1): Measurement grid:dx=12mm, dy=12mm

Maximum value of SAR (measured) = 17.439 mW/g

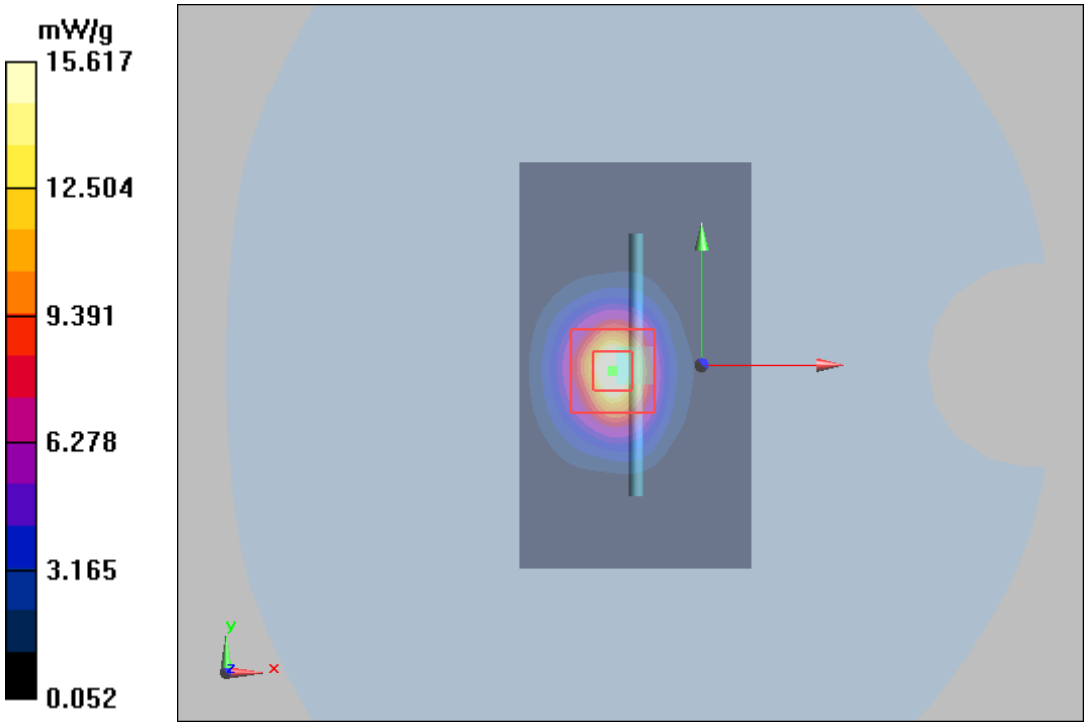
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 87.998 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 31.858 W/kg

SAR(1 g) = 13.9 mW/g; SAR(10 g) = 6.07 mW/g

Maximum value of SAR (measured) = 15.617 mW/g



Plot 4 System Performance Check at 3500 MHz TSL

DUT: Dipole 3500 MHz; Type: D3500V2; Serial: D3500V2

Date: 12/18/2020

Communication System: UID 0, CW (0); Frequency: 3500 MHz;Duty Cycle: 1:1

Medium parameters used: f = 3500 MHz; σ = 2.82 S/m; ε_r = 37.3; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.03, 7.03, 7.03) ; Calibrated: 7/6/2020;

Electronics: DAE4 SN1291; Calibrated: 2/24/2020

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

d=10mm, Pin=100mW/ Area Scan (6x10x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 13.6 W/kg

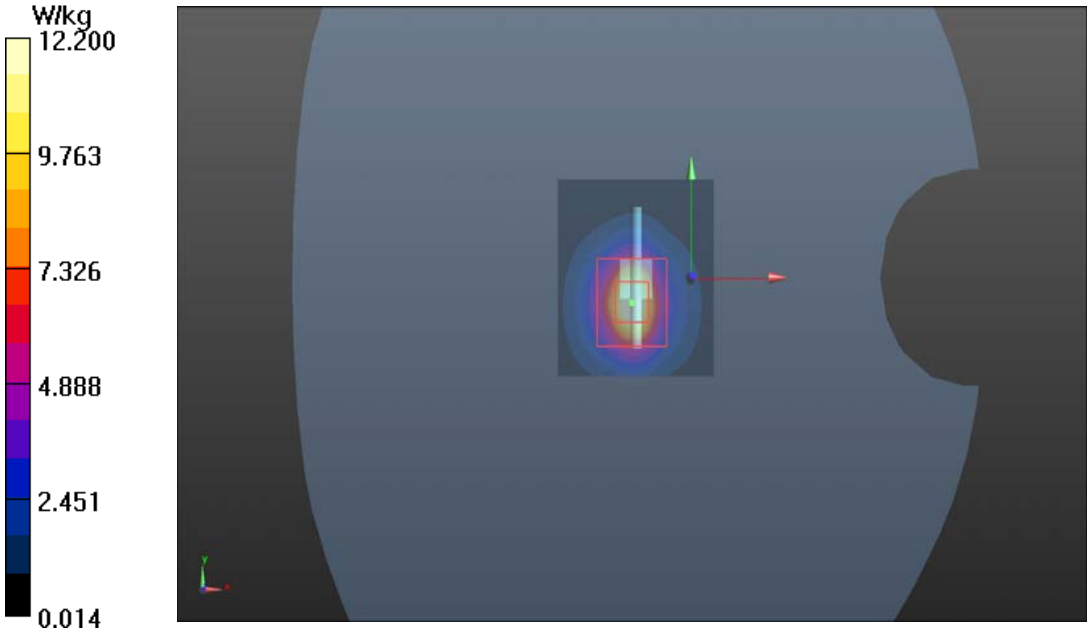
d=10mm, Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 46.00 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 18.2 W/kg

SAR(1 g) = 6.57W/kg; SAR(10 g) = 2.51 W/kg

Maximum value of SAR (measured) = 12.2 W/kg



Plot 5 System Performance Check at 3700 MHz TSL

DUT: Dipole 3700 MHz; Type: D3700V2; Serial: D3700V2

Date: 12/19/2020

Communication System: UID 0, CW (0); Frequency: 3700 MHz; Duty Cycle: 1:1

Medium parameters used: f = 3700 MHz; σ = 3.03 S/m; ε_r = 37.9; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(6.83, 6.83, 6.83); Calibrated: 7/6/2020;

Electronics: DAE4 SN1291; Calibrated: 2/24/2020

Phantom: SAM1; Type: SAM;

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

d=10mm, Pin=100mW /Area Scan (6x10x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 13.6 W/kg

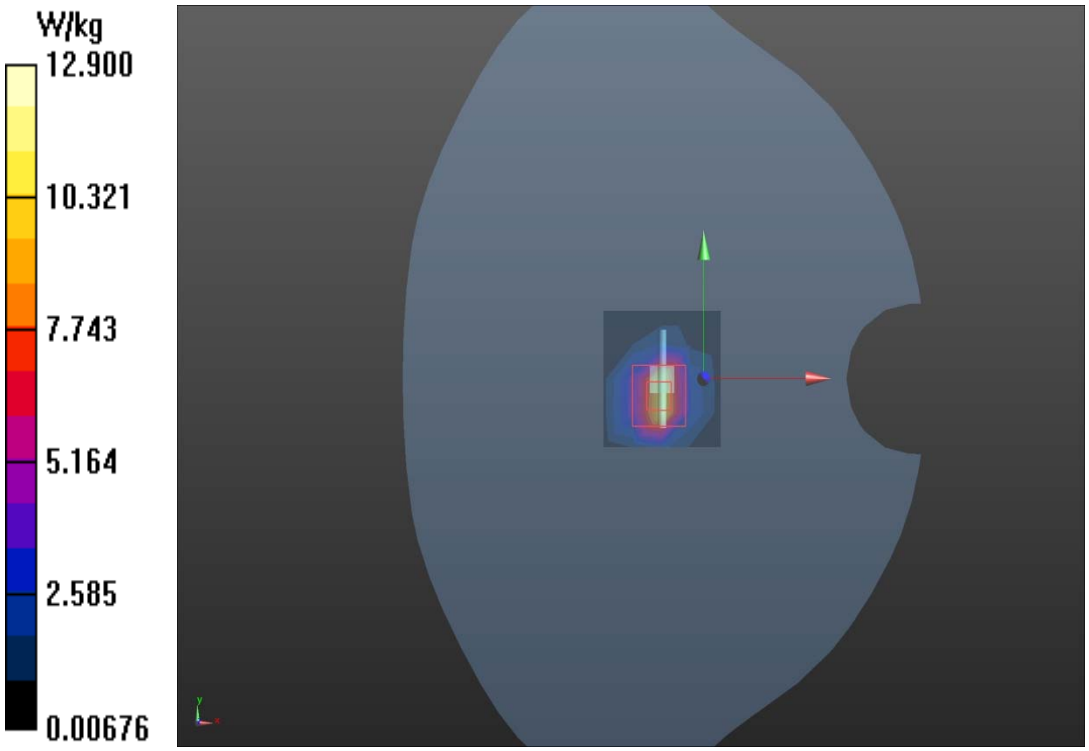
d=10mm, Pin=100mW /Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 46.00 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 18.2 W/kg

SAR(1 g) = 6.83 W/kg; SAR(10 g) = 2.53 W/kg

Maximum value of SAR (measured) = 12.9 W/kg



Plot 6 System Performance Check at 5250 MHz TSL

DUT: Dipole 5250 MHz; Type: D5GHzV2; Serial: D5GHzV2

Date: 12/28/2020

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

Medium parameters used: f = 5250 MHz; σ = 4.80 S/m; ε_r = 35.5; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(5.55, 5.55, 5.55); Calibrated: 7/6/2020;

Electronics: DAE4 SN1291; Calibrated: 2/24/2020

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

d=10mm, Pin=100mW/Area Scan (6x10x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 9.14 mW/g

