MOTOROLA SOLUTIONS

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DECLARATION OF COMPLIANCE SAR ASSESSMENT Part 1 of 2

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Date of Report: 9/19/2016
Report Revision: A

Responsible Engineer:	Chang Chi Chern (EME Engineer)
Report Author:	Chang Chi Chern (EME Engineer)
Date/s Tested:	9/15/2016 – 9/19/2016
Manufacturer:	Motorola Solutions Inc.
DUT Description:	Mission Critical Handheld Portable
Test TX mode(s):	GSM/GPRS, WCDMA, WLAN, LTE & BT
Max. Power output:	Refer to Part 1, Table 3
Nominal Power:	Refer to Part 1, Table 3
Tx Frequency Bands:	GSM: B2, B3, B5 & B8; WCDMA: B1, B2, B4, B5 & B8; WLAN: 2.4GHz / 5GHz; BT ; LTE: *B2, B3, B4, B5, B7, B8, B20, B26 & B28
Signaling type:	TDMA, CDMA, LTE, DSSS, OFDM & FHSS
Model(s) Tested:	LEX L10i
Model(s) Certified:	LEX L10i
Serial Number(s):	171PRQ1019
Classification:	General Population/Uncontrolled
FCC ID:	AZ489FT7078; GSM (B2 & B5), WCDMA (B2, B4 & B5), LTE (*B2, B4, B5, B7, B26) WLAN & BT

- This report contains results that are immaterial for FCC equipment approval, which are clearly identified.

Note: * Add in new LTE band (LTE B2) for this PCII filing.

The test results clearly demonstrate compliance with FCC General Population/Uncontrolled RF Exposure limits of 1.6 W/kg averaged over 1 gram per the requirements of OET Bulletin 65. The 10 grams result is not applicable to FCC filing. The test results clearly demonstrate compliance with ICNIRP (1998) Guidelines for limiting exposure in time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz), Health Physics 74, 494-522 RF Exposure limits of 2.0 W/kg averaged over 10grams of contiguous tissue.

Based on the information and the testing results provided herein, the undersigned certifies that when used as stated in the operating instructions supplied, said product complies with the national and international reference standards and guidelines listed in section 4.0 of this report. This report shall not be reproduced without written approval from an officially designated representative of the Motorola Solutions Inc EME Laboratory.
I attest to the accuracy of the data and assume full responsibility for the completeness of these measurements. This reporting format is consistent with the suggested guidelines of the TIA TSB-150 December 2004. The results and statements contained in this report pertain only to the device(s) evaluated.

Tiong

Tiong Nguk Ing

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Part 1 of 2

APPENDICES

Part 2 of 2

APPENDICES

Report Revision History

Date	Revision	Comments
09/19/2016	A	Initial release

1.0 Introduction

This report details the utilization, test setup, test equipment, and test results of the Specific Absorption Rate (SAR) measurements performed at the Motorola Solutions Inc. EME Test Laboratory for handheld portable model number LEX L10i. This device is classified as General Population/Uncontrolled. The information herein is to show evidence of Class II Permissive Change compliance base on SAR evaluation of new introduced LTE band 2.

2.0 FCC SAR Summary

Table 1

Equipment Class	Mode	Max Calc at Body (W/kg)		Max Calc at Hot Spot (W/kg)		Max Calc at Head (W/kg)	
		1g-SAR	10g-SAR	1g-SAR	10g-SAR	1g-SAR	10g-SAR
PCE	LTE B2 (1850-1910MHz)	**0.64**	**0.41**	**0.83**	**0.49**	**0.69**	**0.42**
DTS	2.4 GHz WLAN	**0.09**	**0.05**	0.11	0.05	0.23	0.11
DTS	5GHz WLAN	0.03	0.01	**0.57**	**0.19**	**0.41**	**0.12**
DSS	BT	NR	NR	NR	NR	NR	NR
Highest Simultaneous Results		**0.73**	**0.46**	**1.4**	**0.68**	**1.10**	**0.54**

NR – Results not required per KDB 447498 (derived in previous initial SAR report)

Note:
Initial filed highest reported SAR values for head, body-worn, hotspot and simultaneous transmission is 1.00 W/kg, 0.82 W/kg, 1.02 W/kg and 1.59 W/kg respectively. Degradation of SAR was not observed for this PCII therefore numbers found on initial compliance assessment report remain.

3.0 Abbreviations / Definitions

BT: Bluetooth
CNR: Calibration Not Required
DL: Downlink
DSS: Direct Spread Spectrum
DTM: Dual Transfer Mode
DTS: Digital Transmissions Systems
DUT: Device Under Test
EME: Electromagnetic Energy
EGPRS: Enhanced Data Rates for GSM
FHSS: Frequency Hopping Spread Spectrum
GFSK: Gaussian Frequency-Shift Keying
GPRS: General Packet Radio Service
GSM: Global System for Mobile
LTE: Long Term Evolution
NA: Not Applicable
OFDM: Orthogonal Frequency Division Multiplexing
PCE: PCS Licensed Transmitter held to ear
QPSK: Quadrature Pulse Shift Key

RB: Resource Blocks
SAR: Specific Absorption Rate
SC-FDMA: Single Carrier Frequency Division Multiple Access
TDD: Time Division Duplex
TDMA: Time Division Multiple Access
UL: Up Link
UMTS: Universal Mobile Telecommunications System
WCDMA: Wideband Code Division Multiple Access
WLAN: Wireless Local Area Network
4FSK: 4 Level Frequency Shift Keying
16QAM: 16 State Quadrature Amplitude Modulation

4.0 Referenced Standards and Guidelines

This product is designed to comply with the following applicable national and international standards and guidelines.

- IEC62209-1 (2005) Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)
- Federal Communications Commission, “Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields”, OET Bulletin 65, FCC, Washington, D.C.: 1997.
- 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
- American National Standards Institute (ANSI) / Institute of Electrical and Electronics Engineers (IEEE) C95. 1-1992
- Institute of Electrical and Electronics Engineers (IEEE) C95.1-2005
- International Commission on Non-Ionizing Radiation Protection (ICNIRP) 1998
- Ministry of Health (Canada) Safety Code 6 (2015), Limits of Human Exposure to Radio frequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz
- RSS-102 (Issue 5) – Radio Frequency (RF) Exposure Compliance of Radio communication Apparatus (All Frequency Bands)
- Australian Communications Authority Radio communications (Electromagnetic Radiation - Human Exposure) Standard (2014)
- ANATEL, Brazil Regulatory Authority, Resolution No. 303 of July 2, 2002 "Regulation of the limitation of exposure to electrical, magnetic, and electromagnetic fields in the radio frequency range between 9 kHz and 300 GHz." and “Attachment to resolution # 303 from July 2, 2002”

- IEC62209-2 Edition 1.0 2010-03, Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures – Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)

- FCC KDB – 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB – 865664 D02 RF Exposure Reporting v01r02
- FCC KDB – 447498 D01 General RF Exposure Guidance v06
- FCC KDB – 941225 D05 SAR for LTE Devices v02r05
- FCC KDB – 941225 D01 3G SAR Procedures v03r01
- FCC KDB – 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB - 648474 D04 Handset SAR v01r03

5.0 SAR Limits

Table 2

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average - ANSI - (averaged over the whole body)	0.08	0.4
Spatial Peak - ANSI - (averaged over any 1-g of tissue)	1.6	8.0
Spatial Peak – ICNIRP/ANSI - (hands/wrists/feet/ankles averaged over 10-g)	4.0	20.0
Spatial Peak - ICNIRP - (Head and Trunk 10-g)	2.0	10.0

6.0 Description of Device Under Test (DUT)

The DUT is a mission critical handheld portable device with the following technologies;

This device includes LTE technology, which is capable of OFDM (Orthogonal Frequency Division Multiplexing) on the downlink and SC-FDMA (Single Carrier Frequency Division Multiple Access) on the uplink. TDD is not supported. Table 3 below lists the LTE bands and associated duty cycles and output powers.

This device includes GSM/EDGE/GPRS technologies which operate in Time Division Multiple Access (TDMA). The DUT is designated class B, multi-slot class 12 supporting maximum 4 UL or 4 DL with a total maximum of 5 slots. This device does not support DTM. The maximum duty cycles and output powers are defined in Table 3.

This device includes WCDMA technology which operates in Wideband Code Division Multiple Access. The device supports HSPA+ (QPSK only on the uplink) but does not support Dual-Carrier HSPA. The maximum duty cycles and output powers are defined in Table 3.

This device includes WLAN 802.11 a/b/g/n technology with channel bandwidths of 20MHz & 40MHz. The maximum duty cycles and output powers are defined in Table 3.

This device includes standard and low energy Bluetooth (BT) technologies. The Bluetooth radio is used for wireless links to transfer data. Table 3 below lists these technologies along with their duty cycles and output powers. The standard BT uses Frequency Hopping Spread Spectrum (FHSS) while BT LE uses DSSS.

The intended operating position are “at the body”, hotspot mode and “at the side of the head”.

Maximum output powers in Table 3 are defined as upper limit of the production line final test station.

Table 3

Radio Type	TX Band (MHz)	Transmission	Max Duty Cycle (%)	Nominal Power (mW)	Max Power (mW)
GSM/GPRS/EGPRS – B5	824 -849	TDMA	50	1584.9	1995.3
GSM/GPRS/EGPRS – B8	880-915	TDMA	50	1584.9	1995.3
GSM/GPRS/EGPRS – B3	1710-1785	TDMA	50	794.3	1000.0
GSM/GPRS/EGPRS – B2	1850-1910	TDMA	50	794.3	1000.0
UMTS-B1	1920-1980	WCDMA	100	199.5	251.2
UMTS-B2	1850-1910	WCDMA	100	199.5	251.2
UMTS-B4	1710-1755	WCDMA	100	199.5	251.2
UMTS-B5	824 -849	WCDMA	100	199.5	251.2
UMTS-B8	880-915	WCDMA	100	199.5	251.2
*LTE-B2	1850 – 1910	SC-FDMA	100	199.5	251.2
LTE-B3	1710-1785	SC-FDMA	100	199.5	251.2
LTE-B4	1710-1755	SC-FDMA	100	199.5	251.2
LTE-B5	824 -849	SC-FDMA	100	199.5	251.2
LTE-B7	2500-2570	SC-FDMA	100	177.8	199.5
LTE-B8	880-915	SC-FDMA	100	199.5	251.2
LTE-B20	832-862	SC-FDMA	100	199.5	251.2
LTE-B26	814-849	SC-FDMA	100	199.5	251.2
LTE-B28	703-748	SC-FDMA	100	199.5	251.2

* LTE band 2 is new band introduced to this device with software upgrade.

Table 3 (Continued)

Radio Type	TX Band (MHz)	Transmission	Max Duty Cycle (%)	Nominal Power (mW)	Max Power (mW)
WLAN - 802.11b	2.4 GHz	DSSS	99.9	15.8	22.4
WLAN - 802.11g	2.4 GHz	DSSS/OFDM	99.9	15.8	22.4
WLAN - 802.11n	2.4 GHz	OFDM	99.9	15.8	22.4
WLAN - 802.11a	5GHz	OFDM	92	25.1	35.5
WLAN - 802.11n	5GHz	OFDM	92	20.0	28.2
BT	2.4 GHz	FHSS	75	4.0	6.3
BT LE	2.4 GHz	DSSS	60	1.6	2.5

7.0 Optional Accessories and Test Criteria

This device is offered with optional accessories. The following section identifies the test criteria and details for each accessory category applicable for this PCII filing only. Detail listing of all approved offered accessories available in original filing report.

7.1 Antenna

There is one new antenna applicable for this PCII filing. The table below describes the antenna.

Table 3

Antenna Models	Description	Tested
Ant 1 - PL1000248	LTE/UMTS/GSM Tx/Rx Inverted-L Monopole Antenna 1710-2690 MHz ¼ wave, 28.7mm, 0.8 to -0.6 dBi	Yes

7.2 Batteries

There are two batteries applicable for this PC II filing. The table below describes the batteries.

Table 4

Battery Models	Description	Selected for test	Tested	Comments
PMNN4472B	Standard Li-ion 2340mAh	Yes	Yes	Default battery
PMNN4475B	Extended Li-ion 4680mAh	Yes	Yes	

7.3 Body worn Accessory

There is one body worn accessory applicable for this PC II filling. The table below describes the body worn accessory.

