JQA File No. : KL80170088S
Issue Date : June 13, 2017

TEST REPORT

Applicant	:	SHARP CORPORATION, IoT Communication BU
Address	:	2-13-1, Iida Hachihonmatsu, Higashi-Hiroshima City, Hiroshima, 739-0192, Japan
Products	:	Smart Phone
Model No.	:	606SH
Serial No.	:	004401/11/612057/3 004401/11/612067/2
FCC ID	:	APYHRO00250
Test Standard	:	CFR 47 FCC Rules and Regulations Part 15
Test Results	:	**Passed**
Date of Test	:	May 16 ~ 22, 2017

ilac-MRA VLAC Lab Accreditation VLAC-001-2

Kousei Shibata
Manager
Japan Quality Assurance Organization
KITA-KANSAI Testing Center
SAITO EMC Branch
7-3-10, Saito-asagi, Ibaraki-shi, Osaka 567-0085, Japan

- The test results in this test report was made by using the measuring instruments which are traceable to national standards of measurement in accordance with ISO/IEC 17025.
- The applicable standard, testing condition and testing method which were used for the tests are based on the request of the applicant.
- The test results presented in this report relate only to the offered test sample.
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DEFINITIONS FOR ABBREVIATION AND SYMBOLS USED IN THIS TEST REPORT

EUT : Equipment Under Test
AE : Associated Equipment
N/A : Not Applicable
N/T : Not Tested

EMC : Electromagnetic Compatibility
EMI : Electromagnetic Interference
EMS : Electromagnetic Susceptibility

☑ - indicates that the listed condition, standard or equipment is applicable for this report.
☐ - indicates that the listed condition, standard or equipment is not applicable for this report.

1 Description of the Equipment Under Test

1.	Manufacturer	:	SHARP CORPORATION, IoT Communication BU 2-13-1, Iida Hachihonmatsu, Higashi-Hiroshima City, Hiroshima, 739-0192, Japan
2.	Products	:	Smart Phone
3.	Model No.	:	606SH
4.	Serial No.	:	004401/11/612057/3 004401/11/612067/2
5.	Product Type	:	Pre-production
6.	Date of Manufacture	:	April, 2017
7.	Power Rating	:	4.0VDC (Lithium-ion Battery UBATIA270AFN1 3010mAh)
8.	Grounding	:	None
9.	Transmitting Frequency	: :	WLAN: 2412.0 MHz(01CH) –2462.0MHz(11CH) Bluetooth LE: 2402.0 MHz(00CH) – 2480.0MHz(39CH)
10.	Receiving Frequency	:	WLAN: 2412.0 MHz(01CH) –2462.0MHz(11CH) Bluetooth LE: 2402.0 MHz(00CH) – 2480.0MHz(39CH)
11.	Max. RF Output Power	: : : :	18.24 dBm(Measure Value of IEEE802.11b) 21.98 dBm(Measure Value of IEEE802.11g) 22.29 dBm(Measure Value of IEEE802.11n) 1.43 dBm(Measure Value of Bluetooth LE)
12.	Antenna Type	:	Inverted-L Type Antenna (Integral)
13.	Antenna Gain	:	0 dBi (Main/Sub)
14.	Category	:	DTS
15.	EUT Authorization	:	Certification
16.	Received Date of EUT	:	May 15, 2017

17. Channel Plan

WLAN:
The carrier spacing is 5 MHz.
The carrier frequency is designated by the absolute frequency channel number (ARFCN).
The carrier frequency is expressed in the equation shown as follows:

Transmitting Frequency (in MHz) = 2407.0 + 5*n
Receiving Frequency (in MHz) = 2407.0 + 5*n
where, n : channel number ($1 \leq n \leq 11$)

Bluetooth Low Energy Mode:
The carrier spacing is 2 MHz.
The carrier frequency is designated by the absolute frequency channel number (ARFCN).
The carrier frequency is expressed in the equation shown as follows:

Transmitting Frequency (in MHz) = 2402.0 + 2*n
Receiving Frequency (in MHz) = 2402.0 + 2*n
where, n : channel number ($0 \leq n \leq 39$)

2 Summary of Test Results

Applied Standard : CFR 47 FCC Rules and Regulations Part 15
Subpart C – Intentional Radiators

The EUT described in clause 1 was tested according to the applied standard shown above.
Details of the test configuration is shown in clause 6.
The conclusion for the test items of which are required by the applied standard is indicated under the test result.

☑ - The test result was **passed** for the test requirements of the applied standard.

☐ - The test result was **failed** for the test requirements of the applied standard.

☐ - The test result was **not judged** the test requirements of the applied standard.

In the approval of test results,
- Determining compliance with the limits in this report was based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
- No deviations were employed from the applied standard.
- No modifications were conducted by JQA to achieve compliance to the limitations.

Reviewed by:

Shigeru Kinoshita
Assistant Manager
JQA KITA-KANSAI Testing Center
SAITO EMC Branch

Tested by:

Shigeru Osawa
Deputy Manager
JQA KITA-KANSAI Testing Center
SAITO EMC Branch

3 Test Procedure

Test Requirements : §15.247, §15.207 and §15.209

Test Procedure : ANSI C63.10–2013
Testing unlicensed wireless devices.

KDB 558074 D01
DTS Meas Guidance v04: April 5, 2017.

KDB 414788 D01
Radiated Test Site v01: April 18, 2017

4 Test Location

Japan Quality Assurance Organization (JQA)
KITA-KANSAI Testing Center
7-7, Ishimaru, 1-chome, Minoh-shi, Osaka, 562-0027, Japan
SAITO EMC Branch
7-3-10, Saito-asagi, Ibaraki-shi, Osaka 567-0085, Japan

5 Recognition of Test Laboratory

JQA KITA-KANSAI Testing Center SAITO EMC Branch is accredited under ISO/IEC 17025 by following accreditation bodies and the test facility is registered by the following bodies.

VLAC Accreditation No.	:	VLAC-001-2 (Expiry date : March 30, 2018)
VCCI Registration No.	:	A-0002 (Expiry date : March 30, 2018)
BSMI Registration No.	:	SL2-IS-E-6006, SL2-IN-E-6006, SL2-R1/R2-E-6006, SL2-A1-E-6006 (Expiry date : September 14, 2019)
IC Registration No.	:	2079E-3, 2079E-4 (Expiry date : July 16, 2017)

Accredited as conformity assessment body for Japan electrical appliances and material law by METI. (Expiry date : February 22, 2019)

6 Description of Test Setup

6.1 Test Configuration

The equipment under test (EUT) consists of :

	Item	Manufacturer	Model No.	Serial No.	FCC ID
A	Smart Phone	Sharp	606SH	004401/11/612057/3 *1) 004401/11/612067/2 *2)	APYHRO00250
B	AC Adapter	Sharp	SHCEJ1	--	N/A
C	Stereo Handsfree	Sharp	--	--	N/A
D	DTV Antenna	Sharp	--	--	N/A

*1) Used for Field Strength of Spurious Emission.
*2) Used for Antenna Conducted Emission.

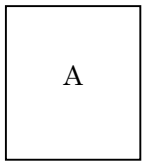
The auxiliary equipment used for testing :
None

Type of Cable:

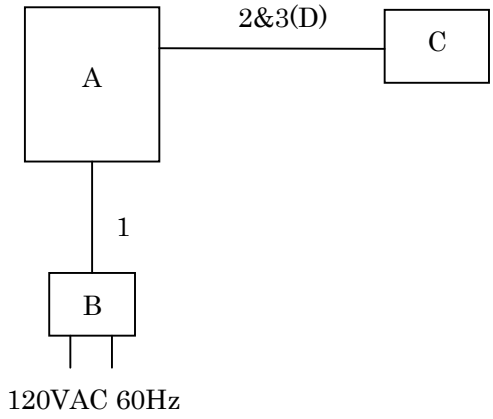
No.	Description	Identification (Manu. etc.)	Connector Shielded	Cable Shielded	Ferrite Core	Length (m)
1	USB conversion cable	--	--	NO	NO	1.5
2	Handsfree Cable	--	--	NO	NO	1.5
3	DTV Antenna Cable	--	--	NO	NO	0.1

6.2 Test Arrangement (Drawings)

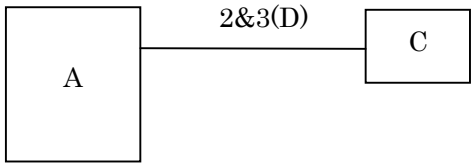
a) Single Unit



b) AC Adapter used



c) Earphone used



6.3 Operating Condition

Power Supply Voltage : 4.0 VDC (for Battery)
120 VAC, 60 Hz (For AC Adapter)

Transmitting/Receiving

WLAN:
Transmitting frequency : 2412.0 MHz(1CH) – 2462.0 MHz(11CH)
Receiver frequency : 2412.0 MHz(1CH) – 2462.0 MHz(11CH)

Bluetooth Low Energy Mode(Bluetooth 4.2 + EDR + LE):
Transmitting frequency : 2402.0 MHz(0CH) – 2480.0 MHz(39CH)
Receiver frequency : 2402.0 MHz(0CH) – 2480.0 MHz(39CH)

Modulation Type
1. 802.11b : DSSS
2. 802.11g : OFDM
3. 802.11n : OFDM
4. LE Packet (Modulation Type : GFSK)

Other Clock Frequency
19.2MHz, 27MHz, 27.12MHz

The tests were carried under the worst channel (maximum power).
(Ref. JQA File number: KL80160050, FCC ID: APYHRO00237)
1. IEEE802.11b: 2412.0 MHz (1 ch)
2. IEEE802.11g: 2437.0 MHz (6 ch)
3. IEEE802.11n: 2462.0 MHz (11 ch)
4. Bluetooth LE: 2402.0 MHz (0 ch)

The tests were performed in the following worst condition.

Mode	Condition
IEEE802.11b	11 Mbps
IEEE802.11g	18 Mbps
IEEE802.11n	MCS5 (52 Mbps)

Note: The worst condition was determined based on the test result of Maximum Peak Output Power.

The EUT was rotated through three orthogonal axis (X, Y and Z axis) in radiated measurement.
The EUT with temporary antenna port was used in conducted measurement.

The test were carried out using the following test program supplied by applicant;
- Software Name: WLAN_BT Manual test mode operation_ver 2
- Software Version: Version 2
- Storage Location: Controller PC(supplied by applicant)

7 Test Requirements

7.0.1 Introduction

This application re-use data collected on a similar device. The subjected device of this application (Model No.: 606SH, FCC ID: APYHRO00250) is electrically identical to the reference device (Model No.: 507SH, FCC ID: APYHRO00237) for the portions of the circuitry corresponding to the data being re-used.
The FCC ID: APYHRO00237 test data shall remain representative of FCC ID: APYHRO00250.
A statement that the applicant takes full responsibility that the test data as referenced in this section represent compliance for this FCC ID: APYHRO00250.

7.0.2 Difference Section

The device of this application is electrically identical to the reference device other than the FeliCa Block. Please refer to the Comparison List Between 507SH and 606SH.

7.0.3 Spot Check Verification Data Section

The spot check verification tests were carried under the worst channel (maximum power).
(Ref. JQA File number: KL80160050, FCC ID: APYHRO00237)
1. Conducted: 2462.0 MHz (11 ch)
2. Radiated: 2412.0 MHz (1 ch)

Test Item	Reference Model (FCC ID: APYHRO00237)	Spot Check Model (FCC ID: APYHRO00250)
Peak Output Power (Conduction)	21.86dBm (at 2462.0 MHz)	22.29dBm (at 2462.0 MHz)
Radiated Emission	43.51dBuV/m (at 2390.0MHz)	44.20dBuV/m (at 2390.0MHz)

Summary of the Test Results

Test Item	FCC Specification	Reference of the Test Report	Results	Remarks
Antenna Requirement	Section 15.203	Section 1.12	Passed	-
Channel Separation	Section 15.247(a)(1)	-		-
Minimum Hopping Channel	Section 15.247(a)(1)(iii)	-	-	-
Occupied Bandwidth	Section 15.247(a)(2)	Section 7.3	Not Tested	-
Dwell Time	Section 15.247(a)(1)(iii)	-	-	-
Peak Output Power (Conduction)	Section 15.247(b)(3)	Section 7.5	Passed	-
Peak Power Density (Conduction)	Section 15.247(e)	Section 7.6	Not Tested	-
Spurious Emissions (Conduction)	Section 15.247(d)	Section 7.7	Not Tested	-
AC Powerline Conducted Emission	Section 15.207	Section 7.8	Not Tested	-
Radiated Emission	Section 15.247(d)	Section 7.9	Passed	-

7.0.4 Reference Detail Section

Equipment Class	FCC ID	Test Report Title	Report Section
DTS (WLAN, Bluetooth LE)	APYHRO00250	APYHRO00237_TestReport_KL80160050 (DTS)	All sections applicable

7.1 Channel Separation

For the requirements, ☐ - Applicable [☐ - Tested. ☐ - Not tested by applicant request.]
☑ - Not Applicable

Remarks : _____

7.2 Minimum Hopping Channel

For the requirements, ☐ - Applicable [☐ - Tested. ☐ - Not tested by applicant request.]
☑ - Not Applicable

Remarks : _____

7.3 Occupied Bandwidth

For the requirements, ☑ - Applicable [☐ - Tested. ☑ - Not tested by applicant request.]
☐ - Not Applicable

7.4 Dwell Time

For the requirements, ☐ - Applicable [☐ - Tested. ☐ - Not tested by applicant request.]
☑ - Not Applicable

Remarks : _____

7.5 Peak Output Power(Conduction)

For the requirements, ☑ - Applicable [☑ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

7.5.1 Test Results

For the standard, ☑ - **Passed** ☐ - **Failed** ☐ - **Not judged**

Peak Output Power of IEEE802.11b is	18.24	dBm	at	2412.0	MHz
Peak Output Power of IEEE802.11g is	21.98	dBm	at	2437.0	MHz
Peak Output Power of IEEE802.11n is	22.29	dBm	at	2462.0	MHz
Peak Output Power of Bluetooth LE is	1.43	dBm	at	2402.0	MHz

Uncertainty of Measurement Results ± 0.9 dB(2σ)

Remarks : _____

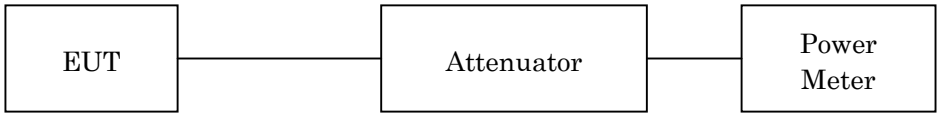
7.5.2 Test Instruments

Shielded Room S4				
Type	**Model**	**Serial No. (ID)**	**Manufacturer**	**Cal. Due**
Power Meter	N1911A	GB45100291 (B-63)	Agilent	2017/07/10
Power Sensor	N1921A	US44510470 (B-64)	Agilent	2017/07/10
Attenuator	54A-10	W5675 (D-28)	Weinschel	2017/08/2
RF Cable	SUCOFLEX102	14253/2 (C-52)	HUBER+SUHNER	2017/08/2

NOTE : The calibration interval of the above test instruments is 12 months.

