

SAR Test Report

Report No. : SF200206C21-1

Applicant : Fibocom Wireless Inc.

Address : 5/F, Tower A, Technology Building II, 1057 Nanhai Blvd, Nanshan, Shenzhen, China

Product : LTE module

FCC ID : ZMOL860GL

Brand : Fibocom

Model No. : L860-GL

Standards : FCC 47 CFR Part 2 (2.1093), IEEE C95.1:1992, IEEE Std 1528:2013
KDB 865664 D01 v01r04, KDB 865664 D02 v01r02
KDB 248227 D01 v02r02, KDB 447498 D01 v06, KDB 616217 D04 v01r02
KDB 941225 D01 v03r01, KDB 941225 D05 v02r05

Sample Received Date : Feb. 06, 2020

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Test Location : No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City, Taiwan

CERTIFICATION: The above equipment have been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch-Lin Kou Laboratories**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's SAR characteristics under the conditions specified in this report. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product certification, approval, or endorsement by TAF or any government agencies.

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FCC Accredited No.: TW0003

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Release Control Record

Report No.	Reason for Change	Date Issued
SF200206C21-1	Initial release	Apr. 08, 2020

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1. Summary of Maximum SAR Value

Equipment Class	Mode	Highest SAR-1g Body (W/kg)
PCB	WCDMA II	0.00
	WCDMA IV	0.00
	WCDMA V	0.00
	LTE 2	0.00
	LTE 4	0.00
	LTE 5	0.00
	LTE 7	0.00
	LTE 12	0.00
	LTE 13	0.00
	LTE 14	0.00
	LTE 17	0.00
	LTE 25	0.00
	LTE 26	0.00
	LTE 30	0.00
	LTE 38	0.00
	LTE 40	0.00
	LTE 41	0.00
	LTE 66	0.00

Note:

1. The SAR criteria (**Head & Body: SAR-1g1.6 W/kg, and Extremity: SAR-10g 4.0 W/kg**)for general population/uncontrolled exposure is specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992.
2. The WLAN MAX SAR value please refer to Intel WLAN test report page. 8.

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2. Description of Equipment Under Test

EUT Type	LTE module
FCC ID	ZMOL860GL
Brand Name	Fibocom
Model Name	L860-GL
EUT Configurations	Sample 1 : EUT with WNC Antenna Sample 2 : EUT with Hong-Bo Antenna Sample 3 : EUT with AWAN Antenna
Tx Frequency Bands (Unit: MHz)	WCDMA Band II : 1852.4 ~ 1907.6 WCDMA Band IV : 1712.4 ~ 1752.6 WCDMA Band V : 826.4 ~ 846.6 LTE Band 2 : 1850.7 ~ 1909.3 (BW: 1.4M, 3M, 5M, 10M, 15M, 20M) LTE Band 4 : 1710.7 ~ 1754.3 (BW: 1.4M, 3M, 5M, 10M, 15M, 20M) LTE Band 5 : 824.7 ~ 848.3 (BW: 1.4M, 3M, 5M, 10M) LTE Band 7 : 2502.5 ~ 2567.5 (BW: 5M, 10M, 15M, 20M) LTE Band 12 : 699.7 ~ 715.3 (BW: 1.4M, 3M, 5M, 10M) LTE Band 13 : 779.5 ~ 784.5 (BW: 5M, 10M) LTE Band 14 : 790.5 ~ 795.5 (BW: 5M, 10M) LTE Band 17 : 706.5 ~ 713.5 (BW: 5M, 10M) LTE Band 25 : 1850.7 ~ 1914.3 (BW: 1.4M, 3M, 5M, 10M, 15M, 20M) LTE Band 26 : 814.7 ~ 848.3 (BW: 1.4M, 3M, 5M, 10M, 15M) LTE Band 29 : 717 ~ 728(Rx only) LTE Band 30 : 2307.5 ~ 2312.5 (BW: 5M, 10M) LTE Band 38 : 2572.5 ~ 2617.5 (BW: 5M, 10M, 15M, 20M) LTE Band 41 : 2502.5 ~ 2687.5 (BW: 5M, 10M, 15M, 20M) LTE Band 66 : 1710.7 ~ 1779.3 (BW: 1.4M, 3M, 5M, 10M, 15M, 20M)
Uplink Modulations	WCDMA : QPSK LTE : QPSK, 16QAM
Maximum Tune-up Conducted Power (Unit: dBm)	Please refer to section 4.6.1 of this report
Antenna Type	Refer note as below
EUT Stage	Identical Prototype

Note:

- The EUT is authorized for use in specific End-product. Please refer to below for more details.

Item	Brand Name	Model Name
Notebook Computer	HP	HSN-I36C

- The information of module collocated in this End-product is listed as below.

Item	Brand Name	Model Name	Specification
BT + WiFi module	Intel	AX201NGW	2T2R 802.11 a/b/g/n/ac/ax WLAN + Bluetooth
WWAN module	Fibocom	L860-GL	WCDMA Band II/IV/V, LTE Band 2/4/5/7/12/13/14/17/25/26/29/30/38/40/41/66
NFC module	WNC	XRAV-1	NFC

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3. The WWAN antenna information is listed as below.

LTE Band	AWAN		HONG-BO		WNC	
	NB Mode		NB Mode		NB Mode	
	TX1	TX2	TX1	TX2	TX1	TX2
Parts number	6036B0255901 (AUP6Y-100025)	6036B0255301 (AUP6Y-100026)	6036B0257701 (260-27365)	6036B0258501 (260-27366)	6036B0253201 (81EABB15.G35)	6036B0253301 (81EABB15.G36)
FDD B2	1.68	-2.80	-0.81	-1.69	0.22	-0.45
FDD B4	-1.27	-1.93	-2.26	-0.61	-1.11	0.63
FDD B5	-3.75	-4.57	-0.78	-2.70	0.08	-2.65
FDD B7	-	-5.17	0.22	-2.82	-0.19	-1.32
FDD B12	-1.02	-1.97	-1.20	-4.12	-1.73	-3.12
FDD B13	-2.50	-2.00	-2.13	-4.84	-1.47	-3.10
FDD B14	-2.33	-1.87	-	-	-	-
FDD B17	-3.51	-1.97	-1.20	-4.12	-1.73	-3.12
FDD B25	1.68	-2.80	-0.81	-1.69	0.22	-0.45
FDD B26	-3.75	-3.95	-0.78	-2.70	0.08	-2.65
FDD B29	-	-2.27	-	-	-	-
FDD B30	-	-1.26	-	-2.21	-	0.55
TDD B38	-0.38	-4.73	0.03	-2.82	-1.30	-2.14
TDD B41	0.74	-1.53	0.22	-2.82	-0.19	-1.32
FDD B66	-1.27	-1.93	-2.26	-0.61	-1.11	0.63
WCDMA B2	1.68	-2.80	-0.81	-1.69	0.22	-0.45
WCDMA B4	-1.27	-1.93	-2.26	-0.61	-1.11	0.63
WCDMA B5	-3.75	-4.57	-0.78	-2.70	0.08	-2.65

4. The above EUT information is declared by manufacturer and for more detailed features description please refers to the manufacturer's specifications or User's Manual.

3. SAR Measurement System

3.1 Definition of Specific Absorption Rate (SAR)

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

$$SAR = \frac{d}{dt} \left(\frac{dW}{dm} \right) = \frac{d}{dt} \left(\frac{dW}{\rho dv} \right)$$

SAR is expressed in units of Watts per kilogram (W/kg)

SAR measurement can be related to the electrical field in the tissue by

$$SAR = \frac{\sigma |E|^2}{\rho}$$

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

3.2 SPEAG DASY6 System

DASY6 system consists of high precision robot, probe alignment sensor, phantom, robot controller, controlled measurement server and near-field probe. The robot includes six axes that can move to the precision position of the DASY6 software defined. The DASY6 software can define the area that is detected by the probe. The robot is connected to controlled box. Controlled measurement server is connected to the controlled robot box. The DAE includes amplifier, signal multiplexing, AD converter, offset measurement and surface detection. It is connected to the Electro-optical coupler (ECO). The ECO performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC.

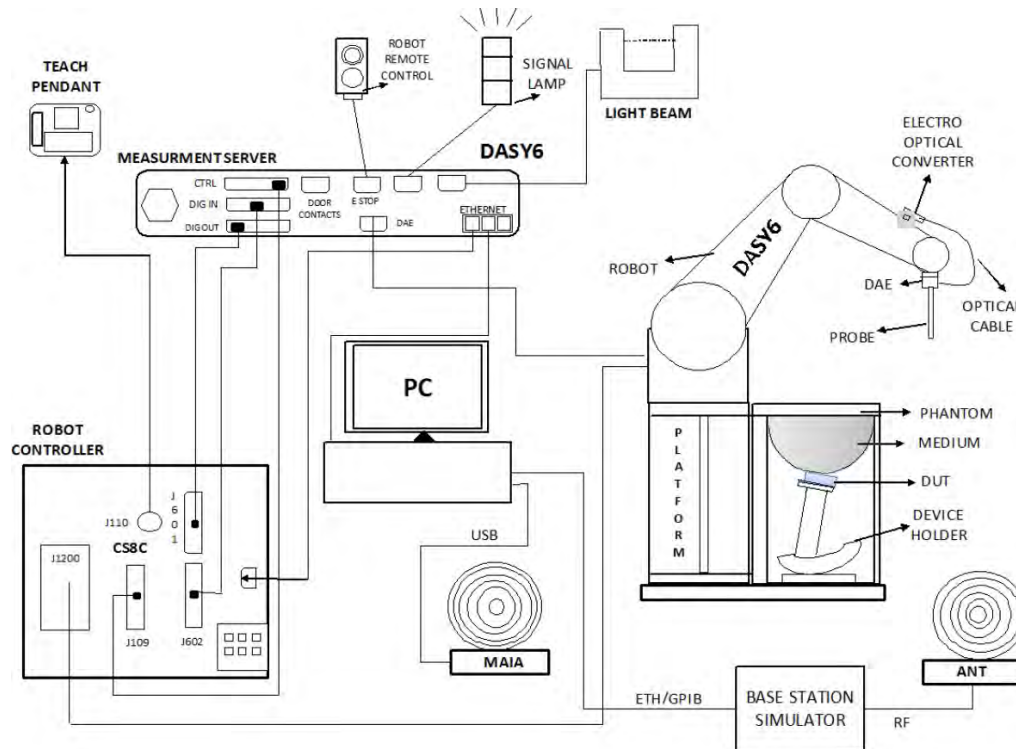


Fig-3.1 SPEAG DASY6 System Setup

3.2.1 Robot

The DASY6 systems use the high precision robots from Stäubli SA (France). For the 6-axis controller system, the robot controller version of CS8c from Stäubli is used. The Stäubli robot series have many features that are important for our application:

- High precision (repeatability ± 0.035 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)

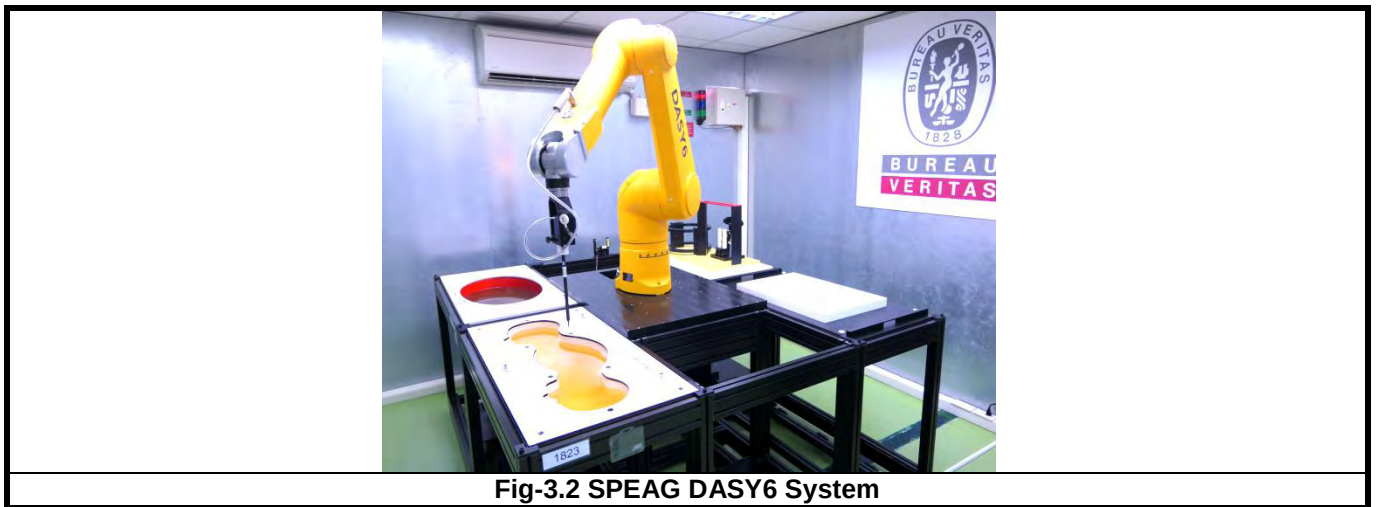


Fig-3.2 SPEAG DASY6 System

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3.2.2 Probes

The SAR measurement is conducted with the dosimetric probe. The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency.

Model	EX3DV4	
Construction	Symmetrical design with triangular core. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE).	
Frequency	4 MHz to 10 GHz Linearity: ± 0.2 dB	
Directivity	± 0.1 dB in TSL (rotation around probe axis) ± 0.3 dB in TSL (rotation normal to probe axis)	
Dynamic Range	10 μ W/g to 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 μ W/g)	
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm	

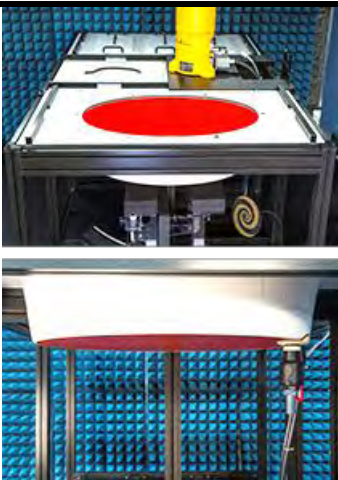
3.2.3 Data Acquisition Electronics (DAE)

Model	DAE3, DAE4	
Construction	Signal amplifier, multiplexer, A/D converter and control logic. Serial optical link for communication with DASY embedded system (fully remote controlled). Two step probe touch detector for mechanical surface detection and emergency robot stop.	
Measurement Range	-100 to +300 mV (16 bit resolution and two range settings: 4mV, 400mV)	
Input Offset Voltage	$< 5\mu$ V (with auto zero)	
Input Bias Current	< 50 fA	
Dimensions	60 x 60 x 68 mm	

3.2.4 Phantoms

Model	SAM-Twin Phantom	
Construction	The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE Std 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body-mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.	
Material	Vinylester, fiberglass reinforced (VE-GF)	
Shell Thickness	2 ± 0.2 mm (6 ± 0.2 mm at ear point)	
Dimensions	Length: 1000 mm Width: 500 mm Height: adjustable feet	
Filling Volume	approx. 25 liters	

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Model	ELI	
Construction	The ELI phantom is used for compliance testing of handheld and body-mounted wireless devices. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.	
Material	Vinylester, fiberglass reinforced (VE-GF)	
Shell Thickness	2.0 ± 0.2 mm (bottom plate)	
Dimensions	Major axis: 600 mm Minor axis: 400 mm	
Filling Volume	approx. 30 liters	

3.2.5 Device Holder

Model	MD4HHTV5 - Mounting Device for Hand-Held Transmitters	
Construction	In combination with the Twin SAM or ELI phantoms, the Mounting Device for Hand-Held Transmitters enables rotation of the mounted transmitter device to specified spherical coordinates. At the heads, the rotation axis is at the ear opening. Transmitter devices can be easily and accurately positioned according to IEC 62209-1, IEEE 1528, FCC, or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat).	
Material	Polyoxymethylene (POM)	

Model	MDA4WTV5 - Mounting Device Adaptor for Ultra Wide Transmitters	
Construction	An upgrade kit to Mounting Device to enable easy mounting of wider devices like big smart-phones, e-books, small tablets, etc. It holds devices with width up to 140 mm.	
Material	Polyoxymethylene (POM)	

Model	MDA4SPV6 - Mounting Device Adaptor for Smart Phones	
Construction	The solid low-density MDA4SPV6 adaptor assuring no impact on the DUT radiation performance and is conform with any DUT design and shape.	
Material	ROHACELL	

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Model	MD4LAPV5 - Mounting Device for Laptops and other Body-Worn Transmitters	
Construction	In combination with the Twin SAM or ELI phantoms, the Mounting Device (Body-Worn) enables testing of transmitter devices according to IEC 62209-2 specifications. The device holder can be locked for positioning at a flat phantom section.	
Material	Polyoxymethylene (POM), PET-G, Foam	

3.2.6 System Validation Dipoles

Model	D-Serial	
Construction	Symmetrical dipole with 1/4 balun. Enables measurement of feed point impedance with NWA. Matched for use near flat phantoms filled with tissue simulating solutions.	
Frequency	750 MHz to 5800 MHz	
Return Loss	> 20 dB	
Power Capability	> 100 W (f < 1GHz), > 40 W (f > 1GHz)	

3.2.7 Power Source

Model	Powersource1	
Signal Type	Continuous Wave	
Operating Frequencies	600 MHz to 5850 MHz	
Output Power	-5.0 dBm to +17.0 dBm	
Power Supply	5V DC, via USB jack	
Power Consumption	<3 W	
Applications	System performance check and validation with a CW signal.	

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3.2.8 Tissue Simulating Liquids

For SAR measurement of the field distribution inside the phantom, the phantom must be filled with homogeneous tissue simulating liquid to a depth of at least 15 cm. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm. The nominal dielectric values of the tissue simulating liquids in the phantom and the tolerance of 10 % are listed in Table-3.1.

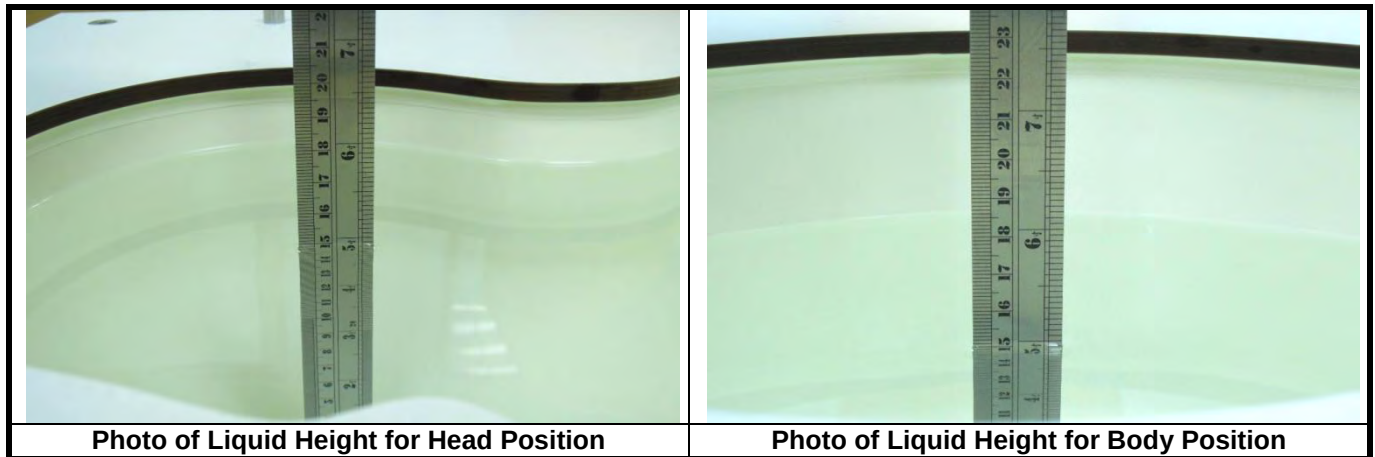


Table-3.1 Targets of Tissue Simulating Liquid

Frequency (MHz)	Target Permittivity	Range of $\pm 10\%$	Target Conductivity	Range of $\pm 10\%$
450	43.5	39.2 ~ 47.9	0.87	0.78 ~ 0.96
750	41.9	37.7 ~ 46.1	0.89	0.80 ~ 0.98
835	41.5	37.4 ~ 45.7	0.90	0.81 ~ 0.99
900	41.5	37.4 ~ 45.7	0.97	0.87 ~ 1.07
1450	40.5	36.5 ~ 44.6	1.20	1.08 ~ 1.32
1500	40.4	36.4 ~ 44.4	1.23	1.11 ~ 1.35
1640	40.2	36.2 ~ 44.2	1.31	1.18 ~ 1.44
1750	40.1	36.1 ~ 44.1	1.37	1.23 ~ 1.51
1800	40.0	36.0 ~ 44.0	1.40	1.26 ~ 1.54
1900	40.0	36.0 ~ 44.0	1.40	1.26 ~ 1.54
2000	40.0	36.0 ~ 44.0	1.40	1.26 ~ 1.54
2100	39.8	35.8 ~ 43.8	1.49	1.34 ~ 1.64
2300	39.5	35.6 ~ 43.5	1.67	1.50 ~ 1.84
2450	39.2	35.3 ~ 43.1	1.80	1.62 ~ 1.98
2600	39.0	35.1 ~ 42.9	1.96	1.76 ~ 2.16
3000	38.5	34.7 ~ 42.4	2.40	2.16 ~ 2.64
3500	37.9	34.1 ~ 41.7	2.91	2.62 ~ 3.20
4000	37.4	33.7 ~ 41.1	3.43	3.09 ~ 3.77
4500	36.8	33.1 ~ 40.5	3.94	3.55 ~ 4.33
5000	36.2	32.6 ~ 39.8	4.45	4.01 ~ 4.90
5200	36.0	32.4 ~ 39.6	4.66	4.19 ~ 5.13
5400	35.8	32.2 ~ 39.4	4.86	4.37 ~ 5.35
5600	35.5	32.0 ~ 39.1	5.07	4.56 ~ 5.58
5800	35.3	31.8 ~ 38.8	5.27	4.74 ~ 5.80
6000	35.1	31.6 ~ 38.6	5.48	4.93 ~ 6.03

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The dielectric properties of the tissue simulating liquids are defined in IEC 62209-1 and IEC 62209-2. The dielectric properties of the tissue simulating liquids were verified prior to the SAR evaluation using a dielectric assessment kit and a network analyzer.