Table 5

Body worn Models	Description	Selected for test	Tested	Comments
HKLN4618A	Leather holster	Yes	Yes	

7.4 Audio Accessory

None of audio accessory applicable for this PC II filling.

8.0 Description of Test System

8.1 Descriptions of Robotics/Probes/Readout Electronics

Table 6

Dosimetric System type	System version	DAE type	Probe Type
Schmid & Partner Engineering AG SPEAG DASY 5	52.8.8 (1222)	DAE4	ES3DV3 (E-Field)

The DASY5™ system is operated per the instructions in the DASY5™ Users Manual. The complete manual is available directly from SPEAG™. All measurement equipment used to assess SAR compliance was calibrated according to ISO/IEC 17025 A2LA guidelines. Section 9.0 presents additional test equipment information. Appendices B and C present the applicable calibration certificates. The E-field probe first scans a coarse grid over a large area inside the phantom in order to locate the interpolated maximum SAR distribution. After the coarse scan measurement, the probe is automatically moved to a position at the interpolated maximum. The subsequent scan can directly use this position as reference for the cube evaluations.

8.2 Description of Phantom(s)

Table 7

Phantom Type	Phantom(s) Used	Material Parameters	Phantom Dimensions LxWxD (mm)	Material Thickness (mm)	Support Structure Material	Loss Tangent (wood)
Triple Flat	√	200MHz -6GHz; Er = 3-5, Loss Tangent = ≤0.05	280x175x175	2mm +/- 0.2mm	Wood	< 0.05
SAM	√	300MHz -6GHz; Er = < 5, Loss Tangent = ≤0.05	Human Model			
Oval Flat	NA	300MHz -6GHz; Er = 4+/- 1, Loss Tangent = ≤0.05	600x400x190			

8.3 Description of Simulated Tissue

The sugar based simulate tissue is produced by placing the correct measured amount of De-ionized water into a large container. Each of the dried ingredients are weighed and added to the water carefully to avoid clumping. If the solution has a high sugar concentration the water is pre-heated to aid in dissolving the ingredients. For Diacetin and similar type simulates, sugar and HEC ingredients are not needed. The solution is mixed thoroughly, covered, and allowed to sit overnight prior to use.

The simulated tissue mixture was mixed based on the Simulated Tissue Composition indicated in Table 8. During the daily testing of this product, the applicable mixture was used to measure the Di-electric parameters at each of the tested frequencies to verify that the Di-electric parameters were within the tolerance of the tissue specifications.

Simulated Tissue Composition (percent by mass)

Table 8

Ingredients	1950MHz	
	Head	Body
Sugar	NA	NA
Diacetin	51.5	35.0
De ionized – Water	48.03	64.52
Salt	0.37	0.38
HEC	NA	NA
Bact.	0.1	0.1

9.0 Additional Test Equipment

The Table below lists additional test equipments used during the SAR assessment.

Table 9

Equipment Type	Model Number	Serial Number	Calibration Date	Calibration Due Date
Speag Probe	ES3DV3	3096	4/29/2016	4/29/2017
Speag DAE	DAE4	688	4/21/2016	4/21/2017
Amplifier	5S1G4	313326	CNR	CNR
Wideband Radio Communication Tester	CMW500	153169	5/12/2015	5/12/2017
Power Meter	E4418B	MY45101014	11/4/2015	11/4/2017
Power Meter	E4419B	MY40330364	5/29/2015	5/29/2017
Power Sensor (With 30dB PAD)	8482B	MY41090719	6/15/2016	6/15/2017
Power Sensor (With 30dB PAD)	8482B	2703A04641	6/15/2016	6/15/2017
Signal Generator (Vector ESG 250KHz-6GHz)	E4438C	MY45091270	7/26/2016	7/26/2018
Bi-directional Coupler	3022	81640	9/2/2016	9/2/2017
Thermometer	HH806AU	080307	4/8/2016	4/8/2017
Dickson Temperature Recorder	TM320	12253047	11/19/2015	11/19/2016
Temperature Probe	80PK-25	080428.01	8/5/2016	8/5/2017
Dielectric Assessment Kit	DAK-12	1051	3/8/2016	3/8/2017
Network Analyzer	E5071B	MY42403147	11/6/2015	11/6/2016
SPEAG DIPOLE	D1900V2	5d064	2/15/2016	2/15/2018

10.0 SAR Measurement System Validation and Verification

DASY output files of the probe/dipole calibration certificates and system verification test results are included in appendices B, C & D respectively.

10.1 System Validation

The SAR measurement system was validated according to procedures in KDB 865664. The validation status summary Table is below.

Table 10

<table>
<tr><th rowspan="2">Dates</th><th rowspan="2" colspan="2">Probe Calibration Point</th><th rowspan="2">Probe SN</th><th colspan="2">Measured Tissue Parameters</th><th colspan="3">Validation</th></tr>
<tr><th>σ</th><th>ϵ_r</th><th>Sensitivity</th><th>Linearity</th><th>Isotropy</th></tr>
<tr><td colspan="9">CW</td></tr>
<tr><td>6/1/2016</td><td>Body</td><td>1900</td><td rowspan="2">3096</td><td>1.53</td><td>50.9</td><td>Pass</td><td>Pass</td><td>Pass</td></tr>
<tr><td>6/1/2016</td><td>Head</td><td>1900</td><td>1.46</td><td>38.3</td><td>Pass</td><td>Pass</td><td>Pass</td></tr>
<tr><td colspan="9">LTE</td></tr>
<tr><td>7/22/2016</td><td>Body</td><td>1900</td><td rowspan="2">3096</td><td>1.45</td><td>50.7</td><td>Pass</td><td>Pass</td><td>Pass</td></tr>
<tr><td>7/21/2016</td><td>Head</td><td>1900</td><td>1.45</td><td>38.3</td><td>Pass</td><td>Pass</td><td>Pass</td></tr>
</table>

10.2 System Verification

System verification checks were conducted each day during the SAR assessment. The results are normalized to 1W. Appendix D includes DASY plots for each day during the SAR assessment. The Table below summarizes the daily system check results used for the SAR assessment.

Table 11

Probe Serial #	Tissue Type	Dipole Kit / Serial #	Ref SAR @ 1W (W/kg)	System Check Results Measured (W/kg)	System Check Test Results when normalized to 1W (W/kg)	Tested Date
3096	FCC Body	SPEAG D1900V2 / 5d064	39.90 +/- 10%	9.24	36.96	9/15/2016
				9.12	36.48	9/16/2016
	IEEE/IEC Head		39.00 +/- 10%	9.45	37.80	9/16/2016
				9.13	36.52	9/19/2016

10.3 Equivalent Tissue Test Results

Simulated tissue prepared for SAR measurements is measured daily and within 24 hours prior to actual SAR testing to verify that the tissue is within +/- 5% of target parameters at the center of the transmit band. This measurement is done using the applicable equipment indicated in section 9.0. The Table below summarizes the measured tissue parameters used for the SAR assessment.

Table 12

Frequency (MHz)	Tissue Type	Conductivity Target (S/m)	Dielectric Constant Target	Conductivity Meas. (S/m)	Dielectric Constant Meas.	Tested Date
1860	FCC Body	1.52 (1.44-1.60)	53.3 (50.6-56.0)	1.49	52.7	9/15/2016
				1.52	52.6	9/16/2016
	IEEE/IEC Head	1.40 (1.33-1.47)	40.0 (38.0-42.0)	1.43	38.6	9/16/2016
				1.40	38.5	9/19/2016
1900	FCC Body	1.52 (1.44-1.60)	53.3 (50.6-56.0)	1.56	52.4	9/15/2016
				1.58	52.3	9/16/2016
	IEEE/IEC Head	1.40 (1.33-1.47)	40.0 (38.0-42.0)	1.47	38.3	9/16/2016
				1.45	38.2	9/19/2016

11.0 Environmental Test Conditions

The EME Laboratory's ambient environment is well controlled resulting in very stable simulated tissue temperature and therefore stable dielectric properties. Simulated tissue temperature is measured prior to each scan to insure it is within +/ - 2^{o}C of the temperature at which the dielectric properties were determined. The liquid depth within the phantom used for measurements was at least 15cm. Additional precautions are routinely taken to ensure the stability of the simulated tissue such as covering the phantoms when scans are not actively in process in order to minimize evaporation. The lab environment is continuously monitored. The Table below presents the range and average environmental conditions during the SAR tests reported herein:

Table 13

	Target	Measured
Ambient Temperature	18 – 25 ˚C	Range: 20.7 – 23.4 ˚C Avg. 22.0 ˚C
Tissue Temperature	NA	Range: 20.2-21.7˚C Avg. 20.9˚C

Relative humidity target range is a recommended target

The EME Lab RF environment uses a Spectrum Analyzer to monitor for extraneous large signal RF contaminants that could possibly affect the test results. If such unwanted signals are discovered the SAR scans are repeated.

12.0 DUT Test Setup and Methodology

12.1 Measurements

SAR measurements were performed using the DASY system described in section 8.0 using zoom scans. Oval flat phantoms filled with applicable simulated tissue were used for body and face testing.

The Table below includes the step sizes and resolution of area and zoom scans per KDB 865664 requirements.

Table 14

<table>
<tr><th colspan="2">Description</th><th>≤ 3 GHz</th><th>> 3 GHz</th></tr>
<tr><td colspan="2">Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5 ± 1 mm</td><td>½·δ·ln(2) ± 0.5 mm</td></tr>
<tr><td colspan="2">Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30° ± 1°</td><td>20° ± 1°</td></tr>
<tr><td colspan="2" rowspan="2">Maximum area scan spatial resolution: ΔxArea, ΔyArea</td><td>≤ 2 GHz: ≤ 15 mm
2 – 3 GHz: ≤ 12 mm</td><td>3 – 4 GHz: ≤ 12 mm
4 – 6 GHz: ≤ 10 mm</td></tr>
<tr><td colspan="2">When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.</td></tr>
<tr><td colspan="2">Maximum zoom scan spatial resolution: ΔxZoom, ΔyZoom</td><td>≤ 2 GHz: ≤ 8 mm
2 – 3 GHz: ≤ 5 mm*</td><td>3 – 4 GHz: ≤ 5 mm*
4 – 6 GHz: ≤ 4 mm*</td></tr>
<tr><td>Maximum zoom scan spatial resolution, normal to phantom surface</td><td>uniform grid: ΔzZoom(n)</td><td>≤ 5 mm</td><td>3 – 4 GHz: ≤ 4 mm
4 – 5 GHz: ≤ 3 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td colspan="4">Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.
* When zoom scan is required and the reported SAR from the area scan based 1-g SAR estimation procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.</td></tr>
</table>

12.2 DUT Configuration(s)

The DUT is a portable device operational at the body, hotspot and head as described in section 6.0 while using the applicable accessories listed in section 7.0. All accessories listed in section 7.0 of this report were considered when implementing the guidelines specified in section 4.0

12.3 DUT Positioning Procedures

The positioning of the device for each body location is described below and illustrated in Appendix G.

12.3.1 Body

The DUT was positioned in normal use configuration against the phantom with the offered body worn accessory.

12.3.2 Hotspot

The DUT was positioned with its front, back, and edges of the device with transmitting antennas within 2.5cm from the edge separated 1.0 cm from the phantom. The DUT was also tested along the edge containing the WLAN / BT antenna if the transmitting antenna was not within 2.5cm from that edge.

12.3.3 Head

The DUT was placed against the right and left heads of the SAM phantom in the cheek touch and tilt positions.

