SAR TEST REPORT

Test item	:	WiMAX Mobile Hostpot Router
Model No.	:	SWR-8225
Order No.	:	1008-00774
Date of receipt	:	2010-08-26
Test duration	:	2010-09-03 ~ 2010-09-14
Date of issue	:	2010-09-16
Use of report	:	FCC Original Grant

Applicant : EpiCom Co., Ltd

Lordland EZ Tower #511, 513, Gumi-dong, Bundang-Gu, Sungnam City, Kyunggi-Do, Korea

Test laboratory : Digital EMC Co., Ltd.

683-3, Yubang-Dong, Cheoin-Gu, Yongin-Si, Kyunggi-Do, 449-080, Korea

Test specification	:	§2.1093, FCC/OET Bulletin 65 Supplement C[July 2001]
Test environment	:	See appended test report
Test result	:	☒ Pass ☐ Fail

Tested by:	Witnessed by:	Reviewed by:
Engineer S.K.Ryu	N/A	Technical Director Harvey Sung

CONTENTS

1. General Information

1.1 Equipment information

FCC Equipment Class	Licensed Non-Broadcast Station Transmitter(TNB)
Equipment type	WiMAX Mobile Hostpot Router
Equipment model name	SWR-8225
Equipment add model name	N/A
Modulation Technology	W-LAN, QPSK, 16QAM
Duplex Method	TDD
Equipment serial no.	Identical prototype
TX Frequency Range	2412 ~ 2462 MHz (IEEE 802.11 b/g), 2501 ~2685 MHz (10MHz OBW)
RX Frequency Range	2412 ~ 2462 MHz (IEEE 802.11 b/g), 2501 ~2685 MHz (10MHz OBW)
Max. SAR Measurement	**0.040** mW/g W-LAN(802.11b) Body SAR **0.368** mW/g WiMAX 10M Body SAR

Table 1 : 802.16e/WiMAX Device and System Operation Parameters

2. INTROCUCTION/SAR DEFINITION

In 1974, the International Radiation Protection Association (IRPA) formed a working group on non-ionizing radiation (NIR), which examined the problems arising in the field of Protection against the various types of NIR. At the IRPA Congress in Paris in 1977, this working group because the International Non-Ionizing Radiation Committee (INIRC).

In cooperation with the Environmental Health Division of the World Health Organization (WHO), the IRPA/INIRC developed a number of health criteria documents on NIR as part of WHO'S Environmental Health Criteria Programme, sponsored by the United Nations Environment Programme (UNEP). Each document includes an overview of the physical characteristics, measurement and instrumentation, sources, and applications of NIR, a thorough review of the literature on biological effects, and an evaluation of the health risks of exposure to NIR. These health criteria have provided the scientific database for the subsequent development of exposure limits and codes of practice relating to NIR.

At the Eighth International Congress of the IRPA (Montreal, 18-22 May 1992), a new, independent scientific organization-the International Commission on Non-Ionizing Radiation Protection (ICNIRP)-was established as a successor to the IRPA/INIRC. The functions of the Commission are to investigate the hazards that may be association with the different forms of NIR, develop international guidelines on NIR exposure to static and extremely-low-frequency (ELF) electric and magnetic field have been reviewed by UNEP/WHO/IRPA (1984, 1987). Those publications and a number of others, including UNEP/WHO/IRPA (1993) and Allen et al. (1991), provided the scientific rationale for these guidelines.

A glossary of terms appears in the Appendix.

2.1 SAR Definition

Specific Absorption Rate (SAR) is defined as the time derivative (rate) of the incremental energy (dU)absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density (ρ) It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body (see Fig. 1.1)

$$\boxed{SAR = \frac{d}{dt}\left(\frac{dU}{dm}\right) = \frac{d}{dt}\left(\frac{dU}{\rho\, dv}\right)}$$

Figure 1.1
SAR Mathematical Equation

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

SAR = E^2 / ρ

Where:

σ = conductivity of the tissue-simulant material (S/m)

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

E = Total RMS electric field strength (V/m)

NOTE: The primary factors that control rate of energy absorption were found to be the wavelength of the incident field in relations to the dimensions and geometry of the irradiated organism, the orientation of the organism in relation to the polarity of field vectors, the presence of reflecting surfaces, and whether conductive contact is made by the organism with a ground plane.[6]

3. SAR MEASUREMENT SETUP

3.1Robotic System

Measurements are performed using the DASY4 automated dosimetric assessment system.The DASY4 is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerlandand consists of high precision robotics system (Staubli), robot controller, Pentium III computer, near-field probe, probe alignment sensor, and the generic twin phantom containing the brain equivalent material. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF) (see Fig. 2.1).

3.2 System Hardware

A cellcontroller system contains the power supply, robot controller, teach pendant(Joystick), and a remote control used to drive the robot motors. The PC consists of the Micron Pentium IV 500 MHz computer with Windows NT system and SAR Measurement Software DASY4, A/D interface card, monitor, mouse, and keyboard. The Staubli Robotis connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit that performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC plug-in card.

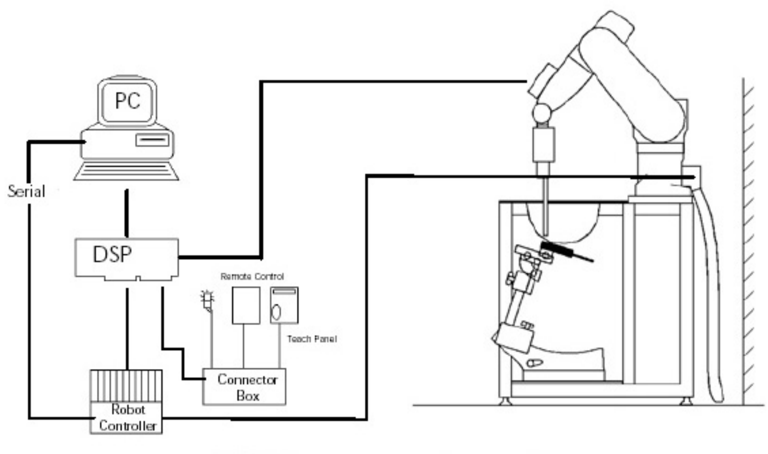


Figure 2.1 SAR Measurement System Setup

3.3 System Electronics

The DAE3 consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe mounting device include stwo different sensor systems for frontal and sidewise probe contacts. They are also used forme chanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer. The system is described in detail in [7].

3.4Probe Measurement System

Figure 3.1 DAE System

The SAR measurements were conducted with the dosimetric probe EX3DV4,designed in the classical triangular configuration [7](see Fig. 3.2) and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines onceramic substrates. The probe is equipped with an optical multi fiber line ending at the front of the probe tip (see Fig. 3.3). It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reach esmaximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY4 software reads the reflection during a software approach and looks for the maximum using a 2nd order fitting (see Fig.3.1). The approach is stopped at reaching the maximum.

3.5 Probe Specifications

Calibration: In air from 10 MHz to 6.0 GHz
In brain and muscle simulating tissue at Frequencies of
835 MHz, 1750 MHz, 1900 MHz, 2450 MHz, 2600 MHz, 3500 MHz

Frequency: 10 MHz to 6 GHz

Linearity: ±0.2dB (30 MHz to 6 GHz)

Dynamic: 10 mW/kg to 100 W/kg

Range: Linearity: ±0.2dB

Dimensions: Overall length: 330 mm

Tip length: 20 mm

Body diameter: 12 mm

Tip diameter: 2.5 mm

Distance from probe tip to sensor center: 1 mm

Application: SAR Dosimetry Testing
Compliance tests of mobile phones

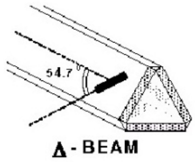


Figure 3.1 Triangular Probe Configuration

Figure 3.2 Probe Thick-Film Technique

4. Probe Calibration Process

4.1Dosimetric Assessment Procedure

Each probe is calibrated according to a dosimetric assessment procedure described in [8] with accuracy better than +/- 10%. The spherical isotropy was evaluated with the procedure described in[9] and found to be better than +/-0.25dB. The sensitivity parameters (NormX, NormY, NormZ), thediode compression parameter (DCP) and the conversion factor (ConvF) of the probe is tested.

4.2Free Space Assessment

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies below 1 GHz (see Fig. 4.1), and in a waveguide above 1GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity at the proper orientation with the field. The probe is then rotated 360 degrees.