Since the range of $\pm 10\%$ of the required target values is used to measure relative permittivity and conductivity, the SAR correction procedure is applied to correct measured SAR for the deviations in permittivity and conductivity. Only positive correction has been used to scale up the measured SAR, and SAR result would not be corrected if the correction Δ SAR has a negative sign.

The following table gives the recipes for tissue simulating liquids.

Table-3.2 Recipes of Tissue Simulating Liquid

Tissue Type	Bactericide	DGBE	HEC	NaCl	Sucrose	Triton X-100	Water	Diethylene Glycol Mono-hexylether
H750	0.2	-	0.2	1.5	56.0	-	42.1	-
H835	0.2	-	0.2	1.5	57.0	-	41.1	-
H900	0.2	-	0.2	1.4	58.0	-	40.2	-
H1450	-	43.3	-	0.6	-	-	56.1	-
H1640	-	45.8	-	0.5	-	-	53.7	-
H1750	-	47.0	-	0.4	-	-	52.6	-
H1800	-	44.5	-	0.3	-	-	55.2	-
H1900	-	44.5	-	0.2	-	-	55.3	-
H2000	-	44.5	-	0.1	-	-	55.4	-
H2300	-	44.9	-	0.1	-	-	55.0	-
H2450	-	45.0	-	0.1	-	-	54.9	-
H2600	-	45.1	-	0.1	-	-	54.8	-
H3500	-	8.0	-	0.2	-	20.0	71.8	-
H5G	-	-	-	-	-	17.2	65.5	17.3

3.3 SAR System Verification

The system check verifies that the system operates within its specifications. It is performed daily or before every SAR measurement. The system check uses normal SAR measurements in the flat section of the phantom with a matched dipole at a specified distance. The system verification setup is shown as below.

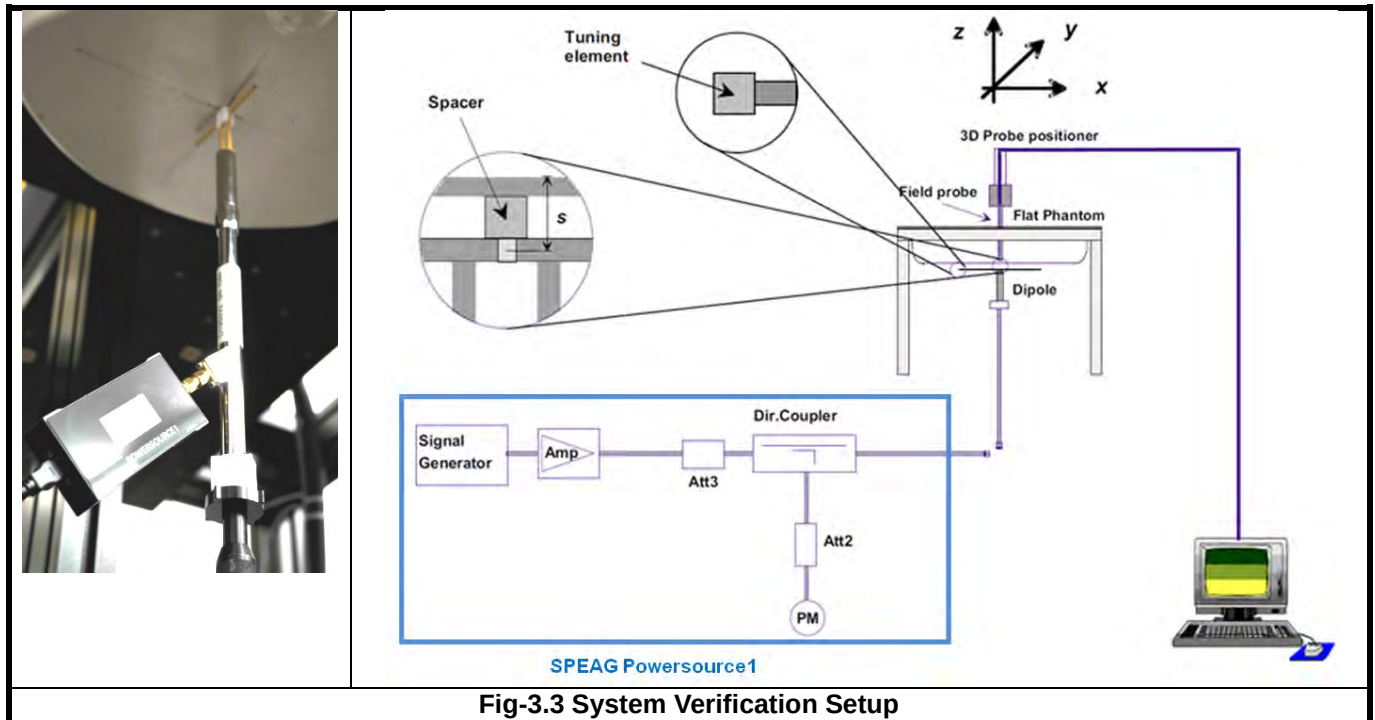


Fig-3.3 System Verification Setup

The SPEAG Powersource1 is a portable and very stable RF source providing a continuous wave (CW) signal. It is designed for conducting SAR system checks and SAR system validation of DASY and is compatible with IEC 62209-1, IEC 62209-2 and IEEE Std 1528 standards. The Powersource1 has been calibrated by SPEAG's ISO/IEC 17025-accredited calibration center. When using Powersource1, the setup can be simplified, as shown in Fig-3.3. The signal purity is warranted by design. Since the Powersource1 is calibrated, no additional equipment is needed and the Powersource1 can directly be connected to the SMA connector of the dipole without a cable as all separate components (signal generator, amplifier, coupler and power meter) are built into the unit.

The validation dipole is placed beneath the flat phantom with the specific spacer in place. The distance spacer is touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The Powersource1 is adjusted for the desired forward power of 17 dBm at the dipole connector and the RF output power would be turned on. After system check testing, the SAR result will be normalized to 1W forward input power and compared with the reference SAR value derived from validation dipole certificate report. The deviation of system check should be within 10 %.

3.4 SAR Measurement Procedure

According to the SAR test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

- Power reference measurement
- Area scan
- Zoom scan
- Power drift measurement

The SAR measurement procedures for each of test conditions are as follows:

- Make EUT to transmit maximum output power
- Measure conducted output power through RF cable
- Place the EUT in the specific position of phantom
- Perform SAR testing steps on the DASY system
- Record the SAR value

3.4.1 Area Scan and Zoom Scan Procedure

First area scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an area scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, zoom scan is required. The zoom scan is performed around the highest E-field value to determine the averaged SAR-distribution.

Measure the local SAR at a test point at 1.4 mm of the inner surface of the phantom recommended by SEPAG. The area scan (two-dimensional SAR distribution) is performed cover at least an area larger than the projection of the EUT or antenna. The measurement resolution and spatial resolution for interpolation shall be chosen to allow identification of the local peak locations to within one-half of the linear dimension of the corresponding side of the zoom scan volume. Following table provides the measurement parameters required for the area scan.

Parameter	$f \leq 3 \text{ GHz}$	$3 \text{ GHz} < f \leq 6 \text{ GHz}$
Maximum distance from closest measurement point to phantom surface	5 ± 1	$\delta \ln(2)/2 \pm 0.5$
Maximum probe angle from probe axis to phantom surface normal at the measurement location	$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$
Maximum area scan spatial resolution: $\Delta x_{\text{Area}}, \Delta y_{\text{Area}}$	$\leq 2 \text{ GHz: } \leq 15 \text{ mm}$ $2 - 3 \text{ GHz: } \leq 12 \text{ mm}$	$3 - 4 \text{ GHz: } \leq 12 \text{ mm}$ $4 - 6 \text{ GHz: } \leq 10 \text{ mm}$

From the scanned SAR distribution, identify the position of the maximum SAR value, in addition identify the positions of any local maxima with SAR values within 2 dB of the maximum value that will not be within the zoom scan of other peaks. Additional peaks shall be measured only when the primary peak is within 2 dB of the SAR compliance limit (e.g. 1 W/kg for 1.6 W/kg, 1 g limit; or 1.26 W/kg for 2 W/kg, 10 g limit).

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The zoom scan (three-dimensional SAR distribution) is performed at the local maxima locations identified in previous area scan procedure. The zoom scan volume must be larger than the required minimum dimensions. When graded grids are used, which only applies in the direction normal to the phantom surface, the initial grid separation closest to the phantom surface and subsequent graded grid increment ratios must satisfy the required protocols. The 1-g SAR averaging volume must be fully contained within the zoom scan measurement volume boundaries; otherwise, the measurement must be repeated by shifting or expanding the zoom scan volume. The similar requirements also apply to 10-g SAR measurements. Following table provides the measurement parameters required for the zoom scan.

Parameter		$f \leq 3 \text{ GHz}$	$3 \text{ GHz} < f \leq 6 \text{ GHz}$
Maximum zoom scan spatial resolution: $\Delta x_{\text{zoom}}, \Delta y_{\text{zoom}}$		$\leq 2 \text{ GHz: } \leq 8 \text{ mm}$ $2 - 3 \text{ GHz: } \leq 5 \text{ mm}$	$3 - 4 \text{ GHz: } \leq 5 \text{ mm}$ $4 - 6 \text{ GHz: } \leq 4 \text{ mm}$
Maximum zoom scan spatial resolution, normal to phantom surface	<i>uniform grid: $\Delta z_{\text{zoom}}(n)$</i>	$\leq 5 \text{ mm}$	$3 - 4 \text{ GHz: } \leq 4 \text{ mm}$ $4 - 5 \text{ GHz: } \leq 3 \text{ mm}$ $5 - 6 \text{ GHz: } \leq 2 \text{ mm}$
	<i>graded grids: $\Delta z_{\text{zoom}}(1)$</i>	$\leq 4 \text{ mm}$	$3 - 4 \text{ GHz: } \leq 3.0 \text{ mm}$ $4 - 5 \text{ GHz: } \leq 2.5 \text{ mm}$ $5 - 6 \text{ GHz: } \leq 2.0 \text{ mm}$
	$\Delta z_{\text{zoom}}(n>1)$	$\leq 1.5 \cdot \Delta z_{\text{zoom}}(n-1) \text{ mm}$	
Minimum zoom scan volume (x, y, z)		$\geq 30 \text{ mm}$	$3 - 4 \text{ GHz: } \geq 28 \text{ mm}$ $4 - 5 \text{ GHz: } \geq 25 \text{ mm}$ $5 - 6 \text{ GHz: } \geq 22 \text{ mm}$

Per IEC 62209-2 AMD1, the successively higher resolution zoom scan is required if the zoom scan measured as defined above complies with both of the following criteria, or if the peak spatial-average SAR is below 0.1 W/kg, no additional measurements are needed:

- (1) The smallest horizontal distance from the local SAR peaks to all points 3 dB below the SAR peak shall be larger than the horizontal grid steps in both x and y directions ($\Delta x, \Delta y$). This shall be checked for the measured zoom scan plane conformal to the phantom at the distance z_{M1} .
- (2) The ratio of the SAR at the second measured point (M2) to the SAR at the closest measured point (M1) at the x-y location of the measured maximum SAR value shall be at least 30 %.

If one or both of the above criteria are not met, the zoom scan measurement shall be repeated using a finer resolution. New horizontal and vertical grid steps shall be determined from the measured SAR distribution so that the above criteria are met. Compliance with the above two criteria shall be demonstrated for the new measured zoom scan.

3.4.2 Volume Scan Procedure

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.

3.4.3 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 drift more than 5%, the SAR will be retested.

3.4.4 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

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

- (a) Extraction of the measured data (grid and values) from the Zoom Scan
- (b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
- (c) Generation of a high-resolution mesh within the measured volume
- (d) Interpolation of all measured values from the measurement grid to the high-resolution grid
- (e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
- (f) Calculation of the averaged SAR within masses of 1g and 10g

3.4.5 SAR Averaged Methods

In DASY, the interpolation and extrapolation are both based on the modified Quadratic Shepard's method. The interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5 mm.

4. SAR Measurement Evaluation

4.1 EUT Configuration and Setting

<Connections between EUT and System Simulator>

For WWAN SAR testing, the EUT was linked and controlled by base station emulator. Communication between the EUT and the emulator was established by air link. The distance between the EUT and the communicating antenna of the emulator is larger than 50 cm and the output power radiated from the emulator antenna is at least 30 dB smaller than the output power of EUT. The EUT was set from the emulator to radiate maximum output power during SAR testing.

<Considerations Related to WCDMA for Setup and Testing>

Handsets with Release 5 HSDPA

The 3G SAR test reduction procedure is applied to HSDPA body-worn configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for HSDPA using the HSDPA body SAR procedures in the “Release 5 HSDPA Data Devices”, for the highest reported SAR body-worn exposure configuration in 12.2 kbps RMC. Handsets with both HSDPA and HSUPA are tested according to Release 6 HSPA test procedures.

Handsets with Release 6 HSUPA

The 3G SAR test reduction procedure is applied to HSPA (HSUPA/HSDPA with RMC) body-worn configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for HSPA using the HSPA body SAR procedures in the “Release 6 HSPA Data Devices”, for the highest reported body-worn exposure SAR configuration in 12.2 kbps RMC. When VOIP is applicable for next to the ear head exposure in HSPA, the 3G SAR test reduction procedure is applied to HSPA with 12.2 kbps RMC as the primary mode; otherwise, the same HSPA configuration used for body-worn measurements is tested for next to the ear head exposure.

Release 5 HSDPA Data Devices

The 3G SAR test reduction procedure is applied to body SAR with 12.2 kbps RMC as the primary mode. Otherwise, body SAR for HSDPA is measured using an FRC with H-Set 1 in Sub-test 1 and a 12.2 kbps RMC configured in Test Loop Mode 1, for the highest reported SAR configuration in 12.2 kbps RMC without HSDPA. HSDPA is configured according to the applicable UE category of a test device. The number of HS-DSCH / HS-PDSCHs, HARQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the H-set. To maintain a consistent test configuration and stable transmission conditions, QPSK is used in the H-set for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 4 ms and a CQI repetition factor of 2 to maintain a constant rate of active CQI slots. DPCCH and DPDCH gain factors (β_c , β_d), and HS-DPCCH power offset parameters (Δ_{ACK} , Δ_{NACK} , Δ_{CQI}) are set according to values indicated in below. The CQI value is determined by the UE category, transport block size, number of HS-PDSCHs and modulation used in the H-set.

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Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	$\beta_{HS}^{(1)(2)}$	CM ⁽³⁾ (dB)	MPR ⁽³⁾ (dB)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 ⁽⁴⁾	15/15 ⁽⁴⁾	64	12/15 ⁽⁴⁾	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note 1: Δ_{ACK} , Δ_{NACK} and $\Delta_{CQI} = 30/15$ with $\beta_{HS} = 30/15 * \beta_c$.

Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, Δ_{ACK} and $\Delta_{NACK} = 30/15$ with $\beta_{HS} = 30/15 * \beta_c$, and $\Delta_{CQI} = 24/15$ with $\beta_{HS} = 24/15 * \beta_c$.

Note 3: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{HS}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Note 4: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 11/15$ and $\beta_d = 15/15$.

Release 6 HSPA Data Devices

The 3G SAR test reduction procedure is applied to body SAR with 12.2 kbps RMC as the primary mode. Otherwise, body SAR for HSPA is measured with E-DCH Sub-test 5, using H-Set 1 and QPSK for FRC and a 12.2 kbps RMC configured in Test Loop Mode 1 and power control algorithm 2, according to the highest reported body SAR configuration in 12.2 kbps RMC without HSPA. When VOIP applies to head exposure, the 3G SAR test reduction procedure is applied with 12.2 kbps RMC as the primary mode. Otherwise, the same HSPA configuration used for body SAR measurements are applied to head exposure testing. Due to inner loop power control requirements in HSPA, a communication test set is required for output power and SAR tests. The 12.2 kbps RMC, FRC H-set 1 and E-DCH configurations for HSPA are configured according to the β values indicated in below.

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	$\beta_{HS}^{(1)}$	β_{ec}	$\beta_{ed}^{(4)(5)}$	β_{ed} (SF)	β_{ed} (Codes)	CM ⁽²⁾ (dB)	MPR ⁽²⁾⁽⁶⁾ (dB)	AG ⁽⁵⁾ Index	E-TFCI
1	11/15 ⁽³⁾	15/15 ⁽³⁾	64	11/15 ⁽³⁾	22/15	209/225	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	$\beta_{ed1}: 47/15$ $\beta_{ed2}: 47/15$	4 4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15	0	-	-	5/15	5/15	47/15	4	1	1.0	0.0	12	67

Note 1: For sub-test 1 to 4, Δ_{ACK} , Δ_{NACK} and $\Delta_{CQI} = 30/15$ with $\beta_{HS} = 30/15 * \beta_c$. For sub-test 5, Δ_{ACK} , Δ_{NACK} and $\Delta_{CQI} = 5/15$ with $\beta_{HS} = 5/15 * \beta_c$.

Note 2: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{HS}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.

Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 10/15$ and $\beta_d = 15/15$.

Note 4: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.

Note 5: β_{ed} can not be set directly; it is set by Absolute Grant Value.

Note 6: For subtests 2, 3 and 4, UE may perform E-DPDCH power scaling at max power which could results in slightly smaller MPR values.

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<Considerations Related to LTE for Setup and Testing>

This device contains LTE transmitter which follows 3GPP standards, is category 3, supports both QPSK and 16QAM modulations, and supported LTE band and channel bandwidth is listed in below. The output power was tested per 3GPP TS 36.521-1 maximum transmit procedures for both QPSK and 16QAM modulation. The results please refer to section 4.6 of this report.

EUT Supported LTE Band and Channel Bandwidth						
LTE Band	BW 1.4 MHz	BW 3 MHz	BW 5 MHz	BW 10 MHz	BW 15 MHz	BW 20 MHz
2	V	V	V	V	V	V
4	V	V	V	V	V	V
5	V	V	V	V		
7			V	V	V	V
12	V	V	V	V		
13			V	V		
14			V	V		
17			V	V		
25	V	V	V	V	V	V
26	V	V	V	V	V	
30			V	V		
38			V	V	V	V
41			V	V	V	V
66	V	V	V	V	V	V

The LTE maximum power reduction (MPR) in accordance with 3GPP TS 36.101 is active all times during LTE operation. The allowed MPR for the maximum output power is specified in below.

Modulation	Channel Bandwidth / RB Configurations						LTE MPR Setting (dB)
	BW 1.4 MHz	BW 3 MHz	BW 5 MHz	BW 10 MHz	BW 15 MHz	BW 20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	1
16QAM	<= 5	<= 4	<= 8	<= 12	<= 16	<= 18	1
16QAM	> 5	> 4	> 8	> 12	> 16	> 18	2

Note: MPR is according to the standard and implemented in the circuit (mandatory).

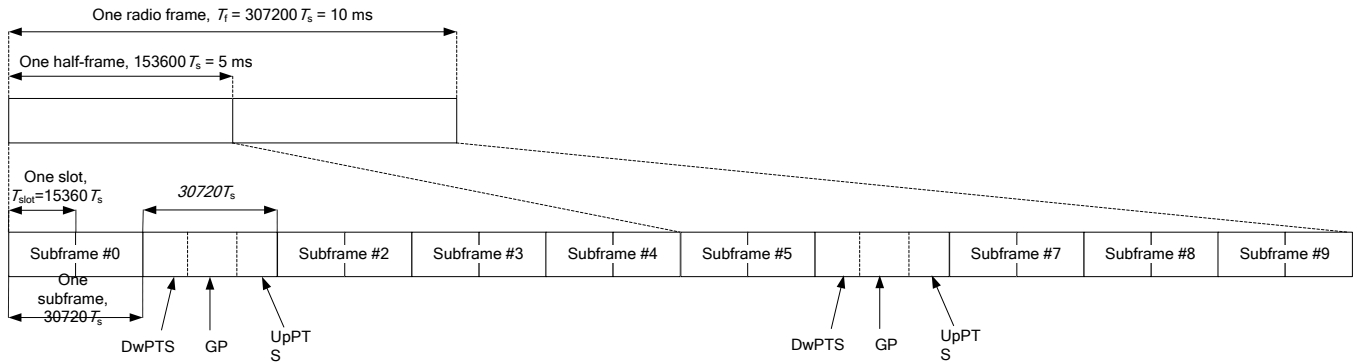
In addition, the device is compliant with additional maximum power reduction (A-MPR) requirements defined in 3GPP TS 36.101 section 6.2.4 that was disabled for all FCC compliance testing.

During LTE SAR testing, the related parameters of operating band, channel bandwidth, uplink channel number, modulation type, and RB was set in base station simulator. When the EUT has registered and communicated to base station simulator, the simulator set to make EUT transmitting the maximum radiated power.

TDD-LTE Setup Configurations

According to KDB 941225 D05, SAR testing for TDD-LTE device must be tested using a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by the defined 3GPP TDD-LTE configurations. The TDD-LTE of this device supports frame structure type 2 defined in 3GPP TS 36.211 section 4.2, and the frame structure configuration can be referred to below.

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3GPP TS 36.211 Figure 4.2-1: Frame Structure Type 2

Special Subframe Configuration	Normal Cyclic Prefix in Downlink			Extended Cyclic Prefix in Downlink		
	DwPTS	UpPTS		DwPTS	UpPTS	
		Normal Cyclic Prefix in Uplink	Extended Cyclic Prefix in Uplink		Normal Cyclic Prefix in Uplink	Extended Cyclic Prefix in Uplink
0	6592 • Ts	2192 • Ts	2560 • Ts	7680 • Ts	2192 • Ts	2560 • Ts
1	19760 • Ts			20480 • Ts		
2	21952 • Ts			23040 • Ts		
3	24144 • Ts			25600 • Ts		
4	26336 • Ts	4384 • Ts	5120 • Ts	7680 • Ts	4384 • Ts	5120 • Ts
5	6592 • Ts			20480 • Ts		
6	19760 • Ts			23040 • Ts		
7	21952 • Ts			12800 • Ts		
8	24144 • Ts	-	-	-	-	-
9	13168 • Ts			-	-	-

3GPP TS 36.211 Table 4.2-1: Configuration of Special Subframe

Uplink-Downlink Configuration	Downlink-to-Uplink Switch-Point Periodicity	Subframe Number									
		0	1	2	3	4	5	6	7	8	9
0	5 ms	D	S	U	U	U	D	S	U	U	U
1	5 ms	D	S	U	U	D	D	S	U	U	D
2	5 ms	D	S	U	D	D	D	S	U	D	D
3	10 ms	D	S	U	U	U	D	D	D	D	D
4	10 ms	D	S	U	U	D	D	D	D	D	D
5	10 ms	D	S	U	D	D	D	D	D	D	D
6	5 ms	D	S	U	U	U	D	S	U	U	D

3GPP TS 36.211 Table 4.2-2: Uplink-Downlink Configurations

The variety of different TD-LTE uplink-downlink configurations allows a network operator to allocate the network's capacity between uplink and downlink traffic to meet the needs of the network. The uplink duty cycle of these seven configurations can readily be computed and shown in below.