12.4 DUT Test Channels

The number of test channels was determined by using the following IEEE 1528 equation. The use of this equation produces the same or more test channels compared to the FCC KDB 447498 number of test channels formula.

$$N_c = 2 * roundup[10 * (f_{high} - f_{low}) / f_c] + 1$$

Where
N_c = Number of channels
F_{high} = Upper channel
F_{low} = Lower channel
F_c = Center channel

12.5 SAR Result Scaling Methodology

The calculated 1-gram and 10-gram averaged SAR results indicated as "Max Calc. 1g-SAR" and "Max Calc.10g-SAR" in the data Tables is determined by scaling the measured SAR to account for power leveling variations and drift. Appendix F includes a shortened scan to justify SAR scaling for drift. For this device the "Max Calc. 1g-SAR" and "Max Calc.10g-SAR" are scaled using the following formula:

$$Max\_Calc = SAR\_meas \cdot 10^{\frac{-Drift}{10}} \cdot \frac{P\_\max}{P\_\text{int}} \cdot DC$$

P_max = Maximum Power (W)
P_int = Initial Power (W)
Drift = DASY drift results (dB)
SAR_meas = Measured 1-g or 10-g Avg. SAR (W/kg)
DC = Transmission mode duty cycle in % where applicable
50% duty cycle is applied for PTT operation

Note: for conservative results, the following are applied:
If P_int > P_max, then P_max/P_int = 1.
Drift = 1 for positive drift

Additional SAR scaling was applied using the methodologies outlined in FCC KDB 865664 using tissue sensitivity values. SAR was scaled for conditions where the tissue permittivity was measured above the nominal target and for tissue conductivity that was measured below the nominal target. Negative or reduced SAR scaling is not permitted.

12.6 DUT Test Plan

The guidelines and requirements outlined in section 4.0 were used to assess compliance of this device for new offered LTE band 2. All modes of operation identified in section 6.0 were considered during the development of the test plan.

13.0 Assessments at LTE B2 (1850 – 1910 MHz)

13.1 Output Power Data

These power measurements were used to determine the necessary modes for SAR testing according to KDB 941225.

Table 15

Band	Bandwidth	Modulation	RB Size	RB Offset	Channel L-M-H	Downlink Channel	Uplink Channel	Frequency (MHz)	Power (dBm)
Band 2	20 MHz 100 Blocks	1 Block QPSK I_MCS 5	1	lower	Low	700	18700	1860.0	23.26
			1	middle	Low	700	18700	1860.0	23.39
			1	**upper**	**Low**	**700**	**18700**	**1860.0**	**23.47**
			1	lower	Mid	900	18900	1880.0	23.45
			1	middle	Mid	900	18900	1880.0	23.29
			1	upper	Mid	900	18900	1880.0	23.08
			1	lower	High	1100	19100	1900.0	23.05
			1	middle	High	1100	19100	1900.0	22.68
			1	upper	High	1100	19100	1900.0	22.86

Table 15 (Continued)

Band	Bandwidth	Modulation	RB Size	RB Offset	Channel L-M-H	Downlink Channel	Uplink Channel	Frequency (MHz)	Power (dBm)
Band 2	20 MHz 100 Blocks	50 Block QPSK I_MCS 5	50%	lower	Low	700	18700	1860.0	22.33
			50%	middle	Low	700	18700	1860.0	22.46
			50%	**upper**	**Low**	**700**	**18700**	**1860.0**	**22.48**
			50%	lower	Mid	900	18900	1880.0	22.33
			50%	middle	Mid	900	18900	1880.0	22.27
			50%	upper	Mid	900	18900	1880.0	22.19
			50%	lower	High	1100	19100	1900.0	21.83
			50%	middle	High	1100	19100	1900.0	21.76
			50%	upper	High	1100	19100	1900.0	21.77
		100 Blocks QPSK I_MCS 5	100%	lower	Low	700	18700	1860.0	22.49
			100%	lower	Mid	900	18900	1880.0	22.31
			100%	lower	High	1100	19100	1900.0	21.92
		1 Block 16 QAM I_MCS 12	1	lower	Low	700	18700	1860.0	22.38
			1	middle	Low	700	18700	1860.0	22.48
			1	upper	Low	700	18700	1860.0	22.61
			1	lower	Mid	900	18900	1880.0	22.44
			1	middle	Mid	900	18900	1880.0	22.27
			1	upper	Mid	900	18900	1880.0	22.06
			1	lower	High	1100	19100	1900.0	21.93
			1	middle	High	1100	19100	1900.0	21.75
			1	upper	High	1100	19100	1900.0	21.97
		50 Block 16 QAM I_MCS 12	50%	lower	Low	700	18700	1860.0	21.38
			50%	middle	Low	700	18700	1860.0	21.50
			50%	upper	Low	700	18700	1860.0	21.52
			50%	lower	Mid	900	18900	1880.0	21.26
			50%	middle	Mid	900	18900	1880.0	21.22
			50%	upper	Mid	900	18900	1880.0	21.21
			50%	lower	High	1100	19100	1900.0	20.84
			50%	middle	High	1100	19100	1900.0	20.74
			50%	upper	High	1100	19100	1900.0	20.79
		100 Blocks 16 QAM I_MCS 12	100%	lower	Low	700	18700	1860.0	21.55
			100%	lower	Mid	900	18900	1880.0	21.24
			100%	lower	High	1100	19100	1900.0	20.95
	15 MHz 75 Blocks	1 Block QPSK I_MCS 5	1	lower	Low	675	18675	1857.5	23.43
			1	middle	Low	675	18675	1857.5	23.54
			1	upper	Low	675	18675	1857.5	23.59
			1	lower	Mid	900	18900	1880.0	23.24
			1	middle	Mid	900	18900	1880.0	23.18
			1	upper	Mid	900	18900	1880.0	23.08
			1	lower	High	1125	19125	1902.5	22.81
			1	middle	High	1125	19125	1902.5	22.74
			1	upper	High	1125	19125	1902.5	22.86

Table 15 (Continued)

Band	Bandwidth	Modulation	RB Size	RB Offset	Channel L-M-H	Downlink Channel	Uplink Channel	Frequency (MHz)	Power (dBm)
Band 2	15 MHz 75 Blocks	36 Block QPSK I_MCS 5	50%	lower	Low	675	18675	1857.5	22.40
			50%	middle	Low	675	18675	1857.5	22.48
			50%	upper	Low	675	18675	1857.5	22.50
			50%	lower	Mid	900	18900	1880.0	22.24
			50%	middle	Mid	900	18900	1880.0	22.23
			50%	upper	Mid	900	18900	1880.0	22.23
			50%	lower	High	1125	19125	1902.5	21.74
			50%	middle	High	1125	19125	1902.5	21.73
			50%	upper	High	1125	19125	1902.5	21.75
		75 Blocks QPSK I_MCS 5	100%	lower	Low	675	18675	1857.5	22.51
			100%	lower	Mid	900	18900	1880.0	22.35
			100%	lower	High	1125	19125	1902.5	21.90
		1 Block 16 QAM I_MCS 12	1	lower	Low	675	18675	1857.5	22.71
			1	middle	Low	675	18675	1857.5	22.90
			1	upper	Low	675	18675	1857.5	22.93
			1	lower	Mid	900	18900	1880.0	22.07
			1	middle	Mid	900	18900	1880.0	22.03
			1	upper	Mid	900	18900	1880.0	21.94
			1	lower	High	1125	19125	1902.5	22.01
			1	middle	High	1125	19125	1902.5	21.93
			1	upper	High	1125	19125	1902.5	22.15
		36 Block 16 QAM I_MCS 12	50%	lower	Low	675	18675	1857.5	21.32
			50%	middle	Low	675	18675	1857.5	21.42
			50%	upper	Low	675	18675	1857.5	21.42
			50%	lower	Mid	900	18900	1880.0	21.18
			50%	middle	Mid	900	18900	1880.0	21.20
			50%	upper	Mid	900	18900	1880.0	21.16
			50%	lower	High	1125	19125	1902.5	20.83
			50%	middle	High	1125	19125	1902.5	20.79
			50%	upper	High	1125	19125	1902.5	20.83
		75 Blocks 16 QAM I_MCS 12	100%	lower	Low	675	18675	1857.5	21.51
			100%	lower	Mid	900	18900	1880.0	21.30
			100%	lower	High	1125	19125	1902.5	20.89
	10 MHz 50 Blocks	1 Block QPSK I_MCS 5	1	lower	Low	650	18650	1855.0	22.39
			1	middle	Low	650	18650	1855.0	22.36
			1	upper	Low	650	18650	1855.0	22.37
			1	lower	Mid	900	18900	1880.0	22.28
			1	middle	Mid	900	18900	1880.0	22.28
			1	upper	Mid	900	18900	1880.0	22.29
			1	lower	High	1150	19150	1905.0	21.79
			1	middle	High	1150	19150	1905.0	21.79
			1	upper	High	1150	19150	1905.0	21.79

Table 15 (Continued)

Band	Bandwidth	Modulation	RB Size	RB Offset	Channel L-M-H	Downlink Channel	Uplink Channel	Frequency (MHz)	Power (dBm)
Band 2	10 MHz 50 Blocks	25 Block QPSK I_MCS 5	50%	lower	Low	650	18650	1855.0	22.36
			50%	middle	Low	650	18650	1855.0	22.39
			50%	upper	Low	650	18650	1855.0	22.39
			50%	lower	Mid	900	18900	1880.0	22.28
			50%	middle	Mid	900	18900	1880.0	22.28
			50%	upper	Mid	900	18900	1880.0	22.27
			50%	lower	High	1150	19150	1905.0	21.78
			50%	middle	High	1150	19150	1905.0	21.78
			50%	upper	High	1150	19150	1905.0	21.78
		50 Blocks QPSK I_MCS 5	100%	lower	Low	650	18650	1855.0	22.39
			100%	lower	Mid	900	18900	1880.0	22.28
			100%	lower	High	1150	19150	1905.0	21.82
		1 Block 16 QAM I_MCS 12	1	lower	Low	650	18650	1855.0	22.38
			1	middle	Low	650	187650	1855.0	22.38
			1	upper	Low	650	18650	1855.0	22.37
			1	lower	Mid	900	18900	1880.0	22.26
			1	middle	Mid	900	18900	1880.0	22.27
			1	upper	Mid	900	18900	1880.0	22.27
			1	lower	High	1150	19150	1905.0	21.80
			1	middle	High	1150	19150	1905.0	21.81
			1	upper	High	1150	19150	1905.0	21.81
		25 Block 16 QAM I_MCS 12	50%	lower	Low	650	18650	1855.0	22.37
			50%	middle	Low	650	187650	1855.0	22.37
			50%	upper	Low	650	18650	1855.0	22.36
			50%	lower	Mid	900	18900	1880.0	22.25
			50%	middle	Mid	900	18900	1880.0	22.26
			50%	upper	Mid	900	18900	1880.0	22.26
			50%	lower	High	1150	19150	1905.0	21.80
			50%	middle	High	1150	19150	1905.0	21.80
			50%	upper	High	1150	19150	1905.0	21.80
		50 Blocks 16 QAM I_MCS 12	100%	lower	Low	650	18650	1855.0	22.37
			100%	lower	Mid	900	18900	1880.0	22.26
			100%	lower	High	1150	19150	1905.0	21.80
	5 MHz 25 Blocks	1 Block QPSK I_MCS 5	1	lower	Low	625	18625	1852.5	23.26
			1	middle	Low	625	18625	1852.5	23.23
			1	upper	Low	625	18625	1852.5	23.37
			1	lower	Mid	900	18900	1880.0	23.32
			1	middle	Mid	900	18900	1880.0	23.17
			1	upper	Mid	900	18900	1880.0	23.26
			1	lower	High	1175	19175	1907.5	22.80
			1	middle	High	1175	19175	1907.5	22.87
			1	upper	High	1175	19175	1907.5	22.90

Table 15 (Continued)

