FCC SAR Test Report

APPLICANT	:	**ZTE CORPORATION**
EQUIPMENT	:	**LTE USB Modem**
BRAND NAME	:	**ZTE**
MODEL NAME	:	**MF820B**
FCC ID	:	**Q78-MF820B**
STANDARD	:	**FCC 47 CFR Part 2 (2.1093) IEEE C95.1-1991 IEEE 1528-2003 FCC OET Bulletin 65 Supplement C (Edition 01-01)**

The product was received on Dec. 31, 2011 and completely tested on Mar. 21, 2012. We, SPORTON INTERNATIONAL (KUNSHAN) INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and shown the compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL (KUNSHAN) INC., the test report shall not be reproduced except in full.

Reviewed by:

Jones Tsai

Jones Tsai / Manager

ilac-MRA

TAF Testing Laboratory 1190

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA1D3102	Rev. 01	Initial issue of report	Apr. 11, 2012

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **ZTE CORPORATION LTE USB Modem MF820B** are as follows.

Band	Position	SAR_{1g} (W/kg)
WCDMA Band V	Body (0.5 cm)	0.56
WCDMA Band IV	Body (0.5 cm)	1.17
WCDMA Band II	Body (0.5 cm)	1.1
LTE Band 12	Body (0.5 cm)	1.08
LTE Band 17	Body (0.5 cm)	1.01
LTE Band 4	Body (0.5 cm)	0.942

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1991, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2003 and FCC OET Bulletin 65 Supplement C (Edition 01-01).

2. Administration Data

2.1 Testing Laboratory

Test Site	SPORTON INTERNATIONAL (KUNSHAN) INC.
Test Site Location	No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P.R.C. TEL: +86-0512-5790-0158 FAX: +86-0512-5790-0958

2.2 Applicant

Company Name	ZTE CORPORATION
Address	ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R.China

2.3 Manufacturer

Company Name	ZTE CORPORATION
Address	ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R.China

2.4 Application Details

Date of Receipt of Application	Dec. 31, 2011
Date of Start during the Test	Mar. 11, 2012
Date of End during the Test	Mar. 21, 2012

3. General Information

3.1 Description of Device Under Test (DUT)

Product Feature & Specification	
EUT	LTE USB Modem
Brand Name	ZTE
Model Name	MF820B
FCC ID	Q78-MF820B
Tx Frequency	WCDMA Band V: 826.4 MHz ~ 846.6 MHz WCDMA Band IV : 1712.4 MHz ~ 1782.6 MHz WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz LTE Band 12: 699.7 MHz ~ 715.3 MHz LTE Band 17: 706.5 MHz ~ 713.5 MHz LTE Band 4: 1710.7MHz ~ 1754.3 MHz
Rx Frequency	WCDMA Band V: 871.4 MHz ~ 891.6 MHz WCDMA Band IV : 2112.4 MHz ~ 2152.6 MHz WCDMA Band II: 1932.4 MHz ~ 1987.6 MHz LTE Band 12: 729.7 MHz ~ 745.3 MHz LTE Band 17 : 736.5 MHz ~ 743.5 MHz LTE Band 4 : 2110.7 MHz ~ 2154.3 MHz
Maximum Average Output Power to Antenna	WCDMA Band V: 21.90 dBm WCDMA Band IV: 22.25 dBm WCDMA Band II: 21.73 dBm LTE Band 12: 23.51 dBm LTE Band 17: 23.25 dBm LTE Band 4: 22.15 dBm
Antenna Type	PIFA Antenna
HW Version	xl3A+xi8A
SW Version	EN_CLA_MF820BV1.0.0B01
Type of Modulation	WCDMA: QPSK (uplink) HSDPA: QPSK (uplink) HSUPA: QPSK (uplink) LTE: QPSK / 16QAM (uplink)
DUT Stage	Production Unit

Remark:
1. The above DUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. Voice call is not supported.
3. EUT will choose either LTE or WCDMA/HSPA according to the network signal condition, therefore, LTE transmission will not exist with WCDMA/HSPA at the same time.

The table below summarized necessary items addressed in KDB 941225 D05 v01.

FCC ID	Q78-MF820B
EUT	LTE USB Modem
Operating Frequency Range of each LTE transmission band	Band 4: TX: 1710.7MHz ~ 1754.3 MHz, RX: 2110.7 MHz ~ 2154.3 MHz Band 17: TX:706.5 MHz ~ 713.5 MHz, RX: 736.5 MHz ~ 743.5 MHz Band 12: TX: 699.7 MHz ~ 715.3 MHz, RX: 729.7 MHz ~ 745.3 MHz
Channel Bandwidth	Band 4: 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz Band 17: 5MHz, 10MHz Band 12: 1.4MHz, 3MHz, 5MHz, 10MHz

Transmission (H, M, L) channel numbers and frequencies in each LTE band

Band 4

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	19957	1710.7	19965	1711.5	19975	1712.5	20000	1715	20025	1717.5	20050	1720
M	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5
H	20393	1754.3	20385	1753.5	20375	1752.5	20350	1750	20325	1747.5	20300	1745

Band 17

	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Frequency (MHz)	Channel #	Frequency (MHz)
L	23755	706.5	23780	709
M	23790	710	23790	710
H	23825	713.5	23800	711

Band 12

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Frequency	Channel #	Frequency	Channel #	Frequency	Channel #	Frequency
L	23017	699.7	23025	700.5	23034	701.4	23057	703.7
M	23095	707.5	23095	707.5	23095	707.5	23095	707.5
H	23173	715.3	23165	714.5	23156	713.6	23133	711.3

UE category, uplink modulations used	Category 3, QPSK, and 16QAM	
LTE transmitter and antenna implementation (standalone or sharing hardware components / antennas)	Main Antenna: LTE share the antenna with UMTS.	
LTE Voice / Data requirements	Data only	
LTE MPR permanently built-in by design	Yes	
LTE A-MPR	Disabled during SAR testing. With CMW500, set NS value to NS_01 to disable A-MPR.	
LTE maximum averaged conducted output power	LTE Band 4: 22.15 dBm LTE Band 17: 23.25 dBm LTE Band 12 : 23.51 dBm	
Other U.S. wireless operating modes / bands	WCDMA HSDPA / HSUPA	Band V: UL: 826.4~846.6MHz / DL: 871.4~891.6MHz Band IV: UL: 1712.4~1782.6MHz / DL: 2112.4~2152.6MHz Band II: UL: 1852.4~1907.6MHz / DL: 1932.4~1987.6MHz
Simultaneous transmission configurations	Not supported.	
Power reduction applied to satisfy SAR compliance	No.	

3.2 Product Photos

Please refer to Appendix D

3.3 Applied Standards

The Specific Absorption Rate (SAR) testing specification, method and procedure for this device is in accordance with the following standards:

- FCC 47 CFR Part 2 (2.1093)
- IEEE C95.1-1991
- IEEE 1528-2003
- FCC OET Bulletin 65 Supplement C (Edition 01-01)
- FCC KDB 447498 D01 v04
- FCC KDB 447498 D02 v02
- FCC KDB 941225 D01 v02
- FCC KDB 941225 D05 v01

3.4 Device Category and SAR Limits

This device belongs to portable device category because its radiating structure is allowed to be used within 20 centimeters of the body of the user. Limit for General Population/Uncontrolled exposure should be applied for this device, it is 1.6 W/kg as averaged over any 1 gram of tissue.

3.5 Test Conditions

3.5.1 Ambient Condition

Ambient Temperature	20 to 24 ℃
Humidity	< 60 %

3.5.2 Test Configuration

The device was controlled by using a base station emulator. Communication between the device and the emulator was established by air link. The distance between the DUT and the 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 DUT. The DUT was set from the emulator to radiate maximum output power during all tests.

4. Specific Absorption Rate (SAR)

4.1 Introduction

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.

4.2 SAR Definition

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 either related to the temperature elevation in tissue by

$$\mathbf{SAR} = \mathbf{C}\left(\frac{\boldsymbol{\delta}\mathbf{T}}{\boldsymbol{\delta}\mathbf{t}}\right)$$

Where: C is the specific heat capacity, δT is the temperature rise and δt is the exposure duration, or 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.

