MOTOROLA SOLUTIONS

MS ISO/IEC 17025
TESTING
SAMM No.0826

DECLARATION OF COMPLIANCE SAR ASSESSMENT PCII Report Part 1 of 2

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Date of Report: 06/27/2019
Report Revision: A

Responsible Engineer:	Goh Jue Yie (EME Engineer)
Report Author:	Ch'ng Jian Sheng (EME Engineer)
Date/s Tested:	06/17/2019, 06/19/2019, 07/04/2019
Manufacturer:	Motorola Solutions Inc.
DUT Description:	Handheld Portable – APX6000 and APX6000XE Refresh VHF 136-174 MHz 6W
Test TX mode(s):	CW (PTT) , Bluetooth, WLAN 802.11 b/g/n
Max. Power output:	6.6 W (LMR 136-174 MHz band), 10 mW (Bluetooth), 1.98 mW (Bluetooth LE), 63.1 mW (WLAN 802.11 b), 25.1 mW (WLAN 802.11g), 15.5 mW (WLAN 802.11n)
Nominal Power:	6.0 W (LMR 136-174 MHz band), 8 mW (Bluetooth), 1.5 mW (Bluetooth LE), 31.6 mW (WLAN 802.11 b), 12.5 mW (WLAN 802.11g), 12.5 mW (WLAN 802.11n)
Tx Frequency Bands:	LMR 136-174 MHz; Bluetooth 2.402-2.480 GHz; WLAN 802.11 b/g/n 2.412-2.462 GHz
Signaling type:	FM (LMR), FHSS (Bluetooth), 802.11 b/g/n (WLAN)
Model(s) Tested:	H98KGD9PW5BN (PMUD3372C) & H98KGH9PW7BN (PMUD3374C)
Model(s) Certified:	Refer to Table 1
Serial Number(s):	481TVK0415 & 481TVK0529
Classification:	Occupational/Controlled
FCC ID:	AZ489FT7087; LMR 150.8-173.4 MHz, Bluetooth 2.402-2.480 GHz, WLAN 802.11 b/g/n 2.412-2.462 GHz This report contains results that are immaterial for FCC equipment approval, which are clearly identified.
IC:	109U-89FT7087; LMR 138-174 MHz, Bluetooth 2.402-2.480 GHz, WLAN 802.11 b/g/n 2.412-2.462 GHz This report contains results that are immaterial for ISED equipment approval, which are clearly identified.
ISED Test Site registration:	109AK
FCC Test Firm Registration Number:	823256

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 (no deviation from standard methods). 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
Digitally signed by Tiong Nguk Ing
Date: 2019.08.02 21:43:52 +08'00'

Tiong Nguk Ing
Deputy Technical Manager (Approved Signatory)
Approval Date: 8/2/2019

Part 1 of 2

APPENDICES

Part 2 of 2

APPENDICES

Report Revision History

Date	Revision	Comments
06/27/2019	A	Release of PCII results

1.0 Introduction

This report details the utilization, test setup, test equipment, and test results of the Specific Absorption Rate (SAR) measurements performed at the Motorola Solutions Inc. EME Test Laboratory for handheld portable devices with model numbers:

Table 1

Model Number	Description
H98KGD9PW5BNI	APX5000 VHF Model 1.5
H98KGF9PW6BNI	APX5000 VHF Model 2.5
H98KGH9PW7BNI	APX5000 VHF Model 3.5
H99KGD9PW5BN	SRX2200 VHF Model 1.5
H99KGH9PW7BN	SRX2200 VHF Model 3.5
H98KGD9PW5BN	APX6000 VHF Model 1.5
H98KGF9PW6BN	APX6000 VHF Model 2.5
H98KGH9PW7BN	APX6000 VHF Model 3.5
H98KGD9PW5BN (IC Model: APX6000XE_V_1.5)	APX6000XE VHF Model 1.5
H98KGF9PW6BN (IC Model: APX6000XE_V_2.5)	APX6000XE VHF Model 2.5
H98KGH9PW7BN (IC Model: APX6000XE_V_3.5)	APX6000XE VHF Model 3.5

These devices are classified as Occupational/Controlled.

The information herein is to show evidence of Class II Permissive Change is compliant based on the SAR evaluation of the DUT that have undergone changes. The changes do not impact BT/WLAN transmitter.

2.0 FCC SAR Summary

Table 2

Equipment Class	Frequency band (MHz)	Max Calc at Body (W/kg)	Max Calc at Face (W/kg)
		1g-SAR	1g-SAR
TNF	150.8-173.4MHz (LMR)	3.41	0.85
*DSS	2402-2480MHz (Bluetooth)	NA	NA
DTS	2412-2462 MHz (WLAN 802.11 b/g/n)	0.037	0.196
Simultaneous Results		3.45	1.05

*Results not required per KDB (refer to section 14.0)

The new highest reported SAR value for head, body-worn accessory and simultaneous transmission exposure conditions are 0.85 W/kg, 3.41 W/kg and 3.45 W/kg respectively.

The initial filed results 0.83 W/kg, 2.43 W/kg and 2.47 W/kg are hereby replaced with the results presented herein.

3.0 Abbreviations / Definitions

BT: Bluetooth
CNR: Calibration Not Required
CW: Continuous Wave
DSSS: Direct Sequence Spread Spectrum
DTS: Digital Transmission System
DUT: Device Under Test
EME: Electromagnetic Energy
FHSS: Frequency Hopping Spread Spectrum
Li-ion: Lithium-Ion
LMR: Land Mobile Radio
NA: Not Applicable
NiMH: Nickel Metal Hydride
OFDM: Orthogonal Frequency Division Multiplexing
PTT: Push to Talk
RF: Radio Frequency
SAR: Specific Absorption Rate
TNF: Licensed Non-Broadcast Transmitter Held to Face
WLAN: Wireless Local Area Network

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

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

4.0 Referenced Standards and Guidelines

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

- IEC62209-1 (2016) Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)
- Federal Communications Commission, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields", OET Bulletin 65, FCC, Washington, D.C.: 1997.
- IEEE 1528 (2013), Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
- American National Standards Institute (ANSI) / Institute of Electrical and Electronics Engineers (IEEE) C95. 1-1992
- Institute of Electrical and Electronics Engineers (IEEE) C95.1-2005
- International Commission on Non-Ionizing Radiation Protection (ICNIRP) 1998
- Ministry of Health (Canada) Safety Code 6 (2015), Limits of Human Exposure to Radio frequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz
- RSS-102 (Issue 5) – Radio Frequency (RF) Exposure Compliance of Radio communication Apparatus (All Frequency Bands)
- Australian Communications Authority Radio communications (Electromagnetic Radiation - Human Exposure) Standard (2014)
- ANATEL, Brazil Regulatory Authority, Resolution No. 303 of July 2, 2002 "Regulation of the limitation of exposure to electrical, magnetic, and electromagnetic fields in the radio frequency range between 9 kHz and 300 GHz." and "Attachment to resolution # 303 from July 2, 2002"
- IEC62209-2 Edition 1.0 2010-03, Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures – Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz).
- FCC KDB – 643646 D01 SAR Test for PTT Radios v01r03
- FCC KDB – 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB – 865664 D02 RF Exposure Reporting v01r02
- FCC KDB – 447498 D01 General RF Exposure Guidance v06
- FCC KDB – 248227 D01 802.11 Wi-Fi SAR v02r02

5.0 SAR Limits

Table 3

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

6.0 Description of Device Under Test (DUT)

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

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

These devices also incorporate Class 1 Bluetooth Low energy (LE) device which is a Frequency Hopping Spread Spectrum (FHSS) technology and LE intended to reduce power consumption. The Bluetooth radio modem is used to wireless link audio accessories. The maximum actual transmission duty cycle is imposing by Bluetooth standard. Packet types varying duty cycles: 1-slot, 3-slots and 5-slots packets. A 5-slot packet type receives on 1-slot and transmits on 5-slots, and thus maximum duty cycle = 76.1%.

WLAN 802.11 b/g/n operates using Direct Sequence Spread Spectrum (DSSS) and Orthogonal Frequency-Division Multiplexing (OFDM) accordance with the IEEE 802.11 b/g/n. With WiFi access, the radio can receive new code plug, firmware and software feature while allow users keep talking without interruption.

Table 4 below lists the technology, band, maximum duty cycle and maximum output power. The maximum output power is defined as the upper limit of the production line final test station.

Table 4

Technologies	Band (MHz)	Transmission	Duty Cycle (%)	Max Power (W)
LMR	136-174	FM	*50	6.6
BT	2402-2480	FHSS	76.1	0.01
BT LE	2402-2480	DSSS	76.1	0.00198
WLAN	2412-2462	802.11b	100	0.0631
WLAN	2412-2462	802.11g	100	0.0251
WLAN	2412-2462	802.11n	100	0.0155

Note - * includes 50% PTT operation

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

7.0 Optional Accessories and Test Criteria

These devices are offered with optional accessories. The following sections identify the test criteria and details for each accessory category applicable for this PCII filing only. Detailed listings of all the approved offered accessories are available in the original filing report.

7.1 Antenna

There is only one antenna applicable for this PCII filing. The Table below lists its descriptions.

Table 5

Antenna No.	Antenna Models	Description	Selected for test	Tested
1	NAR6593A	VHF/GPS Antenna, 136-174 MHz and 1575 MHz, ¼ Wave, -2 dBd	Yes	Yes

7.2 Batteries

There are two batteries applicable for this PCII filing. The Table below lists their descriptions.

Table 6

Battery No.	Battery Models	Description	Selected for test	Tested
1	NNTN7034B	Battery Delta-T 4200 mAh	Yes	Yes
2	PMNN4485A	APX Gen 2 Impress slim Delta-T 2400 mAh	Yes	Yes

7.3 Body worn Accessories

There is only one body worn accessory applicable for this PCII filing. The Table below lists its descriptions.

