Nemko Korea Co., Ltd.

155 & 159, Osan-Ro, Mohyeon-Eup, Cheoin-Gu, Yongin-Si, Gyeonggi-Do 16885 KOREA, REPUBLIC OF
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FCC and IC SAR EVALUATION REPORT FOR CERTIFICATION

Applicant :
LG Electronics Inc.
222, LG-ro, Jinwi-myeon,
Pyeongtaek-si, Gyeonggi-do, 17709,
Republic of Korea
Attn. : Eunyee Ko

Dates of Issue : Jan 28, 2022
Test Report No. : NK-21-R-387
Test Site : Nemko Korea Co., Ltd.

FCC	**BEJLGSBWAC93**
IC	**2703H-LGSBWAC93**
Brand Name	**LG**
Contact Person	**LG Electronics Inc.** **222, LG-ro, Jinwi-myeon,** **Pyeongtaek-si, Gyeonggi-do,** **17709, Republic of Korea** **Eunyee Ko** **Telephone No. : +82-10-2210-7856**

Applied Standard:	FCC 47 CFR Part 2(2.1093) and IC RSS-102 Issue 5
Classification:	Digital Transmission System (DTS) Unlicensed National Information Infrastructure(UNII)
EUT Type:	Flat Panel Digital X-Ray Detector

Jan. 28. 2022

Tested By : Wonjae Song
Test Engineer

Jan. 28. 2022

Reviewed By : Seungyong Shin
Technical Manager

Revision History

Rev.	Issue Date	Revisions	Revised By
00	Jan 28, 2022	Initial issue	

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1. SCOPE

Measurement and determination of electromagnetic field intended to be used at a position near the human body with radio frequency device at distance up to and including 200mm from a human body for compliance with the technical rules and regulations of the Federal Communications Commission under FCC part 2 and IC RSS-102 Issue5.

Responsible Party :	LG Electronics Inc.
Contact Person :	Eunyee Ko
Manufacturer :	LG Electronics Inc. 77, Sanho-daero, Gumi-si , Gyeongsangbuk-do, 39381, Republic of Korea

- FCC ID: BEJLGSBWAC93
- IC: 2703H-LGSBWAC93
- Model: LGSBWAC93
- HVIN: TWCM-K504D
- Brand Name: LG
- EUT Type: Flat Panel Digital X-Ray Detector
- Classification: Digital Transmission System (DTS)
  Unlicensed National Information Infrastructure(UNII)
- Test Procedures(s): IEC/IEEE 62209-1528:2020
  IEEE 1528-2013
  KDB 447498 D01 General RF exposure Guidance v06
- Dates of Test: Dec 21, 2021 ~ Jan 20, 2022
- Place of Tests: Nemko Korea Co., Ltd.

2. INTRODUCTION

2.1 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 from **LG Electronics Inc. FCC ID : BEJLGSBWAC93** and **IC : 2703H-LGSBWAC93.**

These measurement tests were conducted at ***Nemko Korea Co., Ltd. EMC Laboratory*** .
The site address 155 & 159, Osan-Ro, Mohyeon-Myeon, Cheoin-Gu, Yongin-Si, Gyeonggi-Do 16885 KOREA, REPULIC OF.
The area of Nemko Korea Corporation Ltd. EMC Test Site is located in a mountain area at 80 km (48 miles) southeast and Incheon International Airport (Incheon Airport), 30 km (18miles) south-southeast from central Seoul.
It is located in the valley surrounded by mountains in all directions where ambient radio signal conditions are quiet and a favorable area to measure the radio frequency interference on open field test site for the computing and ISM devices manufactures.
The detailed description of the measurement facility was found to be in compliance with the requirements of ANSI C63.4-2014 according to §2.948.

Nemko Korea Co., Ltd.
EMC Lab.
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Fig. 1. The map above shows the Seoul in Korea vicinity area.
The map also shows Nemko Korea Corporation Ltd. EMC Lab. and Incheon Airport.

2.2 Accreditation and listing

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

3. TEST CONDITIONS & EUT INFORMATION

3.1 Operation During Test

The EUT is the SISO, MIMO(CDD,SDM) transceiver which is the 802.11a/b/g/n/ac mode (802.11a/b/g/n(20,40MHz)/ac(20,40,80MHz) : 1TX/RX, 2TX/RX.
The Laptop was used to control the EUT to transmit the wanted TX channel by the testing program (MT7668 QA 0.0.1.94) which manufacturer supported. 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.

3.1.1 Operating Environment

Parameters	Recording during test	Accepted deviation
Ambient temperature	(20.4 ~ 20.8) ℃	(18.0 ~ 25.0) ℃
Relative Humidity	(37.0 ~ 40.0) %	(30.0 ~ 70.0) %

3.1.2 Table of test power setting

Frequency	Mode	Power setting Level (SISO)	Power setting Level (MIMO)
2412 MHz	802.11b	12.5	12.5
	802.11g	12.5	12.5
	802.11n (20 MHz)	12.5	12.5
2437 MHz	802.11b	13.5	13.5
	802.11g	13.5	13.5
	802.11n (20 MHz)	14.0	14.0
2462 MHz	802.11b	14.0	14.0
	802.11g	13.0	13.0
	802.11n (20 MHz)	14.0	14.0
2467 MHz	802.11b	13.5	13.5
	802.11g	13.5	13.5
	802.11n (20 MHz)	13.5	13.5
2472 MHz	802.11b	13.5	13.5
	802.11g	11.5	11.5
	802.11n (20 MHz)	12.0	12.0

Frequency	Mode	Power setting Level (SISO)	Power setting Level (MIMO)
2422 MHz	802.11n (40 MHz)	11.0	11.0
2437 MHz		18.0	18.0
2452 MHz		14.0	14.0
5180 MHz	802.11a	11.5	11.5
	802.11n (20 MHz)	12.0	12.0
	802.11ac (20 MHz)	10.0	10.0
5200 MHz	802.11a	10.0	10.0
	802.11n (20 MHz)	11.0	11.0
	802.11ac (20 MHz)	9.5	9.5
5240 MHz	802.11a	7.5	7.5
	802.11n (20 MHz)	9.0	9.0
	802.11ac (20 MHz)	8.5	8.5
5190 MHz	802.11n (40 MHz)	7.5	7.5
	802.11ac (40 MHz)	7.0	7.0
5230 MHz	802.11n (40 MHz)	13.0	13.0
	802.11ac (40 MHz)	13.0	13.0
5210 MHz	802.11ac (80 MHz)	9.5	9.5
5260 MHz	802.11a	7.0	7.0
	802.11n (20 MHz)	8.5	8.5
	802.11ac (20 MHz)	9.5	9.5
5300 MHz	802.11a	8.5	8.5
	802.11n (20 MHz)	9.0	9.0
	802.11ac (20 MHz)	13.0	13.0
5320 MHz	802.11a	9.5	9.5
	802.11n (20 MHz)	11.0	11.0
	802.11ac (20 MHz)	13.0	13.0
5270 MHz	802.11n (40 MHz)	11.0	11.0
	802.11ac (40 MHz)	13.0	13.0
5310 MHz	802.11n (40 MHz)	10.0	10.0
	802.11ac (40 MHz)	11.0	11.0

Frequency	Mode	Power setting Level (SISO)	Power setting Level (MIMO)
5290 MHz	802.11ac (80 MHz)	11.0	11.0
5500 MHz	802.11a	11.0	11.0
	802.11n (20 MHz)	12.0	12.0
	802.11ac (20 MHz)	13.0	13.0
5580 MHz	802.11a	13.0	13.0
	802.11n (20 MHz)	13.0	13.0
	802.11ac (20 MHz)	13.0	13.0
5720 MHz	802.11a	13.0	13.0
	802.11n (20 MHz)	13.0	13.0
	802.11ac (20 MHz)	13.0	13.0
5510 MHz	802.11n (40 MHz)	9.5	9.5
	802.11ac (40 MHz)	8.5	8.5
5550 MHz	802.11n (40 MHz)	13.0	13.0
	802.11ac (40 MHz)	12.0	12.0
5710 MHz	802.11n (40 MHz)	13.0	13.0
	802.11ac (40 MHz)	13.0	13.0
5530 MHz	802.11ac (80 MHz)	10.5	10.5
5690 MHz	802.11ac (80 MHz)	13.0	13.0
5745 MHz	802.11a	13.0	13.0
	802.11n (20 MHz)	13.0	13.0
	802.11ac (20 MHz)	13.0	13.0
5785 MHz	802.11a	13.0	13.0
	802.11n (20 MHz)	13.0	13.0
	802.11ac (20 MHz)	13.0	13.0
5825 MHz	802.11a	13.0	13.0
	802.11n (20 MHz)	13.0	13.0
	802.11ac (20 MHz)	13.0	13.0
5755 MHz	802.11n (40 MHz)	13.0	13.0
	802.11ac (40 MHz)	13.0	13.0
5795 MHz	802.11n (40 MHz)	13.0	13.0
	802.11ac (40 MHz)	13.0	13.0
5775 MHz	802.11ac (80 MHz)	13.0	13.0

3.1.3 Table of test channels

Frequency band	Mode	Test Channel (CH)	Frequency (MHz)
DTS	802.11b,g,n (20 MHz)	1	2412
		6	2437
		11	2462
		12	2467
		13	2472
	802.11n (40 MHz)	3	2422
		6	2437
		9	2452
U-NII-1	802.11a,n,ac (20 MHz)	36	5180
		40	5200
		48	5240
	802.11n,ac (40 MHz)	38	5190
		46	5230
	802.11ac (80 MHz)	42	5210
U-NII-2A	802.11a,n,ac (20 MHz)	52	5260
		60	5300
		64	5320
	802.11n,ac (40 MHz)	54	5270
		62	5310
	802.11ac (80 MHz)	58	5290
U-NII-2C	802.11a,n,ac (20 MHz)	100	5500
		116	5580
		144	5720
	802.11n,ac (40 MHz)	102	5510
		110	5550
		142	5710
U-NII-2C	802.11ac (80 MHz)	106	5530
		138	5690
U-NII-3	802.11a,n,ac (20 MHz)	149	5745
		157	5785
		165	5825
	802.11n,ac (40 MHz)	151	5755
		159	5795
	802.11ac (80 MHz)	155	5775

3.1.4 Antenna TX mode information

Frequency band	Mode	Datarate	Antenna TX mode	MIMO	
				Support CDD	Support SDM
2.4 GHz	802.11b,g	All	■ 1TX, ■ 2TX	■ Yes, □ No	□ Yes, ■ No
	802.11n (20MHz)	NSS1MCS0~ NSS1MCS7	■ 1TX, ■ 2TX	■ Yes, □ No	□ Yes, ■ No
		NSS2MCS8~ NSS2MCS15	□ 1TX, ■ 2TX	□ Yes, ■ No	■ Yes, □ No
	802.11n (40MHz)	NSS1MCS0~ NSS1MCS7	■ 1TX, ■ 2TX	■ Yes, □ No	□ Yes, ■ No
		NSS2MCS8~ NSS2MCS15	□ 1TX, ■ 2TX	□ Yes, ■ No	■ Yes, □ No
5 GHz	802.11a	All	■ 1TX, ■ 2TX	■ Yes, □ No	□ Yes, ■ No
	802.11n (20MHz)	NSS1MCS0~ NSS1MCS7	■ 1TX, ■ 2TX	■ Yes, □ No	□ Yes, ■ No
		NSS2MCS8~ NSS2MCS15	□ 1TX, ■ 2TX	□ Yes, ■ No	■ Yes, □ No
	802.11n (40MHz)	NSS1MCS0~ NSS1MCS7	■ 1TX, ■ 2TX	■ Yes, □ No	□ Yes, ■ No
		NSS2MCS8~ NSS2MCS15	□ 1TX, ■ 2TX	□ Yes, ■ No	■ Yes, □ No
	802.11ac (20MHz)	NSS1MCS0~ NSS1MCS8	■ 1TX, ■ 2TX	■ Yes, □ No	□ Yes, ■ No
		NSS2MCS0~ NSS2MCS8	□ 1TX, ■ 2TX	□ Yes, ■ No	■ Yes, □ No
	802.11ac (40MHz)	NSS1MCS0~ NSS1MCS9	■ 1TX, ■ 2TX	■ Yes, □ No	□ Yes, ■ No
		NSS2MCS0~ NSS2MCS9	□ 1TX, ■ 2TX	□ Yes, ■ No	■ Yes, □ No
	802.11ac (80MHz)	NSS1MCS0~ NSS1MCS9	■ 1TX, ■ 2TX	■ Yes, □ No	□ Yes, ■ No
		NSS2MCS0~ NSS2MCS9	□ 1TX, ■ 2TX	□ Yes, ■ No	■ Yes, □ No

Note:

1. *CDD mode is Cyclic Delay Diversity mode.*
2. *SDM mode is Spatial Diversity Multiplexing mode.*
3. *For 802.11b,g, EUT support SISO, CDD mode for all datarate.*
4. *For 802.11n(20 MHz,40MHz), EUT support SISO,CDD mode for NSS1MCS0~ NSS1MCS7 and SDM mode for NSS2MCS8~ NSS2MCS15.*
5. *For 802.11ac(20 MHz), EUT support SISO,CDD mode for NSS1MCS0~NSS1MCS8 and SDM mode for NSS2MCS0~NSS2MCS8.*

6. *For 802.11ac(40 MHz, 80 MHz), EUT support SISO,CDD mode for NSS1MCS0~NSS1MCS9 and SDM mode for NSS2MCS0~NSS2MCS9.*
7. *CDD mode, N_{SS} = 1, SDM mode, N_{SS} = 2, where N_{SS} = number of spatial streams.*
8. *EUT doesn't support Beamforming transmission.*

3.1.5 Additional Information Related to Testing

SAR testing was performed front side with a device-to-phantom separation distance of 0 mm.
Except for the front side, the other side doesn't contact with the human body.

3.2 Support Equipment

Equipment	Manufacturer	Model Name	Serial Number
Laptop	LG	14T90P	008QCYQ562762
a.c.- d.c. Adapter	LG	ADT-65FSU-D03-EPK	HLNL5658958111092

3.3. Maximum Target power among production units

Tune up tolerance is specified in operation description. SAR values were scaled to the maximum tune-up power to determine compliance per KDB Publication 447498 D01v06.

Band & Mode			SISO[dBm]		MIMO[dBm]
			Ant1	Ant2	
DTS	802.11b	Maximum	16	16	21
		Nominal	15	15	18
		Minimum	14	14	17
	802.11g	Maximum	16	16	21
		Nominal	15	15	18
		Minimum	14	14	17
	802.11n (20 MHz)	Maximum	16	16	19
		Nominal	15	15	18
		Minimum	14	14	17
DTS	802.11n (40 MHz)	Maximum	20	20	23
		Nominal	19	19	22
		Minimum	18	18	21
U-NII-1	802.11a	Maximum	14	14	17
		Nominal	13	13	16
		Minimum	12	12	15

U-NII-2A	802.11a	Maximum	11	11	14
		Nominal	10	10	13
		Minimum	9	9	12
U-NII-2C	802.11a	Maximum	16	16	19
		Nominal	15	15	18
		Minimum	14	14	17
U-NII-3	802.11a	Maximum	16	16	19
		Nominal	15	15	18
		Minimum	14	14	17
U-NII-1	802.11n (20 MHz)	Maximum	14	14	17
		Nominal	13	13	16
		Minimum	12	12	15
U-NII-2A	802.11n (20 MHz)	Maximum	12	12	15
		Nominal	11	11	14
		Minimum	10	10	13
U-NII-2C	802.11n (20 MHz)	Maximum	16	16	19
		Nominal	15	15	18
		Minimum	14	14	17
U-NII-3	802.11n (20 MHz)	Maximum	16	16	19
		Nominal	15	15	18
		Minimum	14	14	17
U-NII-1	802.11n (40 MHz)	Maximum	14	14	17
		Nominal	13	13	16
		Minimum	12	12	15
U-NII-2A	802.11n (40 MHz)	Maximum	12	12	15
		Nominal	11	11	14
		Minimum	10	10	13
U-NII-2C	802.11n (40 MHz)	Maximum	16	16	19
		Nominal	15	15	18
		Minimum	14	14	17
U-NII-3	802.11n (40 MHz)	Maximum	16	16	19
		Nominal	15	15	18
		Minimum	14	14	17
U-NII-1	802.11ac (20 MHz)	Maximum	12	12	15
		Nominal	11	11	14
		Minimum	10	10	13
U-NII-2A	802.11ac (20 MHz)	Maximum	13	13	16
		Nominal	12	12	15
		Minimum	11	11	14
U-NII-2C	802.11ac (20 MHz)	Maximum	16	16	19
		Nominal	15	15	18
		Minimum	14	14	17
U-NII-3	802.11ac (20 MHz)	Maximum	16	16	19
		Nominal	15	15	18
		Minimum	14	14	17

U-NII-1	802.11ac (40 MHz)	Maximum	14	14	17
		Nominal	13	13	16
		Minimum	12	12	15
U-NII-2A	802.11ac (40 MHz)	Maximum	16	16	19
		Nominal	15	15	18
		Minimum	14	14	17
U-NII-2C	802.11ac (40 MHz)	Maximum	16	16	19
		Nominal	15	15	18
		Minimum	14	14	17
U-NII-3	802.11ac (40 MHz)	Maximum	16	16	19
		Nominal	15	15	18
		Minimum	14	14	17
U-NII-1	802.11ac (80 MHz)	Maximum	10	10	13
		Nominal	9	9	12
		Minimum	8	8	11
U-NII-2A	802.11ac (80 MHz)	Maximum	11	11	14
		Nominal	10	10	13
		Minimum	9	9	12
U-NII-2C	802.11ac (80 MHz)	Maximum	14	14	17
		Nominal	13	13	16
		Minimum	12	12	15
U-NII-3	802.11ac (80 MHz)	Maximum	16	16	19
		Nominal	15	15	18
		Minimum	14	14	17

3.4 SAR testing EUT configuration

Device Type	Band/Mode	Device edge for SAR Testing					
		Front	Back	Left edge	Right edge	Top	Bottom
X-Ray detector	WLAN 2.4G, 5G	Yes	N/A	N/A	N/A	N/A	N/A
Human Body Contact		O	X	X	X	X	X

3.5 SAR Test consideration

Per FCC KDB 447498 D01v06, The SAR exclusion threshold for distance < 50mm is defined by the following equation.

$$\frac{(max.power\ of\ channel, including\ tune{-}up\ tolerance, mW)}{(min.test\ separation\ distance, mm)} \times \sqrt{f(GHz)} \leq 3.0 \quad \{1\text{ g SAR}\}$$

$$\frac{(max.power\ of\ channel, including\ tune{-}up\ tolerance, mW)}{(min.test\ separation\ distance, mm)} \times \sqrt{f(GHz)} \leq 7.5 \quad \{10\text{ g SAR}\}$$

Band (Ant)	Mode	Freq	Maximum Conducted power	Maximum tune up Power	E.I.R.P *)	Separation	FCC SAR exclusion			IC SAR exclusion	
							≤ 3.0	≤ 7.5	FCC SAR Test	IC Limit	IC SAR Test
		[GHz]	[mW]	[mW]	[mW]	[mm]	1-g SAR	10-g SAR		[mW]	
DTS (Ant1)	802.11n (40M)	2.437	76.74	96.61	149.28	5	30.16	N/A	Yes	≤ 4.07	Yes
DTS (Ant2)	802.11n (40M)	2.437	76.56	96.38	99.08	5	30.09	N/A	Yes	≤ 4.07	Yes
DTS (MIMO)	802.11n (40M)	2.437	157.40	198.15	179.89	5	61.87	N/A	Yes	≤ 4.07	Yes
UNII-1 (Ant1)	802.11n (40M)	5.230	24.83	31.26	32.14	5	14.30	N/A	Yes	≤ 1.25	Yes
UNII-1 (Ant2)	802.11n (20M)	5.180	19.50	24.55	44.67	5	11.17	N/A	Yes	≤ 1.27	Yes
UNII-1 (MIMO)	802.11n (40M)	5.230	42.85	53.95	150.61	5	24.68	N/A	Yes	≤ 1.25	Yes
UNII-2A (Ant1)	802.11ac (40M)	5.270	24.15	30.41	27.61	5	13.96	N/A	Yes	≤ 1.23	Yes
UNII-2A (Ant2)	802.11ac (40M)	5.270	18.58	23.39	35.48	5	10.74	N/A	Yes	≤ 1.23	Yes
UNII-2A (MIMO)	802.11ac (40M)	5.270	44.46	55.98	133.56	5	25.70	N/A	Yes	≤ 1.23	Yes
UNII-2C (Ant1)	802.11a	5.720	30.76	38.73	47.53	5	18.52	N/A	Yes	≤ 1.03	Yes
UNII-2C (Ant2)	802.11n (20M)	5.720	26.73	33.65	80.17	5	16.10	N/A	Yes	≤ 1.03	Yes
UNII-2C (MIMO)	802.11a	5.720	53.58	67.45	237.09	5	32.26	N/A	Yes	≤ 1.03	Yes
UNII-3 (Ant1)	802.11a	5.785	26.12	32.89	40.64	5	15.82	N/A	Yes	≤ 1.01	Yes
UNII-3 (Ant2)	802.11a	5.785	22.86	28.77	64.42	5	13.84	N/A	Yes	≤ 1.01	Yes
UNII-3 (MIMO)	802.11a	5.785	47.75	60.12	204.44	5	28.92	N/A	Yes	≤ 1.01	Yes

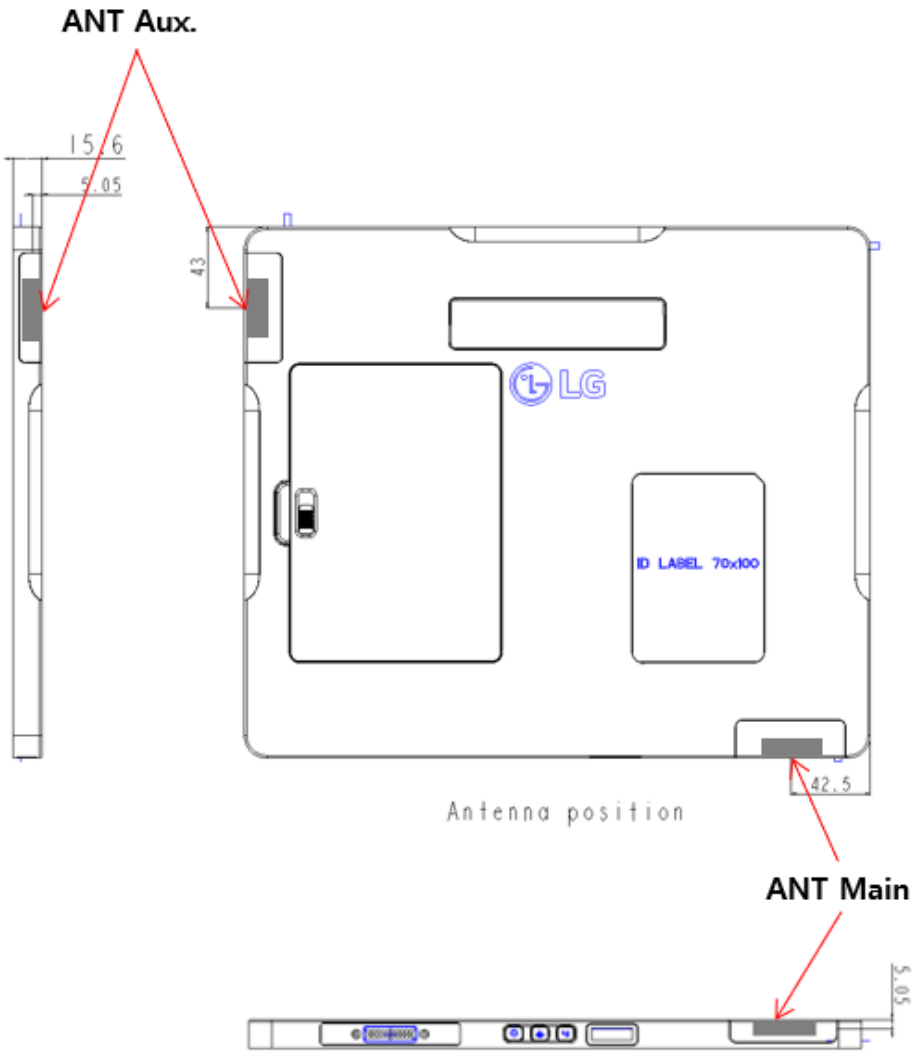
*) E.I.R.P = [Maximum conducted power] + [Ant gain(dBi)]
In case of FCC, SAR test was required for all modes.
Per RSS-102 issue 5, E.I.R.P was applied to testing, because E.I.R.P was higher than maximum tune up power.

IC SAR Limit was calculated using linear interpolation and below table.

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

For IC exclusion, SAR test was required for all modes.

