FCC TEST REPORT

Job No.	**: GPEM2010001184EH**
Applicant Name	**: LG Electronics USA**
Equipment Under Test (EUT) :	
Product Name : Wi-Fi / BLE Combo Module	
Model Name : PWFSA3	
FCC Authorization Type	**: Certification**
Applied Standards	**: FCC Part 15 Subpart B, Class B**
	ANSI C63.4a:2017
FCC ID	**: BEJ-PWFSA3**
Date of Receipt	**: October 15, 2020**
Date of Test	**: November 18, 2020**
Date of Issue	**: November 26, 2020**
Test Results	**: Complied**

Tested by : ---------- **Noah Jeon**

Reviewed by : ---------- **Julia Choi**

This test report does not assure KOLAS accreditation.
1) The results of this test report are effective only to the items tested.
2) The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received.

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SGS Korea Co.,Ltd. | 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, 435-040 Korea t+82 31 428 5700 f+82 31 427 2370 www.sgsgroup.kr

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Revision History

Revision	Report number	Description
0	F690501-RF-EMH000921	Initial

1. General Information

1.1 Client Information

Applicant : LG Electronics USA
Address : 1000 Sylvan Avenue Englewood Cliffs New Jersey United States 07632

Manufacturer : LG Electronics Inc.
Address : 170, Seongsanpaechong-ro, Seongsan-gu, Changwon-si, Gyeongsangnam-do, 51533, Korea

1.2 Test Laboratory

Name and Address : SGS Korea Co., Ltd.
- Giheung 1 Lab : 35, Giheungdanji-ro 121beon-gil, Giheung-gu, Yongin-si, Gyeonggi-do, Republic of Korea, 17086
- Giheung 2 Lab : 23, Giheungdanji-ro 24beon-gil, Giheung-gu, Yongin-si, Gyeonggi-do, Republic of Korea, 17086

FCC Registration No. : KR0150
IC Registration No. : 7837B
Phone : + 82 31 548 0710
Fax : + 82 31 548 0719
e-mail : Julia.choi@sgs.com

1.3 General Information of E.U.T.

Classification	Specification
Product Name	Wi-Fi / BLE Combo Module
Model Name	PWFSA3
Internal Max Clock Frequency	2.4 ㎓
Test Power	DC 5 V, DC 12 V
Rated Power	DC 5 V, DC 12 V
Operating Temp.	0 ℃ ~ 70 ℃
Transmit/Receive Freq.	WLAN : 802.11 b/g/n (Bandwidth : 20 ㎒) : 2 412 ㎒ ~ 2 472 ㎒ Bluetooth Low Energy: 2 402 ㎒ ~ 2 480 ㎒
Output	WLAN : 10 ㎽/㎒ Bluetooth Low Energy : 3 ㎽
Function	Wi-Fi, BLE combo module

1.4 Operating Modes and Conditions

Operating mode	Operating Condition
1) Audio(5 V)	It was status of the audio play.(5 Vd.c.)
2) Audio(12 V)	It was status of the audio play.(12 Vd.c.)

1.5 Peripheral Equipments

Description	Model	Serial No.	Manufacturer
DC Power Supply	U8002A	-	Aglient
Audio	-	EBD63525301	-

