FCC SAR Test Report
FCC ID: HFSQTA-LI7FM101

Report No.	:	BTL-FCC SAR-1-2107T083B
Equipment	:	LTE Module
Model Name	:	FM101-GL
Applicant	:	Quanta Computer Inc.
Address	:	No. 188, Wenhua 2nd Rd., Guishan Dist., Taoyuan City 33377, Taiwan
Radio Function	:	WCDMA Band II, IV, V and LTE Band 2, 4, 5, 7, 12, 13, 14, 17, 25, 26, 30, 38, 41, 48 ,66, 71
Standard(s)	:	**KDB447498 D04** Interim General RF Exposure Guidance v01 **KDB865664 D01** SAR measurement 100 MHz to 6 GHz v01r04 **KDB865664 D02** SAR Reporting v01r02 **KDB616217 D04** SAR for laptop and Tablets **KDB941225 D01** 3G SAR Procedures v03r01 **KDB941225 D05** SAR for LTE Devices v02r05 **FCC§2.1093** Radiofrequency radiation exposure evaluation: portable devices **IEEE C95.1:1992** Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz. **IEC/IEEE 62209-1528:2020** Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Part 1528: Human models, instrumentation, and procedures (Frequency range of 4 MHz to 10 GHz)
Date of Receipt	:	Feb. 23, 2023
Date of Test	:	Mar. 6, 2023 ~ Mar. 15, 2023
Issued Date	:	Mar. 22, 2023

The above equipment has been tested and found in compliance with the requirement of the above standards by BTL Inc.

Prepared by :

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Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

This report is the confidential property of the client. As a mutual protection to the clients, the public and ourselves, the test report shall not be reproduced, except in full, without our written approval.

BTL's laboratory quality assurance procedures are in compliance with the **ISO/IEC 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

BTL is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.

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REPORT ISSUED HISTORY

Report Version	Description	Issued Date
R00	Original Issue.	2023/3/22

1 GENERAL INFORMATION

1.1 GENERAL DESCRIPTION OF EUT

<table>
<tr><td>Equipment</td><td colspan="3">LTE Module</td></tr>
<tr><td>Model Name</td><td colspan="3">FM101-GL</td></tr>
<tr><td colspan="4">Host device information</td></tr>
<tr><td>Equipment</td><td colspan="3">Notebook Computer</td></tr>
<tr><td>Model Name</td><td colspan="3">NL72LTE</td></tr>
<tr><td>Brand Name</td><td colspan="3">CTL ; Quanta</td></tr>
<tr><td>Added Models</td><td colspan="3">NL72CT-LTE, LI7, LI7XXXXXXXXXX, NL7XXXXXXXXXX(The “X" Can be 0-9,A-Z, a-z ,- or blank for the marketing purpose)</td></tr>
<tr><td>Model Name Difference</td><td colspan="3">Market Segmentation,different models</td></tr>
<tr><td>Power Source</td><td colspan="3">DC voltage supplied from External Power Supply.</td></tr>
<tr><td>Power Rating</td><td colspan="3">Brand : LITEON
Model : PA-1450-50
I/P : 100-240V~1.3A 50-60Hz
O/P : 5V/9V/12V/15V 3A, 20V 2.25A</td></tr>
<tr><td>Battery Information</td><td colspan="3">Brand : Zhuhai CosMX
Model : QTA-CB1
Rating : 5781mAh / 44.5Wh</td></tr>
<tr><td rowspan="21">Operation Frequency</td><td>Function</td><td>Band</td><td>Frequency (MHz)</td></tr>
<tr><td rowspan="3">WCDMA</td><td>UMTS Band II</td><td>TX : 1850 - 1910</td></tr>
<tr><td>UMTS Band IV</td><td>TX : 1710 - 1755</td></tr>
<tr><td>UMTS Band V</td><td>TX : 824 - 849</td></tr>
<tr><td rowspan="17">LTE</td><td>LTE Band 2</td><td>TX : 1850 - 1910</td></tr>
<tr><td>LTE Band 4</td><td>TX : 1710 - 1755</td></tr>
<tr><td>LTE Band 5</td><td>TX : 824 - 849</td></tr>
<tr><td>LTE Band 7</td><td>TX : 2500 - 2570</td></tr>
<tr><td>LTE Band 12</td><td>TX : 699 - 716</td></tr>
<tr><td>LTE Band 13</td><td>TX : 777 - 787</td></tr>
<tr><td>LTE Band 14</td><td>TX : 788 - 798</td></tr>
<tr><td>LTE Band 17</td><td>TX : 704 - 716</td></tr>
<tr><td>LTE Band 25</td><td>TX : 1850 - 1915</td></tr>
<tr><td>LTE Band 26</td><td>TX : 814 - 849</td></tr>
<tr><td>LTE Band 30</td><td>TX : 2305 - 2315</td></tr>
<tr><td>LTE Band 38</td><td>TX : 2570 - 2620</td></tr>
<tr><td>LTE Band 41</td><td>TX : 2496 - 2690</td></tr>
<tr><td>LTE Band 48</td><td>TX : 3550 - 3700</td></tr>
<tr><td>LTE Band 66</td><td>TX : 1710 - 1780</td></tr>
<tr><td>LTE Band 71</td><td>TX : 663 - 698</td></tr>
<tr><td>Test Model</td><td colspan="3">NL72LTE</td></tr>
<tr><td>Sample Status</td><td colspan="3">Engineering Sample</td></tr>
<tr><td>EUT Modification(s)</td><td colspan="3">N/A</td></tr>
</table>

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.
The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-FCC-SAR-1-2107T083B) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of TAF according to the ISO-17025 quality assessment standard and technical standard(s).

2 SUMMARY OF SAR MEASUREMENT

2.1 TEST FACILITY

The test facilities used to collect the test data in this report is **SAR Test room** at the location of No. 68-1, Ln. 169, Sec.2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan.

2.2 MEASUREMENT UNCERTAINTY

Uncertainty Budget for Frequency range of 300 MHz to 3 GHz

Error Description	Uncertainty Value (± %)	Probability Distribution	Divisor	Ci (1g)	Ci (10g)	Standard Uncertainty (1g)	Standard Uncertainty (10g)	Vi V_{eff}
Measurement System								
Probe Calibration	6.05	Normal	1	1	1	± 6.05 %	± 6.05 %	∞
Axial Isotropy	4.7	Rectangular	$\sqrt{3}$	0.7	0.7	± 1.9 %	± 1.9 %	∞
Hemispherical Isotropy	9.6	Rectangular	$\sqrt{3}$	0.7	0.7	± 3.9 %	± 3.9 %	∞
Boundary Effects	1	Rectangular	$\sqrt{3}$	1	1	± 0.6 %	± 0.6 %	∞
Linearity	4.7	Rectangular	$\sqrt{3}$	1	1	± 2.7 %	± 2.7 %	∞
Detection Limits	1	Rectangular	$\sqrt{3}$	1	1	± 0.6 %	± 0.6 %	∞
Modulation response	2.4	Rectangular	$\sqrt{3}$	1	1	±1.4 %	±1.4 %	∞
Readout Electronics	0.3	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Response Time	0.8	Rectangular	$\sqrt{3}$	1	1	± 0.5%	± 0.5 %	∞
Integration Time	2.6	Rectangular	$\sqrt{3}$	1	1	± 1.5 %	± 1.5 %	∞
RF Ambient – Noise	3	Rectangular	$\sqrt{3}$	1	1	± 1.7 %	± 1.7 %	∞
RF Ambient– Reflections	3	Rectangula	$\sqrt{3}$	1	1	± 1.7 %	± 1.7 %	∞
Probe Positioner	0.4	Rectangular	$\sqrt{3}$	1	1	± 0.2 %	± 0.2 %	∞
Probe Positioning	2.9	Rectangular	$\sqrt{3}$	1	1	± 1.7 %	±1.7 %	∞
Post-processing	4	Rectangular	$\sqrt{3}$	1	1	± 2.3 %	± 2.3 %	∞
Max.SAR Evaluation	2	Rectangular	$\sqrt{3}$	1	1	± 1.15 %	± 1.15 %	∞
Test Sample Related								
Device Positioning	1.6 / 1.8	Normal	1	1	1	± 1.6 %	± 1.8 %	145
Device Holder	1.5 / 1.7	Normal	1	1	1	± 1.5 %	± 1.7 %	5
Power Drift	5.0	Rectangular	$\sqrt{3}$	1	1	± 2.9 %	± 2.9 %	∞
Phantom and Setup								
Phantom Production Tolerances	6.1	Rectangular	$\sqrt{3}$	1	1	3.52	3.52	∞
SAR correction	1.9	Rectangular	$\sqrt{3}$	1	0.84	1.10	1.10	
Liquid Conductivity (mea.)	2.4	Rectangular	$\sqrt{3}$	0.78	0.71	1.08	1.08	∞
Liquid Permittivity (mea.)	2.4	Rectangular	$\sqrt{3}$	0.26	0.26	0.36	0.36	∞
Temp. unc. - Conductivity	3.4	Rectangular	$\sqrt{3}$	0.78	0.71	1.53	1.53	∞
Temp. unc. - Permittivity	0.4	Rectangular	$\sqrt{3}$	0.23	0.26	0.05	0.05	∞
Combined Standard Uncertainty (K = 1)						± 10.42 %	± 10.48 %	361
Expanded Uncertainty (K = 2)						**± 20.84 %**	**± 20.97 %**	

Uncertainty Budget for Frequency range of 3 GHz to 6 GHz

Error Description	Uncertainty Value (± %)		Probability Distribution	Divisor	Ci (1g)	Ci (10g)	Standard Uncertainty (1g)	Standard Uncertainty (10g)	Vi V_{eff}
Measurement System									
Probe Calibration	6.65		Normal	1	1	1	± 6.65 %	± 6.65 %	∞
Axial Isotropy	4.7		Rectangular	$\sqrt{3}$	0.7	0.7	± 1.9 %	± 1.9 %	∞
Hemispherical Isotropy	9.6		Rectangular	$\sqrt{3}$	0.7	0.7	± 3.9 %	± 3.9 %	∞
Boundary Effects	2		Rectangular	$\sqrt{3}$	1	1	± 1.2 %	± 1.2 %	∞
Linearity	4.7		Rectangular	$\sqrt{3}$	1	1	± 2.7 %	± 2.7 %	∞
Detection Limits	1		Rectangular	$\sqrt{3}$	1	1	± 0.6 %	± 0.6 %	∞
Modulation response	2.4		Rectangular	$\sqrt{3}$	1	1	±1.4 %	±1.4 %	∞
Readout Electronics	0.3		Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Response Time	0.8		Rectangular	$\sqrt{3}$	1	1	± 0.5%	± 0.5 %	∞
Integration Time	2.6		Rectangular	$\sqrt{3}$	1	1	± 1.5 %	± 1.5 %	∞
RF Ambient – Noise	3		Rectangular	$\sqrt{3}$	1	1	± 1.7 %	± 1.7 %	∞
RF Ambient– Reflections	3		Rectangular	$\sqrt{3}$	1	1	± 1.7 %	± 1.7 %	∞
Probe Positioner	0.4		Rectangular	$\sqrt{3}$	1	1	± 0.2 %	± 0.2 %	∞
Probe Positioning	6.7		Rectangular	$\sqrt{3}$	1	1	± 3.9 %	±3.9 %	∞
Post-processing	4		Rectangular	$\sqrt{3}$	1	1	± 2.3 %	± 2.3 %	∞
Max.SAR Evaluation	4		Rectangular	$\sqrt{3}$	1	1	± 2.3 %	± 2.3 %	∞
Test Sample Related									
Device Positioning	1.6	1.8	Normal	1	1	1	±1.6 %	± 1.8 %	145
Device Holder	1.5	1.7	Normal	1	1	1	± 1.5 %	± 1.7 %	5
Power Drift	5.0		Rectangular	$\sqrt{3}$	1	1	± 2.9 %	± 2.9 %	∞
Phantom and Setup									
Phantom Production Tolerances	6.6		Rectangular	$\sqrt{3}$	1	1	3.81	3.81	∞
SAR correction	1.9		Rectangular	$\sqrt{3}$	1	0.84	1.10	0.92	
Liquid Conductivity (mea.)	2.4		Rectangular	$\sqrt{3}$	0.78	0.71	1.08	0.98	∞
Liquid Permittivity (mea.)	2.4		Rectangular	$\sqrt{3}$	0.26	0.26	0.36	0.36	∞
Temp. unc. - Conductivity	3.4		Rectangular	$\sqrt{3}$	0.78	0.71	1.53	1.39	∞
Temp. unc. - Permittivity	0.4		Rectangular	$\sqrt{3}$	0.23	0.26	0.05	0.06	∞
Combined Standard Uncertainty (K = 1)							± 11.65 %	± 11.66 %	361
Expanded Uncertainty (K = 2)							**± 23.29 %**	**± 23.33 %**	

2.3. Antenna Information

For WWAN

Antenna	Manufacture	P/N	Type	Connector	Gain (dBi)	Note
Main	WNC	DQ6415G0100	PIFA	NGFF	0.55	UMTS-Band II
					0.88	UMTS-Band IV
					-0.95	UMTS-Band V
					0.55	LTE Band 2
					0.88	LTE Band 4
					-0.95	LTE Band 5
					2.95	LTE Band 7
					-0.34	LTE Band 12
					-0.30	LTE Band 13
					-0.22	LTE Band 14
					-0.34	LTE Band 17
					0.55	LTE Band 25
					-0.95	LTE Band 26
					0.74	LTE Band 30
					2.99	LTE Band 38
					2.99	LTE Band 41
					1.51	LTE Band 48
					0.88	LTE Band 66
					-1.57	LTE Band 71
Aux	WNC	DQ6415G0200	PIFA	NGFF	-	RX only

2.4. The Maximum SAR 1g Values

Mode	Distance(mm)	Highest Body Reported SAR-1g(W/kg)
UMTS Band II	0	0.639
UMTS Band IV	0	0.691
UMTS Band V	0	0.209
LTE Band 2	0	0.735
LTE Band 4	0	0.843
LTE Band 5	0	0.172
LTE Band 7	0	0.583
LTE Band 12	0	0.048
LTE Band 13	0	0.080
LTE Band 14	0	0.301
LTE Band 17	0	0.049
LTE Band 25	0	0.727
LTE Band 26	0	0.157
LTE Band 30	0	0.365
LTE Band 38	0	0.275
LTE Band 41	0	0.334
LTE Band 48	0	0.516
LTE Band 66	0	0.602
LTE Band 71	0	0.073

Note:

1) The device is in compliance with Specific Absorption Rate(SAR)for general population uncontrolled exposure limits according to the FCC rule §2.1093, the ANSI C95.1:2019/IEEE C95.1:2019, the NCRP Report Number 86 for uncontrolled environment and had been tested in accordance with the measurement methods and procedures specified in IEC/IEEE 62209-1528:2020.
2) The WLAN antenna is designed in panel the distance to bottom is large than 25mm, So simultaneous SAR evaluation are not required.

2.5. Laboratory Environment

Temperature	Min. = 18ºC, Max. = 25ºC
Relative humidity	Min. = 30%, Max. = 70%
Ground system resistance	< 0.5Ω
Ambient noise is checked and found very low and in compliance with requirement of standards. Reflection of surrounding objects is minimized and in compliance with requirement of standards.	

2.6. Main Test Instruments

Item	Equipment	Manufacturer	Model	Serial No.	Cal. Date	Cal. Interval
1	Data Acquisition Electronics	Speag	DAE4	1289	May. 31, 2022	1 Year
2	E-field Probe	Speag	EX3DV4	7678	Aug. 30, 2022	1 Year
3	System Validation Dipole	Speag	D750V3	1145	May. 27, 2022	3 Year
4	System Validation Dipole	Speag	D900V2	1d185	May. 23, 2022	3 Year
5	System Validation Dipole	Speag	D1800V2	2d210	May. 30, 2022	3 Year
6	System Validation Dipole	Speag	D1900V2	5d208	May. 23, 2022	3 Year
7	System Validation Dipole	Speag	D2300V2	1054	May. 25, 2022	3 Year
8	System Validation Dipole	Speag	D2600V2	1111	May. 25, 2022	3 Year
9	System Validation Dipole	Speag	D3500V2	1067	Jan. 22, 2023	3 Year
10	System Validation Dipole	Speag	D3700V2	1074	Jan. 26, 2023	3 Year
11	ELI4 Phantom	Speag	ELI4 Phantom V8.0	2149	N/A	N/A
12	ENA Network Analyzer	Agilent	E5071C	MY46524658	Mar. 21, 2022	1 Year
12	Signal Generator	R&S	SMB100A	E-613	Jul. 29, 2022	1 Year
14	Spectrum Analyzer	Keysight	N9010A	E-692	Oct. 19, 2022	1 Year
15	Power Meter	Anritsu	ML2495A	1128008	Jun. 1, 2022	1 Year
16	Power Sensor	Anritsu	MA2411B	1126001	Jun. 1, 2022	1 Year
17	Dielectric Probe Kit	Agilent	85070E	2593	N/A	N/A
18	Low pass filter	Mini-Circuits	SLP-2950+	M108294	N/A	N/A
19	Power Amplifier	Mini-Circuits	ZVE-2W-272+	N650001538	N/A	N/A
20	Power Amplifier	Mini-Circuits	ZVE-8G+	N628801631	N/A	N/A
21	Thermometer	kolin	KGM-DVB03	E-1093	Oct. 14, 2022	1 Year

Remark: “N/A” denotes no model name, serial No. or calibration specified.

