Nemko Korea Co., Ltd.

165-51, Yurim-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, 17042, Republic of Korea
TEL:+82 31 330-1700 FAX:+82 31 322 2332

FCC SAR EVALUATION REPORT FOR VERIFICATION

Project No : NK-23-R-438

Applicant : LG Electronics USA., Inc.

111 Sylvan Avenue North Building, Englewood Cliffs, New Jersey State, 07632, USA
Attn. : David Kim

Dates of receipt : December 08, 2023

Dates of Issue : January 2, 2024

Test Site :
Nemko Korea Co., Ltd.

FCC ID:	**BEJF1DA2835P**
Applicant :	**LG Electronics USA., Inc**
Brand Name :	LG

Model:	F1DA2835P
Host Model Name:	XG2T
Additional Host Model(s):	*XG2T**
EUT Type:	PORTABLE BLUETOOTH SPEAKER
Classification:	FCC Part 15 Spread Spectrum Transmitter (DSS) Digital Transmission System(DTS)
Date of Test:	December 08, 2023 ~ December 16, 2023
Applied Standard:	FCC 47 CFR Part 2.1093

The device bearing the brand name and model specified above has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in IEEE 1528-2013. The client should not use it to claim product endorsement by TAF or any government agencies. The test results in the report only apply to the tested sample.

I attest to the accuracy of data and all measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Tested By : Wonhee Lee
Test Engineer

Reviewed By : Wonjae Song
Technical Manager

Revision History

Rev.	Issue Date	Revisions	Revised By
00	January 2, 2024	Initial issue	Wonhee Lee

TABLE OF CONTENTS

1. INTRODUCTION 5
1.1 Test facility 5
1.2 Accreditation and listing 5
2. EUT INFORMATION & TEST CONDITIONS 6
2.1 EUT Information 6
2.2 Operation During Test 7
2.2.1 Operating Environment 7
2.2.2 Table of test channels 7
2.2.3 Table of test power setting 8
2.2.4 Antenna Information 8
2.2.5 Additional Information Related to Testing 8
2.3 Support Equipment 8
2.4 Maximum Target Power among production units 9
2.5 SAR Test Consideration 9
2.6 SAR testing EUT configuration 10
2.7 Antenna Location 10
2.8 Bluetooth Duty Cycle plot 11
3. TEST METHODOLOGY 12
4. Power Density Measurement System 13
5.1 SAR Measurement Setup 13
5.2 SAR Measurement System 13
5.2.1 SPEAG DASY8 System 13
5.2.2 SAR Probe 14
5.2.3 SAM Phantom 14
5.2.4 ELI Phantom 15
5.3 Simulating Mixture Characterization 16
5.4 Device Holder for Transmitters 17
6. Limits For Specific Absorption Rate (SAR) 18
7. Measurement Uncertainty & Decision Rule 19
7.1 Measurement Uncertainty 19
7.2 Decision Rule 19
8. Test Equipments 20

9. Output Power Measurement *21*
9.1 Measurement procedures for Output Power 21
9.2 Conducted RF Output Power 22
10. System Verification *23*
10.1 Tissue verification results 23
10.2 System Verification Test setup 24
10.3 System Verification Results 25
11. SAR Measurement Results *26*
11. Conclusion *27*
APPENDIX A. PLOTS OF SAR RESULTS *28*
APPENDIX B. PLOTS OF SYSTEM VERIFICATION *33*
APPENDIX C. CALIBRATION REPORT OF THE PROBE *35*
APPENDIX D. CALIBRATION REPORT OF THE DIPOLE ANTENNA *58*

1. INTRODUCTION

1.1 Test facility

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2014), the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2013) was used in determining radiated and conducted emissions emanating.

These measurement tests were conducted at **Nemko Korea Co., Ltd..**
The site address 165-51, Cheoin-Gu, Yongin-Si, Gyeonggi-Do 17042 Republic of Korea.

1.2 Accreditation and listing

Accreditation type		Accreditation number
	CAB Accreditation for DOC	Designation No. KR0026
	KOLAS Accredited Lab. (Korea Laboratory Accreditation Scheme)	Registration No. KT155
	Canada IC Registered site	Site No. 2040E
	VCCI registration site(RE/CE/Telecom CE)	Member No. 2118
	EMC CBTL	TL124
	KCC(RRL)Designated Lab.	Registration No. KR0026

2. EUT INFORMATION & TEST CONDITIONS

2.1 EUT Information

Specifications:

EUT Type	PORTABLE BLUETOOTH SPEAKER
Model Name	F1DA2835P
Host Model Name	XG2T
Variant Host Model Name	*XG2T**
Brand Name	LG
Frequency of Operation	(2 402 ~ 2 480) ㎒
Average Output Power (Conducted)	GFSK : 6.67 ㏈m π/4DQPSK : 3.60 ㏈m 8DPSK : 3.62 ㏈m LE 1 Mbps : 3.78 ㏈m LE 2 Mbps : 3.53 ㏈m
Modulations	GFSK, π/4DQPSK, 8DPSK
Highest SAR Value (Reported)	0.117 W/kg
Highest Simultaneous SAR Value(Reported)	N/A
FCC Classification	FCC Pasrt 15 Spread Spectrum Transmitter (DSS) Digital Transmission System (DTS)
Channel Number	DSS : 79 ch DTS : 40 ch
Antenna Gain (peak)	2.10 ㏈i
Antenna Setup	1TX / 1RX
Remarks	RF module FCC ID: BEJ-F1DA2835P RF module(F1DA2835P) report No.: REP015887-1(Bluetooth) REP015887-2(Bluetooth LE)

2.1.1 Variants Covered By This Report(Model Distinction)

Model Distinction
XG2T*
Note 1)Front * : Code by region or customer -ex) D: Germany, U: UK, M: North America Walmart
Note 2)Back ** : Product color -ex) BK : Black / BE : Beige / RD : Red / GD : Green
The symbol '*' in the model name can be alphanumeric characters or blank.

2.2 Operation During Test

The EUT contains FCC approved RF module.
The EUT is the transceiver which is Bluetooth v5.3 module supporting BDR/EDR/LE mode.
The Laptop was used to control the EUT to transmit the wanted TX channel continuously by the testing program (FCC Test Tools V2.25) supported by manufacturer.
The EUT was tested at the lowest channel, middle channel and the highest channel with the maximum output power in accordance with the manufacturer's specifications. The worst data were recorded in the report.

2.2.1 Operating Environment

Parameters	Recording during test	Accepted deviation
Ambient temperature	(21.5 ~ 22.4) ℃	(18.0 ~ 25.0) ℃
Relative Humidity	(37.2 ~ 45.8) %	(30.0 ~ 70.0) %

2.2.2 Table of test channels

Frequency band	Modulation	Test Channel (CH)	Frequency (㎒)
(2 402 ~ 2 480) ㎒	GFSK, π/4DQPSK, 8DPSK	0	2 402
		39	2 441
		78	2 480
	LE 1 Mbps, LE 2 Mbps	0	2 402
		19	2 440
		39	2 480

2.2.3 Table of test power setting

Frequency	Mode	Power Setting Level
(2 402 ~ 2 480) ㎒	GFSK	DUT Mode & Max. Power
	π/4DQPSK	DUT Mode & Max. Power
	8DPSK	DUT Mode & Max. Power
	LE 1 Mbps	10
	LE 2 Mbps	10

2.2.4 Antenna Information

Frequency	Mode	Antenna TX mode	Support MIMO
(2 402 ~ 2 480) ㎒	GFSK, π/4DQPSK, 8DPSK	■ 1TX, □ 2TX	□ Yes, ■ No
(2 402 ~ 2 480) ㎒	LE 1 Mbps, 2 Mbps	■ 1TX, □ 2TX	□ Yes, ■ No

2.2.5 Additional Information Related to Testing

RF module approved as below are installed in this device.

Product Name	Module Name	FCC ID	Remark
Bluetooth Module	F1DA2835P	BEJ-F1DA2835P	BDR/EDR/LE module

SAR testing was performed with a device-to-phantom separation distance of 0 mm according to KDB 447498 requirements.

2.3 Support Equipment

EUT	LG Electronics USA., Inc Model : XG2T	S/N: N/A
Laptop Computer	SAMSUNG Model : NT300E5Q	FCC DOC S/N : 0QR291IHC00394L
AC/DC Adapter	SAMSUNG Model : A13-040N2A 0.75 m unshielded power cable	FCC DOC S/N : CN60BA4400313ADON871C04L2

2.4 Maximum Target Power among production units

Tune up tolerance is specified in operational description.
SAR values were scaled to the maximum tune-up power to determine compliance per KDB Publication 447498 D04 Interim General RF Exposure Guidance v01.

Mode	Nominal Power (dB m)	Maximum Power (dB m)
GFSK	6.0	7.0
π/4DQPSK	3.0	4.0
8DPSK	3.0	4.0
LE 1 Mbps	3.5	4.5
LE 2 Mbps	3.5	4.5

2.5 SAR Test Consideration

Per FCC KDB 447498 D04 Interim General RF Exposure Guidance v01, SAR-based exemption threshold for distance ≤ 20 ㎝ is defined by the following equation.

$$P_{\text{th}}\ (\text{mW}) = \begin{cases} ERP_{20\ \text{cm}}(d/20\ \text{cm})^{x} & d \le 20\ \text{cm} \\ ERP_{20\ \text{cm}} & 20\ \text{cm} < d \le 40\ \text{cm} \end{cases}$$

$$x = -\log_{10}\left(\frac{60}{ERP_{20\ \text{cm}}\sqrt{f}}\right)$$

f is in ㎓.

d is the separation distance (㎝).

Because the minimum separation distance was assumed to be 5 ㎜, the equation is used $ERP_{20cm}(d/20\ \text{㎝})^{x}$.