UL-DL Configuration	0	1	2	3	4	5	6
Highest Duty-Cycle	63.33%	43.33%	23.33%	31.67%	21.67%	11.67%	53.33%

4.2 EUT Testing Position

4.2.1 Body Exposure Conditions

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

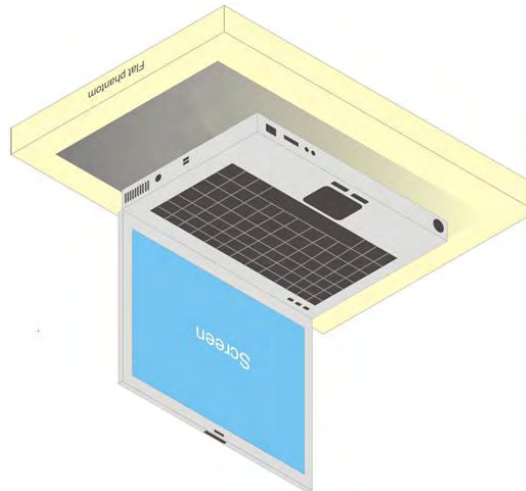


Fig-4.1 Illustration for Laptop Setup

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4.3 Tissue Verification

Frequency (MHz)	Liquid Temp. (°C)	Measured Conductivity (σ)	Measured Permittivity (ϵ_r)	Target Conductivity (σ)	Target Permittivity (ϵ_r)	Conductivity Deviation (%)	Permittivity Deviation (%)	Test Date
750	23.2	0.894	43.418	0.89	41.9	0.45	3.62	Feb. 24, 2020
750	23.4	0.892	42.799	0.89	41.9	0.22	2.15	Feb. 25, 2020
835	23.3	0.906	43.027	0.9	41.5	0.67	3.68	Feb. 23, 2020
835	23.1	0.928	41.919	0.9	41.5	3.11	1.01	Feb. 26, 2020
1750	23.3	1.326	39.152	1.37	40.1	-3.21	-2.36	Feb. 23, 2020
1750	23.1	1.324	40.863	1.37	40.1	-3.36	1.90	Feb. 26, 2020
1750	23.3	1.321	39.01	1.37	40.1	-3.58	-2.72	Apr. 07, 2020
1900	23.3	1.451	38.601	1.4	40	3.64	-3.50	Feb. 23, 2020
1900	23.1	1.453	40.451	1.4	40	3.79	1.13	Feb. 26, 2020
2300	23.3	1.73	39.008	1.67	39.5	3.59	-1.25	Feb. 23, 2020
2300	23.2	1.717	39.242	1.67	39.5	2.81	-0.65	Feb. 24, 2020
2300	23.1	1.698	39.599	1.67	39.5	1.68	0.25	Feb. 26, 2020
2600	23.2	2.034	38.245	1.96	39	3.78	-1.94	Feb. 24, 2020
2600	23.1	2.047	38.553	1.96	39	4.44	-1.15	Feb. 26, 2020

Note:

The dielectric properties of the tissue simulating liquid have been measured within 24 hours before the SAR testing and within $\pm 10\%$ of the target values. Liquid temperature during the SAR testing has kept within $\pm 2^\circ\text{C}$.

4.4 System Validation

The SAR measurement system was validated according to procedures in KDB 865664 D01. The validation status in tabulated summary is as below.

Test Date	Probe S/N	Calibration Point	Measured Conductivity (σ)	Measured Permittivity (ϵ_r)	Validation for CW			Validation for Modulation		
					Sensitivity Range	Probe Linearity	Probe Isotropy	Modulation Type	Duty Factor	PAR
Feb. 24, 2020	3898	750	0.894	43.418	Pass	Pass	Pass	N/A	N/A	N/A
Feb. 25, 2020	3971	750	0.892	42.799	Pass	Pass	Pass	N/A	N/A	N/A
Feb. 23, 2020	7472	835	0.906	43.027	Pass	Pass	Pass	N/A	N/A	N/A
Feb. 26, 2020	3971	835	0.928	41.919	Pass	Pass	Pass	N/A	N/A	N/A
Feb. 23, 2020	7472	1750	1.326	39.152	Pass	Pass	Pass	N/A	N/A	N/A
Feb. 26, 2020	3971	1750	1.324	40.863	Pass	Pass	Pass	N/A	N/A	N/A
Apr. 07, 2020	3898	1750	1.321	39.01	Pass	Pass	Pass	N/A	N/A	N/A
Feb. 23, 2020	7472	1900	1.451	38.601	Pass	Pass	Pass	N/A	N/A	N/A
Feb. 26, 2020	3971	1900	1.453	40.451	Pass	Pass	Pass	N/A	N/A	N/A
Feb. 23, 2020	7472	2300	1.73	39.008	Pass	Pass	Pass	N/A	N/A	N/A
Feb. 24, 2020	3898	2300	1.717	39.242	Pass	Pass	Pass	N/A	N/A	N/A
Feb. 26, 2020	3971	2300	1.698	39.599	Pass	Pass	Pass	N/A	N/A	N/A
Feb. 24, 2020	3898	2600	2.034	38.245	Pass	Pass	Pass	N/A	N/A	N/A
Feb. 26, 2020	3971	2600	2.047	38.553	Pass	Pass	Pass	N/A	N/A	N/A

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4.5 System Verification

The measuring result for system verification is tabulated as below.

Test Date	Frequency (MHz)	1W Target SAR-1g (W/kg)	Measured SAR-1g (W/kg)	Normalized to 1W SAR-1g (W/kg)	Deviation (%)	Dipole S/N	Probe S/N	DAE S/N
Feb. 24, 2020	750	8.56	0.393	7.86	-8.18	1013	3898	914
Feb. 25, 2020	750	8.56	0.454	9.08	6.07	1013	3971	1277
Feb. 23, 2020	835	9.61	0.462	9.24	-3.85	4d121	7472	1431
Feb. 26, 2020	835	9.61	0.469	9.38	-2.39	4d121	3971	1277
Feb. 23, 2020	1750	37.00	1.87	37.40	1.08	1055	7472	1431
Feb. 26, 2020	1750	37.00	1.85	37.00	0.00	1055	3971	1277
Apr. 07, 2020	1750	37.00	1.7	34.00	-8.11	1055	3898	914
Feb. 23, 2020	1900	40.30	1.95	39.00	-3.23	5d018	7472	1431
Feb. 26, 2020	1900	40.30	1.97	39.40	-2.23	5d018	3971	1277
Feb. 23, 2020	2300	47.90	2.37	47.40	-1.04	1092	7472	1431
Feb. 24, 2020	2300	47.90	2.3	46.00	-3.97	1092	3898	914
Feb. 26, 2020	2300	47.90	2.32	46.40	-3.13	1092	3971	1277
Feb. 24, 2020	2600	57.30	2.81	56.20	-1.92	1020	3898	914
Feb. 26, 2020	2600	57.30	2.83	56.60	-1.22	1020	3971	1277

Note:

Comparing to the reference SAR value provided by SPEAG in dipole calibration certificate, the deviation of system check results is within its specification of 10 %. The result indicates the system check can meet the variation criterion and the plots please refer to **Appendix A** of this report.

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4.6 Maximum Output Power

4.6.1 Maximum Target Conducted Power

The maximum conducted average power (Unit: dBm) including tune-up tolerance is shown as below.

Mode	WCDMA Band II	WCDMA Band IV	WCDMA Band V
RMC 12.2K	24.0	24.0	24.0
HSDPA / HSUPA / DC-HSDPA	24.0	24.0	24.0

Mode	LTE 2	LTE 4	LTE 5	LTE 7
Maximum Target Power	23.5	23.5	23.5	23.5

Mode	LTE 12	LTE 13	LTE 14	LTE 17
Maximum Target Power	23.5	23.5	23.5	23.5

Mode	LTE 25	LTE 26	LTE 30	LTE 38
Maximum Target Power	23.5	23.5	23.5	23.5

Mode	LTE 41	LTE 66
Maximum Target Power	24.0	23.5

4.6.2 Measured Conducted Power Result

The measuring conducted average power (Unit: dBm) is shown as below.

Band	WCDMA Band II			WCDMA Band IV			WCDMA Band V			3GPP MPR (dB)
Channel	9262	9400	9538	1312	1413	1513	4132	4182	4233	
Frequency (MHz)	1852.4	1880.0	1907.6	1712.4	1732.6	1752.6	826.4	836.4	846.6	
RMC 12.2K	23.71	23.99	23.82	23.99	23.86	23.77	23.43	23.32	23.35	-
HSDPA Subtest-1	23.63	23.86	23.74	23.95	23.85	23.68	23.33	23.31	23.35	0
HSDPA Subtest-2	23.41	23.54	23.39	23.71	23.59	23.53	23.10	23.08	23.07	0
HSDPA Subtest-3	23.17	23.30	23.15	23.47	23.33	23.28	22.85	22.87	22.80	0.5
HSDPA Subtest-4	22.94	23.05	22.89	23.23	23.12	23.04	22.58	22.61	22.57	0.5
DC-HSDPA Subtest-1	23.62	23.82	23.74	23.94	23.82	23.68	23.31	23.30	23.35	0
DC-HSDPA Subtest-2	23.41	23.51	23.36	23.71	23.55	23.50	23.06	23.08	23.04	0
DC-HSDPA Subtest-3	23.15	23.30	23.10	23.45	23.33	23.22	22.82	22.85	22.78	0.5
DC-HSDPA Subtest-4	22.90	23.03	22.89	23.23	23.10	22.97	22.57	22.59	22.55	0.5
HSUPA Subtest-1	23.43	23.49	23.39	23.81	23.65	23.44	23.26	22.91	22.93	0
HSUPA Subtest-2	21.45	21.55	21.47	21.89	21.71	21.71	21.15	21.19	21.15	2
HSUPA Subtest-3	22.45	22.62	22.53	22.81	22.79	22.68	22.20	22.16	22.13	1
HSUPA Subtest-4	21.74	21.88	21.77	21.95	21.86	21.76	21.48	21.46	21.43	2
HSUPA Subtest-5	23.50	23.60	23.40	23.90	23.80	23.70	23.20	23.10	23.10	0

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LTE Band 2															
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		18700	18900	19100				Channel		18675	18900	19125	
		Frequency (MHz)		1860.0	1880.0	1900.0				Frequency (MHz)		1857.5	1880.0	1902.5	
20M	QPSK	1	0	23.47	23.38	23.35	0	15M	QPSK	1	0	23.46	23.36	23.32	0
		1	50	23.46	23.35	23.33	0			1	37	23.40	23.27	23.25	0
		1	99	23.45	23.31	23.33	0			1	74	23.37	23.28	23.33	0
		50	0	22.47	22.38	22.35	1			36	0	22.44	22.36	22.32	1
		50	25	22.45	22.36	22.31	1			36	19	22.41	22.30	22.27	1
		50	50	22.40	22.30	22.29	1			36	39	22.35	22.27	22.19	1
		100	0	22.42	22.33	22.31	1			75	0	22.32	22.27	22.24	1
	16QAM	1	0	22.44	22.35	22.32	1		16QAM	1	0	22.40	22.29	22.25	1
		1	50	22.43	22.37	22.30	1			1	37	22.33	22.28	22.21	1
		1	99	22.33	22.24	22.21	1			1	74	22.31	22.20	22.17	1
		50	0	20.96	20.88	20.80	2			36	0	20.88	20.87	20.80	2
		50	25	21.07	20.98	20.95	2			36	19	21.05	20.93	20.91	2
		50	50	21.09	21.07	20.95	2			36	39	21.01	20.98	20.88	2
		100	0	21.12	21.02	20.96	2			75	0	21.05	20.92	20.87	2
10M	QPSK	1	0	23.28	23.24	23.21	0	5M	QPSK	1	0	23.39	23.33	23.12	0
		1	24	23.31	23.26	23.24	0			1	12	23.38	23.29	23.15	0
		1	49	23.40	23.22	23.24	0			1	24	23.29	23.22	23.11	0
		25	0	22.40	22.26	22.30	1			12	0	22.33	22.36	22.19	1
		25	12	22.23	22.20	22.19	1			12	6	22.27	22.20	22.07	1
		25	25	22.21	22.08	22.14	1			12	13	22.22	22.07	22.05	1
		50	0	22.27	22.25	22.20	1			25	0	22.38	22.23	22.05	1
	16QAM	1	0	22.31	22.33	22.13	1		16QAM	1	0	22.37	22.22	22.28	1
		1	24	22.22	22.26	22.09	1			1	12	22.26	22.18	22.17	1
		1	49	22.24	22.06	22.17	1			1	24	22.16	22.05	22.09	1
		25	0	20.84	20.78	20.60	2			12	0	20.90	20.86	20.62	2
		25	12	20.92	20.83	20.85	2			12	6	20.97	20.79	20.86	2
		25	25	20.92	20.98	20.81	2			12	13	20.98	21.01	20.75	2
		50	0	20.96	20.91	20.83	2			25	0	20.95	20.99	20.82	2
3M	QPSK	1	0	23.26	23.29	23.26	0	1.4M	QPSK	1	0	23.34	23.29	23.29	0
		1	7	23.31	23.24	23.18	0			1	2	23.24	23.29	23.15	0
		1	14	23.28	23.10	23.22	0			1	5	23.40	23.15	23.16	0
		8	0	22.36	22.31	22.17	1			3	0	23.36	23.16	23.21	0
		8	3	22.40	22.23	22.10	1			3	1	23.38	23.25	23.25	0
		8	7	22.25	22.21	22.19	1			3	3	23.17	23.19	23.12	0
		15	0	22.25	22.14	22.16	1			6	0	22.32	22.13	22.25	1
	16QAM	1	0	22.41	22.24	22.19	1		16QAM	1	0	22.31	22.26	22.27	1
		1	7	22.20	22.23	22.16	1			1	2	22.29	22.28	22.11	1
		1	14	22.25	22.20	22.10	1			1	5	22.29	22.11	22.16	1
		8	0	20.83	20.73	20.68	2			3	0	21.79	21.68	21.67	1
		8	3	20.90	20.94	20.79	2			3	1	21.98	21.75	21.89	1
		8	7	21.03	21.06	20.76	2			3	3	21.98	21.94	21.87	1
		15	0	21.05	20.88	20.86	2			6	0	20.97	20.88	20.88	2

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LTE Band 4															
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		20050	20175	20300				Channel		20025	20175	20325	
		Frequency (MHz)		1720.0	1732.5	1745.0				Frequency (MHz)		1717.5	1732.5	1747.5	
20M	QPSK	1	0	23.46	23.41	23.32	0	15M	QPSK	1	0	23.39	23.20	23.11	0
		1	50	23.40	23.36	23.29	0			1	37	23.21	23.26	23.19	0
		1	99	23.29	23.25	23.20	0			1	74	23.23	23.08	23.05	0
		50	0	22.49	22.45	22.40	1			36	0	22.50	22.34	22.26	1
		50	25	22.44	22.40	22.35	1			36	19	22.24	22.30	22.26	1
		50	50	22.34	22.31	22.27	1			36	39	22.20	22.20	22.06	1
		100	0	22.46	22.41	22.32	1			75	0	22.39	22.39	22.28	1
	16QAM	1	0	22.47	22.42	22.33	1		16QAM	1	0	22.32	22.36	22.23	1
		1	50	22.36	22.35	22.24	1			1	37	22.32	22.26	22.22	1
		1	99	22.19	22.14	22.05	1			1	74	22.01	22.04	21.94	1
		50	0	21.21	21.19	21.09	2			36	0	21.12	21.10	20.90	2
		50	25	21.08	21.03	20.94	2			36	19	20.86	20.92	20.76	2
		50	50	20.99	20.92	20.90	2			36	39	20.79	20.70	20.70	2
		100	0	21.11	21.03	20.97	2			75	0	21.01	20.84	20.89	2
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		20000	20175	20350				Channel		19975	20175	20375	
		Frequency (MHz)		1715.0	1732.5	1750.0				Frequency (MHz)		1712.5	1732.5	1752.5	
10M	QPSK	1	0	23.36	23.34	23.11	0	5M	QPSK	1	0	23.38	23.22	23.13	0
		1	24	23.20	23.27	23.27	0			1	12	23.25	23.27	23.09	0
		1	49	23.09	23.07	23.08	0			1	24	23.11	23.08	22.92	0
		25	0	22.39	22.31	22.31	1			12	0	22.42	22.40	22.15	1
		25	12	22.31	22.35	22.19	1			12	6	22.37	22.27	22.08	1
		25	25	22.23	22.09	22.19	1			12	13	22.12	22.30	22.16	1
		50	0	22.42	22.23	22.13	1			25	0	22.31	22.26	22.18	1
	16QAM	1	0	22.24	22.24	22.33	1		16QAM	1	0	22.27	22.21	22.17	1
		1	24	22.29	22.23	22.09	1			1	12	22.21	22.18	22.11	1
		1	49	22.18	22.08	22.00	1			1	24	22.05	22.13	22.02	1
		25	0	21.15	20.99	20.90	2			12	0	21.00	21.09	20.91	2
		25	12	20.85	20.82	20.73	2			12	6	21.02	20.81	20.85	2
		25	25	20.76	20.75	20.84	2			12	13	20.90	20.83	20.72	2
		50	0	21.05	21.00	20.81	2			25	0	21.06	20.93	20.84	2
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		19965	20175	20385				Channel		19957	20175	20393	
		Frequency (MHz)		1711.5	1732.5	1753.5				Frequency (MHz)		1710.7	1732.5	1754.3	
3M	QPSK	1	0	23.23	23.32	23.24	0	1.4M	QPSK	1	0	23.33	23.27	23.19	0
		1	7	23.29	23.15	23.20	0			1	2	23.28	23.27	23.22	0
		1	14	23.17	23.19	23.20	0			1	5	23.21	23.16	23.07	0
		8	0	22.49	22.44	22.23	1			3	0	23.38	23.43	23.29	0
		8	3	22.34	22.32	22.30	1			3	1	23.31	23.27	23.30	0
		8	7	22.15	22.11	22.24	1			3	3	23.21	23.17	23.09	0
		15	0	22.33	22.28	22.24	1			6	0	22.27	22.20	22.21	1
	16QAM	1	0	22.33	22.28	22.24	1		16QAM	1	0	22.29	22.29	22.30	1
		1	7	22.23	22.22	22.04	1			1	2	22.25	22.17	22.06	1
		1	14	22.07	22.01	21.92	1			1	5	22.01	21.96	21.96	1
		8	0	21.13	21.02	20.96	2			3	0	22.09	22.09	21.87	1
		8	3	20.90	20.94	20.82	2			3	1	21.88	21.98	21.77	1
		8	7	20.84	20.72	20.82	2			3	3	21.96	21.87	21.74	1
		15	0	21.01	20.88	20.81	2			6	0	20.95	20.89	20.91	2

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LTE Band 5															
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		20450	20525	20600				Channel		20425	20525	20625	
		Frequency (MHz)		829.0	836.5	844.0				Frequency (MHz)		826.5	836.5	846.5	
10M	QPSK	1	0	22.97	22.91	22.77	0	5M	QPSK	1	0	22.90	22.89	22.67	0
		1	24	22.86	22.75	22.67	0			1	12	22.76	22.70	22.63	0
		1	49	22.90	22.82	22.72	0			1	24	22.83	22.74	22.63	0
		25	0	21.95	21.89	21.75	1			12	0	21.87	21.86	21.74	1
		25	12	21.88	21.83	21.70	1			12	6	21.85	21.77	21.65	1
		25	25	21.86	21.81	21.68	1			12	13	21.79	21.78	21.61	1
	16QAM	50	0	21.90	21.84	21.75	1		25	0	21.83	21.83	21.73	1	
		1	0	21.93	21.87	21.73	1		16QAM	1	0	21.90	21.81	21.73	1
		1	24	21.86	21.80	21.71	1			1	12	21.78	21.74	21.65	1
		1	49	21.85	21.80	21.70	1			1	24	21.77	21.74	21.66	1
		25	0	20.59	20.53	20.39	2			12	0	20.57	20.44	20.37	2
		25	12	20.57	20.51	20.39	2			12	6	20.48	20.51	20.29	2
25	25	20.56	20.49	20.37	2	12	13	20.49		20.42	20.28	2			
50	0	20.58	20.53	20.35	2	25	0	20.50	20.45	20.35	2				
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		20415	20525	20635				Channel		20407	20525	20643	
		Frequency (MHz)		825.5	836.5	847.5				Frequency (MHz)		824.7	836.5	848.3	
3M	QPSK	1	0	22.74	22.83	22.64	0	1.4M	QPSK	1	0	22.88	22.75	22.65	0
		1	7	22.81	22.70	22.51	0			1	2	22.80	22.60	22.60	0
		1	14	22.76	22.65	22.60	0			1	5	22.70	22.61	22.54	0
		8	0	21.90	21.80	21.68	1			3	0	22.72	22.81	22.69	0
		8	3	21.78	21.64	21.57	1			3	1	22.83	22.59	22.64	0
		8	7	21.78	21.65	21.49	1			3	3	22.72	22.65	22.63	0
	16QAM	15	0	21.84	21.70	21.66	1		16QAM	6	0	21.69	21.64	21.68	1
		1	0	21.80	21.72	21.66	1			1	0	21.75	21.78	21.63	1
		1	7	21.70	21.69	21.52	1			1	2	21.76	21.74	21.47	1
		1	14	21.64	21.72	21.48	1			1	5	21.79	21.61	21.62	1
		8	0	20.45	20.41	20.33	2			3	0	21.51	21.39	21.33	1
		8	3	20.43	20.48	20.26	2			3	1	21.39	21.50	21.19	1
8	7	20.37	20.29	20.33	2	3	3	21.35	21.45	21.15	1				
15	0	20.50	20.41	20.21	2	6	0	20.55	20.32	20.14	2				
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		20800	21100	21400				Channel		20775	21100	21425	
		Frequency (MHz)		2505.0	2535.0	2565.0				Frequency (MHz)		2502.5	2535.0	2567.5	
20M	QPSK	1	0	23.05	23.27	23.28	0	15M	QPSK	1	0	23.04	23.26	23.18	0
		1	50	22.91	23.12	23.15	0			1	37	22.81	23.11	23.08	0
		1	99	22.68	22.90	22.91	0			1	74	22.68	22.88	22.87	0
		50	0	22.05	22.30	22.31	1			36	0	22.02	22.20	22.24	1
		50	25	22.00	22.22	22.23	1			36	19	22.00	22.17	22.20	1
		50	50	22.04	22.24	22.28	1			36	39	21.96	22.14	22.20	1
	16QAM	100	0	22.03	22.28	22.29	1		16QAM	75	0	22.03	22.21	22.24	1
		1	0	22.12	22.34	22.35	1			1	0	22.04	22.27	22.30	1
		1	24	21.77	21.95	22.00	1			1	12	21.75	21.97	21.93	1
		1	49	21.64	21.84	21.80	1			1	24	21.56	21.85	21.86	1
		25	0	20.63	20.88	20.85	2			12	0	20.60	20.83	20.87	2
		25	12	20.50	20.73	20.73	2			12	6	20.51	20.81	20.73	2
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		20800	21100	21400				Channel		20775	21100	21425	
		Frequency													

