Motorola Solutions Inc.

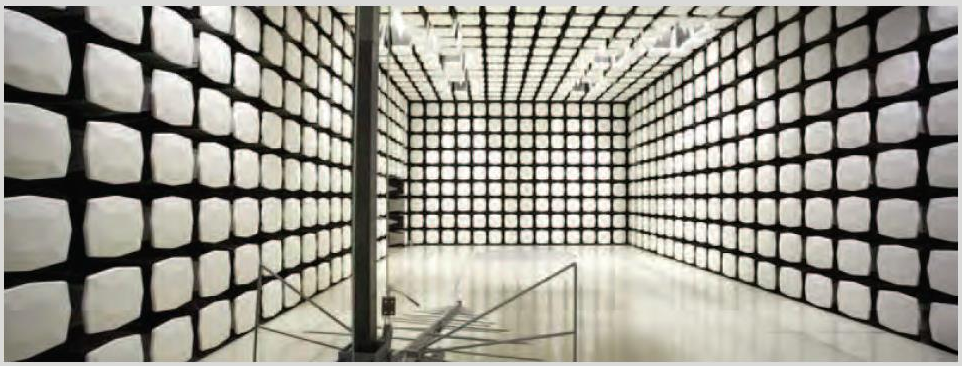
HiFi Mic 3.0

Bluetooth Low Energy (DTS) Radio

SAR Evaluation Report: WTVD0040 Rev. 1, Issue Date: December 8, 2021

Evaluated to the following SAR specification:

FCC 2.1093:2021



ACCREDITED
CERT #3310.05

CERTIFICATE OF TEST

Last Date of Test: September 29, 2021
Motorola Solutions Inc.
EUT: HiFi Mic 3.0

Applicable Standard:

Test Description	Specification	Test Method	Pass/Fail
SAR Evaluation	FCC 2.1093:2021	IEEE Std 1528:2013 FCC KDB 865664 D01 v01r04 FCC KDB 865664 D02 v01r02 FCC KDB 447498 D01 v06	Pass

Highest Measured SAR Values:

Radio	Equipment Class	Frequency Band (MHz)	Duty Cycle used for Evaluation	Body (W/kg)	Limit (W/kg)	Exposure Environment
				1g	1g	
BLE	DTS	2402-2480	28.26%	0.28	1.6	General Population

Deviations From Test Standards

None

Approved By:

Don Facteau, Systems Architect

REVISION HISTORY

Revision Number	Description	Date (yyyy-mm-dd)	Page Number
01	Scaled reported SAR values to account for test mode duty cycle.	2021-12-07	2, 20
	Clarified notes on “Test Location and Separation Distances.”	2021-12-07	7
	Added TEL verification taken at the conclusion of testing.	2021-12-07	12
	Changed term “Max. Field Duty Cycle” to “Operating Duty Cycle.”	2021-12-07	2, 20
	Converted the displayed units for the power scaling factor from dBm to mW.	2021-12-07	20
	Re-calculated reported SAR values based on rounded SAR values instead of non-rounded SAR values.	2021-12-07	2, 20

ACCREDITATIONS AND AUTHORIZATIONS

United States

FCC - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

A2LA - Each laboratory is accredited by A2LA to ISO / IEC 17025, and as a product certifier to ISO / IEC 17065 which allows Element to certify transmitters to FCC and IC specifications.

Canada

ISED - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB) and as a CAB for the acceptance of test data.

European Union

European Commission – Recognized as an EU Notified Body validated for the EMCD and RED Directives.

United Kingdom

BEIS – Recognized by the UK as an Approved Body under the UK Radio Equipment and UK EMC Regulations.

Australia/New Zealand

ACMA - Recognized by ACMA as a CAB for the acceptance of test data.

Korea

MSIT / RRA - Recognized by KCC's RRA as a CAB for the acceptance of test data.

Japan

VCCI - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

Taiwan

BSMI – Recognized by BSMI as a CAB for the acceptance of test data.

NCC - Recognized by NCC as a CAB for the acceptance of test data.

Singapore

IDA – Recognized by IDA as a CAB for the acceptance of test data.

Israel

MOC – Recognized by MOC as a CAB for the acceptance of test data.

Hong Kong

OFCA – Recognized by OFCA as a CAB for the acceptance of test data.

Vietnam

MIC – Recognized by MIC as a CAB for the acceptance of test data.

SCOPE

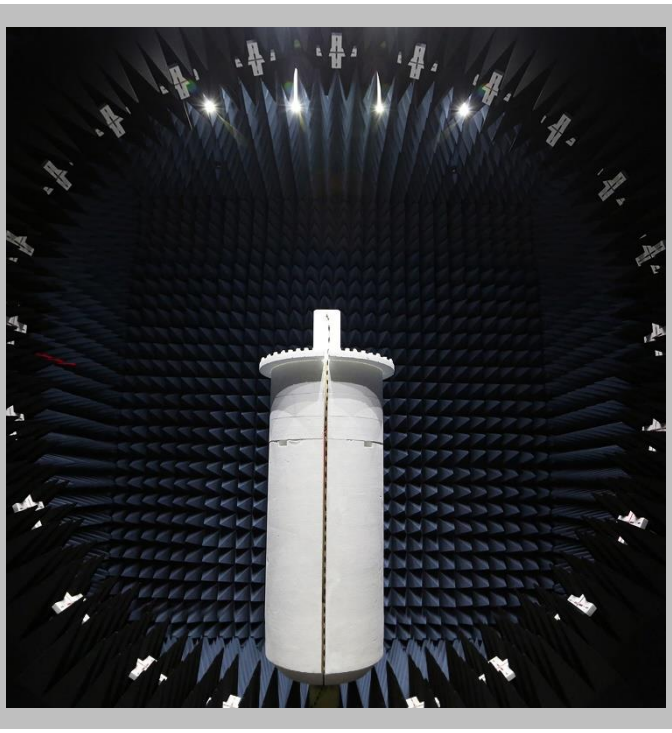
For details on the Scopes of our Accreditations, please visit:

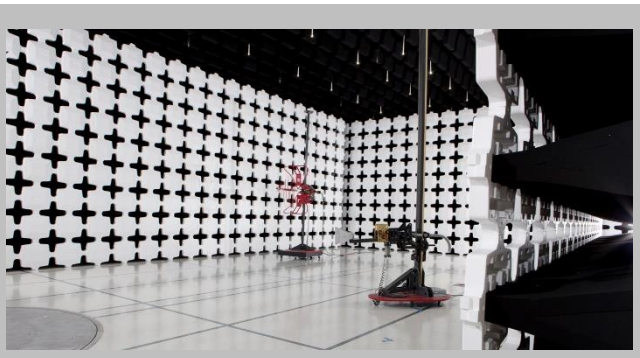
California Minnesota Oregon Texas Washington

