# FCC Part 15
# EMI TEST REPORT

# of

E.U.T. : Smart Module

FCC ID. : VIXMOD1

Model No. : MOD1

# for

APPLICANT : Voxx Accessories Corp.

ADDRESS : 3502 Woodview Trace, Suite 220, Indianapolis, IN 46268, United States

Test Performed by

**ELECTRONICS TESTING CENTER, TAIWAN**
NO. 34. LIN 5. DINGFU VIL., LINKOU DIST.,
NEW TAIPEI CITY, TAIWAN, 24442, R.O.C.
Tel : (02)26023052 Fax : (02)26010910
http://www.etc.org.tw ; e-mail: emc@etc.org.tw
Report Number : 17-03-RBF-032-01

# TEST REPORT CERTIFICATION

Applicant : Voxx Accessories Corp.
3502 Woodview Trace, Suite 220, Indianapolis, IN 46268, United States

Manufacturer : Good Mind Industries, Co.,Ltd
No.22, Ta Yeou 2nd Street, Ta Fa Industrial District, Ta Liau District, Kaohsiung City 83163 Taiwan (R.O.C.)

Description of EUT

a) Type of EUT : Smart Module

b) Trade Name : RCA, MYGUARD

c) Model No. : MOD1

d) Power Supply : Adapter Model: AMS135-1201000FU
I/P: 100-240Vac, 50/60Hz, 0.5A
O/P: 12.0Vdc, 1.0A

Regulation Applied : FCC Rules and Regulations Part 15 Subpart C

I HEREBY CERTIFY THAT: The data shown in this report were made in accordance with the procedures given in ANSI C63.10-2013, and the energy emitted by the device was founded to be within the limits applicable. I assume full responsibility for accuracy and completeness of these data.

Note: 1. The result of the testing report relate only to the item tested.
2. The testing report shall not be reproduced expect in full, without the written approval of ETC

**Summary of Tests**

| Test | Results |
|---|---|
| Radiated Emission | **Pass** |
| Conducted Emission | **Pass** |
| Emission Bandwidth | **Pass** |
| Output Power | **Pass** |
| 100 kHz Bandwidth of Band Edges | **Pass** |
| Power Density | **Pass** |
| Out-of-Band Conducted Emission | **Pass** |
| Duty Cycle | **Pass** |

| | | |
|---|---|---|
| Date Test Item Received | : | Mar. 29, 2018 |
| Date Test Campaign Completed | : | July 06, 2018 |
| Date of Issue | : | July 06, 2018 |

Test Engineer : Kazuma Ho

(Kazuma Ho, Engineer )

Approve & Authorized Signer : S. S. Liou

S. S. Liou, Section Manager
EMC Dept. II of ELECTRONICS
TESTING CENTER, TAIWAN

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# 1 GENERAL INFORMATION

## 1.1 Product Description

a) Type of EUT : Smart Module

b) Trade Name : RCA

c) Model No. : MOD1

d) Power Supply : Adapter Model: AMS135-1201000FU
I/P: 100-240Vac, 50/60Hz, 0.3A
O/P: 12.0Vdc, 1.0A

e) Difference Description : N.A.

## 1.2 Characteristics of Device

The product is a Smart Module.

MOD1 is a device with wireless 802.11 b/g/n function and it supports user to monitor the Automatic laundry water shut-off system via wireless network.

a) Power Source : Adapter Model: AMS135-1201000FU
I/P: 100-240Vac, 50/60Hz, 0.5A
O/P: 12.0Vdc, 1.0A

## 1.3 Test Methodology

Both conducted and radiated emissions were performed according to the procedures illustrated in ANSI C63.10-2013. Other required measurements were illustrated in separate sections of this test report for details. For RF test the measurement procedure was refered to FCC KDB 558074 D01 DTS Meas Guidance v04.

| Software | Version | Note |
|---|---|---|
| e3 | Version 6.100618f | Radiated Emission Test |
| e3 | Version 6.100421 | Conducted Emission Test |

## 1.4 Test Facility

Location of the Test site: No.34, Lin 5, Dingfu Vil., Linkou Dist., New Taipei City, Taiwan 24442, R.O.C.

Designation Number: TW2628.

# 2 PROVISIONS APPLICABLE

## 2.1 Definition

**Unintentional radiator:**
A device that intentionally generates and radio frequency energy for use within the device, or that sends radio frequency signals by conduction to associated equipment via connecting wiring, but which is not intended to emit RF energy by radiation or induction.

Class A Digital Device:
A digital device which is marketed for use in commercial or business environment; exclusive of a device which is market for use by the general public, or which is intended to be used in the home.

Class B Digital Device :
A digital device which is marketed for use in a residential environment notwithstanding use in a commercial, business of industrial environment. Example of such devices that are marketed for the general public.

Note : A manufacturer may also qualify a device intended to be marketed in a commercial, business, or industrial environment as a Class B digital device, and in fact is encouraged to do so, provided the device complies with the technical specifications for a Class B Digital Device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a digital device as a Class B Digital Device, Regardless of its intended use.

**Intentional radiator:**
A device that intentionally generates and emits radio frequency energy by radiation or induction.

## 2.2 Requirement for Compliance

### (1) Conducted Emission Requirement

Except for Class A digital devices, for equpment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

| Frequency MHz | Quasi Peak dB $\mu$V | Average dB $\mu$V |
|---|---|---|
| 0.15 - 0.5 | 66-56* | 56-46* |
| 0.5 - 5.0 | 56 | 46 |
| 5.0 - 30.0 | 60 | 50 |

* Decreases with the logarithm of the frequency

### (2) Radiated Emission Requirement

For unintentional device, according to §15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

| Frequency MHz | Distance Meters | Radiated dB $\mu$V/m | Radiated $\mu$V/m |
|---|---|---|---|
| 30 - 88 | 3 | 40.0 | 100 |
| 88 - 216 | 3 | 43.5 | 150 |
| 216 - 960 | 3 | 46.0 | 200 |
| Above 960 | 3 | 54.0 | 500 |

For intentional device, according to §15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

### (3) Antenna Requirement

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

**(4) Bandwidth Requirement**

For direct sequence system, according to 15.247(a)(2), the minimum 6dB bandwidth shall be at least 500 kHz.

**(5) Output Power Requirement**

For direct sequence system, according to 15.247(b), the maximum peak output power of the transmitter shall not exceed 1 Watt. If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

**(6) 100 kHz Bandwidth of Frequency Band Edges Requirement**

According to 15.247(c), if any 100 kHz bandwidth outside these frequency bands, the radio frequency power that is produced by the modulation products of the spreading sequence, the information sequence and the carrier frequency shall be either at least 20 dB below that in any 100 kHz bandwidth within the band that contains the highest level of the desired power or shall not exceed the general levels specified in §15.209(a), whichever results in the lesser attenuation.

**(7) Power Density Requirement**

According to 15.247(d), for direct sequence systems, the transmitted power density averaged over any 1 second interval shall not be greater than 8 dBm in any 3 kHz bandwidth within these bands.

## 2.3 Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below :

| MHz | MHz | MHz | GHz |
|---|---|---|---|
| 0.090 - 0.110 | 16.42-16.423 | 399.9-410 | 4.5-5.15 |
| 0.495 - 0.505 ** | 16.69475 - 16.69525 | 608-614 | 5.35-5.46 |
| 2.1735 - 2.1905 | 16.80425 - 16.80475 | 960-1240 | 7.25-7.75 |
| 4.125-4.128 | 25.5-25.67 | 1300-1427 | 8.025-8.5 |
| 4.17725-4.17775 | 37.5-38.25 | 1435-1626.5 | 9.0-9.2 |
| 4.20725-4.20775 | 73-74.6 | 1645.5-1646.5 | 9.3-9.5 |
| 6.215-6.218 | 74.8-75.2 | 1660-1710 | 10.6-12.7 |
| 6.26775-6.26825 | 108-121.94 | 1718.8-1722.2 | 13.25-13.4 |
| 6.31175-6.31225 | 123-138 | 2200-2300 | 14.47-14.5 |
| 8.291-8.294 | 149.9-150.05 | 2310-2390 | 15.35-16.2 |
| 8.362-8.366 | 156.52475 - 156.52525 | 2483.5-2500 | 17.7-21.4 |
| 8.37625-8.38675 | 156.7-156.9 | 2655-2900 | 22.01-23.12 |
| 8.41425-8.41475 | 162.0125-167.17 | 3260-3267 | 23.6-24.0 |
| 12.29-12.293 | 167.72-173.2 | 3332-3339 | 31.2-31.8 |
| 12.51975-12.52025 | 240-285 | 3345.8-3358 | 36.43-36.5 |
| 12.57675-12.57725 | 322-335.4 | 3360-4400 | Above 38.6 |
| 13.36-13.41 | | | |

** : Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

## 2.4 Labeling Requirement

The device shall bear the following statement in a conspicuous location on the device :

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions : (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

## 2.5 User Information

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual.

The Federal Communications Commission Radio Frequency Interference Statement includes the following paragraph.

This equipment has been tested and found to comply with the limits for a Class B Digital Device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction may cause harmful interference to radio communication. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-- Reorient or relocate the receiving antenna.

-- Increase the separation between the equipment and receiver.

-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-- Consult the dealer or an experienced radio / TV technician for help.

# 3. SYSTEM TEST CONFIGURATION

## 3.1 Justification

For both radiated and conducted emissions, the system was configured for testing in a typical fashion as a customer would normally use it. The peripherals other than EUT were connected in normally standing by situation. Measurement was performed under the condition that a computer program was exercised to simulate data communication of EUT, and the transmission rate was set to maximum allowed by EUT. Three highest emissions were verified with varying placement of the cables connected to EUT to maximize the emission from EUT.

For conducted and radiated spurious emissions, whichever RF channel is operated, the digital circuits function identically. As the reason, measurement of radiated emissions from digital circuits is only performed with channel 1 by transmitting mode.

## 3.2 Devices for Tested System

| Device | Manufacture | Model | Cable Description |
|---|---|---|---|
| Smart Module * | Good Mind. | MOD1 | 20 inch or 5ft power cord |
| AC/DC power adapter | Amigo. | AMS135-1201000FU | 1.5 m Unshielded AC Power Cord |
| Automatic laundry water shut off system | Jebsee Electronics (Shenzhen) Co., Ltd | MGWLD | 1.5 m Unshielded Power Core x 2 pcs |

Remark "*" means equipment under test.

# 4 RADIATED EMISSION MEASUREMENT

## 4.1 Applicable Standard

For unintentional radiator, the radiated emission shall comply with §15.109(a).
For intentional radiators, according to §15.247 (a), operation under this provision is limited to frequency hopping and direct sequence spread spectrum, and the out band emission shall be comply with §15.247 (c)

## 4.2 Measurement Procedure

1. Setup the configuration per figure 1 and 2 for frequencies measured below and above 1 GHz respectively.

2. For emission frequencies measured below 1 GHz, a pre-scan is performed in a shielded chamber to determine the accurate frequencies of higher emissions will be checked on a open test site. As the same purpose, for emission frequencies measured above 1 GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.

3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 100 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.

4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0 ° to 360 ° with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading. A RF test receiver is also used to confirm emissions measured.

5. Repeat step 4 until all frequencies need to be measured were complete.

6. Repeat step 5 with search antenna in vertical polarized orientations.

7. Check the three frequencies of highest emission with varying the placement of cables associated with EUT to obtain the worse case and record the result.

Figure 1 : Frequencies measured below 1 GHz configuration

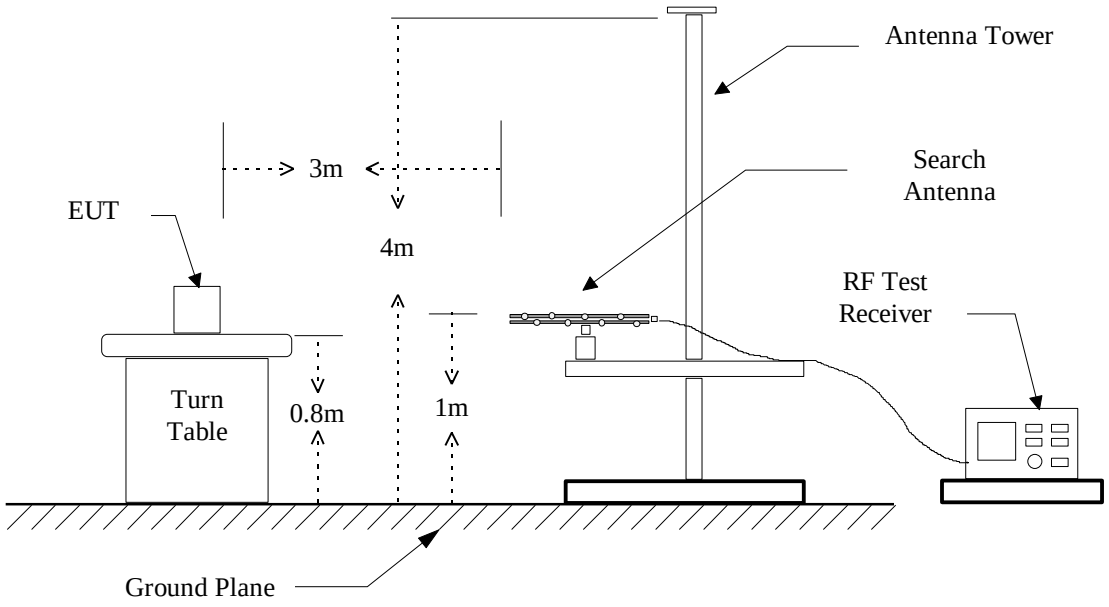
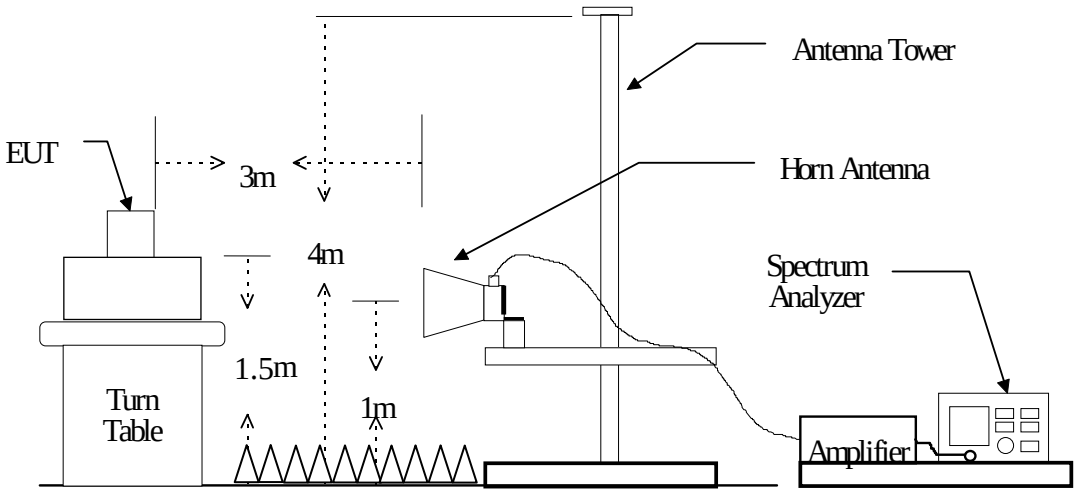



Figure 2 : Frequencies measured above 1 GHz configuration



## 4.3 Measuring Instrument

The following instrument are used for radiated emissions measurement:

| Equipment | Manufacturer | Model No. | Calibration Date | Next Cal. Date |
|---|---|---|---|---|
| EMI Test Receiver | Rohde & Schwarz | ESU 40 | 2017/11/15 | 2018/11/14 |
| Bi-Log Antenna | ETC | MCTD 2786 | 2017/10/26 | 2018/10/25 |
| Horn Antenna | EMCO | 3115 | 2017/10/11 | 2018/10/10 |
| Horn Antenna | EMCO | 3116 | 2017/11/15 | 2018/11/14 |
| Amplifier | HP | 8447D | 2017/12/08 | 2018/12/07 |
| Amplifier | HP | 83051A | 2017/08/25 | 2018/08/24 |
| LOOP Antenna | EMCO | 6512 | 2017/10/13 | 2018/10/12 |

Measuring instrument setup in measured frequency band when specified detector function is used :

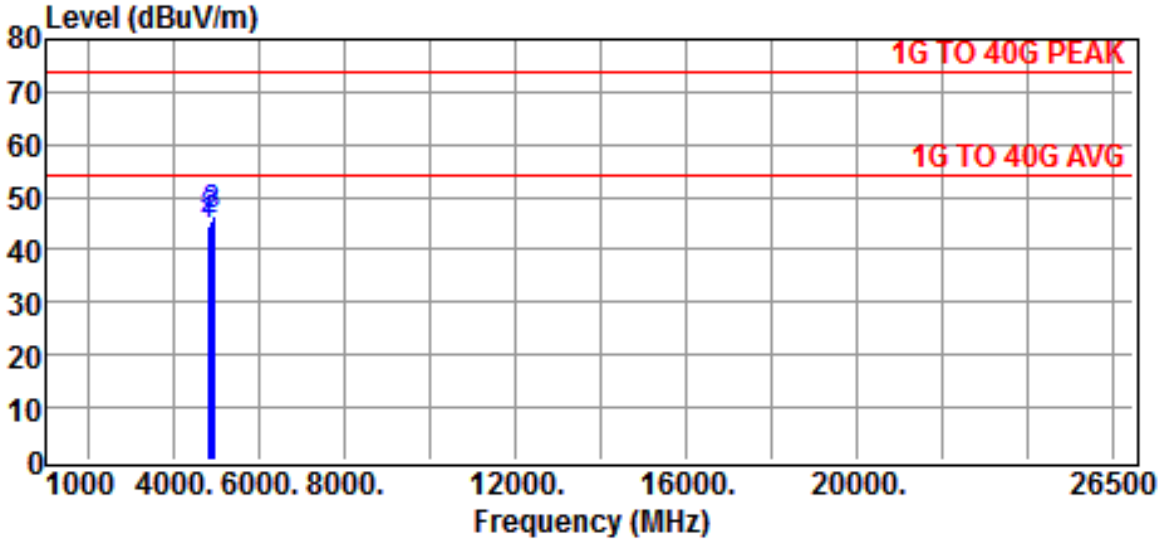
| Frequency Band (MHz) | Instrument | Function | Resolution bandwidth | Video Bandwidth |
|---|---|---|---|---|
| 30 to 1000 | RF Test Receiver | Quasi-Peak | 120 kHz | N/A |
| | Spectrum Analyzer | Peak | 100 kHz | 100 kHz |
| Above 1000 | Spectrum Analyzer | Peak | 1 MHz | 1 MHz |
| | Spectrum Analyzer | Average | 1 MHz | 10 Hz or ≥ 1/T (Note 1) |

Note 1:
VBW = 10 Hz, when the duty cycle is no less than 98%.
VBW ≥ 1/T, when duty cycle is less than 98% where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

## 4.4 Radiated Emission Data

### 4.4.1 RF Portion

### A. (802.11b)



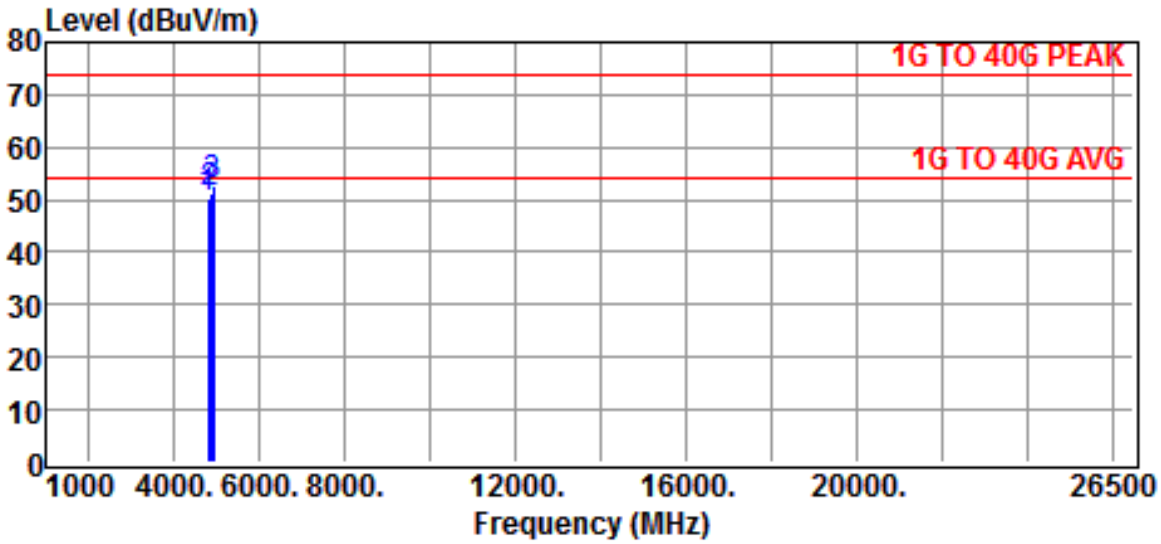

| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-07-06 |
| Limit | : 1G TO 40G PEAK | Ant. Pol. | : HORIZONTAL |
| EUT | : Smart Module | Model | : MOD1 |
| Power Rating | : AC120V 60Hz | Temp. | : 29˚C |
| Engineer | : Kazuma Ho | Humi. | : 52 % |
| Test Mode | : WiFi-B | | |

| Freq<br>MHz | Reading<br>dBuV | Correction Factor<br>dB | Result<br>dBuV/m | Limits (AVG)<br>dBuV/m | Over limit<br>dB | Detector |
|---|---|---|---|---|---|---|
| 4824.0000 | 42.78 | 1.54 | 44.32 | 54.00 | -9.68 | Peak |
| 4874.0000 | 43.76 | 1.70 | 45.46 | 54.00 | -8.54 | Peak |
| 4924.0000 | 44.49 | 1.88 | 46.37 | 54.00 | -7.63 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

**A. (802.11b)**



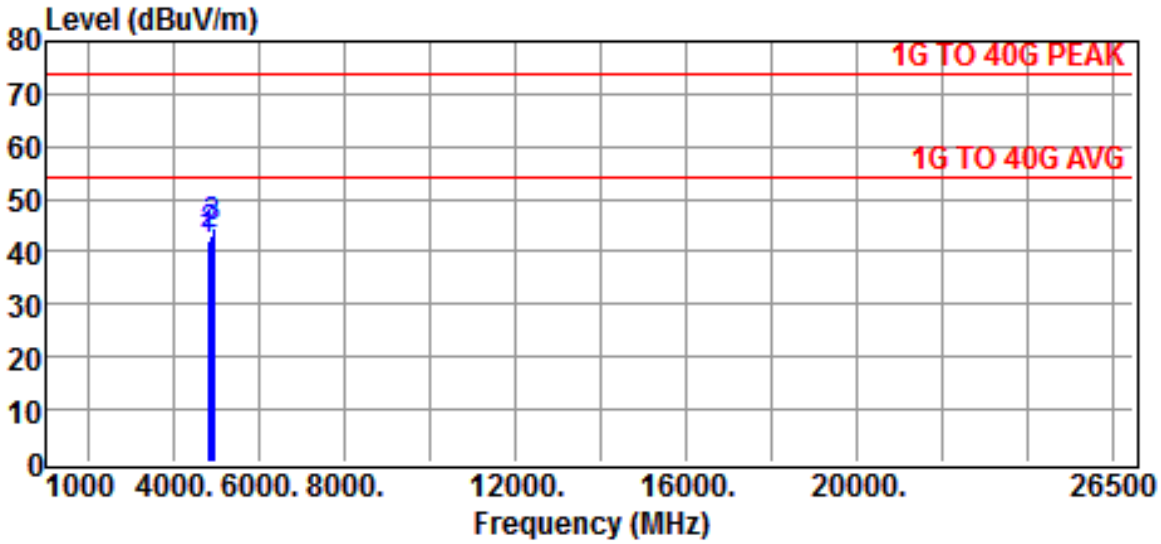

| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-07-06 |
| Limit | : 1G TO 40G PEAK | Ant. Pol. | : VERTICAL |
| EUT | : Smart Module | Model | : MOD1 |
| Power Rating | : AC120V 60Hz | Temp. | : 29˚C |
| Engineer | : Kazuma Ho | Humi. | : 52 % |
| Test Mode | : WiFi-B | | |

| Freq<br>MHz | Reading<br>dBuV | Correction Factor<br>dB | Result<br>dBuV/m | Limits (AVG)<br>dBuV/m | Over limit<br>dB | Detector |
|---|---|---|---|---|---|---|
| 4824.0000 | 48.67 | 1.54 | 50.21 | 54.00 | -3.79 | Peak |
| 4874.0000 | 49.56 | 1.70 | 51.26 | 54.00 | -2.74 | Peak |
| 4924.0000 | 50.71 | 1.88 | 52.59 | 54.00 | -1.41 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

**B. (802.11g)**



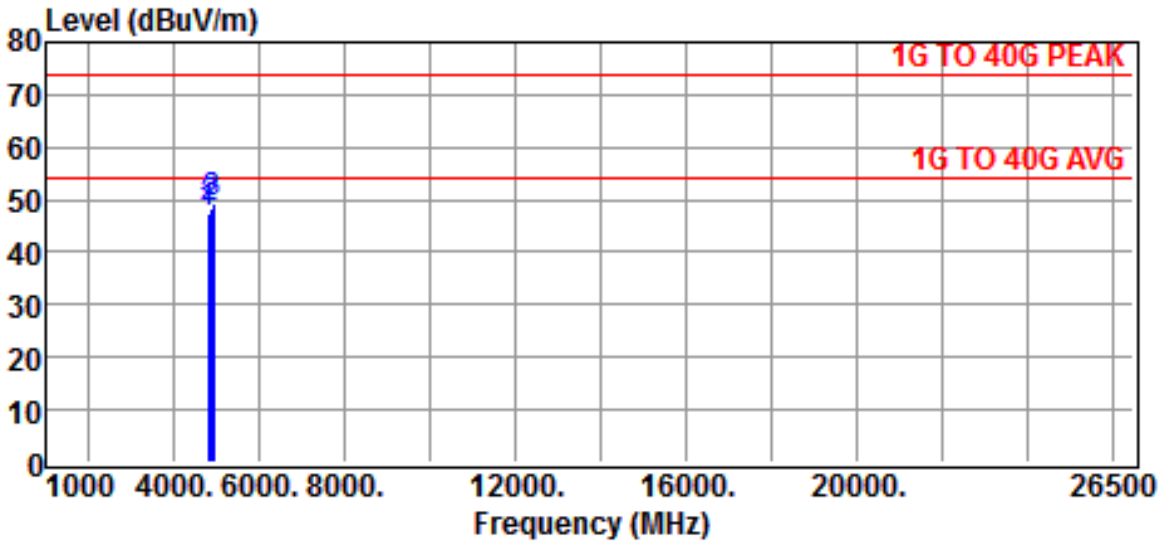

| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-07-06 |
| Limit | : 1G TO 40G PEAK | Ant. Pol. | : HORIZONTAL |
| EUT | : Smart Module | Model | : MOD1 |
| Power Rating | : AC120V 60Hz | Temp. | : 29˚C |
| Engineer | : Kazuma Ho | Humi. | : 52 % |
| Test Mode | : WiFi-G | | |

| Freq<br><br>MHz | Reading<br><br>dBuV | Correction Factor<br>dB | Result<br><br>dBuV/m | Limits (AVG)<br>dBuV/m | Over limit<br><br>dB | Detector |
|---|---|---|---|---|---|---|
| 4824.0000 | 40.53 | 1.54 | 42.07 | 54.00 | -11.93 | Peak |
| 4874.0000 | 41.55 | 1.70 | 43.25 | 54.00 | -10.75 | Peak |
| 4924.0000 | 42.63 | 1.88 | 44.51 | 54.00 | -9.49 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

**B. (802.11g)**



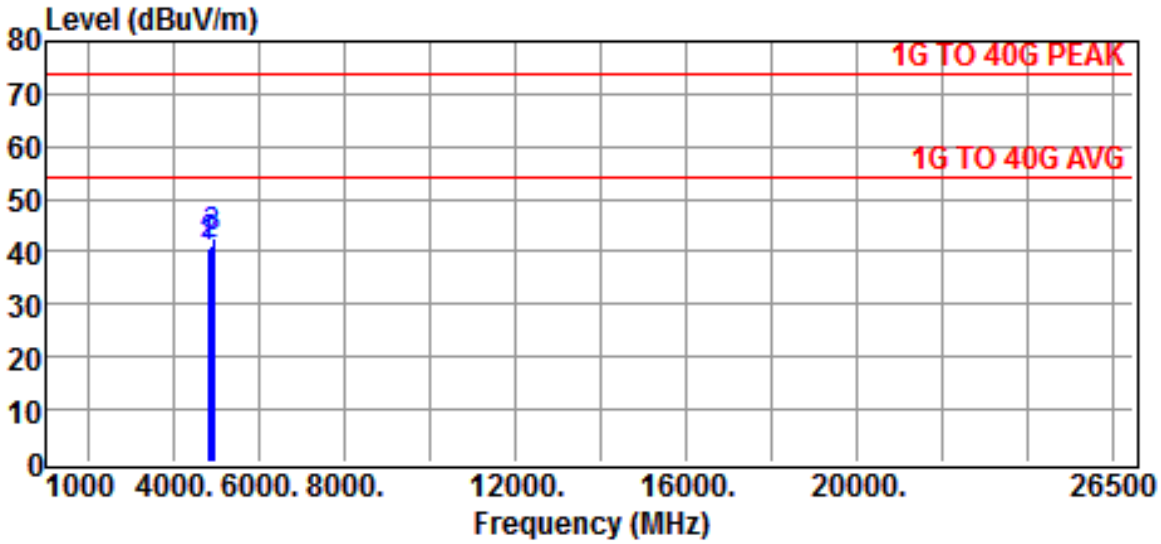

| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-07-06 |
| Limit | : 1G TO 40G PEAK | Ant. Pol. | : VERTICAL |
| EUT | : Smart Module | Model | : MOD1 |
| Power Rating | : AC120V 60Hz | Temp. | : 29˚C |
| Engineer | : Kazuma Ho | Humi. | : 52 % |
| Test Mode | : WiFi-G | | |

| Freq<br>MHz | Reading<br>dBuV | Correction Factor<br>dB | Result<br>dBuV/m | Limits (AVG)<br>dBuV/m | Over limit<br>dB | Detector |
|---|---|---|---|---|---|---|
| 4824.0000 | 45.65 | 1.54 | 47.19 | 54.00 | -6.81 | Peak |
| 4874.0000 | 46.79 | 1.70 | 48.49 | 54.00 | -5.51 | Peak |
| 4924.0000 | 47.55 | 1.88 | 49.43 | 54.00 | -4.57 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

**C. (802.11n HT-20)**



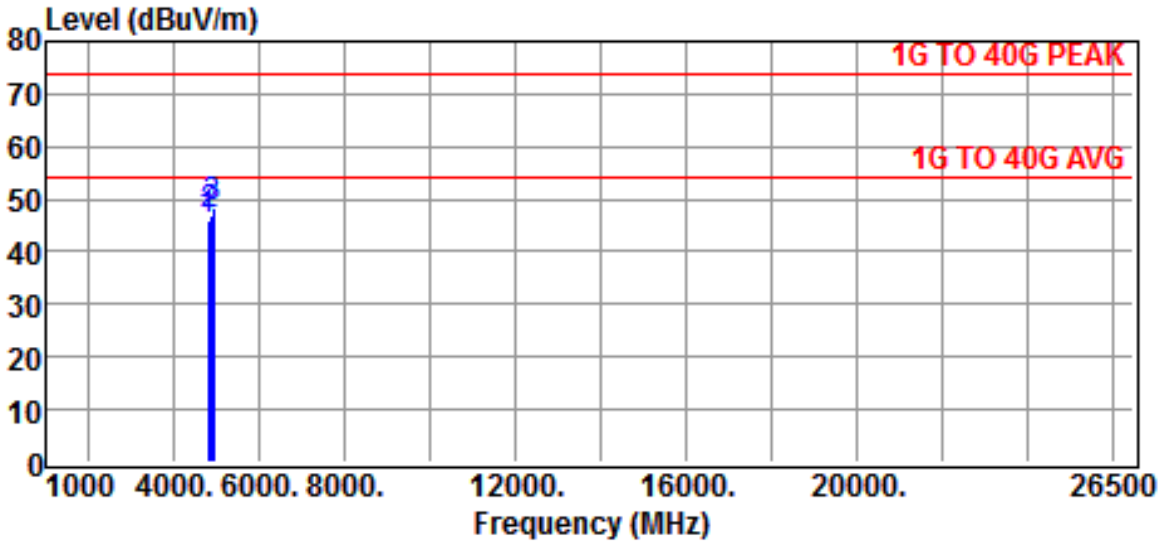

| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-07-06 |
| Limit | : 1G TO 40G PEAK | Ant. Pol. | : HORIZONTAL |
| EUT | : Smart Module | Model | : MOD1 |
| Power Rating | : AC120V 60Hz | Temp. | : 29˚C |
| Engineer | : Kazuma Ho | Humi. | : 52 % |
| Test Mode | : WiFi-N20 | | |

| Freq<br>MHz | Reading<br>dBuV | Correction Factor<br>dB | Result<br>dBuV/m | Limits (AVG)<br>dBuV/m | Over limit<br>dB | Detector |
|---|---|---|---|---|---|---|
| 4824.0000 | 39.00 | 1.54 | 40.54 | 54.00 | -13.46 | Peak |
| 4874.0000 | 39.63 | 1.70 | 41.33 | 54.00 | -12.67 | Peak |
| 4924.0000 | 40.70 | 1.88 | 42.58 | 54.00 | -11.42 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

**C. (802.11n HT-20)**



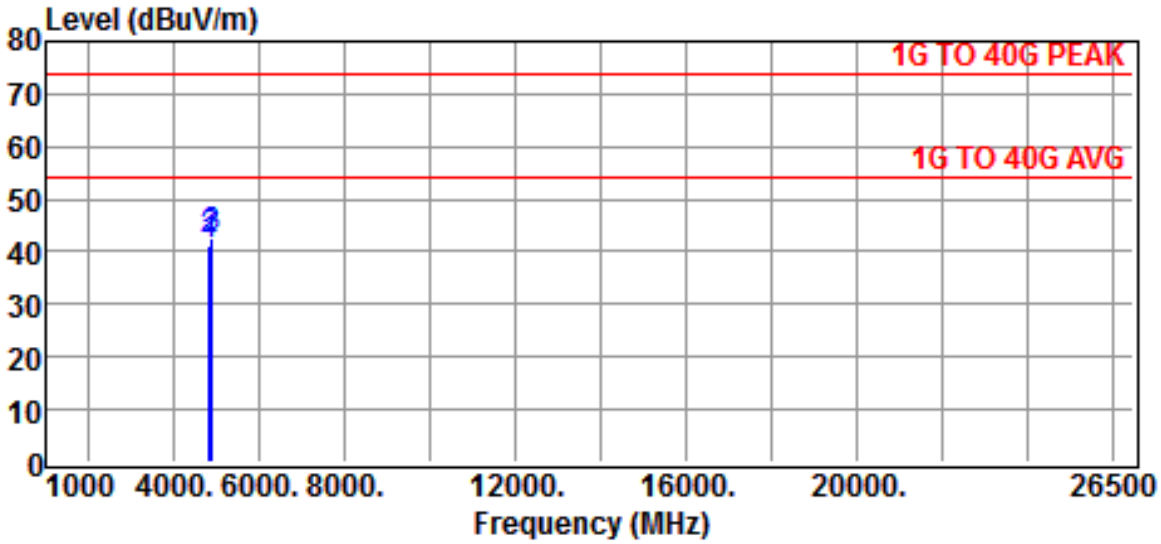

| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-07-06 |
| Limit | : 1G TO 40G PEAK | Ant. Pol. | : VERTICAL |
| EUT | : Smart Module | Model | : MOD1 |
| Power Rating | : AC120V 60Hz | Temp. | : 29˚C |
| Engineer | : Kazuma Ho | Humi. | : 52 % |
| Test Mode | : WiFi-N20 | | |

| Freq<br>MHz | Reading<br>dBuV | Correction Factor<br>dB | Result<br>dBuV/m | Limits (AVG)<br>dBuV/m | Over limit<br>dB | Detector |
|---|---|---|---|---|---|---|
| 4824.0000 | 44.67 | 1.54 | 46.21 | 54.00 | -7.79 | Peak |
| 4874.0000 | 45.35 | 1.70 | 47.05 | 54.00 | -6.95 | Peak |
| 4924.0000 | 46.47 | 1.88 | 48.35 | 54.00 | -5.65 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

**D. (802.11n HT-40)**



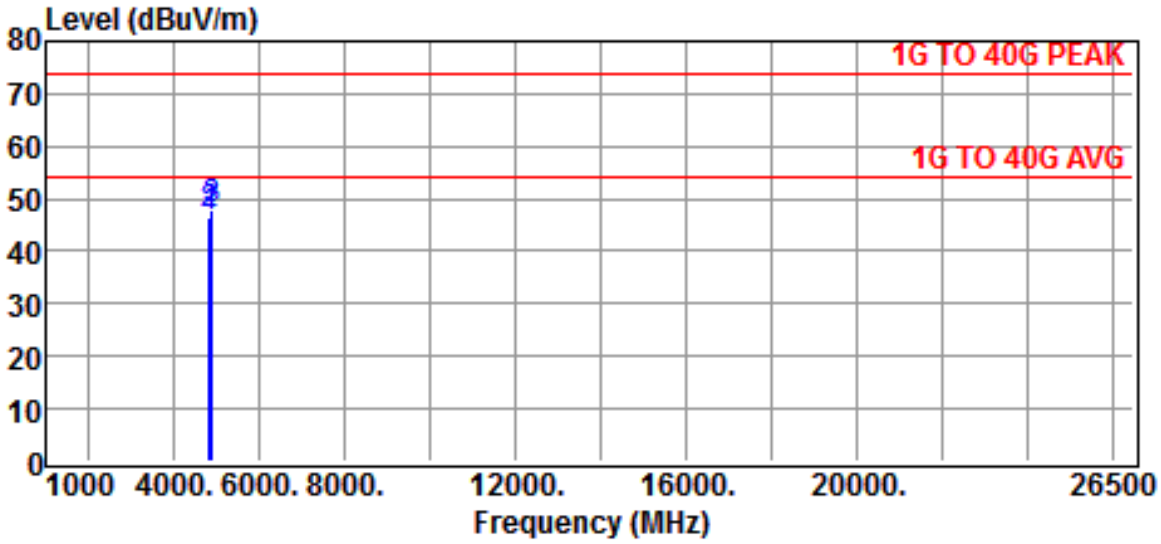

| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-05-18 |
| Limit | : 1G TO 40G PEAK | Ant. Pol. | : HORIZONTAL |
| EUT | : Smart Module | Model | : MOD1 |
| Power Rating | : AC120V 60Hz | Temp. | : 27˚C |
| Engineer | : Kazuma Ho | Humi. | : 51 % |
| Test Mode | : WiFi-N40 | | |

| Freq<br>MHz | Reading<br>dBuV | Correction Factor<br>dB | Result<br>dBuV/m | Limits (AVG)<br>dBuV/m | Over limit<br>dB | Detector |
|---|---|---|---|---|---|---|
| 4844.0000 | 39.59 | 1.60 | 41.19 | 54.00 | -12.81 | Peak |
| 4874.0000 | 40.26 | 1.70 | 41.96 | 54.00 | -12.04 | Peak |
| 4904.0000 | 40.93 | 1.82 | 42.75 | 54.00 | -11.25 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