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LTE Band 12															
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		23060	23095	23130				Channel		23035	23095	23155	
		Frequency (MHz)		704.0	707.5	711.0				Frequency (MHz)		701.5	707.5	713.5	
10M	QPSK	1	0	22.89	22.96	22.97	0	5M	QPSK	1	0	22.89	22.92	22.94	0
		1	24	22.74	22.82	22.84	0			1	12	22.71	22.76	22.74	0
		1	49	22.71	22.77	22.78	0			1	24	22.70	22.77	22.78	0
		25	0	21.80	21.86	21.87	1			12	0	21.73	21.80	21.78	1
		25	12	21.72	21.76	21.80	1			12	6	21.65	21.70	21.77	1
		25	25	21.69	21.72	21.75	1			12	13	21.64	21.67	21.71	1
		50	0	21.65	21.75	21.76	1			25	0	21.57	21.65	21.74	1
	16QAM	1	0	21.89	21.96	21.97	1		16QAM	1	0	21.89	21.95	21.87	1
		1	24	21.82	21.88	21.91	1			1	12	21.72	21.87	21.86	1
		1	49	21.67	21.74	21.75	1			1	24	21.59	21.71	21.65	1
		25	0	20.52	20.57	20.60	2			12	0	20.50	20.53	20.58	2
		25	12	20.50	20.52	20.53	2			12	6	20.43	20.46	20.53	2
		25	25	20.39	20.46	20.47	2			12	13	20.33	20.45	20.40	2
		50	0	20.35	20.42	20.47	2			25	0	20.28	20.37	20.41	2
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		23025	23095	23165				Channel		23017	23095	23173	
		Frequency (MHz)		700.5	707.5	714.5				Frequency (MHz)		699.7	707.5	715.3	
3M	QPSK	1	0	22.82	22.95	22.94	0	1.4M	QPSK	1	0	22.77	22.81	22.87	0
		1	7	22.72	22.81	22.80	0			1	2	22.63	22.75	22.63	0
		1	14	22.65	22.68	22.78	0			1	5	22.56	22.62	22.73	0
		8	0	21.74	21.78	21.83	1			3	0	22.63	22.70	22.64	0
		8	3	21.62	21.72	21.76	1			3	1	22.50	22.61	22.67	0
		8	7	21.61	21.69	21.70	1			3	3	22.49	22.68	22.58	0
		15	0	21.65	21.72	21.67	1			6	0	21.52	21.61	21.66	1
	16QAM	1	0	21.81	21.93	21.94	1		16QAM	1	0	21.74	21.82	21.89	1
		1	7	21.73	21.81	21.83	1			1	2	21.78	21.64	21.89	1
		1	14	21.64	21.71	21.65	1			1	5	21.57	21.59	21.67	1
		8	0	20.42	20.50	20.54	2			3	0	21.45	21.51	21.47	1
		8	3	20.49	20.46	20.50	2			3	1	21.38	21.41	21.47	1
		8	7	20.32	20.39	20.40	2			3	3	21.33	21.32	21.41	1
		15	0	20.31	20.38	20.41	2			6	0	20.24	20.41	20.38	2

LTE Band 13															
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel			23230					Channel		23205	23230	23225	
		Frequency (MHz)			782.0					Frequency (MHz)		779.5	782.0	784.5	
10M	QPSK	1	0		22.96		0	5M	QPSK	1	0	22.79	22.95	22.94	0
		1	24		22.94		0			1	12	22.74	22.91	22.89	0
		1	49		22.93		0			1	24	22.78	22.94	22.91	0
		25	0		21.93		1			12	0	21.66	21.84	21.83	1
		25	12		21.92		1			12	6	21.67	21.83	21.83	1
		25	25		21.91		1			12	13	21.68	21.85	21.76	1
		50	0		21.95		1			25	0	21.70	21.84	21.77	1
	16QAM	1	0		21.75		1		16QAM	1	0	21.77	21.95	21.94	1
		1	24		21.92		1			1	12	21.75	21.93	21.89	1
		1	49		21.97		1			1	24	21.69	21.85	21.84	1
		25	0		20.43		2			12	0	20.40	20.56	20.50	2
		25	12		20.51		2			12	6	20.36	20.51	20.50	2
		25	25		20.57		2			12	13	20.34	20.50	20.42	2
		50	0		20.52		2			25	0	20.33	20.51	20.46	2

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LTE Band 14																			
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)				
		Channel								23330	Channel					23305	23330	23355	
		Frequency (MHz)								793.0	Frequency (MHz)					790.5	793	795.5	
10M	QPSK	1	0		22.98		0	5M	QPSK	1	0	22.96	22.94	22.92	0				
		1	24		22.89		0			1	12	22.93	22.90	22.87	0				
		1	49		22.87		0			1	24	22.95	22.93	22.92	0				
		25	0		21.88		1			12	0	21.91	21.88	21.86	1				
		25	12		21.84		1			12	6	21.94	21.90	21.85	1				
		25	25		21.85		1			12	13	21.77	21.75	21.71	1				
		50	0		21.84		1			25	0	21.90	21.86	21.80	1				
	16QAM	1	0		21.98		1		16QAM	1	0	21.94	21.92	21.89	1				
		1	24		21.81		1			1	12	21.95	21.94	21.90	1				
		1	49		21.86		1			1	24	21.99	21.97	21.95	1				
		25	0		20.52		2			12	0	20.57	20.51	20.49	2				
		25	12		20.54		2			12	6	20.63	20.61	20.60	2				
		25	25		20.49		2			12	13	20.51	20.49	20.47	2				
		50	0		20.53		2			25	0	20.55	20.52	20.51	2				

LTE Band 17															
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		23780	23790	23800				Channel		23755	23790	23825	
		Frequency (MHz)		709.0	710.0	711.0				Frequency (MHz)		706.5	710.0	713.5	
10M	QPSK	1	0	23.11	23.09	23.15	0	5M	QPSK	1	0	23.06	23.00	23.05	0
		1	24	23.10	23.08	23.14	0			1	12	23.03	23.05	23.13	0
		1	49	22.96	22.94	23.00	0			1	24	22.91	22.86	22.93	0
		25	0	22.12	22.10	22.16	1			12	0	22.04	22.00	22.14	1
		25	12	22.07	22.05	22.11	1			12	6	22.05	22.03	22.02	1
		25	25	21.89	21.87	21.93	1			12	13	21.80	21.80	21.92	1
		50	0	22.04	22.02	22.08	1			25	0	22.04	22.02	21.98	1
	16QAM	1	0	22.11	22.49	22.10	1		16QAM	1	0	21.96	21.99	22.03	1
		1	24	22.09	22.47	22.14	1			1	12	22.00	22.00	22.02	1
		1	49	21.95	22.32	21.97	1			1	24	21.82	21.85	21.87	1
		25	0	21.07	21.20	21.08	2			12	0	21.08	21.01	21.10	2
		25	12	21.07	21.14	21.08	2			12	6	21.04	20.93	20.99	2
		25	25	20.85	20.97	20.91	2			12	13	20.72	20.78	20.79	2
		50	0	20.96	21.09	21.01	2			25	0	21.00	20.93	21.05	2

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LTE Band 25															
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		26140	26365	26590				Channel		26115	26365	26615	
		Frequency (MHz)		1860.0	1882.5	1905.0				Frequency (MHz)		1857.5	1882.5	1907.5	
20M	QPSK	1	0	23.23	23.28	23.07	0	15M	QPSK	1	0	23.21	23.23	22.99	0
		1	50	23.22	23.27	23.06	0			1	37	23.19	23.25	23.01	0
		1	99	23.09	23.14	22.93	0			1	74	23.01	23.09	22.92	0
		50	0	22.28	22.33	22.12	1			36	0	22.25	22.31	22.02	1
		50	25	22.26	22.31	22.10	1			36	19	22.19	22.21	22.09	1
		50	50	22.15	22.20	21.99	1			36	39	22.15	22.13	21.99	1
		100	0	22.32	22.37	22.16	1			75	0	22.28	22.32	22.15	1
	16QAM	1	0	22.21	22.48	22.04	1		16QAM	1	0	22.08	22.09	21.91	1
		1	50	22.14	22.46	22.06	1			1	37	22.10	22.21	22.00	1
		1	99	22.04	22.48	21.86	1			1	74	22.03	22.01	21.89	1
		50	0	21.26	21.38	21.07	2			36	0	21.16	21.24	21.02	2
		50	25	21.25	21.37	21.01	2			36	19	21.11	21.16	20.93	2
		50	50	21.10	21.27	20.94	2			36	39	21.03	21.03	20.93	2
		100	0	21.22	21.43	21.13	2			75	0	21.24	21.27	21.00	2
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		26090	26365	26640				Channel		26065	26365	26665	
		Frequency (MHz)		2855.0	1882.5	1910.0				Frequency (MHz)		1852.5	1882.5	1912.5	
10M	QPSK	1	0	23.06	23.16	22.91	0	5M	QPSK	1	0	23.18	23.16	22.92	0
		1	24	23.00	23.24	23.01	0			1	12	23.11	23.19	22.82	0
		1	49	23.01	23.02	22.78	0			1	24	22.94	22.93	22.78	0
		25	0	22.18	22.21	22.01	1			12	0	22.22	22.10	21.86	1
		25	12	22.08	22.29	21.97	1			12	6	22.12	22.12	21.91	1
		25	25	21.92	22.11	21.81	1			12	13	22.02	22.09	21.80	1
		50	0	22.26	22.27	22.01	1			25	0	22.16	22.19	21.91	1
	16QAM	1	0	22.11	21.99	21.76	1		16QAM	1	0	22.01	22.04	21.94	1
		1	24	22.15	22.21	21.96	1			1	12	22.00	22.19	21.93	1
		1	49	21.83	22.09	21.74	1			1	24	21.90	22.00	21.62	1
		25	0	21.25	21.20	20.90	2			12	0	21.14	21.06	20.95	2
		25	12	21.08	21.10	20.99	2			12	6	20.99	21.15	20.92	2
		25	25	21.03	21.04	20.92	2			12	13	20.94	20.99	20.83	2
		50	0	21.14	21.27	20.99	2			25	0	21.02	21.28	21.05	2
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		26055	26365	26675				Channel		26047	26365	26683	
		Frequency (MHz)		1851.5	1882.5	1913.5				Frequency (MHz)		1850.7	1882.5	1914.3	
3M	QPSK	1	0	23.11	23.15	22.99	0	1.4M	QPSK	1	0	23.12	23.17	23.02	0
		1	7	23.14	23.11	22.99	0			1	2	23.10	23.22	22.91	0
		1	14	22.95	22.94	22.83	0			1	5	22.94	23.07	22.82	0
		8	0	22.22	22.19	21.93	1			3	0	23.11	23.12	22.92	0
		8	3	22.19	22.09	21.97	1			3	1	23.07	23.14	23.02	0
		8	7	22.10	22.03	21.91	1			3	3	23.08	23.12	22.91	0
		15	0	22.25	22.31	21.98	1			6	0	22.31	22.22	21.98	1
	16QAM	1	0	22.05	22.16	21.84	1		16QAM	1	0	21.97	22.07	21.87	1
		1	7	21.95	22.22	21.84	1			1	2	22.09	22.16	21.88	1
		1	14	21.87	21.87	21.78	1			1	5	21.91	22.04	21.71	1
		8	0	21.14	21.13	20.95	2			3	0	22.07	22.11	21.93	1
		8	3	21.01	21.20	20.93	2			3	1	22.05	22.01	21.91	1
		8	7	20.99	21.07	20.90	2			3	3	22.00	22.16	21.78	1
		15	0	21.06	21.16	21.01	2			6	0	21.14	21.16	20.95	2

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LTE Band 26															
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		26765	26865	26965				Channel		26740	26865	26990	
		Frequency (MHz)		821.5	831.5	841.5				Frequency (MHz)		819.0	831.5	844.0	
15M	QPSK	1	0	22.70	22.86	23.19	0	10M	QPSK	1	0	22.68	22.84	23.10	0
		1	37	22.69	22.84	23.18	0			1	24	22.61	22.80	23.08	0
		1	74	22.66	22.82	23.16	0			1	49	22.59	22.73	23.11	0
		36	0	21.78	21.95	22.27	1			25	0	21.78	21.94	22.23	1
		36	19	21.73	21.93	22.25	1			25	12	21.71	21.84	22.22	1
		36	39	21.75	21.90	22.24	1			25	25	21.71	21.82	22.21	1
		75	0	21.94	22.07	22.40	1			50	0	21.87	21.99	22.34	1
	16QAM	1	0	21.99	22.17	22.48	1		16QAM	1	0	21.89	22.12	22.39	1
		1	37	21.99	22.14	22.47	1			1	24	21.92	22.07	22.46	1
		1	74	21.95	22.13	22.44	1			1	49	21.90	22.04	22.41	1
		36	0	20.92	21.10	21.40	2			25	0	20.85	21.10	21.37	2
		36	19	20.91	21.12	21.45	2			25	12	20.81	21.09	21.40	2
		36	39	20.93	21.14	21.48	2			25	25	20.93	21.06	21.40	2
		75	0	20.95	21.16	21.47	2			50	0	20.85	21.10	21.42	2
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		26715	26865	27015				Channel		26705	26865	27025	
		Frequency (MHz)		816.5	831.5	846.5				Frequency (MHz)		815.5	831.5	847.5	
5M	QPSK	1	0	22.61	22.70	23.08	0	3M	QPSK	1	0	22.56	22.81	22.95	0
		1	12	22.60	22.59	23.08	0			1	7	22.63	22.80	23.00	0
		1	24	22.45	22.69	23.10	0			1	14	22.62	22.63	23.05	0
		12	0	21.59	21.90	22.19	1			8	0	21.70	21.83	21.93	1
		12	6	21.56	21.85	22.06	1			8	3	21.68	21.89	21.94	1
		12	13	21.54	21.82	22.18	1			8	7	21.56	21.80	22.08	1
		25	0	21.92	21.98	22.24	1			15	0	21.75	22.04	22.14	1
	16QAM	1	0	21.95	22.15	22.32	1		16QAM	1	0	21.83	22.07	22.33	1
		1	12	21.75	22.02	22.38	1			1	7	21.90	22.02	22.27	1
		1	24	21.87	22.01	22.37	1			1	14	21.91	21.95	22.29	1
		12	0	20.73	20.99	21.33	2			8	0	20.77	20.97	21.16	2
		12	6	20.77	21.05	21.30	2			8	3	20.75	20.92	21.30	2
		12	13	20.77	21.05	21.42	2			8	7	20.91	21.01	21.37	2
		25	0	20.78	20.98	21.37	2			15	0	20.73	21.02	21.33	2
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)								
		Channel		26697	26865	27033									
		Frequency (MHz)		814.7	831.5	848.3									
1.4M	QPSK	1	0	22.59	22.76	23.01	0								
		1	2	22.60	22.73	23.10	0								
		1	5	22.58	22.80	23.09	0								
		3	0	22.66	22.89	23.10	0								
		3	1	22.63	22.75	23.02	0								
		3	3	22.54	22.81	23.13	0								
		6	0	21.76	21.91	22.21	1								
	16QAM	1	0	21.92	22.05	22.40	1								
		1	2	21.87	22.06	22.40	1								
		1	5	21.78	22.02	22.33	1								
		3	0	21.71	22.06	22.30	1								
		3	1	21.72	22.01	22.26	1								
		3	3	21.86	21.99	22.38	1								
		6	0	20.84	21.01	21.37	2								

LTE Band 30															
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		27710	27710	27710				Channel		27685	27710	27735	
		Frequency (MHz)		2310.0	2310.0	2310.0				Frequency (MHz)		2307.5	2310.0	2312.5	
10M	QPSK	1	0		22.49		0	5M	QPSK	1	0	22.21	22.41	22.30	0
		1	24		22.44		0			1	12	22.39	22.38	22.47	0
		1	49		22.39		0			1	24	22.37	22.34	22.35	0
		25	0		21.44		1			12	0	21.53	21.57	21.56	1
		25	12		21.40		1			12	6	21.48	21.46	21.53	1
		25	25		21.39		1			12	13	21.39	21.30	21.31	1
		50	0		21.43		1			25	0	21.49	21.49	21.41	1
	16QAM	1	0		21.92		1		16QAM	1	0	21.48	21.53	21.56	1
		1	24		21.74		1			1	12	21.36	21.35	21.34	1
		1	49		21.77		1			1	24	21.31	21.20	21.28	1
		25	0		20.54		2			12	0	20.49	20.58	20.50	2
		25	12		20.51		2			12	6	20.35	20.46	20.46	2
		25	25		20.37		2			12	13	20.27	20.22	20.31	2
		50	0		20.44		2			25	0	20.44	20.33	20.42	2

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LTE Band 38															
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		37850	38000	38150				Channel		37825	38000	38175	
		Frequency (MHz)		2580	2595	2610				Frequency (MHz)		2577.5	2595	2612.5	
20M	QPSK	1	0	23.47	23.43	23.49	0	15M	QPSK	1	0	23.44	23.37	23.46	0
		1	50	23.43	23.37	23.47	0			1	37	23.41	23.28	23.41	0
		1	99	23.42	23.39	23.41	0			1	74	23.43	23.29	23.41	0
		50	0	22.45	22.44	22.47	1			36	0	22.33	22.37	22.42	1
		50	25	22.39	22.42	22.42	1			36	19	22.39	22.36	22.44	1
		50	50	22.37	22.46	22.46	1			36	39	22.48	22.43	22.40	1
		100	0	22.45	22.39	22.47	1			75	0	22.47	22.39	22.45	1
	16QAM	1	0	22.41	22.36	22.42	1		16QAM	1	0	22.45	22.37	22.39	1
		1	50	22.45	22.32	22.44	1			1	37	22.38	22.28	22.31	1
		1	99	22.41	22.34	22.49	1			1	74	22.41	22.24	22.43	1
		50	0	21.47	21.41	21.44	2			36	0	21.48	21.32	21.46	2
		50	25	21.44	21.39	21.42	2			36	19	21.44	21.25	21.45	2
		50	50	21.46	21.40	21.44	2			36	39	21.41	21.31	21.45	2
		100	0	21.41	21.42	21.43	2			75	0	21.49	21.35	21.49	2
10M	QPSK	1	0	23.43	23.22	23.35	0	5M	QPSK	1	0	23.47	23.31	23.39	0
		1	24	23.41	23.35	23.33	0			1	12	23.39	23.22	23.35	0
		1	49	23.49	23.21	23.49	0			1	24	23.47	23.25	23.18	0
		25	0	22.39	22.33	22.43	1			12	0	22.41	22.40	22.35	1
		25	12	22.41	22.24	22.41	1			12	6	22.45	22.22	22.41	1
		25	25	22.48	22.37	22.46	1			12	13	22.43	22.44	22.32	1
		50	0	22.47	22.31	22.46	1			25	0	22.40	22.28	22.44	1
	16QAM	1	0	22.40	22.13	22.34	1		16QAM	1	0	22.50	22.25	22.36	1
		1	24	22.46	22.13	22.34	1			1	12	22.47	22.17	22.17	1
		1	49	22.44	22.17	22.37	1			1	24	22.44	22.15	22.35	1
		25	0	21.36	21.21	21.36	2			12	0	21.46	21.31	21.45	2
		25	12	21.47	21.28	21.38	2			12	6	21.48	21.23	21.35	2
		25	25	21.44	21.28	21.49	2			12	13	21.43	21.23	21.37	2
		50	0	21.41	21.39	21.25	2			25	0	21.47	21.27	21.41	2