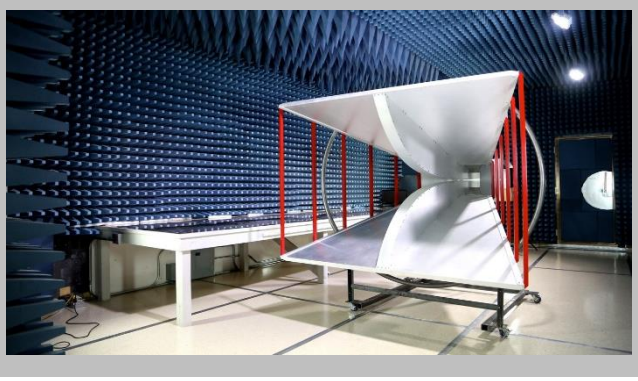
FACILITIES

element
2020.12.15

California	Minnesota	Oregon	Texas	Washington
Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-11 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120th Ave NE Bothell, WA 98011 (425)984-6600
A2LA				
Lab Code: 3310.04	Lab Code: 3310.05	Lab Code: 3310.02	Lab Code: 3310.03	Lab Code: 3310.06
Innovation, Science and Economic Development Canada				
2834B-1, 2834B-3	2834E-1, 2834E-3	2834D-1	2834G-1	2834F-1
BSMI				
SL2-IN-E-1154R	SL2-IN-E-1152R	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI				
A-0029	A-0109	A-0108	A-0201	A-0110
Recognized Phase I CAB for ISED, ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA				
US0158	US0175	US0017	US0191	US0157







PRODUCT DESCRIPTION

2014-12-10

Client and Equipment Under Test (EUT) Information

Company Name:	Motorola Solutions, Inc.
Address:	415 East Exchange Pkwy
City, State, Zip:	Allen, TX 75002
Test Requested By:	Navaid Karimi
Model:	HiFi Mic 3.0
First Date of Test:	July 28, 2021
Last Date of Test:	September 29, 2021
Receipt Date of Samples:	July 8, 2021
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:

Microphone system containing a BLE Radio clipped onto clothing. The clip and the microphone are accessories that must be used to transmit in proximity with the human body.

FCC ID: AZ499FT6029

The device contains the following radios:
BLE – 2402-2480MHz

Location of transmit antenna(s):

PRODUCT DESCRIPTION

2014-12-10

Testing Locations and Separation Distances:

Technology	Accessory	EUT Orientation					
		Front	Back	Bottom	Right	Top	Left
Bluetooth LE	Shirt Clip	0 mm	0 mm	0 mm	0 mm	0 mm	10 mm[2]
	Belt Clip	Reduced[1]	Reduced[1]	Reduced[1]	Reduced[1]	Reduced[1]	10 mm[2]

1: Reduced based on One Factor at a Time (OFAT) reduction.
2: 10 mm of separation distance caused by the attached microphone. This represents the closest distance the body can get to this side of the device.

Rated Power and Software Power Settings:

Radio and Band	Channel	Frequency (MHz)	Data Rate	Modulation	Rated Power (dBm)	Tune-Up Power (dB)	Max Rated Power (dBm)
BLE	37	2402	1 Mbps	GFFSK	12.3	1	13.3
			500 kbps	GFFSK	12.3	1	13.3
			125 kbps	GFFSK	12.3	1	13.3
	17	2440	1 Mbps	GFFSK	13.4	1	14.4
			500 kbps	GFFSK	13.4	1	14.4
			125 kbps	GFFSK	13.4	1	14.4
	39	2480	1 Mbps	GFFSK	11.6	1	12.6
			500 kbps	GFFSK	11.6	1	12.6
			125 kbps	GFFSK	11.6	1	12.6

Simultaneous Transmission:

The EUT does not have simultaneous transmission capability.

Testing Objective:

To demonstrate compliance of the BLE Radio with the SAR requirements of FCC 2.1093:2021

CONFIGURATIONS

Configuration WTVD0040- 3

Software/Firmware Running during test	
Description	**Version**
DTM	1.0

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
HiFi Mic 3.0	Motorola Solutions, Inc	MIC-WRL-TRN-500	GABY

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Microphone	Motorola Solutions, Inc	WPG00809	NA
Shirt Clip	Motorola Solutions, Inc	WGA00361	NA

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Microphone Cable SAR	No	1.2m	No	Microphone	HiFi Mic 3.0

Configuration WTVD0040- 4

Software/Firmware Running during test	
Description	**Version**
DTM	1.0

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
HiFi Mic 3.0	Motorola Solutions, Inc	MIC-WRL-TRN-500	WGA00366

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Microphone	Motorola Solutions, Inc	WPG00809	NA
Belt Clip	Motorola Solutions, Inc	WGA00360	NA

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Microphone Cable SAR	No	1.2m	No	Microphone	HiFi Mic 3.0

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2021-07-28	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
2	2021-07-29	SAR Evaluation	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
3	2021-09-29	SAR Evaluation	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

TISSUE – EQUIVALENT LIQUID DESCRIPTION

Characterization of tissue-equivalent liquid dielectric properties

When below 5 GHz, the measured values must be within ±10% of the target values provided SAR error compensation algorithms documented in IEEE Std 1528-2013 section E.3.2.2 are implemented for upward correction purposes only. When between 5 and 6 GHz, measured values must with within ±5% of the target values. The temperature variation in the liquid during SAR measurements must be within ± 2 °C of that recorded when the dielectric properties were measured.

The dielectric parameters of the tissue-equivalent liquids were measured using the SPEAG DAKS:200 dielectric assessment kit. The dielectric measurements were made across the frequency range of the liquid. The attached data sheets show that the dielectric parameters of the liquid were within the required tolerances.

Target values of dielectric parameters

Per KDB 865664 D01 v01r04, Appendix A:

The head tissue dielectric parameters recommended by IEEE Std 1528-2013 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in IEEE Std 1528 are derived from tissue dielectric parameters computed from the 4-Cole-Cole equations described above and extrapolated according to the head parameters specified in IEEE Std 1528.

Linear interpolation is used for determining target dielectric parameters for values between those listed. Linear extrapolation is used for determining target dielectric parameters for values above 5800 MHz.