However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

5. SAR Measurement System

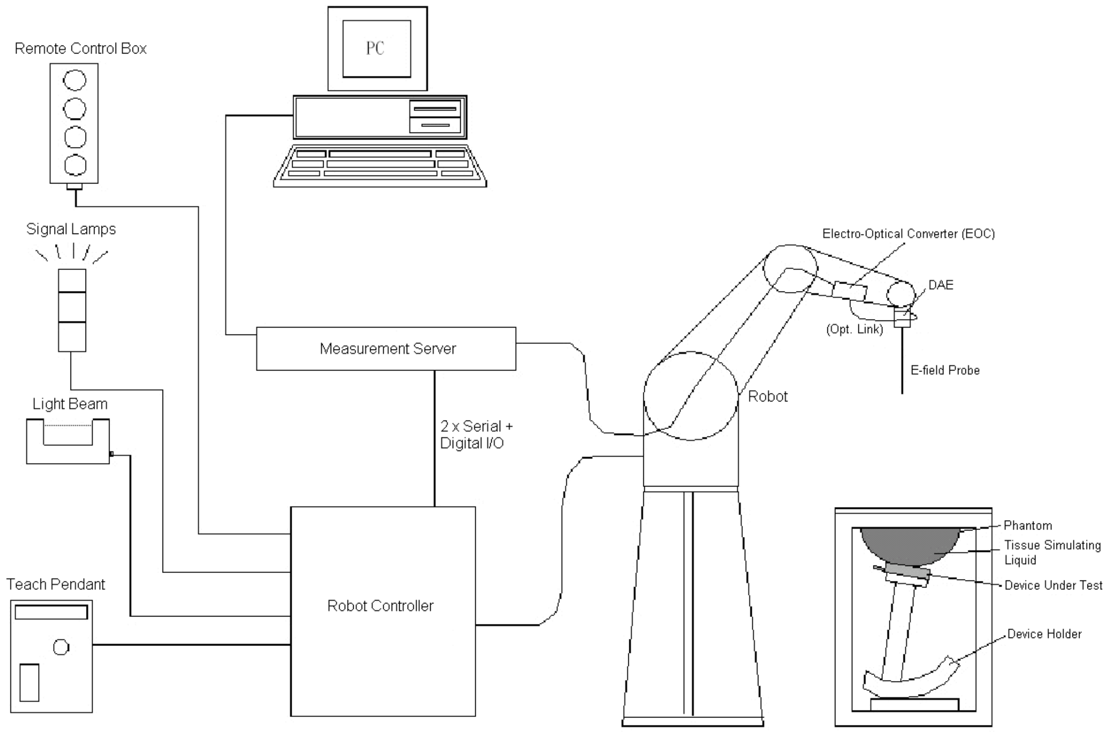


Fig 5.1 SPEAG DASY System Configurations

The DASY system for performance compliance tests is illustrated above graphically. This system consists of the following items:

- A standard high precision 6-axis robot with controller, a teach pendant and software
- A data acquisition electronic (DAE) attached to the robot arm extension
- A dosimetric probe equipped with an optical surface detector system
- The electro-optical converter (ECO) performs the conversion between optical and electrical signals
- A measurement server performs the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the accuracy of the probe positioning
- A computer operating Windows XP
- DASY software
- Remove control with teach pendant and additional circuitry for robot safety such as warming lamps, etc.
- The SAM twin phantom
- A device holder
- Tissue simulating liquid
- Dipole for evaluating the proper functioning of the system

Some of the components are described in details in the following sub-sections.

5.1 E-Field Probe

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG).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. This probe has a built in optical surface detection system to prevent from collision with phantom.

5.1.1 E-Field Probe Specification

<EX3DV4 Probe>

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: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm

Fig 5.2 Photo of EX3DV4

5.1.2 E-Field Probe Calibration

Each probe needs to be calibrated according to a dosimetric assessment procedure with accuracy better than ± 10%. The spherical isotropy shall be evaluated and within ± 0.25 dB. The sensitivity parameters (NormX, NormY, and NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested. The calibration data can be referred to appendix C of this report.

5.2 Data Acquisition Electronics (DAE)

The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.

The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

Fig 5.3 Photo of DAE

5.3 Robot

The SPEAG DASY system uses the high precision robots (DASY5: TX90XL) type 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)

Fig 5.4 Photo of DASY5

5.4 Measurement Server

The measurement server is based on a PC/104 CPU board with CPU (DASY5: 400 MHz, Intel Celeron), chipdisk (DASY5: 128 MB), RAM (DASY5: 128 MB). The necessary circuits for communication with the DAE electronic box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY I/O board, which is directly connected to the PC/104 bus of the CPU board.

The measurement server performs all the real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operations.

Fig 5.5 Photo of Server for DASY5

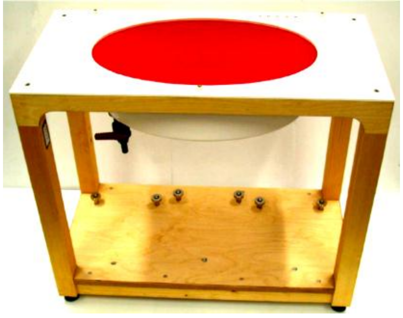
5.5 Phantom

<SAM Twin Phantom>

<table>
<tr><td>Shell Thickness</td><td>2 ± 0.2 mm;
Center ear point: 6 ± 0.2 mm</td><td rowspan="4">
Fig 5.6 Photo of SAM Phantom</td></tr>
<tr><td>Filling Volume</td><td>Approx. 25 liters</td></tr>
<tr><td>Dimensions</td><td>Length: 1000 mm; Width: 500 mm;
Height: adjustable feet</td></tr>
<tr><td>Measurement Areas</td><td>Left Hand, Right Hand, Flat Phantom</td></tr>
</table>

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

<ELI4 Phantom>

Shell Thickness	2 ± 0.2 mm (sagging: <1%)	
Filling Volume	Approx. 30 liters	
Dimensions	Major ellipse axis: 600 mm Minor axis: 400 mm	**Fig 5.7 Photo of ELI4 Phantom**

The ELI4 phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.

5.6 Device Holder

<Laptop Extension Kit>

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the mounting device in place of the phone positioned. The extension is fully compatible with the SAM Twin and ELI phantoms.

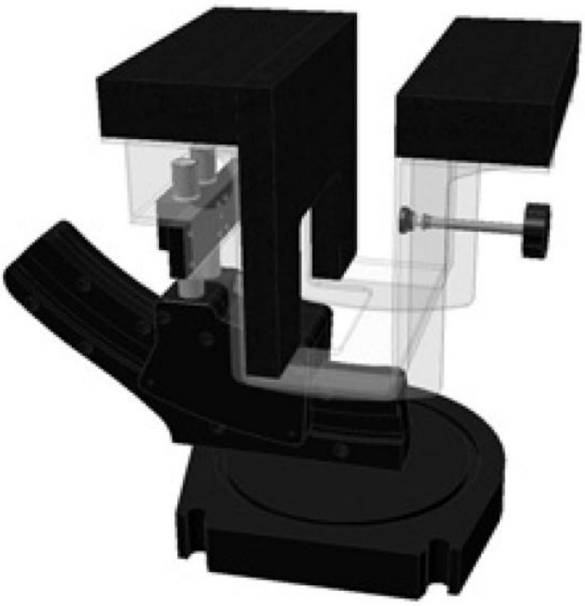


Fig 5.8 Laptop Extension Kit

5.7 Data Storage and Evaluation

5.7.1 Data Storage

The DASY software stores the assessed data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all the necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files. The post-processing software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of erroneous parameter settings. For example, if a measurement has been performed with an incorrect crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be reevaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type (e.g., [V/m], [A/m], [mW/g]). Some of these units are not available in certain situations or give meaningless results, e.g., a SAR-output in a non-lose media, will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

5.7.2 Data Evaluation

The DASY post-processing software (SEMCAD) automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software：

Probe parameters：	- Sensitivity	$Norm_i$, a_{i0}, a_{i1}, a_{i2}
	- Conversion factor	$ConvF_i$
	- Diode compression point	dcp_i
Device parameters：	- Frequency	f
	- Crest factor	cf
Media parameters：	- Conductivity	σ
	- Density	ρ

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY components. In the direct measuring mode of the multi-meter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power.

The formula for each channel can be given as：

$$\mathbf{V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}}$$

with V_i = compensated signal of channel i, (i = x, y, z)
U_i = input signal of channel i, (i = x, y, z)
cf = crest factor of exciting field (DASY parameter)
dcp_i = diode compression point (DASY parameter)

From the compensated input signals, the primary field data for each channel can be evaluated：

E-field Probes：$\mathbf{E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}}$

H-field Probes：$\mathbf{H_i = \sqrt{V_i} \cdot \frac{a_{i0} + a_{i1} f + a_{i2} f^2}{f}}$

with V_i = compensated signal of channel i, (i = x, y, z)
$Norm_i$ = sensor sensitivity of channel i, (i = x, y, z), μV/(V/m)^2 for E-field Probes
ConvF = sensitivity enhancement in solution
a_{ij} = sensor sensitivity factors for H-field probes
f = carrier frequency [GHz]
E_i = electric field strength of channel i in V/m
H_i = magnetic field strength of channel i in A/m

The RSS value of the field components gives the total field strength (Hermitian magnitude)：

$$\mathbf{E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}}$$

The primary field data are used to calculate the derived field units.

$$\mathbf{SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1000}}$$

with SAR = local specific absorption rate in mW/g
E_{tot} = total field strength in V/m
σ = conductivity in [mho/m] or [Siemens/m]
ρ = equivalent tissue density in g/cm^3

Note that the density is set to 1, to account for actual head tissue density rather than the density of the tissue simulating liquid.