LTE Band 41																			
BW	MCS Index	RB Size	RB Offset	Low	Mid	Mid	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	Mid	Mid	High	3GPP MPR (dB)
		Channel		39750	40185	40620	41055	41490				Channel		39725	40173	40620	41068	41515	
		Frequency (MHz)		2506	2549.5	2593.0	2636.5	2680.0				Frequency (MHz)		2503.5	2548.3	2593.0	2637.8	2682.5	
20M	QPSK	1	0	23.84	23.75	23.59	23.81	23.72	0	15M	QPSK	1	0	23.78	23.75	23.52	23.74	23.66	0
		1	50	23.78	23.69	23.53	23.75	23.66	0			1	37	23.68	23.67	23.52	23.74	23.56	0
		1	99	23.80	23.71	23.55	23.77	23.68	0			1	74	23.74	23.62	23.54	23.73	23.58	0
		50	0	22.86	22.77	22.61	22.83	22.74	1			36	0	22.81	22.76	22.55	22.79	22.71	1
		50	25	22.83	22.74	22.58	22.80	22.71	1			36	19	22.78	22.65	22.53	22.78	22.65	1
		50	50	22.85	22.76	22.60	22.82	22.73	1			36	39	22.84	22.71	22.55	22.81	22.64	1
		100	0	22.83	22.74	22.58	22.80	22.71	1			75	0	22.73	22.68	22.52	22.70	22.63	1
	16QAM	1	0	22.81	22.72	22.56	22.78	22.69	1		16QAM	1	0	22.81	22.75	22.58	22.77	22.62	1
		1	50	22.69	22.60	22.44	22.66	22.57	1			1	37	22.78	22.66	22.47	22.71	22.63	1
		1	99	22.78	22.69	22.53	22.75	22.66	1			1	74	22.79	22.62	22.55	22.68	22.67	1
		50	0	21.81	21.72	21.56	21.78	21.69	2			36	0	21.77	21.68	21.56	21.75	21.72	2
		50	25	21.72	21.63	21.47	21.69	21.60	2			36	19	21.76	21.70	21.48	21.70	21.69	2
		50	50	21.79	21.70	21.54	21.76	21.67	2			36	39	21.80	21.69	21.57	21.72	21.66	2
		100	0	21.82	21.73	21.57	21.79	21.70	2			75	0	21.79	21.72	21.52	21.80	21.69	2
BW	MCS Index	RB Size	RB Offset	Low	Mid	Mid	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	Mid	Mid	High	3GPP MPR (dB)
		Channel		39700	40160	40620	41080	41540				Channel		39675	40148	40620	41093	41565	
		Frequency (MHz)		2501	2547.0	2593.0	2639.0	2685.0				Frequency (MHz)		2500.5	2545.8	2593.0	2640.3	2687.5	
10M	QPSK	1	0	23.68	23.61	23.57	23.68	23.60	0	5M	QPSK	1	0	23.72	23.59	23.42	23.69	23.54	0
		1	24	23.72	23.52	23.45	23.68	23.55	0			1	12	23.69	23.58	23.42	23.67	23.57	0
		1	49	23.69	23.63	23.38	23.68	23.54	0			1	24	23.67	23.62	23.53	23.64	23.63	0
		25	0	22.74	22.69	22.57	22.81	22.70	1			12	0	22.77	22.74	22.55	22.67	22.71	1
		25	12	22.79	22.67	22.43	22.68	22.65	1			12	6	22.73	22.64	22.53	22.67	22.56	1
		25	25	22.76	22.57	22.54	22.79	22.68	1			12	13	22.77	22.59	22.46	22.67	22.67	1
		50	0	22.74	22.63	22.53	22.78	22.53	1			25	0	22.82	22.60	22.44	22.67	22.60	1
	16QAM	1	0	22.66	22.66	22.52	22.68	22.62	1		16QAM	1	0	22.74	22.57	22.47	22.71	22.63	1
		1	24	22.74	22.61	22.40	22.61	22.60	1			1	12	22.69	22.53	22.47	22.66	22.57	1
		1	49	22.72	22.63	22.44	22.71	22.54	1			1	24	22.66	22.55	22.50	22.64	22.67	1
		25	0	21.78	21.65	21.60	21.72	21.65	2			12	0	21.78	21.66	21.53	21.74	21.64	2
		25	12	21.80	21.73	21.45	21.71	21.67	2			12	6	21.69	21.57	21.55	21.74	21.54	2
		25	25	21.75	21.58	21.57	21.77	21.67	2			12	13	21.77	21.57	21.42	21.71	21.71	2
		50	0	21.72	21.63	21.52	21.78	21.58	2			25	0	21.78	21.67	21.49	21.70	21.64	2

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LTE Band 66															
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		132072	132322	132572				Channel		132047	132322	132597	
		Frequency (MHz)		1720.0	1745.0	1770.0				Frequency (MHz)		1717.5	1745.0	1772.5	
20M	QPSK	1	0	23.47	23.36	23.28	0	15M	QPSK	1	0	23.42	23.29	23.26	0
		1	50	23.45	23.33	23.26	0			1	37	23.39	23.24	23.21	0
		1	99	23.34	23.25	23.14	0			1	74	23.28	23.18	23.14	0
		50	0	22.49	22.38	22.30	1			36	0	22.46	22.32	22.27	1
		50	25	22.38	22.29	22.19	1			36	19	22.28	22.26	22.12	1
		50	50	22.28	22.20	22.10	1			36	39	22.19	22.10	22.00	1
		100	0	22.41	22.28	22.23	1			75	0	22.36	22.19	22.23	1
	16QAM	1	0	22.49	22.38	22.30	1		16QAM	1	0	22.39	22.36	22.25	1
		1	50	22.47	22.37	22.26	1			1	37	22.43	22.29	22.19	1
		1	99	22.34	22.23	22.15	1			1	74	22.24	22.16	22.14	1
		50	0	21.48	21.35	21.30	2			36	0	21.41	21.29	21.22	2
		50	25	21.44	21.33	21.24	2			36	19	21.41	21.27	21.23	2
		50	50	21.37	21.26	21.19	2			36	39	21.37	21.21	21.13	2
		100	0	21.48	21.39	21.27	2			75	0	21.43	21.37	21.21	2
10M	QPSK	1	0	23.36	23.33	23.17	0	5M	QPSK	1	0	23.32	23.24	23.10	0
		1	24	23.34	23.19	23.10	0			1	12	23.41	23.20	23.19	0
		1	49	23.23	23.10	23.04	0			1	24	23.12	23.00	22.92	0
		25	0	22.35	22.20	22.20	1			12	0	22.33	22.13	22.11	1
		25	12	22.31	22.17	22.03	1			12	6	22.35	22.23	22.05	1
		25	25	22.13	21.97	21.99	1			12	13	22.25	22.10	21.91	1
		50	0	22.40	22.25	22.10	1			25	0	22.26	22.12	21.91	1
	16QAM	1	0	22.41	22.30	22.22	1		16QAM	1	0	22.33	22.27	22.18	1
		1	24	22.38	22.22	22.22	1			1	12	22.35	22.17	22.19	1
		1	49	22.32	22.05	22.04	1			1	24	22.23	22.04	22.03	1
		25	0	21.35	21.16	21.15	2			12	0	21.25	21.11	21.16	2
		25	12	21.38	21.17	21.04	2			12	6	21.29	21.21	21.23	2
		25	25	21.13	21.07	21.10	2			12	13	21.27	21.06	21.01	2
		50	0	21.29	21.18	21.13	2			25	0	21.28	21.27	21.08	2
3M	QPSK	1	0	23.28	23.29	23.20	0	1.4M	QPSK	1	0	23.28	23.27	23.09	0
		1	7	23.40	23.21	23.21	0			1	2	23.44	23.17	23.09	0
		1	14	23.26	23.22	23.09	0			1	5	23.10	23.21	22.94	0
		8	0	22.45	22.23	22.15	1			3	0	23.32	23.28	23.13	0
		8	3	22.31	22.07	22.06	1			3	1	23.22	23.15	23.09	0
		8	7	22.26	22.03	22.00	1			3	3	23.24	23.03	22.85	0
		15	0	22.21	22.22	22.15	1			6	0	22.26	22.15	22.15	1
	16QAM	1	0	22.47	22.18	22.12	1		16QAM	1	0	22.36	22.24	22.21	1
		1	7	22.32	22.22	22.10	1			1	2	22.35	22.28	22.09	1
		1	14	22.17	22.08	22.04	1			1	5	22.23	22.16	21.91	1
		8	0	21.41	21.27	21.25	2			3	0	22.43	22.33	22.18	1
		8	3	21.29	21.29	21.14	2			3	1	22.27	22.25	22.10	1
		8	7	21.20	21.10	20.97	2			3	3	22.16	22.15	22.02	1
		15	0	21.25	21.18	21.10	2			6	0	21.42	21.16	21.08	2

4.7 SAR Testing Results

4.7.1 SAR Test Reduction Considerations

<KDB 447498 D01, General RF Exposure Guidance>

Testing of other required channels within the operating mode of a frequency band is not required when the reported SAR for the mid-band or highest output power channel is:

- (1) ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
- (2) ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
- (3) ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

When SAR is not measured at the maximum power level allowed for production units, the measured SAR will be scaled to the maximum tune-up tolerance limit to determine compliance. The scaling factor for the tune-up power is defined as maximum tune-up limit (mW) / measured conducted power (mW). The reported SAR would be calculated by measured SAR x tune-up power scaling factor.

The SAR has been measured with highest transmission duty factor supported by the test mode tools for WLAN and/or Bluetooth. When the transmission duty factor could not achieve 100%, the reported SAR will be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up power. The scaling factor for the duty factor is defined as 100% / transmission duty cycle (%). The reported SAR would be calculated by measured SAR x tune-up power scaling factor x duty cycle scaling factor.

<KDB 941225 D01, 3G SAR Measurement Procedures>

The mode tested for SAR is referred to as the primary mode. The equivalent modes considered for SAR test reduction are denoted as secondary modes. Both primary and secondary modes must be in the same frequency band. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is $\leq 1/4$ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode.

<KDB 941225 D05, SAR Evaluation Considerations for LTE Devices>

- (1) QPSK with 1 RB and 50% RB allocation

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

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(2) QPSK with 100% RB allocation

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

(3) Higher order modulations

SAR is required only when the highest maximum output power for the configuration in the higher order modulation is $> 1/2$ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg.

(4) Other channel bandwidth

SAR is required when the highest maximum output power of the smaller channel bandwidth is $> 1/2$ dB higher than the equivalent channel configurations in the largest channel bandwidth configuration or the reported SAR of a configuration for the largest channel bandwidth is > 1.45 W/kg.

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4.7.2 SAR Results for Body Exposure Condition (Test Separation Distance is 0 mm)

Plot No.	Band	Mode	Test Position	Ch.	Sample	Max. Tune-up Power (dBm)	Measured Conducted Power (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR-1g (W/kg)	Scaled SAR-1g (W/kg)
	WCDMA II	RMC12.2K	Bottom	9400	1	24.00	23.99	1.00	0	0	0.00
	WCDMA II	RMC12.2K	Bottom	9262	1	24.00	23.71	1.07	0	0	0.00
	WCDMA II	RMC12.2K	Bottom	9538	1	24.00	23.82	1.04	0	0	0.00
	WCDMA II	RMC12.2K	Bottom	9400	2	24.00	23.99	1.00	0	0	0.00
	WCDMA II	RMC12.2K	Bottom	9400	3	24.00	23.99	1.00	0	0	0.00
	WCDMA IV	RMC12.2K	Bottom	1312	1	24.00	23.99	1.00	0	0	0.00
	WCDMA IV	RMC12.2K	Bottom	1413	1	24.00	23.86	1.03	0	0	0.00
	WCDMA IV	RMC12.2K	Bottom	1513	1	24.00	23.77	1.05	0	0	0.00
	WCDMA IV	RMC12.2K	Bottom	1312	2	24.00	23.99	1.00	0	0	0.00
	WCDMA IV	RMC12.2K	Bottom	1312	3	24.00	23.99	1.00	0	0	0.00
	WCDMA V	RMC12.2K	Bottom	4132	1	24.00	23.43	1.14	0	0	0.00
	WCDMA V	RMC12.2K	Bottom	4182	1	24.00	23.32	1.17	0	0	0.00
	WCDMA V	RMC12.2K	Bottom	4233	1	24.00	23.35	1.16	0	0	0.00
	WCDMA V	RMC12.2K	Bottom	4132	2	24.00	23.43	1.14	0	0	0.00
	WCDMA V	RMC12.2K	Bottom	4132	3	24.00	23.43	1.14	0	0	0.00

Plot No.	Band	Mode	Test Position	Ch.	RB#	RB Offset	Sample	Max. Tune-up Power (dBm)	Measured Conducted Power (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR-1g (W/kg)	Scaled SAR-1g (W/kg)
	LTE 2	QPSK20M	Bottom	18700	1	0	1	23.50	23.47	1.01	0	0	0.00
	LTE 2	QPSK20M	Bottom	18700	50	0	1	22.50	22.47	1.01	0	0	0.00
	LTE 2	QPSK20M	Bottom	18900	1	0	1	23.50	23.38	1.03	0	0	0.00
	LTE 2	QPSK20M	Bottom	19100	1	0	1	23.50	23.35	1.04	0	0	0.00
	LTE 2	QPSK20M	Bottom	18700	1	0	2	23.50	23.47	1.01	0	0	0.00
	LTE 2	QPSK20M	Bottom	18700	1	0	3	23.50	23.47	1.01	0	0	0.00
	LTE 4	QPSK20M	Bottom	20050	1	0	1	23.50	23.46	1.01	0	0	0.00
	LTE 4	QPSK20M	Bottom	20050	50	0	1	22.50	22.49	1.00	0	0	0.00
	LTE 4	QPSK20M	Bottom	20175	1	0	1	23.50	23.41	1.02	0	0	0.00
	LTE 4	QPSK20M	Bottom	20300	1	0	1	23.50	23.32	1.04	0	0	0.00
	LTE 4	QPSK20M	Bottom	20050	1	0	2	23.50	23.46	1.01	0	0	0.00
	LTE 4	QPSK20M	Bottom	20050	1	0	3	23.50	23.46	1.01	0	0	0.00
	LTE 5	QPSK10M	Bottom	20450	1	0	1	23.50	22.97	1.13	0	0	0.00
	LTE 5	QPSK10M	Bottom	20450	25	0	1	22.50	21.95	1.14	0	0	0.00
	LTE 5	QPSK10M	Bottom	20525	1	0	1	23.50	22.91	1.15	0	0	0.00
	LTE 5	QPSK10M	Bottom	20600	1	0	1	23.50	22.77	1.18	0	0	0.00
	LTE 5	QPSK10M	Bottom	20450	1	0	2	23.50	22.97	1.13	0	0	0.00
	LTE 5	QPSK10M	Bottom	20450	1	0	3	23.50	22.97	1.13	0	0	0.00
	LTE 7	QPSK20M	Bottom	21350	1	0	1	23.50	23.28	1.05	0	0	0.00
	LTE 7	QPSK20M	Bottom	21350	50	0	1	22.50	22.31	1.04	0	0	0.00
	LTE 7	QPSK20M	Bottom	20850	1	0	1	23.50	23.05	1.11	0	0	0.00
	LTE 7	QPSK20M	Bottom	21100	1	0	1	23.50	23.27	1.05	0	0	0.00
	LTE 7	QPSK20M	Bottom	21350	1	0	2	23.50	23.28	1.05	0	0	0.00
	LTE 7	QPSK20M	Bottom	21350	1	0	3	23.50	23.28	1.05	0	0	0.00
	LTE 12	QPSK10M	Bottom	23130	1	0	1	23.50	22.97	1.13	0	0	0.00
	LTE 12	QPSK10M	Bottom	23130	25	0	1	22.50	21.87	1.16	0	0	0.00
	LTE 12	QPSK10M	Bottom	23060	1	0	1	23.50	22.89	1.15	0	0	0.00
	LTE 12	QPSK10M	Bottom	23095	1	0	1	23.50	22.96	1.13	0	0	0.00
	LTE 12	QPSK10M	Bottom	23130	1	0	2	23.50	22.97	1.13	0	0	0.00
	LTE 12	QPSK10M	Bottom	23130	1	0	3	23.50	22.97	1.13	0	0	0.00
	LTE 13	QPSK10M	Bottom	23230	1	0	1	23.50	22.96	1.13	0	0	0.00
	LTE 13	QPSK10M	Bottom	23230	25	0	1	22.50	21.93	1.14	0	0	0.00
	LTE 13	QPSK10M	Bottom	23230	1	0	2	23.50	22.96	1.13	0	0	0.00
	LTE 13	QPSK10M	Bottom	23230	1	0	3	23.50	22.96	1.13	0	0	0.00
	LTE 14	QPSK10M	Bottom	23330	1	0	1	23.50	22.98	1.13	0	0	0.00
	LTE 14	QPSK10M	Bottom	23330	25	0	1	22.50	21.88	1.15	0	0	0.00
	LTE 14	QPSK10M	Bottom	23330	1	0	2	23.50	22.98	1.13	0	0	0.00
	LTE 14	QPSK10M	Bottom	23330	1	0	3	23.50	22.98	1.13	0	0	0.00

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Plot No.	Band	Mode	Test Position	Ch.	RB#	RB Offset	Sample	Max. Tune-up Power (dBm)	Measured Conducted Power (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR-1g (W/kg)	Scaled SAR-1g (W/kg)
	LTE 17	QPSK10M	Bottom	23800	1	0	1	23.50	23.15	1.08	0	0	0.00
	LTE 17	QPSK10M	Bottom	23800	25	0	1	22.50	22.16	1.08	0	0	0.00
	LTE 17	QPSK10M	Bottom	23780	1	0	1	23.50	23.11	1.09	0	0	0.00
	LTE 17	QPSK10M	Bottom	23790	1	0	1	23.50	23.09	1.10	0	0	0.00
	LTE 17	QPSK10M	Bottom	23800	1	0	2	23.50	23.15	1.08	0	0	0.00
	LTE 17	QPSK10M	Bottom	23800	1	0	3	23.50	23.15	1.08	0	0	0.00
	LTE 25	QPSK20M	Bottom	26365	1	0	1	23.50	23.28	1.05	0	0	0.00
	LTE 25	QPSK20M	Bottom	26365	50	0	1	22.50	22.33	1.04	0	0	0.00
	LTE 25	QPSK20M	Bottom	26140	1	0	1	23.50	23.23	1.06	0	0	0.00
	LTE 25	QPSK20M	Bottom	26590	1	0	1	23.50	23.07	1.10	0	0	0.00
	LTE 25	QPSK20M	Bottom	26365	1	0	2	23.50	23.28	1.05	0	0	0.00
	LTE 25	QPSK20M	Bottom	26365	1	0	3	23.50	23.28	1.05	0	0	0.00
	LTE 26	QPSK15M	Bottom	26965	1	0	1	23.50	23.19	1.07	0	0	0.00
	LTE 26	QPSK15M	Bottom	26965	36	0	1	22.50	22.27	1.05	0	0	0.00
	LTE 26	QPSK15M	Bottom	26765	1	0	1	23.50	22.70	1.20	0	0	0.00
	LTE 26	QPSK15M	Bottom	26865	1	0	1	23.50	22.86	1.16	0	0	0.00
	LTE 26	QPSK15M	Bottom	26965	1	0	2	23.50	23.19	1.07	0	0	0.00
	LTE 26	QPSK15M	Bottom	26365	1	0	3	23.50	23.19	1.07	0	0	0.00
	LTE 30	QPSK10M	Bottom	27710	1	24	1	23.50	22.48	1.26	0	0	0.00
	LTE 30	QPSK10M	Bottom	27710	25	12	1	22.50	21.44	1.28	0	0	0.00
	LTE 30	QPSK10M	Bottom	27710	1	24	2	23.50	22.48	1.26	0	0	0.00
	LTE 30	QPSK10M	Bottom	27710	1	24	3	23.50	22.48	1.26	0	0	0.00
	LTE 38	QPSK20M	Bottom	38150	1	0	1	23.50	23.49	1.00	0	0	0.00
	LTE 38	QPSK20M	Bottom	38150	50	0	1	22.50	22.47	1.01	0	0	0.00
	LTE 38	QPSK20M	Bottom	37850	1	0	1	23.50	23.47	1.01	0	0	0.00
	LTE 38	QPSK20M	Bottom	38000	1	0	1	23.50	23.43	1.02	0	0	0.00
	LTE 38	QPSK20M	Bottom	38150	1	0	2	23.50	23.49	1.00	0	0	0.00
	LTE 38	QPSK20M	Bottom	38150	1	0	3	23.50	23.49	1.00	0	0	0.00
	LTE 41	QPSK20M	Bottom	39750	1	0	1	24.00	23.84	1.04	0	0	0.00
	LTE 41	QPSK20M	Bottom	39750	50	0	1	23.00	22.86	1.03	0	0	0.00
	LTE 41	QPSK20M	Bottom	40185	1	0	1	24.00	23.75	1.06	0	0	0.00
	LTE 41	QPSK20M	Bottom	40620	1	0	1	24.00	23.59	1.10	0	0	0.00
	LTE 41	QPSK20M	Bottom	41055	1	0	1	24.00	23.81	1.04	0	0	0.00
	LTE 41	QPSK20M	Bottom	41490	1	0	1	24.00	23.72	1.07	0	0	0.00
	LTE 41	QPSK20M	Bottom	39750	1	0	2	24.00	23.84	1.04	0	0	0.00
	LTE 41	QPSK20M	Bottom	39750	1	0	3	24.00	23.84	1.04	0	0	0.00
	LTE 66	QPSK20M	Bottom	132072	1	0	1	23.50	23.47	1.01	0	0	0.00
	LTE 66	QPSK20M	Bottom	132072	50	0	1	22.50	22.49	1.00	0	0	0.00
	LTE 66	QPSK20M	Bottom	132322	1	0	1	23.50	23.36	1.03	0	0	0.00
	LTE 66	QPSK20M	Bottom	132572	1	0	1	23.50	23.28	1.05	0	0	0.00
	LTE 66	QPSK20M	Bottom	132072	1	0	2	23.50	23.47	1.01	0	0	0.00
	LTE 66	QPSK20M	Bottom	132072	1	0	3	23.50	23.47	1.01	0	0	0.00

4.7.3 SAR Measurement Variability

According to KDB 865664 D01, SAR measurement variability was assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. Alternatively, if the highest measured SAR for both head and body tissue-equivalent media are ≤ 1.45 W/kg and the ratio of these highest SAR values, i.e., largest divided by smallest value, is ≤ 1.10 , the highest SAR configuration for either head or body tissue-equivalent medium may be used to perform the repeated measurement. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

Since all the measured SAR are less than 0.8 W/kg, the repeated measurement is not required.

4.7.4 Simultaneous Multi-band Transmission Evaluation

Due to the WWAN SAR Data is 0 in bottom position, there is no impact to co-location SAR between WWAN and WLAN

Note :

WLAN SAR simultaneous multi-band transmission evaluation please refer to appendix D.

5. Calibration of Test Equipment

Equipment	Manufacturer	Model	SN	Cal. Date	Cal. Interval
System Validation Dipole	SPEAG	D750V3	1013	Aug. 23, 2019	1 Year
System Validation Dipole	SPEAG	D835V2	4d121	Aug. 23, 2019	1 Year
System Validation Dipole	SPEAG	D1750V2	1055	Aug. 23, 2019	1 Year
System Validation Dipole	SPEAG	D1900V2	5d018	Jun. 27, 2019	1 Year
System Validation Dipole	SPEAG	D2300V2	1092	Dec. 13, 2019	1 Year
System Validation Dipole	SPEAG	D2600V2	1020	Aug. 26, 2019	1 Year
Dosimetric E-Field Probe	SPEAG	EX3DV4	3898	Jun. 27, 2019	1 Year
Dosimetric E-Field Probe	SPEAG	EX3DV4	3971	Jan. 27, 2020	1 Year
Dosimetric E-Field Probe	SPEAG	EX3DV4	7472	Aug. 30, 2019	1 Year
Data Acquisition Electronics	SPEAG	DAE4	914	Jun. 20, 2019	1 Year
Data Acquisition Electronics	SPEAG	DAE4	1277	Jan. 24, 2020	1 Year
Data Acquisition Electronics	SPEAG	DAE4	1431	Mar. 25, 2019	1 Year
Radio Communication Analyzer	Anritsu	MT8821C	6201381727	Jun. 14, 2019	1 Year
Universal Radio Communication Tester	Anritsu	MT8821C	6261786083	Jun. 27, 2019	1 Year
Spectrum Analyzer	R&S	FSL6	102006	Mar. 26, 2019	1 Year
Spectrum Analyzer	Anritsu	MS2720T	1513085	May. 30, 2019	1 Year
Thermometer	YFE	YF-160A	130504591	Mar. 22, 2019	1 Year
Thermometer	YFE	YF-160A	120702365	Aug. 06, 2019	1 Year
Dielectric Assessment Kit	SPEAG	DAK-3.5	1151	Aug. 20, 2019	1 Year
Dielectric Assessment Kit	SPEAG	DAKS-3.5	1092	May. 07, 2019	1 Year
Dielectric Assessment Kit	SPEAG	DAKS_VNA R140	0010917	May. 08, 2019	1 Year
Powersource1	SPEAG	SE_UMS_160 BA	4010	Aug. 21, 2019	1 Year

SAR Test Report

6. Measurement Uncertainty

According to KDB 865664 D01, SAR measurement uncertainty analysis is required in SAR reports only when the highest measured SAR in a frequency band is ≥ 1.5 W/kg for 1-g SAR, and ≥ 3.75 W/kg for 10-g SAR. The procedures described in IEEE Std 1528-2013 should be applied. The expanded SAR measurement uncertainty must be $\leq 30\%$, for a confidence interval of $k = 2$. When the highest measured SAR within a frequency band is < 1.5 W/kg for 1-g and < 3.75 W/kg for 10-g, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. Hence, the measurement uncertainty analysis is not required in this SAR report because the test result met the condition.