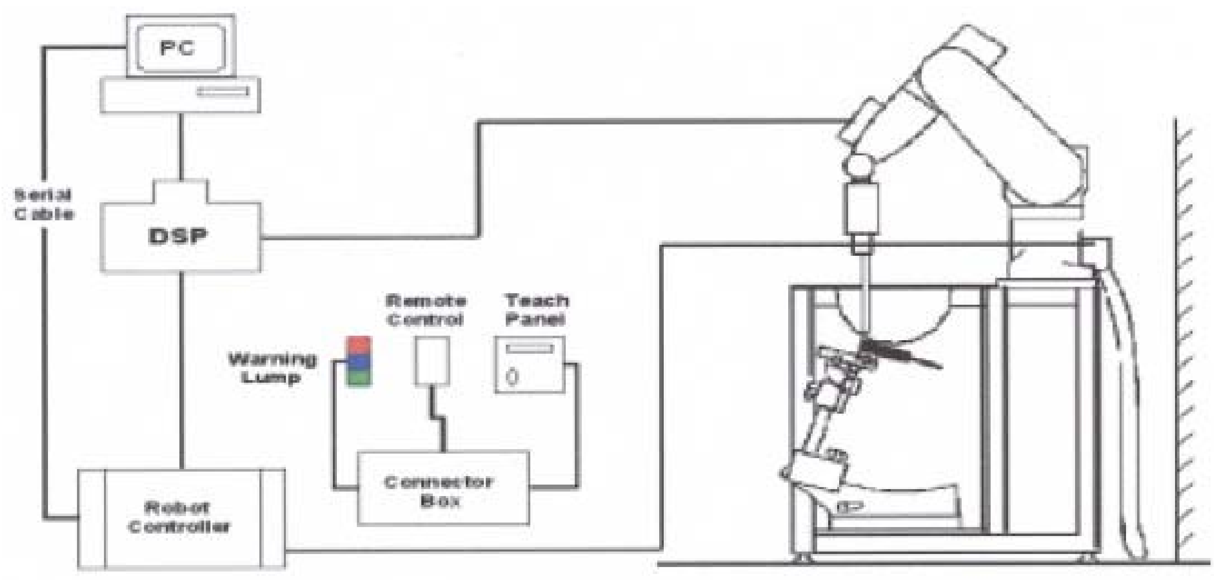
3 SAR MEASUREMENTS SYSTEM CONFIGURATION

3.1 SAR Measurement Setup

The DASY5 system for performing compliance tests consists of the following items:

1. A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).
2. A dosimetric probe, i.e. an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
3. A data acquisition electronic (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
4. A unit to operate the optical surface detector which is connected to the EOC.
5. The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY5 measurement server.
6. The DASY5 measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. A computer operating Windows.
7. DASY5 software and SEMCAD data evaluation software.
8. Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
9. The generic twin phantom enabling the testing of left-hand and right-hand usage.
10. The device holder for handheld mobile phones.
11. Tissue simulating liquid mixed according to the given recipes.
12. System validation dipoles allowing to validate the proper functioning of the system.

3.1.1 TEST SETUP LAYOUT

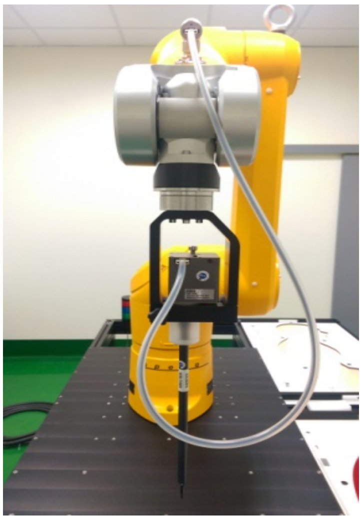


3.2 DASY5 E-field Probe System

The SAR measurements were conducted with the dosimetric probe EX3DV4 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

3.2.1 EX3DV4 PROBE SPECIFICATION

Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available
Frequency	10 MHz to 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 μW/g to > 100 mW/g Linearity: ± 0.2dB
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Distance from probe tip to dipole centers: 1.0 mm



EX3DV4 E-field Probe

3.2.2 E-FIELD PROBE CALIBRATION

Each probe is calibrated according to a dosimetric assessment procedure with accuracy better than ±10%. The spherical isotropy was evaluated and found to be better than ± 0.25dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies bellow 1 GHz, and in a wave guide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The measured free space E-field in the medium correlates to temperature rise in a dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

$$SAR = C\frac{\Delta T}{\Delta t}$$

Where: Δt = Exposure time (30 seconds),

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

ΔT = Temperature increase due to RF exposure.

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

Where: σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m3).

3.2.3 OTHER TEST EQUIPMENT

3.2.3.1. DEVICE HOLDER FOR TRANSMITTERS

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. The extension is fully compatible with the Twin SAM, ELI4 and SAM v6.0 Phantoms.
Material: POM, Acrylic glass, Foam

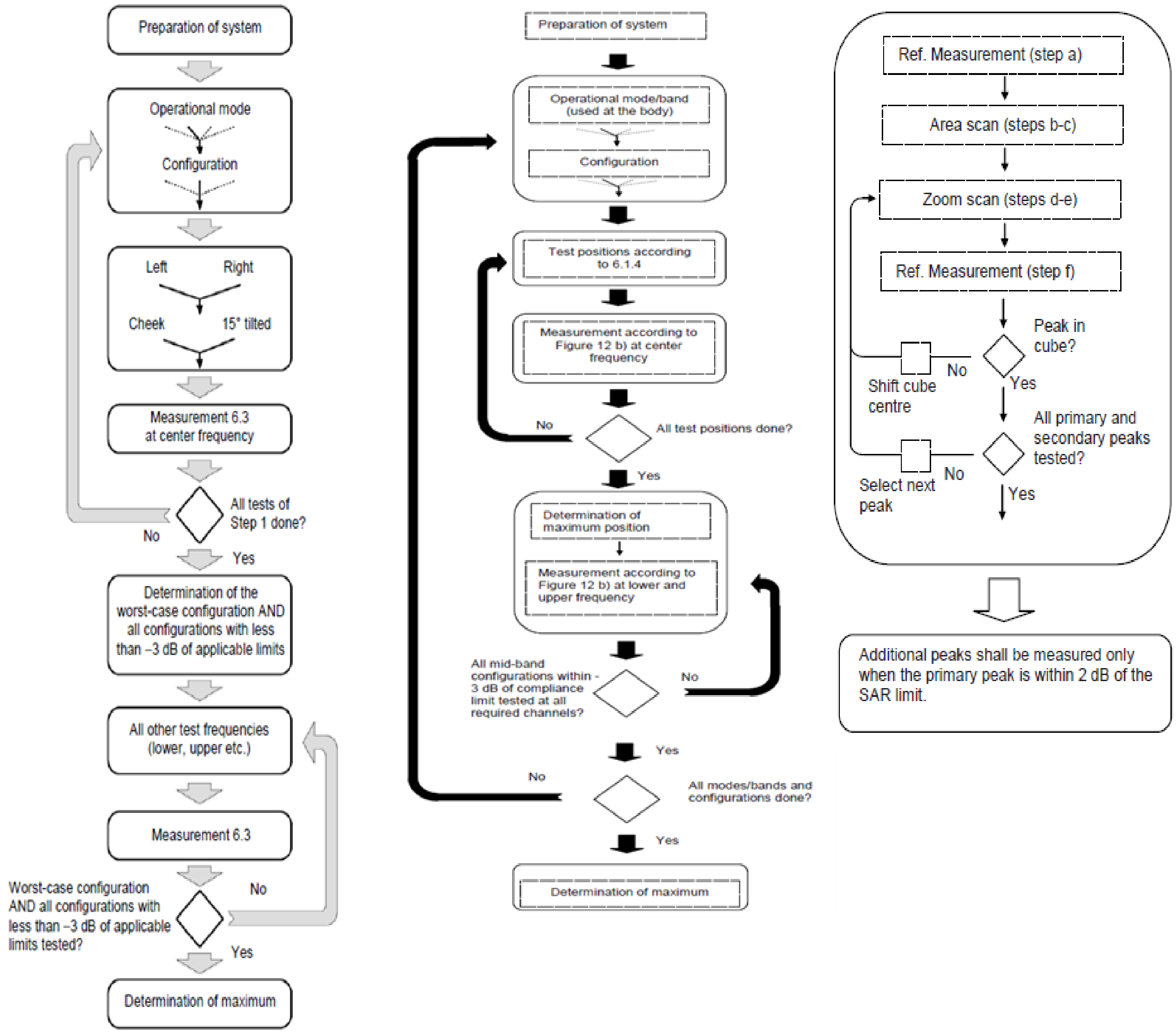
3.2.3.2. PHANTOM

Model	ELI4 Phantom
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.
Shell Thickness	2±0.1 mm
Filling Volume	Approx. 30 liters
Dimensions	Length: 600 mm ; Width: 190mm Height: adjustable feet
Aailable	Special

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

3.2.4 SCANNING PROCEDURE

The SAR test against the head and body-worn phantom was carried out as follow:



After an area scan has been done at a fixed distance of 1.4mm from the surface of the phantom on the source side, a 3D scan is set up around the location of the maximum spot SAR. First, a point within the scan area is visited by the probe and a SAR reading taken at the start of testing. At the end of testing, the probe is returned to the same point and a second reading is taken. Comparison between these start and end readings enables the power drift during measurement to be assessed.

Above is the scanning procedure flow chart and table from the IEEE1528 standard.

This is the procedure for which all compliant testing should be carried out to ensure that all variations of the device position and transmission behavior are tested.

3.2.5 DATA STORAGE AND EVALUATION

3.2.5.1. DATA STORAGE

The DASY5 software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension “DAE4”. The 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 incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [mW/g], [mW/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

3.2.6 DATA EVALUATION BY SEMCAD

The SEMCAD software 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	Normi, 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	
	Density	

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 DASY5 components. In the direct measuring mode of the multimeter 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:

$$V_i = U_i + U_i^2 \cdot cf / dcpi$$

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: $E_i = (V_i \ / \ Norm_i \cdot ConvF)^{1/2}$

H-field probes: $H_i = (V_i)^{1/2} \cdot (a_{i0} + a_{i1} f + a_{i2} f^2) / f$

With V_i = compensated signal of channel i (i = x, y, z)

$Norm_i$ = sensor sensitivity of channel i (i = x, y, z)
$[mV/(V/m)^2]$ for E-field Probes

ConvF = sensitivity enhancement in solution

aij = 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):

$$E_{tot} = (E_X^2 + E_Y^2 + E_Z^2)^{1/2}$$

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

$$SAR = (E_{tot})^2 \cdot \sigma / (\rho \cdot 1000)$$

With SAR = local specific absorption rate in mW/g

E_{tot} = total field strength in V/m
= conductivity in [mho/m] or [Siemens/m]
= equivalent tissue density in g/cm^3

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid. The power flow density is calculated assuming the excitation field to be a free space field.

$$P_{pwe} = E_{tot}^2 / 3770 \text{ or } Ppwe = H_{tot}^2 \cdot 37.7$$

With P_{pwe} = equivalent power density of a plane wave in mW/cm^2

E_{tot} = total field strength in V/m
H_{tot} = total magnetic field strength in A/m

4 TISSUE-EQUIVALENT LIQUID

4.1 Tissue-equivalent Liquid Ingredients

The liquid is consisted of water, salt and Glycol, Sugar, Preventol and Cellulose. The liquid has previously been proven to be suited for worst-case. The measured conductivity and relative permittivity should be within ±5% of the target values. The below table shows the detail solution. It’s satisfying the latest tissue dielectric parameters requirements proposed by the IEC 62209.

Composition of the Tissue Equivalent Matter

Tissue Type	Bactericide	DGBE	HEC	NaCl	Sucrose	Triton X-100	Water	Diethylene Glycol Mono-hexylether
Head 750	0.2	-	0.2	1.5	56.0	-	42.1	-
Head 900	0.2	-	0.2	1.4	58.0	-	40.2	-
Head 1800	-	44.5	-	0.3	-	-	55.2	-
Head 1900	-	44.5	-	0.2	-	-	55.3	-
Head 2300		44.9	-	0.1	-	-	55.0	-
Head 2600	-	45.1	-	0.1	-	-	54.8	-
Head 3500	-	8.0	-	0.2	-	20.0	71.8	-
Head 3700	-	8.1	-	0.2	-	20.0	71.7	-

4.2 Tissue-equivalent Liquid Properties

Dielectric Performance of Tissue Simulating Liquid

Date	Tissue Type	Frequency (MHz)	Conductivity (σ)	Permittivity (εr)	Targeted Conductivity (σ)	Targeted Permittivity (εr)	Deviation Conductivity (σ) (%)	Deviation Permittivity (εr) (%)	Limit (%) ±5
2023/3/7	Head	750	0.91	42.58	0.89	41.94	1.41	1.51	±5
2023/3/9	Head	900	0.96	42.78	0.97	41.50	-1.03	3.07	±5
2023/3/6	Head	1800	1.38	41.42	1.40	40.00	-1.64	3.55	±5
2023/3/6	Head	1900	1.41	41.05	1.40	40.00	0.86	2.64	±5
2023/3/13	Head	2300	1.68	40.98	1.67	39.47	0.98	3.84	±5
2023/3/9	Head	2600	2.01	37.41	1.96	39.01	2.76	-4.10	±5
2023/3/15	Head	3500	2.88	38.34	2.91	37.90	-1.13	1.17	±5
2023/3/15	Head	3700	3.09	37.99	3.12	37.70	-1.12	0.76	±5

Note:
1)The dielectric parameters of the tissue-equivalent liquid should be measured under similar ambient conditions and within 2 °C of the conditions expected during the SAR evaluation to satisfy protocol requirements.
2)KDB 865664 was ensured to be applied for probe calibration frequencies greater than or equal to 50MHz of the EUT frequencies.
3)The above measured tissue parameters were used in the DASY software to perform interpolation via the DASY software to determine actual dielectric parameters at the test frequencies. The SAR test plots may slightly differ from the table above since the DASY rounds to three significant digits.
4) According to FCC TCB workshop April, 2019 RF Exposure Procedures Update(Effective February 19,2019, FCC has permitted the use of single head-tissue simulating liquid specified in IEEE 62209-1- for all SAR tests.

5 SYSTEM CHECK

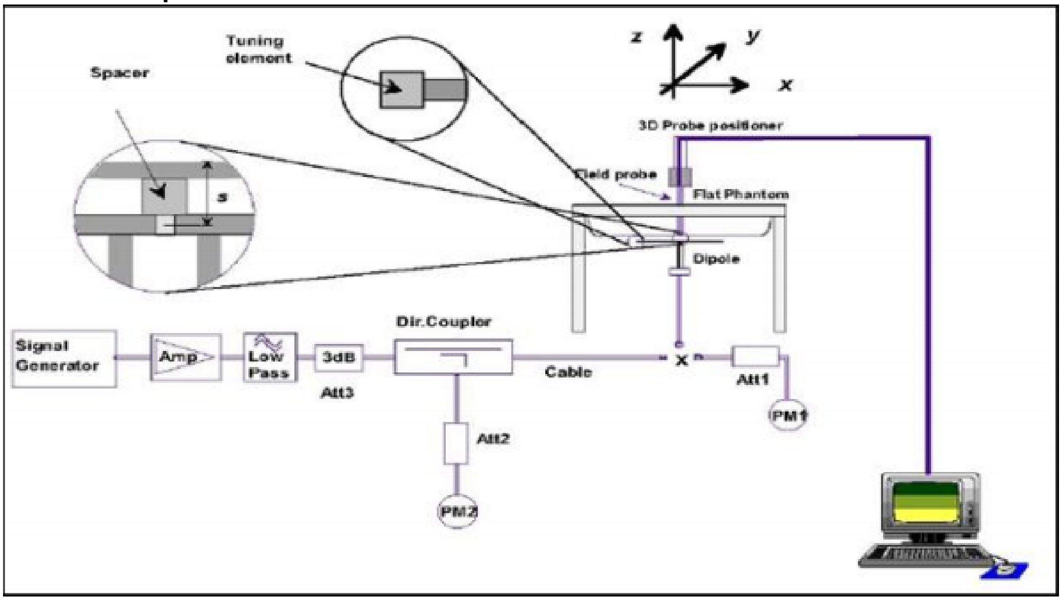
5.1 DESCRIPTION OF SYSTEM CHECK

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulants were measured every day using the dielectric probe kit and the network analyzer. A system check measurement was made following the determination of the dielectric parameters of the simulant, using the dipole validation kit. A power level of 250 mW(below 3GHz) or 100mW(3-6GHz), which was placed under the flat section of the twin SAM phantom. The system check results (dielectric parameters and SAR values) are given in the 6.2.