4.3 Temperature Assessment *

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate esimulated brain tissue. The measured free space E-field in the medium, correlates to temperature risein a dielectric medium. For temperature correlation calibration a RF transparent the rmisto rbased temperature probe is used in conjunction with the E-field probe (see Fig. 4.2).

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

where:

Δt = exposure time (30 seconds),

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

ΔT = temperature increase due to RF exposure.

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

where:

σ = simulated tissue conductivity,

ρ = Tissue density (1.25 g/cm^3 for brain tissue)

SAR is proportional to$\Delta T / \Delta t$, the initial rate of tissue heating, before thermal diffusion takes place. Now it's possible to quantify the electric field in the simulated tissue by equating the thermally derived SAR to the E- field;

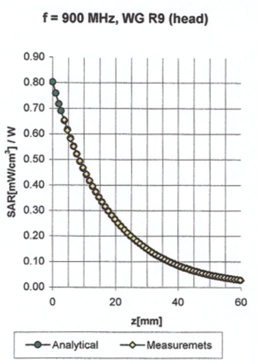


Figure 4.1 E-Field and Temperature Measurements at 900MHz[7]

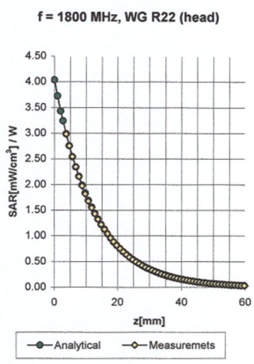


Figure 4.2 E-Field and Temperature Measurements at 1900MHz[7]

5. PHANTOM & EQUIVALENT TISSUES

5.1SAM Phantom

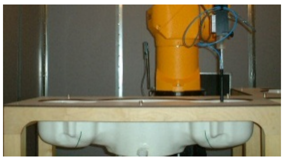


Figure 5.1 SAM Twin Phantom

The SAM Twin Phantom V4.0 is constructed of a fiberglass shell integrated in a woodentable. The shape of the shell is based on data from an anatomical study designed to determine the maximum exposure in at least 90% of all users [11][12]. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usageat the flat phantom region. A cover prevents the evaporation of the liquid.
Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot. (see Fig. 5.1)

5.2 Brain & Muscle Simulating Mixture Characterization

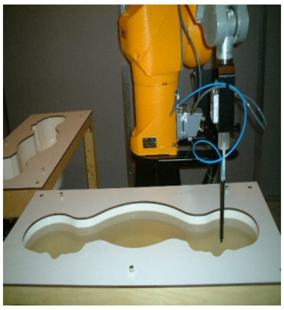


Figure 5.2 Simulated Tissue

The brain and muscle mixtures consist of a viscous gel using hydroxethylcellullose (HEC) gellingagent and saline solution (see Table 6.1). Preservation with a bacteriacide is added and visualin spection is made to make sure air bubbles are not trapped during the mixing process. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the desired tissue. The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 have been incorporated in the following table. Other head and body tissue parameters that have not be specified in P1528 are derived from the issue dielectric parameters computed from he 4-Cole-Cole equations The mixture characterizations used for the brain and muscle tissues imulating liquids are according to the data by C. Gabriel and G. Hartsgrove [13].(see Fig. 5.2)

Table 5.1 Composition of the Muscle Tissue Equivalent Matter

Ingredient	Muscle Simulating Liquid 2450MHz(MSL-2450)	Muscle Simulating Liquid 2600MHz(MSL-2600)
Water	73.20 %	69.83%
DGMBE	26.70 %	30.17%
Salt	0.040 %	N/A
Dielectric Parameters at 22℃	F=2450 MHz ε= 52.7 %±5% σ= 1.95 ±5% S/m	F=2600MHz ε= 52.5 %±5% σ= 2.16 ±5% S/m

5.3Device Holder for Transmitters

Figure 5.2 Mounting Device

In combination with the SAM Twin Phantom V4.0 the Mounting Device(see Fig. 5.2),enables the rotation of the mounted transmitter in spherical coordinates whereby the rotation point is the ear opening. The devices can be easily, accurately, and repeat ably be positioned according to the FCC specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

- Note: A simulating human hand is not used due to the complex anatomical and geometrical structure of the hand that may produce infinite number of configurations [12]. To produce the worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.

6. TEST SYSTEM SPECIFICATIONS

6.1Automated Test System Specifications

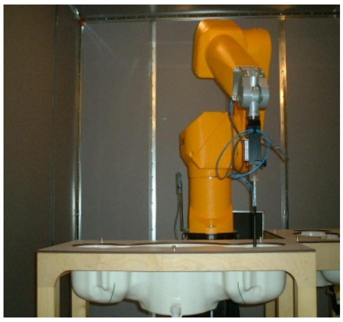


Figure 6.1 DASY4 Test System

Positioner

Robot: Stäubli Unimation Corp. Robot Model: RX60L
Repeatability:0.02 mm
No. of axis:6

Data Acquisition Electronic (DAE) System
Cell Controller

Processor: Pentium 4 CPU
Clock Speed: 3 GHz
Operating System: Window 2000
Data Card: DASY4 PC-Board

Data Converter

Features: Signal,multiplexer,A/D converter. & control logic
Software:DASY4
Connecting Lines : Optical downlink for data and status info
Optical uplink for commands and clock

PC Interface Card

Function: 24 bit (64 MHz) DSP for real time processing
Link to DAE 3
16 bit A/D converter for surface detection system
serial link to robot
direct emergency stop output for robot

E-Field Probes

Model: EX3DV4 S/N: 3643
Construction: Triangular core fiber optic detection system
Frequency:10 MHz to 6 GHz
Linearity:±0.2dB (30MHz to 6GHz)

Phantom

Phantom:SAM Twin Phantom (V4.0)
Shell Material: Vivac Composite
Thickness:2.0 ± 0.2 mm

7. DOSIMETRIC ASSESSMENT & PHANTOM SPECS

7.1 Measurement Procedure

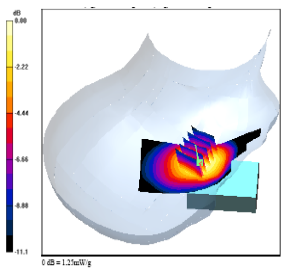


Figure 7.1 Sample Sar Area Scan

The evaluation was performed using the following procedure:

1. The SAR measurement was taken at a selected spatial reference point to monitor power variations during testing. This fixed location point was measured and used as a reference value.
2. The SAR distribution at the exposed side of the head was measured at a distance of 3.9mm from the Inner surface of the shell. The are covered then tire dimension of the head and the horizontal grid spacing was 15 mm x 15 mm.
3. Based on the area scan data, the area of the maximum absorption was determined by spline interpolation. Around this point, a volume of 30 mm x30 mm x 30 mm(fine resolution volume scan, zoom scan)was assessed by measuring 7 x 7 x 7 points. On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see Fig. 7.1):
   a. The data at the surface was extrapolated, since the center of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2mm. The extrapolation was based on a least square algorithm [15]. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.
   b. The maximum interpolated value was searched with a straight-forward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1g or 10g) were computed using the 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the “Not a knot” condition (in x, y, and z directions) [15][16]. The volume was integrated with the trapezoidal algorithm. One thousand points (10 x 10x 10) were interpolated to calculate the average.
   c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.
4. TheSAR reference value, at the same location as procedure #1,was re-measured. If the value changed by more than 5%, the evaluation is repeated.

7.2 Specific Anthropomorphic Mannequin (SAM) Specifications

The phantom for handset SAR assessment testing is a low-loss dielectric shell, with shape and dimensions derived from the anthropometric data of the 90th percentile adult male head dimensions as tabulated by the US Army. The SAM Twin Phantom shell is bisected along the mid-sagittal plane into right and left halves (see Fig. 7.2). The perimeter side walls of each phantom halves are extended to allow filling with liquid to a depth that is sufficient to minimizedre flections from the upper surface. The liquid depth is maintained at a minimum depth of 15cm to minimize reflections from the upper surface.