**D. (802.11n HT-40)**




| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-05-18 |
| Limit | : 1G TO 40G PEAK | Ant. Pol. | : VERTICAL |
| EUT | : Smart Module | Model | : MOD1 |
| Power Rating | : AC120V 60Hz | Temp. | : 27˚C |
| Engineer | : Kazuma Ho | Humi. | : 51 % |
| Test Mode | : WiFi-N40 | | |

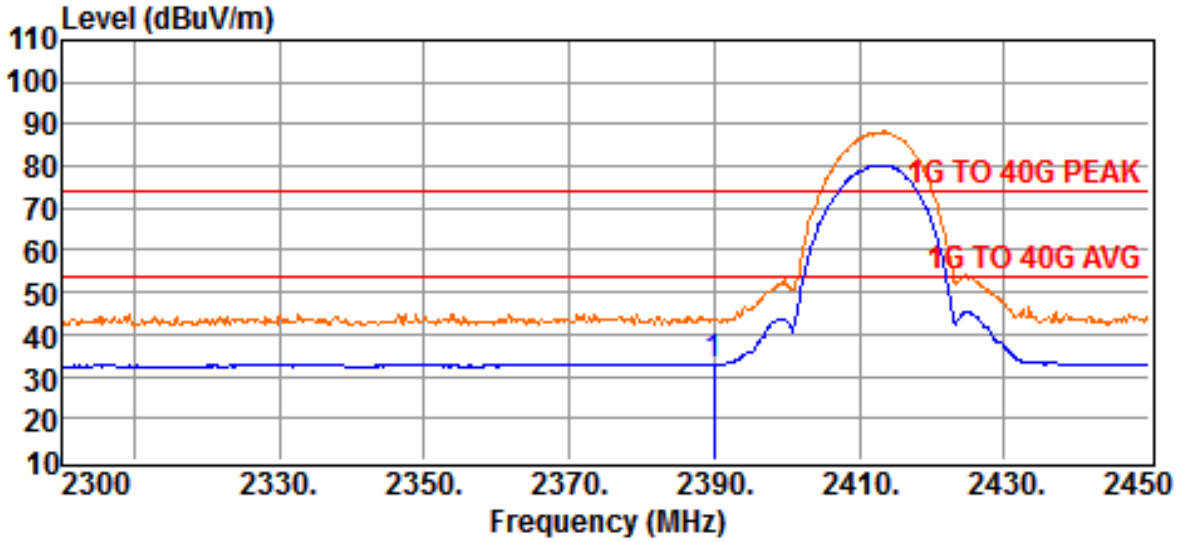
| Freq<br>MHz | Reading<br>dBuV | Correction Factor<br>dB | Result<br>dBuV/m | Limits (AVG)<br>dBuV/m | Over limit<br>dB | Detector |
|---|---|---|---|---|---|---|
| 4844.0000 | 44.64 | 1.60 | 46.24 | 54.00 | -7.76 | Peak |
| 4874.0000 | 45.27 | 1.70 | 46.97 | 54.00 | -7.03 | Peak |
| 4904.0000 | 46.28 | 1.82 | 48.10 | 54.00 | -5.90 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

### 4.4.2 Radiated Eimssion of Restricted bands

**Mode: 802.11b**



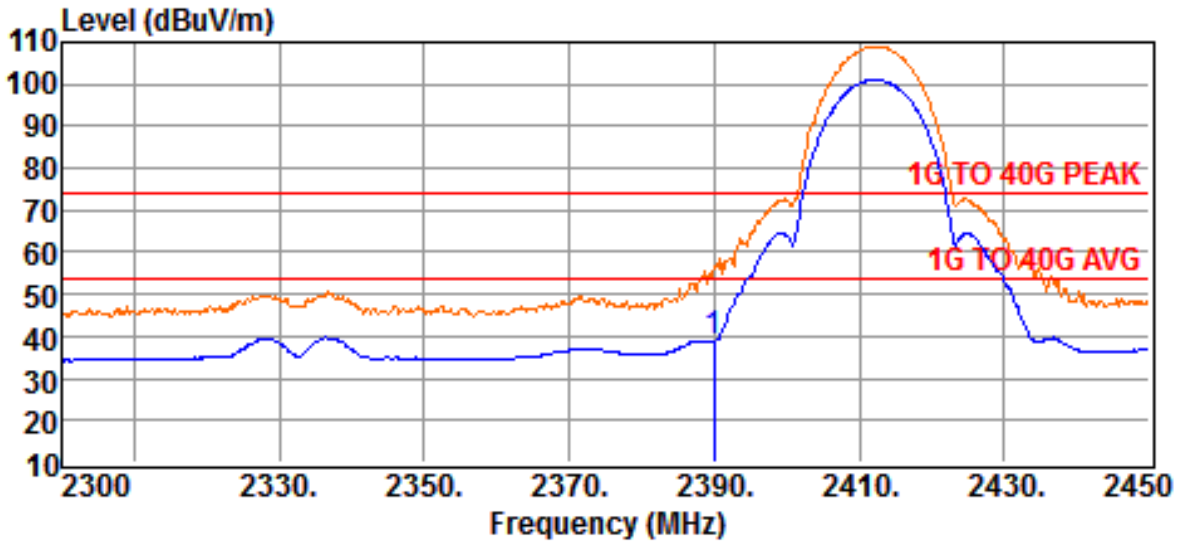

| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-07-05 |
| Limit | : 1G TO 40G PEAK | Ant. Pol. | : HORIZONTAL |
| EUT | : Smart Module | Model | : MOD 1 |
| Power Rating | : AC120V 60Hz | Temp. | : 29˚C |
| Engineer | : Kazuma Ho | Humi. | : 53 % |
| Test Mode | : 2412MHz | | |
| Test Mode | : B | | |

| Freq<br>MHz | Reading<br>dBuV | Correction Factor<br>dB | Result<br>dBuV/m | Limits<br>dBuV/m | Over limit<br>dB | Detector |
|---|---|---|---|---|---|---|
| 2390.0000 | 38.36 | -5.48 | 32.88 | 54.00 | -21.12 | Average |
| 2390.0000 | 48.59 | -5.48 | 43.11 | 74.00 | -30.89 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

**Mode: 802.11b**



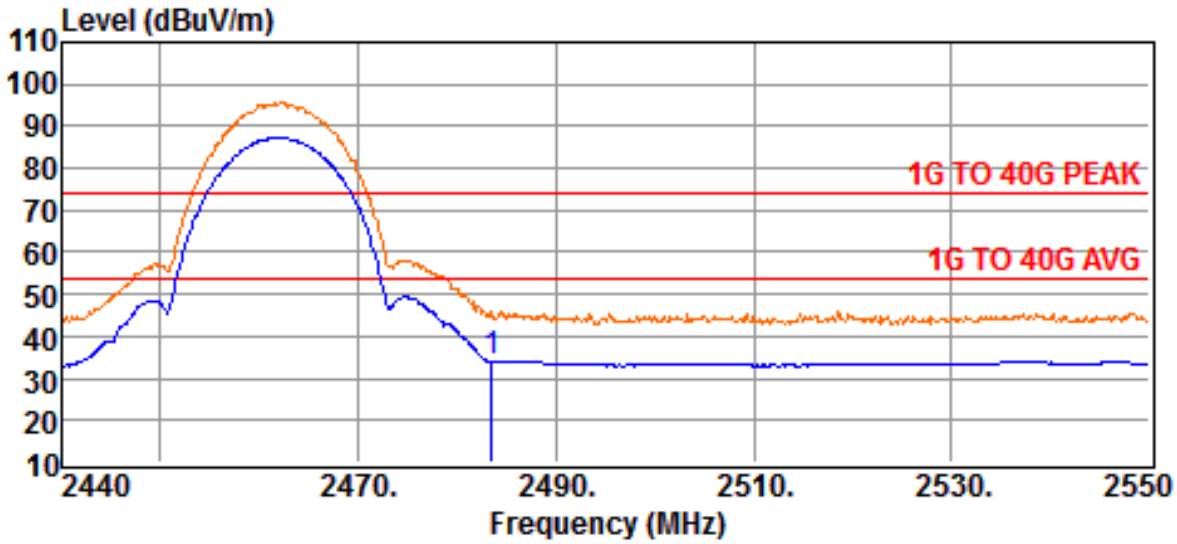

| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-07-05 |
| Limit | : 1G TO 40G PEAK | Ant. Pol. | : VERTICAL |
| EUT | : Smart Module | Model | : MOD 1 |
| Power Rating | : AC120V 60Hz | Temp. | : 29˚C |
| Engineer | : Kazuma Ho | Humi. | : 53 % |
| Test Mode | : 2412MHz | | |
| Test Mode | : B | | |

| Freq<br>MHz | Reading<br>dBuV | Correction Factor<br>dB | Result<br>dBuV/m | Limits<br>dBuV/m | Over limit<br>dB | Detector |
|---|---|---|---|---|---|---|
| 2390.0000 | 44.34 | -5.48 | 38.86 | 54.00 | -15.14 | Average |
| 2390.0000 | 60.73 | -5.48 | 55.25 | 74.00 | -18.75 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

**Mode: 802.11b**



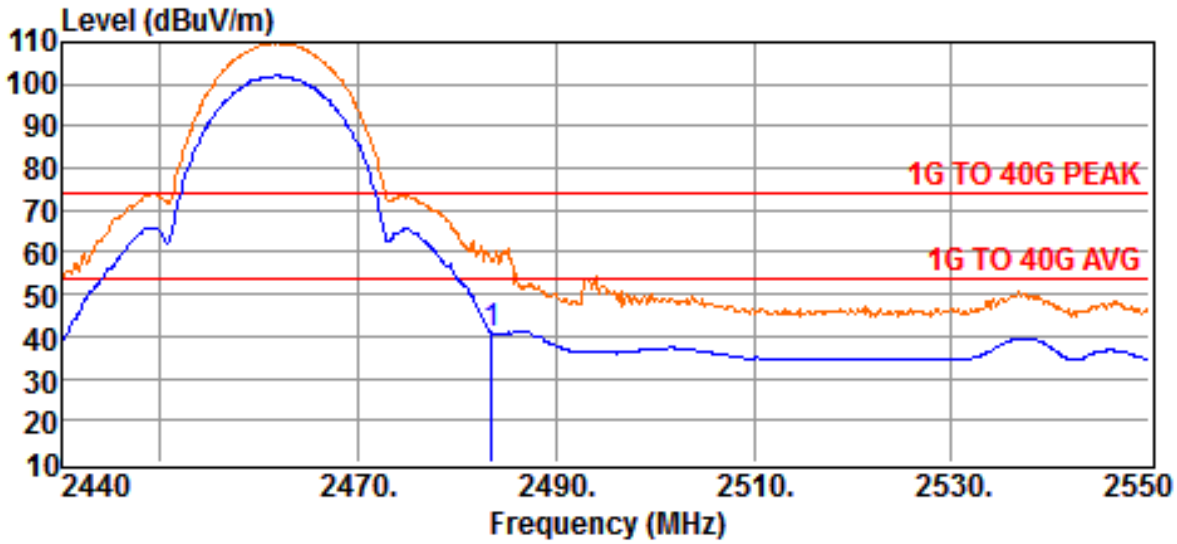

| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-07-05 |
| Limit | : 1G TO 40G PEAK | Ant. Pol. | : HORIZONTAL |
| EUT | : Smart Module | Model | : MOD 1 |
| Power Rating | : AC120V 60Hz | Temp. | : 29˚C |
| Engineer | : Kazuma Ho | Humi. | : 53 % |
| Test Mode | : 2462MHz | | |
| Test Mode | : B | | |

| Freq<br>MHz | Reading<br>dBuV | Correction Factor<br>dB | Result<br>dBuV/m | Limits<br>dBuV/m | Over limit<br>dB | Detector |
|---|---|---|---|---|---|---|
| 2483.5000 | 39.01 | -5.27 | 33.74 | 54.00 | -20.26 | Average |
| 2483.5000 | 50.59 | -5.27 | 45.32 | 74.00 | -28.68 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

**Mode: 802.11b**



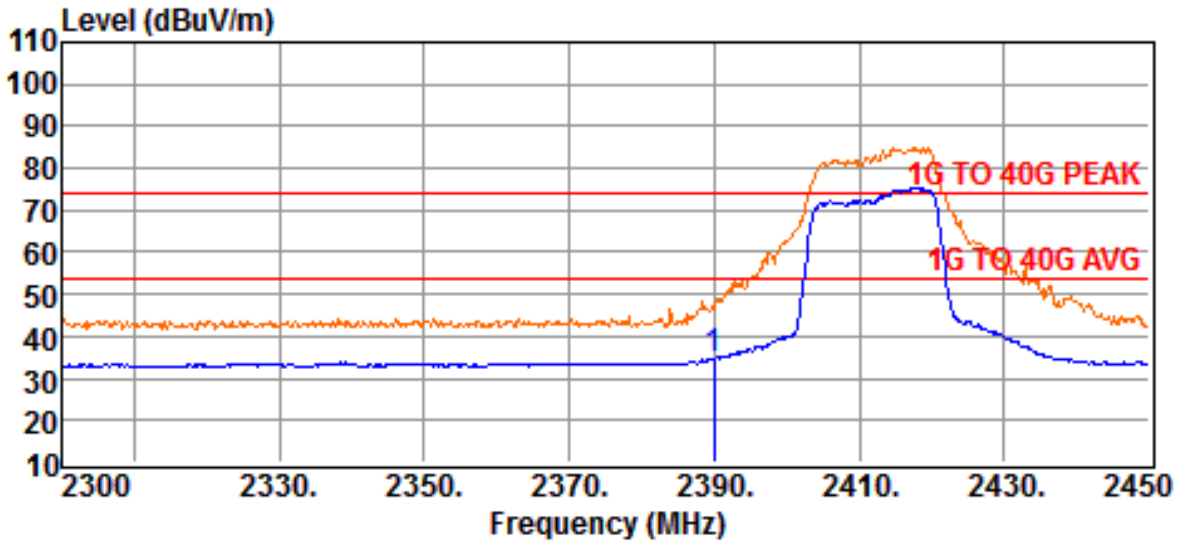

| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-07-05 |
| Limit | : 1G TO 40G PEAK | Ant. Pol. | : VERTICAL |
| EUT | : Smart Module | Model | : MOD 1 |
| Power Rating | : AC120V 60Hz | Temp. | : 29˚C |
| Engineer | : Kazuma Ho | Humi. | : 53 % |
| Test Mode | : 2462MHz | | |
| Test Mode | : B | | |

| Freq<br>MHz | Reading<br>dBuV | Correction Factor<br>dB | Result<br>dBuV/m | Limits<br>dBuV/m | Over limit<br>dB | Detector |
|---|---|---|---|---|---|---|
| 2483.5000 | 46.02 | -5.27 | 40.75 | 54.00 | -13.25 | Average |
| 2483.5000 | 64.89 | -5.27 | 59.62 | 74.00 | -14.38 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

**Mode: 802.11g**



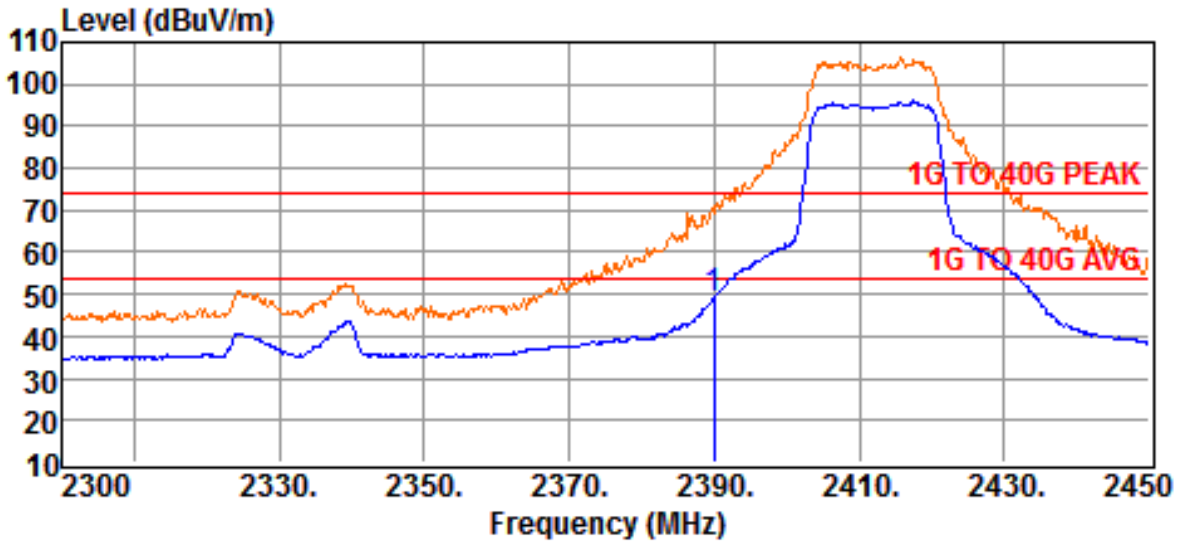

| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-07-05 |
| Limit | : 1G TO 40G PEAK | Ant. Pol. | : HORIZONTAL |
| EUT | : Smart Module | Model | : MOD 1 |
| Power Rating | : AC120V 60Hz | Temp. | : 29˚C |
| Engineer | : Kazuma Ho | Humi. | : 53 % |
| Test Mode | : 2412MHz | | |
| Test Mode | : G | | |

| Freq<br>MHz | Reading<br>dBuV | Correction Factor<br>dB | Result<br>dBuV/m | Limits<br>dBuV/m | Over limit<br>dB | Detector |
|---|---|---|---|---|---|---|
| 2390.0000 | 40.01 | -5.48 | 34.53 | 54.00 | -19.47 | Average |
| 2390.0000 | 52.67 | -5.48 | 47.19 | 74.00 | -26.81 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

**Mode: 802.11g**



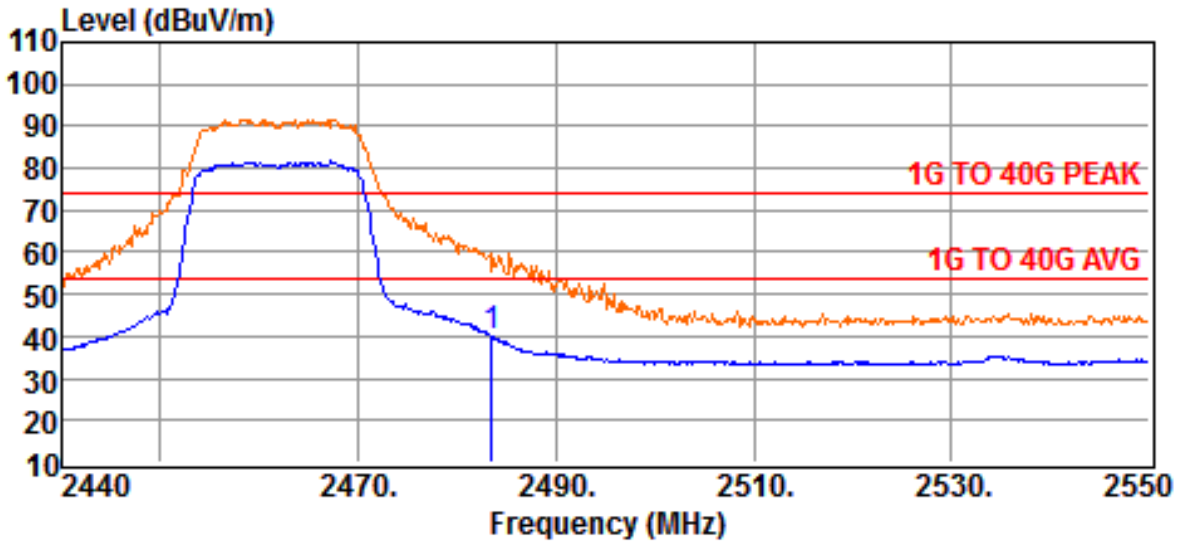

| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-07-05 |
| Limit | : 1G TO 40G PEAK | Ant. Pol. | : VERTICAL |
| EUT | : Smart Module | Model | : MOD 1 |
| Power Rating | : AC120V 60Hz | Temp. | : 29˚C |
| Engineer | : Kazuma Ho | Humi. | : 53 % |
| Test Mode | : 2412MHz | | |
| Test Mode | : G | | |

| Freq<br>MHz | Reading<br>dBuV | Correction Factor<br>dB | Result<br>dBuV/m | Limits<br>dBuV/m | Over limit<br>dB | Detector |
|---|---|---|---|---|---|---|
| 2390.0000 | 54.59 | -5.48 | 49.11 | 54.00 | -4.89 | Average |
| 2390.0000 | 77.43 | -5.48 | 71.95 | 74.00 | -2.05 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

**Mode: 802.11g**



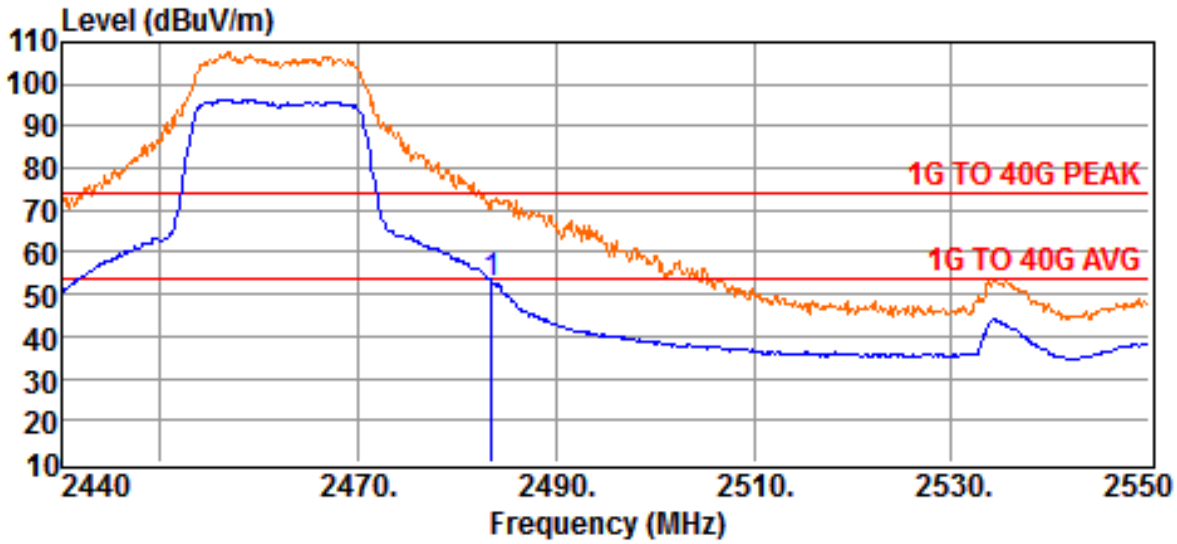

| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-07-05 |
| Limit | : 1G TO 40G PEAK | Ant. Pol. | : HORIZONTAL |
| EUT | : Smart Module | Model | : MOD 1 |
| Power Rating | : AC120V 60Hz | Temp. | : 29˚C |
| Engineer | : Kazuma Ho | Humi. | : 53 % |
| Test Mode | : 2462MHz | | |
| Test Mode | : G | | |

| Freq<br><br>MHz | Reading<br><br>dBuV | Correction<br>Factor<br>dB | Result<br><br>dBuV/m | Limits<br><br>dBuV/m | Over limit<br><br>dB | Detector |
|---|---|---|---|---|---|---|
| 2483.5000 | 45.28 | -5.27 | 40.01 | 54.00 | -13.99 | Average |
| 2483.5000 | 64.56 | -5.27 | 59.29 | 74.00 | -14.71 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

**Mode: 802.11g**



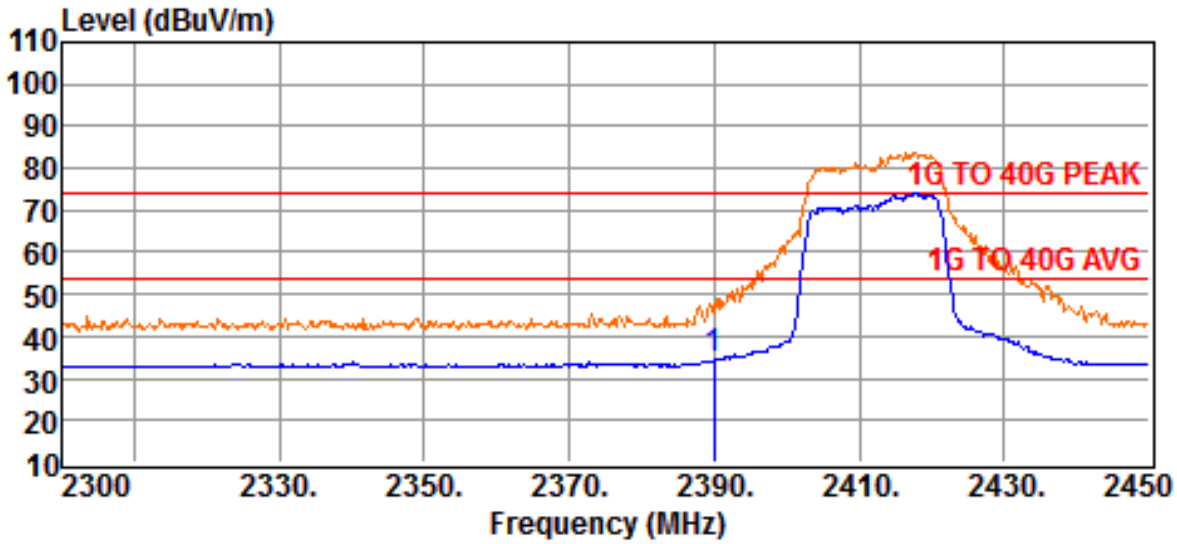

| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-07-05 |
| Limit | : 1G TO 40G PEAK | Ant. Pol. | : VERTICAL |
| EUT | : Smart Module | Model | : MOD 1 |
| Power Rating | : AC120V 60Hz | Temp. | : 29˚C |
| Engineer | : Kazuma Ho | Humi. | : 53 % |
| Test Mode | : 2462MHz | | |
| Test Mode | : G | | |

| Freq<br>MHz | Reading<br>dBuV | Correction Factor<br>dB | Result<br>dBuV/m | Limits<br>dBuV/m | Over limit<br>dB | Detector |
|---|---|---|---|---|---|---|
| 2483.5000 | 57.54 | -5.27 | 52.27 | 54.00 | -1.73 | Average |
| 2483.5000 | 78.25 | -5.27 | 72.98 | 74.00 | -1.02 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

**Mode: 802.11n HT-20**



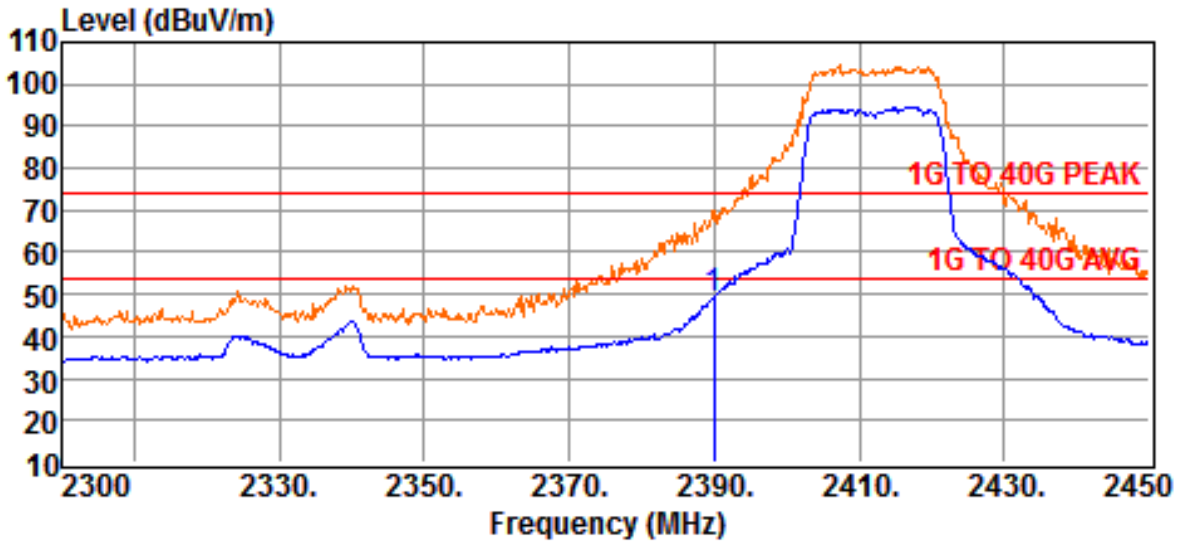

| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-07-05 |
| Limit | : 1G TO 40G PEAK | Ant. Pol. | : HORIZONTAL |
| EUT | : Smart Module | Model | : MOD 1 |
| Power Rating | : AC120V 60Hz | Temp. | : 29˚C |
| Engineer | : Kazuma Ho | Humi. | : 53 % |
| Test Mode | : 2412MHz | | |
| Test Mode | : N20 | | |

| Freq<br>MHz | Reading<br>dBuV | Correction Factor<br>dB | Result<br>dBuV/m | Limits<br>dBuV/m | Over limit<br>dB | Detector |
|---|---|---|---|---|---|---|
| 2390.0000 | 39.77 | -5.48 | 34.29 | 54.00 | -19.71 | Average |
| 2390.0000 | 54.85 | -5.48 | 49.37 | 74.00 | -24.63 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

**Mode: 802.11n HT-20**



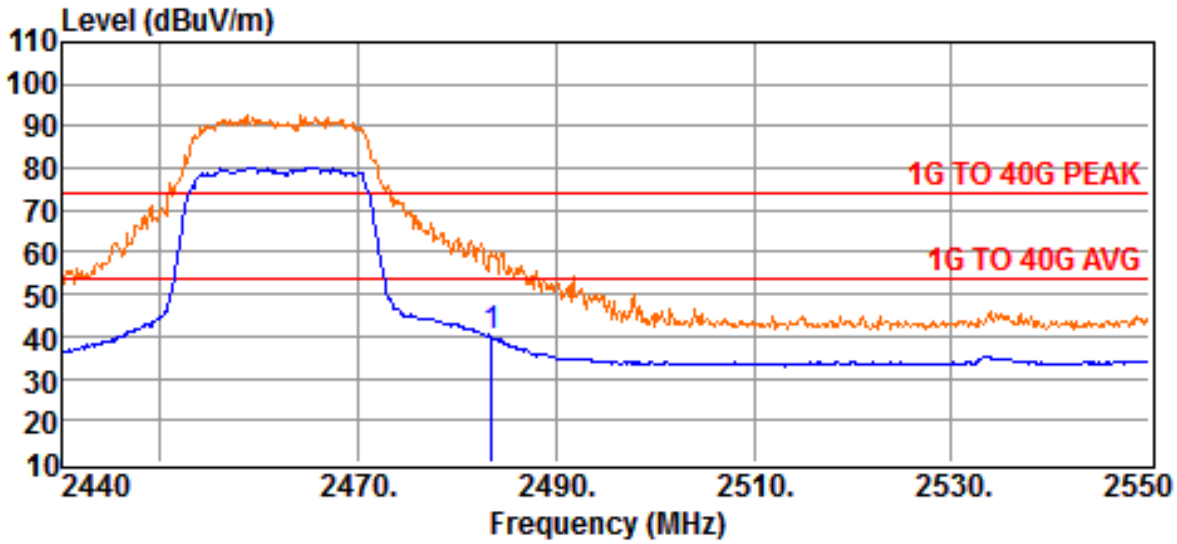

| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-07-05 |
| Limit | : 1G TO 40G PEAK | Ant. Pol. | : VERTICAL |
| EUT | : Smart Module | Model | : MOD 1 |
| Power Rating | : AC120V 60Hz | Temp. | : 29˚C |
| Engineer | : Kazuma Ho | Humi. | : 53 % |
| Test Mode | : 2412MHz | | |
| Test Mode | : N20 | | |

| Freq<br>MHz | Reading<br>dBuV | Correction Factor<br>dB | Result<br>dBuV/m | Limits<br>dBuV/m | Over limit<br>dB | Detector |
|---|---|---|---|---|---|---|
| 2390.0000 | 54.62 | -5.48 | 49.14 | 54.00 | -4.86 | Average |
| 2390.0000 | 75.56 | -5.48 | 70.08 | 74.00 | -3.92 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

**Mode: 802.11n HT-20**



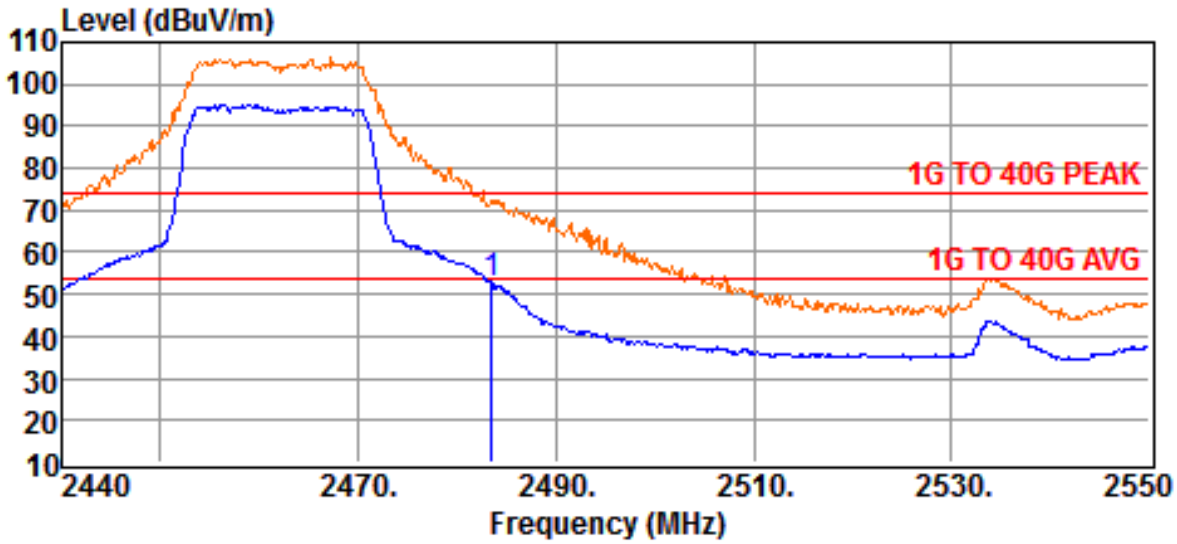

| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-07-05 |
| Limit | : 1G TO 40G PEAK | Ant. Pol. | : HORIZONTAL |
| EUT | : Smart Module | Model | : MOD 1 |
| Power Rating | : AC120V 60Hz | Temp. | : 29˚C |
| Engineer | : Kazuma Ho | Humi. | : 53 % |
| Test Mode | : 2462MHz | | |
| Test Mode | : N20 | | |

| Freq<br>MHz | Reading<br>dBuV | Correction Factor<br>dB | Result<br>dBuV/m | Limits<br>dBuV/m | Over limit<br>dB | Detector |
|---|---|---|---|---|---|---|
| 2483.5000 | 44.96 | -5.27 | 39.69 | 54.00 | -14.31 | Average |
| 2483.5000 | 65.15 | -5.27 | 59.88 | 74.00 | -14.12 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

**Mode: 802.11n HT-20**



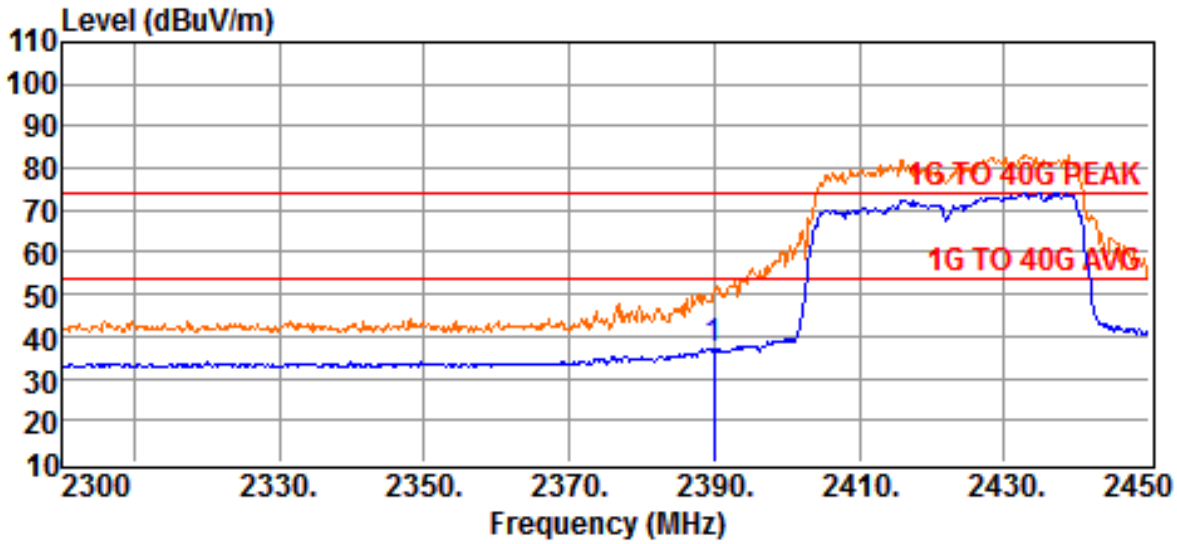

| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-07-05 |
| Limit | : 1G TO 40G PEAK | Ant. Pol. | : VERTICAL |
| EUT | : Smart Module | Model | : MOD 1 |
| Power Rating | : AC120V 60Hz | Temp. | : 29˚C |
| Engineer | : Kazuma Ho | Humi. | : 53 % |
| Test Mode | : 2462MHz | | |
| Test Mode | : N20 | | |

| Freq<br>MHz | Reading<br>dBuV | Correction Factor<br>dB | Result<br>dBuV/m | Limits<br>dBuV/m | Over limit<br>dB | Detector |
|---|---|---|---|---|---|---|
| 2483.5000 | 57.60 | -5.27 | 52.33 | 54.00 | -1.67 | Average |
| 2483.5000 | 77.78 | -5.27 | 72.51 | 74.00 | -1.49 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

