SAR EVALUATION REPORT

For

HONGKONG UCLOUDLINK NETWORK TECHNOLOGY LIMITED

Unit D. 16F., Chenknang plaza 250 Hennessy Road, wanchai Hongkong

FCC ID: 2AC88-G1S

Report Type: Original Report	Product Type: 3G Free Roaming Hotspot
Test Engineer:	Terry XiaHou
Report Number:	RSC150205051-20B
Report Date:	2015-04-22
Reviewed By:	Bell Hu SAR Engineer
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Attestation of Test Results		
EUT Information	**Company Name**	HONGKONG UCLOUDLINK NETWORK TECHNOLOGY LIMITED
	EUT Description	3G Free Roaming Hotspot
	FCC ID	2AC88-G1S
	Model Number	G1S
	Test Date	2015-03-28

Frequency	Max. SAR Level(s) Reported	Limit(W/Kg)
GSM 850	0.785 W/kg 1g Body SAR	**1. 6**
PCS 1900	0.183 W/kg 1g Body SAR	
WCDMA850	0.705 W/kg 1g Body SAR	
WCDMA1900	0.597 W/kg 1g Body SAR	
Simultaneous	1.185 W/kg 1g Body SAR	

Applicable Standards	**ANSI/IEEE C95.1: 2005** IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fileds,3 kHz to 300 GHz.
	ANSI/IEEE C95.3 : 2002 IEEE Recommended Practice for Measurements and Computations of Radio Frequency Electromagnetic Fields With Respect to Human Exposure to SuchFields,100 kHz—300 GHz.
	IEEE 1528: 2013 IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
	KDB procedures KDB447498 D01 General RF Exposure Guidance v05r02. KDB 648474 D04 Handset SAR v01r02. KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01r03 KDB 865664 D02 RF Exposure Reporting v01r01 KDB 941225 D01 3G SAR Procedures v03 KDB 941225 D06 Hotspot Mode v02

Note: This wireless device has been shown to be capable of compliance for localized specific absorption rate (SAR) for General Population/Uncontrolled Exposure limits specified in ANSI/IEEE Standards and has been tested in accordance with the measurement procedures specified in IEEE 1528-2013 and RF exposure KDB procedures.

The results and statements contained in this report pertain only to the device(s) evaluated.

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	RSC150205051-20B	Original Report	2015-04-22

EUT DESCRIPTION

This report has been prepared on behalf of HONGKONG UCLOUDLINK NETWORK TECHNOLOGY LIMITED and their product, FCC ID: 2AC88-G1S , Model: G1S or the EUT (Equipment under Test) as referred to in the rest of this report.

Technical Specification

<table>
<tr><td>Product Type</td><td colspan="2">Portable</td></tr>
<tr><td>Exposure Category:</td><td colspan="2">Population/Uncontrolled</td></tr>
<tr><td>Antenna Type(s):</td><td colspan="2">Internal Antenna</td></tr>
<tr><td>Body-Worn Accessories:</td><td colspan="2">None</td></tr>
<tr><td>Face-Head Accessories:</td><td colspan="2">None</td></tr>
<tr><td>Multi-slot Class:</td><td colspan="2">Class12</td></tr>
<tr><td>Operation Mode :</td><td colspan="2">GPRS/EDGE Data, WCDMA and Wi-Fi</td></tr>
<tr><td>Frequency Band:</td><td colspan="2">GSM 850 : 824-849 MHz(TX) ; 869-894 MHz(RX)
PCS 1900: 1850-1910 MHz(TX) ; 1930-1990 MHz(RX)
WCDMA850: 824-849 MHz(TX) ; 869-894 MHz(RX)
WCDMA1900: 1850-1910 MHz(TX) ; 1930-1990 MHz(RX)
Wi-Fi(802.11b/g/n20): 2412MHz-2462MHz
Wi-Fi(n40): 2422MHz-2452MHz</td></tr>
<tr><td rowspan="3">Conducted RF Power:</td><td>Antenna 1#</td><td>GSM 850: 31.71 dBm
PCS 1900: 28.07 dBm
WCDMA 850: 23.69 dBm
WCDMA 1900: 22.09 dBm</td></tr>
<tr><td>Antenna 2#</td><td>GSM 850: 32.26 dBm
PCS 1900: 28.40 dBm
WCDMA 850: 22.58 dBm
WCDMA 1900: 21.89 dBm</td></tr>
<tr><td colspan="2">Wi-Fi (802.11b/g/n20): 12.88 dBm
Wi-Fi (802.11n40): 11.35 dBm</td></tr>
<tr><td>Dimensions (L*W*H):</td><td colspan="2">116 mm (L) × 62 mm (W) × 21 mm (H)</td></tr>
<tr><td>Power Source:</td><td colspan="2">3.7 V_{DC} Rechargeable Battery</td></tr>
<tr><td>Normal Operation:</td><td colspan="2">Body-worn</td></tr>
</table>

REFERENCE, STANDARDS, AND GUILDELINES

FCC:

The Report and Order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 mW/g as recommended by the ANSI/IEEE standard C95.1-1992 [6] for an uncontrolled environment (Paragraph 65). According to the Supplement C of OET Bulletin 65 “Evaluating Compliance with FCC Guide-lines for Human Exposure to Radio frequency Electromagnetic Fields", released on Jun 29, 2001 by the FCC, the device should be evaluated at maximum output power (radiated from the antenna) under “worst-case” conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

This report describes the methodology and results of experiments performed on wireless data terminal. The objective was to determine if there is RF radiation and if radiation is found, what is the extent of radiation with respect to safety limits. SAR (Specific Absorption Rate) is the measure of RF exposure determined by the amount of RF energy absorbed by human body (or its parts) – to determine how the RF energy couples to the body or head which is a primary health concern for body worn devices. The limit below which the exposure to RF is considered safe by regulatory bodies in North America is 1.6 mW/g average over 1 gram of tissue mass.

CE:

The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 2 mW/g as recommended by EN62209-1 for an uncontrolled environment. According to the Standard, the device should be evaluated at maximum output power (radiated from the antenna) under “worst-case” conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

This report describes the methodology and results of experiments performed on wireless data terminal. The objective was to determine if there is RF radiation and if radiation is found, what is the extent of radiation with respect to safety limits. SAR (Specific Absorption Rate) is the measure of RF exposure determined by the amount of RF energy absorbed by human body (or its parts) – to determine how the RF energy couples to the body or head which is a primary health concern for body worn devices. The limit below which the exposure to RF is considered safe by regulatory bodies in Europe is 2 mW/g average over 10 gram of tissue mass.

The test configurations were laid out on a specially designed test fixture to ensure the reproducibility of measurements. Each configuration was scanned for SAR. Analysis of each scan was carried out to characterize the above effects in the device.

SAR Limits

FCC Limit (1g Tissue)

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average (averaged over the whole body)	0.08	0.4
Spatial Peak (averaged over any 1 g of tissue)	1.60	8.0
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.0	20.0

CE Limit (10g Tissue)

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average (averaged over the whole body)	0.08	0.4
Spatial Peak (averaged over any 10 g of tissue)	2.0	10
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.0	20.0

Population/Uncontrolled Environments are defined as locations where there is the exposure of individual who have no knowledge or control of their exposure.

Occupational/Controlled Environments are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure (i.e. as a result of employment or occupation).

General Population/Uncontrolled environments Spatial Peak limit 1.6W/kg (FCC) & 2 W/kg (CE) applied to the EUT.

FACILITIES

The test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect data is located at 6/F, the 3rd Phase of WanLi Industrial Building, Shi Hua Road, Fu Tian Free Trade Zone, Shenzhen, Guangdong, P.R. of China

DESCRIPTION OF TEST SYSTEM

These measurements were performed with ALSAS 10 Universal Integrated SAR Measurement system from APREL Laboratories.

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.

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.

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.

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.

ALSAS-10U Interpolation and Extrapolation Uncertainty

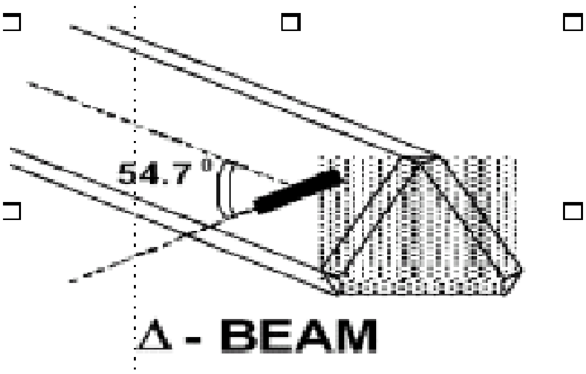
The overall uncertainty for the methodology and algorithms the used during the SAR calculation was evaluated using the data from IEEE 1528 based on the example f3 algorithm:

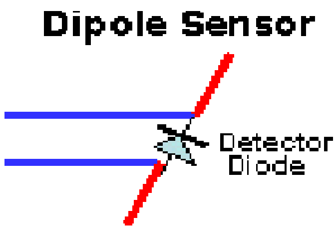
$$f_3(x,y,z) = A\frac{a^2}{\frac{a^2}{4}+x'^2+y'^2}\cdot\left(e^{-\frac{2z}{a}}+\frac{a^2}{2(a+2z)^2}\right)$$

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.

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.

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

Isotropic E-Field Probe Specification

Calibration Method	Frequency Dependent Below 1 GHz Calibration in air performed in a TEM Cell Above 1 GHz Calibration in air performed in waveguide
Sensitivity	0.70 $\mu V/(V/m)^2$ to 0.85 $\mu V/(V/m)^2$
Dynamic Range	0.0005 W/kg to 100 W/kg
Isotropic Response	Better than 0.1 dB
Diode Compression Point (DCP)	Calibration for Specific Frequency
Probe Tip Diameter	< 2.9 mm
Sensor Offset	1.56 (+/- 0.02 mm)
Probe Length	289 mm
Video Bandwidth	@ 500 Hz: 1 dB @ 1.02 kHz: 3 dB
Boundary Effect	Less than 2.1% for distance greater than 0.58 mm
Spatial Resolution	The spatial resolution uncertainty is less than 1.5% for 4.9mm diameter probe. The spatial resolution uncertainty is less than 1.0% for 2.5mm diameter probe

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.

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	20 mV to 200 mV and 150 mV to 800 mV
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

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	0.05 mm
Controller Type	Single phase Pentium based C500C
Robot Reach	710 mm
Communication	RS232 and LAN compatible

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.

Universal Device Positioner

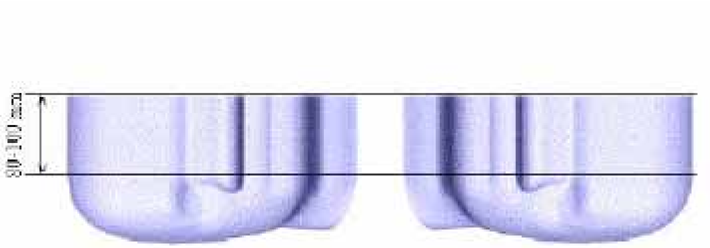
The universal device positioner allows complete freedom of movement of the EUT. Developed to hold a EUT in a free-space scenario any additional loading attributable to the material used in the construction of the positioner has been eliminated. Repeatability has been enhanced through the linear scales 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.

Phantom Types

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

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.



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.

Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 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 P1528 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 in P1528.

Ingredients (% by weight)	Frequency (MHz)									
	450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (Nacl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton x-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (s/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78

Recommended Tissue Dielectric Parameters for Head and Body

Frequency (MHz)	Head Tissue		Body Tissue	
	εr	σ (S/m)	εr	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

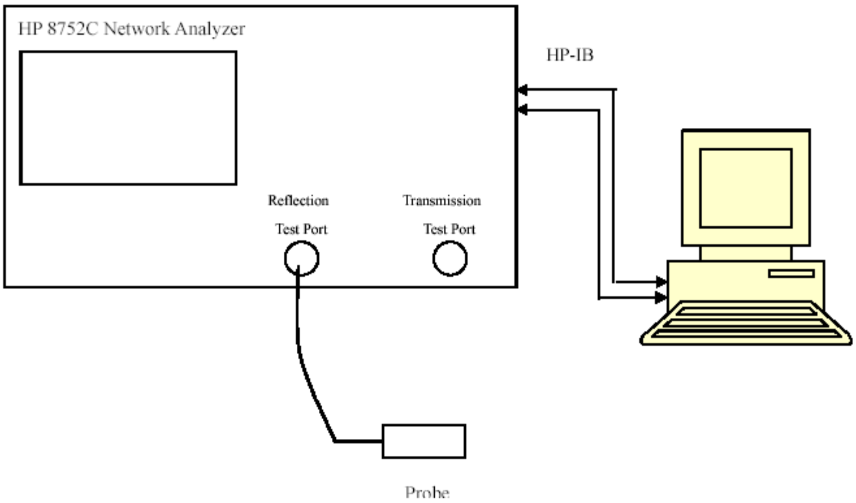
EQUIPMENT LIST AND CALIBRATION

Equipments List & Calibration Information

Equipment	Model	Calibration Date	S/N
CRS F3 robot	ALS-F3	N/A	RAF0805352
CRS F3 Software	ALS-F3-SW	N/A	N/A
CRS C500C controller	ALS-C500	N/A	RCF0805379
Probe mounting device & Boundary Detection Sensor System	ALS-PMDPS-3	N/A	120-00270
Universal Work Station	ALS-UWS	N/A	100-00157
Data Acquisition Package	ALS-DAQ-PAQ-3	2014-10-14	110-00212
Miniature E-Field Probe	ALS-E-020	2014-10-14	500-00283
Dipole, 835MHz	ALS-D-835-S-2	2014-10-08	180-00558
Dipole, 1900MHz	ALS-D-1900-S-2	2014-10-09	210-00710
Dipole Spacer	ALS-DS-U	N/A	250-00907
Device holder/Positioner	ALS-H-E-SET-2	N/A	170-00510
Left ear SAM phantom	ALS-P-SAM-L	N/A	130-00311
Right ear SAM phantom	ALS-P-SAM-R	N/A	140-00359
UniPhantom	ALS-P-UP-1	N/A	150-00413
Simulated Tissue 835 MHz Body	ALS-TS-835-B	Each Time	270-02101
Simulated Tissue 1900 MHz Body	ALS-TS-1900-B	Each Time	295-02102
Power Amplifier	5S1G4	N/A	71377
Directional couple	DC6180A	N/A	0325849
Attenuator	3dB	2014-05-08	5402
Network analyzer	8752C	2014-06-03	3410A02356
Dielectric probe kit	HP85070B	2014-06-13	N/A
Synthesized Sweeper	HP 8341B	2014-06-03	2624A00116
UNIVERSAL RADIO COMMUNICATION TESTER	CMU200	2014-11-23	106891
EMI Test Receiver	ESCI	2014-06-13	101746

SAR MEASUREMENT SYSTEM VERIFICATION

Liquid Verification



Liquid Verification Setup Block Diagram

Liquid Verification Results

Frequency	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		ε_r	σ (S/m)	ε_r	σ (S/m)	$\Delta\varepsilon_r$	Δσ (S/m)	
824.2	Body	53.87	0.95	55.20	0.97	-2.409	-2.062	±5
826.4	Body	53.81	0.95	55.20	0.97	-2.518	-2.062	±5
836.6	Body	53.79	0.96	55.20	0.97	-2.554	-1.031	±5
846.6	Body	53.82	0.97	55.20	0.97	-2.500	0.000	±5
848.8	Body	53.85	0.97	55.20	0.97	-2.446	0.000	±5
1850.2	Body	52.10	1.49	53.30	1.52	-2.251	-1.974	±5
1852.4	Body	51.84	1.49	53.30	1.52	-2.739	-1.974	±5
1880.0	Body	51.77	1.52	53.30	1.52	-2.871	0.000	±5
1907.6	Body	51.85	1.53	53.30	1.52	-2.720	0.658	±5
1909.8	Body	52.00	1.54	53.30	1.52	-2.439	1.316	±5

**Liquid Verification was performed on 2015-03-28.*

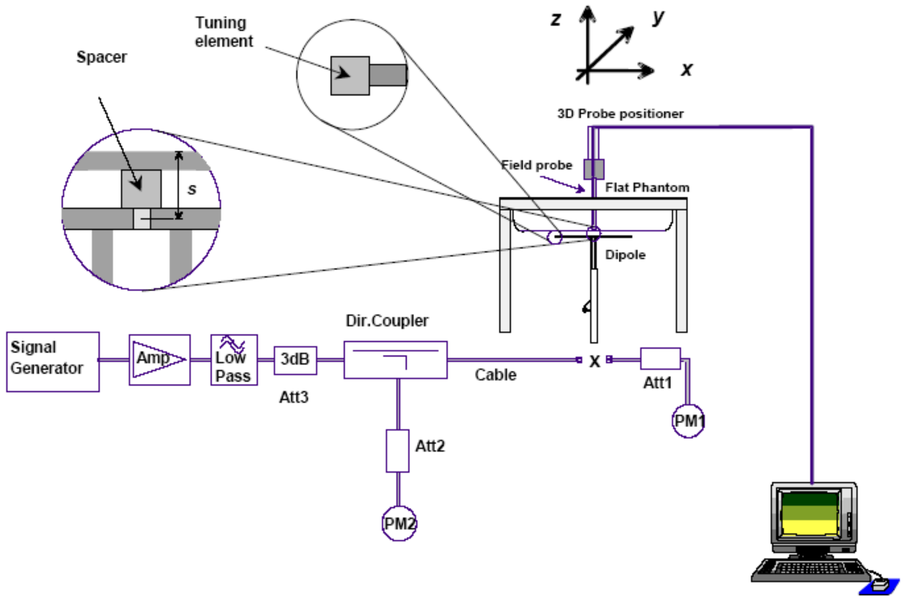
Please refer to the following tables.