3.6 Antenna Location



3.7 EUT Information

The EUT is the **LG Electronics In. Flat Panel Digital X-ray Detector FCC ID: BEJLGSBWAC93, IC: 2703H-LGSBWAC93.**

Specifications:

EUT Type	Flat Panel Digital X-ray Detector
Model Name	LGSBWAC93
Host Model Name *)	10HQ701G
Brand Name	LG
Frequency of Operation	For DTS Band 2 412 MHz to 2 472 MHz (802.11b,g,n(20 MHz)) 2 422 MHz to 2 452 MHz (802.11n(40 MHz)) For U-NII-1 Band 5 180 MHz to 5 240 MHz (802.11a,n,ac(20 MHz)) 5 190 MHz to 5 230 MHz (802.11n,ac(40 MHz)) 5 210 MHz (802.11n,ac(80 MHz)) For U-NII-2A Band 5 260 MHz to 5 320 MHz (802.11a,n,ac(20 MHz)) 5 270 MHz to 5 310 MHz (802.11n,ac(40 MHz)) 5 290 MHz (802.11n,ac(80 MHz)) For U-NII-2C Band 5 500 MHz to 5 720 MHz (802.11a,n,ac(20 MHz)) 5 510 MHz to 5 710 MHz (802.11n,ac(40 MHz)) 5 530 MHz to 5 690 MHz (802.11n,ac(80 MHz)) For U-NII-3 Band 5 745 MHz to 5 825 MHz (802.11a,n,ac(20 MHz)) 5 755 MHz to 5 795 MHz (802.11n,ac(40 MHz)) 5 775 MHz (802.11n,ac(80 MHz))
Average Output Power (Conducted)	For DTS Band 802.11b : 18.29 dBm 802.11g : 17.67 dBm 802.11n (20 MHz) : 18.04 dBm 802.11n (40 MHz) : 21.97 dBm For U-NII-1 Band 802.11a : 15.99 dBm 802.11n (20 MHz) : 16.23 dBm 802.11n (40 MHz) : 16.32 dBm 802.11ac (20 MHz) : 14.61 dBm 802.11ac (40 MHz) : 16.31 dBm 802.11ac (80 MHz) : 12.72 dBm For U-NII-2A Band 802.11a : 12.11 dBm 802.11n (20 MHz) : 13.45 dBm

	802.11n (40 MHz) : 14.41 dBm 802.11ac (20 MHz) : 15.63 dBm 802.11ac (40 MHz) : 16.48 dBm 802.11ac (80 MHz) : 13.72 dBm For U-NII-2C Band 802.11a : 17.29 dBm 802.11n (20 MHz) : 17.26 dBm 802.11n (40 MHz) : 17.27 dBm 802.11ac (20 MHz) : 17.05 dBm 802.11ac (40 MHz) : 16.95 dBm 802.11ac (80 MHz) : 15.49 dBm For U-NII-3 Band 802.11a : 16.79 dBm 802.11n (20 MHz) : 16.76 dBm 802.11n (40 MHz) : 16.74 dBm 802.11ac (20 MHz) : 16.72 dBm 802.11ac (40 MHz) : 16.78 dBm 802.11ac (80 MHz) : 16.77 dBm
Highest Body SAR (Reported)	0.028 W/kg
Highest Simultaneous SAR(Reported)	0.031 W/kg
FCC Classification	Digital Transmission System (DTS) Unlicensed National Information Infrastructure (UNII)
Channels	For DTS Band 802.11b,g,n (20 MHz) : 13 ch 802.11n (40 MHz) : 9 ch For U-NII-1 Band 802.11a,n,ac (20 MHz) : 4 ch 802.11n,ac (40 MHz) : 2 ch 802.11ac (80 MHz) : 1 ch For U-NII-2A Band 802.11a,n,ac (20 MHz) : 4 ch 802.11n,ac (40 MHz) : 2 ch 802.11ac (80 MHz) : 1 ch For U-NII-2C Band 802.11a,n,ac (20 MHz) : 9 ch 802.11n,ac (40 MHz) : 4 ch 802.11ac (80 MHz) : 2 ch For U-NII-3 Band 802.11a,n,ac (20 MHz) : 5 ch 802.11n,ac (40 MHz) : 2 ch 802.11ac (80 MHz) : 1 ch
Modulation type	CCK, BPSK, QPSK, 16QAM, 64QAM, 256QAM (802.11 a,b,g,n,ac)

Antenna Gain (peak)	ANT 0 (Main)	2.91 dBi(802.11b,g,n in DTS band) 3.60 dBi(802.11a,n,ac in UNII-1 band) 2.81 dBi(802.11a,n,ac in UNII-2A band) 4.77 dBi(802.11a,n,ac in UNII-2C band) 4.50 dBi(802.11a,n,ac in UNII-3 band)
	ANT 1 (Aux)	2.89 dBi(802.11b,g,n in DTS band) 1.12 dBi(802.11a,n,ac in UNII-1 band) 0.58 dBi(802.11a,n,ac in UNII-2A band) 1.89 dBi(802.11a,n,ac in UNII-2C band) 1.92 dBi(802.11a,n,ac in UNII-3 band)
Power	Battery : 7.7 Vdc, 4725 mAh	
Dimensions (L x W x H)	About 460 cm x 460 cm X 15.6 cm	
Weight	About 3600 g	
HVIN (Hardware Version Identification Number)	TWCM-K504D	
FVIN (Firmware Version Identification Number)	MT7668_V1.0	
Remarks	The above RF information of EUT is referred to the RF Module report. RF module(LGSBWAC93) report No.: HCT-RF-1904-FI005 HCT-RF-1904-FI004	

*) This antenna was applied to SAR testing in this report.
*) 10HQ701G is host device with certified RF module(LGSBWAC93) installed.

3.8 Description of change

- No Comment

3.9 Variants covered by this report

- No Comment

3.10 Modification

- No Comment

4. GUIDANCE APPLIED

The Specific Absorption Rate(SAR)testing specification, method, and procedure for this device is in Accordance with the following standards:

- FCC 47 CFR Part 2(2.1093)
- RSS-102 Issue 5
- IEEE 1528-2013
- IEC/IEEE 62209-1528
- FCC KDB Publication 447498 D01 v06
- FCC KDB Publication 865664 D01 v01r04
- FCC KDB Publication 865664 D02 v01r02
- April 2019 TCB Workshop Notes (Tissue Simulating Liquids)

5. DESCRIPTION OF TEST EQUIPMENT

5.1 SAR Measurement Setup

Robotic System

Measurements are performed using the DASY4 automated dosimetric assessment system. Which is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland and consists of high precision robotics system (Stäubli), robot controller, measurement server, H/P computer, nearfield probe, probe alignment sensor, and the SAM twin 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) (see Fig. 5.1).

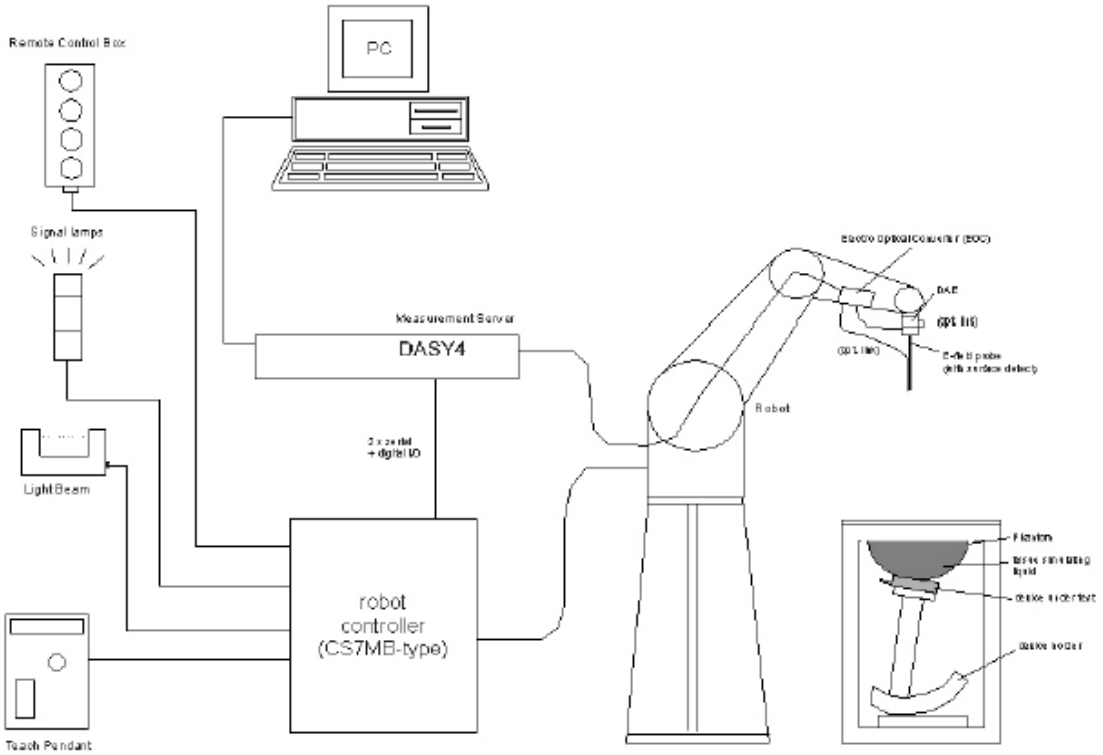


Figure 5.1 SAR Measurement System Setup

System Hardware

A cell controller system contains the power supply, robot controller, teach pendant (Joystick), and a remote control is used to drive the robot motors. The PC consists of the H/P computer with Windows XP system and SAR Measurement Software DASY4, LCD monitor, mouse and keyboard. The Stäubli Robot is connected to the cell controller to allow software manipulation of the robot. A Data Acquisition Electronic (DAE) circuit that performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. Is connected to the Electro-Optical Coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the measurement server.

System Electronics

The DAE4 consists of a highly sensitive electrometer-grade preamplifier with autozeroing, a channel and gain-switching multiplexer, a fast 16-bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer.

5.2 E-field Probe

The SAR measurement were conducted with the dosimetric probe designed in the classical triangular configuration (see Fig.5.3) 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 an optical multi-fiber line ending at the front of the probe tip (see Fig.5.4). 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 DASY4 software reads the reflection during a software approach and looks for the maximum using a 2nd order fitting (see Fig.5.2). The approach is stopped at reaching the maximum.

Figure 5.2 DAE System

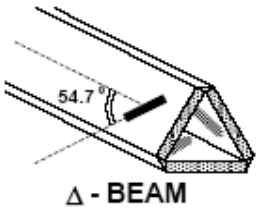


Figure 5.3 Triangular Probe Configuration

Figure 5.4 Probe Thick-Film Technique

Probe Specifications
Manufacturer : SPEAG
model name: EX3DV4
Serial number : 3947
Probe spec : refer to the Appendix C
Probe calibration : July 29, 2021

5.3 SAM Phantom

The SAM Twin Phantom V4.0C is constructed of a fiberglass shell Integrated in a wooden table. The shape of the shell is based on data from an anatomical study designed to determine the maximum exposure in at least 90% of all users.
It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region.
A cover prevents the evaporation of the liquid Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot.

Phantom Specification
Construction : The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEC/IEEE 62209-1528.
It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region.
A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.
Shell Thickness : 2 ± 0.2 mm
Filling Volume : Approx. 25 liters
Dimensions : Height; 830 mm; Length: 1000 mm; Width: 500 mm

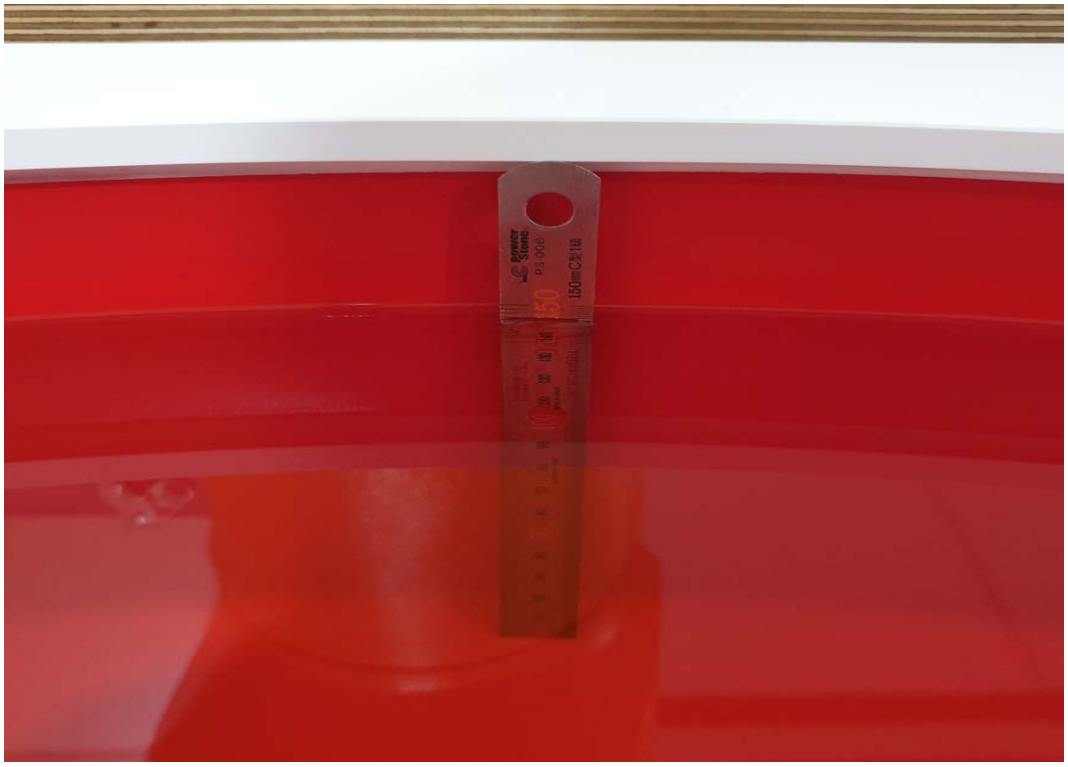
5.4 Simulating Mixture Characterization

The dielectric properties of the liquid material used in the phantom shall be those listed in Table 5.1. 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 5.1 Composition of the Head Tissue Equivalent Matter

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

INGREDIENTS	SIMULATING TISSUE
	5000 to 5800 MHz Head
De-ionised water	65.53 %
Diethylenglycol monohexylether	17.24 %
Triton X-100	17.24 %
Sum	100 %



2 GHz (Head) Tissue Simulating Liquid, Depth: 150 mm

5 GHz (Head) Tissue Simulating Liquid, Depth: 150 mm

5.5 Device Holder for Transmitters

In combination with the SAM Twin Phantom V4.0, the Mounting Device enables the rotation of the mounted transmitter in spherical coordinates whereby the rotation point is the ear opening.
The device holder can be locked at different phantom locations (left head, right head, flat phantom).

* Note: A simulating human hand is not used due to the Complex anatomical and geometrical structure of the hand that may produce infinite number of configurations .
To produce the worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.

6. SAR MEASUREMENT PROCEDURE

EUT at the maximum power level is placed by a non metallic device holder in the above described positions at a shell phantom of a human being.
The distribution of the electric field strength *E* is measured in the tissue simulating liquid within the shell phantom. For this miniaturized field probes with high sensitivity and low field disturbance are used. Afterwards the corresponding SAR values are calculated with the known electrical conductivity σ and the mass density *p* of the tissue in the SEMCAD software.
The software is able to determine the averaged SAR values (averaging region 1g or 10g) for compliance testing. The measurements are done by two scans: first a coarse scan determines the region of the maximum SAR, afterwards the averaged SAR is measured in a second scan within the sharp of a cube. The measurement times takes about 20 minutes.
The following steps are used for each test position:

STEP 1
Establish a call with the maximum output power with a base station simulator.
The connection between the mobile phone and the base station simulator is established via air interface.

STEP 2
Measurement of the local E-Field value at a fixed location (P1).
This value serves as a reference value for calculating a possible power drift.

STEP 3
Measurement of the SAR distribution with a grid spacing of 15mm × 15mm and a constant distance to the inner surface of the phantom.
Since the sensors can not directly measure at the inner surface of the phantom.
Since the sensors can not directly measure at the inner phantom surface, the values between the sensors and the inner phantom surface are extrapolated. With this values the area of the maximum SAR is calculated by a interpolation scheme (combination of a least-square fitted function and a weighted average method). Additional peaks within 3dB of the maximum SAR are searched.

STEP 4
Around this points, a cube of 30mm×30mm×30mm is assessed by measuring 5×5×5 points.
With these data, the peak spatial-average SAR value can be calculated with the SEMCAD software.

STEP 5
The used extrapolation and interpolation routines are all based on the modified Quadratic Shepard's method [DASY4].

STEP 6
Repetition of the E-Field measurement at the fixed location(P1) and repetition of the whole procedure if the two results differ by more than ±0.223dB.

7. 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 the appropriate averaging time.

8. MEASUREMENT UNCERTAINTY

2.4 GHz Band

Uncertainty Component	Tolerance (±%)	Prob. Dist.	Divisor	(Ci) (1g)	Standard Uncertainty (±%) (1g)	(Vi)
Measurement System						
Probe Calibration	6.00	Normal	1	1	6.00	∞
Axial Isotropy	4.70	Rectangular	1.73	0.7	1.90	∞
Hemispherical Isotropy	9.60	Rectangular	1.73	0.7	3.88	∞
Boundary Effects	1.00	Rectangular	1.73	1	0.58	∞
Linearity	4.70	Rectangular	1.73	1	2.72	∞
System Detection Limits	1.00	Rectangular	1.73	1	0.58	∞
Readout Electronics	1.00	Normal	1	1	1.00	∞
Response Time	0.80	Rectangular	1.73	1	0.46	∞
Integration Time	2.60	Rectangular	1.73	1	1.50	∞
RF Ambient Conditions	3.00	Rectangular	1.73	1	1.73	∞
Probe Positioner	0.40	Rectangular	1.73	1	0.23	∞
Probe Positioning	2.90	Rectangular	1.73	1	1.68	∞
Max. SAR Eval.	1.00	Rectangular	1.73	1	0.58	∞
Test Sample Related						
Device Positioning	5.66	Normal	1	1	5.66	11
Device Holder	4.94	Normal	1	1	4.94	5
Power Drift	5.00	Rectangular	1.73	1	2.90	∞
Phantom and Setup						
Phantom Uncertainty	4.00	Rectangular	1.73	1	2.31	∞
Medium Conductivity Temperature	5.00	Rectangular	1	0.78	3.90	∞
Liquid Conductivity(Meas.)	3.00	Normal	1	0.64	1.92	5
Medium Permittivity Temperature	5.00	Rectangular	1	0.23	1.20	∞
Liquid Permittivity(meas.)	2.96	Normal	1	0.60	1.78	5
Combined Std. Uncertainty		RSS			**12.80**	59
Expanded STD Uncertainty		*k* = 2			**25.70**	

The above measurement uncertainties are according to IEEE 62209-1528.

5 GHz Band

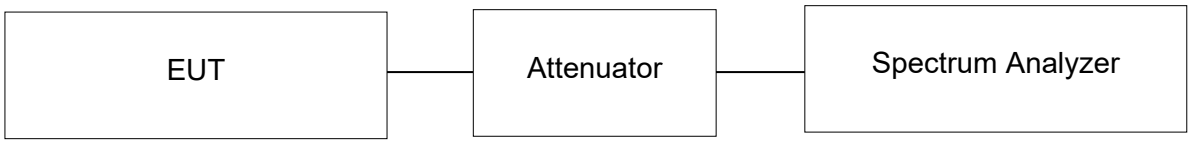
Uncertainty Component	Tolerance (±%)	Prob. Dist.	Divisor	(Ci) (1g)	Standard Uncertainty (±%) (1g)	(Vi)
Measurement System						
Probe Calibration	6.55	Normal	1	1	6.55	∞
Axial Isotropy	4.70	Rectangular	1.73	0.7	1.90	∞
Hemispherical Isotropy	9.60	Rectangular	1.73	0.7	3.88	∞
Boundary Effects	1.00	Rectangular	1.73	1	0.58	∞
Linearity	4.70	Rectangular	1.73	1	2.72	∞
System Detection Limits	1.00	Rectangular	1.73	1	0.58	∞
Readout Electronics	1.00	Normal	1	1	1.00	∞
Response Time	0.80	Rectangular	1.73	1	0.46	∞
Integration Time	2.60	Rectangular	1.73	1	1.50	∞
RF Ambient Conditions	3.00	Rectangular	1.73	1	1.73	∞
Probe Positioner	0.40	Rectangular	1.73	1	0.23	∞
Probe Positioning	2.90	Rectangular	1.73	1	1.68	∞
Max. SAR Eval.	1.00	Rectangular	1.73	1	0.58	∞
Test Sample Related						
Device Positioning	5.66	Normal	1	1	5.66	11
Device Holder	4.94	Normal	1	1	4.94	5
Power Drift	5.00	Rectangular	1.73	1	2.90	∞
Phantom and Setup						
Phantom Uncertainty	4.00	Rectangular	1.73	1	2.31	∞
Medium Conductivity Temperature	5.00	Rectangular	1	0.78	3.90	∞
Liquid Conductivity(Meas.)	3.00	Normal	1	0.64	1.92	5
Medium Permittivity Temperature	5.00	Rectangular	1	0.23	1.20	∞
Liquid Permittivity(meas.)	2.96	Normal	1	0.60	1.78	5
Combined Std. Uncertainty		RSS			**13.10**	59
Expanded STD Uncertainty		*k* = 2			**26.20**	

The above measurement uncertainties are according to IEEE 62209-1528.

9. OUTPUT POWER MEASUREMENT

9.1 Measurement procedure 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 (Unit: dBm)

DTS Band

Mode	Measured Frequency (MHz)	SISO/ MIMO	Datarate	Measured Output Power (dBm)	
				ANT 0 (Main)	ANT 1 (Aux)
802.11b	2412	SISO	1	13.57	13.32
			2	13.43	13.20
			5.5	13.40	13.17
			11	13.44	13.21
		MIMO	1	16.43	
			2	16.40	
			5.5	16.29	
			11	16.24	
	2437	SISO	1	14.54	14.31
			2	14.44	14.34
			5.5	14.27	14.13
			11	14.43	14.35
		MIMO	1	17.63	
			2	17.69	
			5.5	17.42	
			11	17.47	
	2462	SISO	1	14.99	15.05
			2	15.13	15.02
			5.5	14.75	15.08
			11	14.95	15.03
		MIMO	1	18.20	
			2	18.29	
			5.5	18.07	
			11	18.24	
	2467	SISO	1	14.39	14.36
			2	14.60	14.32
			5.5	14.18	14.33
			11	14.40	14.35
		MIMO	1	17.57	
			2	17.73	
			5.5	17.47	
			11	17.53	
	2472	SISO	1	14.49	14.29
			2	14.43	14.17
			5.5	14.31	14.26
			11	14.51	14.18
		MIMO	1	17.63	
			2	17.63	
			5.5	17.42	
			11	17.52	
802.11g	2412	SISO	6	13.88	13.69
			9	13.86	13.63
			12	13.81	13.68

802.11g	2412	SISO	18	13.75	13.60
			24	13.58	13.57
			36	13.62	13.52
			48	11.90	11.50
			54	11.96	11.53
802.11g	2412	MIMO	6	16.82	
			9	16.82	
			12	16.80	
			18	16.76	
			24	16.63	
			36	16.58	
			48	14.47	
			54	14.43	
	2437	SISO	6	14.29	14.09
			9	14.21	14.16
			12	14.19	14.10
			18	14.43	14.43
			24	14.20	14.08
			36	14.40	14.40
			48	12.22	12.31
			54	12.38	12.22
		MIMO	6	17.22	
			9	17.29	
			12	17.35	
			18	17.67	
			24	17.36	
			36	17.66	
			48	15.41	
			54	15.45	
	2462	SISO	6	13.74	13.66
			9	13.75	13.65
			12	13.70	13.70
			18	13.69	13.62
			24	13.58	13.53
			36	13.58	13.45
			48	11.34	11.28
			54	11.31	11.28
		MIMO	6	16.61	
			9	16.66	
			12	16.64	
			18	16.56	
			24	16.59	
			36	16.56	
			48	14.43	
			54	14.39	
	2467	SISO	6	14.16	14.51
			9	14.15	14.39
			12	14.35	14.44
			18	14.38	14.33
			24	14.26	14.38

802.11g	2467	SISO	36	14.06	14.16
			48	12.27	12.24
			54	12.43	12.38
802.11g	2467	MIMO	6	17.41	
			9	17.50	
			12	17.50	
			18	17.48	
			24	17.42	
			36	17.55	
			48	15.53	
			54	15.73	
	2472	SISO	6	12.12	12.10
			9	12.23	12.09
			12	12.22	12.14
			18	12.41	12.06
			24	12.20	12.01
			36	12.59	11.95
			48	9.96	9.86
			54	10.14	9.94
		MIMO	6	15.37	
			9	15.23	
			12	15.39	
			18	15.47	
			24	15.36	
			36	15.46	
			48	13.13	
			54	13.10	
802.11n (20 MHz)	2412	SISO	MCS0	13.34	13.35
			MCS1	13.40	13.36
			MCS2	13.32	13.35
			MCS3	13.31	13.26
			MCS4	13.35	13.23
			MCS5	13.23	13.19
			MCS6	11.03	11.08
			MCS7	11.07	11.07
		MIMO	MCS0	16.31	
			MCS1	16.30	
			MCS2	16.29	
			MCS3	16.21	
			MCS4	16.17	
			MCS5	16.22	
			MCS6	14.04	
			MCS7	14.02	
			MCS8	16.35	
			MCS9	16.33	
			MCS10	16.29	
			MCS11	16.26	
			MCS12	16.20	
			MCS13	16.19	
			MCS14	14.06	
			MCS15	14.00	

802.11n (20 MHz)	2437	SISO	MCS0	14.74	14.70
			MCS1	14.77	14.84
			MCS2	14.74	14.53
			MCS3	14.76	14.66
			MCS4	14.87	14.66
			MCS5	14.75	14.82
			MCS6	12.63	12.64
			MCS7	12.65	12.67
		MIMO	MCS0	17.94	
			MCS1	18.04	
			MCS2	17.81	
			MCS3	17.84	
			MCS4	18.00	
			MCS5	17.90	
			MCS6	15.77	
			MCS7	15.64	
			MCS8	17.79	
			MCS9	17.93	
			MCS10	17.91	
			MCS11	17.83	
			MCS12	17.92	
			MCS13	17.85	
			MCS14	15.92	
			MCS15	15.73	
	2462	SISO	MCS0	14.62	14.57
			MCS1	14.86	14.35
			MCS2	14.62	14.45
			MCS3	14.53	14.43
			MCS4	14.77	14.26
			MCS5	14.85	14.26
			MCS6	12.68	13.00
			MCS7	12.71	12.69
		MIMO	MCS0	17.92	
			MCS1	17.83	
			MCS2	17.79	
			MCS3	17.61	
			MCS4	17.63	
			MCS5	17.77	
			MCS6	15.92	
			MCS7	15.90	
			MCS8	17.83	
			MCS9	17.88	
			MCS10	17.88	
			MCS11	17.70	
			MCS12	17.67	
			MCS13	17.59	
			MCS14	15.71	
			MCS15	15.66	