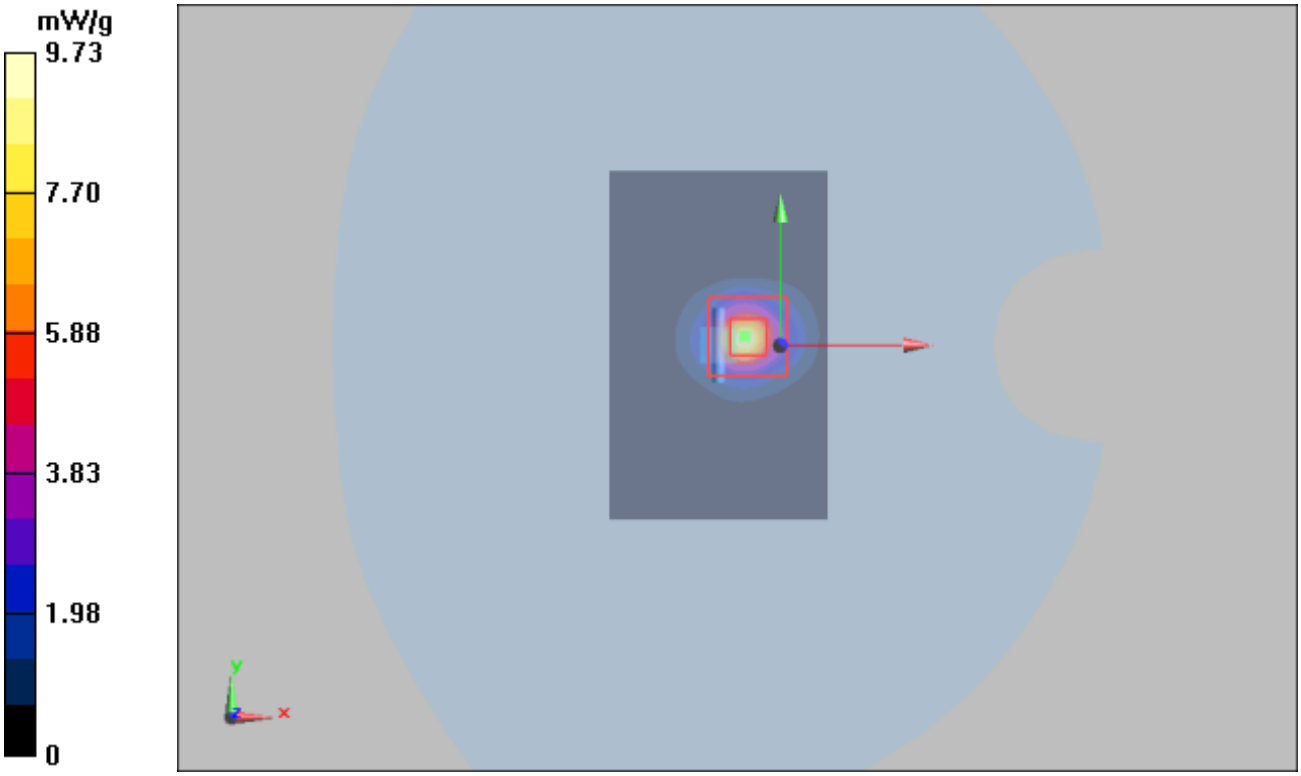
d=10mm, Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 33.6 V/m; Power Drift = -0.095 dB

Peak SAR (extrapolated) = 52.2 W/kg

SAR(1 g) = 7.87 mW/g; SAR(10 g) = 2.25 mW/g

Maximum value of SAR (measured) = 9.73 mW/g



Plot 7 System Performance Check at 5750 MHz TSL

DUT: Dipole 5750 MHz; Type: D5GHzV2; Serial: D5GHzV2

Date: 12/28/2020

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

Medium parameters used: f = 5750 MHz; σ = 5.21 S/m; ε_r = 34.9; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(5.00, 5.00, 5.00); Calibrated: 7/6/2020;

Electronics: DAE4 SN1291; Calibrated: 2/24/2020

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

d=10mm, Pin=100mW/Area Scan (6x10x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 8.31 mW/g

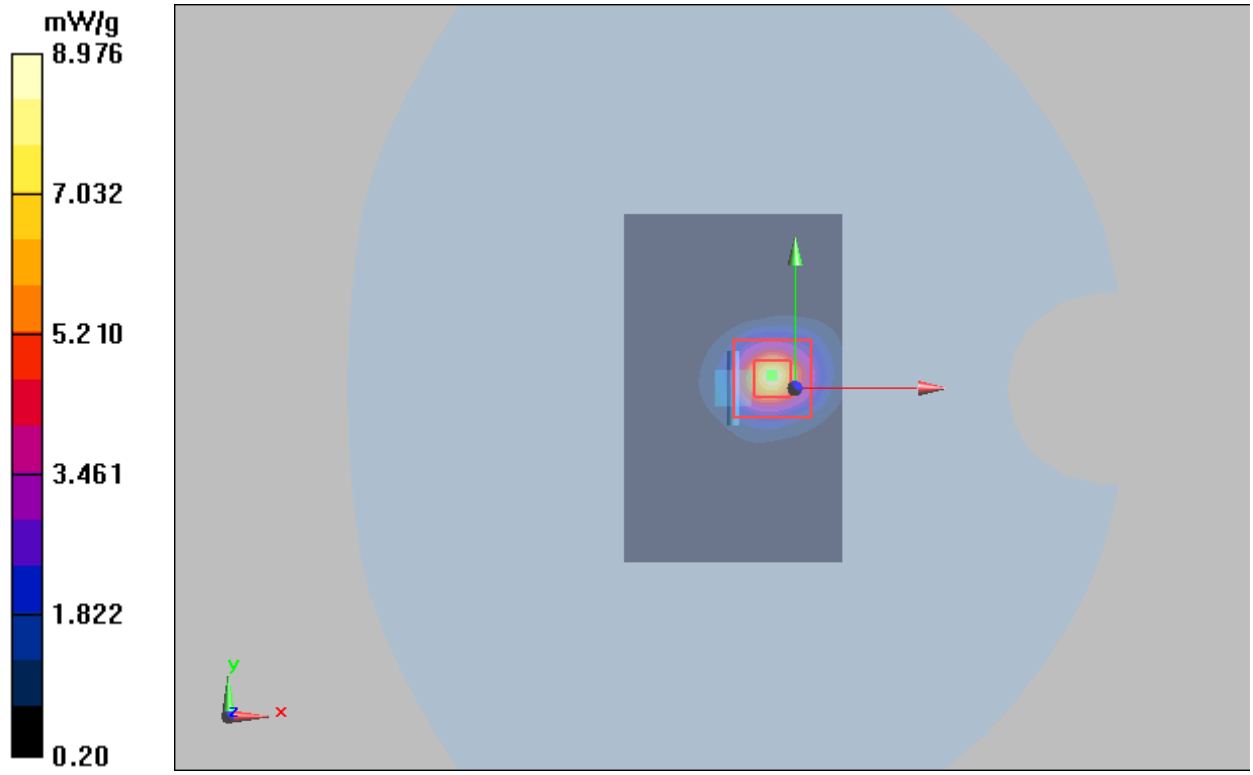
d=10mm, Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 23.1 V/m; Power Drift = 0.044 dB

Peak SAR (extrapolated) = 23.4 W/kg

SAR(1 g) = 7.66 mW/g; SAR(10 g) = 2.27 mW/g

Maximum value of SAR (measured) = 8.976 mW/g



ANNEX C: Highest Graph Results

Plot 8 LTE Band 38 1RB Back Side Low(Distance 5mm)

Date: 12/16/2020

Communication System: UID 0, LTE (0); Frequency: 2580 MHz;Duty Cycle: 1:1.58

Medium parameters used: f = 2580 MHz; σ = 1.954 S/m; ε_r = 38.099; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.26, 7.26, 7.26); Calibrated: 7/6/2020;

Electronics: DAE4 SN1291; Calibrated: 2/24/2020

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Back Side Low/Area Scan (10x14x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 0.375 W/kg

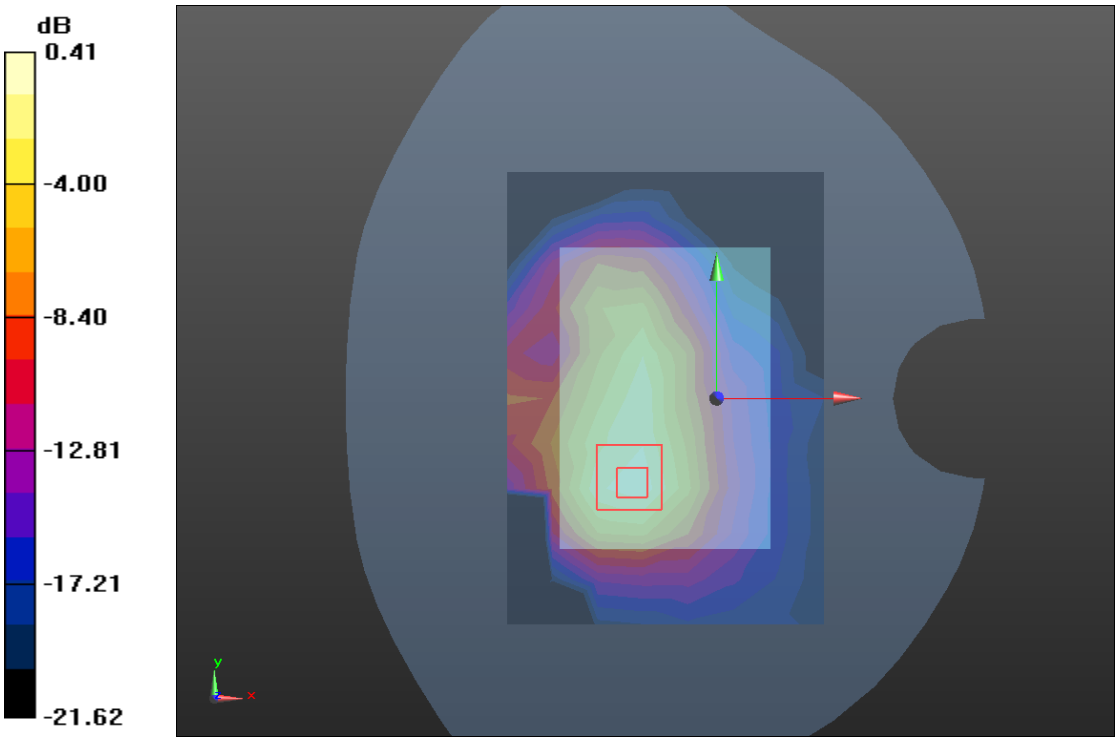
Back Side Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 9.835 V/m; Power Drift = -0.18 dB

Peak SAR (extrapolated) = 0.731 W/kg

SAR(1 g) = 0.343 W/kg; SAR(10 g) = 0.167 W/kg

Maximum value of SAR (measured) = 0.41 W/kg



Plot 9 LTE Band 40 1RB Back Side Low(Distance 5mm)

Date: 12/16/2020

Communication System: UID 0, LTE (0); Frequency: 2310 MHz;Duty Cycle: 1:1.58

Medium parameters used: f = 2310 MHz; σ = 1.654 S/m; ε_r = 39.087; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.69, 7.69, 7.69); Calibrated: 7/6/2020;

Electronics: DAE4 SN1291; Calibrated: 2/24/2020

Phantom: SAM 2; Type: SAM;

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Back Side Low/Area Scan (10x14x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 0.366 W/kg