7.5.3 Test Method and Test Setup (Diagrammatic illustration)

The Conducted RF Power Output was measured with a power meter, one attenuator and a short, low loss cable.



7.5.4 Test Data

1) IEEE 802.11b

Test Date: May 16, 2017
Temp.: 26 °C, Humi: 43 %

Data Rate : 11Mbps

Transmitting Frequency		Correction Factor	Meter Reading	Conducted Peak Output Power		Limits	Margin
CH	[MHz]	[dB]	[dBm]	[dBm]	[mW]	[dBm]	[dB]
01	2412	10.15	8.09	18.24	66.68	30.00	+11.76

Calculated result at 2412.000 MHz, as the worst point shown on underline:

Correction Factor	=	10.15 dB	
+) Meter Reading	=	8.09 dBm	
Result	=	18.24 dBm	= 66.68 mW

Minimum Margin: 30.00 - 18.24 = 11.76 (dB)

NOTES
1. The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.
2. Setting of measuring instrument(s) :

Detector Function	Video B.W.
Peak	OFF

CH	[MHz]
06	2437

Rate	Meter Reading [dBm]	Remark
1Mbps	7.82	
2Mbps	8.06	
5.5Mbps	8.03	
11Mbps	8.09	*

* : Worst Rate
All comparison were performed on the same measurement condition.

2) IEEE 802.11g

Test Date: May 16, 2017
Temp.: 26 °C, Humi: 43 %

Data Rate : 18Mbps

Transmitting Frequency		Correction Factor	Meter Reading	Conducted Peak Output Power		Limits	Margin
CH	[MHz]	[dB]	[dBm]	[dBm]	[mW]	[dBm]	[dB]
06	2437	10.15	11.83	21.98	157.76	30.00	+ 8.02

Calculated result at 2437.000 MHz, as the worst point shown on underline:

	Correction Factor	=	10.15 dB
+)	Meter Reading	=	11.83 dBm
	Result	=	21.98 dBm = 157.76 mW

Minimum Margin: 30.00 - 21.98 = 8.02 (dB)

NOTES
1. The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.
2. Setting of measuring instrument(s) :

Detector Function	Video B.W.
Peak	OFF

CH	[MHz]
06	2437

Rate	Meter Reading [dBm]	Remark
6Mbps	10.74	
9Mbps	11.27	
12Mbps	11.60	
18Mbps	11.83	*
24Mbps	11.15	
36Mbps	11.74	
48Mbps	11.27	
54Mbps	11.66	

* : Worst Rate
All comparison were performed on the same measurement condition.

3) IEEE 802.11n

Test Date: May 16, 2017
Temp.: 26 °C, Humi: 43 %

Data Rate : MCS5

Transmitting Frequency		Correction Factor	Meter Reading	Conducted Peak Output Power		Limits	Margin
CH	[MHz]	[dB]	[dBm]	[dBm]	[mW]	[dBm]	[dB]
11	2462	10.15	12.14	22.29	169.43	30.00	+ 7.71

Calculated result at 2462.000 MHz, as the worst point shown on underline:

	Correction Factor	=	10.15 dB
+)	Meter Reading	=	12.14 dBm
	Result	=	22.29 dBm = 169.43 mW

Minimum Margin: 30.00 - 22.29 = 7.71 (dB)

NOTES
1. The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.
2. Setting of measuring instrument(s) :

Detector Function	Video B.W.
Peak	OFF

CH	[MHz]
06	2437

Rate	Meter Reading [dBm]	Remark
MCS0	11.35	
MCS1	11.67	
MCS2	11.68	
MCS3	11.62	
MCS4	11.75	
MCS5	12.14	*
MCS6	11.79	
MCS7	11.27	

* : Worst Rate
All comparison were performed on the same measurement condition.

4) Bluetooth LE(Modulation type : GFSK)

Test Date: May 16, 2017
Temp.: 26 °C, Humi: 43 %

Transmitting Frequency		Correction Factor	Meter Reading	Conducted Peak Output Power		Limits	Margin
CH	[MHz]	[dB]	[dBm]	[dBm]	[mW]	[dBm]	[dB]
00	2402	10.15	-8.72	1.43	1.39	30.00	+28.57

Calculated result at 2402.000 MHz, as the worst point shown on underline:

	Correction Factor	=	10.15 dB
+)	Meter Reading	=	-8.72 dBm
	Result	=	1.43 dBm = 1.39 mW

Minimum Margin: 30.00 - 1.43 = 28.57 (dB)

NOTES
1. The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.
2. Setting of measuring instrument(s) :

Detector Function	Video B.W.
Peak	Off

7.6 Peak Power Density(Conduction)

For the requirements, ☑ - Applicable [☐ - Tested. ☑ - Not tested by applicant request.]
☐ - Not Applicable

7.7 Spurious Emissions(Conduction)

For the requirements, ☑ - Applicable [☐ - Tested. ☑ - Not tested by applicant request.]
☐ - Not Applicable

7.8 AC Powerline Conducted Emission

For the requirements, ☑ - Applicable [☐ - Tested. ☑ - Not tested by applicant request.]
☐ - Not Applicable

7.9 Radiated Emission

For the requirements, ☑ - Applicable [☑ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

7.9.1 Test Results

For the standard, ☑ - **Passed** ☐ - **Failed** ☐ - **Not judged**

Min. Limit Margin (Average) 9.8 dB at 2390.0 MHz

Uncertainty of Measurement Results

9 kHz – 30 MHz	± 3.0	dB(2σ)
30 MHz – 300 MHz	± 3.8	dB(2σ)
300 MHz – 1000 MHz	± 4.8	dB(2σ)
1 GHz – 6 GHz	± 4.7	dB(2σ)
6 GHz – 18 GHz	± 4.6	dB(2σ)
18 GHz – 40 GHz	± 5.5	dB(2σ)

Remarks : IEEE802.11n mode, Y axis position.

7.9.2 Test Instruments

Anechoic Chamber A2				
Type	**Model**	**Serial No. (ID)**	**Manufacturer**	**Cal. Due**
Test Receiver	ESU 26	100170 (A-6)	Rohde & Schwarz	2018/02/28
Loop Antenna	HFH2-Z2	872096/25 (C-2)	Rohde & Schwarz	2017/07/21
RF Cable	RG213/U	--- (H-28)	HUBER+SUHNER	2017/07/21
Pre-Amplifier	310N	304573 (A-17)	SONOMA	2018/04/02
Biconical Antenna	VHA9103/BBA9106	2355 (C-30)	Schwarzbeck	2017/05/18
Log-periodic Antenna	UHALP9108-A1	0694 (C-31)	Schwarzbeck	2017/05/18
RF Cable	S 10162 B-11 etc.	--- (H-4)	HUBER+SUHNER	2018/04/02
Pre-Amplifier	TPA0118-36	1010 (A-37)	TOYO	2018/05/14
Horn Antenna	91888-2	562 (C-41-1)	EATON	2017/06/12
Horn Antenna	91889-2	568 (C-41-2)	EATON	2017/06/12
Horn Antenna	3160-04	9903-1053 (C-55)	EMCO	2017/06/13
Horn Antenna	3160-05	9902-1061 (C-56)	EMCO	2017/06/13
Horn Antenna	3160-06	9712-1045 (C-57)	EMCO	2017/06/13
Horn Antenna	3160-07	9902-1113 (C-58)	EMCO	2017/06/13
Horn Antenna	3160-08	9904-1099 (C-59)	EMCO	2017/06/13
Horn Antenna	3160-09	9808-1117 (C-48)	EMCO	2017/06/15
Attenuator	54A-10	W5713 (D-29)	Weinschel	2017/06/13
Attenuator	2-10	BA6214 (D-79)	Weinschel	2017/06/15
RF Cable	SUCOFLEX104	267479/4 (C-66)	HUBER+SUHNER	2017/08/02
RF Cable	SUCOFLEX104	267414/4 (C-67)	HUBER+SUHNER	2017/11/21
RF Cable	SUCOFLEX102EA	3041/2EA (C-69)	HUBER+SUHNER	2018/01/10
Band Rejection Filter	BRM50701	029 (D-93)	MICRO-TRONICS	2018/01/10

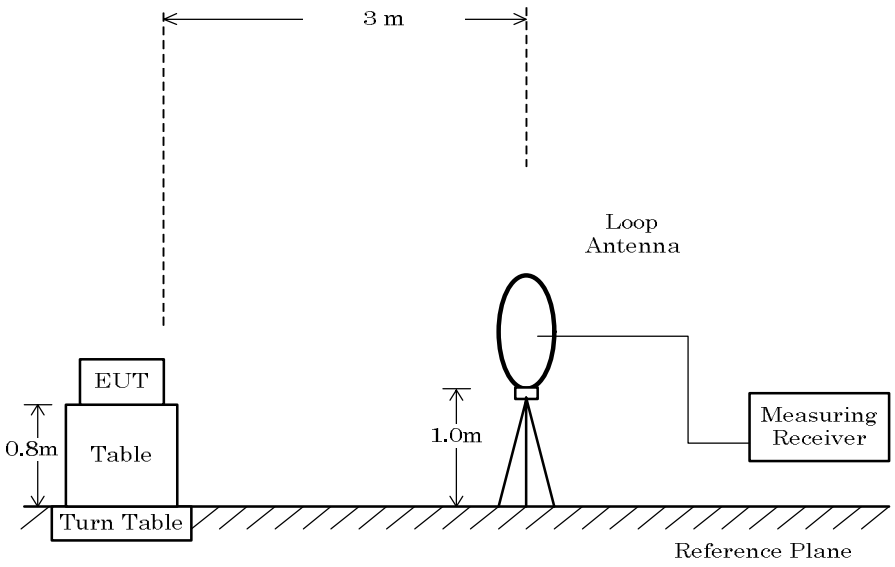
NOTE : The calibration interval of the above test instruments is 12 months.

7.9.3 Test Method and Test Setup (Diagrammatic illustration)

7.9.3.1 Radiated Emission 9 kHz – 30 MHz

The preliminary tests were performed at the measurement distance that specified for compliance to determine the emission characteristics of the EUT.
The EUT configuration(in X, Y and Z axis), cable configuration and mode of operation were determined for producing the maximum level of emissions.
The measurement were performed about three antenna orientations (parallel, perpendicular, and ground-parallel).
According to KDB 414788, a used anechoic chamber were equivalent to those on an open fields site based on comparison measurements.
This configurations was used for the final tests.

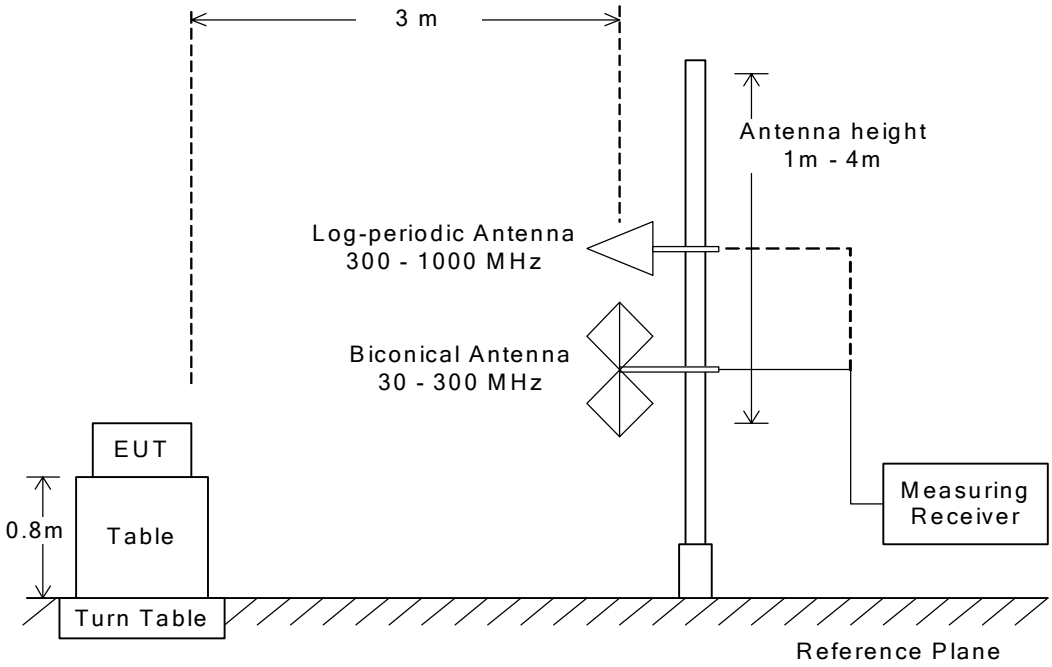
– Side View –



7.9.3.2 Radiated Emission 30 MHz – 1000 MHz

The preliminary tests were performed at the measurement distance that specified for compliance to determine the emission characteristics of the EUT.
The EUT configuration(in X, Y and Z axis), cable configuration and mode of operation were determined for producing the maximum level of emissions.
This configurations was used for the final tests.

– Side View –



7.9.3.3 Radiated Emission above 1 GHz

The preliminary tests were performed at the measurement distance that specified for compliance to determine the emission characteristics of the EUT.
The EUT configuration(in X, Y and Z axis), cable configuration and mode of operation were determined for producing the maximum level of emissions.
This configurations was used for the final tests.