Table B.2—Example Power Thresholds (mW)

Frequency (MHz)	Distance (mm)										
	5	10	15	20	25	30	35	40	45	50
300	39	65	88	110	129	148	166	184	201	217
450	22	44	67	89	112	135	158	180	203	226
835	9	25	44	66	90	116	145	175	207	240
1900	3	12	26	44	66	92	122	157	195	236
2450	3	10	22	38	59	83	111	143	179	219
3600	2	8	18	32	49	71	96	125	158	195
5800	1	6	14	25	40	58	80	106	136	169

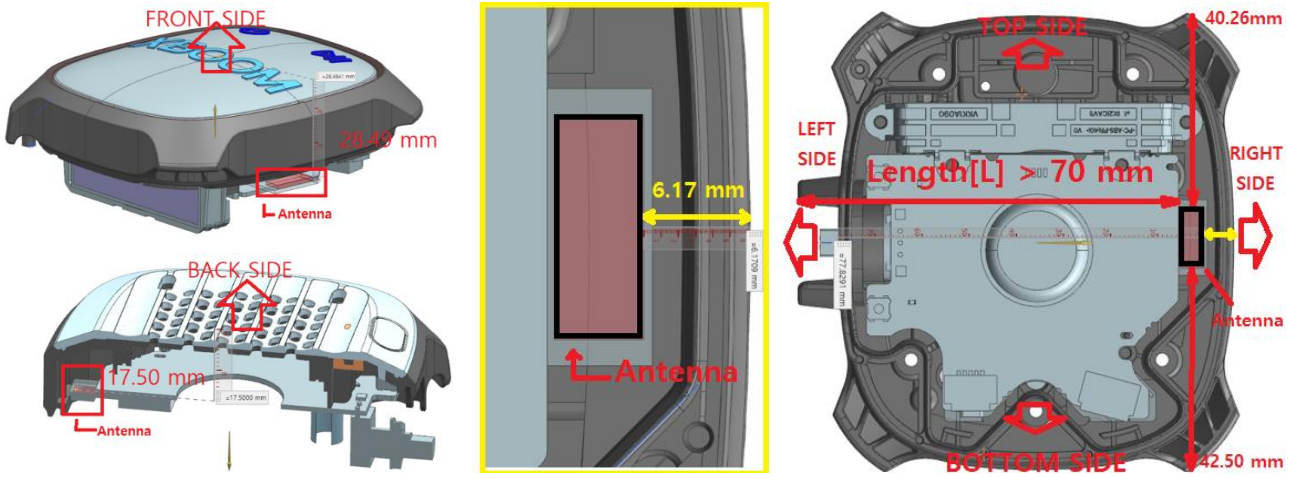
According to the FCC KDB 447498 D04 Interim General RF Exposure Guidance v01 Appendix B.2 Table, BDR(GFSK) is required to SAR testing.
Refer to the following table.

Mode	Max. Average Output Power (dB m)	Max. Average Output Power (mW)	Required to SAR test
GFSK	6.67	4.65	**Yes**
π/4DQPSK	3.60	2.29	No
8DPSK	3.62	2.30	No
LE 1 Mbps	3.78	2.39	No
LE 2 Mbps	3.53	2.25	No

2.6 SAR testing EUT configuration

Device Type	Band/Mode	Device edge for SAR Testing					
		Front	Back	Left edge	Right edge	Top	Bottom
Bluetooth Speaker	BT/GFSK	N/A	Yes	N/A	Yes	N/A	N/A

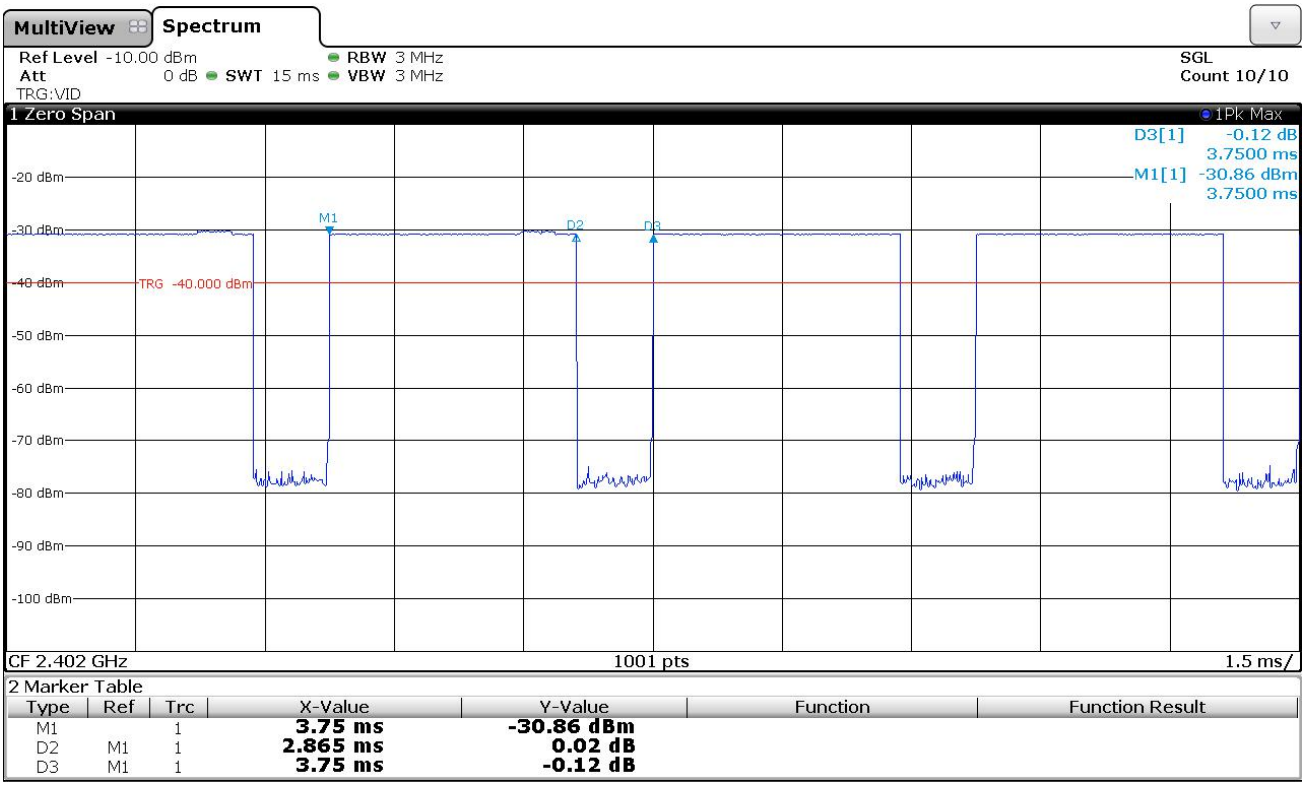
2.7 Antenna Location



2.8 Bluetooth Duty Cycle plot

Per October 2016 TCB Workshop Notes, When call box and Bluetooth protocol are used, time-domain plots are required to identify duty factor supporting the test setup and results.

Mode	Packet	On time (ms)	On-Off time (ms)	Duty cycle (%)
BDR(GFSK)	DH5	2.865	3.750	76.40



3. TEST METHODOLOGY

1. FCC 47 CFR Part 2 (2.1093)
2. IEEE 1528-2013
3. FCC KDB Publication 447498 D04v01(Interim General RF Exposure)
4. FCC KDB Publication 865664 D01v01r04 (SAR Measurements up to 6 GHz)
5. 2016 October TCB Workshop Notes (RF Exposure Procedures)
6. 2019 April TCB Workshop Notes (Tissue Simulating Liquids)
7. SPEAG DASY8 System Handbook

4. Power Density Measurement System

5.1 SAR Measurement Setup

Measurement are performed using the DASY8 automated dosi-metric assessment system. Which is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland and consists of high precision robotics system (Staubli), robot controller, measurement server, H/P computer, nearfield probe, probe alignment sensor and the SAM phantom containing the brain equivalent material. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF).

5.2 SAR Measurement System

5.2.1 SPEAG DASY8 System

The DASY8 system uses the high-precision industrial robots TX2-90XL from Staubli. The robots are controlled by the Staubli CS9c controllers. The Robot arm is an essentially maintenance-free 6-axis robot arm equipped with servomotors coupled to safe digital absolute encoders for each joint axis. The DASY8 measurement server handles all time critical tasks such as acquisition of measurement data, detection of phantom surface, control of robot movements, supervision of safety features. The Electrical to Optical Converter(EOC8) supports several functionalities that exchange between the DAE and the measurement server, power supply for DAE4IP and MAGPy-ES, touch/collision detection for applications that do not require a DAE4, data acquisition based on ethernet protocol, device positioner for DASY8. The DAE is used to acquire the probe sensor voltages and transfer them to the DASY8 measurement server and to report mechanical surface detection and probe collisions.

