

SAR Test Report

Product Name : TU25 USB Modem

Model No. : TU25

Applicant : ZTE Corporation

Address : ZTE Plaza, Keji Road South, Hi-tech Industrial
Park, Nanshan District, Shenzhen, P.R. China

Date of Receipt : 2008/02/18

Issued Date : 2008/09/30

Report No. : 082185R-HPUSP09V01

Version : V1.1

The test results relate only to the samples tested.

The test report shall not be reproduced except in full without the written approval of Quietek Corporation.

Test Report Certification

Issued Date: 2008/09/30

Report No.:082185R-HPUSP09V01



Product Name : TU25 USB Modem
Applicant : ZTE Corporation
Address : ZTE Plaza, Keji Road South, Hi-tech Industrial Park,
Nanshan District, Shenzhen, P.R. China
Manufacturer : ZTE Corporation
Model No. : TU25
FCC ID : Q78-ZTE-TU25
Trade Name : ZTE
Applicable Standard : FCC Oet65 Supplement C June 2001
IEEE Std. 1528-2003, 47CFR § 2.1093
Test Result : Max. SAR Measurement (1g)
1.30 W/kg
Application Type : Certification

The test results relate only to the samples tested.

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Documented By :

(Engineering Adm. Assistant/
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Tested By :

(Engineer / Jung Chang)

Approved By :

(Manager / Vincent Lin)

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1. General Information

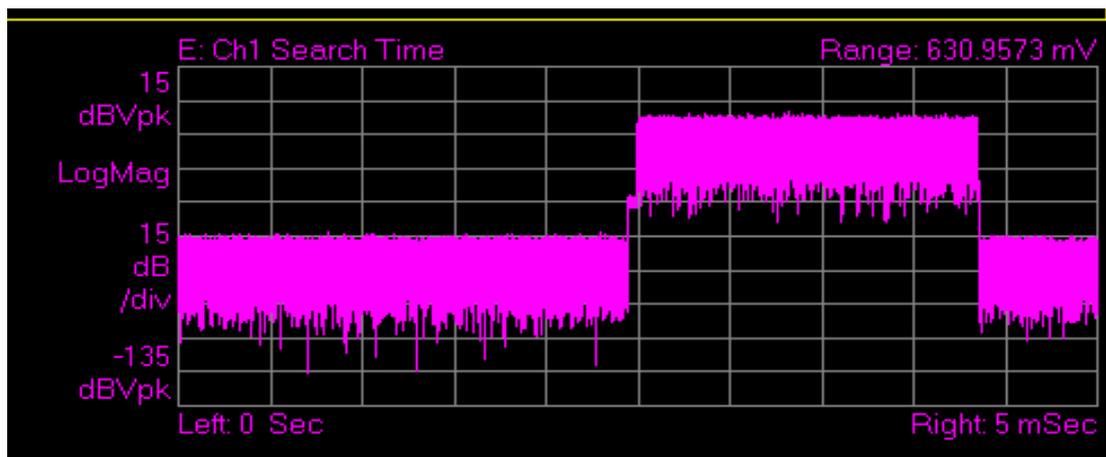
1.1 EUT Description

| | |
|------------------------------|--|
| Product Name | TU25 USB Modem |
| Trade Name | ZTE |
| Model No. | TU25 |
| FCC ID | Q78-ZTE-TU25 |
| TX Frequency | 2.496-2.690GHz |
| Type of Modulation | OFDMA QPSK, 16QAM, 64QAM (DL) |
| Antenna Type | Monopole |
| Device Category | Exposure |
| RF Exposure Environment | Uncontrolled |
| Transfer Rate | Maximum Data rate: 10 Mbps in downlink, 3Mbps in uplink |
| Antenna Diversity | The device has One Tx / Two Rx antennas |
| Normal operation dc voltages | DC Voltages: 5V |
| dc currents | DC Current: 485mA |

The ZTE TU25 device is 2.6 GHz WiMAX transceiver in a USB dongle configuration using Beceem chipset which supports 1xTx and 2xRx for this device. Only one antenna is used for both transmitting and receiving signal and the other antenna is strictly used for RX diversity. Its uplink is capable of both 10 MHz and 5 MHz bandwidths. For the 10 MHz bandwidth, it has 35 sub-channels structured from 1024 subcarriers; 184 are used as spare/safeguard subcarriers, leaving 840 available for transmission. From this, 560 subcarriers for data transmission with 280 subcarriers intended for pilot use. For the 5 MHz bandwidth, it contains 17 sub-channels using 512 subcarriers; 104 subcarriers as spare/safeguard subcarriers, 272 for data transmission, and 136 for pilot. The up-link sub-frame is triggered by an Allocation Start Time contained in the information of UL-MAP. This information specifies the starting times of the Up-link and Down-link frames. In any UL sub-frame, the duty factor ranging and bandwidth information is used to ensure optimal system operation. In normal device transmission the device will transmit control signaling at the first 3 up-link symbols and then use the rest of the up-link symbols for data traffic bursts in the uplink sub-frame. Since the first 3 symbols are also used for ranging detection purposes and are shared among other device users, its transmitting power is much smaller than the data burst symbol power. During the testing modes the first 3 symbols are also kept in reduced power level and the data traffic bursts are always running at the maximum output power

level. In the real usage, the data burst power will be adjusted according to the signal strength of the communication. In this way, by using the test mode arrangement we are transmitting at a worst case RF level.” [Maximum possible would be having all 18 symbols at full power.]

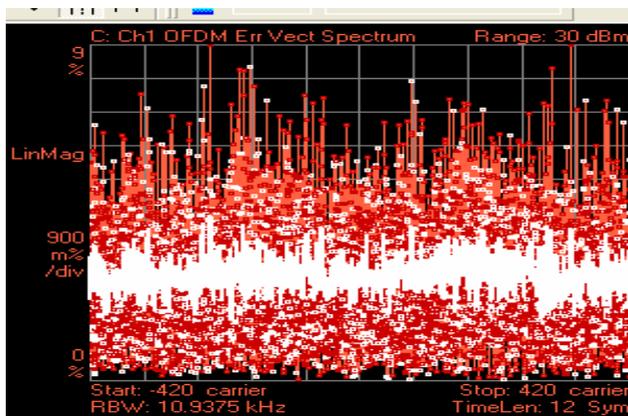
Sprint Nextel and other US WiMAX operators in the BRS/EBS band have agreed to operate with 29 OFDMA symbols downstream and 18 symbols upstream. US operators are working through the Wireless Communications Association International (WCA) to finalize a US best practices document including this ratio. The proposal has been approved at the WCA working group level and is awaiting final approval by the Board of Directors. There are 48 OFDMA symbols in a 5 ms frame. Thus, the maximum duty cycle – assuming a user device is transmitting constantly – would seem to be 18/48 or 37.5%. Taking into consideration the first 3 up-link symbols are running at reduced power level, the actual duty factor would be more like 15/48 or 31.5%. In practice, it would be expected that individual devices would typically operate with an even lower duty cycle since much of the time as the wireless device will be waiting for the computer or other device to have data to be transmitted upstream.



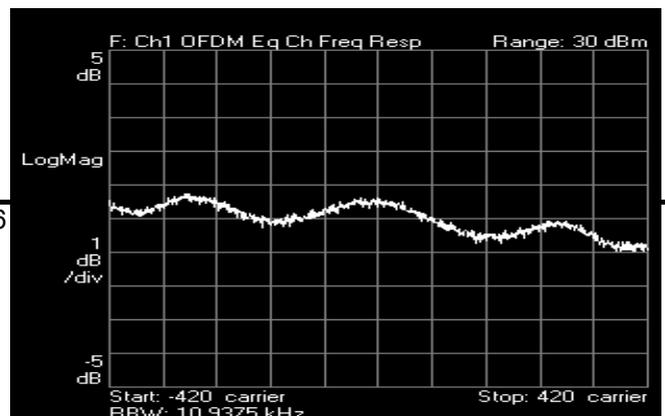
The frame signals with a nominal duty factor of 37.5%.

US WiMAX operators in the BRS/EBS band, including Sprint Nextel, plan to operate user devices only with PUSC (and not FUSC) in order to leave capacity to serve multiple users simultaneous. Thus testing of devices under FUSC conditions would not represent typical use of these devices.

PUSC with 840 sub-carriers for 10 MHz Bandwidth



e: 6



1.2 Test Environment

Ambient conditions in the laboratory:

Test Date: Sep. 06, 2008

| Items | Required | Actual |
|------------------|----------|--------|
| Temperature (°C) | 18-25 | 20.7 |
| Humidity (%RH) | 30-70 | 51 |

Test Date: Sep. 07, 2008

| Items | Required | Actual |
|------------------|----------|--------|
| Temperature (°C) | 18-25 | 20.7 |
| Humidity (%RH) | 30-70 | 50 |

Test Date: Sep. 11, 2008

| Items | Required | Actual |
|------------------|----------|--------|
| Temperature (°C) | 18-25 | 20.7 |
| Humidity (%RH) | 30-70 | 51 |

Test Date: Sep. 26, 2008

| Items | Required | Actual |
|------------------|----------|--------|
| Temperature (°C) | 18-25 | 20.7 |
| Humidity (%RH) | 30-70 | 51 |

Site Description:

Accredited by TAF
 Accredited Number: 0914
 Effective through: December 12, 2008



Site Name: Quietek Corporation

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2. SAR Measurement System

2.1 ALSAS-10U System Description

ALSAS-10-U is fully compliant with the technical and scientific requirements of IEEE 1528, IEC 62209, CENELEC, ARIB, ACA, and the Federal Communications Commission. The system comprises of a six axes articulated robot which utilizes a dedicated controller.

ALSAS-10U uses the latest methodologies and FDTD modeling to provide a platform which is repeatable with minimum uncertainty.