The setting of the measuring instruments are shown as follows:

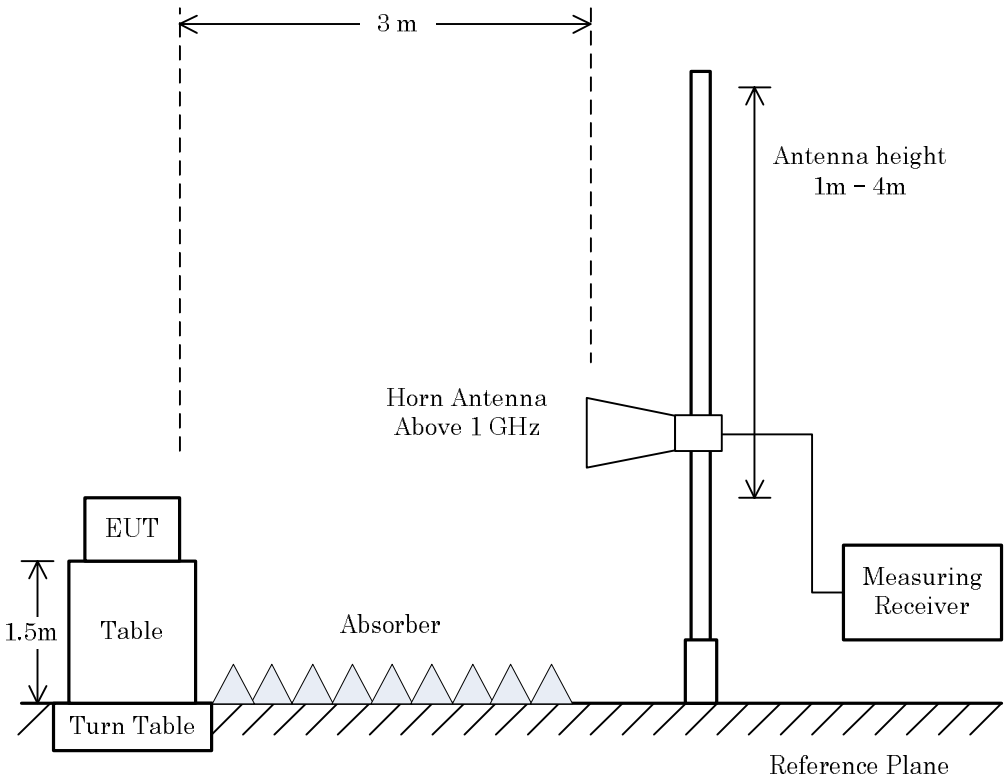
Type	Peak	Average
Detector Function	Peak	Peak
Res. Bandwidth	1 MHz	1 MHz
Video Bandwidth	3 MHz	≥ 1/T *1)
Video Filtering	Linear Voltage	Linear Voltage
Sweep Time	AUTO	AUTO
Trace	Max Hold	Max Hold

Note: 1. T: Minimum transmission duration

Average (VBW) Setting:

Mode	Interval (msec)	Cycle (msec)	Duty cycle (%)	Burst on period(T) (msec)	Min. VBW(1/T) (kHz)	VBW Setting (kHz)
IEEE802.11b(11Mbps)	0.02	0.94	97.9%	0.92	1.09	2.00
IEEE802.11g(18Mbps)	0.02	0.49	95.9%	0.47	2.13	3.00
IEEE802.11n(52Mbps(MCS5))	0.02	0.21	90.5%	0.19	5.26	10.00
Bluetooth LE	0.23	0.63	63.5%	0.40	2.50	3.00

– Side View –



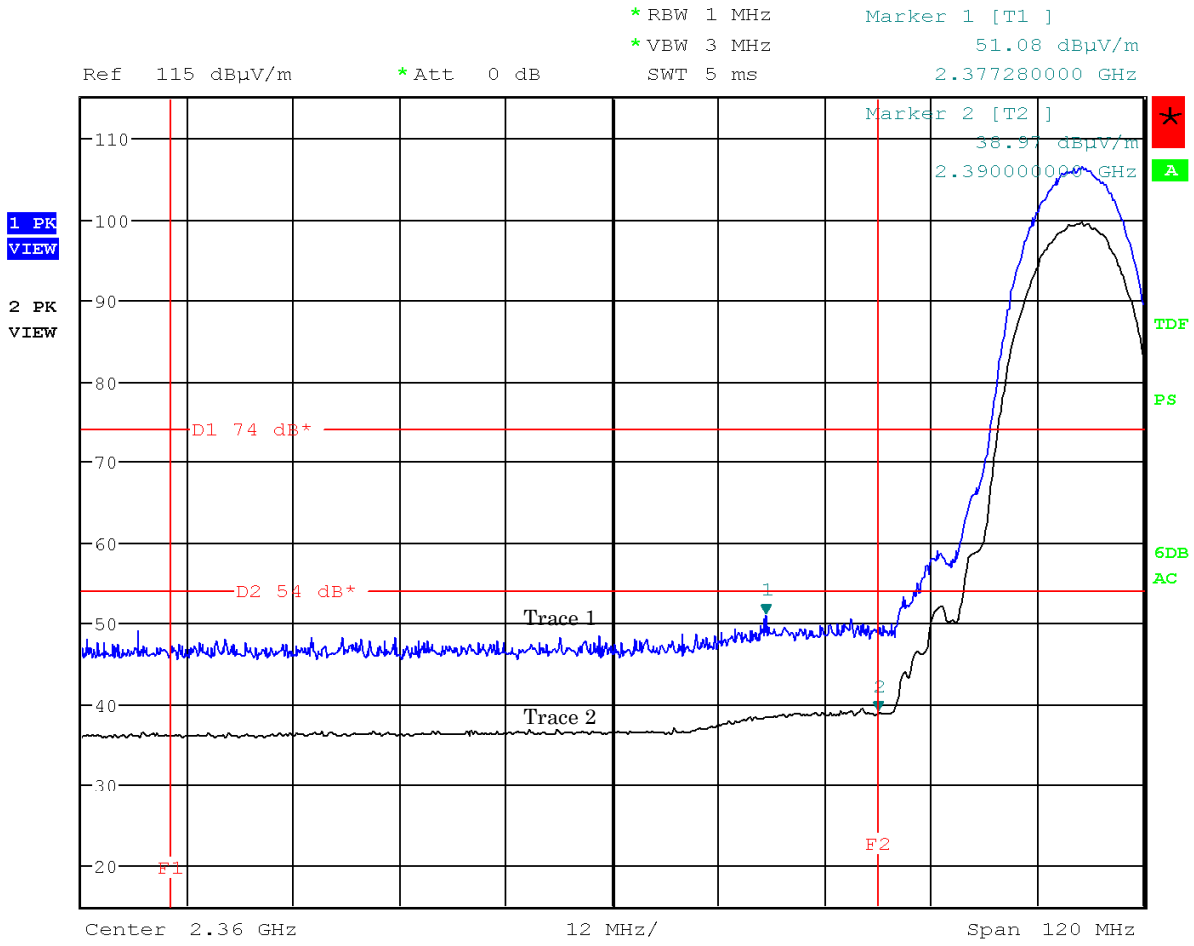
NOTE
When the EUT is manipulated through three different orientations, the scan height upper range for the measurement antenna is limited to 2.5 m or 0.5 m above the top of the EUT.

7.9.4 Test Data

7.9.4.1 Band-edge Compliance

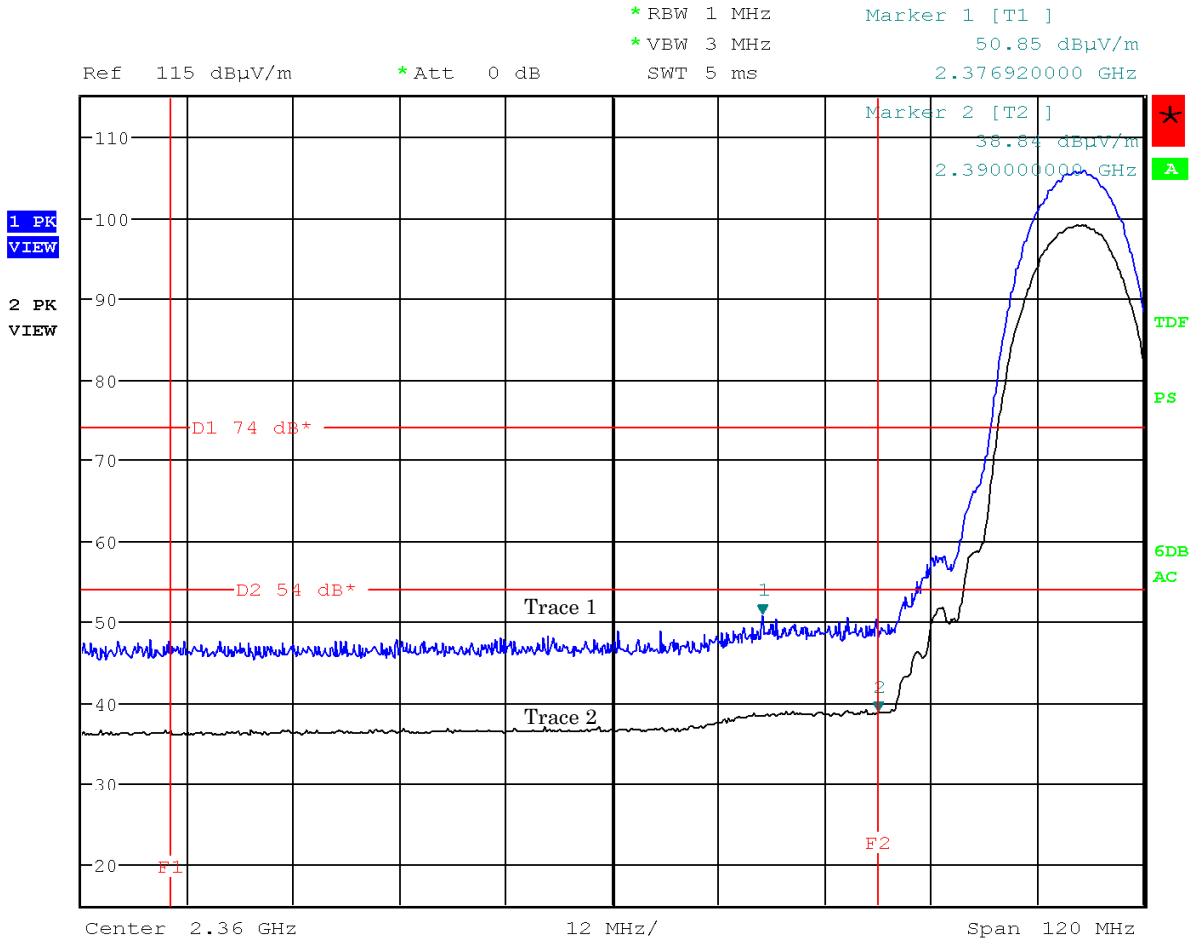
Test Date :May 19, 2017
Temp.:23°C, Humi:37%

Mode of EUT : 1ch: 2412 MHz, (IEEE 802.11b)
Antenna Polarization : Horizontal



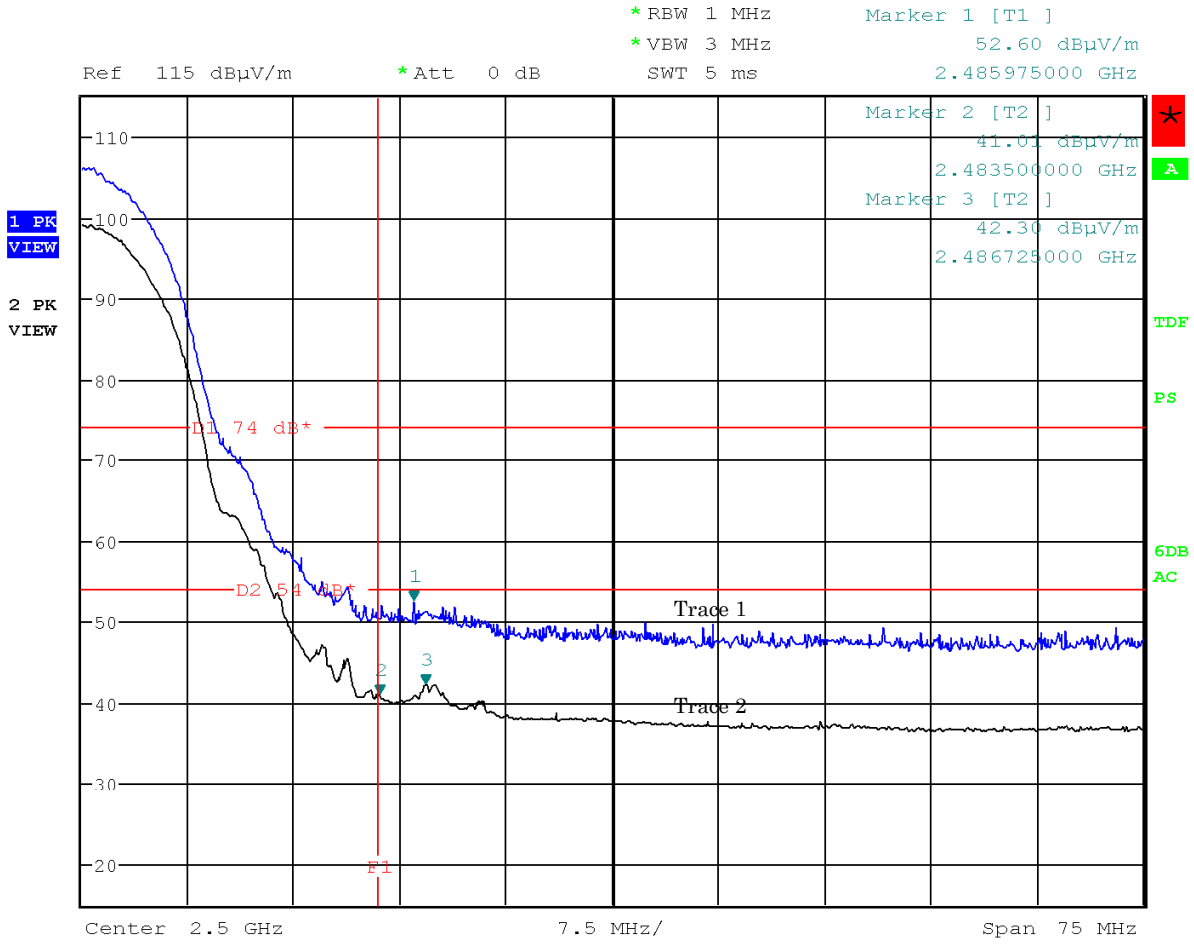
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : 1ch: 2412 MHz, (IEEE 802.11b)
Antenna Polarization : Vertical



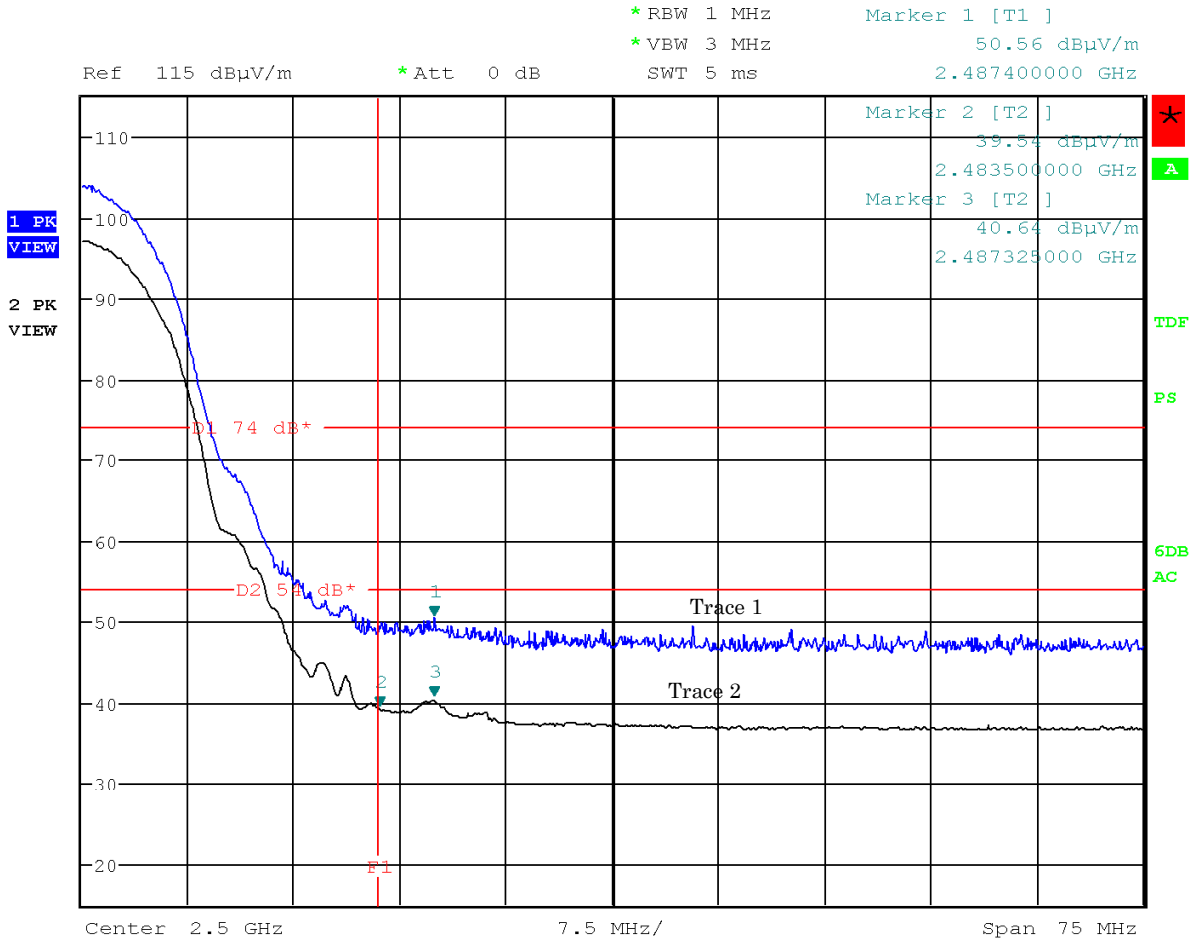
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : 11ch: 2462 MHz, (IEEE 802.11b)
Antenna Polarization : Horizontal



