SAR EVALUATION REPORT

For

Posh Mobile Limited

1011A, 10/F., Harbour Centre Tower 1, No. 1 Hok Cheung St., Hung Hom,

Kowloon, Hong Kong

FCC ID: 2ABN6L500

Report Type:	**Product Type:**
Original Report	Ultra 5.0 LTE

Test Engineer:	Terry XiaHou
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Reviewed By:	Bell Hu SAR Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 www.baclcorp.com.cn

Note: This test report is prepared for the customer shown above and for the equipment described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.

Attestation of Test Results		
EUT Information	**Company Name**	Posh Mobile Limited
	EUT Description	Ultra 5.0 LTE
	FCC ID	2ABN6L500
	Model Number	Test model: L500A ; Adding model: L500B
	Test Date	2015-05-29

Frequency	Max. SAR Level(s) Reported	Limit(W/Kg)
GSM 850	0.181 W/kg 1g Head SAR 0.290 W/kg 1g Body SAR	**1. 6**
PCS 1900	0.140 W/kg 1g Head SAR 0.248 W/kg 1g Body SAR	
WCDMA 850	0.069 W/kg 1g Head SAR 0.125 W/kg 1g Body SAR	
WCDMA 1700	0.068 W/kg 1g Head SAR 0.142 W/kg 1g Body SAR	
WCDMA 1900	0.051 W/kg 1g Head SAR 0.079 W/kg 1g Body SAR	
LTE Band 4	0.107 W/kg 1g Head SAR 0.239 W/kg 1g Body SAR	
Wi-Fi (802.11b)	0.150 W/kg 1g Head SAR	
Simultaneous	0.394 W/kg 1g Head SAR 0.677 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.
	IEEE1528:2013 IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
	IEC62209-2:2010 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 wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)
	KDB procedures KDB 447498 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 D05 SAR for LTE Devices v02r03 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	RDG150525002-20	Original Report	2015-06-10

EUT DESCRIPTION

This report has been prepared on behalf of Posh Mobile Limited and their product, FCC ID: 2ABN6L500, Model: L500A or the EUT (Equipment under Test) as referred to in the rest of this report.

***Note:**
1. This series products model: L500A and L500B, we select model: L500A to test, there is no electrical change has been made to the equipment, please refer to the product similarity letter.
2. The device is capable of personal hotspot mode. Wi-Fi Hotspot mode permits the device to share its cellular data connection with other 2.4 GHz Wi-Fi enabled devices (channels 1 - 11).

Technical Specification

Product Type	Portable
Exposure Category:	Population / Uncontrolled
Antenna Type(s):	Internal Antenna
Body-Worn Accessories:	Headset
Face-Head Accessories:	None
Multi-slot Class:	Class12
Operation Mode :	GSM Voice, GPRS/EDGE, WCDMA, LTE, Wi-Fi and Bluetooth
Frequency Band:	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) WCDMA 1700: 1710-1755 MHz(TX) ; 2110-2155 MHz(RX) WCDMA1900: 1850-1910 MHz(TX) ; 1930-1990 MHz(RX) LTE Band 4: 1710-1755 MHz(TX) ; 2110-2155 MHz(RX) Wi-Fi(802.11b/g/n20): 2412MHz-2462MHz Bluetooth : 2402MHz-2480MHz
Conducted RF Power:	GSM 850 : 32.70 dBm PCS 1900: 29.90 dBm WCDMA 850: 22.99 dBm WCDMA 1700: 22.95 dBm WCDMA 1900:22.42 dBm LTE Band 4:21.32 dBm Wi-Fi(802.11b/g/n20): 12.69 dBm BT 3.0:7.19 dBm BLE:-4.61dBm
Dimensions (L*W*H):	143 mm (L) × 73 mm (W) × 8 mm (H)
Power Source:	3.8 V_{DC} Rechargeable Battery
Normal Operation:	Head and Body-worn

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 OET Bulletin 65, Supplement C Cross-Reference “Evaluating Compliance with FCC Guide-lines for Human Exposure to Radio frequency Electromagnetic Fields", released on Jun 17, 2014 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

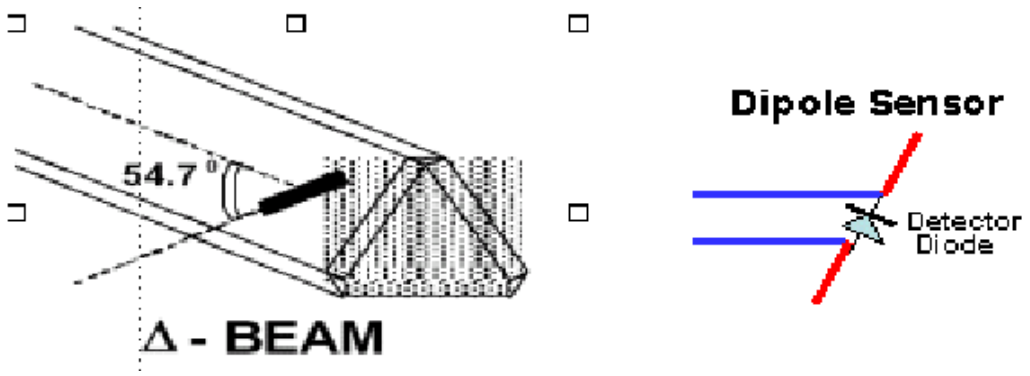
The overall uncertainty for the methodology and algorithms the used during the SAR calculation was evaluated using the data from IEEE 1528 based on the example f3 algorithm:

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

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 μV/(V/m)^2 to 0.85 μV/(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

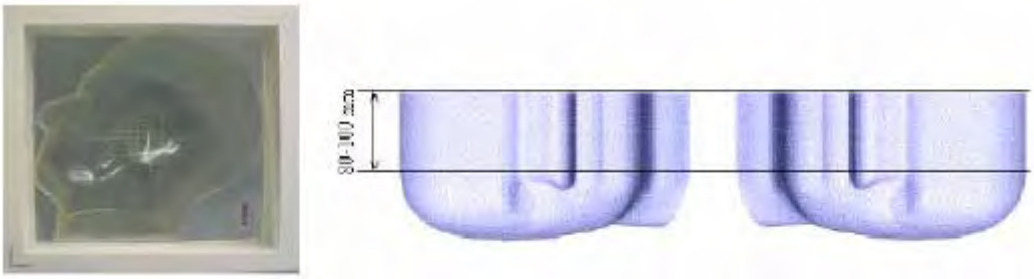
The universal device positioner allows complete freedom of movement of the EUT. Developed to hold a EUT in a free-space scenario any additional loading attributable to the material used in the construction of the positioner has been eliminated. Repeatability has been enhanced through the linear scales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

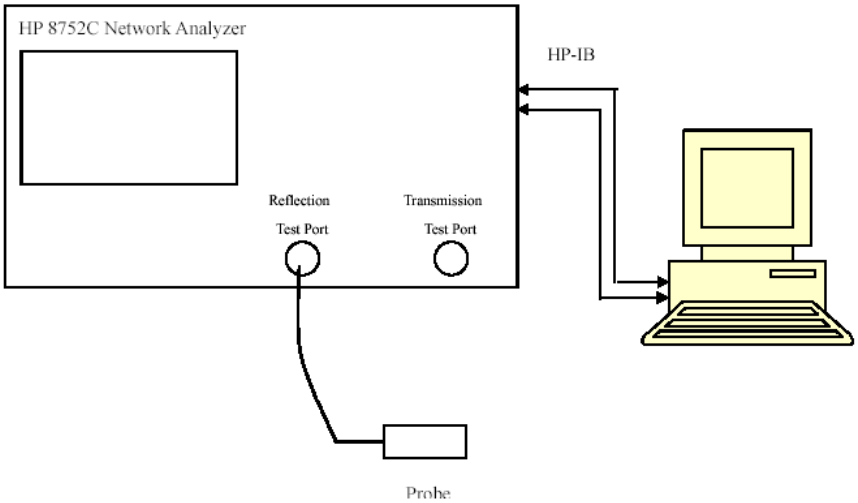
EQUIPMENT LIST AND CALIBRATION

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, 1750MHz	ALS-D-1750-S-2	2013-10-08	198-00304
Dipole, 1900MHz	ALS-D-1900-S-2	2014-10-09	210-00710
Dipole, 2450MHz	ALS-D-2450-S-2	2014-10-09	220-00758
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 Head	ALS-TS-835-H	Each Time	270-01002
Simulated Tissue 835 MHz Body	ALS-TS-835-B	Each Time	270-02101
Simulated Tissue 1750 MHz Head	ALS-TS-1750-H	Each Time	295-01103
Simulated Tissue 1750 MHz Body	ALS-TS-1750-B	Each Time	295-02102
Simulated Tissue 1900 MHz Head	ALS-TS-1900-H	Each Time	295-01103
Simulated Tissue 1900 MHz Body	ALS-TS-1900-B	Each Time	295-02102
Simulated Tissue 2450 MHz Head	ALS-TS-2450-H	Each Time	290-01108
Simulated Tissue 2450 MHz Body	ALS-TS-2450-B	Each Time	290-01109
Directional couple	DC6180A	N/A	0325849
Power Amplifier	5S1G4	N/A	71377
Dielectric probe kit	HP85070B	N/A	N/A
Attenuator	3dB	2015-05-07	5402
Network analyzer	8752C	2014-06-03	3410A02356
Synthesized Sweeper	HP 8341B	2014-06-03	2624A00116
UNIVERSAL RADIO COMMUNICATION TESTER	CMU200	2014-11-23	106891
WIDEBAND RADIO COMMUNICATION TESTER	CMW500	2015-04-18	114772
EMI Test Receiver	ESCI	2014-06-12	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	Head	41.07	0.90	41.50	0.90	-1.036	0.000	±5
	Body	53.82	0.95	55.20	0.97	-2.500	-2.062	±5
826.4	Head	41.07	0.90	41.50	0.90	-1.036	0.000	±5
	Body	53.83	0.95	55.20	0.97	-2.482	-2.062	±5
836.6	Head	41.09	0.91	41.50	0.90	-0.988	1.111	±5
	Body	53.85	0.96	55.20	0.97	-2.446	-1.031	±5
846.6	Head	41.04	0.91	41.50	0.90	-1.108	1.111	±5
	Body	53.85	0.97	55.20	0.97	-2.446	0.000	±5
848.8	Head	41.05	0.91	41.50	0.90	-1.084	1.111	±5
	Body	53.86	0.98	55.20	0.97	-2.428	1.031	±5
1712.4	Head	39.30	1.36	40.08	1.37	-1.946	-0.730	±5
	Body	51.88	1.49	53.43	1.49	-2.901	0.000	±5
1720	Head	39.26	1.38	40.08	1.37	-2.046	0.730	±5
	Body	51.86	1.50	53.43	1.49	-2.938	0.671	±5
1732.4	Head	39.60	1.36	40.08	1.37	-1.198	-0.730	±5
	Body	51.99	1.51	53.43	1.49	-2.695	1.342	±5
1732.5	Head	39.60	1.36	40.08	1.37	-1.198	-0.730	±5
	Body	51.99	1.51	53.43	1.49	-2.695	1.342	±5
1745	Head	39.36	1.39	40.08	1.37	-1.796	1.460	±5
	Body	51.91	1.52	53.43	1.49	-2.845	2.013	±5
1752.6	Head	39.51	1.41	40.08	1.37	-1.422	2.920	±5
	Body	51.98	1.53	53.43	1.49	-2.714	2.685	±5
1850.2	Head	39.69	1.38	40.00	1.40	-0.775	-1.429	±5
	Body	51.96	1.50	53.30	1.52	-2.514	-1.316	±5
1852.4	Head	39.73	1.38	40.00	1.40	-0.675	-1.429	±5
	Body	52.05	1.50	53.30	1.52	-2.345	-1.316	±5
1880.0	Head	39.59	1.40	40.00	1.40	-1.025	0.000	±5
	Body	51.95	1.51	53.30	1.52	-2.533	-0.658	±5
1907.6	Head	39.56	1.40	40.00	1.40	-1.100	0.000	±5
	Body	51.75	1.54	53.30	1.52	-2.908	1.316	±5
1909.8	Head	39.72	1.42	40.00	1.40	-0.700	1.429	±5
	Body	51.90	1.55	53.30	1.52	-2.627	1.974	±5
2412	Head	39.66	1.79	39.20	1.80	1.173	-0.556	±5
	Body	52.82	2.02	52.70	1.95	0.228	3.590	±5
2437	Head	39.47	1.82	39.20	1.80	0.689	1.111	±5
	Body	52.84	2.01	52.70	1.95	0.266	3.077	±5
2462	Head	39.90	1.83	39.20	1.80	1.786	1.667	±5
	Body	52.86	1.98	52.70	1.95	0.304	1.538	±5

**Liquid Verification was performed on 2015-05-29.*

Please refer to the following tables.

835 MHz Head				835 MHz Body		
Frequency (MHz)	e'	e''		Frequency (MHz)	e'	e''
824.0	41.0670	19.6743		824.0	53.8151	20.7073
824.5	41.0546	19.6645		824.5	53.8514	20.6572
825.0	41.0470	19.7009		825.0	53.8109	20.6470
825.5	41.0814	19.6727		825.5	53.7671	20.6780
826.0	41.0675	19.7501		826.0	53.8375	20.6760
826.5	41.0728	19.6835		826.5	53.8336	20.6600
827.0	41.1072	19.7128		827.0	53.8603	20.6941
827.5	41.0976	19.7648		827.5	53.8131	20.6691
828.0	41.0289	19.6746		828.0	53.8722	20.6275
828.5	41.0050	19.6924		828.5	53.7825	20.6966
829.0	41.0481	19.6799		829.0	53.8120	20.6769
829.5	41.0719	19.7609		829.5	53.8094	20.6297
830.0	41.0068	19.7663		830.0	53.7784	20.6955
830.5	41.0081	19.7618		830.5	53.8002	20.6538
831.0	41.0124	19.6870		831.0	53.8102	20.6796
831.5	41.0291	19.7323		831.5	53.8199	20.6164
832.0	41.0941	19.7262		832.0	53.8232	20.6759
832.5	41.0646	19.7670		832.5	53.7766	20.6188
833.0	41.0296	19.6991		833.0	53.8026	20.6815
833.5	41.0866	19.6860		833.5	53.8496	20.6781
834.0	41.0470	19.7328		834.0	53.7755	20.6965
834.5	41.0286	19.7178		834.5	53.7760	20.6154
835.0	41.1072	19.7626		835.0	53.8344	20.7063
835.5	41.0869	19.6919		835.5	53.8515	20.6268
836.0	41.0746	19.7479		836.0	53.8358	20.6702
836.5	41.0566	19.7521		836.5	53.8712	20.6698
837.0	41.0457	19.6857		837.0	53.8011	20.6362
837.5	41.0422	19.7721		837.5	53.7756	20.6634
838.0	41.1024	19.7202		838.0	53.8683	20.6424
838.5	41.0374	19.7552		838.5	53.7707	20.6783
839.0	41.0945	19.6967		839.0	53.8483	20.6926
839.5	41.0552	19.7319		839.5	53.8300	20.6141
840.0	41.0137	19.4442		840.0	53.8370	20.6675
840.5	41.0964	19.4437		840.5	53.8021	20.6421
841.0	41.0691	19.4400		841.0	53.8674	20.6902
841.5	41.0019	19.4022		841.5	53.8657	20.6765
842.0	41.0229	19.4075		842.0	53.8321	20.6366
842.5	41.0913	19.3769		842.5	53.8010	20.6663
843.0	41.0091	19.3834		843.0	53.7731	20.6146
843.5	41.0589	19.4030		843.5	53.7852	20.6457
844.0	40.9967	19.3975		844.0	53.8408	20.6927
844.5	41.1034	19.4061		844.5	53.8162	20.6822
845.0	41.0965	19.3660		845.0	53.7878	20.6760
845.5	41.0615	19.3816		845.5	53.8639	20.6210
846.0	41.0661	19.4724		846.0	53.8470	20.6599
846.5	41.0405	19.4001		846.5	53.8509	20.6782
847.0	41.0877	19.4705		847.0	53.7905	20.6178
847.5	41.0758	19.3698		847.5	53.8712	20.7104
848.0	41.0800	19.3985		848.0	53.8693	20.6928
848.5	41.0207	19.4145		848.5	53.7733	20.6266
849.0	41.0532	19.3772		849.0	53.8601	20.6830

1750 MHz Head				1750 MHz Body		
Frequency (MHz)	e'	e''		Frequency (MHz)	e'	e''
1710.0	39.1414	14.1850		1710.0	51.8831	15.7090
1711.5	39.1215	14.1952		1711.5	51.8976	15.6560
1713.0	39.4855	14.3826		1713.0	51.8668	15.6709
1714.5	39.2244	14.3819		1714.5	51.9643	15.7143
1716.0	39.5851	14.4754		1716.0	51.8849	15.6094
1717.5	39.3499	14.1270		1717.5	51.9489	15.6155
1719.0	39.3046	14.2343		1719.0	51.9030	15.6600
1720.5	39.2393	14.4626		1720.5	51.8398	15.6928
1722.0	39.6339	14.1983		1722.0	51.8523	15.6902
1723.5	39.1191	14.2506		1723.5	51.9559	15.6871
1725.0	39.5608	14.3541		1725.0	51.9951	15.5652
1726.5	39.5768	14.0959		1726.5	51.8686	15.6758
1728.0	39.4118	14.4125		1728.0	51.9330	15.7086
1729.5	39.2958	14.3414		1729.5	51.8682	15.6685
1731.0	39.2780	14.3235		1731.0	51.8811	15.6994
1732.5	39.6044	14.1151		1732.5	51.9946	15.7133
1734.0	39.2559	14.4404		1734.0	51.9121	15.6285
1735.5	39.6211	14.2792		1735.5	51.8593	15.6442
1737.0	39.2758	14.3406		1737.0	51.9411	15.6264
1738.5	39.1871	14.3045		1738.5	51.9082	15.6011
1740.0	39.4640	14.2406		1740.0	51.9519	15.6234
1741.5	39.2620	14.1036		1741.5	51.8545	15.6529
1743.0	39.3123	14.0946		1743.0	51.9206	15.6662
1744.5	39.3647	14.2650		1744.5	51.8899	15.6874
1746.0	39.3534	14.3960		1746.0	51.9984	15.6284
1747.5	39.3172	14.4193		1747.5	51.8624	15.6882
1749.0	39.5321	14.4641		1749.0	51.9716	15.6068
1750.5	39.1695	14.2162		1750.5	51.8740	15.6963
1752.0	39.5226	14.5157		1752.0	51.9892	15.6829
1753.5	39.4439	14.1850		1753.5	51.9616	15.6487
1755.0	39.4644	14.5349		1755.0	51.9501	15.6346
1756.5	39.5879	14.4063		1756.5	51.9196	15.6196
1758.0	39.2666	14.3602		1758.0	51.9650	15.5262
1759.5	39.5125	14.3146		1759.5	51.9105	15.5153
1761.0	39.1627	14.5148		1761.0	51.8822	15.5339
1762.5	39.5892	14.5333		1762.5	51.8954	15.4748
1764.0	39.2588	14.3382		1764.0	51.8527	15.3345
1765.5	39.4066	14.5756		1765.5	51.9189	15.4479
1767.0	39.1431	14.1363		1767.0	51.8675	15.4609
1768.5	39.2239	14.3297		1768.5	51.9631	15.4724
1770.0	39.1886	14.1830		1770.0	51.9562	15.4115
1771.5	39.2517	14.3171		1771.5	51.9697	15.2933
1773.0	39.4564	14.2858		1773.0	51.9918	15.4955
1774.5	39.1775	14.5544		1774.5	51.9959	15.3936
1776.0	39.5229	14.0877		1776.0	51.8826	15.3787
1777.5	39.6375	14.4889		1777.5	51.8710	15.5230
1779.0	39.5465	14.5100		1779.0	51.9550	15.5627
1780.5	39.5499	14.3587		1780.5	51.8439	15.3014
1782.0	39.3835	14.2145		1782.0	51.9637	15.4719
1783.5	39.5773	14.2823		1783.5	51.9136	15.5745
1785.0	39.2105	14.3069		1785.0	51.9890	15.3590

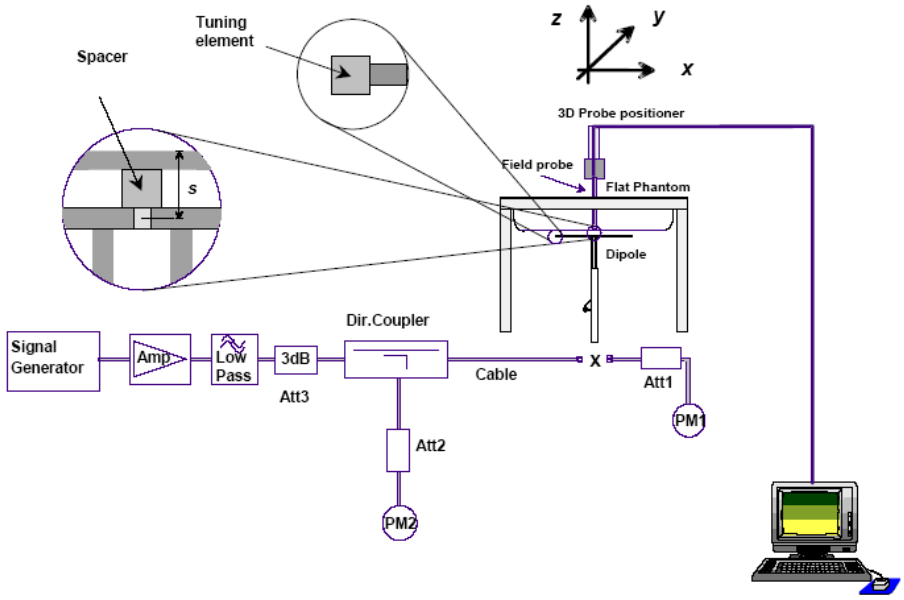
1900 MHz Head				1900 MHz Body		
Frequency (MHz)	e'	e''		Frequency (MHz)	e'	e''
1850.0	39.6907	13.4043		1850.0	51.9569	14.5528
1851.2	39.6477	13.2951		1851.2	51.8956	14.4602
1852.4	39.7300	13.4148		1852.4	52.0545	14.5685
1853.6	39.7141	13.3292		1853.6	51.8941	14.4544
1854.8	39.6499	13.3368		1854.8	52.0800	14.4741
1856.0	39.5859	13.3086		1856.0	51.7846	14.5038
1857.2	39.7055	13.2564		1857.2	51.8565	14.5427
1858.4	39.7285	13.3754		1858.4	51.9104	14.5240
1859.6	39.5954	13.3583		1859.6	52.0022	14.4599
1860.8	39.6345	13.3135		1860.8	51.9427	14.4435
1862.0	39.5571	13.3488		1862.0	51.9155	14.4973
1863.2	39.5973	13.3534		1863.2	52.0753	14.5314
1864.4	39.5763	13.3356		1864.4	51.8658	14.4871
1865.6	39.7286	13.3622		1865.6	51.9149	14.4666
1866.8	39.5685	13.4155		1866.8	51.7339	14.4759
1868.0	39.5713	13.4343		1868.0	51.9650	14.5022
1869.2	39.6363	13.3003		1869.2	51.8959	14.4446
1870.4	39.6158	13.3961		1870.4	52.0083	14.4592
1871.6	39.6928	13.4151		1871.6	52.0066	14.5136
1872.8	39.6479	13.2608		1872.8	52.0051	14.5578
1874.0	39.7106	13.3054		1874.0	51.8882	14.4491
1875.2	39.6317	13.2539		1875.2	51.8515	14.4757
1876.4	39.5691	13.2916		1876.4	51.9880	14.5452
1877.6	39.6094	13.3829		1877.6	52.0795	14.4324
1878.8	39.6846	13.3571		1878.8	51.7398	14.5344
1880.0	39.5937	13.4266		1880.0	51.9483	14.4566
1881.2	39.6751	13.4000		1881.2	52.0609	14.5420
1882.4	39.6441	13.3498		1882.4	52.0108	14.4937
1883.6	39.6934	13.2929		1883.6	51.8252	14.5475
1884.8	39.5846	13.3497		1884.8	51.9621	14.5342
1886.0	39.6723	13.3949		1886.0	52.0089	14.5116
1887.2	39.6124	13.3786		1887.2	52.0676	14.5734
1888.4	39.6751	13.3585		1888.4	51.9395	14.5478
1889.6	39.5807	13.2872		1889.6	51.8605	14.4804
1890.8	39.7262	13.3898		1890.8	51.9474	14.4360
1892.0	39.7013	13.3765		1892.0	52.1006	14.5145
1893.2	39.6732	13.3023		1893.2	51.7972	14.5225
1894.4	39.6911	13.4096		1894.4	51.9201	14.4605
1895.6	39.7181	13.3809		1895.6	51.7557	14.4471
1896.8	39.6206	13.2439		1896.8	51.9694	14.5553
1898.0	39.7431	13.4097		1898.0	52.1004	14.4753
1899.2	39.5903	13.3556		1899.2	51.8898	14.5601
1900.4	39.6975	13.3385		1900.4	51.8821	14.4534
1901.6	39.6330	13.2440		1901.6	52.0000	14.5049
1902.8	39.7244	13.4240		1902.8	51.9318	14.5453
1904.0	39.6348	13.3959		1904.0	51.7534	14.4458
1905.2	39.7344	13.2866		1905.2	52.0687	14.5490
1906.4	39.5558	13.3603		1906.4	52.0743	14.5297
1907.6	39.5613	13.2452		1907.6	51.7477	14.5091
1908.8	39.6907	13.2952		1908.8	52.0006	14.4780
1910.0	39.7189	13.3290		1910.0	51.9026	14.5737

2450 MHz Head				2450 MHz Body		
Frequency (MHz)	e'	e''		Frequency (MHz)	e'	e''
2410.0	39.5117	13.5812		2410.0	52.7977	14.2159
2411.0	39.6376	13.5335		2411.0	52.8647	14.3181
2412.0	39.6614	13.3195		2412.0	52.8248	15.0293
2413.0	39.9733	13.4483		2413.0	52.8646	14.6385
2414.0	39.4830	13.5260		2414.0	52.8127	14.2724
2415.0	39.7986	13.3759		2415.0	52.8845	14.8212
2416.0	39.9591	13.5717		2416.0	52.8675	14.9892
2417.0	39.6591	13.3845		2417.0	52.8273	14.3527
2418.0	39.5587	13.5998		2418.0	52.8599	14.4652
2419.0	39.4834	13.5404		2419.0	52.8545	14.9374
2420.0	39.8348	13.4633		2420.0	52.8575	14.5157
2421.0	39.5278	13.3406		2421.0	52.8766	14.1513
2422.0	39.9312	13.5631		2422.0	52.8809	14.2175
2423.0	39.5395	13.4576		2423.0	52.8020	14.3969
2424.0	39.5158	13.4681		2424.0	52.8182	14.7388
2425.0	39.4653	13.3280		2425.0	52.8296	14.7064
2426.0	39.6610	13.2938		2426.0	52.8771	15.1516
2427.0	39.7462	13.4826		2427.0	52.8000	14.6681
2428.0	39.6625	13.3358		2428.0	52.8265	13.9556
2429.0	39.7919	13.4742		2429.0	52.8200	14.6601
2430.0	39.7841	13.4451		2430.0	52.8840	14.1580
2431.0	39.8570	13.5040		2431.0	52.8204	15.1160
2432.0	39.9271	13.5394		2432.0	52.8757	14.3551
2433.0	39.8280	13.5111		2433.0	52.8243	15.0815
2434.0	39.7500	13.4811		2434.0	52.8835	13.9835
2435.0	39.8165	13.3489		2435.0	52.8739	14.7362
2436.0	39.9221	13.3793		2436.0	52.8454	14.0495
2437.0	39.4682	13.3952		2437.0	52.8365	14.8287
2438.0	39.7172	13.5534		2438.0	52.8691	14.7111
2440.0	39.5335	13.3265		2440.0	52.8105	15.0100
2441.0	39.7421	13.5699		2441.0	52.8357	14.9613
2442.0	39.8742	13.3297		2442.0	52.8460	14.8449
2443.0	39.9175	13.2823		2443.0	52.7978	14.4553
2444.0	39.7784	13.5217		2444.0	52.8326	14.8587
2445.0	39.6562	13.5211		2445.0	52.8521	14.5820
2446.0	39.8243	13.2729		2446.0	52.7970	14.8224
2447.0	39.9002	13.4070		2447.0	52.8918	15.1148
2448.0	39.6219	13.5583		2448.0	52.8198	14.5228
2449.0	39.6259	13.5367		2449.0	52.8492	14.6831
2450.0	39.8091	13.5230		2450.0	52.8899	14.9946
2451.0	39.8529	13.3037		2451.0	52.8507	14.5738
2452.0	39.7121	13.3378		2452.0	52.8231	14.9471
2453.0	39.4566	13.5205		2453.0	52.8224	14.8134
2454.0	39.7585	13.4729		2454.0	52.8692	14.8318
2455.0	39.9670	13.2862		2455.0	52.8912	14.8255
2456.0	39.5677	13.3368		2456.0	52.8870	15.0291
2457.0	39.4455	13.3720		2457.0	52.8071	14.4482
2458.0	39.5912	13.4422		2458.0	52.8003	14.8468
2459.0	39.7040	13.3479		2459.0	52.8171	14.5909
2460.0	39.9386	13.4029		2460.0	52.8694	15.0653
2461.0	39.8149	13.5841		2461.0	52.8558	14.2049
2462.0	39.8969	13.4086		2462.0	52.8581	14.4825

