SAR TEST REPORT

Applicant	Huawei Technologies Co., Ltd.
FCC ID	QISE3619U-828
Product	Huawei Locator
Model	E3619U-828
Report No.	R1812H0172-S1
Issue Date	January 21, 2019

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.

Songyan Fan Guangchang Fan

Approved by: Songyan Fan *Approved by: Guangchang Fan*

TA Technology (Shanghai) Co., Ltd.

No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China

TEL: +86-021-50791141/2/3

FAX: +86-021-50791141/2/3-8000

Table of Contents

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

CNAS (accreditation number:L2264)

TA Technology (Shanghai) Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS).

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 electromagnetic emissions measurements.

IC (recognition number is 8510A)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

VCCI (recognition number is C-4595, T-2154, R-4113, G-10766)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission 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
Contact:	Xu Kai
Telephone:	+86-021-50791141/2/3
Fax:	+86-021-50791141/2/3-8000
Website:	http://www.ta-shanghai.com
E-mail:	xukai@ta-shanghai.com

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-SAR (Separation 0mm)
GSM 850	0.42
GSM 1900	**0.80**
eMTC Band 2	0.36
eMTC Band 4	0.16
eMTC Band 5	＜0.1
NB-IOT Band 2	0.34
NB-IOT Band 4	0.15
NB-IOT Band 5	＜0.1
WI-FI 2.4G	＜0.1
BLE	/
Date of Testing:	January 3, 2019 ~ January 9, 2019

Note: 1) The highest Reported SAR for body-SAR, and simultaneous transmission exposure conditions are 0.80W/kg and 0.83 W/kg.
2) Sand-alone SAR evaluation is not required for BLE, more details information see section 10.2

The device is in compliance with Specific Absorption Rate (SAR) for general population/uncontraolled exposure limits according to the FCC rule §2.1093, the ANSI C95.1: 1992/IEEE C95.1: 1991, and had been tested in accordance with the measurement methods and procedures specified in IEEE Std 1528-2013.

3 Description of Equipment under Test

Client Information

Applicant	Huawei Technologies Co., Ltd.
Applicant address	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.China.
Manufacturer	Huawei Technologies Co., Ltd.
Manufacturer address	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.China.

General Technologies

Application Purpose:	Original Grant
EUT Stage:	Identical Prototype
Model:	E3619U-828
IMEI:	/
Hardware Version:	IM1E3619UM VER.E
Software Version:	1.0.0.35(H126SP9C00)
Antenna Type:	Internal Antenna
Device Class:	C
Power Class:	GSM 850:4 GSM 1900:1 eMTC Band 2/4/5:3 NB-IOT Band 2/4/5:3
Power Level:	GSM 850:level 5 GSM 1900:level 0 eMTC Band 2/4/5:max power NB-IOT Band 2/4/5:max power
EUT Accessory	
Battery 1	Manufacturer: Amperex Technology Limited Model: HB642735ECW
Battery 2	Manufacturer: Tianjin Lishen Battery Joint-Stock Co., Ltd Model: HB642735ECW

Wireless Technology and Frequency Range

Wireless Technology		Modulation	Operating mode	Tx (MHz)
GSM	850	GPRS(GMSK) EGPRS(GMSK,8PSK)	☐Multi-slot Class:8-1UP ☐Multi-slot Class:10-2UP ☒Multi-slot Class:12-4UP ☐Multi-slot Class:33-4UP	824 ~ 849
	1900			1850 ~ 1910
	Does this device support DTM (Dual Transfer Mode)? ☐Yes ☒No			
eMTC	FDD 2	QPSK 16QAM	Full RB allocation = 6	1850 ~ 1910
	FDD 4			1710 ~ 1755
	FDD 5			824 ~ 849
NB-IOT	FDD 2	BPSK, QPSK	Sub-carrier Spacing=3.75(kHz) / 15(kHz)	1850 ~ 1910
	FDD 4			1710 ~ 1755
	FDD 5			824 ~ 849
BT	2.4G	Version 4.2 LE		2402 ~2480
Wi-Fi	2.4G	DSSS,OFDM	802.11b/g/n HT20	2412 ~ 2462
	Does this device support MIMO ☐Yes ☒No			
Note: 1) The device does not support voice function. 2) The device does not support hotspot function.				

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:

248227 D01 802.11Wi-Fi SAR v02r02
447498 D01 General RF Exposure Guidance v06
648474 D04 Handset SAR v01r03
690783 D01 SAR Listings on Grants v01r03
865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
865664 D02 RF Exposure Reporting v01r02
941225 D01 3G SAR Procedures v03r01
941225 D05 SAR for LTE Devices v02r05

5 Operational Conditions during Test

5.1 Test Positions

5.1.1 Body Worn Configuration

According to the operating mode of the antenna, the report takes full account of the SAR conformance of the device, and evaluates the distance of all the surfaces that may be exposed to the human body at the distance of the 0 mm, more details information see section 10.1.

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 GSM Test Configuration

According to specification 3GPP TS 51.010, the maximum power of the GSM can do the power reduction for the multi-slot. The allowed power reduction in the multi-slot configuration is as following:

Output power of reductions:

Table 2: The allowed power reduction in the multi-slot configuration

Number of timeslots in uplink assignment	Permissible nominal reduction of maximum output power,(dB)
1	0
2	0 to 3,0
3	1,8 to 4,8
4	3,0 to 6,0

SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power specified for production units, including tune-up tolerance. The data mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested. GPRS data use GMSK, which is a constant amplitude modulation with minimal peak to average power difference within the time-slot burst. For EDGE, GMSK is used for MCS 1 – MCS 4 and 8-PSK is used for MCS 5 – MCS 9; where 8-PSK has an inherently higher peak-to-average power ratio. The GMSK and 8-PSK EDGE configurations are considered separately for SAR compliance. The GMSK EDGE configurations are grouped with GPRS and considered with respect to time-averaged maximum output power to determine compliance. The 3G SAR test reduction procedure is applied to 8-PSK EDGE with GMSK GPRS/EDGE as the primary mode.

5.3.2 eMTC Test Configuration

eMTC as LTE technology to the Internet of Things development of a technology, the detailed technology based on 3GPP36.101 and 3GPP36.521-1.

The Maximum Power Reduction (MPR) for the maximum output power allowed is in accordance with the category M1 power class 3.

For power measurements were performed on the configuration with the follow table from 3GPP36.521-1

Test Parameters for Channel Bandwidths				
	Downlink Configuration	Uplink Configuration		
Ch BW	N/A for Max UE output power testing	Mod'n	RB allocation	
			FDD and HD-FDD	TDD
5MHz		QPSK	1	1
5MHz		QPSK	3(Note 5)	3(Note 5)
10MHz		QPSK	1	1
10MHz		QPSK	4(Note 4), 5 (Note 5)	4(Note 4), 5(Note 5)
15MHz		QPSK	1	1
15MHz		QPSK	6	6
20MHz		QPSK	1	1
20MHz		QPSK	6	6

1) Initial test configuration.

Start with the largest channel bandwidth and measure SAR for QPSK, using the RB offset and Index required test channel combination with the highest maximum output power. For the remaining required test channels with RB offset and index configuration is determine the highest output power for that channel.

2) Higher order modulations

For 16QAM modulation, apply the QPSK procedures in 1) to determine the 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 report SAR for the QPSK configuration is > 75% limit.

3) 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 1) and 2) to determine the channels and RB configurations that need SAR testing, then 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.

5.3.3 NB-IOT Test Configuration

NB-IOT as LTE technology to the Internet of Things development of a technology, the detailed technology based on 3GPP36.101 and 3GPP36.521-1.

For UE category NB1 power class 3, the allowed Maximum Power Reduction (MPR) for the maximum output power as follows:

Modulation	QPSK		
Tone positions for 3 Tones allocation	0-2	3-5 and 6-8	9-11
MPR	≤0.5 dB	0 dB	≤0.5 dB
Tone positions for 6 Tones allocation	0-5 and 6-11		
MPR	≤ 1 dB	≤ 1 dB	
Tone positions for 12 Tones allocation	0-11		
MPR	≤ 2 dB		

For power measurements were performed on the configuration with the follow table from 3GPP36.521-1

Test Parameters				
Configuration ID	Downlink Configuration	Uplink Configuration		
		Modulation	N_{tones}	Sub-carrier spacing (kHz)
1 (Note 2)	N/A	BPSK	1@0	3.75
2 (Note 3)		BPSK	1@47	3.75
3 (Note 2)		QPSK	1@0	15
4 (Note 3)		QPSK	1@11	15
5 (Note 1)		QPSK	3@3	15
Note 1: Applicable to UE supporting UL multi-tone transmissions.				
Note 2: only applicable for low range.				
Note 3: only applicable for high range.				

1) Initial test configuration.

Start SAR for QPSK, using the Sub-carrier spacing and Ntones required test channel combination with the highest maximum output power. For the remaining required test channels with Sub-carrier spacing and Ntones configuration is determine the highest output power for that channel.

2) Other modulation

For BPSK modulation, apply the QPSK procedures in 1) to determine the 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 BPSK modulation is > ½ dB higher than the same configuration in QPSK or when the report SAR for the QPSK configuration is > 75% limit.

5.3.4 Low Duty Cycle devices description

This device is the Low Duty Cycle device, it support dual-mode wireless access 2G+NB-IoT and 2G+eMTC, and can realize the Wi-Fi, GPS positioning, outdoor use GPS positioning, indoor use wi-fi location function. This device support BLE function, when the standby for more than 60 days, to work for up to 21 days.

Table: Overview of upload mechanism duty cycle

	The retransmission times	Upload time（s）	Waiting time（s）	Total upload time（s）	Total retransmission time（s）	Dyty Cycle（60s）
Reporting and retransmission mechanism	0	0.47	0	0.47	2	0.78%（0.47/60）
	1	0.47	5	0.94	9	1.63%(0.98/60)
	2	0.47	8	1.41	19	2.35%(1.41/60)

	3	0.47	12	1.88	33	3.1%(1.88/60)
	4	**0.47**	**17**	**2.35**	**52**	**3.92%(2.35/60)**
	5	0.47	23	2.82	77	3.66%（2.82/77）
	6	0.47	23	3.29	102	3.23%（3.29/102）
	reconnection					

Table: Overview of total duty cycle (one cycle)

		Cellular networks	WiFi scanning
limiting conditions	Positioning cycle	60s	60s
	Positioning data size	72000b	/
	Positioning minimum rate	17Kbps	/
	positioning time	4.24s	2
	Positioning the maximum times/time of retransmission	0 time	0 time
	Reporting cycle	60s	NA
	Size of reported data	8000b	NA
	Minimum reporting rate	17Kbps	NA
	Reporting time	0.47s	NA
	Report the maximum times/time of retransmission	4 times	NA
	Duty Cycle	10.98%	3.3%（2/60）

Note: It can be seen from the data of the re-transmission mechanism that, when the total re-transmission time is less than 60s, the upload Duty Cycle= the total upload time / 60s, and when the total re-transmission time is greater than 60s, the upload Duty Cycle= the total upload time/total re-transmission time, and it can be seen from the data that the four re-transmission time Duty Cycle is the largest.

Total Duty Cycle (highest) = (positioning time + total reporting time)/Cycle time = {4.24s (positioning time) + 0.47s (reporting time) * {1+4 (maximum reporting and retransmission times)}}/60s(Cycle time)= 10.98%

SAR test plan

1) **For Cellular mode**, all bands need to test SAR. During the test process, the analog base station (CMW500) control equipment is used to make it in the mode of maximum power, duty cycle of 100%, continuous transmission of data.
2) **For Wi-Fi/BLE mode,** a communication link is set up with the test mode software for Wi-Fi/BLE mode test. During the test, the EUT can provide continuous transmitting RF signal with maximum output power mode.
3) **Report SAR calculation**

The SAR value will take into account the actual duty cycle of the device.

Power scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.

Duty cycle scaling Factor = Total Duty Cycle (highest) / 100%, where Total Duty Cycle (highest) is the maximum rated duty cycle among all production units.

Report SAR 1g = Measured SAR 1g * Tune-up scaling Factor * Duty cycle scaling Factor

5.3.5 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.

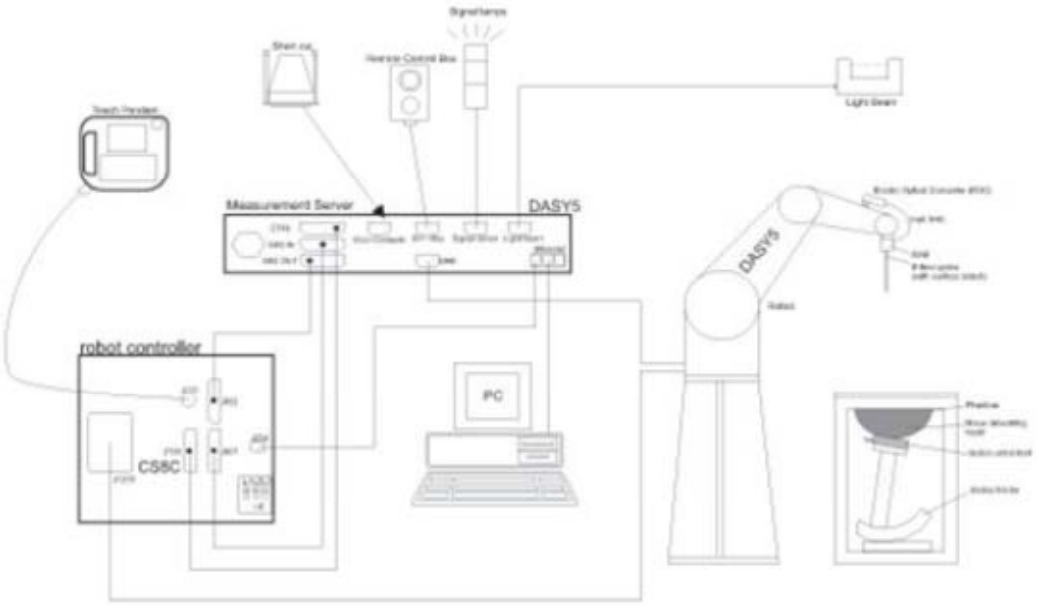
To determine the initial test position, Area Scans were performed to determine the position with the Maximum Value of SAR (measured). The position that produced the highest Maximum Value of SAR is considered the worst case position; thus used as the initial test position.

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∆T/∆t

Where: ∆t = Exposure time (30 seconds),

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

∆T = Temperature increase due to RF exposure.

Or

SAR=|E|^{2}σ/ρ

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.

	≤3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: ΔxArea, ΔyArea	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	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.	