Band	Bandwidth	Modulation	RB Size	RB Offset	Channel L-M-H	Downlink Channel	Uplink Channel	Frequency (MHz)	Power (dBm)
Band 2	5 MHz 25 Blocks	12 Block QPSK I_MCS 5	50%	lower	Low	625	18625	1852.5	22.35
			50%	middle	Low	625	18625	1852.5	22.28
			50%	upper	Low	625	18625	1852.5	22.41
			50%	lower	Mid	900	18900	1880.0	22.27
			50%	middle	Mid	900	18900	1880.0	22.29
			50%	upper	Mid	900	18900	1880.0	22.32
			50%	lower	High	1175	19175	1907.5	21.88
			50%	middle	High	1175	19175	1907.5	21.86
			50%	upper	High	1175	19175	1907.5	21.90
		25 Blocks QPSK I_MCS 5	100%	lower	Low	625	18625	1852.5	22.33
			100%	lower	Mid	900	18900	1880.0	22.24
			100%	lower	High	1175	19175	1907.5	21.95
		1 Block 16 QAM I_MCS 12	1	lower	Low	625	18625	1852.5	22.18
			1	middle	Low	625	18625	1852.5	22.11
			1	upper	Low	625	18625	1857.5	22.32
			1	lower	Mid	900	18900	1880.0	22.10
			1	middle	Mid	900	18900	1880.0	21.97
			1	upper	Mid	900	18900	1880.0	22.13
			1	lower	High	1175	19175	1907.5	21.97
			1	middle	High	1175	19175	1907.5	22.08
			1	upper	High	1175	19175	1907.5	22.14
		12 Block 16 QAM I_MCS 12	50%	lower	Low	625	18625	1852.5	21.24
			50%	middle	Low	625	18625	1852.5	21.27
			50%	upper	Low	625	18625	1857.5	21.35
			50%	lower	Mid	900	18900	1880.0	21.23
			50%	middle	Mid	900	18900	1880.0	21.20
			50%	upper	Mid	900	18900	1880.0	21.31
			50%	lower	High	1175	19175	1907.5	20.95
			50%	middle	High	1175	19175	1907.5	20.97
			50%	upper	High	1175	19175	1907.5	20.98
		25 Blocks 16 QAM I_MCS 12	100%	lower	Low	625	18625	1852.5	21.26
			100%	lower	Mid	900	18900	1880.0	21.35
			100%	lower	High	1175	19175	1907.5	20.96
	3 MHz 15 Blocks	1 Block QPSK I_MCS 5	1	lower	Low	615	18615	1851.5	22.32
			1	middle	Low	615	18615	1851.5	22.31
			1	upper	Low	615	18615	1851.5	22.30
			1	lower	Mid	900	18900	1880.0	22.33
			1	middle	Mid	900	18900	1880.0	22.27
			1	upper	Mid	900	18900	1880.0	22.24
			1	lower	High	1185	19185	1908.5	21.97
			1	middle	High	1185	19185	1908.5	21.86
			1	upper	High	1185	19185	1908.5	21.86

Table 15 (Continued)

Band	Bandwidth	Modulation	RB Size	RB Offset	Channel L-M-H	Downlink Channel	Uplink Channel	Frequency (MHz)	Power (dBm)
Band 2	3 MHz 15 Blocks	8 Block QPSK I_MCS 5	50%	lower	Low	615	18615	1851.5	22.32
			50%	middle	Low	615	18615	1851.5	22.35
			50%	upper	Low	615	18615	1851.5	22.32
			50%	lower	Mid	900	18900	1880.0	22.32
			50%	middle	Mid	900	18900	1880.0	22.32
			50%	upper	Mid	900	18900	1880.0	22.22
			50%	lower	High	1185	19185	1908.5	21.96
			50%	middle	High	1185	19185	1908.5	21.93
			50%	upper	High	1185	19185	1908.5	21.96
		15 Blocks QPSK I_MCS 5	100%	lower	Low	615	18615	1851.5	22.32
			100%	lower	Mid	900	18900	1880.0	22.32
			100%	lower	High	1185	19185	1908.5	21.96
		1 Block 16 QAM I_MCS 12	1	lower	Low	615	18615	1851.5	22.31
			1	middle	Low	615	18615	1851.5	22.32
			1	upper	Low	615	18615	1851.5	22.35
			1	lower	Mid	900	18900	1880.0	22.27
			1	middle	Mid	900	18900	1880.0	22.24
			1	upper	Mid	900	18900	1880.0	22.32
			1	lower	High	1185	19185	1908.5	21.85
			1	middle	High	1185	19185	1908.5	21.94
			1	upper	High	1185	19185	1908.5	21.85
		8 Block 16 QAM I_MCS 12	50%	lower	Low	615	18615	1851.5	22.36
			50%	middle	Low	615	18615	1851.5	22.31
			50%	upper	Low	615	18615	1851.5	22.34
			50%	lower	Mid	900	18900	1880.0	22.32
			50%	middle	Mid	900	18900	1880.0	22.32
			50%	upper	Mid	900	18900	1880.0	22.25
			50%	lower	High	1185	19185	1908.5	21.85
			50%	middle	High	1185	19185	1908.5	21.89
			50%	upper	High	1185	19185	1908.5	21.95
		15 Blocks 16 QAM I_MCS 12	100%	lower	Low	615	18615	1851.5	22.35
			100%	lower	Mid	900	18900	1880.0	22.27
			100%	lower	High	1185	19185	1908.5	21.87
	1.4 MHz 6 Blocks	1 Block QPSK I_MCS 5	1	lower	Low	607	18607	1850.7	22.41
			1	middle	Low	607	18607	1850.7	22.38
			1	upper	Low	607	18607	1850.7	22.43
			1	lower	Mid	900	18900	1880.0	22.36
			1	middle	Mid	900	18900	1880.0	22.36
			1	upper	Mid	900	18900	1880.0	22.36
			1	lower	High	1193	19193	1909.3	21.89
			1	middle	High	1193	19193	1909.3	21.90
			1	upper	High	1193	19193	1909.3	21.90

Table 15 (Continued)

Band	Bandwidth	Modulation	RB Size	RB Offset	Channel L-M-H	Downlink Channel	Uplink Channel	Frequency (MHz)	Power (dBm)
Band 2	1.4 MHz 6 Blocks	3 Block QPSK I_MCS 5	50%	lower	Low	607	18607	1850.7	22.43
			50%	middle	Low	607	18607	1850.7	22.41
			50%	upper	Low	607	18607	1850.7	22.42
			50%	lower	Mid	900	18900	1880.0	22.36
			50%	middle	Mid	900	18900	1880.0	22.30
			50%	upper	Mid	900	18900	1880.0	22.29
			50%	lower	High	1193	19193	1909.3	21.91
			50%	middle	High	1193	19193	1909.3	21.90
			50%	upper	High	1193	19193	1909.3	21.90
		6 Blocks QPSK I_MCS 5	100%	lower	Low	607	18607	1850.7	22.43
			100%	lower	Mid	900	18900	1880.0	22.29
			100%	lower	High	1193	19193	1909.3	21.89
		1 Block 16 QAM I_MCS 12	1	lower	Low	607	18607	1850.7	22.42
			1	middle	Low	607	18607	1850.7	22.43
			1	upper	Low	607	18607	1850.7	22.42
			1	lower	Mid	900	18900	1880.0	22.28
			1	middle	Mid	900	18900	1880.0	22.29
			1	upper	Mid	900	18900	1880.0	22.29
			1	lower	High	1193	19193	1909.3	21.90
			1	middle	High	1193	19193	1909.3	21.89
			1	upper	High	1193	19193	1909.3	21.90
		3 Block 16 QAM I_MCS 12	50%	lower	Low	607	18607	1850.7	22.42
			50%	middle	Low	607	18607	1850.7	22.42
			50%	upper	Low	607	18607	1850.7	22.42
			50%	lower	Mid	900	18900	1880.0	22.29
			50%	middle	Mid	900	18900	1880.0	22.28
			50%	upper	Mid	900	18900	1880.0	22.29
			50%	lower	High	1193	19193	1909.3	21.90
			50%	middle	High	1193	19193	1909.3	21.90
			50%	upper	High	1193	19193	1909.3	21.90
		6 Blocks 16 QAM I_MCS 12	100%	lower	Low	607	18607	1850.7	22.43
			100%	lower	Mid	900	18900	1880.0	22.35
			100%	lower	High	1193	19193	1909.3	21.91

13.2 Assessments at the Body

Table below presents the data of the body assessment. SAR plot(s) are included in Appendix E for the bolded data.

Table 16

Assessments at the Body (LTE B2) 1850 – 1910MHz band												
Antenna Pos.	**Battery**	**Test position**	**Carry Case**	**Cable Accessory**	**Freq (MHz)**	**Initial Power (mW)**	**SAR Drift (dB)**	**Meas. 1g-SAR (mW/g)**	**Meas. 10g-SAR (mW/g)**	**Max Calc. 1g-SAR (mW/g)**	**Max Calc. 10g-SAR (mW/g)**	**Run Number**
Assessment at body – 1 RB, 20MHz BW Ch.												
Ant 1	PMNN4472B Standard	Body	HKLN4618A back	None	1860.0	222	0.01	0.527	0.332	0.60	0.38	TLC-AB-160915-02
Ant 1	PMNN4472B Standard	Body	HKLN4618A front	None	1860.0	222	-0.20	0.404	0.253	0.48	0.30	TLC-AB-160915-04

Table 16 (Continued)

Assessments at the Body (LTE B2) 1850 – 1910MHz band												
Antenna Pos.	**Battery**	**Test position**	**Carry Case**	**Cable Accessory**	**Freq (MHz)**	**Initial Power (mW)**	**SAR Drift (dB)**	**Meas. 1g-SAR (mW/g)**	**Meas. 10g-SAR (mW/g)**	**Max Calc. 1g-SAR (mW/g)**	**Max Calc. 10g-SAR (mW/g)**	**Run Number**
Assessment at body – 50% RB, 20MHz BW Ch.												
Ant 1	PMNN4472B Standard	Body	HKLN4618A back	None	1860.0	177	0.13	0.452	0.288	**0.64**	**0.41**	TLC-AB-160915-03
Ant 1	PMNN4472B Standard	Body	HKLN4618A front	None	1860.0	177	0.09	0.338	0.212	0.48	0.30	TLC-AB-160915-05
Assessment at the body – extended battery												
Ant 1	PMNN4475B Extended	Body	HKLN4618A back	None	1860.0	177	0.02	0.331	0.211	0.47	0.30	TLC-AB-160915-06

13.3 Assessments at Hot spot mode

Table below presents the data of the body assessment. SAR plot(s) are included in Appendix E for the bolded data.

Table 17

Assessments at the Hot spot mode (LTE B2) 1850 – 1910MHz band												
Antenna Pos.	**Battery**	**Test position**	**Carry Case**	**Cable Accessory**	**Freq (MHz)**	**Initial Power (mW)**	**SAR Drift (dB)**	**Meas. 1g-SAR (mW/g)**	**Meas. 10g-SAR (mW/g)**	**Max Calc. 1g-SAR (mW/g)**	**Max Calc. 10g-SAR (mW/g)**	**Run Number**
Assessment at Hot spot mode – 1 RB, 20MHz BW Ch.												
Ant 1	PMNN4472B Standard	Body	Back of DUT @ 1cm	None	1860.0	222	-0.02	0.610	0.355	0.69	0.40	AZ-AB-160916-02
Ant 1	PMNN4472B Standard	Body	Front of DUT @ 1cm	None	1860.0	222	0.05	0.558	0.356	0.63	0.40	AZ-AB-160916-03
Ant 1	PMNN4472B Standard	Body	Non PTT Side of DUT @ 1cm	None	1860.0	222	0.03	0.682	0.405	0.7717	0.458	AZ-AB-160916-05
Ant 1	PMNN4472B Standard	Body	Bottom of DUT @ 1cm	None	1860.0	222	-0.05	0.407	0.245	0.47	0.28	AZ-AB-160916-10
Assessment at Hot spot mode – 50% RB, 20MHz BW Ch.												
Ant 1	PMNN4472B Standard	Body	Back of DUT @ 1cm	None	1860.0	177	-0.04	0.474	0.273	0.68	0.39	AZ-AB-160916-08
Ant 1	PMNN4472B Standard	Body	Front of DUT @ 1cm	None	1860.0	177	0.00	0.497	0.317	0.71	0.45	AZ-AB-160916-07
Ant 1	PMNN4472B Standard	Body	Non PTT Side of DUT @ 1cm	None	1860.0	177	0.01	0.544	0.323	0.7720	0.458	AZ-AB-160916-06
Ant 1	PMNN4472B Standard	Body	Bottom of DUT @ 1cm	None	1860.0	177	-0.01	0.324	0.196	0.46	0.28	AZ-AB-160916-09
Assessment at the Hot spot mode – extended battery												
Ant 1	PMNN4475B Extended	Body	Non PTT Side of DUT @ 1cm	None	1860.0	177	0.07	0.585	0.346	**0.83**	**0.49**	TLC-AB-160916-11

13.4 Assessments at the Head

Table below presents the data of the head assessment. SAR plot(s) are included in Appendix E for the bolded data.

