

Test Report

Applicant : ASUSTeK COMPUTER INC.
Applicant Address : 1F., No. 15, Lide Rd., Beitou Dist., Taipei City 112, Taiwan
Product Type : LTE module
Trade Name : FIBOCOM
Model Number : L850-GL
Applicable Standard : 47 CFR Part §2.1093
Received Date : Jun. 10, 2021
Test Period : Jun. 29 ~ Jul. 04, 2021
Issued Date : Aug. 04, 2021

Issued by

Approved By :



(Kris Pan)

A Test Lab Techno Corp.
No. 140-1, Changan Street, Bade District,
Taoyuan City 33465, Taiwan (R.O.C.)
Tel : +886-3-2710188 / Fax : +886-3-2710190



Taiwan Accreditation Foundation accreditation number: 1330

Test Firm MRA designation number: TW0010

Note:

1. The test results are valid only for samples provided by customers and under the test conditions described in this report.
2. This report shall not be reproduced except in full, without the written approval of A Test Lab Technology Corporation.
3. The relevant information is provided by customers in this test report. According to the correctness, appropriateness or completeness of the information provided by the customer, if there is any doubt or error in the information which affects the validity of the test results, the laboratory does not take the responsibility.



Revision History

Rev.	Issue Date	Revisions	Revised By
00	Jul. 12, 2021	Initial Issue	Nicole Chu
01	Jul. 27, 2021	Revised 3 chapter (P.05) Revised 11.3 chapter (P.62 ~ P.65) Revised 11.4 chapter (P.71~ P.75) Revised 11.6 chapter (P.85) Revised 11.7.1 chapter (P.87~ P.91)	Nicole Chu
02	Aug. 04, 2021	Revised 11.3 chapter (P.62 ~ P.65) Revised 11.7.1 chapter (P.91) Revised 11.8.2 chapter (P.95) Revised Appendix B (P.116~ P.118) Revised 11.7.1 chapter (P.91)	Nicole Chu

Contents

1. General Information	4
1.1 Reference Testing Standards	4
2. Test Site Environment	4
3. Description of Device Under Test (DUT)	5
4. Summary of Maximum Value	9
5. Introduction	10
5.1 SAR Definition	10
5.2 RF Exposure Limits	10
6. System Description	11
6.1 SAR Measurement System.....	11
6.2 Tissue Simulating Liquids (TSL)	15
7. System Verification	18
7.1 SAR System Verification	18
7.1.1 SAR Verification Summary.....	19
8. Test Equipment List	20
8.1 SAR Test Equipment List	20
9. Measurement Procedure	21
9.1 SAR Measurement Procedure	21
9.1.1 Area & Zoom Scan Procedures	22
9.1.2 Volume Scan Procedures	23
9.1.3 Power Drift Monitoring	23
9.1.4 Spatial Peak SAR Evaluation.....	23
10. Measurement Uncertainty	24
10.1 SAR Measurement Uncertainty	24
11. Measurement Evaluation.....	27
11.1 Positioning of the DUT in Relation to the Phantom	27
11.2 SAR Testing with RF Transmitter	28
11.2.1 SAR Testing with WCDMA	28
11.2.2 SAR Testing with HSDPA / HSUPA	29
11.2.3 SAR Testing with LTE.....	31
11.2.4 SAR Testing with LTE.....	32
11.2.5 Proximity Sensor.....	35
11.2.5.1. Proximity Sensor Evaluation and Test.....	35
11.2.5.2. Procedures for determining proximity sensor triggering distances.....	35
11.2.5.3. Procedures for determining tablet tilt angle influences to proximity sensor triggering	36
11.2.5.4. Proximity sensor triggering testing summary	37
11.3 Conducted Power Measurements	38
11.4 Power Reduction.....	66
11.5 Antenna location.....	84
11.6 SAR Test Exclusion.....	85
11.7 Test Results.....	87
11.7.1 SAR Test Result.....	87
11.8 Simultaneous Transmission Evaluation.....	92
11.8.1 Simultaneous Transmission Configurations	92
11.8.2 Simultaneous Transmission Result	92
11.8.3 SAR to peak location separation (SPLSR).....	96
11.9 Measurement Variability	99
11.10 Spot Check	100
11.11 Requirements on the Uncertainty Evaluation	101
12. Conclusion	101
Appendix A - System Performance Check	102
Appendix B - Measurement Data	108
Appendix C - Calibration	123

1. General Information

1.1 Reference Testing Standards

Standard	Description	Version
IEC/IEEE 62209-1528	Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Part 1528: Human models, instrumentation, and procedures (Frequency range of 4 MHz to 10 GHz)	2020
IEEE 1528	Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques	2013
IEEE C95.1	American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 300 KHz to 100 GHz, New York	1992
47 CFR Part §2.1093	Radiofrequency radiation exposure evaluation: portable devices	-
KDB 248227 D01	SAR guidance for IEEE 802.11 (Wi-Fi) transmitters	v02r02
KDB 447498 D01	RF exposure procedures and equipment authorization policies for mobile and portable devices	v06
KDB 616217 D04	SAR evaluation considerations for laptop, notebook and tablet computers	v01r02
KDB 865664 D01	SAR measurement requirement for 100 MHz to 6 GHz	v01r04
KDB 865664 D02	RF exposure compliance reporting and documentation considerations	v01r02
KDB 941225 D05	SAR evaluation considerations for LTE devices	v02r05
KDB 941225 D05A	REL. 10 LTE SAR test guidance and KDB inquiries	v01r02
KDB 941225 D06	SAR evaluation procedures for portable devices with wireless router capabilities	v02r01

2. Test Site Environment

Temperature (°C)	21-23
------------------	-------

3. Description of Device Under Test (DUT)

Applicant	ASUSTeK COMPUTER INC. 1F., No. 15, Lide Rd., Beitou Dist., Taipei City 112, Taiwan
Manufacture	ASUSTeK COMPUTER INC. 1F., No. 15, Lide Rd., Beitou Dist., Taipei City 112, Taiwan
Product Type	LTE module
Trade Name	FIBOCOM
Model Number	L850-GL
IMEI No.	862372048347460
FCC ID	MSQL850GL
Class II Permissive Change	(1) This is to request a Class II permissive change for FCC ID: MSQL850GL , originally granted on 2020/12/16 Modification: -Change #1: Additional chassis added, ASUSTeK, model number: CR1100FK, CR1100CK Models differences: All models are electrically identical, different model names are for marketing purpose and the flip angle of panel, as below. CR1100FK is for 360 degree ; CR1100CK is for 180 degree -Change #2: This filing also addresses co-location with WLAN, BT module FCC ID : MSQAX201D2. -Change #3: Add two antennas which have the same antenna type as original grant, and each antenna gain is lower.
Host Information	Product Type: Notebook PC Trade Name: ASUS Model Name: CR1100FK, CR1100CK All models are electrically identical, different model names are for marketing purpose and the flip angle of panel, as below. CR1100FK is for 360 degree ; CR1100CK is for 180 degree

Frequency Range	Operate Bands	Operate Frequency (GHz)
	WCDMA Band II	1852.4 - 1907.6
	WCDMA Band IV	1712.4 - 1752.6
	WCDMA Band V	826.4 - 846.6
	LTE Band 2 (BW 1.4, 3, 5, 10, 15, 20 MHz)	1850.7 - 1909.3
	LTE Band 4 (BW 1.4, 3, 5, 10, 15, 20 MHz)	1710.7 - 1754.3
	LTE Band 5 (BW 1.4, 3, 5, 10 MHz)	824.7 - 848.3
	LTE Band 7 (BW 5, 10, 15, 20 MHz)	2502.5 - 2567.5
	LTE Band 12 (BW 1.4, 3, 5, 10 MHz)	699.7 - 715.3
	LTE Band 13 (BW 5, 10 MHz)	779.5 - 784.5
	LTE Band 17 (BW 5, 10 MHz)	706.5 - 713.15
	LTE Band 26 (BW 1.4, 3, 5, 10, 15 MHz)	814.7 - 848.3
	LTE Band 30 (BW 5, 10 MHz)	2307.5 - 2312.5
	LTE Band 38 (BW 5, 10, 15, 20 MHz)	2572.5 - 2617.5
	LTE Band 41 (BW 5, 10, 15, 20 MHz)	2498.5 - 2687.5
	LTE Band 66 (BW 1.4, 3, 5, 10, 15, 20 MHz)	1710.7 - 1779.3
Modulations	WCDMA: RMC 12.2Kbps/HSPA+ LTE: QPSK/16QAM	
Device Category	Portable Device	
Application Type	Certification	

Note:

1. The above information of DUT was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

Antenna list :

Antenna Source	ANT	Manufacturer	Part No. (Vendor)	Type	Max. Gain (dBi)		
					Band	NB	PAD
1	Chain A	SHENZHEN SOUTH STAR TECHNOLOGY CO., LTD	N19-0866-R0A	PIFA Antenna	WCDMA Band II	-1.18	-3.46
					WCDMA Band IV	-3.41	-5.84
					WCDMA Band V	-1.45	-2.00
					LTE Band 2	-1.18	-3.46
					LTE Band 4	-3.41	-5.84
					LTE Band 5	-1.45	-2.00
					LTE Band 7	0.67	-4.14
					LTE Band 12	-2.25	-2.96
					LTE Band 13	-1.66	-3.30
					LTE Band 17	-2.25	-2.96
					LTE Band 26	-2.18	-2.00
					LTE Band 30	0.04	-0.36
					LTE Band 38	-1.85	-6.62
					LTE Band 41	0.67	-4.14
					LTE Band 66	-3.41	-5.84
	Chain B	SHENZHEN SOUTH STAR TECHNOLOGY CO., LTD	N19-0866-R0A	PIFA Antenna	WCDMA Band II	-1.13	1.40
					WCDMA Band IV	0.45	-1.89
					WCDMA Band V	-1.93	-3.09
					LTE Band 2	-1.13	1.40
					LTE Band 4	0.45	-1.89
					LTE Band 5	-1.93	-3.09
					LTE Band 7	1.87	0.55
					LTE Band 12	-2.13	-3.14
					LTE Band 13	-2.33	-3.11
					LTE Band 17	-2.13	-4.73
					LTE Band 26	-1.93	-2.94
					LTE Band 30	-0.58	-0.54
					LTE Band 38	1.43	0.55
					LTE Band 41	1.87	0.55
					LTE Band 66	0.77	-1.01

Antenna Source	ANT	Manufacturer	Part No. (Vendor)	Type	Max. Gain (dBi)		
					Band	NB	PAD
2	Chain A	AWAN	AXFMY-300003	PIFA Antenna	WCDMA Band II	-2.18	-5.83
					WCDMA Band IV	-4.41	-6.36
					WCDMA Band V	-2.45	-4.5
					LTE Band 2	-2.18	-5.83
					LTE Band 4	-4.41	-6.36
					LTE Band 5	-2.45	-4.5
					LTE Band 7	-0.33	-6.64
					LTE Band 12	-3.25	-3.39
					LTE Band 13	-2.66	-3.38
					LTE Band 17	-3.25	-3.39
					LTE Band 26	-2.45	-4.5
					LTE Band 30	-0.96	-0.91
					LTE Band 38	-2.85	-7.31
					LTE Band 41	-0.33	-6.64
					LTE Band 66	-4.41	-6.07
	Chain B	AWAN	AXFMY-300003	PIFA Antenna	WCDMA Band II	-2.13	-3.37
					WCDMA Band IV	-0.73	-2.66
					WCDMA Band V	-2.93	-3.42
					LTE Band 2	-2.13	-3.37
					LTE Band 4	-0.73	-2.66
					LTE Band 5	-2.93	-3.42
					LTE Band 7	0.42	0.5
					LTE Band 12	-3.13	-4.76
					LTE Band 13	-3.33	-3.21
					LTE Band 17	-3.13	-4.93
					LTE Band 26	-2.93	-3.16
					LTE Band 30	-1.58	-1.88
					LTE Band 38	0.43	-0.73
					LTE Band 41	0.87	0.5
					LTE Band 66	-0.73	-2.45

Note :

1. Antenna Source 1 (SHENZHEN SOUTH STAR TECHNOLOGY CO., LTD) gain is higher. Hence, it is regarded as the initial configuration, and then tested and recorded in this report.
2. Antenna Source 1 (SHENZHEN SOUTH STAR TECHNOLOGY CO., LTD) and Antenna Source 2 (AWAN) are the same type of antenna, only different in manufacturer.
3. The Chain A is connected to AUX port / Chain B is connected to Main port of module.

4. Summary of Maximum Value

Equipment Class	Mode	Highest Reported 1g SAR (W/kg)			
		Tablet/SKU1		Notebook/SKU2	
		Body standalone SAR _{1g} (W/kg)	Highest Simultaneous Transmission SAR	Body standalone SAR _{1g} (W/kg)	Highest Simultaneous Transmission SAR
Licensed	WCDMA Band II	1.15	1.59	0.64	0.89
	WCDMA Band IV	0.70		0.59	
	WCDMA Band V	1.10		0.19	
	LTE Band 2	0.88		0.42	
	LTE Band 7	1.16		0.30	
	LTE Band 12/17	0.83		0.12	
	LTE Band 13	1.04		0.18	
	LTE Band 26/5	0.99		0.18	
	LTE Band 30	0.72		0.10	
	LTE Band 41/38	0.89		0.13	
	LTE Band 66/4	0.65		0.34	
DTS	WLAN2.4GHz Ant Main	0.33	1.58	0.07	0.78
	WLAN2.4GHz Ant Aux	0.72		0.46	
U-NII	WLAN5GHz Ant Main	0.53	1.59	0.16	0.89
	WLAN5GHz Ant Aux	1.11		0.74	
DSS	Bluetooth Ant Aux	0.14	1.58	0.08	0.89

Note:

- The SAR limit (Head & Body: SAR_{1g} 1.6 W/kg) for general population / uncontrolled exposure is specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992.
- This device has two kinds of SKU, SKU 1 is 360 convertible laptop computer, SKU 2 is laptop only. All circuit designs, circuit board and other related designs are electrically identical.
- According to October 2014 TCB workshop SAR guidance for overlapping bands that support roaming using multiple frequency band indicator. This device supports LTE B5/26, B12/17, B4/66 and B38/41 Since the supported frequency span falls completely within the supports frequency span, both LTE bands have the same target power, and both LTE bands share the same transmission path; therefore, SAR was assessed B12/26/38/66.
- SAR testing for WCDMA V, LTE 5/12/13/17 and 26 was performed on the maximum power mode.
- WLAN of the SAR value reference to the FCC ID MSQAX201D2 of the report no. 2107FS11. The Devices evaluated Spot Check, please see as below : 11.10 Spot Check.

5. Introduction

5.1 SAR Definition

Specific Absorption Rate (SAR) is defined as 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:

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

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

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

Where :

σ = conductivity of the tissue (S/m)

ρ = mass density of the tissue (kg/m³)

E = RMS electric field strength (V/m)

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

5.2 RF Exposure Limits

Table 1 Safety Limits for Controlled / Uncontrolled Environment Exposure

SAR Exposure Limit		
	General Population / Uncontrolled Exposure ¹ (W/kg)	Occupational / Controlled Exposure ² (W/kg)
Spatial Peak SAR ³ (head or Body)	1.60	8.00
Spatial Peak SAR ⁴ (Whole Body)	0.08	0.40
Spatial Peak SAR ⁵ (Hands / Feet / Ankle / Wrist)	4.00	20.00

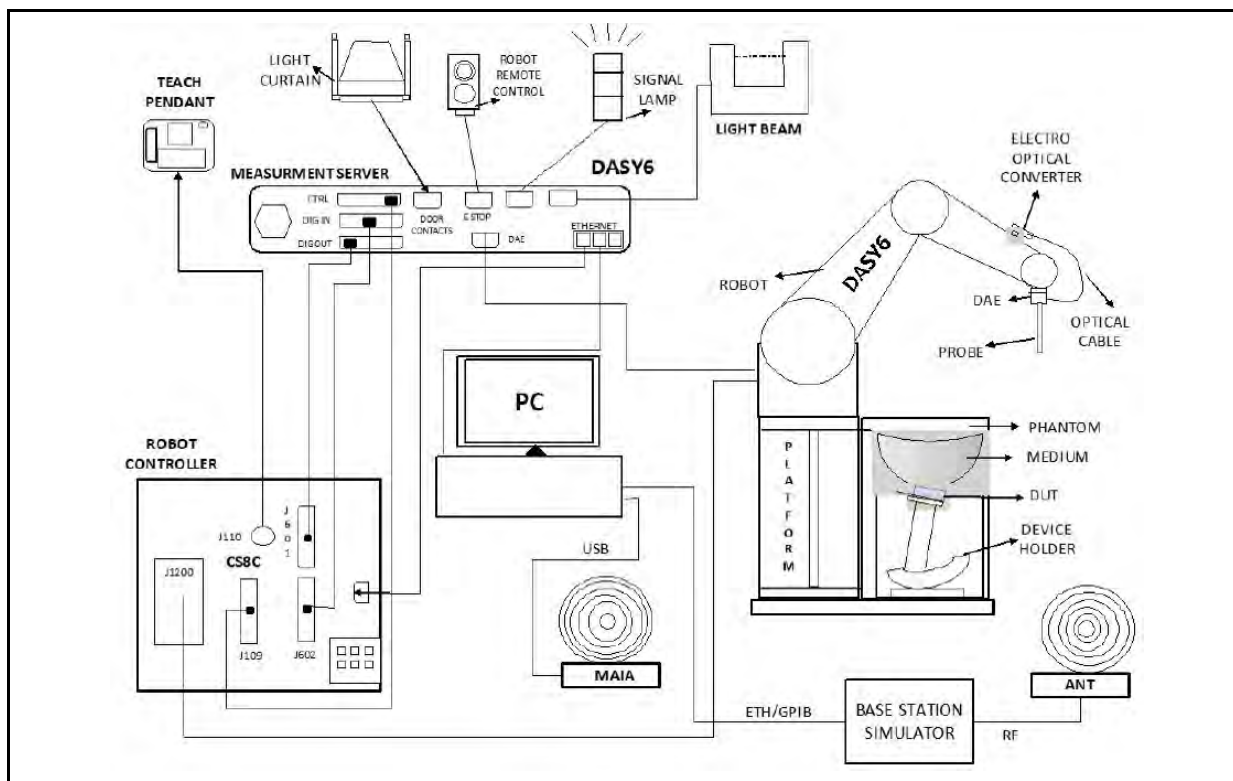
Notes :

- General Population / Uncontrolled Environments** are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.
- Occupational / Controlled Environments** are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation).
- The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
- The Spatial Average value of the SAR averaged over the whole body.
- The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

6. System Description

6.1 SAR Measurement System

The DASY6 system in cDASY6/DASY5 V5.2 SAR Configuration is shown below:



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

1. A standard high precision 6-axis robot (Stäubli TX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
2. An isotropic field probe optimized and calibrated for the targeted measurements.
3. A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
4. The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
5. The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
6. The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
7. A computer running Win7/Win8/Win10 professional operating system and the cDASY6 and DASY5 V5.2 software.
8. Remote controls with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
9. The phantom, the device holder and other accessories according to the targeted measurement.
10. Tissue simulating liquid mixed according to the given recipes.
11. The validation dipole has been calibrated within and the system performance check has been successful.

<DASY E-Field Probe System>

The SAR measurements were conducted with the dosimetric probe (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multi-fiber line ending at the front of the probe tip. It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY software reads the reflection during a software approach and looks for the maximum using a 2nd order fitting. The approach is stopped when reaching the maximum.

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 (30 MHz to 10 GHz)
Directivity	± 0.1 dB in TSL (rotation around probe axis) ± 0.3 dB in TSL (rotation normal to probe axis)
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
Calibration	ISO/IEC 17025 calibration service available
 	
EX3DV4 E-Field Probe Probe setup on robot	

<Data Acquisition Electronic (DAE) System>

Model	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: 4 mV, 400 mV)	
Input Offset Voltage	< 5 μ V (with auto zero)	
Input Bias Current	< 50 fA	
Dimensions	60 x 60 x 68 mm	

<Robot>

Positioner	Stäubli Unimation Corp.	
Robot Model	TX90XL	
Number of Axes	6	
Norminal Load	5 kg	
Reach	1450 mm	
Repeatability	$\pm$ 0.035 mm	

<Device Holder>

The DASY device holder is constructed of low-loss POM material having the following dielectric parameters: relative permittivity $\epsilon=3$ and loss tangent $\delta=0.02$. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

	
Device Holder 1	Device Holder 2

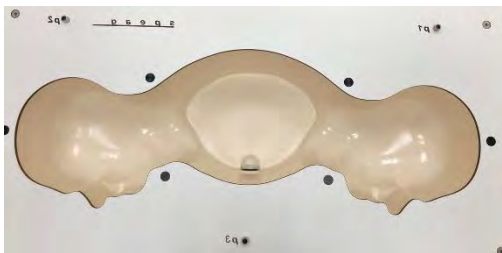
<Oval Flat Phantom – ELI>

The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (Oval Flat) phantom defined in IEEE 1528, IEC 62209-2 and IEC/IEEE 62209-1528. It enables the dosimetric evaluation of wireless portable device 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 manually teaching three points with the robot.

Shell Thickness	2 ±0.2 mm	
Filling Volume	Approx. 30 liters	
Dimensions	190×600×400 mm (H × L × W)	

<SAM Phantom>

The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528, IEC 62209-1 and IEC/IEEE 62209-1528. 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.

Shell Thickness	2 ±0.2 mm	
Filling Volume	Approx. 25 liters	
Dimensions	Length: 1000 mm Width: 500 mm Height: adjustable feet	

6.2 Tissue Simulating Liquids (TSL)

<Tissue Dielectric Parameters in IEEE 1528-2013 and IEC/IEEE 62209-1528>

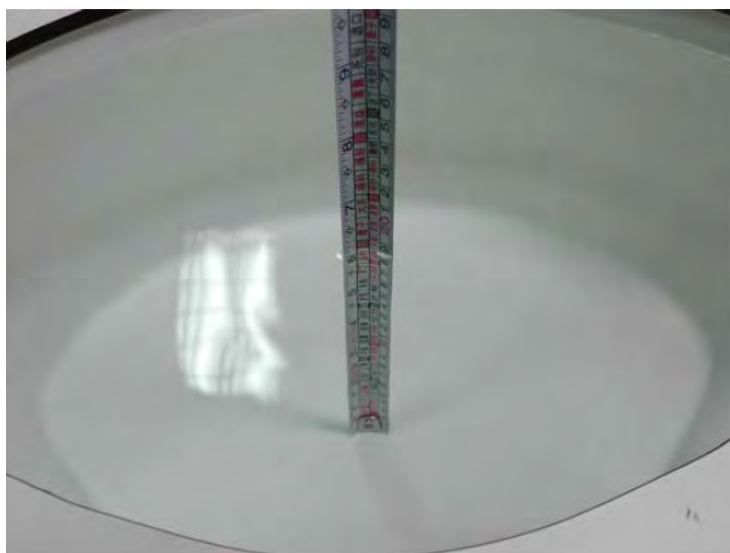
The following table incorporates the tissue dielectric parameters of head recommended by IEEE 1528-2013 and IEC/IEEE 62209-1528. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in human head. Other head and body tissue parameters that have not been specified are derived from the tissue dielectric parameters which computed by the 4-Cole-Cole equation according to the above-mentioned standards.

Table 2 Dielectric properties of the tissue-equivalent liquid material

Frequency	Real part of the complex relative	Conductivity, σ
30	55.0	0.75
150	52.3	0.76
300	45.3	0.87
450	43.5	0.87
750	41.9	0.89
835	41.5	0.90
900	41.5	0.97
1450	40.5	1.20
1800	40.0	1.40
1900	40.0	1.40
1950	40.0	1.40
2000	40.0	1.40
2100	39.8	1.49
2450	39.2	1.80
2600	39.0	1.98
3000	38.5	2.40
3500	37.9	2.91
4000	37.4	3.43
4500	36.8	3.94
5000	36.2	4.45
5200	36.0	4.66
5400	35.8	4.86
5600	35.5	5.07
5800	35.3	5.27
6000	35.1	5.48
6500	34.5	6.07
7000	33.9	6.65
7500	33.3	7.24
8000	32.7	7.84
8500	32.1	8.46
9000	31.6	9.08
9500	31.0	9.71
10000	30.4	10.4

<Liquid Depth>

The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm to ensure that the probe is immersed sufficiently in the tissue medium.



Tissue-equivalent Liquid Height

<Liquid Check>

1. The dielectric parameters of the liquids were verified prior to the SAR evaluation using a DAKS 3.5 Probe Kit.
2. The SAR testing with IEC tissue parameters as an alternative option to Head and body parameters. The head TSL were applied to body SAR tests with restrictions below:

The mixing and matching of head TSL and body TSL for body SAR testing in a single application are not permitted. For example, testing body SAR with head TSL and then switch to Body TSL for body SAR test is not allowed. The consistency of TSL is required.

Tissue Temp (°C)	Liquid Type	Frequency (MHz)	Cond.	Perm.	target Cond.	target Perm.	σ (Delta) (%)	ϵ_r (Delta) (%)	Limit (%)	Date
			σ	ϵ_r	σ	ϵ_r				
23.2	Head	704 MHz	0.85	43.21	0.89	42.15	-3.68	2.53	±5	Jun. 29, 2021
23.2	Head	707.5 MHz	0.86	43.16	0.89	42.12	-3.39	2.48	±5	Jun. 29, 2021
23.2	Head	711 MHz	0.86	43.12	0.89	42.11	-2.91	2.39	±5	Jun. 29, 2021
23.2	Head	782 MHz	0.92	42.16	0.89	41.75	3.18	0.99	±5	Jun. 29, 2021
23.2	Head	709 MHz	0.88	44.00	0.89	42.12	-0.27	4.46	±5	Jun. 29, 2021
23.2	Head	710 MHz	0.89	43.98	0.89	42.11	-0.16	4.45	±5	Jun. 29, 2021
23.2	Head	711 MHz	0.89	43.97	0.89	42.11	-0.05	4.41	±5	Jun. 29, 2021
22.3	Head	826.4 MHz	0.90	42.54	0.90	41.54	-0.44	2.41	±5	Jun. 30, 2021
22.3	Head	836.4 MHz	0.91	42.40	0.90	41.50	0.34	2.17	±5	Jun. 30, 2021

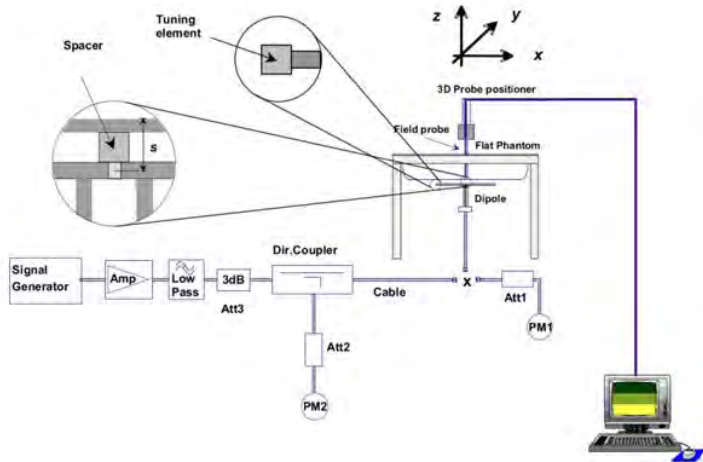


Tissue Temp (°C)	Liquid Type	Frequency (MHz)	Cond.	Perm.	target Cond.	target Perm.	σ (Delta) (%)	ϵ_r (Delta) (%)	Limit (%)	Date
			σ	ϵ_r	σ	ϵ_r				
22.3	Head	846.6 MHz	0.92	42.26	0.91	41.50	0.27	1.82	±5	Jun. 30, 2021
22.3	Head	829 MHz	0.90	42.50	0.90	41.53	-0.14	2.34	±5	Jun. 30, 2021
22.3	Head	836.5 MHz	0.91	42.40	0.90	41.50	0.36	2.16	±5	Jun. 30, 2021
22.3	Head	844 MHz	0.91	42.29	0.91	41.50	0.32	1.90	±5	Jun. 30, 2021
22.3	Head	821.5 MHz	0.89	42.61	0.90	41.57	-0.88	2.50	±5	Jun. 30, 2021
22.3	Head	831.5 MHz	0.90	42.47	0.90	41.51	0.03	2.31	±5	Jun. 30, 2021
22.3	Head	841.5 MHz	0.91	42.32	0.91	41.50	0.37	1.98	±5	Jun. 30, 2021
22.7	Head	1852.4 MHz	1.39	41.37	1.40	40.00	-0.68	3.43	±5	Jul. 01, 2021
22.7	Head	1880 MHz	1.42	41.28	1.40	40.00	1.41	3.19	±5	Jul. 01, 2021
22.7	Head	1907.6 MHz	1.44	41.21	1.40	40.00	3.21	3.02	±5	Jul. 01, 2021
22.7	Head	1860 MHz	1.40	41.34	1.40	40.00	0.02	3.34	±5	Jul. 01, 2021
22.7	Head	1880 MHz	1.42	41.28	1.40	40.00	1.41	3.19	±5	Jul. 01, 2021
22.7	Head	1900 MHz	1.44	41.23	1.40	40.00	2.70	3.07	±5	Jul. 01, 2021
22.5	Head	1712.4 MHz	1.35	40.79	1.35	40.13	-0.11	1.65	±5	Jul. 02, 2021
22.5	Head	1732.6 MHz	1.36	40.75	1.36	40.10	0.23	1.62	±5	Jul. 02, 2021
22.5	Head	1752.6 MHz	1.38	40.69	1.37	40.07	0.54	1.54	±5	Jul. 02, 2021
22.5	Head	1720 MHz	1.36	40.78	1.35	40.11	0.11	1.67	±5	Jul. 02, 2021
22.5	Head	1732.5 MHz	1.36	40.75	1.36	40.10	0.23	1.62	±5	Jul. 02, 2021
22.5	Head	1745 MHz	1.37	40.71	1.37	40.08	0.41	1.57	±5	Jul. 02, 2021
22.5	Head	1720 MHz	1.35	40.78	1.35	40.11	0.04	1.67	±5	Jul. 02, 2021
22.5	Head	1745 MHz	1.37	40.71	1.37	40.08	0.41	1.57	±5	Jul. 02, 2021
22.5	Head	1770 MHz	1.40	40.64	1.38	40.04	0.91	1.50	±5	Jul. 02, 2021
21.3	Head	2510 MHz	1.87	39.37	1.86	39.12	0.49	0.64	±5	Jul. 03, 2021
21.3	Head	2535 MHz	1.91	39.34	1.89	39.09	0.75	0.64	±5	Jul. 03, 2021
21.3	Head	2560 MHz	1.93	39.26	1.92	39.05	0.80	0.55	±5	Jul. 03, 2021
21.3	Head	2580 MHz	1.96	39.17	1.94	39.03	1.06	0.37	±5	Jul. 03, 2021
21.3	Head	2595 MHz	1.98	39.12	1.95	39.01	1.49	0.27	±5	Jul. 03, 2021
21.3	Head	2610 MHz	2.00	39.08	1.97	38.99	1.68	0.22	±5	Jul. 03, 2021
21.3	Head	2510 MHz	1.87	39.37	1.86	39.12	0.49	0.64	±5	Jul. 03, 2021
21.3	Head	2549.5 MHz	1.92	39.31	1.91	39.07	0.64	0.62	±5	Jul. 03, 2021
21.3	Head	2595 MHz	1.98	39.12	1.95	39.01	1.49	0.27	±5	Jul. 03, 2021
21.3	Head	2636.5 MHz	2.04	38.99	2.00	38.96	1.75	0.09	±5	Jul. 03, 2021
21.3	Head	2680 MHz	2.09	38.85	2.05	38.90	2.04	-0.13	±5	Jul. 03, 2021
21.3	Head	2506 MHz	1.87	39.38	1.86	39.13	0.41	0.63	±5	Jul. 03, 2021
22.1	Head	2310 MHz	1.64	40.01	1.68	39.44	-2.33	1.44	±5	Jul. 04, 2021

7. System Verification

7.1 SAR System Verification

<Symmetric Dipoles for SAR System Verification>

Construction	Symmetrical dipole with $\lambda/4$ balun enables measurement of feed point impedance with NWA matched for use near flat phantoms filled with head simulating solutions Includes distance holder and tripod adaptor Calibration Calibrated SAR value for specified position and input power at the flat phantom in head simulating solutions.
Return Loss	> 20 dB at specified verification position.
Options	Dipoles for other frequencies or solutions and other calibration conditions are available upon request.
 The diagram illustrates the system verification setup. It includes a Signal Generator connected to an Amplifier (Amp), followed by a Low Pass filter, a 3dB attenuator (Att3), and a Directional Coupler (Dir. Coupler). The Dir. Coupler is connected to a Cable, which leads to a Dipole antenna. The Dipole is positioned near a Flat Phantom. A 3D Probe positioner is used to move the Dipole. A Field probe is also shown. The setup is connected to a computer (PM1) and a power meter (PM2). A Tuning element and Spacer are also shown.  A photograph of the Validation Kit, showing a black tripod stand with a silver metal rod and a blue cable attached to it.	
System Verification Setup Diagram Validation Kit	



7.1.1 SAR Verification Summary

Prior to the assessment, the validation data compared to the original value provided by SPEAG should be within its specifications of $\pm 10\%$. The measured SAR will be normalized to 1 W input power. The result indicates the system check can meet the variation criterion and plots can be referred to Appendix A of this report.

Mixture Type	Frequency (MHz)	Power	Probe	Dipole	SAR _{1g} (W/Kg)	Normalize to 1 Watt 1 g (W/Kg)	1 W Target SAR _{1g} (W/Kg)	SAR _{10g} (W/Kg)	Normalize to 1 Watt 10 g (W/Kg)	1 W Target SAR _{10g} (W/Kg)	Difference percentage 1 g	Difference percentage 10 g	Date
			Model / Serial No.	Model / Serial No.									
Head	750	250 mW	EX3DV4-SN 3977	D750V3 – SN1004	2.24	8.96	8.37	1.47	5.88	5.48	7.0%	7.3%	Jun. 29, 2021
Head	835	250 mW	EX3DV4-SN 3977	D835V2 – SN4d082	2.52	10.08	9.49	1.66	6.64	6.17	6.2%	7.6%	Jun. 30, 2021
Head	1750	250 mW	EX3DV4-SN 3977	D1750V2 – SN1111	8.29	33.16	36.40	4.3	17.2	19.00	-8.9%	-9.5%	Jul. 02, 2021
Head	1900	250 mW	EX3DV4-SN 3977	D1900V2 – SN5d111	10.7	42.8	40.10	5.6	22.4	20.70	6.7%	8.2%	Jul. 01, 2021
Head	2300	250 mW	EX3DV4-SN 3977	D2300V2 – SN1005	11.6	46.4	47.70	5.42	21.68	22.10	-2.7%	-1.9%	Jul. 04, 2021
Head	2600	250 mW	EX3DV4-SN 3977	D2600V2 – SN1007	15.3	61.2	57.30	7	28	25.90	6.8%	8.1%	Jul. 03, 2021



8. Test Equipment List

8.1 SAR Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Cal. Date	Cal.Period
SPEAG	750MHz System Validation Kit	D750V3	1004	2020/09/17	1 year
SPEAG	835MHz System Validation Kit	D835V2	4d082	2020/09/17	1 year
SPEAG	1750MHz System Validation Kit	D1750V2	1111	2021/04/14	1 year
SPEAG	1900MHz System Validation Kit	D1900V2	5d111	2020/09/18	1 year
SPEAG	2300MHz System Validation Kit	D2300V2	1005	2021/04/14	1 year
SPEAG	2600MHz System Validation Kit	D2600V2	1007	2020/09/29	1 year
SPEAG	Dosimetric E-Field Probe	EX3DV4	3977	2020/07/29	1 year
SPEAG	Data Acquisition Electronics	DAE4	1253	2020/12/16	1 year
SPEAG	Measurement Server	SE UMS 011 BB	1241	NCR	
SPEAG	Device Holder	N/A	N/A	NCR	
SPEAG	Phantom	SAM V4.0	TP-1623	NCR	
SPEAG	Phantom	ELI V5.0	1175	NCR	
SPEAG	Robot	Staubli TX90XL	F11/5G9EA1/A/01	NCR	
SPEAG	Software	DASY52 V52.10 (3)	N/A	NCR	
SPEAG	Software	SEMCAD X V14.6.13 (7474)	N/A	NCR	
R&S	Wireless Communication Test Set	CMU200	112387	2021/03/17	1 year
Anritsu	Radio Communication Analyzer	MT8820C	6201342039	2020/12/03	1 year
SPEAG	Network Analyzer	DAKS_VNA R140	0010318	2021/05/26	1 year
SPEAG	Dielectric Probe Kit	DAKS-3.5	1101	2021/05/26	1 year
HILA	Digital Thermometer	TM-906A	1500033	2020/10/28	1 year
Anritsu	Power Sensor	MA2411B	1126022	2020/09/01	1 year
Anritsu	Power Meter	ML2495A	1135009	2020/09/01	1 year
Agilent	Signal Generator	E8257D	MY44320425	2021/02/18	1 year
Agilent	Spectrum Analyzer	N9030A	MT-112	2021/01/08	1 year
Agilent	Dual Directional Coupler	778D	50334	NCR	
Woken	Dual Directional Coupler	0100AZ20200801O	11012409517	NCR	
Mini-Circuits	Power Amplifier	EMC014225P	980292	NCR	
Mini-Circuits	Power Amplifier	EMC2830P	980293	NCR	
Aisi	Attenuator	IEAT 3dB	N/A	NCR	

Testing Engineer: Jason Tsao / Ted Hsieh

9. Measurement Procedure

9.1 SAR Measurement Procedure

The measurement procedures are as follows:

1. The DUT is installed engineering testing software that provides continuous transmitting signal.
2. Measure output power through RF cable and power meter
3. Set scan area, grid size and other setting on the DASY software
4. Find out the largest SAR result on these testing positions of each band
5. Measure SAR results for other channels in worst SAR testing position if the SAR of highest power channel is larger than 0.8 W/kg

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

1. Power reference measurement
2. Area scan
3. Zoom scan
4. Power drift measurement

9.1.1 Area & Zoom Scan Procedures

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 measures points and step size follow as below. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution.

The measure settings are referred to KDB 865664 D01v01r04 :

			≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			5 mm $\pm$ 1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2)$ mm $\pm$ 0.5 mm
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: Δx_{Area} , Δy_{Area}			≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
			When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	
Maximum zoom scan spatial resolution: Δx_{Area} , Δy_{Area}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	Graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$ mm	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see IEEE Std 1528-2013 for details.				
* When zoom scan is required and the reported SAR from the area scan based 1-g SAR estimation procedures of KDB Publication 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

9.1.2 Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1 g aggregate SAR, the DUT 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.

9.1.3 Power Drift Monitoring

All SAR testing is under the DUT 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 DUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drifts more than 5 %, the SAR will be retested.