2.1.1 Applications

Predefined measurement procedures compliant with the guidelines of CENELEC, IEEE, IEC, FCC, etc are utilized during the assessment for the device. Automatic detection for all SAR maxima are embedded within the core architecture for the system, ensuring that peak locations used for centering the zoom scan are within a 1mm resolution and a 0.05mm repeatable position. System operation range currently available up-to 6 GHz in simulated tissue.

2.1.2 Area Scans

Area scans are defined prior to the measurement process being executed with a user defined variable spacing between each measurement point (integral) allowing low uncertainty measurements to be conducted. Scans defined for FCC applications utilize a 10mm² step integral, with 1mm interpolation used to locate the peak SAR area used for zoom scan assessments.

Where the system identifies multiple SAR peaks (which are within 25% of peak value) the system will provide the user with the option of assessing each peak location individually for zoom scan averaging.



2.1.3 Zoom Scan (Cube Scan Averaging)

The averaging zoom scan volume utilized in the ALSAS-10U software is in the shape of a cube and the side dimension of a 1 g or 10 g mass is dependent on the density of the liquid representing the simulated tissue. A density of 1000 kg/m³ is used to represent the head and body tissue density and not the phantom liquid density, in order to be consistent with the definition of the liquid dielectric properties, i.e. the side length of the 1 g cube is 10mm, with the side length of the 10 g cube 21,5mm.

When the cube intersects with the surface of the phantom, it is oriented so that 3 vertices touch the surface of the shell or the center of a face is tangent to the surface. The face of the cube closest to the surface is modified in order to conform to the tangent surface.

The zoom scan integer steps can be user defined so as to reduce uncertainty, but normal practice for typical test applications (including FCC) utilize a physical step of 5x5x8 (8mmx8mmx5mm) providing a volume of 32mm in the X & Y axis, and 35mm in the Z axis.

2.1.4 ALSAS-10U Interpolation and Extrapolation Uncertainty

The overall uncertainty for the methodology and algorithms the used during the SAR calculation was evaluated using the data from IEEE 1528 based on the example f3 algorithm:

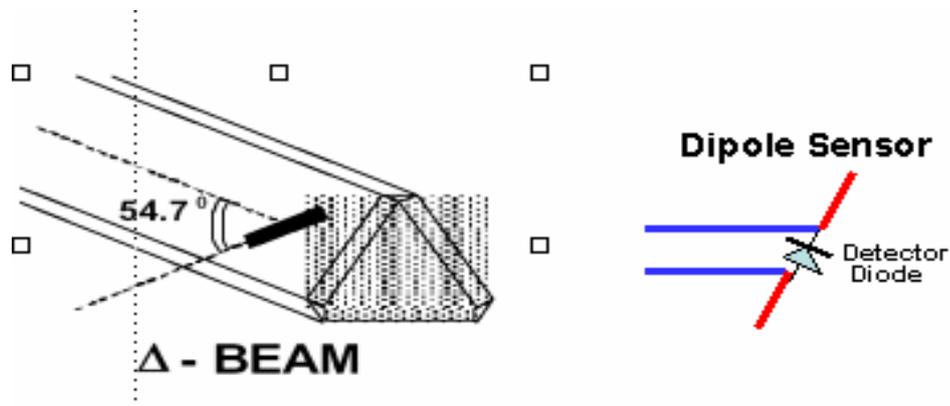
$$f_3(x, y, z) = A \frac{a^2}{\frac{a^2}{4} + x'^2 + y'^2} \cdot \left(e^{-\frac{2z}{a}} + \frac{a^2}{2(a + 2z)^2} \right)$$

2.2 Isotropic E-Field Probe

The isotropic E-Field probe has been fully calibrated and assessed for isotropicity, and boundary effect within a controlled environment. Depending on the frequency for which the probe is calibrated the method utilized for calibration will change. A number of methods is used for calibrating probes, and these are outlined in the table below:

| Calibration Frequency | Air Calibration | Tissue Calibration |
|-----------------------|-----------------|--------------------|
| 2600MHz | Waveguide | Temperature |

The E-Field probe utilizes a triangular sensor arrangement as detailed in the diagram below:



SAR is assessed with a calibrated probe which moves at a default height of 5mm from the center of the diode, which is mounted to the sensor, to the phantom surface (in the Z Axis). The 5mm offset height has been selected so as to minimize any resultant boundary effect due to the probe being in close proximity to the phantom surface.

The following algorithm is an example of the function used by the system for linearization of the output from the probe when measuring complex modulation schemes.

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

2.2.1 Isotropic E-Field Probe Specification

| | |
|--------------------------------------|---|
| Calibration in Air | Frequency Dependent Below 2GHz Calibration in air performed in a TEM Cell Above 2GHz Calibration in air performed in waveguide |
| Sensitivity | 1.0 $\mu\text{V}/(\text{V}/\text{m})^2$ to 1.3 $\mu\text{V}/(\text{V}/\text{m})^2$ |
| Dynamic Range | 0.0005 W/kg to 100W/kg |
| Isotropic Response | Better than 0.2dB |
| Diode Compression point (DCP) | Calibration for Specific Frequency |
| Probe Tip Radius | < 5mm |
| Sensor Offset | 1.56 (+/- 0.02mm) |
| Probe Length | 290mm |
| Video Bandwidth | @ 500 Hz: 1dB @1.02 KHz: 3dB |
| Boundary Effect | Less than 2% for distance greater than 2.4mm |
| Spatial Resolution | Diameter less than 5mm Compliant with Standards |

2.3 Boundary Detection Unit and Probe Mounting Device

ALSAS-10U incorporates a boundary detection unit with a sensitivity of 0.05mm for detecting all types of surfaces. The robust design allows for detection during probe tilt (probe normalize) exercises, and utilizes a second stage emergency stop. The signal electronics are fed directly into the robot controller for high accuracy surface detection in lateral and axial detection modes (X, Y, & Z).

The probe is mounted directly onto the Boundary Detection unit for accurate tooling and displacement calculations controlled by the robot kinematics. The probe is connect to an isolated probe interconnect where the output stage of the probe is fed directly into the amplifier stage of the Daq-Paq.

2.4 Daq-Paq (Analog to Digital Electronics)

ALSAS-10U incorporates a fully calibrated Daq-Paq (analog to digital conversion system) which has a 4 channel input stage, sent via a 2 stage auto-set amplifier module. The input signal is amplified accordingly so as to offer a dynamic range from 5µV to 800mV. Integration of the fields measured is carried out at board level utilizing a Co-Processor which then sends the measured fields down into the main computational module in digitized form via an RS232 communications port. Probe linearity and duty cycle compensation is carried out within the main Daq-Paq module.

| | |
|---------------------------------|---|
| ADC | 12 Bit |
| Amplifier Range | 20mV to 200mV and 150mV to 800mV |
| Field Integration | Local Co-Processor utilizing proprietary integration algorithms |
| Number of Input Channels | 4 in total 3 dedicated and 1 spare |
| Communication | Packet data via RS232 |

2.5 Axis Articulated Robot



ALSAS-10U utilizes a six axis articulated robot, which is controlled using a Pentium based real-time movement controller. The movement kinematics engine utilizes proprietary (Thermo CRS) interpolation and extrapolation algorithms, which allow full freedom of movement for each of the six joints within the working envelope. Utilization of joint 6 allows for full probe rotation with a tolerance better than 0.05mm around the central axis.

| | |
|--------------------------------------|-----------------------------------|
| Robot/Controller Manufacturer | Thermo CRS |
| Number of Axis | Six independently controlled axis |
| Positioning Repeatability | 0.05mm |
| Controller Type | Single phase Pentium based C500C |
| Robot Reach | 710mm |
| Communication | RS232 and LAN compatible |

2.6 ALSAS Universal Workstation

ALSAS Universal workstation allows for repeatability and fast adaptability. It allows users to do calibration, testing and measurements using different types of phantoms with one set up, which significantly speeds up the measurement process.

2.7 Universal Device Positioner

The universal device positioner allow complete freedom of movement of the EUT. Developed to hold a EUT in a free-space scenario any additional loading attributable to the material used in the construction of the positioner has been eliminated. Repeatability has been enhanced through the linear scales which form the design used to indicate positioning for any given test scenario in all major axes. A 15° tilt indicator is included for the of aid cheek to tilt movements for head SAR analysis. Overall uncertainty for measurements have been reduced due to the design of the Universal device positioner, which allows positioning of a device in as near to a free-space scenario as possible, and by providing the means for complete repeatability.

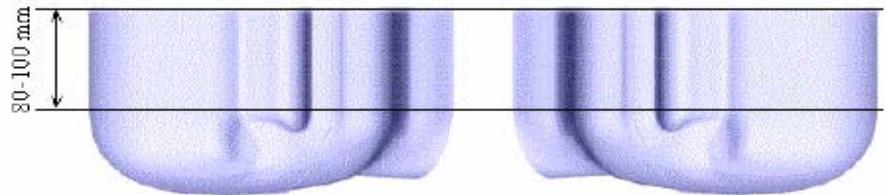


2.8 Phantom Types

The ALSAS-10U allows the integration of multiple phantom types. SAM Phantoms fully compliant with IEEE 1528, Universal Phantom, and Universal Flat.

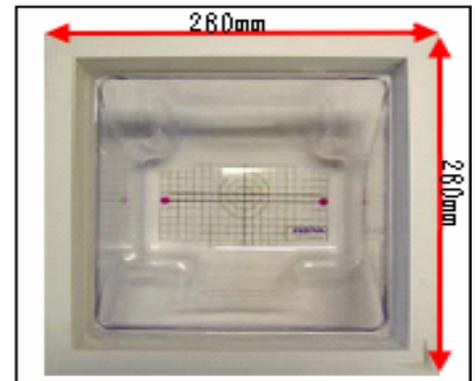
2.8.1 APREL SAM Phantoms

The SAM phantoms developed using the IEEE SAM CAD file. They are fully compliant with the requirements for both IEEE 1528 and FCC Supplement C. Both the left and right SAM phantoms are interchangeable, transparent and include the IEEE 1528 grid with visible NF and MB lines.