**Mode: 802.11n HT-40**



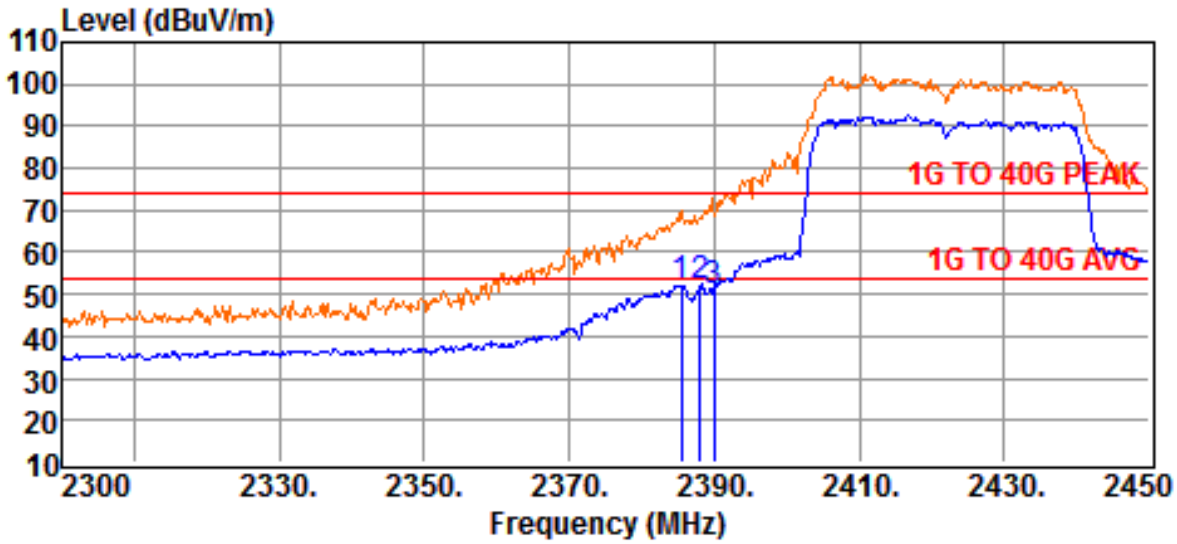

| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-07-05 |
| Limit | : 1G TO 40G PEAK | Ant. Pol. | : HORIZONTAL |
| EUT | : Smart Module | Model | : MOD 1 |
| Power Rating | : AC120V 60Hz | Temp. | : 29˚C |
| Engineer | : Kazuma Ho | Humi. | : 53 % |
| Test Mode | : 2422MHz | | |
| Test Mode | : N40 | | |

| Freq<br><br>MHz | Reading<br><br>dBuV | Correction<br>Factor<br>dB | Result<br><br>dBuV/m | Limits<br><br>dBuV/m | Over limit<br><br>dB | Detector |
|---|---|---|---|---|---|---|
| 2390.0000 | 42.14 | -5.48 | 36.66 | 54.00 | -17.34 | Average |
| 2390.0000 | 58.60 | -5.48 | 53.12 | 74.00 | -20.88 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

**Mode: 802.11n HT-40**



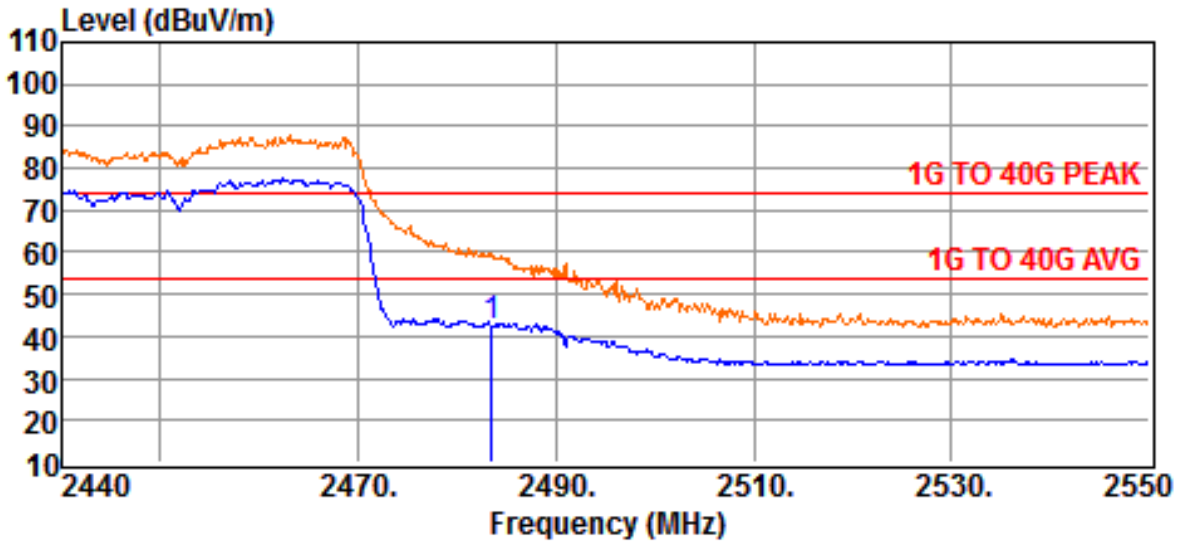

| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-07-05 |
| Limit | : 1G TO 40G PEAK | Ant. Pol. | : VERTICAL |
| EUT | : Smart Module | Model | : MOD 1 |
| Power Rating | : AC120V 60Hz | Temp. | : 29˚C |
| Engineer | : Kazuma Ho | Humi. | : 53 % |
| Test Mode | : 2422MHz | | |
| Test Mode | : N40 | | |

| Freq<br>MHz | Reading<br>dBuV | Correction Factor<br>dB | Result<br>dBuV/m | Limits<br>dBuV/m | Over limit<br>dB | Detector |
|---|---|---|---|---|---|---|
| 2385.5000 | 57.34 | -5.49 | 51.85 | 54.00 | -2.15 | Average |
| 2388.0500 | 57.40 | -5.49 | 51.91 | 54.00 | -2.09 | Average |
| 2390.0000 | 56.46 | -5.48 | 50.98 | 54.00 | -3.02 | Average |
| 2390.0000 | 77.83 | -5.48 | 72.35 | 74.00 | -1.65 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

**Mode: 802.11n HT-40**



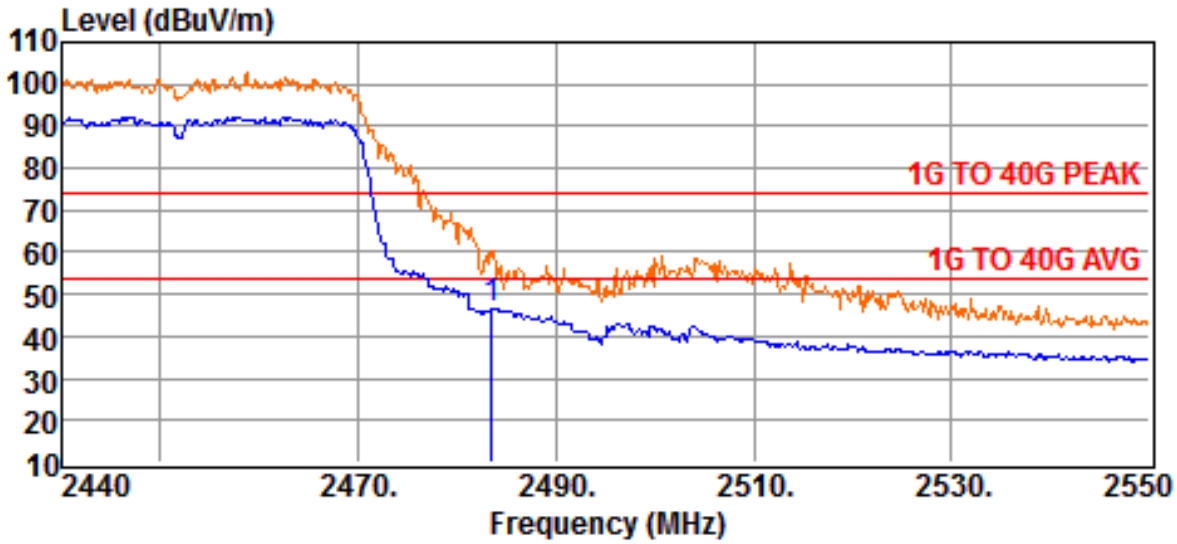

| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-07-05 |
| Limit | : 1G TO 40G PEAK | Ant. Pol. | : HORIZONTAL |
| EUT | : Smart Module | Model | : MOD 1 |
| Power Rating | : AC120V 60Hz | Temp. | : 29˚C |
| Engineer | : Kazuma Ho | Humi. | : 53 % |
| Test Mode | : 2452MHz | | |
| Test Mode | : N40 | | |

| Freq<br>MHz | Reading<br>dBuV | Correction Factor<br>dB | Result<br>dBuV/m | Limits<br>dBuV/m | Over limit<br>dB | Detector |
|---|---|---|---|---|---|---|
| 2483.5000 | 47.67 | -5.27 | 42.40 | 54.00 | -11.60 | Average |
| 2483.5000 | 65.20 | -5.27 | 59.93 | 74.00 | -14.07 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

**Mode: 802.11n HT-40**




| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-07-05 |
| Limit | : 1G TO 40G PEAK | Ant. Pol. | : VERTICAL |
| EUT | : Smart Module | Model | : MOD 1 |
| Power Rating | : AC120V 60Hz | Temp. | : 29˚C |
| Engineer | : Kazuma Ho | Humi. | : 53 % |
| Test Mode | : 2452MHz | | |
| Test Mode | : N40 | | |

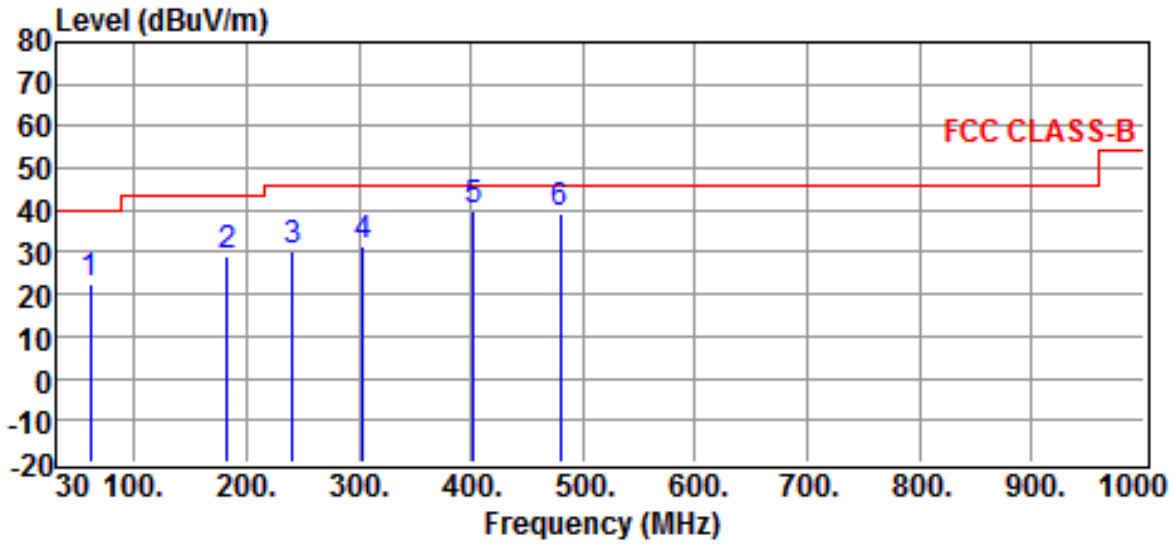
| Freq<br>MHz | Reading<br>dBuV | Correction Factor<br>dB | Result<br>dBuV/m | Limits<br>dBuV/m | Over limit<br>dB | Detector |
|---|---|---|---|---|---|---|
| 2483.5000 | 51.71 | -5.27 | 46.44 | 54.00 | -7.56 | Average |
| 2483.5000 | 65.48 | -5.27 | 60.21 | 74.00 | -13.79 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

### 4.4.3 Other Emission

**a. Emission frequencies below 1 GHz**

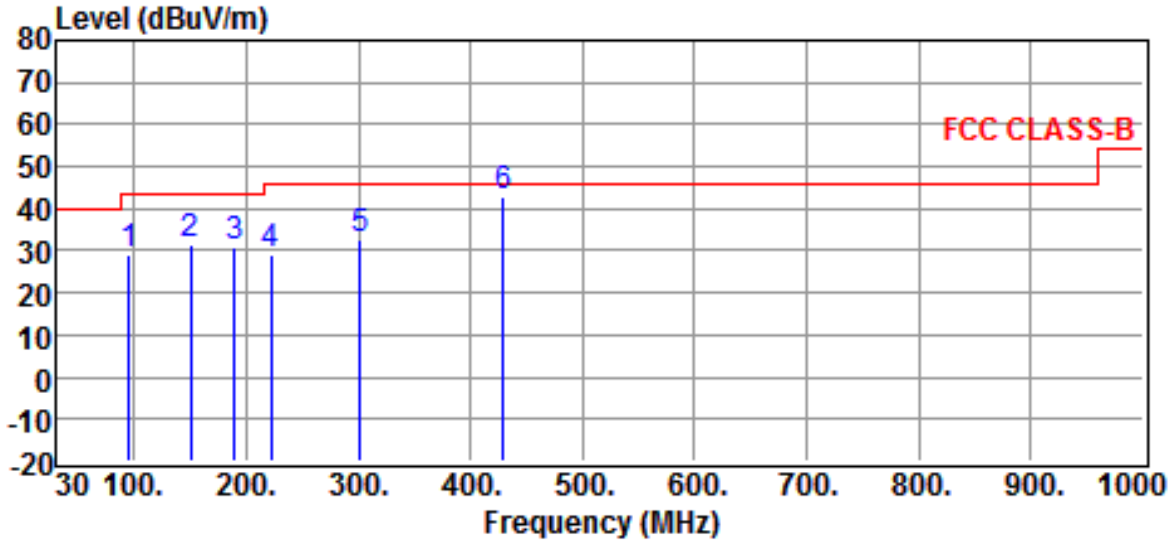



| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-03-09 |
| Limit | : FCC CLASS-B | Ant. Pol. | : HORIZONTAL |
| EUT | : Samrt Module | Model | : MOD1 |
| Power Rating | : AC120V 60Hz | Temp. | : 18˚C |
| Engineer | : Kazuma Ho | Humi. | : 52 % |
| Test Mode | : Alarm Mode | | |
| Test Mode | : MOD1 with 20 inch Power cord | | |

| Freq<br>MHz | Reading<br>dBuV | Correction Factor<br>dB | Result<br>dBuV/m | Limits<br>dBuV/m | Over limit<br>dB | Detector |
|---|---|---|---|---|---|---|
| 61.0400 | 38.64 | -16.34 | 22.30 | 40.00 | -17.70 | QP |
| 183.2600 | 39.63 | -10.43 | 29.20 | 43.50 | -14.30 | QP |
| 241.4600 | 37.89 | -7.60 | 30.29 | 46.00 | -15.71 | QP |
| 303.5400 | 35.39 | -4.12 | 31.27 | 46.00 | -14.73 | QP |
| 402.4800 | 41.89 | -1.91 | 39.98 | 46.00 | -6.02 | QP |
| 480.0800 | 40.37 | -1.01 | 39.36 | 46.00 | -6.64 | QP |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

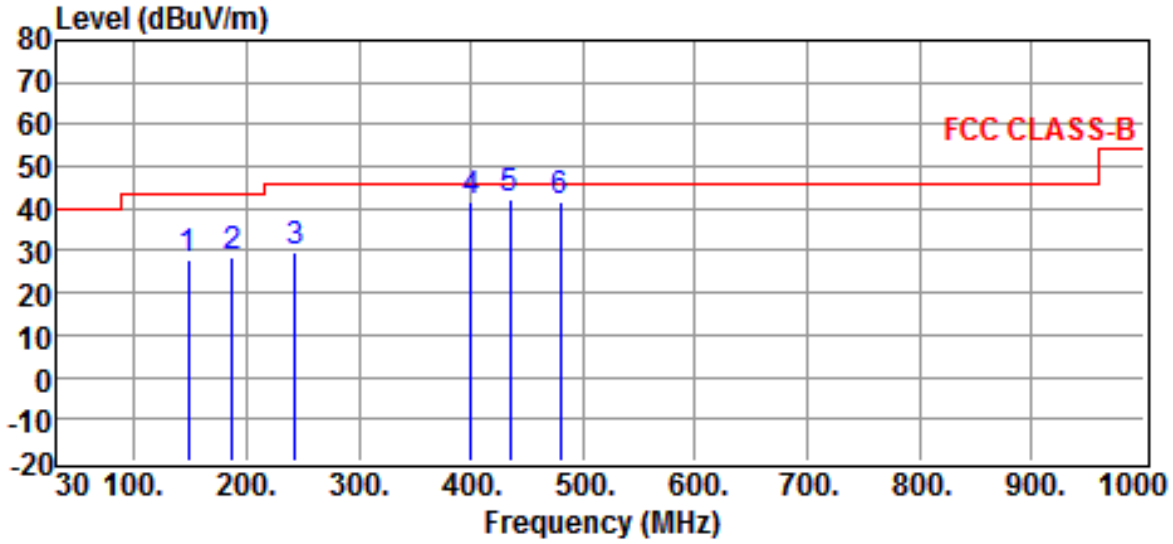



| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-03-09 |
| Limit | : FCC CLASS-B | Ant. Pol. | : VERTICAL |
| EUT | : Smart Module | Model | : MOD1 |
| Power Rating | : AC120V 60Hz | Temp. | : 18˚C |
| Engineer | : Kazuma Ho | Humi. | : 52 % |
| Test Mode | : Alarm Mode | | |
| Test Mode | : MOD1 with 20 inch Power cord | | |

| Freq<br><br>MHz | Reading<br><br>dBuV | Correction Factor<br>dB | Result<br><br>dBuV/m | Limits<br><br>dBuV/m | Over limit<br><br>dB | Detector |
|---|---|---|---|---|---|---|
| 95.9600 | 40.64 | -11.70 | 28.94 | 43.50 | -14.56 | QP |
| 150.2800 | 40.12 | -8.81 | 31.31 | 43.50 | -12.19 | QP |
| 189.0800 | 41.48 | -10.66 | 30.82 | 43.50 | -12.68 | QP |
| 222.0600 | 37.53 | -8.36 | 29.17 | 46.00 | -16.83 | QP |
| 301.6000 | 36.84 | -4.14 | 32.70 | 46.00 | -13.30 | QP |
| 429.6400 | 44.45 | -1.57 | 42.88 | 46.00 | -3.12 | QP |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

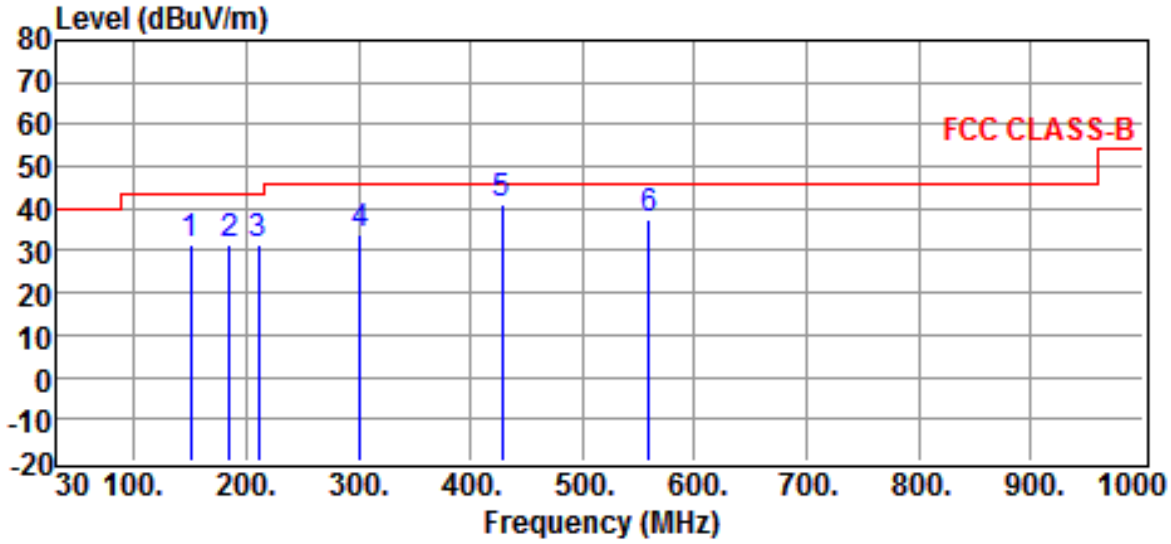



| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-03-09 |
| Limit | : FCC CLASS-B | Ant. Pol. | : HORIZONTAL |
| EUT | : Smart Module | Model | : MOD1 |
| Power Rating | : AC120V 60Hz | Temp. | : 18˚C |
| Engineer | : Kazuma Ho | Humi. | : 52 % |
| Test Mode | : Normal Mode | | |
| Test Mode | : MOD1 with 20 inch Power cord | | |

| Freq<br><br>MHz | Reading<br><br>dBuV | Correction Factor<br>dB | Result<br><br>dBuV/m | Limits<br><br>dBuV/m | Over limit<br><br>dB | Detector |
|---|---|---|---|---|---|---|
| 148.3400 | 36.43 | -8.79 | 27.64 | 43.50 | -15.86 | QP |
| 187.1400 | 39.34 | -10.58 | 28.76 | 43.50 | -14.74 | QP |
| 243.4000 | 37.18 | -7.30 | 29.88 | 46.00 | -16.12 | QP |
| 400.5400 | 43.56 | -1.93 | 41.63 | 46.00 | -4.37 | QP |
| 435.4600 | 43.50 | -1.50 | 42.00 | 46.00 | -4.00 | QP |
| 480.0800 | 42.70 | -1.01 | 41.69 | 46.00 | -4.31 | QP |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

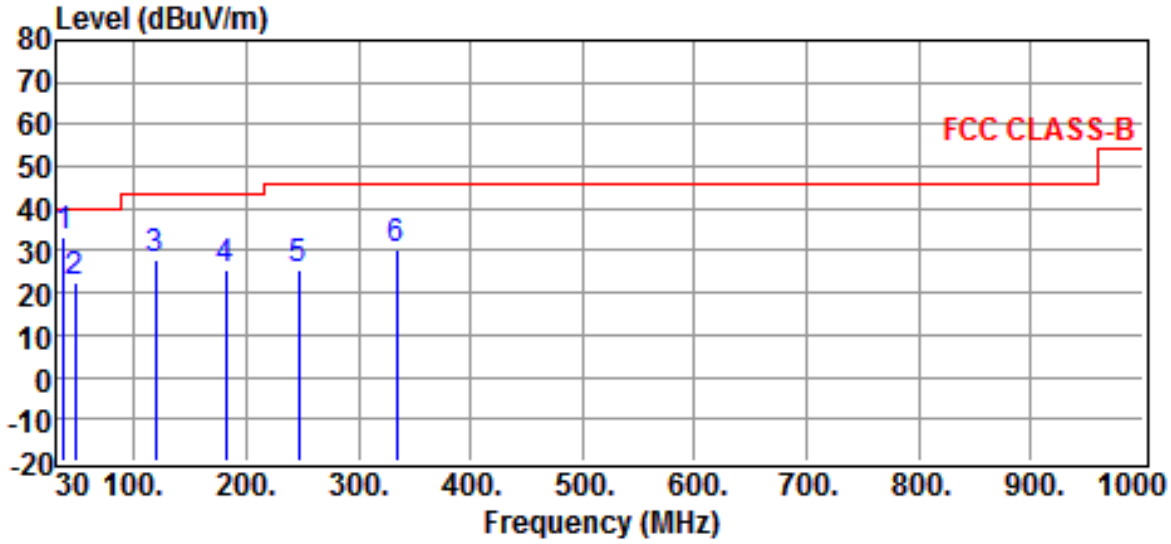



| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-03-09 |
| Limit | : FCC CLASS-B | Ant. Pol. | : VERTICAL |
| EUT | : Smart Module | Model | : MOD1 |
| Power Rating | : AC120V 60Hz | Temp. | : 18˚C |
| Engineer | : Kazuma Ho | Humi. | : 52 % |
| Test Mode | : Normal Mode | | |
| Test Mode | : MOD1 with 20 inch Power cord | | |

| Freq<br><br>MHz | Reading<br><br>dBuV | Correction Factor<br>dB | Result<br><br>dBuV/m | Limits<br><br>dBuV/m | Over limit<br><br>dB | Detector |
|---|---|---|---|---|---|---|
| 150.2800 | 40.36 | -8.81 | 31.55 | 43.50 | -11.95 | QP |
| 185.2000 | 41.74 | -10.51 | 31.23 | 43.50 | -12.27 | QP |
| 210.4200 | 39.52 | -7.87 | 31.65 | 43.50 | -11.85 | QP |
| 301.6000 | 37.93 | -4.14 | 33.79 | 46.00 | -12.21 | QP |
| 427.7000 | 42.86 | -1.60 | 41.26 | 46.00 | -4.74 | QP |
| 559.6200 | 37.39 | 0.09 | 37.48 | 46.00 | -8.52 | QP |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

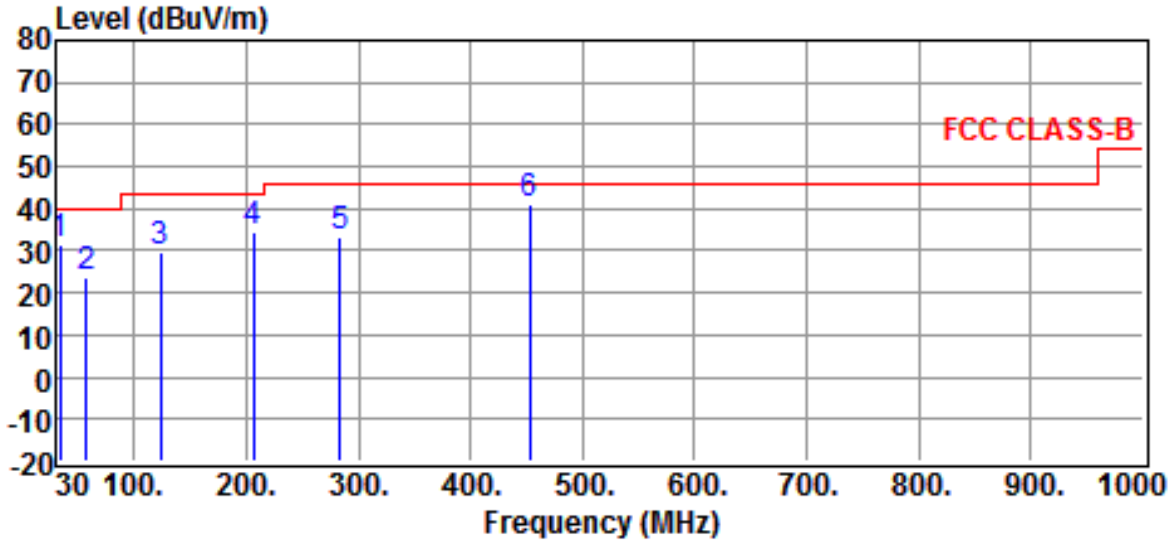



| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-05-17 |
| Limit | : FCC CLASS-B | Ant. Pol. | : HORIZONTAL |
| EUT | : Samrt Module | Model | : MOD1 |
| Power Rating | : AC120V 60Hz | Temp. | : 27˚C |
| Engineer | : Kazuma Ho | Humi. | : 52 % |
| Test Mode | : Alarm Mode | | |
| Test Mode | : MOD1 with 5ft power cord | | |

| Freq<br><br>MHz | Reading<br><br>dBuV | Correction<br>Factor<br>dB | Result<br><br>dBuV/m | Limits<br><br>dBuV/m | Over limit<br><br>dB | Detector |
|---|---|---|---|---|---|---|
| 37.7600 | 39.95 | -6.50 | 33.45 | 40.00 | -6.55 | QP |
| 47.4600 | 33.99 | -11.43 | 22.56 | 40.00 | -17.44 | QP |
| 119.2400 | 37.67 | -9.57 | 28.10 | 43.50 | -15.40 | QP |
| 181.3200 | 35.64 | -10.36 | 25.28 | 43.50 | -18.22 | QP |
| 247.2800 | 31.98 | -6.68 | 25.30 | 46.00 | -20.70 | QP |
| 334.5800 | 34.20 | -3.71 | 30.49 | 46.00 | -15.51 | QP |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

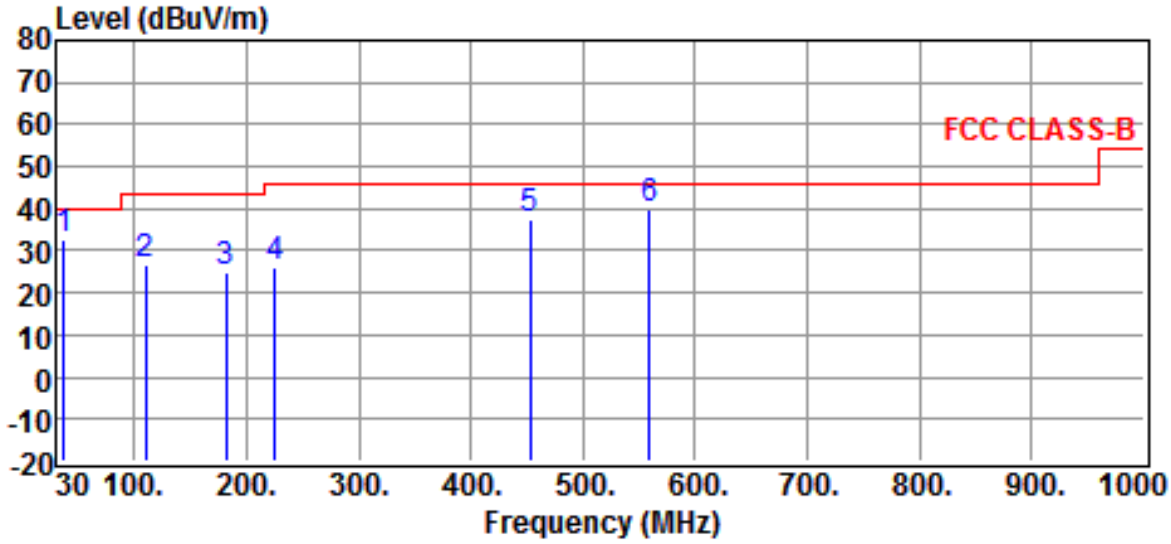



| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-05-17 |
| Limit | : FCC CLASS-B | Ant. Pol. | : VERTICAL |
| EUT | : Smart Module | Model | : MOD1 |
| Power Rating | : AC120V 60Hz | Temp. | : 27˚C |
| Engineer | : Kazuma Ho | Humi. | : 52 % |
| Test Mode | : Alarm Mode | | |
| Test Mode | : MOD1 with 5ft power cord | | |

| Freq<br><br>MHz | Reading<br><br>dBuV | Correction Factor<br>dB | Result<br><br>dBuV/m | Limits<br><br>dBuV/m | Over limit<br><br>dB | Detector |
|---|---|---|---|---|---|---|
| 33.8800 | 35.93 | -4.49 | 31.44 | 40.00 | -8.56 | QP |
| 57.1600 | 39.28 | -15.31 | 23.97 | 40.00 | -16.03 | QP |
| 123.1200 | 39.28 | -9.32 | 29.96 | 43.50 | -13.54 | QP |
| 206.5400 | 43.01 | -8.55 | 34.46 | 43.50 | -9.04 | QP |
| 284.1400 | 38.38 | -5.11 | 33.27 | 46.00 | -12.73 | QP |
| 452.9200 | 42.11 | -1.30 | 40.81 | 46.00 | -5.19 | QP |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

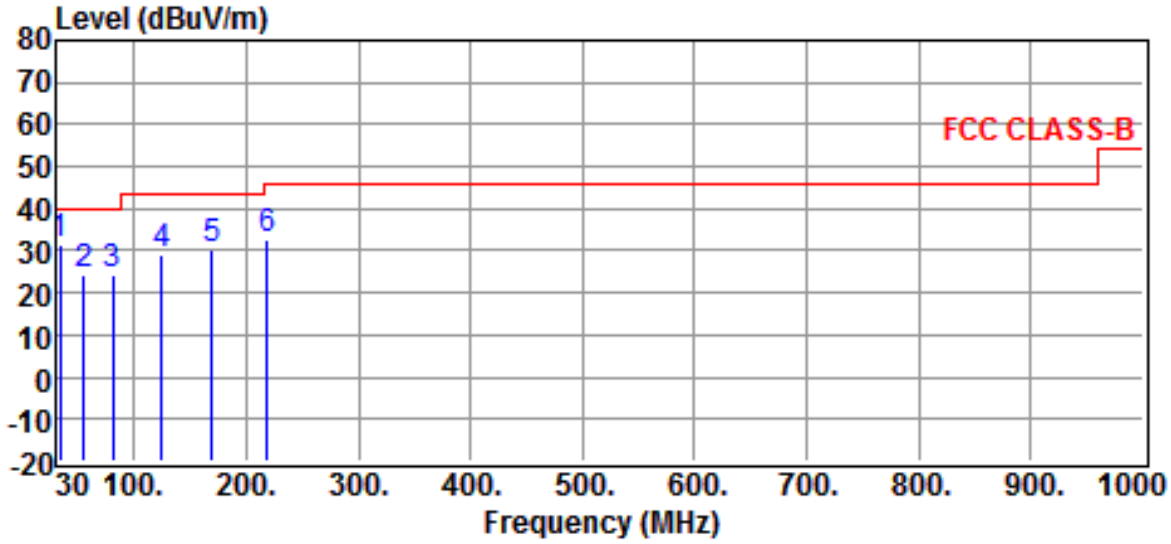



| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-05-17 |
| Limit | : FCC CLASS-B | Ant. Pol. | : HORIZONTAL |
| EUT | : Smart Module | Model | : MOD1 |
| Power Rating | : AC120V 60Hz | Temp. | : 27˚C |
| Engineer | : Kazuma Ho | Humi. | : 52 % |
| Test Mode | : Normal Mode | | |
| Test Mode | : MOD1 with 5ft power cord | | |

| Freq<br><br>MHz | Reading<br><br>dBuV | Correction<br>Factor<br>dB | Result<br><br>dBuV/m | Limits<br><br>dBuV/m | Over limit<br><br>dB | Detector |
|---|---|---|---|---|---|---|
| 37.7600 | 39.15 | -6.50 | 32.65 | 40.00 | -7.35 | QP |
| 109.5400 | 36.93 | -10.24 | 26.69 | 43.50 | -16.81 | QP |
| 181.3200 | 35.12 | -10.36 | 24.76 | 43.50 | -18.74 | QP |
| 225.9400 | 34.61 | -8.33 | 26.28 | 46.00 | -19.72 | QP |
| 452.9200 | 38.77 | -1.30 | 37.47 | 46.00 | -8.53 | QP |
| 559.6200 | 39.60 | 0.09 | 39.69 | 46.00 | -6.31 | QP |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.