9.1.4 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1 g and 10 g, 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 1 g and 10 g 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 1 g and 10 g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

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

10. Measurement Uncertainty

10.1 SAR Measurement Uncertainty

Uncertainty Budget for frequency range 300 MHz to 3 GHz:

Measurement uncertainty (0.3GHz ~3 GHz)								
Uncertainty component	Tol.	Prob. Dist.	Div.	C _i - 1g	C _i - 10g	u _i - 1g (+ %)	u _i - 10g (+ %)	v _i
Measurement system								
Probe calibration	6.1	N	1	1	1	6.1	6.1	∞
Axial isotropy	4.7	R	1.732	0.7	0.7	1.9	1.9	∞
Hemispherical isotropy	9.6	R	1.732	0.7	0.7	3.9	3.9	∞
Boundary effect	1	R	1.732	1	1	0.6	0.6	∞
Linearity	4.7	R	1.732	1	1	2.7	2.7	∞
System detection limits	0.25	R	1.732	1	1	0.1	0.1	∞
Readout electronics	0.3	N	1	1	1	0.3	0.3	∞
Response time	0.8	R	1.732	1	1	0.5	0.5	∞
Integration time	2.6	R	1.732	1	1	1.5	1.5	∞
RF Ambient Noise	3	R	1.732	1	1	1.7	1.7	∞
RF Ambient Reflections	3	R	1.732	1	1	1.7	1.7	∞
Probe Positioner	0.02	R	1.732	1	1	0	0	∞
Probe Positioning	0.4	R	1.732	1	1	0.2	0.2	∞
Max. SAR evaluation	2	R	1.732	1	1	1.2	1.2	∞
Test sample related								
Test sample positioning	2.9	N	1	1	1	2.9	2.9	145
Device holder uncertainty	3.6	N	1	1	1	3.6	3.6	5
SAR drift measurement	5	R	1.732	1	1	2.9	2.9	∞
Phantom and tissue parameters								
Phantom shell uncertainty	7.6	R	1.732	1	1	4.4	4.4	∞
Liquid Conductivity (target)	5	R	1.732	0.78	0.71	2.3	2	∞
Liquid Conductivity (measurement)	4.8	R	1.732	0.78	0.71	2.2	2	∞
Liquid Permittivity (target)	5	R	1.732	0.23	0.26	0.7	0.8	∞
Liquid Permittivity (measurement)	4.8	R	1.732	0.23	0.26	0.6	0.7	∞
Combined standard uncertainty								
-	-	RSS	-	-	-	11.5	11.5	515
Expanded uncertainty (95% confidence interval)								
-	-	k=2	-	-	-	23.1	22.9	

Uncertainty Budget for frequency range 3 GHz to 6 GHz:

Measurement uncertainty (3 GHz~6 GHz)								
Uncertainty component	Tol.	Prob. Dist.	Div.	C _i - 1g	C _i - 10g	u _i - 1g ($\pm$ %)	u _i - 10g ($\pm$ %)	v _i
Measurement system								
Probe calibration	6.7	N	1	1	1	6.7	6.7	∞
Axial isotropy	4.7	R	1.732	0.7	0.7	1.9	1.9	∞
Hemispherical isotropy	9.6	R	1.732	0.7	0.7	3.9	3.9	∞
Boundary effect	2	R	1.732	1	1	1.2	1.2	∞
Linearity	4.7	R	1.732	1	1	2.7	2.7	∞
System detection limits	0.25	R	1.732	1	1	0.1	0.1	∞
Readout electronics	0.3	N	1	1	1	0.3	0.3	∞
Response time	0	R	1.732	1	1	0	0	∞
Integration time	2.6	R	1.732	1	1	1.5	1.5	∞
RF Ambient Noise	3	R	1.732	1	1	1.7	1.7	∞
RF Ambient Reflections	3	R	1.732	1	1	1.7	1.7	∞
Probe Positioner	0.04	R	1.732	1	1	0.02	0.02	∞
Probe Positioning	0.8	R	1.732	1	1	0.5	0.5	∞
Max. SAR evaluation	4	R	1.732	1	1	2.3	2.3	∞
Test sample related								
Test sample positioning	2.9	N	1	1	1	2.9	2.9	145
Device holder uncertainty	3.6	N	1	1	1	3.6	3.6	7
SAR drift measurement	5	R	1.732	1	1	2.9	2.9	∞
Phantom and tissue parameters								
Phantom shell uncertainty	7.6	R	1.732	1	1	4.4	4.4	∞
Liquid Conductivity (target)	5	R	1.732	0.78	0.71	2.3	2	∞
Liquid Conductivity (measurement)	4.8	R	1.732	0.78	0.71	2.2	2	∞
Liquid Permittivity (target)	5	R	1.732	0.23	0.26	0.7	0.8	∞
Liquid Permittivity (measurement)	4.8	R	1.732	0.23	0.26	0.6	0.7	∞
Combined standard uncertainty								
-	-	RSS	-	-	-	12.1	12.0	859
Expanded uncertainty (95% confidence interval)								
-	-	k =2	-	-	-	24.1	24.0	-

Uncertainty Budget for frequency range 6 GHz to 10 GHz:

Measurement uncertainty (6 GHz~10 GHz)								
Uncertainty component	Tol.	Prob. Dist.	Div.	C _i - 1g	C _i - 10g	u _i - 1g ($\pm$ %)	u _i - 10g ($\pm$ %)	v _i
Measurement system								
Probe calibration	9.3	N	1	1	1	9.3	9.3	∞
Axial isotropy	4.7	R	1.732	0.7	0.7	1.9	1.9	∞
Hemispherical isotropy	9.6	R	1.732	0.7	0.7	3.9	3.9	∞
Boundary effect	2	R	1.732	1	1	1.2	1.2	∞
Linearity	4.7	R	1.732	1	1	2.7	2.7	∞
System detection limits	0.25	R	1.732	1	1	0.1	0.1	∞
Readout electronics	0.3	N	1	1	1	0.3	0.3	∞
Response time	0.8	R	1.732	1	1	0.5	0.5	∞
Integration time	2.6	R	1.732	1	1	1.5	1.5	∞
RF Ambient Noise	3	R	1.732	1	1	1.7	1.7	∞
RF Ambient Reflections	3	R	1.732	1	1	1.7	1.7	∞
Probe Positioner	0.04	R	1.732	1	1	0	0	∞
Probe Positioning	1.6	R	1.732	1	1	0.9	0.9	∞
Max. SAR evaluation	6	R	1.732	1	1	3.5	3.5	∞
Test sample related								
Test sample positioning	2.9	N	1	1	1	2.9	2.9	145
Device holder uncertainty	3.6	N	1	1	1	3.6	3.6	5
SAR drift measurement	5	R	1.732	1	1	2.9	2.9	∞
Phantom and tissue parameters								
Phantom shell uncertainty	6.6	R	1.732	1	1	3.3	3.3	∞
Liquid Conductivity (target)	5	R	1.732	0.78	0.71	2.3	2	∞
Liquid Conductivity (measurement)	4.8	N	1	0.78	0.71	3.7	3.4	∞
Liquid Permittivity (target)	5	R	1.732	0.23	0.26	0.7	0.8	∞
Liquid Permittivity (measurement)	4.8	N	1	0.23	0.26	1.1	1.2	∞
Combined standard uncertainty								
-	-	RSS	-	-	-	14.2	14.1	1174
Expanded uncertainty (95% confidence interval)								
-	-	k =2	-	-	-	28.3	28.1	-

11. Measurement Evaluation

11.1 Positioning of the DUT in Relation to the Phantom

The following measurement procedure shall be according to RSS-102 Supplementary procedures (SPR-001):

Unless the side(s)/edge(s) of the laptop type computer (laptop mode/tablet mode) containing the built-in antenna(s) was already tested against the flat phantom.

Industry Canada requires SAR measurements to be performed with the side(s)/edge(s) of the display screen containing the built-in antenna(s) pointing towards the flat phantom.

1. If the integrated antenna(s) are located in the back side of the display screen, the back side shall be facing towards the flat phantom at a distance not exceeding 25 mm.
2. If the integrated antenna(s) are installed along the edge(s) of the display screen, the edge(s) shall be facing towards the flat phantom at a distance not exceeding 25 mm.

According to KDB 616217 D04:

1. When antennas are incorporated in the keyboard section of a laptop computer, SAR is required for the bottom surface of the keyboard. Provided tablet use conditions are not supported by the laptop computer, SAR tests for bystander exposure from the edges of the keyboard.
2. Some 2-in-1 tablets may operate with the display folded on top of the keyboard. Most recent tablets are designed with an interactive display that may not require a physical keyboard. Both configurations are used in similar manners and require SAR evaluation for the back surface and edges of the tablet. For keyboards that can be unfolded like a laptop, the procedures for laptop platform should also be applied.



11.2 SAR Testing with RF Transmitter

11.2.1 SAR Testing with WCDMA

<General requirements>

1. The default test configuration is to measure SAR with an established radio link between the handset and a communication test set using a 12.2 kbps RMC (reference measurement channel) configured in Test Loop Mode 1.
2. SAR must be measured according to these maximum output conditions and requirements in KDB Publication 447498 D01.
3. **Head SAR:**
 - SAR for next to the ear head exposure is measured using a 12.2 kbps RMC with TPC bits configured to all "1's".
4. **Body-Worn Accessory SAR:**
 - SAR for body-worn accessory configurations is measured using a 12.2 kbps RMC with TPC bits configured to all "1's".
 - The 3G SAR test reduction procedure is applied to other spreading codes and multiple DPDCHn configurations supported by the handset with 12.2 kbps RMC as the primary mode.

<Setup >

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 specification. The DUT supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7).

- Step1: set a Test Mode 1 loop back with a 12.2 kbps Reference Measurement Channel (RMC).
- Step 2: set and send continuously up power control commands to the device.
- Step 3: measure the power at the device antenna connector using the power meter with average detector and test SAR.

11.2.2 SAR Testing with HSDPA / HSUPA

<General requirements>

1. The following procedures are applicable to HSPA (HSUPA/HSDPA) data devices operating under 3GPP Release 6. Body exposure conditions generally apply to these devices, including handsets and data modems operating in various electronic devices.
2. HSUPA operates in conjunction with WCDMA and HSDPA. SAR is initially measured in WCDMA test configurations without HSPA. The default test configuration is to establish a radio link between the DUT and a communication test set to configure a 12.2 kbps RMC (reference measurement channel) in Test Loop Mode 1.
3. SAR for HSPA is selectively measured with HS-DPCCH, EDPCCCH and E-DPDCH, all enabled, along with a 12.2 kbps RMC using the highest SAR configuration in WCDMA with 12.2 kbps RMC only. An FRC is configured according to HSDPCCH Sub-test 1 using H-set 1 and QPSK. HSPA is configured according to E-DCH Subtest 5 requirements.

SAR for other HSPA sub-test configurations is also confirmed selectively according to output power, exposure conditions and E-DCH UE Category. Maximum output power is verified according to procedures in applicable versions of 3GPP TS 34.121 and SAR must be measured according to these maximum output conditions. The UE Categories for HSDPCCH and HSPA should be clearly identified in the SAR report. The following procedures are applicable only if Maximum Power Reduction (MPR) is implemented according to Cubic Metric (CM) requirements.

4. When voice transmission and head exposure conditions are applicable to a WCDMA/HSPA data device, head exposure is measured according to the 'Head SAR Measurements' procedures in the 'WCDMA Handsets' section of this document.
5. SAR for body exposure configurations are measured according to the 'Body SAR Measurements' procedures in the 'WCDMA Handsets' section of this document. In addition, body SAR is also measured for HSPA when the maximum average output of each RF channel with HSPA active is at least ¼ dB higher than that measured without HSPA using 12.2 kbps RMC or the maximum SAR for 12.2 kbps RMC is above 75% of the SAR limit.
6. 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 with power control algorithm 2, according to the highest body SAR configuration in 12.2 kbps RMC without HSPA. When VOIP is applicable for head exposure, SAR is not required when the maximum output of each RF channel with HSPA is less than ¼ dB higher than that measured using 12.2 kbps RMC; otherwise, the same HSPA configuration used for body measurements should be used to test for head exposure.
7. Due to inner loop power control requirements in HSPA, a commercial communication test set should be used for the output power and SAR tests. The 12.2 kbps RMC, FRC H-set 1 and E-DCH configurations for HSPA should be configured according to the β values indicated below as well as other applicable procedures described in the 'WCDMA Handset' and 'Release 5 HSDPA Data Devices' sections of this document.

<Setup >

HSDPA should be configured according to the 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 with 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}) should be set according to values indicated in the Table below. The CQI value is determined by the UE category, transport block size, number of HS-PDSCHs and modulation used in the H-set.

Setup for Release 5 HSDPA							
Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	$\beta_{hs}^{(1,2)}$	CM ⁽³⁾ (dB)	MRP ⁽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 $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$ 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 $\beta_{hs} = 24/15 * \beta_c$ 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. 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 signaled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 11/15$ and $\beta_d = 15/15$.							

11.2.3 SAR Testing with LTE

<FDD Setup >

All SAR measurements for LTE were performed using the Anritsu MT8820C. A closed loop power control setting allowed the UE to transmit at the maximum output power during the SAR measurements. Configure the basestation to support LTE tests in respect to the 3GPP 36.521-1, and set ch , RB allocation number ,RB allocation offset , and send continuously Up power control commands to the device.

MPR was enabled for this device. A-MPR was disabled for all SAR test measurements.

<TDD Setup >

All SAR measurements for LTE were performed using the Anritsu MT8820C. A closed loop power control setting allowed the UE to transmit at the maximum output power during the SAR measurements. Configure the basestation to support LTE tests in respect to the 3GPP 36.521-1, and set ch , TDD mode , RB allocation number ,RB allocation offset , and send continuously Up power control commands to the device.

MPR was enabled for this device. A-MPR was disabled for all SAR test measurements.

For 3GPP table 4.2.1 as below, support configurations and worst-case UpPTS information into the table.

The EUT only supports the 40 % case, which is Table 4.2.2, configuration #1 below.

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

<Maximum power reduction (MPR) >

Identify the LTE voice/data requirements in each operating mode and exposure condition with respect to head and body test configurations, antenna locations, handset flip-cover or slide positions, antenna diversity conditions etc.

The voice and data transmission:

- ◆ Data only device.

Identify if Maximum Power Reduction (MPR) is optional or mandatory, i.e. built-in by design:

- ◆ Maximum Power Reduction (MPR) is mandatory, i.e. built-in by design.
- ◆ A-MPR (additional MPR) must be disabled
- ◆ A-MPR was disabled during testing.

Maximum Power Reduction (MPR) for Power Class 1, 2 and 3							
Channel bandwidth / Transmission bandwidth configuration (RB)							
Modulation	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20MHz	MPR (dB)
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3
256 QAM	≥ 1						≤ 5

11.2.4 SAR Testing with LTE

<General requirements>

1. Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
2. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel.
3. When the highest reported SAR for 1 RB and 50% RB allocation are > 0.8 W/kg, SAR is measured for the highest output power channel in 100%RB.
4. 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.
5. The procedures required for 1 RB allocation are applied to measure the SAR for QPSK with 50% RB allocation.
6. For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation 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.
7. SAR is required only when the highest maximum output power for the configuration in the higher order modulation is $> \frac{1}{2}$ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg.
8. According to 5.3 of KDB 941225 D05, that about the test reduction for other channel bandwidth, if the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is $> \frac{1}{2}$ 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, then SAR need to test.
9. When a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing; therefore, the requirement for H, M, and L channels may not fully apply.

<FDD Setup >

All SAR measurements for LTE were performed using the Anritsu MT8820C. A closed loop power control setting allowed the UE to transmit at the maximum output power during the SAR measurements. Configure the basestation to support LTE tests in respect to the 3GPP 36.521-1, and set ch , RB allocation number ,RB allocation offset , and send continuously Up power control commands to the device.

MPR was enabled for this device. A-MPR was disabled for all SAR test measurements.

<TDD Setup >

All SAR measurements for LTE were performed using the Anritsu MT8820C. A closed loop power control setting allowed the UE to transmit at the maximum output power during the SAR measurements. Configure the basestation to support LTE tests in respect to the 3GPP 36.521-1, and set ch , TDD mode , RB allocation number ,RB allocation offset , and send continuously Up power control commands to the device.

MPR was enabled for this device. A-MPR was disabled for all SAR test measurements.

For 3GPP table 4.2.1 as below, support configurations and worst-case UpPTS information into the table.

3GPP Table 4.2-1: Configuration of special subframe (lengths of DwPTS/GP/UpPTS).

Special subframe configuration	Normal cyclic prefix in downlink			Extended cyclic prefix in downlink			EUT Support Special subframe	Worst case UpPTS
	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			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			-	-	-	☐	☐
Duty cycle _(maximum)								43.33 %

The EUT only supports the 40 % case, which is Table 4.2.2, configuration #1 below.

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

<Maximum power reduction (MPR) >

Identify the LTE voice/data requirements in each operating mode and exposure condition with respect to head and body test configurations, antenna locations, handset flip-cover or slide positions, antenna diversity conditions etc.

The voice and data transmission:

- ◆ Data only device.

Identify if Maximum Power Reduction (MPR) is optional or mandatory, i.e. built-in by design:

- ◆ Maximum Power Reduction (MPR) is mandatory, i.e. built-in by design.
- ◆ A-MPR (additional MPR) must be disabled
- ◆ A-MPR was disabled during testing.

Maximum Power Reduction (MPR) for Power Class 1, 2 and 3							
Channel bandwidth / Transmission bandwidth configuration (RB)							
Modulation	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20MHz	MPR (dB)
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3
256 QAM	≥ 1						≤ 5

11.2.5 Proximity Sensor

11.2.5.1. Proximity Sensor Evaluation and Test

The device supports WWAN, WLAN, and Bluetooth capabilities. It is designed with a proximity sensor which can trigger/not trigger power reduction for WCDMA and LTE on Side 1 of EUT for SAR compliance. Others RF capability (WLAN and Bluetooth) have no power reduction.

11.2.5.2. Procedures for determining proximity sensor triggering distances

The proximity sensor triggering distance was determined per KDB 616217 for rear face and applicable edge. Summary for power verification per distance was tabulated in the below table.

Depending on how the antenna and sensor are overlapping, Since The proximity sensor which is combined with antenna in one component, the procedure for proximity sensor coverage is not required.

Side 1(Near to Far)											
Gap (mm)	15	16	17	18	19	20	21	22	23	24	25
Band	on	on	on	on	on	on	off	off	off	off	off
WCDMA Band II	18.50	18.50	18.50	18.50	18.50	18.50	24.50	24.50	24.50	24.50	24.50
WCDMA Band IV	18.50	18.50	18.50	18.50	18.50	18.50	24.50	24.50	24.50	24.50	24.50
LTE Band 2	18.00	18.00	18.00	18.00	18.00	18.00	24.00	24.00	24.00	24.00	24.00
LTE Band 4	18.00	18.00	18.00	18.00	18.00	18.00	24.00	24.00	24.00	24.00	24.00
LTE Band 7	15.50	15.50	15.50	15.50	15.50	15.50	24.00	24.00	24.00	24.00	24.00
LTE Band 30	18.00	18.00	18.00	18.00	18.00	18.00	24.00	24.00	24.00	24.00	24.00
LTE Band 38	16.50	16.50	16.50	16.50	16.50	16.50	24.00	24.00	24.00	24.00	24.00
LTE Band 41	16.50	16.50	16.50	16.50	16.50	16.50	24.00	24.00	24.00	24.00	24.00
LTE Band 66	18.00	18.00	18.00	18.00	18.00	18.00	24.00	24.00	24.00	24.00	24.00

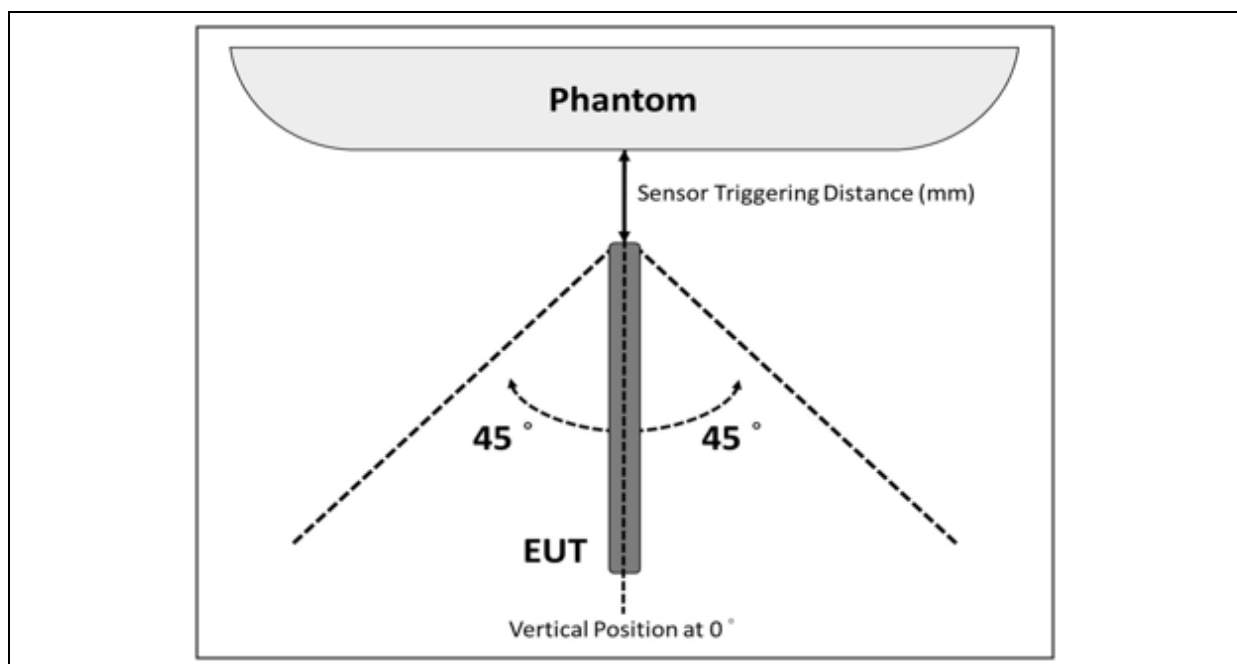
Side 1(Far to Near)											
Gap (mm)	25	24	23	22	21	20	19	18	17	16	15
Band	off	off	off	off	off	on	on	on	on	on	on
WCDMA Band II	24.50	24.50	24.50	24.50	24.50	18.50	18.50	18.50	18.50	18.50	18.50
WCDMA Band IV	24.50	24.50	24.50	24.50	24.50	18.50	18.50	18.50	18.50	18.50	18.50
LTE Band 2	24.00	24.00	24.00	24.00	24.00	18.00	18.00	18.00	18.00	18.00	18.00
LTE Band 4	24.00	24.00	24.00	24.00	24.00	18.00	18.00	18.00	18.00	18.00	18.00
LTE Band 7	24.00	24.00	24.00	24.00	24.00	15.50	15.50	15.50	15.50	15.50	15.50
LTE Band 30	24.00	24.00	24.00	24.00	24.00	18.00	18.00	18.00	18.00	18.00	18.00
LTE Band 38	24.00	24.00	24.00	24.00	24.00	16.50	16.50	16.50	16.50	16.50	16.50
LTE Band 41	24.00	24.00	24.00	24.00	24.00	16.50	16.50	16.50	16.50	16.50	16.50
LTE Band 66	24.00	24.00	24.00	24.00	24.00	18.00	18.00	18.00	18.00	18.00	18.00

11.2.5.3. Procedures for determining tablet tilt angle influences to proximity sensor triggering

The influence of table tilt angles to proximity sensor triggering is determined by positioning each tablet edge that contains a transmitting antenna, perpendicular to the flat phantom, at the smallest sensor triggering test distance determined in KDB 616217. Summary for proximity sensor tilt angle influence is shown in below table.

WWAN Antenna _ Trigger Distance Test (Side 1 of tablet)		
Sensor Triggering Distance (mm)		
Actual Test	Far to Near	Near to Far
	20	21
Average triggering distance	20	20
Sensor on distance	20	20

WWAN Antenna _ Trigger Distance Test (Side 1 of tablet)			
Angle change	Sensor Triggering Distance (mm)		
	Far to Near	Near to Far	Min trigger distance
0 degree	20	21	20
10 degree	Front toward to the phantom		20
20 degree			20
30 degree			20
40 degree			19
45 degree			18
-10 degree	Back toward to the phantom		20
-20 degree			20
-30 degree			20
-40 degree			19
-45 degree			18



11.2.5.4. Proximity sensor triggering testing summary

The smallest power sensor triggering distance is 20 mm for DUT.

For the influence of tilt angle, test performed at the above separation distance until proximity sensor no longer release and the output power remained in reduced mode. The smallest separation distance for tilt angle influence is 18 mm consequently, and then subtract 1 mm for SAR measurement.

Considering SAR compliance and the conservative distance for sensor triggering, SAR test at 0 mm with power reduction for DUT and 17 mm without power reduction for DUT, respectively.

The power reduction is determined by proximity sensor input, and the proximity sensor function is set by manual operation with engineering testing software during SAR measurement.

11.3 Conducted Power Measurements

Band	Modulation	Date Rate or Sub-test	CH		Frequency	Avg Conducted power (dBm)	Tune up (dBm)
WCDMA II	RMC12.2K	---	Lowest	9262	1852.4	23.09	24.50
			Middle	9400	1880.0	23.30	24.50
			Highest	9538	1907.6	22.71	24.50
HSDPA II	QPSK	1	Lowest	9262	1852.4	22.89	24.50
			Middle	9400	1880.0	23.17	24.50
			Highest	9538	1907.6	23.05	24.50
		2	Lowest	9262	1852.4	22.90	24.50
			Middle	9400	1880.0	23.18	24.50
			Highest	9538	1907.6	23.06	24.50
		3	Lowest	9262	1852.4	22.40	24.00
			Middle	9400	1880.0	22.68	24.00
			Highest	9538	1907.6	22.53	24.00
		4	Lowest	9262	1852.4	22.39	24.00
			Middle	9400	1880.0	22.68	24.00
			Highest	9538	1907.6	22.56	24.00
HSUPA II	QPSK	1	Lowest	9262	1852.4	22.90	24.50
			Middle	9400	1880.0	23.17	24.50
			Highest	9538	1907.6	23.06	24.50
		2	Lowest	9262	1852.4	20.90	22.50
			Middle	9400	1880.0	21.18	22.50
			Highest	9538	1907.6	21.05	22.50
		3	Lowest	9262	1852.4	21.90	23.50
			Middle	9400	1880.0	22.18	23.50
			Highest	9538	1907.6	22.06	23.50
		4	Lowest	9262	1852.4	20.89	22.50
			Middle	9400	1880.0	21.18	22.50
			Highest	9538	1907.6	21.06	22.50
		5	Lowest	9262	1852.4	22.88	24.50
			Middle	9400	1880.0	23.18	24.50
			Highest	9538	1907.6	23.03	24.50

Band	Modulation	Date Rate or Sub-test	CH		Frequency (MHz)	Avg Conducted power (dBm)	Tune up (dBm)
WCDMA IV	RMC12.2K	---	Lowest	1312	1712.4	22.86	24.50
			Middle	1413	1732.6	22.98	24.50
			Highest	1513	1752.6	23.39	24.50
HSDPA IV	QPSK	1	Lowest	1312	1712.4	22.66	24.50
			Middle	1413	1732.6	22.78	24.50
			Highest	1513	1752.6	22.90	24.50
		2	Lowest	1312	1712.4	22.66	24.50
			Middle	1413	1732.6	22.78	24.50
			Highest	1513	1752.6	22.90	24.50
		3	Lowest	1312	1712.4	22.16	24.00
			Middle	1413	1732.6	22.28	24.00
			Highest	1513	1752.6	22.33	24.00
		4	Lowest	1312	1712.4	22.16	24.00
			Middle	1413	1732.6	22.28	24.00
			Highest	1513	1752.6	22.40	24.00
HSUPA IV		1	Lowest	1312	1712.4	22.66	24.50
			Middle	1413	1732.6	22.78	24.50
			Highest	1513	1752.6	22.88	24.50
		2	Lowest	1312	1712.4	20.66	22.50
			Middle	1413	1732.6	20.77	22.50
			Highest	1513	1752.6	20.90	22.50
		3	Lowest	1312	1712.4	21.66	23.50
			Middle	1413	1732.6	21.78	23.50
			Highest	1513	1752.6	21.90	23.50
		4	Lowest	1312	1712.4	20.59	22.50
			Middle	1413	1732.6	20.78	22.50
			Highest	1513	1752.6	20.90	22.50
		5	Lowest	1312	1712.4	22.63	24.50
			Middle	1413	1732.6	22.78	24.50
			Highest	1513	1752.6	22.90	24.50

Band	Modulation	Date Rate or Sub-test	CH		Frequency (MHz)	Avg Conducted power (dBm)	Tune up (dBm)
WCDMA V	RMC12.2K	---	Lowest	4132	826.4	23.53	24.50
			Middle	4182	836.4	23.69	24.50
			Highest	4233	846.6	23.62	24.50
HSDPA V	QPSK	1	Lowest	4132	826.4	23.17	24.50
			Middle	4182	836.4	23.29	24.50
			Highest	4233	846.6	23.25	24.50
		2	Lowest	4132	826.4	23.18	24.50
			Middle	41832	836.4	23.30	24.50
			Highest	4233	846.6	23.26	24.50
		3	Lowest	4132	826.4	22.68	24.00
			Middle	4182	836.4	22.80	24.00
			Highest	4233	846.6	22.76	24.00
		4	Lowest	4132	826.4	22.68	24.00
			Middle	4182	836.4	22.80	24.00
			Highest	4233	846.6	22.76	24.00
HSUPA V		1	Lowest	4132	826.4	23.18	24.50
			Middle	4182	836.4	23.30	24.50
			Highest	4233	846.6	23.26	24.50
		2	Lowest	4132	826.4	21.18	22.50
			Middle	4182	836.4	21.30	22.50
			Highest	4233	846.6	21.26	22.50
		3	Lowest	4132	826.4	22.18	23.50
			Middle	4182	836.4	22.30	23.50
			Highest	4233	846.6	22.26	23.50
		4	Lowest	4132	826.4	21.18	22.50
			Middle	4182	836.4	21.30	22.50
			Highest	4233	846.6	21.26	22.50
		5	Lowest	4132	826.4	23.18	24.50
			Middle	4182	836.4	23.30	24.50
			Highest	4233	846.6	23.26	24.50

LTE Band 2							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
18607	18900	19193	Channel				
1850.7	1880	1909.3	Freq. (MHz)				
22.34	22.71	21.91	24	QPSK	1.4MHz	1	0
22.22	22.67	22.07	24	QPSK	1.4MHz	1	2
22.30	22.63	21.88	24	QPSK	1.4MHz	1	5
22.29	22.59	21.99	24	QPSK	1.4MHz	3	0
22.28	22.60	21.87	24	QPSK	1.4MHz	3	1
22.24	22.59	22.00	24	QPSK	1.4MHz	3	3
21.28	21.66	20.91	23	QPSK	1.4MHz	6	0
21.22	22.29	21.52	23	16QAM	1.4MHz	1	0
21.80	22.27	21.37	23	16QAM	1.4MHz	1	2
22.18	21.90	21.09	23	16QAM	1.4MHz	1	5
21.26	21.80	20.96	23	16QAM	1.4MHz	3	0
21.47	21.71	21.04	23	16QAM	1.4MHz	3	1
21.34	21.74	21.04	23	16QAM	1.4MHz	3	3
20.37	20.81	20.05	22	16QAM	1.4MHz	6	0

LTE Band 2							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
18615	18900	19185	Channel				
1851.5	1880	1908.5	Freq. (MHz)				
22.48	22.63	22.16	24	QPSK	3MHz	1	0
22.56	22.70	22.22	24	QPSK	3MHz	1	7
22.47	22.71	22.18	24	QPSK	3MHz	1	14
21.44	21.68	21.13	23	QPSK	3MHz	8	0
21.38	21.67	21.10	23	QPSK	3MHz	8	3
21.40	21.68	21.08	23	QPSK	3MHz	8	7
21.44	21.66	21.16	23	QPSK	3MHz	15	0
21.96	21.88	21.55	23	16QAM	3MHz	1	0
21.45	21.58	21.63	23	16QAM	3MHz	1	7
21.83	21.86	21.58	23	16QAM	3MHz	1	14
20.60	20.73	20.20	22	16QAM	3MHz	8	0
20.46	20.70	20.21	22	16QAM	3MHz	8	3
20.47	20.65	20.23	22	16QAM	3MHz	8	7
20.46	20.73	20.23	22	16QAM	3MHz	15	0

LTE Band 2							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
18625	18900	19175	Channel				
1852.5	1880	1907.5	Freq. (MHz)				
22.55	22.73	22.33	24	QPSK	5MHz	1	0
22.46	22.64	22.27	24	QPSK	5MHz	1	12
22.28	22.63	22.19	24	QPSK	5MHz	1	24
21.47	21.72	21.26	23	QPSK	5MHz	12	0
21.42	21.71	21.21	23	QPSK	5MHz	12	6
21.37	21.76	21.14	23	QPSK	5MHz	12	13
21.46	21.73	21.17	23	QPSK	5MHz	25	0
22.05	22.04	21.51	23	16QAM	5MHz	1	0
21.97	22.29	21.57	23	16QAM	5MHz	1	12
21.77	22.26	21.86	23	16QAM	5MHz	1	24
20.59	20.75	20.29	22	16QAM	5MHz	12	0
20.53	20.80	20.16	22	16QAM	5MHz	12	6
20.45	20.79	20.22	22	16QAM	5MHz	12	13
20.40	20.77	20.22	22	16QAM	5MHz	25	0

LTE Band 2							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
18650	18900	19150	Channel				
1855	1880	1905	Freq. (MHz)				
22.44	22.69	22.21	24	QPSK	10MHz	1	0
22.15	22.72	22.22	24	QPSK	10MHz	1	24
22.24	22.60	22.04	24	QPSK	10MHz	1	49
21.30	21.67	21.22	23	QPSK	10MHz	25	0
21.17	21.67	21.17	23	QPSK	10MHz	25	12
21.13	21.62	21.18	23	QPSK	10MHz	25	25
21.17	21.65	21.24	23	QPSK	10MHz	50	0
21.72	21.92	21.61	23	16QAM	10MHz	1	0
21.49	22.05	21.37	23	16QAM	10MHz	1	24
21.44	21.86	21.36	23	16QAM	10MHz	1	49
20.36	20.85	20.32	22	16QAM	10MHz	25	0
20.16	20.85	20.21	22	16QAM	10MHz	25	12
20.16	20.75	20.26	22	16QAM	10MHz	25	25
20.16	20.72	20.32	22	16QAM	10MHz	50	0

LTE Band 2							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
18675	18900	19125	Channel				
1857.5	1880	1902.5	Freq. (MHz)				
22.42	22.59	22.22	24	QPSK	15MHz	1	0
22.19	22.71	22.23	24	QPSK	15MHz	1	37
22.26	22.49	22.04	24	QPSK	15MHz	1	74
21.23	21.63	21.14	23	QPSK	15MHz	36	0
21.17	21.69	21.13	23	QPSK	15MHz	36	19
21.20	21.62	21.16	23	QPSK	15MHz	36	39
21.19	21.68	21.28	23	QPSK	15MHz	75	0
21.87	21.95	21.34	23	16QAM	15MHz	1	0
21.51	21.93	21.42	23	16QAM	15MHz	1	37
21.62	21.80	21.39	23	16QAM	15MHz	1	74
20.25	20.71	20.18	22	16QAM	15MHz	36	0
20.12	20.73	20.26	22	16QAM	15MHz	36	19
20.32	20.66	20.22	22	16QAM	15MHz	36	39
20.15	20.67	20.33	22	16QAM	15MHz	75	0

LTE Band 2							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
18700	18900	19100	Channel				
1860	1880	1900	Freq. (MHz)				
22.61	22.73	22.63	24	QPSK	20MHz	1	0
22.10	22.66	22.23	24	QPSK	20MHz	1	49
22.68	22.55	22.26	24	QPSK	20MHz	1	99
21.37	21.67	21.32	23	QPSK	20MHz	50	0
21.29	21.72	21.24	23	QPSK	20MHz	50	25
21.36	21.62	21.23	23	QPSK	20MHz	50	50
21.40	21.85	21.37	23	QPSK	20MHz	100	0
21.94	22.01	21.74	23	16QAM	20MHz	1	0
21.65	22.21	21.56	23	16QAM	20MHz	1	49
21.55	22.07	21.52	23	16QAM	20MHz	1	99
20.44	20.70	20.30	22	16QAM	20MHz	50	0
20.34	20.76	20.21	22	16QAM	20MHz	50	25
20.44	20.70	20.26	22	16QAM	20MHz	50	50
20.53	20.85	20.56	22	16QAM	20MHz	100	0

LTE Band 4							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
19957	20175	20393	Channel				
1710.7	1732.5	1754.3	Freq. (MHz)				
22.76	22.62	23.06	24	QPSK	1.4MHz	1	0
22.69	22.57	23.12	24	QPSK	1.4MHz	1	2
22.63	22.65	23.19	24	QPSK	1.4MHz	1	5
22.64	22.60	23.11	24	QPSK	1.4MHz	3	0
22.65	22.62	23.12	24	QPSK	1.4MHz	3	1
22.65	22.64	23.12	24	QPSK	1.4MHz	3	3
21.64	21.64	22.12	23	QPSK	1.4MHz	6	0
21.89	22.02	22.04	23	16QAM	1.4MHz	1	0
21.39	21.89	22.17	23	16QAM	1.4MHz	1	2
21.85	21.93	21.77	23	16QAM	1.4MHz	1	5
21.69	21.63	22.10	23	16QAM	1.4MHz	3	0
21.69	21.60	22.05	23	16QAM	1.4MHz	3	1
21.52	21.72	22.13	23	16QAM	1.4MHz	3	3
20.75	20.74	20.94	22	16QAM	1.4MHz	6	0

LTE Band 4							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
19965	20175	20385	Channel				
1711.5	1732.5	1753.5	Freq. (MHz)				
22.73	22.71	23.17	24	QPSK	3MHz	1	0
22.75	22.67	23.11	24	QPSK	3MHz	1	7
22.74	22.60	23.13	24	QPSK	3MHz	1	14
21.71	21.68	22.16	23	QPSK	3MHz	8	0
21.70	21.65	22.16	23	QPSK	3MHz	8	3
21.72	21.73	22.12	23	QPSK	3MHz	8	7
21.72	21.75	22.09	23	QPSK	3MHz	15	0
22.04	21.85	22.18	23	16QAM	3MHz	1	0
21.38	22.17	22.51	23	16QAM	3MHz	1	7
22.10	21.71	22.53	23	16QAM	3MHz	1	14
20.84	20.72	21.23	22	16QAM	3MHz	8	0
20.69	20.67	21.08	22	16QAM	3MHz	8	3
20.79	20.81	21.25	22	16QAM	3MHz	8	7
20.67	20.89	21.26	22	16QAM	3MHz	15	0

LTE Band 4							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
19975	20175	20375	Channel				
1712.5	1732.5	1752.5	Freq. (MHz)				
22.81	22.91	23.08	24	QPSK	5MHz	1	0
22.78	22.74	23.13	24	QPSK	5MHz	1	12
22.84	22.71	23.15	24	QPSK	5MHz	1	24
21.75	21.76	22.17	23	QPSK	5MHz	12	0
21.78	21.72	22.18	23	QPSK	5MHz	12	6
21.80	21.71	22.13	23	QPSK	5MHz	12	13
21.77	21.76	22.10	23	QPSK	5MHz	25	0
22.04	21.40	22.33	23	16QAM	5MHz	1	0
22.08	21.89	22.58	23	16QAM	5MHz	1	12
22.00	22.25	22.55	23	16QAM	5MHz	1	24
20.82	20.78	21.08	22	16QAM	5MHz	12	0
20.88	20.72	21.17	22	16QAM	5MHz	12	6
20.82	20.71	21.12	22	16QAM	5MHz	12	13
20.76	20.72	21.16	22	16QAM	5MHz	25	0

LTE Band 4							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
20000	20175	20350	Channel				
1715	1732.5	1750	Freq. (MHz)				
22.74	22.61	23.22	24	QPSK	10MHz	1	0
22.99	22.64	23.16	24	QPSK	10MHz	1	24
22.82	22.78	23.06	24	QPSK	10MHz	1	49
21.78	21.76	22.06	23	QPSK	10MHz	25	0
21.83	21.67	22.10	23	QPSK	10MHz	25	12
21.95	21.70	22.12	23	QPSK	10MHz	25	25
21.87	21.67	22.07	23	QPSK	10MHz	50	0
22.14	22.12	22.38	23	16QAM	10MHz	1	0
21.97	21.83	22.53	23	16QAM	10MHz	1	24
22.29	21.92	22.56	23	16QAM	10MHz	1	49
20.86	20.84	21.13	22	16QAM	10MHz	25	0
20.91	20.71	21.20	22	16QAM	10MHz	25	12
21.00	20.70	21.24	22	16QAM	10MHz	25	25
20.89	20.76	21.12	22	16QAM	10MHz	50	0

LTE Band 4							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
20025	20175	20325	Channel				
1717.5	1732.5	1747.5	Freq. (MHz)				
22.80	22.82	22.94	24	QPSK	15MHz	1	0
22.96	22.73	23.06	24	QPSK	15MHz	1	37
22.76	22.87	23.20	24	QPSK	15MHz	1	74
21.83	21.66	21.99	23	QPSK	15MHz	36	0
21.89	21.61	21.97	23	QPSK	15MHz	36	19
21.88	21.63	22.08	23	QPSK	15MHz	36	39
22.02	21.64	21.97	23	QPSK	15MHz	75	0
22.13	22.03	22.09	23	16QAM	15MHz	1	0
22.10	21.87	22.38	23	16QAM	15MHz	1	37
22.13	21.73	21.90	23	16QAM	15MHz	1	74
20.90	20.72	21.04	22	16QAM	15MHz	36	0
20.97	20.71	21.07	22	16QAM	15MHz	36	19
20.81	20.75	21.12	22	16QAM	15MHz	36	39
20.99	20.80	21.14	22	16QAM	15MHz	75	0