Mode	Measured Frequency (MHz)	SISO/ MIMO	Datarate	Measured Output Power (dBm)	
				ANT 0 (Main)	ANT 1 (Aux)
802.11n (20 MHz)	2467	SISO	MCS0	14.26	14.27
			MCS1	14.36	14.23
			MCS2	14.17	14.14
			MCS3	14.11	14.12
			MCS4	14.30	14.07
			MCS5	14.20	14.01
			MCS6	12.30	12.34
			MCS7	12.10	12.23
		MIMO	MCS0	17.16	
			MCS1	17.39	
			MCS2	17.27	
			MCS3	17.25	
			MCS4	17.25	
			MCS5	17.38	
			MCS6	15.36	
			MCS7	15.36	
			MCS8	17.25	
			MCS9	17.38	
			MCS10	17.33	
			MCS11	17.37	
			MCS12	17.39	
			MCS13	17.31	
			MCS14	15.34	
			MCS15	15.27	
	2472	SISO	MCS0	13.50	13.42
			MCS1	13.48	13.48
			MCS2	13.51	13.45
			MCS3	13.54	13.44
			MCS4	13.44	13.36
			MCS5	13.42	13.37
			MCS6	11.27	11.17
			MCS7	11.20	11.15
		MIMO	MCS0	16.47	
			MCS1	16.44	
			MCS2	16.50	
			MCS3	16.49	
			MCS4	16.41	
			MCS5	16.37	
			MCS6	14.19	
			MCS7	14.18	
			MCS8	16.46	
			MCS9	16.44	
			MCS10	16.39	
			MCS11	16.36	
			MCS12	16.34	
			MCS13	16.29	
			MCS14	14.09	
			MCS15	14.04	

802.11n (40 MHz)	2422	SISO	MCS0	11.68	11.57
			MCS1	11.66	11.52
			MCS2	11.67	11.54
			MCS3	11.59	11.47
			MCS4	11.50	11.50
			MCS5	11.53	11.48
			MCS6	9.88	9.46
			MCS7	9.86	9.40
		MIMO	MCS0	14.68	
			MCS1	14.67	
			MCS2	14.67	
			MCS3	14.64	
			MCS4	14.54	
			MCS5	14.50	
			MCS6	12.34	
			MCS7	12.33	
			MCS8	14.59	
			MCS9	14.54	
			MCS10	14.59	
			MCS11	14.59	
			MCS12	14.56	
			MCS13	14.51	
			MCS14	12.39	
			MCS15	12.38	
	2437	SISO	MCS0	18.57	18.74
			MCS1	18.80	18.73
			MCS2	18.67	18.84
			MCS3	18.63	18.70
			MCS4	18.85	18.66
			MCS5	18.79	18.71
			MCS6	16.92	16.69
			MCS7	16.92	16.70
		MIMO	MCS0	21.79	
			MCS1	21.97	
			MCS2	21.86	
			MCS3	21.82	
			MCS4	21.91	
			MCS5	21.89	
			MCS6	19.95	
			MCS7	19.97	
			MCS8	21.95	
			MCS9	21.95	
			MCS10	21.90	
			MCS11	21.89	
			MCS12	21.73	
			MCS13	21.74	
			MCS14	19.91	
			MCS15	19.98	

Mode	Measured Frequency (MHz)	SISO/ MIMO	Datarate	Measured Output Power (dBm)	
				ANT 0 (Main)	ANT 1 (Aux)
802.11n (40 MHz)	2452	SISO	MCS0	15.15	14.98
			MCS1	15.07	15.02
			MCS2	15.09	14.97
			MCS3	15.14	14.94
			MCS4	15.13	14.96
			MCS5	15.03	14.99
			MCS6	14.10	13.02
			MCS7	14.02	13.02
		MIMO	MCS0	17.98	
			MCS1	17.95	
			MCS2	17.95	
			MCS3	17.95	
			MCS4	17.88	
			MCS5	17.83	
			MCS6	15.65	
			MCS7	15.67	
			MCS8	17.89	
			MCS9	17.82	
			MCS10	17.84	
			MCS11	17.82	
			MCS12	17.76	
			MCS13	17.73	
			MCS14	15.55	
			MCS15	15.57	

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Mode	Measured Frequency(MHz)	SISO/ MIMO	Datarate	Measured Output Power (dBm)	
				ANT 0 (Main)	ANT 1 (Aux)
802.11a	5180	SISO	6	13.23	11.80
			9	13.27	11.85
			12	13.27	11.96
			18	13.47	11.90
			24	13.41	11.85
			36	13.27	11.73
			48	11.27	9.65
			54	11.26	9.63
		MIMO	6	15.79	
			9	15.86	
			12	15.87	
			18	15.89	
			24	15.99	
			36	15.83	
			48	13.80	
			54	13.68	
	5200	SISO	6	12.05	11.95
			9	12.16	11.94
			12	12.18	11.97
			18	12.07	11.90
			24	11.97	11.82
			36	12.04	11.88
			48	10.08	9.75
			54	10.07	9.73
		MIMO	6	14.99	
			9	14.96	
			12	14.99	
			18	14.92	
			24	14.92	
			36	14.86	
			48	12.86	
			54	12.88	
	5240	SISO	6	9.53	9.43
			9	9.46	9.35
			12	9.48	9.40
			18	9.51	9.33
			24	9.46	9.44
			36	9.36	9.30
			48	7.37	7.29
			54	7.24	7.25
		MIMO	6	12.49	
			9	12.51	
			12	12.49	
			18	12.44	
			24	12.37	
			36	12.41	
			48	10.26	
			54	10.22	

802.11n (20 MHz)	5180	SISO	MCS0	13.70	12.90
			MCS1	13.54	12.82
			MCS2	13.65	12.82
			MCS3	13.74	12.62
			MCS4	13.72	12.41
			MCS5	13.69	12.31
			MCS6	11.66	10.13
			MCS7	11.72	10.13
		MIMO	MCS0	16.21	
			MCS1	16.11	
			MCS2	16.23	
			MCS3	16.22	
			MCS4	16.21	
			MCS5	16.14	
			MCS6	14.12	
			MCS7	14.20	
			MCS8	15.73	
			MCS9	15.74	
			MCS10	15.74	
			MCS11	15.74	
			MCS12	15.54	
			MCS13	15.44	
			MCS14	13.20	
			MCS15	13.19	
	5200	SISO	MCS0	12.85	12.74
			MCS1	12.81	12.70
			MCS2	12.84	12.77
			MCS3	12.76	12.65
			MCS4	12.76	12.63
			MCS5	12.63	12.54
			MCS6	10.53	10.36
			MCS7	10.52	10.41
		MIMO	MCS0	15.72	
			MCS1	15.71	
			MCS2	15.75	
			MCS3	15.65	
			MCS4	15.66	
			MCS5	15.60	
			MCS6	13.43	
			MCS7	13.40	
			MCS8	15.68	
			MCS9	15.63	
			MCS10	15.64	
			MCS11	15.64	
			MCS12	15.57	
			MCS13	15.58	
			MCS14	13.41	
			MCS15	13.40	

802.11n (20 MHz)	5240	SISO	MCS0	10.85	10.77
			MCS1	10.76	10.64
			MCS2	10.80	10.60
			MCS3	10.81	10.66
			MCS4	10.67	10.53
			MCS5	10.53	10.56
			MCS6	8.36	8.50
			MCS7	8.34	8.44
		MIMO	MCS0	13.76	
			MCS1	13.74	
			MCS2	13.69	
			MCS3	13.69	
			MCS4	13.58	
			MCS5	13.58	
			MCS6	11.44	
			MCS7	11.41	
			MCS8	13.69	
			MCS9	13.65	
			MCS10	13.65	
			MCS11	13.62	
			MCS12	13.60	
			MCS13	13.55	
			MCS14	11.41	
			MCS15	11.37	
802.11ac (20 MHz)	5180	SISO	MCS0	11.49	10.02
			MCS1	11.59	10.14
			MCS2	11.66	10.19
			MCS3	11.65	10.18
			MCS4	11.81	10.23
			MCS5	11.65	10.05
			MCS6	11.75	10.18
			MCS7	9.73	8.08
			MCS8	8.56	6.97
		MIMO (CDD)	MCS0	14.10	
			MCS1	14.12	
			MCS2	14.19	
			MCS3	14.26	
			MCS4	14.20	
			MCS5	14.09	
			MCS6	14.14	
			MCS7	12.15	
			MCS8	11.01	
		MIMO (SDM)	MCS0	13.84	
			MCS1	14.06	
			MCS2	14.05	
			MCS3	13.96	
			MCS4	13.93	
			MCS5	13.87	
			MCS6	13.86	
			MCS7	11.86	
			MCS8	10.77	

802.11ac (20 MHz)	5200	SISO	MCS0	11.59	11.48
			MCS1	11.48	11.54
			MCS2	11.53	11.50
			MCS3	11.50	11.43
			MCS4	11.53	11.36
			MCS5	11.47	11.34
			MCS6	11.42	11.42
			MCS7	9.32	9.26
			MCS8	9.29	9.25
		MIMO (CDD)	MCS0	14.61	
			MCS1	14.56	
			MCS2	14.60	
			MCS3	14.58	
			MCS4	14.52	
			MCS5	14.46	
			MCS6	14.45	
			MCS7	12.33	
			MCS8	12.29	
		MIMO (SDM)	MCS0	14.58	
			MCS1	14.60	
			MCS2	14.52	
			MCS3	14.46	
			MCS4	14.52	
			MCS5	14.43	
			MCS6	14.40	
			MCS7	12.32	
			MCS8	12.25	
	5240	SISO	MCS0	10.63	9.58
			MCS1	10.61	9.54
			MCS2	10.60	9.56
			MCS3	10.62	9.55
			MCS4	10.51	9.51
			MCS5	10.47	9.48
			MCS6	10.45	9.44
			MCS7	8.26	7.31
			MCS8	8.27	7.26
		MIMO (CDD)	MCS0	13.12	
			MCS1	13.13	
			MCS2	13.09	
			MCS3	13.07	
			MCS4	13.03	
			MCS5	13.02	
			MCS6	13.01	
			MCS7	10.83	
			MCS8	10.80	
		MIMO (SDM)	MCS0	13.06	
			MCS1	13.07	
			MCS2	13.07	
			MCS3	12.99	
			MCS4	12.92	
			MCS5	12.87	
			MCS6	12.91	
			MCS7	10.77	
			MCS8	10.75	

802.11n (40 MHz)	5190	SISO	MCS0	9.74	9.66
			MCS1	9.72	9.67
			MCS2	9.70	9.65
			MCS3	9.68	9.60
			MCS4	9.65	9.57
			MCS5	9.60	9.61
			MCS6	7.45	7.55
			MCS7	7.42	7.40
		MIMO	MCS0	12.72	
			MCS1	12.68	
			MCS2	12.66	
			MCS3	12.69	
			MCS4	12.63	
			MCS5	12.58	
			MCS6	10.41	
			MCS7	10.38	
			MCS8	12.70	
			MCS9	12.69	
			MCS10	12.67	
			MCS11	12.64	
			MCS12	12.64	
			MCS13	12.60	
			MCS14	10.38	
			MCS15	10.38	
	5230	SISO	MCS0	13.95	12.14
			MCS1	13.83	12.12
			MCS2	13.87	12.26
			MCS3	13.76	12.16
			MCS4	13.83	11.99
			MCS5	13.74	12.06
			MCS6	11.64	9.93
			MCS7	11.67	9.95
		MIMO	MCS0	16.32	
			MCS1	16.27	
			MCS2	16.24	
			MCS3	16.22	
			MCS4	16.12	
			MCS5	16.07	
			MCS6	14.08	
			MCS7	14.05	
			MCS8	15.20	
			MCS9	16.08	
			MCS10	16.09	
			MCS11	16.00	
			MCS12	15.97	
			MCS13	15.89	
			MCS14	14.66	
			MCS15	13.87	

802.11ac (40 MHz)	5190	SISO	MCS0	7.89	7.21
			MCS1	7.84	7.17
			MCS2	7.86	7.10
			MCS3	7.83	7.01
			MCS4	7.80	7.13
			MCS5	7.77	6.98
			MCS6	7.81	6.86
			MCS7	7.74	6.75
			MCS8	5.54	4.70
			MCS9	5.53	4.56
		MIMO (CDD)	MCS0	10.49	
			MCS1	10.50	
			MCS2	10.49	
			MCS3	10.48	
			MCS4	10.48	
			MCS5	10.40	
			MCS6	10.35	
			MCS7	10.29	
			MCS8	8.25	
			MCS9	8.19	
		MIMO (SDM)	MCS0	10.51	
			MCS1	10.52	
			MCS2	10.38	
			MCS3	10.47	
			MCS4	10.38	
			MCS5	10.33	
			MCS6	10.26	
			MCS7	10.21	
			MCS8	8.08	
			MCS9	8.04	
	5230	SISO	MCS0	13.87	12.14
			MCS1	13.92	12.25
			MCS2	13.93	12.24
			MCS3	13.76	12.19
			MCS4	13.92	12.10
			MCS5	13.80	12.18
			MCS6	13.67	12.13
			MCS7	11.70	10.01
			MCS8	10.65	8.90
			MCS9	10.64	8.90
		MIMO (CDD)	MCS0	16.31	
			MCS1	16.16	
			MCS2	16.13	
			MCS3	16.21	
			MCS4	16.20	
			MCS5	16.06	
			MCS6	16.14	
			MCS7	14.01	
			MCS8	12.89	
			MCS9	12.91	

802.11ac (40 MHz)	5230	MIMO (SDM)	MCS0	16.03	
			MCS1	16.10	
			MCS2	16.09	
			MCS3	16.03	
			MCS4	15.98	
			MCS5	15.93	
			MCS6	15.85	
			MCS7	13.92	
			MCS8	12.70	
			MCS9	12.71	
802.11ac (80 MHz)	5210	SISO	MCS0	10.31	8.62
			MCS1	10.24	8.63
			MCS2	10.22	8.69
			MCS3	10.29	8.54
			MCS4	10.29	8.60
			MCS5	10.23	8.62
			MCS6	10.14	8.44
			MCS7	8.10	6.48
			MCS8	7.10	5.17
			MCS9	7.02	5.19
		MIMO (CDD)	MCS0	12.66	
			MCS1	12.61	
			MCS2	12.72	
			MCS3	12.71	
			MCS4	12.52	
			MCS5	12.49	
			MCS6	12.52	
			MCS7	10.40	
			MCS8	9.43	
			MCS9	9.36	
		MIMO (SDM)	MCS0	12.24	
			MCS1	12.19	
			MCS2	12.17	
			MCS3	12.14	
			MCS4	12.14	
			MCS5	12.17	
			MCS6	12.10	
			MCS7	10.06	
			MCS8	9.02	
			MCS9	9.02	

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Mode	Measured Frequency(MHz)	SISO/ MIMO	Datarate	Measured Output Power (dBm)	
				ANT 0 (Main)	ANT 1 (Aux)
802.11a	5260	SISO	6	7.06	6.09
			9	7.05	6.15
			12	7.10	6.11
			18	7.08	6.14
			24	7.03	6.07
			36	7.01	6.09
			48	5.31	4.19
			54	5.22	4.22
		MIMO	6	9.67	
			9	9.68	
			12	9.67	
			18	9.67	
			24	9.58	
			36	9.57	
			48	7.65	
			54	7.65	
	5300	SISO	6	8.59	7.44
			9	8.56	7.40
			12	8.55	7.48
			18	8.56	7.44
			24	8.57	7.38
			36	8.44	7.37
			48	6.48	5.26
			54	6.47	5.25
		MIMO	6	11.02	
			9	11.00	
			12	10.99	
			18	10.96	
			24	10.95	
			36	10.91	
			48	8.95	
			54	8.98	
	5320	SISO	6	9.46	8.25
			9	9.54	8.21
			12	9.55	8.38
			18	9.50	8.37
			24	9.46	8.09
			36	9.43	6.01
			48	7.32	6.00
			54	7.27	5.92
		MIMO	6	11.98	
			9	12.02	
			12	12.05	
			18	12.11	
			24	12.07	
			36	12.03	
			48	9.88	
			54	9.75	

802.11n (20 MHz)	5260	SISO	MCS0	8.35	8.29
			MCS1	8.28	8.26
			MCS2	8.20	8.23
			MCS3	8.25	8.30
			MCS4	8.18	8.14
			MCS5	8.09	8.07
			MCS6	6.08	6.03
			MCS7	6.00	6.06
		MIMO	MCS0	11.35	
			MCS1	11.33	
			MCS2	11.28	
			MCS3	11.29	
			MCS4	11.22	
			MCS5	11.16	
			MCS6	9.16	
			MCS7	9.06	
			MCS8	11.36	
			MCS9	11.34	
			MCS10	11.31	
			MCS11	11.25	
			MCS12	11.22	
			MCS13	11.14	
			MCS14	9.13	
			MCS15	9.06	
	5300	SISO	MCS0	8.85	8.81
			MCS1	8.83	8.79
			MCS2	8.84	8.80
			MCS3	8.77	8.72
			MCS4	8.73	8.70
			MCS5	8.66	8.67
			MCS6	6.50	7.44
			MCS7	6.48	7.45
		MIMO	MCS0	11.79	
			MCS1	11.76	
			MCS2	11.79	
			MCS3	11.77	
			MCS4	11.75	
			MCS5	11.72	
			MCS6	10.51	
			MCS7	10.50	
			MCS8	11.77	
			MCS9	11.75	
			MCS10	11.72	
			MCS11	11.70	
			MCS12	11.68	
			MCS13	11.66	
			MCS14	9.55	
			MCS15	9.52	

802.11n (20 MHz)	5320	SISO	MCS0	10.69	9.63
			MCS1	10.71	9.46
			MCS2	10.85	9.72
			MCS3	10.83	9.73
			MCS4	10.72	9.71
			MCS5	10.75	9.64
			MCS6	8.67	7.41
			MCS7	8.63	7.48
		MIMO	MCS0	13.40	
			MCS1	13.34	
			MCS2	13.45	
			MCS3	13.44	
			MCS4	13.40	
			MCS5	13.37	
			MCS6	11.28	
			MCS7	11.25	
			MCS8	13.25	
			MCS9	13.37	
			MCS10	13.35	
			MCS11	13.33	
			MCS12	13.29	
			MCS13	13.14	
			MCS14	11.08	
			MCS15	11.05	
802.11ac (20 MHz)	5260	SISO	MCS0	9.63	8.66
			MCS1	9.57	8.61
			MCS2	9.51	8.56
			MCS3	9.54	8.51
			MCS4	9.46	8.48
			MCS5	9.44	8.45
			MCS6	9.40	8.42
			MCS7	7.31	6.28
			MCS8	7.25	6.25
		MIMO (CDD)	MCS0	12.13	
			MCS1	12.13	
			MCS2	12.08	
			MCS3	12.10	
			MCS4	12.03	
			MCS5	11.98	
			MCS6	11.98	
			MCS7	9.79	
			MCS8	9.74	
		MIMO (SDM)	MCS0	12.09	
			MCS1	12.11	
			MCS2	12.06	
			MCS3	12.01	
			MCS4	12.01	
			MCS5	11.96	
			MCS6	11.93	
			MCS7	9.78	
			MCS8	9.78	

802.11ac (20 MHz)	5300	SISO	MCS0	13.07	11.72
			MCS1	12.91	11.65
			MCS2	13.05	11.75
			MCS3	12.95	11.80
			MCS4	13.00	11.86
			MCS5	13.00	11.73
			MCS6	13.08	9.54
			MCS7	10.96	9.64
			MCS8	9.94	9.60
		MIMO (CDD)	MCS0	15.74	
			MCS1	15.72	
			MCS2	15.76	
			MCS3	15.76	
			MCS4	15.77	
			MCS5	15.67	
			MCS6	14.94	
			MCS7	13.68	
			MCS8	14.27	
		MIMO (SDM)	MCS0	15.72	
			MCS1	15.74	
			MCS2	15.66	
			MCS3	15.63	
			MCS4	15.57	
			MCS5	15.52	
			MCS6	15.48	
			MCS7	13.46	
			MCS8	12.85	
	5320	SISO	MCS0	13.07	12.06
			MCS1	13.10	12.12
			MCS2	13.14	12.08
			MCS3	13.11	12.01
			MCS4	13.09	11.95
			MCS5	13.07	11.96
			MCS6	13.05	11.85
			MCS7	11.01	9.79
			MCS8	10.97	9.77
		MIMO (CDD)	MCS0	15.61	
			MCS1	15.59	
			MCS2	15.53	
			MCS3	15.56	
			MCS4	15.48	
			MCS5	15.47	
			MCS6	15.46	
			MCS7	13.41	
			MCS8	13.35	
		MIMO (SDM)	MCS0	15.63	
			MCS1	15.61	
			MCS2	15.60	
			MCS3	15.59	
			MCS4	15.58	
			MCS5	15.49	
			MCS6	15.44	
			MCS7	13.35	
			MCS8	13.33	

802.11n (40 MHz)	5270	SISO	MCS0	11.70	10.55
			MCS1	11.66	10.53
			MCS2	11.77	10.53
			MCS3	11.75	10.39
			MCS4	11.80	10.45
			MCS5	11.67	10.33
			MCS6	9.73	8.41
			MCS7	9.80	8.22
		MIMO	MCS0	14.33	
			MCS1	14.34	
			MCS2	14.41	
			MCS3	14.40	
			MCS4	14.34	
			MCS5	14.25	
			MCS6	12.21	
			MCS7	12.27	
			MCS8	14.24	
			MCS9	14.34	
			MCS10	14.31	
			MCS11	14.25	
			MCS12	14.16	
			MCS13	14.07	
			MCS14	12.11	
			MCS15	12.05	
	5310	SISO	MCS0	11.03	10.98
			MCS1	10.95	10.96
			MCS2	10.94	10.88
			MCS3	10.98	10.86
			MCS4	10.90	10.80
			MCS5	10.84	10.77
			MCS6	8.67	8.57
			MCS7	8.70	8.55
		MIMO	MCS0	13.98	
			MCS1	13.97	
			MCS2	13.94	
			MCS3	13.92	
			MCS4	13.88	
			MCS5	13.80	
			MCS6	11.74	
			MCS7	11.71	
			MCS8	13.98	
			MCS9	13.94	
			MCS10	13.95	
			MCS11	13.94	
			MCS12	13.92	
			MCS13	13.91	
			MCS14	11.78	
			MCS15	11.79	

802.11ac (40 MHz)	5270	SISO	MCS0	13.71	12.69
			MCS1	13.65	12.62
			MCS2	13.77	12.64
			MCS3	13.74	12.55
			MCS4	13.83	12.50
			MCS5	13.67	12.48
			MCS6	13.76	12.51
			MCS7	11.77	10.40
			MCS8	10.70	9.20
			MCS9	10.71	9.23
		MIMO (CDD)	MCS0	16.40	
			MCS1	16.48	
			MCS2	16.43	
			MCS3	16.35	
			MCS4	16.33	
			MCS5	16.27	
			MCS6	16.25	
			MCS7	14.18	
			MCS8	13.02	
			MCS9	13.03	
		MIMO (SDM)	MCS0	16.19	
			MCS1	16.33	
			MCS2	16.29	
			MCS3	16.34	
			MCS4	16.21	
			MCS5	16.22	
			MCS6	16.13	
			MCS7	14.13	
			MCS8	13.05	
			MCS9	13.05	
	5310	SISO	MCS0	11.79	11.21
			MCS1	11.71	11.18
			MCS2	11.82	11.14
			MCS3	11.65	11.06
			MCS4	11.70	11.09
			MCS5	11.64	10.97
			MCS6	11.53	10.96
			MCS7	11.47	10.90
			MCS8	9.35	8.88
			MCS9	9.32	8.74
		MIMO (CDD)	MCS0	14.48	
			MCS1	14.42	
			MCS2	14.41	
			MCS3	14.41	
			MCS4	14.30	
			MCS5	14.23	
			MCS6	14.19	
			MCS7	14.14	
			MCS8	12.23	
			MCS9	12.20	

802.11ac (40 MHz)	5310	MIMO (SDM)	MCS0	14.44	
			MCS1	14.42	
			MCS2	14.44	
			MCS3	14.42	
			MCS4	14.32	
			MCS5	14.25	
			MCS6	14.24	
			MCS7	14.19	
			MCS8	12.17	
			MCS9	12.13	
802.11ac (80 MHz)	5290	SISO	MCS0	11.24	9.88
			MCS1	11.03	9.83
			MCS2	10.99	9.77
			MCS3	11.02	9.80
			MCS4	10.98	9.79
			MCS5	11.05	9.62
			MCS6	11.01	9.61
			MCS7	8.97	7.61
			MCS8	7.85	6.44
			MCS9	7.85	6.42
		MIMO (CDD)	MCS0	13.72	
			MCS1	13.67	
			MCS2	13.59	
			MCS3	13.60	
			MCS4	13.51	
			MCS5	13.45	
			MCS6	13.46	
			MCS7	11.32	
			MCS8	10.28	
			MCS9	10.28	
		MIMO (SDM)	MCS0	13.60	
			MCS1	13.58	
			MCS2	13.55	
			MCS3	13.49	
			MCS4	13.51	
			MCS5	13.55	
			MCS6	13.44	
			MCS7	11.36	
			MCS8	10.18	
			MCS9	10.16	

U-NII-2C Band

Mode	Measured Frequency(MHz)	SISO/ MIMO	Datarate	Measured Output Power (dBm)	
				ANT 0 (Main)	ANT 1 (Aux)
802.11a	5500	SISO	6	12.45	11.59
			9	12.46	11.56
			12	12.40	11.57
			18	12.43	11.57
			24	12.36	11.50
			36	12.38	11.43
			48	10.29	9.40
			54	10.21	9.43
		MIMO	6	15.02	
			9	15.01	
			12	15.02	
			18	14.98	
			24	14.92	
			36	14.88	
			48	12.83	
			54	12.80	
	5580	SISO	6	14.38	13.19
			9	14.36	13.36
			12	14.35	13.36
			18	14.34	13.30
			24	14.33	13.42
			36	14.48	13.43
			48	12.40	11.21
			54	12.27	11.25
		MIMO	6	16.92	
			9	17.05	
			12	17.04	
			18	17.16	
			24	17.11	
			36	17.15	
			48	15.07	
			54	14.96	
	5720	SISO	6	14.88	13.77
			9	14.83	13.76
			12	14.75	13.79
			18	14.78	13.63
			24	14.79	13.58
			36	14.62	13.48
			48	12.45	11.31
			54	12.36	11.24
		MIMO	6	17.29	
			9	17.25	
			12	17.20	
			18	17.20	
			24	17.15	
			36	17.09	
			48	14.89	
			54	14.88	