Table 7

Body worn No.	Body worn Models	Description	Selected for test	Tested
1	HLN6875A	3” belt clip	Yes	Yes

7.4 Audio Accessories

No audio accessory is applicable for this PCII filing.

8.0 Description of Test System

8.1 Descriptions of Robotics/Probes/Readout Electronics

Table 8

Dosimetric System type	System version	DAE type	Probe Type
Schmid & Partner Engineering AG SPEAG DASY 5	52.10.2.1495	DAE4	EX3DV4 (E-Field)

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

8.2 Description of Phantom(s)

Table 9

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

8.3 Description of Simulated Tissue

The sugar based simulate tissue is produced by placing the correct measured amount of De-ionized water into a large container. Each of the dried ingredients are weighed and added to the water carefully to avoid clumping. If the solution has a high sugar concentration the water is pre-heated to aid in dissolving the ingredients. The solution is mixed thoroughly, covered, and allowed to sit overnight prior to use.

The simulated tissue mixture was mixed based on the Simulated Tissue Composition indicated in Table 10. During the daily testing of this product, the applicable mixture was used to measure the Di-electric parameters at each of the tested frequencies to verify that the Di-electric parameters were within the tolerance of the tissue specifications.

Simulated Tissue Composition (% by mass)

Table 10

Ingredients	150MHz	
	Head	Body
Sugar	55.40	49.70
Diacetin	0	0
De ionized –Water	38.35	46.20
Salt	5.15	3.00
HEC	1.00	1.00
Bact.	0.10	0.10

9.0 Additional Test Equipment

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

Table 11

Equipment Type	Model Number	Serial Number	Calibration Date	Calibration Due Date
SPEAG PROBE	EX3DV4	7364	01/23/2019	01/23/2020
SPEAG PROBE	EX3DV4	3612	10/18/2018	10/18/2019
SPEAG DIPOLE	DAE4	1483	01/10/2019	01/10/2020
SPEAG DIPOLE	DAE4	684	10/9/2018	10/9/2019
AMPLIFIER POWER	10W1000C	312859	CNR	CNR
AMPLIFIER POWER	50W 1000A	14715	CNR	CNR
BI-DIRECTIONAL COUPLER	3020A	41931	07/04/2018	07/04/2019
BI-DIRECTIONAL COUPLER	3020A	40295	9/4/2018	9/4/2019
POWER METER	E4418B	GB40206480	09/16/2018	09/16/2019
POWER METER	E4418B	MY45100532	11/7/2018	11/7/2019
POWER SENSOR	E9301B	MY50280001	07/05/2018	07/05/2019
POWER SENSOR	E9301B	MY41495733	4/19/2019	4/19/2020
POWER METER	E4419B	MY40330364	09/16/2017	09/16/2019
POWER METER	E4418B	MY45100911	7/14/2017	7/14/2019
POWER SENSOR	E9301B	MY41495594	08/15/2018	08/15/2019
POWER SENSOR	8481B	SG41090248	12/20/2018	12/20/2019
VECTOR SIGNAL GENERATOR	E4438C	MY45091270	08/13/2018	08/13/2020
VECTOR SIGNAL GENERATOR	E4438C	MY44270302	3/9/2019	3/9/2020
TEMPERATURE & HUMINIDITY LOGGER	TM320	12253047	10/30/2018	10/30/2019
THERMOMETER	HH806AU	080307	12/05/2018	12/05/2019
TEMPERATURE PROBE	80PK-22	06032017	12/05/2018	12/05/2019
TEMPERATURE PROBE	80PK-22	05032017	12/26/2018	12/26/2019
THERMOMETER	HH202A	35881	12/26/2018	12/26/2019
NETWORK ANALYZER	E5071B	MY42403218	09/06/2018	09/06/2019
DIELECTRIC ASSESSMENT KIT	DAK-12	1069	01/08/2019	01/08/2020
SPEAG DIPOLE	CLA150	4005	02/09/2018	02/09/2020

10.0 SAR Measurement System Validation and Verification

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

10.1 System Validation

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

Table 12

Dates	Probe Calibration Point		Probe SN	Measured Tissue Parameters		Validation		
				σ	ϵ_r	Sensitivity	Linearity	Isotropy
CW								
03/09/2019	Body	150	7364	0.79	59.1	Pass	Pass	Pass
03/14/2019	Head	150		0.73	50.5	Pass	Pass	Pass
11/11/2018	Body	150	3612	0.80	59.6	Pass	Pass	Pass
11/11/2018	Head	150		0.73	50.1	Pass	Pass	Pass

10.2 System Verification

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

Table 13

Probe Serial #	Tissue Type	Dipole Kit / Serial #	Ref SAR @ 1W (W/kg)	System Check Results Measured (W/kg)	System Check Test Results when normalized to 1W (W/kg)	Tested Date
7364	FCC Body	CLA150 / 4005	3.84 +/- 10%	3.94	3.94	06/16/2019#
				4.08	4.08	06/27/2019
	IEEE/IEC Head		3.77 +/- 10%	4.07	4.07	06/19/2019
3612	FCC Body	CLA150 / 4005	3.84 +/- 10%	3.92	3.92	07/04/2019
	IEEE/IEC Head		3.77 +/- 10%	3.86	3.86	07/04/2019

Tissue sheet date cover next testing day (within 24 hrs)

10.3 Equivalent Tissue Test Results

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

Table 14

Frequency (MHz)	Tissue Type	Conductivity Target (S/m)	Dielectric Constant Target	Conductivity Meas. (S/m)	Dielectric Constant Meas.	Tested Date
140	FCC Body	0.79 (0.75-0.83)	62.2 (59.0-65.3)	0.79	59.2	06/27/2019
	IEEE/ IEC Head	0.75 (0.72-0.79)	52.8 (50.1-55.4)	0.78	52.0	07/04/2019
150	FCC Body	0.80 (0.76-0.84)	61.9 (58.8-65.0)	0.77	59.8	06/16/2019#
				0.79	58.8	06/27/2019
				0.77	60.0	07/04/2019
	IEEE/ IEC Head	0.76 (0.72-0.80)	52.3 (49.7-54.9)	0.75	51.5	06/19/2019
				0.79	51.6	07/04/2019
168	FCC Body	0.81 (0.77-0.86)	61.5 (58.4-64.5)	0.78	59.4	06/16/2019#
				0.78	59.6	07/04/2019
	IEEE/ IEC Head	0.77 (0.73-0.81)	51.5 (48.9-54.0)	0.77	50.8	06/19/2019

Tissue sheet date cover next testing day (within 24 hrs)

11.0 Environmental Test Conditions

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

Table 15

	Target	Measured
Ambient Temperature	18 – 25 ˚C	Range: 20.2-23.9˚C Avg. 22.6˚C
Tissue Temperature	18 – 25 ˚C	Range: 21. 2-21.3˚C Avg. 21.25˚C

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

12.0 DUT Test Setup and Methodology

12.1 Measurements

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

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

Table 16

Description		≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface		5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location		30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: ΔxArea, ΔyArea		≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
		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.	
Maximum zoom scan spatial resolution: ΔxZoom, ΔyZoom		≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: ΔzZoom(n)	≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
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.			

12.2 DUT Configuration(s)

The DUT is a portable device operational at the body and face as described in section 6.0 while using the applicable accessories listed in section 7.0.

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 against the phantom with the offered body worn accessory and without audio accessories.

12.3.2 Head

Not applicable.

12.3.3 Face

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

12.4 DUT Test Channels

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

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

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

12.5 SAR Result Scaling Methodology

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

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

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

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

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

12.6 DUT Test Plan

The DUT was assessed at the body and face using the highest applicable configuration found during initial compliance assessment on filed with the FCC and ISED. All modes of operation identified in section 6.0 were considered during the development of the test plan. All tests were performed in CW and 50% duty cycle was applied to PTT configurations in the final results.

13.0 DUT Test Data

13.1 LMR assessment for FCC

Assessments at the Body and Face were done with offered antenna, batteries and body worn accessory indicated in section 7.0 without an audio accessory attached, which represents the highest applicable configuration at the body found during the initial compliance assessment on file with the FCC. SAR plot of the result presented in Table 17 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)	Max Calc. 1g-SAR (W/kg)	Run#
Body									
NAR6593A	NNTN7034B	HLN6875A	None	167.7500	6.44	-0.11	6.23	3.27	LOH-AB-190617-13#
Face									
NAR6593A	PMNN4485A	None; Radio @front	None	167.7500	6.34	-0.04	1.61	0.85	LOH-FACE-190619-06

13.2 LMR assessment for ISED

Assessments at the Body and Face were done with offered antenna and battery and body worn accessory indicated in section 7.0, which represent the highest applicable configurations at the face found during the initial compliance assessment on file with the ISED. SAR plot of the result presented in Table 18 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)	Max Calc. 1g-SAR (W/kg)	Run#
Body									
NAR6593A	NNTN7034B	HLN6875A	None	139.7000	6.34	-0.28	8.41	4.67	ZZ-AB-190627-09
Face									
NAR6593A	PMNN4485A	None; Radio @front	None	139.7000	6.60	-0.17	1.99	1.03	LOH-FACE-190704-06

13.3 Shortened Scan Assessment

A "shortened" scan using the highest SAR configuration overall from FCC 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 E.

Table 19

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Run#
NAR6593A	NNTN7034B	HLN6875A	None	167.7500	6.44	-0.56	5.85	**3.41**	LOH-AB-190704-04

14.0 Simultaneous Transmission between LMR, WLAN and BT

These devices use a single transmitter module and antenna for both WLAN and BT. WLAN and BT cannot transmit simultaneously. Simultaneous transmission for BT had been excluded as derived in the initial filing. WLAN 802.11b measured SAR during initial compliance assessment is used in conjunction with LMR for simultaneous results.