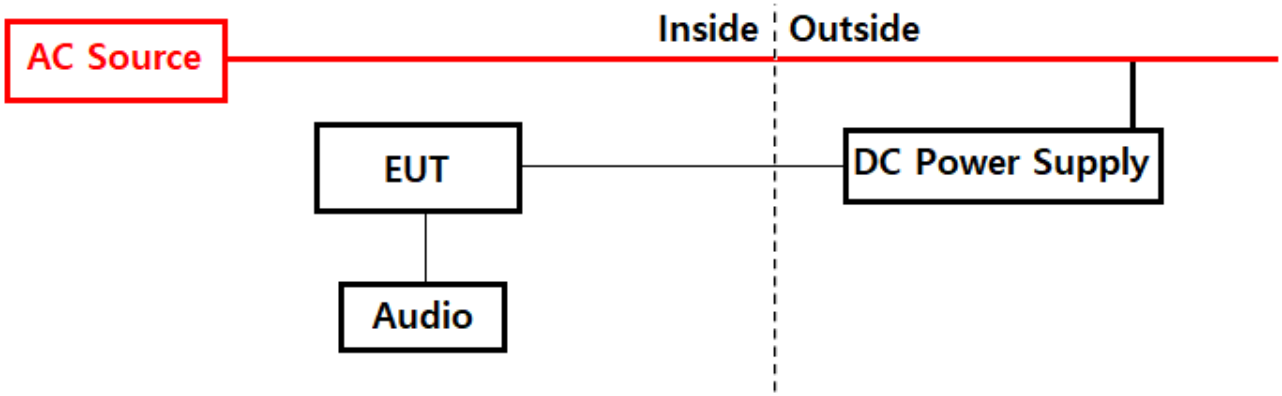
1.6 Cable List

Start		END		Cable Spec.		Used core
Name	I/O Port	Name	I/O Port	Length (m)	Shield	
EUT	DC IN	DC Power Supply	DC OUT	1.5	Unshield	No
	CN103	Audio	8 Pin Connector	0.8	Unshield	No
DC Power Supply	AC IN	AC Source	-	1.8	Unshield	No

1.7 System Configurations

Description	Model	Serial No.	Manufacturer
-	-	-	-

1.8 Test System Layout



1.9 Modifications

- There is no modified item during the test.

1.10 Applicable Standards for Testing

Standards	Status	Deviation
FCC Part 15 : Subpart B	Applicable	No Deviation

1.11 Summary of Test Results

Test Item	Standards	Results
Conducted Emission	FCC Part 15 Subpart B Section 15.107	N/A
Radiated Emission	FCC Part 15 Subpart B Section 15.109	Complied

Note : Test methods of all test items are performed according to the basic standards in this table.

EMISSION

2.1 Test Results

Test Items	Standards	Test Results
Conducted Emission	FCC Part 15 Subpart B Section 15.107	**N/A**
Radiated Emission	FCC Part 15 Subpart B Section 15.109	**Complied**

2.2 Test Method and Limits

2.2.1 Test Method

Test Items	Measuring Frequency Range	RBW	Measuring Distance
Conducted Emission	0.15 ㎒ ~ 30 ㎒	9 ㎑	-
Radiated Emission	30 ㎒ ~ 1 ㎓	120 ㎑	10 m & 3 m
	Above 1 ㎓	1 ㎒	3 m

Note : 10 m method of radiated emission measurement is only applied to Class A equipment over the frequency range of 30 ㎒ ~ 1 ㎓. Except this, 3 m method is applied to Class B equipment over the frequency range of 30 ㎒ ~ 1 ㎓ and Class A and Class B equipment above 1 ㎓.

2.2.2 Test Limits

-Conducted Emission Limits

Frequency Range	Limits(㏈㎶)		Class
	Quasi-peak	Average	
0.15 ㎒ ~ 0.5 ㎒	79	66	**Class A**
0.5 ㎒ ~ 30 ㎒	73	60	
0.15 ㎒ ~ 0.5 ㎒	66 to 56	56 to 46	**Class B**
0.5 ㎒ ~ 5 ㎒	56	46	
5 ㎒ ~ 30 ㎒	60	50	

Note : The lower limit shall apply at the transition frequencies. The limit decreases linearly with the logarithm of the frequency in the range 0.15 ㎒ to 0.5 ㎒.