Target Frequency (MHz)	Head		Body	
	ε_r	σ (S/m)	ε_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800-2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

(ε_r = relative permittivity, σ = conductivity, and ρ = 1000 kg/m^3)

TISSUE – EQUIVALENT LIQUID DESCRIPTION

Composition of Ingredients for Liquid Tissue Phantoms

Element uses broadband tissue equivalent liquids prepared by SPEAG and confirmed by Element to be within ±10% of target values below 5 GHz and ±5% of target values between 5 and 6 GHz. SAR error compensation algorithms documented in IEEE Std 1528-2013 are implemented for upward correction purposes only.

By percent weight, the approximate compositions of the broadband tissue are listed below. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation:

Material	Percent Weight
Ethanediol	<5.2%
Sodium Petroleum Sulfonate	<2.9%
Hexylene Glycol	<2.9%
Alkoxylated Alcohol	<2.0%
Mineral Oils	<20%
Deionized Water	Fill to volume

The exact liquid recipes are proprietary to the tissue equivalent liquid manufacturer.

SAR Correction Formula for Deviation from Target Dielectric Values

When measuring below 5 GHz, a correction formula is automatically applied by the measurement software to SAR data to account for the deviation from the target dielectric values. The correction formula only scales measured values upward. The SAR system manufacturer has been contacted and has verified Element's implementation and understanding of the SAR correction formula. The correction is calculated following IEEE Std 1528-2013 Annex E.3. Where SAR correction is considered, there will be a note next to TSL correction saying "Positive only."

$$\Delta SAR = c_\varepsilon \Delta\varepsilon_r + c_\sigma \Delta\sigma$$

Where the values for, $\Delta\varepsilon_r$ and $\Delta\sigma$ and are the percent the permittivity and conductivity respectively are away from ideal values and where ΔSAR is the percent the measured SAR value is corrected.

When 1 g peak spatial-average SAR measurements are taken:

$$c_\varepsilon = -7.854 \times 10^{-4} f^3 + 9.402 \times 10^{-3} f^2 - 2.742 \times 10^{-2} f - 0.2026$$
$$c_\sigma = 9.804 \times 10^{-3} f^3 - 8.661 \times 10^{-2} f^2 + 2.981 \times 10^{-2} f + 0.7829$$

Where *f* is the frequency in GHz.

When 10 g peak spatial-average SAR measurements are taken:

$$c_\varepsilon = 3.456 \times 10^{-3} f^3 - 3.531 \times 10^{-2} f^2 + 7.675 \times 10^{-2} f - 0.1860$$
$$c_\sigma = 4.479 \times 10^{-3} f^3 - 1.586 \times 10^{-2} f^2 - 0.1972 f + 0.7717$$

Where *f* is the frequency in GHz.

TISSUE – EQUIVALENT LIQUID

EUT:	HiFi Mic 3.0	Work Order:	WTVD0040
Customer:	Motorola Solutions, Inc	Job Site:	MN11
Attendees:	None	Customer Project:	None

TEST SPECIFICATIONS

Specification	Test Method
FCC 2.1093:2021	IEEE Std 1528:2013 FCC KDB 865664 D01 v01r04 FCC KDB 865664 D02 v01r02 FCC KDB 447498 D01 v06

MBBL600-6000V6

Date	Tissue Temp (°C)	Ambient Temp (°C)	Freq. (MHz)	Measured Values		Target Values		Deviation	
				Relative Permittivity	Cond. (S/m)	Relative Permittivity	Cond. (S/m)	Permittivity Deviation	Cond. Deviation
7/29/2021	21.6	21.6	2400	54.0	2.01	52.8	1.90	2.3%	5.8%
			2450	53.9	2.06	52.7	1.95	2.3%	5.7%
			2500	53.8	2.11	52.6	2.02	2.4%	4.5%
9/29/2021	21.3	21.9	2400	53.4	2.02	52.8	1.90	1.0%	6.4%
			2450	53.3	2.07	52.7	1.95	1.1%	6.2%
			2500	53.2	2.12	52.6	2.02	1.1%	5.0%

SAR SYSTEM VERIFICATION DESCRIPTION

element
WSSV.2017.1.31

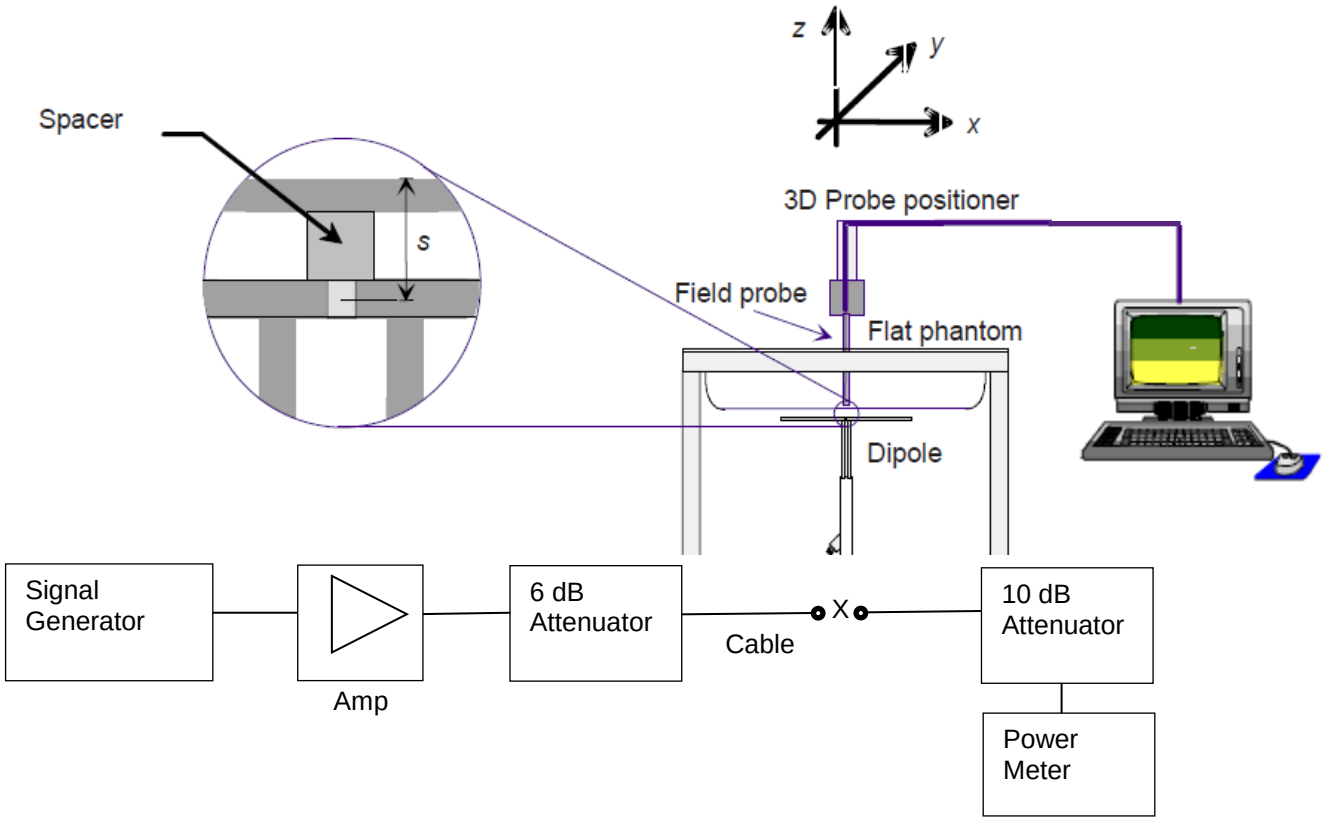
REQUIREMENT
Per IEEE 1528, Section 8.2.1, “System checks are performed prior to compliance tests and the results must always be within ± 10% of the target value corresponding to the test frequency, liquid, and the source used. The target values are 1 g or 10 g averaged SAR values measured on systems having current system validation and calibration status, and using the system check setup as shown in Figure 14. These target values should be determined using a standard source.”