Table 18

Assessments at the Head (LTE B2) 1850 – 1910MHz band												
Antenna Pos.	**Battery**	**Test position**	**Carry Case**	**Cable Accessory**	**Freq (MHz)**	**Initial Power (mW)**	**SAR Drift (dB)**	**Meas. 1g-SAR (mW/g)**	**Meas. 10g-SAR (mW/g)**	**Max Calc. 1g-SAR (mW/g)**	**Max Calc. 10g-SAR (mW/g)**	**Run Number**
Assessment at right ear – 1 RB, 20MHz BW Ch.												
Ant 1	PMNN4472B Standard	REAR	Touch	None	1860.0	222	-0.01	0.542	0.332	0.61	0.38	TLC-REAR-160916-14
Ant 1	PMNN4472B Standard	REAR	Tilt	None	1860.0	222	-0.04	0.298	0.170	0.34	0.19	TLC-REAR-160916-16
Assessment at right ear – 50% RB, 20MHz BW Ch.												
Ant 1	PMNN4472B Standard	REAR	Touch	None	1860.0	177	-0.11	0.471	0.288	**0.69**	**0.42**	TLC-REAR-160916-17
Ant 1	PMNN4472B Standard	REAR	Tilt	None	1860.0	177	0.17	0.240	0.136	0.34	0.19	TLC-REAR-160916-18
Assessment at left ear – 1 RB, 20MHz BW Ch.												
Ant 1	PMNN4472B Standard	LEAR	Touch	None	1860.0	222	-0.16	0.519	0.325	0.61	0.38	TLC-LEAR-160919-02
Ant 1	PMNN4472B Standard	LEAR	Tilt	None	1860.0	222	0.01	0.276	0.160	0.31	0.18	TLC-LEAR-160916-20
Assessment at left ear – 50% RB, 20MHz BW Ch.												
Ant 1	PMNN4472B Standard	LEAR	Touch	None	1860.0	177	0.02	0.454	0.277	0.64	0.39	TLC-LEAR-160916-21
Ant 1	PMNN4472B Standard	LEAR	Tilt	None	1860.0	177	-0.02	0.222	0.128	0.32	0.18	TLC-LEAR-160916-22
Assessment at the head – extended battery												
Ant 1	PMNN4475B Extended	REAR	Touch	None	1860.0	177	0.05	0.457	0.274	0.65	0.39	TLC-REAR-160919-05

13.5 Shortened Scan Assessment

A “shortened” scan using the highest SAR configuration overall from above was performed to validate the SAR drift of the full DASY5™ coarse and zoom scans. Note that the shortened scan represents the zoom scan performance result; this is obtained by first running a coarse scan to find the peak area and then, using a newly charged battery, a zoom scan only was performed. The results of the shortened cube scan presented in Appendix D demonstrate that the scaling methodology used to determine the calculated SAR results presented herein are valid. The SAR result from the Table below is provided in Appendix F.

Table 19

Antenna Pos.	Battery	Test position	Carry Case	Cable Accessory	Freq (MHz)	Initial Power (mW)	SAR Drift (dB)	Meas. 1g-SAR (mW/g)	Meas. 10g-SAR (mW/g)	Max Calc. 1g-SAR (mW/g)	Max Calc. 10g-SAR (mW/g)	Run Number
Ant 1	PMNN4475B Extended	Body	Non PTT Side of DUT @ 1cm	None	1860.0	177	0.04	0.543	0.322	0.77	0.46	TLC-AB-160916-13

14.0 Simultaneous Transmission Scenarios

Table 20

No.	Capable Transmit Configuration	Body	Hot Spot	Head
1	1 LTE + WLAN (2.4 GHz or 5GHz)	Yes	Yes	Yes
2	1 WCDMA + WLAN (2.4 GHz or 5GHz)	Yes	Yes	Yes
3	1 GSM + WLAN (2.4 GHz or 5GHz)	Yes	Yes	Yes
4	1 LTE + BT	Yes	Yes	Yes
5	1 WCDMA + BT	Yes	Yes	Yes
6	1 GSM + BT	Yes	Yes	Yes

WLAN 2.4GHz, 5.0GHz and BT share the same chipset, transmission path and antenna. The transmissions of these technologies are controlled by switching which only allows one technology to transmit at a single time and therefore do not support simultaneous transmission.

No changes on WLAN 2.4 GHz, 5 GHz and BT from initial filing. WLAN 2.4 GHz and 5 GHz Measured SAR during initial compliance assessment is used in conjunction with LTE for simultaneous results. Simultaneous transmission of BT had been excluded as derived in initial filing.

15.0 Results Summary

Based on the test guidelines from section 4.0 and satisfying frequencies within FCC bands, the highest Operational Maximum Calculated 1-gram and 10-gram average SAR values found for this filing:

Table 21

Equipment Class	Mode	Max Calc at Body (W/kg)		Max Calc at Hot Spot (W/kg)		Max Calc at Head (W/kg)	
		1g-SAR	10g-SAR	1g-SAR	10g-SAR	1g-SAR	10g-SAR
PCE	LTE B2 (1850-1910MHz)	**0.64**	**0.41**	**0.83**	**0.49**	**0.69**	**0.42**
DTS	2.4 GHz WLAN	**0.09**	**0.05**	0.11	0.05	0.23	0.11
DTS	5GHz WLAN	0.03	0.01	**0.57**	**0.19**	**0.41**	**0.12**
DSS	BT	NR	NR	NR	NR	NR	NR
Highest Simultaneous Results		**0.73**	**0.46**	**1.4**	**0.68**	**1.10**	**0.54**

NR – Results not required per KDB 447498 (derived in previous initial SAR report)

The test results clearly demonstrate compliance with FCC General Population/Uncontrolled RF Exposure limits of 1.6 W/kg averaged over 1 gram per the requirements of 47 CFR 2.1093(d). The 10 grams result is not applicable to FCC filing.

Note:
Initial filed highest reported SAR values for head, body-worn, hotspot and simultaneous transmission is 1.00 W/kg, 0.82 W/kg, 1.02 W/kg and 1.59 W/kg respectively. Degradation of SAR was not observed for this PCII therefore numbers found on initial compliance assessment report remain.

16.0 Variability Assessment

Per the guidelines in KDB 865664 SAR variability assessment is required because SAR results are above 0.8W/kg (General population).
The Table below includes test results of the original measurement(s), the repeated measurement(s), and the ratio (SAR_{high}/SAR_{low}) for the applicable test configuration(s).

Table 22

Run#	Antenna Pos.	Battery	Test position	Carry Case	Cable Accessory	Test Freq. (MHz)	Adj Calc. 1g-SAR (W/kg)	Ratio	Comments
TLC-AB-160916-11	Ant 1	PMNN4475B Extended	Body	Non PTT Side of DUT @ 1cm	None	1860.0	0.59	1.09	No additional repeated scans is required due to the Ratio (SAR_{high}/SAR_{low}) < 1.20
TLC-AB-160916-13							0.54		

17.0 System Uncertainty

A system uncertainty analysis is not required for this report per KDB 865664 because the highest report SAR value for General Population exposure is less than 1.5 W/kg

Per the guidelines of ISO 17025 a reported system uncertainty is required and therefore measurement uncertainty budget is included in Appendix A.

Appendix A
Measurement Uncertainty Budget

Table A.1: Uncertainty Budget for Device Under Test for 1900 MHz

a	*b*	*c*	*d*	*e = f(d,k)*	*f*	*g*	*h = c x f / e*	*i = c x g / e*	*k*
Uncertainty Component	**IEEE 1528 section**	**Tol. (± %)**	**Prob Dist**	**Div.**	c_i **(1 g)**	c_i **(10 g)**	**1 g** u_i **(±%)**	**10 g** u_i **(±%)**	v_i
Measurement System									
Probe Calibration	E.2.1	6.0	N	1.00	1	1	6.0	6.0	∞
Axial Isotropy	E.2.2	4.7	R	1.73	0.707	0.707	1.9	1.9	∞
Hemispherical Isotropy	E.2.2	9.6	R	1.73	0.707	0.707	3.9	3.9	∞
Boundary Effect	E.2.3	1.0	R	1.73	1	1	0.6	0.6	∞
Linearity	E.2.4	4.7	R	1.73	1	1	2.7	2.7	∞
System Detection Limits	E.2.5	1.0	R	1.73	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	0.3	N	1.00	1	1	0.3	0.3	∞
Response Time	E.2.7	1.1	R	1.73	1	1	0.6	0.6	∞
Integration Time	E.2.8	1.1	R	1.73	1	1	0.6	0.6	∞
RF Ambient Conditions - Noise	E.6.1	3.0	R	1.73	1	1	1.7	1.7	∞
RF Ambient Conditions - Reflections	E.6.1	0.0	R	1.73	1	1	0.0	0.0	∞
Probe Positioner Mech. Tolerance	E.6.2	0.4	R	1.73	1	1	0.2	0.2	∞
Probe Positioning w.r.t Phantom	E.6.3	1.4	R	1.73	1	1	0.8	0.8	∞
Max. SAR Evaluation (ext., int., avg.)	E.5	3.4	R	1.73	1	1	2.0	2.0	∞
Test sample Related									
Test Sample Positioning	E.4.2	3.2	N	1.00	1	1	3.2	3.2	29
Device Holder Uncertainty	E.4.1	4.0	N	1.00	1	1	4.0	4.0	8
SAR drift	6.6.2	5.0	R	1.73	1	1	2.9	2.9	∞
Phantom and Tissue Parameters									
Phantom Uncertainty	E.3.1	4.0	R	1.73	1	1	2.3	2.3	∞
Liquid Conductivity (target)	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity (measurement)	E.3.3	3.3	N	1.00	0.64	0.43	2.1	1.4	∞
Liquid Permittivity (target)	E.3.2	5.0	R	1.73	0.6	0.49	1.7	1.4	∞
Liquid Permittivity (measurement)	E.3.3	1.9	N	1.00	0.6	0.49	1.1	0.9	∞
Combined Standard Uncertainty			RSS				11	11	419
Expanded Uncertainty (95% CONFIDENCE LEVEL)			*k*=2				22	22	

Notes for uncertainty budget Tables:
a) Column headings *a*-*k* are given for reference.
b) Tol. - tolerance in influence quantity.
c) Prob. Dist. – Probability distribution
d) N, R - normal, rectangular probability distributions
e) Div. - divisor used to translate tolerance into normally distributed standard uncertainty
f) *ci* - sensitivity coefficient that should be applied to convert the variability of the uncertainty component into a variability of SAR.
g) *ui* – SAR uncertainty
h) *vi* - degrees of freedom for standard uncertainty and effective degrees of freedom for the expanded uncertainty

Table A.2: Uncertainty Budget for System Validation (dipole & flat phantom) for 1900 MHz

a	*b*	*c*	*d*	*e = f(d,k)*	*f*	*g*	*h = c x f / e*	*i = c x g / e*	*k*
Uncertainty Component	IEEE 1528 section	**Tol. (± %)**	**Prob. Dist.**	**Div.**	c_i **(1 g)**	c_i **(10 g)**	**1 g** u_i **(±%)**	**10 g** u_i **(±%)**	v_i
Measurement System									
Probe Calibration	E.2.1	6.0	N	1.00	1	1	6.0	6.0	∞
Axial Isotropy	E.2.2	4.7	R	1.73	1	1	2.7	2.7	∞
Spherical Isotropy	E.2.2	9.6	R	1.73	0	0	0.0	0.0	∞
Boundary Effect	E.2.3	1.0	R	1.73	1	1	0.6	0.6	∞
Linearity	E.2.4	4.7	R	1.73	1	1	2.7	2.7	∞
System Detection Limits	E.2.5	1.0	R	1.73	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	0.3	N	1.00	1	1	0.3	0.3	∞
Response Time	E.2.7	1.1	R	1.73	1	1	0.6	0.6	∞
Integration Time	E.2.8	0.0	R	1.73	1	1	0.0	0.0	∞
RF Ambient Conditions - Noise	E.6.1	3.0	R	1.73	1	1	1.7	1.7	∞
RF Ambient Conditions - Reflections	E.6.1	0.0	R	1.73	1	1	0.0	0.0	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.4	R	1.73	1	1	0.2	0.2	∞
Probe Positioning w.r.t. Phantom	E.6.3	1.4	R	1.73	1	1	0.8	0.8	∞
Max. SAR Evaluation (ext., int., avg.)	E.5	3.4	R	1.73	1	1	2.0	2.0	∞
Dipole									
Dipole Axis to Liquid Distance	8, E.4.2	2.0	R	1.73	1	1	1.2	1.2	∞
Input Power and SAR Drift Measurement	8, 6.6.2	5.0	R	1.73	1	1	2.9	2.9	∞
Phantom and Tissue Parameters									
Phantom Uncertainty	E.3.1	4.0	R	1.73	1	1	2.3	2.3	∞
Liquid Conductivity (target)	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity (measurement)	E.3.3	3.3	R	1.73	0.64	0.43	1.2	0.8	∞
Liquid Permittivity (target)	E.3.2	5.0	R	1.73	0.6	0.49	1.7	1.4	∞
Liquid Permittivity (measurement)	E.3.3	1.9	R	1.73	0.6	0.49	0.6	0.5	∞
Combined Standard Uncertainty			RSS				9	9	99999
Expanded Uncertainty (95% CONFIDENCE LEVEL)			*k*=2				18	17	