System check results have to be equal or near the values determined during dipole calibration with the relevant liquids and test system (±10 %).

System check is performed regularly on all frequency bands where tests are performed with the DASY5 system.

System Check Set-up



5.2 DESCRIPTION OF SYSTEM CHECK

System Check in Tissue Simulating Liquid

The system check is performed for verifying the accuracy of the complete measurement system and performance of the software. The system check is performed with tissue equivalent material according to IEEE P1528 (described above). The following table shows system check results for all frequency bands and tissue liquids used during the tests.

Date	System Dipole			Parameters	Target [W/kg]	Measured [W/kg]	Deviation [%]	Limited [%]
	Type	Serial No.	Liquid					
2023/3/7	D750V3	1145	Head	1g SAR	8.55	8.76	2.46	± 10
2023/3/9	D900V2	1d185	Head	1g SAR	11.10	10.32	-7.03	± 10
2023/3/6	D1800V2	2d210	Head	1g SAR	38.20	37.16	-2.72	± 10
2023/3/6	D1900V2	5d208	Head	1g SAR	40.20	38.12	-5.17	± 10
2023/3/13	D2300V2	1054	Head	1g SAR	48.20	49.20	2.07	± 10
2023/3/9	D2600V2	1111	Head	1g SAR	55.80	60.00	7.53	± 10
2023/3/15	D3500V2	1067	Head	1g SAR	65.10	63.20	-2.92	± 10
2023/3/15	D3700V2	1074	Head	1g SAR	66.70	67.00	0.45	± 10

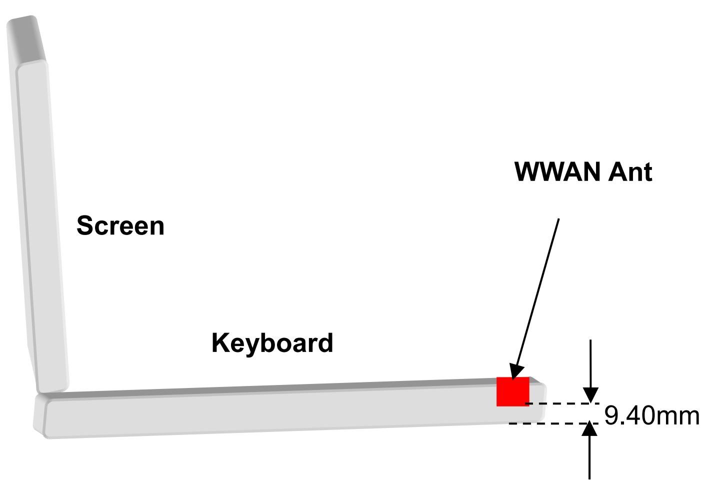
6 OPERATIONAL CONDITIONS DURING TEST

6.1 General Description of Test Procedures

Connection to the EUT is established via air interface with base station An, and the EUT is Set to maximum output power by base station. The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power output. The antenna connected to the output of the base station simulator shall be placed at least 50cm away from the EUT. The signal transmitted by the simulator to the antenna feeding point shall be lower than the output power level of the EUT by at least 30dB.

6.2 Test position Antenna Location

For WWAN



6.3 Test Position of Portable Devices

For WWAN

Minimum Separation Distance					
P-Sensor	**Mode**	**Antenna**	**Position**	**Distance (mm)**	**Evaluation Test**
on	WWAN	Main	Bottom	9.40	Yes
off		Main	Bottom	19.40	Yes

6.4 TEST CONFIGURATION

The SAR Exclusion Threshold in KDB 447498 D04 can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an EUT edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned adjacent the phantom and the edge containing the antenna positioned perpendicular to the phantom.

SAR test reduction and exclusion guidance

(1)The SAR exclusion threshold for is defined by the following equation:

$$P_{\text{th}}\ (\text{mW}) = \begin{cases} ERP_{20\ \text{cm}}(d/20\ \text{cm})^x & d \leq 20\ \text{cm} \\ ERP_{20\ \text{cm}} & 20\ \text{cm} < d \leq 40\ \text{cm} \end{cases} \quad (\text{B}.2)$$

where

$$x = -\log_{10}\left(\frac{60}{ERP_{20\ \text{cm}}\sqrt{f}}\right)$$

and f is in GHz, d is the separation distance (cm), and $ERP_{20\text{cm}}$ is per Formula (B.1).

Example values shown in Table B.2 are for illustration only.

Table B.2—Example Power Thresholds (mW)

	Distance (mm)									
Frequency (MHz)	5	10	15	20	25	30	35	40	45	50
300	39	65	88	110	129	148	166	184	201	217
450	22	44	67	89	112	135	158	180	203	226
835	9	25	44	66	90	116	145	175	207	240
1900	3	12	26	44	66	92	122	157	195	236
2450	3	10	22	38	59	83	111	143	179	219
3600	2	8	18	32	49	71	96	125	158	195
5800	1	6	14	25	40	58	80	106	136	169

6.5. SAR Exclusion Calculations for WWAN Antenna

P-SENSOR ON

Mode	Ant	Position	Distance (mm)	f (MHz)	Max Power(dBm)	Max Power(mW)	SAR Exclusion threshold(mW)	Test required
UMTS Band II	Main	Bottom	9.40	1880	21.50	141.25	3	Yes
UMTS Band IV	Main	Bottom	9.40	1732.6	21.50	141.25	3	Yes
UMTS Band V	Main	Bottom	9.40	836.4	21.50	141.25	9	Yes

Mode	Ant	Position	Distance (mm)	f (MHz)	Max Power(dBm)	Max Power(mW)	SAR Exclusion threshold(mW)	Test required
LTE Band 2	Main	Bottom	9.40	1880	21.50	141.25	3	Yes
LTE Band 4	Main	Bottom	9.40	1732.5	21.50	141.25	3	Yes
LTE Band 5	Main	Bottom	9.40	836.5	21.50	141.25	9	Yes
LTE Band 7	Main	Bottom	9.40	2535	21.50	141.25	3	Yes
LTE Band 12	Main	Bottom	9.40	707.5	21.50	141.25	9	Yes
LTE Band 13	Main	Bottom	9.40	782	21.50	141.25	9	Yes
LTE Band 14	Main	Bottom	9.40	793	21.50	141.25	9	Yes
LTE Band 17	Main	Bottom	9.40	710	21.50	141.25	9	Yes
LTE Band 25	Main	Bottom	9.40	1882.5	21.50	141.25	3	Yes
LTE Band 26	Main	Bottom	9.40	831	21.50	141.25	9	Yes
LTE Band 30	Main	Bottom	9.40	2310	21.50	141.25	3	Yes
LTE Band 38	Main	Bottom	9.40	2595	21.50	141.25	3	Yes
LTE Band 41	Main	Bottom	9.40	2593	21.50	141.25	3	Yes
LTE Band 48	Main	Bottom	9.40	3646.7	21.50	141.25	2	Yes
LTE Band 66	Main	Bottom	9.40	1745	21.50	141.25	3	Yes
LTE Band 71	Main	Bottom	9.40	680.5	21.50	141.25	9	Yes

P-SENSOR OFF

Mode	Ant	Position	Distance (mm)	f (MHz)	Max Power(dBm)	Max Power(mW)	SAR Exclusion threshold(mW)	Test required
UMTS Band II	Main	Bottom	19.40	1880	24.50	281.84	26	Yes
UMTS Band IV	Main	Bottom	19.40	1732.6	24.50	281.84	26	Yes
UMTS Band V	Main	Bottom	19.40	836.4	24.50	281.84	44	Yes

Mode	Ant	Position	Distance (mm)	f (MHz)	Max Power(dBm)	Max Power(mW)	SAR Exclusion threshold(mW	Test required
LTE Band 2	Main	Bottom	19.40	1880	23.00	199.53	26	Yes
LTE Band 4	Main	Bottom	19.40	1732.5	23.00	199.53	26	Yes
LTE Band 5	Main	Bottom	19.40	836.5	25.00	316.23	44	Yes
LTE Band 7	Main	Bottom	19.40	2535	24.00	251.19	22	Yes
LTE Band 12	Main	Bottom	19.40	707.5	25.00	316.23	44	Yes
LTE Band 13	Main	Bottom	19.40	782	24.00	251.19	44	Yes
LTE Band 14	Main	Bottom	19.40	793	25.00	316.23	44	Yes
LTE Band 17	Main	Bottom	19.40	710	25.00	316.23	44	Yes
LTE Band 25	Main	Bottom	19.40	1882.5	23.00	199.53	26	Yes
LTE Band 26	Main	Bottom	19.40	831	25.00	316.23	44	Yes
LTE Band 30	Main	Bottom	19.40	2310	23.00	199.53	22	Yes
LTE Band 38	Main	Bottom	19.40	2595	24.00	251.19	22	Yes
LTE Band 41	Main	Bottom	19.40	2593	24.00	251.19	22	Yes
LTE Band 41(HPUE)	Main	Bottom	19.40	2593	27.00	501.19	22	Yes
LTE Band 48	Main	Bottom	19.40	3646.7	22.00	158.49	18	Yes
LTE Band 66	Main	Bottom	19.40	1745	24.00	251.19	26	Yes
LTE Band 71	Main	Bottom	19.40	680.5	24.00	251.19	44	Yes

7 SAR MEASUREMENT VARIABILITY AND UNCERTAINTY

7.1 SAR measurement variability

Per KDB865664 D01 SAR measurement 100 MHz to 6 GHz, SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. The 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.

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.
2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

The same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.

The detailed repeated measurement results are shown in Section 8.2.

7.2 WCDMA Test Configuration

1. Output Power Verification

Maximum output power is verified on the High, Middle and Low channels according to the procedures description in section 5.2 of 3GPP TS 34.121,using the appropriate RMC or AMR with TPC(transmit power control) set to all “1s” for WCDMA/HSDPA or applying the required inner loop power control procedure to maintain maximum output power while HSUPA is active. Result for all applicable physical channel configurations(DPCCH,DPDCHn and spreading codes, HSDPA, HSPA)
Should be tabulated in the SAR report .All configuration that are not supported by the DUT or cannot be measured due to technical or equipment limitation should be clearly identified.

2. WCDMA

(1).Head SAR Measurements
SAR for Head exposure configurations in voice mode is measured using a 12.2 kbps RMC with TPC bits configured to all “1s”. SAR in AMR configurations is not required when the maximum average output of each RF channel for 12.2 kbps AMR is less than ¼ dB higher than that measured in 12.2 kbps RMC. Otherwise SAR is measured on the maximum output channel in 12.2 kbps AMR with 3.4kbps SRB(signalling radio bearer) using the exposure configuration that results in the highest SAR in12.2kbps RMC for that RF channel.

(2).Body SAR Measurements
SAR for body exposure configurations is measured using the 12.2 kbps RMC with the TPC bits configured to all “1s”. SAR for other spreading codes and multiple DPDCHn, when supported by the EUT, are not required when the maximum average outputs of each RF channel, for each spreading code and DPDCHn configuration, are less than ¼ dB higher than those measured in 12.2 kbps RMC.

3. HSDPA

SAR for body exposure configurations is measured according to the “Body SAR Measurements”" procedures of 3G device. In addition, body SAR is also measured for HSDPA when the maximum average outputs of each RF channel with HSDPA active is at ¼ dB higher than that measured without HSDPA using 12.2kbps RMC or the maximum SAR 12.2kbps RMC is above 75% of the SAR limit. Body SAR for HSDPA is measured using an FRC with H-Set 1 in Sub-test 1 and a 12.2kbps RMC configured in Test Loop Mode 1, using the highest body SAR configuration in 12.2 kbps RMC without HSDPA.
HSDPA should be configured according to UE category of a test device. The number of HS-DSCH/HS-PDSCHs, HAPRQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the H-set. To maintain a consistent test configuration and stable transmission condition, QPSK is used in the H-set for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 4ms with a CQI repetition factor of 2 to maintain a constant rate of active CQI slots. The β_c and β_d gain factors for DPCCH and DPDCH were set according to the values in the below table, β_{hs} for HS-DPCCH is set automatically to the correct value when △ACK, △NACK, △CQI = 8. The variation of the β_c / β_d ratio causes a power reduction at sub-tests 2 - 4.

Sub-test	β_c	β_d	β_d (SF)	β_c / β_d	β_{hs} (1)	CM(dB)(2)	MPR (dB)
1	2/15	15/15	64	2/15	4/15	0.0	0
2	12/15(3)	15/15(3)	64	12/15(3)	24/15	1.0	0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note 1: △ACK, △NACK and △CQI = 8 $A_{hs} = \beta_{hs}/\beta_c = 30/15$ $\beta_{hs} = 30/15 * \beta_c$

Note 2 : CM=1 for β_c/β_d= 12/15, $\beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCH,DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Note 3 : For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1,TF1) to β_c = 11/15 and β_d = 15/15

The measurements were performed with a Fixed Reference Channel (FRC) and H-Set 1 QPSK.

Settings of required H-Set 1 QPSK acc. to 3GPP 34.121

Parameter	Value
Nominal average inf. bit rate	534 kbit/s
Inter-TTI Distance	3 TTI"s
Number of HARQ Processes	2 Processes
Information Bit Payload	3202 Bits
MAC-d PDU size	336 Bits
Number Code Blocks	1 Block
Binary Channel Bits Per TTI	4800 Bits
Total Available SMLs in UE	19200 SMLs
Number of SMLs per HARQ Process	9600 SMLs
Coding Rate	0.67
Number of Physical Channel Codes	5

HSDPA UE category

HS-DSCH Category	Maximum HS-DSCH Codes Received	Minimum Inter-TTI Interval	Maximum HS-DSCH Transport Block Bits/HS-DSCH TTI	Total Soft Channel Bits
1	5	3	7298	19200
2	5	3	7298	28800
3	5	2	7298	28800
4	5	2	7298	38400
5	5	1	7298	57600
6	5	1	7298	67200
7	10	1	14411	115200
8	10	1	14411	134400
9	15	1	25251	172800
10	15	1	27952	172800
11	5	2	3630	14400
12	5	1	3630	28800
13	15	1	34800	259200
14	15	1	42196	259200
15	15	1	23370	345600
16	15	1	27952	345600

4. HSUPA

SAR for Body exposure configurations is measured according to the “Body SAR Measurements” procedures of 3G device. When the maximum output power is ≤¼ dB higher than the primary mode or when the SAR of the primary mode is scaled by the ratio of specified maximum output power and SAR is ≤ 75% SAR Limit, SAR measurement is not required for the secondary mode.

The 3G SAR test reduction procedures is applied to HSPA(HSUPA/HSDPA with RMC) body configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for HSPA using the HSPA body SAR procedures for the highest reported body exposure SAR configuration in 12.2 kbps RMC.

Due to inner loop power control requirements in HSUPA, a commercial communication test set should be used for the output power and SAR tests. The 12.2 kbps RMC, FRC H-set 1 and E-DCH configurations for HSDPA should be configured according to the values indicated below as well as other applicable procedures described in the “WCDMA Handset“ and „Release 5 HSDPA Data Device” sections of 3G device.