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	2018-05-20	2019-05-19
Dielectric Probe Kit	HP	85070E	US44020115	2018-05-20	2019-05-19
Power meter	Agilent	E4417A	GB41291714	2018-05-21	2019-05-20
Power sensor	Agilent	N8481H	MY50350004	2018-05-21	2019-05-20
Power sensor	Agilent	E9327A	US40441622	2018-05-20	2019-05-19
Dual directional coupler	Agilent	778D-012	50519	2018-05-21	2019-05-20
Dual directional coupler	Agilent	777D	50146	2018-05-20	2019-05-19
Amplifier	INDEXSAR	IXA-020	0401	2018-05-20	2019-05-19
Wideband radio communication tester	R&S	CMW 500	113645	2018-05-20	2019-05-19
E-field Probe	SPEAG	EX3DV4	3677	2018-05-29	2019-05-28
DAE	SPEAG	DAE4	1317	2018-03-23	2019-03-22
Validation Kit 835MHz	SPEAG	D835V2	4d020	2017-08-28	2020-08-27
Validation Kit 1750MHz	SPEAG	D1750V2	1033	2017-01-10	2020-01-09
Validation Kit 1900MHz	SPEAG	D1900V2	5d060	2017-08-26	2020-08-25
Validation Kit 2450MHz	SPEAG	D2450V2	786	2017-08-29	2020-08-28
Temperature Probe	Tianjin jinming	JM222	AA1009129	2018-05-17	2019-05-16
Hygrothermograph	Anymetr	NT-311	20150731	2018-05-17	2019-05-16
Software for Test	Speag	DASY5	52.8.8.1222	/	/
Softwarefor Tissue	Agilent	85070	E06.01.36	/	/

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 3 – 4 days 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)
Body	835	52.5	1.4	45	0	0.1	1.0	55.2	0.97
	1750	69.91	0.12	0	29.97	0	0	53.4	1.49
	1900	69.91	0.13	0	29.96	0	0	53.3	1.52
	2450	73.2	0.1	0	26.7	0	0	52.7	1.95

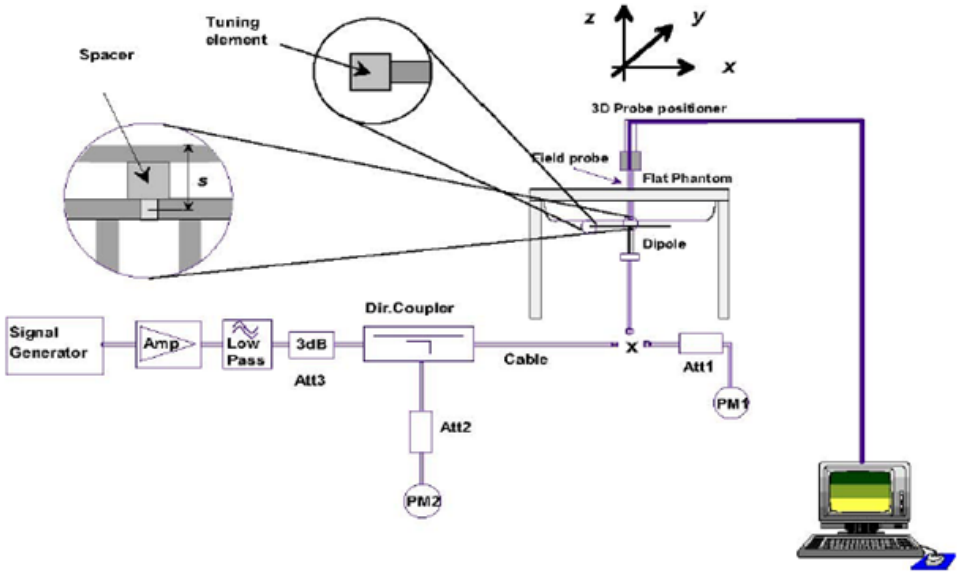
Measurements results

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(%)
835	Body	1/3/2019	21.5	53.8	0.97	55.2	0.97	-2.54	0.00
1750	Body	1/9/2019	21.5	51.4	1.44	53.4	1.49	-3.75	-3.36
1900	Body	1/5/2019	21.5	52.8	1.51	53.3	1.52	-0.94	-0.66
2450	Body	1/9/2019	21.5	51.1	1.97	52.7	1.95	-3.04	1.03
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 D835V2 SN: 4d020	Body Liquid	8/28/2017	-24.8	/	46.8	/
		8/27/2018	-27.4	-10.48	48.1	1.3
Dipole D1750V2 SN: 1033	Body Liquid	1/10/2017	-35.0	/	44.7	/
		1/9/2018	-34.7	0.86	44.9	-0.2
Dipole D1900V2 SN: 5d060	Body Liquid	8/26/2017	-21.4	/	52.7	/
		8/25/2018	-24.6	-14.95	55.6	2.9
Dipole D2450V2 SN: 786	Body Liquid	8/29/2017	-23.6	/	51.0	/
		8/28/2018	-23.7	-0.42	55.2	4.2

System Check results

Frequency (MHz)		Test Date	Temp ℃	250mW Measured SAR_{1g} (W/kg)	1W Normalized SAR_{1g} (W/kg)	1W Target SAR_{1g} (W/kg)	Δ % (Limit ±10%)	Plot No.
835	Body	1/3/2019	21.5	2.46	9.84	9.75	0.92	1
1750	Body	1/9/2019	21.5	9.40	37.60	37.60	0.00	2
1900	Body	1/5/2019	21.5	9.82	39.28	39.50	-0.56	3
2450	Body	1/9/2019	21.5	12.50	50.00	50.80	-1.57	4

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 GSM Mode

GSM 850		Burst-Averaged output power(dBm)				Division Factors	Frame-Averaged output power(dBm)			
		Tune-up	Channel/Frenqucy(MHz)				Tune-up	Channel/Frenqucy(MHz)		
		MAX	128 /824.2	190 /836.6	251 /848.8		MAX	128 /824.2	190 /836.6	251 /848.8
GPRS/ EGPRS (GMSK)	1 Tx Slot	33.00	31.89	32.23	31.98	9.03	23.97	22.86	23.20	22.95
	2 Tx Slots	31.00	28.79	28.96	28.84	6.02	24.98	22.77	22.94	22.82
	3 Tx Slots	30.00	27.07	27.18	27.06	4.26	**25.74**	**22.81**	**22.92**	**22.80**
	4 Tx Slots	28.00	25.08	24.98	25.04	3.01	24.99	22.07	21.97	22.03
EGPRS (8PSK)	1 Tx Slot	28.00	26.69	26.63	26.72	9.03	18.97	17.66	17.60	17.69
	2 Tx Slots	25.50	23.73	23.87	23.84	6.02	19.48	17.71	17.85	17.82
	3 Tx Slots	23.50	21.54	21.47	21.52	4.26	19.24	17.28	17.21	17.26
	4 Tx Slots	22.00	19.87	19.89	19.76	3.01	18.99	16.86	16.88	16.75
GSM 1900		Burst-Averaged output power(dBm)				Division Factors	Frame-Averaged output power(dBm)			
		Tune-up	Channel/Frenqucy(MHz)				Tune-up	Channel/Frenqucy(MHz)		
		MAX	512 /1850.2	661 /1880	810 /1909.8		MAX	512 /1850.2	661 /1880	810 /1909.8
GPRS/ EGPRS (GMSK)	1 Tx Slot	31.00	30.10	30.54	30.92	9.03	21.97	21.07	21.51	21.89
	2 Tx Slots	28.50	27.90	27.87	27.97	6.02	22.48	21.88	21.85	21.95
	3 Tx Slots	27.00	25.35	25.85	25.98	4.26	**22.74**	**21.09**	**21.59**	**21.72**
	4 Tx Slots	24.50	23.27	23.76	23.70	3.01	21.49	20.26	20.75	20.69
EGPRS (8PSK)	1 Tx Slot	27.00	25.89	26.35	26.75	9.03	17.97	16.86	17.32	17.72
	2 Tx Slots	24.50	22.87	23.13	23.74	6.02	18.48	16.85	17.11	17.72
	3 Tx Slots	23.00	20.72	20.91	21.34	4.26	18.74	16.46	16.65	17.08
	4 Tx Slots	21.00	18.81	18.92	19.20	3.01	17.99	15.80	15.91	16.19
Notes: The worst-case configuration and mode for SAR testing is determined to be as follows: 1. Standalone: GSM 850 GMSK (GPRS) mode with 3 time slots for Max power, GSM 1900 GMSK (GPRS) mode with 3 time slots for Max power, based on the output power measurements above..										

9.2 eMTC Mode

For UE category M1 power class 3, the allowed Maximum Power Reduction (MPR) for the maximum output power.

eMTC Band 2	Channel /Freq.(MHz)	RB# RBstart	Maximum Output Power (dBm)					
			Tune up (MAX)	QPSK	MPR	Tune up (MAX)	16QAM	MPR
1.4MHz	18607/1850.7	1#0	24.50	23.73	0	23.50	23.28	1
		6#0	22.50	21.95	2	22.50	21.92	2
	18900/1880	1#0	24.50	23.99	0	23.50	23.36	1
		6#0	22.50	22.20	2	22.50	22.21	2
	19193/1909.3	1#0	24.50	24.05	0	23.50	23.19	1
		6#0	22.50	22.28	2	22.50	22.37	2
3MHz	18615/1851.5	1#0	24.50	24.02	0	23.50	22.35	1
		6#0	22.50	21.88	2	22.50	22.09	2
	18900/1880	1#0	24.50	24.40	0	23.50	22.85	1
		6#0	22.50	22.30	2	22.50	22.38	2
	19185/1908.5	1#0	24.50	24.39	0	23.50	23.13	1
		6#0	22.50	22.41	2	22.50	22.49	2
5MHz	18625/1852.5	1#0	24.50	24.14	0	24.50	23.80	0
		6#0	23.50	23.00	1	22.50	22.25	2
	18900/1880	1#0	24.50	24.32	0	24.50	24.15	0
		6#0	23.50	23.23	1	22.50	22.48	2
	19175/1907.5	1#0	24.50	24.37	0	24.50	24.22	0
		6#0	23.50	23.36	1	22.50	22.44	2
10MHz	18650/1855	1#0	24.50	24.07	0	24.50	23.79	0
		6#0	24.50	24.34	0	23.50	23.42	1
	18900/1880	1#0	24.50	24.32	0	24.50	24.11	0
		6#0	24.50	24.42	0	23.50	23.43	1
	19150/1905	1#0	24.50	24.43	0	24.50	24.19	0
		6#0	24.50	24.36	0	23.50	23.45	1
15MHz	18675/1857.5	1#0	24.50	24.09	0	24.50	23.91	0
		6#0	24.50	23.99	0	24.50	24.30	0
	18900/1880	1#0	24.50	24.39	0	24.50	24.18	0
		6#0	24.50	24.37	0	24.50	24.34	0
	19125/1902.5	1#0	24.50	24.45	0	24.50	24.19	0
		6#0	24.50	24.33	0	24.50	24.43	0
20MHz	18700/1860	1#0	24.50	24.41	0	24.50	24.01	0
		6#0	24.50	24.13	0	24.50	24.36	0
	18900/1880	1#0	24.50	23.95	0	24.50	24.25	0
		6#0	24.50	24.44	0	24.50	24.18	0
	19100/1900	1#0	24.50	24.47	0	24.50	24.17	0

		6#0	24.50	24.30	0	24.50	24.43	0

eMTC Band 4	Channel /Freq.(MHz)	RB# RBstart	Maximum Output Power (dBm)					
			Tune up (MAX)	QPSK	MPR	Tune up (MAX)	16QAM	MPR
1.4MHz	19957 1710.7	1#0	24.50	23.56	0	23.50	22.02	1
		6#0	22.50	21.49	2	22.50	21.62	2
	20175/1732.5	1#0	24.50	23.55	0	23.50	21.90	1
		6#0	22.50	21.48	2	22.50	21.92	2
	20393/1754.3	1#0	24.50	23.57	0	23.50	22.32	1
		6#0	22.50	21.34	2	22.50	21.59	2
3MHz	19965/1711.5	1#0	24.50	23.12	0	23.50	22.77	1
		6#0	22.50	21.48	2	22.50	21.44	2
	20175/1732.5	1#0	24.50	23.61	0	23.50	21.95	1
		6#0	22.50	21.53	2	22.50	21.97	2
	20385/1753.5	1#0	24.50	23.50	0	23.50	21.95	1
		6#0	22.50	21.33	2	22.50	21.79	2
5MHz	19975/1712.5	1#0	24.50	23.60	0	24.50	23.32	0
		6#0	23.50	22.55	1	22.50	21.83	2
	20175/1732.5	1#0	24.50	23.58	0	24.50	23.42	0
		6#0	23.50	22.53	1	22.50	21.85	2
	20375/1752.5	1#0	24.50	23.48	0	24.50	23.17	0
		6#0	23.50	22.40	1	22.50	21.75	2
10MHz	20000/1715	1#0	24.50	23.08	0	24.50	23.80	0
		6#0	24.50	23.49	0	23.50	22.31	1
	20175/1732.5	1#0	24.50	23.53	0	24.50	23.03	0
		6#0	24.50	23.78	0	23.50	22.97	1
	20350/1750	1#0	24.50	23.44	0	24.50	23.05	0
		6#0	24.50	23.28	0	23.50	22.91	1
15MHz	20025/1717.5	1#0	24.50	23.14	0	24.50	23.86	0
		6#0	24.50	23.41	0	24.50	23.60	0
	20175/1732.5	1#0	24.50	23.67	0	24.50	23.31	0
		6#0	24.50	23.49	0	24.50	23.76	0
	20325/1747.5	1#0	24.50	23.44	0	24.50	23.25	0
		6#0	24.50	23.43	0	24.50	23.50	0
20MHz	20050/1720	1#0	24.50	23.55	0	24.50	23.10	0
		6#0	24.50	23.51	0	24.50	23.63	0
	20175/1732.5	1#0	24.50	23.80	0	24.50	23.66	0
		6#0	24.50	23.71	0	24.50	24.08	0
	20300/1745	1#0	24.50	23.53	0	24.50	23.29	0
		6#0	24.50	23.44	0	24.50	23.47	0

eMTC Band5	Channel /Freq.(MHz)	RB# RBstart	Maximum Output Power (dBm)					
			Tune up (MAX)	QPSK	MPR	Tune up (MAX)	16QAM	MPR
1.4MHz	20407/824.7	1#0	24.50	23.51	0	23.50	23.04	1
		6#0	22.50	21.75	2	22.50	21.70	2
	20525/836.5	1#0	24.50	23.59	0	23.50	22.23	1
		6#0	22.50	21.74	2	22.50	21.93	2
	20643/848.3	1#0	24.50	24.04	0	23.50	22.30	1
		6#0	22.50	21.87	2	22.50	22.01	2
3MHz	20415/825.5	1#0	24.50	24.07	0	23.50	22.35	1
		6#0	22.50	21.85	2	22.50	22.35	2
	20525/836.5	1#0	24.50	23.98	0	23.50	22.34	1
		6#0	22.50	21.76	2	22.50	22.28	2
	20635/847.5	1#0	24.50	23.88	0	23.50	22.32	1
		6#0	22.50	21.86	2	22.50	22.28	2
5MHz	20425/826.5	1#0	24.50	23.91	0	24.50	24.23	0
		6#0	23.50	22.90	1	22.50	22.15	2
	20525/836.5	1#0	24.50	23.65	0	24.50	23.52	0
		6#0	23.50	22.85	1	22.50	22.13	2
	20625/846.5	1#0	24.50	24.01	0	24.50	23.68	0
		6#0	23.50	22.83	1	22.50	21.92	2
10MHz	20450/829	1#0	24.50	23.68	0	24.50	23.36	0
		6#0	24.50	23.58	0	23.50	22.43	1
	20525/836.5	1#0	24.50	23.27	0	24.50	23.14	0
		6#0	24.50	23.63	0	23.50	22.91	1
	20600/844	1#0	24.50	23.57	0	24.50	23.36	0
		6#0	24.50	23.39	0	23.50	22.94	1

9.3 NB-IOT Mode

For power measurements were performed on the configuration with the follow table from 3GPP36.521-1