LTE Band 4							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
20050	20175	20300	Channel				
1720	1732.5	1745	Freq. (MHz)				
22.82	22.75	22.99	24	QPSK	20MHz	1	0
23.03	22.75	23.10	24	QPSK	20MHz	1	49
22.64	23.17	23.15	24	QPSK	20MHz	1	99
21.93	21.95	21.90	23	QPSK	20MHz	50	0
21.89	22.06	22.01	23	QPSK	20MHz	50	25
21.77	22.13	22.08	23	QPSK	20MHz	50	50
22.08	22.27	22.21	23	QPSK	20MHz	100	0
22.22	22.21	22.18	23	16QAM	20MHz	1	0
22.27	21.85	22.46	23	16QAM	20MHz	1	49
21.99	22.14	22.23	23	16QAM	20MHz	1	99
21.02	20.92	21.03	22	16QAM	20MHz	50	0
20.92	20.76	21.15	22	16QAM	20MHz	50	25
20.77	20.81	21.15	22	16QAM	20MHz	50	50
21.12	20.90	21.23	22	16QAM	20MHz	100	0

LTE Band 5							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
20407	20525	20643	Channel				
824.7	836.5	848.3	Freq. (MHz)				
22.28	22.27	22.51	24	QPSK	1.4MHz	1	0
22.33	22.32	22.52	24	QPSK	1.4MHz	1	2
22.26	22.27	22.59	24	QPSK	1.4MHz	1	5
22.32	22.30	22.61	24	QPSK	1.4MHz	3	0
22.33	22.27	22.55	24	QPSK	1.4MHz	3	1
22.34	22.25	22.54	24	QPSK	1.4MHz	3	3
21.34	21.27	21.57	23	QPSK	1.4MHz	6	0
21.64	21.25	21.97	23	16QAM	1.4MHz	1	0
21.33	21.29	21.95	23	16QAM	1.4MHz	1	2
21.81	21.69	22.06	23	16QAM	1.4MHz	1	5
21.39	21.33	21.61	23	16QAM	1.4MHz	3	0
21.45	21.24	21.66	23	16QAM	1.4MHz	3	1
21.18	21.33	21.60	23	16QAM	1.4MHz	3	3
20.48	20.38	20.64	22	16QAM	1.4MHz	6	0

LTE Band 5							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
20415	20525	20635	Channel				
825.5	836.5	847.5	Freq. (MHz)				
22.55	22.32	22.42	24	QPSK	3MHz	1	0
22.50	22.26	22.63	24	QPSK	3MHz	1	7
22.45	22.40	22.52	24	QPSK	3MHz	1	14
21.51	21.34	21.58	23	QPSK	3MHz	8	0
21.47	21.39	21.60	23	QPSK	3MHz	8	3
21.49	21.44	21.59	23	QPSK	3MHz	8	7
21.48	21.36	21.73	23	QPSK	3MHz	15	0
21.91	21.85	21.79	23	16QAM	3MHz	1	0
21.76	21.72	21.88	23	16QAM	3MHz	1	7
21.22	21.86	21.99	23	16QAM	3MHz	1	14
20.49	20.43	20.66	22	16QAM	3MHz	8	0
20.42	20.49	20.44	22	16QAM	3MHz	8	3
20.59	20.50	20.45	22	16QAM	3MHz	8	7
20.40	20.49	20.68	22	16QAM	3MHz	15	0

LTE Band 5							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
20425	20525	20625	Channel				
826.5	836.5	846.5	Freq. (MHz)				
22.49	22.40	22.47	24	QPSK	5MHz	1	0
22.38	22.36	22.53	24	QPSK	5MHz	1	12
22.63	22.40	22.64	24	QPSK	5MHz	1	24
21.45	21.39	21.52	23	QPSK	5MHz	12	0
21.44	21.36	21.52	23	QPSK	5MHz	12	6
21.41	21.42	21.60	23	QPSK	5MHz	12	13
21.48	21.43	21.46	23	QPSK	5MHz	25	0
21.70	22.00	21.64	23	16QAM	5MHz	1	0
21.86	21.60	22.00	23	16QAM	5MHz	1	12
21.96	21.82	22.04	23	16QAM	5MHz	1	24
20.57	20.60	20.48	22	16QAM	5MHz	12	0
20.55	20.49	20.59	22	16QAM	5MHz	12	6
20.54	20.49	20.82	22	16QAM	5MHz	12	13
20.56	20.47	20.72	22	16QAM	5MHz	25	0

LTE Band 5							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
20450	20525	20600	Channel				
829	836.5	844	Freq. (MHz)				
22.46	22.55	22.61	24	QPSK	10MHz	1	0
22.43	22.38	22.55	24	QPSK	10MHz	1	24
22.35	22.68	22.66	24	QPSK	10MHz	1	49
21.44	21.56	21.50	23	QPSK	10MHz	25	0
21.54	21.55	21.50	23	QPSK	10MHz	25	12
21.45	21.57	21.52	23	QPSK	10MHz	25	25
21.57	21.70	21.63	23	QPSK	10MHz	50	0
21.74	21.68	21.97	23	16QAM	10MHz	1	0
22.02	21.97	21.74	23	16QAM	10MHz	1	24
21.97	21.39	22.05	23	16QAM	10MHz	1	49
20.55	20.42	20.55	22	16QAM	10MHz	25	0
20.57	20.53	20.61	22	16QAM	10MHz	25	12
20.59	20.49	20.62	22	16QAM	10MHz	25	25
20.62	20.42	20.65	22	16QAM	10MHz	50	0

LTE Band 7							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
20775	21100	21425	Channel				
2502.5	2535	2567.5	Freq. (MHz)				
22.85	22.63	22.41	24	QPSK	5MHz	1	0
22.79	22.62	22.30	24	QPSK	5MHz	1	12
22.91	22.58	22.40	24	QPSK	5MHz	1	24
21.86	21.63	21.43	23	QPSK	5MHz	12	0
21.85	21.65	21.40	23	QPSK	5MHz	12	6
21.91	21.66	21.52	23	QPSK	5MHz	12	13
21.94	21.64	21.47	23	QPSK	5MHz	25	0
22.48	22.08	21.36	23	16QAM	5MHz	1	0
22.06	21.91	21.63	23	16QAM	5MHz	1	12
22.31	22.15	21.98	23	16QAM	5MHz	1	24
20.92	20.57	20.39	22	16QAM	5MHz	12	0
20.87	20.58	20.43	22	16QAM	5MHz	12	6
21.03	20.75	20.54	22	16QAM	5MHz	12	13
20.86	20.65	20.49	22	16QAM	5MHz	25	0

LTE Band 7							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
20800	21100	21400	Channel				
2505	2535	2565	Freq. (MHz)				
22.82	22.52	22.27	24	QPSK	10MHz	1	0
22.83	22.53	22.54	24	QPSK	10MHz	1	24
22.91	22.59	22.50	24	QPSK	10MHz	1	49
21.95	21.64	21.45	23	QPSK	10MHz	25	0
21.98	21.66	21.45	23	QPSK	10MHz	25	12
22.01	21.71	21.45	23	QPSK	10MHz	25	25
21.98	21.67	21.41	23	QPSK	10MHz	50	0
22.18	22.04	21.62	23	16QAM	10MHz	1	0
22.12	21.83	21.79	23	16QAM	10MHz	1	24
22.52	22.00	21.83	23	16QAM	10MHz	1	49
20.97	20.66	20.55	22	16QAM	10MHz	25	0
20.99	20.70	20.45	22	16QAM	10MHz	25	12
21.05	20.79	20.50	22	16QAM	10MHz	25	25
20.97	20.69	20.48	22	16QAM	10MHz	50	0

LTE Band 7							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
20825	21100	21375	Channel				
2507.5	2535	2562.5	Freq. (MHz)				
22.74	22.42	22.31	24	QPSK	15MHz	1	0
22.97	22.54	22.20	24	QPSK	15MHz	1	37
22.73	22.55	22.27	24	QPSK	15MHz	1	74
21.88	21.54	21.37	23	QPSK	15MHz	36	0
21.95	21.58	21.39	23	QPSK	15MHz	36	19
21.86	21.53	21.36	23	QPSK	15MHz	36	39
21.95	21.58	21.37	23	QPSK	15MHz	75	0
21.92	21.52	21.49	23	16QAM	15MHz	1	0
22.00	21.54	21.47	23	16QAM	15MHz	1	37
21.92	21.64	21.73	23	16QAM	15MHz	1	74
20.96	20.54	20.39	22	16QAM	15MHz	36	0
20.94	20.65	20.46	22	16QAM	15MHz	36	19
20.92	20.56	20.44	22	16QAM	15MHz	36	39
20.94	20.62	20.47	22	16QAM	15MHz	75	0

LTE Band 7							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
20850	21100	21350	Channel				
2510	2535	2560	Freq. (MHz)				
22.77	22.58	22.42	24	QPSK	20MHz	1	0
22.81	22.53	22.33	24	QPSK	20MHz	1	49
22.92	22.58	22.44	24	QPSK	20MHz	1	99
21.94	21.62	21.42	23	QPSK	20MHz	50	0
21.92	21.64	21.39	23	QPSK	20MHz	50	25
21.90	21.67	21.45	23	QPSK	20MHz	50	50
22.01	21.76	21.51	23	QPSK	20MHz	100	0
21.84	21.77	21.90	23	16QAM	20MHz	1	0
22.08	21.70	21.68	23	16QAM	20MHz	1	49
21.48	21.91	21.60	23	16QAM	20MHz	1	99
21.01	20.66	20.45	22	16QAM	20MHz	50	0
20.94	20.65	20.42	22	16QAM	20MHz	50	25
20.94	20.62	20.45	22	16QAM	20MHz	50	50
20.99	20.74	20.48	22	16QAM	20MHz	100	0

LTE Band 12							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
23017	23095	23173	Channel				
699.7	707.5	715.3	Freq. (MHz)				
22.55	22.54	22.48	24	QPSK	1.4MHz	1	0
22.68	22.48	22.43	24	QPSK	1.4MHz	1	2
22.65	22.55	22.48	24	QPSK	1.4MHz	1	5
22.58	22.56	22.40	24	QPSK	1.4MHz	3	0
22.57	22.45	22.43	24	QPSK	1.4MHz	3	1
22.59	22.55	22.38	24	QPSK	1.4MHz	3	3
21.56	21.56	21.44	23	QPSK	1.4MHz	6	0
22.03	21.68	21.85	23	16QAM	1.4MHz	1	0
21.65	22.05	21.90	23	16QAM	1.4MHz	1	2
22.36	22.11	21.77	23	16QAM	1.4MHz	1	5
21.43	21.52	21.27	23	16QAM	1.4MHz	3	0
21.61	21.41	21.44	23	16QAM	1.4MHz	3	1
21.74	21.56	21.28	23	16QAM	1.4MHz	3	3
20.69	20.60	20.44	22	16QAM	1.4MHz	6	0

LTE Band 12							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
23025	23095	23165	Channel				
700.5	707.5	714.5	Freq. (MHz)				
22.45	22.64	22.43	24	QPSK	3MHz	1	0
22.59	22.46	22.48	24	QPSK	3MHz	1	7
22.59	22.52	22.37	24	QPSK	3MHz	1	14
21.61	21.55	21.47	23	QPSK	3MHz	8	0
21.56	21.54	21.50	23	QPSK	3MHz	8	3
21.63	21.65	21.47	23	QPSK	3MHz	8	7
21.63	21.57	21.40	23	QPSK	3MHz	15	0
21.97	21.81	21.99	23	16QAM	3MHz	1	0
22.17	21.96	21.82	23	16QAM	3MHz	1	7
21.82	21.88	21.91	23	16QAM	3MHz	1	14
20.66	20.70	20.52	22	16QAM	3MHz	8	0
20.61	20.63	20.37	22	16QAM	3MHz	8	3
20.70	20.74	20.69	22	16QAM	3MHz	8	7
20.62	20.58	20.49	22	16QAM	3MHz	15	0

LTE Band 12							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
23035	23095	23155	Channel				
701.5	707.5	713.5	Freq. (MHz)				
22.38	22.58	22.62	24	QPSK	5MHz	1	0
22.39	22.49	22.43	24	QPSK	5MHz	1	12
22.43	22.60	22.42	24	QPSK	5MHz	1	24
21.51	21.44	21.54	23	QPSK	5MHz	12	0
21.51	21.49	21.56	23	QPSK	5MHz	12	6
21.51	21.59	21.39	23	QPSK	5MHz	12	13
21.50	21.54	21.38	23	QPSK	5MHz	25	0
21.88	22.00	22.03	23	16QAM	5MHz	1	0
21.99	21.77	21.93	23	16QAM	5MHz	1	12
22.11	22.02	21.67	23	16QAM	5MHz	1	24
20.63	20.58	20.54	22	16QAM	5MHz	12	0
20.65	20.48	20.54	22	16QAM	5MHz	12	6
20.54	20.70	20.57	22	16QAM	5MHz	12	13
20.58	20.56	20.37	22	16QAM	5MHz	25	0

LTE Band 12							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
23060	23095	23130	Channel				
704	707.5	711	Freq. (MHz)				
22.67	22.69	22.43	24	QPSK	10MHz	1	0
22.49	22.35	22.62	24	QPSK	10MHz	1	24
22.66	22.58	22.41	24	QPSK	10MHz	1	49
21.59	21.53	21.69	23	QPSK	10MHz	25	0
21.43	21.56	21.70	23	QPSK	10MHz	25	12
21.58	21.71	21.60	23	QPSK	10MHz	25	25
21.55	21.66	21.59	23	QPSK	10MHz	50	0
21.94	22.10	21.82	23	16QAM	10MHz	1	0
22.05	21.88	21.76	23	16QAM	10MHz	1	24
21.97	21.88	21.85	23	16QAM	10MHz	1	49
20.65	20.66	20.70	22	16QAM	10MHz	25	0
20.62	20.65	20.72	22	16QAM	10MHz	25	12
20.72	20.85	20.62	22	16QAM	10MHz	25	25
20.68	20.75	20.74	22	16QAM	10MHz	50	0

LTE Band 13							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
23205	23230	23255	Channel				
779.5	782	784.5	Freq. (MHz)				
22.86	22.81	22.93	24	QPSK	5MHz	1	0
22.94	22.84	22.85	24	QPSK	5MHz	1	12
22.90	22.96	22.87	24	QPSK	5MHz	1	24
21.86	21.87	22.01	23	QPSK	5MHz	12	0
21.85	21.91	21.92	23	QPSK	5MHz	12	6
21.87	21.93	21.93	23	QPSK	5MHz	12	13
21.99	22.02	21.94	23	QPSK	5MHz	25	0
21.98	21.93	22.25	23	16QAM	5MHz	1	0
22.35	22.25	22.14	23	16QAM	5MHz	1	12
22.24	22.35	22.27	23	16QAM	5MHz	1	24
21.02	20.89	20.96	22	16QAM	5MHz	12	0
20.75	20.79	20.85	22	16QAM	5MHz	12	6
20.98	20.87	21.03	22	16QAM	5MHz	12	13
20.82	20.96	21.00	22	16QAM	5MHz	25	0

LTE Band 13						
Maximum Average Power (dBm)		Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
23230		Channel				
782		Freq. (MHz)				
22.84		24	QPSK	10MHz	1	0
22.93		24	QPSK	10MHz	1	24
23.00		24	QPSK	10MHz	1	49
22.08		23	QPSK	10MHz	25	0
22.00		23	QPSK	10MHz	25	12
22.04		23	QPSK	10MHz	25	25
22.15		23	QPSK	10MHz	50	0
22.15		23	16QAM	10MHz	1	0
22.17		23	16QAM	10MHz	1	24
22.31		23	16QAM	10MHz	1	49
21.13		22	16QAM	10MHz	25	0
21.12		22	16QAM	10MHz	25	12
21.11		22	16QAM	10MHz	25	25
21.16		22	16QAM	10MHz	50	0

LTE Band 17							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
23755	23790	23825	Channel				
706.5	710	713.5	Freq. (MHz)				
22.50	22.51	22.63	24	QPSK	5MHz	1	0
22.49	22.59	22.46	24	QPSK	5MHz	1	12
22.73	22.72	22.49	24	QPSK	5MHz	1	24
21.57	21.58	21.65	23	QPSK	5MHz	12	0
21.57	21.58	21.58	23	QPSK	5MHz	12	6
21.54	21.63	21.49	23	QPSK	5MHz	12	13
21.54	21.74	21.48	23	QPSK	5MHz	25	0
21.94	21.88	21.99	23	16QAM	5MHz	1	0
21.89	21.72	21.93	23	16QAM	5MHz	1	12
22.22	22.08	22.05	23	16QAM	5MHz	1	24
20.60	20.66	20.74	22	16QAM	5MHz	12	0
20.68	20.70	20.60	22	16QAM	5MHz	12	6
20.73	20.67	20.57	22	16QAM	5MHz	12	13
20.60	20.65	20.56	22	16QAM	5MHz	25	0

LTE Band 17							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
23780	23790	23800	Channel				
709	710	711	Freq. (MHz)				
22.47	22.58	22.50	24	QPSK	10MHz	1	0
22.52	22.62	22.72	24	QPSK	10MHz	1	24
22.51	22.80	22.78	24	QPSK	10MHz	1	49
21.55	21.71	21.70	23	QPSK	10MHz	25	0
21.68	21.71	21.70	23	QPSK	10MHz	25	12
21.76	21.77	21.65	23	QPSK	10MHz	25	25
21.68	21.81	21.78	23	QPSK	10MHz	50	0
21.96	22.02	21.74	23	16QAM	10MHz	1	0
22.17	21.79	22.14	23	16QAM	10MHz	1	24
22.20	21.90	21.90	23	16QAM	10MHz	1	49
20.66	20.65	20.73	22	16QAM	10MHz	25	0
20.70	20.78	20.75	22	16QAM	10MHz	25	12
20.92	20.75	20.81	22	16QAM	10MHz	25	25
20.90	20.91	20.74	22	16QAM	10MHz	50	0

LTE Band 26							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
26697	26865	27033	Channel				
814.7	831.5	848.3	Freq. (MHz)				
22.47	22.57	22.67	24	QPSK	1.4MHz	1	0
22.49	22.53	22.68	24	QPSK	1.4MHz	1	2
22.57	22.53	22.66	24	QPSK	1.4MHz	1	5
22.55	22.51	22.64	24	QPSK	1.4MHz	3	0
22.55	22.48	22.63	24	QPSK	1.4MHz	3	1
22.56	22.56	22.66	24	QPSK	1.4MHz	3	3
21.57	21.54	21.62	23	QPSK	1.4MHz	6	0
21.91	21.86	21.99	23	16QAM	1.4MHz	1	0
21.88	21.79	21.48	23	16QAM	1.4MHz	1	2
22.06	22.07	22.01	23	16QAM	1.4MHz	1	5
21.44	21.54	21.71	23	16QAM	1.4MHz	3	0
21.55	21.33	21.73	23	16QAM	1.4MHz	3	1
21.42	21.52	21.61	23	16QAM	1.4MHz	3	3
20.68	20.55	20.86	22	16QAM	1.4MHz	6	0

LTE Band 26							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
26705	26865	27025	Channel				
815.5	831.5	847.5	Freq. (MHz)				
22.50	22.49	22.60	24	QPSK	3MHz	1	0
22.51	22.52	22.73	24	QPSK	3MHz	1	7
22.44	22.49	22.63	24	QPSK	3MHz	1	14
21.54	21.58	21.62	23	QPSK	3MHz	8	0
21.56	21.52	21.72	23	QPSK	3MHz	8	3
21.50	21.51	21.81	23	QPSK	3MHz	8	7
21.57	21.53	21.74	23	QPSK	3MHz	15	0
21.54	22.14	22.01	23	16QAM	3MHz	1	0
21.78	21.86	22.13	23	16QAM	3MHz	1	7
21.83	21.73	21.41	23	16QAM	3MHz	1	14
20.68	20.77	20.84	22	16QAM	3MHz	8	0
20.61	20.69	20.85	22	16QAM	3MHz	8	3
20.60	20.56	20.75	22	16QAM	3MHz	8	7
20.57	20.55	20.87	22	16QAM	3MHz	15	0

LTE Band 26							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
26715	26865	27015	Channel				
816.5	831.5	846.5	Freq. (MHz)				
22.52	22.66	22.55	24	QPSK	5MHz	1	0
22.50	22.54	22.61	24	QPSK	5MHz	1	12
22.49	22.57	22.69	24	QPSK	5MHz	1	24
21.58	21.62	21.66	23	QPSK	5MHz	12	0
21.51	21.55	21.64	23	QPSK	5MHz	12	6
21.50	21.56	21.77	23	QPSK	5MHz	12	13
21.55	21.56	21.72	23	QPSK	5MHz	25	0
22.01	22.08	21.91	23	16QAM	5MHz	1	0
21.37	22.00	21.82	23	16QAM	5MHz	1	12
21.91	21.92	22.08	23	16QAM	5MHz	1	24
20.67	20.69	20.65	22	16QAM	5MHz	12	0
20.56	20.76	20.81	22	16QAM	5MHz	12	6
20.56	20.71	20.78	22	16QAM	5MHz	12	13
20.54	20.68	20.73	22	16QAM	5MHz	25	0

LTE Band 26							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
26740	26865	26990	Channel				
819	831.5	844	Freq. (MHz)				
22.58	22.58	22.51	24	QPSK	10MHz	1	0
22.47	22.55	22.58	24	QPSK	10MHz	1	24
22.54	22.39	22.73	24	QPSK	10MHz	1	49
21.62	21.67	21.73	23	QPSK	10MHz	25	0
21.53	21.58	21.68	23	QPSK	10MHz	25	12
21.68	21.59	21.71	23	QPSK	10MHz	25	25
21.55	21.60	21.75	23	QPSK	10MHz	50	0
21.94	21.89	21.97	23	16QAM	10MHz	1	0
21.81	21.93	21.91	23	16QAM	10MHz	1	24
22.31	21.61	21.96	23	16QAM	10MHz	1	49
20.59	20.75	20.66	22	16QAM	10MHz	25	0
20.49	20.64	20.72	22	16QAM	10MHz	25	12
20.68	20.68	20.74	22	16QAM	10MHz	25	25
20.59	20.69	20.78	22	16QAM	10MHz	50	0

LTE Band 26							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
26765	26865	26965	Channel				
821.5	831.5	841.5	Freq. (MHz)				
22.35	22.41	22.44	24	QPSK	15MHz	1	0
22.30	22.38	22.40	24	QPSK	15MHz	1	37
22.20	22.61	22.51	24	QPSK	15MHz	1	74
21.39	21.41	21.45	23	QPSK	15MHz	36	0
21.34	21.47	21.44	23	QPSK	15MHz	36	19
21.31	21.55	21.42	23	QPSK	15MHz	36	39
21.46	21.61	21.59	23	QPSK	15MHz	75	0
21.69	21.68	21.38	23	16QAM	15MHz	1	0
21.56	21.41	21.97	23	16QAM	15MHz	1	37
20.95	21.54	21.85	23	16QAM	15MHz	1	74
20.53	20.56	20.54	22	16QAM	15MHz	36	0
20.45	20.54	20.52	22	16QAM	15MHz	36	19
20.40	20.43	20.60	22	16QAM	15MHz	36	39
20.61	20.65	20.69	22	16QAM	15MHz	75	0

LTE Band 30							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
27685	27710	27735	Channel				
2307.5	2310	2312.5	Freq. (MHz)				
22.94	22.86	22.83	24	QPSK	5MHz	1	0
22.88	22.84	22.68	24	QPSK	5MHz	1	12
22.82	22.72	22.82	24	QPSK	5MHz	1	24
21.92	21.89	21.84	23	QPSK	5MHz	12	0
21.83	21.84	21.75	23	QPSK	5MHz	12	6
21.86	21.85	21.85	23	QPSK	5MHz	12	13
21.92	21.86	21.77	23	QPSK	5MHz	25	0
22.18	22.12	21.97	23	16QAM	5MHz	1	0
22.15	21.87	21.62	23	16QAM	5MHz	1	12
22.40	22.06	22.26	23	16QAM	5MHz	1	24
20.98	20.85	20.74	22	16QAM	5MHz	12	0
20.99	20.81	20.63	22	16QAM	5MHz	12	6
21.02	20.73	20.89	22	16QAM	5MHz	12	13
21.00	20.83	20.77	22	16QAM	5MHz	25	0

LTE Band 30					
Maximum Average Power (dBm)	Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
27710	Channel				
2310	Freq. (MHz)				
22.90	24	QPSK	10MHz	1	0
22.86	24	QPSK	10MHz	1	24
22.99	24	QPSK	10MHz	1	49
22.06	23	QPSK	10MHz	25	0
21.96	23	QPSK	10MHz	25	12
21.91	23	QPSK	10MHz	25	25
22.09	23	QPSK	10MHz	50	0
22.16	23	16QAM	10MHz	1	0
22.39	23	16QAM	10MHz	1	24
22.39	23	16QAM	10MHz	1	49
21.12	22	16QAM	10MHz	25	0
21.01	22	16QAM	10MHz	25	12
20.98	22	16QAM	10MHz	25	25
21.14	22	16QAM	10MHz	50	0

LTE Band 38							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
37775	38000	38225	Channel				
2572.5	2595	2617.5	Freq. (MHz)				
22.26	22.25	22.29	24	QPSK	5MHz	1	0
22.24	22.15	22.23	24	QPSK	5MHz	1	12
22.27	22.20	22.25	24	QPSK	5MHz	1	24
21.35	21.29	21.29	23	QPSK	5MHz	12	0
21.34	21.27	21.28	23	QPSK	5MHz	12	6
21.34	21.28	21.28	23	QPSK	5MHz	12	13
21.33	21.26	21.28	23	QPSK	5MHz	25	0
21.60	21.48	21.54	23	16QAM	5MHz	1	0
21.57	21.45	21.51	23	16QAM	5MHz	1	12
21.60	21.48	21.54	23	16QAM	5MHz	1	24
20.41	20.33	20.35	22	16QAM	5MHz	12	0
20.38	20.34	20.33	22	16QAM	5MHz	12	6
20.39	20.35	20.33	22	16QAM	5MHz	12	13
20.45	20.37	20.35	22	16QAM	5MHz	25	0

LTE Band 38							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
37800	38000	38200	Channel				
2575	2595	2615	Freq. (MHz)				
22.10	22.06	22.11	24	QPSK	10MHz	1	0
22.05	22.02	22.09	24	QPSK	10MHz	1	24
22.09	22.05	22.12	24	QPSK	10MHz	1	49
21.29	21.22	21.29	23	QPSK	10MHz	25	0
21.29	21.23	21.28	23	QPSK	10MHz	25	12
21.26	21.24	21.30	23	QPSK	10MHz	25	25
21.22	21.17	21.23	23	QPSK	10MHz	50	0
21.38	21.33	21.37	23	16QAM	10MHz	1	0
21.34	21.28	21.35	23	16QAM	10MHz	1	24
21.33	21.31	21.40	23	16QAM	10MHz	1	49
20.30	20.26	20.32	22	16QAM	10MHz	25	0
20.28	20.24	20.29	22	16QAM	10MHz	25	12
20.27	20.23	20.31	22	16QAM	10MHz	25	25
20.24	20.20	20.28	22	16QAM	10MHz	50	0

LTE Band 38							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
37825	38000	38175	Channel				
2577.5	2595	2612.5	Freq. (MHz)				
22.92	22.77	22.74	24	QPSK	15MHz	1	0
22.89	22.74	22.74	24	QPSK	15MHz	1	37
22.88	22.69	22.77	24	QPSK	15MHz	1	74
21.90	21.69	21.69	23	QPSK	15MHz	36	0
21.84	21.71	21.71	23	QPSK	15MHz	36	19
21.84	21.71	21.72	23	QPSK	15MHz	36	39
21.87	21.71	21.68	23	QPSK	15MHz	75	0
21.88	21.68	21.65	23	16QAM	15MHz	1	0
21.75	21.67	21.67	23	16QAM	15MHz	1	37
21.76	21.66	21.70	23	16QAM	15MHz	1	74
20.98	20.86	20.79	22	16QAM	15MHz	36	0
20.96	20.86	20.80	22	16QAM	15MHz	36	19
20.96	20.86	20.81	22	16QAM	15MHz	36	39
20.87	20.79	20.76	22	16QAM	15MHz	75	0

LTE Band 38							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
37850	38000	38150	Channel				
2580	2595	2610	Freq. (MHz)				
22.47	22.44	22.48	24	QPSK	20MHz	1	0
22.42	22.38	22.40	24	QPSK	20MHz	1	49
22.43	22.43	22.47	24	QPSK	20MHz	1	99
21.33	21.29	21.30	23	QPSK	20MHz	50	0
21.31	21.25	21.31	23	QPSK	20MHz	50	25
21.30	21.27	21.34	23	QPSK	20MHz	50	50
21.33	21.32	21.37	23	QPSK	20MHz	100	0
21.32	21.26	21.31	23	16QAM	20MHz	1	0
21.23	21.21	21.27	23	16QAM	20MHz	1	49
21.22	21.24	21.32	23	16QAM	20MHz	1	99
20.40	20.38	20.41	22	16QAM	20MHz	50	0
20.40	20.35	20.41	22	16QAM	20MHz	50	25
20.37	20.38	20.43	22	16QAM	20MHz	50	50
20.32	20.31	20.36	22	16QAM	20MHz	100	0

LTE Band 41									
Maximum Average Power (dBm)					Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
39675	40148	40620	41093	41565	Channel				
2498.5	2545.8	2593	2640.3	2687.5	Freq. (MHz)				
22.51	22.28	22.27	22.00	22.17	24	QPSK	5MHz	1	0
22.45	22.17	22.31	21.99	22.16	24	QPSK	5MHz	1	12
22.48	22.21	22.29	22.03	22.23	24	QPSK	5MHz	1	24
21.58	21.31	21.28	21.07	21.25	23	QPSK	5MHz	12	0
21.55	21.30	21.35	21.10	21.25	23	QPSK	5MHz	12	6
21.56	21.29	21.36	21.05	21.25	23	QPSK	5MHz	12	13
21.55	21.27	21.36	21.02	21.23	23	QPSK	5MHz	25	0
21.71	21.55	21.55	21.29	21.45	23	16QAM	5MHz	1	0
21.66	21.46	21.59	21.27	21.45	23	16QAM	5MHz	1	12
21.70	21.50	21.61	21.28	21.53	23	16QAM	5MHz	1	24
20.64	20.38	20.40	20.08	20.30	22	16QAM	5MHz	12	0
20.62	20.34	20.45	20.07	20.29	22	16QAM	5MHz	12	6
20.63	20.34	20.46	20.05	20.30	22	16QAM	5MHz	12	13
20.67	20.38	20.48	20.11	20.28	22	16QAM	5MHz	25	0

LTE Band 41									
Maximum Average Power (dBm)					Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
39700	40160	40620	41080	41540	Channel				
2501	2547	2593	2639	2685	Freq. (MHz)				
22.39	22.19	22.18	21.97	22.11	24	QPSK	10MHz	1	0
22.37	22.11	22.21	21.84	22.09	24	QPSK	10MHz	1	24
22.37	22.06	22.26	21.87	22.17	24	QPSK	10MHz	1	49
21.57	21.35	21.35	21.09	21.28	23	QPSK	10MHz	25	0
21.54	21.28	21.40	21.07	21.27	23	QPSK	10MHz	25	12
21.55	21.22	21.40	21.09	21.28	23	QPSK	10MHz	25	25
21.54	21.24	21.35	21.05	21.23	23	QPSK	10MHz	50	0
21.62	21.42	21.42	21.22	21.39	23	16QAM	10MHz	1	0
21.55	21.33	21.47	21.16	21.36	23	16QAM	10MHz	1	24
21.60	21.32	21.48	21.18	21.44	23	16QAM	10MHz	1	49
20.60	20.37	20.36	20.12	20.27	22	16QAM	10MHz	25	0
20.56	20.30	20.40	20.11	20.27	22	16QAM	10MHz	25	12
20.55	20.23	20.40	20.10	20.29	22	16QAM	10MHz	25	25
20.56	20.28	20.37	20.09	20.28	22	16QAM	10MHz	50	0

LTE Band 41									
Maximum Average Power (dBm)					Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
39725	40173	40620	41068	41515	Channel				
2503.5	2548.3	2593	2637.8	2682.5	Freq. (MHz)				
22.78	22.50	22.48	22.27	22.22	24	QPSK	15MHz	1	0
22.72	22.39	22.46	22.13	22.27	24	QPSK	15MHz	1	37
22.69	22.32	22.46	22.15	22.37	24	QPSK	15MHz	1	74
21.85	21.62	21.60	21.39	21.45	23	QPSK	15MHz	36	0
21.84	21.56	21.65	21.32	21.52	23	QPSK	15MHz	36	19
21.83	21.50	21.65	21.30	21.52	23	QPSK	15MHz	36	39
21.91	21.58	21.64	21.33	21.50	23	QPSK	15MHz	75	0
21.82	21.65	21.56	21.40	21.32	23	16QAM	15MHz	1	0
21.83	21.55	21.57	21.29	21.38	23	16QAM	15MHz	1	37
21.83	21.49	21.59	21.23	21.47	23	16QAM	15MHz	1	74
21.02	20.76	20.71	20.48	20.56	22	16QAM	15MHz	36	0
20.99	20.71	20.79	20.41	20.61	22	16QAM	15MHz	36	19
20.97	20.63	20.77	20.38	20.60	22	16QAM	15MHz	36	39
20.90	20.62	20.72	20.32	20.60	22	16QAM	15MHz	75	0

LTE Band 41									
Maximum Average Power (dBm)					Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
39750	40185	40620	41055	41490	Channel				
2506	2549.5	2593	2636.5	2680	Freq. (MHz)				
22.77	22.73	22.70	22.54	22.58	24	QPSK	20MHz	1	0
22.79	22.52	22.70	22.37	22.47	24	QPSK	20MHz	1	49
22.86	22.55	22.80	22.41	22.56	24	QPSK	20MHz	1	99
21.89	21.56	21.53	21.35	21.41	23	QPSK	20MHz	50	0
21.79	21.42	21.59	21.28	21.45	23	QPSK	20MHz	50	25
21.77	21.44	21.58	21.30	21.42	23	QPSK	20MHz	50	50
21.84	21.45	21.65	21.29	21.58	23	QPSK	20MHz	100	0
21.57	21.46	21.36	21.21	21.19	23	16QAM	20MHz	1	0
21.51	21.21	21.34	21.03	21.10	23	16QAM	20MHz	1	49
21.64	21.23	21.46	21.07	21.22	23	16QAM	20MHz	1	99
20.74	20.48	20.50	20.27	20.33	22	16QAM	20MHz	50	0
20.70	20.35	20.57	20.19	20.34	22	16QAM	20MHz	50	25
20.70	20.34	20.50	20.19	20.39	22	16QAM	20MHz	50	50
20.67	20.27	20.50	20.13	20.36	22	16QAM	20MHz	100	0

LTE Band 66							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
131979	132322	132665	Channel				
1710.7	1745	1779.3	Freq. (MHz)				
22.44	22.51	22.44	24	QPSK	1.4MHz	1	0
22.42	22.44	22.41	24	QPSK	1.4MHz	1	2
22.45	22.50	22.45	24	QPSK	1.4MHz	1	5
22.45	22.47	22.46	24	QPSK	1.4MHz	3	0
22.45	22.44	22.44	24	QPSK	1.4MHz	3	1
22.46	22.46	22.45	24	QPSK	1.4MHz	3	3
21.49	21.45	21.47	23	QPSK	1.4MHz	6	0
22.09	21.87	21.70	23	16QAM	1.4MHz	1	0
21.24	21.80	21.97	23	16QAM	1.4MHz	1	2
22.15	21.70	21.83	23	16QAM	1.4MHz	1	5
21.67	21.48	21.65	23	16QAM	1.4MHz	3	0
21.30	21.38	21.29	23	16QAM	1.4MHz	3	1
21.35	21.51	21.63	23	16QAM	1.4MHz	3	3
20.59	20.62	20.59	22	16QAM	1.4MHz	6	0

LTE Band 66							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
131987	132322	132657	Channel				
1711.5	1745	1778.5	Freq. (MHz)				
22.44	22.49	22.54	24	QPSK	3MHz	1	0
22.45	22.52	22.46	24	QPSK	3MHz	1	7
22.42	22.53	22.47	24	QPSK	3MHz	1	14
21.50	21.53	21.50	23	QPSK	3MHz	8	0
21.42	21.50	21.50	23	QPSK	3MHz	8	3
21.48	21.57	21.57	23	QPSK	3MHz	8	7
21.46	21.51	21.52	23	QPSK	3MHz	15	0
21.62	21.51	21.35	23	16QAM	3MHz	1	0
21.62	21.83	21.41	23	16QAM	3MHz	1	7
21.90	21.97	21.84	23	16QAM	3MHz	1	14
20.50	20.58	20.67	22	16QAM	3MHz	8	0
20.49	20.63	20.67	22	16QAM	3MHz	8	3
20.69	20.79	20.60	22	16QAM	3MHz	8	7
20.55	20.57	20.59	22	16QAM	3MHz	15	0

LTE Band 66							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
131997	132322	132647	Channel				
1712.5	1745	1777.5	Freq. (MHz)				
22.75	22.73	22.92	24	QPSK	5MHz	1	0
22.58	22.69	22.52	24	QPSK	5MHz	1	12
23.04	22.65	22.70	24	QPSK	5MHz	1	24
21.76	21.76	21.71	23	QPSK	5MHz	12	0
21.73	21.71	21.62	23	QPSK	5MHz	12	6
21.74	21.79	21.74	23	QPSK	5MHz	12	13
21.70	21.68	21.70	23	QPSK	5MHz	25	0
21.84	22.01	21.79	23	16QAM	5MHz	1	0
22.04	21.94	21.76	23	16QAM	5MHz	1	12
22.28	21.55	22.02	23	16QAM	5MHz	1	24
20.72	20.64	20.80	22	16QAM	5MHz	12	0
20.84	20.68	20.65	22	16QAM	5MHz	12	6
20.87	20.80	20.82	22	16QAM	5MHz	12	13
20.70	20.55	20.69	22	16QAM	5MHz	25	0

LTE Band 66							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
132022	132322	132622	Channel				
1715	1745	1775	Freq. (MHz)				
22.85	22.79	22.81	24	QPSK	10MHz	1	0
22.79	22.74	22.75	24	QPSK	10MHz	1	24
22.88	22.74	22.91	24	QPSK	10MHz	1	49
21.94	21.91	21.89	23	QPSK	10MHz	25	0
21.89	21.83	21.75	23	QPSK	10MHz	25	12
21.82	21.71	21.79	23	QPSK	10MHz	25	25
21.98	21.95	21.90	23	QPSK	10MHz	50	0
22.31	22.23	21.91	23	16QAM	10MHz	1	0
22.37	22.01	21.72	23	16QAM	10MHz	1	24
22.22	22.14	22.18	23	16QAM	10MHz	1	49
20.90	20.93	20.90	22	16QAM	10MHz	25	0
20.89	20.87	20.87	22	16QAM	10MHz	25	12
20.88	20.72	20.86	22	16QAM	10MHz	25	25
21.02	20.99	20.92	22	16QAM	10MHz	50	0

LTE Band 66							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
132047	132322	132597	Channel				
1717.5	1745	1772.5	Freq. (MHz)				
22.50	22.60	22.60	24	QPSK	15MHz	1	0
22.36	22.32	22.46	24	QPSK	15MHz	1	37
22.52	22.44	22.71	24	QPSK	15MHz	1	74
21.57	21.54	21.60	23	QPSK	15MHz	36	0
21.48	21.43	21.52	23	QPSK	15MHz	36	19
21.49	21.51	21.53	23	QPSK	15MHz	36	39
21.62	21.58	21.57	23	QPSK	15MHz	75	0
21.88	21.80	21.94	23	16QAM	15MHz	1	0
21.57	21.88	21.75	23	16QAM	15MHz	1	37
21.66	21.68	21.91	23	16QAM	15MHz	1	74
20.63	20.65	20.66	22	16QAM	15MHz	36	0
20.49	20.58	20.59	22	16QAM	15MHz	36	19
20.56	20.60	20.61	22	16QAM	15MHz	36	39
20.60	20.66	20.65	22	16QAM	15MHz	75	0

LTE Band 66							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
132072	132322	132572	Channel				
1720	1745	1770	Freq. (MHz)				
22.65	22.65	22.65	24	QPSK	20MHz	1	0
22.63	22.64	22.66	24	QPSK	20MHz	1	49
23.01	22.69	22.71	24	QPSK	20MHz	1	99
21.77	21.72	21.70	23	QPSK	20MHz	50	0
21.75	21.71	21.69	23	QPSK	20MHz	50	25
21.78	21.69	21.70	23	QPSK	20MHz	50	50
21.84	21.82	21.79	23	QPSK	20MHz	100	0
21.84	21.66	22.04	23	16QAM	20MHz	1	0
21.81	21.92	21.25	23	16QAM	20MHz	1	49
21.93	21.88	21.97	23	16QAM	20MHz	1	99
20.85	20.79	20.78	22	16QAM	20MHz	50	0
20.75	20.78	20.74	22	16QAM	20MHz	50	25
20.77	20.82	20.67	22	16QAM	20MHz	50	50
20.87	20.88	20.84	22	16QAM	20MHz	100	0