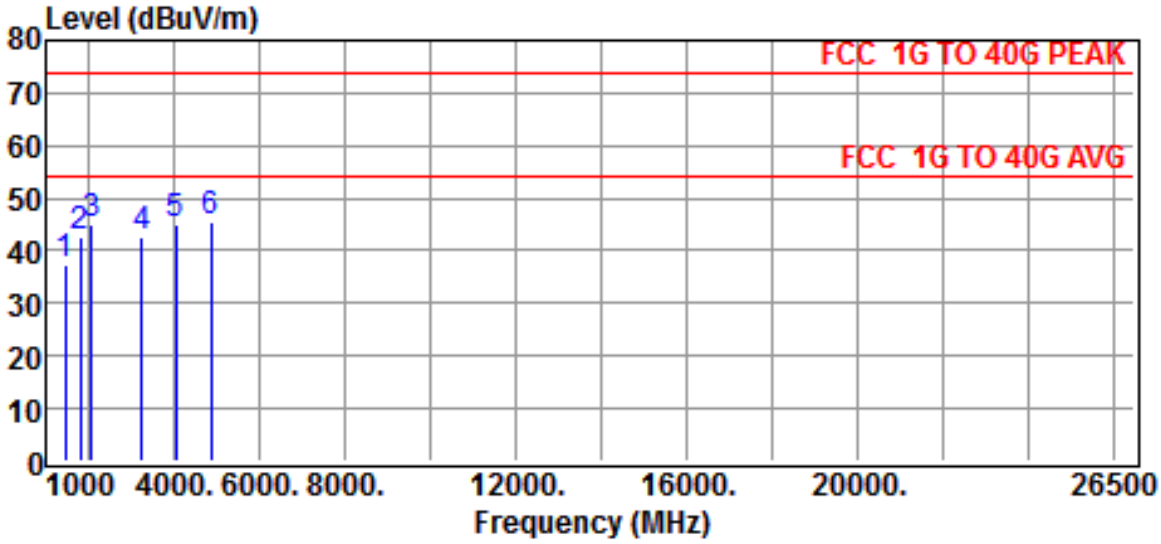

| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-05-17 |
| Limit | : FCC CLASS-B | Ant. Pol. | : VERTICAL |
| EUT | : Smart Module | Model | : MOD1 |
| Power Rating | : AC120V 60Hz | Temp. | : 27˚C |
| Engineer | : Kazuma Ho | Humi. | : 52 % |
| Test Mode | : Normal Mode | | |
| Test Mode | : MOD1 with 5ft power cord | | |

| Freq<br><br>MHz | Reading<br><br>dBuV | Correction Factor<br>dB | Result<br><br>dBuV/m | Limits<br><br>dBuV/m | Over limit<br><br>dB | Detector |
|---|---|---|---|---|---|---|
| 33.8800 | 36.00 | -4.49 | 31.51 | 40.00 | -8.49 | QP |
| 55.2200 | 39.04 | -14.57 | 24.47 | 40.00 | -15.53 | QP |
| 80.4400 | 37.98 | -13.93 | 24.05 | 40.00 | -15.95 | QP |
| 124.0900 | 38.34 | -9.25 | 29.09 | 43.50 | -14.41 | QP |
| 169.6800 | 39.79 | -9.56 | 30.23 | 43.50 | -13.27 | QP |
| 218.1800 | 41.01 | -8.27 | 32.74 | 46.00 | -13.26 | QP |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

**b. 1-26.5GHz**

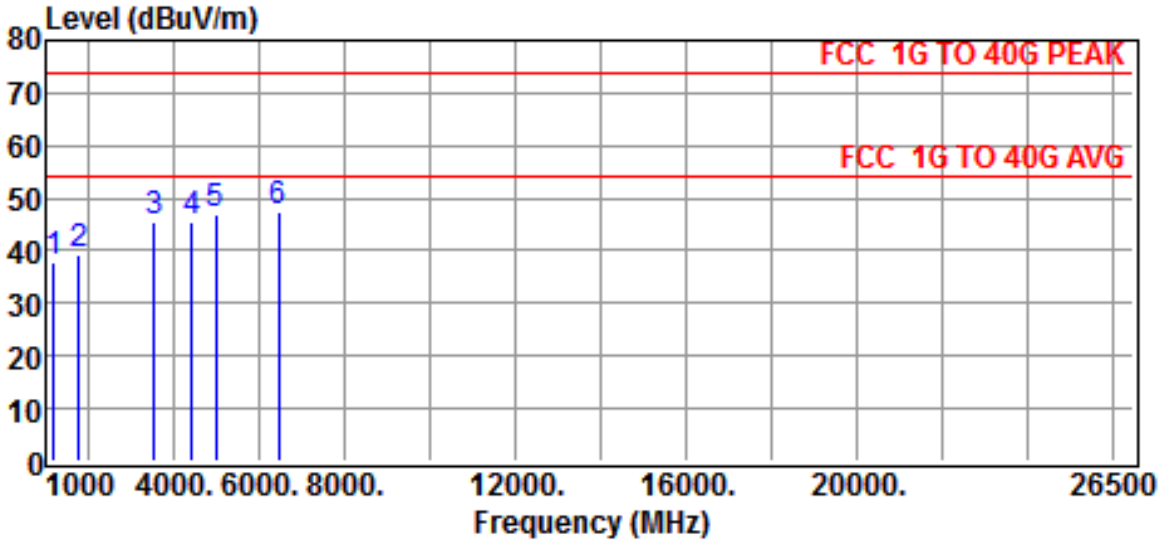



| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-05-17 |
| Limit | : FCC 1G TO 40G PEAK | Ant. Pol. | : HORIZONTAL |
| EUT | : Smart Module | Model | : MOD1 |
| Power Rating | : AC120V 60Hz | Temp. | : 27˚C |
| Engineer | : Kazuma Ho | Humi. | : 52 % |
| Test Mode | : Alarm Mode | | |
| Test Mode | : MOD1 with 20 inch power cord | | |

| Freq<br>MHz | Reading<br>dBuV | Correction Factor<br>dB | Result<br>dBuV/m | Limits (AVG)<br>dBuV/m | Over limit<br>dB | Detector |
|---|---|---|---|---|---|---|
| 1459.0000 | 47.18 | -9.87 | 37.31 | 54.00 | -16.69 | Peak |
| 1816.0000 | 50.37 | -7.62 | 42.75 | 54.00 | -11.25 | Peak |
| 2071.0000 | 51.35 | -6.24 | 45.11 | 54.00 | -8.89 | Peak |
| 3244.0000 | 45.34 | -2.48 | 42.86 | 54.00 | -11.14 | Peak |
| 4060.0000 | 44.56 | 0.25 | 44.81 | 54.00 | -9.19 | Peak |
| 4876.0000 | 43.73 | 1.70 | 45.43 | 54.00 | -8.57 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

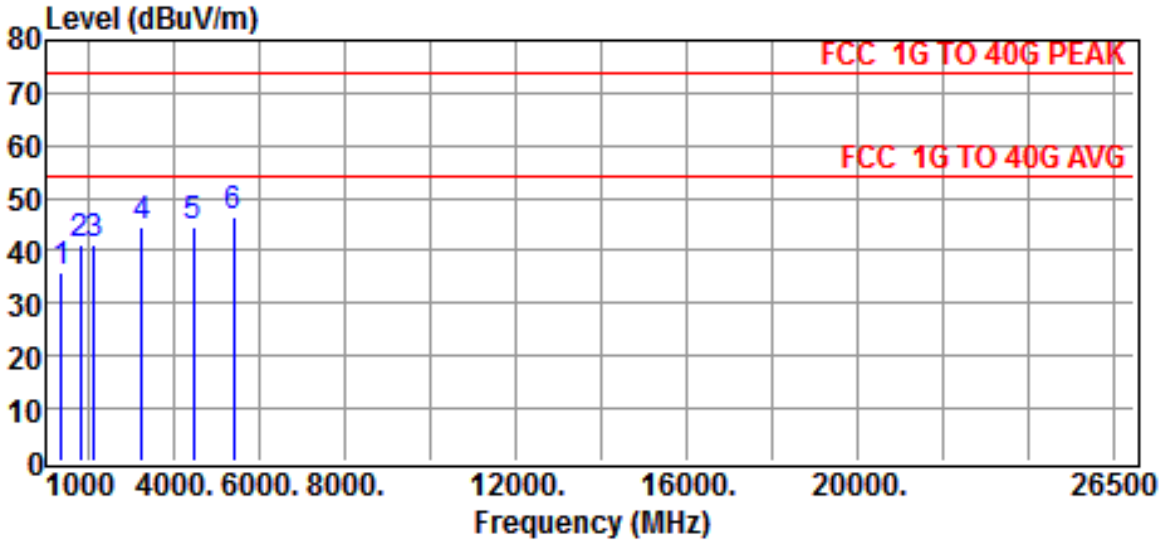



| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-05-17 |
| Limit | : FCC 1G TO 40G PEAK | Ant. Pol. | : VERTICAL |
| EUT | : Smart Module | Model | : MOD1 |
| Power Rating | : AC120V 60Hz | Temp. | : 27˚C |
| Engineer | : Kazuma Ho | Humi. | : 52 % |
| Test Mode | : Alarm Mode | | |
| Test Mode | : MOD1 with 20 inch power cord | | |

| Freq<br>MHz | Reading<br>dBuV | Correction Factor<br>dB | Result<br>dBuV/m | Limits (AVG)<br>dBuV/m | Over limit<br>dB | Detector |
|---|---|---|---|---|---|---|
| 1204.0000 | 48.40 | -10.66 | 37.74 | 54.00 | -16.26 | Peak |
| 1790.5000 | 46.97 | -7.83 | 39.14 | 54.00 | -14.86 | Peak |
| 3550.0000 | 46.95 | -1.47 | 45.48 | 54.00 | -8.52 | Peak |
| 4417.0000 | 44.91 | 0.42 | 45.33 | 54.00 | -8.67 | Peak |
| 4978.0000 | 44.76 | 2.05 | 46.81 | 54.00 | -7.19 | Peak |
| 6457.0000 | 43.34 | 4.04 | 47.38 | 54.00 | -6.62 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

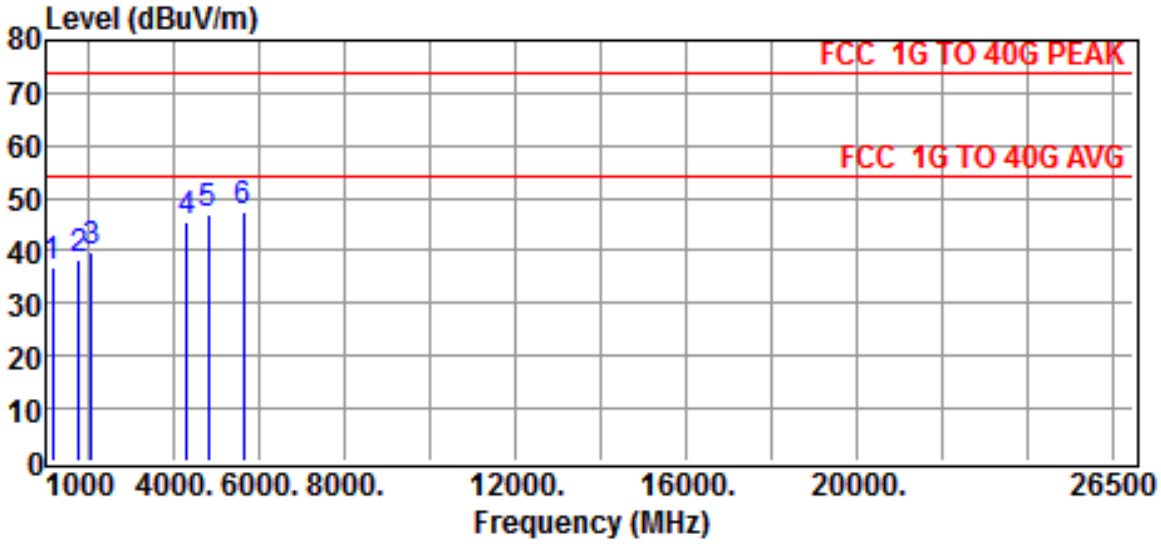



| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-05-17 |
| Limit | : FCC 1G TO 40G PEAK | Ant. Pol. | : HORIZONTAL |
| EUT | : Smart Module | Model | : MOD1 |
| Power Rating | : AC120V 60Hz | Temp. | : 27˚C |
| Engineer | : Kazuma Ho | Humi. | : 52 % |
| Test Mode | : Normal Mode | | |
| Test Mode | : MOD1 with 20 inch power cord | | |

| Freq<br><br>MHz | Reading<br><br>dBuV | Correction Factor<br>dB | Result<br><br>dBuV/m | Limits (AVG)<br>dBuV/m | Over limit<br><br>dB | Detector |
|---|---|---|---|---|---|---|
| 1357.0000 | 46.30 | -10.18 | 36.12 | 54.00 | -17.88 | Peak |
| 1816.0000 | 48.77 | -7.62 | 41.15 | 54.00 | -12.85 | Peak |
| 2122.0000 | 47.11 | -6.12 | 40.99 | 54.00 | -13.01 | Peak |
| 3244.0000 | 47.06 | -2.48 | 44.58 | 54.00 | -9.42 | Peak |
| 4468.0000 | 44.18 | 0.45 | 44.63 | 54.00 | -9.37 | Peak |
| 5411.5000 | 43.31 | 2.96 | 46.27 | 54.00 | -7.73 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

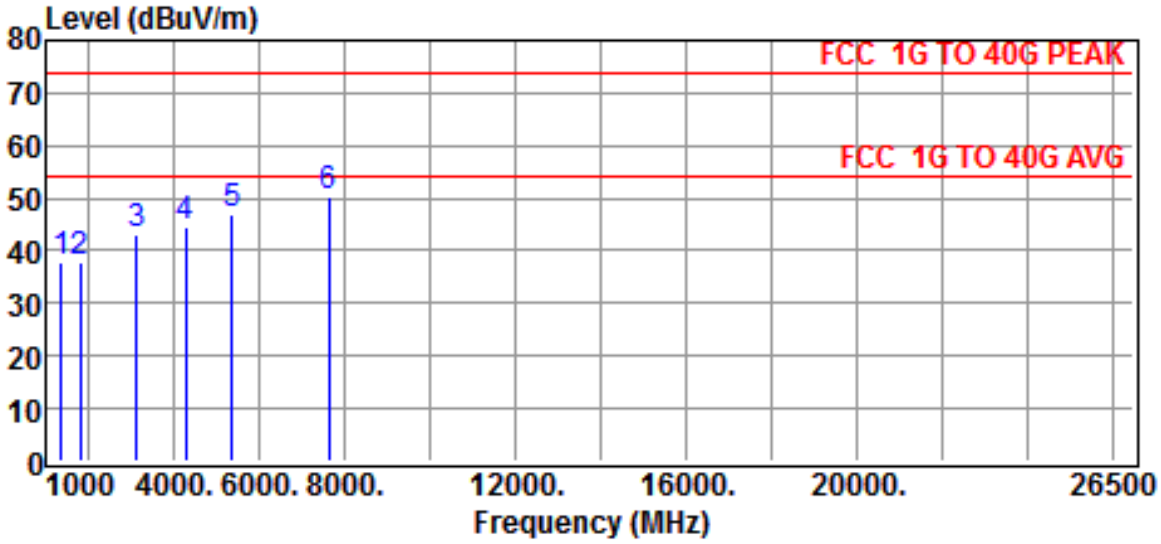



| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-05-17 |
| Limit | : FCC 1G TO 40G PEAK | Ant. Pol. | : VERTICAL |
| EUT | : Smart Module | Model | : MOD1 |
| Power Rating | : AC120V 60Hz | Temp. | : 27˚C |
| Engineer | : Kazuma Ho | Humi. | : 52 % |
| Test Mode | : Normal Mode | | |
| Test Mode | : MOD1 with 20 inch power cord | | |

| Freq<br><br>MHz | Reading<br><br>dBuV | Correction Factor<br>dB | Result<br><br>dBuV/m | Limits (AVG)<br>dBuV/m | Over limit<br><br>dB | Detector |
|---|---|---|---|---|---|---|
| 1153.0000 | 47.91 | -10.82 | 37.09 | 54.00 | -16.91 | Peak |
| 1790.5000 | 46.04 | -7.83 | 38.21 | 54.00 | -15.79 | Peak |
| 2071.0000 | 46.13 | -6.24 | 39.89 | 54.00 | -14.11 | Peak |
| 4315.0000 | 45.24 | 0.38 | 45.62 | 54.00 | -8.38 | Peak |
| 4825.0000 | 45.25 | 1.54 | 46.79 | 54.00 | -7.21 | Peak |
| 5641.0000 | 43.88 | 3.31 | 47.19 | 54.00 | -6.81 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

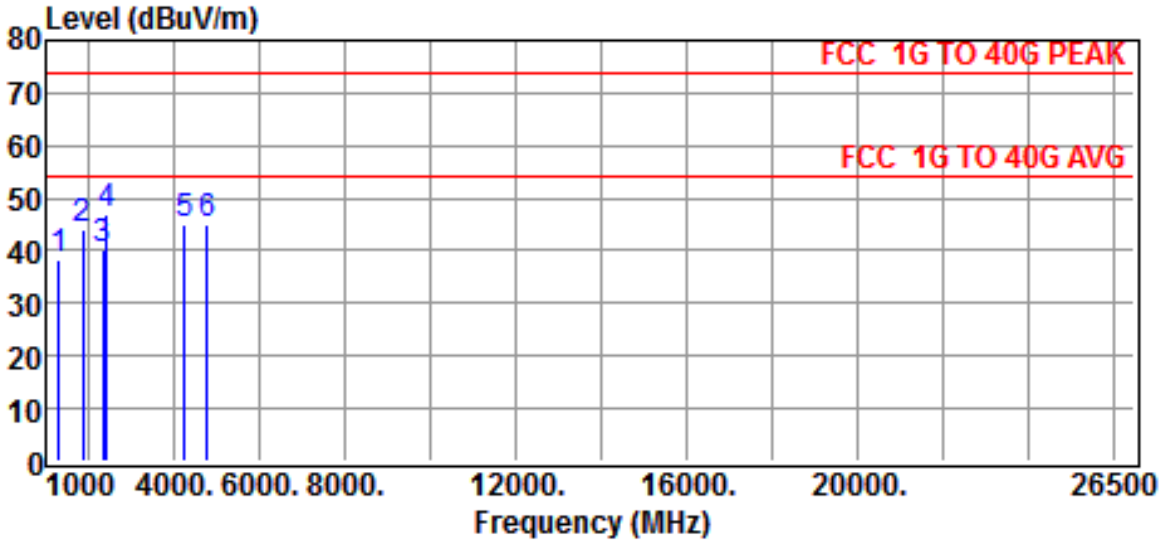



| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-05-17 |
| Limit | : FCC 1G TO 40G PEAK | Ant. Pol. | : HORIZONTAL |
| EUT | : Smart Module | Model | : MOD1 |
| Power Rating | : AC120V 60Hz | Temp. | : 27˚C |
| Engineer | : Kazuma Ho | Humi. | : 52 % |
| Test Mode | : Alarm Mode | | |
| Test Mode | : MOD1 with 5ft power cord | | |

| Freq<br><br>MHz | Reading<br><br>dBuV | Correction Factor<br>dB | Result<br><br>dBuV/m | Limits (AVG)<br>dBuV/m | Over limit<br><br>dB | Detector |
|---|---|---|---|---|---|---|
| 1357.0000 | 47.99 | -10.18 | 37.81 | 54.00 | -16.19 | Peak |
| 1816.0000 | 45.67 | -7.62 | 38.05 | 54.00 | -15.95 | Peak |
| 3142.0000 | 46.12 | -2.80 | 43.32 | 54.00 | -10.68 | Peak |
| 4289.5000 | 44.18 | 0.35 | 44.53 | 54.00 | -9.47 | Peak |
| 5386.0000 | 43.91 | 2.90 | 46.81 | 54.00 | -7.19 | Peak |
| 7630.0000 | 43.86 | 6.63 | 50.49 | 54.00 | -3.51 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

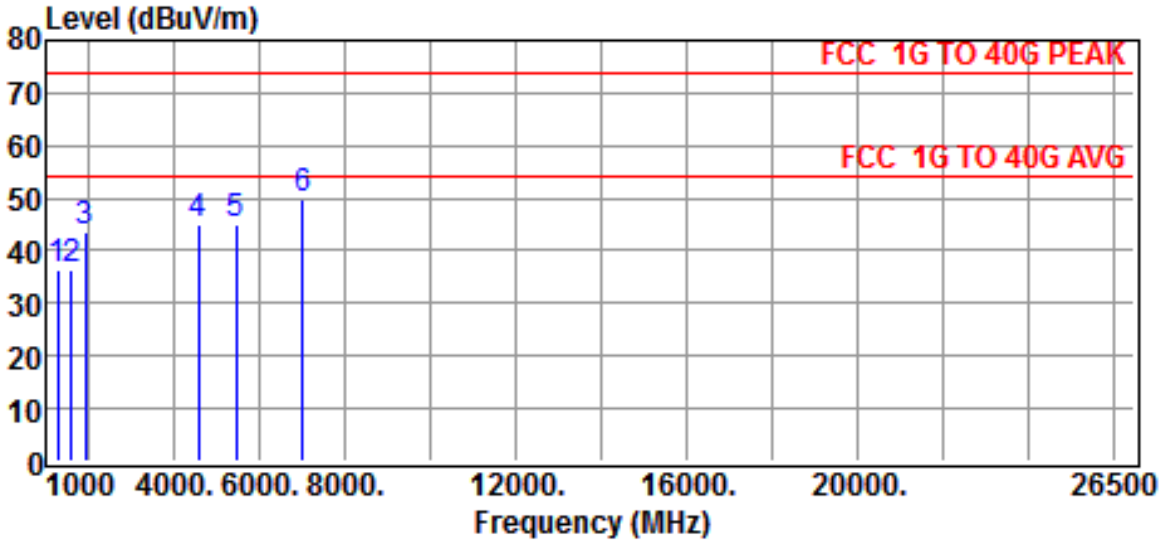



| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-05-17 |
| Limit | : FCC 1G TO 40G PEAK | Ant. Pol. | : VERTICAL |
| EUT | : Smart Module | Model | : MOD1 |
| Power Rating | : AC120V 60Hz | Temp. | : 27˚C |
| Engineer | : Kazuma Ho | Humi. | : 52 % |
| Test Mode | : Alarm Mode | | |
| Test Mode | : MOD1 with 5ft power cord | | |

| Freq<br>MHz | Reading<br>dBuV | Correction Factor<br>dB | Result<br>dBuV/m | Limits (AVG)<br>dBuV/m | Over limit<br>dB | Detector |
|---|---|---|---|---|---|---|
| 1306.0000 | 48.46 | -10.34 | 38.12 | 54.00 | -15.88 | Peak |
| 1867.0000 | 51.15 | -7.28 | 43.87 | 54.00 | -10.13 | Peak |
| 2326.0000 | 45.85 | -5.64 | 40.21 | 54.00 | -13.79 | Peak |
| 2428.0000 | 52.52 | -5.39 | 47.13 | 54.00 | -6.87 | Peak |
| 4264.0000 | 44.92 | 0.35 | 45.27 | 54.00 | -8.73 | Peak |
| 4774.0000 | 43.76 | 1.37 | 45.13 | 54.00 | -8.87 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

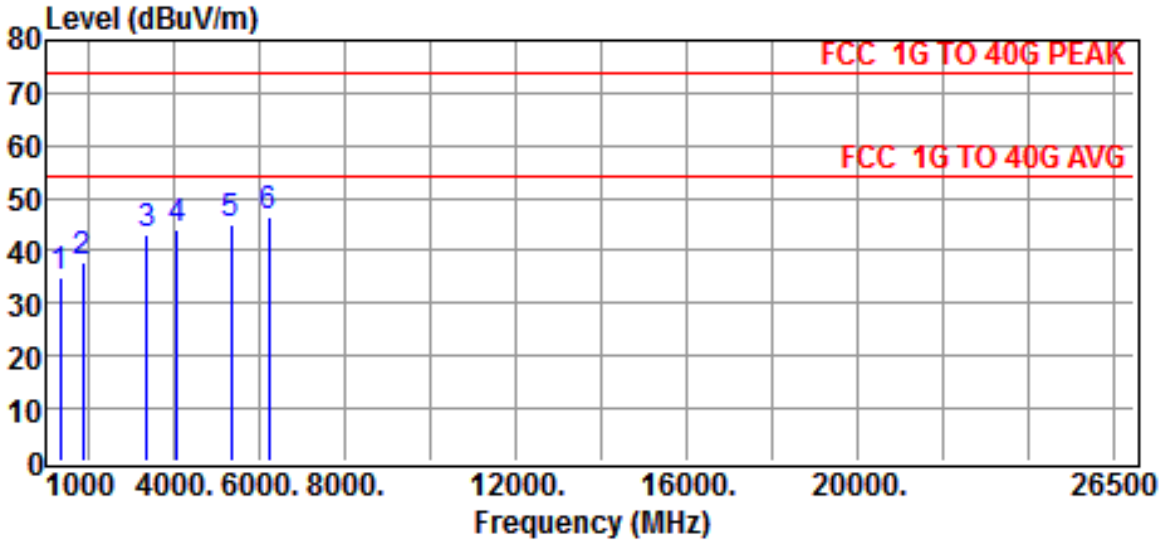



| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-05-17 |
| Limit | : FCC 1G TO 40G PEAK | Ant. Pol. | : HORIZONTAL |
| EUT | : Smart Module | Model | : MOD1 |
| Power Rating | : AC120V 60Hz | Temp. | : 27˚C |
| Engineer | : Kazuma Ho | Humi. | : 52 % |
| Test Mode | : Normal Mode | | |
| Test Mode | : MOD1 with 5ft power cord | | |

| Freq<br><br>MHz | Reading<br><br>dBuV | Correction Factor<br>dB | Result<br><br>dBuV/m | Limits (AVG)<br>dBuV/m | Over limit<br><br>dB | Detector |
|---|---|---|---|---|---|---|
| 1280.5000 | 46.82 | -10.43 | 36.39 | 54.00 | -17.61 | Peak |
| 1612.0000 | 45.54 | -8.96 | 36.58 | 54.00 | -17.42 | Peak |
| 1918.0000 | 50.52 | -6.95 | 43.57 | 54.00 | -10.43 | Peak |
| 4570.0000 | 44.44 | 0.69 | 45.13 | 54.00 | -8.87 | Peak |
| 5462.5000 | 42.22 | 3.04 | 45.26 | 54.00 | -8.74 | Peak |
| 7018.0000 | 44.62 | 5.23 | 49.85 | 54.00 | -4.15 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.




| | | | |
|---|---|---|---|
| Site | : Chamber #2 | Date | : 2018-05-17 |
| Limit | : FCC 1G TO 40G PEAK | Ant. Pol. | : VERTICAL |
| EUT | : Smart Module | Model | : MOD1 |
| Power Rating | : AC120V 60Hz | Temp. | : 27˚C |
| Engineer | : Kazuma Ho | Humi. | : 52 % |
| Test Mode | : Normal Mode | | |
| Test Mode | : MOD1 with 5ft power cord | | |

| Freq<br>MHz | Reading<br>dBuV | Correction Factor<br>dB | Result<br>dBuV/m | Limits (AVG)<br>dBuV/m | Over limit<br>dB | Detector |
|---|---|---|---|---|---|---|
| 1331.5000 | 45.28 | -10.27 | 35.01 | 54.00 | -18.99 | Peak |
| 1867.0000 | 45.08 | -7.28 | 37.80 | 54.00 | -16.20 | Peak |
| 3371.5000 | 44.94 | -2.05 | 42.89 | 54.00 | -11.11 | Peak |
| 4085.5000 | 44.03 | 0.26 | 44.29 | 54.00 | -9.71 | Peak |
| 5335.0000 | 42.48 | 2.79 | 45.27 | 54.00 | -8.73 | Peak |
| 6227.5000 | 42.67 | 3.93 | 46.60 | 54.00 | -7.40 | Peak |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

**a) Emission frequencies Above 1GHz**

Radiated emission frequencies above 1 GHz to 25 GHz were too low to be measured with a pre-amplifier of 35 dB.

**b) Emission frequencies below 30MHz (9kHz - 30MHz)**

According to exploratory test no any obvious emissions were detected from 9 kHz to 30MHz. All emissions were greater than 20 dB below the limit. Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

## 4.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor, High Pass Filter Loss(if used) and Cable Loss, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation calculation is as follows:

***Result = Reading + Corrected Factor***

where

Corrected Factor = Antenna FACTOR + Cable Loss + High Pass Filter Loss - Amplifier Gain

# 5 CONDUCTED EMISSION MEASUREMENT

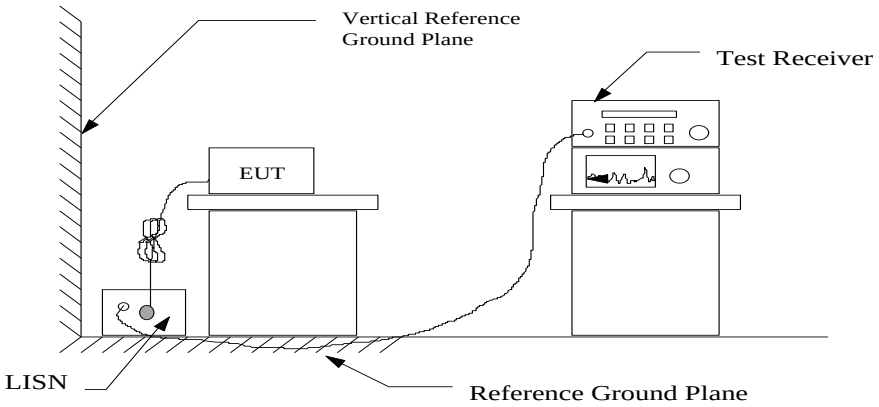
## 5.1 Standard Applicable

For unintentional and intentional device, Line Conducted Emission Limits are in accordance to §15.107(a) and §15.207(a) respectively. Both Limits are identical specification.

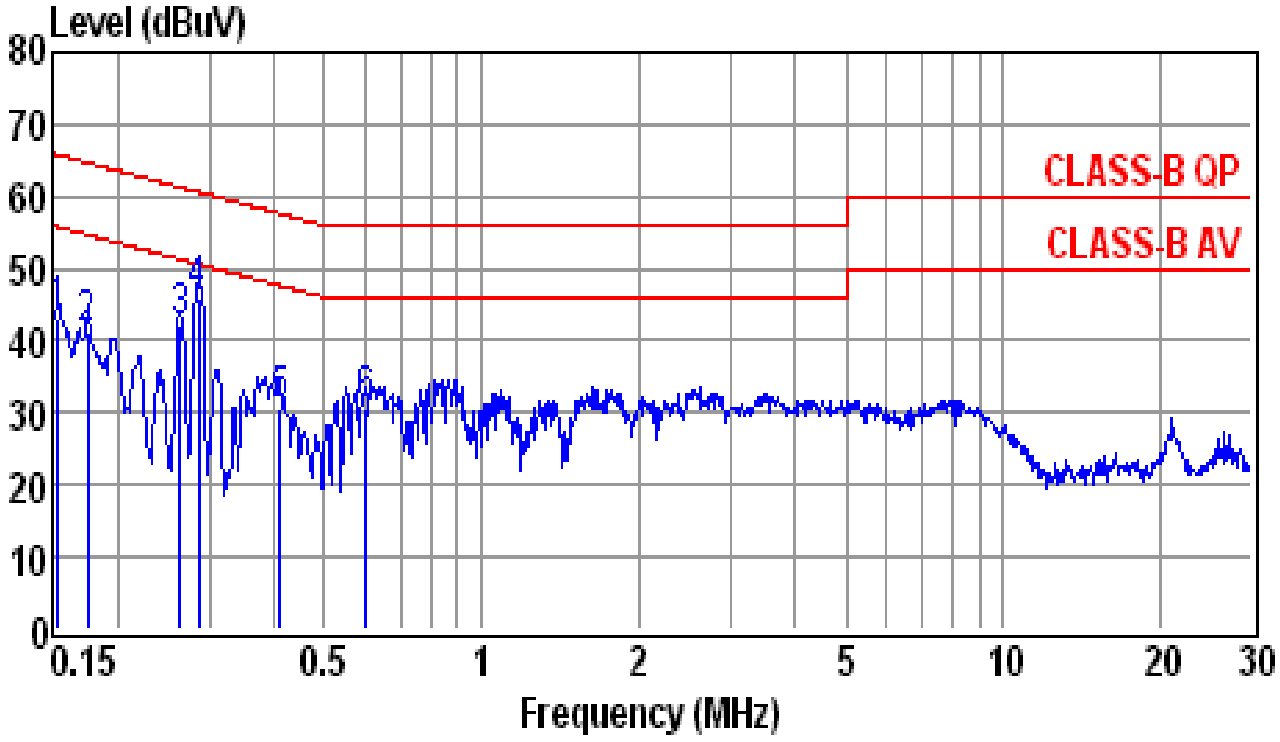
## 5.2 Measurement Procedure

1. Setup the configuration per figure 3.
2. A preliminary scan with a spectrum monitor is performed to identify the frequency of emission that has the highest amplitude relative to the limit by operating the EUT in selected modes of operation, typical cable positions, and with a typical system configuration.
3. Record the 6 or 8 highest emissions relative to the limit.
4. Measure each frequency obtained from step 3 by a test receiver set on quasi peak detector function, and then record the accuracy frequency and emission level. If all emissions measured in the specified band are attenuated more than 20 dB from the limit, this step would be ignored, and the peak detector function would be used.
5. Confirm the highest three emissions with variation of the EUT cable configuration and record the final data.
6. Repeat all above procedures on measuring each operation mode of EUT.

Figure 3 : Conducted emissions measurement configuration



## 5.3 Conducted Emission Data

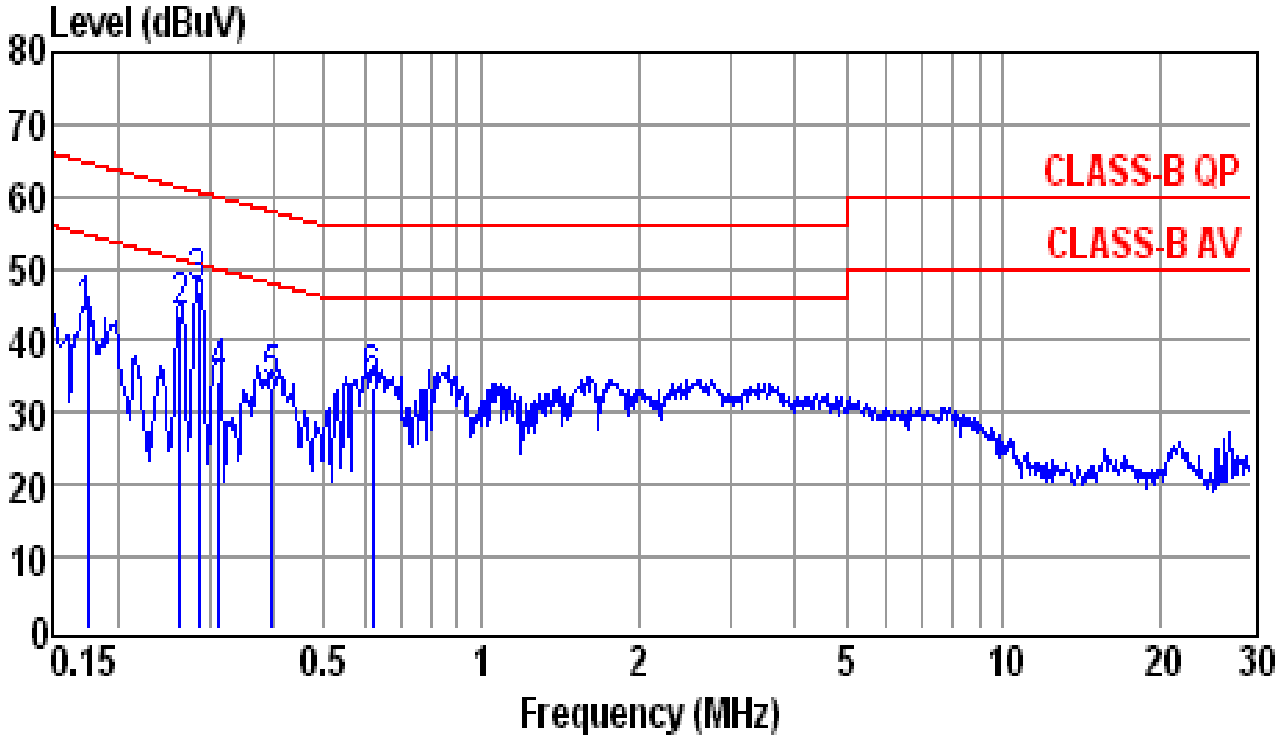



| | | | |
|---|---|---|---|
| Site | : conducted #1 | Date | : 03-09-2018 |
| Condition | : CLASS-B QP | LISN | : LINE |
| Tem / Hum | : 19 ℃ / 52% | Test Mode | : Alarm |
| EUT | : MOD1 | Power Rating | : AC120V 60Hz |
| Memo | : | Memo | : MOD1 with 20 inch power cord |

| Freq (MHz) | Reading (dBuV) | Factor (dB) | Emission Level (dBuV) | Limit Line (dBuV) | Over Limit (dB) | Remark |
|---|---|---|---|---|---|---|
| 0.1540 | 32.87 | 10.18 | 43.05 | 65.78 | -22.73 | QP |
| 0.1749 | 30.85 | 10.19 | 41.04 | 64.72 | -23.68 | QP |
| 0.2644 | 32.16 | 10.19 | 42.35 | 61.29 | -18.94 | QP |
| 0.2863 | 36.03 | 10.19 | 46.22 | 60.63 | -14.41 | QP |
| 0.4105 | 20.68 | 10.20 | 30.88 | 57.64 | -26.76 | QP |
| 0.6011 | 20.29 | 10.21 | 30.50 | 56.00 | -25.50 | QP |

Note :

1. Result = Reading + Factor
2. Factor = LISN Factor + Cable Loss

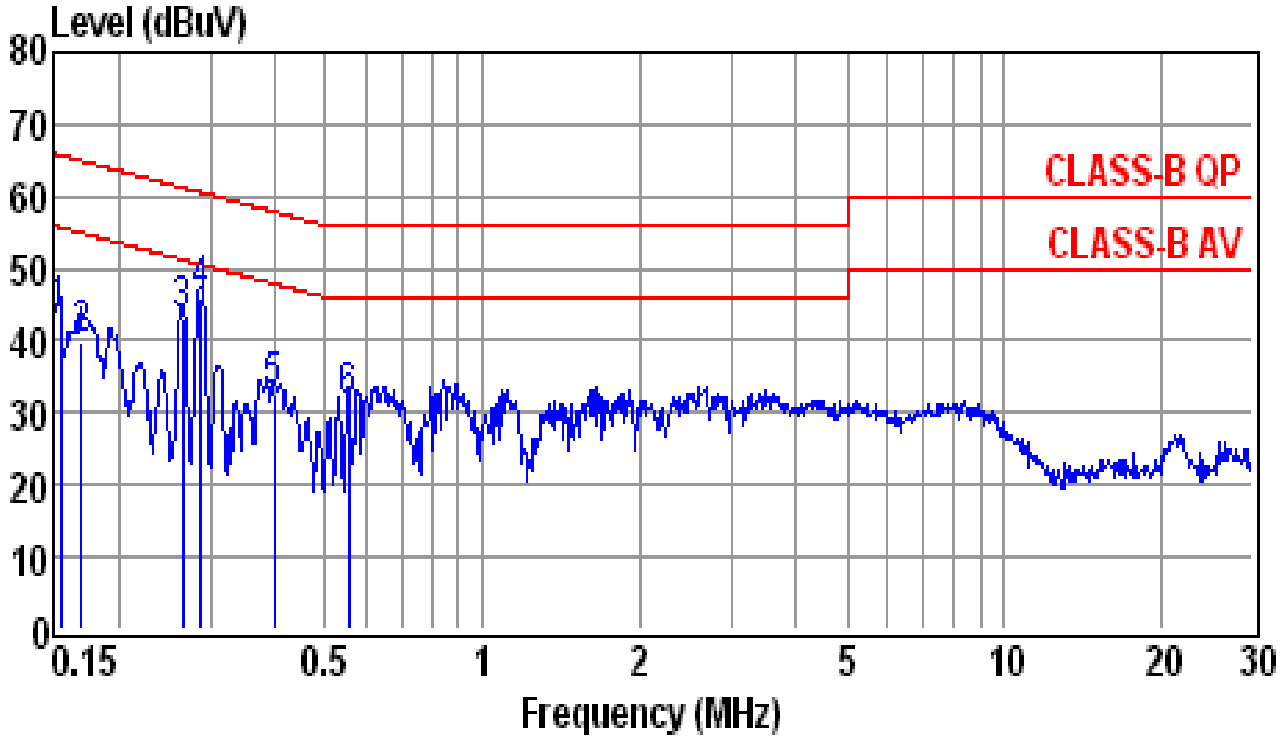



| | | | |
|---|---|---|---|
| Site | : conducted #1 | Date | : 03-09-2018 |
| Condition | : CLASS-B QP | LISN | : NEUTRAL |
| Tem / Hum | : 19 ℃ / 52% | Test Mode | : Alarm |
| EUT | : MOD1 | Power Rating | : AC120V 60Hz |
| Memo | : | Memo | : MOD1 with 20 inch power cord |

| Freq (MHz) | Reading (dBuV) | Factor (dB) | Emission Level (dBuV) | Limit Line (dBuV) | Over Limit (dB) | Remark |
|---|---|---|---|---|---|---|
| 0.1749 | 32.73 | 10.18 | 42.91 | 64.72 | -21.81 | QP |
| 0.2644 | 33.50 | 10.19 | 43.69 | 61.29 | -17.60 | QP |
| 0.2863 | 36.72 | 10.19 | 46.91 | 60.63 | -13.72 | QP |
| 0.3133 | 24.46 | 10.19 | 34.65 | 59.88 | -25.23 | QP |
| 0.3955 | 23.55 | 10.21 | 33.76 | 57.95 | -24.19 | QP |
| 0.6173 | 23.11 | 10.22 | 33.33 | 56.00 | -22.67 | QP |

Note :