Modulation	QPSK		
Tone positions for 3 Tones allocation	0-2	3-5 and 6-8	9-11
MPR	≤0.5 dB	0 dB	≤0.5 dB
Tone positions for 6 Tones allocation	0-5 and 6-11		
MPR	≤ 1 dB	≤ 1 dB	
Tone positions for 12 Tones allocation	0-11		
MPR	≤ 2 dB		

Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Maximum Output Power (dBm)				
				18601/1850.1	18900/1880	19199/1909.9	Tune up (MAX)	MPR
NB-IOT Band 2 Standalone	BPSK	3.75	1@0	23.06	23.27	23.15	24.00	0
			1@47	22.98	23.16	23.08	24.00	0
		15	1@0	22.92	23.45	23.26	24.00	0
			1@11	22.83	23.39	23.21	24.00	0
	QPSK	3.75	1@0	23.06	23.27	23.22	24.00	0
			1@47	22.97	23.21	23.28	24.00	0
		15	1@0	23.01	23.32	23.29	24.00	0
			1@11	22.98	23.36	23.18	24.00	0
		15	3@0	22.97	23.14	22.94	23.50	0.5
			6@0	22.67	22.59	22.71	23.00	1.0
		15	12@0	21.53	21.45	21.35	22.00	2.0

Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Maximum Output Power (dBm)				
				19951/1710.1	20175/1732.5	20399/1754.9	Tune up (MAX)	MPR
NB-IOT Band 4 Standalone	BPSK	3.75	1@0	23.33	23.01	22.73	24.00	0
			1@47	23.26	22.99	22.64	24.00	0
		15	1@0	23.36	23.12	22.83	24.00	0
			1@11	23.31	23.05	22.77	24.00	0
	QPSK	3.75	1@0	23.03	23.07	22.78	24.00	0
			1@47	22.95	23.02	22.75	24.00	0
		15	1@0	23.44	23.18	22.90	24.00	0
			1@11	23.37	23.13	22.94	24.00	0
		15	3@0	22.86	22.79	22.67	23.50	0.5
			6@0	22.31	22.19	22.17	23.00	1.0
		15	12@0	21.64	21.42	21.09	22.00	2.0

Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Maximum Output Power (dBm)				
				20401/824.1	20525/836.5	20649/848.9	Tune up (MAX)	MPR
NB-IOT Band 5 Standalone	BPSK	3.75	1@0	22.73	22.62	22.68	24.00	0
			1@47	22.69	22.58	22.61	24.00	0
		15	1@0	22.87	22.66	22.75	24.00	0
			1@11	22.78	22.69	22.79	24.00	0
	QPSK	3.75	1@0	22.83	22.66	22.78	24.00	0
			1@47	22.72	22.53	22.75	24.00	0
		15	1@0	23.02	22.81	22.90	24.00	0
			1@11	22.94	22.75	22.86	24.00	0
		15	3@0	22.41	22.37	22.46	23.50	0.5
			6@0	22.13	21.98	21.87	23.00	1.0
		15	12@0	21.35	21.06	21.05	22.00	2.0

9.4 WLAN Mode

Wi-Fi 2.4G Mode	Channel /Frequency(MHz)	Maximum Output Power (dBm)		
		Tune-up	Meas.	TP Set Level
802.11b (1M)	1/2412	15.00	14.87	43
	6/2437	15.00	14.88	49
	11/2462	15.00	14.82	40
802.11g (6M)	1/2412	13.00	12.72	50
	6/2437	13.00	12.62	52
	11/2462	13.00	12.70	46
802.11n-HT20 (MCS0)	1/2412	13.00	12.88	50
	6/2437	13.00	12.78	52
	11/2462	13.00	12.65	46

9.5 Bluetooth Mode

BLE	Ch 0/2402 MHz	Ch 19/2440 MHz	Ch 39/2480 MHz	Tune-up Limit (dBm)
GFSK	2.55	2.32	2.46	6.00

10 Measured and Reported (Scaled) SAR Results

10.1 EUT Antenna Locations

The Detailed Antenna Locations refer to *Antenna Locations.*

Overall (Length x Width): 49.42 mm x 37 mm						
Distance of the Antenna to the EUT surface/edge						
Antenna	Back Side	Front side	Left Edge	Right Edge	Top Edge	Bottom Edge
Main-Antenna	＜25mm	＜25mm	＜25mm	＜25mm	＜25mm	＜25mm
Wi-Fi Antenna	＜25mm	＜25mm	＜25mm	＜25mm	＜25mm	＜25mm
Hotspot mode, Positions for SAR tests						
Mode	Back Side	Front side	Left Edge	Right Edge	Top Edge	Bottom Edge
Main-Antenna	Yes	Yes	Yes	Yes	Yes	Yes
Wi-Fi Antenna	Yes	Yes	Yes	Yes	Yes	Yes

Note: 1. SAR is measured for all sides and surfaces with a transmitting antenna located within 25 mm from that surface or edge.
2. When multiple slots are used, SAR should be tested to account for the maximum source-based time-averaged output power.
3. 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:
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 200 MHz.
c) ≤ 0.4 W/kg or 1.0 Wkg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz.
4.When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.
3. Power scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
5. Duty cycle scaling Factor = Total Duty Cycle (highest) / 100%, where Total Duty Cycle (highest) is the maximum rated duty cycle among all production units.
6. Report SAR 1g = Measured SAR 1g * Tune-up scaling Factor * Duty cycle scaling Factor.

10.2 Standalone SAR test exclusion considerations

Per KDB 447498 D01, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] ·[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for product specific 10-g SAR

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

Per KDB 447498 D01, when the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Bluetooth	Distance (mm)	MAX Power (dBm)	Frequency (MHz)	Ratio	Evaluation
Body-SAR	5	6	2480	1.25	No

10.3 Measured SAR Results

Table 3: GSM 850

Test Position	Cover Type	Time slot	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	Duty Cycle Scaling Factor	Report SAR1g	
Body SAR (Distance 0mm)											
Back Side	standard	3Txslots	190/836.6	30.00	27.18	0.889	0.029	1.91	10.98%	0.187	/
Front Side	standard	3Txslots	190/836.6	30.00	27.18	1.920	-0.180	1.91	10.98%	0.404	/
Left Edge	standard	3Txslots	190/836.6	30.00	27.18	0.256	-0.160	1.91	10.98%	0.054	/
Right Edge	standard	3Txslots	190/836.6	30.00	27.18	1.840	-0.073	1.91	10.98%	0.387	/
Top Edge	standard	3Txslots	190/836.6	30.00	27.18	0.368	-0.090	1.91	10.98%	0.077	/
Bottom Edge	standard	3Txslots	190/836.6	30.00	27.18	0.781	0.010	1.91	10.98%	0.164	/
Front Side	Battery2	3Txslots	190/836.6	30.00	27.18	1.980	-0.090	1.91	10.98%	0.416	5
Front Side	Repeated	3Txslots	190/836.6	30.00	27.18	1.970	-0.080	1.91	10.98%	0.414	/

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

2. When multiple slots are used, SAR should be tested to account for the maximum source-based time-averaged output power.

3. Accessories that do not contain RF transmitters and have been proven to increase the peak SAR by less than 5 %, such as hands-free kits, do not need SAR tests separate from the SAR tests attached to a main EUT configuration.

Measurement Variability				
Test Position	**Channel/ Frequency(MHz)**	**MAX Measured SAR1g (W/kg)**	**1st Repeated SAR1g (W/kg)**	**Ratio**
Front Side	190/836.6	1.980	1.970	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 4: GSM 1900

Test Position	Cover Type	Time slot	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	Duty Cycle Scaling Factor	Report SAR1g	
Body SAR (Distance 0mm)											
Back Side	standard	3Txslots	661/1880	27.00	25.85	3.840	0.140	1.30	10.98%	0.549	/
Front Side	standard	3Txslots	661/1880	27.00	25.85	5.430	0.090	1.30	10.98%	0.777	/
Left Edge	standard	3Txslots	661/1880	27.00	25.85	0.471	-0.101	1.30	10.98%	0.067	/
Right Edge	standard	3Txslots	661/1880	27.00	25.85	1.620	0.022	1.30	10.98%	0.232	/
Top Edge	standard	3Txslots	661/1880	27.00	25.85	3.050	-0.020	1.30	10.98%	0.436	/
Bottom Edge	standard	3Txslots	661/1880	27.00	25.85	2.690	0.100	1.30	10.98%	0.385	/
Front Side	Battery2	3Txslots	661/1880	27.00	25.85	5.570	0.051	1.30	10.98%	0.797	6
Front Side	Repeated	3Txslots	661/1880	27.00	25.85	5.560	0.080	1.30	10.98%	0.794	/

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

2. When multiple slots are used, SAR should be tested to account for the maximum source-based time-averaged output power.

3. Accessories that do not contain RF transmitters and have been proven to increase the peak SAR by less than 5 %, such as hands-free kits, do not need SAR tests separate from the SAR tests attached to a main EUT configuration.

Measurement Variability				
Test Position	**Channel/ Frequency(MHz)**	**MAX Measured SAR1g (W/kg)**	**1st Repeated SAR1g (W/kg)**	**Ratio**
Front Side	661/1880	5.570	5.560	1.00

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 5: eMTC Band 2

Test Position	Cover Type	RB# RBstart	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	Duty Cycle Scaling Factor	Report SAR1g	
Body SAR (QPSK, Distance 0mm)											
Back Side	Standard	1#0	19100/1900	24.50	24.47	2.050	0.080	1.01	10.98%	0.227	/
Front Side	Standard	1#0	19100/1900	24.50	24.47	3.210	0.140	1.01	10.98%	0.355	7
Left Edge	Standard	1#0	19100/1900	24.50	24.47	0.144	0.090	1.01	10.98%	0.016	/
Right Edge	Standard	1#0	19100/1900	24.50	24.47	0.941	-0.029	1.01	10.98%	0.104	/
Top Edge	Standard	1#0	19100/1900	24.50	24.47	1.380	0.120	1.01	10.98%	0.153	/
Bottom Edge	Standard	1#0	19100/1900	24.50	24.47	1.470	0.060	1.01	10.98%	0.163	/
Front Side	Battery2	1#0	19100/1900	24.50	24.47	2.640	0.060	1.01	10.98%	0.292	/
Front Side	Repeated	1#0	19100/1900	24.50	24.47	3.180	0.170	1.01	10.98%	0.353	/

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

2. Initial test configuration is the highest channel bandwidth with QPSK modulation for eMTC mode.

3. Others modulations and channel bandwidth SAR test is required only when the highest maximum output power for the configuration in the other modulation or channel bandwidth is > ½ dB higher than the same configuration in the highest channel bandwidth with QPSK or when the report SAR for the QPSK configuration is > 75% limit.

Measurement Variability				
Test Position	Channel/ Frequency(MHz)	MAX Measured SAR_{1g} (W/kg)	1st Repeated SAR_{1g} (W/kg)	Ratio
Front Side	19100/1900	3.210	3.180	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 6: eMTC Band 4

Test Position	Cover Type	RB# RBstart	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	Duty Cycle Scaling Factor	Report SAR1g	
Body SAR (QPSK, Distance 0mm)											
Back Side	Standard	1#0	20175/1732.5	24.50	23.80	0.814	0.028	1.17	10.98%	0.105	/
Front Side	Standard	1#0	20175/1732.5	24.50	23.80	1.160	0.039	1.17	10.98%	0.150	/
Left Edge	Standard	1#0	20175/1732.5	24.50	23.80	0.413	0.040	1.17	10.98%	0.053	/
Right Edge	Standard	1#0	20175/1732.5	24.50	23.80	0.698	0.050	1.17	10.98%	0.090	/
Top Edge	Standard	1#0	20175/1732.5	24.50	23.80	0.918	0.070	1.17	10.98%	0.118	/
Bottom Edge	Standard	1#0	20175/1732.5	24.50	23.80	0.471	0.097	1.17	10.98%	0.061	/
Front Side	Battery2	1#0	20175/1732.5	24.50	23.80	1.230	0.045	1.17	10.98%	0.159	8
Front Side	Repeated	1#0	20175/1732.5	24.50	23.80	1.190	0.060	1.17	10.98%	0.154	/

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

2. Initial test configuration is the highest channel bandwidth with QPSK modulation for eMTC mode.

3. Others modulations and channel bandwidth SAR test is required only when the highest maximum output power for the configuration in the other modulation or channel bandwidth is > ½ dB higher than the same configuration in the highest channel bandwidth with QPSK or when the report SAR for the QPSK configuration is > 75% limit.

Measurement Variability				
Test Position	Channel/ Frequency(MHz)	MAX Measured SAR_{1g} (W/kg)	1st Repeated SAR_{1g} (W/kg)	Ratio
Front Side	20175/1732.5	1.230	1.190	1.03

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 7: eMTC Band 5

Test Position	Cover Type	RB# RBstart	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	Duty Cycle Scaling Factor	Report SAR1g	
Body SAR (QPSK, Distance 0mm)											
Back Side	Standard	1#0	20450/829	24.50	23.68	0.394	0.024	1.21	10.98%	0.052	/
Front Side	Standard	1#0	20450/829	24.50	23.68	0.557	0.021	1.21	10.98%	0.074	9
Left Edge	Standard	1#0	20450/829	24.50	23.68	0.209	0.120	1.21	10.98%	0.028	/
Right Edge	Standard	1#0	20450/829	24.50	23.68	0.347	0.170	1.21	10.98%	0.046	/
Top Edge	Standard	1#0	20450/829	24.50	23.68	0.297	0.090	1.21	10.98%	0.039	/
Bottom Edge	Standard	1#0	20450/829	24.50	23.68	0.339	0.180	1.21	10.98%	0.045	/

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

2. Initial test configuration is the highest channel bandwidth with QPSK modulation for eMTC mode.

3. Others modulations and channel bandwidth SAR test is required only when the highest maximum output power for the configuration in the other modulation or channel bandwidth is > ½ dB higher than the same configuration in the highest channel bandwidth with QPSK or when the report SAR for the QPSK configuration is > 75% limit.

Table 8: NB-IOT Band 2

Test Position	Cover Type	Spacing (KHz)	Ntones	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	Duty Cycle Scaling Factor	Report SAR1g	
Body SAR (QPSK, Distance 0mm)												
Back Side	Standard	15	1@11	18900/1880	24.00	23.36	1.520	0.090	1.16	10.98%	0.193	/
Front Side	Standard	15	1@11	18900/1880	24.00	23.36	2.700	0.030	1.16	10.98%	0.344	10
Left Edge	Standard	15	1@11	18900/1880	24.00	23.36	0.149	-0.031	1.16	10.98%	0.019	/
Right Edge	Standard	15	1@11	18900/1880	24.00	23.36	0.834	-0.160	1.16	10.98%	0.106	/
Top Edge	Standard	15	1@11	18900/1880	24.00	23.36	1.090	0.060	1.16	10.98%	0.139	/
Bottom Edge	Standard	15	1@11	18900/1880	24.00	23.36	0.929	0.050	1.16	10.98%	0.118	/
Front Side	Battery2	15	1@11	18900/1880	24.00	23.36	2.190	0.190	1.16	10.98%	0.279	/
Front Side	Repeated	15	1@11	18900/1880	24.00	23.36	2.640	0.031	1.16	10.98%	0.336	/

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

2. Initial test configuration is QPSK modulation for NB-IOT mode.

3. Others modulations SAR test is required only when the highest maximum output power for the configuration in the other modulation is > ½ dB higher than the same configuration in QPSK or when the report SAR for the QPSK configuration is > 75% limit.