2.8.2 APREL Laboratories Universal Phantom

The Universal Phantom is used on the ALSAS-10U as a system validation phantom. The Universal Phantom has been fully validated both experimentally from 800MHz to 6GHz and numerically using XFDTD numerical software. The shell thickness is 2mm overall, with a 4mm spacer located at the NF/MB intersection providing an overall thickness of 6mm in line with the requirements of IEEE-1528. The design allows for fast and accurate measurements, of handsets, by allowing the conservative SAR to be evaluated at on frequency for both left and right head experiments in one measurement.



2.9 Dielectric Probe Kit

The measurement system is comprised of the dielectric probe connected to a vector network analyzer and a computer pre-loaded with APREL Laboratories proprietary software *AprelCoaxialProb.vxe*. The complete system automatically acquires the dielectric material properties post processes the raw data and presents a detailed test report. Its working frequency Band is from 200MHz to 6GHz (nominal). APREL Laboratories open-ended coaxial probe test kit was evaluated according to the procedure



recommended by the standard IEEE 1528. Methanol parameters are compared to the standard values. The typical accuracy for APREL Laboratories dielectric test system is $\pm 5\%$.

3. Tissue Simulating Liquid

3.1 The composition of the tissue simulating liquid

| INGREDIENT (% Weight) | 2450MHz Head | 2450MHz Body | 2600MHz Head | 2600MHz Body | 5800MHz Head | 5800MHz Body |
|--------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Water | -- | -- | -- | 71.3 | -- | -- |
| Salt | -- | -- | -- | 0.05 | -- | -- |
| Sugar | -- | -- | -- | 0.00 | -- | -- |
| HEC | -- | -- | -- | 0.00 | -- | -- |
| Preventol | -- | -- | -- | 0.00 | -- | -- |
| DGBE | -- | -- | -- | 28.65 | -- | -- |

3.2 Tissue Calibration Result

The dielectric parameters of the liquids were verified prior to the SAR evaluation using APREL Dielectric Probe Kit and Anritsu MS4623B Vector Network Analyzer.

| Body Tissue Simulant Measurement | | | | |
|---|--------------------------------------|------------------------|----------------------|----------------------|
| Frequency [MHz] | Description | Dielectric Parameters | | Tissue Temp. [°C] |
| | | ϵ_r | σ [s/m] | |
| 2600MHz | Reference result $\pm 5\%$ window | 52.5 49.87 to 55.12 | 2.16 2.05 to 2.26 | N/A |
| | 06-Sep-08 | 52.32 | 2.06 | 20.2 |
| | 11-Sep-08 | 52.33 | 2.05 | 20.2 |
| | 17-Sep-08 | 52.15 | 2.06 | 20.2 |
| | 26-Sep-08 | 52.21 | 2.05 | 20.2 |

3.3 Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEEE 1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in IEEE 1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations described in Reference [12] and extrapolated according to the head parameters specified IEEE 1528.

| Target Frequency (MHz) | Head | | Body | |
|---------------------------|--------------|----------------|--------------|----------------|
| | ϵ_r | σ (S/m) | ϵ_r | σ (S/m) |
| 150 | 52.3 | 0.76 | 61.9 | 0.80 |
| 300 | 45.3 | 0.87 | 58.2 | 0.92 |
| 450 | 43.5 | 0.87 | 56.7 | 0.94 |
| 835 | 41.5 | 0.90 | 55.2 | 0.97 |
| 900 | 41.5 | 0.97 | 55.0 | 1.05 |
| 915 | 41.5 | 0.98 | 55.0 | 1.06 |
| 1450 | 40.5 | 1.20 | 54.0 | 1.30 |
| 1610 | 40.3 | 1.29 | 53.8 | 1.40 |
| 1800 – 2000 | 40.0 | 1.40 | 53.3 | 1.52 |
| 2450 | 39.2 | 1.80 | 52.7 | 1.95 |
| 3000 | 38.5 | 2.40 | 52.0 | 2.73 |
| 5800 | 35.3 | 5.27 | 48.2 | 6.00 |

(ϵ_r = relative permittivity, σ = conductivity and $\rho = 1000 \text{ kg/m}^3$)

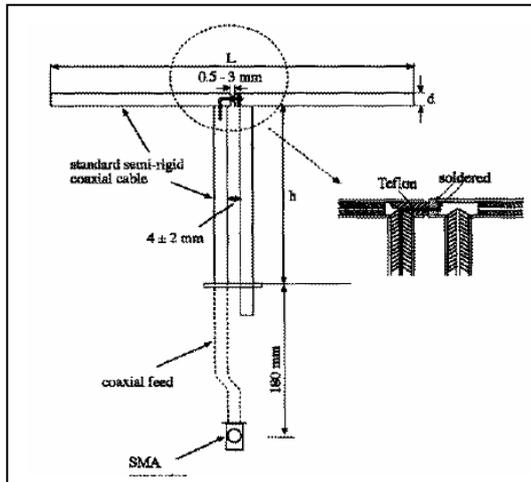
Note:

Reference [12]: Gabriel, C., "Compilation of the Dielectric Properties of Body Tissues at RF and Microwave Frequencies", Brooks Air Force Technical Report AL/OE-TR-1996-0037, 1996.

3. SAR Measurement Procedure

4.1 SAR System Validation

4.1.1 Validation Dipoles



The dipoles used is based on the IEEE-1528 standard, and is complied with mechanical and electrical specifications in line with the requirements of both IEEE and FCC Supplement C. the table below provides details for the mechanical and electrical specifications for the dipoles.

| Frequency | L (mm) | h (mm) | d (mm) |
|-----------|--------|--------|--------|
| 2600MHz | 49.5 | 30 | 3.6 |

4.1.2 Validation Result

| System Performance Check at 2600MHz | | | | |
|-------------------------------------|-------------------------------|--------------------|--------------------|-------------------|
| Validation Kit: ASL-D-2600-S-2 | | | | |
| Frequency [MHz] | Description | SAR [w/kg] 1g | SAR [w/kg] 10g | Tissue Temp. [°C] |
| 2600 MHz | Reference result ± 10% window | 54 48.6 to 59.4 | 23 20.7 to 25.3 | N/A |
| | 06-Sep-08 | 55.056 | 22.361 | 20.2 |
| | 11-Sep-08 | 54.863 | 24.004 | 20.2 |
| | 17-Sep-08 | 55.124 | 23.947 | 20.2 |
| | 26-Sep-08 | 58.011 | 23.294 | 20.2 |

Note: All SAR values are normalized to 1W forward power.

4.2 SAR Measurement Procedure

The ALSAS-10U calculates SAR using the following equation,

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

σ : represents the simulated tissue conductivity

ρ : represents the tissue density

The EUT is set to transmit at the required power in line with product specification, at each frequency relating to the LOW, MID, and HIGH channel settings.

Pre-scans are made on the device to establish the location for the transmitting antenna, using a large area scan in either air or tissue simulation fluid.

The EUT is placed against the Universal Phantom where the maximum area scan dimensions are larger than the physical size of the resonating antenna. When the scan size is not large enough to cover the peak SAR distribution, it is modified by either extending the area scan size in both the X and Y directions, or the device is shifted within the predefined area.

The area scan is then run to establish the peak SAR location (interpolated resolution set at 1mm²) which is then used to orient the center of the zoom . The zoom scan is then executed and the 1g and 10g averages are derived from the zoom scan volume (interpolated resolution set at 1mm³).

4. SAR Exposure Limits

SAR assessments have been made in line with the requirements of IEEE-1528, FCC Supplement C, and comply with ANSI/IEEE C95.1-1992 “Uncontrolled Environments” limits. These limits apply to a location which is deemed as “Uncontrolled Environment” which can be described as a situation where the general public may be exposed to an RF source with no prior knowledge or control over their exposure.

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

| Type Exposure | Uncontrolled Environment Limit |
|--|---------------------------------------|
| Spatial Peak SAR (1g cube tissue for brain or body) | 1.60 W/kg |
| Spatial Average SAR (whole body) | 0.08 W/kg |
| Spatial Peak SAR (10g for hands, feet, ankles and wrist) | 4.00 W/kg |

5. Test Equipment List

| Instrument | Manufacturer | Model No. | Serial No. | Last Calibration | Next Calibration |
|---|--------------------|----------------|------------|------------------|------------------|
| Data Acquisition Package | Aprel | ALS-DAQ-PAQ-2 | QTK-337 | Nov. 2006 | only once |
| Aprel Laboratories Probe 2600Mhz | Aprel | ALS-E020 | 265 | May. 2008 | May. 2009 |
| Aprel Reference Dipole 2600Mhz | Aprel | ALS-D-2600-S-2 | 225-00901 | Dec. 2006 | Dec. 2008 |
| Boundary Detection Sensor System | Aprel | ALS-PMDPS-2 | QTK-336 | N/A | N/A |
| Dielectric Probe Kit | Aprel | ALS-PR-DIEL | QTK-296 | N/A | N/A |
| Universal Work Station | Aprel | ALS-UWS | QTK-326 | N/A | N/A |
| Device Holder 2.0 | Aprel | ALS-H-E-SET-2 | QTK-294 | N/A | N/A |
| Left Ear SAM Phantom | Aprel | ALS-P-SAM-L | QTK-292 | N/A | N/A |
| Right Ear SAM Phantom | Aprel | ALS-P-SAM-R | QTK-288 | N/A | N/A |
| Universal Phantom | Aprel | ALS-P-UP-1 | QTK-246 | N/A | N/A |
| Aprel Dipole Spacer | Aprel | ALS-DS-U | QTK-295 | N/A | N/A |
| SAR Software | Aprel | ALSAS-10 | Ver. 2.3.6 | N/A | N/A |
| CRS C500C Controller | Thermo | ALS-C500 | RCF0404433 | N/A | N/A |
| CRF F3 Robot | Thermo | ALS-F3 | RAF0412222 | N/A | N/A |
| Power Amplifier | Mini-Circuit | ZHL-42 | D051404-20 | N/A | N/A |
| Directional Coupler | Agilent | 778D-012 | 50550 | N/A | N/A |
| Universal Radio Communication Tester | Rohde & Schwarz | CMU 200 | 104846 | Apr. 2008 | Apr. 2009 |
| Radio Communication Analyzer | Anritsu | MT8820A | 6200323183 | Apr. 2008 | Apr. 2009 |
| Vector Network | Anritsu | MS4623B | 992801 | Apr. 2008 | Apr. 2009 |
| Signal Generator | Anritsu | MG3692A | 042319 | Jun. 2008 | Jun. 2009 |
| Power Meter | Anritsu | ML2487A | 6K00001447 | Apr. 2008 | Apr. 2009 |
| Wide Bandwidth Sensor | Anritsu | MA2491 | 030677 | Apr. 2008 | Apr. 2009 |

