Prüfbericht-Nr.: *Test report no.:*	CN213YZV (FCC-SAR) 001	**Auftrags-Nr.:** *Order no.*:	238517543	Seite 1 von 46 *Page 1 of 46*
Kunden-Referenz-Nr.: *Client reference no.:*	N/A	**Auftragsdatum:** *Order date:*	2021-07-12	
Auftraggeber: *Client:*	AGUILA CONVERGENCE WORLDWIDE, INC. 46168,1581 S. Perry road,Plainfield,Indiana,USA			
Prüfgegenstand: *Test item:*	Secure Dongle, OOB Dongle			
Bezeichnung / Typ-Nr.: *Identification / Type no.:*	NCT8610 / NCT9610			
Auftrags-Inhalt: *Order content*:	Test Report for FCC SAR			
Prüfgrundlage: *Test specification:*	FCC 47 CFR §2.1093 IEEE Std 1528-2013 Published RF exposure KDB procedures			

Wareneingangsdatum: *Date of sample receipt:*	2021-07-07
Prüfmuster-Nr.: *Test sample no:*	A003086990-033
Prüfzeitraum: *Testing period:*	2021-07-26 - 2021-08-07
Ort der Prüfung: *Place of testing:*	EMC/RF Taipei Testing Site
Prüflaboratorium: *Testing laboratory:*	Taipei Testing Laboratories
Prüfergebnis*: *Test result*:*	Pass

überprüft von: *compiled by:*	David Huang	**genehmigt von:** authorized by:	Ryan Chen
Datum: *Date:* 2021-09-07		**Ausstellungsdatum:** *Issue date:* 2021-09-07	
Stellung / *Position:*	David Huang Project Manager	**Stellung** / *Position:*	Senior Project Manager

Sonstiges / *Other:* The models/product names are electrically identical, the differences are the package, and the color of the case and logo.

Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt
Condition of the test item at delivery: *Test item complete and undamaged*

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
* *Legend:*	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

CONTENTS

HISTORY OF THIS TEST REPORT

Report No.	Description	Date Issued
CN213YZV (FCC-SAR) 001	Original Release	2021-09-07

1. General Information

1.1 Statement of Compliance

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

Equipment Class	Operating Mode	Highest Reported Body SAR_{1g} (0.5 cm Gap) (W/kg)
PCB	LTE Cat-M1 Band 5	0.075
	LTE Cat-M1 Band 12	0.058
	LTE Cat-M1 Band 13	0.114
	LTE Cat-M1 Band 25	0.065
	LTE Cat-M1 Band 26	0.070
	LTE Cat-M1 Band 66	0.392
	NB-IoT Band 5	0.400
	NB-IoT Band 12	0.028
	NB-IoT Band 13	0.046
	NB-IoT Band 25	0.028
	NB-IoT Band 26	0.042
	NB-IoT Band 66	0.163
DTS	Bluetooth	0.4
Highest Simultaneous Transmission SAR		Body-Worn (W/Kg)
PCE + DTS		0.792

Note:

1. The maximum results of Specific Absorption Rate (SAR) found during testing for the EUT are as follows: This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6W/kg as averaged over any 1 gram of tissue; 10-gram SAR for Product Specific 10g SAR, limit: 4.0W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.
2. According to TCB workshop October, 2014 RF Exposure Procedures Update (Overlapping LTE Bands): SAR for LTE Band 2 (Frequency range: 1850 - 1910 MHz) is covered by LTE Band 25 (Frequency range: 1850 - 1915 MHz) due to similar frequency range, the same maximum tune up limit and same channel bandwidth.
3. According to TCB workshop October, 2014 RF Exposure Procedures Update (Overlapping LTE Bands): SAR for LTE Band 4 (Frequency range: 1710 - 1755 MHz) is covered by LTE Band 66 (Frequency range: 1710 - 1780 MHz) due to similar frequency range, the same maximum tune up limit and same channel bandwidth.
4. According to TCB workshop October, 2014 RF Exposure Procedures Update (Overlapping LTE Bands): SAR for LTE Band 17 (Frequency range: 704 - 716 MHz) is covered by LTE Band 12 (Frequency range: 699 - 716 MHz) due to similar frequency range, the same maximum tune up limit and same channel bandwidth.

1.2 Equipment Under Test (EUT) Information

1.2.1 General Information

EUT Type	Secure Dongle, OOB Dongle
Model Name	NCT8610 / NCT9610
FCC ID	2ANPO00NRF9160
Antenna Type	PCB Antenna
Antenna Gain:	Cat-M1 & NB-IoT: Band 2: 1.3 dBi Band 4: 2.4 dBi Band 5: 1.3 dBi Band 12: 1.3 dBi Band 13: 1.3 dBi Band 17: 1.3 dBi Band 25: 2.4 dBi Band 26: 1.3 dBi Band 66: 2.4 dBi Bluetooth LE: 1.16 dBi
EUT Stage	Identical Prototype

1.2.2 Wireless Technologies

Tx Frequency Bands (Unit: MHz)	Cat-M1 & NB-IoT Band 2: 1850 ~ 1910 Band 4: 1710 ~ 1755 Band 5: 824 ~ 849 Band 12: 699 ~ 716 Band 13: 777 ~ 787 Band 17: 704 ~ 716 (for NB-IoT only) Band 25: 1850 ~ 1915 Band 26: 814 ~ 849 Band 66: 1710 ~1780 Bluetooth: 2402 MHz ~ 2480 MHz
Uplink Modulations	Cat-M1: QPSK, 16QAM NB-IoT: BPSK, QPSK Bluetooth LE: GFSK

1.3 Maximum Conducted Power

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

<Cat-M1>

Mode	Band 2	Band 4	Band 5	Band 12
QPSK / 16QAM	24.0	24.0	23.5	24.0

Mode	Band 13	Band 25	Band 26	Band 66
QPSK / 16QAM	24.0	24.0	24.0	24.0

<NB-IoT>

Mode	Band 2	Band 4	Band 5	Band 12
BPSK	24.0	23.5	23.5	23.5

Mode	Band 13	Band 17	Band 25	Band 26	Band 66
BPSK	23.5	23.5	23.5	23.5	23.5

Mode	2.4G Bluetooth
LE	3.5

2. Test Sites

2.1 Test Laboratory

Taipei Testing Laboratories

11F., No. 758, Sec. 4, Bade Rd., Songshan Dist., Taipei City 105 Taiwan (R.O.C.)

2.2 Test Facilities

Taipei Testing Laboratories

No. 458-18, Sec. 2, Fenliao Rd., Linkou Dist., New Taipei City 244 Taiwan (R.O.C.)

The tests at the test sites have been conducted under the supervision of a TÜV engineer.

2.3 List of Test and Measurement Instruments

Equipment	Manufacturer	Model	SN	Cal. Date	Cal. Interval
E-field probes	SPEAG	EX3DV4	7400	Apr.27,2021	1 Year
Data Acquisition Electronics	SPEAG	DAE4	855	Apr.28,2021	1 Year
System Validation Dipole	SPEAG	D750V3	1199	Mar.17,2021	1 Year
System Validation Dipole	SPEAG	D835V2	4d058	Mar.17,2021	1 Year
System Validation Dipole	SPEAG	D1800V2	2d156	Mar.18,2021	1 Year
System Validation Dipole	SPEAG	D1900V2	5d090	Mar.18,2021	1 Year
Power Meter	Anritsu	ML2495A	1901008	Mar.24,2021	1 Year
Power Sensor	Anritsu	MA2411B	1725269	Mar.24,2021	1 Year
Power Sensor	R&S	NRP33S	101622	Mar.19,2021	1 Year
Signal Analyzer	R&S	FSV40	101513	May.27,2021	1 Year
Signal Generator	R&S	SMB100A03	181334	Jan.29,2021	1 Year
Wireless Tester	R&S	CMW500	166923	Feb.17,2021	1 Year
Directional coupler	Fairview Microwave	FMCP1025-20	A000553136-001	N/A	N/A
Dielectric Assessment Kit	SPEAG	DAK-3.5	1292	N/A	N/A
ELI Phantom	SPEAG	ELI Phantom	1153	N/A	N/A
Power Amplifier	EMCI	EMC2830P	980352	N/A	N/A

3. Measurement Uncertainty

The component of uncertainly may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainly by the statistical analysis of a series of observations is termed a Type An evaluation of uncertainty. The evaluation of uncertainty by means other than the statistical analysis of a series of observation is termed a Type B evaluation of uncertainty. Each component of uncertainty, however evaluated, is represented by an estimated standard deviation, termed standard uncertainty, which is determined by the positive square root of the estimated variance.

A Type A evaluation of standard uncertainty may be based on any valid statistical method for treating data. This includes calculating the standard deviation of the mean of a series of independent observations; using the method of least squares to fit a curve to the data in order to estimate the parameter of the curve and their standard deviations; or carrying out an analysis of variance in order to identify and quantify random effects in certain kinds of measurement.

A type B evaluation of standard uncertainty is typically based on scientific judgment using all of the relevant information available. These may include previous measurement data, experience, and knowledge of the behavior and properties of relevant materials and instruments, manufacture's specification, data provided in calibration reports and uncertainties assigned to reference data taken from handbooks. Broadly speaking, the uncertainty is either obtained from an outdoor source or obtained from an assumed distribution, such as the normal distribution, rectangular or triangular distributions indicated in table below.

Uncertainty Distributions	Normal	Rectangular	Triangular	U-Shape
Multi-plying Factor(a)	1/k(b)	$1/\sqrt{3}$	$1/\sqrt{6}$	$1/\sqrt{2}$

(a) standard uncertainty is determined as the product of the multiplying factor and the estimated range of variations in the measured quantity
(b) κ is the coverage factor

Standard Uncertainty for Assumed Distribution

The combined standard uncertainty of the measurement result represents the estimated standard deviation of the result. It is obtained by combining the individual standard uncertainties of both Type A and Type B evaluation using the usual "root-sum-squares" (RSS) methods of combining standard deviations by taking the positive square root of the estimated variances.

Expanded uncertainty is a measure of uncertainty that defines an interval about the measurement result within which the measured value is confidently believed to lie. It is obtained by multiplying the combined standard uncertainty by a coverage factor. Typically, the coverage factor ranges from 2 to 3. Using a coverage factor allows the true value of a measured quantity to be specified with a defined probability within the specified uncertainty range. For purpose of this document, a coverage factor two is used, which corresponds to confidence interval of about 95 %. The DASY uncertainty Budget is shown in the following tables.

Source of Uncertainty	Tolerance (± %)	Probability Distribution	Divisor	Ci (1g)	Ci (10g)	Standard Uncertainty (1g)	Standard Uncertainty (10g)	Vi Veff
Measurement System								
Probe Calibration	6	Normal	1	1	1	±6.0%	±6.0%	∞
Axial Isotropy	4.7	Rectangular	√3	0.7	0.7	±1.9%	±1.9%	∞
Hemispherical Isotropy	9.6	Rectangular	√3	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effects	1	Rectangular	√3	1	1	±0.6%	±0.6%	∞
Linearity	4.7	Rectangular	√3	1	1	±2.7%	±2.7%	∞
Detection Limits	1	Rectangular	√3	1	1	±0.58%	±0.58%	∞
Modulation Response	2.4	Rectangular	√3	1	1	±1.4%	±1.4%	∞
Readout Electronics	0.3	Normal	1	1	1	±0.3%	±0.3%	∞
Response Time	0.8	Rectangular	√3	1	1	±0.5%	±0.5%	∞
Integration Time	2.6	Rectangular	√3	1	1	±1.5%	±1.5%	∞
RF Ambient – Noise	3	Rectangular	√3	1	1	±1.7%	±1.7%	∞
RF Ambient – Reflections	3	Rectangular	√3	1	1	±1.7%	±1.7%	∞
Probe Positioner	0.4	Rectangular	√3	1	1	±0.23%	±0.23%	∞
Probe Positioning	2.9	Rectangular	√3	1	1	±1.67%	±1.67%	∞
Max. SAR Evaluation	2	Rectangular	√3	1	1	±1.2%	±1.2%	∞
Test Sample Related								
Device Positioning	2.3 / 2.6	Normal	1	1	1	±2.3%	±2.6%	145
Device Holder	3.2 / 2.8	Normal	1	1	1	±3.2%	±2.8%	5
Power Drift	5	Rectangular	√3	1	1	±2.9%	±2.9%	∞
Power Scaling	0	Rectangular	√3	1	1	±0.0%	±0.0%	∞
Phantom and Setup								
Phantom Uncertainty	6.1	Rectangular	√3	1	1	±3.81%	±3.52%	∞
SAR correction	1.9	Rectangular	√3	1	0.84	±1.10%	±1.10%	∞
LiquidConductivity (Meas.)	2.4	Normal	1	0.78	0.71	±1.08%	±1.08%	∞
Liquid Permittivity (Meas.)	2.4	Normal	1	0.26	0.26	±0.36%	±0.36%	∞
Temp. unc. - Conductivity	3.4	Rectangular	√3	0.78	0.71	±1.53%	±1.53%	∞
Temp. unc. - Permittivity	0.4	Rectangular	√3	0.23	0.26	±0.05%	±0.05%	∞
Combined Standard Uncertainty (K = 1)						±10.9%	±10.85%	361
Expanded Uncertainty (K = 2)						±21.79%	±21.71%	

