SAR EVALUATION REPORT

For

Corporativo Lanix S.A. de C.V.

Carrtera internacional Hermosillo-Nogale Km 8.5
Hermosillo, 83000

FCC ID: ZC4LX8

Report Type:	**Product Type:**
Original Report	LX8

Test Engineer: Wilson Chen

Report Number: RSZ141016003-20

Report Date: 2014-11-03

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

Attestation of Test Results		
EUT Information	**Company Name**	Corporativo Lanix S.A. de C.V.
	EUT Description	LX8
	FCC ID	ZC4LX8
	Model Number	LX8
	Test Date	2014-10-15

Frequency	Max. SAR Level(s) Reported	Limit(W/Kg)
GSM 850	0.331 W/kg 1g Head SAR 1.055 W/kg 1g Body SAR	**1. 6**
PCS 1900	0.187 W/kg 1g Head SAR 0.459 W/kg 1g Body SAR	
Simultaneous	0.646 W/kg 1g Head SAR 1.160 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
	KDB procedures KDB 447498 D01 Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies. KDB 648474 D04 SAR Evaluation Considerations for Wireless Handsets KDB 865664 D01SAR Measurement Requirements for 100 MHz to 6 GHz

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.

TABLE OF CONTENTS

DOCUMENT REVISION HISTORY 5

EUT DESCRIPTION 6

TECHNICAL SPECIFICATION 6

REFERENCE, STANDARDS, AND GUILDELINES 7

SAR LIMITS 8

FACILITIES 9

DESCRIPTION OF TEST SYSTEM 10

EQUIPMENT LIST AND CALIBRATION 17

EQUIPMENTS LIST & CALIBRATION INFORMATION 17

SAR MEASUREMENT SYSTEM VERIFICATION 18

LIQUID VERIFICATION 18
SYSTEM ACCURACY VERIFICATION 21
SAR SYSTEM VALIDATION DATA 22

EUT TEST STRATEGY AND METHODOLOGY 30

TEST POSITIONS FOR DEVICE OPERATING NEXT TO A PERSON'S EAR 30
CHEEK/TOUCH POSITION 31
EAR/TILT POSITION 31
TEST POSITIONS FOR BODY-WORN AND OTHER CONFIGURATIONS 32
SAR EVALUATION PROCEDURE 33
TEST METHODOLOGY 33

CONDUCTED OUTPUT POWER MEASUREMENT 34

PROVISION APPLICABLE 34
TEST PROCEDURE 34
MAXIMUM OUTPUT POWER AMONG PRODUCTION UNITS 34
TEST RESULTS: 35

SAR MEASUREMENT RESULTS 37

SAR TEST DATA 37

SAR SIMULTANEOUS TRANSMISSION DESCRIPTION 39

SAR PLOTS (SUMMARY OF THE HIGHEST SAR VALUES) 41

APPENDIX A MEASUREMENT UNCERTAINTY 45

APPENDIX B – PROBE CALIBRATION CERTIFICATES 46

APPENDIX C DIPOLE CALIBRATION CERTIFICATES 56

APPENDIX D EUT TEST POSITION PHOTOS 76

LIQUID DEPTH ≥ 15CM 76
BODY-WORN BACK SETUP PHOTO (15MM) 76
LEFT HEAD TOUCH SETUP PHOTO 77
LEFT HEAD TILT SETUP PHOTO 77
RIGHT HEAD TOUCH SETUP PHOTO 78
RIGHT HEAD TILT SETUP PHOTO 78

APPENDIX E EUT PHOTOS 79

EUT – FRONT VIEW 79
EUT – BACK VIEW 79
EUT –LEFT SIDE VIEW 80
EUT – RIGHT SIDE VIEW 80
EUT – TOP VIEW 81

EUT – BOTTOM VIEW..81
EUT – UNCOVER VIEW..82

APPENDIX F INFORMATIVE REFERENCES...83

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	RSZ141016003-20	Original Report	2014-11-03

EUT DESCRIPTION

This report has been prepared on behalf of Corporativo Lanix S.A. de C.V. and their product, FCC ID: ZC4LX8, Model: LX8 or the EUT (Equipment under Test) as referred to in the rest of this report.

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:	Class 12
Operation Mode :	GSM Voice, GPRS Data, 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) Wi-Fi: 2412MHz-2462MHz Bluetooth : 2402MHz-2480MHz
Conducted RF Power:	GSM 850 : 31.44 dBm PCS 1900: 28.61 dBm Wi-Fi: 7.92dBm Bluetooth: 8.80dBm
Dimensions (L*W*H):	115 mm (L) × 61 mm (W) × 13 mm (H)
Power Source:	3.7 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 the Supplement C of OET Bulletin 65 “Evaluating Compliance with FCC Guide-lines for Human Exposure to Radio frequency Electromagnetic Fields", released on Jun 29, 2001 by the FCC, the device should be evaluated at maximum output power (radiated from the antenna) under “worst-case” conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

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

CE:

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

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

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

SAR Limits

FCC Limit (1g Tissue)

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

CE Limit (10g Tissue)

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

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

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

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

FACILITIES

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

DESCRIPTION OF TEST SYSTEM

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

ALSAS-10U System Description

ALSAS-10-U is fully compliant with the technical and scientific requirements of IEEE 1528, IEC 62209, CENELEC, ARIB, ACA, and the Federal Communications Commission. The system comprises of a six axes articulated robot which utilizes a dedicated controller.
ALSAS-10U uses the latest methodologies. And FDTD modeling to provide a platform which is repeatable with minimum uncertainty.

Applications

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

Area Scans

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

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

Zoom Scan (Cube Scan Averaging)

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

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

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

ALSAS-10U Interpolation and Extrapolation Uncertainty

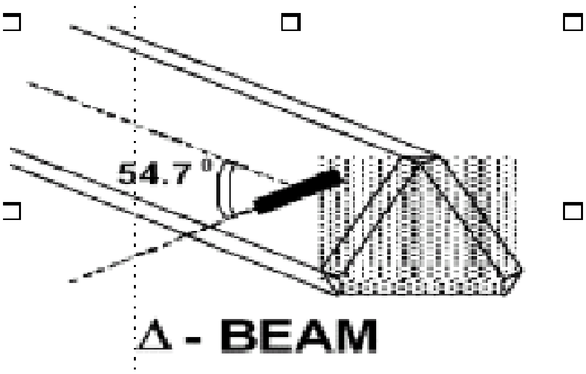
The overall uncertainty for the methodology and algorithms the used during the SAR calculation was evaluated using the data from IEEE 1528 based on the example f3 algorithm:

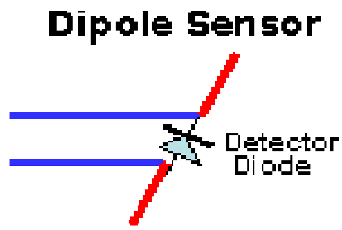
$$f_3(x, y, z) = A \frac{a^2}{\frac{a^2}{4} + x'^2 + y'^2} \cdot \left(e^{-\frac{2z}{a}} + \frac{a^2}{2(a + 2z)^2} \right)$$

Isotropic E-Field Probe

The isotropic E-Field probe has been fully calibrated and assessed for isotropicity, and boundary effect within a controlled environment. Depending on the frequency for which the probe is calibrated the method utilized for calibration will change.

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





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

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

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

Isotropic E-Field Probe Specification

Calibration Method	Frequency Dependent Below 1 GHz Calibration in air performed in a TEM Cell Above 1 GHz Calibration in air performed in waveguide
Sensitivity	0.70 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

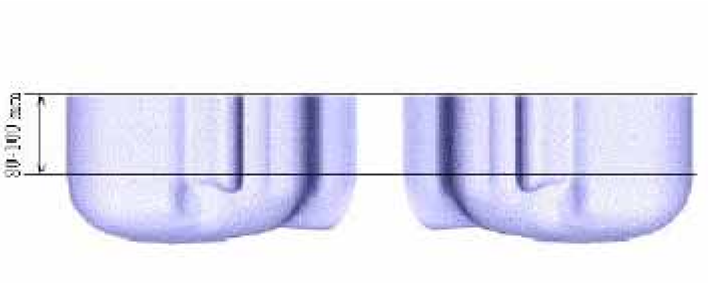
The universal device positioner allows complete freedom of movement of the EUT. Developed to hold a EUT in a free-space scenario any additional loading attributable to the material used in the construction of the positioner has been eliminated. Repeatability has been enhanced through the linear scales 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	σ (S/m)	εr	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800-2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

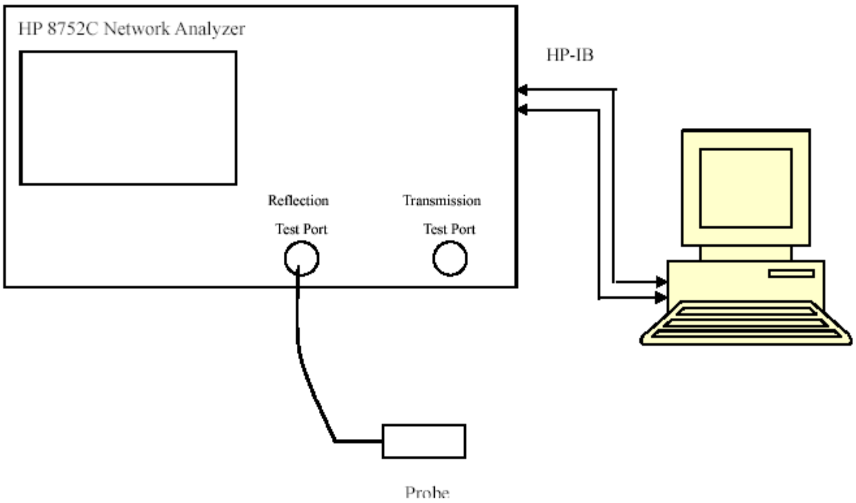
EQUIPMENT LIST AND CALIBRATION

Equipments List & Calibration Information

Equipment	Model	Calibration Date	S/N
CRS F3 robot	ALS-F3	N/A	RAF0805352
CRS F3 Software	ALS-F3-SW	N/A	N/A
CRS C500C controller	ALS-C500	N/A	RCF0805379
Probe mounting device & Boundary Detection Sensor System	ALS-PMDPS-3	N/A	120-00270
Universal Work Station	ALS-UWS	N/A	100-00157
Data Acquisition Package	ALS-DAQ-PAQ-3	2014-10-14	110-00212
Miniature E-Field Probe	ALS-E-020	2014-10-14	500-00283
Dipole, 835MHz	ALS-D-835-S-2	2014-10-08	180-00558
Dipole, 1900MHz	ALS-D-1900-S-2	2014-10-09	210-00710
Dipole Spacer	ALS-DS-U	N/A	250-00907
Device holder/Positioner	ALS-H-E-SET-2	N/A	170-00510
Left ear SAM phantom	ALS-P-SAM-L	N/A	130-00311
Right ear SAM phantom	ALS-P-SAM-R	N/A	140-00359
UniPhantom	ALS-P-UP-1	N/A	150-00413
Simulated Tissue 835 MHz Head	ALS-TS-835-H	Each Time	270-01002
Simulated Tissue 835 MHz Body	ALS-TS-835-B	Each Time	270-02101
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
Power Amplifier	5S1G4	N/A	71377
Directional couple	DC6180A	2013-11-12	0325849
Attenuator	3dB	2014-05-08	5402
Network analyzer	8752C	2014-06-03	3410A02356
Dielectric probe kit	HP85070B	N/A	N/A
Synthesized Sweeper	HP 8341B	2014-06-03	2624A00116
UNIVERSAL RADIO COMMUNICATION TESTER	CMU200	2013-11-23	106891
EMI Test Receiver	ESCI	2014-06-13	101120

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	Ơ (S/m)	ε_r	Ơ (S/m)	$\Delta\varepsilon_r$	ΔƠ (S/m)	
824.2	Head	41.08	0.90	41.50	0.90	-1.012	0.000	±5
	Body	53.87	0.94	55.20	0.97	-2.409	-3.093	±5
836.6	Head	41.09	0.91	41.50	0.90	-0.988	1.111	±5
	Body	53.86	0.95	55.20	0.97	-2.428	-2.062	±5
848.8	Head	41.06	0.91	41.50	0.90	-1.060	1.111	±5
	Body	53.81	0.97	55.20	0.97	-2.518	0.000	±5
1850.2	Head	39.77	1.38	40.00	1.40	-0.575	-1.429	±5
	Body	52.12	1.47	53.30	1.52	-2.214	-3.289	±5
1880.0	Head	39.70	1.39	40.00	1.40	-0.750	-0.714	±5
	Body	51.93	1.49	53.30	1.52	-2.570	-1.974	±5
1909.8	Head	39.63	1.42	40.00	1.40	-0.925	1.429	±5
	Body	51.85	1.51	53.30	1.52	-2.720	-0.658	±5

**Liquid Verification was performed on 2014-10-15.*

Please refer to the following tables.