Source of Uncertainty	Uncertainty ($\pm$ %)	Probability Distribution	Divisor	Ci (1g)	Ci (10g)	Standard Uncertainty ($\pm$ %, 1g)	Standard Uncertainty ($\pm$ %, 10g)	Vi
Measurement System								
Probe Calibration	6.0	Normal	1	1	1	6.0	6.0	∞
Axial Isotropy	4.7	Rectangular	$\sqrt{3}$	$\sqrt{0.5}$	$\sqrt{0.5}$	1.9	1.9	∞
Hemispherical Isotropy	9.6	Rectangular	$\sqrt{3}$	$\sqrt{0.5}$	$\sqrt{0.5}$	3.9	3.9	∞
Boundary Effect	1.0	Rectangular	$\sqrt{3}$	1	1	0.6	0.6	∞
Linearity	4.7	Rectangular	$\sqrt{3}$	1	1	2.7	2.7	∞
Detection Limits	0.25	Rectangular	$\sqrt{3}$	1	1	0.14	0.14	∞
Probe Modulation Response	4.8	Rectangular	$\sqrt{3}$	1	1	2.8	2.8	∞
Readout Electronics	0.3	Normal	1	1	1	0.3	0.3	∞
Response Time	0.0	Rectangular	$\sqrt{3}$	1	1	0.0	0.0	∞
Integration Time	1.7	Rectangular	$\sqrt{3}$	1	1	1.0	1.0	∞
RF Ambient Conditions – Noise	3.0	Rectangular	$\sqrt{3}$	1	1	1.7	1.7	∞
RF Ambient Conditions – Reflections	3.0	Rectangular	$\sqrt{3}$	1	1	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	0.02	Rectangular	$\sqrt{3}$	1	1	0.01	0.01	∞
Probe Positioning with Respect to Phantom	0.4	Rectangular	$\sqrt{3}$	1	1	0.2	0.2	∞
Post-processing	2.0	Rectangular	$\sqrt{3}$	1	1	1.2	1.2	∞
Test Sample Related								
Test Sample Positioning	2.82 / 1.60	Normal	1	1	1	2.8	1.6	35
Device Holder Uncertainty	2.55 / 2.76	Normal	1	1	1	2.6	2.8	7
Power Drift of Measurement	5.0	Rectangular	$\sqrt{3}$	1	1	2.9	2.9	∞
Power Scaling	0.0	Rectangular	$\sqrt{3}$	1	1	0.0	0.0	∞
Phantom and Setup								
Phantom Uncertainty (Shape and Thickness Tolerances)	5.7	Rectangular	$\sqrt{3}$	1	1	3.3	3.3	∞
Liquid Conductivity (Temperature Uncertainty)	2.58	Rectangular	$\sqrt{3}$	0.78	0.71	1.2	1.1	∞
Liquid Conductivity (Measured)	2.95	Normal	1	0.78	0.71	2.3	2.1	61
Liquid Permittivity (Temperature Uncertainty)	1.97	Rectangular	$\sqrt{3}$	0.23	0.26	0.3	0.3	∞
Liquid Permittivity (Measured)	3.04	Normal	1	0.23	0.26	0.7	0.8	47
Combined Standard Uncertainty						± 10.9 %	± 10.7 %	
Expanded Uncertainty (K=2)						± 21.8 %	± 21.4 %	

Head SAR Uncertainty Budget for Frequency Range of 300 MHz to 3 GHz

SAR Test Report

Source of Uncertainty	Uncertainty ($\pm$ %)	Probability Distribution	Divisor	Ci (1g)	Ci (10g)	Standard Uncertainty ($\pm$ %, 1g)	Standard Uncertainty ($\pm$ %, 10g)	Vi
Measurement System								
Probe Calibration	6.55	Normal	1	1	1	6.55	6.55	∞
Axial Isotropy	4.7	Rectangular	$\sqrt{3}$	0.7	0.7	1.9	1.9	∞
Hemispherical Isotropy	9.6	Rectangular	$\sqrt{3}$	0.7	0.7	3.9	3.9	∞
Boundary Effect	2.0	Rectangular	$\sqrt{3}$	1	1	1.2	1.2	∞
Linearity	4.7	Rectangular	$\sqrt{3}$	1	1	2.7	2.7	∞
Detection Limits	0.25	Rectangular	$\sqrt{3}$	1	1	0.14	0.14	∞
Probe Modulation Response	4.8	Rectangular	$\sqrt{3}$	1	1	2.8	2.8	∞
Readout Electronics	0.3	Normal	1	1	1	0.3	0.3	∞
Response Time	0.0	Rectangular	$\sqrt{3}$	1	1	0.0	0.0	∞
Integration Time	1.7	Rectangular	$\sqrt{3}$	1	1	1.0	1.0	∞
RF Ambient Conditions – Noise	3.0	Rectangular	$\sqrt{3}$	1	1	1.7	1.7	∞
RF Ambient Conditions – Reflections	3.0	Rectangular	$\sqrt{3}$	1	1	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	0.04	Rectangular	$\sqrt{3}$	1	1	0.02	0.02	∞
Probe Positioning with Respect to Phantom	0.8	Rectangular	$\sqrt{3}$	1	1	0.5	0.5	∞
Post-processing	4.0	Rectangular	$\sqrt{3}$	1	1	2.3	2.3	∞
Test Sample Related								
Test Sample Positioning	2.82 / 1.60	Normal	1	1	1	2.8	1.6	35
Device Holder Uncertainty	2.55 / 2.76	Normal	1	1	1	2.6	2.8	7
Power Drift of Measurement	5.0	Rectangular	$\sqrt{3}$	1	1	2.9	2.9	∞
PowerScaling	0.0	Rectangular	$\sqrt{3}$	1	1	0.0	0.0	∞
Phantom and Setup								
Phantom Uncertainty (Shape and Thickness Tolerances)	6.2	Rectangular	$\sqrt{3}$	1	1	3.6	3.6	∞
Liquid Conductivity (Temperature Uncertainty)	2.58	Rectangular	$\sqrt{3}$	0.78	0.71	1.2	1.1	∞
Liquid Conductivity (Measured)	2.95	Normal	1	0.78	0.71	2.3	2.1	61
Liquid Permittivity (Temperature Uncertainty)	1.97	Rectangular	$\sqrt{3}$	0.23	0.26	0.3	0.3	∞
Liquid Permittivity (Measured)	3.04	Normal	1	0.23	0.26	0.7	0.8	47
Combined Standard Uncertainty						± 11.6 %	± 11.3 %	
Expanded Uncertainty (K=2)						± 23.2 %	± 22.6 %	

Head SAR Uncertainty Budget for Frequency Range of 3 GHz to 6 GHz

SAR Test Report

Source of Uncertainty	Uncertainty (± %)	Probability Distribution	Divisor	Ci (1g)	Ci (10g)	Standard Uncertainty (± %, 1g)	Standard Uncertainty (± %, 10g)	Vi
Measurement System								
Probe Calibration	6.0	Normal	1	1	1	6.0	6.0	∞
Axial Isotropy	4.7	Rectangular	√3	√0.5	√0.5	1.9	1.9	∞
Hemispherical Isotropy	9.6	Rectangular	√3	√0.5	√0.5	3.9	3.9	∞
Boundary Effect	1.0	Rectangular	√3	1	1	0.6	0.6	∞
Linearity	4.7	Rectangular	√3	1	1	2.7	2.7	∞
Detection Limits	0.25	Rectangular	√3	1	1	0.14	0.14	∞
Probe Modulation Response	4.8	Rectangular	√3	1	1	2.8	2.8	∞
Readout Electronics	0.3	Normal	1	1	1	0.3	0.3	∞
Response Time	0.0	Rectangular	√3	1	1	0.0	0.0	∞
Integration Time	1.7	Rectangular	√3	1	1	1.0	1.0	∞
RF Ambient Conditions – Noise	3.0	Rectangular	√3	1	1	1.7	1.7	∞
RF Ambient Conditions – Reflections	3.0	Rectangular	√3	1	1	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	0.02	Rectangular	√3	1	1	0.01	0.01	∞
Probe Positioning with Respect to Phantom	0.4	Rectangular	√3	1	1	0.2	0.2	∞
Post-processing	2.0	Rectangular	√3	1	1	1.2	1.2	∞
Test Sample Related								
Test Sample Positioning	3.68 / 1.73	Normal	1	1	1	3.7	1.7	29
Device Holder Uncertainty	2.55 / 2.76	Normal	1	1	1	2.6	2.8	7
Power Drift of Measurement	5.0	Rectangular	√3	1	1	2.9	2.9	∞
PowerScaling	0.0	Rectangular	√3	1	1	0.0	0.0	∞
Phantom and Setup								
Phantom Uncertainty (Shape and Thickness Tolerances)	7.2	Rectangular	√3	1	1	4.2	4.2	∞
Liquid Conductivity (Temperature Uncertainty)	2.58	Rectangular	√3	0.78	0.71	1.2	1.1	∞
Liquid Conductivity (Measured)	2.95	Normal	1	0.78	0.71	2.3	2.1	61
Liquid Permittivity (Temperature Uncertainty)	1.97	Rectangular	√3	0.23	0.26	0.3	0.3	∞
Liquid Permittivity (Measured)	3.04	Normal	1	0.23	0.26	0.7	0.8	47
Combined Standard Uncertainty						± 11.5 %	± 11.0 %	
Expanded Uncertainty (K=2)						± 23.0 %	± 22.0 %	

Body SAR Uncertainty Budget for Frequency Range of 300 MHz to 3 GHz

SAR Test Report

Source of Uncertainty	Uncertainty (± %)	Probability Distribution	Divisor	Ci (1g)	Ci (10g)	Standard Uncertainty (± %, 1g)	Standard Uncertainty (± %, 10g)	Vi
Measurement System								
Probe Calibration	6.55	Normal	1	1	1	6.55	6.55	∞
Axial Isotropy	4.7	Rectangular	√3	0.7	0.7	1.9	1.9	∞
Hemispherical Isotropy	9.6	Rectangular	√3	0.7	0.7	3.9	3.9	∞
Boundary Effect	2.0	Rectangular	√3	1	1	1.2	1.2	∞
Linearity	4.7	Rectangular	√3	1	1	2.7	2.7	∞
Detection Limits	0.25	Rectangular	√3	1	1	0.14	0.14	∞
Probe Modulation Response	4.8	Rectangular	√3	1	1	2.8	2.8	∞
Readout Electronics	0.3	Normal	1	1	1	0.3	0.3	∞
Response Time	0.0	Rectangular	√3	1	1	0.0	0.0	∞
Integration Time	1.7	Rectangular	√3	1	1	1.0	1.0	∞
RF Ambient Conditions – Noise	3.0	Rectangular	√3	1	1	1.7	1.7	∞
RF Ambient Conditions – Reflections	3.0	Rectangular	√3	1	1	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	0.04	Rectangular	√3	1	1	0.02	0.02	∞
Probe Positioning with Respect to Phantom	0.8	Rectangular	√3	1	1	0.5	0.5	∞
Post-processing	4.0	Rectangular	√3	1	1	2.3	2.3	∞
Test Sample Related								
Test Sample Positioning	3.68 / 1.73	Normal	1	1	1	3.7	1.7	29
Device Holder Uncertainty	2.55 / 2.76	Normal	1	1	1	2.6	2.8	7
Power Drift of Measurement	5.0	Rectangular	√3	1	1	2.9	2.9	∞
PowerScaling	0.0	Rectangular	√3	1	1	0.0	0.0	∞
Phantom and Setup								
Phantom Uncertainty (Shape and Thickness Tolerances)	7.6	Rectangular	√3	1	1	4.4	4.4	∞
Liquid Conductivity (Temperature Uncertainty)	2.58	Rectangular	√3	0.78	0.71	1.2	1.1	∞
Liquid Conductivity (Measured)	2.95	Normal	1	0.78	0.71	2.3	2.1	61
Liquid Permittivity (Temperature Uncertainty)	1.97	Rectangular	√3	0.23	0.26	0.3	0.3	∞
Liquid Permittivity (Measured)	3.04	Normal	1	0.23	0.26	0.7	0.8	47
Combined Standard Uncertainty						± 12.1 %	± 11.6 %	
Expanded Uncertainty (K=2)						± 24.2 %	± 23.2 %	

Body SAR Uncertainty Budget for Frequency Range of 3 GHz to 6 GHz

7. Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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The road map of all our labs can be found in our web site also.

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Appendix A. SAR Plots of System Verification

The plots for system verification with largest deviation for each SAR system combination are shown as follows.

System Check_H750_200224

DUT: Dipole 750 MHz; Type: D750V3; SN: 1013

Communication System: CW; Frequency: 750 MHz; Duty Cycle: 1:1

Medium: H06T09N1_0224 Medium parameters used: $f = 750$ MHz; $\sigma = 0.894$ S/m; $\epsilon_r = 43.418$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.6 °C ; Liquid Temperature : 23.2 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3898; ConvF(10.19, 10.19, 10.19); Calibrated: 2019/06/27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn914; Calibrated: 2019/06/20
- Phantom: ELI Phantom_1204; Type: QDOVA;
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Pin=50mW/Area Scan (61x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.521 W/kg

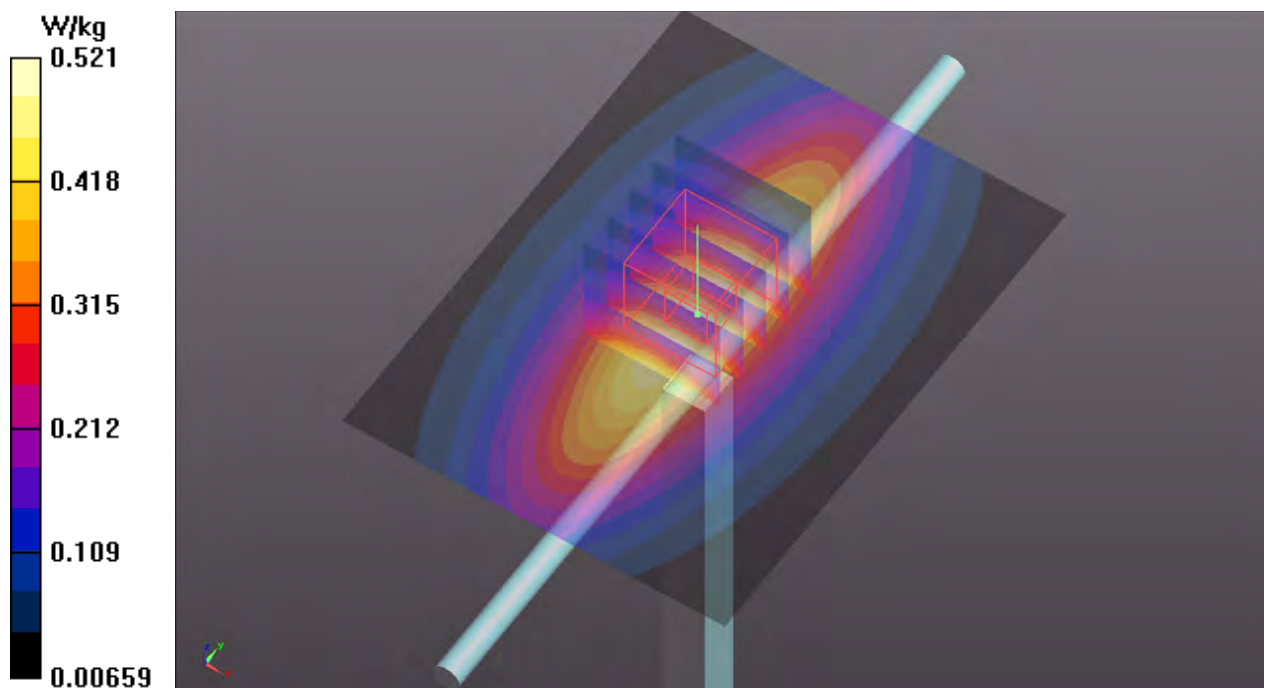
Pin=50mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 25.22 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.587 W/kg

SAR(1 g) = 0.393 W/kg; SAR(10 g) = 0.259 W/kg (SAR corrected for target medium)

Maximum value of SAR (measured) = 0.522 W/kg



System Check_H835_200223

DUT: Dipole 835 MHz; Type: D835V2; SN: 4d121

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

Medium: H07T10N1_0223 Medium parameters used: $f = 835$ MHz; $\sigma = 0.906$ S/m; $\epsilon_r = 43.027$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.6 °C ; Liquid Temperature : 23.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN7472; ConvF(10.18, 10.18, 10.18); Calibrated: 2019/08/30
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1431; Calibrated: 2019/03/25
- Phantom: ELI Phantom_1206; Type: QDOVA002AA;
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Pin=50mW/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.594 W/kg

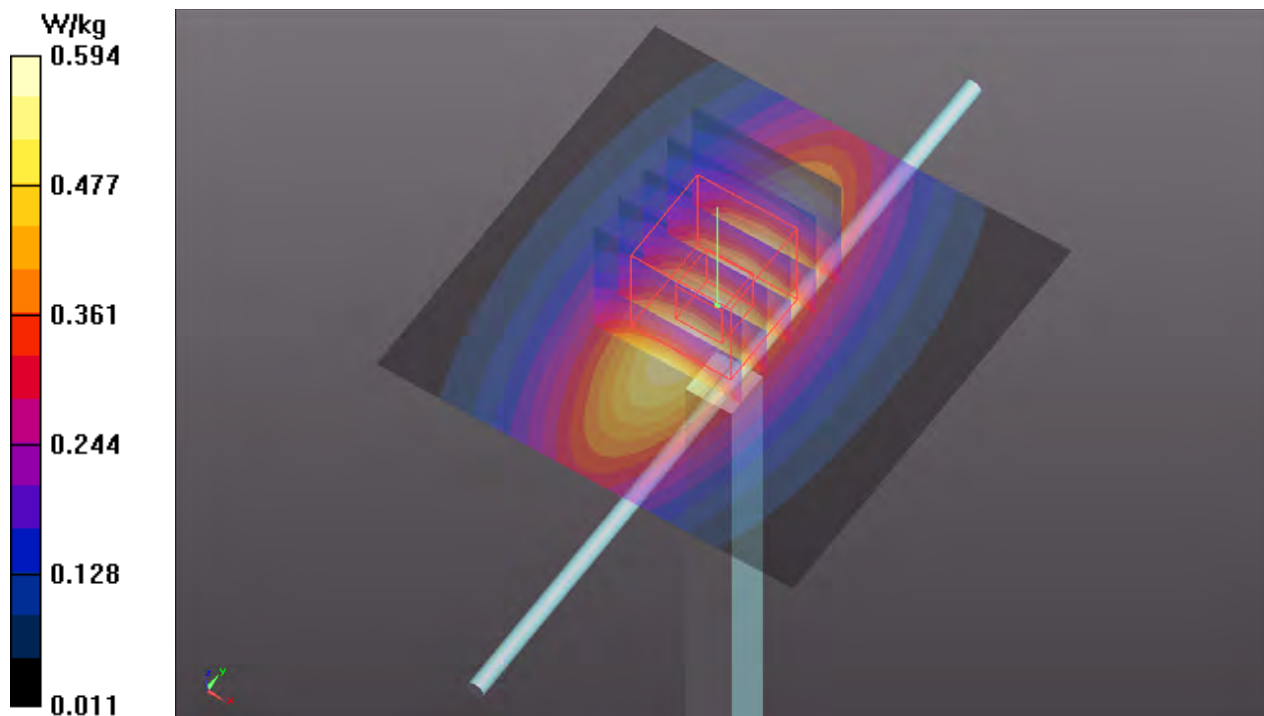
Pin=50mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 26.84 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.670 W/kg

SAR(1 g) = 0.462 W/kg; SAR(10 g) = 0.308 W/kg (SAR corrected for target medium)

Maximum value of SAR (measured) = 0.602 W/kg



System Check_H1750_200407

DUT: Dipole 1750 MHz; Type: D1750V2; SN: 1055

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

Medium: H16T20N3_0407 Medium parameters used: $f = 1750$ MHz; $\sigma = 1.321$ S/m; $\epsilon_r = 39.01$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.7 °C ; Liquid Temperature : 23.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3898; ConvF(8.72, 8.72, 8.72); Calibrated: 2019/06/27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn914; Calibrated: 2019/06/20
- Phantom: ELI Phantom_1204; Type: QDOVA;
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Pin=50mW/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 2.55 W/kg