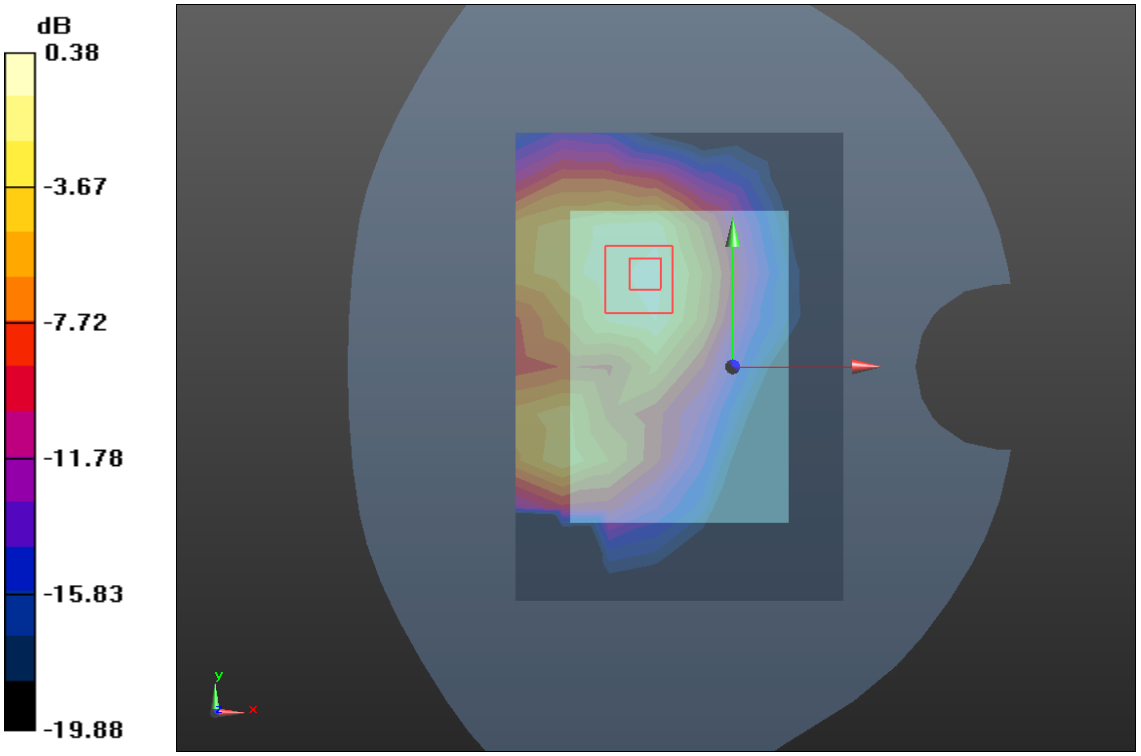
Back Side Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 6.979 V/m; Power Drift = 0.057 dB

Peak SAR (extrapolated) = 0.551 W/kg

SAR(1 g) = 0.342 W/kg; SAR(10 g) = 0.206 W/kg

Maximum value of SAR (measured) = 0.38 W/kg



Plot 10 LTE Band 41 50%RB Back Side High (Distance 5mm)

Date: 12/16/2020

Communication System: UID 0, LTE (0); Frequency: 2680 MHz;Duty Cycle: 1:1.58

Medium parameters used: f = 2680 MHz; σ = 2.068 S/m; ε_r = 37.767; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.26, 7.26, 7.26); Calibrated: 7/6/2020;

Electronics: DAE4 SN1291; Calibrated: 2/24/2020

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Back Side High/Area Scan (10x14x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 0.490 W/kg

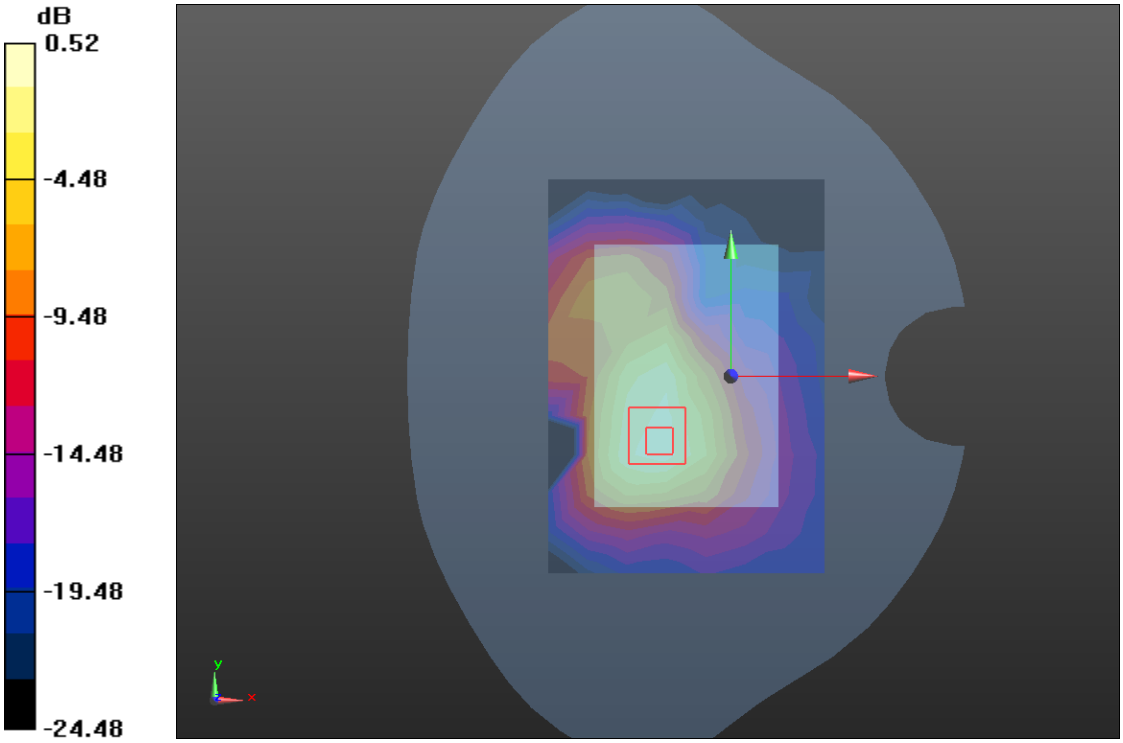
Back Side High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 10.47 V/m; Power Drift = 0.041 dB

Peak SAR (extrapolated) = 1.07 W/kg

SAR(1 g) = 0.385 W/kg; SAR(10 g) = 0.204 W/kg

Maximum value of SAR (measured) = 0.52 W/kg



Plot 11 LTE Band 42 1RB Bottom Edge High (Distance 5mm)

Date: 12/18/2020

Communication System: UID 0, LTE (0); Frequency: 3590 MHz;Duty Cycle: 1:1.58

Medium parameters used (interpolated): f = 3590 MHz; σ = 2.908 S/m; ε_r = 38.11; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.03, 7.03, 7.03) ; Calibrated: 7/6/2020;

Electronics: DAE4 SN1291; Calibrated: 2/24/2020

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Bottom Edge High/Area Scan (6x17x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.701 W/kg

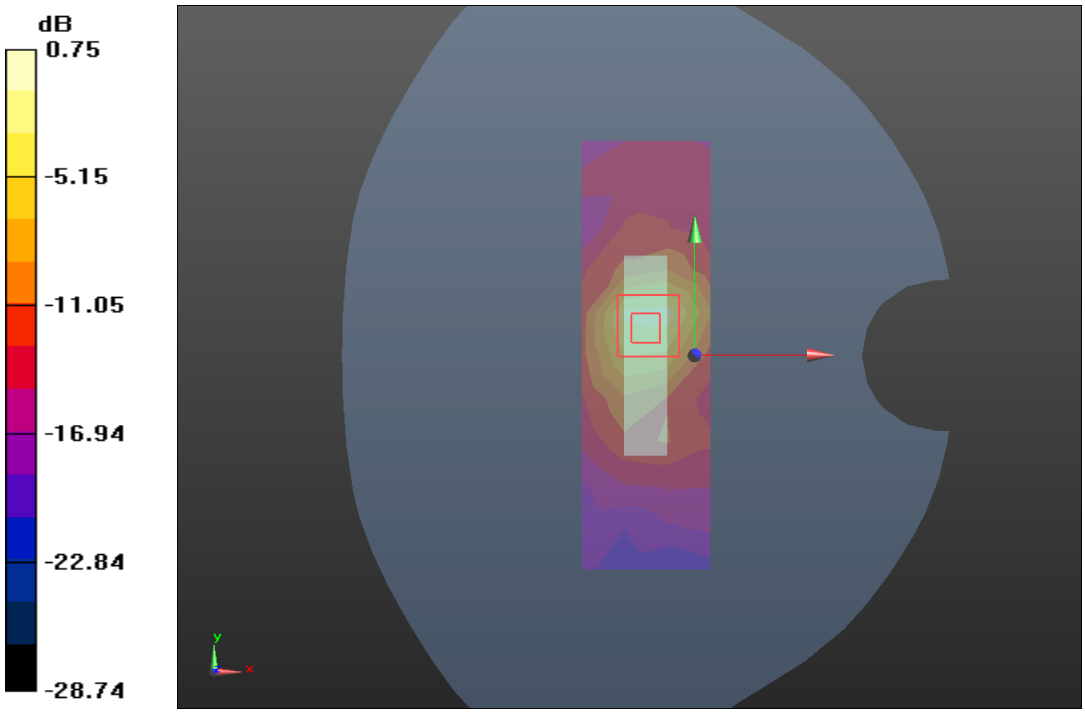
Bottom Edge High/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 9.834 V/m; Power Drift = 0.18 dB

Peak SAR (extrapolated) = 2.07 W/kg

SAR(1 g) = 0.660 W/kg; SAR(10 g) = 0.236 W/kg

Maximum value of SAR (measured) = 0.75 W/kg



Plot 12 LTE Band 43 1RB Bottom Edge Low (Distance 5mm)

Date: 12/18/2020

Communication System: UID 0, LTE (0); Frequency: 3610 MHz;Duty Cycle: 1:1.58

Medium parameters used: f = 3610 MHz; σ = 3.025 S/m; ε_r = 37.888; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(6.83, 6.83, 6.83); Calibrated: 7/6/2020;

Electronics: DAE4 SN1291; Calibrated: 2/24/2020

Phantom: SAM1; Type: SAM;

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Bottom Edge Low/Area Scan (6x17x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.571 W/kg

