MOTOROLA SOLUTIONS

TESTING CERT # 2518.05

DECLARATION OF COMPLIANCE SAR ASSESSMENT Part 1 of 2

Motorola Solutions Inc.
EME Test Laboratory
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Date of Report: 5/13/2016
Report Revision: A

Responsible Engineer:	Patrick Saw (EME Engineer)
Report Author:	Tiong Nguk Ing (EME Engineer)
Date/s Tested:	4/20/2016-5/12/2016
Manufacturer:	Motorola Solutions Inc.
DUT Description:	Video RSM with Bluetooth and WiFi
Test TX mode(s):	Bluetooth, WLAN 802.11 b/g/n (2.4 GHz), WLAN 802.11 ac/n (5 GHz)
Max. Power output:	12.68 mW (Bluetooth), 39.8 mW (WLAN 2.4 GHz 802.11 b), 39.8 mW (WLAN 2.4 GHz 802.11g), 25.1 mW (WLAN 2.4 GHz 802.11n), 25.1 mW (WLAN 5 GHz 802.11ac), 25.1 mW (WLAN 5 GHz 802.11n)
Nominal Power:	10.0 mW (Bluetooth), 39.8 mW (WLAN 2.4 GHz 802.11 b), 39.8 mW (WLAN 2.4 GHz 802.11g), 25.1 mW (WLAN 2.4 GHz 802.11n), 25.1 mW (WLAN 5 GHz 802.11ac), 25.1 mW (WLAN 5 GHz 802.11n)
Tx Frequency Bands:	Bluetooth, WLAN 2.4 GHz 802.11 b/g/n, WLAN 5 GHz 802.11ac/n
Signaling type:	FHSS (Bluetooth), 802.11 b/g/n (WLAN 2.4 GHz), 802.11 ac/n (WLAN 5 GHz)
Model(s) Tested:	HK2061A
Model(s) Certified:	HK2061A , HK2062A
Serial Number(s):	372TSD0262
Classification:	General Population / Uncontrolled
FCC ID:	AZ489FT7088; Bluetooth, WLAN 2.4 GHz 802.11 b/g/n, WLAN 5 GHz 802.11ac/n This report contains results that are immaterial for FCC equipment approval, which are clearly identified.
IC:	109U-89FT7088; This report contains results that are immaterial for IC equipment approval, which are clearly identified.

The test results clearly demonstrate compliance with FCC General Population/Uncontrolled RF Exposure limits of 1.6 W/kg averaged over 1 gram per the requirements of OET Bulletin 65. The 10 grams result is not applicable to FCC filing. The test results clearly demonstrate compliance with ICNIRP (1998) Guidelines for limiting exposure in time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz), Health Physics 74, 494-522 RF Exposure limits of 2 W/kg averaged over 10grams of contiguous tissue.

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

Tiong

Tiong Nguk Ing
Deputy Technical Manager
Approval Date: 5/17/2016

Tiong Nguk Ing

Digitally signed by Tiong Nguk Ing
DN: cn=Tiong Nguk Ing, o=Motorola Solutions, ou=Regulatory Compliance Lab, email=n.i.tiong@motorolasolutions.com, c=MY
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Certification Date: 5/17/2016

Certification No.: L1160408, L1160409

Part 1 of 2

APPENDICES

Part 2 of 2

APPENDICES

Report Revision History

Date	Revision	Comments
5/13/2016	A	Initial release for PCII filing

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 Video Remote Speaker Microphone with Bluetooth and WiFi, models HK2061A and HK2062A. These devices are classified as General Population/Uncontrolled. Class II permissive Change required due to improper test mode configurations in original filing at 5GHz WLAN frequency band.

2.0 FCC SAR Summary

Table 1

Equipment Class	Frequency band (MHz)	Max Calc at Body (W/kg)		Max Calc at Face (W/kg)	
		1g-SAR	10g-SAR	1g-SAR	10g-SAR
DTS	2.4GHz WLAN (WLAN 802.11 b/g/n)	0.17	0.09	0.06	0.03
NII	#5GHz WLAN (WLAN 802.11 ac/n)	**0.81**	**0.26**	**0.34**	**0.15**
*DSS	Bluetooth	NA	NA	NA	NA

Note:
*Results not required per KDB
The previous reported results at 5GHz are replaced with the results presented herein.

3.0 Abbreviations / Definitions

BT: Bluetooth
CNR: Calibration Not Required
CW: Continuous Wave
DSS: Direct Spread Spectrum
DTS: Digital Transmission System
DUT: Device Under Test
EME: Electromagnetic Energy
FHSS: Frequency Hopping Spread Spectrum
RF: Radio Frequency
SAR: Specific Absorption Rate
NA: Not Applicable
DSSS: Direct Sequence Spread Spectrum
OFDM: Orthogonal Frequency-Division Multiplexing
WLAN: Wireless Local Area Network
NII: National Information Infrastructure
U-NII: Unlicensed National Information Infrastructure

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 – 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB – 865664 D02 RF Exposure Reporting v01r02
- FCC KDB – 447498 D01 General RF Exposure Guidance v06
- FCC KDB – 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB – 648474 D04 Handset SAR v01r03

5.0 SAR Limits

Table 2

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

6.0 Description of Devices Under Test (DUT)

These devices operate in the WLAN technology for data capabilities over 802.11 b/g/n (2.4 GHz), 802.11ac/n (5 GHz) wireless networks and Bluetooth technology for short range wireless devices.

These devices also incorporate a Bluetooth v4.0, which include classis Bluetooth, and Bluetooth low energy. It is Class 1 Bluetooth device with Frequency Hopping Spread Spectrum (FHSS) technology. The Bluetooth radio modem is used to wireless link audio accessories. The maximum actual transmission duty cycle is imposed by the Bluetooth standard. The maximum duty cycle for BT is derived from 5-slots packet type operation which consists of receiving on 1-slot and transmitting on 5-slots, and thus maximum duty cycle = 78%.

WLAN 2.4GHz 802.11 b/g/n operate using Direct Sequence Spread Spectrum (DSSS) and Orthogonal Frequency-Division Multiplexing (OFDM) with channel bandwidth of 20MHz. WLAN 5GHz 802.11 ac/n operate using Orthogonal Frequency-Division Multiplexing (OFDM) with channel bandwidth of 20MHz, 40MHz and 80MHz.

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

Technologies	Band (MHz)	Transmission	Duty Cycle (%)	Max Power (mW)
WLAN - 802.11b	2412-2462	DSSS	100	39.80
WLAN - 802.11g	2412-2462	OFDM	100	39.80
WLAN - 802.11n	2412-2462	OFDM	90	25.10
WLAN - 802.11ac	5150-5850	OFDM	90	25.10
WLAN - 802.11n	5150-5850	OFDM	90	25.10
BT	2402-2480	FHSS	78	12.68

The intended operating positions are “at the body” and “at the face” with the DUT facing front and back against the phantom. The positions “at the body” by means of the offered body worn accessories.

7.0 Optional Accessories and Test Criteria

The following sections describe the antennas, batteries, and body-worn accessories.

7.1 Antennas

These devices had internal BT/WLAN antenna. The Table below lists it description.

Table 4

Antenna Models	Description	Selected for test	Tested
AN000154A01	2.4 GHz Internal BT/WLAN, 3.2 dBi	Yes	Yes
AN000154A01	5 GHz Internal WLAN, 4.2 dBi	Yes	Yes

7.2 Batteries

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

Table 5

Battery Models	Description	Selected for test	Tested	Comments
PMNN4507A	Fusion Standard Battery (1950 mAh)	Yes	Yes	Standard battery
PMNN4508A	Fusion High Capacity Battery (2925 mAh)	Yes	Yes	Extended battery

7.3 Body worn Accessories

The Table below lists the body worn accessories, and their descriptions.

Table 6

Body worn Models	Description	Selected for test	Tested	Comments
PMLN7414A	Carry Holder	Yes	Yes	Allow device to be flexibly worn with speaker face in or face out.
HW000331A02	Carry Holder, Metal Clip	Yes	Yes	Allow device to be flexibly worn with speaker face in or face out.
PMLN7415A	Shoulder Strap, Left	Yes	Yes	Tested with PMLN7414A and HW000331A02.
PMLN7416A	Shoulder Strap, Right	No	No	By similarity to PMLN7415A

8.0 Description of Test System

8.1 Descriptions of Robotics/Probes/Readout Electronics

Table 7

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 8

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

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 9. 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 9

Ingredients	5 GHz (1)	
	Head	Body
Sugar	NA	NA
Diacetin	NA	NA
De ionized –Water	NA	NA
Salt	NA	NA
HEC	NA	NA
Bact.	NA	NA

Note: (1) SPEAG provides Motorola proprietary stimulant ingredients for the 5 GHz band.

9.0 Additional Test Equipment

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

Table 10

Equipment Type	Model Number	Serial Number	Calibration Date	Calibration Due Date
Speag Probe	EX3DV4	3735	7/16/2015	7/16/2016
Speag DAE	DAE4	850	8/24/2015	8/24/2016
Signal Generator	E4438C	MY47272101	8/12/2014	8/12/2016
Power Meter	E4419B	MY40330364	5/29/2015	5/29/2017
Power Sensor	8482B	3318A07392	6/3/2015	6/3/2016
R&S Smart Sensor	NRP-Z11	120907	2/11/2015	2/11/2017
Power Amplifier	5S4G11	312664	NCR	NCR
Dickson Temperature Recorder	TM320	06153216	7/20/2015	7/20/2016
*Thermometer	HH202A	35881	4/18/2015	4/18/2016
#Thermometer	HH806AU	080307	4/8/2016	4/8/2017
Network Analyzer	E5071B	MY42403218	8/4/2015	8/4/2016
Dielectric Assessment Kit	DAK-3.5	1156	5/12/2015	5/12/2016
Speag Dipole	D5GHzV2	1027	1/26/2016	1/26/2018

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

10.0 SAR Measurement System Validation and Verification

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

10.1 System Validation

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

Table 11

Dates	Probe Calibration Point		Probe SN	Measured Tissue Parameters σ	Measured Tissue Parameters ϵ_r	Validation Sensitivity	Validation Linearity	Validation Isotropy
CW								
12/18/2015	Body	5250	3735	5.40	48.0	Pass	Pass	Pass
12/18/2015	Head	5250		4.52	35.1	Pass	Pass	Pass
12/18/2015	Body	5500		5.79	47.5	Pass	Pass	Pass
12/18/2015	Head	5500		4.81	34.7	Pass	Pass	Pass
12/19/2015	Body	5750		6.30	46.6	Pass	Pass	Pass
12/19/2015	Head	5750		5.18	33.9	Pass	Pass	Pass
802.11								
12/23/2015	Body	5250	3735	5.33	46.2	Pass	Pass	Pass
12/21/2015	Head	5250		4.58	34.5	Pass	Pass	Pass
12/23/2015	Body	5500		5.67	45.7	Pass	Pass	Pass
12/22/2015	Head	5500		4.66	32.9	Pass	Pass	Pass
12/19/2015	Body	5750		6.30	46.6	Pass	Pass	Pass
12/19/2015	Head	5750		5.18	33.9	Pass	Pass	Pass

10.2 System Verification

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

Table 12

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 D5GHzV2 / 1027	5250 73.4 +/- 10%	18.10	72.40	*4/20/2016
				7.58	75.80	5/3/2016
				7.64	76.40	5/4/2016
				7.52	75.20	5/6/2016
				7.67	76.70	5/8/2016
				7.17	71.70	5/12/2016
			5500 77.4 +/- 10%	19.4	77.60	*4/21/2016
				19.6	78.40	5/3/2016
				7.91	79.10	*5/4/2016
				8.13	81.30	*5/7/2016
				8.23	82.30	5/11/2016
			5600 78.7+/-10%	8.52	85.20	5/11/2016
			5750 74.1+/-10%	17.20	68.80	*4/21/2016
				7.39	73.90	5/3/2016
				7.15	71.50	5/5/2016
				7.44	74.40	5/9/2016
				7.55	75.50	5/12/2016

Table 12 (con't)

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	IEEE/ IEC Head	SPEAG D5GHzV2 / 1027	5250 78.7 +/- 10%	7.48	74.80	*4/26/2016
				7.27	72.70	5/4/2016
				7.59	75.90	5/10/2016
			5500 78.4 +/- 10%	20.00	80.00	4/25/2016
				7.28	72.80	5/10/2016
			5750 76.1+/-10%	7.54	75.40	*4/26/2016
				7.53	75.30	*5/10/2016