TEST DESCRIPTION
Within 24 hours of a measurement, then every 72 hours thereafter, Element used the system validation kit (calibrated reference dipole) to test whether the system was operating within its specifications. The validation was performed in the indicated bands by making SAR measurements of the reference dipole with the phantom filled with the tissue-equivalent liquid. First, a signal generator and power amplifier were used to produce a 100mW level as measured with a power meter at the antenna terminals of the dipole (X). Then, the reference dipole was positioned below the bottom of the phantom and centered with its axis parallel to the longest side of the phantom. A low loss and low relative permittivity spacer was used to establish the correct distance between the center axis of the reference dipole and the liquid.

For the reference dipoles, the spacing distance s is given by:

s = 15mm, +/- 0.2mm for 300MHz ≤ f ≤ 1000 MHz:
s = 10mm, +/- 0.2mm for 1000MHz ≤ f ≤ 6000MHz

The measured 1 g and 10 g spatial average SAR values were normalized to a 1W dipole input power for comparison to the calibration data. The results are summarized in the attached table. The deviation is less than 10% in all cases, indicating that the system performance check was within tolerance.



SAR SYSTEM VERIFICATION

element
WSSV.2016.12.19

TEST SPECIFICATIONS

Specification	Test Method
FCC 2.1093:2021	IEEE Std 1528:2013 FCC KDB 865664 D01 v01r04 FCC KDB 865664 D02 v01r02 FCC KDB 447498 D01 v06

MBBL600-6000V6

Date	Tissue Temp (°C)	Ambient Temp (°C)	Freq. (MHz)	Conducted Power into Dipole (dBm)	1W Adj. Factor (dB)	Measured Values		Normalized Values		Target Values		Deviation	
						1g	10g	1g	10g	1g	10g	1g	10g
7/29/2021	21.6	21.6	2450	20.0	10.0	5.44	2.50	54.4	25.0	50.8	23.8	7.1%	5.0%
9/29/2021	21.3	21.9	2450	20.0	10.0	4.97	2.30	49.7	23.0	50.8	23.8	-2.2%	-3.4%

SAR SYSTEM VERIFICATION

element
WSSV.2016.12.19

Tested By:	William Hoffa, Kyle McMullan	Room Temperature (°C):	21.6
Date:	7/29/2021	Liquid Temperature (°C):	21.6
		Humidity (%RH):	56.9
		Bar. Pressure (mb):	1016

System Performance Check Report

Summary

Dipole	Frequency [MHz]	TSL	Power [dBm]	Dev. 1g [%]	Dev. 10g [%]	Dev. Peak [%]	Iso. Error [%]
D2450V2 - SN855	2450.0	MSL	20.0	4.8	4.1	21.8	3.4

Exposure Conditions

Phantom Section, TSL	Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, MSL	10		, 0--	2450.0, 0	7.35	2.06	53.9

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V6.0 (20deg probe tilt) - 2044	MBBL-600-6000 Charge: 190911-1, 2021-Jul-29	EX3DV4 - SN3746, 2020-11-18	DAE4 Sn1237, 2020-11-04

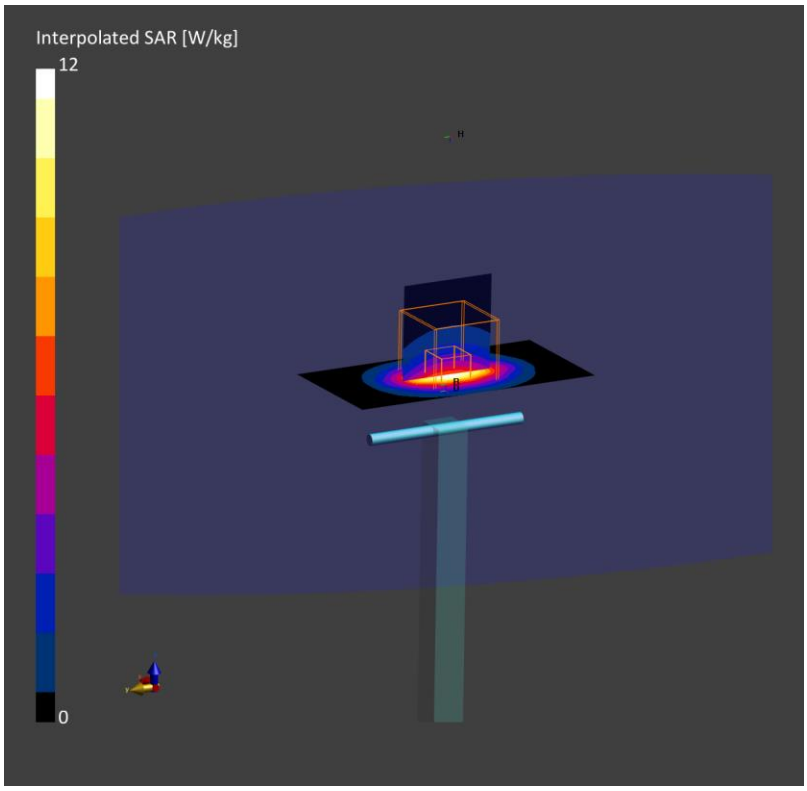
Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	40.0 x 80.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	10.0 x 10.0	5.0 x 5.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2021-07-29, 11:11	2021-07-29, 11:18
psSAR1g [W/Kg]	5.30	5.44
psSAR10g [W/Kg]	2.39	2.50
Power Drift [dB]	0.00	0.00
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	Positive Only	Positive Only