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

Table 20

		LMR Band
	Freq. (MHz)	UHF (136-174 MHz)
WLAN Band	2412 - 2462	√

15.0 Results Summary

The highest Operational Maximum Calculated 1-gram average SAR values found for this filing:

Table 21

Technologies	Frequency band (MHz)	Max Calc. at the Body (W/kg)	Max Calc. at the Face (W/kg)
FCC			
LMR VHF	150.8-173.4	*3.41	*0.85
WLAN	2412-2462	0.037	0.196
ISED			
LMR VHF	138-174	4.67	1.03
WLAN	2412-2462	0.037	0.196

Notes:
1. All results are scaled to the maximum output power.
2. * New highest reported SAR value replaced the initial filed results.

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

Table 22

Designator	Frequency bands	Combined 1g-SAR (W/kg)	
		Body	Face
FCC	LMR VHF and WLAN	*3.45	*1.05
ISED	LMR VHF and WLAN	4.71	1.23

Note:
* New highest reported SAR value replaced the initial filed results.

The new highest reported FCC SAR value for head, body-worn accessory and simultaneous transmission exposure conditions are 0.85 W/kg, 3.41W/kg and 3.45W/kg respectively. The initial FCC filed results 0.83 W/kg, 2.43 W/kg and 2.47 W/kg are hereby replaced with the results presented herein.

The initial ISED filed simultaneous transmission exposure for head 1.42 W/kg and Body 4.74 W/kg remain.

The test results clearly demonstrate compliance with FCC and ISED Occupational/Controlled RF Exposure limits of 8 W/kg averaged over 1 gram per the requirements of FCC 47 CFR § 2.1093 and RSS 102 (Issue 5).

16.0 System Uncertainty

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 150 MHz

a	*b*	*c*	*d*	*e = f(d,k)*	*f*	*g*	*h = c x f / e*	*i = c x g / e*	*k*
Uncertainty Component	**IEEE 1528 section**	**Tol. (± %)**	**Prob Dist**	**Div.**	**c_i (1 g)**	**c_i (10 g)**	**1 g u_i (±%)**	**10 g u_i (±%)**	**v_i**
Measurement System									
Probe Calibration	E.2.1	6.7	N	1.00	1	1	6.7	6.7	∞
Axial Isotropy	E.2.2	4.7	R	1.73	0.707	0.707	1.9	1.9	∞
Hemispherical Isotropy	E.2.2	9.6	R	1.73	0.707	0.707	3.9	3.9	∞
Boundary Effect	E.2.3	1.0	R	1.73	1	1	0.6	0.6	∞
Linearity	E.2.4	4.7	R	1.73	1	1	2.7	2.7	∞
System Detection Limits	E.2.5	1.0	R	1.73	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	0.3	N	1.00	1	1	0.3	0.3	∞
Response Time	E.2.7	1.1	R	1.73	1	1	0.6	0.6	∞
Integration Time	E.2.8	1.1	R	1.73	1	1	0.6	0.6	∞
RF Ambient Conditions - Noise	E.6.1	3.0	R	1.73	1	1	1.7	1.7	∞
RF Ambient Conditions - Reflections	E.6.1	0.0	R	1.73	1	1	0.0	0.0	∞
Probe Positioner Mech. Tolerance	E.6.2	0.4	R	1.73	1	1	0.2	0.2	∞
Probe Positioning w.r.t Phantom	E.6.3	1.4	R	1.73	1	1	0.8	0.8	∞
Max. SAR Evaluation (ext., int., avg.)	E.5	3.4	R	1.73	1	1	2.0	2.0	∞
Test sample Related									
Test Sample Positioning	E.4.2	3.2	N	1.00	1	1	3.2	3.2	29
Device Holder Uncertainty	E.4.1	4.0	N	1.00	1	1	4.0	4.0	8
SAR drift	6.6.2	5.0	R	1.73	1	1	2.9	2.9	∞
Phantom and Tissue Parameters									
Phantom Uncertainty	E.3.1	4.0	R	1.73	1	1	2.3	2.3	∞
Liquid Conductivity (target)	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity (measurement)	E.3.3	3.3	N	1.00	0.64	0.43	2.1	1.4	∞
Liquid Permittivity (target)	E.3.2	5.0	R	1.73	0.6	0.49	1.7	1.4	∞
Liquid Permittivity (measurement)	E.3.3	1.9	N	1.00	0.6	0.49	1.1	0.9	∞
Combined Standard Uncertainty			RSS				12	11	482
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 Validation (dipole & flat phantom) for 150 MHz

a	*b*	*c*	*d*	*e = f(d,k)*	*f*	*g*	*h = c x f / e*	*i = c x g / e*	*k*
Uncertainty Component	**IEEE 1528 section**	**Tol. (± %)**	**Prob. Dist.**	**Div.**	**c_i (1 g)**	**c_i (10 g)**	**1 g u_i (±%)**	**10 g u_i (±%)**	**v_i**
Measurement System									
Probe Calibration	E.2.1	6.7	N	1.00	1	1	6.7	6.7	∞
Axial Isotropy	E.2.2	4.7	R	1.73	1	1	2.7	2.7	∞
Spherical Isotropy	E.2.2	9.6	R	1.73	0	0	0.0	0.0	∞
Boundary Effect	E.2.3	1.0	R	1.73	1	1	0.6	0.6	∞
Linearity	E.2.4	4.7	R	1.73	1	1	2.7	2.7	∞
System Detection Limits	E.2.5	1.0	R	1.73	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	0.3	N	1.00	1	1	0.3	0.3	∞
Response Time	E.2.7	1.1	R	1.73	1	1	0.6	0.6	∞
Integration Time	E.2.8	0.0	R	1.73	1	1	0.0	0.0	∞
RF Ambient Conditions - Noise	E.6.1	3.0	R	1.73	1	1	1.7	1.7	∞
RF Ambient Conditions - Reflections	E.6.1	0.0	R	1.73	1	1	0.0	0.0	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.4	R	1.73	1	1	0.2	0.2	∞
Probe Positioning w.r.t. Phantom	E.6.3	1.4	R	1.73	1	1	0.8	0.8	∞
Max. SAR Evaluation (ext., int., avg.)	E.5	3.4	R	1.73	1	1	2.0	2.0	∞
Dipole									
Dipole Axis to Liquid Distance	8, E.4.2	2.0	R	1.73	1	1	1.2	1.2	∞
Input Power and SAR Drift Measurement	8, 6.6.2	5.0	R	1.73	1	1	2.9	2.9	∞
Phantom and Tissue Parameters									
Phantom Uncertainty	E.3.1	4.0	R	1.73	1	1	2.3	2.3	∞
Liquid Conductivity (target)	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity (measurement)	E.3.3	3.3	R	1.73	0.64	0.43	1.2	0.8	∞
Liquid Permittivity (target)	E.3.2	5.0	R	1.73	0.6	0.49	1.7	1.4	∞
Liquid Permittivity (measurement)	E.3.3	1.9	R	1.73	0.6	0.49	0.6	0.5	∞
Combined Standard Uncertainty			RSS				10	9	99999
Expanded Uncertainty (95% CONFIDENCE LEVEL)			*k*=2				19	18	

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

Appendix B
Probe Calibration Certificates

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

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

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

Accreditation No.: SCS 0108

Client Motorola Solutions MY

Certificate No: EX3-7364_Jan19

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:7364

Calibration procedure(s): QA CAL-01.v9, QA CAL-12.v9, QA CAL-14.v5, QA CAL-23.v5, QA CAL-25.v7
Calibration procedure for dosimetric E-field probes

Calibration date: January 23, 2019

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-18 (No. 217-02682)	Apr-19
DAE4	SN: 660	19-Dec-18 (No. DAE4-660_Dec18)	Dec-19
Reference Probe ES3DV2	SN: 3013	31-Dec-18 (No. ES3-3013_Dec18)	Dec-19
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-18)	In house check: Jun-20
Network Analyzer E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19

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

Issued: January 26, 2019

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, ", "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
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).

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

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.46	0.46	0.57	± 10.1 %
DCP (mV)[B]	99.7	97.6	99.3	

Calibration Results for Modulation Response

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Max dev.	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	114.6	+ 2.7 %	± 4.7 %
		Y	0.0	0.0	1.0		112.4		
		Y	0.0	0.0	1.0		127.7		

Note: For details on UID parameters see Appendix

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

[A] The uncertainties of Norm X,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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

Sensor Model Parameters

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	129.9
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

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

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
150	52.3	0.76	12.97	12.97	12.97	0.00	1.00	± 13.3 %
300	45.3	0.87	12.05	12.05	12.05	0.09	1.20	± 13.3 %
450	43.5	0.87	10.75	10.75	10.75	0.13	1.30	± 13.3 %
750	41.9	0.89	10.42	10.42	10.42	0.56	0.80	± 12.0 %
835	41.5	0.90	10.23	10.23	10.23	0.30	1.09	± 12.0 %
900	41.5	0.97	9.78	9.78	9.78	0.31	1.08	± 12.0 %
1810	40.0	1.40	8.25	8.25	8.25	0.35	0.87	± 12.0 %
1900	40.0	1.40	8.19	8.19	8.19	0.37	0.85	± 12.0 %
2100	39.8	1.49	8.15	8.15	8.15	0.25	1.09	± 12.0 %
2450	39.2	1.80	7.38	7.38	7.38	0.40	0.85	± 12.0 %
5250	35.9	4.71	5.08	5.08	5.08	0.40	1.80	± 13.1 %
5500	35.6	4.96	4.86	4.86	4.86	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.68	4.68	4.68	0.40	1.80	± 13.1 %
5750	35.4	5.22	4.72	4.72	4.72	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. Validity of ConvF assessed at 6 MHz is 4-9 MHz, and ConvF assessed at 13 MHz is 9-19 MHz. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