1. Result = Reading + Factor
2. Factor = LISN Factor + Cable Loss

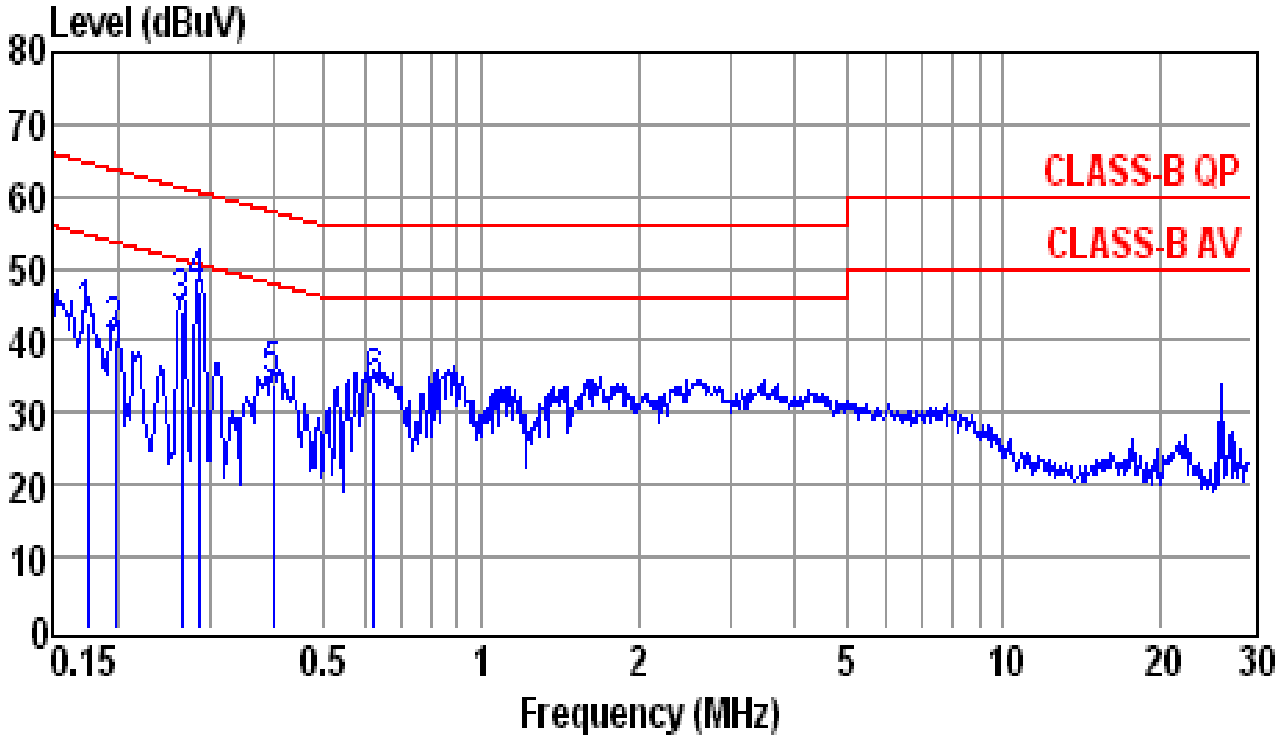



| | | | |
|---|---|---|---|
| Site | : conducted #1 | Date | : 03-09-2018 |
| Condition | : CLASS-B QP | LISN | : LINE |
| Tem / Hum | : 19 ℃ / 52% | Test Mode | : Normal |
| EUT | : MOD1 | Power Rating | : AC120V 60Hz |
| Memo | : | Memo | : MOD1 with 20 inch power cord |

| Freq (MHz) | Reading (dBuV) | Factor (dB) | Emission Level (dBuV) | Limit Line (dBuV) | Over Limit (dB) | Remark |
|---|---|---|---|---|---|---|
| 0.1549 | 32.81 | 10.18 | 42.99 | 65.74 | -22.75 | QP |
| 0.1703 | 29.78 | 10.18 | 39.96 | 64.94 | -24.98 | QP |
| 0.2658 | 32.72 | 10.19 | 42.91 | 61.25 | -18.34 | QP |
| 0.2878 | 35.79 | 10.19 | 45.98 | 60.59 | -14.61 | QP |
| 0.3976 | 22.53 | 10.20 | 32.73 | 57.90 | -25.17 | QP |
| 0.5523 | 20.76 | 10.21 | 30.97 | 56.00 | -25.03 | QP |

Note :

1. Result = Reading + Factor
2. Factor = LISN Factor + Cable Loss

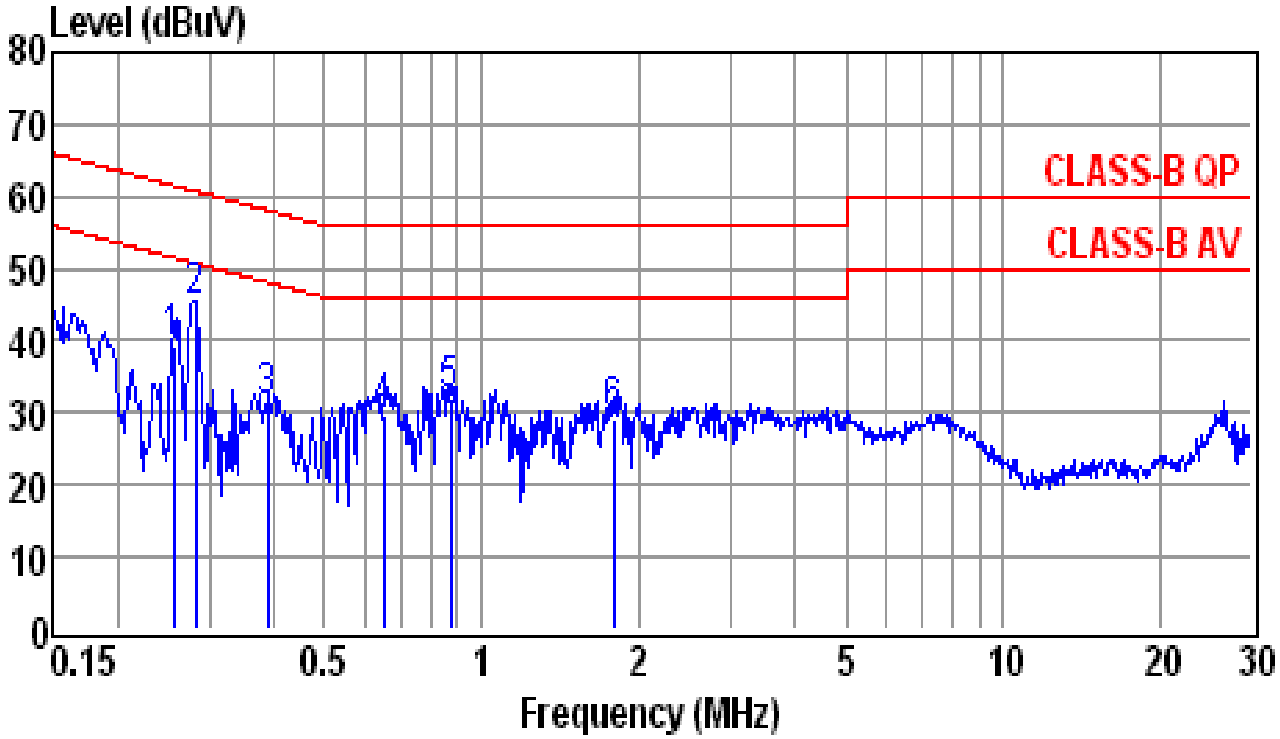



| | | | |
|---|---|---|---|
| Site | : conducted #1 | Date | : 03-09-2018 |
| Condition | : CLASS-B QP | LISN | : NEUTRAL |
| Tem / Hum | : 19 ℃ / 52% | Test Mode | : Normal |
| EUT | : MOD1 | Power Rating | : AC120V 60Hz |
| Memo | : | Memo | : MOD1 with 20 inch power cord |

| Freq (MHz) | Reading (dBuV) | Factor (dB) | Emission Level (dBuV) | Limit Line (dBuV) | Over Limit (dB) | Remark |
|---|---|---|---|---|---|---|
| 0.1749 | 32.57 | 10.18 | 42.75 | 64.72 | -21.97 | QP |
| 0.1986 | 30.21 | 10.18 | 40.39 | 63.67 | -23.28 | QP |
| 0.2658 | 34.05 | 10.19 | 44.24 | 61.25 | -17.01 | QP |
| 0.2863 | 36.53 | 10.19 | 46.72 | 60.63 | -13.91 | QP |
| 0.3976 | 24.03 | 10.21 | 34.24 | 57.90 | -23.66 | QP |
| 0.6238 | 22.95 | 10.22 | 33.17 | 56.00 | -22.83 | QP |

Note :

1. Result = Reading + Factor
2. Factor = LISN Factor + Cable Loss

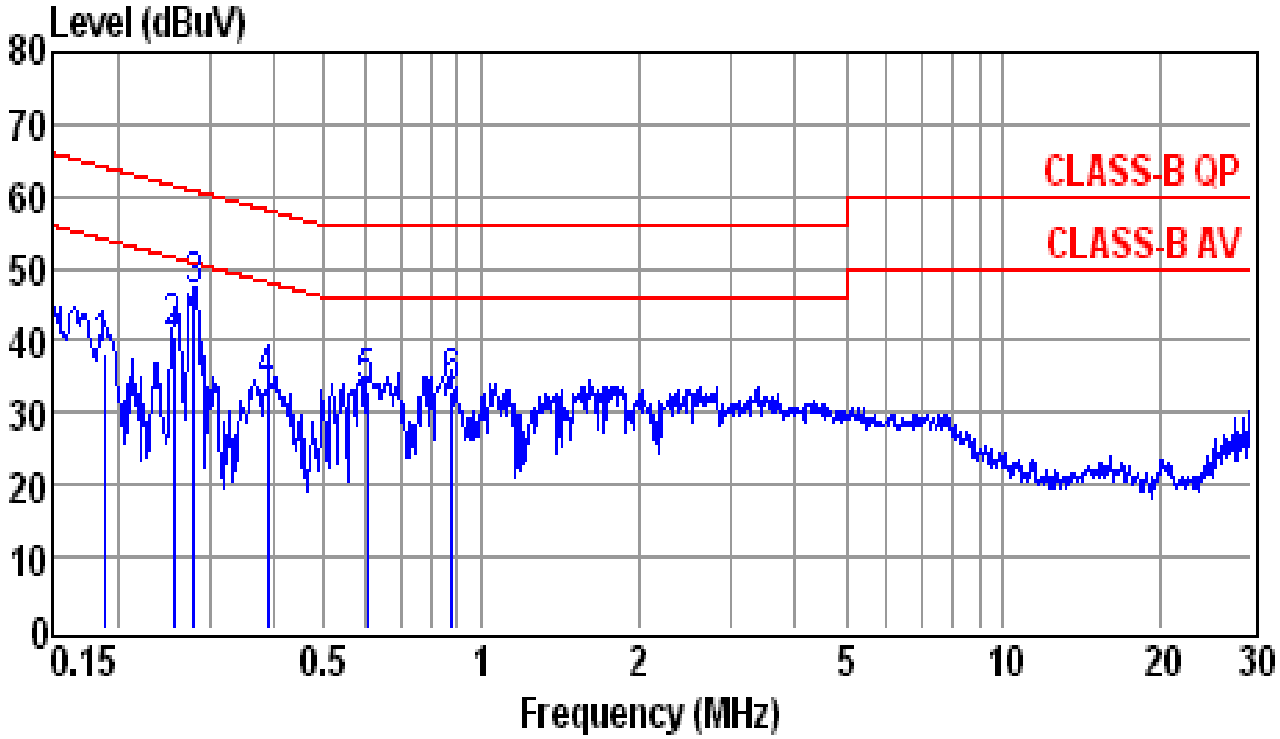



| | | | |
|---|---|---|---|
| Site | : conducted #1 | Date | : 05-17-2018 |
| Condition | : CLASS-B QP | LISN | : LINE |
| Tem / Hum | : 19 ℃ / 52% | Test Mode | : Alarm Mode |
| EUT | : MOD1 | Power Rating | : AC120V 60Hz |
| Memo | : | Memo | : MOD1 with 5ft power cord |

| Freq (MHz) | Reading (dBuV) | Factor (dB) | Emission Level (dBuV) | Limit Line (dBuV) | Over Limit (dB) | Remark |
|---|---|---|---|---|---|---|
| 0.2562 | 28.93 | 10.37 | 39.30 | 61.56 | -22.26 | QP |
| 0.2818 | 34.51 | 10.37 | 44.88 | 60.76 | -15.88 | QP |
| 0.3893 | 20.90 | 10.39 | 31.29 | 58.08 | -26.79 | QP |
| 0.6508 | 19.44 | 10.41 | 29.85 | 56.00 | -26.15 | QP |
| 0.8710 | 21.59 | 10.43 | 32.02 | 56.00 | -23.98 | QP |
| 1.7900 | 18.57 | 10.48 | 29.05 | 56.00 | -26.95 | QP |

Note :

1. Result = Reading + Factor
2. Factor = LISN Factor + Cable Loss

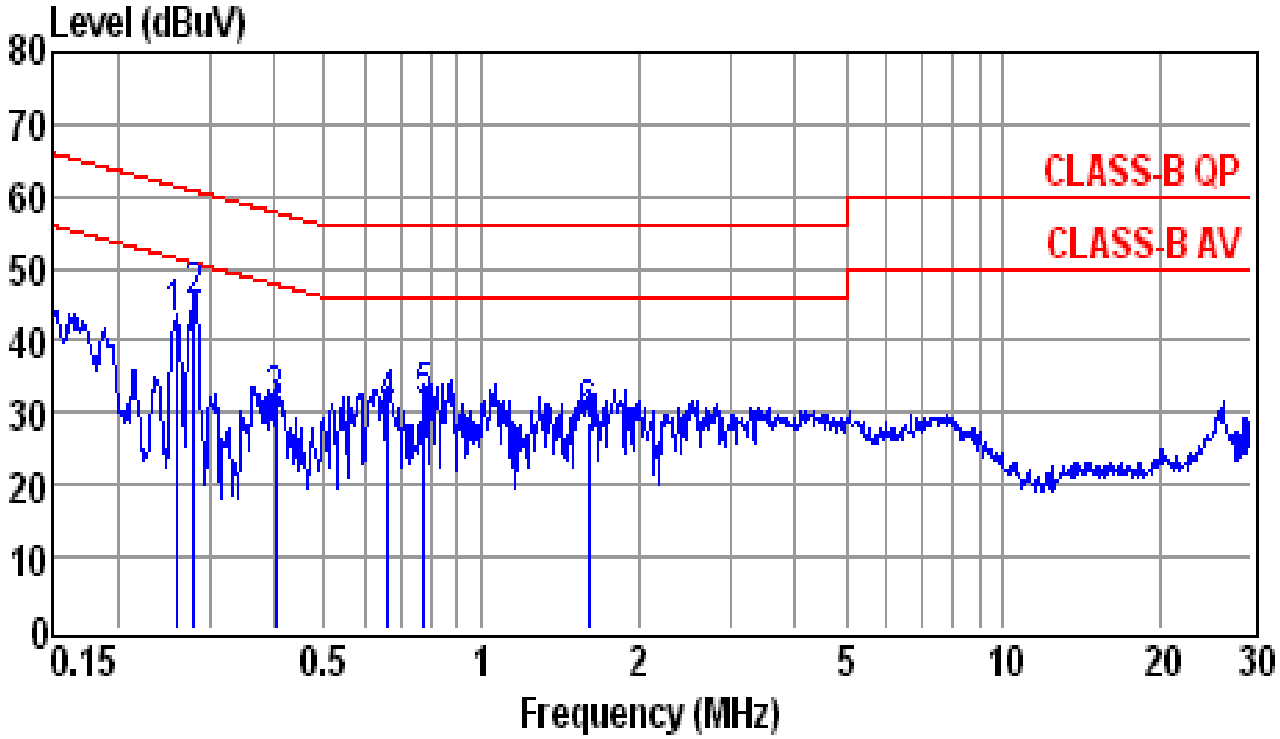



| | | | |
|---|---|---|---|
| Site | : conducted #1 | Date | : 05-17-2018 |
| Condition | : CLASS-B QP | LISN | : NEUTRAL |
| Tem / Hum | : 19 ℃ / 52% | Test Mode | : Alarm Mode |
| EUT | : MOD1 | Power Rating | : AC120V 60Hz |
| Memo | : | Memo | : MOD1 with 5ft power cord |

| Freq (MHz) | Reading (dBuV) | Factor (dB) | Emission Level (dBuV) | Limit Line (dBuV) | Over Limit (dB) | Remark |
|---|---|---|---|---|---|---|
| 0.1884 | 27.78 | 10.43 | 38.21 | 64.11 | -25.90 | QP |
| 0.2562 | 30.06 | 10.43 | 40.49 | 61.56 | -21.07 | QP |
| 0.2803 | 36.03 | 10.43 | 46.46 | 60.81 | -14.35 | QP |
| 0.3893 | 23.19 | 10.45 | 33.64 | 58.08 | -24.44 | QP |
| 0.6043 | 22.71 | 10.46 | 33.17 | 56.00 | -22.83 | QP |
| 0.8757 | 22.80 | 10.49 | 33.29 | 56.00 | -22.71 | QP |

Note :

1. Result = Reading + Factor
2. Factor = LISN Factor + Cable Loss

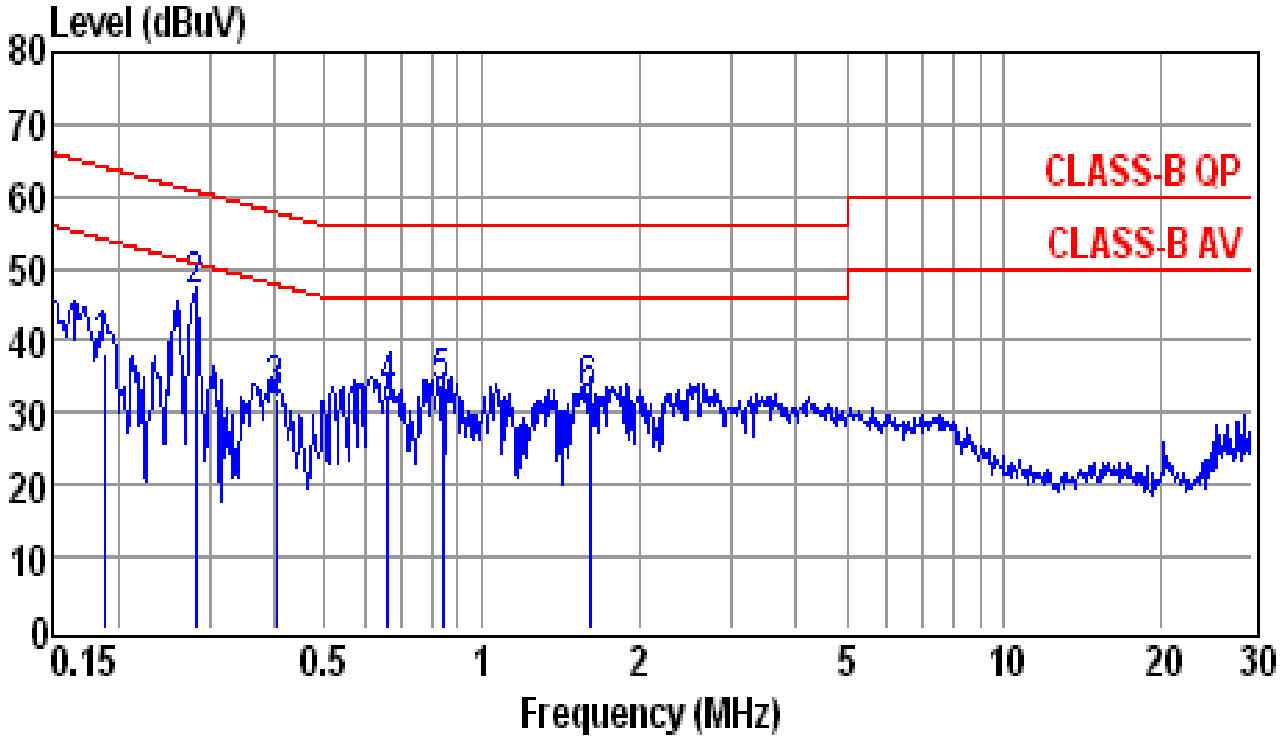



| | | | |
|---|---|---|---|
| Site | : conducted #1 | Date | : 05-17-2018 |
| Condition | : CLASS-B QP | LISN | : LINE |
| Tem / Hum | : 19 ℃ / 52% | Test Mode | : Normal |
| EUT | : MOD1 | Power Rating | : AC120V 60Hz |
| Memo | : | Memo | : MOD1 with 5ft power cord |

| Freq (MHz) | Reading (dBuV) | Factor (dB) | Emission Level (dBuV) | Limit Line (dBuV) | Over Limit (dB) | Remark |
|---|---|---|---|---|---|---|
| 0.2589 | 32.05 | 10.37 | 42.42 | 61.47 | -19.05 | QP |
| 0.2803 | 34.52 | 10.37 | 44.89 | 60.81 | -15.92 | QP |
| 0.4019 | 20.38 | 10.39 | 30.77 | 57.81 | -27.04 | QP |
| 0.6613 | 19.73 | 10.41 | 30.14 | 56.00 | -25.86 | QP |
| 0.7752 | 20.96 | 10.42 | 31.38 | 56.00 | -24.62 | QP |
| 1.6100 | 18.31 | 10.47 | 28.78 | 56.00 | -27.22 | QP |

Note :

1. Result = Reading + Factor
2. Factor = LISN Factor + Cable Loss




| | | | |
|---|---|---|---|
| Site | : conducted #1 | Date | : 05-17-2018 |
| Condition | : CLASS-B QP | LISN | : NEUTRAL |
| Tem / Hum | : 28 ℃ / 52% | Test Mode | : Normal |
| EUT | : MOD1 | Power Rating | : AC120V 60Hz |
| Memo | : | Memo | : MOD1 with 5ft power cord |

| Freq (MHz) | Reading (dBuV) | Factor (dB) | Emission Level (dBuV) | Limit Line (dBuV) | Over Limit (dB) | Remark |
|---|---|---|---|---|---|---|
| 0.1884 | 28.06 | 10.43 | 38.49 | 64.11 | -25.62 | QP |
| 0.2818 | 36.08 | 10.43 | 46.51 | 60.76 | -14.25 | QP |
| 0.4040 | 21.64 | 10.45 | 32.09 | 57.77 | -25.68 | QP |
| 0.6613 | 22.08 | 10.47 | 32.55 | 56.00 | -23.45 | QP |
| 0.8393 | 22.54 | 10.48 | 33.02 | 56.00 | -22.98 | QP |
| 1.6100 | 21.66 | 10.53 | 32.19 | 56.00 | -23.81 | QP |

Note :

1. Result = Reading + Factor
2. Factor = LISN Factor + Cable Loss

## 5.4 Result Data Calculation

The result data is calculated by adding the LISN Factor to the measured reading. The basic equation with a sample calculation is as follows:

***RESULT = READING + LISN FACTOR***

Assume a receiver reading of 22.5 dB $\mu$ V is obtained, and LISN Factor is 0.1 dB, then the total of disturbance voltage is 22.6 dB $\mu$ V.

RESULT = 22.5 + 0.1 = 22.6 dB $\mu$ V
Level in $\mu$ V = Common Antilogarithm[(22.6 dB $\mu$ V)/20]
= 13.48 $\mu$ V

## 5.5 Conducted Measurement Equipment

The following test equipment are used during the conducted test .

| Equipment | Manufacturer | Model No. | Calibration Date | Next Cal. Date |
|---|---|---|---|---|
| EMI Test Receiver | Rohde & Schwarz | ESCI | 2017/09/19 | 2018/09/18 |
| LISN | Rohde & Schwarz | ESH2-Z5 | 2018/04/11 | 2019/04/10 |

# 6 ANTENNA REQUIREMENT

## 6.1 Standard Applicable

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to §15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

## 6.2 Antenna Construction and Directional Gain

The antenna gain is 1.63 dBi so there is no need to reduce the power.

Please see internal photos and the antenna specifications.

# 7 EMISSION BANDWIDTH MEASUREMENT

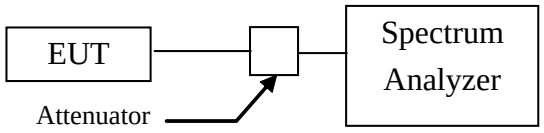
## 7.1 Standard Applicable

According to 15.247(a)(2), for direct sequence system, the minimum 6dB bandwidth shall be at least 500 kHz.

## 7.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value. The settings of spectrum analyzer is as followings.
   1) Set RBW = 100 kHz.
   2) Set the video bandwidth (VBW) ≥ 3 x RBW.
   3) Detector = Peak.
   4) Trace mode = max hold.
   5) Sweep = auto couple.
   6) Allow the trace to stabilize.
   7) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.
3. Repeat above procedures until all frequencies measured were complete.

Figure 4: Emission bandwidth measurement configuration.




## 7.3 Measurement Equipment

| Equipment | Manufacturer | Model No. | Calibration Date | Next Cal. Date |
|---|---|---|---|---|
| Spectrum Analyzer | Rohde & Schwarz | FSP40 | 2017/11/02 | 2018/11/01 |
| Attenuator | MINI-CIRCUITS | BW-S10W2+ | 2016/09/30 | 2018/09/29 |

## 7.4 Measurement Data

Test Date : July 05, 2018 Temperature : 23 ℃ Humidity : 55 %

**A. 802.11b @11 Mbps**

a) Channel Low: 6 dB Emission Bandwidth is 10.24 MHz
b) Channel Mid: 6 dB Emission Bandwidth is 9.6 MHz
c) Channel High: 6 dB Emission Bandwidth is 9.42 MHz

**B. 802.11g @54 Mbps**

a) Channel Low: 6 dB Emission Bandwidth is 16.48 MHz
b) Channel Mid: 6 dB Emission Bandwidth is 16.5 MHz
c) Channel High: 6 dB Emission Bandwidth is 16.5 MHz

**C. 802.11n HT-20 @MCS7**

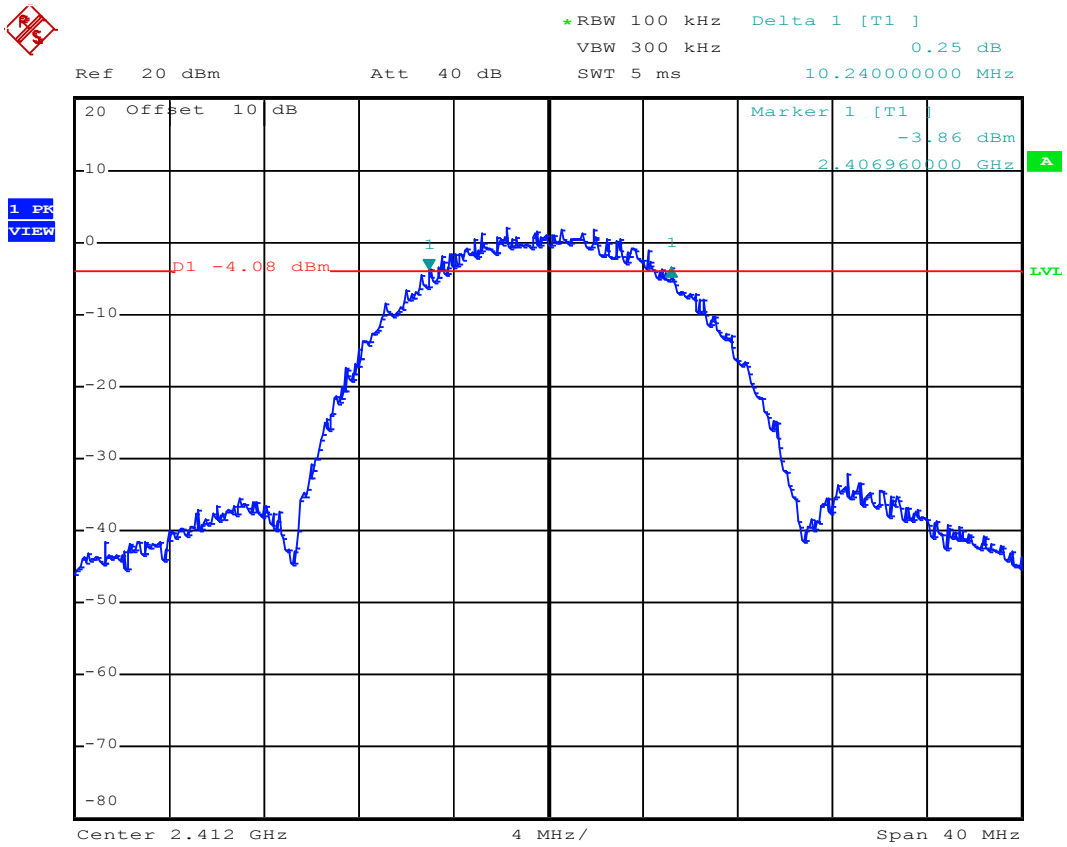
a) Channel Low: 6 dB Emission Bandwidth is 17.68 MHz
b) Channel Mid: 6 dB Emission Bandwidth is 17.7 MHz
c) Channel High: 6 dB Emission Bandwidth is 17.7 MHz

**D. 802.11n HT-40 @MCS7**

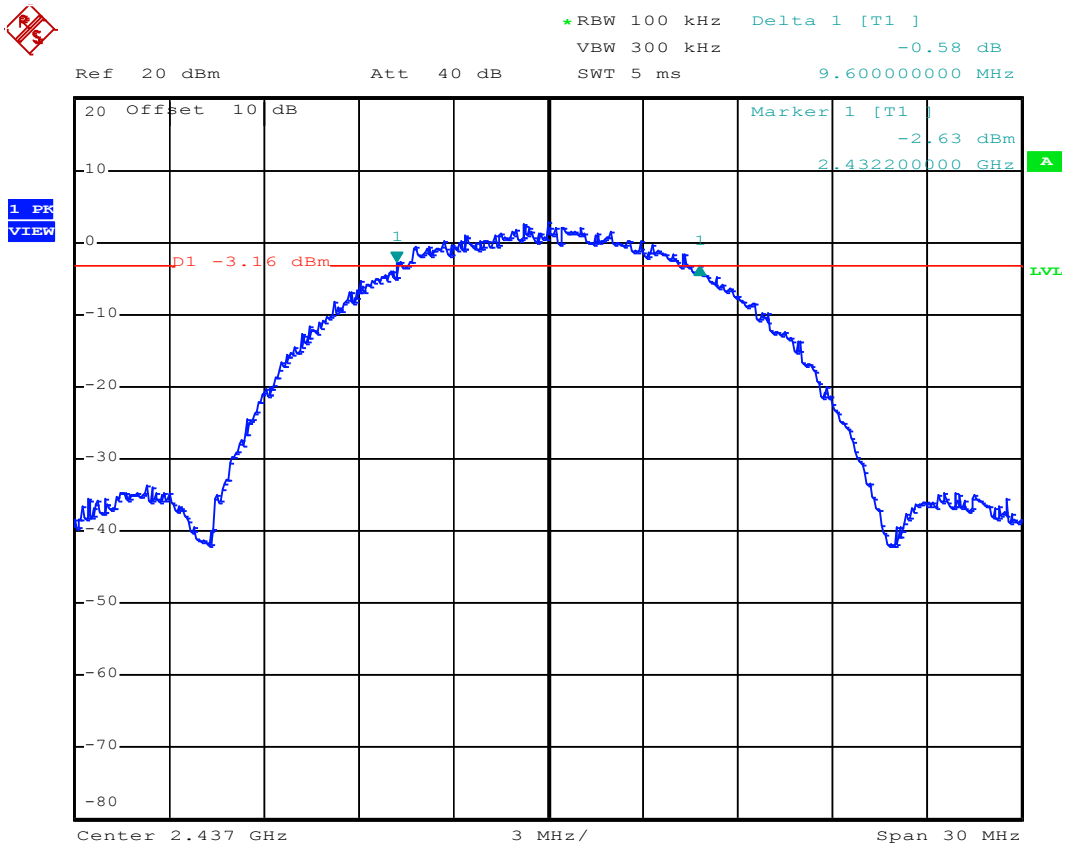
a) Channel Low: 6 dB Emission Bandwidth is 35.90 MHz
b) Channel Mid: 6 dB Emission Bandwidth is 35.90 MHz
c) Channel High: 6 dB Emission Bandwidth is 35.90 MHz