6. Measurement Uncertainty

| Source of Uncertainty | Tolerance Value | Probability Distribution | Divisor | c_i^1 (1-g) | c_i^1 (10-g) | Standard Uncertainty (1-g) % | Standard Uncertainty (10-g) % |
|-----------------------------------|-----------------|--------------------------|------------|------------------|-------------------|------------------------------|-------------------------------|
| Measurement System | | | | | | | |
| Probe Calibration | 3.5 | normal | 1 | 1 | 1 | 3.5 | 3.5 |
| Axial Isotropy | 3.7 | rectangular | $\sqrt{3}$ | $(1-cp)^{1/2}$ | $(1-cp)^{1/2}$ | 1.5 | 1.5 |
| Hemispherical Isotropy | 10.9 | rectangular | $\sqrt{3}$ | \sqrt{cp} | \sqrt{cp} | 4.4 | 4.4 |
| Boundary Effect | 1.0 | rectangular | $\sqrt{3}$ | 1 | 1 | 0.6 | 0.6 |
| Linearity | 4.7 | rectangular | $\sqrt{3}$ | 1 | 1 | 2.7 | 2.7 |
| Detection Limit | 1.0 | rectangular | $\sqrt{3}$ | 1 | 1 | 0.6 | 0.6 |
| Readout Electronics | 1.0 | normal | 1 | 1 | 1 | 1.0 | 1.0 |
| Response Time | 0.8 | rectangular | $\sqrt{3}$ | 1 | 1 | 0.5 | 0.5 |
| Integration Time | 1.7 | rectangular | $\sqrt{3}$ | 1 | 1 | 1.0 | 1.0 |
| RF Ambient Condition | 3.0 | rectangular | $\sqrt{3}$ | 1 | 1 | 1.7 | 1.7 |
| Probe Positioner Mech. | 0.4 | rectangular | $\sqrt{3}$ | 1 | 1 | 0.2 | 0.2 |
| Restriction | | | | | | | |
| Probe Positioning with respect to | 2.9 | rectangular | $\sqrt{3}$ | 1 | 1 | 1.7 | 1.7 |

| | | | | | | | |
|---|-----|--------------|------------|-----|-----|------|------|
| Phantom Shell | | | | | | | |
| Extrapolation and Integration | 3.7 | rectangular | $\sqrt{3}$ | 1 | 1 | 2.1 | 2.1 |
| Test Sample Positioning | 4.0 | normal | 1 | 1 | 1 | 4.0 | 4.0 |
| Device Holder Uncertainty | 2.0 | normal | 1 | 1 | 1 | 2.0 | 2.0 |
| Drift of Output Power | 0.8 | rectangular | $\sqrt{3}$ | 1 | 1 | 0.5 | 0.5 |
| Phantom and Setup | | | | | | | |
| Phantom Uncertainty (shape & thickness tolerance) | 3.4 | rectangular | $\sqrt{3}$ | 1 | 1 | 2.0 | 2.0 |
| Liquid Conductivity (target) | 5.0 | rectangular | $\sqrt{3}$ | 0.7 | 0.5 | 2.0 | 1.4 |
| Liquid Conductivity (meas.) | 1.4 | normal | 1 | 0.7 | 0.5 | 0.0 | 0.0 |
| Liquid Permittivity (target) | 5.0 | rectangular | $\sqrt{3}$ | 0.6 | 0.5 | 1.7 | 1.4 |
| Liquid Permittivity (meas.) | 1.4 | normal | 1 | 0.6 | 0.5 | 0.0 | 0.0 |
| Combined Uncertainty | | RSS | | | | 9.2 | 9.1 |
| Combined Uncertainty (coverage factor=2) | | Normal (k=2) | | | | 18.5 | 18.2 |

7. Test Results

7.1 Output Power Measurement Summary

With an Anritsu ML2487A power meter, we can get two output power reading, there are the peak power and the time averaged power. We can also get a PAR, or a crest factor out of it.

Since the output power will be fluctuated with the EUT working in different modulation, channel frequency and bandwidth, we have measured their typical values for each of them.

The following peak and average power were measured within the frame.

| Conducted Power (QPSK) 5MHz Bandwidth | | | | | |
|---|------------------|-------------------------|--------------------------------------|--------------|-------------|
| Channel | Frequency (MHz) | Peak Output Power (dBm) | Maximum Average Measured Power (dBm) | Crest Factor | Limit (dBm) |
| Low | 2499 | 25.71 | 17.98 | 7.73 | 33 |
| Middle | 2600 | 26.67 | 19.11 | 7.57 | 33 |
| High | 2687 | 27.80 | 20.53 | 7.27 | 33 |
| Conducted Power (16 QAM) 5MHz Bandwidth | | | | | |
| Channel | Frequency (MHz) | Peak Output Power (dBm) | Maximum Average Measured Power (dBm) | Crest Factor | Limit (dBm) |
| Low | 2499 | 23.87 | 15.41 | 8.45 | 33 |
| Middle | 2600 | 25.49 | 17.31 | 8.18 | 33 |
| High | 2687 | 26.92 | 19.20 | 7.71 | 33 |

| Conducted Power (QPSK) 10MHz Bandwidth | | | | | |
|--|-----------------|-------------------------|--------------------------------------|--------------|-------------|
| Channel | Frequency (MHz) | Peak Output Power (dBm) | Maximum Average Measured Power (dBm) | Crest Factor | Limit (dBm) |
| Low | 2501 | 23.36 | 15.39 | 7.97 | 33 |
| Middle | 2600 | 24.39 | 16.51 | 7.88 | 33 |
| High | 2685 | 25.30 | 17.60 | 7.73 | 33 |

| Conducted Power (16 QAM) 10MHz Bandwidth | | | | | |
|--|-----------------|-------------------------|--------------------------------------|--------------|-------------|
| Channel | Frequency (MHz) | Peak Output Power (dBm) | Maximum Average Measured Power (dBm) | Crest Factor | Limit (dBm) |
| Low | 2501 | 22.95 | 14.66 | 8.29 | 33 |
| Low | 2501 | 23.71 | 15.97 | 7.74 | 33 |
| Middle | 2600 | 24.12 | 15.88 | 8.23 | 33 |
| High | 2685 | 25.16 | 17.19 | 7.96 | 33 |

Note:

Since the measurements has being done with a 100% duty factor under reduced chip output power. Because of limitations of the test software control and that temperature compensation was found to not be functional in this mode, the output power of the chip in this mode will be depending on its stating temperature and will be generally running under reduced output power.

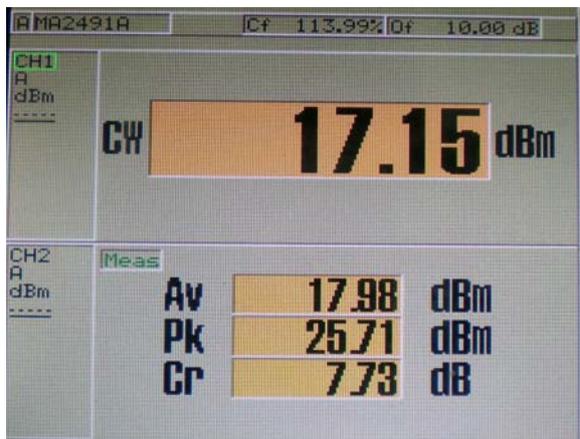
From detailed analysis of the chip by its manufacturer, 100% duty factor mode output could vary from 15.8 to 22.4 dBm depending on starting temperature of operation of the chip. However once started, the chip would maintain a stable output to a few tenths of a dB and therefore considered stable for SAR testing. From various discussions between manufacturer, chip designer, lab, TCB, & FCC, s, scaling and duty factors have been supplied separately to bring measured SAR values at the reduced chip output up to maximum expected average output of 23 dBm. Any measured output outside the range above should be considered suspect.

In order to get the final worst case SAR value for this device, upon detailed discussion with FCC, we decided to use an average power to 23 dBm maximum output power scaling followed with 0.375 duty factor scaling, described in section 7.4 to calculate the scaled worse case SAR values. During this calculation, we find that one of 2501 MHz test set had an unreasonably low measured average output value. By consult with the Chipset manufacturer Beceem, and asking FCC for adjustment solution, this set data was re-tested. The final result at this configuration is based on this new measurement.