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(1750MHz)	ALS-D-1750-S-2	198-00304	2013-10-08	2016-10-07
APREL	Dipole antenna(1900MHz)	ALS-D-1900-S-2	210-00710	2014-10-09	2017-10-08
APREL	Dipole antenna(2450MHz)	ALS-D-2450-S-2	220-00758	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 (%)
2015-05-29	835	Head	1g	9.617	9.773	-1.596	±10
		Body	1g	9.476	9.736	-2.671	±10
	1750	Head	1g	35.199	37.02	-4.919	±10
		Body	1g	35.811	36.65	-2.289	±10
	1900	Head	1g	39.752	39.481	0.686	±10
		Body	1g	40.227	39.715	1.289	±10
	2450	Head	1g	51.355	54.916	-6.484	±10
		Body	1g	50.316	52.418	-4.010	±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 Head 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 : 9.638 W/kg
Power Drift-Finish : 9.727 W/kg
Power Drift (%) : 0.921

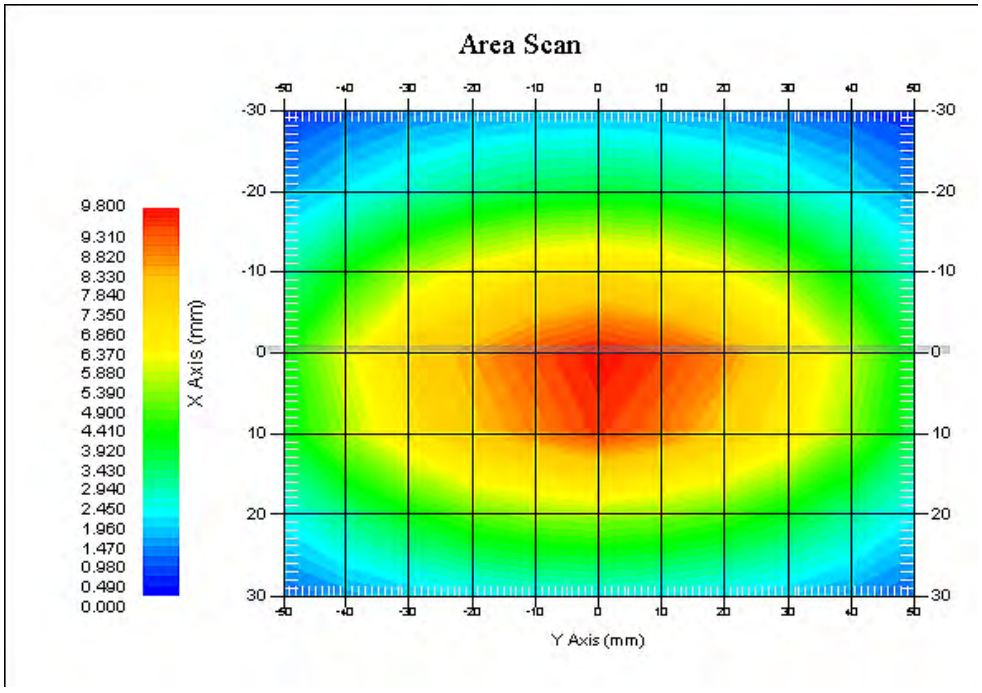
Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Serial No. : System Default
Location : Center
Description : Default
Phantom Data

Tissue Data
Type : Head
Serial No. : 270-01002
Frequency : 835.0 MHz
Last Calib. Date : 29-May-2015
Temperature : 20.00 °C
Ambient Temp. : 21.00 °C
Humidity : 56.00 RH%
Epsilon : 41.11 F/m
Sigma : 0.91 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 : 9.617 W/kg
10 gram SAR value : 6.353 W/kg
Area Scan Peak SAR : 9.766 W/kg
Zoom Scan Peak SAR : 16.257 W/kg



835 MHz System Validation with Head Tissue

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 : 9.565 W/kg
Power Drift-Finish : 9.511 W/kg
Power Drift (%) : -0.579

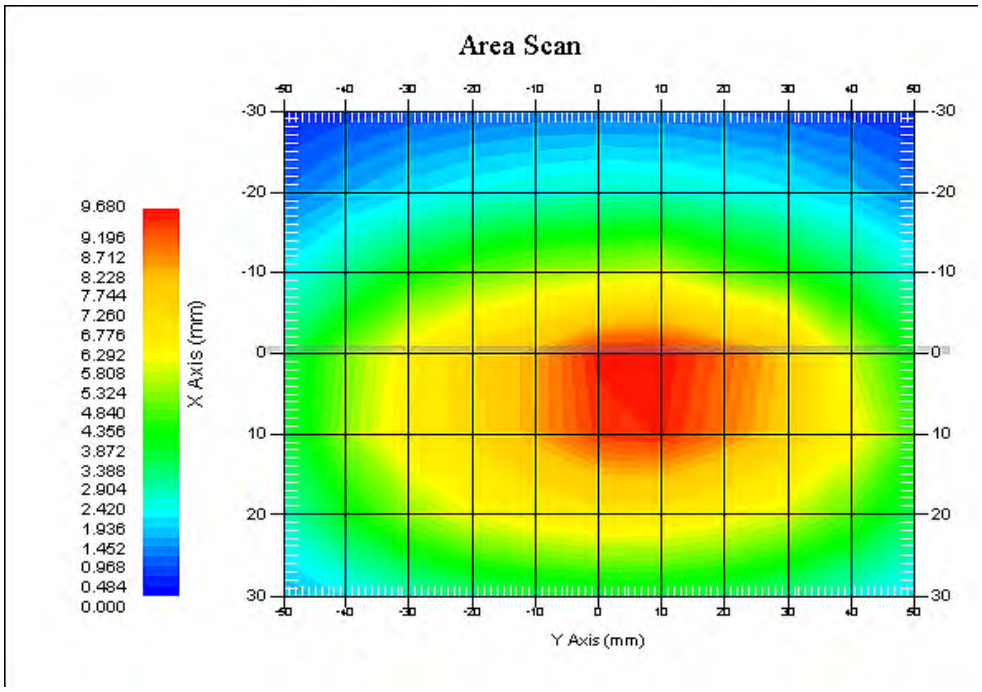
Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Serial No. : System Default
Location : Center
Description : Default
Phantom Data

Tissue Data
Type : Body
Serial No. : 270-02101
Frequency : 835.0 MHz
Last Calib. Date : 29-May-2015
Temperature : 20.00 °C
Ambient Temp. : 21.00 °C
Humidity : 56.00 RH%
Epsilon : 53.83 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 : 9.476 W/kg
10 gram SAR value : 6.322 W/kg
Area Scan Peak SAR : 9.655 W/kg
Zoom Scan Peak SAR : 16.830 W/kg



835 MHz System Validation with Body Tissue

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

System Performance Check 1750 MHz Head Liquid

Dipole 1750 MHz; Type: ALS-D-1750-S-2; S/N: 198-00304

Product Data
Device Name : Dipole 1750MHz
Serial No. : 198-00304
Type : Dipole
Model : ALS-D-1750-S-2
Frequency Band : 1700
Max. Transmit Pwr : 1 W
Drift Time : 3 min(s)
Power Drift-Start : 34.357 W/kg
Power Drift-Finish : 34.883 W/kg
Power Drift (%) : 1.556

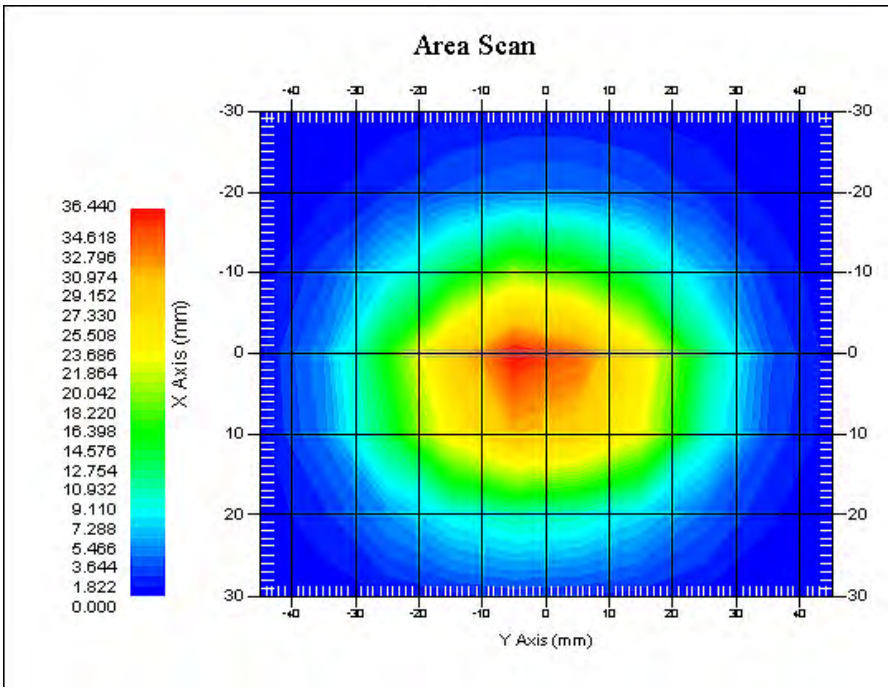
Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Serial No. : System Default
Location : Center
Description : Default

Tissue Data
Type : Head
Serial No. : 295-01101
Frequency : 1750.00 MHz
Last Calib. Date : 29-May-2015
Temperature : 20.00 °C
Ambient Temp. : 21.00 °C
Humidity : 56.00 RH%
Epsilon : 39.27 F/m
Sigma : 1.39 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 : 1750
Duty Cycle Factor : 1
Conversion Factor : 5.4
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. : 20.00 °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 : 35.199 W/kg
10 gram SAR value : 19.339 W/kg
Area Scan Peak SAR : 36.238 W/kg
Zoom Scan Peak SAR : 63.230 W/kg



1750 MHz System Validation with Head Tissue

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

System Performance Check 1750 MHz Body Liquid

Dipole 1750 MHz; Type: ALS-D-1750-S-2; S/N: 198-00304

Product Data
Device Name : Dipole 1750MHz
Serial No. : 198-00304
Type : Dipole
Model : ALS-D-1750-S-2
Frequency Band : 1700
Max. Transmit Pwr : 1 W
Drift Time : 3 min(s)
Power Drift-Start : 36.733 W/kg
Power Drift-Finish : 36.156 W/kg
Power Drift (%) : -1.673

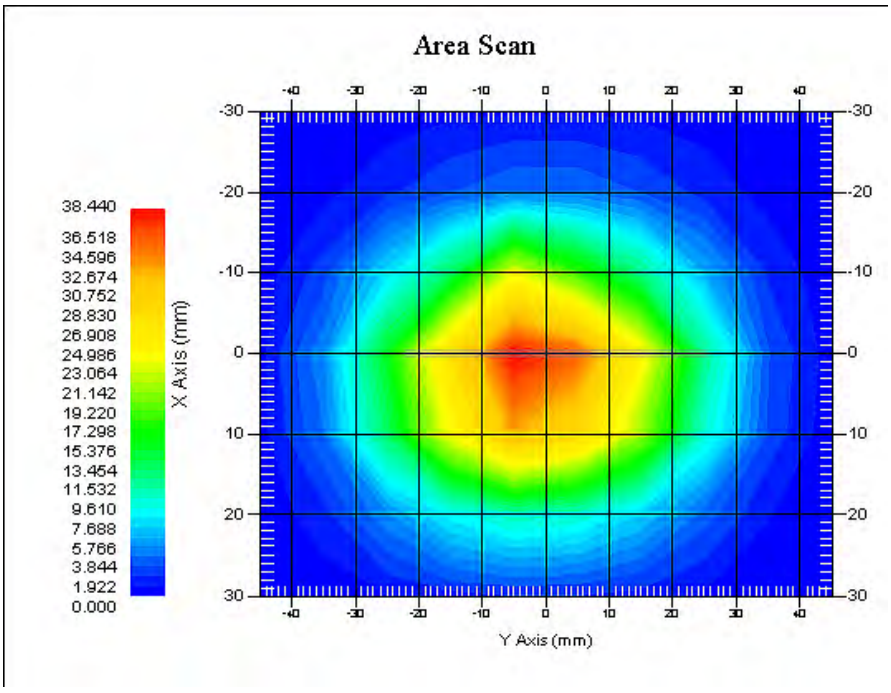
Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Serial No. : System Default
Location : Center
Description : Default

Tissue Data
Type : Body
Serial No. : 295-02105
Frequency : 1750.00 MHz
Last Calib. Date : 29-May-2015
Temperature : 20.00 °C
Ambient Temp. : 21.00 °C
Humidity : 56.00 RH%
Epsilon : 51.91 F/m
Sigma : 1.52 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 : 1750
Duty Cycle Factor : 1
Conversion Factor : 5.3
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 : 35.811 W/kg
10 gram SAR value : 19.725 W/kg
Area Scan Peak SAR : 38.157 W/kg
Zoom Scan Peak SAR : 67.527 W/kg



1750 MHz System Validation with Body Tissue

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

System Performance Check 1900 MHz Head 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 : 43.622 W/kg
Power Drift-Finish : 43.327 W/kg
Power Drift (%) : -0.756

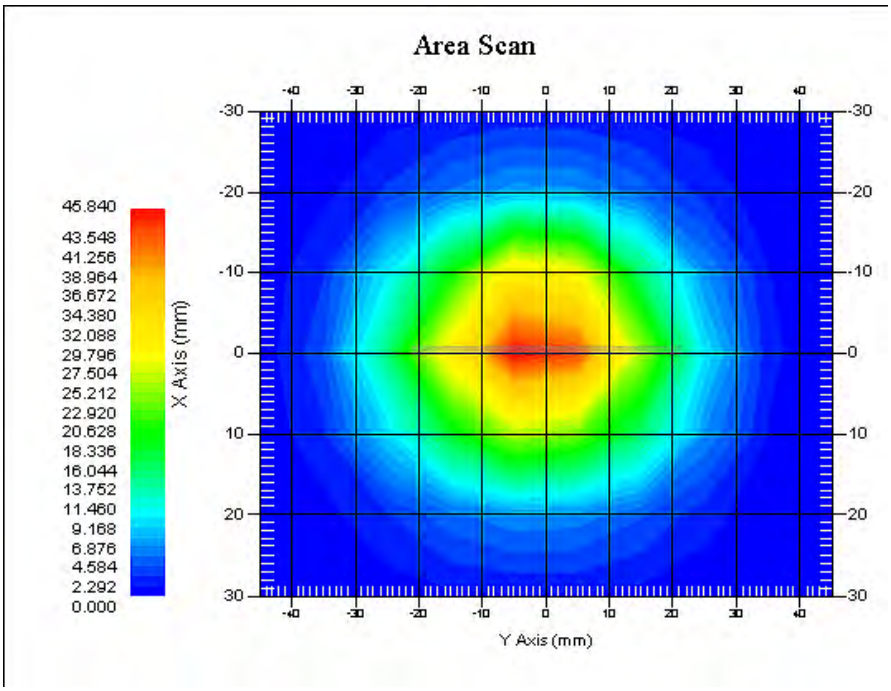
Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Serial No. : System Default
Location : Center
Description : Default

Tissue Data
Type : Head
Serial No. : 295-01103
Frequency : 1900.00 MHz
Last Calib. Date : 29-May-2015
Temperature : 20.00 °C
Ambient Temp. : 21.00 °C
Humidity : 56.00 RH%
Epsilon : 39.65 F/m
Sigma : 1.40 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 : 4.8
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. : 20.00 °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 : 39.752 W/kg
10 gram SAR value : 21.368 W/kg
Area Scan Peak SAR : 45.755 W/kg
Zoom Scan Peak SAR : 73.527 W/kg



1900 MHz System Validation with Head 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 : 45.332 W/kg
Power Drift-Finish : 45.919 W/kg
Power Drift (%) : 1.315

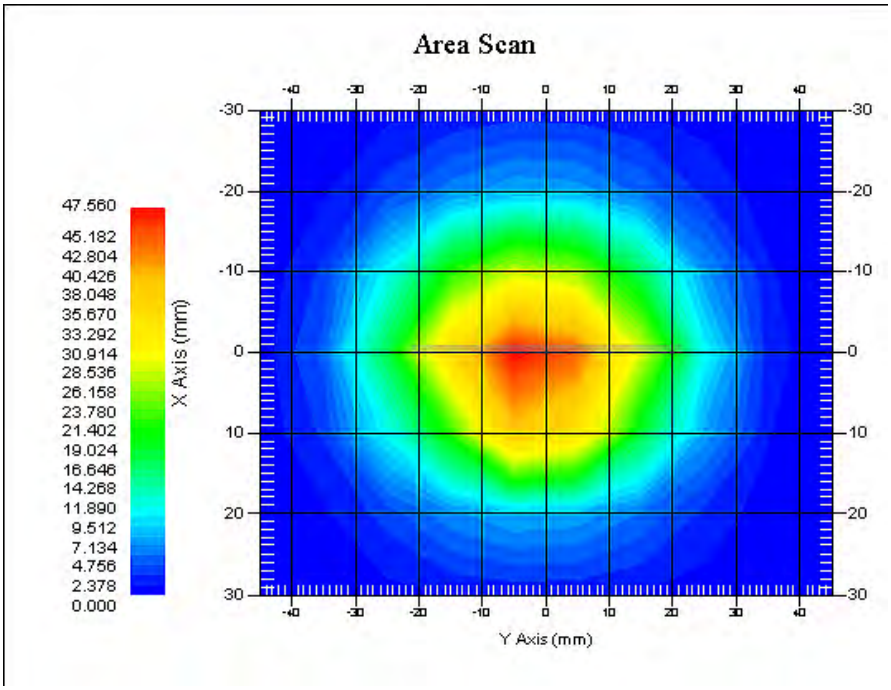
Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Serial No. : System Default
Location : Center
Description : Default

Tissue Data
Type : Body
Serial No. : 295-02102
Frequency : 1900.00 MHz
Last Calib. Date : 29-May-2015
Temperature : 20.00 °C
Ambient Temp. : 21.00 °C
Humidity : 56.00 RH%
Epsilon : 51.88 F/m
Sigma : 1.54 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 : 40.227 W/kg
10 gram SAR value : 21.573 W/kg
Area Scan Peak SAR : 47.510 W/kg
Zoom Scan Peak SAR : 72.822 W/kg



1900 MHz System Validation with Body Tissue

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

System Performance Check 2450 MHz Head Liquid

Dipole 2450 MHz; Type: ALS-D-2450-S-2; S/N: 220-00758

Product Data
Device Name : Dipole 2450MHz
Serial No. : 220-00758
Type : Dipole
Model : ALS-D-2450-S-2
Frequency Band : 2450 MHz
Max. Transmit Pwr : 1 W
Drift Time : 3 min(s)
Power Drift-Start : 55.271 W/kg
Power Drift-Finish : 54.769 W/kg
Power Drift (%) : -0.936

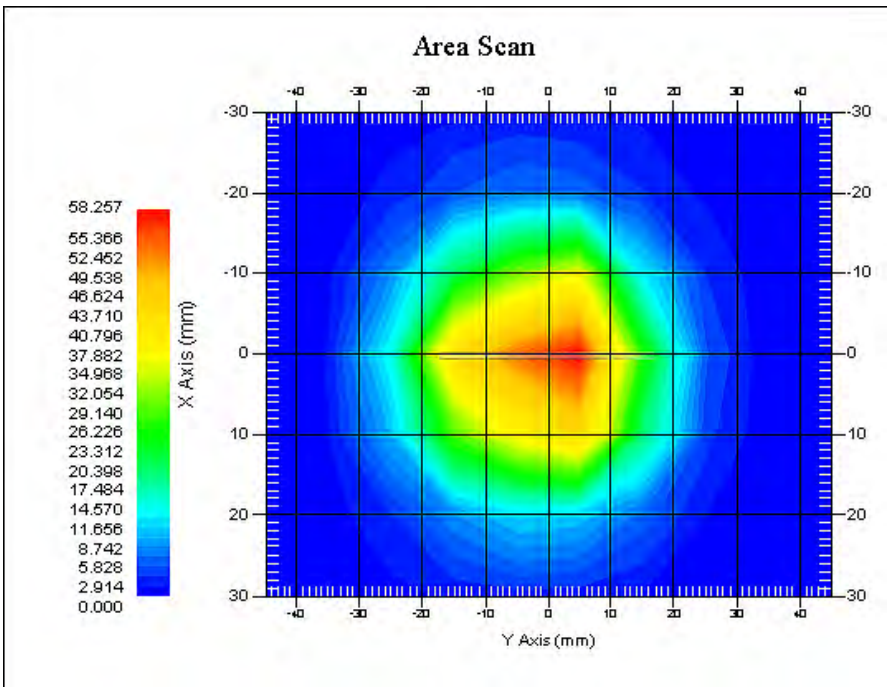
Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Serial No. : System Default
Location : Center
Description : Default

Tissue Data
Type : Head
Serial No. : 290-01109
Frequency : 2450.0 MHz
Last Calib. Date : 29-May-2015
Temperature : 20.00 °C
Ambient Temp. : 21.00 °C
Humidity : 50.00 RH%
Epsilon : 39.81 F/m
Sigma : 1.84 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 : 2450 MHz
Duty Cycle Factor : 1
Conversion Factor : 4.3
Probe Sensitivity : 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point : 95.00 mV
Offset : 1.56 mm

Measurement Data
Crest Factor : 1
Scan Type : Complete
Tissue Temp. : 20.00 °C
Ambient Temp. : 20.00 °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 : 51.355 W/kg
10 gram SAR value : 23.358 W/kg
Area Scan Peak SAR : 57.925 W/kg
Zoom Scan Peak SAR : 88.533 W/kg



2450 MHz System Validation with Head Tissue

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

System Performance Check 2450 MHz Body Liquid

Dipole 2450 MHz; Type: ALS-D-2450-S-2; S/N: 220-00758

Product Data
Device Name : Dipole 2450MHz
Serial No. : 220-00758
Type : Dipole
Model : ALS-D-2450-S-2
Frequency Band : 2450 MHz
Max. Transmit Pwr : 1 W
Drift Time : 3 min(s)
Power Drift-Start : 52.625 W/kg
Power Drift-Finish : 53.510 W/kg
Power Drift (%) : 1.527

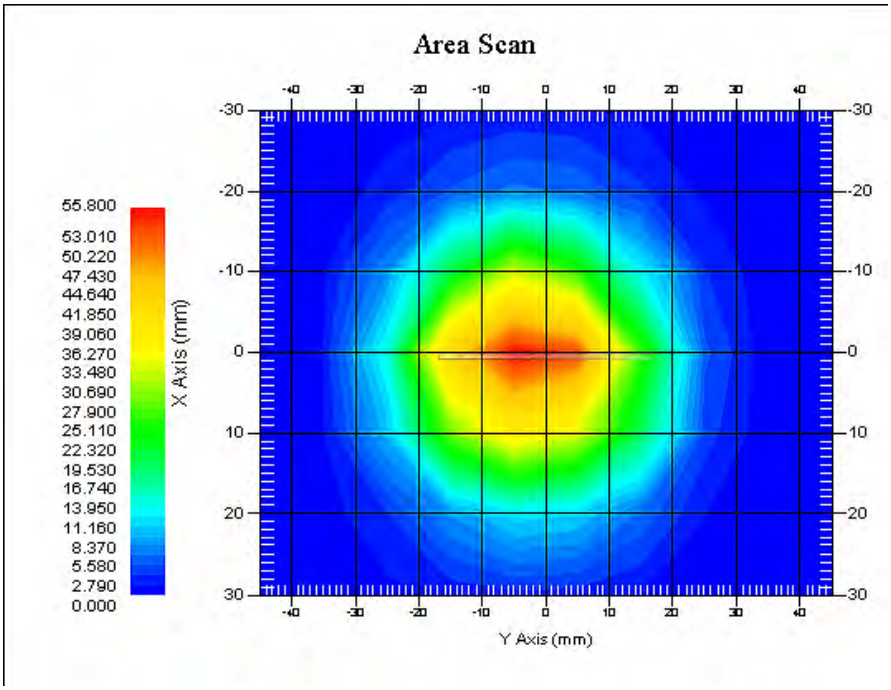
Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Serial No. : System Default
Location : Center
Description : Default

Tissue Data
Type : Body
Serial No. : 290-01109
Frequency : 2450.0 MHz
Last Calib. Date : 29-May-2015
Temperature : 20.00 °C
Ambient Temp. : 21.00 °C
Humidity : 50.00 RH%
Epsilon : 54.89 F/m
Sigma : 2.04 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 : 2450 MHz
Duty Cycle Factor : 1
Conversion Factor : 4.3
Probe Sensitivity : 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point : 95.00 mV
Offset : 1.56 mm

Measurement Data
Crest Factor : 1
Scan Type : Complete
Tissue Temp. : 20.00 °C
Ambient Temp. : 20.00 °C
Area Scan : 8x9x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm

1 gram SAR value : 50.316 W/kg
10 gram SAR value : 22.516 W/kg
Area Scan Peak SAR : 55.536 W/kg
Zoom Scan Peak SAR : 83.590 W/kg



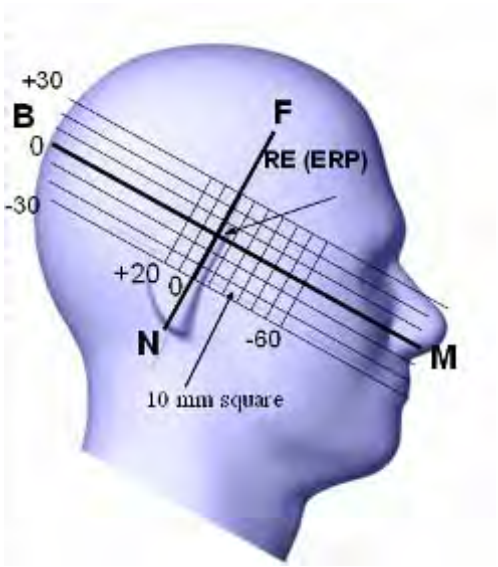
2450 MHz System Validation with Body Tissue

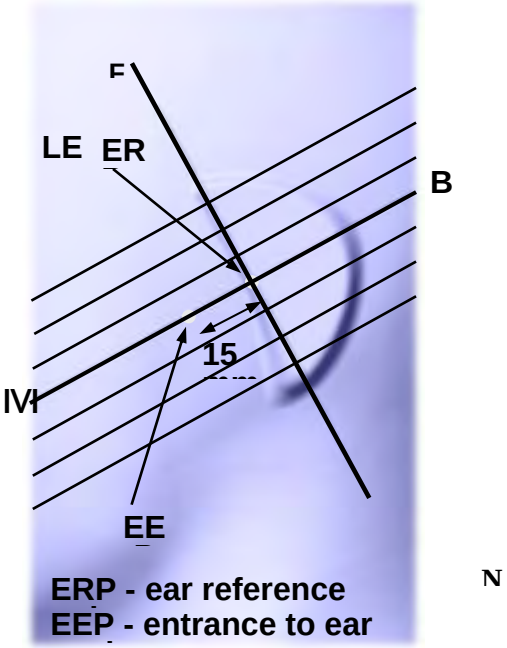
EUT TEST STRATEGY AND METHODOLOGY

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

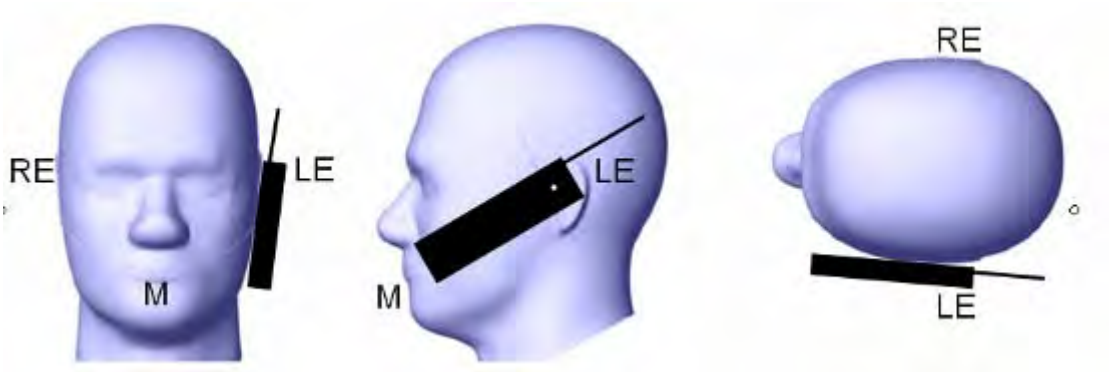
The device is brought toward the mouth of the head phantom by pivoting against the "ear reference point" or along the "N-F" line for the SCC-34/SC-2 head phantom.

