MOTOROLA SOLUTIONS

CERTIFICATE 2518.05

DECLARATION OF COMPLIANCE SAR ASSESSMENT Part 1 of 2

Motorola Solutions, Inc.
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Date of Report: 12/15/2015
Report Revision: C

Responsible Engineer:	Saw Sun Hock (EME Engineer)
Report Author:	Saw Sun Hock (EME Engineer)
Date/s Tested:	10/13/15 – 10/27/2015, 11/04/2015
Manufacturer/Location:	Motorola Solutions, Inc, Penang
DUT Description:	Handheld Portable – FKP 136-174 5W GOB GNSS BT WLAN and NKP 136-174 5W GOB GNSS BT WLAN
Test TX mode(s):	CW (PTT), Bluetooth, and WLAN 802.11b/g/n
Max. Power output:	6.0 W (VHF band), 10.0 mW (Bluetooth), 26.3 mW (802.11b), 8.3 mW (802.11g), 12.6 mW (802.11n)
Nominal Power:	5.0 W (VHF band), 8.9 mW (Bluetooth), 16.6 mW (802.11b), 6.6 mW (802.11g), 10.0 mW (802.11n)
Tx Frequency Bands:	LMR 136-174 MHz; Bluetooth 2.402-2.480 GHz; WLAN 2.412-2.462 GHz
Signaling type:	FM, FHSS (Bluetooth), 802.11b/g/n (WLAN)
Model(s) Tested:	PMUD2904B & PMUD2906B
Model(s) Certified:	PMUD2904B & PMUD2906B
Serial Number(s):	871TRTT144, 871TRTT145, 807TRT5717
Classification:	Occupational/Controlled
FCC ID:	AZ489FT7066; LMR 150.8-173.4 MHz, Bluetooth 2.402-2.480 GHz, WLAN 2.412-2.462 GHz This report contains results that are immaterial for FCC equipment approval, which are clearly identified.
IC:	109U-89FT7066; This report contains results that are immaterial for IC equipment approval, which are clearly identified.

The test results clearly demonstrate compliance with FCC Occupational/Controlled RF Exposure limits of 8 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 10 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.

Deanna Zakharia
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Certification No.: L1151105 & L1151106

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Report Revision History

Date	Revision	Comments
11/17/2015	A	Initial release
12/11/2015	B	Updated WLAN power and KDB dates to newer revisions
12/15/2015	C	Amended the typo error at section 17, Variability Assessment.

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 PMUD2904B and PMUD2906B. These devices are classified as Occupational/Controlled.

2.0 FCC SAR Summary

Table 1

Equipment Class	Frequency band (MHz)	Max Calc at Body (W/kg)		Max Calc at Face (W/kg)	
		1g-SAR	10g-SAR	1g-SAR	10g-SAR
TNF	150.8-173.4 MHz (LMR)	3.01	1.27	1.21	0.93
*DSS	2402-2480 MHz (Bluetooth)	NA	NA	NA	NA
DTS	2412-2462 MHz (WLAN 802.11 b/g/n)	0.0281	0.0193	0.0820	0.0705
**Simultaneous Results		3.04	1.29	1.29	1.00

*Results not required per KDB (refer to sections 13.6 and 14.0)

3.0 Abbreviations / Definitions

BT: Bluetooth
CNR: Calibration Not Required
CW: Continuous Wave
DSS: Direct Spread Spectrum
DTS: Digital Transmission System
DUT: Device Under Test
EME: Electromagnetic Energy
FHSS: Frequency Hopping Spread Spectrum
FKP: Full Keypad
FM: Frequency Modulation
Li-Ion: Lithium-Ion
Li-Mn: Lithium Manganese
LMR: Land Mobile Radio
NA: Not Applicable
NiMH: Nickel Metal Hydride
NKP: No Keypad
OFDM: Orthogonal Frequency Division Multiplexing
PTT: Push to Talk
RF: Radio Frequency
RSM: Remote Speaker Microphone

SAR: Specific Absorption Rate
TNF: Licensed Non-Broadcast Transmitter Held to Face
WLAN: Wireless Local Area Network

Audio accessories: These accessories allow communication while the DUT is worn on the body.

Body worn accessories: These accessories allow the DUT to be worn on the body of the user.
Maximum Power: Defined as the upper limit of the production line final test station.

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 (2003), 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 – 643646 D01 SAR Test for PTT Radios v01r03
- 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 – 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)

These portable devices operate in the LMR bands using frequency modulation (FM). These devices also contain WLAN technology for data capabilities over 802.11b/g/n wireless networks and Bluetooth technology for short range wireless devices.

The LMR bands in these device operate in a half duplex system. A half duplex system only allows the user to transmit or receive. These devices cannot transmit and receive simultaneously. The user must stop transmitting in order to receive a signal or listen for a response, regardless of PTT button or use of voice activated audio accessories. This type of operation, along with the RF safety booklet, which instructs the user to transmit no more than 50% of the time, justifies the use of 50% duty factor for this device.

These devices also incorporate a Bluetooth v4.0, which includes classis Bluetooth, Bluetooth high speed and Bluetooth low energy. It is Class 1 Bluetooth device with Frequency Hopping Spread Spectrum (FHSS) technology. The Bluetooth radio modem is used to wireless link audio accessories. The maximum actual transmission duty cycle is imposed by the Bluetooth standard. The maximum duty cycle for BT is derived from 5-slots packet type operation which consists of receiving on 1-slot and transmitting on 5-slots, and thus maximum duty cycle = 77%

WLAN 802.11 b/g/n operate using Direct Sequence Spread Spectrum (DSSS) and Orthogonal Frequency-Division Multiplexing (OFDM) accordance with the IEEE 802.11 b/g/n

Table 3 below summarizes the technologies, bands, maximum duty cycles and maximum output powers. Maximum output powers are defined as upper limit of the production line final test station.

Table 3

Radio Type	Band (MHz)	Transmission	Duty Cycle (%)	Max Power (W)
LMR	136-174	FM	*50	6.00
BT	2402-2480	FHSS	77	0.01
WLAN	2412-2484	802.11b	100	0.0263
WLAN	2412-2484	802.11g	100	0.0083
WLAN	2412-2484	802.11n	100	0.0126

Note - * includes 50% PTT operation

The intended operating positions are “at the face” with the DUT at least 2.5cm from the mouth, and “at the body” by means of the offered body worn accessories. Body worn audio and PTT operation is accomplished by means of optional remote accessories that are connected to the radio. Operation at the body without an audio accessory attached is possible by means of BT accessories.

7.0 Optional Accessories and Test Criteria

These devices are offered with optional accessories. All accessories were individually evaluated during the test plan creation to determine if testing was required per the guidelines outlined in “SAR Test Reduction Considerations for Occupational PTT Radios” FCC KDB 643646 to assess compliance of the devices. The following sections identify the test criteria and details for each accessory category. Refer to Exhibit 7B for antenna separation distances.

7.1 Antennas

There are optional removable antennas and one internal BT/Wifi antenna offered for these product. The Table below lists their descriptions.

Table 4

Antenna Models	Description	Selected for test	Tested
PMAD4116A	VHF Helical antenna, 144-165MHz, ½ wave, -12dBi	Yes	Yes
PMAD4117A	VHF Helical antenna, 136-155MHz, ½ wave, -12dBi	Yes	Yes
PMAD4118A	VHF Helical antenna, 152-174MHz, ½ wave, -12dBi	Yes	Yes
PMAD4119A	VHF Stubby antenna, 136-148MHz, ¼ wave, -9.5dBi	Yes	Yes
PMAD4120A	VHF Stubby antenna, 146-160MHz, ¼ wave, -9.5dBi	Yes	Yes
PMAD4121B	VHF Stubby antenna, 160-174MHz, ¼ wave, -9.5dBi	Yes	Yes
0104039J80	IFA Bluetooth / WLAN antenna, 2400-2484MHz, ¼ wave, -4dBi	Yes	Yes; only for WLAN

7.2 Battery

There are optional batteries offered for this product. The Table below lists their descriptions.

Table 5

Battery Models	Description	Selected for test	Tested	Comments
PMNN4435A	Li-Mn, 1400 mAh Low Temp -30C Battery Submersible (IP57) 1300 Min 1400 Typical	Yes	Yes	
PMNN4463A	Li-Ion IP57 2000 mAh	Yes	Yes	
NNTN8129A	IMPRES Hi Capacity Li-Ion FM Battery 2300 Min 2350 Typical	Yes	Yes	
PMNN4409BR	IMPRES Hi Capacity Li-Ion Non-FM, 2150 mAh battery 2150 Min 2250 Typical	Yes	Yes	
PMNN4412A	Standard IP67 NiMH 1300 Min 1400 Typical	Yes	Yes	
PMNN4406BR	Core Slim Li-Ion, 1650 mAh Battery 1600 Min 1650 Typical	Yes	Yes	
PMNN4407BR	IMPRES Li-Ion, 1650 mAh Slim Battery 1600 Min 1650 Typical	Yes	Yes	
PMNN4448AR	IMPRES Standard IP67 Li-Ion 2700 Min 2800 Typical	Yes	Yes	
PMNN4493A	Belize Non-TIA High Capacity Low Voltage Li-Ion Battery 2950 Min 3000 Typical	Yes	Yes	Default battery for face testing
PMNN4489A	Belize TIA4950 IMPRES High Capacity Li-Ion Battery 2850 Min 2900 Typical	Yes	Yes	
PMNN4491A	Belize Slim Li-Ion Battery 2000 Min 2050 Typical	Yes	Yes	Default battery for body testing
PMNN4488A	Belize Ultra High Capacity Vibrator 2950 Min 3000 Typical	Yes	Yes	Only compatible with PMLN7296A
NNTN8560A	IMPRES Hi Capacity Li-Ion 2500 mAh battery Submersible (IP57), Intrinsically safe (TIA4950) 2300 Min 2500 Typical	Yes	Yes	

7.3 Body worn Accessories

All body worn accessories were considered. The Table below lists the body worn accessories, and body worn accessory descriptions.

Table 6

Body worn Models	Description	Selected for test	Tested	Comments
RLN4815A	Radio Pack Universal RADIOPAK & Utility Case	Yes	Yes	
HLN6602A	Chest Pack	Yes	Yes	
PMLN7296A	2.5 Inch Vibrating Belt Clip	Yes	Yes	Only compatible with battery PMNN4488A
RLN4570A	Break-A-Way Chest Pack	Yes	Yes	
PMLN7008A	2.5 Inch Belt Clip	Yes	Yes	
PMLN4651A	Belt Clip 2 Inch	Yes	Yes	
PMLN5844A	Nylon Case With 3 Inch Fixed Belt Loop For FKP and LKP	Yes	Yes	Tested with NTN5243A
PMLN5838A	Hard Leather Case With 3 Inch Fixed Belt Loop For FKP	Yes	Yes	Tested with NTN5243A
PMLN5842A	Hard Leather Case With 2.5 Inch Swivel Belt Loop For FKP and LKP	Yes	Yes	Tested without Belt Loop with NTN5243A

Table 6 continued

Body worn Models	Description	Selected for test	Tested	Comments
NTN5243A	Carrying Strap	Yes	Yes	Tested with PMLN5844A, PMLN5838A and PMLN5842A
PMLN5840A	Hard Leather Case With 3 Inch Swivel Belt Loop For FKP	No	No	By similarity to PMLN5842A with NTN5243A
PMLN5845A	Nylon Case with 3 Inch Fixed Belt Loop - No Display	No	No	By similarity to PMLN5844A with NTN5243A
PMLN5846A	Hard Leather Case with 3 Inch Swivel Belt Loop - No Display	No	No	By similarity to PMLN5842A with NTN5243A
PMLN5843A	Hard Leather Case with 2.5 Inch Swivel Belt Loop - No Display	No	No	By similarity to PMLN5842A with NTN5243A
PMLN5839A	Hard Leather Case with 3 Inch Fixed Belt Loop - No Display	No	No	By similarity to PMLN5838A with NTN5243A
4200865599	1.75-Inch Black Leather Belt	No	No	
4280384F89	RADIOPAK Lengthener	No	No	
HLN9985B	Waterproof Bag	No	No	
RLN4295A	Small Clip Epaulet Strap	No	No	
15012157001	Accessory Dust Cover	No	No	

7.4 Audio Accessories

All audio accessories were considered. The Table below lists the offered audio accessories and their descriptions. Exhibit 7B illustrates photos of the tested audio accessories.

Table 7

Audio Acc. Models	Description	Selected for test	Tested	Comments
PMMN4024A	Remote Speaker MIC	Yes	Yes	Default audio
PMLN5097A	IMPRES 3 Wire Surveillance -Black	Yes	*No	
RMN5137A	MT Series Over-The Head Headset, Direct Radio Connect	Yes	*No	
PMLN5275C	Heavy Duty Headset	Yes	*No	
PMLN5973A	Ear Receive With Inline MIC/PTT MagOne	Yes	*No	
PMMN4050A	IMPRES Large RSM With Ear jack, Noise Canceling.	Yes	*No	Tested with RMN4055B
PMMN4040A	Submersible Remote Speaker MIC	Yes	*No	
NNTN8383B	IMPRES Inc RSM, Audio Jack	Yes	*No	Tested with RMN4056B
RMN5058A	Core Lightweight Headset With PTT & VOX	Yes	*No	
PMLN5101A	IMPRES Temple Transducer	Yes	*No	
PMLN5102A	Core Ultra-Lite Headset	Yes	*No	
PMLN5096B	Core Earset D-Shell	Yes	*No	

Table 7 continued

PMLN6853A	Next Generation BTH Heavy Headset GCAI TIA4950	Yes	*No	Phase 2 Accessory
PMLN5975A	Swivel Earpiece With MIC/PTT MagOne	Yes	*No	
PMLN6833A	Temple Transducer With Boom MIC	Yes	*No	
PMLN6095A	PTT Nexus Adapter For Motorola Series Headsets	Yes	*No	Tested with RMN4053B
NNTN8459A	1 Wire Surveillance Kit With Translucent Tube, Black	Yes	*No	
PMLN6125A	Receive Only Surveillance Kit, Black	Yes	*No	
PMLN6127A	IMPRES 2 Wire Surveillance Kit, Black	Yes	*No	
PMLN6129A	IMPRES 2 Wire Surveillance Kit With Translucent Tube, Black	Yes	*No	
PMLN6123A	IMPRES 3 Wire Surveillance Kit With Translucent Tube, Black	Yes	*No	
RMN4055B	HT Series Listen Only Over The Head Headset With 3.5mm Non Treaded Connector	Yes	*No	Tested with PMMN4050A
RMN4056B	Receive Only Hard Hat Mount 3.5mm RT Angle Plug	Yes	*No	Tested with NNTN8383B
PMLN6765A	PTT/VOX Interface	Yes	*No	Tested with PMLN6833A and PMLN6767A
PMLN6767A	Remote Body PTT	Yes	*No	Tested with PMLN6833A and PMLN6765A
RMN4053B	Tactical PRO Series Hard Hat Headset With Nexus Connector	Yes	*No	Tested with PMLN6095A
PMMN4083A	IMPRES Large RSM APX IP68 Delta T (GCAI)	No	No	By similarity to PMMN4050A, Phase 2 Accessory
PMLN6852A	Next Generation Heavy Duty Headset GCAI	No	No	By similarity to PMLN6853A, Phase 2 Accessories
RMN5138A	MT Series Neckband Headset, Direct Radio Connect	No	No	By similarity to RMN5137A
RMN5139A	MT Series Hard Hat Attached Headset, Direct Radio Connect	No	No	By similarity to RMN5137A
PMLN6069A	Earbud with Inline MIC/PTT MagOne	No	No	By similarity to PMLN5973A
PMLN5974A	Lightweight Headset with Boom MIC & PTT MagOne	No	No	By similarity to PMLN5973A
PMLN5976A	Earset With Boom MIC Inline PTT MagOne	No	No	By similarity to PMLN5973A
PMLN5979A	Breeze Headset with Boom MIC & PTT MagOne	No	No	By similarity to PMLN5975A
PMLN5106A	Impres 3 Wire Surveillance - Beige	No	No	By similarity to PMLN5097A
PMMN4025A	Impres Remote Speaker MIC	No	No	By similarity to PMMN4024A
NNTN8382B	IMPRES Inc RSM, IP57	No	No	By similarity to NNTN8383B
PMLN5111A	IMPRES 3-Wire Surveillance with Acoustic Tube - Black	No	No	By similarity to PMLN6123A
PMLN5112A	IMPRES 3-Wire Surveillance with Acoustic Tube - Beige	No	No	By similarity to PMLN6123A
PMLN6088A	MT Series Over-The Head Headset with Nexus Connector	No	No	By similarity to RMN4053B
PMLN6124A	IMPRES 3 Wire Surveillance Kit With Translucent Tube, Beige	No	No	By similarity to PMLN6123A
PMLN6126A	Receive Only Surveillance Kit, Beige	No	No	By similarity to PMLN6125A
PMLN6128A	IMPRES 2 Wire Surveillance Kit, Beige	No	No	By similarity to PMLN6127A
PMLN6130A	IMPRES 2 Wire Surveillance Kit With Trans Tube, Beige	No	No	By similarity to PMLN6129A
PMLN6827A	PTT Interface	No	No	By similarity to PMLN6765A
PMLN6830A	Remote Ring PTT	No	No	By similarity to PMLN6767A
PMMN4046A	IMPRES Large RSM with Volume, Emergency, Programmable Button, IP57	No	No	By similarity to PMMN4050A

Table 7 continued

RLN5878A	Core 1 Wire Surveillance - Black	No	No	By similarity to PMLN6125A
RLN5879A	Core 1 Wire Surveillance - Beige	No	No	By similarity to PMLN6125A
RLN5880A	IMPRES 2 Wire Surveillance -Black	No	No	By similarity to PMLN6127A
RLN5881A	IMPRES 2 Wire Surveillance - Beige	No	No	By similarity to PMLN6127A
RLN5882A	IMPRES 2-Wire Surveillance with Acoustic Tube - Black	No	No	By similarity to PMLN6129A
RLN5883A	IMPRES 2-Wire Surveillance with Acoustic Tube - Beige	No	No	By similarity to PMLN6129A
RMN4052A	Tactical PRO Series Over-The-Head Headset with Nexus Connector	No	No	By similarity to RMN4053B
RMN5132A	HT Series Listen Only Neckband Headset with 3.5mm Non Threaded Connector	No	No	By similarity to RMN4055B
RMN5133A	HT Series Listen Only Hard Hat Headset with 3.5mm Non Threaded Connector	No	No	By similarity to RMN4055B
RMN5135A	Tactical PRO Series Neckband Headset with Nexus Connector	No	No	By similarity to RMN4053B
RMN4057B	Rx Only Hard Hat Mount 3.5mm Threaded	No	No	Receive only
BDN6727A	Receive Only Earpiece, Ext Loud, Black	No	No	Receive only
BDN6666A	Earpiece with Vol Control	No	No	Receive only
BDN6728A	Receive Only Earpiece with Vol, Black	No	No	Receive only
RLN5314A	Receive Only Surveillance Kit (Beige)/Noise	No	No	Receive only
RLN5313A	Receive Only Surveillance Kit (Black) /Noise	No	No	Receive only
BDN6664A	Receive Only Earpiece Beige 1-Wire	No	No	Receive only
BDN6719A	Earpiece w/3.5mm Threaded Plug	No	No	Receive only
BDN6781A	Earbud, Single Speaker	No	No	Receive only
BDN6726A	Receive Only Earpiece Black, 1-Wire	No	No	Receive only
RLN4941A	Receive Only Earpiece with Translucent Tube And Eartip - OTTO	No	No	Receive only
WADN4190B	Over The Ear Receiver For RSM	No	No	Receive only
PMLN4620B	D-Shell RX-Only Earpiece (3.5MM)	No	No	Receive only
AARLN4885B	Receive Only Earbud	No	No	Receive only
MDRLN4885B	Receive-Only Earbud	No	No	Receive only
MDRLN4941A	Receive-Only Earpiece	No	No	Receive only
RLN6284A	Earpiece with Acoustic Tube Assembly-Beige	No	No	Received only
RLN6285A	Earpiece with Acoustic Tube Assembly-Black	No	No	Received only
RLN6288A	Earpiece with High Noise Kit Assembly-Beige	No	No	Received only
RLN6289A	Earpiece with High Noise Kit Assembly-Black	No	No	Received only
RLN6242A	Low Noise Kit with Translucent Tube And 1 Clear Rubber Ear Tip	No	No	Received only
BDN6665A	Receive Only Earpiece, Ext Loud, Beige	No	No	Receive only
RMN4051B	MT Series Hard Hat Attached Headset with Nexus Connector	No	No	By similarity to RMN4053B
RLN6477A	MT Series Neckband Headset with Nexus Connector	No	No	By similarity to RMN4053B