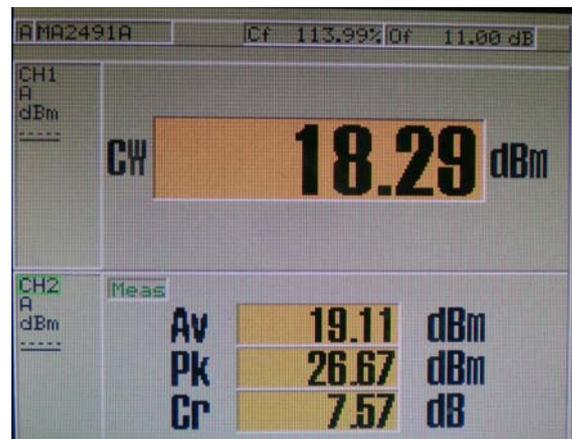
7.2 TU25 Device Crest Factor

The signal measured by power meter is an OFDM modulation signal with certain crest factors running between 7~9 dB. This is due to the nature of OFDMA modulation used for WiMAX device.. The reading shown on “CW” window below is for reference only since it is only valid for continuous wave signal. For the SAR measurement, we mainly concerned with the measured average output power.

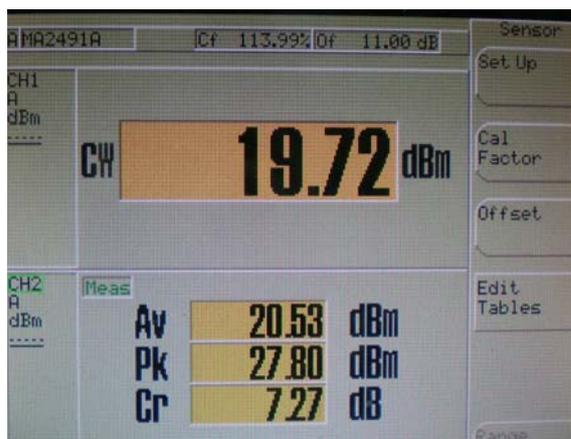
BW=5MHz, QPSK, 2499MHz



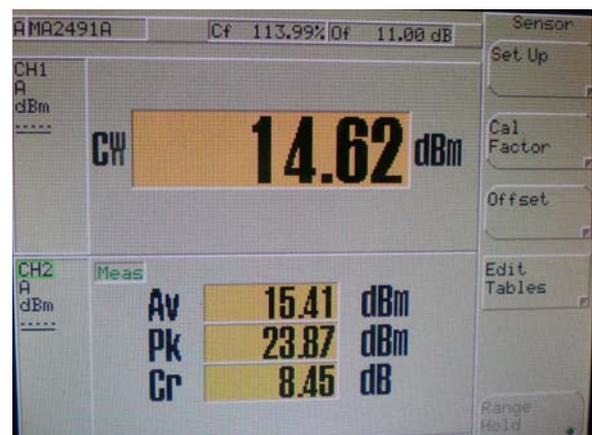
BW=5MHz, QPSK, 2600MHz



BW=5MHz, QPSK, 2687MHz



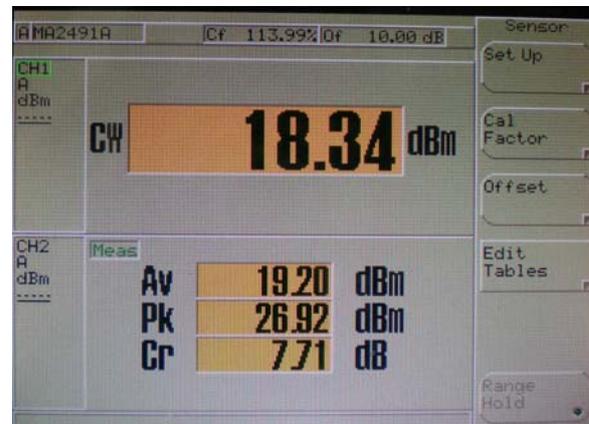
BW=5MHz, 16QAM, 2499MHz



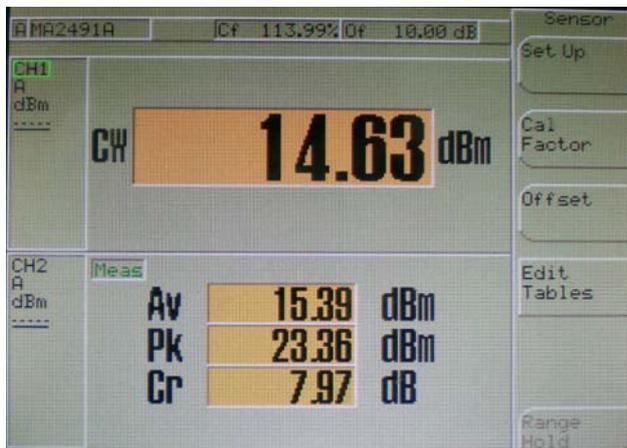
BW=5MHz, 16QAM, 2600MH



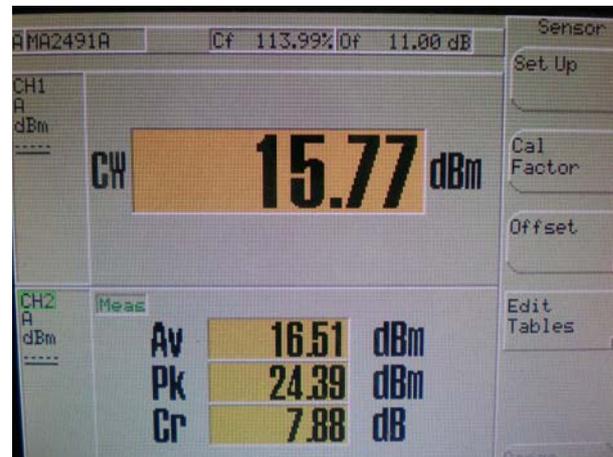
BW=5MHz, 16QAM, 2687MH



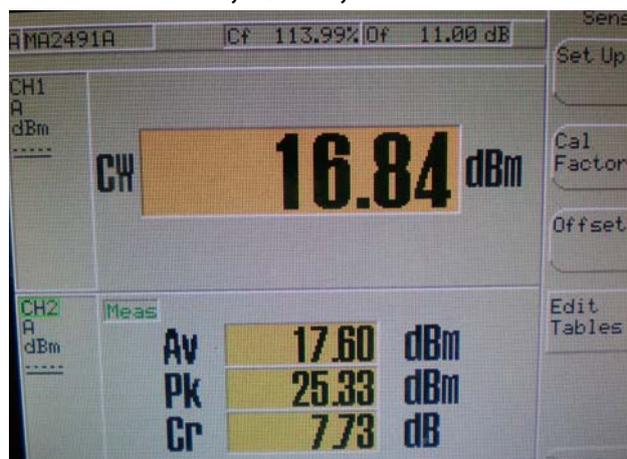
BW=10MHz, QPSK, 2501MHz



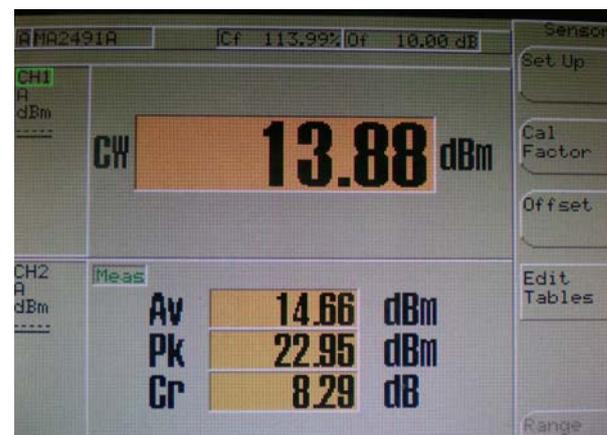
BW=10MHz, QPSK, 2600MHz



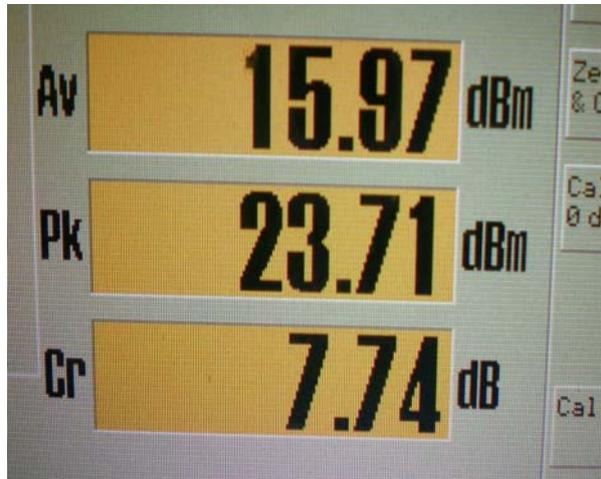
BW=10MHz, QPSK, 2685MHz



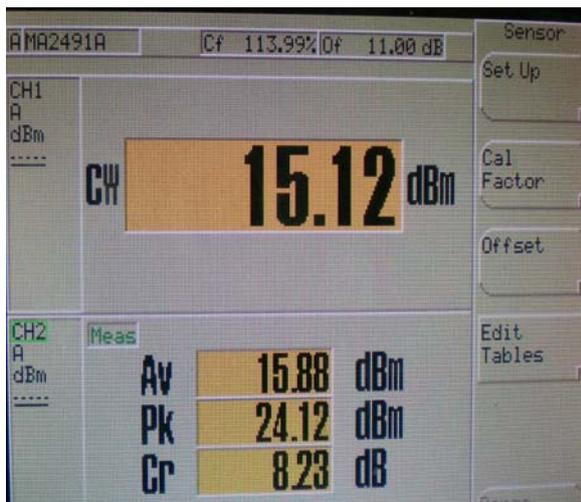
BW=10MHz, 16QAM, 2501MHz



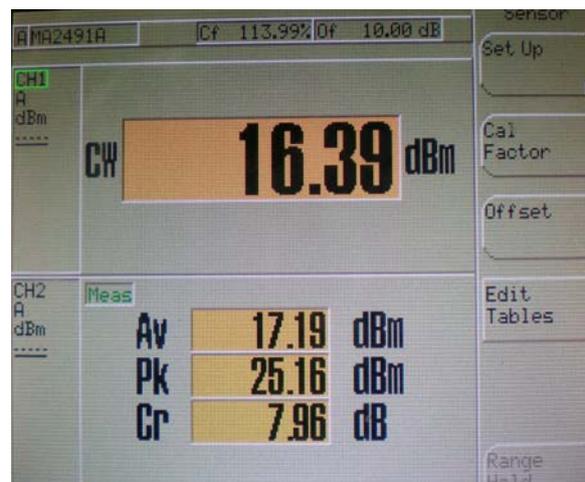
BW=10MHz, 16QAM, 2501MHz (Re-measured Value)



BW=10MHz, 16QAM, 2600MHz



BW=10MHz, 16QAM, 2685MHz



7.3 SAR Test configuration categories and scan area selection

7.3.1 SAR test configuration categories

Due to the fact that this EUT can be plugged in any PC devices, and it has very versatile mounting orientation relative to the PC as well as to the user, we defined the test configuration in three sub-parameters as follows:

1. Antenna relative to the dongle body, there are 4 possible angles as 0° , 90° , 180° , 270° as shown in the following pictures.