-Radiated Emission Limits below 1 ㎓

Frequency Range	Limits(㏈㎶/m)	Class
	Quasi-peak	
30 ㎒ ~ 88 ㎒	39.0	**Class A (10 m method)**
88 ㎒ ~ 216 ㎒	43.5	
216 ㎒ ~ 960 ㎒	46.4	
960 ㎒ ~ 1 ㎓	49.5	
30 ㎒ ~ 88 ㎒	40.0	**Class B (3 m method)**
88 ㎒ ~ 216 ㎒	43.5	
216 ㎒ ~ 960 ㎒	46.0	
960 ㎒ ~ 1 ㎓	54.0	

-Radiated Emission Limits above 1 ㎓ (3 m method)

Frequency Range	Limits(㏈㎶/m)		Class
	Average	Peak	
Above 1 ㎓	59.5	79.5	**Class A**
Above 1 ㎓	54.0	74.0	**Class B**

Note : The limits of class A equipment is extrapolated using an extrapolation factor of 20 ㏈/decade because it was measured at 3 m distance not 10 m distance.

2.3 Radiated Emission

The initial preliminary exploratory scans were performed over the measuring frequency range (30 ㎒ to 14 ㎓) using a max hold mode incorporating a Peak detector and using the software of EMC32 (Version V10.40.10 from R&S). The final test data was measured using a Quasi-Peak detector below 1 ㎓ and Peak and CISPR-Average detector above 1 ㎓.
Measurements were made with the antenna positioned in both the horizontal and vertical planes of polarization. The antenna height was varied from 1 m to 4 m and the EUT was rotated 360° to find the maximum emitting point for each frequency.

2.3.1 Test Equipments

Equipment	Model	Manufacturer	Serial No	Cal Due. Date
EMI TEST RECEIVER	ESU40	R&S	100075	2021.08.18
TRILOG ANTENNA	VULB 9162	SCHWARZBECK	186	2021.07.09
Double Ridged Horn Antenna	HF907	R&S	102578	2021.01.24
AMPLIFIER	8447D	HP	2727A05297	2021.07.10
Microwave Preamplifier	PAM-118A	Com-Power	551074	2021.10.13
RF Cable (EMH-2Lab-RE-01)	-	-	-	2021.03.29
RF Cable (EMH-2Lab-RE-02)	L-502W	CANARE	606	2021.03.29
RF Cable (EMH-2Lab-RE-03)	-	-	-	2021.03.29
RF Cable (EMH-2Lab-RE-04)	SUCOFLEX102	HUBER+SUHNER	803076/2	2021.03.29
3m SEMI-ANECHOIC CHAMBER	-	Will Tech	-	-

2.3.2 Test Site

3m SEMI-ANECHOIC CHAMBER in Giheung 2 Laboratory

2.3.3 Environment Conditions

①Below 1 ㎓

Temperature : (minimum 21.0, maximum 22.0) ℃
Humidity : (minimum 40.0, maximum 41.0) % R.H.
Atmospheric Pressure : (minimum 102.0, maximum 102.0) ㎪
Test Date: November 18, 2020