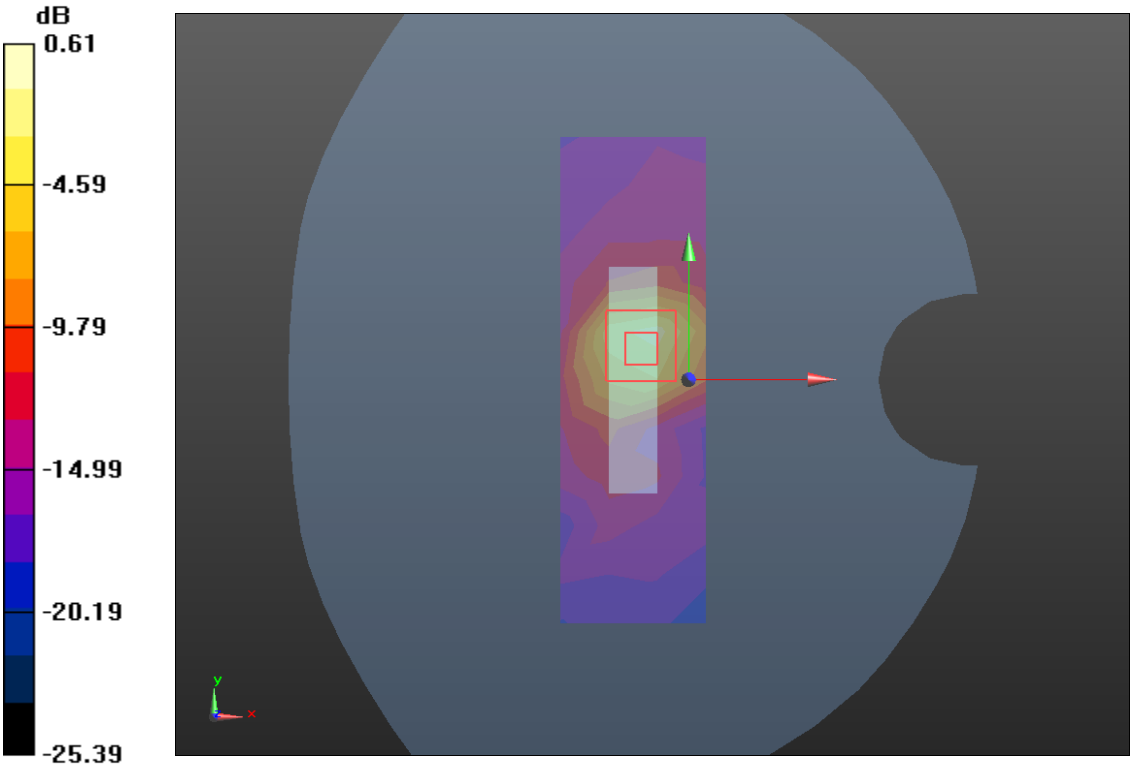
Bottom Edge Low/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 8.301 V/m; Power Drift = 0.021 dB

Peak SAR (extrapolated) = 1.78 W/kg

SAR(1 g) = 0.546 W/kg; SAR(10 g) = 0.192 W/kg

Maximum value of SAR (measured) = 0.61 W/kg

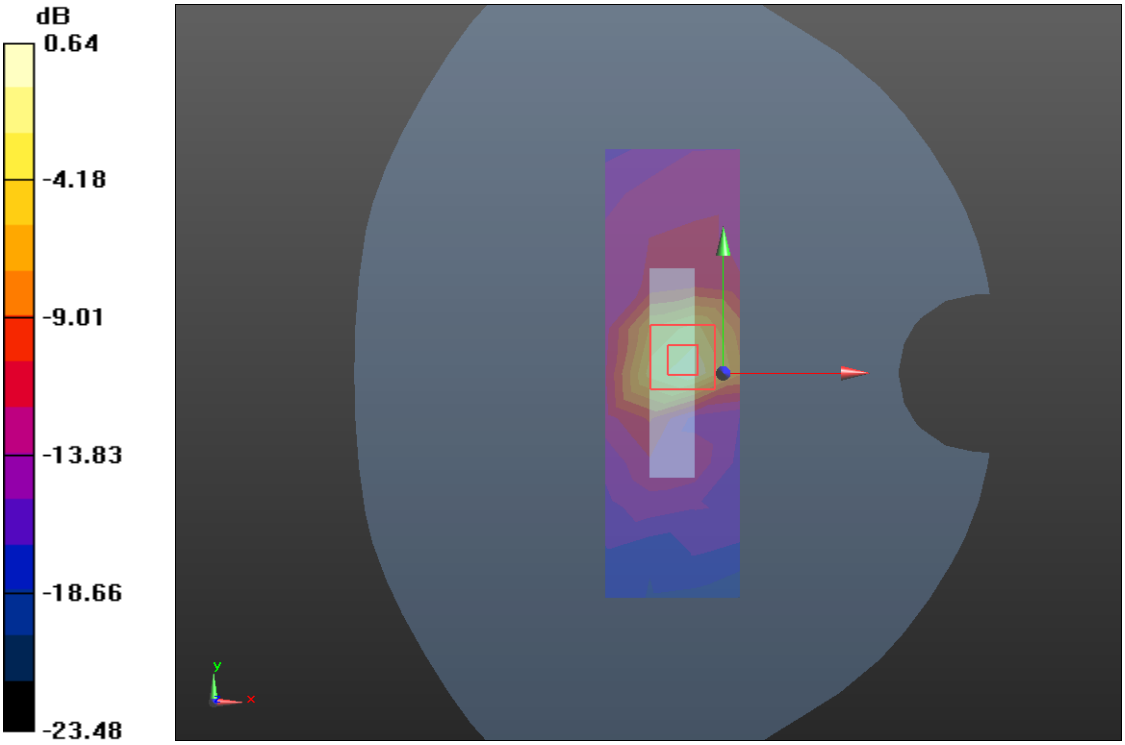


Plot 13 LTE Band 48 1RB Bottom Edge Low (Distance 5mm)

Date: 12/19/2020
Communication System: UID 0, LTE (0); Frequency: 3660MHz;Duty Cycle: 1:1.58
Medium parameters used: f = 3660 MHz; σ = 3.025 S/m; ε_r = 37.888; ρ = 1000 kg/m^3
Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃
Phantom section: Flat Section
DASY5 Configuration:
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Probe: EX3DV4 - SN3677; ConvF(6.83, 6.83, 6.83); Calibrated: 7/6/2020;
Electronics: DAE4 SN1291; Calibrated: 2/24/2020
Phantom: SAM1; Type: SAM;
Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Bottom Edge Low/Area Scan (6x17x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.592 W/kg

Bottom Edge Low/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 13.72 V/m; Power Drift = 0.062 dB
Peak SAR (extrapolated) = 2.07 W/kg
SAR(1 g) = 0.566 W/kg; SAR(10 g) = 0.205 W/kg
Maximum value of SAR (measured) = 0.64 W/kg



Wi-Fi-Antenna

Plot 14 802.11b Right Edge Low (Antenna 1, Distance 5mm)

Date: 12/28/2020

Communication System: UID 0, 802.11b (0); Frequency: 2412 MHz;Duty Cycle: 1:1.01

Medium parameters used: f = 2412 MHz; σ = 1.797 S/m; ε_r = 38.629; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.54, 7.54, 7.54); Calibrated: 7/6/2020;

Electronics: DAE4 SN1291; Calibrated: 2/24/2020

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Right Edge Low/Area Scan (10x14x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 0.782 W/kg

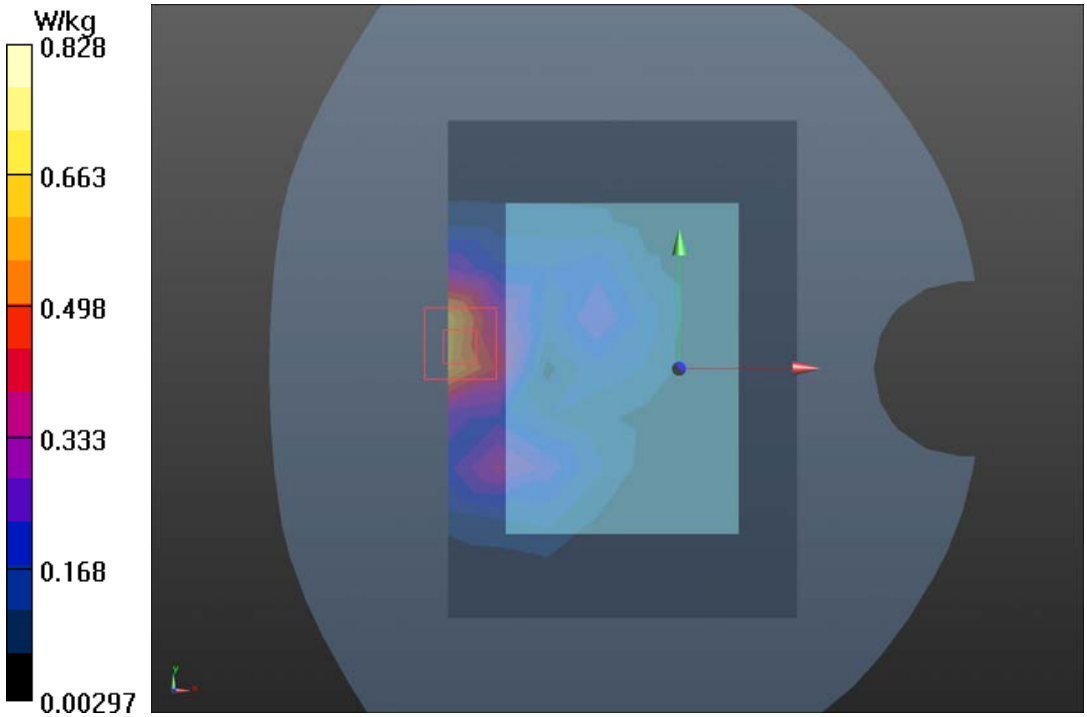
Right Edge Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 9.552 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 1.68 W/kg

SAR(1 g) = 0.719 W/kg; SAR(10 g) = 0.327 W/kg

Maximum value of SAR (measured) = 0.828 W/kg



Plot 15 802.11b Back Side Low (Antenna 2, Distance 5mm)

Date: 12/28/2020

Communication System: UID 0, 802.11b (0); Frequency: 2412 MHz;Duty Cycle: 1:1.01

Medium parameters used: f = 2412 MHz; σ = 1.797 S/m; ε_r = 38.629; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.54, 7.54, 7.54); Calibrated: 7/6/2020;

Electronics: DAE4 SN1291; Calibrated: 2/24/2020

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Back Side Low/Area Scan (10x14x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 0.566 W/kg

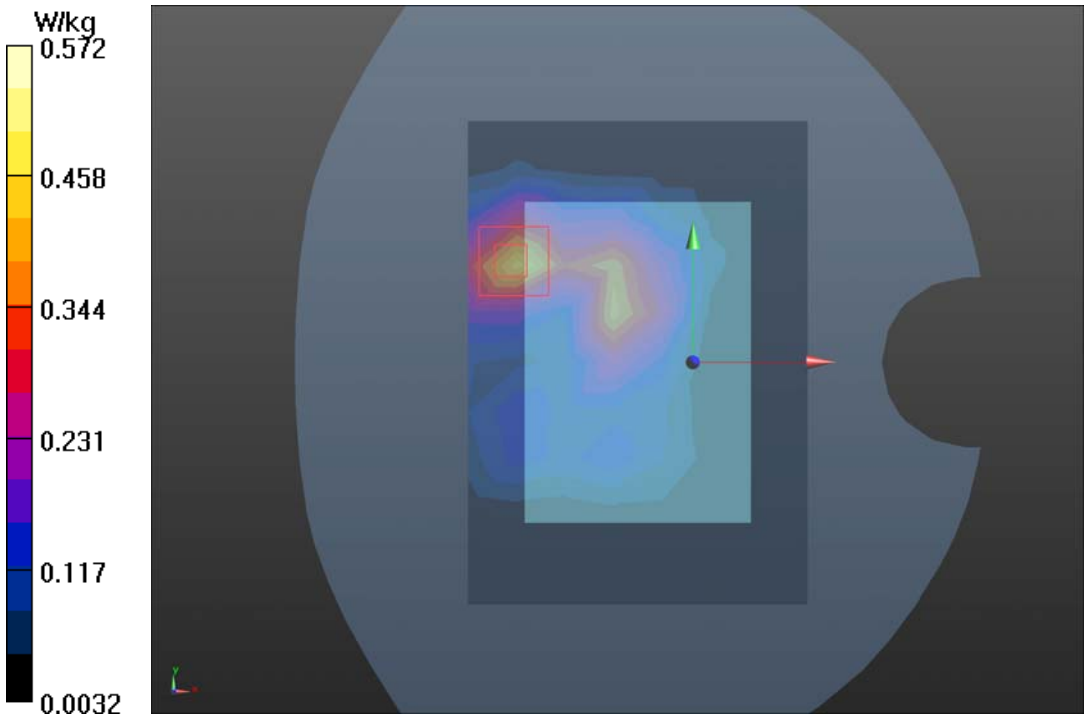
Back Side Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 11.73 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.904 W/kg