Antenna 0°



Antenna 90°



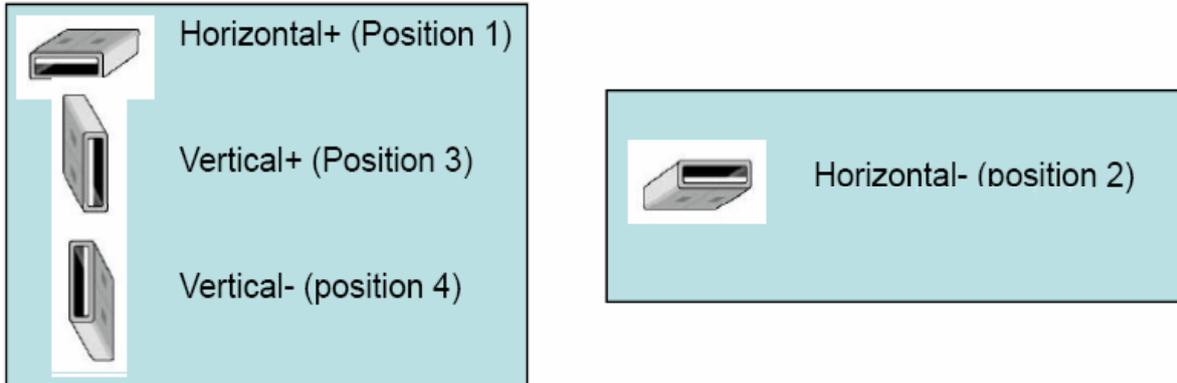
Antenna 180°



Antenna 270°



2. Orientation of the dongle relative to PC. According to FCC knowledge database KDB 447498, there are 4 different positions required for SAR test as shown in the following pictures.



Horizontal +(Position 1) :

Antenna 0° , Antenna 90° , Antenna 180°

Horizontal -(Position 2) (EUT was tested with DELL M/N:M65 via USB cable) :

Antenna 0° , Antenna 180° , Antenna 270°

Vertical +(Position 3) (EUT was tested with DELL M/N:M65 via USB cable) :

Antenna 0° , Antenna 90° , Antenna 180° , Antenna 270°

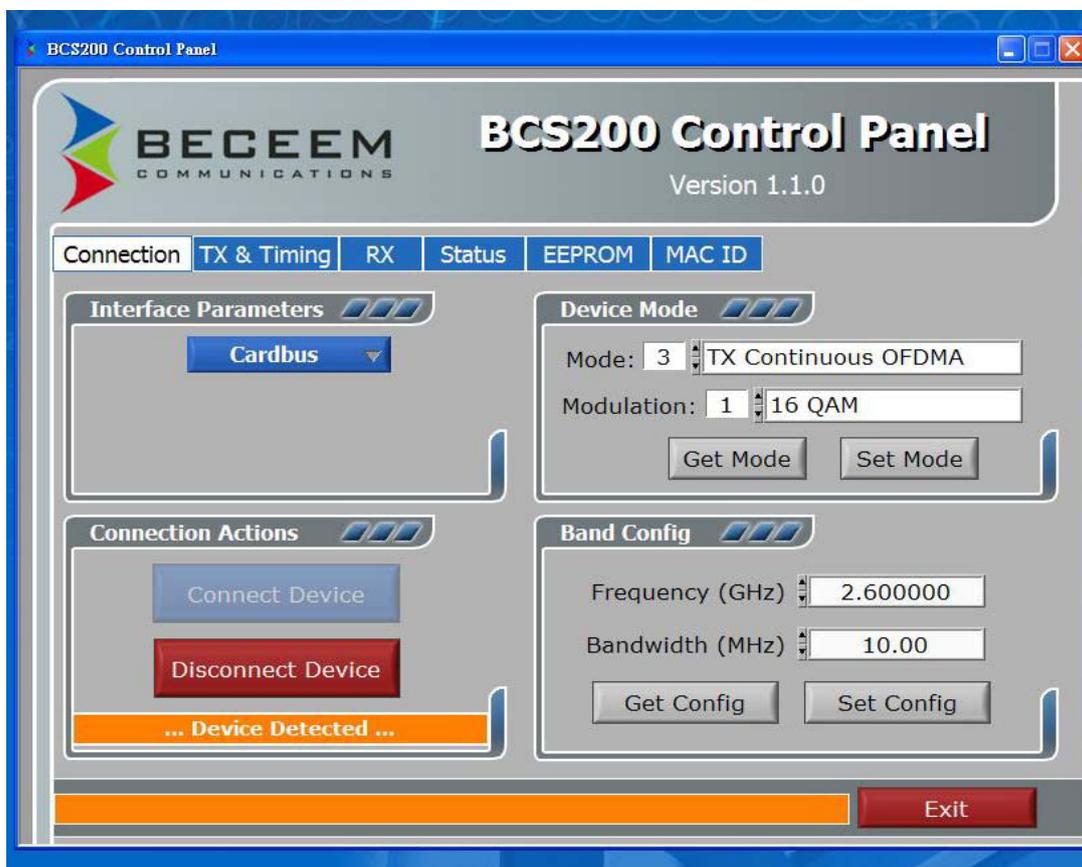
Vertical -(Position 4) (EUT was tested with DELL M/N:M65 via USB cable) :

Antenna 0° , Antenna 90° , Antenna 180° , Antenna 270°

3. EUT was being controlled by BECEEM chipset driver control panel software which allows the working modes being chosen in between QPSK and 16QAM; Transmission bandwidth being chosen in between 5MHz and 10 MHz. Under the "Tx continuous OFDMA" mode the device is working with 100% duty factor, continuously transmitting Up-link signal at a periodically stable transmission mode. All the tests were done under this manufacturer chipset driver control panel. There are four possible mode configurations under present software driver control panel as follows:

5MHz QPSK, 10MHz QPSK, 5MHz 16QAM and 10MHz 16QAM.

The channel frequency can be chosen through this control software.



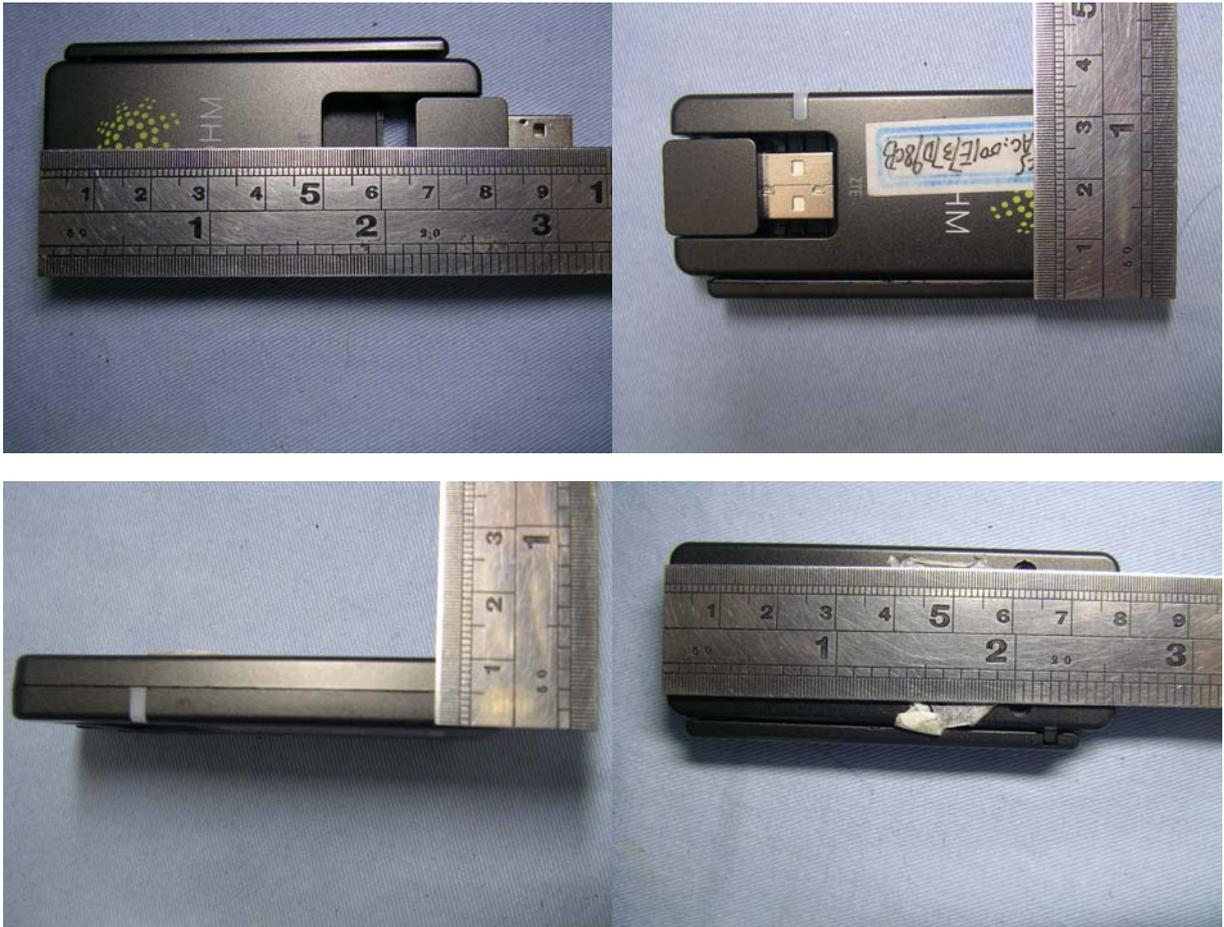
With all possible configurations, we can summarize the estimated number of cases are as follows:
 Total possible number of conf. = 3 frequency X 4 position X 4 antenna Angles X 2 bandwidths X 2 modulation modes= 192 possible configurations.