Note - * SAR ≤ 4.0 W/kg, test not require as per KDB 643646 D01

8.0 Description of Test System

8.1 Descriptions of Robotics/Probes/Readout Electronics

Table 8

Dosimetric System type	System version	DAE type	Probe Type
Schmid & Partner Engineering AG SPEAG DASY 5	52.8.8.1222	DAE4	EX3DV4 (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 9

Phantom Type	Phantom(s) Used	Material Parameters	Phantom Dimensions LxWxD (mm)	Material Thickness (mm)	Support Structure Material	Loss Tangent (wood)
Triple Flat	NA	200MHz -6GHz; Er = 3-5, Loss Tangent = ≤0.05	280x175x175	2mm +/- 0.2mm	Wood	< 0.05
SAM	NA	300MHz -6GHz; Er = < 5, Loss Tangent = ≤0.05	Human Model			
Oval Flat	√	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 10. 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 10

Ingredients	150 MHz		2450 MHz	
	Head	Body	Head	Body
Sugar	55.40	49.70	0	0
Diacetin	0	0	51.00	34.50
De ionized – Water	38.35	46.20	48.75	65.20
Salt	5.15	3.00	0.15	0.20
HEC	1.00	1.00	0	0
Bact.	0.10	0.10	0.10	0.10

9.0 Additional Test Equipment

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

Table 11

Equipment Type	Model Number	Serial Number	Calibration Date	Calibration Due Date
Speag Probe	EX3DV4	3568	2/27/2015	2/27/2016
Speag Probe	EX3DV4	7364	6/23/2015	6/23/2016
Speag DAE	DEA4	688	2/23/2015	2/23/2016
Speag DAE	DAE4	684	11/5/2014	11/5/2015
Signal Generator	E4438C	MY45091270	7/9/2014	7/9/2016
Power Meter	E4418B	MY45100911	5/29/2015	5/29/2017
Power Sensor	8481B	SG41090258	7/3/2015	7/3/2016
*Power Meter	E4418B	MY45101014	10/21/2014	10/21/2015
*Power Sensor	8481B	MY41091170	10/25/2014	10/25/2015
Power Meter	E4416A	MY50001037	2/16/2015	2/16/2016
Power Sensor	N8481B	MY51450002	2/23/2015	2/23/2016
† Power Meter	E4418B	MY45100739	5/29/2015	5/29/2017
† Power Sensor	8481B	MY41091243	3/6/2015	3/6/2016
Broadband Power Sensor	NRP-Z11	120907	2/11/2015	2/11/2016
Power Amplifier	5S1G4	312988	CNR	CNR
Power Amplifier	10W1000C	312858	CNR	CNR
Bi-directional Coupler	3020A	41931	7/6/2015	7/6/2016
Bi-directional Coupler	3022	81639	7/6/2015	7/6/2016
Dickson Temperature Recorder	TM320	12253047	11/11/2014	11/11/2015
Temperature Probe	80PK-22	8766	8/21/2015	8/21/2016
Thermometer	DTM3000	3257	8/28/2015	8/28/2016
Thermometer	HH806AU	080307	11/12/2014	11/12/2015
Network Analyzer	E5071B	MY42403218	8/4/2015	8/4/2016
Dielectric Assessment Kit	DAK-12	1069	5/12/2015	5/12/2016
Speag Dipole	CLA150	4010	5/8/2014	5/8/2016
Speag Dipole	D2450V2	781	3/20/2015	3/20/2017

Note: * Equipment used for test dates prior to equipment calibration due date.
† Equipment used to replace equipment out for calibration.

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 12

Dates	Probe Calibration Point		Probe SN	Measured Tissue Parameters		Validation		
				σ	ϵ_r	Sensitivity	Linearity	Isotropy
CW								
4/28/2015	Body	150	3568	0.79	59.4	Pass	Pass	Pass
4/28/2015	Head	150		0.77	51.6	Pass	Pass	Pass
WLAN								
7/15/2015	Body	2450	7364	1.86	48.9	Pass	Pass	Pass
7/15/2015	Head	2450		1.77	36.4	Pass	Pass	Pass

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 13

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
3568	FCC Body	SPEAG CLA150 / 4010	3.69 +/- 10%	3.51	3.51	10/13/2015
				3.58	3.58	10/14/2015
				3.54	3.54	10/15/2015
				3.65	3.65	10/16/2015
				3.77	3.77	10/17/2015
				3.74	3.74	10/18/2015
				3.54	3.54	10/19/2015
				3.66	3.66	10/20/2015
				3.71	3.71	10/21/2015
				3.72	3.72	10/22/2015
				3.65	3.65	10/27/2015
				3.75	3.75	*11/03/2015
	IEEE/IEC Head		3.55 +/- 10%	3.71	3.71	10/23/2015
				3.48	3.48	10/25/2015
				3.47	3.47	10/26/2015
7364	FCC Body	SPEAG D2450V2 / 781	51.9 +/- 10%	12.2	48.80	10/22/2015
				12.3	49.20	10/23/2015
				12.4	49.60	10/24/2015
				12.4	49.60	10/26/2015
				12.5	50.00	10/27/2015
	IEEE/IEC Head		52.3 +/- 10%	13.5	54.00	10/19/2015
				13.3	53.20	10/20/2015
				13.3	53.20	10/21/2015
				13.1	52.40	10/22/2015

Note: * System performance check covered for next test day (within 24 hours).

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 14

Frequency (MHz)	Tissue Type	Conductivity Target (S/m)	Dielectric Constant Target	Conductivity Meas. (S/m)	Dielectric Constant Meas.	Tested Date
136	FCC Body	0.79 (0.75-0.83)	62.3 (59.1-65.4)	0.77	59.6	10/21/2015
				0.79	59.6	10/27/2015
	IEEE/ IEC Head	0.75 (0.71-0.79)	53.0 (50.3-55.6)	0.76	53.4	10/25/2015
				0.76	52.7	10/26/2015
140	FCC Body	0.79 (0.75-0.83)	62.2 (59.0-65.3)	0.77	59.4	10/21/2015
	IEEE/ IEC Head	0.75 (0.72-0.79)	52.8 (50.1-55.4)	0.76	52.5	10/26/2015
144	FCC Body	0.80 (0.76-0.84)	62.1 (58.9-65.2)	0.77	59.3	10/21/2015
	IEEE/ IEC Head	0.76 (0.72-0.79)	52.6 (49.9-55.2)	0.77	53.0	10/25/2015
				0.76	52.3	10/26/2015
146	FCC Body	0.80 (0.76-0.84)	62.0 (58.9-65.1)	0.77	59.2	10/21/2015
	IEEE/ IEC Head	0.76 (0.72-0.80)	52.5 (49.9-55.1)	0.76	52.2	10/26/2015
148	FCC Body	0.80 (0.76-0.84)	62.0 (58.9-65.0)	0.78	59.2	10/21/2015
	IEEE/ IEC Head	0.76 (0.72-0.80)	52.4 (49.8-55.0)	0.77	52.8	10/25/2015
				0.77	52.1	10/26/2015
150	FCC Body	0.80 (0.76-0.84)	61.9 (58.8-65.0)	0.79	59.2	10/13/2015
				0.79	58.9	10/14/2015
				0.80	59.1	10/15/2015
				0.78	59.3	10/16/2015
				0.79	58.9	10/17/2015
				0.81	58.9	10/18/2015
				0.82	58.9	10/19/2015
				0.78	59.2	10/20/2015
				0.78	59.1	10/21/2015
				0.77	59.5	10/22/2015
				0.80	59.2	10/27/2015
				0.77	58.9	*11/03/2015
	IEEE/ IEC Head	0.76 (0.72-0.80)	52.3 (49.7-54.9)	0.79	52.1	10/23/2015
				0.77	52.7	10/25/2015
				0.77	52.0	10/26/2015

Table 14 continued

Frequency (MHz)	Tissue Type	Conductivity Target (S/m)	Dielectric Constant Target	Conductivity Meas. (S/m)	Dielectric Constant Meas.	Tested Date
151	FCC Body	0.80 (0.76-0.84)	61.9 (58.8-65.0)	0.79	59.1	10/13/2015
				0.79	58.9	10/14/2015
				0.80	59.1	10/15/2015
				0.78	59.3	10/16/2015
				0.79	58.9	10/17/2015
				0.81	58.9	10/18/2015
				0.82	58.8	10/19/2015
				0.78	59.2	10/20/2015
				0.78	59.1	10/21/2015
				0.77	58.9	*11/03/2015
	IEEE/ IEC Head	0.76 (0.72-0.80)	52.3 (49.6-54.9)	0.79	52.1	10/23/2015
167	FCC Body	0.81 (0.77-0.85)	61.5 (58.4-64.6)	0.80	58.7	10/13/2015
				0.80	58.5	10/14/2015
				0.81	58.6	10/15/2015
				0.79	58.8	10/16/2015
				0.80	58.5	10/17/2015
				0.81	58.5	10/18/2015
				0.83	58.4	10/19/2015
				0.79	58.7	10/20/2015
	IEEE/ IEC Head	0.77 (0.73-0.81)	51.5 (48.9-54.1)	0.80	51.4	10/23/2015
				0.78	51.9	10/25/2015
2412	FCC Body	1.91 (1.82-2.01)	52.8 (47.5 -58.0)	1.93	48.1	10/22/2015
				1.92	48.2	10/23/2015
				1.94	48.2	10/24/2015
				1.92	47.7	10/26/2015
				1.95	48.1	10/27/2015
	IEEE/ IEC Head	1.77 (1.68-1.86)	39.3 (35.3-43.2)	1.84	35.7	10/19/2015
				1.83	35.5	10/20/2015
				1.80	35.6	10/21/2015
				1.80	35.5	10/22/2015
2450	FCC Body	1.95 (1.85-2.05)	52.7 (47.4-58.0)	1.99	47.9	10/22/2015
				1.97	48.1	10/23/2015
				1.98	48.0	10/24/2015
				1.97	47.6	10/26/2015
				1.98	48.0	10/27/2015
	IEEE/ IEC Head	1.80 (1.71-1.89)	39.2 (35.3-43.1)	1.88	35.5	10/19/2015
				1.86	35.3	10/20/2015
				1.84	35.4	10/21/2015
				1.85	35.3	10/22/2015

Note: * This tissue date covered for next test day (within 24 hours)

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 15

	Target	Measured
Ambient Temperature	18 – 25 ˚C	Range: 19.6 – 22.6˚C Avg. 21.4˚C
Tissue Temperature	NA	Range: 19.3 – 21.9˚C Avg. 20.6˚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 16

<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 and face 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 KDB 643646

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 as well as with and without the offered audio accessories as applicable.

12.3.2 Head

Not applicable.

12.3.3 Face

The DUT was positioned with its’ front separated 2.5cm from the phantom.

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:

$$Max\_Calc = SAR\_meas \cdot 10^{\frac{-Drift}{10}} \cdot \frac{P\_max}{P\_int} \cdot DC$$

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. All modes of operation identified in section 6.0 were considered during the development of the test plan.

LMR tests were performed in CW mode and 50% duty cycle was applied to PTT configurations in the final results.

WLAN tests were performed in 802.11b mode using a duty cycle of 99.88% with results scaled to 100% as per guidelines of KDB 248227.

Standalone and simultaneous BT testing were assessed in sections 13.6 and 14.0 per the guidelines of KDB 447498.

13.0 DUT Test Data

13.1 LMR assessments at the Body for 150.8-173.4 MHz band

Battery PMNN4491A was selected as the default battery for assessments at the Body because it is the thinnest battery (refer to Exhibit 7B for battery illustration). The default battery was used during conducted power measurements for all test channels within FCC allocated frequency range (150.8-173.4MHz) which are listed in Table 17. The channel with the highest conducted power will be identified as the default channel per KDB 643646 (SAR Test for PTT Radios). SAR plots of the highest results per Table (bolded) are presented in Appendix E.

Table 17

Test Freq (MHz)	Power (W)
150.800	5.98
152.000	5.93
155.000	5.92
160.000	5.92
165.000	5.93
166.500	5.95
173.400	5.94

Assessments at the Body with Body worn PMLN4651A

DUT assessment with offered antennas, default battery and, default body worn accessory per KDB 643646. Optional batteries were tested per the requirements of KDB 643646. Refer to Table 17 for highest output power channel. SAR plots of the highest results per Table (bolded) are presented in Appendix E.

Table 18

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
PMAD4116A	PMNN4491A	PMLN4651A	PMMN4024A	150.800	5.89	-0.25	1.430	0.955	0.77	0.52	KKL-AB-151013-06
				155.000							
				165.000							

Table 18 continued

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
PMAD4117A	PMNN4491A	PMLN4651A	PMMN4024A	150.800	5.95	-0.21	0.854	0.566	0.45	0.30	KKL-AB-151013-07
				155.000							
PMAD4118A	PMNN4491A	PMLN4651A	PMMN4024A	152.000							
				160.000							
				166.500	5.94	-0.32	0.750	0.518	0.41	0.28	KKL-AB-151013-08
				173.400							
PMAD4120A	PMNN4491A	PMLN4651A	PMMN4024A	150.800	5.95	-0.64	0.902	0.601	0.53	0.35	KKL-AB-151013-09
				155.000							
				160.000							
PMAD4121B	PMNN4491A	PMLN4651A	PMMN4024A	160.000							
				166.500	5.99	-0.68	0.747	0.513	0.44	0.30	FIE-AB-151014-02
				173.400							
Assessment of Additional Batteries											
PMAD4116A	PMNN4407BR	PMLN4651A	PMMN4024A	150.800	5.95	-0.28	1.450	0.949	0.78	0.51	FIE-AB-151014-03
PMAD4116A	PMNN4406BR	PMLN4651A	PMMN4024A	150.800	5.94	-0.31	1.460	0.949	0.79	0.51	FIE-AB-151014-04
PMAD4116A	PMNN4409BR	PMLN4651A	PMMN4024A	150.800	5.97	-0.29	1.370	0.877	0.74	0.47	FIE-AB-151014-05
PMAD4116A	PMNN4412A	PMLN4651A	PMMN4024A	150.800	6.00	-0.33	1.470	0.932	0.79	0.50	FIE-AB-151014-06
PMAD4116A	NNTN8129A	PMLN4651A	PMMN4024A	150.800	5.82	-0.30	1.400	0.882	0.77	0.49	FIE-AB-151014-07
PMAD4116A	PMNN4435A	PMLN4651A	PMMN4024A	150.800	6.00	-0.29	1.390	0.884	0.74	0.47	FIE-AB-151014-08
PMAD4116A	PMNN4448AR	PMLN4651A	PMMN4024A	150.800	6.00	-0.29	1.430	0.913	0.76	0.49	FIE-AB-151014-09
PMAD4116A	PMNN4489A	PMLN4651A	PMMN4024A	150.800	5.40	-0.23	1.530	0.940	**0.90**	**0.55**	TLC-AB-151014-10
PMAD4116A	PMNN4493A	PMLN4651A	PMMN4024A	150.800	6.00	-0.28	1.480	0.943	0.79	0.50	TLC-AB-151014-11
PMAD4116A	NNTN8560A	PMLN4651A	PMMN4024A	150.800	6.00	-0.20	1.590	0.975	0.83	0.51	TLC-AB-151014-12
PMAD4116A	PMNN4463A	PMLN4651A	PMMN4024A	150.800	6.00	-0.25	1.450	0.930	0.77	0.49	TLC-AB-151014-13

Assessments at the Body with Body worn PMLN7008A

DUT assessment with offered antennas, default battery, and optional body worn accessory per KDB 643646. Optional batteries were tested per the requirements of KDB 643646. Refer to Table 17 for highest output power channel. SAR plots of the highest results per Table (bolded) are presented in Appendix E.

Table 19

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
PMAD4116A	PMNN4491A	PMLN7008A	PMMN4024A	150.800	5.96	-0.25	1.520	1.000	0.81	0.53	TLC-AB-151014-14
				155.000							
				165.000							

Table 19 continued

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
PMAD4117A	PMNN4491A	PMLN7008A	PMMN4024A	150.800	5.95	-0.56	0.910	0.605	0.52	0.35	TLC-AB-151014-15
				155.000							
PMAD4118A	PMNN4491A	PMLN7008A	PMMN4024A	152.000							
				160.000							
				166.500	5.77	-0.23	0.779	0.532	0.43	0.29	TLC-AB-151014-16
				173.400							
PMAD4120A	PMNN4491A	PMLN7008A	PMMN4024A	150.800	5.92	-0.57	0.910	0.599	0.53	0.350	TLC-AB-151014-17
				155.000							
				160.000							
PMAD4121B	PMNN4491A	PMLN7008A	PMMN4024A	160.000							
				166.500	5.95	-0.84	0.817	0.553	0.50	0.34	TLC-AB-151014-18
				173.400							
Assessment of Additional Batteries											
PMAD4116A	PMNN4407BR	PMLN7008A	PMMN4024A	150.800	5.98	-0.26	1.530	0.984	0.81	0.52	TLC-AB-151014-19
PMAD4116A	PMNN4406BR	PMLN7008A	PMMN4024A	150.800	5.91	-0.28	1.600	1.020	0.87	0.55	TLC-AB-151014-20
PMAD4116A	PMNN4409BR	PMLN7008A	PMMN4024A	150.800	5.91	-0.29	1.480	0.931	0.80	0.51	MO-AB-151015-02
PMAD4116A	PMNN4412A	PMLN7008A	PMMN4024A	150.800	5.75	-0.28	1.530	0.963	0.85	0.54	MO-AB-151015-03
PMAD4116A	NNTN8129A	PMLN7008A	PMMN4024A	150.800	5.81	-0.30	1.570	0.971	0.87	0.54	MO-AB-151015-04
PMAD4116A	PMNN4435A	PMLN7008A	PMMN4024A	150.800	6.00	-0.34	1.500	0.936	0.81	0.51	MO-AB-151015-05
PMAD4116A	PMNN4448AR	PMLN7008A	PMMN4024A	150.800	6.00	-0.26	1.470	0.925	0.78	0.49	MO-AB-151015-06
PMAD4116A	PMNN4489A	PMLN7008A	PMMN4024A	150.800	5.71	-0.20	1.640	0.993	0.90	0.55	MO-AB-151015-07
PMAD4116A	PMNN4493A	PMLN7008A	PMMN4024A	150.800	6.00	-0.30	1.530	0.965	0.82	0.52	MO-AB-151015-08
PMAD4116A	NNTN8560A	PMLN7008A	PMMN4024A	150.800	5.73	-0.18	1.670	1.020	**0.91**	**0.56**	MO-AB-151015-09
PMAD4116A	PMNN4463A	PMLN7008A	PMMN4024A	150.800	6.00	-0.33	1.560	0.961	0.84	0.52	MO-AB-151015-10

Assessments at the Body with Body worn RLN4815A
DUT assessment with offered antennas, default battery and, optional body worn accessory per KDB 643646. Optional batteries were tested per the requirements of KDB 643646. Refer to Table 17 for highest output power channel. SAR plots of the highest results per Table (bolded) are presented in Appendix E.