***Note : The expanded uncertainty: frequency $\times 1.65\times 10^{-6}$ (1 GHz $< f \leq$ 18 GHz).***

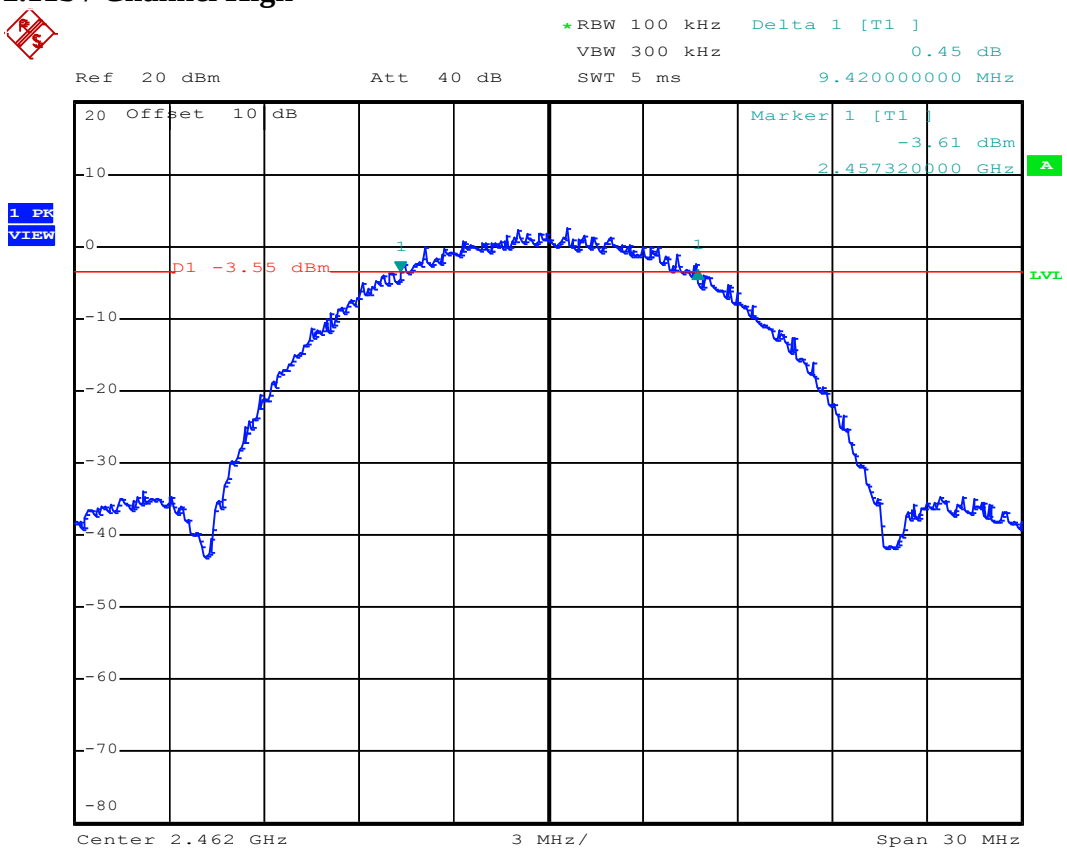
## 802.11b / Channel Low



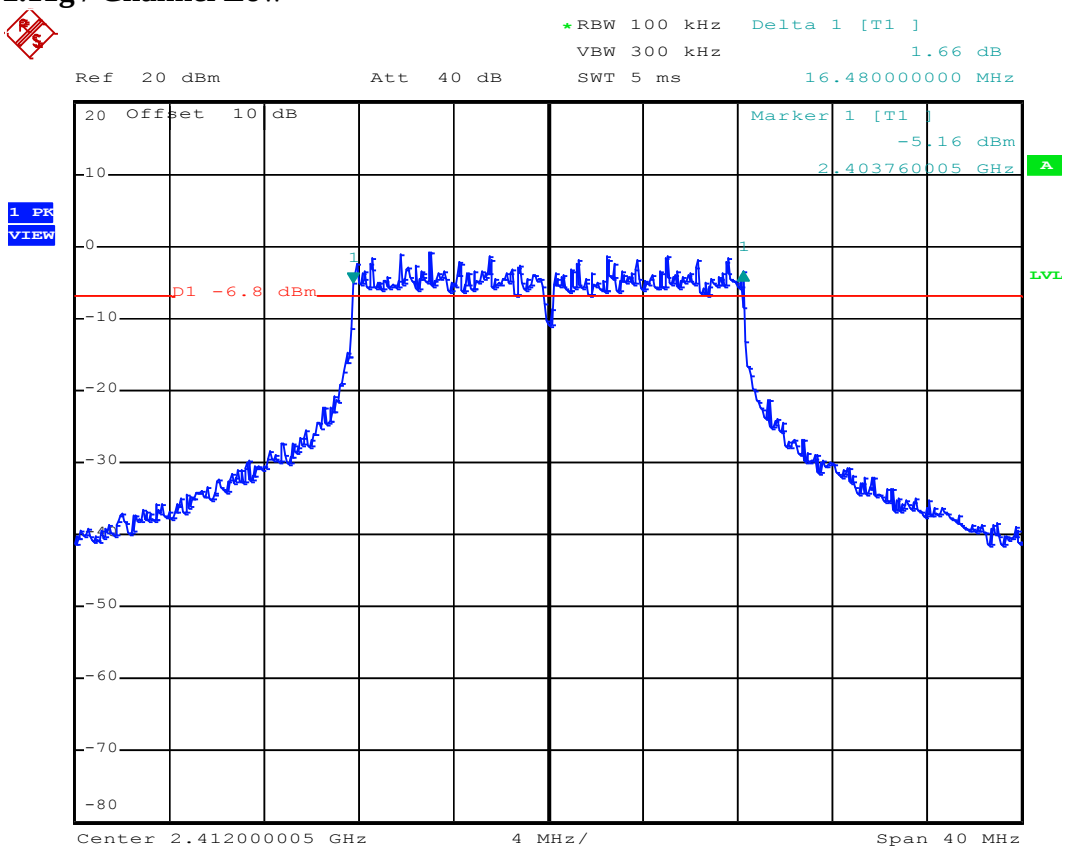
## 802.11b / Channel Mid



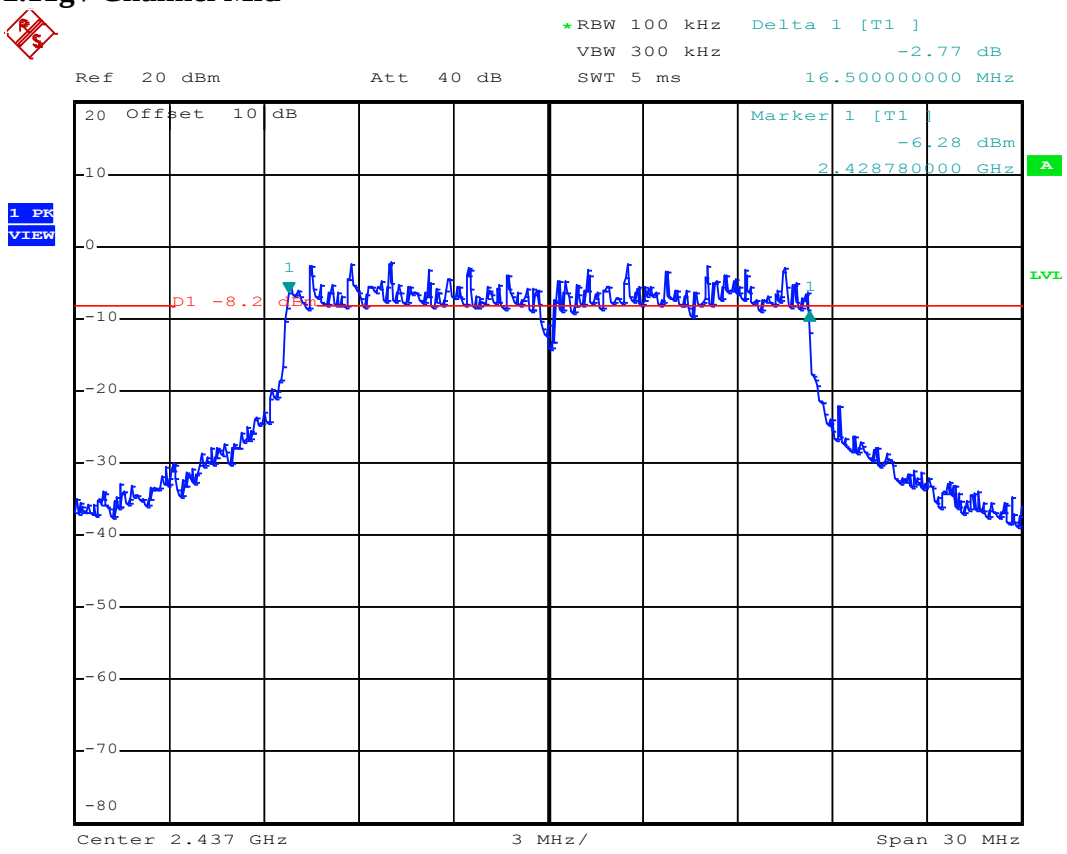
## 802.11b / Channel High



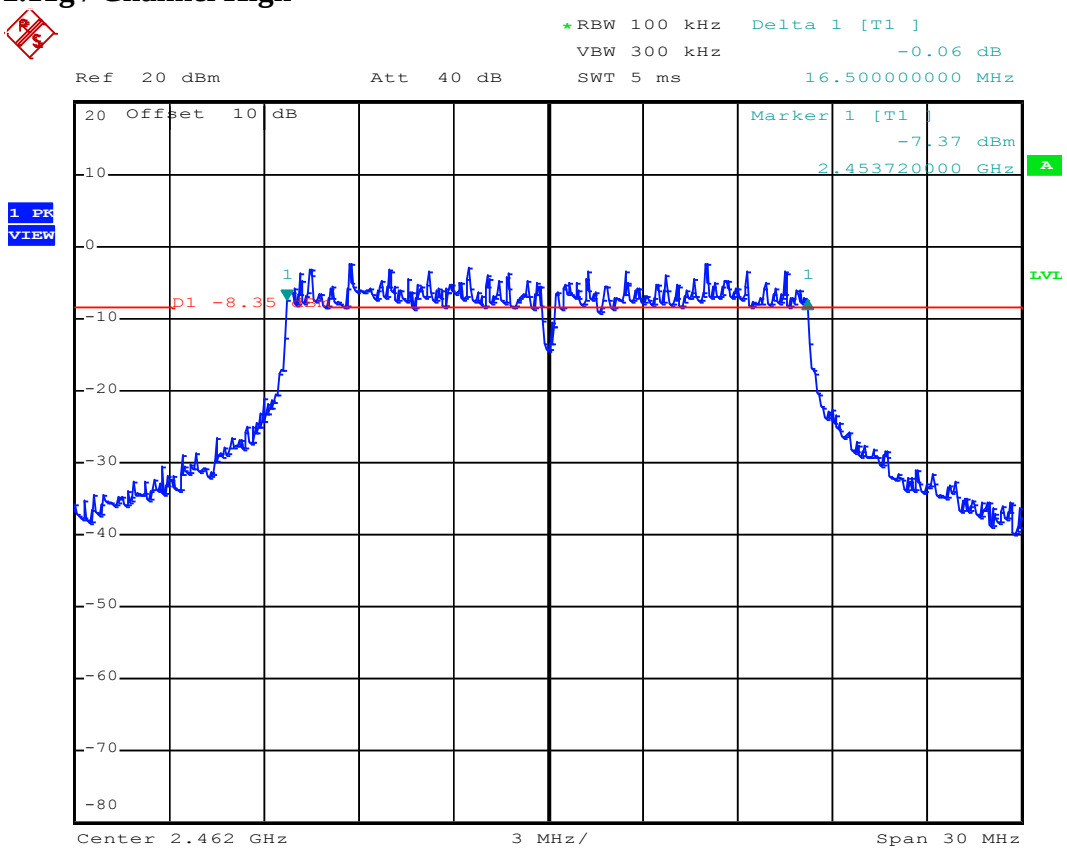
## 802.11g / Channel Low



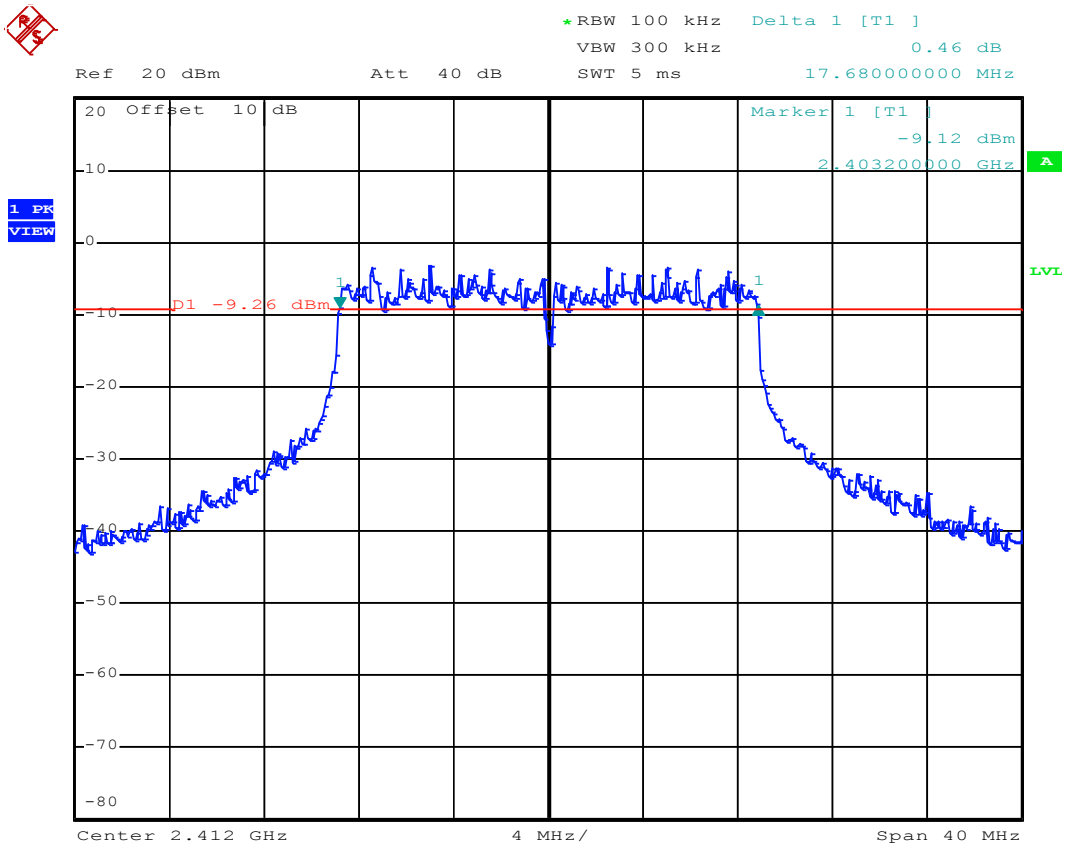
## 802.11g / Channel Mid



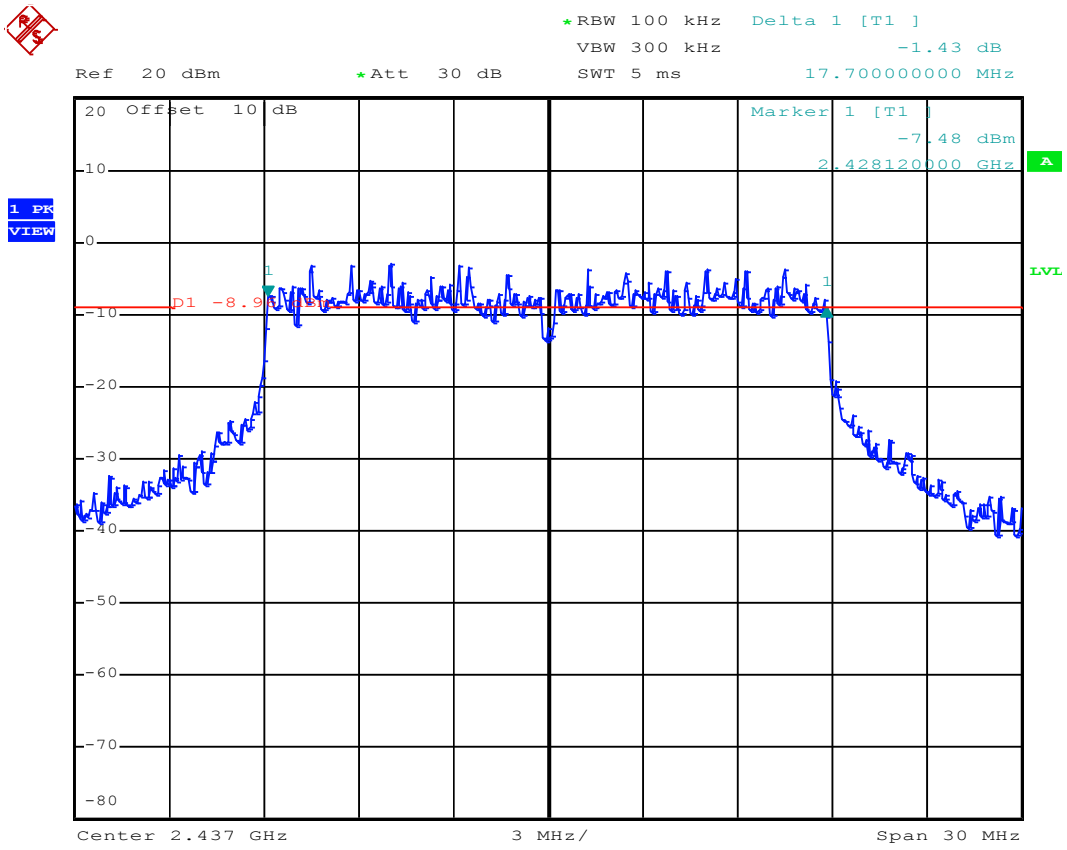
## 802.11g / Channel High



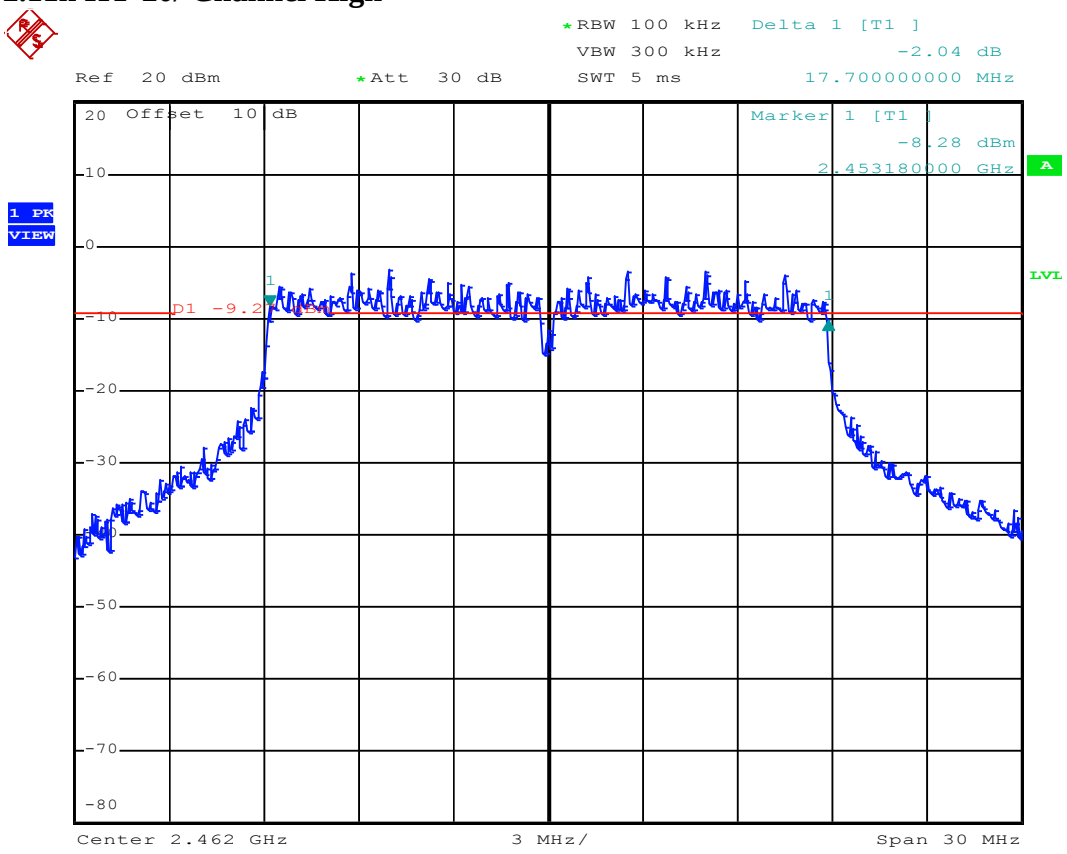
## 802.11n HT-20/ Channel Low



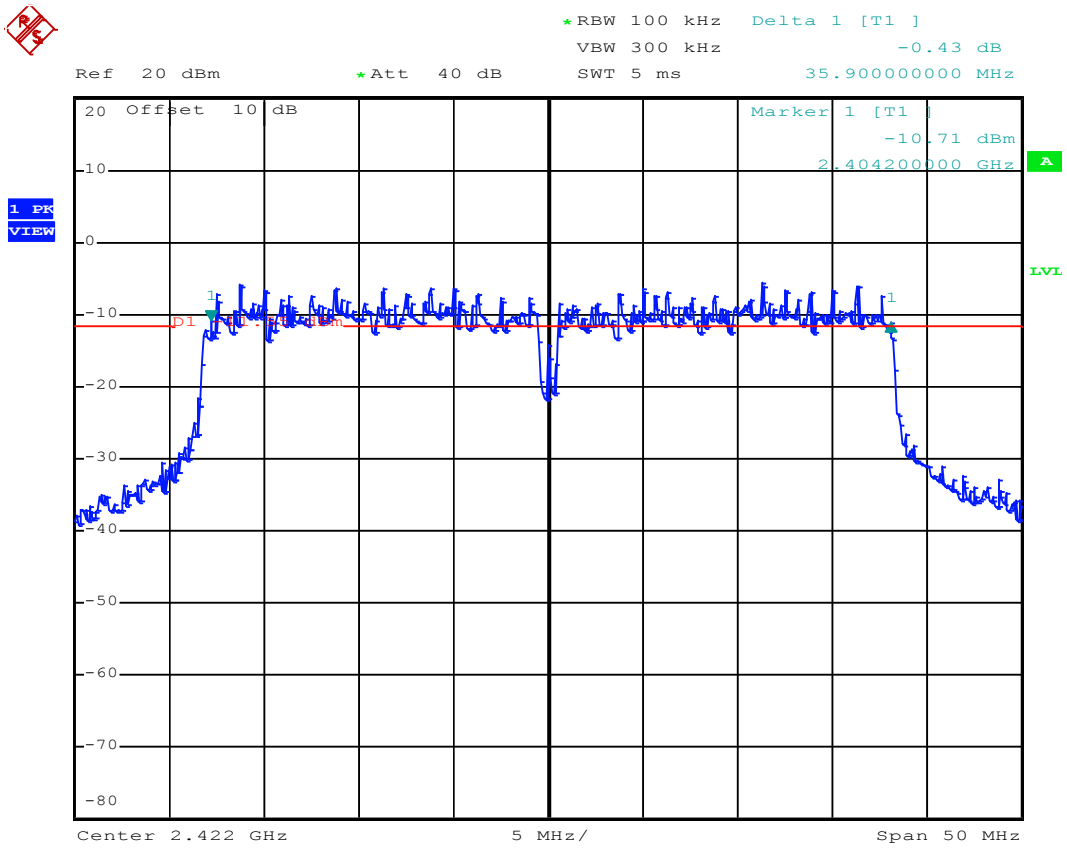
## 802.11n HT-20/ Channel Mid



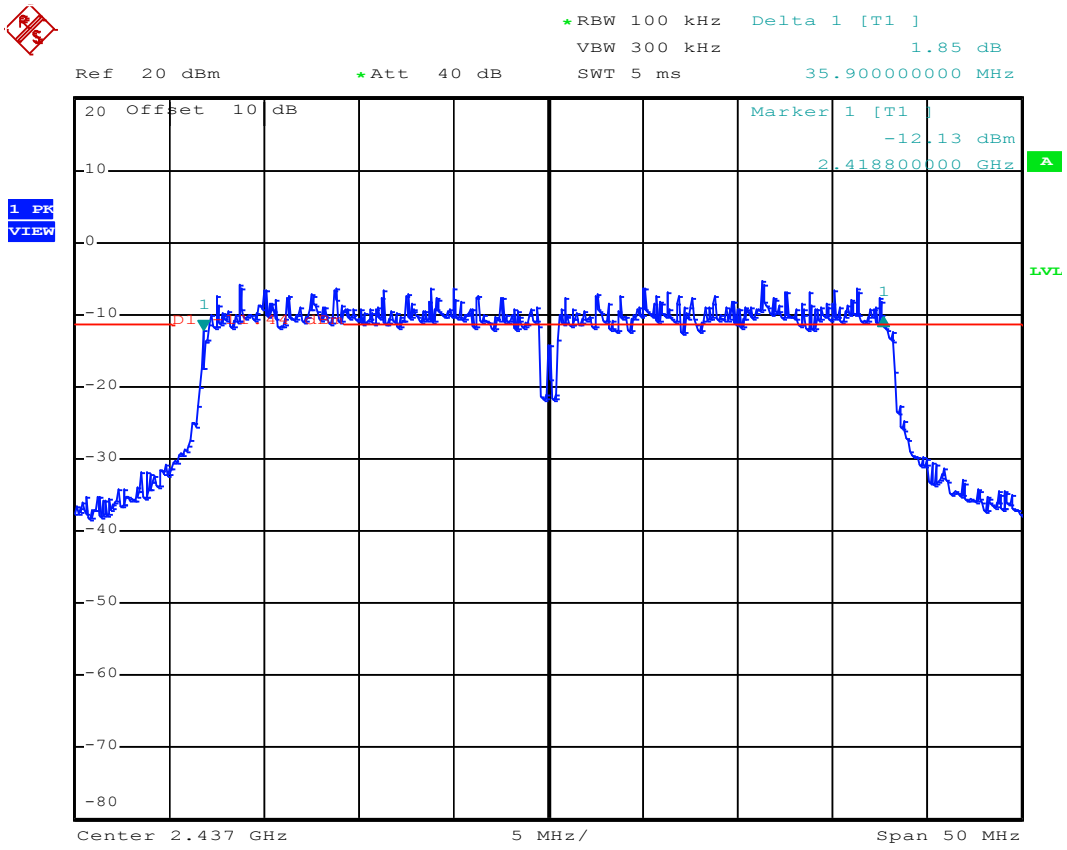
## 802.11n HT-20/ Channel High



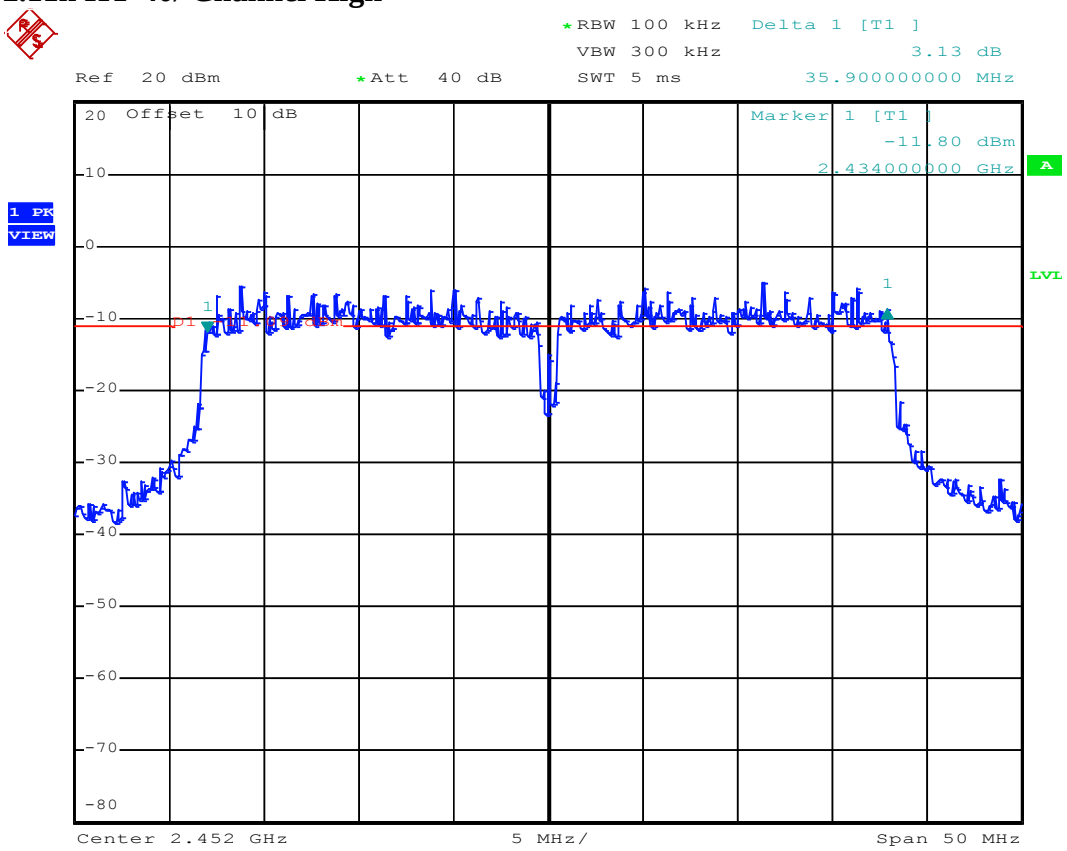
## 802.11n HT-40/ Channel Low



## 802.11n HT-40/ Channel Mid



## 802.11n HT-40/ Channel High



# 8 OUTPUT POWER MEASUREMENT

## 8.1 Standard Applicable

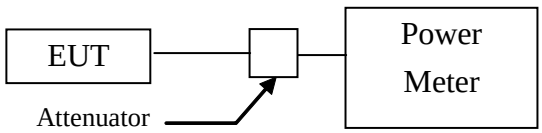
For direct sequence system, according to 15.247(b), the maximum peak output power of the transmitter shall not exceed 1 Watt. If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

## 8.2 Measurement Procedure

Measurement Procedure:
9.1.2 PKPM1 Peak power meter method

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 5 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable.
3. Record the readings on the instrument and add a compensat factor of the attenuator.
4. Repeat above procedures until all frequencies measured were complete.

Figure 5: Output power and measurement configuration.




## 8.3 Measurement Equipment

| Equipment | Manufacturer | Model No. | Calibration Date | Next Cal. Date |
|---|---|---|---|---|
| POWER METER +SENSOR | ANRITSU | ML2487A +MA2491A | 2015/05/13 | 2019/05/22 |
| Attenuator | MINI-CIRCUITS | BW-S10W2+ | 2016/09/30 | 2018/09/29 |

## 8.4 Measurement Data

Test Date : July 05, 2018 Temperature : 23 ℃ Humidity : 55 %

**A. 802.11b @11 Mbps**

| Output Peak Power | | dBm | mW |
|---|---|---|---|
| **Operation** | Channel Low:2412MHz | 16.36 | **43.251** |
| | Channel Mid:2437MHz | 15.83 | **38.283** |
| | Channel High:2462MHz | 15.65 | **36.728** |

**B. 802.11g @54 Mbps**

| Output Peak Power | | dBm | mW |
|---|---|---|---|
| **Operation** | Channel Low:2412MHz | 14.01 | **25.177** |
| | Channel Mid:2437MHz | 13.65 | **23.174** |
| | Channel High:2462MHz | 13.39 | **21.827** |

**C. 802.11n HT-20 @MCS7**

| Output Peak Power | | dBm | mW |
|---|---|---|---|
| **Operation** | Channel Low:2412MHz | 13.12 | **20.512** |
| | Channel Mid:2437MHz | 12.87 | **19.364** |
| | Channel High:2462MHz | 12.72 | **18.71** |

**D. 802.11n HT-40 @ MCS7**

| Output Peak Power | | dBm | mW |
|---|---|---|---|
| **Operation** | Channel Low:2422MHz | 13.07 | **20.277** |
| | Channel Mid:2437MHz | 12.91 | **19.543** |
| | Channel High:2452MHz | 12.73 | **18.750** |

***Note : The expanded uncertainty: 2dB.***

# 9 100 kHz BANDWIDTH OF BAND EDGES MEASUREMENT

## 9.1 Standard Applicable

According to 15.247(c), if any 100 kHz bandwidth outside these frequency bands, the radio frequency power that is produced by the modulation products of the spreading sequence, the information sequence and the carrier frequency shall be either at least 20 dB below that in any 100 kHz bandwidth within the band that contains the highest level of the desired power or shall not exceed the general levels specified in §15.209(a), whichever results in the lesser attenuation.

## 9.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Set both RBW of spectrum analyzer to 100kHz and VBW greater than RBW with a convenient frequency span including 100kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

## 9.3 Measurement Equipment

| Equipment | Manufacturer | Model No. | Calibration Date | Next Cal. Date |
|---|---|---|---|---|
| Spectrum Analyzer | Rohde & Schwarz | FSP40 | 2017/11/02 | 2018/11/01 |
| Attenuator | MINI-CIRCUITS | BW-S10W2+ | 2016/09/30 | 2018/09/29 |

## 9.4 Measurement Data

Test Date : July 05, 2018 Temperature : 23 ℃ Humidity : 55 %

**A. 802.11b @11 Mbps**

a) Lower Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.
b) Upper Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.

**B. 802.11g @54 Mbps**

a) Lower Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.
b) Upper Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.

**C. 802.11n HT-20 @MCS7**

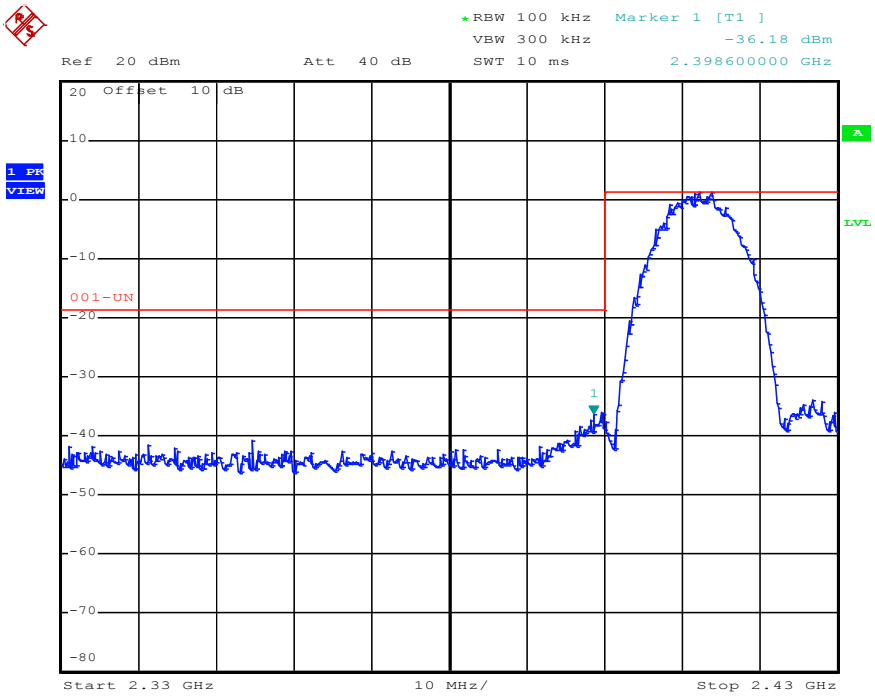
a) Lower Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.
b) Upper Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.

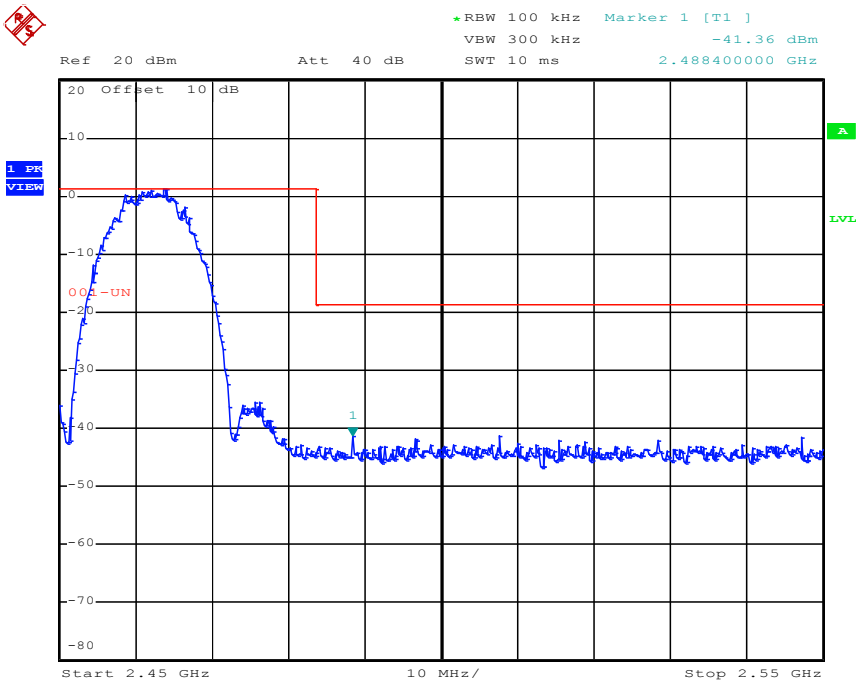
**D. 802.11n HT-40 @ MCS7**

a) Lower Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.
b) Upper Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.

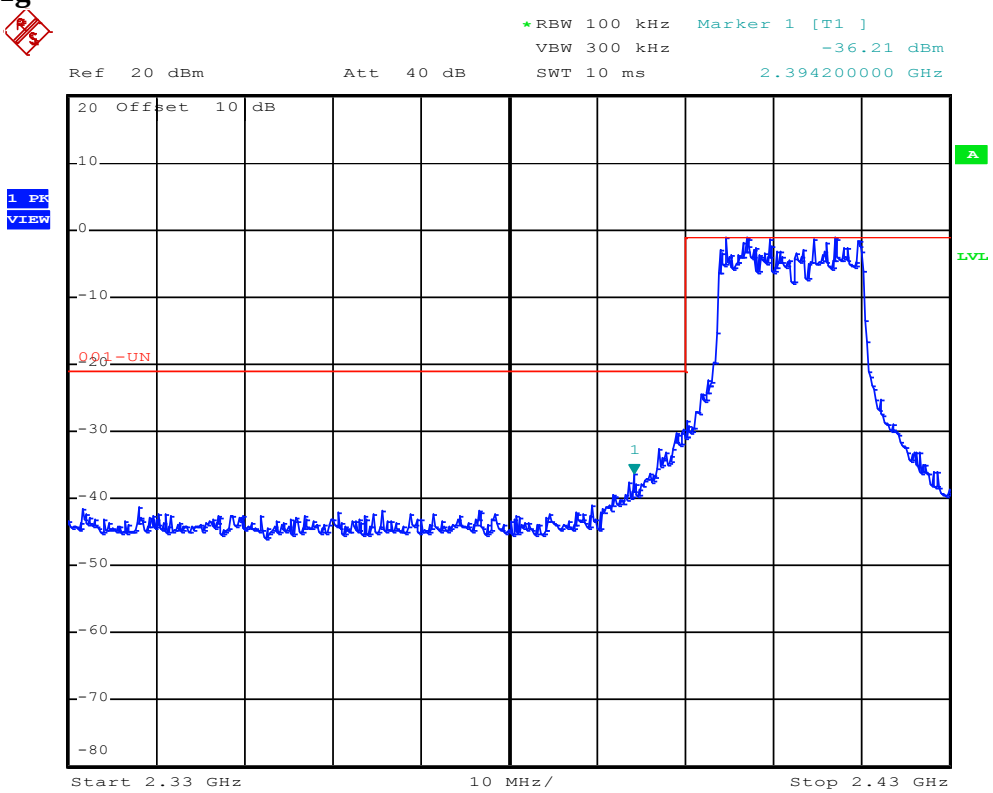
***Note : The expanded uncertainty: 2dB.***

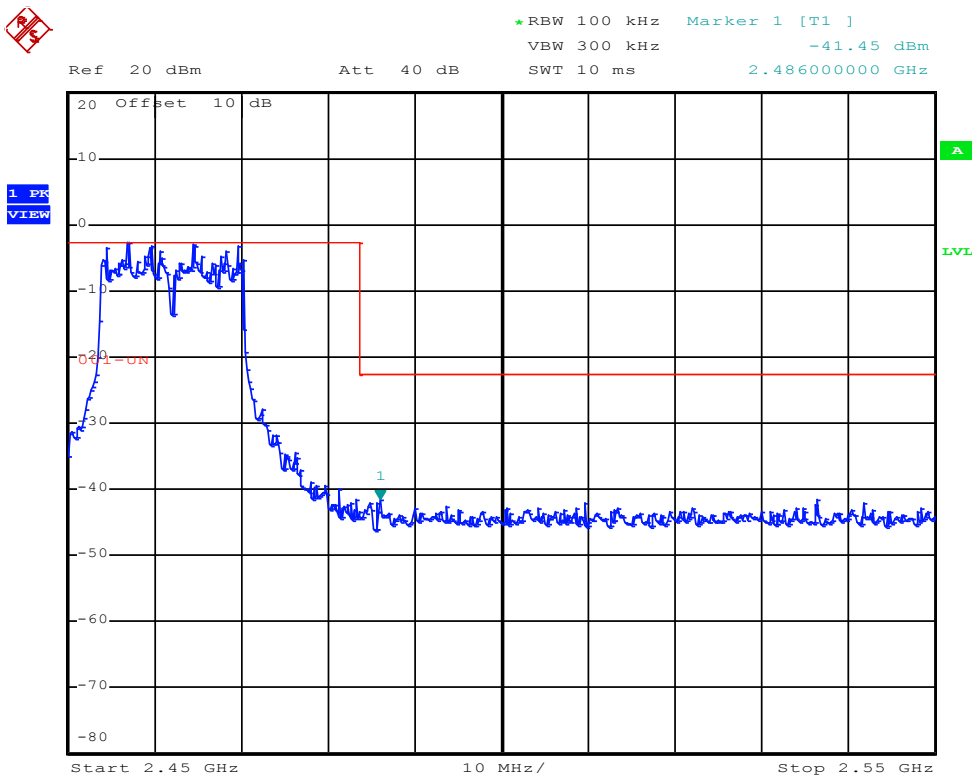
## 802.11b


RBW 100 kHz
VBW 300 kHz
SWT 10 ms
Marker 1 [T1 ]
-36.18 dBm
2.398600000 GHz
Ref 20 dBm
Att 40 dB
Offset 10 dB
1 PK VIEW
A
LVL
001-UN
Start 2.33 GHz
10 MHz/
Stop 2.43 GHz

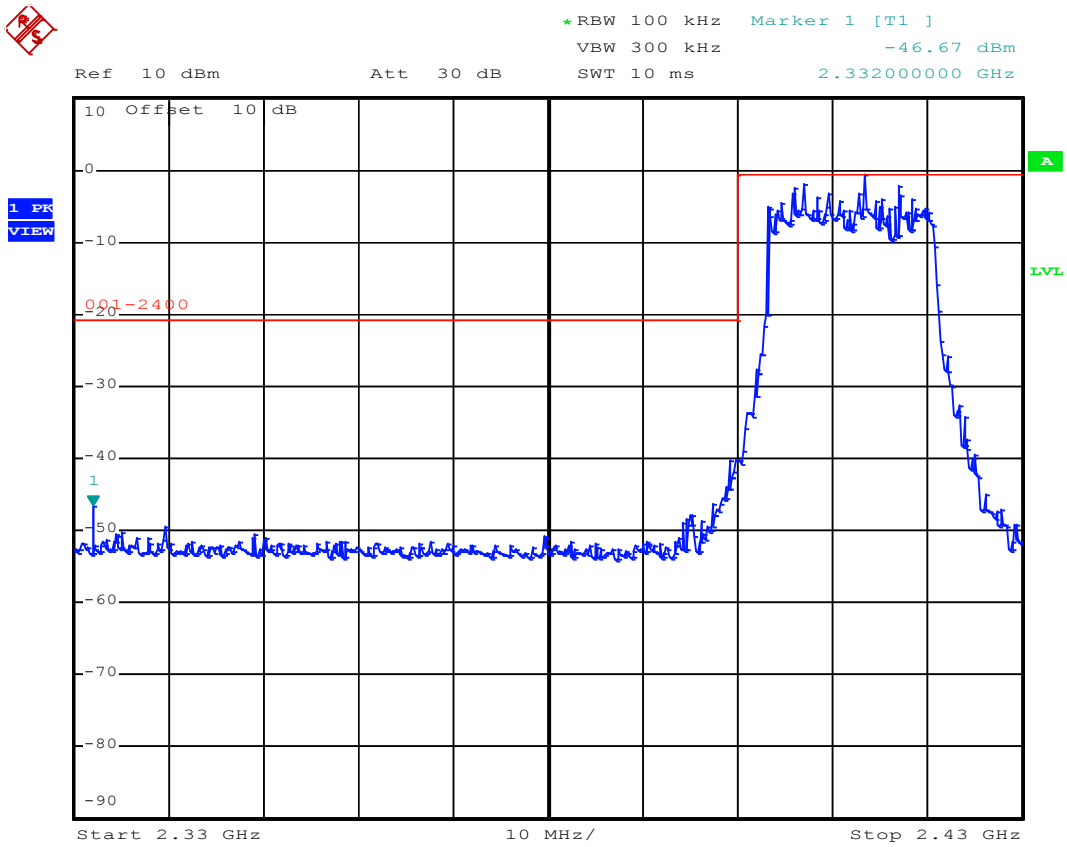

RBW 100 kHz
VBW 300 kHz
SWT 10 ms
Marker 1 [T1 ]
-41.36 dBm
2.488400000 GHz
Ref 20 dBm
Att 40 dB
Offset 10 dB
1 PK VIEW
A
LVL
001-UN
Start 2.45 GHz
10 MHz/
Stop 2.55 GHz

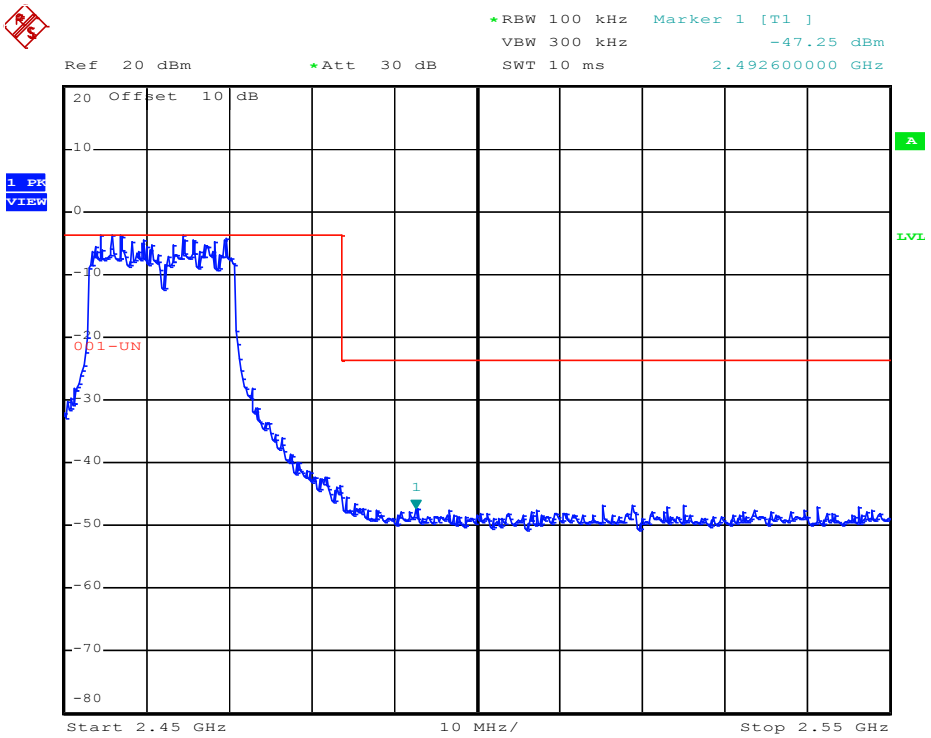
**802.11g**


RBW 100 kHz
Marker 1 [T1 ]
VBW 300 kHz
-36.21 dBm
Ref 20 dBm
Att 40 dB
SWT 10 ms
2.394200000 GHz
20 Offset 10 dB
1 PK VIEW
A
LVL
001-UN
Start 2.33 GHz
10 MHz/
Stop 2.43 GHz