Uncertainty budget for frequency range 300 MHz to 3 GHz

Source of Uncertainty	Tolerance (± %)	Probability Distribution	Divisor	Ci (1g)	Ci (10g)	Standard Uncertainty (1g)	Standard Uncertainty (10g)	Vi Veff
Measurement System								
Probe Calibration	6.55	Normal	1	1	1	± 6.55 %	± 6.55 %	∞
Axial Isotropy	4.7	Rectangular	√3	0.7	0.7	±1.9%	±1.9%	∞
Hemispherical Isotropy	9.6	Rectangular	√3	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effects	2	Rectangular	√3	1	1	±1.2%	±1.2%	∞
Linearity	4.7	Rectangular	√3	1	1	±2.7%	±2.7%	∞
Detection Limits	0.25	Rectangular	√3	1	1	±0.1%	±0.1%	∞
Modulation Response	2.4	Rectangular	√3	1	1	±1.4%	±1.4%	∞
Readout Electronics	0.3	Normal	1	1	1	±0.3%	±0.3%	∞
Response Time	0.8	Rectangular	√3	1	1	±0.0%	±0.0%	∞
Integration Time	1.7	Rectangular	√3	1	1	±1.0%	±1.0%	∞
RF Ambient – Noise	3	Rectangular	√3	1	1	±1.7%	±1.7%	∞
RF Ambient – Reflections	3	Rectangular	√3	1	1	±1.7%	±1.7%	∞
Probe Positioner	0.02	Rectangular	√3	1	1	±0.2%	±0.2%	∞
Probe Positioning	0.4	Rectangular	√3	1	1	±3.9%	±3.9%	∞
Max. SAR Evaluation	4	Rectangular	√3	1	1	±2.3%	±2.3%	∞
Test Sample Related								
Device Positioning	2.1 / 2.5	Normal	1	1	1	±2.1%	±2.5%	145
Device Holder	3.3 / 2.9	Normal	1	1	1	±3.3%	±2.9%	5
Power Drift	5	Rectangular	√3	1	1	±2.9%	±2.9%	∞
Power Scaling	0	Rectangular	√3	1	1	±0.0%	±0.0%	∞
Phantom and Setup								
Phantom Uncertainty	6.6	Rectangular	√3	1	1	±3.81%	±3.81%	∞
SAR correction	1.9	Rectangular	√3	1	0.84	±1.10%	±0.92%	∞
Liquid Conductivity (Meas.)	2.4	Normal	1	0.78	0.71	±1.08%	±0.98%	∞
Liquid Permittivity (Meas.)	2.4	Normal	1	0.26	0.26	±0.36%	±0.36%	∞
Temp. unc. - Conductivity	3.4	Rectangular	√3	0.78	0.71	±1.53%	±1.4%	∞
Temp. unc. - Permittivity	0.4	Rectangular	√3	0.23	0.26	±0.05%	±0.06%	∞
Combined Standard Uncertainty (K = 1)						±12.09%	±12.02%	361
Expanded Uncertainty (K = 2)						±24.18%	±24.05%	

Uncertainty budget for frequency range 3 GHz to 6 GHz

Per KDB865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. The equivalent ratio (1.5/1.6) is applied to extremity and occupational exposure conditions.

4. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR §2.1093, IEEE STD 1528-2013, the following FCC Published RF exposure KDB procedures & manufacturer KDB inquiries:

- KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- KDB 865664 D02 RF Exposure Reporting v01r02
- KDB 447498 D01 General RF Exposure Guidance v06
- KDB 447498 D02 SAR Procedures for Dongle Xmtr v02r01

In addition to the above, the following information was used:

- TCB workshop October, 2014; Page 36, RF Exposure Procedures Update (Overlapping LTE Bands)
- TCB workshop October, 2014; Page 37, LTE Considerations (LTE Band 41 Test Channels)

5. RF Exposure Limits

5.1 Uncontrolled Environment

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

5.2 Controlled Environment

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). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. The exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	8.0	20.0

Limits for General Population/Uncontrolled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	1.6	4.0

Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1 gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is average over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

6. SAR Measurement System

6.1 Definition of Specific Absorption Rate (SAR)

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

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

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

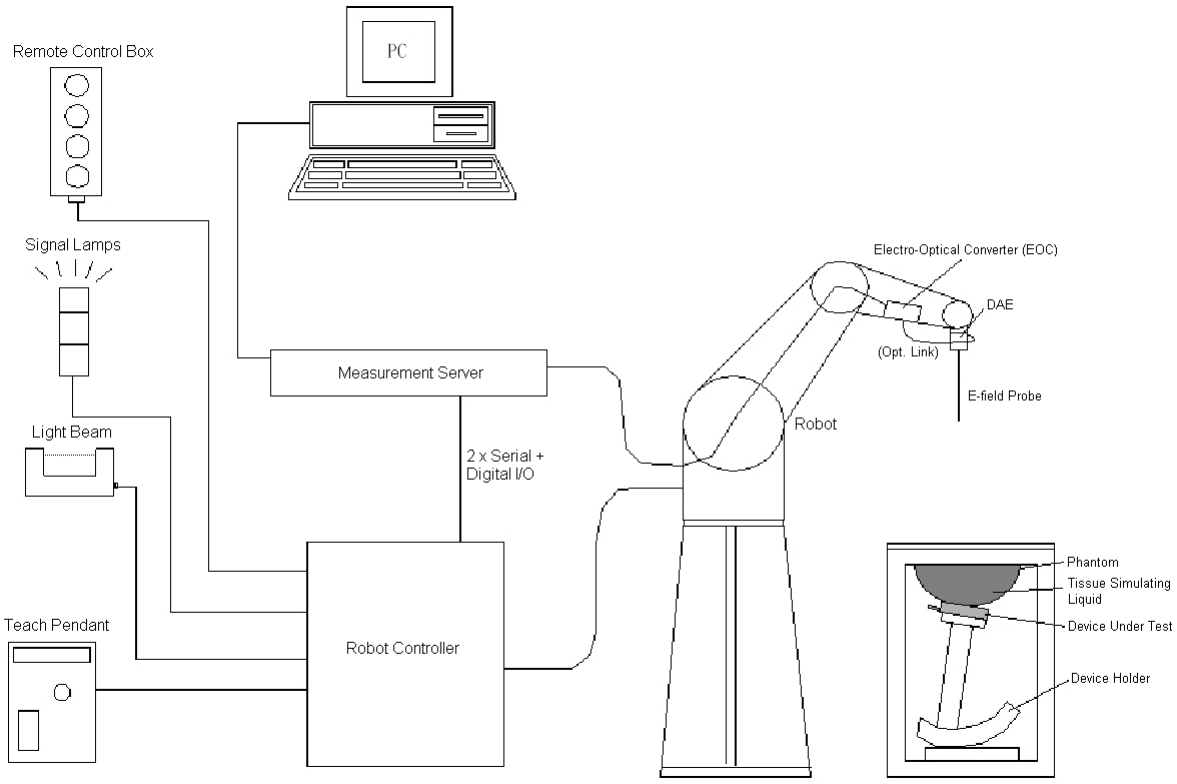
SAR is expressed in units of Watts per kilogram (W/kg)
SAR measurement can be related to the electrical field in the tissue by

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

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

6.2 SPEAG DASY System

DASY system consists of high precision robot, probe alignment sensor, phantom, robot controller, controlled measurement server and near-field probe. The robot includes six axes that can move to the precision position of the DASY5 software defined. The DASY software can define the area that is detected by the probe. The robot is connected to controlled box. Controlled measurement server is connected to the controlled robot box. The DAE includes amplifier, signal multiplexing, AD converter, offset measurement and surface detection. It is connected to the Electro-optical coupler (ECO). The ECO performs the conversion form the optical into digital electric signal of the DAE and transfers data to the PC.



DASY System Setup

6.2.1 Robot

The DASY system uses the high precision robots from Stäubli SA (France). For the 6-axis controller system, the robot controller version (DASY5: CS8c) from Stäubli is used. The Stäubli robot series have many features that are important for our application:

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

DASY5

6.2.2 Probes

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

Model	EX3DV4
Construction	Symmetrical design with triangular core. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE).
Frequency	10 MHz to 6 GHz Linearity: ± 0.2 dB
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 µW/g to 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 µW/g)
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm

6.2.3 Data Acquisition Electronics (DAE)

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

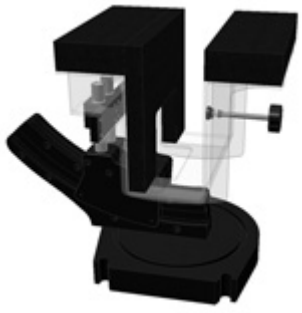
6.2.4 Phantoms

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

Model	ELI	
Construction	Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.	
Material	Vinylester, glass fiber reinforced (VE-GF)	
Shell Thickness	2.0 ± 0.2 mm (bottom plate)	
Dimensions	Major axis: 600 mm Minor axis: 400 mm	
Filling Volume	approx. 30 liters	

6.2.5 Device Holder

Model	Mounting Device	
Construction	In combination with the Twin SAM Phantom or ELI4, the Mounting Device enables the rotation of the mounted transmitter device in spherical coordinates. Rotation point is the ear opening point. Transmitter devices can be easily and accurately positioned according to IEC, IEEE, FCC or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat).	
Material	POM	

Model	Laptop Extensions Kit	
Construction	Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices according to IEC 62209-2 (e.g., laptops, cameras, etc.). It is lightweight and fits easily on the upper part of the Mounting Device in place of the phone positioner.	
Material	POM, Acrylic glass, Foam	

6.2.6 System Validation Dipoles

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

6.2.7 Tissue Simulating Liquids

For SAR measurement of the field distribution inside the phantom, the phantom must be filled with homogeneous tissue simulating liquid to a depth of at least 15 cm. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm. The nominal dielectric values of the tissue simulating liquids in the phantom and the tolerance of 5% are listed.

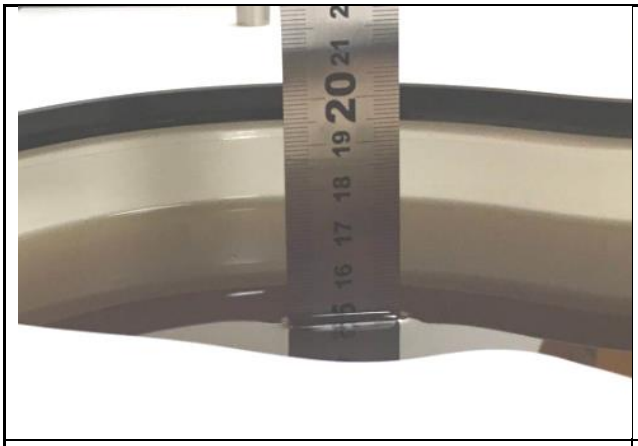
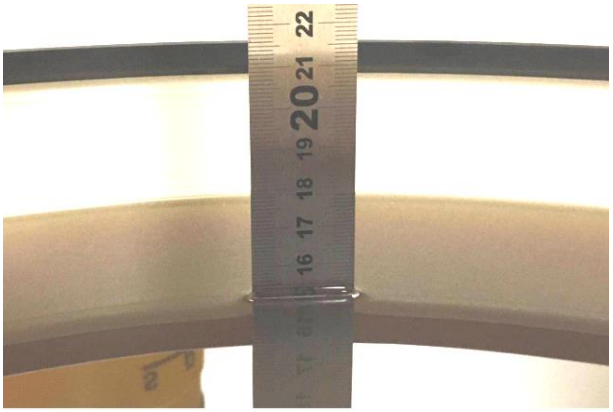
	

Photo of Liquid Height for Head Position	Photo of Liquid Height for Body Position

The dielectric properties of the head tissue simulating liquids are defined in IEEE 1528, and KDB 865664 D01 Appendix A. For the body tissue simulating liquids, the dielectric properties are defined in KDB 865664 D01 Appendix A. The dielectric properties of the tissue simulating liquids were verified prior to the SAR evaluation using a dielectric assessment kit and a network analyzer.

Targets of Tissue Simulating Liquid

Frequency (MHz)	Target Permittivity	Range of ±5%	Target Conductivity	Range of ±5%
For Head				
750	41.9	39.8 ~ 44.0	0.89	0.85 ~ 0.93
835	41.5	39.4 ~ 43.6	0.90	0.86 ~ 0.95
900	41.5	39.4 ~ 43.6	0.97	0.92 ~ 1.02
1450	40.5	38.5 ~ 42.5	1.20	1.14 ~ 1.26
1640	40.3	38.3 ~ 42.3	1.29	1.23 ~ 1.35
1750	40.1	38.1 ~ 42.1	1.37	1.30 ~ 1.44
1800	40.0	38.0 ~ 42.0	1.40	1.33 ~ 1.47
1900	40.0	38.0 ~ 42.0	1.40	1.33 ~ 1.47
2000	40.0	38.0 ~ 42.0	1.40	1.33 ~ 1.47
2300	39.5	37.5 ~ 41.5	1.67	1.59 ~ 1.75
2450	39.2	37.2 ~ 41.2	1.80	1.71 ~ 1.89
2600	39.0	37.1 ~ 41.0	1.96	1.86 ~ 2.06
3500	37.9	36.0 ~ 39.8	2.91	2.76 ~ 3.06
5200	36.0	34.2 ~ 37.8	4.66	4.43 ~ 4.89
5300	35.9	34.1 ~ 37.7	4.76	4.52 ~ 5.00
5500	35.6	33.8 ~ 37.4	4.96	4.71 ~ 5.21
5600	35.5	33.7 ~ 37.3	5.07	4.82 ~ 5.32
5800	35.3	33.5 ~ 37.1	5.27	5.01 ~ 5.53
For Body				
750	55.5	52.7 ~ 58.3	0.96	0.91 ~ 1.01
835	55.2	52.4 ~ 58.0	0.97	0.92 ~ 1.02
900	55.0	52.3 ~ 57.8	1.05	1.00 ~ 1.10
1450	54.0	51.3 ~ 56.7	1.30	1.24 ~ 1.37
1640	53.8	51.1 ~ 56.5	1.40	1.33 ~ 1.47
1750	53.4	50.7 ~ 56.1	1.49	1.42 ~ 1.56
1800	53.3	50.6 ~ 56.0	1.52	1.44 ~ 1.60
1900	53.3	50.6 ~ 56.0	1.52	1.44 ~ 1.60
2000	53.3	50.6 ~ 56.0	1.52	1.44 ~ 1.60
2300	52.9	50.3 ~ 55.5	1.81	1.72 ~ 1.90
2450	52.7	50.1 ~ 55.3	1.95	1.85 ~ 2.05
2600	52.5	49.9 ~ 55.1	2.16	2.05 ~ 2.27
3500	51.3	48.7 ~ 53.9	3.31	3.14 ~ 3.48
5200	49.0	46.6 ~ 51.5	5.30	5.04 ~ 5.57
5300	48.9	46.5 ~ 51.3	5.42	5.15 ~ 5.69
5500	48.6	46.2 ~ 51.0	5.65	5.37 ~ 5.93
5600	48.5	46.1 ~ 50.9	5.77	5.48 ~ 6.06
5800	48.2	45.8 ~ 50.6	6.00	5.70 ~ 6.30

7. SAR Measurement Procedure

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

(a) Power reference measurement
(b) Area scan
(c) Zoom scan
(d) Power drift measurement

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

(a) Make EUT to transmit maximum output power
(b) Measure conducted output power through RF cable
(c) Place the EUT in the specific position of phantom
(d) Perform SAR testing steps on the DASY system
(e) Record the SAR value

7.1 Area & Zoom Scan Procedure

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g. According to KDB 865664 D01, the resolution for Area and Zoom scan is specified in the table below.