5.8 Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	Dosimetric E-Field Probe	EX3DV4	3697	Sep. 02, 2011	Sep. 01, 2012
SPEAG	Data Acquisition Electronics	DAE4	1210	Nov. 18, 2011	Nov. 17, 2012
SPEAG	750MHz System Validation Kit	D750V3	1012	Jun. 11, 2010	Jun. 09, 2012
SPEAG	835MHz System Validation Kit	D835V2	4d091	Nov. 18, 2011	Nov. 17, 2012
SPEAG	1800MHz System Validation Kit	D1800V2	2d177	Nov. 21, 2011	Nov. 20, 2012
SPEAG	1900MHz System Validation Kit	D1900V2	5d118	Nov. 21, 2011	Nov. 20, 2012
SPEAG	SAM Twin Phantom	QD 000 P40 CB	TP-1477	NCR	NCR
SPEAG	SAM Twin Phantom	QD 000 P40 CB	TP-1479	NCR	NCR
Agilent	Wireless Communication Test Set	E5515C	MY48367160	Oct. 26, 2011	Oct. 25, 2012
R&S	Signal Generator	SMR40	100455	Dec. 30, 2011	Dec. 29, 2012
R&S	Spectrum Analyzer	FSP30	101399	Jun. 02, 2011	Jun. 01, 2012

Table 5.1 Test Equipment List

Note:

1. The calibration certificate of DASY can be referred to appendix C of this report.
2. Referring to KDB 450824 D02, the dipole calibration interval can be extended to 3 years with justification. The dipoles are also not physically damaged, or repaired during the interval.
3. The justification data of dipole D750V3, SN: 1012, can be found in appendix C. The return loss is < -20dB, within 20% of prior calibration, the impedance is within 5 ohm of prior calibration.

6. Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. 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, which is shown in Fig. 6.1. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 6.2.

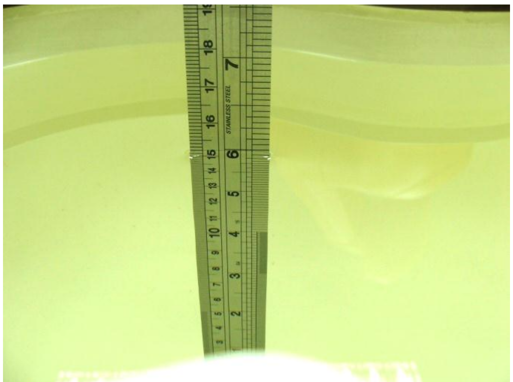


Fig 6.1 Photo of Liquid Height for Head SAR

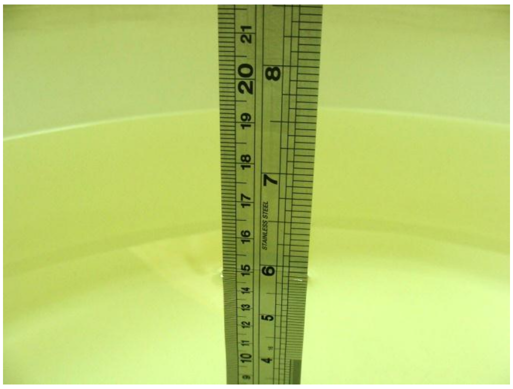


Fig 6.2 Photo of Liquid Height for Body SAR

The following table gives the recipes for tissue simulating liquid.

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (ε_r)
For Head								
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.40	40.0
For Body								
750	51.7	47.2	0	0.9	0.1	0	0.96	55.5
835	50.8	48.2	0	0.9	0.1	0	0.97	55.2
1800, 1900, 2000	70.2	0	0	0.4	0	29.4	1.52	53.3

Table 6.1 Recipes of Tissue Simulating Liquid

The dielectric parameters of the liquids were verified prior to the SAR evaluation using an Agilent 85070D Dielectric Probe Kit and an Agilent Network Analyzer.

The following table shows the measuring results for simulating liquid.

Freq. (MHz)	Liquid Type	Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
750	Body	21.2	0.961	53.913	0.96	55.5	0.10	-2.86	±5	Mar. 20, 2012
750	Body	21.5	0.97	54.633	0.96	55.5	1.04	-1.56	±5	Mar. 21, 2012
835	Body	21.3	0.976	54.36	0.97	55.2	0.62	-1.52	±5	Mar. 11, 2012
1800	Body	21.2	1.59	54.539	1.52	53.3	4.61	2.32	±5	Mar. 12, 2012
1900	Body	21.5	1.547	53.803	1.52	53.3	1.78	0.94	±5	Mar. 11, 2012

Table 6.2 Measuring Results for Simulating Liquid

7. Uncertainty Assessment

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 7.1

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

Table 7.1 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 showed in Table 7.2.

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	Ci (1g)	Standard Uncertainty (1g)
Measurement System					
Probe Calibration	6.0	Normal	1	1	± 6.0 %
Axial Isotropy	4.7	Rectangular	√3	0.7	± 1.9 %
Hemispherical Isotropy	9.6	Rectangular	√3	0.7	± 3.9 %
Boundary Effects	1.0	Rectangular	√3	1	± 0.6 %
Linearity	4.7	Rectangular	√3	1	± 2.7 %
System Detection Limits	1.0	Rectangular	√3	1	± 0.6 %
Readout Electronics	0.3	Normal	1	1	± 0.3 %
Response Time	0.8	Rectangular	√3	1	± 0.5 %
Integration Time	2.6	Rectangular	√3	1	± 1.5 %
RF Ambient Noise	3.0	Rectangular	√3	1	± 1.7 %
RF Ambient Reflections	3.0	Rectangular	√3	1	± 1.7 %
Probe Positioner	0.4	Rectangular	√3	1	± 0.2 %
Probe Positioning	2.9	Rectangular	√3	1	± 1.7 %
Max. SAR Eval.	1.0	Rectangular	√3	1	± 0.6 %
Test Sample Related					
Device Positioning	2.9	Normal	1	1	± 2.9 %
Device Holder	3.6	Normal	1	1	± 3.6 %
Power Drift	5.0	Rectangular	√3	1	± 2.9 %
Phantom and Setup					
Phantom Uncertainty	4.0	Rectangular	√3	1	± 2.3 %
Liquid Conductivity (Target)	5.0	Rectangular	√3	0.64	± 1.8 %
Liquid Conductivity (Meas.)	2.5	Normal	1	0.64	± 1.6 %
Liquid Permittivity (Target)	5.0	Rectangular	√3	0.6	± 1.7 %
Liquid Permittivity (Meas.)	2.5	Normal	1	0.6	± 1.5 %
Combined Standard Uncertainty					± 11.0 %
Coverage Factor for 95 %					K = 2
Expanded Uncertainty					**± 22.0 %**

Table 7.2 Uncertainty Budget of DASY for frequency range 300 MHz to 3 GHz

8. SAR Measurement Evaluation

Each DASY system is equipped with one or more system validation kits. These units, together with the predefined measurement procedures within the DASY software, enable the user to conduct the system performance check and system validation. System validation kit includes a dipole, tripod holder to fix it underneath the flat phantom and a corresponding distance holder.

8.1 Purpose of System Performance check

The system performance check verifies that the system operates within its specifications. System and operator errors can be detected and corrected. It is recommended that the system performance check be performed prior to any usage of the system in order to guarantee reproducible results. The system performance check uses normal SAR measurements in a simplified setup with a well characterized source. This setup was selected to give a high sensitivity to all parameters that might fail or vary over time. The system check does not intend to replace the calibration of the components, but indicates situations where the system uncertainty is exceeded due to drift or failure.

8.2 System Setup

In the simplified setup for system evaluation, the DUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave that comes from a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The equipment setup is shown below:

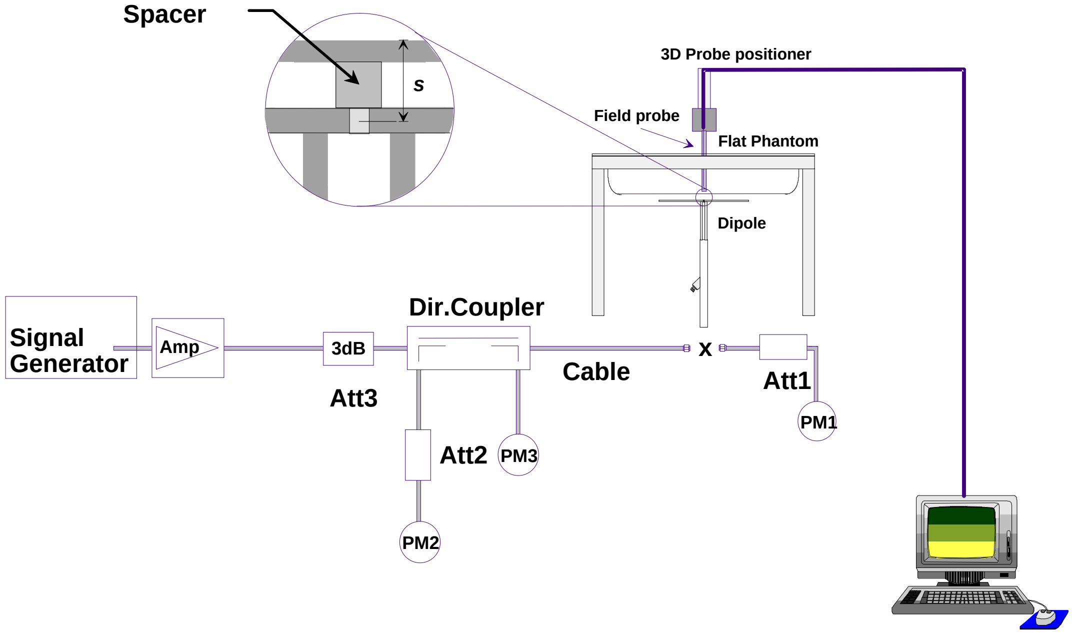


Fig 8.1 System Setup for System Evaluation

1. Signal Generator
2. Amplifier
3. Directional Coupler
4. Power Meter
5. Calibrated Dipole

The output power on dipole port must be calibrated to 24 dBm (250 mW) before dipole is connected.