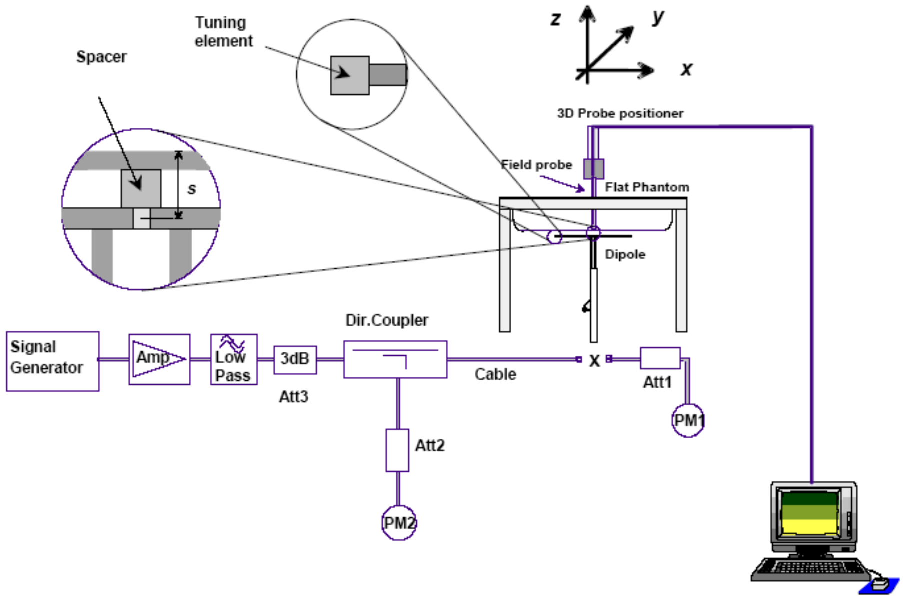
835 MHz Head				835 MHz Body		
Frequency (MHz)	e'	e''		Frequency (MHz)	e'	e''
824.0	41.0803	19.6502		824.0	53.8711	20.4858
824.5	41.1417	19.6287		824.5	53.9175	20.4247
825.0	41.0378	19.6419		825.0	53.8513	20.4913
825.5	41.0541	19.6821		825.5	53.9302	20.4607
826.0	41.0162	19.7317		826.0	53.8241	20.5008
826.5	41.1040	19.7404		826.5	53.8525	20.4778
827.0	41.0641	19.6788		827.0	53.9111	20.4376
827.5	41.0464	19.6469		827.5	53.9455	20.5023
828.0	41.0906	19.7422		828.0	53.8700	20.4991
828.5	41.0836	19.7230		828.5	53.9131	20.4131
829.0	41.1054	19.6388		829.0	53.8610	20.4660
829.5	41.0720	19.7614		829.5	53.8656	20.4906
830.0	41.1074	19.6896		830.0	53.8285	20.5345
830.5	41.1069	19.6717		830.5	53.8256	20.5141
831.0	41.0765	19.6831		831.0	53.8609	20.5113
831.5	41.0092	19.6512		831.5	53.9387	20.4712
832.0	41.0550	19.7217		832.0	53.9214	20.5163
832.5	41.0499	19.6365		832.5	53.8972	20.4459
833.0	41.0715	19.6623		833.0	53.8387	20.4846
833.5	41.1025	19.7040		833.5	53.9263	20.4732
834.0	41.0969	19.6190		834.0	53.8798	20.4872
834.5	41.1025	19.6332		834.5	53.8906	20.4714
835.0	41.0870	19.6992		835.0	53.9326	20.4316
835.5	41.0264	19.6931		835.5	53.8790	20.5034
836.0	41.1158	19.7222		836.0	53.8340	20.4675
836.5	41.0894	19.6600		836.5	53.8636	20.4433
837.0	41.0798	19.6306		837.0	53.8779	20.5097
837.5	41.0690	19.6199		837.5	53.8878	20.4778
838.0	41.1055	19.6298		838.0	53.8695	20.5050
838.5	41.0716	19.6999		838.5	53.8844	20.4945
839.0	41.0657	19.6185		839.0	53.8671	20.4636
839.5	41.0686	19.6131		839.5	53.9368	20.5149
840.0	41.0609	19.4163		840.0	53.8948	20.4987
840.5	41.1168	19.4586		840.5	53.8588	20.4840
841.0	41.1014	19.4140		841.0	53.8897	20.4379
841.5	41.0929	19.3432		841.5	53.8793	20.5247
842.0	41.0571	19.3773		842.0	53.9358	20.4419
842.5	41.0975	19.4355		842.5	53.8696	20.4755
843.0	41.1048	19.4480		843.0	53.8916	20.4733
843.5	41.1176	19.3241		843.5	53.8392	20.4646
844.0	41.0714	19.3321		844.0	53.8908	20.4961
844.5	41.0747	19.3769		844.5	53.9434	20.5271
845.0	41.1243	19.4100		845.0	53.9080	20.4301
845.5	41.1380	19.3593		845.5	53.8551	20.4267
846.0	41.0733	19.4149		846.0	53.8398	20.4625
846.5	41.0930	19.4026		846.5	53.8470	20.5470
847.0	41.1063	19.3752		847.0	53.8268	20.5309
847.5	41.0981	19.4262		847.5	53.8749	20.4793
848.0	41.1227	19.4084		848.0	53.9154	20.5192
848.5	41.0407	19.3654		848.5	53.8838	20.4853
849.0	41.0617	19.3366		849.0	53.8105	20.5510

1900 MHz Head				1900 MHz Body		
Frequency (MHz)	**e'**	**e''**		**Frequency (MHz)**	**e'**	**e''**
1850.0	39.7655	13.3910		1850.0	52.1241	14.2719
1851.2	39.6905	13.2379		1851.2	52.0375	14.1452
1852.4	39.6505	13.2374		1852.4	51.9174	14.2212
1853.6	39.7114	13.3419		1853.6	51.8814	14.2283
1854.8	39.6713	13.3573		1854.8	51.8697	14.2503
1856.0	39.6919	13.3351		1856.0	52.0637	14.1955
1857.2	39.7331	13.2565		1857.2	51.8958	14.2534
1858.4	39.7415	13.2375		1858.4	52.0222	14.1618
1859.6	39.6399	13.3491		1859.6	51.8460	14.2455
1860.8	39.7540	13.2308		1860.8	51.8991	14.3033
1862.0	39.7257	13.3482		1862.0	52.0545	14.2549
1863.2	39.7012	13.3492		1863.2	52.1037	14.2494
1864.4	39.5904	13.2882		1864.4	51.9564	14.1617
1865.6	39.5921	13.2382		1865.6	52.0811	14.2180
1866.8	39.6717	13.3878		1866.8	52.1416	14.1867
1868.0	39.6757	13.3591		1868.0	51.8918	14.1595
1869.2	39.7799	13.3372		1869.2	51.8012	14.1825
1870.4	39.5872	13.2507		1870.4	51.8247	14.2300
1871.6	39.6541	13.2810		1871.6	52.0263	14.2810
1872.8	39.6769	13.3412		1872.8	52.1392	14.2114
1874.0	39.7207	13.3583		1874.0	52.1661	14.1526
1875.2	39.7607	13.4103		1875.2	51.9719	14.2039
1876.4	39.5917	13.3620		1876.4	52.0748	14.2496
1877.6	39.6286	13.2677		1877.6	52.1021	14.2016
1878.8	39.6418	13.3652		1878.8	52.1032	14.1643
1880.0	39.7018	13.2777		1880.0	51.9260	14.2686
1881.2	39.7367	13.2963		1881.2	51.8360	14.2163
1882.4	39.7331	13.2640		1882.4	52.0221	14.2562
1883.6	39.7107	13.2317		1883.6	51.9353	14.1333
1884.8	39.7614	13.2071		1884.8	52.0324	14.2487
1886.0	39.6263	13.2047		1886.0	52.0615	14.1810
1887.2	39.6020	13.3422		1887.2	51.9802	14.2577
1888.4	39.7228	13.3645		1888.4	51.9354	14.2614
1889.6	39.6902	13.3911		1889.6	52.0544	14.1728
1890.8	39.7750	13.3805		1890.8	51.8995	14.1726
1892.0	39.5867	13.3995		1892.0	51.8446	14.3359
1893.2	39.6673	13.2570		1893.2	51.8856	14.3131
1894.4	39.6513	13.2384		1894.4	51.9948	14.2331
1895.6	39.7531	13.3763		1895.6	52.0339	14.2592
1896.8	39.7706	13.2619		1896.8	52.0041	14.1638
1898.0	39.5831	13.2608		1898.0	52.1030	14.2511
1899.2	39.7350	13.3299		1899.2	52.1631	14.1875
1900.4	39.6900	13.3845		1900.4	52.1816	14.2473
1901.6	39.7649	13.2664		1901.6	52.0528	14.1821
1902.8	39.7086	13.2987		1902.8	52.0677	14.3273
1904.0	39.6178	13.2249		1904.0	51.9519	14.1498
1905.2	39.6028	13.3429		1905.2	52.0747	14.1669
1906.4	39.7546	13.2546		1906.4	52.0888	14.3197
1907.6	39.5944	13.3510		1907.6	51.8322	14.1908
1908.8	39.7636	13.2320		1908.8	52.1314	14.2059
1910.0	39.6267	13.3564		1910.0	51.8501	14.2600

System Accuracy Verification

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

System Verification Setup Block Diagram



Probe and dipole antenna List and Detail

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

System Accuracy Check Results

Date	Frequency Band	Liquid Type	Measured SAR (W/Kg)		Target Value (W/Kg)	Delta (%)	Tolerance (%)
2014-10-15	835	Head	1g	9.813	9.773	0.409	±10
		Body	1g	10.113	9.736	3.872	±10
	1900	Head	1g	40.631	39.481	2.913	±10
		Body	1g	41.023	39.715	3.293	±10

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

SAR SYSTEM VALIDATION DATA

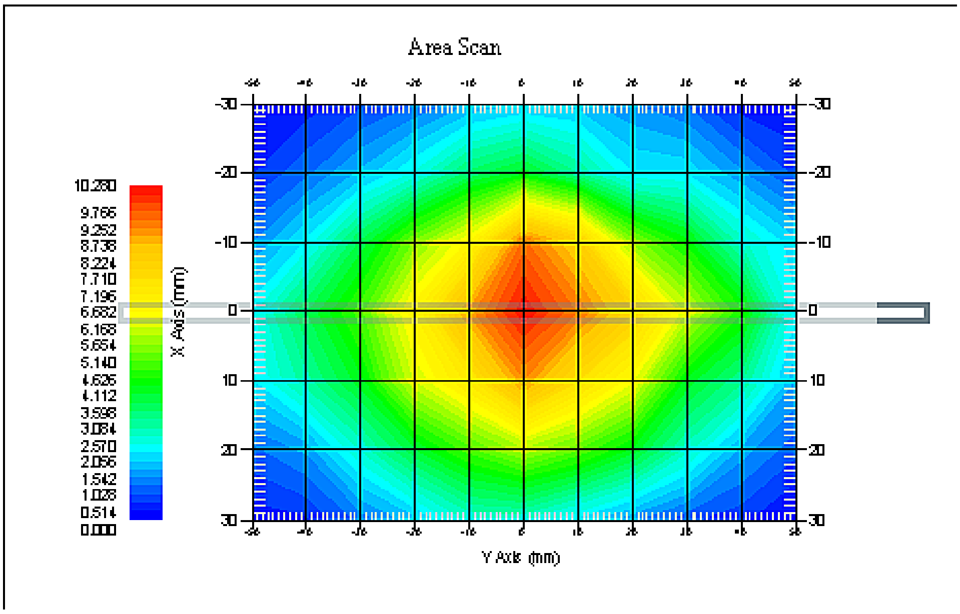
Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

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	: 9.725 W/kg
Power Drift-Finish	: 9.765 W/kg
Power Drift (%)	: 0.411
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	: 15-Oct-2014
Temperature	: 20.00 °C
Ambient Temp.	: 21.00 °C
Humidity	: 56.00 RH%
Epsilon	: 41.08 F/m
Sigma	: 0.92 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	: 9.813 W/kg
10 gram SAR value	: 6.255 W/kg
Area Scan Peak SAR	: 10.225 W/kg
Zoom Scan Peak SAR	: 16.327 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	: 10.557 W/kg
Power Drift-Finish	: 10.422 W/kg
Power Drift (%)	: -1.279

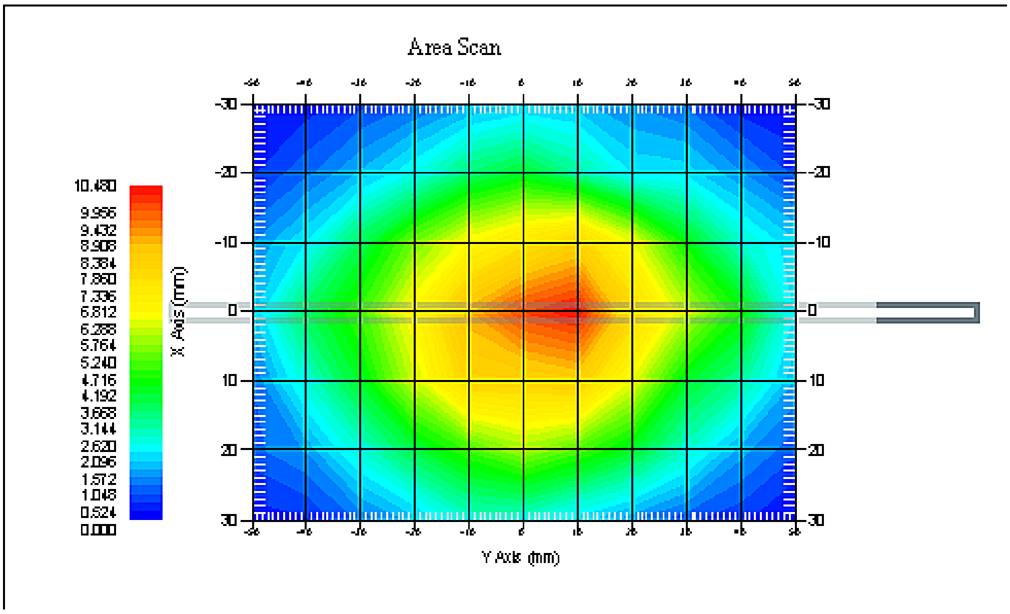
Phantom Data	
Name	: APREL-Uni
Type	: Uni-Phantom
Serial No.	: System Default
Location	: Center
Description	: Default
Phantom Data	