Table 20

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
PMAD4116A	PMNN4491A	RLN4815A	PMMN4024A	150.800	6.00	-0.27	1.080	0.825	0.57	0.44	MO-AB-151015-11
				155.000							
				165.000							

Table 20 continued

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
PMAD4117A	PMNN4491A	RLN4815A	PMMN4024A	150.800	6.00	-0.19	0.697	0.535	0.36	0.28	MO-AB-151015-12
				155.000							
PMAD4118A	PMNN4491A	RLN4815A	PMMN4024A	152.000							
				160.000							
				166.500	6.00	-0.37	0.639	0.488	0.35	0.27	MO-AB-151015-13
				173.400							
PMAD4120A	PMNN4491A	RLN4815A	PMMN4024A	150.800	5.97	-0.68	0.678	0.495	0.40	0.29	MO-AB-151015-14
				155.000							
				160.000							
PMAD4121B	PMNN4491A	RLN4815A	PMMN4024A	160.000							
				166.500	6.00	-0.96	0.586	0.433	0.37	0.27	MO-AB-151015-15
				173.400							
Assessment of Additional Batteries											
PMAD4116A	PMNN4407BR	RLN4815A	PMMN4024A	150.800	6.00	-0.30	1.090	0.836	**0.58**	**0.45**	MO-AB-151015-16
PMAD4116A	PMNN4406BR	RLN4815A	PMMN4024A	150.800	6.00	-0.28	1.030	0.793	0.55	0.42	AZ-AB-151015-17
PMAD4116A	PMNN4409BR	RLN4815A	PMMN4024A	150.800	5.96	-0.30	0.929	0.716	0.50	0.39	AZ-AB-151015-18
PMAD4116A	PMNN4412A	RLN4815A	PMMN4024A	150.800	6.00	-0.32	1.030	0.795	0.55	0.43	AZ-AB-151015-19
PMAD4116A	NNTN8129A	RLN4815A	PMMN4024A	150.800	5.85	-0.30	0.878	0.679	0.48	0.37	AZ-AB-151015-20
PMAD4116A	PMNN4435A	RLN4815A	PMMN4024A	150.800	6.00	-0.37	0.957	0.738	0.52	0.40	AZ-AB-151015-21
PMAD4116A	PMNN4448AR	RLN4815A	PMMN4024A	150.800	6.00	-0.29	0.953	0.735	0.51	0.39	AZ-AB-151015-22
PMAD4116A	PMNN4489A	RLN4815A	PMMN4024A	150.800	5.72	-0.26	0.952	0.736	0.53	0.41	AZ-AB-151016-01
PMAD4116A	PMNN4493A	RLN4815A	PMMN4024A	150.800	6.00	-0.29	0.966	0.744	0.52	0.40	AZ-AB-151016-02
PMAD4116A	NNTN8560A	RLN4815A	PMMN4024A	150.800	5.75	-0.30	0.974	0.751	0.54	0.42	AZ-AB-151016-03
PMAD4116A	PMNN4463A	RLN4815A	PMMN4024A	150.800	6.00	-0.35	0.934	0.722	0.51	0.39	AZ-AB-151016-04

Assessments at the Body with Body worn HLN6602A

DUT assessment with offered antennas, default battery and, optional body worn accessory per KDB 643646. Optional batteries were tested per the requirements of KDB 643646. Refer to Table 17 for highest output power channel. SAR plots of the highest results per Table (bolded) are presented in Appendix E.

Table 21

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
PMAD4116A	PMNN4491A	HLN6602A	PMMN4024A	150.800	6.00	-0.61	1.510	1.100	**0.87**	**0.63**	AZ-AB-151016-05
				155.000							
				165.000							

Table 21 continued

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
PMAD4117A	PMNN4491A	HLN6602A	PMMN4024A	150.800	6.00	-1.08	0.706	0.523	0.45	0.34	AZ-AB-151016-07
				155.000							
PMAD4118A	PMNN4491A	HLN6602A	PMMN4024A	152.000							
				160.000							
				166.500	6.00	-0.36	0.825	0.608	0.45	0.33	AZ-AB-151016-11
				173.400							
PMAD4120A	PMNN4491A	HLN6602A	PMMN4024A	150.800	6.00	-0.66	1.320	0.851	0.77	0.50	AZ-AB-151016-09
				155.000							
				160.000							
PMAD4121B	PMNN4491A	HLN6602A	PMMN4024A	160.000							
				166.500	6.00	-0.58	1.010	0.674	0.58	0.39	MO-AB-151016-13
				173.400							
Assessment of Additional Batteries											
PMAD4116A	PMNN4407BR	HLN6602A	PMMN4024A	150.800	6.00	-0.27	1.480	1.080	0.79	0.57	MO-AB-151016-16
PMAD4116A	PMNN4406BR	HLN6602A	PMMN4024A	150.800	6.00	-0.21	1.490	1.090	0.78	0.57	MO-AB-151016-17
PMAD4116A	PMNN4409BR	HLN6602A	PMMN4024A	150.800	6.00	-0.19	1.360	1.020	0.71	0.53	MO-AB-151016-18
PMAD4116A	PMNN4412A	HLN6602A	PMMN4024A	150.800	5.78	-0.22	1.400	1.040	0.76	0.57	MO-AB-151016-19
PMAD4116A	NNTN8129A	HLN6602A	PMMN4024A	150.800	5.80	-0.24	1.360	1.020	0.74	0.56	MO-AB-151016-20
PMAD4116A	PMNN4435A	HLN6602A	PMMN4024A	150.800	6.00	-0.29	1.390	1.030	0.74	0.55	MO-AB-151016-21
PMAD4116A	PMNN4448AR	HLN6602A	PMMN4024A	150.800	6.00	-0.63	1.370	1.030	0.79	0.60	MO-AB-151016-22
PMAD4116A	PMNN4489A	HLN6602A	PMMN4024A	150.800	5.75	-0.15	1.380	1.030	0.75	0.56	MO-AB-151016-23
PMAD4116A	PMNN4493A	HLN6602A	PMMN4024A	150.800	6.00	-0.54	1.350	1.020	0.76	0.58	MO-AB-151016-24
PMAD4116A	NNTN8560A	HLN6602A	PMMN4024A	150.800	5.70	-0.16	1.360	1.020	0.74	0.56	MO-AB-151016-25
PMAD4116A	PMNN4463A	HLN6602A	PMMN4024A	150.800	6.00	-0.39	1.320	1.000	0.72	0.55	MO-AB-151016-26

Assessments at the Body with Body worn RLN4570A
DUT assessment with offered antennas, default battery and, optional body worn accessory per KDB 643646. Optional batteries were tested per the requirements of KDB 643646. Refer to Table 17 for highest output power channel. SAR plots of the highest results per Table (bolded) are presented in Appendix E.

Table 22

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
PMAD4116A	PMNN4491A	RLN4570A	PMMN4024A	150.800	6.00	-0.62	1.510	1.120	0.87	0.65	AZ-AB-151016-27
				155.000							
				165.000							

Table 22 continued

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
PMAD4117A	PMNN4491A	RLN4570A	PMMN4024A	150.800	6.00	-0.79	0.771	0.575	0.46	0.34	AZ-AB-151016-29
				155.000							
PMAD4118A	PMNN4491A	RLN4570A	PMMN4024A	152.000							
				160.000							
				166.500	6.00	-0.36	0.835	0.622	0.45	0.34	AZ-AB-151016-30
				173.400							
PMAD4120A	PMNN4491A	RLN4570A	PMMN4024A	150.800	5.98	-0.57	1.630	1.030	0.93	0.59	TLC-AB-151017-02
				155.000							
				160.000							
PMAD4121B	PMNN4491A	RLN4570A	PMMN4024A	160.000							
				166.500	5.95	-0.52	1.240	0.795	0.70	0.45	TLC-AB-151017-03
				173.400							
Assessment of Additional Batteries											
PMAD4120A	PMNN4407BR	RLN4570A	PMMN4024A	150.800	5.91	-0.55	1.620	1.010	0.93	0.58	TLC-AB-151017-04
PMAD4120A	PMNN4406BR	RLN4570A	PMMN4024A	150.800	6.00	-0.59	1.720	6.00	**0.99**	**0.62**	MO-AB-151022-10
PMAD4120A	PMNN4409BR	RLN4570A	PMMN4024A	150.800	5.93	-0.58	1.280	0.861	0.74	0.50	TLC-AB-151017-06
PMAD4120A	PMNN4412A	RLN4570A	PMMN4024A	150.800	5.80	-0.46	1.340	0.887	0.77	0.51	TLC-AB-151017-07
PMAD4120A	NNTN8129A	RLN4570A	PMMN4024A	150.800	5.77	-0.56	1.300	0.873	0.77	0.52	TLC-AB-151017-08
PMAD4120A	PMNN4435A	RLN4570A	PMMN4024A	150.800	6.00	-0.55	1.270	0.853	0.72	0.48	TLC-AB-151017-09
PMAD4120A	PMNN4448AR	RLN4570A	PMMN4024A	150.800	6.00	-0.65	1.300	0.864	0.76	0.50	AZ-AB-151018-02
PMAD4120A	PMNN4489A	RLN4570A	PMMN4024A	150.800	5.75	-0.77	1.150	0.794	0.72	0.49	AZ-AB-151018-03
PMAD4120A	PMNN4493A	RLN4570A	PMMN4024A	150.800	6.00	-0.73	1.180	0.813	0.70	0.48	AZ-AB-151018-04
PMAD4120A	NNTN8560A	RLN4570A	PMMN4024A	150.800	5.71	-0.72	1.300	0.871	0.81	0.54	AZ-AB-151018-05
PMAD4120A	PMNN4463A	RLN4570A	PMMN4024A	150.800	6.00	-0.73	1.170	0.814	0.69	0.48	AZ-AB-151018-06

Assessments at the Body with Body worn PMLN5844A with NTN5243A
DUT assessment with offered antennas, default battery and, optional body worn accessory per KDB 643646. Optional batteries were tested per the requirements of KDB 643646. Refer to Table 17 for highest output power channel. SAR plots of the highest results per Table (bolded) are presented in Appendix E.

Table 23

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
PMAD4116A	PMNN4491A	PMLN5844A with fixed belt loop w/NTN5243A	PMMN4024A	150.800	6.00	-0.37	0.825	0.636	**0.449**	**0.35**	AZ-AB-151019-05
				155.000							
				165.000							

Table 23 continued

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
PMAD4117A	PMNN4491A	PMLN5844A with fixed belt loop w/NTN5243 A	PMMN4024A	150.800	6.00	-0.22	0.556	0.431	0.29	0.23	AZ-AB-151019-06
				155.000							
PMAD4118A	PMNN4491A	PMLN5844A with fixed belt loop w/NTN5243 A	PMMN4024A	152.000							
				160.000							
				166.500	6.00	-0.41	0.496	0.380	0.27	0.21	AZ-AB-151019-07
				173.400							
PMAD4120A	PMNN4491A	PMLN5844A with fixed belt loop w/NTN5243 A	PMMN4024A	150.800	6.00	-0.67	0.494	0.374	0.29	0.22	AZ-AB-151019-08
				155.000							
				160.000							
PMAD4121B	PMNN4491A	PMLN5844A with fixed belt loop w/NTN5243 A	PMMN4024A	160.000							
				166.500	6.00	-0.82	0.421	0.318	0.25	0.19	AZ-AB-151019-09
				173.400							
Assessment of Additional Batteries											
PMAD4116A	PMNN4407BR	PMLN5844A with fixed belt loop w/NTN5243 A	PMMN4024A	150.800	6.00	-0.33	0.814	0.629	0.44	0.34	AZ-AB-151019-10
PMAD4116A	PMNN4406BR	PMLN5844A with fixed belt loop w/NTN5243 A	PMMN4024A	150.800	6.00	-0.34	0.820	0.634	0.44	0.34	AZ-AB-151019-11
PMAD4116A	PMNN4409BR	PMLN5844A with fixed belt loop w/NTN5243 A	PMMN4024A	150.800	6.00	-0.36	0.760	0.587	0.41	0.32	AZ-AB-151019-12
PMAD4116A	PMNN4412A	PMLN5844A with fixed belt loop w/NTN5243 A	PMMN4024A	150.800	5.81	-0.34	0.680	0.423	0.38	0.24	AZ-AB-151019-13
PMAD4116A	NNTN8129A	PMLN5844A with fixed belt loop w/NTN5243 A	PMMN4024A	150.800	5.75	-0.34	0.624	0.388	0.35	0.22	AZ-AB-151019-14
PMAD4116A	PMNN4435A	PMLN5844A with fixed belt loop w/NTN5243 A	PMMN4024A	150.800	6.00	-0.40	0.749	0.581	0.41	0.32	AZ-AB-151019-15
PMAD4116A	PMNN4448AR	PMLN5844A with fixed belt loop w/NTN5243 A	PMMN4024A	150.800	6.00	-0.22	0.787	0.609	0.41	0.32	AZ-AB-151019-16

Table 23 continued

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
Assessment of Additional Batteries											
PMAD4116A	PMNN4489A	PMLN5844A with fixed belt loop w/NTN5243A	PMMN4024A	150.800	5.70	-0.27	0.788	0.612	0.44	0.34	AZ-AB-151019-17
PMAD4116A	PMNN4493A	PMLN5844A with fixed belt loop w/NTN5243A	PMMN4024A	150.800	6.00	-0.31	0.822	0.638	0.44	0.34	AZ-AB-151019-18
PMAD4116A	NNTN8560A	PMLN5844A with fixed belt loop w/NTN5243A	PMMN4024A	150.800	5.71	-0.32	0.787	0.611	0.445	0.35	AZ-AB-151019-19
PMAD4116A	PMNN4463A	PMLN5844A with fixed belt loop w/NTN5243A	PMMN4024A	150.800	6.00	-0.36	0.765	0.593	0.42	0.32	AZ-AB-151020-01

Assessments at the Body with Body worn PMLN5838A with NTN5243A
DUT assessment with offered antennas, default battery and, optional body worn accessory per KDB 643646. Optional batteries were tested per the requirements of KDB 643646. Refer to Table 17 for highest output power channel. SAR plots of the highest results per Table (bolded) are presented in Appendix E.

Table 24

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
PMAD4116A	PMNN4491A	PMLN5838A with fixed belt loop w/NTN5243A	PMMN4024A	150.800	6.00	-0.55	0.763	0.454	0.43	0.26	MO-AB-151020-02
				155.000							
				165.000							
PMAD4117A	PMNN4491A	PMLN5838A with fixed belt loop w/NTN5243A	PMMN4024A	150.800	6.00	-0.40	0.481	0.290	0.26	0.16	MO-AB-151020-03
				155.000							
PMAD4118A	PMNN4491A	PMLN5838A with fixed belt loop w/NTN5243A	PMMN4024A	152.000							
				160.000							
				166.500	6.00	-0.60	0.333	0.218	0.19	0.13	MO-AB-151020-04
				173.400							

Table 24 continued

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
PMAD4120A	PMNN4491A	PMLN5838A with fixed belt loop w/NTN5243 A	PMMN4024A	150.800	5.90	-0.70	0.407	0.243	0.24	0.15	MO-AB-151020-05
				155.000							
				160.000							
PMAD4121B	PMNN4491A	PMLN5838A with fixed belt loop w/NTN5243 A	PMMN4024A	160.000							
				166.500	6.00	-1.03	0.305	0.190	0.19	0.12	MO-AB-151020-08
				173.400							
Assessment of Additional Batteries											
PMAD4116A	PMNN4407BR	PMLN5838A with fixed belt loop w/NTN5243 A	PMMN4024A	150.800	6.00	-0.55	0.630	0.383	0.36	0.22	MO-AB-151020-09
PMAD4116A	PMNN4406BR	PMLN5838A with fixed belt loop w/NTN5243 A	PMMN4024A	150.800	6.00	-0.62	0.684	0.425	0.39	0.25	MO-AB-151020-10
PMAD4116A	PMNN4409BR	PMLN5838A with fixed belt loop w/NTN5243 A	PMMN4024A	150.800	6.00	-0.53	0.750	0.445	0.42	0.25	MO-AB-151020-12
PMAD4116A	PMNN4412A	PMLN5838A with fixed belt loop w/NTN5243 A	PMMN4024A	150.800	5.80	-0.65	0.915	0.547	**0.55**	**0.33**	MO-AB-151020-13
PMAD4116A	NNTN8129A	PMLN5838A with fixed belt loop w/NTN5243 A	PMMN4024A	150.800	5.86	-0.52	0.789	0.473	0.46	0.27	MO-AB-151020-17
PMAD4116A	PMNN4435A	PMLN5838A with fixed belt loop w/NTN5243 A	PMMN4024A	150.800	6.00	-0.54	0.769	0.460	0.44	0.26	MO-AB-151020-18
PMAD4116A	PMNN4448AR	PMLN5838A with fixed belt loop w/NTN5243 A	PMMN4024A	150.800	6.00	-0.42	0.786	0.468	0.43	0.26	MO-AB-151020-19
PMAD4116A	PMNN4489A	PMLN5838A with fixed belt loop w/NTN5243 A	PMMN4024A	150.800	6.00	-0.45	0.670	0.388	0.37	0.22	MO-AB-151020-20
PMAD4116A	PMNN4493A	PMLN5838A with fixed belt loop w/NTN5243 A	PMMN4024A	150.800	6.00	-0.47	0.799	0.473	0.45	0.26	MO-AB-151020-21

Table 24 continued

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
Assessment of Additional Batteries											
PMAD4116A	NNTN8560A	PMLN5838A with fixed belt loop w/NTN5243A	PMMN4024A	150.800	6.00	-0.52	0.639	0.383	0.36	0.22	AZ-AB-151020-22
PMAD4116A	PMNN4463A	PMLN5838A with fixed belt loop w/NTN5243A	PMMN4024A	150.800	6.00	-0.55	0.713	0.438	0.41	0.25	AZ-AB-151020-23

Assessments at the Body with Body worn PMLN5842A with NTN5243A

DUT assessment with offered antennas, default battery and, optional body worn accessory per KDB 643646. Optional batteries were tested per the requirements of KDB 643646. Refer to Table 17 for highest output power channel. SAR plots of the highest results per Table (bolded) are presented in Appendix E.

Table 25

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
PMAD4116A	PMNN4491A	PMLN5842A without belt loop w/NTN5243A	PMMN4024A	150.800	6.00	-0.39	0.881	0.505	0.48	0.28	AZ-AB-151020-24
				155.000							
				165.000							
PMAD4117A	PMNN4491A	PMLN5842A without belt loop w/NTN5243A	PMMN4024A	150.800	6.00	-0.65	0.527	0.307	0.31	0.18	AZ-AB-151020-25
				155.000							
PMAD4118A	PMNN4491A	PMLN5842A without belt loop w/NTN5243A	PMMN4024A	152.000							
				160.000							
				166.500	6.00	-0.48	0.327	0.198	0.18	0.11	AZ-AB-151020-26
				173.400							
PMAD4120A	PMNN4491A	PMLN5842A without belt loop w/NTN5243A	PMMN4024A	150.800	6.00	-0.64	0.496	0.287	0.29	0.17	AZ-AB-151020-27
				155.000							
				160.000							

Table 25 continued

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
PMAD4121B	PMNN4491A	PMLN5842A without belt loop w/NTN5243A	PMMN4024A	160.000							
				166.500	6.00	-1.00	0.278	0.169	0.17	0.11	MO-AB-151021-01
				173.400							
Assessment of Additional Batteries											
PMAD4116A	PMNN4407BR	PMLN5842A without belt loop w/NTN5243A	PMMN4024A	150.800	6.00	-0.37	0.692	0.411	0.38	0.22	MO-AB-151021-02
PMAD4116A	PMNN4406BR	PMLN5842A without belt loop w/NTN5243A	PMMN4024A	150.800	6.00	-0.39	0.628	0.378	0.34	0.21	MO-AB-151021-03
PMAD4116A	PMNN4409BR	PMLN5842A without belt loop w/NTN5243A	PMMN4024A	150.800	6.00	-0.33	0.920	0.518	0.50	0.28	MO-AB-151021-04
PMAD4116A	PMNN4412A	PMLN5842A without belt loop w/NTN5243A	PMMN4024A	150.800	5.80	-0.35	1.040	0.578	**0.58**	**0.32**	MO-AB-151021-05
PMAD4116A	NNTN8129A	PMLN5842A without belt loop w/NTN5243A	PMMN4024A	150.800	5.80	-0.32	0.785	0.464	0.44	0.26	MO-AB-151021-06
PMAD4116A	PMNN4435A	PMLN5842A without belt loop w/NTN5243A	PMMN4024A	150.800	6.00	-0.39	0.802	0.469	0.44	0.26	MO-AB-151021-07
PMAD4116A	PMNN4448AR	PMLN5842A without belt loop w/NTN5243A	PMMN4024A	150.800	6.00	-0.34	0.688	0.422	0.37	0.23	MO-AB-151021-08
PMAD4116A	PMNN4489A	PMLN5842A without belt loop w/NTN5243A	PMMN4024A	150.800	5.72	-0.29	0.677	0.466	0.38	0.26	MO-AB-151021-09
PMAD4116A	PMNN4493A	PMLN5842A without belt loop w/NTN5243A	PMMN4024A	150.800	6.00	-0.34	0.790	0.466	0.43	0.25	MO-AB-151021-10
PMAD4116A	NNTN8560A	PMLN5842A without belt loop w/NTN5243A	PMMN4024A	150.800	6.00	-0.22	0.768	0.420	0.40	0.22	MO-AB-151021-12

Table 25 continued

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
Assessment of Additional Batteries											
PMAD4116A	PMNN4463A	PMLN5842A without belt loop w/NTN5243 A	PMMN4024A	150.800	6.00	-0.41	0.894	0.499	0.49	0.27	MO-AB-151021-13

Assessments at the Body with Body worn PMLN7296A
DUT assessment with offered antennas, battery with vibrator PMNN4488A and optional body worn accessory per KDB 643646. Body worn PMLN7296A is not compatible with other optional batteries. Refer to Table 17 for highest output power channel. SAR plots of the highest results per Table (bolded) are presented in Appendix E.