835 MHz Body				1900 MHz Body		
Frequency (MHz)	e'	e''		Frequency (MHz)	e'	e''
824.0	53.8688	20.6975		1850.0	52.0963	14.5052
824.5	53.8021	20.6154		1851.2	52.0402	14.4416
825.0	53.8619	20.6407		1852.4	51.8381	14.4451
825.5	53.7945	20.6542		1853.6	51.8827	14.4889
826.0	53.8604	20.6687		1854.8	51.9976	14.4830
826.5	53.8126	20.6789		1856.0	52.0053	14.5244
827.0	53.7831	20.6231		1857.2	52.0214	14.5726
827.5	53.8635	20.6275		1858.4	51.8979	14.4987
828.0	53.8024	20.6505		1859.6	51.8232	14.4897
828.5	53.8110	20.6872		1860.8	52.0255	14.4651
829.0	53.7796	20.6821		1862.0	51.9091	14.4854
829.5	53.8716	20.6639		1863.2	52.0496	14.4520
830.0	53.8457	20.6550		1864.4	51.7565	14.5408
830.5	53.8248	20.7094		1865.6	51.8929	14.4243
831.0	53.8208	20.6869		1866.8	52.0420	14.5775
831.5	53.7811	20.6240		1868.0	52.0428	14.4243
832.0	53.8499	20.6609		1869.2	51.9884	14.4920
832.5	53.7729	20.6724		1870.4	52.0112	14.4203
833.0	53.7809	20.6989		1871.6	51.9002	14.4555
833.5	53.7986	20.6298		1872.8	51.9784	14.5469
834.0	53.8647	20.6535		1874.0	52.0020	14.5769
834.5	53.8658	20.7086		1875.2	51.8479	14.4902
835.0	53.8396	20.6504		1876.4	51.9175	14.4989
835.5	53.7877	20.6648		1877.6	51.9760	14.5083
836.0	53.8694	20.7002		1878.8	51.9180	14.4195
836.5	53.8260	20.6868		1880.0	51.7682	14.5256
837.0	53.8159	20.6399		1881.2	51.9402	14.5617
837.5	53.8256	20.6817		1882.4	51.9034	14.5521
838.0	53.8338	20.6747		1883.6	51.9197	14.5545
838.5	53.8024	20.6378		1884.8	51.7896	14.4294
839.0	53.8192	20.6542		1886.0	51.9164	14.5029
839.5	53.8048	20.6736		1887.2	51.7582	14.4359
840.0	53.8199	20.6937		1888.4	52.0290	14.4159
840.5	53.7951	20.6756		1889.6	52.0670	14.4652
841.0	53.8686	20.6221		1890.8	52.1003	14.5155
841.5	53.8397	20.6763		1892.0	51.9653	14.5434
842.0	53.7955	20.6941		1893.2	52.0135	14.5419
842.5	53.7833	20.6297		1894.4	51.8513	14.5475
843.0	53.7765	20.6410		1895.6	51.9141	14.5331
843.5	53.7966	20.7027		1896.8	51.7473	14.4531
844.0	53.8073	20.6472		1898.0	51.7742	14.4723
844.5	53.8564	20.6560		1899.2	51.7692	14.4695
845.0	53.8324	20.6554		1900.4	51.7377	14.4513
845.5	53.7894	20.6963		1901.6	51.7889	14.5412
846.0	53.7780	20.6648		1902.8	51.8225	14.5361
846.5	53.8235	20.6356		1904.0	51.9583	14.4548
847.0	53.8050	20.6355		1905.2	51.8883	14.5261
847.5	53.8103	20.6779		1906.4	51.8839	14.5643
848.0	53.8722	20.6613		1907.6	51.8547	14.4338
848.5	53.8206	20.6735		1908.8	51.8933	14.5327
849.0	53.8502	20.6258		1910.0	51.9953	14.4778

System Accuracy Verification

Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of ±10%. The validation results are tabulated below. And also the corresponding SAR plot is attached as well in the SAR plots files.

System Verification Setup Block Diagram



Probe and dipole antenna List and Detail

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
APREL	Probe	ALS-E-020	500-00283	2014-10-14	2015-10-13
APREL	Dipole antenna(835MHz)	ALS-D-835-S-2	180-00558	2014-10-08	2017-10-07
APREL	Dipole antenna(1900MHz)	ALS-D-1900-S-2	210-00710	2014-10-09	2017-10-08

System Accuracy Check Results

Date	Frequency Band	Liquid Type	Measured SAR (W/Kg)		Target Value (W/Kg)	Delta (%)	Tolerance (%)
2015-03-28	835	Body	1g	9.528	9.736	-2.136	±10
	1900	Body	1g	42.810	39.715	7.793	±10

*All SAR values are normalized to 1 Watt forward power.

SAR SYSTEM VALIDATION DATA

Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

System Performance Check 835 MHz Body Liquid

Dipole 835 MHz; Type: ALS-D-835-S-2; S/N: 180-00558

Product Data	
Device Name	: Dipole 835 MHz
Serial No.	: 180-00558
Type	: Dipole
Model	: ALS-D-835-S-2
Frequency Band	: 835
Max. Transmit Pwr	: 1 W
Drift Time	: 3 min(s)
Power Drift-Start	: 9.315 W/kg
Power Drift-Finish	: 9.428 W/kg
Power Drift (%)	: 1.237

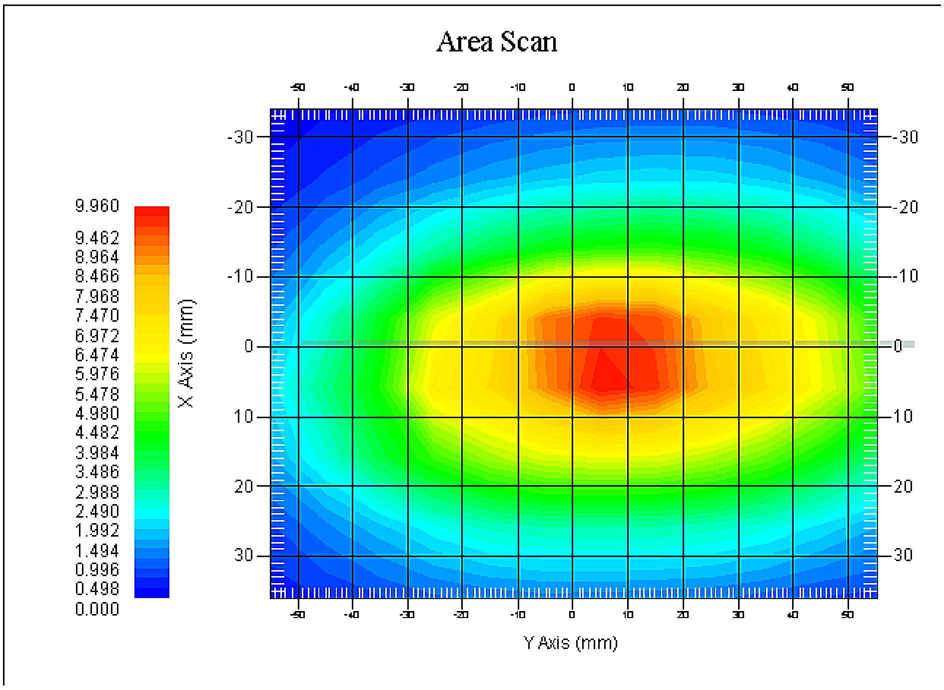
Phantom Data	
Name	: APREL-Uni
Type	: Uni-Phantom
Serial No.	: System Default
Location	: Center
Description	: Default
Phantom Data	

Tissue Data	
Type	: Body
Serial No.	: 270-02101
Frequency	: 835.0 MHz
Last Calib. Date	: 28-Mar-2015
Temperature	: 20.00 °C
Ambient Temp.	: 21.00 °C
Humidity	: 56.00 RH%
Epsilon	: 53.84 F/m
Sigma	: 0.96 S/m
Density	: 1000.00 kg/cu. m

Probe Data	
Name	: E-Field
Model	: E-020
Type	: E-Field Triangle
Serial No.	: 500-00283
Last Calib. Date	: 14-Oct-2014
Frequency Band	: 835
Duty Cycle Factor	: 1
Conversion Factor	: 5.9
Probe Sensitivity	: 1.20 1.20 1.20 µV/(V/m)2
Compression Point	: 95.00 mV
Offset	: 1.56 mm

Measurement Data	
Crest Factor	: 1
Scan Type	: Complete
Tissue Temp.	: 21.00 °C
Ambient Temp.	: 21.00 °C
Area Scan	: 7x9x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan	: 7x7x7 : Measurement x=5mm, y=5mm, z=5mm

1 gram SAR value	: 9.528 W/kg
10 gram SAR value	: 6.736 W/kg
Area Scan Peak SAR	: 9.769 W/kg
Zoom Scan Peak SAR	: 15.368 W/kg



835 MHz System Validation with Body Tissue

Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

System Performance Check 1900 MHz Body Liquid

Dipole 1900 MHz; Type: ALS-D-1900-S-2; S/N: 210-00710

Product Data
Device Name : Dipole 1900MHz
Serial No. : 210-00710
Type : Dipole
Model : ALS-D-1900-S-2
Frequency Band : 1900
Max. Transmit Pwr : 1 W
Drift Time : 3 min(s)
Power Drift-Start : 45.374 W/kg
Power Drift-Finish : 45.864 W/kg
Power Drift (%) : 1.086

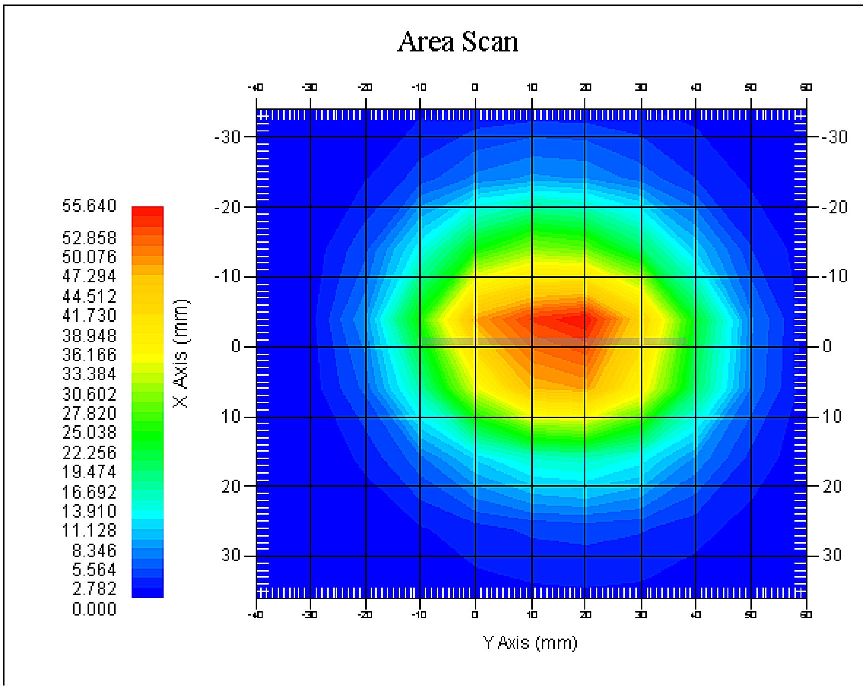
Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Serial No. : System Default
Location : Center
Description : Default

Tissue Data
Type : Body
Serial No. : 295-02102
Frequency : 1900.00 MHz
Last Calib. Date : 28-Mar-2015
Temperature : 20.00 °C
Ambient Temp. : 21.00 °C
Humidity : 56.00 RH%
Epsilon : 51.74 F/m
Sigma : 1.53 S/m
Density : 1000.00 kg/cu. m

Probe Data
Name : E-Field
Model : E-020
Type : E-Field Triangle
Serial No. : 500-00283
Last Calib. Date : 14-Oct-2014
Frequency Band : 1900
Duty Cycle Factor : 1
Conversion Factor : 4.5
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

Measurement Data
Crest Factor : 1
Scan Type : Complete
Tissue Temp. : 20.00 °C
Ambient Temp. : 21.00 °C
Area Scan : 7x9x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm

1 gram SAR value	: 42.810 W/kg
10 gram SAR value	: 22.304 W/kg
Area Scan Peak SAR	: 55.233 W/kg
Zoom Scan Peak SAR	: 75.188 W/kg



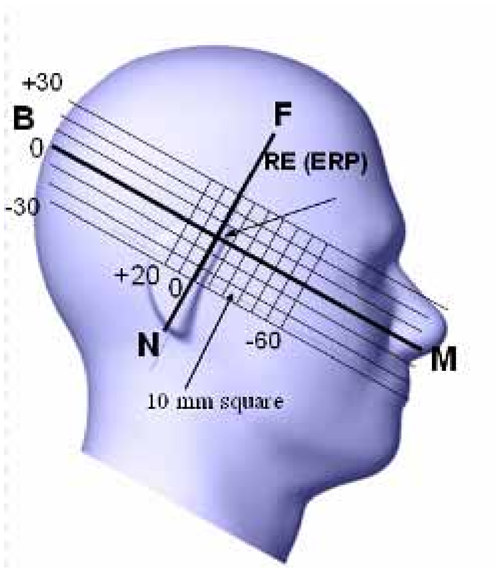
1900 MHz System Validation with Body Tissue

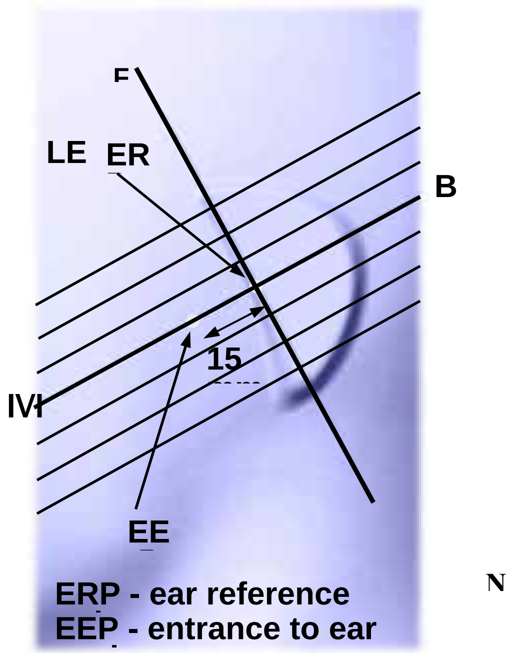
EUT TEST STRATEGY AND METHODOLOGY

Test Positions for Device Operating Next to a Person’s Ear

This category includes most wireless handsets with fixed, retractable or internal antennas located toward the top half of the device, with or without a foldout, sliding or similar keypad cover. The handset should have its earpiece located within the upper ¼ of the device, either along the centerline or off-centered, as perceived by its users. This type of handset should be positioned 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”. The “test device reference point” should be located at the same level as the center of the earpiece region. The “vertical centerline” should bisect the front surface of the handset at its top and bottom edges. A “ear reference point” is located on the outer surface of the head phantom on each ear spacer. It is located 1.5 cm above the center of the ear canal entrance in the “phantom reference plane” defined by the three lines joining the center of each “ear reference point” (left and right) and the tip of the mouth.

A handset should be initially positioned with the earpiece region pressed against the ear spacer of a head phantom. For the SCC-34/SC-2 head phantom, the device should be positioned parallel to the “N-F” line defined along the base of the ear spacer that contains the “ear reference point”. For interim head phantoms, the device should be positioned parallel to the cheek for maximum RF energy coupling. The “test device reference point” is aligned to the “ear reference point” on the head phantom and the “vertical centerline” is aligned to the “phantom reference plane”. This is called the “initial ear position”. While maintaining these three alignments, the body of the handset is gradually adjusted to each of the following positions for evaluating SAR:





Cheek/Touch Position

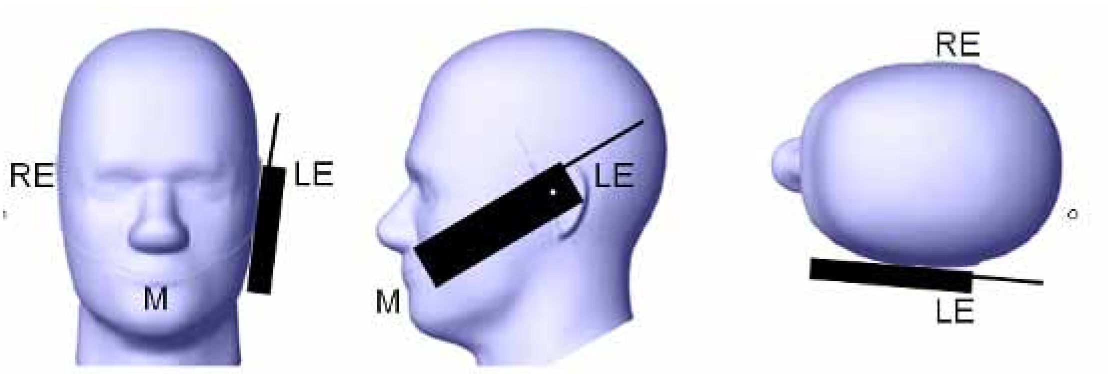
The device is brought toward the mouth of the head phantom by pivoting against the "ear reference point" or along the "N-F" line for the SCC-34/SC-2 head phantom.

This test position is established:

- When any point on the display, keypad or mouthpiece portions of the handset is in contact with the phantom.
- (or) When any portion of a foldout, sliding or similar keypad cover opened to its intended self-adjusting normal use position is in contact with the cheek or mouth of the phantom.

For existing head phantoms – when the handset loses contact with the phantom at the pivoting point, rotation should continue until the device touches the cheek of the phantom or breaks its last contact from the ear spacer.

Cheek /Touch Position



Ear/Tilt Position

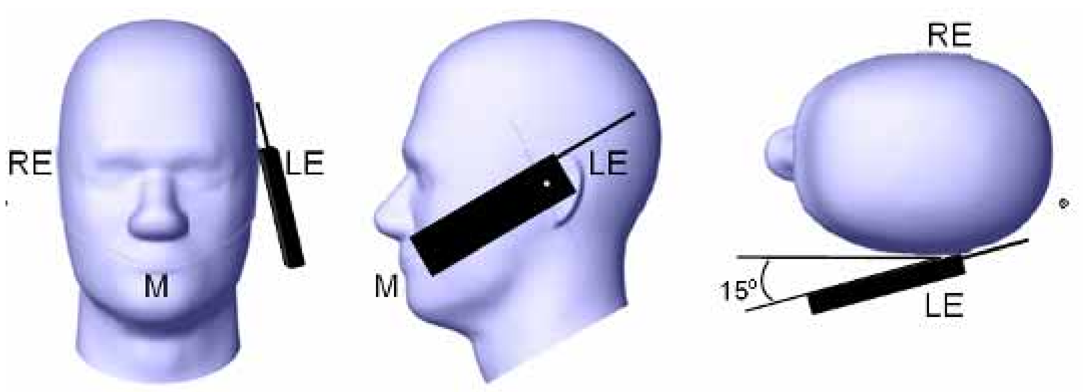
With the handset aligned in the "Cheek/Touch Position":

1) If the earpiece of the handset is not in full contact with the phantom's ear spacer (in the "Cheek/Touch position") and the peak SAR location for the "Cheek/Touch" position is located at the ear spacer region or corresponds to the earpiece region of the handset, the device should be returned to the "initial ear position" by rotating it away from the mouth until the earpiece is in full contact with the ear spacer.