802.11n (20 MHz)	5500	SISO	MCS0	13.25	13.22
			MCS1	13.23	13.17
			MCS2	13.21	13.20
			MCS3	13.25	13.25
			MCS4	13.18	13.21
			MCS5	13.09	13.15
			MCS6	11.10	11.09
			MCS7	11.07	11.05
		MIMO	MCS0	16.22	
			MCS1	16.16	
			MCS2	16.14	
			MCS3	16.18	
			MCS4	16.13	
			MCS5	16.09	
			MCS6	13.97	
			MCS7	13.95	
			MCS8	16.20	
			MCS9	16.14	
			MCS10	16.15	
			MCS11	16.17	
			MCS12	16.07	
			MCS13	16.04	
			MCS14	13.97	
			MCS15	13.91	
	5580	SISO	MCS0	14.18	12.81
			MCS1	14.15	12.78
			MCS2	14.21	13.08
			MCS3	14.35	13.03
			MCS4	14.52	13.22
			MCS5	14.41	13.18
			MCS6	12.36	10.99
			MCS7	12.20	11.04
		MIMO	MCS0	16.74	
			MCS1	16.78	
			MCS2	16.90	
			MCS3	16.89	
			MCS4	17.03	
			MCS5	16.96	
			MCS6	14.84	
			MCS7	14.85	
			MCS8	16.67	
			MCS9	16.80	
			MCS10	16.75	
			MCS11	16.84	
			MCS12	16.82	
			MCS13	16.68	
			MCS14	14.64	
			MCS15	14.53	

802.11n	5720	SISO	MCS0	14.35	14.25
			MCS1	14.27	14.21
			MCS2	14.26	14.24
			MCS3	14.20	14.20
			MCS4	14.25	14.27
			MCS5	14.20	14.21
			MCS6	12.08	12.03
			MCS7	12.11	12.05
		MIMO	MCS0	17.26	
			MCS1	17.24	
			MCS2	17.22	
			MCS3	17.21	
			MCS4	17.21	
			MCS5	17.19	
			MCS6	16.21	
			MCS7	15.09	
			MCS8	16.27	
			MCS9	17.25	
			MCS10	17.24	
			MCS11	17.25	
			MCS12	17.24	
			MCS13	17.15	
			MCS14	15.08	
			MCS15	15.07	
802.11ac (20 MHz)	5500	SISO	MCS0	14.30	13.25
			MCS1	14.20	13.27
			MCS2	14.27	13.20
			MCS3	14.25	13.24
			MCS4	14.21	13.20
			MCS5	14.18	13.17
			MCS6	14.07	13.04
			MCS7	12.11	11.15
			MCS8	12.09	11.09
		MIMO (CDD)	MCS0	16.78	
			MCS1	16.79	
			MCS2	16.76	
			MCS3	16.76	
			MCS4	16.73	
			MCS5	16.68	
			MCS6	16.66	
			MCS7	14.57	
			MCS8	14.59	
		MIMO (SDM)	MCS0	16.76	
			MCS1	16.77	
			MCS2	16.74	
			MCS3	16.72	
			MCS4	16.74	
			MCS5	16.68	
			MCS6	16.66	
			MCS7	14.62	
			MCS8	14.61	

802.11ac (20 MHz)	5580	SISO	MCS0	14.32	13.09
			MCS1	14.07	12.81
			MCS2	14.27	13.00
			MCS3	14.21	13.10
			MCS4	14.43	13.25
			MCS5	14.22	13.10
			MCS6	14.30	13.18
			MCS7	12.21	10.97
			MCS8	11.00	9.78
		MIMO (CDD)	MCS0	16.89	
			MCS1	16.75	
			MCS2	16.87	
			MCS3	16.92	
			MCS4	17.05	
			MCS5	16.98	
			MCS6	16.99	
			MCS7	14.84	
			MCS8	13.67	
		MIMO (SDM)	MCS0	16.73	
			MCS1	16.79	
			MCS2	16.80	
			MCS3	16.72	
			MCS4	16.89	
			MCS5	16.75	
			MCS6	16.79	
			MCS7	14.67	
			MCS8	13.47	
	5720	SISO	MCS0	14.30	13.33
			MCS1	14.29	13.28
			MCS2	14.24	13.20
			MCS3	14.26	13.19
			MCS4	14.20	13.09
			MCS5	14.13	13.04
			MCS6	14.05	13.10
			MCS7	12.03	11.05
			MCS8	11.98	11.01
		MIMO (CDD)	MCS0	16.84	
			MCS1	16.84	
			MCS2	16.79	
			MCS3	16.81	
			MCS4	16.75	
			MCS5	16.71	
			MCS6	16.70	
			MCS7	14.70	
			MCS8	14.66	
		MIMO (SDM)	MCS0	16.80	
			MCS1	16.77	
			MCS2	16.76	
			MCS3	16.73	
			MCS4	16.73	
			MCS5	16.72	
			MCS6	16.66	
			MCS7	14.62	
			MCS8	14.60	

802.11n (40 MHz)	5510	SISO	MCS0	10.85	10.03
			MCS1	10.84	10.10
			MCS2	10.79	10.05
			MCS3	10.76	9.98
			MCS4	10.73	9.96
			MCS5	10.72	9.92
			MCS6	8.65	7.86
			MCS7	8.63	7.85
		MIMO	MCS0	13.44	
			MCS1	13.44	
			MCS2	13.42	
			MCS3	13.39	
			MCS4	13.39	
			MCS5	13.35	
			MCS6	11.39	
			MCS7	11.36	
			MCS8	13.70	
			MCS9	13.66	
			MCS10	13.62	
			MCS11	13.63	
			MCS12	13.58	
			MCS13	13.54	
			MCS14	11.48	
			MCS15	11.48	
	5550	SISO	MCS0	14.40	13.42
			MCS1	14.55	13.41
			MCS2	14.60	13.41
			MCS3	14.44	13.46
			MCS4	14.47	13.47
			MCS5	14.53	13.42
			MCS6	12.39	11.33
			MCS7	12.40	11.33
		MIMO	MCS0	17.16	
			MCS1	17.24	
			MCS2	17.27	
			MCS3	17.15	
			MCS4	17.17	
			MCS5	17.05	
			MCS6	14.97	
			MCS7	15.00	
			MCS8	16.89	
			MCS9	16.98	
			MCS10	16.94	
			MCS11	16.95	
			MCS12	16.95	
			MCS13	16.84	
			MCS14	14.80	
			MCS15	14.79	

802.11n (40 MHz)	5710	SISO	MCS0	14.55	13.67
			MCS1	14.58	13.63
			MCS2	14.61	13.60
			MCS3	14.53	13.58
			MCS4	14.48	13.59
			MCS5	14.44	13.57
			MCS6	12.23	11.50
			MCS7	12.28	11.50
		MIMO	MCS0	16.97	
			MCS1	16.98	
			MCS2	16.99	
			MCS3	16.91	
			MCS4	16.89	
			MCS5	16.84	
			MCS6	14.75	
			MCS7	14.75	
			MCS8	16.96	
			MCS9	16.96	
			MCS10	16.88	
			MCS11	16.81	
			MCS12	16.79	
			MCS13	16.79	
			MCS14	14.71	
			MCS15	14.68	
802.11ac (40 MHz)	5510	SISO	MCS0	9.68	8.77
			MCS1	9.67	8.71
			MCS2	9.60	8.75
			MCS3	9.65	8.62
			MCS4	9.66	8.58
			MCS5	9.57	8.64
			MCS6	9.56	8.53
			MCS7	9.47	8.46
			MCS8	7.35	6.51
			MCS9	7.35	6.47
		MIMO (CDD)	MCS0	12.24	
			MCS1	12.19	
			MCS2	12.14	
			MCS3	12.13	
			MCS4	12.08	
			MCS5	12.08	
			MCS6	12.01	
			MCS7	12.02	
			MCS8	9.93	
			MCS9	9.96	
		MIMO (SDM)	MCS0	12.16	
			MCS1	12.17	
			MCS2	12.07	
			MCS3	12.09	
			MCS4	12.12	
			MCS5	12.03	
			MCS6	12.00	
			MCS7	11.99	
			MCS8	9.81	
			MCS9	9.76	

802.11ac (40 MHz)	5550	SISO	MCS0	13.58	12.67
			MCS1	13.50	12.60
			MCS2	13.56	12.65
			MCS3	13.55	12.64
			MCS4	13.47	12.60
			MCS5	13.51	12.57
			MCS6	13.53	12.55
			MCS7	13.40	12.49
			MCS8	11.35	10.38
			MCS9	11.30	10.34
		MIMO (CDD)	MCS0	16.16	
			MCS1	16.10	
			MCS2	16.12	
			MCS3	16.09	
			MCS4	16.07	
			MCS5	16.07	
			MCS6	16.04	
			MCS7	15.98	
			MCS8	13.90	
			MCS9	13.87	
		MIMO (SDM)	MCS0	16.05	
			MCS1	16.00	
			MCS2	15.98	
			MCS3	16.02	
			MCS4	15.98	
			MCS5	15.98	
			MCS6	16.01	
			MCS7	15.97	
			MCS8	13.90	
			MCS9	13.89	
	5710	SISO	MCS0	14.69	13.26
			MCS1	14.83	13.34
			MCS2	14.59	13.19
			MCS3	14.46	13.08
			MCS4	14.52	13.20
			MCS5	14.54	13.27
			MCS6	14.36	13.09
			MCS7	12.38	11.02
			MCS8	11.21	9.96
			MCS9	11.24	10.02
		MIMO (CDD)	MCS0	16.87	
			MCS1	16.95	
			MCS2	16.85	
			MCS3	16.75	
			MCS4	16.78	
			MCS5	16.71	
			MCS6	16.70	
			MCS7	14.63	
			MCS8	13.60	
			MCS9	13.53	

802.11ac (40 MHz)	5710	MIMO (SDM)	MCS0	16.68	
			MCS1	16.77	
			MCS2	16.67	
			MCS3	16.54	
			MCS4	16.60	
			MCS5	16.66	
			MCS6	16.61	
			MCS7	14.49	
			MCS8	13.45	
			MCS9	13.46	
802.11ac (80 MHz)	5530	SISO	MCS0	10.99	10.20
			MCS1	10.97	10.23
			MCS2	10.97	10.21
			MCS3	10.92	10.17
			MCS4	10.88	10.17
			MCS5	10.89	10.15
			MCS6	10.72	10.16
			MCS7	10.75	10.11
			MCS8	8.66	8.10
			MCS9	8.63	8.13
		MIMO (CDD)	MCS0	13.69	
			MCS1	13.67	
			MCS2	13.68	
			MCS3	13.62	
			MCS4	13.58	
			MCS5	13.56	
			MCS6	13.54	
			MCS7	13.49	
			MCS8	11.44	
			MCS9	11.44	
		MIMO (SDM)	MCS0	13.58	
			MCS1	13.60	
			MCS2	13.62	
			MCS3	13.57	
			MCS4	13.55	
			MCS5	13.55	
			MCS6	13.54	
			MCS7	13.50	
			MCS8	11.45	
			MCS9	11.45	
	5690	SISO	MCS0	12.91	12.12
			MCS1	12.96	11.97
			MCS2	12.88	12.00
			MCS3	12.87	12.01
			MCS4	12.78	12.15
			MCS5	12.54	12.10
			MCS6	12.48	11.96
			MCS7	10.38	9.91
			MCS8	9.02	8.73
			MCS9	9.27	8.71

802.11ac (80 MHz)	5690	MIMO (CDD)	MCS0	15.49
			MCS1	15.39
			MCS2	15.35
			MCS3	15.34
			MCS4	15.40
			MCS5	15.38
			MCS6	15.33
			MCS7	13.19
			MCS8	12.05
			MCS9	12.06
		MIMO (SDM)	MCS0	15.47
			MCS1	15.45
			MCS2	15.43
			MCS3	15.41
			MCS4	15.39
			MCS5	15.43
			MCS6	15.31
			MCS7	13.25
			MCS8	12.03
			MCS9	12.06

U-NII-3 Band

Mode	Measured Frequency(MHz)	SISO/ MIMO	Datarate	Measured Output Power (dBm)	
				ANT 0 (Main)	ANT 1 (Aux)
802.11a	5745	SISO	6	14.05	12.69
			9	14.08	12.62
			12	14.11	12.65
			18	14.13	12.66
			24	14.07	12.60
			36	14.06	12.57
			48	12.04	10.48
			54	12.08	10.49
		MIMO	6	16.39	
			9	16.35	
			12	16.37	
			18	16.35	
			24	16.37	
			36	16.35	
			48	14.34	
			54	14.32	
	5785	SISO	6	13.91	13.54
			9	14.00	13.56
			12	13.97	13.59
			18	14.01	13.52
			24	13.95	13.45
			36	14.17	13.39
			48	11.99	11.88
			54	11.99	11.61
		MIMO	6	16.68	
			9	16.77	
			12	16.79	
			18	16.72	
			24	16.67	
			36	16.61	
			48	14.70	
			54	14.67	
	5825	SISO	6	14.04	13.05
			9	14.03	13.03
			12	14.01	13.01
			18	13.97	12.88
			24	13.95	12.81
			36	13.90	12.79
			48	11.87	11.02
			54	11.88	10.89
		MIMO	6	16.57	
			9	16.53	
			12	16.49	
			18	16.48	
			24	16.45	
			36	16.45	
			48	14.36	
			54	14.31	

802.11n (20 MHz)	5745	SISO	MCS0	13.49	12.71
			MCS1	13.51	12.65
			MCS2	13.55	12.60
			MCS3	13.56	12.62
			MCS4	13.50	12.49
			MCS5	13.47	12.56
			MCS6	11.38	11.44
			MCS7	11.35	11.29
		MIMO	MCS0	16.16	
			MCS1	16.16	
			MCS2	16.16	
			MCS3	16.13	
			MCS4	16.08	
			MCS5	16.09	
			MCS6	14.01	
			MCS7	13.99	
			MCS8	16.12	
			MCS9	16.10	
			MCS10	16.12	
			MCS11	16.08	
			MCS12	16.07	
			MCS13	15.99	
			MCS14	13.89	
			MCS15	13.86	
	5785	SISO	MCS0	13.63	12.70
			MCS1	13.50	12.61
			MCS2	13.73	12.81
			MCS3	13.74	12.80
			MCS4	13.89	13.02
			MCS5	13.88	12.99
			MCS6	11.92	10.87
			MCS7	11.79	10.99
		MIMO	MCS0	16.37	
			MCS1	16.43	
			MCS2	16.49	
			MCS3	16.57	
			MCS4	16.76	
			MCS5	16.61	
			MCS6	14.56	
			MCS7	14.59	
			MCS8	16.35	
			MCS9	16.40	
			MCS10	16.38	
			MCS11	16.38	
			MCS12	16.44	
			MCS13	16.30	
			MCS14	14.34	
			MCS15	14.31	

802.11n (20 MHz)	5825	SISO	MCS0	13.75	12.65
			MCS1	13.69	12.63
			MCS2	13.58	12.60
			MCS3	13.62	12.60
			MCS4	13.55	12.57
			MCS5	13.51	12.54
			MCS6	11.38	10.30
			MCS7	11.35	10.33
		MIMO	MCS0	16.22	
			MCS1	16.20	
			MCS2	16.16	
			MCS3	16.12	
			MCS4	16.05	
			MCS5	16.05	
			MCS6	14.02	
			MCS7	14.03	
			MCS8	16.20	
			MCS9	16.18	
			MCS10	16.19	
			MCS11	16.18	
			MCS12	16.17	
			MCS13	16.10	
			MCS14	13.96	
			MCS15	13.96	
802.11ac (20 MHz)	5745	SISO	MCS0	13.95	13.16
			MCS1	13.87	13.11
			MCS2	13.92	13.06
			MCS3	13.84	13.01
			MCS4	13.88	12.99
			MCS5	13.76	12.96
			MCS6	13.74	12.81
			MCS7	11.58	10.77
			MCS8	11.62	10.65
		MIMO (CDD)	MCS0	16.51	
			MCS1	16.49	
			MCS2	16.44	
			MCS3	16.46	
			MCS4	16.37	
			MCS5	16.35	
			MCS6	16.29	
			MCS7	14.16	
			MCS8	14.15	
		MIMO (SDM)	MCS0	16.43	
			MCS1	16.43	
			MCS2	16.40	
			MCS3	16.36	
			MCS4	16.29	
			MCS5	16.27	
			MCS6	16.18	
			MCS7	14.09	
			MCS8	14.06	

802.11ac (20 MHz)	5785	SISO	MCS0	13.91	13.09
			MCS1	13.48	12.61
			MCS2	13.63	12.90
			MCS3	13.73	12.96
			MCS4	13.88	12.96
			MCS5	13.63	13.01
			MCS6	13.76	12.96
			MCS7	11.75	10.90
			MCS8	10.64	9.68
		MIMO (CDD)	MCS0	16.72	
			MCS1	16.36	
			MCS2	16.40	
			MCS3	16.50	
			MCS4	16.65	
			MCS5	16.56	
			MCS6	16.54	
			MCS7	14.54	
			MCS8	13.35	
		MIMO (SDM)	MCS0	16.65	
			MCS1	16.33	
			MCS2	16.37	
			MCS3	16.31	
			MCS4	16.44	
			MCS5	16.40	
			MCS6	16.34	
			MCS7	14.27	
			MCS8	13.17	
	5825	SISO	MCS0	13.94	13.22
			MCS1	13.93	13.12
			MCS2	13.90	13.07
			MCS3	13.88	13.01
			MCS4	13.81	12.87
			MCS5	13.85	12.85
			MCS6	13.77	12.83
			MCS7	11.68	10.71
			MCS8	11.65	10.66
		MIMO (CDD)	MCS0	16.56	
			MCS1	16.52	
			MCS2	16.53	
			MCS3	16.52	
			MCS4	16.48	
			MCS5	16.41	
			MCS6	16.38	
			MCS7	14.28	
			MCS8	14.26	
		MIMO (SDM)	MCS0	16.35	
			MCS1	16.37	
			MCS2	16.26	
			MCS3	16.33	
			MCS4	16.28	
			MCS5	16.18	
			MCS6	16.10	
			MCS7	14.03	
			MCS8	14.01	

802.11n (40 MHz)	5755	SISO	MCS0	13.89	13.10
			MCS1	13.84	13.00
			MCS2	13.85	12.98
			MCS3	13.88	12.92
			MCS4	13.79	12.90
			MCS5	13.72	12.88
			MCS6	11.65	10.80
			MCS7	11.63	10.73
		MIMO	MCS0	16.53	
			MCS1	16.50	
			MCS2	16.48	
			MCS3	16.42	
			MCS4	16.38	
			MCS5	16.35	
			MCS6	14.32	
			MCS7	14.30	
			MCS8	16.40	
			MCS9	16.24	
			MCS10	16.31	
			MCS11	16.27	
			MCS12	16.23	
			MCS13	16.20	
			MCS14	14.11	
			MCS15	14.06	
	5795	SISO	MCS0	13.70	13.15
			MCS1	13.71	13.12
			MCS2	13.90	13.12
			MCS3	13.95	13.01
			MCS4	13.98	13.11
			MCS5	13.89	13.00
			MCS6	12.02	11.09
			MCS7	11.89	11.02
		MIMO	MCS0	16.61	
			MCS1	16.74	
			MCS2	16.69	
			MCS3	16.56	
			MCS4	16.66	
			MCS5	16.52	
			MCS6	14.53	
			MCS7	14.47	
			MCS8	16.33	
			MCS9	16.43	
			MCS10	16.42	
			MCS11	16.35	
			MCS12	16.50	
			MCS13	16.38	
			MCS14	14.38	
			MCS15	14.34	

802.11ac (40 MHz)	5755	SISO	MCS0	14.05	13.26
			MCS1	14.09	13.33
			MCS2	14.02	13.31
			MCS3	13.97	13.24
			MCS4	13.92	13.20
			MCS5	13.90	13.12
			MCS6	13.85	13.06
			MCS7	13.78	13.03
			MCS8	11.66	10.97
			MCS9	11.60	10.90
		MIMO (CDD)	MCS0	16.59	
			MCS1	16.60	
			MCS2	16.55	
			MCS3	16.55	
			MCS4	16.53	
			MCS5	16.47	
			MCS6	16.42	
			MCS7	16.37	
			MCS8	14.29	
			MCS9	14.29	
		MIMO (SDM)	MCS0	16.63	
			MCS1	16.59	
			MCS2	16.54	
			MCS3	16.45	
			MCS4	16.45	
			MCS5	16.40	
			MCS6	16.35	
			MCS7	16.30	
			MCS8	14.15	
			MCS9	14.12	
	5795	SISO	MCS0	14.15	13.46
			MCS1	14.13	13.49
			MCS2	13.74	13.24
			MCS3	13.63	13.11
			MCS4	13.65	13.15
			MCS5	13.70	13.23
			MCS6	13.64	13.06
			MCS7	11.56	11.13
			MCS8	10.53	9.98
			MCS9	10.55	9.84
		MIMO (CDD)	MCS0	16.96	
			MCS1	16.78	
			MCS2	16.60	
			MCS3	16.51	
			MCS4	16.58	
			MCS5	16.46	
			MCS6	16.35	
			MCS7	14.39	
			MCS8	13.25	
			MCS9	13.25	

802.11ac (40 MHz)	5795	MIMO (SDM)	MCS0	16.91	
			MCS1	16.95	
			MCS2	16.64	
			MCS3	16.60	
			MCS4	16.58	
			MCS5	16.54	
			MCS6	16.43	
			MCS7	14.60	
			MCS8	13.40	
			MCS9	13.49	
802.11ac (80 MHz)	5775	SISO	MCS0	14.13	13.52
			MCS1	14.03	13.49
			MCS2	13.53	13.26
			MCS3	13.54	13.15
			MCS4	13.53	13.25
			MCS5	13.60	13.20
			MCS6	13.57	13.25
			MCS7	11.61	11.06
			MCS8	10.53	10.01
			MCS9	10.54	10.06
		MIMO (CDD)	MCS0	16.77	
			MCS1	16.80	
			MCS2	16.45	
			MCS3	16.48	
			MCS4	16.62	
			MCS5	16.54	
			MCS6	16.52	
			MCS7	14.50	
			MCS8	13.49	
			MCS9	13.40	
		MIMO (SDM)	MCS0	16.63	
			MCS1	16.52	
			MCS2	16.22	
			MCS3	16.17	
			MCS4	16.29	
			MCS5	16.30	
			MCS6	16.18	
			MCS7	14.26	
			MCS8	13.19	
			MCS9	13.14	

10. SYSTEM VERIFICATION

10.1 Tissue Verification

For the measurement of the following parameters(Table 10.1) the DAK-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 IEC/IEEE 62209-1528.

Table 10.1 Measured Tissue Parameters

Date	Liquid Type	Liquid Temp. (℃)	Freq (MHz)	Measured relative Permittivity (ε)	Measured Conductivity (S/m)	Target relative Permittivity (ε)	Target Conductivity (S/m)	Permittivity Error (%)	Conductivity Error (%)
Jan 20.2022	2G /Head	20.40	2412	39.36	1.82	39.27	1.77	0.23	3.17
			2437	39.26	1.86	39.22	1.79	0.09	3.91
			2462	39.25	1.87	39.19	1.81	0.17	2.92
Dec 21.2021	5G /Head	20.70	5180	36.02	4.63	36.01	4.64	0.03	-0.04
			5220	35.74	4.59	35.96	4.68	-0.62	-1.92
			5240	35.66	4.61	35.94	4.70	-0.78	-1.94
			5260	35.63	4.64	35.92	4.72	-0.80	-1.65
			5300	35.58	4.69	35.87	4.76	-0.81	-1.43
			5320	35.51	4.70	35.85	4.78	-0.95	-1.59
Dec 22.2021	5G /Head	20.70	5180	36.46	4.62	36.01	4.64	1.25	-0.35
			5220	36.22	4.63	35.96	4.68	0.71	-1.05
			5240	36.11	4.66	35.94	4.70	0.47	-0.83
			5260	36.06	4.72	35.92	4.72	0.40	0.06
			5300	36.15	4.80	35.87	4.76	0.78	0.95
			5320	36.15	4.80	35.85	4.78	0.84	0.52
Jan 12.2022	5G /Head	20.60	5180	35.31	4.56	36.01	4.64	-1.94	-1.53
			5220	35.33	4.61	35.96	4.68	-1.76	-1.35
			5240	35.32	4.61	35.94	4.70	-1.73	-1.87
			5260	35.22	4.63	35.92	4.72	-1.94	-1.82
			5300	35.18	4.69	35.87	4.76	-1.93	-1.43
			5320	35.12	4.71	35.85	4.78	-2.03	-1.47
Jan 13.2022	5G /Head	20.40	5500	35.19	4.99	35.64	4.96	-1.27	0.58
			5560	35.04	5.09	35.57	5.02	-1.50	1.33
			5600	34.89	5.13	35.53	5.07	-1.80	1.28
			5700	34.66	5.29	35.41	5.17	-1.86	0.74
Jan 17.2022	5G /Head	20.60	5600	34.58	5.14	35.53	5.07	-2.67	1.40
			5700	34.37	5.28	35.41	5.17	-2.68	0.51
			5745	34.16	5.29	35.36	5.21	-3.28	0.74
			5785	33.92	5.36	35.32	5.26	-3.96	2.07
			5825	34.00	5.46	35.27	5.30	-3.60	3.06

10.2 Test System Verification

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 10 g 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.
Refer to Appendix B for each plot.