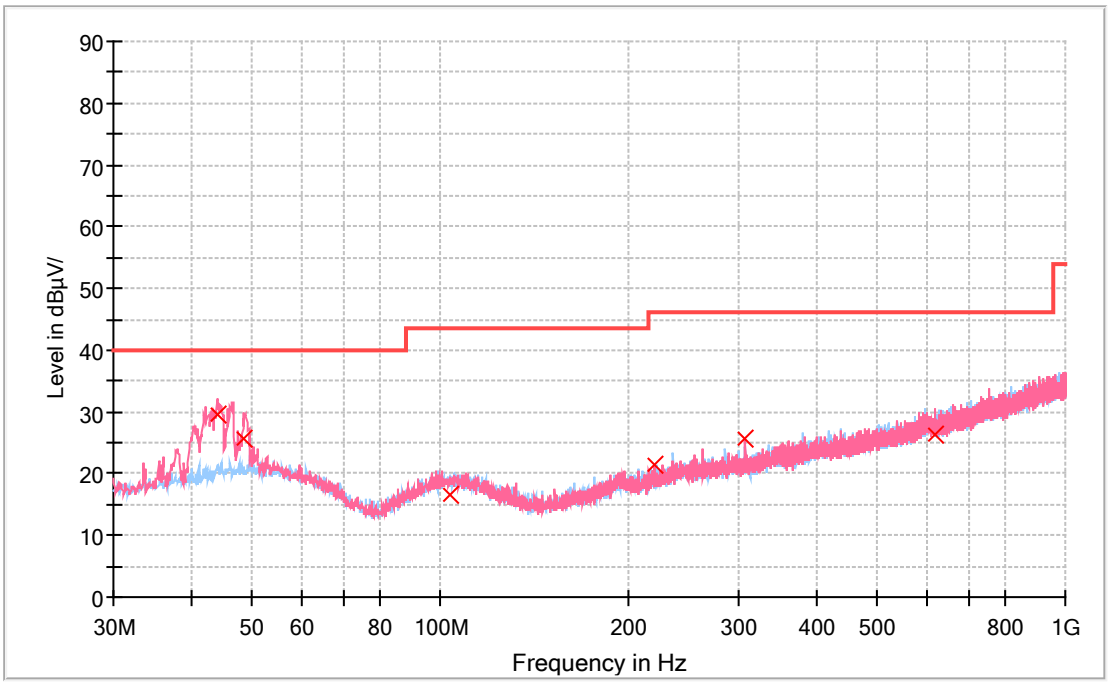
②Above 1 ㎓

Temperature : (minimum 21.0, maximum 22.0) ℃
Humidity : (minimum 44.0, maximum 45.0) % R.H.
Atmospheric Pressure : (minimum 102.0, maximum 102.0) ㎪
Test Date: November 18, 2020

2.3.4 Test Results

①Below 1 ㎓ (10m Method)

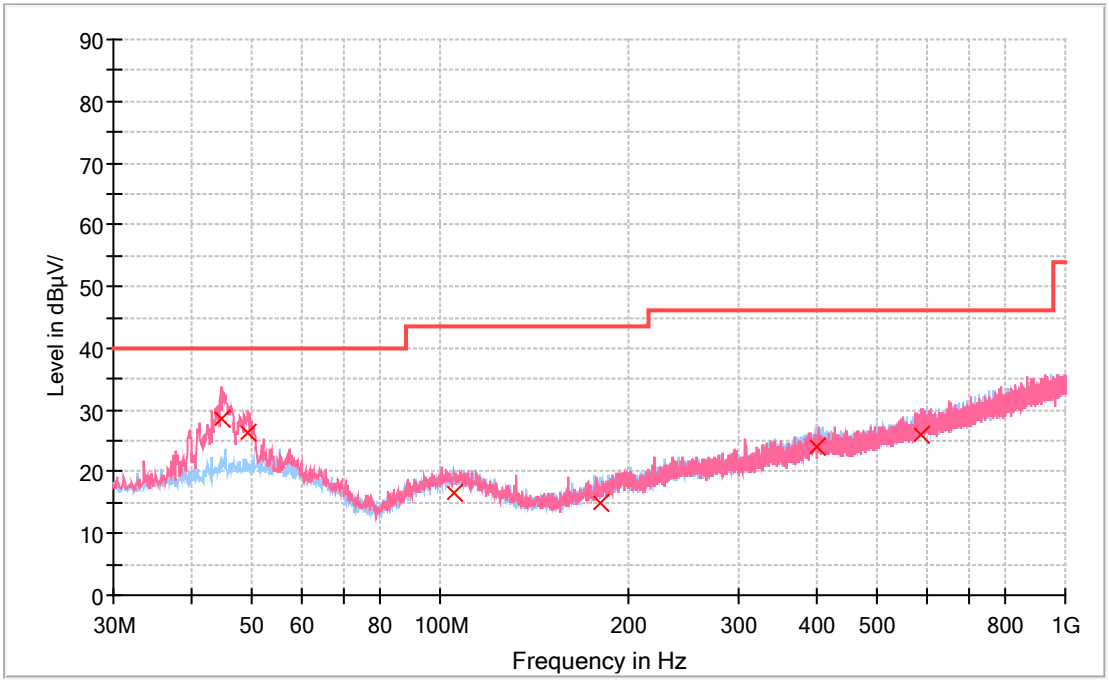
- Test Mode: 1)