Figure 7.2 SAM Twin Phantom shell

8. DEFINITION OF REFERENCE POINTS

8.1 EAR Reference Point

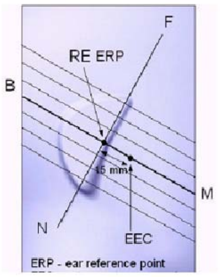


Figure 8.2 Close-up side view of ERPs

Figure 8.1 shows the front, back and side views of the SAM Twin Phantom. The point"M" is the reference point for the center of the mouth, "LE" is the left ear reference point(ERP), and "RE" is the right ERP. The ERPs are 15mm posterior to the entrance to the Earcanal (EEC) along the B-M line (Back-Mouth), as shown in Figure 9.2. The plane Passing, through the two ear canals and M is defined as the Reference Plane. The line N-F (Neck- Front) is perpendicular to the reference plane and passing through the RE (or LE) is called the Reference Pivoting Line (see Figure 8.2). Line B-M is perpendicular to the N-F line. Both N-F and B-M lines are marked on the external phantom shell to facilitate hand set positioning [5]

Figure 8.1 Front, back and side view of SAM Twin Phantom

8.2 Handset Reference Points

Two imaginary lines on the handset were established: the vertical centerline and the horizontal line. The test device was placed in a normal operating position with the "test device reference point" located along the "vertical centerline" on the front of the device aligned to the "ear reference point" (See Fig. 8.3). The "test device reference point" was than located at the same level as the center of the ear reference point. The test device was positioned so that the "vertical centerline" was bisecting the front surface of the handset at it's top and bottom edges, positioning the "ear reference point" on the outersurface of the both the left and right head phantoms on the ear reference point.

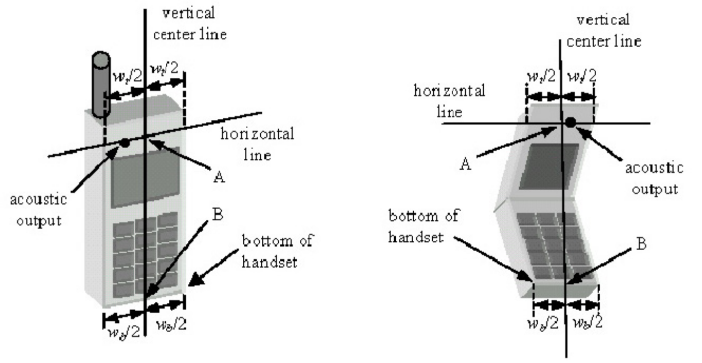


Figure 8.3 Handset Vertical Center & Horizontal Line Reference Points

9. DESCRIPTION OF SUPPORTED UNITS

The EUT has been tested with other necessary accessories or supported units. The following supported units or accessories were used to perform SAR tests for this device.

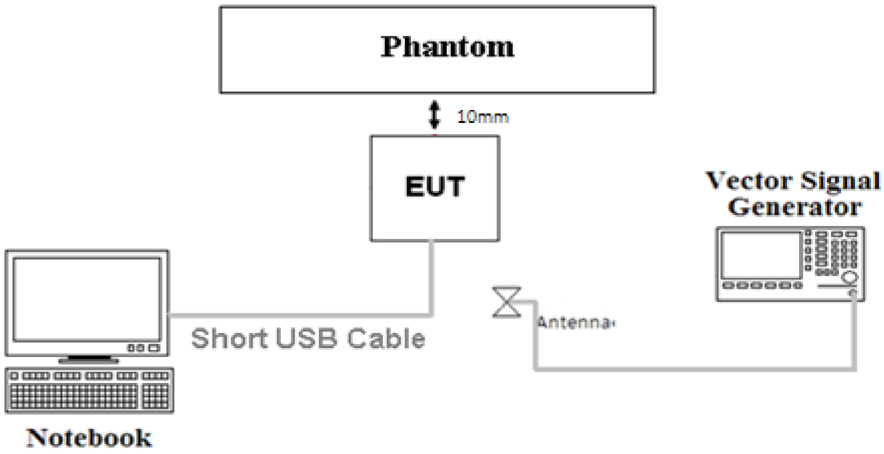
- Supported Units

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	LAPTOP	TOSHIBA	PSME4K-014001	19101993W	CJ6UPA3613WL
2	Vector Signal Generator	Agilent	N5182A	MY48180217	N/A

10. TEST SETUP AND TEST SINGAL DETAIL

The test set-up is shown in the below picture. The EUT to transmit rated output power under appropriate transmission mode and specific frequency.
A beceem diagnostic control panel(V.3.5.0) program is used for verifying a connection status between notebook computer and EUT and to control maximum transmitting power, channel selection, bandwidth.

The EUT uses 29:18 WiMAX frame (Downlink : Uplink Symbols). Currently this is the maximum duty for WiMAX device.This WiMAX frame is selected using the specific wave form in the VSG(Vector Signal Generator).



The EUT is 2.5 GHz WiMAX transceiver using beceem chipset which supports antenna structure for 1TX and 2RX. Only one antenna is used for both transmitting and receiving while the other antenna is strictly used for RX diversity. The EUT has capable of 10 MHz uplink bandwidth only. For the 10 MHz bandwidth of pusc zone format, it has 35 sub-channels structured from1024 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.

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 Uplink and Downlink frames. In any UL sub-frame, the duty factor ranging and bandwidth information is used to ensure optimal system operation. In normal transmission, the device will transmit control signaling at the first 3 uplink symbols and then use the rest of the uplink 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 devices , its transmitting power is much smaller than the data burst symbol power. During the SAR testing, 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.

The VSG produces a downlink burst every 5 milliseconds which simulates the transmission of a BS operating under normal mode. This downlink burst instructs the MS to transmit for 12 symbols in the UL data zone. This UL transmission is repeated every 5 milliseconds. The transmitting power of the MS is set to maximum power.

10. TEST SETUP AND TEST SINGAL DETAIL (Continued)

The VSG and MS use same frequency. The VSG level is much less than the MS Tx power(Approximately 80dB less than the MS power) and so does not affect the SAR readings. Since both the VSG (Base station simulator) and MS are working in TDD mode, co-operation under same frequency is not an issue.

The VSG is loaded with a BS (Base Station)downlink signal which contains the 29:18 information. The mobile station synchronizes to the signal from the VSG in frequency and time and then demodulates two maps contained in the VSG DL frame. The first map, called the DL map, specifies the number of DL symbols(29). The second map, called the UL map, specifies the number of UL symbols(18). The UL map also tells the MS to transmit a burst which occupies all data symbols and all sub-channels. No control channel transmissions are requested by the VSG. Measurements were taken in this configuration with the MS transmitting using the 29:18 ratio, but since there was no energy in the control symbols, the effective power is only across 12 symbols.

As mentioned above the DL:UL frame is specified in the DL and UL maps respectively. There is no ranging present when there is data traffic. The other types of control traffic are HARQ ACK/NACK, CQICH(CINR reporting)and bandwidth(BW) requests. BW requests are piggy-backed onto the data symbols when traffic is present. Since the BW requests are shared across the Control symbols(traffic versus non-traffic modes) and control symbols can be supported only in PUSC zone, the control traffic that is relevant to the SAR calculation is CQICH and HARQ ACK/NACK. So the conducted maximum power for this control traffic is 5/35 of 223.87 mW(23.50 dBm) for 10MHz

In the test mode in PUSC zone format, the UL operates with all data sub-channels(35 sub-channels for 10MHz) occupied with data. During normal operation the MS will transmit on al sub-channels when maximum UL throughput is required. It is possible for the MS to will transmit fewer sub-channels

For the signal from the VSG, it looks identical to the signal that would come from a BS in the field. The intent is to make the think it is in EUT a real network. The transmission from the EUT under test conditions is exactly the same as in the field in normal operation. The only difference is that normally in the field there will be information in some of the control symbols, whereas SAR tests were performed with not having the information in the some control symbols. So it is necessary to calculate a scaling factor that takes into consideration this fact.
You will see a calculation, scaling factor from the measurements (the measurements were taken under a channel configuration of 29:18, without control symbols)to a network configuration using 29:18. This is also calculated for 10MHz bandwidth channels.

The testing was done using a common 29:18 ratio as specified in the WiMAX specifications. The 29 indicates the number of downlink (from the base station)symbols, and the 18 indicates the number of uplink (transmitted from the MS)symbols. Inside the uplink, 15 of the symbols are used for data, and three of the symbols are used for sending control information to the network. During the testing, the control symbols contained no information, so did not contribute to the total energy transmitted. The correct duty factor should be(15*102.8571uS)/5000uS=30.86 %. Using this calculation method eliminates all the other transmit time, guard time, etc, and only uses the transmit time.