Tissue Data	
Type	: Body
Serial No.	: 270-02101
Frequency	: 835.0 MHz
Last Calib. Date	: 15-Oct-2014
Temperature	: 20.00 °C
Ambient Temp.	: 21.00 °C
Humidity	: 56.00 RH%
Epsilon	: 53.91 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	: 10.113 W/kg
10 gram SAR value	: 6.592 W/kg
Area Scan Peak SAR	: 11.360 W/kg
Zoom Scan Peak SAR	: 15.858 W/kg



835 MHz System Validation with Body Tissue

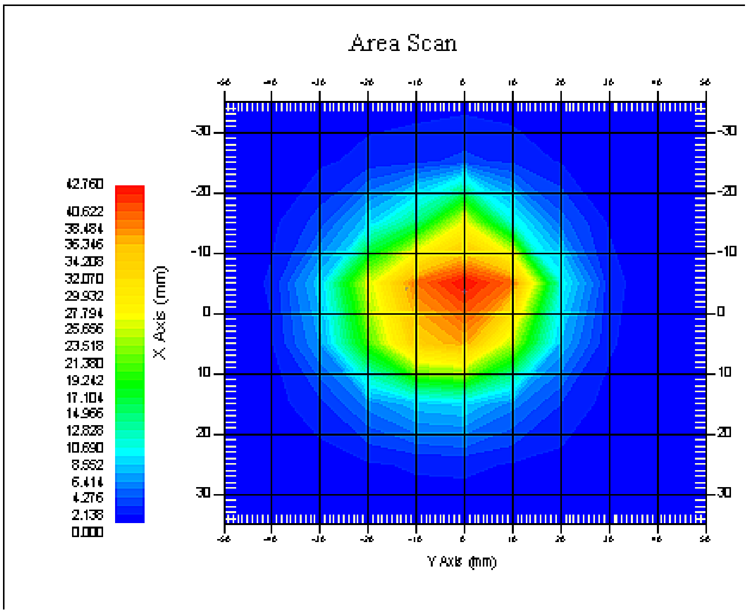
Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

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	: 39.862 W/kg
Power Drift-Finish	: 39.631 W/kg
Power Drift (%)	: -0.579
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	: 15-Oct-2014
Temperature	: 20.00 °C
Ambient Temp.	: 21.00 °C
Humidity	: 56.00 RH%
Epsilon	: 39.68 F/m
Sigma	: 1.42 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 : 40.631 W/kg
10 gram SAR value : 21.531 W/kg
Area Scan Peak SAR : 42.117 W/kg
Zoom Scan Peak SAR : 79.857 W/kg



1900 MHz System Validation with Head Tissue

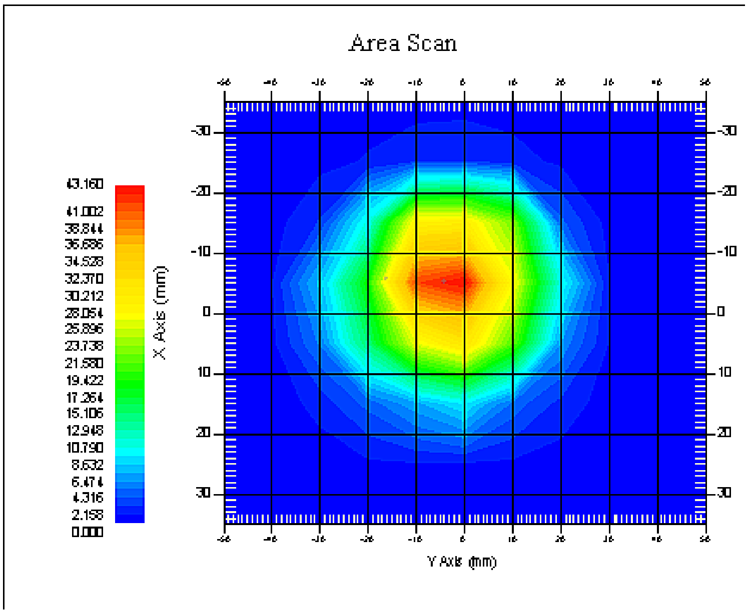
Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

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	: 40.119 W/kg
Power Drift-Finish	: 40.825 W/kg
Power Drift (%)	: 1.760
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	: 15-Oct-2014
Temperature	: 20.00 °C
Ambient Temp.	: 21.00 °C
Humidity	: 56.00 RH%
Epsilon	: 52.13 F/m
Sigma	: 1.51 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	: 41.023 W/kg
10 gram SAR value	: 21.315 W/kg
Area Scan Peak SAR	: 42.857 W/kg
Zoom Scan Peak SAR	: 79.852 W/kg



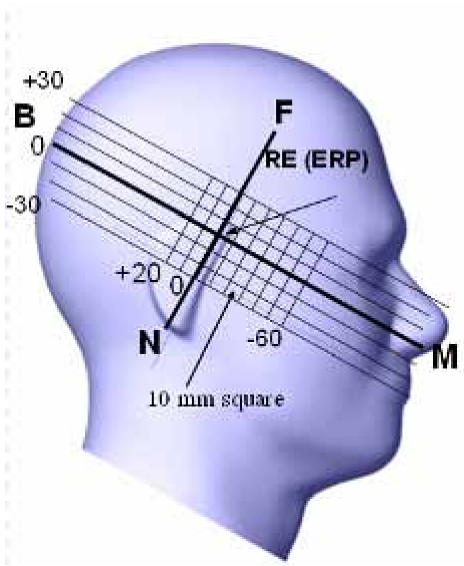
1900 MHz System Validation with Body Tissue

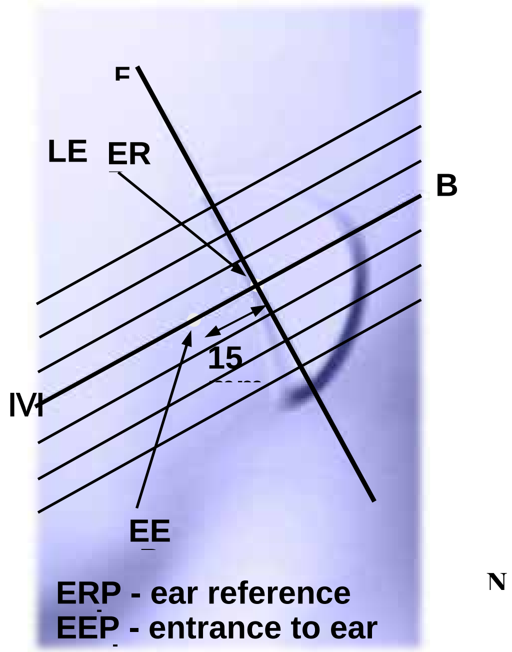
EUT TEST STRATEGY AND METHODOLOGY

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

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

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





Cheek/Touch Position

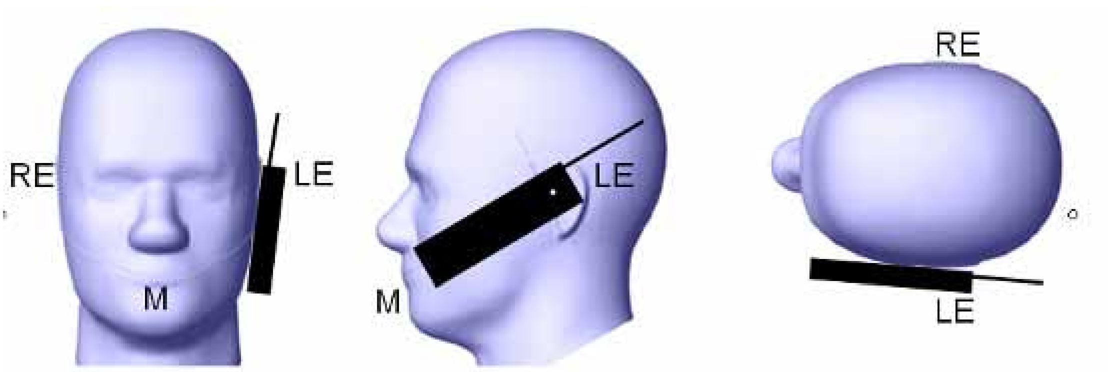
The device is brought toward the mouth of the head phantom by pivoting against the "ear reference point" or along the "N-F" line for the SCC-34/SC-2 head phantom.

This test position is established:

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

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

Cheek /Touch Position



Ear/Tilt Position

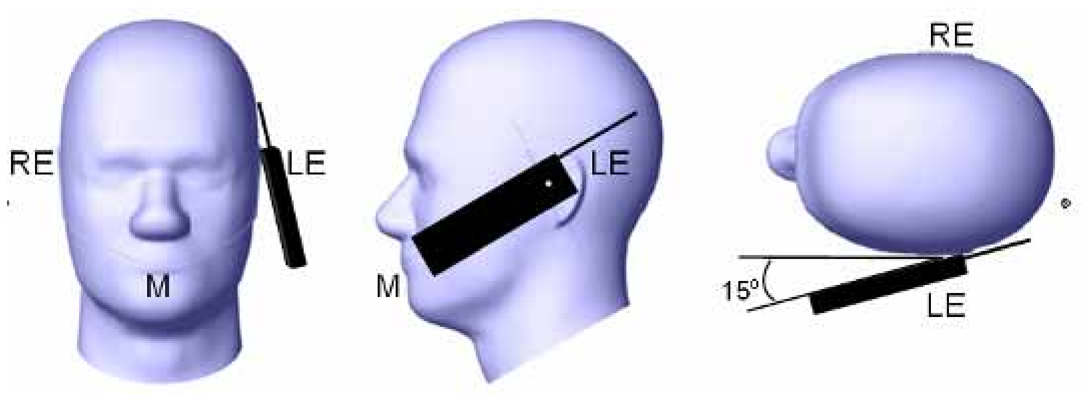
With the handset aligned in the "Cheek/Touch Position":

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

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

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

Ear /Tilt 15° Position



Test positions for body-worn and other configurations

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

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

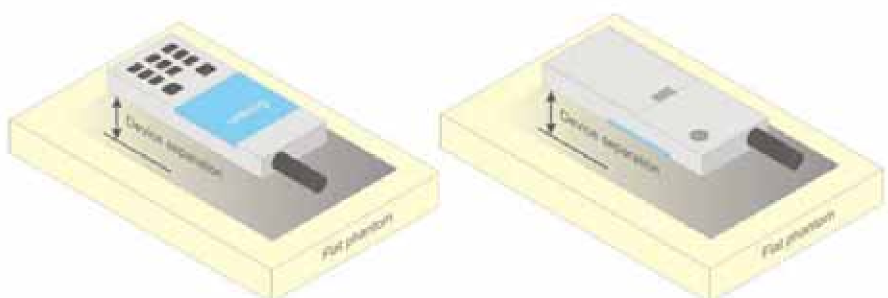


Figure 5 – Test positions for body-worn devices

SAR Evaluation Procedure

The evaluation was performed with the following procedure:

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

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

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

1) The data at the surface were extrapolated, since the center of the dipoles is 1.2 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.3 mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.

2) The maximum interpolated value was searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g or 10 g) were computed by the 3D-Spline interpolation algorithm. The 3D-Spline is composed of three one dimensional splines with the “Not a knot"-condition (in x, y and z-directions). The volume was integrated with the trapezoidal-algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the averages.

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

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

Test methodology

KDB 447498 D01.
KDB 648474 D04
KDB 865664 D01

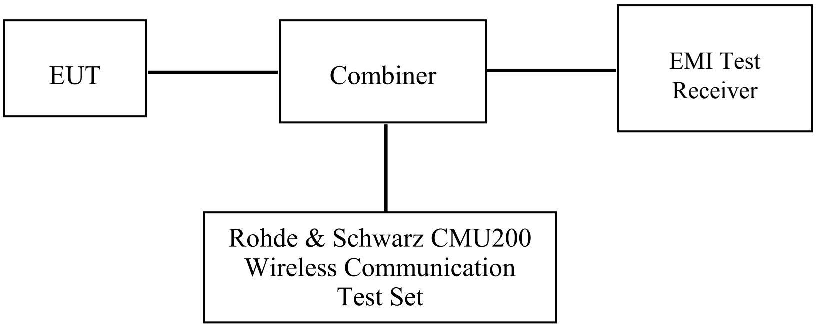
CONDUCTED OUTPUT POWER MEASUREMENT

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

Maximum Output Power among production units

Max Target Power for Production Unit (dBm)			
Mode/Band	Channel		
	Low	Middle	High
GSM 835	31.50	31.50	31.50
GPRS 1 slot	31.50	31.50	31.50
GPRS 2 slot	30.70	30.70	30.70
GPRS 3 slot	28.90	28.90	28.90
GPRS 4 slot	27.80	27.80	27.80
PCS 1900	28.70	28.70	28.70
GPRS 1 slot	28.70	28.70	28.70
GPRS 2 slot	27.90	27.90	27.90
GPRS 3 slot	26.00	26.00	26.00
GPRS 4 slot	24.80	24.80	24.80
Bluetooth	8.80	8.80	8.80
Wi-Fi	8.00	8.00	8.00

Test Results:

GSM:

Band	Frequency (MHz)	Conducted Output Power	
		Meas. Power (dBm)	Meas. Power (W)
GSM 850	824.2	31.28	1.343
	836.6	31.20	1.318
	848.8	**31.44**	1.393
PCS 1900	1850.2	28.47	0.703
	1880.0	28.31	0.678
	1909.8	**28.61**	0.726

GPRS:

Band	Channel No.	Frequency (MHz)	RF Output Power (dBm)			
			1 slot	2 slot	3 slots	4 slots
GSM 850	128	824.2	31.26	30.57	28.88	27.73
	190	836.6	31.34	30.56	28.84	27.57
	251	848.8	31.42	30.67	28.86	27.64
PCS 1900	512	1850.2	28.50	27.71	25.94	24.21
	661	1880.0	28.35	27.53	25.90	24.75
	810	1909.8	28.68	27.86	25.83	24.67

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

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

The time based average power for GPRS

Band	Channel No.	Frequency (MHz)	Time based average Power (dBm)			
			1 slot	2 slot	3 slots	4 slots
GSM 850	128	824.2	22.26	24.57	24.63	**24.73**
	190	836.6	22.34	24.56	24.59	24.57
	251	848.8	22.42	24.67	24.61	24.64
PCS 1900	512	1850.2	19.50	21.71	21.69	21.21
	661	1880.0	19.35	21.53	21.65	21.75
	810	1909.8	19.68	**21.86**	21.58	21.67

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).