Items	≤ 2GHz	2-3 GHz	3-4 GHz	4-5 GHz	5-6 GHz
Area Scan (Δx, Δy)	≦15mm	≦12 mm	≦12 mm	≦10 mm	≦10 mm
Zoom Scan (Δx, Δy)	≦8 mm	≦5 mm	≦5 mm	≦4 mm	≦4 mm
Zoom Scan (Δz)	≦5 mm	≦5 mm	≦4 mm	≦3 mm	≦2 mm
Zoom Scan Volume	≧30 mm	≧30 mm	≧28 mm	≧25 mm	≧22 mm

Note:
When zoom scan is required and report SAR is ≦1.4 W/kg, the zoom scan resolution of Δx / Δy (2-3 GHz): ≦8 mm, 3-4 GHz: ≦7 mm, 4-6 GHz: ≦5 mm) may be applied.

7.2 Volume Scan Procedure

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

7.3 Power Drift Monitoring

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

7.4 Spatial Peak SAR Evaluation

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

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

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

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

7.5 SAR Averaged Methods

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

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

8. SAR Measurement Evaluation

8.1 EUT Configuration and Setting

<Connections between EUT and System Simulator>

For WWAN SAR testing, the EUT was linked and controlled by base station emulator (R&S_CMW500). Communication between the EUT and the emulator was established by air link. The distance between the EUT and the communicating antenna of the emulator is larger than 50 cm and the output power radiated from the emulator antenna is at least 30 dB smaller than the output power of EUT. The EUT was set from the emulator to radiate maximum output power during SAR testing.

<Considerations Related to LTE for Setup and Testing>

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

EUT Supported LTE Band and Channel Bandwidth						
LTE Band	BW 1.4 MHz	BW 3 MHz	BW 5 MHz	BW 10 MHz	BW 15 MHz	BW 20 MHz
2	V	V	V	V	V	V
4	V	V	V	V	V	V
5	V	V	V	V		
12	V	V	V	V		
13			V	V		
25	V	V	V	V	V	V
26	V	V	V	V	V	
66	V	V	V	V	V	V

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

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

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

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

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

8.2 EUT Testing Position

According to KDB 648474 D02, the EUT is tested for SAR compliance in the use configurations described in the following subsections.

8.2.1 Body Exposure Conditions

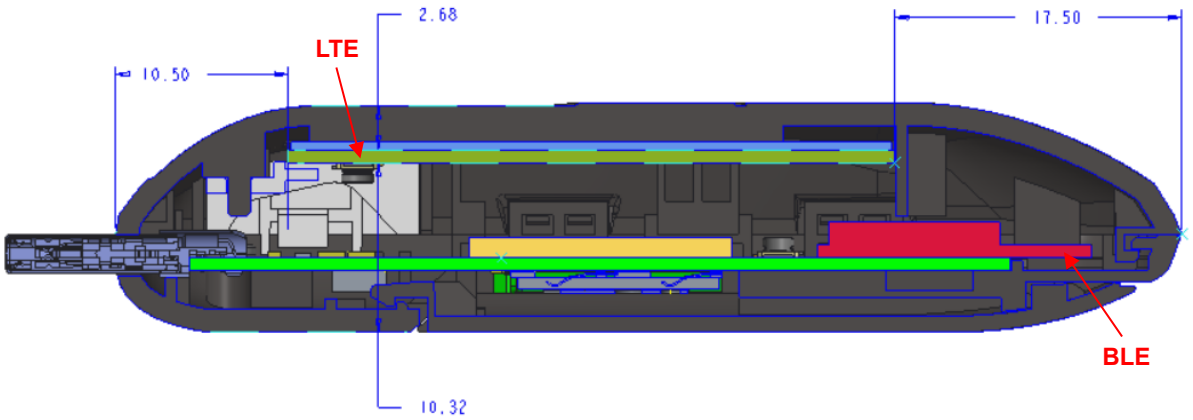
<Simple Dongle Procedures>

For USB dongle transmitter, according to KDB 447498 D02, SAR evaluation is required for all USB orientations illustrated as below with a device-to-phantom separation distance of 5 mm or less. The typical Horizontal-Up USB connection, found in the majority of host computers, must be tested using an appropriate host computer. A host computer with either Vertical-Front or Vertical-Back USB connection should be used to test one of the vertical USB orientations. If a suitable host computer is not available for testing the Horizontal-Down or the remaining Vertical USB orientation, a high quality USB cable, 12 inches or less, may be used for testing these other orientations.

			
USB Orientation 1 (Horizontal-Up)	USB Orientation 2 (Horizontal-Down)	USB Orientation 3 (Vertical-Front)	USB Orientation 4 (Vertical-Back)

Illustration for USB Connector Orientations

8.2.2 Antenna Location



8.2.3 SAR Test Exclusion Evaluations

According to KDB 447498 D01, the SAR test exclusion condition is based on source-based time-averaged maximum conducted output power, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions. The SAR exclusion threshold is determined by the following formula.

$$\frac{\mathbf{Max.\,Tune\ up\ Power_{(mW)}}}{\mathbf{Min.\,Test\ Separation\ Distance_{(mm)}}} \times \sqrt{\mathbf{f_{(GHz)}}} \leq \mathbf{3.0\ for\ SAR\text{-}1g,\ \leq 7.5\ for\ SAR\text{-}10g}$$

When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Antennas ≦ 50mm to edges (100MHz~6G)						
Radio	Frq. (MHz)	Tune-up Power		Separation distances (mm)	Calculated Threshold	
		dBm	mW		Result	limit
BLE	2402	3.94	2.477	5	0.768	3
Test Requirement (Yes/No)					NO	

Note:

1. When separation distance <= 50 mm and the calculated result shown in above table is <= 3.0 for SAR-1g exposure condition, or <= 7.5 for SAR-10g exposure condition, the SAR testing exclusion is applied.

8.3 Simultaneous Transmission Possibilities

The simultaneous transmission possibilities for this device are listed as below.

Simultaneous TX Combination	Capable Transmit Configurations	Body Exposure Condition
1	Cat-M1 Band 2 + BLE	Yes
2	Cat-M1 Band 4 + BLE	Yes
3	Cat-M1 Band 5 + BLE	Yes
4	Cat-M1 Band 12 + BLE	Yes
5	Cat-M1 Band 13 + BLE	Yes
10	Cat-M1 Band 25 + BLE	Yes
11	Cat-M1 Band 26 + BLE	Yes
12	Cat-M1 Band 66 + BLE	Yes
13	NB-IoT Band 2 + BLE	Yes
14	NB-IoT Band 4 + BLE	Yes
15	NB-IoT Band 5 + BLE	Yes
16	NB-IoT Band 12 + BLE	Yes
17	NB-IoT Band 13 + BLE	Yes
18	NB-IoT Band 17 + BLE	Yes
19	NB-IoT Band 25 + BLE	Yes
20	NB-IoT Band 26 + BLE	Yes
21	NB-IoT Band 66 + BLE	Yes

8.4 Tissue Verification

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine of the dielectic parameter are within the tolerances of the specified target values. The measured conductivity and relative permittivity should be within ± 5% of the target values.

The following materials are used for producing the tissue-equivalent materials.

Recipes of Tissue Simulating Liquid

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

Salt: 99+% Pure Sodium Chloride; Sugar: 98+% Pure Sucrose; Water: De-ionized, 16M +resistivity
HEC: Hydroxyethyl Cellulose; DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy) ethanol];
Triton X-100 (ultra pure): Polyethylene glycol mono [4-(1,1,3,3-tetramethylbutyl) phenyl]ether.

The measuring results for tissue simulating liquid are shown as below.

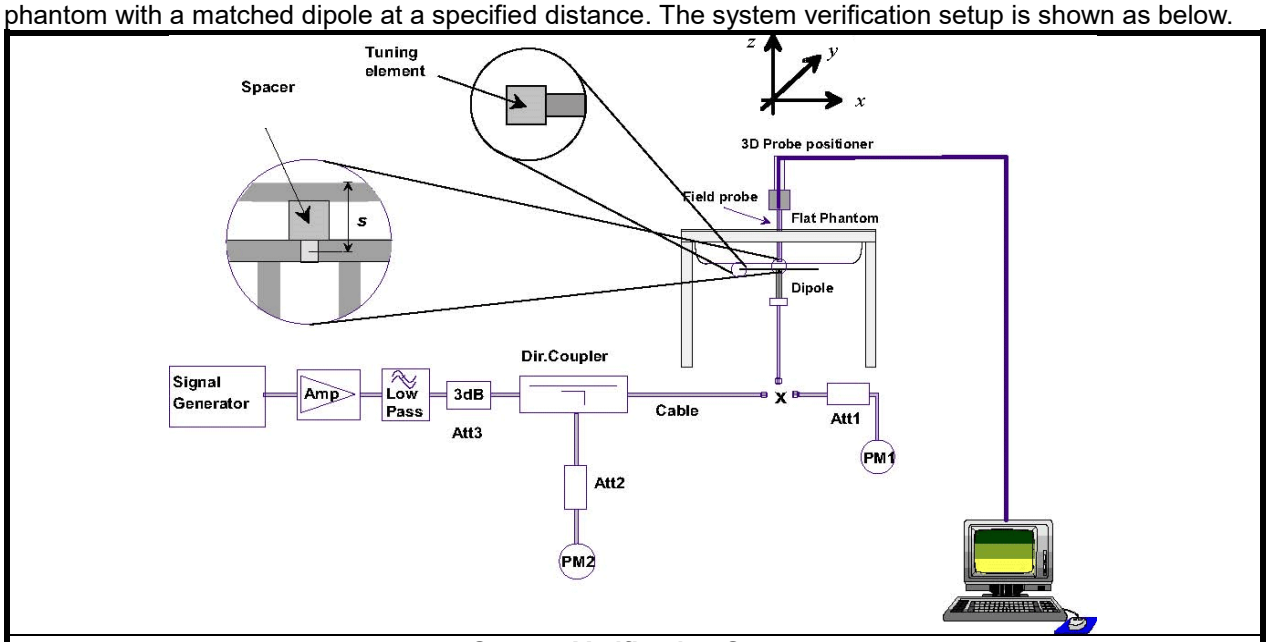
Test Date	Tissue Type	Frequency (MHz)	Measured Conductivity (σ)	Measured Permittivity (ε_r)	Target Conductivity (σ)	Target Permittivity (ε_r)	Conductivity Deviation (%)	Permittivity Deviation (%)
Head	750	0.903	41.769	0.89	41.9	1.46	-0.31	Jul. 29, 2021
Head	750	0.905	42.477	0.89	41.9	1.69	1.38	Aug. 07, 2021
Head	835	0.889	42.158	0.90	41.5	-1.22	1.59	Jul. 29, 2021
Head	835	0.889	42.178	0.90	41.5	-1.22	1.63	Aug. 07, 2021
Head	1800	1.386	40.808	1.40	40.0	-1.00	2.02	Jul. 26, 2021
Head	1900	1.384	38.825	1.40	40.0	-1.14	-2.94	Jul. 26, 2021

Note:
The dielectric properties of the tissue simulating liquid must be measured within 24 hours before the SAR testing and within ±5% of the target values. Liquid temperature during the SAR testing must be within ±2 ℃.

8.5 System Validation

System check Procedure

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



System Verification Setup

The validation dipole is placed beneath the flat phantom with the specific spacer in place. The distance spacer is touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The spectrum analyzer measures the forward power at the location of the system check dipole connector. The signal generator is adjusted for the desired forward power (250 mW is used for 700 MHz to 3 GHz, 100 mW is used for 3.5 GHz to 6 GHz) at the dipole connector and the power meter is read at that level. After connecting the cable to the dipole, the signal generator is readjusted for the same reading at power meter.

After system check testing, the SAR result will be normalized to 1W forward input power and compared with the reference SAR value derived from validation dipole certificate report. The deviation of system check should be within 10 %.

8.6 System Verification

The measuring results for system check are shown as below.