Regarding to why these numbers don't total to 48: Since PUSC is dominant, this determines the allowed DL:UL ratios. In DL PUSC, bursts require two symbols so DL symbol count must be an even number+1 symbol for the preamble. Hence the number of DL symbols must bean odd number. In the UL, PUSC bursts require 3 symbols so UL must be a multiple of three symbols. In addition, the total number of symbols(DL+UL)is chosen to be 47 or less to allow for sufficient time to switch between DL and UL and vice versa.

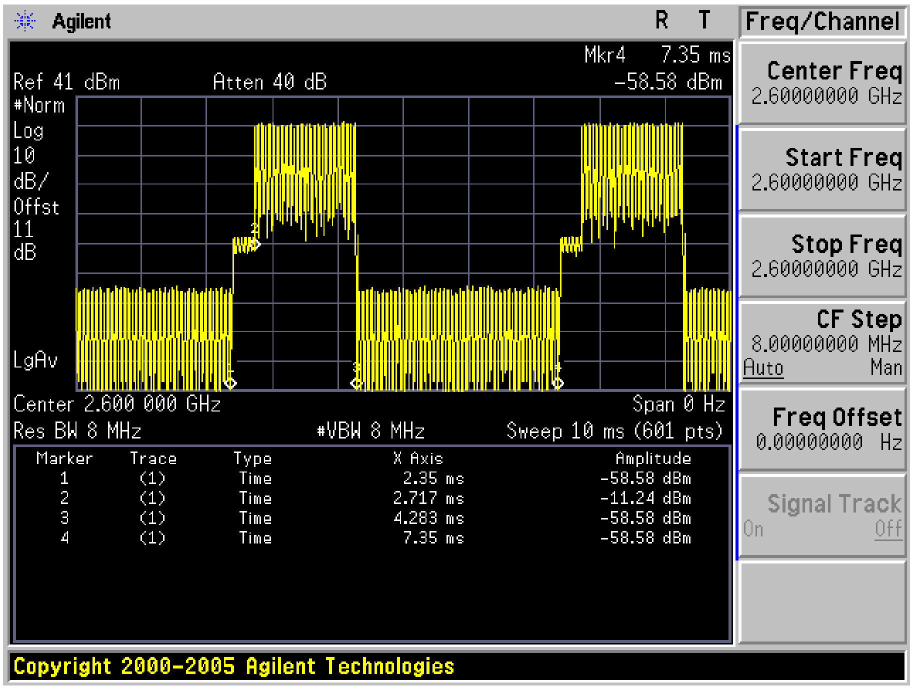
There is a quiet time between the DL and UL transmission and a quiet time between the UL and DL transmission. During these quiet intervals the Base Station is neither transmitting nor receiving. The unoccupied symbols become part of this quiet time.

Ranging is performed to make sure the MS transmits in the correct time window. Data transmission is disabled when the MS is ranging. This is done to prevent the MS from transmitting at the wrong time and interfering with other users. Hence the MS is not allowed to range and transmit data at the same time. So ranging was not considered in the scaling factor.

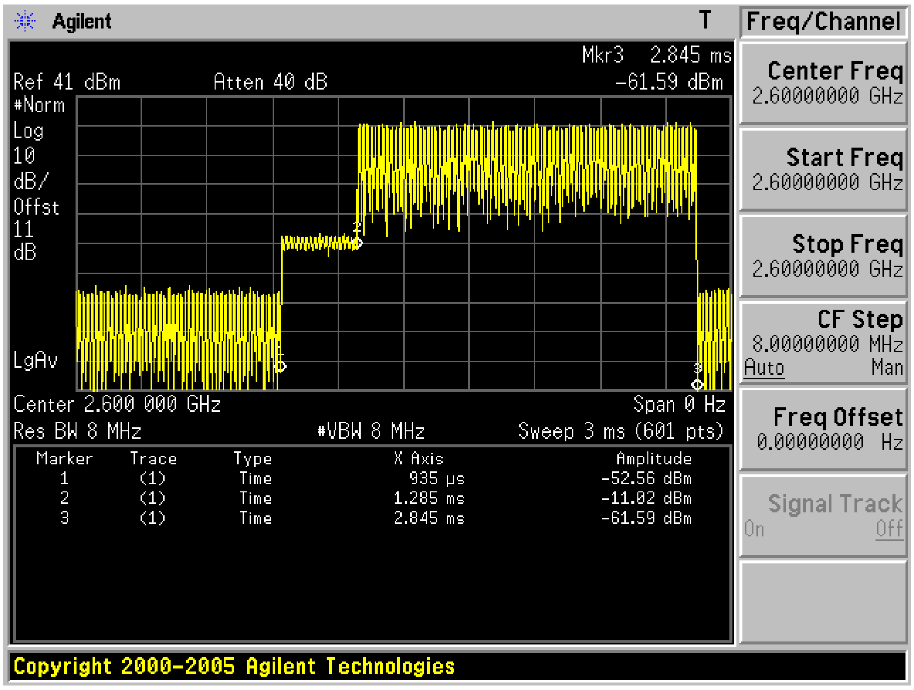
10. TEST SETUP AND TEST SINGAL DETAIL (Continued)

Actual Duty Cycle VS Theoretically Calculated Duty Cycle

PUSC_QPSK 1/2(Plot 1)



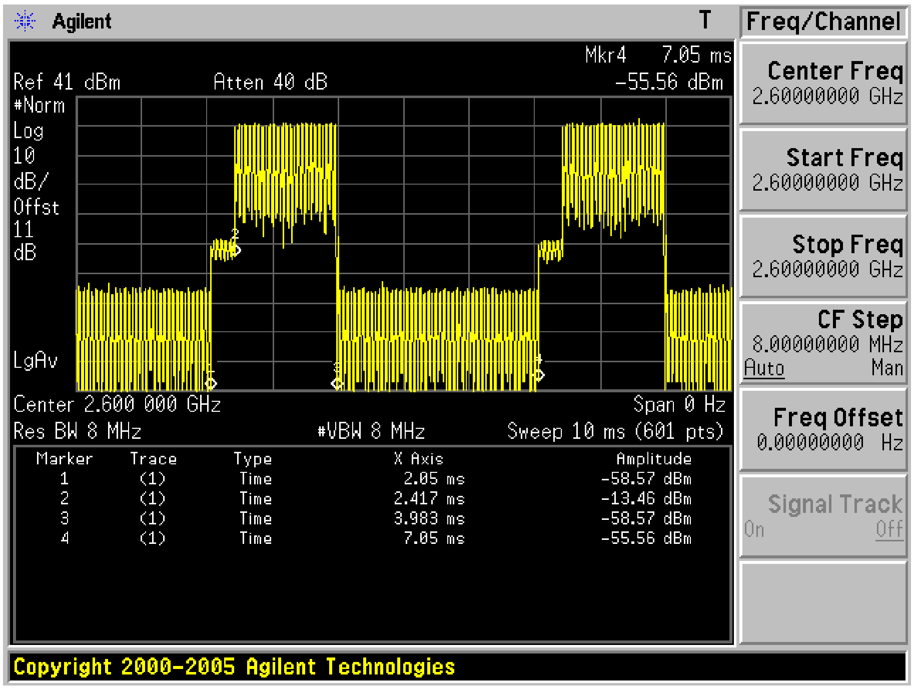
PUSC_QPSK 1/2(Plot 2)



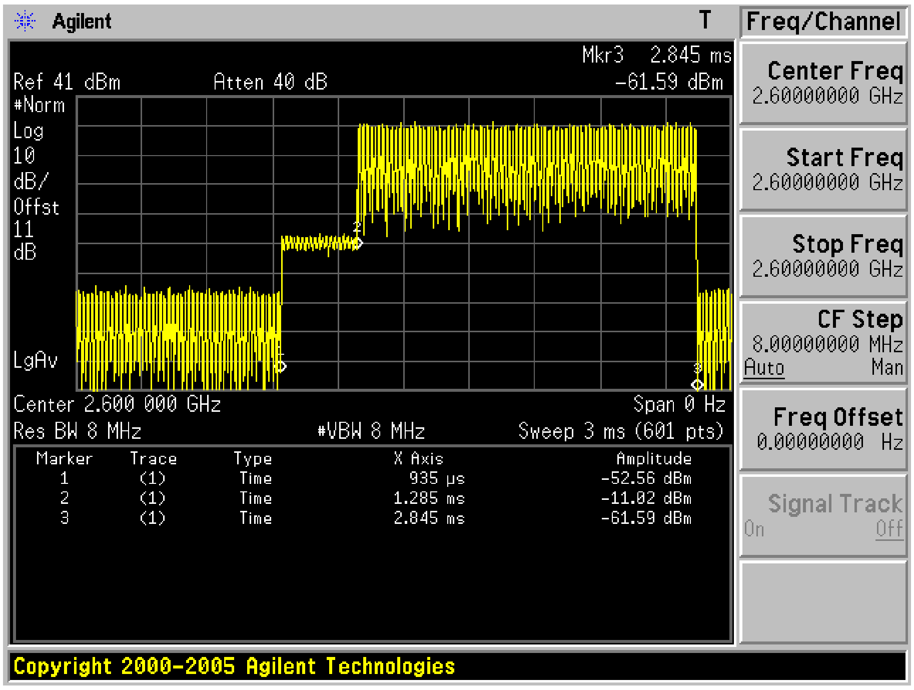
Burst length (Plot 1) = Mark 4 – Mark 1 = 7.35 ms – 2.35 ms = 5 ms
15 uplink symbol length (Plot 2) = Mark 3 – Mark 2= 2.845 ms – 1.285 ms = 1.56 ms
Duty cycle = 1.56 / 5 * 100 % = 31.2 %