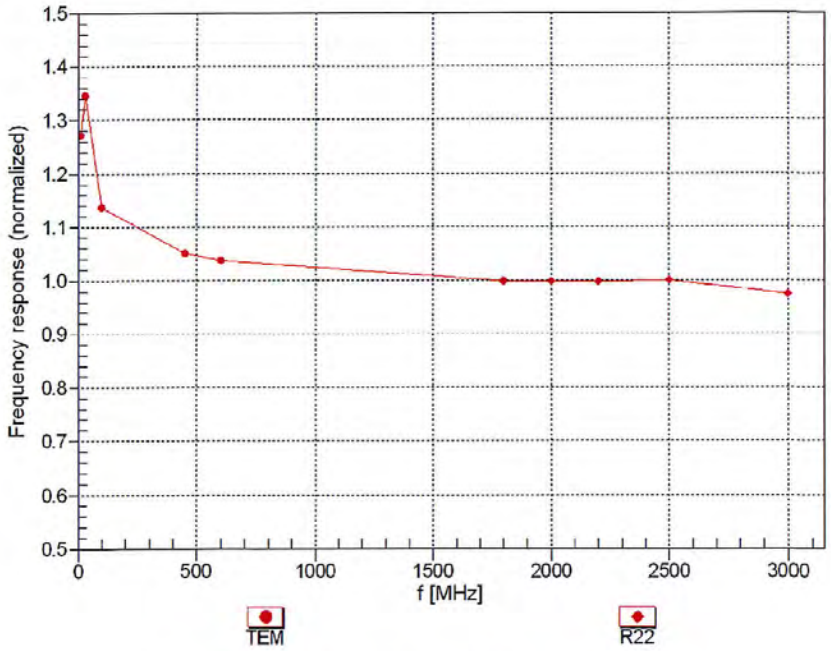
DASY/EASY - Parameters of Probe: EX3DV4 - SN:7364

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
150	61.9	0.80	12.37	12.37	12.37	0.00	1.00	± 13.3 %
300	58.2	0.92	11.79	11.79	11.79	0.05	1.20	± 13.3 %
450	56.7	0.94	11.17	11.17	11.17	0.14	1.30	± 13.3 %
750	55.5	0.96	10.24	10.24	10.24	0.50	0.83	± 12.0 %
835	55.2	0.97	9.94	9.94	9.94	0.41	0.90	± 12.0 %
900	55.0	1.05	9.93	9.93	9.93	0.35	0.96	± 12.0 %
1810	53.3	1.52	7.97	7.97	7.97	0.44	0.85	± 12.0 %
1900	53.3	1.52	7.89	7.89	7.89	0.46	0.85	± 12.0 %
2100	53.2	1.62	7.96	7.96	7.96	0.46	0.90	± 12.0 %
2450	52.7	1.95	7.48	7.48	7.48	0.34	0.98	± 12.0 %
5250	48.9	5.36	4.47	4.47	4.47	0.45	1.90	± 13.1 %
5500	48.6	5.65	4.07	4.07	4.07	0.45	1.90	± 13.1 %
5600	48.5	5.77	3.89	3.89	3.89	0.45	1.90	± 13.1 %
5750	48.3	5.94	4.19	4.19	4.19	0.45	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. Validity of ConvF assessed at 6 MHz is 4-9 MHz, and ConvF assessed at 13 MHz is 9-19 MHz. 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)

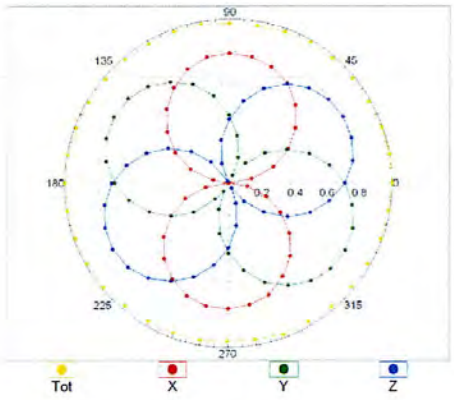


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

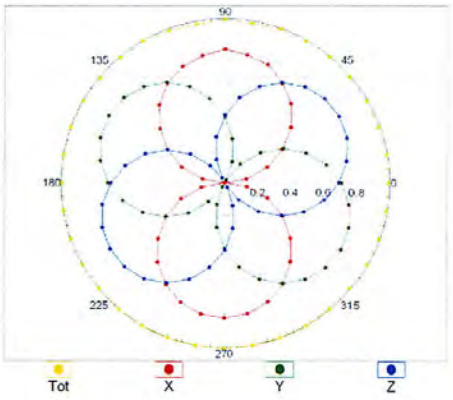
EX3DV4– SN:7364 January 23, 2019

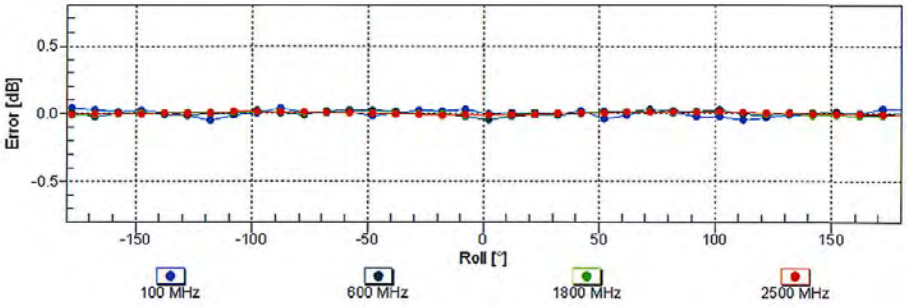
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



f=1800 MHz,R22

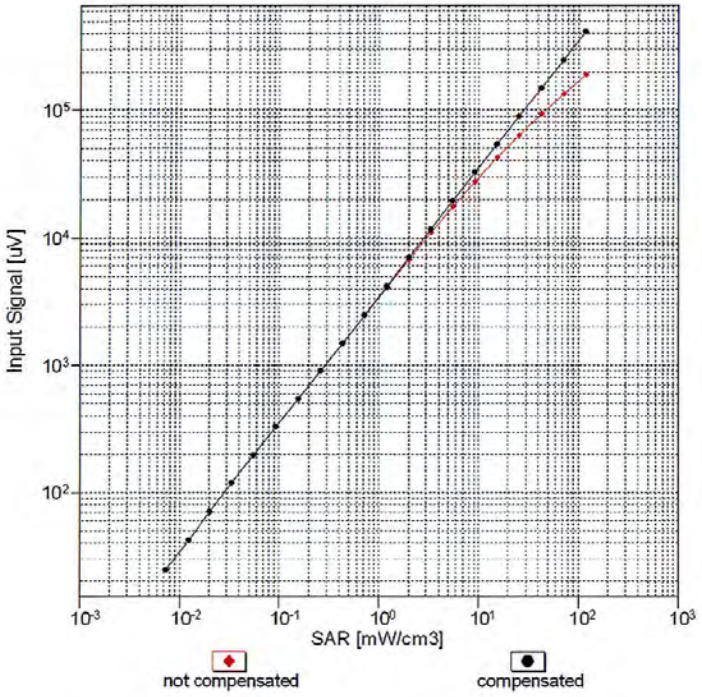


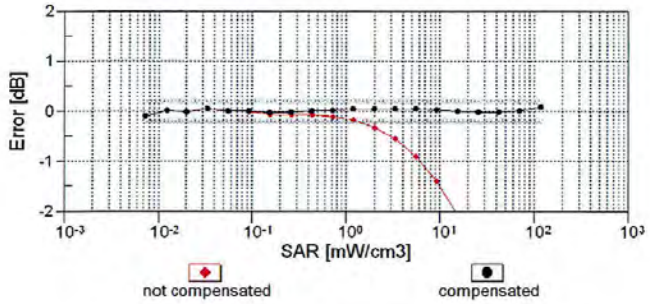


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

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

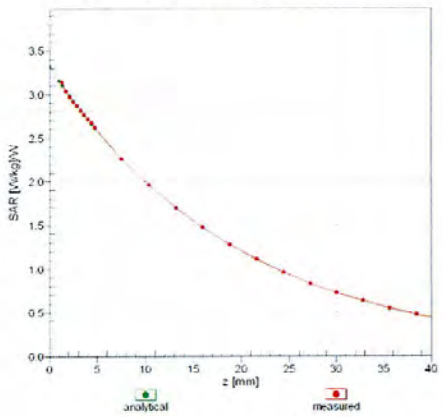




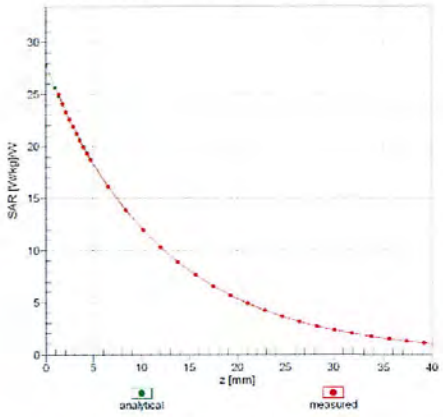
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