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

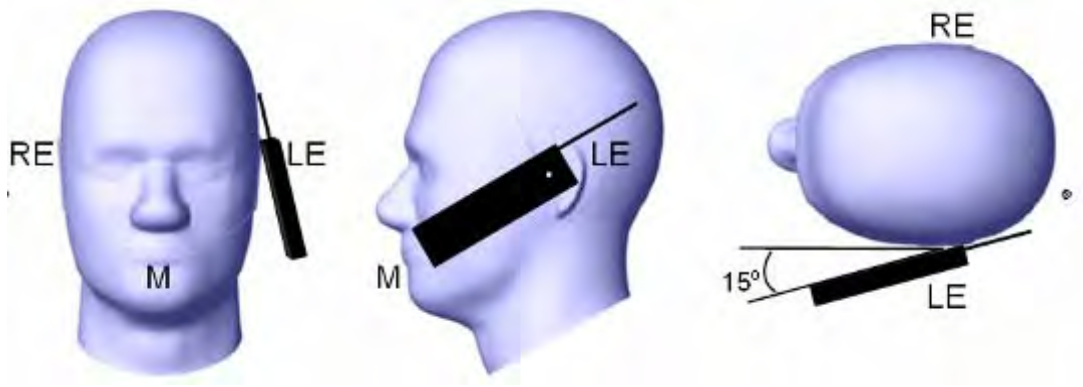
With the handset aligned in the "Cheek/Touch Position":

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, Tilt/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.

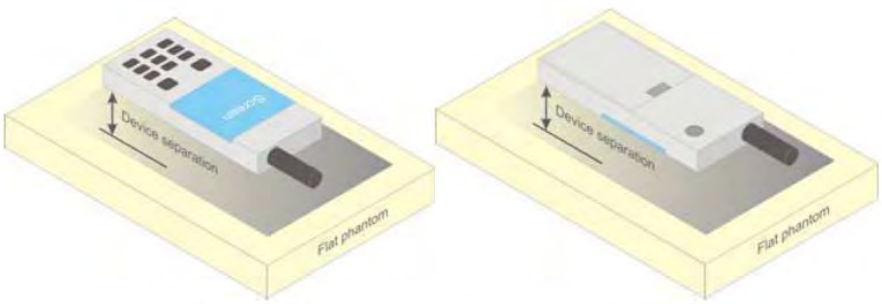


Figure 5 – Test positions for body-worn devices

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

KDB 447498 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 D05 SAR for LTE Devices v02r03
KDB 941225 D06 Hotspot Mode v02

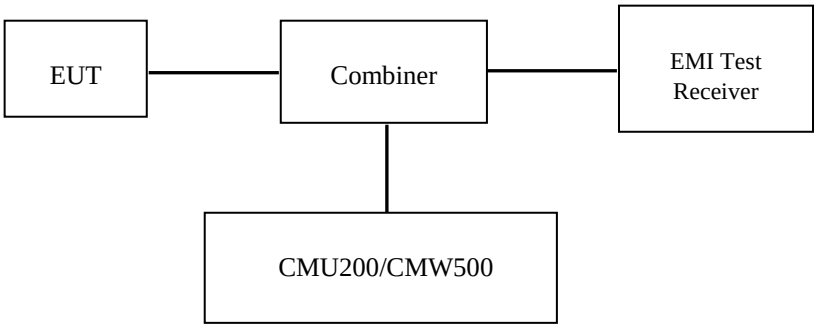
CONDUCTED OUTPUT POWER MEASUREMENT

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&4G

Maximum Output Power among production units

Max Target Power for Production Unit (dBm)			
Mode/Band	Channel		
	Low	Middle	High
GSM 850	32.80	32.80	32.80
GPRS 1 slot	32.20	32.20	32.20
GPRS 2 slot	31.20	31.20	31.20
GPRS 3 slot	30.00	30.00	30.00
GPRS 4 slot	28.90	28.90	28.90
EGPRS 1 slot	27.30	27.30	27.30
EGPRS 2 slot	26.20	26.20	26.20
EGPRS 3 slot	25.10	25.10	25.10
EGPRS 4 slot	23.90	23.90	23.90
PCS 1900	30.00	30.00	30.00
GPRS 1 slot	29.30	29.30	29.30
GPRS 2 slot	28.40	28.40	28.40
GPRS 3 slot	27.40	27.40	27.40
GPRS 4 slot	26.20	26.20	26.20
EGPRS 1 slot	26.20	26.20	26.20
EGPRS 2 slot	25.30	25.30	25.30
EGPRS 3 slot	24.40	24.40	24.40
EGPRS 4 slot	23.20	23.20	23.20
WCDMA 850	23.00	23.00	23.00
WCDMA 1700	23.00	23.00	23.00
WCDMA 1900	22.50	22.50	22.50
LTE Band 4	21.40	21.40	21.40
Wi-Fi	12.70	12.70	12.70
Bluetooth	7.20 (2423MHz)	4.00 (2441 MHz)	7.20 (2464MHz)

Test Results:

GSM:

Band	Frequency (MHz)	Conducted Output Power	
		Meas. Power (dBm)	Meas. Power (W)
GSM 850	824.2	**32.70**	1.862
	836.6	32.60	1.820
	848.8	32.70	1.862
PCS 1900	1850.2	**29.90**	0.977
	1880.0	29.30	0.851
	1909.8	29.10	0.813

GPRS:

Band	Channel No.	Frequency (MHz)	RF Output Power (dBm)			
			1 slot	2 slot	3 slots	4 slots
GSM 850	128	824.2	32.19	31.16	29.98	28.89
	190	836.6	32.12	31.07	29.86	28.75
	251	848.8	32.05	30.92	29.74	28.62
PCS 1900	512	1850.2	29.25	28.37	27.32	26.14
	661	1880.0	28.82	27.94	26.98	25.85
	810	1909.8	28.67	27.58	26.41	25.36

EGPRS:

Band	Channel No.	Frequency (MHz)	RF Output Power (dBm)			
			1 slot	2 slot	3 slots	4 slots
GSM 850	128	824.2	27.28	26.16	24.97	23.81
	190	836.6	27.19	26.02	25.01	23.85
	251	848.8	27.25	26.10	25.06	23.79
PCS 1900	512	1850.2	26.18	25.26	24.31	23.12
	661	1880.0	26.01	25.10	24.04	22.91
	810	1909.8	25.73	24.81	23.97	22.89

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	23.19	25.16	25.73	**25.89**
	190	836.6	23.12	25.07	25.61	25.75
	251	848.8	23.05	24.92	25.49	25.62
PCS 1900	512	1850.2	20.25	22.37	23.07	**23.14**
	661	1880.0	19.82	21.94	22.73	22.85
	810	1909.8	19.67	21.58	22.16	22.36

The time based average power for EGPRS

Band	Channel No.	Frequency (MHz)	Time based average Power (dBm)			
			1 slot	2 slot	3 slots	4 slots
GSM 850	128	824.2	18.28	20.16	20.72	20.81
	190	836.6	18.19	20.02	20.76	**20.85**
	251	848.8	18.25	20.10	20.81	20.79
PCS 1900	512	1850.2	17.18	19.26	20.06	**20.12**
	661	1880.0	17.01	19.10	19.79	19.91
	810	1909.8	16.73	18.81	19.72	19.89

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_FCls	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	

HSPA+

The following tests were conducted according to the test requirements in Table C.11.1.4 of 3GPP TS 34.121-1

Sub-test	β_c (Note3)	β_d	β_{HS} (Note1)	β_{ec}	β_{ed} (2xSF2) (Note 4)	β_{ed} (2xSF4) (Note 4)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 4)	E-TFCI (Note 5)	E-TFCI (boost)
1	1	0	30/15	30/15	$\beta_{ed}1$: 30/15 $\beta_{ed}2$: 30/15	$\beta_{ed}3$: 24/15 $\beta_{ed}4$: 24/15	3.5	2.5	14	105	105

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c .
Note 2: CM = 3.5 and the MPR is based on the relative CM difference, MPR = MAX(CM-1,0).
Note 3: DPDCH is not configured, therefore the β_c is set to 1 and β_d = 0 by default.
Note 4: β_{ed} can not be set directly; it is set by Absolute Grant Value.
Note 5: All the sub-tests require the UE to transmit 2SF2+2SF4 16QAM EDCH and they apply for UE using E-DPDCH category 7. E-DCH TTI is set to 2ms TTI and E-DCH table index = 2. To support these E-DCH configurations DPDCH is not allocated. The UE is signalled to use the extrapolation algorithm.

DC-HSDPA

The following tests were conducted according to the test requirements in Table Table C.8.1.12 of 3GPP TS 34.121-1

Table C.8.1.12: Fixed Reference Channel H-Set 12

Parameter	Unit	Value
Nominal Avg. Inf. Bit Rate	kbps	60
Inter-TTI Distance	TTI's	1
Number of HARQ Processes	Processes	6
Information Bit Payload (N_{INF})	Bits	120
Number Code Blocks	Blocks	1
Binary Channel Bits Per TTI	Bits	960
Total Available SML's in UE	SML's	19200
Number of SML's per HARQ Proc.	SML's	3200
Coding Rate		0.15
Number of Physical Channel Codes	Codes	1
Modulation		QPSK

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

WCDMA 850

Mode	3GPP Sub Test	Conducted Output Power (dBm)					
		Low Channel (Ave. Power)	Low Channel (PAR)	Middle Channel (Ave. Power)	Middle Channel (PAR)	High Channel (Ave. Power)	High Channel (PAR)
Rel 99	1	22.78	3.59	**22.99**	3.19	22.96	3.42
HSDPA	1	21.31	3.48	21.55	3.16	21.43	3.46
	2	21.37	3.53	21.59	3.12	21.49	3.49
	3	21.39	3.56	21.53	3.14	21.44	3.45
	4	21.34	3.50	21.50	3.19	21.48	3.41
HSUPA	1	21.45	3.47	21.62	3.22	21.58	3.53
	2	21.49	3.49	21.67	3.25	21.52	3.50
	3	21.43	3.51	21.64	3.20	21.57	3.54
	4	21.48	3.55	21.69	3.27	21.53	3.58
	5	21.40	3.43	21.60	3.21	21.54	3.51
DC-HSDPA	1	21.59	3.49	21.73	3.26	21.6	3.47
	2	21.54	3.46	21.76	3.18	21.58	3.44
	3	21.57	3.41	21.71	3.29	21.54	3.52
	4	21.51	3.48	21.78	3.23	21.53	3.41
HSPA+	1	21.19	3.32	21.45	3.17	21.23	3.36

WCDMA 1700

Mode	3GPP Sub Test	Conducted Output Power (dBm)					
		Low Channel (Ave. Power)	Low Channel (PAR)	Middle Channel (Ave. Power)	Middle Channel (PAR)	High Channel (Ave. Power)	High Channel (PAR)
Rel 99	1	22.75	3.43	22.63	3.37	**22.95**	3.41
HSDPA	1	21.58	3.39	21.44	3.45	21.79	3.53
	2	21.52	3.37	21.49	3.40	21.74	3.50
	3	21.59	3.32	21.42	3.47	21.77	3.47
	4	21.54	3.35	21.47	3.50	21.71	3.49
HSUPA	1	21.47	3.41	21.39	3.53	21.68	3.57
	2	21.49	3.38	21.33	3.58	21.64	3.52
	3	21.45	3.41	21.36	3.54	21.69	3.55
	4	21.41	3.47	21.31	3.59	21.63	3.57
	5	21.48	3.44	21.37	3.52	21.60	3.51
DC-HSDPA	1	21.47	3.37	21.34	3.57	21.52	3.48
	2	21.40	3.30	21.32	3.53	21.59	3.45
	3	21.34	3.34	21.27	3.50	21.57	3.49
	4	21.39	3.39	21.35	3.46	21.51	3.53
HSPA+	1	21.36	3.27	21.14	3.48	21.43	3.40

WCDMA 1900

Mode	3GPP Sub Test	Conducted Output Power (dBm)					
		Low Channel (Ave. Power)	Low Channel (PAR)	Middle Channel (Ave. Power)	Middle Channel (PAR)	High Channel (Ave. Power)	High Channel (PAR)
Rel 99	1	**22.42**	3.49	22.18	3.06	21.87	3.77
HSDPA	1	21.33	3.43	21.24	3.14	20.79	3.63
	2	21.37	3.41	21.27	3.10	20.82	3.60
	3	21.34	3.47	21.22	3.15	20.85	3.64
	4	21.38	3.44	21.20	3.11	20.81	3.61
HSUPA	1	21.32	3.51	21.06	3.25	20.92	3.59
	2	21.35	3.55	21.10	3.23	20.94	3.55
	3	21.30	3.52	21.13	3.20	20.89	3.58
	4	21.27	3.50	21.08	3.26	20.86	3.56
	5	21.29	3.41	21.15	3.22	20.95	3.52
DC-HSDPA	1	21.16	3.43	21.11	3.19	20.65	3.48
	2	21.19	3.40	21.19	3.13	20.67	3.51
	3	21.22	3.38	21.14	3.18	20.71	3.45
	4	21.14	3.42	21.18	3.16	20.62	3.47
HSPA+	1	20.86	3.46	20.79	3.04	20.54	3.54

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.
4. KDB 941225 D01-SAR is not required for HSPA+, when SAR is required for Rel. 6 HSPA; SAR is not required for DC-HSDPA when SAR is required for Rel. 5 HSDPA.

LTE

The following tests were conducted according to the test requirements outlined in section 6.2 of the 3GPP TS36.101 specification.

UE Power Class: 3 (23 +/- 2dBm). The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS36.101.

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3

Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

The allowed A-MPR values specified below in Table 6.2.4.-1 of 3GPP TS36.101 are in addition to the allowed MPR requirements. All the measurements below were performed with A-MPR disabled, by using Network Signaling Value of "NS_01".

Table 6.2.4-1: Additional Maximum Power Reduction (A-MPR)

Network Signalling value	Requirements (sub-clause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks (N_{RB})	A-MPR (dB)
NS_01	6.6.2.1.1	Table 5.5-1	1.4, 3, 5, 10, 15, 20	Table 5.6-1	NA
NS_03	6.6.2.2.1	2, 4,10, 23, 25, 35, 36	3	>5	≤ 1
			5	>6	≤ 1
			10	>6	≤ 1
			15	>8	≤ 1
			20	>10	≤ 1
NS_04	6.6.2.2.2	41	5	>6	≤ 1
			10, 15, 20	See Table 6.2.4-4	
NS_05	6.6.3.3.1	1	10,15,20	≥ 50	≤ 1
NS_06	6.6.2.2.3	12, 13, 14, 17	1.4, 3, 5, 10	Table 5.6-1	n/a
NS_07	6.6.2.2.3 6.6.3.3.2	13	10	Table 6.2.4-2	Table 6.2.4-2
NS_08	6.6.3.3.3	19	10, 15	> 44	≤ 3
NS_09	6.6.3.3.4	21	10, 15	> 40	≤ 1
				> 55	≤ 2
NS_10		20	15, 20	Table 6.2.4-3	Table 6.2.4-3
NS_11	6.6.2.2.1	23[1]	1.4, 3, 5, 10	Table 6.2.4-5	Table 6.2.4-5
..					
NS_32	-	-	-	-	-

Note 1: Applies to the lower block of Band 23, i.e. a carrier placed in the 2000-2010 MHz region.

LTE Band 4:

BW	Modulation	Resource Block Size& Resource Block Offset	Ave Tx Power (dBm)			MPR
			Low Channel	Mid Channel	High Channel	
1.4M	QPSK	RB Size=1, RB Offset=0	21.35	21.14	21.04	0
		RB Size=1, RB Offset=3	20.85	21.09	21.07	0
		RB Size=1, RB Offset=5	20.79	21.07	21.04	0
		RB Size=3, RB Offset=0	20.19	20.40	20.32	1
		RB Size=3, RB Offset=1	20.35	20.46	20.45	1
		RB Size=3, RB Offset=3	20.33	20.45	20.42	1
		RB Size=6, RB Offset=0	20.10	20.40	20.38	2
	16QAM	RB Size=1, RB Offset=0	20.53	20.76	20.57	1
		RB Size=1, RB Offset=3	20.59	20.74	20.72	1
		RB Size=1, RB Offset=5	20.53	20.79	20.63	1
		RB Size=3, RB Offset=0	19.02	19.29	19.11	2
		RB Size=3, RB Offset=1	19.08	19.26	19.22	2
		RB Size=3, RB Offset=3	19.15	19.28	19.12	2
		RB Size=6, RB Offset=0	18.91	19.13	18.94	2
3M	QPSK	RB Size=1, RB Offset=0	21.29	21.05	21.01	0
		RB Size=1, RB Offset=7	21.30	21.03	20.87	0
		RB Size=1, RB Offset=14	21.28	21.00	20.94	0
		RB Size=8, RB Offset=0	20.21	20.06	19.88	1
		RB Size=8, RB Offset=4	20.20	20.05	19.86	1
		RB Size=8, RB Offset=7	20.25	20.03	19.94	1
		RB Size=15, RB Offset=0	20.23	20.05	19.95	2
	16QAM	RB Size=1, RB Offset=0	20.74	20.60	20.45	1
		RB Size=1, RB Offset=7	20.80	20.63	20.56	1
		RB Size=1, RB Offset=14	20.73	20.59	20.46	1
		RB Size=8, RB Offset=0	19.38	19.18	19.18	2
		RB Size=8, RB Offset=4	19.26	19.15	18.97	2
		RB Size=8, RB Offset=7	19.29	19.13	19.07	2
		RB Size=15, RB Offset=0	19.42	19.12	19.10	2
5M	QPSK	RB Size=1, RB Offset=0	21.34	21.07	20.88	0
		RB Size=1, RB Offset=12	21.15	21.05	20.99	0
		RB Size=1, RB Offset=24	21.27	21.02	20.93	0
		RB Size=12, RB Offset=0	20.13	20.01	19.94	1
		RB Size=12, RB Offset=6	20.33	20.04	20.02	1
		RB Size=12, RB Offset=11	20.22	19.98	19.97	1
		RB Size=25, RB Offset=0	20.09	19.93	19.76	2
	16QAM	RB Size=1, RB Offset=0	20.36	20.10	20.01	1
		RB Size=1, RB Offset=12	20.38	20.08	19.99	1
		RB Size=1, RB Offset=24	20.23	20.09	19.96	1
		RB Size=12, RB Offset=0	19.20	19.00	18.99	2
		RB Size=12, RB Offset=6	19.25	18.98	18.90	2
		RB Size=12, RB Offset=11	19.22	19.03	18.91	2
		RB Size=25, RB Offset=0	19.32	19.05	18.96	2

10M	QPSK	RB Size=1, RB Offset=0	21.09	20.95	20.81	0
		RB Size=1, RB Offset=24	21.11	21.01	20.86	0
		RB Size=1, RB Offset=49	21.24	21.06	20.90	0
		RB Size=25, RB Offset=0	20.16	19.95	19.89	1
		RB Size=25, RB Offset=12	20.01	19.90	19.81	1
		RB Size=25, RB Offset=24	20.07	19.92	19.89	1
		RB Size=50, RB Offset=0	19.95	19.83	19.75	2
	16QAM	RB Size=1, RB Offset=0	20.71	20.57	20.46	1
		RB Size=1, RB Offset=24	20.79	20.61	20.52	1
		RB Size=1, RB Offset=49	20.86	20.60	20.50	1
		RB Size=25, RB Offset=0	19.18	18.97	18.95	2
		RB Size=25, RB Offset=12	19.16	18.94	18.85	2
		RB Size=25, RB Offset=24	19.18	18.98	18.87	2
		RB Size=50, RB Offset=0	19.19	18.90	18.76	2
15M	QPSK	RB Size=1, RB Offset=0	21.19	20.94	20.81	0
		RB Size=1, RB Offset=37	21.23	20.97	20.96	0
		RB Size=1, RB Offset=74	21.04	20.94	20.86	0
		RB Size=36, RB Offset=0	20.28	20.10	20.04	1
		RB Size=36, RB Offset=18	19.98	19.82	19.68	1
		RB Size=36, RB Offset=37	20.11	19.84	19.68	1
		RB Size=75, RB Offset=0	20.09	19.81	19.80	2
	16QAM	RB Size=1, RB Offset=0	20.85	20.60	20.55	1
		RB Size=1, RB Offset=37	20.73	20.56	20.54	1
		RB Size=1, RB Offset=74	20.85	20.61	20.46	1
		RB Size=36, RB Offset=0	19.05	18.87	18.84	2
		RB Size=36, RB Offset=18	18.99	18.81	18.74	2
		RB Size=36, RB Offset=37	18.97	18.83	18.73	2
		RB Size=75, RB Offset=0	19.02	18.84	18.66	2
20M	QPSK	RB Size=1, RB Offset=0	20.82	21.01	21.13	0
		RB Size=1, RB Offset=49	21.05	21.06	21.21	0
		RB Size=1, RB Offset=99	21.01	21.07	**21.32**	0
		RB Size=50, RB Offset=0	19.76	19.82	19.93	1
		RB Size=50, RB Offset=24	19.70	19.78	19.95	1
		RB Size=50, RB Offset=49	19.61	19.80	**19.96**	1
		RB Size=100, RB Offset=0	19.72	19.85	20.02	2
	16QAM	RB Size=1, RB Offset=0	20.17	20.18	20.36	1
		RB Size=1, RB Offset=49	20.10	20.23	20.48	1
		RB Size=1, RB Offset=99	20.12	20.15	20.40	1
		RB Size=50, RB Offset=0	18.65	18.82	19.10	2
		RB Size=50, RB Offset=24	18.60	18.77	19.01	2
		RB Size=50, RB Offset=49	18.59	18.79	18.88	2
		RB Size=100, RB Offset=0	18.90	19.07	19.35	2

Note:

1. SAR for LTE band exposure configurations is measured according to the procedures of KDB 941225 D05 SAR for LTE Devices v02.
2. The CMW500 Wideband Radio Communication tester is used for LTE output power measurements and SAR testing. Closed loop power control is used to keep the radio transmitters the max output power during the test.
3. KDB941225D05v02- SAR for higher order modulation is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg

Bluetooth

Mode	Channel frequency (MHz)	Conducted Output Power	
		(dBm)	(mw)
BDR(GFSK)	2402	2.71	1.866
	2423	6.71	4.688
	2441	3.53	2.254
	2464	6.42	4.385
	2480	3.59	2.286
EDR(4-DQPSK)	2402	2.77	1.892
	2423	6.59	4.560
	2441	3.60	2.291
	2464	6.29	4.256
	2480	3.47	2.223
EDR-8DPSK	2402	3.08	2.032
	2423	**7.19**	5.236
	2441	3.89	2.449
	2464	6.76	4.742
	2480	3.99	2.506
BT4.0	2402	-5.70	0.269
	2440	-4.62	0.345
	2480	-4.61	0.346

Wi-Fi

Band	Frequency (MHz)	Conducted Output Power	
		(dBm)	(mw)
802.11b	2412	12.65	18.408
	2437	12.49	17.742
	2462	**12.69**	18.578
802.11g	2412	12.62	18.281
	2437	12.49	17.742
	2462	12.31	17.022
802.11n HT20	2412	12.42	17.458
	2437	12.67	18.493
	2462	12.46	17.620

Note:

1. The output power was tested under data rate 1Mbps for 802.11b, 6Mbps for 802.11g and 6.5Mbps for 802.11n HT20.
2. KDB 248227 D01 802.11 Wi-Fi SAR v02,§5.2.2: When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

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 2015-05-29

GSM 850:

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Left Head Cheek	824.2	GSM	/	/	/	/	/	/	/
	836.6	GSM	2.164	32.60	32.80	1.047	0.143	0.150	/
	848.8	GSM	/	/	/	/	/	/	/
Left Head Tilt	824.2	GSM	/	/	/	/	/	/	/
	836.6	GSM	-0.900	32.60	32.80	1.047	0.082	0.086	/
	848.8	GSM	/	/	/	/	/	/	/
Right Head Cheek	824.2	GSM	-1.506	32.70	32.80	1.023	0.177	**0.181**	**1#**
	836.6	GSM	1.390	32.60	32.80	1.047	0.151	0.158	/
	848.8	GSM	-2.418	32.70	32.80	1.023	0.139	0.142	/
Right Head Tilt	824.2	GSM	/	/	/	/	/	/	/
	836.6	GSM	-0.943	32.60	32.80	1.047	0.086	0.090	/
	848.8	GSM	/	/	/	/	/	/	/
Body-Back-Headset (10mm)	824.2	GSM	/	/	/	/	/	/	/
	836.6	GSM	3.259	32.60	32.80	1.047	0.193	0.202	/
	848.8	GSM	/	/	/	/	/	/	/

Note:
1. When the 1-g SAR is ≤ 0.8W/Kg, testing for other channels are optional.
2. The EUT transmit and receive through the same GSM antenna while testing SAR.
3. 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.