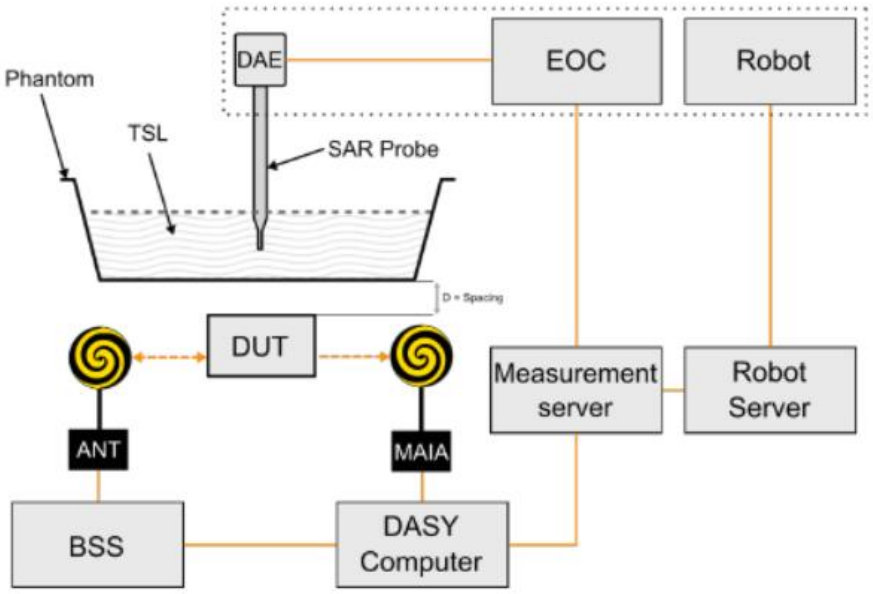


Figure 5.2.1 Typical DASY8 measurement procedure

5.2.2 SAR Probe

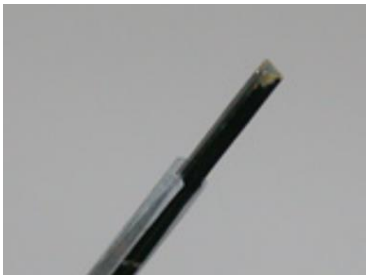
The SAR measurement were conducted with dosimetric probe designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates.

The probe is equipped with ant optical multi-fiber line ending at the front of the probe tip. It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface.

Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches a System maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero.

The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY8 software reads the reflection during a software approach and looks for the maximum using a 2nd order fitting.

The approach is stopped at reaching the maximum.

Model	EX3DV4 (Refer to Appendix)	
Frequency	4 ㎒ to 10 ㎓	
Dynamic Range	10 ㎼/g → 100 ㎽/g	
Linearity	< ± 0.2 ㏈	
Hemispherical Isotropy	< 0.5 ㏈	
Position Precision	< 0.2 mm	
Dimensions	Overall length : 337 mm (tip : 20 mm) Tip diameter : 2.5 mm (body : 12 mm) Typical distance from probe tip to dipole centers : 1 mm	

5.2.3 SAM Phantom

The shells have a very tight tolerance of less than 0.2 mm, and they are fully compliant with the SAR standards and national regulations in the frequency range of 4 ㎒ ~ 10 ㎓. Full computer-aided design (CAD) information have been predefined in the DASY8 software, enabling fast and easy usage.

In DASY8, phantoms are placed in a platform slot. The position of the slot relative to the robot is taught using the three reference points (P1, P2, P3) located on top of the phantom table.

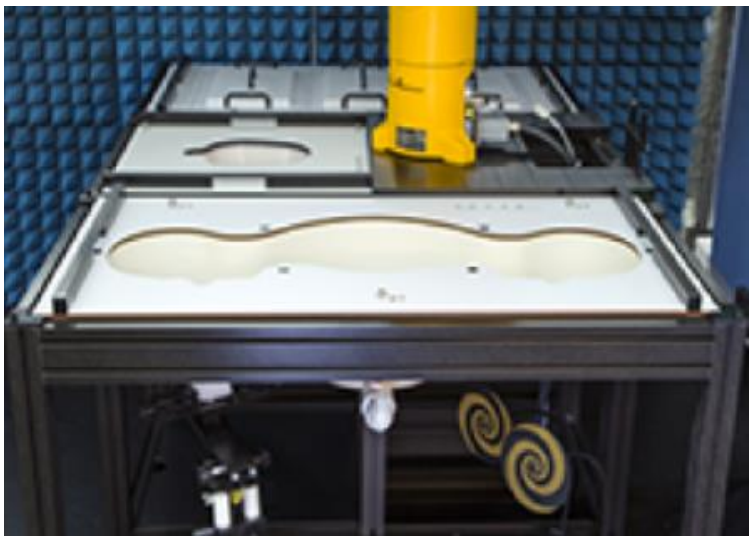


Figure 5.2.3 SAM Twin Phantom

5.2.4 ELI Phantom

The ELI phantom is optimized for compliance testing of large handheld and body-mounted wireless devices (tablets, laptops) or for evaluating transmitters operating at low frequencies.

The size of the phantom, including top plate is 1.0 x 0.5 m (1 full DASY8 platform slot). The filling volume is approximately 25 L.

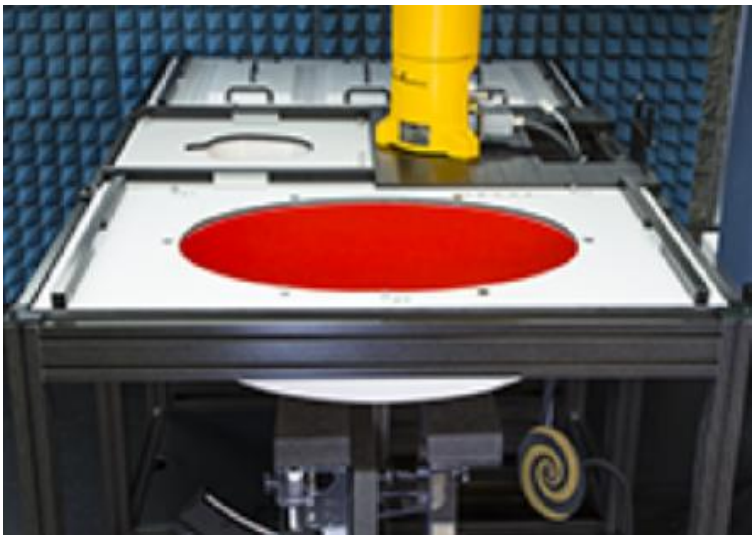


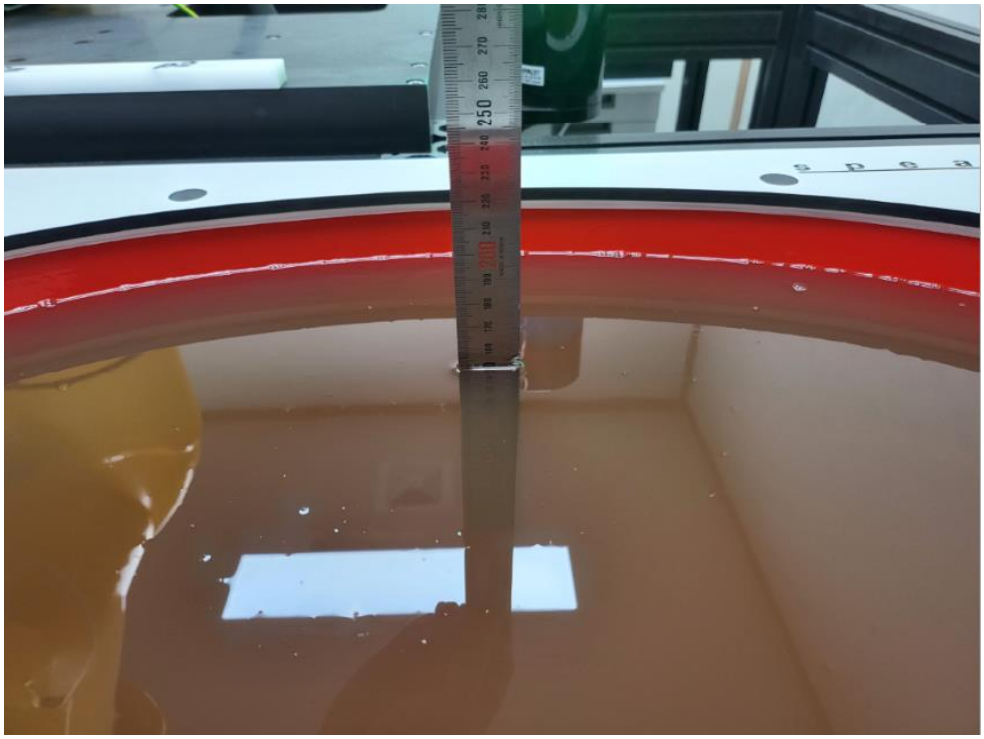
Figure 5.2.4 ELI Phantom

5.3 Simulating Mixture Characterization

The dielectric properties of the liquid material used in the phantom shall be those listed in Table 5.4. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the desired tissue. The tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 have been incorporated in the following table.

Table 5.4 Composition of the Head Tissue Equivalent Matter

INGREDIENTS	SIMULATING TISSUE
	2450 ㎒ Head
De-ionised water	56.23 %
Oxyethylated Sorbitan Mono Laurate	43.67 %
Ethyldihydro	0.1 %
Sum	100 %



600 MHz ~ 10 GHz Head Broad band Tissue Simulating Liquid, Depth: 150 mm

5.4 Device Holder for Transmitters

Accurate device positioning is therefore crucial for accurate and repeatable measurements. The positions at which the devices must be measured are defined by the standards. The DASY8 device holder along with the associated adaptors / options is designed to accommodate different types and sizes of test devices and yet provide accurate and repeatable positioning as described in the test standards.