Subtests for WCDMA Release 6 HSUPA

WCDMA General Settings	Mode	HSPA	HSPA	HSPA	HSPA	HSPA
	Subtest	1	2	3	4	5
	Loopback Mode	Test Mode 1				
	Rel99 RMC	12.2kbps RMC				
	HSDPA FRC	H-Set1				
	HSUPA Test	HSUPA Loopback				
	Power Control Algorithm	Algorithm2				
	βc	11/15	6/15	15/15	2/15	15/15
	βd	15/15	15/15	9/15	15/15	15/15
	βec	209/225	12/15	30/15	2/15	24/15
	βc/βd	11/15	6/15	9/15	2/15	15/15
	βhs	22/15	12/15	30/15	4/15	30/15
	βed	1309/225	94/75	47/15	56/75	134/15
	CM (dB)	1	3	2	3	1
	MPR (dB)	0	2	1	2	0

HSUPA UE category

UE E-DCH Category	Maximum E-DCH Codes Transmitted	Number of HARQ Processes	E-DCH TTI(ms)	Minimum Speading Factor	Maximum E-DCH Transport Block Bits	Max Rate (Mbps)
1	1	4	10	4	7110	0.7296
2	2	8	2	4	2798	1.4592
	2	4	10	4	14484	
3	2	4	10	4	14484	1.4592
4	2	8	2	2	5772	2.9185
	2	4	10	2	20000	2.00
5	2	4	10	2	20000	2.00
6 (No DPDCH)	4	8	10	2SF2&2SF4	11484	5.76
	4	4	2		20000	2.00
7 (No DPDCH)	4	8	2	2SF2&2SF4	22996	?
	4	4	10		20000	?

NOTE: When 4 codes are transmitted in parallel, two codes shall be transmitted with SF2 and two with SF4.UE categories 1 to 6 support QPSK only. UE category 7 supports QPSK and 16QAM.(TS25.306-7.3.0).

5. DC-HSDPA

In DC-HSDPA implementation of this device, the uplink parameters are the same as HSDPA. No additiona channels and modulations (16 QAM, and 64 QAM) are supported in uplink. The difference is only in the downlink parameters, where two carriers are supported. HSDPA settings were used on uplink.

For Rel. 8 DC-HSDPA apply the four subtests from HSDPA Release 5 except use fixed reference channe H-Set 12 for DC-HSDPA. And we can apply the same SAR test exclusion criteria used for Rel. 6 HSPA fc Rel. 7 HSPA+ and Rel. 8 DC-HSDPA. That is, if the HSPA, HSPA+, or the DC-HSDPA maximum output i not more than 0.25 dB higher than WCDMA, SAR measurement for those modes is not required.
The following tests were completed according to procedures in section 7.3.13 of 3GPP TS 34.108 v9.5.0. summary of these settings are illustrated below:

Downlink Physical Channels are set as per 3GPP TS34.121-1 v9.0.0 E.5.0
Levels for HSDPA connection setup

Parameter During Connection setup	Unit	Value
P-CPICH_Ec/Ior	dB	-10
P-CCPCH and SCH_Ec/Ior	dB	-12
PICH _Ec/Ior	dB	-15
HS-PDSCH	dB	off
HS-SCCH_1	dB	off
DPCH_Ec/Ior	dB	-5
OCNS_Ec/Ior	dB	-3.1

Call is set up as per 3GPP TS34.108 v9.5.0 sub clause 7.3.13
The configurations of the fixed reference channels for HSDPA RF tests are described in 3GPP TS 34.121 annex C for FDD and 3GPP TS 34.122.
The measurements were performed with a Fixed Reference Channel (FRC) H-Set 12 with QPSK

Parameter	Value
Nominal average inf. bit rate	60 kbit/s
Inter-TTI Distance	1 TTI"s
Number of HARQ Processes	6 Processes
Information Bit Payload	120 Bits
Number Code Blocks	1 Block
Binary Channel Bits Per TTI	960 Bits
Total Available SMLs in UE	19200 SMLs
Number of SMLs per HARQ Process	3200 SMLs
Coding Rate	0.15
Number of Physical Channel Codes	1

Note:
1. The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table above.
2. Maximum number of transmission is limited to 1,i.e.,retransmission is not allowed. The redundancy and constellation version 0 shall be used.

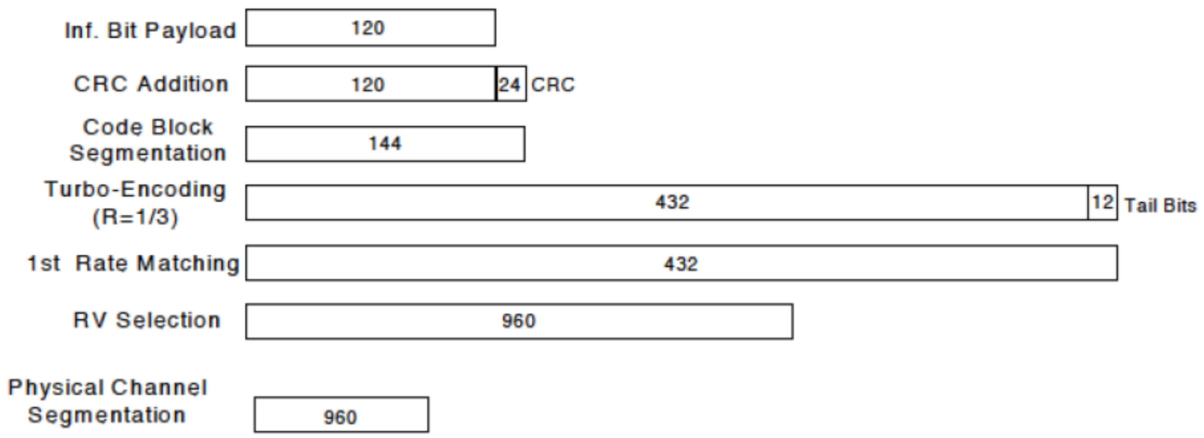


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

The following 4 Sub-tests for HSDPA were completed according to Release 5 procedures. A summary of subtest settings are illustrated below:

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (1)	CM(dB)(2)	MPR (dB)
1	2/15	15/15	64	2/15	4/15	0.0	0
2	12/15(3)	15/15(3)	64	12/15(3)	24/15	1.0	0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note 1: ΔACK, ΔNACK and ΔCQI=8 $A_{hs}=\beta_{hs}/\beta_c=30/15$ $\beta_{hs}=30/15*\beta_c$

Note 2: CM=1 for $\beta_c/\beta_d=12/15$, $\beta_{hs}/\beta_c=24/15$. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Note 3: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c=11/15$ and $\beta_d=15/15$

Up commands are set continuously to set the UE to Max power.

Note:
1.The Dual Carriers transmission only applies to HSDPA physical channels
2.The Dual Carriers belong to the same Node and are on adjacent carriers.
3.The Dual Carriers do not support MIMO to serve UEs configured for dual cell operation
4.The Dual Carriers operate in the same frequency band .
5.The device doesn't support the modulation of 16QAM in uplink but 64QAM in downlink for DC-HSDPA mode.
6.The device doesn’t support carrier aggregation for it just can operate in Release 8.

7.3 LTE Test Configuration

Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR. The RS CMW500 was used for LTE output power measurements and SAR testing. Max power control was used so the UE transmits with maximum output power during SAR testing. SAR must be measured with the maximum TTI(transmit time interval) supported by the device in each LTE configuration.

1)Spectrum Plots for RB configurations
A properly configured base station simulator was used for LTE output power measurements and SAR testing. Therefore, spectrum plots for RB configurations were not required to be included in this report.

2) MPR
MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3-6.2.5 under Table 6.2.3-1.

3)A-MPR
A-MPR(Additional MPR) has been disabled for all SAR tests by using Network Signaling Value of “NS=01”on the base station simulator.

4)SAR test requirements
The LTE SAR test is choice the max power mode and start with the max power channel.
A) Largest channel bandwidth standalone SAR test requirements
i) QPSK with 1 RB allocation
When the SAR is ≤ 1 W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel. When the 10-g SAR of a required test channel is > 1.8 W/kg, SAR is required for all three RB offset configurations for that required test channel.

8 POWER REDUCTION BY PROXIMITY SENSING

A proximity sensor for power reduction is implemented in this device to address RF exposure compliance when the cellular antenna is positioned close to the user's body. The sensor's mechanical structure is designed to fit within the enclosure design used in this device and also extended around the edge and top of the antenna element in order to optimize sensitivity in these orientations. This design combines the antenna printed directly on a plastic part and proximity sensor FPC (Flexible Printed Circuit) bonded together into one piece. According to KDB 616217 D04 SAR for laptop and tablets v01r02)

8.1 Procedures for detrmining proximity sensor triggering distances

The following procedures should be applied to determine proximity sensor triggering distances for the back surface and individual edges of a tablet. Conducted power is monitored qualitatively to identify the general triggering characteristics and recorded quantitatively, versus spacing, as required by the procedures. Unless there is built-in test software that reports the triggering conditions and enables the power levels to be confirmed separately, monitoring of conducted power during the triggering tests typically requires internal access to the antenna ports inside the tablet, which may interfere with the triggering tests.

1. The relevant transmitter should be set to operate at its normal maximum output power.
2. The entire back surface or edge of the tablet is positioned below a flat phantom filled with the required tissue-equivalent medium, and positioned at least 20 mm further than the distance that triggers power reduction.
3. It should be ensured that the cables required for power measurements are not interfering with the proximity sensor. Cable losses should be properly compensated to report the measured power results.
4. The back surface or edge is moved toward the phantom in 3 mm steps until the sensor triggers.
5. The back surface or edge is then moved back (further away) from the phantom by at least 5 mm or until maximum output power is returned to the normal maximum level.
6. The back surface or edge is again moved toward the phantom, but in 1 mm steps, until it is at least 5 mm past the triggering point or touching the phantom. If 1 mm resolution is not suitable for the sensor triggering sensitivity, a KDB inquiry should be submitted to determine alternative test configurations.
7. If the tablet is not touching the phantom, it is moved in 3 mm steps until it touches the phantom to confirm that the sensor remains triggered and the maximum power stays reduced.
8. The process is then reversed by moving the tablet away from the phantom according to steps 4) to 7), to determine triggering release, until it is at least 10 mm beyond the point that triggers the return of normal maximum power.
9. The measured output power within ± 5 mm of the triggering points, or until the tablet is touching the phantom, for movements to and from the phantom should be tabulated in the SAR report.
10. If the sensor design and implementation allow additional variations for triggering distance tolerances, multiple samples should be tested to determine the most conservative distance required for SAR evaluation.
11. To ensure all production units are compliant, it is generally necessary to reduce the triggering distance determined from the triggering tests by 1 mm, or more if it is necessary, and use the smallest distance for movements to and from the phantom, minus 1 mm, as the sensor triggering distance for determining the SAR measurement distance.

8.2 Procedures for detrmining antenna and proximity sensor coverage

The sensing regions are usually limited to areas near the sensor element. If a sensor is spatially offset from the antenna(s), it is necessary to verify sensor triggering for conditions where the antenna is next to the user but the sensor is laterally further away to ensure sensor coverage is sufficient for reducing the power to maintain compliance. The following are used to determine if additional SAR measurements may be necessary due to sensor and antenna offset. 25 These procedures do not apply and are not required for configurations where the antenna and sensor are collocated and the peak SAR location is overlapping with the sensor.

1. The back surface or edge of the tablet is positioned at a test separation distance less than or equal to the distance required for back surface or edge triggering, with both the antenna and sensor pad located at least 20 mm laterally outside the edge (boundary) of the phantom, along the direction of maximum antenna and sensor offset. For the back surface, if the direction of maximum offset is not aligned with the tablet coordinates (physical edges) the tablet test position would not be aligned with the phantom coordinates (orientations). Each applicable tablet edge should be positioned perpendicularly to the phantom to determine sensor coverage. For antennas and/or sensors located near the corner of a tablet, both adjacent edges must be considered.

2. The similar sequence of steps applied to determine sensor triggering distance in section 6.2 are used to verify back surface and edge sensor coverage by moving the tablet (sensor and antenna) horizontally toward the phantom while maintaining the same vertical separation between the back surface or edge and the phantom.

3. After the exact location where triggering of power reduction is determined, with respect to the sensor and antenna, the tablet movement should be continued, in 3 mm increments, until both the sensor and antenna(s) are fully under the phantom and at least 20 mm inside the phantom edge.

4. The process is then repeated from the opposite direction, starting at the other end of the maximum antenna and sensor offset, by rotating the tablet 180° along the vertical axis.

5. The triggering points should be documented graphically, with the antenna and sensor clearly identified, along with all relevant dimensions.

If the subsequently measured peak SAR location for the antenna is not between the triggering points, established by the sensor coverage tests from opposite ends of the antenna and sensor, additional SAR tests may be required for conditions where only part of the back surface or edge of a tablet corresponding to the antenna is in proximity to the user and the sensor may not be triggering as desired. A KDB inquiry must be submitted by the test lab to determine if additional tests are required and the proper test configurations to use for testing. This may include situations where the sensor coverage region is too small for the antenna, the sensor is located too far away from the antenna, the sensor location is insufficient to cover multiple antennas or the antenna is at the corner of a tablet etc.

8.3 Proximity sensor status table of trigger distance

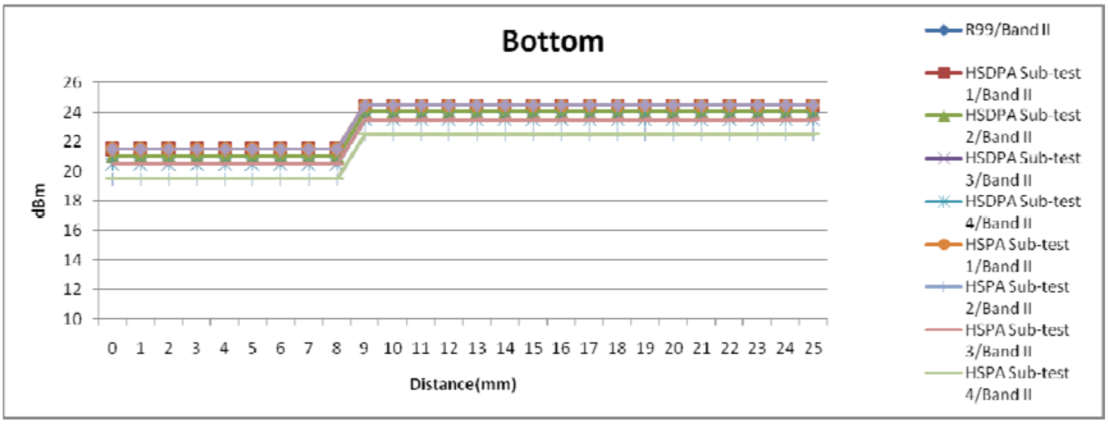
As per the KDB 616217 D04 SAR for laptop and tablets v01r02, section 6.2, the following procedure is used to determine the triggering distances.

