

## TEST REPORT

**Applicant** : Sharp Corporation, Communication Systems Division  
**Address** : 2-13-1, Iida Hachihonmatsu, Higashi-Hiroshima City, Hiroshima,  
739-0192, Japan

**Products** : Smart Phone  
**Model No.** : SH-01H  
**Serial No.** : 004401115521565  
004401115521573

**FCC ID** : APYHRO00225

**Test Standard** : CFR 47 FCC Rules and Regulations Part 15

**Test Results** : **Passed**

**Date of Test** : August 22 ~ September 3, 2015



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

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- The measurement values stated in Test Report was made with traceable to National Institute of Advanced Industrial Science and Technology (AIST) of Japan and National Institute of Information and Communications Technology (NICT) of Japan.
  - 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.
  - The contents of this test report cannot be used for the purposes, such as advertisement for consumers.
  - This test report shall not be reproduced except in full without the written approval of JQA.
  - VLAC does not approve, certify or warrant the product by this test report.

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**DEFINITIONS FOR ABBREVIATION AND SYMBOLS USED IN THIS TEST REPORT****EUT** : Equipment Under Test**EMC** : Electromagnetic Compatibility**AE** : Associated Equipment**EMI** : Electromagnetic Interference**N/A** : Not Applicable**EMS** : Electromagnetic Susceptibility**N/T** : Not Tested - 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, Communication Systems Division  
2-13-1, Iida Hachihonmatsu, Higashi-Hiroshima City, Hiroshima,  
739-0192, Japan
2. Products : Smart Phone
3. Model No. : SH-01H
4. Serial No. : 004401115521565  
004401115521573
5. Product Type : Pre-production
6. Date of Manufacture : July, 2015
7. Power Rating : 4.0VDC (Lithium-ion Battery LIS1613SPPC(SY6) 3100mAh)
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 : 17.84 dBm(Measure Value of IEEE802.11b)  
24.42 dBm(Measure Value of IEEE802.11g)  
24.76 dBm(Measure Value of IEEE802.11n)  
4.53 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 : August 21, 2015

### 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:

$$\text{Transmitting Frequency (in MHz)} = 2407.0 + 5*n$$

$$\text{Receiving Frequency (in MHz)} = 2407.0 + 5*n$$

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:

$$\text{Transmitting Frequency (in MHz)} = 2402.0 + 2*n$$

$$\text{Receiving Frequency (in MHz)} = 2402.0 + 2*n$$

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:

Tested by:



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



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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 C63.10–2009  
Testing unlicensed wireless devices.

KDB 558074 D01  
DTS Meas Guidance v03r03: June 9, 2015.

KDB 662911 D01  
Multiple Transmitter Output v02r01: October 31, 2013

### 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, 2016)  
VCCI Registration No. : A-0002 (Expiry date : March 30, 2016)  
BSMI Registration No. : SL2-IS-E-6006, SL2-IN-E-6006, SL2-R1/R2-E-6006, SL2-A1-E-6006  
(Expiry date : September 14, 2016)  
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, 2016)

## 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	SH-01H	004401115521565 *1) 004401115521573 *2)	APYHRO00225
B	AC Adapter	Fujitsu Corporation	05	XEA	N/A
C	Stereo Handsfree	Sharp	SHLDL1	--	N/A
D	DTV Antenna	Sharp	SH01	--	N/A

\*1) Used for AC Powerline Conducted Emission and Field Strength of Spurious Emission

\*2) Used for Antenna Conducted Emission

The auxiliary equipment used for testing :

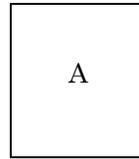
None

Type of Cable:

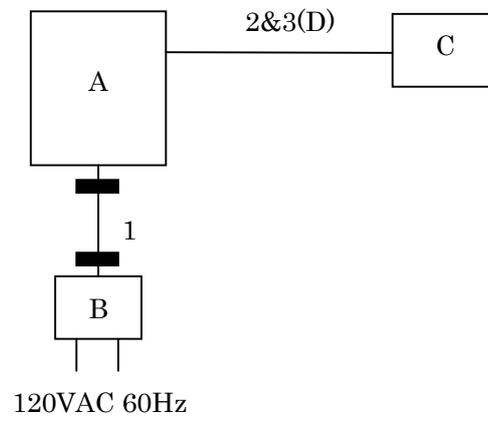
No.	Description	Identification (Manu. etc.)	Connector Shielded	Cable Shielded	Ferrite Core	Length (m)
1	USB conversion cable	--	--	NO	YES	1.2
2	Handsfree Cable	--	--	NO	NO	1.5
3	DTV Antenna Cable	--	--	NO	NO	0.3

**6.2 Test Arrangement (Drawings)**

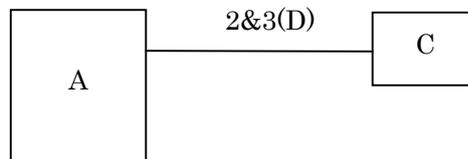
a) Single Unit



b) AC Adapter used



c) Earphone used

 : Ferrite Core

### 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 4.0 + 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)

The equipment has two antennas(Main Antenna[ANT0]/Sub Antenna[ANT1]) in the WLAN mode, and uses the MIMO technology.

This equipment works in 1TX(Main) and 2TX(Main+Sub) mode.

Therefore, the radiated emission tests were carried out in the following mode.

- a) 1TX (Main)
- b) 2TX (Main+Sub)

In 1TX mode and 2TX mode, the output level in each antenna is the same.

Other Clock Frequency

19.2MHz, 48MHz, 12MHz, 27.12MHz

The tests were performed in the following worst condition.

Mode	Condition
IEEE802.11b	11 Mbps
IEEE802.11g	24 Mbps
IEEE802.11n	MCS4 (39 Mbps)

Note: The worst condition was determined based on the test result of Maximum Peak Output Power(Mid channel).(Main Antenna)

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.

**DIRECTIONAL ANTENNA GAIN**

For Power: The TX chains are uncorrelated and the antenna gain is the same for each chain. The directional gain is equal to the antenna gain.

<b>ANT0</b> <b>Antenna</b> <b>Gain</b> <b>[dBi]</b>	<b>ANT1</b> <b>Antenna</b> <b>Gain</b> <b>[dBi]</b>	<b>Uncorrelated Chains</b> <b>Directional</b> <b>Gain</b> <b>[dBi]</b>
0.00	0.00	0.00

For PSD: The TX chains are correlated. The directional gain is:

<b>ANT0</b> <b>Antenna</b> <b>Gain</b> <b>[dBi]</b>	<b>ANT1</b> <b>Antenna</b> <b>Gain</b> <b>[dBi]</b>	<b>Correlated Chains</b> <b>Directional</b> <b>Gain</b> <b>[dBi]</b>
0.00	0.00	3.01

## 7 Test Requirements

### 7.0 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	Passed	-
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	Passed	-
Spurious Emissions (Conduction)	Section 15.247(d)	Section 7.7	Passed	-
AC Powerline Conducted Emission	Section 15.207	Section 7.8	Passed	-
Radiated Emission	Section 15.247(d)	Section 7.9	Passed	-

**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

**7.3.1 Test Results**

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

The 99% Bandwidth of IEEE802.11b is	<u>12.880</u> MHz	at	<u>2412.0</u> MHz
The 99% Bandwidth of IEEE802.11g is	<u>16.458</u> MHz	at	<u>2437.0</u> MHz
The 99% Bandwidth of IEEE802.11n is	<u>17.648</u> MHz	at	<u>2437.0</u> MHz
The 99% Bandwidth of Bluetooth LE is	<u>1098.1</u> kHz	at	<u>2480.0</u> MHz

The 20dB Bandwidth of IEEE802.11b is	<u>8.268</u> MHz	at	<u>2462.0</u> MHz
The 20dB Bandwidth of IEEE802.11g is	<u>16.536</u> MHz	at	<u>2437.0</u> MHz
The 20dB Bandwidth of IEEE802.11n is	<u>17.731</u> MHz	at	<u>2412.0</u> MHz
The 20dB Bandwidth of Bluetooth LE is	<u>670.9</u> kHz	at	<u>2440.0</u> MHz

Uncertainty of Measurement Results ± 0.9 %(2σ)

Remarks : \_\_\_\_\_

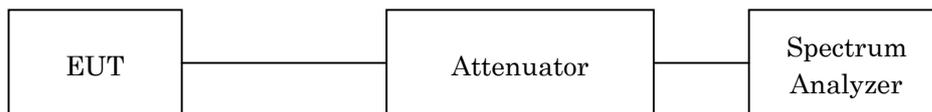
**7.3.2 Test Instruments**

Shielded Room S4				
Type	Model	Serial No. (ID)	Manufacturer	Cal. Due
Spectrum Analyzer	E4446A	US44300388 (A-39)	Agilent	2016/08/11
Attenuator	54A-10	W5675 (D-28)	Weinschel	2016/08/16
RF Cable	SUCOFLEX102	14253/2 (C-52)	HUBER+SUHNER	2016/08/16

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

**7.3.3 Test Method and Test Setup (Diagrammatic illustration)**

The test system is shown as follows:



The setting of the spectrum analyzer are shown as follows:

	WLAN	Bluetooth
Res. Bandwidth	100 kHz	100 kHz
Video Bandwidth	300 kHz	300 kHz
Span	30 MHz	3 MHz
Sweep Time	AUTO	AUTO
Trace	Maxhold	Maxhold

7.3.4 Test Data

Mode of EUT : WLAN

Test Date : August 25, 2015

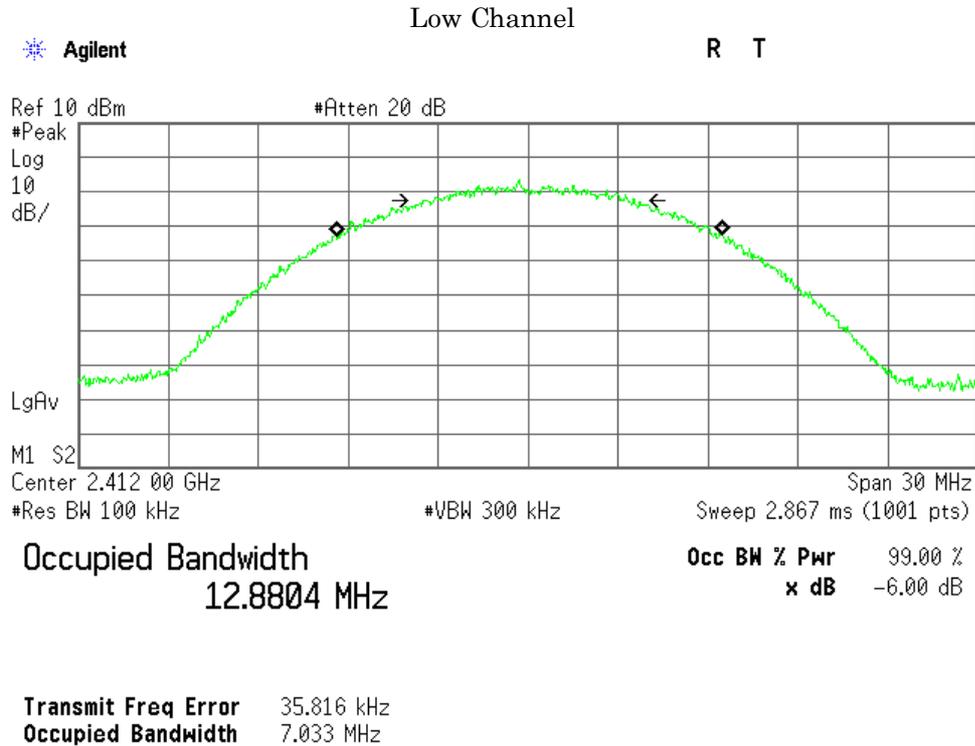
Temp.:26°C, Humi:66%

The resolution bandwidth was set to 100 kHz, -6dBc display line was placed on the screen (or 99% bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace.

A) IEEE 802.11b

1) Main Antenna

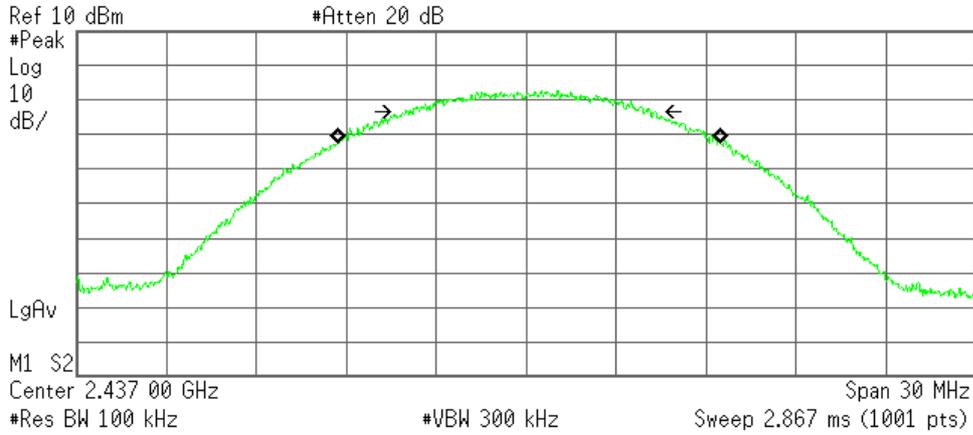
Channel	Frequency (MHz)	99% Bandwidth (MHz)	-6dBc Bandwidth (MHz)	Minimum -6dBc Bandwidth Limit (kHz)
01	2412.0	12.880	7.033	500
06	2437.0	12.759	8.151	500
11	2462.0	12.856	8.268	500



### Middle Channel

Agilent

R T



**Occupied Bandwidth**  
12.7585 MHz

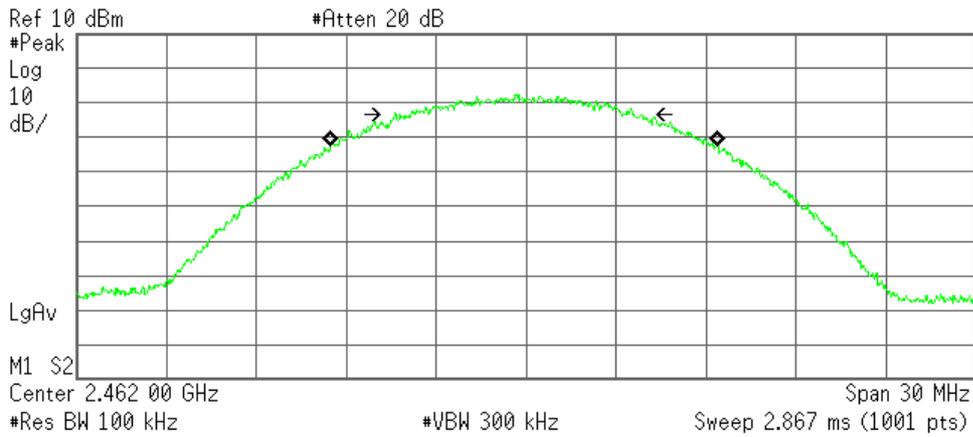
**Occ BW % Pwr** 99.00 %  
**x dB** -6.00 dB

**Transmit Freq Error** 95.889 kHz  
**Occupied Bandwidth** 8.151 MHz

### High Channel

Agilent

R T



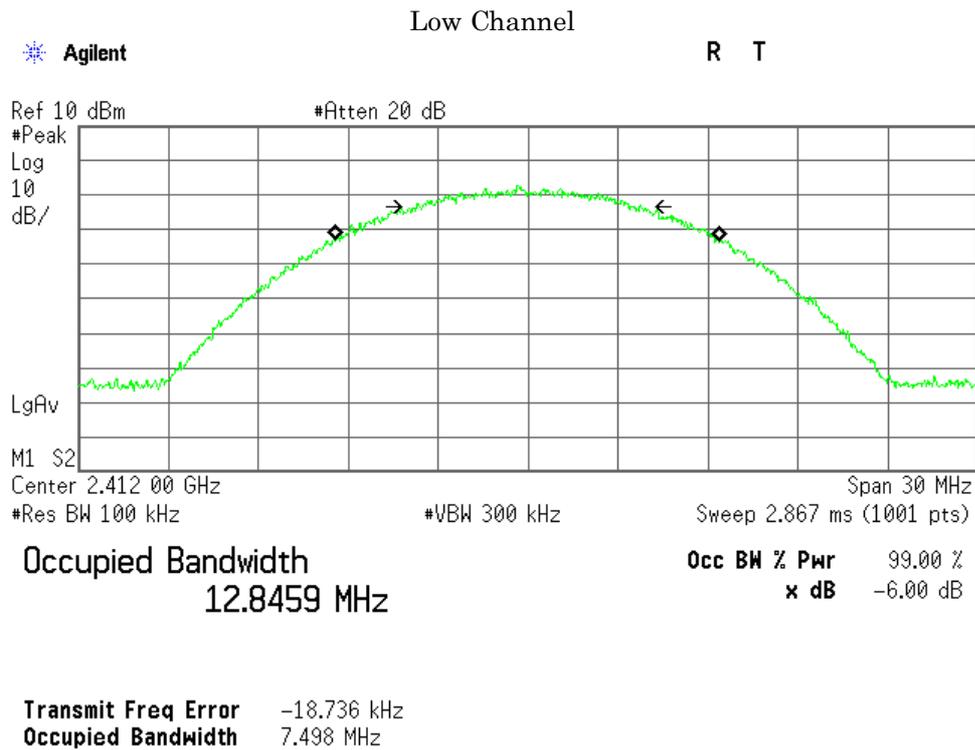
**Occupied Bandwidth**  
12.8560 MHz

**Occ BW % Pwr** 99.00 %  
**x dB** -6.00 dB

**Transmit Freq Error** -68.473 kHz  
**Occupied Bandwidth** 8.268 MHz

2) Sub Antenna

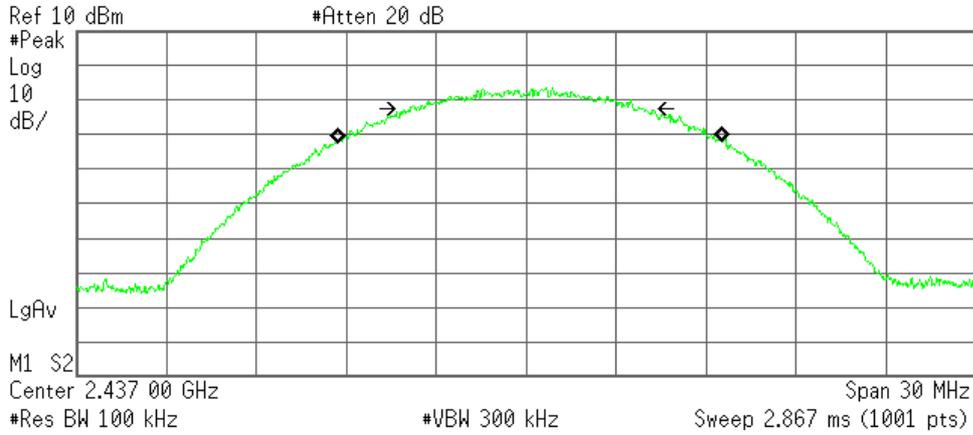
Channel	Frequency (MHz)	99% Bandwidth (MHz)	-6dBc Bandwidth (MHz)	Minimum -6dBc Bandwidth Limit (kHz)
01	2412.0	12.846	7.498	500
06	2437.0	12.798	7.751	500
11	2462.0	12.818	7.913	500



### Middle Channel

Agilent

R L



**Occupied Bandwidth**  
12.7975 MHz

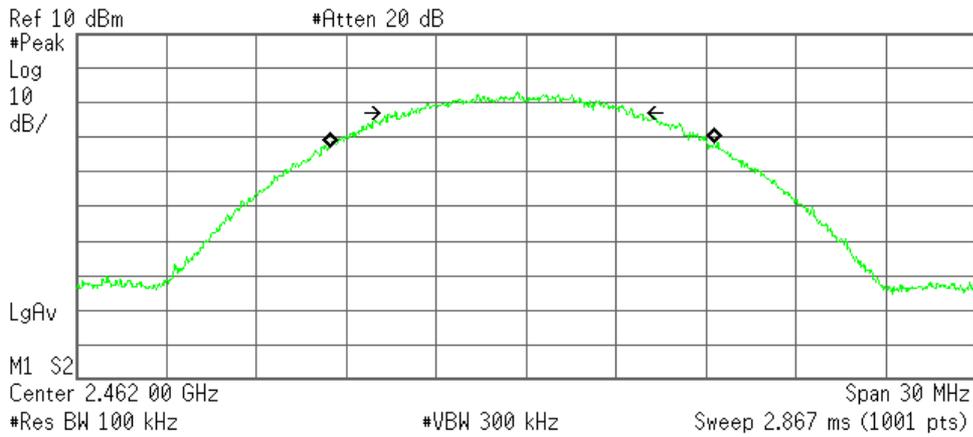
**Occ BW % Pwr** 99.00 %  
**x dB** -6.00 dB

**Transmit Freq Error** 105.463 kHz  
**Occupied Bandwidth** 7.751 MHz

### High Channel

Agilent

R L



**Occupied Bandwidth**  
12.8179 MHz

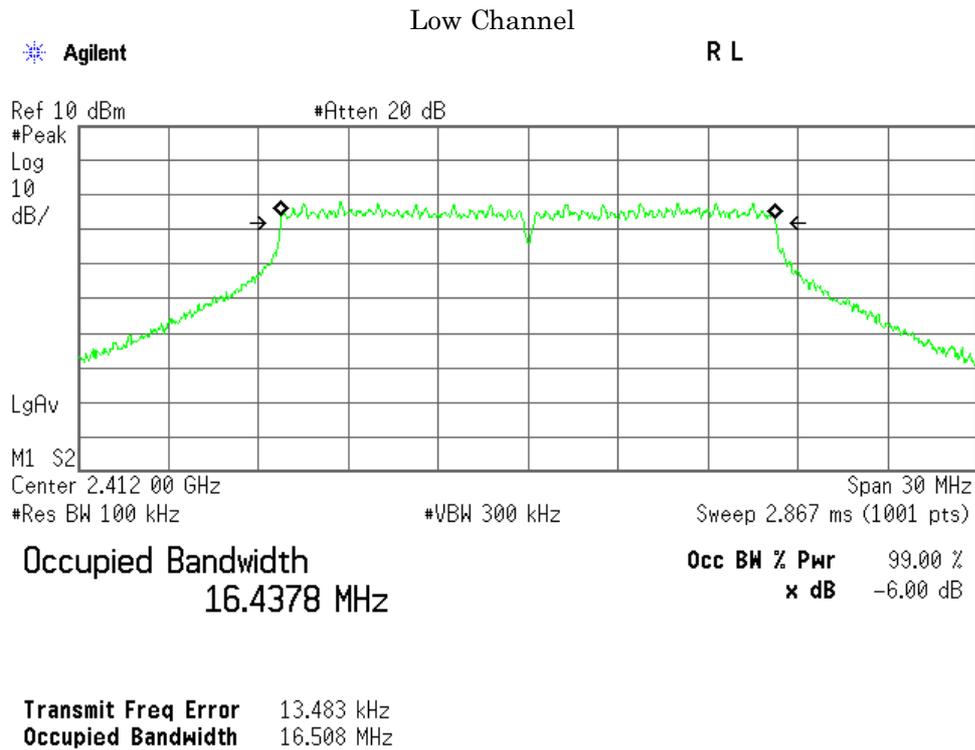
**Occ BW % Pwr** 99.00 %  
**x dB** -6.00 dB

**Transmit Freq Error** -123.232 kHz  
**Occupied Bandwidth** 7.913 MHz

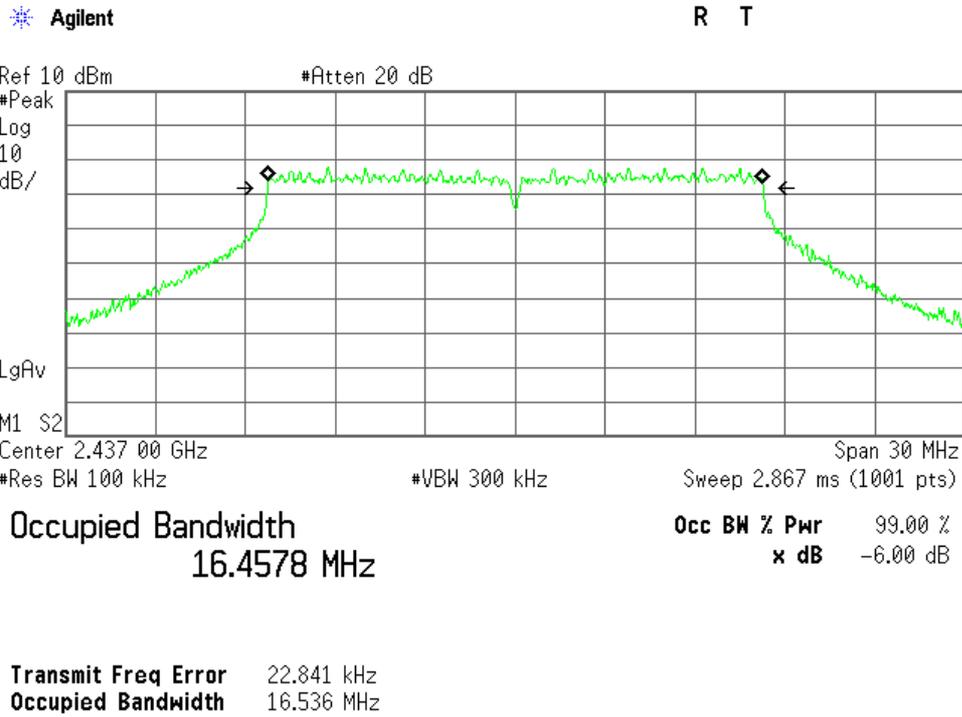
B) IEEE 802.11g

1) Main Antenna

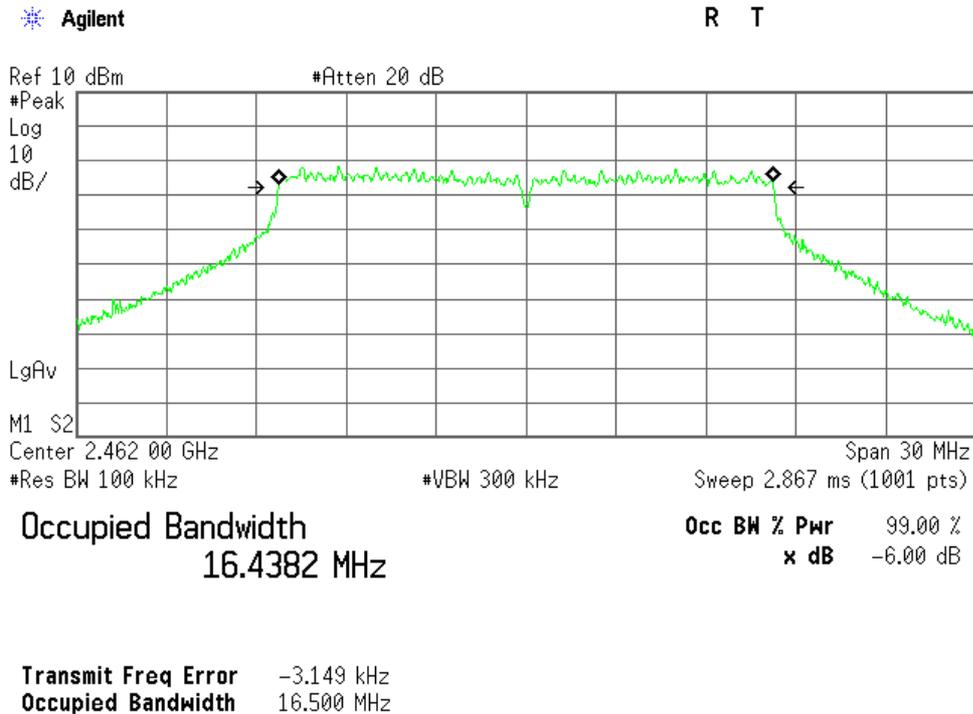
Channel	Frequency (MHz)	99% Bandwidth (MHz)	-6dBc Bandwidth (MHz)	Minimum -6dBc Bandwidth Limit (kHz)
01	2412.0	16.438	16.508	500
06	2437.0	16.458	16.536	500
11	2462.0	16.438	16.500	500



### Middle Channel

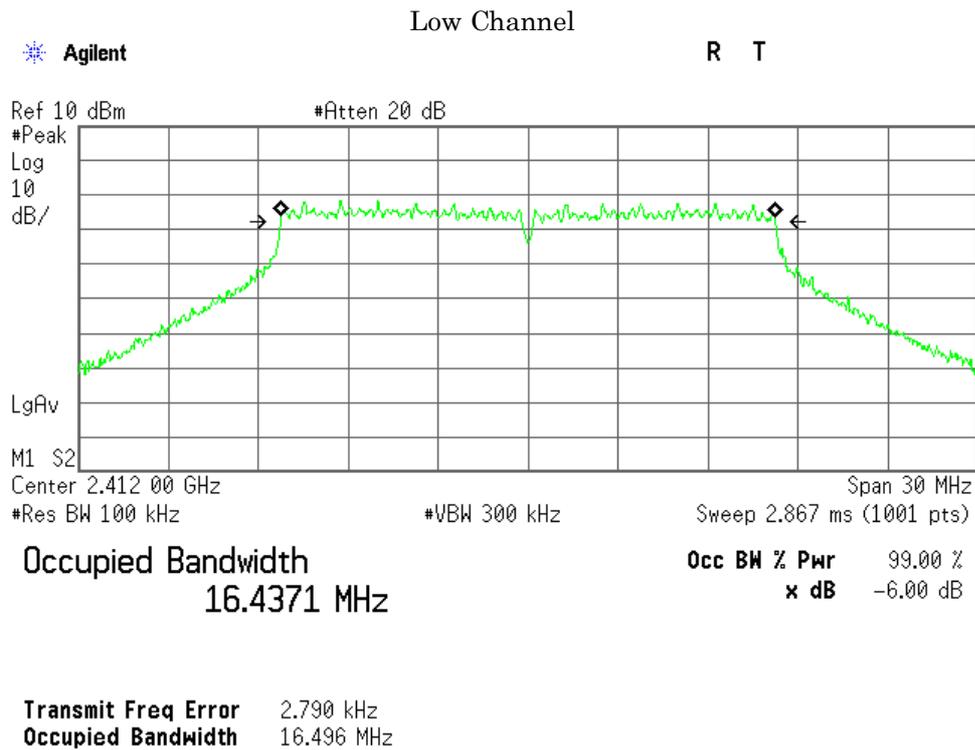


### High Channel



2) Sub Antenna

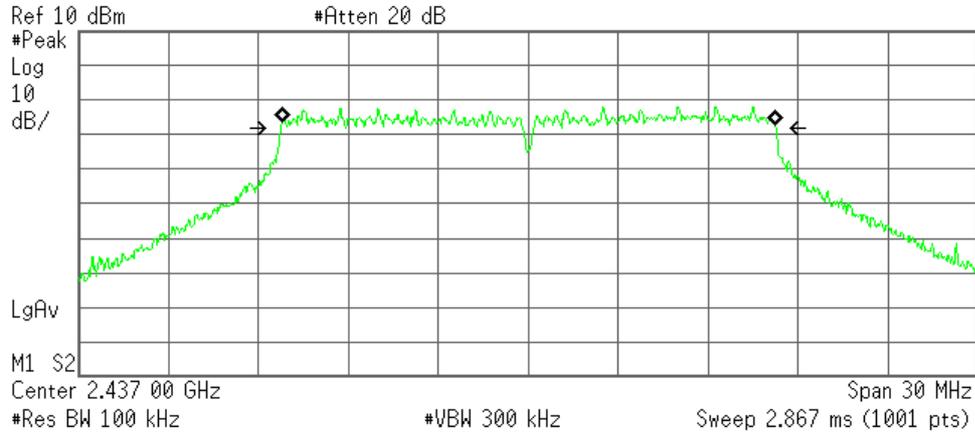
Channel	Frequency (MHz)	99% Bandwidth (MHz)	-6dBc Bandwidth (MHz)	Minimum -6dBc Bandwidth Limit (kHz)
01	2412.0	16.437	16.496	500
06	2437.0	16.441	16.493	500
11	2462.0	16.434	16.465	500



### Middle Channel

Agilent

R L



**Occupied Bandwidth**  
16.4410 MHz

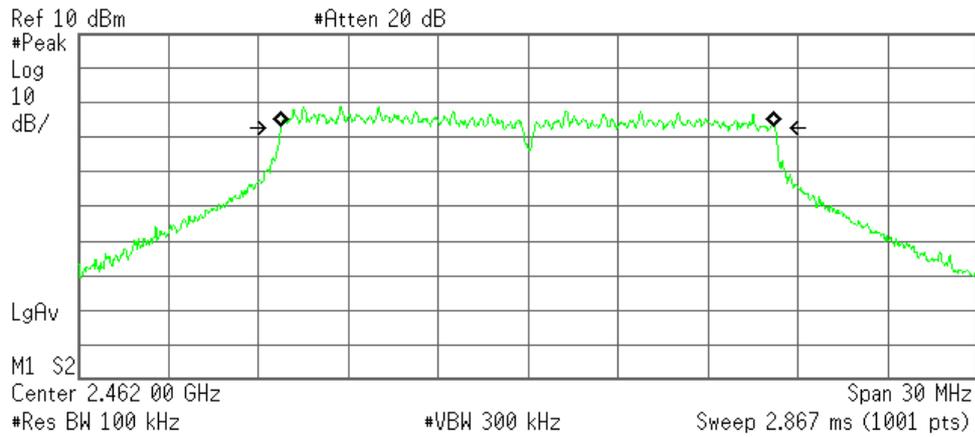
**Occ BW % Pwr** 99.00 %  
**x dB** -6.00 dB

**Transmit Freq Error** 19.966 kHz  
**Occupied Bandwidth** 16.493 MHz

### High Channel

Agilent

R L



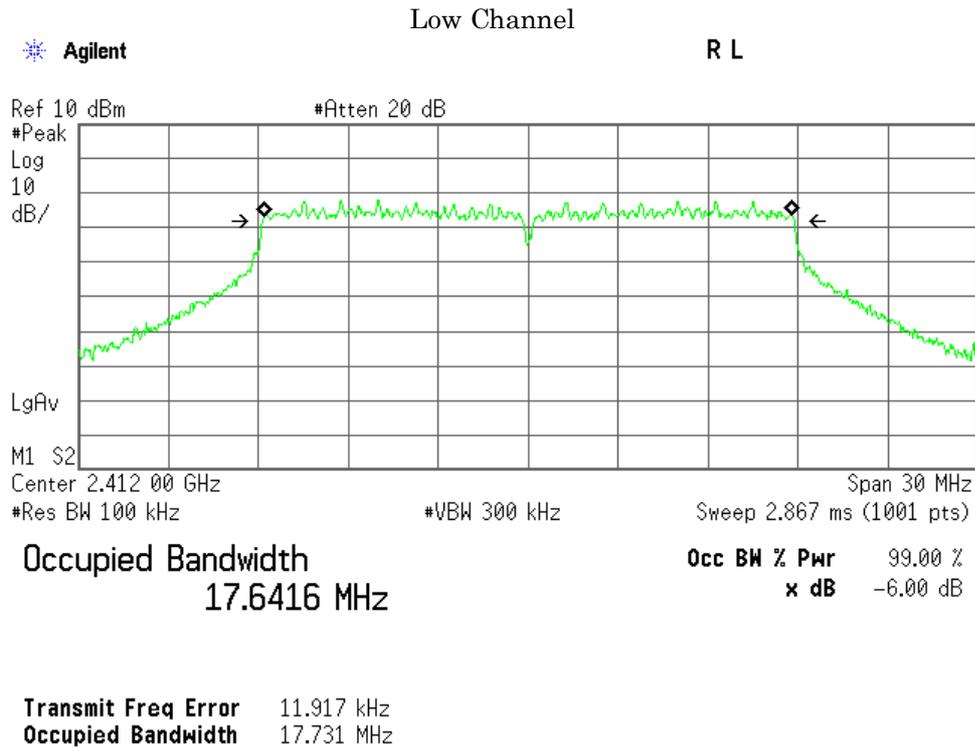
**Occupied Bandwidth**  
16.4337 MHz

**Occ BW % Pwr** 99.00 %  
**x dB** -6.00 dB

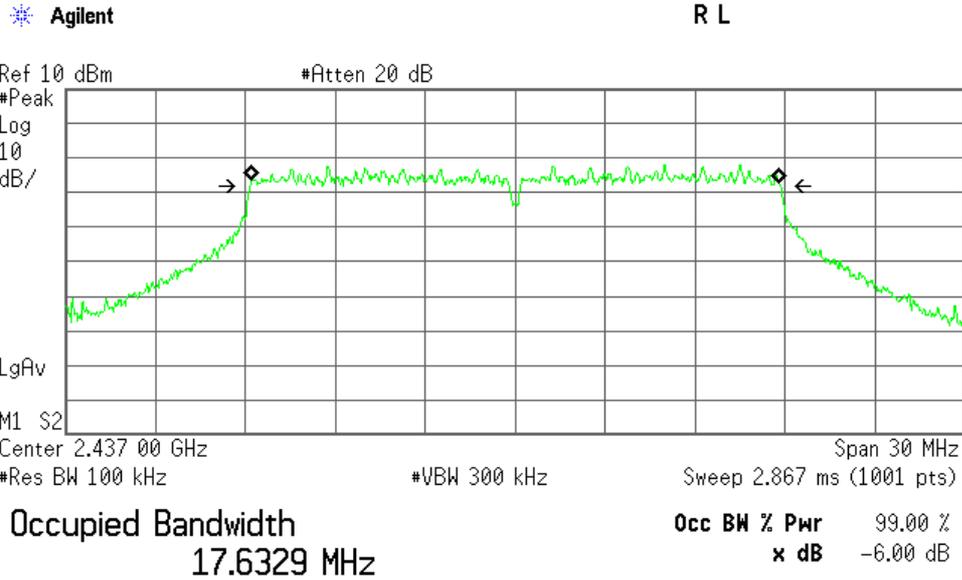
**Transmit Freq Error** -13.315 kHz  
**Occupied Bandwidth** 16.465 MHz

C) IEEE 802.11n  
1) Main Antenna

Channel	Frequency (MHz)	99% Bandwidth (MHz)	-6dBc Bandwidth (MHz)	Minimum -6dBc Bandwidth Limit (kHz)
01	2412.0	17.642	17.731	500
06	2437.0	17.633	17.691	500
11	2462.0	17.643	17.686	500

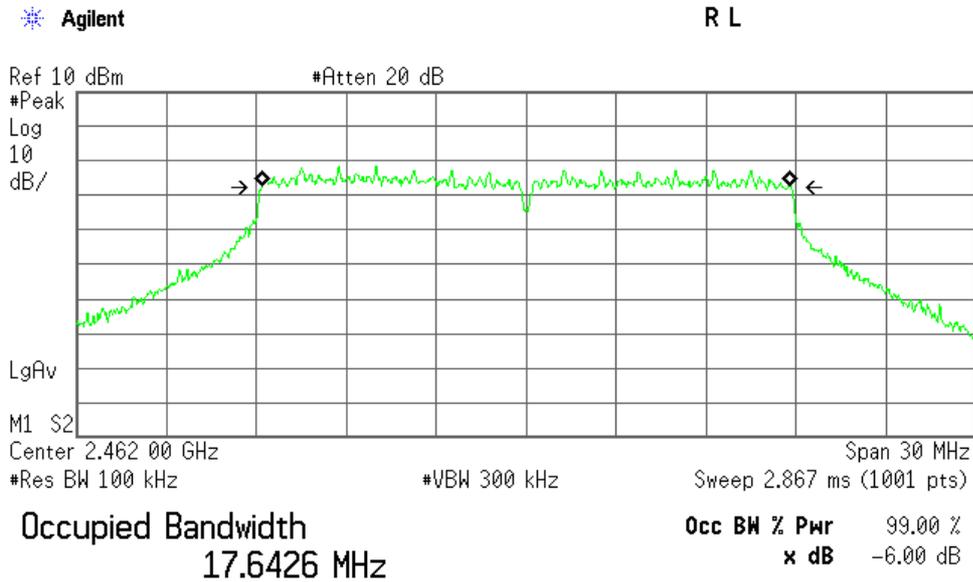


### Middle Channel



**Transmit Freq Error** 9.950 kHz  
**Occupied Bandwidth** 17.691 MHz

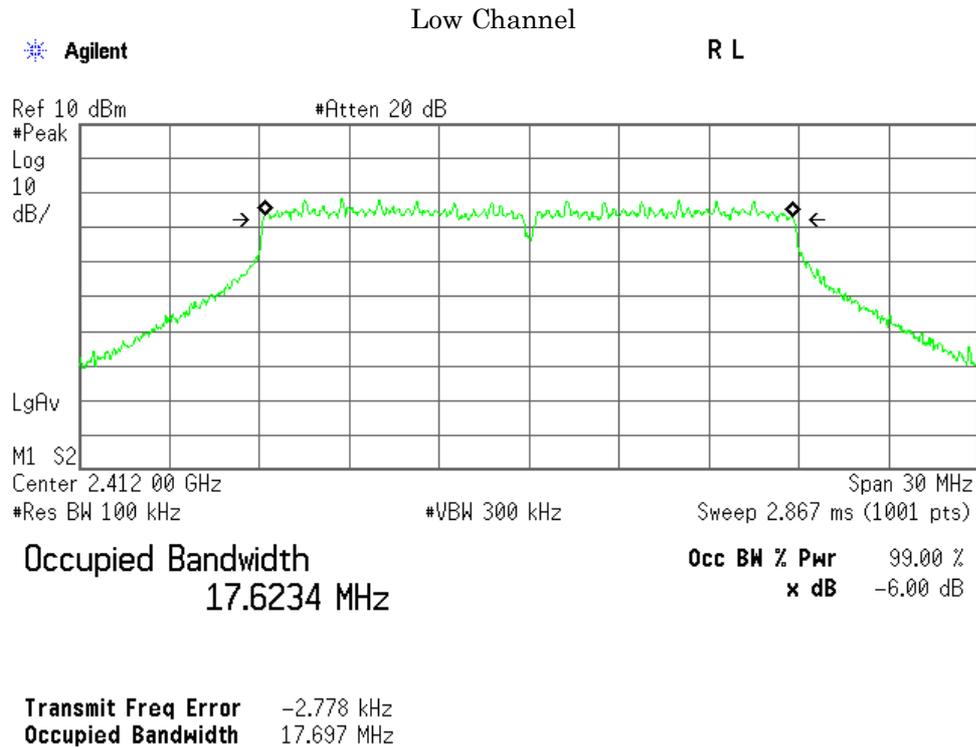
### High Channel



**Transmit Freq Error** -21.808 Hz  
**Occupied Bandwidth** 17.686 MHz

2) Sub Antenna

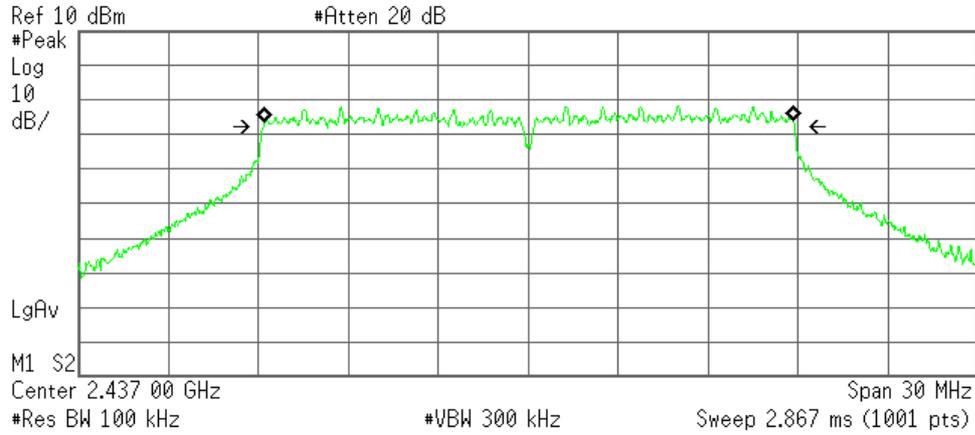
Channel	Frequency (MHz)	99% Bandwidth (MHz)	-6dBc Bandwidth (MHz)	Minimum -6dBc Bandwidth Limit (kHz)
01	2412.0	17.623	17.697	500
06	2437.0	17.648	17.716	500
11	2462.0	17.616	17.402	500



### Middle Channel

Agilent

R L



**Occupied Bandwidth**  
17.6484 MHz

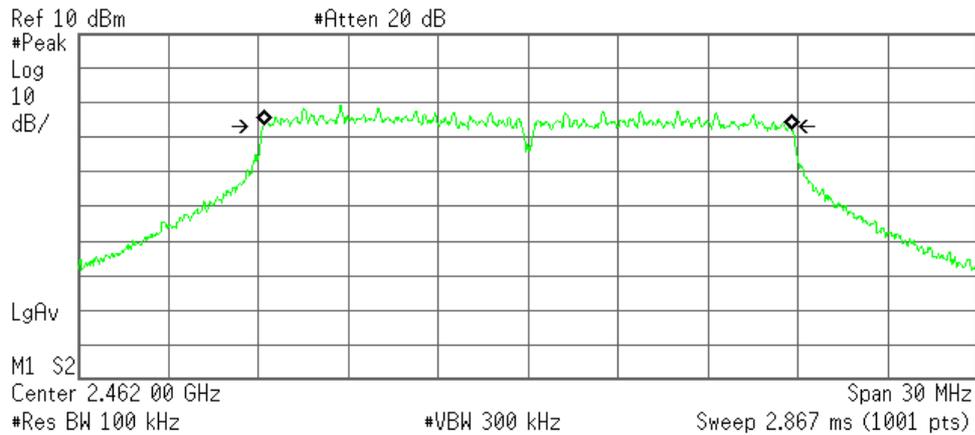
**Occ BW % Pwr** 99.00 %  
**x dB** -6.00 dB

**Transmit Freq Error** 21.285 kHz  
**Occupied Bandwidth** 17.716 MHz

### High Channel

Agilent

R T



**Occupied Bandwidth**  
17.6160 MHz

**Occ BW % Pwr** 99.00 %  
**x dB** -6.00 dB

**Transmit Freq Error** -23.619 kHz  
**Occupied Bandwidth** 17.402 MHz

Mode of EUT : Bluetooth Low Energy

Test Date : August 24, 2015

Temp.:26°C, Humi:62%

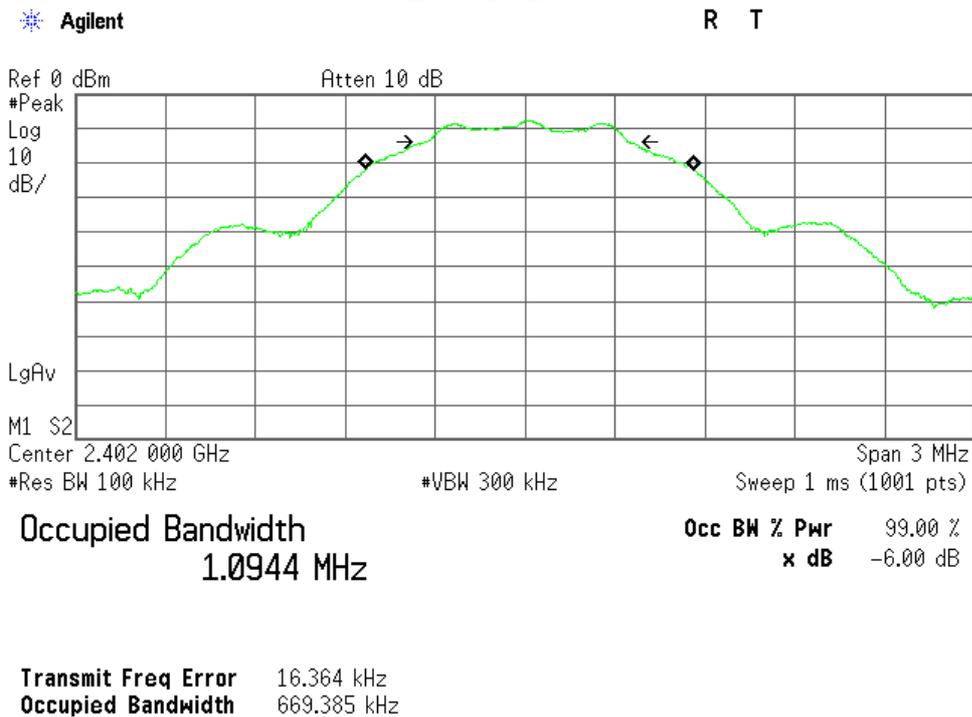
The resolution bandwidth was set to 100 kHz, -6dBc display line was placed on the screen (or 99% bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace.