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

10.3 Equivalent Tissue Test Results

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

Table 13

Frequency (MHz)	Tissue Type	Conductivity Target (S/m)	Dielectric Constant Target	Conductivity Meas. (S/m)	Dielectric Constant Meas.	Tested Date
5250	FCC Body	5.36 (4.82-5.89)	48.9 (44.1-53.8)	5.14	45.1	*4/20/2016
				5.46	46.8	5/3/2016
				5.42	45.8	5/4/2016
				5.48	45.5	5/6/2016
				5.40	44.9	5/8/2016
				5.54	44.7	5/12/2016
	IEEE/ IEC Head	4.71 (4.24-5.18)	36.0 (32.4-39.5)	4.29	33.5	*4/26/2016
				4.41	33.3	5/4/2016
				4.50	34.1	5/10/2016
5290	FCC Body	5.40 (4.86-5.94)	48.9 (44.0-53.8)	5.19	45.1	*4/20/2016
				5.51	46.7	5/3/2016
				5.47	45.7	5/4/2016
				5.54	45.4	5/6/2016
				5.46	44.9	5/8/2016
				5.59	44.6	5/12/2016
	IEEE/ IEC Head	4.75 (4.28-5.23)	35.9 (32.3-39.5)	4.33	33.4	*4/26/2016
				4.45	33.2	5/4/2016
				4.54	34.0	5/10/2016
5500	FCC Body	5.65 (5.08-6.21)	48.6 (43.7-53.5)	5.71	46.3	*4/21/2016
				5.80	46.3	5/3/2016
				5.74	45.4	*5/4/2016
				5.80	44.3	*5/7/2016
				5.8	44.3	5/11/2016
	IEEE/ IEC Head	4.97 (4.47-5.46)	35.7 (32.1-39.2)	4.71	33.8	4/25/2016
				4.74	33.7	5/10/2016

Table 13 (con't)

Frequency (MHz)	Tissue Type	Conductivity Target (S/m)	Dielectric Constant Target	Conductivity Meas. (S/m)	Dielectric Constant Meas.	Tested Date
5530	FCC Body	5.68 (5.12-6.25)	48.6 (43.7-53.4)	5.71	46.3	*4/21/2016
				5.83	46.3	5/3/2016
				5.79	45.3	*5/4/2016
				5.83	44.2	*5/7/2016
				5.88	44.2	5/11/2016
	IEEE/ IEC Head	5.00 (4.50-5.50)	35.6 (32.0-39.2)	4.71	33.8	4/25/2016
				4.77	33.6	5/10/2016
5600	FCC Body	5.77 (5.19-6.34)	48.5 (43.6-53.3)	5.98	44.1	5/11/2016
5610	FCC Body	5.78 (5.20-6.36)	48.5 (43.6-53.3)	5.99	44.1	5/11/2016
5750	FCC Body	5.94 (5.35-6.54)	48.3 (43.4-53.1)	5.71	46.3	*4/21/2016
				6.15	45.9	5/3/2016
				6.09	44.9	5/5/2016
				6.07	43.8	5/9/2016
				6.21	43.7	5/12/2016
	IEEE/ IEC Head	5.22 (4.70-5.74)	35.4 (31.8-38.9)	4.78	32.9	*4/26/2016
				5.03	32.9	*5/10/2016
5775	FCC Body	5.97 (5.37-6.57)	48.2 (43.4-53.1)	5.71	46.3	*4/21/2016
				6.18	45.8	5/3/2016
				6.12	44.9	5/5/2016
				6.11	43.8	5/9/2016
				6.25	43.7	5/12/2016
	IEEE/ IEC Head	5.25 (4.72-5.77)	35.3 (31.8-38.9)	4.80	32.8	*4/26/2016
				5.06	32.9	*5/10/2016

Note: * Tissue 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 14

	Target	Measured
Ambient Temperature	18 – 25 ˚C	Range: 19.4-22.8˚C Avg. 21.1˚C
Tissue Temperature	NA	Range: 18.9-22.3˚C Avg. 20.3˚C

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. Triple 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 15

<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 devices 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 section 4.

12.3 DUT Positioning Procedures

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

12.3.1 Body

The DUT was positioned in normal use configuration with its' front and back against the phantom with the offered body worn accessories.

12.3.2 Head

Not applicable.

12.3.3 Face

The DUT was positioned with its' front and back sides separated 2.5cm from the phantom.

12.4 DUT Test Channels

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

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

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

12.5 SAR Result Scaling Methodology

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

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

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

SAR assessment at WLAN 5GHz was performed in 802.11 ac mode using a duty cycle of 90% with result scaled to 100% as per guideline of KDB 248277 for this PCII filing.

13.0 DUT Test Data

13.1 WLAN assessment at the Body 5GHz (802.11 ac/n)

The tables below represent the output power measurements for WLAN 5 GHz 802.11 ac/n for assessments at the Body using battery PMNN4507A because it is the standard battery. These power measurements were used to determine the necessary modes for SAR testing according to KDB 248227 D01 SAR Measurement Procedures for 802.11 ac/n Transmitters.

The battery was used during conducted power measurements for all test channels within FCC allocated frequency range (5.15-5.85 GHz) which are listed in Table 16.

SAR is not required for 802.11 n when the highest adjusted SAR is ≤ 1.2W/kg.

Table 16

Band	Mode	Channel Bandwidth	Channel	Channel Frequency	Modulation	Battery: PMNN4507A Output Power [mW]	Specified Max Power [mW]
U-NII-2A (5.25-5.35GHz)	802.11n	20MHz	52	5260	OFDM	23.40	25.10
			56	5280		22.90	
			60	5300		25.10	
			64	5320		24.50	
		40MHz	54	5270		21.90	
			62	5310		25.10	
	802.11ac	20MHz	52	5260		24.00	25.10
			56	5280		25.10	
			60	5300		25.10	
			64	5320		23.40	
		40MHz	54	5270		24.00	
			62	5310		25.10	
		80MHz	58	**5290**		**25.10**	
U-NII-2C (<5.65GHz)*	802.11n	20MHz	100	5500		25.10	25.10
			112	5560		24.50	
			116	5580		24.00	
			128	5640		24.00	
		40MHz	102	5510		24.00	
			110	5550		24.50	
			118	5590		24.00	
			126	5630		22.90	
	802.11ac	20MHz	100	5500		23.40	25.10
			112	5560		24.50	
			116	5580		24.00	
			128	5640		24.50	
		40MHz	102	5510		25.10	
			110	5550		24.00	
			118	5590		23.40	
			126	5630		24.00	
		80MHz	106	**5530**		**25.10**	
			122	5610		23.60	

Table 16 (con't)

Band	Mode	Channel Bandwidth	Channel	Channel Frequency	Modulation	Battery: PMNN4507A Output Power [mW]	Specified Max Power [mW]
U-NII-2C (>5.65GHz) + U-NII-3*	802.11n	20MHz	132	5660	OFDM	24.00	25.10
			149	5745		23.40	
			165	5825		24.00	
		40MHz	134	5670		24.00	
			142	5710		24.00	
			151	5755		24.00	
			159	5795		24.00	
	802.11ac	20MHz	132	5660		25.10	25.10
			149	5745		23.40	
			165	5825		25.10	
		40MHz	134	5670		25.10	
			142	5710		25.10	
			151	5755		25.10	
			159	5795		25.10	
		80MHz	138	5690		24.50	
			155	**5775**		**25.10**	

Note:
1) U-NII-1 specified max power was equal to U-NII-2A and not required for data if the SAR of U-NII-2A ≤ 1.2 W/kg as per KDB 248227.
2) All 5GHz bands are tested at 802.11 ac 80MHz and other configurations were not required if the SAR ≤ 1.2 W/kg as per KDB 248227.
3) "* "per KDB 248227, Table 1.

Assessments at the Body U-NII-2A with all offered Body worn
DUT assessment with WLAN internal antenna, all offered batteries without any cable accessory attachment against phantom with all offered body worn. Refer to Table 16 for highest output power channel. SAR plots of the highest results per Table (bolded) are presented in Appendix E.

Table 17

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
AN000154A01	PMNN4507A Standard	PMLN7414A (DUT @Front)	None	5290	0.0245	-0.08	0.090	0.030	0.10	0.03	KBK-AB-160506-06
		PMLN7414A (DUT @Back)		5290	0.0245	-0.28	0.219	0.093	0.26	0.11	KBK-AB-160503-05
		PMLN7414A with PMLN7415A (DUT @Front)		5290	0.0245	-0.34	0.143	0.037	0.17	0.05	KBK-AB-160506-05
		PMLN7414A with PMLN7415A (DUT @Back)		5290	0.0245	-0.16	0.295	0.091	0.34	0.11	FD-AB-160421-03

Table 17 (con't)

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
AN000154A01	PMNN4507A Standard	HW000331A02 (DUT @Front)	None	5290	0.0245	-0.66	0.142	0.044	0.19	0.06	KBK-AB-160506-09
		HW000331A02 (DUT @Back)		5290	0.0245	-0.08	0.583	0.214	0.67	0.25	KBK-AB-160504-10
		HW000331A02 with PMLN7415A (DUT @Front)		5290	0.0245	0.62	0.088	0.035	0.10	0.04	FD-AB-160512-06
		HW000331A02 with PMLN7415A (DUT @Back)		5290	0.0245	0.42	0.248	0.096	0.28	0.11	KBK-AB-160504-09
Assessment of Extended Battery											
AN000154A01	PMNN4508A Extended	HW000331A02 (DUT @Back)	None	5290	0.0232	-0.40	0.526	0.198	**0.69**	**0.26**	KBK-AB-160508-04

Notes:
DUT @ Front - Microphone of DUT face in to the carry accessory.
DUT @ Back - Microphone of DUT face out to the carry accessory.

Assessments at the Body U-NII-2C with all offered Body worn

DUT assessment with WLAN internal antenna, all offered batteries without any cable accessory attachment against phantom with all offered body worn. Refer to Table 16 for highest output power channel. SAR plots of the highest results per Table (bolded) are presented in Appendix E.

Table 18

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
AN000154A01	PMNN4507A Standard	PMLN7414A (DUT @ Front)	None	5530	0.0242	-0.06	0.134	0.046	0.16	0.05	KBK-AB-160507-03
		PMLN7414A (DUT @Back)		5530	0.0242	-0.09	0.268	0.113	0.31	0.13	KBK-AB-160503-02
		PMLN7414A with PMLN7415A (DUT @Front)		5530	0.0242	-0.29	0.194	0.056	0.24	0.07	KBK-AB-160507-02
		PMLN7414A with PMLN7415A (DUT @Back)		5530	0.0242	-0.19	0.330	0.108	0.39	0.13	KBK-AB-160422-07

Table 18 (con't)

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
AN000154A01	PMNN4507A Standard	HW000331A02 (DUT @Front)	None	5530	0.0242	-0.16	0.151	0.048	0.18	0.06	KBK-AB-160508-01
		HW000331A02 (DUT @Back)		5530	0.0242	-0.46	0.627	0.229	0.80	0.29	FD-AB-160505-01
		HW000331A02 with PMLN7415A (DUT @Front)		5530	0.0242	-0.63	0.099	0.039	0.13	0.05	KBK-AB-160507-05
		HW000331A02 with PMLN7415A (DUT @Back)		5530	0.0242	-0.04	0.220	0.088	0.25	0.10	KBK-AB-160504-13
Assessment of Extended Battery											
AN000154A01	PMNN4508A Extended	HW000331A02 (DUT @Back)	None	5530	0.0240	-0.06	0.691	0.225	**0.81**	**0.26**	KBK-AB-160508-02
				5610	0.0246	0.26	0.632	0.213	0.71	0.24	KBK-AB-160511-04

Notes:
DUT @ Front - Microphone of DUT face in to the carry accessory.
DUT @ Back - Microphone of DUT face out to the carry accessory.

Assessments at the Body U-NII-3 with all offered Body worn

DUT assessment with WLAN internal antenna, all offered batteries without any cable accessory attachment against phantom with all offered body worn. Refer to Table 16 for highest output power channel. SAR plots of the highest results per Table (bolded) are presented in Appendix E.

Table 19

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
AN000154A01	PMNN4507A Standard	PMLN7414A (DUT @Front)	None	5775	0.0224	0.04	0.119	0.041	0.15	0.05	FD-AB-160509-03
		PMLN7414A (DUT @Back)		5775	0.0224	0.17	0.237	0.099	0.29	0.12	KBK-AB-160503-07
		PMLN7414A with PMLN7415A (DUT @Front)		5775	0.0224	0.20	0.169	0.046	0.21	0.06	KBK-AB-160509-02
		PMLN7414A with PMLN7415A (DUT @Back)		5775	0.0224	-0.42	0.285	0.089	0.39	0.12	FD-AB-160422-01

Table 19 (con't)

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
AN000154A01	PMNN4507A Standard	HW000331A02 (DUT @Front)	None	5775	0.0224	-0.39	0.096	0.029	0.13	0.04	FD-AB-160509-05
		HW000331A02 (DUT @Back)		5775	0.0224	-0.13	0.607	0.220	0.77	0.28	FD-AB-160505-05
		HW000331A02 with PMLN7415A (DUT @Front)		5775	0.0224	0.30	0.071	0.0280	0.09	0.03	FD-AB-160509-04
		HW000331A02 with PMLN7415A (DUT @Back)		5775	0.0224	-0.43	0.224	0.086	0.30	0.12	FD-AB-160505-04
Assessment of Extended Battery											
AN000154A01	PMNN4508A Extended	HW000331A02 (DUT @Back)	None	5775	0.0248	-0.14	0.687	0.243	**0.79**	**0.28**	FD-AB-160512-07

Notes:
DUT @ Front - Microphone of DUT face in to the carry accessory.
DUT @ Back - Microphone of DUT face out to the carry accessory.