PCS Band:

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Left Head Cheek	1850.2	GSM	-1.906	29.90	30.00	1.023	0.125	0.128	/
	1880.0	GSM	0.667	29.30	30.00	1.175	0.119	**0.140**	**2#**
	1909.8	GSM	0.765	29.10	30.00	1.230	0.091	0.112	/
Left Head Tilt	1850.2	GSM	/	/	/	/	/	/	/
	1880.0	GSM	-1.750	29.30	30.00	1.175	0.046	0.054	/
	1909.8	GSM	/	/	/	/	/	/	/
Right Head Cheek	1850.2	GSM	/	/	/	/	/	/	/
	1880.0	GSM	-2.376	29.30	30.00	1.175	0.106	0.125	
	1909.8	GSM	/	/	/	/	/	/	/
Right Head Tilt	1850.2	GSM	/	/	/	/	/	/	/
	1880.0	GSM	3.305	29.30	30.00	1.175	0.053	0.062	/
	1909.8	GSM	/	/	/	/	/	/	/
Body-Back (10mm)	1850.2	GSM	/	/	/	/	/	/	/
	1880.0	GSM	-2.848	29.30	30.00	1.175	0.155	0.182	/
	1909.8	GSM	/	/	/	/	/	/	/

Note:
1. When the 1-g SAR is ≤ 0.8W/Kg, testing for other channels are optional.
2. The EUT transmit and receive through the same GSM antenna while testing SAR.
3. 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.

WCDMA 850

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Left Head Cheek	826.4	RMC	/	/	/	/	/	/	/
	836.6	RMC	-1.257	22.99	23.00	1.002	0.069	**0.069**	**3#**
	846.6	RMC	/	/	/	/	/	/	/
Left Head Tilt	826.4	RMC	/	/	/	/	/	/	/
	836.6	RMC	-1.178	22.99	23.00	1.002	0.041	0.041	/
	846.6	RMC	/	/	/	/	/	/	/
Right Head Cheek	826.4	RMC	/	/	/	/	/	/	/
	836.6	RMC	2.398	22.99	23.00	1.002	0.066	0.066	/
	846.6	RMC	/	/	/	/	/	/	/
Right Head Tilt	826.4	RMC	/	/	/	/	/	/	/
	836.6	RMC	0.560	22.99	23.00	1.002	0.043	0.043	/
	846.6	RMC	/	/	/	/	/	/	/

WCDMA 1700

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Left Head Cheek	1712.4	RMC	/	/	/	/	/	/	/
	1732.4	RMC	/	/	/	/	/	/	/
	1752.6	RMC	-3.530	22.95	23.00	1.012	0.067	**0.068**	**4#**
Left Head Tilt	1712.4	RMC	/	/	/	/	/	/	/
	1732.4	RMC	/	/	/	/	/	/	/
	1752.6	RMC	-1.676	22.95	23.00	1.012	0.037	0.037	/
Right Head Cheek	1712.4	RMC	/	/	/	/	/	/	/
	1732.4	RMC	/	/	/	/	/	/	/
	1752.6	RMC	3.079	22.95	23.00	1.012	0.061	0.062	/
Right Head Tilt	1712.4	RMC	/	/	/	/	/	/	/
	1732.4	RMC	/	/	/	/	/	/	/
	1752.6	RMC	0.925	22.95	23.00	1.012	0.035	0.035	/

WCDMA 1900

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Left Head Cheek	1852.4	RMC	1.061	22.42	22.50	1.019	0.046	0.047	/
	1880.0	RMC	/	/	/	/	/	/	/
	1907.6	RMC	/	/	/	/	/	/	/
Left Head Tilt	1852.4	RMC	-2.633	22.42	22.50	1.019	0.021	0.022	/
	1880.0	RMC	/	/	/	/	/	/	/
	1907.6	RMC	/	/	/	/	/	/	/
Right Head Cheek	1852.4	RMC	-2.926	22.42	22.50	1.019	0.050	**0.051**	**5#**
	1880.0	RMC	/	/	/	/	/	/	/
	1907.6	RMC	/	/	/	/	/	/	/
Right Head Tilt	1852.4	RMC	3.140	22.42	22.50	1.019	0.023	0.024	/
	1880.0	RMC	/	/	/	/	/	/	/
	1907.6	RMC	/	/	/	/	/	/	/

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. 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.

LTE Band 4:

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Left Head Cheek	1720	1RB,offset=99	/	/	/	/	/	/	/
	1732.5	1RB,offset=99	/	/	/	/	/	/	/
	1745	1RB,offset=99	-1.537	21.32	21.40	1.019	0.105	**0.107**	**6#**
	1745	50% RB,offset=49	-2.248	19.96	21.40	1.393	0.075	0.104	/
Left Head Tilt	1720	1RB,offset=99	/	/	/	/	/	/	/
	1732.5	1RB,offset=99	/	/	/	/	/	/	/
	1745	1RB,offset=99	1.371	21.32	21.40	1.019	0.043	0.044	/
	1745	50% RB,offset=49	0.922	19.96	21.40	1.393	0.031	0.043	
Right Head Cheek	1720	1RB,offset=99	/	/	/	/	/	/	/
	1732.5	1RB,offset=99	/	/	/	/	/	/	/
	1745	1RB,offset=99	3.041	21.32	21.40	1.019	0.101	0.103	/
	1745	50% RB,offset=49	-1.605	19.96	21.40	1.393	0.066	0.092	
Right Head Tilt	1720	1RB,offset=99	/	/	/	/	/	/	/
	1732.5	1RB,offset=99	/	/	/	/	/	/	/
	1745	1RB,offset=99	-2.132	21.32	21.40	1.019	0.046	0.047	/
	1745	50% RB,offset=49	-2.763	19.96	21.40	1.393	0.033	0.046	

Note:

1. When the 1-g SAR is ≤ 0.8W/Kg, testing for other channels are optional.
2. SAR for LTE band exposure configurations is measured according to the procedures of KDB 941225 D05 SAR for LTE Devices v02.
3. KDB941225D05- SAR for higher order modulation is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg
4. KDB941225D05- For QPSK with 100% RB allocation, when the reported SAR measured for the Highest output power channel is <1.45 W/kg, tests for the remaining required test channels are optional.
5. KDB941225D05- For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg.
6. KDB941225D05- Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offset the upper edge, middle and lower edge of each required test channel.
7. Worst case SAR for 50% RB allocation is selected to be tested.

Wi-Fi 802.11b

EUT Position	Frequency (MHz)	Power Drift (%)	Meas. Avg. Power (dBm)	Max. Rated Avg. Power (dBm)	1 g SAR Value (W/Kg)			
					Scaled Factor	Meas. SAR	Scaled SAR	Plot
Left Head Cheek	2412	/	/	/	/	/	/	/
	2437	/	/	/	/	/	/	/
	2462	1.924	12.69	12.70	1.002	0.135	0.135	/
Left Head Tilt	2412	/	/	/	/	/	/	/
	2437	/	/	/	/	/	/	/
	2462	-1.347	12.69	12.70	1.002	0.106	0.106	/
Right Head Cheek	2412	/	/	/	/	/	/	/
	2437	/	/	/	/	/	/	/
	2462	1.632	12.69	12.70	1.002	0.150	**0.150**	**7#**
Right Head Tilt	2412	/	/	/	/	/	/	/
	2437	/	/	/	/	/	/	/
	2462	1.888	12.69	12.70	1.002	0.102	0.102	/

Note:
1. When the 1-g SAR is ≤ 0.8W/Kg, testing for other channel is optional.
2. 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.
3. KDB248227-SAR is not required for 802.11g channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11b channels.

Mobile Hot-Spot Test Result

The DUT is capable of functioning as a Wi-Fi to Cellular Mobile hotspot. Additional SAR testing was performed according to KDB 941225 D06. Testing was performed with a separation of 1cm between the DUT and the flat phantom. The DUT was positioned for SAR tests with the front and back surfaces facing the phantom, and also with the edges facing the phantom in which the transmitting antenna is <2.5 cm from the edge. Each transmit band was utilized for SAR testing. The tested mode has been selected within each band that exhibits the highest time average output power.

Hot spot-GPRS (Frequency Band: 835)

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Body-Back (10mm)	824.2	GPRS	1.157	28.89	28.90	1.002	0.290	**0.291**	**8#**
	836.6	GPRS	/	/	/	/	/	/	/
	848.8	GPRS	/	/	/	/	/	/	/
Body-Left (10mm)	824.2	GPRS	0.763	28.89	28.90	1.002	0.176	0.176	/
	836.6	GPRS	/	/	/	/	/	/	/
	848.8	GPRS	/	/	/	/	/	/	/
Body-Right (10mm)	824.2	GPRS	-2.248	28.89	28.90	1.002	0.155	0.155	/
	836.6	GPRS	/	/	/	/	/	/	/
	848.8	GPRS	/	/	/	/	/	/	/
Body-Bottom (10mm)	824.2	GPRS	1.153	28.89	28.90	1.002	0.057	0.057	/
	836.6	GPRS	/	/	/	/	/	/	/
	848.8	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, 1DL+4UL is the worst case.
4. The EUT transmit and receive through the same GSM antenna while testing SAR.
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.

Hot spot-GPRS (Frequency Band: 1900)

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Body-Back (10mm)	1850.2	GPRS	1.857	26.14	26.20	1.014	0.245	**0.248**	**9#**
	1880.0	GPRS	/	/	/	/	/	/	/
	1909.8	GPRS	/	/	/	/	/	/	/
Body-Left (10mm)	1850.2	GPRS	0.709	26.14	26.20	1.014	0.086	0.087	/
	1880.0	GPRS	/	/	/	/	/	/	/
	1909.8	GPRS	/	/	/	/	/	/	/
Body-Right (10mm)	1850.2	GPRS	0.705	26.14	26.20	1.014	0.113	0.115	/
	1880.0	GPRS	/	/	/	/	/	/	/
	1909.8	GPRS	/	/	/	/	/	/	/
Body-Bottom (10mm)	1850.2	GPRS	2.738	26.14	26.20	1.014	0.202	0.204	/
	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 Class12 which has maximum 4 Downlink slots and 4 Uplink slots, the maximum active slots is 5, when perform the multiple slots scan, 1DL+4UL is the worst case.
4. The EUT transmit and receive through the same GSM antenna while testing SAR.
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.

Hot Spot-WCDMA850

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Body-Back (10mm)	826.4	RMC	/	/	/	/	/	/	/
	836.6	RMC	-2.503	22.99	23.00	1.002	0.125	**0.125**	**10#**
	846.6	RMC	/	/	/	/	/	/	/
Body-Left (10mm)	826.4	RMC	/	/	/	/	/	/	/
	836.6	RMC	-3.009	22.99	23.00	1.002	0.081	0.081	/
	846.6	RMC	/	/	/	/	/	/	/
Body-Right (10mm)	826.4	RMC	/	/	/	/	/	/	/
	836.6	RMC	-1.892	22.99	23.00	1.002	0.076	0.076	/
	846.6	RMC	/	/	/	/	/	/	/
Body-Bottom (10mm)	826.4	RMC	/	/	/	/	/	/	/
	836.6	RMC	3.491	22.99	23.00	1.002	0.032	0.032	/
	846.6	RMC	/	/	/	/	/	/	/

Hot Spot-WCDMA1700

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Body-Back (10mm)	1712.4	RMC	/	/	/	/	/	/	/
	1732.4	RMC	/	/	/	/	/	/	/
	1752.6	RMC	-2.721	22.95	23.00	1.012	0.140	**0.142**	**11#**
Body-Left (10mm)	1712.4	RMC	/	/	/	/	/	/	/
	1732.4	RMC	/	/	/	/	/	/	/
	1752.6	RMC	2.483	22.95	23.00	1.012	0.056	0.057	/
Body-Right (10mm)	1712.4	RMC	/	/	/	/	/	/	/
	1732.4	RMC	/	/	/	/	/	/	/
	1752.6	RMC	1.536	22.95	23.00	1.012	0.061	0.062	/
Body-Bottom (10mm)	1712.4	RMC	/	/	/	/	/	/	/
	1732.4	RMC	/	/	/	/	/	/	/
	1752.6	RMC	-2.347	22.95	23.00	1.012	0.113	0.114	/

Hot Spot-WCDMA1900

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Body-Back (10mm)	1852.4	RMC	-1.916	22.42	22.50	1.019	0.078	**0.079**	**12#**
	1880.0	RMC	/	/	/	/	/	/	/
	1907.6	RMC	/	/	/	/	/	/	/
Body-Left (10mm)	1852.4	RMC	-2.205	22.42	22.50	1.019	0.032	0.033	/
	1880.0	RMC	/	/	/	/	/	/	/
	1907.6	RMC	/	/	/	/	/	/	/
Body-Right (10mm)	1852.4	RMC	0.715	22.42	22.50	1.019	0.042	0.043	/
	1880.0	RMC	/	/	/	/	/	/	/
	1907.6	RMC	/	/	/	/	/	/	/
Body-Bottom (10mm)	1852.4	RMC	-3.298	22.42	22.50	1.019	0.066	0.067	/
	1880.0	RMC	/	/	/	/	/	/	/
	1907.6	RMC	/	/	/	/	/	/	/

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. 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.

LTE Band 4:

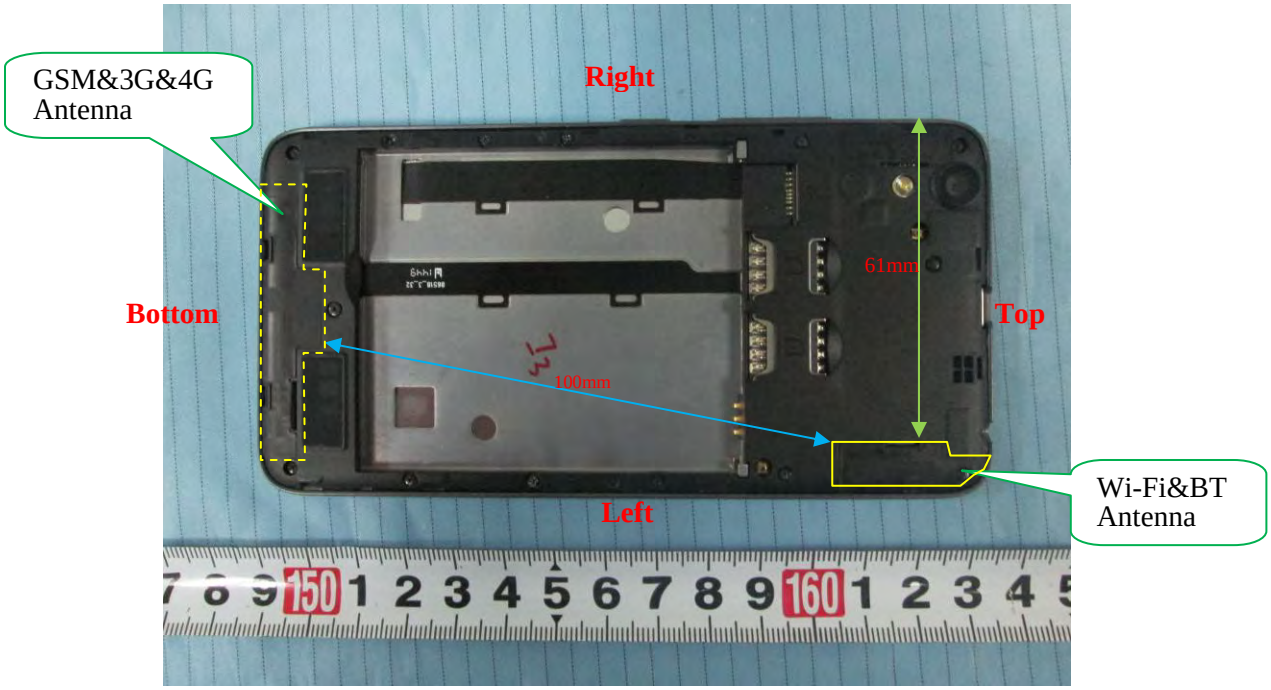
EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Body-Back (10mm)	1720	1RB,offset=99	/	/	/	/	/	/	/
	1732.5	1RB,offset=99	/	/	/	/	/	/	/
	1745	1RB,offset=99	-1.779	21.32	21.40	1.019	0.235	**0.239**	**13#**
	1745	50% RB,offset=49	2.255	19.96	21.40	1.393	0.151	0.210	/
Body-Left (10mm)	1720	1RB,offset=99	/	/	/	/	/	/	/
	1732.5	1RB,offset=99	/	/	/	/	/	/	/
	1745	1RB,offset=99	-1.743	21.32	21.40	1.019	0.108	0.110	/
	1745	50% RB,offset=49	2.711	19.96	21.40	1.393	0.083	0.116	
Body- Right (10mm)	1720	1RB,offset=99	/	/	/	/	/	/	/
	1732.5	1RB,offset=99	/	/	/	/	/	/	/
	1745	1RB,offset=99	-1.364	21.32	21.40	1.019	0.123	0.125	/
	1745	50% RB,offset=49	-0.539	19.96	21.40	1.393	0.089	0.124	
Body- Bottom (10mm)	1720	1RB,offset=99	/	/	/	/	/	/	/
	1732.5	1RB,offset=99	/	/	/	/	/	/	/
	1745	1RB,offset=99	1.283	21.32	21.40	1.019	0.167	0.170	/
	1745	50% RB,offset=49	-1.732	19.96	21.40	1.393	0.113	0.157	

Note:

1. When the 1-g SAR is ≤ 0.8W/Kg, testing for other channels are optional.
2. SAR for LTE band exposure configurations is measured according to the procedures of KDB 941225 D05 SAR for LTE Devices v02.
3. KDB941225D05- SAR for higher order modulation is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg
4. KDB941225D05- For QPSK with 100% RB allocation, when the reported SAR measured for the Highest output power channel is <1.45 W/kg, tests for the remaining required test channels are optional.
5. KDB941225D05- For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg.
6. KDB941225D05- Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offset the upper edge, middle and lower edge of each required test channel.
7. Worst case SAR for 50% RB allocation is selected to be tested.

SAR SIMULTANEOUS TRANSMISSION DESCRIPTION

BT& Wi-Fi and GSM&3G&4G Antennas Location:



Simultaneous Transmission:

Description of Simultaneous Transmit Capabilities			Antennas Distance (mm)
Transmitter Combination	Simultaneous?	Hotspot?	
GSM + WCDMA	×	×	0
GSM + LTE	×	×	0
GSM + Bluetooth	√	×	100
GSM + Wi-Fi	√	√	100
WCDMA + LTE	×	×	0
WCDMA + Bluetooth	√	×	100
WCDMA + Wi-Fi	√	√	100
LTE+ Bluetooth	√	×	100
LTE++ Wi-Fi	√	√	100

Standalone SAR test exclusion considerations

Head Position:

Mode	P_{avg} (dBm)	P_{avg} (mW)	Distance (mm)	Calculated value	Threshold (1-g)	SAR Test Exclusion
GSM850	23.80	239.88	0	44.2	3.0	No
PCS1900	21.00	125.89	0	34.7	3.0	No
WCDMA850	23.00	199.53	0	36.8	3.0	No
WCDMA1700	23.00	199.53	0	52.0	3.0	No
WCDMA1900	22.50	177.83	0	49.0	3.0	No
LTE Band 4	21.40	138.04	0	38.05	3.0	No
Wi-Fi	12.70	18.62	0	5.8	3.0	No
Bluetooth	7.20	5.25	0	**1.6**	3.0	Yes

Body Position:

Mode	P_{avg} (dBm)	P_{avg} (Mw)	Distance (mm)	Calculated value	Threshold (1-g)	SAR Test Exclusion
GPRS850	25.90	389.05	10	35.9	3.0	No
GPRS1900	23.20	208.93	10	28.8	3.0	No
WCDMA850	23.00	199.53	10	18.4	3.0	No
WCDMA1700	23.00	199.53	10	26.0	3.0	No
WCDMA1900	22.50	177.83	10	24.5	3.0	No
LTE Band 4	21.40	138.04	10	19.03	3.0	No
Wi-Fi	12.70	18.62	10	**2.9**	3.0	Yes
Bluetooth	7.20	5.25	10	**0.8**	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)
BT Head	2.464	0	7.20	5.25	0.213
BT Body	2.464	10	7.20	5.25	0.107
Wi-Fi Body	2.462	10	12.70	18.62	0.387

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

Simultaneous SAR test exclusion considerations:

GSM with BT:

Mode	Position	Reported SAR (W/kg)		ΣSAR
		GSM	BT	< 1.6W/kg
GSM850	Left Head Cheek	0.150	0.213	0.363
	Left Head Tilt	0.086	0.213	0.299
	Right Head Cheek	0.181	0.213	**0.394**
	Right Head Tilt	0.090	0.213	0.303
	Body-Back	0.202	0.107	0.309
PCS1900	Left Head Cheek	0.140	0.213	0.353
	Left Head Tilt	0.054	0.213	0.267
	Right Head Cheek	0.125	0.213	0.338
	Right Head Tilt	0.062	0.213	0.275
	Body–Back	0.182	0.107	0.289

WCDMA with BT:

Mode	Position	Reported SAR (W/kg)		ΣSAR
		WCDMA	BT	< 1.6W/kg
WCDMA 850	Left Head Cheek	0.069	0.213	0.282
	Left Head Tilt	0.041	0.213	0.254
	Right Head Cheek	0.066	0.213	0.279
	Right Head Tilt	0.043	0.213	0.256
WCDMA 1700	Left Head Cheek	0.068	0.213	0.281
	Left Head Tilt	0.037	0.213	0.250
	Right Head Cheek	0.062	0.213	0.275
	Right Head Tilt	0.035	0.213	0.248
WCDMA 1900	Left Head Cheek	0.047	0.213	0.260
	Left Head Tilt	0.022	0.213	0.235
	Right Head Cheek	0.051	0.213	0.264
	Right Head Tilt	0.024	0.213	0.237

LTE with BT:

Mode	Position	Reported SAR (W/kg)		ΣSAR
		LTE	BT	< 1.6W/kg
LTE Band 4	Left Head Cheek	0.107	0.213	0.320
	Left Head Tilt	0.044	0.213	0.257
	Right Head Cheek	0.103	0.213	0.316
	Right Head Tilt	0.047	0.213	0.260

GSM with Wi-Fi:

Mode	Position	Reported SAR (W/kg)		ΣSAR
		GSM	Wi-Fi	< 1.6W/kg
GSM850	Left Head Cheek	0.150	0.135	0.285
	Left Head Tilt	0.086	0.106	0.192
	Right Head Cheek	0.181	0.150	0.331
	Right Head Tilt	0.090	0.102	0.192
	Body–Back	0.202	0.387	0.589
PCS1900	Left Head Cheek	0.140	0.135	0.275
	Left Head Tilt	0.054	0.106	0.160
	Right Head Cheek	0.125	0.150	0.275
	Right Head Tilt	0.062	0.102	0.164
	Body–Back	0.182	0.387	0.569

WCDMA with Wi-Fi:

Mode	Position	Reported SAR (W/kg)		ΣSAR
		WCDMA	Wi-Fi	< 1.6W/kg
WCDMA 850	Left Head Cheek	0.069	0.135	0.204
	Left Head Tilt	0.041	0.106	0.147
	Right Head Cheek	0.066	0.150	0.216
	Right Head Tilt	0.043	0.102	0.145
WCDMA 1700	Left Head Cheek	0.068	0.135	0.203
	Left Head Tilt	0.037	0.106	0.143
	Right Head Cheek	0.062	0.150	0.212
	Right Head Tilt	0.035	0.102	0.137
WCDMA 1900	Left Head Cheek	0.047	0.135	0.182
	Left Head Tilt	0.022	0.106	0.128
	Right Head Cheek	0.051	0.150	0.201
	Right Head Tilt	0.024	0.102	0.126

LTE with Wi-Fi:

Mode	Position	Reported SAR (W/kg)		ΣSAR
		LTE	Wi-Fi	< 1.6W/kg
LTE Band 4	Left Head Cheek	0.107	0.135	0.242
	Left Head Tilt	0.044	0.106	0.150
	Right Head Cheek	0.103	0.150	0.253
	Right Head Tilt	0.047	0.102	0.149

Conclusion:

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

Hotspot:

Evaluations for Simultaneous SAR, BT+GSM/3G					
Test Position	Body-Back (1.0cm)	Body-Left (1.0cm)	Body-Right (1.0cm)	Body-Bottom (1.0cm)	Body-Top (1.0cm)
Mode	Stand Alone 1-g SAR (W/Kg)				
GPRS 850	0.290	0.176	0.155	0.057	/
GPRS 1900	0.248	0.087	0.115	0.204	/
WCDMA850	0.125	0.081	0.076	0.032	/
WCDMA1700	0.142	0.057	0.062	0.114	/
WCDMA1900	0.079	0.033	0.043	0.067	/
LTE Band 4	0.239	0.116	0.125	0.170	/
BT	0.107	0.107	0.107	0.107	
	∑ 1-g SAR(W/Kg)				
GPRS850 + BT	0.397	0.283	0.262	0.164	/
GPRS1900 + BT	0.355	0.194	0.222	0.311	/
WCDMA850 + BT	0.232	0.188	0.183	0.139	/
WCDMA1700 + BT	0.249	0.164	0.169	0.221	/
WCDMA1900 + BT	0.186	0.140	0.150	0.174	/
LTE Band 4+ BT	0.346	0.223	0.232	0.277	/
Evaluations for Simultaneous SAR, Mobile Hot Spot Positions					
Test Position	Body-Back (1.0cm)	Body-Left (1.0cm)	Body-Right (1.0cm)	Body-Bottom (1.0cm)	Body-Top (1.0cm)
Mode	Stand Alone 1-g SAR (W/Kg)				
GPRS 850	0.290	0.176	0.155	0.057	/
GPRS 1900	0.248	0.087	0.115	0.204	/
WCDMA850	0.125	0.081	0.076	0.032	/
WCDMA1700	0.142	0.057	0.062	0.114	/
WCDMA1900	0.079	0.033	0.043	0.067	/
LTE Band 4	0.239	0.116	0.125	0.170	/
Wi-Fi	0.387	0.387	0.387	0.387	
	∑ 1-g SAR(W/Kg)				
GPRS850 + Wi-Fi	**0.677**	0.563	0.542	0.444	/
GPRS1900 + Wi-Fi	0.635	0.474	0.502	0.591	/
WCDMA850 + Wi-Fi	0.512	0.468	0.463	0.419	/
WCDMA1700 + Wi-Fi	0.529	0.444	0.449	0.501	/
WCDMA1900 +Wi-Fi	0.466	0.420	0.430	0.454	/
LTE Band 4+ Wi-Fi	0.626	0.503	0.512	0.557	/

Note:

If the sum of the 1g SAR measured for the simultaneously transmitting antennas is less than the SAR limit, SAR measurement for simultaneous transmission is not required.