SAR SYSTEM VERIFICATION



Approved By

SAR SYSTEM VERIFICATION

element
WSSV.2016.12.19

Tested By:	William Hoffa, Kyle McMullan	Room Temperature (°C):	21.9
Date:	9/29/2021	Liquid Temperature (°C):	21.3
		Humidity (%RH):	52.7
		Bar. Pressure (mb):	1014

System Performance Check Report

Summary

Dipole	Frequency [MHz]	TSL	Power [dBm]	Dev. 1g [%]	Dev. 10g [%]	Dev. Peak [%]	Iso. Error [%]
D2450V2 - SN855	2450.0	MSL	20.0	-2.2	-3.4	10.0	-2.0

Exposure Conditions

Phantom Section, TSL	Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, MSL	10		, 0--	2450.0, 0	7.35	2.07	53.3

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V6.0 (20deg probe tilt) - 2044	MBBL-600-6000 Charge: 190911-1, 2021-Sep-29	EX3DV4 - SN3746, 2020-11-18	DAE4 Sn1237, 2020-11-04

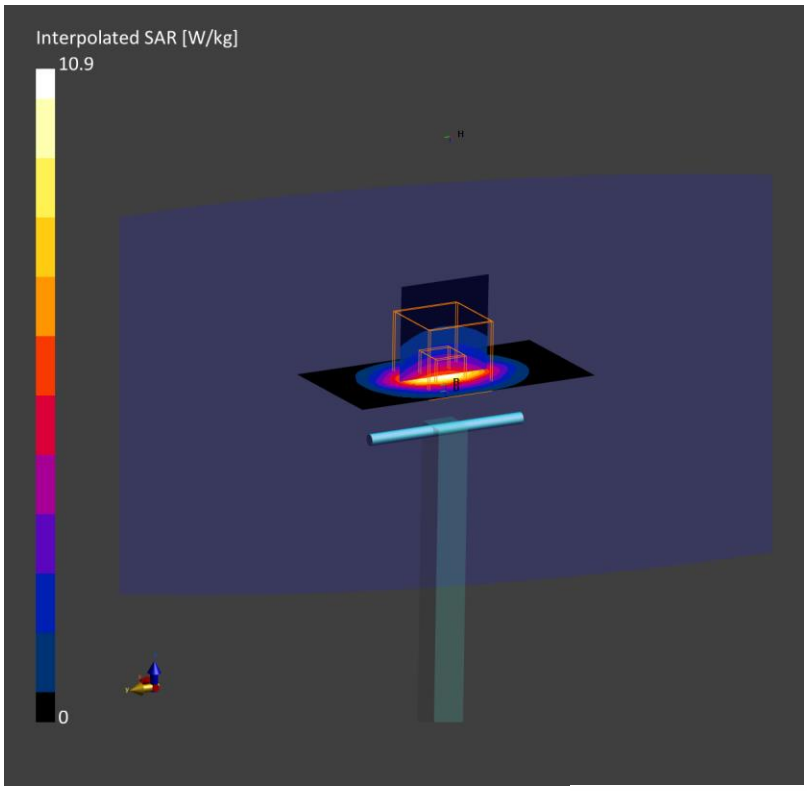
Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	40.0 x 80.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	10.0 x 10.0	5.0 x 5.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2021-09-29, 15:57	2021-09-29, 16:04
psSAR1g [W/Kg]	4.92	4.97
psSAR10g [W/Kg]	2.23	2.30
Power Drift [dB]	-0.01	0.02
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	Positive only	Positive only

SAR SYSTEM VERIFICATION



Approved By

OUTPUT POWER

element
WPM.12.06.24

EUT:	HiFi Mic 3.0	Work Order:	WTVD0040
Serial Number:	WGA00366	Date:	28-Jul-21
Customer:	Motorola Solutions, Inc	Room Temperature (°C):	21.6
Attendees:	None	Humidity (%RH):	61.8
Customer Project:	None	Bar. Pressure (mb):	983.2
Tested By:	William Hoffa	Job Site:	MN11
Power:	Battery	Configuration:	WTVD0040-4

TEST SPECIFICATIONS

Specification	Test Method
FCC 2.1093:2021	IEEE Std 1528:2013 FCC KDB 865664 D01 v01r04 FCC KDB 865664 D02 v01r02 FCC KDB 447498 D01 v06

COMMENTS

None

RESULTS - BLE

Radio and Band	Channel	Frequency (MHz)	Data Rate	Modulation	Software Power Setting	Max Rated Power (dBm)	Output Power (dBm)	Output Power (mW)
BLE	37	2402	1 Mbps	GFSK	3	13.3	12.8	19.1
			500 kbps	GFSK	3	13.3	12.8	19.1
			125 kbps	GFSK	3	13.3	12.8	18.9
	17	2440	1 Mbps	GFSK	3	14.4	13.8	24.0
			500 kbps	GFSK	3	14.4	13.8	24.0
			125 kbps	GFSK	3	14.4	13.8	23.9
	39	2480	1 Mbps	GFSK	2	12.6	12.3	17.1
			500 kbps	GFSK	2	12.6	12.3	16.9
			125 kbps	GFSK	2	12.6	12.3	16.8

SAR TEST DATA

element
WSTD.2016.12.19

EUT:	HiFi Mic 3.0	Work Order:	WTVD0040
Customer:	Motorola Solutions, Inc	Job Site:	MN11
Attendees:	None	Customer Project:	None

TEST SPECIFICATIONS

Specification	Test Method
FCC 2.1093:2021	IEEE Std 1528:2013 FCC KDB 865664 D01 v01r04 FCC KDB 865664 D02 v01r02 FCC KDB 447498 D01 v06

COMMENTS

None

DEVIATIONS FROM TEST STANDARD

None

SCALING FACTORS

Radio	Data Rate	Frequency (MHz)	EUT Power (mW)	Max Power[2] (mW)	Max Power Scaling Factor[1]	Test Mode Duty Cycle (%)	Max. Operating Duty Cycle (%)	Duty Cycle Scaling Factor[3]	Scaling Factor[4]
BLE	1 Mbps	2402	19.1	21.4	1.12	28.26	100	3.54	3.96
		2440	24.0	27.5	1.15	28.26	100	3.54	4.07
		2480	17.1	18.2	1.07	28.26	100	3.54	3.79

1: Max power scaling factor = Max Power (mW) / EUT Power (mW)
2: Converted to mW from values of 13.3, 14.4, and 12.6 dBm for 2402, 2440, and 2480 MHz respectively
3: Duty cycle scaling factor = Max. Operating Duty Cycle (%) / Test Mode Duty Cycle (%)
4: Scaling factor = Max power scaling factor × Duty cycle scaling factor. This value is applied to the measured 1g and 10g SAR values.