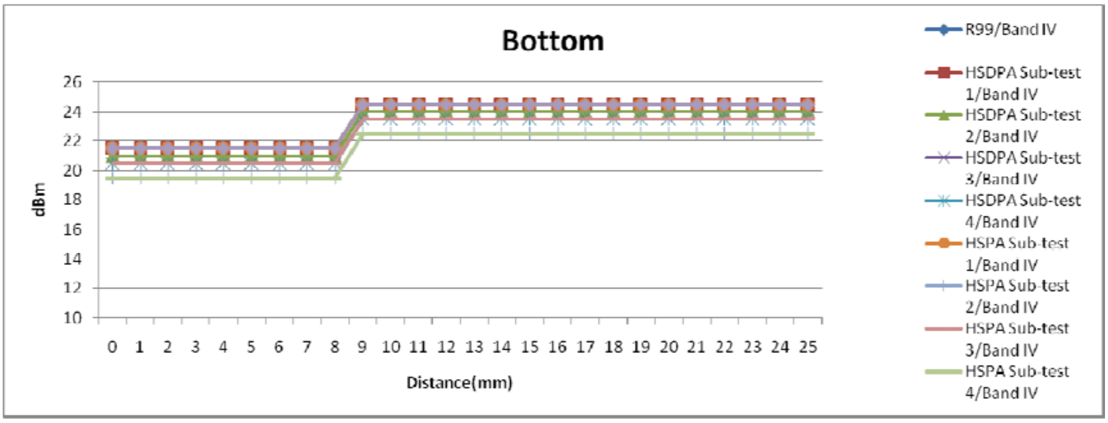
Proximity Sensor Status Table when DUT is moving towards the phantom

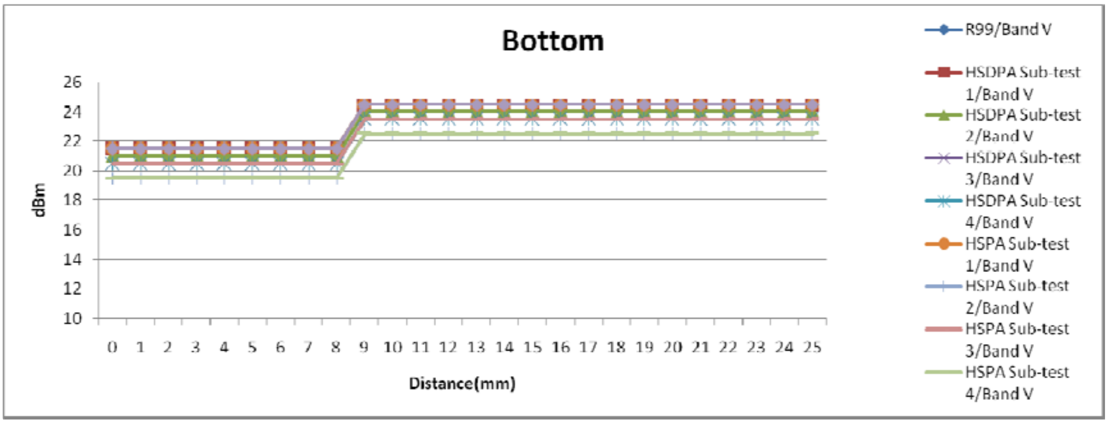
Distance to the DUT (mm)	Proximity Sensor Status – Bottom
30	OFF
27	OFF
25	OFF
24	OFF
23	OFF
22	OFF
21	OFF
20	OFF
19	OFF
18	OFF
17	OFF
16	OFF
15	OFF
14	OFF
13	OFF
12	OFF
11	OFF
10	ON
9	ON
8	ON
7	ON
6	ON
5	ON
4	ON
3	ON
2	ON
1	ON
0	ON

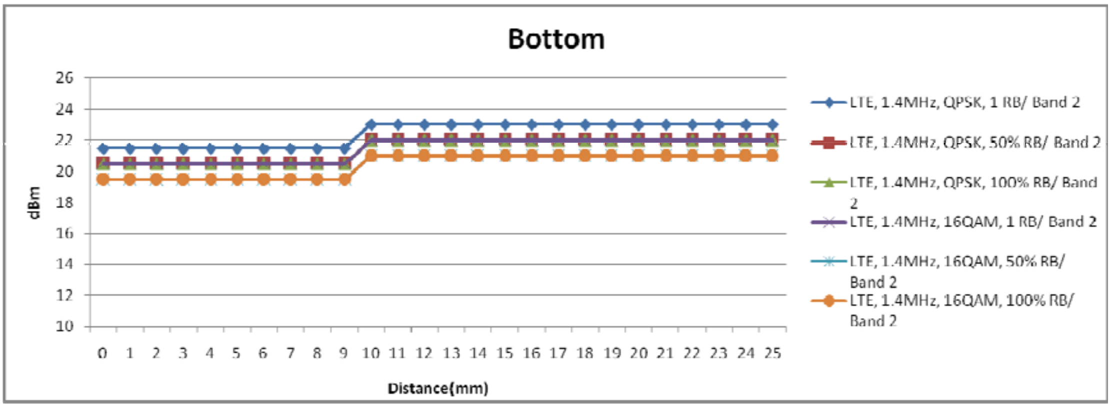
8.4 Power reduction per air-interface

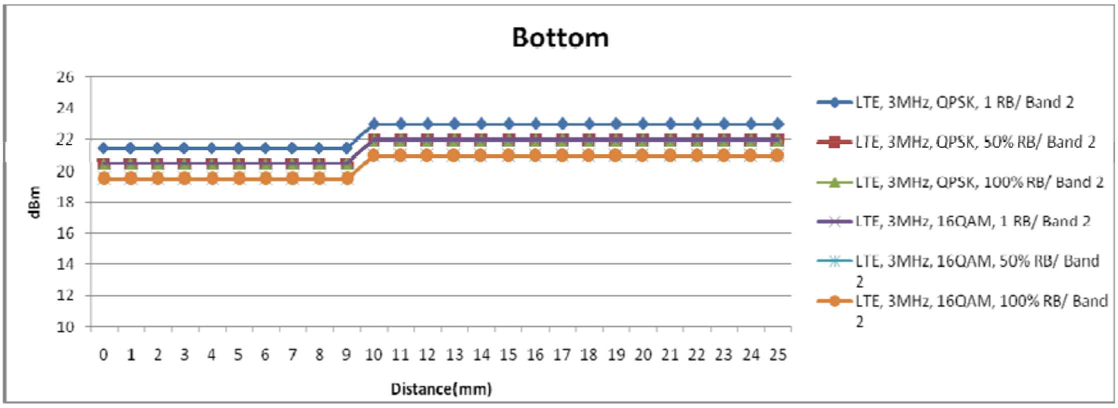
The following graphs show the power level and the distance from the DUT to the flat phantom for the Rear,Edge1 and Bottom Mode Surface.

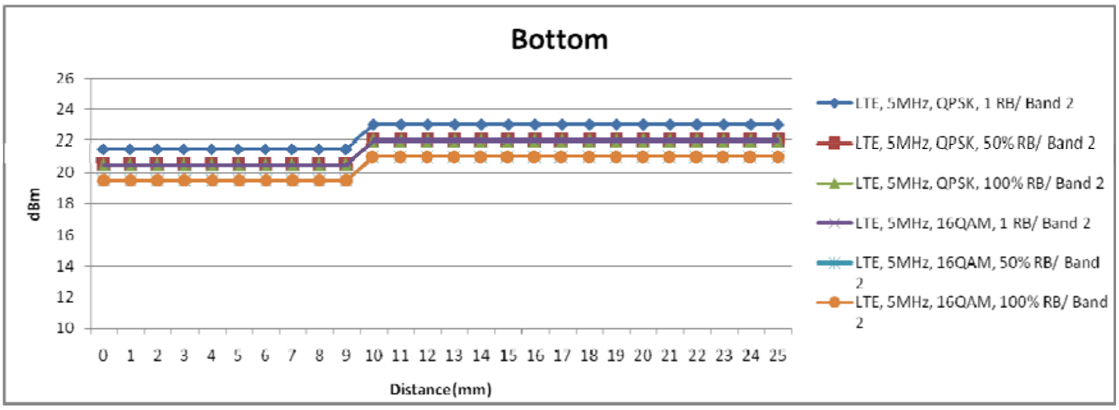


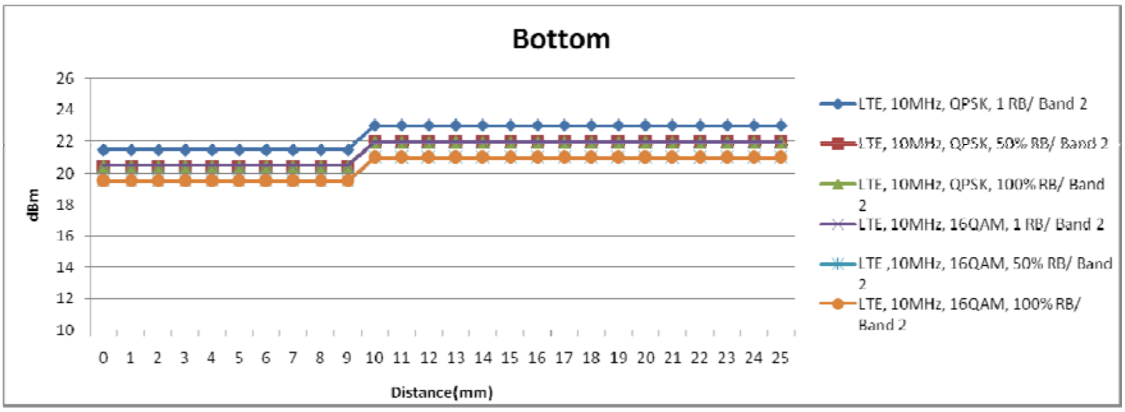


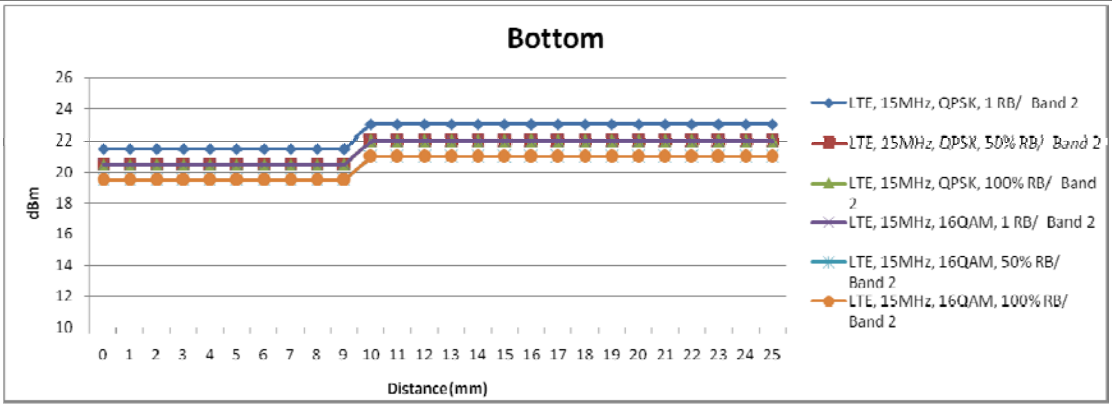


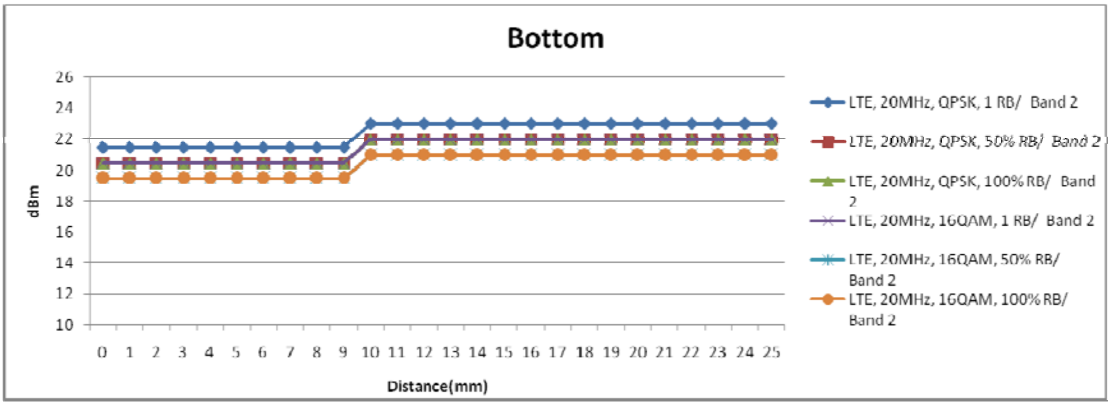

Bottom
dBm
Distance(mm)
LTE, 1.4MHz, QPSK, 1 RB/ Band 2
LTE, 1.4MHz, QPSK, 50% RB/ Band 2
LTE, 1.4MHz, QPSK, 100% RB/ Band 2
LTE, 1.4MHz, 16QAM, 1 RB/ Band 2
LTE, 1.4MHz, 16QAM, 50% RB/ Band 2
LTE, 1.4MHz, 16QAM, 100% RB/ Band 2

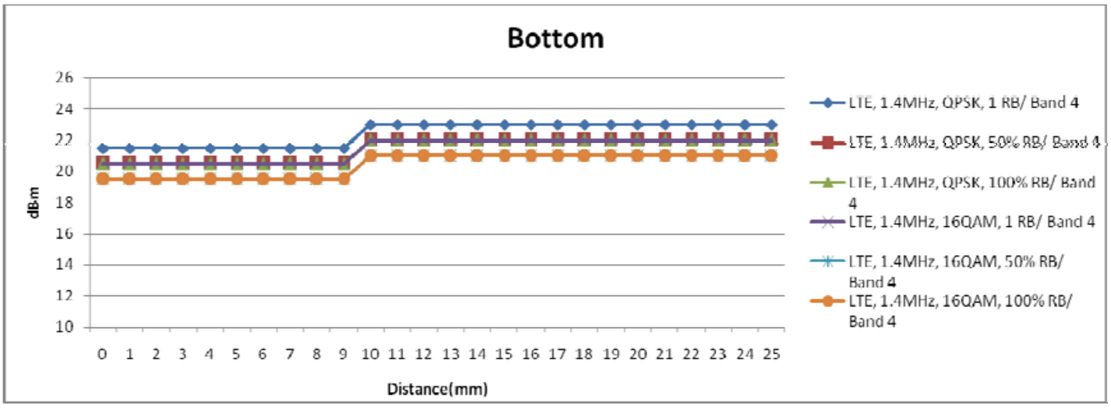

Bottom
dBm
Distance(mm)
LTE, 3MHz, QPSK, 1 RB/ Band 2
LTE, 3MHz, QPSK, 50% RB/ Band 2
LTE, 3MHz, QPSK, 100% RB/ Band 2
LTE, 3MHz, 16QAM, 1 RB/ Band 2
LTE, 3MHz, 16QAM, 50% RB/ Band 2
LTE, 3MHz, 16QAM, 100% RB/ Band 2

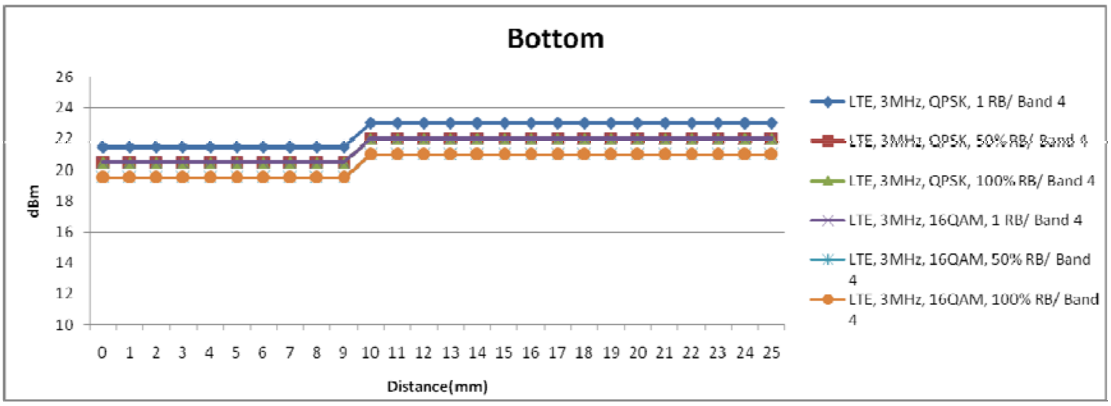

Bottom
dBm
Distance(mm)
LTE, 5MHz, QPSK, 1 RB/ Band 2
LTE, 5MHz, QPSK, 50% RB/ Band 2
LTE, 5MHz, QPSK, 100% RB/ Band 2
LTE, 5MHz, 16QAM, 1 RB/ Band 2
LTE, 5MHz, 16QAM, 50% RB/ Band 2
LTE, 5MHz, 16QAM, 100% RB/ Band 2

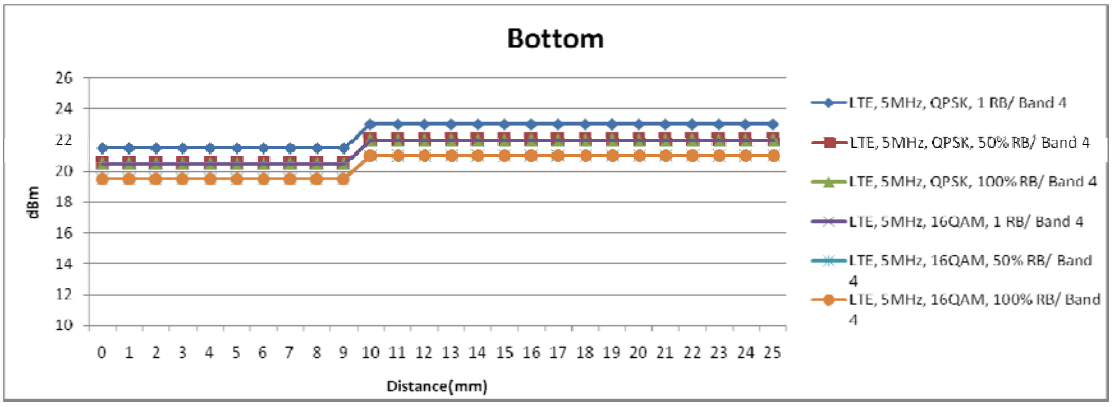

Bottom
dBm
Distance(mm)
LTE, 10MHz, QPSK, 1 RB/ Band 2
LTE, 10MHz, QPSK, 50% RB/ Band 2
LTE, 10MHz, QPSK, 100% RB/ Band 2
LTE, 10MHz, 16QAM, 1 RB/ Band 2
LTE ,10MHz, 16QAM, 50% RB/ Band 2
LTE, 10MHz, 16QAM, 100% RB/ Band 2