Notes for uncertainty budget Tables:
a) Column headings *a*-*k* are given for reference.
b) Tol. - tolerance in influence quantity.
c) Prob. Dist. – Probability distribution
d) N, R - normal, rectangular probability distributions
e) Div. - divisor used to translate tolerance into normally distributed standard uncertainty
f) *ci* - sensitivity coefficient that should be applied to convert the variability of the uncertainty component into a variability of SAR.
g) *ui* – SAR uncertainty
h) *vi* - degrees of freedom for standard uncertainty and effective degrees of freedom for the expanded uncertainty

Appendix B
Probe Calibration Certificates

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **Motorola Solutions MY**

Certificate No: **ES3-3096_Apr16**

CALIBRATION CERTIFICATE

Object	ES3DV3 - SN:3096
Calibration procedure(s)	QA CAL-01.v9, QA CAL-12.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6 Calibration procedure for dosimetric E-field probes
Calibration date:	April 29, 2016

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: S5277 (20x)	05-Apr-16 (No. 217-02293)	Apr-17
Reference Probe ES3DV2	SN: 3013	31-Dec-15 (No. ES3-3013_Dec15)	Dec-16
DAE4	SN: 660	23-Dec-15 (No. DAE4-660_Dec15)	Dec-16
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (No. 217-02285/02284)	In house check: Jun-16
Power sensor E4412A	SN: MY41498087	06-Apr-16 (No. 217-02285)	In house check: Jun-16
Power sensor E4412A	SN: 000110210	06-Apr-16 (No. 217-02284)	In house check: Jun-16
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Apr-13)	In house check: Jun-16
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 29, 2016

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Probe ES3DV3

SN:3096

Manufactured: July 12, 2005
Repaired: April 26, 2016
Calibrated: April 29, 2016

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3096

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (μV/(V/m)²)[A]	0.96	0.89	0.90	± 10.1 %
DCP (mV)[B]	105.7	104.3	104.8	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	185.2	±3.8 %
		Y	0.0	0.0	1.0		173.8	
		Z	0.0	0.0	1.0		196.7	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.57	67.8	19.7	5.67	138.2	±1.7 %
		Y	6.44	67.4	19.5		131.7	
		Z	6.59	67.8	19.5		149.1	
10101-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)	X	7.34	67.0	19.5	6.42	125.4	±1.7 %
		Y	7.61	67.9	20.1		143.6	
		Z	7.40	67.3	19.5		133.1	
10102-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)	X	7.61	67.1	19.7	6.60	127.1	±1.7 %
		Y	7.91	68.2	20.3		145.4	
		Z	7.60	67.1	19.4		135.3	
10108-CAC	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.50	67.5	19.6	5.80	137.0	±1.7 %
		Y	6.39	67.1	19.5		130.5	
		Z	6.44	67.2	19.3		146.5	
10109-CAC	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)	X	7.49	67.8	20.0	6.43	146.2	±1.7 %
		Y	7.37	67.5	19.9		139.9	
		Z	7.05	66.5	19.1		127.8	
10110-CAC	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	X	6.19	66.9	19.4	5.75	132.5	±1.7 %
		Y	6.08	66.6	19.3		127.5	
		Z	6.13	66.7	19.1		142.4	
10111-CAC	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)	X	7.22	67.4	19.8	6.44	141.3	±2.2 %
		Y	7.13	67.2	19.9		135.8	
		Z	7.13	67.4	19.6		148.8	
10112-CAC	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)	X	7.72	67.9	20.1	6.59	146.0	±1.9 %
		Y	7.63	67.7	20.1		140.7	
		Z	7.28	66.7	19.3		129.0	
10113-CAC	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)	X	7.49	67.6	20.1	6.62	143.6	±1.9 %
		Y	7.36	67.3	20.0		137.2	
		Z	7.09	66.6	19.4		127.0	
10140-CAB	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM)	X	7.90	68.2	20.2	6.49	148.7	±1.9 %
		Y	7.81	68.0	20.2		143.9	
		Z	7.56	67.2	19.5		134.1	
10141-CAB	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM)	X	7.70	67.3	19.7	6.53	127.2	±1.9 %
		Y	7.97	68.2	20.3		146.1	
		Z	7.60	67.0	19.4		135.4	

10142-CAC	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, QPSK)	X	6.04	66.7	19.3	5.73	130.8	±1.7 %
		Y	6.19	67.4	19.7		149.8	
		Z	5.97	66.6	19.1		140.2	
10143-CAC	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)	X	7.02	67.3	19.8	6.35	138.0	±1.9 %
		Y	6.90	67.1	19.7		132.9	
		Z	6.94	67.3	19.5		147.4	
10144-CAC	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM)	X	7.38	67.6	20.1	6.65	140.2	±1.9 %
		Y	7.28	67.5	20.1		135.4	
		Z	7.27	67.8	20.0		148.2	
10145-CAC	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)	X	5.78	66.2	19.1	5.76	126.9	±1.4 %
		Y	5.95	67.1	19.6		146.3	
		Z	5.63	65.9	18.6		133.9	
10146-CAC	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM)	X	6.76	67.2	19.7	6.41	133.2	±1.9 %
		Y	6.66	67.0	19.7		128.2	
		Z	6.59	67.1	19.5		140.7	
10147-CAC	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM)	X	7.06	67.4	20.0	6.72	134.5	±2.2 %
		Y	6.96	67.2	20.0		129.8	
		Z	6.95	67.6	20.0		141.4	
10149-CAB	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)	X	7.47	67.8	20.0	6.42	144.6	±1.9 %
		Y	7.41	67.7	20.1		140.2	
		Z	7.13	66.8	19.4		129.1	
10150-CAB	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)	X	7.74	67.9	20.2	6.60	146.5	±1.9 %
		Y	7.67	67.9	20.2		142.5	
		Z	7.35	66.9	19.4		130.7	
10154-CAC	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	6.17	66.8	19.3	5.75	132.7	±1.4 %
		Y	6.12	66.7	19.4		128.1	
		Z	6.16	66.9	19.2		142.4	
10155-CAC	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)	X	7.21	67.4	19.8	6.43	141.3	±1.9 %
		Y	7.16	67.4	20.0		136.7	
		Z	6.79	66.1	19.0		125.3	
10156-CAC	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, QPSK)	X	5.99	66.5	19.2	5.79	129.8	±1.7 %
		Y	6.16	67.3	19.8		149.3	
		Z	5.90	66.4	18.9		137.3	
10157-CAC	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)	X	7.01	67.2	19.8	6.49	136.9	±1.9 %
		Y	6.93	67.2	19.9		131.7	
		Z	6.88	67.2	19.6		143.5	
10158-CAC	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)	X	7.49	67.6	20.1	6.62	142.3	±1.9 %
		Y	7.42	67.6	20.1		137.4	
		Z	7.13	66.7	19.4		125.9	
10159-CAC	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)	X	7.12	67.3	19.9	6.56	137.4	±2.2 %
		Y	7.08	67.4	20.0		132.4	
		Z	7.02	67.5	19.8		145.3	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.61	67.3	19.5	5.82	135.9	±1.7 %
		Y	6.51	67.1	19.5		132.3	
		Z	6.62	67.4	19.5		146.9	

10161-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM)	X	7.52	67.7	20.0	6.43	144.3	±1.9 %
		Y	7.44	67.6	20.0		140.0	
		Z	7.11	66.6	19.2		127.8	
10162-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM)	X	7.75	67.9	20.1	6.58	146.0	±1.9 %
		Y	7.67	67.8	20.1		141.6	
		Z	7.35	66.8	19.4		130.4	
10166-CAC	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK)	X	5.41	66.8	19.4	5.46	143.9	±1.2 %
		Y	5.36	66.8	19.4		138.5	
		Z	5.14	66.1	18.8		129.3	
10167-CAC	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM)	X	6.46	67.9	20.1	6.21	149.0	±1.7 %
		Y	6.36	67.8	20.1		143.6	
		Z	5.99	66.7	19.2		131.7	
10168-CAC	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM)	X	6.66	67.1	20.0	6.79	125.6	±1.9 %
		Y	6.88	68.2	20.7		144.3	
		Z	6.54	67.4	20.0		133.1	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	5.24	66.8	19.5	5.73	135.2	±1.4 %
		Y	5.23	66.9	19.6		133.1	
		Z	5.10	66.7	19.1		145.3	
10170-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)	X	6.17	68.2	20.5	6.52	137.9	±1.7 %
		Y	6.12	68.1	20.5		134.4	
		Z	5.93	68.0	20.2		145.0	
10171-AAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM)	X	6.20	68.4	20.5	6.49	138.1	±1.7 %
		Y	6.14	68.2	20.6		134.7	
		Z	5.91	67.8	20.0		144.8	
10175-CAC	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	5.24	66.9	19.6	5.72	136.0	±1.4 %
		Y	5.21	66.8	19.6		133.5	
		Z	5.07	66.5	19.0		143.3	
10176-CAC	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)	X	6.20	68.3	20.5	6.52	138.9	±1.7 %
		Y	6.14	68.2	20.6		135.4	
		Z	5.91	67.8	20.1		145.0	
10177-CAE	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, QPSK)	X	5.26	67.0	19.6	5.73	136.2	±1.2 %
		Y	5.23	66.9	19.7		133.8	
		Z	5.07	66.5	19.0		143.4	
10178-CAC	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)	X	6.19	68.2	20.5	6.52	138.8	±1.7 %
		Y	6.16	68.2	20.6		135.8	
		Z	5.89	67.7	20.0		144.1	
10179-CAC	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)	X	6.21	68.4	20.5	6.50	138.1	±1.7 %
		Y	6.12	68.2	20.5		133.9	
		Z	5.92	68.0	20.1		143.5	
10180-CAC	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)	X	6.18	68.2	20.5	6.50	138.1	±1.7 %
		Y	6.15	68.3	20.6		134.8	
		Z	5.90	67.9	20.1		143.9	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	5.24	66.9	19.5	5.72	135.5	±1.4 %
		Y	5.25	67.0	19.7		133.1	
		Z	5.10	66.7	19.2		142.5	