13.2 WLAN assessment at the Face 5 GHz for 802.11 ac/n

Battery PMNN4507A was selected as the default battery for assessments at the Face because it is the standard battery. The default battery was used during conducted power measurements for all test channels within FCC allocated frequency range which are listed in Table 16. These power measurements were used to determine the necessary modes for SAR testing according to KDB 248227 D01 SAR Measurement Procedures for 802.11 ac/n Transmitters.

Assessments at the Face U-NII-2A

DUT assessment with WLAN internal antenna, all offered batteries with front and back of DUT positioned 2.5cm facing phantom. Refer to Table 16 for highest output power channel. SAR plots of the highest results per Table (bolded) are presented in Appendix E.

Table 20

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
AN000154A01	PMNN4507A Standard	Front @ 2.5cm	None	5290	0.0245	0.10	0.085	0.035	0.10	0.04	KBK-AB-160510-02
		Back @ 2.5cm		5290	0.0245	0.11	0.23	0.10	0.26	0.11	KBK-FACE-160427-05
Assessment of Extended Battery											
AN000154A01	PMNN4508A Extended	Back @ 2.5cm	None	5290	0.0232	-0.53	0.198	0.087	**0.29**	**0.12**	FD-FACE-160504-04

Assessments at the Face U-NII-2C

DUT assessment with WLAN internal antenna, all offered batteries with front and back of DUT positioned 2.5cm facing phantom. Refer to Table 16 for highest output power channel. SAR plots of the highest results per Table (bolded) are presented in Appendix E.

Table 21

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
AN000154A01	PMNN4507A Standard	Front @ 2.5cm	None	5530	0.0242	-0.32	0.078	0.0340	0.10	0.04	FD-FACE-160510-07
		Back @ 2.5cm		5530	0.0242	-0.24	0.243	0.107	0.29	0.13	KBK-FACE-160425-02
Assessment of Extended Battery											
AN000154A01	PMNN4508A Extended	Back @ 2.5cm	None	5530	0.0240	-0.52	0.265	0.114	**0.34**	**0.15**	FD-FACE-160510-08

Assessments at the Face U-NII-3

DUT assessment with WLAN internal antenna, all offered batteries with front and back of DUT positioned 2.5cm facing phantom. Refer to Table 16 for highest output power channel. SAR plots of the highest results per Table (bolded) are presented in Appendix E.

Table 22

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
AN000154A01	PMNN4507A Standard	Front @ 2.5cm	None	5775	0.0224	-0.29	0.074	0.0310	0.10	0.04	KBK-FACE-160511-01
		Back @ 2.5cm		5775	0.0224	-0.26	0.215	0.094	0.28	0.12	FD-FACE-160427-07
Assessment of Extended Battery											
AN000154A01	PMNN4508A Extended	Back @ 2.5cm	None	5775	0.0248	-0.30	0.280	0.123	**0.33**	**0.15**	KBK-FACE-160511-02

13.2 Assessment for Industry Canada

Additional tests were not required for Industry Canada frequency range as testing performed is in compliance with Industry Canada frequency range.

13.3 Shortened Scan Assessment

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

Table 23

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
AN000154A01	PMNN4508A Extended	HW000331A02 (DUT @Back)	None	5530	0.024	-0.32	0.65	0.23	**0.80**	**0.28**	FD-AB-160511-07

14.0 Simultaneous Transmissions

WLAN 2.4GHz, 5GHz and BT share the same chipset, transmission path and antenna. The transmissions of these technologies are controlled by switching which only allows one technology to transmit at a single time and therefore do not support simultaneous transmission.

15.0 Results Summary

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

Table 24

Type Approval	Frequency band (MHz)	Max Calc at Body (W/kg)		Max Calc at Face (W/kg)	
		1g-SAR	10g-SAR	1g-SAR	10g-SAR
FCC / Industry Canada	2.4 GHz (WLAN 802.11 b/g/n)	0.17	0.09	0.06	0.03
	*2.4 GHz (Bluetooth)	0.06	0.03	0.01	0.01
	#5 GHz (WLAN 802.11 ac/n)	**0.81**	**0.26**	**0.34**	**0.15**

* For Industry Canada only. Result not required for FCC per KDB.
# The previous reported results at 5GHz are replaced with the results presented herein.

The previous reported SAR results at 5GHz are replaced with the bolded results presented herein. The test results clearly demonstrate compliance with FCC General Population/Uncontrolled RF Exposure limits of 1.6 W/kg averaged over 1 gram per the requirements of OET Bulletin 65. The 10 grams result is not applicable to FCC filing.

16.0 Variability Assessment

Per the guidelines in KDB 865664 SAR variability assessment is required because SAR results are above 0.8W/kg (General population).

The Table below includes test results of the original measurement(s), the repeated measurement(s), and the ratio (SAR_{high}/SAR_{low}) for the applicable test configuration(s).

Table 25

Run#	Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq. (MHz)	Adj Calc. 1g-SAR (W/kg)	Ratio	Comments
KBK-AB-160508-02	AN000154A01	PMNN4508A Extended	HW000331A02 (DUT @Back)	None	5530	0.69	1.06	No additional repeated scans is required due to the Ratio (SAR_{high}/SAR_{low}) < 1.20
FD-AB-160511-07						0.65		

17.0 System Uncertainty

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

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

APPENDIX A
Measurement Uncertainty Budget

Uncertainty Budget for Device Under Test for 5.1 to 6 GHz

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	6.6	N	1.00	1	1	6.6	6.6	∞
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	2.0	R	1.73	1	1	1.2	1.2	∞
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	1.0	R	1.73	1	1	0.6	0.6	∞
Probe Positioning w.r.t Phantom	E.6.3	4.0	R	1.73	1	1	2.3	2.3	∞
Max. SAR Evaluation (ext., int., avg.)	E.5	2.1	R	1.73	1	1	1.2	1.2	∞
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	∞
Dielectric Parameter Correction	--	1.4	N	1.00	1	0.79	1.4	1.1	∞
Liquid Conductivity (measurement)	E.3.3	3.3	N	1.00	0.64	0.43	2.1	1.4	∞
Liquid Permittivity (measurement)	E.3.3	1.9	N	1.00	0.6	0.49	1.1	0.9	∞
Combined Standard Uncertainty			RSS				11	11	465
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

Uncertainty Budget for System Verification (dipole & flat phantom) for 5.1 to 6 GHz

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	6.6	N	1.00	1	1	6.6	6.6	∞
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	2.0	R	1.73	1	1	1.2	1.2	∞
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	1.0	R	1.73	1	1	0.6	0.6	∞
Probe Positioning w.r.t. Phantom	E.6.3	4.0	R	1.73	1	1	2.3	2.3	∞
Max. SAR Evaluation (ext., int., avg.)	E.5	2.1	R	1.73	1	1	1.2	1.2	∞
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	∞
Dielectric Parameter Correction	--	1.4	N	1.00	1	0.79	1.4	1.1	∞
Liquid Conductivity (measurement)	E.3.3	3.3	N	1.00	0.64	0.43	2.1	1.4	∞
Liquid Permittivity (measurement)	E.3.3	1.9	N	1.00	0.6	0.49	1.1	0.9	∞
Combined Standard Uncertainty			RSS				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 EME**

Certificate No: **EX3-3735_Jul15**

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:	July 16, 2015

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

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

Calibration Equipment used (M&TE critical for calibration)

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

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

Issued: July 18, 2015

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**

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: July 16, 2015

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 (μV/(V/m)²)^A	0.38	0.40	0.47	± 10.1 %
DCP (mV)^B	111.5	99.9	102.9	

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	188.7	±2.5 %
		Y	0.0	0.0	1.0		193.7	
		Z	0.0	0.0	1.0		146.8	
10012-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	5.18	80.8	24.1	1.87	147.5	±1.2 %
		Y	2.46	64.5	15.7		149.6	
		Z	3.46	71.5	19.9		114.9	
10013-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	10.67	70.2	22.8	9.46	136.0	±2.7 %
		Y	10.60	69.5	22.3		139.4	
		Z	10.27	68.4	21.8		106.6	
10059-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps)	X	5.95	83.5	25.3	2.12	144.6	±0.7 %
		Y	2.73	66.2	16.7		149.3	
		Z	3.70	72.4	20.3		115.3	
10060-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps)	X	10.99	98.9	30.6	2.83	128.2	±0.9 %
		Y	3.35	73.2	20.2		131.9	
		Z	8.60	90.5	27.1		145.6	
10061-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps)	X	14.67	99.7	30.9	3.60	127.5	±0.7 %
		Y	3.91	72.2	20.1		132.3	
		Z	7.03	82.6	24.6		145.7	
10062-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps)	X	10.36	69.9	22.2	8.68	138.1	±2.2 %
		Y	10.32	69.3	21.7		142.9	
		Z	9.97	68.3	21.3		109.6	
10063-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps)	X	10.25	69.9	22.1	8.63	137.4	±2.2 %
		Y	10.21	69.2	21.6		144.7	
		Z	9.86	68.2	21.2		110.0	
10064-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps)	X	10.66	70.2	22.5	9.09	138.1	±2.5 %
		Y	10.63	69.6	22.1		145.8	
		Z	10.30	68.6	21.7		110.5	
10065-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps)	X	10.37	70.1	22.5	9.00	134.2	±2.5 %
		Y	10.34	69.5	22.0		141.7	
		Z	10.01	68.4	21.6		107.6	
10066-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps)	X	10.60	70.4	22.9	9.38	132.9	±2.7 %
		Y	10.54	69.6	22.3		139.7	
		Z	10.27	68.7	22.0		107.1	
10067-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps)	X	11.10	70.9	23.6	10.12	131.6	±3.0 %
		Y	11.05	70.1	23.1		137.5	
		Z	10.85	69.4	22.8		107.0	

10068-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps)	X	10.92	70.8	23.7	10.24	126.8	±3.0 %
		Y	10.85	69.9	23.1		133.2	
		Z	10.70	69.3	22.9		104.2	
10069-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps)	X	11.22	71.0	24.1	10.56	128.7	±3.0 %
		Y	10.52	68.4	22.4		93.7	
		Z	11.02	69.5	23.2		105.9	
10071-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 9 Mbps)	X	10.74	70.4	23.2	9.83	131.2	±3.0 %
		Y	10.68	69.5	22.6		138.2	
		Z	10.47	68.8	22.4		105.9	
10072-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 12 Mbps)	X	10.25	70.0	22.9	9.62	125.4	±2.5 %
		Y	10.19	69.2	22.3		132.4	
		Z	10.04	68.6	22.2		102.3	
10073-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 18 Mbps)	X	10.25	70.1	23.2	9.94	121.4	±2.7 %
		Y	10.13	69.1	22.5		127.7	
		Z	10.14	68.9	22.6		99.9	
10074-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 24 Mbps)	X	10.32	70.3	23.6	10.30	117.5	±2.7 %
		Y	10.15	69.1	22.7		123.1	
		Z	10.23	69.1	23.0		97.2	
10075-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 36 Mbps)	X	10.42	70.5	24.0	10.77	114.3	±3.0 %
		Y	10.20	69.1	23.1		120.4	
		Z	10.38	69.5	23.5		94.8	
10076-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 48 Mbps)	X	10.33	70.3	24.1	10.94	111.7	±3.0 %
		Y	10.14	69.0	23.2		117.2	
		Z	10.35	69.4	23.6		93.0	
10077-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps)	X	10.33	70.4	24.2	11.00	110.5	±3.0 %
		Y	10.11	69.0	23.2		116.2	
		Z	10.34	69.5	23.7		92.3	
10114-CAB	IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK)	X	10.48	69.9	21.7	8.10	148.6	±2.2 %
		Y	9.69	67.5	20.2		106.5	
		Z	10.01	68.3	20.8		116.5	
10115-CAB	IEEE 802.11n (HT Greenfield, 81 Mbps, 16-QAM)	X	10.02	68.1	20.9	8.46	101.0	±2.2 %
		Y	10.17	68.0	20.7		108.3	
		Z	10.55	68.9	21.3		119.8	
10116-CAB	IEEE 802.11n (HT Greenfield, 135 Mbps, 64-QAM)	X	9.59	67.7	20.5	8.15	99.3	±1.9 %
		Y	9.79	67.8	20.4		106.1	
		Z	10.06	68.4	20.9		117.0	
10117-CAB	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	9.58	67.7	20.5	8.07	100.1	±1.9 %
		Y	9.75	67.7	20.3		106.6	
		Z	10.02	68.3	20.8		118.1	
10118-CAB	IEEE 802.11n (HT Mixed, 81 Mbps, 16-QAM)	X	10.17	68.3	21.0	8.59	101.6	±2.2 %
		Y	10.31	68.2	20.9		107.8	
		Z	10.67	69.0	21.5		120.4	
10119-CAB	IEEE 802.11n (HT Mixed, 135 Mbps, 64-QAM)	X	9.62	67.9	20.6	8.13	99.3	±1.9 %
		Y	9.73	67.6	20.3		105.5	
		Z	10.05	68.4	20.9		117.5	