Table 26

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
PMAD4116A	PMNN4488A	PMLN7296A	PMMN4024A	150.800	6.00	-0.28	2.080	0.902	**1.11**	**0.48**	AZ-AB-151018-07
				155.000							
				165.000							
PMAD4117A	PMNN4488A	PMLN4651A	PMMN4024A	150.800	6.00	-0.84	1.200	0.523	0.73	0.32	AZ-AB-151018-09
				155.000							
PMAD4118A	PMNN4488A	PMLN4651A	PMMN4024A	152.000							
				160.000							
				166.500	6.00	-0.32	1.060	0.461	0.57	0.25	AZ-AB-151018-10
				173.400							
PMAD4120A	PMNN4488A	PMLN4651A	PMMN4024A	150.800	6.00	-0.95	1.330	0.582	0.83	0.36	AZ-AB-151019-03
				155.000							
				160.000							
PMAD4121B	PMNN4488A	PMLN4651A	PMMN4024A	160.000							
				166.500	6.00	-0.86	1.170	0.504	0.71	0.31	AZ-AB-151020-16
				173.400							

Assessment at the Body with other audio accessories
Assessment per “KDB 643646 Body SAR Test Consideration for Audio Accessories without Built-in Antenna; Sec 1, A. when overall < 4.0 W/kg, SAR plots of the highest results per Table (bolded) are presented in Appendix E.

Assessment of wireless BT configuration
Assessment using the overall highest SAR configuration at the body from above without an audio accessory attached. SAR plots of the highest results per Table (bolded) are presented in Appendix E.

Table 27

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
PMAD4116A	PMNN4488A	PMLN7296A	NONE	150.800	6.00	-1.01	4.770	2.020	**3.01**	**1.27**	AZ-AB-151021-14
				155.000							
				165.000							

13.2 WLAN assessment at the Body for 802.11 b/g/n

The tables below represent the output power measurements for WLAN 2.4 GHz 802.11b/g/n for assessments at the Body using battery PMNN4491A because it is the thinnest battery (refer to Exhibit 7B for battery illustration). These power measurements were used to determine the necessary modes for SAR testing according to KDB 248227 D01 SAR Measurement Procedures for 802.11a/b/g/ Transmitters.

The battery was used during conducted power measurements for all test channels within FCC allocated frequency range (2.412-2.462 GHz) which are listed in Table 28. The channel with the highest conducted power will be identified as the default channel per KDB 643646 (SAR Test for PTT Radios). SAR plots of the highest results per Table (bolded) are presented in Appendix E.

SAR is not required for 802.11 g/n when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2W/kg.

Table 28

Mode	Channel #	Channel Frequency	Modulation	Battery: PMNN4491A	Antenna Max Power [mW]
				Antenna port[mW]	
802.11b (1Mbps)	1	2412	DSSS	18.42	22.4
	6	2437		14.81	
	11	2462		14.39	
802.11g (6Mbps)	1	2412	OFDM	6.55	8.3
	6	2437		5.94	
	11	2462		5.85	
802.11n (MCS0)	1	2412	OFDM	10.10	12.6
	6	2437		9.18	
	11	2462		8.07	

802.11b was chosen over 802.11 g & n for testing because it has the highest max power

Assessments at the Body with all offered Body worn

DUT assessment with WLAN internal antenna, all offered batteries without any cable accessory attachment against phantom with all offered body worn. Refer to Table 28 for highest output power channel. SAR plots of the highest results per Table (bolded) are presented in Appendix E.

Table 29

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
0104039J80 WiFi Ant	PMNN4491A	PMLN4651A	None	2412.000	0.0180	0.03	0.00363	0.00124	0.0053	0.0018	TLC-AB-151022-11
		PMLN7008A		2412.000	0.0180	0.07	0.00308	0.00108	0.0045	0.0016	FIE-AB-151023-02
		RLN4815A		2412.000	0.0180	-0.32	0.00131	0.00052	0.0021	0.0008	FIE-AB-151023-04
		RLN4570A		2412.000	0.0180	-0.17	0.01000	0.00375	0.0152	0.0057	FIE-AB-151023-05
		HLN6602A		2412.000	0.0180	-0.80	0.01600	0.01100	**0.0281**	**0.0193**	FIE-AB-151023-06
		PMLN5844A with fixed belt loop w/NTN5243 A		2412.000	0.0180	-0.07	0.00000	0.00000	0.0000 0023	0.0000 0002	FIE-AB-151024-03
		PMLN5838A with fixed belt loop w/NTN5243 A		2412.000	0.0180	1.44	0.00001	0.00000	0.0000 17	0.0000 02	TLC-AB-151023-11
		PMLN5842A without belt loop w/NTN5243 A		2412.000	0.0180	3.11	0.00049	0.00005	0.0007	0.0001	FIE-AB-151026-03
	PMNN4488A	PMLN7296A	None	2412.000	0.0180	-0.17	0.01800	0.01600	0.0274	0.0243	FIE-AB-151023-07
Assessment of Additional Batteries											
0104039J80 WiFi Ant	PMNN4407BR	HLN6602A	None	2412.000	0.0184	-0.68	0.00087	0.00024	0.0015	0.0004	FIE-AB-151026-04
	PMNN4406BR			2412.000	0.0181	0.17	0.00198	0.00063	0.0029	0.0009	FIE-AB-151026-05
	PMNN4409BR			2412.000	0.0180	-0.63	0.00418	0.00171	0.0071	0.0029	TLC-AB-151026-06
	PMNN4412A			2412.000	0.0179	1.01	0.00193	0.00063	0.0028	0.0009	TLC-AB-151026-07
	NNTN8129A			2412.000	0.0179	2.54	0.00399	0.00164	0.0059	0.0024	TLC-AB-151026-08
	PMNN4435A			2412.000	0.0182	0.29	0.00419	0.00171	0.0061	0.0025	TLC-AB-151026-10
	PMNN4448AR			2412.000	0.0181	0.38	0.00366	0.00149	0.0053	0.0022	TLC-AB-151027-02
	PMNN4489A			2412.000	0.0181	1.08	0.00235	0.00087	0.0034	0.0013	TLC-AB-151027-03
	PMNN4493A			2412.000	0.0180	-0.29	0.00419	0.00172	0.0066	0.0027	TLC-AB-151027-04
	NNTN8560A			2412.000	0.0183	-0.15	0.00245	0.00064	0.0036	0.0010	TLC-AB-151027-06
	PMNN4463A			2412.000	0.0183	-0.06	0.00613	0.00184	0.0089	0.0027	TLC-AB-151027-07

Random drifts are due to low SAR values near or below the system noise threshold.

13.3 LMR assessments at the Face for 150.8-173.4 MHz band

Battery PMNN4493A was selected as the default battery for assessments at the Face because it has the highest capacity (refer to Exhibit 7B for battery illustration). The default battery was used during conducted power measurements for all test channels within FCC allocated frequency range (150.8-173.4 MHz) which are listed in Table 30. The channel with the highest conducted power will be identified as the default channel per KDB 643646 (SAR Test for PTT Radios). SAR plots of the highest results per Table (bolded) are presented in Appendix E.

Table 30

Test Freq (MHz)	Power (W)
150.800	5.95
152.000	5.95
155.000	5.94
160.000	5.95
165.000	5.95
166.500	5.96
173.400	5.96

DUT assessment with offered antennas, default battery with front of DUT positioned 2.5cm facing phantom per KDB 643646. Optional batteries were tested per the requirements of KDB 643646. Refer to Table 30 for highest output power channel. SAR plots of the highest results per Table (bolded) are presented in Appendix E.

Table 31

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
PMAD4116A	PMNN4493A	NONE	NONE	150.800	6.00	-0.41	1.350	1.050	0.74	0.58	AZ-FACE-151023-03
				155.000							
				165.000							
PMAD4117A	PMNN4493A	NONE	NONE	150.800	6.00	-0.39	1.500	1.160	0.82	0.63	AZ-FACE-151023-04
				155.000							
PMAD4118A	PMNN4493A	NONE	NONE	152.000							
				160.000							
				166.500	6.00	-0.47	2.080	1.600	1.16	0.89	AZ-FACE-151023-05
				173.400							
PMAD4120A	PMNN4493A	NONE	NONE	150.800	6.00	0.06	1.060	0.811	0.53	0.41	AZ-FACE-151023-06
				155.000							
				160.000							

Table 31 continued

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
PMAD4121B	PMNN4493A	NONE	NONE	160.000							
				166.500	6.00	0.30	1.700	1.300	0.85	0.65	AZ-FACE-151023-07
				173.400							
Assessment of Additional Batteries											
PMAD4118A	PMNN4407BR	NONE	NONE	166.500	6.00	-0.52	2.110	1.620	1.19	0.91	AZ-FACE-151023-08
PMAD4118A	PMNN4406BR	NONE	NONE	166.500	6.00	-0.51	2.150	1.660	**1.21**	**0.93**	AZ-FACE-151023-09
PMAD4118A	PMNN4409BR	NONE	NONE	166.500	6.00	-0.53	2.030	1.560	1.15	0.88	AZ-FACE-151023-10
PMAD4118A	PMNN4412A	NONE	NONE	166.500	6.00	-0.68	1.730	1.330	1.01	0.78	AZ-FACE-151025-02
PMAD4118A	NNTN8129A	NONE	NONE	166.500	5.95	-0.51	1.910	1.470	1.08	0.83	AZ-FACE-151025-03
PMAD4118A	PMNN4435A	NONE	NONE	166.500	6.00	-0.59	1.970	1.510	1.13	0.86	AZ-FACE-151025-04
PMAD4118A	PMNN4448AR	NONE	NONE	166.500	6.00	-0.42	2.030	1.560	1.12	0.86	AZ-FACE-151025-05
PMAD4118A	PMNN4489A	NONE	NONE	166.500	5.88	-0.44	1.930	1.490	1.09	0.84	AZ-FACE-151025-06
PMAD4118A	PMNN4488A	NONE	NONE	166.500	6.00	-0.43	2.060	1.590	1.14	0.88	AZ-FACE-151025-07
PMAD4118A	PMNN4491A	NONE	NONE	166.500	6.00	-0.46	2.130	1.640	1.18	0.91	AZ-FACE-151025-08
PMAD4118A	NNTN8560A	NONE	NONE	166.500	5.82	-0.39	1.930	1.490	1.09	0.84	AZ-FACE-151025-09
PMAD4118A	PMNN4463A	NONE	NONE	166.500	6.00	-0.64	1.990	1.530	1.15	0.89	AZ-FACE-151025-10

13.4 WLAN assessment at the Face for 802.11 b/g/n

The tables below represent the output power measurements for WLAN 2.4 GHz 802.11b/g/n for assessments at the Face using battery PMNN4493A because it is has the highest capacity (refer to Exhibit 7B for battery illustration). These power measurements were used to determine the necessary modes for SAR testing according to KDB 248227 D01 SAR Measurement Procedures for 802.11a/b/g/ Transmitters.

The battery was used during conducted power measurements for all test channels within FCC allocated frequency range (2.412-2.462GHz) which are listed in Table 32. The channel with the highest conducted power will be identified as the default channel per KDB 643646 (SAR Test for PTT Radios). SAR plots of the highest results per Table (bolded) are presented in Appendix E.

SAR is not required for 802.11 g/n when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2W/kg.

Table 32

Mode	Channel #	Channel Frequency	Modulation	Battery: PMNN4493A Antenna port[mW]	Antenna Max Power [mW]
802.11b (1Mbps)	1	2412	DSSS	18.17	22.4
	6	2437		16.12	
	11	2462		14.37	
802.11g (6Mbps)	1	2412	OFDM	6.57	8.3
	6	2437		6.00	
	11	2462		5.86	
802.11n (MCS0)	1	2412	OFDM	10.18	12.6
	6	2437		9.30	
	11	2462		8.12	

802.11b was chosen over 802.11 g & n for testing because it has the highest max power

DUT assessment with WLAN internal antenna using all offered batteries with front of the DUT 2.5 cm from phantom. Refer to Table 32 for highest output power channel. SAR plots of the highest results per Table (bolded) are presented in Appendix E.

Table 33

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
0104039J80 WiFi Ant	PMNN4493A	NONE	NONE	2412.000	0.0182	-0.17	0.01700	0.00802	0.0256	0.0121	FIE-FACE-151022-05
Assessment of Additional Batteries											
0104039J80 WiFi Ant	PMNN4407BR	NONE	NONE	2412.000	0.0184	-1.77	0.03600	0.01900	0.0774	0.0409	TLC-FACE-151019-11
	PMNN4406BR			2412.000	0.0181	-0.46	0.01900	0.00954	0.0307	0.0154	TLC-FACE-151020-02
	PMNN4409BR			2412.000	0.0180	-0.18	0.02100	0.01200	0.0320	0.0183	FIE-FACE-151021-06
	PMNN4412A			2412.000	0.0179	-0.30	0.03300	0.02300	0.0520	0.0363	TLC-FACE-151020-05
	NNTN8129A			2412.000	0.0179	-0.19	0.01600	0.00700	0.0246	0.0108	FIE-FACE-151022-03
	PMNN4435A			2412.000	0.0182	1.78	0.04100	0.03100	0.0593	0.0449	FIE-FACE-151021-02
	PMNN4448AR			2412.000	0.0181	-0.22	0.02000	0.00987	0.0306	0.0151	FIE-FACE-151021-04
	PMNN4489A			2412.000	0.0181	-0.04	0.03800	0.01200	0.0558	0.0176	FIE-FACE-151021-05
	PMNN4491A			2412.000	0.0180	0.80	0.00120	0.00061	0.0018	0.0009	FIE-FACE-151021-07
	NNTN8560A			2412.000	0.0183	0.27	0.0570	0.0490	**0.0820**	**0.0705**	FIE-FACE-151021-08
	PMNN4463A			2412.000	0.0183	-0.07	0.02000	0.01000	0.0292	0.0146	FIE-FACE-151021-09
	PMNN4488A			2412.000	0.0180	-0.04	0.01600	0.00746	0.0236	0.0110	FIE-FACE-151022-04

Random drifts are due to low SAR values near or below the system noise threshold.

13.5 Assessment for Industry Canada

Based on the assessment results for body and face per KDB643646 D01, additional tests were required for the Industry Canada frequency range (138-144 MHz), (148-149.9 MHz) and (150.05-174 MHz). The overall highest test configuration from 150.8-173.4 MHz band was repeated with test frequencies 139.7 MHz, 144 MHz, and 148 MHz. The SAR results are in Table 38 (Body) and Table 39 (Head) below. SAR plots of the highest results per Table (bolded) are presented in Appendix E.

Table 34

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
Body											
PMAD4116A	PMNN4488A	PMLN7296A	NONE	144.000	6.00	-1.06	4.780	2.030	3.05	1.30	AZ-AB-151021-15
				148.000	6.00	-0.57	4.490	1.940	2.56	1.11	AZ-AB-151021-16
PMAD4117A	PMNN4488A	PMLN7296A	NONE	139.700	6.00	-1.01	5.270	2.270	**3.32**	**1.43**	AZ-AB-151021-18
				144.000	6.00	-1.00	4.320	1.840	2.72	1.16	AZ-AB-151021-19
				148.000	6.00	-0.77	3.400	1.470	2.03	0.88	AZ-AB-151021-21
PMAD4119A	PMNN4488A	PMLN7296A	NONE	144.000	6.00	-0.53	3.180	1.370	1.80	0.77	AZ-AB-151021-24
				148.000	6.00	-0.37	2.000	0.858	1.09	0.47	AZ-AB-151021-25
PMAD4120A	PMNN4488A	PMLN7296A	NONE	148.000	6.00	-0.96	3.340	1.450	2.08	0.90	MO-AB-151021-27

Table 35

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
Face											
PMAD4116A	PMNN4406BR	NONE	NONE	144.000	5.93	-0.48	1.080	0.838	0.61	0.47	AZ-FACE-151025-11
				148.000	6.00	-0.47	1.090	0.845	0.61	0.47	AZ-FACE-151025-12
PMAD4117A	PMNN4406BR	NONE	NONE	139.700	6.00	-0.54	1.650	1.280	**0.93**	**0.73**	AZ-FACE-151026-02
				144.000	6.00	-0.51	1.360	1.050	0.76	0.59	AZ-FACE-151026-03
				148.000	6.00	-0.45	1.550	1.200	0.86	0.67	AZ-FACE-151026-04
PMAD4119A	PMNN4406BR	NONE	NONE	144.000	5.85	-0.70	1.040	0.800	0.63	0.48	AZ-FACE-151026-06
				148.000	5.96	-0.81	0.875	0.674	0.53	0.41	AZ-FACE-151026-07
PMAD4120A	PMNN4406BR	NONE	NONE	148.000	6.00	-0.24	0.731	0.565	0.39	0.30	AZ-FACE-151026-09

13.6 Assessment at the Bluetooth band

Per guidelines in KDB 447498, the following formula was used to determine the test exclusion for standalone Bluetooth transmitter;

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] *[$\sqrt{F_{(GHz)}}$] = 2.43, which is ≤ 3 for 1-g SAR

Where:

Max. power = 7.7mW (10mW*77% duty cycle)
Min. test separation distance = 5mm for actual test separation < 5mm
F(GHz) = 2.48 GHz

Per the result from the calculation above, the standalone SAR assessment was not required for Bluetooth band. Therefore, SAR results for Bluetooth are not reported herein.

13.7 Assessment outside FCC Part 90

Assessment of outside FCC Part 90 and Industry Canada frequencies using the highest SAR configuration for each band from above. SAR plots of the highest results per Table (bolded) are presented in Appendix E.

Table 36

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
Body											
PMAD4117A	PMNN4488A	PMLN7296A	NONE	136.000	5.95	-0.99	7.75	3.26	**4.91**	**2.06**	AZ-AB-151027-20
PMAD4119A	PMNN4488A	PMLN7296A	NONE	136.000	6.00	-0.79	6.420	2.720	3.85	1.63	AZ-AB-151021-23
PMAD4120A	PMNN4488A	PMLN7296A	NONE	146.000	6.00	-1.05	3.530	1.510	2.25	0.96	MO-AB-151021-26

Table 37

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
Face											
PMAD4117A	PMNN4406BR	NONE	NONE	136.000	6.00	0.06	1.250	0.972	**0.63**	**0.49**	AZ-FACE-151025-13
PMAD4119A	PMNN4406BR	NONE	NONE	136.000	5.92	0.48	0.756	0.584	0.38	0.30	AZ-FACE-151026-05
PMAD4120A	PMNN4406BR	NONE	NONE	146.000	5.75	-0.11	0.736	0.567	0.39	0.30	AZ-FACE-151026-08

13.8 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 38

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
PMAD4116A	PMNN4488A	PMLN7296A	NONE	150.800	6.00	-0.28	4.310	1.920	2.30	1.02	MO-AB-151104-21

14.0 Simultaneous Transmission Exclusion for BT

Per guidelines in KDB 447498, the following formula was used to determine the test exclusion to an antenna that transmits simultaneously with other antennas for test distances ≤ 50mm:

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] *[√F(GHz)/X] = 0.32 W/kg, which is ≤ 0.4 W/kg (1g)

Where:

X = 7.5 for 1g-SAR; 18.75 for 10g
Max. power = 7.7 mW (10mW*77% duty cycle)
Min. test separation distance = 5mm for actual test separation < 5mm
F(GHz) = 2.48 GHz

Per the result from the calculation above, simultaneous exclusion is applied and therefore SAR results are not reported herein.