10182-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)	X	6.17	68.2	20.5	6.52	138.0	±1.7 %
		Y	6.10	68.0	20.5		133.2	
		Z	5.89	67.7	20.0		142.5	
10183-AAA	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM)	X	6.17	68.2	20.5	6.50	137.2	±1.7 %
		Y	6.12	68.2	20.6		133.6	
		Z	5.93	68.1	20.2		142.5	
10184-CAC	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, QPSK)	X	5.22	66.8	19.5	5.73	134.5	±1.2 %
		Y	5.21	66.8	19.6		132.5	
		Z	5.15	66.9	19.3		141.2	
10185-CAC	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)	X	6.18	68.2	20.5	6.51	137.2	±1.9 %
		Y	6.10	68.0	20.5		132.7	
		Z	5.93	67.9	20.1		143.9	
10186-AAC	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM)	X	6.20	68.3	20.5	6.50	136.8	±1.7 %
		Y	6.11	68.1	20.5		133.6	
		Z	6.02	68.5	20.5		142.7	
10187-CAC	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)	X	5.25	66.9	19.5	5.73	134.3	±1.2 %
		Y	5.22	66.9	19.6		132.1	
		Z	5.10	66.7	19.2		141.6	
10188-CAC	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)	X	6.18	68.2	20.5	6.52	136.7	±1.9 %
		Y	6.12	68.1	20.6		132.9	
		Z	5.87	67.7	20.0		143.8	
10189-AAC	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM)	X	6.20	68.3	20.5	6.50	137.0	±1.7 %
		Y	6.11	68.1	20.5		132.3	
		Z	5.97	68.2	20.2		143.8	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.45	67.2	19.5	5.81	131.4	±1.7 %
		Y	6.37	67.1	19.5		128.0	
		Z	6.29	66.6	18.9		134.7	
10298-AAB	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, QPSK)	X	5.82	66.2	19.1	5.72	127.0	±1.4 %
		Y	6.03	67.2	19.7		146.8	
		Z	5.71	66.1	18.8		129.6	
10299-AAB	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)	X	6.84	67.2	19.7	6.39	132.9	±1.7 %
		Y	6.74	67.0	19.7		129.6	
		Z	6.66	67.1	19.5		135.2	
10300-AAB	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM)	X	7.08	67.4	20.0	6.60	134.1	±1.9 %
		Y	7.00	67.3	20.0		130.9	
		Z	6.91	67.4	19.8		141.9	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	7.01	67.8	19.9	6.06	138.2	±1.7 %
		Y	6.99	67.8	20.0		135.2	
		Z	6.74	66.9	19.3		125.0	

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of Norm X,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 8 and 9).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3096

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
150	52.3	0.76	7.16	7.16	7.16	0.08	1.20	± 13.3 %
300	45.3	0.87	7.14	7.14	7.14	0.14	1.60	± 13.3 %
450	43.5	0.87	6.70	6.70	6.70	0.22	1.70	± 13.3 %
750	41.9	0.89	6.55	6.55	6.55	0.80	1.17	± 12.0 %
900	41.5	0.97	6.19	6.19	6.19	0.73	1.22	± 12.0 %
1810	40.0	1.40	5.09	5.09	5.09	0.43	1.61	± 12.0 %
1900	40.0	1.40	5.05	5.05	5.05	0.56	1.39	± 12.0 %
2300	39.5	1.67	4.75	4.75	4.75	0.59	1.41	± 12.0 %
2450	39.2	1.80	4.52	4.52	4.52	0.73	1.32	± 12.0 %
2600	39.0	1.96	4.33	4.33	4.33	0.80	1.27	± 12.0 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

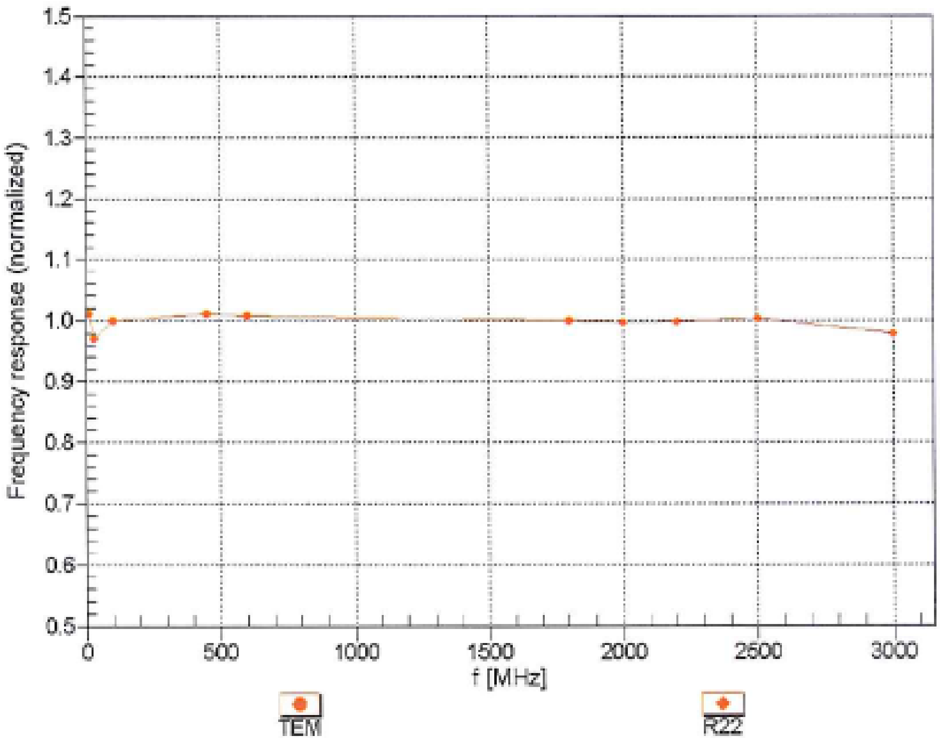
DASY/EASY - Parameters of Probe: ES3DV3 - SN:3096

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
150	61.9	0.80	6.97	6.97	6.97	0.08	1.50	± 13.3 %
300	58.2	0.92	6.76	6.76	6.76	0.12	1.30	± 13.3 %
450	56.7	0.94	6.82	6.82	6.82	0.15	1.30	± 13.3 %
750	55.5	0.96	6.11	6.11	6.11	0.61	1.37	± 12.0 %
900	55.0	1.05	5.97	5.97	5.97	0.62	1.32	± 12.0 %
1810	53.3	1.52	4.91	4.91	4.91	0.63	1.34	± 12.0 %
1900	53.3	1.52	4.74	4.74	4.74	0.56	1.45	± 12.0 %
2300	52.9	1.81	4.46	4.46	4.46	0.80	1.20	± 12.0 %
2450	52.7	1.95	4.31	4.31	4.31	0.80	1.18	± 12.0 %
2600	52.5	2.16	4.15	4.15	4.15	0.80	1.15	± 12.0 %

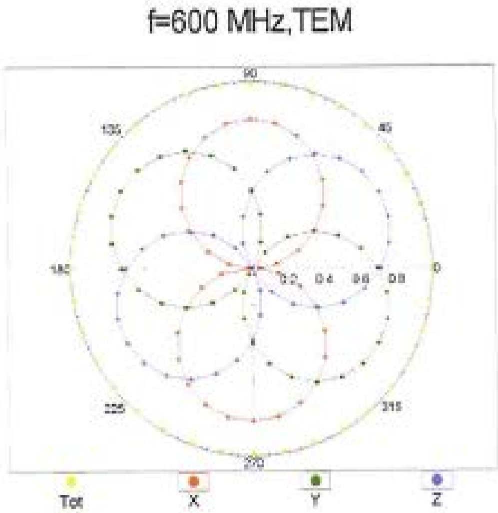
[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

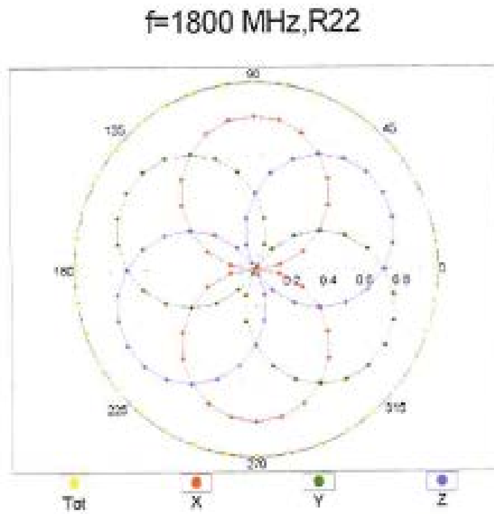
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)

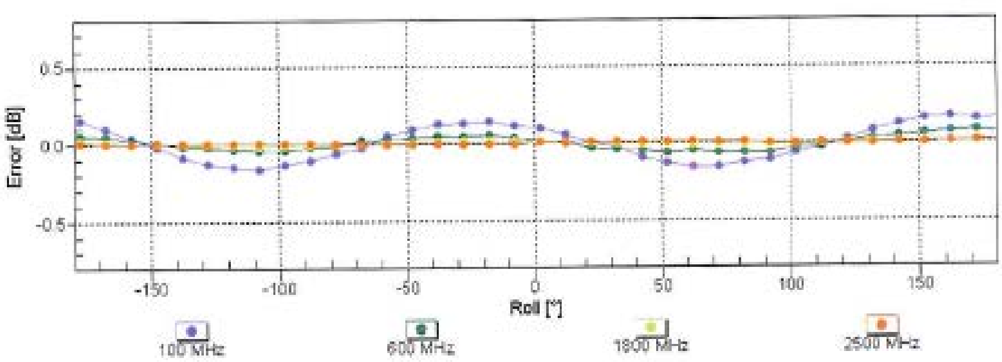


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), ϑ = 0°

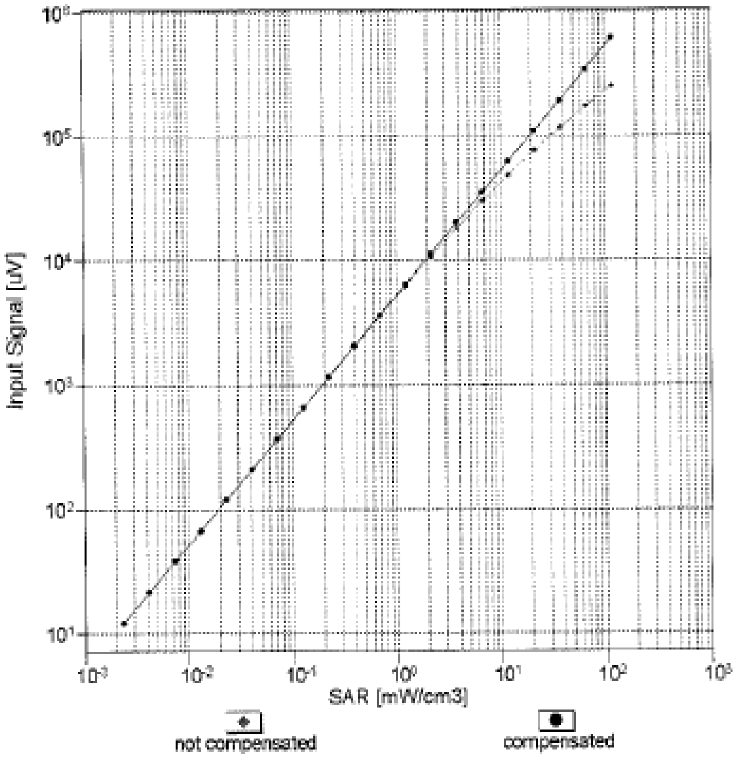


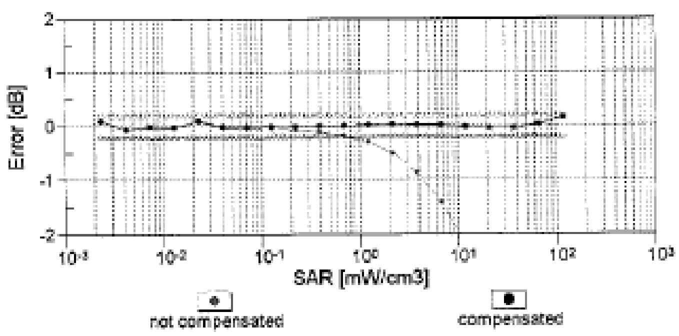




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

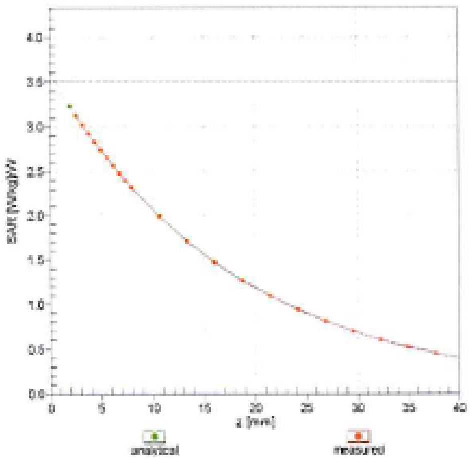
Dynamic Range f(SAR_{head})
(TEM cell , f_{eval}= 1900 MHz)