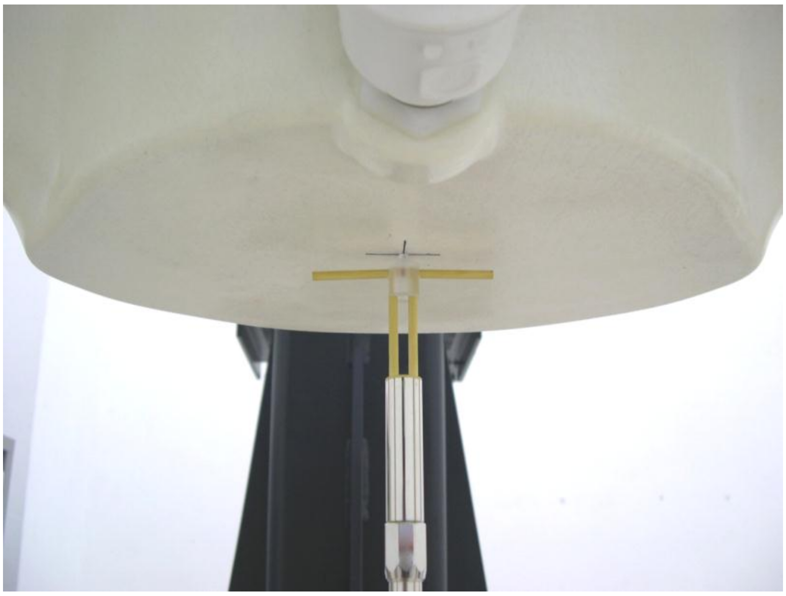


Fig 8.2 Photo of Dipole Setup

8.3 Validation Results

Comparing to the original SAR value provided by SPEAG, the validation data should be within its specification of 10 %. Table 8.1 shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

Measurement Date	Frequency (MHz)	Liquid Type	Targeted SAR_{1g} (W/kg)	Measured SAR_{1g} (W/kg)	Normalized SAR_{1g} (W/kg)	Deviation (%)
Mar. 20, 2012	750	Body	8.86	2.21	8.84	-0.23
Mar. 21, 2012	750	Body	8.86	2.23	8.92	0.68
Mar. 11, 2012	835	Body	9.42	2.51	10.04	6.58
Mar. 12, 2012	1800	Body	39.2	9.97	39.88	1.73
Mar. 11, 2012	1900	Body	41.8	10.6	42.40	1.44

Table 8.1 Target and Measurement SAR after Normalized

9. DUT Testing Position

This DUT was tested in five different USB configurations. They are “direct laptop plug-in for configuration 1 and 4”, “USB cable plug-in for configuration 2 and 3”, and “USB cable plug-in for Tip Mode (the tip of the DUT)” shown as below. Both direct laptop plug-in and USB cable plug-in test configurations are tested with 5 mm separation between the particular dongle orientation and the flat phantom. Please refer to Appendix E for the test setup photos.

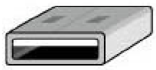
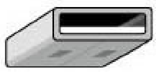
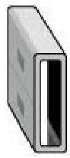
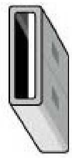
			
Configuration 1 (Horizontal Up)	**Configuration 2 (Horizontal Down)**	**Configuration 3 (Vertical Front)**	**Configuration 4 (Vertical Back)**

Fig 9.1 Illustration for USB Connector Orientations

10. Measurement Procedures

The measurement procedures are as follows:

(a) Use base station simulator (if applicable) or engineering software to transmit RF power continuously (continuous Tx) in the highest power channel.
(b) Keep DUT to radiate maximum output power or 100% duty factor (if applicable)
(c) Measure output power through RF cable and power meter.
(d) Place the DUT in the positions as Appendix E demonstrates.
(e) Set scan area, grid size and other setting on the DASY software.
(f) Measure SAR results for the highest power channel on each testing position.
(g) Find out the largest SAR result on these testing positions of each band
(h) 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:

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

10.1 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

10.2 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 5x5x7 points with step size 8, 8 and 5 mm for 300 MHz to 3 GHz, and 8x8x8 points with step size 4, 4 and 2.5 mm for 3 GHz to 6 GHz. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g.

10.3 Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the DUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing (step-size is 4, 4 and 2.5 mm). When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

10.4 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.

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

11. SAR Test Results

11.1 Conducted Power (Unit: dBm)

<WCDMA>

Band	WCDMA Band V			WCDMA Band II			WCDMA Band IV		
Channel	4132	4182	4233	9262	9400	9538	1312	1413	1513
Frequency (MHz)	826.4	836.4	846.6	1852.4	1880.0	1907.6	1712.4	1732.6	1752.6
RMC 12.2K	21.86	21.79	21.90	21.62	21.73	21.57	21.93	21.85	22.25
HSDPA Subtest-1	21.78	21.70	21.89	21.65	21.70	21.50	22.12	21.84	22.21
HSDPA Subtest-2	21.84	21.79	21.86	21.70	21.72	21.64	22.07	21.86	22.20
HSDPA Subtest-3	21.33	21.23	21.37	21.27	21.47	21.31	21.52	21.32	21.87
HSDPA Subtest-4	21.27	21.27	21.29	21.43	21.20	21.56	21.56	21.49	21.75
HSUPA Subtest-1	20.95	21.74	21.31	21.05	20.88	20.82	20.76	20.77	20.65
HSUPA Subtest-2	19.91	19.90	19.72	19.31	19.75	19.77	19.10	19.16	19.26
HSUPA Subtest-3	20.48	20.62	20.35	20.50	20.67	20.86	20.65	20.60	20.67
HSUPA Subtest-4	19.89	19.75	19.83	19.33	19.58	19.33	19.14	19.49	19.23
HSUPA Subtest-5	20.95	21.56	21.23	20.87	20.86	20.88	20.67	20.67	20.68

MPR										
3GPP Requirement		WCDMA band V			WCDMA band II			WCDMA Band IV		
0	HSDPA Subtest-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	HSDPA Subtest-2	-0.06	-0.09	0.03	-0.05	-0.02	-0.14	0.05	-0.02	0.01
0.5	HSDPA Subtest-3	0.45	0.47	0.52	0.38	0.23	0.19	0.60	0.52	0.34
0.5	HSDPA Subtest-4	0.51	0.43	0.60	0.22	0.50	-0.06	0.56	0.35	0.46
0	HSUPA Subtest-1	0.00	-0.18	-0.08	-0.18	-0.02	0.06	-0.09	-0.10	0.03
2	HSUPA Subtest-2	1.04	1.66	1.51	1.56	1.11	1.11	1.57	1.51	1.42
1	HSUPA Subtest-3	0.47	0.94	0.88	0.37	0.19	0.02	0.02	0.07	0.01
2	HSUPA Subtest-4	1.06	1.81	1.40	1.54	1.28	1.55	1.53	1.18	1.45
0	HSUPA Subtest-5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note:

1. For Body SAR, per KDB 941225 D01, RMC 12.2kbps setting is used to evaluate SAR. If HSDPA subset-1 and HSUPA subset-5 output power is < 1/4 dB higher than RMC, HSDPA and HSUPA SAR evaluation can be excluded.
2. DUT is declared to follow the MPR of 3GPP Table 5.2B.1 specification, and the specification will set during the production. Since there is tolerance in measuring 3G output power, the difference between the measured value and the specification is treated as tolerance. According to KDB 941225 D02 v02, 1)b), the MPR implementation information is provided here.

<LTE Band 12, Low Channel >

Frequency [MHz]	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Maximum Average Power (dBm)	MPR Target (dB)
703.7	23057	10	1	0	QPSK	22.66	0
703.7	23057	10	1	49	QPSK	22.36	0
703.7	23057	10	25	13	QPSK	22.43	0
703.7	23057	10	50	0	QPSK	22.78	0
703.7	23057	10	1	0	16-QAM	23.00	0
703.7	23057	10	1	49	16-QAM	23.05	0
703.7	23057	10	25	13	16-QAM	22.86	0
703.7	23057	10	50	0	16-QAM	22.58	0
701.4	23034	5	1	0	QPSK	22.41	0
701.4	23034	5	1	24	QPSK	22.90	0
701.4	23034	5	12	6	QPSK	22.27	1
701.4	23034	5	25	0	QPSK	22.40	1
701.4	23034	5	1	0	16-QAM	23.16	0
701.4	23034	5	1	24	16-QAM	23.11	0
701.4	23034	5	12	6	16-QAM	22.22	0
701.4	23034	5	25	0	16-QAM	22.43	0
700.5	23025	3	1	0	QPSK	22.61	0
700.5	23025	3	1	14	QPSK	22.52	0
700.5	23025	3	8	4	QPSK	22.36	0
700.5	23025	3	15	0	QPSK	22.00	0
700.5	23025	3	1	0	16-QAM	22.36	0
700.5	23025	3	1	14	16-QAM	22.42	0
700.5	23025	3	8	4	16-QAM	22.10	0
700.5	23025	3	15	0	16-QAM	21.96	0
699.7	23017	1.4	1	0	QPSK	22.67	0
699.7	23017	1.4	1	5	QPSK	22.37	0
699.7	23017	1.4	3	2	QPSK	22.25	0
699.7	23017	1.4	6	0	QPSK	22.23	0
699.7	23017	1.4	1	0	16-QAM	22.90	0
699.7	23017	1.4	1	5	16-QAM	22.67	0
699.7	23017	1.4	3	2	16-QAM	22.28	0
699.7	23017	1.4	6	0	16-QAM	22.47	0