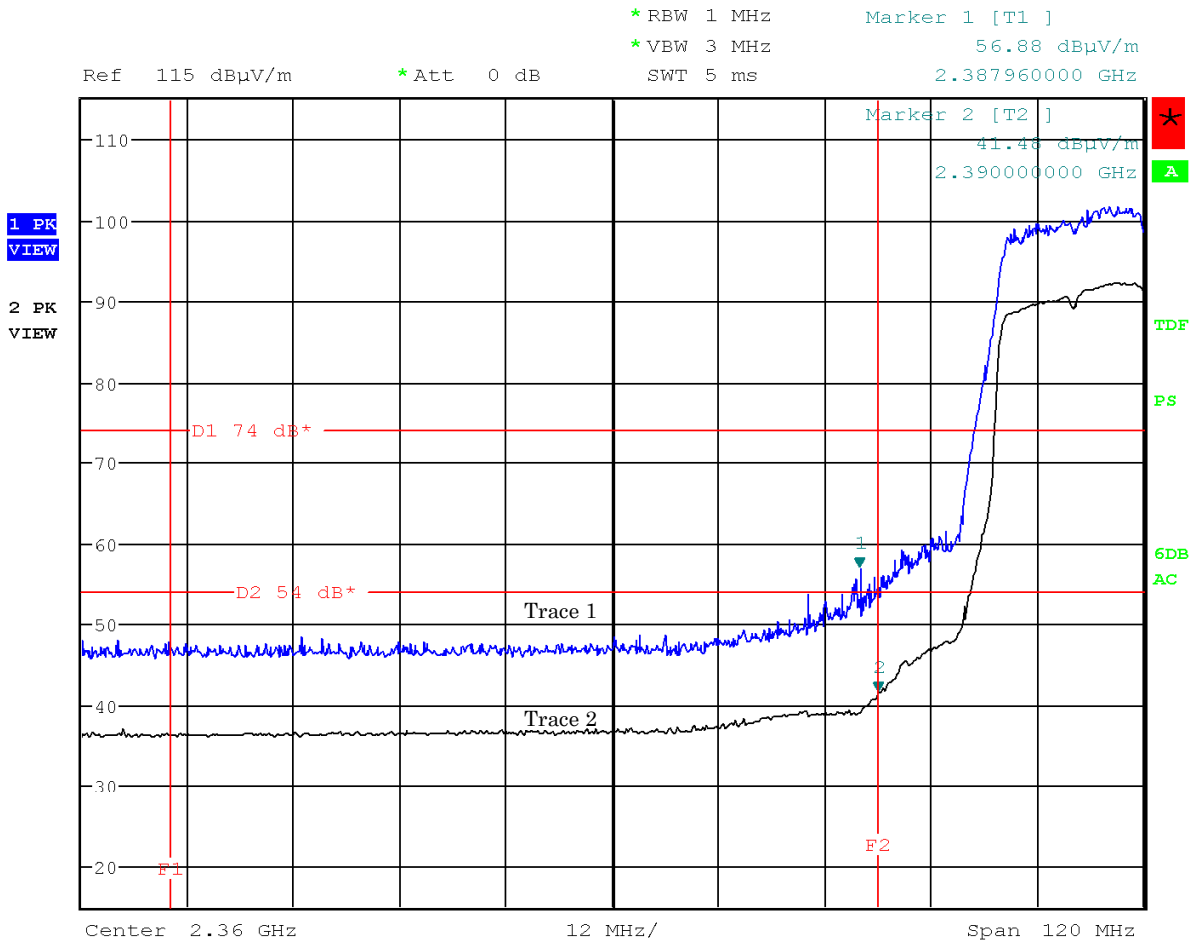
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : 11ch: 2462 MHz, (IEEE 802.11b)
Antenna Polarization : Vertical



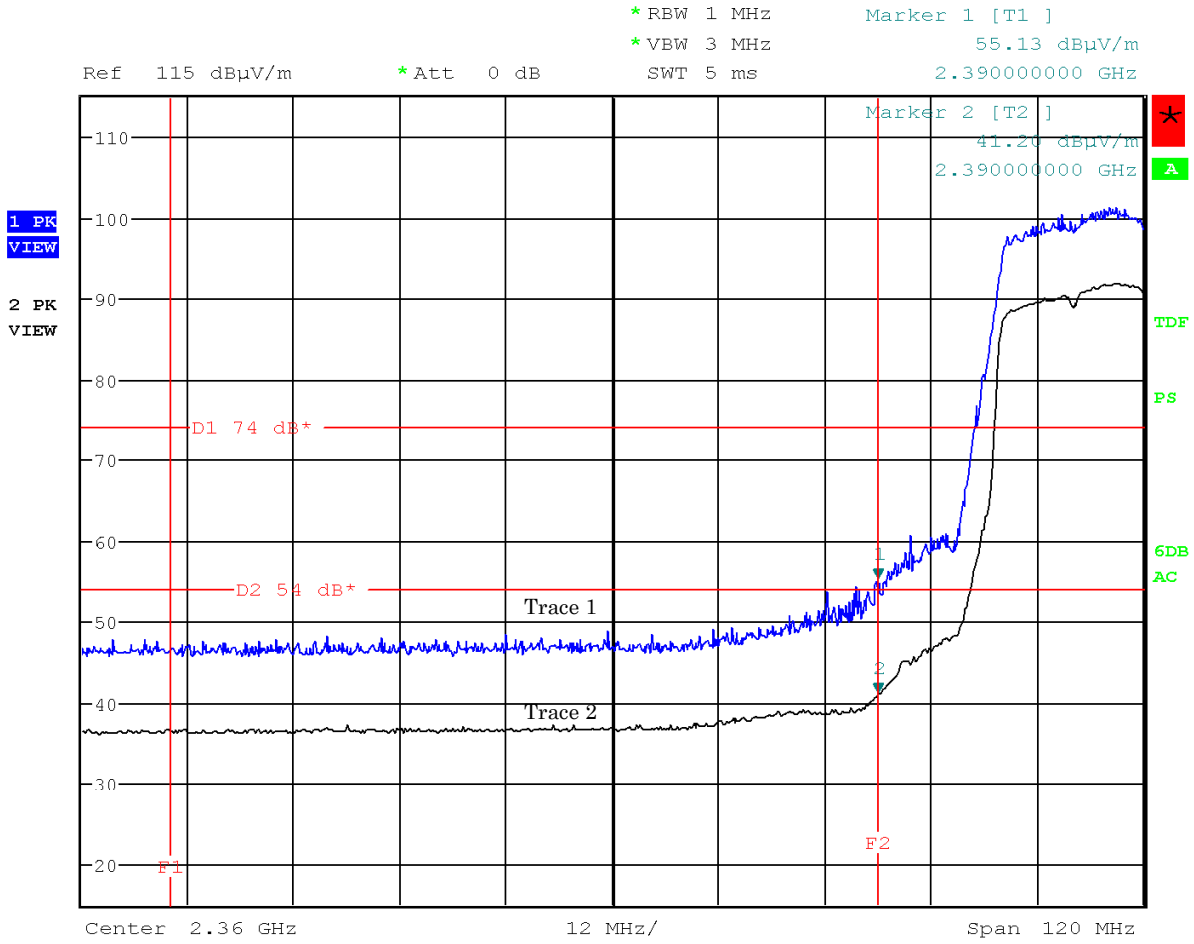
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : 1ch: 2412 MHz, (IEEE 802.11g)
Antenna Polarization : Horizontal



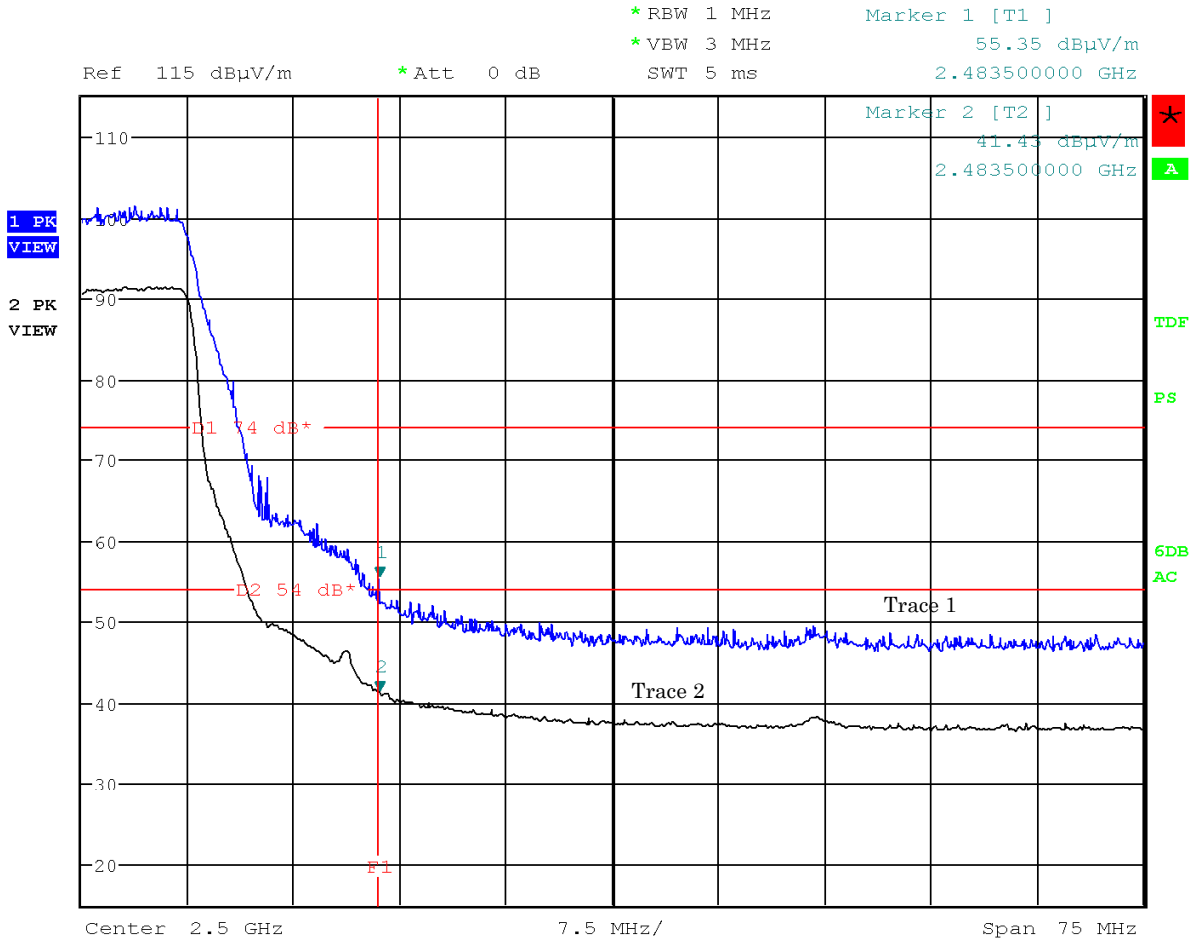
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : 1ch: 2412 MHz, (IEEE 802.11g)
Antenna Polarization : Vertical



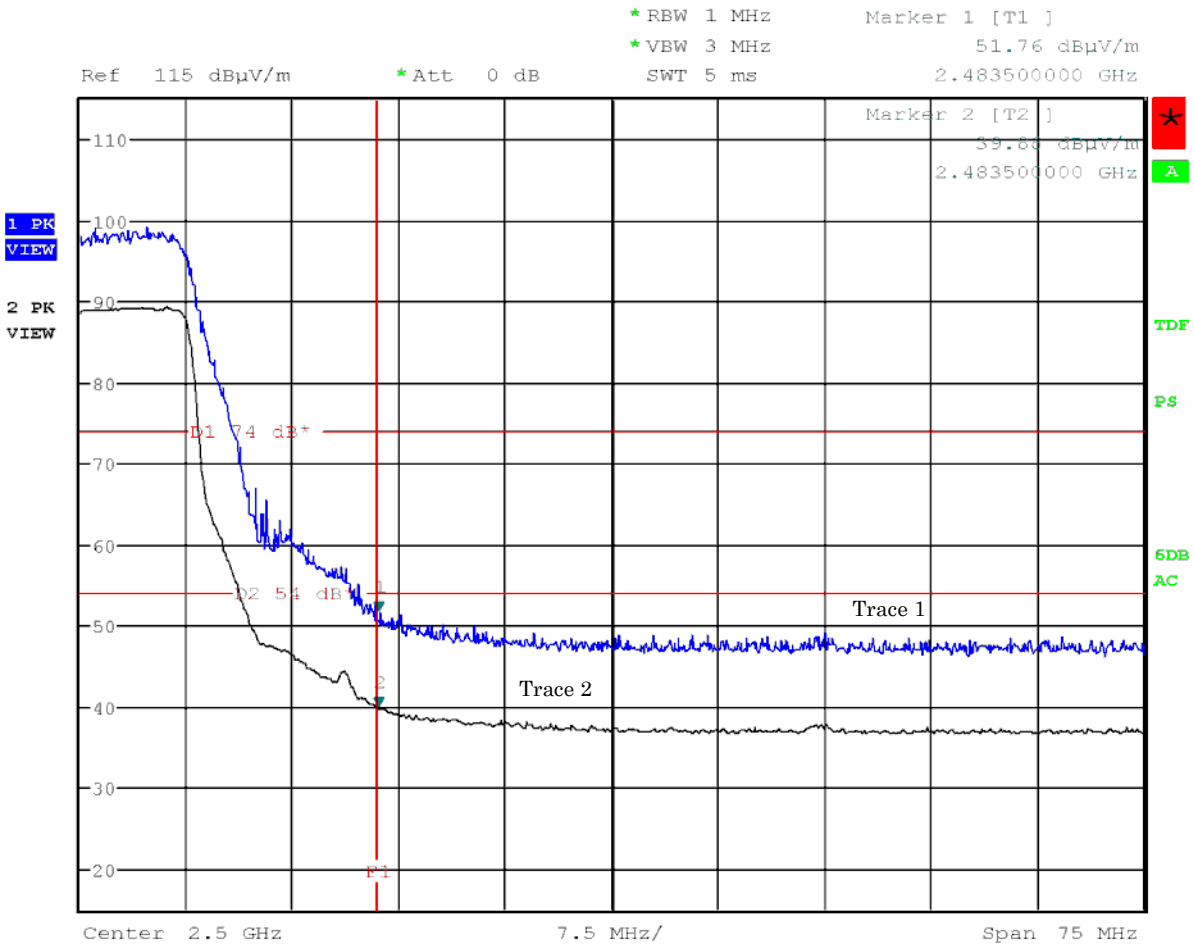
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : 11ch: 2462 MHz, (IEEE 802.11g)
Antenna Polarization : Horizontal