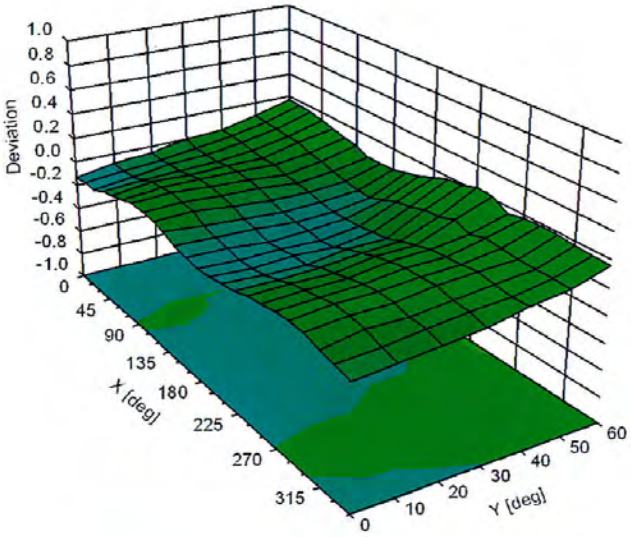


f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

Appendix: Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	114.6	±2.7 %
		Y	0.0	0.0	1.0		112.4	
		Z	0.0	0.0	1.0		127.7	
10021-DAC	GSM-FDD (TDMA, GMSK)	X	1.72	63.0	12.0	9.39	94.6	±1.9 %
		Y	1.71	65.4	13.2		68.7	
		Z	2.22	65.7	13.5		108.0	
10023-DAC	GPRS-FDD (TDMA, GMSK, TN 0)	X	1.75	63.4	12.3	9.57	91.5	±1.7 %
		Y	1.83	65.6	13.2		67.1	
		Z	2.26	65.5	13.3		104.9	
10024-DAC	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	1.71	64.7	10.9	6.56	147.1	±1.2 %
		Y	4.98	81.5	18.4		127.8	
		Z	2.35	69.4	14.0		131.0	
10025-DAC	EDGE-FDD (TDMA, 8PSK, TN 0)	X	5.28	72.4	25.7	12.62	61.2	±1.2 %
		Y	4.38	68.1	23.6		44.2	
		Z	5.84	75.3	27.6		69.5	
10026-DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1)	X	5.13	74.3	24.8	9.55	140.7	±1.9 %
		Y	4.43	71.4	23.6		100.8	
		Z	5.35	74.8	25.1		128.7	
10027-DAC	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	1.22	62.4	8.8	4.80	140.5	±1.7 %
		Y	29.58	100.0	21.9		130.1	
		Z	34.45	99.7	22.2		118.2	
10028-DAC	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	54.30	99.7	20.4	3.55	116.7	±1.9 %
		Y	0.97	66.1	10.9		148.2	
		Z	43.93	99.7	21.0		131.0	
10029-DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1-2)	X	4.59	72.8	23.2	7.78	137.7	±1.4 %
		Y	3.83	68.9	21.1		125.2	
		Z	5.87	78.6	26.0		118.8	
10039-CAB	CDMA2000 (1xRTT, RC1)	X	4.72	66.7	19.1	4.57	123.7	±0.9 %
		Y	4.44	65.3	18.2		121.2	
		Z	4.88	67.4	19.4		140.2	
10056-CAA	UMTS-TDD (TD-SCDMA, 1.28 Mcps)	X	4.17	68.9	23.5	11.01	89.7	±1.4 %
		Y	3.52	65.8	22.2		64.7	
		Z	4.64	71.3	24.8		101.7	
10058-DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1-2-3)	X	4.77	75.3	23.9	6.52	116.4	±1.4 %
		Y	4.03	71.6	22.1		147.1	
		Z	5.32	76.9	24.4		133.3	
10081-CAB	CDMA2000 (1xRTT, RC3)	X	4.00	66.6	18.9	3.97	120.2	±0.5 %
		Y	3.78	65.2	18.0		118.1	
		Z	4.11	67.0	19.1		136.1	

10090-DAC	GPRS-FDD (TDMA, GMSK, TN 0-4)	X	1.59	64.6	11.2	6.56	144.9	±1.9 %
		Y	1.86	68.3	12.9		126.4	
		Z	2.87	71.7	14.8		131.1	
10099-DAC	EDGE-FDD (TDMA, 8PSK, TN 0-4)	X	5.33	75.9	25.9	9.55	139.0	±2.2 %
		Y	4.36	71.0	23.4		99.7	
		Z	5.59	76.5	26.3		126.6	
10117-CAC	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	9.95	68.2	21.0	8.07	124.6	±2.2 %
		Y	9.62	67.4	20.5		119.2	
		Z	10.30	69.2	21.6		143.9	
10196-CAC	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.61	68.0	21.0	8.10	119.9	±1.9 %
		Y	9.28	67.1	20.4		114.4	
		Z	9.94	69.0	21.6		137.6	
10290-AAB	CDMA2000, RC1, SO55, Full Rate	X	4.41	67.8	19.3	3.91	123.6	±0.7 %
		Y	4.02	65.7	18.1		120.5	
		Z	4.58	68.5	19.6		139.9	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.79	67.8	19.3	3.46	120.1	±0.5 %
		Y	3.37	65.1	17.7		117.4	
		Z	3.91	68.2	19.5		135.9	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.75	67.9	19.4	3.39	120.3	±0.5 %
		Y	3.35	65.3	17.8		117.1	
		Z	3.86	68.3	19.5		135.5	
10293-AAB	CDMA2000, RC3, SO3, Full Rate	X	3.86	68.0	19.4	3.50	120.3	±0.5 %
		Y	3.44	65.4	17.9		117.0	
		Z	3.91	68.0	19.4		135.8	
10295-AAB	CDMA2000, RC1, SO3, 1/8th Rate 25 fr.	X	5.27	66.0	23.4	12.49	74.0	±1.4 %
		Y	4.56	62.5	21.4		53.0	
		Z	5.70	68.1	24.8		84.1	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	5.20	70.4	19.9	3.76	126.4	±0.5 %
		Y	4.56	67.7	18.4		123.3	
		Z	5.28	70.5	19.9		143.5	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	5.38	71.6	20.6	3.77	124.9	±0.7 %
		Y	4.42	67.3	18.2		121.9	
		Z	5.02	69.8	19.6		142.4	
10406-AAB	CDMA2000, RC3, SO32, SCH0, Full Rate	X	6.70	71.0	20.9	5.22	129.5	±0.7 %
		Y	5.85	67.9	19.2		125.2	
		Z	6.66	70.6	20.7		148.5	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	3.44	72.9	21.1	1.54	126.4	±0.5 %
		Y	2.56	67.0	17.9		123.5	
		Z	3.20	71.3	20.2		142.2	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	9.70	68.1	21.2	8.23	119.3	±1.9 %
		Y	9.38	67.2	20.5		114.1	
		Z	10.02	69.0	21.7		137.1	

10417-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle)	X	9.70	68.1	21.2	8.23	119.3	±1.9 %
		Y	9.42	67.3	20.6		114.1	
		Z	10.03	69.0	21.7		137.4	
10418-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Long preambule)	X	9.58	68.0	21.1	8.14	118.4	±1.9 %
		Y	9.30	67.2	20.5		113.4	
		Z	9.87	68.9	21.6		136.2	
10458-AAA	CDMA2000 (1xEV-DO, Rev. B, 2 carriers)	X	7.83	67.4	19.9	6.55	108.2	±1.2 %
		Y	7.69	67.0	19.4		104.5	
		Z	8.11	68.2	20.3		124.3	
10459-AAA	CDMA2000 (1xEV-DO, Rev. B, 3 carriers)	X	10.63	69.2	21.7	8.25	130.7	±2.2 %
		Y	10.48	68.9	21.4		123.4	
		Z	10.07	67.8	20.9		101.8	
10515-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 99pc duty cycle)	X	3.51	73.4	21.3	1.58	125.8	±0.5 %
		Y	2.68	68.0	18.5		122.8	
		Z	3.41	72.6	20.8		142.5	
10518-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 99pc duty cycle)	X	9.68	68.0	21.1	8.23	118.9	±1.9 %
		Y	9.42	67.3	20.6		114.1	
		Z	10.04	69.1	21.7		137.4	
10525-AAB	IEEE 802.11ac WiFi (20MHz, MCS0, 99pc duty cycle)	X	9.92	68.2	21.3	8.36	120.5	±1.9 %
		Y	9.66	67.6	20.8		116.3	
		Z	10.24	69.2	21.9		139.1	
10526-AAB	IEEE 802.11ac WiFi (20MHz, MCS1, 99pc duty cycle)	X	10.00	68.3	21.4	8.42	120.7	±1.9 %
		Y	9.69	67.5	20.8		116.2	
		Z	10.32	69.3	22.0		139.3	
10534-AAB	IEEE 802.11ac WiFi (40MHz, MCS0, 99pc duty cycle)	X	10.41	68.7	21.5	8.45	125.5	±2.2 %
		Y	10.06	67.8	20.9		120.8	
		Z	10.78	69.7	22.1		145.9	
10535-AAB	IEEE 802.11ac WiFi (40MHz, MCS1, 99pc duty cycle)	X	10.43	68.7	21.5	8.45	126.5	±2.2 %
		Y	10.08	67.9	20.9		121.2	
		Z	10.78	69.7	22.1		146.0	
10544-AAB	IEEE 802.11ac WiFi (80MHz, MCS0, 99pc duty cycle)	X	10.74	69.0	21.5	8.47	130.5	±2.2 %
		Y	10.26	67.9	20.8		123.8	
		Z	10.20	67.7	20.8		101.3	
10545-AAB	IEEE 802.11ac WiFi (80MHz, MCS1, 99pc duty cycle)	X	10.83	69.1	21.6	8.55	130.8	±2.2 %
		Y	10.36	68.1	21.0		124.5	
		Z	10.28	67.8	20.9		101.7	
10564-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 99pc duty cycle)	X	9.76	68.2	21.2	8.25	119.0	±1.9 %
		Y	9.46	67.4	20.7		114.6	
		Z	10.08	69.1	21.8		137.5	
10571-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 90pc duty cycle)	X	3.65	73.3	21.4	1.99	123.5	±0.5 %
		Y	2.71	67.4	18.4		120.2	
		Z	3.53	72.6	21.0		138.6	