SAR Plots (Summary of the Highest SAR Values)

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

Right Head Cheek (824.2 MHz Low Channel)

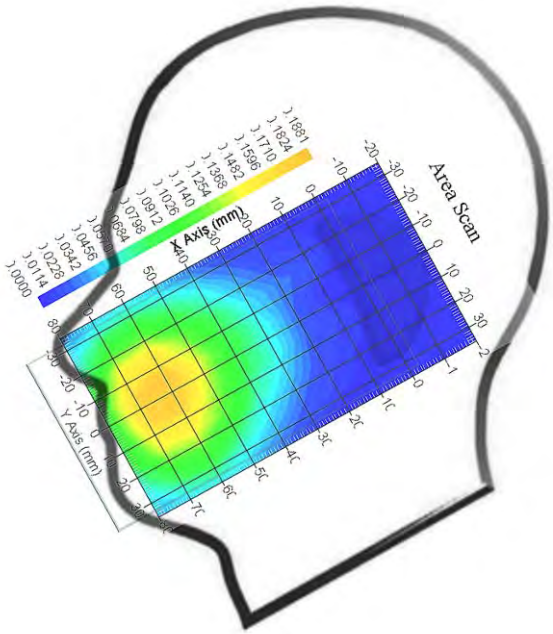
Measurement Data
Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.013 W/kg
Power Drift-Finish : 0.013 W/kg
Power Drift (%) : -1.506

Tissue Data
Type : Head
Frequency : 824.2 MHz
Epsilon : 41.07 F/m
Sigma : 0.90 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 835
Duty Cycle Factor : 8
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 : 0.177 W/kg
10 gram SAR value : 0.123 W/kg
Area Scan Peak SAR : 0.183 W/kg
Zoom Scan Peak SAR : 0.286 W/kg

Plot 1#



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

Left Head Cheek(1880MHz Middle Channel)

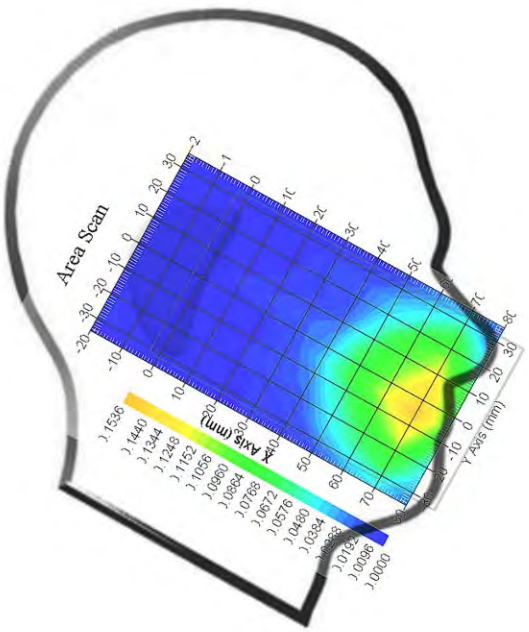
Measurement Data
Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 11x8x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.001 W/kg
Power Drift-Finish : 0.001W/kg
Power Drift (%) : -2.376

Tissue Data
Type : Head
Frequency : 1880 MHz
Epsilon : 39.59 F/m
Sigma : 1.40 S/m
Density : 1000.00 kg/cu. M

Probe Data
Serial No. : 500-00283
Frequency Band : 1900
Duty Cycle Factor : 8
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 : 0.119 W/kg
10 gram SAR value : 0.068 W/kg
Area Scan Peak SAR : 0.150 W/kg
Zoom Scan Peak SAR : 0.180 W/kg

Plot 2#



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

WCDMA850; Left Head Cheek (836.6 MHz Middle Channel)

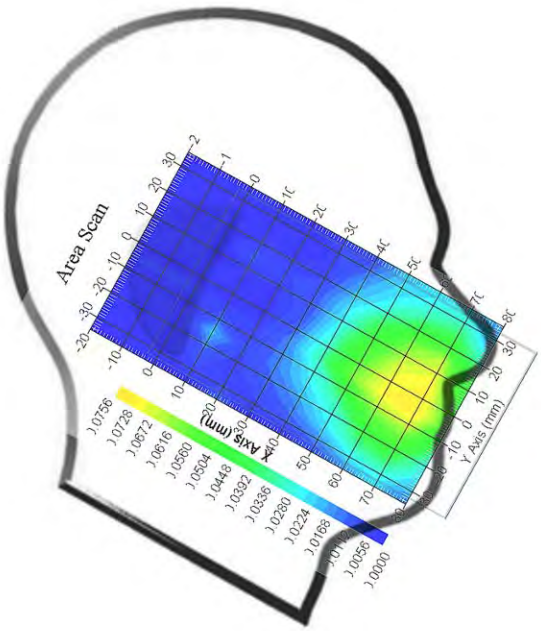
Measurement Data
Test mode : RMC
Crest Factor : 1
Scan Type : Complete
Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.002 W/kg
Power Drift-Finish : 0.002 W/kg
Power Drift (%) : -1.257

Tissue Data
Type : Head
Frequency : 836.6 MHz
Epsilon : 41.09 F/m
Sigma : 0.91 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 : 0.069 W/kg
10 gram SAR value : 0.046 W/kg
Area Scan Peak SAR : 0.073 W/kg
Zoom Scan Peak SAR : 0.112 W/kg

Plot 3#



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

WCDMA 1700; Left Head Cheek (1752.6 MHz High Channel)

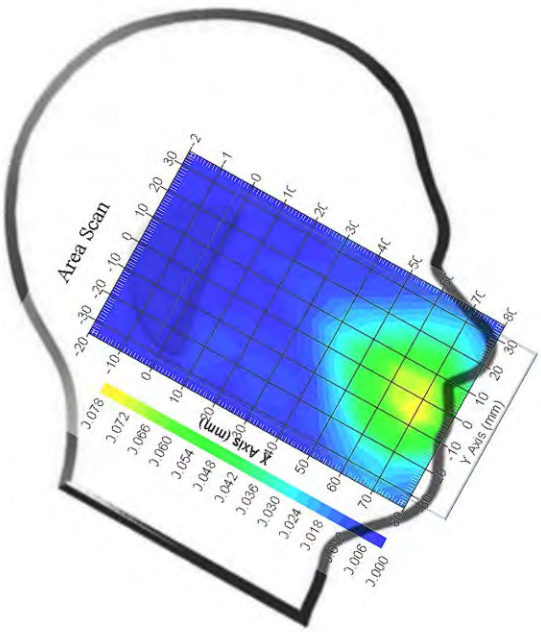
Measurement Data
Test mode : RMC
Crest Factor : 1
Scan Type : Complete
Area Scan : 11x9x1: Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.001 W/kg
Power Drift-Finish : 0.001 W/kg
Power Drift (%) : -3.530

Tissue Data
Type : Head
Frequency : 1752.6 MHz
Epsilon : 39.51 F/m
Sigma : 1.41 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 1750
Duty Cycle Factor : 1
Conversion Factor : 5.3
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 : 0.067 W/kg
10 gram SAR value : 0.038 W/kg
Area Scan Peak SAR : 0.077 W/kg
Zoom Scan Peak SAR : 0.105 W/kg

Plot 4#



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

WCDMA1900; Right Head Cheek (1852.4 MHz Low Channel)

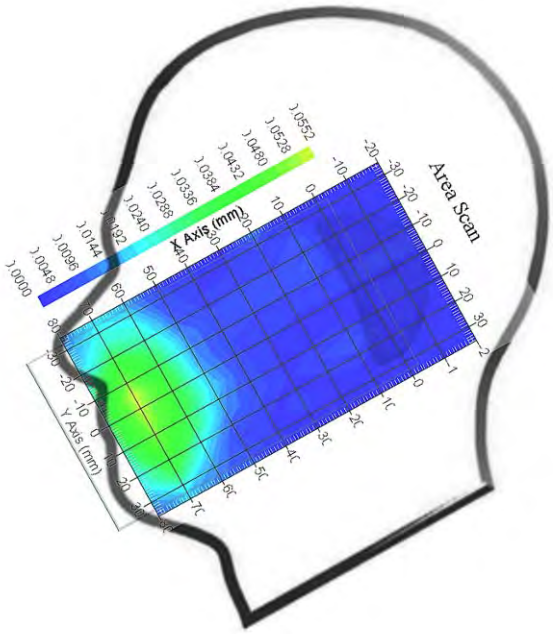
Measurement Data
Test mode : RMC
Crest Factor : 1
Scan Type : Complete
Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.001 W/kg
Power Drift-Finish : 0.001 W/kg
Power Drift (%) : -2.926

Tissue Data
Type : Head
Frequency : 1852.4 MHz
Epsilon : 39.73 F/m
Sigma : 1.38 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 : 0.050 W/kg
10 gram SAR value : 0.027 W/kg
Area Scan Peak SAR : 0.055 W/kg
Zoom Scan Peak SAR : 0.079 W/kg

Plot 5#



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

LTE FDD Band4; Left-Head-Cheek (1745 MHz High Channel);

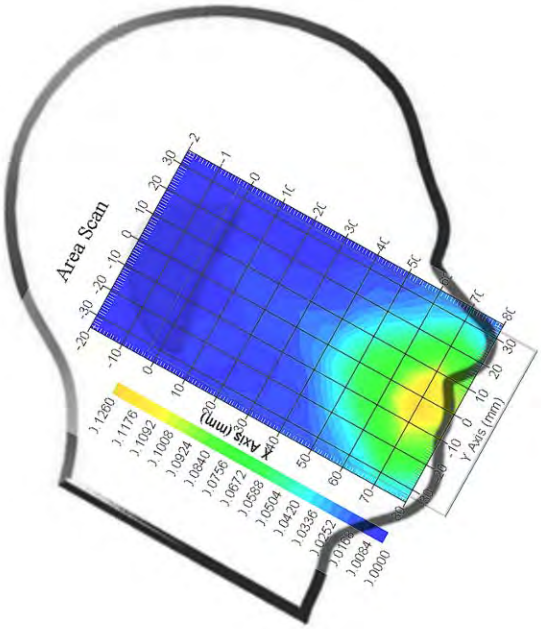
Measurement Data
Test mode : RB1
Crest Factor : 1
Scan Type： : Complete
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.001 W/kg
Power Drift-Finish : 0.001 W/kg
Power Drift (%) : -1.537

Tissue Data
Type : Head
Frequency : 1745 MHz
Epsilon : 39.36 F/m
Sigma : 1.39 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 1750
Duty Cycle Factor : 1
Conversion Factor : 5.4
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 : 0.105 W/kg
10 gram SAR value : 0.071 W/kg
Area Scan Peak SAR : 0.124 W/kg
Zoom Scan Peak SAR : 0.183 W/kg

Plot 6#



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

802.11b; Right Head Cheek (2462 MHz Channel 11)

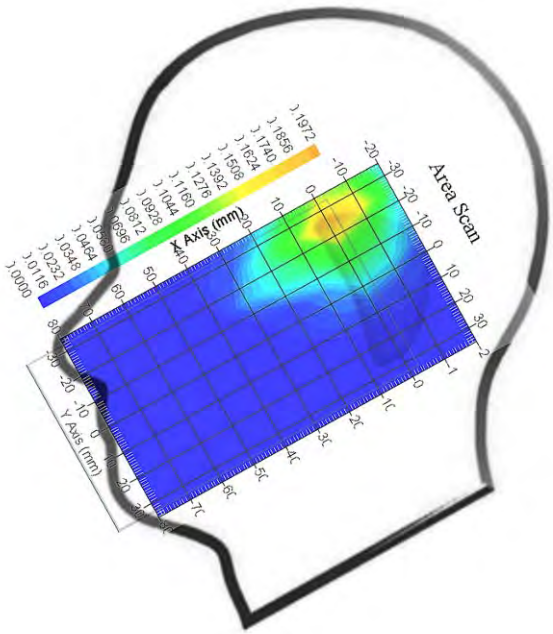
Measurement Data
Test mode : 802.11b
Crest Factor : 1
Scan Type : Complete
Area Scan : 11x9x1: Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.062 W/kg
Power Drift-Finish : 0.063 W/kg
Power Drift (%) : 1.632

Tissue Data
Type : Head
Frequency : 2462 MHz
Epsilon : 39.90 F/m
Sigma : 1.83 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 2450
Duty Cycle Factor : 1
Conversion Factor : 4.9
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 : 0.150 W/kg
10 gram SAR value : 0.086 W/kg
Area Scan Peak SAR : 0.195 W/kg
Zoom Scan Peak SAR : 0.252 W/kg

Plot 7#



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

Body-worn-Back (824.2 MHz Low Channel)

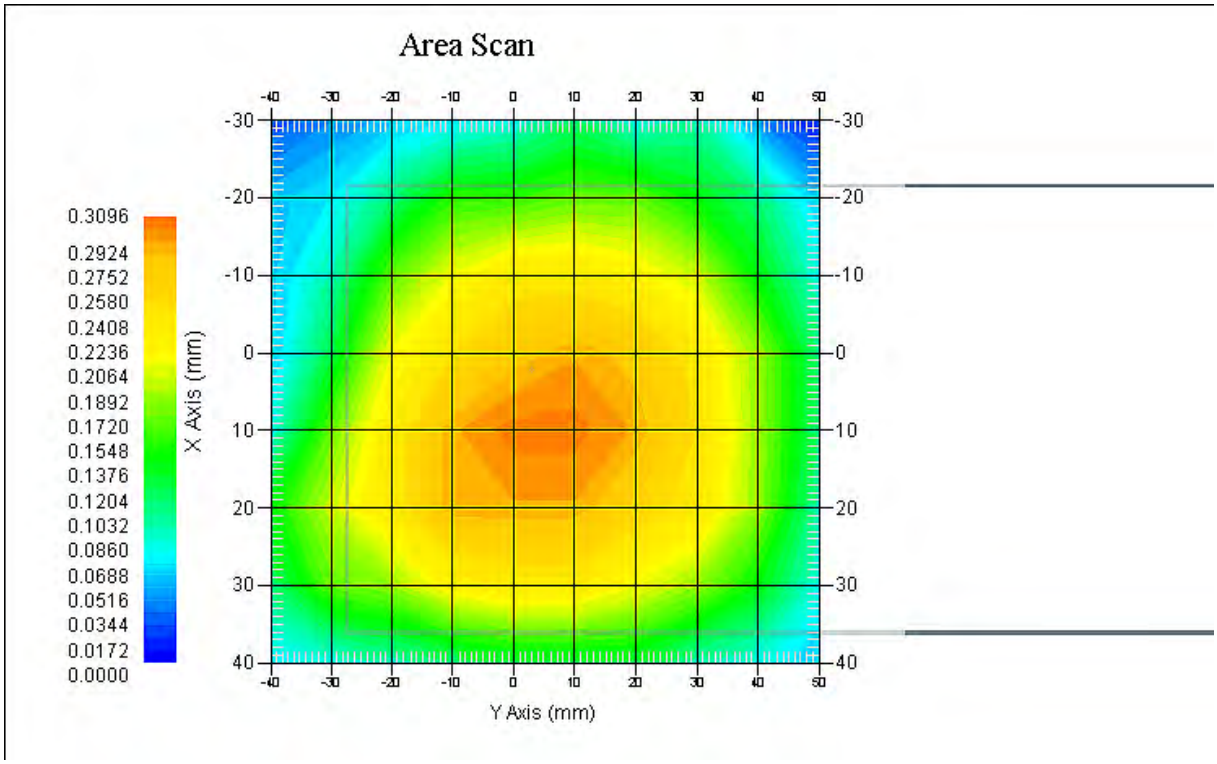
Measurement Data
Test mode : GPRS
Crest Factor : 2
Scan Type： : Complete
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.263 W/kg
Power Drift-Finish : 0.266 W/kg
Power Drift (%) : 1.157

Tissue Data
Type : Body
Frequency : 824.2 MHz
Epsilon : 53.82 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 : 2
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 : 0.290 W/kg
10 gram SAR value : 0.233 W/kg
Area Scan Peak SAR : 0.305 W/kg
Zoom Scan Peak SAR : 0.463 W/kg

Plot 8#



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

Body-worn-Back (1850.2MHz Low Channel)

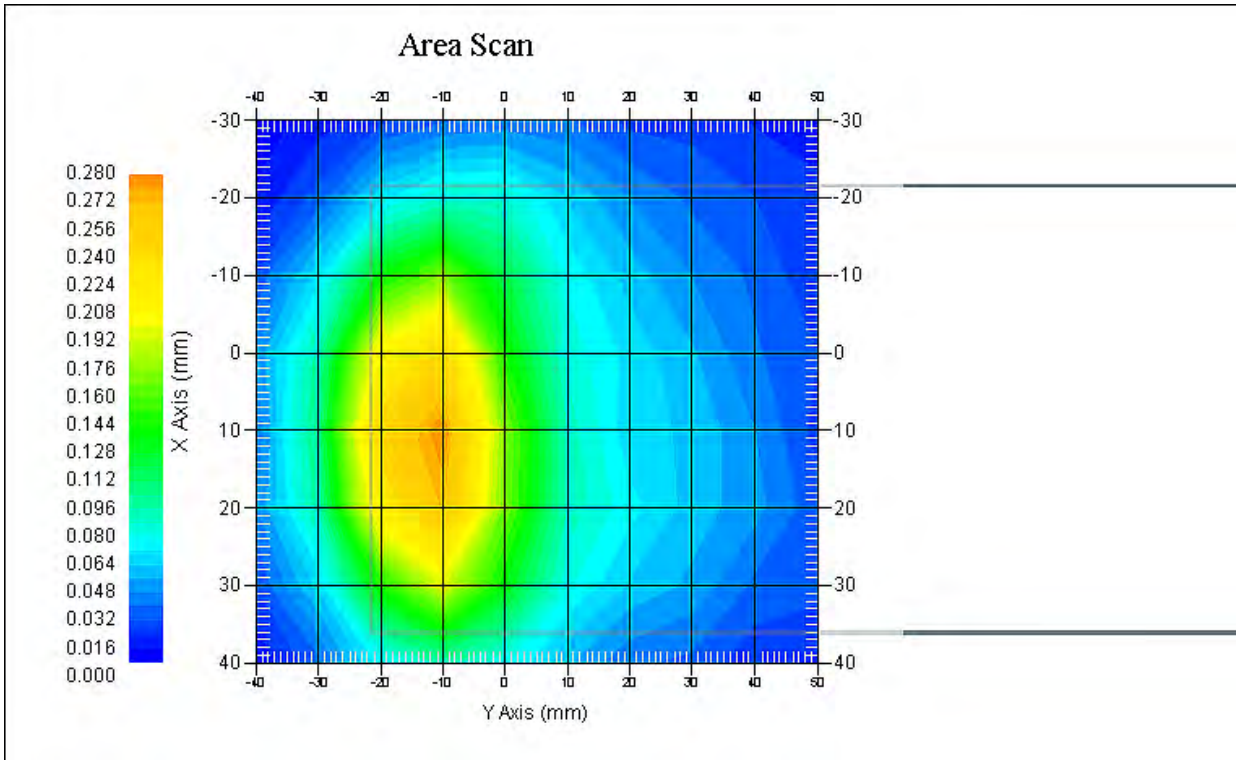
Measurement Data
Test mode : GPRS
Crest Factor : 2
Scan Type : Complete
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.166 W/kg
Power Drift-Finish : 0.169 W/kg
Power Drift (%) : 1.857

Tissue Data
Type : Body
Frequency : 1850.2 MHz
Epsilon : 51.96 F/m
Sigma : 1.50 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 1900
Duty Cycle Factor : 2
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 : 0.245 W/kg
10 gram SAR value : 0.153 W/kg
Area Scan Peak SAR : 0.276 W/kg
Zoom Scan Peak SAR : 0.411 W/kg

Plot 9#



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

WCDMA850; Body-Worn-Back (836.6 MHz Middle Channel)

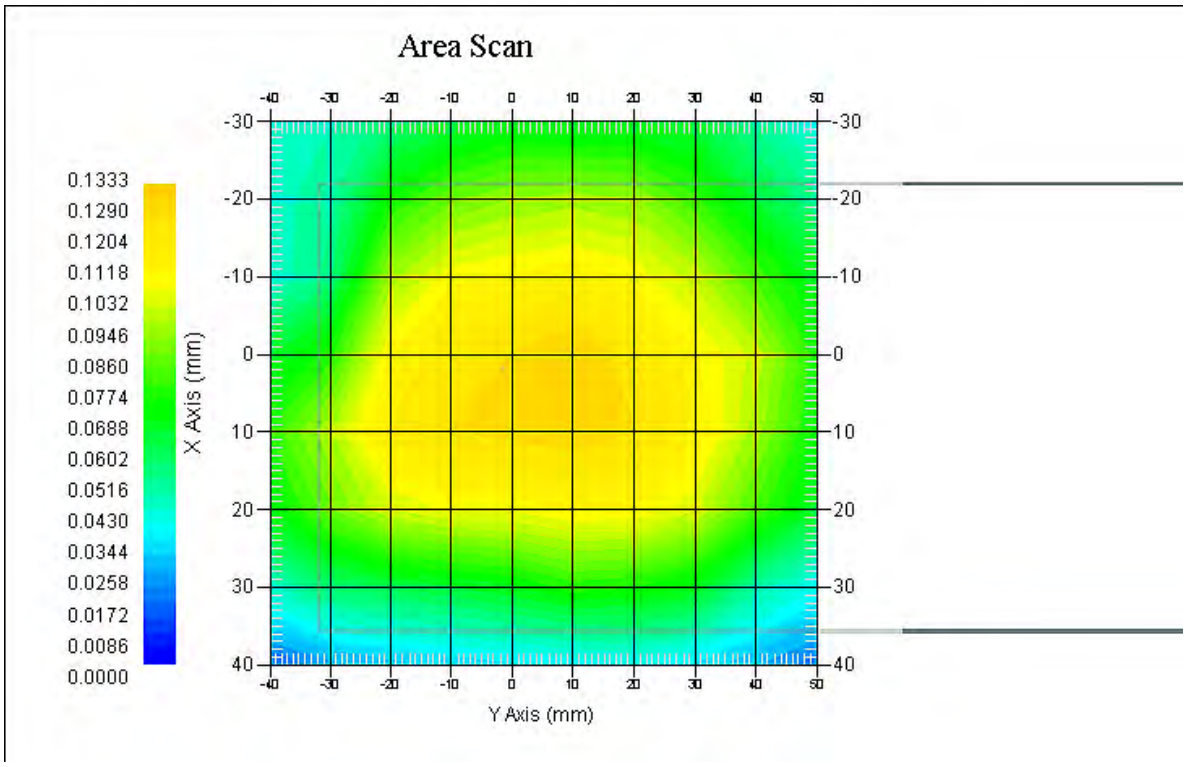
Measurement Data
Test mode : RMC
Crest Factor : 1
Scan Type : Complete
Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.122 W/kg
Power Drift-Finish : 0.119 W/kg
Power Drift (%) : -2.503

Tissue Data
Type : Body
Frequency : 836.6 MHz
Epsilon : 53.85 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 : 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 : 0.125 W/kg
10 gram SAR value : 0.106 W/kg
Area Scan Peak SAR : 0.130 W/kg
Zoom Scan Peak SAR : 0.220 W/kg

Plot 10#



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

WCDMA 1700; Body-Worn-Back (1752.6 MHz High Channel)

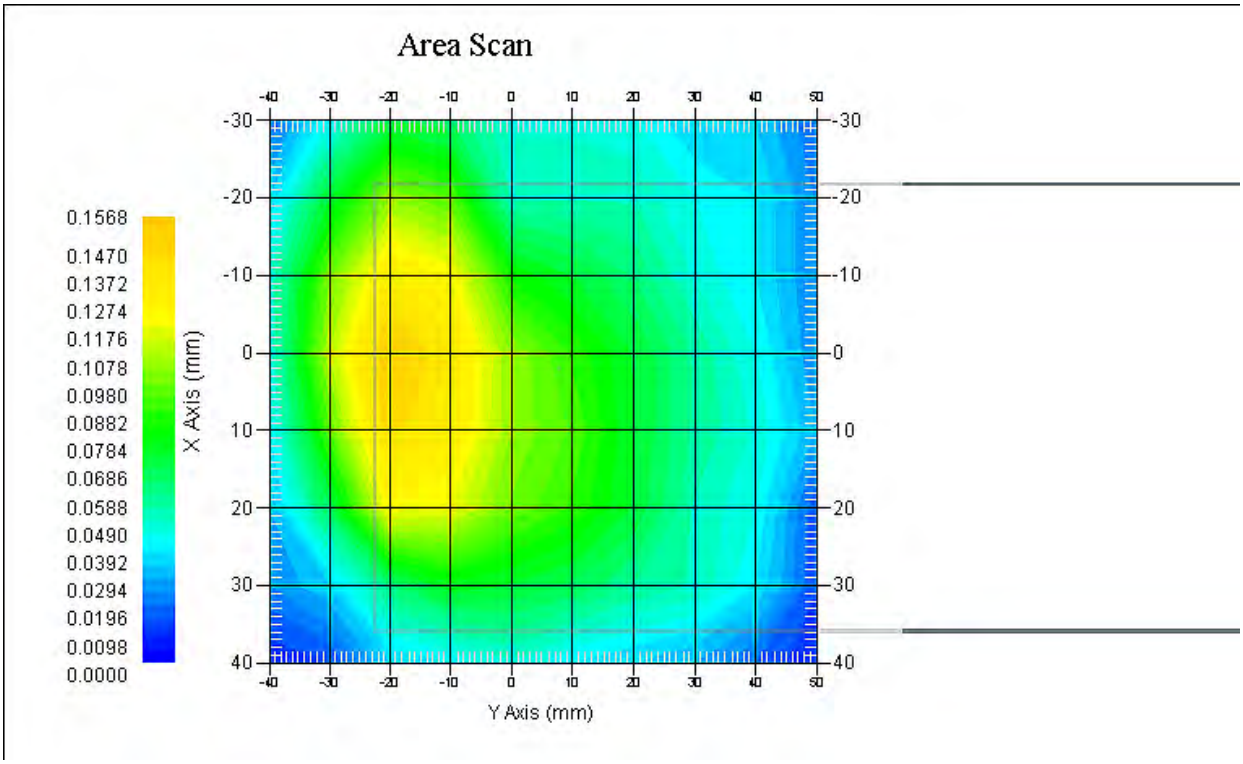
Measurement Data
Test mode : RMC
Crest Factor : 1
Scan Type : Complete
Area Scan : 11x9x1: Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.115 W/kg
Power Drift-Finish : 0.112 W/kg
Power Drift (%) : -2.721

Tissue Data
Type : Body
Frequency : 1752.6 MHz
Epsilon : 51.98 F/m
Sigma : 1.53 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 1750
Duty Cycle Factor : 1
Conversion Factor : 5.4
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 : 0.140 W/kg
10 gram SAR value : 0.087 W/kg
Area Scan Peak SAR : 0.155 W/kg
Zoom Scan Peak SAR : 0.210 W/kg

Plot 11#



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

WCDMA1900; Body-Worn-Back (1852.4 MHz Low Channel)

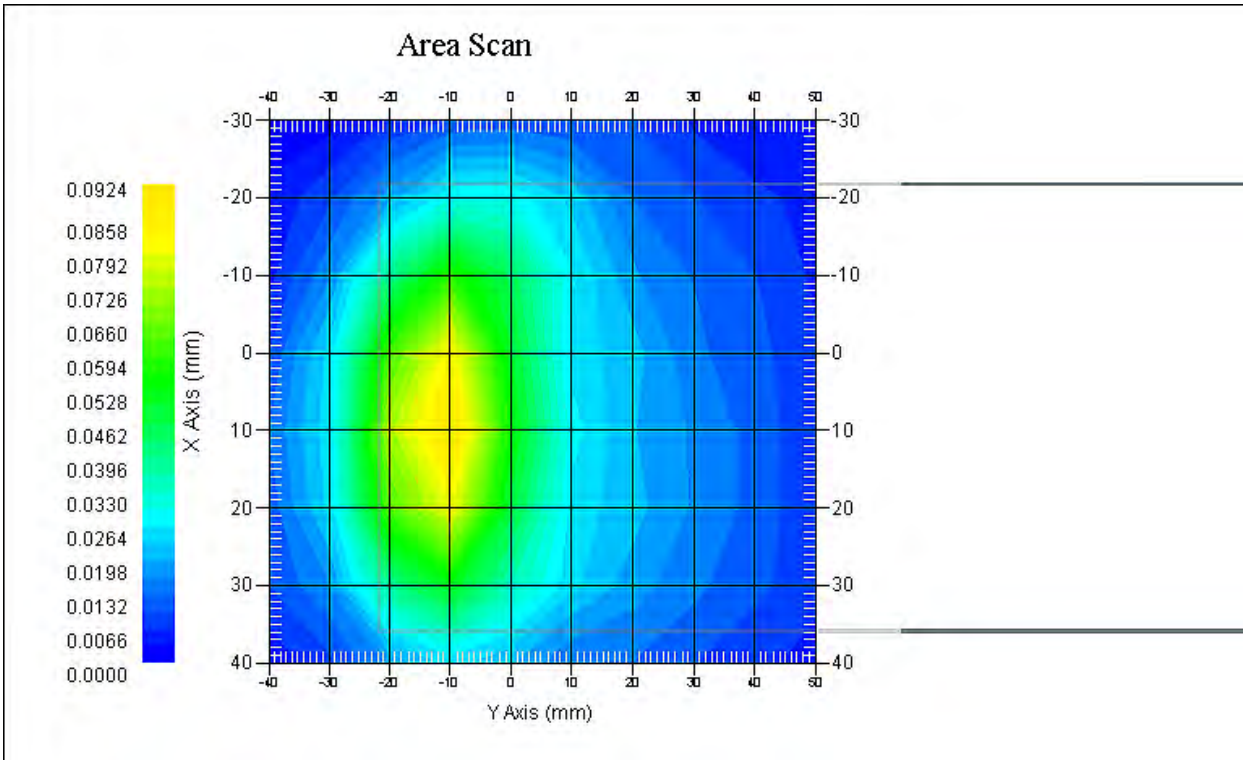
Measurement Data
Test mode : RMC
Crest Factor : 1
Scan Type : Complete
Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.052 W/kg
Power Drift-Finish : 0.051 W/kg
Power Drift (%) : -1.916