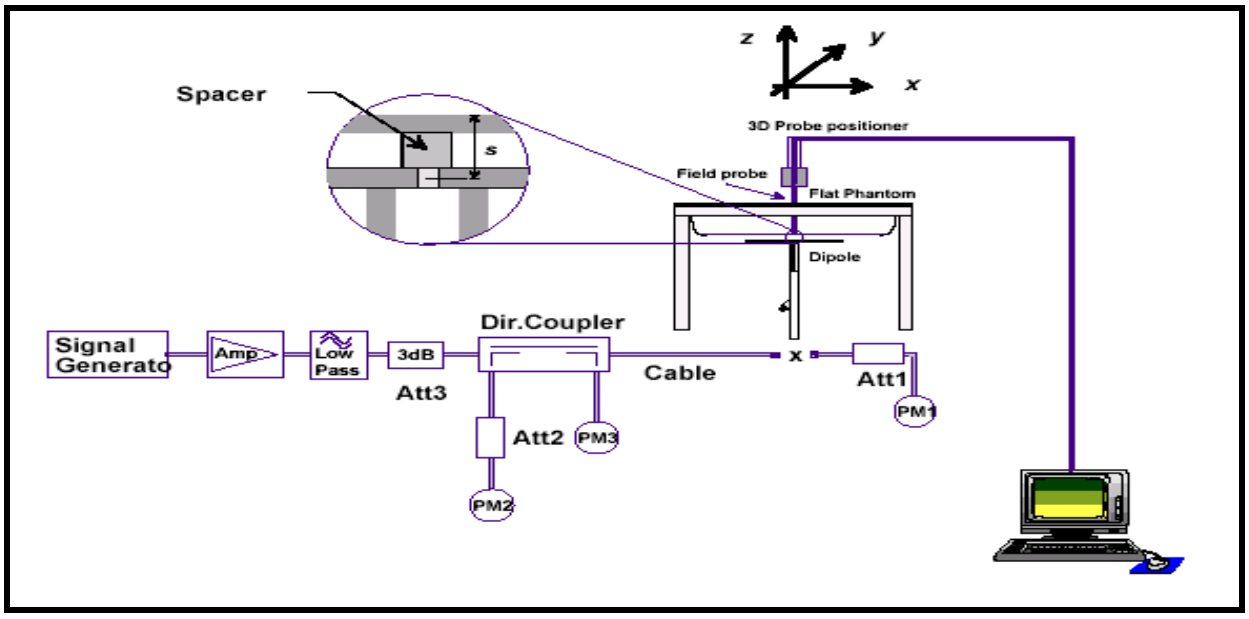
Table 10.2 System Verification Results

Date	Liquid Temperature (°C)	Measured Frequency (MHz)	Targeted 1 g SAR (W/kg)	Measured 1 g SAR (W/kg)	Normalized 1 g SAR (W/kg)	Deviation (%)	Verification Kit	Plot No.
Jan 20.2022	20.40	2450	51.80	13.10	52.40	1.16	D2450V2 SN: 774	#V01
Dec 21.2021	20.70	5200	77.70	19.90	79.60	2.45	D5GHzV2 SN: 1146	#V02
		5300	80.10	19.10	76.40	-4.62	D5GHzV2 SN: 1146	#V03
Dec 22.2021	20.70	5200	77.70	19.60	78.40	0.90	D5GHzV2 SN: 1146	#V04
		5300	80.10	19.30	77.20	-3.62	D5GHzV2 SN: 1146	#V05
Jan 12.2022	20.60	5200	77.70	19.30	77.20	-0.64	D5GHzV2 SN: 1146	#V06
		5300	80.10	20.10	80.40	0.37	D5GHzV2 SN: 1146	#V07
Jan 13.2022	20.40	5500	84.00	20.60	82.40	-1.90	D5GHzV2 SN: 1146	#V08
		5600	83.90	20.70	82.80	-1.31	D5GHzV2 SN: 1146	#V09
Jan 17.2022	20.60	5600	83.90	20.60	82.40	-1.79	D5GHzV2 SN: 1146	#V10
		5800	80.00	19.90	79.60	-0.50	D5GHzV2 SN: 1146	#V11

10.3 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.



11. SAR MEASUREMENT RESULTS

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   Scaling Factor = Maximum Tune-up limit power (mW) / EUT RF Power (mW),
   Where tune-up limit is the maximum rated power among all production units.
   Reported SAR (W/kg) = Scaling Factor * Duty Factor * Measured SAR (W/kg)

2. Tune-up limit power is refer to page 13.

DTS Band : Ant 0 (Main)

Meas. Freq		Mode	EUT Configuration	Average Power (mW)	Maximum Tune-Up Limit pwr (mW)	Scaling Factor	Duty Factor	Test distance	Measured SAR 1g (W/kg)	Reported SAR 1g (W/kg)	Plot No.
MHz	CH										
2437	6	HT40 MCS4	Front	76.74	100	1.30	1.25	0 mm	0.003 *)	N/A	
2452	9			32.58	39.81	1.22	1.25		0.002 *)	N/A	
2422	3			14.13	19.95	1.41	1.25		0.002 *)	N/A	

*) The area scan preceding zoom scan doesn't have any maximum value.
Therefore, This value is the 1 g peak SAR value in the area scan.

DTS Band : Ant 1 (Aux)

Meas. Freq		Mode	EUT Configuration	Average Power (mW)	Maximum Tune-Up Limit pwr (mW)	Scaling Factor	Duty Factor	Test distance	Measured SAR 1g (W/kg)	Reported SAR 1g (W/kg)	Plot No.
MHz	CH										
2437	6	HT40 MCS2	Front	76.56	100	1.31	1.29	0 mm	0.002 *)	N/A	
2452	9			31.41	39.81	1.27	1.07		0.002 *)	N/A	
2422	3			14.26	19.95	1.40	1.29		0.002 *)	N/A	

*) The area scan preceding zoom scan doesn't have any maximum value.
Therefore, This value is the 1 g peak SAR value in the area scan.

DTS Band : Simultaneous Transmission SAR

Position	Ant 0 (Main) (W/kg)	Ant 1 (Aux) (W/kg)	Sum of peak SAR (W/kg)
Front	< 0.10	< 0.10	< 0.10

U-NII-1 Band : Ant 0 (Main)

Meas. Freq		Mode	EUT Configuration	Average Power (mW)	Maximum Tune-Up Limit pwr (mW)	Scaling Factor	Duty Factor	Test distance	Measured SAR 1g (W/kg)	Reported SAR 1g (W/kg)	Plot No.
MHz	CH										
5230	46	HT40 MCS0	Front	24.83	25.12	1.01	1.05	0 mm	0.007	0.007	#S01
5190	38			9.42	12.59	1.34	1.05		0.003	0.004	

U-NII-1 Band: Ant 1 (Aux)

Meas. Freq		Mode	EUT Configuration	Average Power (mW)	Maximum Tune-Up Limit pwr (mW)	Scaling Factor	Duty Factor	Test distance	Measured SAR 1g (W/kg)	Reported SAR 1g (W/kg)	Plot No.
MHz	CH										
5180	36	HT20 MCS0	Front	19.50	25.12	1.29	1.03	0 mm	0.003	0.004	#S02
5200	40			18.79	25.12	1.34	1.03		0.003	0.004	
5240	48			11.94	15.85	1.33	1.03		0.010 *)	N/A	

*) The area scan preceding zoom scan doesn't have any maximum value.
Therefore, This value is the 1 g peak SAR value in the area scan.

U-NII-1 Band: Simultaneous Transmission SAR

Position	Ant 0 (Main) (W/kg)	Ant 1 (Aux) (W/kg)	Sum of peak SAR (W/kg)
Front	0.007	0.004	0.011

U-NII-2A Band : Ant 0 (Main)

Meas. Freq		Mode	EUT Configuration	Average Power (mW)	Maximum Tune-Up Limit pwr (mW)	Scaling Factor	Duty Factor	Test distance	Measured SAR 1g (W/kg)	Reported SAR 1g (W/kg)	Plot No.
MHz	CH										
5270	54	VHT40 MCS4	Front	24.15	39.81	1.65	1.31	0 mm	0.001	0.001	#S03
5310	62			14.79	19.95	1.35	1.33		0.0002	0.0004	

U-NII-2A Band: Ant 1 (Aux)

Meas. Freq		Mode	EUT Configuration	Average Power (mW)	Maximum Tune-Up Limit pwr (mW)	Scaling Factor	Duty Factor	Test distance	Measured SAR 1g (W/kg)	Reported SAR 1g (W/kg)	Plot No.
MHz	CH										
5270	54	VHT40 MCS0	0 mm	18.58	31.62	1.70	1.05	Front	0.011	0.020	#S04
5310	62			13.21	19.95	1.51	1.05	Front	0.007 *)	N/A	

*) The area scan preceding zoom scan doesn't have any maximum value.
Therefore, This value is the 1 g peak SAR value in the area scan.

U-NII-2A Band: Simultaneous Transmission SAR

Position	Ant 0 (Main) (W/kg)	Ant 1 (Aux) (W/kg)	Sum of peak SAR (W/kg)
Front	0.001	0.020	0.021

U-NII-2C Band : Ant 0 (Main)

Meas. Freq		Mode	EUT Configuration	Average Power (mW)	Maximum Tune-Up Limit pwr (mW)	Scaling Factor	Duty Factor	Test distance	Measured SAR 1g (W/kg)	Reported SAR 1g (W/kg)	Plot No.
MHz	CH										
5720	144	6 Mbps	Front	30.76	39.81	1.29	1.02	0 mm	0.009 *)	N/A	
5580	116			27.42	39.81	1.45	1.02		0.002	0.003	#S05
5500	100			17.58	25.12	1.43	1.02		0.014 *)	N/A	

*) The area scan preceding zoom scan doesn't have any maximum value.
Therefore, This value is the 1 g peak SAR value in the area scan.

U-NII-2C Band: Ant 1 (Aux)

Meas. Freq		Mode	EUT Configuration	Average Power (mW)	Maximum Tune-Up Limit pwr (mW)	Scaling Factor	Duty Factor	Test distance	Measured SAR 1g (W/kg)	Reported SAR 1g (W/kg)	Plot No.
MHz	CH										
5720	144	HT20 MCS4	Front	26.73	39.81	1.49	1.25	0 mm	0.007 *)	N/A	
5580	116			20.99	39.81	1.90	1.25		0.012	0.028	#S06
5500	100			20.94	39.81	1.90	1.23		0.011	0.026	

*) The area scan preceding zoom scan doesn't have any maximum value.
Therefore, This value is the 1 g peak SAR value in the area scan.

U-NII-2C Band: Simultaneous Transmission SAR

Position	Ant 0 (Main) (W/kg)	Ant 1 (Aux) (W/kg)	Sum of peak SAR (W/kg)
Front	0.003	0.028	0.031

U-NII-3 Band : Ant 0 (Main)

Meas. Freq		Mode	EUT Configuration	Average Power (mW)	Maximum Tune-Up Limit pwr (mW)	Scaling Factor	Duty Factor	Test distance	Measured SAR 1g (W/kg)	Reported SAR 1g (W/kg)	Plot No.
MHz	CH										
5785	157	36 Mbps	Front	26.12	39.81	1.52	1.34	0 mm	0.008 *)	N/A	
5745	149			25.47	39.81	1.56	1.32		0.009 *)	N/A	
5825	165			24.55	39.81	1.62	1.34		0.006 *)	N/A	

*) The area scan preceding zoom scan doesn't have any maximum value.
Therefore, This value is the 1 g peak SAR value in the area scan.

U-NII-3 Band: Ant 1 (Aux)

Meas. Freq		Mode	EUT Configuration	Average Power (mW)	Maximum Tune-Up Limit pwr (mW)	Scaling Factor	Duty Factor	Test distance	Measured SAR 1g (W/kg)	Reported SAR 1g (W/kg)	Plot No.
MHz	CH										
5785	157	12 Mbps	Front	22.86	39.81	1.74	1.05	0 mm	0.003	0.005	#S07
5745	149			18.41	31.62	1.72	1.05		0.007 *)	N/A	
5825	165			20.00	31.62	1.58	1.05		0.005 *)	N/A	

*) The area scan preceding zoom scan doesn't have any maximum value.
Therefore, This value is the 1 g peak SAR value in the area scan.

U-NII-3 Band: Simultaneous Transmission SAR

Position	Ant 0 (Main) (W/kg)	Ant 1 (Aux) (W/kg)	Sum of peak SAR (W/kg)
Front	< 0.10	0.005	< 0.10

12. TEST EQUIPMENTS

Description	Model	Serial No.	Data of next Calibration
Shield Room	NKRFS1	20020415	N/A
Staubli Robot Unit	RX60L	F05/51E1A1/A/01	N/A
Electro-Optical Converter	EOC3	398	N/A
Oval Flat phantom ELI v6.0	ELI V6.0	2014	N/A
Device Holder	DH2005	SD HAC H01CA	N/A
Dielectric Probe Kit	85070E	MY44300121	N/A
Data Acquisition Electronics	DAE4	672	2022.09.27
E-Field Probe	EX3DV4	3947	2022.07.29
Validation Dipole Antenna	D2450V2	774	2022.04.20
Validation Dipole Antenna	D5GHzV2	1146	2023.01.25
Digital thermometer	DTM3000	3187	2022.10.18
Power Amplifier	5800842	-	2023.01.11
Network Analyzer	8753E	JP38161044	2022.10.13
Dual Directional Coupler	11692D	1212A02175	2022.07.12
Switch and Power detector Unit	OSP120	100857	2023.01.12
Power Meter	NRVS	835360/002	2023.01.11
Power Sensor	NRV-Z5	833722/006	2023.01.11
Power Meter	437B	2912U01687	2022.10.14
Power Sensor	8481A	MY41098315	2022.10.14
USB Wideband Power Sensor	U2022XA	MY56040009	2022.07.13
Signal Generator	SMB100A	175861	2022.07.13
Dielectric Field probe	DAK 3.5	1128	2022.08.25
10 dB Attenuator	8491B	57773	2022.10.14
10 dB Attenuator	40A2W-10	1914	2022.07.12
Vector Signal Generator	SMW200A	105755	2022.04.06

13. CONCLUSION

The SAR evaluation indicates that the EUT complies with the RF radiation exposure limits of the FCC and Industry Canada,, 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

#S01

Date/Time: 2021-12-21 PM 3:39:28

Test Laboratory: Nemko Korea File Name: Port1_Front CH 5230MHz HT40MCS0_lv13_0mm.da4

DUT: 10HQ701G Type: X-ray detector Serial: N/A Applicant : LG Electronics Inc.

Communication System: WLAN 5G Frequency: 5230 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used: f = 5230 MHz; σ = 4.7 mho/m; ε_r = 35.8; ρ = 1000 kg/m^3

DASY4 Configuration:

Probe: EX3DV4 - SN3947; ConvF(5.33, 5.33, 5.33); Calibrated: 2021-07-29

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2021-09-27

Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:xxxx

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

LG detector Front Gap 0mm Position/Area Scan (9x17x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.015 mW/g

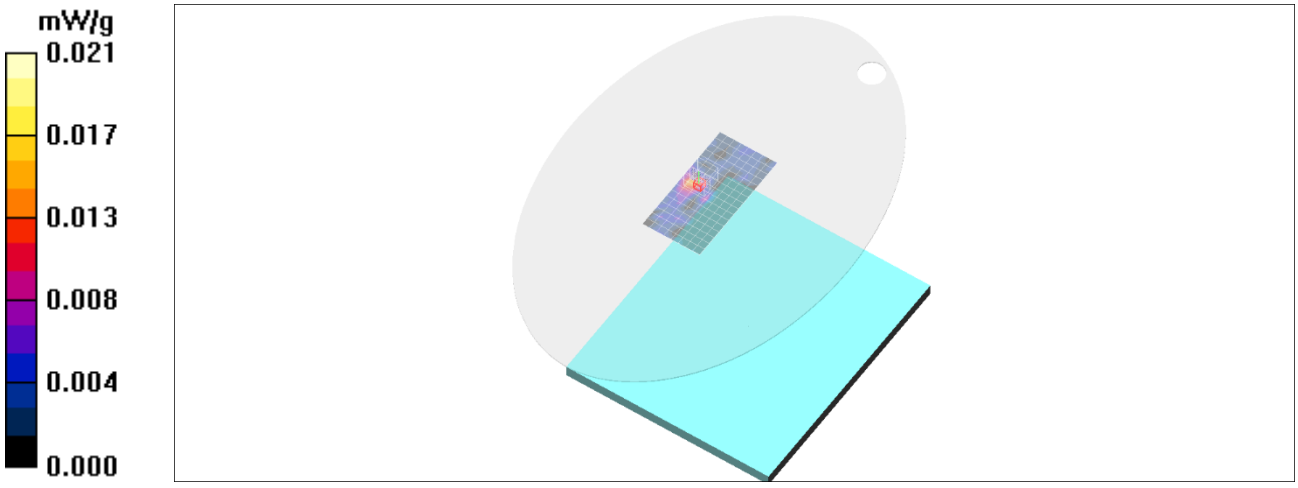
LG detector Front Gap 0mm Position/Zoom Scan (8x8x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 0.964 V/m; Power Drift = 0.124 dB

Peak SAR (extrapolated) = 0.075 W/kg

SAR(1 g) = 0.00749 mW/g

Maximum value of SAR (measured) = 0.021 mW/g



Date/Time: 2021-12-22 PM 4:13:20

Test Laboratory: Nemko Korea File Name: Port2_Front CH 5180MHz HT20MCS0_lv12_0mm.da4

DUT: 10HQ701G Type: X-ray detector Serial: N/A Applicant: LG Electronics Inc.

Communication System: WLAN 5G Frequency: 5180 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used: f = 5180 MHz; σ = 4.62 mho/m; ε_r = 36.5; ρ = 1000 kg/m^3

DASY4 Configuration:

Probe: EX3DV4 - SN3947; ConvF(5.33, 5.33, 5.33); Calibrated: 2021-07-29

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2021-09-27

Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:xxxx

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

LG detector Front Gap 0mm Position/Area Scan (17x9x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.011 mW/g

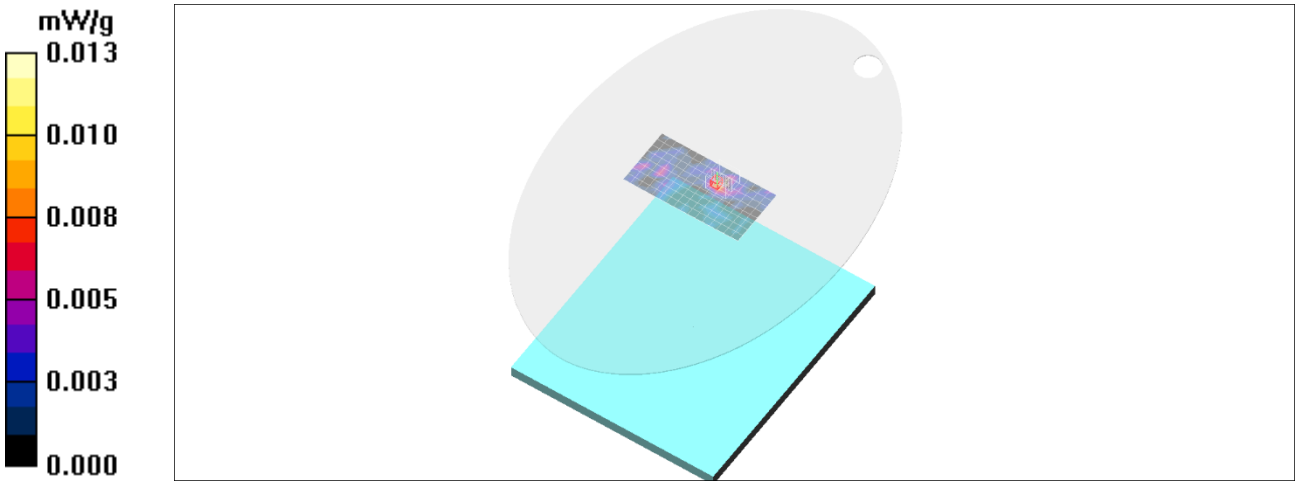
LG detector Front Gap 0mm Position/Zoom Scan (8x8x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 0.000 V/m; Power Drift = 0.000 dB

Peak SAR (extrapolated) = 0.063 W/kg

SAR(1 g) = 0.00261 mW/g

Maximum value of SAR (measured) = 0.013 mW/g



Date/Time: 2021-12-21 PM 5:41:38

Test Laboratory: Nemko Korea File Name: Port1_Front CH 5270MHz VHT40MCS4_lv13_0mm.da4

DUT: 10HQ701G Type: X-ray detector Serial: N/A Applicant: LG Electronics Inc.

Communication System: WLAN 5G Frequency: 5270 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used: f = 5270 MHz; σ = 4.77 mho/m; ε_r = 35.7; ρ = 1000 kg/m^3

DASY4 Configuration:

Probe: EX3DV4 - SN3947; ConvF(5.12, 5.12, 5.12); Calibrated: 2021-07-29

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2021-09-27

Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:xxxx

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

LG detector Front Gap 0mm Position/Area Scan (9x17x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.008 mW/g

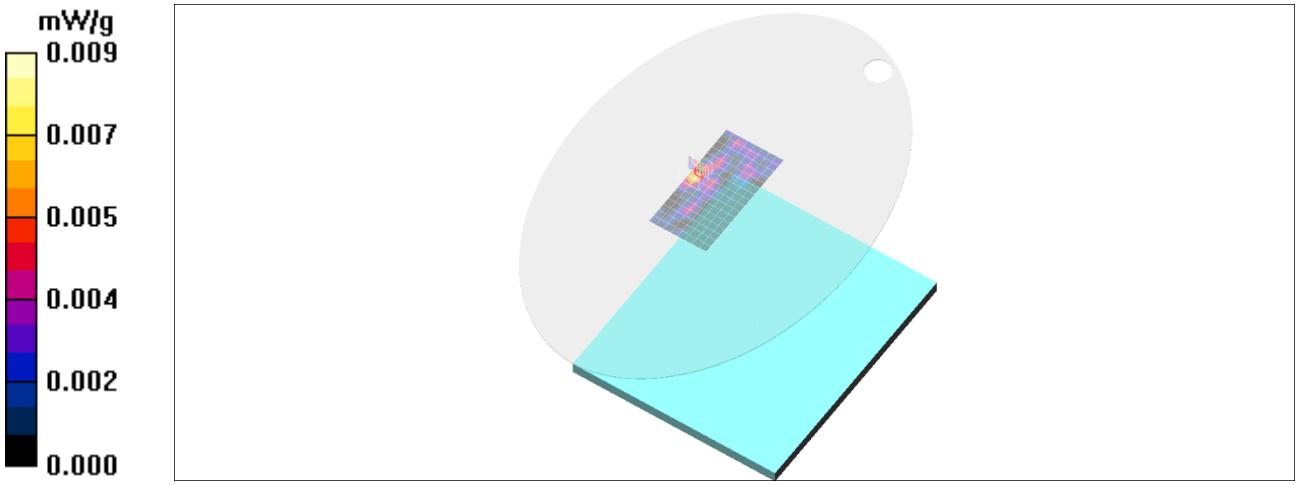
LG detector Front Gap 0mm Position/Zoom Scan (8x8x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 0.469 V/m; Power Drift = -0.156 dB

Peak SAR (extrapolated) = 0.016 W/kg

SAR(1 g) = 0.000757 mW/g

Maximum value of SAR (measured) = 0.009 mW/g



#S04

Date/Time: 2022-01-12 PM 7:15:12

Test Laboratory: Nemko Korea File Name: Port2_Front CH 5270MHz VHT40MCS0_lv13_0mm.da4

DUT: 10HQ701G Type: X-ray detector Serial: N/A Applicant : LG Electronics Inc.

Communication System: WLAN 5G Frequency: 5270 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used: f = 5270 MHz; σ = 4.65 mho/m; ε_r = 35.2; ρ = 1000 kg/m^3

DASY4 Configuration:

Probe: EX3DV4 - SN3947; ConvF(5.12, 5.12, 5.12); Calibrated: 2021-07-29

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2021-09-27

Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:xxxx

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

LG detector Front Gap 0mm Position/Area Scan (17x9x1): Measurement grid: dx=10mm, dy=10mm

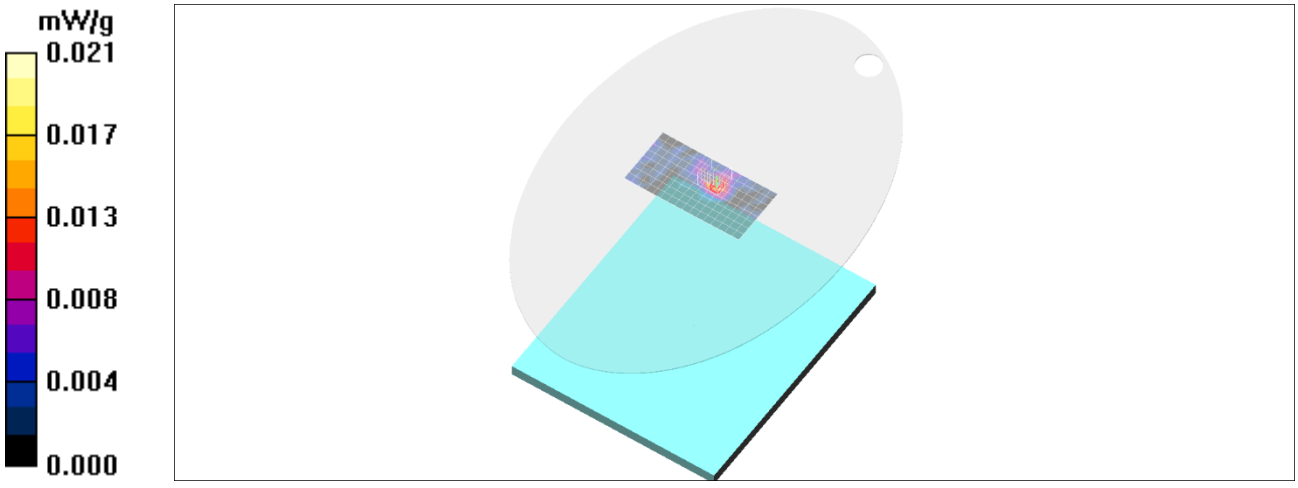
Maximum value of SAR (measured) = 0.021 mW/g

LG detector Front Gap 0mm Position/Zoom Scan (8x8x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 0.971 V/m; Power Drift = -0.076 dB

Peak SAR (extrapolated) = 0.122 W/kg

SAR(1 g) = 0.011 mW/g



#S05

Date/Time: 2022-01-13 PM 4:26:35

Test Laboratory: Nemko Korea File Name: Port1_Front CH 5580MHz 6Mbps_lv13_0mm.da4

DUT: 10HQ701G Type: X-ray detector Serial: N/A Applicant: LG Electronics Inc.