1)Packet Setting : LE (Modulation type : GFSK)

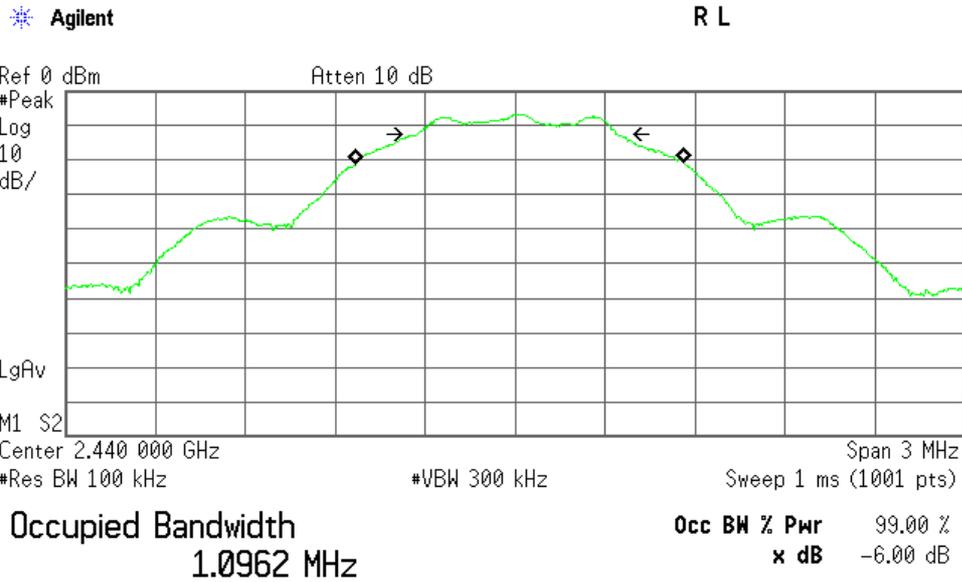
Channel	Frequency (MHz)	99% Bandwidth (kHz)	-6dBc Bandwidth (kHz)	Minimum -6dBc Bandwidth Limit (kHz)
00	2402.0	1094.4	669.4	500
19	2440.0	1096.2	670.9	500
39	2480.0	1098.1	668.9	500

1)Packet Setting : LE (Modulation type : GFSK)

Low Channel

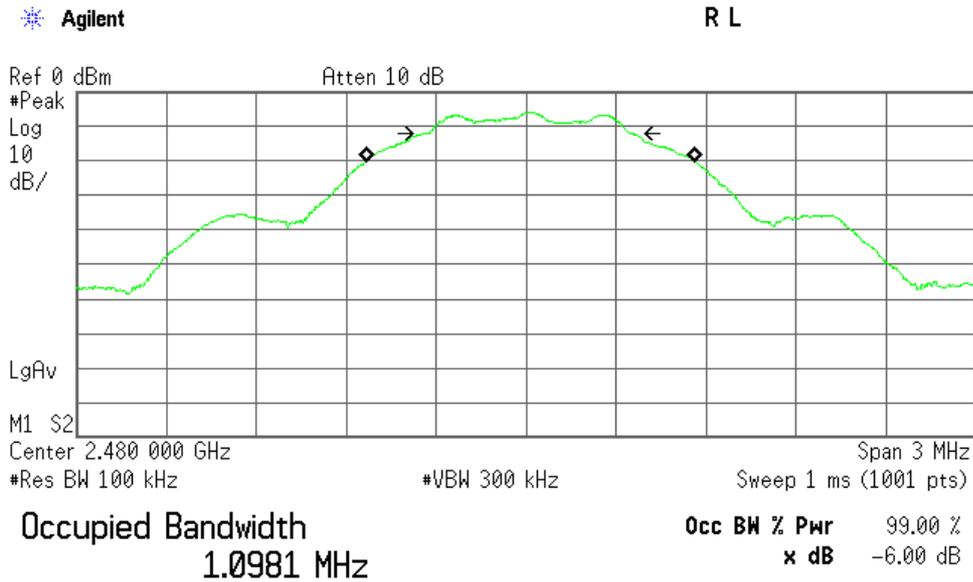


### Middle Channel



**Transmit Freq Error** 15.856 kHz  
**Occupied Bandwidth** 670.940 kHz

### High Channel



**Transmit Freq Error** 15.024 kHz  
**Occupied Bandwidth** 668.930 kHz

#### 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	<u>17.84</u>	dBm	at	<u>2437.0</u>	MHz
Peak Output Power of IEEE802.11g is	<u>24.42</u>	dBm	at	<u>2412.0</u>	MHz
Peak Output Power of IEEE802.11n is	<u>24.76</u>	dBm	at	<u>2412/2437</u>	MHz
Peak Output Power of Bluetooth LE is	<u>4.53</u>	dBm	at	<u>2480.0</u>	MHz

Uncertainty of Measurement Results ± 0.9 dB(2 $\sigma$ )

Remarks : \_\_\_\_\_

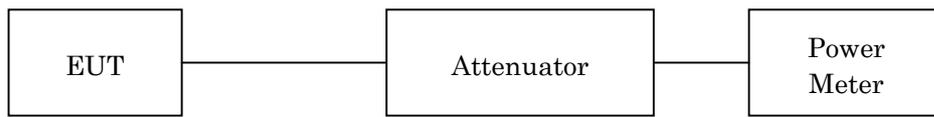
**7.5.2 Test Instruments**

Shielded Room S4				
Type	Model	Serial No. (ID)	Manufacturer	Cal. Due
Power Meter	N1911A	GB45100291 (B-63)	Agilent	2016/07/16
Power Sensor	N1921A	US44510470 (B-64)	Agilent	2016/07/16
Attenuator	54A-10	W5675 (D-28)	Weinschel	2016/08/16
RF Cable	SUCOFLEX102	14253/2 (C-52)	HUBER+SUHNER	2016/08/16

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

Data Rate : 11Mbps

Test Date: August 22, 2015  
Temp.: 26 °C, Humi: 70 %

Transmitting Frequency		Correction Factor [dB]	Meter Reading			Conducted Peak Output Power		Limits [dBm]	Margin [dB]
CH	[MHz]		ANT0 [dBm]	ANT1 [dBm]	Total [dBm]	[dBm]	[mW]		
01	2412	10.34	4.12	3.10	6.65	16.99	50.00	30.00	+13.01
06	2437	10.34	4.49	4.48	7.50	17.84	60.81	30.00	+12.16
11	2462	10.35	3.10	3.43	6.28	16.63	46.03	30.00	+13.37

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

Correction Factor	=	10.34 dB
+ ) Meter Reading	=	7.50 dBm
Result	=	17.84 dBm = 60.81 mW

Minimum Margin: 30.00 - 17.84 = 12.16 (dB)

**NOTES**

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

Detector Function	Video B.W.
Peak	OFF

CH	[MHz]	Rate	Meter Reading [dBm]	Remark
06	2437			
		1Mbps	4.33	
		2Mbps	4.42	
		5.5Mbps	4.27	
		11Mbps	4.49	*

\* : Worst Rate

All comparison were performed on the same measurement condition.

2) IEEE 802.11g

Test Date: August 22, 2015  
 Temp.: 26 °C, Humi: 70 %

Data Rate : 24Mbps

CH	Transmitting Frequency [MHz]	Correction Factor [dB]	Meter Reading			Conducted Peak Output Power		Limits [dBm]	Margin [dB]
			ANT0 [dBm]	ANT1 [dBm]	Total [dBm]	[dBm]	[mW]		
01	2412	10.34	11.20	10.94	14.08	24.42	276.69	30.00	+ 5.58
06	2437	10.34	11.23	10.08	13.70	24.04	253.51	30.00	+ 5.96
11	2462	10.35	10.66	9.64	13.19	23.54	225.94	30.00	+ 6.46

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

Correction Facto	=	10.34 dB
+ ) Meter Reading	=	14.08 dBm
Result	=	24.42 dBm = 276.69 mW

Minimum Margin: 30.00 - 24.42 = 5.58 (dB)

NOTES

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

Detector Function	Video B.W.
Peak	OFF

CH	[MHz]	Rate	Meter Reading [dBm]	Remark
06	2437			
		6Mbps	6.00	
		9Mbps	6.05	
		12Mbps	6.27	
		18Mbps	6.43	
		24Mbps	11.23	*
		36Mbps	11.13	
		48Mbps	11.22	
		54Mbps	11.02	

\* : Worst Rate

All comparison were performed on the same measurement condition.

3) IEEE 802.11n

Test Date: August 22, 2015  
 Temp.: 26 °C, Humi: 70 %

Data Rate : MCS4

CH	Transmitting Frequency [MHz]	Correction Factor [dB]	Meter Reading			Conducted Peak Output Power		Limits [dBm]	Margin [dB]
			ANT0 [dBm]	ANT1 [dBm]	Total [dBm]	[dBm]	[mW]		
01	2412	10.34	11.44	11.37	14.42	24.76	299.23	30.00	+ 5.24
06	2437	10.34	11.49	11.32	14.42	24.76	299.23	30.00	+ 5.24
11	2462	10.35	10.88	9.99	13.47	23.82	240.99	30.00	+ 6.18

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

Correction Facto	=	10.34 dB
+ ) Meter Reading	=	14.42 dBm
Result	=	24.76 dBm = 299.23 mW

Minimum Margin: 30.00 - 24.76 = 5.24 (dB)

NOTES

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

Detector Function	Video B.W.
Peak	OFF

CH	[MHz]	Rate	Meter Reading [dBm]	Remark
06	2437			
		MCS0	6.09	
		MCS1	6.23	
		MCS2	6.30	
		MCS3	10.96	
		MCS4	11.49	*
		MCS5	10.64	
		MCS6	10.70	
		MCS7	10.76	

\* : Worst Rate

All comparison were performed on the same measurement condition.

4) Bluetooth LE(Modulation type : GFSK)

Test Date: August 24, 2015

Temp.: 26 °C, Humi: 62 %

CH	Transmitting Frequency [MHz]	Correction Factor [dB]	Meter Reading [dBm]	Conducted		Limits [dBm]	Margin [dB]
				Peak Output Power [dBm]	[mW]		
00	2402	10.34	-7.57	2.77	1.89	30.00	+27.23
19	2440	10.35	-6.50	3.85	2.43	30.00	+26.15
39	2480	10.36	-5.83	4.53	2.84	30.00	+25.47

Calculated result at 2480.000 MHz, as the worst point shown on underline:

Correction Factor	=	10.36 dB
+ ) Meter Reading	=	<u>-5.83 dBm</u>
Result	=	4.53 dBm = 2.84 mW

Minimum Margin: 30.00 - 4.53 = 25.47 (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

**7.6.1 Test Results**

For the standard,  - Passed  - Failed  - Not judged

Peak Output Power of IEEE802.11b is	<u>1.94</u>	dBm	at	<u>2437.0</u>	MHz
Peak Output Power of IEEE802.11g is	<u>-2.26</u>	dBm	at	<u>2462.0</u>	MHz
Peak Output Power of IEEE802.11n is	<u>-3.08</u>	dBm	at	<u>2437.0</u>	MHz
Peak Output Power of Bluetooth LE is	<u>3.70</u>	dBm	at	<u>2480.0</u>	MHz

Uncertainty of Measurement Results ± 1.7 dB(2σ)

Remarks : \_\_\_\_\_

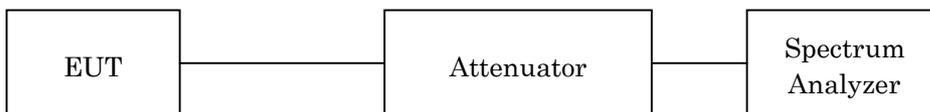
**7.6.2 Test Instruments**

Shielded Room S4				
Type	Model	Serial No. (ID)	Manufacturer	Cal. Due
Spectrum Analyzer	E4446A	US44300388 (A-39)	Agilent	2016/08/11
Attenuator	54A-10	W5675 (D-28)	Weinschel	2016/08/16
RF Cable	SUCOFLEX102	14253/2 (C-52)	HUBER+SUHNER	2016/08/16

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

**7.6.3 Test Method and Test Setup (Diagrammatic illustration)**

The test system is shown as follows:



### 7.6.4 Test Data

1) IEEE 802.11b

Data Rate : 11Mbps

Test Date: August 25, 2015  
 Temp: 26 °C, Humi: 66 %

CH	Transmitting Frequency [MHz]	Correction Factor [dB]	Meter Reading			Conducted		Limits [dBm]	Margin [dB]
			ANT0 [dBm]	ANT1 [dBm]	Total [dBm]	Peak Power Density [dBm]	[mW]		
01	2412	10.34	-12.26	-12.52	-9.38	0.96	1.25	8.00	+ 7.04
06	2437	10.34	-11.27	-11.56	-8.40	1.94	1.56	8.00	+ 6.06
11	2462	10.35	-12.38	-12.17	-9.26	1.09	1.29	8.00	+ 6.91

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

Correction Facto	=	10.34 dB
+ ) Meter Reading	=	-8.40 dBm
Result	=	1.94 dBm = 1.56 mW

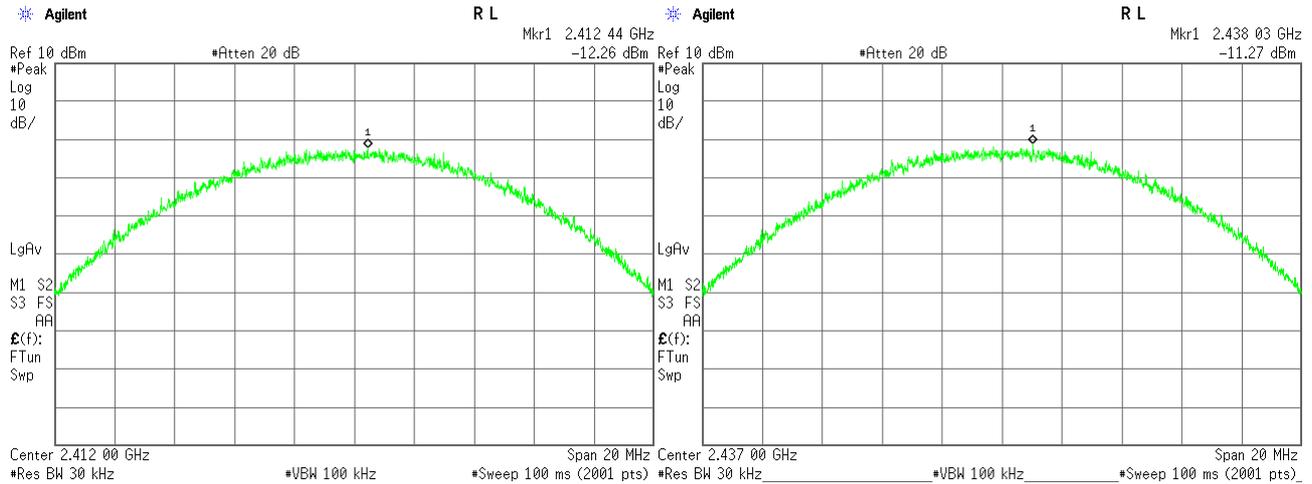
Minimum Margin: 8.00 - 1.94 = 6.06 (dB)

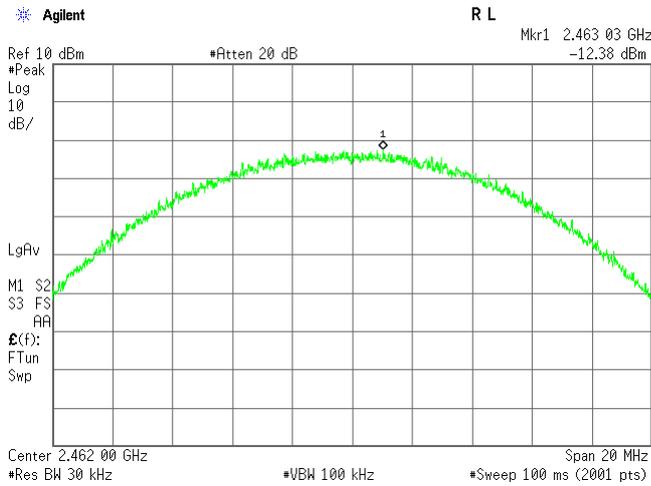
NOTES

- The peak power density complied with the limit using 30 kHz resolution bandwidth of Spectrum Analyzer.
- The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.
- Setting of measuring instrument(s) :

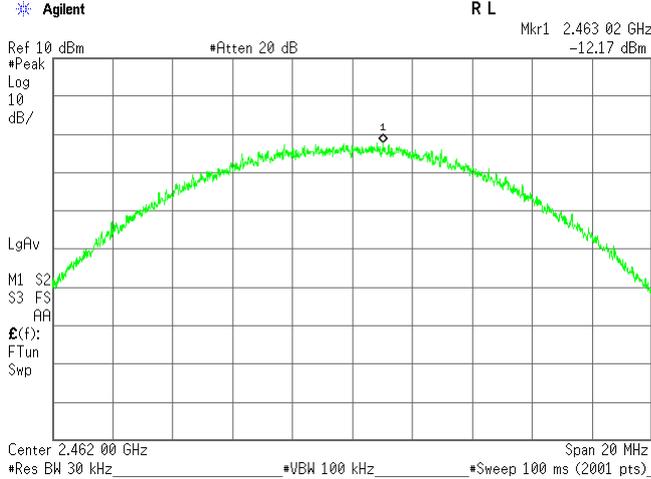
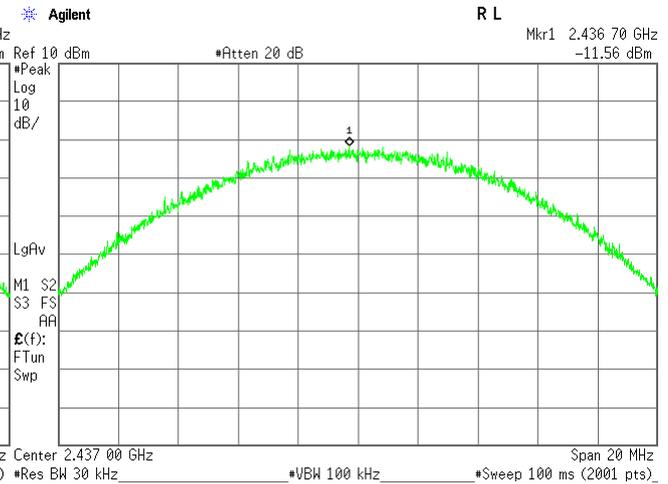
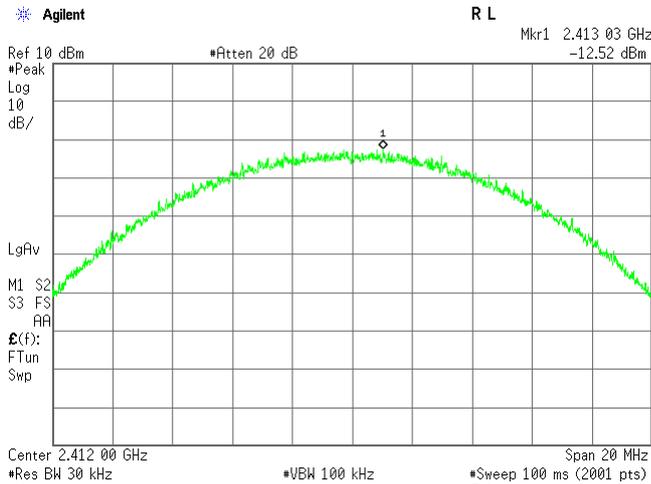
Detector Function	RES B.W.	Video B.W.
Peak	30kHz	100kHz

#### a) Main Antenna (ANT0)





b) Sub Antenna (ANT1)



2) IEEE 802.11g

Test Date: August 25, 2015  
 Temp.: 26 °C, Humi: 66 %

Data Rate : 24Mbps

CH	Transmitting Frequency [MHz]	Correction Factor [dB]	Meter Reading			Conducted Peak Power Density		Limits [dBm]	Margin [dB]
			ANT0 [dBm]	ANT1 [dBm]	Total [dBm]	[dBm]	[mW]		
01	2412	10.34	-16.15	-15.41	-12.76	-2.42	0.57	8.00	+10.42
06	2437	10.34	-16.04	-16.20	-13.11	-2.77	0.53	8.00	+10.77
11	2462	10.35	-15.52	-15.73	-12.61	-2.26	0.59	8.00	+10.26

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

Correction Factor	=	10.35 dB
+ ) Meter Reading	=	-12.61 dBm
Result	=	-2.26 dBm = 0.59 mW

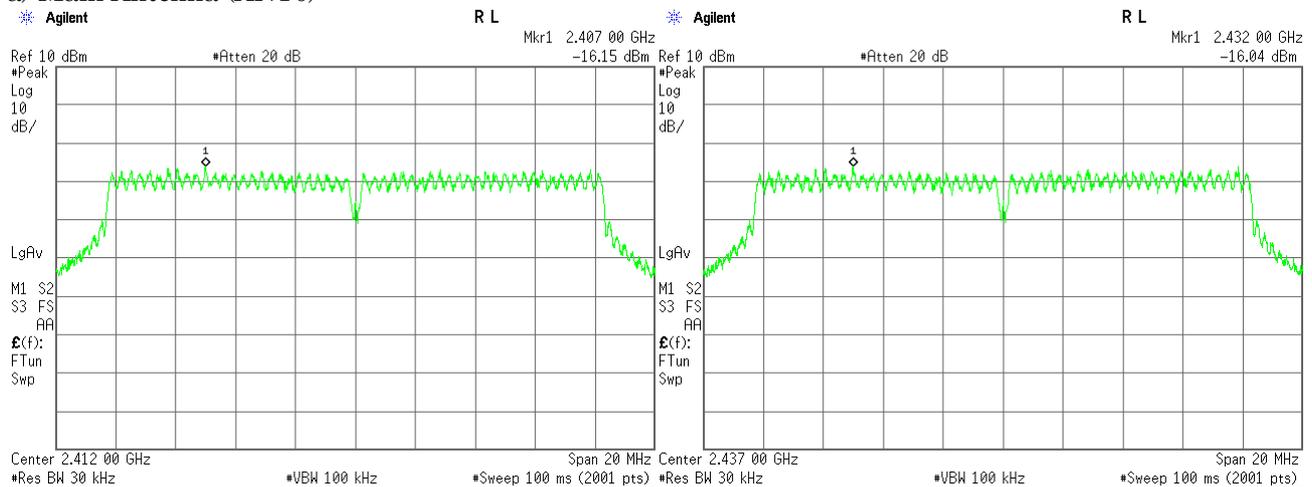
Minimum Margin: 8.00 - -2.26 = 10.26 (dB)

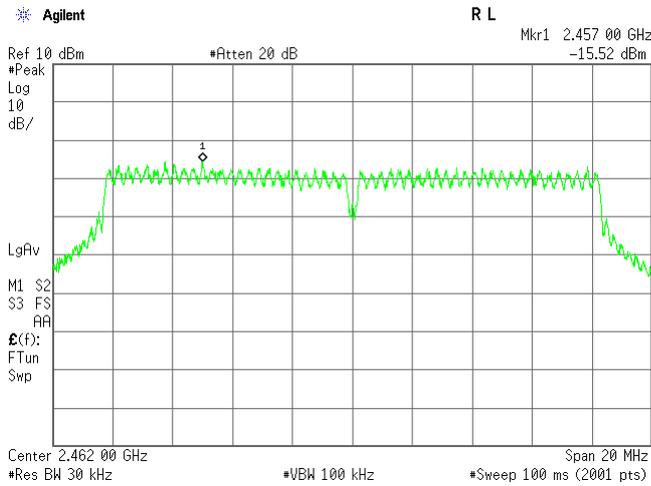
NOTES

1. The peak power density complied with the limit using 30 kHz resolution bandwidth of Spectrum Analyzer.
2. The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.
3. Setting of measuring instrument(s) :

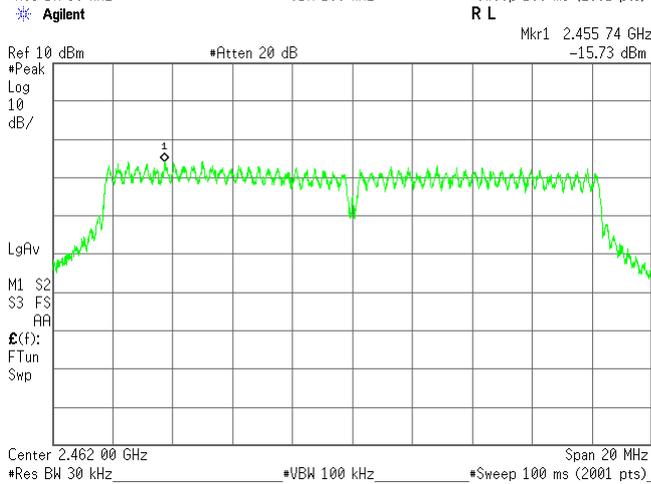
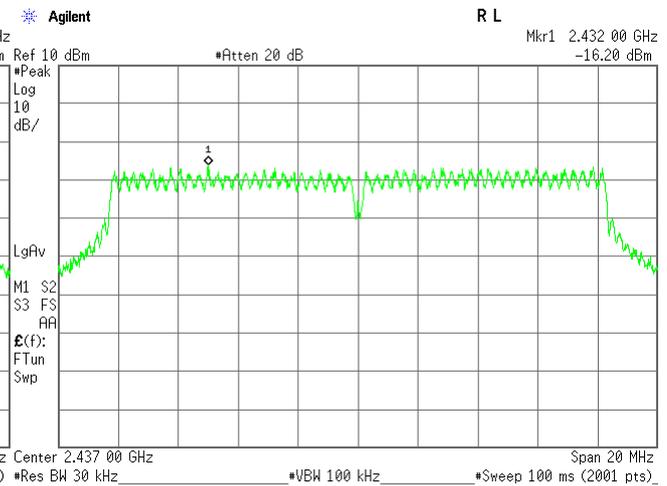
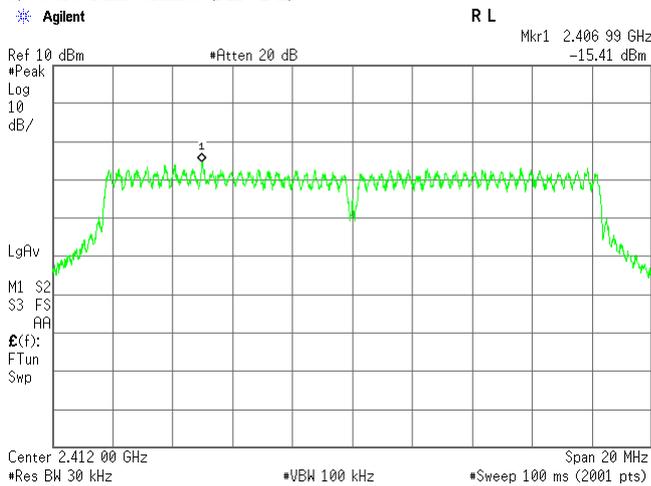
Detector Function	RES B.W.	Video B.W.
Peak	30kHz	100kHz

a) Main Antenna (ANT0)





b) Sub Antenna (ANT1)



3) IEEE 802.11n

Test Date: August 25, 2015

Temp.: 26 °C, Humi: 66 %

Data Rate : MCS4

CH	Transmitting Frequency [MHz]	Correction Factor [dB]	Meter Reading			Conducted Peak Power Density		Limits [dBm]	Margin [dB]
			ANT0 [dBm]	ANT1 [dBm]	Total [dBm]	[dBm]	[mW]		
01	2412	10.34	-16.91	-16.64	-13.76	-3.42	0.45	8.00	+11.42
06	<u>2437</u>	<u>10.34</u>	<u>-16.64</u>	<u>-16.23</u>	<u>-13.42</u>	<u>-3.08</u>	<u>0.49</u>	8.00	+11.08
11	2462	10.35	-17.15	-16.49	-13.80	-3.45	0.45	8.00	+11.45

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

Correction Factor	=	10.34 dB
+ ) Meter Reading	=	-13.42 dBm
Result	=	-3.08 dBm = 0.49 mW

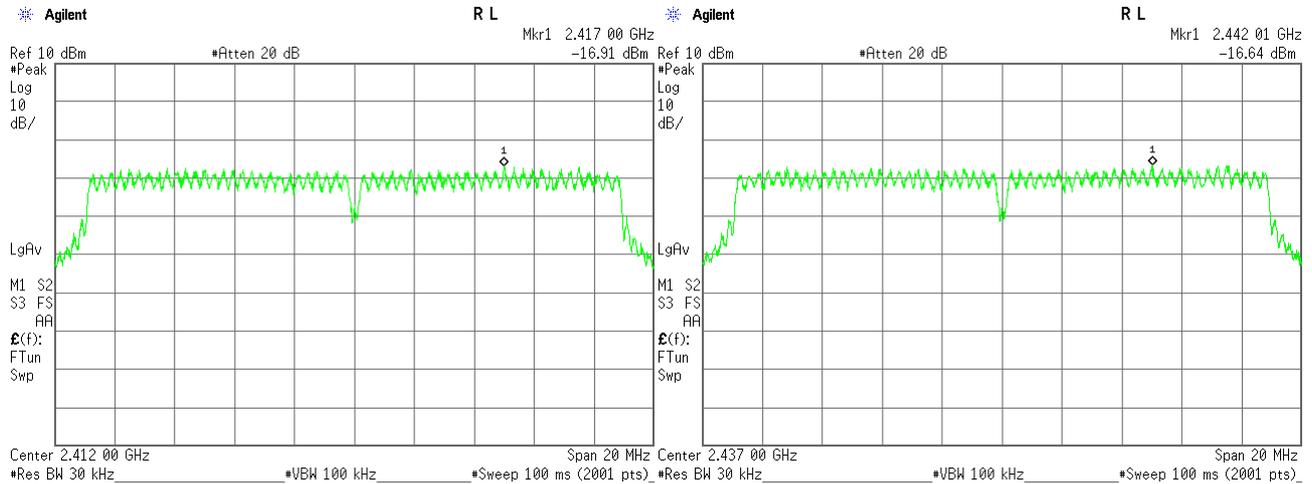
Minimum Margin: 8.00 - -3.08 = 11.08 (dB)

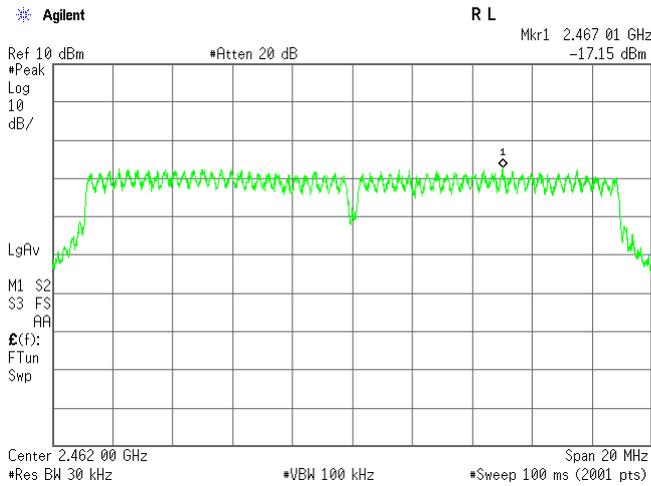
NOTES

1. The peak power density complied with the limit using 30 kHz resolution bandwidth of Spectrum Analyzer.
2. The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.
3. Setting of measuring instrument(s) :

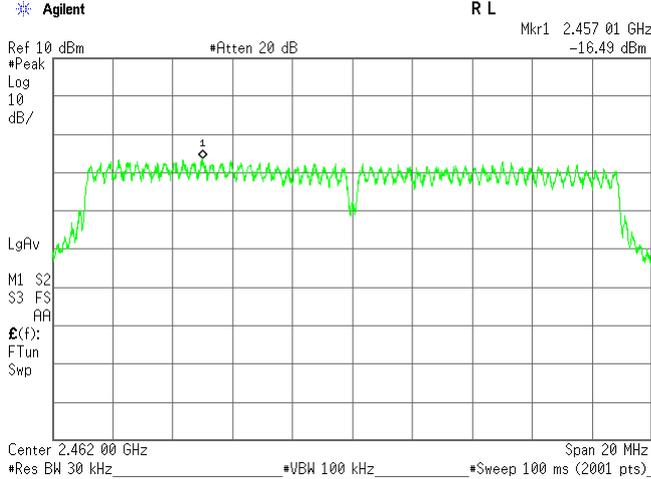
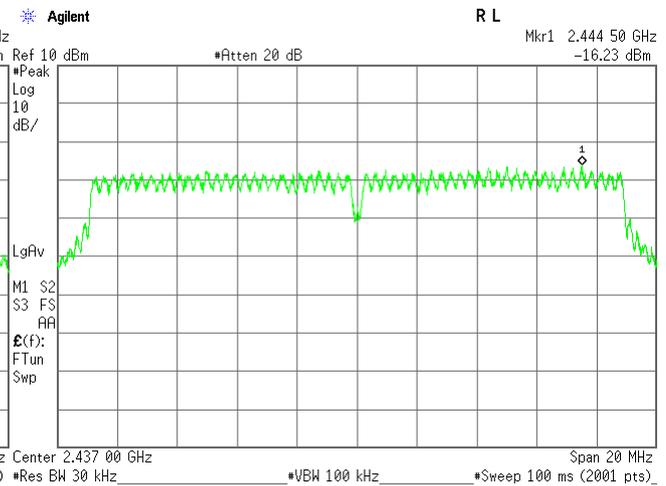
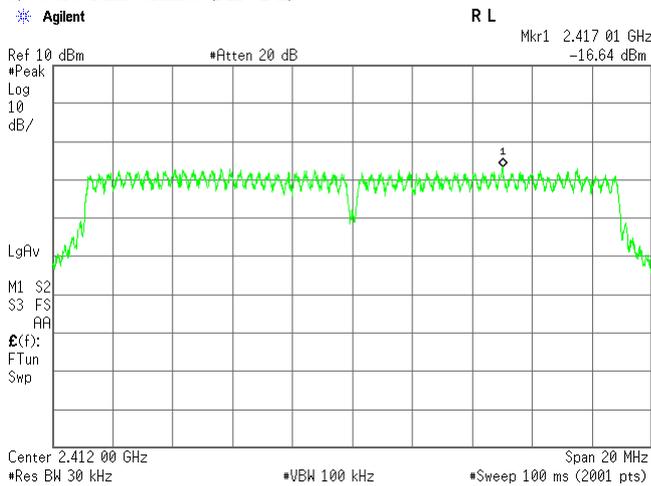
Detector Function	RES B.W.	Video B.W.
Peak	30kHz	100kHz

a) Main Antenna (ANT0)





b) Sub Antenna (ANT1)



4) Bluetooth LE(Modulation type : GFSK)

Test Date: August 24, 2015

Temp.: 26 °C, Humi: 62 %

CH	Transmitting Frequency [MHz]	Correction Factor [dB]	Meter Reading [dBm]	Conducted Peak Power Density [dBm]	Conducted Peak Power Density [mW]	Limits [dBm]	Margin [dB]
00	2402	10.34	-8.43	1.91	1.55	8.00	+ 6.09
19	2440	10.35	-7.36	3.00	1.99	8.00	+ 5.01
39	2480	10.36	-6.66	3.70	2.34	8.00	+ 4.30

Calculated result at 2480.000 MHz, as the worst point shown on underline:

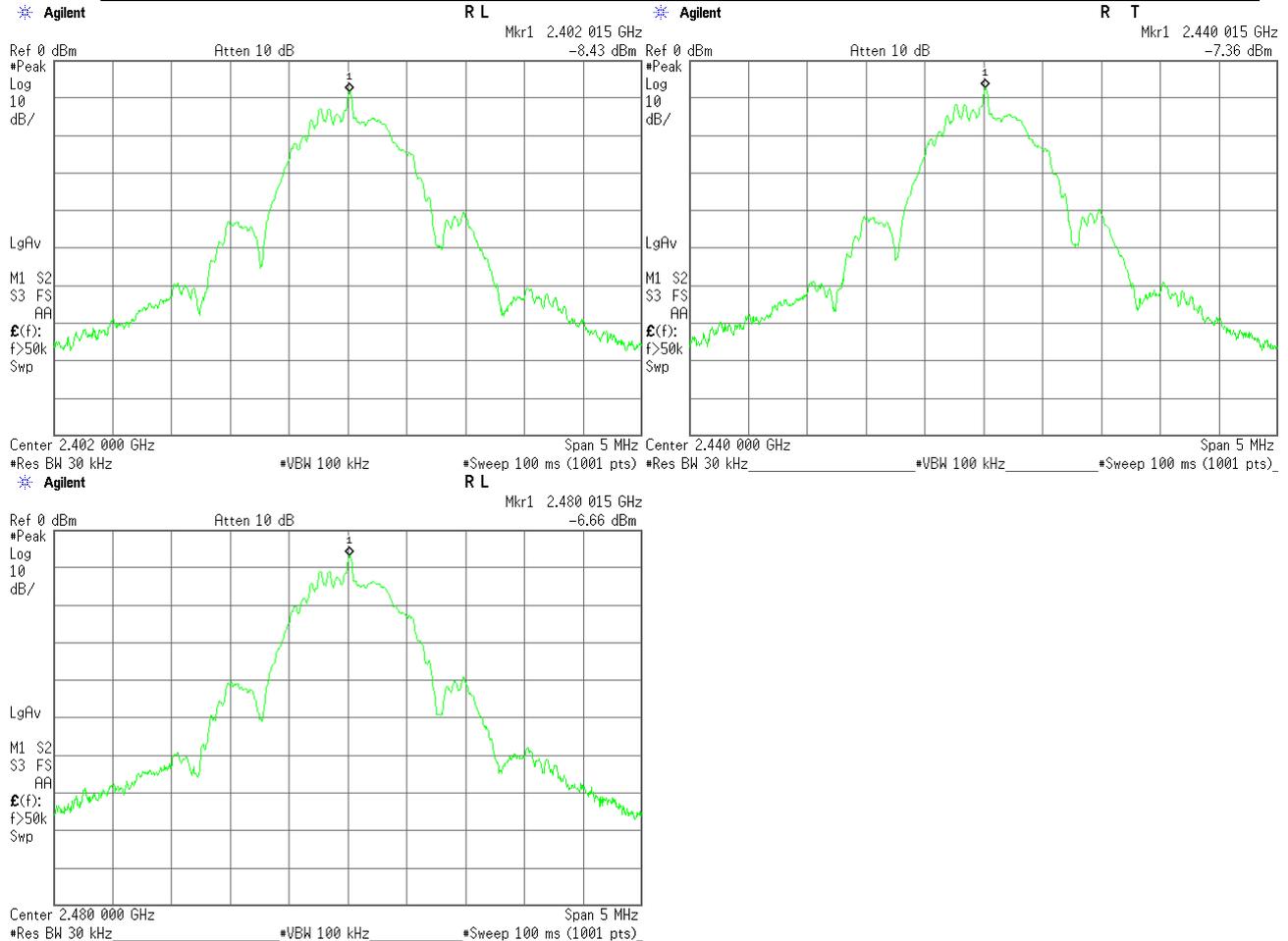
Correction Factor	=	10.36 dB
+ ) Meter Reading	=	-6.66 dBm
Result	=	3.70 dBm = 2.34 mW

Minimum Margin: 8.00 - 3.70 = 4.30 (dB)

NOTES

1. The peak power density complied with the limit using 30 kHz resolution bandwidth of Spectrum Analyzer.
2. The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.
3. Setting of measuring instrument(s) :

Detector Function	RES B.W.	Video B.W.
Peak	30kHz	100kHz



**7.7 Spurious Emissions(Conduction)**

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

**7.7.1 Test Results**

For the standard,  - Passed  - Failed  - Not judged

Uncertainty of Measurement Results

9 kHz – 1 GHz	<u>± 1.4</u>	dB(2σ)
1 GHz – 18 GHz	<u>± 1.7</u>	dB(2σ)
18 GHz – 40 GHz	<u>± 2.3</u>	dB(2σ)