Tissue Data
Type : Body
Frequency : 1852.4 MHz
Epsilon : 52.05 F/m
Sigma : 1.50 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 : 0.078 W/kg
10 gram SAR value : 0.043 W/kg
Area Scan Peak SAR : 0.092 W/kg
Zoom Scan Peak SAR : 0.125 W/kg

Plot 12#



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

LTE FDD Band4; Body-Worn-Back (1745 MHz High Channel);

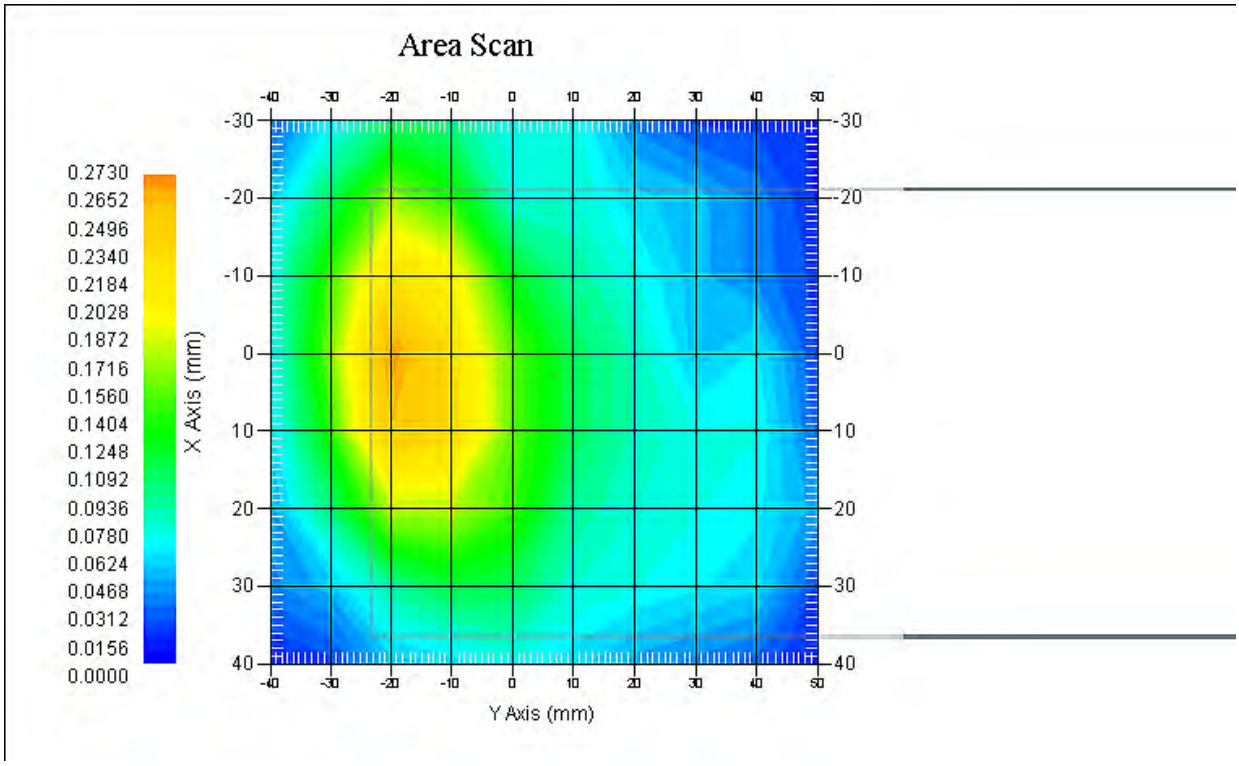
Measurement Data
Test mode : 1RB
Crest Factor : 1
Scan Type： : Complete
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.175 W/kg
Power Drift-Finish : 0.172 W/kg
Power Drift (%) : -1.779

Tissue Data
Type : Body
Frequency : 1745 MHz
Epsilon : 51.91 F/m
Sigma : 1.52 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 1750
Duty Cycle Factor : 1
Conversion Factor : 5.3
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 : 0.235 W/kg
10 gram SAR value : 0.153 W/kg
Area Scan Peak SAR : 0.272 W/kg
Zoom Scan Peak SAR : 0.360 W/kg

Plot 13#



APPENDIX A MEASUREMENT UNCERTAINTY

According to **IEEE1528:2013**, the uncertainty budget has been determined for the Head SAR measurement system and is given in the following Table.

Source of Uncertainty	Tolerance Value	Probability Distribution	Divisor	c_i^1 (1-g)	c_i^1 (10-g)	Standard Uncertainty (1-g) %	Standard Uncertainty (10-g) %
Measurement System							
Probe Calibration	3.5	normal	1	1	1	3.5	3.5
Axial Isotropy	3.7	rectangular	$\sqrt{3}$	$(1-cp)^{1/2}$	$(1-cp)^{1/2}$	1.5	1.5
Hemispherical Isotropy	10.9	rectangular	$\sqrt{3}$	$\sqrt{cp}$	$\sqrt{cp}$	4.4	4.4
Boundary Effect	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Linearity	4.7	rectangular	$\sqrt{3}$	1	1	2.7	2.7
Detection Limit	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Readout Electronics	1.0	normal	1	1	1	1.0	1.0
Response Time	0.8	rectangular	$\sqrt{3}$	1	1	0.5	0.5
Integration Time	1.7	rectangular	$\sqrt{3}$	1	1	1.0	1.0
RF Ambient Condition -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
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 related							
Test sample positioning	2.0	normal	1	1	1	2.0	2.0
Device Holder Uncertainty	4.0	normal	1	1	1	6.215	6.215
Drift of Output Power	5.0	rectangular	$\sqrt{3}$	1	1	2.67	2.67
Phantom and Setup							
Phantom Uncertainty	3.4	rectangular	$\sqrt{3}$	1	1	2.0	2.0
SAR correction in permittivity and conductivity	1.2	normal	1	1	0.85	1.2	1.0
Liquid conductivity measurement	5.0	normal	1	0.78	0.71	3.9	3.6
Liquid permittivity measurement	5.0	normal	1	0.25	0.29	1.3	1.5
conductivity—temperature	1.1	rectangular	$\sqrt{3}$	0.78	0.71	0.5	0.5
permittivity—temperature	1.3	rectangular	$\sqrt{3}$	0.23	0.23	0.2	0.2
Combined Uncertainty		RSS				10.78	10.55
Expanded uncertainty (coverage factor=2)		Normal(k=2)				21.56	21.10

According to **IEC62209-2:2010**, the uncertainty budget has been determined for the Body SAR measurement system and is given in the following Table.

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	1	1.5	1.5
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
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 related							
Test sample positioning	2.0	normal	1	1	1	2.0	2.0
Device Holder Uncertainty	4.0	normal	1	1	1	6.215	6.215
Drift of Output Power	5.0	rectangular	$\sqrt{3}$	1	1	2.67	2.67
Phantom and Setup							
Phantom Uncertainty	3.4	rectangular	$\sqrt{3}$	1	1	2.0	2.0
SAR correction in permittivity and conductivity	1.2	normal	1	1	0.84	1.2	1.0
Liquid conductivity measurement	5.0	normal	1	0.78	0.71	3.9	3.6
Liquid permittivity measurement	5.0	normal	1	0.23	0.26	1.3	1.5
conductivity—temperature	1.1	rectangular	$\sqrt{3}$	0.78	0.71	0.5	0.5
permittivity—temperature	1.3	rectangular	$\sqrt{3}$	0.23	0.26	0.2	0.2
Combined Uncertainty		RSS				9.58	9.49
Expanded uncertainty (coverage factor=2)		Normal(k=2)				19.16	18.98

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.

<1000MHz
TEM Cell for sensitivity in air
Standard phantom using temperature transfer method for sensitivity in tissue

>1000MHz
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
  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
  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
  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

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

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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

Page 3 of 10
This page has been reviewed for content and attested to on Page 2 of this document.

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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 μV/(V/m)^2
Channel Y:	1.2 μV/(V/m)^2
Channel Z:	1.2 μV/(V/m)^2
Diode Compression Point:	95 mV

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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.

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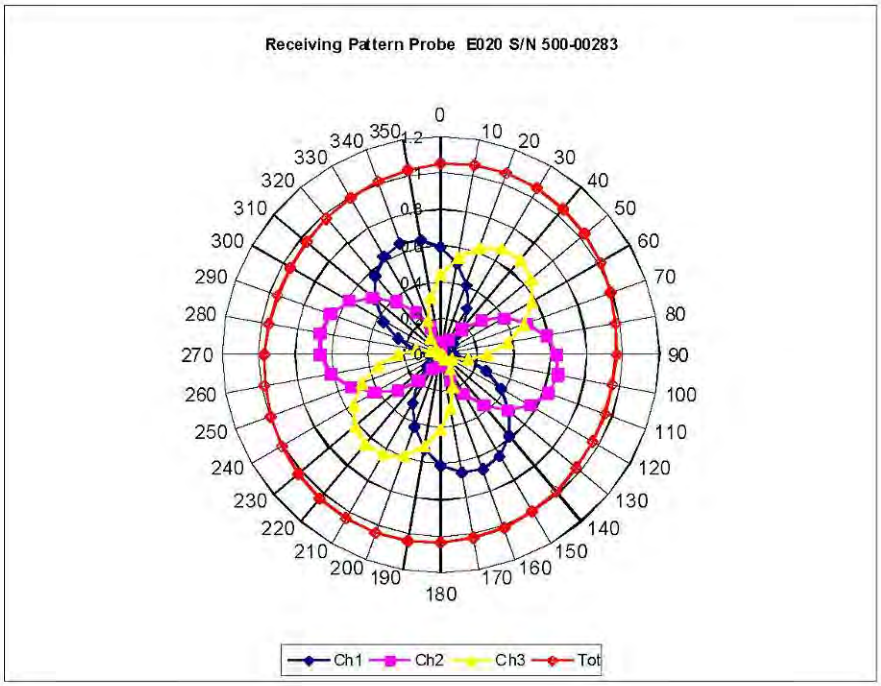
Receiving Pattern Air



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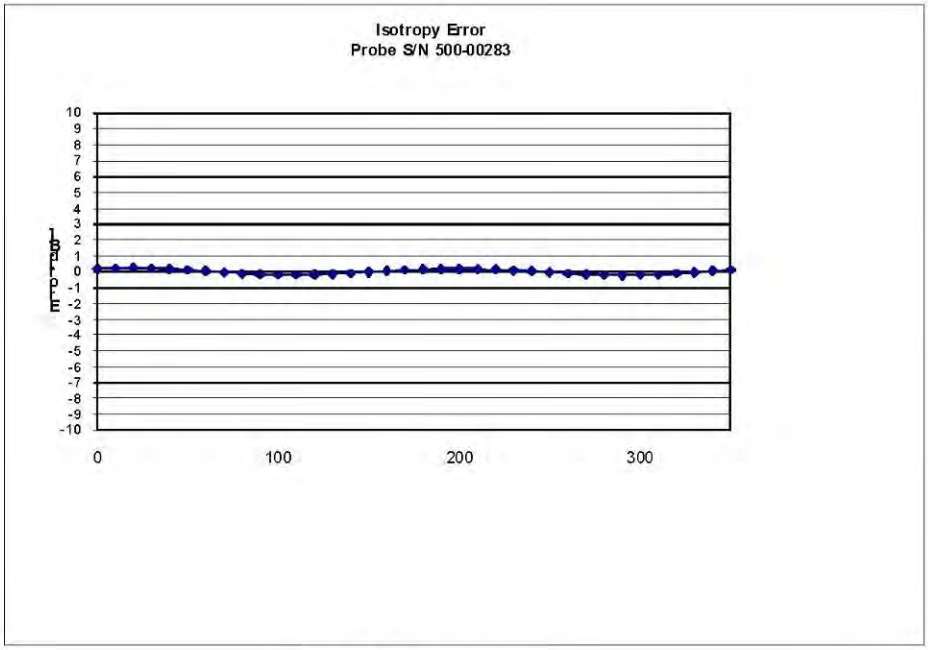
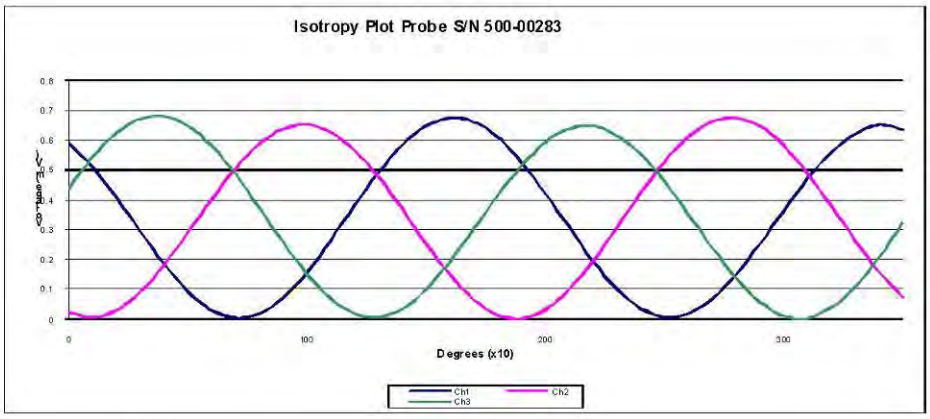
Isotropy Error Air





Isotropicity Tissue: 0.10 dB

Page 8 of 10
This page has been reviewed for content and attested to on Page 2 of this document.

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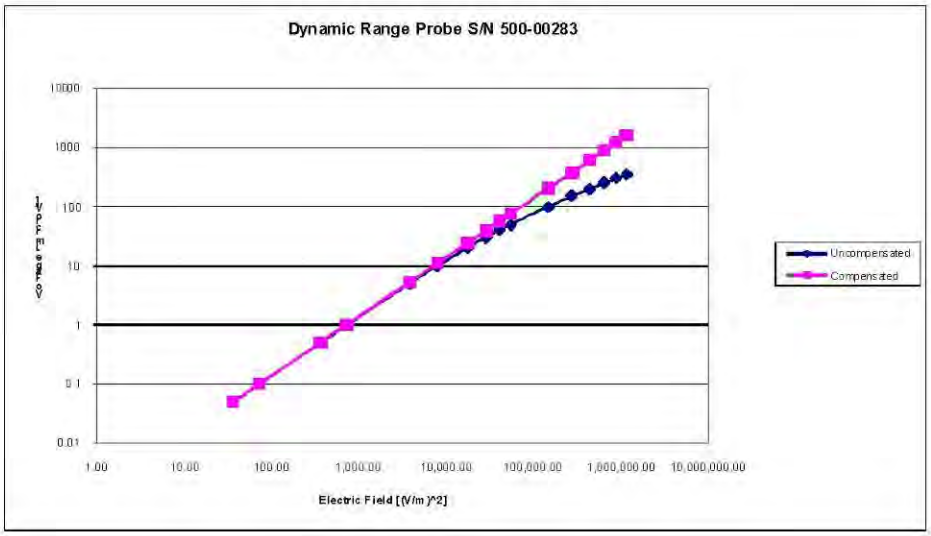
Dynamic Range



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

NCL Calibration Laboratories
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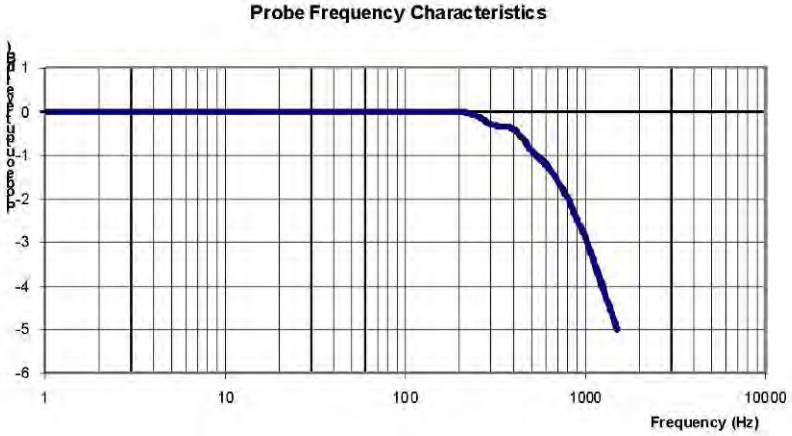
Video Bandwidth



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.

Page 10 of 10
This page has been reviewed for content and attested to on Page 2 of this document.

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

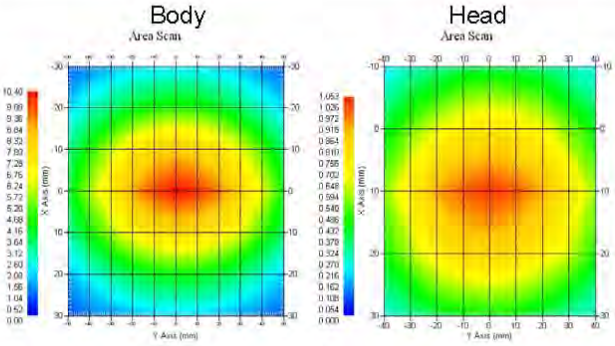
Length: 162.2 mm
Height: 89.4 mm

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



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

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

- IEC-62209 "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)"
- 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 Draft Standard for Calibration of Electromagnetic Field Sensors and Probes, Excluding Antennas, from 9kHz to 40GHz

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)**

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

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	49.001Ω
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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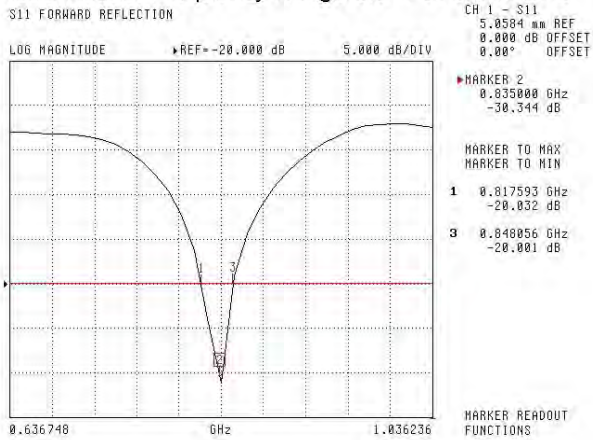
NCL Calibration Laboratories
Division of APREL Laboratories.

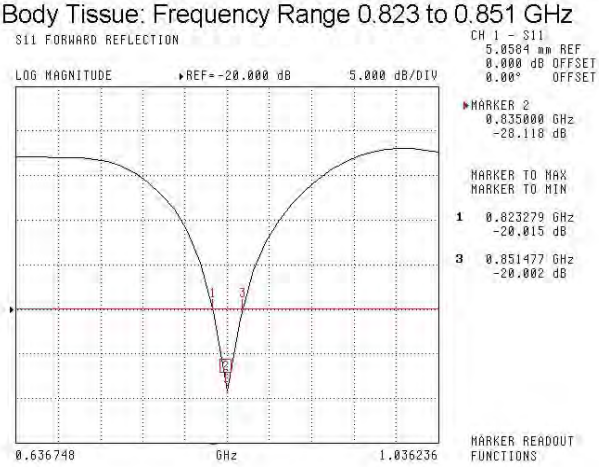
The Following Graphs are the results as displayed on the Vector Network Analyzer.

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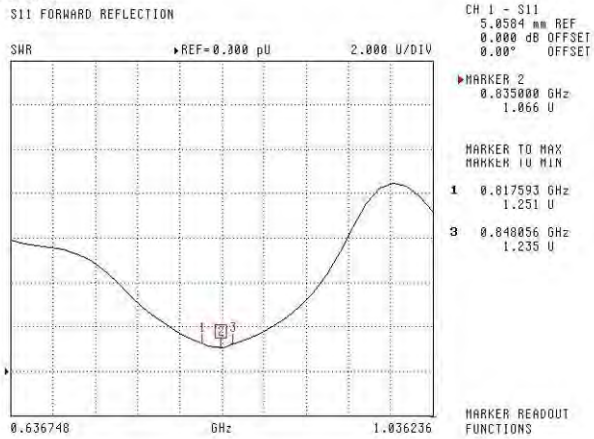
This page has been reviewed for content and attested to by signature within this document.

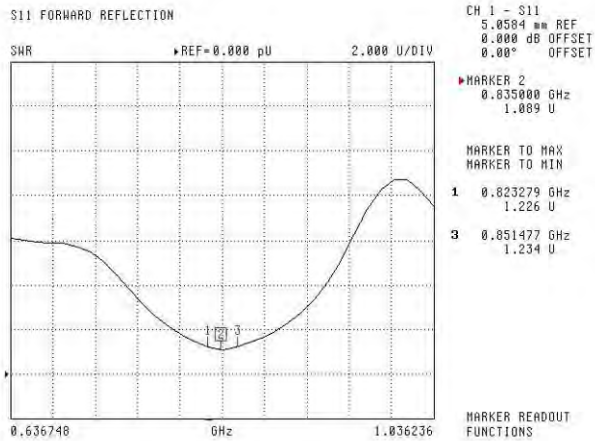
NCL Calibration Laboratories
Division of APREL Laboratories.

SWR

Head



Body



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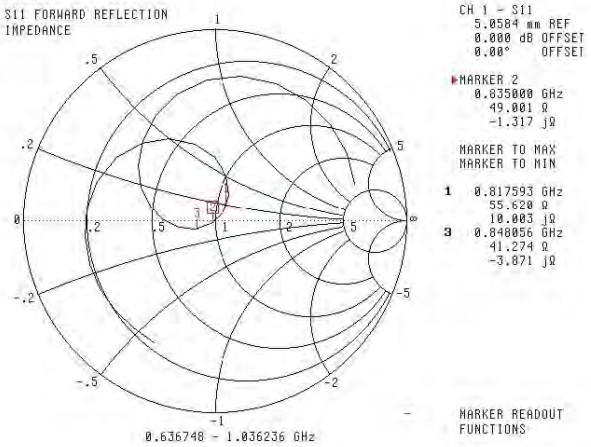
This page has been reviewed for content and attested to by signature within this document.

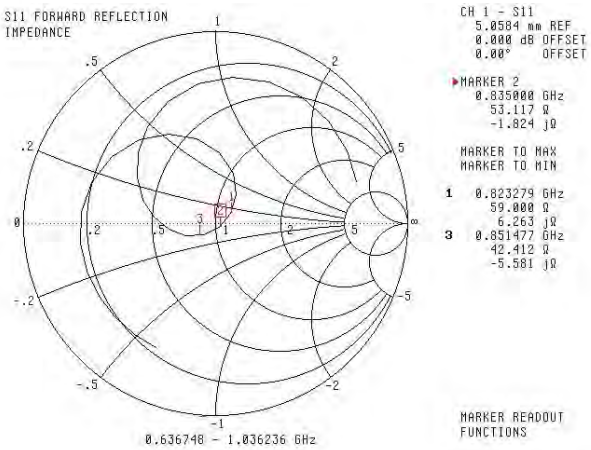
NCL Calibration Laboratories
Division of APREL Laboratories.

Smith Chart Dipole Impedance

Head



Body



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

NCL Calibration Laboratories
Division of APREL Laboratories.

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.

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

NCL CALIBRATION LABORATORIES

Calibration File No: DC-1531
Project Number: BACL-5745

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.

BACL Head & Body Validation Dipole

Manufacturer: APREL Laboratories
Part number: ALS-D-1750-S-2
Frequency: 1750 MHz
Serial No: 198-00304

Customer: ISL

Calibrated: 8th October, 2013
Released on: 8th October, 2013

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 Laboratories.

Conditions

Dipole 198-00304 was an original calibration.

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

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

Constantin Teodorian, Test Engineer

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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: 75 mm
Height: 42 mm

Electrical Calibration

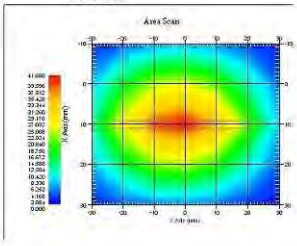
Test	Result Head	Result Body
S11 R/L	-25.567	-20.548 dB
SWR	1.111U	1.207 U
Impedance	53.637Ω	55.929 Ω

System Validation Results, 1750 MHz

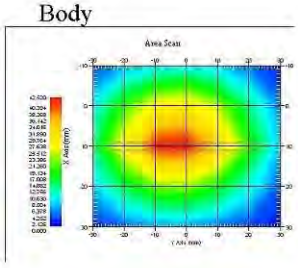
	1g	10g
Head	37.02	18.99
Body	36.65	18.85

Type	Epsilon	Sigma
Head	38.51	1.36
Body	51.79	1.53

Head



Body



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

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. 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-030 130 MHz to 26 GHz E-Field Probe Serial Number 215.

References

SSI-TP-018-ALSAS Dipole Calibration Procedure
SSI-TP-016 Tissue Calibration Procedure
IEEE 1528 "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques"
IEC-62209 "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 "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures"
Part 2 *Draft*: "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)"

Conditions

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

This was an original calibration taken from stock.

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

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

NCL Calibration Laboratories
Division of APREL Laboratories.

Dipole Calibration Results

Mechanical Verification

Measured Length	Measured Height
75 mm	42 mm

Tissue Validation

Frequency	Permittivity ε	Conductivity σ
1750 Head	38.23	1.38
1750 Body	52.86	1.54

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

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NCL Calibration Laboratories
Division of APREL Laboratories.

Electrical Calibration

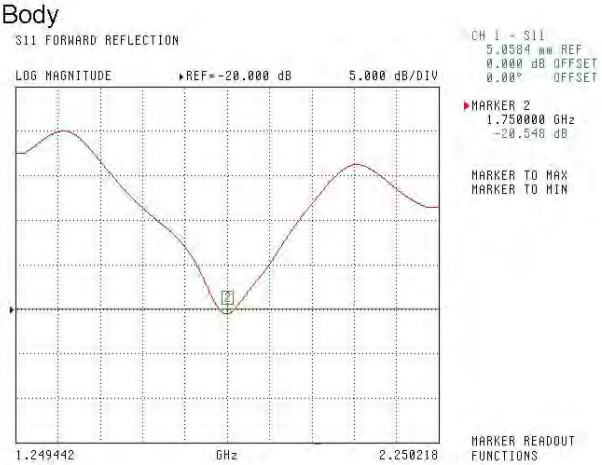
Test	Result Head	Result Body
S11 R/L	-25.567	-20.548 dB
SWR	1.111U	1.207 U
Impedance	53.637Ω	55.929 Ω

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

S11 Parameter Return Loss

Head

Body



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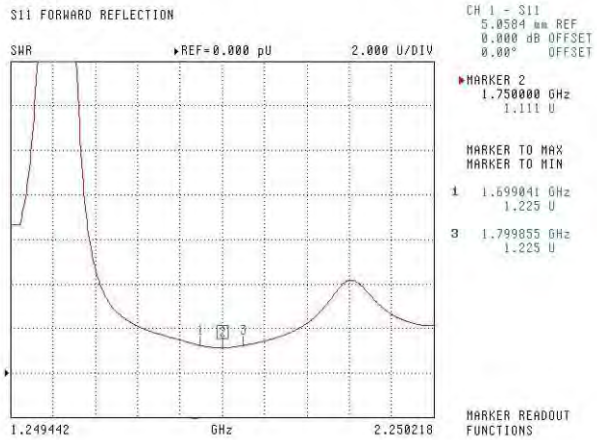
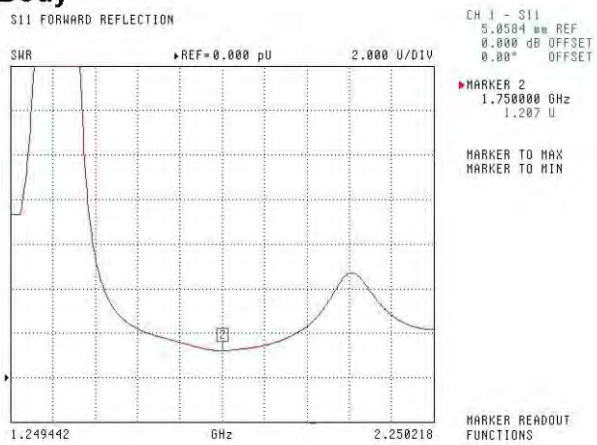
NCL Calibration Laboratories
Division of APREL Laboratories.