RESULTS – BODY CONFIGURATION

Radio and Band	Transmit Freq. (MHz)	EUT Position	EUT Channel	Modulation	Accessory	SAR Drift (%)	Measured Values (mW/g)		Scaling Factor	Scaled (mW/g) Values		Test Run Name
							1g	10g		1g	10g	
Bluetooth DTS	2440	Right	17	1 Mbps	Shirt Clip	-0.29	0.01	0.00	4.07	0.04	0.00	BT 2440 Right 1
	2440	**Left**	**17**	**1 Mbps**	**Shirt Clip**	**-0.54**	**0.07**	**0.03**	**4.07**	**0.28**	**0.12**	**BT 2440 Left 1**
	2440	Front	17	1 Mbps	Shirt Clip	-0.22	0.06	0.03	4.07	0.24	0.12	BT 2440 Front 1
	2440	Back	17	1 Mbps	Shirt Clip	0.20	0.01	0.00	4.07	0.04	0.00	BT 2440 Back 1
	2440	Top	17	1 Mbps	Shirt Clip	-0.38	0.05	0.02	4.07	0.20	0.08	BT 2440 Top 1
	2440	Bottom	17	1 Mbps	Shirt Clip	-0.14	0.05	0.02	4.07	0.20	0.08	BT 2440 Bottom 1
	2402	Left	37	1 Mbps	Shirt Clip	-0.38	0.04	0.01	3.96	0.16	0.04	BT 2402 Left 1
	2480	Left	39	1 Mbps	Shirt Clip	-0.11	0.03	0.01	3.79	0.11	0.04	BT 2480 Left 1
	2440	Left	17	1 Mbps	Belt Clip	-0.12	0.07	0.03	4.07	0.28	0.12	BT 2440 Left 1

1: The signal is lower than the probe could measure. The SAR probe is capable of measurements down to 0.010 mW/g.
2: Measured SAR value is low enough where a SAR drift measurement was not practical.

SAR TEST DATA

element
WSTD.2016.12.19

Tested By:	William Hoffa, Kyle McMullan	Room Temperature (°C):	21.6
Date:	2021-Jul-29	Liquid Temperature (°C):	21.6
Serial Number:	GABY	Humidity (%RH):	56.9
Configuration:	WTVD0040-3	Bar. Pressure (mb):	1016
Comments:	None		

Measurement Report for Device, LEFT, D2450, CW, Channel 17 (2440.0 MHz)

Device Under Test Properties

Model, Manufacturer	Dimensions [mm]	IMEI	DUT Type
HiFi Microphone Transmitter, Motorola Solutions, Inc	75.0 x 45.0 x 50.0		Other

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, MSL	LEFT, 10.00	D2450	CW, 0--	2440.0, 17	7.35	2.05	53.9

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V6.0 (20deg probe tilt) - 2044	MBBL-600-6000 Charge: 190911-1, 2021-Jul-29	EX3DV4 - SN3746, 2020-11-18	DAE4 Sn1237, 2020-11-04

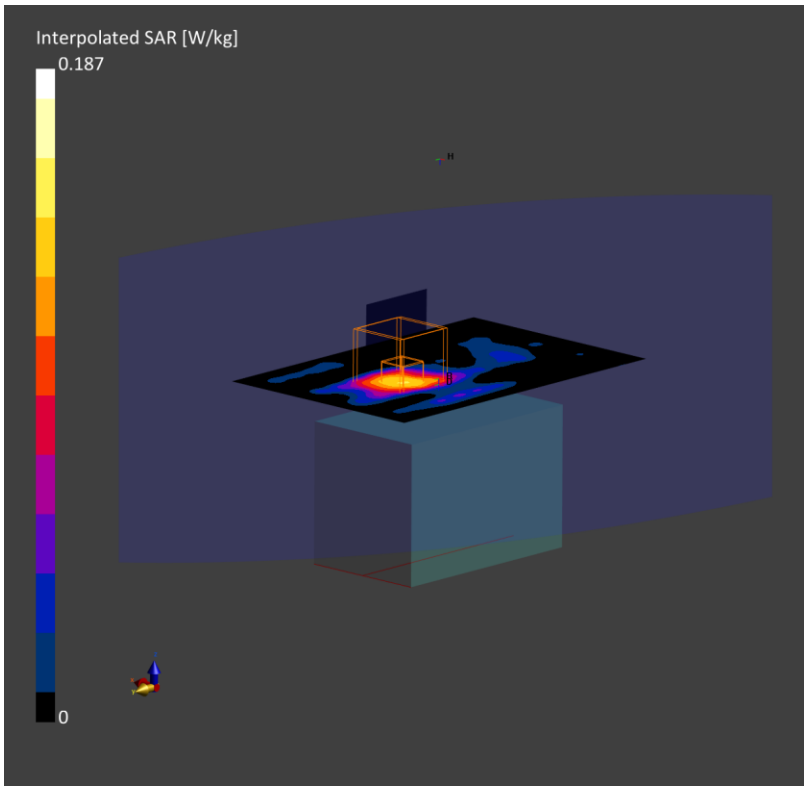
Scans Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 120.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	10.0 x 10.0	5.0 x 5.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2021-07-29, 13:37	2021-07-29, 13:45
psSAR1g [W/Kg]	0.061	0.065
psSAR10g [W/Kg]	0.032	0.029
Power Drift [dB]	-0.44	-0.54
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	Positive only	Positive only
M2/M1 [%]		65.4
Dist 3dB Peak [mm]		7.0