Measurement Variability				
Test Position	**Channel/ Frequency(MHz)**	**MAX Measured SAR_{1g} (W/kg)**	**1st Repeated SAR_{1g} (W/kg)**	**Ratio**
Front Side	18900/1880	2.700	2.640	1.02

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 9: NB-IOT Band 4

Test Position	Cover Type	Spacing (KHz)	Ntones	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	Duty Cycle Scaling Factor	Report SAR1g	
Body SAR (QPSK, Distance 0mm)												
Back Side	Standard	15	1@0	19951/1710.1	24.00	23.44	0.796	0.092	1.14	10.98%	0.099	/
Front Side	Standard	15	1@0	19951/1710.1	24.00	23.44	1.210	0.050	1.14	10.98%	0.151	11
Left Edge	Standard	15	1@0	19951/1710.1	24.00	23.44	0.617	0.070	1.14	10.98%	0.077	/
Right Edge	Standard	15	1@0	19951/1710.1	24.00	23.44	0.914	0.019	1.14	10.98%	0.114	/
Top Edge	Standard	15	1@0	19951/1710.1	24.00	23.44	0.957	0.020	1.14	10.98%	0.120	/
Bottom Edge	Standard	15	1@0	19951/1710.1	24.00	23.44	0.602	0.037	1.14	10.98%	0.075	/
Front Side	Repeated	15	1@0	19951/1710.1	24.00	23.44	1.190	0.040	1.14	10.98%	0.149	/

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

2. Initial test configuration is QPSK modulation for NB-IOT mode.

3. Others modulations SAR test is required only when the highest maximum output power for the configuration in the other modulation is > ½ dB higher than the same configuration in QPSK or when the report SAR for the QPSK configuration is > 75% limit.

Measurement Variability				
Test Position	**Channel/ Frequency(MHz)**	**MAX Measured SAR_{1g} (W/kg)**	**1st Repeated SAR_{1g} (W/kg)**	**Ratio**
Front Side	19951/1710.1	1.210	1.190	1.02

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 10: NB-IOT Band 5

Test Position	Cover Type	Spacing (KHz)	Ntones	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	Duty Cycle Scaling Factor	Report SAR1g	
Body SAR (QPSK, Distance 0mm)												
Back Side	Standard	15	1@0	20401/824.1	24.00	23.02	0.417	0.120	1.25	10.98%	0.057	/
Front Side	Standard	15	1@0	20401/824.1	24.00	23.02	0.567	0.150	1.25	10.98%	0.078	12
Left Edge	Standard	15	1@0	20401/824.1	24.00	23.02	0.104	0.180	1.25	10.98%	0.014	/
Right Edge	Standard	15	1@0	20401/824.1	24.00	23.02	0.173	0.090	1.25	10.98%	0.024	/
Top Edge	Standard	15	1@0	20401/824.1	24.00	23.02	0.247	0.140	1.25	10.98%	0.034	/
Bottom Edge	Standard	15	1@0	20401/824.1	24.00	23.02	0.239	0.020	1.25	10.98%	0.033	/

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

2. Initial test configuration is QPSK modulation for NB-IOT mode.

3. Others modulations SAR test is required only when the highest maximum output power for the configuration in the other modulation is > ½ dB higher than the same configuration in QPSK or when the report SAR for the QPSK configuration is > 75% limit.

Table 11: Wi-Fi (2.4G)

Test Position	Cover Type	Mode 802.11b	Channel/ Frequency (MHz)	Tune-up dBm)	Measured power (dBm)	Limit of SAR 1.6 W/kg (mW/g)						Plot No.
						Area Scan SAR 1g	Zoom Scan SAR 1g	Power Drift (dB)	Scaling Factor	Duty Cycle Scaling Factor	Report SAR 1g	
Body SAR (Distance 0mm)												
Back Side	standard	802.11b	6/2437	15.00	14.88	0.109	0.111	-0.120	1.03	10.98%	0.013	/
Front Side	standard	802.11b	6/2437	15.00	14.88	0.132	0.275	0.000	1.03	10.98%	0.031	13
Left Edge	standard	802.11b	6/2437	15.00	14.88	0.052	0.051	0.070	1.03	10.98%	0.006	/
Right Edge	standard	802.11b	6/2437	15.00	14.88	0.010	0.014	0.100	1.03	10.98%	0.002	/
Top Edge	standard	802.11b	6/2437	15.00	14.88	0.066	0.069	0.140	1.03	10.98%	0.008	/
Bottom Edge	standard	802.11b	6/2437	15.00	14.88	0.097	0.104	0.120	1.03	10.98%	0.012	/
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	Front Side	6/2437	0.031	15	13	0.63	0.020
802.11n HT20	Front Side	6/2437	0.031	15	13	0.63	0.020
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: BLE

Band	Configuration	Frequency (MHz)	Maximum Power (dBm)	Separation Distance (mm)	Estimated SAR (W/kg)
Bluetooth	Body-worn	2480	6	5	0.167
For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01 based on the formula below. (max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]·[√f(GHz)/x] W/kg for test separation distances ≤ 50 mm; where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR.					

10.4 Simultaneous Transmission Analysis

Simultaneous Transmission Configurations	Body-worn
GSM + BLE	Yes
GSM + Wi-Fi-2.4GHz	Yes
eMTC+ BLE	Yes
eMTC+ Wi-Fi 2.4G	Yes
NB-IOT+ BLE	Yes
NB-IOT+ Wi-Fi 2.4G	Yes
BLE+ Wi-Fi	No

General Note:

1. Wi-Fi 2.4G and BLE can't transmit simultaneously. The device does not support voice function. The device does not support hotspot function.

2.The Scaled SAR summation is calculated based on the same configuration and test position.

3. Per KDB 447498 D01, simultaneous transmission SAR is compliant if,

i) Scalar SAR summation < 1.6W, 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 Main-Antenna

SAR_{1g}(W/kg) / Test Position		GSM 850	GSM 1900	eMTC Band 2	eMTC Band 4	eMTC Band 5	NB-IOT Band 2	NB-IOT Band 4	NB-IOT Band 5	MAX. SAR_{1g}
Body SAR	Back Side	0.187	0.549	0.227	0.105	0.052	0.193	0.099	0.057	0.549
	Front Side	0.416	0.797	0.355	0.159	0.074	0.344	0.151	0.078	0.797
	Left Edge	0.054	0.067	0.016	0.053	0.028	0.019	0.077	0.014	0.077
	Right Edge	0.387	0.232	0.104	0.090	0.046	0.106	0.114	0.024	0.387
	Top Edge	0.077	0.436	0.153	0.118	0.039	0.139	0.120	0.034	0.436
	Bottom Edge	0.164	0.385	0.163	0.061	0.045	0.118	0.075	0.033	0.385

About BLE and Main- Antenna

SAR_{1g}(W/kg) / Test Position		Main-antenna	BLE	MAX. ΣSAR_{1g}
Body SAR	Back Side	0.549	0.167	0.716
	Front Side	0.797	0.167	0.964
	Left Edge	0.077	0.167	0.244
	Right Edge	0.387	0.167	0.554
	Top Edge	0.436	0.167	0.603
	Bottom Edge	0.385	0.167	0.552
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} =0.964W/kg<1.6W/kg. so the Simultaneous transimition SAR with volum scan are not required for BLE and Main-Antenna.

About Wi-Fi and Main-antenna

SAR_{1g}(W/kg) / Test Position		Main-antenna	Wi-Fi 2.4G	MAX. ΣSAR_{1g}
Body SAR	Back Side	0.549	0.013	0.562
	Front Side	0.797	0.031	0.828
	Left Edge	0.077	0.006	0.083
	Right Edge	0.387	0.002	0.389
	Top Edge	0.436	0.008	0.444
	Bottom Edge	0.385	0.012	0.397
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} =0.828W/kg<1.6W/kg. so the Simultaneous transimition SAR with volum scan are not required for Wi-Fi and Main-Antenna.

Conclusion:

According to the KDB 690783 D01 section 1) d) i), when the sum of 1-g SAR applies for simultaneous transmission SAR test exclusion, the highest sum of 1-g SAR according to the highest reported stand-alone SAR values is used, and the highest Reported SAR for simultaneous transmission exposure conditions is 0.828 W/kg

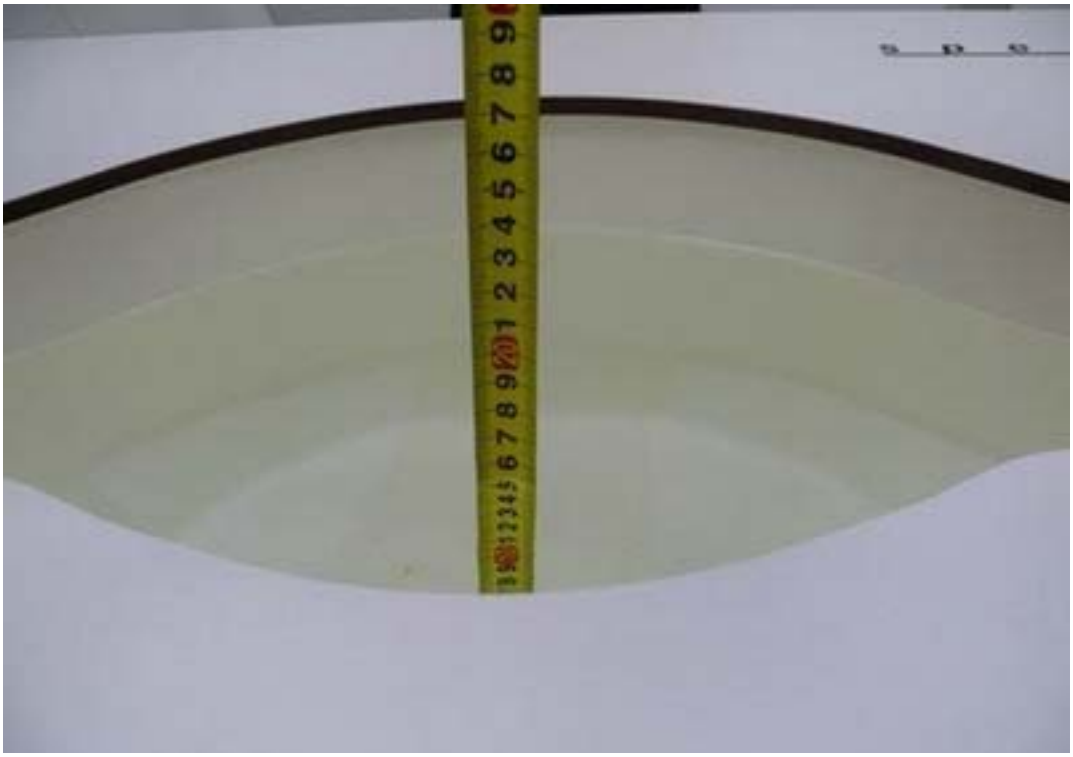
11 Measurement Uncertainty

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. This also applies to the 10-g SAR required for phablets in KDB Publication 648474.

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 835 MHz Body TSL

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2

Date: 1/3/2019

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1

Medium parameters used: f = 835 MHz; σ = 0.97 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.32, 9.32, 9.32); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=15mm, Pin=250mW/Area Scan (41x121x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 2.61 mW/g

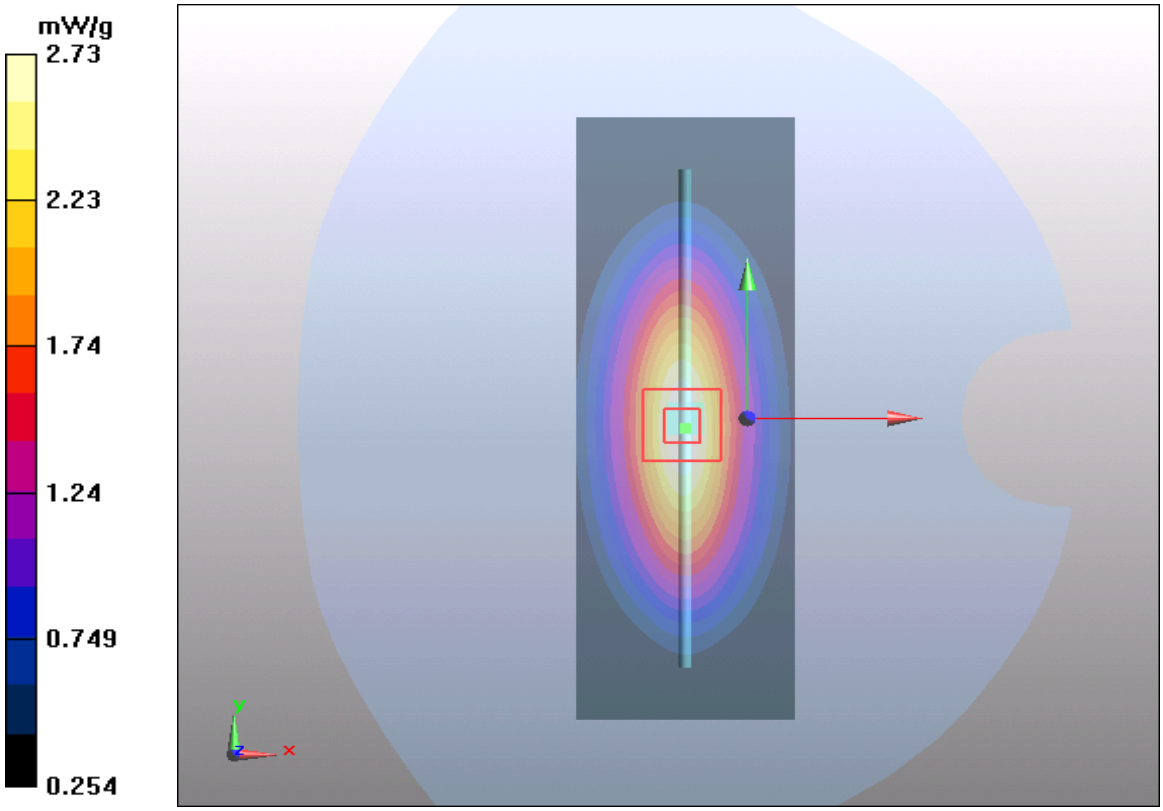
d=15mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 52.09 V/m; Power Drift = -0.11 dB

Peak SAR (extrapolated) = 3.48 W/kg

SAR(1 g) = 2.46 mW/g; SAR(10 g) = 1.67 mW/g

Maximum value of SAR (measured) = 2.73 mW/g



Plot 2 System Performance Check at 1750 MHz Body TSL

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2

Date: 1/9/2019

Communication System: CW; Frequency: 1750 MHz;Duty Cycle: 1:1

Medium parameters used: f = 1750 MHz; σ = 1.44 mho/m; ε_r = 51.4; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.7℃

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.91, 7.91, 7.91); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW/Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 10.65 mW/g