Final Result

Frequency (㎒)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (㎑)	Height (㎝)	Pol	Azimuth (deg)	Corr. (dB)
43.968 000	29.52	40.00	10.48	15 000.0	120.000	111.0	V	327.0	-6.0
48.430 000	25.72	40.00	14.28	15 000.0	120.000	107.0	V	10.0	-5.4
103.914 000	16.69	43.50	26.81	15 000.0	120.000	398.0	H	257.0	-6.8
220.023 000	21.41	46.00	24.59	15 000.0	120.000	108.0	H	212.0	-6.4
308.002 000	25.55	46.00	20.45	15 000.0	120.000	113.0	H	244.0	-3.7
620.245 000	26.16	46.00	19.84	15 000.0	120.000	196.0	V	34.0	1.5

- Test Mode: 2)



Final Result

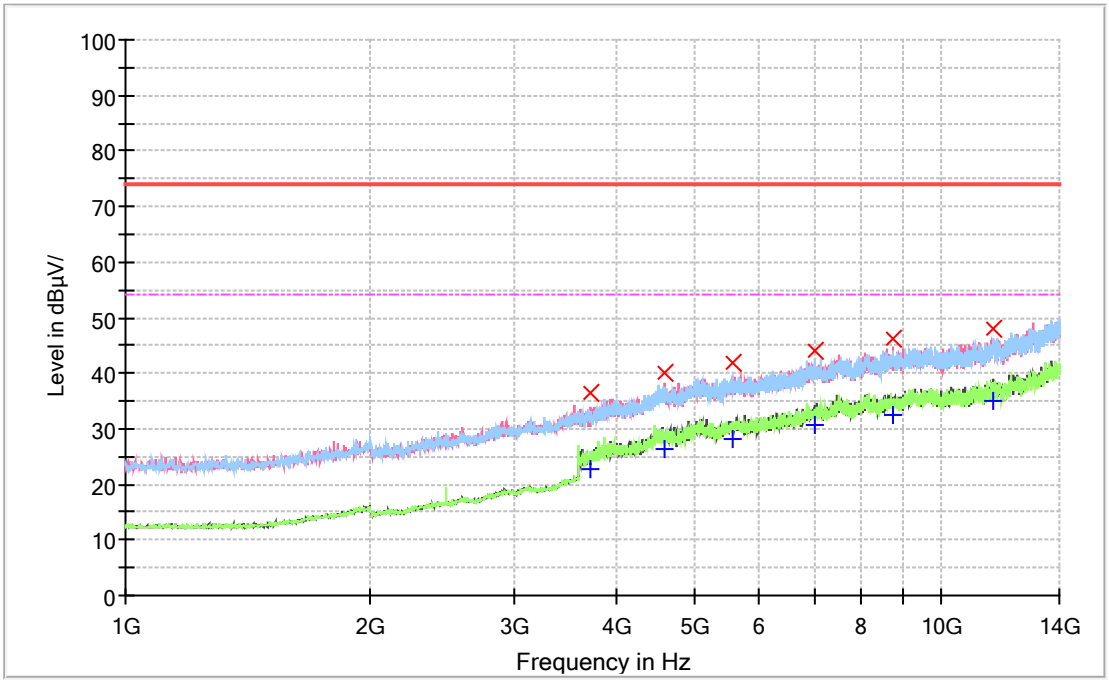
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
44.550 000	28.69	40.00	11.31	15 000.0	120.000	108.0	V	5.0	-5.9
49.206 000	26.17	40.00	13.83	15 000.0	120.000	115.0	V	5.0	-5.4
105.369 000	16.68	43.50	26.82	15 000.0	120.000	103.0	H	15.0	-6.8
180.059 000	15.06	43.50	28.44	15 000.0	120.000	122.0	H	306.0	-8.3
399.085 000	24.18	46.00	21.82	15 000.0	120.000	238.0	H	5.0	-1.7
588.429 000	26.09	46.00	19.91	15 000.0	120.000	191.0	V	5.0	1.4