Communication System: WLAN 5G Frequency: 5580 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used: f = 5580 MHz; σ = 5.12 mho/m; ε_r = 35; ρ = 1000 kg/m^3

DASY4 Configuration:

Probe: EX3DV4 - SN3947; ConvF(4.61, 4.61, 4.61); Calibrated: 2021-07-29

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2021-09-27

Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:xxxx

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

LG detector Front Gap 0mm Position/Area Scan (9x17x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.019 mW/g

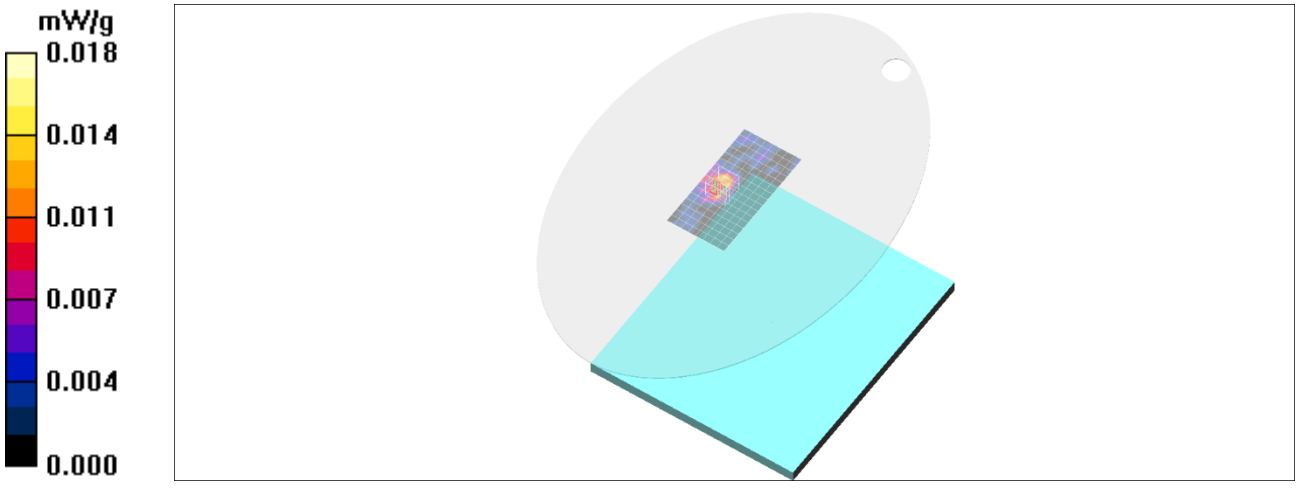
LG detector Front Gap 0mm Position/Zoom Scan (8x8x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 0.000 V/m; Power Drift = 0.000 dB

Peak SAR (extrapolated) = 0.045 W/kg

SAR(1 g) = 0.00193 mW/g

Maximum value of SAR (measured) = 0.018 mW/g



#S06

Date/Time: 2022-01-14 AM 12:35:40

Test Laboratory: Nemko Korea File Name: Port2_Front CH 5580MHz HT20MCS4_lv13_0mm.da4

DUT: 10HQ701G Type: X-ray detector Serial: N/A Applicant: LG Electronics Inc.

Communication System: WLAN 5G Frequency: 5580 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used: f = 5580 MHz; σ = 5.12 mho/m; ε_r = 35; ρ = 1000 kg/m^3

DASY4 Configuration:

Probe: EX3DV4 - SN3947; ConvF(4.61, 4.61, 4.61); Calibrated: 2021-07-29

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2021-09-27

Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:xxxx

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

LG detector Front Gap 0mm Position/Area Scan (17x9x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.019 mW/g

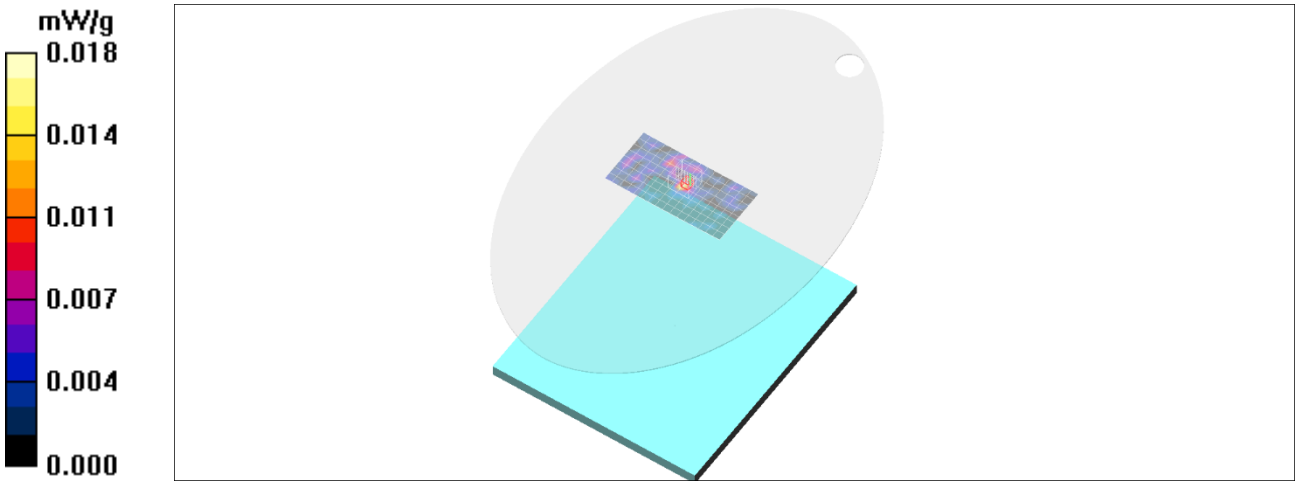
LG detector Front Gap 0mm Position/Zoom Scan (8x8x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 2.00 V/m; Power Drift = 0.088 dB

Peak SAR (extrapolated) = 0.143 W/kg

SAR(1 g) = 0.011 mW/g

Maximum value of SAR (measured) = 0.018 mW/g



#S07

Date/Time: 2022-01-17 PM 9:22:26

Test Laboratory: Nemko Korea File Name: Port2_Front CH 5785MHz 12Mbps_lv13_0mm.da4

DUT: 10HQ701G Type: X-ray detector Serial: N/A Applicant: LG Electronics Inc.

Communication System: WLAN 5G Frequency: 5785 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used: f = 5785 MHz; σ = 5.36 mho/m; ε_r = 33.9; ρ = 1000 kg/m^3

DASY4 Configuration:

Probe: EX3DV4 - SN3947; ConvF(4.65, 4.65, 4.65); Calibrated: 2021-07-29

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2021-09-27

Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:xxxx

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

LG detector Front Gap 0mm Position/Area Scan (17x9x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.013 mW/g

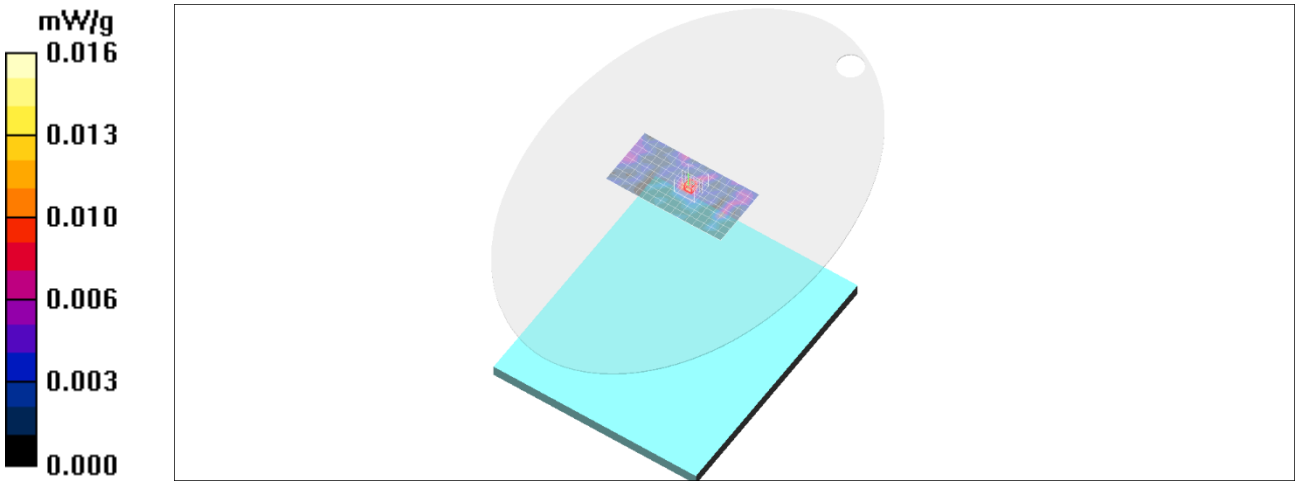
LG detector Front Gap 0mm Position/Zoom Scan (8x8x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 1.41 V/m; Power Drift = 0.088 dB

Peak SAR (extrapolated) = 0.057 W/kg

SAR(1 g) = 0.00329 mW/g

Maximum value of SAR (measured) = 0.016 mW/g



APPENDIX B. PLOTS OF SYSTEM VERIFICATION

#V01

Date/Time: 2022-01-20 PM 2:32:21

Test Laboratory: Nemko Korea File Name: System Verification for 2.45GHz_2022-01-20.da4

DUT: Dipole 2450 MHz Type: D2450V2 Serial: D2450V2 - SN:774

Communication System: CW (2.4G) Frequency: 2450 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used: f = 2450 MHz; σ = 1.87 mho/m; ε_r = 39.3; ρ = 1000 kg/m^3

DASY4 Configuration:

Probe: EX3DV4 - SN3947; ConvF(7.75, 7.75, 7.75); Calibrated: 2021-07-29

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2021-09-27

Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:xxxx

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

2.4GHz System Verification/Area Scan (10x10x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 19.0 mW/g

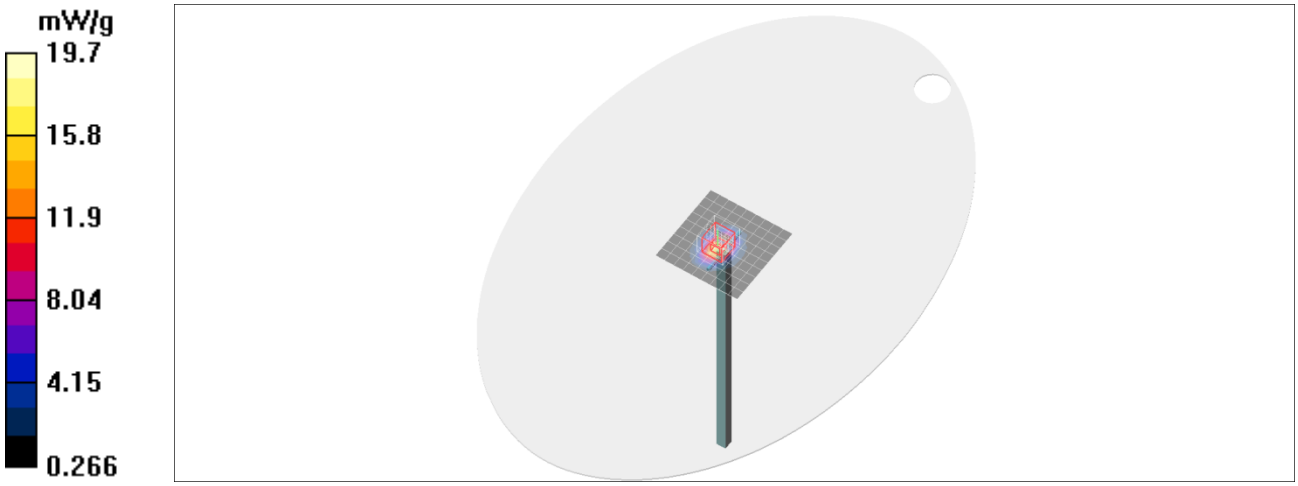
2.4GHz System Verification/Zoom Scan (8x8x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 99.0 V/m; Power Drift = 0.089 dB

Peak SAR (extrapolated) = 26.9 W/kg

SAR(1 g) = 13.1 mW/g; SAR(10 g) = 6.07 mW/g

Maximum value of SAR (measured) = 19.7 mW/g



Date/Time: 2021-12-21 AM 11:05:40

Test Laboratory: Nemko Korea File Name: System Verification for 5.2GHz_2021-12-21.da4

DUT: Dipole 5 GHz Type: D5GHzV2 Serial: D5GHzV2 - SN:1146

Communication System: CW (5G) Frequency: 5200 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used: f = 5200 MHz; σ = 4.66 mho/m; ε_r = 35.9; ρ = 1000 kg/m^3

DASY4 Configuration:

Probe: EX3DV4 - SN3947; ConvF(5.33, 5.33, 5.33); Calibrated: 2021-07-29

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2021-09-27

Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:xxxx

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

5.2GHz System Validation/Area Scan (10x10x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 34.2 mW/g

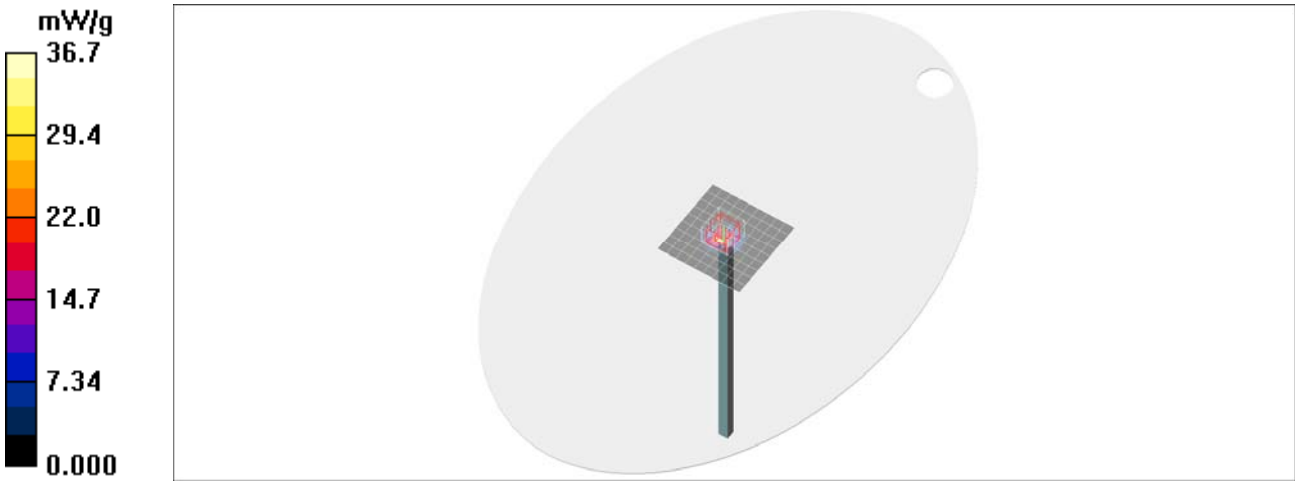
5.2GHz System Validation/Zoom Scan (8x8x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 94.4 V/m; Power Drift = 0.041 dB

Peak SAR (extrapolated) = 71.6 W/kg

SAR(1 g) = 19.9 mW/g; SAR(10 g) = 5.76 mW/g

Maximum value of SAR (measured) = 36.7 mW/g



#V03

Date/Time: 2021-12-21 PM 12:40:32

Test Laboratory: Nemko Korea File Name: System Verification for 5.3GHz_2021-12-21.da4

DUT: Dipole 5 GHz Type: D5GHzV2 Serial: D5GHzV2 - SN:1146

Communication System: CW (5G) Frequency: 5300 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used: f = 5300 MHz; σ = 4.84 mho/m; ε_r = 35.6; ρ = 1000 kg/m^3

DASY4 Configuration:

Probe: EX3DV4 - SN3947; ConvF(5.12, 5.12, 5.12); Calibrated: 2021-07-29

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2021-09-27

Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:xxxx

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

5.3GHz System Validation/Area Scan (10x10x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 34.1 mW/g

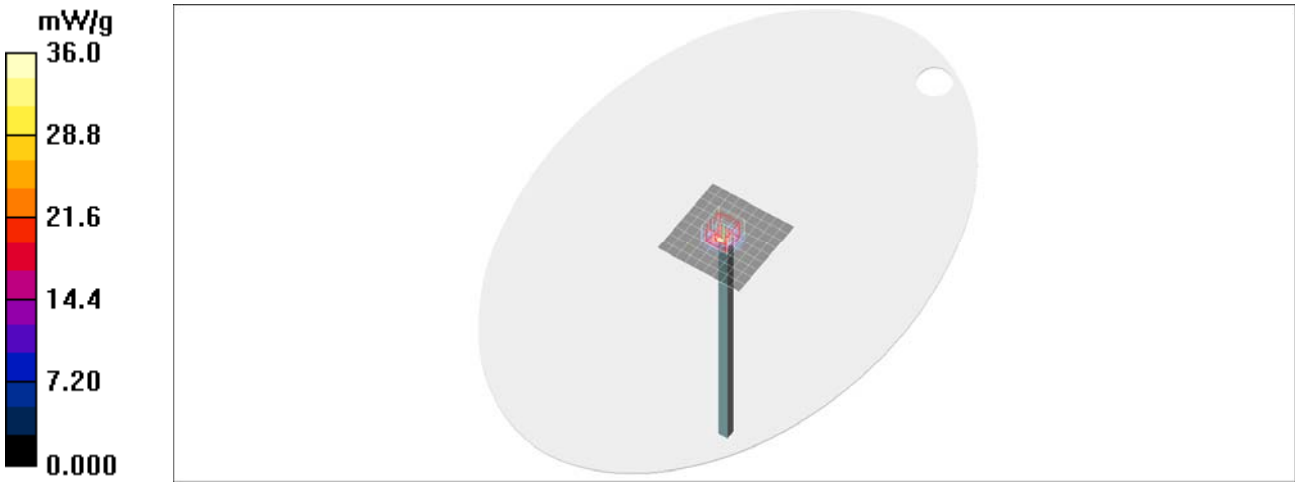
5.3GHz System Validation/Zoom Scan (8x8x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 91.7 V/m; Power Drift = 0.031 dB

Peak SAR (extrapolated) = 70.5 W/kg

SAR(1 g) = 19.1 mW/g; SAR(10 g) = 5.51 mW/g

Maximum value of SAR (measured) = 36.0 mW/g



#V04

Date/Time: 2021-12-22 AM 11:34:34

Test Laboratory: Nemko Korea File Name: System Verification for 5.2GHz_2021-12-22.da4

DUT: Dipole 5 GHz Type: D5GHzV2 Serial: D5GHzV2 - SN:1146

Communication System: CW (5G) Frequency: 5200 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used: f = 5200 MHz; σ = 4.61 mho/m; ε_r = 36.4; ρ = 1000 kg/m^3

DASY4 Configuration:

Probe: EX3DV4 - SN3947; ConvF(5.33, 5.33, 5.33); Calibrated: 2021-07-29

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2021-09-27

Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:xxxx

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

5.2GHz System Validation/Area Scan (10x10x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 34.2 mW/g

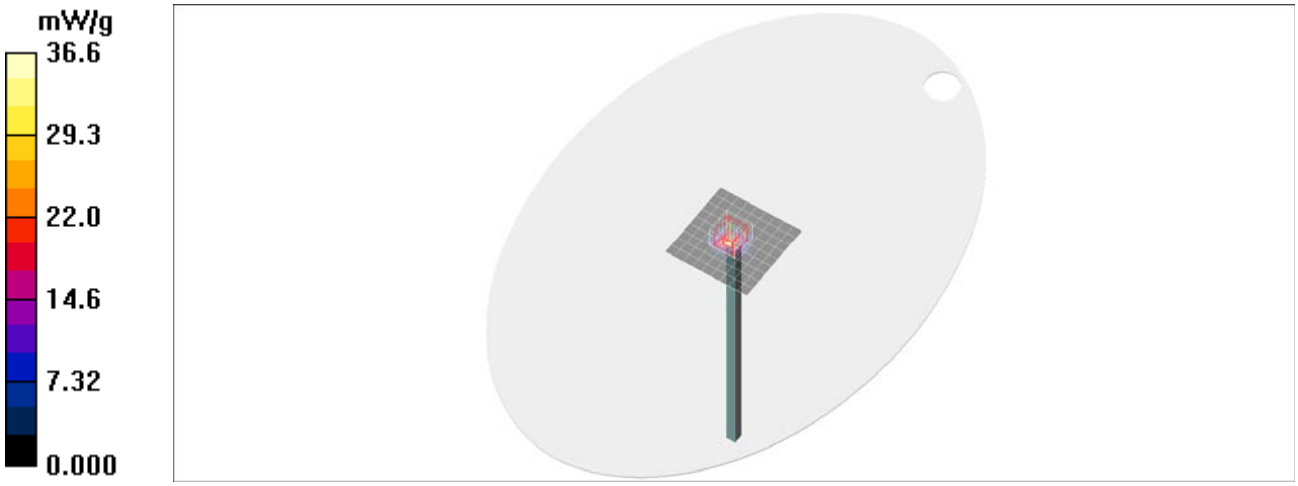
5.2GHz System Validation/Zoom Scan (8x8x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 93.9 V/m; Power Drift = 0.084 dB

Peak SAR (extrapolated) = 68.6 W/kg

SAR(1 g) = 19.6 mW/g; SAR(10 g) = 5.68 mW/g

Maximum value of SAR (measured) = 36.6 mW/g



#V05

Date/Time: 2021-12-22 PM 1:24:33

Test Laboratory: Nemko Korea File Name: System Verification for 5.3GHz_2021-12-22.da4

DUT: Dipole 5 GHz Type: D5GHzV2 Serial: D5GHzV2 - SN:1146

Communication System: CW (5G) Frequency: 5300 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used: f = 5300 MHz; σ = 4.8 mho/m; ε_r = 36.1; ρ = 1000 kg/m^3

DASY4 Configuration:

Probe: EX3DV4 - SN3947; ConvF(5.12, 5.12, 5.12); Calibrated: 2021-07-29

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2021-09-27

Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:xxxx

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

5.3GHz System Validation/Area Scan (10x10x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 34.7 mW/g

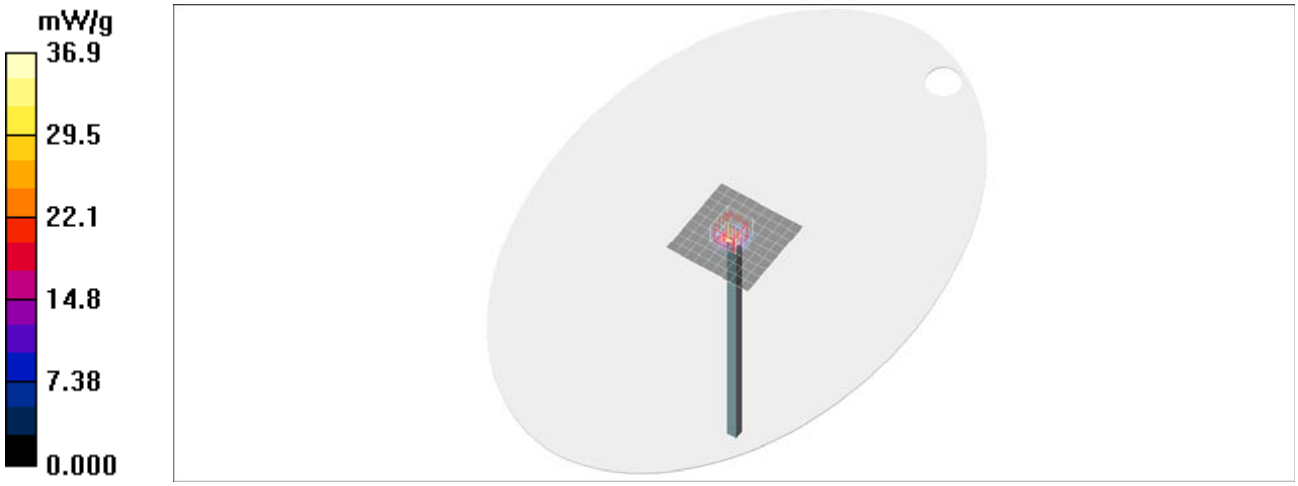
5.3GHz System Validation/Zoom Scan (8x8x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 91.7 V/m; Power Drift = -0.027 dB

Peak SAR (extrapolated) = 69.5 W/kg

SAR(1 g) = 19.3 mW/g; SAR(10 g) = 5.58 mW/g

Maximum value of SAR (measured) = 36.9 mW/g



#V06

Date/Time: 2022-01-12 PM 4:37:36

Test Laboratory: Nemko Korea File Name: System Verification for 5.2GHz_2022-01-12.da4

DUT: Dipole 5 GHz Type: D5GHzV2 Serial: D5GHzV2 - SN:1146

Communication System: CW (5G) Frequency: 5200 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used: f = 5200 MHz; σ = 4.59 mho/m; ε_r = 35.3; ρ = 1000 kg/m^3

DASY4 Configuration:

Probe: EX3DV4 - SN3947; ConvF(5.33, 5.33, 5.33); Calibrated: 2021-07-29

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2021-09-27

Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:xxxx

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

5.2GHz System Validation/Area Scan (10x10x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 29.7 mW/g