2) (otherwise) The handset should be moved (translated) away from the cheek perpendicular to the line passes through both "ear reference points" (note: one of these ear reference points may not physically exist on a split head model) for approximate 2-3 cm. While it is in this position, the device handset is tilted away from the mouth with respect to the "test device reference point" until the inside angle between the vertical centerline on the front surface of the phone and the horizontal line passing through the ear reference point isby 15 80°. After the tilt, it is then moved (translated) back toward the head perpendicular to the line passes through both "ear reference points" until the device touches the phantom or the ear spacer. If the antenna touches the head first, the positioning process should be repeated with a tilt angle less than 15° so that the device and its antenna would touch the phantom simultaneously. This test position may require a device holder or positioner to achieve the translation and tilting with acceptable positioning repeatability.

If a device is also designed to transmit with its keypad cover closed for operating in the head position, such positions should also be considered in the SAR evaluation. The device should be tested on the left and right side of the head phantom in the "Cheek/Touch" and "Ear/Tilt" positions. When applicable, each configuration should be tested with the antenna in its fully extended and fully retracted positions. These test configurations should be tested at the high, middle and low frequency channels of each operating mode; for example, AMPS, CDMA, and TDMA. If the SAR measured at the middle channel for each test configuration (left, right, Cheek/Touch, Tile/Ear, extended and retracted) is at least 2.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s). If the transmission band of the test device is less than 10 MHz, testing at the high and low frequency channels is optional.

Ear /Tilt 15° Position



Test positions for body-worn and other configurations

Body-worn operating configurations should be tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations. Devices with a headset output should be tested with a headset connected to the device. When multiple accessories that do not contain metallic components are supplied with the device, the device may be tested with only the accessory that dictates the closest spacing to the body. When multiple accessories that contain metallic components are supplied with the device, the device must be tested with each accessory that contains a unique metallic component. If multiple accessories share an identical metallic component (e.g., the same metallic belt-clip used with different holsters with no other metallic components), only the accessory that dictates the closest spacing to the body must be tested.

Body-worn accessories may not always be supplied or available as options for some devices that are intended to be authorized for body-worn use. A separation distance of 1.5 cm between the back of the device and a flat phantom is recommended for testing body-worn SAR compliance under such circumstances. Other separation distances may be used, but they should not exceed 2.5 cm. In these cases, the device may use body-worn accessories that provide a separation distance greater than that tested for the device provided however that the accessory contains no metallic components.

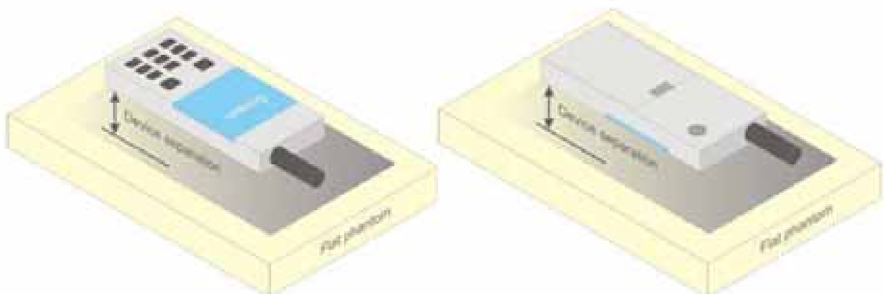


Figure 5 – Test positions for body-worn devices

SAR Evaluation Procedure

The evaluation was performed with the following procedure:

Step 1: Measurement of the SAR value at a fixed location above the ear point or central position was used as a reference value for assessing the power drop. The SAR at this point is measured at the start of the test and then again at the end of the testing.

Step 2: The SAR distribution at the exposed side of the head was measured at a distance of 4 mm from the inner surface of the shell. The area covered the entire dimension of the head or EUT and the horizontal grid spacing was 10 mm x 10 mm. Based on these data, the area of the maximum absorption was determined by spline interpolation. The first Area Scan covers the entire dimension of the EUT to ensure that the hotspot was correctly identified.

Step 3: Around this point, a volume of 35 mm x 35 mm x 35 mm was assessed by measuring 7x 7 x 7 points. On the basis of this data set, the spatial peak SAR value was evaluated under the following procedure:

1) The data at the surface were extrapolated, since the center of the dipoles is 1.2 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.3 mm. The extrapolation was based on a least square algorithm. 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.

2) The maximum interpolated value was searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g or 10 g) were computed by 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). The volume was integrated with the trapezoidal-algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the averages.

All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

Step 4: Re-measurement of the SAR value at the same location as in Step 1. If the value changed by more than 5%, the evaluation was repeated.

Test methodology

KDB447498 D01 General RF Exposure Guidance v05r02.
KDB 648474 D04 Handset SAR v01r02.
KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01r03
KDB 865664 D02 RF Exposure Reporting v01r01
KDB 941225 D01 3G SAR Procedures v03
KDB 941225 D06 Hotspot Mode v02

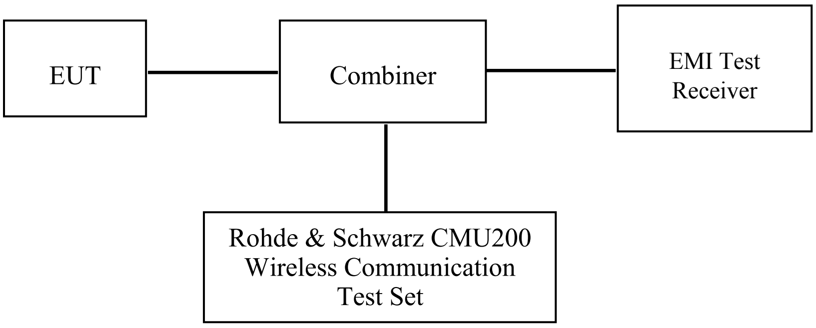
CONDUCTED OUTPUT POWER MEASUREMENT

Provision Applicable

The measured peak output power should be greater and within 5% than EMI measurement.

Test Procedure

The RF output of the transmitter was connected to the input of the EMI Test Receiver through sufficient attenuation.



GSM & 3G

Maximum Output Power among production units

Max Target Power for Production Unit (dBm)				
Mode/Band		Channel		
		Low	Middle	High
ANT1#	GPRS850 1 slot	31.80	31.80	31.80
	GPRS850 2 slots	29.80	29.80	29.80
	GPRS850 3 slots	27.80	27.80	27.80
	GPRS850 4 slots	25.80	25.80	25.80
	EGPRS850 1 slot	25.80	25.80	25.80
	EGPRS850 2 slots	23.70	23.70	23.70
	EGPRS850 3 slots	21.70	21.70	21.70
	EGPRS850 4 slots	19.70	19.70	19.70
	GPRS1900 1 slot	28.10	28.10	28.10
	GPRS1900 2 slots	26.00	26.00	26.00
	GPRS1900 3 slots	24.00	24.00	24.00
	GPRS1900 4 slots	22.10	22.10	22.10
	EGPRS1900 1 slot	24.10	24.10	24.10
	EGPRS1900 2 slots	23.80	23.80	23.80
	EGPRS1900 3 slots	19.80	19.80	19.80
	EGPRS1900 4 slots	17.90	17.90	17.90
	WCDMA850	23.70	21.20	20.80
	WCDMA1900	21.90	22.10	21.70
ANT2#	GPRS850 1 slot	32.30	32.30	32.30
	GPRS850 2 slots	30.20	30.20	30.20
	GPRS850 3 slots	28.20	28.20	28.20
	GPRS850 4 slots	26.20	26.20	26.20
	EGPRS850 1 slot	25.60	25.60	25.60

ANT2#	EGPRS850 2 slots	23.50	23.50	23.50
	EGPRS850 3 slots	21.50	21.50	21.50
	EGPRS850 4 slots	19.50	19.50	19.50
	GPRS1900 1 slot	28.50	28.50	28.50
	GPRS1900 2 slots	26.30	26.30	26.30
	GPRS1900 3 slots	24.40	24.40	24.40
	GPRS1900 4 slots	22.50	22.50	22.50
	EGPRS1900 1 slot	25.20	25.20	25.20
	EGPRS1900 2 slots	23.20	23.20	23.20
	EGPRS1900 3 slots	21.20	21.20	21.20
	EGPRS1900 4 slots	19.30	19.30	19.30
	WCDMA850	22.60	21.10	20.80
	WCDMA1900	21.50	22.00	21.50
Wi-Fi		12.90	12.90	12.90

Note:

1. It was unrealizable for the main Antenna 1# and 2# transmitting simultaneously.

Test Results:

ANT1#:

GPRS:

Band	Channel No.	Frequency (MHz)	RF Output Power (dBm)			
			1 slot	2 slot	3 slots	4 slots
GSM 850	128	824.2	31.65	29.64	27.72	25.68
	190	836.6	31.70	29.69	27.79	25.72
	251	848.8	31.71	29.70	27.76	25.74
PCS 1900	512	1850.2	28.07	25.91	23.98	22.04
	661	1880.0	27.85	25.83	23.90	21.92
	810	1909.8	27.62	25.70	23.84	21.80

EDGE:

Band	Channel No.	Frequency (MHz)	RF Output Power (dBm)			
			1 slot	2 slot	3 slots	4 slots
GSM 850	128	824.2	25.69	23.68	21.66	19.61
	190	836.6	25.75	23.69	21.65	19.60
	251	848.8	25.79	23.61	21.58	19.59
PCS 1900	512	1850.2	24.01	21.86	19.79	17.82
	661	1880.0	23.92	23.74	19.70	17.67
	810	1909.8	23.74	21.43	19.46	17.41

For SAR, the time based average power is relevant, the difference in between depends on the duty cycle of the TDMA signal.

Number of Time slot	1	2	3	4
Duty Cycle	1:8	1:4	1:2.66	1:2
Time based Ave. power compared to slotted Ave. power	-9 dB	-6 dB	-4.25 dB	-3 dB
Crest Factor	8	4	2.66	2

The time based average power for GPRS

Band	Channel No.	Frequency (MHz)	Time based average Power (dBm)			
			1 slot	2 slot	3 slots	4 slots
GSM 850	128	824.2	22.65	23.64	23.47	22.68
	190	836.6	22.70	23.69	23.54	22.72
	251	848.8	22.71	**23.70**	23.51	22.74
PCS 1900	512	1850.2	19.07	**19.91**	19.73	19.04
	661	1880.0	18.85	19.83	19.65	18.92
	810	1909.8	18.62	19.70	19.59	18.80

The time based average power for EDGE

Band	Channel No.	Frequency (MHz)	Time based average Power (dBm)			
			1 slot	2 slot	3 slots	4 slots
GSM 850	128	824.2	16.69	17.68	17.41	16.61
	190	836.6	16.75	**17.69**	17.40	16.60
	251	848.8	16.79	17.61	17.33	16.59
PCS 1900	512	1850.2	15.01	15.86	15.54	14.82
	661	1880.0	14.92	**17.74**	15.45	14.67
	810	1909.8	14.74	15.43	15.21	14.41

Note:

1. Rohde & Schwarz Radio Communication Tester (CMU200) was used for the measurement of GSM peak and average output power for active timeslots.
2. For GSM voice, 1 timeslot has been activated with power level 5 (850 MHz band) and 0 (1900 MHz band).
3. For GPRS, 1, 2, 3 and 4 timeslots has been activated separately with power level 3(850 MHz band) and 3(1900 MHz band).
4. For E-GRPS, 1, 2, 3 and 4 timeslots has been activated separately with power control level 6(850 MHz band) and 5(1900 MHz band).
5. KDB941225 D03-The max average output power of the EGPRS mode is lower than in the normal GSM voice mode, the SAR of EGPRS mode is not required.

ANT2#:

GPRS:

Band	Channel No.	Frequency (MHz)	RF Output Power (dBm)			
			1 slot	2 slot	3 slots	4 slots
GSM 850	128	824.2	32.24	30.07	28.13	26.11
	190	836.6	32.26	30.17	28.18	26.13
	251	848.8	32.16	30.09	28.04	26.01
PCS 1900	512	1850.2	28.40	26.29	24.33	22.41
	661	1880.0	28.23	26.13	24.19	22.15
	810	1909.8	28.09	25.91	24.03	22.04

EDGE:

Band	Channel No.	Frequency (MHz)	RF Output Power (dBm)			
			1 slot	2 slot	3 slots	4 slots
GSM 850	128	824.2	25.37	23.25	21.22	19.24
	190	836.6	25.45	23.41	21.43	19.40
	251	848.8	25.52	23.47	21.49	19.47
PCS 1900	512	1850.2	25.12	23.16	21.10	19.22
	661	1880.0	24.92	22.97	20.92	18.87
	810	1909.8	24.72	22.89	20.83	19.01

For SAR, the time based average power is relevant, the difference in between depends on the duty cycle of the TDMA signal.

Number of Time slot	1	2	3	4
Duty Cycle	1:8	1:4	1:2.66	1:2
Time based Ave. power compared to slotted Ave. power	-9 dB	-6 dB	-4.25 dB	-3 dB
Crest Factor	8	4	2.66	2

The time based average power for GPRS

Band	Channel No.	Frequency (MHz)	Time based average Power (dBm)			
			1 slot	2 slot	3 slots	4 slots
GSM 850	128	824.2	23.24	24.07	23.88	23.11
	190	836.6	23.26	**24.17**	23.93	23.13
	251	848.8	23.16	24.09	23.79	23.01
PCS 1900	512	1850.2	19.40	**20.29**	20.08	19.41
	661	1880.0	19.23	20.13	19.94	19.15
	810	1909.8	19.09	19.91	19.78	19.04

The time based average power for EDGE

Band	Channel No.	Frequency (MHz)	Time based average Power (dBm)			
			1 slot	2 slot	3 slots	4 slots
GSM 850	128	824.2	16.37	17.25	16.97	16.24
	190	836.6	16.45	17.41	17.18	16.40
	251	848.8	16.52	**17.47**	17.24	16.47
PCS 1900	512	1850.2	16.12	**17.16**	16.85	16.22
	661	1880.0	15.92	16.97	16.67	15.87
	810	1909.8	15.72	16.89	16.58	16.01

Note:

1. Rohde & Schwarz Radio Communication Tester (CMU200) was used for the measurement of GSM peak and average output power for active timeslots.
2. For GSM voice, 1 timeslot has been activated with power level 5 (850 MHz band) and 0 (1900 MHz band).
3. For GPRS, 1, 2, 3 and 4 timeslots has been activated separately with power level 3(850 MHz band) and 3(1900 MHz band).
4. For E-GRPS, 1, 2, 3 and 4 timeslots has been activated separately with power control level 6(850 MHz band) and 5(1900 MHz band).
5. KDB941225 D03-The max average output power of the EGPRS mode is lower than in the normal GSM voice mode, the SAR of EGPRS mode is not required.

WCDMA-Release 99:

The following tests were conducted according to the test requirements outlines in section 5.2 of the 3GPP TS34.121-1 specification. The EUT has a nominal maximum output power of 24dBm (+1.7/-3.7).

WCDMA General Settings	**Loopback Mode**	Test Mode 1
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm2
	βc /βd	8/15

WCDMA HSDPA

The following tests were conducted according to the test requirements outlines in section 5.2 of the 3GPP TS34.121-1 specification.

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Subset	1	2	3	4
WCDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set1			
	Power Control Algorithm	Algorithm2			
	βc	2/15	12/15	15/15	15/15
	βd	15/15	15/15	8/15	4/15
	βd (SF)	64			
	βc/ βd	2/15	12/15	15/8	15/4
	βhs	4/15	24/15	30/15	30/15
	MPR(dB)	0	0	0.5	0.5
HSDPA Specific Settings	D_{ACK}	8			
	D_{NAK}	8			
	D_{CQI}	8			
	Ack-Nack repetition factor	3			
	CQI Feedback	4ms			
	CQI Repetition Factor	2			
	Ahs= βhs/ βc	30/15			

WCDMA HSUPA

The following tests were conducted according to the test requirements outlines in section 5.2 of the 3GPP TS34.121-1 specification.

	Mode	HSUPA	HSUPA	HSUPA	HSUPA	HSUPA
	Subset	1	2	3	4	5
WCDMA General Settings	Loopback Mode	Test Mode 1				
	Rel99 RMC	12.2kbps RMC				
	HSDPA FRC	H-Set1				
	HSUPA Test	HSUPA Loopback				
	Power Control Algorithm	Algorithm2				
	βc	11/15	6/15	15/15	2/15	15/15
	βd	15/15	15/15	9/15	15/15	0
	βec	209/225	12/15	30/15	2/15	5/15
	βc/ βd	11/15	6/15	15/9	2/15	-
	βhs	22/15	12/15	30/15	4/15	5/15
	CM(dB)	1.0	3.0	2.0	3.0	1.0
	MPR(dB)	0	2	1	2	0
HSDPA Specific Settings	DACK	8				
	DNAK	8				
	DCQI	8				
	Ack-Nack repetition factor	3				
	CQI Feedback	4ms				
	CQI Repetition Factor	2				
	Ahs= βhs/ βc	30/15				
HSUPA Specific Settings	DE-DPCCH	6	8	8	5	7
	DHARQ	0	0	0	0	0
	AG Index	20	12	15	17	21
	ETFCI	75	67	92	71	81
	Associated Max UL Data Rate kbps	242.1	174.9	482.8	205.8	308.9
	Reference E_FCIs	E-TFCI 11 E E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO23 E-TFCI 75 E-TFCI PO26 E-TFCI 81 E-TFCI PO 27		E-TFCI 11 E-TFCI PO4 E-TFCI 92 E-TFCI PO 18	E-TFCI 11 E E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO23 E-TFCI 75 E-TFCI PO26 E-TFCI 81 E-TFCI PO 27	

Results (12.2kbps RMC)

ANT1#:

Band	Frequency (MHz)	Channel NO.	Conducted Output Power	
			(dBm)	(Watt)
WCDMA 850	826.4	4132	**23.69**	0.234
	836.6	4183	21.18	0.131
	846.6	4233	20.70	0.117
WCDMA 1900	1852.4	9262	21.89	0.155
	1880.0	9400	**22.09**	0.162
	1907.6	9538	21.60	0.145

Results (HSDPA)

Band	Frequency (MHz)	Channel NO.	Conducted Output Power (dBm)			
			Subset 1	Subset 2	Subset 3	Subset 4
WCDMA 850	826.4	4132	23.63	23.57	23.61	23.52
	836.6	4183	20.82	20.93	20.88	20.94
	846.6	4233	20.42	20.47	20.44	20.46
WCDMA 1900	1852.4	9262	21.65	21.60	21.64	21.62
	1880.0	9400	22.01	22.04	21.97	22.03
	1907.6	9538	21.34	21.36	21.30	32.34

Results (HSUPA)