SAR TEST DATA



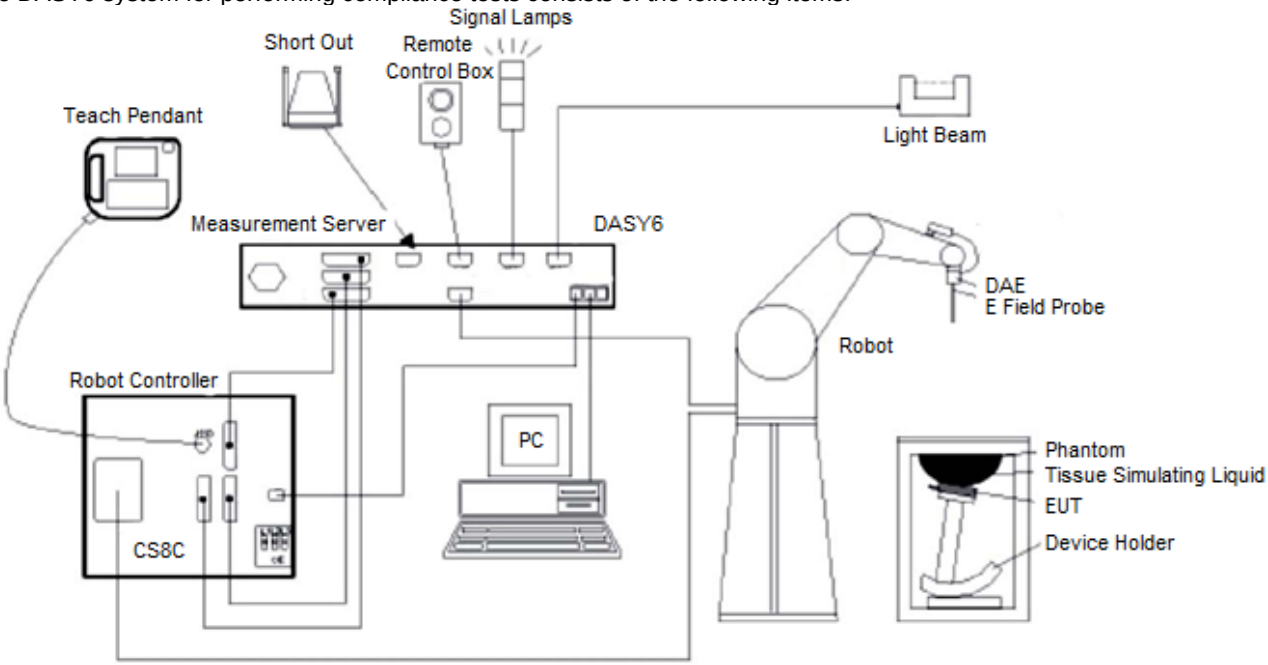
Approved By

SAR MEASUREMENT SYSTEM

Schmid & Partner Engineering AG, DASY6

Element selected the leader in SAR evaluation systems to provide the measurement tools for this evaluation. SPEAG's DASY6 is the fastest and most accurate scanner on the market. It is fully compatible with all world-wide standards for transmitters operating at the ear or within 20cm of the body. It provides full compatibility with IEC/IEEE 62209-1528, IEC 62209-1, IEC 62209-2, IEEE 1528 as well as national adaptations such as FCC OET-65c and Korean Std. MIC #2000-93

The DASY6 system for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot (Stäubli TX=RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running Windows 10 and the DASY6 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom, oval flat phantom, device holder, tissue simulating liquids, and validation dipole kits.

SYSTEM AND TEST SITE DESCRIPTION

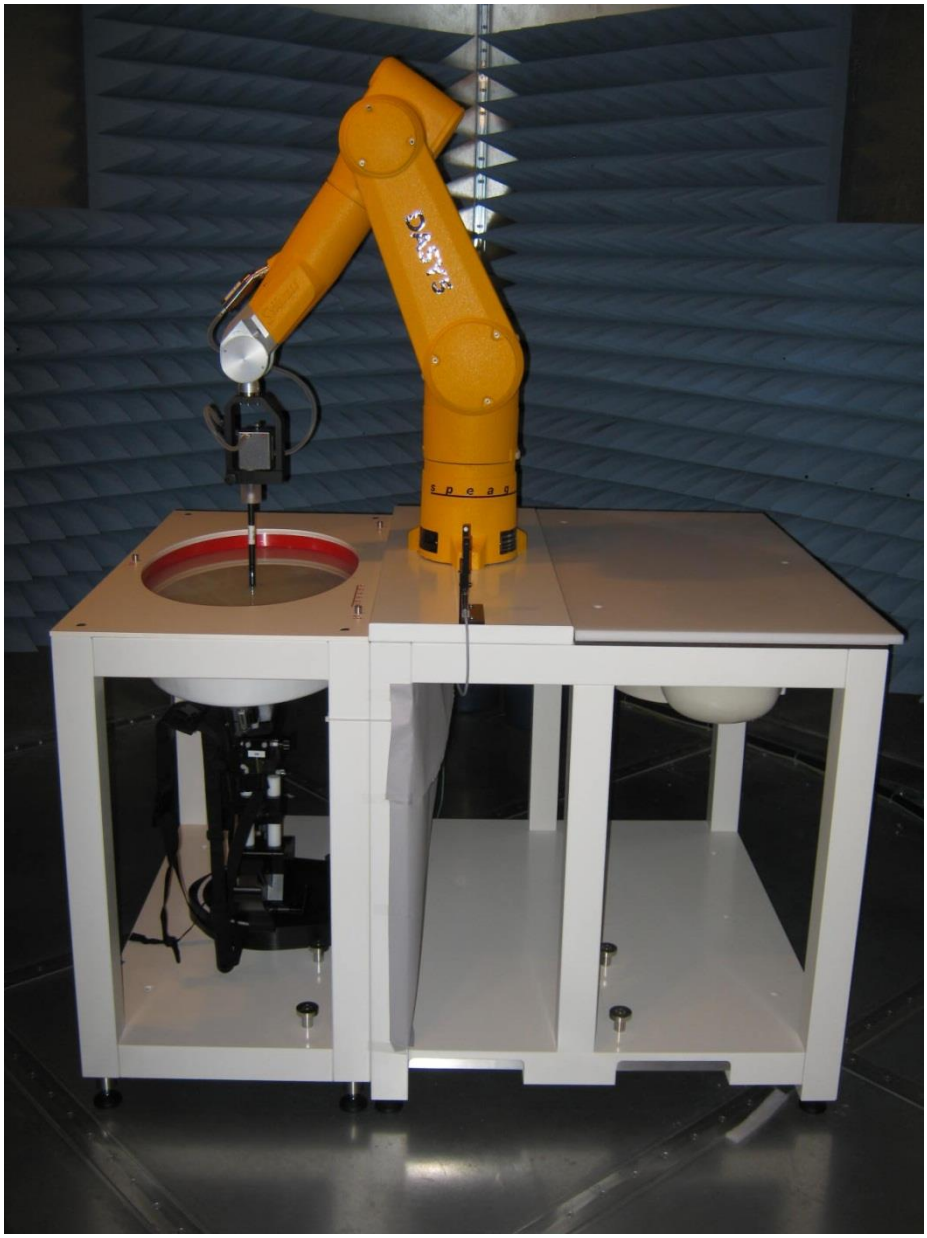
element
WSTD.2017.1.31

TEST SITE

Element

The SAR measurement system is located in a semi-anechoic chamber. This provides an ambient free environment that also eliminates reflections.