Bluetooth

Mode	Channel frequency (MHz)	Conducted Output Power	
		(dBm)	(mw)
BDR(GFSK)	(Low)2402	8.67	7.362
	(Middle)2441	8.73	7.464
	(High)2480	**8.73**	7.464
EDR(4-DQPSK)	(Low)2402	7.75	5.957
	(Middle)2441	7.94	6.223
	(High)2480	7.80	6.026
EDR-8DPSK	(Low)2402	7.99	6.295
	(Middle)2441	8.13	6.501
	(High)2480	8.13	6.501

Wi-Fi

Band	Frequency (MHz)	Conducted Output Power	
		(dBm)	(mw)
802.11b	2412	6.54	4.508
	2437	6.92	4.920
	2462	7.52	5.649
802.11g	2412	6.42	4.385
	2437	6.90	4.898
	2462	7.75	5.957
802.11n HT20	2412	6.61	4.581
	2437	6.90	4.898
	2462	**7.92**	6.194
802.11n HT40	2422	6.85	4.842
	2437	7.15	5.188
	2452	7.75	5.957

Note:

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

SAR MEASUREMENT RESULTS

This page summarizes the results of the performed dosimetric evaluation.

SAR Test Data

Environmental Conditions

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

Testing was performed by Wilson Chen on 2014-10-15

GSM 850:

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	FCC 1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Left Head Cheek	824.2	GSM	-1.254	31.28	31.50	1.052	0.311	0.327	/
	836.6	GSM	-2.062	31.20	31.50	1.072	0.309	**0.331**	**1#**
	848.8	GSM	1.227	31.44	31.50	1.014	0.317	0.321	
Left Head Tilt	824.2	GSM	/	/	/	/	/	/	/
	836.6	GSM	-4.012	31.20	31.50	1.072	0.174	0.187	/
	848.8	GSM	/	/	/	/	/	/	/
Right Head Cheek	824.2	GSM	/	/	/	/	/	/	/
	836.6	GSM	1.339	31.20	31.50	1.072	0.298	0.319	/
	848.8	GSM	/	/	/	/	/	/	/
Right Head Tilt	824.2	GSM	/	/	/	/	/	/	/
	836.6	GSM	2.987	31.20	31.50	1.072	0.162	0.174	/
	848.8	GSM	/	/	/	/	/	/	/
Body-Back-Headset (15mm)	824.2	GSM	/	/	/	/	/	/	/
	836.6	GSM	-1.638	31.20	31.50	1.072	0.684	0.733	/
	848.8	GSM	/	/	/	/	/	/	/
Body-Back (15mm)	824.2	GPRS	0.825	27.73	27.80	1.016	1.038	**1.055**	**1#**
	836.6	GPRS	1.054	27.57	27.80	1.054	0.919	0.969	/
	848.8	GPRS	-3.673	27.64	27.80	1.038	0.752	0.781	/

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. 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. 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.
5. When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel must be used.

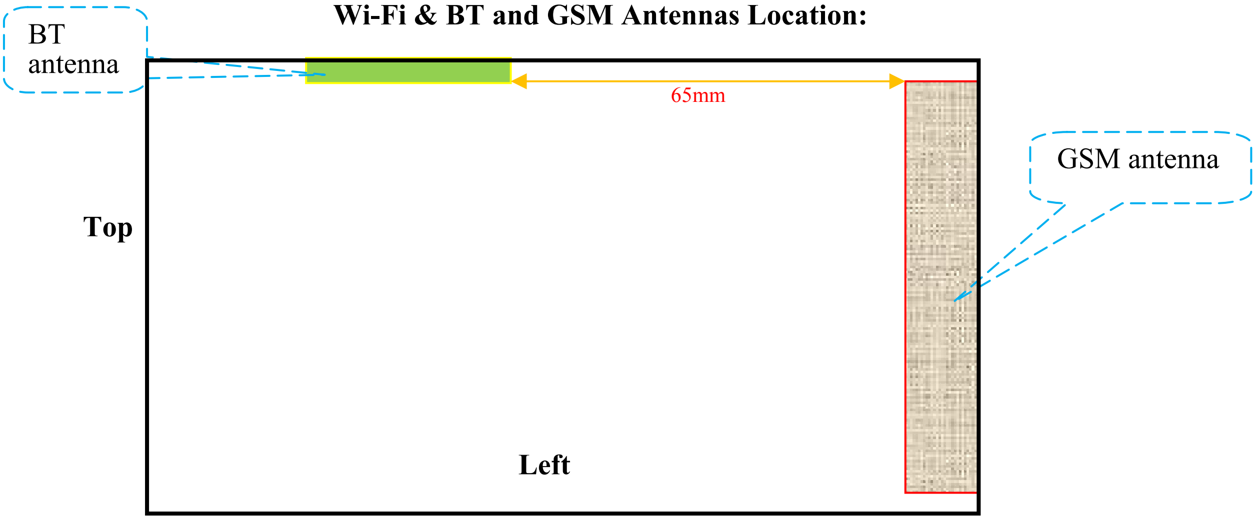
PCS Band:

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	FCC 1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Left Head Cheek	1850.2	GSM	-1.845	28.47	28.70	1.054	0.177	**0.187**	**3#**
	1880.0	GSM	0.637	28.31	28.70	1.094	0.162	0.177	/
	1909.8	GSM	-2.224	28.61	28.70	1.021	0.179	0.183	/
Left Head Tilt	1850.2	GSM	/	/	/	/	/	/	/
	1880.0	GSM	1.697	28.31	28.70	1.094	0.086	0.094	/
	1909.8	GSM	/	/	/	/	/	/	/
Right Head Cheek	1850.2	GSM	/	/	/	/	/	/	/
	1880.0	GSM	-3.637	28.31	28.70	1.094	0.157	0.172	/
	1909.8	GSM	/	/	/	/	/	/	/
Right Head Tilt	1850.2	GSM	/	/	/	/	/	/	/
	1880.0	GSM	1.096	28.31	28.70	1.094	0.075	0.082	/
	1909.8	GSM	/	/	/	/	/	/	/
Body-Back-Headset (15mm)	1850.2	GSM	/	/	/	/	/	/	/
	1880.0	GSM	2.189	28.31	28.70	1.094	0.318	0.348	/
	1909.8	GSM	/	/	/	/	/	/	/
Body-Back (15mm)	1850.2	GPRS	/	/	/	/	/	/	/
	1880.0	GPRS	/	/	/	/	/	/	/
	1909.8	GPRS	-1.791	27.86	27.90	1.009	0.455	**0.459**	**4#**

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. The Multi-slot Classes of EUT is Class 12 which has maximum 4 Downlink slots and 4 Uplink slots, the maximum active slots is 5, when perform the multiple slots scan, 3DL+2UL is the worst case .
4. 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.
5. When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel must be used.

SAR SIMULTANEOUS TRANSMISSION DESCRIPTION

Wi-Fi & BT and GSM Antennas Location:



Simultaneous Transmission:

Description of Simultaneous Transmit Capabilities			Antennas Distance (mm)
Transmitter Combination	Simultaneous?	Hotspot?	
GSM + Wi-Fi & BT	√	×	65

Standalone SAR test exclusion considerations

Head Position:

Mode	Frequency (MHz)	P_{avg} (dBm)	P_{avg} (mW)	Distance (mm)	Calculated value	Threshold (1-g)	SAR Test Exclusion
GSM 835	835	22.50	177.83	0	32.79	3.0	No
PCS1900	1900	19.70	93.33	0	25.73	3.0	No
Bluetooth	2450	8.80	7.59	0	**2.37**	3.0	Yes
Wi-Fi	2450	8.00	6.31	0	**1.98**	3.0	Yes

Body Position:

Mode	Frequency (MHz)	P_{avg} (dBm)	P_{avg} (mW)	Distance (mm)	Calculated value	Threshold (1-g)	SAR Test Exclusion
GPRS 835	835	24.80	302.00	15.00	18.56	3.0	No
GPRS 1900	1900	21.90	154.88	15.00	14.23	3.0	No
Bluetooth	2450	8.80	7.59	15.00	**0.79**	3.0	Yes
Wi-Fi	2450	8.00	6.31	15.00	**0.66**	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 $_{1\text{-g}}$ (W/kg)
BT Head	2.45	0	8.80	7.59	0.315
BT Body	2.45	15	8.80	7.59	0.105
Wi-Fi Head	2.45	0	8.00	6.31	0.264
Wi-Fi Body	2.45	15	8.00	6.31	0.088

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:

Mode	Position	Reported SAR (W/kg)		ΣSAR
		GSM	BT	< 1.6W/kg
GSM835	Left Head Cheek	0.331	0.315	**0.646**
	Left Head Tile	0.187	0.315	0.502
	Right Head Cheek	0.319	0.315	0.634
	Right Head Tilt	0.174	0.315	0.489
	Body-Back	1.055	0.105	**1.160**
PCS1900	Left Head Cheek	0.187	0.315	0.502
	Left Head Tile	0.094	0.315	0.409
	Right Head Cheek	0.172	0.315	0.487
	Right Head Tilt	0.082	0.315	0.397
	Body–Back	0.459	0.105	0.564

Mode	Position	Reported SAR (W/kg)		ΣSAR
		GSM	Wi-Fi	< 1.6W/kg
GSM835	Left Head Cheek	0.331	0.264	0.595
	Left Head Tile	0.187	0.264	0.451
	Right Head Cheek	0.319	0.264	0.583
	Right Head Tilt	0.174	0.264	0.438
	Body-Back	1.055	0.088	1.143
PCS1900	Left Head Cheek	0.187	0.264	0.451
	Left Head Tile	0.094	0.264	0.358
	Right Head Cheek	0.172	0.264	0.436
	Right Head Tilt	0.082	0.264	0.346
	Body–Back	0.459	0.088	0.547

ΣSAR < 1.6 W/kg therefore simultaneous transmission SAR with Volume Scans is **not** required.
BT and Wi-Fi cannot transmit simultaneously.

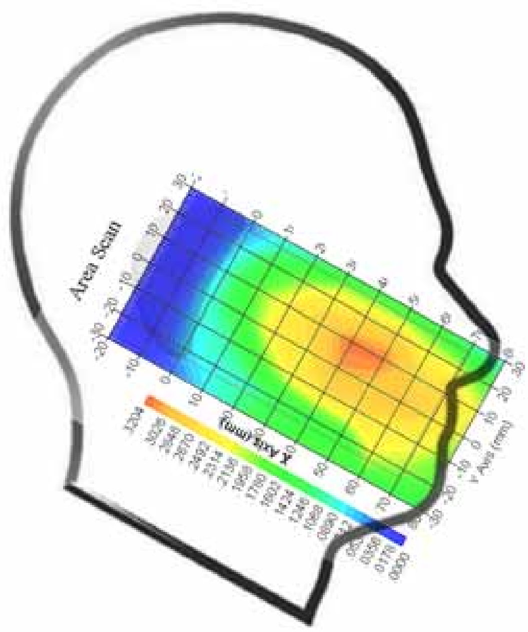
SAR Plots (Summary of the Highest SAR Values)

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

Left Head Cheek (836.6 MHz 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	: 0.012 W/kg
Power Drift-Finish	: 0.012 W/kg
Power Drift (%)	: -2.062
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	: 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	: 0.309 W/kg
10 gram SAR value	: 0.225 W/kg
Area Scan Peak SAR	: 0.320 W/kg
Zoom Scan Peak SAR	: 0.518 W/kg