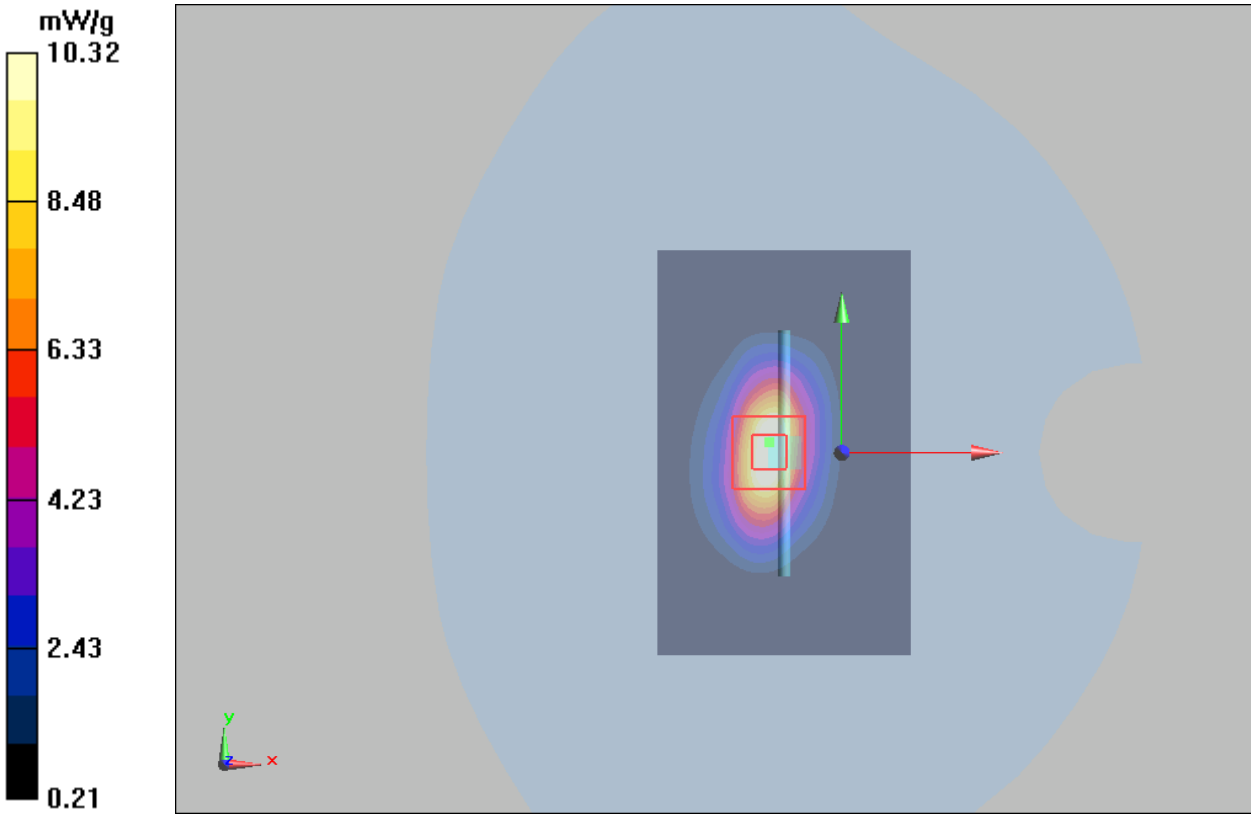
d=10mm, Pin=250mW/Area Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 77.6 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 16.83 W/kg

SAR(1 g) = 9.40 mW/g; SAR(10 g) = 5.22 mW/g

Maximum value of SAR (measured) = 10.32 mW/g



Plot 3 System Performance Check at 1900 MHz Body TSL

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2

Date: 1/5/2019

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1

Medium parameters used: f = 1900 MHz; σ = 1.51 mho/m; ε_r = 52.8; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.70, 7.70, 7.70); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW/Area Scan (41x71x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 11.9 mW/g

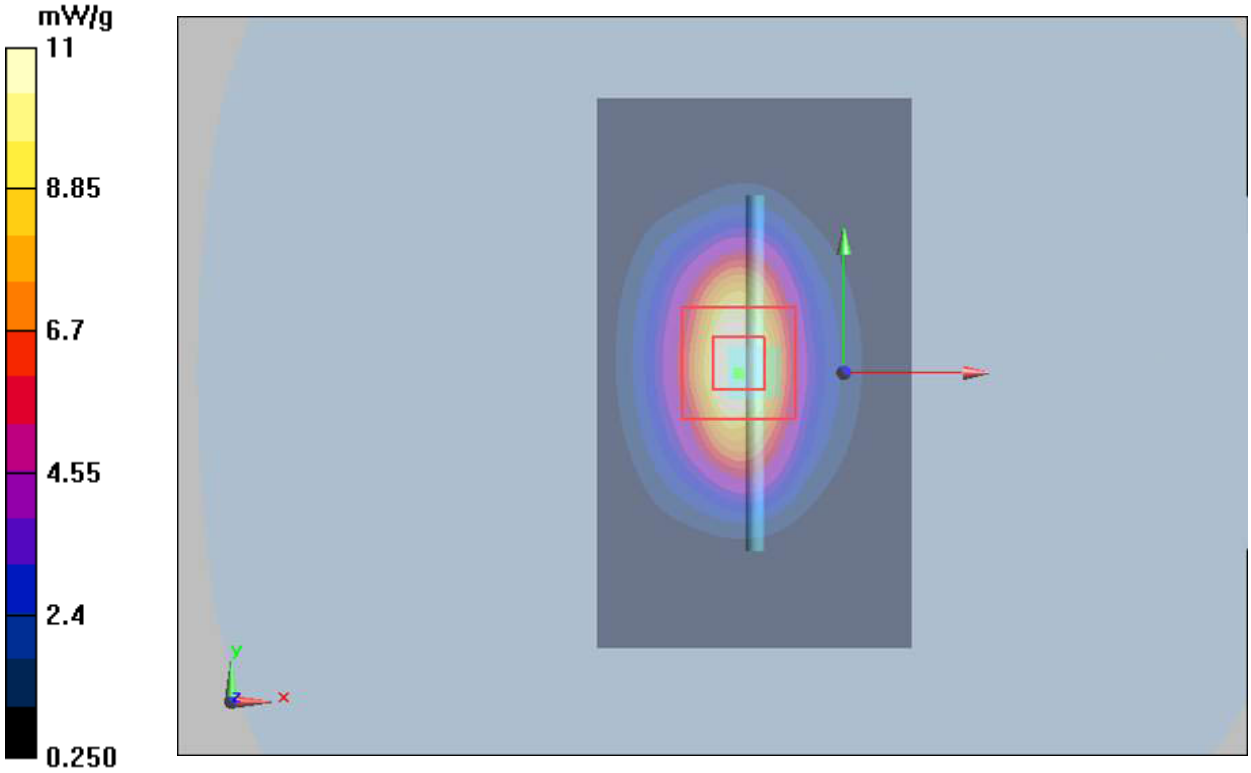
d=10mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 80.8 V/m; Power Drift = -0.063 dB

Peak SAR (extrapolated) = 17.6 W/kg

SAR(1 g) = 9.82 mW/g; SAR(10 g) = 5.2 mW/g

Maximum value of SAR (measured) = 11 mW/g



Plot 4 System Performance Check at 2450 MHz Body TSL

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

Date: 1/9/2019

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

Medium parameters used: f = 2450 MHz; σ = 1.97 mho/m; ε_r = 51.1; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.53, 7.53, 7.53); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW/Area Scan (41x71x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 16 mW/g

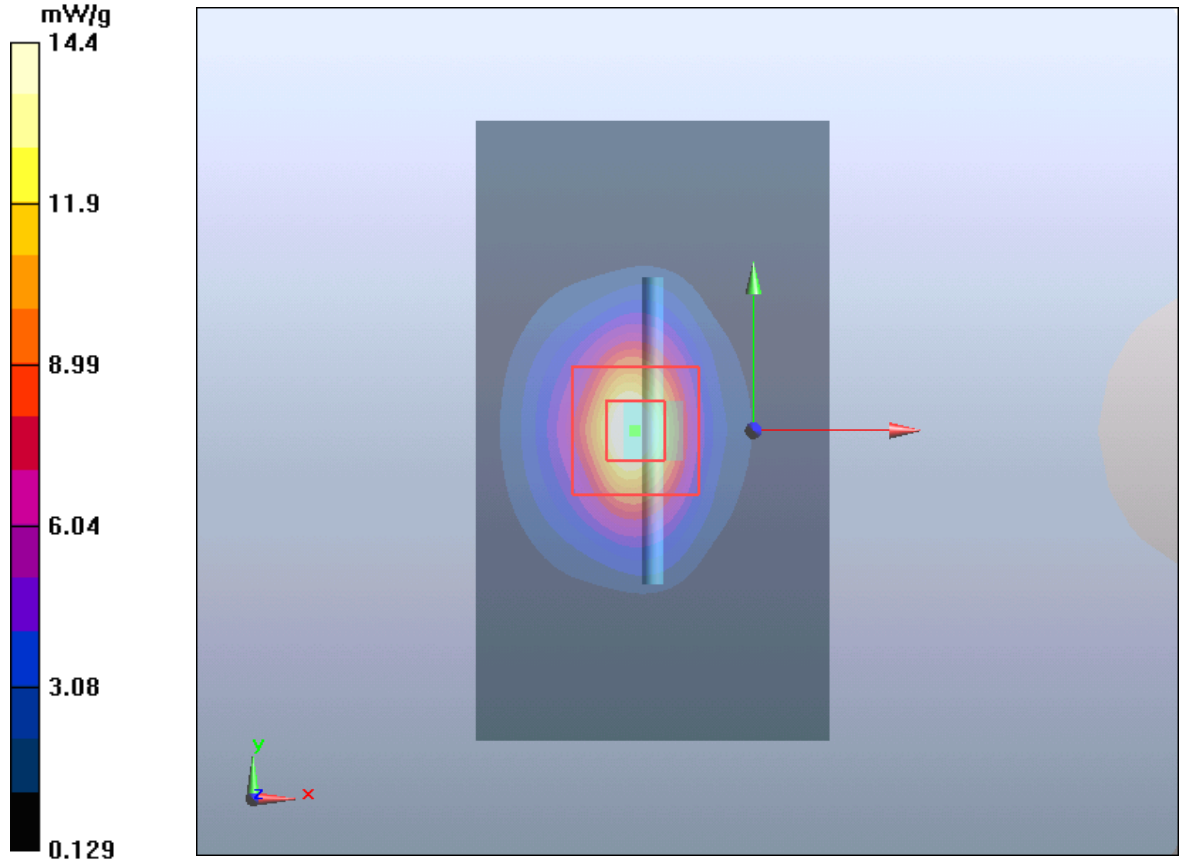
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 81.2 V/m; Power Drift = 0.003 dB

Peak SAR (extrapolated) = 25.4 W/kg

SAR(1 g) = 12.5 mW/g; SAR(10 g) = 6.20 mW/g

Maximum value of SAR (measured) = 14.4 mW/g



ANNEX C: Highest Graph Results

Plot 5 GSM 850 GPRS (3Txslots) Front Side Middle (Battery 2, Distance 0mm)

Date: 1/3/2019

Communication System: UID 0, GPRS 3TX (0); Frequency: 836.6 MHz;Duty Cycle: 1:2.76694

Medium parameters used: f = 837 MHz; σ = 0.974 S/m; ε_r = 53.795; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.32, 9.32, 9.32); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Front Side Middle/Area Scan (51x51x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 2.12 W/kg

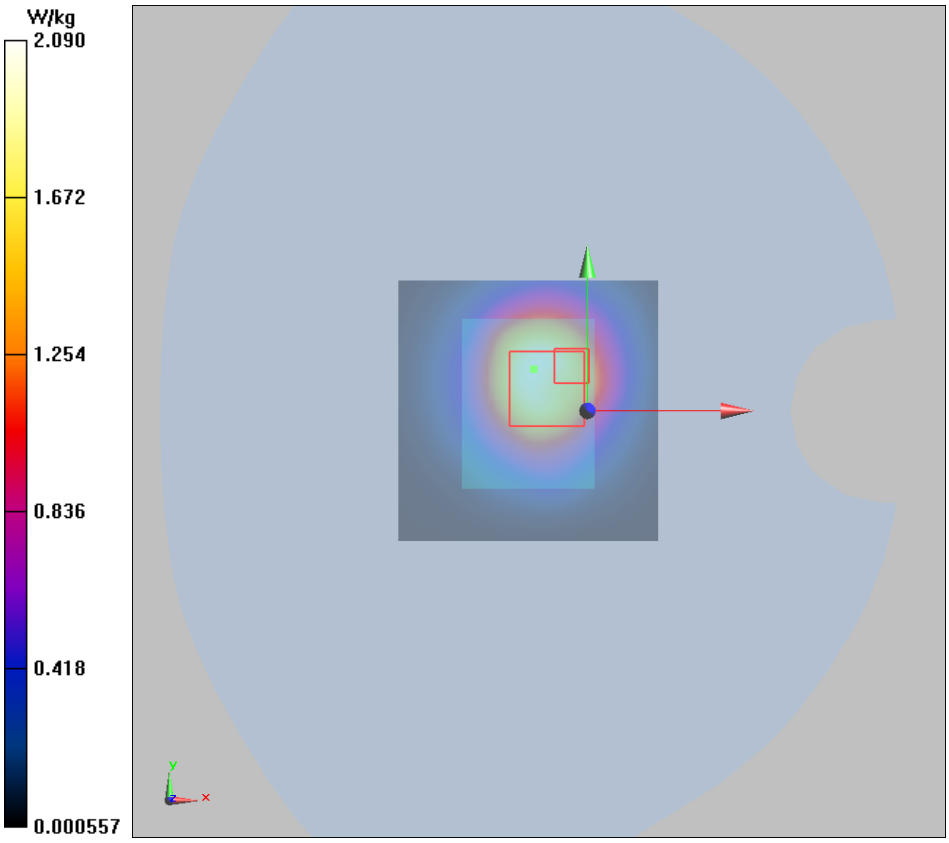
Front Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 40.84 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 5.99 W/kg

SAR(1 g) = 1.98 W/kg; SAR(10 g) = 1.01 W/kg

Maximum value of SAR (measured) = 2.09 W/kg



Plot 6 GSM 1900 GPRS (3Txslots) Front Side Middle (Battery 2, Distance 0mm)

Date: 1/5/2019

Communication System: UID 0, GPRS 3TX (0); Frequency: 1880 MHz;Duty Cycle: 1:2.76694

Medium parameters used: f = 1880 MHz; σ = 1.489 S/m; ε_r = 52.896; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.70, 7.70, 7.70); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Front Side Middle/Area Scan (51x51x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 9.00 W/kg

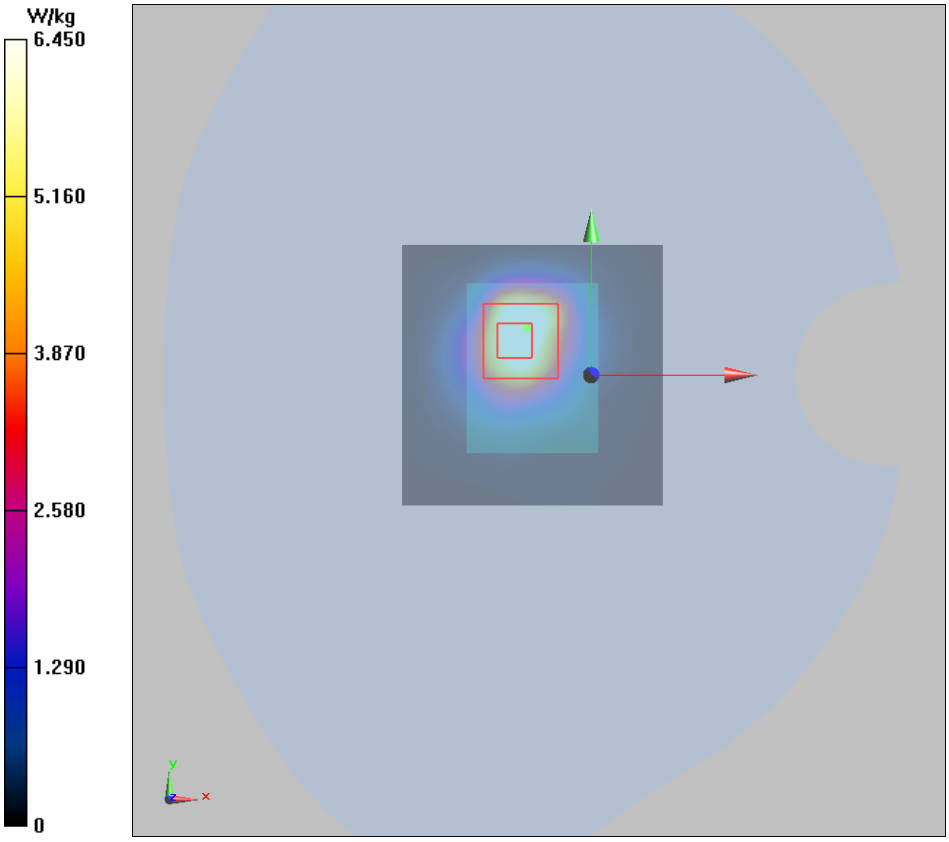
Front Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 55.53 V/m; Power Drift = 0.051 dB