Remarks : \_\_\_\_\_

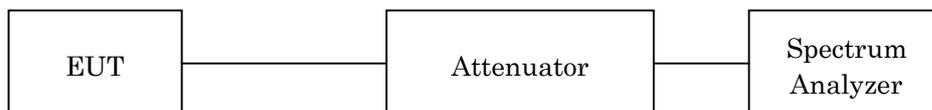
**7.7.2 Test Instruments**

Shielded Room S4				
Type	Model	Serial No. (ID)	Manufacturer	Cal. Due
Spectrum Analyzer	E4446A	US44300388 (A-39)	Agilent	2016/08/11
Attenuator	54A-10	W5675 (D-28)	Weinschel	2016/08/16
RF Cable	SUCOFLEX102	14253/2 (C-52)	HUBER+SUHNER	2016/08/16

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

**7.7.3 Test Method and Test Setup (Diagrammatic illustration)**

The test system is shown as follows:



The setting of the spectrum analyzer are shown as follows:

Frequency Range	30 MHz - 25 GHz	Band-Edge
Res. Bandwidth	100 kHz	100 kHz
Video Bandwidth	300 kHz	300 kHz
Sweep Time	AUTO	AUTO
Trace	Maxhold	Maxhold

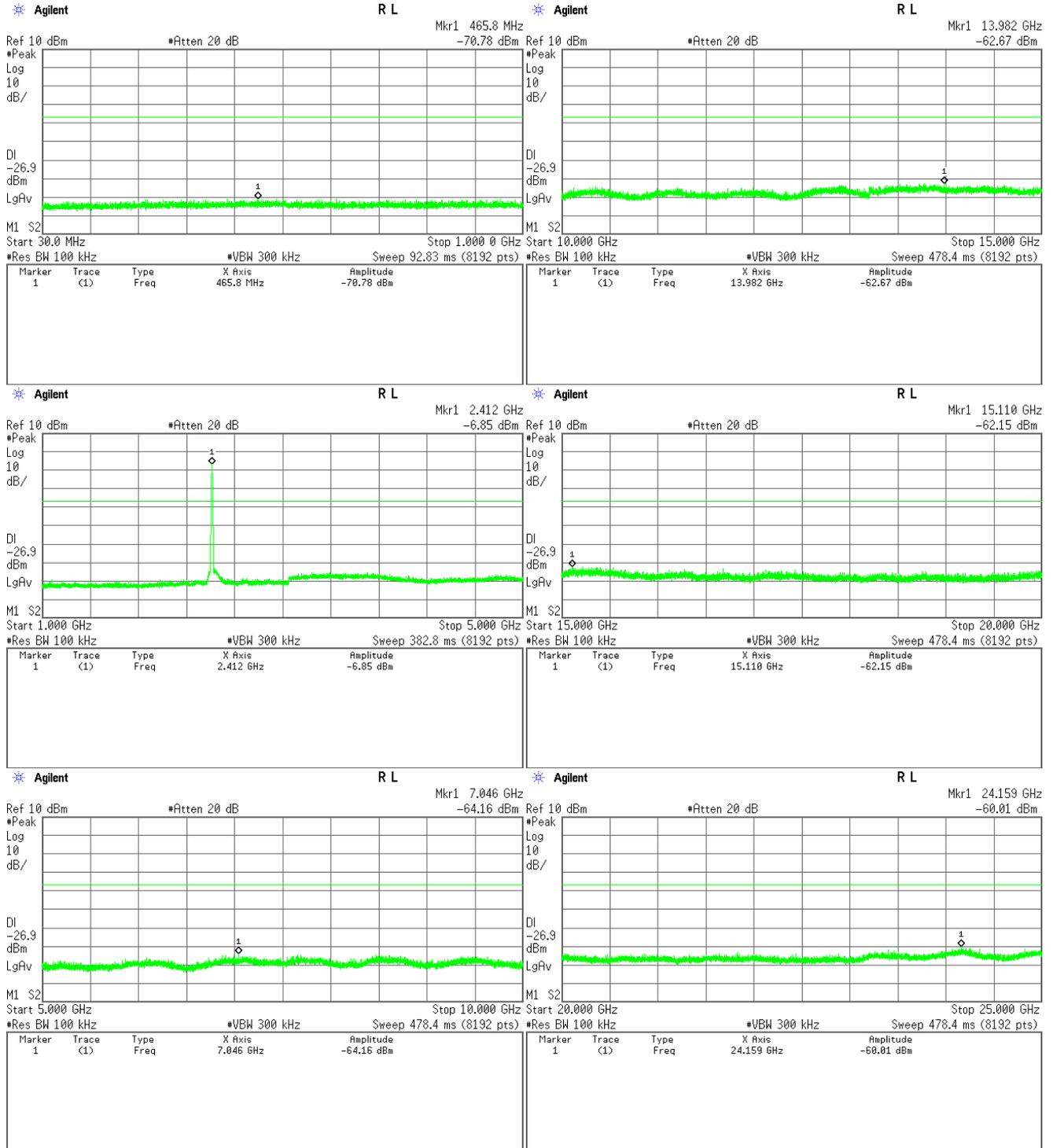
**7.7.4 Test Data**

Test Date : August 25, 2015

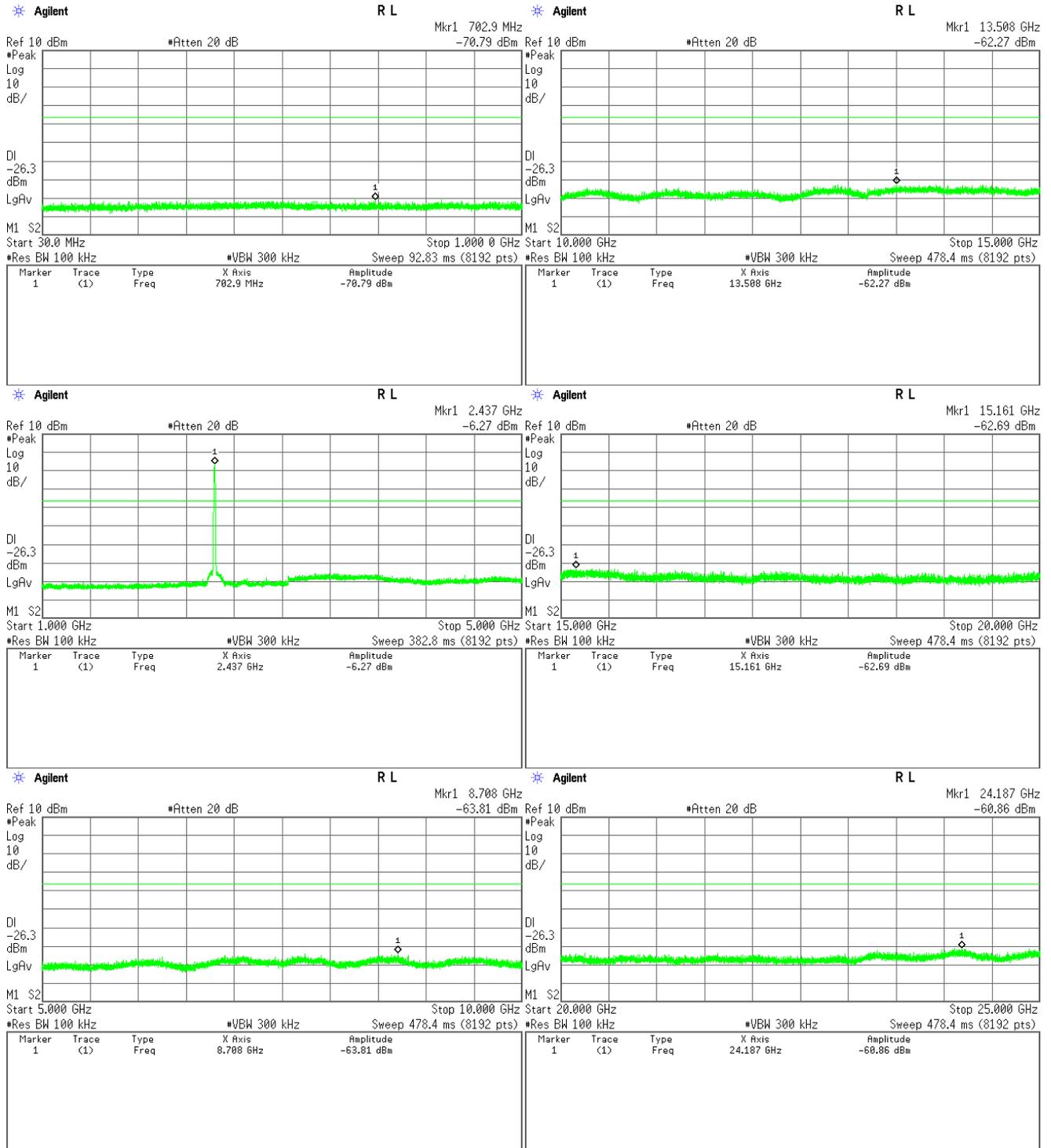
Temp.:26°C, Humi:66%

1-1) IEEE 802.11b (Main Antenna)

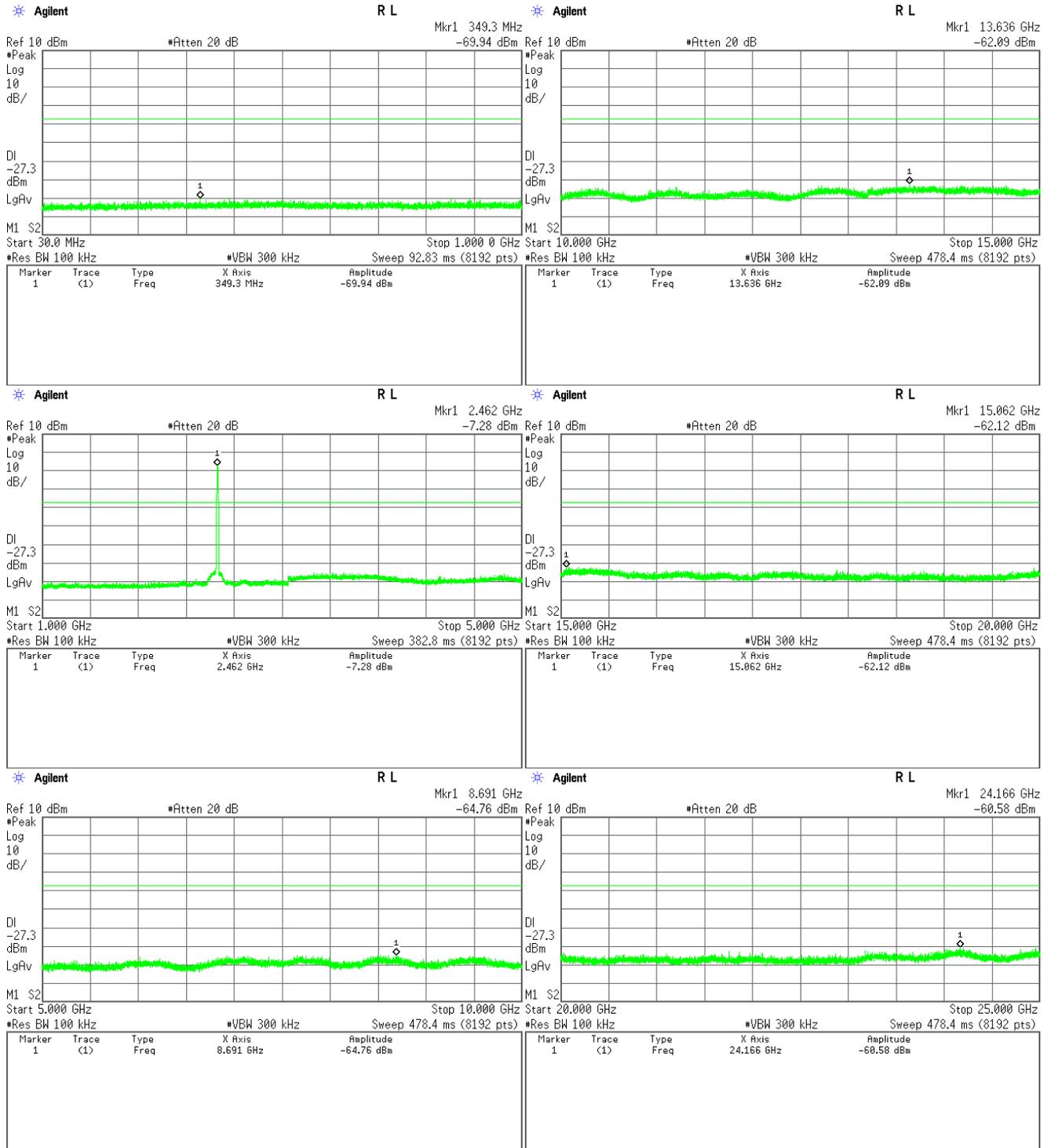
**Low Channel**



## Middle Channel

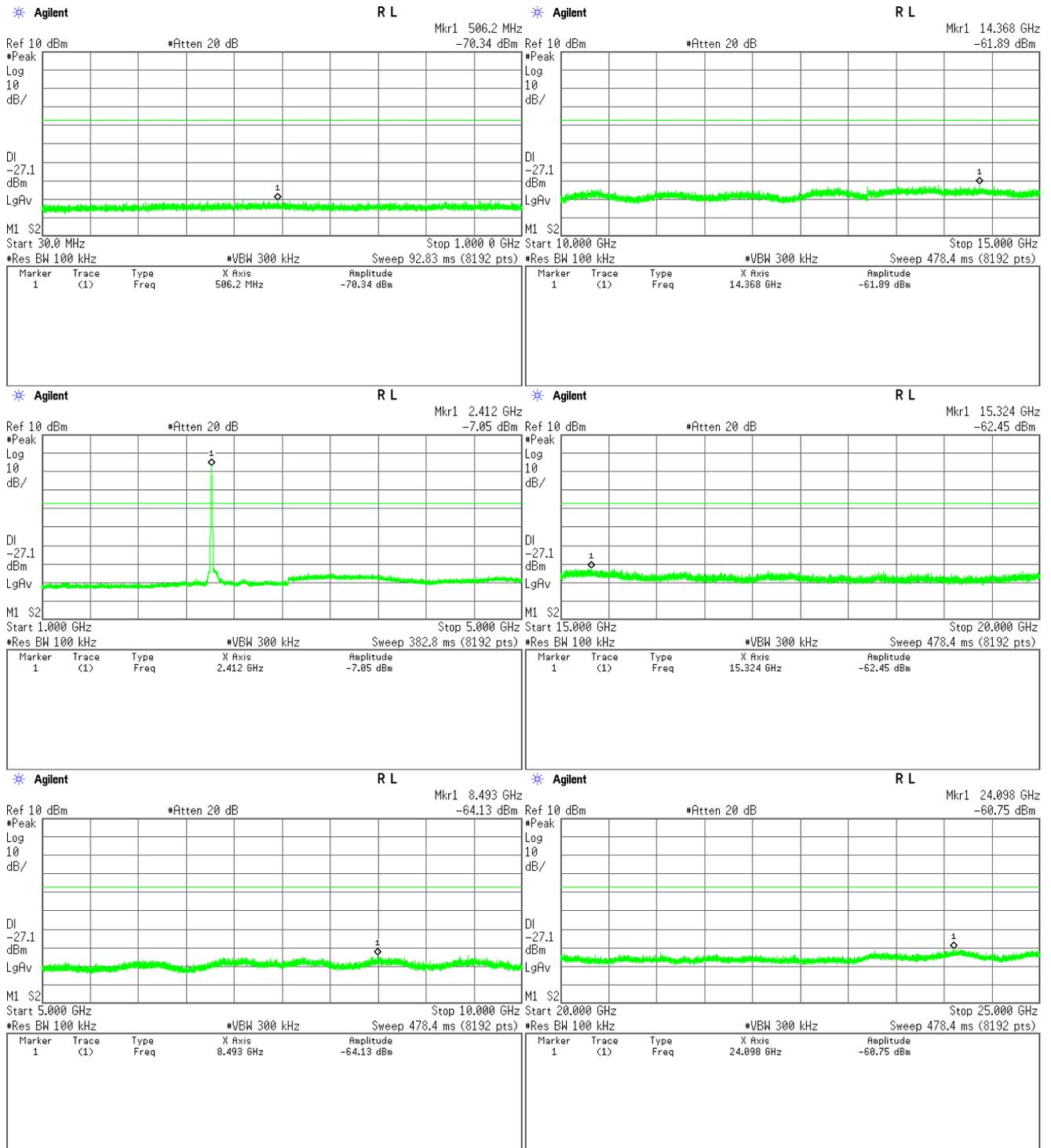


## High Channel

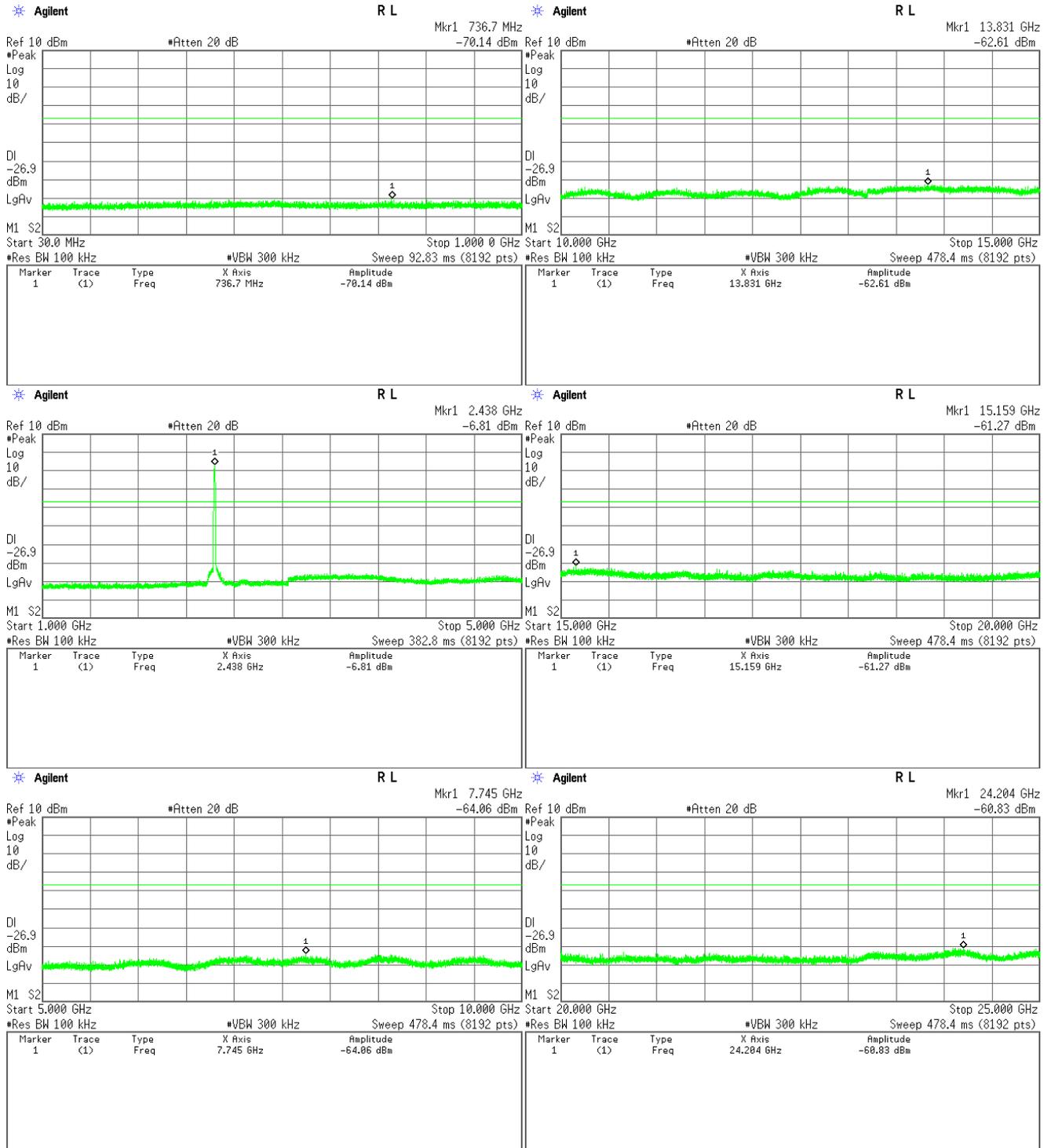


1-2) IEEE 802.11b (Sub Antenna)

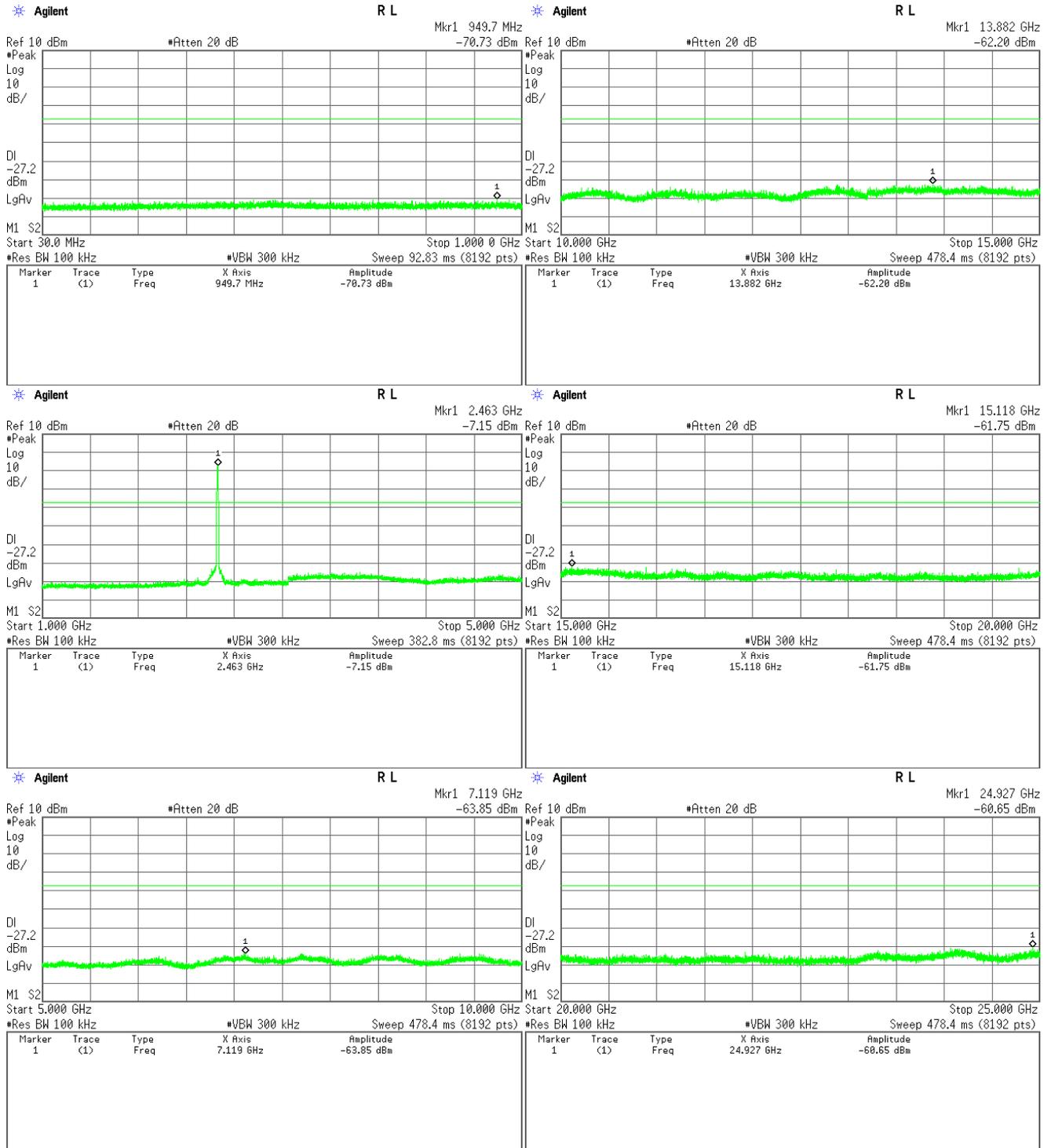
Low Channel



## Middle Channel

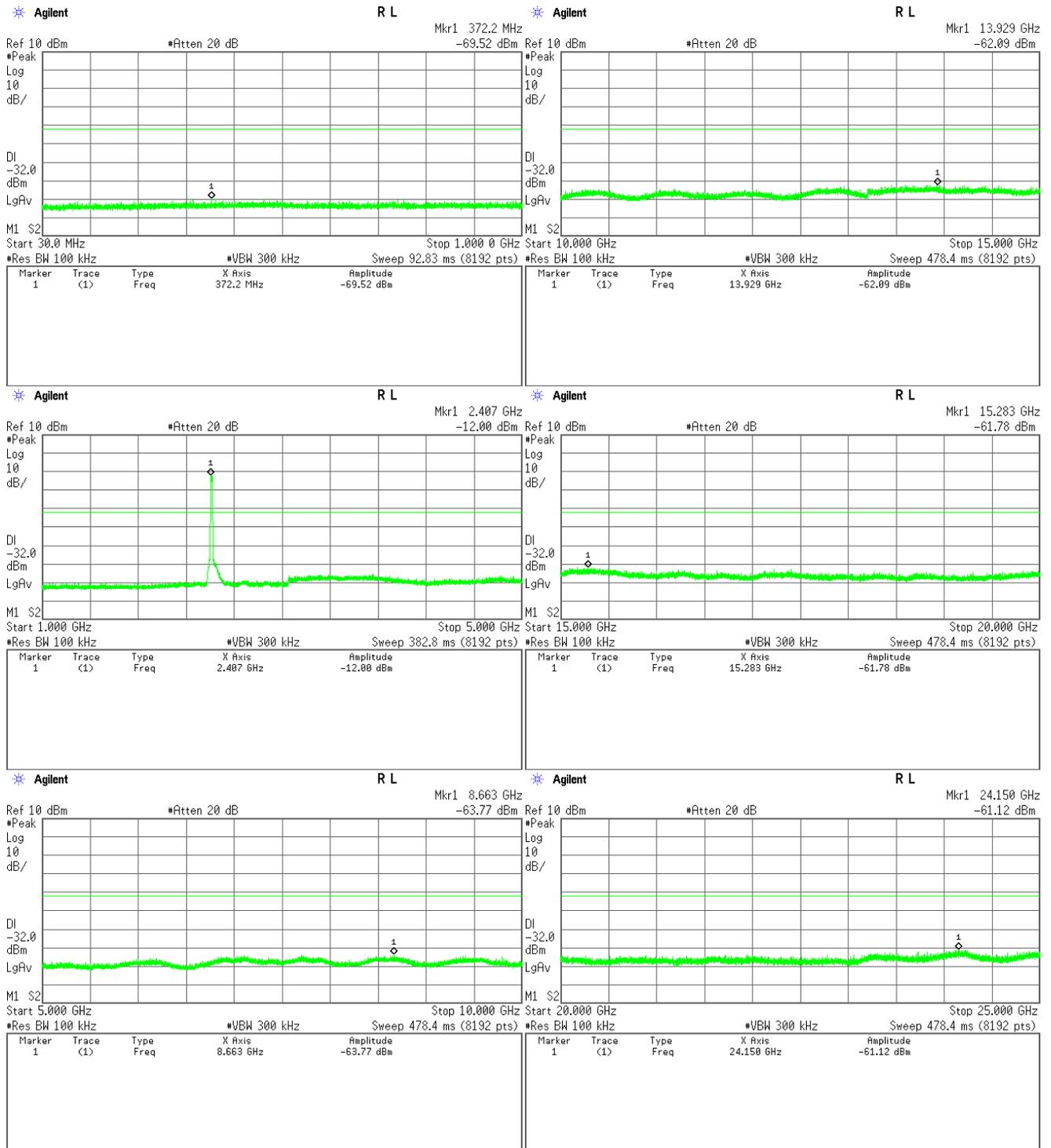


## High Channel

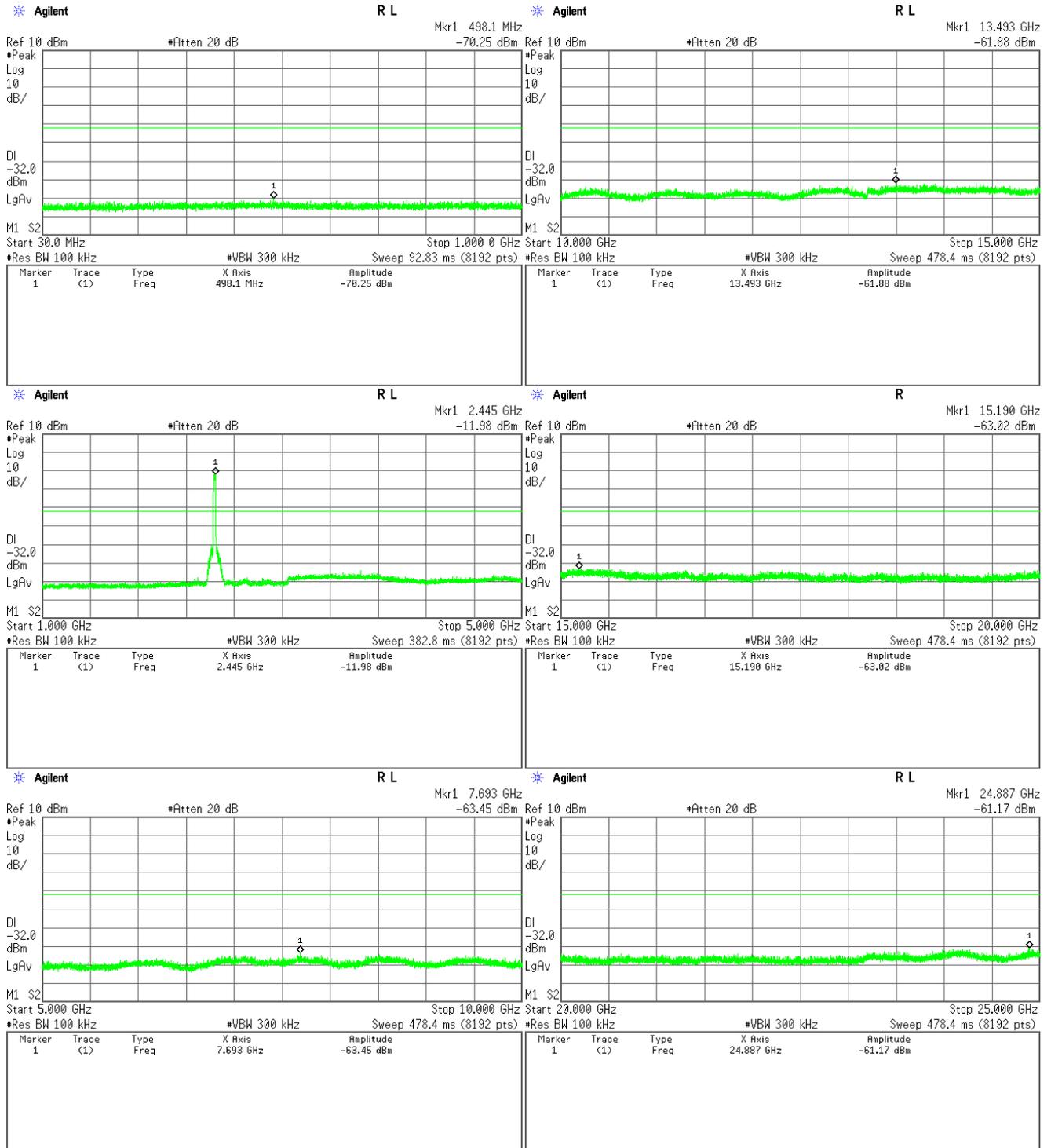


2-1) IEEE 802.11g (Main Antenna)

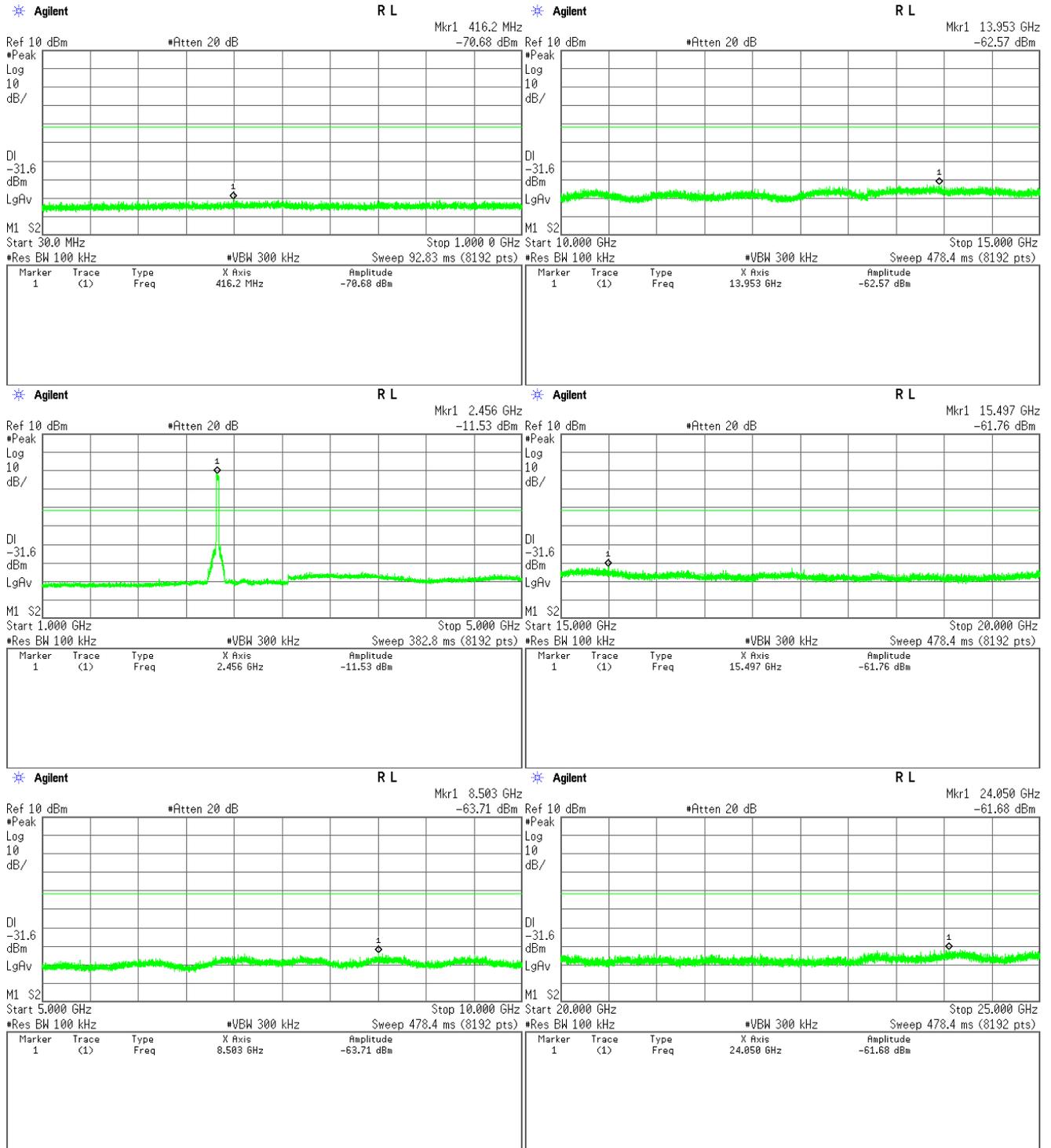
Low Channel



## Middle channel

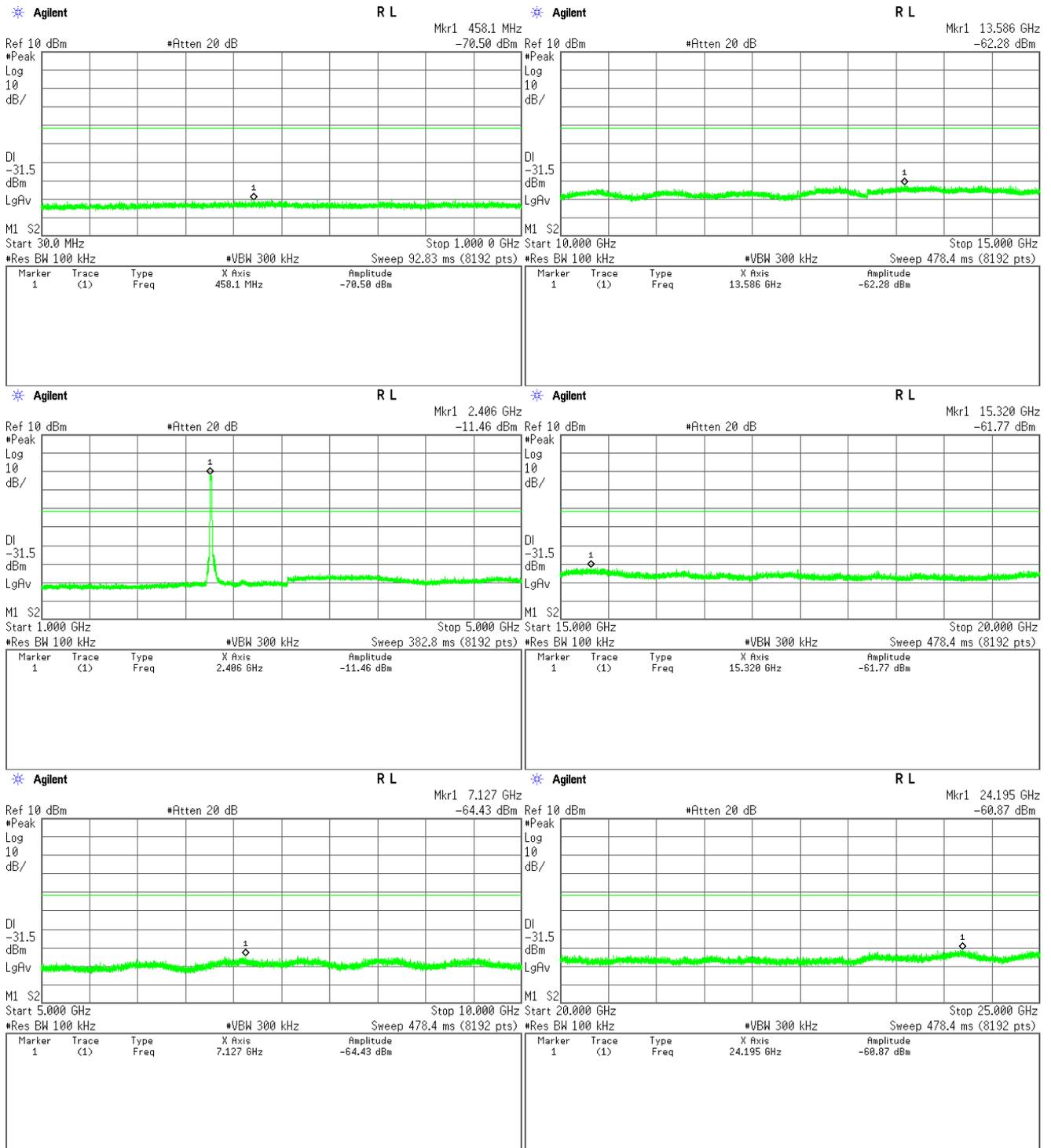


## High Channel

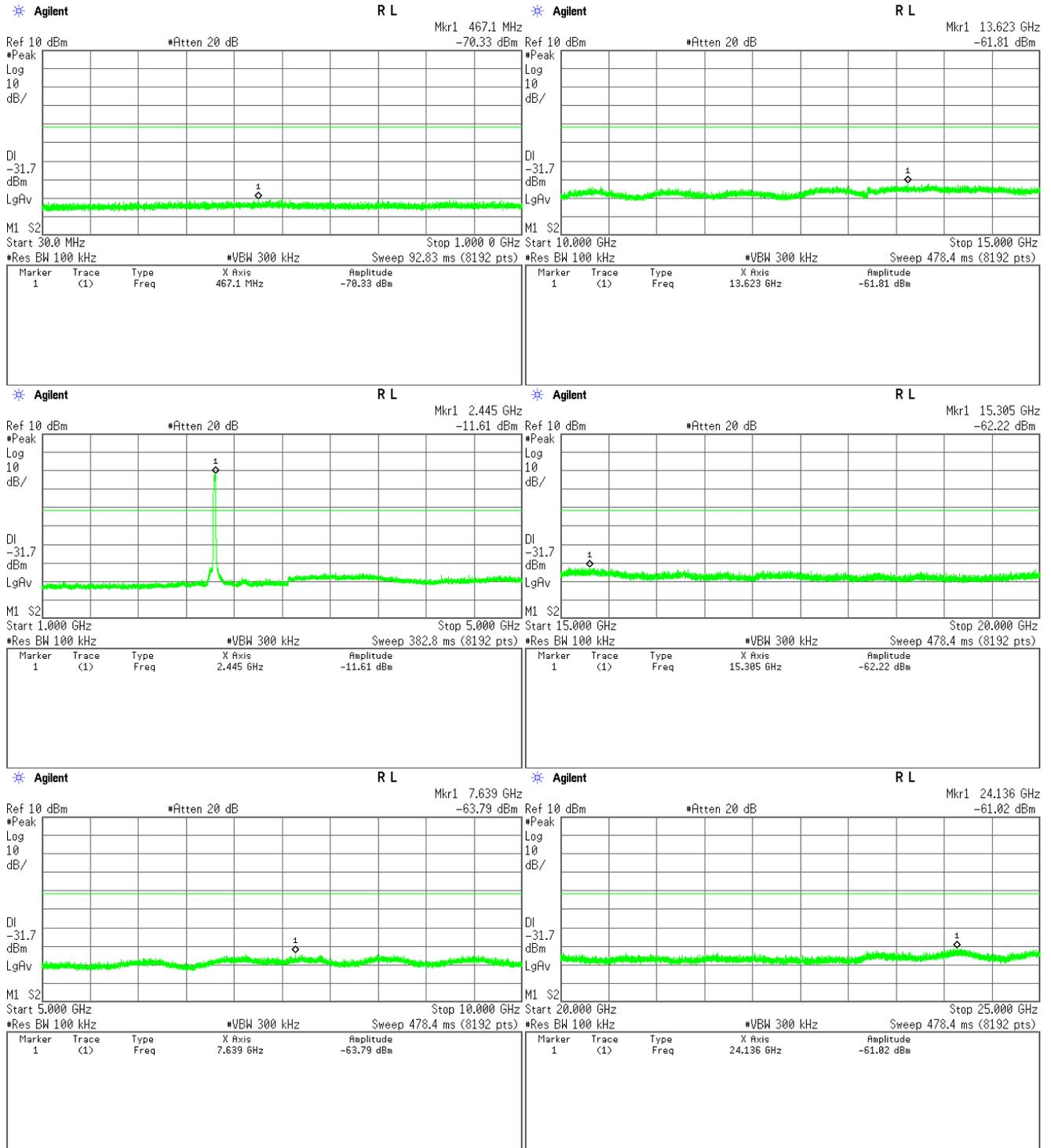


2-2) IEEE 802.11g (Sub Antenna)