Plot 1#

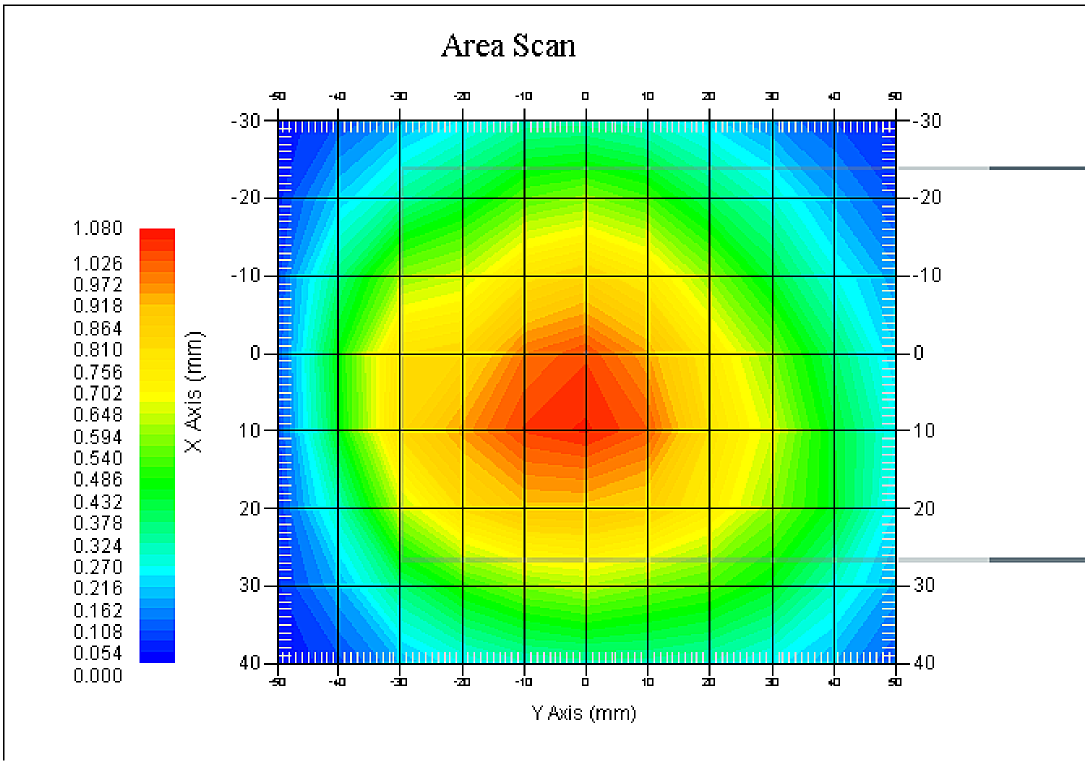


Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

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	: 0.725 W/kg
Power Drift-Finish	: 0.733W/kg
Power Drift (%)	: 0.825
Tissue Data	
Type	: Body
Frequency	: 824.2 MHz
Epsilon	: 53.87 F/m
Sigma	: 0.94 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	: 1.038 W/kg
10 gram SAR value	: 0.652 W/kg
Area Scan Peak SAR	: 1.079 W/kg
Zoom Scan Peak SAR	: 1.593 W/kg

Plot 2#

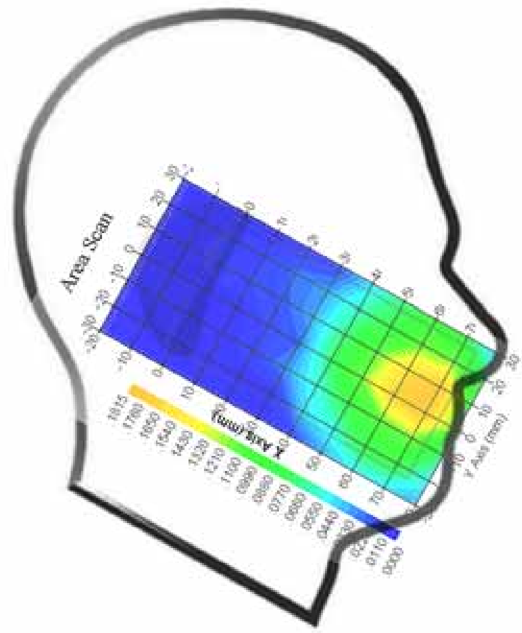


Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

Left Head Cheek(1850.2MHz 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	: 0.004 W/kg
Power Drift-Finish	: 0.004 W/kg
Power Drift (%)	: -1.845
Tissue Data	
Type	: Head
Frequency	: 1850.2 MHz
Epsilon	: 39.77 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	: 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	: 0.177 W/kg
10 gram SAR value	: 0.087 W/kg
Area Scan Peak SAR	: 0.181 W/kg
Zoom Scan Peak SAR	: 0.302 W/kg

Plot 3#

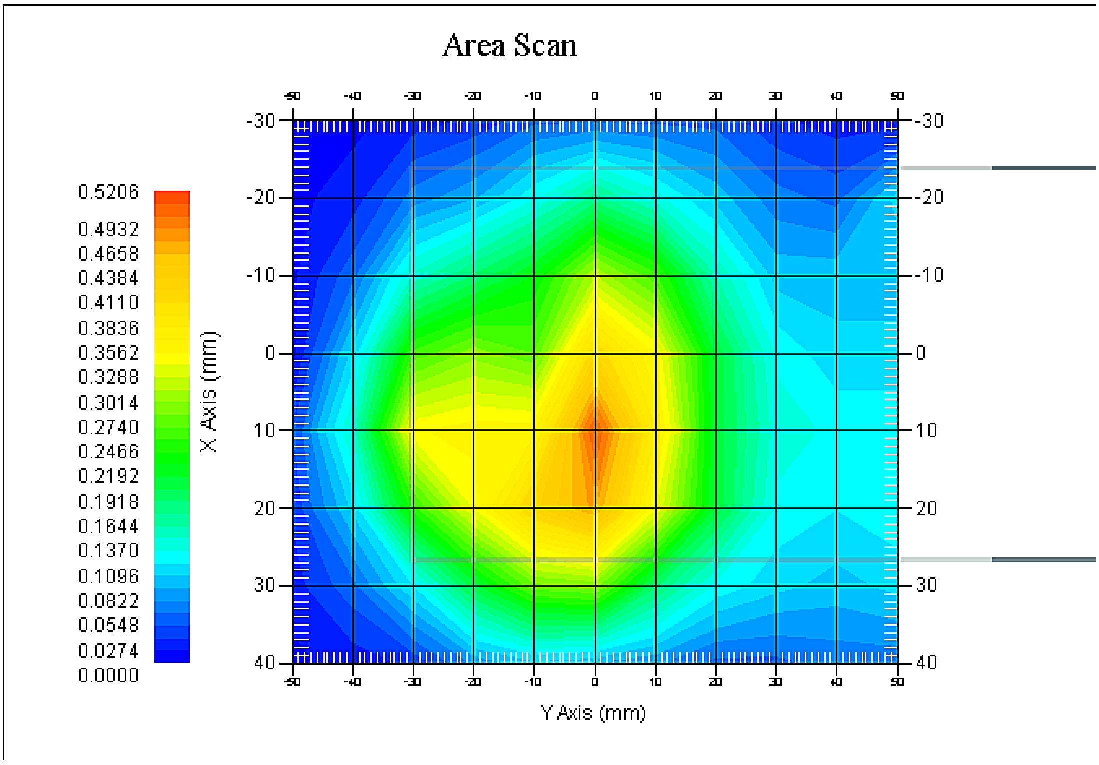


Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

Body-worn-Back (1909.8MHz Middle Channel)

Measurement Data	
Test mode	: GPRS
Crest Factor	: 4
Scan Type	: Complete
Area Scan	: 8x11x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan	: 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start	: 0.336 W/kg
Power Drift-Finish	: 0.330 W/kg
Power Drift (%)	: -1.791
Tissue Data	
Type	: Body
Frequency	: 1909.8 MHz
Epsilon	: 51.85 F/m
Sigma	: 1.51 S/m
Density	: 1000.00 kg/cu. m
Probe Data	
Serial No.	: 500-00283
Frequency Band	: 1900
Duty Cycle Factor	: 4
Conversion Factor	: 4.5
Probe Sensitivity	: 1.20 1.20 1.20 µV/(V/m)2
Compression Point	: 95.00 mV
Offset	: 1.56 mm
1 gram SAR value	: 0.455 W/kg
10 gram SAR value	: 0.289 W/kg
Area Scan Peak SAR	: 0.521 W/kg
Zoom Scan Peak SAR	: 0.793 W/kg

Plot 4#



APPENDIX A MEASUREMENT UNCERTAINTY

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

Measurement Uncertainty for 30MHz to 6GHz

Source of Uncertainty	Tolerance Value	Probability Distribution	Divisor	c_i^1 (1-g)	c_i^1 (10-g)	Standard Uncertainty (1-g) %	Standard Uncertainty (10-g) %
Measurement System							
Probe Calibration	3.5	normal	1	1	1	3.5	3.5
Axial Isotropy	3.7	rectangular	$\sqrt{3}$	$(1\text{-}cp)^{1/2}$	$(1\text{-}cp)^{1/2}$	1.5	1.5
Hemispherical Isotropy	10.9	rectangular	$\sqrt{3}$	$\sqrt{cp}$	$\sqrt{cp}$	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
Restriction							
Probe Positioning with respect to Phantom Shell	2.9	rectangular	$\sqrt{3}$	1	1	1.7	1.7
Extrapolation and Integration	3.7	rectangular	$\sqrt{3}$	1	1	2.1	2.1
Test Sample Positioning	2.3	normal	1	1	1	2.3	2.3
Device Holder Uncertainty	6.215	normal	1	1	1	6.215	6.215
Drift of Output Power	4.627	rectangular	$\sqrt{3}$	1	1	2.67	2.67
Phantom and Setup							
Phantom Uncertainty(shape & thickness tolerance)	3.4	rectangular	$\sqrt{3}$	1	1	2.0	2.0
Liquid Conductivity(target)	5.0	rectangular	$\sqrt{3}$	0.7	0.5	2.0	1.4
Liquid Conductivity(meas.)	1.938	normal	1	0.7	0.5	1.36	0.97
Liquid Permittivity(target)	5.0	rectangular	$\sqrt{3}$	0.6	0.5	1.7	1.4
Liquid Permittivity(meas.)	3.093	normal	1	0.6	0.5	1.86	1.55
Combined Uncertainty		RSS				10.78	10.55
Expanded uncertainty (coverage factor=2)		Normal(k=2)				21.56	21.10

APPENDIX B – PROBE CALIBRATION CERTIFICATES

NCL CALIBRATION LABORATORIES

Calibration File No.: PC-1598

Task No: BACL-5778

CERTIFICATE OF CALIBRATION

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

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

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

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

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

Released By: [signature]

Art Brennan, Quality Manager

NCL CALIBRATION LABORATORIES

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

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

NCL Calibration Laboratories
Division of APREL Inc.

Introduction

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

Calibration Method

Probes are calibrated using the following methods.

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

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

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

References

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

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

NCL Calibration Laboratories
Division of APREL Inc.

Conditions

Probe 500-00283 was a recalibration.

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

Primary Measurement Standards

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

Secondary Measurement Standards

Network Analyzer Anritsu 37347C	002106	Feb. 20, 2015

Attestation

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

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

Art Brennan, Quality Manager

Dan Brooks, Test Engineer

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

NCL Calibration Laboratories
Division of APREL Inc.

Probe Summary

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

*Resistive to recommended tissue recipes per IEEE-1528

Sensitivity in Air

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

Diode Compression Point: 95 mV

Page 4 of 10
This page has been reviewed for content and attested to on Page 2 of this document.

NCL Calibration Laboratories
Division of APREL Inc.

Calibration for Tissue (Head H, Body B)

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

Page 5 of 10
This page has been reviewed for content and attested to on Page 2 of this document.

NCL Calibration Laboratories
Division of APREL Inc.

Boundary Effect:

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

Spatial Resolution:

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

DAQ-PAQ Contribution

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

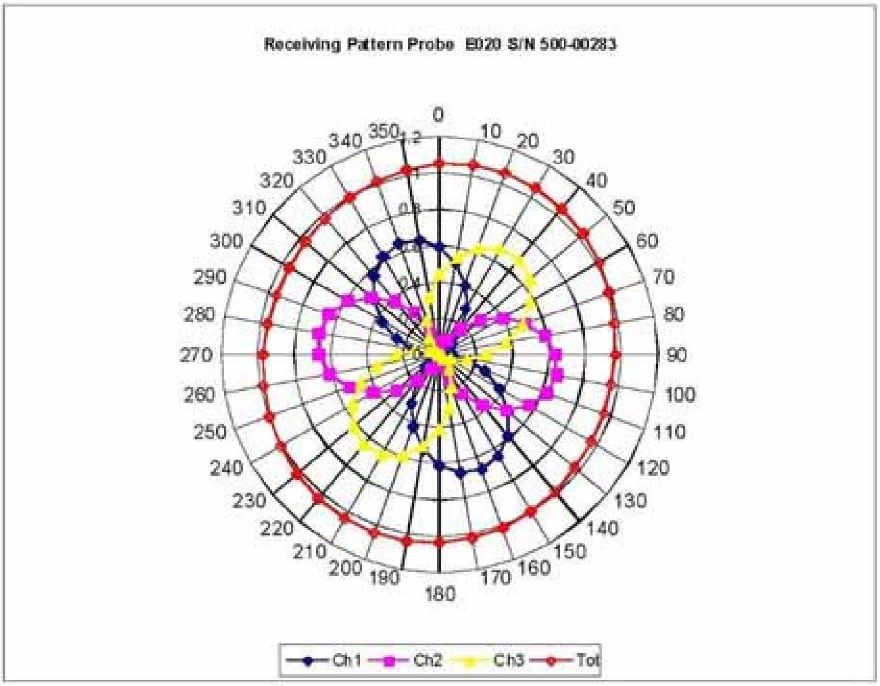
Probe Calibration Uncertainty

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

Page 6 of 10
This page has been reviewed for content and attested to on Page 2 of this document.

NCL Calibration Laboratories
Division of APREL Inc.