SWR

Head



Body



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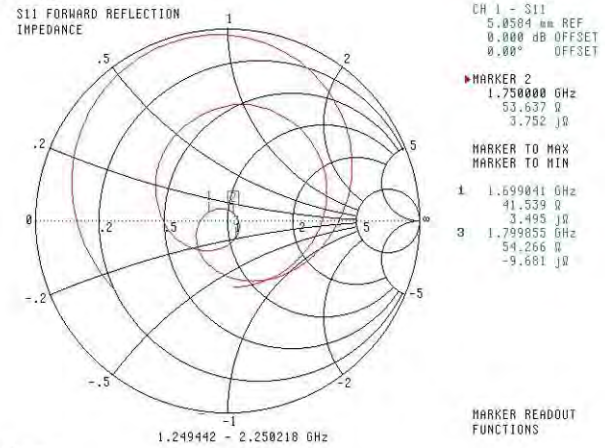
This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

Smith Chart Dipole Impedance

Head



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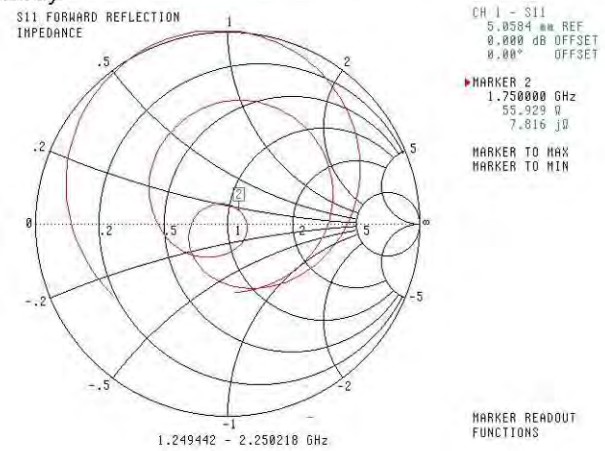

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This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

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 2013
.

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

1750MHz Dipole Calibration By BACL at 2015-04-20

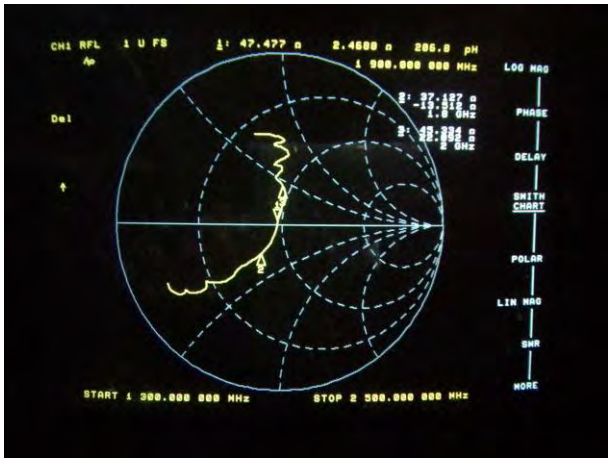
Mechanical Verification

APREL Length	APREL Height	Measured Length	Measured Height
75.0 mm	42 mm	75.1 mm	42.2 mm

Tissue Type	Measured Return Loss	Measured Impedance
Head	-25.083 dB	53.477 Ω
Body	-21.022 dB	55.176 Ω

Test Graphs:

Head Tissue



Body Tissue

1750MHz Dipole Calibration By BACL at 2015-04-20

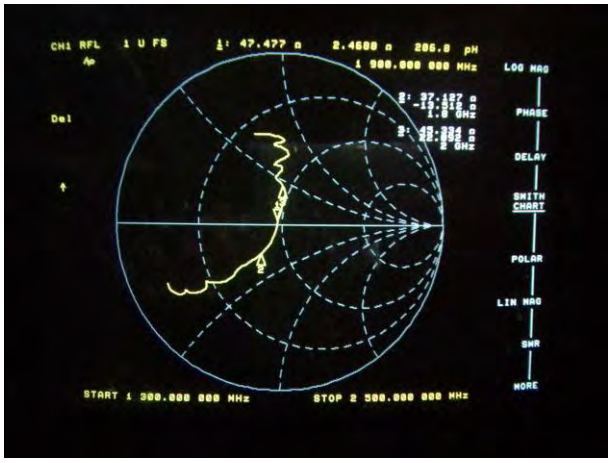
Mechanical Verification

APREL Length	APREL Height	Measured Length	Measured Height
75.0 mm	42 mm	75.1 mm	42.2 mm

Tissue Type	Measured Return Loss	Measured Impedance
Head	-25.083 dB	53.477 Ω
Body	-21.022 dB	55.176 Ω

Test Graphs:

Head Tissue



Body Tissue

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

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: 67.1 mm
Height: 38.9 mm

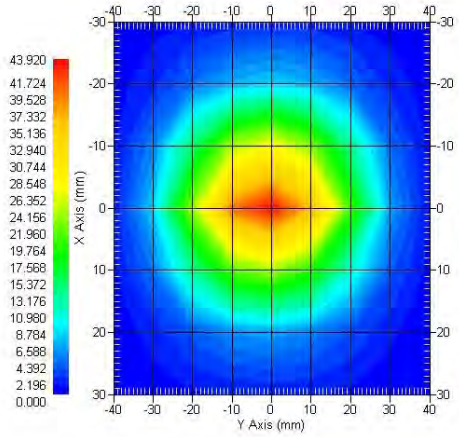
Electrical Specification

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

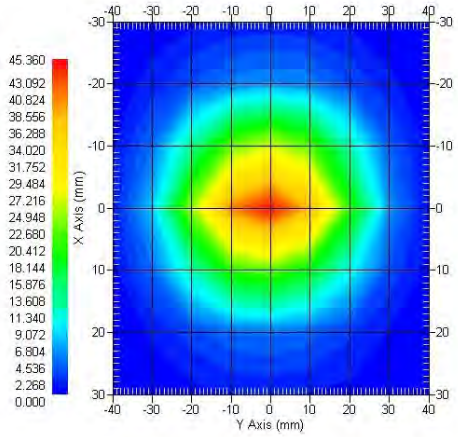
System Validation Results

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

Head
Area Scan



Body
Area Scan



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

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 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

- IEC-62209 "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)"
- 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 Draft Standard for Calibration of Electromagnetic Field Sensors and Probes, Excluding Antennas, from 9kHz to 40GHz

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)**

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

NCL Calibration Laboratories
Division of APREL Laboratories.

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

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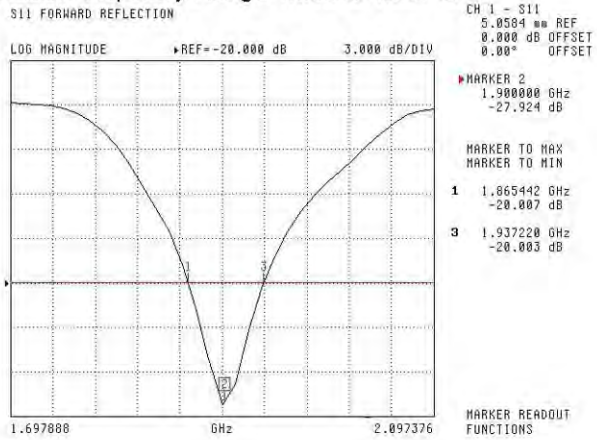
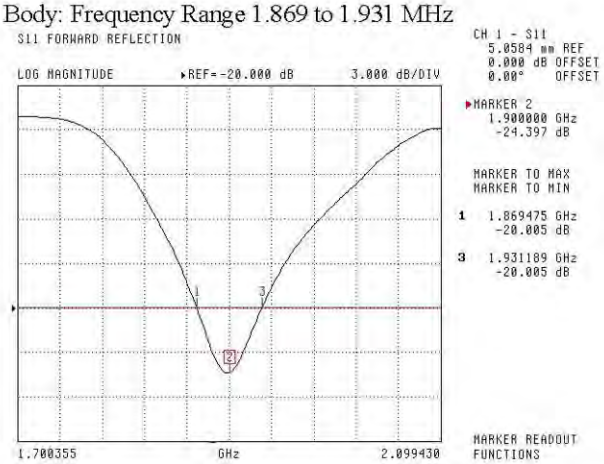
The Following Graphs are the results as displayed on the Vector Network Analyzer.

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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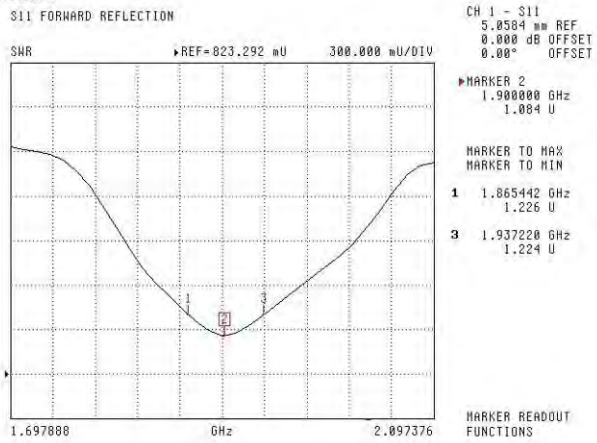
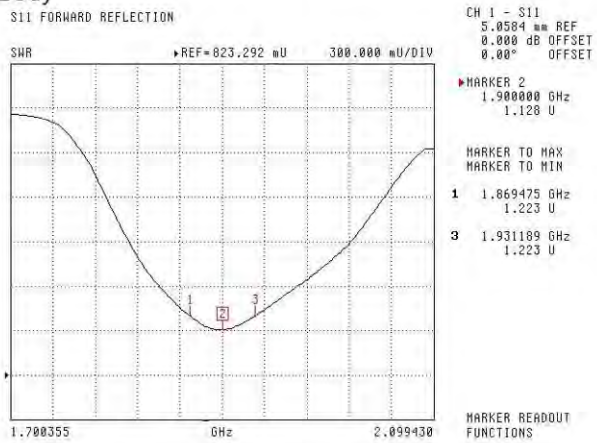
SWR

Head



Body



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NCL Calibration Laboratories
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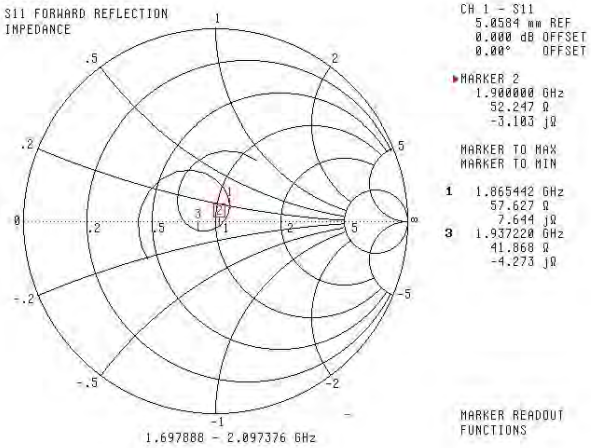
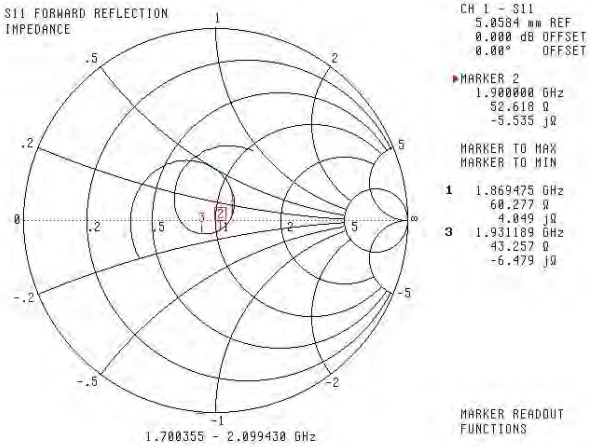
Smith Chart Dipole Impedance

Head



Body



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NCL Calibration Laboratories
Division of APREL Laboratories.

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

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NCL CALIBRATION LABORATORIES

Calibration File No: DC-1602
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-2450-S-2
Frequency: 2450 MHz
Serial No: 220-00758

Customer: Bay Area Compliance Laboratory

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 220-00758 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: 52.4 mm
Height: 30.3 mm

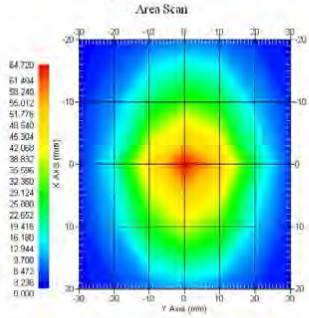
Electrical Specification

Tissue	Frequency	SWR:	Return Loss	Impedance
Head	2450 MHz	1.014 U	-45.184 dB	50.006Ω
Body	2450 MHz	1.070 U	-29.453 dB	50.672 Ω

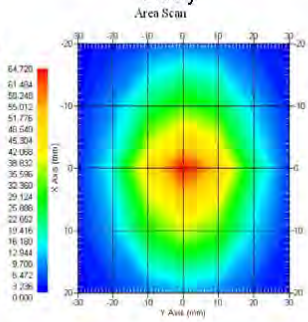
System Validation Results

Tissue	Frequency	1 Gram	10 Gram	Peak
Head	2450 MHz	54.916	25.327	111.97
Body	2450 MHz	52.418	24.691	103.91

Head



Body



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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 220-00758. 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 "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques"
IEC-62209 "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 "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures"
Part 2 *Draft*: "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)"

Conditions

Dipole 220-00758 was a re-calibration.

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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NCL Calibration Laboratories
Division of APREL Laboratories.

Dipole Calibration Results

Mechanical Verification

APREL Length	APREL Height	Measured Length	Measured Height
51.5 mm	30.4 mm	52.4 mm	30.3 mm

Electrical Specification

Tissue	Frequency	SWR:	Return Loss	Impedance
Head	2450 MHz	1.014 U	-45.184 dB	50.006Ω
Body	2450 MHz	1.070 U	-29.453 dB	50.672 Ω

Tissue Validation

	Dielectric constant, ε_r	Conductivity, σ [S/m]
Head Tissue 2450MHz	37.26	1.84
Body Tissue 2450MHz	53.61	1.90

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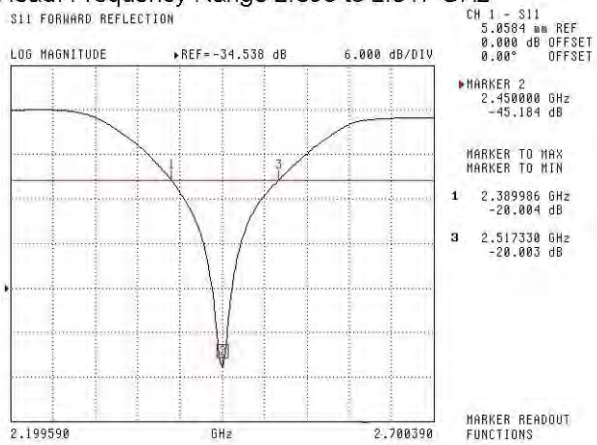
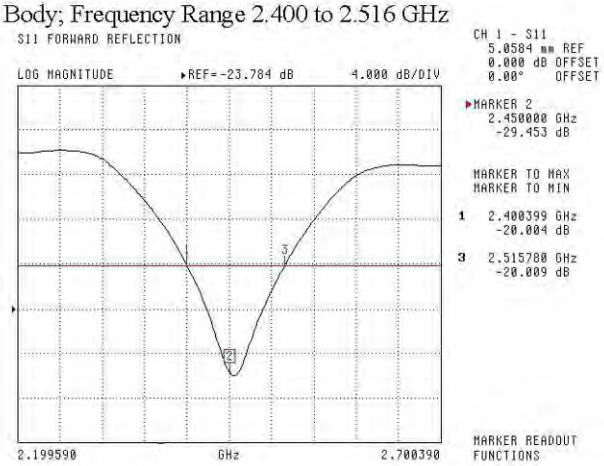
The Following Graphs are the results as displayed on the Vector Network Analyzer.

S11 Parameter Return Loss

Head: Frequency Range 2.390 to 2.517 GHz



Body; Frequency Range 2.400 to 2.516 GHz



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NCL Calibration Laboratories
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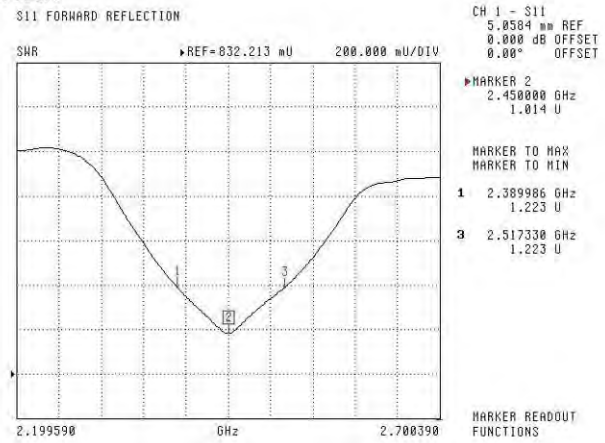
SWR

Head



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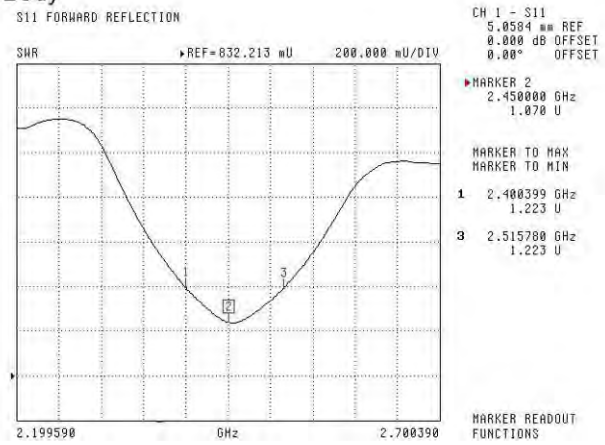

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NCL Calibration Laboratories
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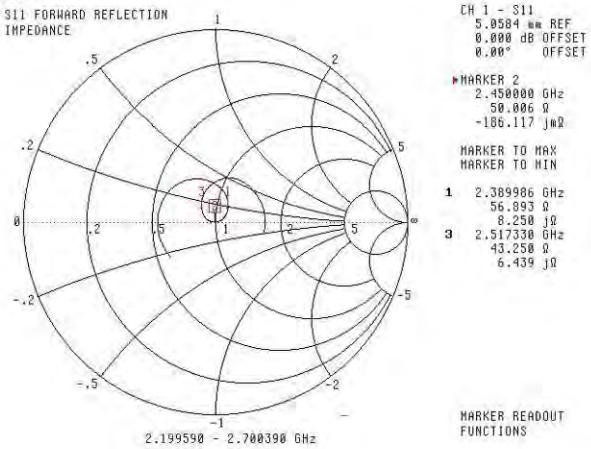
Smith Chart Dipole Impedance

Head



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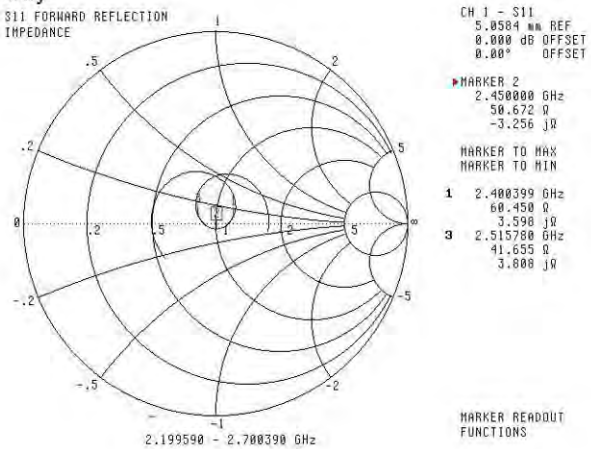

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NCL Calibration Laboratories
Division of APREL Laboratories.

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.

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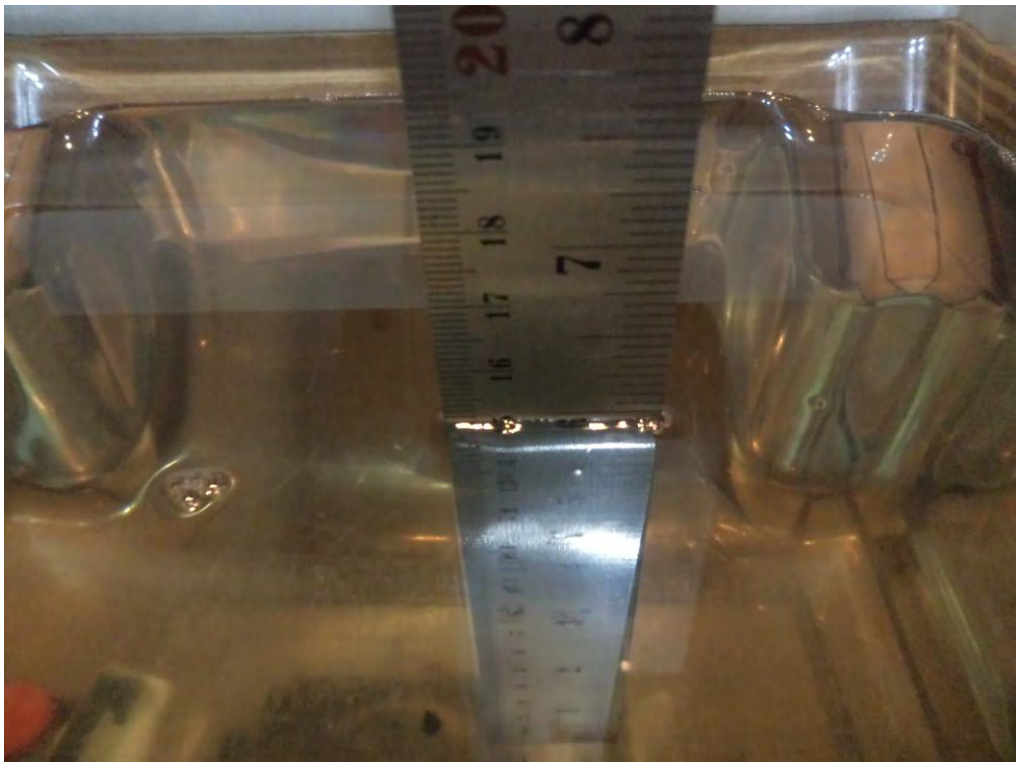
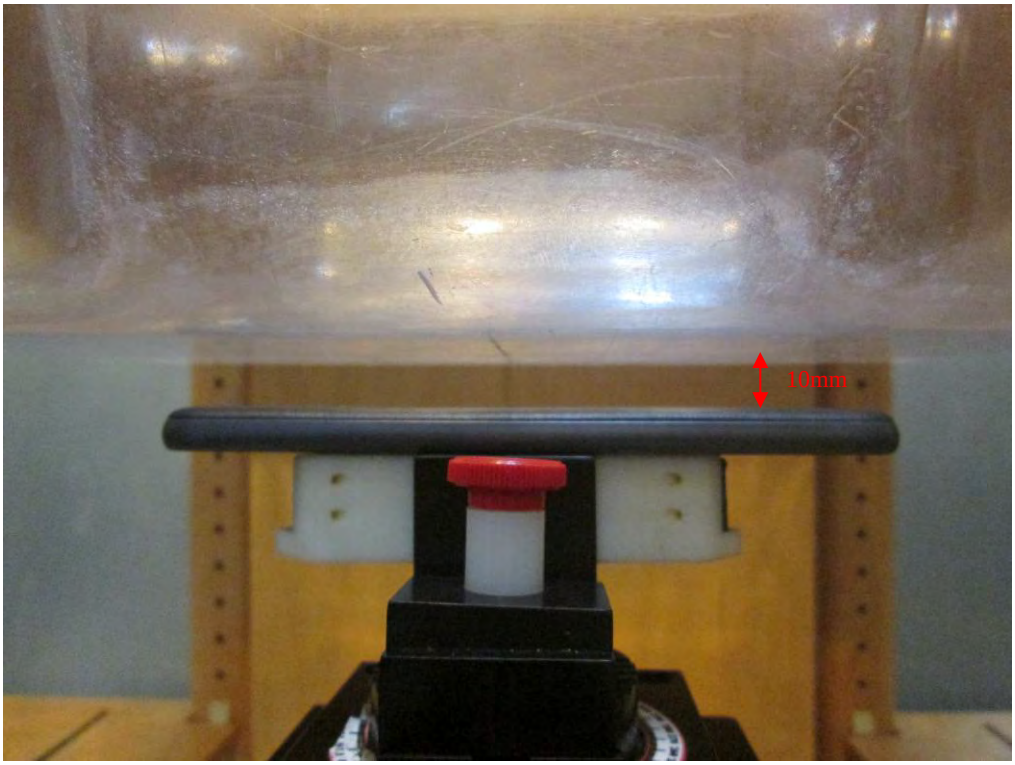
APPENDIX D EUT TEST POSITION PHOTOS