Measurement Uncertainty (Horizontal) : 4.22 dB (The confidential level is about 95 %, *k*=2)
Measurement Uncertainty (Vertical) : 4.27 dB (The confidential level is about 95 %, *k*=2)
Note : • POL H = Horizontal • POL V = Vertical
• Margin = Limit – Quasi Peak • Corr. = Antenna Factor + Cable loss – Amplifier Gain

Ex) In case
Freq ; 100 MHz, level ; 30 dB(µV/m), AF ; 10 dB/m, CL ; 4 dB, Amp ; 25 dB
Result = Level + AF + CL – Amp
= 30 + 10 + 4 - 25
= 19
Margin = Limit – Result
= 43.5 – 19
= 24.5

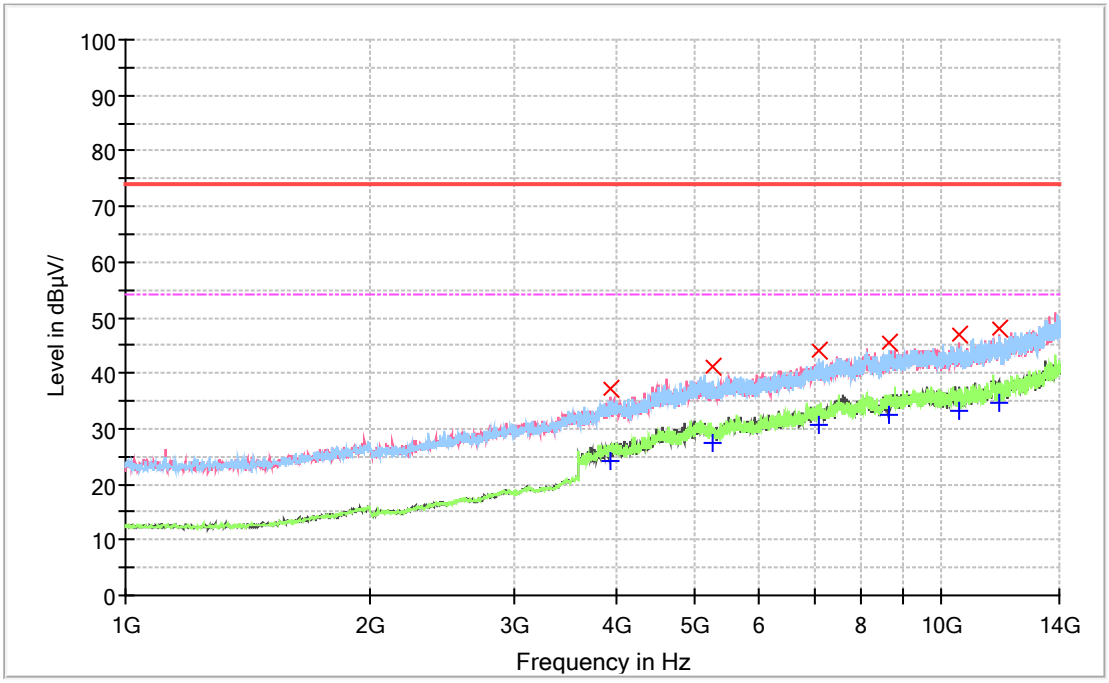
②Above 1 ㎓(3m Method)