In order to reduce the SAR test to a manageable number, we started test under position 1, and then found out the worst SAR value linked with 90° antenna angle, 10 MHz bandwidth, so with other positions 2,3,and 4, we mainly concentrated on these configurations. Also for position 3, since the antenna is far away from phantom, the SAR value is not the worst case SAR value, so we only

tested few configurations for position 3. In this way the final tested configuration is 47 cases.

7.3.2 scan area selection

The ZTE TU25 WiMAX Dongle device has a body dimensions around $L \times W \times T = 8\text{cm} \times 3.5\text{cm} \times 1\text{cm}$. Its detailed dimensions are shown in the following photos:



The width of this device is less than 35mm including the rotatable monopole antenna. The thickness of the device is about 10mm. The length of the device when the antenna arm is folded at 0° position is 80 mm.



The PCB part of this device is only 50mm long; with two narrow strips keep the USB connector connected to the host notebook computer.

When the antenna arm turn to 180° position referenced to the body, the total length is 133 mm, but the actual metal antenna is only 29 mm long, which is a quarter of wavelength as any monopole antenna should be. If we consider the first 30mm occupied by the USB connector, the total length of the active electronic parts has $96-30=66$ mm. When we put the narrow side of the device close to the phantom bottom with the antenna arm at 90° and 270° positions, it only cover the width of less than 60mm scan area. So 80 mm x 80 mm area scan will cover the whole active region of the device if we let the USB part of the device stick out of the scan area for about 25 mm. This is the justification of our area scan dimension selection.

The position and dimensions of the main Tx/Rx antenna and the Rx only antenna are clearly marked on the above photos.

The housing of the antenna has a length of 70mm, with a hinge positioned at 8 mm from the bottom of the device case. But since the upper 40 mm is only plastic casing, it is no need to cover it for SAR measurement.

7.4 SAR Test Results Summary

The original measurements as shown in the tables in this section (section 7.4) were taken with a Crest factor (Duty Factor) set to 4 in the SAR equipment. It was later found that the real duty factor at which the device was operating during the testing was not 4 but 1 (100% duty cycle). Once this inaccuracy was discovered, evaluation of the SAR formulas and discussion with FCC felt that adjustment in this case from CF 4 to a CF of 1 should only benefit the SAR values. As agreed upon with the FCC we use a scaling formula discussed below to compare it with the limitations. An appropriate scaling method was devised to compensate for the test being done at 100% duty cycle in continuous OFDMA mode which resulted in lower average output power compared to maximum of 200mW. As per this method, the final SAR result were scaled to reflect the highest average power by following calculation

Final SAR = Measured SAR * (200/<Avg. Output Power at 100% Duty cycle in mW>)* 0.375

The factor 0.375 in above scaling formula is attributed to the 37.5% of Duty Cycle which is the real world maximum duty cycle for these devices.

During the scaling process, It was found that in one case (10 MHz at 16 QAM Modulation, Antenna Position 90 degree) the original test data resulted in power measurements that were below what the Chipset manufacturer expected them to be for 100% duty cycle testing. The FCC and the chipset manufacturer suggested retaking this one test and accurately measuring the power in this configuration with the same power meter. This test was redone and it was found that the power level was indeed lower in original test (attributed to erroneous measurement) and was actually retested to be within the expected range given by the chip manufacturer. The SAR value (including appropriate scaling as described above) for this configuration was then found to be within the limits of compliance

Horizontal+ (Position 1) ;Tx Bandwidth :5 MHz ; Modulation : QPSK

| Ambient Temperature (°C): 20.9 ± 2 | | | | | | | |
|------------------------------------|------------------|-----------------|-------------------------------|------------|------------|------------------------|---------------------|
| Relative Humidity (%): 48 | | | 5MHz Bandwidth, QPSK | | | | |
| EUT Position | Antenna Position | Frequency (MHz) | Conducted Average Power (dBm) | | SAR Drift% | Measured SAR 1g (W/kg) | Scaled SAR 1g(W/kg) |
| | | | Begin Test | After Test | | | |
| Position 1 | Antenna 0° | 2687 | 20.53 | 19.99 | -2.637 | 0.427 | 0.283 |
| Position 1 | Antenna 90° | 2499 | 17.98 | 18.19 | 1.193 | 0.438 | 0.523 |
| Position 1 | Antenna 90° | 2600 | 19.11 | 18.74 | -1.962 | 0.557 | 0.513 |
| Position 1 | Antenna 90° | 2687 | 20.54 | 19.94 | -2.931 | 0.596 | 0.395 |
| Position 1 | Antenna 180° | 2687 | 20.55 | 19.99 | -2.696 | 0.433 | 0.286 |

Horizontal+ (Position 1) ;Tx Bandwidth :10 MHz ; Modulation : QPSK

| Ambient Temperature (°C): 20.9 ± 2 | | | | | | | |
|------------------------------------|------------------|-----------------|-------------------------------|-----------------------|---------------|------------------------|---------------------|
| Relative Humidity (%): 48 | | | | 10MHz Bandwidth, QPSK | | | |
| EUT Position | Antenna Position | Frequency (MHz) | Conducted Average Power (dBm) | | SAR Drift (%) | Measured SAR 1g (W/kg) | Scaled SAR 1g(W/kg) |
| | | | Begin Test | After Test | | | |
| Position 1 | Antenna 0° | 2685 | 17.6 | 17.28 | -1.796 | 0.636 | 0.829 |
| Position 1 | Antenna 90° | 2501 | 15.4 | 15.11 | -1.865 | 0.603 | 1.30 |
| Position 1 | Antenna 90° | 2600 | 16.51 | 16.05 | -2.761 | 0.595 | 0.997 |
| Position 1 | Antenna 90° | 2685 | 17.62 | 17.13 | -2.891 | 0.805 | 1.04 |
| Position 1 | Antenna 180° | 2685 | 17.63 | 17.08 | -3.108 | 0.746 | 0.966 |

Note : the data marked yellow are selected 5 woast SAR value cases from the 47 cases of tested SAR value.

Horizontal+ (Position 1);Tx Bandwidth :5 MHz ; Modulation :16 QAM,

| Ambient Temperature (°C): 20.9 ± 2 | | | | | | | |
|------------------------------------|------------------|-----------------|-------------------------------|-----------------------|---------------|------------------------|---------------------|
| Relative Humidity (%): 48 | | | | 5MHz Bandwidth, 16QAM | | | |
| EUT Position | Antenna Position | Frequency (MHz) | Conducted Average Power (dBm) | | SAR Drift (%) | Measured SAR 1g (W/kg) | Scaled SAR 1g(W/kg) |
| | | | Begin Test | After Test | | | |
| Position 1 | Antenna 0° | 2687 | 19.21 | 18.65 | 2.153 | 0.404 | 0.363 |
| Position 1 | Antenna 90° | 2499 | 15.41 | 15.74 | 2.993 | 0.433 | 0.934 |
| Position 1 | Antenna 90° | 2600 | 17.31 | 17.83 | -2.974 | 0.489 | 0.681 |
| Position 1 | Antenna 90° | 2687 | 19.22 | 18.65 | -3.654 | 0.511 | 0.459 |
| Position 1 | Antenna 180° | 2687 | 19.2 | 18.5 | -1.812 | 0.487 | 0.439 |

Horizontal+ (Position 1);Tx Bandwidth :10 MHz ; Modulation :16 QAM

| Ambient Temperature (°C): 20.9 ± 2 | | | | | | | |
|------------------------------------|------------------|-----------------|-------------------------------|------------------------|---------------|------------------------|---------------------|
| Relative Humidity (%): 48 | | | | 10MHz Bandwidth, 16QAM | | | |
| EUT Position | Antenna Position | Frequency (MHz) | Conducted Average Power (dBm) | | SAR Drift (%) | Measured SAR 1g (W/kg) | Scaled SAR 1g(W/kg) |
| | | | Begin Test | After Test | | | |
| Position 1 | Antenna 0° | 2685 | 17.19 | 16.88 | -2.214 | 0.523 | 0.749 |
| Position 1 | Antenna 90° | 2501 | 15.97* | 15.41 | -3.247 | 0.578 | 1.10 |
| Position 1 | Antenna 90° | 2600 | 15.88 | 15.53 | 1.541 | 0.610 | 1.18 |
| Position 1 | Antenna 90° | 2685 | 17.21 | 16.76 | -2.609 | 0.643 | 0.917 |
| Position 1 | Antenna 180° | 2685 | 17.23 | 17.38 | 0.842 | 0.542 | 0.769 |

*note. This result was re-measured as described in section 7.1.