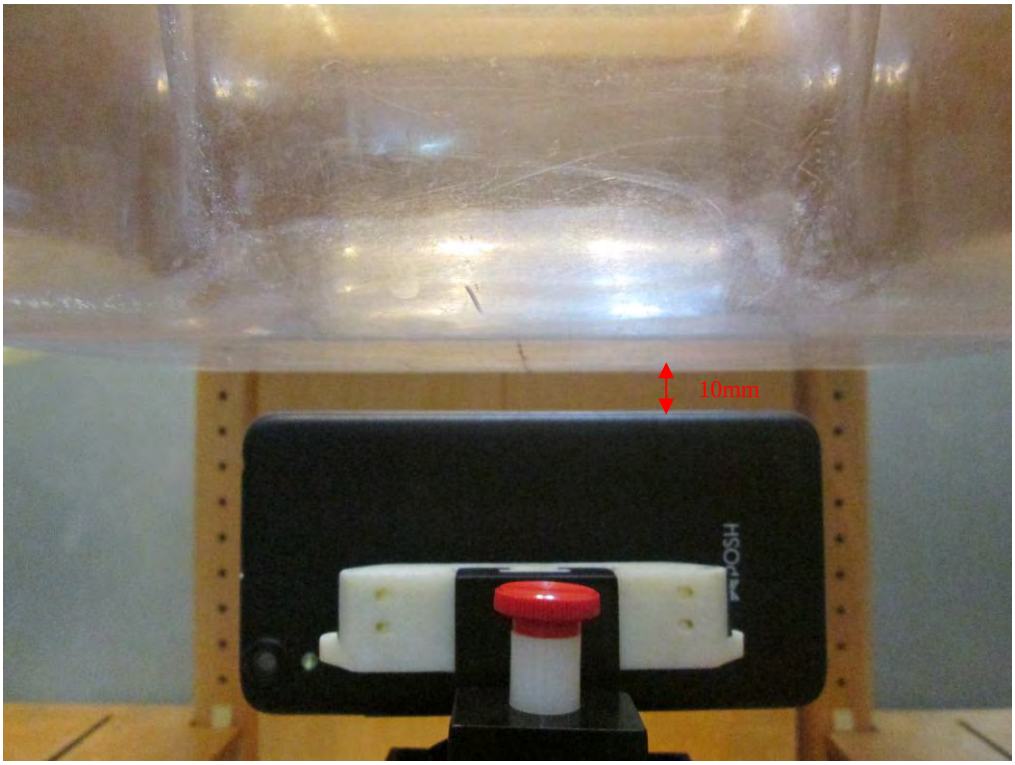
Liquid depth ≥ 15cm



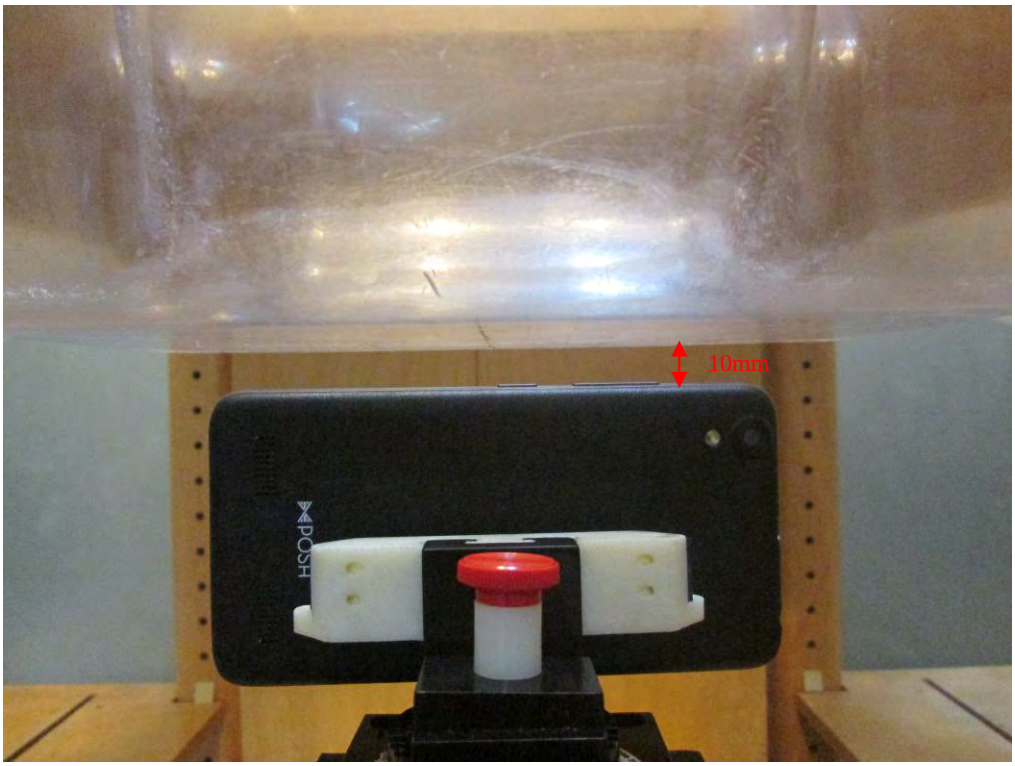
Body-worn Back Setup Photo (10mm)



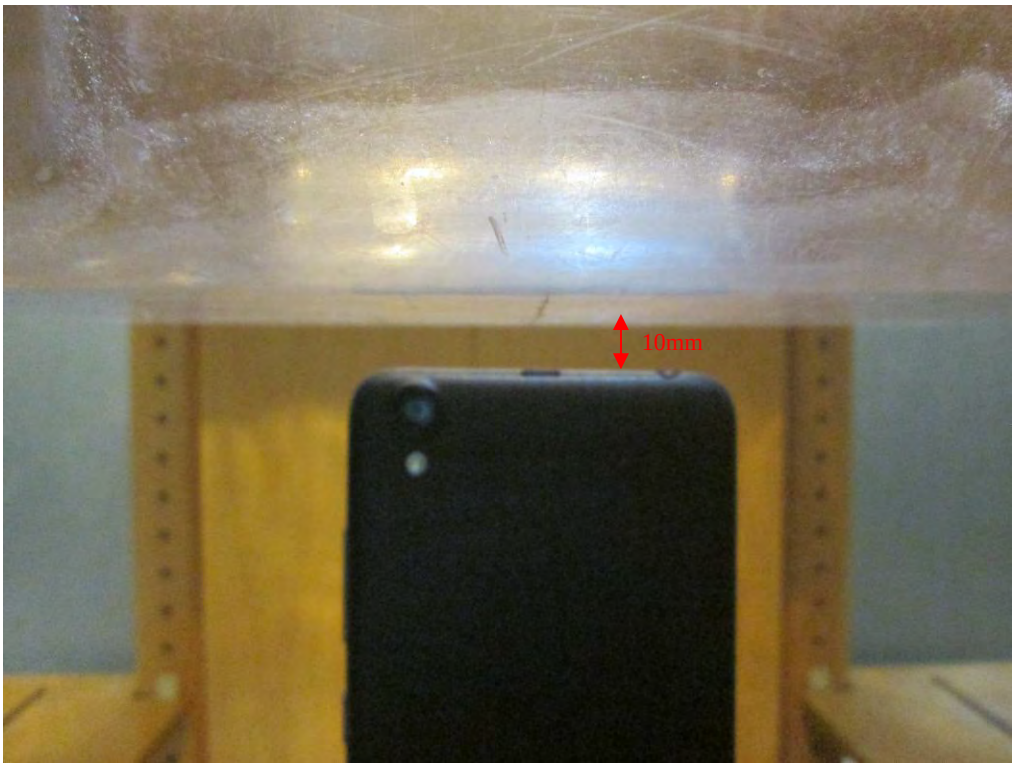
Body-worn Left Setup Photo (10mm)



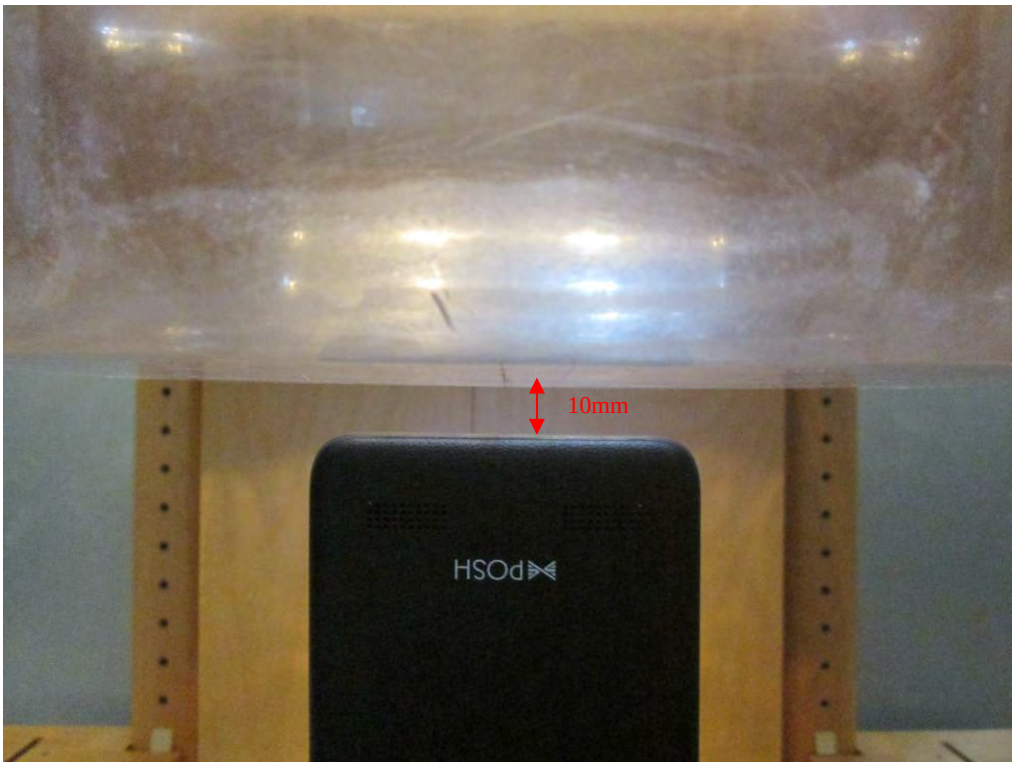
Body-worn Right Setup Photo (10mm)



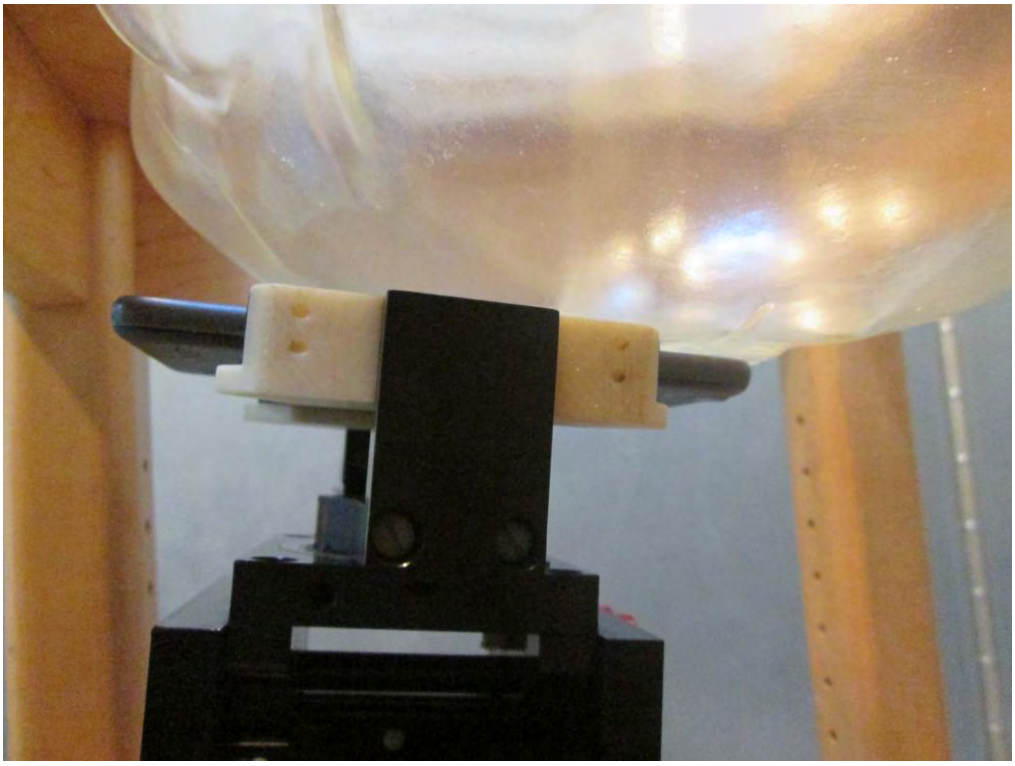
Body-worn Top Setup Photo (10mm)



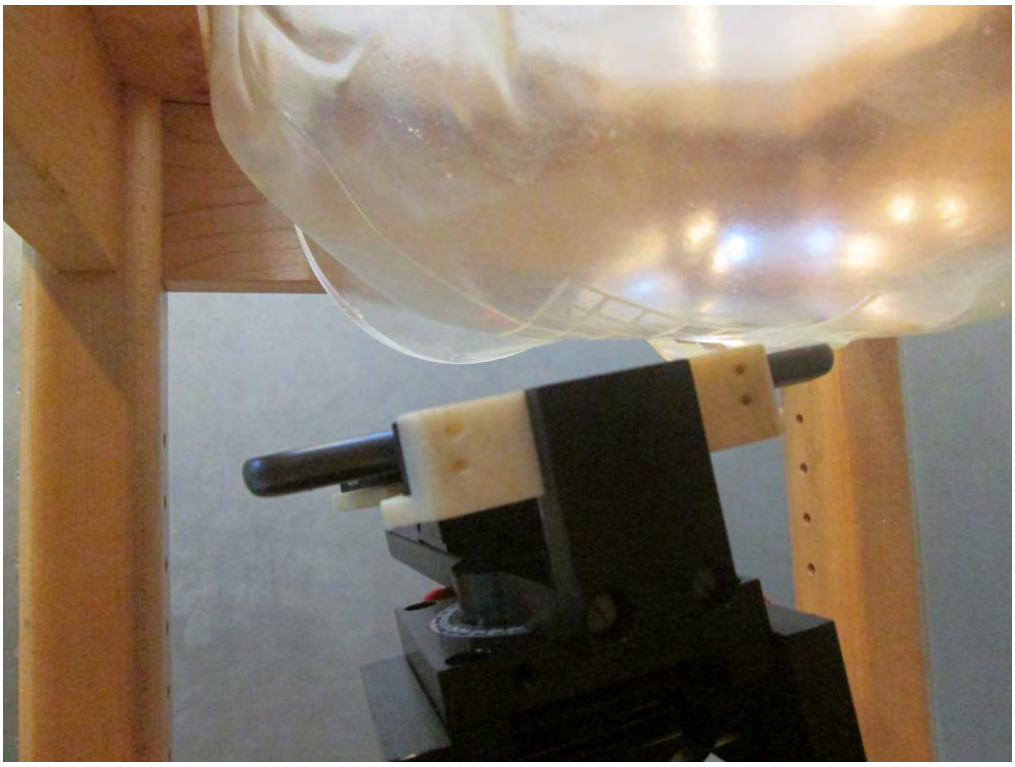
Body-worn Bottom Setup Photo (10mm)



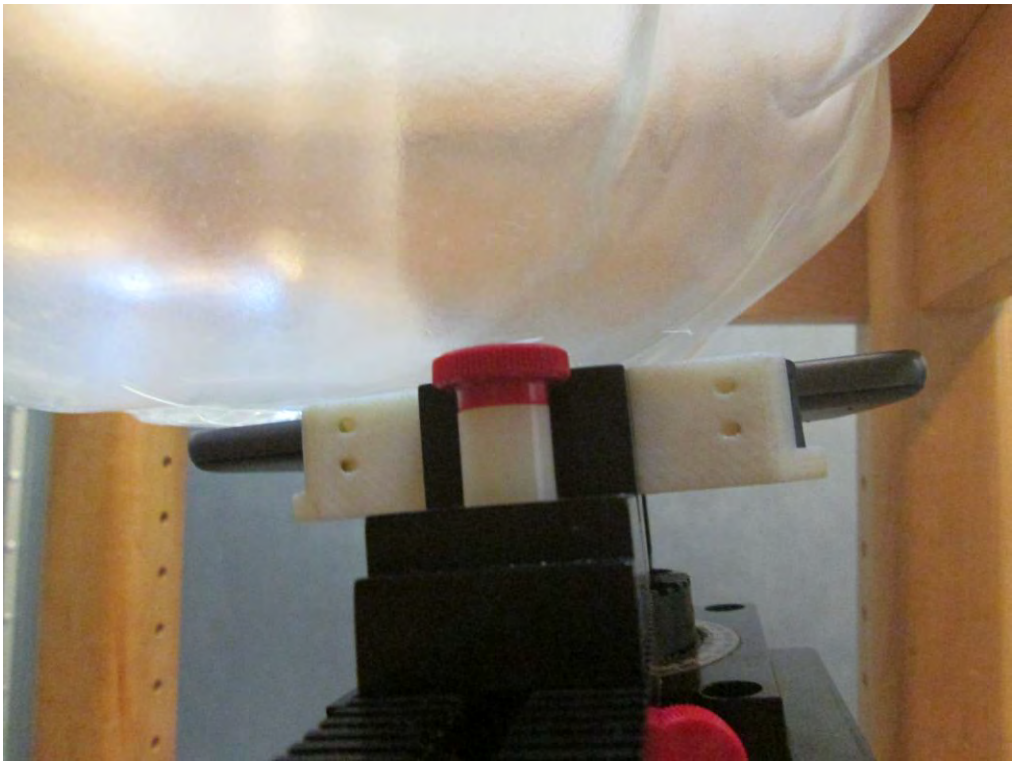
Left Head Touch Setup Photo



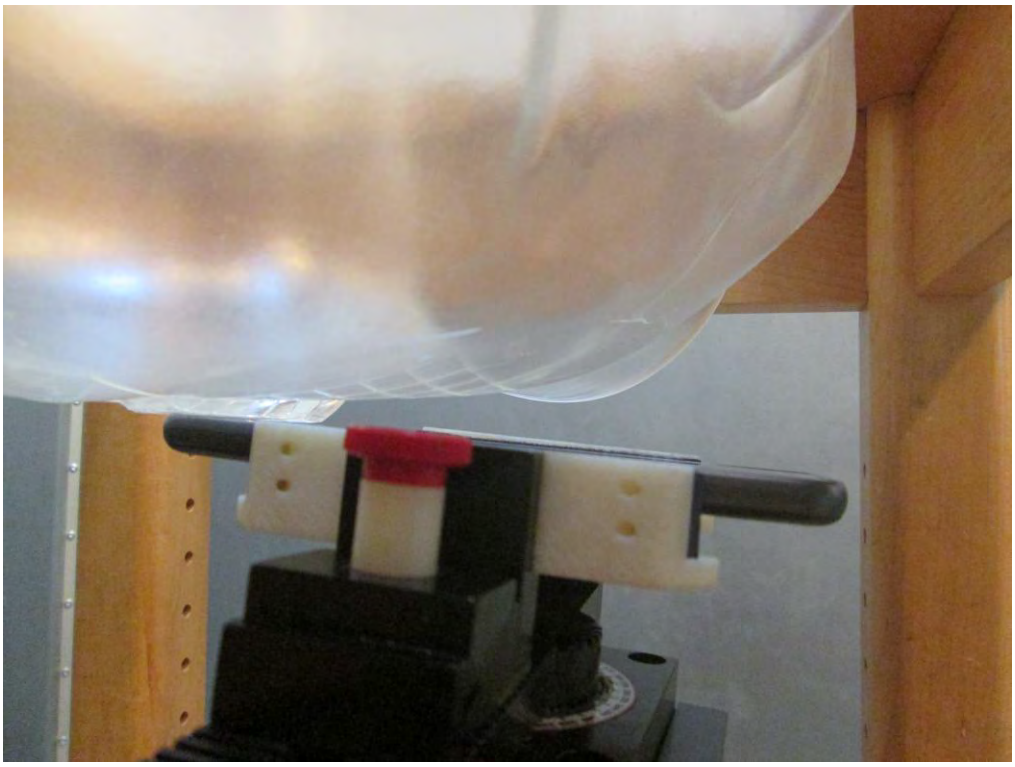
Left Head Tilt Setup Photo



Right Head Touch Setup Photo



Right Head Tilt Setup Photo



APPENDIX E EUT PHOTOS

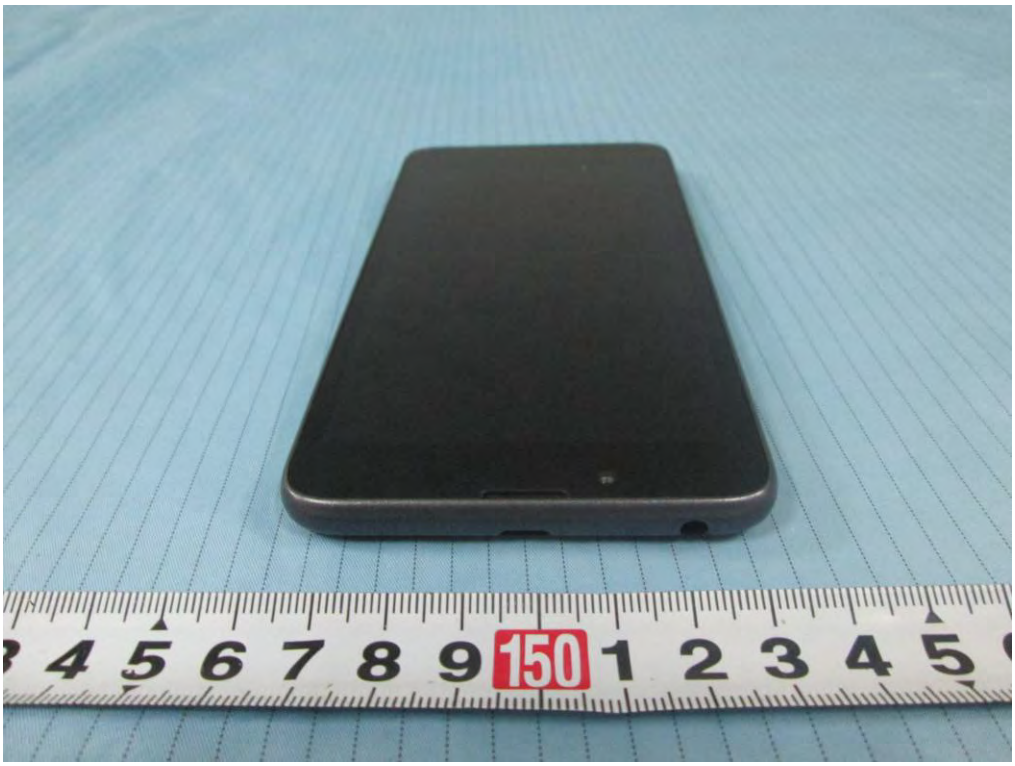
EUT – Front View

EUT – Back View

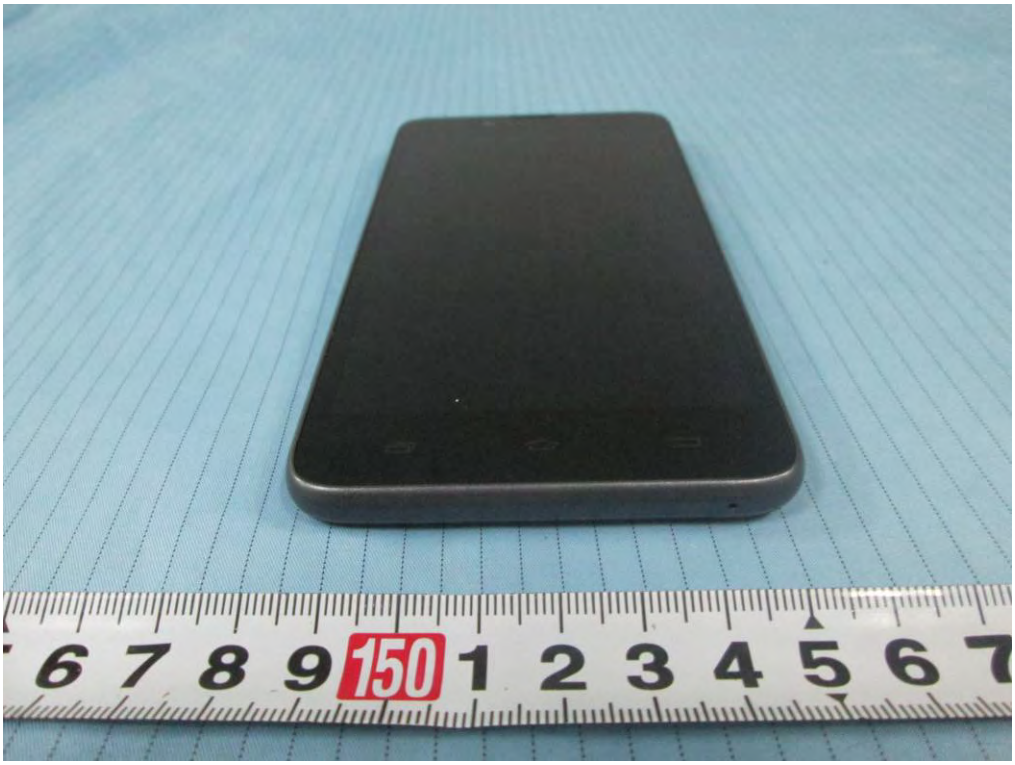
EUT –Left Side View

EUT – Right Side View

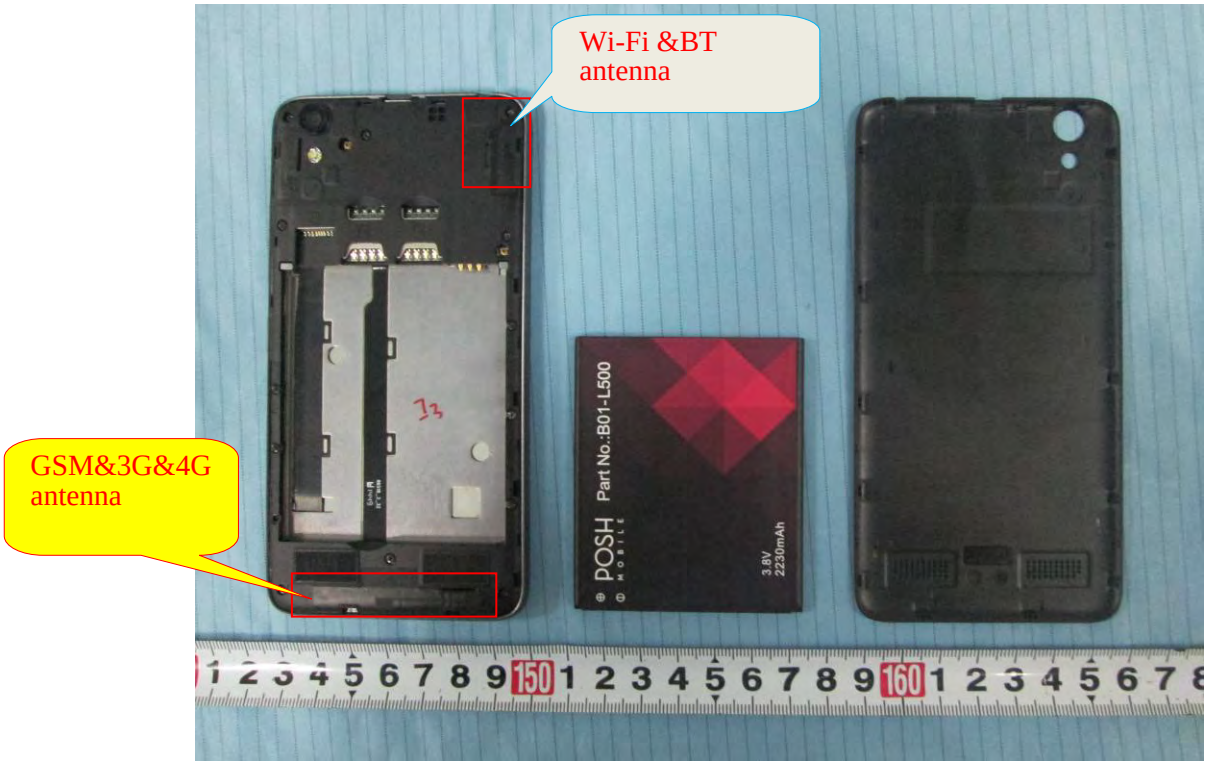
EUT – Top View



EUT – Bottom View



EUT – Uncover 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.

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[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.

[5] CENELEC, \Considerations for evaluating of human exposure to electromagnetic fields (EMFs) from mobile telecommunication equipment (MTE) in the frequency range 30MHz - 6GHz", Tech. Rep., CENELEC, European Committee for Electrotechnical Standardization, Brussels, 1997.

[6] ANSI, ANSI/IEEE C95.1-1992: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz, The Institute of Electrical and Electronics Engineers, Inc., New York, NY 10017, 1992.

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[8] Katja Pokovic, Thomas Schmid, and Niels Kuster, \E-field probe with improved isotropy in brain simulating liquids", in Proceedings of the ELMAR, Zadar, Croatia, 23{25 June, 1996, pp. 172-175.

[9] Volker Hombach, Klaus Meier, Michael Burkhardt, Eberhard K. uhn, and Niels Kuster, \The depen-dence of EM energy absorption upon human head modeling at 900 MHz", IEEE Transactions on Microwave Theory and Techniques, vol. 44, no. 10, pp. 1865-1873, Oct. 1996.

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[12] W. H. Press, S. A. Teukolsky,W. T. Vetterling, and B. P. Flannery, Numerical Recepies in C, The Art of Scientific Computing, Second Edition, Cambridge University Press, 1992.Dosimetric Evaluation of Sample device, month 1998 9

[13] NIS81 NAMAS, \The treatment of uncertainity in EMC measurement", Tech. Rep., NAMAS Executive, National Physical Laboratory, Teddington, Middlesex, England, 1994.

[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 *******