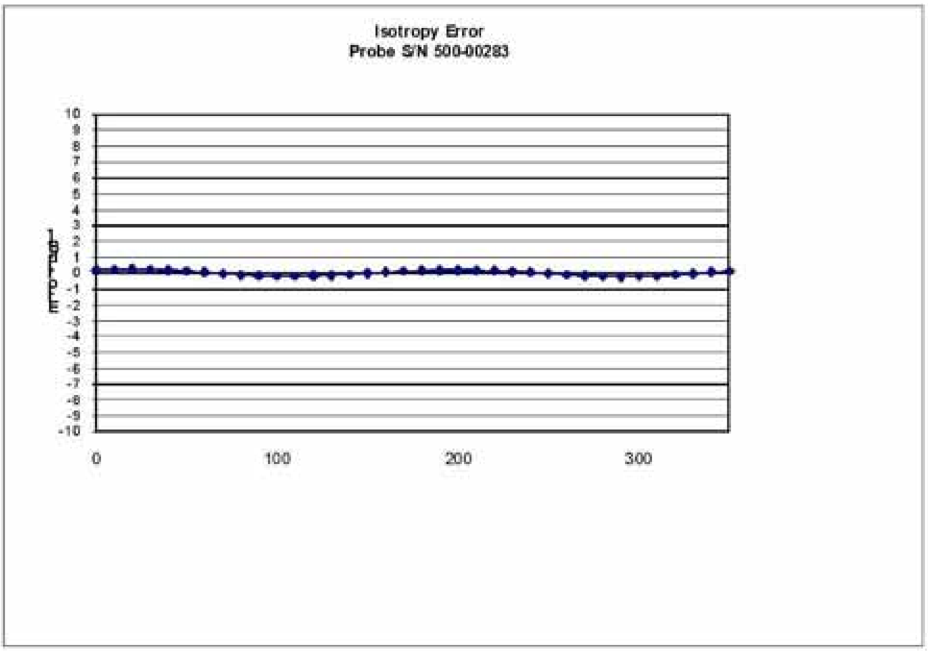
Receiving Pattern Air

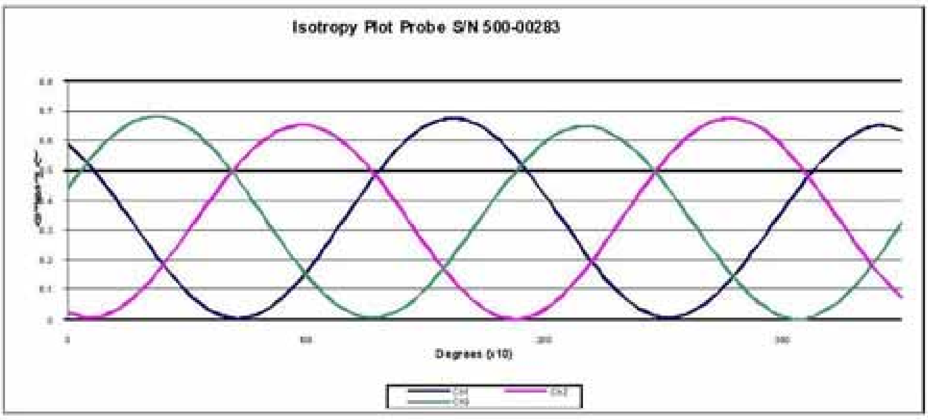


Page 7 of 10
This page has been reviewed for content and attested to on Page 2 of this document.

NCL Calibration Laboratories
Division of APREL Inc.

Isotropy Error Air



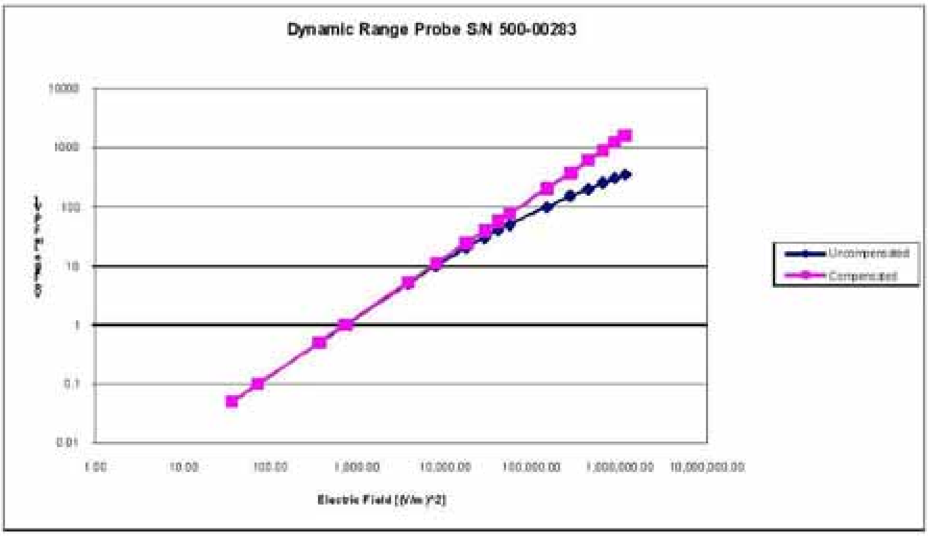


Isotropicity Tissue: 0.10 dB

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

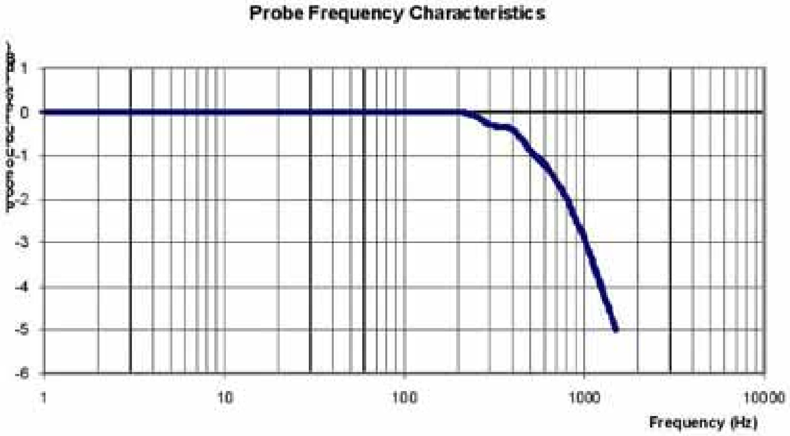
NCL Calibration Laboratories
Division of APREL Inc.

Dynamic Range



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

Video Bandwidth



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

Test Equipment

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

APPENDIX C DIPOLE CALIBRATION CERTIFICATES

NCL CALIBRATION LABORATORIES

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

CERTIFICATE OF CALIBRATION

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

Validation Dipole(Head and Body)

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

Customer: Bay Area Compliance Laboratory (China)

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

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

Released By: ______________________

Art Brennan, Quality Manager

NCL CALIBRATION LABORATORIES

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

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

NCL Calibration Laboratories
Division of APREL Laboratories.

Conditions

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

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

Attestation

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

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

Art Brennan, Quality Manager

Maryna Nesterova Calibration Engineer

Primary Measurement Standards

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

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

NCL Calibration Laboratories
Division of APREL Laboratories.

Calibration Results Summary

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

Mechanical Dimensions

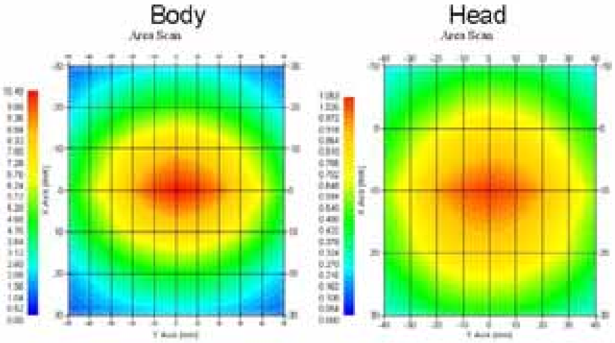
Length: 162.2 mm
Height: 89.4 mm

Electrical Specification

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

System Validation Results

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



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

NCL Calibration Laboratories
Division of APREL Laboratories.

Introduction

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

References

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

Conditions

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

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

Dipole Calibration uncertainty

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

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

4

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	49.001 Ω
Body	-28.118 dB	1.089 U	53.117 Ω □

Tissue Validation

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

This page has been reviewed for content and attested to by signature within this document. 5

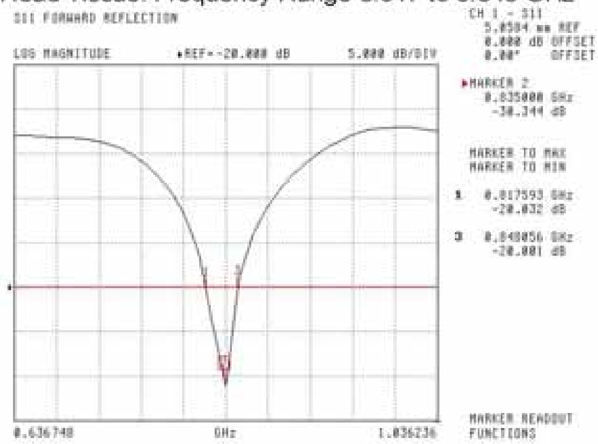
NCL Calibration Laboratories

Division of APREL Laboratories.

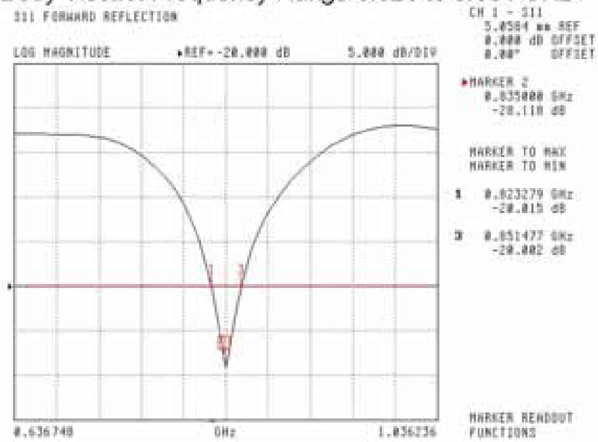
The Following Graphs are the results as displayed on the Vector Network Analyzer.

S11 Parameter Return Loss

Head Tissue: Frequency Range 0.817 to 0.848 GHz



Body Tissue: Frequency Range 0.823 to 0.851 GHz



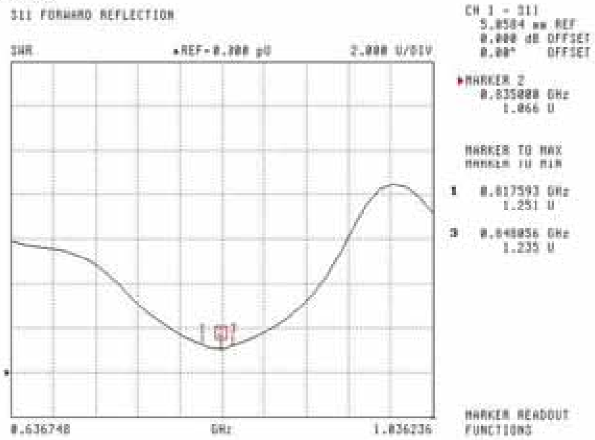
This page has been reviewed for content and attested to by signature within this document. 6

NCL Calibration Laboratories

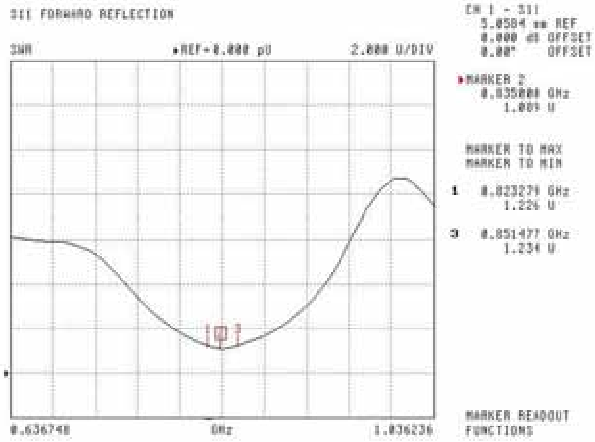
Division of APREL Laboratories.

SWR

Head



Body



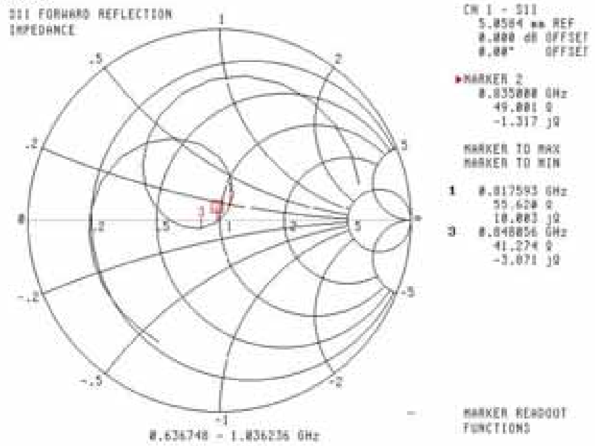
This page has been reviewed for content and attested to by signature within this document. 7

NCL Calibration Laboratories

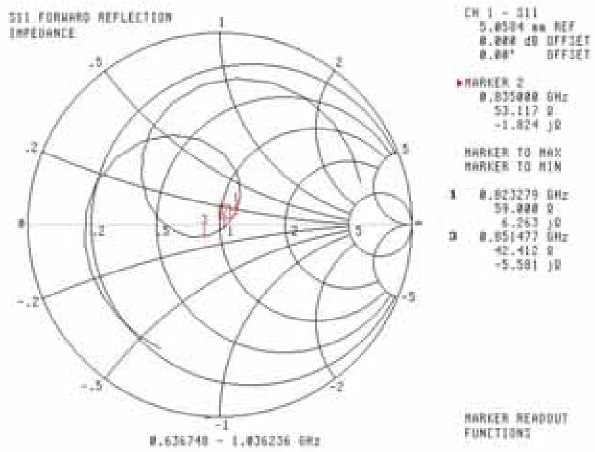
Division of APREL Laboratories.

Smith Chart Dipole Impedance

Head



Body



8

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.