15.0 Simultaneous Transmission between LMR, WLAN and BT

This device uses a single transmitter module and antenna for both WLAN and BT. WLAN and BT cannot transmit simultaneously. Simultaneous transmission for BT had been excluded as mentioned in section 14.0. The maximum sourced-based time-averaged output power for tested 802.11b is 22.4 mW while the BT is 7.7 mW. Therefore the measured SAR from 802.11b is used in conjunction with LMR for simultaneous results.

The Table below summarizes the simultaneous transmissions between LMR and WLAN bands.

Table 39

	Freq. (MHz)	LMR Bands UHF (150.8-173.4 MHz)
WLAN Band	2412 - 2462	√

16.0 Results Summary

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

Table 40

Technologies	Frequency band (MHz)	Max Calc at Body (W/kg)		Max Calc at Face (W/kg)	
		1g-SAR	10g-SAR	1g-SAR	10g-SAR
FCC					
LMR	150.8-173.4	3.01	1.27	1.21	0.93
WLAN	2412-2462	0.0281	0.0193	0.0820	0.0705
Industry Canada					
LMR	138-144, 148-149.9, and 150.05-174	3.32	1.43	1.21	0.93
WLAN	2412-2462	0.0281	0.0193	0.0820	0.0705
Overall					
LMR	403-527	4.91	2.06	1.21	0.93
WLAN	2412-2462	0.0281	0.0193	0.0820	0.0705

All results are scaled to the maximum output power.

The highest combined 1g-SAR results for simultaneous is indicated in the following Table:

Table 41

Designator	Frequency bands	Combined 1g-SAR (W/kg)	Combined 10g-SAR (W/kg)
Body			
FCC	LMR (VHF) and WLAN band	3.04	1.29
Industry Canada	LMR (VHF) and WLAN band	3.35	1.45
Overall	LMR (VHF) and WLAN band	4.94	2.08
Face			
FCC	LMR (VHF) and WLAN band	1.29	1.00
Industry Canada	LMR (VHF) and WLAN band	1.28	1.00
Overall	LMR (VHF) and WLAN band	1.28	1.00

The test results clearly demonstrate compliance with FCC Occupational/Controlled RF Exposure limits of 8 W/kg averaged over 1 gram per the requirements of OET Bulletin 65. The 10 grams result is not applicable to FCC filing.

17.0 Variability Assessment

Per the guidelines in KDB 865664 SAR variability assessment is not required because SAR results are below 4.0W/kg (Occupational).

18.0 System Uncertainty

A system uncertainty analysis is not required for this report per KDB 865664 because the highest report SAR value Occupational exposure is less than 7.5W/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 150 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	6.7	N	1.00	1	1	6.7	6.7	∞
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	477
Expanded Uncertainty (95% CONFIDENCE LEVEL)			*k*=2				23	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 Device Under Test, for 2450 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.**	**ci (1 g)**	**ci (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.3: Uncertainty Budget for System Validation (dipole & flat phantom) for 150 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	6.7	N	1.00	1	1	6.7	6.7	∞
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				10	9	99999
Expanded Uncertainty (95% CONFIDENCE LEVEL)			*k*=2				19	18	

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.4: Uncertainty Budget for System Validation (dipole & flat phantom) for 2450 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: **EX3-3568_Feb15**

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3568

Calibration procedure(s): QA CAL-01.v9, QA CAL-12.v9, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

Calibration date: February 27, 2015

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 E4419B	GB41293874	03-Apr-14 (No. 217-01911)	Apr-15
Power sensor E4412A	MY41498087	03-Apr-14 (No. 217-01911)	Apr-15
Reference 3 dB Attenuator	SN: S5054 (3c)	03-Apr-14 (No. 217-01915)	Apr-15
Reference 20 dB Attenuator	SN: S5277 (20x)	03-Apr-14 (No. 217-01919)	Apr-15
Reference 30 dB Attenuator	SN: S5129 (30b)	03-Apr-14 (No. 217-01920)	Apr-15
Reference Probe ES3DV2	SN: 3013	30-Dec-14 (No. ES3-3013_Dec14)	Dec-15
DAE4	SN: 660	14-Jan-15 (No. DAE4-660_Jan15)	Jan-16
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

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

Issued: February 27, 2015

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)
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Accreditation No.: **SCS 0108**

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

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 EX3DV4

SN:3568

Manufactured: July 15, 2005
Calibrated: February 27, 2015

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3568

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (µV/(V/m)²)^A	0.54	0.51	0.49	± 10.1 %
DCP (mV)^B	99.3	101.3	101.0	

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	192.0	±3.5 %
		Y	0.0	0.0	1.0		175.3	
		Z	0.0	0.0	1.0		190.8	
10012-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	2.65	65.7	16.6	1.87	148.3	±0.7 %
		Y	2.97	68.9	18.7		137.2	
		Z	2.96	68.8	18.6		147.9	
10013-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	10.70	69.3	22.2	9.46	139.2	±3.8 %
		Y	10.51	69.3	22.4		129.1	
		Z	10.53	69.3	22.3		137.1	
10059-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps)	X	2.80	66.3	16.9	2.12	146.6	±0.5 %
		Y	3.31	70.7	19.6		137.1	
		Z	3.06	69.1	18.8		145.2	
10060-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps)	X	3.05	70.6	18.9	2.83	128.5	±0.5 %
		Y	5.39	83.1	24.8		144.2	
		Z	4.17	78.5	23.1		128.7	
10061-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps)	X	3.87	70.8	19.3	3.60	130.1	±0.7 %
		Y	5.34	78.8	23.3		143.9	
		Z	4.50	75.6	22.1		129.6	
10071-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 9 Mbps)	X	10.81	69.5	22.5	9.83	135.7	±3.5 %
		Y	10.59	69.4	22.7		126.5	
		Z	10.58	69.3	22.5		132.2	
10072-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 12 Mbps)	X	10.33	69.1	22.2	9.62	129.8	±3.8 %
		Y	10.63	70.5	23.3		149.0	
		Z	10.12	69.0	22.3		128.4	
10073-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 18 Mbps)	X	10.30	69.1	22.4	9.94	125.1	±3.5 %
		Y	10.63	70.7	23.6		144.4	
		Z	10.41	70.0	23.1		148.6	
10074-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 24 Mbps)	X	10.74	70.3	23.4	10.30	145.6	±3.8 %
		Y	10.72	70.9	24.0		139.7	
		Z	10.44	70.0	23.4		143.8	
10075-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 36 Mbps)	X	10.83	70.5	23.9	10.77	141.4	±4.6 %
		Y	10.78	71.0	24.5		134.7	
		Z	10.52	70.2	23.9		139.3	

10076-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 48 Mbps)	X	10.76	70.4	23.9	10.94	138.3	±4.1 %
		Y	10.73	71.0	24.6		130.1	
		Z	10.44	70.0	23.9		136.2	
10077-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps)	X	10.75	70.4	24.0	11.00	138.0	±4.4 %
		Y	10.70	71.0	24.6		129.2	
		Z	10.40	70.0	23.9		134.9	
10114-CAB	IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK)	X	9.90	67.7	20.4	8.10	124.1	±2.7 %
		Y	10.24	68.9	21.2		142.9	
		Z	9.95	68.2	20.8		126.2	
10115-CAB	IEEE 802.11n (HT Greenfield, 81 Mbps, 16-QAM)	X	10.36	68.1	20.7	8.46	126.5	±3.0 %
		Y	10.78	69.4	21.7		147.2	
		Z	10.37	68.5	21.1		127.1	
10116-CAB	IEEE 802.11n (HT Greenfield, 135 Mbps, 64-QAM)	X	10.31	68.8	21.0	8.15	149.8	±3.0 %
		Y	10.32	69.0	21.3		145.2	
		Z	9.97	68.2	20.8		126.4	
10117-CAB	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	9.89	67.7	20.3	8.07	124.4	±3.0 %
		Y	10.32	69.1	21.3		146.0	
		Z	9.93	68.1	20.7		127.1	
10118-CAB	IEEE 802.11n (HT Mixed, 81 Mbps, 16-QAM)	X	10.50	68.3	20.9	8.59	127.7	±3.3 %
		Y	10.90	69.6	21.8		148.8	
		Z	10.50	68.6	21.2		129.1	
10119-CAB	IEEE 802.11n (HT Mixed, 135 Mbps, 64-QAM)	X	9.88	67.7	20.4	8.13	124.0	±3.0 %
		Y	10.33	69.1	21.3		146.1	
		Z	9.96	68.2	20.8		125.7	
10193-CAB	IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)	X	9.95	68.6	20.9	8.09	146.0	±3.0 %
		Y	9.85	68.7	21.2		138.9	
		Z	9.96	69.0	21.3		146.8	
10194-CAB	IEEE 802.11n (HT Greenfield, 39 Mbps, 16-QAM)	X	9.93	68.5	20.9	8.12	143.4	±3.0 %
		Y	9.86	68.7	21.2		137.8	
		Z	9.95	68.9	21.2		145.1	
10195-CAB	IEEE 802.11n (HT Greenfield, 65 Mbps, 64-QAM)	X	10.08	68.7	21.0	8.21	144.9	±3.0 %
		Y	9.98	68.8	21.3		138.7	
		Z	10.07	69.0	21.3		146.2	
10196-CAB	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.90	68.5	20.9	8.10	143.5	±2.7 %
		Y	9.82	68.7	21.2		137.2	
		Z	9.90	68.8	21.2		144.7	
10197-CAB	IEEE 802.11n (HT Mixed, 39 Mbps, 16-QAM)	X	9.98	68.8	20.9	8.13	144.3	±3.0 %
		Y	9.88	68.7	21.2		138.3	
		Z	9.95	68.8	21.2		144.6	
10198-CAB	IEEE 802.11n (HT Mixed, 65 Mbps, 64-QAM)	X	10.10	68.6	21.0	8.27	144.1	±3.0 %
		Y	10.06	68.9	21.4		138.6	
		Z	10.10	69.0	21.4		145.7	

10219-CAB	IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK)	X	9.78	68.4	20.8	8.03	141.7	±2.7 %
		Y	9.69	68.5	21.1		136.2	
		Z	9.81	68.8	21.2		143.5	
10220-CAB	IEEE 802.11n (HT Mixed, 43.3 Mbps, 16-QAM)	X	9.94	68.5	20.9	8.13	142.5	±2.7 %
		Y	9.88	68.7	21.2		137.6	
		Z	9.95	68.9	21.2		144.6	
10221-CAB	IEEE 802.11n (HT Mixed, 72.2 Mbps, 64-QAM)	X	10.11	68.6	21.0	8.27	144.3	±3.0 %
		Y	10.05	68.9	21.4		138.6	
		Z	10.13	69.0	21.4		146.4	
10222-CAB	IEEE 802.11n (HT Mixed, 15 Mbps, BPSK)	X	10.24	68.7	20.9	8.06	149.8	±3.0 %
		Y	10.24	68.9	21.2		145.0	
		Z	9.87	68.0	20.7		124.7	
10223-CAB	IEEE 802.11n (HT Mixed, 90 Mbps, 16-QAM)	X	10.35	68.1	20.8	8.48	125.5	±3.3 %
		Y	10.82	69.5	21.7		149.4	
		Z	10.40	68.5	21.1		127.9	
10224-CAB	IEEE 802.11n (HT Mixed, 150 Mbps, 64-QAM)	X	10.21	68.6	20.9	8.08	148.2	±3.0 %
		Y	10.27	69.1	21.3		145.7	
		Z	9.88	68.1	20.7		125.1	
10315-AAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle)	X	2.54	65.4	16.4	1.71	146.8	±0.7 %
		Y	2.94	69.2	18.8		142.3	
		Z	3.08	70.2	19.4		149.1	
10316-AAB	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 96pc duty cycle)	X	10.02	68.5	21.0	8.36	139.3	±3.0 %
		Y	9.93	68.7	21.3		135.2	
		Z	10.06	68.9	21.4		142.0	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	2.45	65.2	16.4	1.54	146.0	±0.7 %
		Y	3.04	70.1	19.2		141.8	
		Z	2.90	69.4	19.0		148.8	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	9.90	68.3	20.8	8.23	138.6	±3.0 %
		Y	9.84	68.5	21.2		135.4	
		Z	9.93	68.7	21.2		140.8	
10418-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Long preambule)	X	9.79	68.3	20.8	8.14	138.4	±2.7 %
		Y	9.74	68.5	21.2		135.3	
		Z	9.79	68.6	21.1		140.4	
10419-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Short preambule)	X	9.86	68.3	20.8	8.19	140.0	±2.7 %
		Y	9.82	68.6	21.2		135.6	
		Z	9.89	68.7	21.2		141.3	
10422-AAA	IEEE 802.11n (HT Greenfield, 7.2 Mbps, BPSK)	X	10.14	68.6	21.1	8.32	143.5	±3.0 %
		Y	10.08	68.9	21.4		138.4	
		Z	10.12	68.9	21.4		145.2	
10423-AAA	IEEE 802.11n (HT Greenfield, 43.3 Mbps, 16-QAM)	X	10.29	68.8	21.2	8.47	144.1	±3.0 %
		Y	10.22	69.0	21.5		138.5	
		Z	10.29	69.1	21.5		145.6	

10424-AAA	IEEE 802.11n (HT Greenfield, 72.2 Mbps, 64-QAM)	X	10.17	68.6	21.1	8.40	142.9	±3.3 %
		Y	10.12	68.9	21.5		137.8	
		Z	10.19	69.1	21.5		144.9	
10425-AAA	IEEE 802.11n (HT Greenfield, 15 Mbps, BPSK)	X	10.23	68.0	20.6	8.41	123.3	±3.0 %
		Y	10.71	69.5	21.7		147.2	
		Z	10.26	68.4	21.0		125.5	
10426-AAA	IEEE 802.11n (HT Greenfield, 90 Mbps, 16-QAM)	X	10.28	68.1	20.7	8.45	124.6	±3.0 %
		Y	10.74	69.5	21.7		146.3	
		Z	10.33	68.5	21.1		126.3	
10427-AAA	IEEE 802.11n (HT Greenfield, 150 Mbps, 64-QAM)	X	10.24	68.0	20.7	8.41	125.1	±3.3 %
		Y	10.71	69.4	21.6		148.5	
		Z	10.31	68.5	21.1		126.6	

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 NormX,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: EX3DV4 - SN:3568

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)	Unct. (k=2)
150	52.3	0.76	10.26	10.26	10.26	0.00	1.00	± 13.3 %
300	45.3	0.87	9.57	9.57	9.57	0.12	1.00	± 13.3 %
450	43.5	0.87	8.92	8.92	8.92	0.17	2.21	± 13.3 %
750	41.9	0.89	8.48	8.48	8.48	0.31	1.01	± 12.0 %
900	41.5	0.97	8.26	8.26	8.26	0.38	0.87	± 12.0 %
2450	39.2	1.80	6.38	6.38	6.38	0.37	0.86	± 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: EX3DV4 - SN:3568

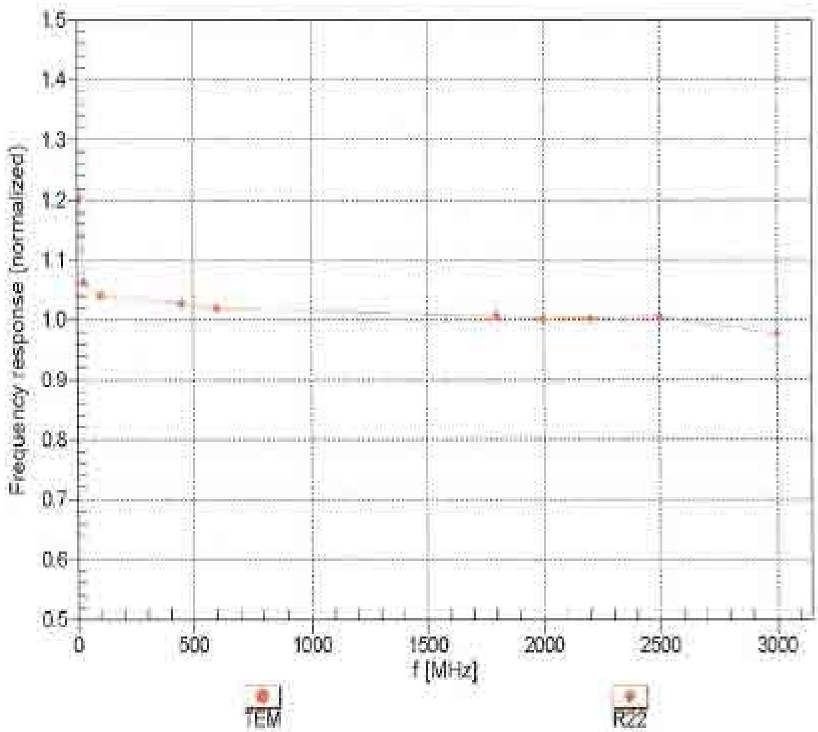
Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
150	61.9	0.80	10.08	10.08	10.08	0.00	1.00	± 13.3 %
300	58.2	0.92	11.07	11.07	11.07	0.08	1.00	± 13.3 %
450	56.7	0.94	8.93	8.93	8.93	0.10	1.00	± 13.3 %
750	55.5	0.96	8.33	8.33	8.33	0.33	0.99	± 12.0 %
900	55.0	1.05	8.09	8.09	8.09	0.30	1.09	± 12.0 %
2450	52.7	1.95	6.63	6.63	6.63	0.80	0.59	± 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

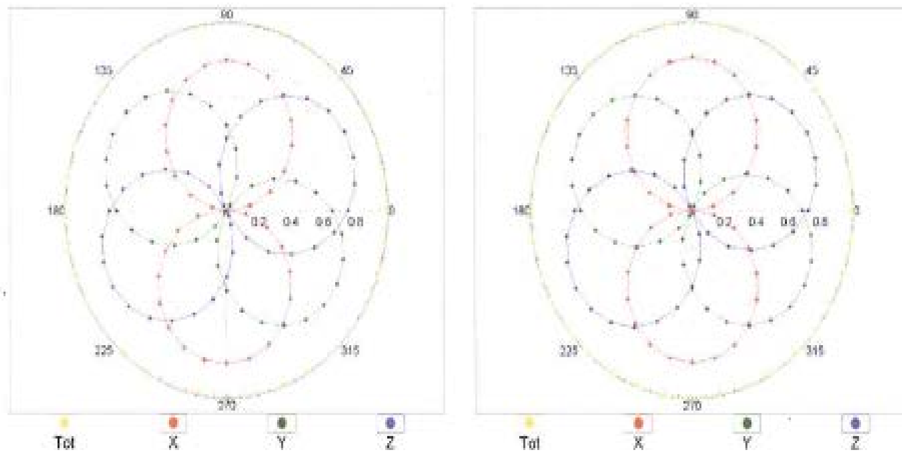
(TEM-Cell:ifi110 EXX, Waveguide: R22)