11.4 Power Reduction

Band	Modulation	Date Rate or Sub-test	CH	Frequency	Avg Conducted power (dBm)	Tune up (dBm)
WCDMA II	RMC12.2K	---	Lowest	9262	1852.4	18.19
			Middle	9400	1880.0	18.29
			Highest	9538	1907.6	18.27
HSDPA II	QPSK	1	Lowest	9262	1852.4	16.52
			Middle	9400	1880.0	16.70
			Highest	9538	1907.6	16.56
		2	Lowest	9262	1852.4	16.45
			Middle	9400	1880.0	16.75
			Highest	9538	1907.6	16.59
		3	Lowest	9262	1852.4	16.01
			Middle	9400	1880.0	16.21
			Highest	9538	1907.6	16.01
		4	Lowest	9262	1852.4	15.94
			Middle	9400	1880.0	16.16
			Highest	9538	1907.6	16.07
HSUPA II	QPSK	1	Lowest	9262	1852.4	16.53
			Middle	9400	1880.0	16.69
			Highest	9538	1907.6	16.59
		2	Lowest	9262	1852.4	14.50
			Middle	9400	1880.0	14.69
			Highest	9538	1907.6	14.51
		3	Lowest	9262	1852.4	15.47
			Middle	9400	1880.0	15.71
			Highest	9538	1907.6	15.53
		4	Lowest	9262	1852.4	14.47
			Middle	9400	1880.0	14.72
			Highest	9538	1907.6	14.56
		5	Lowest	9262	1852.4	16.46
			Middle	9400	1880.0	16.67
			Highest	9538	1907.6	16.55

Band	Modulation	Date Rate or Sub-test	CH		Frequency (MHz)	Avg Conducted power (dBm)	Tune up (dBm)
WCDMA IV	RMC12.2K	---	Lowest	1312	1712.4	17.98	18.50
			Middle	1413	1732.6	18.06	18.50
			Highest	1513	1752.6	18.11	18.50
HSDPA IV	QPSK	1	Lowest	1312	1712.4	16.37	17.00
			Middle	1413	1732.6	16.61	17.00
			Highest	1513	1752.6	16.54	17.00
		2	Lowest	1312	1712.4	16.39	17.00
			Middle	1413	1732.6	16.69	17.00
			Highest	1513	1752.6	16.52	17.00
		3	Lowest	1312	1712.4	15.91	16.50
			Middle	1413	1732.6	16.15	16.50
			Highest	1513	1752.6	16.05	16.50
		4	Lowest	1312	1712.4	15.94	16.50
			Middle	1413	1732.6	16.14	16.50
			Highest	1513	1752.6	16.07	16.50
HSUPA IV	QPSK	1	Lowest	1312	1712.4	16.35	17.00
			Middle	1413	1732.6	16.67	17.00
			Highest	1513	1752.6	16.57	17.00
		2	Lowest	1312	1712.4	14.40	15.00
			Middle	1413	1732.6	14.60	15.00
			Highest	1513	1752.6	14.54	15.00
		3	Lowest	1312	1712.4	15.37	16.00
			Middle	1413	1732.6	15.66	16.00
			Highest	1513	1752.6	15.56	16.00
		4	Lowest	1312	1712.4	14.41	15.00
			Middle	1413	1732.6	14.66	15.00
			Highest	1513	1752.6	14.59	15.00
		5	Lowest	1312	1712.4	16.37	17.00
			Middle	1413	1732.6	16.65	17.00
			Highest	1513	1752.6	16.62	17.00

LTE Band 2							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
18607	18900	19193	Channel				
1850.7	1880	1909.3	Freq. (MHz)				
16.96	16.98	17.03	18	QPSK	1.4MHz	1	0
16.97	17.03	16.98	18	QPSK	1.4MHz	1	2
16.93	17.04	16.95	18	QPSK	1.4MHz	1	5
16.91	17.10	16.98	18	QPSK	1.4MHz	3	0
16.94	17.08	16.95	18	QPSK	1.4MHz	3	1
16.95	16.96	16.96	18	QPSK	1.4MHz	3	3
16.99	17.02	17.00	18	QPSK	1.4MHz	6	0
16.93	17.53	17.33	18	16QAM	1.4MHz	1	0
16.90	17.35	16.59	18	16QAM	1.4MHz	1	2
17.17	17.45	17.15	18	16QAM	1.4MHz	1	5
16.92	17.28	16.91	18	16QAM	1.4MHz	3	0
17.10	16.84	16.92	18	16QAM	1.4MHz	3	1
17.07	17.22	17.04	18	16QAM	1.4MHz	3	3
16.93	17.09	17.07	18	16QAM	1.4MHz	6	0

LTE Band 2							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
18615	18900	19185	Channel				
1851.5	1880	1908.5	Freq. (MHz)				
16.78	17.01	16.82	18	QPSK	3MHz	1	0
16.81	16.83	16.83	18	QPSK	3MHz	1	7
16.61	16.96	16.78	18	QPSK	3MHz	1	14
16.80	17.06	16.88	18	QPSK	3MHz	8	0
16.81	17.10	16.85	18	QPSK	3MHz	8	3
16.79	17.04	16.84	18	QPSK	3MHz	8	7
16.83	17.01	16.85	18	QPSK	3MHz	15	0
16.99	17.53	16.92	18	16QAM	3MHz	1	0
17.13	17.12	17.06	18	16QAM	3MHz	1	7
17.18	17.52	16.39	18	16QAM	3MHz	1	14
16.81	17.06	16.88	18	16QAM	3MHz	8	0
16.94	17.06	16.84	18	16QAM	3MHz	8	3
16.77	16.96	16.84	18	16QAM	3MHz	8	7
16.82	17.08	16.89	18	16QAM	3MHz	15	0

LTE Band 2							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
18625	18900	19175	Channel				
1852.5	1880	1907.5	Freq. (MHz)				
16.80	17.03	16.85	18	QPSK	5MHz	1	0
16.84	16.91	16.79	18	QPSK	5MHz	1	12
16.73	16.81	16.92	18	QPSK	5MHz	1	24
16.84	17.01	16.90	18	QPSK	5MHz	12	0
16.81	17.04	16.96	18	QPSK	5MHz	12	6
16.67	16.99	16.93	18	QPSK	5MHz	12	13
16.82	16.99	16.95	18	QPSK	5MHz	25	0
17.44	16.56	17.13	18	16QAM	5MHz	1	0
17.06	17.37	17.08	18	16QAM	5MHz	1	12
16.30	17.17	17.43	18	16QAM	5MHz	1	24
16.95	17.18	16.98	18	16QAM	5MHz	12	0
16.77	17.18	16.95	18	16QAM	5MHz	12	6
16.77	17.02	16.95	18	16QAM	5MHz	12	13
16.82	17.13	16.95	18	16QAM	5MHz	25	0

LTE Band 2							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
18650	18900	19150	Channel				
1855	1880	1905	Freq. (MHz)				
16.90	17.14	16.65	18	QPSK	10MHz	1	0
16.63	17.19	16.82	18	QPSK	10MHz	1	24
16.67	16.99	17.04	18	QPSK	10MHz	1	49
16.99	17.13	16.86	18	QPSK	10MHz	25	0
16.84	17.12	16.87	18	QPSK	10MHz	25	12
16.80	17.03	17.02	18	QPSK	10MHz	25	25
16.83	17.05	16.93	18	QPSK	10MHz	50	0
16.93	17.32	16.82	18	16QAM	10MHz	1	0
16.73	17.05	16.76	18	16QAM	10MHz	1	24
16.79	16.92	16.93	18	16QAM	10MHz	1	49
16.94	17.20	16.95	18	16QAM	10MHz	25	0
16.81	17.09	16.93	18	16QAM	10MHz	25	12
16.74	17.10	17.04	18	16QAM	10MHz	25	25
16.81	17.11	16.94	18	16QAM	10MHz	50	0

LTE Band 2							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
18675	18900	19125	Channel				
1857.5	1880	1902.5	Freq. (MHz)				
16.79	17.03	16.52	18	QPSK	15MHz	1	0
16.52	16.91	16.67	18	QPSK	15MHz	1	37
16.66	16.84	16.85	18	QPSK	15MHz	1	74
16.72	16.99	16.66	18	QPSK	15MHz	36	0
16.66	17.04	16.83	18	QPSK	15MHz	36	19
16.63	16.92	16.90	18	QPSK	15MHz	36	39
16.65	16.97	16.92	18	QPSK	15MHz	75	0
16.50	17.02	17.10	18	16QAM	15MHz	1	0
16.72	17.36	17.18	18	16QAM	15MHz	1	37
16.62	17.11	16.98	18	16QAM	15MHz	1	74
16.73	17.02	16.71	18	16QAM	15MHz	36	0
16.60	17.07	16.88	18	16QAM	15MHz	36	19
16.65	16.91	16.93	18	16QAM	15MHz	36	39
16.63	16.98	16.90	18	16QAM	15MHz	75	0

LTE Band 2							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
18700	18900	19100	Channel				
1860	1880	1900	Freq. (MHz)				
17.01	17.63	17.21	18	QPSK	20MHz	1	0
16.57	16.99	16.73	18	QPSK	20MHz	1	49
16.81	16.89	16.95	18	QPSK	20MHz	1	99
16.99	17.55	16.96	18	QPSK	20MHz	50	0
17.18	17.46	17.25	18	QPSK	20MHz	50	25
16.76	17.09	17.45	18	QPSK	20MHz	50	50
16.88	17.25	17.08	18	QPSK	20MHz	100	0
17.22	17.12	17.01	18	16QAM	20MHz	1	0
17.22	17.24	16.75	18	16QAM	20MHz	1	49
17.14	17.24	17.04	18	16QAM	20MHz	1	99
16.81	17.09	16.80	18	16QAM	20MHz	50	0
16.69	17.06	16.82	18	16QAM	20MHz	50	25
16.85	17.00	16.91	18	16QAM	20MHz	50	50
16.89	17.23	17.01	18	16QAM	20MHz	100	0

LTE Band 4							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
19957	20175	20393	Channel				
1710.7	1732.5	1754.3	Freq. (MHz)				
16.79	16.83	17.04	18	QPSK	1.4MHz	1	0
16.75	16.78	16.95	18	QPSK	1.4MHz	1	2
16.68	16.71	17.01	18	QPSK	1.4MHz	1	5
16.71	16.76	17.01	18	QPSK	1.4MHz	3	0
16.71	16.75	16.98	18	QPSK	1.4MHz	3	1
16.72	16.77	17.03	18	QPSK	1.4MHz	3	3
16.75	16.78	17.04	18	QPSK	1.4MHz	6	0
16.96	17.41	17.41	18	16QAM	1.4MHz	1	0
17.13	17.03	17.25	18	16QAM	1.4MHz	1	2
17.15	17.29	17.42	18	16QAM	1.4MHz	1	5
16.91	16.84	17.26	18	16QAM	1.4MHz	3	0
16.94	16.96	17.15	18	16QAM	1.4MHz	3	1
16.85	16.95	17.27	18	16QAM	1.4MHz	3	3
16.65	16.68	17.00	18	16QAM	1.4MHz	6	0

LTE Band 4							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
19965	20175	20385	Channel				
1711.5	1732.5	1753.5	Freq. (MHz)				
16.68	16.77	17.04	18	QPSK	3MHz	1	0
16.62	16.72	16.99	18	QPSK	3MHz	1	7
16.78	16.61	16.89	18	QPSK	3MHz	1	14
16.74	16.72	17.04	18	QPSK	3MHz	8	0
16.69	16.75	16.96	18	QPSK	3MHz	8	3
16.80	16.69	17.04	18	QPSK	3MHz	8	7
16.72	16.75	17.02	18	QPSK	3MHz	15	0
16.73	16.98	17.23	18	16QAM	3MHz	1	0
16.88	17.33	17.06	18	16QAM	3MHz	1	7
16.54	16.82	17.26	18	16QAM	3MHz	1	14
16.74	16.82	17.16	18	16QAM	3MHz	8	0
16.84	16.74	17.07	18	16QAM	3MHz	8	3
16.75	16.88	16.91	18	16QAM	3MHz	8	7
16.79	16.72	17.01	18	16QAM	3MHz	15	0

LTE Band 4							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
19975	20175	20375	Channel				
1712.5	1732.5	1752.5	Freq. (MHz)				
16.79	16.83	16.98	18	QPSK	5MHz	1	0
16.78	16.59	17.00	18	QPSK	5MHz	1	12
16.89	16.72	17.06	18	QPSK	5MHz	1	24
16.74	16.79	16.98	18	QPSK	5MHz	12	0
16.82	16.70	16.99	18	QPSK	5MHz	12	6
16.84	16.70	16.97	18	QPSK	5MHz	12	13
16.82	16.74	16.94	18	QPSK	5MHz	25	0
16.98	17.31	17.07	18	16QAM	5MHz	1	0
16.94	16.26	17.33	18	16QAM	5MHz	1	12
16.98	17.05	16.53	18	16QAM	5MHz	1	24
16.68	16.85	16.97	18	16QAM	5MHz	12	0
16.86	16.75	17.01	18	16QAM	5MHz	12	6
16.79	16.64	16.87	18	16QAM	5MHz	12	13
16.79	16.69	16.99	18	16QAM	5MHz	25	0

LTE Band 4							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
20000	20175	20350	Channel				
1715	1732.5	1750	Freq. (MHz)				
16.93	16.90	16.86	18	QPSK	10MHz	1	0
16.91	16.93	16.99	18	QPSK	10MHz	1	24
17.02	16.67	17.12	18	QPSK	10MHz	1	49
16.99	16.93	16.92	18	QPSK	10MHz	25	0
17.03	16.83	17.02	18	QPSK	10MHz	25	12
17.09	16.75	17.09	18	QPSK	10MHz	25	25
17.06	16.79	17.02	18	QPSK	10MHz	50	0
16.80	17.25	17.05	18	16QAM	10MHz	1	0
17.32	17.02	17.12	18	16QAM	10MHz	1	24
16.93	16.82	17.28	18	16QAM	10MHz	1	49
16.99	17.00	16.95	18	16QAM	10MHz	25	0
17.03	16.77	17.05	18	16QAM	10MHz	25	12
17.11	16.82	17.08	18	16QAM	10MHz	25	25
17.06	16.86	16.98	18	16QAM	10MHz	50	0

LTE Band 4							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
20025	20175	20325	Channel				
1717.5	1732.5	1747.5	Freq. (MHz)				
16.70	16.92	16.68	18	QPSK	15MHz	1	0
16.95	16.81	16.77	18	QPSK	15MHz	1	37
16.73	16.65	17.07	18	QPSK	15MHz	1	74
16.91	16.89	16.77	18	QPSK	15MHz	36	0
17.00	16.78	16.93	18	QPSK	15MHz	36	19
16.98	16.71	17.06	18	QPSK	15MHz	36	39
17.03	16.75	16.99	18	QPSK	15MHz	75	0
16.58	17.29	17.09	18	16QAM	15MHz	1	0
16.66	16.90	16.51	18	16QAM	15MHz	1	37
17.01	16.63	17.25	18	16QAM	15MHz	1	74
17.05	16.92	16.88	18	16QAM	15MHz	36	0
17.19	16.83	17.02	18	16QAM	15MHz	36	19
17.01	16.77	17.04	18	16QAM	15MHz	36	39
17.10	16.84	16.96	18	16QAM	15MHz	75	0

LTE Band 4							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
20050	20175	20300	Channel				
1720	1732.5	1745	Freq. (MHz)				
16.85	17.55	16.79	18	QPSK	20MHz	1	0
17.00	16.72	16.71	18	QPSK	20MHz	1	49
16.86	16.61	16.98	18	QPSK	20MHz	1	99
17.08	17.47	16.68	18	QPSK	20MHz	50	0
17.02	16.76	16.82	18	QPSK	20MHz	50	25
16.89	16.66	16.95	18	QPSK	20MHz	50	50
17.18	16.80	17.03	18	QPSK	20MHz	100	0
16.89	17.22	17.42	18	16QAM	20MHz	1	0
17.10	16.95	16.58	18	16QAM	20MHz	1	49
16.70	17.16	17.40	18	16QAM	20MHz	1	99
17.15	17.00	16.65	18	16QAM	20MHz	50	0
17.06	16.86	16.90	18	16QAM	20MHz	50	25
17.00	16.71	16.96	18	16QAM	20MHz	50	50
17.07	16.91	16.94	18	16QAM	20MHz	100	0

LTE Band 7							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
20775	21100	21425	Channel				
2502.5	2535	2567.5	Freq. (MHz)				
14.85	14.91	15.00	15.5	QPSK	5MHz	1	0
14.92	14.89	14.96	15.5	QPSK	5MHz	1	12
14.95	14.87	15.02	15.5	QPSK	5MHz	1	24
14.88	14.87	15.12	15.5	QPSK	5MHz	12	0
14.88	14.93	15.09	15.5	QPSK	5MHz	12	6
14.85	14.86	15.13	15.5	QPSK	5MHz	12	13
14.90	14.89	15.09	15.5	QPSK	5MHz	25	0
14.74	15.19	15.35	15.5	16QAM	5MHz	1	0
14.93	14.39	15.38	15.5	16QAM	5MHz	1	12
15.36	15.29	15.29	15.5	16QAM	5MHz	1	24
14.78	14.97	15.04	15.5	16QAM	5MHz	12	0
14.90	14.83	15.03	15.5	16QAM	5MHz	12	6
14.94	14.99	14.97	15.5	16QAM	5MHz	12	13
14.91	14.97	15.11	15.5	16QAM	5MHz	25	0

LTE Band 7							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
20800	21100	21400	Channel				
2505	2535	2565	Freq. (MHz)				
14.95	14.80	15.12	15.5	QPSK	10MHz	1	0
14.86	14.82	15.09	15.5	QPSK	10MHz	1	24
15.05	14.84	15.26	15.5	QPSK	10MHz	1	49
15.00	15.03	15.14	15.5	QPSK	10MHz	25	0
14.92	14.96	15.12	15.5	QPSK	10MHz	25	12
14.90	15.01	15.13	15.5	QPSK	10MHz	25	25
14.98	14.96	15.11	15.5	QPSK	10MHz	50	0
15.15	15.03	15.28	15.5	16QAM	10MHz	1	0
15.01	14.76	15.01	15.5	16QAM	10MHz	1	24
15.01	15.10	15.37	15.5	16QAM	10MHz	1	49
14.90	14.83	15.18	15.5	16QAM	10MHz	25	0
15.01	14.87	15.17	15.5	16QAM	10MHz	25	12
14.99	14.93	15.24	15.5	16QAM	10MHz	25	25
15.00	14.93	15.18	15.5	16QAM	10MHz	50	0



LTE Band 7							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
20825	21100	21375	Channel				
2507.5	2535	2562.5	Freq. (MHz)				
14.79	14.75	14.99	15.5	QPSK	15MHz	1	0
14.85	14.82	15.06	15.5	QPSK	15MHz	1	37
14.94	14.86	15.03	15.5	QPSK	15MHz	1	74
14.91	14.82	15.10	15.5	QPSK	15MHz	36	0
14.90	14.91	15.09	15.5	QPSK	15MHz	36	19
14.94	14.95	15.10	15.5	QPSK	15MHz	36	39
14.97	14.91	15.10	15.5	QPSK	15MHz	75	0
14.48	15.13	15.38	15.5	16QAM	15MHz	1	0
15.31	14.82	15.05	15.5	16QAM	15MHz	1	37
15.37	15.03	15.05	15.5	16QAM	15MHz	1	74
14.91	14.97	15.10	15.5	16QAM	15MHz	36	0
14.96	15.01	15.19	15.5	16QAM	15MHz	36	19
14.97	14.87	15.15	15.5	16QAM	15MHz	36	39
15.00	14.92	15.12	15.5	16QAM	15MHz	75	0

LTE Band 7							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
20850	21100	21350	Channel				
2510	2535	2560	Freq. (MHz)				
15.49	15.29	15.23	15.5	QPSK	20MHz	1	0
14.98	14.86	15.21	15.5	QPSK	20MHz	1	49
15.10	15.01	15.06	15.5	QPSK	20MHz	1	99
15.49	15.35	15.20	15.5	QPSK	20MHz	50	0
15.01	14.99	15.18	15.5	QPSK	20MHz	50	25
15.04	14.91	15.15	15.5	QPSK	20MHz	50	50
15.22	15.09	15.20	15.5	QPSK	20MHz	100	0
15.02	14.91	15.19	15.5	16QAM	20MHz	1	0
15.01	15.23	15.12	15.5	16QAM	20MHz	1	49
14.93	14.88	15.12	15.5	16QAM	20MHz	1	99
14.99	14.89	15.11	15.5	16QAM	20MHz	50	0
14.98	14.94	15.12	15.5	16QAM	20MHz	50	25
15.01	14.90	15.20	15.5	16QAM	20MHz	50	50
15.20	15.05	15.14	15.5	16QAM	20MHz	100	0

LTE Band 30							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
27685	27710	27735	Channel				
2307.5	2310	2312.5	Freq. (MHz)				
17.17	17.67	16.97	18	QPSK	5MHz	1	0
16.94	17.11	16.98	18	QPSK	5MHz	1	12
17.04	17.09	17.07	18	QPSK	5MHz	1	24
17.15	17.58	17.17	18	QPSK	5MHz	12	0
17.52	17.55	17.17	18	QPSK	5MHz	12	6
17.37	17.39	17.41	18	QPSK	5MHz	12	13
17.11	17.10	16.90	18	QPSK	5MHz	25	0
17.09	17.05	17.10	18	16QAM	5MHz	1	0
17.09	17.10	17.04	18	16QAM	5MHz	1	12
17.11	17.11	17.05	18	16QAM	5MHz	1	24
17.04	17.18	16.98	18	16QAM	5MHz	12	0
17.16	17.09	17.04	18	16QAM	5MHz	12	6
17.02	17.22	17.07	18	16QAM	5MHz	12	13
17.04	16.99	16.95	18	16QAM	5MHz	25	0

LTE Band 30					
Maximum Average Power (dBm)	Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
27710	Channel				
2310	Freq. (MHz)				
17.46	18	QPSK	10MHz	1	0
17.44	18	QPSK	10MHz	1	24
17.22	18	QPSK	10MHz	1	49
17.45	18	QPSK	10MHz	25	0
17.19	18	QPSK	10MHz	25	12
17.14	18	QPSK	10MHz	25	25
17.26	18	QPSK	10MHz	50	0
17.19	18	16QAM	10MHz	1	0
17.17	18	16QAM	10MHz	1	24
17.34	18	16QAM	10MHz	1	49
17.11	18	16QAM	10MHz	25	0
17.18	18	16QAM	10MHz	25	12
17.13	18	16QAM	10MHz	25	25
17.21	18	16QAM	10MHz	50	0

LTE Band 38							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
37775	38000	38225	Channel				
2572.5	2595	2617.5	Freq. (MHz)				
15.63	15.56	15.63	16.5	QPSK	5MHz	1	0
15.60	15.56	15.64	16.5	QPSK	5MHz	1	12
15.61	15.58	15.64	16.5	QPSK	5MHz	1	24
15.64	15.60	15.64	16.5	QPSK	5MHz	12	0
15.63	15.56	15.63	16.5	QPSK	5MHz	12	6
15.62	15.59	15.63	16.5	QPSK	5MHz	12	13
15.62	15.58	15.64	16.5	QPSK	5MHz	25	0
16.23	16.08	16.22	16.5	16QAM	5MHz	1	0
16.25	16.11	16.18	16.5	16QAM	5MHz	1	12
16.22	16.07	16.22	16.5	16QAM	5MHz	1	24
15.72	15.64	15.72	16.5	16QAM	5MHz	12	0
15.71	15.63	15.71	16.5	16QAM	5MHz	12	6
15.70	15.62	15.73	16.5	16QAM	5MHz	12	13
15.68	15.61	15.73	16.5	16QAM	5MHz	25	0

LTE Band 38							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
37800	38000	38200	Channel				
2575	2595	2615	Freq. (MHz)				
15.63	15.59	15.63	16.5	QPSK	10MHz	1	0
15.61	15.55	15.60	16.5	QPSK	10MHz	1	24
15.63	15.58	15.62	16.5	QPSK	10MHz	1	49
15.65	15.60	15.65	16.5	QPSK	10MHz	25	0
15.62	15.59	15.63	16.5	QPSK	10MHz	25	12
15.65	15.61	15.65	16.5	QPSK	10MHz	25	25
15.56	15.56	15.63	16.5	QPSK	10MHz	50	0
16.35	16.17	16.20	16.5	16QAM	10MHz	1	0
16.26	16.16	16.22	16.5	16QAM	10MHz	1	24
16.24	16.20	16.30	16.5	16QAM	10MHz	1	49
15.72	15.69	15.73	16.5	16QAM	10MHz	25	0
15.71	15.66	15.73	16.5	16QAM	10MHz	25	12
15.72	15.66	15.73	16.5	16QAM	10MHz	25	25
15.64	15.62	15.65	16.5	16QAM	10MHz	50	0



LTE Band 38							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
37825	38000	38175	Channel				
2577.5	2595	2612.5	Freq. (MHz)				
15.64	15.62	15.64	16.5	QPSK	15MHz	1	0
15.62	15.61	15.62	16.5	QPSK	15MHz	1	37
15.61	15.58	15.67	16.5	QPSK	15MHz	1	74
15.59	15.57	15.59	16.5	QPSK	15MHz	36	0
15.58	15.58	15.61	16.5	QPSK	15MHz	36	19
15.56	15.57	15.60	16.5	QPSK	15MHz	36	39
15.55	15.53	15.58	16.5	QPSK	15MHz	75	0
16.25	16.16	16.19	16.5	16QAM	15MHz	1	0
16.20	16.13	16.22	16.5	16QAM	15MHz	1	37
16.16	16.14	16.23	16.5	16QAM	15MHz	1	74
15.67	15.61	15.67	16.5	16QAM	15MHz	36	0
15.67	15.62	15.68	16.5	16QAM	15MHz	36	19
15.62	15.61	15.67	16.5	16QAM	15MHz	36	39
15.63	15.61	15.66	16.5	16QAM	15MHz	75	0

LTE Band 38							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
37850	38000	38150	Channel				
2580	2595	2610	Freq. (MHz)				
16.46	16.49	16.31	16.5	QPSK	20MHz	1	0
16.31	16.31	16.29	16.5	QPSK	20MHz	1	49
16.34	16.31	16.39	16.5	QPSK	20MHz	1	99
15.72	15.73	15.71	16.5	QPSK	20MHz	50	0
15.70	15.67	15.69	16.5	QPSK	20MHz	50	25
15.73	15.70	15.71	16.5	QPSK	20MHz	50	50
15.71	15.67	15.66	16.5	QPSK	20MHz	100	0
15.80	15.73	15.71	16.5	16QAM	20MHz	1	0
15.74	15.67	15.67	16.5	16QAM	20MHz	1	49
15.77	15.71	15.71	16.5	16QAM	20MHz	1	99
15.71	15.67	15.69	16.5	16QAM	20MHz	50	0
15.70	15.67	15.67	16.5	16QAM	20MHz	50	25
15.66	15.67	15.69	16.5	16QAM	20MHz	50	50
15.64	15.69	15.68	16.5	16QAM	20MHz	100	0

LTE Band 41									
Maximum Average Power (dBm)					Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
39675	40148	40620	41093	41565	Channel				
2498.5	2545.8	2593	2640.3	2687.5	Freq. (MHz)				
15.22	15.21	15.31	15.57	15.47	16.5	QPSK	5MHz	1	0
15.18	15.20	15.29	15.54	15.42	16.5	QPSK	5MHz	1	12
15.22	15.21	15.31	15.52	15.55	16.5	QPSK	5MHz	1	24
15.24	15.22	15.31	15.58	15.45	16.5	QPSK	5MHz	12	0
15.21	15.21	15.31	15.58	15.43	16.5	QPSK	5MHz	12	6
15.23	15.20	15.30	15.58	15.44	16.5	QPSK	5MHz	12	13
15.23	15.20	15.31	15.55	15.47	16.5	QPSK	5MHz	25	0
15.94	15.90	15.81	16.20	15.99	16.5	16QAM	5MHz	1	0
15.90	15.87	15.79	16.13	15.96	16.5	16QAM	5MHz	1	12
15.92	15.93	15.83	16.13	16.12	16.5	16QAM	5MHz	1	24
15.33	15.31	15.39	15.58	15.53	16.5	16QAM	5MHz	12	0
15.30	15.30	15.37	15.58	15.52	16.5	16QAM	5MHz	12	6
15.31	15.32	15.40	15.60	15.54	16.5	16QAM	5MHz	12	13
15.27	15.26	15.35	15.59	15.54	16.5	16QAM	5MHz	25	0

LTE Band 41									
Maximum Average Power (dBm)					Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
39700	40160	40620	41080	41540	Channel				
2501	2547	2593	2639	2685	Freq. (MHz)				
15.22	15.23	15.30	15.59	15.45	16.5	QPSK	10MHz	1	0
15.14	15.17	15.29	15.51	15.40	16.5	QPSK	10MHz	1	24
15.09	15.25	15.27	15.46	15.51	16.5	QPSK	10MHz	1	49
15.22	15.20	15.32	15.54	15.46	16.5	QPSK	10MHz	25	0
15.22	15.17	15.25	15.55	15.44	16.5	QPSK	10MHz	25	12
15.22	15.27	15.31	15.57	15.45	16.5	QPSK	10MHz	25	25
15.17	15.15	15.22	15.50	15.46	16.5	QPSK	10MHz	50	0
15.92	15.96	15.96	16.30	15.97	16.5	16QAM	10MHz	1	0
15.93	15.94	15.87	16.22	15.96	16.5	16QAM	10MHz	1	24
15.83	15.97	15.90	16.23	16.14	16.5	16QAM	10MHz	1	49
15.30	15.30	15.32	15.66	15.55	16.5	16QAM	10MHz	25	0
15.27	15.29	15.35	15.64	15.54	16.5	16QAM	10MHz	25	12
15.27	15.36	15.34	15.64	15.55	16.5	16QAM	10MHz	25	25
15.14	15.20	15.29	15.55	15.53	16.5	16QAM	10MHz	50	0

LTE Band 41									
Maximum Average Power (dBm)					Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
39725	40173	40620	41068	41515	Channel				
2503.5	2548.3	2593	2637.8	2682.5	Freq. (MHz)				
15.21	15.23	15.30	15.62	15.41	16.5	QPSK	15MHz	1	0
15.17	15.25	15.28	15.57	15.48	16.5	QPSK	15MHz	1	37
15.13	15.31	15.28	15.52	15.53	16.5	QPSK	15MHz	1	74
15.14	15.18	15.25	15.55	15.38	16.5	QPSK	15MHz	36	0
15.12	15.18	15.25	15.51	15.43	16.5	QPSK	15MHz	36	19
15.08	15.23	15.27	15.51	15.42	16.5	QPSK	15MHz	36	39
15.13	15.16	15.22	15.48	15.43	16.5	QPSK	15MHz	75	0
15.92	15.96	15.85	16.25	15.94	16.5	16QAM	15MHz	1	0
15.84	15.98	15.81	16.23	15.96	16.5	16QAM	15MHz	1	37
15.79	16.00	15.85	16.19	16.12	16.5	16QAM	15MHz	1	74
15.21	15.21	15.30	15.62	15.45	16.5	16QAM	15MHz	36	0
15.21	15.26	15.32	15.57	15.50	16.5	16QAM	15MHz	36	19
15.15	15.29	15.32	15.57	15.47	16.5	16QAM	15MHz	36	39
15.20	15.24	15.32	15.59	15.55	16.5	16QAM	15MHz	75	0

LTE Band 41									
Maximum Average Power (dBm)					Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
39750	40185	40620	41055	41490	Channel				
2506	2549.5	2593	2636.5	2680	Freq. (MHz)				
15.83	15.83	16.29	16.21	16.18	16.5	QPSK	20MHz	1	0
15.82	15.79	16.17	16.16	16.03	16.5	QPSK	20MHz	1	49
15.79	15.78	16.26	16.18	16.14	16.5	QPSK	20MHz	1	99
15.81	15.71	16.12	16.22	15.76	16.5	QPSK	20MHz	50	0
15.62	15.81	16.19	15.54	15.88	16.5	QPSK	20MHz	50	25
15.33	15.82	15.93	15.53	15.78	16.5	QPSK	20MHz	50	50
15.24	15.22	15.61	16.21	16.12	16.5	QPSK	20MHz	100	0
15.21	15.04	15.62	15.62	15.60	16.5	16QAM	20MHz	1	0
15.09	15.08	15.58	15.51	15.52	16.5	16QAM	20MHz	1	49
15.10	15.10	15.70	15.50	15.60	16.5	16QAM	20MHz	1	99
15.18	14.95	15.58	15.57	15.54	16.5	16QAM	20MHz	50	0
15.07	14.97	15.60	15.49	15.57	16.5	16QAM	20MHz	50	25
15.10	14.98	15.59	15.50	15.60	16.5	16QAM	20MHz	50	50
15.15	14.98	15.60	15.47	15.61	16.5	16QAM	20MHz	100	0

LTE Band 66							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
131979	132322	132665	Channel				
1710.7	1745	1779.3	Freq. (MHz)				
16.47	16.50	16.60	18	QPSK	1.4MHz	1	0
16.43	16.46	16.66	18	QPSK	1.4MHz	1	2
16.44	16.53	16.52	18	QPSK	1.4MHz	1	5
16.49	16.48	16.49	18	QPSK	1.4MHz	3	0
16.51	16.55	16.52	18	QPSK	1.4MHz	3	1
16.53	16.59	16.54	18	QPSK	1.4MHz	3	3
16.54	16.52	16.53	18	QPSK	1.4MHz	6	0
16.77	16.55	16.49	18	16QAM	1.4MHz	1	0
16.73	16.55	17.01	18	16QAM	1.4MHz	1	2
16.58	16.92	17.03	18	16QAM	1.4MHz	1	5
16.57	16.65	16.77	18	16QAM	1.4MHz	3	0
16.53	16.58	16.57	18	16QAM	1.4MHz	3	1
16.45	16.60	16.48	18	16QAM	1.4MHz	3	3
16.52	16.67	16.74	18	16QAM	1.4MHz	6	0

LTE Band 66							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
131987	132322	132657	Channel				
1711.5	1745	1778.5	Freq. (MHz)				
16.50	16.55	16.56	18	QPSK	3MHz	1	0
16.62	16.63	16.56	18	QPSK	3MHz	1	7
16.45	16.54	16.56	18	QPSK	3MHz	1	14
16.55	16.57	16.56	18	QPSK	3MHz	8	0
16.51	16.49	16.51	18	QPSK	3MHz	8	3
16.53	16.50	16.53	18	QPSK	3MHz	8	7
16.53	16.53	16.51	18	QPSK	3MHz	15	0
16.44	17.14	16.84	18	16QAM	3MHz	1	0
16.43	16.55	16.87	18	16QAM	3MHz	1	7
16.53	17.04	16.95	18	16QAM	3MHz	1	14
16.59	16.51	16.52	18	16QAM	3MHz	8	0
16.51	16.69	16.56	18	16QAM	3MHz	8	3
16.61	16.51	16.54	18	16QAM	3MHz	8	7
16.57	16.62	16.58	18	16QAM	3MHz	15	0

LTE Band 66							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
131997	132322	132647	Channel				
1712.5	1745	1777.5	Freq. (MHz)				
16.94	16.98	16.97	18	QPSK	5MHz	1	0
16.95	16.91	16.94	18	QPSK	5MHz	1	12
17.00	17.05	17.02	18	QPSK	5MHz	1	24
17.05	17.02	16.95	18	QPSK	5MHz	12	0
16.93	16.95	16.87	18	QPSK	5MHz	12	6
16.89	16.96	16.88	18	QPSK	5MHz	12	13
16.97	16.91	16.94	18	QPSK	5MHz	25	0
17.52	17.30	17.08	18	16QAM	5MHz	1	0
17.45	17.40	16.91	18	16QAM	5MHz	1	12
17.59	17.48	17.46	18	16QAM	5MHz	1	24
17.03	16.85	16.97	18	16QAM	5MHz	12	0
16.96	16.98	16.96	18	16QAM	5MHz	12	6
16.99	16.93	16.95	18	16QAM	5MHz	12	13
17.00	16.86	16.83	18	16QAM	5MHz	25	0

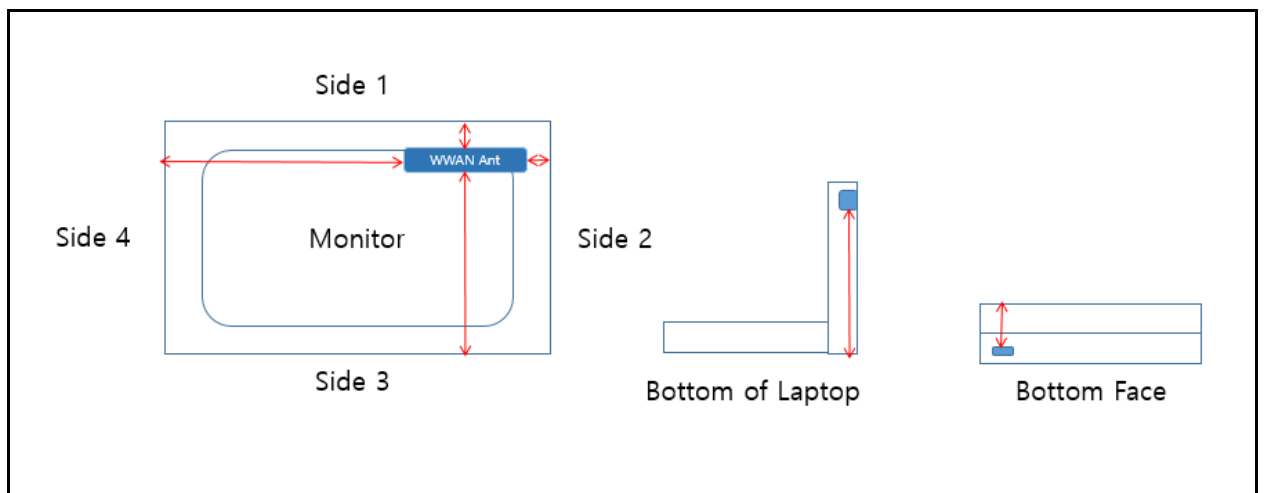
LTE Band 66							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
132022	132322	132622	Channel				
1715	1745	1775	Freq. (MHz)				
17.14	17.07	17.07	18	QPSK	10MHz	1	0
17.24	16.99	16.92	18	QPSK	10MHz	1	24
17.10	17.21	17.13	18	QPSK	10MHz	1	49
17.07	17.03	17.07	18	QPSK	10MHz	25	0
17.17	17.10	17.14	18	QPSK	10MHz	25	12
17.13	17.10	16.99	18	QPSK	10MHz	25	25
17.10	17.12	17.08	18	QPSK	10MHz	50	0
16.30	16.24	16.22	18	16QAM	10MHz	1	0
16.19	16.35	16.21	18	16QAM	10MHz	1	24
16.25	16.49	16.27	18	16QAM	10MHz	1	49
16.33	16.39	16.28	18	16QAM	10MHz	25	0
16.28	16.25	16.27	18	16QAM	10MHz	25	12
16.31	16.25	16.31	18	16QAM	10MHz	25	25
16.35	16.33	16.35	18	16QAM	10MHz	50	0

LTE Band 66							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
132047	132322	132597	Channel				
1717.5	1745	1772.5	Freq. (MHz)				
16.59	16.52	16.59	18	QPSK	15MHz	1	0
16.43	16.40	16.53	18	QPSK	15MHz	1	37
16.49	16.59	16.64	18	QPSK	15MHz	1	74
16.55	16.47	16.56	18	QPSK	15MHz	36	0
16.56	16.49	16.53	18	QPSK	15MHz	36	19
16.48	16.47	16.46	18	QPSK	15MHz	36	39
16.58	16.61	16.55	18	QPSK	15MHz	75	0
16.83	16.61	16.95	18	16QAM	15MHz	1	0
16.70	16.83	16.91	18	16QAM	15MHz	1	37
16.69	17.03	16.60	18	16QAM	15MHz	1	74
16.61	16.56	16.63	18	16QAM	15MHz	36	0
16.54	16.56	16.66	18	16QAM	15MHz	36	19
16.53	16.51	16.64	18	16QAM	15MHz	36	39
16.61	16.64	16.73	18	16QAM	15MHz	75	0