Band	Frequency (MHz)	Channel NO.	Conducted Output Power (dBm)				
			Subset 1	Subset 2	Subset 3	Subset 4	Subset 5
WCDMA 850	826.4	4132	23.44	23.41	23.43	23.39	23.40
	836.6	4183	21.00	20.97	20.91	20.96	20.98
	846.6	4233	20.48	20.49	20.43	20.40	20.41
WCDMA 1900	1852.4	9262	21.61	21.58	21.66	21.56	21.59
	1880.0	9400	22.07	21.94	21.97	21.96	21.94
	1907.6	9538	21.39	21.31	21.33	21.38	21.30

ANT2#:

Band	Frequency (MHz)	Channel NO.	Conducted Output Power	
			(dBm)	(Watt)
WCDMA 850	826.4	4132	**22.58**	0.181
	836.6	4183	21.04	0.127
	846.6	4233	20.51	0.112
WCDMA 1900	1852.4	9262	21.41	0.138
	1880.0	9400	**21.89**	0.155
	1907.6	9538	21.31	0.135

Results (HSDPA)

Band	Frequency (MHz)	Channel NO.	Conducted Output Power (dBm)			
			Subset 1	Subset 2	Subset 3	Subset 4
WCDMA 850	826.4	4132	21.49	21.44	21.40	21.48
	836.6	4183	20.23	20.28	20.21	20.24
	846.6	4233	20.34	20.30	20.38	20.35
WCDMA 1900	1852.4	9262	20.79	20.74	20.78	20.73
	1880.0	9400	20.19	20.14	20.10	20.18
	1907.6	9538	20.66	20.61	20.58	20.64

Results (HSUPA)

Band	Frequency (MHz)	Channel NO.	Conducted Output Power (dBm)				
			Subset 1	Subset 2	Subset 3	Subset 4	Subset 5
WCDMA 850	826.4	4132	21.43	21.46	21.47	21.42	21.45
	836.6	4183	20.29	20.27	20.20	20.25	20.26
	846.6	4233	20.31	20.39	20.33	20.36	20.32
WCDMA 1900	1852.4	9262	20.76	20.71	20.77	20.72	20.70
	1880.0	9400	20.16	20.13	20.10	20.17	20.12
	1907.6	9538	20.68	20.59	20.63	20.69	20.62

Note:

1. The default test configuration is to measure SAR with an established radio link between the EUT and a communication test set using a 12.2 kbps RMC (reference measurement Channel) Configured in Test Loop Model 1.
2. KDB 941225 D01-Body SAR is not required for HSDPA when the maximum average output of each RF channel with HSDPA active is less than ¼ dB higher than measured without HSDPA using 12.2kbps RMC or the maximum SAR for 12.2kbps RMC is < 75% of SAR limit.
3. KDB 941225 D01-Body SAR is not required for HSUPA when the maximum average output of each RF channel with HSUPA active is less than ¼ dB higher than measured without HSUPA using 12.2kbps RMC and the maximum SAR for 12.2kbps RMC is < 75% of SAR limit.

Wi-Fi

Band	Frequency (MHz)	Conducted Output Power	
		(dBm)	(mw)
802.11b	2412	12.66	18.450
	2437	12.82	19.143
	2462	12.73	18.750
802.11g	2412	12.74	18.793
	2437	12.66	18.450
	2462	12.82	19.143
802.11n HT20	2412	12.64	18.365
	2437	12.73	18.750
	2462	**12.88**	19.409
802.11n HT40	2422	11.35	13.646
	2437	11.23	13.274
	2452	11.31	13.521

Note:

1. The output power was tested under data rate 1 Mbps for 802.11b, 6 Mbps for 802.11g, 6.5 Mbps for 802.11n HT20, 13.5 Mbps for 802.11n HT40.

SAR MEASUREMENT RESULTS

This page summarizes the results of the performed dosimetric evaluation.

SAR Test Data

Environmental Conditions

Temperature:	21-24 ℃
Relative Humidity:	50-53 %
ATM Pressure:	1001-1002 mbar

Testing was performed by Terry XiaHou on 2015-03-28

GSM 850:

EUT Position	Frequency (MHz)	Test Mode	Antenna	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
							Scaled Factor	Meas. SAR	Scaled SAR	Plot
Body-Front (10.0mm)	824.2	GPRS	Antenna2#	/	/	/	/	/	/	/
	836.6	GPRS		0.640	30.17	30.20	1.007	0.639	0.643	/
	848.8	GPRS		/	/	/	/	/	/	/
Body-Back (10.0mm)	824.2	GPRS		/	/	/	/	/	/	/
	836.6	GPRS		-0.664	30.17	30.20	1.007	0.780	**0.785**	**1#**
	848.8	GPRS		/	/	/	/	/	/	/
Body-Left (10.0mm)	824.2	GPRS		/	/	/	/	/	/	/
	836.6	GPRS		-2.256	30.17	30.20	1.007	0.403	0.406	/
	848.8	GPRS		/	/	/	/	/	/	/
Body-Right (10.0mm)	824.2	GPRS		/	/	/	/	/	/	/
	836.6	GPRS		1.886	30.17	30.20	1.007	0.157	0.158	/
	848.8	GPRS		/	/	/	/	/	/	/
Body-Top (10.0mm)	824.2	GPRS		/	/	/	/	/	/	/
	836.6	GPRS		-2.496	30.17	30.20	1.007	0.287	0.289	/
	848.8	GPRS		/	/	/	/	/	/	/
Body-Front (10.0mm)	824.2	GPRS	Antenna1#	/	/	/	/	/	/	/
	836.6	GPRS		/	/	/	/	/	/	/
	848.8	GPRS		-0.048	29.70	29.80	1.023	0.367	0.376	/
Body-Back (10.0mm)	824.2	GPRS		/	/	/	/	/	/	/
	836.6	GPRS		/	/	/	/	/	/	/
	848.8	GPRS		-1.292	29.70	29.80	1.023	0.535	0.547	/
Body-Left (10.0mm)	824.2	GPRS		/	/	/	/	/	/	/
	836.6	GPRS		/	/	/	/	/	/	/
	848.8	GPRS		1.965	29.70	29.80	1.023	0.261	0.267	/
Body-Right (10.0mm)	824.2	GPRS		/	/	/	/	/	/	/
	836.6	GPRS		/	/	/	/	/	/	/
	848.8	GPRS		4.486	29.70	29.80	1.023	0.238	0.244	/
Body-Bottom (10.0mm)	824.2	GPRS		/	/	/	/	/	/	/
	836.6	GPRS		/	/	/	/	/	/	/
	848.8	GPRS		-0.915	29.70	29.80	1.023	0.372	0.381	/

PCS 1900:

EUT Position	Frequency (MHz)	Test Mode	Antenna	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)				
							Scaled Factor	Meas. SAR	Scaled SAR	Plot
Body-Front (10.0mm)	1850.2	GPRS	Antenna2#	-0.690	26.29	26.30	1.002	0.151	0.151	/
	1880.0	GPRS		/	/	/	/	/	/	/
	1909.8	GPRS		/	/	/	/	/	/	/
Body-Back (10.0mm)	1850.2	GPRS		-1.093	26.29	26.30	1.002	0.183	**0.183**	**2#**
	1880.0	GPRS		/	/	/	/	/	/	/
	1909.8	GPRS		/	/	/	/	/	/	/
Body-Left (10.0mm)	1850.2	GPRS		1.894	26.29	26.30	1.002	0.067	0.067	/
	1880.0	GPRS		/	/	/	/	/	/	/
	1909.8	GPRS		/	/	/	/	/	/	/
Body-Right (10.0mm)	1850.2	GPRS		-0.730	26.29	26.30	1.002	0.035	0.035	/
	1880.0	GPRS		/	/	/	/	/	/	/
	1909.8	GPRS		/	/	/	/	/	/	/
Body-Top (10.0mm)	1850.2	GPRS		1.456	26.29	26.30	1.002	0.105	0.105	/
	1880.0	GPRS		/	/	/	/	/	/	/
	1909.8	GPRS		/	/	/	/	/	/	/
Body-Front (10.0mm)	1850.2	GPRS	Antenna1#	3.220	25.91	26.00	1.021	0.122	0.125	/
	1880.0	GPRS		/	/	/	/	/	/	/
	1909.8	GPRS		/	/	/	/	/	/	/
Body-Back (10.0mm)	1850.2	GPRS		-0.547	25.91	26.00	1.021	0.117	0.119	/
	1880.0	GPRS		/	/	/	/	/	/	/
	1909.8	GPRS		/	/	/	/	/	/	/
Body-Left (10.0mm)	1850.2	GPRS		-2.270	25.91	26.00	1.021	0.072	0.074	/
	1880.0	GPRS		/	/	/	/	/	/	/
	1909.8	GPRS		/	/	/	/	/	/	/
Body-Right (10.0mm)	1850.2	GPRS		-2.736	25.91	26.00	1.021	0.083	0.085	/
	1880.0	GPRS		/	/	/	/	/	/	/
	1909.8	GPRS		/	/	/	/	/	/	/
Body-Bottom (10.0mm)	1850.2	GPRS		1.637	25.91	26.00	1.021	0.077	0.079	/
	1880.0	GPRS		/	/	/	/	/	/	/
	1909.8	GPRS		/	/	/	/	/	/	/

Note:
1. When the 1-g SAR is ≤ 0.8W/Kg, testing for other channels are optional.
2. The EUT is a Capability Class B mobile phone which can be attached to both GPRS and GSM services.
3.The Multi-slot Classes of EUT is Class 12 which has maximum 4 Downlink slots and 4 Uplink slots, the maximum active slots is 5, when perform the multiple slots scan, 3DL+2UL is the worst case.
4. It was unrealizable for the main Antenna 1# and 2# transmitting simultaneously.

WCDMA 850

EUT Position	Frequency (MHz)	Test Mode	Antenna	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
							Scaled Factor	Meas. SAR	Scaled SAR	Plot
Body-Front (10.0mm)	826.4	WCDMA850	Antenna1#	2.815	23.69	23.70	1.002	0.526	0.527	/
	836.6	WCDMA850		/	/	/	/	/	/	/
	846.6	WCDMA850		/	/	/	/	/	/	/
Body-Back (10.0mm)	826.4	WCDMA850		-1.319	23.69	23.70	1.002	0.703	**0.705**	3#
	836.6	WCDMA850		/	/	/	/	/	/	/
	846.6	WCDMA850		/	/	/	/	/	/	/
Body-Left (10.0mm)	826.4	WCDMA850		-1.389	23.69	23.70	1.002	0.325	0.326	/
	836.6	WCDMA850		/	/	/	/	/	/	/
	846.6	WCDMA850		/	/	/	/	/	/	/
Body-Right (10.0mm)	826.4	WCDMA850		1.512	23.69	23.70	1.002	0.173	0.173	/
	836.6	WCDMA850		/	/	/	/	/	/	/
	846.6	WCDMA850		/	/	/	/	/	/	/
Body-Bottom (10.0mm)	826.4	WCDMA850		-2.468	23.69	23.70	1.002	0.277	0.278	/
	836.6	WCDMA850		/	/	/	/	/	/	/
	846.6	WCDMA850		/	/	/	/	/	/	/
Body-Front (10.0mm)	826.4	WCDMA850	Antenna2#	-3.283	22.58	22.60	1.005	0.401	0.403	/
	836.6	WCDMA850		/	/	/	/	/	/	/
	846.6	WCDMA850		/	/	/	/	/	/	/
Body-Back (10.0mm)	826.4	WCDMA850		-0.702	22.58	22.60	1.005	0.377	0.379	/
	836.6	WCDMA850		/	/	/	/	/	/	/
	846.6	WCDMA850		/	/	/	/	/	/	/
Body-Left (10.0mm)	826.4	WCDMA850		2.845	22.58	22.60	1.005	0.219	0.220	/
	836.6	WCDMA850		/	/	/	/	/	/	/
	846.6	WCDMA850		/	/	/	/	/	/	/
Body-Right (10.0mm)	826.4	WCDMA850		-4.609	22.58	22.60	1.005	0.134	0.135	/
	836.6	WCDMA850		/	/	/	/	/	/	/
	846.6	WCDMA850		/	/	/	/	/	/	/
Body-Top (10.0mm)	826.4	WCDMA850		-4.483	22.58	22.60	1.005	0.203	0.204	/
	836.6	WCDMA850		/	/	/	/	/	/	/
	846.6	WCDMA850		/	/	/	/	/	/	/

WCDMA 1900

EUT Position	Frequency (MHz)	Test Mode	Antenna	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
							Scaled Factor	Meas. SAR	Scaled SAR	Plot
Body-Front (10.0mm)	1852.4	WCDMA1900	Antenna1#	/	/	/	/	/	/	/
	1880.0	WCDMA1900		2.282	22.09	22.10	1.002	0.423	0.424	/
	1907.6	WCDMA1900		/	/	/	/	/	/	/
Body-Back (10.0mm)	1852.4	WCDMA1900		/	/	/	/	/	/	/
	1880.0	WCDMA1900		1.047	22.09	22.10	1.002	0.596	**0.597**	**4#**
	1907.6	WCDMA1900		/	/	/	/	/	/	/
Body-Left (10.0mm)	1852.4	WCDMA1900		/	/	/	/	/	/	/
	1880.0	WCDMA1900		0.674	22.09	22.10	1.002	0.236	0.237	/
	1907.6	WCDMA1900		/	/	/	/	/	/	/
Body-Right (10.0mm)	1852.4	WCDMA1900		/	/	/	/	/	/	/
	1880.0	WCDMA1900		-2.005	22.09	22.10	1.002	0.156	0.156	/
	1907.6	WCDMA1900		/	/	/	/	/	/	/
Body-Bottom (10.0mm)	1852.4	WCDMA1900		/	/	/	/	/	/	/
	1880.0	WCDMA1900		-1.745	22.09	22.10	1.002	0.363	0.364	/
	1907.6	WCDMA1900		/	/	/	/	/	/	/
Body-Front (10.0mm)	1852.4	WCDMA1900	Antenna2#	/	/	/	/	/	/	/
	1880.0	WCDMA1900		1.433	21.89	22.00	1.026	0.314	0.322	/
	1907.6	WCDMA1900		/	/	/	/	/	/	/
Body-Back (10.0mm)	1852.4	WCDMA1900		/	/	/	/	/	/	/
	1880.0	WCDMA1900		-2.969	21.89	22.00	1.026	0.427	0.438	/
	1907.6	WCDMA1900		/	/	/	/	/	/	/
Body-Left (10.0mm)	1852.4	WCDMA1900		/	/	/	/	/	/	/
	1880.0	WCDMA1900		1.812	21.89	22.00	1.026	0.183	0.188	/
	1907.6	WCDMA1900		/	/	/	/	/	/	/
Body-Right (10.0mm)	1852.4	WCDMA1900		/	/	/	/	/	/	/
	1880.0	WCDMA1900		4.460	21.89	22.00	1.026	0.12	0.123	/
	1907.6	WCDMA1900		/	/	/	/	/	/	/
Body-Top (10.0mm)	1852.4	WCDMA1900		/	/	/	/	/	/	/
	1880.0	WCDMA1900		-1.954	21.89	22.00	1.026	0.251	0.258	/
	1907.6	WCDMA1900		/	/	/	/	/	/	/

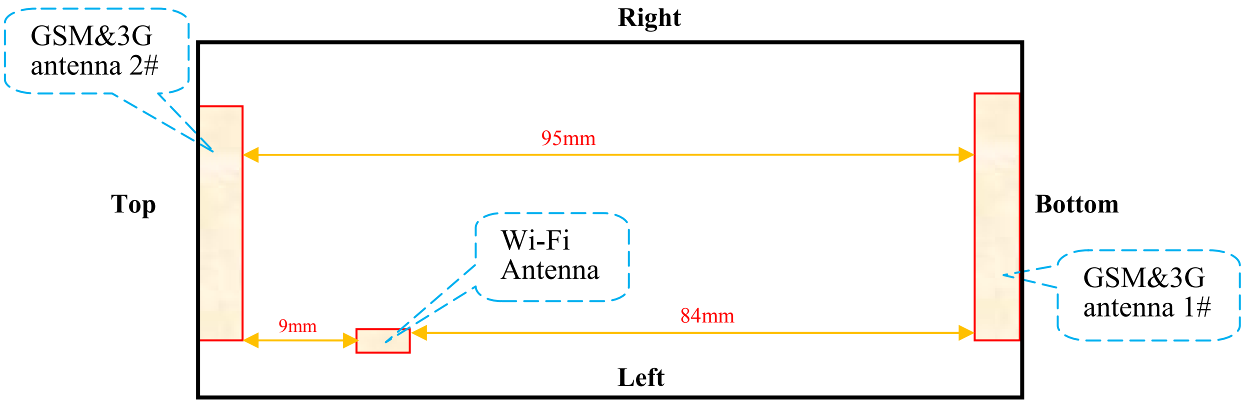
Note:

1. When the 1-g SAR is ≤ 0.8W/Kg, testing for other channels are optional.
2. The default test configuration is to measure SAR with an established radio link between the EUT and a communication test set using a 12.2 kbps RMC (reference measurement Channel) Configured in Test Loop Model.
3. KDB 941225 D01-Body SAR is not required for HSDPA when the maximum average output of each RF channel with HSDPA active is less than ¼ dB higher than measured without HSDPA using 12.2kbps RMC or the maximum SAR for 12.2kbps RMC is < 75% of SAR limit.
4. KDB 941225 D01-Body SAR is not required for HSUPA when the maximum average output of each RF channel with HSUPA active is less than ¼ dB higher than measured without HSUPA using 12.2kbps RMC and the maximum SAR for 12.2kbps RMC is < 75% of SAR limit.

5. When SAR or MPE is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance.
6. It was unrealizable for the main Antenna 1# and 2# transmitting simultaneously.

SAR SIMULTANEOUS TRANSMISSION DESCRIPTION

Wi-Fi and GSM&3G Antennas Location:



Simultaneous Transmission:

Description of Simultaneous Transmit Capabilities			Antennas Distance (mm)
Transmitter Combination	Simultaneous?	Hotspot?	
Antenna 1# + Antenna 2#	×	×	95
Antenna 1# + Wi-Fi	√	√	84
Antenna 2# + Wi-Fi	√	√	9

Note:

1. It was unrealizable for the main Antenna 1# and 2# transmitting simultaneously.

Standalone SAR test exclusion considerations

Body Position:

Antenna	Mode	Frequency (MHz)	P_{avg} (dBm)	P_{avg} (mW)	Distance (mm)	Calculated value	Threshold (1-g)	SAR Test Exclusion
Antenna1#	GPRS850	850	23.80	239.88	10.00	22.12	3.0	No
	GPRS1900	1900	20.00	100.00	10.00	13.78	3.0	No
	WCDMA850	850	23.70	234.42	10.00	21.61	3.0	No
	WCDMA1900	1900	22.10	162.18	10.00	22.36	3.0	No
Antenna2#	GPRS850	850	24.20	263.03	10.00	24.25	3.0	No
	GPRS1900	1900	20.30	107.15	10.00	14.77	3.0	No
	WCDMA850	850	22.60	181.97	10.00	16.78	3.0	No
	WCDMA1900	1900	22.00	158.49	10.00	21.85	3.0	No
Wi-Fi		2450	12.90	19.50	10.00	**3.00**	3.0	Yes

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:
[(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

1. f(GHz) is the RF channel transmit frequency in GHz.
2. Power and distance are rounded to the nearest mW and mm before calculation.
3. The result is rounded to one decimal place for comparison.
4. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test Exclusion.