Test Date	Frequency (MHz)	1W Target SAR-1g (W/kg)	Measured SAR-1g (W/kg)	Normalized to 1W SAR-1g (W/kg)	Deviation (%)	Dipole S/N	Probe S/N	DAE S/N
Jul. 29, 2021	750	8.46	1.98	7.92	-6.38	1199	7400	855
Aug. 07, 2021	750	8.46	1.99	7.96	-5.91	1199	7400	855
Jul. 29, 2021	835	9.74	2.45	9.80	0.62	4d058	7400	855
Aug. 07, 2021	835	9.74	2.49	9.96	2.26	4d058	7400	855
Jul. 26, 2021	1800	38.60	9.40	37.60	-2.59	2d156	7400	855
Jul. 26, 2021	1900	40.10	10.00	40.00	-0.25	5d090	7400	855

Note:
Comparing to the reference SAR value provided by SPEAG, the validation data should be within its specification of 10 %. The result indicates the system check can meet the variation criterion and the plots can be referred to Appendix A of this report.

8.7 Maximum Output Power

8.7.1 Measured Conducted Power Result

All Rate have been tested, the Worst average power (Unit: dBm) is shown as below.

<LTE Cat-M1>

LTE Cat-M1 B2/BW=1.4M				Average Conducted Power (dBm)				LTE Cat-M1 B2/BW=3M				Average Conducted Power (dBm)			
					Channel/Frequency(MHz)								Channel/Frequency(MHz)		
Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	18607/ 1850.7	18900/ 1880	19193/ 1909.3	Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	18615/ 1851.5	18900/ 1880	19185/ 1908.5
QPSK	1	0	0	23.50	23.43	23.40	23.20	QPSK	1	0	0	24.00	23.38	23.30	23.21
	1	5	0	23.50	23.41	23.35	23.14		1	5	1	24.00	23.41	23.26	23.19
	3	0	0	22.50	22.45	22.42	22.32		3	0	0	24.00	22.48	22.43	22.26
	3	3	0	22.50	22.48	22.49	22.35		3	3	1	24.00	22.51	23.32	22.31
	6	0	0	22.00	21.58	21.47	21.44		6	0	0	21.50	21.42	21.42	21.35
									6	0	1	21.50	21.48	21.43	21.36
16QAM	1	0	0	22.50	22.47	22.42	22.48	16QAM	1	0	0	23.00	22.72	22.39	22.28
	1	4	0	22.50	22.42	22.50	22.48		1	4	1	23.00	22.61	22.23	22.19
	3	0	0	22.00	21.51	21.44	21.39		3	0	0	22.00	21.54	21.46	21.38
	3	2	0	22.00	21.48	21.48	21.45		3	2	1	21.50	21.48	21.37	21.28
	5	0	0	22.00	21.52	21.36	21.46		5	0	0	21.50	21.48	21.32	21.23
									5	0	1	21.50	21.46	21.44	21.34
LTE Cat-M1 B2/BW=5M				Average Conducted Power (dBm)				LTE Cat-M1 B2/BW=10M				Average Conducted Power (dBm)			
					Channel/Frequency(MHz)								Channel/Frequency(MHz)		
Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	18625/ 1852.5	18900/ 1880	19175/ 1907.5	Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	18650/ 1855	18900/ 1880	19150/ 1905
QPSK	1	0	0	24.00	23.34	23.33	23.15	QPSK	1	0	0	24.00	23.38	23.56	23.16
	1	0	3	24.00	23.29	23.23	23.10		1	0	3	24.00	23.34	23.51	23.15
	1	5	0	24.00	23.34	23.32	23.08		1	5	4	24.00	23.38	23.24	23.13
	1	5	3	24.00	23.32	23.39	23.12		1	5	7	24.00	23.40	23.25	23.10
	3	0	0	24.00	22.46	22.45	22.21		3	0	0	24.00	23.50	23.51	23.29
	3	3	3	24.00	22.48	22.39	22.25		3	3	7	24.00	23.47	23.49	23.29
	6	0	0	23.50	22.50	22.37	22.32		6	0	0	23.50	22.37	22.41	22.25
	6	0	3	23.50	22.47	22.41	22.26		6	0	7	23.50	22.38	22.38	22.21
16QAM	1	0	0	23.00	22.68	22.53	22.41	16QAM	1	0	0	23.00	22.71	22.42	22.33
	1	0	3	23.00	22.71	22.57	22.28		1	0	3	23.00	22.73	22.50	22.28
	1	4	0	23.00	22.72	22.66	22.45		1	4	4	23.00	22.75	22.59	22.44
	1	4	3	23.00	22.76	22.62	22.47		1	4	7	23.00	22.65	22.52	22.45
	3	0	0	23.00	22.58	22.53	22.43		3	0	0	23.00	22.59	22.55	22.50
	3	2	3	23.00	22.67	22.57	22.49		3	2	7	23.00	22.63	22.61	22.52
	5	0	0	22.00	21.42	21.45	21.31		5	0	0	22.50	22.41	22.48	22.31
	5	0	3	22.00	21.58	21.31	21.12		5	0	7	22.50	22.44	22.42	22.35
LTE Cat-M1 B2/BW=15M				Average Conducted Power (dBm)				LTE Cat-M1 B2/BW=20M				Average Conducted Power (dBm)			
					Channel/Frequency(MHz)								Channel/Frequency(MHz)		
Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	18675/ 1857.5	18900/ 1880	19125/ 1902.5	Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	18700/ 1860	18900/ 1880	19100/ 1900
QPSK	1	0	0	24.00	23.32	23.22	23.13	QPSK	1	0	0	24.00	23.55	23.74	23.46
	1	0	3	24.00	23.31	23.25	23.08		1	0	3	24.00	23.51	23.61	23.42
	1	5	8	24.00	23.34	23.18	23.09		1	5	12	24.00	23.45	23.58	23.39
	1	5	11	24.00	23.27	23.21	23.04		1	5	15	24.00	23.47	23.54	23.43
	3	0	0	24.00	23.53	23.33	23.33		3	0	0	24.00	23.56	23.71	23.54
	3	3	11	24.00	23.41	23.39	23.19		3	3	15	24.00	23.53	23.63	23.46
	6	0	0	23.50	23.50	23.34	23.32		6	0	0	23.50	23.45	23.50	23.44
	6	0	11	23.50	23.45	23.26	23.16		6	0	15	23.50	23.41	23.35	23.41
16QAM	1	0	0	23.00	22.55	22.28	22.22	16QAM	1	0	0	23.00	22.55	22.65	22.49
	1	0	3	23.00	22.59	22.68	22.46		1	0	3	23.00	22.50	22.55	22.37
	1	4	8	23.00	22.68	22.65	22.51		1	4	12	23.00	22.45	22.46	22.47
	1	4	11	23.00	22.73	22.53	22.56		1	4	15	23.00	22.52	22.53	22.44
	3	0	0	23.00	22.62	22.56	22.32		3	0	0	23.00	22.56	22.53	22.39
	3	2	11	23.00	22.64	22.58	22.46		3	2	15	23.00	22.61	22.59	22.47
	5	0	0	22.50	22.49	22.45	22.41		5	0	0	23.00	22.52	22.45	22.39
	5	0	11	22.50	22.43	22.48	22.37		5	0	15	23.00	22.41	22.44	22.32

LTE Cat-M1 B4/BW=1.4M				Average Conducted Power (dBm)				LTE Cat-M1 B4/BW=3M				Average Conducted Power (dBm)			
Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)			Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)		
					19957/ 1710.7	20175/ 1732.5	20393/ 1754.3						19965/ 1711.5	20175/ 1732.5	20385/ 1753.5
QPSK	1	0	0	23.50	23.12	23.22	23.35	QPSK	1	0	0	23.50	23.08	23.25	23.34
	1	5	0	23.50	23.10	23.19	23.32		1	5	1	23.50	23.14	23.27	23.42
	3	0	0	22.50	22.15	22.31	22.47		3	0	0	23.50	22.24	22.37	22.46
	3	3	0	22.50	22.22	22.33	22.39		3	3	1	23.50	22.25	22.39	22.50
	6	0	0	22.00	21.26	21.30	21.50		6	0	0	21.50	21.32	21.40	21.47
									6	0	1	21.50	21.33	21.42	21.45
16QAM	1	0	0	23.00	22.34	22.48	22.56	16QAM	1	0	0	23.00	22.31	22.36	22.56
	1	4	0	23.00	22.43	22.51	22.55		1	4	1	23.00	22.39	22.52	22.65
	3	0	0	22.00	21.24	21.37	21.52		3	0	0	22.00	21.24	21.37	21.44
	3	2	0	21.50	21.26	21.42	21.43		3	2	1	22.00	21.28	21.44	21.56
	5	0	0	21.50	21.25	21.40	21.46		5	0	0	22.00	21.22	21.32	21.45
									5	0	1	21.50	21.28	21.44	21.41

LTE Cat-M1 B4/BW=5M				Average Conducted Power (dBm)				LTE Cat-M1 B4/BW=10M				Average Conducted Power (dBm)			
Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)			Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)		
					19975/ 1712.5	20175/ 1732.5	20375/ 1752.5						20000/ 1715	20175/ 1732.5	20350/ 1750
QPSK	1	0	0	23.50	23.10	23.22	23.35	QPSK	1	0	0	23.50	23.16	23.27	23.42
	1	0	3	23.50	23.08	23.26	23.31		1	0	3	23.50	23.22	23.33	23.41
	1	5	0	23.50	23.11	23.24	23.34		1	5	4	23.50	23.18	23.31	23.38
	1	5	3	23.50	23.13	23.29	23.38		1	5	7	23.50	23.20	23.49	23.46
	3	0	0	23.50	22.20	22.42	22.45		3	0	0	23.50	23.23	23.38	23.42
	3	3	3	23.50	22.21	22.41	22.47		3	3	7	23.50	23.26	23.43	23.47
	6	0	0	23.50	22.14	22.31	22.57		6	0	0	23.50	22.27	22.34	22.52
	6	0	3	23.50	22.18	22.34	22.51		6	0	7	23.50	22.30	22.35	22.53
16QAM	1	0	0	23.00	22.55	22.54	22.69	16QAM	1	0	0	23.00	22.57	22.44	22.61
	1	0	3	23.00	22.59	22.57	22.66		1	0	3	23.00	22.48	22.52	22.73
	1	4	0	23.00	22.56	22.56	22.67		1	4	4	23.00	22.52	22.68	22.82
	1	4	3	23.00	22.58	22.60	22.71		1	4	7	23.00	22.58	22.71	22.71
	3	0	0	22.50	22.35	22.35	22.40		3	0	0	22.50	22.38	22.46	22.48
	3	2	3	23.00	22.43	22.44	22.57		3	2	7	23.00	22.45	22.62	22.64
	5	0	0	23.00	21.33	21.25	21.48		5	0	0	23.00	22.24	22.38	22.58
	5	0	3	23.00	21.26	21.30	21.52		5	0	7	23.00	22.37	22.50	22.56

LTE Cat-M1 B4/BW=15M				Average Conducted Power (dBm)				LTE Cat-M1 B4/BW=20M				Average Conducted Power (dBm)			
Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)			Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)		
					20025/ 1717.5	20175/ 1732.5	20325/ 1747.5						20050/ 1720	20175/ 1732.5	20300/ 1745
QPSK	1	0	0	23.50	23.18	23.29	23.38	QPSK	1	0	0	24.00	23.42	23.58	23.53
	1	0	3	23.50	23.21	23.31	23.39		1	0	3	24.00	23.41	23.53	23.47
	1	5	8	23.50	23.32	23.38	23.44		1	5	12	24.00	23.31	23.38	23.36
	1	5	11	23.50	23.28	23.37	23.43		1	5	15	24.00	23.33	23.45	23.42
	3	0	0	23.50	23.19	23.28	23.47		3	0	0	24.00	23.27	23.58	23.54
	3	3	11	23.50	23.38	23.43	23.46		3	3	15	24.00	23.36	23.57	23.50
	6	0	0	23.50	23.26	23.36	23.50		6	0	0	24.00	23.21	23.38	23.33
	6	0	11	23.50	23.43	23.41	23.45		6	0	15	24.00	23.37	23.55	23.51
16QAM	1	0	0	23.00	22.37	22.45	22.55	16QAM	1	0	0	23.00	22.43	22.48	22.58
	1	0	3	23.00	22.43	22.57	22.67		1	0	3	23.00	22.41	22.53	22.64
	1	4	8	23.00	22.57	22.67	22.81		1	4	12	23.00	22.51	22.73	22.77
	1	4	11	23.00	22.66	22.76	22.76		1	4	15	23.00	22.54	22.69	22.68
	3	0	0	22.50	22.39	22.37	22.49		3	0	0	23.00	22.34	22.40	22.52
	3	2	11	23.00	22.54	22.68	22.73		3	2	15	23.00	22.44	22.71	22.69
	5	0	0	23.00	22.33	22.41	22.51		5	0	0	23.00	22.30	22.39	22.47
	5	0	11	23.00	22.48	22.53	22.65		5	0	15	23.00	22.47	22.45	22.53