LTE Band 66							
Maximum Average Power (dBm)			Tune up (dBm)	Modulation	Bandwidth	# of Resource Blocks	Resource Block Offset
132072	132322	132572	Channel				
1720	1745	1770	Freq. (MHz)				
17.49	17.68	17.60	18	QPSK	20MHz	1	0
17.22	17.55	16.86	18	QPSK	20MHz	1	49
17.11	17.48	16.68	18	QPSK	20MHz	1	99
17.09	17.65	17.11	18	QPSK	20MHz	50	0
17.16	17.04	17.08	18	QPSK	20MHz	50	25
17.16	17.06	17.06	18	QPSK	20MHz	50	50
17.09	17.01	17.19	18	QPSK	20MHz	100	0
16.31	16.30	16.38	18	16QAM	20MHz	1	0
16.36	16.37	16.36	18	16QAM	20MHz	1	49
16.38	16.08	16.35	18	16QAM	20MHz	1	99
16.35	16.26	16.31	18	16QAM	20MHz	50	0
16.36	16.32	16.30	18	16QAM	20MHz	50	25
16.37	16.32	16.28	18	16QAM	20MHz	50	50
16.36	16.38	16.35	18	16QAM	20MHz	100	0

11.5 Antenna location

Antenna	Bottom of Laptop (mm)	Bottom Face (mm)	Side 1 (mm)	Side 2 (mm)	Side 3 (mm)	Side 4 (mm)
WWAN	187.23	<5	<5	26.75	187.23	183.85





11.6 SAR Test Exclusion

Body SAR test reduction																	
Ant. Used	Band	Frequency	Tune-Power		Distance of Ant. To User (mm)						Calculated value and evaluated result (mW)						exclusion threshold
		(GHz)	(dBm)	(mW)	Bottom of laptop	Bottom face	Side1	Side2	Side3	Side4	Bottom of laptop	Bottom face	Side1	Side2	Side3	Side4	
WWAN Antenna	WCDMA II	1.907	24.5	282	187.23	5	5	26.75	187.23	183.85	1481.0	77.9	77.9	14.6	1481.0	1447.0	3
											EXEMPT	MEASURE	MEASURE	MEASURE	EXEMPT	EXEMPT	
	WCDMA IV	1.750	24.5	282	187.23	5	5	26.75	187.23	183.85	1486.0	74.6	74.6	14.0	1486.0	1452.0	3
											EXEMPT	MEASURE	MEASURE	MEASURE	EXEMPT	EXEMPT	
	WCDMA V	0.846	24.5	282	187.23	5	5	26.75	187.23	183.85	937.1	51.9	51.9	9.7	937.1	918.0	3
											EXEMPT	MEASURE	MEASURE	MEASURE	EXEMPT	EXEMPT	
	LTE 2	1.909	24	251	187.23	5	5	26.75	187.23	183.85	1481.0	69.4	69.4	13.0	1481.0	1447.0	3
											EXEMPT	MEASURE	MEASURE	MEASURE	EXEMPT	EXEMPT	
	LTE 4	1.754	24	251	187.23	5	5	26.75	187.23	183.85	1486.0	66.5	66.5	12.4	1486.0	1452.0	3
											EXEMPT	MEASURE	MEASURE	MEASURE	EXEMPT	EXEMPT	
	LTE 5	0.848	24	251	187.23	5	5	26.75	187.23	183.85	938.7	46.2	46.2	8.6	938.7	919.6	3
											EXEMPT	MEASURE	MEASURE	MEASURE	EXEMPT	EXEMPT	
	LTE 7	2.567	24	251	187.23	5	5	26.75	187.23	183.85	1466.0	80.4	80.4	15.0	1466.0	1432.0	3
											EXEMPT	MEASURE	MEASURE	MEASURE	EXEMPT	EXEMPT	
	LTE 12	0.715	24	251	187.23	5	5	26.75	187.23	183.85	831.5	42.5	42.5	7.9	831.5	815.4	3
											EXEMPT	MEASURE	MEASURE	MEASURE	EXEMPT	EXEMPT	
	LTE 13	0.783	24	251	187.23	5	5	26.75	187.23	183.85	885.9	44.4	44.4	8.3	885.9	868.2	3
											EXEMPT	MEASURE	MEASURE	MEASURE	EXEMPT	EXEMPT	
	LTE 17	0.713	24	251	187.23	5	5	26.75	187.23	183.85	829.9	42.4	42.4	7.9	829.9	813.9	3
											EXEMPT	MEASURE	MEASURE	MEASURE	EXEMPT	EXEMPT	
	LTE 26	0.848	24	251	187.23	5	5	26.75	187.23	183.85	938.7	46.2	46.2	8.6	938.7	919.6	3
											EXEMPT	MEASURE	MEASURE	MEASURE	EXEMPT	EXEMPT	
	LTE 30	2.310	24	251	187.23	5	5	26.75	187.23	183.85	1471.0	76.3	76.3	14.3	1471.0	1437.0	3
											EXEMPT	MEASURE	MEASURE	MEASURE	EXEMPT	EXEMPT	
	LTE 38	2.618	24	251	187.23	5	5	26.75	187.23	183.85	1465.0	81.2	81.2	15.2	1465.0	1431.0	3
											EXEMPT	MEASURE	MEASURE	MEASURE	EXEMPT	EXEMPT	
	LTE 41	2.688	24	251	187.23	5	5	26.75	187.23	183.85	1464.0	82.3	82.3	15.4	1464.0	1430.0	3
											EXEMPT	MEASURE	MEASURE	MEASURE	EXEMPT	EXEMPT	
	LTE 66	1.779	24	251	187.23	5	5	26.75	187.23	183.85	1485.0	67.0	67.0	12.5	1485.0	1451.0	3
											EXEMPT	MEASURE	MEASURE	MEASURE	EXEMPT	EXEMPT	

Note:

1. The test reduction for distance less than 50 mm and more than 50 mm. Use the max power to make sure minimum distance by evaluated for SAR testing.
2. For 100 MHz to 6 GHz and test separation distances > 50 mm, According to KDB 447498, if the calculated Power threshold is less than the output power then SAR testing is required.
3. For 100 MHz to 6 GHz and test separation distances $\leq$ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:
According to KDB 447498, if the calculated threshold values are >3 then Body SAR and >7.5 then Limbs, SAR testing are required. Calculated Value only include number format, that means through compare output power with threshold, if the Calculated value more than 3, the SAR test should be perform. Otherwise, the SAR test could be exempt. (<50 mm)
4. The threshold P_{th} (mW) described in §1.1307(b)(3)(i)(B) was also considered and compared with the calculated values from KDB447498 v06. The most conservative values compared between KDB447498 v06 method and §1.1307 method were select as the threshold in this report.
5. When an antenna qualifies for the standalone SAR test exclusion and also transmits simultaneously with other antennas, the standalone SAR value must be estimated in accordance with KDB 447498.
6. Power and distance are rounded to the nearest mW and mm before calculation.
7. The result is rounded to one decimal place for comparison.
8. The SAR test has included the exemption part in practice.

11.7 Test Results

11.7.1 SAR Test Result

Index.	Band	Frequency		Modulation or Sub-Test	Test Position	Spacing	SAR _{1g}	Burst Avg Power (dBm)	Max tune-up (dBm)	Reported SAR _{1g}	Ant	Note
		Ch.	MHz			(mm)	(W/Kg)					
	WCDMA Band II	9400	1880	RMC12.2K	Bottom of laptop	0	0.01	23.3	24.5	0.013	South Star	
	WCDMA Band II	9400	1880	RMC12.2K	Back of display screen	25	0.482	23.3	24.5	0.635	South Star	
#239	WCDMA Band II	9400	1880	RMC12.2K	Bottom Face	0	0.871	23.3	24.5	1.148	South Star	
	WCDMA Band II	9262	1852.4	RMC12.2K	Bottom Face	0	0.823	23.09	24.5	1.139	South Star	
	WCDMA Band II	9538	1907.6	RMC12.2K	Bottom Face	0	0.646	22.71	24.5	0.976	South Star	
	WCDMA Band II	9400	1880	RMC12.2K	Side 1	0	0.812	18.29	18.5	0.852	South Star	Power Reduce
	WCDMA Band II	9262	1852.4	RMC12.2K	Side 1	0	0.798	18.19	18.5	0.857	South Star	Power Reduce
	WCDMA Band II	9538	1907.6	RMC12.2K	Side 1	0	0.806	18.27	18.5	0.850	South Star	Power Reduce
#500	WCDMA Band II	9400	1880	RMC12.2K	Side 1	17	0.901	23.3	24.5	1.188	South Star	
	WCDMA Band II	9400	1880	RMC12.2K	Side 1	17	0.844	23.3	24.5	1.113	AWAN	
	WCDMA Band II	9262	1852.4	RMC12.2K	Side 1	17	0.837	23.09	24.5	1.158	South Star	
	WCDMA Band II	9538	1907.6	RMC12.2K	Side 1	17	0.463	22.71	24.5	0.699	South Star	
	WCDMA Band II	9400	1880	RMC12.2K	Side 2	0	0.284	23.3	24.5	0.374	South Star	
	WCDMA Band II	9400	1880	RMC12.2K	Side 3	0	0.01	23.3	24.5	0.013	South Star	
	WCDMA Band II	9400	1880	RMC12.2K	Side 4	0	0.054	23.3	24.5	0.071	South Star	
	WCDMA Band IV	1513	1752.6	RMC12.2K	Bottom of laptop	0	0.04	23.39	24.5	0.052	South Star	
	WCDMA Band IV	1513	1752.6	RMC12.2K	Back of display screen	25	0.46	23.39	24.5	0.594	South Star	
	WCDMA Band IV	1513	1752.6	RMC12.2K	Bottom Face	0	0.535	23.39	24.5	0.691	South Star	
#249	WCDMA Band IV	1513	1752.6	RMC12.2K	Bottom Face	0	0.538	23.39	24.5	0.695	AWAN	
	WCDMA Band IV	1312	1712.4	RMC12.2K	Bottom Face	0	0.404	22.86	24.5	0.589	AWAN	
	WCDMA Band IV	1413	1732.6	RMC12.2K	Bottom Face	0	0.303	22.98	24.5	0.430	AWAN	
	WCDMA Band IV	1513	1752.6	RMC12.2K	Side 1	0	0.541	18.11	18.5	0.592	South Star	Power Reduce
	WCDMA Band IV	1513	1752.6	RMC12.2K	Side 1	17	0.211	23.39	24.5	0.272	South Star	
	WCDMA Band IV	1513	1752.6	RMC12.2K	Side 2	0	0.045	23.39	24.5	0.058	South Star	
	WCDMA Band IV	1513	1752.6	RMC12.2K	Side 3	0	0.063	23.39	24.5	0.081	South Star	
	WCDMA Band IV	1513	1752.6	RMC12.2K	Side 4	0	0.01	23.39	24.5	0.013	South Star	
	WCDMA Band V	4182	836.4	RMC12.2K	Bottom of laptop	0	0.01	23.69	24.5	0.012	South Star	
	WCDMA Band V	4182	836.4	RMC12.2K	Back of display screen	25	0.159	23.69	24.5	0.192	South Star	
	WCDMA Band V	4182	836.4	RMC12.2K	Bottom Face	0	0.268	23.69	24.5	0.323	South Star	
	WCDMA Band V	4182	836.4	RMC12.2K	Side 1	0	0.742	23.69	24.5	0.894	South Star	
#288	WCDMA Band V	4182	836.4	RMC12.2K	Side 1	0	0.915	23.69	24.5	1.103	AWAN	
	WCDMA Band V	4132	826.4	RMC12.2K	Side 1	0	0.863	23.53	24.5	1.079	AWAN	
	WCDMA Band V	4233	846.6	RMC12.2K	Side 1	0	0.878	23.62	24.5	1.075	AWAN	
	WCDMA Band V	4182	836.4	RMC12.2K	Side 2	0	0.101	23.69	24.5	0.122	South Star	
	WCDMA Band V	4182	836.4	RMC12.2K	Side 3	0	0.01	23.69	24.5	0.012	South Star	
	WCDMA Band V	4182	836.4	RMC12.2K	Side 4	0	0.01	23.69	24.5	0.012	South Star	



Index.	Band	Frequency		Bandwidth	Modulation	RB Size	RB Offset	Test Position	Spacing (mm)	SAR _{1g} (W/Kg)	Burst Avg Power (dBm)	Max tune-up (dBm)	Reported SAR _{1g}	Antenna	Note
		Ch.	MHz												
	LTE Band 2	18900	1880	20M	QPSK	1	0	Bottom of laptop	0	0.01	22.73	24	0.013	South Star	
	LTE Band 2	18900	1880	20M	QPSK	50	25	Bottom of laptop	0	0.01	21.72	23	0.013	South Star	
	LTE Band 2	18900	1880	20M	QPSK	1	0	Back of display screen	25	0.308	22.73	24	0.413	South Star	
	LTE Band 2	18900	1880	20M	QPSK	50	25	Back of display screen	25	0.311	21.72	23	0.418	South Star	
	LTE Band 2	18900	1880	20M	QPSK	1	0	Bottom Face	0	0.511	22.73	24	0.685	South Star	
#1006	LTE Band 2	18900	1880	20M	QPSK	50	25	Bottom Face	0	0.569	21.72	23	0.764	South Star	
	LTE Band 2	18900	1880	20M	QPSK	1	0	Side 1	0	0.804	17.63	18	0.875	South Star	Power Reduce
	LTE Band 2	18700	1860	20M	QPSK	1	0	Side 1	0	0.703	17.01	18	0.883	South Star	Power Reduce
	LTE Band 2	19100	1900	20M	QPSK	1	0	Side 1	0	0.424	17.21	18	0.509	South Star	Power Reduce
	LTE Band 2	18900	1880	20M	QPSK	50	0	Side 1	0	0.585	17.55	18	0.649	South Star	Power Reduce
	LTE Band 2	18900	1880	20M	QPSK	100	0	Side 1	0	0.567	17.25	18	0.674	South Star	Power Reduce
#18	LTE Band 2	18900	1880	20M	QPSK	1	0	Side 1	17	0.81	22.73	24	1.085	South Star	
	LTE Band 2	18900	1880	20M	QPSK	1	0	Side 1	17	0.689	22.73	24	0.923	AWAN	
	LTE Band 2	18700	1860	20M	QPSK	1	99	Side 1	17	0.485	22.68	24	0.657	South Star	
	LTE Band 2	19100	1900	20M	QPSK	1	0	Side 1	17	0.336	22.63	24	0.461	South Star	
	LTE Band 2	18900	1880	20M	QPSK	50	25	Side 1	17	0.677	21.72	23	0.909	South Star	
	LTE Band 2	18900	1880	20M	QPSK	100	0	Side 1	17	0.342	21.85	23	0.446	South Star	
	LTE Band 2	18900	1880	20M	QPSK	1	0	Side 2	0	0.19	22.73	24	0.255	South Star	
	LTE Band 2	18900	1880	20M	QPSK	50	25	Side 2	0	0.191	21.72	23	0.256	South Star	
	LTE Band 2	18900	1880	20M	QPSK	1	0	Side 3	0	0.051	22.73	24	0.068	South Star	
	LTE Band 2	18900	1880	20M	QPSK	50	25	Side 3	0	0.052	21.72	23	0.070	South Star	
	LTE Band 2	18900	1880	20M	QPSK	1	0	Side 4	0	0.01	22.73	24	0.013	South Star	
	LTE Band 2	18900	1880	20M	QPSK	50	25	Side 4	0	0.01	21.72	23	0.013	South Star	
	LTE Band 7	20850	2510	20M	QPSK	1	99	Bottom of laptop	0	0.01	22.92	24	0.013	South Star	
	LTE Band 7	20850	2510	20M	QPSK	50	0	Bottom of laptop	0	0.01	21.94	23	0.013	South Star	
	LTE Band 7	20850	2510	20M	QPSK	1	99	Back of display screen	25	0.237	22.92	24	0.304	South Star	
	LTE Band 7	20850	2510	20M	QPSK	50	0	Back of display screen	25	0.223	21.94	23	0.285	South Star	
#1002	LTE Band 7	20850	2510	20M	QPSK	1	99	Bottom Face	0	0.602	22.92	24	0.772	South Star	
	LTE Band 7	20850	2510	20M	QPSK	50	0	Bottom Face	0	0.597	21.94	23	0.762	South Star	
	LTE Band 7	20850	2510	20M	QPSK	1	0	Side 1	0	1.1	15.49	15.5	1.103	South Star	Power Reduce
	LTE Band 7	21100	2535	20M	QPSK	1	0	Side 1	0	0.938	15.29	15.5	0.984	South Star	Power Reduce
	LTE Band 7	21350	2560	20M	QPSK	1	0	Side 1	0	0.888	15.23	15.5	0.945	South Star	Power Reduce
	LTE Band 7	20850	2510	20M	QPSK	50	0	Side 1	0	1.13	15.49	15.5	1.133	South Star	Power Reduce
#123	LTE Band 7	20850	2510	20M	QPSK	50	0	Side 1	0	1.16	15.49	15.5	1.163	AWAN	Power Reduce
	LTE Band 7	21100	2535	20M	QPSK	50	0	Side 1	0	0.893	15.35	15.5	0.924	AWAN	Power Reduce
	LTE Band 7	21350	2560	20M	QPSK	50	0	Side 1	0	0.852	15.2	15.5	0.913	AWAN	Power Reduce
	LTE Band 7	20850	2510	20M	QPSK	100	0	Side 1	0	1.052	15.22	15.5	1.122	South Star	Power Reduce
	LTE Band 7	20850	2510	20M	QPSK	1	99	Side 1	17	0.443	22.92	24	0.568	South Star	
	LTE Band 7	20850	2510	20M	QPSK	50	0	Side 1	17	0.359	21.94	23	0.458	South Star	
	LTE Band 7	20850	2510	20M	QPSK	1	99	Side 2	0	0.244	22.92	24	0.313	South Star	
	LTE Band 7	20850	2510	20M	QPSK	50	0	Side 2	0	0.229	21.94	23	0.292	South Star	
	LTE Band 7	20850	2510	20M	QPSK	1	99	Side 3	0	0.01	22.92	24	0.013	South Star	
	LTE Band 7	20850	2510	20M	QPSK	50	0	Side 3	0	0.01	21.94	23	0.013	South Star	
	LTE Band 7	20850	2510	20M	QPSK	1	99	Side 4	0	0.045	22.92	24	0.058	South Star	
	LTE Band 7	20850	2510	20M	QPSK	50	0	Side 4	0	0.042	21.94	23	0.054	South Star	



Index.	Band	Frequency		Bandwidth	Modulation	RB Size	RB Offset	Test Position	Spacing (mm)	SAR _{1g} (W/Kg)	Burst Avg Power (dBm)	Max tune-up (dBm)	Reported SAR _{1g}	Antenna	Note
		Ch.	MHz												
	LTE Band 12	23095	707.5	10M	QPSK	1	0	Bottom of laptop	0	0.01	22.69	24	0.014	South Star	
	LTE Band 12	23095	707.5	10M	QPSK	25	25	Bottom of laptop	0	0.01	21.71	23	0.013	South Star	
	LTE Band 12	23095	707.5	10M	QPSK	1	0	Back of display screen	25	0.085	22.69	24	0.115	South Star	
	LTE Band 12	23095	707.5	10M	QPSK	25	25	Back of display screen	25	0.072	21.71	23	0.097	South Star	
	LTE Band 12	23095	707.5	10M	QPSK	1	0	Bottom Face	0	0.159	22.69	24	0.215	South Star	
	LTE Band 12	23095	707.5	10M	QPSK	25	25	Bottom Face	0	0.137	21.71	23	0.184	South Star	
	LTE Band 12	23095	707.5	10M	QPSK	1	0	Side 1	0	0.602	22.69	24	0.814	South Star	
#79	LTE Band 12	23095	707.5	10M	QPSK	1	0	Side 1	0	0.612	22.69	24	0.827	AWAN	
	LTE Band 12	23095	707.5	10M	QPSK	25	25	Side 1	0	0.502	21.71	23	0.676	AWAN	
	LTE Band 12	23095	707.5	10M	QPSK	50	0	Side 1	0	0.415	21.66	23	0.565	AWAN	
	LTE Band 12	23095	707.5	10M	QPSK	1	0	Side 2	0	0.097	22.69	24	0.131	South Star	
	LTE Band 12	23095	707.5	10M	QPSK	25	25	Side 2	0	0.085	21.71	23	0.114	South Star	
	LTE Band 12	23095	707.5	10M	QPSK	1	0	Side 3	0	0.01	22.69	24	0.014	South Star	
	LTE Band 12	23095	707.5	10M	QPSK	25	25	Side 3	0	0.01	21.71	23	0.013	South Star	
	LTE Band 12	23095	707.5	10M	QPSK	1	0	Side 4	0	0.01	22.69	24	0.014	South Star	
	LTE Band 12	23095	707.5	10M	QPSK	25	25	Side 4	0	0.01	21.71	23	0.013	South Star	
#115	LTE Band 17	23790	710	10M	QPSK	1	49	Side 1	0	0.615	22.8	24	0.811	AWAN	
	LTE Band 13	23230	782	10M	QPSK	1	49	Bottom of laptop	0	0.01	23.00	24	0.013	South Star	
	LTE Band 13	23230	782	10M	QPSK	25	0	Bottom of laptop	0	0.01	22.08	23	0.012	South Star	
	LTE Band 13	23230	782	10M	QPSK	1	49	Back of display screen	25	0.146	23.00	24	0.184	South Star	
	LTE Band 13	23230	782	10M	QPSK	25	0	Back of display screen	25	0.116	22.08	23	0.143	South Star	
	LTE Band 13	23230	782	10M	QPSK	1	49	Bottom Face	0	0.248	23.00	24	0.312	South Star	
	LTE Band 13	23230	782	10M	QPSK	25	0	Bottom Face	0	0.187	22.08	23	0.231	South Star	
	LTE Band 13	23230	782	10M	QPSK	1	49	Side 1	0	0.771	23.00	24	0.971	South Star	
#977	LTE Band 13	23230	782	10M	QPSK	1	49	Side 1	0	0.822	23.00	24	1.035	AWAN	
	LTE Band 13	23230	782	10M	QPSK	25	0	Side 1	0	0.53	22.08	23	0.655	AWAN	
	LTE Band 13	23230	782	10M	QPSK	50	0	Side 1	0	0.256	22.15	23	0.311	AWAN	
	LTE Band 13	23230	782	10M	QPSK	1	49	Side 2	0	0.101	23.00	24	0.127	South Star	
	LTE Band 13	23230	782	10M	QPSK	25	0	Side 2	0	0.069	22.08	23	0.085	South Star	
	LTE Band 13	23230	782	10M	QPSK	1	49	Side 3	0	0.01	23.00	24	0.013	South Star	
	LTE Band 13	23230	782	10M	QPSK	25	0	Side 3	0	0.01	22.08	23	0.012	South Star	
	LTE Band 13	23230	782	10M	QPSK	1	49	Side 4	0	0.01	23.00	24	0.013	South Star	
	LTE Band 13	23230	782	10M	QPSK	25	0	Side 4	0	0.01	22.08	23	0.012	South Star	



Index.	Band	Frequency		Bandwidth	Modulation	RB Size	RB Offset	Test Position	Spacing (mm)	SAR _{1g} (W/Kg)	Burst Avg Power (dBm)	Max tune-up (dBm)	Reported SAR _{1g}	Antenna	Note
		Ch.	MHz												
	LTE Band 26	26865	831.5	15M	QPSK	1	74	Bottom of laptop	0	0.01	22.61	24	0.014	South Star	
	LTE Band 26	26865	831.5	15M	QPSK	36	39	Bottom of laptop	0	0.01	21.55	23	0.014	South Star	
	LTE Band 26	26865	831.5	15M	QPSK	1	74	Back of display screen	25	0.131	22.61	24	0.180	South Star	
	LTE Band 26	26865	831.5	15M	QPSK	36	39	Back of display screen	25	0.116	21.55	23	0.162	South Star	
	LTE Band 26	26865	831.5	15M	QPSK	1	74	Bottom Face	0	0.179	22.61	24	0.247	South Star	
	LTE Band 26	26865	831.5	15M	QPSK	36	39	Bottom Face	0	0.153	21.55	23	0.214	South Star	
	LTE Band 26	26865	831.5	15M	QPSK	1	74	Side 1	0	0.541	22.61	24	0.745	South Star	
#401	LTE Band 26	26865	831.5	15M	QPSK	1	74	Side 1	0	0.721	22.61	24	0.993	AWAN	
	LTE Band 26	26865	831.5	15M	QPSK	36	39	Side 1	0	0.688	21.55	23	0.961	AWAN	
	LTE Band 26	26865	831.5	15M	QPSK	75	0	Side 1	0	0.693	21.61	23	0.954	AWAN	
	LTE Band 26	26865	831.5	15M	QPSK	1	74	Side 2	0	0.095	22.61	24	0.131	South Star	
	LTE Band 26	26865	831.5	15M	QPSK	36	39	Side 2	0	0.067	21.55	23	0.094	South Star	
	LTE Band 26	26865	831.5	15M	QPSK	1	74	Side 3	0	0.01	22.61	24	0.014	South Star	
	LTE Band 26	26865	831.5	15M	QPSK	36	39	Side 3	0	0.01	21.55	23	0.014	South Star	
	LTE Band 26	26865	831.5	15M	QPSK	1	74	Side 4	0	0.01	22.61	24	0.014	South Star	
	LTE Band 26	26865	831.5	15M	QPSK	36	39	Side 4	0	0.01	21.55	23	0.014	South Star	
#433	LTE Band 5	20525	836.5	10M	QPSK	1	49	Side 1	0	0.724	22.68	24	0.981	AWAN	
	LTE Band 30	27710	2310	10M	QPSK	1	49	Bottom of laptop	0	0.01	22.99	24	0.013	South Star	
	LTE Band 30	27710	2310	10M	QPSK	25	0	Bottom of laptop	0	0.01	22.06	23	0.012	South Star	
	LTE Band 30	27710	2310	10M	QPSK	1	49	Back of display screen	25	0.08	22.99	24	0.101	South Star	
	LTE Band 30	27710	2310	10M	QPSK	25	0	Back of display screen	25	0.071	22.06	23	0.088	South Star	
#1001	LTE Band 30	27710	2310	10M	QPSK	1	49	Bottom Face	0	0.569	22.99	24	0.718	South Star	
	LTE Band 30	27710	2310	10M	QPSK	1	49	Bottom Face	0	0.557	22.99	24	0.703	AWAN	
	LTE Band 30	27710	2310	10M	QPSK	25	0	Bottom Face	0	0.489	22.06	23	0.607	South Star	
	LTE Band 30	27710	2310	10M	QPSK	1	0	Side 1	0	0.452	17.46	18	0.512	South Star	Power Reduce
	LTE Band 30	27710	2310	10M	QPSK	25	0	Side 1	0	0.429	17.45	18	0.487	South Star	Power Reduce
	LTE Band 30	27710	2310	10M	QPSK	1	49	Side 1	17	0.158	22.99	24	0.199	South Star	
	LTE Band 30	27710	2310	10M	QPSK	25	0	Side 1	17	0.166	22.06	23	0.206	South Star	
	LTE Band 30	27710	2310	10M	QPSK	1	49	Side 2	0	0.483	22.99	24	0.609	South Star	
	LTE Band 30	27710	2310	10M	QPSK	25	0	Side 2	0	0.463	22.06	23	0.575	South Star	
	LTE Band 30	27710	2310	10M	QPSK	1	49	Side 3	0	0.013	22.99	24	0.016	South Star	
	LTE Band 30	27710	2310	10M	QPSK	25	0	Side 3	0	0.012	22.06	23	0.015	South Star	
	LTE Band 30	27710	2310	10M	QPSK	1	49	Side 4	0	0.061	22.99	24	0.077	South Star	
	LTE Band 30	27710	2310	10M	QPSK	25	0	Side 4	0	0.053	22.06	23	0.066	South Star	



Index.	Band	Frequency		Bandwidth	Modulation	RB Size	RB Offset	Test Position	Spacing (mm)	SAR _{1g} (W/Kg)	Burst Avg Power (dBm)	Max tune-up (dBm)	Reported SAR _{1g}	Antenna	Note
		Ch.	MHz												
	LTE Band 41	39750	2506	20M	QPSK	1	99	Bottom of laptop	0	0.026	22.86	24	0.034	South Star	
	LTE Band 41	39750	2506	20M	QPSK	50	0	Bottom of laptop	0	0.029	21.89	23	0.038	South Star	
	LTE Band 41	39750	2506	20M	QPSK	1	99	Back of display screen	25	0.097	22.86	24	0.127	South Star	
	LTE Band 41	39750	2506	20M	QPSK	50	0	Back of display screen	25	0.088	21.89	23	0.114	South Star	
	LTE Band 41	39750	2506	20M	QPSK	1	99	Bottom Face	0	0.243	22.86	24	0.318	South Star	
	LTE Band 41	39750	2506	20M	QPSK	50	0	Bottom Face	0	0.229	21.89	23	0.298	South Star	
	LTE Band 41	40620	2593	20M	QPSK	1	0	Side 1	0	0.466	16.29	16.5	0.492	South Star	Power Reduce
	LTE Band 41	39750	2506	20M	QPSK	1	0	Side 1	0	0.569	15.83	16.5	0.668	South Star	Power Reduce
#73	LTE Band 41	40185	2549.5	20M	QPSK	1	0	Side 1	0	0.76	15.83	16.5	0.892	South Star	Power Reduce
	LTE Band 41	40185	2549.5	20M	QPSK	1	0	Side 1	0	0.562	15.83	16.5	0.660	AWAN	Power Reduce
	LTE Band 41	41055	2636.5	20M	QPSK	1	0	Side 1	0	0.332	16.21	16.5	0.357	South Star	Power Reduce
	LTE Band 41	41490	2680	20M	QPSK	1	0	Side 1	0	0.154	16.18	16.5	0.167	South Star	Power Reduce
	LTE Band 41	41055	2636.5	20M	QPSK	50	0	Side 1	0	0.297	16.22	16.5	0.319	South Star	Power Reduce
	LTE Band 41	41055	2636.5	20M	QPSK	100	0	Side 1	0	0.269	16.21	16.5	0.289	South Star	Power Reduce
	LTE Band 41	39750	2506	20M	QPSK	1	99	Side 1	17	0.152	22.86	24	0.199	South Star	
	LTE Band 41	39750	2506	20M	QPSK	50	0	Side 1	17	0.129	21.89	23	0.168	South Star	
	LTE Band 41	39750	2506	20M	QPSK	1	99	Side 2	0	0.05	22.86	24	0.065	South Star	
	LTE Band 41	39750	2506	20M	QPSK	50	0	Side 2	0	0.044	21.89	23	0.057	South Star	
	LTE Band 41	39750	2506	20M	QPSK	1	99	Side 3	0	0.012	22.86	24	0.016	South Star	
	LTE Band 41	39750	2506	20M	QPSK	50	0	Side 3	0	0.012	21.89	23	0.016	South Star	
	LTE Band 41	39750	2506	20M	QPSK	1	99	Side 4	0	0.044	22.86	24	0.058	South Star	
	LTE Band 41	39750	2506	20M	QPSK	50	0	Side 4	0	0.038	21.89	23	0.049	South Star	
#511	LTE Band 38	38000	2595	20M	QPSK	1	0	Side 1	0	0.581	16.49	16.5	0.586	South Star	Power Reduce
	LTE Band 66	132072	1720	20M	QPSK	1	99	Bottom of laptop	0	0.01	23.01	24	0.013	South Star	
	LTE Band 66	132072	1720	20M	QPSK	50	50	Bottom of laptop	0	0.01	21.78	23	0.013	South Star	
	LTE Band 66	132072	1720	20M	QPSK	1	99	Back of display screen	25	0.271	23.01	24	0.340	South Star	
	LTE Band 66	132072	1720	20M	QPSK	50	50	Back of display screen	25	0.249	21.78	23	0.330	South Star	
#1003	LTE Band 66	132072	1720	20M	QPSK	1	99	Bottom Face	0	0.509	23.01	24	0.639	South Star	
	LTE Band 66	132072	1720	20M	QPSK	50	50	Bottom Face	0	0.395	21.78	23	0.523	South Star	
#235	LTE Band 66	132322	1745	20M	QPSK	1	0	Side 1	0	0.602	17.68	18	0.648	South Star	Power Reduce
	LTE Band 66	132322	1745	20M	QPSK	1	0	Side 1	0	0.453	17.68	18	0.488	AWAN	Power Reduce
	LTE Band 66	132322	1745	20M	QPSK	50	0	Side 1	0	0.589	17.65	18	0.638	South Star	Power Reduce
	LTE Band 66	132072	1770	20M	QPSK	1	99	Side 1	17	0.251	23.01	24	0.315	South Star	
	LTE Band 66	132072	1770	20M	QPSK	50	50	Side 1	17	0.195	21.78	23	0.258	South Star	
	LTE Band 66	132072	1720	20M	QPSK	1	99	Side 2	0	0.042	23.01	24	0.053	South Star	
	LTE Band 66	132072	1720	20M	QPSK	50	50	Side 2	0	0.041	21.78	23	0.054	South Star	
	LTE Band 66	132072	1720	20M	QPSK	1	99	Side 3	0	0.064	23.01	24	0.080	South Star	
	LTE Band 66	132072	1720	20M	QPSK	50	50	Side 3	0	0.047	21.78	23	0.062	South Star	
	LTE Band 66	132072	1720	20M	QPSK	1	99	Side 4	0	0.01	23.01	24	0.013	South Star	
	LTE Band 66	132072	1720	20M	QPSK	50	50	Side 4	0	0.01	21.78	23	0.013	South Star	
#25	LTE Band 4	20175	1732.5	20M	QPSK	1	0	Side 1	0	0.578	17.55	18	0.641	South Star	Power Reduce

11.8 Simultaneous Transmission Evaluation

11.8.1 Simultaneous Transmission Configurations

Condition(s)	Band					
	WWAN	WLAN 2.4GHz Ant Main	WLAN 2.4GHz Ant Aux	WLAN 5GHz Ant Main	WLAN 5GHz Ant Aux	Bluetooth
1	V	V	-	-	-	-
2	V	-	V	-	-	-
3	V	V	V	-	-	-
4	V	V	-	-	-	V
5	V	-	-	V	-	-
6	V	-	-	-	V	-
7	V	-	-	V	V	-
8	V	-	-	V	-	V
9	V	-	-	V	V	V

11.8.2 Simultaneous Transmission Result

When the sum of 1-g SAR of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit, SAR test exclusion applies to that simultaneous transmission configuration.

Sum of 1-g SAR of summary is shown as below:

WWAN Band		Exposure Position	1	2	3	4	5	6	$1+2$ $\sum$ 1g SAR (W/kg)	$1+3$ $\sum$ 1g SAR (W/kg)	$1+2+3$ $\sum$ 1g SAR (W/kg)	$1+2+6$ $\sum$ 1g SAR (W/kg)	$1+4$ $\sum$ 1g SAR (W/kg)	$1+5$ $\sum$ 1g SAR (W/kg)	$1+4+5$ $\sum$ 1g SAR (W/kg)	$1+4+6$ $\sum$ 1g SAR (W/kg)	$1+4+5+6$ $\sum$ 1g SAR (W/kg)	SPLSR No.	
			WWAN	WLAN 2.4GHz Ant Main	WLAN 2.4GHz Ant Aux	WLAN 5GHz Ant Main	WLAN 5GHz Ant Aux	Bluetooth Ant Aux											
			1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)											
WCDMA	WCDMA Band II	Bottom Face at 0mm -	1.148	0.088	0.716	0.010	1.109	0.138	1.236	1.864	1.952	1.374	1.158	2.257	2.267	1.296	2.405	#1	#2
		side 1 at 0mm -	0.857	0.060	0.128	0.217	0.426	0.049	0.917	0.985	1.045	0.966	1.074	1.283	1.500	1.123	1.549		
		side 2 at 0mm -	0.374	0.013	0.013	0.010	0.013	0.013	0.387	0.387	0.400	0.400	0.384	0.387	0.397	0.397	0.410		
		side 3 at 0mm -	0.013	0.079	0.013	0.010	0.013	0.013	0.092	0.026	0.105	0.105	0.023	0.026	0.036	0.036	0.049		
		side 4 at 0mm -	0.071	0.333	0.054	0.526	0.242	0.050	0.404	0.125	0.458	0.454	0.597	0.313	0.839	0.647	0.889		
	WCDMA Band IV	Bottom Face at 0mm -	0.695	0.088	0.716	0.010	1.109	0.138	0.783	1.411	1.499	0.921	0.705	1.804	1.814	0.843	1.952		#3
		side 1 at 0mm -	0.592	0.060	0.128	0.217	0.426	0.049	0.652	0.720	0.780	0.701	0.809	1.018	1.235	0.858	1.284		
		side 2 at 0mm -	0.058	0.013	0.013	0.010	0.013	0.013	0.071	0.071	0.084	0.084	0.068	0.071	0.081	0.081	0.094		
		side 3 at 0mm -	0.081	0.079	0.013	0.010	0.013	0.013	0.160	0.094	0.173	0.173	0.091	0.094	0.104	0.104	0.117		
		side 4 at 0mm -	0.013	0.333	0.054	0.526	0.242	0.050	0.346	0.067	0.400	0.396	0.539	0.255	0.781	0.589	0.831		
	WCDMA Band V	Bottom Face at 0mm -	0.323	0.088	0.716	0.010	1.109	0.138	0.411	1.039	1.127	0.549	0.333	1.432	1.442	0.471	1.580		
		side 1 at 0mm -	1.103	0.060	0.128	0.217	0.426	0.049	1.163	1.231	1.291	1.212	1.320	1.529	1.746	1.369	1.795		
		side 2 at 0mm -	0.122	0.013	0.013	0.010	0.013	0.013	0.135	0.135	0.148	0.148	0.132	0.135	0.145	0.145	0.158		
		side 3 at 0mm -	0.012	0.079	0.013	0.010	0.013	0.013	0.091	0.025	0.104	0.104	0.022	0.025	0.035	0.035	0.048		
		side 4 at 0mm -	0.012	0.333	0.054	0.526	0.242	0.050	0.345	0.066	0.399	0.395	0.538	0.254	0.780	0.588	0.830		