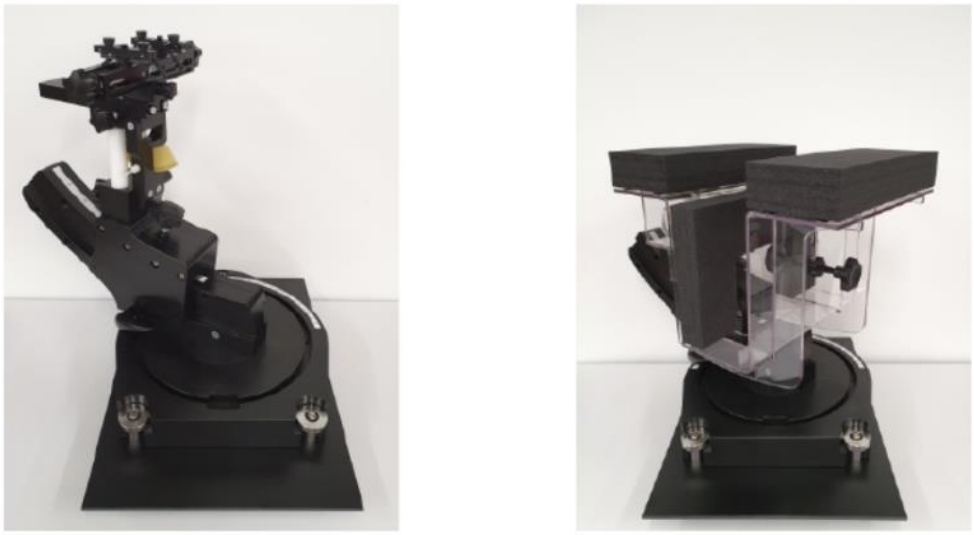


Figure 5.5 Mounting Device for Hand-held Devices and Laptop / Body-Worn Devices

6. Limits For Specific Absorption Rate (SAR)

HUMAN EXPOSURE	SAR (W/kg)	
	General Population / Uncontrolled Exposure Environment	Occupational / Controlled Exposure Environment
Spatial Peak SAR (Brain)	1.6	8.0
Spatial Average SAR (Whole Body)	0.08	0.4
Spatial Peak SAR (Hands, Wrists, Feet and Ankles)	4.0	20.0

1. This limits accord to SAR Human Exposure Specified in ANSI/IEEE C95.1-1992 and Health Canada Safety Code 6.
2. The Spatial Peak value of the SAR averaged over any 1g of tissue and over the appropriate averaging time.
3. The Spatial average value of the SAR averaged over the whole body.
4. The Spatial Peak value of the SAR averaged over any 10g of tissue and over appropriate averaging time.

7. Measurement Uncertainty & Decision Rule

7.1 Measurement Uncertainty

Per KDB 865664 D01 SAR measurement 100 MHz to 6 GHz clause 2.8.2, SAR measurement uncertainty analysis is required in SAR report only when the highest measured SAR in a frequency band is ≥ 1.5 W/kg for 1-g SAR and ≥ 3.75 W/kg for 10-g SAR. The expanded SAR measurement uncertainty must be ≤ 30 %, for confidence interval of k = 2.

For this device, the highest measured 1-g SAR is less 1.5 W/kg and 10-g SAR is less 3.75 W/kg. Therefore, the measurement uncertainty table is not required in this report.

7.2 Decision Rule

The choice of whether or not to include the measurement uncertainty of the measuring system used in the test in the conformance determination.:

☐ Application of internal procedures used in type testing where traceability of measurement uncertainty is established.

☒ Applying the decision that the standard used for type testing does not require it.

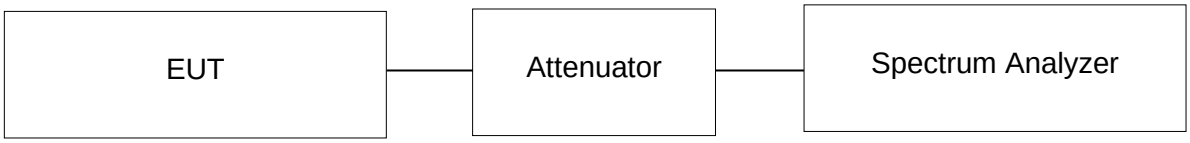
8. Test Equipments

No.	Instrument	Manufacturer	Model	Serial No.	Calibration Data	Calibration Due date
1	DASY8 System Robot	SPEAG	TX2-90XL	F/22/0036542/A/001	N/A	N/A
2	Shield Room	SY Corporation	NKRFS2	20220619	N/A	N/A
3	DASY8 Robot Controller	SPEAG	CS9spe-TX2-90	F/22/0036542/c/001	N/A	N/A
4	E-Field probe	SPEAG	EX3DV4	7731	2023-05-22	2024-05-22
5	Device Holder	SPEAG	DH2005	SD HAC H01 CA	N/A	N/A
6	Dipole Antenna	SPEAG	D2450V2	774	2022-04-25	2024-04-25
7	Power Meter	R&S	NRVS	835360/002	2023-01-09	2024-01-09
8	Power Sensor	R&S	NRV-Z5	833722/006	2023-01-09	2024-01-09
9	Power Meter	H.P	437B	2912U01687	2023-10-10	2024-10-10
10	Power Sensor	H.P	8481A	3318A83210	2023-10-10	2024-10-10
11	Power Meter	Anritsu	ML2437A	97310060	2023-07-03	2024-07-03
12	Power Sensor	Anritsu	MA2474A	181289	2023-07-03	2024-07-03
13	Low Pass Filter	Mini-Circuit	VLF-3000+	3 2044	2023-12-12	2024-12-12
14	3 dB Attenuator	Mini-Circuit	BW-S3W20+	2224	2023-10-10	2024-10-10
15	RF Power Amplifier	EXODUS ADVANCED	AMP2027ADB	10004	2023-10-11	2024-10-11
16	Vector Reflectometer	SPEAG	R140	21460035	2023-08-29	2024-08-29
17	Oval Flat phantom ELI v8	SPEAG	QD OVA 004 A	2170	N/A	N/A
18	Signal & Spectrum Analyzer	R&S	FSW43	100732	2023-03-30	2024-03-30
19	DIGITAL MULTIMETER	EZ DIGITAL	DM-334	2111395	2023-10-11	2024-10-11
20	Data Acquisition Electronics	SPEAG	DAE4	1726	2023-05-23	2024-05-23
21	Humidity Temperature	Lutron	MHB-382SD	65456	2023-10-17	2024-10-17
22	DUAL DIRECTIONAL COUPLER	KEYSIGHT	772D	MY52180366	2023-03-30	2024-03-30
23	10 dB Attenuator	H.P	8491B	57773	2023-10-10	2024-10-10
24	WIDEBAND RADIO COMMUNICATION TESTER	R&S	CMW500	145181	2023-04-13	2024-04-13

9. Output Power Measurement

9.1 Measurement procedures for Output Power

EUTs average output power was measured at low, middle, high channels with a spectrum analyzer connected to the antenna terminal while the EUTs operating at its maximum power control level.



Power measurement Test Setup

9.2 Conducted RF Output Power

Mode	Measured Frequency (㎒)	Measured Output Power (dB m)	
		Measured Output Power (dB m)	Measured Output Power (㎽)
BDR(GFSK)	2 402	6.35	4.32
	2 441	6.37	4.34
	2 480	6.67	4.65
EDR(π/4DQPSK)	2 402	3.60	2.29
	2 441	3.51	2.24
	2 480	3.51	2.24
EDR(8DPSK)	2 402	3.62	2.30
	2 441	3.59	2.29
	2 480	3.43	2.20
LE 1 Mbps	2 402	3.77	2.38
	2 440	3.68	2.33
	2 480	3.78	2.19
LE 2 Mbps	2 402	3.48	2.23
	2 440	3.40	2.19
	2 480	3.53	2.25

10. System Verification

10.1 Tissue verification results

For the measurement of the following parameters the DAKS-3.5 was used, representing the open-ended slim form probe measurement procedure. The measured values should be within ±5% of the recommended values given by IEEE 1528-2013.

Table 10.1 Measured Tissue Parameters

Date	Liquid Type	Liquid Temp. (℃)	Frequency (㎒)	Measured relative Permittivity (ε)	Measured Conductivity (S/m)	Target relative Permittivity (ε)	Target Conductivity (S/m)	Permittivity Error (%)	Conductivity Error (%)
Dec 08.2023	2G /Head	22.30	2 402	38.318	1.815	39.285	1.757	-2.461	3.256
			2 441	38.256	1.844	39.216	1.792	-2.448	2.922
			2 450	38.247	1.852	39.200	1.800	-2.432	2.862
			2 480	38.198	1.877	39.162	1.833	-2.460	2.411

10.2 System Verification Test setup

The system verification is verified to the ±10% of the specifications at each frequency band by using the system validation kit.

1. Perform internal calibration of each equipment.
2. Cabling the system, using the verification kit equipment.
3. The input level is set to be about 250 mW from the signal generator to the dipole antenna.
4. Dipole antenna was located below the phantom.
5. System verification was performed and 1g / 10g SAR was measured.
6. The results were normalized to 1 W input power.
7. Check if the 1 W normalized value was within ±10% of the target value.

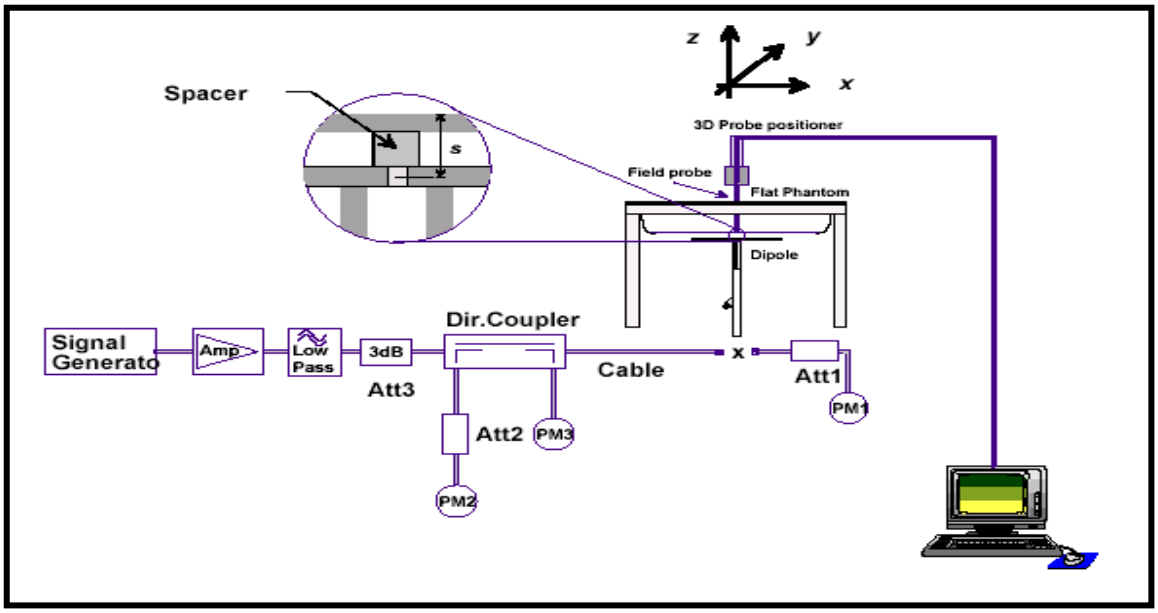


Figure 10.2 System Verification setup

10.3 System Verification Results

A complete 1 g and/or 10 g averaged SAR measurement is performed using a standard source. The input power of the standard source is adjusted to produce a 1 g and/or 10 g averaged SAR value falling in the range of 0.4 W/kg to 10 W/kg. The 1 g and/or 10g averaged SAR is measured at frequencies in Table 10.2 within the range to be used in compliance tests. The results are normalized to 1 W forward input power and compared with the reference SAR value.