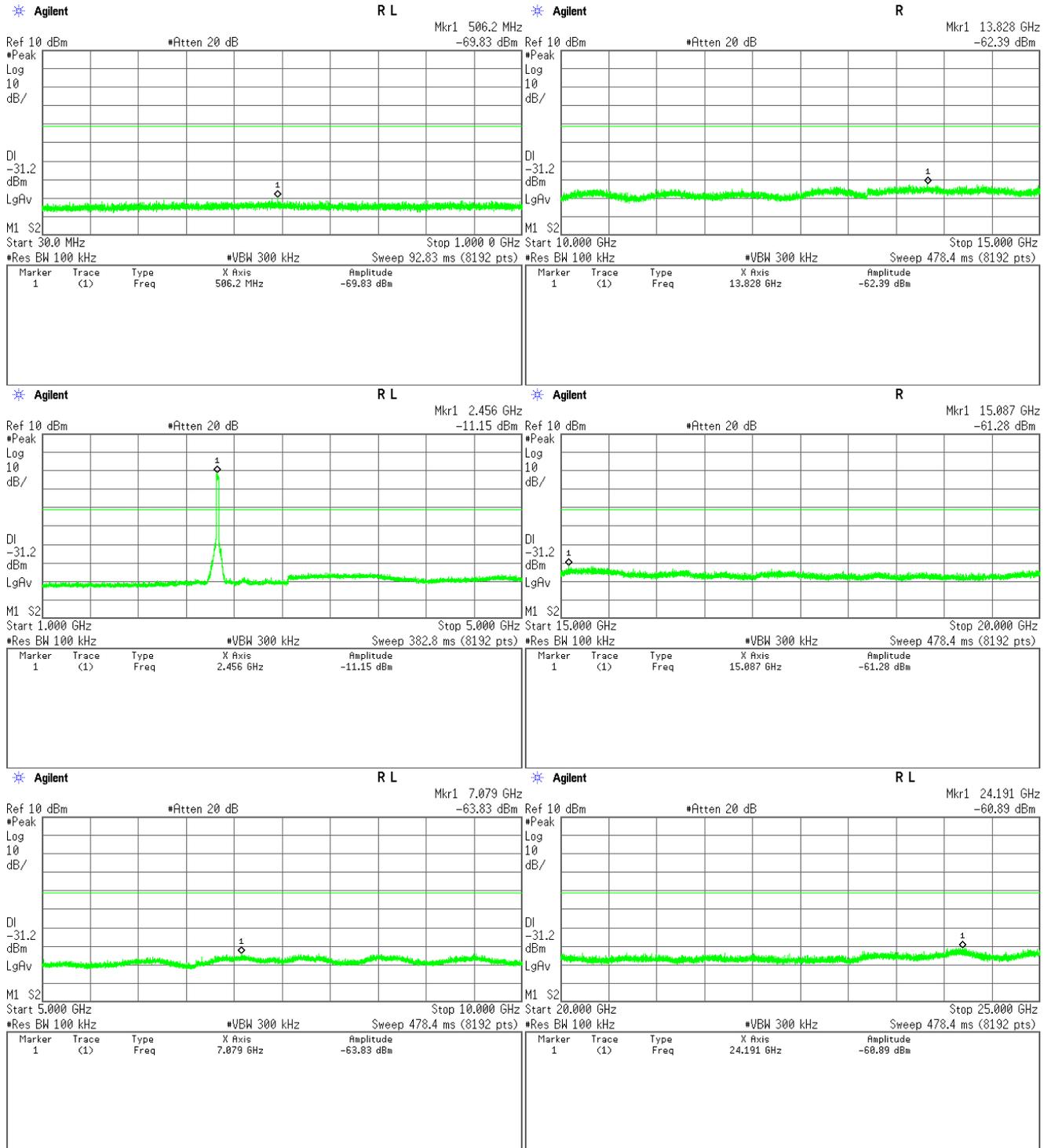
Low Channel



## Middle channel

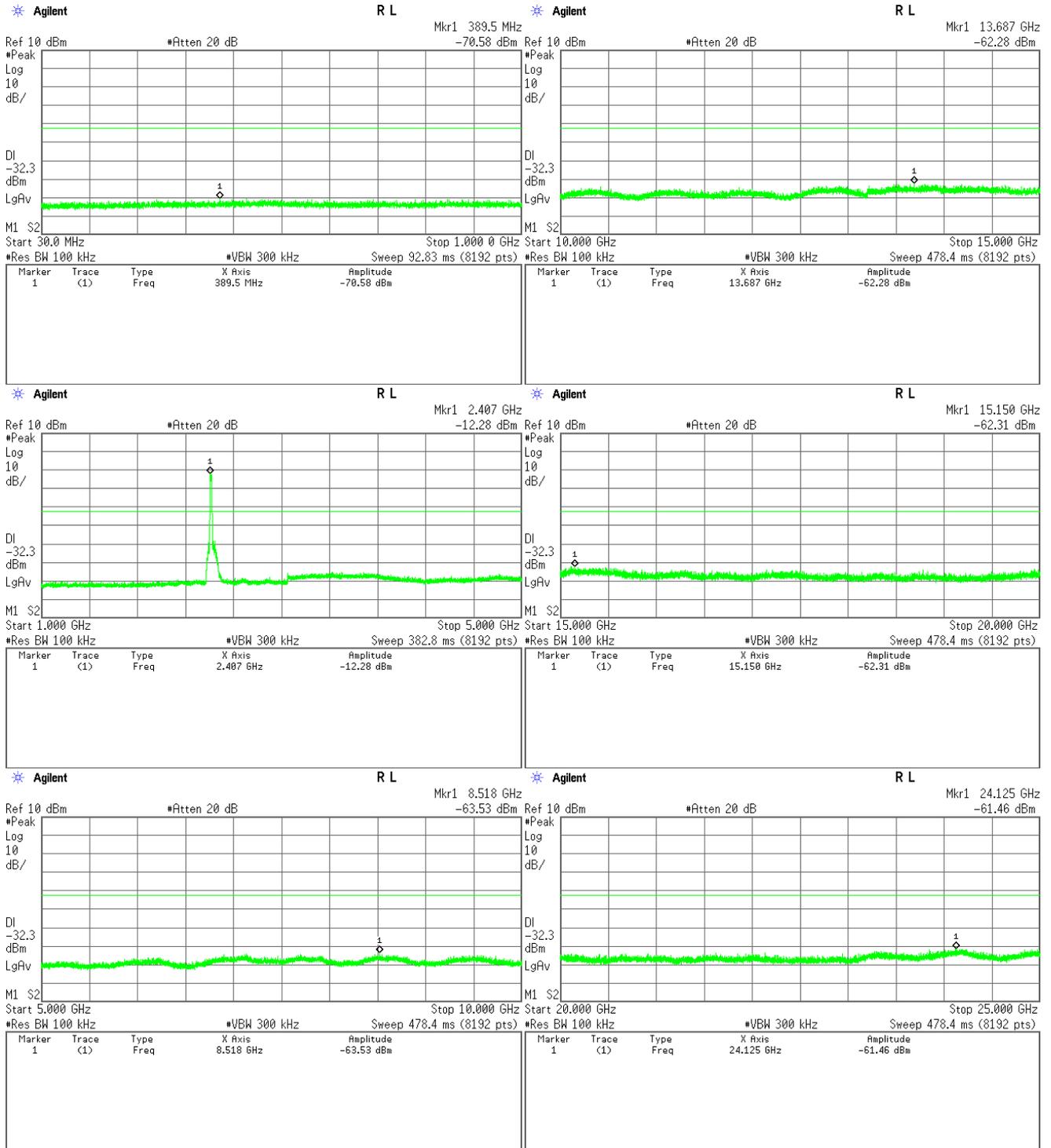


## High Channel

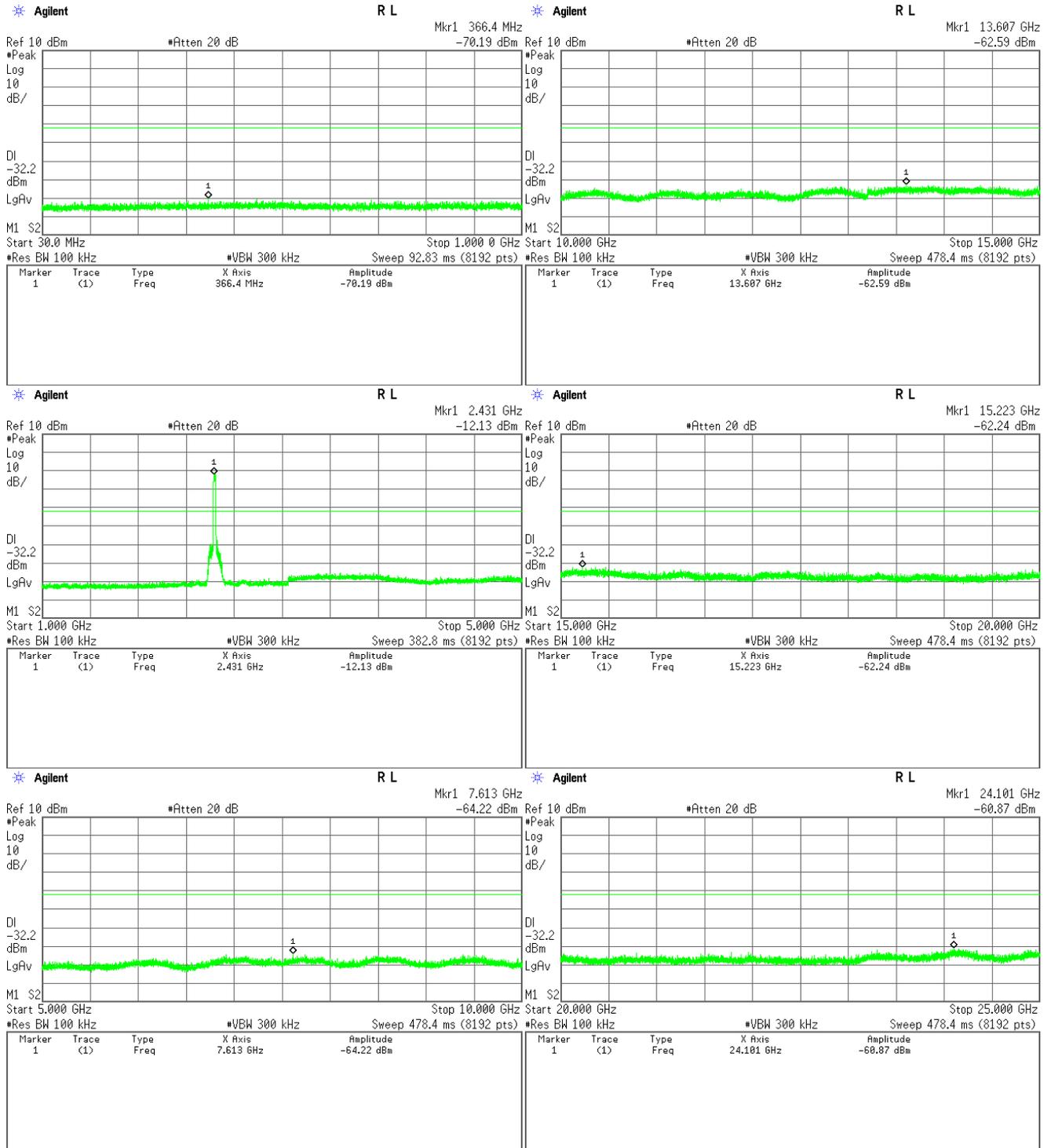


3-1) IEEE 802.11n (Main Antenna)

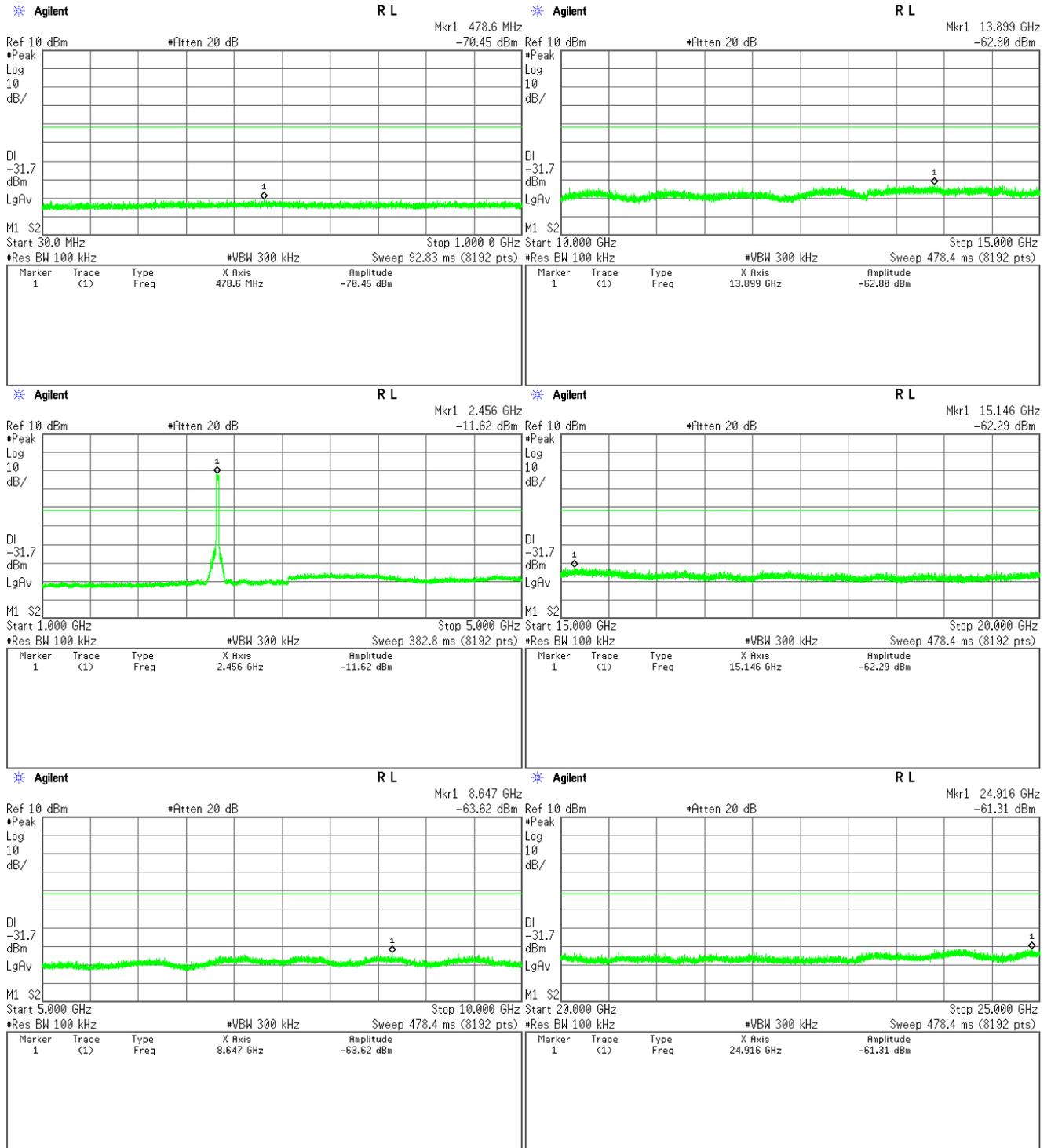
Low Channel



## Middle Channel

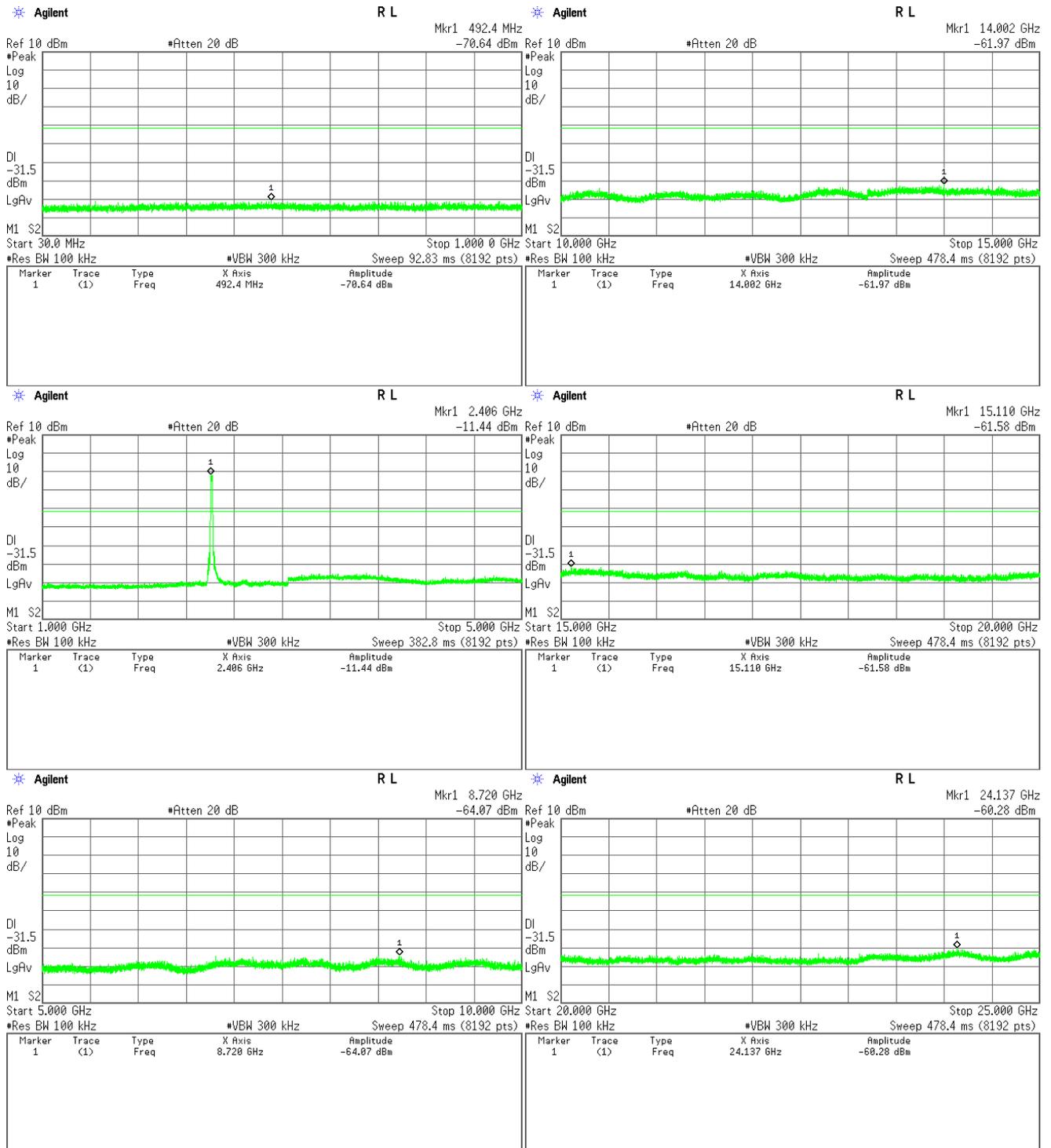


## High Channel

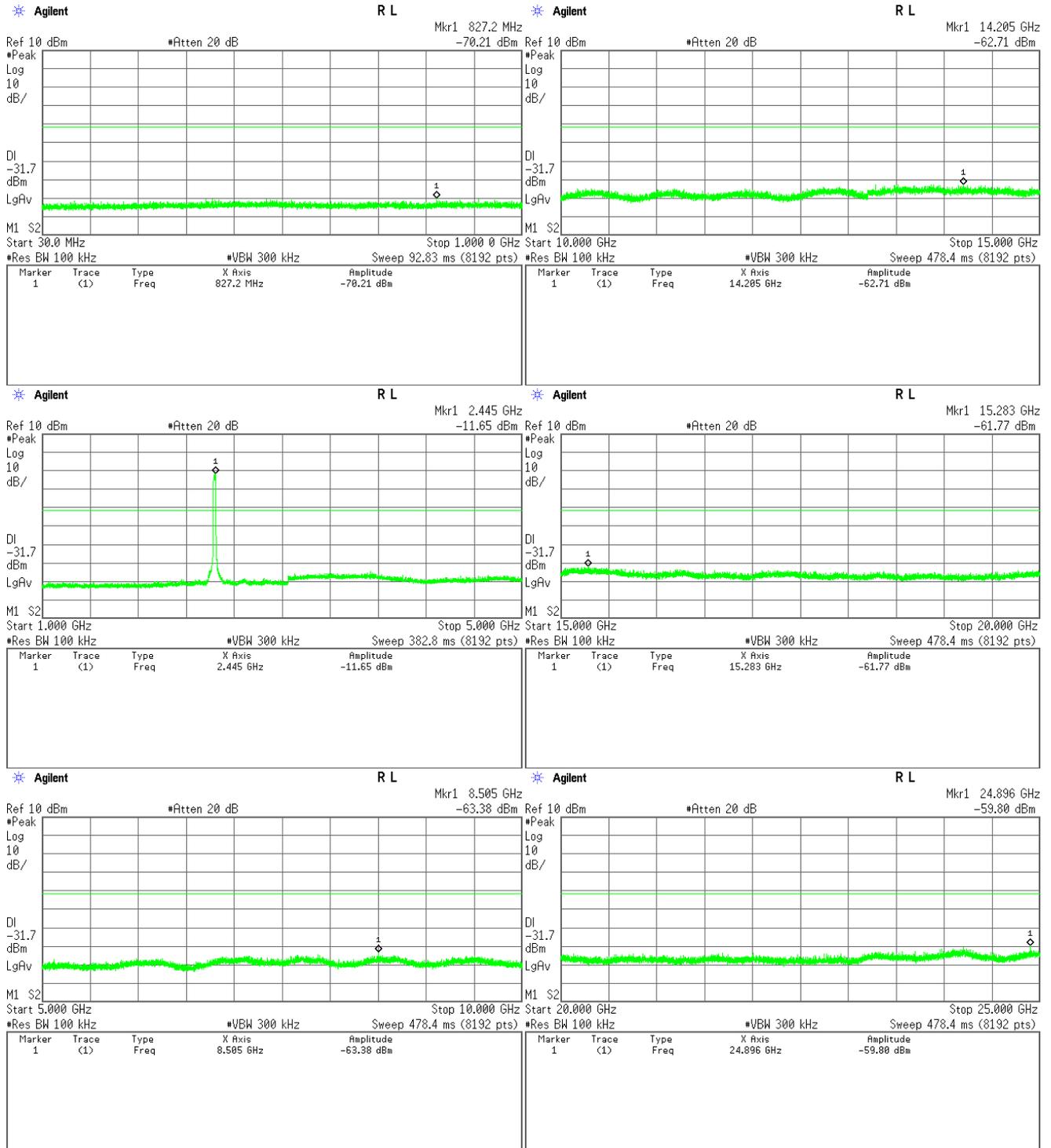


3-2) IEEE 802.11n (Sub Antenna)

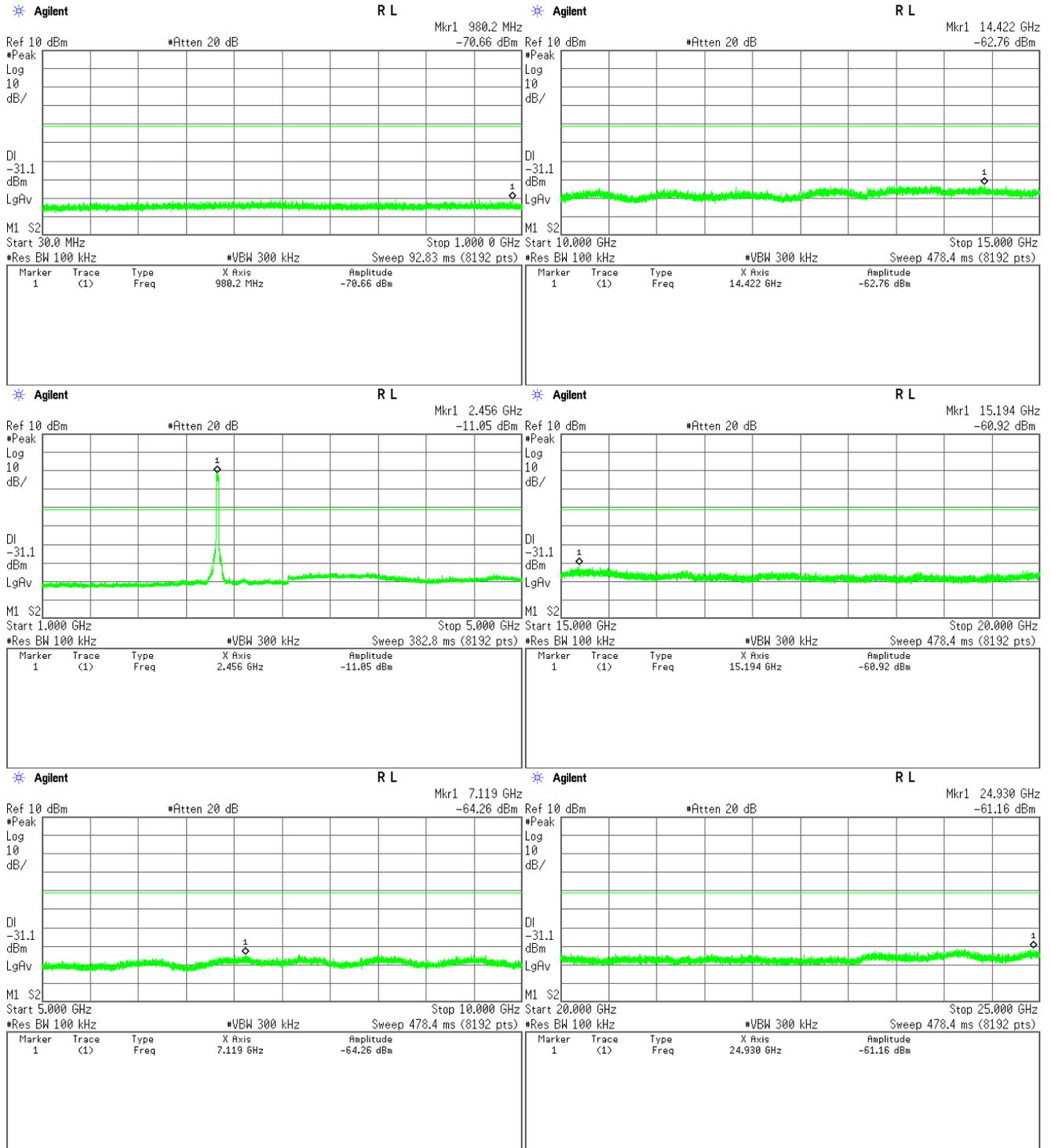
Low Channel



## Middle Channel

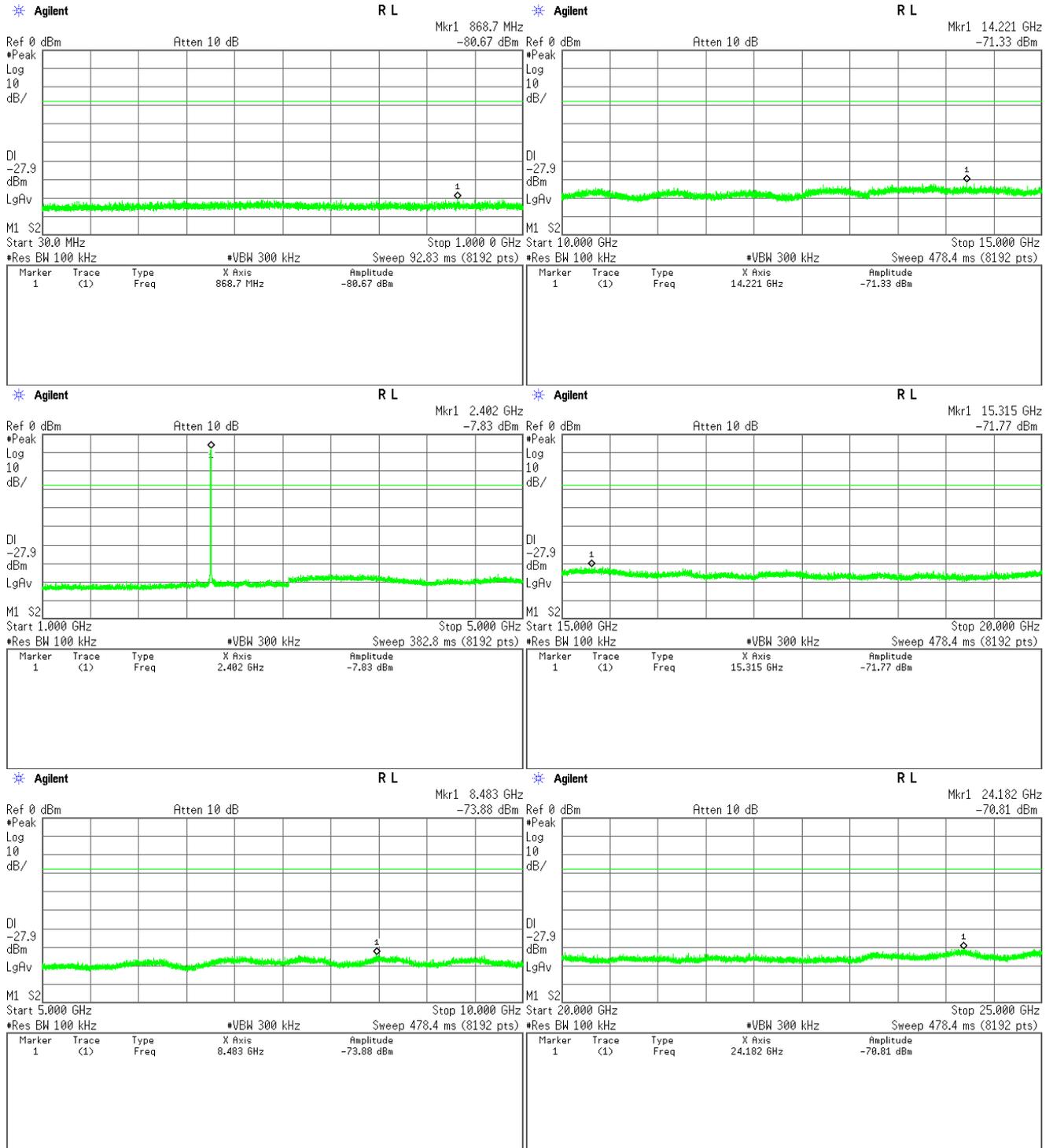


## High Channel

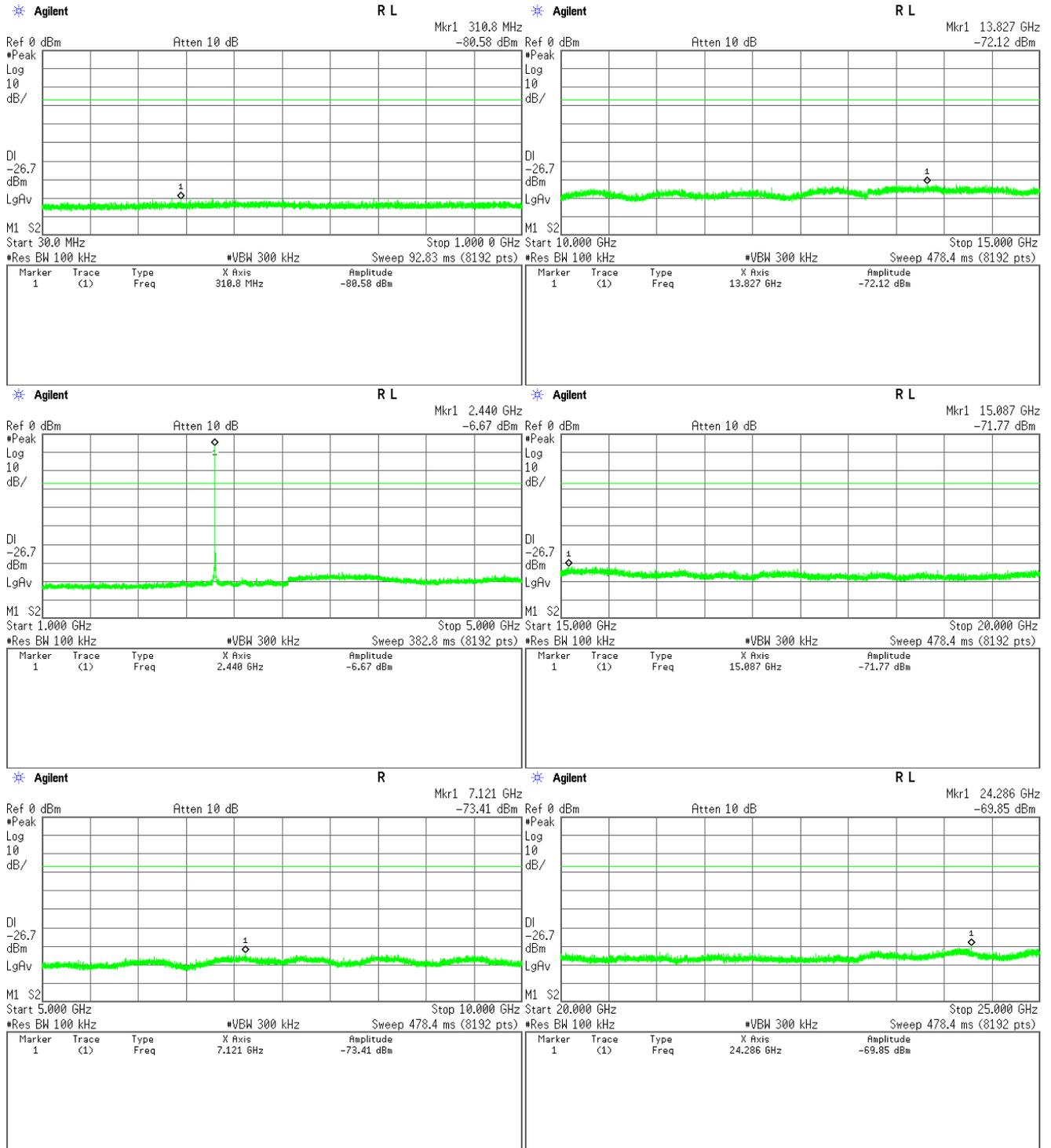


## 4) Bluetooth Low Energy

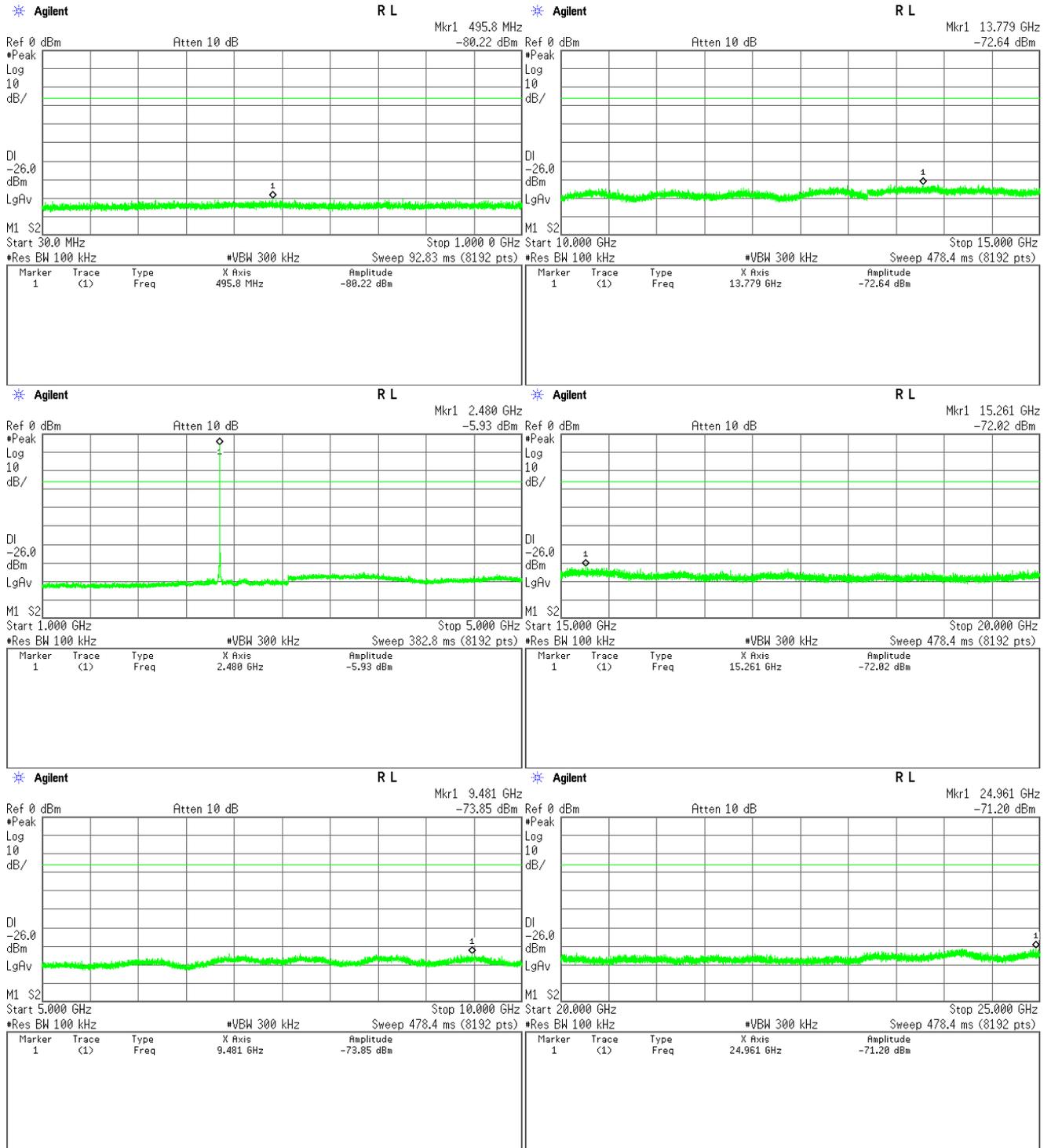
### Low Channel



## Middle Channel



## High Channel



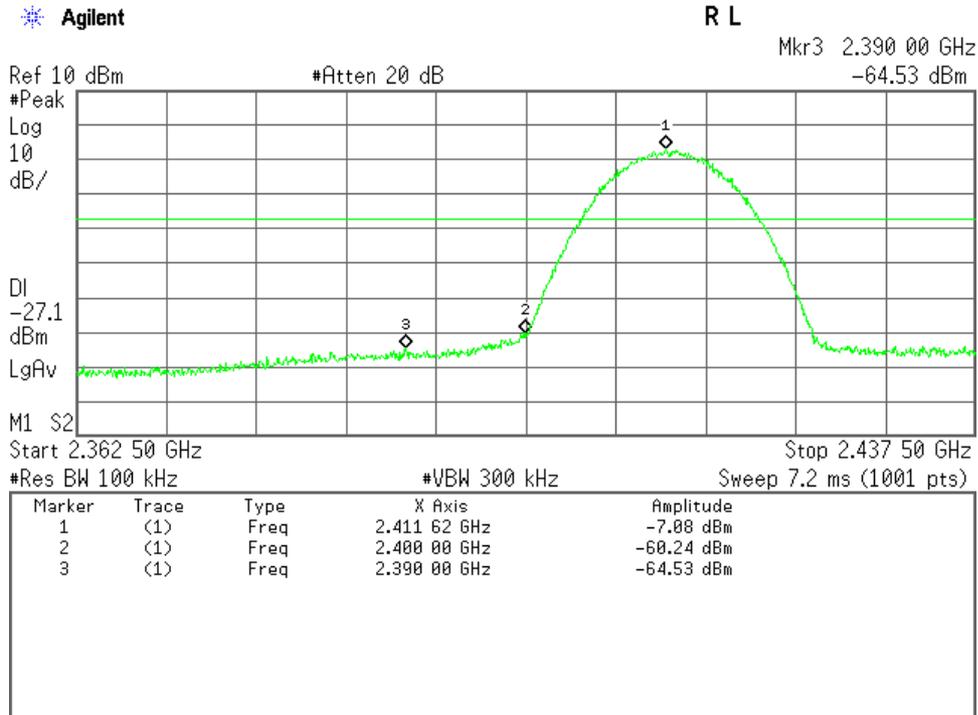
## Band-Edge Emission

Test Date : August 25, 2015

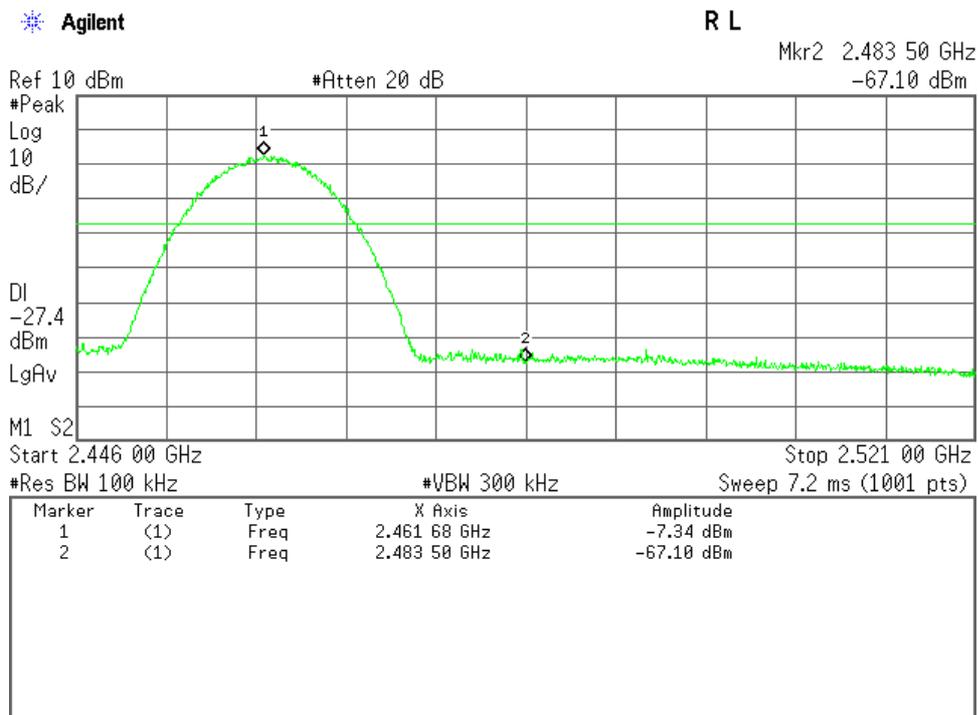
Temp.:26°C, Humi:66%

1-1) IEEE 802.11b (Main Antenna)

### Low Channel

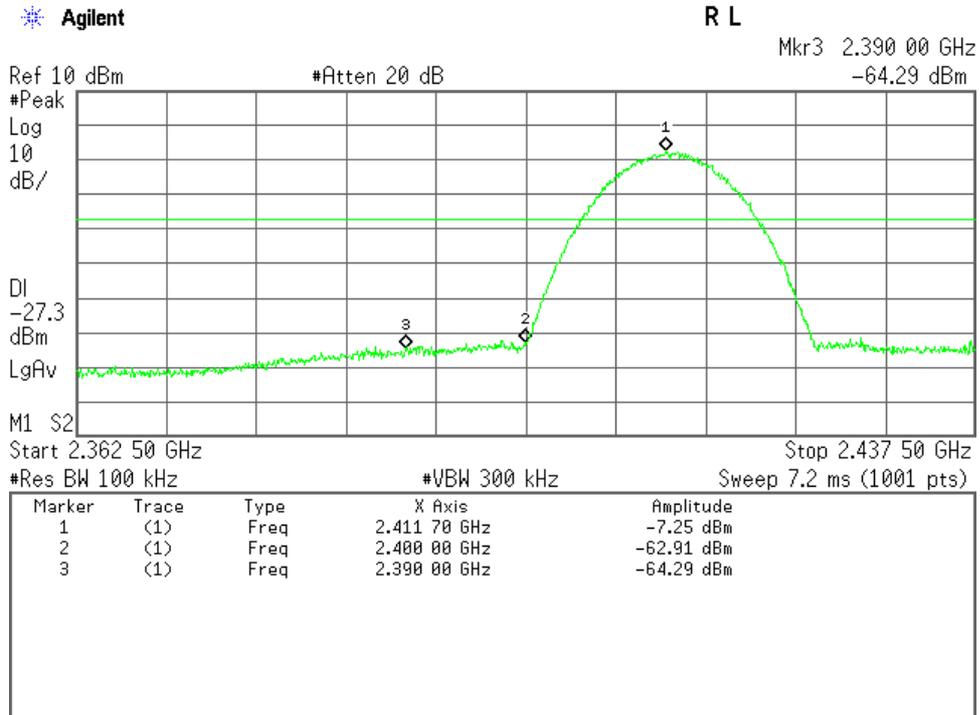


### High Channel

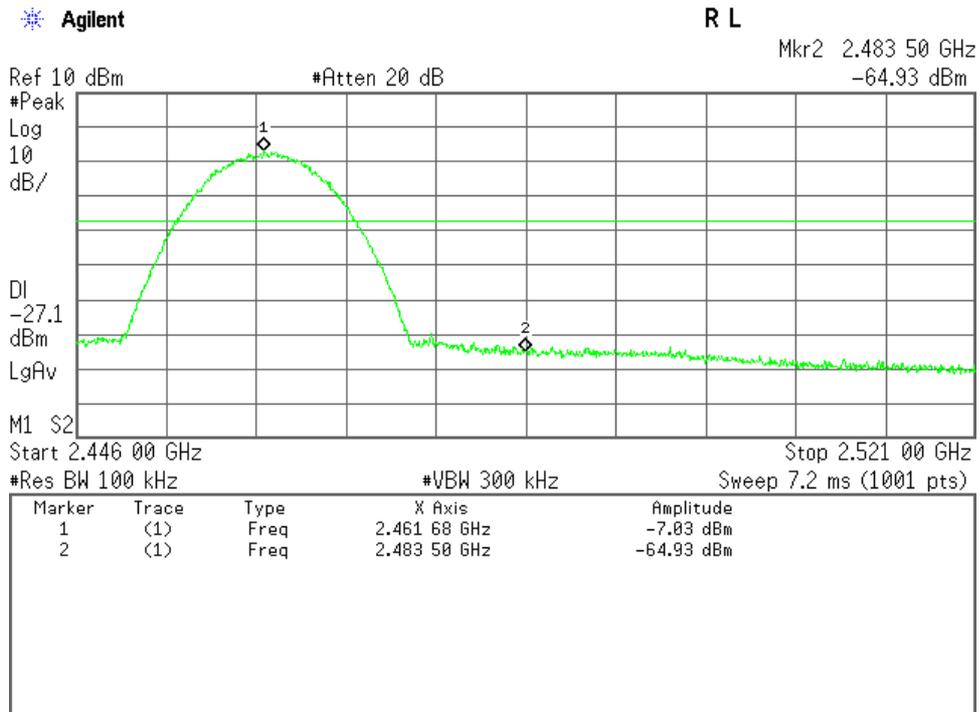


1-2) IEEE 802.11b (Sub Antenna)