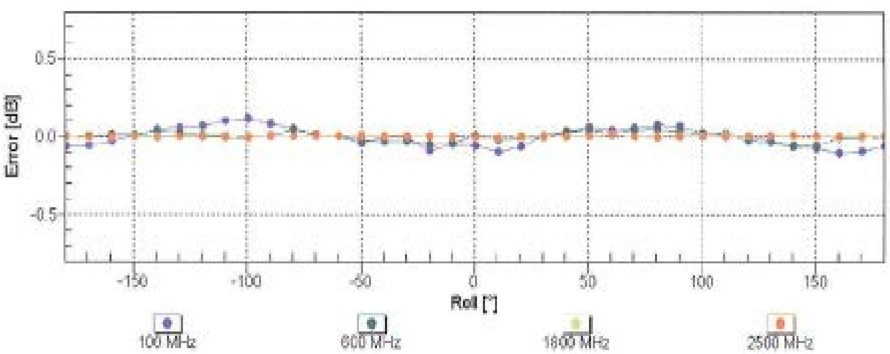


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM f=1800 MHz,R22

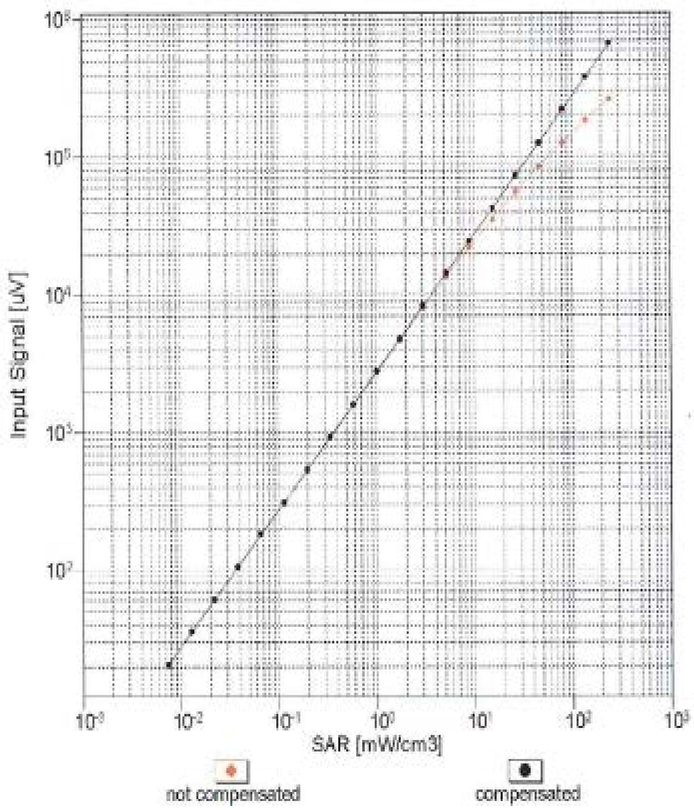


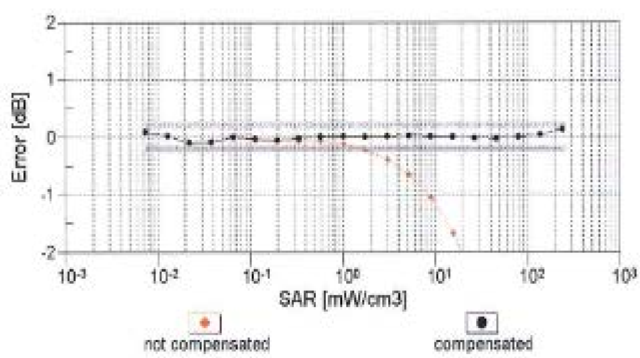


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR$_{head}$)

(TEM cell , f_{eval}= 1900 MHz)

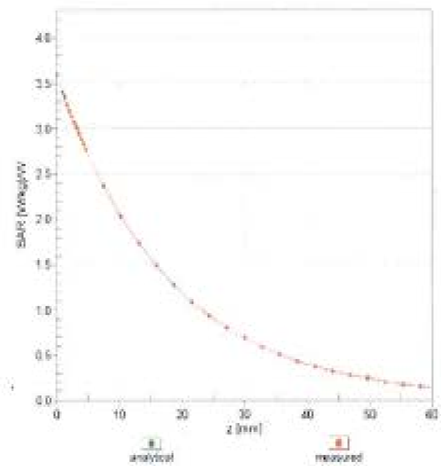




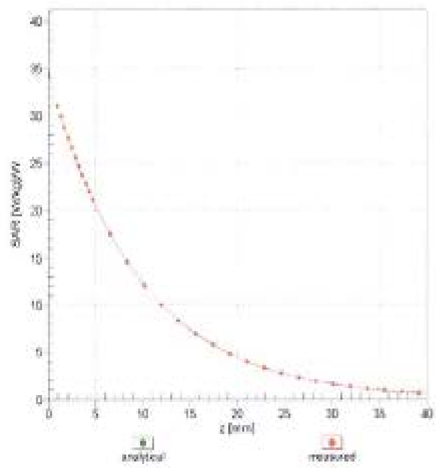
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 900 MHz,WGLS R9 (H_convF)

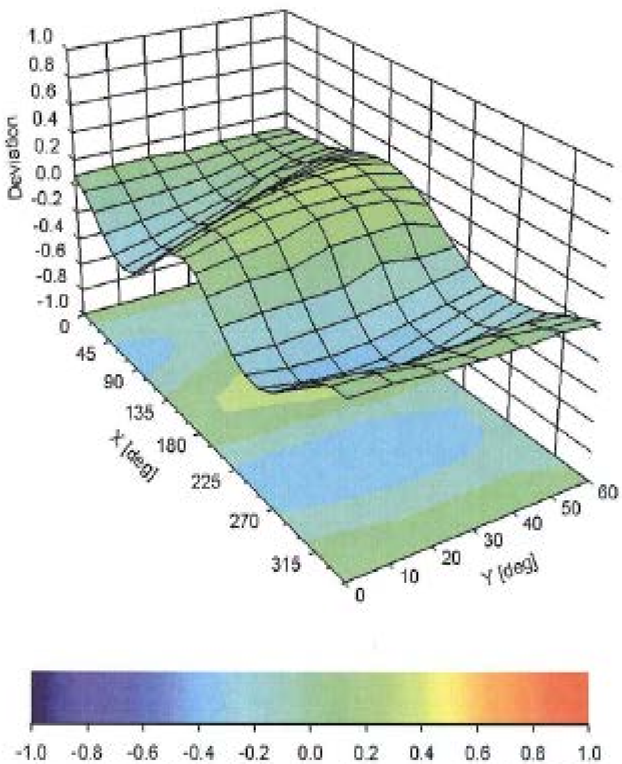


f = 2450 MHz,WGLS R22 (H_convF)



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: EX3DV4 - SN:3568

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-119.5
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

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

S Schweizerischer Kalibrierdienst
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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: **EX3-7364_Jun15**

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:7364
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:	June 23, 2015

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 E4419B	GB41293874	01-Apr-15 (No. 217-02128)	Mar-16
Power sensor E4412A	MY41498087	01-Apr-15 (No. 217-02128)	Mar-16
Reference 3 dB Attenuator	SN: S5054 (3c)	01-Apr-15 (No. 217-02129)	Mar-16
Reference 20 dB Attenuator	SN: S5277 (20x)	01-Apr-15 (No. 217-02132)	Mar-16
Reference 30 dB Attenuator	SN: S5129 (30b)	01-Apr-15 (No. 217-02133)	Mar-16
Reference Probe ES3DV2	SN: 3013	30-Dec-14 (No. ES3-3013_Dec14)	Dec-15
DAE4	SN: 660	14-Jan-15 (No. DAE4-660_Jan15)	Jan-16
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

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

Issued: June 24, 2015

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

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

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Accreditation No.: **SCS 0108**

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

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 EX3DV4

SN:7364

Manufactured: February 5, 2015
Calibrated: June 23, 2015

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7364

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (µV/(V/m)²)[A]	0.48	0.46	0.59	± 10.1 %
DCP (mV)[B]	97.7	96.3	97.3	

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	115.0	±3.5 %
		Y	0.0	0.0	1.0		110.5	
		Z	0.0	0.0	1.0		124.6	
10011-CAB	UMTS-FDD (WCDMA)	X	3.42	67.2	18.6	2.91	122.6	±0.5 %
		Y	3.14	64.8	16.9		117.5	
		Z	3.48	67.3	18.5		135.3	
10012-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	2.86	68.1	18.5	1.87	122.4	±0.5 %
		Y	2.39	63.9	15.8		117.3	
		Z	3.01	69.0	18.8		135.0	
10013-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	10.47	68.7	22.2	9.46	115.4	±2.7 %
		Y	10.30	68.1	21.6		107.3	
		Z	10.58	69.3	22.6		126.2	
10059-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps)	X	3.03	69.0	19.0	2.12	120.5	±0.5 %
		Y	2.58	65.1	16.6		115.0	
		Z	2.93	68.2	18.4		133.3	
10060-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps)	X	3.74	77.3	22.8	2.83	148.9	±0.5 %
		Y	2.75	70.3	19.2		141.7	
		Z	3.40	75.1	21.8		118.0	
10061-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps)	X	3.83	73.4	21.4	3.60	145.6	±0.7 %
		Y	3.06	68.2	18.5		139.1	
		Z	3.96	74.0	21.7		117.9	
10062-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps)	X	10.17	68.5	21.5	8.68	116.8	±2.5 %
		Y	9.91	67.6	20.8		107.4	
		Z	10.39	69.3	22.0		132.5	
10063-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps)	X	10.01	68.4	21.4	8.63	116.3	±2.5 %
		Y	9.85	67.7	20.9		108.8	
		Z	10.24	69.2	22.0		131.7	
10064-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps)	X	10.46	68.7	21.9	9.09	117.4	±2.7 %
		Y	10.34	68.2	21.3		110.7	
		Z	10.69	69.6	22.5		132.1	
10065-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps)	X	10.10	68.4	21.7	9.00	113.5	±2.5 %
		Y	10.01	68.0	21.2		107.5	
		Z	10.29	69.2	22.2		127.6	
10066-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps)	X	10.32	68.7	22.1	9.38	113.2	±2.5 %
		Y	10.20	68.1	21.6		106.0	
		Z	10.49	69.4	22.6		125.8	

10067-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps)	X	10.83	69.1	22.8	10.12	111.9	±3.0 %
		Y	10.70	68.6	22.3		105.5	
		Z	11.04	70.0	23.5		125.5	
10068-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps)	X	10.64	69.0	22.9	10.24	108.5	±3.3 %
		Y	11.07	70.0	23.2		145.3	
		Z	10.83	69.9	23.5		121.7	
10069-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps)	X	10.95	69.2	23.2	10.56	109.6	±3.5 %
		Y	11.38	70.3	23.6		148.1	
		Z	11.13	70.1	23.8		122.0	
10071-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 9 Mbps)	X	10.46	68.7	22.4	9.83	110.6	±2.5 %
		Y	10.36	68.2	21.9		105.8	
		Z	10.71	69.6	23.1		124.2	
10072-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 12 Mbps)	X	10.01	68.4	22.2	9.62	106.7	±3.0 %
		Y	10.38	69.2	22.4		144.1	
		Z	10.18	69.1	22.7		119.4	
10073-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 18 Mbps)	X	10.78	70.9	23.9	9.94	149.7	±3.0 %
		Y	10.27	69.1	22.6		139.1	
		Z	10.17	69.3	23.1		115.9	
10074-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 24 Mbps)	X	10.82	71.0	24.2	10.30	144.0	±3.3 %
		Y	10.30	69.2	22.9		133.6	
		Z	10.22	69.5	23.4		111.6	
10075-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 36 Mbps)	X	10.91	71.3	24.8	10.77	138.9	±3.3 %
		Y	10.34	69.2	23.3		129.4	
		Z	10.31	69.7	23.9		108.0	
10076-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 48 Mbps)	X	10.84	71.1	24.9	10.94	134.9	±3.3 %
		Y	10.25	69.0	23.3		125.9	
		Z	10.28	69.7	24.1		106.3	
10077-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps)	X	10.81	71.1	24.9	11.00	133.2	±3.5 %
		Y	10.23	69.1	23.4		124.7	
		Z	11.06	72.3	25.6		148.3	
10097-CAB	UMTS-FDD (HSDPA)	X	4.64	66.4	18.3	3.98	129.4	±0.7 %
		Y	4.47	65.1	17.4		126.4	
		Z	4.82	67.2	18.8		144.7	
10098-CAB	UMTS-FDD (HSUPA, Subtest 2)	X	4.66	66.5	18.4	3.98	130.1	±0.7 %
		Y	4.50	65.3	17.5		126.7	
		Z	4.78	67.0	18.7		145.5	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.59	67.6	19.7	5.67	136.1	±1.4 %
		Y	6.37	66.4	18.8		131.7	
		Z	6.14	66.0	18.9		107.5	
10101-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)	X	7.66	67.9	20.1	6.42	146.1	±1.7 %
		Y	7.50	67.0	19.4		140.3	
		Z	7.24	66.6	19.5		115.2	
10102-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)	X	8.00	68.2	20.4	6.60	148.5	±1.7 %
		Y	7.78	67.2	19.6		141.8	
		Z	7.54	66.9	19.7		117.4	

10108-CAC	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.41	67.0	19.5	5.80	133.0	±1.2 %
		Y	6.24	66.1	18.8		128.4	
		Z	6.04	65.7	18.9		106.2	
10109-CAC	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)	X	7.40	67.6	20.0	6.43	141.0	±1.7 %
		Y	7.23	66.7	19.3		135.5	
		Z	6.98	66.3	19.4		111.0	
10110-CAC	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	X	6.05	66.5	19.2	5.75	129.1	±1.4 %
		Y	5.89	65.5	18.5		124.3	
		Z	6.26	67.4	19.8		145.9	
10111-CAC	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)	X	7.12	67.4	20.0	6.44	136.5	±1.4 %
		Y	6.94	66.5	19.2		130.6	
		Z	6.69	66.0	19.3		107.3	
10112-CAC	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)	X	7.64	67.8	20.2	6.59	142.4	±1.7 %
		Y	7.46	66.9	19.5		136.7	
		Z	7.21	66.5	19.6		111.3	
10113-CAC	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)	X	7.32	67.5	20.1	6.62	137.7	±1.7 %
		Y	7.15	66.6	19.4		131.4	
		Z	6.92	66.2	19.4		108.9	
10114-CAB	IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK)	X	10.23	68.5	21.0	8.10	124.2	±2.5 %
		Y	10.04	67.9	20.5		117.0	
		Z	10.56	69.5	21.7		142.7	
10115-CAB	IEEE 802.11n (HT Greenfield, 81 Mbps, 16-QAM)	X	10.80	69.1	21.5	8.46	128.6	±2.5 %
		Y	10.61	68.5	21.0		120.9	
		Z	11.08	70.0	22.1		145.6	
10116-CAB	IEEE 802.11n (HT Greenfield, 135 Mbps, 64-QAM)	X	10.31	68.7	21.1	8.15	125.0	±2.5 %
		Y	10.13	68.1	20.6		118.2	
		Z	10.59	69.6	21.7		142.4	
10117-CAB	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.27	68.6	21.1	8.07	125.9	±2.5 %
		Y	10.08	68.0	20.5		119.0	
		Z	10.52	69.4	21.6		142.8	
10118-CAB	IEEE 802.11n (HT Mixed, 81 Mbps, 16-QAM)	X	10.91	69.2	21.7	8.59	128.3	±2.5 %
		Y	10.70	68.6	21.1		121.2	
		Z	11.21	70.2	22.3		146.3	
10119-CAB	IEEE 802.11n (HT Mixed, 135 Mbps, 64-QAM)	X	10.27	68.6	21.1	8.13	125.1	±2.5 %
		Y	10.10	68.0	20.6		118.1	
		Z	10.57	69.6	21.7		142.8	
10140-CAB	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM)	X	7.93	68.3	20.4	6.49	147.7	±1.7 %
		Y	7.73	67.4	19.6		142.8	
		Z	7.42	66.8	19.6		116.6	
10141-CAB	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM)	X	8.04	68.2	20.3	6.53	149.1	±1.7 %
		Y	7.84	67.4	19.6		143.2	
		Z	7.58	66.9	19.7		117.6	
10142-CAC	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, QPSK)	X	5.83	66.2	19.1	5.73	125.7	±1.2 %
		Y	5.68	65.2	18.4		121.2	
		Z	6.04	67.0	19.6		142.9	

EX3DV4– SN:7364 June 23, 2015

10143-CAC	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)	X	6.82	67.3	19.9	6.35	131.4	±1.4 %
		Y	6.65	66.3	19.1		126.5	
		Z	7.04	68.1	20.4		148.1	
10144-CAC	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM)	X	7.15	67.5	20.1	6.65	132.6	±1.4 %
		Y	6.96	66.6	19.4		127.2	
		Z	7.36	68.4	20.7		149.1	
10145-CAC	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)	X	5.54	65.9	19.0	5.76	120.5	±1.2 %
		Y	5.42	65.1	18.3		116.1	
		Z	5.76	66.9	19.6		135.7	
10146-CAC	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM)	X	6.48	67.3	19.9	6.41	124.0	±1.4 %
		Y	6.28	66.2	19.1		119.2	
		Z	6.70	68.1	20.4		140.0	
10147-CAC	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM)	X	6.74	67.4	20.1	6.72	124.3	±1.7 %
		Y	6.55	66.4	19.4		119.3	
		Z	6.97	68.3	20.7		140.2	
10149-CAB	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)	X	7.35	67.4	19.9	6.42	138.2	±1.4 %
		Y	7.17	66.5	19.2		133.3	
		Z	6.97	66.3	19.4		109.6	
10150-CAB	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)	X	7.61	67.7	20.1	6.60	140.5	±1.4 %
		Y	7.45	66.9	19.5		135.0	
		Z	7.22	66.5	19.6		112.4	
10154-CAC	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	6.03	66.4	19.2	5.75	127.0	±1.4 %
		Y	5.85	65.3	18.4		122.3	
		Z	6.24	67.3	19.8		145.2	
10155-CAC	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)	X	7.06	67.2	19.8	6.43	134.1	±1.4 %
		Y	6.91	66.4	19.2		128.7	
		Z	6.69	66.1	19.3		107.1	
10156-CAC	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, QPSK)	X	5.76	66.0	19.1	5.79	123.3	±1.2 %
		Y	5.63	65.1	18.3		118.7	
		Z	5.97	67.0	19.7		139.3	
10157-CAC	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)	X	6.80	67.2	19.9	6.49	128.7	±1.4 %
		Y	6.62	66.3	19.2		123.2	
		Z	6.99	68.0	20.4		144.9	
10158-CAC	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)	X	7.30	67.4	20.0	6.62	134.5	±1.4 %
		Y	7.12	66.5	19.3		129.0	
		Z	6.91	66.3	19.5		107.5	
10159-CAC	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)	X	6.91	67.4	20.0	6.56	129.3	±1.4 %
		Y	6.69	66.3	19.2		123.1	
		Z	7.12	68.2	20.5		145.9	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.54	67.1	19.6	5.82	132.9	±1.4 %
		Y	6.29	65.9	18.7		126.6	
		Z	6.71	67.9	20.0		149.3	
10161-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM)	X	7.41	67.6	20.0	6.43	139.7	±1.7 %
		Y	7.22	66.6	19.3		133.2	
		Z	6.97	66.2	19.3		110.0	