10193-CAB	IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)	X	10.06	69.8	21.7	8.09	142.7	±2.2 %
		Y	10.03	69.1	21.2		148.7	
		Z	9.66	68.1	20.9		112.6	
10194-CAB	IEEE 802.11n (HT Greenfield, 39 Mbps, 16-QAM)	X	10.10	69.8	21.7	8.12	142.3	±1.9 %
		Y	10.05	69.1	21.3		147.4	
		Z	9.68	68.1	20.9		113.1	
10195-CAB	IEEE 802.11n (HT Greenfield, 65 Mbps, 64-QAM)	X	10.24	70.0	21.9	8.21	142.8	±2.2 %
		Y	10.17	69.3	21.4		147.7	
		Z	9.75	68.1	20.9		113.5	
10196-CAB	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	10.08	69.8	21.8	8.10	140.8	±1.9 %
		Y	9.94	68.9	21.1		147.5	
		Z	9.63	68.1	20.8		112.6	
10197-CAB	IEEE 802.11n (HT Mixed, 39 Mbps, 16-QAM)	X	10.12	69.8	21.8	8.13	141.6	±1.9 %
		Y	10.09	69.2	21.3		147.6	
		Z	9.65	68.0	20.8		112.5	
10198-CAB	IEEE 802.11n (HT Mixed, 65 Mbps, 64-QAM)	X	10.24	69.9	21.9	8.28	141.7	±1.9 %
		Y	10.22	69.3	21.5		146.6	
		Z	9.84	68.3	21.0		113.2	
10219-CAB	IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK)	X	9.96	69.7	21.7	8.03	140.1	±1.9 %
		Y	9.89	69.0	21.2		146.3	
		Z	9.47	67.8	20.7		111.3	
10220-CAB	IEEE 802.11n (HT Mixed, 43.3 Mbps, 16-QAM)	X	10.10	69.8	21.8	8.13	141.4	±1.9 %
		Y	10.08	69.2	21.3		147.4	
		Z	9.66	68.0	20.8		112.4	
10221-CAB	IEEE 802.11n (HT Mixed, 72.2 Mbps, 64-QAM)	X	10.28	70.0	21.9	8.27	142.2	±1.9 %
		Y	10.25	69.4	21.5		147.3	
		Z	9.81	68.1	20.9		112.9	
10222-CAB	IEEE 802.11n (HT Mixed, 15 Mbps, BPSK)	X	10.48	70.0	21.8	8.06	148.5	±1.9 %
		Y	9.73	67.8	20.4		104.7	
		Z	9.97	68.3	20.8		116.9	
10223-CAB	IEEE 802.11n (HT Mixed, 90 Mbps, 16-QAM)	X	10.05	68.2	21.0	8.48	101.5	±2.2 %
		Y	10.21	68.1	20.8		106.6	
		Z	10.54	68.8	21.3		119.6	
10224-CAB	IEEE 802.11n (HT Mixed, 150 Mbps, 64-QAM)	X	9.58	67.9	20.6	8.08	99.7	±1.9 %
		Y	9.74	67.8	20.5		104.7	
		Z	9.99	68.4	20.9		117.2	
10315-AAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle)	X	6.51	86.2	26.4	1.71	147.6	±0.7 %
		Y	3.20	69.8	18.4		108.5	
		Z	3.53	72.5	20.4		118.2	
10316-AAB	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 96pc duty cycle)	X	10.19	69.8	21.9	8.36	138.7	±2.2 %
		Y	10.18	69.3	21.6		143.5	
		Z	9.78	68.1	21.0		111.6	
10317-AAB	IEEE 802.11a WiFi 5 GHz (OFDM, 6 Mbps, 96pc duty cycle)	X	10.21	69.9	22.0	8.36	140.4	±2.2 %
		Y	10.21	69.3	21.5		148.0	
		Z	9.78	68.1	21.0		112.0	

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10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	9.26	93.6	29.0	1.54	145.9	±0.9 %
		Y	3.29	70.6	18.7		109.4	
		Z	3.36	72.0	20.2		120.1	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	10.14	69.9	21.9	8.23	139.7	±1.9 %
		Y	10.08	69.2	21.4		145.0	
		Z	9.69	68.0	20.9		111.6	
10417-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle)	X	10.17	69.9	21.9	8.23	140.9	±1.9 %
		Y	10.10	69.2	21.4		148.2	
		Z	9.66	68.0	20.9		111.9	
10418-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Long preambule)	X	9.99	69.7	21.7	8.14	139.4	±1.9 %
		Y	9.98	69.2	21.3		146.6	
		Z	9.56	67.9	20.8		111.1	
10419-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Short preambule)	X	10.09	69.8	21.9	8.19	139.7	±1.9 %
		Y	10.02	69.1	21.3		145.1	
		Z	9.66	68.1	20.9		111.7	
10422-AAA	IEEE 802.11n (HT Greenfield, 7.2 Mbps, BPSK)	X	10.29	69.9	21.9	8.32	141.8	±1.9 %
		Y	10.27	69.4	21.6		146.7	
		Z	9.85	68.2	21.0		113.2	
10423-AAA	IEEE 802.11n (HT Greenfield, 43.3 Mbps, 16-QAM)	X	10.47	70.1	22.1	8.47	142.0	±2.2 %
		Y	10.40	69.4	21.6		149.4	
		Z	10.02	68.3	21.2		113.4	
10424-AAA	IEEE 802.11n (HT Greenfield, 72.2 Mbps, 64-QAM)	X	10.38	70.1	22.1	8.40	141.4	±2.2 %
		Y	10.30	69.3	21.5		148.5	
		Z	9.98	68.4	21.2		114.1	
10425-AAA	IEEE 802.11n (HT Greenfield, 15 Mbps, BPSK)	X	10.86	70.3	22.1	8.41	149.7	±2.2 %
		Y	10.10	68.0	20.7		105.9	
		Z	10.48	68.8	21.3		120.6	
10426-AAA	IEEE 802.11n (HT Greenfield, 90 Mbps, 16-QAM)	X	9.97	68.1	21.0	8.45	100.1	±1.9 %
		Y	10.14	68.1	20.8		106.2	
		Z	10.47	68.8	21.3		119.7	
10427-AAA	IEEE 802.11n (HT Greenfield, 150 Mbps, 64-QAM)	X	9.96	68.1	20.9	8.41	100.3	±2.2 %
		Y	10.11	68.0	20.7		106.4	
		Z	10.46	68.8	21.3		120.5	

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

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

DASY/EASY - Parameters of Probe: 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	11.17	11.17	11.17	0.00	1.00	± 13.3 %
220	49.0	0.81	10.50	10.50	10.50	0.00	1.00	± 13.3 %
2450	39.2	1.80	6.85	6.85	6.85	0.40	0.85	± 12.0 %
4950	36.3	4.40	5.26	5.26	5.26	0.35	1.80	± 13.1 %
5200	36.0	4.66	5.01	5.01	5.01	0.35	1.80	± 13.1 %
5300	35.9	4.76	4.73	4.73	4.73	0.35	1.80	± 13.1 %
5500	35.6	4.96	4.49	4.49	4.49	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.29	4.29	4.29	0.40	1.80	± 13.1 %
5800	35.3	5.27	4.42	4.42	4.42	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.

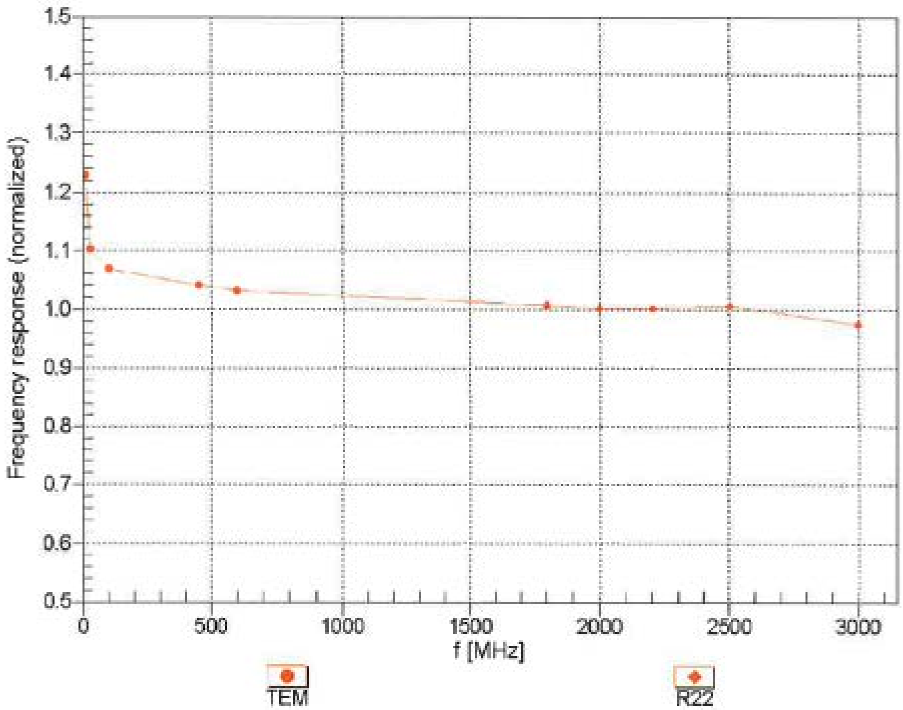
DASY/EASY - Parameters of Probe: EX3DV4 - SN:3735

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	10.63	10.63	10.63	0.00	1.00	± 13.3 %
220	60.2	0.86	9.94	9.94	9.94	0.00	1.00	± 13.3 %
2450	52.7	1.95	6.96	6.96	6.96	0.26	0.95	± 12.0 %
4950	49.4	5.01	4.57	4.57	4.57	0.40	1.90	± 13.1 %
5200	49.0	5.30	4.28	4.28	4.28	0.45	1.90	± 13.1 %
5300	48.9	5.42	4.10	4.10	4.10	0.45	1.90	± 13.1 %
5500	48.6	5.65	3.79	3.79	3.79	0.50	1.90	± 13.1 %
5600	48.5	5.77	3.70	3.70	3.70	0.50	1.90	± 13.1 %
5800	48.2	6.00	3.84	3.84	3.84	0.50	1.90	± 13.1 %

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

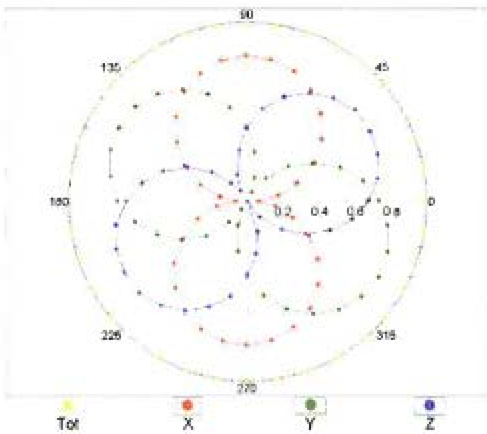
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



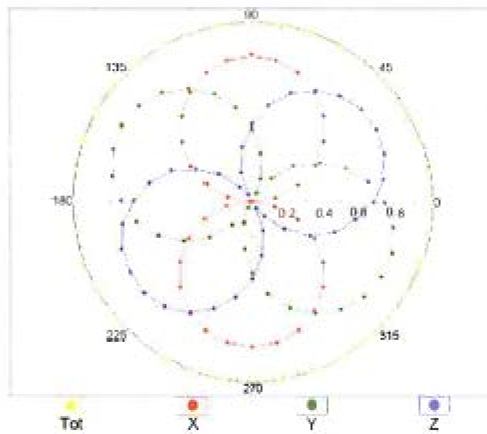
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

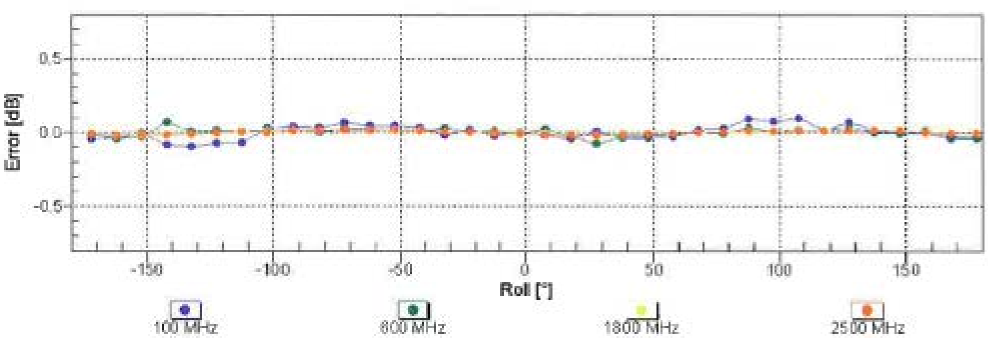
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