Low Channel

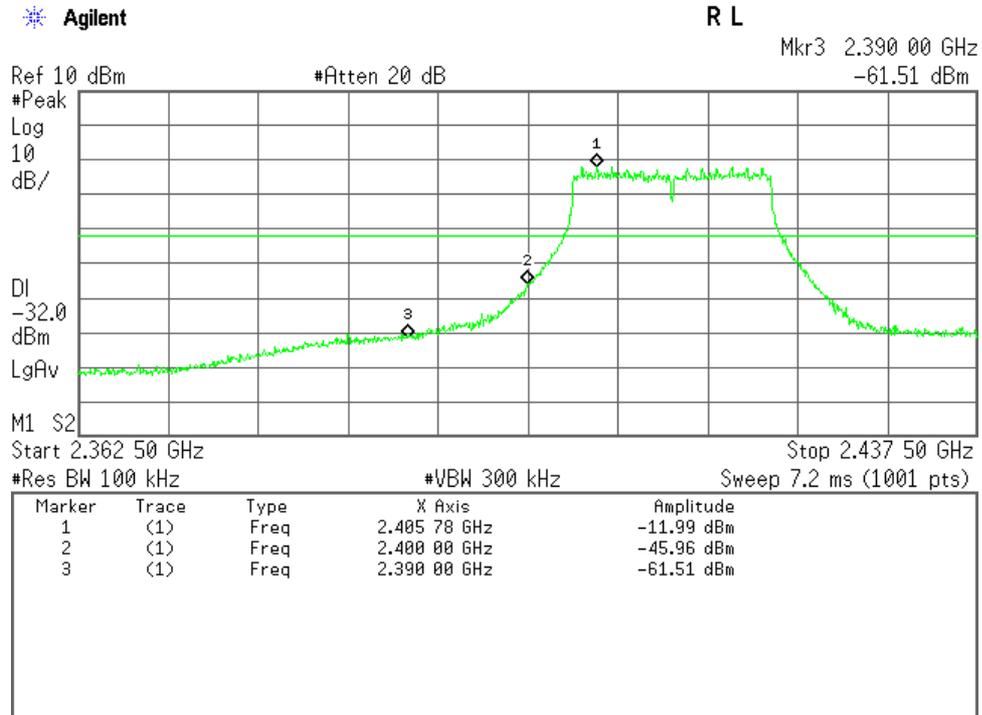


High Channel

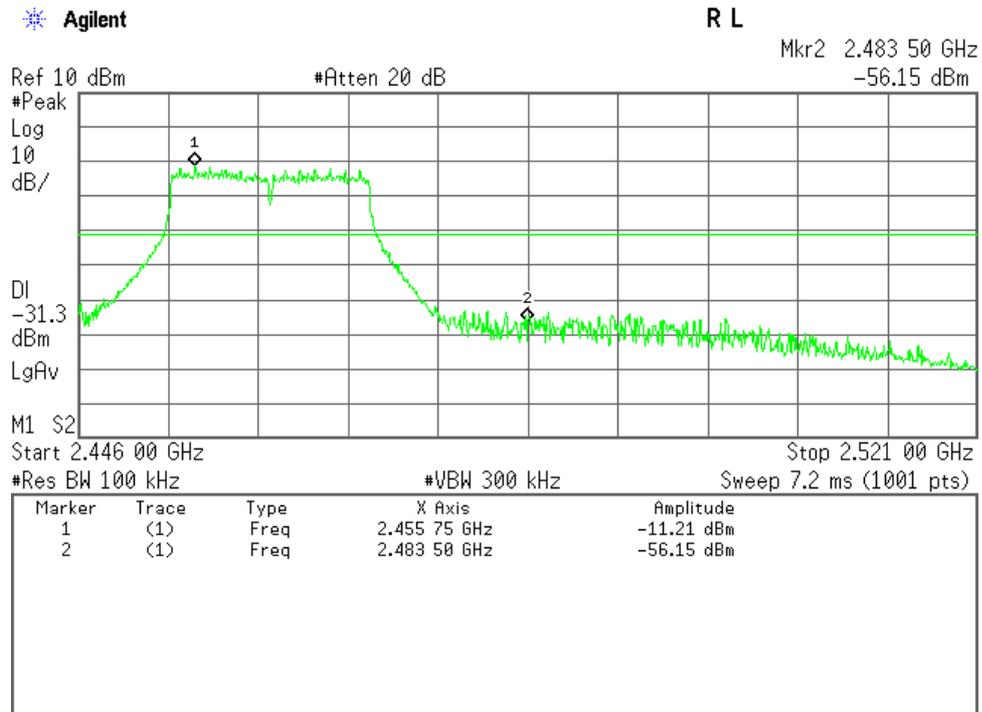


2-1) IEEE 802.11g (Main Antenna)

Low Channel

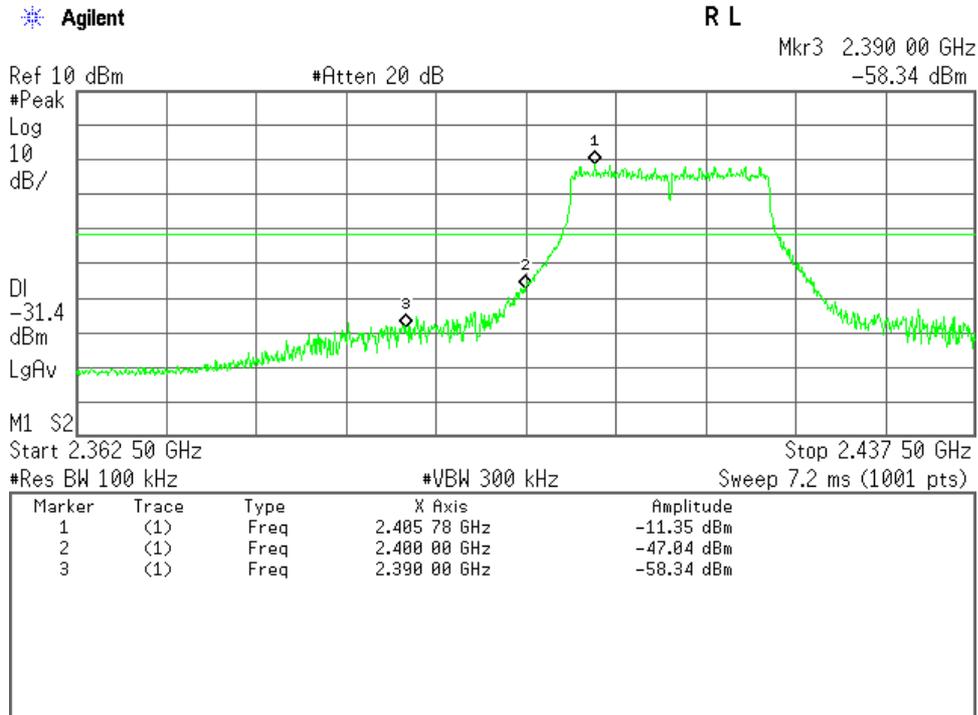


High Channel

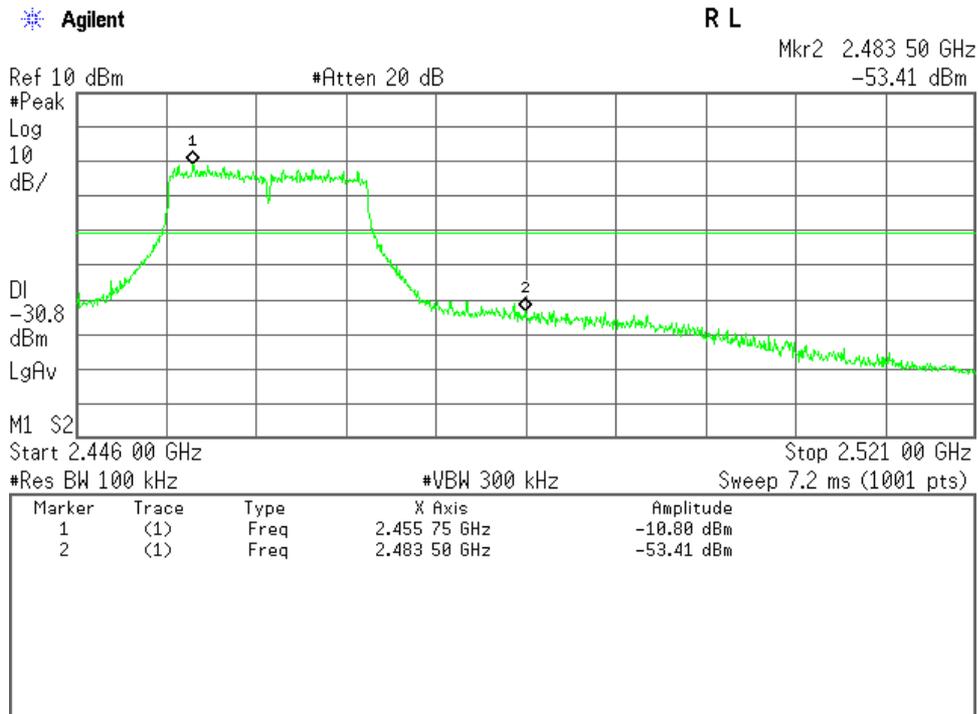


2-2) IEEE 802.11g (Sub Antenna)

Low Channel

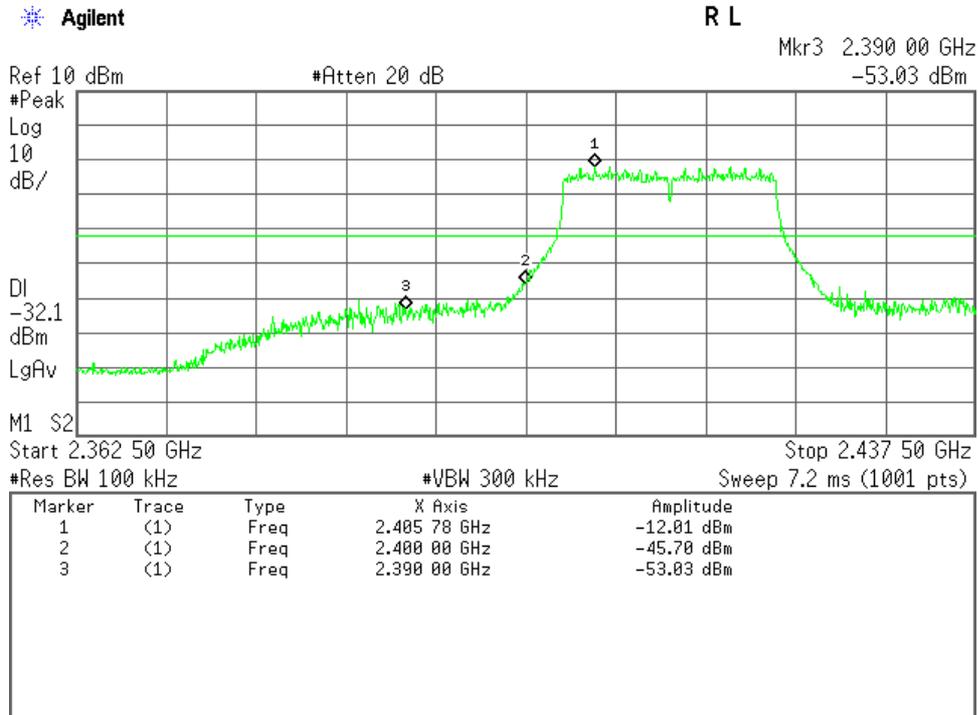


High Channel

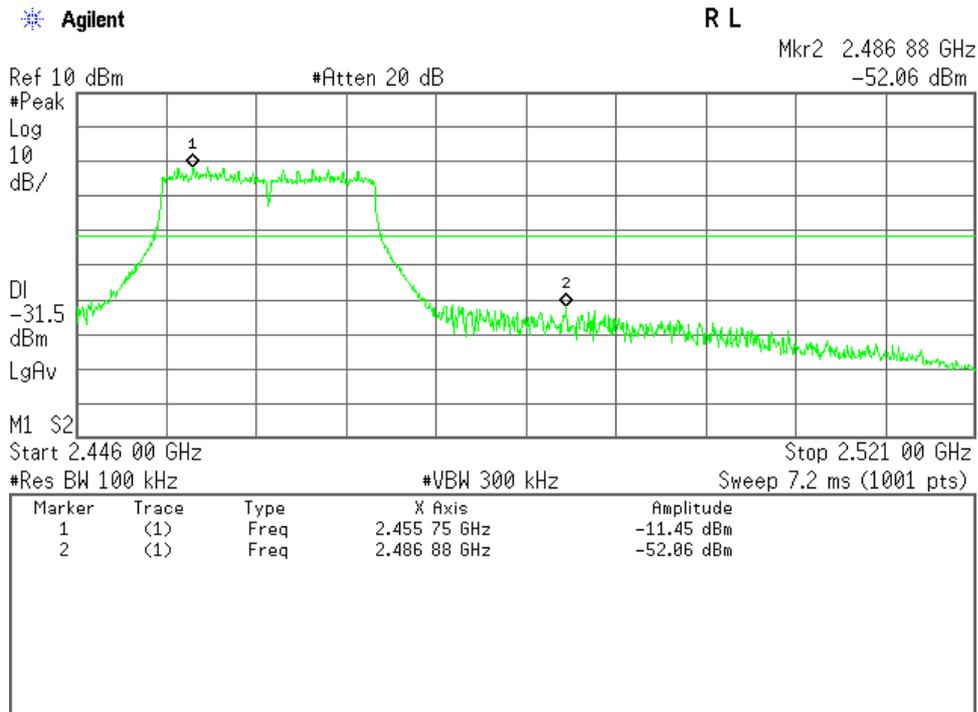


3-1) IEEE 802.11n (Main Antenna)

Low Channel

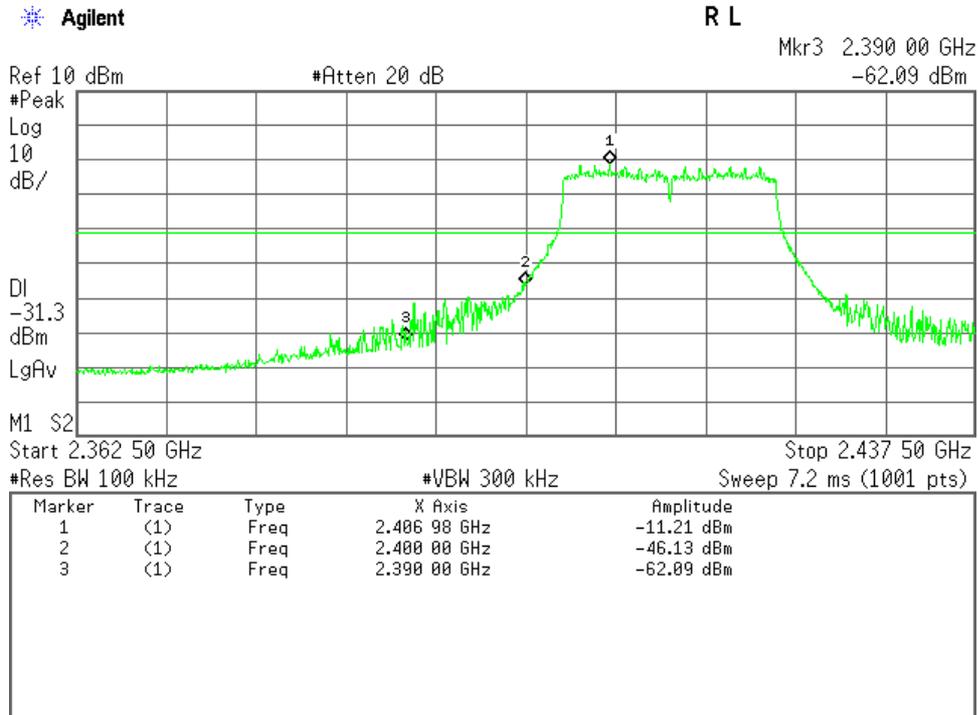


High Channel

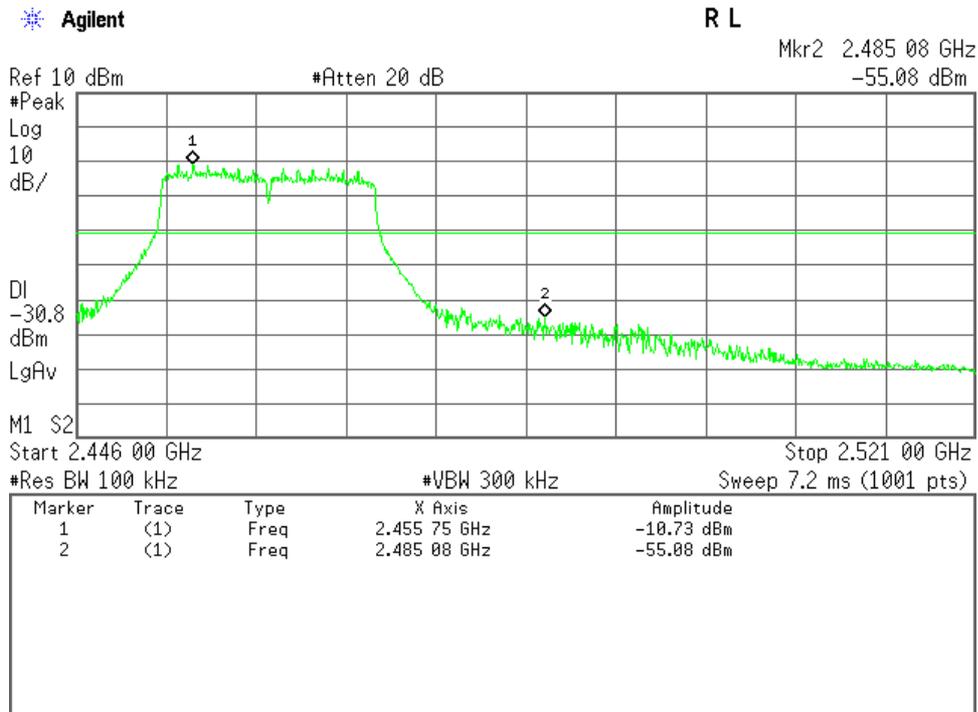


3-2) IEEE 802.11n (Sub Antenna)

Low Channel

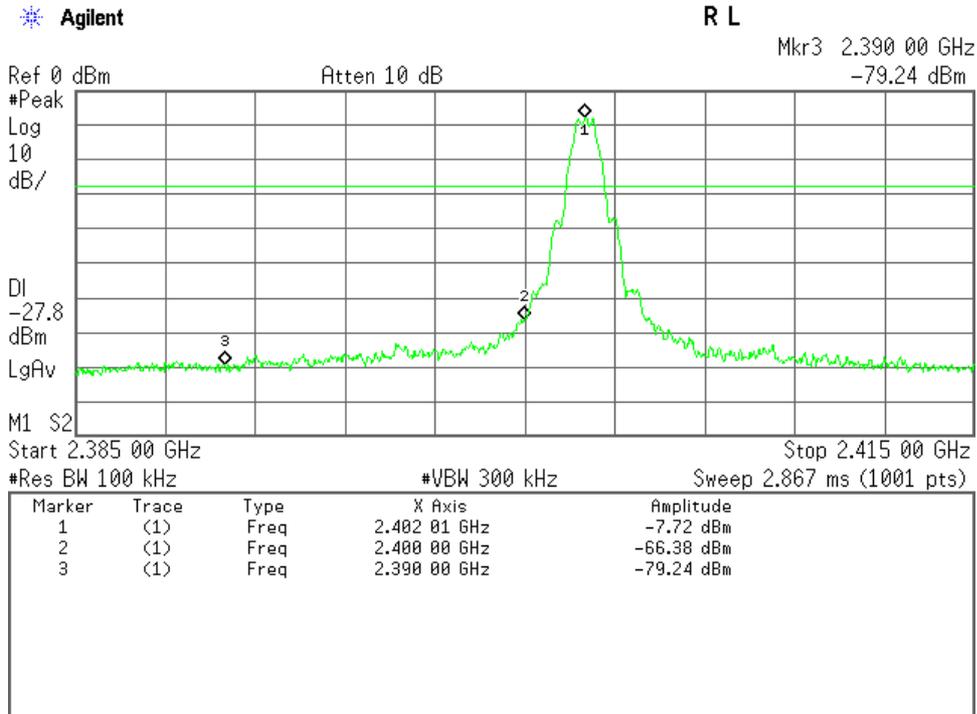


High Channel

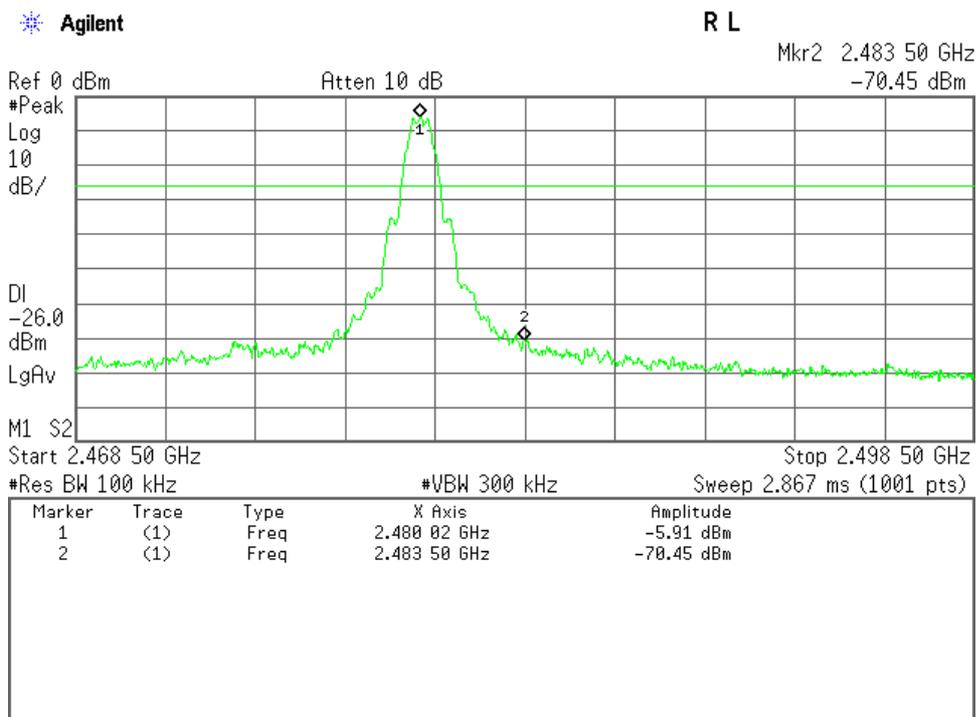


4) Bluetooth Low Energy

Low Channel



High Channel



**7.8 AC Powerline Conducted Emission**

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

**7.8.1 Test Results**

For the standard,  - Passed  - Failed  - Not judged

Min. Limit Margin (Quasi-Peak) 9.1 dB at 0.502 MHz

Uncertainty of Measurement Results ± 2.6 dB(2σ)

Remarks : Bluetooth Low Energy mode

**7.8.2 Test Instruments**

Measurement Room M2				
Type	Model	Serial No. (ID)	Manufacturer	Cal. Due
Test Receiver	ESU 26	100170 (A-6)	Rohde & Schwarz	2016/04/25
AMN (main)	ESH3-Z5	893045/007 (D-12)	Rohde & Schwarz	2016/08/27
RF Cable	RG223/U	--- (H-34)	HUBER+SUHNER	2016/06/04

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

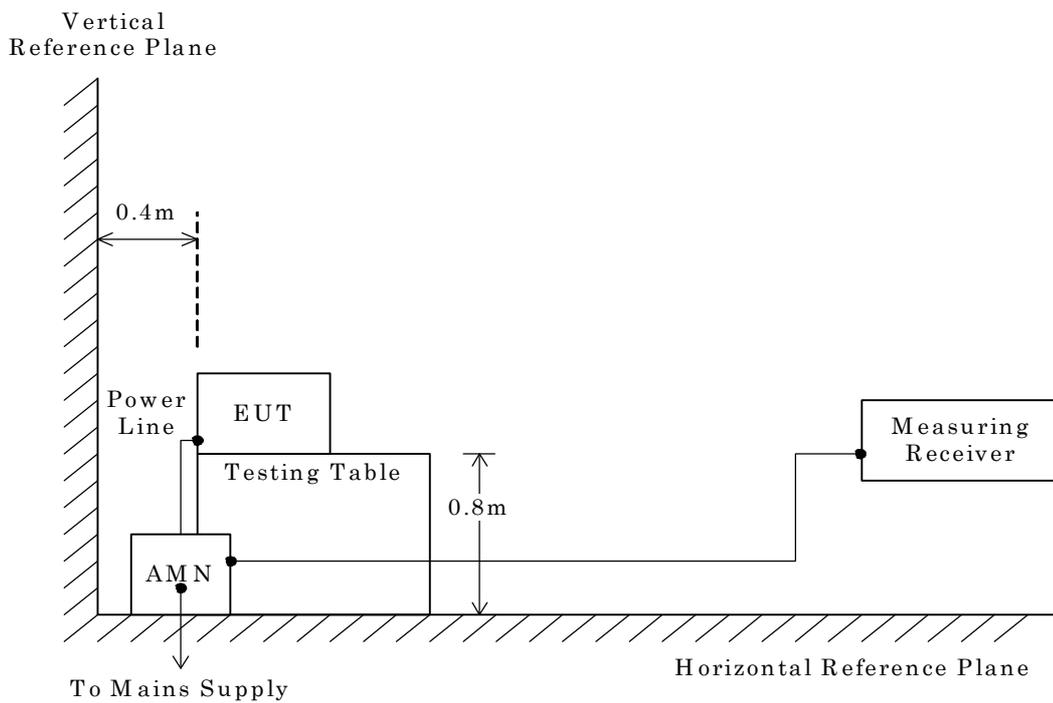
**7.8.3 Test Method and Test Setup (Diagrammatic illustration)**

The preliminary tests were performed using the scan mode of test receiver or spectrum analyzer to observe the emissions characteristics of the EUT.

The EUT configuration, cable configuration and mode of operation were determined for producing the maximum level of emissions.

This configurations was used for final tests.

– Side View –



NOTE

AMN : Artificial Mains Network

### 7.8.4 Test Data

- 1) Mode of EUT : (WLAN) All modes have been investigated and the worst case mode for channel (06ch: 2437MHz / IEEE 802.11b, IEEE 802.11g and IEEE 802.11n) has been listed.

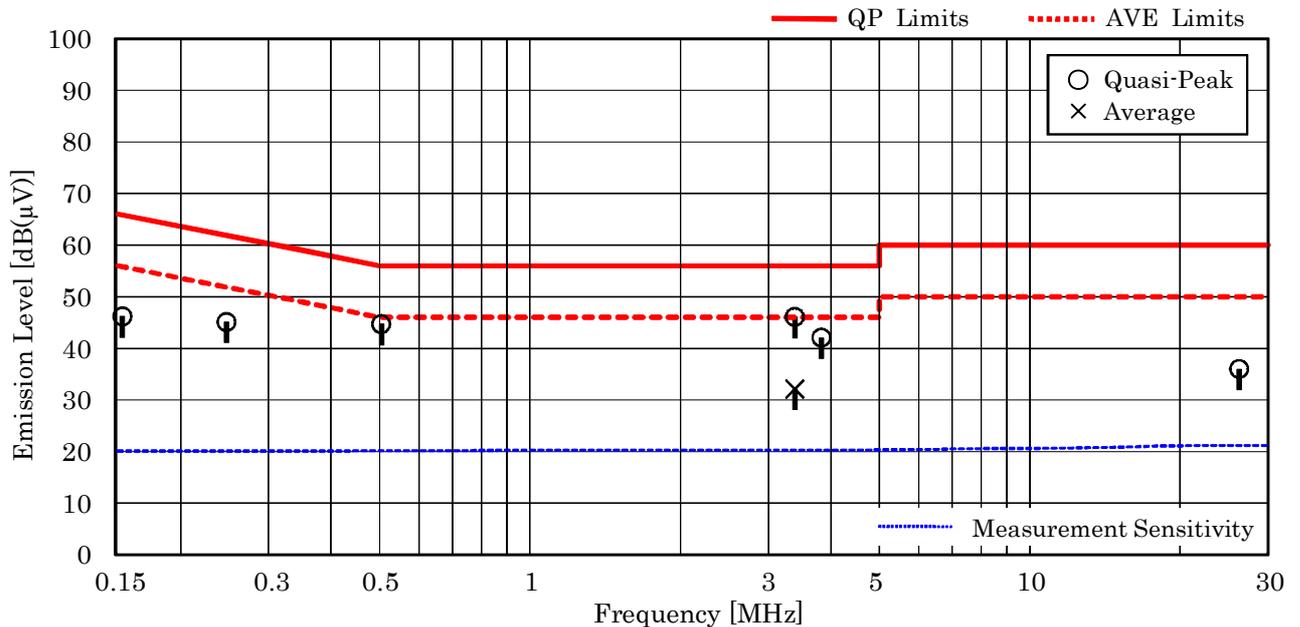
Test voltage : 120VAC 60Hz

Test Date: September 3, 2015

Temp.: 27 °C, Humi.: 72 %

Measured phase : L1

Frequency [MHz]	Corr. Factor [dB]	Meter Readings [dB(μV)]		Limits [dB(μV)]		Results [dB(μV)]		Margin [dB]		Remarks
		QP	AVE	QP	AVE	QP	AVE	QP	AVE	
0.153	10.1	36.1	--	65.8	55.8	46.2	--	+19.6	--	-
0.247	10.2	34.9	--	61.9	51.9	45.1	--	+16.8	--	-
0.504	10.2	34.5	--	56.0	46.0	44.7	--	+11.3	--	-
<u>3.387</u>	<u>10.3</u>	<u>35.8</u>	<u>21.8</u>	<u>56.0</u>	<u>46.0</u>	<u>46.1</u>	<u>32.1</u>	<u>+ 9.9</u>	<u>+13.9</u>	-
3.829	10.3	31.8	--	56.0	46.0	42.1	--	+13.9	--	-
26.237	11.3	24.7	--	60.0	50.0	36.0	--	+24.0	--	-



#### NOTES

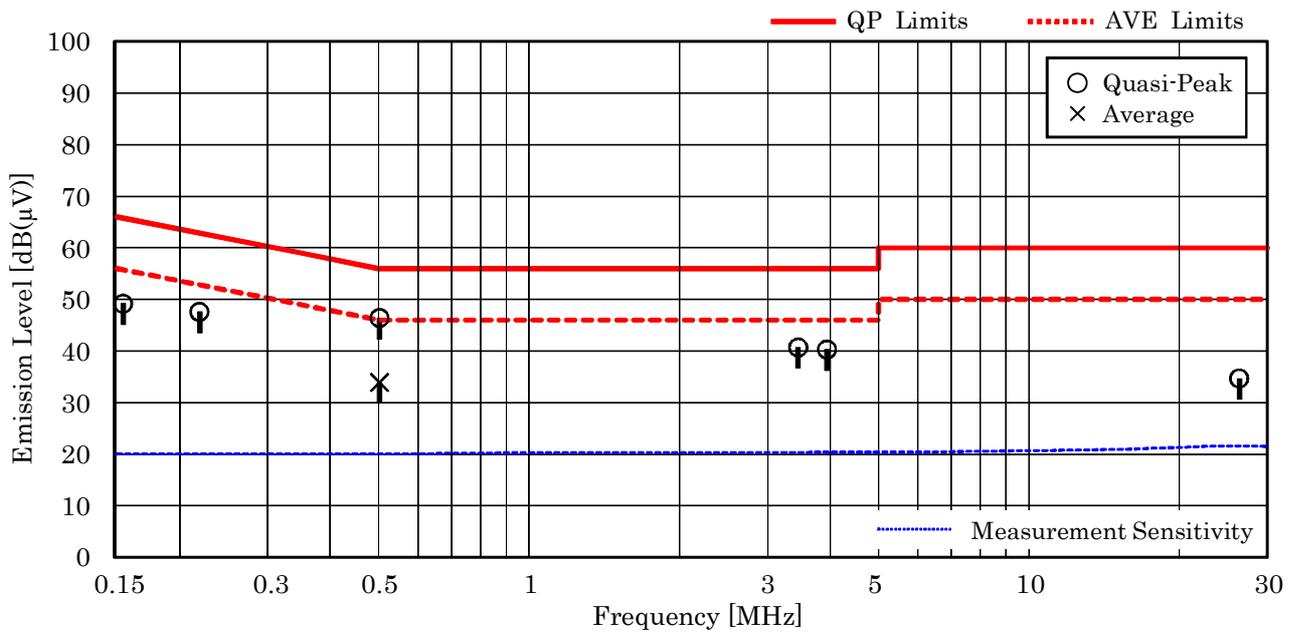
1. The spectrum was checked from 0.15 MHz to 30 MHz.
2. The correction factor includes the AMN insertion loss and the cable loss.
3. The symbol of "<" means "or less".
4. The symbol of ">" means "more than".
5. The symbol of "--" means "not applicable".
6. Calculated result at 3.387 MHz, as the worst point shown on underline:  
Correction Factor + Meter Reading (QP) = 10.3 + 35.8 = 46.1 dB(μV)
7. QP : Quasi-Peak Detector / AVE : Average Detector
8. Test receiver setting(s) : CISPR QP 9 kHz / Average 9 kHz

Test voltage : 120VAC 60Hz

Test Date: September 3, 2015  
Temp.: 27 °C, Humi.: 72 %

Measured phase : L2

Frequency [MHz]	Corr. Factor [dB]	Meter Readings [dB(μV)]		Limits [dB(μV)]		Results [dB(μV)]		Margin [dB]		Remarks
		QP	AVE	QP	AVE	QP	AVE	QP	AVE	
0.154	10.1	39.1	--	65.8	55.8	49.2	--	+16.6	--	-
0.219	10.1	37.5	--	62.9	52.9	47.6	--	+15.3	--	-
<u>0.502</u>	<u>10.1</u>	<u>36.3</u>	<u>23.8</u>	<u>56.0</u>	<u>46.0</u>	<u>46.4</u>	<u>33.9</u>	<u>+ 9.6</u>	<u>+12.1</u>	-
3.456	10.3	30.4	--	56.0	46.0	40.7	--	+15.3	--	-
3.945	10.3	30.0	--	56.0	46.0	40.3	--	+15.7	--	-
26.357	11.6	23.1	--	60.0	50.0	34.7	--	+25.3	--	-



**NOTES**

1. The spectrum was checked from 0.15 MHz to 30 MHz.
2. The correction factor includes the AMN insertion loss and the cable loss.
3. The symbol of "<" means "or less".
4. The symbol of ">" means "more than".
5. The symbol of "--" means "not applicable".
6. Calculated result at 0.502 MHz, as the worst point shown on underline:  
 Correction Factor + Meter Reading (QP) = 10.1 + 36.3 = 46.4 dB(μV)
7. QP : Quasi-Peak Detector / AVE : Average Detector
8. Test receiver setting(s) : CISPR QP 9 kHz / Average 9 kHz

2) Mode of EUT : Bluetooth Low Energy

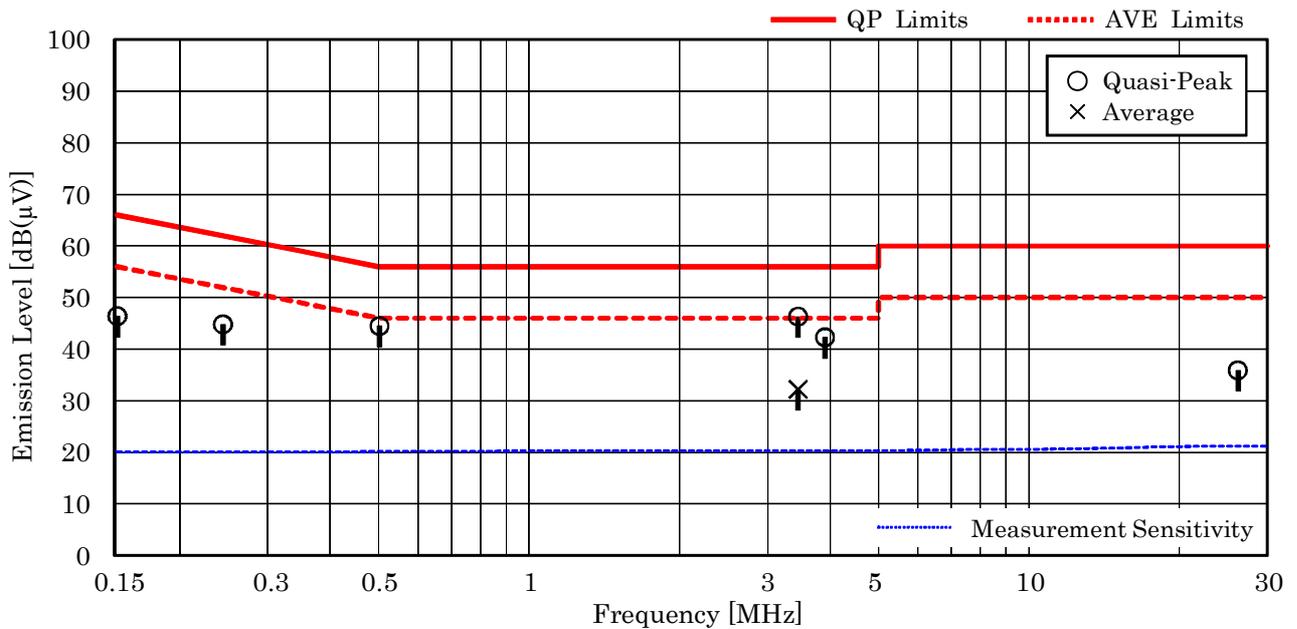
Test voltage : 120VAC 60Hz

Test Date: September 3, 2015

Temp.: 27 °C, Humi.: 72 %

Measured phase : L1

Frequency [MHz]	Corr. Factor [dB]	Meter Readings [dB(μV)]		Limits [dB(μV)]		Results [dB(μV)]		Margin [dB]		Remarks
		QP	AVE	QP	AVE	QP	AVE	QP	AVE	
0.150	10.1	36.3	--	66.0	56.0	46.4	--	+19.6	--	-
0.244	10.2	34.6	--	62.0	52.0	44.8	--	+17.2	--	-
0.502	10.2	34.3	--	56.0	46.0	44.5	--	+11.5	--	-
<u>3.455</u>	<u>10.3</u>	<u>36.0</u>	<u>21.9</u>	<u>56.0</u>	<u>46.0</u>	<u>46.3</u>	<u>32.2</u>	<u>+ 9.7</u>	<u>+13.8</u>	-
3.910	10.3	32.0	--	56.0	46.0	42.3	--	+13.7	--	-
26.192	11.3	24.6	--	60.0	50.0	35.9	--	+24.1	--	-



NOTES

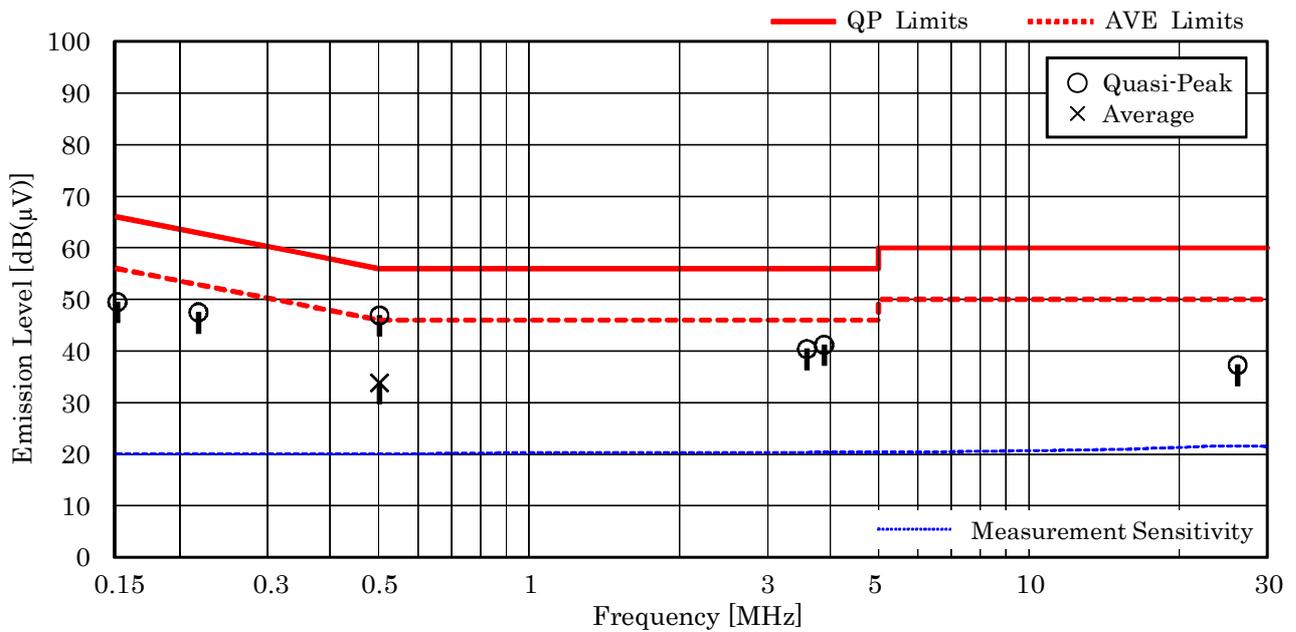
1. The spectrum was checked from 0.15 MHz to 30 MHz.
2. The correction factor includes the AMN insertion loss and the cable loss.
3. The symbol of "<" means "or less".
4. The symbol of ">" means "more than".
5. The symbol of "--" means "not applicable".
6. Calculated result at 3.455 MHz, as the worst point shown on underline:  
Correction Factor + Meter Reading (QP) = 10.3 + 36.0 = 46.3 dB(μV)
7. QP : Quasi-Peak Detector / AVE : Average Detector
8. Test receiver setting(s) : CISPR QP 9 kHz / Average 9 kHz

Test voltage : 120VAC 60Hz

Test Date: September 3, 2015  
Temp.: 27 °C, Humi.: 72 %

Measured phase : L2

Frequency [MHz]	Corr. Factor [dB]	Meter Readings [dB(μV)]		Limits [dB(μV)]		Results [dB(μV)]		Margin [dB]		Remarks
		QP	AVE	QP	AVE	QP	AVE	QP	AVE	
0.150	10.1	39.4	--	66.0	56.0	49.5	--	+16.5	--	-
0.218	10.1	37.4	--	62.9	52.9	47.5	--	+15.4	--	-
<u>0.502</u>	<u>10.1</u>	<u>36.8</u>	<u>23.7</u>	<u>56.0</u>	<u>46.0</u>	<u>46.9</u>	<u>33.8</u>	<u>+ 9.1</u>	<u>+12.2</u>	-
3.596	10.3	30.1	--	56.0	46.0	40.4	--	+15.6	--	-
3.893	10.3	30.9	--	56.0	46.0	41.2	--	+14.8	--	-
26.176	11.6	25.7	--	60.0	50.0	37.3	--	+22.7	--	-



**NOTES**

1. The spectrum was checked from 0.15 MHz to 30 MHz.
2. The correction factor includes the AMN insertion loss and the cable loss.
3. The symbol of "<" means "or less".
4. The symbol of ">" means "more than".
5. The symbol of "--" means "not applicable".
6. Calculated result at 0.502 MHz, as the worst point shown on underline:  
 Correction Factor + Meter Reading (QP) = 10.1 + 36.8 = 46.9 dB(μV)
7. QP : Quasi-Peak Detector / AVE : Average Detector
8. Test receiver setting(s) : CISPR QP 9 kHz / Average 9 kHz

## 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 (Peak) 4.1 dB at 2483.9 MHz

Uncertainty of Measurement Results	9 kHz – 30 MHz	<u>± 3.0</u>	dB(2 $\sigma$ )
	30 MHz – 300 MHz	<u>± 3.8</u>	dB(2 $\sigma$ )
	300 MHz – 1000 MHz	<u>± 4.8</u>	dB(2 $\sigma$ )
	1 GHz – 6 GHz	<u>± 4.7</u>	dB(2 $\sigma$ )
	6 GHz – 18 GHz	<u>± 4.6</u>	dB(2 $\sigma$ )
	18 GHz – 40 GHz	<u>± 5.5</u>	dB(2 $\sigma$ )

Remarks : IEEE802.11g mode, Y axis position. The measurement result is within the range of measurement uncertainty.