10572-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 90pc duty cycle)	X	3.80	74.3	21.8	1.99	122.7	±0.5 %
		Y	2.83	68.4	18.9		120.1	
		Z	3.60	73.2	21.2		138.7	
10575-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 90pc duty cycle)	X	9.84	68.2	21.5	8.59	117.1	±1.9 %
		Y	9.55	67.4	20.9		112.7	
		Z	10.17	69.1	22.0		134.4	
10576-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 90pc duty cycle)	X	9.84	68.2	21.5	8.60	116.5	±1.9 %
		Y	9.55	67.4	20.9		112.4	
		Z	10.18	69.2	22.1		134.2	
10583-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty cycle)	X	9.87	68.3	21.5	8.59	117.1	±1.9 %
		Y	9.55	67.4	20.9		112.6	
		Z	10.18	69.2	22.1		134.3	
10584-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 90pc duty cycle)	X	9.87	68.3	21.5	8.60	116.6	±1.9 %
		Y	9.54	67.4	20.9		112.3	
		Z	10.17	69.2	22.1		134.1	
10591-AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS0, 90pc duty cycle)	X	9.98	68.3	21.5	8.63	118.4	±1.9 %
		Y	9.66	67.4	20.9		113.7	
		Z	10.29	69.2	22.1		136.0	
10592-AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS1, 90pc duty cycle)	X	10.14	68.4	21.7	8.79	118.6	±2.2 %
		Y	9.83	67.6	21.1		113.8	
		Z	10.49	69.5	22.3		136.9	
10599-AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS0, 90pc duty cycle)	X	10.57	68.8	21.8	8.79	124.4	±2.2 %
		Y	10.16	67.8	21.1		118.7	
		Z	10.89	69.7	22.4		143.5	
10600-AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS1, 90pc duty cycle)	X	10.65	68.9	21.9	8.88	123.9	±2.2 %
		Y	10.24	67.9	21.2		118.8	
		Z	10.98	69.9	22.5		143.9	
10607-AAB	IEEE 802.11ac WiFi (20MHz, MCS0, 90pc duty cycle)	X	9.99	68.3	21.5	8.64	118.6	±2.2 %
		Y	9.67	67.4	20.9		113.5	
		Z	10.33	69.3	22.1		136.4	
10608-AAB	IEEE 802.11ac WiFi (20MHz, MCS1, 90pc duty cycle)	X	10.13	68.4	21.7	8.77	118.9	±1.9 %
		Y	9.80	67.6	21.1		113.5	
		Z	10.48	69.5	22.3		137.0	
10616-AAB	IEEE 802.11ac WiFi (40MHz, MCS0, 90pc duty cycle)	X	10.58	68.8	21.8	8.82	124.5	±2.2 %
		Y	10.21	67.9	21.2		118.8	
		Z	10.94	69.8	22.4		143.9	
10617-AAB	IEEE 802.11ac WiFi (40MHz, MCS1, 90pc duty cycle)	X	10.59	68.8	21.8	8.81	124.8	±2.2 %
		Y	10.21	67.9	21.2		118.9	
		Z	10.93	69.8	22.4		144.1	
10626-AAB	IEEE 802.11ac WiFi (80MHz, MCS0, 90pc duty cycle)	X	10.89	69.1	21.8	8.83	128.8	±2.2 %
		Y	10.39	68.0	21.1		121.6	
		Z	11.24	70.1	22.4		149.4	

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10627-AAB	IEEE 802.11ac WiFi (80MHz, MCS1, 90pc duty cycle)	X	10.94	69.1	21.9	8.88	129.3	±2.2 %
		Y	10.43	68.0	21.1		121.2	
		Z	11.32	70.2	22.5		149.9	
10648-AAA	CDMA2000 (1x Advanced)	X	3.77	67.8	19.4	3.45	120.1	±0.7 %
		Y	3.51	66.0	18.3		117.6	
		Z	3.94	68.6	19.8		136.8	

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

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

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The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Client **Motorola Solutions MY**

Certificate No: **EX3-3612_Oct18**

CALIBRATION CERTIFICATE

Object EX3DV4 - SN:3612

Calibration procedure(s) QA CAL-01.v9, QA CAL-12.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

Calibration date: October 18, 2018

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-18 (No. 217-02682)	Apr-19
Reference Probe ES3DV2	SN: 3013	30-Dec-17 (No. ES3-3013_Dec17)	Dec-18
DAE4	SN: 660	21-Dec-17 (No. DAE4-660_Dec17)	Dec-18
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-18)	In house check: Jun-20
Network Analyzer E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19

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

Issued: October 23, 2018

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

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Accredited by the Swiss Accreditation Service (SAS) Accreditation No.: **SCS 0108**
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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, ", "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

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

Probe EX3DV4

SN:3612

Manufactured: March 23, 2007
Calibrated: October 18, 2018

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

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

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.43	0.48	0.39	± 10.1 %
DCP (mV)[B]	97.2	94.9	96.3	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	147.9	±3.5 %
		Y	0.0	0.0	1.0		139.1	
		Z	0.0	0.0	1.0		141.6	

Note: For details on UID parameters see Appendix.

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

[A] The uncertainties of Norm X,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
150	52.3	0.76	9.98	9.98	9.98	0.00	1.00	± 13.3 %
300	45.3	0.87	9.88	9.88	9.88	0.07	1.30	± 13.3 %
450	43.5	0.87	9.09	9.09	9.09	0.13	1.30	± 13.3 %
750	41.9	0.89	8.79	8.79	8.79	0.36	1.00	± 12.0 %
835	41.5	0.90	8.23	8.23	8.23	0.52	0.84	± 12.0 %
900	41.5	0.97	8.08	8.08	8.08	0.49	0.86	± 12.0 %
1810	40.0	1.40	7.20	7.20	7.20	0.35	0.96	± 12.0 %
1900	40.0	1.40	7.16	7.16	7.16	0.40	0.90	± 12.0 %
2100	39.8	1.49	7.27	7.27	7.27	0.40	0.90	± 12.0 %
2450	39.2	1.80	6.51	6.51	6.51	0.40	0.90	± 12.0 %
4950	36.3	4.40	4.95	4.95	4.95	0.40	1.80	± 13.1 %
5250	35.9	4.71	4.63	4.63	4.63	0.40	1.80	± 13.1 %
5500	35.6	4.96	4.55	4.55	4.55	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.31	4.31	4.31	0.40	1.80	± 13.1 %
5750	35.4	5.22	4.70	4.70	4.70	0.40	1.80	± 13.1 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

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

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

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
150	61.9	0.80	9.73	9.73	9.73	0.00	1.00	± 13.3 %
300	58.2	0.92	9.32	9.32	9.32	0.05	1.20	± 13.3 %
450	56.7	0.94	9.24	9.24	9.24	0.07	1.20	± 13.3 %
750	55.5	0.96	8.55	8.55	8.55	0.47	0.87	± 12.0 %
835	55.2	0.97	8.21	8.21	8.21	0.39	0.91	± 12.0 %
900	55.0	1.05	8.17	8.17	8.17	0.47	0.85	± 12.0 %
1810	53.3	1.52	6.97	6.97	6.97	0.40	0.95	± 12.0 %
1900	53.3	1.52	6.83	6.83	6.83	0.45	0.90	± 12.0 %
2100	53.2	1.62	7.02	7.02	7.02	0.30	1.07	± 12.0 %
2450	52.7	1.95	6.70	6.70	6.70	0.40	0.95	± 12.0 %
4950	49.4	5.01	4.28	4.28	4.28	0.50	1.90	± 13.1 %
5250	48.9	5.36	4.14	4.14	4.14	0.50	1.90	± 13.1 %
5500	48.6	5.65	3.78	3.78	3.78	0.50	1.90	± 13.1 %
5600	48.5	5.77	3.69	3.69	3.69	0.50	1.90	± 13.1 %
5750	48.3	5.94	3.96	3.96	3.96	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.

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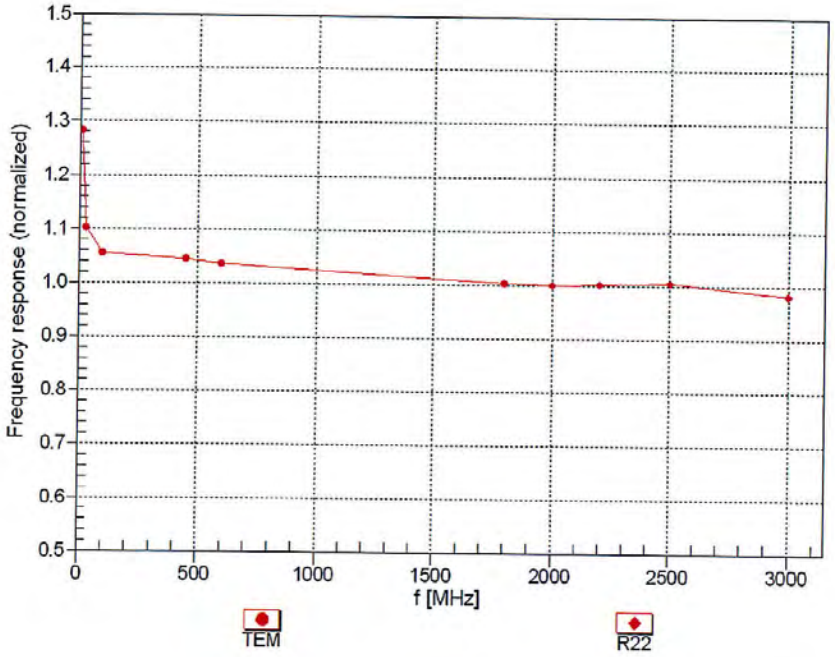
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