Peak SAR (extrapolated) = 13.0 W/kg

SAR(1 g) = 5.57 W/kg; SAR(10 g) = 3.14 W/kg

Maximum value of SAR (measured) = 6.45 W/kg



Plot 7 eMTC Band 2 Front Side High (Distance 0mm)

Date: 1/5/2019

Communication System: UID 0, LTE (0); Frequency: 1900 MHz;Duty Cycle: 1:1

Medium parameters used: f = 1900 MHz; σ = 1.508 S/m; ε_r = 52.751; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.70, 7.70, 7.70); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Front Side High/Area Scan (51x51x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 4.38 W/kg

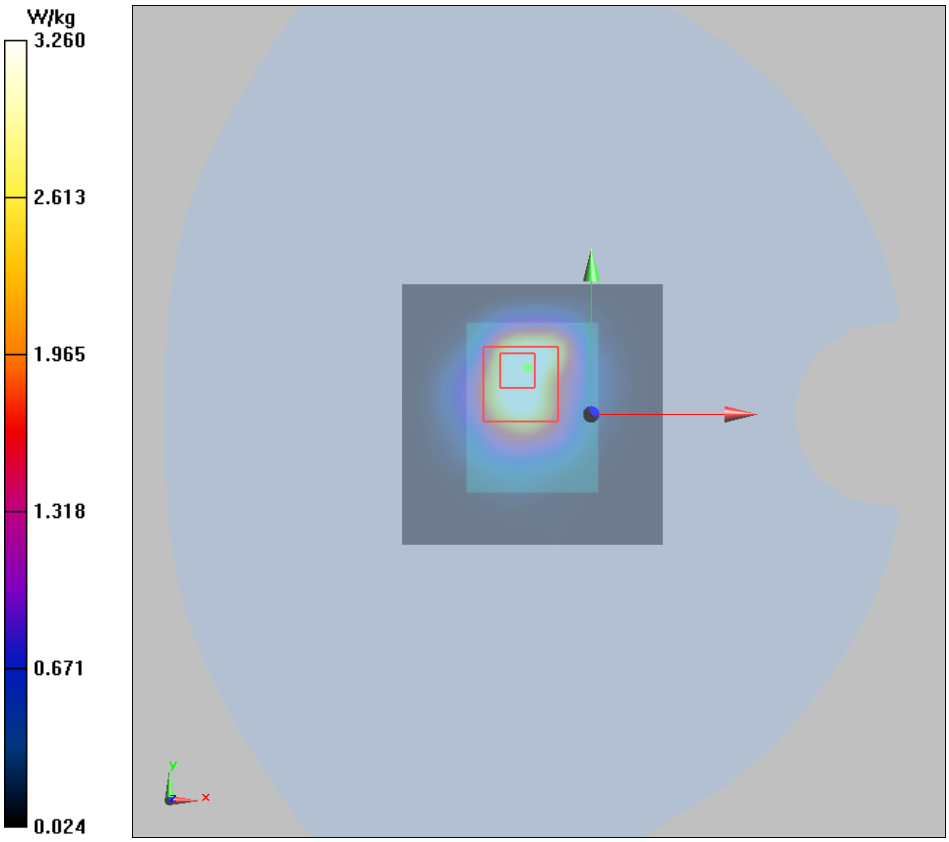
Front Side High/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 42.87 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 6.84 W/kg

SAR(1 g) = 3.21 W/kg; SAR(10 g) = 1.63 W/kg

Maximum value of SAR (measured) = 3.26 W/kg



Plot 8 eMTC Band 4 Front Side Middle (Battery2, Distance 0mm)

Date: 1/9/2019

Communication System: UID 0, LTE (0); Frequency: 1732.5 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 1732.5 MHz; σ = 1.421 S/m; ε_r = 51.486; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.91, 7.91, 7.91); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Front Side Middle/Area Scan (51x51x1): Interpolated grid: dx=15 mm, dy=15 mm

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

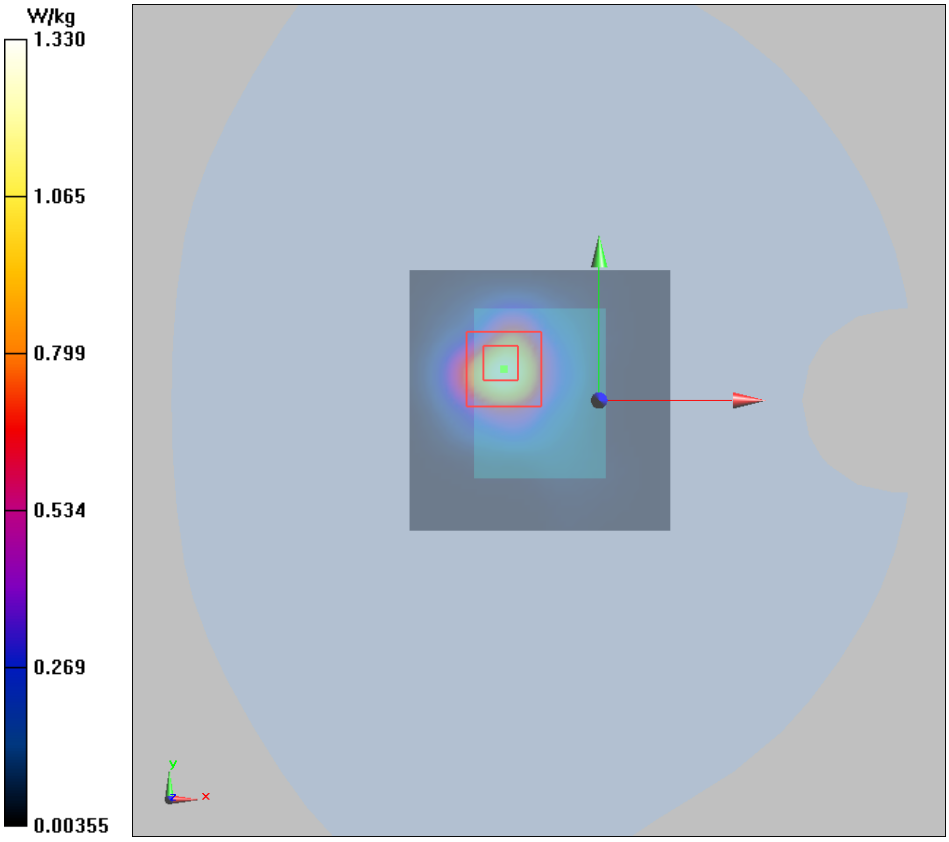
Front Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 18.73 V/m; Power Drift = 0.045 dB

Peak SAR (extrapolated) = 2.76 W/kg

SAR(1 g) = 1.23 W/kg; SAR(10 g) = 0.557 W/kg

Maximum value of SAR (measured) = 1.33 W/kg



Plot 9 eMTC Band 5 Front Side Low (Distance 0mm)

Date: 1/3/2019

Communication System: UID 0, LTE (0); Frequency: 829 MHz;Duty Cycle: 1:1

Medium parameters used: f = 829 MHz; σ = 0.9671 S/m; ε_r = 53.86; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.32, 9.32, 9.32); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Front Side Low/Area Scan (51x51x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.691 W/kg

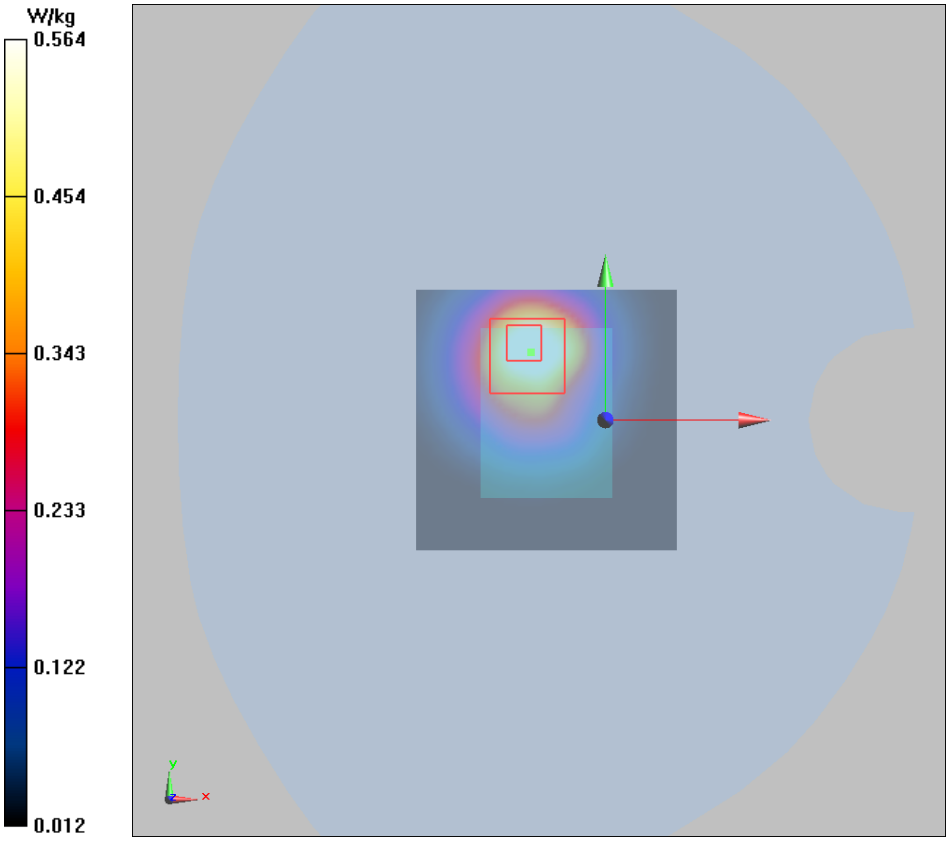
Front Side Low/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 17.49 V/m; Power Drift = 0.021 dB

Peak SAR (extrapolated) = 1.39 W/kg

SAR(1 g) = 0.557 W/kg; SAR(10 g) = 0.282 W/kg

Maximum value of SAR (measured) = 0.564 W/kg



Plot 10 NB-IOT Band 2 Front Side Middle (Distance 0mm)

Date: 1/5/2019

Communication System: UID 0, NB; Frequency: 1880 MHz;Duty Cycle: 1:1

Medium parameters used: f = 1880 MHz; σ = 1.489 S/m; ε_r = 52.896; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.70, 7.70, 7.70); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Front Side Middle/Area Scan (51x51x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 4.65 W/kg

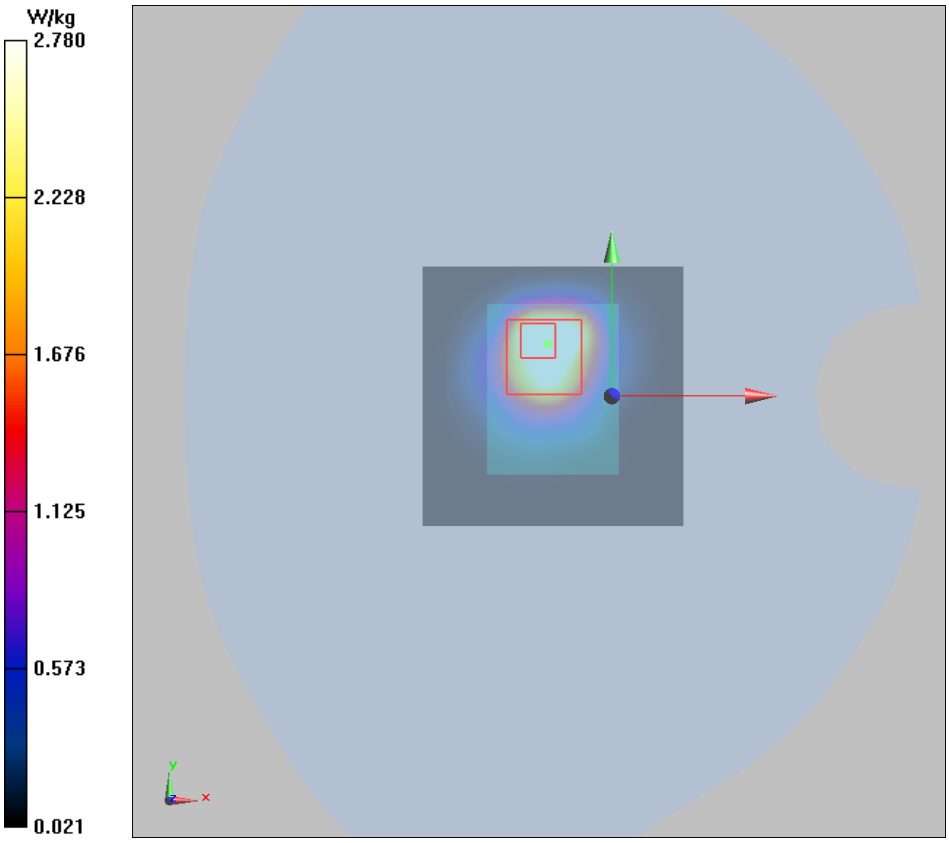
Front Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 37.08 V/m; Power Drift = 0.030 dB

Peak SAR (extrapolated) = 6.42 W/kg

SAR(1 g) = 2.7 W/kg; SAR(10 g) = 1.37 W/kg

Maximum value of SAR (measured) = 2.78 W/kg



Plot 11 NB-IOT Band 4 Front Side Middle (Distance 0mm)

Date: 1/9/2019

Communication System: UID 0, NB; Frequency: 1710.1 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 1710.1 MHz; σ = 1.399 S/m; ε_r = 51.561; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.91, 7.91, 7.91); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Front Side Middle/Area Scan (51x51x1): Interpolated grid: dx=15 mm, dy=15 mm