WWAN Band	Exposure Position	1	2	3	4	5	6	$\sum$ 1+2 1g SAR (W/kg)	$\sum$ 1+3 1g SAR (W/kg)	$\sum$ 1+2+3 1g SAR (W/kg)	$\sum$ 1+2+6 1g SAR (W/kg)	$\sum$ 1+4 1g SAR (W/kg)	$\sum$ 1+5 1g SAR (W/kg)	$\sum$ 1+4+5 1g SAR (W/kg)	$\sum$ 1+4+6 1g SAR (W/kg)	$\sum$ 1+4+5+6 1g SAR (W/kg)	SPLSR No.	
		WWAN	WLAN 2.4GHz Ant Main	WLAN 2.4GHz Ant Aux	WLAN 5GHz Ant Main	WLAN 5GHz Ant Aux	Bluetooth Ant Aux											
		1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)											
LTE	LTE Band 2	Bottom Face at 0mm -	0.764	0.088	0.716	0.010	1.109	0.138	0.852	1.480	1.568	0.990	0.774	1.873	1.883	0.912	2.021	#5
		side 1 at 0mm -	0.883	0.060	0.128	0.217	0.426	0.049	0.943	1.011	1.071	0.992	1.100	1.309	1.526	1.149	1.575	
		side 2 at 0mm -	0.256	0.013	0.013	0.010	0.013	0.013	0.269	0.269	0.282	0.282	0.266	0.269	0.279	0.279	0.292	
		side 3 at 0mm -	0.070	0.079	0.013	0.010	0.013	0.013	0.149	0.083	0.162	0.162	0.080	0.083	0.093	0.093	0.106	
		side 4 at 0mm -	0.013	0.333	0.054	0.526	0.242	0.050	0.346	0.067	0.400	0.396	0.539	0.255	0.781	0.589	0.831	
	LTE Band 7	Bottom Face at 0mm -	0.772	0.088	0.716	0.010	1.109	0.138	0.860	1.488	1.576	0.998	0.782	1.881	1.891	0.920	2.029	#6
		side 1 at 0mm -	1.163	0.060	0.128	0.217	0.426	0.049	1.223	1.291	1.351	1.272	1.380	1.589	1.806	1.429	1.855	
		side 2 at 0mm -	0.313	0.013	0.013	0.010	0.013	0.013	0.326	0.326	0.339	0.339	0.323	0.326	0.336	0.336	0.349	
		side 3 at 0mm -	0.013	0.079	0.013	0.010	0.013	0.013	0.092	0.026	0.105	0.105	0.023	0.026	0.036	0.036	0.049	
		side 4 at 0mm -	0.058	0.333	0.054	0.526	0.242	0.050	0.391	0.112	0.445	0.441	0.584	0.300	0.826	0.634	0.876	
	LTE Band 12/17	Bottom Face at 0mm -	0.215	0.088	0.716	0.010	1.109	0.138	0.303	0.931	1.019	0.441	0.225	1.324	1.334	0.363	1.472	
		side 1 at 0mm -	0.827	0.060	0.128	0.217	0.426	0.049	0.887	0.955	1.015	0.936	1.044	1.253	1.470	1.093	1.519	
		side 2 at 0mm -	0.131	0.013	0.013	0.010	0.013	0.013	0.144	0.144	0.157	0.157	0.141	0.144	0.154	0.154	0.167	
		side 3 at 0mm -	0.014	0.079	0.013	0.010	0.013	0.013	0.093	0.027	0.106	0.106	0.024	0.027	0.037	0.037	0.050	
		side 4 at 0mm -	0.014	0.333	0.054	0.526	0.242	0.050	0.347	0.068	0.401	0.397	0.540	0.256	0.782	0.590	0.832	
	LTE Band 13	Bottom Face at 0mm -	0.312	0.088	0.716	0.010	1.109	0.138	0.400	1.028	1.116	0.538	0.322	1.421	1.431	0.460	1.569	
		side 1 at 0mm -	1.035	0.060	0.128	0.217	0.426	0.049	1.095	1.163	1.223	1.144	1.252	1.461	1.678	1.301	1.727	
		side 2 at 0mm -	0.127	0.013	0.013	0.010	0.013	0.013	0.140	0.140	0.153	0.153	0.137	0.140	0.150	0.150	0.163	
		side 3 at 0mm -	0.013	0.079	0.013	0.010	0.013	0.013	0.092	0.026	0.105	0.105	0.023	0.026	0.036	0.036	0.049	
		side 4 at 0mm -	0.013	0.333	0.054	0.526	0.242	0.050	0.346	0.067	0.400	0.396	0.539	0.255	0.781	0.589	0.831	
	LTE Band 26/5	Bottom Face at 0mm -	0.247	0.088	0.716	0.010	1.109	0.138	0.335	0.963	1.051	0.473	0.257	1.356	1.366	0.395	1.504	
		side 1 at 0mm -	0.993	0.060	0.128	0.217	0.426	0.049	1.053	1.121	1.181	1.102	1.210	1.419	1.636	1.259	1.685	
		side 2 at 0mm -	0.131	0.013	0.013	0.010	0.013	0.013	0.144	0.144	0.157	0.157	0.141	0.144	0.154	0.154	0.167	
		side 3 at 0mm -	0.014	0.079	0.013	0.010	0.013	0.013	0.093	0.027	0.106	0.106	0.024	0.027	0.037	0.037	0.050	
		side 4 at 0mm -	0.014	0.333	0.054	0.526	0.242	0.050	0.347	0.068	0.401	0.397	0.540	0.256	0.782	0.590	0.832	
	LTE Band 30	Bottom Face at 0mm -	0.718	0.088	0.716	0.010	1.109	0.138	0.806	1.434	1.522	0.944	0.728	1.827	1.837	0.866	1.975	#9
		side 1 at 0mm -	0.512	0.060	0.128	0.217	0.426	0.049	0.572	0.640	0.700	0.621	0.729	0.938	1.155	0.778	1.204	
		side 2 at 0mm -	0.609	0.013	0.013	0.010	0.013	0.013	0.622	0.622	0.635	0.635	0.619	0.622	0.632	0.632	0.645	
		side 3 at 0mm -	0.016	0.079	0.013	0.010	0.013	0.013	0.095	0.029	0.108	0.108	0.026	0.029	0.039	0.039	0.052	
		side 4 at 0mm -	0.077	0.333	0.054	0.526	0.242	0.050	0.410	0.131	0.464	0.460	0.603	0.319	0.845	0.653	0.895	
	LTE Band 41/38	Bottom Face at 0mm -	0.318	0.088	0.716	0.010	1.109	0.138	0.406	1.034	1.122	0.544	0.328	1.427	1.437	0.466	1.575	
		side 1 at 0mm -	0.892	0.060	0.128	0.217	0.426	0.049	0.952	1.020	1.080	1.001	1.109	1.318	1.535	1.158	1.584	
		side 2 at 0mm -	0.065	0.013	0.013	0.010	0.013	0.013	0.078	0.078	0.091	0.091	0.075	0.078	0.088	0.088	0.101	
		side 3 at 0mm -	0.016	0.079	0.013	0.010	0.013	0.013	0.095	0.029	0.108	0.108	0.026	0.029	0.039	0.039	0.052	
		side 4 at 0mm -	0.058	0.333	0.054	0.526	0.242	0.050	0.391	0.112	0.445	0.441	0.584	0.300	0.826	0.634	0.876	



WWAN Band	Exposure Position	1	2	3	4	5	6	$\sum$ 1+2 1g SAR (W/kg)	$\sum$ 1+3 1g SAR (W/kg)	$\sum$ 1+2+3 1g SAR (W/kg)	$\sum$ 1+2+6 1g SAR (W/kg)	$\sum$ 1+4 1g SAR (W/kg)	$\sum$ 1+5 1g SAR (W/kg)	$\sum$ 1+4+5 1g SAR (W/kg)	$\sum$ 1+4+6 1g SAR (W/kg)	$\sum$ 1+4+5+6 1g SAR (W/kg)	SPLSR No.	
		WWAN	WLAN 2.4GHz Ant Main	WLAN 2.4GHz Ant Aux	WLAN 5GHz Ant Main	WLAN 5GHz Ant Aux	Bluetooth Ant Aux											
		1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)											
LTE	LTE Band 66/4	Bottom Face at 0mm -	0.639	0.088	0.716	0.010	1.109	0.138	0.727	1.355	1.443	0.865	0.649	1.748	1.758	0.787	1.896	#11
		side 1 at 0mm -	0.648	0.060	0.128	0.217	0.426	0.049	0.708	0.776	0.836	0.757	0.865	1.074	1.291	0.914	1.340	
		side 2 at 0mm -	0.054	0.013	0.013	0.010	0.013	0.013	0.067	0.067	0.080	0.080	0.064	0.067	0.077	0.077	0.090	
		side 3 at 0mm -	0.080	0.079	0.013	0.010	0.013	0.013	0.159	0.093	0.172	0.172	0.090	0.093	0.103	0.103	0.116	
		side 4 at 0mm -	0.013	0.333	0.054	0.526	0.242	0.050	0.346	0.067	0.400	0.396	0.539	0.255	0.781	0.589	0.831	



WWAN Band		Exposure Position	1	2	3	4	5	6											
			WWAN	WLAN 2.4GHz Ant Main	WLAN 2.4GHz Ant Aux	WLAN 5GHz Ant Main	WLAN 5GHz Ant Aux	Bluetooth Ant Aux	1+2 Σ 1g SAR (W/kg)	1+3 Σ 1g SAR (W/kg)	1+2+3 Σ 1g SAR (W/kg)	1+2+6 Σ 1g SAR (W/kg)	1+4 Σ 1g SAR (W/kg)	1+5 Σ 1g SAR (W/kg)	1+4+5 Σ 1g SAR (W/kg)	1+4+6 Σ 1g SAR (W/kg)	1+4+5+6 Σ 1g SAR (W/kg)	SPLSR No.	
			1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)											
WCDMA	WCDMA Band II	Bottom of laptop at 0mm -	0.013	0.013	0.464	0.010	0.737	0.080	0.026	0.477	0.490	0.106	0.023	0.750	0.760	0.103	0.840		
		Back of display screen at 25mm -	0.635	0.068	0.013	0.159	0.013	0.080	0.703	0.648	0.716	0.783	0.794	0.648	0.807	0.874	0.887		
	WCDMA Band IV	Bottom of laptop at 0mm -	0.052	0.013	0.464	0.010	0.737	0.080	0.065	0.516	0.529	0.145	0.062	0.789	0.799	0.142	0.879		
		Back of display screen at 25mm -	0.594	0.068	0.013	0.159	0.013	0.080	0.662	0.607	0.675	0.742	0.753	0.607	0.766	0.833	0.846		
	WCDMA Band V	Bottom of laptop at 0mm -	0.012	0.013	0.464	0.010	0.737	0.080	0.025	0.476	0.489	0.105	0.022	0.749	0.759	0.102	0.839		
		Back of display screen at 25mm -	0.192	0.068	0.013	0.159	0.013	0.080	0.260	0.205	0.273	0.340	0.351	0.205	0.364	0.431	0.444		
LTE	LTE Band 2	Bottom of laptop at 0mm -	0.013	0.013	0.464	0.010	0.737	0.080	0.026	0.477	0.490	0.106	0.023	0.750	0.760	0.103	0.840		
		Back of display screen at 25mm -	0.418	0.068	0.013	0.159	0.013	0.080	0.486	0.431	0.499	0.566	0.577	0.431	0.590	0.657	0.670		
	LTE Band 7	Bottom of laptop at 0mm -	0.013	0.013	0.464	0.010	0.737	0.080	0.026	0.477	0.490	0.106	0.023	0.750	0.760	0.103	0.840		
		Back of display screen at 25mm -	0.304	0.068	0.013	0.159	0.013	0.080	0.372	0.317	0.385	0.452	0.463	0.317	0.476	0.543	0.556		
	LTE Band 12/17	Bottom of laptop at 0mm -	0.014	0.013	0.464	0.010	0.737	0.080	0.027	0.478	0.491	0.107	0.024	0.751	0.761	0.104	0.841		
		Back of display screen at 25mm -	0.115	0.068	0.013	0.159	0.013	0.080	0.183	0.128	0.196	0.263	0.274	0.128	0.287	0.354	0.367		
	LTE Band 13	Bottom of laptop at 0mm -	0.013	0.013	0.464	0.010	0.737	0.080	0.026	0.477	0.490	0.106	0.023	0.750	0.760	0.103	0.840		
		Back of display screen at 25mm -	0.184	0.068	0.013	0.159	0.013	0.080	0.252	0.197	0.265	0.332	0.343	0.197	0.356	0.423	0.436		
	LTE Band 26/5	Bottom of laptop at 0mm -	0.014	0.013	0.464	0.010	0.737	0.080	0.027	0.478	0.491	0.107	0.024	0.751	0.761	0.104	0.841		
		Back of display screen at 25mm -	0.180	0.068	0.013	0.159	0.013	0.080	0.248	0.193	0.261	0.328	0.339	0.193	0.352	0.419	0.432		
	LTE Band 30	Bottom of laptop at 0mm -	0.013	0.013	0.464	0.010	0.737	0.080	0.026	0.477	0.490	0.106	0.023	0.750	0.760	0.103	0.840		
		Back of display screen at 25mm -	0.101	0.068	0.013	0.159	0.013	0.080	0.169	0.114	0.182	0.249	0.260	0.114	0.273	0.340	0.353		
	LTE Band 41/38	Bottom of laptop at 0mm -	0.038	0.013	0.464	0.010	0.737	0.080	0.051	0.502	0.515	0.131	0.048	0.775	0.785	0.128	0.865		
		Back of display screen at 25mm -	0.127	0.068	0.013	0.159	0.013	0.080	0.195	0.140	0.208	0.275	0.286	0.140	0.299	0.366	0.379		
	LTE Band 66/4	Bottom of laptop at 0mm -	0.013	0.013	0.464	0.010	0.737	0.080	0.026	0.477	0.490	0.106	0.023	0.750	0.760	0.103	0.840		
		Back of display screen at 25mm -	0.340	0.068	0.013	0.159	0.013	0.080	0.408	0.353	0.421	0.488	0.499	0.353	0.512	0.579	0.592		

11.8.3 SAR to peak location separation (SPLSR)

According to KDB 447498, when the sum of SAR is greater than the limit, SAR test exclusion is determined by the SAR to peak location separation ratio (SPLSR), and the simultaneously transmitting antennas must be considered one pair at a time. The ratio is determined by $(SAR1+SAR2)^{1.5} / (\text{separation distance between the peak SAR locations for the antenna pair, mm})$, round to two decimal digits, and must be ≤ 0.04 for all antenna pairs in the configuration to qualify for 1-g SAR test exclusion.

If the sum of SAR is under the SAR limit, SPLSR analysis is not required.

#1_WCDMA II + 2.4GHz Aux						
Antenna	Index	Frequency (GHz)	Reported SAR1g (W/Kg)	Σ Reported SAR1g (W/Kg)	Antenna pair(mm)	Peak location separation ratio
WCDMA II	239	1.88	1.148	1.87	195.51	0.01
2.4GHz Aux	22	2.462	0.716			
Maxima and position w.r.t. Grid Reference Point Zoom Scan (C:\Users\dasy\Desktop\SPLSR\#1\239_WCDMA Band II CH 9400_Bottom Face_0mm.da53:0/Flat) Max. 1 at (91.00, 82.70, -1.68) mm 1.15 W/kg (Power Scale Factor: 1.31825673856) Zoom Scan (C:\Users\dasy\Desktop\SPLSR\#1\22_ IEEE 802.11 b CH 11_1M_Bottom Face_0mm_Ant Aux.da53:0/Flat) Max. 2 at (89.00, -112.80, -1.20) mm 0.72 W/kg (Power Scale Factor: 1.288014) Distances and Separation Ratios Max. 1 - Max. 2 Distance [mm]: 195.51 / Separation ratio [W/kg/mm]: 0.01						

#2_WCDMA II + 5GHz Aux						
Antenna	Index	Frequency (GHz)	Reported SAR1g (W/Kg)	Σ Reported SAR1g (W/Kg)	Antenna pair(mm)	Peak location separation ratio
WCDMA II	239	1.88	1.148	2.26	193.96	0.02
5GHz Aux	62	5.57	1.109			

Maxima and position w.r.t. Grid Reference Point

associated 1g averages

Zoom Scan (C:\Users\dasy\Desktop\SPLSR\#2\239_WCDMA Band II CH 9400_Bottom Face_0mm.da53:0/Flat)

Max. 1 at (91.00, 82.70, -1.68) mm

1.15 W/kg (Power Scale Factor: 1.31825673856)

Zoom Scan (C:\Users\dasy\Desktop\SPLSR\#2\62_ IEEE 802.11ac 160 CH 114_VHT0_Bottom Face_0mm_Ant Aux.da53:0/Flat)

Max. 2 at (95.60, -111.20, -0.74) mm

1.11 W/kg (Power Scale Factor: 1.153508)

Distances and Separation Ratios

Max. 1 - Max. 2

Distance [mm]: 193.96 / Separation ratio [W/kg/mm]: 0.02

#3_WCDMA IV + 5GHz Aux						
Antenna	Index	Frequency (GHz)	Reported SAR1g (W/Kg)	Σ Reported SAR1g (W/Kg)	Antenna pair(mm)	Peak location separation ratio
WCDMA IV	249	1.7526	0.695	1.81	198.54	0.01
5GHz Aux	62	5.57	1.109			

Maxima and position w.r.t. Grid Reference Point

Zoom Scan (C:\Users\dasy\Desktop\SPLSR\#3\249_WCDMA Band IV CH 1513_Bottom Face_0mm.da53:0/Flat)

Max. 1 at (88.10, 87.20, -1.70) mm

0.70 W/kg (Power Scale Factor: 1.295)

Zoom Scan (C:\Users\dasy\Desktop\SPLSR\#3\62_IEEE 802.11ac 160 CH 114_VHT0_Bottom Face_0mm_Ant Aux.da53:0/Flat)

Max. 2 at (95.60, -111.20, -0.74) mm

1.11 W/kg (Power Scale Factor: 1.153508)

Distances and Separation Ratios

Max. 1 - Max. 2

Distance [mm]: 198.54 / Separation ratio [W/kg/mm]: 0.01

#5_LTE Band 2 + 5GHz Aux						
Antenna	Index	Frequency (GHz)	Reported SAR1g (W/Kg)	Σ Reported SAR1g (W/Kg)	Antenna pair(mm)	Peak location separation ratio
LTE Band 2	1006	1.18	0.764	1.87	198.54	0.01
5GHz Aux	62	5.57	1.109			

Maxima and position w.r.t. Grid Reference Point

| associated 1g averages

Zoom Scan (C:\Users\dasy\Desktop\SPLSR\#5\1006_LTE Band 2 CH 18900_QPSK_BW 20M_50RB Size 25RB_Bottom Face_0mm.da53:0/Flat)

Max. 1 at (88.10, 87.20, -1.70) mm

0.76 W/kg (Power Scale Factor: 1.3427649611)

Zoom Scan (C:\Users\dasy\Desktop\SPLSR\#5\62_IEEE 802.11ac 160 CH 114_VHT0_Bottom Face_0mm_Ant Aux.da53:0/Flat)

Max. 2 at (95.60, -111.20, -0.74) mm

1.11 W/kg (Power Scale Factor: 1.153508)

Distances and Separation Ratios

Max. 1 - Max. 2

Distance [mm]: 198.54 / Separation ratio [W/kg/mm]: 0.01

#6_LTE Band 7 + 5GHz Aux						
Antenna	Index	Frequency (GHz)	Reported SAR1g (W/Kg)	Σ Reported SAR1g (W/Kg)	Antenna pair(mm)	Peak location separation ratio
LTE Band 7	1002	2.51	0.772	1.88	177.76	0.01
5GHz Aux	62	5.57	1.109			

Maxima and position w.r.t. Grid Reference Point

Zoom Scan (C:\Users\dasy\Desktop\SPLSR\#6\1002_LTE Band 7 CH 20850_QPSK_BW 20M_1RB Size 99RB_Bottom Face_0mm.da53:0/Flat)

Max. 1 at (100.10, 66.50, -1.84) mm

0.77 W/kg (Power Scale Factor: 1.2823305826)

Zoom Scan (C:\Users\dasy\Desktop\SPLSR\#6\62_IEEE 802.11ac 160 CH 114_VHT0_Bottom Face_0mm_Ant Aux.da53:0/Flat)

Max. 2 at (95.60, -111.20, -0.74) mm

1.11 W/kg (Power Scale Factor: 1.153508)

Distances and Separation Ratios

Max. 1 - Max. 2

Distance [mm]: 177.76 / Separation ratio [W/kg/mm]: 0.01

#9_LTE Band 30 + 5GHz Aux						
Antenna	Index	Frequency (GHz)	Reported SAR1g (W/Kg)	Σ Reported SAR1g (W/Kg)	Antenna pair(mm)	Peak location separation ratio
LTE Band 30	1001	2.31	0.718	1.83	201.77	0.01
5GHz Aux	62	5.57	1.109			

Maxima and position w.r.t. Grid Reference Point | associated 1g averages

Zoom Scan (C:\Users\dasy\Desktop\SPLSR\#9\1001_LTE Band 30 CH 27710_QPSK_BW 10M_1RB Size 49RB_Bottom Face_0mm.da53:0/Flat)

Max. 1 at (83.40, 90.20, -1.90) mm0.72 W/kg (Power Scale Factor: 1.2618275345)

Zoom Scan (C:\Users\dasy\Desktop\SPLSR\#9\62_IEEE 802.11ac 160 CH 114_VHT0_Bottom Face_0mm_Ant Aux.da53:0/Flat)

Max. 2 at (95.60, -111.20, -0.74) mm1.11 W/kg (Power Scale Factor: 1.153508)

Distances and Separation Ratios

Max. 1 - Max. 2Distance [mm]: 201.77 / Separation ratio [W/kg/mm]: 0.01

#11_LTE Band 66 + 5GHz Aux						
Antenna	Index	Frequency (GHz)	Reported SAR1g (W/Kg)	Σ Reported SAR1g (W/Kg)	Antenna pair(mm)	Peak location separation ratio
LTE Band 66	1003	1.72	0.639	1.75	195.54	0.01
5GHz Aux	62	5.57	1.109			

Maxima and position w.r.t. Grid Reference Point

| associated 1g averages

Zoom Scan (C:\Users\dasy\Desktop\SPLSR\#11\1003_LTE Band 66 CH 132072_QPSK_BW 20M_1RB Size 99RB_Bottom Face_0mm.da53:0/Flat)

Max. 1 at (88.10, 84.20, -1.11) mm

0.64 W/kg (Power Scale Factor: 1.2560299636)

Zoom Scan (C:\Users\dasy\Desktop\SPLSR\#11\62_IEEE 802.11ac 160 CH 114_VHT0_Bottom Face_0mm_Ant Aux.da53:0/Flat)

Max. 2 at (95.60, -111.20, -0.74) mm

1.11 W/kg (Power Scale Factor: 1.153508)

Distances and Separation Ratios

Max. 1 - Max. 2

Distance [mm]: 195.54 / Separation ratio [W/kg/mm]: 0.01

11.9 Measurement Variability

Band	Frequency		Bandwidth	Modulation or Sub-Test	RB Size	RB Offset	Test Position	Spacing (mm)	Note	Original SAR _{1g}	First SAR _{1g}	First Ratio SAR _{1g}
	Ch.	MHz								(W/kg)	(W/kg)	
WCDMA Band II	9400	1880	---	RMC12.2K	---	---	Side 1	17	original #500_once	0.901	0.884	1.89%
WCDMA Band V	4182	836.4	---	RMC12.2K	---	---	Side 1	0	original #288_once	0.915	0.897	1.97%
LTE Band 7	20850	2510	20M	QPSK	50	0	Side 1	0	original #123_once	1.18	1.15	2.54%
LTE Band 13	23230	782	10M	QPSK	1	49	Side 1	0	original #977_once	0.822	0.812	1.22%

According to KDB 865664 D01v01r04, SAR measurement variability must be 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.

The following procedures are applied to determine if repeated measurements are required:

1. The original highest measured Reported SAR 1-g is <0.80 W/kg, repeated that measurement once.
2. Perform a second repeated measurement the ratio of the largest to the smallest SAR for the original and first repeated measurements is <1.2 W/kg, or when the original or repeated measurement is ≥ 1.45 W/kg (~10% from the 1-g SAR limit).



11.10 Spot Check

Band	Mode	Frequency		Data Rate	Test Position	Spacing	SAR _{1g}	Burst Avg Power (dBm)	Max tune-up (dBm)	Duty Cycle (%)	Reported SAR _{1g}	Antenna	Note	Deviation
		Ch.	MHz			(mm)	(W/Kg)							
WLAN2.4GHz	802.11b	11	2462	1 Mbps	Side 4	0	0.257	15.92	17	99.11	0.333	Ant Main	AWAN	
WLAN2.4GHz	802.11b	11	2462	1 Mbps	Side 4	0	0.237	15.92	17	99.11	0.307	Ant Main	AWAN	-7.81%
WLAN2.4GHz	802.11b	11	2462	1 Mbps	Bottom Face	0	0.556	15.95	17	98.96	0.716	Ant Aux	AWAN	
WLAN2.4GHz	802.11b	11	2462	1 Mbps	Bottom Face	0	0.532	15.95	17	98.96	0.685	Ant Aux	AWAN	-4.33%
Bluetooth		78	2480	1 Mbps	Bottom Face	0	0.104	8.37	8.5	77.60	0.138	Ant Aux	AWAN	
Bluetooth		78	2480	1 Mbps	Bottom Face	0	0.102	8.37	8.5	77.60	0.135	Ant Aux	AWAN	-2.17%
WLAN5GHz	802.11ac 80 MHz	58	5290	VHT0	Side 4	0	0.414	13.98	14	98.52	0.422	Ant Main	AWAN	
WLAN5GHz	802.11ac 80 MHz	58	5290	VHT0	Side 4	0	0.399	13.98	14	98.52	0.407	Ant Main	AWAN	-3.55%
WLAN5GHz	802.11ac 80 MHz	58	5290	VHT0	Bottom Face	0	0.698	10.96	12	98.43	0.901	Ant Aux	AWAN	
WLAN5GHz	802.11ac 80 MHz	58	5290	VHT0	Bottom Face	0	0.678	10.96	12	98.43	0.875	Ant Aux	AWAN	-2.89%
WLAN5GHz	802.11ac 80 MHz	106	5530	VHT0	Side 4	0	0.436	13.96	14	98.52	0.447	Ant Main	AWAN	
WLAN5GHz	802.11ac 80 MHz	106	5530	VHT0	Side 4	0	0.422	13.96	14	98.52	0.432	Ant Main	AWAN	-3.36%
WLAN5GHz	802.11ac 160 MHz	114	5570	VHT0	Bottom Face	0	0.961	11.46	12	98.15	1.109	Ant Aux	South Star	
WLAN5GHz	802.11ac 160 MHz	114	5570	VHT0	Bottom Face	0	0.936	11.46	12	98.15	1.080	Ant Aux	South Star	-2.61%
WLAN5GHz	802.11n 40 MHz	151	5755	HT0	Side 4	0	0.514	13.98	14	98.12	0.526	Ant Main	AWAN	
WLAN5GHz	802.11n 40 MHz	151	5755	HT0	Side 4	0	0.501	13.98	14	98.12	0.513	Ant Main	AWAN	-2.47%
WLAN5GHz	802.11n 40 MHz	151	5755	HT0	Bottom Face	0	0.845	11.47	12	98.03	0.974	Ant Aux	AWAN	
WLAN5GHz	802.11n 40 MHz	151	5755	HT0	Bottom Face	0	0.841	11.47	12	98.03	0.969	Ant Aux	AWAN	-0.51%



11.11 Requirements on the Uncertainty Evaluation

Decision Rule

- ☒ Uncertainty is not included.
☐ Uncertainty is included.

The highest measured 1-g SAR is less than 1.5 W/kg and the highest measured 10-g SAR is less than 3.75 W/kg. Therefore, per KDB Publication 865664 D01v01r04, the extended measurement uncertainty analysis described in IEEE 1528-2013 and IEC/IEEE 62209-1528 is not required.

12. Conclusion

The SAR test values found for the device are below the maximum limit of 1.6 W/kg.

Appendix A - System Performance Check

Test Laboratory: A Test Lab Techno Corp.

Date: 2021/6/29

System Performance Check at 750MHz_Head

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1004

Communication System: UID 0, CW (0); Frequency: 750 MHz;Duty Cycle: 1:1

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.895 \text{ S/m}$; $\epsilon_r = 42.586$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

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

DASY5.2 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV4 - SN3977; ConvF(10.32, 10.32, 10.32) @ 750 MHz; Calibrated: 2020/7/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1253; Calibrated: 2020/12/16
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 AA; Serial: 1175
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

System Performance Check at 750MHz/Area Scan (61x121x1): Interpolated grid: $dx=1.500 \text{ mm}$, $dy=1.500 \text{ mm}$

Maximum value of SAR (interpolated) = 3.06 W/kg

System Performance Check at 750MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 60.43 V/m; Power Drift = -0.04 dB

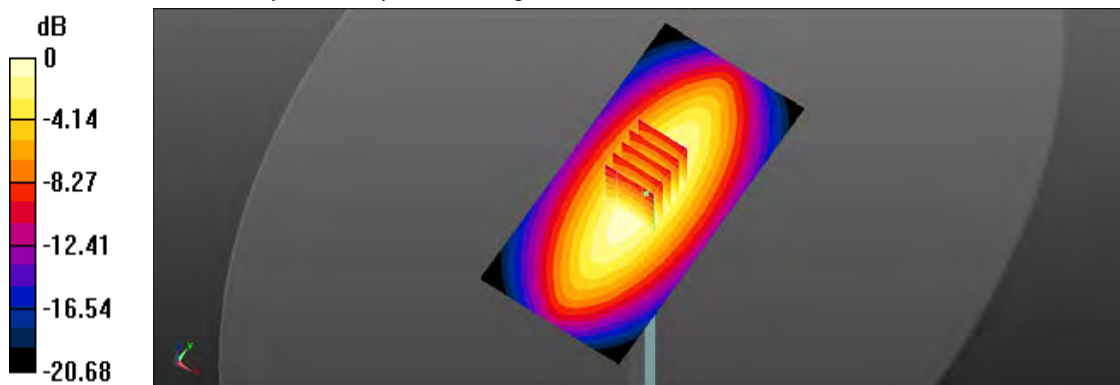
Peak SAR (extrapolated) = 3.55 W/kg

SAR(1 g) = 2.24 W/kg; SAR(10 g) = 1.47 W/kg

Smallest distance from peaks to all points 3 dB below = 19.5 mm

Ratio of SAR at M2 to SAR at M1 = 63.4%

Maximum value of SAR (measured) = 3.07 W/kg



0 dB = 3.07 W/kg = 4.87 dBW/kg

Test Laboratory: A Test Lab Techno Corp.

Date: 2021/6/30

System Performance Check at 835MHz_Head

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d082

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

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.904 \text{ S/m}$; $\epsilon_r = 42.419$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

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

DASY5.2 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV4 - SN3977; ConvF(9.85, 9.85, 9.85) @ 835 MHz; Calibrated: 2020/7/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1253; Calibrated: 2020/12/16
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 AA; Serial: 1175
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

System Performance Check at 835MHz/Area Scan (61x121x1): Interpolated grid: $dx=1.500 \text{ mm}$, $dy=1.500 \text{ mm}$

Maximum value of SAR (interpolated) = 3.37 W/kg

System Performance Check at 835MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 62.77 V/m; Power Drift = -0.17 dB

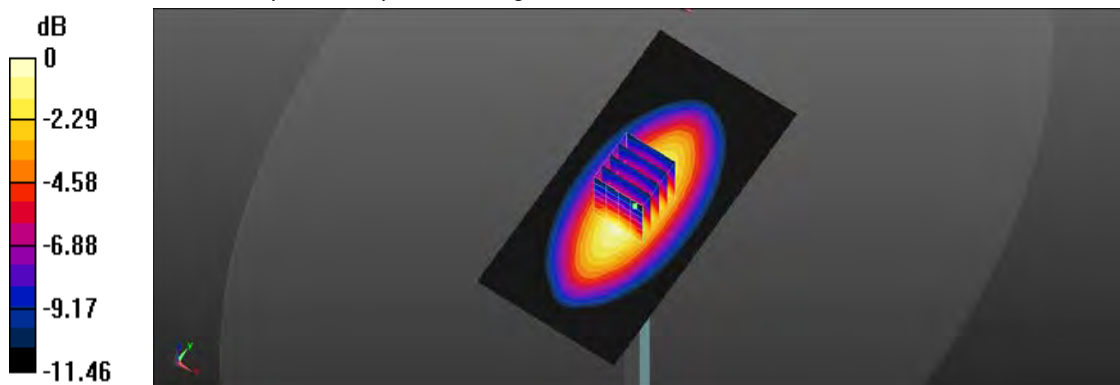
Peak SAR (extrapolated) = 3.90 W/kg

SAR(1 g) = 2.52 W/kg; SAR(10 g) = 1.66 W/kg

Smallest distance from peaks to all points 3 dB below = 16 mm

Ratio of SAR at M2 to SAR at M1 = 65%

Maximum value of SAR (measured) = 3.40 W/kg



0 dB = 3.40 W/kg = 5.31 dBW/kg

Test Laboratory: A Test Lab Techno Corp.

Date: 2021/7/2

System Performance Check at 1750MHz_Head

DUT: Dipole D1750V2; Type: D1750V2; Serial: D1750V2 - SN1111

Communication System: UID 0, CW (0); Frequency: 1750 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.379$ S/m; $\epsilon_r = 40.693$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5.2 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV4 - SN3977; ConvF(8.54, 8.54, 8.54) @ 1750 MHz; Calibrated: 2020/7/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1253; Calibrated: 2020/12/16
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 AA; Serial: 1175
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

System Performance Check at 1750MHz/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

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

System Performance Check at 1750MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 97.66 V/m; Power Drift = 0.12 dB

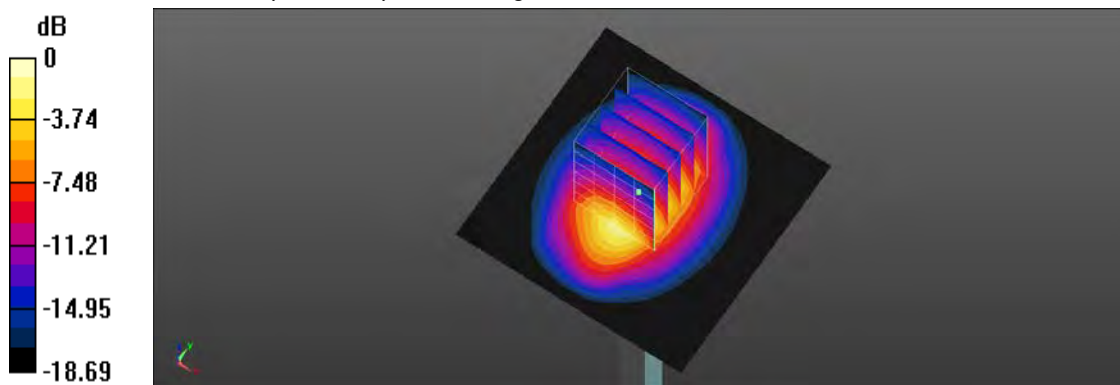
Peak SAR (extrapolated) = 15.5 W/kg

SAR(1 g) = 8.29 W/kg; SAR(10 g) = 4.3 W/kg

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

Ratio of SAR at M2 to SAR at M1 = 53.7%

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



0 dB = 12.9 W/kg = 11.11 dBW/kg

Test Laboratory: A Test Lab Techno Corp.

Date: 2021/7/1

System Performance Check at 1900MHz_Head

DUT: Dipole 1900 MHz D1900V2; Type: D1900V2; Serial: D1900V2 - SN:5d111

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

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.438$ S/m; $\epsilon_r = 41.226$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5.2 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV4 - SN3977; ConvF(8.21, 8.21, 8.21) @ 1900 MHz; Calibrated: 2020/7/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1253; Calibrated: 2020/12/16
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 AA; Serial: 1175
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

System Performance Check at 1900MHz/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 16.4 W/kg

System Performance Check at 1900MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 110.7 V/m; Power Drift = 0.01 dB

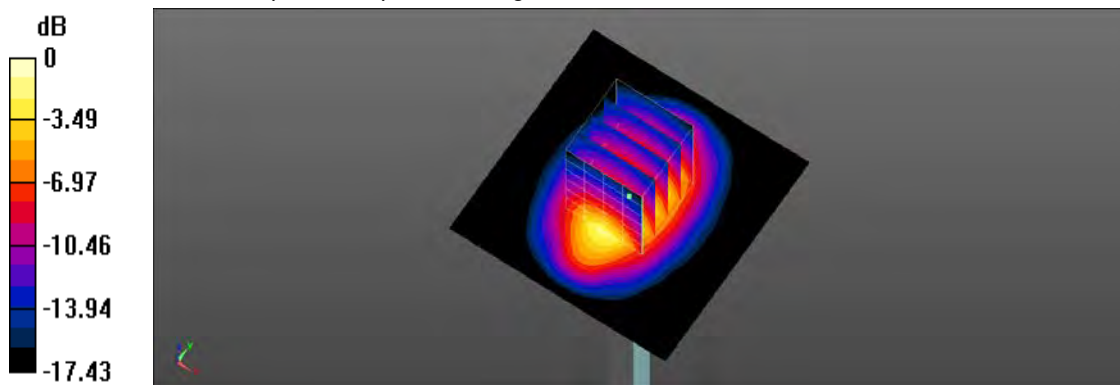
Peak SAR (extrapolated) = 19.5 W/kg

SAR(1 g) = 10.7 W/kg; SAR(10 g) = 5.6 W/kg

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

Ratio of SAR at M2 to SAR at M1 = 54.7%

Maximum value of SAR (measured) = 16.5 W/kg



0 dB = 16.5 W/kg = 12.17 dBW/kg

Test Laboratory: A Test Lab Techno Corp.

Date: 2021/7/4

System Performance Check at 2300MHz_Head

DUT: Dipole 2300 MHz; Type: D2300V2; Serial: D2300V2 - SN:1005

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

Medium parameters used: $f = 2300$ MHz; $\sigma = 1.627$ S/m; $\epsilon_r = 40.062$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5.2 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV4 - SN3977; ConvF(7.88, 7.88, 7.88) @ 2300 MHz; Calibrated: 2020/7/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1253; Calibrated: 2020/12/16
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 AA; Serial: 1175
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

System Performance Check at 2300MHz/Area Scan (81x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 19.4 W/kg

System Performance Check at 2300MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 106.4 V/m; Power Drift = 0.08 dB

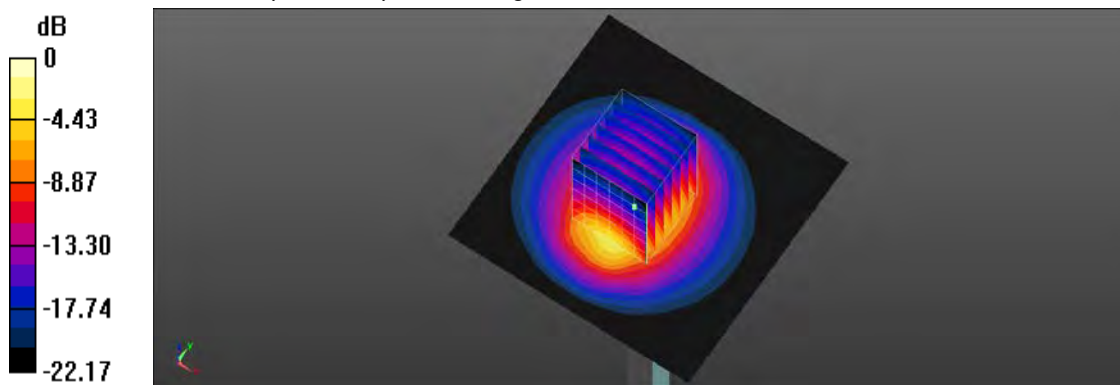
Peak SAR (extrapolated) = 23.9 W/kg

SAR(1 g) = 11.6 W/kg; SAR(10 g) = 5.42 W/kg

Smallest distance from peaks to all points 3 dB below = 9 mm

Ratio of SAR at M2 to SAR at M1 = 48.6%

Maximum value of SAR (measured) = 19.3 W/kg



0 dB = 19.3 W/kg = 12.86 dBW/kg

Test Laboratory: A Test Lab Techno Corp.

Date: 2021/7/3

System Performance Check at 2600MHz_Head

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1007

Communication System: UID 0, CW (0); Frequency: 2600 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2600$ MHz; $\sigma = 1.99$ S/m; $\epsilon_r = 39.104$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5.2 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV4 - SN3977; ConvF(7.42, 7.42, 7.42) @ 2600 MHz; Calibrated: 2020/7/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1253; Calibrated: 2020/12/16
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 AA; Serial: 1175
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

System Performance Check at 2600MHz/Area Scan (81x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 26.1 W/kg

System Performance Check at 2600MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 118.6 V/m; Power Drift = -0.15 dB

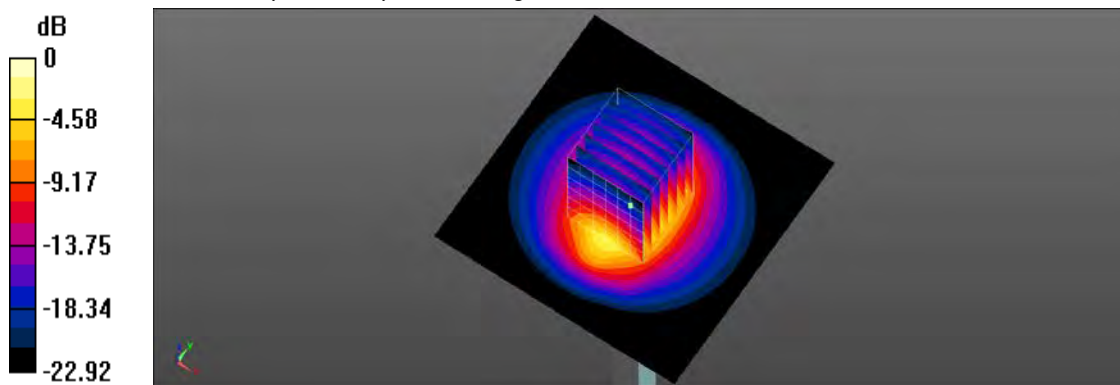
Peak SAR (extrapolated) = 32.2 W/kg

SAR(1 g) = 15.3 W/kg; SAR(10 g) = 7 W/kg

Smallest distance from peaks to all points 3 dB below = 9 mm

Ratio of SAR at M2 to SAR at M1 = 47.4%

Maximum value of SAR (measured) = 26.0 W/kg



0 dB = 26.0 W/kg = 14.15 dBW/kg

Appendix B - Measurement Data

Test Laboratory: A Test Lab Techno Corp.