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

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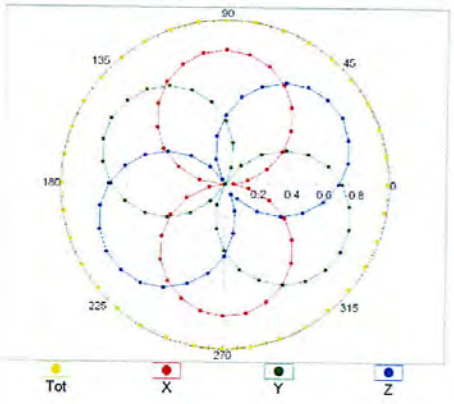
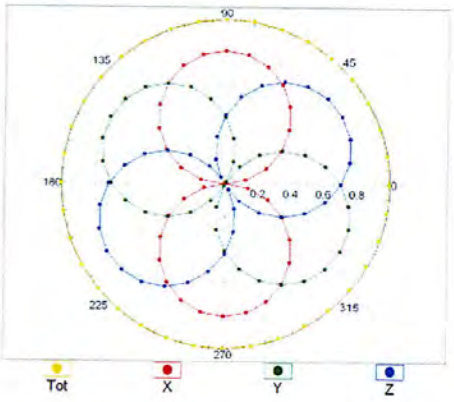
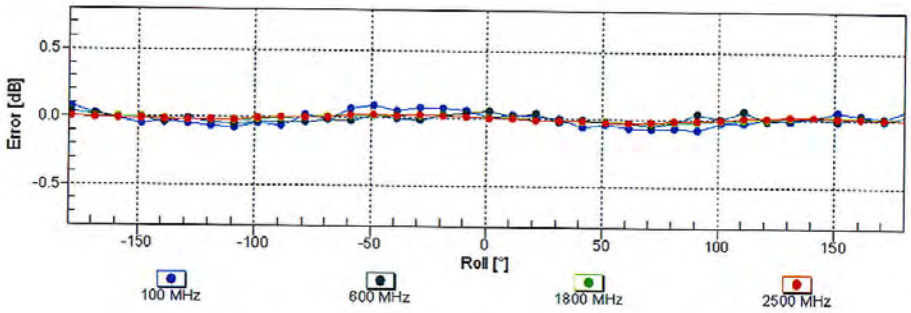
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



f=1800 MHz,R22





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

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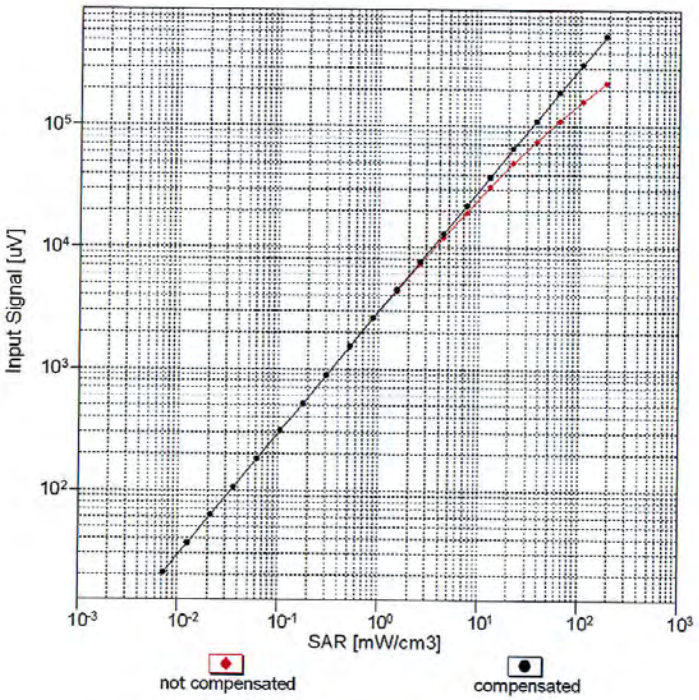
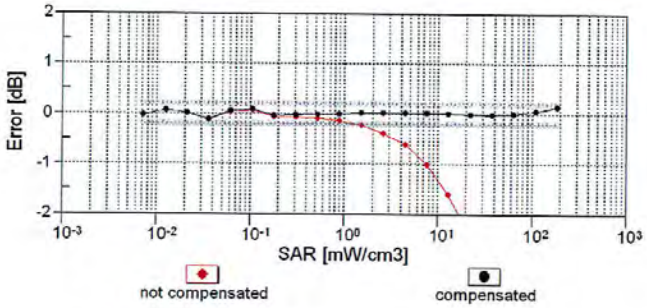
Dynamic Range f(SAR$_{head}$)
(TEM cell , f_{eval}= 1900 MHz)





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

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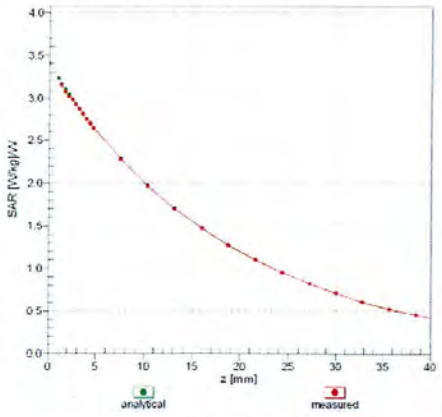
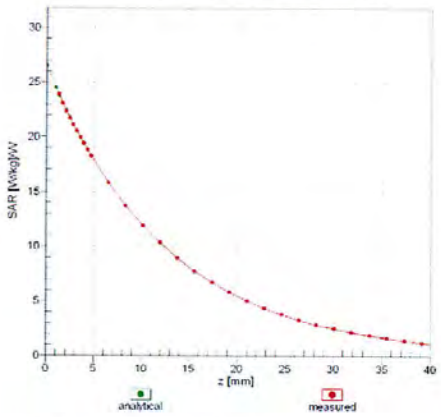
Conversion Factor Assessment

f = 900 MHz,WGLS R9 (H_convF)

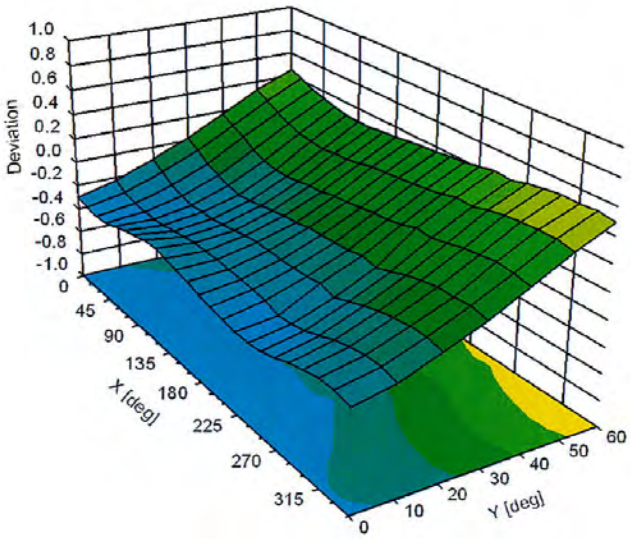


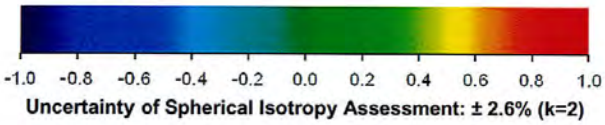
f = 1810 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





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

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

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	81.3
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

Appendix: Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	147.9	±3.5 %
		Y	0.0	0.0	1.0		139.1	
		Z	0.0	0.0	1.0		141.6	
10021-DAC	GSM-FDD (TDMA, GMSK)	X	1.69	63.3	11.9	9.39	89.4	±1.4 %
		Y	1.80	66.0	13.2		62.6	
		Z	1.81	63.3	12.3		87.6	
10023-DAC	GPRS-FDD (TDMA, GMSK, TN 0)	X	1.68	62.7	11.5	9.57	86.7	±1.4 %
		Y	1.83	66.3	13.4		60.7	
		Z	1.80	62.8	12.0		85.4	
10024-DAC	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	1.53	64.1	11.0	6.56	137.8	±1.2 %
		Y	2.39	71.8	14.2		115.7	
		Z	2.22	68.5	13.3		134.8	
10025-DAC	EDGE-FDD (TDMA, 8PSK, TN 0)	X	5.30	72.2	25.5	12.62	58.2	±1.2 %
		Y	3.83	63.8	21.1		40.1	
		Z	5.51	72.8	25.8		56.5	
10026-DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1)	X	4.79	72.5	24.1	9.55	131.7	±1.2 %
		Y	3.79	66.5	20.7		91.4	
		Z	5.19	74.1	24.7		129.8	
10027-DAC	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	1.07	61.6	8.6	4.80	132.4	±1.2 %
		Y	1.21	66.9	11.9		147.8	
		Z	1.41	64.1	10.0		128.7	
10028-DAC	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	37.91	99.7	21.0	3.55	148.0	±1.2 %
		Y	0.70	62.0	9.0		135.5	
		Z	0.96	61.1	7.5		144.3	
10029-DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1-2)	X	4.32	71.0	22.1	7.78	130.4	±1.4 %
		Y	4.18	70.9	22.2		143.3	
		Z	4.75	73.1	23.2		126.8	
10039-CAB	CDMA2000 (1xRTT, RC1)	X	4.53	65.7	18.4	4.57	116.3	±0.9 %
		Y	4.50	65.4	18.2		149.7	
		Z	4.44	65.3	18.1		111.9	
10056-CAA	UMTS-TDD (TD-SCDMA, 1.28 Mcps)	X	4.05	68.3	23.1	11.01	84.6	±1.4 %
		Y	3.35	64.7	21.6		58.7	
		Z	4.22	68.9	23.4		82.5	
10058-DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1-2-3)	X	4.59	73.8	23.0	6.52	148.8	±0.9 %
		Y	3.53	68.1	20.3		133.4	
		Z	4.80	73.9	22.5		144.7	
10081-CAB	CDMA2000 (1xRTT, RC3)	X	3.83	65.4	18.1	3.97	113.8	±0.7 %
		Y	3.72	64.6	17.6		146.8	
		Z	3.76	65.0	17.8		109.2	