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

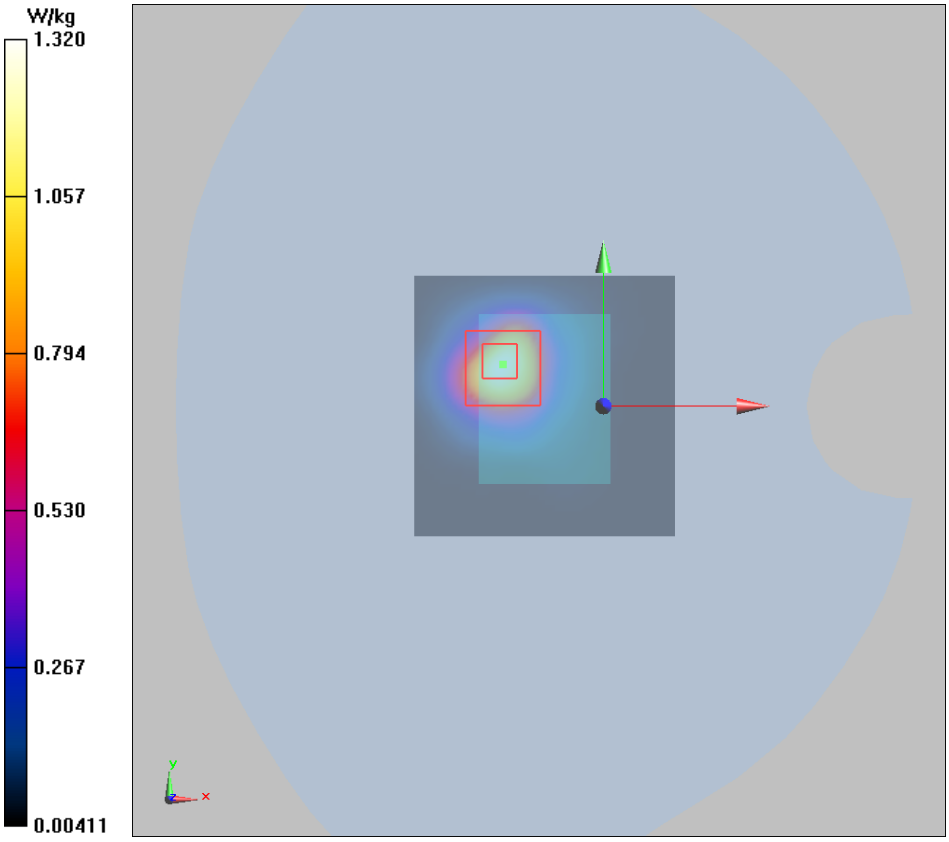
Front Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 16.09 V/m; Power Drift = 0.050 dB

Peak SAR (extrapolated) = 2.69 W/kg

SAR(1 g) = 1.21 W/kg; SAR(10 g) = 0.563 W/kg

Maximum value of SAR (measured) = 1.32 W/kg



Plot 12 NB-IOT Band 5 Front Side Low (Distance 0mm)

Date: 1/3/2019

Communication System: UID 0, NB; Frequency: 824.1 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 824.1 MHz; σ = 0.963 S/m; ε_r = 53.906; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.32, 9.32, 9.32); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Front Side Low/Area Scan (51x51x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.691 W/kg

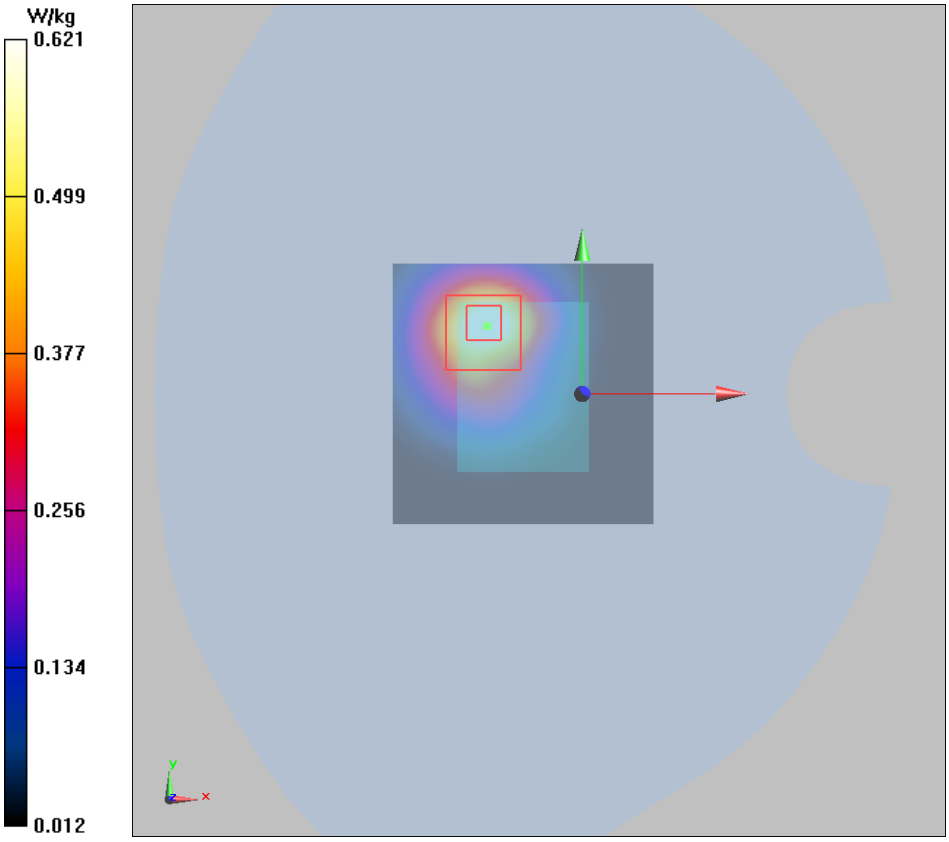
Front Side Low/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 15.14 V/m; Power Drift = 0.15 dB

Peak SAR (extrapolated) = 1.37 W/kg

SAR(1 g) = 0.567 W/kg; SAR(10 g) = 0.286 W/kg

Maximum value of SAR (measured) = 0.621 W/kg



Plot 13 802.11b Front Side Middle (Distance 0mm)

Date: 1/9/2019

Communication System: UID 0, 802.11b (0); Frequency: 2437 MHz;Duty Cycle: 1:1

Medium parameters used: f = 2437 MHz; σ = 1.959 S/m; ε_r = 51.134; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.53, 7.53, 7.53); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Front Side Middle/Area Scan (71x71x1): Interpolated grid: dx=12 mm, dy=12 mm

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

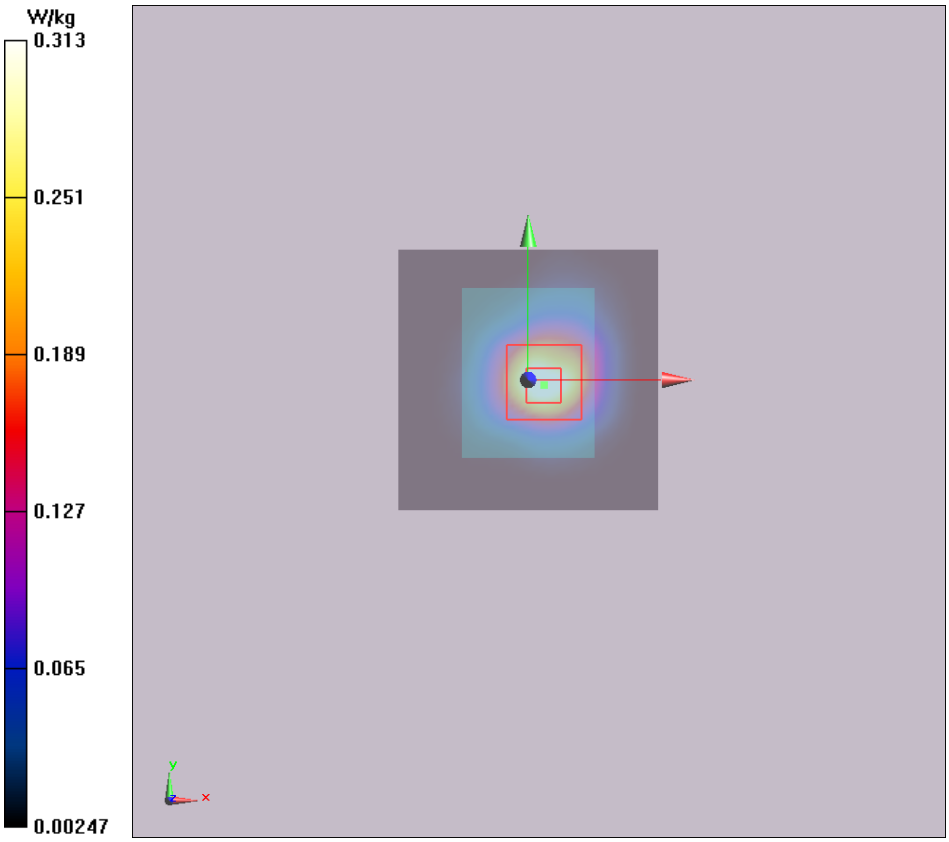
Front Side Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 12.31 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 0.584 W/kg

SAR(1 g) = 0.275 W/kg; SAR(10 g) = 0.128 W/kg

Maximum value of SAR (measured) = 0.313 W/kg



ANNEX D: Probe Calibration Certificate

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

中国认可
国际互认
校准
CALIBRATION
CNAS L0570

Client TA(shanghai) Certificate No: Z18-60093

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3677
Calibration Procedure(s)	FF-Z11-004-01 Calibration Procedures for Dosimetric E-field Probes
Calibration date:	May 29, 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 NRP2	101919	27-Jun-17 (CTTL, No.J17X05857)	Jun-18
Power sensor NRP-Z91	101547	27-Jun-17 (CTTL, No.J17X05857)	Jun-18
Power sensor NRP-Z91	101548	27-Jun-17 (CTTL, No.J17X05857)	Jun-18
Reference10dBAttenuator	18N50W-10dB	09-Feb-18(CTTL, No.J18X01133)	Feb-20
Reference20dBAttenuator	18N50W-20dB	09-Feb-18(CTTL, No.J18X01132)	Feb-20
Reference Probe EX3DV4	SN 3846	25-Jan-18(SPEAG,No.EX3-3846_Jan18)	Jan-19
DAE4	SN 777	15-Dec-17(SPEAG, No.DAE4-777_Dec17)	Dec -18
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
SignalGeneratorMG3700A	6201052605	27-Jun-17 (CTTL, No.J17X05858)	Jun-18
Network Analyzer E5071C	MY46110673	14-Jan-18 (CTTL, No.J18X00561)	Jan -19

	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: May 31, 2018

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

Certificate No: Z18-60093 Page 1 of 11

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

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).

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

Probe EX3DV4

SN: 3677

Calibrated: May 29, 2018

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

Certificate No: Z18-60093 Page 3 of 11

In Collaboration with
s p e a g
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

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	0.41	±10.0%
DCP(mV)[B]	99.9	102.7	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	152.4	±2.4%
		Y	0.0	0.0	1.0		161.7	
		Z	0.0	0.0	1.0		152.2	

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 E^2-field uncertainty inside TSL (see Page 5 and Page 6).
[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.

In Collaboration with
s p e a g
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

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	9.40	9.40	9.40	0.40	0.80	±12.1%
835	41.5	0.90	9.10	9.10	9.10	0.15	1.41	±12.1%
1750	40.1	1.37	8.19	8.19	8.19	0.21	1.15	±12.1%
1900	40.0	1.40	7.96	7.96	7.96	0.25	1.01	±12.1%
2300	39.5	1.67	7.91	7.91	7.91	0.40	0.78	±12.1%
2450	39.2	1.80	7.57	7.57	7.57	0.53	0.76	±12.1%
2600	39.0	1.96	7.28	7.28	7.28	0.64	0.70	±12.1%
5250	35.9	4.71	5.60	5.60	5.60	0.40	1.15	±13.3%
5600	35.5	5.07	4.87	4.87	4.87	0.45	1.05	±13.3%
5750	35.4	5.22	4.99	4.99	4.99	0.45	1.35	±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.

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

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

Calibration Parameter Determined in Body 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	55.5	0.96	9.79	9.79	9.79	0.40	0.80	±12.1%
835	55.2	0.97	9.32	9.32	9.32	0.15	1.51	±12.1%
1750	53.4	1.49	7.91	7.91	7.91	0.23	1.09	±12.1%
1900	53.3	1.52	7.70	7.70	7.70	0.20	1.18	±12.1%
2300	52.9	1.81	7.65	7.65	7.65	0.53	0.82	±12.1%
2450	52.7	1.95	7.53	7.53	7.53	0.37	1.10	±12.1%
2600	52.5	2.16	7.16	7.16	7.16	0.55	0.80	±12.1%
5250	48.9	5.36	5.04	5.04	5.04	0.50	1.55	±13.3%
5600	48.5	5.77	4.27	4.27	4.27	0.51	1.66	±13.3%
5750	48.3	5.94	4.43	4.43	4.43	0.50	1.81	±13.3%

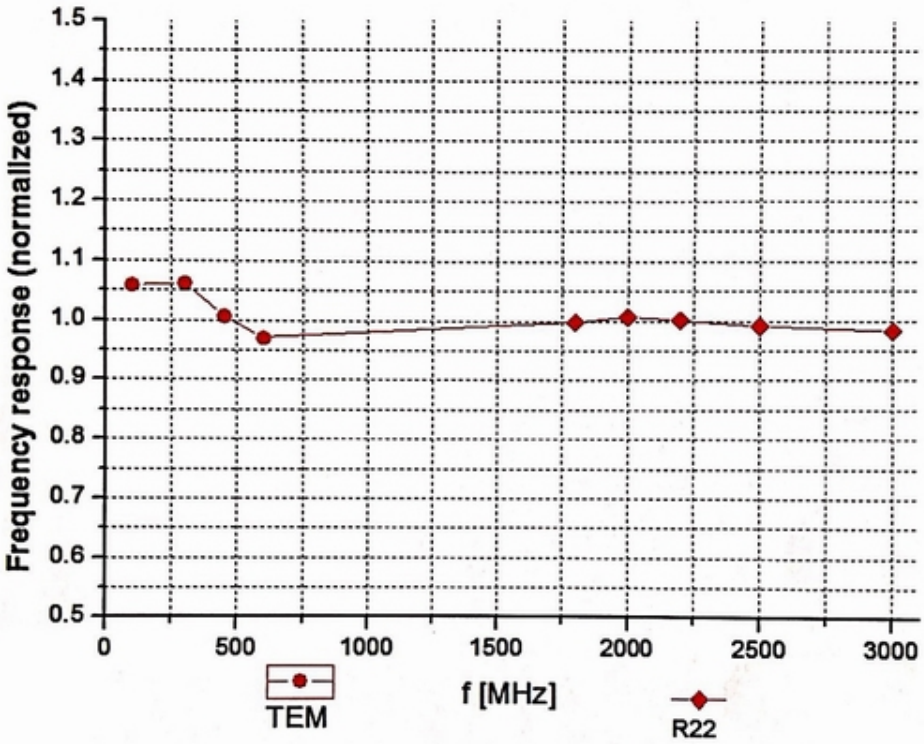
[C] Frequency validity above 300 MHz of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 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.