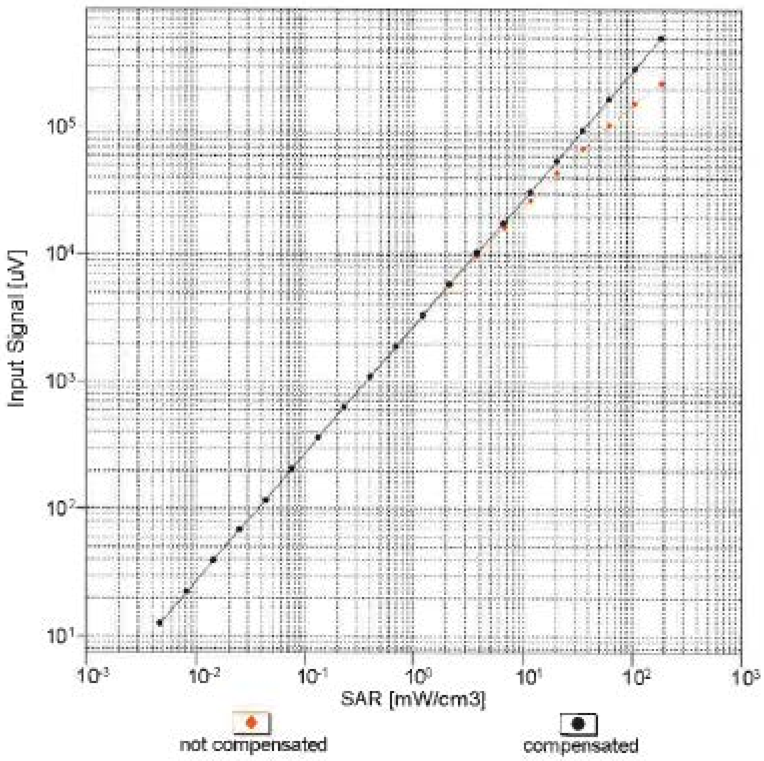
f=1800 MHz,R22

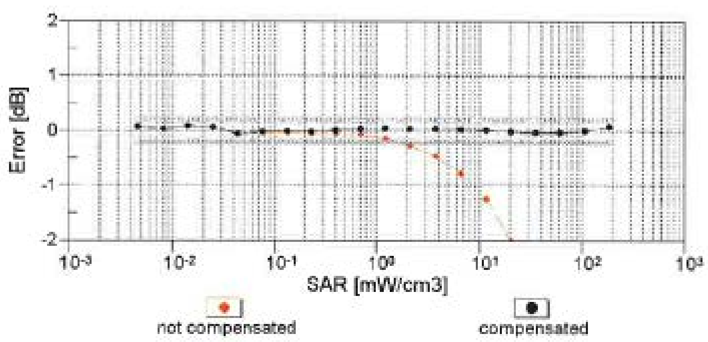




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

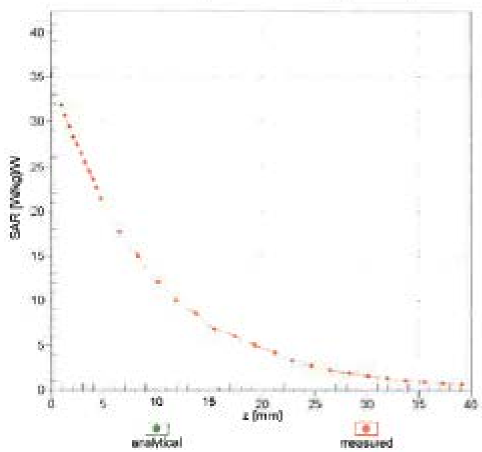




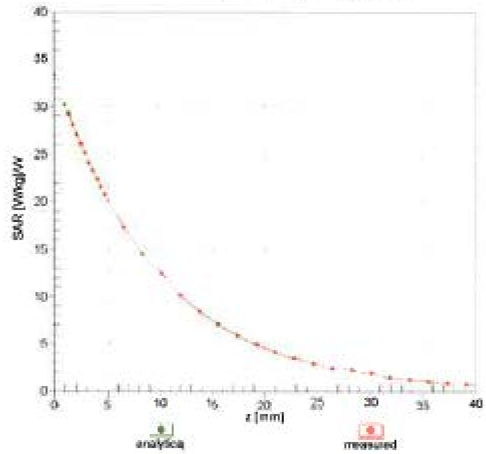
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 2450 MHz,WGLS R22 (H_convF)

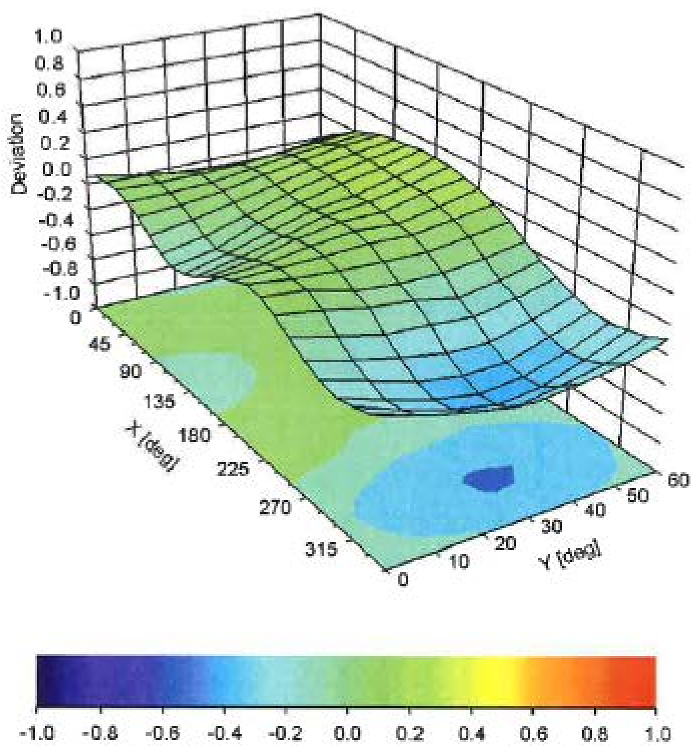


f = 2450 MHz,WGLS R22 (M_convF)



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 (°)	-2.2
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

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

S Schweizerischer Kalibrierdienst
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 EME**

Certificate No: **EX3-3735_Nov15**

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3735
Calibration procedure(s)	QA CAL-01.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6 Calibration procedure for dosimetric E-field probes
Calibration date:	November 25, 2015 (Additional Conversion Factors)

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

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

Calibration Equipment used (M&TE critical for calibration)

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

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

Issued: November 25, 2015

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

Certificate No: EX3-3735_Nov15 Page 1 of 12

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).

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Probe EX3DV4

SN:3735

Additional Conversion Factors
Additional PMR Factors

Manufactured: February 15, 2010
Calibrated: November 25, 2015

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]	0.38	0.40	0.47	± 10.1 %
DCP (mV)[B]	111.5	99.9	102.9	

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	188.7	±2.5 %
		Y	0.0	0.0	1.0		193.7	
		Z	0.0	0.0	1.0		146.8	
10400-AAC	IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)	X	10.29	69.7	21.9	8.37	143.3	±2.5 %
		Y	10.26	69.2	21.6		144.0	
		Z	10.66	70.2	22.8		136.4	
10401-AAC	IEEE 802.11ac WiFi (40MHz, 64-QAM, 99pc duty cycle)	X	10.67	69.3	21.7	8.60	126.3	±2.5 %
		Y	10.75	69.2	21.6		128.5	
		Z	11.45	70.8	23.1		148.0	
10402-AAC	IEEE 802.11ac WiFi (80MHz, 64-QAM, 99pc duty cycle)	X	10.93	69.7	21.7	8.53	128.7	±2.2 %
		Y	10.80	69.1	21.4		130.6	
		Z	11.33	70.4	22.7		123.6	
10525-AAA	IEEE 802.11ac WiFi (20MHz, MCS0, 99pc duty cycle)	X	10.39	69.9	22.1	8.36	144.3	±2.5 %
		Y	10.42	69.6	21.9		148.1	
		Z	10.75	70.3	22.9		138.8	
10526-AAA	IEEE 802.11ac WiFi (20MHz, MCS1, 99pc duty cycle)	X	10.47	70.0	22.2	8.42	143.2	±2.5 %
		Y	10.49	69.7	21.9		147.3	
		Z	10.78	70.2	22.8		138.5	
10527-AAA	IEEE 802.11ac WiFi (20MHz, MCS2, 99pc duty cycle)	X	10.28	69.9	22.0	8.21	140.2	±2.2 %
		Y	10.29	69.6	21.8		145.8	
		Z	10.59	70.2	22.7		137.5	
10528-AAA	IEEE 802.11ac WiFi (20MHz, MCS3, 99pc duty cycle)	X	10.37	69.9	22.1	8.36	141.2	±2.2 %
		Y	10.44	69.7	22.0		146.5	
		Z	10.76	70.3	22.9		138.2	
10529-AAA	IEEE 802.11ac WiFi (20MHz, MCS4, 99pc duty cycle)	X	10.39	70.0	22.1	8.36	141.0	±2.5 %
		Y	10.45	69.7	22.0		145.0	
		Z	10.76	70.4	22.9		138.0	
10531-AAA	IEEE 802.11ac WiFi (20MHz, MCS6, 99pc duty cycle)	X	10.41	70.0	22.2	8.43	140.0	±2.2 %
		Y	10.46	69.7	22.0		144.8	
		Z	10.78	70.4	23.0		137.1	
10532-AAA	IEEE 802.11ac WiFi (20MHz, MCS7, 99pc duty cycle)	X	10.22	69.9	22.1	8.29	138.8	±2.2 %
		Y	10.30	69.7	22.0		141.5	
		Z	10.60	70.3	22.8		136.0	

EX3DV4– SN:3735 November 25, 2015

10533-AAA	IEEE 802.11ac WiFi (20MHz, MCS8, 99pc duty cycle)	X	10.41	70.0	22.2	8.38	140.2	±2.2 %
		Y	10.48	69.8	22.1		145.0	
		Z	10.81	70.5	23.0		137.7	
10534-AAA	IEEE 802.11ac WiFi (40MHz, MCS0, 99pc duty cycle)	X	10.92	70.3	22.2	8.45	149.2	±2.5 %
		Y	10.66	69.4	21.8		125.0	
		Z	11.33	70.8	23.1		145.2	
10535-AAA	IEEE 802.11ac WiFi (40MHz, MCS1, 99pc duty cycle)	X	10.49	69.2	21.7	8.45	121.4	±2.2 %
		Y	10.65	69.3	21.7		125.5	
		Z	11.34	70.8	23.1		146.4	
10536-AAA	IEEE 802.11ac WiFi (40MHz, MCS2, 99pc duty cycle)	X	10.79	70.3	22.2	8.32	149.1	±2.5 %
		Y	10.50	69.3	21.6		125.2	
		Z	11.18	70.8	23.0		145.0	
10537-AAA	IEEE 802.11ac WiFi (40MHz, MCS3, 99pc duty cycle)	X	10.44	69.2	21.6	8.44	121.6	±2.2 %
		Y	10.60	69.3	21.7		126.2	
		Z	11.29	70.8	23.0		146.0	
10538-AAA	IEEE 802.11ac WiFi (40MHz, MCS4, 99pc duty cycle)	X	10.58	69.3	21.8	8.54	122.5	±2.2 %
		Y	10.75	69.3	21.8		127.1	
		Z	11.48	71.0	23.2		147.8	
10540-AAA	IEEE 802.11ac WiFi (40MHz, MCS6, 99pc duty cycle)	X	10.45	69.2	21.6	8.39	122.0	±2.2 %
		Y	10.57	69.2	21.6		126.1	
		Z	11.31	70.8	23.1		147.3	
10541-AAA	IEEE 802.11ac WiFi (40MHz, MCS7, 99pc duty cycle)	X	10.51	69.3	21.7	8.46	122.4	±2.2 %
		Y	10.66	69.3	21.7		127.4	
		Z	11.36	70.8	23.1		146.9	
10542-AAA	IEEE 802.11ac WiFi (40MHz, MCS8, 99pc duty cycle)	X	10.73	69.4	21.8	8.65	123.8	±2.2 %
		Y	10.93	69.6	21.9		129.0	
		Z	11.63	71.1	23.3		148.9	
10543-AAA	IEEE 802.11ac WiFi (40MHz, MCS9, 99pc duty cycle)	X	10.80	69.5	21.9	8.65	124.5	±1.9 %
		Y	10.98	69.6	22.0		129.2	
		Z	11.29	70.1	22.8		124.2	
10544-AAA	IEEE 802.11ac WiFi (80MHz, MCS0, 99pc duty cycle)	X	10.96	69.7	21.7	8.47	127.3	±1.9 %
		Y	10.96	69.5	21.7		129.8	
		Z	11.45	70.5	22.7		125.8	
10545-AAA	IEEE 802.11ac WiFi (80MHz, MCS1, 99pc duty cycle)	X	11.05	69.9	21.8	8.55	126.5	±1.9 %
		Y	11.01	69.5	21.7		129.9	
		Z	11.51	70.5	22.8		125.9	
10546-AAA	IEEE 802.11ac WiFi (80MHz, MCS2, 99pc duty cycle)	X	10.88	69.7	21.7	8.35	126.1	±1.9 %
		Y	10.85	69.4	21.6		129.5	
		Z	11.34	70.5	22.6		125.5	
10547-AAA	IEEE 802.11ac WiFi (80MHz, MCS3, 99pc duty cycle)	X	11.03	69.9	21.8	8.49	126.6	±1.9 %
		Y	10.97	69.5	21.7		130.3	
		Z	11.50	70.6	22.8		126.0	
10548-AAA	IEEE 802.11ac WiFi (80MHz, MCS4, 99pc duty cycle)	X	10.87	69.7	21.7	8.37	125.7	±1.7 %
		Y	10.86	69.5	21.6		128.6	
		Z	11.38	70.5	22.7		125.5	