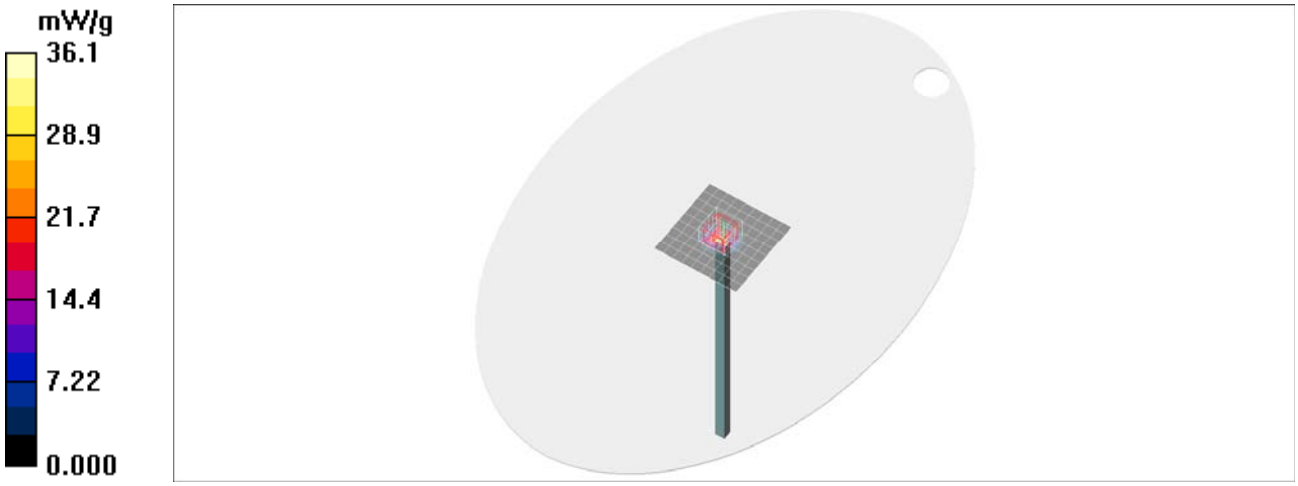
5.2GHz System Validation/Zoom Scan (8x8x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 96.5 V/m; Power Drift = 0.057 dB

Peak SAR (extrapolated) = 70.4 W/kg

SAR(1 g) = 19.3 mW/g; SAR(10 g) = 5.61 mW/g

Maximum value of SAR (measured) = 36.1 mW/g



#V07

Date/Time: 2022-01-12 PM 6:13:30

Test Laboratory: Nemko Korea File Name: System Verification for 5.3GHz_2022-01-12.da4

DUT: Dipole 5 GHz Type: D5GHzV2 Serial: D5GHzV2 - SN:1146

Communication System: CW (5G) Frequency: 5300 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used: f = 5300 MHz; σ = 4.69 mho/m; ε_r = 35.2; ρ = 1000 kg/m^3

DASY4 Configuration:

Probe: EX3DV4 - SN3947; ConvF(5.12, 5.12, 5.12); Calibrated: 2021-07-29

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2021-09-27

Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:xxxx

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

5.3GHz System Validation/Area Scan (10x10x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 36.1 mW/g

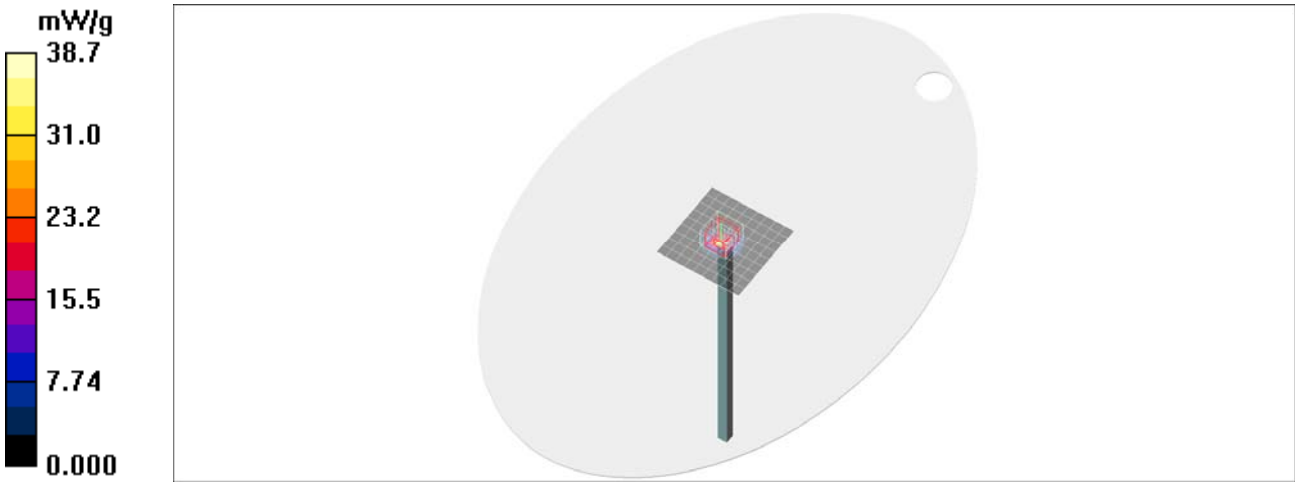
5.3GHz System Validation/Zoom Scan (8x8x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 92.5 V/m; Power Drift = 0.052 dB

Peak SAR (extrapolated) = 74.5 W/kg

SAR(1 g) = 20.1 mW/g; SAR(10 g) = 5.84 mW/g

Maximum value of SAR (measured) = 38.7 mW/g



#V08

Date/Time: 2022-01-13 PM 12:35:50

Test Laboratory: Nemko Korea File Name: System Verification for 5.5GHz_2022-01-13.da4

DUT: Dipole 5 GHz Type: D5GHzV2 Serial: D5GHzV2 - SN:1146

Communication System: CW (5G) Frequency: 5500 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used: f = 5500 MHz; σ = 4.99 mho/m; ε_r = 35.2; ρ = 1000 kg/m^3

DASY4 Configuration:

Probe: EX3DV4 - SN3947; ConvF(4.7, 4.7, 4.7); Calibrated: 2021-07-29

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2021-09-27

Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:xxxx

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

5.5GHz System Validation/Area Scan (10x10x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 34.2 mW/g

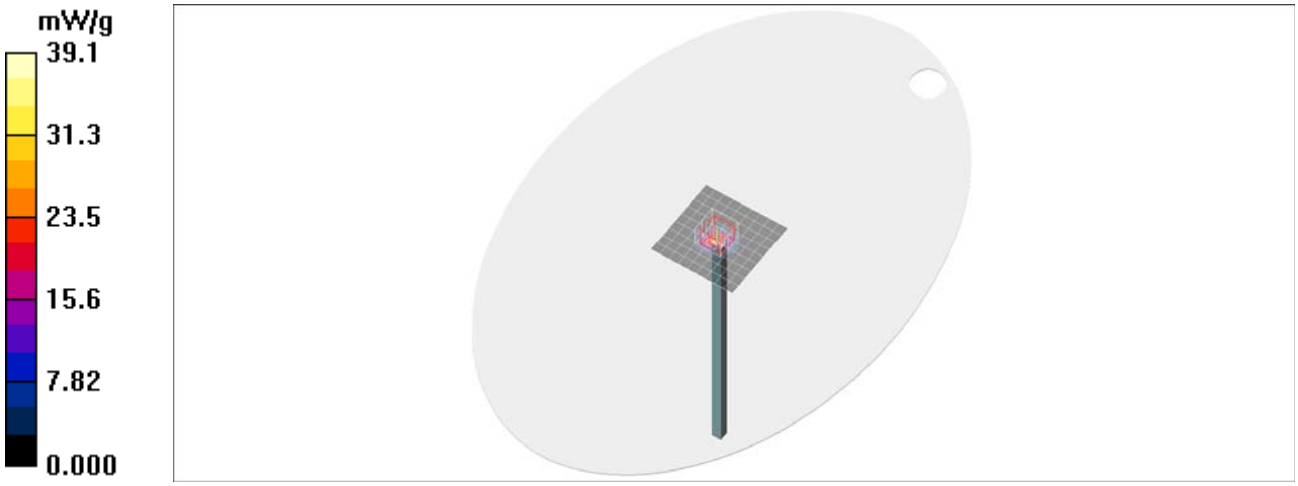
5.5GHz System Validation/Zoom Scan (8x8x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 94.9 V/m; Power Drift = 0.003 dB

Peak SAR (extrapolated) = 79.0 W/kg

SAR(1 g) = 20.6 mW/g; SAR(10 g) = 5.98 mW/g

Maximum value of SAR (measured) = 39.1 mW/g



#V09

Date/Time: 2022-01-13 PM 2:07:27

Test Laboratory: Nemko Korea File Name: System Verification for 5.6GHz_2022-01-13.da4

DUT: Dipole 5 GHz Type: D5GHzV2 Serial: D5GHzV2 - SN:1146

Communication System: CW (5G) Frequency: 5600 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used: f = 5600 MHz; σ = 5.13 mho/m; ε_r = 34.9; ρ = 1000 kg/m^3

DASY4 Configuration:

Probe: EX3DV4 - SN3947; ConvF(4.61, 4.61, 4.61); Calibrated: 2021-07-29

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2021-09-27

Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:xxxx

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

5.6GHz System Validation/Area Scan (10x10x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 33.3 mW/g

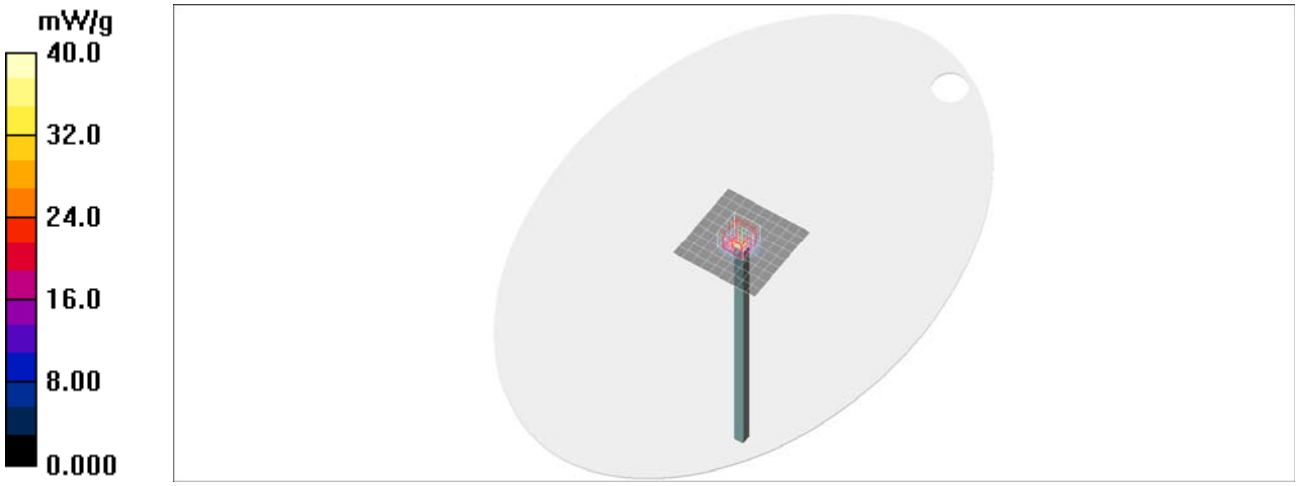
5.6GHz System Validation/Zoom Scan (8x8x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 92.4 V/m; Power Drift = -0.009 dB

Peak SAR (extrapolated) = 82.8 W/kg

SAR(1 g) = 20.7 mW/g; SAR(10 g) = 5.92 mW/g

Maximum value of SAR (measured) = 40.0 mW/g



#V10

Date/Time: 2022-01-17 PM 2:27:26

Test Laboratory: Nemko Korea File Name: System Verification for 5.6GHz_2022-01-17.da4

DUT: Dipole 5 GHz Type: D5GHzV2 Serial: D5GHzV2 - SN:1146

Communication System: CW (5G) Frequency: 5600 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used: f = 5600 MHz; σ = 5.14 mho/m; ε_r = 34.6; ρ = 1000 kg/m^3

DASY4 Configuration:

Probe: EX3DV4 - SN3947; ConvF(4.61, 4.61, 4.61); Calibrated: 2021-07-29

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2021-09-27

Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:xxxx

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

5.6GHz System Validation/Area Scan (10x10x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 38.1 mW/g

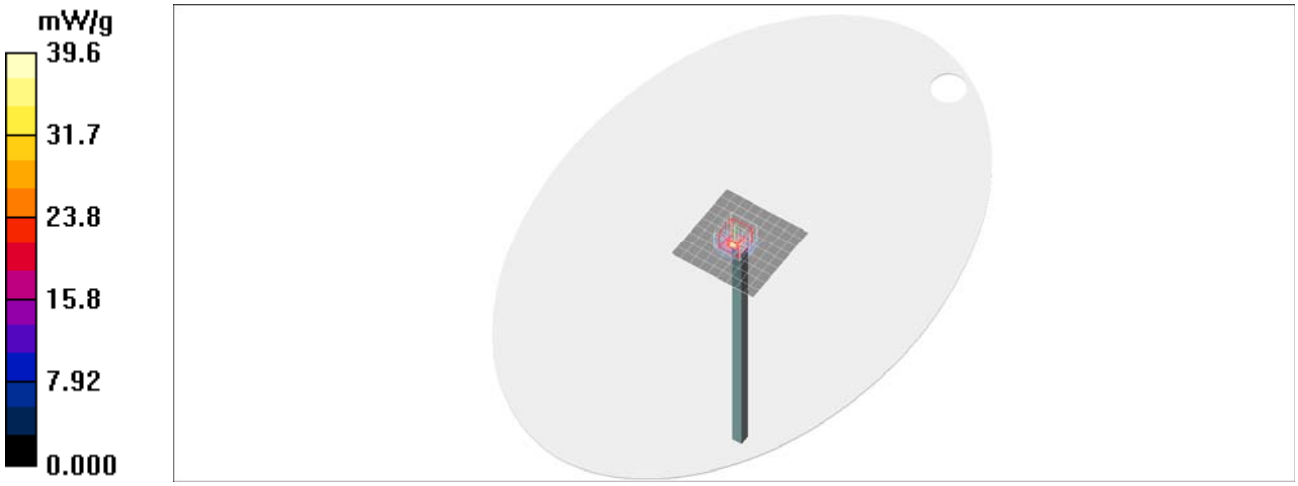
5.6GHz System Validation/Zoom Scan (8x8x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 87.3 V/m; Power Drift = 0.091 dB

Peak SAR (extrapolated) = 81.0 W/kg

SAR(1 g) = 20.6 mW/g; SAR(10 g) = 5.94 mW/g

Maximum value of SAR (measured) = 39.6 mW/g



#V11

Date/Time: 2022-01-17 PM 4:26:38

Test Laboratory: Nemko Korea File Name: System Verification for 5.8GHz_2022-01-17.da4

DUT: Dipole 5 GHz Type: D5GHzV2 Serial: D5GHzV2 - SN:1146

Communication System: CW (5G) Frequency: 5800 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used: f = 5800 MHz; σ = 5.41 mho/m; ε_r = 33.9; ρ = 1000 kg/m^3

DASY4 Configuration:

Probe: EX3DV4 - SN3947; ConvF(4.65, 4.65, 4.65); Calibrated: 2021-07-29

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2021-09-27

Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:xxxx

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

5.8GHz System Validation/Area Scan (10x10x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 37.8 mW/g

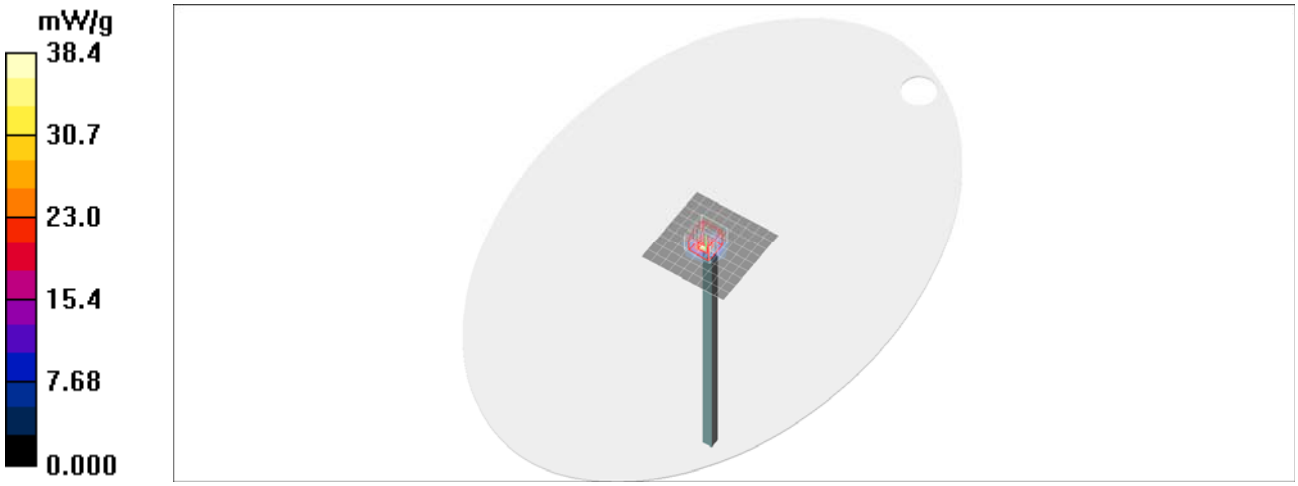
5.8GHz System Validation/Zoom Scan (8x8x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 84.2 V/m; Power Drift = 0.062 dB

Peak SAR (extrapolated) = 84.0 W/kg

SAR(1 g) = 19.9 mW/g; SAR(10 g) = 5.7 mW/g

Maximum value of SAR (measured) = 38.4 mW/g



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
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 (Dymstec)** Certificate No: **EX3-3947_Jul21**

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3947
Calibration procedure(s)	QA CAL-01.v9, QA CAL-14.v6, QA CAL-23.v5, QA CAL-25.v7 Calibration procedure for dosimetric E-field probes
Calibration date:	July 29, 2021

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	09-Apr-21 (No. 217-03291/03292)	Apr-22
Power sensor NRP-Z91	SN: 103244	09-Apr-21 (No. 217-03291)	Apr-22
Power sensor NRP-Z91	SN: 103245	09-Apr-21 (No. 217-03292)	Apr-22
Reference 20 dB Attenuator	SN: CC2552 (20x)	09-Apr-21 (No. 217-03343)	Apr-22
DAE4	SN: 660	23-Dec-20 (No. DAE4-660_Dec20)	Dec-21
Reference Probe ES3DV2	SN: 3013	30-Dec-20 (No. ES3-3013_Dec20)	Dec-21
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-20)	In house check: Jun-22
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-20)	In house check: Jun-22
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-20)	In house check: Jun-22
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-20)	In house check: Jun-22
Network Analyzer E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-21

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

Issued: July 30, 2021

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

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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) 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 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).

EX3DV4 – SN:3947 July 29, 2021

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3947

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.46	0.33	0.56	± 10.1 %
DCP (mV)[B]	100.3	106.3	100.5	

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	153.3	± 2.5 %	± 4.7 %
		Y	0.0	0.0	1.0		153.8		
		Z	0.0	0.0	1.0		148.0		

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:3947

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	160.6
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.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3947

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)
2450	39.2	1.80	7.75	7.75	7.75	0.38	0.90	± 12.0 %
5200	36.0	4.66	5.34	5.34	5.34	0.40	1.80	± 13.1 %
5300	35.9	4.76	5.12	5.12	5.12	0.40	1.80	± 13.1 %
5500	35.6	4.96	4.70	4.70	4.70	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.61	4.61	4.61	0.40	1.80	± 13.1 %
5800	35.3	5.27	4.65	4.65	4.65	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.

EX3DV4– SN:3947 July 29, 2021

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3947

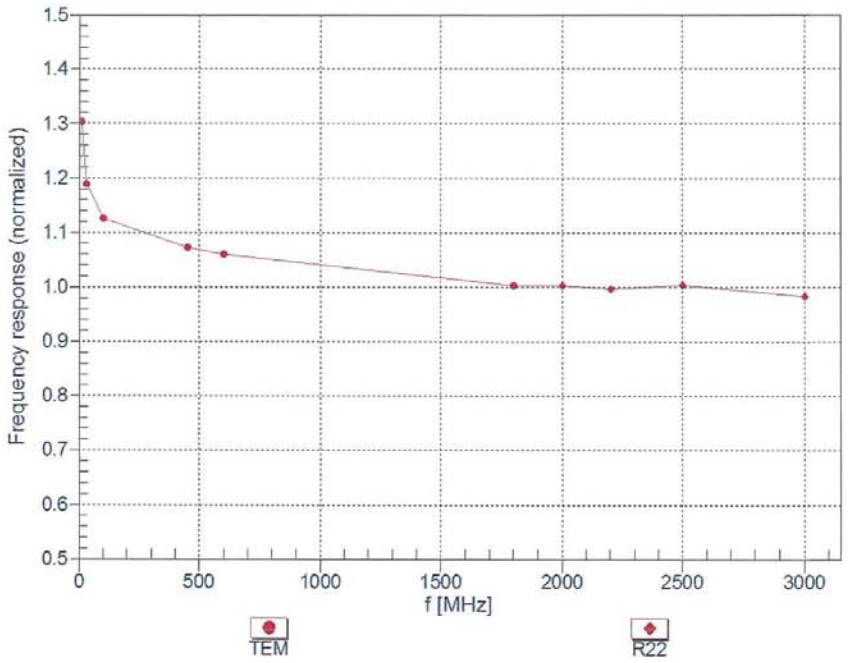
Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
2450	52.7	1.95	7.56	7.56	7.56	0.43	0.93	± 12.0 %
5200	49.0	5.30	4.66	4.66	4.66	0.50	1.90	± 13.1 %
5300	48.9	5.42	4.51	4.51	4.51	0.50	1.90	± 13.1 %
5500	48.6	5.65	4.16	4.16	4.16	0.50	1.90	± 13.1 %
5600	48.5	5.77	4.03	4.03	4.03	0.50	1.90	± 13.1 %
5800	48.2	6.00	4.07	4.07	4.07	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. 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.

EX3DV4– SN:3947 July 29, 2021

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

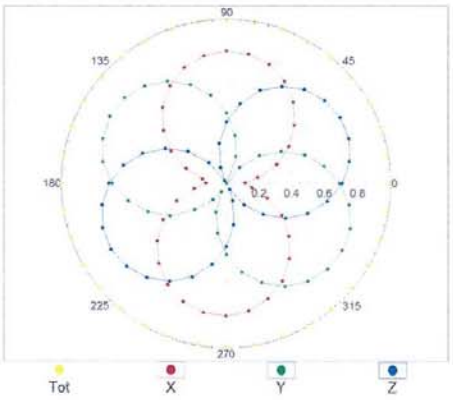


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

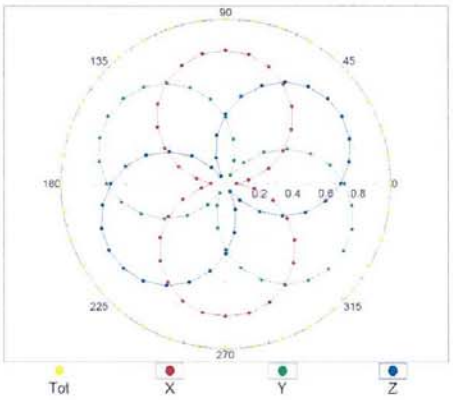
EX3DV4– SN:3947 July 29, 2021

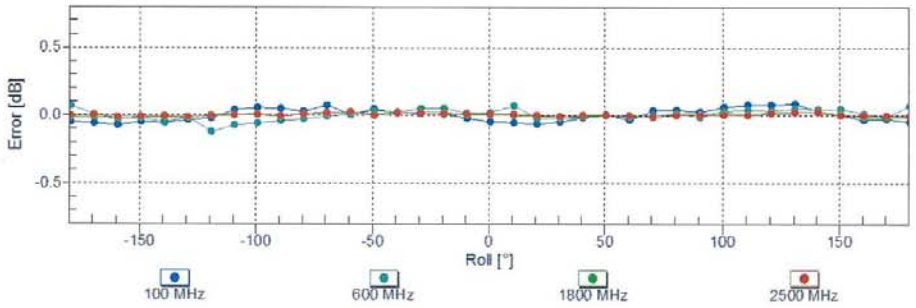
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



f=1800 MHz,R22

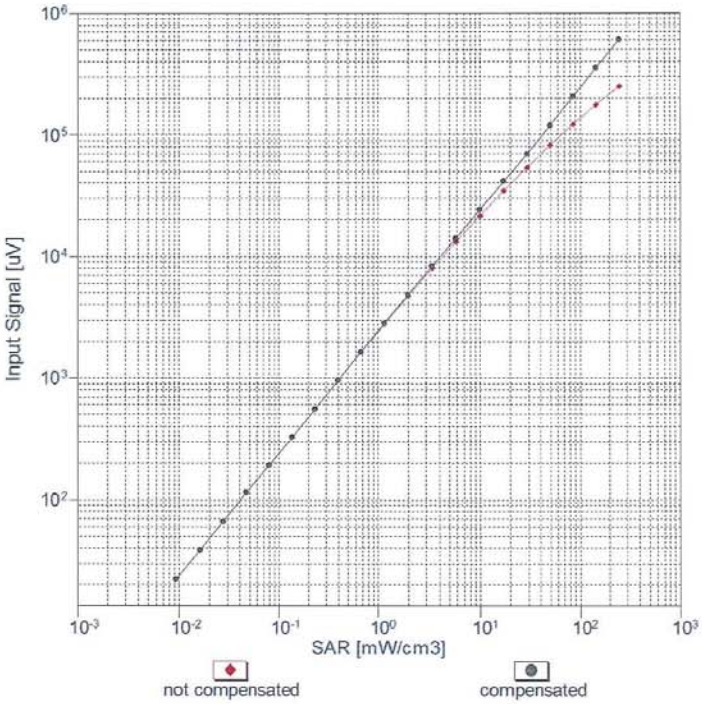


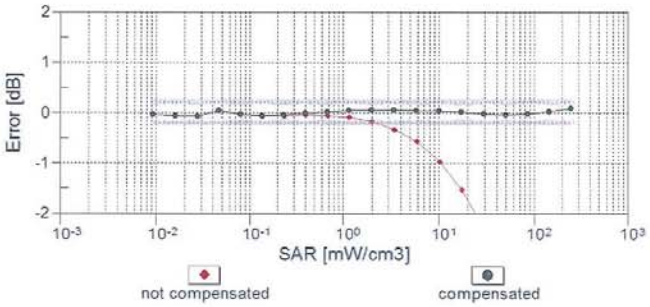


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

EX3DV4– SN:3947 July 29, 2021

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

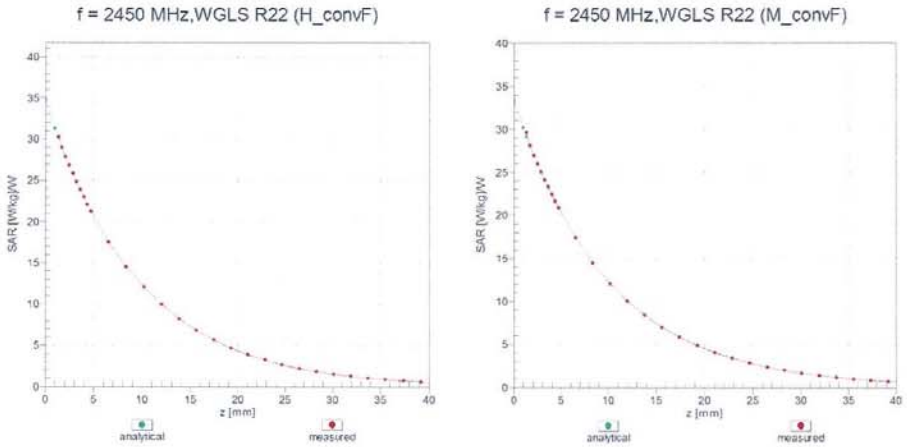




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

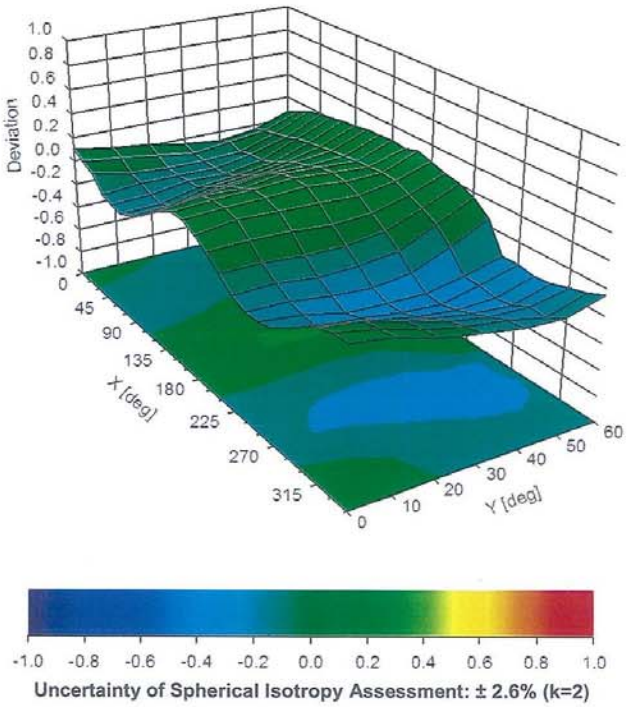
EX3DV4– SN:3947 July 29, 2021

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

APPENDIX D. CALIBRATION REPORT OF THE DIPOLE ANTENNA

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

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Accreditation No.: **SCS 0108**