Standalone SAR estimation:

Mode	Frequency (GHz)	Distance (mm)	P_{avg} (dBm)	P_{avg} (mW)	Estimated $_{1-g}$ (W/kg)
Wi-Fi Body	2.45	10	12.90	19.50	0.400

When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:
[(*max. power of channel, including* ***tune-up tolerance****, mW*)/(*min. test separation distance,mm*)]·[√f(GHz)/*x*] W/kg for *test separation distances* ≤ 50 mm;
where *x* = 7.5 for 1-g SAR.
When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test Exclusion

Hotspot:

Evaluations for Simultaneous SAR, Mobile Hot Spot Positions (Body-worn at 1.0 cm)				
Test Position	Mode	Standalone 1-g SAR(W/Kg)	WiFi Estimated 1-g (W/kg)	∑ 1-g SAR(W/Kg)
Body-worn	GPRS 850	0.785	0.400	1.185
	GPRS 1900	0.183	0.400	0.583
	WCDMA 850	0.705	0.400	1.105
	WCDMA 1900	0.597	0.400	0.997

Conclusion:

ΣSAR < 1.6 W/kg therefore simultaneous transmission SAR with Volume Scans is **not** required.

SAR Plots (Summary of the Highest SAR Values)

Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

ANT2#: Body-worn- Back (836.6 MHz Middle Channel)

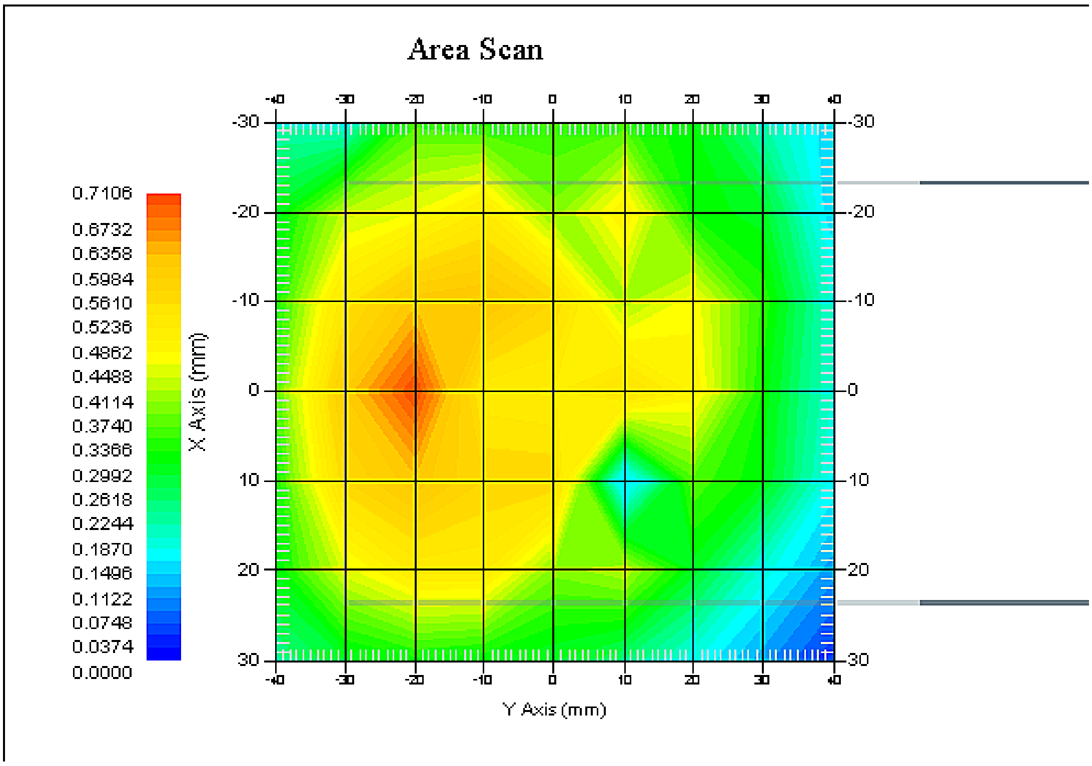
Measurement Data
Test mode : GPRS
Crest Factor : 4
Scan Type： : Complete
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.452 W/kg
Power Drift-Finish : 0.449W/kg
Power Drift (%) : -0.664

Tissue Data
Type : Body
Frequency : 836.6 MHz
Epsilon : 53.79 F/m
Sigma : 0.96 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 835
Duty Cycle Factor : 4
Conversion Factor : 5.9
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.780 W/kg
10 gram SAR value : 0.426 W/kg
Area Scan Peak SAR : 0.710 W/kg
Zoom Scan Peak SAR : 1.052 W/kg

Plot 1#



Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

ANT2#: Body-worn- Back (1850.2MHz Low Channel)

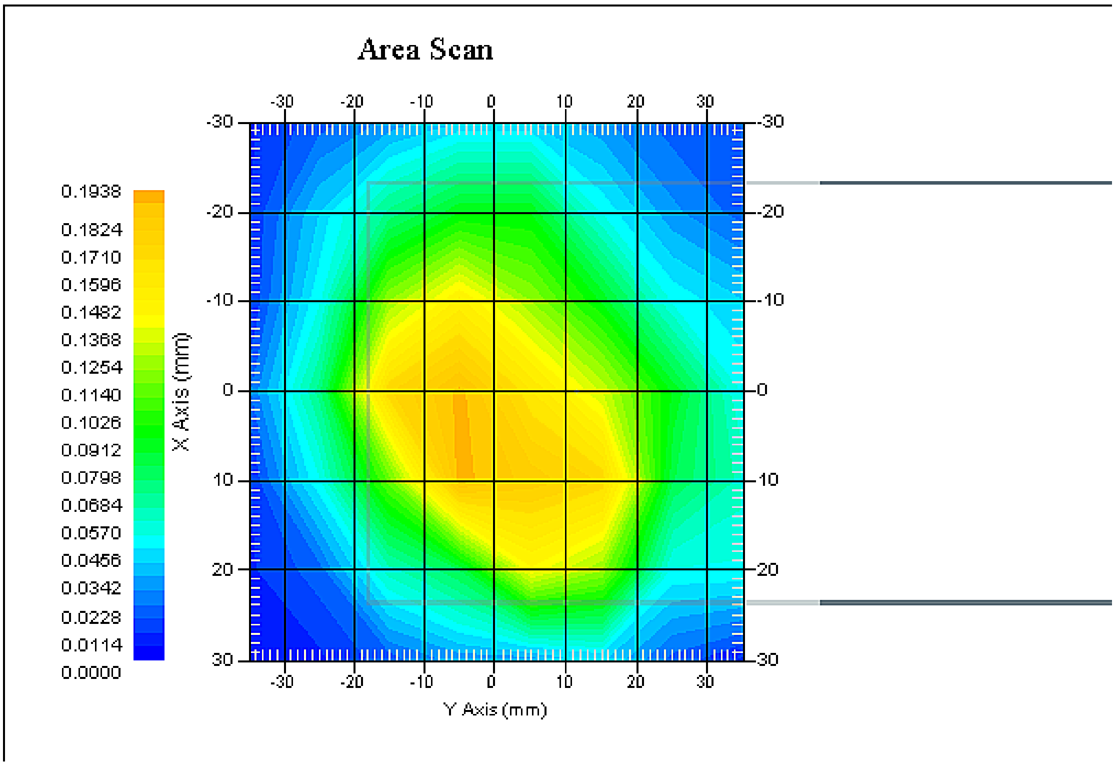
Measurement Data
Test mode : GPRS
Crest Factor : 4
Scan Type : Complete
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.183 W/kg
Power Drift-Finish : 0.181 W/kg
Power Drift (%) : -1.093

Tissue Data
Type : Body
Frequency : 1850.2 MHz
Epsilon : 52.10 F/m
Sigma : 1.49 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 1900
Duty Cycle Factor : 4
Conversion Factor : 4.5
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.183 W/kg
10 gram SAR value : 0.102 W/kg
Area Scan Peak SAR : 0.191 W/kg
Zoom Scan Peak SAR : 0.286 W/kg

Plot 2#

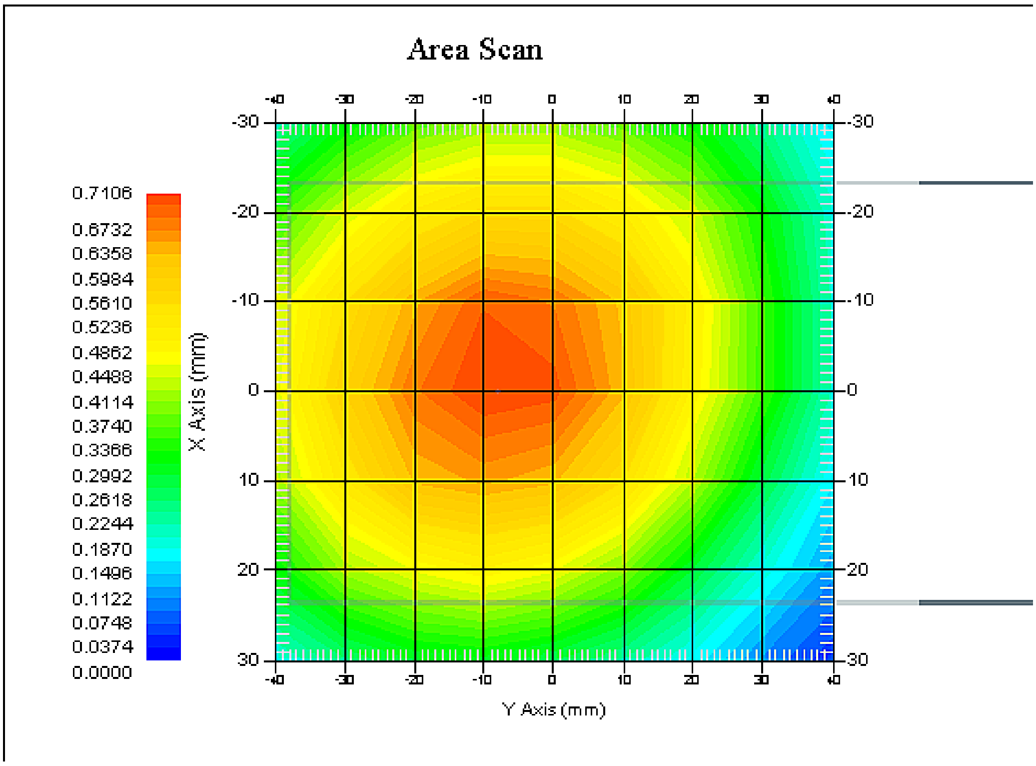


Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

ANT1#:WCDMA850; Body-Worn- Back (826.4 MHz Low Channel)

Measurement Data	
Test mode	: WCDMA850
Crest Factor	: 1
Scan Type	: Complete
Area Scan	: 11x8x1: Measurement x=10mm, y=10mm, z=4mm
Zoom Scan	: 7x7x7: Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start	: 0.657 W/kg
Power Drift-Finish	: 0.645 W/kg
Power Drift (%)	: -1.319
Tissue Data	
Type	: Body
Frequency	: 826.4 MHz
Epsilon	: 53.81 F/m
Sigma	: 0.95 S/m
Density	: 1000.00 kg/cu. m
Probe Data	
Serial No.	: 500-00283
Frequency Band	: 835
Duty Cycle Factor	: 1
Conversion Factor	: 5.9
Probe Sensitivity	: 1.20 1.20 1.20 µV/(V/m)2
Compression Point	: 95.00 mV
Offset	: 1.56 mm
1 gram SAR value	: 0.703 W/kg
10 gram SAR value	: 0.451 W/kg
Area Scan Peak SAR	: 0.706 W/kg
Zoom Scan Peak SAR	: 1.091 W/kg

Plot 3#

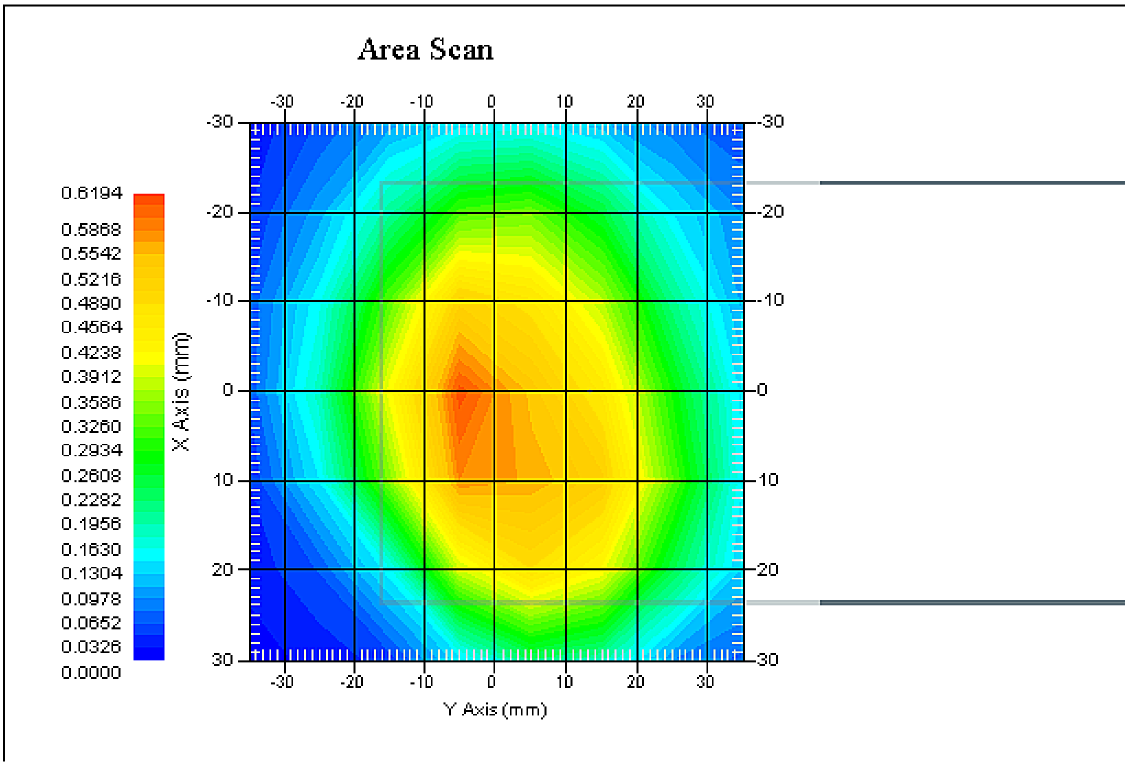


Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

ANT1#:WCDMA1900; Body-Worn- Back (1880 MHz Middle Channel)

Measurement Data	
Test mode	: WCDMA1900
Crest Factor	: 1
Scan Type	: Complete
Area Scan	: 11x9x1: Measurement x=10mm, y=10mm, z=4mm
Zoom Scan	: 7x7x7: Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start	: 0.573 W/kg
Power Drift-Finish	: 0.579 W/kg
Power Drift (%)	: 1.047
Tissue Data	
Type	: Body
Frequency	: 1880 MHz
Epsilon	: 51.77 F/m
Sigma	: 1.52 S/m
Density	: 1000.00 kg/cu. m
Probe Data	
Serial No.	: 500-00283
Frequency Band	: 1900
Duty Cycle Factor	: 1
Conversion Factor	: 4.8
Probe Sensitivity	: 1.20 1.20 1.20 µV/(V/m)2
Compression Point	: 95.00 mV
Offset	: 1.56 mm
1 gram SAR value	: 0.596 W/kg
10 gram SAR value	: 0.343 W/kg
Area Scan Peak SAR	: 0.616 W/kg
Zoom Scan Peak SAR	: 0.936 W/kg

Plot 4#



APPENDIX A MEASUREMENT UNCERTAINTY

The uncertainty budget has been determined for the measurement system and is given in the following Table.

Measurement Uncertainty for 30MHz to 6GHz

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	$\sqrt{3}$	$(1\text{-cp})^{1/2}$	$(1\text{-cp})^{1/2}$	1.5	1.5
Hemispherical Isotropy	10.9	rectangular	$\sqrt{3}$	√cp	√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 -Noise	0.6	rectangular	$\sqrt{3}$	1	1	0.3	0.3
RF Ambient Condition - Reflections	3.0	rectangular	$\sqrt{3}$	1	1	1.7	1.7
Probe Positioner Mech. Restrictions	0.4	rectangular	$\sqrt{3}$	1	1	0.2	0.2
Restriction							
Probe Positioning with respect to Phantom Shell	2.9	rectangular	$\sqrt{3}$	1	1	1.7	1.7
Extrapolation and Integration	3.7	rectangular	$\sqrt{3}$	1	1	2.1	2.1
Test Sample Positioning	2.3	normal	1	1	1	2.3	2.3
Device Holder Uncertainty	6.215	normal	1	1	1	6.215	6.215
Drift of Output Power	4.627	rectangular	$\sqrt{3}$	1	1	2.67	2.67
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.)	1.938	normal	1	0.7	0.5	1.36	0.97
Liquid Permittivity(target)	5.0	rectangular	$\sqrt{3}$	0.6	0.5	1.7	1.4
Liquid Permittivity(meas.)	3.093	normal	1	0.6	0.5	1.86	1.55
Combined Uncertainty		RSS				10.78	10.55
Expanded uncertainty (coverage factor=2)		Normal(k=2)				21.56	21.10

APPENDIX B – PROBE CALIBRATION CERTIFICATES

NCL CALIBRATION LABORATORIES

Calibration File No.: PC-1598

Task No: BACL-5778

CERTIFICATE OF CALIBRATION

It is certified that the equipment identified below has been calibrated in the **NCL CALIBRATION LABORATORIES** by qualified personnel following recognized procedures and using transfer standards traceable to NRC/NIST.