10550-AAA	IEEE 802.11ac WiFi (80MHz, MCS6, 99pc duty cycle)	X	10.91	69.7	21.7	8.38	126.1	±1.9 %
		Y	10.84	69.3	21.5		129.8	
		Z	11.38	70.5	22.6		126.0	
10551-AAA	IEEE 802.11ac WiFi (80MHz, MCS7, 99pc duty cycle)	X	10.94	69.7	21.7	8.50	125.3	±1.9 %
		Y	10.94	69.5	21.7		128.8	
		Z	11.41	70.4	22.7		125.1	
10552-AAA	IEEE 802.11ac WiFi (80MHz, MCS8, 99pc duty cycle)	X	10.87	69.7	21.7	8.42	126.0	±1.9 %
		Y	10.81	69.3	21.5		127.9	
		Z	11.38	70.5	22.7		125.1	
10553-AAA	IEEE 802.11ac WiFi (80MHz, MCS9, 99pc duty cycle)	X	10.97	69.7	21.7	8.45	127.0	±1.9 %
		Y	10.94	69.5	21.6		130.0	
		Z	11.45	70.5	22.7		125.7	
10607-AAA	IEEE 802.11ac WiFi (20MHz, MCS0, 90pc duty cycle)	X	10.53	70.1	22.4	8.64	142.1	±2.5 %
		Y	10.57	69.8	22.2		145.6	
		Z	10.99	70.7	23.3		139.0	
10608-AAA	IEEE 802.11ac WiFi (20MHz, MCS1, 90pc duty cycle)	X	10.67	70.3	22.6	8.77	142.6	±2.5 %
		Y	10.71	70.0	22.4		143.6	
		Z	11.09	70.7	23.3		139.7	
10609-AAA	IEEE 802.11ac WiFi (20MHz, MCS2, 90pc duty cycle)	X	10.47	70.2	22.4	8.57	141.0	±2.5 %
		Y	10.49	69.8	22.2		143.3	
		Z	10.91	70.7	23.2		136.6	
10610-AAA	IEEE 802.11ac WiFi (20MHz, MCS3, 90pc duty cycle)	X	10.64	70.2	22.6	8.78	140.0	±2.5 %
		Y	10.71	70.1	22.5		142.6	
		Z	11.07	70.7	23.4		136.5	
10611-AAA	IEEE 802.11ac WiFi (20MHz, MCS4, 90pc duty cycle)	X	10.52	70.1	22.5	8.70	139.6	±2.7 %
		Y	10.60	70.0	22.4		142.2	
		Z	10.93	70.5	23.2		135.7	
10612-AAA	IEEE 802.11ac WiFi (20MHz, MCS5, 90pc duty cycle)	X	10.58	70.3	22.6	8.77	139.0	±2.5 %
		Y	10.62	70.0	22.4		141.4	
		Z	11.01	70.7	23.4		135.5	
10613-AAA	IEEE 802.11ac WiFi (20MHz, MCS6, 90pc duty cycle)	X	10.73	70.4	22.7	8.94	139.4	±2.5 %
		Y	10.79	70.1	22.6		142.3	
		Z	11.15	70.7	23.5		135.3	
10614-AAA	IEEE 802.11ac WiFi (20MHz, MCS7, 90pc duty cycle)	X	10.39	70.1	22.4	8.59	138.6	±2.5 %
		Y	10.47	69.9	22.3		140.7	
		Z	10.80	70.5	23.2		134.2	
10615-AAA	IEEE 802.11ac WiFi (20MHz, MCS8, 90pc duty cycle)	X	10.70	70.4	22.6	8.82	141.8	±2.5 %
		Y	10.75	70.1	22.5		142.3	
		Z	11.13	70.8	23.4		136.5	
10616-AAA	IEEE 802.11ac WiFi (40MHz, MCS0, 90pc duty cycle)	X	11.15	70.5	22.6	8.82	149.6	±2.7 %
		Y	11.13	70.2	22.5		149.0	
		Z	11.59	71.0	23.4		144.1	
10617-AAA	IEEE 802.11ac WiFi (40MHz, MCS1, 90pc duty cycle)	X	10.71	69.5	22.0	8.81	122.3	±2.5 %
		Y	10.86	69.6	22.1		124.1	
		Z	11.65	71.2	23.5		145.8	

10618-AAA	IEEE 802.11ac WiFi (40MHz, MCS2, 90pc duty cycle)	X	10.90	70.4	22.4	8.58	149.2	±2.5 %
		Y	10.62	69.4	21.9		123.1	
		Z	11.35	70.9	23.3		143.1	
10619-AAA	IEEE 802.11ac WiFi (40MHz, MCS3, 90pc duty cycle)	X	10.72	69.5	22.1	8.86	122.2	±2.5 %
		Y	11.16	70.3	22.5		149.1	
		Z	11.65	71.2	23.5		145.1	
10620-AAA	IEEE 802.11ac WiFi (40MHz, MCS4, 90pc duty cycle)	X	10.77	69.5	22.1	8.87	122.5	±2.5 %
		Y	10.99	69.8	22.3		123.2	
		Z	11.71	71.2	23.5		145.5	
10621-AAA	IEEE 802.11ac WiFi (40MHz, MCS5, 90pc duty cycle)	X	10.69	69.4	21.9	8.77	122.5	±2.5 %
		Y	10.93	69.8	22.2		123.8	
		Z	11.68	71.3	23.5		146.8	
10622-AAA	IEEE 802.11ac WiFi (40MHz, MCS6, 90pc duty cycle)	X	10.58	69.3	21.9	8.68	122.5	±2.5 %
		Y	10.81	69.6	22.1		123.1	
		Z	11.54	71.1	23.4		145.1	
10623-AAA	IEEE 802.11ac WiFi (40MHz, MCS7, 90pc duty cycle)	X	10.71	69.4	22.0	8.82	122.0	±2.5 %
		Y	10.95	69.8	22.2		123.5	
		Z	11.64	71.1	23.5		145.0	
10624-AAA	IEEE 802.11ac WiFi (40MHz, MCS8, 90pc duty cycle)	X	10.95	69.7	22.2	8.96	123.8	±2.7 %
		Y	11.11	69.8	22.3		124.6	
		Z	11.88	71.3	23.6		147.3	
10625-AAA	IEEE 802.11ac WiFi (40MHz, MCS9, 90pc duty cycle)	X	11.00	69.7	22.2	8.96	125.4	±2.7 %
		Y	11.17	69.8	22.3		126.5	
		Z	12.00	71.5	23.7		149.6	
10626-AAA	IEEE 802.11ac WiFi (80MHz, MCS0, 90pc duty cycle)	X	11.20	70.0	22.1	8.83	127.0	±2.2 %
		Y	11.12	69.6	21.9		126.7	
		Z	11.73	70.8	23.1		124.7	
10627-AAA	IEEE 802.11ac WiFi (80MHz, MCS1, 90pc duty cycle)	X	11.25	70.0	22.1	8.88	127.7	±2.2 %
		Y	11.18	69.7	22.0		127.0	
		Z	11.77	70.8	23.1		124.6	
10628-AAA	IEEE 802.11ac WiFi (80MHz, MCS2, 90pc duty cycle)	X	11.08	69.9	21.9	8.71	126.8	±2.2 %
		Y	11.04	69.6	21.9		126.5	
		Z	11.60	70.7	23.0		124.3	
10629-AAA	IEEE 802.11ac WiFi (80MHz, MCS3, 90pc duty cycle)	X	11.27	70.1	22.1	8.85	128.1	±2.2 %
		Y	11.23	69.8	22.1		127.7	
		Z	11.81	70.9	23.2		124.9	
10630-AAA	IEEE 802.11ac WiFi (80MHz, MCS4, 90pc duty cycle)	X	11.17	70.1	22.1	8.72	127.4	±2.2 %
		Y	11.09	69.7	21.9		127.2	
		Z	11.68	70.8	23.0		124.3	
10631-AAA	IEEE 802.11ac WiFi (80MHz, MCS5, 90pc duty cycle)	X	11.18	70.0	22.1	8.81	127.0	±2.2 %
		Y	11.12	69.7	22.0		126.5	
		Z	11.67	70.7	23.0		123.6	
10632-AAA	IEEE 802.11ac WiFi (80MHz, MCS6, 90pc duty cycle)	X	11.20	70.1	22.1	8.74	127.8	±1.9 %
		Y	11.12	69.6	21.9		128.5	
		Z	11.72	70.8	23.0		125.0	

10633-AAA	IEEE 802.11ac WiFi (80MHz, MCS7, 90pc duty cycle)	X	11.24	70.1	22.2	8.83	127.2	±2.2 %
		Y	11.17	69.7	22.0		128.0	
		Z	11.78	70.9	23.1		123.9	
10634-AAA	IEEE 802.11ac WiFi (80MHz, MCS8, 90pc duty cycle)	X	11.21	70.1	22.1	8.80	126.9	±2.2 %
		Y	11.17	69.7	22.0		126.8	
		Z	11.77	70.9	23.1		124.6	
10635-AAA	IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)	X	11.31	70.2	22.2	8.81	128.2	±2.2 %
		Y	11.27	69.9	22.1		128.9	
		Z	11.83	70.9	23.1		125.7	

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

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 9 and 12).
[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)
5250	35.9	4.71	4.87	4.87	4.87	0.35	1.80	± 13.1 %
5750	35.4	5.22	4.45	4.45	4.45	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

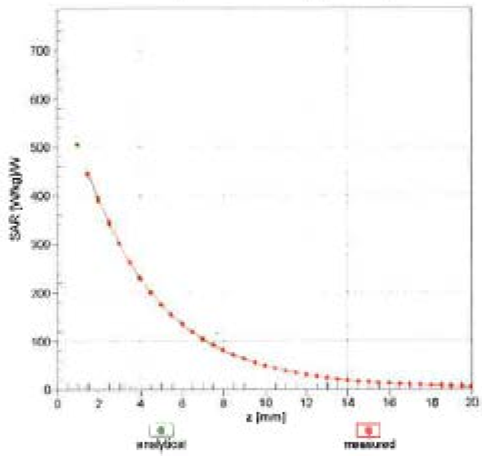
Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
5250	48.9	5.36	4.12	4.12	4.12	0.45	1.90	± 13.1 %
5750	48.3	5.94	3.83	3.83	3.83	0.50	1.90	± 13.1 %

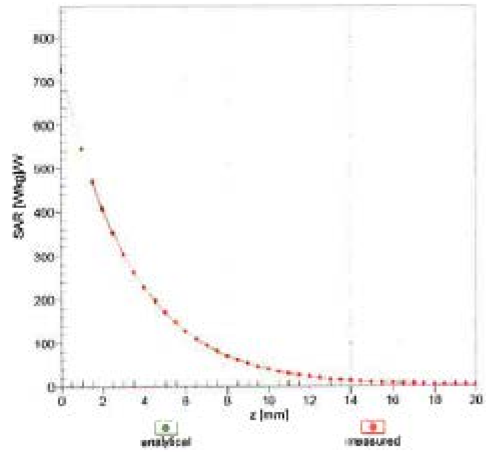
[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz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

Conversion Factor Assessment

f = 5250 MHz,WGLS R58 (H_convF)-SCS

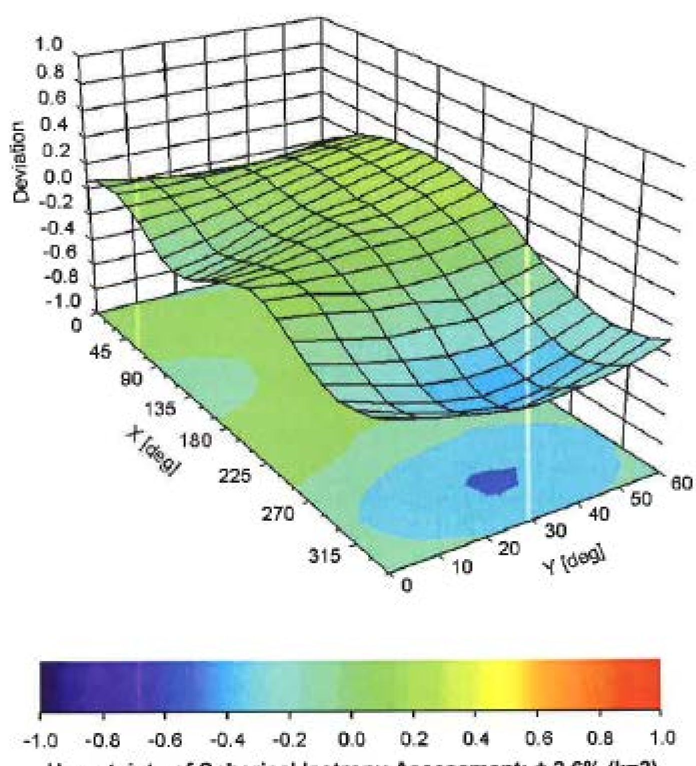


f = 5750 MHz,WGLS R58 (H_convF)-SCS



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 (°)	-2.2
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