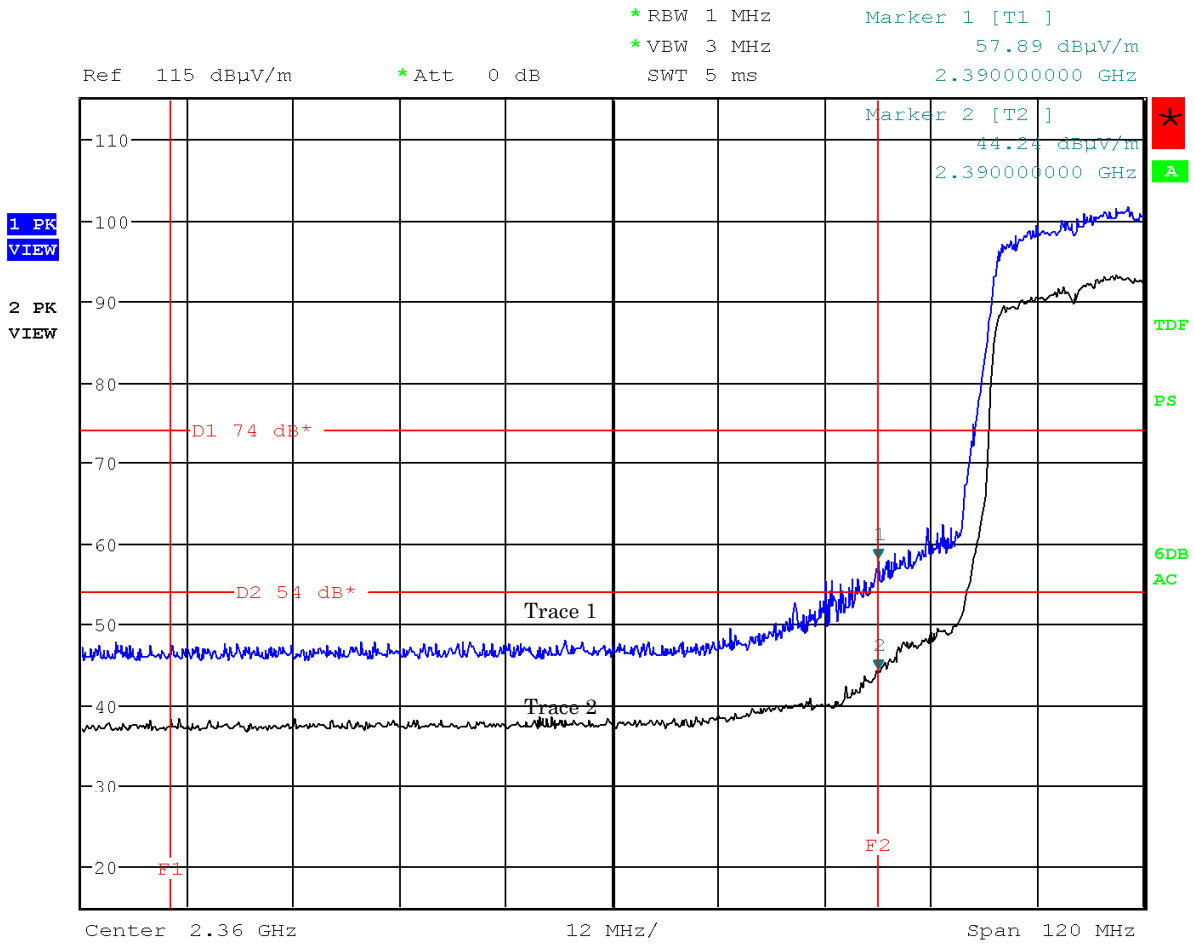
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : 11ch: 2462 MHz, (IEEE 802.11g)
Antenna Polarization : Vertical



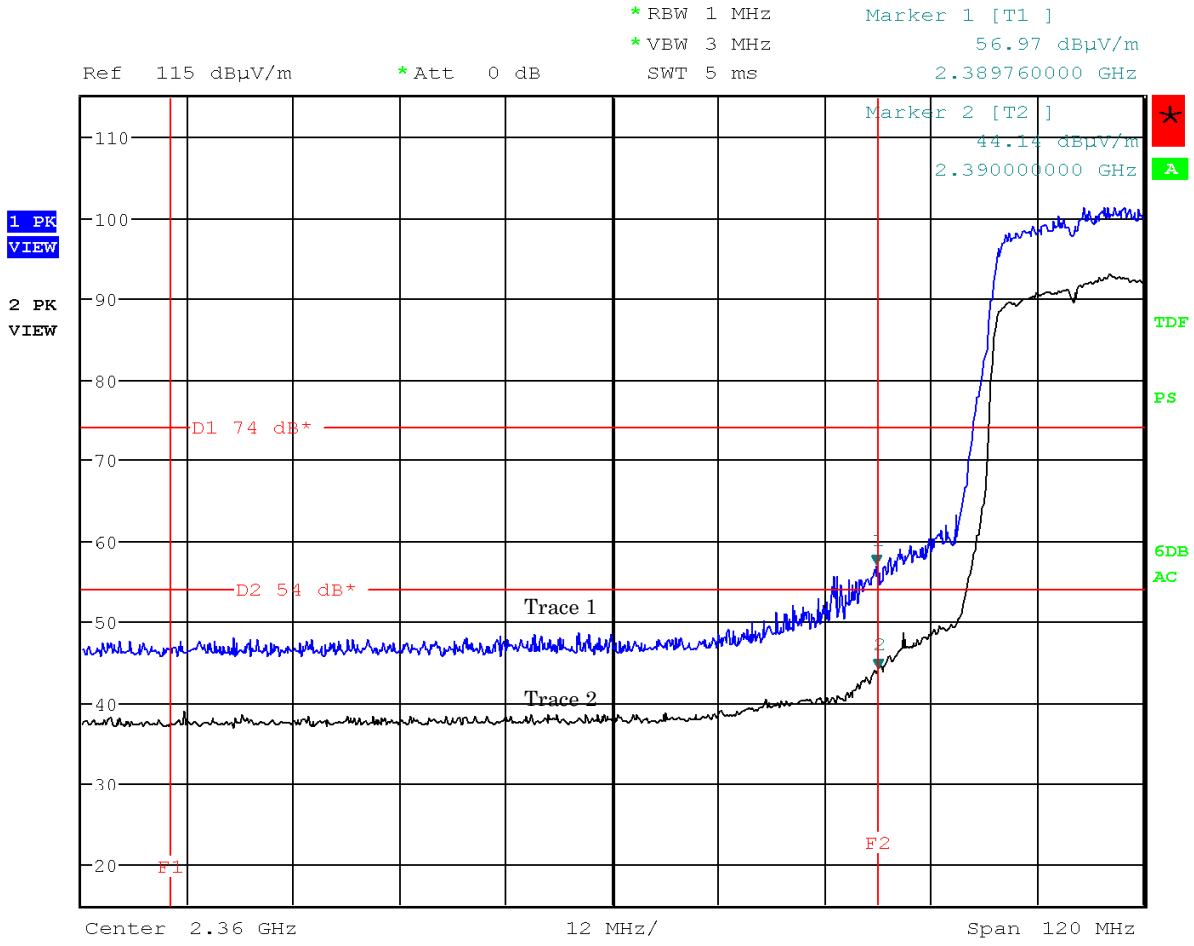
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : 1ch: 2412 MHz, (IEEE 802.11n)
Antenna Polarization : Horizontal



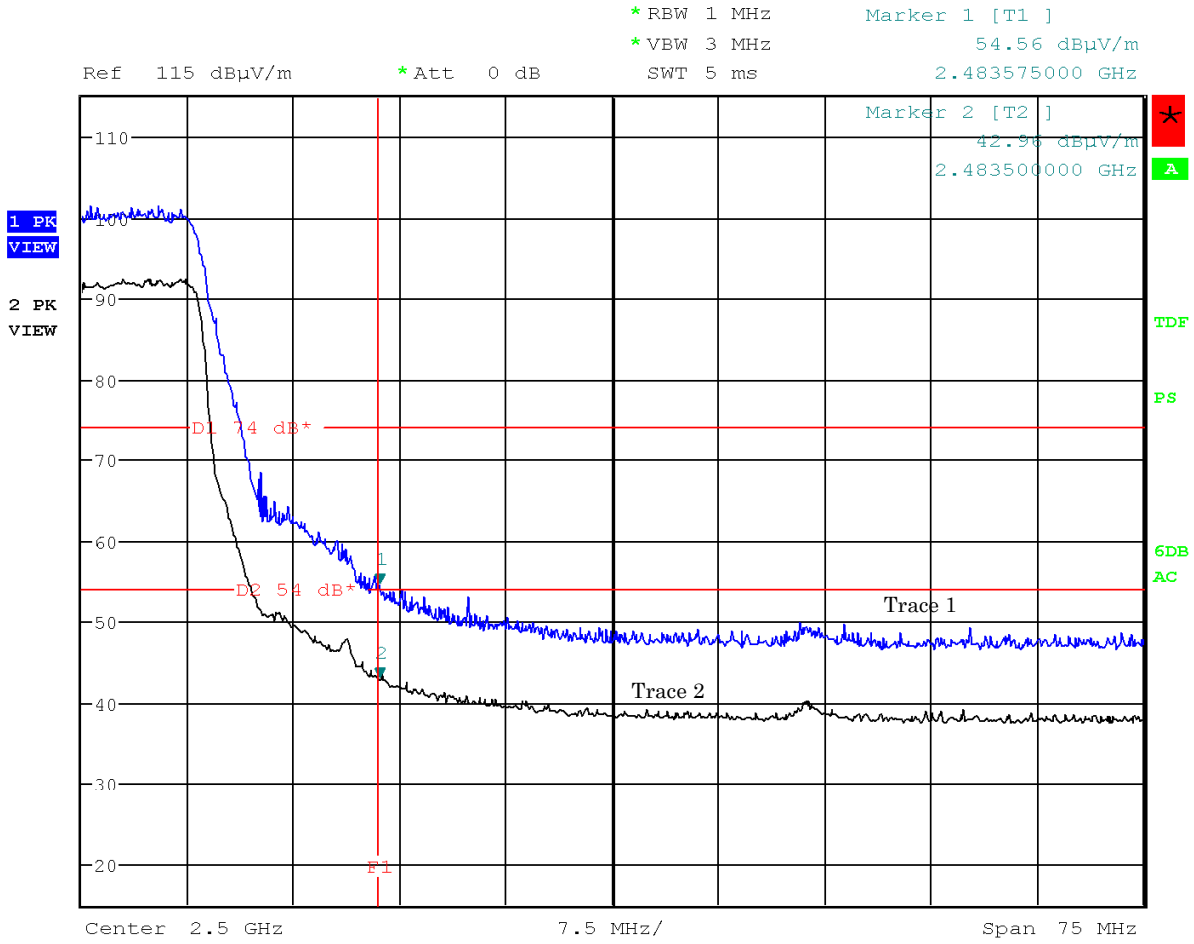
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : 1ch: 2412 MHz, (IEEE 802.11n)
Antenna Polarization : Vertical



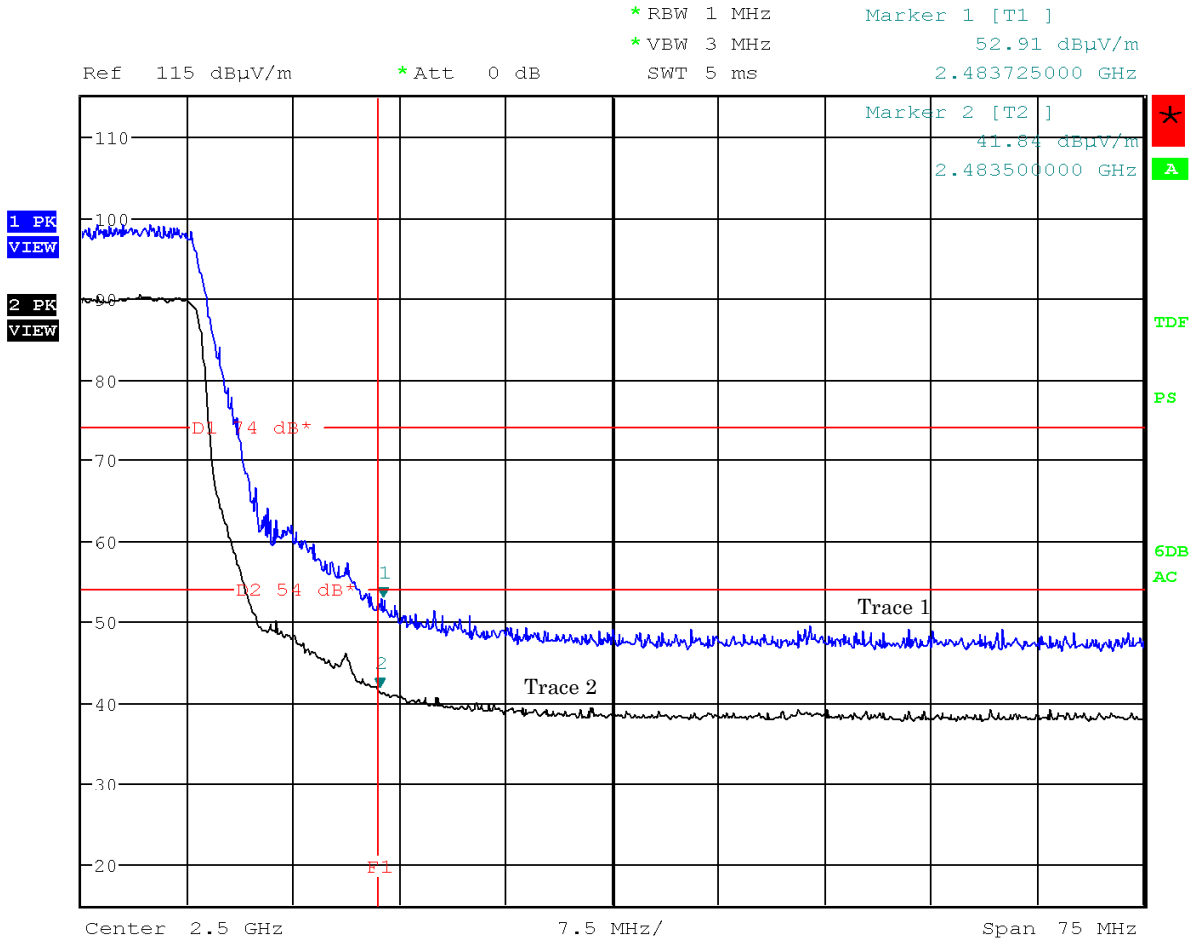
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : 11ch: 2462 MHz, (IEEE 802.11n)
Antenna Polarization : Horizontal



Note: The trace 1 is Peak . The trace 2 is Average.