Table 10.2 System Verification Results

Date	Liquid Temperature (°C)	Measured Frequency (㎒)	Targeted 1 g SAR (W/kg)	Measured 1 g SAR (W/kg)	Normalized 1 g SAR (W/kg)	Deviation (%)	Verification Kit	Plot No.
Dec 08.2023	22.3	2 450	52.80	13.70	54.80	3.79	D2450V2 SN: 774	#V01

11. SAR Measurement Results

1. Per KDB 447498 D04v01, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.

Scaling Factor = Maximum Tune-up limit power(㎽) / EUT RF Power(㎽),

Where tune-up limit is the maximum rated power among all production units.

Reported SAR(W/kg) = Scaling Factor * Measured SAR (W/kg)

2. Tune-up Limit power is refer to clause 2.4.

Measured Frequency		Mode	Test distance	Average Power (mW)	Maximum Tune-Up Limit pwr (mW)	Scaling Factor	Duty Factor	EUT Configuration	Measured SAR 1g (W/kg)	Reported SAR 1g (W/kg)	Plot No.
㎒	CH										
2480	78	GFSK	0 mm	4.65	5.01	1.08	1.31	Back	0.024	0.034	#S01
								Right	0.060	0.085	#S02
2402	0			4.32		1.16	1.31	Right	0.077	0.117	#S03
2441	39			4.34		1.16	1.31	Right	0.073	0.110	#S04

11. Conclusion

The SAR evaluation indicates that the EUT complies with the RF radiation exposure limits of the FCC with respect to all parameters subject to this test. These measurements were taken to simulate the RF effects of RF exposure under worst-case conditions. The results and statements relate only to the item(s) tested.

APPENDIX A. PLOTS OF SAR RESULTS

Measurement PLOT #S01

Measurement Report for F1DA2835P, BACK, ISM 2.4 GHz Band, UID 10032 CAA, Channel 78 (2480.000MHz)

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	IMEI	DUT Type
XG2T,	100.0 x 91.0 x 50.0		Phone

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, HSL	BACK, 0.00	ISM 2.4 GHz Band	Bluetooth, 10032-CAA	2480.000, 78	7.86	1.88	38.2

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2170	HBBL-600-10000 Charge:xxxx, 2023-Dec-08	EX3DV4 - SN3947, 2023-03-24	DAE4 Sn1726, 2023-05-23

Scan Setup

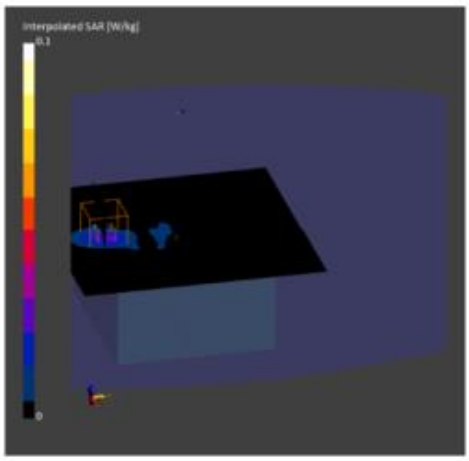
	Area Scan	Zoom Scan
Grid Extents [mm]	140.0 x 140.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	10.0 x 10.0	5.0 x 5.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	Y	Y
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-12-08, 16:03	2023-12-08, 16:17
psSAR1g [W/kg]	0.024	0.024
psSAR10g [W/kg]	0.011	0.010
Power Drift [dB]	-0.16	0.09
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		77.7
Dist 3dB Peak [mm]		9.5

Warning(s) / Error(s)

Details	Area Scan	Zoom Scan
Warning(s)		
Error(s)		



Measurement PLOT #S02

Measurement Report for F1DA2835P, EDGE RIGHT, ISM 2.4 GHz Band, UID 10032 CAA, Channel 78 (2480.000MHz)

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	IMEI	DUT Type
XG2T,	100.0 x 91.0 x 50.0		Phone

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, HSL	EDGE RIGHT, 0.00	ISM 2.4 GHz Band	Bluetooth, 10032-CAA	2480.000, 78	7.86	1.88	38.2

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2170	HBBL-600-10000 Charge:xxxx, 2023-Dec-08	EX3DV4 - SN3947, 2023-03-24	DAE4 Sn1726, 2023-05-23

Scan Setup

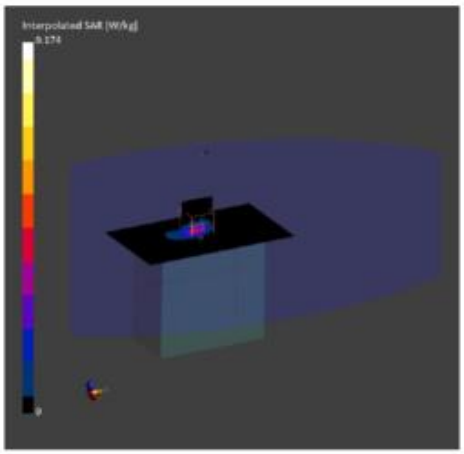
	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 140.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	10.0 x 10.0	5.0 x 5.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	Y	Y
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-12-08, 19:23	2023-12-08, 19:36
psSAR1g [W/kg]	0.059	0.060
psSAR10g [W/kg]	0.023	0.021
Power Drift [dB]	0.16	-0.16
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		70.4
Dist 3dB Peak [mm]		5.7

Warning(s) / Error(s)

Details	Area Scan	Zoom Scan
Warning(s)		
Error(s)		



Measurement PLOT #S03

Measurement Report for F1DA2835P, EDGE RIGHT, ISM 2.4 GHz Band, UID 10032 CAA, Channel 0 (2402.000MHz)

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	IMEI	DUT Type
XG2T,	100.0 x 91.0 x 50.0		Phone

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, HSL	EDGE RIGHT, 0.00	ISM 2.4 GHz Band	Bluetooth, 10032-CAA	2402.000, 0	7.86	1.81	38.3

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2170	HBBL-600-10000 Charge:xxxx, 2023-Dec-08	EX3DV4 - SN3947, 2023-03-24	DAE4 Sn1726, 2023-05-23

Scan Setup

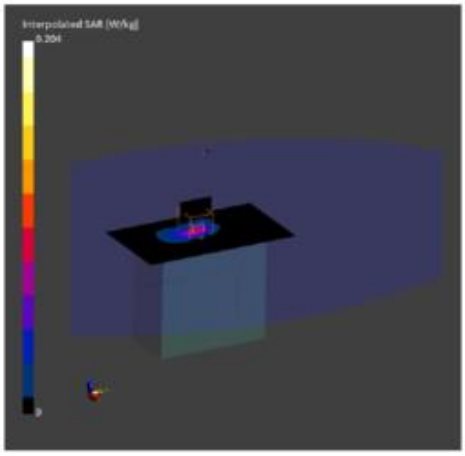
	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 140.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	10.0 x 10.0	5.0 x 5.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	Y	Y
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-12-08, 19:02	2023-12-08, 19:16
psSAR1g [W/kg]	0.077	0.077
psSAR10g [W/kg]	0.033	0.030
Power Drift [dB]	0.09	-0.03
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		71.5
Dist 3dB Peak [mm]		7.3

Warning(s) / Error(s)

Details	Area Scan	Zoom Scan
Warning(s)		
Error(s)		



Measurement PLOT #S04

Measurement Report for F1DA2835P, EDGE RIGHT, ISM 2.4 GHz Band, UID 10032 CAA, Channel 39 (2441.000MHz)

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	IMEI	DUT Type
XG2T,	100.0 x 91.0 x 50.0		Phone

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, HSL	EDGE RIGHT, 0.00	ISM 2.4 GHz Band	Bluetooth, 10032-CAA	2441.000, 39	7.86	1.84	38.3

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2170	HBBL-600-10000 Charge:xxxx, 2023-Dec-08	EX3DV4 - SN3947, 2023-03-24	DAE4 Sn1726, 2023-05-23

Scan Setup

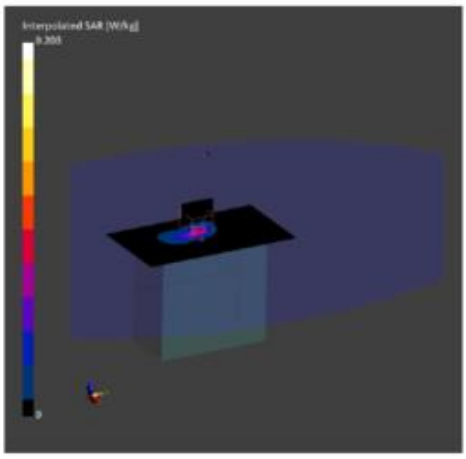
	Area Scan	Zoom Scan
Grid Extents [mm]	80.0 x 140.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	10.0 x 10.0	5.0 x 5.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	Y	Y
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-12-08, 19:47	2023-12-08, 20:01
psSAR1g [W/kg]	0.073	0.073
psSAR10g [W/kg]	0.030	0.027
Power Drift [dB]	-0.04	-0.07
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		70.8
Dist 3dB Peak [mm]		6.5