Equipment: Miniature Isotropic RF Probe
Record of Calibration
Head and Body
Manufacturer: APREL Laboratories
Model No.: E-020
Serial No.: 500-00283

Calibration Procedure: D01-032-E020-V2, D22-012-Tissue, D28-002-Dipole
Project No: BACL-5745

Calibrated: 14th October 2014
Released on: 14th October 2014

This Calibration Certificate is Incomplete Unless Accompanied with the Calibration Results Summary

Released By: ______________________
Art Brennan, Quality Manager

NCL CALIBRATION LABORATORIES

Suite 102, 303 Terry Fox Dr,
OTTAWA, ONTARIO
CANADA K2K 3J1

Division of APREL Lab.
TEL: (613) 435-8300
FAX: (613) 435-8306

NCL Calibration Laboratories

Division of APREL Inc.

Introduction

This Calibration Report reproduces the results of the calibration performed in line with the references listed below. Calibration is performed using accepted methodologies as per the references listed below. Probes are calibrated for air, and tissue and the values reported are the results from the physical quantification of the probe through meteorgical practices.

Calibration Method

Probes are calibrated using the following methods.

<800 MHz
TEM Cell for sensitivity in air
Standard phantom using temperature transfer method for sensitivity in tissue

>800 MHz
Waveguide* method to determine sensitivity in air and tissue
*Waveguide is numerically (simulation) assessed to determine the field distribution and power

The boundary effect for the probe is assessed using a standard flat phantom where the probe output is compared against a numerically simulated series of data points

References

- IEEE Standard 1528:2013
  IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
- EN 62209-1:2006
  Human Exposure to RF Fields from hand-held and body-mounted wireless communication devices - Human models. instrumentation, and procedures - Part 1: Procedure to measure the Specific Absorption Rate (SAR) for hand-held mobile wireless devices
- IEC 62209-2:2010
  Human exposure to RF fields from hand-held and body-mounted wireless devices - Human models, instrumentation, and procedures - Part 2: specific absorption rate (SAR) for wireless communication devices (30 MHz - 6 GHz)
- TP-D01-032-E020-V2 E-Field probe calibration procedure
- D22-012-Tissue dielectric tissue calibration procedure
- D28-002-Dipole procedure for validation of SAR system using a dipole
- IEEE 1309 Standard for Calibration of Electromagnetic Field Sensors and Probes, Excluding Antennas, from 9kHz to 40GHz

NCL Calibration Laboratories

Division of APREL Inc.

Conditions

Probe 500-00283 was a recalibration.

Ambient Temperature of the Laboratory:	22 °C +/- 1.5°C
Temperature of the Tissue:	21 °C +/- 1.5°C
Relative Humidity:	< 60%

Primary Measurement Standards

Instrument	Serial Number	Cal due date
Tektronix USB Power Meter	11C940	May 14, 2015
Signal Generator HP 83640B	3844A00689	Feb 12, 2015

Secondary Measurement Standards

Network Analyzer Anritsu 37347C	002106	Feb. 20, 2015

Attestation

The below named signatories have conducted the calibration and review of the data which is presented in this calibration report.

We the undersigned attest that to the best of our knowledge the calibration of this subject has been accurately conducted and that all information contained within the results pages have been reviewed for accuracy.

Art Brennan, Quality Manager

Dan Brooks, Test Engineer

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This page has been reviewed for content and attested to on Page 2 of this document.

Probe Summary

Probe Type:	E-Field Probe E020
Serial Number:	500-00283
Frequency:	As presented on page 5
Sensor Offset:	1.56
Sensor Length:	2.5
Tip Enclosure:	Composite*
Tip Diameter:	< 2.9 mm
Tip Length:	55 mm
Total Length:	289 mm

*Resistive to recommended tissue recipes per IEEE-1528

Sensitivity in Air

Channel X:	1.2 $\mu V/(V/m)^2$
Channel Y:	1.2 $\mu V/(V/m)^2$
Channel Z:	1.2 $\mu V/(V/m)^2$

Diode Compression Point:	95 mV

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Division of APREL Inc.

Calibration for Tissue (Head H, Body B)

Frequency	Tissue Type	Measured Epsilon	Measured Sigma	Standard Uncertainty (%)	Calibration Frequency Range (MHz)	Conversion Factor
450 H	Head	43.59	0.86	3.5	±50	5.7
450 B	Body	56.74	0.94	3.5	±50	5.8
750 H	Head	42.98	0.92	3.5	±50	6.0
750 B	Body	43.05	0.93	3.5	±50	5.5
835 H	Head	43.42	0.94	3.5	±50	5.9
835 B	Body	55.77	1.01	3.5	±50	5.9
900 H	Head	41.87	1.06	3.5	±50	6.0
900 B	Body	55.62	1.05	3.5	±50	5.9
1450 H	Head	X	X	X	X	X
1450 B	Body	X	X	X	X	X
1500 H	Head	X	X	X	X	X
1500 B	Body	X	X	X	X	X
1640 H	Head	X	X	X	X	X
1640 B	Body	X	X	X	X	X
1750 H	Head	38.23	1.38	3.5	±75	5.4
1750 B	Body	52.86	1.54	3.5	±75	5.3
1800 H	Head	X	X	X	X	X
1800 B	Body	X	X	X	X	X
1900 H	Head	40.20	1.38	3.5	±75	4.8
1900 B	Body	52.63	1.46	3.5	±75	4.5
2000 H	Head	X	X	X	X	X
2000 B	Body	X	X	X	X	X
2100 H	Head	X	X	X	X	X
2100 B	Body	X	X	X	X	X
2300 H	Head	X	X	X	X	X
2300 B	Body	X	X	X	X	X
2450 H	Head	37.26	1.84	3.5	±75	4.9
2450B	Body	53.61	1.9	3.5	±75	4.3
3000 H	Head	X	X	X	X	X
3000 B	Body	X	X	X	X	X
3600 H	Head	37.49	3.16	3.5	±100	4.5
3600 B	Body	49.94	3.86	3.5	±100	4.0
5250 H	Head	35.51	4.78	3.5	±100	3.0
5250 B	Body	47.54	5.11	3.5	±100	2.8
5600 H	Head	36.05	5.15	3.5	±100	2.8
5600 B	Body	46.49	5.72	3.5	±100	2.2
5800 H	Head	45.99	6.01	3.5	±100	3.2
5800 B	Body	35.6	5.37	3.5	±100	2.5

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This page has been reviewed for content and attested to on Page 2 of this document.

Boundary Effect:

Uncertainty resulting from the boundary effect is less than 2.1% for the distance between the tip of the probe and the tissue boundary, when less than 0.58mm.

Spatial Resolution:

The spatial resolution uncertainty is less than 1.5% for 4.9mm diameter probe.
The spatial resolution uncertainty is less than 1.0% for 2.5mm diameter probe.

DAQ-PAQ Contribution

To minimize the uncertainty calculation all tissue sensitivity values were calculated using a load impedance of 5 MΩ.

Probe Calibration Uncertainty

Uncertainty component	Tolerance (± %)	Probability distribution	Divisor	Standard uncertainty (± %)
Incident or forward power	2.5	R	√3	1.44
Reflected power	2	R	√3	1.15
Liquid conductivity measurement	1	R	√3	0.58
Liquid permittivity measurement	1	R	√3	0.58
Liquid conductivity deviation	1.5	R	√3	0.87
Liquid permittivity deviation	1.5	R	√3	0.87
Frequency deviation	2.25	R	√3	1.30
Field homogeneity	2.5	R	√3	1.44
Field-probe positioning	2.5	R	√3	1.44
Field-probe linearity	1.55	R	√3	0.89
Combined standard uncertainty		RSS		**3.50**

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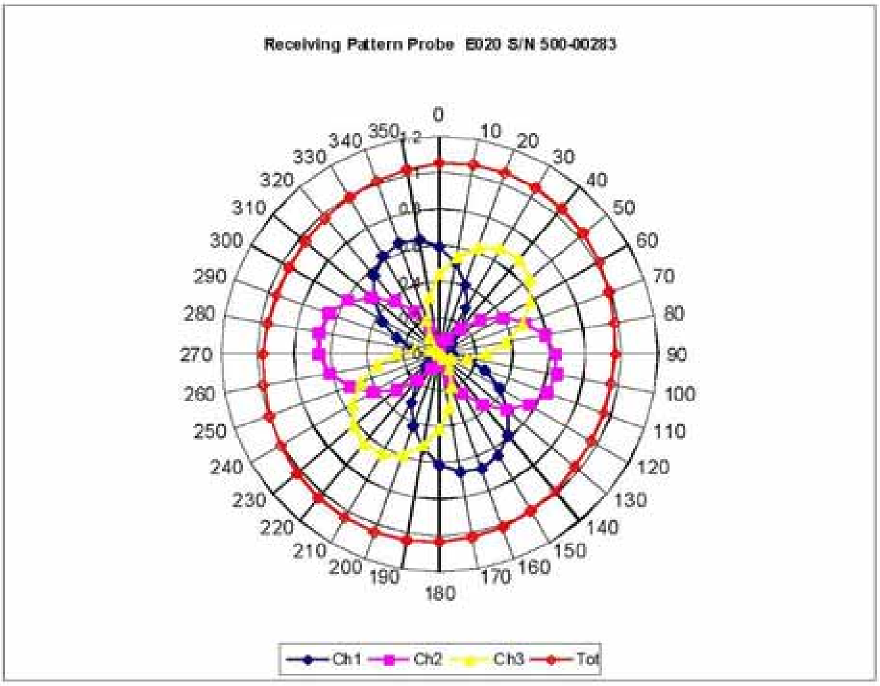
Division of APREL Inc.

Receiving Pattern Air



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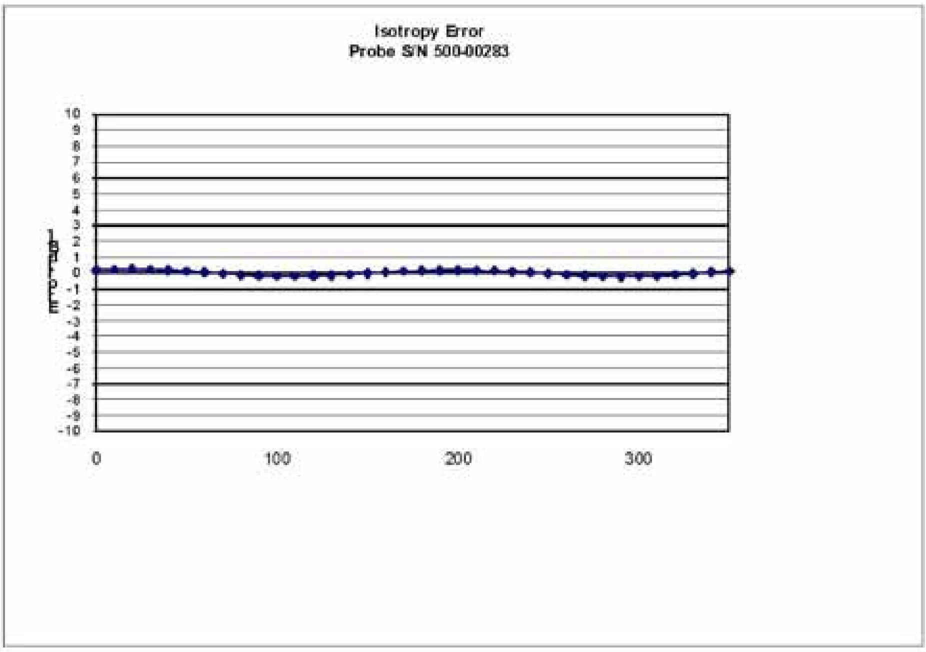
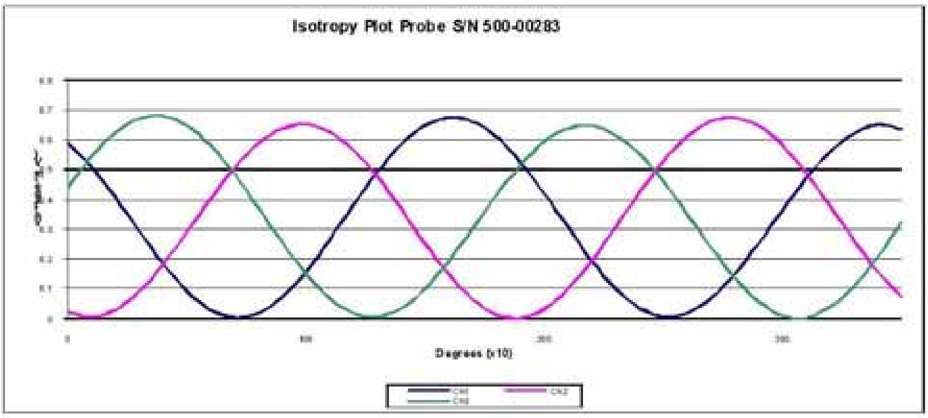
Isotropy Error Air





Isotropicity Tissue: 0.10 dB

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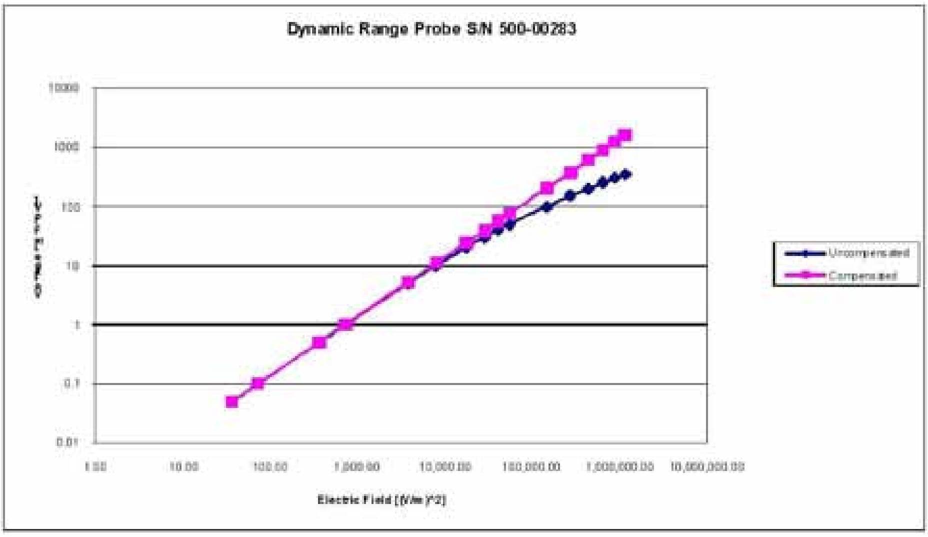
Dynamic Range



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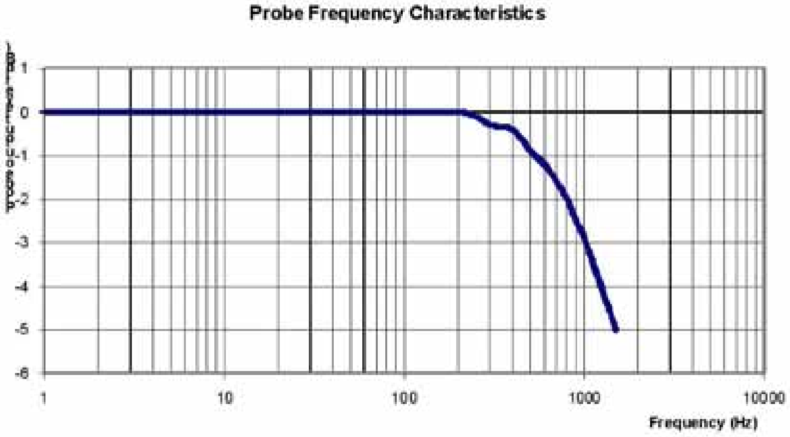
Video Bandwidth



Video Bandwidth at 500 Hz	1 dB
Video Bandwidth at 1.02 KHz:	3 dB

Test Equipment

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List May 2014.

APPENDIX C DIPOLE CALIBRATION CERTIFICATES

NCL CALIBRATION LABORATORIES

Calibration File No: DC-1599
Project Number: BAC-dipole-cal-5779

CERTIFICATE OF CALIBRATION

It is certified that the equipment identified below has been calibrated in the **NCL CALIBRATION LABORATORIES** by qualified personnel following recognized procedures and using transfer standards traceable to NRC/NIST.

Validation Dipole(Head and Body)

Manufacturer: APREL Laboratories
Part number: ALS-D-835-S-2
Frequency: 835 MHz
Serial No: 180-00558

Customer: Bay Area Compliance Laboratory (China)

Calibrated: 8th October 2014
Released on: 8th October 2014

This Calibration Certificate is Incomplete Unless Accompanied with the Calibration Results Summary

Released By: ______________________

Art Brennan, Quality Manager

NCL CALIBRATION LABORATORIES
Suite 102, 303 Terry Fox Dr.
Kanata, ONTARIO
CANADA K2K 3J1
Division of APREL Lab.
TEL: (613) 435-8300
FAX: (613)435-8306

NCL Calibration Laboratories
Division of APREL Laboratories.

Conditions

Dipole 180-00558 was received with a damaged connection for a re-calibration.

Ambient Temperature of the Laboratory:	22 °C +/- 0.5°C
Temperature of the Tissue:	21 °C +/- 0.5°C

Attestation

The below named signatories have conducted the calibration and review of the data which is presented in this calibration report.

We the undersigned attest that to the best of our knowledge the calibration of this subject has been accurately conducted and that all information contained within the results pages have been reviewed for accuracy.

Art Brennan, Quality Manager

Maryna Nesterova Calibration Engineer

Primary Measurement Standards

Instrument	Serial Number	Cal due date
Tektronix USB Power Meter	11C940	May 14, 2015
Network Analyzer Anritsu 37347C	002106	Feb. 20, 2015

This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

Calibration Results Summary

The following results relate the Calibrated Dipole and should be used as a quick reference for the user.

Mechanical Dimensions

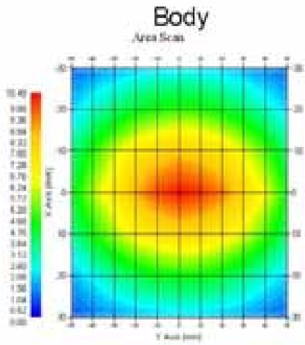
Length: 162.2 mm
Height: 89.4 mm

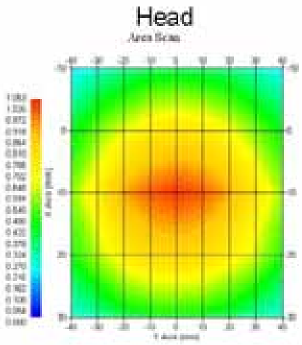
Electrical Specification

Tissue	Frequency	SWR:	Return Loss	Impedance
Head	835 MHz	1.066 U	-30.344 dB	49.001 Ω
Body	835 MHz	1.089 U	-28.118 dB	53.117 Ω

System Validation Results

Tissue	Frequency	1 Gram	10 Gram	Peak
Head	835 MHz	9.773	6.174	14.713
Body	835 MHz	9.736	6.297	14.513





This page has been reviewed for content and attested to by signature within this document. 3

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NCL Calibration Laboratories
Division of APREL Laboratories.