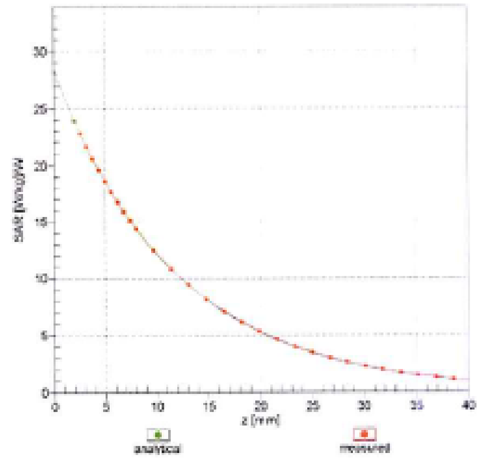




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

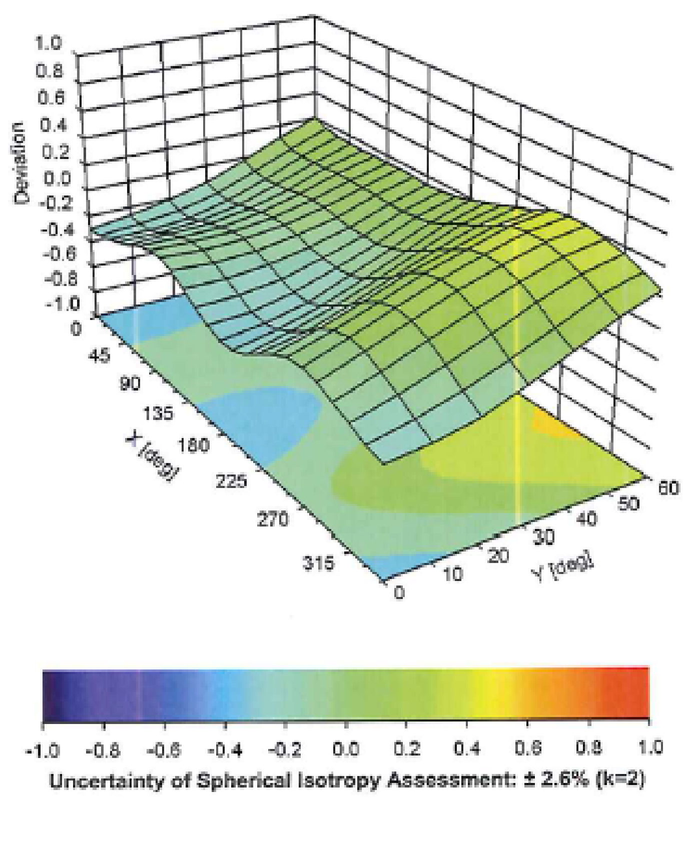
Conversion Factor Assessment





Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3096

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	2.3
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

Appendix C
Dipole Calibration Certificates

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **Motorola Solutions MY**

Certificate No: **D1900V2-5d064_Feb16**

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d064
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	February 15, 2016

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	07-Oct-15 (No. 217-02222)	Oct-16
Power sensor HP 8481A	US37292783	07-Oct-15 (No. 217-02222)	Oct-16
Power sensor HP 8481A	MY41092317	07-Oct-15 (No. 217-02223)	Oct-16
Reference 20 dB Attenuator	SN: 5058 (20k)	01-Apr-15 (No. 217-02131)	Mar-16
Type-N mismatch combination	SN: 5047.2 / 06327	01-Apr-15 (No. 217-02134)	Mar-16
Reference Probe EX3DV4	SN: 7349	31-Dec-15 (No. EX3-7349_Dec15)	Dec-16
DAE4	SN: 601	30-Dec-15 (No. DAE4-601_Dec15)	Dec-16

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100972	15-Jun-15 (in house check Jun-15)	In house check: Jun-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	M.Weber
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 16, 2016

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.3 ± 6 %	1.40 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.69 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**39.0 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.10 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**20.5 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.9 ± 6 %	1.52 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.0 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**39.9 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.31 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.2 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.5 Ω + 7.0 jΩ
Return Loss	- 22.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.9 Ω + 8.7 jΩ
Return Loss	- 21.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.193 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	December 10, 2004

DASY5 Validation Report for Head TSL

Date: 12.02.2016

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d064

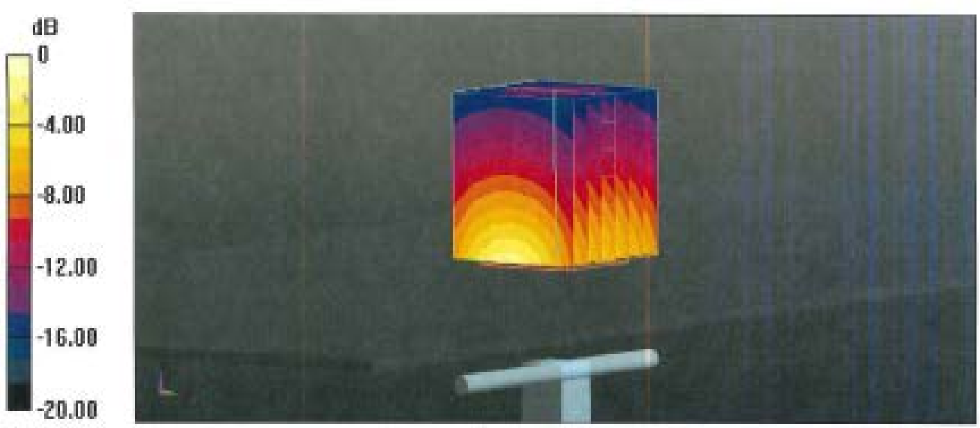
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.4 S/m; ε_r = 41.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.2, 8.2, 8.2); Calibrated: 31.12.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

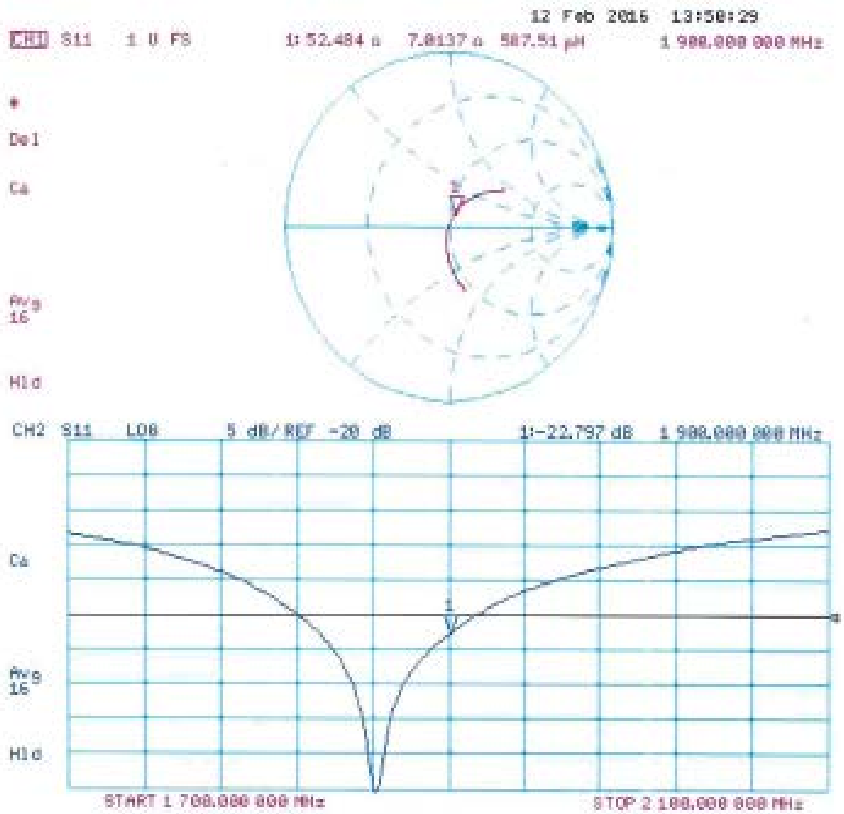
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 107.1 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 17.5 W/kg
SAR(1 g) = 9.69 W/kg; SAR(10 g) = 5.1 W/kg
Maximum value of SAR (measured) = 14.7 W/kg



0 dB = 14.7 W/kg = 11.67 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 15.02.2016

Test Laboratory: SPEAG, Zurich, Switzerland

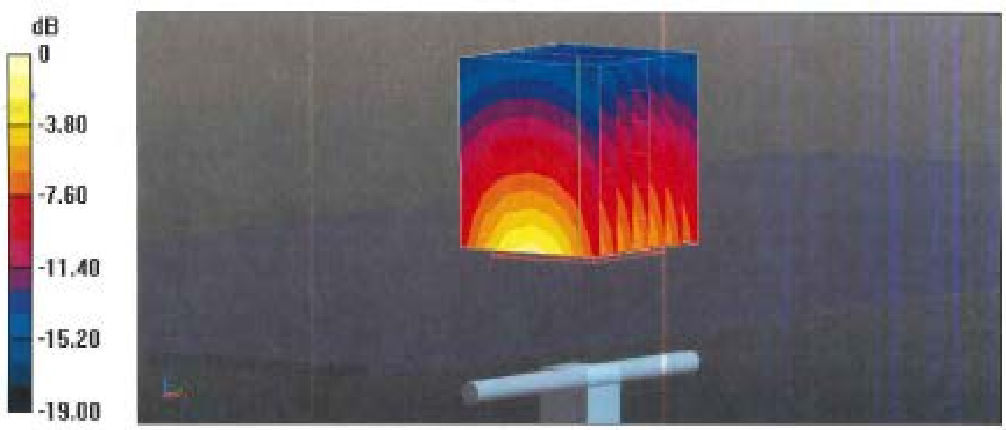
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d064

Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.52 S/m; ε_r = 52.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.03, 8.03, 8.03); Calibrated: 31.12.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 104.2 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 17.7 W/kg
SAR(1 g) = 10 W/kg; SAR(10 g) = 5.31 W/kg
Maximum value of SAR (measured) = 15.1 W/kg



0 dB = 15.1 W/kg = 11.79 dBW/kg

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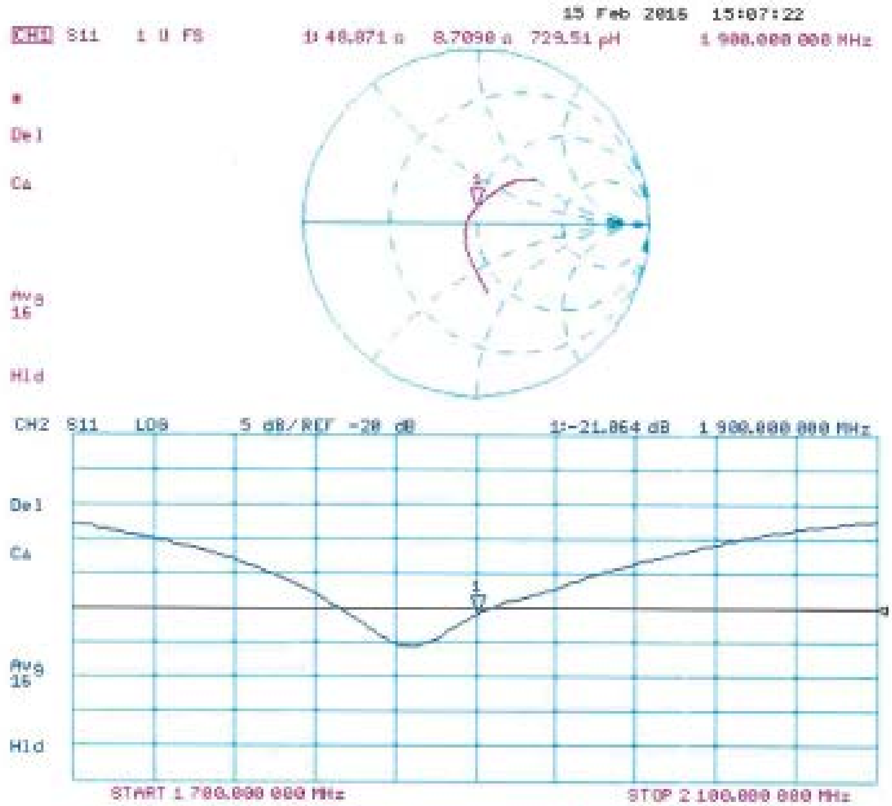
Impedance Measurement Plot for Body TSL



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Dipole Data

As stated in KDB 865664, only dipoles exceed annual calibration interval required to provide supporting information and measurement to qualify for extended calibration interval.

Dipole D1900V2 (Serial Number 5d064) not exceed annual calibration date, hence no further justification required.