835MHz Dipole Calibration By BACL at 2013-12-20

Mechanical Verification

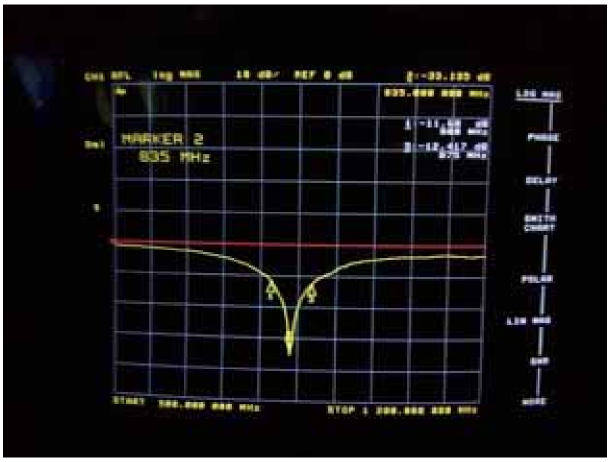
APREL Length	APREL Height	Measured Length	Measured Height
161.0 mm	89.8 mm	161.1 mm	89.7 mm

Tissue Type	Measured Return Loss	Measured Impedance
Head	-33.135 dB	51.898 Ω
Body	-25.362 dB	50.604 Ω

Test Graphs：

Head Tissue

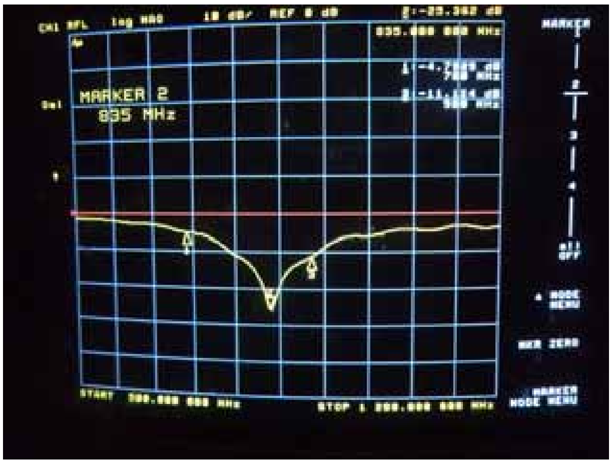
Return Loss :



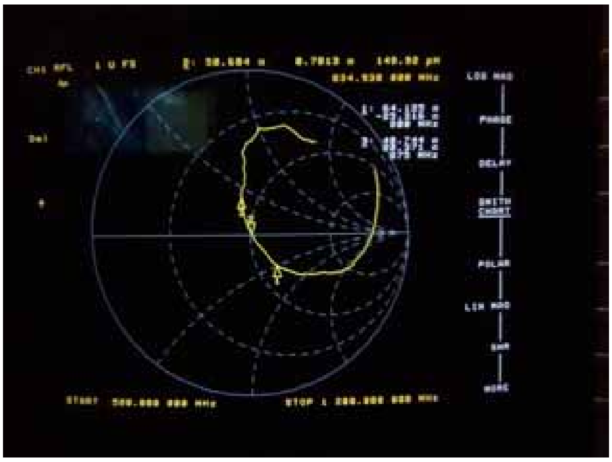
Impedance :

Body Tissue

Return Loss :



Impedance :



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

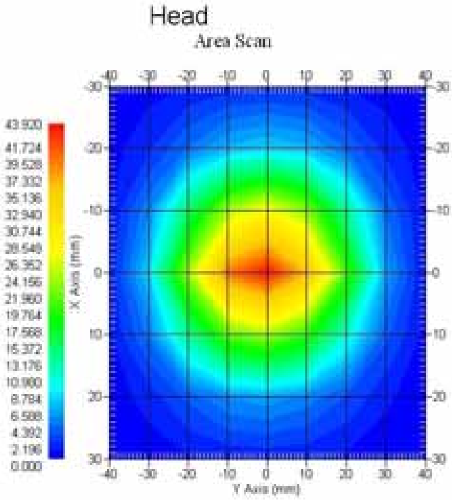
Electrical Specification

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

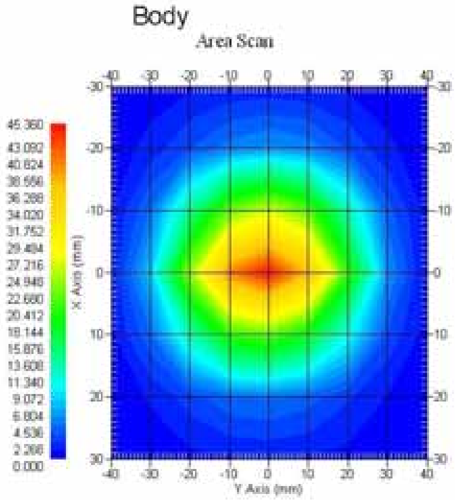
System Validation Results

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



Body



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

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

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

Conditions

Dipole 210-00710 was a recalibration.

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

Dipole Calibration uncertainty

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

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

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

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

5

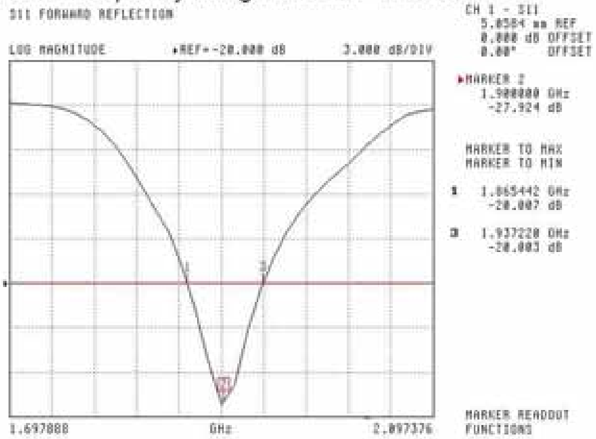
This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

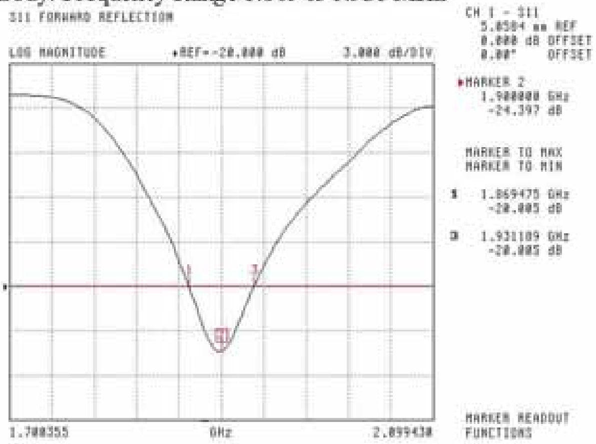
The Following Graphs are the results as displayed on the Vector Network Analyzer.

S11 Parameter Return Loss

Head: Frequency Range 1.865 to 1.937 GHz



Body: Frequency Range 1.869 to 1.931 MHz



6

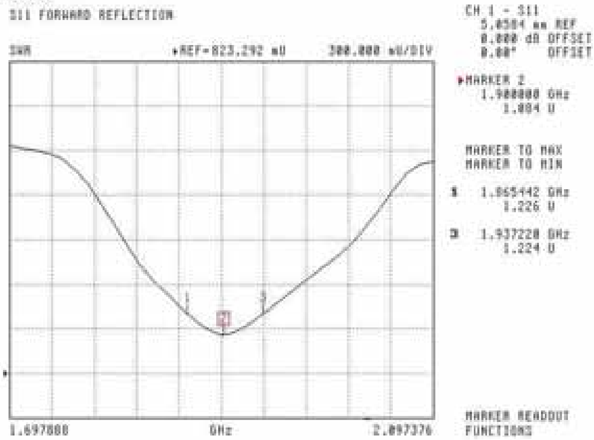
This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories

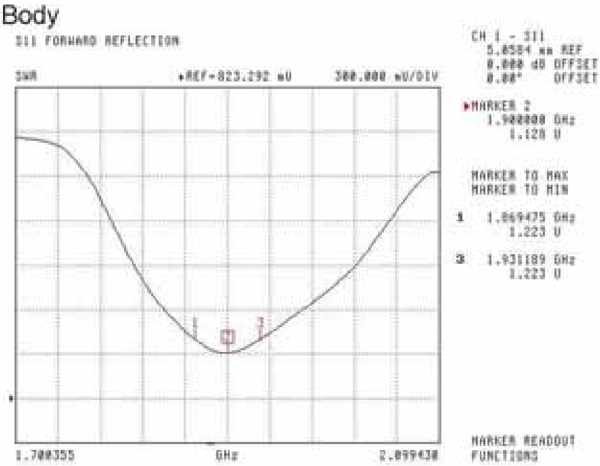
Division of APREL Laboratories.

SWR

Head



Body



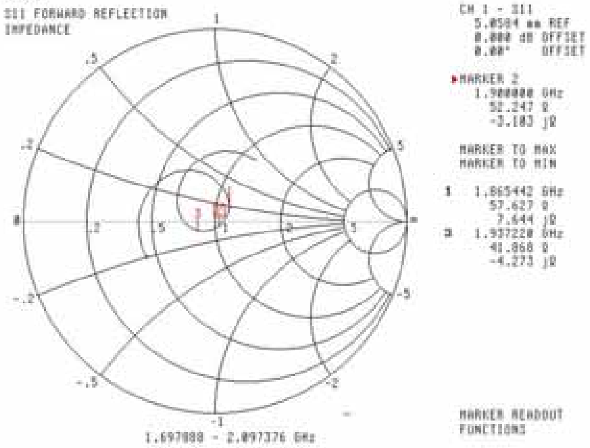
This page has been reviewed for content and attested to by signature within this document. 7

NCL Calibration Laboratories

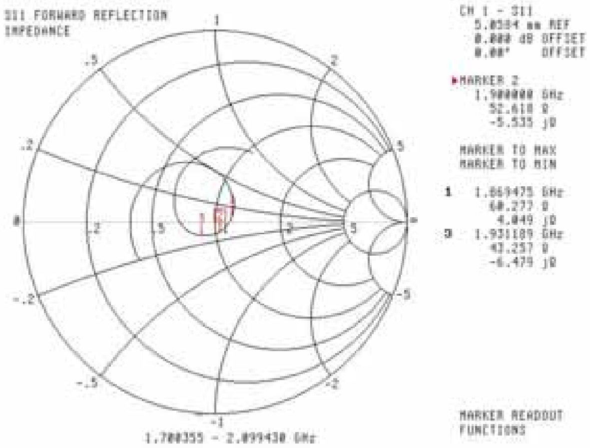
Division of APREL Laboratories.

Smith Chart Dipole Impedance

Head



Body



This page has been reviewed for content and attested to by signature within this document. 8

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

1900MHz Dipole Calibration By BACL at 2013-12-20

Mechanical Verification

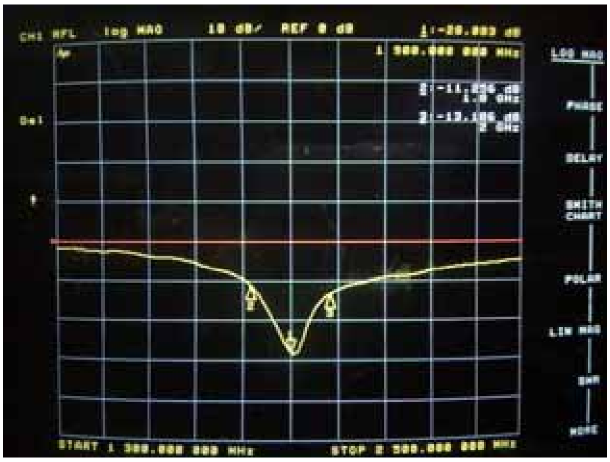
APREL Length	APREL Height	Measured Length	Measured Height
68.0 mm	39.4 mm	68.3 mm	39.2 mm

Tissue Type	Measured Return Loss	Measured Impedance
Head	-28.083 dB	47.477 Ω
Body	-22.022 dB	48.076 Ω

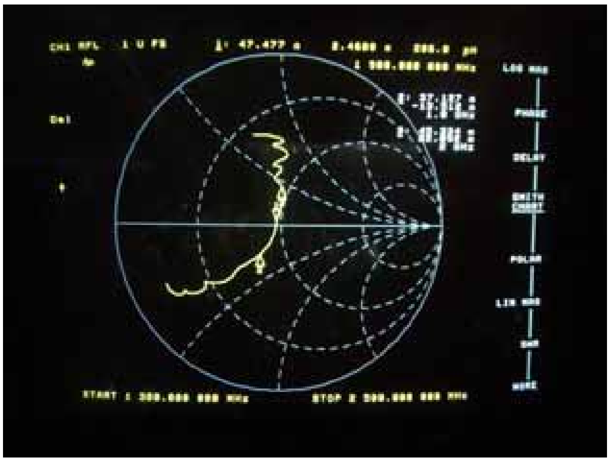
Test Graphs：

Head Tissue

Return Loss :

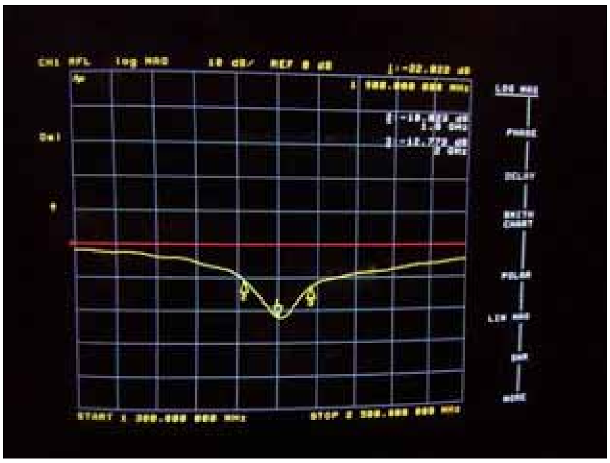


Impedance :



Body Tissue

Return Loss :