LTE Cat-M1 B5/BW=1.4M				Average Conducted Power (dBm)				LTE Cat-M1 B5/BW=3M				Average Conducted Power (dBm)			
Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)			Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)		
					20407/ 824.7	20525/ 836.5	20643/ 848.3						20415/ 825.5	20525/ 836.5	20635/ 847.5
QPSK	1	0	0	23.50	23.21	23.19	23.22	QPSK	1	0	0	23.50	23.16	23.21	23.25
	1	5	0	23.50	23.23	23.23	23.26		1	5	1	23.50	23.34	23.18	23.23
	3	0	0	22.50	22.33	22.34	22.26		3	0	0	22.50	22.37	22.42	22.30
	3	3	0	22.50	22.35	22.38	22.37		3	3	1	22.50	22.36	22.29	22.32
	6	0	0	21.50	21.38	21.33	21.39		6	0	0	21.50	21.48	21.37	21.39
									6	0	1	21.50	21.47	21.43	21.42
16QAM	1	0	0	22.50	22.42	22.36	22.43	16QAM	1	0	0	22.50	22.36	22.41	22.37
	1	4	0	22.50	22.47	22.50	22.46		1	4	1	22.50	22.40	22.32	22.44
	3	0	0	21.50	21.34	21.42	21.41		3	0	0	22.00	21.42	21.43	21.28
	3	2	0	21.50	21.32	21.43	21.39		3	2	1	22.00	21.54	21.46	21.30
	5	0	0	21.50	21.41	21.32	21.30		5	0	0	21.50	21.35	21.42	21.34
									5	0	1	21.50	21.33	21.29	21.32

LTE Cat-M1 B5/BW=5M				Average Conducted Power (dBm)				LTE Cat-M1 B5/BW=10M				Average Conducted Power (dBm)			
Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)			Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)		
					20425/ 826.5	20525/ 836.5	20625/ 846.5						20450/ 829	20525/ 836.5	20600/ 844
QPSK	1	0	0	23.50	23.20	23.22	23.29	QPSK	1	0	0	23.50	23.37	23.48	23.27
	1	0	3	23.50	23.25	23.21	23.27		1	0	3	23.50	23.32	23.37	23.26
	1	5	0	23.50	23.15	23.24	23.30		1	5	4	23.50	23.33	23.29	23.27
	1	5	3	23.50	23.32	23.13	23.24		1	5	7	23.50	23.26	23.27	23.28
	3	0	0	22.50	22.39	22.38	22.31		3	0	0	23.50	23.36	23.45	23.37
	3	3	3	22.50	22.36	22.36	22.32		3	3	7	23.50	23.35	23.36	23.35
	6	0	0	22.50	22.38	22.39	22.34		6	0	0	22.50	22.31	22.46	22.34
	6	0	3	22.50	22.35	22.37	22.33		6	0	7	22.50	22.32	22.38	22.30
16QAM	1	0	0	23.50	23.27	23.18	23.29	16QAM	1	0	0	23.50	23.20	23.35	23.19
	1	0	3	23.50	23.24	23.33	23.26		1	0	3	23.50	23.18	23.26	23.13
	1	4	0	23.50	23.26	23.27	23.42		1	4	4	23.50	23.26	23.13	23.18
	1	4	3	23.50	23.33	23.32	23.38		1	4	7	23.50	23.30	23.22	23.21
	3	0	0	23.00	22.52	22.52	22.37		3	0	0	23.50	23.24	23.22	23.23
	3	2	3	23.00	22.53	22.48	22.52		3	2	7	23.50	23.14	23.13	23.18
	5	0	0	22.00	21.33	21.39	21.29		5	0	0	22.50	22.45	22.45	22.37
	5	0	3	22.00	21.29	21.33	21.33		5	0	7	22.50	22.42	22.41	22.34

LTE Cat-M1 B12/BW=1.4M				Average Conducted Power (dBm)				LTE Cat-M1 B12/BW=3M				Average Conducted Power (dBm)			
Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)			Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)		
					23017/ 699.7	23095/ 707.5	23173/ 715.3						23025/ 700.5	23095/ 707.5	23165/ 714.5
QPSK	1	0	0	23.50	23.36	23.44	23.33	QPSK	1	0	0	23.50	23.26	23.39	23.28
	1	5	0	23.50	23.37	23.41	23.30		1	5	1	23.50	23.32	23.42	23.34
	3	0	0	23.00	22.54	22.58	22.52		3	0	0	23.00	22.54	22.52	22.41
	3	3	0	22.50	22.48	22.48	22.46		3	3	1	22.50	22.47	22.42	22.37
	6	0	0	22.00	21.43	21.53	21.48		6	0	0	22.00	21.43	21.54	21.39
									6	0	1	22.00	21.42	21.55	21.36
16QAM	1	0	0	23.00	22.55	22.63	22.47	16QAM	1	0	0	23.00	22.39	22.62	22.49
	1	4	0	23.00	22.53	22.70	22.43		1	4	1	23.00	22.46	22.50	22.43
	3	0	0	21.50	21.44	21.50	21.42		3	0	0	22.00	21.57	21.46	21.44
	3	2	0	21.50	21.46	21.43	21.49		3	2	1	22.00	21.49	21.50	21.43
	5	0	0	21.50	21.39	21.40	21.43		5	0	0	21.50	21.18	21.32	21.35
									5	0	1	21.50	21.28	21.47	21.45

LTE Cat-M1 B12/BW=5M				Average Conducted Power (dBm)				LTE Cat-M1 B12/BW=10M				Average Conducted Power (dBm)			
Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)			Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)		
					23035/ 701.5	23095/ 707.5	23155/ 713.5						23060/ 704	23095/ 707.5	23130/ 711
QPSK	1	0	0	23.50	23.31	23.41	23.29	QPSK	1	0	0	24.00	23.34	23.52	23.33
	1	0	3	23.50	23.27	23.42	23.31		1	0	3	24.00	23.38	23.37	23.31
	1	5	0	23.50	23.23	23.37	23.28		1	5	4	24.00	23.39	23.38	23.28
	1	5	3	23.50	23.25	23.34	23.24		1	5	7	24.00	23.35	23.35	23.26
	3	0	0	23.00	22.44	22.59	22.55		3	0	0	23.50	23.34	23.47	23.41
	3	3	3	23.00	22.34	22.43	22.46		3	3	7	23.50	23.42	23.41	23.40
	6	0	0	23.00	22.46	22.47	22.43		6	0	0	22.50	22.48	22.41	22.47
	6	0	3	22.50	22.41	22.41	22.36		6	0	7	22.50	22.47	22.38	22.45
16QAM	1	0	0	23.50	23.19	23.29	23.27	16QAM	1	0	0	23.50	23.24	23.28	23.30
	1	0	3	23.50	23.22	23.30	23.20		1	0	3	23.50	23.27	23.35	23.25
	1	4	0	23.50	23.45	23.37	23.31		1	4	4	23.50	23.41	23.34	23.24
	1	4	3	23.50	23.37	23.34	23.30		1	4	7	23.50	23.30	23.25	23.27
	3	0	0	23.00	22.61	22.60	22.66		3	0	0	23.50	23.27	23.27	23.31
	3	2	3	23.00	22.64	22.65	22.57		3	2	7	23.50	23.26	23.24	23.16
	5	0	0	22.00	21.54	21.57	21.48		5	0	0	23.00	22.55	22.47	22.58
	5	0	3	22.00	21.26	21.53	21.55		5	0	7	23.00	22.58	22.46	22.46

LTE Cat-M1 B13/BW=5M				Average Conducted Power (dBm)				LTE Cat-M1 B13/BW=10M				Average Conducted Power (dBm)			
Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)			Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)		
					23205/ 779.5	23230/ 782	23255/ 784.5							23230/ 782	
QPSK	1	0	0	23.50	23.28	23.26	23.28	QPSK	1	0	0	24.00		23.51	
	1	0	3	23.50	23.21	23.17	23.26		1	0	3	23.50		23.25	
	1	5	0	23.50	23.30	23.26	23.25		1	5	4	23.50		23.39	
	1	5	3	23.50	23.21	23.15	23.23		1	5	7	23.50		23.41	
	3	0	0	22.50	22.39	22.35	22.34		3	0	0	23.50		23.50	
	3	3	3	22.50	22.37	22.38	22.35		3	3	7	23.50		23.43	
	6	0	0	22.50	22.39	22.39	22.37		6	0	0	22.50		22.42	
	6	0	3	22.50	22.33	22.30	22.47		6	0	7	22.50		22.36	
16QAM	1	0	0	23.50	23.30	23.30	23.27	16QAM	1	0	0	23.50		23.21	
	1	0	3	23.50	23.26	23.29	23.32		1	0	3	23.50		23.12	
	1	4	0	23.50	23.34	23.31	23.38		1	4	4	23.50		23.30	
	1	4	3	23.50	23.29	23.24	23.41		1	4	7	23.50		23.40	
	3	0	0	22.50	22.42	22.44	22.33		3	0	0	23.50		23.16	
	3	2	3	22.50	22.49	22.45	22.41		3	2	7	23.50		23.21	
	5	0	0	21.50	21.24	21.32	21.34		5	0	0	22.50		22.46	
	5	0	3	21.50	21.16	21.23	21.47		5	0	7	22.50		22.48	

LTE Cat-M1 B25/BW=1.4M				Average Conducted Power (dBm)				LTE Cat-M1 B25/BW=3M				Average Conducted Power (dBm)			
Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)			Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)		
					26047/ 1850.7	26365/ 1882.5	26683/ 1914.3						26055/ 1851.5	26365/ 1882.5	26675/ 1913.5
QPSK	1	0	0	23.50	23.38	23.26	23.20	QPSK	1	0	0	23.50	23.47	23.31	23.13
	1	5	0	23.50	23.37	23.25	23.15		1	5	1	23.50	23.34	23.35	23.15
	3	0	0	22.50	22.43	22.37	22.31		3	0	0	22.50	22.44	22.46	22.32
	3	3	0	22.50	22.43	22.34	22.30		3	3	1	22.50	22.46	22.38	22.27
	6	0	0	22.00	21.45	21.35	21.39		6	0	0	22.00	21.59	21.47	21.30
									6	0	1	22.00	21.56	21.51	21.36
16QAM	1	0	0	22.50	22.44	22.43	22.31	16QAM	1	0	0	23.00	22.37	22.52	22.33
	1	4	0	22.50	22.43	22.47	22.33		1	4	1	22.50	22.50	22.36	22.37
	3	0	0	21.50	21.46	21.42	21.28		3	0	0	21.50	21.48	21.40	21.39
	3	2	0	21.50	21.43	21.44	21.34		3	2	1	21.50	21.42	21.45	21.32
	5	0	0	21.50	21.46	21.35	21.30		5	0	0	21.50	21.31	21.41	21.38
									5	0	1	21.50	21.44	21.48	21.36

LTE Cat-M1 B25/BW=5M				Average Conducted Power (dBm)				LTE Cat-M1 B25/BW=10M				Average Conducted Power (dBm)			
Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)			Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)		
					26065/ 1852.5	26365/ 1882.5	26665/ 1912.5						26090/ 1855	26365/ 1882.5	26640/ 1910
QPSK	1	0	0	23.50	23.38	23.25	23.09	QPSK	1	0	0	23.50	23.37	23.28	23.13
	1	0	3	23.50	23.27	23.28	23.12		1	0	3	23.50	23.26	23.32	23.10
	1	5	0	23.50	23.30	23.40	23.09		1	5	4	23.50	23.28	23.35	23.09
	1	5	3	23.50	23.28	23.39	23.17		1	5	7	23.50	23.29	23.29	23.08
	3	0	0	23.50	22.45	22.47	22.26		3	0	0	23.50	23.47	23.49	23.25
	3	3	3	23.50	22.51	22.38	22.33		3	3	7	23.50	23.45	23.44	23.17
	6	0	0	23.50	22.47	22.48	22.27		6	0	0	23.50	22.46	22.39	22.33
	6	0	3	23.50	22.45	22.46	22.28		6	0	7	23.50	22.44	22.45	22.37
16QAM	1	0	0	23.00	22.67	22.72	22.46	16QAM	1	0	0	23.00	22.49	22.59	22.43
	1	0	3	23.00	22.69	22.52	22.40		1	0	3	23.00	22.47	22.63	22.36
	1	4	0	23.00	22.73	22.63	22.51		1	4	4	23.00	22.63	22.69	22.37
	1	4	3	23.00	22.80	22.69	22.46		1	4	7	23.00	22.66	22.61	22.49
	3	0	0	23.00	22.51	22.56	22.34		3	0	0	23.00	22.52	22.37	22.30
	3	2	3	23.00	22.61	22.49	22.46		3	2	7	23.00	22.48	22.51	22.37
	5	0	0	21.50	21.39	21.40	21.27		5	0	0	22.50	22.44	22.41	22.33
	5	0	3	21.50	21.43	21.47	21.35		5	0	7	22.50	22.45	22.36	22.30

LTE Cat-M1 B25/BW=15M				Average Conducted Power (dBm)				LTE Cat-M1 B25/BW=20M				Average Conducted Power (dBm)			
Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)			Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)		
					26115/ 1857.5	26365/ 1882.5	26615/ 1907.5						26140/ 1860	26365/ 1882.5	26590/ 1905
QPSK	1	0	0	23.50	23.30	23.26	23.09	QPSK	1	0	0	24.00	23.40	23.75	23.41
	1	0	3	23.50	23.24	23.22	23.06		1	0	3	24.00	23.37	23.53	23.38
	1	5	8	23.50	23.33	23.29	23.14		1	5	12	24.00	23.35	23.39	23.37
	1	5	11	23.50	23.31	23.24	23.12		1	5	15	24.00	23.28	23.33	23.22
	3	0	0	23.50	23.42	23.44	23.25		3	0	0	24.00	23.44	23.54	23.42
	3	3	11	23.50	23.39	23.26	23.24		3	3	15	24.00	23.37	23.34	23.31
	6	0	0	23.50	23.35	23.47	23.25		6	0	0	23.50	23.38	23.29	23.27
	6	0	11	23.50	23.43	23.37	23.27		6	0	15	23.50	23.31	23.30	23.31
16QAM	1	0	0	23.00	22.53	22.59	22.38	16QAM	1	0	0	23.00	22.56	22.55	22.55
	1	0	3	23.00	22.64	22.53	22.43		1	0	3	23.00	22.58	22.52	22.38
	1	4	8	23.00	22.56	22.66	22.48		1	4	12	23.00	22.65	22.64	22.44
	1	4	11	23.00	22.62	22.62	22.44		1	4	15	23.00	22.64	22.50	22.56
	3	0	0	23.00	22.48	22.53	22.40		3	0	0	23.00	22.52	22.54	22.36
	3	2	11	23.00	22.56	22.49	22.42		3	2	15	23.00	22.54	22.56	22.40
	5	0	0	23.00	22.54	22.51	22.26		5	0	0	23.00	22.53	22.37	22.42
	5	0	11	23.00	22.53	22.42	22.31		5	0	15	23.00	22.58	22.43	22.35