APPENDIX C
Dipole Calibration Certificates

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

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

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

Accreditation No.: SCS 0108

Client **Motorola Solutions MY**

Certificate No: **D5GHzV2-1027_Jan16**

CALIBRATION CERTIFICATE

Object D5GHzV2 - SN: 1027

Calibration procedure(s) QA CAL-22.v2
Calibration procedure for dipole validation kits between 3-6 GHz

Calibration date: January 26, 2016

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	07-Oct-15 (No. 217-02222)	Oct-16
Power sensor HP 8481A	US37292783	07-Oct-15 (No. 217-02222)	Oct-16
Power sensor HP 8481A	MY41092317	07-Oct-15 (No. 217-02223)	Oct-16
Reference 20 dB Attenuator	SN: 5058 (20k)	01-Apr-15 (No. 217-02131)	Mar-16
Type-N mismatch combination	SN: 5047.2 / 06327	01-Apr-15 (No. 217-02134)	Mar-16
Reference Probe EX3DV4	SN: 3503	31-Dec-15 (No. EX3-3503_Dec15)	Dec-16
DAE4	SN: 601	30-Dec-15 (No. DAE4-601_Dec15)	Dec-16

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

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

Issued: January 28, 2016

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

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

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

Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-2, "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
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5000 MHz ± 1 MHz 5200 MHz ± 1 MHz 5250 MHz ± 1 MHz 5300 MHz ± 1 MHz 5500 MHz ± 1 MHz 5600 MHz ± 1 MHz 5750 MHz ± 1 MHz 5800 MHz ± 1 MHz	

Head TSL parameters at 5000 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	36.2	4.45 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.5 ± 6 %	4.31 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5000 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.13 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**71.0 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.08 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**20.7 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.2 ± 6 %	4.51 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.76 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**77.2 W / kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.23 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.1 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.71 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.2 ± 6 %	4.55 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5250 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.91 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**78.7 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.28 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.6 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.76 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.1 ± 6 %	4.60 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5300 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.95 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**79.1 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.31 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.9 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.6	4.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.8 ± 6 %	4.79 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5500 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.89 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**78.4 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.27 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.5 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.7 ± 6 %	4.90 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.31 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**82.6 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.6 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.4	5.22 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.5 ± 6 %	5.05 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5750 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.66 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**76.1 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.20 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**21.8 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.4 ± 6 %	5.10 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.63 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**75.8 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.18 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**21.6 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5000 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.3	5.07 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.5 ± 6 %	5.10 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5000 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.00 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**69.5 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.00 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**19.8 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.1 ± 6 %	5.37 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.22 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**71.6 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.04 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.2 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.36 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.0 ± 6 %	5.44 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5250 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.40 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**73.4 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.09 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.7 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.42 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.9 ± 6 %	5.50 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5300 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.52 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**74.6 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.12 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.0 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.6	5.65 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.6 ± 6 %	5.76 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5500 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.80 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**77.4 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.19 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.7 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.4 ± 6 %	5.91 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.93 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**78.7 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.22 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**22.0 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.3	5.94 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.1 ± 6 %	6.12 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5750 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.47 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**74.1 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.10 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.8 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.0 ± 6 %	6.19 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.55 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**74.9 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.11 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.9 W/kg ± 19.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 5000 MHz

Impedance, transformed to feed point	48.9 Ω - 18.0 jΩ
Return Loss	- 14.9 dB

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	46.7 Ω - 11.8 jΩ
Return Loss	- 18.4 dB

Antenna Parameters with Head TSL at 5250 MHz

Impedance, transformed to feed point	48.9 Ω - 9.1 jΩ
Return Loss	- 20.7 dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	50.1 Ω - 8.8 jΩ
Return Loss	- 21.1 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	49.1 Ω - 7.0 jΩ
Return Loss	- 22.9 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	55.5 Ω - 7.9 jΩ
Return Loss	- 20.8 dB

Antenna Parameters with Head TSL at 5750 MHz

Impedance, transformed to feed point	56.7 Ω - 7.6 jΩ
Return Loss	- 20.5 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	55.6 Ω - 8.8 jΩ
Return Loss	- 20.1 dB

Antenna Parameters with Body TSL at 5000 MHz

Impedance, transformed to feed point	49.2 Ω - 15.4 jΩ
Return Loss	- 16.3 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	48.8 Ω - 10.3 jΩ
Return Loss	- 19.6 dB

Antenna Parameters with Body TSL at 5250 MHz

Impedance, transformed to feed point	49.7 Ω - 7.8 jΩ
Return Loss	- 22.2 dB

Antenna Parameters with Body TSL at 5300 MHz

Impedance, transformed to feed point	50.4 Ω - 7.1 jΩ
Return Loss	- 23.0 dB

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	50.7 Ω - 5.8 jΩ
Return Loss	- 24.7 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	56.9 Ω - 7.2 jΩ
Return Loss	- 20.6 dB

Antenna Parameters with Body TSL at 5750 MHz

Impedance, transformed to feed point	58.2 Ω - 6.4 jΩ
Return Loss	- 20.4 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	57.5 Ω - 7.6 jΩ
Return Loss	- 20.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.201 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	July 09, 2004

DASY5 Validation Report for Head TSL

Date: 26.01.2016

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1027

Communication System: UID 0 - CW; Frequency: 5000 MHz, Frequency: 5200 MHz, Frequency: 5250 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5000 MHz; σ = 4.31 S/m; ε_r = 35.5; ρ = 1000 kg/m^3 , Medium parameters used: f = 5200 MHz; σ = 4.51 S/m; ε_r = 35.2; ρ = 1000 kg/m^3 , Medium parameters used: f = 5250 MHz; σ = 4.55 S/m; ε_r = 35.2; ρ = 1000 kg/m^3 , Medium parameters used: f = 5300 MHz; σ = 4.6 S/m; ε_r = 35.1; ρ = 1000 kg/m^3 , Medium parameters used: f = 5500 MHz; σ = 4.79 S/m; ε_r = 34.8; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 4.9 S/m; ε_r = 34.7; ρ = 1000 kg/m^3 , Medium parameters used: f = 5750 MHz; σ = 5.05 S/m; ε_r = 34.5; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 5.1 S/m; ε_r = 34.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(6.1, 6.1, 6.1); Calibrated: 31.12.2015, ConvF(5.59, 5.59, 5.59); Calibrated: 31.12.2015, ConvF(5.53, 5.53, 5.53); Calibrated: 31.12.2015, ConvF(5.25, 5.25, 5.25); Calibrated: 31.12.2015, ConvF(5.18, 5.18, 5.18); Calibrated: 31.12.2015, ConvF(4.99, 4.99, 4.99); Calibrated: 31.12.2015, ConvF(4.95, 4.95, 4.95); Calibrated: 31.12.2015; ConvF(4.95, 4.95, 4.95); Calibrated: 31.12.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5000MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 69.30 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 25.0 W/kg
SAR(1 g) = 7.13 W/kg; SAR(10 g) = 2.08 W/kg
Maximum value of SAR (measured) = 16.4 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 71.70 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 28.0 W/kg
SAR(1 g) = 7.76 W/kg; SAR(10 g) = 2.23 W/kg
Maximum value of SAR (measured) = 18.2 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 72.21 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 28.7 W/kg
SAR(1 g) = 7.91 W/kg; SAR(10 g) = 2.28 W/kg
Maximum value of SAR (measured) = 18.5 W/kg

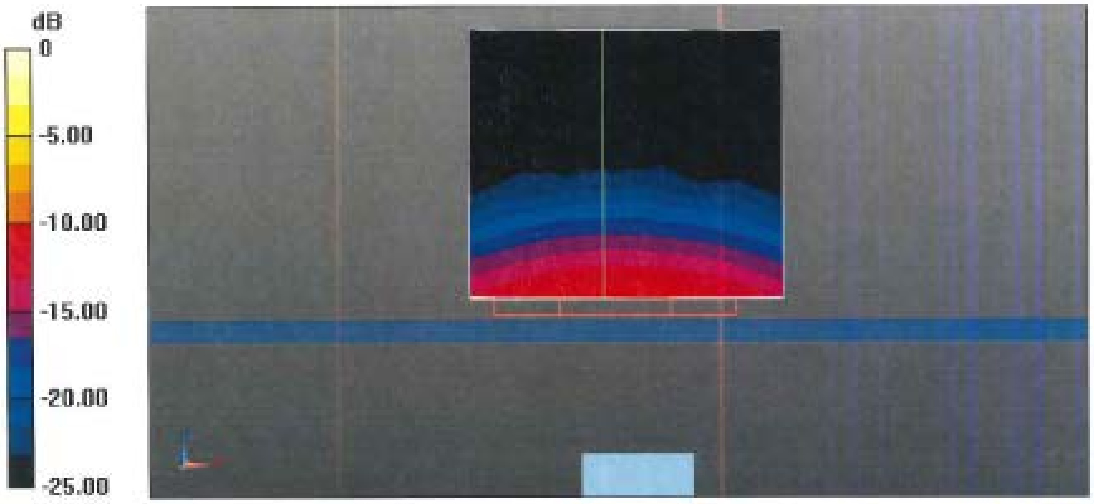
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 71.87 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 29.9 W/kg
SAR(1 g) = 7.95 W/kg; SAR(10 g) = 2.31 W/kg
Maximum value of SAR (measured) = 19.0 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 71.21 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 30.8 W/kg
SAR(1 g) = 7.89 W/kg; SAR(10 g) = 2.27 W/kg
Maximum value of SAR (measured) = 19.1 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 72.83 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 32.7 W/kg
SAR(1 g) = 8.31 W/kg; SAR(10 g) = 2.38 W/kg
Maximum value of SAR (measured) = 20.3 W/kg

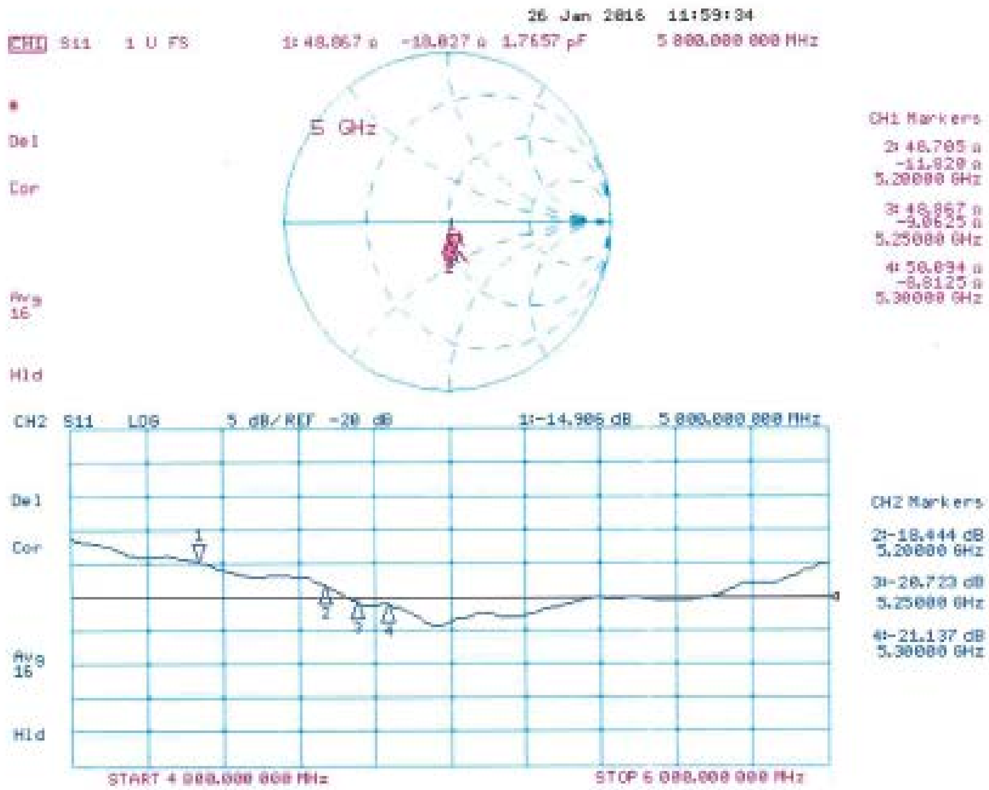
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 69.24 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 31.1 W/kg
SAR(1 g) = 7.66 W/kg; SAR(10 g) = 2.2 W/kg
Maximum value of SAR (measured) = 18.8 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 68.93 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 31.5 W/kg
SAR(1 g) = 7.63 W/kg; SAR(10 g) = 2.18 W/kg
Maximum value of SAR (measured) = 18.8 W/kg