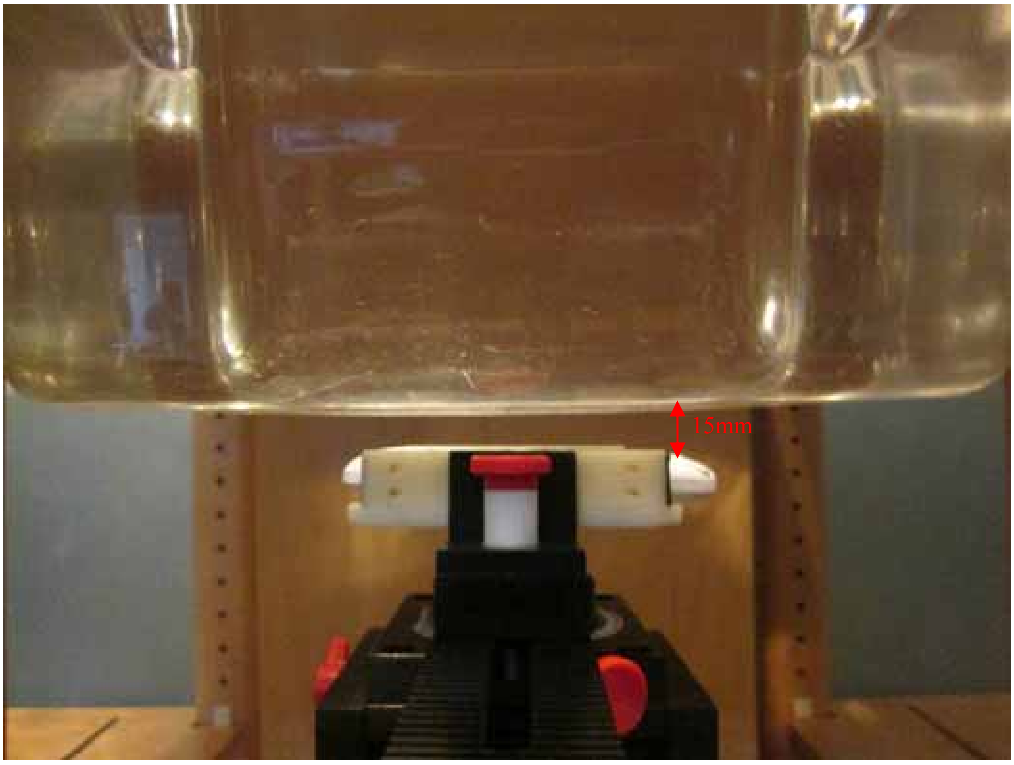


Impedance :

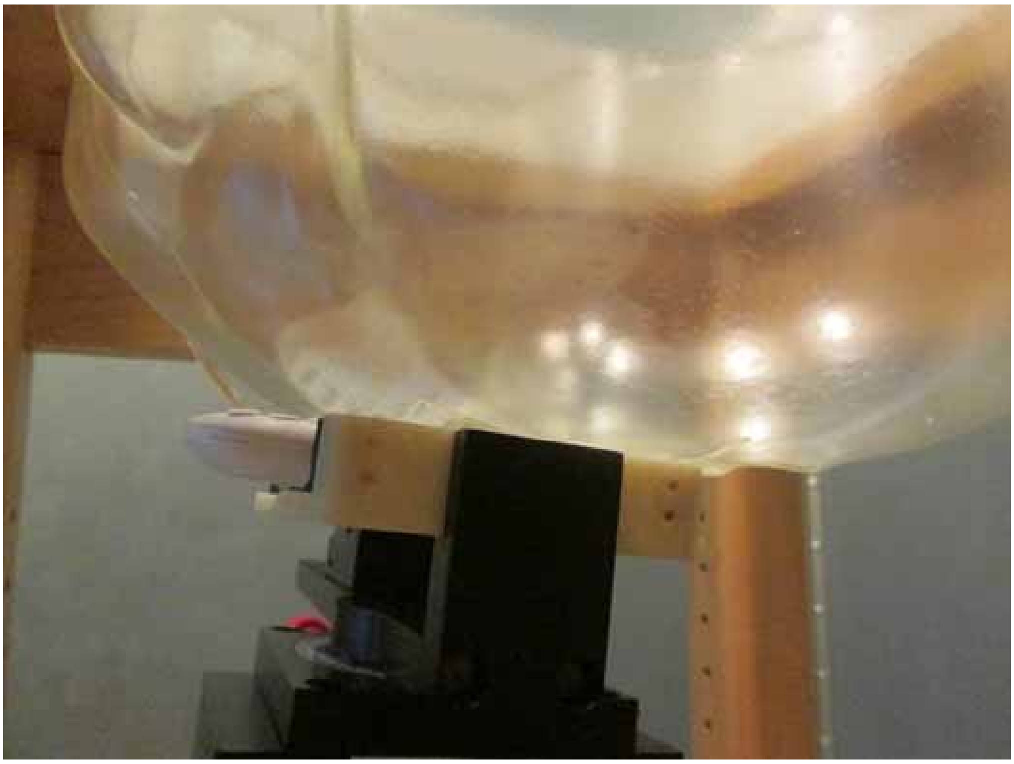
APPENDIX D EUT TEST POSITION PHOTOS

Liquid depth ≥ 15cm

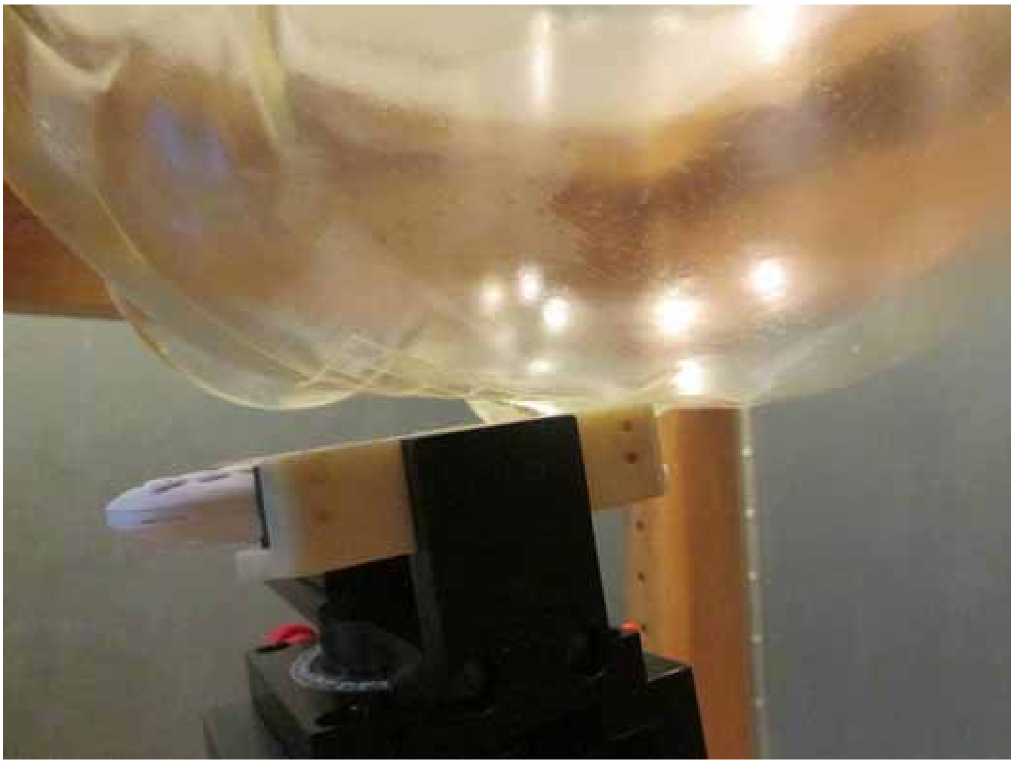
Body-worn Back Setup Photo (15mm)



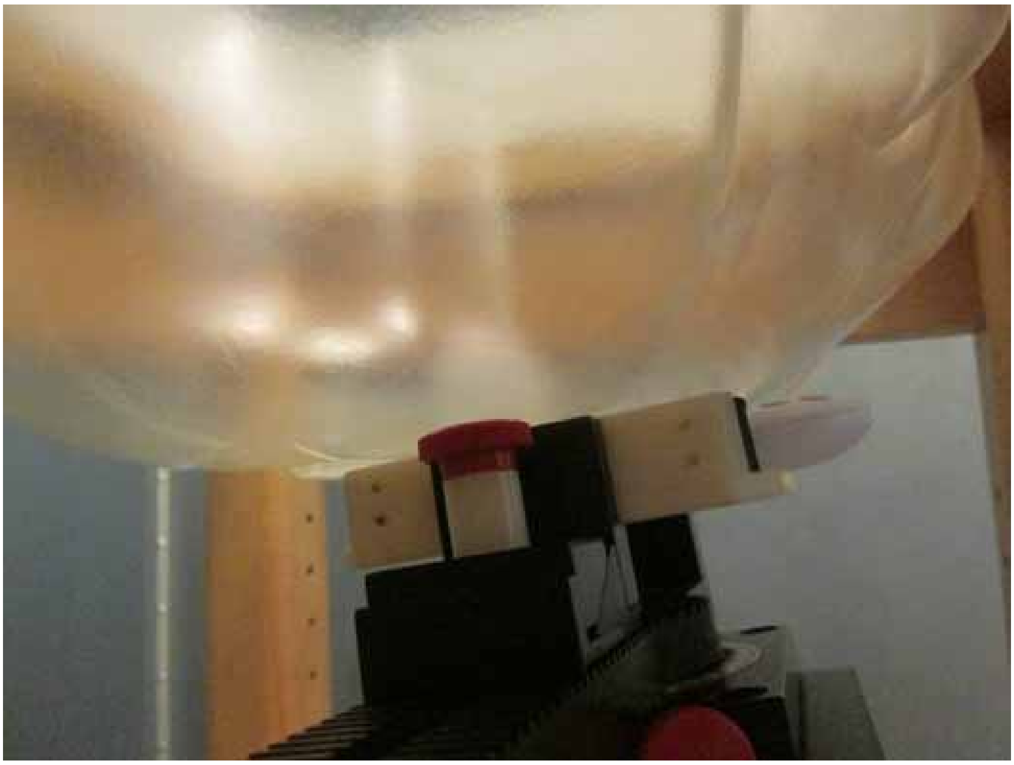
Left Head Touch Setup Photo



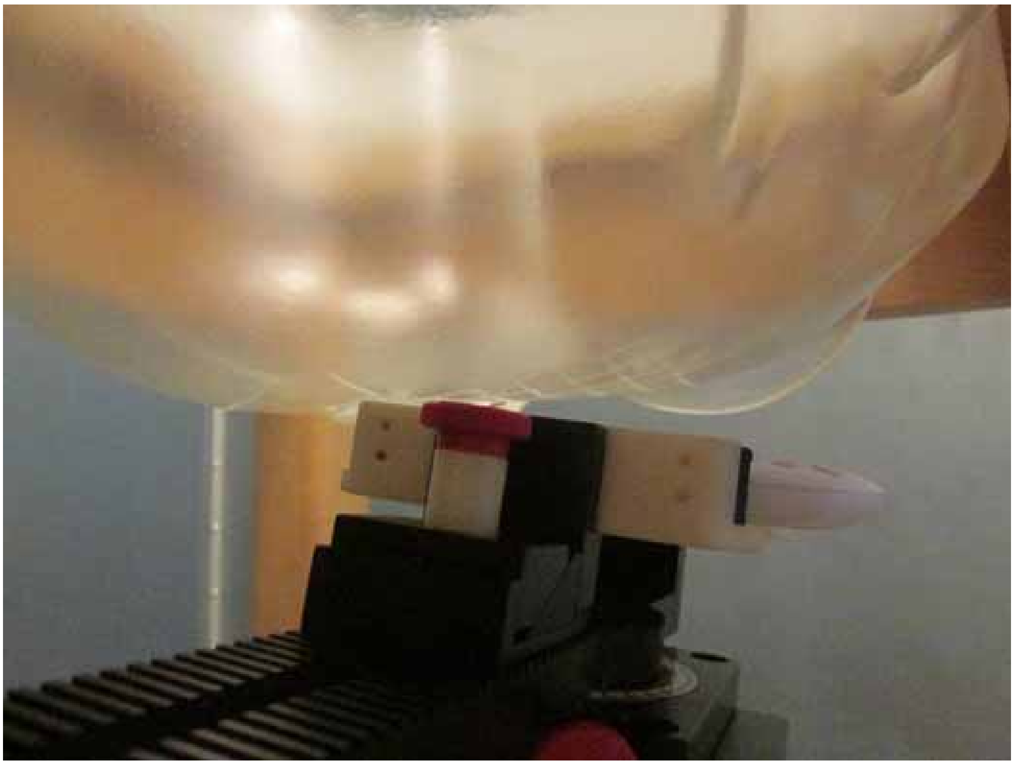
Left Head Tilt Setup Photo



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.

[3] Thomas Schmid, Oliver Egger, and Niels Kuster, \Automated E-_eld scanning system for dosimetricPage 83 of 83
assessments", IEEE Transactions on Microwave Theory and Techniques, vol. 44, pp. 105{113, Jan. 1996.

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

[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.

[7] Katja Pokovic, Thomas Schmid, and Niels Kuster, \Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies", in ICECOM _ 97, Dubrovnik, October 15{17, 1997, pp. 120-24.

[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.

[10] Klaus Meier, Ralf Kastle, Volker Hombach, Roger Tay, and Niels Kuster, \The dependence of EM energy absorption upon human head modeling at 1800 MHz", IEEE Transactions on Microwave Theory and Techniques, Oct. 1997, in press.

[11] W. Gander, Computermathematik, Birkhaeuser, Basel, 1992.

[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 *******