10090-DAC	GPRS-FDD (TDMA, GMSK, TN 0-4)	X	1.83	67.3	12.6	6.56	136.2	±1.4 %
		Y	3.66	77.8	16.6		113.9	
		Z	1.76	65.0	11.3		134.2	
10099-DAC	EDGE-FDD (TDMA, 8PSK, TN 0-4)	X	5.14	74.3	24.9	9.55	131.6	±1.7 %
		Y	4.11	69.2	22.4		90.6	
		Z	5.28	74.4	24.8		128.8	
10117-CAC	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	9.79	67.6	20.6	8.07	117.2	±2.2 %
		Y	9.39	66.6	20.0		106.3	
		Z	9.69	67.3	20.4		111.8	
10196-CAC	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.44	67.4	20.6	8.10	112.5	±2.5 %
		Y	9.68	68.1	20.9		147.7	
		Z	9.32	67.1	20.4		106.9	
10290-AAB	CDMA2000, RC1, SO55, Full Rate	X	4.21	66.6	18.6	3.91	116.4	±0.7 %
		Y	3.77	64.3	17.2		109.2	
		Z	4.05	65.7	17.9		111.9	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.53	65.9	18.2	3.46	113.6	±0.7 %
		Y	3.36	64.8	17.5		147.1	
		Z	3.55	65.9	18.1		109.1	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.48	65.9	18.2	3.39	113.1	±0.5 %
		Y	3.32	64.9	17.5		146.7	
		Z	3.53	66.2	18.1		109.1	
10293-AAB	CDMA2000, RC3, SO3, Full Rate	X	3.53	65.7	18.1	3.50	113.4	±0.7 %
		Y	3.37	64.7	17.4		147.0	
		Z	3.66	66.5	18.4		109.1	
10295-AAB	CDMA2000, RC1, SO3, 1/8th Rate 25 fr.	X	5.19	65.7	23.2	12.49	69.6	±1.2 %
		Y	4.39	61.5	20.8		48.0	
		Z	5.26	65.9	23.3		67.8	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	4.97	68.6	18.9	3.76	146.2	±0.7 %
		Y	5.26	69.9	19.9		132.8	
		Z	5.62	72.1	20.9		144.9	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	4.78	68.8	19.1	3.77	117.5	±0.5 %
		Y	4.44	67.2	18.1		110.4	
		Z	4.64	68.2	18.5		113.3	
10406-AAB	CDMA2000, RC3, SO32, SCH0, Full Rate	X	6.34	69.5	20.1	5.22	121.0	±0.9 %
		Y	5.63	66.9	18.6		113.0	
		Z	6.31	69.6	20.0		116.6	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	2.82	68.3	18.7	1.54	119.1	±0.5 %
		Y	2.28	64.6	16.6		111.7	
		Z	2.89	68.5	18.4		115.2	

10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	9.54	67.5	20.8	8.23	111.7	±2.5 %
		Y	9.74	68.0	21.0		147.4	
		Z	9.44	67.2	20.6		106.6	
10417-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle)	X	9.54	67.5	20.8	8.23	111.9	±2.5 %
		Y	9.75	68.1	21.0		147.2	
		Z	9.44	67.2	20.6		106.7	
10418-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Long preambule)	X	9.41	67.4	20.7	8.14	110.8	±2.5 %
		Y	9.61	68.0	20.9		146.6	
		Z	9.29	67.1	20.4		105.9	
10458-AAA	CDMA2000 (1xEV-DO, Rev. B, 2 carriers)	X	8.37	68.9	20.6	6.55	145.1	±1.9 %
		Y	7.89	67.4	19.7		134.8	
		Z	8.31	68.8	20.4		139.5	
10459-AAA	CDMA2000 (1xEV-DO, Rev. B, 3 carriers)	X	10.43	68.7	21.4	8.25	120.8	±2.2 %
		Y	10.22	68.1	20.9		110.4	
		Z	10.29	68.5	21.2		114.9	
10515-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 99pc duty cycle)	X	2.95	69.4	19.2	1.58	118.9	±0.5 %
		Y	2.34	65.1	16.9		111.6	
		Z	2.88	68.5	18.4		114.9	
10518-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 99pc duty cycle)	X	9.52	67.4	20.8	8.23	110.1	±2.5 %
		Y	9.75	68.1	21.0		147.8	
		Z	9.44	67.2	20.6		106.1	
10525-AAB	IEEE 802.11ac WiFi (20MHz, MCS0, 99pc duty cycle)	X	9.73	67.6	20.9	8.36	111.8	±2.5 %
		Y	9.96	68.2	21.2		149.6	
		Z	9.65	67.4	20.7		107.2	
10526-AAB	IEEE 802.11ac WiFi (20MHz, MCS1, 99pc duty cycle)	X	9.81	67.7	21.0	8.42	112.9	±1.9 %
		Y	9.47	66.8	20.4		104.2	
		Z	9.70	67.4	20.7		107.7	
10534-AAB	IEEE 802.11ac WiFi (40MHz, MCS0, 99pc duty cycle)	X	10.26	68.1	21.1	8.45	118.1	±2.2 %
		Y	9.86	67.2	20.5		108.3	
		Z	10.20	67.9	21.0		112.8	
10535-AAB	IEEE 802.11ac WiFi (40MHz, MCS1, 99pc duty cycle)	X	10.28	68.1	21.2	8.45	118.5	±2.2 %
		Y	9.83	67.0	20.4		108.5	
		Z	10.17	67.8	20.9		113.2	
10544-AAB	IEEE 802.11ac WiFi (80MHz, MCS0, 99pc duty cycle)	X	10.55	68.4	21.1	8.47	122.3	±2.2 %
		Y	10.03	67.1	20.4		110.6	
		Z	10.46	68.1	20.9		116.7	
10545-AAB	IEEE 802.11ac WiFi (80MHz, MCS1, 99pc duty cycle)	X	10.64	68.5	21.2	8.55	121.9	±2.2 %
		Y	10.11	67.2	20.5		110.1	
		Z	10.54	68.2	21.0		116.6	

10564-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 99pc duty cycle)	X	9.56	67.5	20.8	8.25	110.7	±2.5 %
		Y	9.80	68.2	21.1		148.1	
		Z	9.47	67.2	20.6		106.2	
10571-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 90pc duty cycle)	X	2.94	68.6	19.1	1.99	116.3	±0.5 %
		Y	2.44	65.1	17.1		148.4	
		Z	2.94	68.2	18.4		111.5	
10572-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 90pc duty cycle)	X	3.02	69.2	19.3	1.99	115.7	±0.5 %
		Y	2.39	64.9	16.9		148.1	
		Z	3.03	68.9	18.8		111.0	
10575-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 90pc duty cycle)	X	9.64	67.4	21.0	8.59	108.5	±2.5 %
		Y	9.85	68.1	21.2		143.2	
		Z	9.57	67.3	20.9		103.8	
10576-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 90pc duty cycle)	X	9.67	67.5	21.0	8.60	108.8	±2.5 %
		Y	9.87	68.1	21.3		143.7	
		Z	9.58	67.3	20.9		103.6	
10583-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty cycle)	X	9.64	67.4	21.0	8.59	109.3	±2.5 %
		Y	9.85	68.1	21.3		143.6	
		Z	9.58	67.3	20.9		104.1	
10584-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 90pc duty cycle)	X	9.64	67.4	21.0	8.60	108.7	±2.5 %
		Y	9.88	68.2	21.3		143.1	
		Z	9.57	67.3	20.8		103.4	
10591-AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS0, 90pc duty cycle)	X	9.80	67.6	21.1	8.63	110.8	±2.7 %
		Y	9.95	68.1	21.3		144.8	
		Z	9.69	67.3	20.9		105.1	
10592-AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS1, 90pc duty cycle)	X	9.96	67.8	21.3	8.79	111.0	±2.7 %
		Y	10.14	68.3	21.5		145.5	
		Z	9.85	67.5	21.0		105.3	
10599-AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS0, 90pc duty cycle)	X	10.40	68.2	21.4	8.79	116.5	±2.2 %
		Y	9.94	67.1	20.7		105.3	
		Z	10.30	67.9	21.2		110.9	
10600-AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS1, 90pc duty cycle)	X	10.49	68.3	21.5	8.88	116.8	±2.2 %
		Y	10.04	67.2	20.8		106.0	
		Z	10.37	68.0	21.3		111.0	
10607-AAB	IEEE 802.11ac WiFi (20MHz, MCS0, 90pc duty cycle)	X	9.82	67.6	21.1	8.64	111.1	±2.5 %
		Y	9.99	68.1	21.3		145.3	
		Z	9.73	67.4	20.9		105.7	
10608-AAB	IEEE 802.11ac WiFi (20MHz, MCS1, 90pc duty cycle)	X	9.97	67.8	21.3	8.77	111.5	±2.7 %
		Y	10.13	68.3	21.5		145.1	
		Z	9.89	67.6	21.1		105.8	

10616-AAB	IEEE 802.11ac WiFi (40MHz, MCS0, 90pc duty cycle)	X	10.42	68.2	21.4	8.82	116.6	±2.2 %
		Y	9.98	67.1	20.7		106.0	
		Z	10.36	68.0	21.3		111.3	
10617-AAB	IEEE 802.11ac WiFi (40MHz, MCS1, 90pc duty cycle)	X	10.41	68.2	21.4	8.81	116.3	±2.2 %
		Y	9.96	67.1	20.7		106.2	
		Z	10.33	67.9	21.2		111.2	
10626-AAB	IEEE 802.11ac WiFi (80MHz, MCS0, 90pc duty cycle)	X	10.71	68.4	21.4	8.83	121.0	±2.2 %
		Y	10.16	67.2	20.6		108.5	
		Z	10.63	68.2	21.2		115.3	
10627-AAB	IEEE 802.11ac WiFi (80MHz, MCS1, 90pc duty cycle)	X	10.78	68.5	21.5	8.88	120.9	±2.2 %
		Y	10.17	67.1	20.6		108.1	
		Z	10.73	68.4	21.4		115.9	
10648-AAA	CDMA2000 (1x Advanced)	X	3.67	66.8	18.8	3.45	113.4	±0.7 %
		Y	3.43	65.4	17.8		147.2	
		Z	3.58	66.2	18.2		108.9	

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