10. TEST SETUP AND TEST SINGAL DETAIL (Continued)

PUSC_16QAM 3/4(Plot 1)



PUSC_16QAM 3/4(Plot 2)



Burst length (Plot 1) = Mark 4 – Mark 1 = 7.05 ms – 2.05 ms = 5 ms

15 uplink symbol length (Plot 2) = Mark 3 – Mark 2= 2.845 ms- 1.285 ms = 1.56 ms

Duty cycle = 1.56 / 5 * 100 % = 31.2 %

The theoretically Calculated Duty Cycle = (15*102.8571uS)/5000uS=30.86 %.

This agrees with the actual duty cycles of this device.

11. SUMMARY OF TEST RESULTS

Scaling Factor for a 10MHz channel bandwidth

For the 29:18 frame the UL consists of 18 symbols.

The first three symbols are control channels (BS signaling)and the remaining 15 symbols are for data.
Since PUSC zone only support control signal, the first 3 symbols have a total of 35 slots in a 10 MHz channel bandwidth. The maximum number of control slots that an active can occupy in any frame is:

(A) 2 slots for CQICH report - maximum of 2 simultaneous CQICH reports are allowed by the Standard from any MS
(B) 3 slots for HARQ ACK/NAK (5 ACK/NAK bits corresponding to maximum of 5 DL HARQ bursts in previous DL frame allowed by the standard - each HARQ ACK/NAK bit is transmitted using 1/2 slot)

These 5 slots occupy 5/35 of the total number of available UL slots.

If the UL data burst is transmitted at full power (23.50 dBm in PUSC), then the control channels using 5/35th thetotal number of slots transmitting at the maximum power should use 23.50 dBm-10log(35/5)=(23.50-8.45098)dBm =15.04902dBm=31.98173mW.

BW requests from the MS to the BS are piggy-backed on the data symbols if the MS is transmitting in the frame.
For a 10MHz channel using the maximum 31.98 mW for each control symbol, and 223.87 mW on the data symbols, the math is as follow:

On the 29:18(15 data symbols are used)
Scaling Factor =(3*31.98+15*223.87)/(15*223.87)=1.03
=(3*31.98+15*223.87)/(15*max measured power of the channel tested)

So the worst case SAR data can be compensated as below
0.350*1.05=0.368 mW/g

Currently 29:18 (Downlink / Uplink Ratio) is the maximum duty for WIMAX device. Since US WiMAX operators in the BRS/EBS band have agreed to operate with 29OFDMA symbols downstream and 18symbols 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 approval at the WCA working group level and is awaiting final approval by the Board of Directors.
Therefore other duty (downlink : uplink symbol ratio) is not considered for SAR test of this device.

10MHz Scaling Factor Deriving

	ZONE FORMAT			
	PUSC			
Frequency	QPSK12	QPSK34	16QAM12	16QAM34
2501.0	1.34	1.35	1.35	1.34
2600.0	1.05	1.06	1.07	1.03
2685.0	1.32	1.30	1.34	1.33

12. TEST CONFIGURATION POSITIONS

12.1 The exterior of the device

Short term confidential exhibit

12. TEST CONFIGURATION POSITIONS(Continued)

12.2 The following test configurations have been applied in this test report(only WiMAX):

SAR test was performed with following two orientations on the following closest separation distance to the edge or surface with all modulations by positioning the modem 1 cm away from the flat phantom (air-gap).
(Refer to attached manufacturer's drawings to determine closest separation between antenna and surfaces or edges)

Short Term Confidential Exhibit

13. ANSI / IEEE C95.1-1992 RF EXPOSURE LIMITS

13.1 Uncontrolled Environment

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

13.2 Controlled Environment

CONTROLLEDENVIRONMENTS are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Table 13.1.SAR Human Exposure Specified in ANSI/IEEE C95.1-1992

	HUMAN EXPOSURE LIMITS	
	General Public Exposure (W/kg) or (mW/g)	Occupational Exposure (W/kg) or (mW/g)
Whole-Body average SAR (W/kg)	0.08	0.40
Localized SAR (head and trunk) (W/kg)	1.60	8.00
Localized SAR (limbs) (W/kg)	4.00	20.0

14. IEEE P1528 –MEASUREMENT UNCERTAINTIES

Error Description	Uncertaint value ±%	Probability Distribution	Divisor	(Ci) 1g	Standard (1g)	vi 2 or Veff
Measurement System						
Probe calibration	± 4.8	Normal	1	1	± 4.8 %	∞
Axial isotropy	± 4.7	Rectangular	√3	0.7	± 1.9%	∞
Hemispherical isotropy	± 9.6	Rectangular	√3	0.7	± 3.9%	∞
Boundary Effects	± 1.0	Rectangular	√3	1	± 0.6 %	∞
Probe Linearity	± 4.7	Rectangular	√3	1	± 2.7 %	∞
Detection limits	± 1.0	Rectangular	√3	1	± 0.6 %	∞
Readout Electronics	± 1.0	Normal	1	1	± 1.0 %	∞
Response time	± 0.8	Rectangular	√3	1	± 0.5 %	∞
Integration time	± 2.6	Rectangular	√3	1	± 1.5 %	∞
RF Ambient Conditions	± 3.0	Rectangular	√3	1	± 1.7 %	∞
Probe Positioner	± 0.4	Rectangular	√3	1	± 0.2 %	∞
Probe Positioning	± 2.9	Rectangular	√3	1	± 1.7 %	∞
Algorithms for Max. SAR Eval.	± 1.0	Rectangular	√3	1	± 0.6 %	∞
Test Sample Related						
Device Positioning	± 2.9	Normal	1	1	± 2.9 %	145
Device Holder	± 3.6	Normal	1	1	± 3.6 %	5
Power Drift	± 5.0	Rectangular	√3	1	± 2.9 %	∞
Physical Parameters						
Phantom Shell	± 4.0	Rectangular	√3	1	± 2.3 %	∞
Liquid conductivity (Target)	± 5.0	Rectangular	√3	0.64	± 1.8 %	∞
Liquid conductivity (Meas.)	± 2.5	Normal	1	0.64	± 1.6 %	∞
Liquid permittivity (Target)	± 5.0	Rectangular	√3	0.6	± 1.7 %	∞
Liquid permittivity (Meas.)	± 2.5	Normal	1	0.6	± 1.5 %	∞
Combined Standard Uncertainty					**± 10.3 %**	330
Expanded Uncertainty (k=2)					**± 20.6 %**	

The above measurement uncertainties are according to IEEE P1528 (2003)

15. SYSTEM VERIFICATION

15.1 Tissue Verification

Table 15.1 Simulated Tissue Verification [5]

MEASURED TISSUE PARAMETERS					
Date(s)	Target Frequency	Dielectric constant: ε		Conductivity: σ	
		Target	Measured	Target	Measured
September. 03, 2010	2412 MHz Muscle	52.7	53.0	1.95	1.99
	2437 MHz Muscle	52.7	53.1	1.95	2.00
	2450 MHz Muscle	52.7	53.3	1.95	2.09
	2462 MHz Muscle	52.7	53.4	1.95	2.11
September. 14, 2010	2501 MHz Muscle	52.6	53.6	2.02	2.16
	2600 MHz Muscle	52.5	53.6	2.16	2.16
	2685 MHz Muscle	52.4	53.5	2.28	2.16