- Test Mode: 1)



Frequency (㎒)	MaxPeak (dB㎶/m)	Caverage (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)	Meas. Time (㎳)	Bandwidth (㎑)	Height (㎝)	Pol	Azimuth (deg)	Corr. (dB)
3 718.300 000	36.40	---	74.00	37.60	15 000.0	1 000.000	184.0	V	241.0	-3.5
3 718.300 000	---	22.85	54.00	31.15	15 000.0	1 000.000	189.0	V	241.0	-3.5
4 592.100 000	40.01	---	74.00	33.99	15 000.0	1 000.000	119.0	V	156.0	-0.8
4 592.100 000	---	26.46	54.00	27.54	15 000.0	1 000.000	104.0	V	156.0	-0.8
5 576.400 000	---	28.25	54.00	25.75	15 000.0	1 000.000	195.0	V	151.0	1.5
5 576.400 000	41.72	---	74.00	32.28	15 000.0	1 000.000	210.0	V	151.0	1.5
7 024.800 000	---	30.69	54.00	23.31	15 000.0	1 000.000	184.0	H	258.0	3.1
7 024.800 000	44.10	---	74.00	29.90	15 000.0	1 000.000	185.0	H	258.0	3.1
8 765.600 000	46.14	---	74.00	27.86	15 000.0	1 000.000	119.0	V	353.0	5.2
8 765.600 000	---	32.46	54.00	21.54	15 000.0	1 000.000	115.0	V	353.0	5.2
11 604.600 000	48.12	---	74.00	25.88	15 000.0	1 000.000	103.0	H	30.0	6.3
11 604.600 000	---	34.84	54.00	19.16	15 000.0	1 000.000	119.0	H	30.0	6.3

- Test Mode: 2)



Frequency (MHz)	MaxPeak (dBµV/m)	Caverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
3 937.600 000	---	24.05	54.00	29.95	15 000.0	1 000.000	203.0	V	206.0	-2.8
3 937.600 000	37.22	---	74.00	36.78	15 000.0	1 000.000	208.0	V	206.0	-2.8
5 246.600 000	41.00	---	74.00	33.00	15 000.0	1 000.000	107.0	H	135.0	0.9
5 246.600 000	---	27.42	54.00	26.58	15 000.0	1 000.000	113.0	H	135.0	0.9
7 091.100 000	---	30.75	54.00	23.25	15 000.0	1 000.000	191.0	H	5.0	3.2
7091.100 000	44.08	---	74.00	29.92	15 000.0	1 000.000	206.0	H	5.0	3.2
8 631.300 000	---	32.31	54.00	21.69	15 000.0	1 000.000	102.0	H	301.0	5.1
8 631.300 000	45.63	---	74.00	28.37	15 000.0	1 000.000	119.0	H	301.0	5.1
10 571.000 000	46.83	---	74.00	27.17	15 000.0	1 000.000	213.0	V	99.0	5.6
10 571.000 000	---	33.31	54.00	20.69	15 000.0	1 000.000	192.0	V	99.0	5.6
11 805.200 000	---	34.72	54.00	19.28	15 000.0	1 000.000	180.0	V	311.0	6.4
11 805.200 000	48.08	---	74.00	25.92	15 000.0	1 000.000	185.0	V	311.0	6.4

Measurement Uncertainty (Horizontal) : 4.02 dB (The confidential level is about 95 %, *k*=2)
Measurement Uncertainty (Vertical) : 4.18 dB (The confidential level is about 95 %, *k*=2)
Note : • POL H = Horizontal • POL V = Vertical
• Margin = Limit – MaxPeak • Corr. = Antenna Factor + Cable loss – Amplifier Gain

Ex) In case
Freq ; 100 MHz, level ; 30 dB(µV/m), AF ; 10 dB/m, CL ; 4 dB, Amp ; 25 dB
Result = Level + AF + CL – Amp
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- End of Test Report -