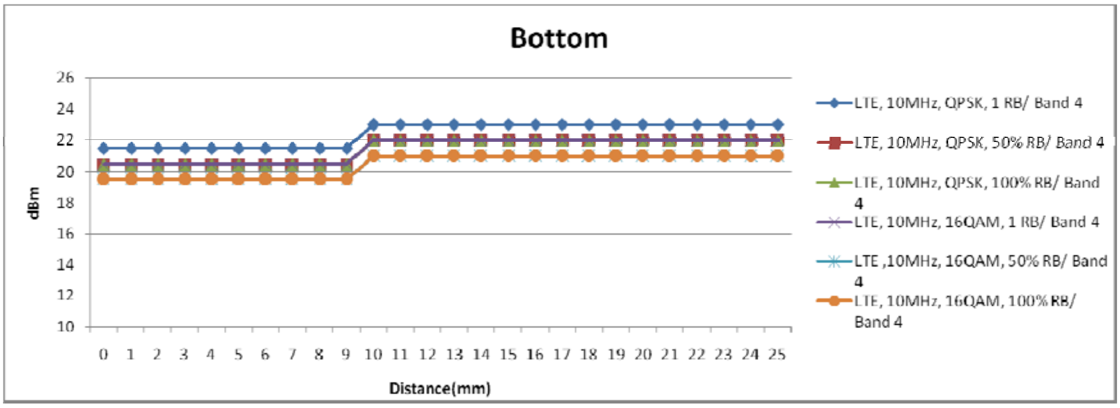

Bottom
26
24
22
20
18
16
14
12
10
dBm
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Distance(mm)
LTE, 15MHz, QPSK, 1 RB/ Band 2
LTE, 15MHz, QPSK, 50% RB/ Band 2
LTE, 15MHz, QPSK, 100% RB/ Band 2
LTE, 15MHz, 16QAM, 1 RB/ Band 2
LTE, 15MHz, 16QAM, 50% RB/ Band 2
LTE, 15MHz, 16QAM, 100% RB/ Band 2

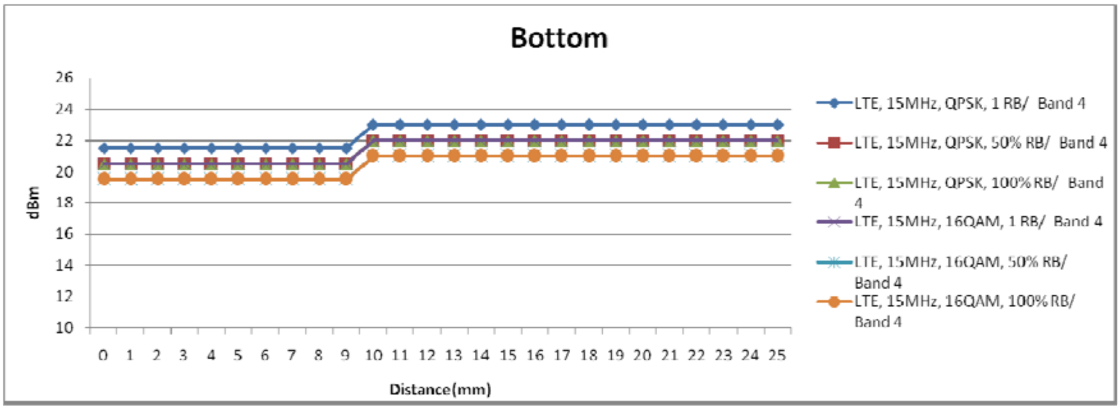

Bottom
26
24
22
20
18
16
14
12
10
dBm
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Distance(mm)
LTE, 20MHz, QPSK, 1 RB/ Band 2
LTE, 20MHz, QPSK, 50% RB/ Band 2
LTE, 20MHz, QPSK, 100% RB/ Band 2
LTE, 20MHz, 16QAM, 1 RB/ Band 2
LTE, 20MHz, 16QAM, 50% RB/ Band 2
LTE, 20MHz, 16QAM, 100% RB/ Band 2

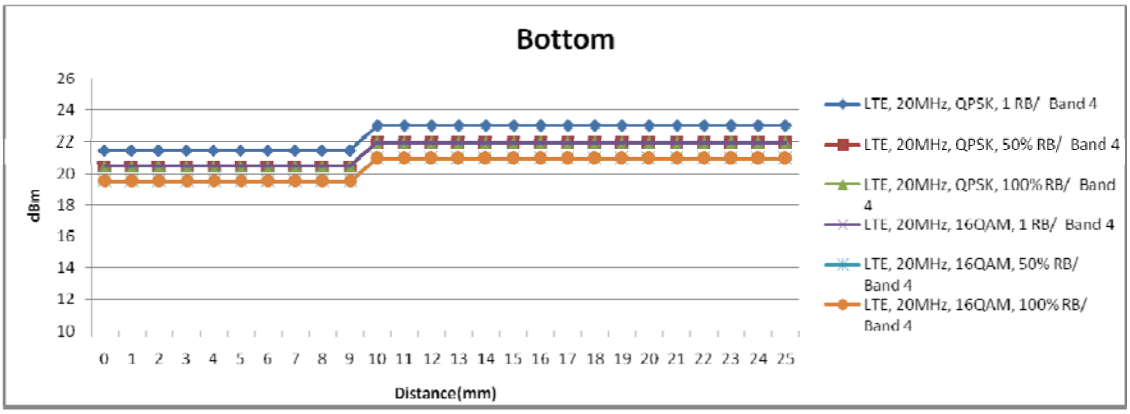

Bottom
26
24
22
20
18
16
14
12
10
dBm
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Distance(mm)
LTE, 1.4MHz, QPSK, 1 RB/ Band 4
LTE, 1.4MHz, QPSK, 50% RB/ Band 4
LTE, 1.4MHz, QPSK, 100% RB/ Band 4
LTE, 1.4MHz, 16QAM, 1 RB/ Band 4
LTE, 1.4MHz, 16QAM, 50% RB/ Band 4
LTE, 1.4MHz, 16QAM, 100% RB/ Band 4

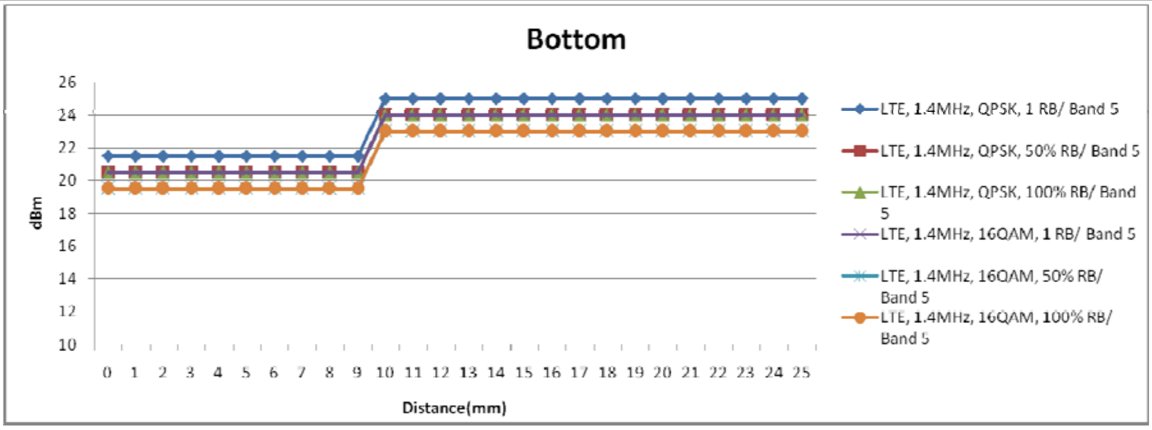

Bottom
26
24
22
20
18
16
14
12
10
dBm
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Distance(mm)
LTE, 3MHz, QPSK, 1 RB/ Band 4
LTE, 3MHz, QPSK, 50% RB/ Band 4
LTE, 3MHz, QPSK, 100% RB/ Band 4
LTE, 3MHz, 16QAM, 1 RB/ Band 4
LTE, 3MHz, 16QAM, 50% RB/ Band 4
LTE, 3MHz, 16QAM, 100% RB/ Band 4

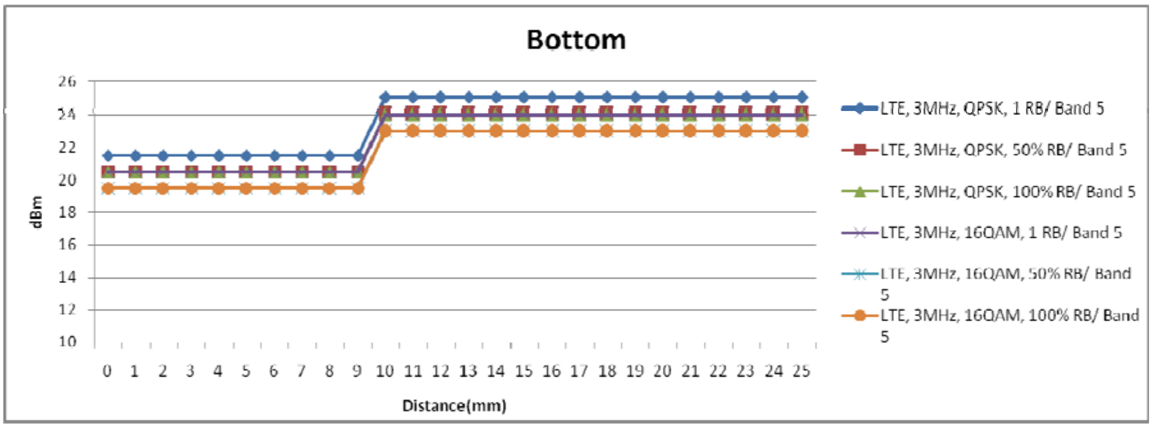

Bottom
dBm
Distance(mm)
LTE, 5MHz, QPSK, 1 RB/ Band 4
LTE, 5MHz, QPSK, 50% RB/ Band 4
LTE, 5MHz, QPSK, 100% RB/ Band 4
LTE, 5MHz, 16QAM, 1 RB/ Band 4
LTE, 5MHz, 16QAM, 50% RB/ Band 4
LTE, 5MHz, 16QAM, 100% RB/ Band 4

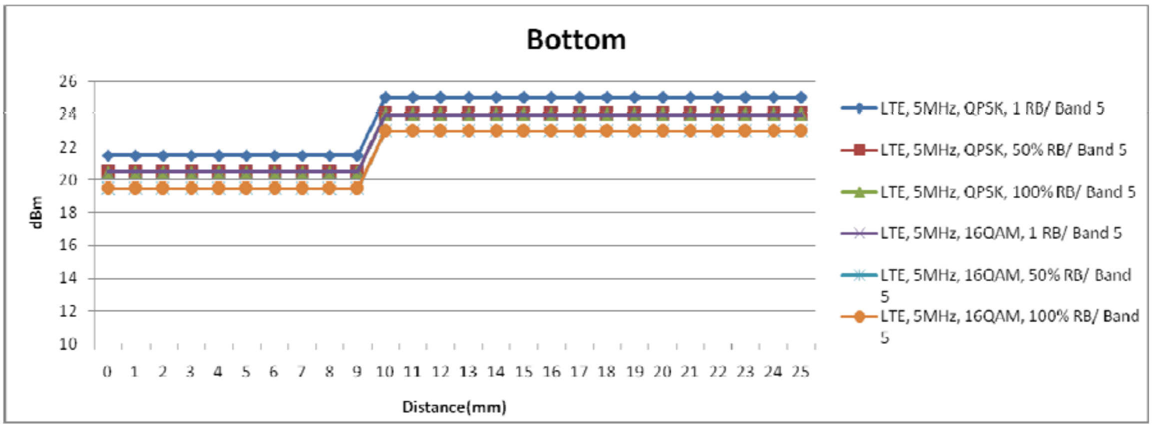

Bottom
dBm
Distance(mm)
LTE, 10MHz, QPSK, 1 RB/ Band 4
LTE, 10MHz, QPSK, 50% RB/ Band 4
LTE, 10MHz, QPSK, 100% RB/ Band 4
LTE, 10MHz, 16QAM, 1 RB/ Band 4
LTE ,10MHz, 16QAM, 50% RB/ Band 4
LTE, 10MHz, 16QAM, 100% RB/ Band 4

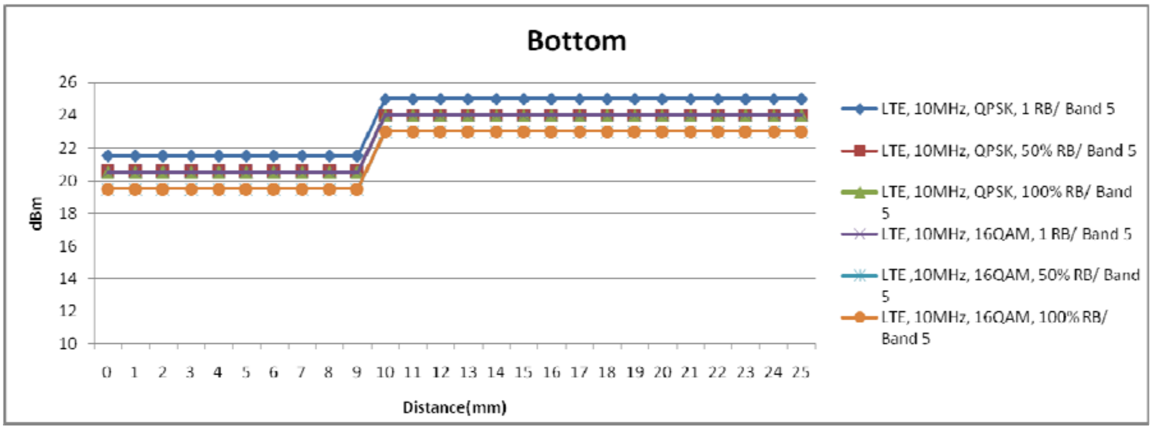

Bottom
dBm
Distance(mm)
LTE, 15MHz, QPSK, 1 RB/ Band 4
LTE, 15MHz, QPSK, 50% RB/ Band 4
LTE, 15MHz, QPSK, 100% RB/ Band 4
LTE, 15MHz, 16QAM, 1 RB/ Band 4
LTE, 15MHz, 16QAM, 50% RB/ Band 4
LTE, 15MHz, 16QAM, 100% RB/ Band 4

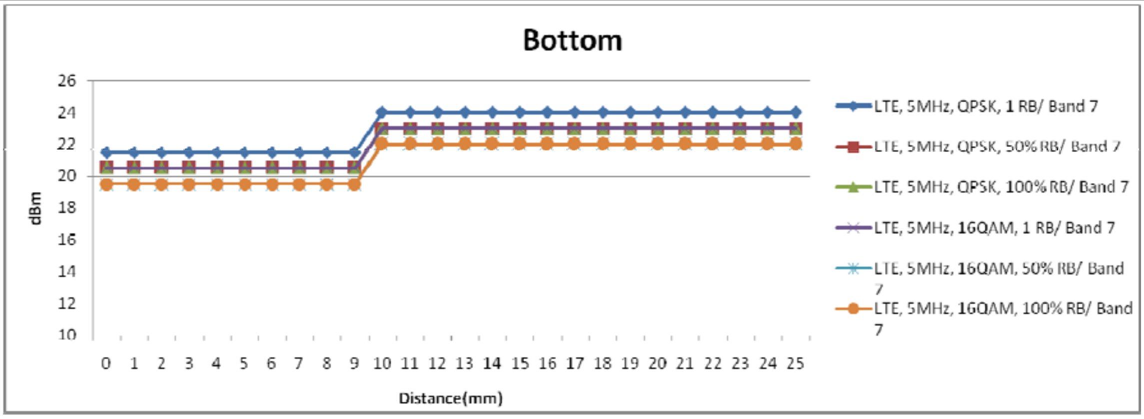

Bottom
dBm
Distance(mm)
LTE, 20MHz, QPSK, 1 RB/ Band 4
LTE, 20MHz, QPSK, 50% RB/ Band 4
LTE, 20MHz, QPSK, 100% RB/ Band 4
LTE, 20MHz, 16QAM, 1 RB/ Band 4
LTE, 20MHz, 16QAM, 50% RB/ Band 4
LTE, 20MHz, 16QAM, 100% RB/ Band 4