Warning(s) / Error(s)

Details	Area Scan	Zoom Scan
Warning(s)		
Error(s)		



APPENDIX B. PLOTS OF SYSTEM VERIFICATION

Measurement PLOT #V01 (System Verification Results)

System Performance Check Report

Summary

Dipole	Frequency [MHz]	TSL	Power [dBm]	Dev. 1g [%]	Dev. 10g [%]	Dev. Peak [%]	Iso. Error [%]
D2450V2 - SN774	2450.0	HSL	24.0	1.0	0.2	14.1	-12.6

Exposure Conditions

Phantom Section, TSL	Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	10		CW, 0---	2450.000, 0	7.86	1.85	38.2

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt) - 2170	HBBL-600-10000 Charge:xxxx, 2023-Dec-08	EX3DV4 - SN3947, 2023-03-24	DAE4 Sn1726, 2023-05-23

Scan Setup

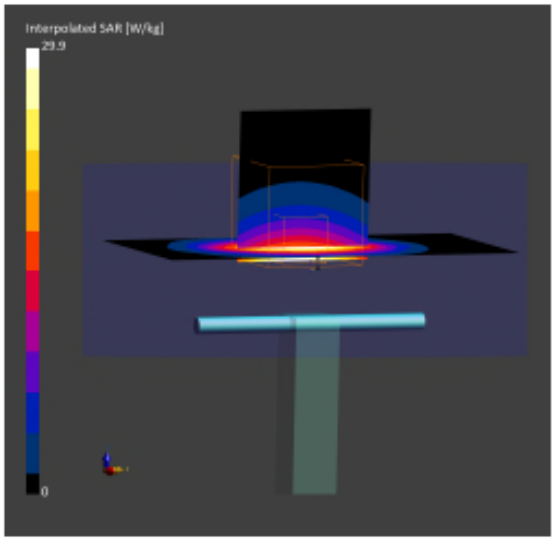
	Area Scan	Zoom Scan
Grid Extents [mm]	40.0 x 80.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	10.0 x 10.0	5.0 x 5.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-12-08, 13:38	2023-12-08, 13:51
psSAR1g [W/Kg]	13.6	13.7
psSAR10g [W/Kg]	6.44	6.34
Power Drift [dB]	0.01	-0.00
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction

Warning(s) / Error(s)

Details	Area Scan	Zoom Scan
Warning(s)		
Error(s)		



APPENDIX C. CALIBRATION REPORT OF THE PROBE

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

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

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

Accreditation No.: SCS 0108

Client	**Nemko** **Gyeonggi-do, Republic of Korea**	Certificate No.	**EX-7731_May23**

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:7731
Calibration procedure(s)	QA CAL-01.v10, QA CAL-12.v10, QA CAL-14.v7, QA CAL-23.v6, QA CAL-25.v8 Calibration procedure for dosimetric E-field probes
Calibration date	May 22, 2023

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 NRP2	SN: 104778	30-Mar-23 (No. 217-03804/03805)	Mar-24
Power sensor NRP-Z91	SN: 103244	30-Mar-23 (No. 217-03804)	Mar-24
OCP DAK-3.5 (weighted)	SN: 1249	20-Oct-22 (OCP-DAK3.5-1249_Oct22)	Oct-23
OCP DAK-12	SN: 1016	20-Oct-22 (OCP-DAK12-1016_Oct22)	Oct-23
Reference 20 dB Attenuator	SN: CC2552 (20x)	30-Mar-23 (No. 217-03809)	Mar-24
DAE4	SN: 660	16-Mar-23 (No. DAE4-660_Mar23)	Mar-24
Reference Probe ES3DV2	SN: 3013	06-Jan-23 (No. ES3-3013_Jan23)	Jan-24

Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-22)	In house check: Jun-24
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-22)	In house check: Jun-24
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-22)	In house check: Jun-24
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-22)	In house check: Jun-24
Network Analyzer E8358A	SN: US41080477	31-Mar-14 (in house check Oct-22)	In house check: Oct-24

	Name	Function	Signature
Calibrated by	Jeton Kastrati	Laboratory Technician	
Approved by	Sven Kühn	Technical Manager	

Issued: May 23, 2023

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

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

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

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

Accreditation No.: SCS 0108

Glossary

TSL	tissue simulating liquid
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., $\vartheta = 0$ 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) IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices – Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
b) 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 $\vartheta = 0$ ($f \le 900$ 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. 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 $f \le 800$ 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).

Parameters of Probe: EX3DV4 - SN:7731

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc ($k = 2$)
Norm ($\mu V/(V/m)^2$) [A]	0.47	0.49	0.51	±10.1%
DCP (mV) [B]	101.2	101.5	101.3	±4.7%

Calibration Results for Modulation Response

UID	Communication System Name		A dB	B $dB\sqrt{\mu V}$	C	D dB	VR mV	Max dev.	Max Unc[E] $k = 2$
0	CW	X	0.00	0.00	1.00	0.00	141.1	±3.3%	±4.7%
		Y	0.00	0.00	1.00		134.7		
		Z	0.00	0.00	1.00		128.6		
10352	Pulse Waveform (200Hz, 10%)	X	1.51	60.74	6.58	10.00	60.0	±2.9%	±9.6%
		Y	1.35	60.00	5.93		60.0		
		Z	1.67	61.47	6.88		60.0		
10353	Pulse Waveform (200Hz, 20%)	X	0.76	60.00	4.93	6.99	80.0	±2.5%	±9.6%
		Y	0.83	60.00	4.79		80.0		
		Z	0.80	60.00	4.96		80.0		
10354	Pulse Waveform (200Hz, 40%)	X	0.51	114.83	1.75	3.98	95.0	±2.4%	±9.6%
		Y	0.44	60.00	3.63		95.0		
		Z	0.02	128.53	0.01		95.0		
10355	Pulse Waveform (200Hz, 60%)	X	0.00	153.82	53.88	2.22	120.0	±1.6%	±9.6%
		Y	11.19	133.36	1.89		120.0		
		Z	1.91	156.86	11.63		120.0		
10387	QPSK Waveform, 1 MHz	X	0.44	62.09	10.99	1.00	150.0	±4.6%	±9.6%
		Y	0.56	65.06	13.23		150.0		
		Z	0.43	63.20	11.45		150.0		
10388	QPSK Waveform, 10 MHz	X	1.32	65.87	13.70	0.00	150.0	±0.8%	±9.6%
		Y	1.37	66.87	14.27		150.0		
		Z	1.22	65.74	13.50		150.0		
10396	64-QAM Waveform, 100 kHz	X	1.60	63.63	15.66	3.01	150.0	±1.6%	±9.6%
		Y	1.76	65.36	16.35		150.0		
		Z	1.57	64.07	16.07		150.0		
10399	64-QAM Waveform, 40 MHz	X	2.81	66.22	15.08	0.00	150.0	±3.1%	±9.6%
		Y	2.84	66.69	15.35		150.0		
		Z	2.71	66.12	15.01		150.0		
10414	WLAN CCDF, 64-QAM, 40 MHz	X	3.81	65.93	15.29	0.00	150.0	±4.7%	±9.6%
		Y	3.78	66.27	15.41		150.0		
		Z	3.82	66.48	15.50		150.0		

Note: For details on UID parameters see Appendix

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

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

EX3DV4 - SN:7731 May 22, 2023

Parameters of Probe: EX3DV4 - SN:7731

Sensor Model Parameters

	C1 fF	C2 fF	α V^{-1}	T1 $ms\,V^{-2}$	T2 $ms\,V^{-1}$	T3 ms	T4 V^{-2}	T5 V^{-1}	T6
x	10.0	74.69	35.66	1.55	0.00	4.96	0.00	0.08	1.00
y	8.8	64.17	34.24	4.46	0.00	4.90	0.55	0.00	1.00
z	9.0	67.16	35.05	3.28	0.00	4.98	0.00	0.04	1.01

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle	-71.8°
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

Note: Measurement distance from surface can be increased to 3–4 mm for an *Area Scan* job.

Parameters of Probe: EX3DV4 - SN:7731

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz)[C]	Relative Permittivity[F]	Conductivity[F] (S/m)	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unc ($k = 2$)
835	41.5	0.90	10.68	10.68	10.68	0.34	1.07	±12.0%
900	41.5	0.97	10.39	10.39	10.39	0.48	0.80	±12.0%
1810	40.0	1.40	9.11	9.11	9.11	0.35	0.86	±12.0%
1950	40.0	1.40	8.87	8.87	8.87	0.31	0.86	±12.0%
2450	39.2	1.80	8.49	8.49	8.49	0.28	0.90	±12.0%
3500	37.9	2.91	7.45	7.45	7.45	0.30	1.35	±14.0%
3700	37.7	3.12	7.20	7.20	7.20	0.30	1.35	±14.0%
5200	36.0	4.66	6.14	6.14	6.14	0.40	1.80	±14.0%
5300	35.9	4.76	5.89	5.89	5.89	0.40	1.80	±14.0%
5500	35.6	4.96	5.54	5.54	5.54	0.40	1.80	±14.0%
5600	35.5	5.07	5.37	5.37	5.37	0.40	1.80	±14.0%
5800	35.3	5.27	5.45	5.45	5.45	0.40	1.80	±14.0%

[C] Frequency validity above 300 MHz of ±100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ±50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ±10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. 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] The probes are calibrated using tissue simulating liquids (TSL) that deviate for ε and σ by less than ±5% from the target values (typically better than ±3%) and are valid for TSL with deviations of up to ±10%. If TSL with deviations from the target of less than ±5% are used, the calibration uncertainties are 11.1% for 0.7 - 3 GHz and 13.1% for 3 - 6 GHz.