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10162-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM)	X	7.86	67.9	20.2	6.58	141.5	±1.7 %
		Y	7.48	67.0	19.5		134.6	
		Z	7.18	66.4	19.5		112.1	
10166-CAC	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK)	X	4.96	65.8	18.8	5.46	115.4	±0.9 %
		Y	4.76	64.5	17.9		110.2	
		Z	5.13	66.5	19.3		130.4	
10167-CAC	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM)	X	5.82	66.9	19.6	6.21	117.4	±1.2 %
		Y	5.60	65.7	18.8		109.9	
		Z	6.07	67.9	20.3		132.7	
10168-CAC	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM)	X	6.28	67.1	20.0	6.79	117.2	±1.4 %
		Y	6.06	66.0	19.2		111.0	
		Z	6.49	67.9	20.6		132.0	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	4.78	65.8	19.1	5.73	109.6	±1.2 %
		Y	4.92	66.1	19.0		145.3	
		Z	4.94	66.5	19.6		123.2	
10170-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)	X	5.36	66.3	19.7	6.52	107.4	±1.4 %
		Y	5.59	67.0	19.8		142.7	
		Z	5.61	67.4	20.4		121.7	
10171-AAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM)	X	5.38	66.5	19.7	6.49	107.3	±1.4 %
		Y	5.59	67.1	19.8		144.6	
		Z	5.64	67.6	20.4		121.5	
10175-CAC	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	4.71	65.4	18.6	5.72	107.7	±1.2 %
		Y	4.91	66.0	18.9		144.8	
		Z	4.91	66.3	19.4		122.3	
10176-CAC	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)	X	5.78	68.1	20.6	6.52	149.6	±1.4 %
		Y	5.57	66.9	19.7		142.9	
		Z	5.65	67.6	20.5		121.7	
10177-CAE	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, QPSK)	X	5.05	67.1	19.7	5.73	150.0	±1.2 %
		Y	4.91	66.0	18.9		144.6	
		Z	4.93	66.5	19.5		122.4	
10178-CAC	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)	X	5.80	68.2	20.7	6.52	149.3	±1.4 %
		Y	5.59	67.0	19.8		142.5	
		Z	5.63	67.5	20.4		121.7	
10179-CAC	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)	X	5.80	68.3	20.7	6.50	149.2	±1.4 %
		Y	5.62	67.2	19.9		144.9	
		Z	5.61	67.5	20.4		121.4	
10180-CAC	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)	X	5.80	68.3	20.7	6.50	148.6	±1.4 %
		Y	5.60	67.1	19.8		144.4	
		Z	5.63	67.5	20.4		121.6	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	5.04	67.0	19.7	5.72	149.4	±1.2 %
		Y	4.94	66.2	19.1		145.5	
		Z	4.92	66.4	19.5		122.1	
10182-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)	X	5.79	68.2	20.7	6.52	148.9	±1.4 %
		Y	5.57	66.9	19.7		142.2	
		Z	5.63	67.5	20.5		121.0	

10183-AAA	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM)	X	5.81	68.4	20.8	6.50	148.4	±1.4 %
		Y	5.62	67.2	19.9		144.3	
		Z	5.62	67.5	20.4		121.1	
10184-CAC	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, QPSK)	X	5.06	67.1	19.8	5.73	149.2	±1.2 %
		Y	4.91	66.0	18.9		144.9	
		Z	4.94	66.5	19.5		122.0	
10185-CAC	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)	X	5.77	68.1	20.6	6.51	148.4	±1.4 %
		Y	5.57	66.9	19.8		142.5	
		Z	5.62	67.5	20.4		121.5	
10186-AAC	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM)	X	5.81	68.4	20.8	6.50	148.0	±1.7 %
		Y	5.63	67.3	19.9		144.7	
		Z	5.60	67.5	20.3		121.0	
10187-CAC	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)	X	5.07	67.1	19.8	5.73	149.3	±1.2 %
		Y	4.94	66.2	19.0		145.6	
		Z	4.91	66.3	19.4		122.3	
10188-CAC	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)	X	5.79	68.2	20.7	6.52	148.1	±1.7 %
		Y	5.57	66.9	19.7		142.5	
		Z	5.61	67.4	20.4		121.2	
10189-AAC	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM)	X	5.83	68.5	20.8	6.50	148.1	±1.4 %
		Y	5.60	67.1	19.8		144.5	
		Z	5.64	67.6	20.4		121.5	
10193-CAB	IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)	X	9.64	67.7	20.6	8.09	112.5	±2.2 %
		Y	9.63	67.5	20.3		109.6	
		Z	10.04	68.9	21.4		132.4	
10194-CAB	IEEE 802.11n (HT Greenfield, 39 Mbps, 16-QAM)	X	9.78	68.0	20.9	8.12	116.1	±2.2 %
		Y	9.67	67.5	20.4		110.9	
		Z	10.06	68.9	21.5		131.8	
10195-CAB	IEEE 802.11n (HT Greenfield, 65 Mbps, 64-QAM)	X	9.93	68.3	21.0	8.21	117.1	±2.5 %
		Y	9.81	67.7	20.5		112.3	
		Z	10.19	69.1	21.5		134.2	
10196-CAB	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.73	68.0	20.8	8.10	116.3	±2.2 %
		Y	9.62	67.5	20.3		111.7	
		Z	10.01	68.9	21.4		132.6	
10197-CAB	IEEE 802.11n (HT Mixed, 39 Mbps, 16-QAM)	X	9.77	68.0	20.8	8.13	116.4	±2.2 %
		Y	9.75	67.7	20.5		111.4	
		Z	10.10	69.0	21.5		132.9	
10198-CAB	IEEE 802.11n (HT Mixed, 65 Mbps, 64-QAM)	X	9.96	68.2	21.0	8.27	117.4	±2.5 %
		Y	9.88	67.8	20.6		112.8	
		Z	10.29	69.3	21.7		135.1	
10219-CAB	IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK)	X	9.62	67.9	20.8	8.03	116.5	±2.2 %
		Y	9.53	67.4	20.3		111.0	
		Z	9.94	68.9	21.4		132.9	
10220-CAB	IEEE 802.11n (HT Mixed, 43.3 Mbps, 16-QAM)	X	9.81	68.1	20.9	8.13	117.2	±2.2 %
		Y	9.70	67.6	20.4		111.6	
		Z	10.10	69.0	21.5		134.0	

10221-CAB	IEEE 802.11n (HT Mixed, 72.2 Mbps, 64-QAM)	X	9.97	68.2	21.0	8.27	118.3	±2.5 %
		Y	9.89	67.8	20.6		112.7	
		Z	10.29	69.2	21.7		135.4	
10222-CAB	IEEE 802.11n (HT Mixed, 15 Mbps, BPSK)	X	10.14	68.4	20.9	8.06	122.8	±2.5 %
		Y	10.02	67.9	20.5		116.9	
		Z	10.48	69.4	21.6		140.6	
10223-CAB	IEEE 802.11n (HT Mixed, 90 Mbps, 16-QAM)	X	10.72	69.0	21.4	8.48	126.2	±2.5 %
		Y	10.54	68.3	20.9		119.3	
		Z	11.04	69.9	22.1		143.9	
10224-CAB	IEEE 802.11n (HT Mixed, 150 Mbps, 64-QAM)	X	10.13	68.4	20.9	8.08	123.4	±2.5 %
		Y	10.01	68.0	20.5		115.7	
		Z	10.44	69.3	21.5		140.3	
10225-CAB	UMTS-FDD (HSPA+)	X	7.19	67.5	19.6	5.97	143.8	±1.4 %
		Y	7.05	66.7	19.0		138.4	
		Z	6.78	66.2	19.0		112.5	
10274-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10)	X	6.03	66.9	18.8	4.87	136.9	±1.2 %
		Y	5.89	66.1	18.1		131.5	
		Z	5.76	66.1	18.5		109.1	
10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.32	65.7	18.0	3.96	119.3	±0.9 %
		Y	4.16	64.5	17.1		112.7	
		Z	4.57	66.9	18.7		136.2	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.29	66.6	19.2	5.81	126.9	±1.4 %
		Y	6.12	65.6	18.5		120.7	
		Z	6.52	67.5	19.8		142.9	
10298-AAB	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, QPSK)	X	5.62	66.1	19.1	5.72	120.8	±1.2 %
		Y	5.44	65.0	18.3		115.1	
		Z	5.80	66.9	19.6		136.0	
10299-AAB	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)	X	6.55	67.1	19.8	6.39	125.4	±1.4 %
		Y	6.35	66.1	19.0		119.2	
		Z	6.82	68.2	20.5		140.5	
10300-AAB	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM)	X	6.73	67.3	20.0	6.60	125.1	±1.4 %
		Y	6.53	66.3	19.2		118.8	
		Z	6.99	68.2	20.6		140.9	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	6.94	67.4	19.7	6.06	135.3	±1.4 %
		Y	6.75	66.4	19.0		129.1	
		Z	6.55	66.2	19.2		106.3	
10315-AAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle)	X	2.71	67.3	17.7	1.71	120.4	±0.5 %
		Y	2.36	64.0	15.7		114.8	
		Z	2.97	68.9	18.7		133.5	
10316-AAB	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 96pc duty cycle)	X	9.89	68.1	21.1	8.36	116.2	±2.5 %
		Y	9.75	67.5	20.5		108.9	
		Z	10.15	69.0	21.6		131.4	
10317-AAB	IEEE 802.11a WiFi 5 GHz (OFDM, 6 Mbps, 96pc duty cycle)	X	9.89	68.1	21.1	8.36	116.7	±2.5 %
		Y	9.76	67.6	20.6		110.0	
		Z	10.16	69.0	21.7		132.3	

10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	2.58	66.6	17.4	1.54	122.6	±0.5 %
		Y	2.36	64.2	15.8		117.2	
		Z	2.79	68.0	18.2		136.1	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	9.83	68.1	21.0	8.23	117.6	±2.2 %
		Y	9.72	67.6	20.5		110.8	
		Z	10.12	69.0	21.6		132.8	
10417-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle)	X	9.82	68.1	20.9	8.23	117.7	±2.2 %
		Y	9.76	67.7	20.5		111.5	
		Z	10.11	69.0	21.6		133.6	
10418-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Long preambule)	X	9.69	68.0	20.9	8.14	116.8	±2.2 %
		Y	9.59	67.5	20.4		110.3	
		Z	9.95	68.8	21.4		131.4	
10419-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Short preambule)	X	9.76	68.1	20.9	8.19	117.3	±2.2 %
		Y	9.70	67.6	20.5		111.1	
		Z	10.04	68.9	21.5		132.4	
10422-AAA	IEEE 802.11n (HT Greenfield, 7.2 Mbps, BPSK)	X	10.03	68.4	21.1	8.32	119.6	±2.5 %
		Y	9.90	67.7	20.6		112.6	
		Z	10.29	69.2	21.7		133.6	
10423-AAA	IEEE 802.11n (HT Greenfield, 43.3 Mbps, 16-QAM)	X	10.19	68.5	21.3	8.47	120.0	±2.5 %
		Y	10.08	68.0	20.8		112.9	
		Z	10.43	69.3	21.8		134.2	
10424-AAA	IEEE 802.11n (HT Greenfield, 72.2 Mbps, 64-QAM)	X	10.08	68.4	21.2	8.40	119.6	±2.5 %
		Y	9.96	67.8	20.7		112.6	
		Z	10.33	69.2	21.8		133.7	
10425-AAA	IEEE 802.11n (HT Greenfield, 15 Mbps, BPSK)	X	10.62	68.9	21.4	8.41	126.1	±2.7 %
		Y	10.42	68.2	20.8		117.7	
		Z	10.92	69.8	22.0		142.2	
10426-AAA	IEEE 802.11n (HT Greenfield, 90 Mbps, 16-QAM)	X	10.66	69.0	21.5	8.45	126.5	±2.7 %
		Y	10.43	68.2	20.8		118.2	
		Z	10.95	69.8	22.0		142.5	
10427-AAA	IEEE 802.11n (HT Greenfield, 150 Mbps, 64-QAM)	X	10.65	69.0	21.4	8.41	126.9	±2.7 %
		Y	10.40	68.2	20.8		118.2	
		Z	10.92	69.8	22.0		142.7	
10434-AAA	W-CDMA (BS Test Model 1, 64 DPCH)	X	9.04	67.7	21.1	8.60	103.3	±2.7 %
		Y	9.68	69.3	21.7		143.5	
		Z	9.37	68.8	21.8		116.7	

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 NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 12 and 13).
[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: EX3DV4 - SN:7364

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)	Unct. (k=2)
150	52.3	0.76	12.95	12.95	12.95	0.00	1.00	± 13.3 %
300	45.3	0.87	11.95	11.95	11.95	0.10	1.10	± 13.3 %
450	43.5	0.87	10.72	10.72	10.72	0.15	1.10	± 13.3 %
750	41.9	0.89	10.01	10.01	10.01	0.29	1.08	± 12.0 %
900	41.5	0.97	9.26	9.26	9.26	0.24	1.23	± 12.0 %
1810	40.0	1.40	7.93	7.93	7.93	0.33	0.80	± 12.0 %
1900	40.0	1.40	7.93	7.93	7.93	0.35	0.80	± 12.0 %
2450	39.2	1.80	7.18	7.18	7.18	0.27	0.98	± 12.0 %
2600	39.0	1.96	6.93	6.93	6.93	0.34	0.93	± 12.0 %
5200	36.0	4.66	5.22	5.22	5.22	0.35	1.80	± 13.1 %
5300	35.9	4.76	5.00	5.00	5.00	0.35	1.80	± 13.1 %
5500	35.6	4.96	4.75	4.75	4.75	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.64	4.64	4.64	0.40	1.80	± 13.1 %
5800	35.3	5.27	4.52	4.52	4.52	0.40	1.80	± 13.1 %

[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: EX3DV4 - SN:7364

Calibration Parameter Determined in Body Tissue Simulating Media

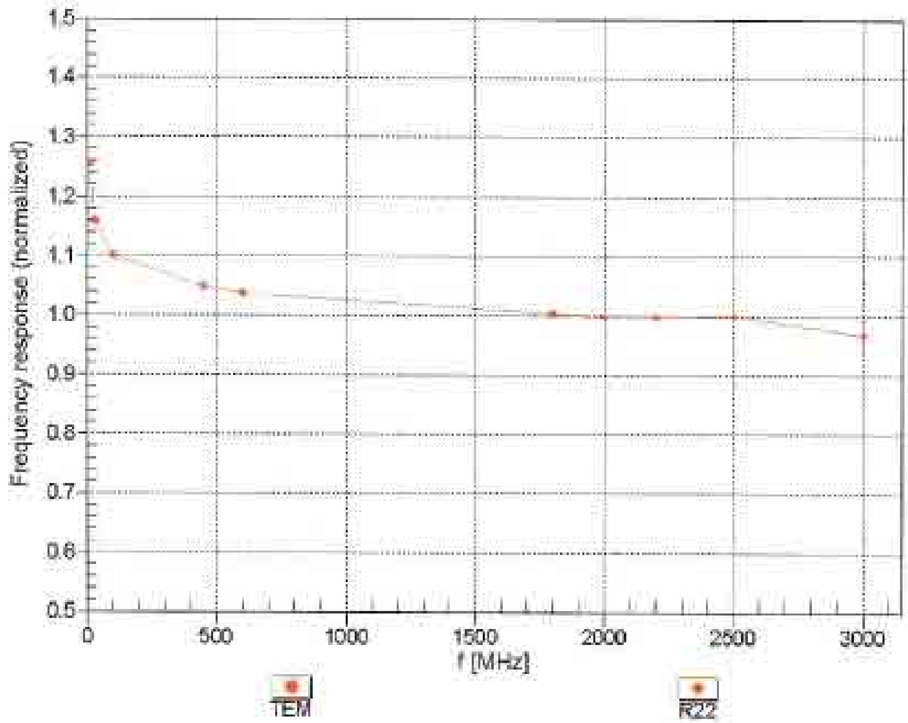
f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
150	61.9	0.80	12.28	12.28	12.28	0.00	1.00	± 13.3 %
300	58.2	0.92	11.24	11.24	11.24	0.08	1.10	± 13.3 %
450	56.7	0.94	11.02	11.02	11.02	0.09	1.10	± 13.3 %
750	55.5	0.96	9.42	9.42	9.42	0.27	1.06	± 12.0 %
900	55.0	1.05	9.20	9.20	9.20	0.27	1.22	± 12.0 %
1810	53.3	1.52	7.75	7.75	7.75	0.43	0.85	± 12.0 %
1900	53.3	1.52	7.57	7.57	7.57	0.47	0.80	± 12.0 %
2450	52.7	1.95	7.33	7.33	7.33	0.35	0.90	± 12.0 %
2600	52.5	2.16	7.17	7.17	7.17	0.31	0.95	± 12.0 %
5200	49.0	5.30	4.52	4.52	4.52	0.45	1.90	± 13.1 %
5300	48.9	5.42	4.29	4.29	4.29	0.45	1.90	± 13.1 %
5500	48.6	5.65	3.92	3.92	3.92	0.50	1.90	± 13.1 %
5600	48.5	5.77	3.74	3.74	3.74	0.50	1.90	± 13.1 %
5800	48.2	6.00	4.06	4.06	4.06	0.50	1.90	± 13.1 %

[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.

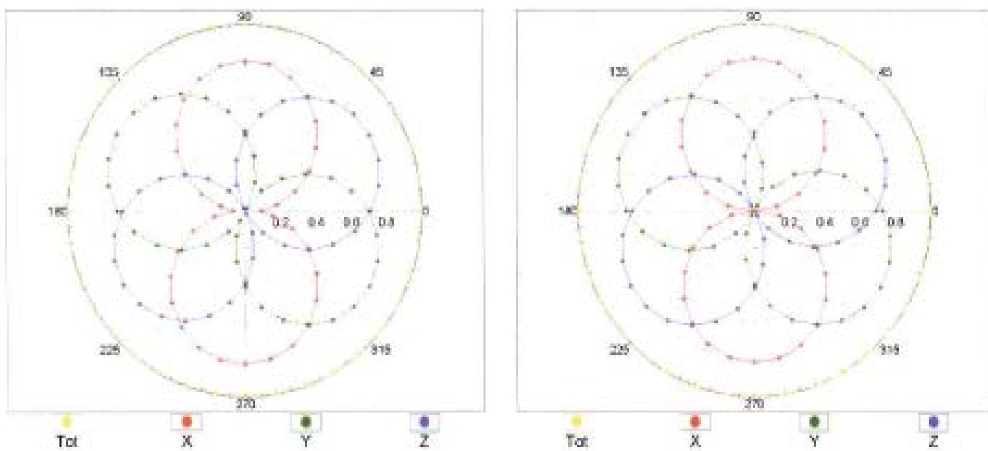
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)

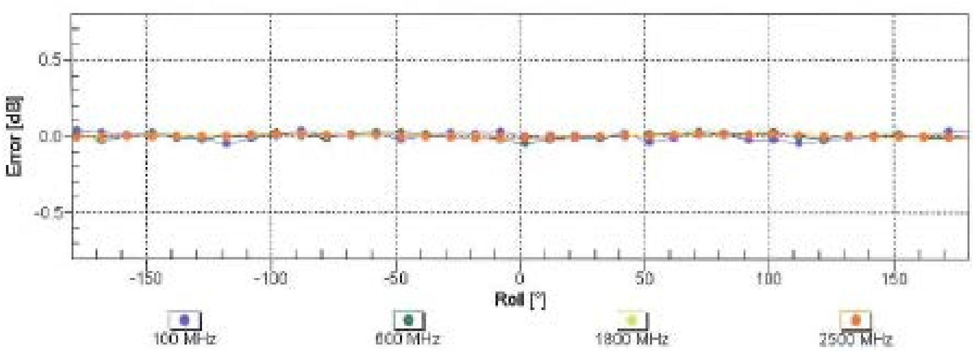


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), ϑ = 0°

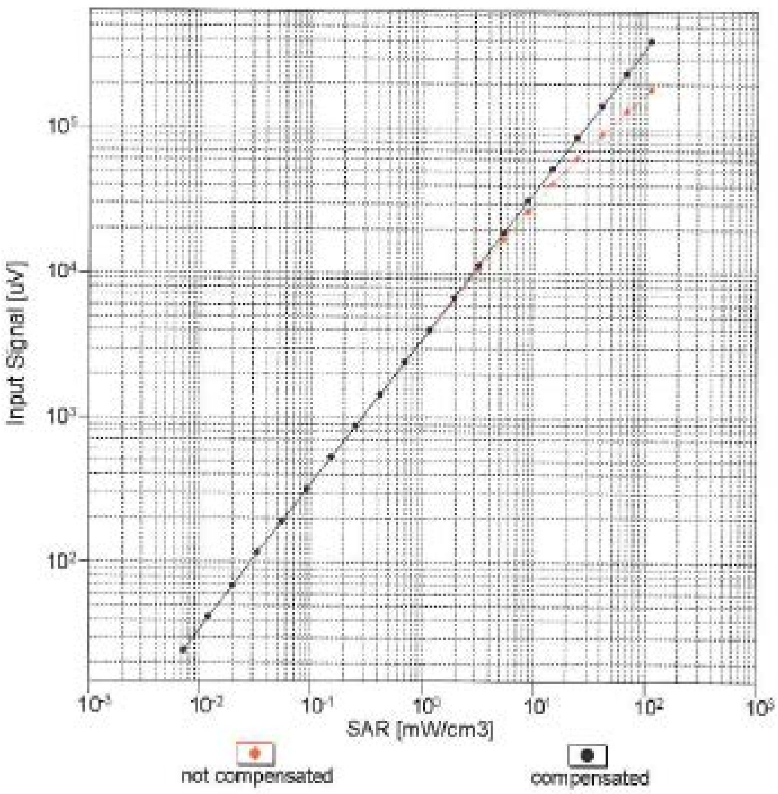
f=600 MHz,TEM f=1800 MHz,R22

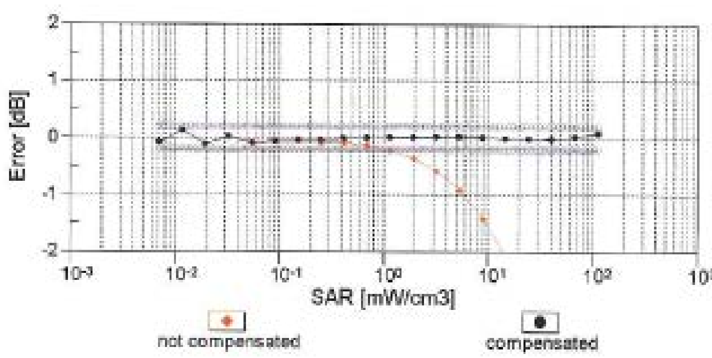




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

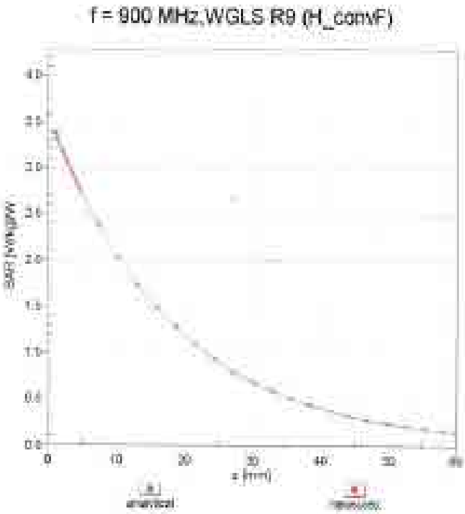
Dynamic Range f(SAR_{head})
(TEM cell , f_{eval}= 1900 MHz)