LTE Cat-M1 B26/BW=1.4M				Average Conducted Power (dBm)			
Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)		
					26697/ 814.7	26865/ 831.5	27033/ 848.3
QPSK	1	0	0	23.50	23.04	23.25	23.31
	1	5	0	23.50	23.03	23.14	23.29
	3	0	0	22.50	22.10	22.39	22.29
	3	3	0	22.50	22.15	22.44	22.37
	6	0	0	21.50	21.24	21.32	21.38
16QAM	1	0	0	23.00	22.35	22.41	22.45
	1	4	0	22.50	22.34	22.38	22.37
	3	0	0	22.00	21.29	21.35	21.51
	3	2	0	22.00	21.35	21.43	21.53
	5	0	0	22.00	21.25	21.28	21.44

LTE Cat-M1 B26/BW=3M				Average Conducted Power (dBm)			
Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)		
					26705/ 815.5	26865/ 831.5	27025/ 847.5
QPSK	1	0	0	23.50	23.02	23.19	23.27
	1	5	1	23.50	23.06	23.14	23.22
	3	0	0	22.50	22.24	22.33	22.37
	3	3	1	22.50	22.23	22.32	22.32
	6	0	0	21.50	21.18	21.30	21.33
	6	0	1	21.50	21.31	21.39	21.34
16QAM	1	0	0	22.50	22.49	22.37	22.38
	1	4	1	22.50	22.34	22.26	22.24
	3	0	0	21.50	21.28	21.33	21.33
	3	2	1	21.50	21.23	21.29	21.24
	5	0	0	21.50	21.35	21.26	21.42
	5	0	1	21.50	21.25	21.35	21.36

LTE Cat-M1 B26/BW=5M				Average Conducted Power (dBm)			
Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)		
					26715/ 816.5	26865/ 831.5	27015/ 846.5
QPSK	1	0	0	23.50	23.22	23.20	23.24
	1	0	3	23.50	23.19	23.17	23.22
	1	5	0	23.50	23.09	23.13	23.28
	1	5	3	23.50	23.05	23.09	23.18
	3	0	0	23.00	22.31	22.28	22.32
	3	3	3	23.00	22.28	22.25	22.26
	6	0	0	22.50	22.29	22.32	22.31
	6	0	3	22.50	22.22	22.35	22.26
16QAM	1	0	0	23.50	23.32	23.29	23.17
	1	0	3	23.50	23.23	23.26	23.06
	1	4	0	23.50	23.26	23.32	23.13
	1	4	3	23.50	23.29	22.43	23.17
	3	0	0	23.00	22.53	22.56	22.62
	3	2	3	23.00	22.46	22.52	22.48
	5	0	0	21.50	21.45	21.32	21.36
	5	0	3	21.50	21.42	21.29	21.32

LTE Cat-M1 B26/BW=10M				Average Conducted Power (dBm)			
Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)		
					26740/ 819	26865/ 831.5	26990/ 844
QPSK	1	0	0	23.50	23.32	23.29	23.26
	1	0	3	23.50	23.30	23.27	23.23
	1	5	4	23.50	23.26	23.21	23.24
	1	5	7	23.50	23.27	23.30	23.22
	3	0	0	23.50	23.45	23.38	23.31
	3	3	7	23.50	23.40	23.33	23.35
	6	0	0	22.50	22.32	22.32	22.36
	6	0	7	22.50	22.30	22.37	22.27
16QAM	1	0	0	23.50	23.32	23.22	23.18
	1	0	3	23.50	23.26	23.19	23.11
	1	4	4	23.50	23.27	23.35	23.18
	1	4	7	23.50	23.24	23.31	23.23
	3	0	0	23.50	23.09	23.16	23.12
	3	2	7	23.50	23.21	23.12	23.10
	5	0	0	22.50	22.42	22.49	22.46
	5	0	7	22.50	22.43	22.42	22.38

LTE Cat-M1 B26/BW=15M				Average Conducted Power (dBm)			
Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)		
					26765/ 821.5	26865/ 831.5	26965/ 841.5
QPSK	1	0	0	24.00	23.47	23.53	23.36
	1	0	3	24.00	23.45	23.47	23.30
	1	5	8	24.00	23.41	23.45	23.28
	1	5	11	24.00	23.37	23.41	23.26
	3	0	0	24.00	23.46	23.52	23.32
	3	3	11	24.00	23.41	23.48	23.42
	6	0	0	23.50	23.16	23.27	23.28
	6	0	11	23.50	23.12	23.18	23.27
16QAM	1	0	0	23.50	23.22	23.27	23.21
	1	0	3	23.50	23.17	23.23	23.18
	1	4	8	23.50	23.16	23.22	23.15
	1	4	11	23.50	23.14	23.24	23.09
	3	0	0	23.50	23.28	23.17	23.22
	3	2	11	23.50	23.15	23.07	23.20
	5	0	0	23.50	23.12	23.14	23.11
	5	0	11	23.50	23.08	23.11	23.06

LTE Cat-M1 B66/BW=1.4M				Average Conducted Power (dBm)				LTE Cat-M1 B66/BW=3M				Average Conducted Power (dBm)			
Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)			Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)		
					131979/ 1710.7	132322/ 1745	132665/ 1779.3						131987/ 1711.5	132322/ 1745	132657/ 1778.5
QPSK	1	0	0	23.50	23.10	23.19	23.11	QPSK	1	0	0	23.50	23.05	23.23	23.02
	1	5	0	23.50	23.13	23.22	23.05		1	5	1	23.50	23.08	23.24	23.01
	3	0	0	22.50	22.19	22.21	22.16		3	0	0	22.50	22.23	22.29	22.08
	3	3	0	22.50	22.14	22.22	22.06		3	3	1	22.50	22.17	22.22	22.06
	6	0	0	21.50	21.18	21.32	21.13		6	0	0	21.50	21.23	21.34	21.18
									6	0	1	21.50	21.21	21.25	21.16
16QAM	1	0	0	22.50	22.33	22.39	22.23	16QAM	1	0	0	22.50	22.34	22.43	22.15
	1	4	0	22.50	22.35	22.36	22.27		1	4	1	22.50	22.28	22.40	22.21
	3	0	0	21.50	21.13	21.33	21.15		3	0	0	21.50	21.29	21.42	21.16
	3	2	0	21.50	21.20	21.28	21.19		3	2	1	21.50	21.26	21.34	21.14
	5	0	0	21.50	21.16	21.26	21.10		5	0	0	21.50	21.16	21.33	21.20
									5	0	1	21.50	21.24	21.28	21.15

LTE Cat-M1 B66/BW=5M				Average Conducted Power (dBm)				LTE Cat-M1 B66/BW=10M				Average Conducted Power (dBm)			
Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)			Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)		
					131997/ 1712.5	132322/ 1745	132647/ 1777.5						132022/ 1715	132322/ 1745	132622/ 1775
QPSK	1	0	0	23.50	23.07	23.20	23.09	QPSK	1	0	0	23.50	23.06	23.17	23.08
	1	0	3	23.50	23.09	23.18	23.12		1	0	3	23.50	23.09	23.14	23.10
	1	5	0	23.50	23.08	23.23	23.11		1	5	4	23.50	23.14	23.21	23.12
	1	5	3	23.50	23.12	23.14	23.10		1	5	7	23.50	23.18	23.22	23.13
	3	0	0	23.50	22.20	22.24	22.16		3	0	0	23.50	23.26	23.31	23.21
	3	3	3	23.50	22.19	22.27	22.10		3	3	7	23.50	23.26	23.29	23.15
	6	0	0	23.50	22.10	22.25	22.15		6	0	0	23.50	22.13	22.21	22.12
	6	0	3	23.50	22.17	22.32	22.12		6	0	7	23.50	22.20	22.23	22.15
16QAM	1	0	0	22.50	22.41	22.48	22.41	16QAM	1	0	0	22.50	22.35	22.39	22.32
	1	0	3	22.50	22.46	22.49	22.32		1	0	3	22.50	22.38	22.43	22.36
	1	4	0	22.50	22.35	22.43	22.41		1	4	4	22.50	22.45	22.42	22.41
	1	4	3	22.50	22.40	22.45	22.41		1	4	7	22.50	22.47	22.46	22.43
	3	0	0	22.50	22.27	22.39	22.19		3	0	0	22.50	22.31	22.43	22.39
	3	2	3	22.50	22.42	23.45	22.32		3	2	7	22.50	22.40	22.42	22.26
	5	0	0	21.50	21.29	21.40	21.19		5	0	0	22.50	22.18	22.31	22.20
	5	0	3	21.50	21.32	21.36	21.26		5	0	7	22.50	22.24	22.26	22.18

LTE Cat-M1 B66/BW=15M				Average Conducted Power (dBm)				LTE Cat-M1 B66/BW=20M				Average Conducted Power (dBm)			
Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)			Modula-tion	RB Size	RB Offset	NB Index	Max. Tune-up	Channel/Frequency(MHz)		
					132047/ 1717.5	132322/ 1745	132597/ 1772.5						132072/ 1720	132322/ 1745	132572/ 1770
QPSK	1	0	0	23.50	23.09	23.19	23.04	QPSK	1	0	0	24.00	23.48	23.61	23.42
	1	0	3	23.50	23.13	23.16	23.03		1	0	3	24.00	23.41	23.52	23.39
	1	5	8	23.50	23.14	23.23	23.01		1	5	12	24.00	23.36	23.49	23.33
	1	5	11	23.50	23.15	23.12	22.99		1	5	15	24.00	23.33	23.41	23.29
	3	0	0	23.50	23.14	23.21	23.26		3	0	0	24.00	23.44	23.52	23.24
	3	3	11	23.50	23.30	23.27	23.20		3	3	15	24.00	23.35	23.51	23.20
	6	0	0	23.50	23.23	23.28	23.18		6	0	0	23.50	23.35	23.44	23.17
	6	0	11	23.50	23.30	23.31	23.24		6	0	15	23.50	23.45	23.49	23.19
16QAM	1	0	0	22.50	22.40	22.39	22.37	16QAM	1	0	0	23.00	22.33	22.50	22.44
	1	0	3	22.50	22.45	22.44	22.47		1	0	3	23.00	22.29	22.54	22.39
	1	4	8	22.50	22.41	22.50	22.39		1	4	12	23.00	22.43	22.56	22.43
	1	4	11	22.50	22.46	22.43	22.46		1	4	15	23.00	22.48	22.59	22.48
	3	0	0	22.50	22.30	22.40	22.33		3	0	0	22.50	22.25	22.36	22.32
	3	2	11	22.50	22.44	22.39	22.29		3	2	15	22.50	22.46	22.48	22.33
	5	0	0	22.50	22.24	22.26	22.16		5	0	0	22.50	22.15	22.35	22.27
	5	0	11	22.50	22.38	22.32	22.27		5	0	15	22.50	22.28	22.40	22.23

<LTE NB-IoT>

NB-IoT B2/BW=3.75kHz		Average Conducted Power (dBm)				NB-IoT B2/BW=15kHz		Average Conducted Power (dBm)			
Modulation	Ntones	Max. Tune-up	Channel/Frequency(MHz)			Modulation	Ntones	Max. Tune-up	Channel/Frequency(MHz)		
			18601/ 1850.1	18900/ 1880	19199/ 1909.9				18601/ 1850.1	18900/ 1880	19199/ 1909.9
BPSK	1@0	23.50	23.40	23.43	23.50	QPSK	1@0	24.00	23.35	23.60	23.46
	1@47	23.50	23.34	23.50	23.40		1@11	23.50	23.33	23.41	23.44
							3@3	23.50	23.37	23.47	23.40

NB-IoT B4/BW=3.75kHz		Average Conducted Power (dBm)				NB-IoT B4/BW=15kHz		Average Conducted Power (dBm)			
Modulation	Ntones	Max. Tune-up	Channel/Frequency(MHz)			Modulation	Ntones	Max. Tune-up	Channel/Frequency(MHz)		
			19951/ 1710.1	20175/ 1732.5	20399/ 1754.9				19951/ 1710.1	20175/ 1732.5	20399/ 1754.9
BPSK	1@0	23.50	23.23	23.29	23.24	QPSK	1@0	23.50	23.16	23.44	23.37
	1@47	23.50	23.21	23.24	23.39		1@11	23.50	23.18	23.18	23.34
							3@3	23.50	23.12	23.29	23.13

NB-IoT B5/BW=3.75kHz		Average Conducted Power (dBm)				NB-IoT B5/BW=15kHz		Average Conducted Power (dBm)			
Modulation	Ntones	Max. Tune-up	Channel/Frequency(MHz)			Modulation	Ntones	Max. Tune-up	Channel/Frequency(MHz)		
			20401/ 824.1	20525/ 836.5	20649/ 848.9				20401/ 824.1	20525/ 836.5	20649/ 848.9
BPSK	1@0	23.50	23.09	23.04	23.03	QPSK	1@0	23.50	23.09	23.14	23.10
	1@47	23.50	23.00	23.07	23.05		1@11	23.50	23.07	23.02	23.08
							3@3	23.50	23.05	23.06	23.04