SAR(1 g) = 0.541 W/kg; SAR(10 g) = 0.245 W/kg

Maximum value of SAR (measured) = 0.572 W/kg

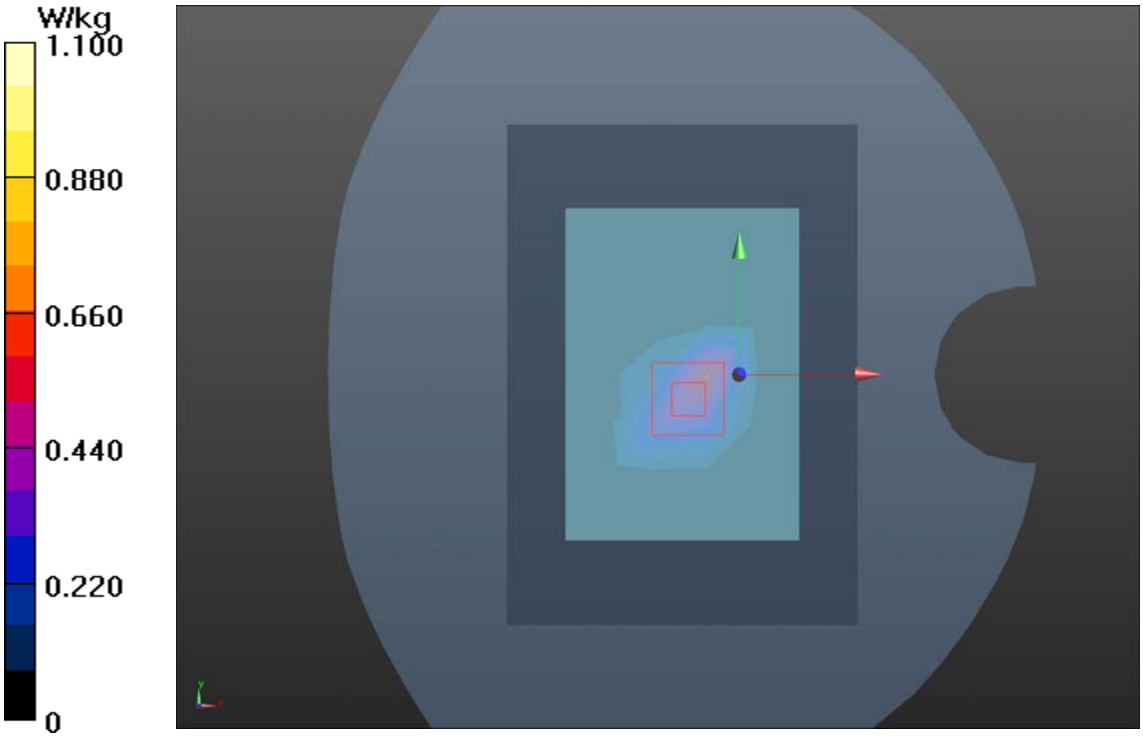


Plot 16 802.11a U-NII-1 Right Edge High (Antenna 1, Distance 5mm)

Date: 12/28/2020
Communication System: UID 0, 802.11ac-VHT40 (0); Frequency: 5230 MHz;Duty Cycle: 1:1.11
Medium parameters used: f = 5230 MHz; σ = 4.858 S/m; ε_r = 36.82; ρ = 1000 kg/m^3
Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃
Phantom section: Flat Section
DASY5 Configuration:
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Probe: EX3DV4 - SN3677; ConvF(5.55, 5.55, 5.55); Calibrated: 7/6/2020;
Electronics: DAE4 SN1291; Calibrated: 2/24/2020
Phantom: SAM1; Type: SAM; Serial: TP-1534
Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Right Edge High/Area Scan (6x17x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.913 W/kg

Right Edge High/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 11.89 V/m; Power Drift = -0.106 dB
Peak SAR (extrapolated) = 2.44 W/kg
SAR(1 g) = 0.846 W/kg; SAR(10 g) = 0.263 W/kg
Maximum value of SAR (measured) = 1.10 W/kg



Plot 17 802.11a U-NII-1 Right Edge Middle (MIMO Antenna, Distance 5mm)

Date: 12/28/2020

Communication System: UID 0, 802.11ac VHT40 (0); Frequency: 5230 MHz;Duty Cycle: 1:1.11

Medium parameters used: f = 5230 MHz; σ = 4.858 S/m; ε_r = 36.82; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(5.55, 5.55, 5.55); Calibrated: 7/6/2020;

Electronics: DAE4 SN1291; Calibrated: 2/24/2020

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Right Edge Middle/Area Scan (6x17x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.611 W/kg

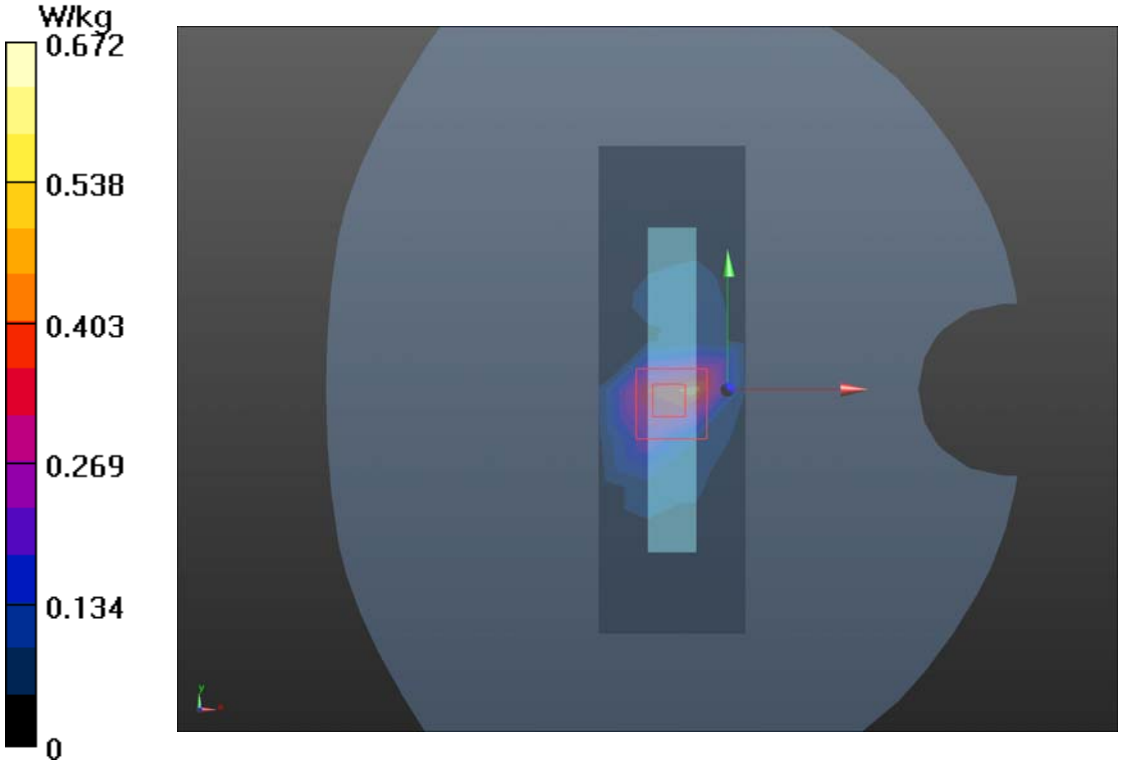
Right Edge Middle/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 13.45 V/m; Power Drift = -0.107 dB

Peak SAR (extrapolated) = 1.64 W/kg

SAR(1 g) = 0.566 W/kg; SAR(10 g) = 0.177 W/kg

Maximum value of SAR (measured) = 0.672 W/kg



Plot 18 802.11a U-NII-3 Right Edge High (Antenna 1, Distance 5mm)

Date: 12/28/2020

Communication System: UID 0, 802.11ac VHT20 (0); Frequency: 5825 MHz;Duty Cycle: 1:1.04

Medium parameters used: f = 5825 MHz; σ = 5.48 S/m; ε_r = 35.186; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(5.00, 5.00, 5.00); Calibrated: 7/6/2020;

Electronics: DAE4 SN1291; Calibrated: 2/24/2020

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Right Edge High/Area Scan (6x17x1): Measurement grid: dx=10mm, dy=10mm

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

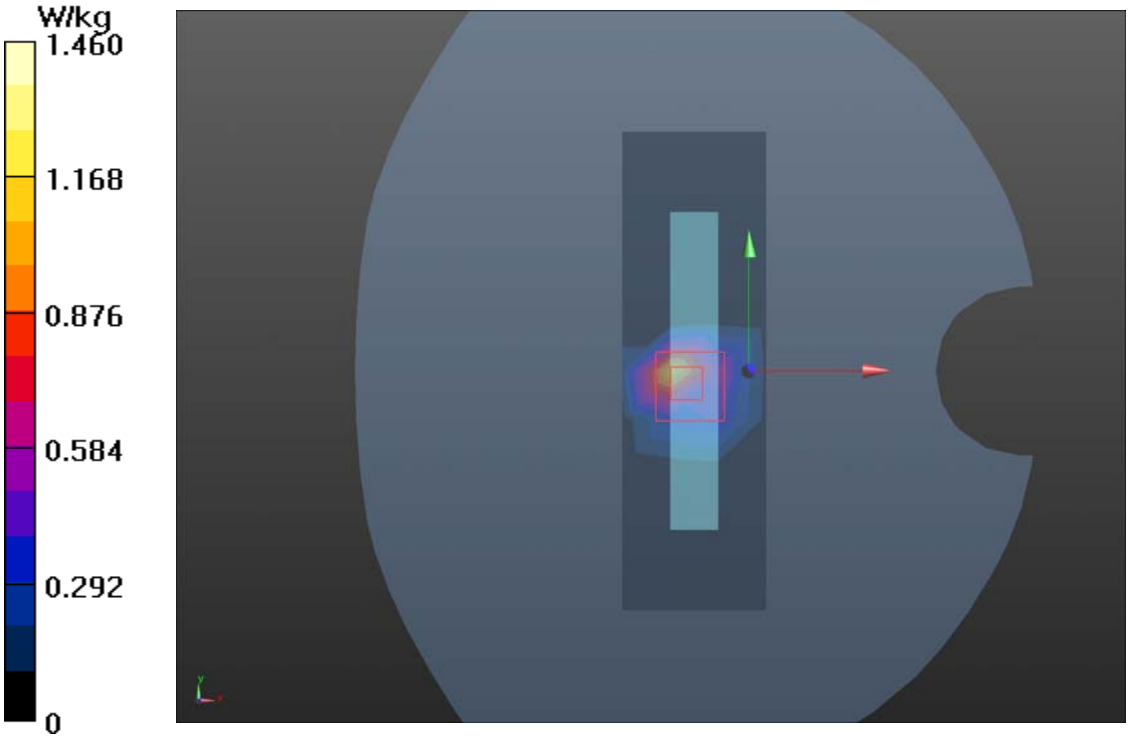
Right Edge High/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 16.39 V/m; Power Drift = 0.022 dB