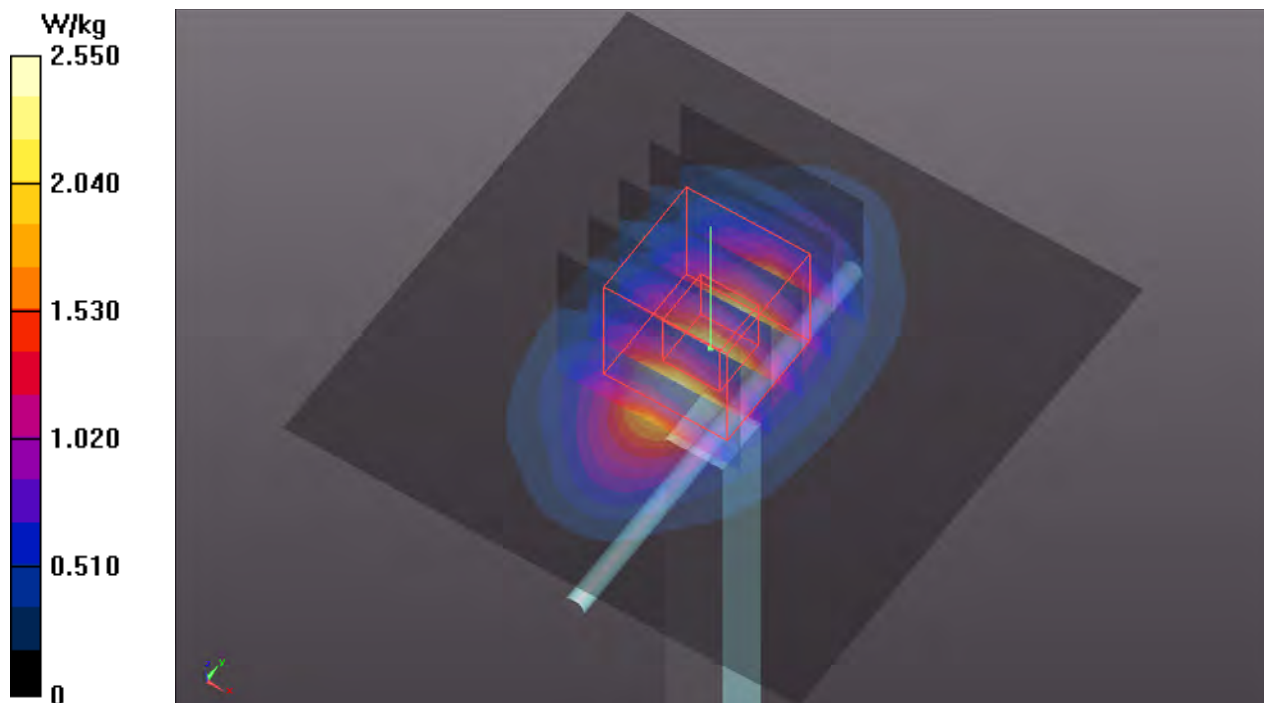
Pin=50mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 45.17 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 3.05 W/kg

SAR(1 g) = 1.7 W/kg; SAR(10 g) = 0.903 W/kg (SAR corrected for target medium)

Maximum value of SAR (measured) = 2.58 W/kg



System Check_H1900_200223

DUT: Dipole 1900 MHz; Type: D1900V2; SN: 5d018

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

Medium: H16T20N1_0223 Medium parameters used: $f = 1900$ MHz; $\sigma = 1.451$ S/m; $\epsilon_r = 38.601$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.6 °C ; Liquid Temperature : 23.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN7472; ConvF(8.34, 8.34, 8.34); Calibrated: 2019/08/30
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1431; Calibrated: 2019/03/25
- Phantom: ELI Phantom_1206; Type: QDOVA002AA;
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Pin=50mW/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 3.09 W/kg

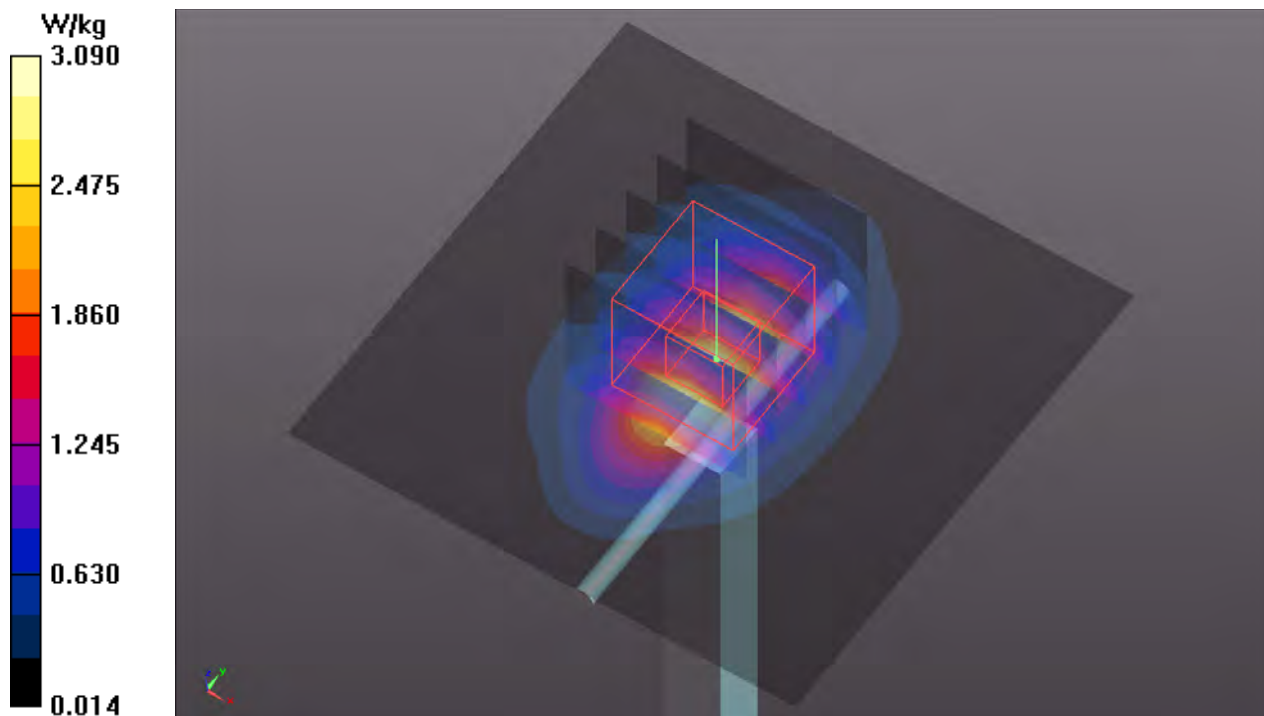
Pin=50mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 47.42 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 3.68 W/kg

SAR(1 g) = 1.95 W/kg; SAR(10 g) = 1.05 W/kg (SAR corrected for target medium)

Maximum value of SAR (measured) = 3.11 W/kg



System Check_H2300_200224

DUT: Dipole 2300 MHz; Type: D2300V2; SN: 1092

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

Medium: H19T27N1_0224 Medium parameters used: $f = 2300$ MHz; $\sigma = 1.717$ S/m; $\epsilon_r = 39.242$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.8 °C ; Liquid Temperature : 23.2 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3898; ConvF(8.03, 8.03, 8.03); Calibrated: 2019/06/27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn914; Calibrated: 2019/06/20
- Phantom: ELI Phantom_1204; Type: QDOVA;
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Pin=50mW/Area Scan (81x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 3.84 W/kg

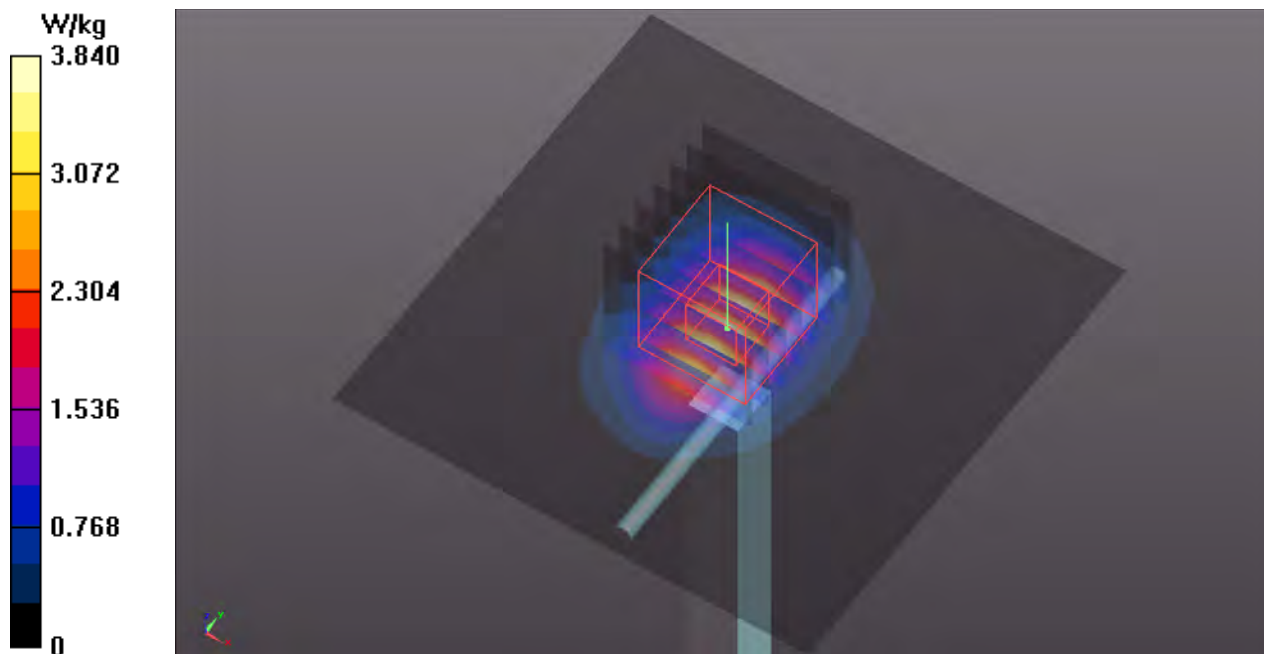
Pin=50mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 48.09 V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 4.80 W/kg

SAR(1 g) = 2.3 W/kg; SAR(10 g) = 1.11 W/kg (SAR corrected for target medium)

Maximum value of SAR (measured) = 3.88 W/kg



System Check_H2600_200224

DUT: Dipole 2600 MHz; Type: D2600V2; SN: 1020

Communication System: CW; Frequency: 2600 MHz; Duty Cycle: 1:1

Medium: H19T27N1_0224 Medium parameters used: $f = 2600$ MHz; $\sigma = 2.034$ S/m; $\epsilon_r = 38.245$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.8 °C ; Liquid Temperature : 23.2 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3898; ConvF(7.41, 7.41, 7.41); Calibrated: 2019/06/27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn914; Calibrated: 2019/06/20
- Phantom: ELI Phantom_1204; Type: QDOVA;
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Pin=50mW/Area Scan (81x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 4.87 W/kg

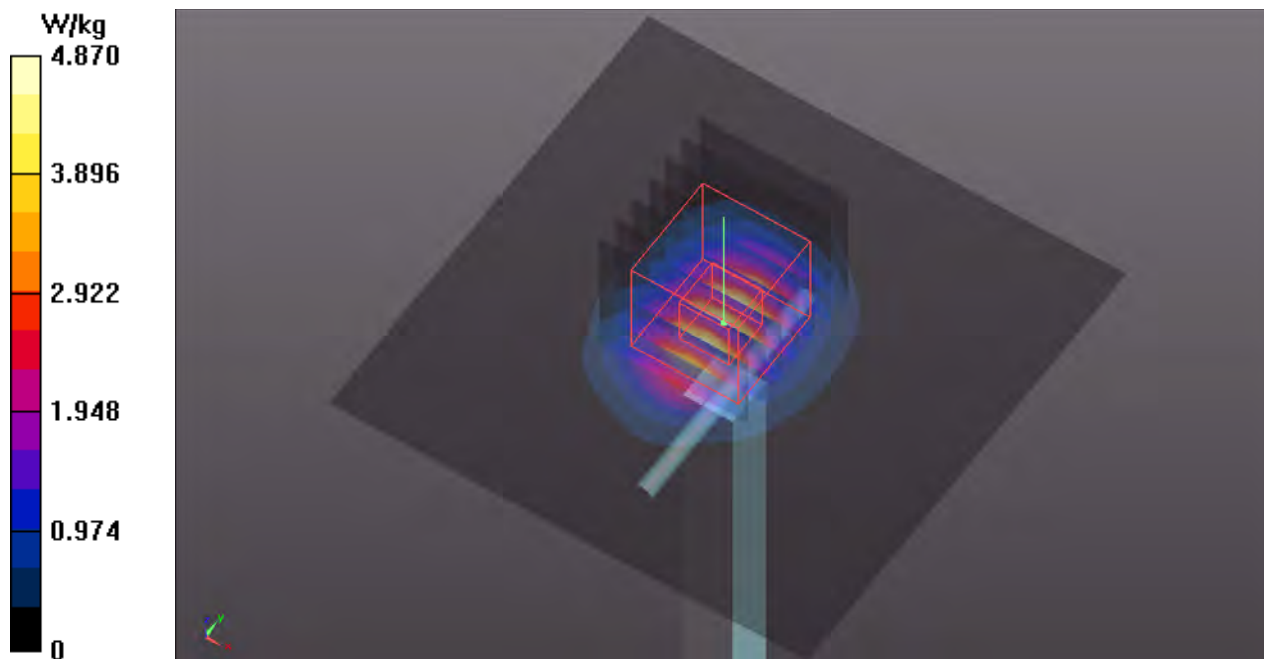
Pin=50mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 49.37 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 6.16 W/kg

SAR(1 g) = 2.81 W/kg; SAR(10 g) = 1.27 W/kg (SAR corrected for target medium)

Maximum value of SAR (measured) = 4.94 W/kg



Appendix B. Calibration Certificate for Probe and Dipole

The SPEAG calibration certificates are shown as follows.



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 0108**

The Swiss Accreditation Service is one of the signatories to the EA
 Multilateral Agreement for the recognition of calibration certificates

Client **B.V. ADT (Auden)**

Certificate No: **D750V3-1013_Aug19**

CALIBRATION CERTIFICATE

Object **D750V3 - SN:1013**

Calibration procedure(s) **QA CAL-05.v11**
Calibration Procedure for SAR Validation Sources between 0.7-3 GHz

Calibration date: **August 23, 2019**

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)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	03-Apr-19 (No. 217-02892/02893)	Apr-20
Power sensor NRP-Z91	SN: 103244	03-Apr-19 (No. 217-02892)	Apr-20
Power sensor NRP-Z91	SN: 103245	03-Apr-19 (No. 217-02893)	Apr-20
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-19 (No. 217-02894)	Apr-20
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-19 (No. 217-02895)	Apr-20
Reference Probe EX3DV4	SN: 7349	29-May-19 (No. EX3-7349_May19)	May-20
DAE4	SN: 601	30-Apr-19 (No. DAE4-601_Apr19)	Apr-20
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Feb-19)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19

Calibrated by: **Jeton Kastrati** **Laboratory Technician** **Signature**

Approved by: **Katja Pokovic** **Technical Manager**

Issued: August 23, 2019

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



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 0108**

The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

- 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%.

Measurement Conditions

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

DASY Version	DASY5	V52.10.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	42.7 $\pm$ 6 %	0.90 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.15 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.56 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.41 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.62 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.7 Ω - 0.2 j Ω
Return Loss	- 28.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.034 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
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DASY5 Validation Report for Head TSL

Date: 23.08.2019

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1013

Communication System: UID 0 - CW; Frequency: 750 MHz

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.9 \text{ S/m}$; $\epsilon_r = 42.7$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.07, 10.07, 10.07) @ 750 MHz; Calibrated: 29.05.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2019
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.2(1504); SEMCAD X 14.6.12(7470)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

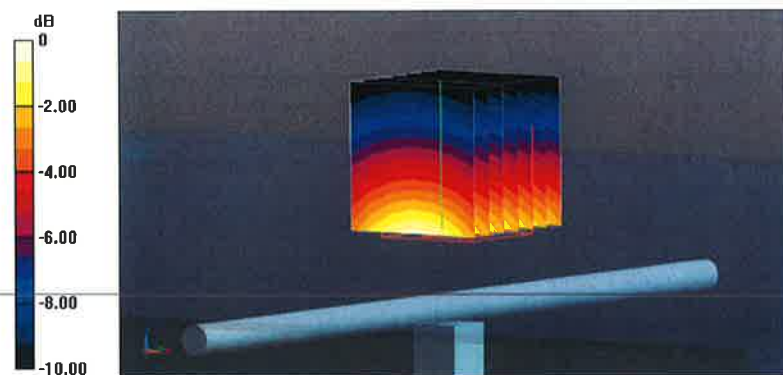
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 59.83 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 3.22 W/kg

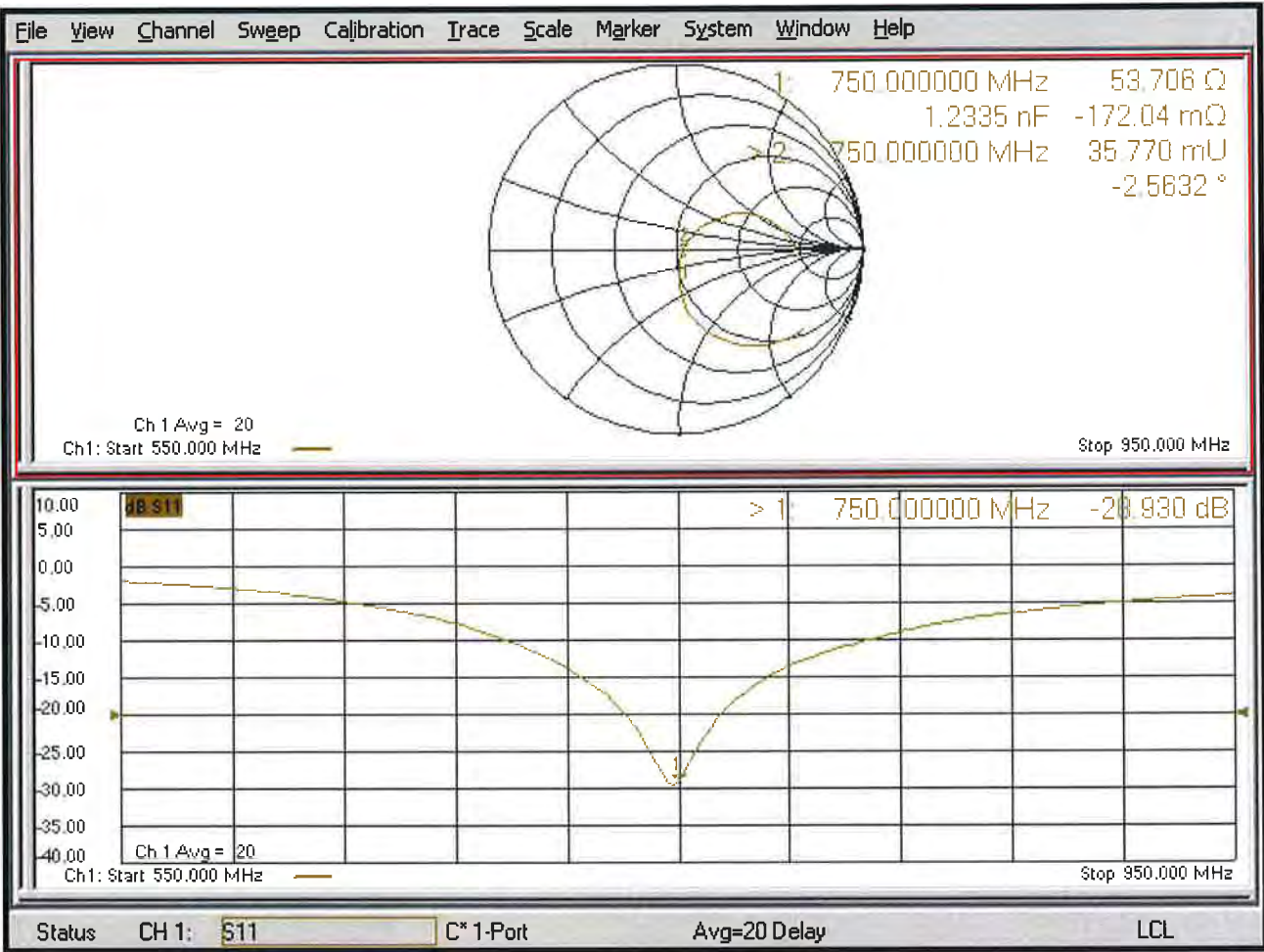
SAR(1 g) = 2.15 W/kg; SAR(10 g) = 1.41 W/kg

Maximum value of SAR (measured) = 2.86 W/kg



0 dB = 2.86 W/kg = 4.56 dBW/kg

Impedance Measurement Plot for Head TSL





Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 0108**

The Swiss Accreditation Service is one of the signatories to the EA
 Multilateral Agreement for the recognition of calibration certificates

Client **B.V. ADT (Auden)**

Certificate No: **D835V2-4d121_Aug19**

CALIBRATION CERTIFICATE

Object **D835V2 - SN:4d121**

Calibration procedure(s) **QA CAL-05.v11**
Calibration Procedure for SAR Validation Sources between 0.7-3 GHz

Calibration date: **August 23, 2019**

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)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	03-Apr-19 (No. 217-02892/02893)	Apr-20
Power sensor NRP-Z91	SN: 103244	03-Apr-19 (No. 217-02892)	Apr-20
Power sensor NRP-Z91	SN: 103245	03-Apr-19 (No. 217-02893)	Apr-20
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-19 (No. 217-02894)	Apr-20
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-19 (No. 217-02895)	Apr-20
Reference Probe EX3DV4	SN: 7349	29-May-19 (No. EX3-7349_May19)	May-20
DAE4	SN: 601	30-Apr-19 (No. DAE4-601_Apr19)	Apr-20
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Feb-19)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19

Calibrated by: **Jeton Kastrati** **Laboratory Technician**

Approved by: **Katja Pokovic** **Technical Manager**

Signature

Issued: August 23, 2019

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Accredited by the Swiss Accreditation Service (SAS)

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

- 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%.