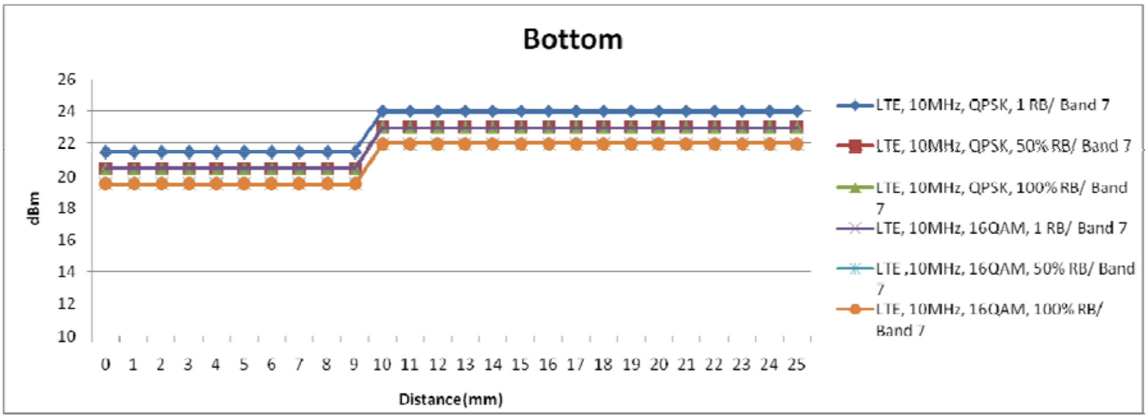

Bottom
dBm
Distance(mm)
LTE, 1.4MHz, QPSK, 1 RB/ Band 5
LTE, 1.4MHz, QPSK, 50% RB/ Band 5
LTE, 1.4MHz, QPSK, 100% RB/ Band 5
LTE, 1.4MHz, 16QAM, 1 RB/ Band 5
LTE, 1.4MHz, 16QAM, 50% RB/ Band 5
LTE, 1.4MHz, 16QAM, 100% RB/ Band 5

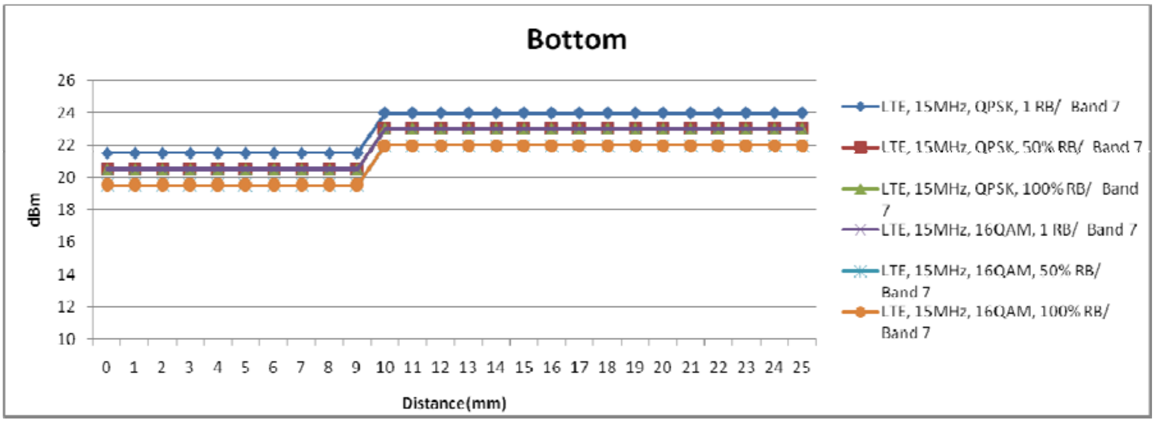

Bottom
dBm
Distance(mm)
LTE, 3MHz, QPSK, 1 RB/ Band 5
LTE, 3MHz, QPSK, 50% RB/ Band 5
LTE, 3MHz, QPSK, 100% RB/ Band 5
LTE, 3MHz, 16QAM, 1 RB/ Band 5
LTE, 3MHz, 16QAM, 50% RB/ Band 5
LTE, 3MHz, 16QAM, 100% RB/ Band 5

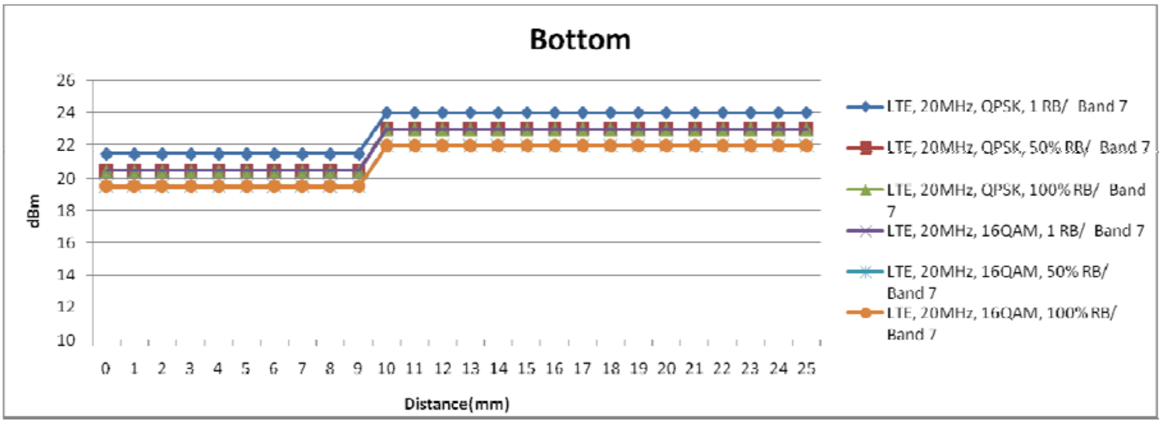

Bottom
dBm
Distance(mm)
LTE, 5MHz, QPSK, 1 RB/ Band 5
LTE, 5MHz, QPSK, 50% RB/ Band 5
LTE, 5MHz, QPSK, 100% RB/ Band 5
LTE, 5MHz, 16QAM, 1 RB/ Band 5
LTE, 5MHz, 16QAM, 50% RB/ Band 5
LTE, 5MHz, 16QAM, 100% RB/ Band 5

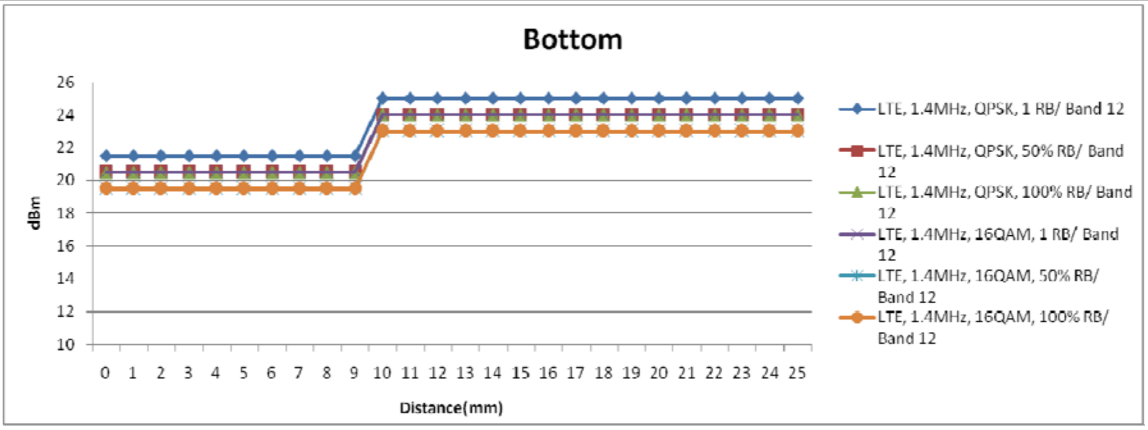

Bottom
dBm
Distance(mm)
LTE, 10MHz, QPSK, 1 RB/ Band 5
LTE, 10MHz, QPSK, 50% RB/ Band 5
LTE, 10MHz, QPSK, 100% RB/ Band 5
LTE, 10MHz, 16QAM, 1 RB/ Band 5
LTE ,10MHz, 16QAM, 50% RB/ Band 5
LTE, 10MHz, 16QAM, 100% RB/ Band 5


Bottom
26
24
22
20
18
16
14
12
10
dBm
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Distance(mm)
LTE, 5MHz, QPSK, 1 RB/ Band 7
LTE, 5MHz, QPSK, 50% RB/ Band 7
LTE, 5MHz, QPSK, 100% RB/ Band 7
LTE, 5MHz, 16QAM, 1 RB/ Band 7
LTE, 5MHz, 16QAM, 50% RB/ Band 7
LTE, 5MHz, 16QAM, 100% RB/ Band 7

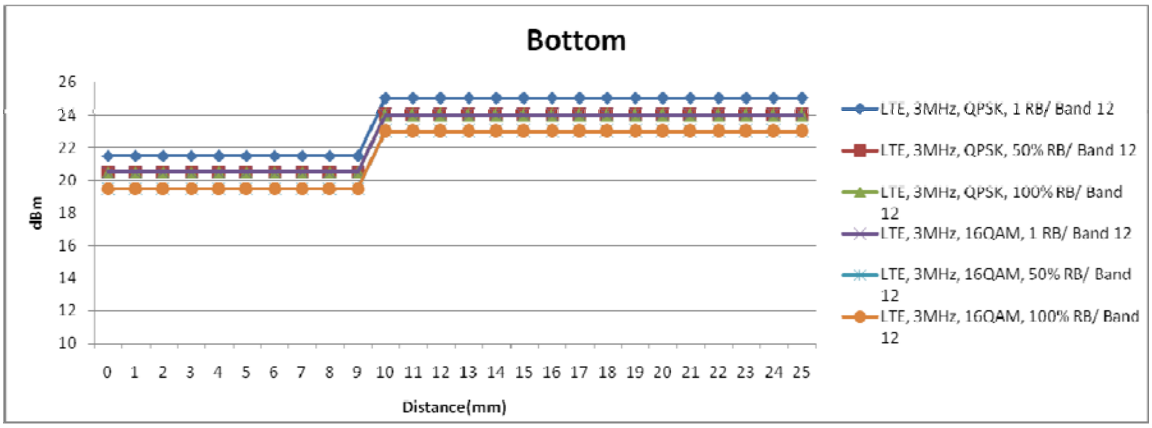

Bottom
26
24
22
20
18
16
14
12
10
dBm
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Distance(mm)
LTE, 10MHz, QPSK, 1 RB/ Band 7
LTE, 10MHz, QPSK, 50% RB/ Band 7
LTE, 10MHz, QPSK, 100% RB/ Band 7
LTE, 10MHz, 16QAM, 1 RB/ Band 7
LTE ,10MHz, 16QAM, 50% RB/ Band 7
LTE, 10MHz, 16QAM, 100% RB/ Band 7


Bottom
26
24
22
20
18
16
14
12
10
dBm
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Distance(mm)
LTE, 15MHz, QPSK, 1 RB/ Band 7
LTE, 15MHz, QPSK, 50% RB/ Band 7
LTE, 15MHz, QPSK, 100% RB/ Band 7
LTE, 15MHz, 16QAM, 1 RB/ Band 7
LTE, 15MHz, 16QAM, 50% RB/ Band 7
LTE, 15MHz, 16QAM, 100% RB/ Band 7

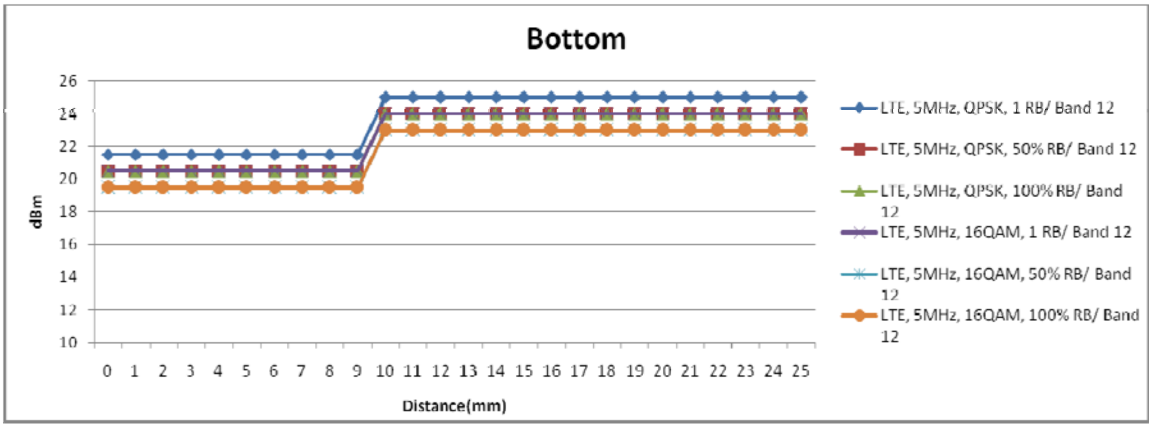

Bottom
26
24
22
20
18
16
14
12
10
dBm
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Distance(mm)
LTE, 20MHz, QPSK, 1 RB/ Band 7
LTE, 20MHz, QPSK, 50% RB/ Band 7
LTE, 20MHz, QPSK, 100% RB/ Band 7
LTE, 20MHz, 16QAM, 1 RB/ Band 7
LTE, 20MHz, 16QAM, 50% RB/ Band 7
LTE, 20MHz, 16QAM, 100% RB/ Band 7



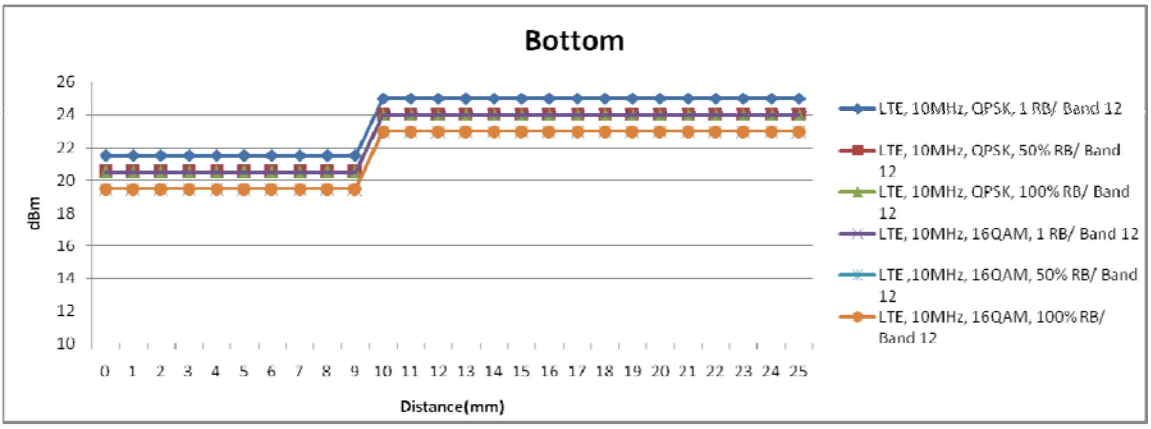
Bottom
dBm
Distance(mm)
LTE, 1.4MHz, QPSK, 1 RB/ Band 12
LTE, 1.4MHz, QPSK, 50% RB/ Band 12
LTE, 1.4MHz, QPSK, 100% RB/ Band 12
LTE, 1.4MHz, 16QAM, 1 RB/ Band 12
LTE, 1.4MHz, 16QAM, 50% RB/ Band 12
LTE, 1.4MHz, 16QAM, 100% RB/ Band 12



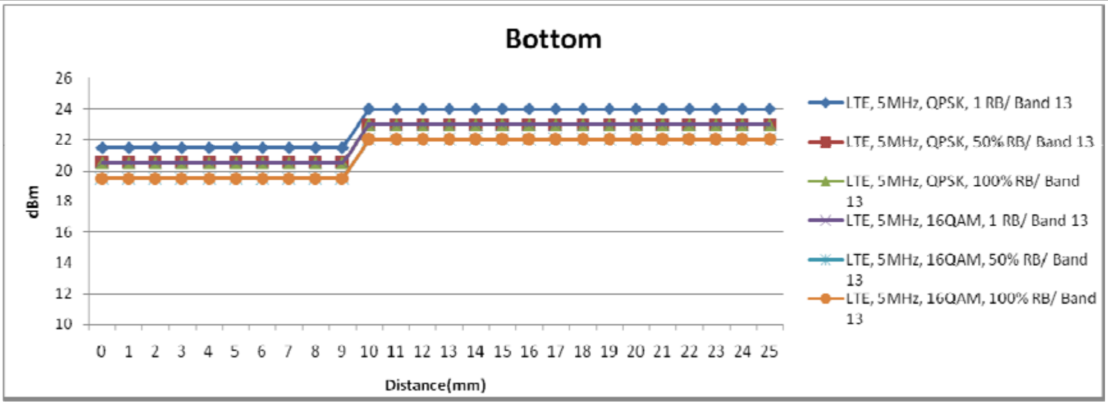
Bottom
dBm
Distance(mm)
LTE, 3MHz, QPSK, 1 RB/ Band 12
LTE, 3MHz, QPSK, 50% RB/ Band 12
LTE, 3MHz, QPSK, 100% RB/ Band 12
LTE, 3MHz, 16QAM, 1 RB/ Band 12
LTE, 3MHz, 16QAM, 50% RB/ Band 12
LTE, 3MHz, 16QAM, 100% RB/ Band 12