Date: 2021/7/1

500_WCDMA Band II CH 9400_Side 1_17mm

DUT: CR1100FK, CR1100CK; Type: Notebook PC

Communication System: UID 0, WCDMA Band II (0); Frequency: 1880 MHz;Duty Cycle: 1:1

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.42$ S/m; $\epsilon_r = 41.275$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5.2 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV4 - SN3977; ConvF(8.21, 8.21, 8.21) @ 1880 MHz; Calibrated: 2020/7/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1253; Calibrated: 2020/12/16
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 AA; Serial: 1175
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

Area Scan (51x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 1.30 W/kg

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

Reference Value = 30.78 V/m; Power Drift = -0.05 dB

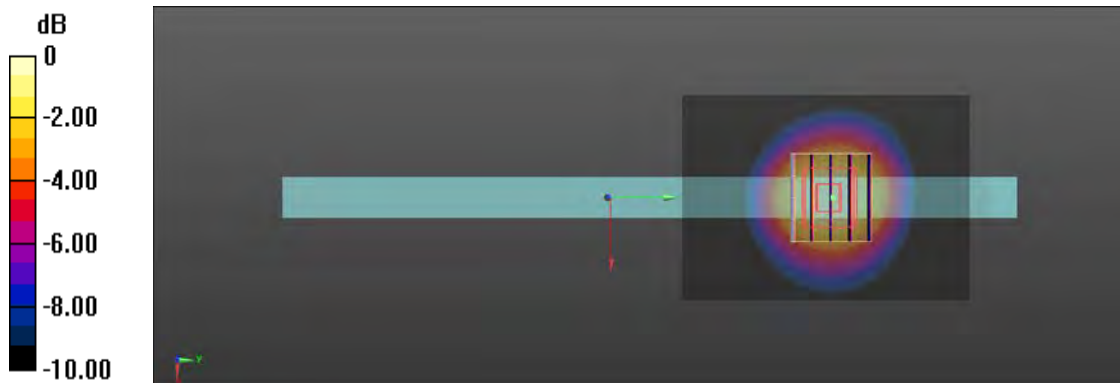
Peak SAR (extrapolated) = 1.47 W/kg

SAR(1 g) = 0.901 W/kg; SAR(10 g) = 0.542 W/kg

Smallest distance from peaks to all points 3 dB below = 16.3 mm

Ratio of SAR at M2 to SAR at M1 = 62.1%

Maximum value of SAR (measured) = 1.26 W/kg



0 dB = 1.26 W/kg = 1.00 dBW/kg

Test Laboratory: A Test Lab Techno Corp.

Date: 2021/7/2

249_WCDMA Band IV CH 1513_Bottom Face_0mm

DUT: CR1100FK, CR1100CK; Type: Notebook PC

Communication System: UID 0, WCDMA Band IV (0); Frequency: 1752.6 MHz;Duty Cycle: 1:1

Medium parameters used: $f = 1753$ MHz; $\sigma = 1.381$ S/m; $\epsilon_r = 40.685$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5.2 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV4 - SN3977; ConvF(8.54, 8.54, 8.54) @ 1752.6 MHz; Calibrated: 2020/7/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1253; Calibrated: 2020/12/16
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 AA; Serial: 1175
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

Area Scan (41x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.758 W/kg

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

Reference Value = 22.93 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 0.921 W/kg

SAR(1 g) = 0.538 W/kg; SAR(10 g) = 0.296 W/kg

Smallest distance from peaks to all points 3 dB below = 9.1 mm

Ratio of SAR at M2 to SAR at M1 = 61.6%

Maximum value of SAR (measured) = 0.769 W/kg



0 dB = 0.769 W/kg = -1.14 dBW/kg

Test Laboratory: A Test Lab Techno Corp.

Date: 2021/6/30

288_WCDMA Band V CH 4182_Side 1_0mm

DUT: CR1100FK, CR1100CK; Type: Notebook PC

Communication System: UID 0, WCDMA Band V (0); Frequency: 836.4 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 837$ MHz; $\sigma = 0.906$ S/m; $\epsilon_r = 42.39$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5.2 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV4 - SN3977; ConvF(9.85, 9.85, 9.85) @ 836.4 MHz; Calibrated: 2020/7/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1253; Calibrated: 2020/12/16
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 AA; Serial: 1175
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

Area Scan (51x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 1.65 W/kg

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

Reference Value = 41.84 V/m; Power Drift = 0.12 dB

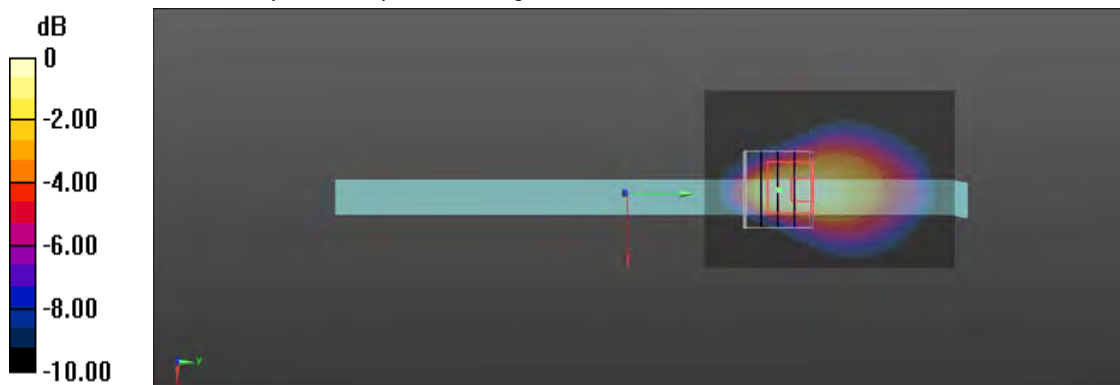
Peak SAR (extrapolated) = 1.86 W/kg

SAR(1 g) = 0.915 W/kg; SAR(10 g) = 0.485 W/kg

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

Ratio of SAR at M2 to SAR at M1 = 47.5%

Maximum value of SAR (measured) = 1.50 W/kg



0 dB = 1.50 W/kg = 1.76 dBW/kg

Test Laboratory: A Test Lab Techno Corp.

Date: 2021/7/1

18_LTE Band 2 CH 18900_QPSK_BW 20M_1RB Size 0RB_Side 1_17mm

DUT: CR1100FK, CR1100CK; Type: Notebook PC

Communication System: UID 0, Generic LTE (0); Frequency: 1880 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.42$ S/m; $\epsilon_r = 41.275$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5.2 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV4 - SN3977; ConvF(8.21, 8.21, 8.21) @ 1880 MHz; Calibrated: 2020/7/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1253; Calibrated: 2020/12/16
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 AA; Serial: 1175
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

Area Scan (41x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 1.16 W/kg

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

Reference Value = 4.208 V/m; Power Drift = -0.12 dB

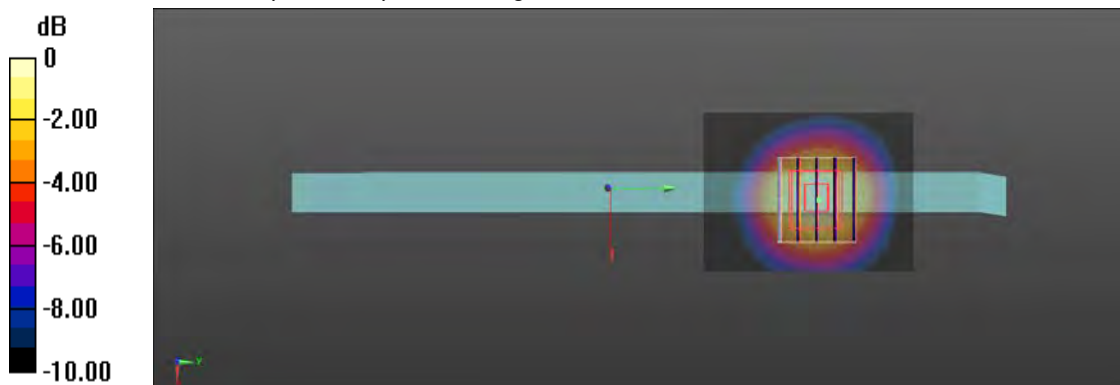
Peak SAR (extrapolated) = 1.33 W/kg

SAR(1 g) = 0.810 W/kg; SAR(10 g) = 0.484 W/kg

Smallest distance from peaks to all points 3 dB below = 16 mm

Ratio of SAR at M2 to SAR at M1 = 61.6%

Maximum value of SAR (measured) = 1.14 W/kg



0 dB = 1.14 W/kg = 0.57 dBW/kg

Test Laboratory: A Test Lab Techno Corp.

Date: 2021/7/2

25_LTE Band 4 CH 20175_QPSK_BW 20M_1RB Size 0RB_Side 1_0mm

DUT: CR1100FK, CR1100CK; Type: Notebook PC

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

Medium parameters used (interpolated): $f = 1732.5$ MHz; $\sigma = 1.364$ S/m; $\epsilon_r = 40.748$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5.2 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV4 - SN3977; ConvF(8.54, 8.54, 8.54) @ 1732.5 MHz; Calibrated: 2020/7/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1253; Calibrated: 2020/12/16
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 AA; Serial: 1175
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

Area Scan (41x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.977 W/kg

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

Reference Value = 26.85 V/m; Power Drift = -0.12 dB

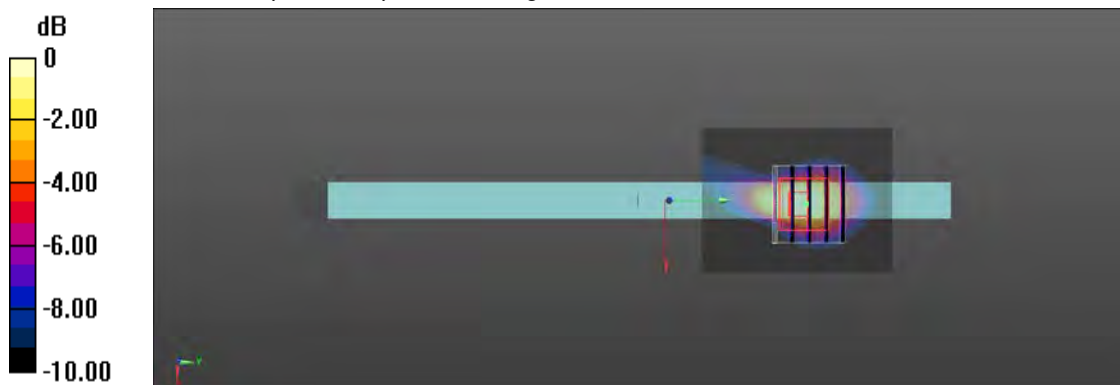
Peak SAR (extrapolated) = 1.15 W/kg

SAR(1 g) = 0.578 W/kg; SAR(10 g) = 0.294 W/kg

Smallest distance from peaks to all points 3 dB below = 8 mm

Ratio of SAR at M2 to SAR at M1 = 50.8%

Maximum value of SAR (measured) = 0.936 W/kg



0 dB = 0.936 W/kg = -0.29 dBW/kg

Test Laboratory: A Test Lab Techno Corp.

Date: 2021/6/30

433 LTE Band 5 CH 20525_QPSK_BW 10M_1RB Size 49RB_Side 1

DUT: CR1100FK, CR1100CK; Type: Notebook PC

Communication System: UID 0, Generic LTE (0); Frequency: 836.5 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 836.5$ MHz; $\sigma = 0.905$ S/m; $\epsilon_r = 42.397$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5.2 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV4 - SN3977; ConvF(9.85, 9.85, 9.85) @ 836.5 MHz; Calibrated: 2020/7/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1253; Calibrated: 2020/12/16
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 AA; Serial: 1175
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

Area Scan (51x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 1.37 W/kg

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

Reference Value = 36.39 V/m; Power Drift = -0.12 dB

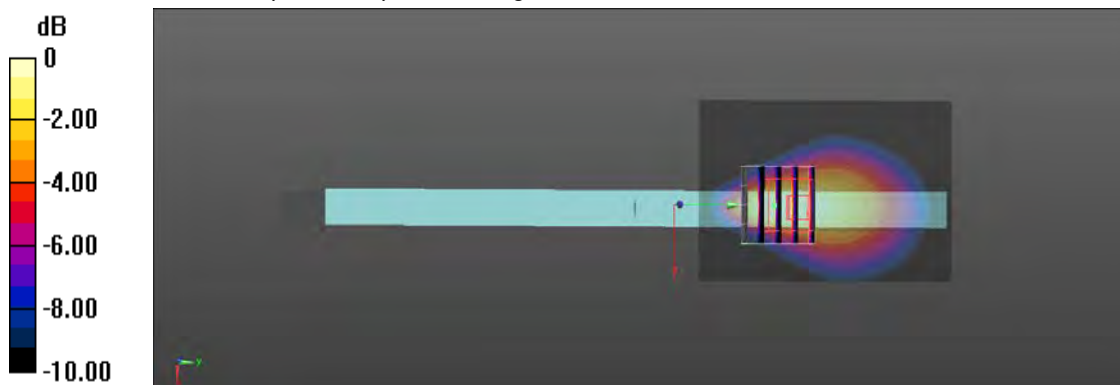
Peak SAR (extrapolated) = 1.48 W/kg

SAR(1 g) = 0.724 W/kg; SAR(10 g) = 0.378 W/kg

Smallest distance from peaks to all points 3 dB below = 9.7 mm

Ratio of SAR at M2 to SAR at M1 = 47.3%

Maximum value of SAR (measured) = 1.17 W/kg



0 dB = 1.17 W/kg = 0.68 dBW/kg

Test Laboratory: A Test Lab Techno Corp.

Date: 2021/7/3

123 LTE Band 7 CH 20850_QPSK_BW 20M_50RB Size 0RB_Side 1_0mm

DUT: CR1100FK, CR1100CK; Type: Notebook PC

Communication System: UID 0, Generic LTE (0); Frequency: 2510 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2510$ MHz; $\sigma = 1.873$ S/m; $\epsilon_r = 39.372$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5.2 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV4 - SN3977; ConvF(7.67, 7.67, 7.67) @ 2510 MHz; Calibrated: 2020/7/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1253; Calibrated: 2020/12/16
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 AA; Serial: 1175
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

Area Scan (41x61x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 2.25 W/kg

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

Reference Value = 35.73 V/m; Power Drift = -0.04 dB

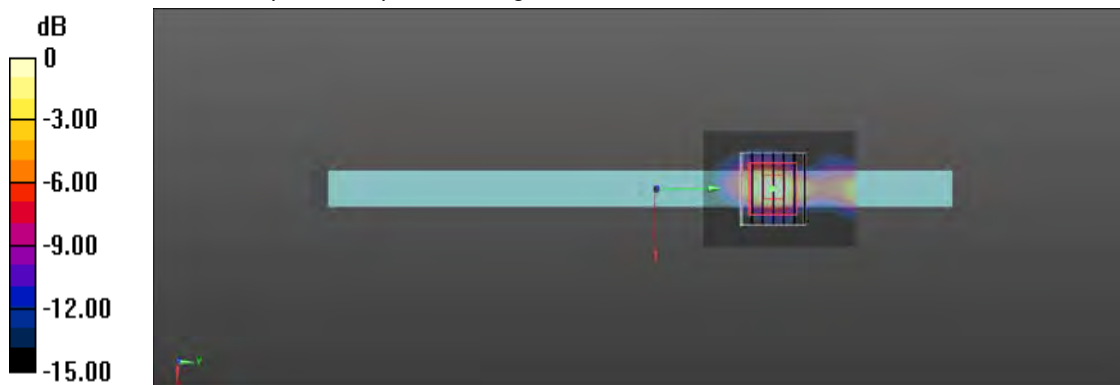
Peak SAR (extrapolated) = 2.74 W/kg

SAR(1 g) = 1.16 W/kg; SAR(10 g) = 0.444 W/kg

Smallest distance from peaks to all points 3 dB below = 6 mm

Ratio of SAR at M2 to SAR at M1 = 46.4%

Maximum value of SAR (measured) = 2.15 W/kg



0 dB = 2.15 W/kg = 3.32 dBW/kg

Test Laboratory: A Test Lab Techno Corp.

Date: 2021/6/29

79_LTE Band 12 CH 23095_QPSK_BW 10M_1RB Size 0RB_Side 1

DUT: CR1100FK, CR1100CK; Type: Notebook PC

Communication System: UID 0, Generic LTE (0); Frequency: 707.5 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 707.5$ MHz; $\sigma = 0.858$ S/m; $\epsilon_r = 43.163$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5.2 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV4 - SN3977; ConvF(10.32, 10.32, 10.32) @ 707.5 MHz; Calibrated: 2020/7/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1253; Calibrated: 2020/12/16
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 AA; Serial: 1175
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

Area Scan (51x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 1.05 W/kg

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

Reference Value = 35.02 V/m; Power Drift = -0.19 dB

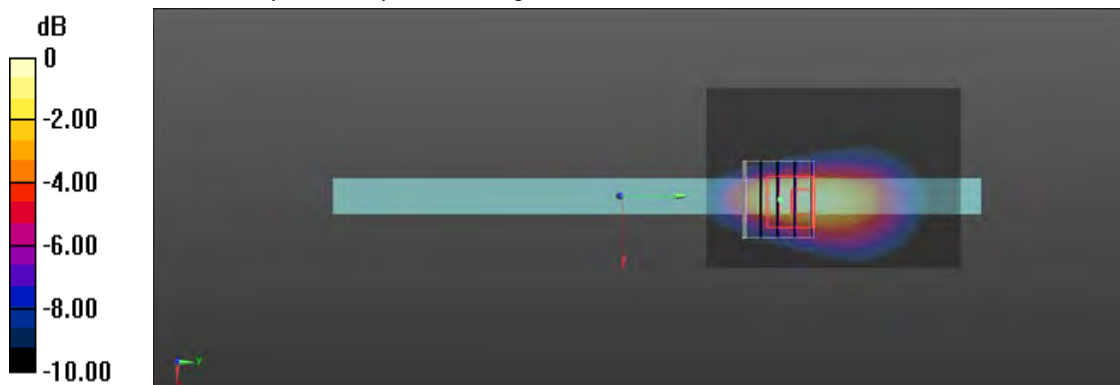
Peak SAR (extrapolated) = 1.46 W/kg

SAR(1 g) = 0.612 W/kg; SAR(10 g) = 0.320 W/kg

Smallest distance from peaks to all points 3 dB below = 6.4 mm

Ratio of SAR at M2 to SAR at M1 = 38.3%

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



0 dB = 1.09 W/kg = 0.37 dBW/kg

Test Laboratory: A Test Lab Techno Corp.

Date: 2021/6/29

977_LTE Band 13 CH 23230_QPSK_BW 10M_1RB Size 49RB_Side 1

DUT: CR1100FK, CR1100CK; Type: Notebook PC

Communication System: UID 0, Generic LTE (0); Frequency: 782 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 782 \text{ MHz}$; $\sigma = 0.922 \text{ S/m}$; $\epsilon_r = 42.164$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

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

DASY5.2 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV4 - SN3977; ConvF(10.32, 10.32, 10.32) @ 782 MHz; Calibrated: 2020/7/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1253; Calibrated: 2020/12/16
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 AA; Serial: 1175
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

Area Scan (51x81x1): Interpolated grid: $dx=1.500 \text{ mm}$, $dy=1.500 \text{ mm}$

Maximum value of SAR (interpolated) = 1.53 W/kg

Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 39.66 V/m; Power Drift = -0.12 dB

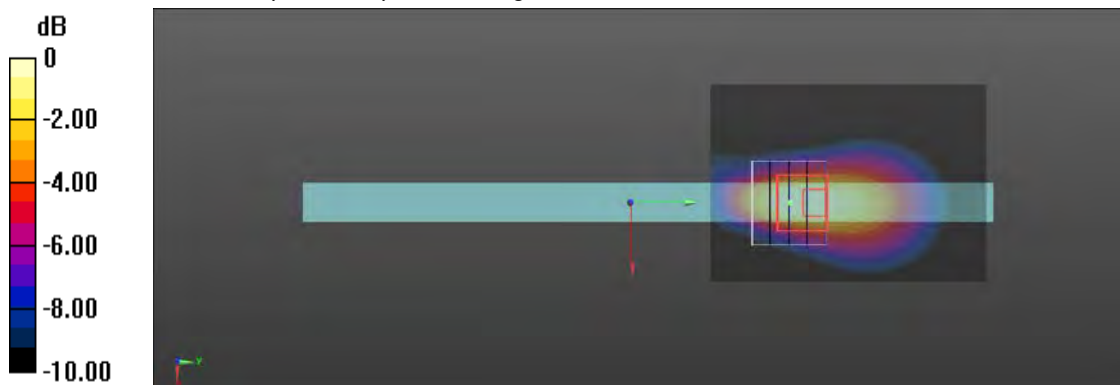
Peak SAR (extrapolated) = 1.78 W/kg

SAR(1 g) = 0.822 W/kg; SAR(10 g) = 0.433 W/kg

Smallest distance from peaks to all points 3 dB below = 9.3 mm

Ratio of SAR at M2 to SAR at M1 = 45.6%

Maximum value of SAR (measured) = 1.41 W/kg



0 dB = 1.41 W/kg = 1.49 dBW/kg

Test Laboratory: A Test Lab Techno Corp.

Date: 2021/6/29

115 LTE Band 17 CH 23790_QPSK_BW 10M_1RB Size 49RB_Side 1

DUT: CR1100FK, CR1100CK; Type: Notebook PC

Communication System: UID 0, Generic LTE (0); Frequency: 710 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 710$ MHz; $\sigma = 0.886$ S/m; $\epsilon_r = 43.983$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5.2 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV4 - SN3977; ConvF(10.32, 10.32, 10.32) @ 710 MHz; Calibrated: 2020/7/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1253; Calibrated: 2020/12/16
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 AA; Serial: 1175
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

Area Scan (51x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 1.10 W/kg

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

Reference Value = 34.44 V/m; Power Drift = -0.13 dB

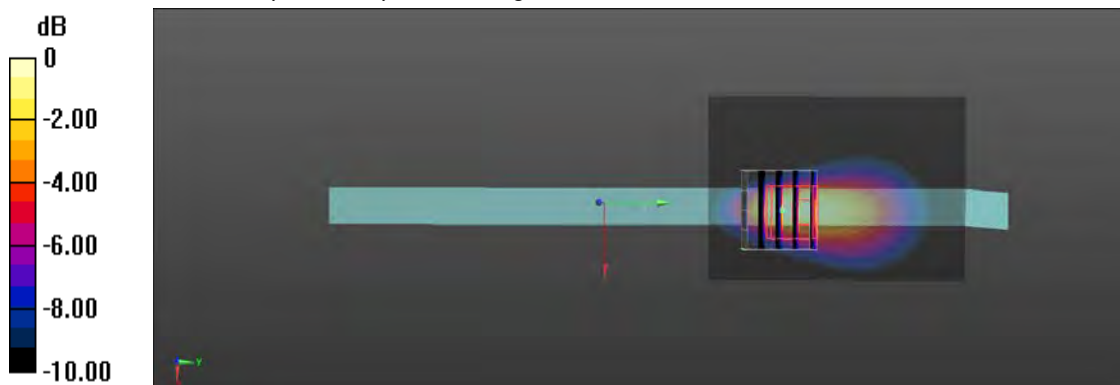
Peak SAR (extrapolated) = 1.50 W/kg

SAR(1 g) = 0.615 W/kg; SAR(10 g) = 0.314 W/kg

Smallest distance from peaks to all points 3 dB below = 8 mm

Ratio of SAR at M2 to SAR at M1 = 43.6%

Maximum value of SAR (measured) = 1.14 W/kg



0 dB = 1.14 W/kg = 0.57 dBW/kg

Test Laboratory: A Test Lab Techno Corp.

Date: 2021/6/30

401 LTE Band 26 CH 26865_QPSK_BW 15M_1RB Size 74RB_Side 1

DUT: CR1100FK, CR1100CK; Type: Notebook PC

Communication System: UID 0, Generic LTE (0); Frequency: 831.5 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 831.5$ MHz; $\sigma = 0.901$ S/m; $\epsilon_r = 42.469$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5.2 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV4 - SN3977; ConvF(9.85, 9.85, 9.85) @ 831.5 MHz; Calibrated: 2020/7/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1253; Calibrated: 2020/12/16
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 AA; Serial: 1175
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

Area Scan (51x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 1.36 W/kg

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

Reference Value = 35.88 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 1.45 W/kg

SAR(1 g) = 0.721 W/kg; SAR(10 g) = 0.380 W/kg

Smallest distance from peaks to all points 3 dB below = 9.7 mm

Ratio of SAR at M2 to SAR at M1 = 48%

Maximum value of SAR (measured) = 1.16 W/kg



0 dB = 1.16 W/kg = 0.64 dBW/kg

Test Laboratory: A Test Lab Techno Corp.

Date: 2021/7/4

1001_LTE Band 30 CH 27710_QPSK_BW 10M_1RB Size 49RB_Bottom Face_0mm

DUT: CR1100FK, CR1100CK; Type: Notebook PC

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

Medium parameters used: $f = 2310$ MHz; $\sigma = 1.637$ S/m; $\epsilon_r = 40.007$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5.2 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV4 - SN3977; ConvF(7.88, 7.88, 7.88) @ 2310 MHz; Calibrated: 2020/7/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1253; Calibrated: 2020/12/16
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 AA; Serial: 1175
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

Area Scan (41x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.801 W/kg

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

Reference Value = 23.18 V/m; Power Drift = -0.01 dB

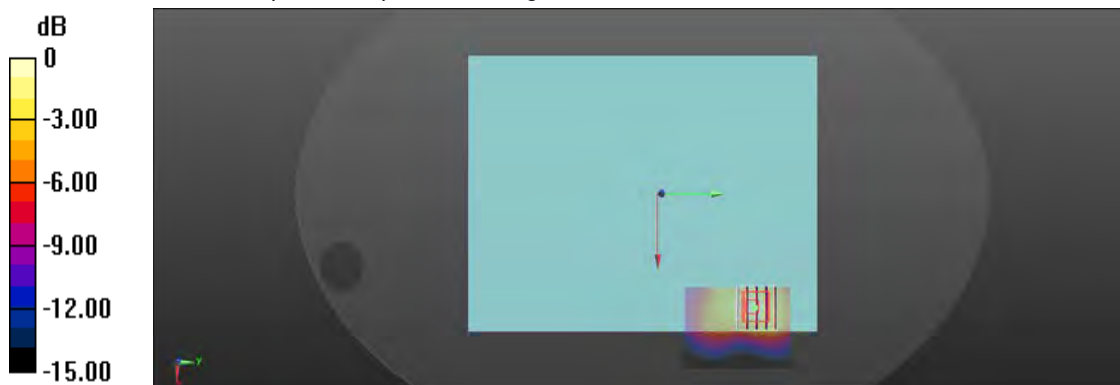
Peak SAR (extrapolated) = 0.999 W/kg

SAR(1 g) = 0.569 W/kg; SAR(10 g) = 0.301 W/kg

Smallest distance from peaks to all points 3 dB below = 11.3 mm

Ratio of SAR at M2 to SAR at M1 = 59.3%

Maximum value of SAR (measured) = 0.807 W/kg



0 dB = 0.807 W/kg = -0.93 dBW/kg

Test Laboratory: A Test Lab Techno Corp.

Date: 2021/7/3

511 LTE Band 38 CH 38000_QPSK_BW 20M_1RB Size 0RB_Side 1_0mm

DUT: CR1100FK, CR1100CK; Type: Notebook PC

Communication System: UID 0, Generic LTE (0); Frequency: 2595 MHz; Duty Cycle: 1:1.59

Medium parameters used (interpolated): $f = 2595$ MHz; $\sigma = 1.983$ S/m; $\epsilon_r = 39.12$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5.2 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV4 - SN3977; ConvF(7.42, 7.42, 7.42) @ 2595 MHz; Calibrated: 2020/7/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1253; Calibrated: 2020/12/16
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 AA; Serial: 1175
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

Area Scan (41x71x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 1.11 W/kg

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

Reference Value = 24.35 V/m; Power Drift = -0.08 dB

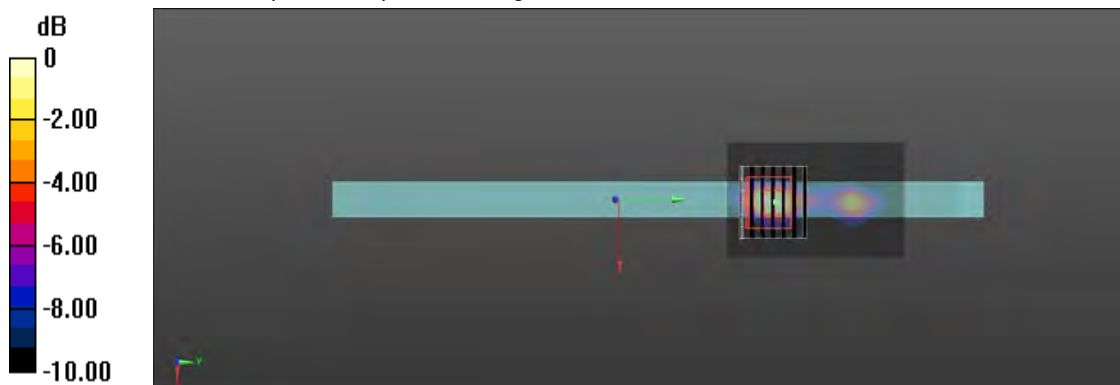
Peak SAR (extrapolated) = 1.41 W/kg

SAR(1 g) = 0.581 W/kg; SAR(10 g) = 0.212 W/kg

Smallest distance from peaks to all points 3 dB below = 6 mm

Ratio of SAR at M2 to SAR at M1 = 44.3%

Maximum value of SAR (measured) = 1.08 W/kg



0 dB = 1.08 W/kg = 0.33 dBW/kg

Test Laboratory: A Test Lab Techno Corp.

Date: 2021/7/3

73_LTE Band 41 CH 40185_QPSK_BW 20M_1RB Size 0RB_Side 1_0mm

DUT: CR1100FK, CR1100CK; Type: Notebook PC

Communication System: UID 0, Generic LTE (0); Frequency: 2549.5 MHz; Duty Cycle: 1:1.59

Medium parameters used: $f = 2550$ MHz; $\sigma = 1.92$ S/m; $\epsilon_r = 39.304$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5.2 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV4 - SN3977; ConvF(7.67, 7.67, 7.67) @ 2549.5 MHz; Calibrated: 2020/7/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1253; Calibrated: 2020/12/16
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 AA; Serial: 1175
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

Area Scan (41x71x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 1.52 W/kg

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

Reference Value = 28.02 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 1.88 W/kg

SAR(1 g) = 0.760 W/kg; SAR(10 g) = 0.272 W/kg

Smallest distance from peaks to all points 3 dB below = 6 mm

Ratio of SAR at M2 to SAR at M1 = 43.2%

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



0 dB = 1.46 W/kg = 1.64 dBW/kg

Test Laboratory: A Test Lab Techno Corp.

Date: 2021/7/2

235_LTE Band 66 CH 132322_QPSK_BW 20M_1RB Size 0RB_Side 1_0mm

DUT: CR1100FK, CR1100CK; Type: Notebook PC

Communication System: UID 0, Generic LTE (0); Frequency: 1745 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1745$ MHz; $\sigma = 1.375$ S/m; $\epsilon_r = 40.708$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5.2 Configuration:

- Area Scan setting - Find Secondary Maximum Within:2.0dB and with a peak SAR value greater than 0.5 W/Kg
- Probe: EX3DV4 - SN3977; ConvF(8.54, 8.54, 8.54) @ 1745 MHz; Calibrated: 2020/7/29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1253; Calibrated: 2020/12/16
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 AA; Serial: 1175
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

Area Scan (41x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 1.04 W/kg

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

Reference Value = 26.98 V/m; Power Drift = -0.07 dB

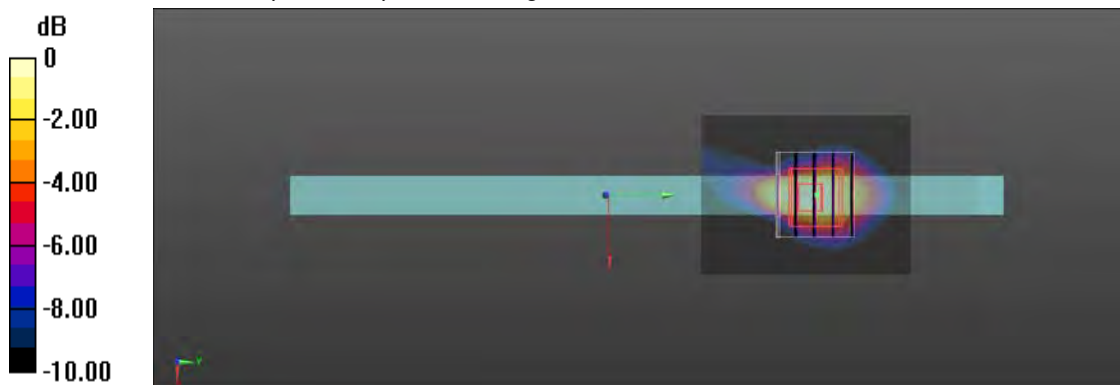
Peak SAR (extrapolated) = 1.18 W/kg

SAR(1 g) = 0.602 W/kg; SAR(10 g) = 0.310 W/kg

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

Ratio of SAR at M2 to SAR at M1 = 50.4%

Maximum value of SAR (measured) = 0.956 W/kg



0 dB = 0.956 W/kg = -0.20 dBW/kg



Appendix C - Calibration

All of the instruments Calibration information are listed below.

- Dipole _ D750V3 SN: 1004
- Dipole _ D8350V2 SN: 4d082
- Dipole _ D1750V2 SN: 1111
- Dipole _ D1900V2 SN: 5d111
- Dipole _ D2300V2 SN: 1005
- Dipole _ D2600V2 SN: 1007
- Probe _ EX3DV4 SN: 3977
- DAE _ DAE4 SN: 1253



ST-044_20-185

In Collaboration with

s p e a g

CALIBRATION LABORATORY

中国认可
国际互认
校准
CALIBRATION
CNAS L0570

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

Client **ATL**

Certificate No: **Z20-60365**

CALIBRATION CERTIFICATE

Object **D750V3 - SN: 1004**

Calibration Procedure(s) **FF-Z11-003-01**
Calibration Procedures for dipole validation kits

Calibration date: **September 17, 2020**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106276	12-May-20 (CTTL, No.J20X02965)	May-21
Power sensor NRP6A	101369	12-May-20 (CTTL, No.J20X02965)	May-21
ReferenceProbe EX3DV4	SN 3617	30-Jan-20(SPEAG,No.EX3-3617_Jan20)	Jan-21
DAE4	SN 771	10-Feb-20(CTTL-SPEAG,No.Z20-60017)	Feb-21
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	25-Feb-20 (CTTL, No.J20X00516)	Feb-21
NetworkAnalyzer E5071C	MY46110673	10-Feb-20 (CTTL, No.J20X00515)	Feb-21

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

Issued: September 22, 2020

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

Certificate No: Z20-60365

Page 1 of 6



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

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / 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 assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- KDB865664, 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%.



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

Measurement Conditions

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

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	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	42.3 $\pm$ 6 %	0.88 mho/m $\pm$ 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.07 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.37 W/kg $\pm$ 18.8 % (k=2)
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.36 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.48 W/kg $\pm$ 18.7 % (k=2)



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

Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.9Ω+ 1.70jΩ
Return Loss	- 29.6dB

General Antenna Parameters and Design

Electrical Delay (one direction)	0.900 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
-----------------	-------



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

DASY5 Validation Report for Head TSL

Date: 09.17.2020

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1004

Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.88 \text{ S/m}$; $\epsilon_r = 42.25$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(10.07, 10.07, 10.07) @ 750 MHz; Calibrated: 2020-01-30
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2020-02-10
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

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

Reference Value = 55.56 V/m; Power Drift = -0.01 dB

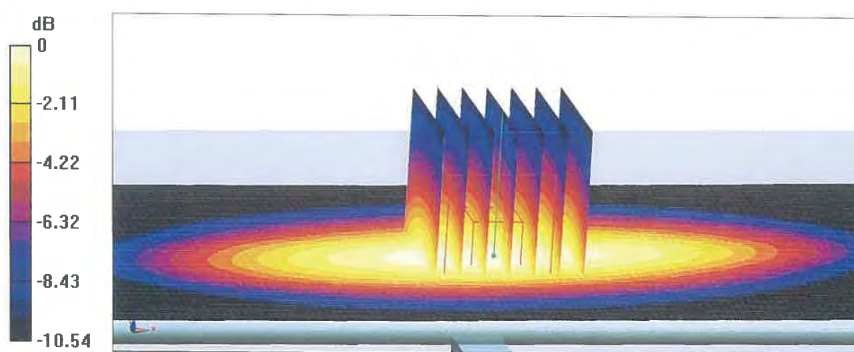
Peak SAR (extrapolated) = 3.08 W/kg

SAR(1 g) = 2.07 W/kg; SAR(10 g) = 1.36 W/kg

Smallest distance from peaks to all points 3 dB below = 18.9 mm

Ratio of SAR at M2 to SAR at M1 = 67%

Maximum value of SAR (measured) = 2.75 W/kg



0 dB = 2.75 W/kg = 4.39 dBW/kg

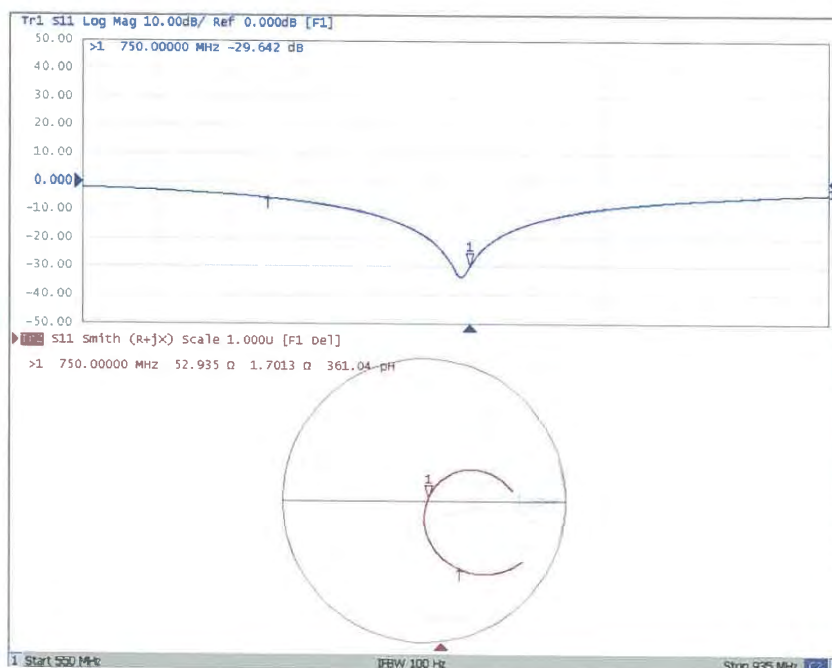
Certificate No: Z20-60365

Page 5 of 6



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

Impedance Measurement Plot for Head TSL





Client ATL

Certificate No: Z20-60366

CALIBRATION CERTIFICATE

Object D835V2 - SN: 4d082

Calibration Procedure(s) FF-Z11-003-01
Calibration Procedures for dipole validation kits

Calibration date: September 17, 2020

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106276	12-May-20 (CTTL, No.J20X02965)	May-21
Power sensor NRP6A	101369	12-May-20 (CTTL, No.J20X02965)	May-21
ReferenceProbe EX3DV4	SN 3617	30-Jan-20(SPEAG,No.EX3-3617_Jan20)	Jan-21
DAE4	SN 771	10-Feb-20(CTTL-SPEAG,No.Z20-60017)	Feb-21
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	25-Feb-20 (CTTL, No.J20X00516)	Feb-21
NetworkAnalyzer E5071C	MY46110673	10-Feb-20 (CTTL, No.J20X00515)	Feb-21

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

Issued: September 22, 2020

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

Certificate No: Z20-60366

Page 1 of 6



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

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / 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 assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- KDB865664, 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%.