Peak SAR (extrapolated) = 3.87 W/kg

SAR(1 g) = 1.26 W/kg; SAR(10 g) = 0.402 W/kg

Maximum value of SAR (measured) = 1.46 W/kg



Plot 19 802.11a U-NII-3 Right Edge Middle (MIMO Antenna, Distance 5mm)

Date: 12/28/2020

Communication System: UID 0, 802.11a (0); Frequency: 5785 MHz;Duty Cycle: 1:1.43

Medium parameters used: f = 5785 MHz; σ = 5.48 S/m; ε_r = 35.343; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(5.00, 5.00, 5.00); Calibrated: 7/6/2020;

Electronics: DAE4 SN1291; Calibrated: 2/24/2020

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Right Edge Middle/Area Scan (6x17x1): Measurement grid: dx=10mm, dy=10mm

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

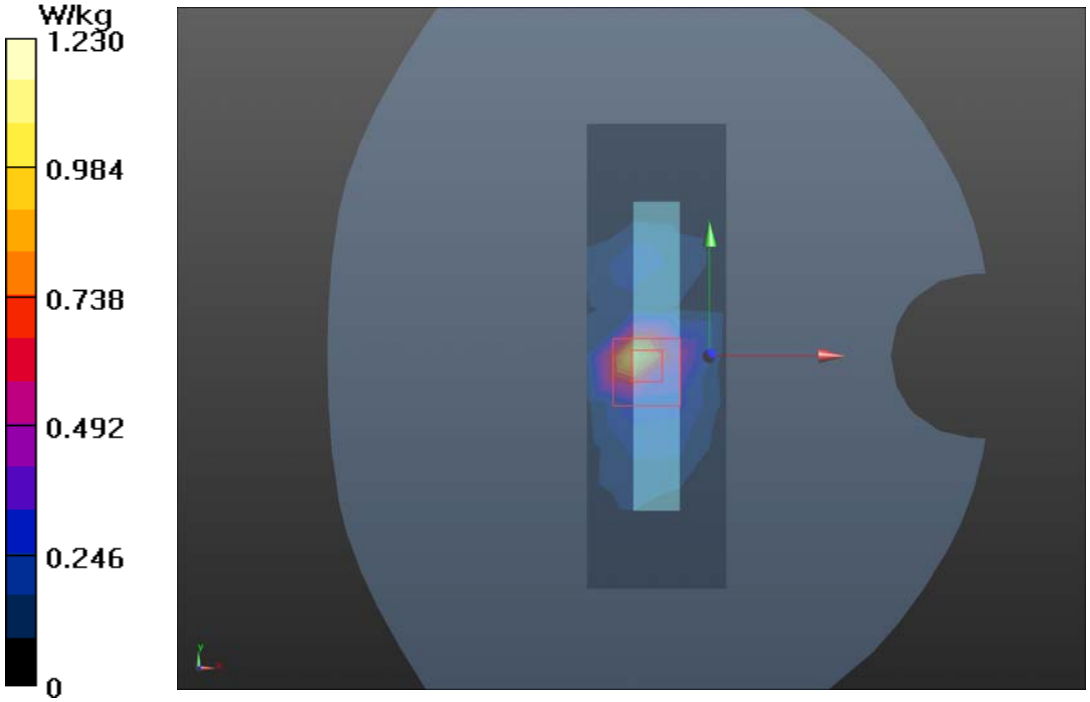
Right Edge Middle/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 15.83 V/m; Power Drift = 0.062 dB

Peak SAR (extrapolated) = 3.06 W/kg

SAR(1 g) = 0.945 W/kg; SAR(10 g) = 0.319 W/kg

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



ANNEX D: Probe Calibration Certificate

In Collaboration with
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中国认可 国际互认 校准 CALIBRATION CNAS L0570

Client TA(Shanghai) Certificate No: Z20-60218

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN : 3677
Calibration Procedure(s)	FF-Z11-004-01 Calibration Procedures for Dosimetric E-field Probes
Calibration date:	July 06, 2020

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	16-Jun-20(CTTL, No.J20X04344)	Jun-21
Power sensor NRP-Z91	101547	16-Jun-20(CTTL, No.J20X04344)	Jun-21
Power sensor NRP-Z91	101548	16-Jun-20(CTTL, No.J20X04344)	Jun-21
Reference 10dBAttenuator	18N50W-10dB	10-Feb-20(CTTL, No.J20X00525)	Feb-22
Reference 20dBAttenuator	18N50W-20dB	10-Feb-20(CTTL, No.J20X00526)	Feb-22
Reference Probe EX3DV4	SN 3617	30-Jan-20(SPEAG, No.EX3-3617_Jan20/2)	Jan-21
DAE4	SN 1556	4-Feb-20(SPEAG, No.DAE4-1556_Feb20)	Feb-21
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
SignalGenerator MG3700A	6201052605	23-Jun-20(CTTL, No.J20X04343)	Jun-21
Network Analyzer E5071C	MY46110673	10-Feb-20(CTTL, No.J20X00515)	Feb-21

	Name	Function	Signature
Calibrated by:	Yu Zongying	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: July 08, 2020

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

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Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A,B,C,D	modulation dependent linearization parameters
Polarization Φ	Φ rotation around probe axis
Polarization θ	θ rotation around an axis that is in the plane normal to probe axis (at measurement center), i θ=0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013

b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016

c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010

d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization θ=0 (f≤900MHz in TEM-cell; f>1800MHz: waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the E^2-field uncertainty inside TSL (see below ConvF).
- *NORM(f)x,y,z = NORMx,y,z* frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics.
- *Ax,y,z; Bx,y,z; Cx,y,z;VRx,y,z:*A,B,C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f≤800MHz) and inside waveguide using analytical field distributions based on power measurements for f >800MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty valued are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORMx,y,z* ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from±50MHz to±100MHz.
- *Spherical isotropy (3D deviation from isotropy):* in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset:* The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle:* The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

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DASY/EASY – Parameters of Probe: EX3DV4 – SN:3677

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (*k*=2)
Norm(μV/(V/m)²)[A]	0.41	0.46	0.40	±10.0%
DCP(mV)[B]	100.7	102.6	102.1	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (*k*=2)
0	CW	X	0.0	0.0	1.0	0.00	174.8	±2.0%
		Y	0.0	0.0	1.0		186.9	
		Z	0.0	0.0	1.0		173.5	

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor *k*=2, which for a normal distribution Corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of Norm X, Y, Z do not affect the E²-field uncertainty inside TSL (see Page 4).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainly is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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DASY/EASY – Parameters of Probe: EX3DV4 – SN:3677

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz][C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unct. (k=2)
750	41.9	0.89	9.78	9.78	9.78	0.40	0.75	±12.1%
835	41.5	0.90	9.38	9.38	9.38	0.21	1.11	±12.1%
1750	40.1	1.37	8.25	8.25	8.25	0.26	1.05	±12.1%
1900	40.0	1.40	7.90	7.90	7.90	0.28	1.06	±12.1%
2000	40.0	1.40	7.97	7.97	7.97	0.23	1.17	±12.1%
2300	39.5	1.67	7.69	7.69	7.69	0.66	0.68	±12.1%
2450	39.2	1.80	7.54	7.54	7.54	0.66	0.70	±12.1%
2600	39.0	1.96	7.26	7.26	7.26	0.74	0.67	±12.1%
3300	38.2	2.71	7.07	7.07	7.07	0.48	0.97	±13.3%
3500	37.9	2.91	7.03	7.03	7.03	0.49	0.93	±13.3%
3700	37.7	3.12	6.83	6.83	6.83	0.49	0.97	±13.3%
3900	37.5	3.32	6.76	6.76	6.76	0.40	1.20	±13.3%
4100	37.2	3.53	6.78	6.78	6.78	0.40	1.15	±13.3%
4400	36.9	3.84	6.47	6.47	6.47	0.40	1.20	±13.3%
4600	36.7	4.04	6.42	6.42	6.42	0.50	1.13	±13.3%
4800	36.4	4.25	6.35	6.35	6.35	0.45	1.25	±13.3%
4950	36.3	4.40	6.22	6.22	6.22	0.45	1.25	±13.3%
5250	35.9	4.71	5.55	5.55	5.55	0.50	1.15	±13.3%
5600	35.5	5.07	4.97	4.97	4.97	0.55	1.22	±13.3%
5750	35.4	5.22	5.00	5.00	5.00	0.55	1.27	±13.3%

[C] Frequency validity above 300 MHz of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequency below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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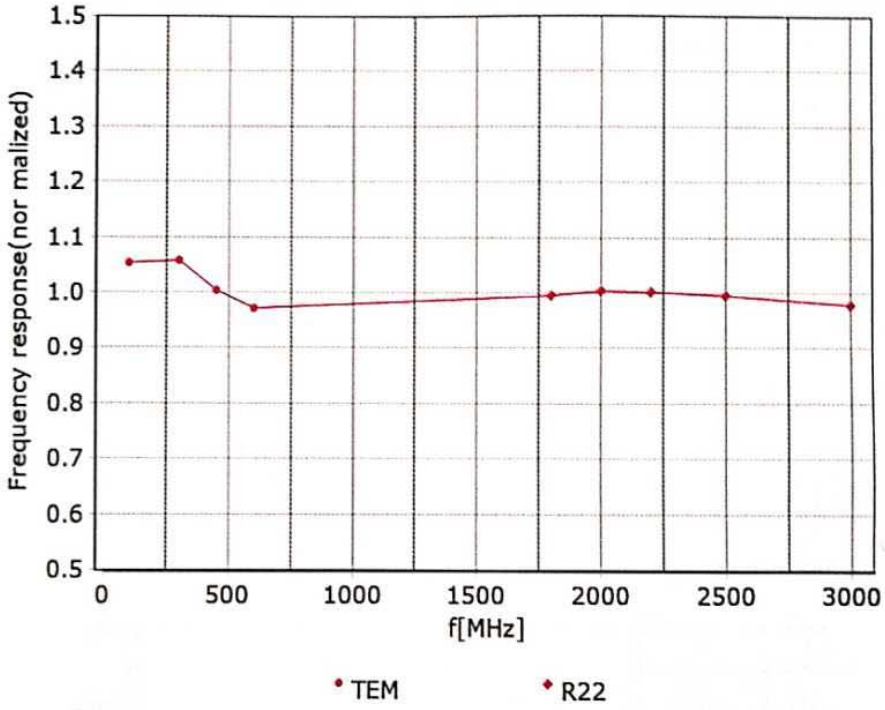
Frequency Response of E-Field
(TEM-Cell: ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ±7.4% (*k*=2)