The chamber is 12 ft wide by 16 ft long x 8 ft high. A dedicated HVAC unit provides +/- 1 degree C temperature control.



TEST EQUIPMENT

element
WSEQ.2016.12.19

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Amplifier	Mini Circuits	ZVE-3W-83+	TTA	NCR [1]	0 mo
Antenna - Dipole	SPEAG	D2450V2	ADL	11/9/2020	12 mo
DAE	SPEAG	SD 000 D04 EJ	SAH	11/4/2020	12 mo
Device Holder	SPEAG	N/A	SAW	NCR	0 mo
Dielectric Assessment Kit	SPEAG	DAKS:200	IPR	4/25/2019	36 mo
Generator - Signal	Agilent	V2920A	TIH	NCR	0 mo
Meter - Power	Agilent	N1913A	SQL	7/12/2021	12 mo
Power Sensor	Agilent	N8481A	SQN	7/12/2021	12 mo
Probe - Dielectric	SPEAG	DAKS-3.5	IPRA	11/12/2019	36 mo
Probe - SAR	SPEAG	EX3DV4	SAG	11/18/2020	12 mo
SAR - Tissue Test Solution	SPEAG	MBBL600-6000V6	SALM	At start of testing	
SAR Test System	Staeubli	DASY6	SAK	NCR	0 mo
SAR Test System	SPEAG	QD OVA 001 BB	SAC	NCR	0 mo
Thermometer	Omega Engineering, Inc.	HH311	DUI	2/2/2021	36 mo

Note 1: The output of the signal generator / amplifier is verified with the calibrated power meter listed above.

Dipole	Date	Freq.	Tissue Perm.	Tissue Cond.	CW				OFDM		
					Sensitivity	Linearity	Isotropy	Reduced DC	802.11n	LTE	LTE TDD
ADL	5/5/2021	2450	40.2	1.85	Pass	Pass	Pass	Pass[1]	Pass	N/A	N/A
ADL[4]	7/28/2021	2450	41.0	1.82	Pass	Pass	Pass	Pass[1,2,3]	Pass	Pass	Pass

1: Reduced to a duty factor of 0.1 with a 10 Hz pulse repitition rate.
2: Reduced duty cycle to match a single GSM time slot.
3: Reduced duty cycle to match a single DECT time slot.
4: ADL measurement on 7/28/2021 used to confirm system validation after software upgrade.

MEASUREMENT UNCERTAINTY

element
2021.09.01

MEASUREMENT UNCERTAINTY BUDGETS PER IEEE 1528:2013

300-3000 MHz Range

Uncertainty Component	Tolerance (+/- %)	Probability Distribution	Divisor	c_i (1g)	c_i (10g)	u_i (1g) (+/-%)	u_i (10g) (+/-%)	v_i
Measurement System								
Probe calibration (k=1)	6.0	normal	1	1	1	6.0	6.0	∞
Axial isotropy	4.7	rectangular	1.732	0.707	0.707	1.9	1.9	∞
Hemispherical isotropy	9.6	rectangular	1.732	0.707	0.707	3.9	3.9	∞
Boundary effect	1.0	rectangular	1.732	1	1	0.6	0.6	∞
Linearity	4.7	rectangular	1.732	1	1	2.7	2.7	∞
System detection limits	1.0	rectangular	1.732	1	1	0.6	0.6	∞
Modulation Response	2.4	rectangular	1.732	1	1	1.4	1.4	∞
Readout electronics	0.3	normal	1	1	1	0.3	0.3	∞
Response time	0.8	rectangular	1.732	1	1	0.5	0.5	∞
Integration time	2.6	rectangular	1.732	1	1	1.5	1.5	∞
RF ambient conditions - noise	3.0	rectangular	1.732	1	1	1.7	1.7	∞
RF Ambient Reflections	3.0	rectangular	1.732	1	1	1.7	1.7	∞
Probe positioner mechanical tolerance	0.4	rectangular	1.732	1	1	0.2	0.2	∞
Probe positioner with respect to phantom shell	2.9	rectangular	1.732	1	1	1.7	1.7	∞
Extrapolation, interpolation, and integration algorithms for max. SAR evaluation	2.0	rectangular	1.732	1	1	1.2	1.2	∞
Test Sample Related								
Device Positioning	2.9	normal	1	1	1	2.9	2.9	145
Device Holder	3.6	normal	1	1	1	3.6	3.6	5
Power Drift	5.0	rectangular	1.732	1	1	2.9	2.9	∞
Power scaling	1.0	rectangular	1.732	1	1	0.6	0.6	∞
Phantom and tissue parameters								
Phantom Uncertainty - shell thickness tolerances	6.1	rectangular	1.732	1	1	3.5	3.5	∞
Uncertainty in SAR correction for deviations in permittivity and conductivity	1.9	normal	1	1.00	0.84	1.9	1.6	∞
Liquid conductivity - measurement uncertainty	2.5	normal	1	0.78	0.71	2.0	1.8	∞
Liquid permittivity - measurement uncertainty	2.5	normal	1	0.26	0.26	0.7	0.7	∞
Temp Uncertainty - Conductivity	3.4	rectangular	1.732	0.8	0.71	1.5	1.4	∞
Temp Uncertainty - Permittivity	0.4	rectangular	1.732	0.2	0.26	0.1	0.1	∞
Combined Standard Uncertainty		RSS				11.4	11.3	361
Expanded Measurement Uncertainty (95% Confidence/		normal (k=2)				22.8	22.7	

Full measurement uncertainty included for ISO 17025 accreditation purposes.