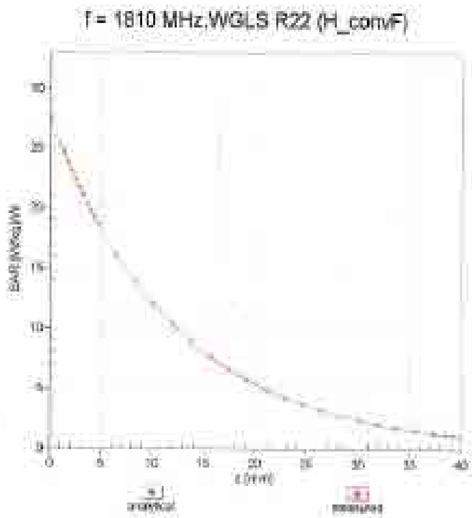




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

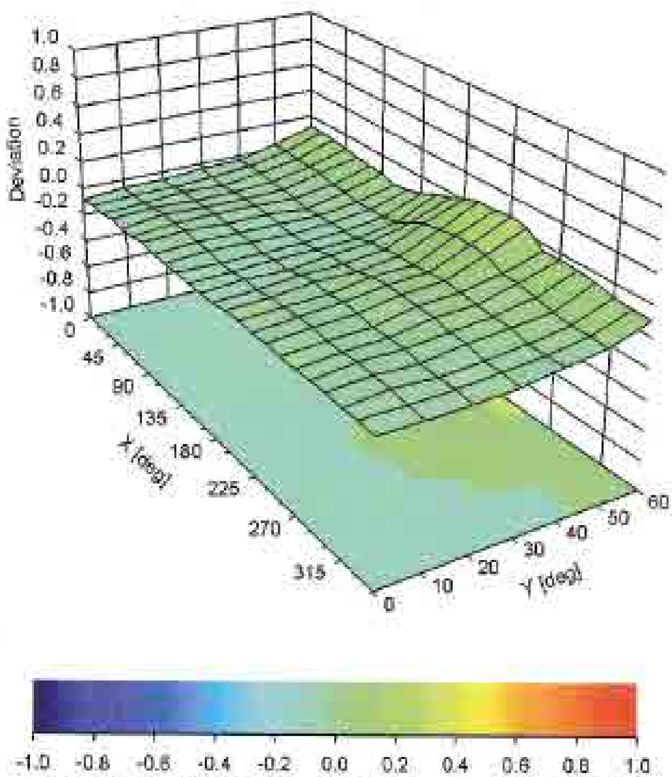
Conversion Factor Assessment





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: EX3DV4 - SN:7364

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	132.1
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

Appendix C
Dipole Calibration Certificates

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

S Schweizerischer Kalibrierdienst
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Accreditation No.: **SCS 108**

Client **Motorola MY**

Certificate No: **CLA150-4010_May14**

CALIBRATION CERTIFICATE

Object	CLA150 - SN: 4010
Calibration procedure(s)	QA CAL-15.v8 Calibration procedure for system validation sources below 700 MHz
Calibration date:	May 08, 2014

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 E4419B	GB41293874	03-Apr-14 (No. 217-01911)	Apr-15
Power sensor E4412A	MY41498087	03-Apr-14 (No. 217-01911)	Apr-15
Reference 3 dB Attenuator	SN: S5054 (3c)	03-Apr-14 (No. 217-01915)	Apr-15
Reference 20 dB Attenuator	SN: S5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe EX3DV4	SN: 3877	06-Jan-14 (No. EX3-3877_Jan14)	Jan-15
DAE4	SN: 654	18-Jul-13 (No. DAE4-654_Jul13)	Jul-14

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	04-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

	Name	Function	Signature
Calibrated by:	Israe El-Naouq	Laboratory Technician	[signature]
Approved by:	Katja Pokovic	Technical Manager	[signature]

Issued: May 8, 2014

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

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) IEC 62209-2, "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 2013
b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

c) 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 source is mounted in a touch configuration below the center marking of the flat phantom.
- *Return Loss:* This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. 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	ELI4 Flat Phantom	Shell thickness: 2 ± 0.2 mm
EUT Positioning	Touch Position	
Zoom Scan Resolution	dx, dy, dz = 5.0 mm	
Frequency	150 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	52.3	0.76 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	49.9 ± 6 %	0.76 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	1 W input power	3.59 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**3.55 W/kg ± 18.4 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	1 W input power	2.39 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**2.37 W/kg ± 18.0 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	61.9	0.80 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	62.5 ± 6 %	0.80 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	1 W input power	3.68 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**3.69 W/kg ± 18.4 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	1 W input power	2.46 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**2.46 W/kg ± 18.0 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.2 Ω - 3.5 jΩ
Return Loss	- 28.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.6 Ω - 7.7 jΩ
Return Loss	- 22.3 dB

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	April 15, 2014

DASY5 Validation Report for Head TSL

Date: 08.05.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: CLA150; Type: CLA150; Serial: CLA150 - SN: 4010

Communication System: UID 0 - CW; Frequency: 150 MHz
Medium parameters used: f = 150 MHz; $\sigma = 0.76$ S/m; $\varepsilon_r = 49.9$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3877; ConvF(11.76, 11.76, 11.76); Calibrated: 06.01.2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn654; Calibrated: 18.07.2013
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:1003
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

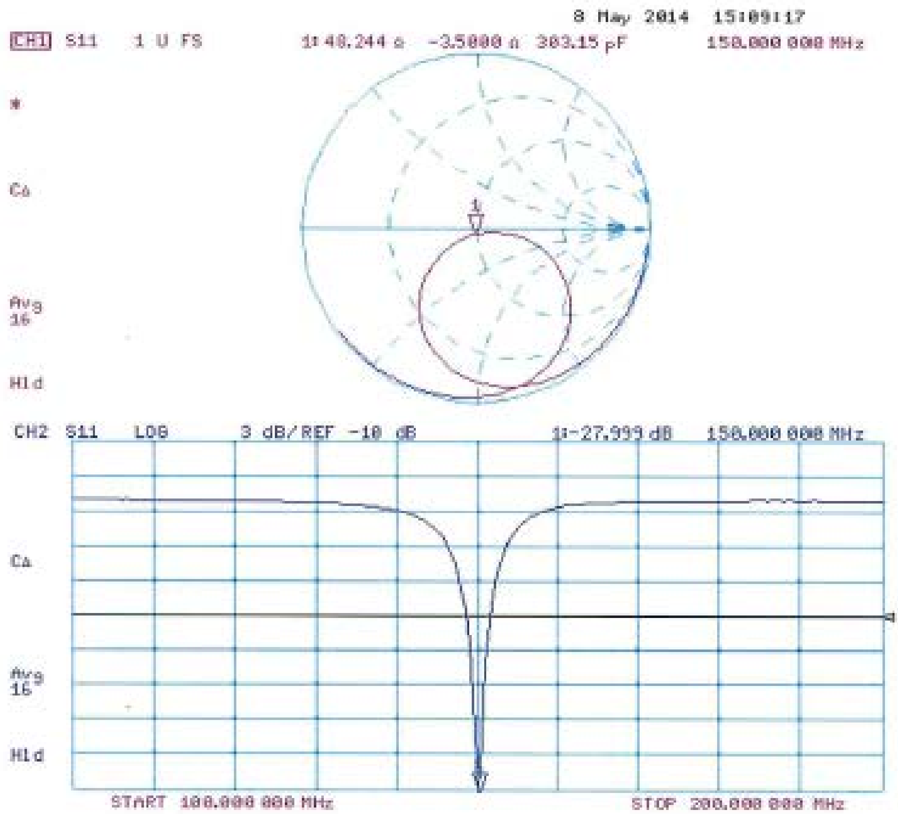
CLA Calibration for HSL-LF Tissue/CLA150, touch configuration, Pin=1W/Area Scan (81x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 4.65 W/kg

CLA Calibration for HSL-LF Tissue/CLA150, touch configuration, Pin=1W/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 78.11 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 5.77 W/kg
SAR(1 g) = 3.59 W/kg; SAR(10 g) = 2.39 W/kg
Maximum value of SAR (measured) = 4.64 W/kg

0 dB = 4.65 W/kg = 6.67 dBW/kg

Certificate No: CLA150-4010_May14 Page 5 of 8

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 08.05.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: CLA150; Type: CLA150; Serial: CLA150 - SN: 4010

Communication System: UID 0 - CW; Frequency: 150 MHz
Medium parameters used: f = 150 MHz; σ = 0.8 S/m; ε_r = 62.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

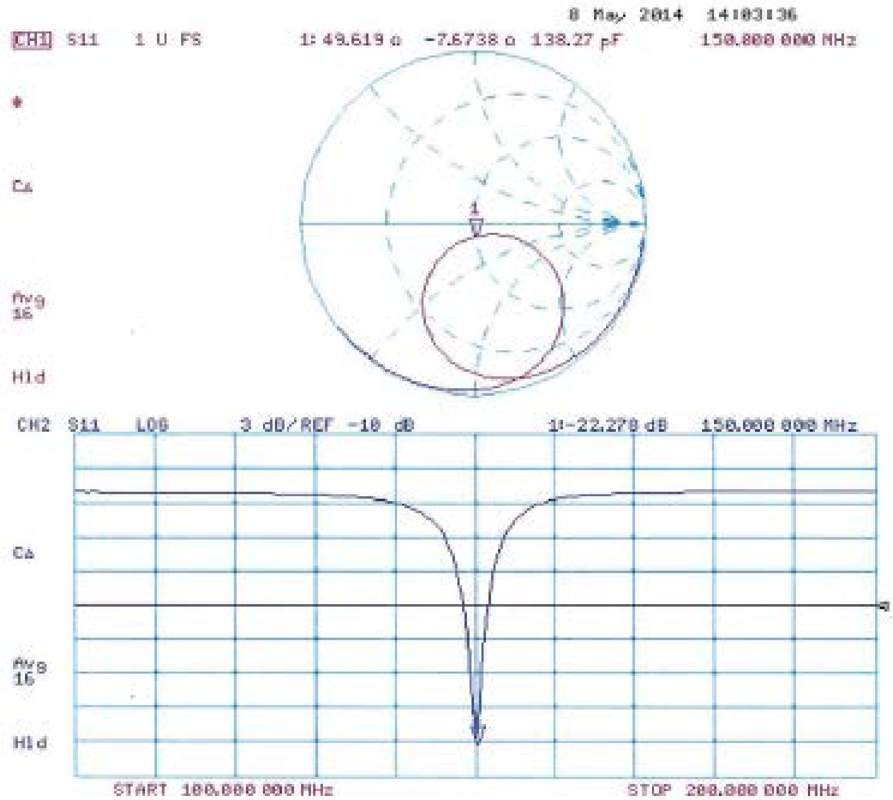
- Probe: EX3DV4 - SN3877; ConvF(11.45, 11.45, 11.45); Calibrated: 06.01.2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn654; Calibrated: 18.07.2013
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:1003
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

CLA Calibration for MSL-LF Tissue/CLA150, touch configuration, Pin=1W/Area Scan (81x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 4.77 W/kg

CLA Calibration for MSL-LF Tissue/CLA150, touch configuration, Pin=1W/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 76.42 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 5.84 W/kg
SAR(1 g) = 3.68 W/kg; SAR(10 g) = 2.46 W/kg
Maximum value of SAR (measured) = 4.73 W/kg

0 dB = 4.77 W/kg = 6.79 dBW/kg

Impedance Measurement Plot for Body TSL



Calibration Laboratory of
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Engineering AG
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Accreditation No.: SCS 0108

Client Motorola Solutions MY

Certificate No: D2450V2-781_Mar15

CALIBRATION CERTIFICATE

Object	D2450V2 - SN:781
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	March 20, 2015

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-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	US37292783	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	MY41092317	07-Oct-14 (No. 217-02021)	Oct-15
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-14 (No. ES3-3205_Dec14)	Dec-15
DAE4	SN: 601	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

	Name	Function	Signature
Calibrated by:	Israe Elnaouq	Laboratory Technician	[signature]
Approved by:	Katja Pokovic	Technical Manager	[signature]

Issued: March 20, 2015

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

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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) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) 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	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.8 ± 6 %	1.83 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.3 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**52.3 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.16 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.4 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	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	50.8 ± 6 %	2.02 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.3 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**51.9 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.15 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**24.2 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	53.9 Ω + 1.2 jΩ
Return Loss	- 28.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.9 Ω + 3.2 jΩ
Return Loss	- 30.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.155 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	May 06, 2005

DASY5 Validation Report for Head TSL

Date: 20.03.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:781

Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.83 S/m; ε_r = 37.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.54, 4.54, 4.54); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

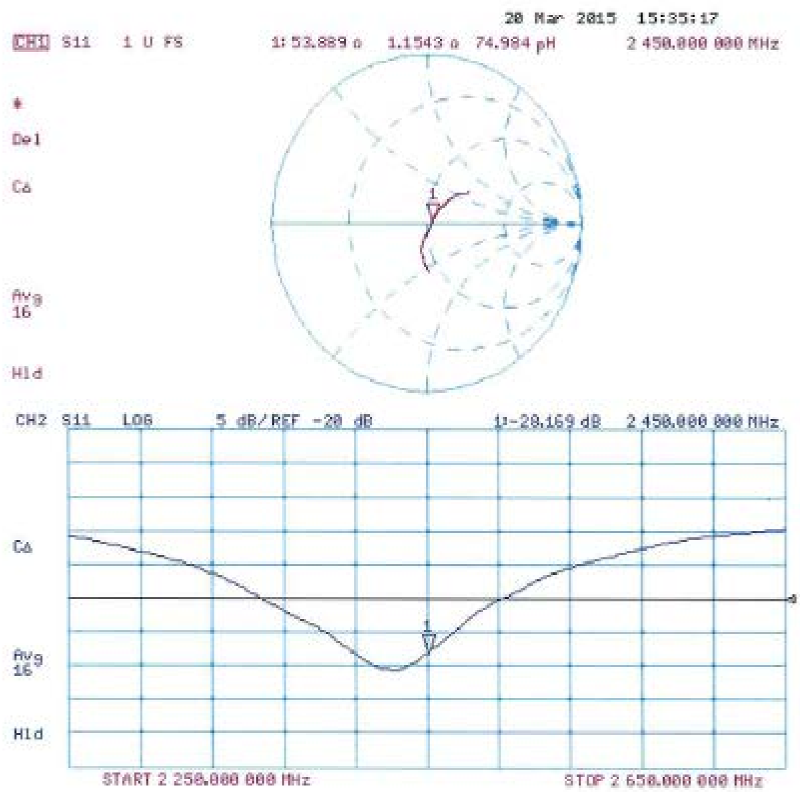
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 101.2 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 27.9 W/kg
SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.16 W/kg
Maximum value of SAR (measured) = 17.4 W/kg

0 dB = 17.4 W/kg = 12.41 dBW/kg

Certificate No: D2450V2-781_Mar15 Page 5 of 8

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 19.03.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:781

Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.02 S/m; ε_r = 50.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.32, 4.32, 4.32); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

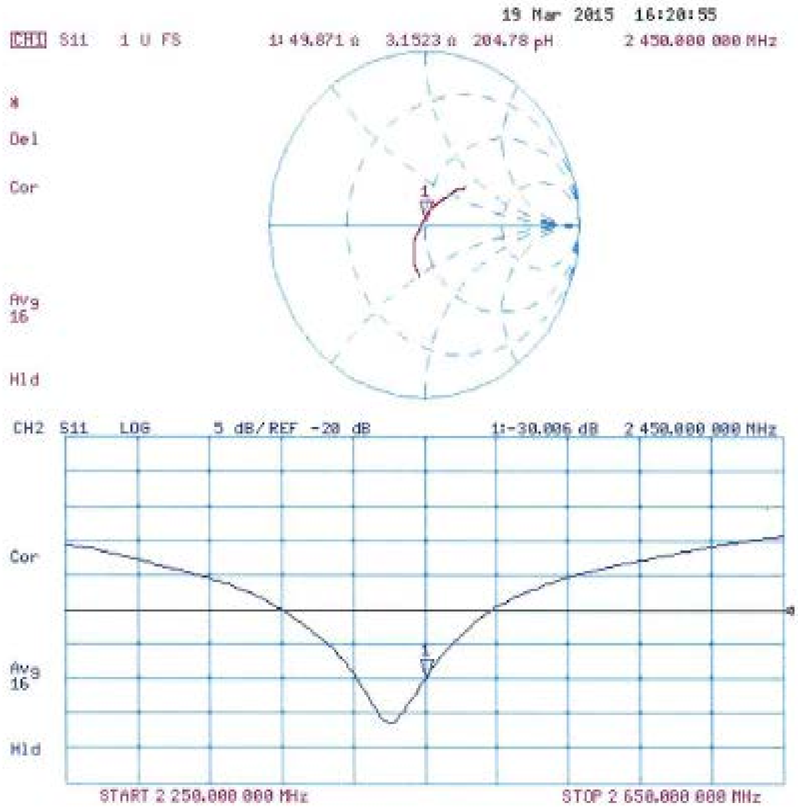
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.66 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 28.0 W/kg
SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.15 W/kg
Maximum value of SAR (measured) = 17.4 W/kg

0 dB = 17.4 W/kg = 12.41 dBW/kg

Certificate No: D2450V2-781_Mar15 Page 7 of 8

Impedance Measurement Plot for Body TSL



Dipole Data

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

Dipole CLA150-4010	Head			Body		
Date Measured	Impedance		Return Loss	Impedance		Return Loss
	real Ω	imag jΩ	dB	real Ω	imag jΩ	dB
9/11/2014	48.10	3.20	-28.00	51.10	-4.90	-22.60
4/15/2015	47.54	3.02	-28.28	50.86	-2.06	-23.82

D2450V2 (serial number 781) does not exceed the annual calibration date, hence no further justification required.