Introduction

This Calibration Report has been produced in line with the SSI Dipole Calibration Procedure SSI-TP-018-ALSAS. The results contained within this report are for Validation Dipole 180-00558. The calibration routine consisted of a three-step process. Step 1 was a mechanical verification of the dipole to ensure that it meets the mechanical specifications. Step 2 was an Electrical Calibration for the Validation Dipole, where the SWR, Impedance, and the Return loss were assessed. Step 3 involved a System Validation using the ALSAS-10U, along with APREL E-020 30 MHz to 6 GHz E-Field Probe Serial Number 225.

References

- SSI-TP-018-ALSAS Dipole Calibration Procedure
- SSI-TP-016 Tissue Calibration Procedure
- IEEE 1528:2013 "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques"
- IEC-62209-1:2006 "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures"
  Part 1: "Procedure to determine the Specific Absorption Rate (SAR) for hand-held devices used in close proximity of the ear (frequency range of 300 MHz to 3 GHz)"
- IEC-62209-2:2010 "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures"
  Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for hand-held devices used in close proximity of the ear (frequency range of 30 MHz to 6 GHz)"
- D28-002 Procedure for validation of SAR system using a dipole

Conditions

Dipole 180-00558 was repaired prior to this calibration. The repair reliability depends upon correct usage of the dipole.

Ambient Temperature of the Laboratory:	22 °C +/- 0.5°C
Temperature of the Tissue:	20 °C +/- 0.5°C

Dipole Calibration uncertainty

The calibration uncertainty for the dipole is made up of various parameters presented below.

Mechanical	1%
Positioning Error	1.22%
Electrical	1.7%
Tissue	2.2%
Dipole Validation	2.2%
TOTAL	**8.32% (16.64% K=2)**

4

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NCL Calibration Laboratories
Division of APREL Laboratories.

Dipole Calibration Results

Mechanical Verification

APREL Length	APREL Height	Measured Length	Measured Height
161.0 mm	89.8 mm	162.2 mm	89.4 mm

Electrical Verification

Tissue Type	Return Loss:	SWR:	Impedance:
Head	-30.344 dB	1.066 U	49.001 Ω
Body	-28.118 dB	1.089 U	53.117 Ω

Tissue Validation

	Dielectric constant, ε_r	Conductivity, σ [S/m]
Head Tissue 835MHz	43.42	0.94
Body Tissue 835MHz	55.77	1.01

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NCL Calibration Laboratories

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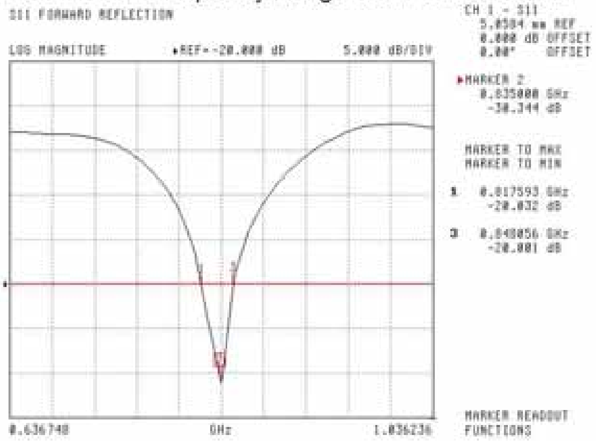
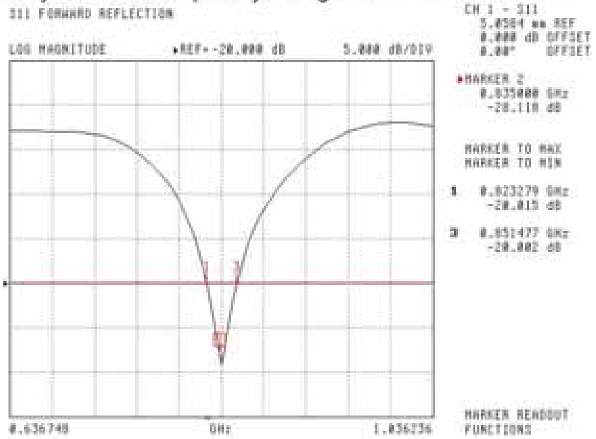
The Following Graphs are the results as displayed on the Vector Network Analyzer.

S11 Parameter Return Loss

Head Tissue: Frequency Range 0.817 to 0.848 GHz



Body Tissue: Frequency Range 0.823 to 0.851 GHz



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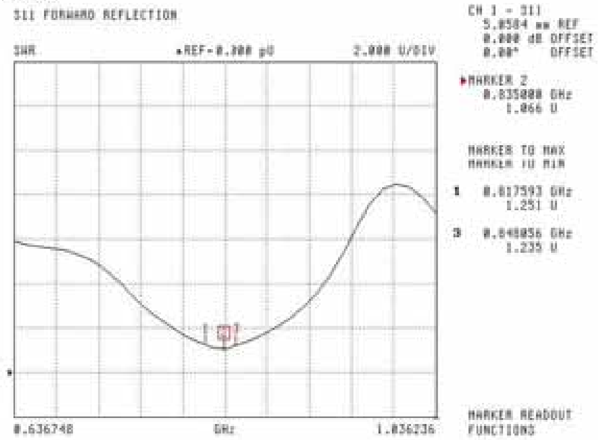
NCL Calibration Laboratories

Division of APREL Laboratories.

SWR

Head



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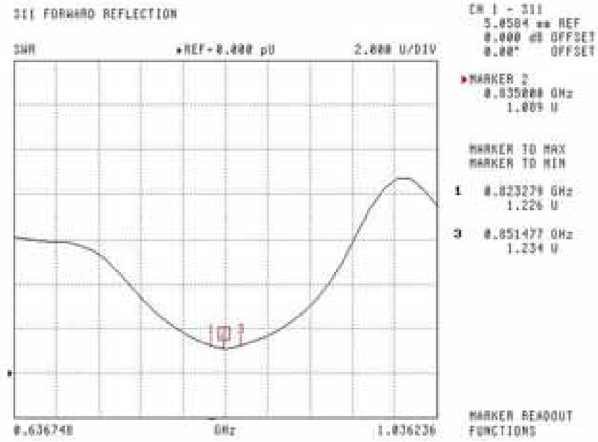

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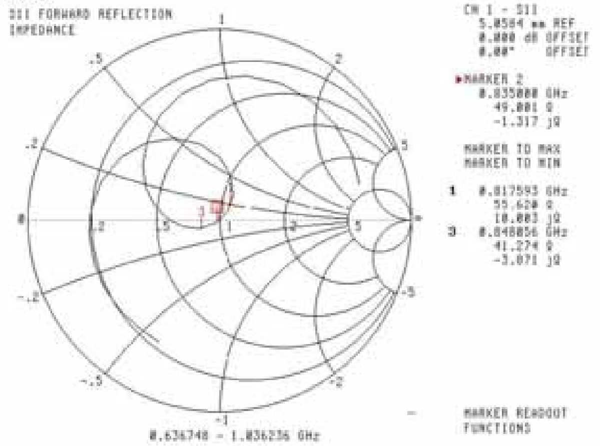
NCL Calibration Laboratories

Division of APREL Laboratories.

Smith Chart Dipole Impedance

Head



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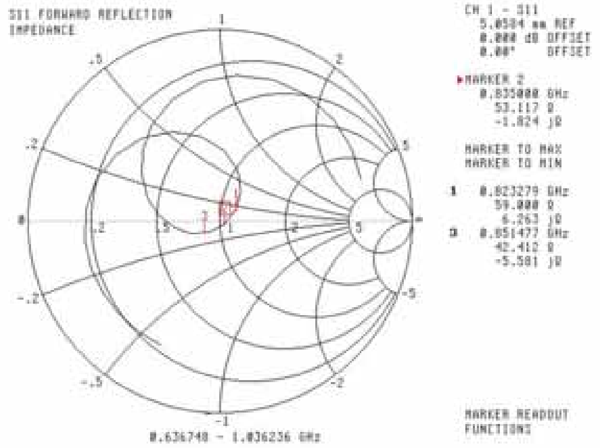

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Test Equipment

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List 2014.

NCL CALIBRATION LABORATORIES

Calibration File No: DC-1601
Project Number: BAC-dipole –cal-5779

CERTIFICATE OF CALIBRATION

It is certified that the equipment identified below has been calibrated in the **NCL CALIBRATION LABORATORIES** by qualified personnel following recognized procedures and using transfer standards traceable to NRC/NIST.

Validation Dipole (Head & Body)

Manufacturer: APREL Laboratories
Part number: ALS-D-1900-S-2
Frequency: 1900 MHz
Serial No: 210-00710

Customer: Bay Area Compliance Laboratory (China)

Calibrated: 9th October, 2014
Released on: 9th October, 2014

This Calibration Certificate is Incomplete Unless Accompanied with the Calibration Results Summary

Released By: ______________________

Art Brennan, Quality Manager

NCL CALIBRATION LABORATORIES
Suite 102, 303 Terry Fox Dr.
Kanata, ONTARIO
CANADA K2K 3J1
Division of APREL Lab.
TEL: (613) 435-8300
FAX: (613)435-8306

NCL Calibration Laboratories
Division of APREL Laboratories.

Conditions

Dipole 210-00710 was received in good condition and was a re-calibration.

Ambient Temperature of the Laboratory: 22 °C +/- 0.5°C
Temperature of the Tissue: 21 °C +/- 0.5°C

Attestation

The below named signatories have conducted the calibration and review of the data which is presented in this calibration report.

We the undersigned attest that to the best of our knowledge the calibration of this subject has been accurately conducted and that all information contained within the results pages have been reviewed for accuracy.

Art Brennan, Quality Manager

Maryna Nesterova Calibration Engineer

Primary Measurement Standards

Instrument	Serial Number	Cal due date
Tektronix USB Power Meter	11C940	May 14, 2015
Network Analyzer Anritsu 37347C	002106	Feb. 20, 2015

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NCL Calibration Laboratories

Division of APREL Laboratories.

Calibration Results Summary

The following results relate the Calibrated Dipole and should be used as a quick reference for the user.

Mechanical Dimensions

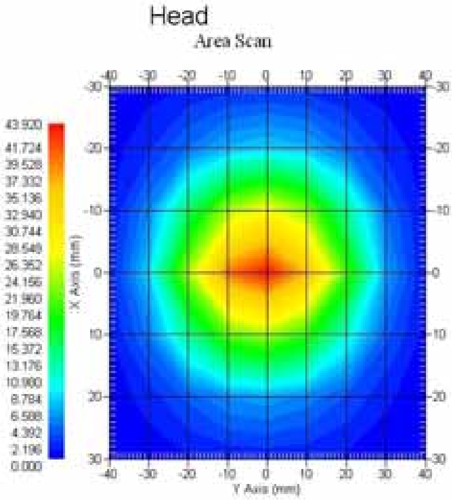
Length: 67.1 mm
Height: 38.9 mm

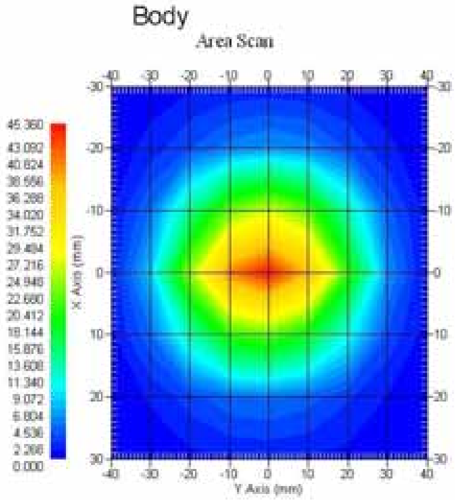
Electrical Specification

Tissue	Frequency	SWR:	Return Loss	Impedance
Head	1900MHz	1.084 U	-27.92 dB	52.247 Ω
Body	1900MHz	1.128 U	-24.40 dB	52.618 Ω

System Validation Results

Tissue	Frequency	1 Gram	10 Gram	Peak
Head	1900 MHz	39.481	20.44	73.364
Body	1900 MHz	39.715	20.552	73.565





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Introduction

This Calibration Report has been produced in line with the SSI Dipole Calibration Procedure SSI-TP-018-ALSAS. The results contained within this report are for Validation Dipole 210-00710. The calibration routine consisted of a three-step process. Step 1 was a mechanical verification of the dipole to ensure that it meets the mechanical specifications. Step 2 was an Electrical Calibration for the Validation Dipole, where the SWR, Impedance, and the Return loss were assessed. Step 3 involved a System Validation using the ALSAS-10U, along with APREL E-020 30 MHz to 6 GHz E-Field Probe Serial Number 225.

References

- SSI-TP-018-ALSAS Dipole Calibration Procedure
- SSI-TP-016 Tissue Calibration Procedure
- IEEE 1528:2013 "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques"
- IEC-62209-1:2006 "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures"
  Part 1: "Procedure to determine the Specific Absorption Rate (SAR) for hand-held devices used in close proximity of the ear (frequency range of 300 MHz to 3 GHz)"
- IEC-62209-2:2010 "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures"
  Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for hand-held devices used in close proximity of the ear (frequency range of 30 MHz to 6 GHz)"
- D28-002 Procedure for validation of SAR system using a dipole

Conditions

Dipole 210-00710 was a recalibration.

Ambient Temperature of the Laboratory:	22 °C +/- 0.5°C
Temperature of the Tissue:	20 °C +/- 0.5°C

Dipole Calibration uncertainty

The calibration uncertainty for the dipole is made up of various parameters presented below.

Mechanical	1%
Positioning Error	1.22%
Electrical	1.7%
Tissue	2.2%
Dipole Validation	2.2%
TOTAL	**8.32% (16.64% K=2)**

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Dipole Calibration Results

Mechanical Verification

APREL Length	APREL Height	Measured Length	Measured Height
68.0 mm	39.5 mm	67.1mm	38.9 mm

Electrical Validation

Tissue	Frequency	SWR:	Return Loss	Impedance
Head	1900MHz	1.084 U	-27.92 dB	52.247 Ω
Body	1900MHz	1.128 U	-24.40 dB	52.618 Ω

Tissue Validation

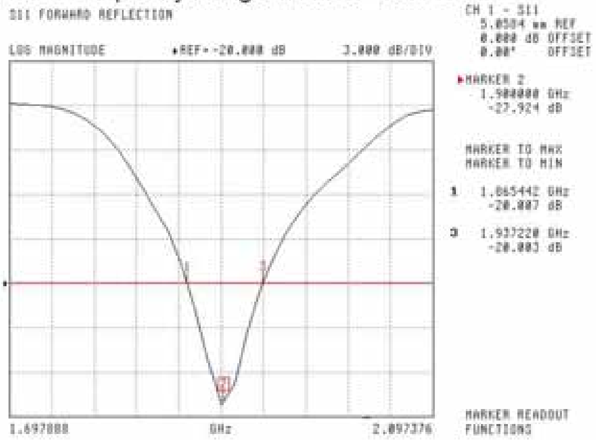
	Dielectric constant, ε_r	Conductivity, σ [S/m]
Head Tissue 1900MHz	40.20	1.38
Body Tissue 1900MHz	52.63	1.46

NCL Calibration Laboratories
Division of APREL Laboratories.

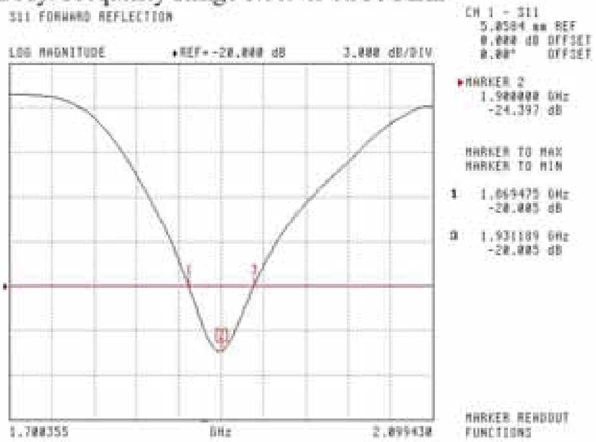
The Following Graphs are the results as displayed on the Vector Network Analyzer.

S11 Parameter Return Loss

Head: Frequency Range 1.865 to 1.937 GHz



Body: Frequency Range 1.869 to 1.931 MHz



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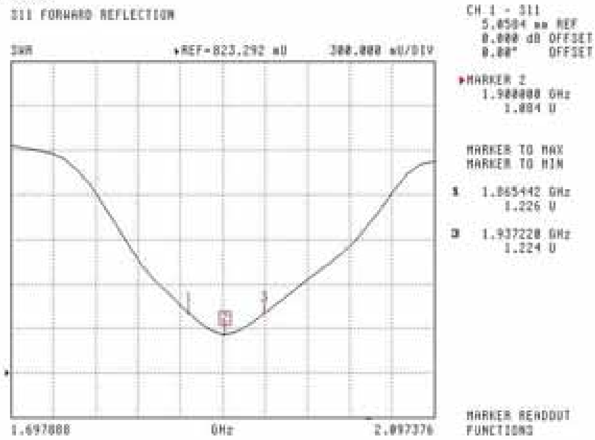
NCL Calibration Laboratories

Division of APREL Laboratories.