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

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



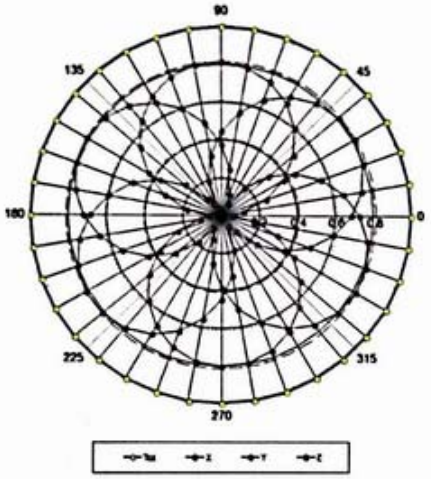
Uncertainty of Frequency Response of E-field: ±7.4% (k=2)

Certificate No: Z18-60093 Page 7 of 11

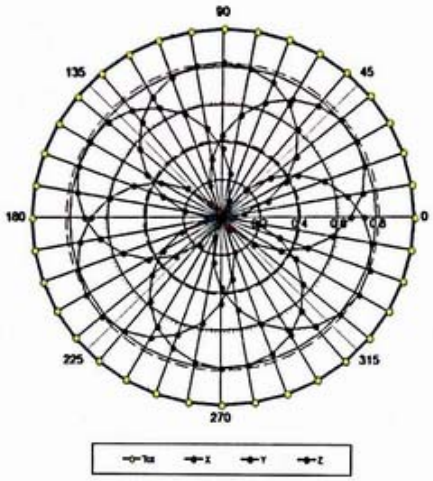
In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

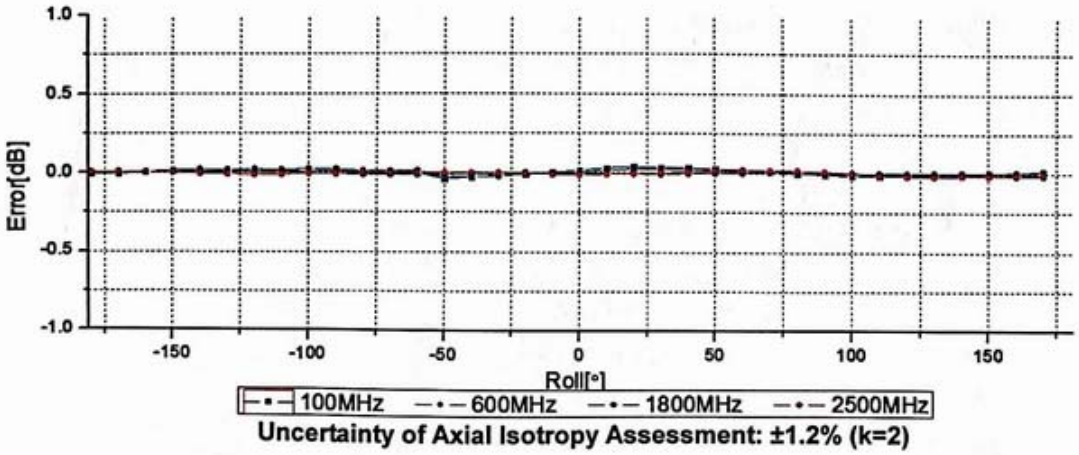
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM



f=1800 MHz, R22



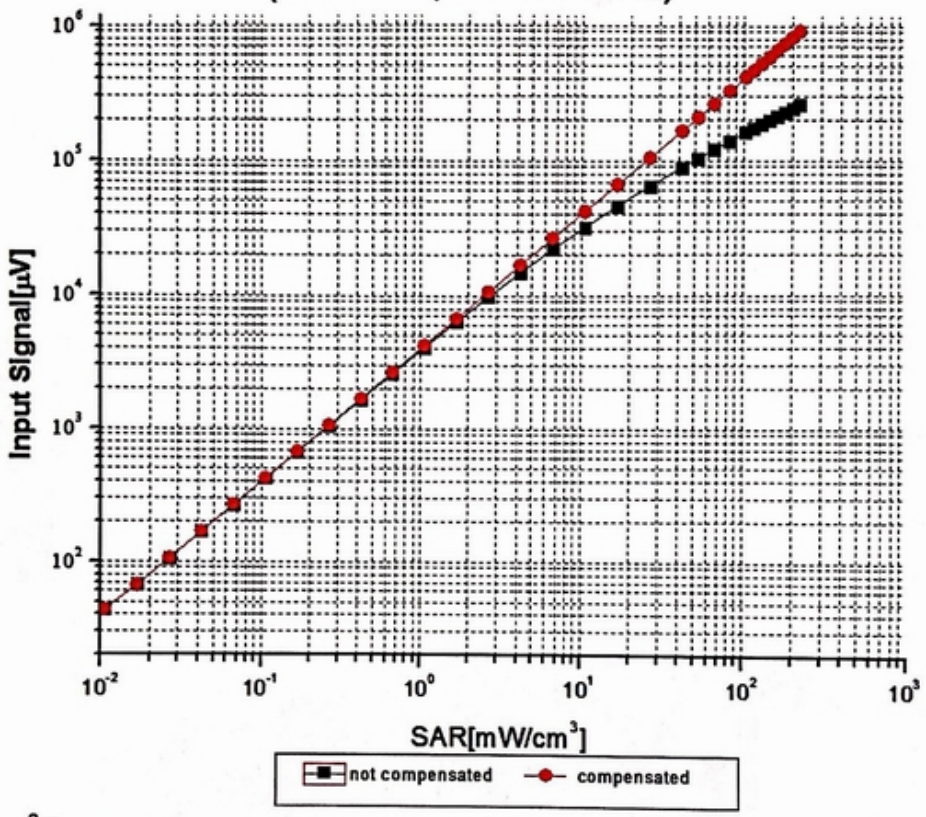


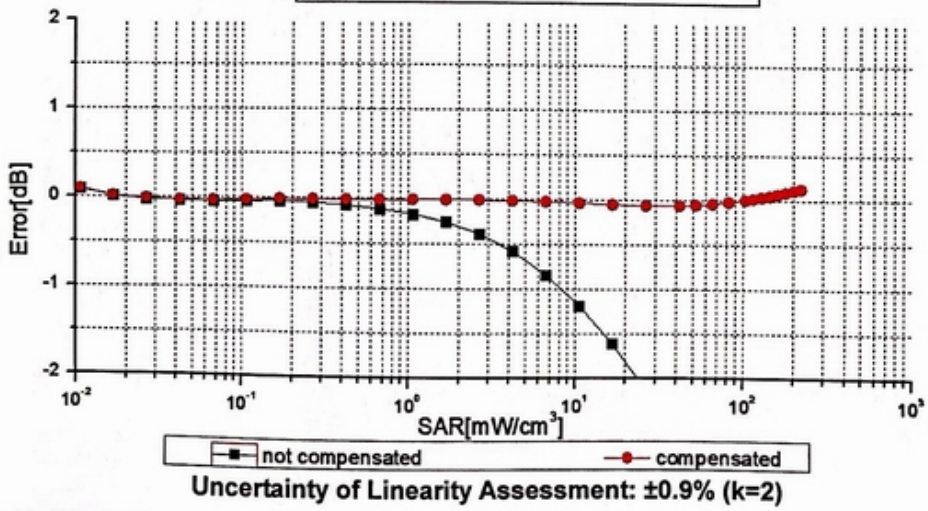
Uncertainty of Axial Isotropy Assessment: ±1.2% (k=2)

Certificate No: Z18-60093 Page 8 of 11

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

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





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

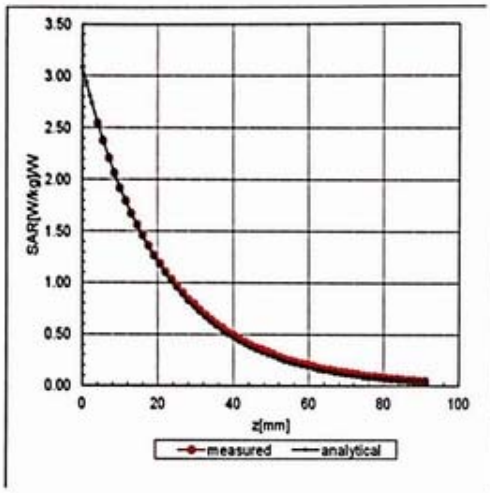
Certificate No: Z18-60093

Page 9 of 11

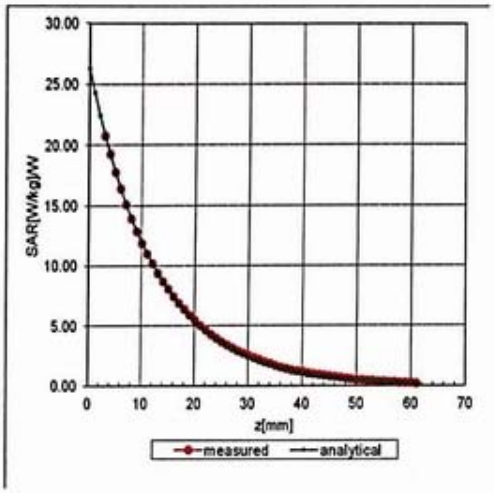
In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

Conversion Factor Assessment

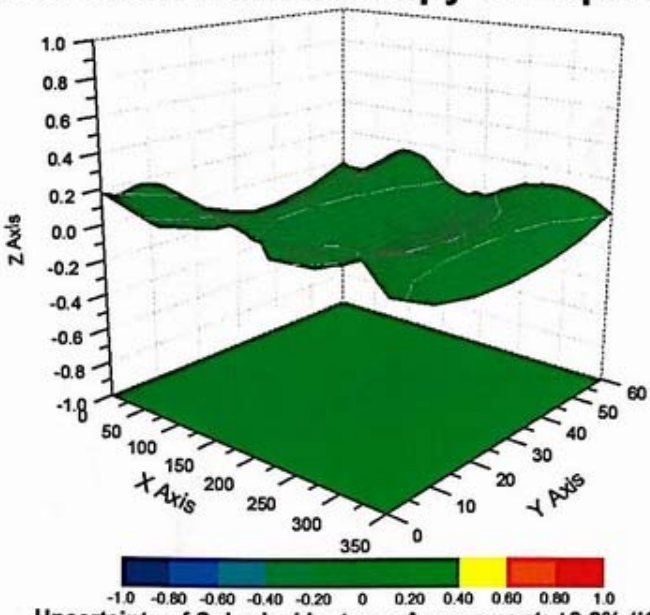
f=750 MHz, WGLS R9(H_convF)



f=1750 MHz, WGLS R22(H_convF)



Deviation from Isotropy in Liquid



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

Certificate No: Z18-60093 Page 10 of 11

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

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

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	118.3
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	9mm
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: D835V2 Dipole Calibration Certificate

In Collaboration with speag CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

中国认可 国际互认 校准 CALIBRATION CNAS L0570

Client TA(Shanghai) Certificate No: Z17-97114

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 4d020
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	August 28, 2017

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	102083	22-Sep-16 (CTTL, No.J16X06809)	Sep-17
Power sensor NRV-Z5	100595	22-Sep-16 (CTTL, No.J16X06809)	Sep-17
Reference Probe EX3DV4	SN 3617	23-Jan-17(SPEAG,No.EX3-3617_Jan17)	Jan-18
DAE4	SN 1331	19-Jan-17(CTTL-SPEAG,No.Z17-97015)	Jan-18
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	13-Jan-17 (CTTL, No.J17X00286)	Jan-18
Network Analyzer E5071C	MY46110673	13-Jan-17 (CTTL, No.J17X00285)	Jan-18

	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: August 31, 2017

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

Certificate No: Z17-97114 Page 1 of 8

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

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%.

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Measurement Conditions

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

DASY Version	DASY52	52.10.0.1446
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.2 ± 6 %	0.89 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	2.34 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**9.45 mW /g ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.51 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**6.09 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	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	55.6 ± 6 %	0.98 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	2.46 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**9.75 mW /g ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	1.63 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**6.47 mW /g ± 18.7 % (k=2)**

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.3Ω- 2.54jΩ
Return Loss	- 31.9dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.8Ω- 4.57jΩ
Return Loss	- 24.8dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.495 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

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

DASY5 Validation Report for Head TSL Date: 08.28.2017

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d020

Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: f = 835 MHz; σ = 0.887 S/m; ε_r = 41.22; ρ = 1000 kg/m^3

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(9.73, 9.73, 9.73); Calibrated: 1/23/2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 1/19/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

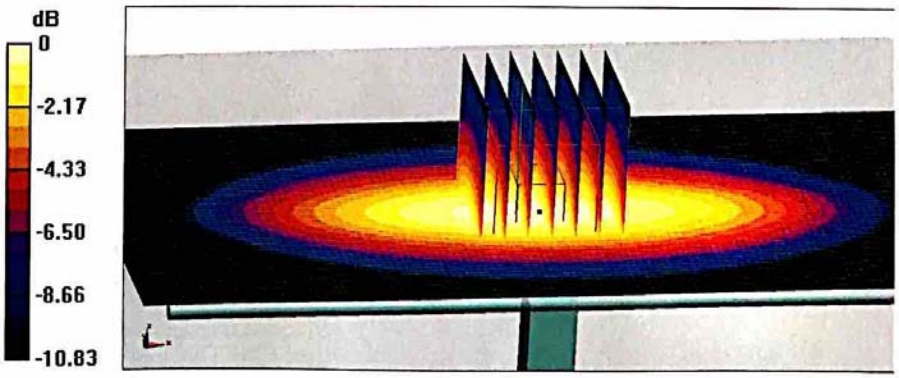
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 58.74V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 3.60 W/kg

SAR(1 g) = 2.34 W/kg; SAR(10 g) = 1.51 W/kg

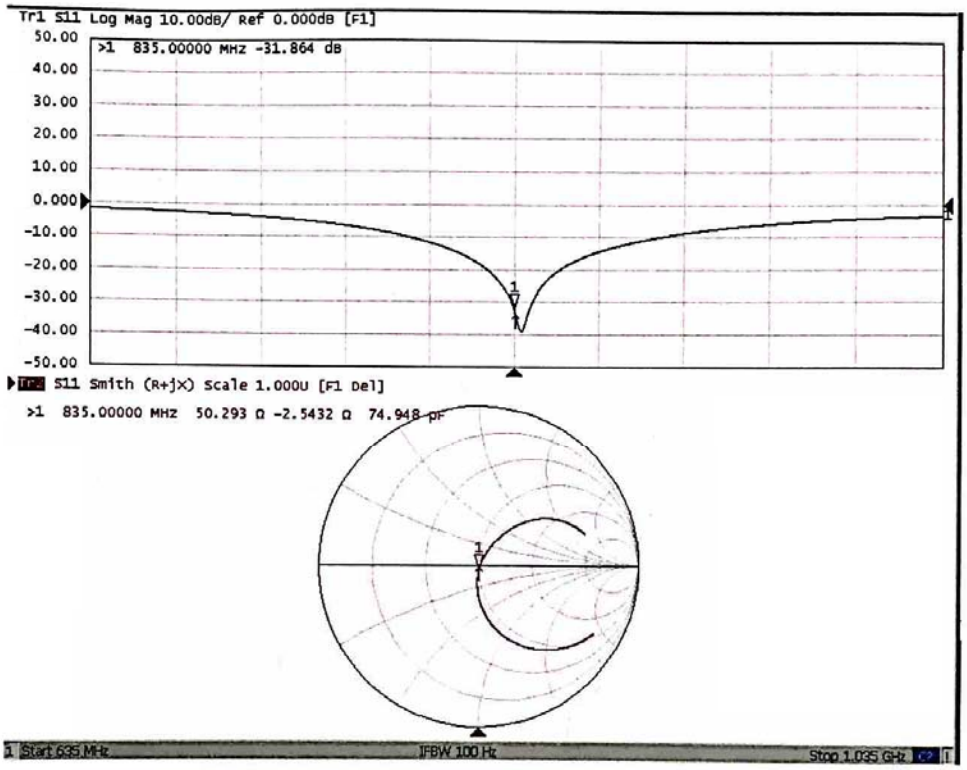
Maximum value of SAR (measured) = 3.16 W/kg



0 dB = 3.16 W/kg = 5.00 dBW/kg

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Impedance Measurement Plot for Head TSL



Certificate No: Z17-97114 Page 6 of 8