Measurement Conditions

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

DASY Version	DASY5	V52.10.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz $\pm$ 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 $\pm$ 0.2) °C	42.5 $\pm$ 6 %	0.92 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.43 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.61 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.57 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.22 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.8 Ω - 2.7 j Ω
Return Loss	- 31.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.395 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
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DASY5 Validation Report for Head TSL

Date: 23.08.2019

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d121

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.92 \text{ S/m}$; $\epsilon_r = 42.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.89, 9.89, 9.89) @ 835 MHz; Calibrated: 29.05.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2019
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.2(1504); SEMCAD X 14.6.12(7470)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

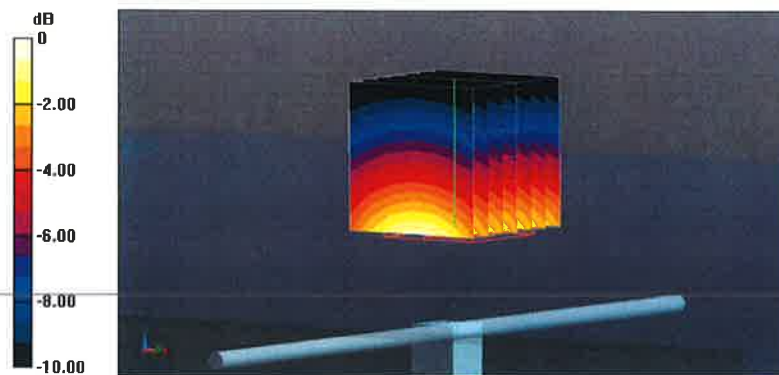
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 63.40 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 3.63 W/kg

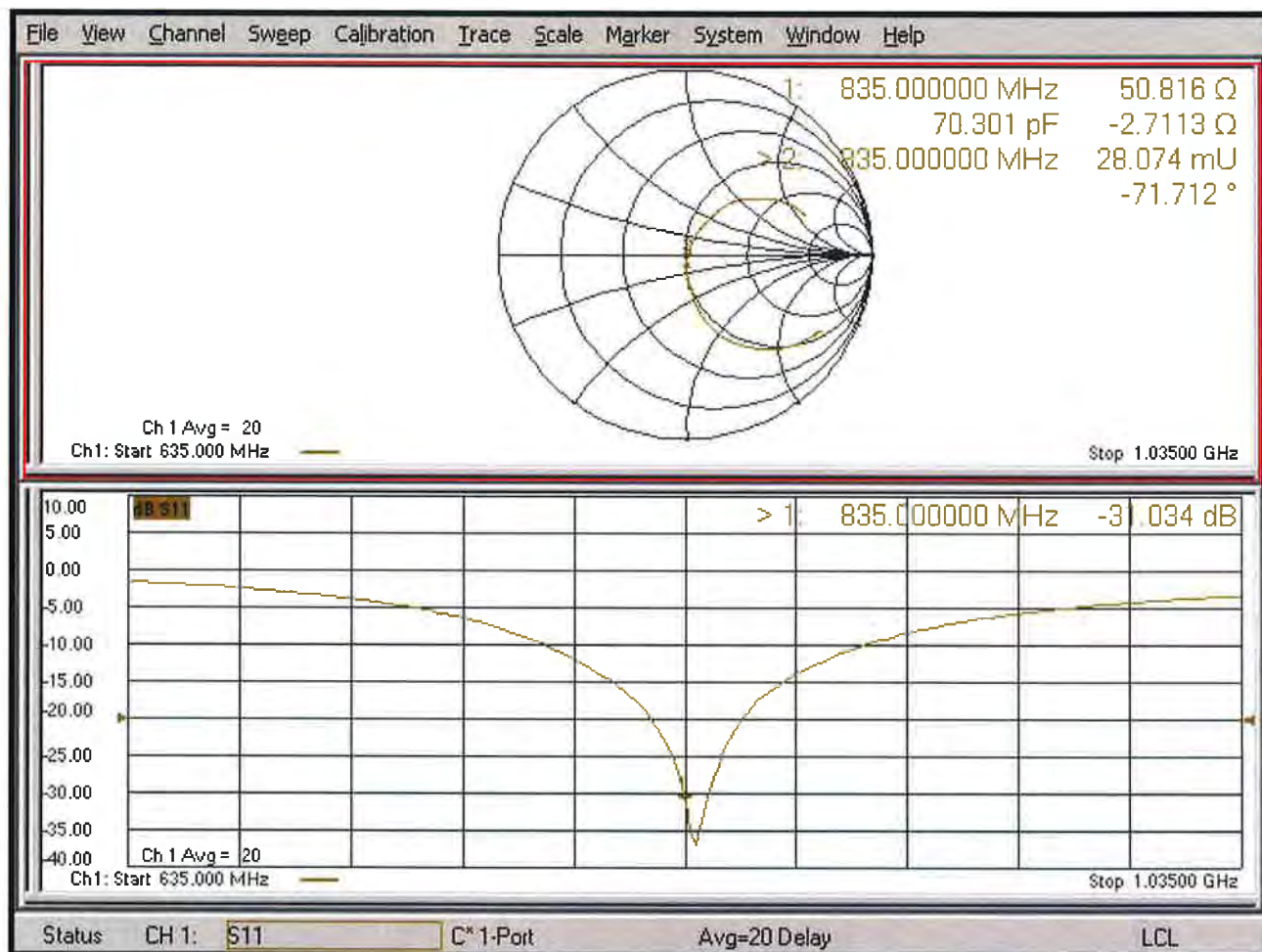
SAR(1 g) = 2.43 W/kg; SAR(10 g) = 1.57 W/kg

Maximum value of SAR (measured) = 3.23 W/kg



0 dB = 3.23 W/kg = 5.09 dBW/kg

Impedance Measurement Plot for Head TSL





Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 0108**

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 Multilateral Agreement for the recognition of calibration certificates

Client **B.V. ADT (Auden)**

Certificate No: **D1750V2-1055_Aug19**

CALIBRATION CERTIFICATE

Object **D1750V2 - SN:1055**

Calibration procedure(s) **QA CAL-05.v11**
Calibration Procedure for SAR Validation Sources between 0.7-3 GHz

Calibration date: **August 23, 2019**

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)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	03-Apr-19 (No. 217-02892/02893)	Apr-20
Power sensor NRP-Z91	SN: 103244	03-Apr-19 (No. 217-02892)	Apr-20
Power sensor NRP-Z91	SN: 103245	03-Apr-19 (No. 217-02893)	Apr-20
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-19 (No. 217-02894)	Apr-20
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-19 (No. 217-02895)	Apr-20
Reference Probe EX3DV4	SN: 7349	29-May-19 (No. EX3-7349_May19)	May-20
DAE4	SN: 601	30-Apr-19 (No. DAE4-601_Apr19)	Apr-20

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Feb-19)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: August 23, 2019

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



Accredited by the Swiss Accreditation Service (SAS)

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

- 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%.

Measurement Conditions

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

DASY Version	DASY5	V52.10.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	40.8 $\pm$ 6 %	1.36 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.17 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	37.0 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.85 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	19.5 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$49.8\ \Omega + 1.1\ j\Omega$
Return Loss	- 39.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.221 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
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DASY5 Validation Report for Head TSL

Date: 23.08.2019

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1055

Communication System: UID 0 - CW; Frequency: 1750 MHz

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.36$ S/m; $\epsilon_r = 40.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.67, 8.67, 8.67) @ 1750 MHz; Calibrated: 29.05.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2019
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.2(1504); SEMCAD X 14.6.12(7470)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

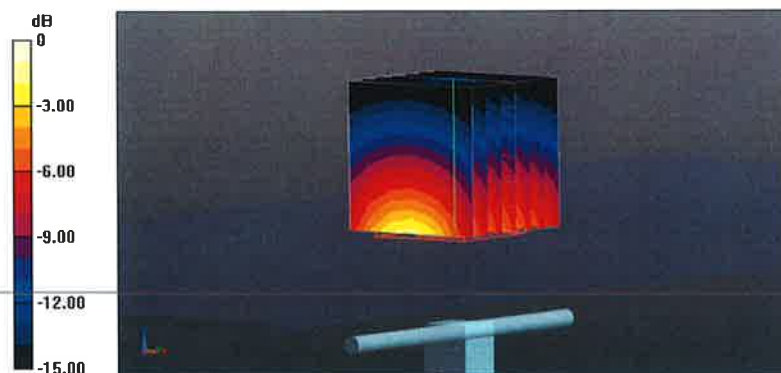
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 106.5 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 17.0 W/kg

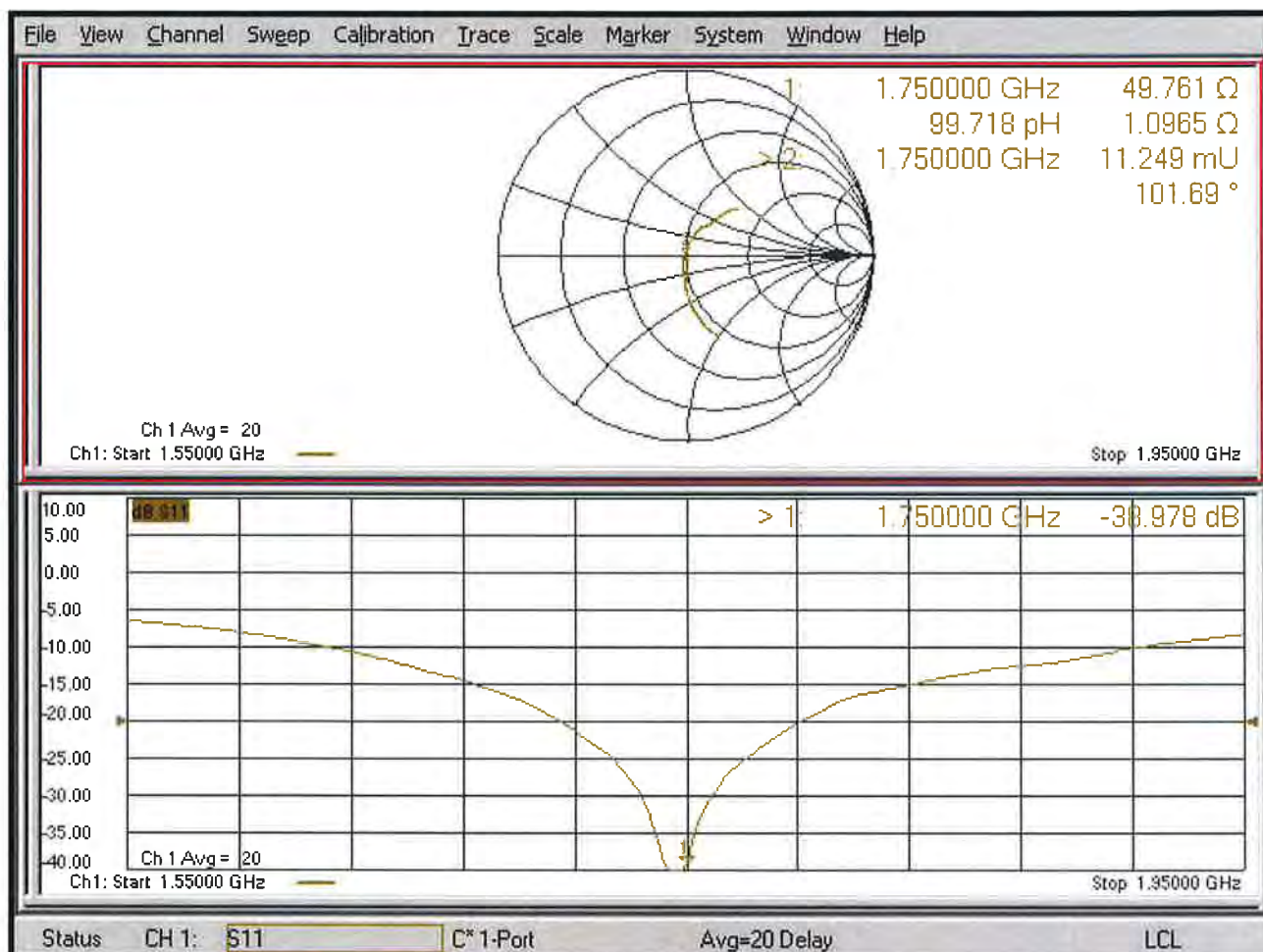
SAR(1 g) = 9.17 W/kg; SAR(10 g) = 4.85 W/kg

Maximum value of SAR (measured) = 14.1 W/kg



0 dB = 14.1 W/kg = 11.49 dBW/kg

Impedance Measurement Plot for Head TSL





Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **Auden**

Certificate No: **D1900V2-5d018_Jun19**

CALIBRATION CERTIFICATE

Object **D1900V2 - SN:5d018**

Calibration procedure(s) **QA CAL-05.v11
Calibration Procedure for SAR Validation Sources between 0.7-3 GHz**

Calibration date: **June 27, 2019**

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)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	03-Apr-19 (No. 217-02892/02893)	Apr-20
Power sensor NRP-Z91	SN: 103244	03-Apr-19 (No. 217-02892)	Apr-20
Power sensor NRP-Z91	SN: 103245	03-Apr-19 (No. 217-02893)	Apr-20
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-19 (No. 217-02894)	Apr-20
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-19 (No. 217-02895)	Apr-20
Reference Probe EX3DV4	SN: 7349	29-May-19 (No. EX3-7349_May19)	May-20
DAE4	SN: 601	30-Apr-19 (No. DAE4-601_Apr19)	Apr-20

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Feb-19)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	

	Name	Function	Signature
Approved by:	Katja Pokovic	Technical Manager	

Issued: June 27, 2019

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



Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

- 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%.

Measurement Conditions

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

DASY Version	DASY5	V52.10.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	41.4 $\pm$ 6 %	1.39 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.96 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	40.3 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.24 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	21.1 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	54.2 $\pm$ 6 %	1.50 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.91 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	40.1 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.25 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.2 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$50.8 \Omega + 1.8 j\Omega$
Return Loss	- 34.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$47.5 \Omega + 3.0 j\Omega$
Return Loss	- 28.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.196 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
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DASY5 Validation Report for Head TSL

Date: 27.06.2019

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d018

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.39$ S/m; $\epsilon_r = 41.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.44, 8.44, 8.44) @ 1900 MHz; Calibrated: 29.05.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2019
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.2(1504); SEMCAD X 14.6.12(7470)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

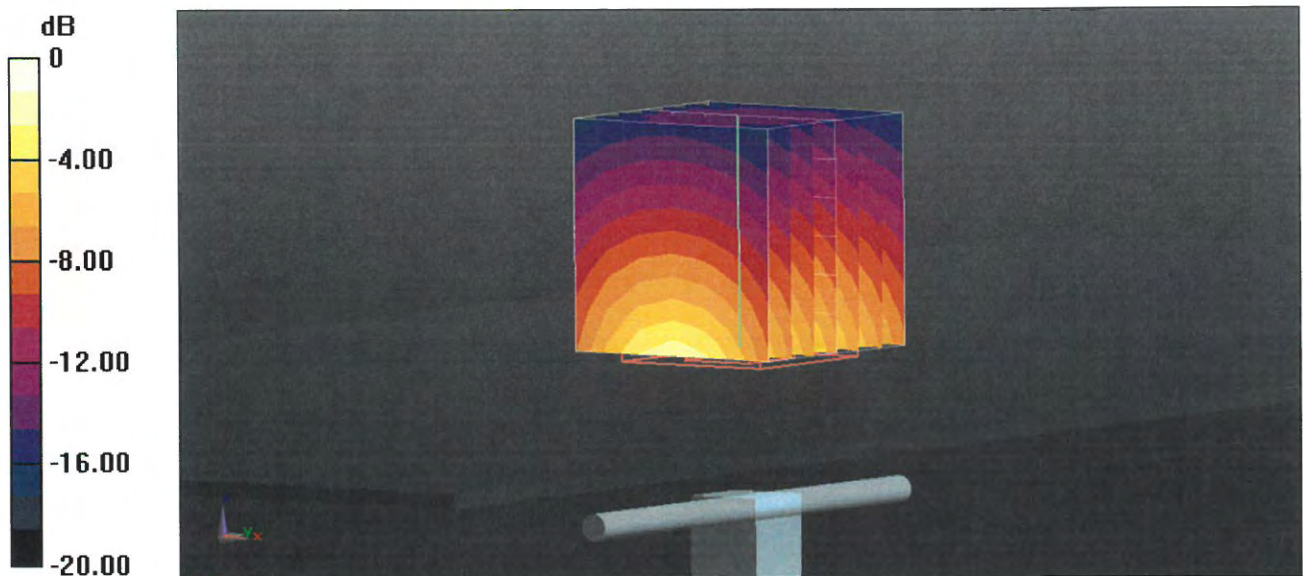
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 109.9 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 18.5 W/kg

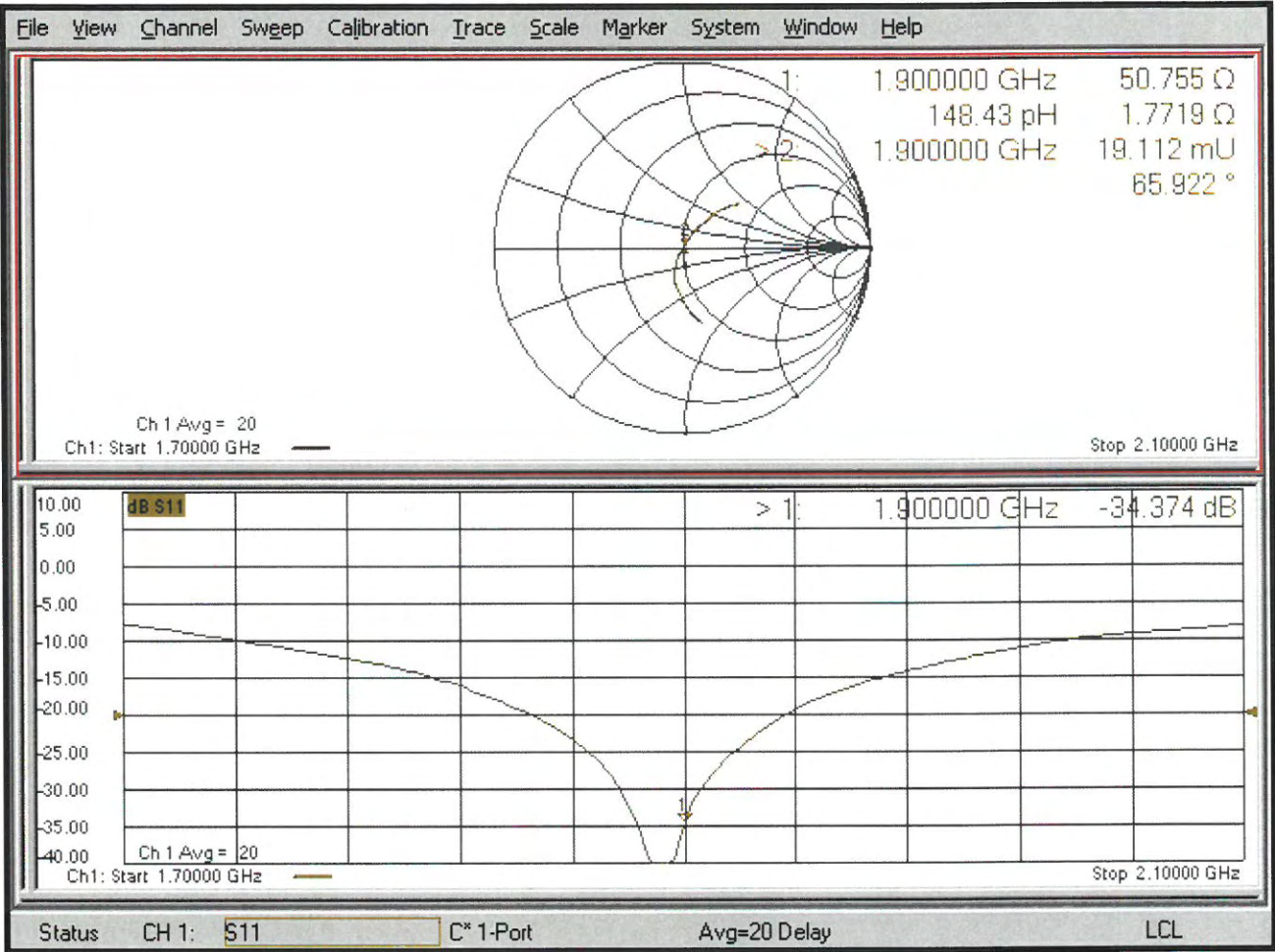
SAR(1 g) = 9.96 W/kg; SAR(10 g) = 5.24 W/kg

Maximum value of SAR (measured) = 15.5 W/kg



0 dB = 15.5 W/kg = 11.90 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 27.06.2019

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d018

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.5$ S/m; $\epsilon_r = 54.2$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.42, 8.42, 8.42) @ 1900 MHz; Calibrated: 29.05.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2019
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.2(1504); SEMCAD X 14.6.12(7470)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

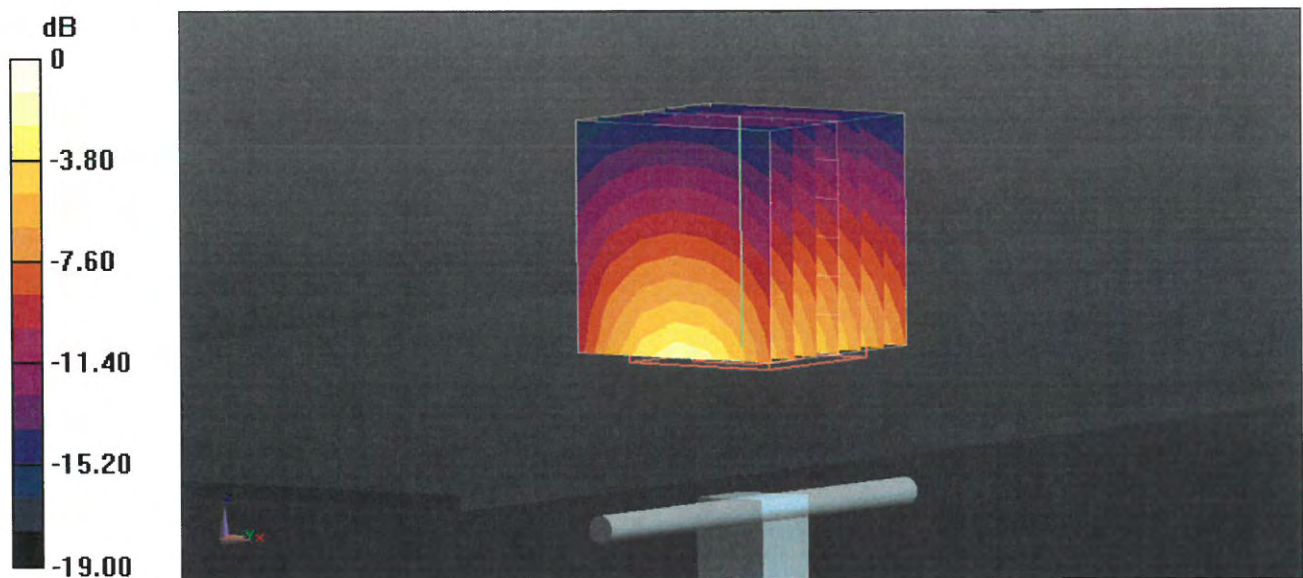
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 104.5 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 17.7 W/kg

SAR(1 g) = 9.91 W/kg; SAR(10 g) = 5.25 W/kg

Maximum value of SAR (measured) = 14.9 W/kg



0 dB = 14.9 W/kg = 11.73 dBW/kg

Impedance Measurement Plot for Body TSL