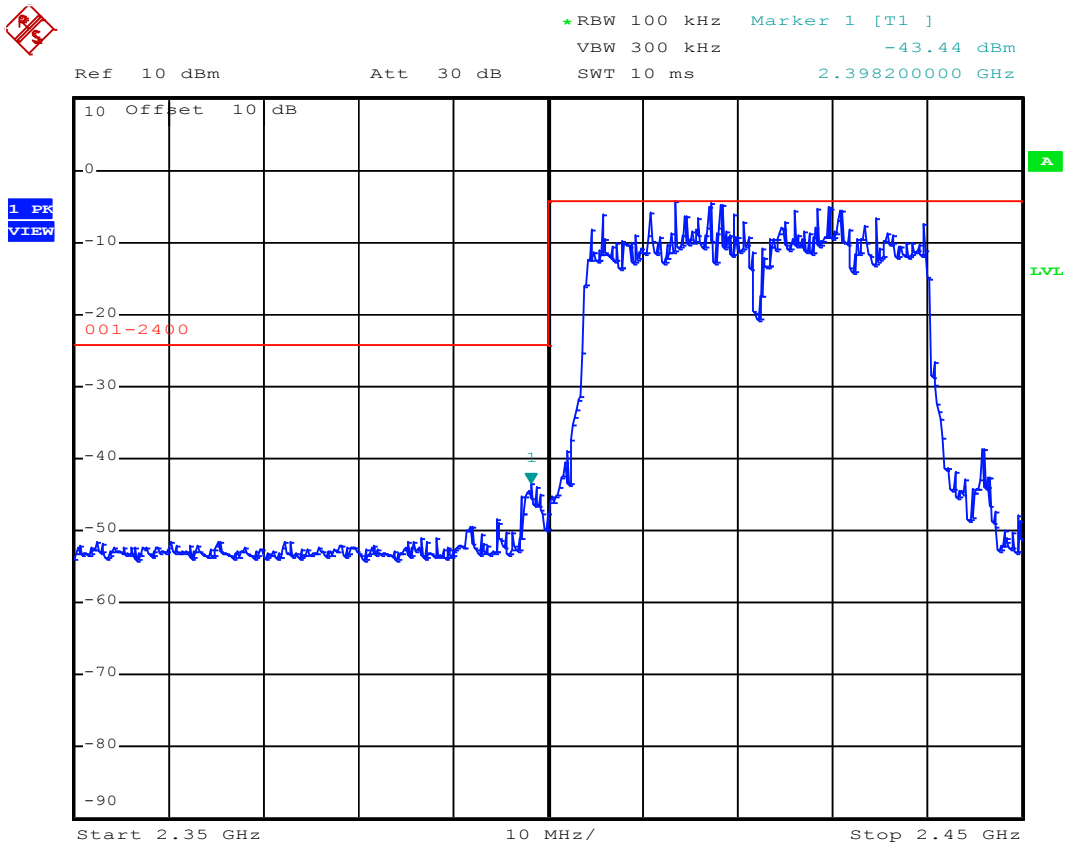

RBW 100 kHz
Marker 1 [T1 ]
VBW 300 kHz
-41.45 dBm
Ref 20 dBm
Att 40 dB
SWT 10 ms
2.486000000 GHz
20 Offset 10 dB
1 PK VIEW
A
LVL
001-UN
Start 2.45 GHz
10 MHz/
Stop 2.55 GHz

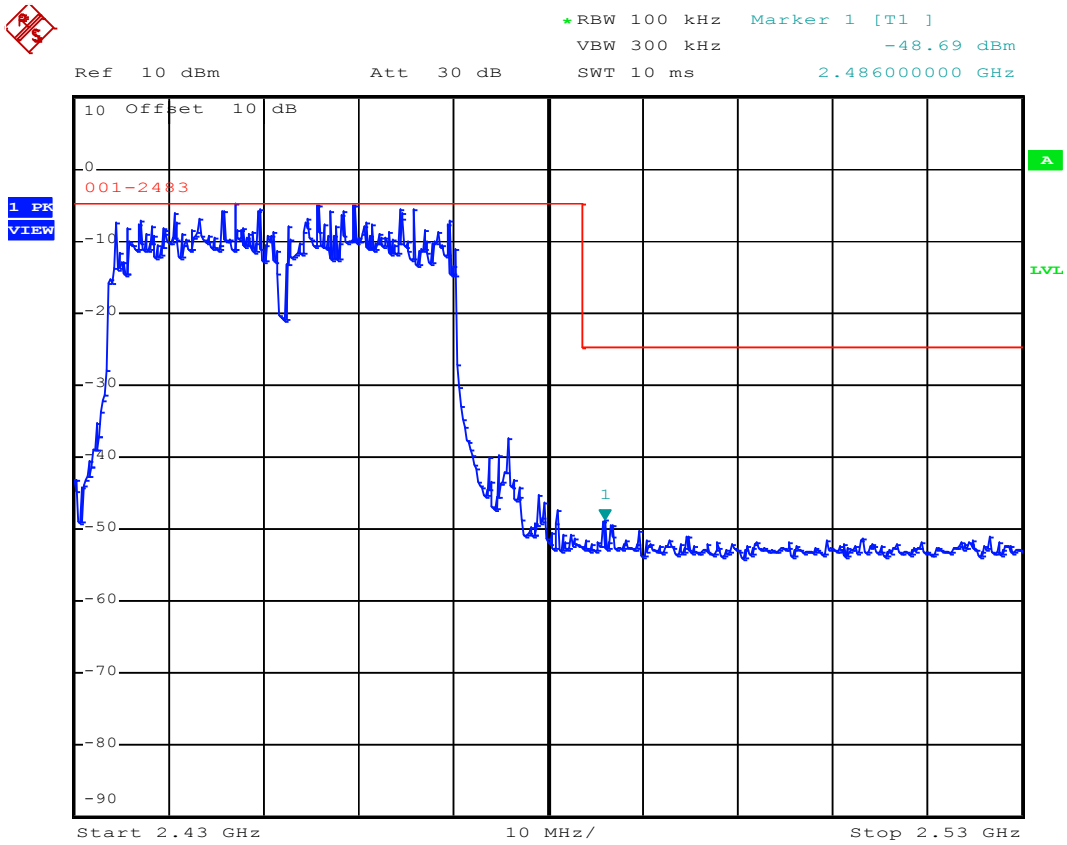
## 802.11n HT-20


*RBW 100 kHz
VBW 300 kHz
SWT 10 ms
Marker 1 [T1 ]
-46.67 dBm
2.332000000 GHz
Ref 10 dBm
Att 30 dB
10 Offset 10 dB
1 PK VIEW
A
LVL
001-2400
Start 2.33 GHz
10 MHz/
Stop 2.43 GHz


*RBW 100 kHz
VBW 300 kHz
SWT 10 ms
Marker 1 [T1 ]
-47.25 dBm
2.492600000 GHz
Ref 20 dBm
*Att 30 dB
20 Offset 10 dB
1 PK VIEW
A
LVL
001-UN
Start 2.45 GHz
10 MHz/
Stop 2.55 GHz

## 802.11n HT-40


*RBW 100 kHz
Marker 1 [T1 ]
VBW 300 kHz
-43.44 dBm
Ref 10 dBm
Att 30 dB
SWT 10 ms
2.398200000 GHz
10 Offset 10 dB
1 PK VIEW
A
LVL
001-2400
Start 2.35 GHz
10 MHz/
Stop 2.45 GHz


*RBW 100 kHz
Marker 1 [T1 ]
VBW 300 kHz
-48.69 dBm
Ref 10 dBm
Att 30 dB
SWT 10 ms
2.486000000 GHz
10 Offset 10 dB
1 PK VIEW
A
LVL
001-2483
Start 2.43 GHz
10 MHz/
Stop 2.53 GHz

# 10 POWER DENSITY MEASUREMENT

## 10.1 Standard Applicable

According to 15.247(d), for direct sequence systems, the transmitted power density averaged over any 1 second interval shall not be greater than 8 dBm in any 3 kHz bandwidth within these bands.

## 10.2 Measurement Procedure

Measurement Method: PKPSD

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 5 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set EUT to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Set analyzer center frequency to DTS channel center frequency.
4. Set the span to 1.5 times the DTS bandwidth.
5. Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
6. Set the VBW ≥ 3 x RBW.
7. Detector = peak.
8. Sweep time = auto couple.
9. Trace mode = max hold.
10. Allow trace to fully stabilize.
11. Use the peak marker function to determine the maximum amplitude level within the RBW.
12. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
13. Repeat above procedures until all measured frequencies were complete.

## 10.3 Measurement Equipment

| Equipment | Manufacturer | Model No. | Calibration Date | Next Cal. Date |
|---|---|---|---|---|
| Spectrum Analyzer | Rohde & Schwarz | FSP40 | 2017/11/02 | 2018/11/01 |
| Attenuator | MINI-CIRCUITS | BW-S10W2+ | 2016/09/30 | 2018/09/29 |

## 10.4 Measurement Data

Test Date : July 05, 2018 Temperature : 23 ℃ Humidity : 55 %

**A. 802.11b @11 Mbps**

a) Channel Low: Maximun PSD is -13.17 dBm
b) Channel Mid: Maximun PSD is -13.28 dBm
c) Channel High: Maximun PSD is -12.05 dBm

**B. 802.11g @54 Mbps**

a) Channel Low: Maximun PSD is -16.22 dBm
b) Channel Mid: Maximun PSD is -19.12 dBm
c) Channel High: Maximun PSD is -17.67 dBm

**C. 802.11n HT-20 @ MCS7**

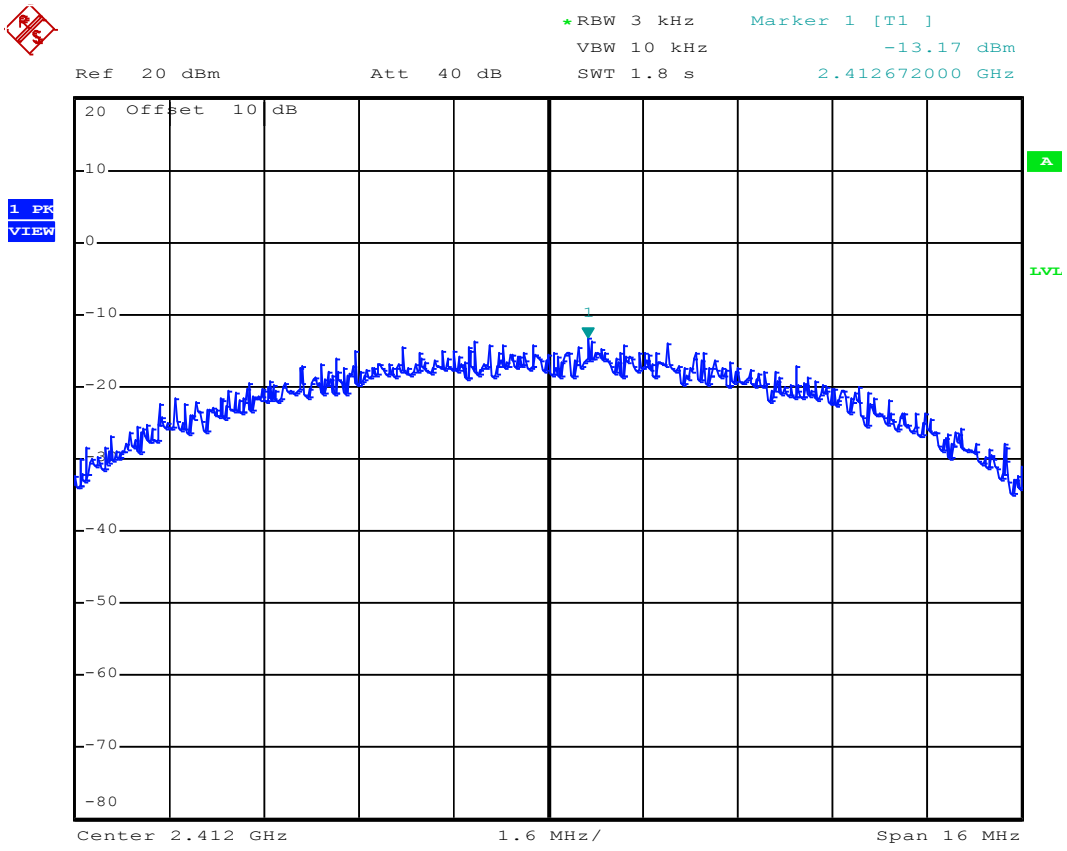
a) Channel Low: Maximun PSD is -18.85 dBm
b) Channel Mid: Maximun PSD is -17.81 dBm
c) Channel High: Maximun PSD is -19.64 dBm

**D. 802.11n HT-40 @ MCS7**

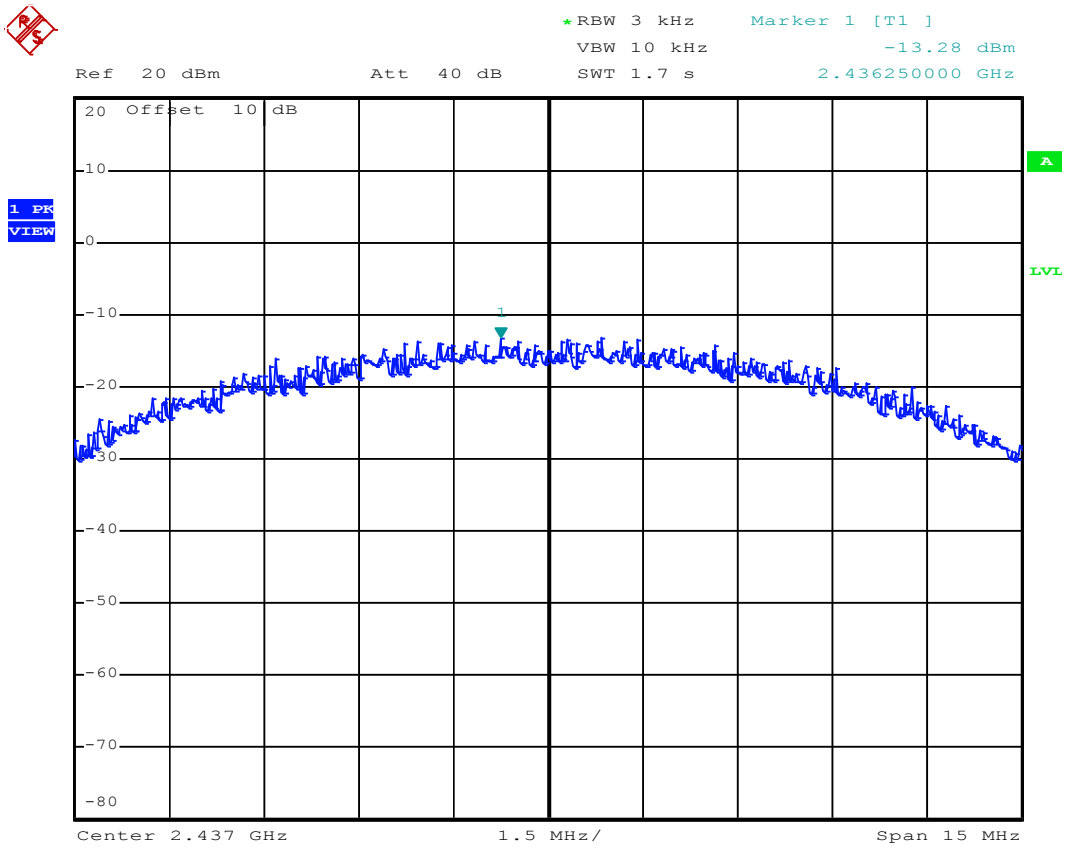
a) Channel Low: Maximun PSD is -18.51 dBm
b) Channel Mid: Maximun PSD is -19.90 dBm
c) Channel High: Maximun PSD is -21.64 dBm