Horizontal -(Position 2) ; Tx Bandwidth :5 MHz ; Modulation : QPSK

| Ambient Temperature (°C): 20.9 ± 2 | | | | | | | |
|------------------------------------|------------------|-----------------|-------------------------------|----------------------|---------------|------------------------|---------------------|
| Relative Humidity (%): 48 | | | | 5MHz Bandwidth, QPSK | | | |
| EUT Position | Antenna Position | Frequency (MHz) | Conducted Average Power (dBm) | | SAR Drift (%) | Measured SAR 1g (W/kg) | Scaled SAR 1g(W/kg) |
| | | | Begin Test | After Test | | | |
| Position 2 | Antenna 180° | 2685 | 17.63 | 17.76 | 0.741 | 0.499 | 0.646 |

Horizontal -(Position 2) ; Tx Bandwidth :10 MHz ; Modulation : QPSK

| Ambient Temperature (°C): 20.9 ± 2 | | | | | | | |
|------------------------------------|------------------|-----------------|-------------------------------|-----------------------|---------------|------------------------|---------------------|
| Relative Humidity (%): 48 | | | | 10MHz Bandwidth, QPSK | | | |
| EUT Position | Antenna Position | Frequency (MHz) | Conducted Average Power (dBm) | | SAR Drift (%) | Measured SAR 1g (W/kg) | Scaled SAR 1g(W/kg) |
| | | | Begin Test | After Test | | | |
| Position 2 | Antenna 0° | 2685 | 17.6 | 17.87 | 1.534 | 0.512 | 0.667 |
| Position 2 | Antenna 180° | 2685 | 17.63 | 18.17 | 3.063 | 0.573 | 0.742 |
| Position 2 | Antenna 270° | 2685 | 17.62 | 18.18 | 3.21 | 0.510 | 0.662 |

Horizontal -(Position 2) ; Tx Bandwidth :10 MHz ; Modulation : 16QAM,

| Ambient Temperature (°C): 20.9 ± 2 | | | | | | | |
|------------------------------------|------------------|-----------------|-------------------------------|------------------------|---------------|------------------------|---------------------|
| Relative Humidity (%): 48 | | | | 10MHz Bandwidth, 16QAM | | | |
| EUT Position | Antenna Position | Frequency (MHz) | Conducted Average Power (dBm) | | SAR Drift (%) | Measured SAR 1g (W/kg) | Scaled SAR 1g(W/kg) |
| | | | Begin Test | After Test | | | |
| Position 2 | Antenna 0° | 2685 | 17.19 | 16.67 | -2.997 | 0.451 | 0.646 |
| Position 2 | Antenna 180° | 2685 | 17.22 | 17.62 | 2.343 | 0.482 | 0.686 |
| Position 2 | Antenna 270° | 2685 | 17.21 | 17.21 | 0.02 | 0.512 | 0.730 |

Vertical +(Position 3) ; Tx Bandwidth :5 MHz ; Modulation : QPSK,

| Ambient Temperature (°C): 20.9 ± 2 | | | | | | | |
|------------------------------------|------------------|-----------------|-------------------------------|----------------------|---------------|------------------------|---------------------|
| Relative Humidity (%): 48 | | | | 5MHz Bandwidth, QPSK | | | |
| EUT Position | Antenna Position | Frequency (MHz) | Conducted Average Power (dBm) | | SAR Drift (%) | Measured SAR 1g (W/kg) | Scaled SAR 1g(W/kg) |
| | | | Begin Test | After Test | | | |
| Position 3 | Antenna 90° | 2685 | 17.62 | 17.87 | 1.433 | 0.320 | 0.415 |

Vertical +(Position 3) ; Tx Bandwidth :10 MHz ; Modulation : QPSK,

| Ambient Temperature (°C): 20.9 ± 2 | | | | | | | |
|------------------------------------|------------------|-----------------|-------------------------------|-----------------------|---------------|------------------------|---------------------|
| Relative Humidity (%): 48 | | | | 10MHz Bandwidth, QPSK | | | |
| EUT Position | Antenna Position | Frequency (MHz) | Conducted Average Power (dBm) | | SAR Drift (%) | Measured SAR 1g (W/kg) | Scaled SAR 1g(W/kg) |
| | | | Begin Test | After Test | | | |
| Position 3 | Antenna 0° | 2685 | 17.6 | 17.27 | -1.861 | 0.302 | 0.394 |
| Position 3 | Antenna 90° | 2685 | 17.62 | 17.98 | 2.04 | 0.434 | 0.563 |
| Position 3 | Antenna 180° | 2685 | 17.61 | 17.9 | 1.67 | 0.405 | 0.527 |
| Position 3 | Antenna 270° | 2685 | 17.62 | 17.12 | -2.86 | 0.397 | 0.515 |

Vertical +(Position 3) ; Tx Bandwidth :10 MHz ; Modulation : 16QAM,

| Ambient Temperature (°C): 20.9 ± 2 | | | | | | | |
|------------------------------------|------------------|-----------------|-------------------------------|------------------------|---------------|------------------------|---------------------|
| Relative Humidity (%): 48 | | | | 10MHz Bandwidth, 16QAM | | | |
| EUT Position | Antenna Position | Frequency (MHz) | Conducted Average Power (dBm) | | SAR Drift (%) | Measured SAR 1g (W/kg) | Scaled SAR 1g(W/kg) |
| | | | Begin Test | After Test | | | |
| Position 3 | Antenna 0° | 2685 | 17.20 | 17.81 | 3.552 | 0.33 | 0.472 |
| Position 3 | Antenna 90° | 2685 | 17.22 | 16.68 | -3.131 | 0.411 | 0.585 |
| Position 3 | Antenna 180° | 2685 | 17.22 | 17.37 | 0.875 | 0.354 | 0.504 |
| Position 3 | Antenna 270° | 2685 | 17.21 | 17.16 | -0.308 | 0.356 | 0.508 |

Vertical -(Position 4) ; Tx Bandwidth :5 MHz ; Modulation : QPSK,

| Ambient Temperature (°C): 20.9 ± 2 | | | | | | | |
|------------------------------------|------------------|-----------------|-------------------------------|----------------------|---------------|------------------------|---------------------|
| Relative Humidity (%): 48 | | | | 5MHz Bandwidth, QPSK | | | |
| EUT Position | Antenna Position | Frequency (MHz) | Conducted Average Power (dBm) | | SAR Drift (%) | Measured SAR 1g (W/kg) | Scaled SAR 1g(W/kg) |
| | | | Begin Test | After Test | | | |
| Position 4 | Antenna 90° | 2685 | 17.62 | 17.23 | -2.2 | 0.44 | 0.571 |

Vertical -(Position 4) ; Tx Bandwidth :10 MHz ; Modulation : QPSK,

| Ambient Temperature (°C): 20.9 ± 2 | | | | | | | |
|------------------------------------|---------------------------------------|-----------------|-------------------------------|-----------------------|---------------|------------------------|---------------------|
| Relative Humidity (%): 48 | | | | 10MHz Bandwidth, QPSK | | | |
| EUT Position | Antenna Position | Frequency (MHz) | Conducted Average Power (dBm) | | SAR Drift (%) | Measured SAR 1g (W/kg) | Scaled SAR 1g(W/kg) |
| | | | Begin Test | After Test | | | |
| Position 4 | Antenna 0° | 2685 | 17.61 | 18.02 | 2.324 | 0.331 | 0.430 |
| Position 4 | Antenna 90° | 2685 | 17.62 | 18.05 | 2.421 | 0.512 | 0.664 |
| Position 4 | Antenna 90° (central shift -30mm) | 2685 | 17.62 | 18.05 | -1.193 | 0.544 | 0.706 |
| Position 4 | Antenna 180° | 2685 | 17.62 | 17.15 | -2.671 | 0.359 | 0.466 |
| Position 4 | Antenna 270° | 2685 | 17.63 | 17.08 | -3.125 | 0.488 | 0.632 |
| Position 4 | Antenna 270° (certral shift +30mm) | 2685 | 17.63 | 17.08 | -1.299 | 0.464 | 0.601 |

Vertical -(Position 4) ; Tx Bandwidth :10 MHz ; Modulation : 16QAM,

| Ambient Temperature (°C): 20.9 ± 2 | | | | | | | |
|------------------------------------|--|-----------------|-------------------------------|------------------------|---------------|------------------------|---------------------|
| Relative Humidity (%): 48 | | | | 10MHz Bandwidth, 16QAM | | | |
| EUT Position | Antenna Position | Frequency (MHz) | Conducted Average Power (dBm) | | SAR Drift (%) | Measured SAR 1g (W/kg) | Scaled SAR 1g(W/kg) |
| | | | Begin Test | After Test | | | |
| Position 4 | Antenna 0° | 2685 | 17.2 | 16.6 | -3.463 | 0.31 | 0.443 |
| Position 4 | Antenna 90° | 2685 | 17.19 | 17.8 | 3.547 | 0.496 | 0.710 |
| Position 4 | Antenna 180° | 2685 | 17.21 | 17.58 | 2.127 | 0.504 | 0.719 |
| Position 4 | Antenna 180° (Minor peak zoom scan) | 2685 | 17.21 | 16.89 | -1.866 | 0.481 | 0.686 |
| Position 4 | Antenna 270° | 2685 | 17.2 | 16.6 | -3.481 | 0.463 | 0.662 |

Appendix**Appendix A. SAR System Validation Data****Appendix B. SAR measurement Data****Appendix D. Test Setup Photographs & EUT Photographs****Appendix E. Probe Calibration Data****Appendix F. Dipole Calibration Data**