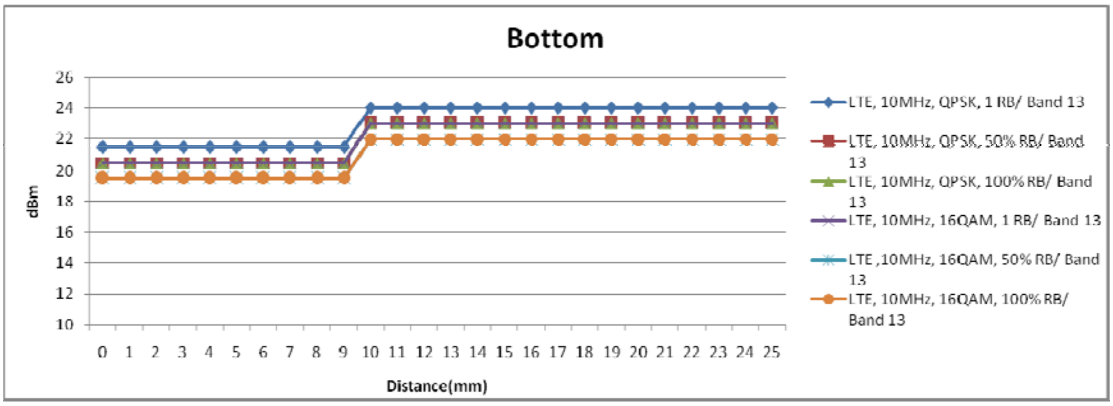


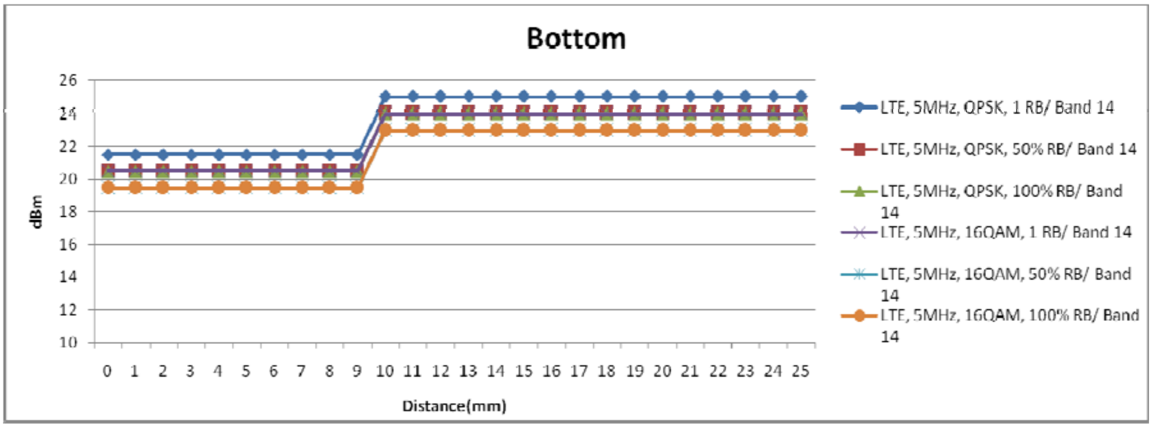
Bottom
dBm
Distance(mm)
LTE, 5MHz, QPSK, 1 RB/ Band 12
LTE, 5MHz, QPSK, 50% RB/ Band 12
LTE, 5MHz, QPSK, 100% RB/ Band 12
LTE, 5MHz, 16QAM, 1 RB/ Band 12
LTE, 5MHz, 16QAM, 50% RB/ Band 12
LTE, 5MHz, 16QAM, 100% RB/ Band 12

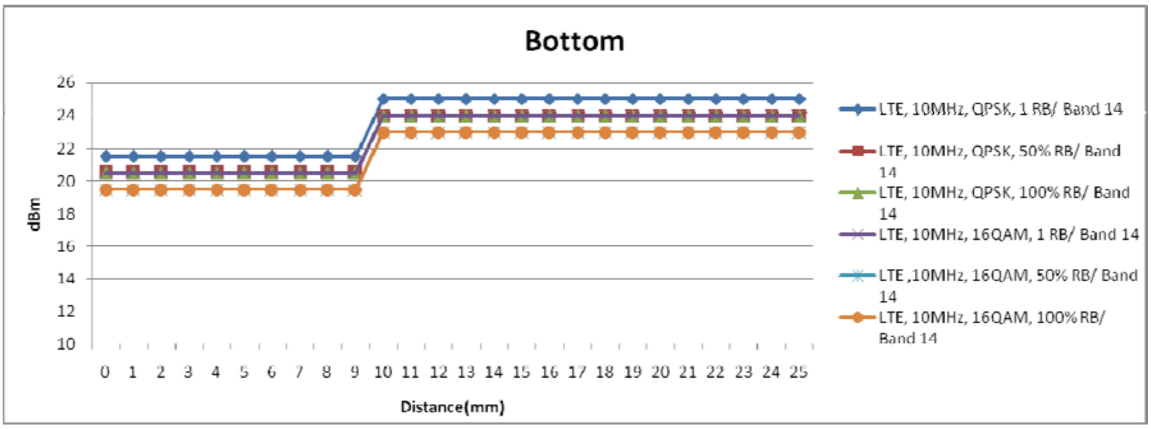


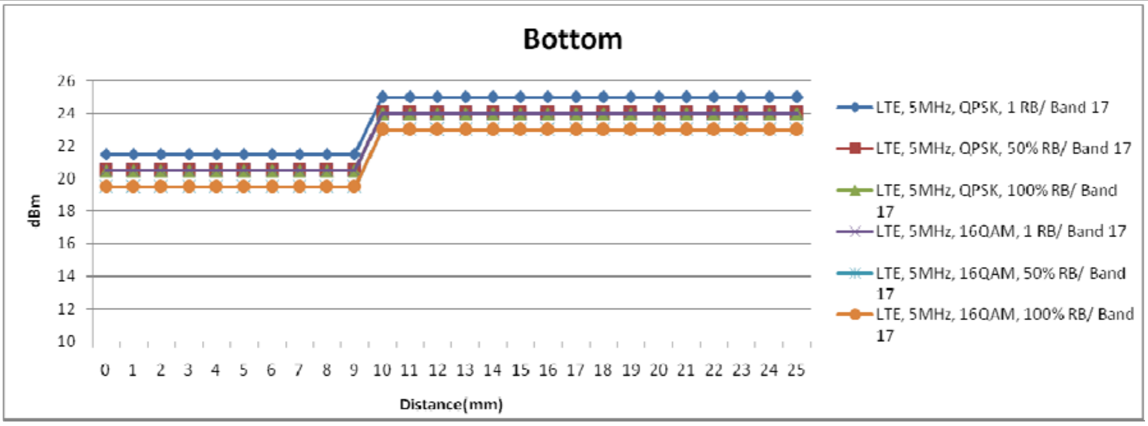
Bottom
dBm
Distance(mm)
LTE, 10MHz, QPSK, 1 RB/ Band 12
LTE, 10MHz, QPSK, 50% RB/ Band 12
LTE, 10MHz, QPSK, 100% RB/ Band 12
LTE, 10MHz, 16QAM, 1 RB/ Band 12
LTE ,10MHz, 16QAM, 50% RB/ Band 12
LTE, 10MHz, 16QAM, 100% RB/ Band 12

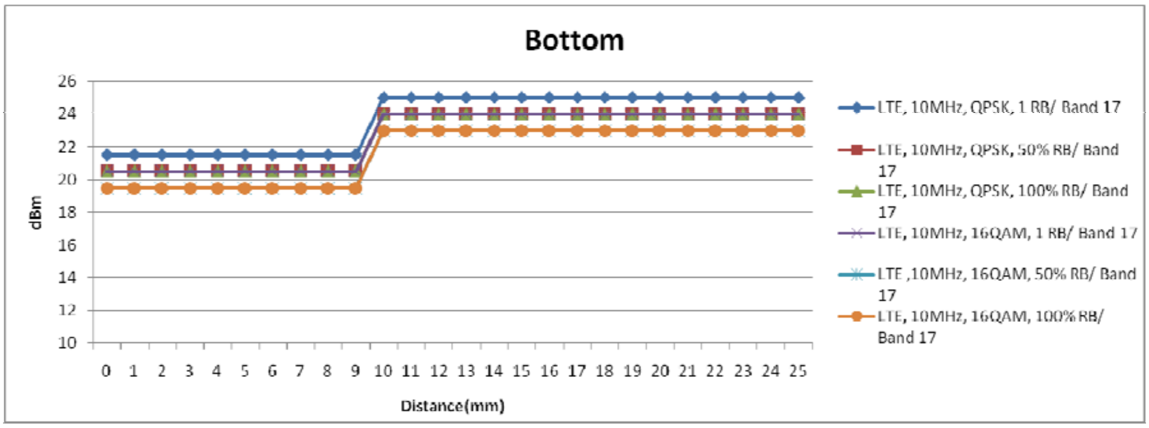

Bottom
dBm
Distance(mm)
LTE, 5MHz, QPSK, 1 RB/ Band 13
LTE, 5MHz, QPSK, 50% RB/ Band 13
LTE, 5MHz, QPSK, 100% RB/ Band 13
LTE, 5MHz, 16QAM, 1 RB/ Band 13
LTE, 5MHz, 16QAM, 50% RB/ Band 13
LTE, 5MHz, 16QAM, 100% RB/ Band 13

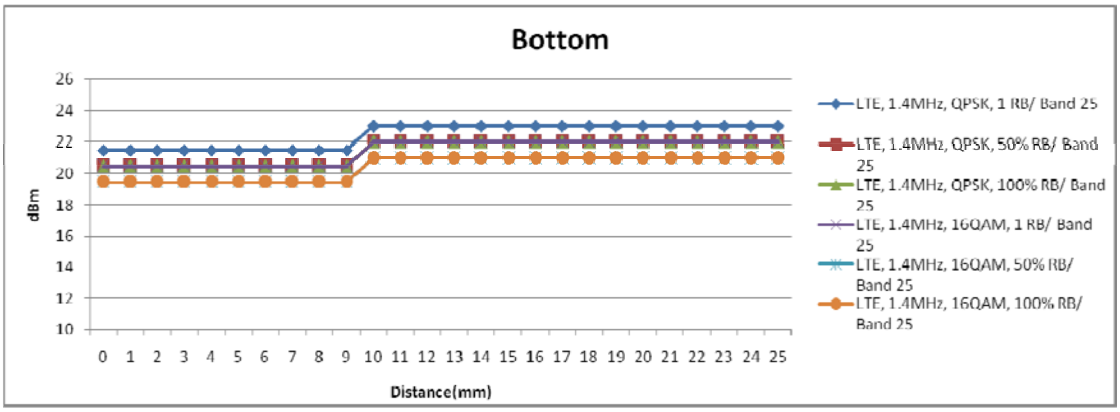

Bottom
dBm
Distance(mm)
LTE, 10MHz, QPSK, 1 RB/ Band 13
LTE, 10MHz, QPSK, 50% RB/ Band 13
LTE, 10MHz, QPSK, 100% RB/ Band 13
LTE, 10MHz, 16QAM, 1 RB/ Band 13
LTE ,10MHz, 16QAM, 50% RB/ Band 13
LTE, 10MHz, 16QAM, 100% RB/ Band 13

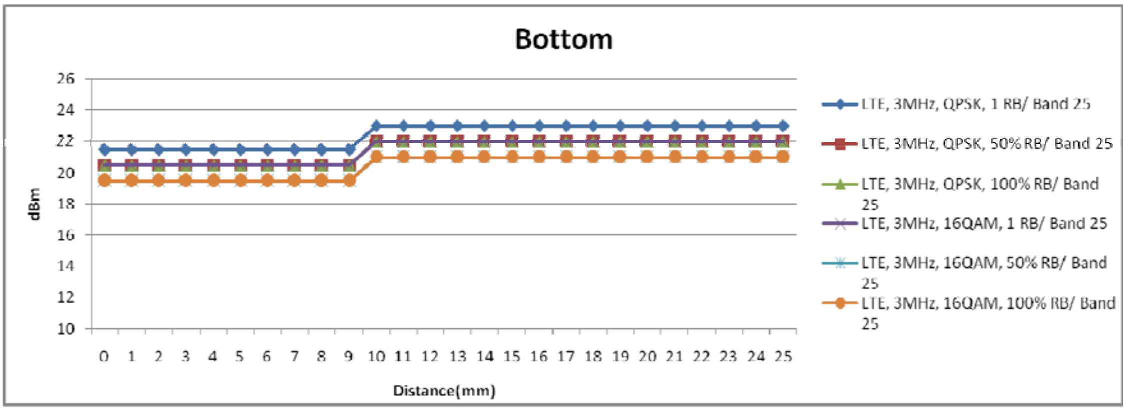

Bottom
dBm
Distance(mm)
LTE, 5MHz, QPSK, 1 RB/ Band 14
LTE, 5MHz, QPSK, 50% RB/ Band 14
LTE, 5MHz, QPSK, 100% RB/ Band 14
LTE, 5MHz, 16QAM, 1 RB/ Band 14
LTE, 5MHz, 16QAM, 50% RB/ Band 14
LTE, 5MHz, 16QAM, 100% RB/ Band 14


Bottom
dBm
Distance(mm)
LTE, 10MHz, QPSK, 1 RB/ Band 14
LTE, 10MHz, QPSK, 50% RB/ Band 14
LTE, 10MHz, QPSK, 100% RB/ Band 14
LTE, 10MHz, 16QAM, 1 RB/ Band 14
LTE ,10MHz, 16QAM, 50% RB/ Band 14
LTE, 10MHz, 16QAM, 100% RB/ Band 14


Bottom
dBm
26
24
22
20
18
16
14
12
10
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Distance(mm)
LTE, 5MHz, QPSK, 1 RB/ Band 17
LTE, 5MHz, QPSK, 50% RB/ Band 17
LTE, 5MHz, QPSK, 100% RB/ Band 17
LTE, 5MHz, 16QAM, 1 RB/ Band 17
LTE, 5MHz, 16QAM, 50% RB/ Band 17
LTE, 5MHz, 16QAM, 100% RB/ Band 17


Bottom
dBm
26
24
22
20
18
16
14
12
10
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Distance(mm)
LTE, 10MHz, QPSK, 1 RB/ Band 17
LTE, 10MHz, QPSK, 50% RB/ Band 17
LTE, 10MHz, QPSK, 100% RB/ Band 17
LTE, 10MHz, 16QAM, 1 RB/ Band 17
LTE ,10MHz, 16QAM, 50% RB/ Band 17
LTE, 10MHz, 16QAM, 100% RB/ Band 17


Bottom
dBm
26
24
22
20
18
16
14
12
10
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Distance(mm)
LTE, 1.4MHz, QPSK, 1 RB/ Band 25
LTE, 1.4MHz, QPSK, 50% RB/ Band 25
LTE, 1.4MHz, QPSK, 100% RB/ Band 25
LTE, 1.4MHz, 16QAM, 1 RB/ Band 25
LTE, 1.4MHz, 16QAM, 50% RB/ Band 25
LTE, 1.4MHz, 16QAM, 100% RB/ Band 25


Bottom
dBm
26
24
22
20
18
16
14
12
10
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Distance(mm)
LTE, 3MHz, QPSK, 1 RB/ Band 25
LTE, 3MHz, QPSK, 50% RB/ Band 25
LTE, 3MHz, QPSK, 100% RB/ Band 25
LTE, 3MHz, 16QAM, 1 RB/ Band 25
LTE, 3MHz, 16QAM, 50% RB/ Band 25
LTE, 3MHz, 16QAM, 100% RB/ Band 25