SWR

Head



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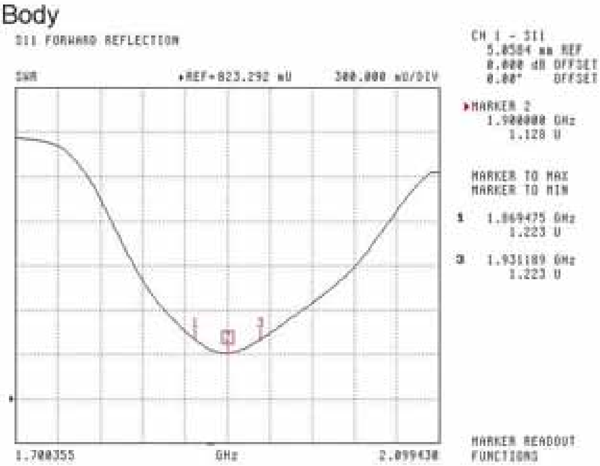

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NCL Calibration Laboratories

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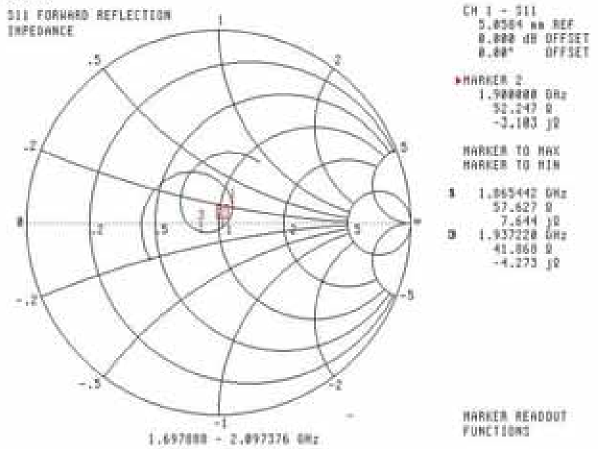
Smith Chart Dipole Impedance

Head



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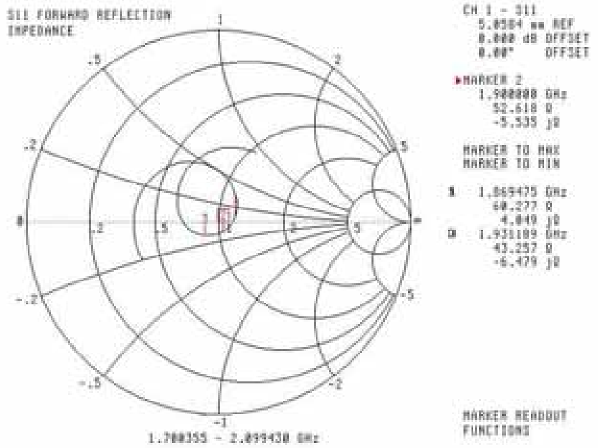

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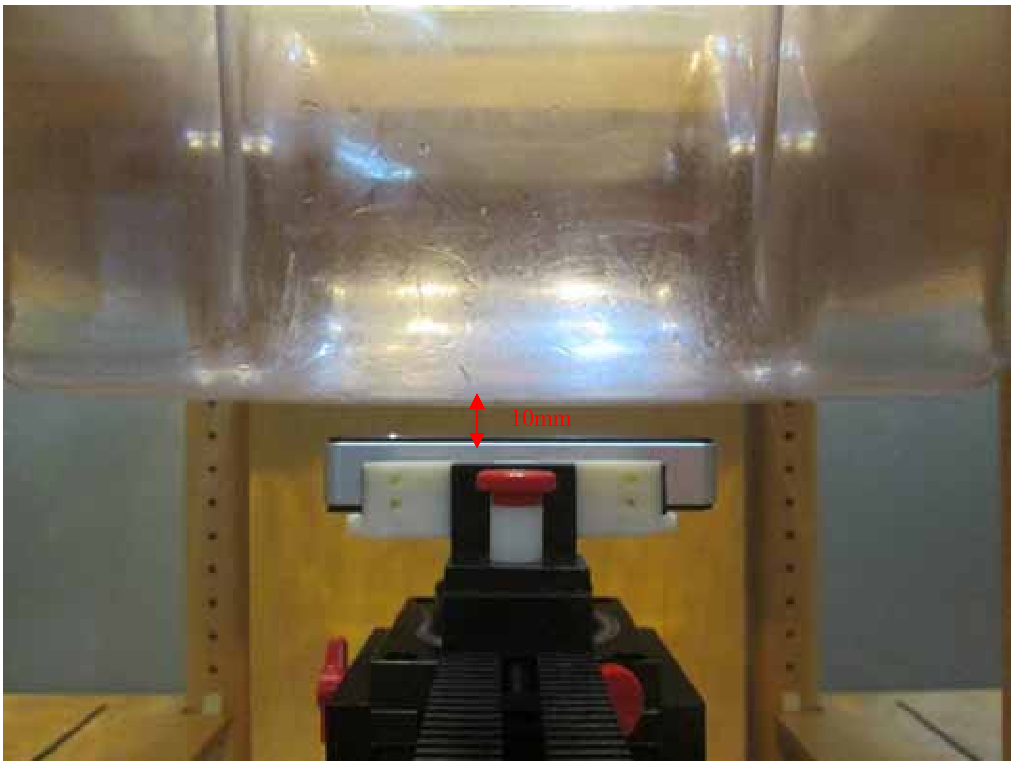
Test Equipment

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List 2014

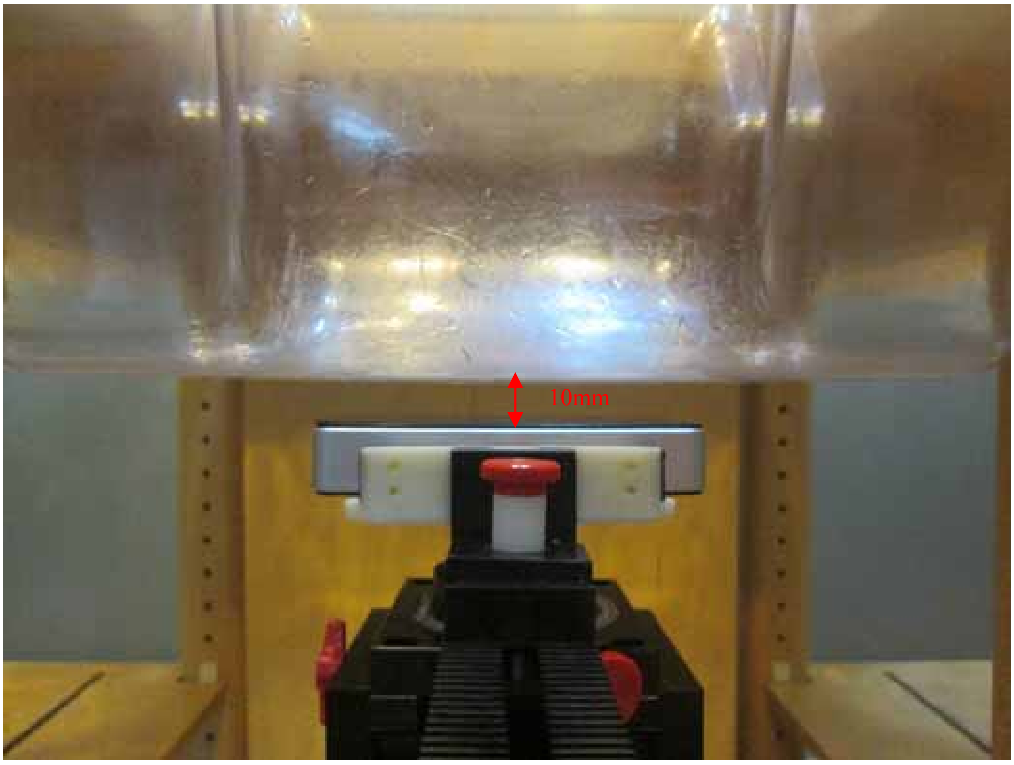
APPENDIX D EUT TEST POSITION PHOTOS

Liquid depth ≥ 15cm

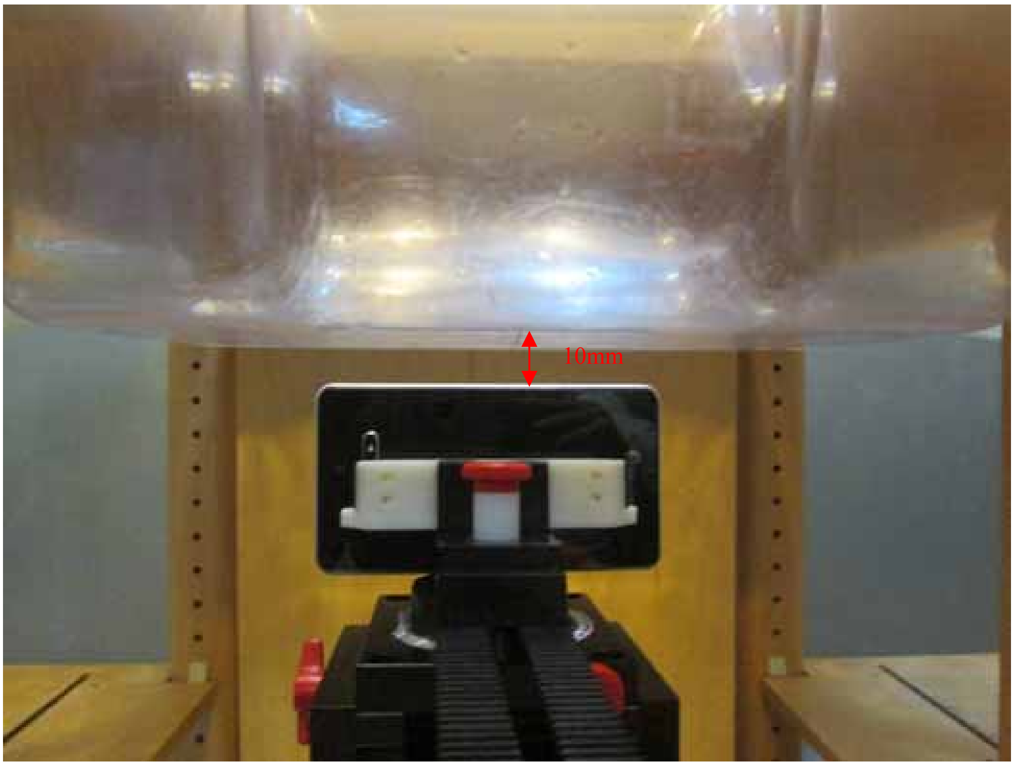
Body-worn Front Setup Photo



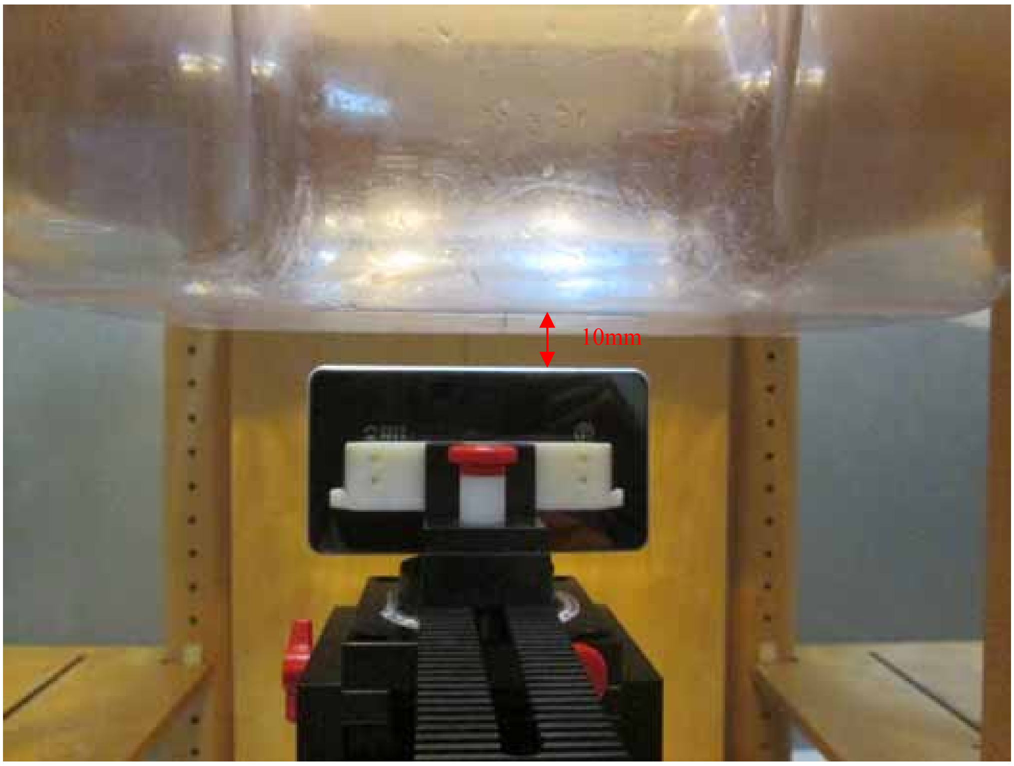
Body-worn Back Setup Photo



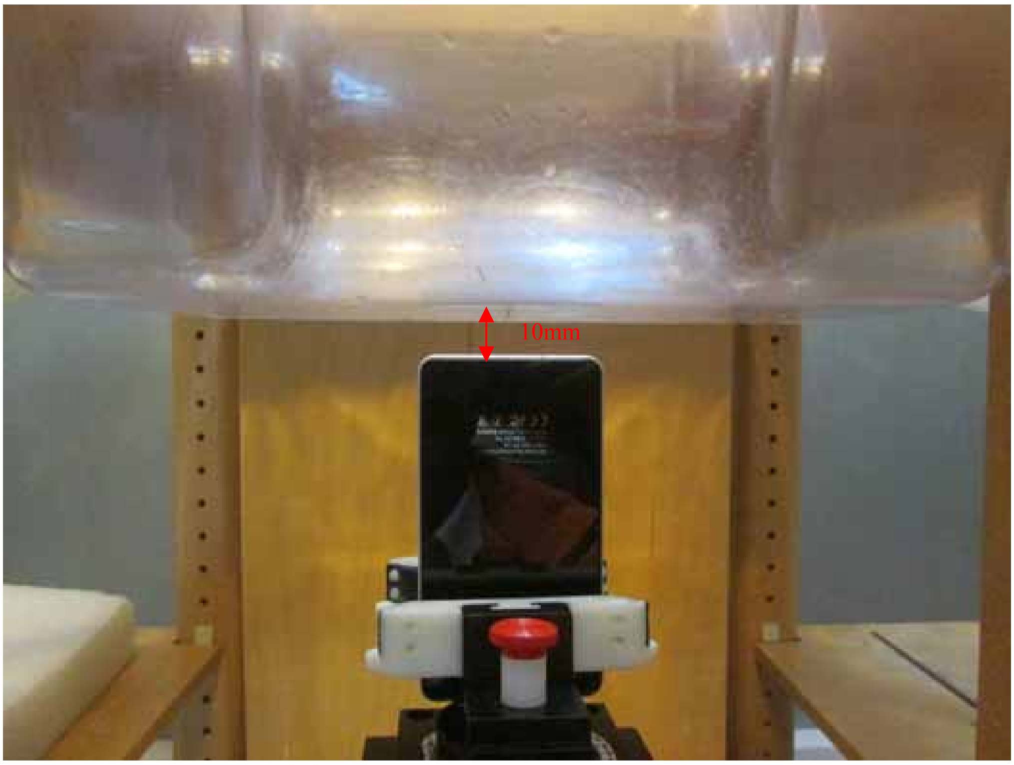
Body-worn Left Setup Photo



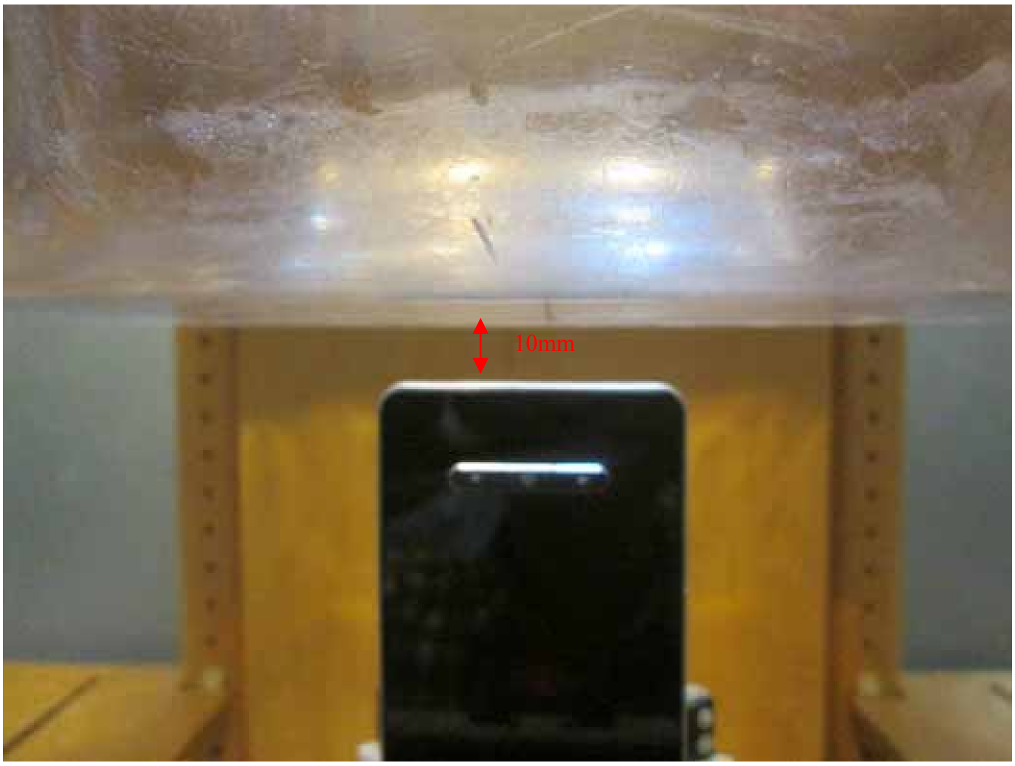
Body-worn Right Setup Photo



Body-worn Bottom Setup Photo



Body-worn Top Setup Photo



APPENDIX E EUT PHOTOS

EUT – Front View

EUT – Back View

EUT – Left Side View

EUT – Right Side View

EUT – Top View

EUT – Bottom View

EUT – Uncovered View

APPENDIX F INFORMATIVE REFERENCES

[1] Federal Communications Commission, \Report and order: Guidelines for evaluating the environmental effects of radiofrequency radiation", Tech. Rep. FCC 96-326, FCC, Washington, D.C. 20554, 1996.

[2] David L. Means Kwok Chan, Robert F. Cleveland, \Evaluating compliance with FCC guidelines for human exposure to radiofrequency electromagnetic fields", Tech. Rep., Federal Communication Commission, O_ce of Engineering & Technology, Washington, DC, 1997.

[3] Thomas Schmid, Oliver Egger, and Niels Kuster, \Automated E-_eld scanning system for dosimetricPage 87 of 87
assessments", IEEE Transactions on Microwave Theory and Techniques, vol. 44, pp. 105{113, Jan. 1996.

[4] Niels Kuster, Ralph K.astle, and Thomas Schmid, \Dosimetric evaluation of mobile communications equipment with known precision", IEICE Transactions on Communications, vol. E80-B, no. 5, pp. 645{652, May 1997.

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[14] Barry N. Taylor and Christ E. Kuyatt, \Guidelines for evaluating and expressing the uncertainty of NIST measurement results", Tech. Rep., National Institute of Standards and Technology, 1994. Dosimetric Evaluation of Sample device, month 1998 10.

******* END OF REPORT *******