15.2 Test System Validation

Prior to assessment, the system is verified to the± 10 % of the specifications at 2450 MHz, 2600 MHz by using the system validation kit(s). (Graphic Plots Attached)

Table 15.2 System Validation [5]

SYSTEM DIPOLE VALIDATION TARGET & MEASURED (2450 MHz, 2600 MHz values are normalized to a forward power of 1/4 W)					
Date(s)	System Validation Kit:	Target Frequency	Targeted SAR_{1g} (mW/g)	Measured SAR_{1g} (mW/g)	Deviation (%)
September. 03, 2010	D-2450V2, S/N: 726	2450 MHz Body	13.1	12.6	-3.82
September. 14, 2010	D-2600V2, S/N: 1016	2600 MHz Body	14.5	13.9	-4.14

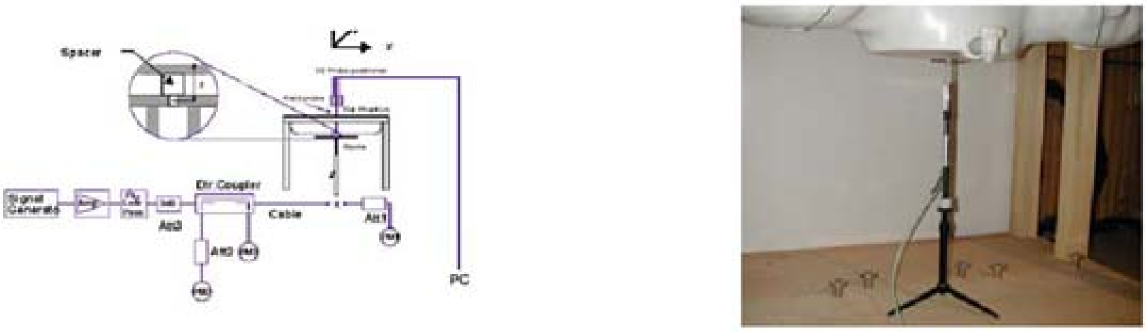


Figure 15.1 Dipole Validation Test Setup

16DESCRIPTION OF TEST MODE AND SUMMARY OF RESULTS

16.1 DESCRIPTION OF TEST MODE

TEST MODE	COMMUNICATION	MODULATION TYPE & CODING RATE NOTE 1	Zone Format	ASSESSEMENT POSITION	TESTED CHANNEL
1	WiMAX-10 M	16QAM 3/4, QPSK 1/2	PUSC	A Note 2	L, M, H
2	WiMAX-10 M	QPSK 1/2	PUSC	B Note 2	M

Note 1 : 29 :18 frame structure is used for the SAR tests with rated maximum output power.
Note 2: The SAR tests were performed with 2 possible closest separation positions from the body (Please refer to clause 12.2 of this report and attached "dimension diagram_SWR-8225.pdf ")

16.2 SUMMARY OF TEST RESULTS (Actual measured SAR)

- BANDWIDTH: 10 MHz

	MEASURED VALUE OF 1g SAR (W/kg)			
TEST MODE	1		2	
MODULATION TYPE	16QAM	QPSK	16QAM	QPSK
LOW CHANNEL	0.272	0.274	-	-
Middle CHANNEL	0.275	**0.350**	-	0.097*NOTE
HIGH CHANNEL	0.228	0.237	-	-

***NOTE: The SAR tests were performed at low, middle and high channel with the test mode 1.**
In case of test mode 2, the SAR test was repeated at the worst case channel of test mode 1.

17. SCALING VALUE OF SAR

17.1 SUMMARY OF TEST RESULTS (Scaling SAR)

- BANDWIDTH: 10 MHz

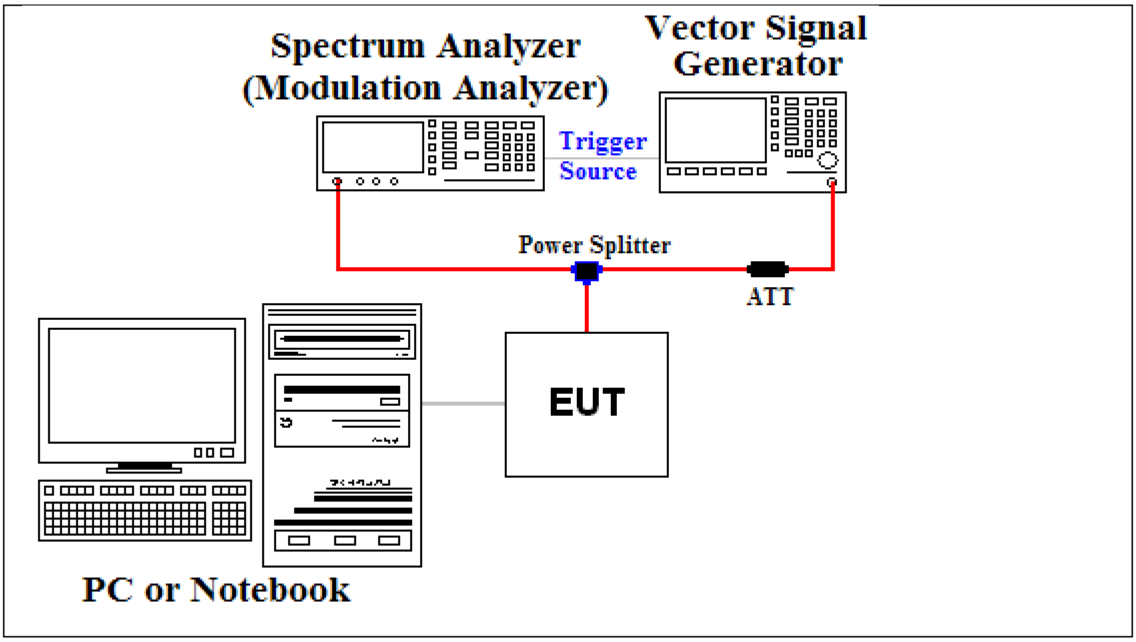
	MEASURED VALUE OF 1g SAR (W/kg)							
TEST MODE	1				2			
MODULATION TYPE	16QAM		QPSK		16QAM		QPSK	
Channel	Meas.	Scaled	Meas.	Scaled	Meas.	Scaled	Meas.	Scaled
LOW CHANNEL	0.272	0.364	0.274	0.367	-	-	-	-
Middle CHANNEL	0.275	0.283	**0.350**	**0.368**	-	**-**	0.097	0.102
HIGH CHANNEL	0.228	0.303	0.237	0.313	-	-	-	-

18. POWER TABLE

18.1WiMAX Max. Power Output Table for SWR-8225 (W/ USB Cable)

Bandwidth	Zone Format	Frequency (MHz)	QPSK 1/2 (dBm)	QPSK 3/4 (dBm)	16QAM 1/2 (dBm)	16QAM 3/4 (dBm)
10MHz	PUSC	2501	22.34	22.31	22.32	22.34
		2600	**23.40**	23.38	23.33	**23.50**
		2685	22.42	22.49	22.36	22.37

18.2 WiMAX Conducted Power Test Setup Diagram



19.Multiple TRANSMITTERS SAR CONSIDERATIONS

19.1 Introduction

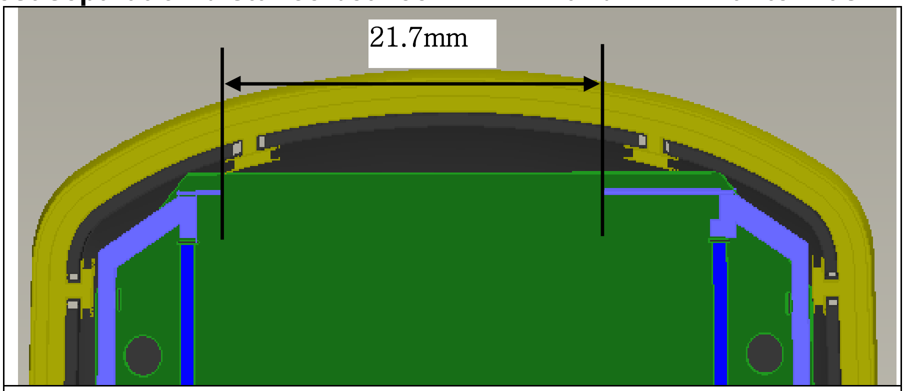
The following procedures adopted from "FCC SAR Evaluation Considerations for Handsets with Multiple Transmitters"(v01r05 #648474) on September 2008 are applicable to handsets with built-in unlicensed transmitters such as 802.11 a/b/g and Bluetooth devices which may simultaneously transmit with the licensed transmitter.