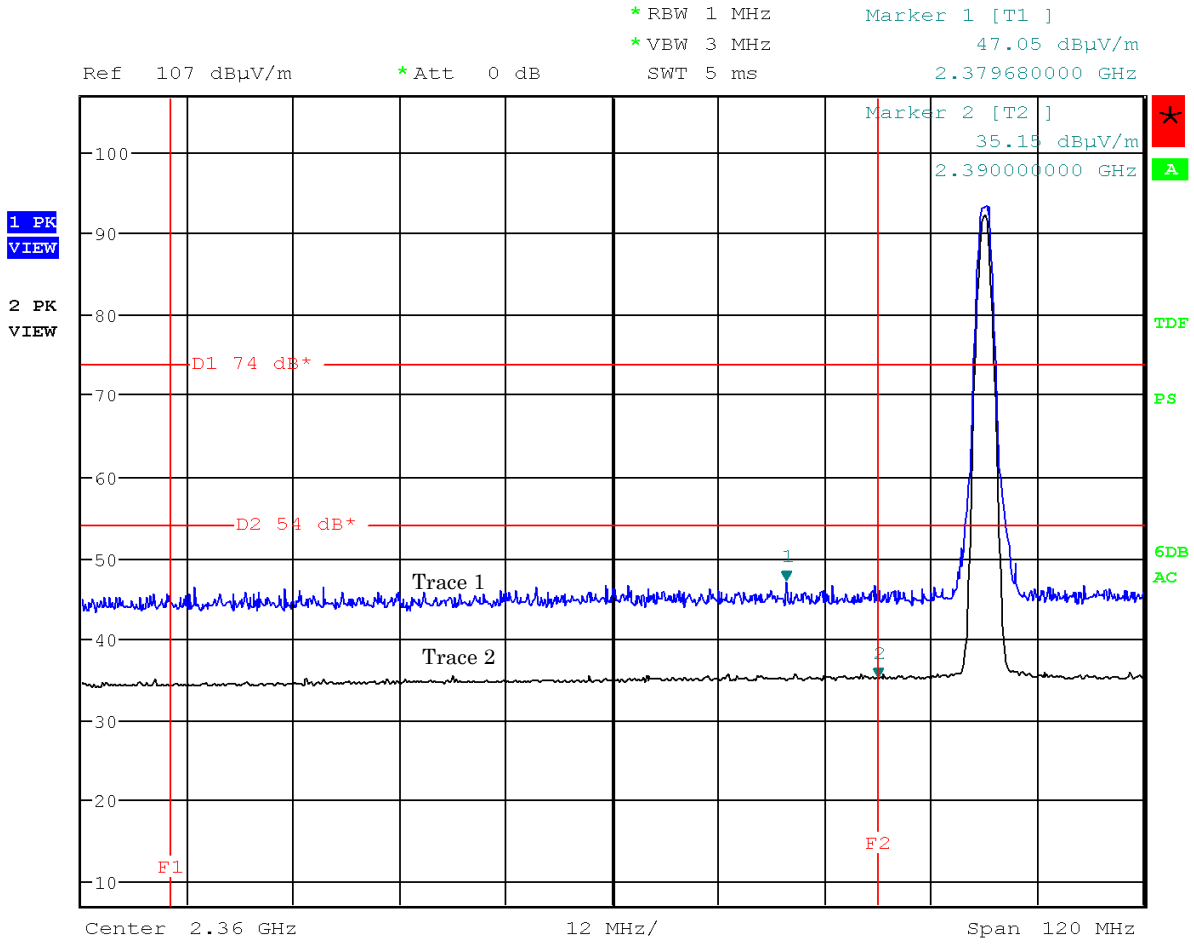
Mode of EUT : 11ch: 2462 MHz, (IEEE 802.11n)
Antenna Polarization : Vertical



Note: The trace 1 is Peak . The trace 2 is Average.

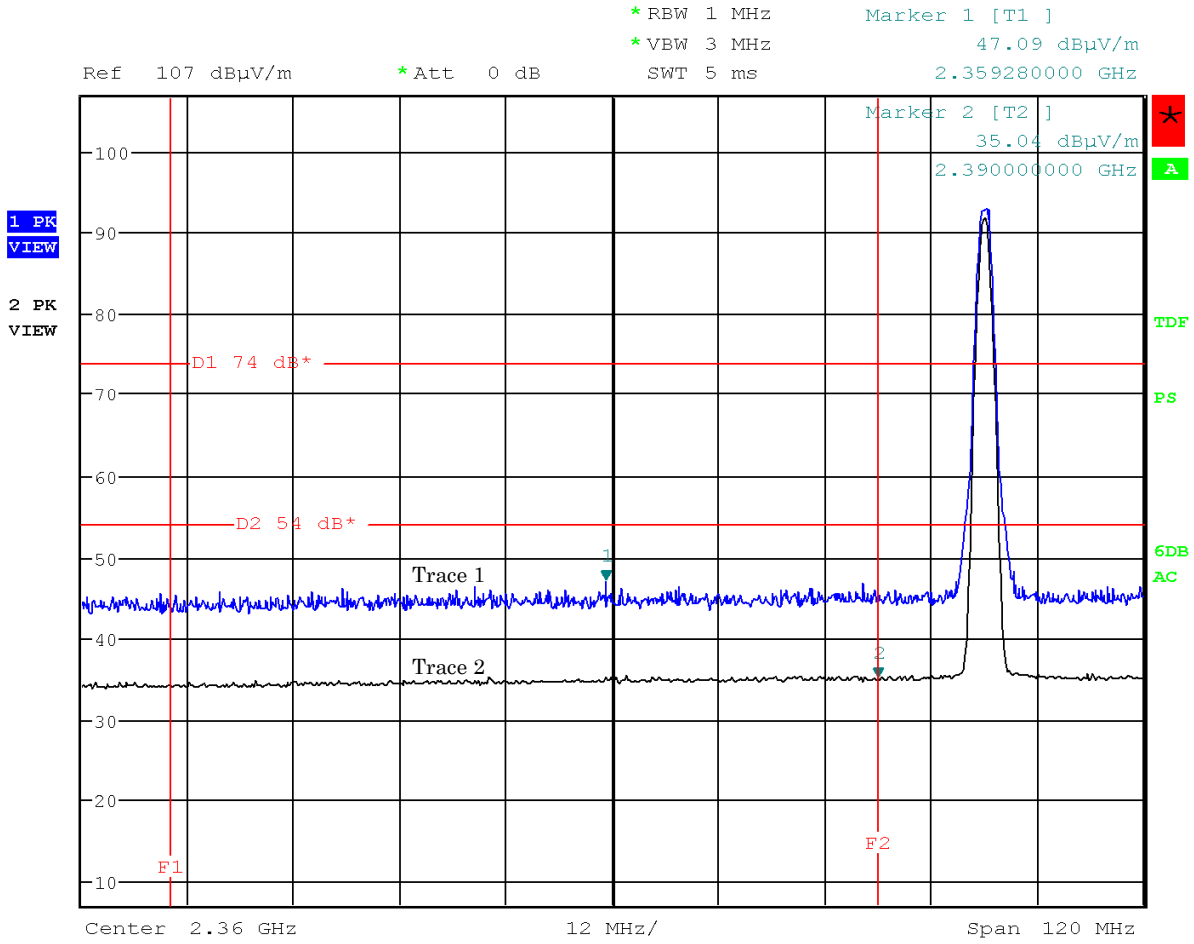
Test Date :May 22, 2017
Temp.:25°C, Humi:49%

Mode of EUT : Bluetooth Low Energy, Hopping off (0ch: 2402 MHz)
Antenna Polarization : Horizontal



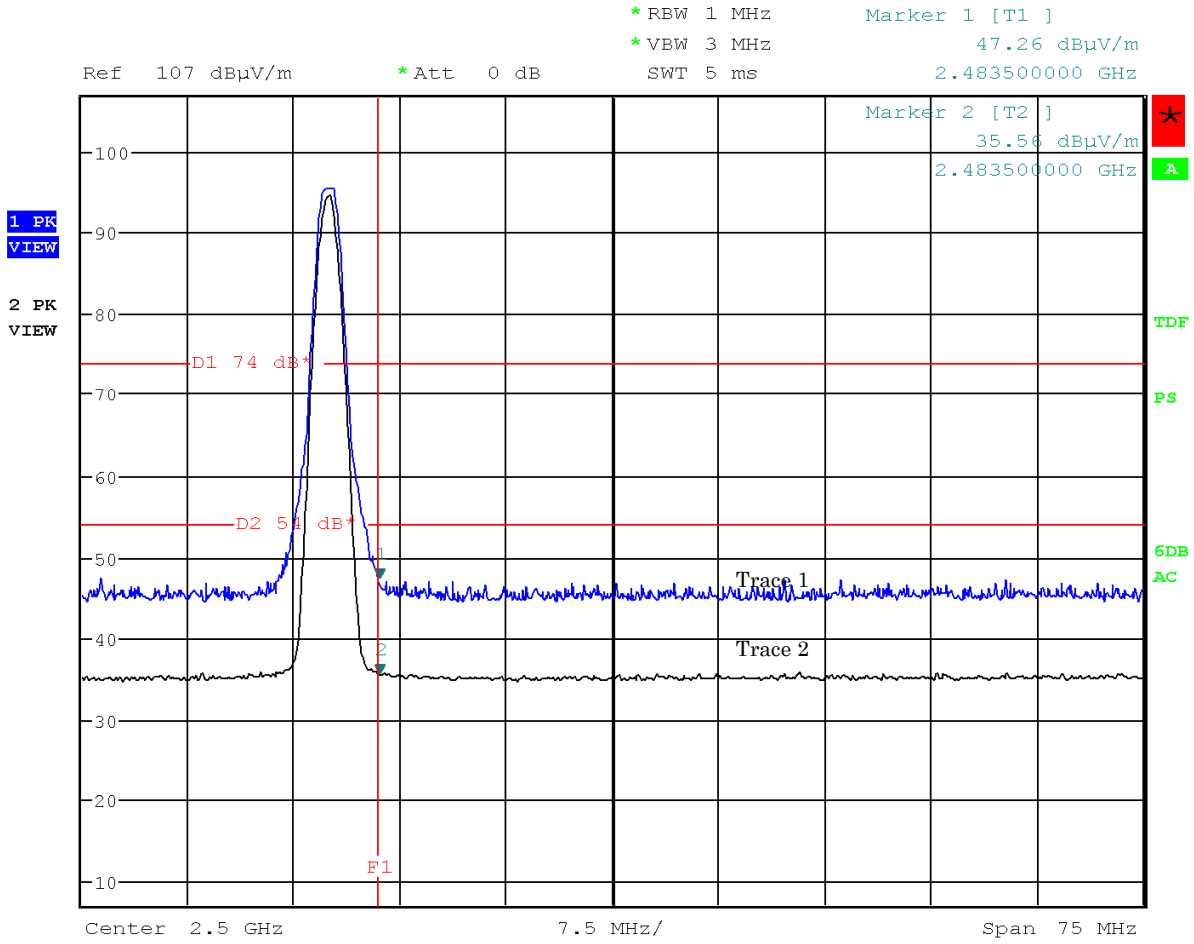
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : Bluetooth Low Energy, Hopping off (0ch: 2402 MHz)
Antenna Polarization : Vertical



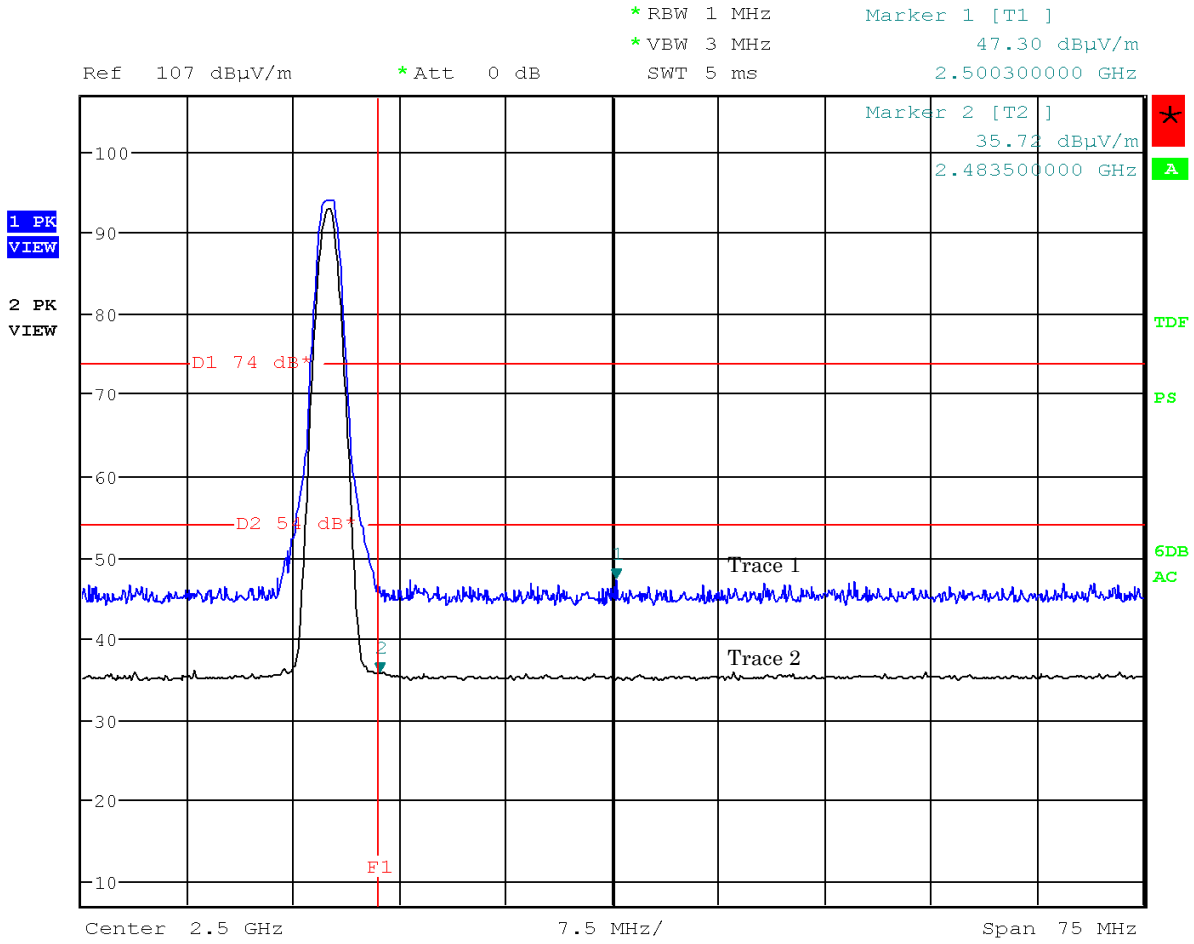
Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : Bluetooth Low Energy, Hopping off (39ch: 2480 MHz)
Antenna Polarization : Horizontal



Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : Bluetooth Low Energy, Hopping off (39ch: 2480 MHz)
Antenna Polarization : Vertical



Note: The trace 1 is Peak . The trace 2 is Average.