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

Measurement Conditions

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

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz $\pm$ 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	40.9 $\pm$ 6 %	0.87 mho/m $\pm$ 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.33 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.49 W/kg $\pm$ 18.8 % ($k=2$)
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.52 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.17 W/kg $\pm$ 18.7 % ($k=2$)



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

Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.8Ω- 2.36jΩ
Return Loss	- 30.7dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.253 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
-----------------	-------



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

DASY5 Validation Report for Head TSL

Date: 09.17.2020

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d082

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

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.874 \text{ S/m}$; $\epsilon_r = 40.86$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(9.66, 9.66, 9.66) @ 835 MHz; Calibrated: 2020-01-30
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2020-02-10
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

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

Reference Value = 58.90 V/m; Power Drift = 0.04 dB

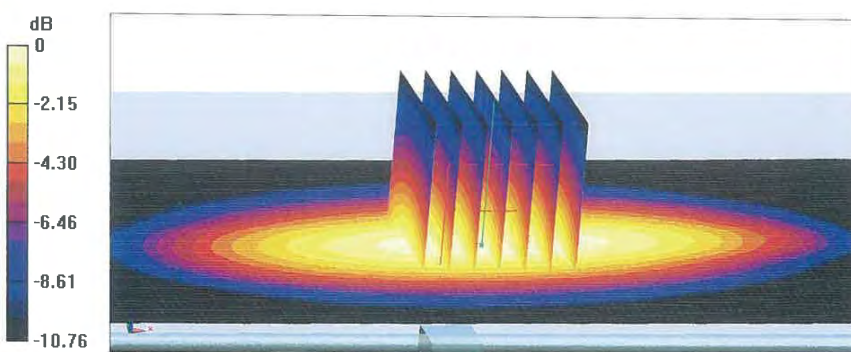
Peak SAR (extrapolated) = 3.48 W/kg

SAR(1 g) = 2.33 W/kg; SAR(10 g) = 1.52 W/kg

Smallest distance from peaks to all points 3 dB below = 16.6 mm

Ratio of SAR at M2 to SAR at M1 = 66.7%

Maximum value of SAR (measured) = 3.12 W/kg



0 dB = 3.12 W/kg = 4.94 dBW/kg

Certificate No: Z20-60366

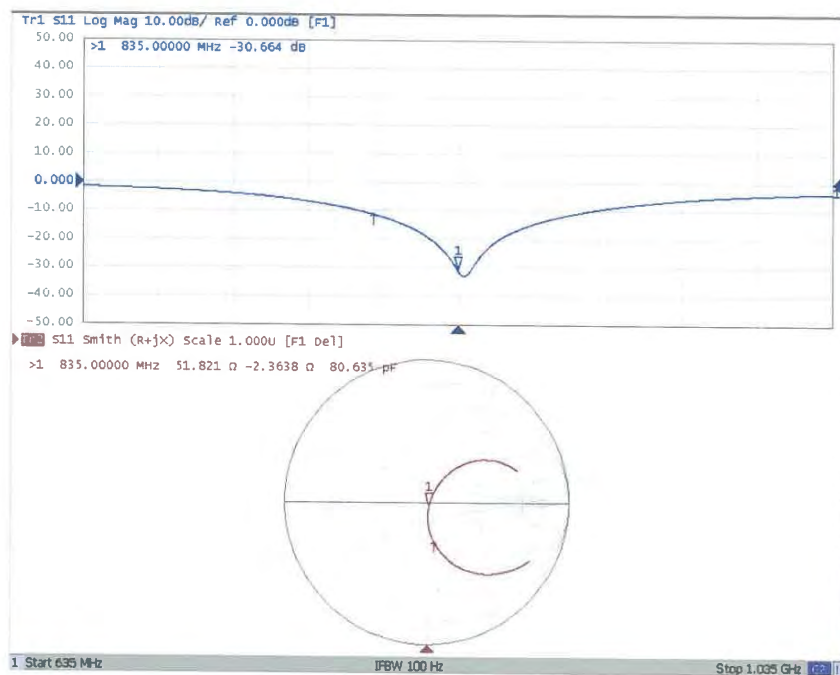
Page 5 of 6



In Collaboration with
s p e a g
CALIBRATION LABORATORY

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

Impedance Measurement Plot for Head TSL





In Collaboration with
s p e a g
CALIBRATION LABORATORY



中国认可
国际互认
校准
CALIBRATION
CNAS L0570

Add: No.52 Hua YuanBei Road, Haidian District, Beijing, 100191, Ch
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Client **AUDEN**

Certificate No: **Z21-60099**

CALIBRATION CERTIFICATE

Object **D1750V2 - SN: 1111**

Calibration Procedure(s) **FF-Z11-003-01**
Calibration Procedures for dipole validation kits

Calibration date: **April 14, 2021**

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(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106276	12-May-20 (CTTL, No.J20X02965)	May-21
Power sensor NRP6A	101369	12-May-20 (CTTL, No.J20X02965)	May-21
ReferenceProbe EX3DV4	SN 7307	29-May-20(SPEAG,No.EX3-7307_May20)	May-21
DAE4	SN 777	08-Jan-21(CTTL-SPEAG,No.Z21-60003)	Jan-22
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	01-Feb-21 (CTTL, No.J21X00593)	Jan-22
NetworkAnalyzer E5071C	MY46110673	14-Jan-21 (CTTL, No.J21X00232)	Jan-22

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

Issued: April 19, 2021

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

Certificate No: Z21-60099

Page 1 of 6



Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: ttl@chinattl.com http://www.chinattl.cn

Glossary:

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

Calibration is Performed According to the Following Standards:

- 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 assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- KDB865664, 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%.



Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Measurement Conditions

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

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	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	40.5 $\pm$ 6 %	1.39 mho/m $\pm$ 6 %
Head TSL temperature change during test	<1.0 °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.16 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	36.4 W/kg $\pm$ 18.8 % (k=2)
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	4.78 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	19.0 W/kg $\pm$ 18.7 % (k=2)



Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.9Ω- 4.12jΩ
Return Loss	- 27.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.125 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
-----------------	-------



Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

DASY5 Validation Report for Head TSL

Date: 04.14.2021

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1111

Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.391$ S/m; $\epsilon_r = 40.52$; $\rho = 1000$ kg/m³

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7307; ConvF(8.64, 8.64, 8.64) @ 1750 MHz; Calibrated: 2020-05-29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn777; Calibrated: 2021-01-08
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

$dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 94.69 V/m; Power Drift = -0.08 dB

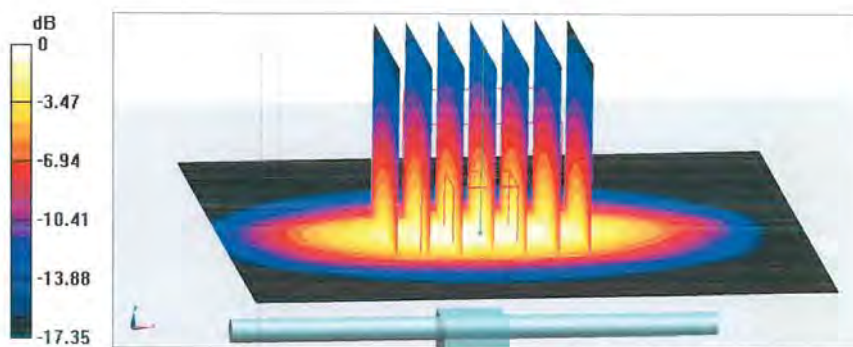
Peak SAR (extrapolated) = 17.3 W/kg

SAR(1 g) = 9.16 W/kg; SAR(10 g) = 4.78 W/kg

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

Ratio of SAR at M2 to SAR at M1 = 53.3%

Maximum value of SAR (measured) = 14.4 W/kg



0 dB = 14.4 W/kg = 11.58 dBW/kg

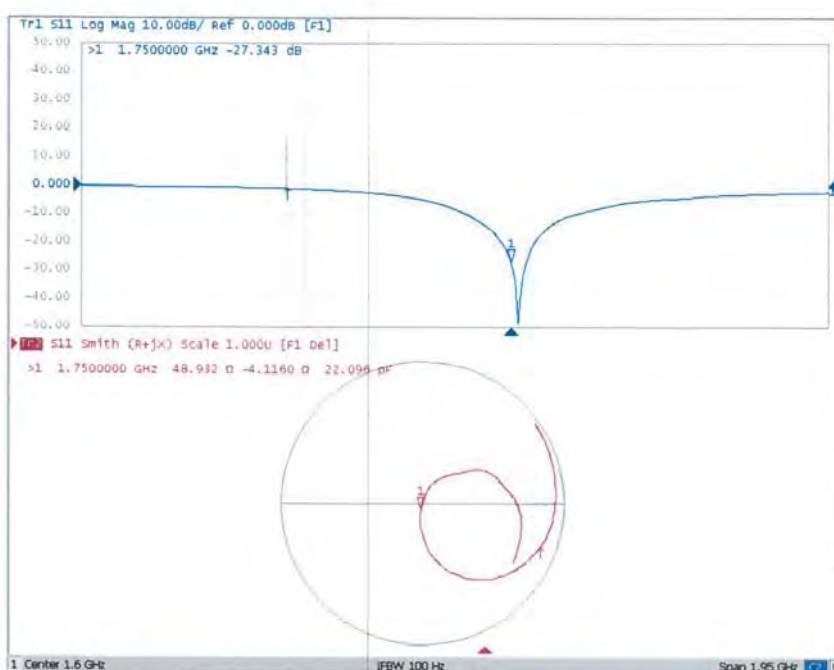
Certificate No: Z21-60099

Page 5 of 6



Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Impedance Measurement Plot for Head TSL





Client **ATL**

Certificate No: **Z20-60367**

CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 5d111**

Calibration Procedure(s) **FF-Z11-003-01**
Calibration Procedures for dipole validation kits

Calibration date: **September 18, 2020**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106276	12-May-20 (CTTL, No.J20X02965)	May-21
Power sensor NRP6A	101369	12-May-20 (CTTL, No.J20X02965)	May-21
ReferenceProbe EX3DV4	SN 3617	30-Jan-20(SPEAG,No.EX3-3617_Jan20)	Jan-21
DAE4	SN 771	10-Feb-20(CTTL-SPEAG,No.Z20-60017)	Feb-21
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	25-Feb-20 (CTTL, No.J20X00516)	Feb-21
NetworkAnalyzer E5071C	MY46110673	10-Feb-20 (CTTL, No.J20X00515)	Feb-21

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

Issued: September 22, 2020

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

Certificate No: Z20-60367

Page 1 of 6



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

lossary:

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 assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- KDB865664, 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%.



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

Measurement Conditions

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

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	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	39.9 $\pm$ 6 %	1.40 mho/m $\pm$ 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	10.0 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	40.1 W/kg $\pm$ 18.8 % ($k=2$)
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.17 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	20.7 W/kg $\pm$ 18.7 % ($k=2$)



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

Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.1Ω+ 6.43jΩ
Return Loss	- 23.9dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.066 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
-----------------	-------



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

DASY5 Validation Report for Head TSL

Date: 09.18.2020

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d111

Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1900 \text{ MHz}$; $\sigma = 1.395 \text{ S/m}$; $\epsilon_r = 39.89$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(8.14, 8.14, 8.14) @ 1900 MHz; Calibrated: 2020-01-30
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2020-02-10
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

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

Reference Value = 101.0 V/m; Power Drift = -0.04 dB

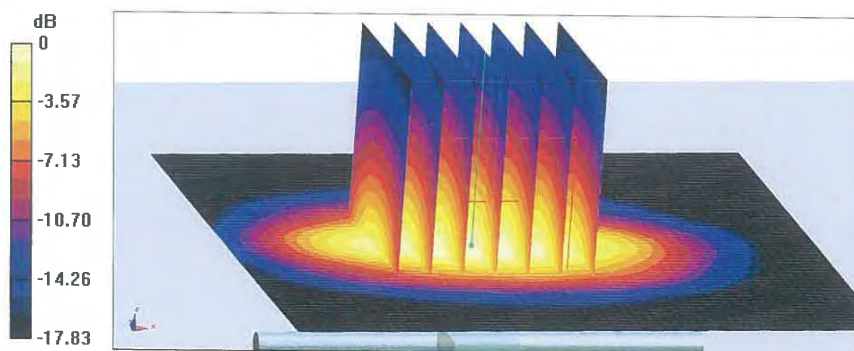
Peak SAR (extrapolated) = 19.2 W/kg

SAR(1 g) = 10 W/kg; SAR(10 g) = 5.17 W/kg

Smallest distance from peaks to all points 3 dB below = 9.8 mm

Ratio of SAR at M2 to SAR at M1 = 52.5%

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

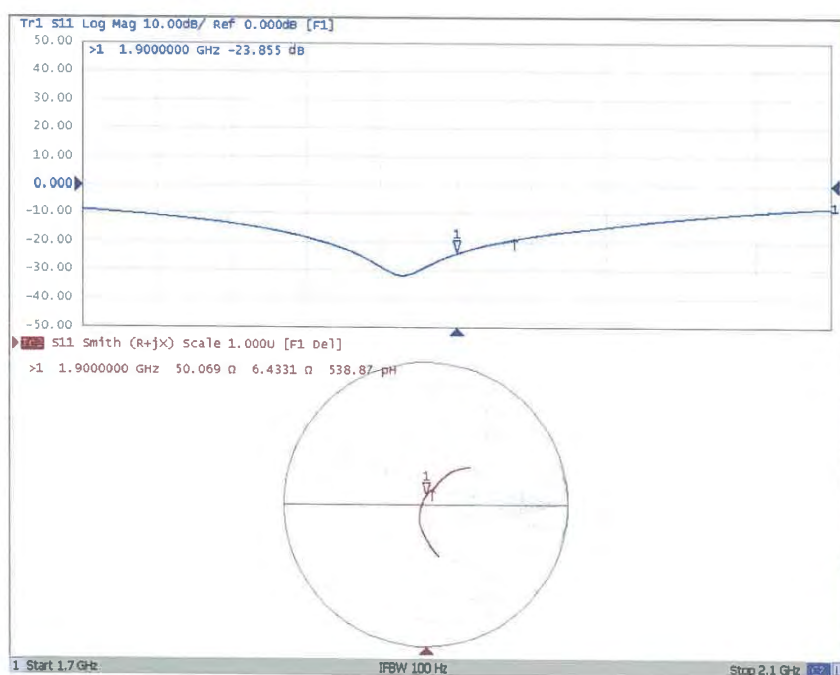


0 dB = 15.9 W/kg = 12.01 dBW/kg



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

Impedance Measurement Plot for Head TSL





Client ATL

ertificate No: Z21-60115

CALIBRATION CERTIFICATE

Object D2300V2 - SN: 1005

Calibration Procedure(s) FF-Z11-003-01
Calibration Procedures for dipole validation kits

Calibration date: April 14, 2021

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(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106276	12-May-20 (CTTL, No.J20X02965)	May-21
Power sensor NRP6A	101369	12-May-20 (CTTL, No.J20X02965)	May-21
ReferenceProbe EX3DV4	SN 7307	29-May-20(SPEAG,No.EX3-7307_May20)	May-21
DAE4	SN 777	08-Jan-21(CTTL-SPEAG,No.Z21-60003)	Jan-22
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	01-Feb-21 (CTTL, No.J21X00593)	Jan-22
NetworkAnalyzer E5071C	MY46110673	14-Jan-21 (CTTL, No.J21X00232)	Jan-22

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

Issued: April 19, 2021

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

Certificate No: Z21-60115

Page 1 of 6



In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / 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 assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- KDB865664, 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%.



In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Measurement Conditions

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

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2300 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.5	1.67 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	39.9 $\pm$ 6 %	1.64 mho/m $\pm$ 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	11.8 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	47.7 W/kg $\pm$ 18.8 % ($k=2$)
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.48 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.1 W/kg $\pm$ 18.7 % ($k=2$)



Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	46.9Ω- 1.76jΩ
Return Loss	- 28.7dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.058 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
-----------------	-------



Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

DASY5 Validation Report for Head TSL

Date: 04.14.2021

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2300 MHz; Type: D2300V2; Serial: D2300V2 - SN: 1005

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

Medium parameters used: $f = 2300$ MHz; $\sigma = 1.643$ S/m; $\epsilon_r = 39.87$; $\rho = 1000$ kg/m³

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7307; ConvF(8.15, 8.15, 8.15) @ 2300 MHz; Calibrated: 2020-05-29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn777; Calibrated: 2021-01-08
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

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

Reference Value = 102.3 V/m; Power Drift = -0.08 dB

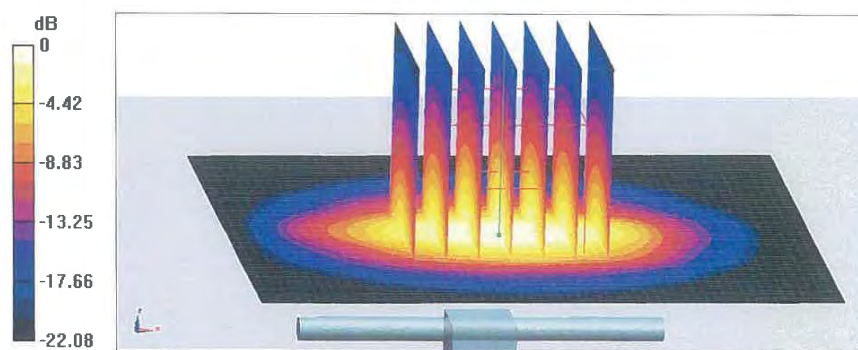
Peak SAR (extrapolated) = 24.8 W/kg

SAR(1 g) = 11.8 W/kg; SAR(10 g) = 5.48 W/kg

Smallest distance from peaks to all points 3 dB below = 9 mm

Ratio of SAR at M2 to SAR at M1 = 47.5%

Maximum value of SAR (measured) = 19.9 W/kg



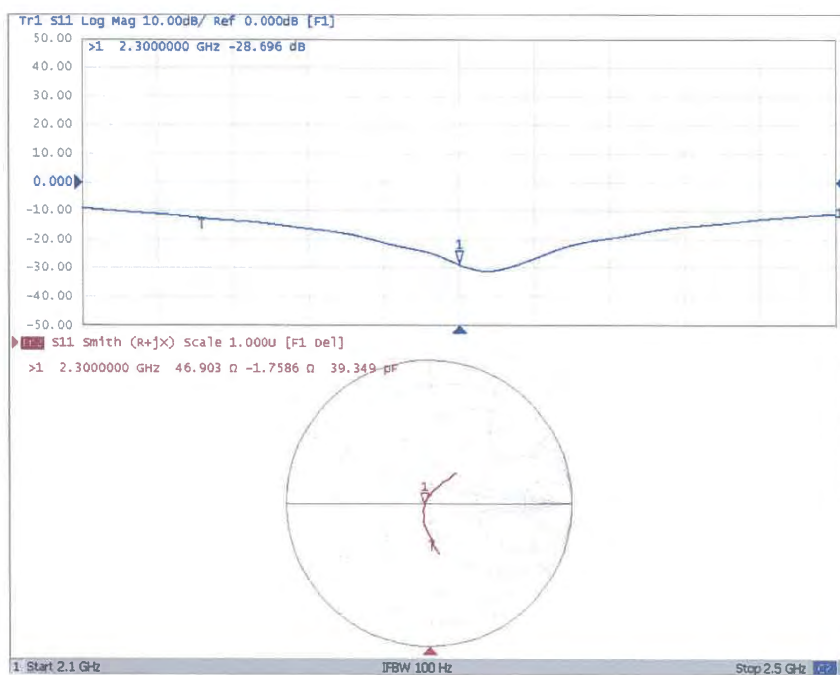
0 dB = 19.9 W/kg = 12.99 dBW/kg



In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Impedance Measurement Plot for Head TSL





Client **ATL**

Certificate No: **Z20-60374**

CALIBRATION CERTIFICATE

Object **D2600V2 - SN: 1007**

Calibration Procedure(s) **FF-Z11-003-01**
Calibration Procedures for dipole validation kits

Calibration date: **September 29, 2020**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106276	12-May-20 (CTTL, No.J20X02965)	May-21
Power sensor NRP6A	101369	12-May-20 (CTTL, No.J20X02965)	May-21
Reference Probe EX3DV4	SN 3617	30-Jan-20(SPEAG,No.EX3-3617_Jan20)	Jan-21
DAE4	SN 771	10-Feb-20(CTTL-SPEAG,No.Z20-60017)	Feb-21
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	25-Feb-20 (CTTL, No.J20X00516)	Feb-21
Network Analyzer E5071C	MY46110673	10-Feb-20 (CTTL, No.J20X00515)	Feb-21

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

Issued: October 4, 2020

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

Certificate No: Z20-60374

Page 1 of 6



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

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / 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 assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- KDB865664, 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%.



In Collaboration with
s p e a g
CALIBRATION LABORATORY

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

Measurement Conditions

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

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2600 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	37.9 $\pm$ 6 %	1.96 mho/m $\pm$ 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	14.4 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	57.3 W/kg $\pm$ 18.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.51 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	25.9 W/kg $\pm$ 18.7 % (k=2)



In Collaboration with
s p e a g
CALIBRATION LABORATORY

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

Appendix(Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.1 Ω - 3.65j Ω
Return Loss	- 27.5dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.018 ns
----------------------------------	----------

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

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

Additional EUT Data

Manufactured by	SPEAG
-----------------	-------



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

DASY5 Validation Report for Head TSL

Date: 09.29.2020

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1007

Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2600$ MHz; $\sigma = 1.955$ S/m; $\epsilon_r = 37.94$; $\rho = 1000$ kg/m³

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(7.52, 7.52, 7.52) @ 2600 MHz; Calibrated: 2020-01-30
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2020-02-10
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

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

Reference Value = 102.3 V/m; Power Drift = -0.08 dB

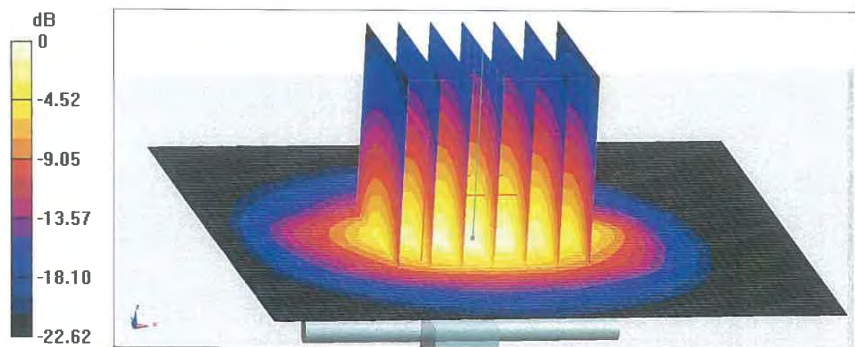
Peak SAR (extrapolated) = 30.3 W/kg

SAR(1 g) = 14.4 W/kg; SAR(10 g) = 6.51 W/kg

Smallest distance from peaks to all points 3 dB below = 8.5 mm

Ratio of SAR at M2 to SAR at M1 = 48.3%

Maximum value of SAR (measured) = 24.4 W/kg



0 dB = 24.4 W/kg = 13.87 dBW/kg

Certificate No: Z20-60374

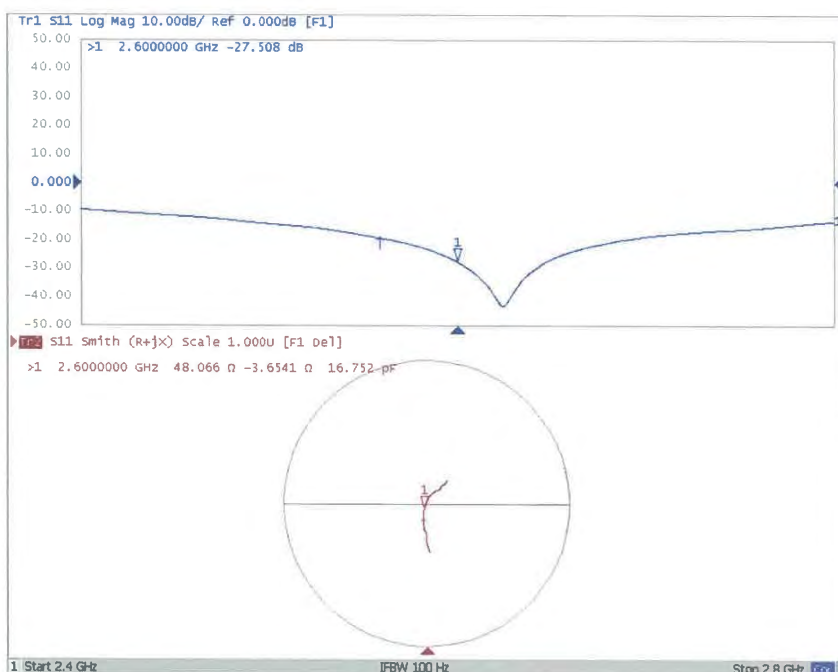
Page 5 of 6



In Collaboration with
s p e a g
CALIBRATION LABORATORY

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

Impedance Measurement Plot for Head TSL





In Collaboration with
s p e a g
CALIBRATION LABORATORY



中国认可
国际互认
校准
CALIBRATION
CNAS L0570

EX-043-20-148

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com [Http://www.chinattl.cn](http://www.chinattl.cn)

Client

ATL

Certificate No: Z20-60261

CALIBRATION CERTIFICATE

Object EX3DV4 - SN : 3977

Calibration Procedure(s) FF-Z11-004-01
Calibration Procedures for Dosimetric E-field Probes

Calibration date: July 29, 2020

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	16-Jun-20(CTTL, No.J20X04344)	Jun-21
Power sensor NRP-Z91	101547	16-Jun-20(CTTL, No.J20X04344)	Jun-21
Power sensor NRP-Z91	101548	16-Jun-20(CTTL, No.J20X04344)	Jun-21
Reference 10dBAttenuator	18N50W-10dB	10-Feb-20(CTTL, No.J20X00525)	Feb-22
Reference 20dBAttenuator	18N50W-20dB	10-Feb-20(CTTL, No.J20X00526)	Feb-22
Reference Probe EX3DV4	SN 7307	29-May-20(SPEAG, No.EX3-7307_May20)	May-21
DAE4	SN 1556	4-Feb-20(SPEAG, No.DAE4-1556_Feb20)	Feb-21
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
SignalGenerator MG3700A	6201052605	23-Jun-20(CTTL, No.J20X04343)	Jun-21
Network Analyzer E5071C	MY46110673	10-Feb-20(CTTL, No.J20X00515)	Feb-21

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

Issued: July 31, 2020

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

Certificate No: Z20-60261

Page 1 of 9



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com <http://www.chinattl.cn>

Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A,B,C,D	modulation dependent linearization parameters
Polarization Φ	Φ rotation around probe axis
Polarization θ	θ rotation around an axis that is in the plane normal to probe axis (at measurement center), i $\theta=0$ is normal to probe axis

Connector Angle information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

- 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"

Methods Applied and Interpretation of Parameters:

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



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com [Http://www.chinattl.cn](http://www.chinattl.cn)

DASY/EASY – Parameters of Probe: EX3DV4 – SN:3977

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	0.53	0.58	0.51	±10.0%
DCP(mV) ^B	102.4	102.5	102.6	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB· μV	C	D dB	VR mV	Unc ^E (k=2)
0	CW	X	0.0	0.0	1.0	0.00	187.4	±2.0%
		Y	0.0	0.0	1.0		197.4	
		Z	0.0	0.0	1.0		178.9	

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

^A The uncertainties of Norm X, Y, Z do not affect the E^2 -field uncertainty inside TSL (see Page 4).

^B Numerical linearization parameter: uncertainty not required.

^E Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com [Http://www.chinattl.cn](http://www.chinattl.cn)

DASY/EASY – Parameters of Probe: EX3DV4 – SN:3977

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz] ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unct. (k=2)
750	41.9	0.89	10.32	10.32	10.32	0.40	0.75	±12.1%
835	41.5	0.90	9.85	9.85	9.85	0.19	1.23	±12.1%
900	41.5	0.97	9.91	9.91	9.91	0.22	1.15	±12.1%
1750	40.1	1.37	8.54	8.54	8.54	0.22	1.08	±12.1%
1810	40.0	1.40	8.30	8.30	8.30	0.27	0.94	±12.1%
1900	40.0	1.40	8.21	8.21	8.21	0.28	0.99	±12.1%
2000	40.0	1.40	8.26	8.26	8.26	0.23	1.14	±12.1%
2300	39.5	1.67	7.88	7.88	7.88	0.59	0.70	±12.1%
2450	39.2	1.80	7.67	7.67	7.67	0.59	0.72	±12.1%
2600	39.0	1.96	7.42	7.42	7.42	0.65	0.67	±12.1%
3500	37.9	2.91	6.78	6.78	6.78	0.47	0.90	±13.3%
3700	37.7	3.12	6.57	6.57	6.57	0.47	0.99	±13.3%
5250	35.9	4.71	5.51	5.51	5.51	0.50	1.20	±13.3%
5600	35.5	5.07	4.86	4.86	4.86	0.50	1.30	±13.3%
5750	35.4	5.22	5.03	5.03	5.03	0.50	1.30	±13.3%

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

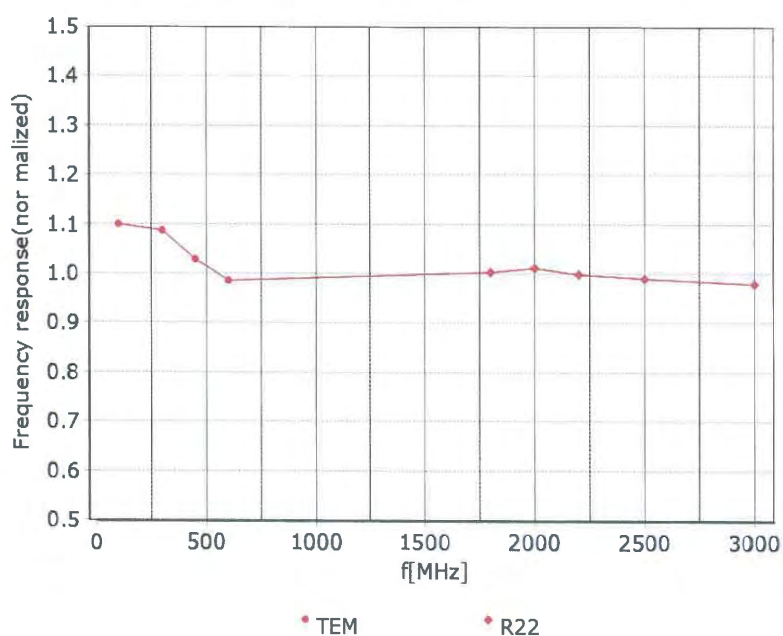
^F At frequency below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty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

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



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: ctl@chinatl.com <http://www.chinatl.cn>

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



Uncertainty of Frequency Response of E-field: $\pm 7.4\%$ ($k=2$)

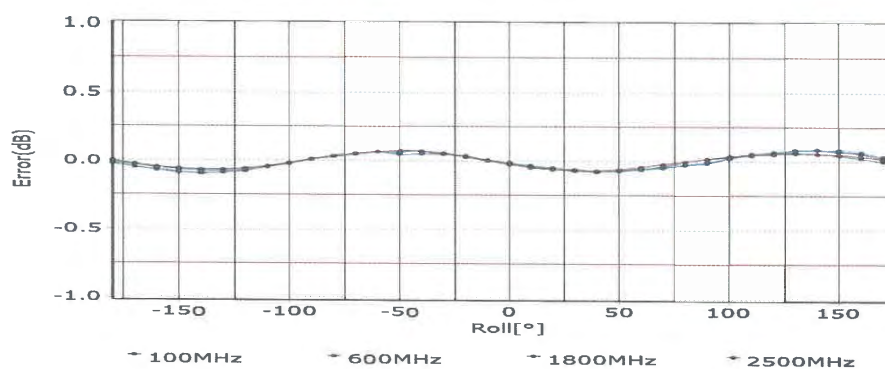
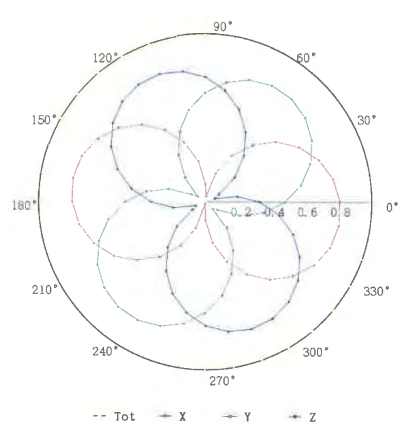
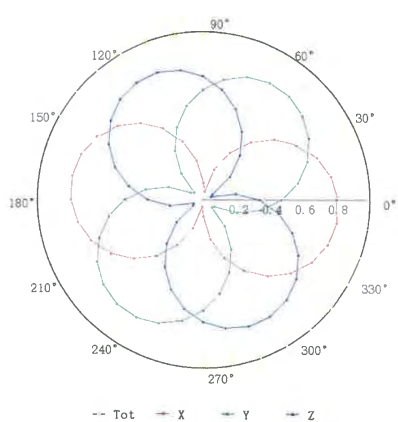


Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com [Http://www.chinattl.cn](http://www.chinattl.cn)

Receiving Pattern (Φ), $\theta=0^\circ$

f=600 MHz, TEM

f=1800 MHz, R22

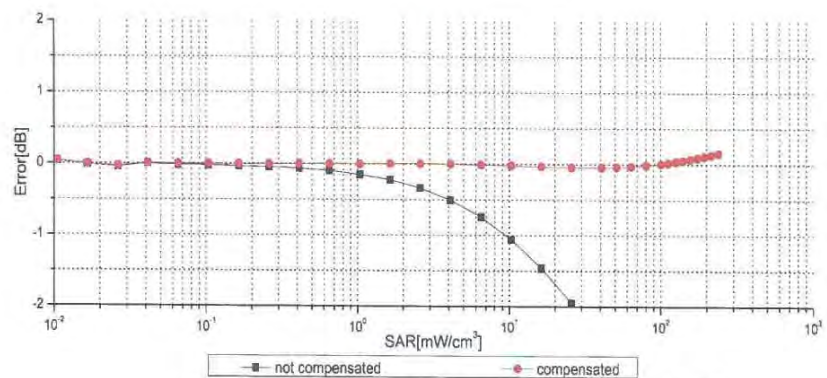
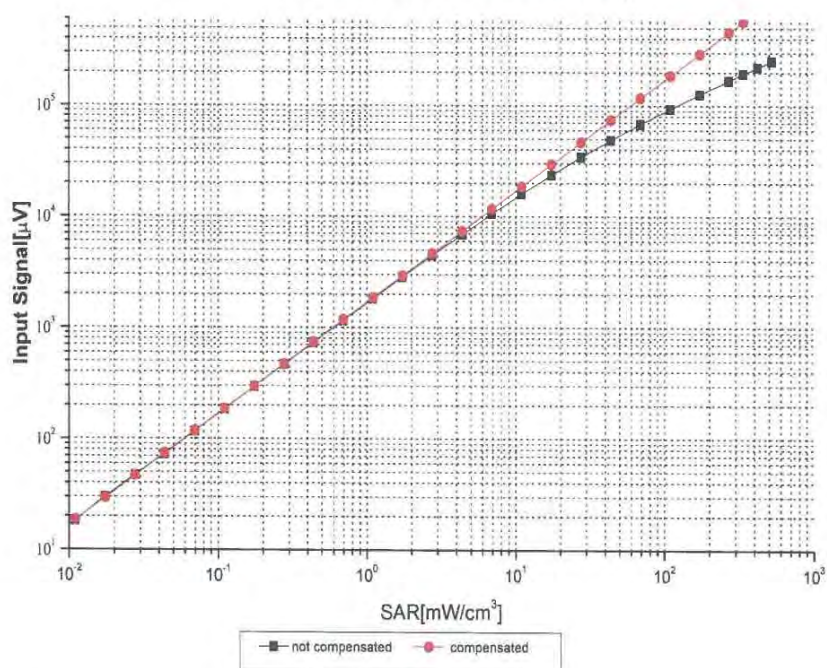


Uncertainty of Axial Isotropy Assessment: $\pm 1.2\%$ ($k=2$)



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com [Http://www.chinattl.cn](http://www.chinattl.cn)

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



Uncertainty of Linearity Assessment: $\pm 0.9\%$ ($k=2$)

Certificate No:Z20-60261

Page 7 of 9

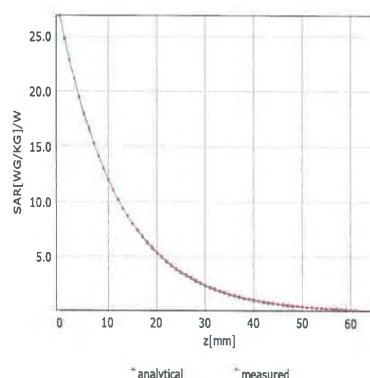
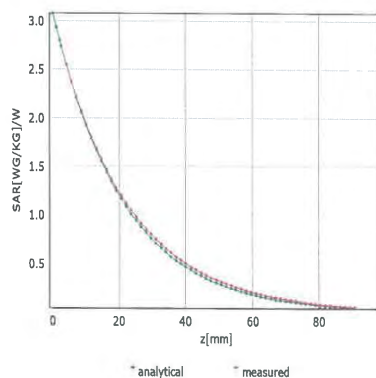


Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com [Http://www.chinattl.cn](http://www.chinattl.cn)

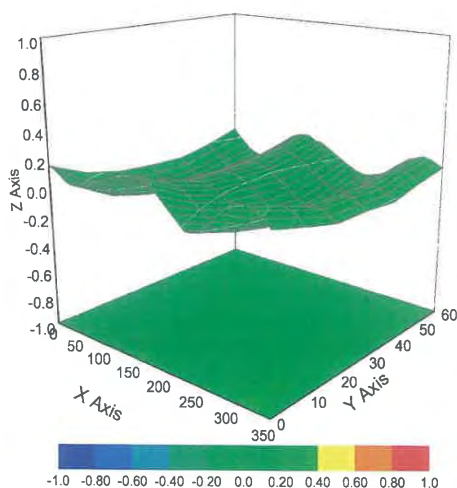
Conversion Factor Assessment

f=750 MHz,WGLS R9(H_convF)

f=1750 MHz,WGLS R22(H_convF)



Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment: $\pm 3.2\%$ ($k=2$)



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: ctl@chinatl.com <http://www.chinatl.cn>

DASY/EASY – Parameters of Probe: EX3DV4 – SN:3977

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	25.7
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	10mm
Tip Diameter	2.5mm
Probe Tip to Sensor X Calibration Point	1mm
Probe Tip to Sensor Y Calibration Point	1mm
Probe Tip to Sensor Z Calibration Point	1mm
Recommended Measurement Distance from Surface	1.4mm



MR-275-21-003
Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland



S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

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-KS**

Certificate No: **DAE4-1253_Dec20**

CALIBRATION CERTIFICATE

Object **DAE4 - SD 000 D04 BM - SN: 1253**

Calibration procedure(s) **QA CAL-06.v30**
Calibration procedure for the data acquisition electronics (DAE)

Calibration date: **December 16, 2020**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	07-Sep-20 (No:28647)	Sep-21
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Auto DAE Calibration Unit	SE UWS 053 AA 1001	09-Jan-20 (in house check)	In house check: Jan-21
Calibrator Box V2.1	SE UMS 006 AA 1002	09-Jan-20 (in house check)	In house check: Jan-21

Calibrated by: **Dominique Steffen** **Laboratory Technician**

Signature

Approved by: **Sven Kühn** **Deputy Manager**

Issued: December 16, 2020

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

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland



S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

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

DAE data acquisition electronics
Connector angle information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle:* The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
 - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
 - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
 - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
 - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
 - *Input Offset Measurement:* Output voltage and statistical results over a large number of zero voltage measurements.
 - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
 - *Input resistance:* Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
 - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
 - *Power consumption:* Typical value for information. Supply currents in various operating modes.



DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1 μ V , full range = -100...+300 mV

Low Range: 1LSB = 61nV , full range = -1.....+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	404.356 $\pm$ 0.02% (k=2)	404.540 $\pm$ 0.02% (k=2)	404.466 $\pm$ 0.02% (k=2)
Low Range	3.96086 $\pm$ 1.50% (k=2)	3.98759 $\pm$ 1.50% (k=2)	3.97759 $\pm$ 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	353.0 ° $\pm$ 1 °
---	-------------------



Appendix (Additional assessments outside the scope of SCS0108)

1. DC Voltage Linearity

High Range	Reading (μV)	Difference (μV)	Error (%)
Channel X + Input	200034.00	2.90	0.00
Channel X + Input	20005.12	-0.09	-0.00
Channel X - Input	-20004.14	1.09	-0.01
Channel Y + Input	200029.40	-2.26	-0.00
Channel Y + Input	20003.43	-1.67	-0.01
Channel Y - Input	-20005.68	-0.28	0.00
Channel Z + Input	200029.53	-1.36	-0.00
Channel Z + Input	20002.84	-2.24	-0.01
Channel Z - Input	-20006.49	-1.02	0.01

Low Range	Reading (μV)	Difference (μV)	Error (%)
Channel X + Input	2001.19	-0.08	-0.00
Channel X + Input	201.48	0.23	0.11
Channel X - Input	-198.78	0.09	-0.04
Channel Y + Input	2001.18	0.04	0.00
Channel Y + Input	200.43	-0.64	-0.32
Channel Y - Input	-199.48	-0.55	0.28
Channel Z + Input	2001.63	0.59	0.03
Channel Z + Input	199.65	-1.36	-0.68
Channel Z - Input	-200.08	-1.02	0.51

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	-7.42	-8.91
	- 200	9.59	8.14
Channel Y	200	-11.03	-11.34
	- 200	9.30	9.38
Channel Z	200	-13.13	-13.17
	- 200	11.97	11.44

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	-0.02	-4.91
Channel Y	200	6.53	-	1.55
Channel Z	200	8.50	4.53	-

4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	15759	16091
Channel Y	16178	15874
Channel Z	16183	16058

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	0.41	-0.80	1.71	0.38
Channel Y	-0.81	-1.75	-0.21	0.31
Channel Z	-0.60	-1.75	0.45	0.36

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	-0.01	-8	-9