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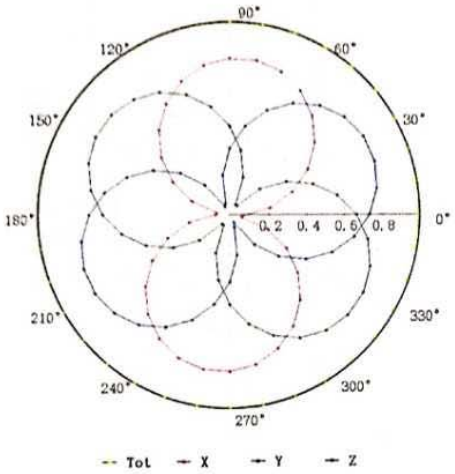
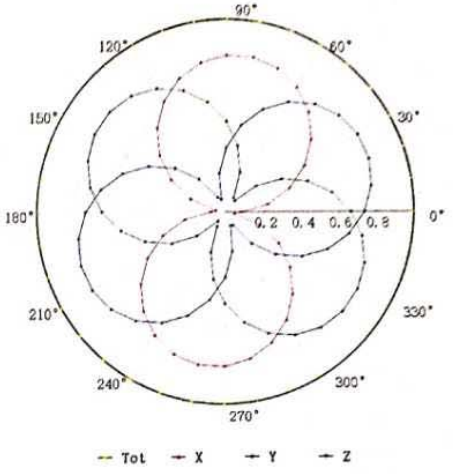
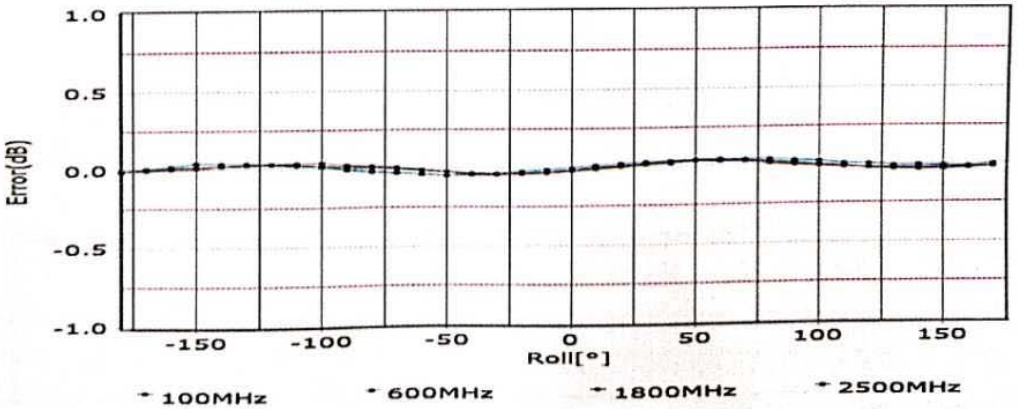
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM



f=1800 MHz, R22





Uncertainty of Axial Isotropy Assessment: ±1.2% (*k*=2)

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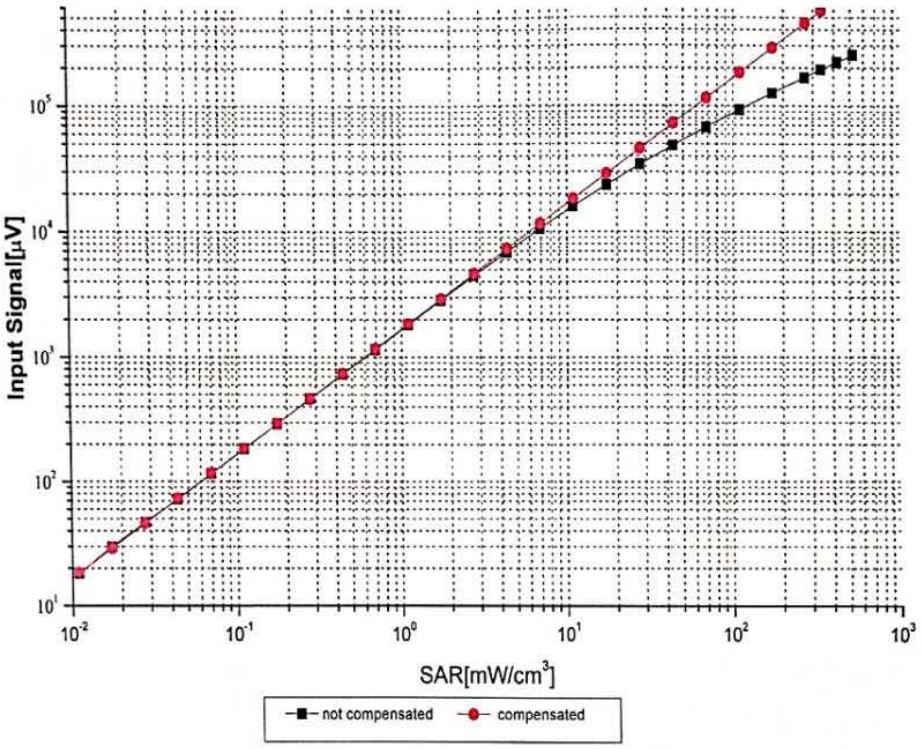
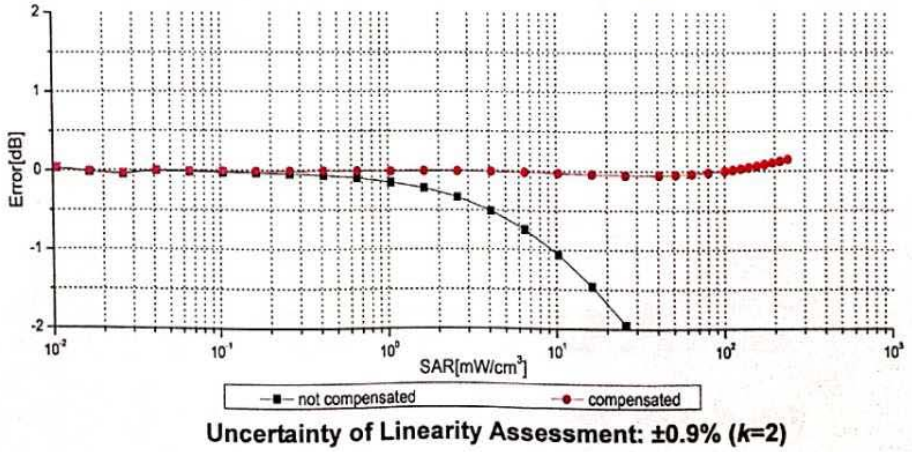
Dynamic Range f(SAR_{head})
(TEM cell, f = 900 MHz)





Uncertainty of Linearity Assessment: ±0.9% (*k*=2)

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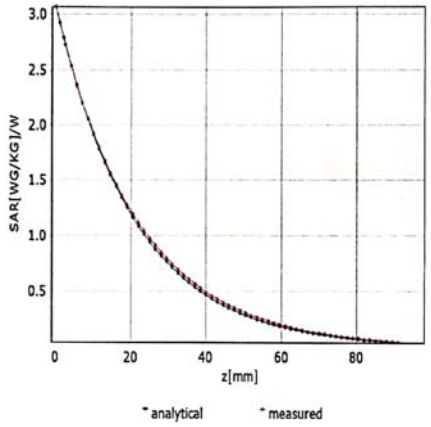
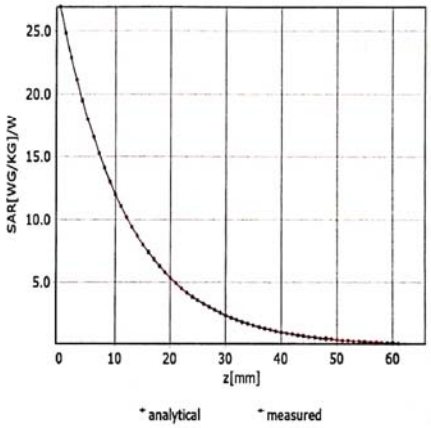
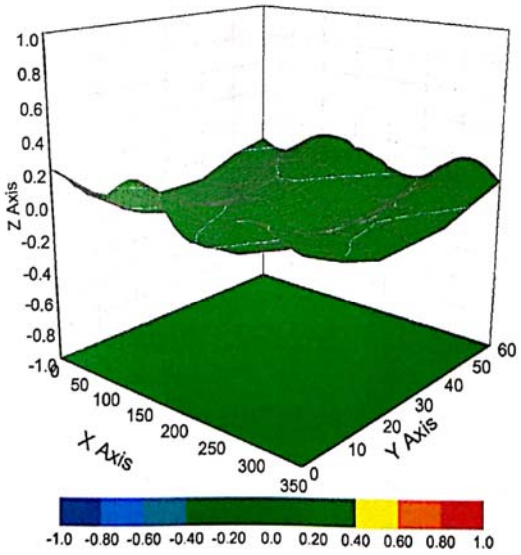
Conversion Factor Assessment

f=750 MHz,WGLS R9(H_convF) **f=1750 MHz,WGLS R22(H_convF)**





Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment: ±3.2% (*k*=2)

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DASY/EASY – Parameters of Probe: EX3DV4 – SN:3677

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	115.7
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	10mm
Tip Diameter	2.5mm
Probe Tip to Sensor X Calibration Point	1mm
Probe Tip to Sensor Y Calibration Point	1mm
Probe Tip to Sensor Z Calibration Point	1mm
Recommended Measurement Distance from Surface	1.4mm

ANNEX E: D2300V2 Dipole Calibration Certificate

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CNAS L0570

Client ECIT Certificate No: Z18-60429

CALIBRATION CERTIFICATE

Object	D2300V2 - SN: 1021
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	November 1, 2018

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRVD	102196	07-Mar-18 (CTTL, No.J18X01510)	Mar-19
Power sensor NRV-Z5	100596	07-Mar-18 (CTTL, No.J18X01510)	Mar-19
Reference Probe EX3DV4	SN 7514	27-Aug-18(SPEAG,No.EX3-7514_Aug18)	Aug-19
DAE4	SN 1555	20-Aug-18(SPEAG,No.DAE4-1555_Aug18)	Aug-19
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	23-Jan-18 (CTTL, No.J18X00560)	Jan-19
NetworkAnalyzer E5071C	MY46110673	24-Jan-18 (CTTL, No.J18X00561)	Jan-19

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: November 5, 2018

Certificate No: Z18-60429 Page 1 of 8

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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORMx,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor k=2, which for a normal distribution Corresponds to a coverage probability of approximately 95%.