7.9.4.2 Other Spurious Emission (9kHz – 30MHz)

Test Date :May 18, 2017
Temp.:23°C, Humi:43%

Mode of EUT : WLAN/Bluetooth LE
Results : No spurious emissions in the range 20dB below the limit.

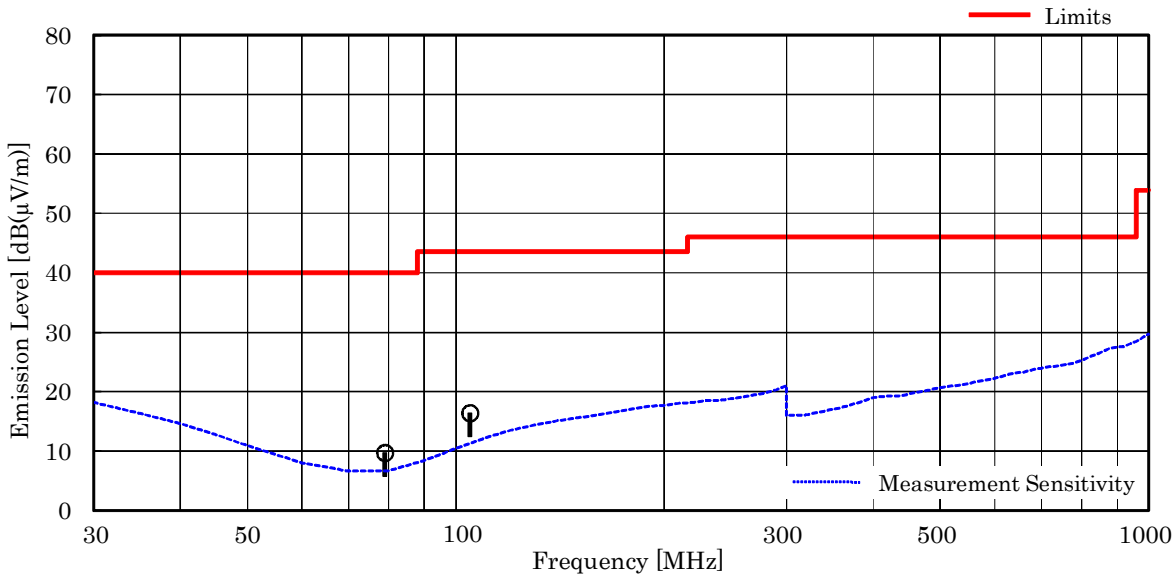
7.9.4.3 Other Spurious Emission (30MHz – 1000MHz)

Mode of EUT : (WLAN) All modes have been investigated and the worst case mode for channel (06ch: 2437MHz / IEEE802.11b, IEEE802.11g and IEEE802.11n) has been listed.

Test Date: May 18, 2017
Temp.: 23 °C, Humi: 43 %

Antenna pole : Horizontal

Frequency [MHz]	Antenna Factor [dB(1/m)]	Corr. Factor [dB]	Meter Readings [dB(μV)]	Limits [dB(μV/m)]	Results [dB(μV/m)]	Margin [dB]	Remarks
78.99	6.5	-26.9	30.1	40.0	9.7	+30.3	-
104.82	11.0	-26.6	32.0	43.5	16.4	+27.1	-

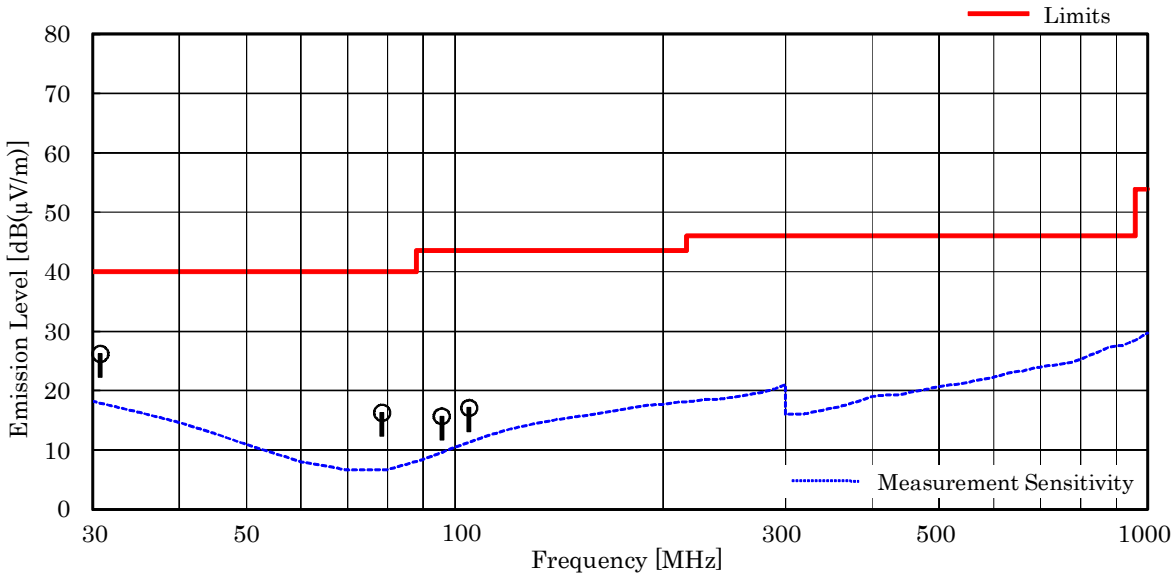


NOTES
1. Test Distance : 3 m
2. The spectrum was checked from 30 MHz to 1000 MHz.
3. The correction factor is composed of cable loss, pad attenuation and/or amplifier gain.
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. Calculated result at 104.82 MHz, as the worst point shown on underline:
   Antenna Factor + Correction Factor + Meter Reading = 11.0 + (-26.6) + 32.0 = 16.4 dB(μV/m)
   Antenna Height : 177 cm, Turntable Angle : 241 °
7. Test receiver setting(s) : CISPR QP 120 kHz [QP : Quasi-Peak]

Test Date: May 18, 2017
Temp.: 23 °C, Humi: 43 %

Antenna pole : Vertical

Frequency [MHz]	Antenna Factor [dB(1/m)]	Corr. Factor [dB]	Meter Readings [dB(μV)]	Limits [dB(μV/m)]	Results [dB(μV/m)]	Margin [dB]	Remarks
30.75	18.5	-27.6	35.3	40.0	26.2	+13.8	-
78.46	6.5	-26.9	36.7	40.0	16.3	+23.7	-
95.66	9.3	-26.7	33.1	43.5	15.7	+27.8	-
104.82	11.0	-26.6	32.7	43.5	17.1	+26.4	-



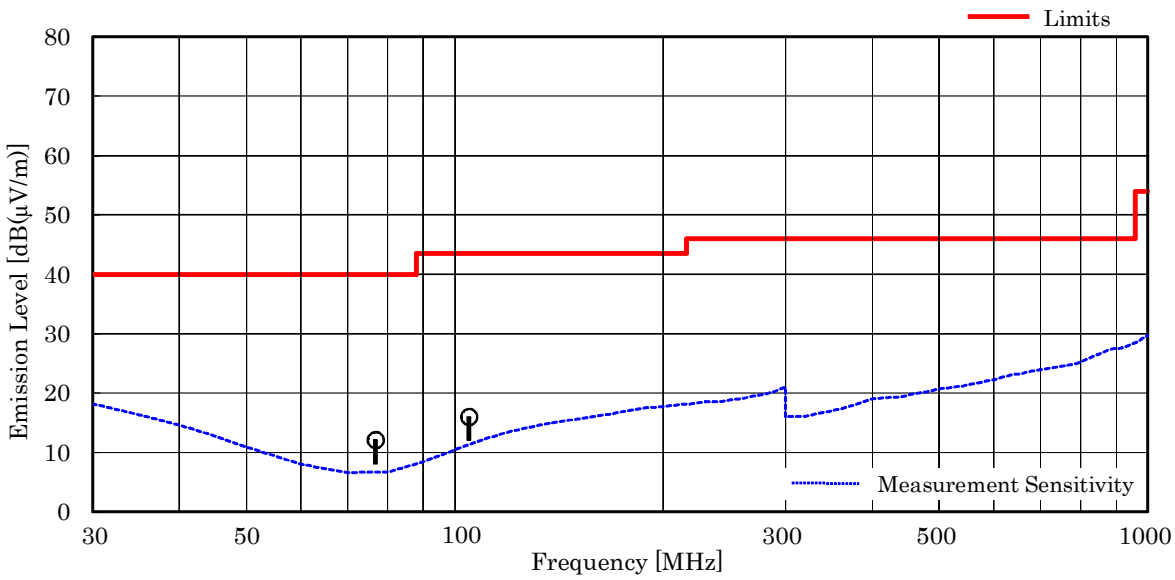
NOTES
1. Test Distance : 3 m
2. The spectrum was checked from 30 MHz to 1000 MHz.
3. The correction factor is composed of cable loss, pad attenuation and/or amplifier gain.
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. Calculated result at 30.75 MHz, as the worst point shown on underline:
   Antenna Factor + Correction Factor + Meter Reading = 18.5 + (-27.6) + 35.3 = 26.2 dB(μV/m)
   Antenna Height : 100 cm, Turntable Angle : 28 °
7. Test receiver setting(s) : CISPR QP 120 kHz [QP : Quasi-Peak]

Mode of EUT : Bluetooth Low Energy

Test Date: May 18, 2017
Temp.: 23 °C, Humi: 43 %

Antenna pole : Horizontal

Frequency [MHz]	Antenna Factor [dB(1/m)]	Corr. Factor [dB]	Meter Readings [dB(μV)]	Limits [dB(μV/m)]	Results [dB(μV/m)]	Margin [dB]	Remarks
76.82	6.4	-26.9	32.6	40.0	12.1	+27.9	-
104.82	11.0	-26.6	31.6	43.5	16.0	+27.5	-

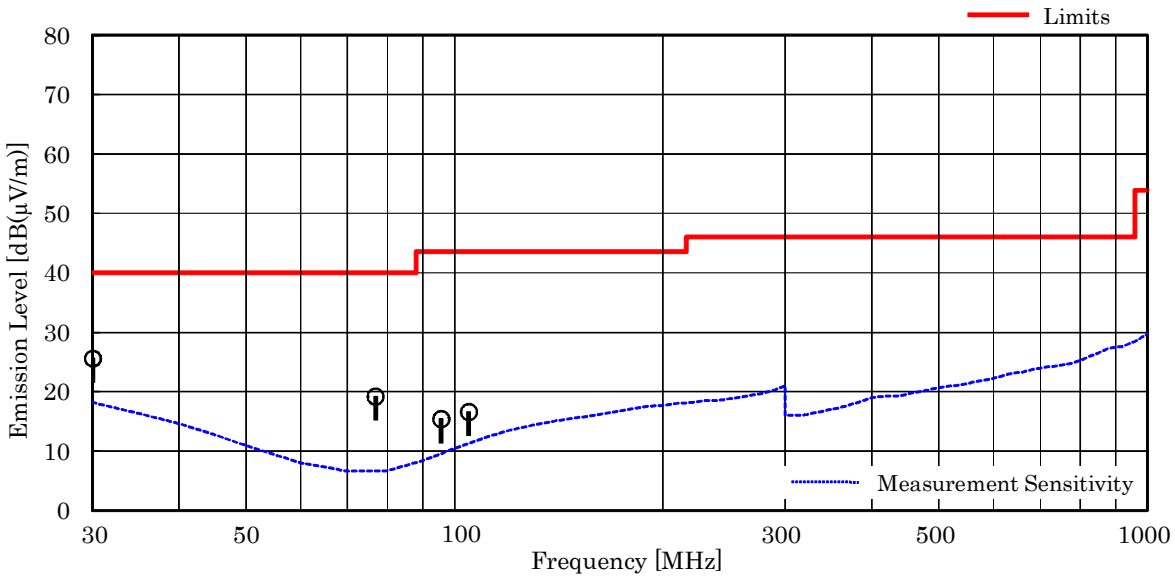


NOTES
1. Test Distance : 3 m
2. The spectrum was checked from 30 MHz to 1000 MHz.
3. The correction factor is composed of cable loss, pad attenuation and/or amplifier gain.
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. Calculated result at 104.82 MHz, as the worst point shown on underline:
   Antenna Factor + Correction Factor + Meter Reading = 11.0 + (-26.6) + 31.6 = 16.0 dB(μV/m)
   Antenna Height : 174 cm, Turntable Angle : 235 °
7. Test receiver setting(s) : CISPR QP 120 kHz [QP : Quasi-Peak]

Test Date: May 18, 2017
Temp.: 23 °C, Humi: 43 %

Antenna pole : Vertical

Frequency [MHz]	Antenna Factor [dB(1/m)]	Corr. Factor [dB]	Meter Readings [dB(μV)]	Limits [dB(μV/m)]	Results [dB(μV/m)]	Margin [dB]	Remarks
30.03	18.8	-27.6	34.4	40.0	25.6	+14.4	-
76.84	6.4	-26.9	39.7	40.0	19.2	+20.8	-
95.58	9.3	-26.7	32.8	43.5	15.4	+28.1	-
104.82	11.0	-26.6	32.2	43.5	16.6	+26.9	-



NOTES
1. Test Distance : 3 m
2. The spectrum was checked from 30 MHz to 1000 MHz.
3. The correction factor is composed of cable loss, pad attenuation and/or amplifier gain.
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. Calculated result at 30.03 MHz, as the worst point shown on underline:
   Antenna Factor + Correction Factor + Meter Reading = 18.8 + (-27.6) + 34.4 = 25.6 dB(μV/m)
   Antenna Height : 100 cm, Turntable Angle : 346 °
7. Test receiver setting(s) : CISPR QP 120 kHz [QP : Quasi-Peak]

7.9.4.4 Other Spurious Emission (Above 1000MHz)

Mode of EUT : IEEE802.11b

Test Date: May 22, 2017
Temp.: 25 °C, Humi: 49 %

Frequency [MHz]	Antenna Factor [dB(1/m)]	Corr. Factor [dB]	Meter Readings [dB(μV)] Horizontal PK	Horizontal AVE	Vertical PK	Vertical AVE	Limits [dB(μV/m)] PK	Limits AVE	Results [dB(μV/m)] PK	Results AVE	Margin [dB]	Remarks
Test condition : Tx Low Ch												
4824.0	27.0	-15.8	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.2	< 39.2	> +14.8	
12060.0	33.4	-25.4	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 46.0	< 36.0	> +18.0	
14472.0	37.0	-26.1	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 48.9	< 38.9	> +15.1	
19296.0	40.5	-43.0	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.5	< 37.5	> +16.5	