[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.

Parameters of Probe: EX3DV4 - SN:7731

Calibration Parameter Determined in Head Tissue Simulating Media

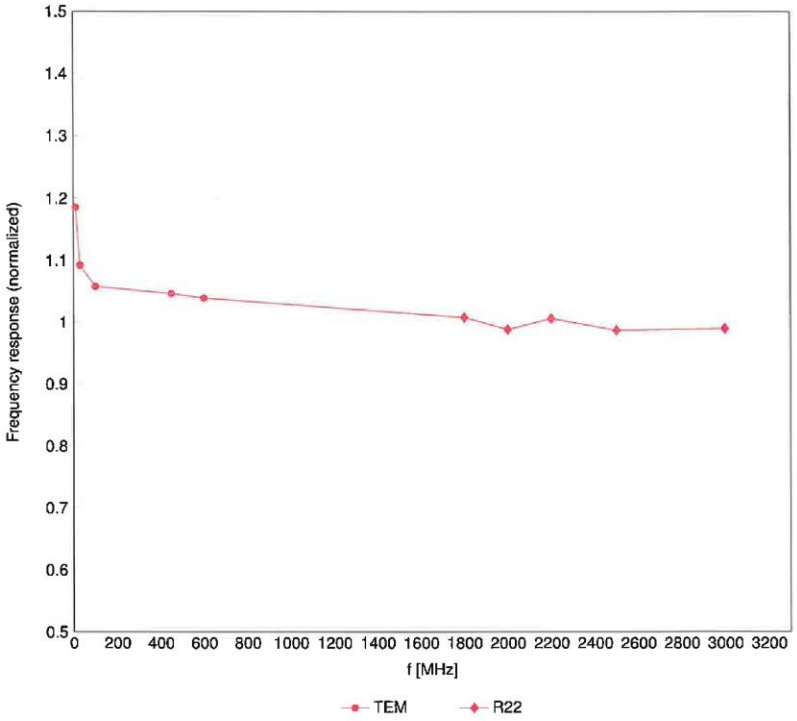
f (MHz)[C]	Relative Permittivity[F]	Conductivity[F] (S/m)	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unc ($k = 2$)
6500	34.5	6.07	5.75	5.75	5.75	0.20	2.50	±18.6%

[C] Frequency validity at 6.5 GHz is −600/+700 MHz, and ±700 MHz at or above 7 GHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] The probes are calibrated using tissue simulating liquids (TSL) that deviate for ε and σ by less than ±10% from the target values (typically better than ±6%) and are valid for TSL with deviations of up to ±10%.
[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; below ±2% for frequencies between 3–6 GHz; and below ±4% for frequencies between 6–10 GHz at any distance larger than half the probe tip diameter from the boundary.

EX3DV4 - SN:7731 May 22, 2023

Frequency Response of E-Field

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

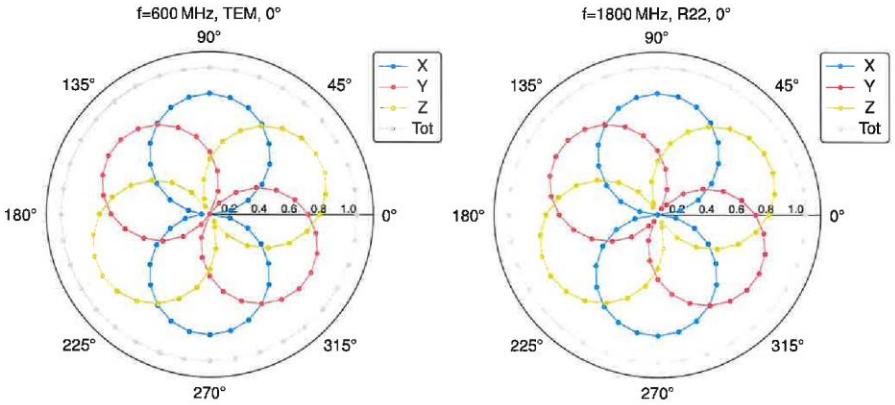


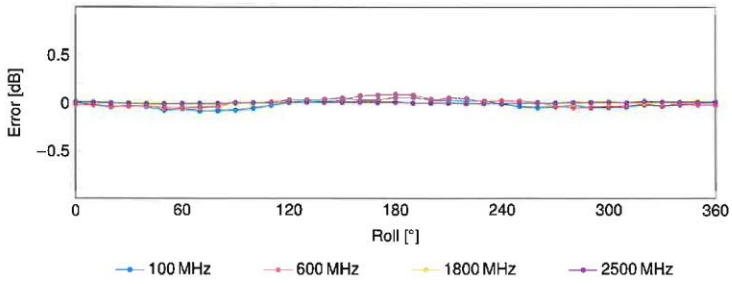
Uncertainty of Frequency Response of E-field: ±6.3% (k=2)

Certificate No: EX-7731_May23 Page 7 of 22

EX3DV4 - SN:7731 May 22, 2023

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



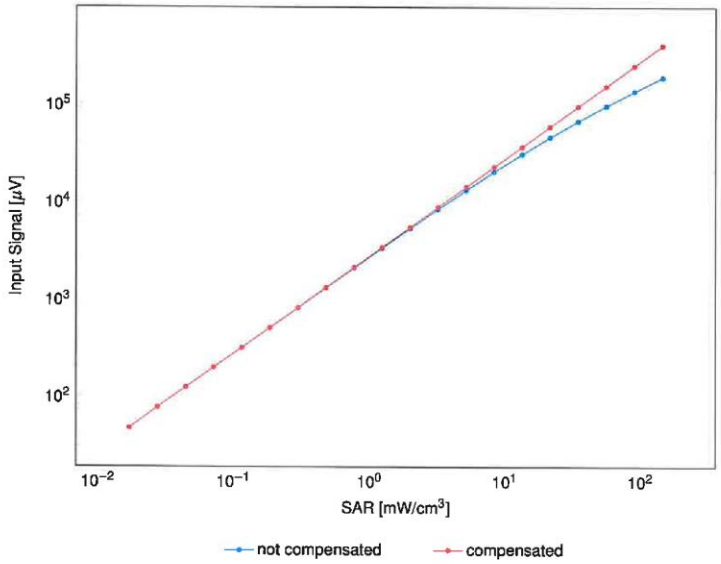


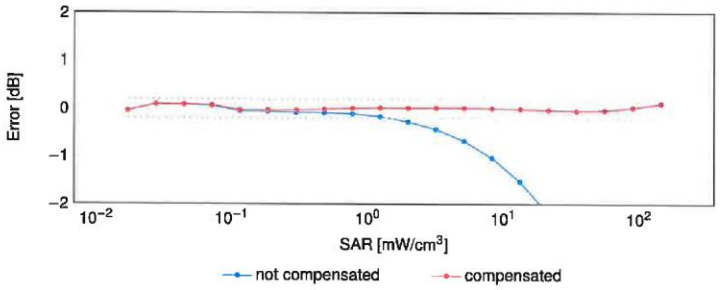
Uncertainty of Axial Isotropy Assessment: ±0.5% (k=2)

Certificate No: EX-7731_May23 Page 8 of 22

Dynamic Range f(SAR_{head})

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

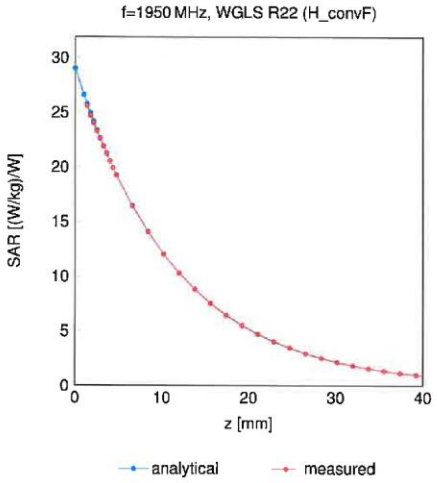




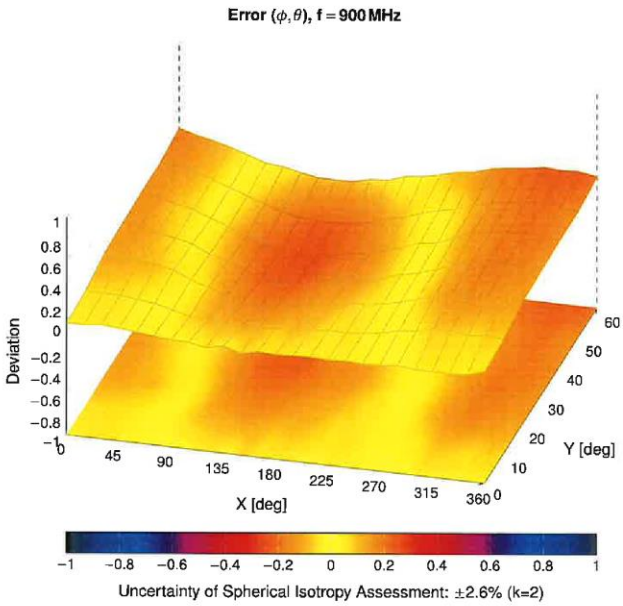
Uncertainty of Linearity Assessment: ±0.6% (k=2)