NB-IoT B12/BW=3.75kHz		Average Conducted Power (dBm)				NB-IoT B12/BW=15kHz		Average Conducted Power (dBm)			
Modulation	Ntones	Max. Tune-up	Channel/Frequency(MHz)			Modulation	Ntones	Max. Tune-up	Channel/Frequency(MHz)		
			23011/ 699.1	23095/ 707.5	23179/ 715.9				23011/ 699.1	23095/ 707.5	23179/ 715.9
BPSK	1@0	23.50	23.16	23.06	23.17	QPSK	1@0	23.50	23.15	23.26	23.08
	1@47	23.50	23.16	23.11	23.05		1@11	23.50	23.13	23.07	23.06
							3@3	23.50	23.10	23.03	22.99

NB-IoT B13/BW=3.75kHz		Average Conducted Power (dBm)				NB-IoT B13/BW=15kHz		Average Conducted Power (dBm)			
Modulation	Ntones	Max. Tune-up	Channel/Frequency(MHz)			Modulation	Ntones	Max. Tune-up	Channel/Frequency(MHz)		
			23181/ 777.1	23230/ 782.0	23279/ 786.9				23181/ 777.1	23230/ 782.0	23279/ 786.9
BPSK	1@0	23.50	23.15	23.01	23.17	QPSK	1@0	23.50	23.02	23.19	22.96
	1@47	23.50	23.04	22.93	23.07		1@11	23.50	23.00	22.94	23.14
							3@3	23.50	23.01	23.13	22.84

NB-IoT B17/BW=3.75kHz		Average Conducted Power (dBm)				NB-IoT B17/BW=15kHz		Average Conducted Power (dBm)			
Modulation	Ntones	Max. Tune-up	Channel/Frequency(MHz)			Modulation	Ntones	Max. Tune-up	Channel/Frequency(MHz)		
			23731/ 704.1	23790/ 710.0	23849/ 715.9				23731/ 704.1	23790/ 710.0	23849/ 715.9
BPSK	1@0	23.50	23.18	23.14	23.14	QPSK	1@0	23.50	23.22	23.28	23.18
	1@47	23.50	23.12	23.15	23.10		1@11	23.50	23.18	23.15	23.16
							3@3	23.50	23.13	23.10	23.01

NB-IoT B25/BW=3.75kHz		Average Conducted Power (dBm)				NB-IoT B25/BW=15kHz		Average Conducted Power (dBm)			
Modulation	Ntones	Max. Tune-up	Channel/Frequency(MHz)			Modulation	Ntones	Max. Tune-up	Channel/Frequency(MHz)		
			26041/ 1850.1	26365/ 1882.50	26689/ 1914.9				26041/ 1850.1	26365/ 1882.50	26689/ 1914.9
BPSK	1@0	23.50	23.43	23.50	23.43	QPSK	1@0	24.00	23.33	23.66	23.43
	1@47	23.50	23.38	23.47	23.45		1@11	23.50	23.31	23.41	23.41
							3@3	23.50	23.45	23.48	23.46

NB-IoT B26/BW=3.75kHz		Average Conducted Power (dBm)				NB-IoT B26/BW=15kHz		Average Conducted Power (dBm)			
Modulation	Ntones	Max. Tune-up	Channel/Frequency(MHz)			Modulation	Ntones	Max. Tune-up	Channel/Frequency(MHz)		
			26691/ 814.1	26865/ 831.50	27039/ 848.9				26691/ 814.1	26865/ 831.50	27039/ 848.9
BPSK	1@0	23.50	23.08	23.02	23.01	QPSK	1@0	23.50	23.07	23.16	23.00
	1@47	23.50	23.01	23.05	23.02		1@11	23.50	23.04	23.04	22.97
							3@3	23.50	23.09	23.09	23.01

NB-IoT B66/BW=3.75kHz		Average Conducted Power (dBm)				NB-IoT B66/BW=15kHz		Average Conducted Power (dBm)			
Modulation	Ntones	Max. Tune-up	Channel/Frequency(MHz)			Modulation	Ntones	Max. Tune-up	Channel/Frequency(MHz)		
			131973/ 1710.1	132322/ 1745	132671/ 1779.9				131973/ 1710.1	132322/ 1745	132671/ 1779.9
BPSK	1@0	23.50	23.20	23.30	23.12	QPSK	1@0	23.50	23.18	23.47	23.26
	1@47	23.50	23.16	23.13	23.17		1@11	23.50	23.16	23.25	23.15
							3@3	23.50	23.08	23.28	23.08

<Bluetooth>

BT	Average Conducted Power (dBm)			
	Max. Tune up	CH0	CH19	CH39
		2402MHz	2440MHz	2480MHz
BLE(1M)	3.50	3.94	3.04	2.44
BLE(2M)	3.50	3.33	2.45	1.93

8.8 SAR Testing Results

8.8.1 SAR Test Reduction Considerations

<KDB 447498 D01, General RF Exposure Guidance>

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

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

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

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

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

(2) QPSK with 100% RB allocation

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

(3) Higher order modulations

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

(4) Other channel bandwidth

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

8.8.2 SAR Results for Body Exposure Condition (Separation Distance is 0.5cm Gap)

Plot No.	Band	Mode	Ch.	RB#	RB Offset	Index	Test Position	Max. Tune-up Power (dBm)	Measured Conducted Power (dBm)	Power Drift (dB)	Measured SAR-1g (W/kg)	Scaling Factor	Reported SAR-1g (W/kg)
P15	LTE B5 Cat M1	QPSK10M	20525	1	0	0	Horizontal up	23.5	23.48	0.07	0.074	1.005	0.074
P16	LTE B5 Cat M1	QPSK10M	20525	1	0	0	Horizontal Down	23.5	23.48	-0.05	0.0029	1.005	0.003
P17	LTE B5 Cat M1	QPSK10M	20525	1	0	0	Vertical Front	23.5	23.48	-0.11	0.0044	1.005	0.004
P18	LTE B5 Cat M1	QPSK10M	20525	1	0	0	Vertical Back	23.5	23.48	-0.03	0.0031	1.005	0.003
P19	LTE B5 Cat M1	QPSK10M	20525	1	0	0	Tip mode	23.5	23.48	0	<0.001	1.005	<0.001
P22	LTE B5 Cat M1	QPSK10M	20525	3	0	0	Horizontal up	23.5	23.45	0.08	0.074	1.012	**0.075**
P23	LTE B5 Cat M1	QPSK10M	20525	3	0	0	Horizontal Down	23.5	23.45	-0.07	0.0044	1.012	0.004
P24	LTE B5 Cat M1	QPSK10M	20525	3	0	0	Vertical Front	23.5	23.45	-0.04	0.0073	1.012	0.007
P25	LTE B5 Cat M1	QPSK10M	20525	3	0	0	Vertical Back	23.5	23.45	0.09	0.0039	1.012	0.004
P26	LTE B5 Cat M1	QPSK10M	20525	3	0	0	Tip mode	23.5	23.45	0	<0.001	1.012	<0.001
P29	LTE B12 Cat M1	QPSK10M	23095	1	0	0	Horizontal up	24	23.52	-0.074	0.052	1.117	**0.058**
P30	LTE B12 Cat M1	QPSK10M	23095	1	0	0	Horizontal Down	24	23.52	0.02	0.042	1.117	0.047
P31	LTE B12 Cat M1	QPSK10M	23095	1	0	0	Vertical Front	24	23.52	-0.06	0.035	1.117	0.039
P32	LTE B12 Cat M1	QPSK10M	23095	1	0	0	Vertical Back	24	23.52	0.15	0.044	1.117	0.049
P33	LTE B12 Cat M1	QPSK10M	23095	1	0	0	Tip mode	24	23.52	<0.001	<0.001	1.117	<0.001
P36	LTE B12 Cat M1	QPSK10M	23095	3	0	0	Horizontal up	23.5	23.47	0.09	0.053	1.007	0.053
P37	LTE B12 Cat M1	QPSK10M	23095	3	0	0	Horizontal Down	23.5	23.47	-0.04	0.031	1.007	0.031
P38	LTE B12 Cat M1	QPSK10M	23095	3	0	0	Vertical Front	23.5	23.47	-0.09	0.048	1.007	0.048
P39	LTE B12 Cat M1	QPSK10M	23095	3	0	0	Vertical Back	23.5	23.47	0.06	0.043	1.007	0.043
P40	LTE B12 Cat M1	QPSK10M	23095	3	0	0	Tip mode	23.5	23.47	0	<0.001	1.007	<0.001
P43	LTE B13 Cat M1	QPSK10M	23230	1	0	0	Horizontal up	24	23.51	-0.04	0.102	1.119	**0.114**
P44	LTE B13 Cat M1	QPSK10M	23230	1	0	0	Horizontal Down	24	23.51	-0.09	0.025	1.119	0.028
P45	LTE B13 Cat M1	QPSK10M	23230	1	0	0	Vertical Front	24	23.51	0.02	0.021	1.119	0.024
P46	LTE B13 Cat M1	QPSK10M	23230	1	0	0	Vertical Back	24	23.51	-0.15	0.027	1.119	0.030
P47	LTE B13 Cat M1	QPSK10M	23230	1	0	0	Tip mode	24	23.51	0	<0.001	1.119	<0.001
P48	LTE B13 Cat M1	QPSK10M	23230	3	0	0	Horizontal up	23.5	23.5	0.19	0.105	1.000	0.105
P49	LTE B13 Cat M1	QPSK10M	23230	3	0	0	Horizontal Down	23.5	23.5	-0.05	0.025	1.000	0.025
P50	LTE B13 Cat M1	QPSK10M	23230	3	0	0	Vertical Front	23.5	23.5	-0.18	0.031	1.000	0.031
P51	LTE B13 Cat M1	QPSK10M	23230	3	0	0	Vertical Back	23.5	23.5	0.09	0.007	1.000	0.007
P52	LTE B13 Cat M1	QPSK10M	23230	3	0	0	Tip mode	23.5	23.5	0	<0.001	1.000	<0.001

Note: "<0.001" means the SAR value is too low to be measured.

Plot No.	Band	Mode	Ch.	RB#	RB Offset	Index	Test Position	Max. Tune-up Power (dBm)	Measured Conducted Power (dBm)	Power Drift (dB)	Measured SAR-1g (W/kg)	Scaling Factor	Reported SAR-1g (W/kg)
P63	LTE B25 Cat M1	QPSK20M	26365	1	0	0	Horizontal up	24	23.75	0.02	0.061	1.059	**0.065**
P64	LTE B25 Cat M1	QPSK20M	26365	1	0	0	Horizontal Down	24	23.75	-0.02	0.00509	1.059	0.005
P65	LTE B25 Cat M1	QPSK20M	26365	1	0	0	Vertical Front	24	23.75	-0.14	0.041	1.059	0.043
P66	LTE B25 Cat M1	QPSK20M	26365	1	0	0	Vertical Back	24	23.75	-0.05	0.00157	1.059	0.002
P67	LTE B25 Cat M1	QPSK20M	26365	1	0	0	Tip mode	24	23.75	-0.07	0.00267	1.059	0.003
P70	LTE B25 Cat M1	QPSK20M	26365	3	0	0	Horizontal up	24	23.54	-0.14	0.055	1.112	0.061
P71	LTE B25 Cat M1	QPSK20M	26365	3	0	0	Horizontal Down	24	23.54	-0.15	0.00184	1.112	0.002
P72	LTE B25 Cat M1	QPSK20M	26365	3	0	0	Vertical Front	24	23.54	-0.02	0.036	1.112	0.040
P73	LTE B25 Cat M1	QPSK20M	26365	3	0	0	Vertical Back	24	23.54	-0.08	0.00105	1.112	0.001
P74	LTE B25 Cat M1	QPSK20M	26365	3	0	0	Tip mode	24	23.54	0.02	0.0012	1.112	0.001
P77	LTE B26 Cat M1	QPSK15M	23865	1	0	0	Horizontal up	24	23.53	0.1	0.064	1.114	**0.071**
P78	LTE B26 Cat M1	QPSK15M	23865	1	0	0	Horizontal Down	24	23.53	-0.02	0.0041	1.114	0.005
P79	LTE B26 Cat M1	QPSK15M	23865	1	0	0	Vertical Front	24	23.53	0.09	0.043	1.114	0.048
P80	LTE B26 Cat M1	QPSK15M	23865	1	0	0	Vertical Back	24	23.53	0.15	0.031	1.114	0.035
P81	LTE B26 Cat M1	QPSK15M	23865	1	0	0	Tip mode	24	23.53	0	<0.001	1.114	<0.001
P84	LTE B26 Cat M1	QPSK15M	26865	3	0	0	Horizontal up	24	23.52	0.19	0.062	1.117	0.069
P85	LTE B26 Cat M1	QPSK15M	26865	3	0	0	Horizontal Down	24	23.52	-0.07	0.0038	1.117	0.004
P86	LTE B26 Cat M1	QPSK15M	26865	3	0	0	Vertical Front	24	23.52	0.05	0.034	1.117	0.038
P87	LTE B26 Cat M1	QPSK15M	26865	3	0	0	Vertical Back	24	23.52	-0.02	0.027	1.117	0.030
P88	LTE B26 Cat M1	QPSK15M	26865	3	0	0	Tip mode	24	23.52	0	<0.001	1.117	<0.001
P91	LTE B66 Cat M1	QPSK20M	132322	1	0	0	Horizontal up	24	23.61	0.08	0.3	1.094	0.328
P92	LTE B66 Cat M1	QPSK20M	132322	1	0	0	Horizontal Down	24	23.61	-0.04	0.066	1.094	0.072
P93	LTE B66 Cat M1	QPSK20M	132322	1	0	0	Vertical Front	24	23.61	0.09	0.273	1.094	0.299
P94	LTE B66 Cat M1	QPSK20M	132322	1	0	0	Vertical Back	24	23.61	-0.13	0.03	1.094	0.033
P95	LTE B66 Cat M1	QPSK20M	132322	1	0	0	Tip mode	24	23.61	-0.18	0.00604	1.094	0.007
P98	LTE B66 Cat M1	QPSK20M	132322	3	0	0	Horizontal up	24	23.52	0.07	0.351	1.117	**0.392**
P99	LTE B66 Cat M1	QPSK20M	132322	3	0	0	Horizontal Down	24	23.52	-0.01	0.069	1.117	0.077
P100	LTE B66 Cat M1	QPSK20M	132322	3	0	0	Vertical Front	24	23.52	0.03	0.289	1.117	0.323
P101	LTE B66 Cat M1	QPSK20M	132322	3	0	0	Vertical Back	24	23.52	-0.11	0.032	1.117	0.036
P102	LTE B66 Cat M1	QPSK20M	132322	3	0	0	Tip mode	24	23.52	-0.15	0.00615	1.117	0.007

Note: "<0.001" means the SAR value is too low to be measured.