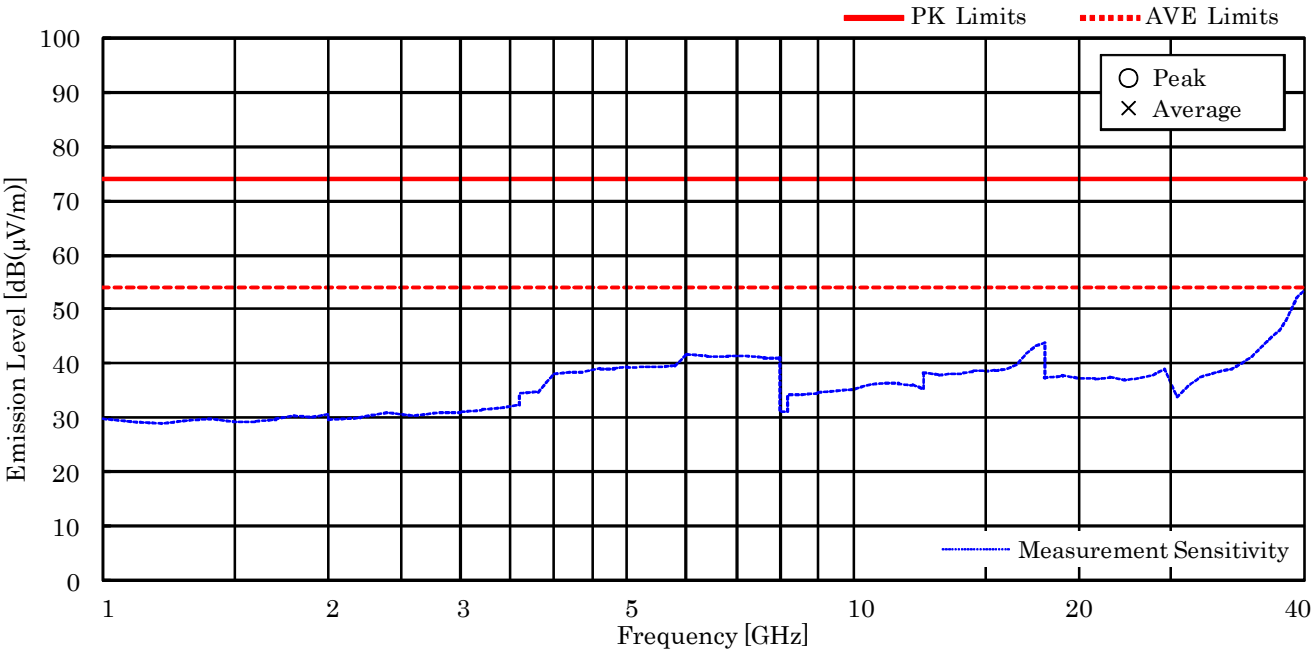
Calculated result at 4824.0 MHz, as the worst point shown on underline:

	Antenna Factor	=	27.0 dB(1/m)
	Corr. Factor	=	-15.8 dB
+)	Meter Reading	=	<28.0 dB(μV)
	Result	=	<39.2 dB(μV/m)

Minimum Margin: 54.0 - <39.2 = >14.8 (dB)

NOTES
1. Test Distance : 3 m
2. The spectrum was checked from 1 GHz to 25 GHz (10th harmonic of the highest fundamental frequency).
3. The correction factor is shown as follows:
   Corr. Factor [dB] = Cable Loss + 20dB Pad Att. - Pre-Amp. Gain [dB] (1.0 - 7.6GHz)
   Corr. Factor [dB] = Cable Loss + 10dB Pad Att. - Pre-Amp. Gain [dB] (7.6 - 18.0GHz)
   Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain [dB] (over 18 GHz)
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. PK : Peak / AVE : Average

Mode of EUT : IEEE802.11b
TX Low ch (Horizontal/Vertical)



Mode of EUT : IEEE802.11g

Test Date: May 22, 2017
Temp.: 25 °C, Humi: 49 %

Frequency	Antenna Factor	Corr. Factor	Meter Readings [dB(μV)] Horizontal		Vertical		Limits [dB(μV/m)]		Results [dB(μV/m)]		Margin [dB]	Remarks
[MHz]	[dB(1/m)]	[dB]	PK	AVE	PK	AVE	PK	AVE	PK	AVE		
Test condition : TX Middle Ch												
4874.0	27.0	-15.9	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.1	< 39.1	> +14.9	
7311.0	29.9	-16.1	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 51.8	< 41.8	> +12.2	
12185.0	33.3	-25.7	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 45.6	< 35.6	> +18.4	
19496.0	40.5	-43.0	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.5	< 37.5	> +16.5	

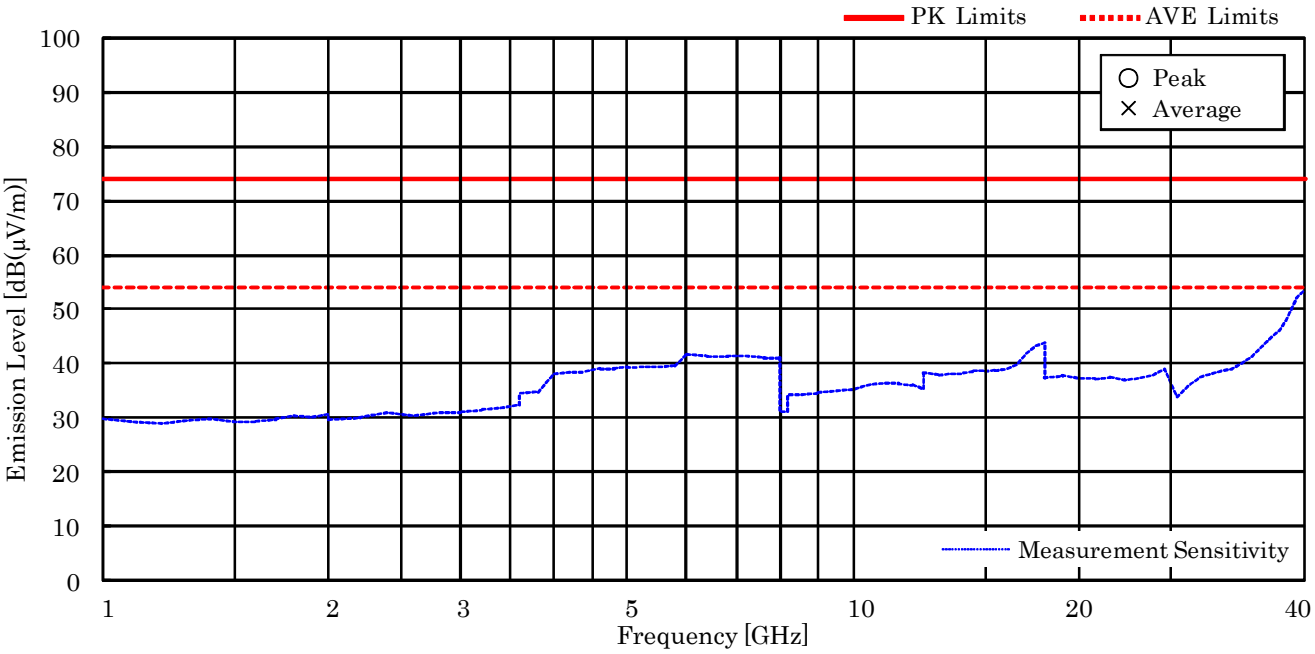
Calculated result at 7311.0 MHz, as the worst point shown on underline:

	Antenna Factor	=	29.9 dB(1/m)
	Corr. Factor	=	-16.1 dB
+)	Meter Reading	=	<28.0 dB(μV)
	Result	=	<41.8 dB(μV/m)

Minimum Margin: 54.0 - <41.8 = >12.2 (dB)

NOTES
1. Test Distance : 3 m
2. The spectrum was checked from 1 GHz to 25 GHz (10th harmonic of the highest fundamental frequency).
3. The correction factor is shown as follows:
   Corr. Factor [dB] = Cable Loss + 20dB Pad Att. - Pre-Amp. Gain [dB] (1.0 - 7.6GHz)
   Corr. Factor [dB] = Cable Loss + 10dB Pad Att. - Pre-Amp. Gain [dB] (7.6 - 18.0GHz)
   Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain [dB] (over 18 GHz)
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. PK : Peak / AVE : Average

Mode of EUT : IEEE802.11g
TX Middle ch (Horizontal/Vertical)



Mode of EUT : IEEE802.11n

Test Date: May 22, 2017
Temp.: 25 °C, Humi: 49 %

Frequency [MHz]	Antenna Factor [dB(1/m)]	Corr. Factor [dB]	Meter Readings [dB(μV)] Horizontal PK	Horizontal AVE	Vertical PK	Vertical AVE	Limits [dB(μV/m)] PK	Limits AVE	Results [dB(μV/m)] PK	Results AVE	Margin [dB]	Remarks
Test condition : TX High Ch												
4924.0	27.0	-15.8	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.2	< 39.2	> +14.8	
7386.0	29.8	-16.1	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 51.7	< 41.7	> +12.3	
12310.0	33.3	-25.9	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 45.4	< 35.4	> +18.6	
19696.0	40.5	-43.0	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.5	< 37.5	> +16.5	
22158.0	40.6	-43.4	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.2	< 37.2	> +16.8	

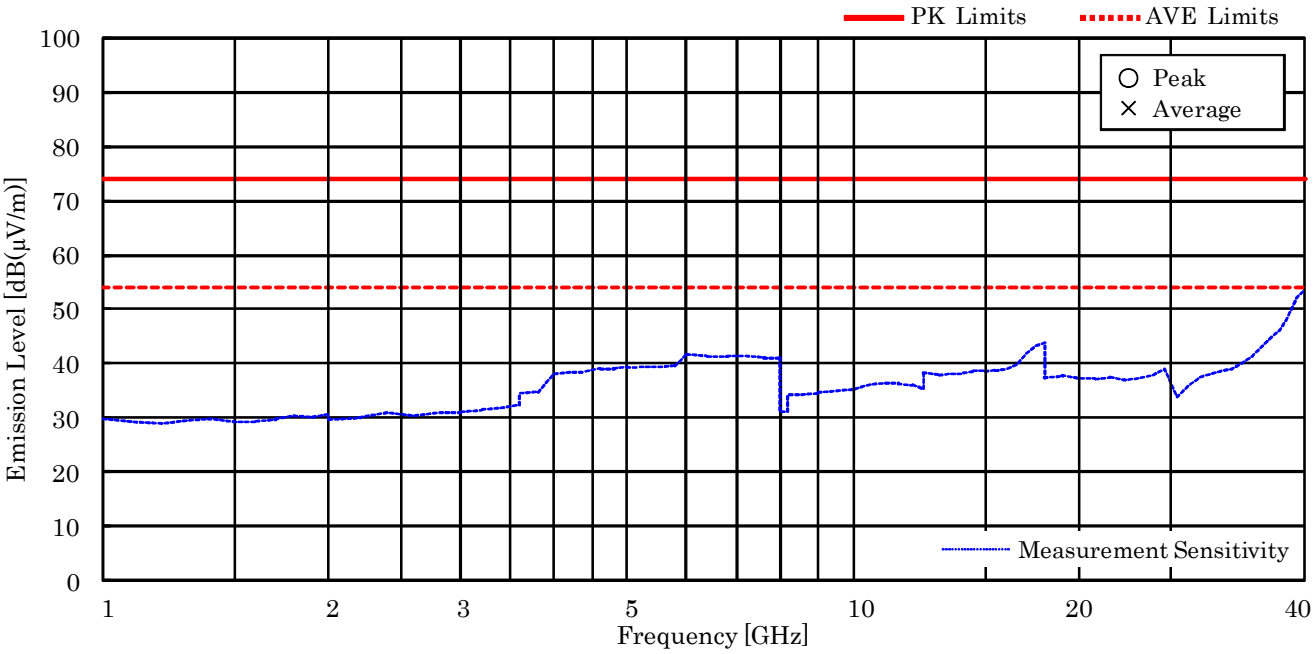
Calculated result at 7386.0 MHz, as the worst point shown on underline:

	Antenna Factor	=	29.8 dB(1/m)
	Corr. Factor	=	-16.1 dB
+)	Meter Reading	=	<28.0 dB(μV)
	Result	=	<41.7 dB(μV/m)

Minimum Margin: 54.0 - <41.7 = >12.3 (dB)

NOTES
1. Test Distance : 3 m
2. The spectrum was checked from 1 GHz to 25 GHz (10th harmonic of the highest fundamental frequency).
3. The correction factor is shown as follows:
   Corr. Factor [dB] = Cable Loss + 20dB Pad Att. - Pre-Amp. Gain [dB] (1.0 - 7.6GHz)
   Corr. Factor [dB] = Cable Loss + 10dB Pad Att. - Pre-Amp. Gain [dB] (7.6 - 18.0GHz)
   Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain [dB] (over 18 GHz)
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. PK : Peak / AVE : Average

Mode of EUT : IEEE802.11n
TX High ch (Horizontal/Vertical)



Mode of EUT : Bluetooth Low Energy

Test Date: May 22, 2017
Temp.: 25 °C, Humi: 49 %

Frequency [MHz]	Antenna Factor [dB(1/m)]	Corr. Factor [dB]	Meter Readings [dB(μV)] Horizontal PK	Horizontal AVE	Vertical PK	Vertical AVE	Limits [dB(μV/m)] PK	Limits [dB(μV/m)] AVE	Results [dB(μV/m)] PK	Results [dB(μV/m)] AVE	Margin [dB]	Remarks
Test condition : Tx Low Ch												
4804.0	27.1	-15.9	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.2	< 39.2	> +14.8	
12010.0	33.5	-25.3	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 46.2	< 36.2	> +17.8	
19216.0	40.5	-43.1	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.4	< 37.4	> +16.6	

Calculated result at 4804.0 MHz, as the worst point shown on underline:

	Antenna Factor	=	27.1 dB(1/m)
	Corr. Factor	=	-15.9 dB
+)	Meter Reading	=	<28.0 dB(μV)
	Result	=	<39.2 dB(μV/m)

Minimum Margin: 54.0 - <39.2 = >14.8 (dB)

NOTES
1. Test Distance : 3 m
2. The spectrum was checked from 1 GHz to 25 GHz (10th harmonic of the highest fundamental frequency).
3. The correction factor is shown as follows:
   Corr. Factor [dB] = Cable Loss + 20dB Pad Att. - Pre-Amp. Gain [dB] (1.0 - 7.6GHz)
   Corr. Factor [dB] = Cable Loss + 10dB Pad Att. - Pre-Amp. Gain [dB] (7.6 - 18.0GHz)
   Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain [dB] (over 18 GHz)
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. PK : Peak / AVE : Average

Mode of EUT : Bluetooth Low Energy
TX Low ch (Horizontal/Vertical)