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	2016/04/25
Loop Antenna	HFH2-Z2	872096/25 (C-2)	Rohde & Schwarz	2016/07/26
RF Cable	RG213/U	--- (H-28)	HUBER+SUHNER	2016/07/26
Biconical Antenna	VHA9103/BBA9106	2355 (C-30)	Schwarzbeck	2016/05/24
Log-periodic Antenna	UHALP9108-A1	0694 (C-31)	Schwarzbeck	2016/05/24
RF Cable	S 10162 B-11 etc.	--- (H-4)	HUBER+SUHNER	2016/04/15
Site Attenuation	--	--- (H-15)	----	2016/01/05
Pre-Amplifier	TPA0118-36	1010 (A-37)	TOYO	2016/05/11
Horn Antenna	91888-2	562 (C-41-1)	EATON	2016/06/16
Horn Antenna	91889-2	568 (C-41-2)	EATON	2016/06/16
Horn Antenna	3160-04	9903-1053 (C-55)	EMCO	2016/06/29
Horn Antenna	3160-05	9902-1061 (C-56)	EMCO	2016/06/29
Horn Antenna	3160-06	9712-1045 (C-57)	EMCO	2016/06/29
Horn Antenna	3160-07	9902-1113 (C-58)	EMCO	2016/06/29
Horn Antenna	3160-08	9904-1099 (C-59)	EMCO	2016/06/29
Horn Antenna	3160-09	9808-1117 (C-48)	EMCO	2016/06/28
Attenuator	54A-10	W5713 (D-29)	Weinschel	2016/08/16
Attenuator	2-10	BA6214 (D-79)	Weinschel	2015/11/18
RF Cable	SUCOFLEX104	267479/4 (C-66)	HUBER+SUHNER	2016/01/19
RF Cable	SUCOFLEX104	267414/4 (C-67)	HUBER+SUHNER	2016/01/19
RF Cable	SUCOFLEX102EA	3041/2EA (C-69)	HUBER+SUHNER	2016/01/19
Band Rejection Filter	BRM50701	029 (D-93)	MICRO-TRONICS	2016/02/08
SVSWR	--	--- (H-19)	----	2016/02/27

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

### 7.9.3 Test Method and Test Setup (Diagrammatic illustration)

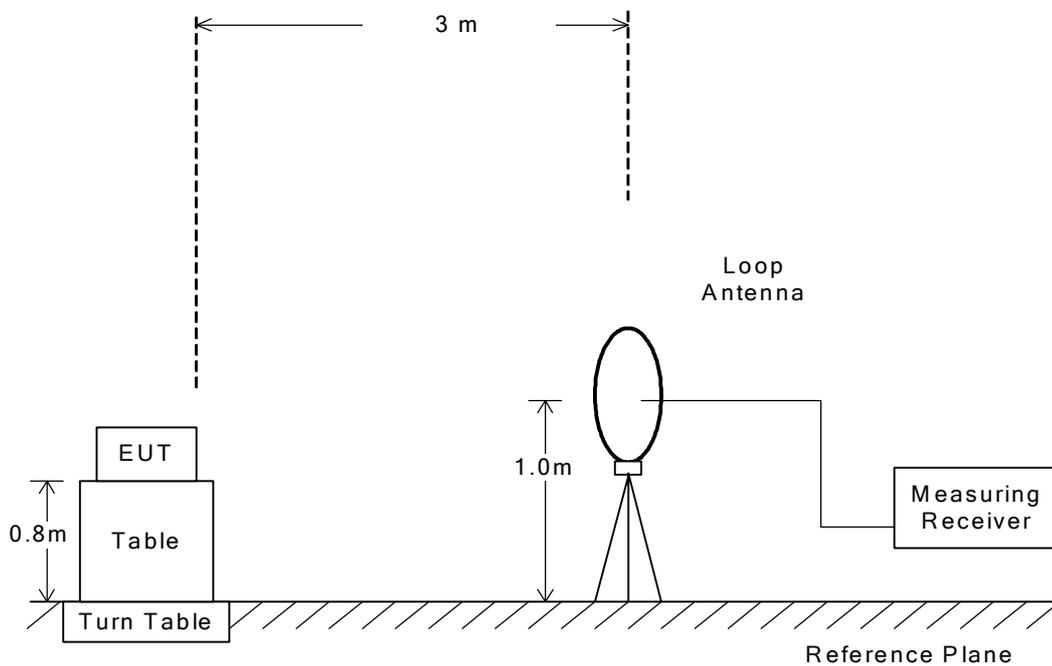
#### 7.9.3.1 Radiated Emission 9 kHz – 30 MHz

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.

This configurations was used for the final tests.

– Side View –



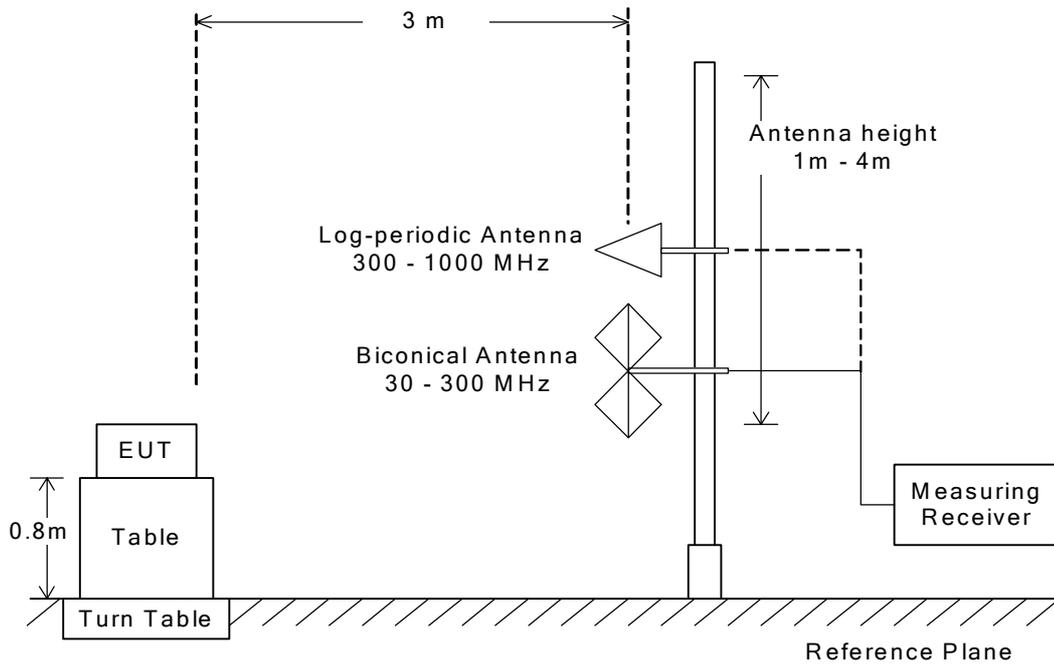
**7.9.3.2 Radiated Emission 30 MHz – 1000 MHz**

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:

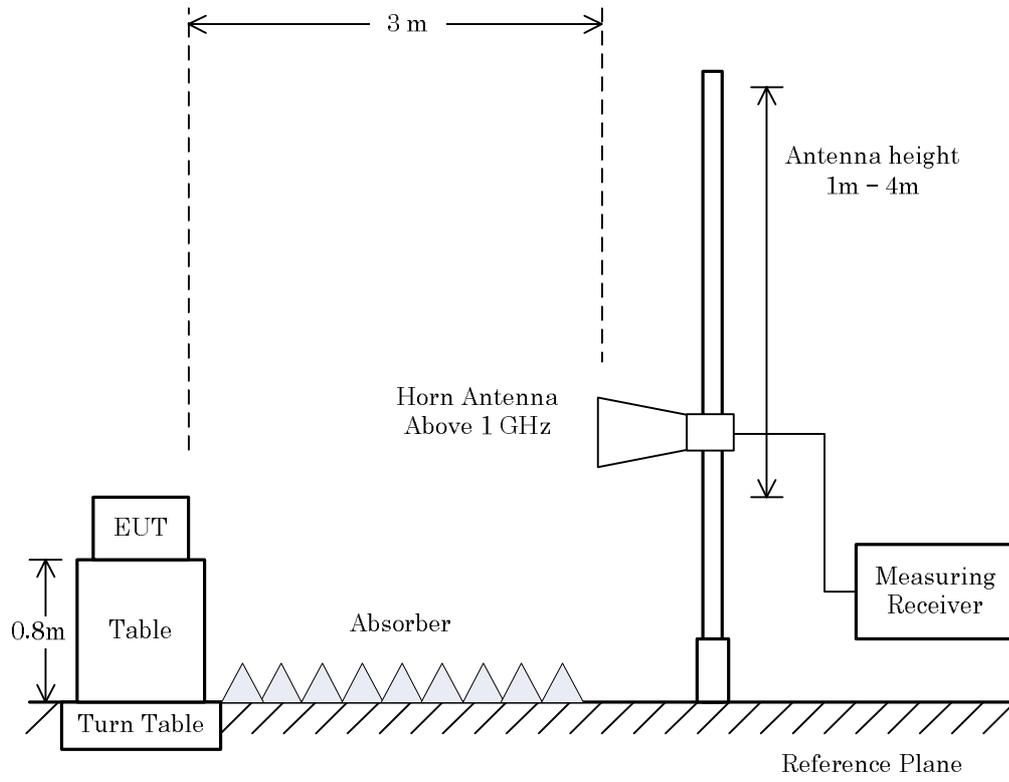
Type	Peak	Average
Detector Function	Peak	Peak
Res. Bandwidth	1 MHz	1 MHz
Video Bandwidth	3 MHz	$\geq 1/T *1)$
Video Filtering	Linear Voltage	Linear Voltage
Sweep Time	AUTO	AUTO
Trace	Max Hold	Max Hold

Note: 1. T: Minimum transmission duration

Average (VBW) Setting:

Mode	Interval	Cycle	Duty cycle	Burst on period(T)	Min. VBW(1/T)	VBW Setting
	(msec)	(msec)	(%)	(msec)	(kHz)	(kHz)
IEEE802.11b(11Mbps)	0.10	1.39	92.8%	1.29	0.78	1.00
IEEE802.11g(24Mbps)	0.11	0.63	82.5%	0.52	1.92	2.00
IEEE802.11n(39Mbps(MCS4))	0.11	0.45	75.6%	0.34	2.94	3.00
Bluetooth LE	0.22	0.62	64.5%	0.40	2.50	3.00

– Side View –

**NOTE**

The antenna height is scanned depending on the EUT's size and mounting height.

**7.9.4 Test Data**

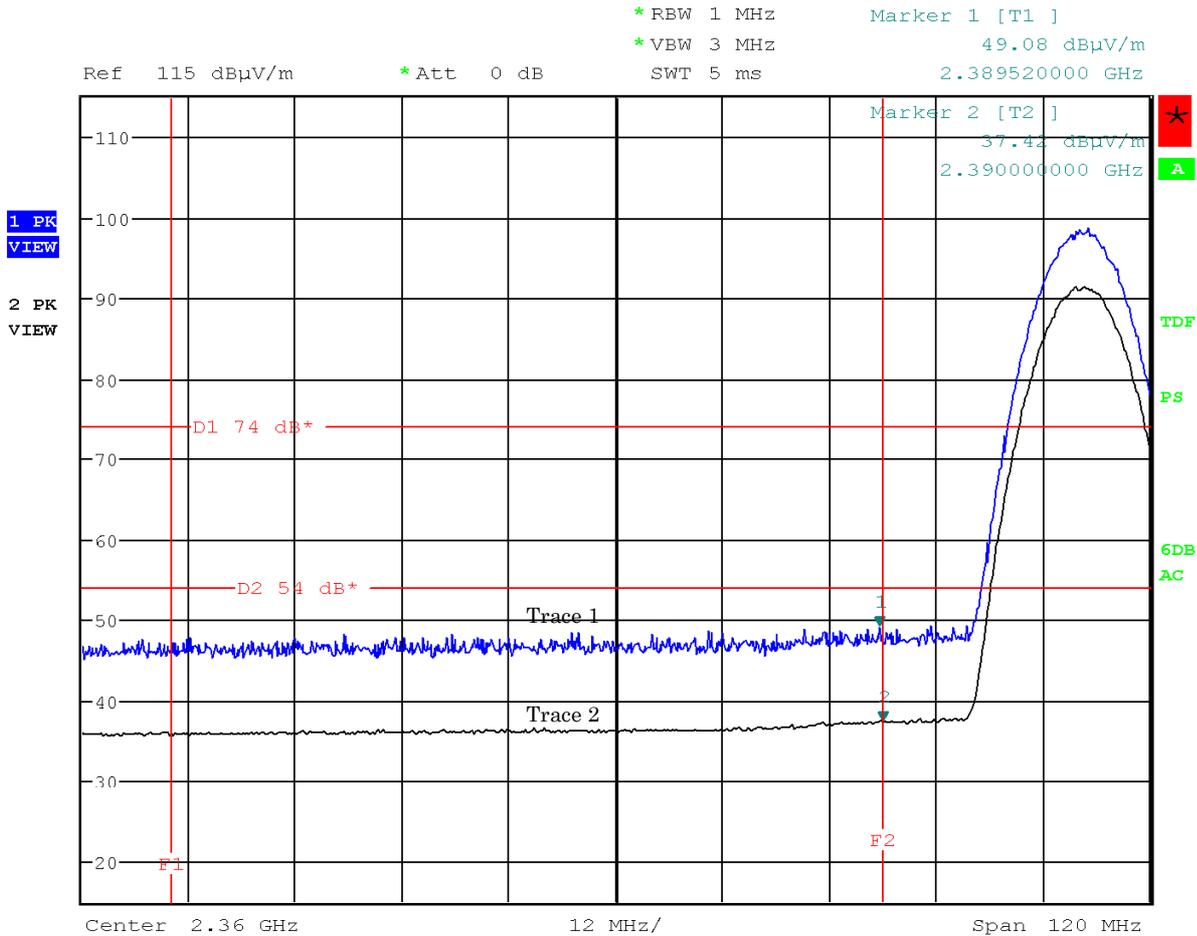
**7.9.4.1 Band-edge Compliance**

Test Date : August 26, 2015

Temp.:24°C, Humi:72%

Mode of EUT : 1TX: Main ( 1ch: 2412 MHz, (IEEE 802.11b))

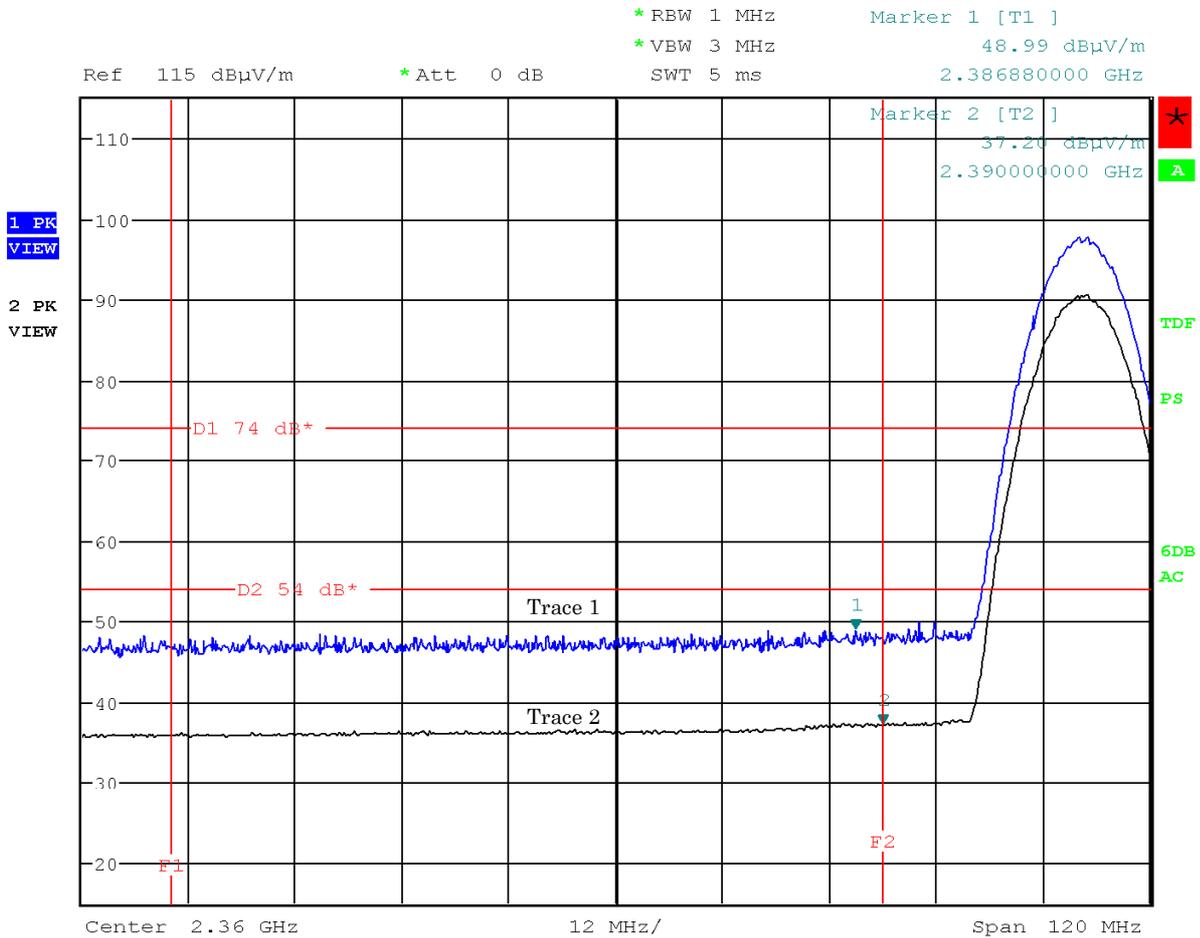
Antenna Polarization : Horizontal



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

Mode of EUT : 1TX: Main ( 1ch: 2412 MHz, (IEEE 802.11b))

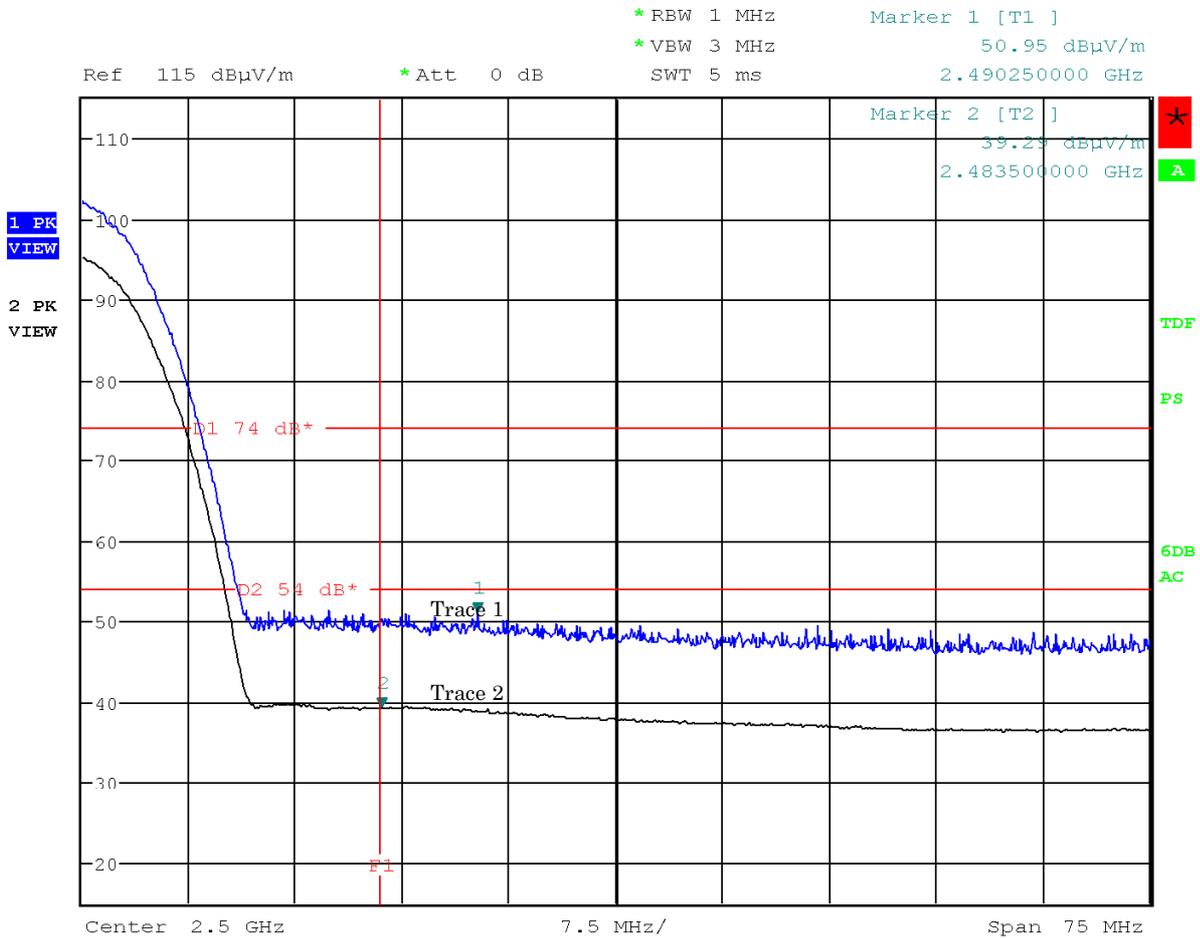
Antenna Polarization : Vertical



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

Mode of EUT : 1TX: Main ( 11ch: 2462 MHz, (IEEE 802.11b))

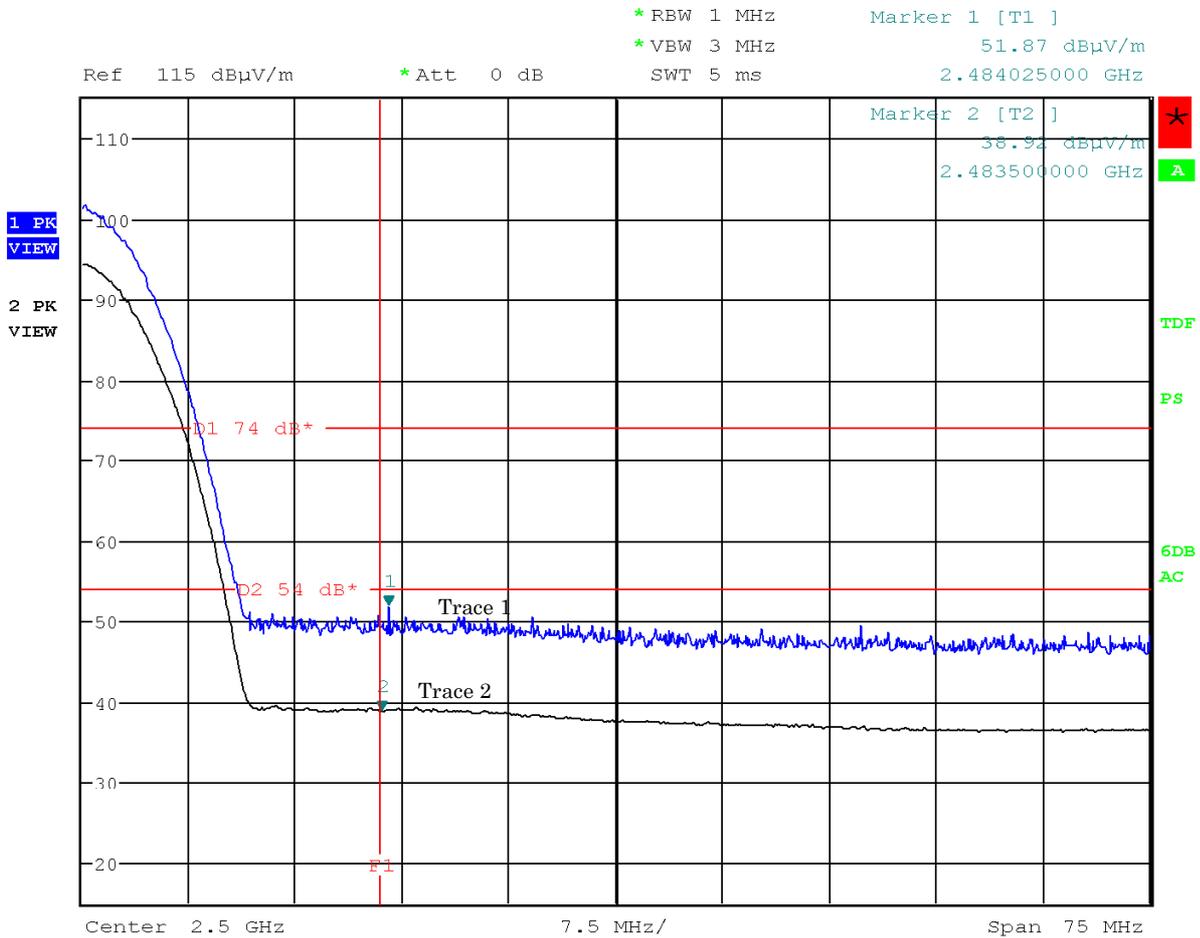
Antenna Polarization : Horizontal



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

Mode of EUT : 1TX: Main ( 11ch: 2462 MHz, (IEEE 802.11b))

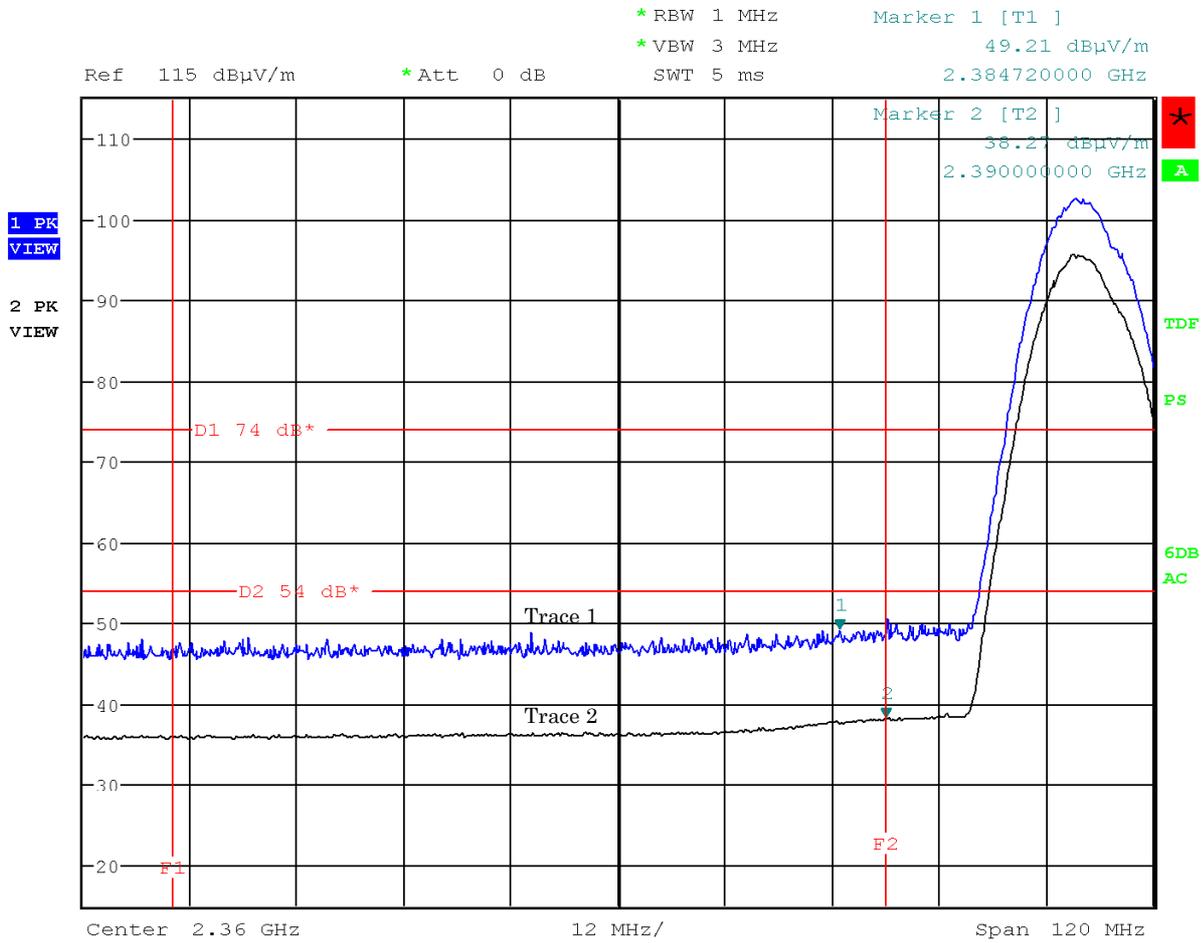
Antenna Polarization : Vertical



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

Mode of EUT : 2TX: Main+Sub ( 1ch: 2412 MHz, (IEEE 802.11b))

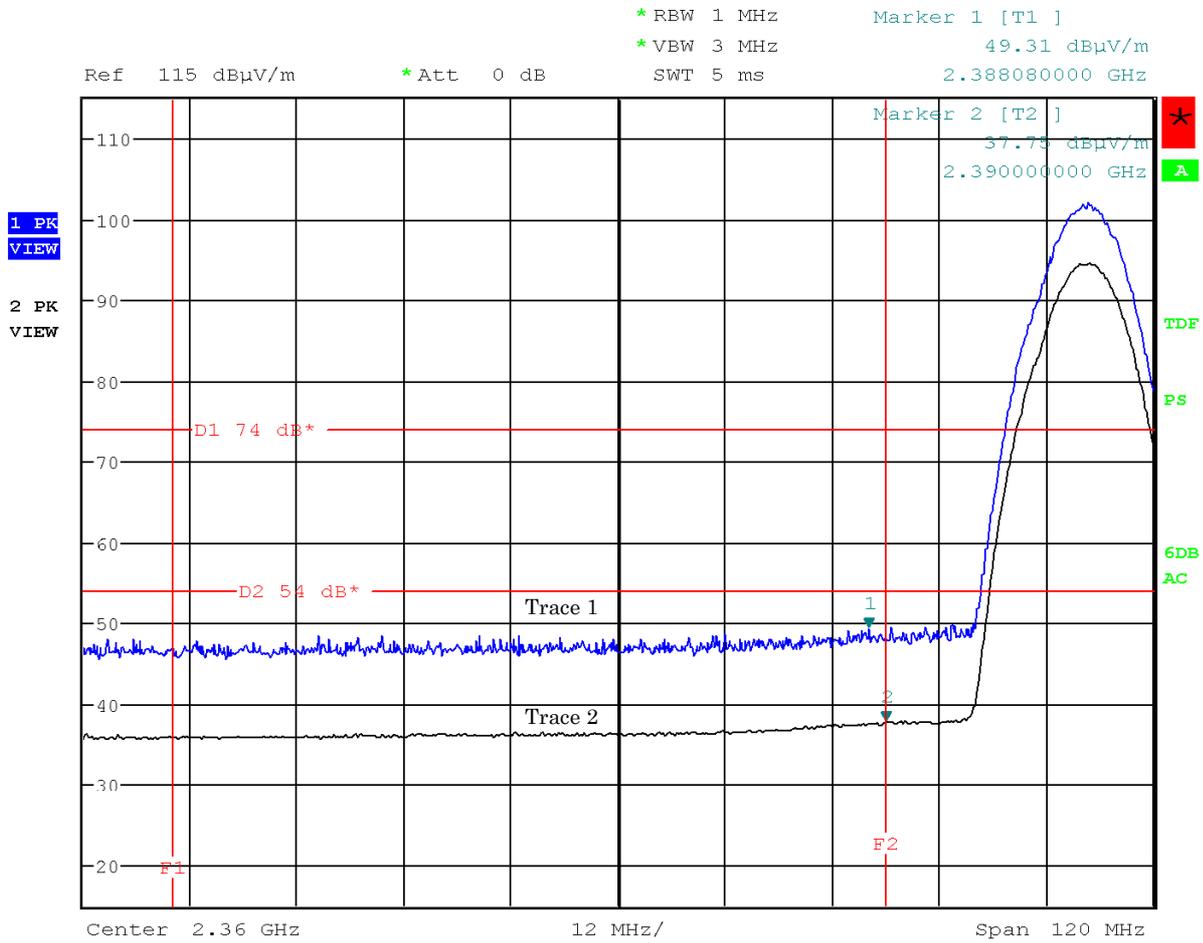
Antenna Polarization : Horizontal



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

Mode of EUT : 2TX: Main+Sub ( 1ch: 2412 MHz, (IEEE 802.11b))

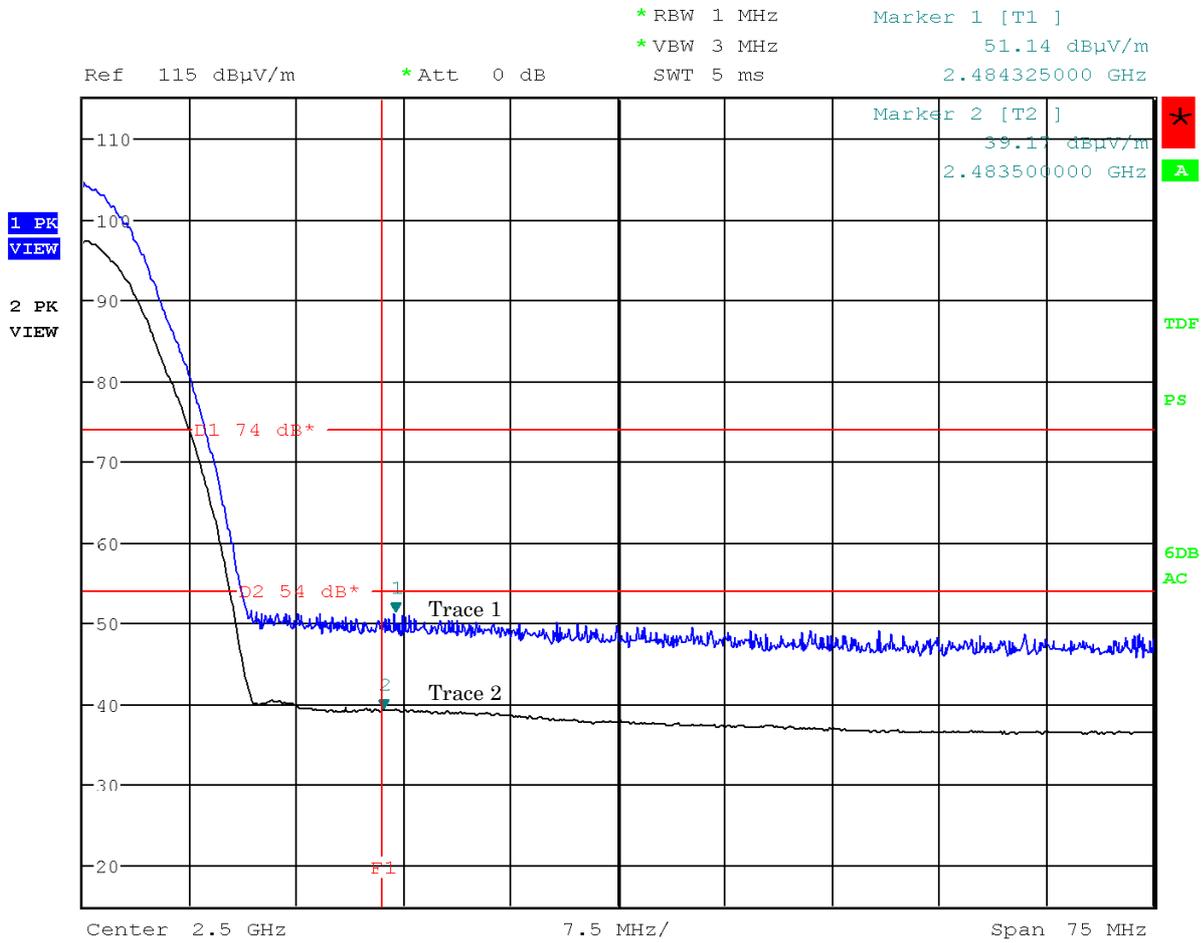
Antenna Polarization : Vertical



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

Mode of EUT : 2TX: Main+Sub ( 11ch: 2462 MHz, (IEEE 802.11b))

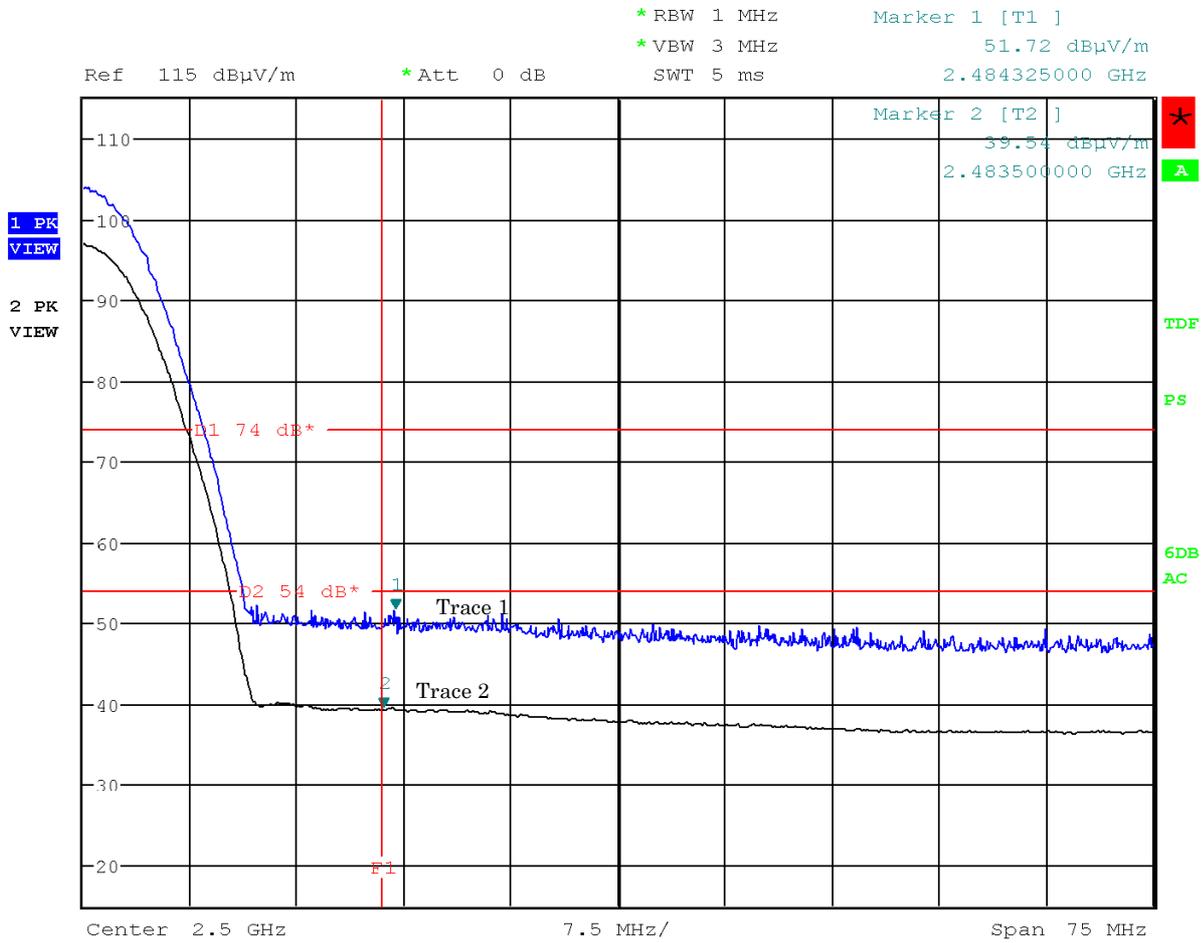
Antenna Polarization : Horizontal



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

Mode of EUT : 2TX: Main+Sub ( 11ch: 2462 MHz, (IEEE 802.11b))

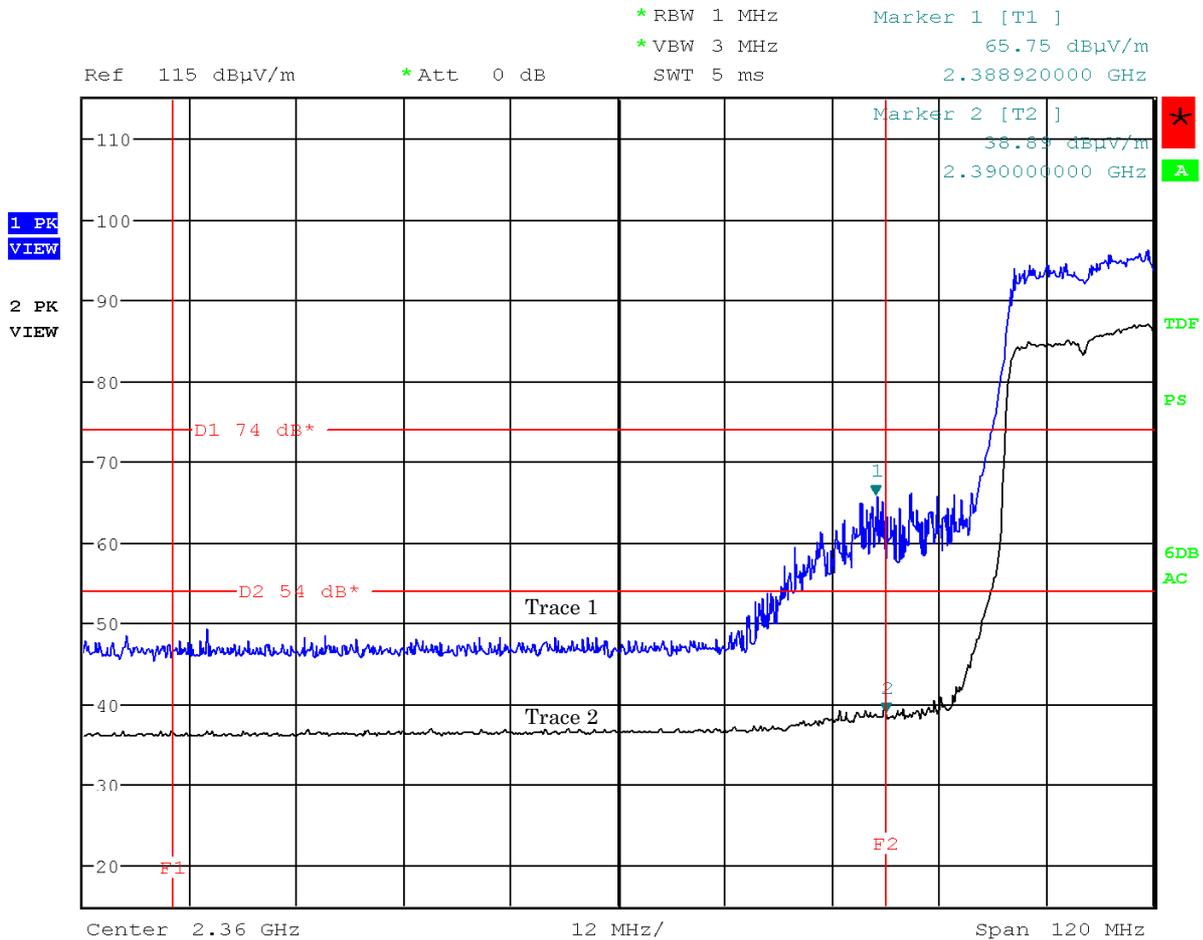
Antenna Polarization : Vertical



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

Mode of EUT : 1TX: Main ( 1ch: 2412 MHz, (IEEE 802.11g))