EX3DV4 - SN:7731 May 22, 2023

Conversion Factor Assessment



Deviation from Isotropy in Liquid



Appendix: Modulation Calibration Parameters

UID	Rev	Communication System Name	Group	PAR (dB)	Unc^E $k=2$
0		CW	CW	0.00	±4.7
10010	CAB	SAR Validation (Square, 100 ms, 10 ms)	Test	10.00	±9.6
10011	CAC	UMTS-FDD (WCDMA)	WCDMA	2.91	±9.6
10012	CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	WLAN	1.87	±9.6
10013	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	WLAN	9.46	±9.6
10021	DAC	GSM-FDD (TDMA, GMSK)	GSM	9.39	±9.6
10023	DAC	GPRS-FDD (TDMA, GMSK, TN 0)	GSM	9.57	±9.6
10024	DAC	GPRS-FDD (TDMA, GMSK, TN 0-1)	GSM	6.56	±9.6
10025	DAC	EDGE-FDD (TDMA, 8PSK, TN 0)	GSM	12.62	±9.6
10026	DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1)	GSM	9.55	±9.6
10027	DAC	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	GSM	4.80	±9.6
10028	DAC	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	GSM	3.55	±9.6
10029	DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1-2)	GSM	7.78	±9.6
10030	CAA	IEEE 802.15.1 Bluetooth (GFSK, DH1)	Bluetooth	5.30	±9.6
10031	CAA	IEEE 802.15.1 Bluetooth (GFSK, DH3)	Bluetooth	1.87	±9.6
10032	CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	Bluetooth	1.16	±9.6
10033	CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH1)	Bluetooth	7.74	±9.6
10034	CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH3)	Bluetooth	4.53	±9.6
10035	CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH5)	Bluetooth	3.83	±9.6
10036	CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH1)	Bluetooth	8.01	±9.6
10037	CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH3)	Bluetooth	4.77	±9.6
10038	CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH5)	Bluetooth	4.10	±9.6
10039	CAB	CDMA2000 (1xRTT, RC1)	CDMA2000	4.57	±9.6
10042	CAB	IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Halfrate)	AMPS	7.78	±9.6
10044	CAA	IS-91/EIA/TIA-553 FDD (FDMA, FM)	AMPS	0.00	±9.6
10048	CAA	DECT (TDD, TDMA/FDM, GFSK, Full Slot, 24)	DECT	13.80	±9.6
10049	CAA	DECT (TDD, TDMA/FDM, GFSK, Double Slot, 12)	DECT	10.79	±9.6
10056	CAA	UMTS-TDD (TD-SCDMA, 1.28 Mcps)	TD-SCDMA	11.01	±9.6
10058	DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1-2-3)	GSM	6.52	±9.6
10059	CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps)	WLAN	2.12	±9.6
10060	CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps)	WLAN	2.83	±9.6
10061	CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps)	WLAN	3.60	±9.6
10062	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps)	WLAN	8.68	±9.6
10063	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps)	WLAN	8.63	±9.6
10064	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps)	WLAN	9.09	±9.6
10065	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps)	WLAN	9.00	±9.6
10066	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps)	WLAN	9.38	±9.6
10067	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps)	WLAN	10.12	±9.6
10068	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps)	WLAN	10.24	±9.6
10069	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps)	WLAN	10.56	±9.6
10071	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 9 Mbps)	WLAN	9.83	±9.6
10072	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 12 Mbps)	WLAN	9.62	±9.6
10073	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 18 Mbps)	WLAN	9.94	±9.6
10074	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 24 Mbps)	WLAN	10.30	±9.6
10075	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 36 Mbps)	WLAN	10.77	±9.6
10076	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 48 Mbps)	WLAN	10.94	±9.6
10077	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps)	WLAN	11.00	±9.6
10081	CAB	CDMA2000 (1xRTT, RC3)	CDMA2000	3.97	±9.6
10082	CAB	IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Fullrate)	AMPS	4.77	±9.6
10090	DAC	GPRS-FDD (TDMA, GMSK, TN 0-4)	GSM	6.56	±9.6
10097	CAC	UMTS-FDD (HSDPA)	WCDMA	3.98	±9.6
10098	CAC	UMTS-FDD (HSUPA, Subtest 2)	WCDMA	3.98	±9.6
10099	DAC	EDGE-FDD (TDMA, 8PSK, TN 0-4)	GSM	9.55	±9.6
10100	CAF	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	LTE-FDD	5.67	±9.6
10101	CAF	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)	LTE-FDD	6.42	±9.6
10102	CAF	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)	LTE-FDD	6.60	±9.6
10103	CAH	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	LTE-TDD	9.29	±9.6
10104	CAH	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)	LTE-TDD	9.97	±9.6
10105	CAH	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)	LTE-TDD	10.01	±9.6
10108	CAH	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	LTE-FDD	5.80	±9.6
10109	CAH	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)	LTE-FDD	6.43	±9.6
10110	CAH	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	LTE-FDD	5.75	±9.6
10111	CAH	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)	LTE-FDD	6.44	±9.6

EX3DV4 - SN:7731 May 22, 2023

UID	Rev	Communication System Name	Group	PAR (dB)	Unc^E $k=2$
10112	CAH	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)	LTE-FDD	6.59	±9.6
10113	CAH	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)	LTE-FDD	6.62	±9.6
10114	CAD	IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK)	WLAN	8.10	±9.6
10115	CAD	IEEE 802.11n (HT Greenfield, 81 Mbps, 16-QAM)	WLAN	8.46	±9.6
10116	CAD	IEEE 802.11n (HT Greenfield, 135 Mbps, 64-QAM)	WLAN	8.15	±9.6
10117	CAD	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	WLAN	8.07	±9.6
10118	CAD	IEEE 802.11n (HT Mixed, 81 Mbps, 16-QAM)	WLAN	8.59	±9.6
10119	CAD	IEEE 802.11n (HT Mixed, 135 Mbps, 64-QAM)	WLAN	8.13	±9.6
10140	CAF	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM)	LTE-FDD	6.49	±9.6
10141	CAF	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM)	LTE-FDD	6.53	±9.6
10142	CAF	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, QPSK)	LTE-FDD	5.73	±9.6
10143	CAF	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)	LTE-FDD	6.35	±9.6
10144	CAF	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM)	LTE-FDD	6.65	±9.6
10145	CAG	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)	LTE-FDD	5.76	±9.6
10146	CAG	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM)	LTE-FDD	6.41	±9.6
10147	CAG	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM)	LTE-FDD	6.72	±9.6
10149	CAF	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)	LTE-FDD	6.42	±9.6
10150	CAF	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)	LTE-FDD	6.60	±9.6
10151	CAH	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	LTE-TDD	9.28	±9.6
10152	CAH	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)	LTE-TDD	9.92	±9.6
10153	CAH	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)	LTE-TDD	10.05	±9.6
10154	CAH	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	LTE-FDD	5.75	±9.6
10155	CAH	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)	LTE-FDD	6.43	±9.6
10156	CAH	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, QPSK)	LTE-FDD	5.79	±9.6
10157	CAH	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)	LTE-FDD	6.49	±9.6
10158	CAH	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)	LTE-FDD	6.62	±9.6
10159	CAH	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)	LTE-FDD	6.56	±9.6
10160	CAF	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	LTE-FDD	5.82	±9.6
10161	CAF	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM)	LTE-FDD	6.43	±9.6
10162	CAF	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM)	LTE-FDD	6.58	±9.6
10166	CAG	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK)	LTE-FDD	5.46	±9.6
10167	CAG	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM)	LTE-FDD	6.21	±9.6
10168	CAG	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM)	LTE-FDD	6.79	±9.6
10169	CAF	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	LTE-FDD	5.73	±9.6
10170	CAF	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)	LTE-FDD	6.52	±9.6
10171	AAF	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM)	LTE-FDD	6.49	±9.6
10172	CAH	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	LTE-TDD	9.21	±9.6
10173	CAH	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)	LTE-TDD	9.48	±9.6
10174	CAH	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM)	LTE-TDD	10.25	±9.6
10175	CAH	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	LTE-FDD	5.72	±9.6
10176	CAH	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)	LTE-FDD	6.52	±9.6
10177	CAJ	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, QPSK)	LTE-FDD	5.73	±9.6
10178	CAH	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)	LTE-FDD	6.52	±9.6
10179	CAH	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)	LTE-FDD	6.50	±9.6
10180	CAH	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)	LTE-FDD	6.50	±9.6
10181	CAF	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	LTE-FDD	5.72	±9.6
10182	CAF	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)	LTE-FDD	6.52	±9.6
10183	AAE	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM)	LTE-FDD	6.50	±9.6
10184	CAF	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, QPSK)	LTE-FDD	5.73	±9.6
10185	CAF	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)	LTE-FDD	6.51	±9.6
10186	AAF	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM)	LTE-FDD	6.50	±9.6
10187	CAG	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)	LTE-FDD	5.73	±9.6
10188	CAG	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)	LTE-FDD	6.52	±9.6
10189	AAG	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM)	LTE-FDD	6.50	±9.6
10193	CAD	IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)	WLAN	8.09	±9.6
10194	CAD	IEEE 802.11n (HT Greenfield, 39 Mbps, 16-QAM)	WLAN	8.12	±9.6
10195	CAD	IEEE 802.11n (HT Greenfield, 65 Mbps, 64-QAM)	WLAN	8.21	±9.6
10196	CAD	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	WLAN	8.10	±9.6
10197	CAD	IEEE 802.11n (HT Mixed, 39 Mbps, 16-QAM)	WLAN	8.13	±9.6
10198	CAD	IEEE 802.11n (HT Mixed, 65 Mbps, 64-QAM)	WLAN	8.27	±9.6
10219	CAD	IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK)	WLAN	8.03	±9.6
10220	CAD	IEEE 802.11n (HT Mixed, 43.3 Mbps, 16-QAM)	WLAN	8.13	±9.6
10221	CAD	IEEE 802.11n (HT Mixed, 72.2 Mbps, 64-QAM)	WLAN	8.27	±9.6
10222	CAD	IEEE 802.11n (HT Mixed, 15 Mbps, BPSK)	WLAN	8.06	±9.6
10223	CAD	IEEE 802.11n (HT Mixed, 90 Mbps, 16-QAM)	WLAN	8.48	±9.6
10224	CAD	IEEE 802.11n (HT Mixed, 150 Mbps, 64-QAM)	WLAN	8.08	±9.6