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Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	52.10.2.1495
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2300 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.5	1.67 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.4 ± 6 %	1.70 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	12.5 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**49.5 mW /g ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.94 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**23.6 mW /g ± 18.7 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.9	1.81 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.0 ± 6 %	1.86 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.2 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**48.1 mW /g ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.81 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**23.1 mW /g ± 18.7 % (k=2)**

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.9Ω- 3.53jΩ
Return Loss	- 28.6dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.9Ω- 0.73jΩ
Return Loss	- 29.6dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.034 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

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DASY5 Validation Report for Head TSL Date: 11.01.2018

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2300 MHz; Type: D2300V2; Serial: D2300V2 - SN: 1021

Communication System: UID 0, CW; Frequency: 2300 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2300 MHz; σ = 1.7 S/m; ε_r = 39.42; ρ = 1000 kg/m3

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7514; ConvF(7.42, 7.42, 7.42) @ 2300 MHz; Calibrated: 8/27/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1555; Calibrated: 8/20/2018
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

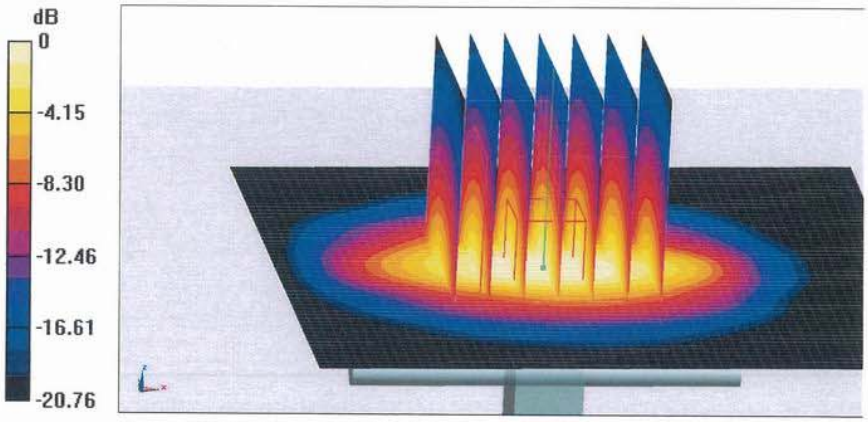
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 106.5 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 26.1 W/kg

SAR(1 g) = 12.5 W/kg; SAR(10 g) = 5.94 W/kg

Maximum value of SAR (measured) = 21.0 W/kg



0 dB = 21.0 W/kg = 13.22 dBW/kg

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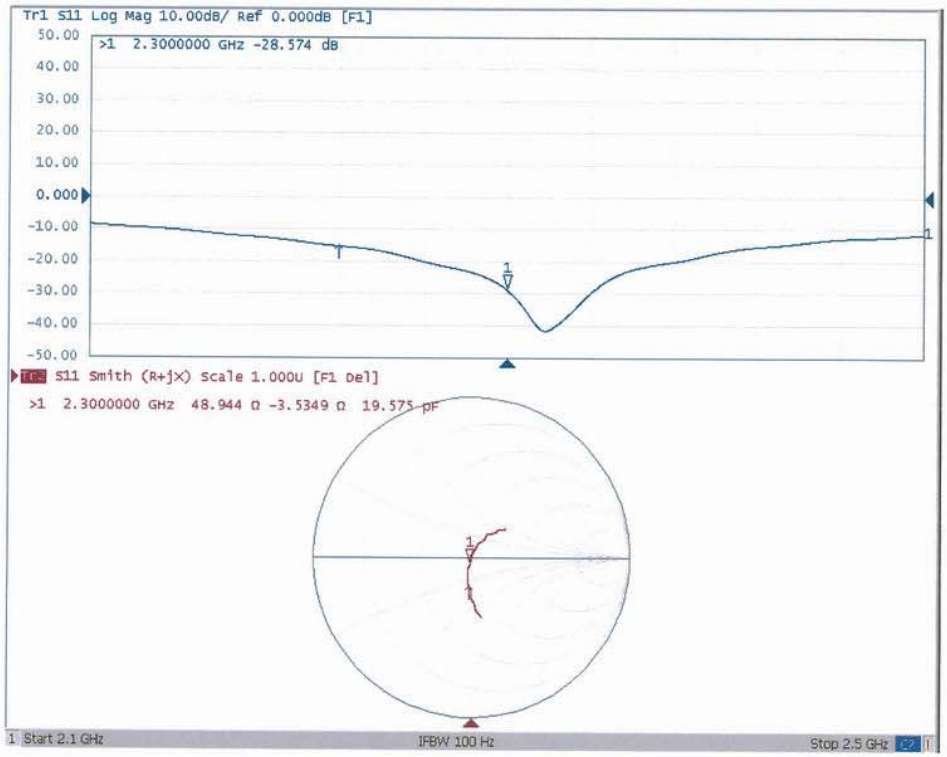
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL Date: 11.01.2018

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2300 MHz; Type: D2300V2; Serial: D2300V2 - SN: 1021

Communication System: UID 0, CW; Frequency: 2300 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2300 MHz; σ = 1.864 S/m; ε_r = 52.96; ρ = 1000 kg/m3

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7514; ConvF(7.25, 7.25, 7.25) @ 2300 MHz; Calibrated: 8/27/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1555; Calibrated: 8/20/2018
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

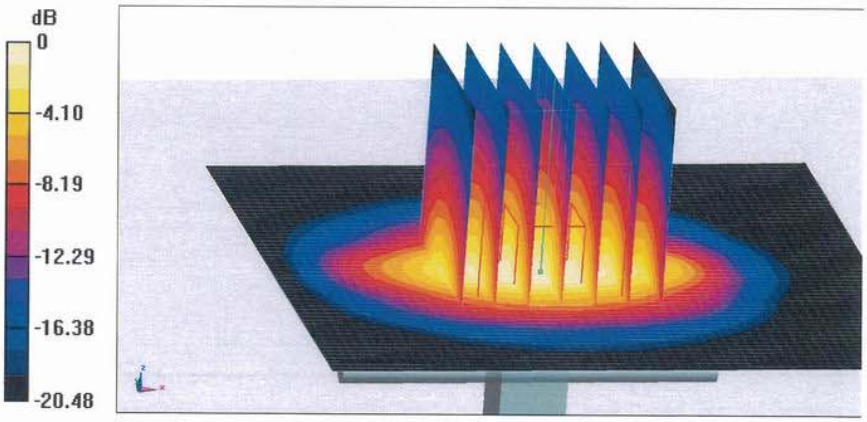
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 99.08 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 24.5 W/kg

SAR(1 g) = 12.2 W/kg; SAR(10 g) = 5.81 W/kg

Maximum value of SAR (measured) = 20.0 W/kg



0 dB = 20.0 W/kg = 13.01 dBW/kg

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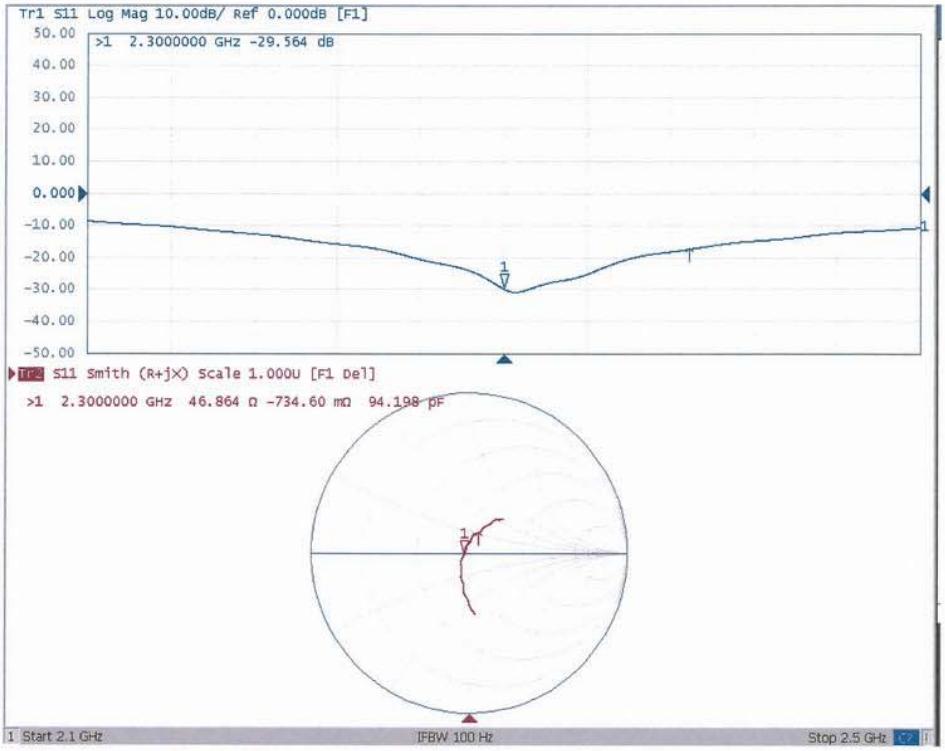
Impedance Measurement Plot for Body TSL



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ANNEX F: D2450V2 Dipole Calibration Certificate

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CNAS L0570

Client TA(Shanghai) Certificate No: Z20-60298

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 786
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	August 27, 2020

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106276	12-May-20 (CTTL, No.J20X02965)	May-21
Power sensor NRP6A	101369	12-May-20 (CTTL, No.J20X02965)	May-21
Reference Probe EX3DV4	SN 3617	30-Jan-20(SPEAG,No.EX3-3617_Jan20)	Jan-21
DAE4	SN 771	10-Feb-20(CTTL-SPEAG,No.Z20-60017)	Feb-21
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	25-Feb-20 (CTTL, No.J20X00516)	Feb-21
NetworkAnalyzer E5071C	MY46107873	10-Feb-20 (CTTL, No.J20X00515)	Feb-21

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: September 2, 2020

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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORMx,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", September 2013
b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor k=2, which for a normal distribution Corresponds to a coverage probability of approximately 95%.

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Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.5 ± 6 %	1.79 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.0 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**52.3 W/kg ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.99 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.0 W/kg ± 18.7 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.1 ± 6 %	1.94 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.1 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**52.4 W/kg ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	6.08 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**24.3 W/kg ± 18.7 % (k=2)**

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.5Ω+ 1.44 jΩ
Return Loss	- 26.9dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.9Ω+ 5.09 jΩ
Return Loss	- 25.8dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.018 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG