MS ISO/IEC 17025
TESTING
SAMM No.0826

DECLARATION OF COMPLIANCE SAR ASSESSMENT Part 1 of 2

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Date of Report: 02/26/2018
Report Revision: A

Responsible Engineer:	Saw Sun Hock (EME Engineer)
Report Author:	Saw Sun Hock (EME Engineer)
Date/s Tested:	1/11/2018 -2/14/2018, 2/25/2018-2/26/2018
Manufacturer:	Motorola Solutions Inc.
DUT Description:	Handheld Portable – Frequency bands; LMR 136-174MHz
Test TX mode(s):	CW (PTT)
Max. Power output:	6 W
Nominal Power:	5 W
Tx Frequency Bands:	LMR 136-174MHz
Signaling type:	FM, TDMA
Model(s) Tested:	AAH01JDC9JA2AN (PMUD3231B)
Model(s) Certified:	AAH01JDC9JA2AN (PMUD3231B) / PMUD3231BAANAA, AAH01JDC9JC2AN (PMUD3231B) / PMUD3231BAANEA
Serial Number(s):	752TTZ7469, 752TTZ7451
Classification:	Occupational/Controlled
FCC ID:	AZ489FT3845; LMR 150.8-173.4MHz This report contains results that are immaterial for FCC equipment approval, which are clearly identified.
IC:	109U-89FT3845 This report contains results that are immaterial for IC equipment approval, which are identified.
ISED Test Site registration:	109AK
FCC Test Firm Registration Number:	823256

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 FCC 47 CFR § 2.1093.

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

Tiong

Tiong Nguk Ing
Deputy Technical Manager
Approval Date: 2/27/2018

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Report Revision History

Date	Revision	Comments
02/26/2018	A	Initial release

1.0 Introduction

This report details the utilization, test setup, test equipment, and test results of the Specific Absorption Rate (SAR) measurements performed at the Motorola Solutions Inc. EME Test Laboratory for handheld portable model number AAH01JDC9JA2AN (PMUD3231B). This device is 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	1g-SAR
TNF	150.8-173.4MHz (LMR)	1.94	0.64

3.0 Abbreviations / Definitions

CNR: Calibration Not Required
CW: Continuous Wave
DUT: Device Under Test
EME: Electromagnetic Energy
FM: Frequency Modulation
LMR: Land Mobile Radio
NA: Not Applicable
PTT: Push to Talk
RSM: Remote Speaker Microphone
SAR: Specific Absorption Rate
TNF: Licensed Non-Broadcast Transmitter Held to Face
RF: Radio Frequency
NKP: Non-Keypad

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 (2013), Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
- American National Standards Institute (ANSI) / Institute of Electrical and Electronics Engineers (IEEE) C95. 1-1992
- Institute of Electrical and Electronics Engineers (IEEE) C95.1-2005
- International Commission on Non-Ionizing Radiation Protection (ICNIRP) 1998
- Ministry of Health (Canada) Safety Code 6 (2015), Limits of Human Exposure to Radio frequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz
- RSS-102 (Issue 5) – Radio Frequency (RF) Exposure Compliance of Radio communication Apparatus (All Frequency Bands)
- Australian Communications Authority Radio communications (Electromagnetic Radiation - Human Exposure) Standard (2014)
- ANATEL, Brazil Regulatory Authority, Resolution No. 303 of July 2, 2002 "Regulation of the limitation of exposure to electrical, magnetic, and electromagnetic fields in the radio frequency range between 9 kHz and 300 GHz." and "Attachment to resolution # 303 from July 2, 2002"
- IEC62209-2 Edition 1.0 2010-03, Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures – Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz).

- FCC KDB – 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

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)

This device operates in the LMR band using either frequency modulation (FM) with 100% transmit duty cycle or TDMA signals with maximum of 50% transmit duty cycle. For conservative assessment, FM signal was tested.

The model represented under this filing utilizes removable antennas and capable of transmitting in the 136-174 MHz band respectively. The nominal output power is 5.0 watts with maximum output power of 6.0 watts defined by upper limit of the production line final test station.

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

Technology	Band (MHz)	Transmission	Duty Cycle (%)	Max Power (W)
LMR	136-174	FM / TDMA	*50 / *25	6.00

Note - * includes 50% PTT operation

The intended operating positions are “at the face” with the DUT at least 2.5 cm 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.

7.0 Optional Accessories and Test Criteria

This device is 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 this device. 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 offered for this product. The Table below lists their descriptions.

Table 4

Antenna No.	Antenna Models	Description	Selected for test	Tested
1	HAD9742A	Stubby antenna, 146-162MHz, 1/4 wave, -11.5 dBi	Yes	Yes
2	HAD9743A	Stubby antenna, 162-174MHz, 1/4 wave, -11.5 dBi	Yes	Yes
3	NAD6502AR	Heliflex antenna, 146-174MHz, 1/4 wave, -11 dBi	Yes	Yes
4	PMAD4012A	Stubby antenna, 136-155MHz, 1/4 wave, -11.5 dBi	Yes	Yes
5	PMAD4014A	Whip antenna, 136-155MHz, 1/4 wave, -11 dBi	Yes	Yes
6	PMAD4042A	Heliflex antenna, 136-150.8MHz, 1/4 wave, -11 dBi	Yes	Yes

7.2 Battery

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

Table 5

Battery No.	Battery Models	Description	Selected for test	Tested	Comments
1	NNTN4970A	Battery Li-ion 1700T	Yes	Yes	Default battery for body testing
2	NNTN4497DR	Battery Li-ion 2250T	Yes	Yes	
3	NNTN4851A	Battery NiMH 1480T	Yes	Yes	
4	PMNN4450AR	Battery Li-ion IP54 2900T	Yes	Yes	Default battery for face testing
5	PMNN4072A	Battery MagOne NiMH 1480T	Yes	Yes	
6	PMNN4098A	Battery NiMH 1400T	Yes	Yes	
7	PMNN4251AR	Battery NiMH 1400T	Yes	Yes	
8	PMNN4253AR	Battery Li-ion 1600T	Yes	Yes	
9	PMNN4254AR	Battery Li-ion 2300T	Yes	Yes	
10	PMNN4258AR	Battery Pack, Battery Li-ion IP54 2900T	Yes	Yes	
11	PMNN4259AR	Battery Pack, Battery MagOne Li-ion 2075T	Yes	Yes	
12	PMNN4458BR	Battery Pack, Battery MagOne Li-ion 2150T	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 No.	Body worn Models	Description	Selected for test	Tested	Comments
1	RLN5644A	2 Inch Belt Clip	Yes	Yes	
2	HLN8255B	Spring Belt Clip Black	Yes	Yes	
3	HLN6602A	Universal Chest Pack	Yes	Yes	
4	RLN4815A	Fanny Pack Carry Accessory	Yes	Yes	
5	RLN4570A	Breakaway Chest Pack	Yes	Yes	
6	RLN5383A	Leather Carry Case with Belt Loop and D-Ring	Yes	Yes	Tested with NTN5243A
7	RLN5384B	Leather Case With 2.5 Inch Swivel belt loop	Yes	Yes	Tested with NTN5243A without belt loop
8	HLN9701B	Nylon Carry Case Short DTMF	Yes	Yes	Tested with NTN5243A
9	NTN5243A	Strap	Yes	Yes	Tested with RLN5383A,RLN5384B , HLN9701B
10	HLN9985B	Weatherproof Baggie	No	No	
11	RLN5385B	Leather Case With 3 Inch Swivel loop	No	No	By similarity to RLN5384B

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 No.	Audio Acc. Models	Description	Selected for test	Tested	Comments
1	PMMN4092A	Remote Speaker Microphone, MagOne	Yes	Yes	Default Audio
2	PMLN6530A	2 Wire with Translucent Tube, Black	Yes	No	Per KDB provisions test not required.
3	PMLN6531A	Ear Receiver with In-Line Mic/ PTT/VOX switch	Yes	No	Per KDB provisions test not required.
4	PMLN6537A	Ear set with Boom Mic and In-Line PTT/VOX switch	Yes	No	Per KDB provisions test not required.
5	PMLN6538A	Lightweight Headset with Swivel Boom Microphone	Yes	No	Per KDB provisions test not required.
6	PMLN6539A	Medium Weight Over-The-Head Dual Muff Headset	Yes	No	Per KDB provisions test not required.
7	PMLN6540A	Heavy-Duty Noise Cancelling Boom Mic Headset	Yes	No	Per KDB provisions test not required.
8	PMMN4013A	Microphone, Remote Speaker Microphone, RX-Jack (2pin)	Yes	No	Tested with RLN4941A, Per KDB provisions test not required.
9	RLN4941A	Receive only Earpiece with translucent tube & ear tip	Yes	No	Tested with PMMN4013A, Per KDB provisions test not required.
10	PMLN6541A	Lightweight Temple Transducer Headset	Yes	No	Per KDB provisions test not required.
11	AARLN4885B	Receive only covered ear bud with Coiled Cord	No	No	By similarity to RLN4941A
12	PMLN4620B	D-Shell receive only earpiece (One Size) for Remote Speaker Microphone	No	No	By similarity to RLN4941A
13	WADN4190B	Receive only Flexible Earpiece	No	No	By similarity to RLN4941A

Table 7 (Continued)

Audio No.	Audio Acc. Models	Description	Selected for test	Tested	Comments
14	PMLN6534A	Ear bud with In-line Microphone/PTT/VOX, MagOne	No	No	By similarity to PMLN6531A
15	PMLN6535A	D-Style Earpiece with Mic/PTT	No	No	By similarity to PMLN6530A
16	PMLN6533A	Accessory Kit, Ear set with Combined Microphone/PTT	No	No	By similarity to PMLN6530A
17	PMMN4029A	Remote Speaker Microphone IP57	No	No	By similarity to PMMN4092A
18	PMLN6445A	2-Wire Surveillance (Beige) with Clear Acoustic Earpiece	No	No	By similarity to PMLN6530A
19	PMLN6536A	Accessory Kit, 2 Wires with Translucent Tube, Black	No	No	By similarity to PMLN6530A
20	PMLN6532A	Swivel Earpiece with Microphone/PTT MagOne	No	No	By similarity to PMLN6531A
21	PMLN6542A	Accessory Kit, Breeze Headset with Boom Microphone and PTT MagOne	No	No	By similarity to PMLN6537A
22	MDRLN4941A	Receiver-only earpiece with translucent tube and rubber eartip for remote speaker microphone	No	No	By similarity to RLN4941A
23	MDPMMN4013A	Remote Speaker Microphone With Jack IP54	No	No	By similarity to PMMN4013A
24	MDPMMN4029A	Remote Speaker Microphone Without Jack IP57	No	No	By similarity to PMMN4029A
25	MDRLN4885D	Receive only covered ear bud with Coiled Cord	No	No	By similarity to RLN4941A

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	
	Head	Body
Sugar	55.4	49.7
Diacetin	0	0
De ionized – Water	38.35	46.2
Salt	5.15	3.0
HEC	1.0	1.0
Bact.	0.1	0.1

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	3735	10-Mar-17	10-Mar-18
Speag Probe	EX3DV4	3612	17-May-17	17-May-18
Speag DAE	DAE4	1488	14-Feb-17	14-Feb-18
Speag DAE	DAE4	1294	23-May-17	23-May-18
Amplifier	10WD1000	28782	CNR	CNR
Amplifier	10W1000C	312859	CNR	CNR
Power Sensor (With 30dB Pad)	E9301B	MY41495594	20-Jul-17	20-Jul-18
Power Sensor (With 30dB Pad)	8481B	SG41090258	27-Jun-17	27-Jun-18
Power Sensor	E9301B	MY55210003	29-Sep-17	29-Sep-18
Power Meter	E4416A	MY50001037	22-May-17	22-May-19
Power Meter	E4418B	MY45100532	1-Nov-16	1-Nov-18
Power Meter	E4418B	MY45107917	22-May-17	22-May-19
Power Sensor	E9301B	MY50280001	23-Jun-17	23-Jun-18
Power Sensor	E9301B	MY41495594	20-Jul-17	20-Jul-18
Power Meter	E4419B	MY45103725	22-May-17	22-May-19
Power Meter	E4418B	MY45100911	14-Jul-17	14-Jul-19
Bi-directional Coupler	3020A	40295	4-Sep-17	4-Sep-18
Vector Signal Generator	E4438C	MY42081753	8-Apr-17	8-Apr-18
Signal Generator (Vector ESG 250KHz-6GHz)	E4438C	MY45091270	26-Jul-16	26-Jul-18
Bi-directional Coupler	3020A	41931	21-Jul-17	21-Jul-18
Thermometer	HH202A	18812	13-Oct-17	13-Oct-18
Temperature Probe	JHSS-18U-RSC-6	AGIL700245	13-Oct-17	13-Oct-18
Temperature Probe	80PK-22	6032017	24-Mar-17	24-Mar-18
Thermometer	HH202A	18812	13-Oct-17	13-Oct-18
Dickson Temperature Recorder	TM320	06153216	11-Aug-17	11-Aug-18
NETWORK ANALYZER	E5071B	MY42403218	24-Aug-17	24-Aug-18
DIELECTRIC ASSESSMENT KIT	DAK-12	1051	16-Mar-17	16-Mar-18
SPEAG Dipole	CLA150	4010	8-Nov-16	8-Nov-18

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								
04/06/2017	Body	150	3735	0.82	60.0	Pass	Pass	Pass
04/05/2017	Head	150		0.73	50.3	Pass	Pass	Pass
06/06/2017	Body	150	3612	0.81	59.7	Pass	Pass	Pass
06/06/2017	Head	150		0.76	50.7	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 E 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
3735	FCC Body	SPEAG CLA-150 / 4010	3.78 +/- 10%	4.07	4.07	*1/10/2018
				4.00	4.00	*1/11/2018
				3.89	3.89	*1/12/2018
				4.11	4.11	*1/15/2018
				3.98	3.98	*1/16/2018
				4.00	4.00	1/17/2018
				3.95	3.95	*1/18/2018
				3.92	3.92	*1/19/2018
				3.97	3.97	*1/22/2018
				3.90	3.90	*1/23/2018
				3.81	3.81	*1/24/2018
				3.93	3.93	*1/25/2018
				3.88	3.88	1/28/2018
				3.94	3.94	*1/29/2018
	IEEE/IEC Head		3.69 +/- 10%	3.75	3.75	*1/26/2018
				3.82	3.82	1/28/2018
				3.63	3.63	*1/30/2018
3612	FCC Body	SPEAG CLA-150 / 4010	3.78 +/- 10%	3.95	3.95	2/25/2018
	IEEE/IEC Head		3.69 +/- 10%	3.83	3.83	*2/12/2018
				4.04	4.04	2/14/2018
				3.61	3.61	2/26/2018

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)	0.79	60.1	2/25/2018
	IEEE/ IEC Head	0.75 (0.71-0.79)	53.0 (50.3-55.6)	0.76	50.3	*2/25/2018
142	FCC Body	0.79 (0.75-0.83)	62.1 (59.0-65.2)	0.79	59.9	2/25/2018
	IEEE/ IEC Head	0.75 (0.72-0.79)	52.7 (50.0-55.3)	0.76	50.1	*2/25/2018
146	FCC Body	0.80 (0.76-0.84)	62.0 (58.9-65.1)	0.79	59.8	2/25/2018
	IEEE/ IEC Head	0.76 (0.72-0.80)	52.5 (49.9-55.1)	0.77	51.5	1/30/2018
				0.76	49.9	*2/25/2018
150	FCC Body	0.80 (0.76-0.84)	61.9 (58.8-65.0)	0.78	59.7	*1/10/2018
				0.78	61.2	*1/11/2018
				0.79	60.4	*1/12/2018
				0.79	60.4	*1/15/2018
				0.78	60.3	*1/16/2018
				0.78	60.3	1/17/2018
				0.77	60.3	*1/18/2018
				0.78	59.7	*1/19/2018
				0.76	59.2	*1/22/2018
				0.77	61.4	*1/23/2018
				0.80	60.0	*1/24/2018
				0.80	60.0	*1/25/2018
				0.82	59.7	1/28/2018
				0.79	60.2	*1/29/2018
				0.80	59.7	2/25/2018
	IEEE/ IEC Head	0.76 (0.72-0.80)	52.3 (49.7-54.9)	0.74	49.9	*1/26/2018
				0.75	51.2	1/28/2018
				0.78	51.3	*1/30/2018
				0.72	51.0	*2/12/2018
				0.72	50.2	2/14/2018
				0.77	49.8	*2/25/2018

Note: * System performance check cover next testing day (within 24 hours)

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)	0.78	59.7	*1/10/2018
				0.78	61.2	*1/11/2018
				0.79	60.4	1/15/2018
				0.78	60.3	1/17/2018
				0.77	60.2	1/18/2018
				0.78	59.7	*1/19/2018
				0.80	60.0	*1/24/2018
				0.80	60.0	1/25/2018
	IEEE/ IEC Head	0.76 (0.72-0.80)	52.3 (49.6-54.9)	0.78	51.3	*1/30/2018
				0.73	51.0	*2/12/2018
155	IEEE/ IEC Head	0.76 (0.73-0.80)	52.1 (49.5-54.7)	0.74	49.7	*1/26/2018
				0.75	51.0	1/28/2018
				0.73	50.8	*2/12/2018
				0.73	50.0	2/14/2018
156	FCC Body	0.80 (0.76-0.85)	61.8 (58.7-64.8)	0.78	59.5	*1/10/2018
				0.78	61.0	*1/11/2018
				0.80	60.2	1/15/2018
				0.78	60.1	*1/16/2018
				0.78	60.0	1/18/2018
				0.78	59.5	1/19/2018
				0.77	61.1	*1/23/2018
				0.80	59.9	*1/24/2018
				0.83	59.5	1/28/2018
162	FCC Body	0.81 (0.77-0.85)	61.6 (58.5-64.7)	0.79	59.8	*1/29/2018
	IEEE/ IEC Head	0.77 (0.73-0.81)	51.7 (49.2-54.3)	0.74	49.3	1/26/2018
167	FCC Body	0.81 (0.77-0.85)	61.5 (58.4-64.6)	0.80	59.7	*1/29/2018
173	FCC Body	0.82 (0.78-0.86)	61.3 (58.3-64.4)	0.79	59.0	*1/10/2018
				0.79	60.5	*1/11/2018
				0.80	59.6	*1/12/2018
				0.80	59.6	*1/15/2018
				0.79	59.5	*1/16/2018
				0.78	59.2	*1/18/2018
				0.79	59.0	*1/19/2018
				0.78	58.6	*1/22/2018

Note: * System performance check cover next testing day (within 24 hours)

Table 14 (Continued)

Frequency (MHz)	Tissue Type	Conductivity Target (S/m)	Dielectric Constant Target	Conductivity Meas. (S/m)	Dielectric Constant Meas.	Tested Date
173	FCC Body	0.82 (0.78-0.86)	61.3 (58.3-64.4)	0.78	60.4	*1/23/2018
				0.81	59.5	*1/24/2018
				0.81	59.4	*1/25/2018
				0.80	59.5	*1/29/2018
	IEEE/ IEC Head	0.78 (0.74-0.82)	51.2 (48.7-53.8)	0.79	50.4	*1/30/2018

Note: * System performance check cover next testing 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: 19.2 – 22.8˚C Avg. 21.2 ˚C
Tissue Temperature	NA	Range: 19.0 – 21.2˚C Avg. 20.3˚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 H.

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 the offered audio accessories.

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” 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” scaled using the following formula:

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

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

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

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

12.6 DUT Test Plan

The guidelines and requirements outlined in section 4.0 were used to assess compliance of this device. All modes of operation identified in section 6.0 were considered during the development of the test plan. All tests were performed in CW and 50% duty cycle was applied to PTT configurations in the final results.

13.0 DUT Test Data

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

Battery NNTN4970A 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 F.

Table 17

Test Freq (MHz)	Power (W)
150.8000	5.63
155.0000	5.62
156.4000	5.65
158.3000	5.64
162.0000	5.64
167.0000	5.69
173.4000	5.72

Assessments at the Body with Body worn RLN5644A

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 F.

Table 18

<table>
<tr><th>Antenna</th><th>Battery</th><th>Carry Accessory</th><th>Cable Accessory</th><th>Test Freq (MHz)</th><th>Init Pwr (W)</th><th>SAR Drift (dB)</th><th>Meas. 1g-SAR (W/kg)</th><th>Max Calc. 1g-SAR (W/kg)</th><th>Run#</th></tr>
<tr><td rowspan="5">HAD9742A</td><td rowspan="5">NNTN4970A</td><td rowspan="5">RLN5644A</td><td rowspan="5">PMMN4092A</td><td>150.8000</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>155.0000</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>156.4000</td><td>5.65</td><td>-0.31</td><td>0.66</td><td>0.37</td><td>AZ-AB-180111-01#</td></tr>
<tr><td>158.3000</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>162.0000</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="3">HAD9743A</td><td rowspan="3">NNTN4970A</td><td rowspan="3">RLN5644A</td><td rowspan="3">PMMN4092A</td><td>162.0000</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>167.0000</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>173.4000</td><td>5.72</td><td>-0.53</td><td>0.44</td><td>0.26</td><td>AZ-AB-180111-02#</td></tr>
</table>

Table 18 (Continued)

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Run#
NAD6502AR	NNTN4970A	RLN5644A	PMMN4092A	150.8000					
				155.0000					
				156.4000					
				158.3000					
				162.0000					
				167.0000					
				173.4000	5.65	-0.16	0.42	0.23	AZ-AB-180111-03#
PMAD4012A	NNTN4970A	RLN5644A	PMMN4092A	150.8000	5.60	-0.01	0.33	0.18	AZ-AB-180111-04#
				155.0000					
PMAD4014A	NNTN4970A	RLN5644A	PMMN4092A	150.8000	5.66	0.08	0.50	0.27	ZR(AN)-AB-180111-06#
				155.0000					
PMAD4042A	NNTN4970A	RLN5644A	PMMN4092A	150.8000	5.56	-0.06	0.52	0.29	ZR(AN)-AB-180111-05#
Assessment of Additional Batteries									
HAD9742A	NNTN4497DR	RLN5644A	PMMN4092A	156.4000	6.00	-0.33	0.36	0.20	ZR(AN)-AB-180111-07#
	NNTN4851A				6.00	-0.39	0.42	0.23	ZR(AN)-AB-180111-08#
	PMNN4450AR				6.00	-0.34	0.37	0.20	ZR(AN)-AB-180111-09#
	PMNN4072A				5.98	-0.36	0.45	0.25	AZ-AB-180111-12
	PMNN4098A				5.77	-0.46	0.49	0.28	AZ-AB-180111-13
	PMNN4251AR				6.00	-0.35	0.40	0.22	AZ-AB-180111-14
	PMNN4253AR				5.53	-0.36	0.44	0.26	AZ-AB-180111-15
	PMNN4254AR				6.00	-0.36	0.40	0.22	AZ-AB-180112-01#
	PMNN4258AR				5.98	-0.34	0.40	0.22	AZ-AB-180112-02#
	PMNN4259AR				6.00	-0.33	0.39	0.21	AZ-AB-180112-03#
	PMNN4458BR				6.00	-0.31	0.40	0.21	AZ-AB-180112-04#

Assessments at the Body with Body worn HLN8255B

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 F.

Table 19

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Run#
HAD9742A	NNTN4970A	HLN8255B	PMMN4092A	150.8000					
				155.0000					
				156.4000	5.80	-0.38	0.45	0.25	ZR(AN)-AB-180117-01#
				158.3000					
				162.0000					
HAD9743A	NNTN4970A	HLN8255B	PMMN4092A	162.0000					
				167.0000					
				173.4000	5.63	0.14	0.86	0.46	AZ-AB-180112-13
NAD6502AR	NNTN4970A	HLN8255B	PMMN4092A	150.8000					
				155.0000					
				156.4000					
				158.3000					
				162.0000					
				167.0000					
				173.4000	5.71	0.10	0.87	0.45	AZ-AB-180112-15
PMAD4012A	NNTN4970A	HLN8255B	PMMN4092A	150.8000	5.40	-0.06	0.27	0.15	AZ-AB-180112-14
				155.0000					
PMAD4014A	NNTN4970A	HLN8255B	PMMN4092A	150.8000	5.63	0.06	0.38	0.20	ZR(AN)-AB-180112-10#
				155.0000					
PMAD4042A	NNTN4970A	HLN8255B	PMMN4092A	150.8000	5.63	0.00	0.40	0.22	ZR(AN)-AB-180112-09#
Assessment of Additional Batteries									
HAD9743A	NNTN4497DR	HLN8255B	PMMN4092A	173.4000	6.00	0.14	0.52	0.26	ZR(AN)-AB-180112-11#
	NNTN4851A				6.00	-0.04	1.47	0.74	AZ-AB-180113-01#
	PMNN4450AR				6.00	0.00	0.48	0.24	AZ-AB-180113-02#
	PMNN4072A				5.88	-0.33	1.06	0.58	AZ-AB-180113-04#
	PMNN4098A				5.96	-0.47	**1.43**	**0.80**	AZ-AB-180113-05#
	PMNN4251AR				5.89	-0.13	0.50	0.26	AZ-AB-180115-02
	PMNN4253AR				5.73	-0.35	1.38	0.78	AZ-AB-180115-03
	PMNN4254AR				5.96	0.04	1.31	0.66	AZ(LOH)-AB-180115-04
	PMNN4258AR				5.94	0.00	0.54	0.27	AZ(LOH)-AB-180115-05
	PMNN4259AR				6.00	-0.12	0.48	0.25	AZ(LOH)-AB-180115-06
	PMNN4458BR				6.00	0.04	0.55	0.27	AZ(LOH)-AB-180115-07

Assessments at the Body with Body worn HLN6602A

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 F.

Table 20

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Run#
HAD9742A	NNTN4970A	HLN6602A	PMMN4092A	150.8000					
				155.0000					
				156.4000	5.50	-0.39	0.80	0.48	AZ-AB-180115-08
				158.3000					
				162.0000					
HAD9743A	NNTN4970A	HLN6602A	PMMN4092A	162.0000					
				167.0000					
				173.4000	5.60	-0.19	**1.87**	**1.05**	AZ-AB-180115-09
NAD6502AR	NNTN4970A	HLN6602A	PMMN4092A	150.8000					
				155.0000					
				156.4000					
				158.3000					
				162.0000					
				167.0000					
				173.4000	5.55	-0.34	1.15	0.67	AZ-AB-180115-10
PMAD4012A	NNTN4970A	HLN6602A	PMMN4092A	150.8000	5.60	-0.05	0.42	0.23	ZR(AN)-AB-180115-11
				155.0000					
PMAD4014A	NNTN4970A	HLN6602A	PMMN4092A	150.8000	5.75	0.01	0.54	0.28	ZR(AN)-AB-180115-13
				155.0000					
PMAD4042A	NNTN4970A	HLN6602A	PMMN4092A	150.8000	5.75	0.03	0.59	0.31	ZR(AN)-AB-180115-12
Assessment of Additional Batteries									
HAD9743A	NNTN4497DR	HLN6602A	PMMN4092A	173.4000	6.00	-0.31	1.33	0.71	ZR(AN)-AB-180117-03#
	NNTN4851A				5.93	-0.29	1.43	0.77	ZR(AN)-AB-180117-02#
	PMNN4450AR				6.00	-0.46	0.80	0.44	ZR(AN)-AB-180116-03#
	PMNN4072A				5.95	-0.47	0.98	0.55	ZR(AN)-AB-180116-04#
	PMNN4098A				5.95	-0.59	0.94	0.54	AZ-AB-180116-07
	PMNN4251AR				5.96	-0.57	0.66	0.38	AZ-AB-180116-08
	PMNN4253AR				5.96	-0.10	0.77	0.40	AZ-AB-180116-09
	PMNN4254AR				6.00	-0.20	0.47	0.25	AZ-AB-180116-10
	PMNN4258AR				6.00	-0.56	0.39	0.22	AZ-AB-180116-14
	PMNN4259AR				5.99	-0.06	0.65	0.33	AZ-AB-180116-12
	PMNN4458BR				6.00	-0.64	0.56	0.33	AZ-AB-180116-13

Assessments at the Body with Body worn RLN4815A

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 F.

Table 21

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Run#
HAD9742A	NNTN4970A	RLN4815A	PMMN4092A	150.8000					
				155.0000					
				156.4000	5.71	-0.32	0.29	0.17	ZR(AN)-AB-180117-04#
				158.3000					
				162.0000					
HAD9743A	NNTN4970A	RLN4815A	PMMN4092A	162.0000					
				167.0000					
				173.4000	5.64	0.03	0.63	0.33	AZ-AB-180122-09
NAD6502AR	NNTN4970A	RLN4815A	PMMN4092A	150.8000					
				155.0000					
				156.4000					
				158.3000					
				162.0000					
				167.0000					
				173.4000	5.62	0.28	0.56	0.30	AM(AN)-AB-180122-06
PMAD4012A	NNTN4970A	RLN4815A	PMMN4092A	150.8000	5.65	-0.05	0.24	0.13	AZ(LOH)-AB-180117-09
				155.0000					
PMAD4014A	NNTN4970A	RLN4815A	PMMN4092A	150.8000	5.55	0.05	0.34	0.18	AZ-AB-180117-11
				155.0000					
PMAD4042A	NNTN4970A	RLN4815A	PMMN4092A	150.8000	5.60	0.02	0.36	0.19	AZ(LOH)-AB-180117-10
Assessment of Additional Batteries									
HAD9743A	NNTN4497DR	RLN4815A	PMMN4092A	156.4000	6.00	-0.24	0.47	0.25	AZ-AB-180122-10
	NNTN4851A				5.98	-0.29	0.79	0.42	AZ-AB-180123-01#
	PMNN4450AR				6.00	-0.07	0.53	0.27	AZ-AB-180123-02#
	PMNN4072A				5.86	0.17	0.91	0.47	AZ-AB-180123-03#
	PMNN4098A				5.95	-0.22	**1.15**	**0.61**	AZ-AB-180123-04#
	PMNN4251AR				5.80	-0.22	0.49	0.27	FD(AN)-AB-180123-07
	PMNN4253AR				5.70	0.08	0.56	0.30	FD(AN)-AB-180123-08
	PMNN4254AR				5.89	-0.10	0.34	0.18	FD(AN)-AB-180123-09
	PMNN4258AR				5.89	0.22	0.65	0.33	FD(AN)-AB-180123-10
	PMNN4259AR				5.92	0.07	0.50	0.25	FD(AN)-AB-180123-11
	PMNN4458BR				5.88	-0.09	0.57	0.30	FD(AN)-AB-180123-12

Assessments at the Body with Body worn RLN4570A
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 F.

Table 22

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Run#
HAD9742A	NNTN4970A	RLN4570A	PMMN4092A	150.8000					
				155.0000					
				156.4000	5.65	-0.57	0.95	0.58	AZ-AB-180128-09
				158.3000					
				162.0000					
HAD9743A	NNTN4970A	RLN4570A	PMMN4092A	162.0000					
				167.0000					
				173.4000	5.86	-0.07	1.19	0.62	AZ-AB-180118-12
NAD6502AR	NNTN4970A	RLN4570A	PMMN4092A	150.8000					
				155.0000					
				156.4000					
				158.3000					
				162.0000					
				167.0000					
				173.4000	5.79	-0.03	0.86	0.45	ZR(AN)-AB-180118-13
PMAD4012A	NNTN4970A	RLN4570A	PMMN4092A	150.8000	5.58	-0.09	0.48	0.26	ZR(AN)-AB-180118-14
				155.0000					
PMAD4014A	NNTN4970A	RLN4570A	PMMN4092A	150.8000	5.73	0.07	0.56	0.29	ZR(AN)-AB-180118-16
				155.0000					
PMAD4042A	NNTN4970A	RLN4570A	PMMN4092A	150.8000	5.60	0.00	0.58	0.31	ZR(AN)-AB-180118-15
Assessment of Additional Batteries									
HAD9743A	NNTN4497DR	RLN4570A	PMMN4092A	173.4000	5.93	-0.21	0.94	0.50	ZR(AN)-AB-180118-17
	NNTN4851A				5.82	-0.48	1.29	0.74	ZR(AN)-AB-180118-18
	PMNN4450AR				5.80	-0.03	0.89	0.46	ZR(AN)-AB-180119-01#
	PMNN4072A				5.75	-0.47	**1.38**	**0.80**	ZR(AN)-AB-180119-02#
	PMNN4098A				5.86	-0.47	1.15	0.66	ZR(AN)-AB-180119-04#
	PMNN4251AR				5.75	-0.35	0.73	0.41	AZ-AB-180119-06
	PMNN4253AR				5.73	-0.33	1.24	0.70	AZ-AB-180119-07
	PMNN4254AR				5.93	-0.37	0.88	0.48	AZ-AB-180119-08
	PMNN4258AR				5.90	0.04	0.95	0.48	AZ-AB-180119-09
	PMNN4259AR				5.95	-0.21	1.01	0.53	AZ-AB-180119-10
	PMNN4458BR				6.00	-0.47	1.00	0.56	AZ-AB-180119-11

Assessments at the Body with Body worn RLN5383A w/ NTN5243A

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 F.

Table 23

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Run#
HAD9742A	NNTN4970A	RLN5383A w/ NTN5243A	PMMN4092A	150.8000					
				155.0000					
				156.4000	5.70	-0.32	0.25	0.14	ZR(AN)-AB-180119-12
				158.3000					
				162.0000					
HAD9743A	NNTN4970A	RLN5383A w/ NTN5243A	PMMN4092A	162.0000					
				167.0000					
				173.4000	5.69	-0.04	2.68	1.43	ZR(AN)-AB-180119-13
NAD6502AR	NNTN4970A	RLN5383A w/ NTN5243A	PMMN4092A	150.8000					
				155.0000					
				156.4000					
				158.3000					
				162.0000					
				167.0000					
				173.4000	5.64	0.04	2.48	1.32	ZR(AN)-AB-180119-14
PMAD4012A	NNTN4970A	RLN5383A w/ NTN5243A	PMMN4092A	150.8000	5.74	-0.05	0.32	0.17	ZR(AN)-AB-180119-15
				155.0000					
PMAD4014A	NNTN4970A	RLN5383A w/ NTN5243A	PMMN4092A	150.8000	5.86	-0.21	0.40	0.22	ZR(AN)-AB-180120-02#
				155.0000					
PMAD4042A	NNTN4970A	RLN5383A w/ NTN5243A	PMMN4092A	150.8000	5.62	-0.11	0.44	0.24	ZR(AN)-AB-180120-01#
Assessment of Additional Batteries									
HAD9743A	NNTN4497DR	RLN5383A w/ NTN5243A	PMMN4092A	173.4000	6.00	-0.19	2.50	1.31	ZR(AN)-AB-180120-03#
	NNTN4851A				5.98	-0.87	1.13	0.69	AZ-AB-180124-03#
	PMNN4450AR				5.88	-0.19	1.80	0.96	AM(AN)-AB-180122-02
	PMNN4072A				5.89	0.46	**3.35**	**1.71**	AM(AN)-AB-180122-03
	PMNN4098A				6.00	-0.32	1.17	0.63	AZ-AB-180124-04#
	PMNN4251AR				6.00	-0.15	1.59	0.82	AZ-AB-180123-13
	PMNN4253AR				5.76	-0.14	1.63	0.88	AZ-AB-180123-14
	PMNN4254AR				6.00	-0.23	1.44	0.76	AZ-AB-180123-15
	PMNN4258AR				6.00	-0.14	1.96	1.01	AZ-AB-180123-16
	PMNN4259AR				6.00	-0.57	1.38	0.79	AZ-AB-180124-01#
	PMNN4458BR				6.00	-0.44	0.87	0.48	AZ-AB-180124-02#

Assessments at the Body with Body worn RLN5384B w/ NTN5243A

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 F.

Table 24

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Run#
HAD9742A	NNTN4970A	RLN5384B w/ NTN5243A	PMMN4092A	150.8000					
				155.0000					
				156.4000	5.60	-0.34	0.21	0.12	AZ-AB-180124-05#
				158.3000					
				162.0000					
HAD9743A	NNTN4970A	RLN5384B w/ NTN5243A	PMMN4092A	162.0000					
				167.0000					
				173.4000	5.65	-0.58	0.98	0.59	AZ-AB-180124-07
NAD6502AR	NNTN4970A	RLN5384B w/ NTN5243A	PMMN4092A	150.8000					
				155.0000					
				156.4000					
				158.3000					
				162.0000					
				167.0000					
				173.4000	5.61	0.06	1.06	0.57	AZ-AB-180124-08
PMAD4012A	NNTN4970A	RLN5384B w/ NTN5243A	PMMN4092A	150.8000	5.61	-0.03	0.15	0.08	AZ-AB-180124-10
				155.0000					
PMAD4014A	NNTN4970A	R RLN5384B w/ NTN5243A	PMMN4092A	150.8000	5.62	0.01	0.18	0.09	AZ-AB-180125-02#
				155.0000					
PMAD4042A	NNTN4970A	R RLN5384B w/ NTN5243A	PMMN4092A	150.8000	5.62	0.07	0.22	0.12	AZ-AB-180125-01#
Assessment of Additional Batteries									
HAD9743A	NNTN4497DR	RLN5384B w/ NTN5243A	PMMN4092A	173.4000	6.00	-0.56	1.02	0.58	AZ-AB-180125-03#
	NNTN4851A				5.91	-0.31	**1.74**	**0.95**	AZ-AB-180125-04#
	PMNN4450AR				5.89	-0.53	0.94	0.54	AZ-AB-180125-05#
	PMNN4072A				5.93	-0.40	1.45	0.80	AZ-AB-180125-06#
	PMNN4098A				5.95	-0.53	1.44	0.82	AZ-AB-180125-07#
	PMNN4251AR				5.91	-0.45	1.11	0.62	AZ-AB-180125-08#
	PMNN4253AR				5.81	-0.28	1.54	0.85	AZ-AB-180125-09#
	PMNN4254AR				6.00	-0.14	1.36	0.70	FD(AN)-AB-180125-10#
	PMNN4258AR				6.00	-0.26	1.24	0.66	FD(AN)-AB-180125-11#
	PMNN4259AR				6.00	-0.47	1.18	0.66	FD(AN)-AB-180125-12#
	PMNN4458BR				6.00	-0.30	1.35	0.72	FD(AN)-AB-180125-13#

Assessments at the Body with Body worn HLN9701B w/ NTN5243A
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 F.

Table 25

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Run#
HAD9742A	NNTN4970A	HLN9701B w/ NTN5243A	PMMN4092A	150.8000					
				155.0000					
				156.4000	5.63	-0.46	0.32	0.19	FD(AN)-AB-180125-14#
				158.3000					
				162.0000					
HAD9743A	NNTN4970A	HLN9701B w/ NTN5243A	PMMN4092A	162.0000					
				167.0000					
				173.4000	5.62	-0.18	0.61	0.34	AZ-AB-180125-21
NAD6502AR	NNTN4970A	HLN9701B w/ NTN5243A	PMMN4092A	150.8000					
				155.0000					
				156.4000					
				158.3000					
				162.0000					
				167.0000					
				173.4000	5.65	0.20	0.44	0.23	AZ-AB-180125-22
PMAD4012A	NNTN4970A	HLN9701B w/ NTN5243A	PMMN4092A	150.8000	5.58	-0.21	0.22	0.13	FD(AN)-AB-180125-17#
				155.0000					
PMAD4014A	NNTN4970A	R HLN9701B w/ NTN5243A	PMMN4092A	150.8000	5.70	0.03	0.24	0.13	AZ-AB-180125-20
				155.0000					
PMAD4042A	NNTN4970A	HLN9701B w/ NTN5243A	PMMN4092A	150.8000	5.56	-0.11	0.33	0.18	FD(AN)-AB-180125-18#
Assessment of Additional Batteries									
HAD9743A	NNTN4497DR	HLN9701B w/ NTN5243A	PMMN4092A	173.4000	6.00	-0.36	0.50	0.27	AZ-AB-180126-01#
	NNTN4851A				5.96	-0.26	1.07	0.57	AZ-AB-180126-02#
	PMNN4450AR				5.96	-0.02	1.03	0.52	AZ-AB-180126-03#
	PMNN4072A				5.95	-0.37	0.80	0.44	AZ-AB-180126-04#
	PMNN4098A				5.97	-0.50	**1.53**	**0.86**	AZ-AB-180126-05#
	PMNN4251AR				5.90	-0.25	1.07	0.58	AZ-AB-180126-06#
	PMNN4253AR				5.85	-0.10	0.58	0.30	AZ-AB-180126-07#
	PMNN4254AR				5.88	0.06	0.58	0.30	AZ-AB-180126-08#
	PMNN4258AR				6.00	-0.06	0.78	0.40	AZ-AB-180126-09#
	PMNN4259AR				6.00	0.04	0.61	0.31	AZ-AB-180126-10#
	PMNN4458BR				6.00	-0.45	0.54	0.30	FD(AN)-AB-180126-11#

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 tested for that audio accessory is not necessary." This was applicable to all remaining accessories.

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

Battery PMNN4450AR 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 (150.8-173.4MHz) which are listed in Table 26. 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 F.

Table 26

Test Freq (MHz)	Power (W)
150.8000	5.93
155.0000	5.94
156.4000	5.92
158.3000	5.93
162.0000	5.91
167.0000	5.90
173.4000	5.88

DUT assessment with offered antennas, default battery with front of DUT positioned 2.5cm facing phantom per KDB 643646 SAR. Optional batteries were tested per the requirements of KDB 643646. Refer to Table 26 for highest output power channel. SAR plots of the highest results per Table (bolded) are presented in Appendix F.

Table 27

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Run#
HAD9742A	PMNN4450AR	None, Radio @ Front	None	150.8000					
				155.0000	5.96	-0.10	0.81	0.42	FD(AN)-FACE-180126-14
				156.4000					
				158.3000					
				162.0000					
HAD9743A	PMNN4450AR	None, Radio @ Front	None	162.0000	5.94	-0.02	0.55	0.28	FD(AN)-FACE-180126-15
				167.0000					
				173.4000					

Table 27 (Continued)

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Run#
NAD6502AR	PMNN4450AR	None, Radio @ Front	None	150.8000					
				155.0000	6.00	-0.20	1.20	0.63	AZ-FACE-180126-20
				156.4000					
				158.3000					
				162.0000					
				167.0000					
				173.4000					
PMAD4012A	PMNN4450AR	None, Radio @ Front	None	150.8000					
				155.0000	6.00	-0.42	0.21	0.11	AZ-FACE-180126-17
PMAD4014A	PMNN4450AR	None, Radio @ Front	None	150.8000					
				155.0000	5.99	-0.37	0.59	0.32	FD-FACE-180214-03
PMAD4042A	PMNN4450AR	None, Radio @ Front	None	150.8000	5.91	-0.14	0.79	0.41	ZR(ZZ)-FACE-180213-01#
Assessment of Additional Batteries									
NAD6502AR	NNTN4497DR	None, Radio @ Front	None	155.0000	6.00	-0.26	1.15	0.61	AZ-FACE-180127-01#
	NNTN4851A				5.81	-0.22	1.17	0.64	AZ-FACE-180127-02#
	NNTN4970A				5.50	-0.20	1.12	0.64	AZ-FACE-180127-03#
	PMNN4072A				5.70	-0.26	1.14	0.64	AZ-FACE-180127-04#
	PMNN4098A				5.88	-0.25	**1.19**	**0.64**	AZ-FACE-180127-05#
	PMNN4251AR				5.83	-0.28	1.14	0.63	AZ-FACE-180127-06#
	PMNN4253AR				5.60	-0.24	1.12	0.63	AZ-FACE-180127-07#
	PMNN4254AR				5.96	-0.27	1.16	0.62	AZ-FACE-180127-08#
	PMNN4258AR				5.93	-0.28	1.13	0.61	AZ-FACE-180128-02
	PMNN4259AR				5.98	-0.28	1.15	0.62	AZ-FACE-180128-04
	PMNN4458BR				6.00	-0.22	1.14	0.60	AZ-FACE-180128-03

13.3 Assessment at outside FCC Part 90

Assessment of outside FCC Part 90 using highest SAR configuration from above. SAR plots of the highest results per Table (bolded) are presented in Appendix F.

Table 28

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Run#
Body									
PMAD4012A	PMNN4072A	RLN5383A w/ NTN5243A	PMMN4092A	136.0000	5.85	0.98	1.50	0.77	FD-AB-180225-09
PMAD4014A	PMNN4072A	RLN5383A w/ NTN5243A	PMMN4092A	136.0000	5.90	-0.14	2.02	1.06	FD-AB-180225-11
PMAD4042A	PMNN4072A	RLN5383A w/ NTN5243A	PMMN4092A	136.0000	5.81	-0.04	**2.12**	**1.10**	FD-AB-180225-13
Face									
PMAD4012A	PMNN4098A	None, Radio @ Front	None	136.0000	5.84	0.10	0.65	0.33	ZR-FACE-180226-03#
PMAD4014A	PMNN4098A	None, Radio @ Front	None	136.0000	5.95	0.28	**1.27**	**0.64**	ZR-FACE-180226-05#
PMAD4042A	PMNN4098A	None, Radio @ Front	None	136.0000	5.85	0.56	1.11	0.57	ZR-FACE-180226-07#

13.4 Assessment for ISED Canada

Based on the assessment results for body and face per KDB643646, additional tests were required for ISED Canada frequency range (138-174MHz). The overall highest test configuration from 150.8-173.4MHz was repeated with test frequencies 142MHz and 146MHz. SAR plots of the highest results per Table (bolded) are presented in Appendix F.

Table 29

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Run#
Body									
HAD9742A	PMNN4072A	RLN5383A w/ NTN5243A	PMMN4092A	146.0000	5.66	0.37	1.08	0.57	FD-AB-180225-03
NAD6502AR	PMNN4072A	RLN5383A w/ NTN5243A	PMMN4092A	146.0000	5.77	0.26	**1.50**	**0.78**	FD-AB-180225-06
PMAD4012A	PMNN4072A	RLN5383A w/ NTN5243A	PMMN4092A	142.0000	5.82	0.02	1.12	0.58	FD-AB-180225-10
PMAD4014A	PMNN4072A	RLN5383A w/ NTN5243A	PMMN4092A	142.0000	5.75	-0.03	1.26	0.66	FD-AB-180225-12
PMAD4042A	PMNN4072A	RLN5383A w/ NTN5243A	PMMN4092A	142.0000	5.71	-0.32	1.37	0.77	FD-AB-180225-14
Face									
HAD9742A	PMNN4098A	None, Radio @ Front	None	146.0000	5.88	-0.63	0.70	0.41	ZR-FACE-180226-02#
NAD6502AR	PMNN4098A	None, Radio @ Front	None	146.0000	5.78	-0.40	0.81	0.46	ZR(AN)-FACE-180130-21
PMAD4012A	PMNN4098A	None, Radio @ Front	None	142.0000	5.81	-0.53	0.83	0.48	ZR-FACE-180226-04#
PMAD4014A	PMNN4098A	None, Radio @ Front	None	142.0000	5.83	-0.54	0.97	0.57	ZR-FACE-180226-06#
PMAD4042A	PMNN4098A	None, Radio @ Front	None	142.0000	5.98	-0.80	**1.00**	**0.60**	ZR-FACE-180226-08#

As per ISED Notice 2016-DRS001, additional tests were required for the low, mid and high frequency channels for the configuration with the highest SAR value.

Table 30

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Run#
Body									
HAD9743A	PMNN4072A	RLN5383A w/ NTN5243A	PMMN4092A	162.0000	5.75	0.13	0.30	0.16	AZ-AB-180130-09#
				167.0000	5.82	-0.33	0.16	0.09	AZ-AB-180130-11#
				173.4000	5.89	0.46	**3.35**	**1.71**	AM(AN)-AB-180122-03
Face									
NAD6502AR	PMNN4098A	None, Radio @ Front	None	146.0000	5.78	-0.40	0.81	0.46	ZR(AN)-FACE-180130-21
				155.0000	5.88	-0.25	**1.19**	**0.64**	AZ-FACE-180127-05#
				173.40000	5.89	-0.43	0.88	0.50	AZ-FACE-180131-10#

13.5 Shortened Scan Assessment

A "shortened" scan using the highest SAR configuration overall from above was performed to validate the SAR drift of the full DASY5™ coarse and zoom scans. Note that the shortened scan represents the zoom scan performance result; this is obtained by first running a coarse scan to find the peak area and then, using a newly charged battery, a zoom scan only was performed. The results of the shortened cube scan presented in Appendix G 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 G.

Table 31

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Run#
HAD9743A	PMNN4072A	RLN5383A w/ NTN5243A	PMMN4092A	173.4000	5.82	-0.39	3.44	1.94	AZ-AB-180130-06#

14.0 Results Summary

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

Table 32

Designator	Frequency band (MHz)	Max Calc at Body (W/kg)	Max Calc at Face (W/kg)
		1g-SAR	1g-SAR
FFC, US	150.8-173.4	1.94	0.64
ISED, Canada	150.8-173.4	1.94	0.64

All results are scaled to the maximum output power.

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 FCC 47 CFR § 2.1093.

15.0 Variability Assessment

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

16.0 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/IEC 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	∞
Liquid Conductivity (Temperature Uncertainty)	E3.4	2.7	R	1.73	0.78	0.71	1.2	1.1	∞
Liquid Permittivity (Temperature Uncertainty)	E3.4	0.4	R	1.73	0.26	0.10	0.1	0.1	∞
Combined Standard Uncertainty			RSS				12	11	498
Expanded Uncertainty (95% CONFIDENCE LEVEL)			*k*=2				23	23	

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

Table A.2: Uncertainty Budget for System Validation (dipole & flat phantom) for 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	∞
Liquid Conductivity (Temperature Uncertainty)	E3.4	2.7	R	1.73	0.78	0.71	1.2	1.1	∞
Liquid Permittivity (Temperature Uncertainty)	E3.4	0.4	R	1.73	0.26	0.10	0.1	0.1	∞
Combined Standard Uncertainty			RSS				10	9	99999
Expanded Uncertainty (95% CONFIDENCE LEVEL)			*k*=2				19	19	

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: **EX3-3735_Mar17**

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3735
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:	March 10, 2017

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: S5277 (20x)	05-Apr-16 (No. 217-02293)	Apr-17
Reference Probe ES3DV2	SN: 3013	31-Dec-16 (No. ES3-3013_Dec16)	Dec-17
DAE4	SN: 660	7-Dec-16 (No. DAE4-660_Dec16)	Dec-17
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-16)	In house check: Jun-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-16)	In house check: Oct-17

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: March 14, 2017

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**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

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

Probe EX3DV4

SN:3735

Manufactured: February 15, 2010
Calibrated: March 10, 2017

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3735

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.37	0.39	0.46	± 10.1 %
DCP (mV)[B]	105.5	101.6	100.2	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B $dB\sqrt{\mu V}$	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	141.9	±3.0 %
		Y	0.0	0.0	1.0		141.6	
		Z	0.0	0.0	1.0		149.0	

Note: For details on UID parameters see Appendix.

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

[A] The uncertainties of Norm X,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[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:3735

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
150	52.3	0.76	11.79	11.79	11.79	0.00	1.00	± 13.3 %
300	45.3	0.87	11.08	11.08	11.08	0.08	1.30	± 13.3 %
450	43.5	0.87	10.37	10.37	10.37	0.16	1.30	± 13.3 %
750	41.9	0.89	9.82	9.82	9.82	0.45	0.86	± 12.0 %
835	41.5	0.90	9.44	9.44	9.44	0.50	0.80	± 12.0 %
900	41.5	0.97	9.28	9.28	9.28	0.36	1.00	± 12.0 %
1450	40.5	1.20	8.46	8.46	8.46	0.36	0.80	± 12.0 %
1810	40.0	1.40	7.97	7.97	7.97	0.27	1.01	± 12.0 %
1900	40.0	1.40	7.89	7.89	7.89	0.33	0.85	± 12.0 %
2100	39.8	1.49	7.83	7.83	7.83	0.27	0.80	± 12.0 %
2300	39.5	1.67	7.37	7.37	7.37	0.29	0.88	± 12.0 %
2450	39.2	1.80	7.08	7.08	7.08	0.38	0.86	± 12.0 %
2600	39.0	1.96	6.78	6.78	6.78	0.34	0.89	± 12.0 %
4950	36.3	4.40	5.49	5.49	5.49	0.40	1.80	± 13.1 %
5250	35.9	4.71	4.88	4.88	4.88	0.40	1.80	± 13.1 %
5500	35.6	4.96	4.57	4.57	4.57	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.40	4.40	4.40	0.40	1.80	± 13.1 %
5750	35.4	5.22	4.56	4.56	4.56	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.

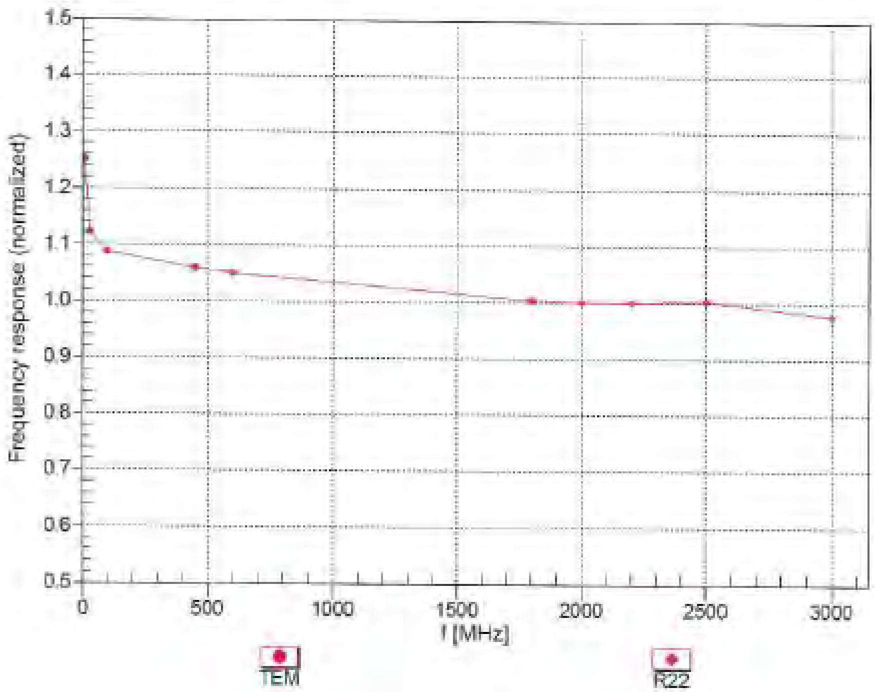
DASY/EASY - Parameters of Probe: EX3DV4 - SN:3735

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
150	61.9	0.80	11.23	11.23	11.23	0.00	1.00	± 13.3 %
300	58.2	0.92	10.61	10.61	10.61	0.05	1.20	± 13.3 %
450	56.7	0.94	10.56	10.56	10.56	0.07	1.20	± 13.3 %
750	55.5	0.96	9.52	9.52	9.52	0.30	1.00	± 12.0 %
835	55.2	0.97	9.28	9.28	9.28	0.42	0.87	± 12.0 %
900	55.0	1.05	9.19	9.19	9.19	0.44	0.80	± 12.0 %
1450	54.0	1.30	8.07	8.07	8.07	0.34	0.80	± 12.0 %
1810	53.3	1.52	7.88	7.88	7.88	0.36	0.85	± 12.0 %
1900	53.3	1.52	7.76	7.76	7.76	0.30	0.90	± 12.0 %
2100	53.2	1.62	7.73	7.73	7.73	0.40	0.80	± 12.0 %
2300	52.9	1.81	7.32	7.32	7.32	0.42	0.80	± 12.0 %
2450	52.7	1.95	7.24	7.24	7.24	0.41	0.86	± 12.0 %
2600	52.5	2.16	6.90	6.90	6.90	0.38	0.89	± 12.0 %
4950	49.4	5.01	4.51	4.51	4.51	0.40	1.90	± 13.1 %
5250	48.9	5.36	4.35	4.35	4.35	0.40	1.90	± 13.1 %
5500	48.6	5.65	4.00	4.00	4.00	0.40	1.90	± 13.1 %
5600	48.5	5.77	3.75	3.75	3.75	0.50	1.90	± 13.1 %
5750	48.3	5.94	3.83	3.83	3.83	0.50	1.90	± 13.1 %

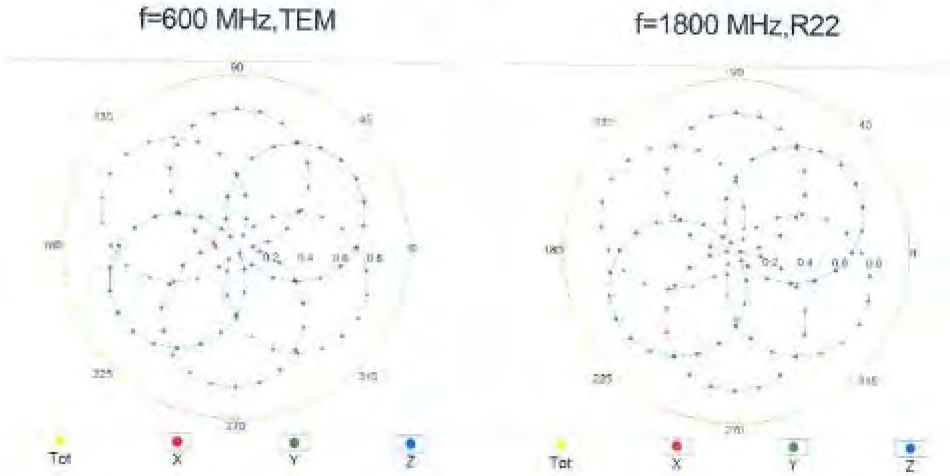
[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz 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.

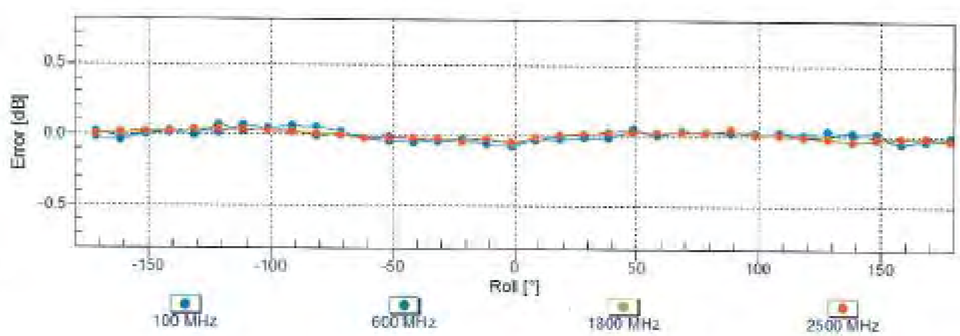
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



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

Receiving Pattern (ϕ), ϑ = 0°

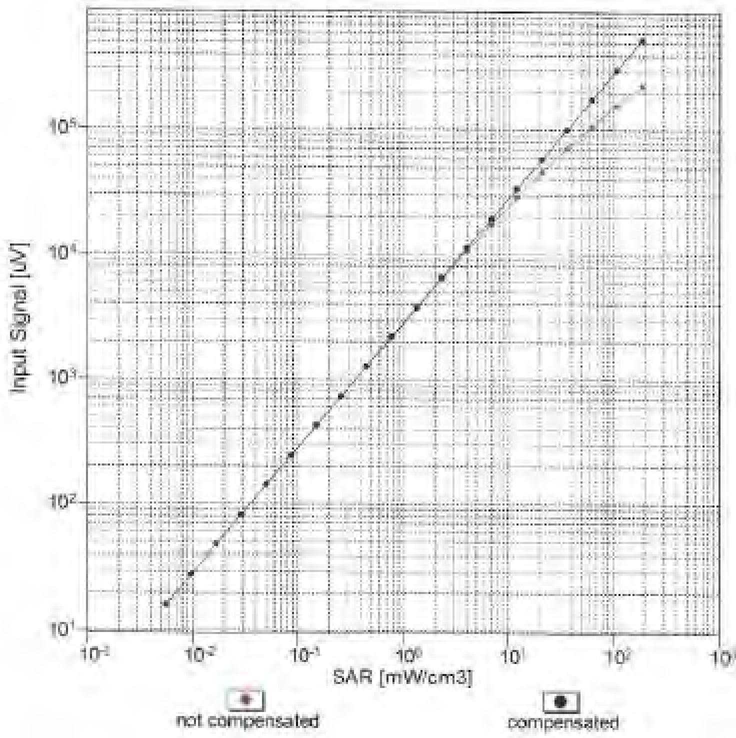


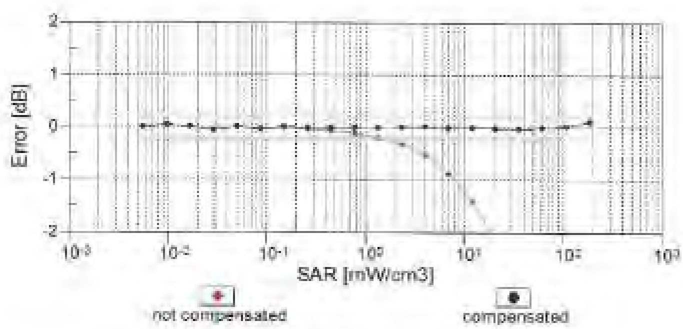


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

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

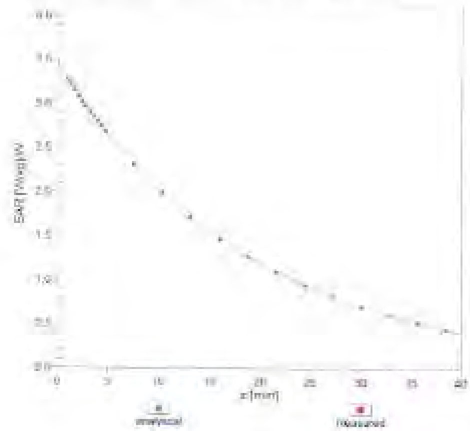




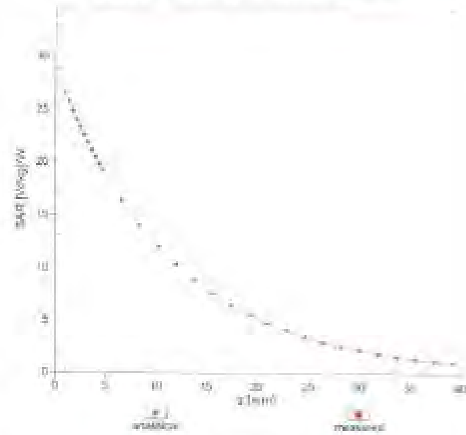
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

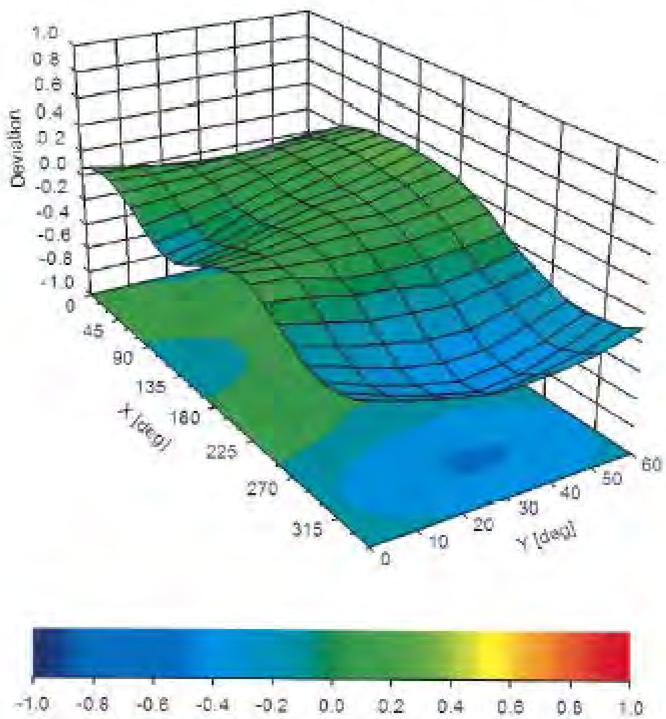


f = 1900 MHz,WGLS R22 (H_convF)



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:3735

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-1.5
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

Appendix: 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	141.9	±3.0 %
		Y	0.0	0.0	1.0		141.6	
		Z	0.0	0.0	1.0		149.0	
10021-DAC	GSM-FDD (TDMA, GMSK)	X	3.44	68.2	14.9	9.39	118.0	±2.2 %
		Y	3.22	69.4	16.8		85.0	
		Z	12.08	88.1	24.1		147.1	
10023-DAC	GPRS-FDD (TDMA, GMSK, TN 0)	X	4.06	71.2	16.7	9.57	114.5	±2.7 %
		Y	3.01	68.0	16.2		83.3	
		Z	11.22	87.4	24.1		141.6	
10024-DAC	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	5.62	76.3	17.1	6.56	149.2	±2.2 %
		Y	6.09	79.3	19.0		142.0	
		Z	16.49	90.1	22.6		125.8	
10025-DAC	EDGE-FDD (TDMA, 8PSK, TN 0)	X	6.61	75.2	26.4	12.62	77.0	±2.2 %
		Y	5.33	69.5	23.9		56.8	
		Z	7.84	79.0	28.9		89.4	
10026-DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1)	X	7.48	79.8	26.6	9.55	147.0	±2.5 %
		Y	5.75	73.4	23.8		120.4	
		Z	9.68	84.4	28.7		127.8	
10027-DAC	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	40.65	99.8	23.0	4.80	145.4	±1.7 %
		Y	23.67	96.2	22.9		147.6	
		Z	47.87	100.0	23.5		143.2	
10028-DAC	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	43.00	100.0	22.3	3.55	130.4	±1.7 %
		Y	36.95	99.6	22.6		133.5	
		Z	60.81	99.8	22.1		126.2	
10029-DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1-2)	X	7.59	81.3	26.3	7.78	145.1	±2.7 %
		Y	5.99	75.7	23.9		143.3	
		Z	9.66	84.1	27.1		146.1	
10039-CAB	CDMA2000 (1xRTT, RC1)	X	5.02	67.8	19.4	4.57	149.2	±0.9 %
		Y	4.68	66.2	18.6		129.2	
		Z	4.64	66.4	18.5		138.5	
10056-CAA	UMTS-TDD (TD-SCDMA, 1.28 Mcps)	X	6.17	75.3	25.9	11.01	118.9	±3.0 %
		Y	4.85	69.1	23.0		86.4	
		Z	9.59	85.3	30.7		147.5	
10058-DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1-2-3)	X	6.02	76.9	23.7	6.52	133.8	±2.2 %
		Y	5.32	73.9	22.4		136.6	
		Z	7.69	79.7	24.5		131.6	
10061-CAB	CDMA2000 (1xRTT, RC3)	X	4.24	67.6	19.3	3.97	142.4	±0.7 %
		Y	3.96	66.1	18.4		145.9	
		Z	3.98	65.7	18.0		133.7	

10090-DAC	GPRS-FDD (TDMA, GMSK, TN 0-4)	X	5.59	77.4	18.0	6.56	143.9	±2.5 %
		Y	5.36	77.0	18.0		139.4	
		Z	14.11	87.2	21.4		126.1	
10099-DAC	EDGE-FDD (TDMA, 8PSK, TN 0-4)	X	7.91	81.7	27.6	9.55	141.4	±2.2 %
		Y	6.07	75.0	24.6		116.8	
		Z	9.76	84.6	26.7		126.1	
10117-CAB	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	9.99	68.2	20.8	8.07	124.1	±2.7 %
		Y	10.02	68.1	20.7		128.3	
		Z	10.36	68.9	21.1		144.0	
10196-CAB	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	10.14	69.3	21.5	8.10	147.6	±3.0 %
		Y	9.68	67.9	20.6		124.3	
		Z	10.02	68.7	21.1		140.2	
10290-AAB	CDMA2000, RC1, SO55, Full Rate	X	4.76	69.1	19.8	3.91	148.6	±0.7 %
		Y	4.37	67.2	18.8		127.1	
		Z	4.48	67.1	18.5		141.7	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	4.23	69.8	20.2	3.46	141.9	±0.7 %
		Y	3.74	67.0	18.7		144.4	
		Z	3.66	66.0	17.9		134.6	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	4.06	69.2	19.8	3.39	141.8	±0.7 %
		Y	3.68	67.1	18.7		143.8	
		Z	3.63	66.3	18.0		133.7	
10293-AAB	CDMA2000, RC3, SO3, Full Rate	X	4.15	69.1	19.8	3.50	140.6	±0.7 %
		Y	3.76	67.0	18.7		142.9	
		Z	3.72	66.3	18.2		133.4	
10295-AAB	CDMA2000, RC1, SO3, 1/8th Rate 25 fr.	X	7.03	71.7	25.9	12.49	95.3	±2.7 %
		Y	5.86	66.3	22.9		68.8	
		Z	9.34	78.7	29.6		118.5	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	6.00	72.8	20.9	3.76	128.4	±0.7 %
		Y	4.95	68.7	18.9		133.1	
		Z	4.96	68.0	18.5		142.1	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	5.91	72.8	20.9	3.77	127.8	±0.7 %
		Y	4.93	68.9	19.0		130.8	
		Z	4.87	68.0	18.5		141.9	
10406-AAB	CDMA2000, RC3, SO32, SCH0, Full Rate	X	6.96	71.2	20.9	5.22	134.2	±0.9 %
		Y	6.38	69.1	19.8		136.9	
		Z	6.47	68.7	19.5		125.4	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	4.22	76.7	22.8	1.54	149.3	±1.2 %
		Y	3.68	73.6	20.9		128.1	
		Z	2.82	68.3	18.2		138.3	
10417-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle)	X	10.18	69.2	21.6	8.23	145.8	±3.0 %
		Y	10.09	68.8	21.2		148.6	
		Z	10.04	68.6	21.1		136.8	

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10418-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Long preambule)	X	10.12	69.4	21.8	8.14	146.6	±2.7 %
		Y	9.97	68.7	21.2		147.5	
		Z	9.96	68.6	21.1		137.7	
10419-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Short preambule)	X	10.24	69.5	21.7	8.19	148.0	±3.0 %
		Y	10.04	68.8	21.2		149.3	
		Z	10.07	68.7	21.2		140.0	
10458-AAA	CDMA2000 (1xEV-DO, Rev. B, 2 carriers)	X	8.54	69.2	20.7	6.55	135.8	±1.9 %
		Y	8.28	68.3	20.1		137.1	
		Z	8.19	67.6	19.7		129.9	
10459-AAA	CDMA2000 (1xEV-DO, Rev. B, 3 carriers)	X	10.88	69.8	21.8	8.25	136.2	±3.0 %
		Y	10.86	69.4	21.5		138.8	
		Z	10.71	68.6	21.1		133.1	
10515-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 99pc duty cycle)	X	5.92	82.8	24.9	1.58	128.2	±0.7 %
		Y	3.52	73.0	20.8		130.5	
		Z	2.69	68.7	18.4		143.9	
10518-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 99pc duty cycle)	X	10.26	69.5	21.7	8.23	145.6	±3.0 %
		Y	10.10	68.8	21.2		147.6	
		Z	10.16	68.9	21.3		140.0	
10525-AAA	IEEE 802.11ac WiFi (20MHz, MCS0, 99pc duty cycle)	X	10.03	68.5	21.2	8.36	122.7	±3.0 %
		Y	10.00	68.2	21.0		124.0	
		Z	10.40	69.1	21.5		142.7	
10526-AAA	IEEE 802.11ac WiFi (20MHz, MCS1, 99pc duty cycle)	X	10.10	68.5	21.3	8.42	123.6	±2.7 %
		Y	10.05	68.2	21.0		123.9	
		Z	10.48	69.2	21.5		143.3	
10534-AAA	IEEE 802.11ac WiFi (40MHz, MCS0, 99pc duty cycle)	X	10.58	69.0	21.4	8.45	129.5	±2.7 %
		Y	10.49	68.6	21.2		129.9	
		Z	10.47	68.5	21.1		123.7	
10535-AAA	IEEE 802.11ac WiFi (40MHz, MCS1, 99pc duty cycle)	X	10.58	69.0	21.4	8.45	129.7	±2.7 %
		Y	10.52	68.7	21.2		132.0	
		Z	10.49	68.5	21.1		124.1	
10544-AAA	IEEE 802.11ac WiFi (80MHz, MCS0, 99pc duty cycle)	X	11.04	69.6	21.5	8.47	134.3	±2.7 %
		Y	10.75	68.7	21.0		133.9	
		Z	10.88	69.0	21.1		127.7	
10545-AAA	IEEE 802.11ac WiFi (80MHz, MCS1, 99pc duty cycle)	X	11.10	69.6	21.5	8.55	134.0	±2.7 %
		Y	10.82	68.8	21.1		134.4	
		Z	10.97	69.0	21.2		127.9	
10564-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 99pc duty cycle)	X	9.90	68.5	21.2	8.25	122.7	±3.0 %
		Y	9.89	68.3	21.0		124.9	
		Z	10.26	69.1	21.4		142.4	
10571-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 90pc duty cycle)	X	6.11	82.4	24.9	1.99	129.0	±0.7 %
		Y	3.46	71.4	20.1		149.7	
		Z	3.49	70.6	19.3		141.5	

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10572-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 90pc duty cycle)	X	6.14	82.6	25.0	1.99	127.7	±0.9 %
		Y	3.59	72.3	20.6		148.0	
		Z	3.56	71.0	19.5		140.0	
10575-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 90pc duty cycle)	X	10.06	68.6	21.5	8.59	122.5	±3.0 %
		Y	10.34	69.1	21.6		147.4	
		Z	10.50	69.3	21.8		139.6	
10576-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 90pc duty cycle)	X	10.61	70.0	22.2	8.60	149.8	±2.7 %
		Y	10.38	69.2	21.7		148.3	
		Z	10.55	69.4	21.8		140.8	
10583-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty cycle)	X	10.11	68.7	21.5	8.59	124.6	±2.7 %
		Y	10.35	69.1	21.6		148.8	
		Z	10.51	69.4	21.8		140.5	
10584-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 90pc duty cycle)	X	10.11	68.7	21.5	8.60	123.0	±3.0 %
		Y	10.07	68.4	21.2		123.3	
		Z	10.56	69.5	21.8		141.6	
10591-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS0, 90pc duty cycle)	X	10.23	68.8	21.6	8.63	125.2	±3.0 %
		Y	10.15	68.4	21.2		124.7	
		Z	10.65	69.4	21.8		142.5	
10592-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS1, 90pc duty cycle)	X	10.40	69.0	21.8	8.79	125.2	±2.7 %
		Y	10.34	68.5	21.4		126.6	
		Z	10.85	69.7	22.1		144.2	
10599-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS0, 90pc duty cycle)	X	10.88	69.4	21.8	8.79	132.6	±3.0 %
		Y	10.75	69.0	21.5		132.8	
		Z	10.78	68.8	21.5		124.2	
10600-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS1, 90pc duty cycle)	X	10.94	69.4	21.9	8.88	131.7	±3.0 %
		Y	10.84	69.0	21.6		132.9	
		Z	10.86	68.9	21.6		124.4	
10607-AAA	IEEE 802.11ac WiFi (20MHz, MCS0, 90pc duty cycle)	X	10.26	68.8	21.6	8.64	125.4	±3.0 %
		Y	10.24	68.5	21.3		126.7	
		Z	10.71	69.6	21.9		144.0	
10608-AAA	IEEE 802.11ac WiFi (20MHz, MCS1, 90pc duty cycle)	X	10.40	69.0	21.7	8.77	125.8	±3.3 %
		Y	10.36	68.6	21.4		127.2	
		Z	10.87	69.8	22.1		145.4	
10616-AAA	IEEE 802.11ac WiFi (40MHz, MCS0, 90pc duty cycle)	X	10.90	69.4	21.9	8.82	131.8	±3.0 %
		Y	10.79	68.9	21.5		132.7	
		Z	10.83	68.9	21.5		123.8	
10617-AAA	IEEE 802.11ac WiFi (40MHz, MCS1, 90pc duty cycle)	X	10.91	69.4	21.9	8.81	132.1	±3.0 %
		Y	10.78	69.0	21.5		133.1	
		Z	10.83	68.9	21.5		124.0	
10626-AAA	IEEE 802.11ac WiFi (80MHz, MCS0, 90pc duty cycle)	X	11.37	69.9	21.9	8.83	136.7	±3.0 %
		Y	11.05	69.1	21.4		134.9	
		Z	11.27	69.5	21.6		128.1	

10627-AAA	IEEE 802.11ac WiFi (80MHz, MCS1, 90pc duty cycle)	X	11.44	70.0	22.0	8.88	137.5	±3.0 %
		Y	11.10	69.1	21.5		135.1	
		Z	11.35	69.5	21.7		128.9	
10648-AAA	CDMA2000 (1x Advanced)	X	4.39	70.8	20.9	3.45	146.1	±0.9 %
		Y	3.84	67.8	19.3		148.6	
		Z	3.78	66.9	18.5		139.2	

[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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Accreditation No.: **SCS 0108**

Client **Motorola MY**

Certificate No: **EX3-3612_May17**

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3612
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:	May 17, 2017

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02525)	Apr-18
Reference 20 dB Attenuator	SN: S5277 (20x)	07-Apr-17 (No. 217-02528)	Apr-18
Reference Probe ES3DV2	SN: 3013	31-Dec-16 (No. ES3-3013_Dec16)	Dec-17
DAE4	SN: 660	7-Dec-16 (No. DAE4-660_Dec16)	Dec-17
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-16)	In house check: Jun-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-16)	In house check: Oct-17

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: May 18, 2017

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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
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

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

Probe EX3DV4

SN:3612

Manufactured: March 23, 2007
Calibrated: May 17, 2017

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3612

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.43	0.48	0.39	± 10.1 %
DCP (mV)[B]	94.2	96.8	97.5	

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	140.4	±2.7 %
		Y	0.0	0.0	1.0		140.7	
		Z	0.0	0.0	1.0		141.7	

Note: For details on UID parameters see Appendix.

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

[A] The uncertainties of Norm X,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[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:3612

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
150	52.3	0.76	10.17	10.17	10.17	0.00	1.00	± 13.3 %
300	45.3	0.87	9.87	9.87	9.87	0.09	1.20	± 13.3 %
450	43.5	0.87	9.25	9.25	9.25	0.16	1.20	± 13.3 %
750	41.9	0.89	8.71	8.71	8.71	0.46	0.93	± 12.0 %
835	41.5	0.90	8.45	8.45	8.45	0.46	0.90	± 12.0 %
900	41.5	0.97	8.27	8.27	8.27	0.48	0.84	± 12.0 %
1450	40.5	1.20	7.78	7.78	7.78	0.39	0.80	± 12.0 %
1810	40.0	1.40	7.18	7.18	7.18	0.33	0.85	± 12.0 %
1900	40.0	1.40	7.16	7.16	7.16	0.25	0.86	± 12.0 %
2100	39.8	1.49	7.17	7.17	7.17	0.33	0.80	± 12.0 %
2300	39.5	1.67	6.88	6.88	6.88	0.32	0.80	± 12.0 %
2450	39.2	1.80	6.59	6.59	6.59	0.35	0.80	± 12.0 %
2600	39.0	1.96	6.49	6.49	6.49	0.37	0.80	± 12.0 %
4950	36.3	4.40	5.12	5.12	5.12	0.35	1.80	± 13.1 %
5250	35.9	4.71	4.76	4.76	4.76	0.35	1.80	± 13.1 %
5500	35.6	4.96	4.56	4.56	4.56	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.36	4.36	4.36	0.40	1.80	± 13.1 %
5750	35.4	5.22	4.85	4.85	4.85	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:3612

Calibration Parameter Determined in Body Tissue Simulating Media

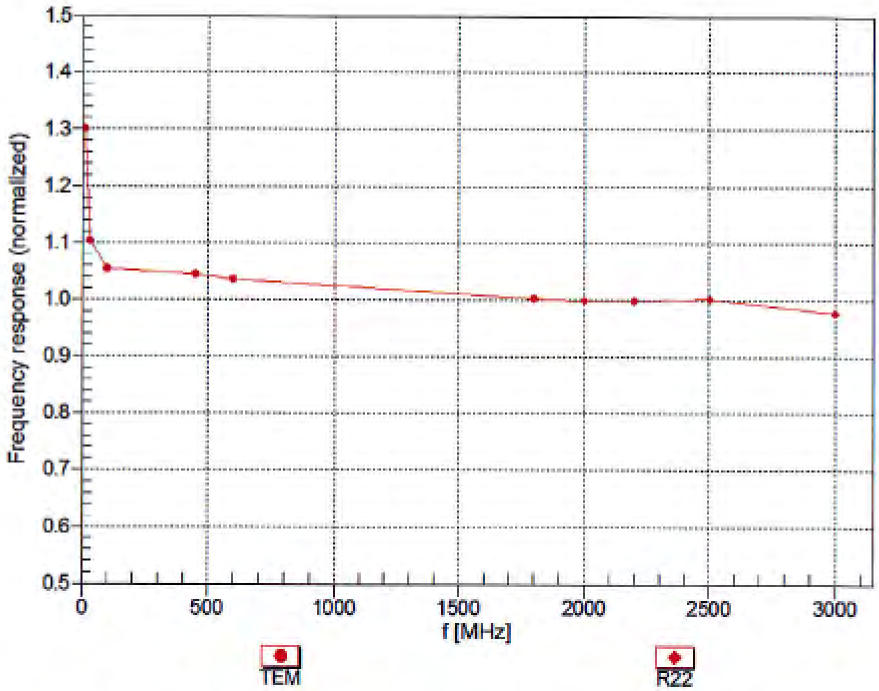
f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
150	61.9	0.80	9.82	9.82	9.82	0.00	1.00	± 13.3 %
300	58.2	0.92	9.51	9.51	9.51	0.05	1.25	± 13.3 %
450	56.7	0.94	9.35	9.35	9.35	0.09	1.25	± 13.3 %
750	55.5	0.96	8.62	8.62	8.62	0.44	0.80	± 12.0 %
835	55.2	0.97	8.41	8.41	8.41	0.52	0.84	± 12.0 %
900	55.0	1.05	8.38	8.38	8.38	0.27	1.11	± 12.0 %
1450	54.0	1.30	7.39	7.39	7.39	0.32	0.80	± 12.0 %
1810	53.3	1.52	7.13	7.13	7.13	0.34	0.94	± 12.0 %
1900	53.3	1.52	7.07	7.07	7.07	0.40	0.80	± 12.0 %
2100	53.2	1.62	7.27	7.27	7.27	0.42	0.80	± 12.0 %
2300	52.9	1.81	6.86	6.86	6.86	0.40	0.80	± 12.0 %
2450	52.7	1.95	6.82	6.82	6.82	0.27	0.92	± 12.0 %
2600	52.5	2.16	6.58	6.58	6.58	0.29	0.90	± 12.0 %
4950	49.4	5.01	4.39	4.39	4.39	0.40	1.90	± 13.1 %
5250	48.9	5.36	4.31	4.31	4.31	0.40	1.90	± 13.1 %
5500	48.6	5.65	3.89	3.89	3.89	0.45	1.90	± 13.1 %
5600	48.5	5.77	3.80	3.80	3.80	0.45	1.90	± 13.1 %
5750	48.3	5.94	4.00	4.00	4.00	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.

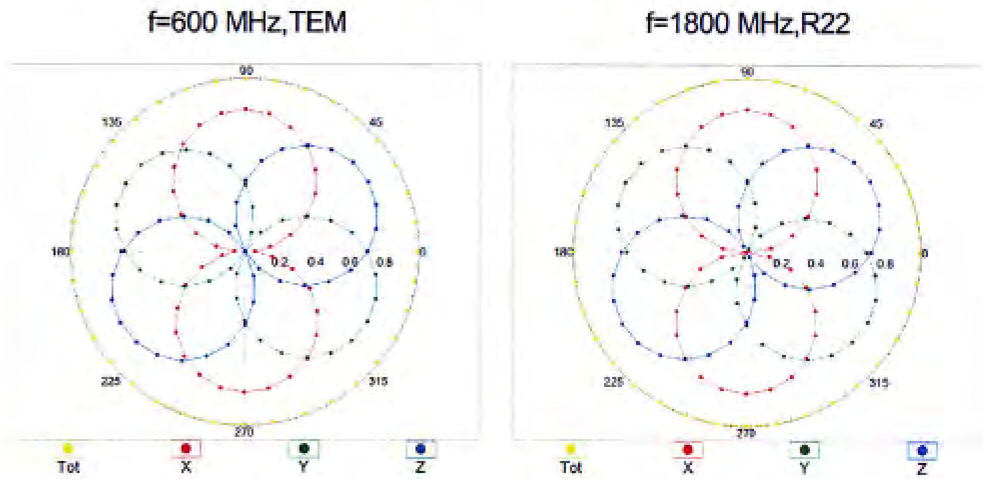
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

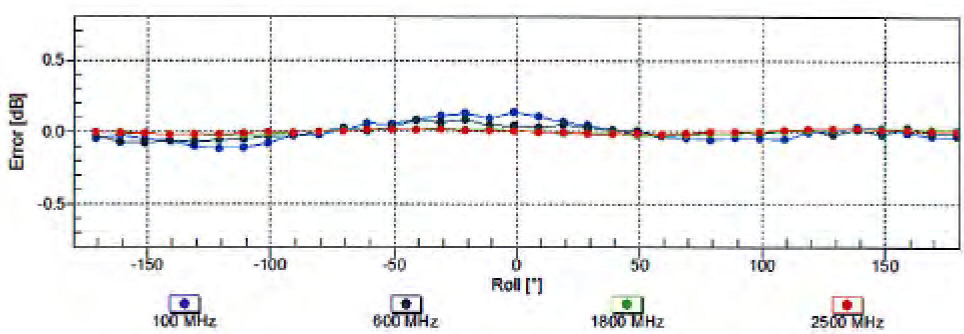
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



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

Receiving Pattern (ϕ), $\vartheta = 0°$

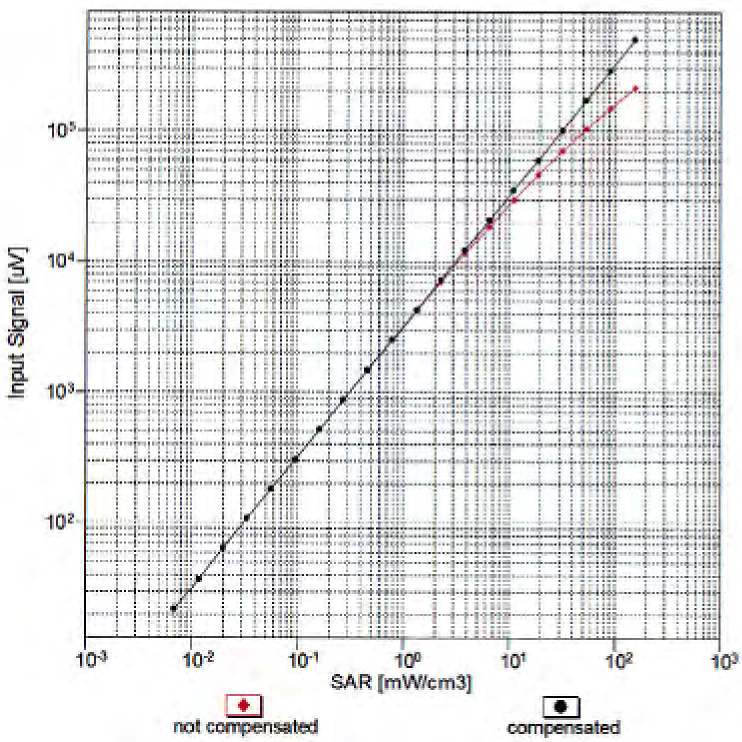


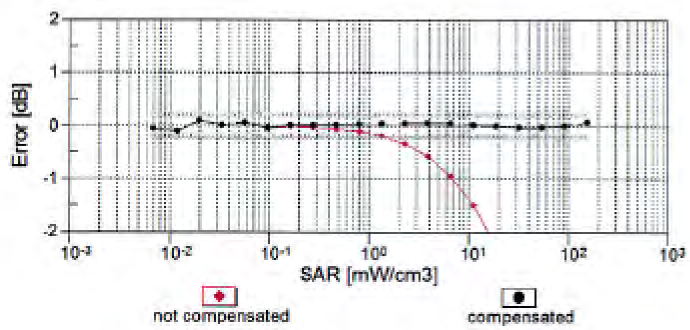


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

(TEM cell , f$_{eval}$= 1900 MHz)

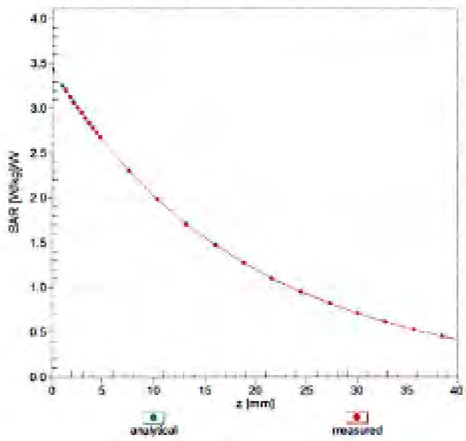




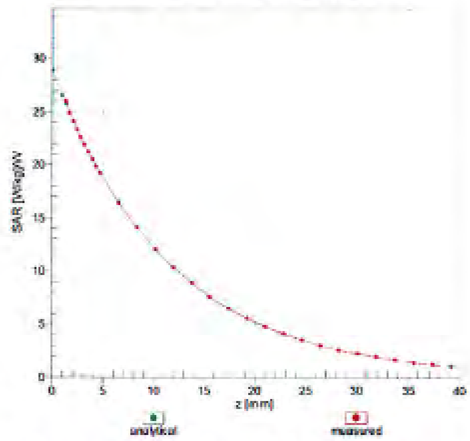
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

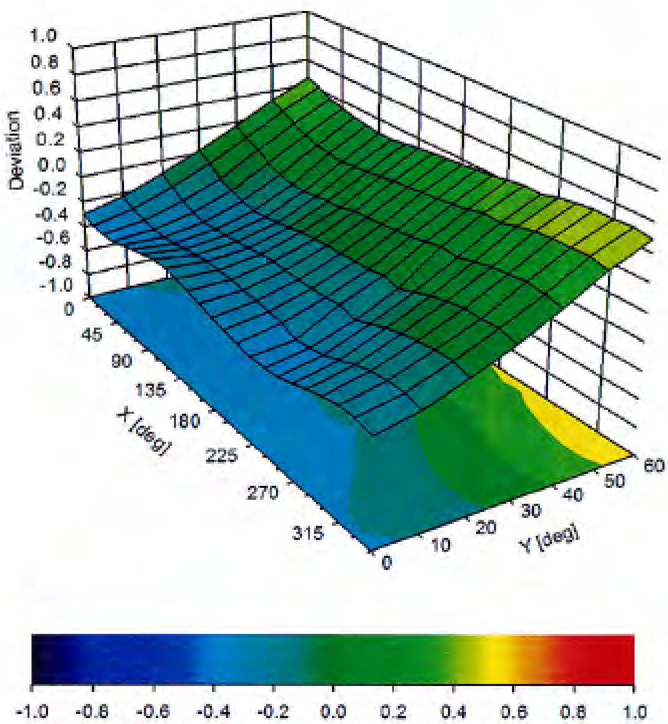


f = 1900 MHz,WGLS R22 (H_convF)



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:3612

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	78.9
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: 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	140.4	±2.7 %
		Y	0.0	0.0	1.0		140.7	
		Z	0.0	0.0	1.0		141.7	
10021-DAC	GSM-FDD (TDMA, GMSK)	X	2.13	66.5	13.8	9.39	117.9	±1.9 %
		Y	1.67	63.5	12.5		76.9	
		Z	2.34	68.1	14.8		107.2	
10023-DAC	GPRS-FDD (TDMA, GMSK, TN 0)	X	2.14	66.8	14.2	9.57	111.5	±3.8 %
		Y	1.63	62.7	12.1		76.2	
		Z	2.63	70.4	16.4		103.6	
10024-DAC	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	1.99	68.1	13.5	6.56	145.4	±1.7 %
		Y	3.88	78.0	17.9		140.9	
		Z	4.74	79.7	18.3		133.7	
10025-DAC	EDGE-FDD (TDMA, 8PSK, TN 0)	X	5.57	74.0	27.0	12.62	79.2	±1.9 %
		Y	4.98	70.0	24.6		53.4	
		Z	5.49	73.8	27.0		72.1	
10026-DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1)	X	5.37	75.0	25.5	9.55	146.2	±1.7 %
		Y	4.77	71.4	23.6		110.0	
		Z	5.63	76.6	26.4		133.4	
10027-DAC	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	5.38	81.3	17.6	4.80	147.9	±1.9 %
		Y	23.73	100.0	23.3		131.0	
		Z	24.58	99.7	23.1		133.0	
10028-DAC	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	39.40	99.8	21.2	3.55	136.7	±1.4 %
		Y	31.48	99.6	21.6		141.3	
		Z	28.30	99.9	22.2		145.2	
10029-DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1-2)	X	5.33	76.0	24.9	7.78	148.8	±1.4 %
		Y	4.63	71.9	22.8		147.6	
		Z	5.44	76.7	25.3		134.9	
10039-CAB	CDMA2000 (1xRTT, RC1)	X	4.85	66.6	18.9	4.57	141.0	±1.2 %
		Y	4.94	67.2	19.4		149.5	
		Z	5.04	68.2	20.1		149.8	
10056-CAA	UMTS-TDD (TD-SCDMA, 1.28 Mcps)	X	4.53	70.5	24.5	11.01	117.8	±1.7 %
		Y	4.00	67.1	22.6		80.0	
		Z	4.65	71.8	25.4		108.8	
10058-DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1-2-3)	X	4.64	73.1	22.6	6.52	141.0	±1.4 %
		Y	4.57	72.9	22.7		147.2	
		Z	4.81	75.0	24.0		129.0	
10081-CAB	CDMA2000 (1xRTT, RC3)	X	3.96	65.7	18.3	3.97	135.8	±0.9 %
		Y	4.08	66.6	19.0		143.5	
		Z	4.22	67.9	19.8		145.3	
10090-DAC	GPRS-FDD (TDMA, GMSK, TN 0-4)	X	2.01	68.4	13.4	6.56	142.9	±2.2 %
		Y	2.59	71.6	15.0		138.5	
		Z	11.30	91.6	22.2		133.5	

10099-DAC	EDGE-FDD (TDMA, 8PSK, TN 0-4)	X	5.86	77.8	26.9	9.55	141.6	±2.5 %
		Y	5.01	72.9	24.3		106.0	
		Z	6.21	79.8	28.0		149.0	
10117-CAB	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.60	69.2	21.5	8.07	149.0	±3.0 %
		Y	10.31	68.4	21.0		129.5	
		Z	10.46	69.1	21.5		133.8	
10196-CAB	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	10.22	69.0	21.5	8.10	145.1	±3.0 %
		Y	10.01	68.3	21.0		125.8	
		Z	10.02	68.7	21.4		129.7	
10290-AAB	CDMA2000, RC1, SO55, Full Rate	X	4.45	67.2	18.8	3.91	144.2	±0.9 %
		Y	4.55	67.9	19.5		127.3	
		Z	4.73	69.3	20.4		130.2	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.70	66.4	18.4	3.46	138.0	±0.7 %
		Y	3.88	67.9	19.6		141.5	
		Z	4.05	69.3	20.4		146.1	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.62	66.4	18.3	3.39	139.1	±0.7 %
		Y	3.90	68.4	19.8		142.7	
		Z	4.08	70.0	20.7		145.6	
10293-AAB	CDMA2000, RC3, SO3, Full Rate	X	3.72	66.4	18.4	3.50	138.6	±0.7 %
		Y	3.90	67.8	19.6		141.4	
		Z	4.07	69.3	20.4		146.0	
10295-AAB	CDMA2000, RC1, SO3, 1/8th Rate 25 fr.	X	5.79	67.9	24.6	12.49	96.8	±1.7 %
		Y	5.20	64.3	22.3		64.1	
		Z	5.69	67.9	24.7		87.8	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	4.97	68.6	18.9	3.76	146.2	±0.7 %
		Y	5.26	69.9	19.9		132.8	
		Z	5.62	72.1	20.9		144.9	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	4.91	68.7	19.0	3.77	146.5	±0.9 %
		Y	5.19	70.0	20.0		130.3	
		Z	5.50	72.0	21.0		143.3	
10406-AAB	CDMA2000, RC3, SO32, SCH0, Full Rate	X	6.36	68.9	19.8	5.22	129.3	±1.2 %
		Y	6.53	69.3	20.1		136.2	
		Z	6.83	71.2	21.2		149.8	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	2.71	67.5	18.2	1.54	144.4	±0.7 %
		Y	3.45	73.1	21.5		128.2	
		Z	3.71	75.0	22.4		141.4	
10417-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle)	X	10.31	69.0	21.6	8.23	145.7	±3.0 %
		Y	10.10	68.4	21.2		125.0	
		Z	10.29	69.3	21.9		139.9	
10418-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Long preambule)	X	10.22	69.1	21.6	8.14	146.2	±3.0 %
		Y	10.02	68.4	21.2		125.4	
		Z	10.15	69.2	21.7		139.0	

10458-AAA	CDMA2000 (1xEV-DO, Rev. B, 2 carriers)	X	8.26	68.0	20.1	6.55	134.0	±1.7 %
		Y	8.55	68.6	20.5		140.6	
		Z	8.23	68.4	20.5		125.9	
10459-AAA	CDMA2000 (1xEV-DO, Rev. B, 3 carriers)	X	10.79	68.9	21.5	8.25	137.1	±3.0 %
		Y	11.20	69.7	21.9		143.6	
		Z	10.71	69.2	21.8		127.5	
10515-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 99pc duty cycle)	X	2.74	67.8	18.4	1.58	148.0	±0.7 %
		Y	3.62	74.2	22.0		129.4	
		Z	3.89	76.1	22.9		140.5	
10518-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 99pc duty cycle)	X	10.45	69.4	21.8	8.23	149.5	±2.5 %
		Y	10.13	68.4	21.2		126.1	
		Z	10.29	69.3	21.8		139.5	
10525-AAA	IEEE 802.11ac WiFi (20MHz, MCS0, 99pc duty cycle)	X	10.21	68.4	21.3	8.36	126.0	±3.0 %
		Y	10.41	68.7	21.5		129.4	
		Z	10.50	69.4	22.0		142.0	
10526-AAA	IEEE 802.11ac WiFi (20MHz, MCS1, 99pc duty cycle)	X	10.32	68.5	21.4	8.42	126.6	±3.0 %
		Y	10.47	68.8	21.5		130.1	
		Z	10.61	69.6	22.1		142.2	
10534-AAA	IEEE 802.11ac WiFi (40MHz, MCS0, 99pc duty cycle)	X	10.83	69.1	21.6	8.45	133.9	±2.7 %
		Y	10.87	69.1	21.6		135.0	
		Z	10.65	68.9	21.6		123.6	
10535-AAA	IEEE 802.11ac WiFi (40MHz, MCS1, 99pc duty cycle)	X	10.84	69.1	21.6	8.45	134.6	±3.0 %
		Y	10.89	69.1	21.6		135.1	
		Z	10.73	69.1	21.7		125.5	
10544-AAA	IEEE 802.11ac WiFi (80MHz, MCS0, 99pc duty cycle)	X	11.29	69.6	21.7	8.47	138.9	±3.0 %
		Y	11.10	69.2	21.5		136.9	
		Z	11.14	69.5	21.7		128.7	
10545-AAA	IEEE 802.11ac WiFi (80MHz, MCS1, 99pc duty cycle)	X	11.46	69.9	21.9	8.55	141.1	±3.0 %
		Y	11.21	69.3	21.6		138.1	
		Z	11.26	69.7	21.9		129.9	
10564-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 99pc duty cycle)	X	10.12	68.5	21.3	8.25	127.9	±2.7 %
		Y	10.22	68.6	21.3		127.3	
		Z	10.39	69.5	22.0		142.2	
10571-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 90pc duty cycle)	X	2.82	67.6	18.5	1.99	147.5	±0.9 %
		Y	3.44	72.5	21.5		148.6	
		Z	3.68	73.9	21.9		138.7	
10572-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 90pc duty cycle)	X	2.93	68.4	18.8	1.99	146.0	±0.7 %
		Y	3.53	73.1	21.7		145.7	
		Z	4.04	76.1	22.9		137.5	
10575-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 90pc duty cycle) ✓	X	10.18	68.4	21.5	8.59	124.0	±3.0 %
		Y	10.32	68.6	21.6		123.8	
		Z	10.48	69.5	22.2		139.0	
10576-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 90pc duty cycle)	X	10.20	68.4	21.5	8.60	123.9	±3.0 %
		Y	10.35	68.7	21.6		123.7	
		Z	10.53	69.6	22.3		140.0	

10583-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty cycle)	X	10.63	69.6	22.2	8.59	149.6	±2.7 %
		Y	10.33	68.6	21.6		124.0	
		Z	10.48	69.5	22.2		139.5	
10584-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 90pc duty cycle)	X	10.22	68.5	21.5	8.60	124.2	±3.0 %
		Y	10.35	68.6	21.6		124.1	
		Z	10.52	69.6	22.3		139.8	
10591-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS0, 90pc duty cycle) /6.5	X	10.34	68.5	21.6	8.63	125.6	±3.0 %
		Y	10.51	68.8	21.7		127.7	
		Z	10.66	69.7	22.3		143.1	
10592-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS1, 90pc duty cycle)	X	10.51	68.7	21.7	8.79	126.2	±3.0 %
		Y	10.66	68.9	21.8		128.2	
		Z	10.82	69.8	22.5		143.2	
10599-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS0, 90pc duty cycle) /13.5	X	11.01	69.2	21.9	8.79	133.1	±3.0 %
		Y	11.06	69.3	21.9		134.2	
		Z	10.85	69.1	21.9		123.7	
10600-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS1, 90pc duty cycle)	X	11.07	69.3	22.0	8.88	132.7	±3.0 %
		Y	11.11	69.3	21.9		134.8	
		Z	10.95	69.2	22.1		124.9	
10607-AAA	IEEE 802.11ac WiFi (20MHz, MCS0, 90pc duty cycle)	X	10.30	68.4	21.5	8.64	124.6	±3.0 %
		Y	10.51	68.8	21.7		129.3	
		Z	10.65	69.6	22.3		142.8	
10608-AAA	IEEE 802.11ac WiFi (20MHz, MCS1, 90pc duty cycle)	X	10.49	68.7	21.7	8.77	125.7	±2.7 %
		Y	10.67	69.0	21.8		130.0	
		Z	10.83	69.9	22.5		143.9	
10616-AAA	IEEE 802.11ac WiFi (40MHz, MCS0, 90pc duty cycle)	X	11.01	69.2	21.9	8.82	132.0	±2.7 %
		Y	11.09	69.3	21.9		136.2	
		Z	11.34	70.3	22.6		149.7	
10617-AAA	IEEE 802.11ac WiFi (40MHz, MCS1, 90pc duty cycle)	X	10.98	69.1	21.8	8.81	131.8	±3.0 %
		Y	11.09	69.3	21.9		135.7	
		Z	10.85	69.0	21.9		123.4	
10626-AAA	IEEE 802.11ac WiFi (80MHz, MCS0, 90pc duty cycle)	X	11.48	69.8	22.0	8.83	136.8	±3.0 %
		Y	11.33	69.4	21.8		138.3	
		Z	11.32	69.6	22.0		127.1	
10627-AAA	IEEE 802.11ac WiFi (80MHz, MCS1, 90pc duty cycle)	X	11.56	69.9	22.1	8.88	136.8	±3.0 %
		Y	11.40	69.5	21.9		138.3	
		Z	11.37	69.7	22.1		127.3	
10648-AAA	CDMA2000 (1x Advanced)	X	3.75	66.8	18.7	3.45	142.8	±0.7 %
		Y	4.06	69.0	20.3		148.6	
		Z	4.02	69.3	20.5		135.3	

[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

Appendix C
Dipole Calibration Certificates

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

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

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

Accreditation No.: SCS 0108

Client **Motorola Solutions MY** Certificate No: **CLA150-4010_Nov16**

CALIBRATION CERTIFICATE

Object: CLA150 - SN: 4010

Calibration procedure(s): QA CAL-15.v8
Calibration procedure for system validation sources below 700 MHz

Calibration date: November 08, 2016

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 30 dB Attenuator	SN: 5129 (30b)	05-Apr-16 (No. 217-02294)	Apr-17
Type-N mismatch combination	SN: 5047.2 / 06327	05-Apr-16 (No. 217-02295)	Apr-17
Reference Probe EX3DV4	SN: 3877	31-Dec-15 (No. EX3-3877_Dec15)	Dec-16
DAE4	SN: 654	12-Aug-16 (No. DAE4-654_Aug16)	Aug-17

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (No. 217-02285/02284)	In house check: Jun-18
Power sensor E4412A	SN: MY41498087	06-Apr-16 (No. 217-02285)	In house check: Jun-18
Power sensor E4412A	SN: 000110210	06-Apr-16 (No. 217-02284	In house check: Jun-18
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-16)	In house check: Jun-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-15)	In house check: Oct-17

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: November 9, 2016

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

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

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

Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The 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 = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
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	50.1 ± 6 %	0.75 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	1 W input power	3.69 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**3.69 W/kg ± 18.4 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	1 W input power	2.45 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**2.46 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	61.4 ± 6 %	0.82 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	1 W input power	3.86 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**3.78 W/kg ± 18.4 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	1 W input power	2.56 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**2.51 W/kg ± 18.0 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	45.9 Ω - 4.5 jΩ
Return Loss	- 24.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.9 Ω - 6.6 jΩ
Return Loss	- 23.7 dB

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	April 15, 2014

DASY5 Validation Report for Head TSL

Date: 07.11.2016

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: CLA-150; Type: CLA-150; Serial: 4010

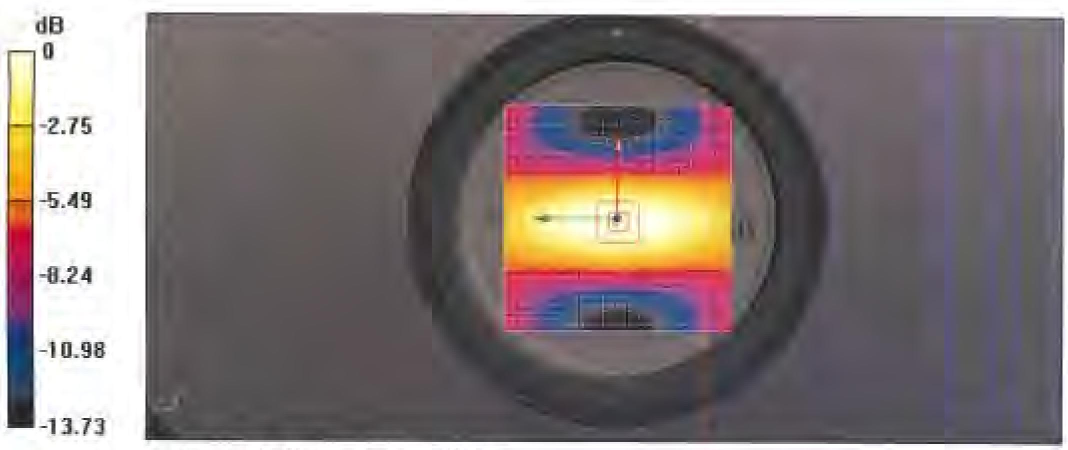
Communication System: UID 0 - CW; Frequency: 150 MHz
Medium parameters used: f = 150 MHz; $\sigma = 0.75$ S/m; $\varepsilon_r = 50.1$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3877; ConvF(12.02, 12.02, 12.02); Calibrated: 31.12.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn654; Calibrated: 12.08.2016
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:1003
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

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) = 5.16 W/kg

CLA Calibration for HSL-LF Tissue/CLA150, touch configuration, Pin=1W/Zoom Scan, dist=1.4mm (8x10x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 82.42 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 6.93 W/kg
SAR(1 g) = 3.69 W/kg; SAR(10 g) = 2.45 W/kg
Maximum value of SAR (measured) = 5.16 W/kg



0 dB = 5.16 W/kg = 7.13 dBW/kg

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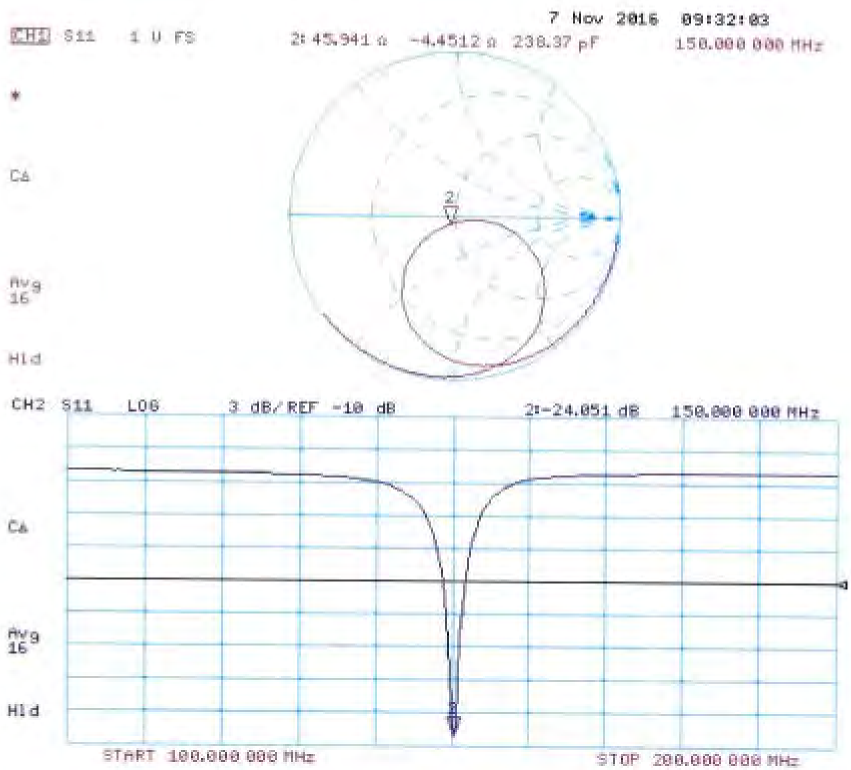
Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 08.11.2016

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: CLA-150; Type: CLA-150; Serial: 4010

Communication System: UID 0 - CW; Frequency: 150 MHz
Medium parameters used: f = 150 MHz; σ = 0.82 S/m; ε_r = 61.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3877; ConvF(11.44, 11.44, 11.44); Calibrated: 31.12.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn654; Calibrated: 12.08.2016
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:1003
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

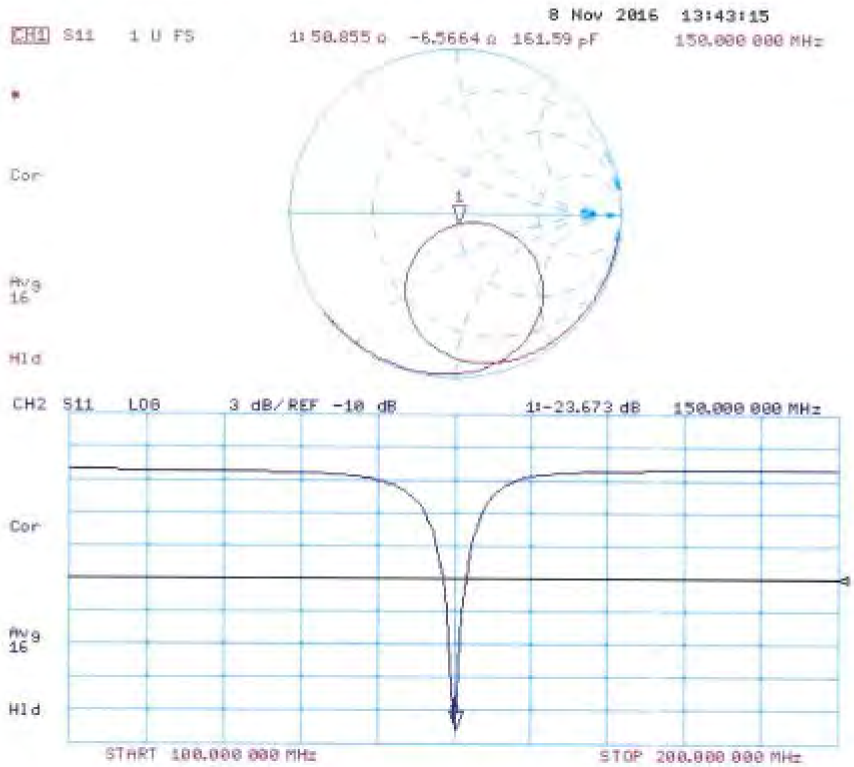
CLA Calibration for MSL-LF Tissue/CLA150, touch configuration, Pin=1W/Area Scan (81x81x1):
Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 5.45 W/kg

CLA Calibration for MSL-LF Tissue/CLA150, touch configuration, Pin=1W/Zoom Scan, dist=1.4mm (8x10x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 80.49 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 7.18 W/kg
SAR(1 g) = 3.86 W/kg; SAR(10 g) = 2.56 W/kg
Maximum value of SAR (measured) = 5.38 W/kg

0 dB = 5.45 W/kg = 7.36 dBW/kg

Certificate No: CLA150-4010_Nov16 Page 7 of 8

Impedance Measurement Plot for Body TSL



Dipole Data

The table below includes dipole impedance and return loss measurement data measured by Motorola Solutions' EME lab. The results meet the requirements stated in KDB 865664.

Dipole 450-1075	Head			Body		
	Impedance		Return Loss	Impedance		Return Loss
Date Measured	real Ω	imag jΩ	dB	real Ω	imag jΩ	dB
12/15/2016	48.67	4.80	-25.98	51.29	2.50	-31.07
12/15/2017	48.37	5.26	-24.97	50.97	3.34	-29.04

Appendix D
SAR Summary Results Table for FCC PAG review

Table D.1 Body Configuration VHF SAR Summary Result

Table #	Body / Head / Face	Antenna No.	Battery No.	Body Worn No.	Audio No.	f1	f2	f3	f3	f4	f5	f6
						150.8	155	156.4	158.3	162	167	173.4
18	Body	1	1	1	1			0.37				
18	Body	2	1	1	1							0.26
18	Body	3	1	1	1							0.23
18	Body	4	1	1	1	0.18						
18	Body	5	1	1	1	0.27						
18	Body	6	1	1	1	0.29						
18	Body	1	2	1	1			0.20				
18	Body	1	3	1	1			0.23				
18	Body	1	4	1	1			0.20				
18	Body	1	5	1	1			0.25				
18	Body	1	6	1	1			0.28				
18	Body	1	7	1	1			0.22				
18	Body	1	8	1	1			0.26				
18	Body	1	9	1	1			0.22				
18	Body	1	10	1	1			0.22				
18	Body	1	11	1	1			0.21				
18	Body	1	12	1	1			0.21				
19	Body	1	1	2	1			0.25				
19	Body	2	1	2	1							0.46
19	Body	3	1	2	1							0.45
19	Body	4	1	2	1	0.15						
19	Body	5	1	2	1	0.20						
19	Body	6	1	2	1	0.22						
19	Body	2	2	2	1							0.26
19	Body	2	3	2	1							0.74
19	Body	2	4	2	1							0.24
19	Body	2	5	2	1							0.58
19	Body	2	6	2	1							0.80
19	Body	2	7	2	1							0.26
19	Body	2	8	2	1							0.78
19	Body	2	9	2	1							0.66
19	Body	2	10	2	1							0.27
19	Body	2	11	2	1							0.25
19	Body	2	12	2	1							0.27
20	Body	1	1	3	1			0.48				
20	Body	2	1	3	1							1.05
20	Body	3	1	3	1							0.67
20	Body	4	1	3	1	0.23						
20	Body	5	1	3	1	0.28						
20	Body	6	1	3	1	0.31						
20	Body	2	2	3	1							0.71
20	Body	2	3	3	1							0.77
20	Body	2	4	3	1							0.44
20	Body	2	5	3	1							0.55
20	Body	2	6	3	1							0.54
20	Body	2	7	3	1							0.38
20	Body	2	8	3	1							0.40
20	Body	2	9	3	1							0.25
20	Body	2	10	3	1							0.22
20	Body	2	11	3	1							0.33
20	Body	2	12	3	1							0.33

Table D.1 Body Configuration VHF SAR Summary Result (Continued)

Table #	Body / Head / Face	Antenna No.	Battery No.	Body Worn No.	Audio No.	f1	f2	f3	f3	f4	f5	f6
						150.8	155	156.4	158.3	162	167	173.4
21	Body	1	1	4	1			0.17				
21	Body	2	1	4	1							0.33
21	Body	3	1	4	1							0.30
21	Body	4	1	4	1	0.13						
21	Body	5	1	4	1	0.18						
21	Body	6	1	4	1	0.19						
21	Body	2	2	4	1							0.25
21	Body	2	3	4	1							0.42
21	Body	2	4	4	1							0.27
21	Body	2	5	4	1							0.47
21	Body	2	6	4	1							0.61
21	Body	2	7	4	1							0.27
21	Body	2	8	4	1							0.30
21	Body	2	9	4	1							0.18
21	Body	2	10	4	1							0.33
21	Body	2	11	4	1							0.25
21	Body	2	12	4	1							0.30
22	Body	1	1	5	1			0.58				
22	Body	2	1	5	1							0.62
22	Body	3	1	5	1							0.45
22	Body	4	1	5	1	0.26						
22	Body	5	1	5	1	0.29						
22	Body	6	1	5	1	0.33						
22	Body	2	2	5	1							0.50
22	Body	2	3	5	1							0.74
22	Body	2	4	5	1							0.46
22	Body	2	5	5	1							0.80
22	Body	2	6	5	1							0.66
22	Body	2	7	5	1							0.41
22	Body	2	8	5	1							0.70
22	Body	2	9	5	1							0.48
22	Body	2	10	5	1							0.48
22	Body	2	11	5	1							0.53
22	Body	2	12	5	1							0.56
23	Body	1	1	6&9	1			0.14				
23	Body	2	1	6&9	1							1.43
23	Body	3	1	6&9	1							1.32
23	Body	4	1	6&9	1	0.17						
23	Body	5	1	6&9	1	0.22						
23	Body	6	1	6&9	1	0.24						
23	Body	2	2	6&9	1							1.31
23	Body	2	3	6&9	1							0.69
23	Body	2	4	6&9	1							0.96
23	Body	2	5	6&9	1							1.71
23	Body	2	6	6&9	1							0.63
23	Body	2	7	6&9	1							0.82
23	Body	2	8	6&9	1							0.88
23	Body	2	9	6&9	1							0.76
23	Body	2	10	6&9	1							1.01
23	Body	2	11	6&9	1							0.79
23	Body	2	12	6&9	1							0.48

Table D.1 Body Configuration VHF SAR Summary Result (Continued)

Table #	Body / Head / Face	Antenna No.	Battery No.	Body Worn No.	Audio No.	f1	f2	f3	f3	f4	f5	f6
						150.8	155	156.4	158.3	162	167	173.4
24	Body	1	1	7&9	1			0.12				
24	Body	2	1	7&9	1							0.59
24	Body	3	1	7&9	1							0.57
24	Body	4	1	7&9	1	0.08						
24	Body	5	1	7&9	1	0.09						
24	Body	6	1	7&9	1	0.12						
24	Body	2	2	7&9	1							0.58
24	Body	2	3	7&9	1							0.95
24	Body	2	4	7&9	1							0.54
24	Body	2	5	7&9	1							0.80
24	Body	2	6	7&9	1							0.82
24	Body	2	7	7&9	1							0.62
24	Body	2	8	7&9	1							0.85
24	Body	2	9	7&9	1							0.70
24	Body	2	10	7&9	1							0.66
24	Body	2	11	7&9	1							0.66
24	Body	2	12	7&9	1							0.72
25	Body	1	1	8&9	1			0.19				
25	Body	2	1	8&9	1							0.34
25	Body	3	1	8&9	1							0.23
25	Body	4	1	8&9	1	0.13						
25	Body	5	1	8&9	1	0.13						
25	Body	6	1	8&9	1	0.18						
25	Body	2	2	8&9	1							0.27
25	Body	2	3	8&9	1							0.57
25	Body	2	4	8&9	1							0.52
25	Body	2	5	8&9	1							0.44
25	Body	2	6	8&9	1							0.86
25	Body	2	7	8&9	1							0.58
25	Body	2	8	8&9	1							0.30
25	Body	2	9	8&9	1							0.30
25	Body	2	10	8&9	1							0.40
25	Body	2	11	8&9	1							0.31
25	Body	2	12	8&9	1							0.30

Table D.2 Face Configuration VHF SAR Summary Result

Table #	Body / Head / Face	Antenna No.	Battery No.	Body Worn No.	Audio No.	f1	f2	f3	f3	f4	f5	f6
						150.8	155	156.4	158.3	162	167	173.4
27	Face	1	4				0.42					
27	Face	2	4								0.28	
27	Face	3	4				0.53					
27	Face	4	4				0.11					
27	Face	5	4				0.32					
27	Face	6	4			0.41						
27	Face	3	2				0.61					
27	Face	3	3				0.64					
27	Face	3	1				0.64					
27	Face	3	5				0.64					
27	Face	3	6				0.64					
27	Face	3	7				0.63					
27	Face	3	8				0.63					
27	Face	3	9				0.62					
27	Face	3	10				0.61					
27	Face	3	11				0.62					
27	Face	3	12				0.60					