<LTE Band 12, Middle Channel >

Frequency [MHz]	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Maximum Average Power (dBm)	MPR Target (dB)
707.5	23095	10	1	0	QPSK	22.75	0
707.5	23095	10	1	49	QPSK	22.38	0
707.5	23095	10	25	13	QPSK	22.15	0
707.5	23095	10	50	0	QPSK	22.10	0
707.5	23095	10	1	0	16-QAM	22.98	0
707.5	23095	10	1	49	16-QAM	22.95	0
707.5	23095	10	25	13	16-QAM	22.54	0
707.5	23095	10	50	0	16-QAM	22.14	0
707.5	23095	5	1	0	QPSK	22.55	0
707.5	23095	5	1	24	QPSK	23.03	0
707.5	23095	5	12	6	QPSK	22.53	1
707.5	23095	5	25	0	QPSK	22.47	1
707.5	23095	5	1	0	16-QAM	23.16	0
707.5	23095	5	1	24	16-QAM	23.01	0
707.5	23095	5	12	6	16-QAM	22.51	0
707.5	23095	5	25	0	16-QAM	**23.51**	0
707.5	23095	3	1	0	QPSK	22.52	0
707.5	23095	3	1	14	QPSK	22.27	0
707.5	23095	3	8	4	QPSK	22.43	0
707.5	23095	3	15	0	QPSK	22.52	0
707.5	23095	3	1	0	16-QAM	23.00	0
707.5	23095	3	1	14	16-QAM	23.02	0
707.5	23095	3	8	4	16-QAM	22.66	0
707.5	23095	3	15	0	16-QAM	22.29	0
707.5	23095	1.4	1	0	QPSK	22.32	0
707.5	23095	1.4	1	5	QPSK	22.32	0
707.5	23095	1.4	3	2	QPSK	22.59	0
707.5	23095	1.4	6	0	QPSK	22.41	0
707.5	23095	1.4	1	0	16-QAM	22.80	0
707.5	23095	1.4	1	5	16-QAM	22.73	0
707.5	23095	1.4	3	2	16-QAM	22.63	0
707.5	23095	1.4	6	0	16-QAM	22.64	0

<LTE Band 12, High Channel>

Frequency [MHz]	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Maximum Average Power (dBm)	MPR Target (dB)
711.3	23133	10	1	0	QPSK	22.73	0
711.3	23133	10	1	49	QPSK	22.34	0
711.3	23133	10	25	13	QPSK	22.12	0
711.3	23133	10	50	0	QPSK	21.95	0
711.3	23133	10	1	0	16-QAM	22.93	0
711.3	23133	10	1	49	16-QAM	22.41	0
711.3	23133	10	25	13	16-QAM	23.00	0
711.3	23133	10	50	0	16-QAM	21.87	0
713.6	23156	5	1	0	QPSK	21.80	0
713.6	23156	5	1	24	QPSK	22.09	0
713.6	23156	5	12	6	QPSK	22.06	1
713.6	23156	5	25	0	QPSK	22.08	1
713.6	23156	5	1	0	16-QAM	22.75	0
713.6	23156	5	1	24	16-QAM	22.53	0
713.6	23156	5	12	6	16-QAM	22.18	0
713.6	23156	5	25	0	16-QAM	22.25	0
714.5	23165	3	1	0	QPSK	22.11	0
714.5	23165	3	1	14	QPSK	21.95	0
714.5	23165	3	8	4	QPSK	22.27	0
714.5	23165	3	15	0	QPSK	22.13	0
714.5	23165	3	1	0	16-QAM	22.58	0
714.5	23165	3	1	14	16-QAM	22.61	0
714.5	23165	3	8	4	16-QAM	22.31	0
714.5	23165	3	15	0	16-QAM	22.00	0
715.3	23173	1.4	1	0	QPSK	22.22	0
715.3	23173	1.4	1	5	QPSK	21.95	0
715.3	23173	1.4	3	2	QPSK	22.14	0
715.3	23173	1.4	6	0	QPSK	22.16	0
715.3	23173	1.4	1	0	16-QAM	22.36	0
715.3	23173	1.4	1	5	16-QAM	22.50	0
715.3	23173	1.4	3	2	16-QAM	22.26	0
715.3	23173	1.4	6	0	16-QAM	22.24	0

<LTE Band 17, Low Channel>

Frequency [MHz]	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Maximum Average Power (dBm)	MPR Target (dB)
709	23780	10	1	0	QPSK	22.60	0
709	23780	10	1	49	QPSK	22.59	0
709	23780	10	25	13	QPSK	22.17	0
709	23780	10	50	0	QPSK	22.31	0
709	23780	10	1	0	16-QAM	22.81	0
709	23780	10	1	49	16-QAM	22.87	0
709	23780	10	25	13	16-QAM	22.67	0
709	23780	10	50	0	16-QAM	22.19	0
706.5	23755	5	1	0	QPSK	22.58	0
706.5	23755	5	1	24	QPSK	22.46	0
706.5	23755	5	12	6	QPSK	22.55	0
706.5	23755	5	25	0	QPSK	22.36	0
706.5	23755	5	1	0	16-QAM	22.80	0
706.5	23755	5	1	24	16-QAM	**23.25**	0
706.5	23755	5	12	6	16-QAM	22.54	0
706.5	23755	5	25	0	16-QAM	23.05	0

<LTE Band 17, Middle Channel>

Frequency [MHz]	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Maximum Average Power (dBm)	MPR Target (dB)
710	23790	10	1	0	QPSK	22.62	0
710	23790	10	1	49	QPSK	22.40	0
710	23790	10	25	13	QPSK	22.18	0
710	23790	10	50	0	QPSK	22.17	0
710	23790	10	1	0	16-QAM	22.99	0
710	23790	10	1	49	16-QAM	22.74	0
710	23790	10	25	13	16-QAM	23.03	0
710	23790	10	50	0	16-QAM	22.05	0
710	23790	5	1	0	QPSK	22.24	0
710	23790	5	1	24	QPSK	22.00	0
710	23790	5	12	6	QPSK	22.43	0
710	23790	5	25	0	QPSK	22.36	0
710	23790	5	1	0	16-QAM	22.73	0
710	23790	5	1	24	16-QAM	22.90	0
710	23790	5	12	6	16-QAM	22.47	0
710	23790	5	25	0	16-QAM	22.73	0

<LTE Band 17, High Channel>

Frequency [MHz]	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Maximum Average Power (dBm)	MPR Target (dB)
711	23800	10	1	0	QPSK	22.42	0
711	23800	10	1	49	QPSK	21.73	0
711	23800	10	25	13	QPSK	21.97	0
711	23800	10	50	0	QPSK	21.86	0
711	23800	10	1	0	16-QAM	23.02	0
711	23800	10	1	49	16-QAM	22.30	0
711	23800	10	25	13	16-QAM	22.73	0
711	23800	10	50	0	16-QAM	21.77	0
713.5	23825	5	1	0	QPSK	21.70	0
713.5	23825	5	1	24	QPSK	21.62	0
713.5	23825	5	12	6	QPSK	22.19	0
713.5	23825	5	25	0	QPSK	22.28	0
713.5	23825	5	1	0	16-QAM	22.34	0
713.5	23825	5	1	24	16-QAM	22.06	0
713.5	23825	5	12	6	16-QAM	22.08	0
713.5	23825	5	25	0	16-QAM	22.33	0