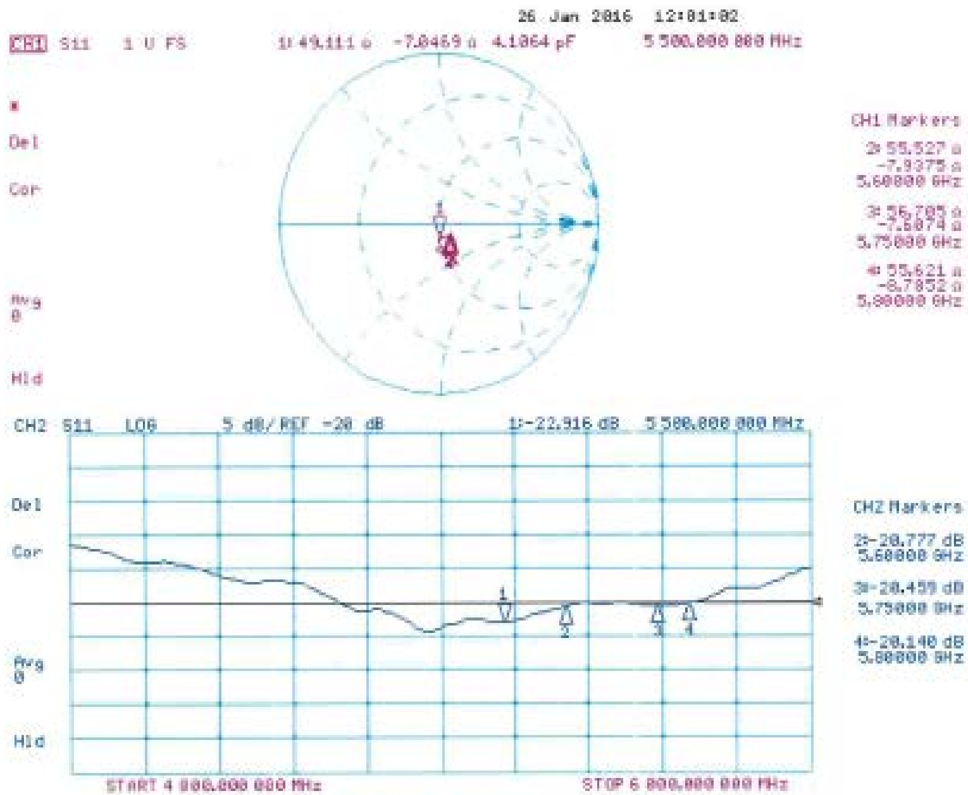


0 dB = 18.8 W/kg = 12.74 dBW/kg

Impedance Measurement Plot for Head TSL (5000, 5200, 5250, 5300)



Impedance Measurement Plot for Head TSL (5500, 5600, 5750, 5800)



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DASY5 Validation Report for Body TSL

Date: 25.01.2016

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1027

Communication System: UID 0 - CW; Frequency: 5000 MHz, Frequency: 5200 MHz, Frequency: 5250 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5000 MHz; σ = 5.1 S/m; ε_r = 47.5; ρ = 1000 kg/m^3 , Medium parameters used: f = 5200 MHz; σ = 5.37 S/m; ε_r = 47.1; ρ = 1000 kg/m^3 , Medium parameters used: f = 5250 MHz; σ = 5.44 S/m; ε_r = 47; ρ = 1000 kg/m^3 , Medium parameters used: f = 5300 MHz; σ = 5.5 S/m; ε_r = 46.9; ρ = 1000 kg/m^3 , Medium parameters used: f = 5500 MHz; σ = 5.76 S/m; ε_r = 46.6; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 5.91 S/m; ε_r = 46.4; ρ = 1000 kg/m^3 , Medium parameters used: f = 5750 MHz; σ = 6.12 S/m; ε_r = 46.1; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 6.19 S/m; ε_r = 46; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.28, 5.28, 5.28); Calibrated: 31.12.2015, ConvF(4.99, 4.99, 4.99); Calibrated: 31.12.2015, ConvF(4.85, 4.85, 4.85); Calibrated: 31.12.2015, ConvF(4.75, 4.75, 4.75); Calibrated: 31.12.2015, ConvF(4.4, 4.4, 4.4); Calibrated: 31.12.2015, ConvF(4.35, 4.35, 4.35); Calibrated: 31.12.2015, ConvF(4.3, 4.3, 4.3); Calibrated: 31.12.2015, ConvF(4.27, 4.27, 4.27); Calibrated: 31.12.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5000MHz/Zoom Scan (4x4x1.4mm), dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 66.10 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 24.6 W/kg
SAR(1 g) = 7 W/kg; SAR(10 g) = 2 W/kg
Maximum value of SAR (measured) = 16.0 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 66.43 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 26.9 W/kg
SAR(1 g) = 7.22 W/kg; SAR(10 g) = 2.04 W/kg
Maximum value of SAR (measured) = 17.0 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 66.81 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 28.1 W/kg
SAR(1 g) = 7.4 W/kg; SAR(10 g) = 2.09 W/kg
Maximum value of SAR (measured) = 17.5 W/kg

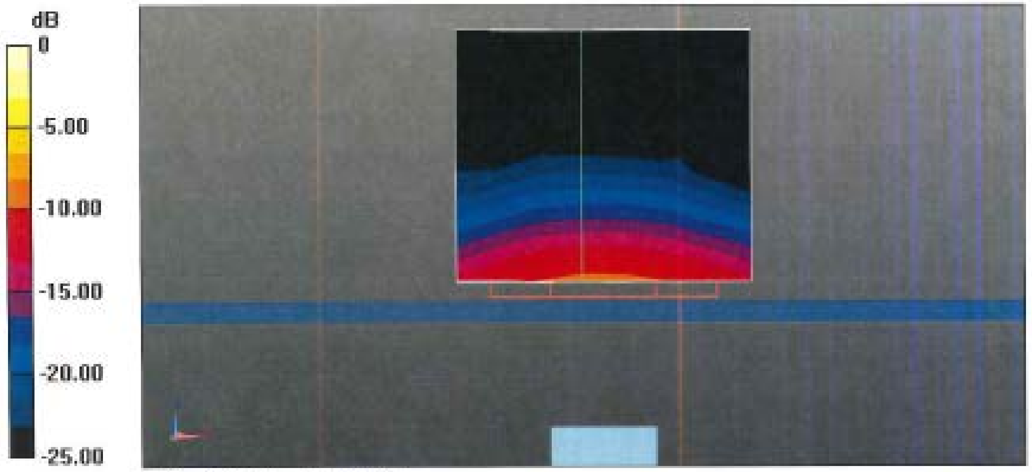
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 67.45 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 28.9 W/kg
SAR(1 g) = 7.52 W/kg; SAR(10 g) = 2.12 W/kg
Maximum value of SAR (measured) = 17.9 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 67.44 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 31.4 W/kg
SAR(1 g) = 7.8 W/kg; SAR(10 g) = 2.19 W/kg
Maximum value of SAR (measured) = 18.8 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 67.75 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 32.9 W/kg
SAR(1 g) = 7.93 W/kg; SAR(10 g) = 2.22 W/kg
Maximum value of SAR (measured) = 19.4 W/kg

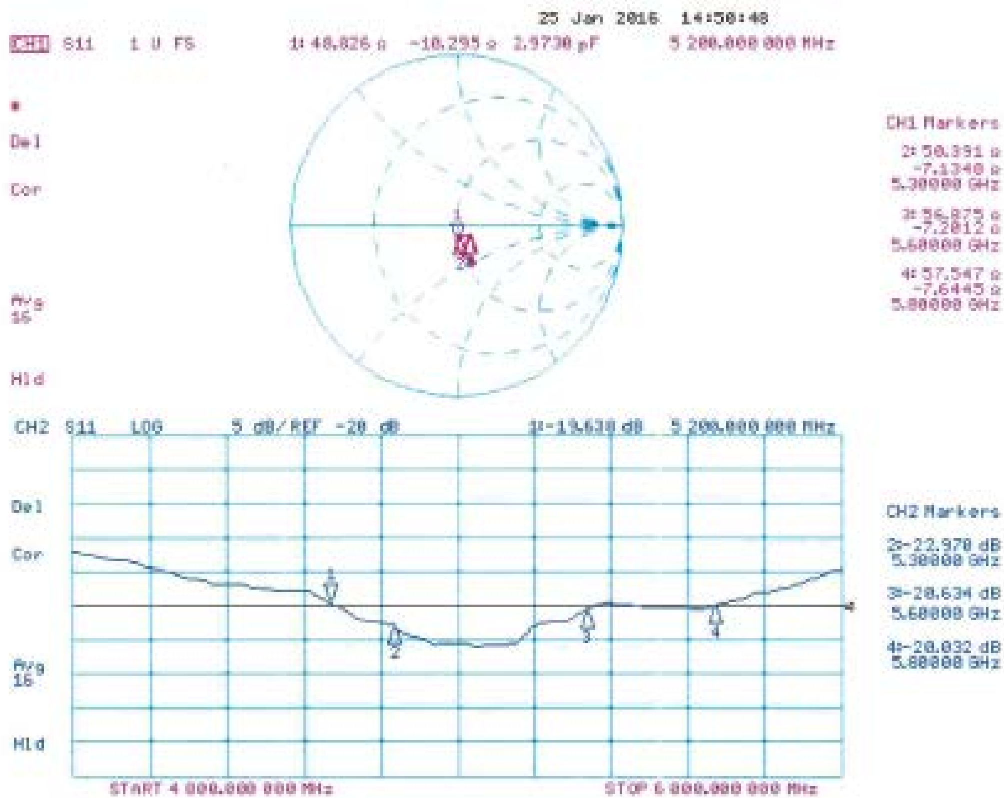
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.50 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 31.9 W/kg
SAR(1 g) = 7.47 W/kg; SAR(10 g) = 2.1 W/kg
Maximum value of SAR (measured) = 18.5 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.23 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 33.1 W/kg
SAR(1 g) = 7.55 W/kg; SAR(10 g) = 2.11 W/kg
Maximum value of SAR (measured) = 18.9 W/kg

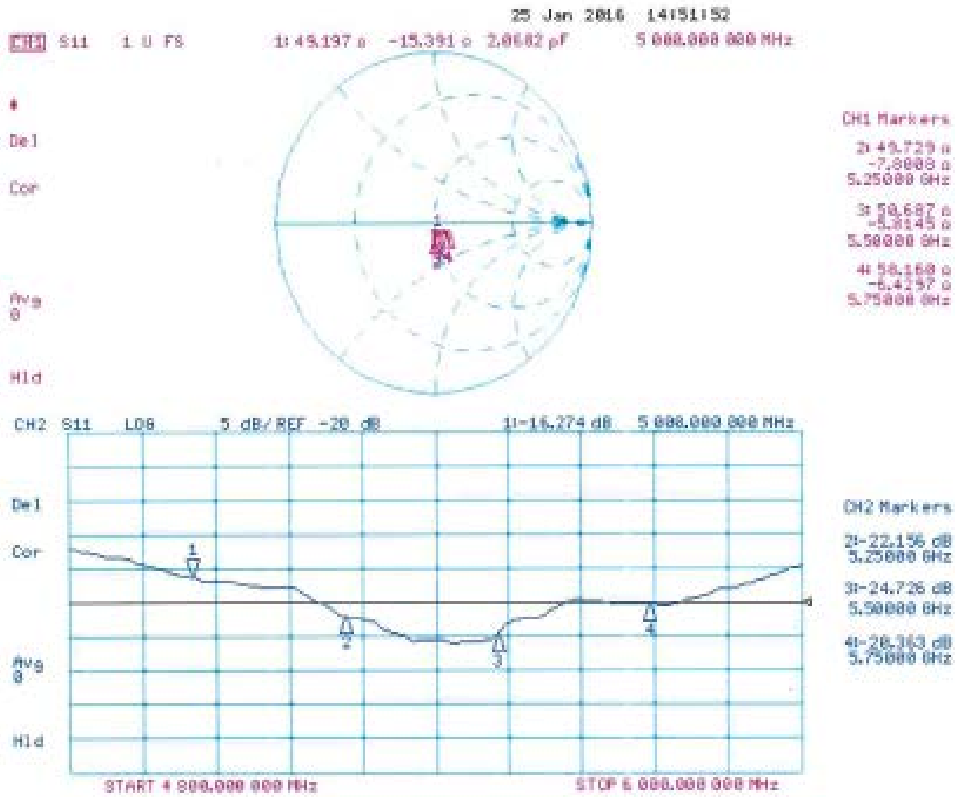


0 dB = 18.9 W/kg = 12.76 dBW/kg

Impedance Measurement Plot for Body TSL (5200, 5300, 5600, 5800)



Impedance Measurement Plot for Body TSL (5000, 5250, 5500, 5750)



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Dipole Data

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

Dipole D5GHzV2-1027 does not exceed the annual calibration data, therefore validation for impedance and return loss is not required.