19.2 Output Power Thresholds for Unlicensed Transmitters

	2.45	5.15-5.35	5.47-5.85	GHz
P Ref	12	5	5	mW
Device output power should be rounded to the nearest mW to compare with values specified in this table				

19.3 Multiple Antenna Transmission Information for SWR-8225

19.3.1 The closest separation distance between WiMAX and W-LAN antennas



WiMAX – W-LAN : 2.170 cm

19.3.2 W-LAN Max. Power Output Table for SWR-8225 (W/ USB Cable)

Test Mode	Frequency	Test Results	
		dBm	W
802.11b	Lowest	15.80	0.0380
	Middle	15.81	0.0381
	Highest	13.83	0.0242
802.11g	Lowest	12.12	0.0163
	Middle	12.34	0.0171
	Highest	11.58	0.0144

※ SAR is not required for 802.11g channels when the maximum average output power is less than $^{1}/_{4}$ dB higher than that measured on the corresponding 802.11b channels.

Note 1: Unlicensed transmitter's stand alone SAR is not required when following condition.
- Output power ≤ P_{Ref}, antenna distance from other antennas > 2.5cm each with either output power ≤ P_{Ref} or 1-g SAR < 1.2 W/kg
- The DUT's antenna distance is less than 2.5 cm and output power is more than ≥ P_{Ref} therefore W-LAN stand alone SAR is required.

Note 2 : SAR For Simultaneous transmission
- When ($WiMAX_{sar}$ + $W\text{-}LAN_{sar}$)> 1.6 W/kg, then simultaneous transmission is not performed.

19.4 Summary of SAR Evaluation Requirements for Cell phones with MultipleTransmitters

<table>
<tr><th></th><th>Individual Transmitter</th><th>Simultaneous Transmission</th></tr>
<tr><td>Licensed Transmitters</td><td><u>Routine evaluation required</u></td><td rowspan="2">SAR not required:
<u>Unlicensed only</u>
o when stand-alone 1-g SAR is not required and antenna is > 5 cm from other antennas
<u>Licensed & Unlicensed</u>
o when the sum of the 1-g SAR is <1.6 W/kg for all simultaneous transmitting antennas
o when SAR to antenna separation ratio of simultaneous transmitting antenna pair is < 0.3

SAR required:
<u>Licensed & Unlicensed</u>
antenna pairs with SAR to antenna separation ratio ≥ 0.3; test is only required for the configuration that results in the highest SAR in standalone configuration for each wireless mode and exposure condition

Note: simultaneous transmission exposure conditions for head and body can be different for different style phones; therefore, different test requirements may apply</td></tr>
<tr><td>Unlicensed Transmitters</td><td>When there is no simultaneous transmission –
o output < 60/f: SAR not required
o output ≥ 60/f: stand-alone SAR required

When there is simultaneous transmission –
<u>Stand-alone SAR not required when</u>
O output ≤ 2.P_{Ref} and antenna is > 5.0 cm from other antennas
o output ≤ P_{Ref} and antenna is > 2.5 cm from other antennas, each either output power output ≤ P_{Ref} or 1-g SAR < 1.2 W/Kg

<u>Otherwise stand-alone SAR is required</u>

When stand-alone SAR is required
o test SAR on highest output channel for each wireless mode and exposure condition

o if SAR for highest output channel is > 50% of SAR limit, evaluate all channels according to normal procedures</td></tr>
</table>

20. Configuring 802.11 a/b/g Transmitters for SAR Measurement

20.1 SAR Testing with IEEE 802.11 a/b/g Transmitters

Normal network operating configurations are not suitable for measuring the SAR of 802.11 a/b/g transmitters. Unpredictable in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure the results are consistent and reliable.

20.2 General Device Setup

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters. The test frequencies should correspond to actual channel frequencies defined for domestic use. SAR for devices with switched diversity should be measured with only one antenna transmitting at a time during each SAR measurement, according to a fixed modulation and data rate. The same data pattern should be sued for all measurements.

20.3 Frequency Channel Configurations

802.11 a/b/g and 4.9 GHz operation modes are tested independently according to the service requirements in each frequency band. 802.11 b/g modes are tested on channels 1. 6 and 11. 802.11a is tested for UNII operations on channels 36 and 48 in the 5.15-5.25 GHz Band; channels 52 and 64 in the 5.25-5.35 GHz band; channels 104, 116, 124 and 136 in the 5.470-5.725 GHz BAND; and channel 149 and 161 in the 5.8 GHz band. When 5.8 GHz § 15.247 is also available, channels 149, 157 and 165 should be tested of the UNII channels. 4.9 GHz is tested on channels 1., 10 and 5 or 6, whichever has the higher output power, for 5MHz channels; channels 11, 15 and 19 for 10MHz channels; and channels 21 and 25 for 20MHz channels. These are referred to as the " default test channels". 802.11g mode was evaluated only if the output power was 0.25 dB higher than the 802.11b mode.

Table 20.1802.11 Test channels per FCC Requirements

Mode		GHz	Channel	Turbo Channel	"Default Test Channels" §15.247 802.11b	§15.247 802.11g	UNII	
802.11 b/g		2.412	1[#]		√	∇		
		2.437	6	6	√	∇		
		2.462	11[#]		√	∇		
802.11a	UNII	5.18	36				√	
		5.20	40	42 (5.21 GHz)				*
		5.22	44					*
		5.24	48	50 (5.25 GHz)			√	
		5.26	52				√	
		5.28	56	58 (5.29 GHz)				*
		5.30	60					*
		5.32	64				√	
		5.500	100	Unknown				*
		5.520	104				√	
		5.540	108					*
		5.560	112					*
		5.580	116				√	
		5.600	120					*
		5.620	124				√	
		5.640	128					*
		5.660	132					*
		5.680	136				√	
		5.700	140					*
	UNII or §15.247	5.745	149		√		√	
		5.765	153	152 (5.76 GHz)		*		*
		5.785	157		√			*
		5.805	161	160 (5.80 GHz)		*	√	
	§15.247	5.825	165		√			

21. SAR TEST DATA SUMMARY

Mixture Type: 2450 MHz Body

21.1 MEASUREMENT RESULTS (W-LAN(802.11b) Body SAR)							
FREQUENCY		Begin Power (dBm)	Drift Power (dB)	Mode	Device Test Position	Antenna Position	SAR (W/kg)
MHz	Ch						
2412	1	15.80	-0.295	W-LAN	10 mm [Top]	Internal	0.037
2437	**6**	**15.81**	**0.041**	**W-LAN**	**10 mm [Top]**	**Internal**	**0.040**
2462	11	13.83	-0.109	W-LAN	10 mm [Top]	Internal	0.00559
2437	6	15.81	-0.107	W-LAN	10 mm [Bottom]	Internal	0.00271
2437	6	15.81	-0.003	W-LAN	10 mm [H - Up]	Internal	0.011
2437	6	15.81	0.156	W-LAN	10 mm [H - Down]	Internal	0.020
2437	6	15.81	-0.147	W-LAN	10 mm [V - Front]	Internal	0.023
2437	6	15.81	-0.058	W-LAN	10 mm [V - Back]	Internal	0.010
ANSI / IEEE C95.1 1992 – SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/ Occupational Exposure**							**Body** **1.6 W/kg** **(mW/g)** averaged over 1 gram

NOTE:

1. The test data reported are the worst-case SAR value with the antenna-body position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supp.C [July 2001].
2. All modes of operation were investigated, and worst-case results are reported.
3. Prior to testing the conducted output power was measured.
4. The EUT is tested 2nd hot-spot peak, if it is less than 2dB below the highest peak.
5. Battery is fully charged for all readings.
6. Test Signal Call Mode ▣Continuous Tx On □Manu.Test Codes □BaseStation Simulator
7. Tissue parameters and temperatures are listed on the SAR plots.
8. Liquid tissue depth is 15.0cm.±0.1
9. The 802.11b modes of this DUT were programmed to be in continuously transmitting mode.