<LTE Band 4, Low Channel>

Frequency [MHz]	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Maximum Average Power (dBm)	MPR Target (dB)
1720	20050	20	1	0	QPSK	22.07	0
1720	20050	20	1	99	QPSK	21.73	0
1720	20050	20	50	25	QPSK	20.81	1
1720	20050	20	100	0	QPSK	20.94	1
1720	20050	20	1	0	16-QAM	21.35	0.5
1720	20050	20	1	99	16-QAM	21.12	0.5
1720	20050	20	50	25	16-QAM	20.02	1.5
1720	20050	20	100	0	16-QAM	19.95	1.5
1717.5	20025	15	1	0	QPSK	22.06	0
1717.5	20025	15	1	74	QPSK	21.74	0
1717.5	20025	15	36	18	QPSK	20.80	1
1717.5	20025	15	75	0	QPSK	20.81	1
1717.5	20025	15	1	0	16-QAM	21.44	0.5
1717.5	20025	15	1	74	16-QAM	21.09	0.5
1717.5	20025	15	36	18	16-QAM	19.92	1.5
1717.5	20025	15	75	0	16-QAM	19.84	1.5
1715	20000	10	1	0	QPSK	22.04	0
1715	20000	10	1	49	QPSK	21.81	0
1715	20000	10	25	13	QPSK	20.94	1
1715	20000	10	50	0	QPSK	20.88	1
1715	20000	10	1	0	16-QAM	21.32	0.5
1715	20000	10	1	49	16-QAM	21.30	0.5
1715	20000	10	25	13	16-QAM	20.15	1.5
1715	20000	10	50	0	16-QAM	20.04	1.5
1712.5	19975	5	1	0	QPSK	21.94	0
1712.5	19975	5	1	24	QPSK	21.87	0
1712.5	19975	5	12	6	QPSK	20.64	1
1712.5	19975	5	25	0	QPSK	20.69	1
1712.5	19975	5	1	0	16-QAM	21.22	0.5
1712.5	19975	5	1	24	16-QAM	21.12	0.5
1712.5	19975	5	12	6	16-QAM	19.75	1.5
1712.5	19975	5	25	0	16-QAM	20.17	1.5
1711.5	19965	3	1	0	QPSK	21.96	0
1711.5	19965	3	1	14	QPSK	21.98	0
1711.5	19965	3	8	4	QPSK	20.73	1
1711.5	19965	3	15	0	QPSK	20.75	1
1711.5	19965	3	1	0	16-QAM	21.20	0.5
1711.5	19965	3	1	14	16-QAM	21.34	0.5
1711.5	19965	3	8	4	16-QAM	19.93	1.5
1711.5	19965	3	15	0	16-QAM	19.81	1.5
1710.7	19957	1.4	1	0	QPSK	22.01	0
1710.7	19957	1.4	1	5	QPSK	21.99	0
1710.7	19957	1.4	3	2	QPSK	21.86	0
1710.7	19957	1.4	6	0	QPSK	20.72	0
1710.7	19957	1.4	1	0	16-QAM	21.37	0.5
1710.7	19957	1.4	1	5	16-QAM	21.35	0.5
1710.7	19957	1.4	3	2	16-QAM	21.12	0.5
1710.7	19957	1.4	6	0	16-QAM	20.01	0.5

<LTE Band 4, Middle Channel>

Frequency [MHz]	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Maximum Average Power (dBm)	MPR Target (dB)
1732.5	20175	20	1	0	QPSK	21.81	0
1732.5	20175	20	1	99	QPSK	22.06	0
1732.5	20175	20	50	25	QPSK	20.77	1
1732.5	20175	20	100	0	QPSK	20.82	1
1732.5	20175	20	1	0	16-QAM	21.25	0.5
1732.5	20175	20	1	99	16-QAM	21.32	0.5
1732.5	20175	20	50	25	16-QAM	20.07	1.5
1732.5	20175	20	100	0	16-QAM	19.98	1.5
1732.5	20175	15	1	0	QPSK	21.94	0
1732.5	20175	15	1	74	QPSK	21.95	0
1732.5	20175	15	36	18	QPSK	20.86	1
1732.5	20175	15	75	0	QPSK	20.91	1
1732.5	20175	15	1	0	16-QAM	21.22	0.5
1732.5	20175	15	1	74	16-QAM	21.44	0.5
1732.5	20175	15	36	18	16-QAM	19.96	1.5
1732.5	20175	15	75	0	16-QAM	19.86	1.5
1732.5	20175	10	1	0	QPSK	21.86	0
1732.5	20175	10	1	49	QPSK	21.81	0
1732.5	20175	10	25	13	QPSK	20.67	1
1732.5	20175	10	50	0	QPSK	20.75	1
1732.5	20175	10	1	0	16-QAM	21.20	0.5
1732.5	20175	10	1	49	16-QAM	21.21	0.5
1732.5	20175	10	25	13	16-QAM	20.18	1.5
1732.5	20175	10	50	0	16-QAM	19.90	1.5
1732.5	20175	5	1	0	QPSK	21.85	0
1732.5	20175	5	1	24	QPSK	21.91	0
1732.5	20175	5	12	6	QPSK	20.70	1
1732.5	20175	5	25	0	QPSK	20.68	1
1732.5	20175	5	1	0	16-QAM	21.12	0.5
1732.5	20175	5	1	24	16-QAM	21.20	0.5
1732.5	20175	5	12	6	16-QAM	19.70	1.5
1732.5	20175	5	25	0	16-QAM	20.13	1.5
1732.5	20175	3	1	0	QPSK	21.85	0
1732.5	20175	3	1	14	QPSK	21.90	0
1732.5	20175	3	8	4	QPSK	20.71	1
1732.5	20175	3	15	0	QPSK	20.66	1
1732.5	20175	3	1	0	16-QAM	21.19	0.5
1732.5	20175	3	1	14	16-QAM	21.23	0.5
1732.5	20175	3	8	4	16-QAM	19.93	1.5
1732.5	20175	3	15	0	16-QAM	19.68	1.5
1732.5	20175	1.4	1	0	QPSK	21.91	0
1732.5	20175	1.4	1	5	QPSK	21.85	0
1732.5	20175	1.4	3	2	QPSK	21.78	0
1732.5	20175	1.4	6	0	QPSK	20.77	0
1732.5	20175	1.4	1	0	16-QAM	21.17	0.5
1732.5	20175	1.4	1	5	16-QAM	21.25	0.5
1732.5	20175	1.4	3	2	16-QAM	21.04	0.5
1732.5	20175	1.4	6	0	16-QAM	20.02	0.5

<LTE Band 4, High Channel>

Frequency [MHz]	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Maximum Average Power (dBm)	MPR Target (dB)
1745	20300	20	1	0	QPSK	21.99	0
1745	20300	20	1	99	QPSK	22.15	0
1745	20300	20	50	25	QPSK	21.08	1
1745	20300	20	100	0	QPSK	21.14	1
1745	20300	20	1	0	16-QAM	21.51	0.5
1745	20300	20	1	99	16-QAM	21.33	0.5
1745	20300	20	50	25	16-QAM	20.19	1.5
1745	20300	20	100	0	16-QAM	20.26	1.5
1747.5	20325	15	1	0	QPSK	22.05	0
1747.5	20325	15	1	74	QPSK	22.14	0
1747.5	20325	15	36	18	QPSK	21.02	1
1747.5	20325	15	75	0	QPSK	21.10	1
1747.5	20325	15	1	0	16-QAM	21.37	0.5
1747.5	20325	15	1	74	16-QAM	21.48	0.5
1747.5	20325	15	36	18	16-QAM	20.24	1.5
1747.5	20325	15	75	0	16-QAM	20.13	1.5
1750	20350	10	1	0	QPSK	22.03	0
1750	20350	10	1	49	QPSK	22.13	0
1750	20350	10	25	13	QPSK	20.95	1
1750	20350	10	50	0	QPSK	20.91	1
1750	20350	10	1	0	16-QAM	21.65	0.5
1750	20350	10	1	49	16-QAM	21.52	0.5
1750	20350	10	25	13	16-QAM	20.24	1.5
1750	20350	10	50	0	16-QAM	20.06	1.5
1752.5	20375	5	1	0	QPSK	21.98	0
1752.5	20375	5	1	24	QPSK	22.04	0
1752.5	20375	5	12	6	QPSK	20.77	1
1752.5	20375	5	25	0	QPSK	20.86	1
1752.5	20375	5	1	0	16-QAM	21.34	0.5
1752.5	20375	5	1	24	16-QAM	21.31	0.5
1752.5	20375	5	12	6	16-QAM	19.93	1.5
1752.5	20375	5	25	0	16-QAM	20.37	1.5
1753.5	20385	3	1	0	QPSK	22.01	0
1753.5	20385	3	1	14	QPSK	22.02	0
1753.5	20385	3	8	4	QPSK	20.96	1
1753.5	20385	3	15	0	QPSK	20.87	1
1753.5	20385	3	1	0	16-QAM	21.18	0.5
1753.5	20385	3	1	14	16-QAM	21.01	0.5
1753.5	20385	3	8	4	16-QAM	20.15	1.5
1753.5	20385	3	15	0	16-QAM	20.00	1.5
1754.3	20393	1.4	1	0	QPSK	22.06	0
1754.3	20393	1.4	1	5	QPSK	22.03	0
1754.3	20393	1.4	3	2	QPSK	21.94	0
1754.3	20393	1.4	6	0	QPSK	21.02	0
1754.3	20393	1.4	1	0	16-QAM	21.44	0.5
1754.3	20393	1.4	1	5	16-QAM	21.47	0.5
1754.3	20393	1.4	3	2	16-QAM	21.50	0.5
1754.3	20393	1.4	6	0	16-QAM	20.17	0.5

Note: Per KDB 941225, if the output power variation across the band < 0.5dB, test middle channel SAR first and determine further test reduction based on the SAR results.

LTE Target MPR level

The device implements maximum power reduction per 3GPP 36.101 requirements where the MPR target is as below table. The MPR settings are implemented configured into firmware and cannot be disabled by the end user or LTE carrier network.