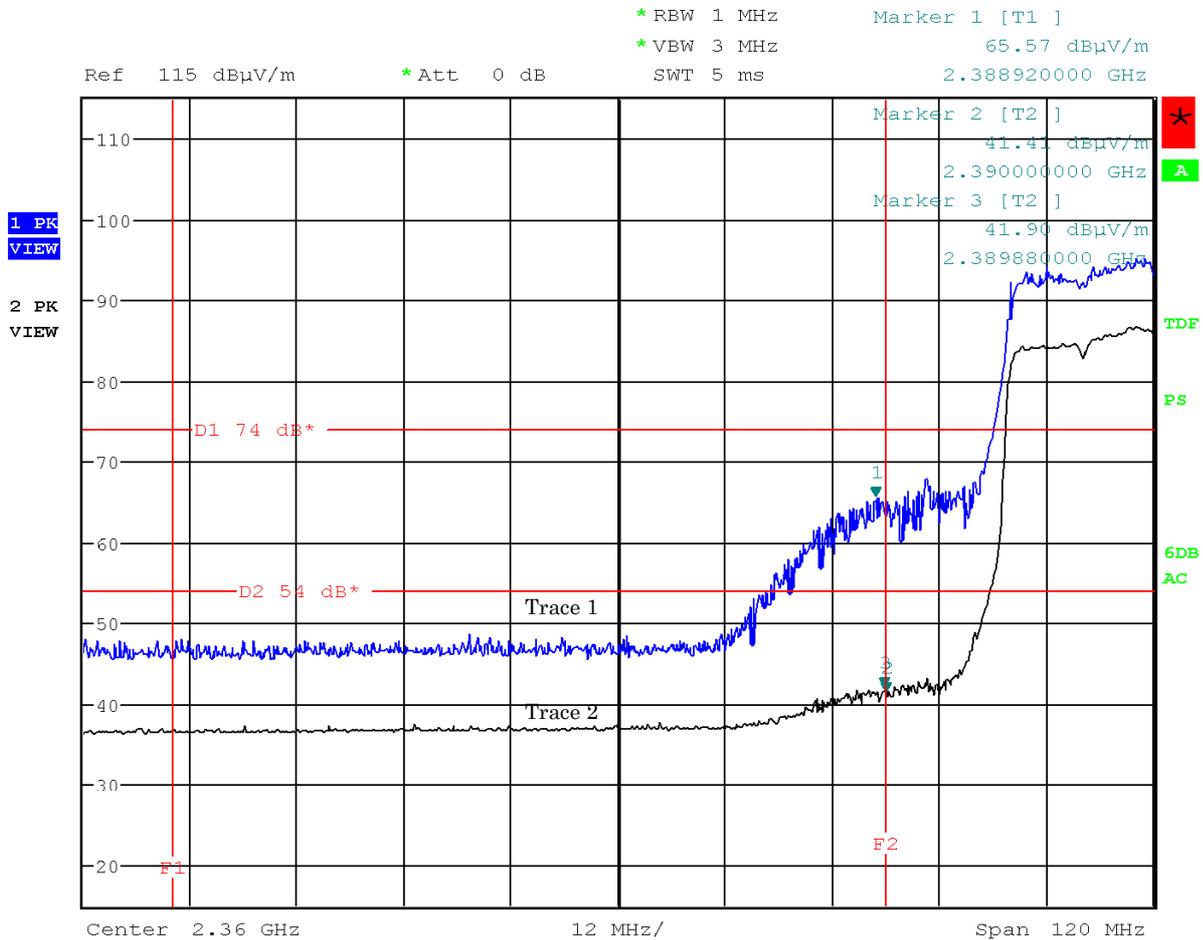
Antenna Polarization : Horizontal



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

Mode of EUT : 1TX: Main ( 1ch: 2412 MHz, (IEEE 802.11g))

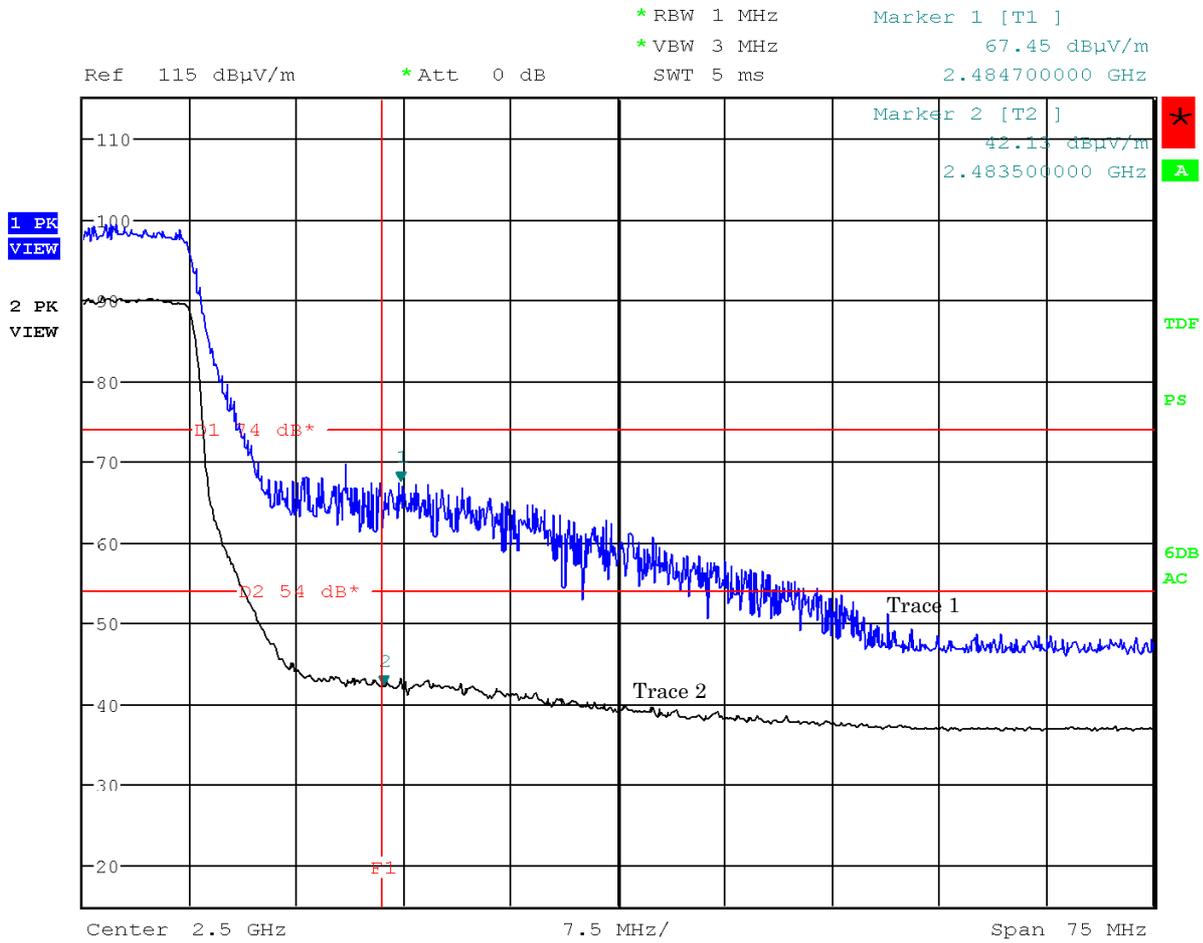
Antenna Polarization : Vertical



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

Mode of EUT : 1TX: Main ( 11ch: 2462 MHz, (IEEE 802.11g))

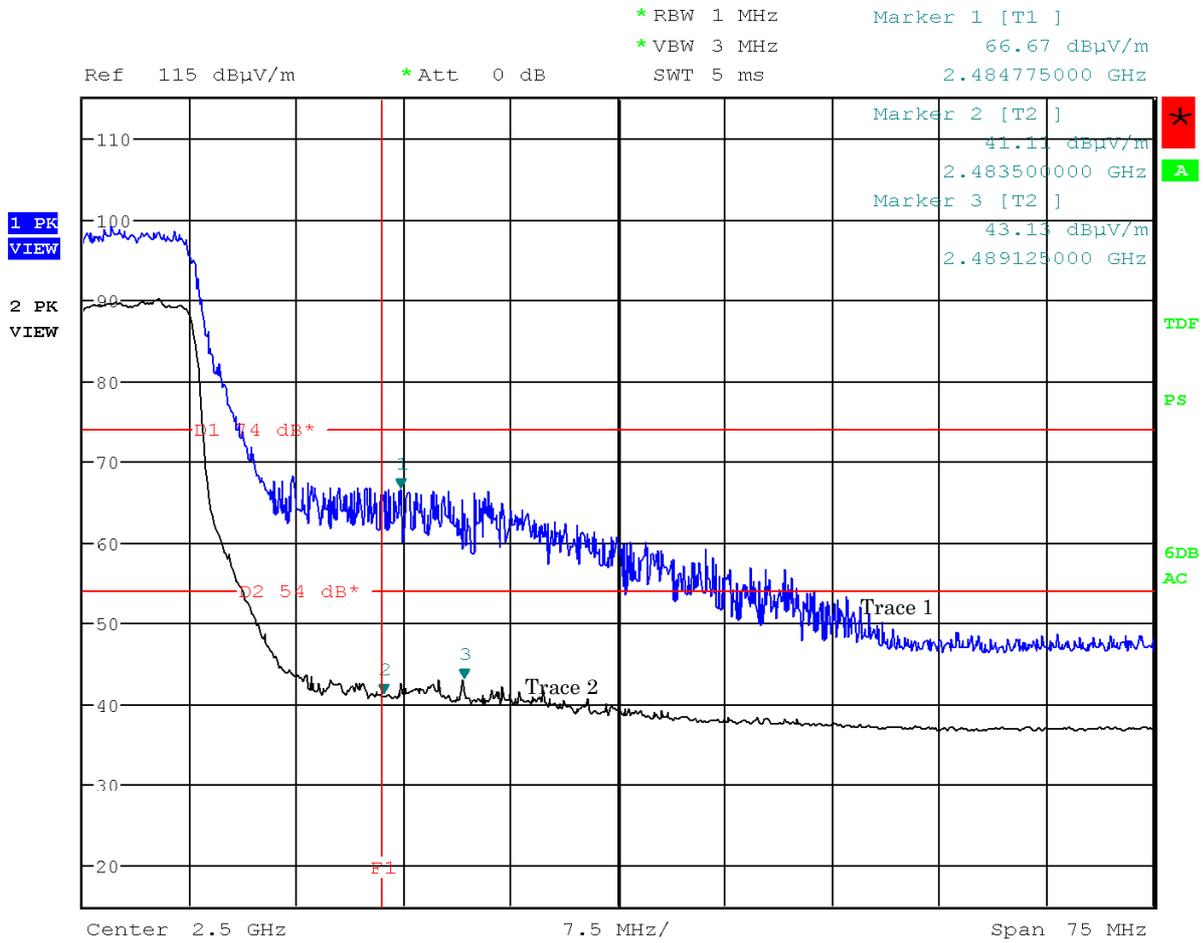
Antenna Polarization : Horizontal



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

Mode of EUT : 1TX: Main ( 11ch: 2462 MHz, (IEEE 802.11g))

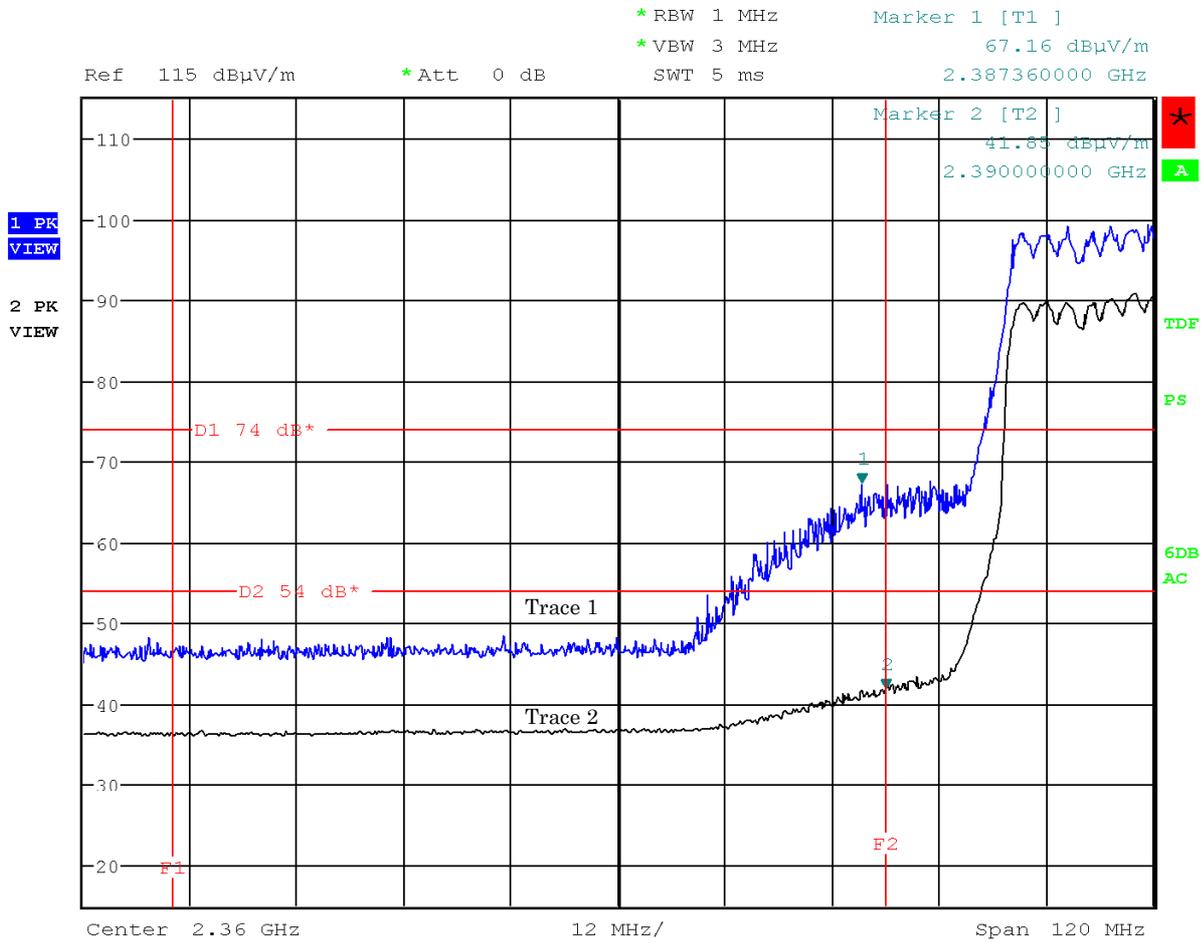
Antenna Polarization : Vertical



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

Mode of EUT : 2TX: Main+Sub ( 1ch: 2412 MHz, (IEEE 802.11g))

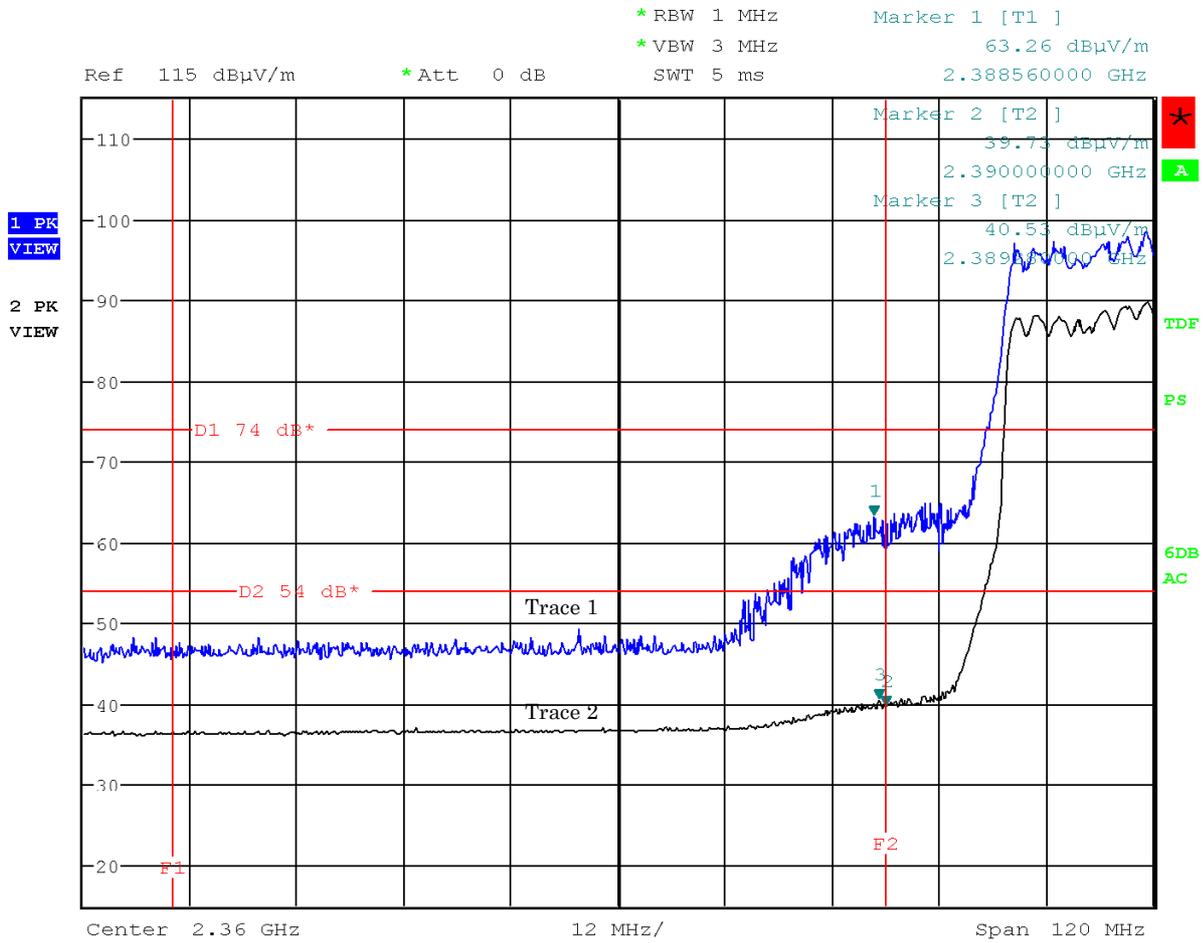
Antenna Polarization : Horizontal



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

Mode of EUT : 2TX: Main+Sub ( 1ch: 2412 MHz, (IEEE 802.11g))

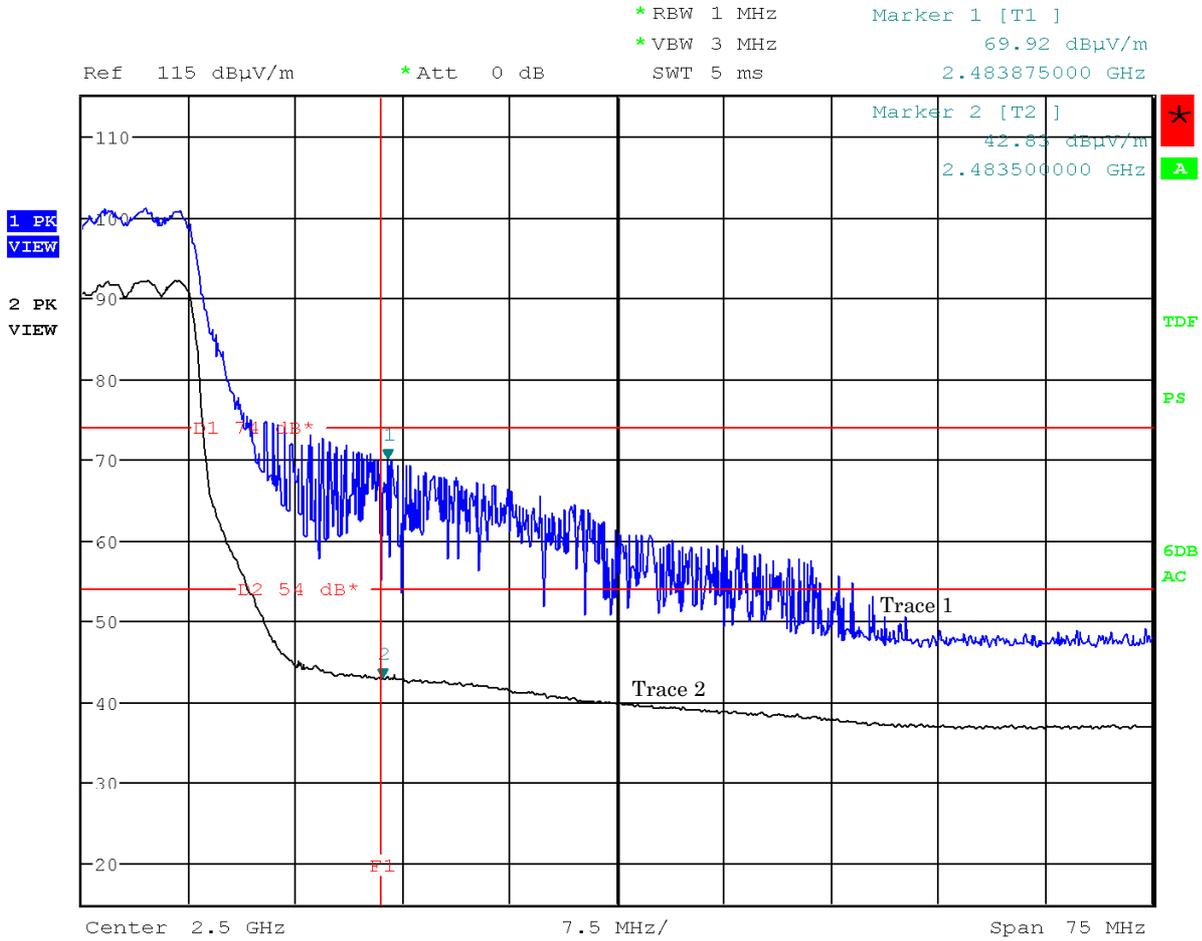
Antenna Polarization : Vertical



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

Mode of EUT : 2TX: Main+Sub ( 11ch: 2462 MHz, (IEEE 802.11g))

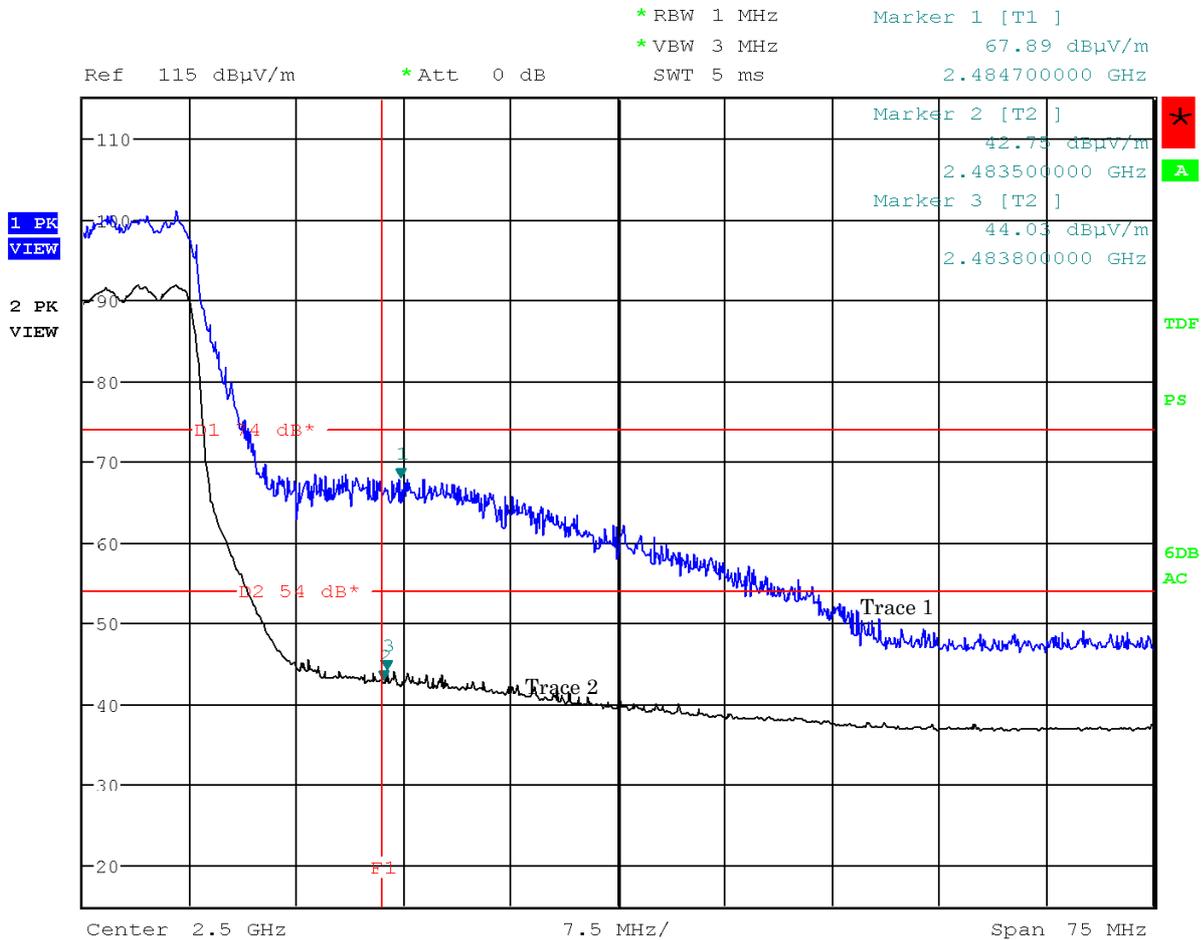
Antenna Polarization : Horizontal



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

Mode of EUT : 2TX: Main+Sub ( 11ch: 2462 MHz, (IEEE 802.11g))

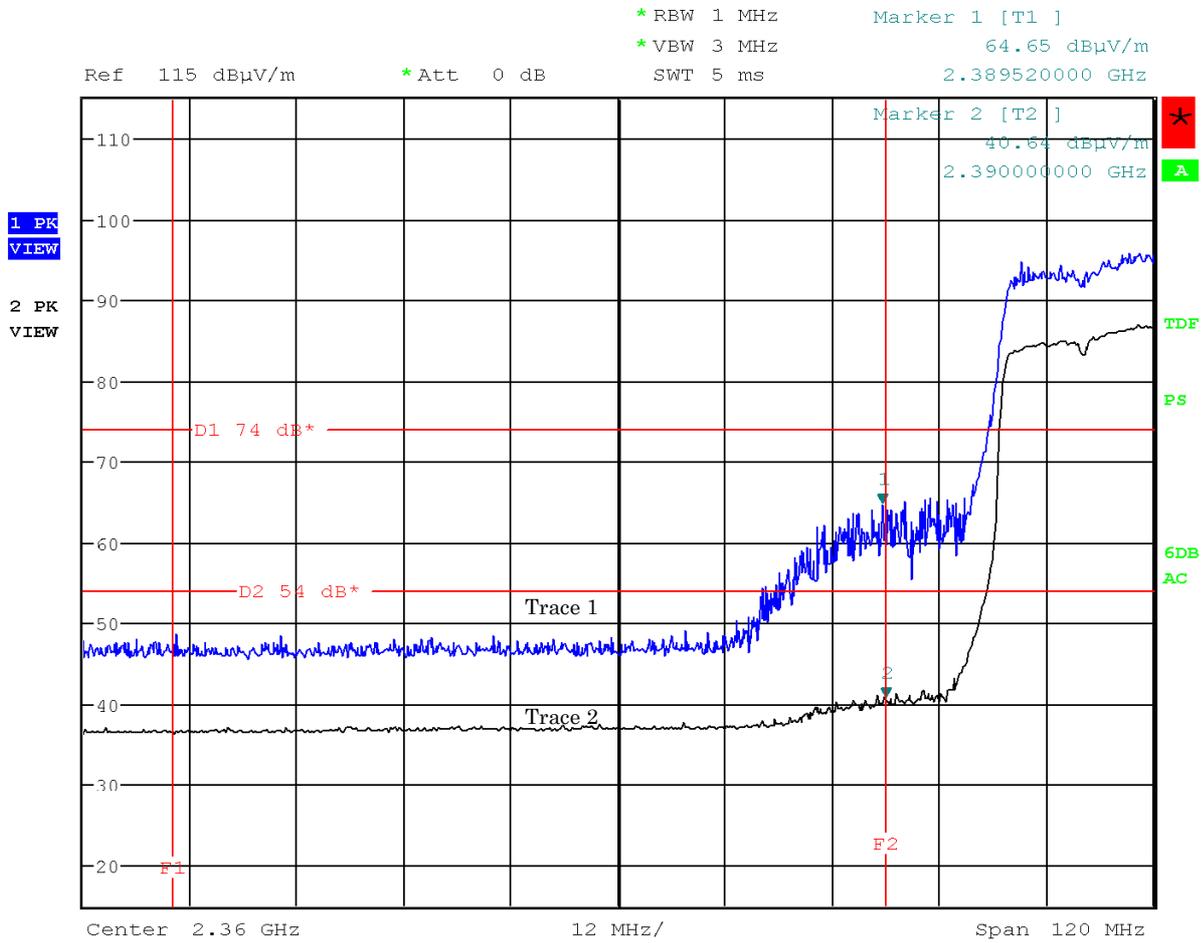
Antenna Polarization : Vertical



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

Mode of EUT : 1TX: Main ( 1ch: 2412 MHz, (IEEE 802.11n))

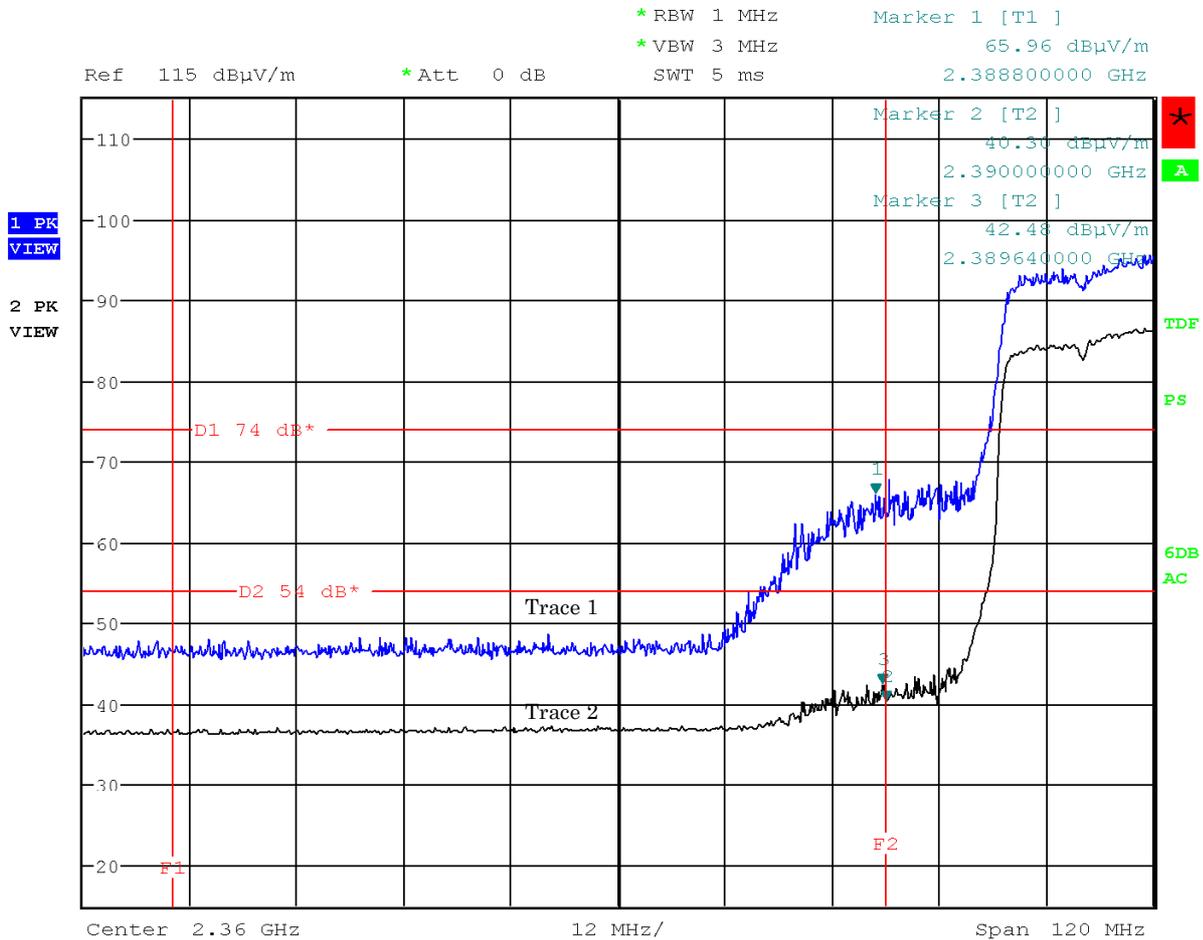
Antenna Polarization : Horizontal



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

Mode of EUT : 1TX: Main ( 1ch: 2412 MHz, (IEEE 802.11n))

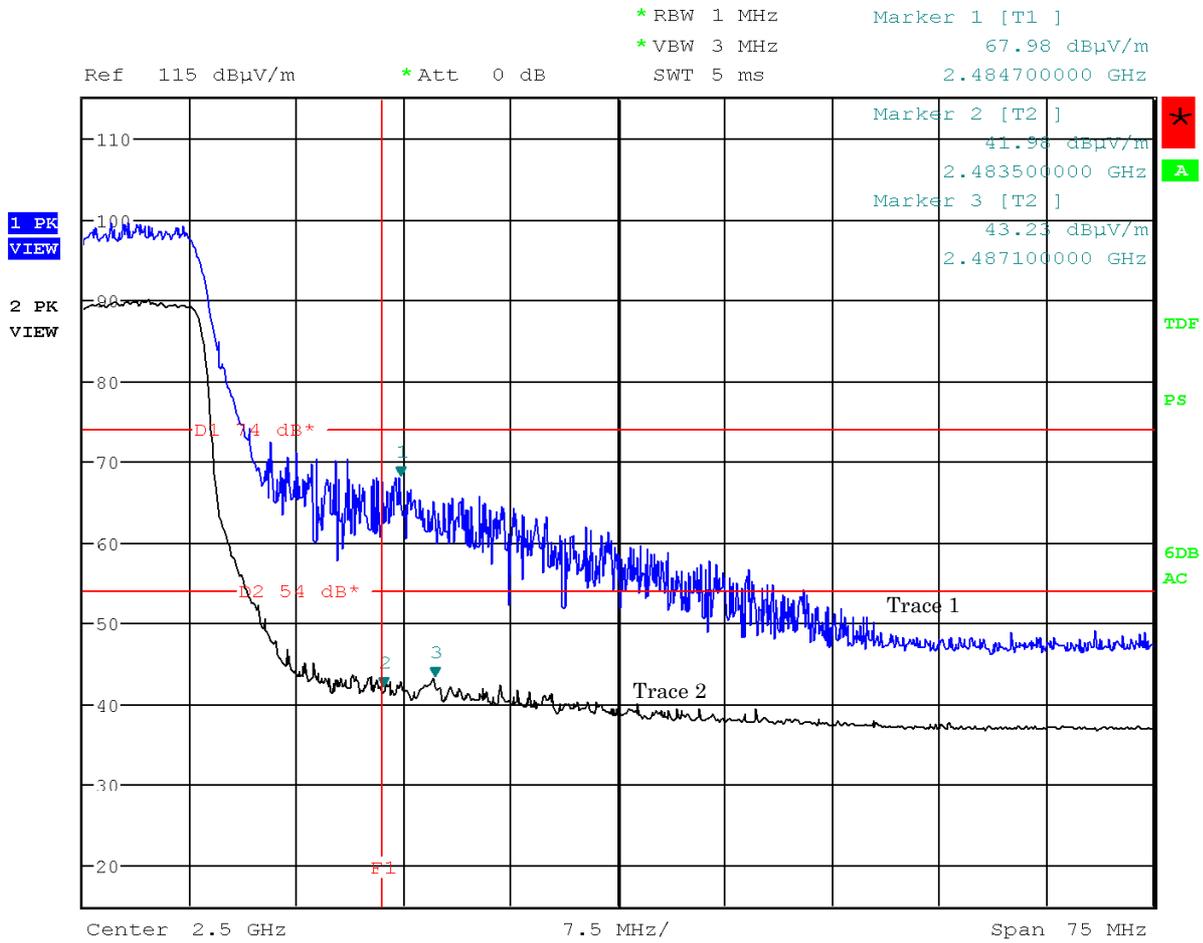
Antenna Polarization : Vertical



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

Mode of EUT : 1TX: Main ( 11ch: 2462 MHz, (IEEE 802.11n))

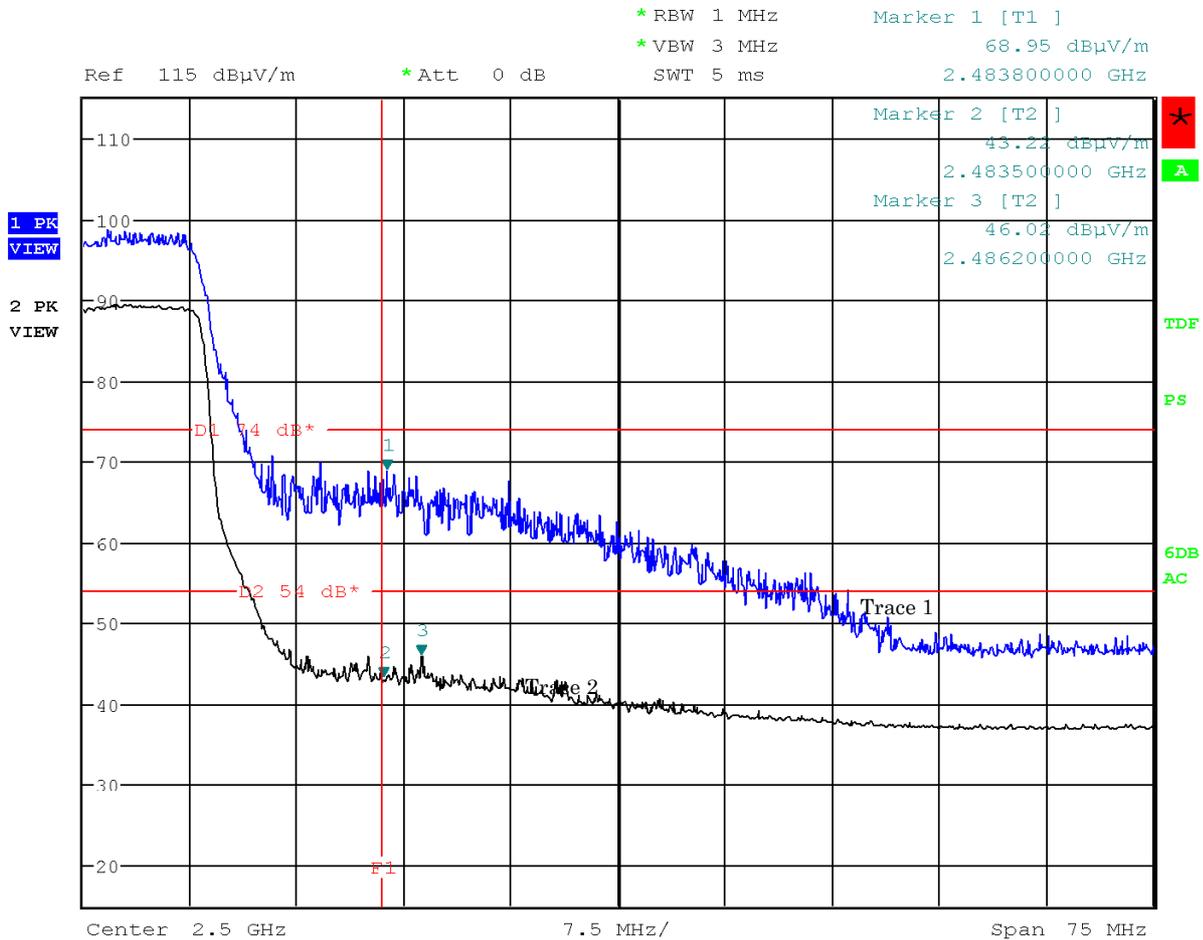
Antenna Polarization : Horizontal



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

Mode of EUT : 1TX: Main ( 11ch: 2462 MHz, (IEEE 802.11n))

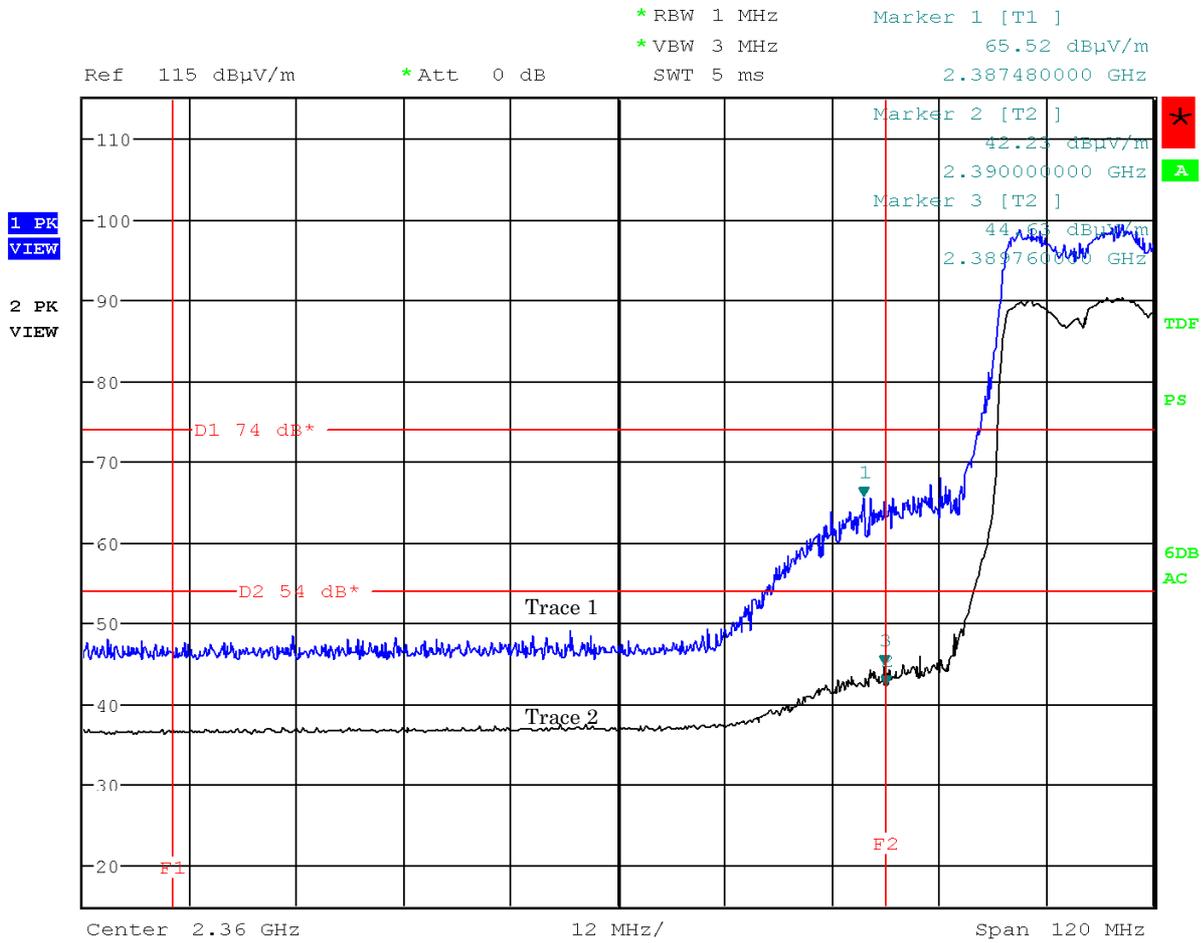
Antenna Polarization : Vertical



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

Mode of EUT : 2TX: Main+Sub ( 1ch: 2412 MHz, (IEEE 802.11n))