Client **Nemko (Dymstec)** Certificate No: **D2450V2-774_Apr20**

CALIBRATION CERTIFICATE

Object	D2450V2 - SN:774
Calibration procedure(s)	QA CAL-05.v11 Calibration Procedure for SAR Validation Sources between 0.7-3 GHz
Calibration date:	April 20, 2020

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	01-Apr-20 (No. 217-03100/03101)	Apr-21
Power sensor NRP-Z91	SN: 103244	01-Apr-20 (No. 217-03100)	Apr-21
Power sensor NRP-Z91	SN: 103245	01-Apr-20 (No. 217-03101)	Apr-21
Reference 20 dB Attenuator	SN: BH9394 (20k)	31-Mar-20 (No. 217-03106)	Apr-21
Type-N mismatch combination	SN: 310982 / 06327	31-Mar-20 (No. 217-03104)	Apr-21
Reference Probe EX3DV4	SN: 7349	31-Dec-19 (No. EX3-7349_Dec19)	Dec-20
DAE4	SN: 601	27-Dec-19 (No. DAE4-601_Dec19)	Dec-20

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Feb-19)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-19)	In house check: Oct-20

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

Issued: April 21, 2020

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

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Accreditation No.: SCS 0108

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "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"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.6 ± 6 %	1.86 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.2 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**51.8 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.10 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.1 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.5 ± 6 %	2.03 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.9 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**50.4 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.00 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**23.7 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.4 Ω + 4.8 jΩ
Return Loss	- 24.9 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.4 Ω + 6.7 jΩ
Return Loss	- 23.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.152 ns

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

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

Additional EUT Data

Manufactured by	SPEAG

DASY5 Validation Report for Head TSL

Date: 20.04.2020

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:774

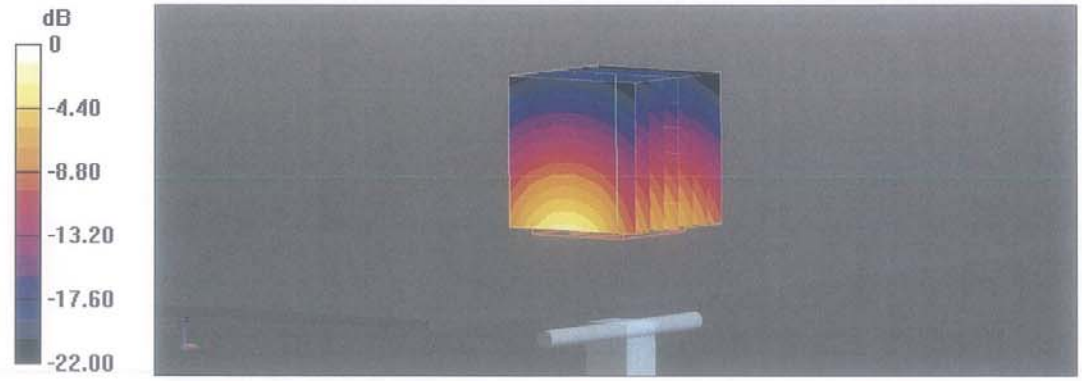
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.86 S/m; ε_r = 38.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.98, 7.98, 7.98) @ 2450 MHz; Calibrated: 31.12.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.12.2019
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

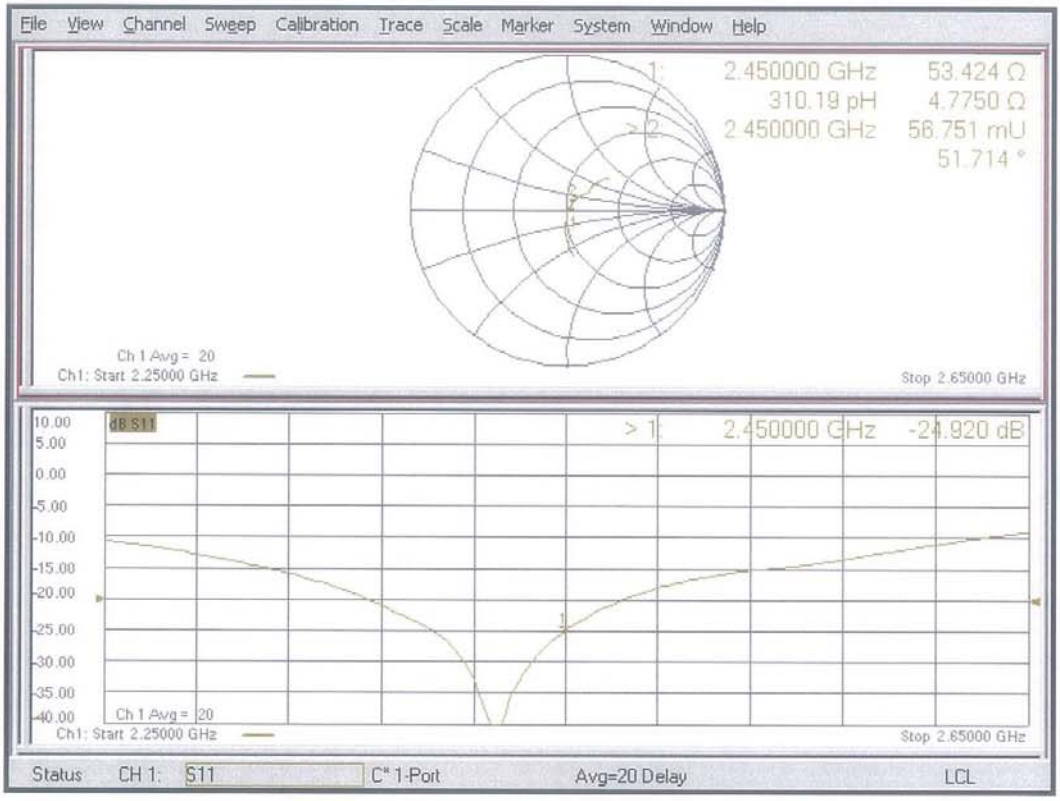
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 115.4 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 26.1 W/kg
SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.1 W/kg
Smallest distance from peaks to all points 3 dB below = 9 mm
Ratio of SAR at M2 to SAR at M1 = 50.7%
Maximum value of SAR (measured) = 21.4 W/kg



0 dB = 21.4 W/kg = 13.30 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 20.04.2020

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:774

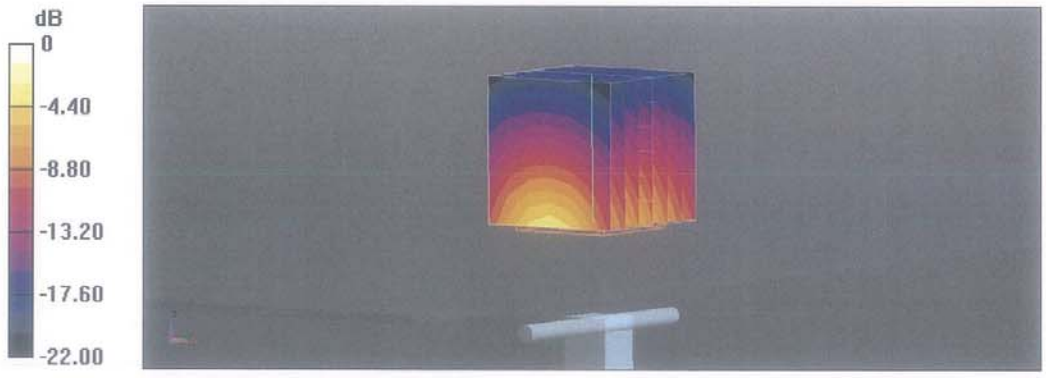
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.03 S/m; ε_r = 51.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.02, 8.02, 8.02) @ 2450 MHz; Calibrated: 31.12.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.12.2019
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

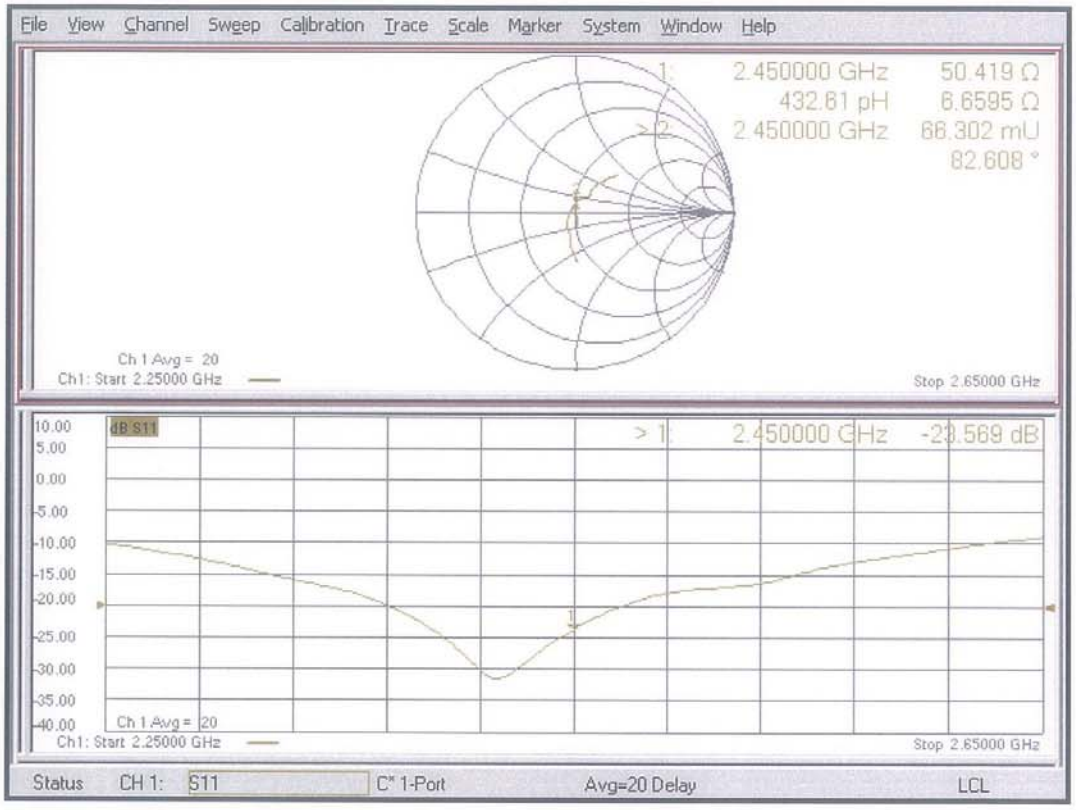
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 108.9 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 24.8 W/kg
SAR(1 g) = 12.9 W/kg; SAR(10 g) = 6 W/kg
Smallest distance from peaks to all points 3 dB below = 8.9 mm
Ratio of SAR at M2 to SAR at M1 = 53%
Maximum value of SAR (measured) = 20.6 W/kg



0 dB = 20.6 W/kg = 13.14 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 0108

Client Nemko (Dymstec)

Certificate No: D5GHzV2-1146_Jan21

CALIBRATION CERTIFICATE

Object	D5GHzV2 - SN:1146
Calibration procedure(s)	QA CAL-22.v5 Calibration Procedure for SAR Validation Sources between 3-10 GHz
Calibration date:	January 25, 2021

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	01-Apr-20 (No. 217-03100/03101)	Apr-21
Power sensor NRP-Z91	SN: 103244	01-Apr-20 (No. 217-03100)	Apr-21
Power sensor NRP-Z91	SN: 103245	01-Apr-20 (No. 217-03101)	Apr-21
Reference 20 dB Attenuator	SN: BH9394 (20k)	31-Mar-20 (No. 217-03106)	Apr-21
Type-N mismatch combination	SN: 310982 / 06327	31-Mar-20 (No. 217-03104)	Apr-21
Reference Probe EX3DV4	SN: 3503	30-Dec-20 (No. EX3-3503_Dec20)	Dec-21
DAE4	SN: 601	02-Nov-20 (No. DAE4-601_Nov20)	Nov-21

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-20)	In house check: Oct-22
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-21

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

Issued: January 26, 2021

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Accreditation No.: SCS 0108

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "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"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz ± 1 MHz 5300 MHz ± 1 MHz 5500 MHz ± 1 MHz 5600 MHz ± 1 MHz 5800 MHz ± 1 MHz	

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.1 ± 6 %	4.46 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.82 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**77.7 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.22 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.0 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.76 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.0 ± 6 %	4.56 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5300 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.06 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**80.1 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.29 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.7 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.6	4.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.7 ± 6 %	4.76 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5500 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.46 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**84.0 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.6 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.5 ± 6 %	4.86 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.46 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**83.9 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.39 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.6 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.2 ± 6 %	5.07 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.07 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**80.0 W/kg ± 19.9 % (k=2)**

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

Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	49.4 ± 6 %	5.44 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.36 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**73.8 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.05 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.6 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.42 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	49.2 ± 6 %	5.57 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5300 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.48 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**74.9 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.08 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.9 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.6	5.65 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	48.9 ± 6 %	5.85 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5500 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.86 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**78.9 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.15 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.6 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	48.7 ± 6 %	5.99 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.77 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**77.9 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.5 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	48.3 ± 6 %	6.27 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.54 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**75.6 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.05 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.5 W/kg ± 19.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	51.6 Ω - 8.0 jΩ
Return Loss	- 21.9 dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	52.2 Ω - 5.9 jΩ
Return Loss	- 24.2 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	54.4 Ω - 4.6 jΩ
Return Loss	- 24.2 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	57.3 Ω - 0.1 jΩ
Return Loss	- 23.3 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	57.2 Ω - 1.6 jΩ
Return Loss	- 23.3 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	51.4 Ω - 6.4 jΩ
Return Loss	- 23.8 dB

Antenna Parameters with Body TSL at 5300 MHz

Impedance, transformed to feed point	52.7 Ω - 4.2 jΩ
Return Loss	- 26.2 dB

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	54.2 Ω - 2.4 jΩ
Return Loss	- 26.6 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	59.1 Ω + 1.4 jΩ
Return Loss	- 21.5 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	58.8 Ω - 0.3 jΩ
Return Loss	- 21.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.199 ns

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

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

Additional EUT Data

Manufactured by	SPEAG

DASY5 Validation Report for Head TSL

Date: 25.01.2021

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1146

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 4.46 S/m; ε_r = 35.1; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5300 MHz; σ = 4.56 S/m; ε_r = 35; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5500 MHz; σ = 4.76 S/m; ε_r = 34.7; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5600 MHz; σ = 4.86 S/m; ε_r = 34.5; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5800 MHz; σ = 5.07 S/m; ε_r = 34.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.8, 5.8, 5.8) @ 5200 MHz, ConvF(5.49, 5.49, 5.49) @ 5300 MHz, ConvF(5.25, 5.25, 5.25) @ 5500 MHz, ConvF(5.1, 5.1, 5.1) @ 5600 MHz, ConvF(5.01, 5.01, 5.01) @ 5800 MHz; Calibrated: 30.12.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.11.2020
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

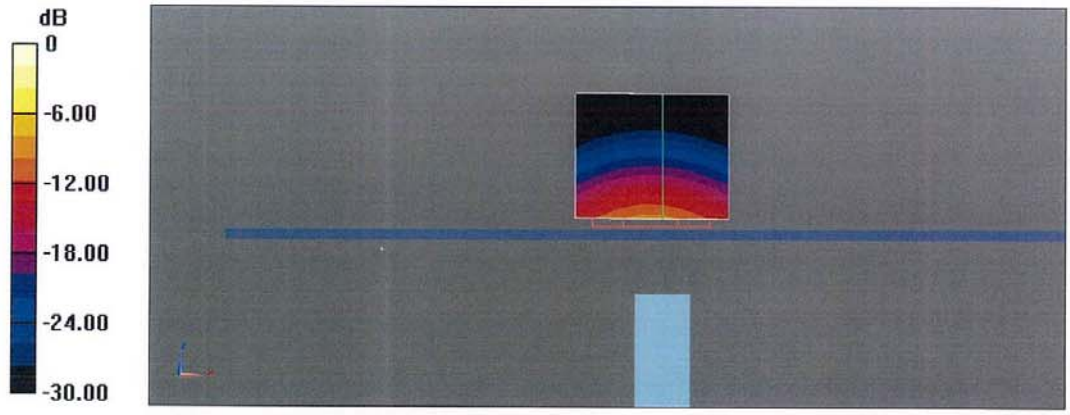
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 76.85 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 27.5 W/kg
SAR(1 g) = 7.82 W/kg; SAR(10 g) = 2.22 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 69.3%
Maximum value of SAR (measured) = 17.8 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 77.67 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 28.3 W/kg
SAR(1 g) = 8.06 W/kg; SAR(10 g) = 2.29 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 69.4%
Maximum value of SAR (measured) = 18.3 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 76.91 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 32.1 W/kg
SAR(1 g) = 8.46 W/kg; SAR(10 g) = 2.38 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 66.5%
Maximum value of SAR (measured) = 19.7 W/kg

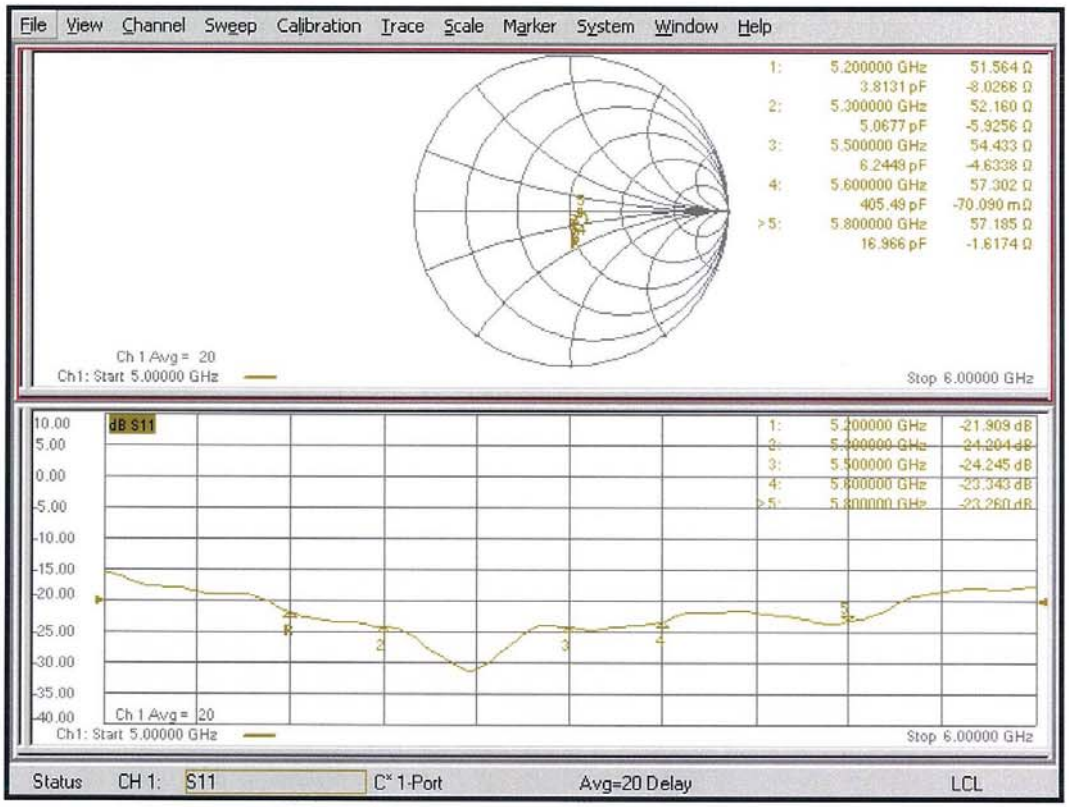
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 78.52 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 31.1 W/kg
SAR(1 g) = 8.46 W/kg; SAR(10 g) = 2.39 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 67.6%
Maximum value of SAR (measured) = 19.6 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 75.28 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 31.9 W/kg
SAR(1 g) = 8.07 W/kg; SAR(10 g) = 2.27 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 65.5%
Maximum value of SAR (measured) = 19.4 W/kg



0 dB = 18.3 W/kg = 12.63 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 20.01.2021

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1146

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 5.44 S/m; ε_r = 49.4; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5300 MHz; σ = 5.57 S/m; ε_r = 49.2; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5500 MHz; σ = 5.85 S/m; ε_r = 48.9; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5600 MHz; σ = 5.99 S/m; ε_r = 48.7; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5800 MHz; σ = 6.27 S/m; ε_r = 48.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.29, 5.29, 5.29) @ 5200 MHz, ConvF(5.23, 5.23, 5.23) @ 5300 MHz, ConvF(4.84, 4.84, 4.84) @ 5500 MHz, ConvF(4.79, 4.79, 4.79) @ 5600 MHz, ConvF(4.62, 4.62, 4.62) @ 5800 MHz; Calibrated: 30.12.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.11.2020
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

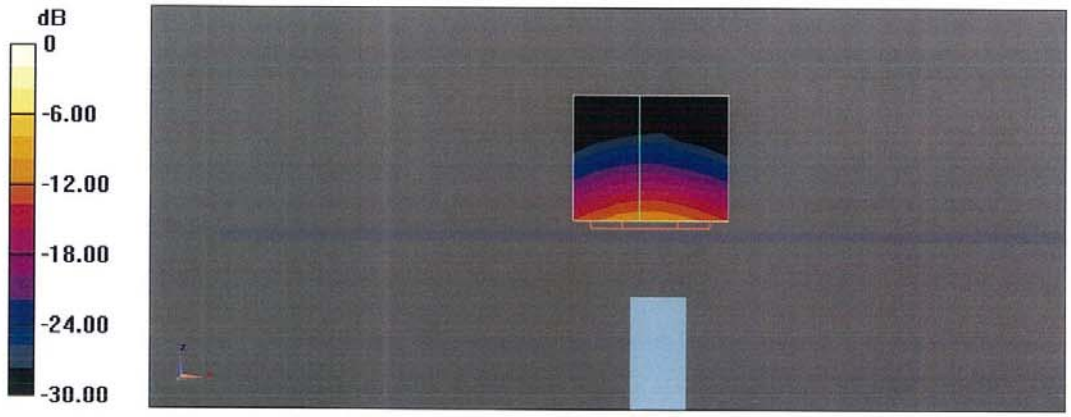
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 67.74 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 27.4 W/kg
SAR(1 g) = 7.36 W/kg; SAR(10 g) = 2.05 W/kg
Smallest distance from peaks to all points 3 dB below = 6.8 mm
Ratio of SAR at M2 to SAR at M1 = 68.1%
Maximum value of SAR (measured) = 16.8 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 66.65 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 29.1 W/kg
SAR(1 g) = 7.48 W/kg; SAR(10 g) = 2.08 W/kg
Smallest distance from peaks to all points 3 dB below = 6.8 mm
Ratio of SAR at M2 to SAR at M1 = 66.5%
Maximum value of SAR (measured) = 17.3 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 67.84 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 32.5 W/kg
SAR(1 g) = 7.86 W/kg; SAR(10 g) = 2.15 W/kg
Smallest distance from peaks to all points 3 dB below = 6.8 mm
Ratio of SAR at M2 to SAR at M1 = 64.9%
Maximum value of SAR (measured) = 18.5 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 67.10 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 33.5 W/kg
SAR(1 g) = 7.77 W/kg; SAR(10 g) = 2.14 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 63.5%
Maximum value of SAR (measured) = 18.6 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.51 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 32.7 W/kg
SAR(1 g) = 7.54 W/kg; SAR(10 g) = 2.05 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 63%
Maximum value of SAR (measured) = 18.3 W/kg



0 dB = 16.8 W/kg = 12.25 dBW/kg

Impedance Measurement Plot for Body TSL