<LTE Band 12 MPR level>

Modulation	Channel bandwidth / Transmission bandwidth configuration [RB]				MPR Target (dB)				3GPP MPR (dB)
	1.4 MHz	3 MHz	5 MHz	10 MHz	1.4 MHz	3 MHz	5 MHz	10 MHz	
QPSK	> 5	> 4	> 8	> 12	0	0	1	0	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	0	0	0	0	≤ 1
16 QAM	> 5	> 4	> 8	> 12	0	0	0	0	≤ 2

<LTE Band 17 MPR level>

Modulation	Channel bandwidth / Transmission bandwidth configuration [RB]		MPR Target (dB)		3GPP MPR (dB)
	5 MHz	10 MHz	5 MHz	10 MHz	
QPSK	> 8	> 12	0	0	≤ 1
16 QAM	≤ 8	≤ 12	0	0	≤ 1
16 QAM	> 8	> 12	0	0	≤ 2

<LTE Band 4 MPR level>

Modulation	Channel bandwidth / Transmission bandwidth configuration [RB]						MPR Target (dB)						3GPP MPR (dB)
	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	0	1	1	1	1	1	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	0.5	0.5	0.5	0.5	0.5	0.5	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	0.5	1.5	1.5	1.5	1.5	1.5	≤ 2

11.2 Test Records for Body SAR Test

<WWAN>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Output Power (dBm)	SAR_{1g} (W/kg)	Power Drift (dB)
1	WCDMA V	RMC12.2K	Horizontal Up	0.5	4233	21.90	0.357	0.06
2	WCDMA V	RMC12.2K	Horizontal Down	0.5	4233	21.90	0.46	-0.04
3	WCDMA V	RMC12.2K	Vertical Front	0.5	4233	21.90	0.279	0.01
4	**WCDMA V**	**RMC12.2K**	**Vertical Back**	**0.5**	**4233**	**21.90**	**0.56**	**-0.15**
5	WCDMA V	RMC12.2K	Tip Mode	0.5	4233	21.90	0.124	0.01
6	WCDMA IV	RMC12.2K	Horizontal Up	0.5	1513	22.25	1.06	-0.04
7	WCDMA IV	RMC12.2K	Horizontal Down	0.5	1513	22.25	0.841	0.03
8	WCDMA IV	RMC12.2K	Vertical Front	0.5	1513	22.25	1.09	-0.01
9	WCDMA IV	RMC12.2K	Vertical Back	0.5	1513	22.25	0.16	-0.01
10	WCDMA IV	RMC12.2K	Tip Mode	0.5	1513	22.25	0.72	-0.07
11	WCDMA IV	RMC12.2K	Horizontal Up	0.5	1312	21.93	0.904	-0.02
12	WCDMA IV	RMC12.2K	Horizontal Up	0.5	1413	21.85	1.13	0.03
13	WCDMA IV	RMC12.2K	Horizontal Down	0.5	1312	21.93	0.752	0.05
14	WCDMA IV	RMC12.2K	Horizontal Down	0.5	1413	21.85	0.938	0.18
15	WCDMA IV	RMC12.2K	Vertical Front	0.5	1312	21.93	1.04	-0.01
16	**WCDMA IV**	**RMC12.2K**	**Vertical Front**	**0.5**	**1413**	**21.85**	**1.17**	**0.09**
17	WCDMA II	RMC12.2K	Horizontal Up	0.5	9400	21.73	1.07	-0.04
18	WCDMA II	RMC12.2K	Horizontal Down	0.5	9400	21.73	1.05	0.127
19	**WCDMA II**	**RMC12.2K**	**Vertical Front**	**0.5**	**9400**	**21.73**	**1.1**	**-0.02**
20	WCDMA II	RMC12.2K	Vertical Back	0.5	9400	21.73	0.162	0.15
21	WCDMA II	RMC12.2K	Tip Mode	0.5	9400	21.73	0.817	-0.0087
22	WCDMA II	RMC12.2K	Tip Mode	0.5	9262	21.62	0.807	-0.19
23	WCDMA II	RMC12.2K	Tip Mode	0.5	9538	21.57	0.732	-0.13
24	WCDMA II	RMC12.2K	Vertical Front	0.5	9262	21.62	1.08	0.13
25	WCDMA II	RMC12.2K	Vertical Front	0.5	9538	21.57	0.935	-0.03
26	WCDMA II	RMC12.2K	Horizontal Down	0.5	9262	21.62	1.05	-0.06
27	WCDMA II	RMC12.2K	Horizontal Down	0.5	9538	21.57	0.953	0.01
28	WCDMA II	RMC12.2K	Horizontal Up	0.5	9262	21.62	1.09	-0.09
29	WCDMA II	RMC12.2K	Horizontal Up	0.5	9538	21.57	0.913	-0.19

Note: Per KDB 447498, if the highest output channel SAR for each exposure position ≤ 0.8 W/kg other channels SAR tests are not necessary.

<LTE>

Plot No.	Band	Mode	BW [MHz]	RB Size	RB Offset	Test Position	Gap (cm)	Ch.	Output Power (dBm)	SAR_{1g} (W/kg)	Power Drift (dB)
82	LTE Band 12	QPSK	10M	25	13	Horizontal Up	0.5	23095	22.15	0.418	-0.04
83	LTE Band 12	QPSK	10M	25	13	Horizontal Down	0.5	23095	22.15	0.644	-0.009
84	LTE Band 12	QPSK	10M	25	13	Vertical Front	0.5	23095	22.15	0.421	0.00099
85	LTE Band 12	QPSK	10M	25	13	Vertical Back	0.5	23095	22.15	0.738	0.02
86	LTE Band 12	QPSK	10M	25	13	Tip Mode	0.5	23095	22.15	0.136	0.07
87	LTE Band 12	QPSK	10M	1	0	Horizontal Up	0.5	23095	22.75	0.659	-0.05
88	LTE Band 12	QPSK	10M	1	0	Horizontal Down	0.5	23095	22.75	0.73	-0.136
89	LTE Band 12	QPSK	10M	1	0	Vertical Front	0.5	23095	22.75	0.602	-0.141
90	LTE Band 12	QPSK	10M	1	0	Vertical Back	0.5	23095	22.75	0.907	-0.09
91	LTE Band 12	QPSK	10M	1	0	Tip Mode	0.5	23095	22.75	0.149	-0.05
92	LTE Band 12	QPSK	10M	1	49	Horizontal Up	0.5	23095	22.38	0.604	0.02
93	LTE Band 12	QPSK	10M	1	49	Horizontal Down	0.5	23095	22.38	0.692	-0.02
94	LTE Band 12	QPSK	10M	1	49	Vertical Front	0.5	23095	22.38	0.534	0.14
95	**LTE Band 12**	**QPSK**	**10M**	**1**	**49**	**Vertical Back**	**0.5**	**23095**	**22.38**	**1.08**	**-0.18**
96	LTE Band 12	QPSK	10M	1	49	Tip Mode	0.5	23095	22.38	0.125	-0.132
97	LTE Band 12	16QAM	10M	25	13	Horizontal Up	0.5	23095	22.54	0.448	-0.04
98	LTE Band 12	16QAM	10M	25	13	Horizontal Down	0.5	23095	22.54	0.656	-0.03
99	LTE Band 12	16QAM	10M	25	13	Vertical Front	0.5	23095	22.54	0.422	0.03
100	LTE Band 12	16QAM	10M	25	13	Vertical Back	0.5	23095	22.54	0.787	0.02
101	LTE Band 12	16QAM	10M	25	13	Tip Mode	0.5	23095	22.54	0.148	0.07
102	LTE Band 12	16QAM	10M	1	0	Horizontal Up	0.5	23095	22.98	0.753	-0.08
103	LTE Band 12	16QAM	10M	1	0	Horizontal Down	0.5	23095	22.98	0.792	0.02
104	LTE Band 12	16QAM	10M	1	0	Vertical Front	0.5	23095	22.98	0.582	-0.08
105	**LTE Band 12**	**16QAM**	**10M**	**1**	**0**	**Vertical Back**	**0.5**	**23095**	**22.98**	**0.933**	**-0.07**
106	LTE Band 12	16QAM	10M	1	0	Tip Mode	0.5	23095	22.98	0.154	0.130
107	LTE Band 12	16QAM	10M	1	49	Horizontal Up	0.5	23057	23.05	0.418	-0.0084
108	LTE Band 12	16QAM	10M	1	49	Horizontal Down	0.5	23057	23.05	0.742	-0.04
109	LTE Band 12	16QAM	10M	1	49	Vertical Front	0.5	23057	23.05	0.445	0.09
110	LTE Band 12	16QAM	10M	1	49	Vertical Back	0.5	23057	23.05	0.743	0.02
111	LTE Band 12	16QAM	10M	1	49	Tip Mode	0.5	23057	23.05	0.153	0.03