21. SAR TEST DATA SUMMARY (Continued)

Mixture Type : 2600 MHz Body

BANDWIDTH: 10MHz

21.2 MEASUREMENT RESULTS						
FREQUENCY MHz	**Begin Power (dBm)**	**Drift Power (dB)**	**Mode**	**Spacing**	**Device Test Position**	**SAR (W/kg)**
2501	22.34	0.018	PUSC_16QAM	10 mm [Phantom]	A	0.272
2600	23.50	0.225	PUSC _16QAM	10 mm [Phantom]	A	0.275
2685	22.37	-0.270	PUSC _16QAM	10 mm [Phantom]	A	0.228
2501	22.34	-0.357	PUSC_QPSK	10 mm [Phantom]	A	0.274
2600	**23.40**	**-0.025**	**PUSC_QPSK**	**10 mm [Phantom]**	**A**	**0.350**
2685	22.42	0.181	PUSC_QPSK	10mm [Phantom]	A	0.237
2600	23.40	-0.173	PUSC_QPSK	10 mm [Phantom]	B	0.097*
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population						**Body 1.6 W/kg (mW/g)** averaged over 1 gram

NOTE:

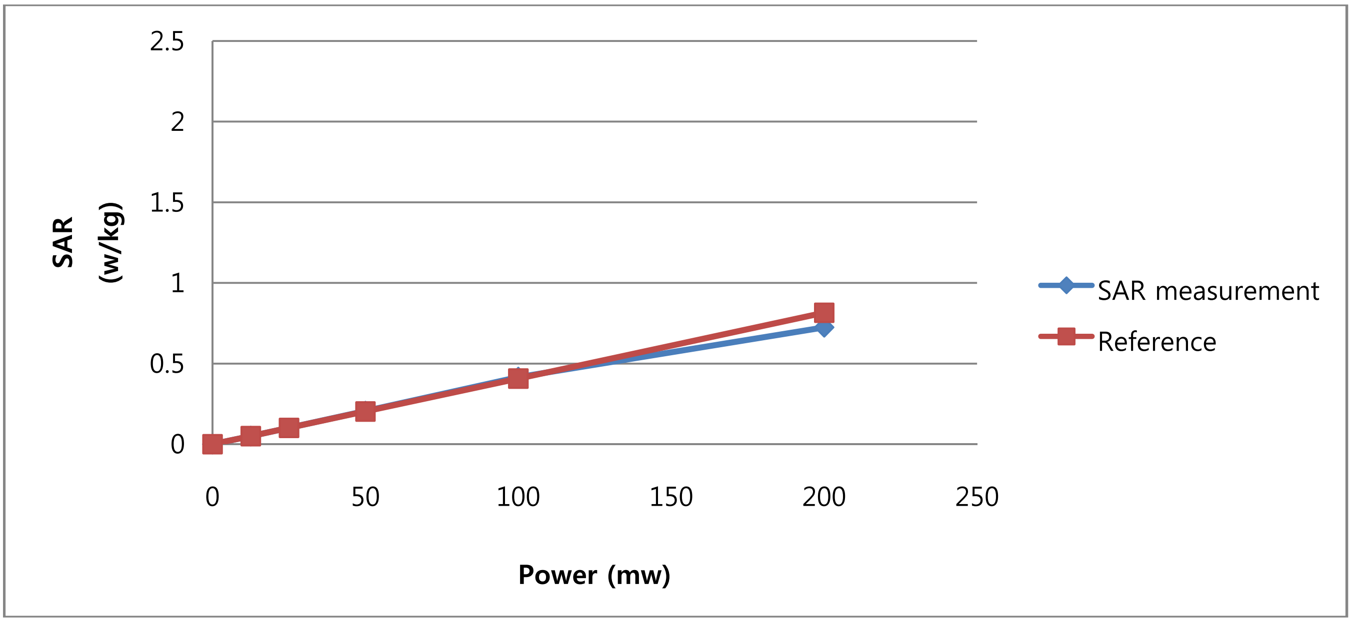
1. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001] and KDB 615223WiMax SAR Guidance.
2. All modes of operation were investigated, and worst-case results are reported.
3. Prior to testing the conducted output power was measured.
4. The EUT is tested 2nd hot-spot peak, if it is less than 2 dB below the highest peak.
5. Tissue parameters and temperatures are listed on the SAR plots.
6. Liquid tissue depth is 15.0cm ± 0.1
7. Test configuration of each mode is described in section 12.2
8. * This SAR test was repeated at the worst case channel of test position A.

22.Linearity response & Scan resolution check

22.1 Linearity response check:

Distance between phantom and the front of EUT is touch from body. Control EUT to transmit at various average power level and do single point peak SAR measurement at specified power level. The reported power is RMS average measured during burst-on period by trigger and gating.

Wimax Peak RMS output power (mW)	12.5	25	50	100	200
Measured SAR (mW / g)	0.050	0.101	0.205	0.416	0.724
Value from 12.5-25mw reference line	0.050	0.101	0.203	0.407	0.815
Difference	0	0	0.002	0.009	-0.091
Percentage of Difference %	0	0	0.985	2.211	-11.166



22.2 Compare with different scan grid size

With EUT hold on the highest raw 1g SAR configuration (10M bandwidth / middle channel/ front configuration position which has highest measured SAR number) with no any change in position or setting.
Two 1g SAR evaluations were performed with different scanning grid size as listed below for assessing the impact on SAR reading.

Middle channel of 10MHz at Front position.		
Area scan grid size(mm)	Zoom scan grid size(mm)	SAR value (w/kg)
15	8	0.354
5	4	0.352

23. SAR TEST EQUOPMENT

Table 23.1 Test Equipment Calibration

EQUIPMENT SPECIFICATIONS			
Type	**Calibration Date**	**Next Calibration Date**	**Serial Number**
Robot	N/A	N/A	F02/5Q85A1/A/01
Robot Controller	N/A	N/A	F02/5Q85A1/C/01
Joystick	N/A	N/A	D221340031
Hicron Computer 1.1GHz Pentium Celeron ,Window 2000	N/A	N/A	N/A
Data Acquisition Electronics	November 19, 2009	November 19, 2010	520
Dosimetric E-Field Probe	January 26, 2010	January 26, 2011	3643
Dummy Probe	N/A	N/A	N/A
Sam Phantom	N/A	N/A	N/A
Probe Alignment Unit LB	N/A	N/A	321
SPEAG Validation Dipole D2450 MHz	March 18, 2010	March 18, 2012	726
SPEAG Validation Dipole D2600 MHz	May 27, 2010	May 27, 2012	1016
Head Equivalent Matter(2450 MHz)	January 2010	January 2011	N/A
Body Equivalent Matter(2450 MHz)	January 2010	January 2011	N/A
Head Equivalent Matter(2600 MHz)	January 2010	January 2011	N/A
Body Equivalent Matter(2600 MHz)	January 2010	January 2011	N/A
HP EPM-442A Power Meter	March 12, 2010	March 12, 2011	GB37170267
HP E4421A Signal Generator	July 01, 2010	July 01, 2011	US37230529
Attenuator (10dB)	January 11, 2010	January 11, 2011	BP4387
Attenuator (3dB)	July 01, 2010	July 01,2011	MY39260700
Low pass filter (1.5GHz)	January 01, 2010	January 01, 2011	N/A
Low pass filter (3.0GHz)	October 13, 2009	October 13, 2010	N/A
Dual Directional Coupler	January 11, 2010	January 11, 2011	50228
Amplifier	November 02, 2009	November 02, 2010	1020 D/C 0221
Network Analyzer	March 12, 2010	March 12, 2011	3410J01204
HP85070D Dielectric Probe Kit	N/A	N/A	LISO1440118
SEMITEC Engineering	N/A	N/A	Shield Room
Vector Signal Generator	November 04,2009	November 04,2010	MY48180217

NOTE:
The E-field probe was calibrated by SPEAG, by temperature measurement procedure. Dipole Validation measurement is performed by Digital EMC. before each test. The brain simulating material is calibrated by Digital EMC using the dielectric probe system and network analyzer to determine the conductivity and permittivity (dielectric constant) of the brain-equivalent material.

24.CONCLUSION

Measurement Conclusion

The SAR measurement indicates that the EUT complies with the RF radiation exposure limits of the FCC. These measurements are taken to simulate the RF effects exposure under worst-case conditions. Precise laboratory measures were taken to assure repeat ability of the tests. The tested device complies with the requirements in respect to all parameters subject to the test. The test results and statements relate only to the item(s)tested.
Please note that the absorption and distribution of electromagnetic energy in the body are very complex phenomena that depend on the mass, shape, and size of the body, the orientation of the body with respect to the field vectors, and the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease).
Because innumerable factors may interact to determine the specific biological outcome of an exposure to electromagnetic fields, any protection guide shall consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables.

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