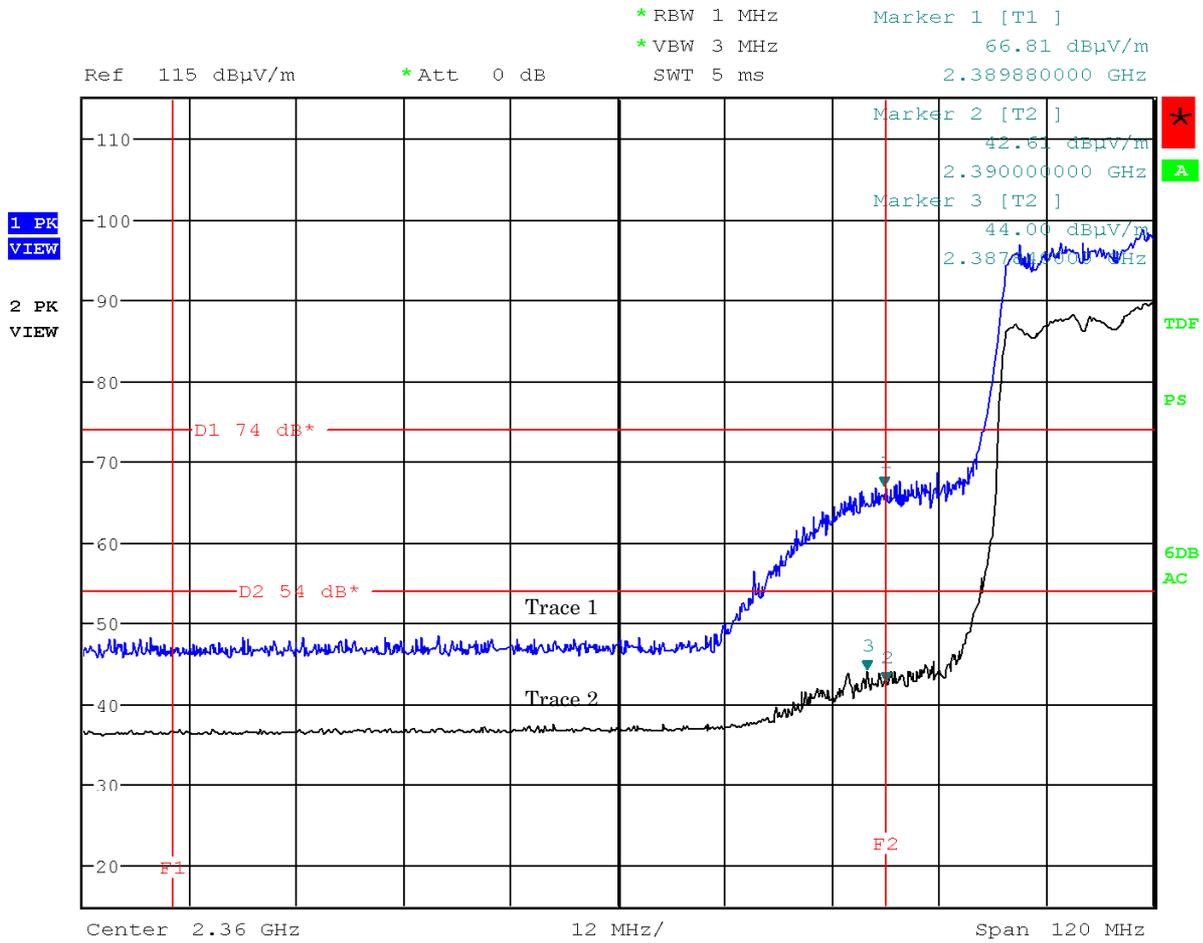
Antenna Polarization : Horizontal



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

Mode of EUT : 2TX: Main+Sub ( 1ch: 2412 MHz, (IEEE 802.11n))

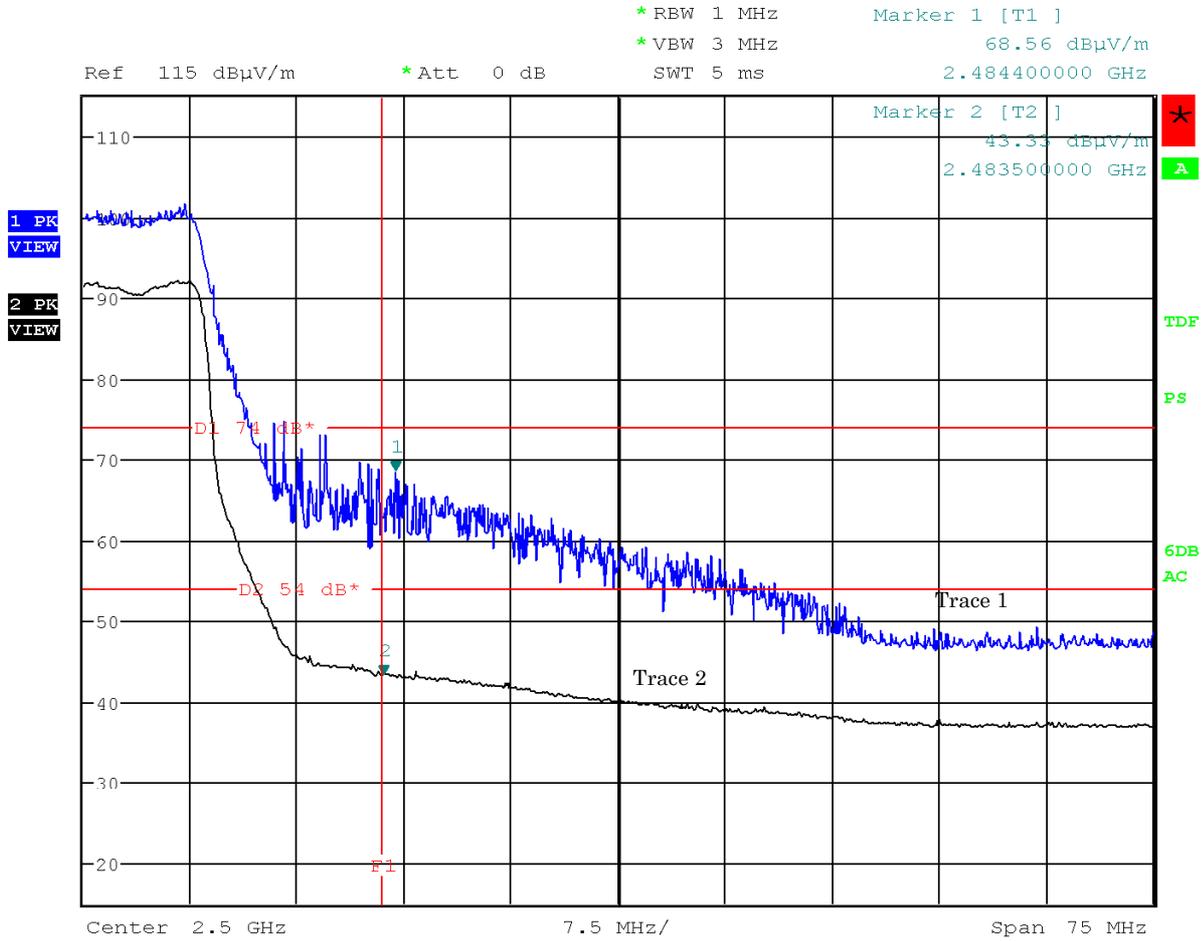
Antenna Polarization : Vertical



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

Mode of EUT : 2TX: Main+Sub ( 11ch: 2462 MHz, (IEEE 802.11n))

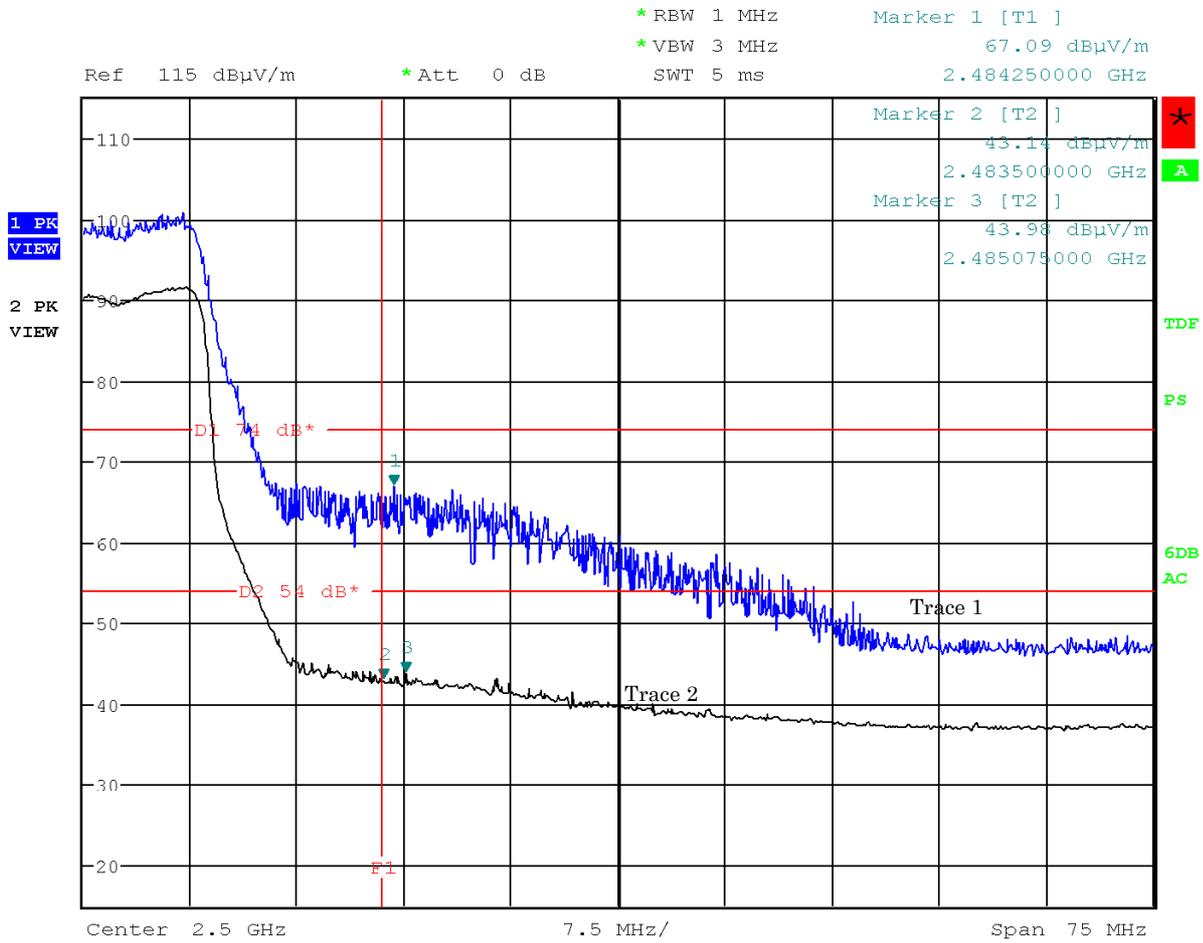
Antenna Polarization : Horizontal



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

Mode of EUT : 2TX: Main+Sub ( 11ch: 2462 MHz, (IEEE 802.11n))

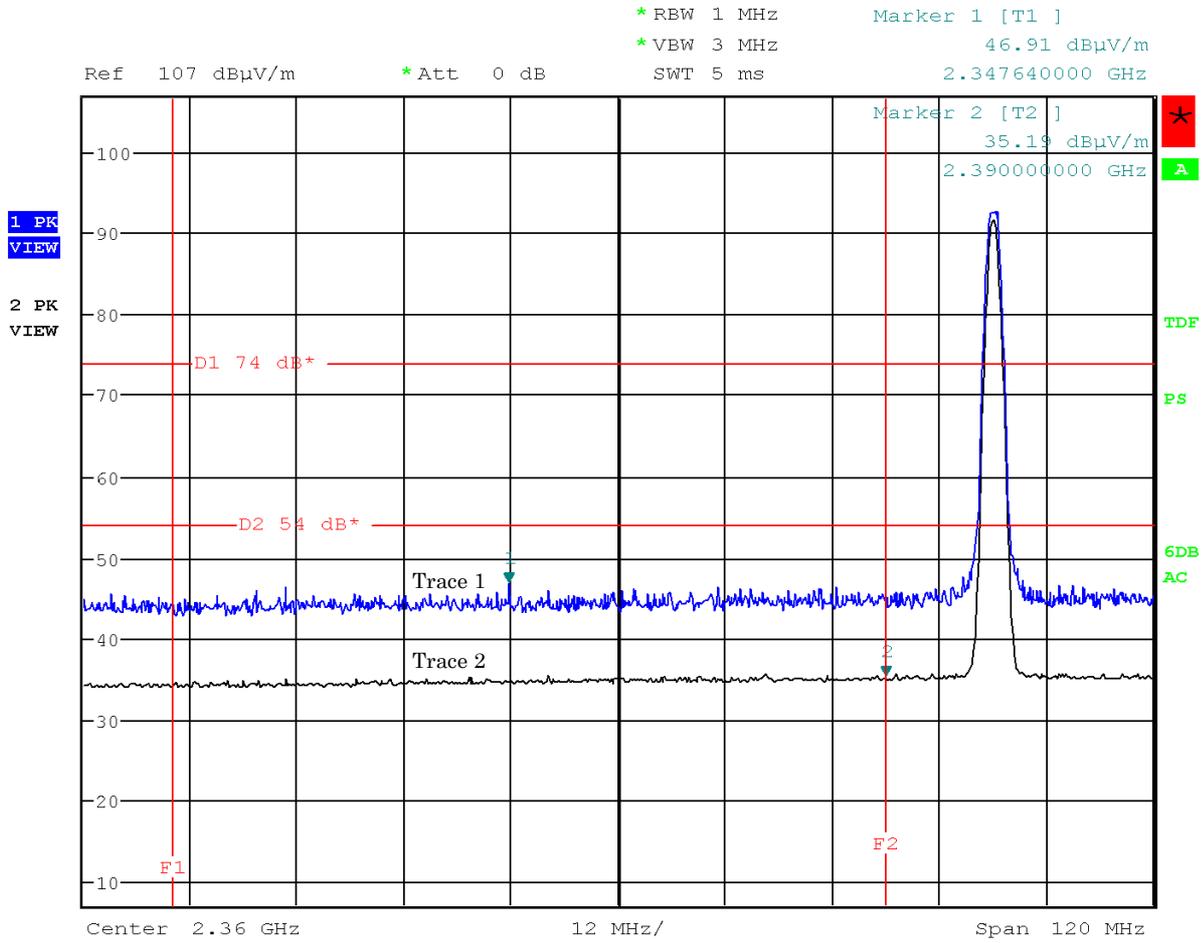
Antenna Polarization : Vertical



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

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

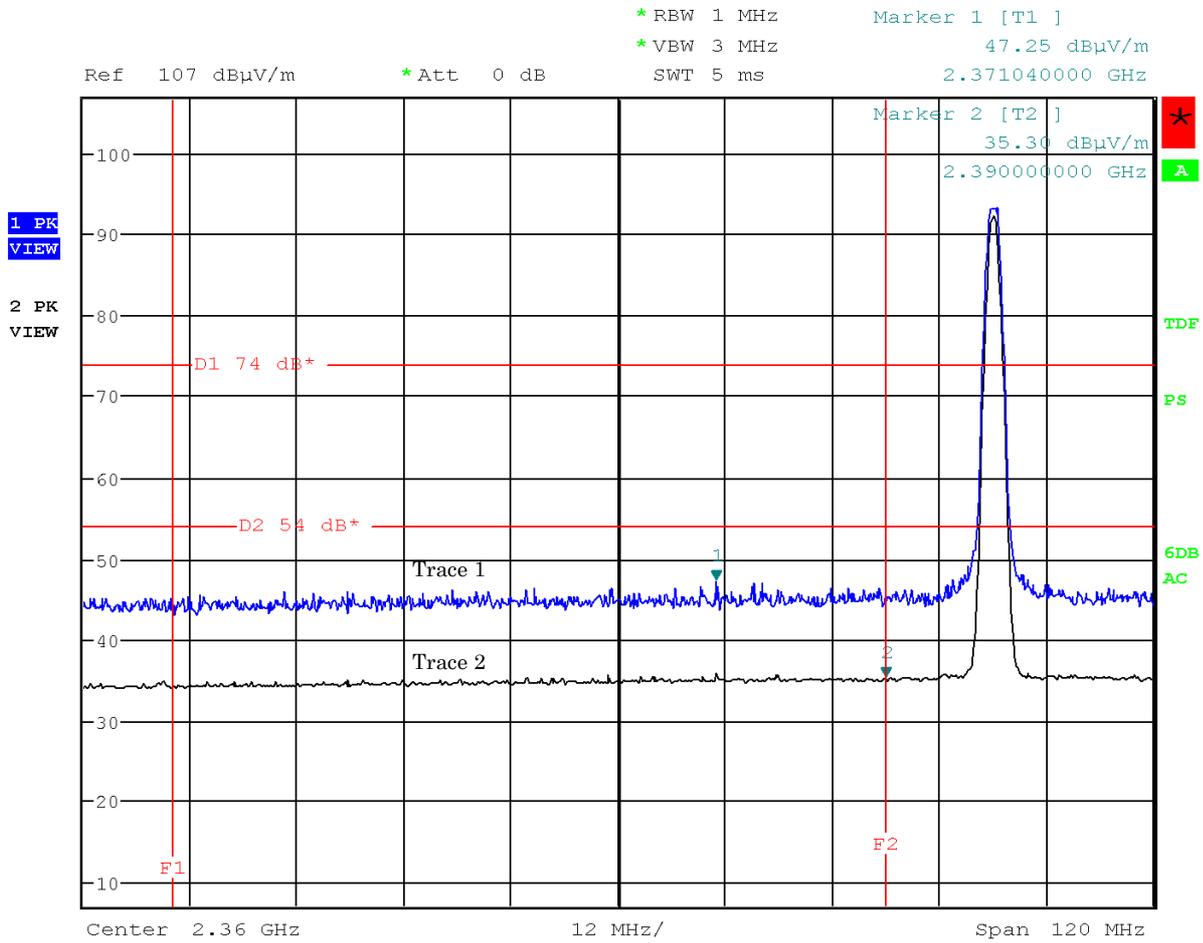
Antenna Polarization : Horizontal



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

Mode of EUT : Bluetooth Low Energy, Hopping off (Och: 2402 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 : September 1, 2015

Temp.:26°C, Humi:72%

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)**

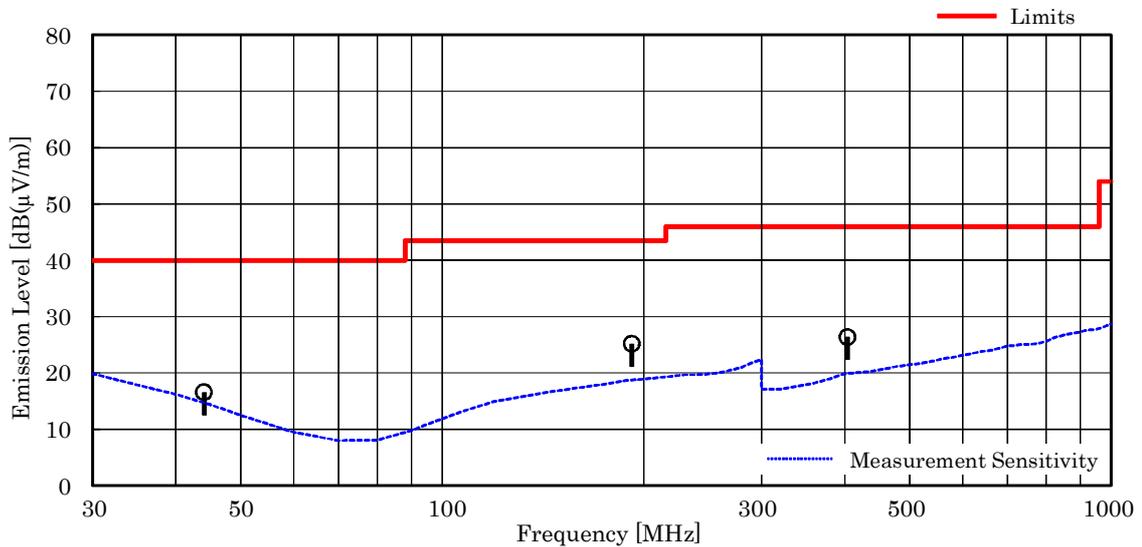
Mode of EUT : (WLAN) All modes have been investigated and the worst case mode for channel (06ch: 2437MHz / IEEE802.11b, IEEE802.11g and IEEE802.11n) has been listed.

Test Date: September 1, 2015

Temp.: 26 °C, Humi: 72 %

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
44.04	13.5	1.2	1.9	40.0	16.6	+23.4	-
192.00	16.2	2.5	6.5	43.5	25.2	+18.3	-
403.35	16.5	3.5	6.4	46.0	26.4	+19.6	-



NOTES

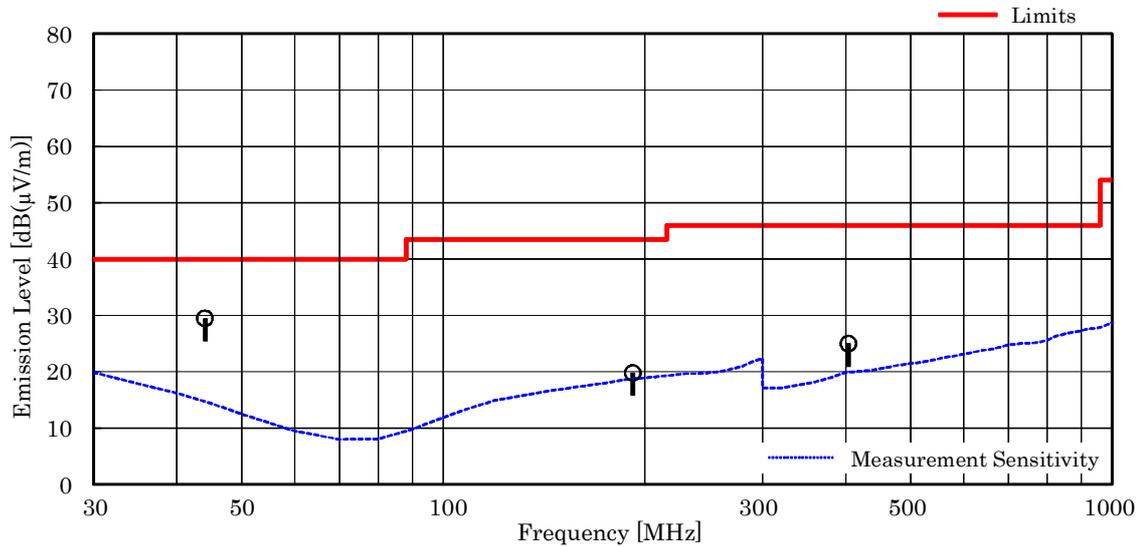
1. Test Distance : 3 m
2. The spectrum was checked from 30 MHz to 1000 MHz.
3. The correction factor is composed of cable loss, pad attenuation and/or amplifier gain.
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. Calculated result at 192.00 MHz, as the worst point shown on underline:  
 Antenna Factor + Coorection Factor + Meter Reading = 16.2 + 2.5 + 6.5 = 25.2 dB(μV/m)  
 Antenna Height : 1.68 m, Turntable Angle : 15 °
7. Test receiver setting(s) : CISPR QP 120 kHz (QP : Quasi-Peak)

Test Date: September 1, 2015

Temp.: 26 °C, Humi: 72 %

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
<u>44.04</u>	13.5	1.2	14.8	40.0	29.5	+10.5	-
192.00	16.2	2.5	1.1	43.5	19.8	+23.7	-
403.35	16.5	3.5	5.0	46.0	25.0	+21.0	-



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 44.04 MHz, as the worst point shown on underline:  
 $\text{Antenna Factor} + \text{Coorection Factor} + \text{Meter Reading} = 13.5 + 1.2 + 14.8 = 29.5 \text{ dB}(\mu\text{V/m})$   
 Antenna Height : 1.00 m, Turntable Angle : 182 °
7. Test receiver setting(s) : CISPR QP 120 kHz (QP : Quasi-Peak)

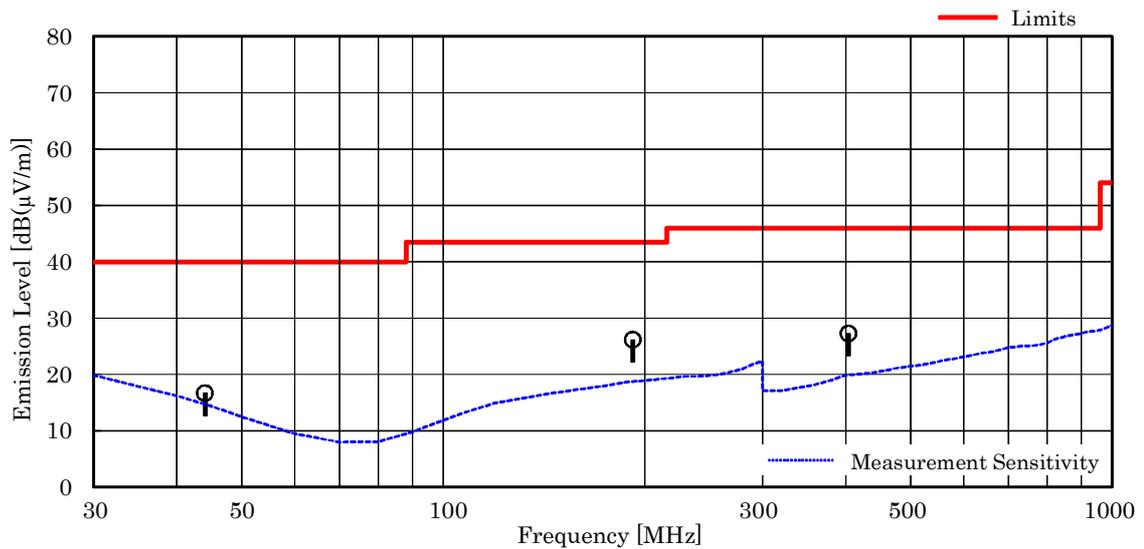
Mode of EUT : Bluetooth Low Energy

Test Date: September 1, 2015

Temp.: 26 °C, Humi: 72 %

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
44.04	13.5	1.2	2.0	40.0	16.7	+23.3	-
192.00	16.2	2.5	7.5	43.5	26.2	+17.3	-
403.35	16.5	3.5	7.3	46.0	27.3	+18.7	-



NOTES

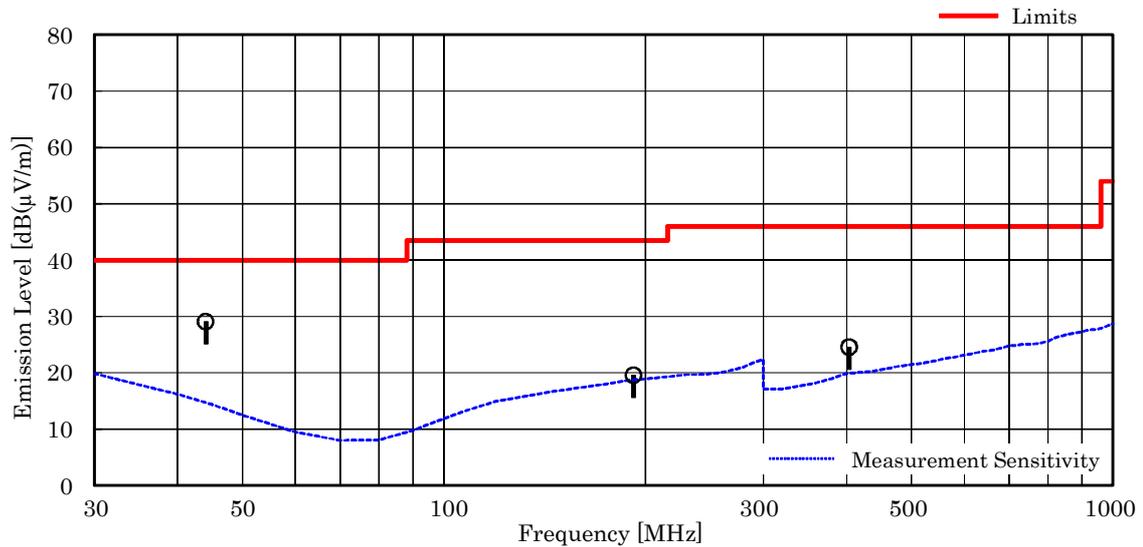
1. Test Distance : 3 m
2. The spectrum was checked from 30 MHz to 1000 MHz.
3. The correction factor is composed of cable loss, pad attenuation and/or amplifier gain.
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. Calculated result at 192.00 MHz, as the worst point shown on underline:  
 $\text{Antenna Factor} + \text{Coorection Factor} + \text{Meter Reading} = 16.2 + 2.5 + 7.5 = 26.2 \text{ dB}(\mu\text{V}/\text{m})$   
 Antenna Height : 1.68 m, Turntable Angle : 17 °
7. Test receiver setting(s) : CISPR QP 120 kHz (QP : Quasi-Peak)

Test Date: September 1, 2015

Temp.: 26 °C, Humi: 72 %

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
<u>44.04</u>	13.5	1.2	14.4	40.0	29.1	+10.9	-
192.00	16.2	2.5	0.9	43.5	19.6	+23.9	-
403.35	16.5	3.5	4.6	46.0	24.6	+21.4	-



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 44.04 MHz, as the worst point shown on underline:  
 $\text{Antenna Factor} + \text{Coorection Factor} + \text{Meter Reading} = 13.5 + 1.2 + 14.4 = 29.1 \text{ dB}(\mu\text{V/m})$   
 Antenna Height : 1.00 m, Turntable Angle : 176 °
7. Test receiver setting(s) : CISPR QP 120 kHz (QP : Quasi-Peak)

**7.9.4.4 Other Spurious Emission (Above 1000MHz)**

**7.9.4.4.1 Mode of TX**

**7.9.4.4.1.1 IEEE802.11b**

a) 1TX (Main)

Test Date: August 28, 2015

Temp.: 25 °C, Humi: 68 %

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
			Horizontal		Vertical		PK	AVE	PK	AVE		
<b>Test condition : Tx Low Ch</b>												
4824.0	27.3	-16.1	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.2	< 39.2	> +14.8	
12060.0	33.6	-25.8	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 45.8	< 35.8	> +18.2	
14472.0	37.2	-26.5	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 48.7	< 38.7	> +15.3	
19296.0	40.5	-42.8	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.7	< 37.7	> +16.3	
<b>Test condition : TX Middle Ch</b>												
4874.0	27.3	-16.0	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.3	< 39.3	> +14.7	
<u>7311.0</u>	29.8	-16.5	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 51.3	< 41.3	> +12.7	
12185.0	33.5	-26.1	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 45.4	< 35.4	> +18.6	
19496.0	40.5	-42.8	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.7	< 37.7	> +16.3	
<b>Test condition : TX High Ch</b>												
4924.0	27.3	-16.0	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.3	< 39.3	> +14.7	
7386.0	29.8	-16.6	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 51.2	< 41.2	> +12.8	
12310.0	33.4	-26.4	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 45.0	< 35.0	> +19.0	
19696.0	40.5	-42.9	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.6	< 37.6	> +16.4	
22158.0	40.6	-43.3	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.3	< 37.3	> +16.7	

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

Antenna Factor = 29.8 dB(1/m)  
 Corr. Factor = -16.5 dB  
 + ) Meter Reading = <28.0 dB(μV)  
 Result = <41.3 dB(μV/m)

Minimum Margin: 54.0 - <41.3 = >12.7 (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

b) 2TX (Main+Sub)

Test Date: August 28, 2015

Temp.: 25 °C, Humi: 68%

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
			Horizontal		Vertical		PK	AVE	PK	AVE		
			PK	AVE	PK	AVE						
<b>Test condition : Tx Low Ch</b>												
4824.0	27.3	-16.1	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.2	< 39.2	> +14.8	
12060.0	33.6	-25.8	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 45.8	< 35.8	> +18.2	
14472.0	37.2	-26.5	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 48.7	< 38.7	> +15.3	
19296.0	40.5	-42.8	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.7	< 37.7	> +16.3	
<b>Test condition : TX Middle Ch</b>												
4874.0	27.3	-16.0	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.3	< 39.3	> +14.7	
7311.0	29.8	-16.5	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 51.3	< 41.3	> +12.7	
12185.0	33.5	-26.1	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 45.4	< 35.4	> +18.6	
19496.0	40.5	-42.8	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.7	< 37.7	> +16.3	
<b>Test condition : TX High Ch</b>												
4924.0	27.3	-16.0	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.3	< 39.3	> +14.7	
7386.0	29.8	-16.6	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 51.2	< 41.2	> +12.8	
12310.0	33.4	-26.4	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 45.0	< 35.0	> +19.0	
19696.0	40.5	-42.9	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.6	< 37.6	> +16.4	
22158.0	40.6	-43.3	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.3	< 37.3	> +16.7	

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

Antenna Factor	=	29.8 dB(1/m)
Corr. Factor	=	-16.5 dB
+ ) Meter Reading	=	<28.0 dB(μV)
Result	=	<41.3 dB(μV/m)

Minimum Margin: 54.0 - <41.3 = >12.7 (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

7.9.4.4.1.2 IEEE802.11g

a) 1TX (Main)

Test Date: August 28, 2015

Temp.: 25 °C, Humi: 68%

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
			Horizontal		Vertical		PK	AVE	PK	AVE		
			PK	AVE	PK	AVE						
<b>Test condition : Tx Low Ch</b>												
4824.0	27.3	-16.1	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.2	< 39.2	> +14.8	
12060.0	33.6	-25.8	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 45.8	< 35.8	> +18.2	
14472.0	37.2	-26.5	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 48.7	< 38.7	> +15.3	
19296.0	40.5	-42.8	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.7	< 37.7	> +16.3	
<b>Test condition : TX Middle Ch</b>												
4874.0	27.3	-16.0	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.3	< 39.3	> +14.7	
7311.0	29.8	-16.5	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 51.3	< 41.3	> +12.7	
12185.0	33.5	-26.1	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 45.4	< 35.4	> +18.6	
19496.0	40.5	-42.8	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.7	< 37.7	> +16.3	
<b>Test condition : TX High Ch</b>												
4924.0	27.3	-16.0	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.3	< 39.3	> +14.7	
7386.0	29.8	-16.6	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 51.2	< 41.2	> +12.8	
12310.0	33.4	-26.4	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 45.0	< 35.0	> +19.0	
19696.0	40.5	-42.9	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.6	< 37.6	> +16.4	
22158.0	40.6	-43.3	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.3	< 37.3	> +16.7	

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

Antenna Factor	=	29.8 dB(1/m)
Corr. Factor	=	-16.5 dB
+ ) Meter Reading	=	<28.0 dB(μV)
Result	=	<41.3 dB(μV/m)

Minimum Margin: 54.0 - <41.3 = >12.7 (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

b) 2TX (Main+Sub)

Test Date: August 28, 2015

Temp.: 25 °C, Humi: 68%

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
			Horizontal		Vertical		PK	AVE	PK	AVE		
			PK	AVE	PK	AVE						
<b>Test condition : Tx Low Ch</b>												
4824.0	27.3	-16.1	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.2	< 39.2	> +14.8	
12060.0	33.6	-25.8	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 45.8	< 35.8	> +18.2	
14472.0	37.2	-26.5	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 48.7	< 38.7	> +15.3	
19296.0	40.5	-42.8	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.7	< 37.7	> +16.3	
<b>Test condition : TX Middle Ch</b>												
4874.0	27.3	-16.0	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.3	< 39.3	> +14.7	
7311.0	29.8	-16.5	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 51.3	< 41.3	> +12.7	
12185.0	33.5	-26.1	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 45.4	< 35.4	> +18.6	
19496.0	40.5	-42.8	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.7	< 37.7	> +16.3	
<b>Test condition : TX High Ch</b>												
4924.0	27.3	-16.0	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.3	< 39.3	> +14.7	
7386.0	29.8	-16.6	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 51.2	< 41.2	> +12.8	
12310.0	33.4	-26.4	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 45.0	< 35.0	> +19.0	
19696.0	40.5	-42.9	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.6	< 37.6	> +16.4	
22158.0	40.6	-43.3	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.3	< 37.3	> +16.7	

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

Antenna Factor	=	29.8 dB(1/m)
Corr. Factor	=	-16.5 dB
+ ) Meter Reading	=	<28.0 dB(μV)
Result	=	<41.3 dB(μV/m)

Minimum Margin: 54.0 - <41.3 = >12.7 (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

7.9.4.4.1.3 IEEE802.11n

a) 1TX (Main)

Test Date: August 28, 2015

Temp.: 25 °C, Humi: 68%

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
			Horizontal		Vertical		PK	AVE	PK	AVE		
			PK	AVE	PK	AVE						
<b>Test condition : Tx Low Ch</b>												
4824.0	27.3	-16.1	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.2	< 39.2	> +14.8	
12060.0	33.6	-25.8	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 45.8	< 35.8	> +18.2	
14472.0	37.2	-26.5	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 48.7	< 38.7	> +15.3	
19296.0	40.5	-42.8	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.7	< 37.7	> +16.3	
<b>Test condition : TX Middle Ch</b>												
4874.0	27.3	-16.0	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.3	< 39.3	> +14.7	
7311.0	29.8	-16.5	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 51.3	< 41.3	> +12.7	
12185.0	33.5	-26.1	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 45.4	< 35.4	> +18.6	
19496.0	40.5	-42.8	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.7	< 37.7	> +16.3	
<b>Test condition : TX High Ch</b>												
4924.0	27.3	-16.0	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.3	< 39.3	> +14.7	
7386.0	29.8	-16.6	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 51.2	< 41.2	> +12.8	
12310.0	33.4	-26.4	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 45.0	< 35.0	> +19.0	
19696.0	40.5	-42.9	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.6	< 37.6	> +16.4	
22158.0	40.6	-43.3	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.3	< 37.3	> +16.7	

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

Antenna Factor	=	29.8 dB(1/m)
Corr. Factor	=	-16.5 dB
+ ) Meter Reading	=	<28.0 dB(μV)
Result	=	<41.3 dB(μV/m)

Minimum Margin: 54.0 - <41.3 = >12.7 (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

b) 2TX (Main+Sub)

Test Date: August 28, 2015

Temp.: 25 °C, Humi: 68%

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
			Horizontal		Vertical		PK	AVE	PK	AVE		
			PK	AVE	PK	AVE						
<b>Test condition : Tx Low Ch</b>												
4824.0	27.3	-16.1	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.2	< 39.2	> +14.8	
12060.0	33.6	-25.8	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 45.8	< 35.8	> +18.2	
14472.0	37.2	-26.5	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 48.7	< 38.7	> +15.3	
19296.0	40.5	-42.8	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.7	< 37.7	> +16.3	
<b>Test condition : TX Middle Ch</b>												
4874.0	27.3	-16.0	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.3	< 39.3	> +14.7	
7311.0	29.8	-16.5	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 51.3	< 41.3	> +12.7	
12185.0	33.5	-26.1	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 45.4	< 35.4	> +18.6	
19496.0	40.5	-42.8	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.7	< 37.7	> +16.3	
<b>Test condition : TX High Ch</b>												
4924.0	27.3	-16.0	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.3	< 39.3	> +14.7	
7386.0	29.8	-16.6	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 51.2	< 41.2	> +12.8	
12310.0	33.4	-26.4	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 45.0	< 35.0	> +19.0	
19696.0	40.5	-42.9	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.6	< 37.6	> +16.4	
22158.0	40.6	-43.3	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.3	< 37.3	> +16.7	

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

Antenna Factor	=	29.8 dB(1/m)
Corr. Factor	=	-16.5 dB
+ ) Meter Reading	=	<28.0 dB(μV)
Result	=	<41.3 dB(μV/m)

Minimum Margin: 54.0 - <41.3 = >12.7 (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

7.9.4.4.1.4 Bluetooth Low Energy

Test Date: August 28, 2015

Temp.: 25 °C, Humi: 68 %

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
			Horizontal		Vertical		PK	AVE	PK	AVE		
			PK	AVE	PK	AVE						
<b>Test condition : Tx Low Ch</b>												
4804.0	27.3	-16.1	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.2	< 39.2	> +14.8	
12010.0	33.6	-25.7	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 45.9	< 35.9	> +18.1	
19216.0	40.5	-42.7	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.8	< 37.8	> +16.2	
<b>Test condition : TX Middle Ch</b>												
4880.0	27.3	-16.0	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.3	< 39.3	> +14.7	
7320.0	29.9	-16.5	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 51.4	< 41.4	> +12.6	
12200.0	33.5	-26.1	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 45.4	< 35.4	> +18.6	
19520.0	40.4	-42.6	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.8	< 37.8	> +16.2	
<b>Test condition : TX High Ch</b>												
4960.0	27.3	-15.9	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.4	< 39.4	> +14.6	
7440.0	29.8	-16.5	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 51.3	< 41.3	> +12.7	
12400.0	33.6	-26.5	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 45.1	< 35.1	> +18.9	
19840.0	40.4	-42.8	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.6	< 37.6	> +16.4	
22320.0	40.6	-43.2	< 50.0	< 40.0	< 50.0	< 40.0	74.0	54.0	< 47.4	< 37.4	> +16.6	

Calculated result at 7320.0 MHz, as the worst point shown on underline:

Antenna Factor	=	29.9 dB(1/m)
Corr. Factor	=	-16.5 dB
+) Meter Reading	=	<28.0 dB(μV)
Result	=	<41.4 dB(μV/m)

Minimum Margin: 54.0 - <41.4 = >12.6 (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

7.9.4.4.2 Mode of RX (WLAN)

Test Date: August 28, 2015

Temp.: 25 °C, Humi: 68 %

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
			Horizontal		Vertical		PK	AVE	PK	AVE		
			PK	AVE	PK	AVE	PK	AVE	PK	AVE		
<b>Test condition : RX Middle Ch</b>												
2437.0	21.5	-18.7	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 40.8	< 30.8	> +23.2	
4874.0	27.3	-16.3	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.0	< 39.0	> +15.0	
7311.0	29.8	-16.8	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 51.0	< 41.0	> +13.0	

Calculated result at 4874.0 MHz, as the worst point shown on underline:

Antenna Factor	=	27.3 dB(1/m)
Corr. Factor	=	-16.3 dB
+ ) Meter Reading	=	<28.0 dB(μV)
Result	=	<39.0 dB(μV/m)

Minimum Margin: 54.0 - <39.0 =>13.0 (dB)

NOTES

1. Test Distance : 3 m
2. The spectrum was checked from 1 GHz to 7.5 GHz .
3. The correction factor is shown as follows:  
Corr. Factor [dB] = Cable Loss + 20dB Pad Att. - Pre-Amp. Gain [dB] (1.0 - 7.6GHz)
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. PK : Peak / AVE : Average

**7.9.4.4.3 Mode of RX (Bluetooth Low Energy)**

Test Date: August 28, 2015

Temp.: 25 °C, Humi: 68 %

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
			Horizontal		Vertical		PK	AVE	PK	AVE		
			PK	AVE	PK	AVE						
<b>Test condition : RX Middle Ch</b>												
2440.0	21.2	-18.6	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 40.6	< 30.6	> +23.4	
4880.0	27.3	-16.3	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 49.0	< 39.0	> +15.0	
7320.0	29.9	-16.8	< 38.0	< 28.0	< 38.0	< 28.0	74.0	54.0	< 51.1	< 41.1	> +12.9	

Calculated result at 7320.0 MHz, as the worst point shown on underline:

Antenna Factor	=	29.9 dB(1/m)
Corr. Factor	=	-16.8 dB
+ ) Meter Reading	=	<28.0 dB(μV)
Result	=	<41.1 dB(μV/m)

Minimum Margin: 54.0 - <41.1 =>12.9 (dB)

**NOTES**

1. Test Distance : 3 m
2. The spectrum was checked from 1 GHz to 7.5 GHz .
3. The correction factor is shown as follows:  
Corr. Factor [dB] = Cable Loss + 20dB Pad Att. - Pre-Amp. Gain [dB] (1.0 - 7.6GHz)
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. PK : Peak / AVE : Average