Plot No.	Band	Mode	BW [MHz]	RB Size	RB Offset	Test Position	Gap (cm)	Ch.	Output Power (dBm)	SAR_{1g} (W/kg)	Power Drift (dB)
112	LTE Band 17	QPSK	10M	25	13	Horizontal Up	0.5	23790	22.18	0.472	-0.06
113	LTE Band 17	QPSK	10M	25	13	Horizontal Down	0.5	23790	22.18	0.74	-0.19
114	LTE Band 17	QPSK	10M	25	13	Vertical Front	0.5	23790	22.18	0.451	0.02
115	LTE Band 17	QPSK	10M	25	13	Vertical Back	0.5	23790	22.18	0.888	-0.01
116	LTE Band17	QPSK	10M	25	13	Tip Mode	0.5	23790	22.18	0.138	0.0084
142	LTE Band 17	QPSK	10M	25	13	Vertical Back	0.5	23780	22.17	0.802	-0.06
143	**LTE Band 17**	**QPSK**	**10M**	**25**	**13**	**Vertical Back**	**0.5**	**23800**	**21.97**	**0.942**	**-0.08**
117	LTE Band 17	QPSK	10M	1	0	Horizontal Up	0.5	23800	22.42	0.438	0.11
118	LTE Band 17	QPSK	10M	1	0	Horizontal Down	0.5	23800	22.42	0.63	0.03
119	LTE Band 17	QPSK	10M	1	0	Vertical Front	0.5	23800	22.42	0.406	-0.01
120	LTE Band 17	QPSK	10M	1	0	Vertical Back	0.5	23800	22.42	0.73	-0.08
121	LTE Band 17	QPSK	10M	1	0	Tip Mode	0.5	23800	22.42	0.154	0.04
122	LTE Band 17	QPSK	10M	1	49	Horizontal Up	0.5	23800	21.73	0.449	0.06
123	LTE Band 17	QPSK	10M	1	49	Horizontal Down	0.5	23800	21.73	0.576	0.04
124	LTE Band 17	QPSK	10M	1	49	Vertical Front	0.5	23800	21.73	0.31	0.05
125	LTE Band17	QPSK	10M	1	49	Vertical Back	0.5	23800	21.73	0.925	-0.005
126	LTE Band 17	QPSK	10M	1	49	Tip Mode	0.5	23800	21.73	0.119	0.11
127	LTE Band 17	16QAM	10M	25	13	Horizontal Up	0.5	23800	22.73	0.553	-0.07
128	LTE Band 17	16QAM	10M	25	13	Horizontal Down	0.5	23800	22.73	0.682	-0.12
129	LTE Band 17	16QAM	10M	25	13	Vertical Front	0.5	23800	22.73	0.455	0.02
130	**LTE Band 17**	**16QAM**	**10M**	**25**	**13**	**Vertical Back**	**0.5**	**23800**	**22.73**	**1.01**	**0.0046**
131	LTE Band 17	16QAM	10M	25	13	Tip Mode	0.5	23800	22.73	0.129	0.02
132	LTE Band 17	16QAM	10M	1	0	Horizontal Up	0.5	23800	23.02	0.446	0.04
133	LTE Band17	16QAM	10M	1	0	Horizontal Down	0.5	23800	23.02	0.695	0.06
134	LTE Band 17	16QAM	10M	1	0	Vertical Front	0.5	23800	23.02	0.442	0.0069
135	LTE Band 17	16QAM	10M	1	0	Vertical Back	0.5	23800	23.02	0.79	-0.10
136	LTE Band 17	16QAM	10M	1	0	Tip Mode	0.5	23800	23.02	0.162	0.123
137	LTE Band 17	16QAM	10M	1	49	Horizontal Up	0.5	23800	22.30	0.489	0.07
138	LTE Band 17	16QAM	10M	1	49	Horizontal Down	0.5	23800	22.30	0.581	0.10
139	LTE Band 17	16QAM	10M	1	49	Vertical Front	0.5	23800	22.30	0.338	-0.06
140	LTE Band 17	16QAM	10M	1	49	Vertical Back	0.5	23800	22.30	0.973	0.05
141	LTE Band 17	16QAM	10M	1	49	Tip Mode	0.5	23800	22.30	0.126	-0.02

Plot No.	Band	Mode	BW [MHz]	RB Size	RB Offset	Test Position	Gap (cm)	Ch.	Output Power (dBm)	SAR_{1g} (W/kg)	Power Drift (dB)
30	LTE Band 4	QPSK	20M	50	25	Horizontal Up	0.5	20175	20.77	0.872	-0.03
31	LTE Band 4	QPSK	20M	50	25	Horizontal Down	0.5	20175	20.77	0.748	0.01
32	LTE Band 4	QPSK	20M	50	25	Vertical Front	0.5	20175	20.77	0.639	0.05
33	LTE Band 4	QPSK	20M	50	25	Vertical Back	0.5	20175	20.77	0.244	0.06
34	LTE Band 4	QPSK	20M	50	25	Tip Mode	0.5	20175	20.77	0.648	0.03
64	LTE Band 4	QPSK	20M	50	25	Horizontal Up	0.5	20050	20.81	0.662	-0.02
65	**LTE Band 4**	**QPSK**	**20M**	**50**	**25**	**Horizontal Up**	**0.5**	**20300**	**21.08**	**0.942**	**-0.02**
37	LTE Band 4	QPSK	20M	1	0	Horizontal Up	0.5	20050	22.07	0.803	-0.05
38	LTE Band 4	QPSK	20M	1	0	Horizontal Down	0.5	20050	22.07	0.751	0.03
39	LTE Band 4	QPSK	20M	1	0	Vertical Front	0.5	20050	22.07	0.609	0.07
40	LTE Band 4	QPSK	20M	1	0	Vertical Back	0.5	20050	22.07	0.243	0.03
41	LTE Band 4	QPSK	20M	1	0	Tip Mode	0.5	20050	22.07	0.666	0.02
42	LTE Band 4	QPSK	20M	1	99	Horizontal Up	0.5	20300	22.15	0.916	-0.01
43	LTE Band 4	QPSK	20M	1	99	Horizontal Down	0.5	20300	22.15	0.762	0.01
44	LTE Band 4	QPSK	20M	1	99	Vertical Front	0.5	20300	22.15	0.811	0.15
45	LTE Band 4	QPSK	20M	1	99	Vertical Back	0.5	20300	22.15	0.247	0.19
46	LTE Band 4	QPSK	20M	1	99	Tip Mode	0.5	20300	22.15	0.67	-0.04
49	LTE Band 4	16QAM	20M	50	25	Horizontal Up	0.5	20300	20.19	0.783	-0.03
50	LTE Band 4	16QAM	20M	50	25	Horizontal Down	0.5	20300	20.19	0.658	0.04
51	LTE Band 4	16QAM	20M	50	25	Vertical Front	0.5	20300	20.19	0.584	0.12
52	LTE Band 4	16QAM	20M	50	25	Vertical Back	0.5	20300	20.19	0.268	0.03
53	LTE Band 4	16QAM	20M	50	25	Tip Mode	0.5	20300	20.19	0.58	-0.03
54	**LTE Band 4**	**16QAM**	**20M**	**1**	**0**	**Horizontal Up**	**0.5**	**20300**	**21.51**	**0.923**	**0.09**
55	LTE Band 4	16QAM	20M	1	0	Horizontal Down	0.5	20300	21.51	0.862	0.0081
56	LTE Band 4	16QAM	20M	1	0	Vertical Front	0.5	20300	21.51	0.766	0.02
57	LTE Band 4	16QAM	20M	1	0	Vertical Back	0.5	20300	21.51	0.351	0.10
58	LTE Band 4	16QAM	20M	1	0	Tip Mode	0.5	20300	21.51	0.781	0.06
59	LTE Band 4	16QAM	20M	1	99	Horizontal Up	0.5	20300	21.33	0.783	0.03
60	LTE Band 4	16QAM	20M	1	99	Horizontal Down	0.5	20300	21.33	0.654	0.08
61	LTE Band 4	16QAM	20M	1	99	Vertical Front	0.5	20300	21.33	0.642	0.08
62	LTE Band 4	16QAM	20M	1	99	Vertical Back	0.5	20300	21.33	0.247	0.02
63	LTE Band 4	16QAM	20M	1	99	Tip Mode	0.5	20300	21.33	0.569	0.02

Note:

1. Per KDB 941225 D05, for LTE, if the smaller bandwidth output power is within +/- 0.5dB of the largest bandwidth, and the maximum SAR of the largest bandwidth is < 1.45 W/kg, SAR for smaller bandwidth can be excluded. Therefore LTE 5MHz bandwidth SAR tests are excluded..
2. If the middle channel 50%-RB QPSK SAR ≤ 0.8 W/kg, other channels SAR tests are not necessary referring to KDB 941225.
3. Per KDB 941225 D05, for LTE, if 50%-RB QPSK/16QAM SAR < 1.45 W/kg, 100%-RB SAR can be excluded.

12. References

[1] FCC 47 CFR Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”

[2] IEEE Std. C95.1-1991, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, 1991

[3] IEEE Std. 1528-2003, “Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, December 2003

[4] FCC OET Bulletin 65 (Edition 97-01) Supplement C (Edition 01-01), “Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields”, June 2001

[5] SPEAG DASY System Handbook

[6] FCC KDB 248227 D01 v01r02, “SAR Measurement Procedures for 802.11 a/b/g Transmitters”, May 2007

[7] FCC KDB 447498 D01 v04, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, November 2009

[8] FCC KDB 447498 D02 v02, "SAR Measurement Procedures for USB Dongle Transmitters", November 2009

[9] FCC KDB 941225 D01 v02, “SAR Measurement Procedures for 3G Devices – CDMA 2000 / Ev-Do / WCDMA / HSDPA / HSPA”, October 2007

[10] FCC KDB 941225 D03 v01, “Recommended SAR Test Reduction Procedures for GSM / GPRS / EDGE”, December 2008

[11] FCC KDB 941225 D04 v01, “Evaluating SAR for GSM/(E)GPRS Dual Transfer Mode”, January 27 2010

[12] FCC KDB 941225 D05 v01, “SAR Test Considerations for LTE Handsets and Data Modems”, December 2010

[13] FCC KDB 941225 D06 v01, "SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities", April 2011

[14] FCC KDB 388624 D02, "Permit But Ask List", December 2011.

Appendix A. Plots of System Performance Check

The plots are shown as follows.

Appendix B. Plots of SAR Measurement

The plots are shown as follows.

Appendix C. DASY Calibration Certificate

The DASY calibration certificates are shown as follows.