Plot No.	Band	Mode	Ch.	Index	Test Position	Max. Tune-up Power (dBm)	Measured Conducted Power (dBm)	Power Drift (dB)	Measured SAR-1g (W/kg)	Scaling Factor	Reported SAR-1g (W/kg)
200	LTE B5 NB-IOT	QPSK15KHz	20525	1@0	Horizontal up	23.5	23.14	0.02	0.037	1.086	**0.040**
201	LTE B5 NB-IOT	QPSK15KHz	20525	1@0	Horizontal Down	23.5	23.14	-0.06	0.00115	1.086	0.001
202	LTE B5 NB-IOT	QPSK15KHz	20525	1@0	Vertical Front	23.5	23.14	-0.15	0.00531	1.086	0.006
203	LTE B5 NB-IOT	QPSK15KHz	20525	1@0	Vertical Back	23.5	23.14	-0.03	0.00226	1.086	0.002
204	LTE B5 NB-IOT	QPSK15KHz	20525	1@0	Tip mode	23.5	23.14	0	<0.001	1.086	<0.001
207	LTE B5 NB-IOT	QPSK15KHz	20525	3@3	Horizontal up	23.5	23.06	-0.08	0.036	1.107	0.040
208	LTE B5 NB-IOT	QPSK15KHz	20525	3@3	Horizontal Down	23.5	23.06	-0.16	0.00386	1.107	0.004
209	LTE B5 NB-IOT	QPSK15KHz	20525	3@3	Vertical Front	23.5	23.06	-0.05	0.00459	1.107	0.005
210	LTE B5 NB-IOT	QPSK15KHz	20525	3@3	Vertical Back	23.5	23.06	-0.08	0.00257	1.107	0.003
214	LTE B12 NB-IOT	QPSK15KHz	23095	1@0	Horizontal up	23.5	23.26	0.01	0.021	1.057	0.022
215	LTE B12 NB-IOT	QPSK15KHz	23095	1@0	Horizontal Down	23.5	23.26	-0.07	0.00229	1.057	0.002
216	LTE B12 NB-IOT	QPSK15KHz	23095	1@0	Vertical Front	23.5	23.26	-0.05	0.00375	1.057	0.004
217	LTE B12 NB-IOT	QPSK15KHz	23095	1@0	Vertical Back	23.5	23.26	0.02	0.00751	1.057	0.008
218	LTE B12 NB-IOT	QPSK15KHz	23095	1@0	Tip mode	23.5	23.26	0	<0.001	1.057	<0.001
221	LTE B12 NB-IOT	QPSK15KHz	23095	3@3	Horizontal up	23.5	23.03	-0.04	0.025	1.114	**0.028**
222	LTE B12 NB-IOT	QPSK15KHz	23095	3@3	Horizontal Down	23.5	23.03	-0.15	0.00221	1.114	0.002
223	LTE B12 NB-IOT	QPSK15KHz	23095	3@3	Vertical Front	23.5	23.03	-0.09	0.00356	1.114	0.004
224	LTE B12 NB-IOT	QPSK15KHz	23095	3@3	Vertical Back	23.5	23.03	-0.05	0.009	1.114	0.010
225	LTE B12 NB-IOT	QPSK15KHz	23095	3@3	Tip mode	23.5	23.03	0	<0.001	1.114	<0.001
228	LTE B13 NB-IOT	QPSK15KHz	23230	1@0	Horizontal up	23.5	23.19	0.07	0.041	1.074	0.044
229	LTE B13 NB-IOT	QPSK15KHz	23230	1@0	Horizontal Down	23.5	23.19	-0.05	0.00345	1.074	0.004
230	LTE B13 NB-IOT	QPSK15KHz	23230	1@0	Vertical Front	23.5	23.19	0.06	0.00859	1.074	0.009
231	LTE B13 NB-IOT	QPSK15KHz	23230	1@0	Vertical Back	23.5	23.19	0.11	0.00825	1.074	0.009
232	LTE B13 NB-IOT	QPSK15KHz	23230	1@0	Tip mode	23.5	23.19	0	<0.001	1.074	<0.001
235	LTE B13 NB-IOT	QPSK15KHz	23230	3@3	Horizontal up	23.5	23.13	0.07	0.042	1.089	**0.046**
236	LTE B13 NB-IOT	QPSK15KHz	23230	3@3	Horizontal Down	23.5	23.13	-0.05	0.00302	1.089	0.003
237	LTE B13 NB-IOT	QPSK15KHz	23230	3@3	Vertical Front	23.5	23.13	0.03	0.00816	1.089	0.009
238	LTE B13 NB-IOT	QPSK15KHz	23230	3@3	Vertical Back	23.5	23.13	0.06	0.011	1.089	0.012
239	LTE B13 NB-IOT	QPSK15KHz	23230	3@3	Tip mode	23.5	23.13	0	<0.001	1.089	<0.001

Note: "<0.001" means the SAR value is too low to be measured.

Plot No.	Band	Mode	Ch.	Index	Test Position	Max. Tune-up Power (dBm)	Measured Conducted Power (dBm)	Power Drift (dB)	Measured SAR-1g (W/kg)	Scaling Factor	Reported SAR-1g (W/kg)
242	LTE B25 NB-IOT	QPSK15KHz	26365	1@0	Horizontal up	24	23.66	0.08	0.026	1.081	**0.028**
243	LTE B25 NB-IOT	QPSK15KHz	26365	1@0	Horizontal Down	24	23.66	-0.16	0.000938	1.081	0.001
244	LTE B25 NB-IOT	QPSK15KHz	26365	1@0	Vertical Front	24	23.66	-0.06	0.019	1.081	0.021
245	LTE B25 NB-IOT	QPSK15KHz	26365	1@0	Vertical Back	24	23.66	0	<0.001	1.081	<0.001
246	LTE B25 NB-IOT	QPSK15KHz	26365	1@0	Tip mode	24	23.66	0	<0.001	1.081	<0.001
249	LTE B25 NB-IOT	QPSK15KHz	26365	3@3	Horizontal up	23.5	23.48	-0.04	0.019	1.005	0.019
250	LTE B25 NB-IOT	QPSK15KHz	26365	3@3	Horizontal Down	23.5	23.48	-0.06	0.000828	1.005	0.001
251	LTE B25 NB-IOT	QPSK15KHz	26365	3@3	Vertical Front	23.5	23.48	-0.03	0.018	1.005	0.018
252	LTE B25 NB-IOT	QPSK15KHz	26365	3@3	Vertical Back	23.5	23.48	0	<0.001	1.005	<0.001
253	LTE B25 NB-IOT	QPSK15KHz	26365	3@3	Tip mode	23.5	23.48	0	<0.001	1.005	<0.001
256	LTE B26 NB-IOT	QPSK15KHz	26865	1@0	Horizontal up	23.5	23.16	0.08	0.038	1.081	0.041
257	LTE B26 NB-IOT	QPSK15KHz	26865	1@0	Horizontal Down	23.5	23.16	-0.05	0.00171	1.081	0.002
258	LTE B26 NB-IOT	QPSK15KHz	26865	1@0	Vertical Front	23.5	23.16	-0.16	0.00667	1.081	0.007
259	LTE B26 NB-IOT	QPSK15KHz	26865	1@0	Vertical Back	23.5	23.16	-0.02	0.00689	1.081	0.007
260	LTE B26 NB-IOT	QPSK15KHz	26865	1@0	Tip mode	23.5	23.16	0	<0.001	1.081	<0.001
263	LTE B26 NB-IOT	QPSK15KHz	26865	3@3	Horizontal up	23.5	23.09	0.17	0.038	1.099	**0.042**
264	LTE B26 NB-IOT	QPSK15KHz	26865	3@3	Horizontal Down	23.5	23.09	-0.05	0.00073	1.099	0.001
265	LTE B26 NB-IOT	QPSK15KHz	26865	3@3	Vertical Front	23.5	23.09	-0.11	0.00553	1.099	0.006
266	LTE B26 NB-IOT	QPSK15KHz	26865	3@3	Vertical Back	23.5	23.09	0.04	0.011	1.099	0.012
267	LTE B26 NB-IOT	QPSK15KHz	26865	3@3	Tip mode	23.5	23.09	0	<0.001	1.099	<0.001
270	LTE B66 NB-IOT	QPSK20M	132322	1@0	Horizontal up	23.5	23.33	-0.09	0.157	1.040	**0.163**
271	LTE B66 NB-IOT	QPSK20M	132322	1@0	Horizontal Down	23.5	23.33	-0.13	0.032	1.040	0.033
272	LTE B66 NB-IOT	QPSK20M	132322	1@0	Vertical Front	23.5	23.33	0.04	0.139	1.040	0.145
273	LTE B66 NB-IOT	QPSK20M	132322	1@0	Vertical Back	23.5	23.33	-0.05	0.0044	1.040	0.005
274	LTE B66 NB-IOT	QPSK20M	132322	1@0	Tip mode	23.5	23.33	-0.09	0.004	1.040	0.004
277	LTE B66 NB-IOT	QPSK20M	132322	3@3	Horizontal up	23.5	23.28	-0.04	0.132	1.052	0.139
278	LTE B66 NB-IOT	QPSK20M	132322	3@3	Horizontal Down	23.5	23.28	-0.05	0.029	1.052	0.031
279	LTE B66 NB-IOT	QPSK20M	132322	3@3	Vertical Front	23.5	23.28	0.12	0.127	1.052	0.134
280	LTE B66 NB-IOT	QPSK20M	132322	3@3	Vertical Back	23.5	23.28	-0.07	0.00375	1.052	0.004
281	LTE B66 NB-IOT	QPSK20M	132322	3@3	Tip mode	23.5	23.28	-0.17	0.003	1.052	0.003

Note: "<0.001" means the SAR value is too low to be measured.

Test Engineer: Morrison Huang

8.8.3 SAR Measurement Variability

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

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

8.8.4 DUT Holder Perturbations

Depending on antenna locations, buttons locations on phones or device, form factor (e.g. dongles etc.), the measured SAR could be influenced by the relative positions of the test device and its holder.

When the highest reported SAR of an antenna is > 1.2 W/kg, holder perturbation verification is required, using the highest SAR configuration among all applicable frequency bands with and without the device holder.

All the measured SAR are less than 1.2 W/kg, so the holder perturbation verification is not required.

8.8.5 Simultaneous Multi-band Transmission Evaluation

<Estimated SAR Calculation>

According to KDB 447498 D01, when standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR was estimated according to following formula to result in substantially conservative SAR values of <= 0.4 W/kg to determine simultaneous transmission SAR test exclusion.

$$\text{Estimated SAR} = \frac{\text{Max. Tune up Power}_{(\text{mW})}}{\text{Min. Test Separation Distance}_{(\text{mm})}} \times \frac{\sqrt{f_{(\text{GHz})}}}{7.5}$$

If the minimum test separation distance is < 5 mm, a distance of 5 mm is used for estimated SAR calculation. When the test separation distance is > 50 mm, the 0.4 W/kg is used for SAR-1g.

Mode / Band	Frequency (GHz)	Max. Tune-up Power (dBm)	Test Position	Separation Distance (mm)	Estimated SAR (W/kg)
BLE (DTS)	2.402	3.5	Body	0.5	0.4

Note:

1. The separation distance is determined from the outer housing of the EUT to the user.
2. When standalone SAR testing is not required, an estimated SAR can be applied to determine simultaneous transmission SAR test exclusion.

<SAR Summation Analysis>

Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneous transmitting antenna. When the sum of SAR_{1g} of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit (SAR_{1g} 1.6 W/kg), the simultaneous transmission SAR is not required. When the sum of SAR_{1g} is greater than the SAR limit (SAR_{1g} 1.6 W/kg), SAR test exclusion is determined by the SPLSR.

Position	Maximum WWAN SAR	Maximum BLE SAR	Maximum SAR Summation
Horizontal Up	0.392	0.4	0.792
Horizontal Down	0.077	0.4	0.477
Vertical Front	0.323	0.4	0.723
Vertical Back	0.049	0.4	0.449
Tip Mode	0.007	0.4	0.407

9. Appendixes

Appendix A – SAR Plots of System Verification

Appendix B – SAR Plots of SAR Measurement

Appendix C – Calibration Certificate for Probe and Dipole

Appendix D – Photographs of the Test Set-Up

---END---