***Note : The expanded uncertainty: 2dB.***

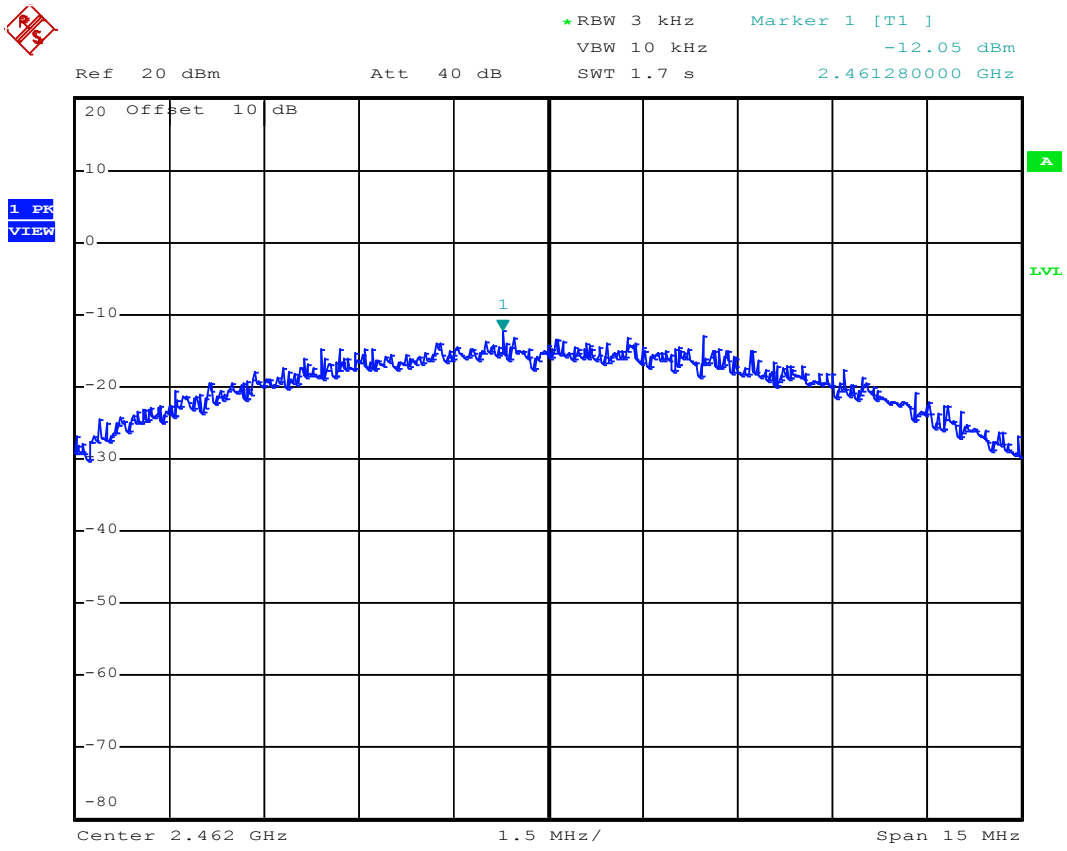
## 802.11b / Channel Low



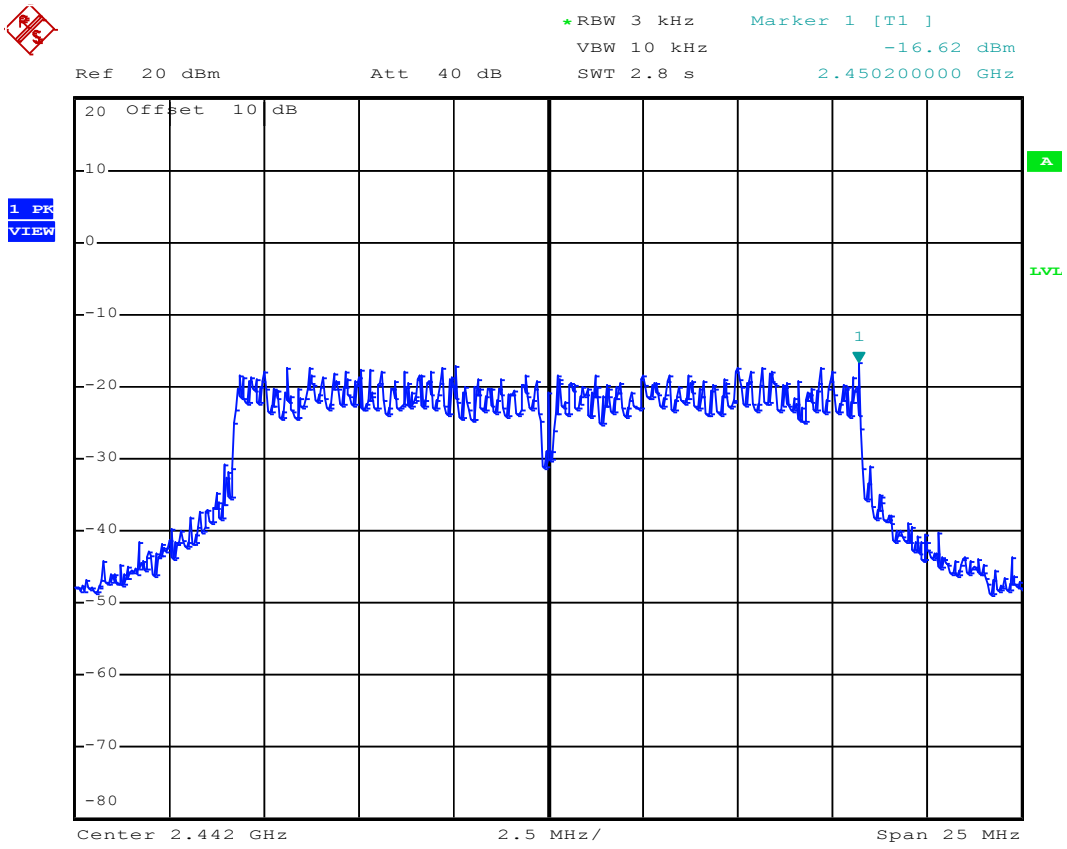
## 802.11b / Channel Mid



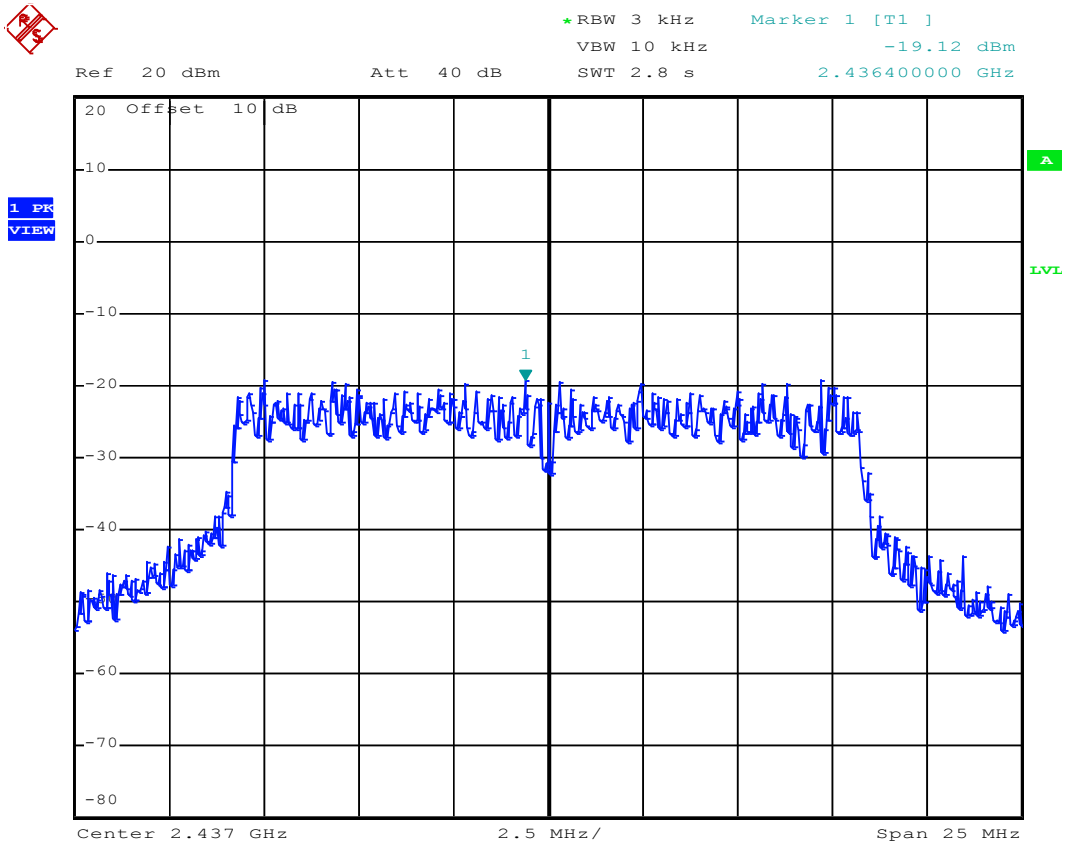
## 802.11b / Channel High



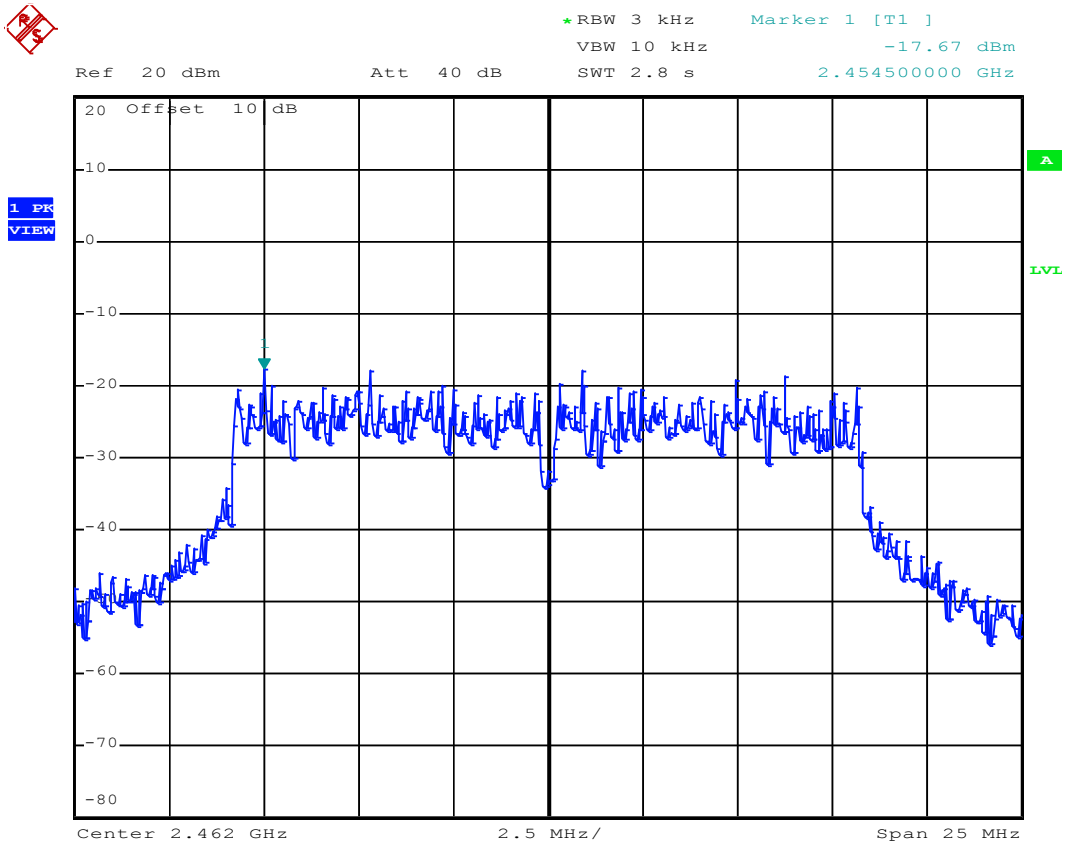
## 802.11g / Channel Low



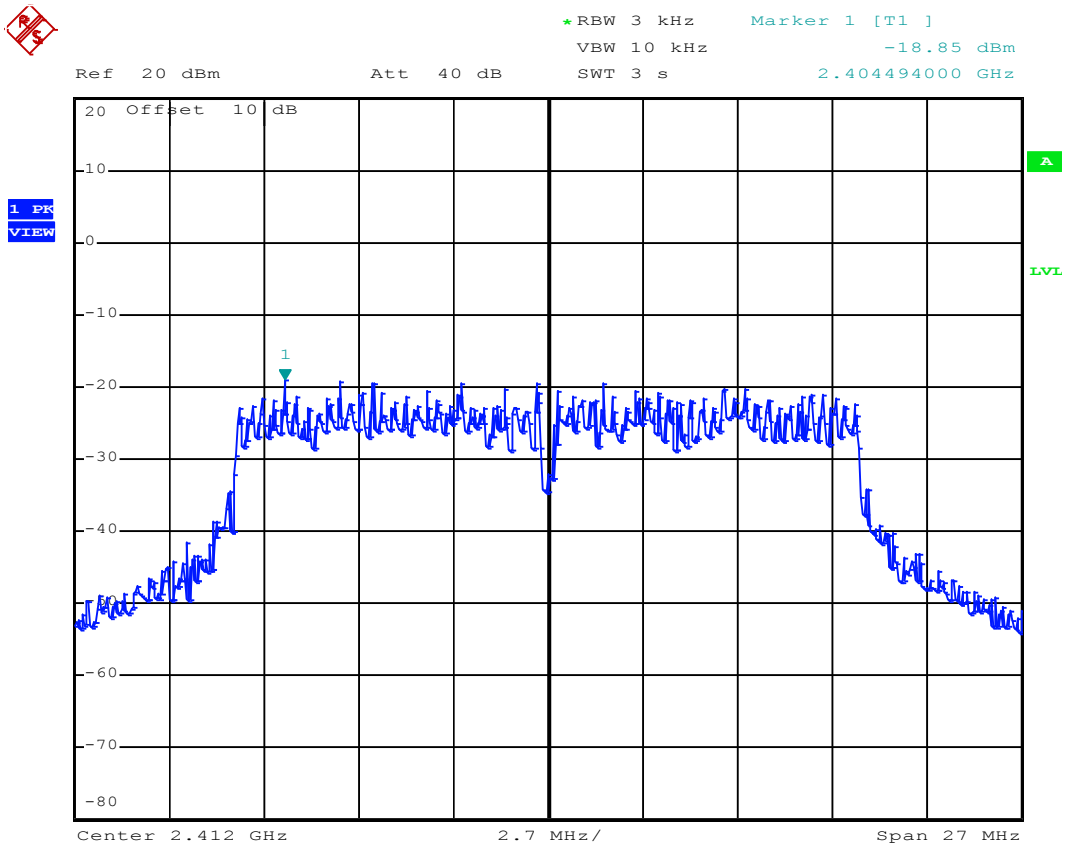
## 802.11g / Channel Mid



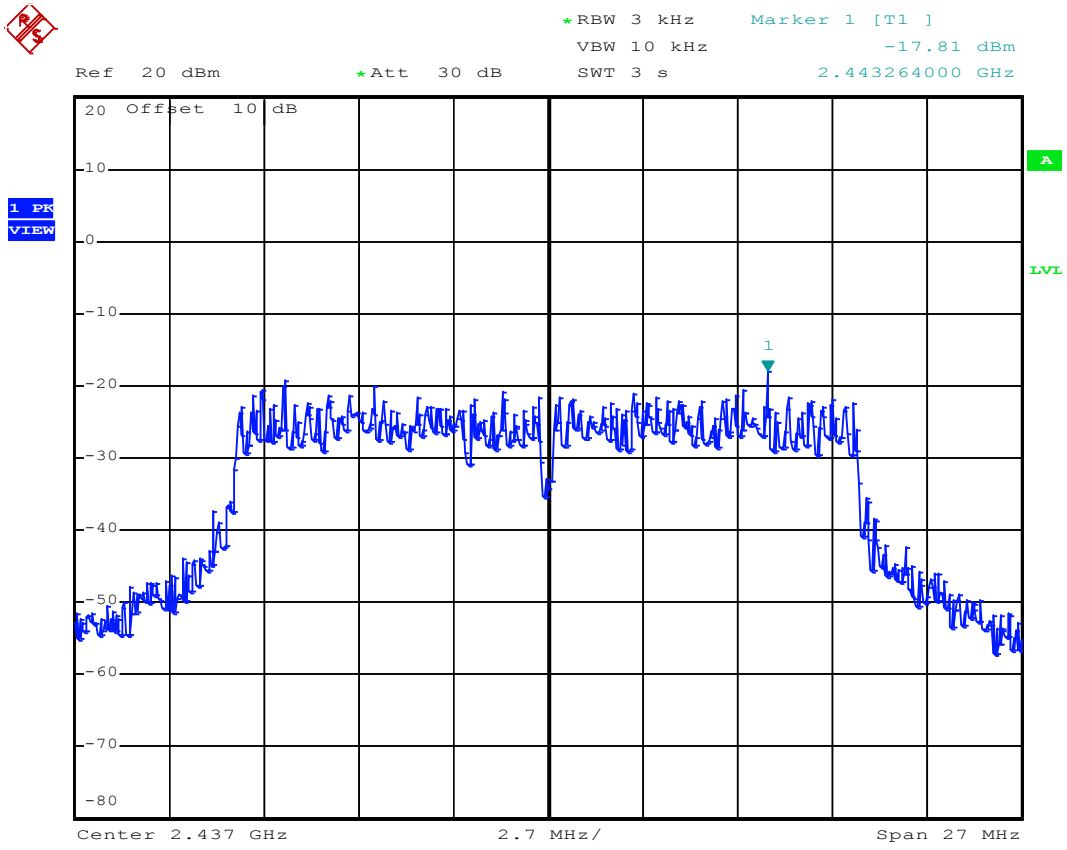
## 802.11g / Channel High



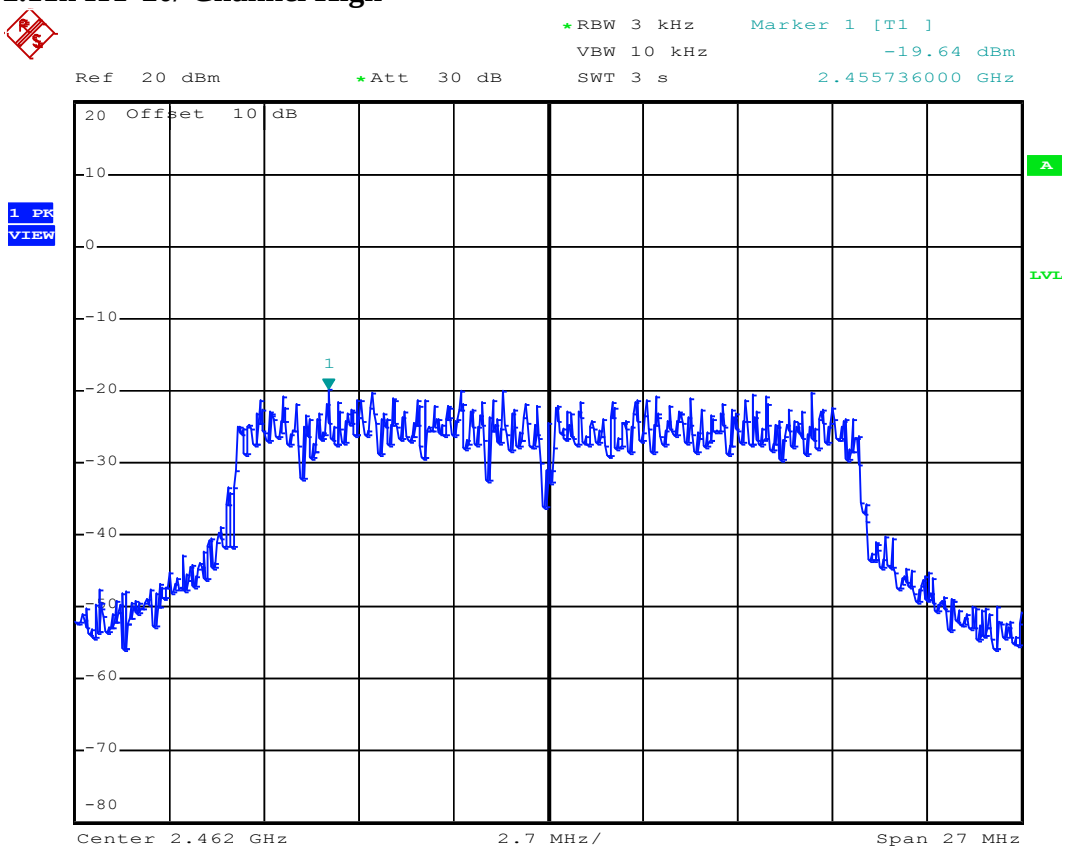
## 802.11n HT-20/Channel Low



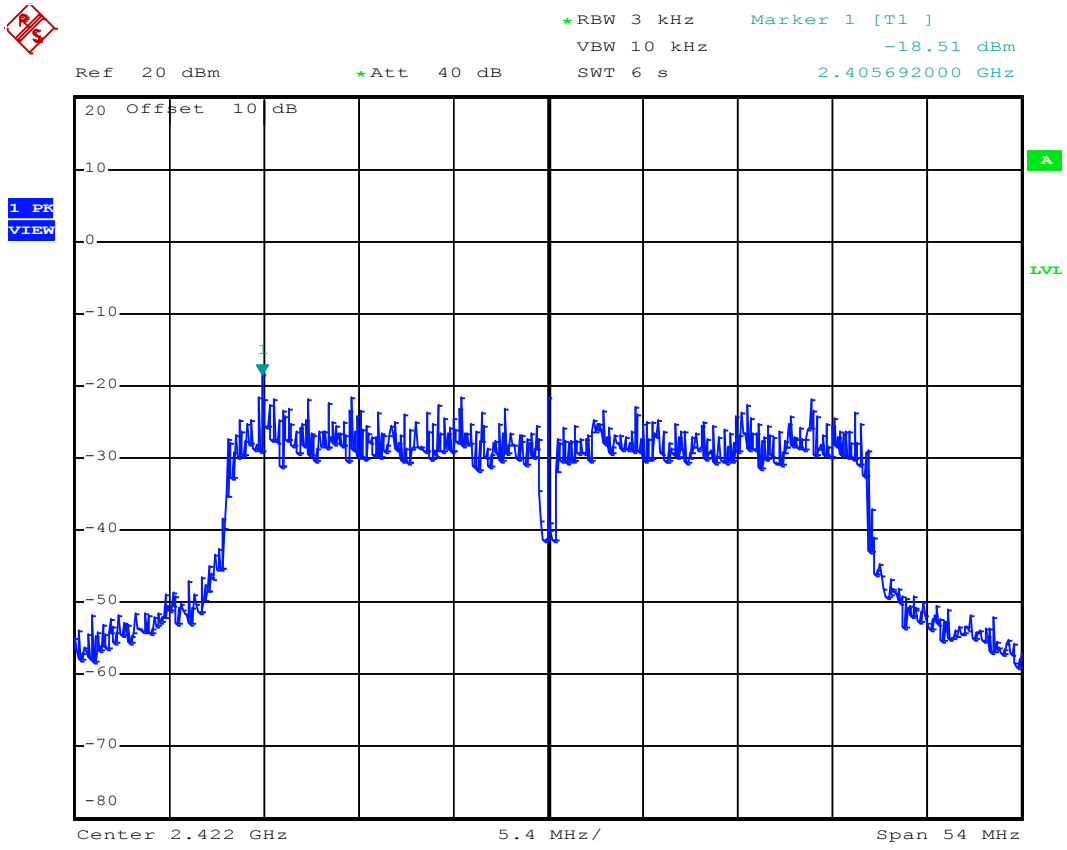
## 802.11n HT-20/ Channel Mid



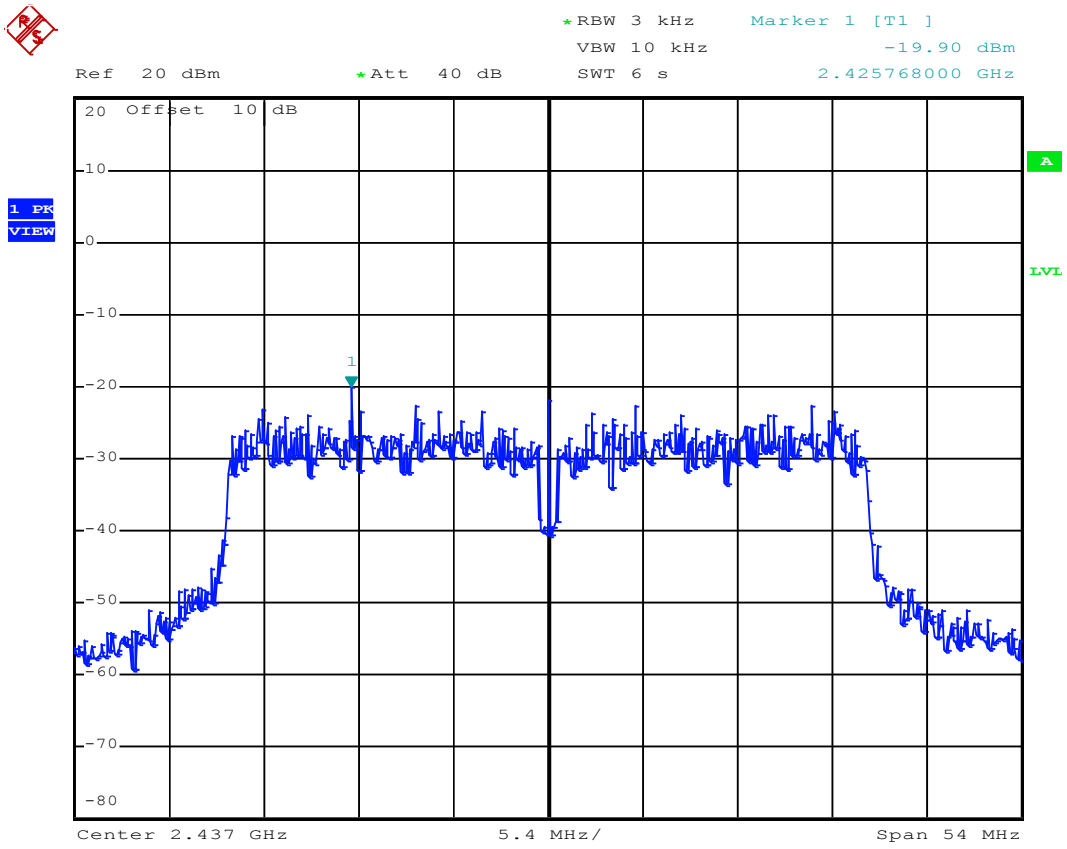
## 802.11n HT-20/ Channel High



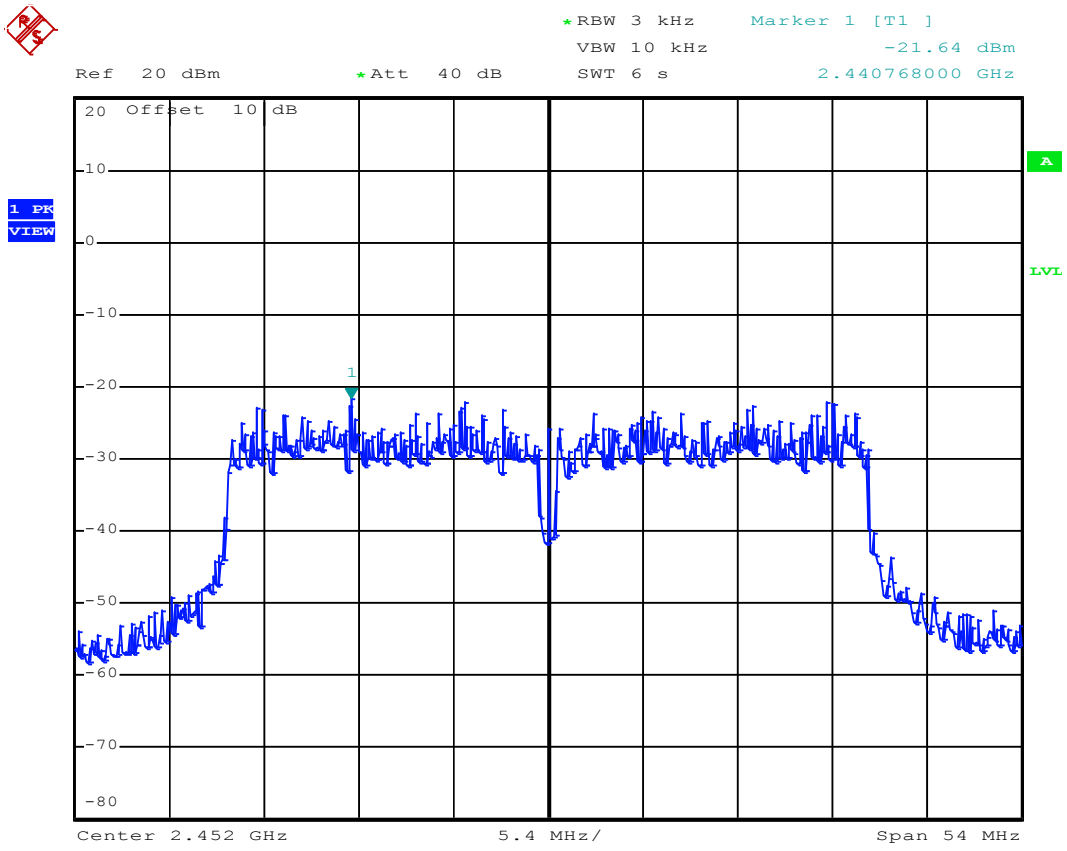
## 802.11n HT-40/ Channel Low



## 802.11n HT-40 Channel Mid



## 802.11n HT-40/ Channel High



# 11. OUT-OF-BAND CONDUCTED EMISSION MEASUREMENT

## 11.1 Standard Applicable

According to 15.247(c), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.

## 11.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Use the following spectrum analyzer settings:
   Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
   RBW = 100 kHz
   VBW ≥ RBW
   Sweep = auto
   Detector function = peak
   Trace = max hold.
4. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded. Plot the result on the screen of spectrum analyzer.
5. Repeat above procedures until all measured frequencies were complete.

## 11.3 Measurement Equipment

| Equipment | Manufacturer | Model No. | Calibration Date | Next Cal. Date |
|---|---|---|---|---|
| Spectrum Analyzer | Rohde & Schwarz | FSP40 | 2017/11/02 | 2018/11/01 |
| Attenuator | MINI-CIRCUITS | BW-S10W2+ | 2016/09/30 | 2018/09/29 |

## 11.4 Measurement Data

Test Date : July 05, 2018 Temperature : 23 ℃ Humidity : 55 %

**A. 802.11b @11 Mbps**

**Mode: Channel Low, Mid, High**

30 MHz to 26.5 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.

**B. 802.11g @54 Mbps**

**Mode: Channel Low, Mid, High**

30 MHz to 26.5 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.

**C. 802.11n HT-20 @MCS7**

**Mode: Channel Low, Mid, High**

30 MHz to 26.5 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.

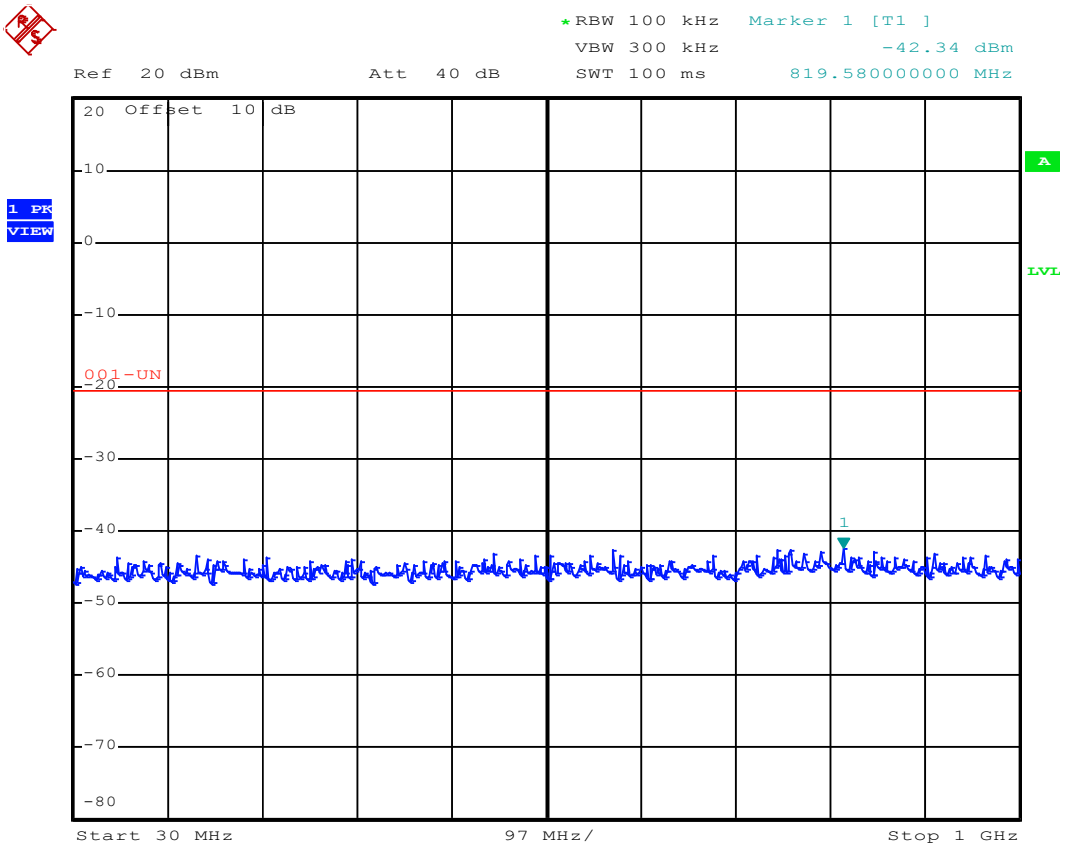
**D. 802.11n HT-40 @ MCS7**

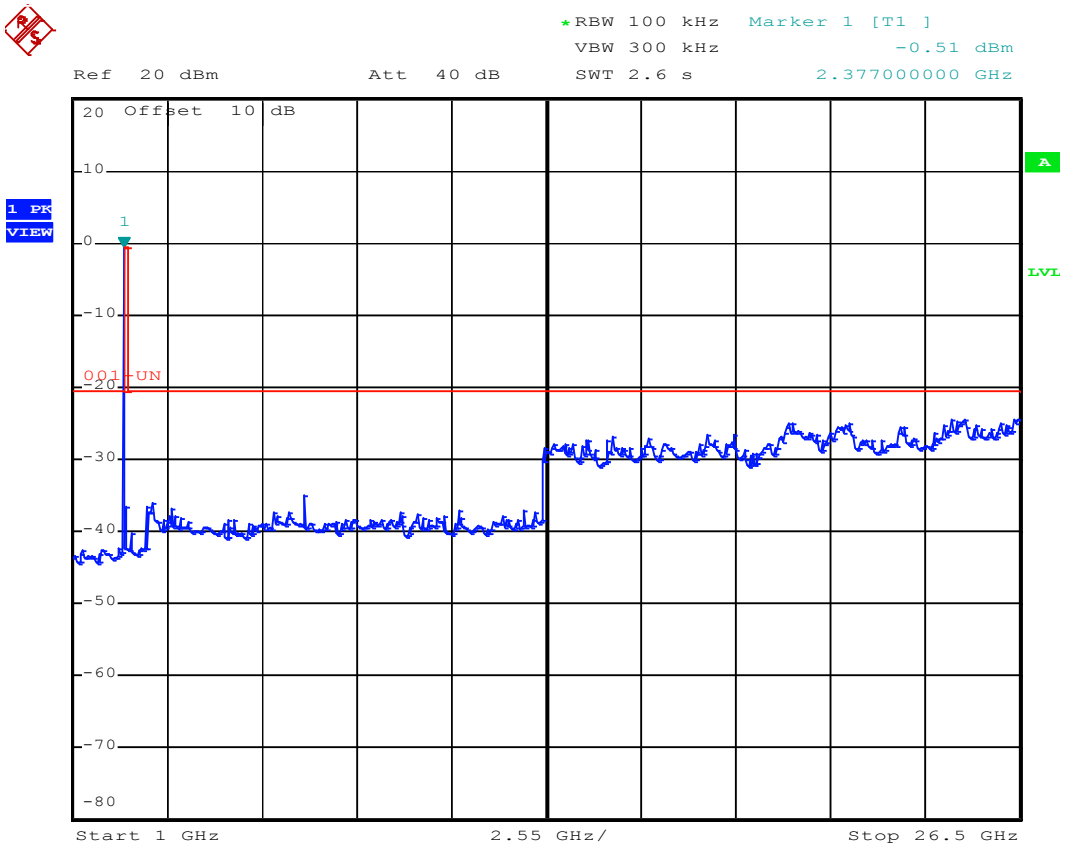
**Mode: Channel Low, Mid, High**

30 MHz to 26.5 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.

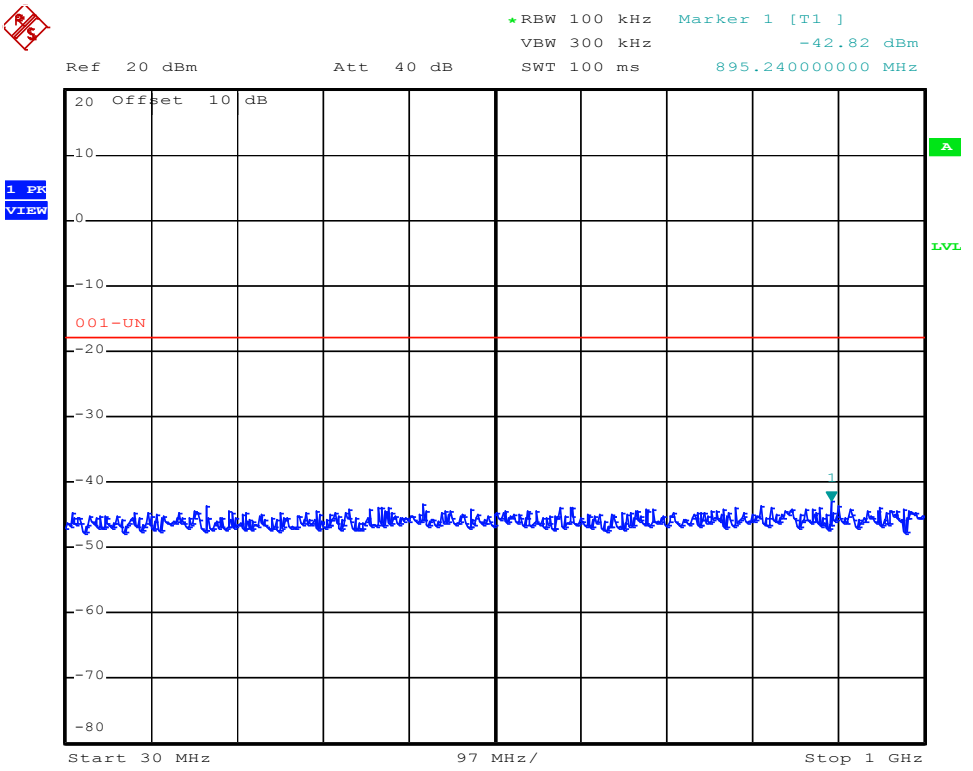
***Note : The expanded uncertainty: 2dB.***

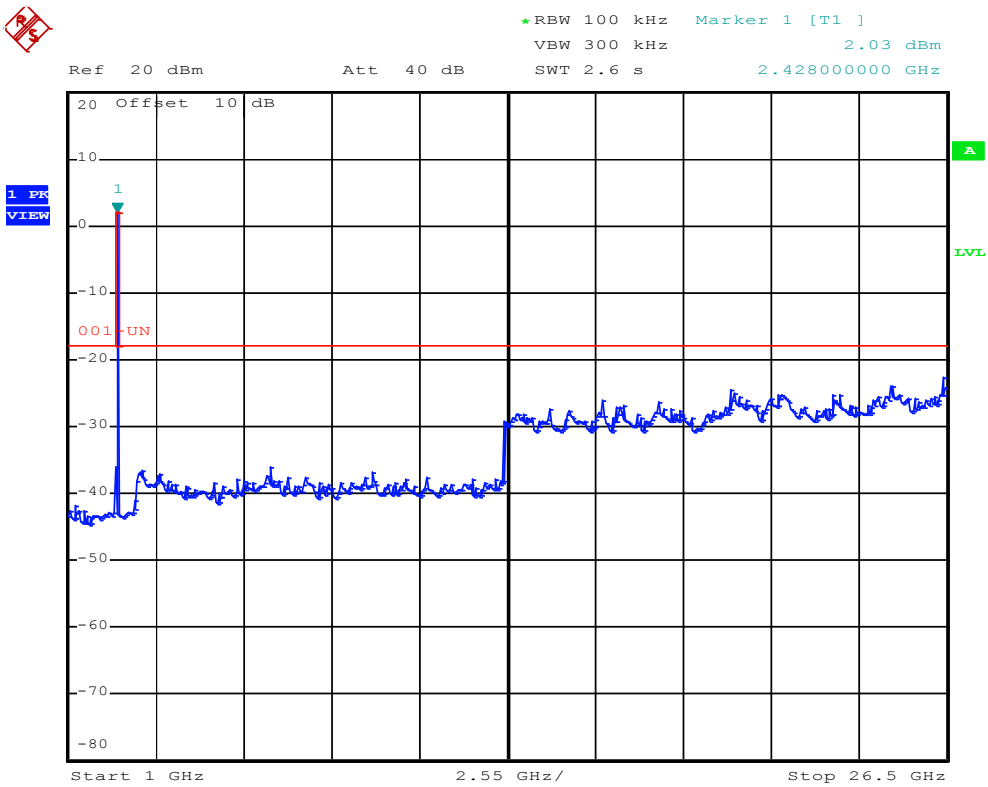
## 802.11b / Channel Low



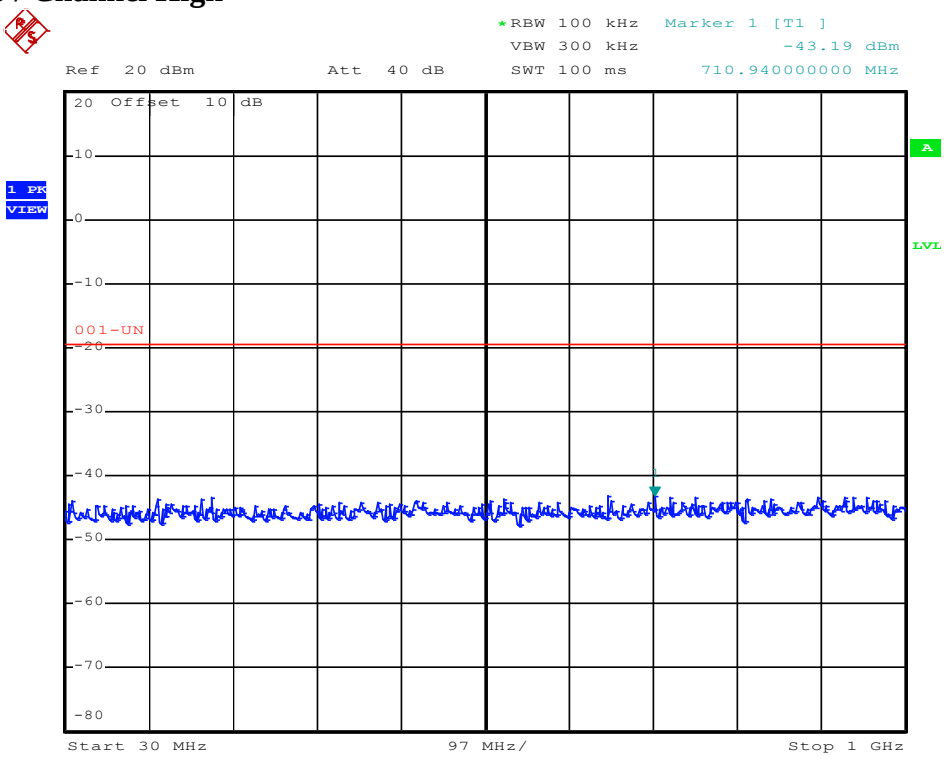



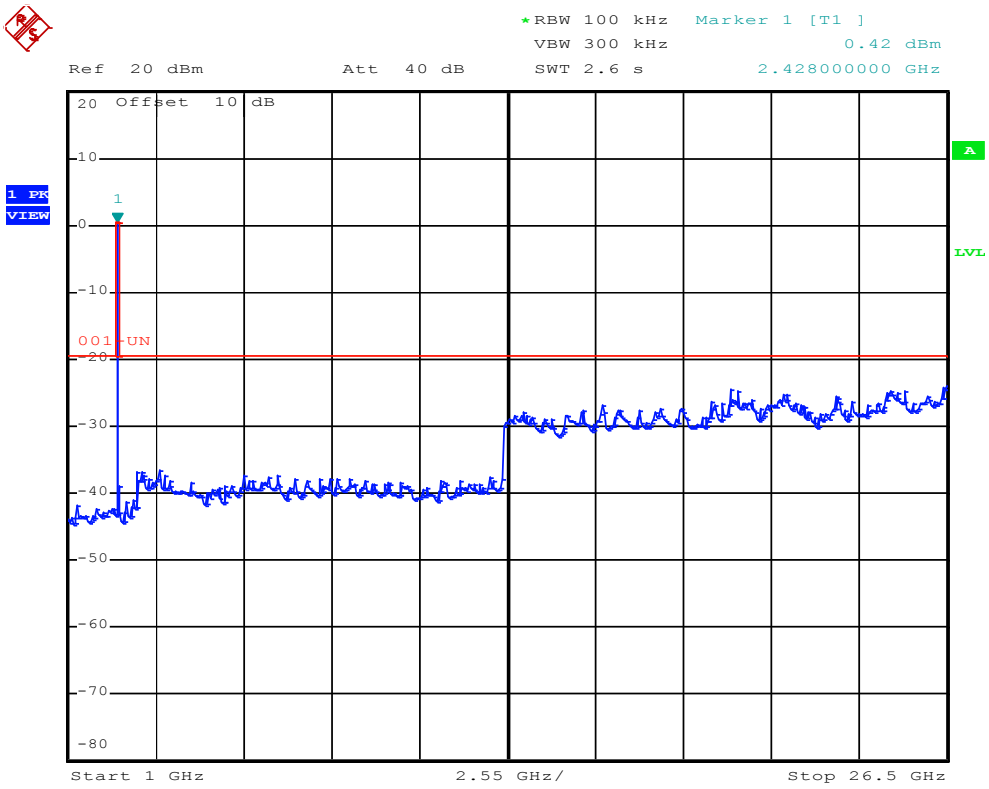
## 802.11b / Channel Mid



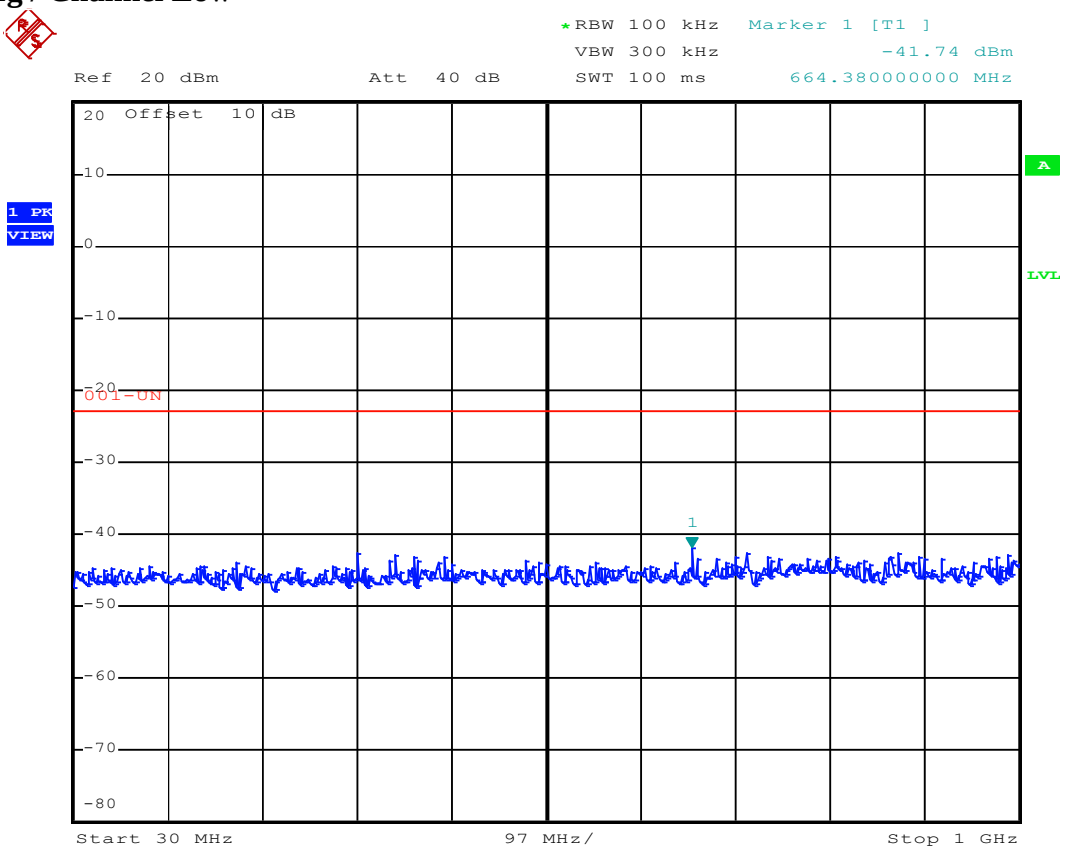



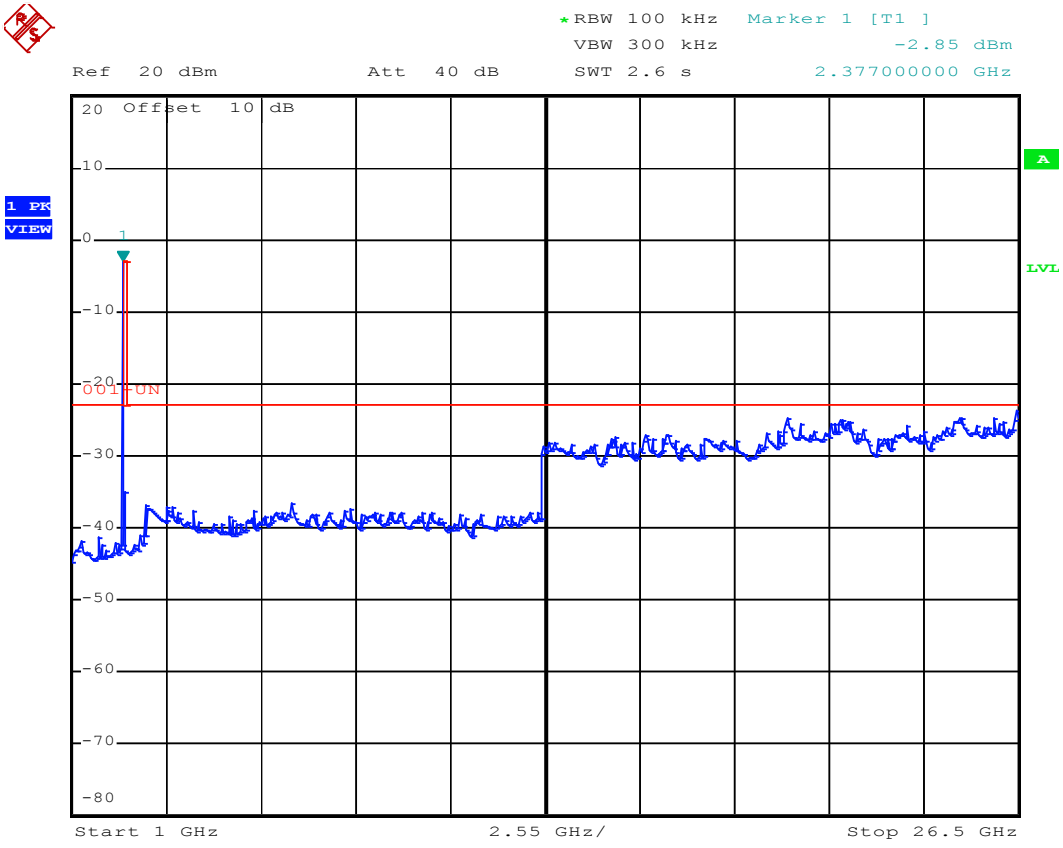
## 802.11b / Channel High



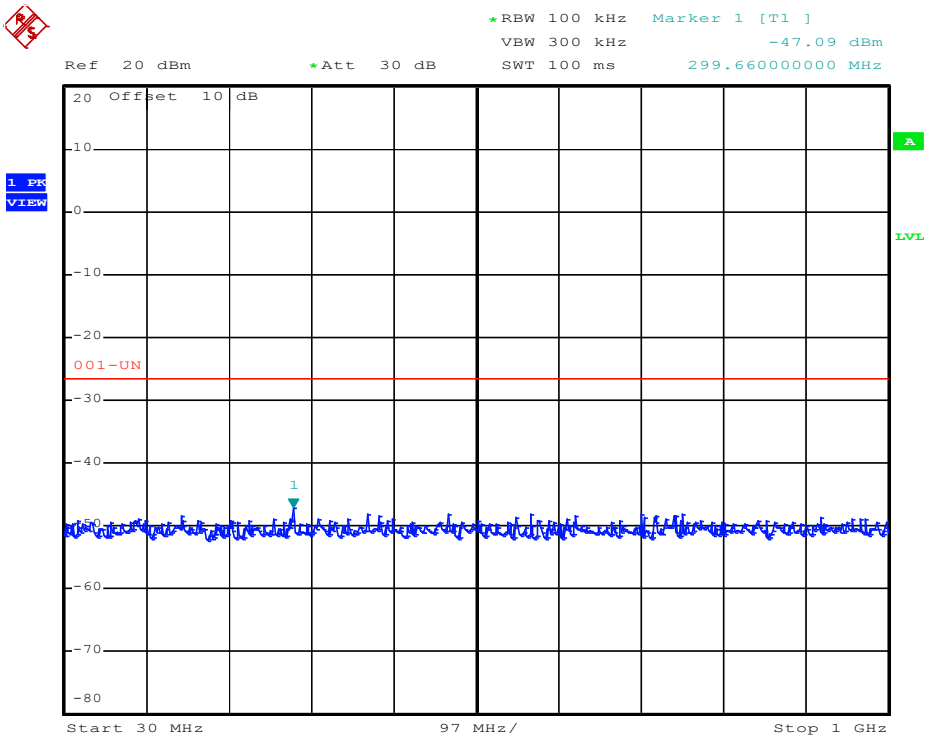



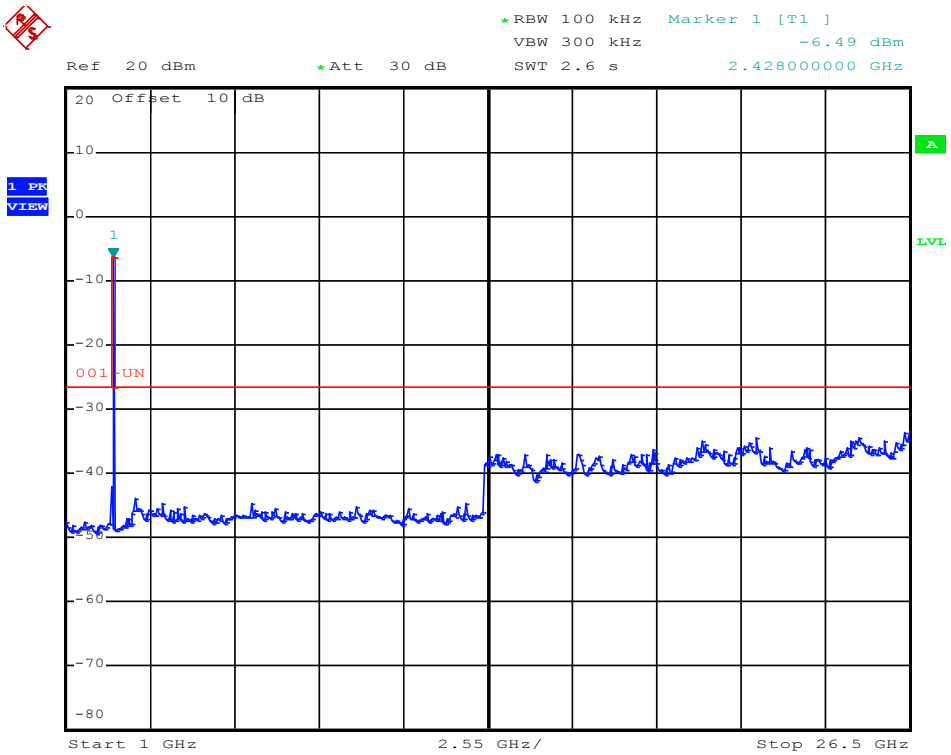
## 802.11g / Channel Low



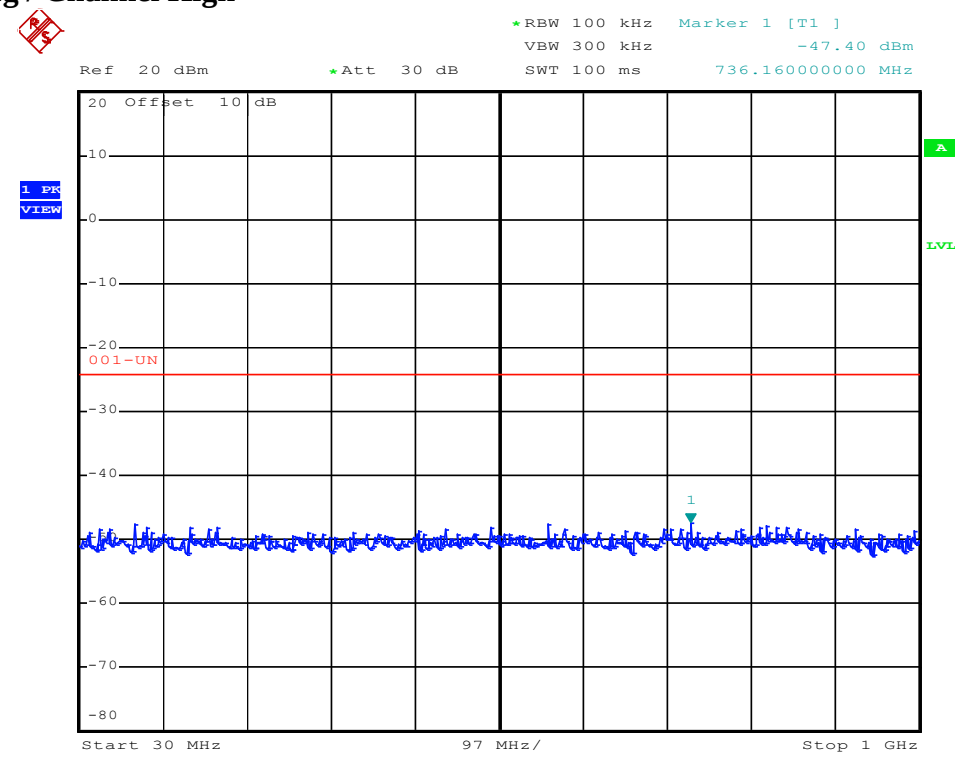



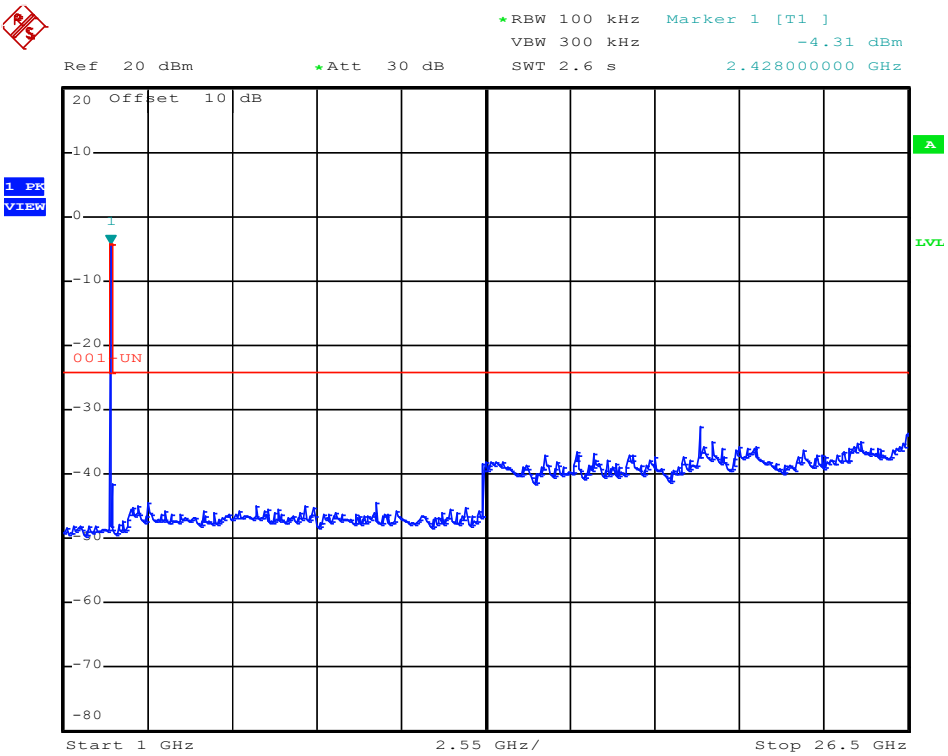
## 802.11g / Channel Mid



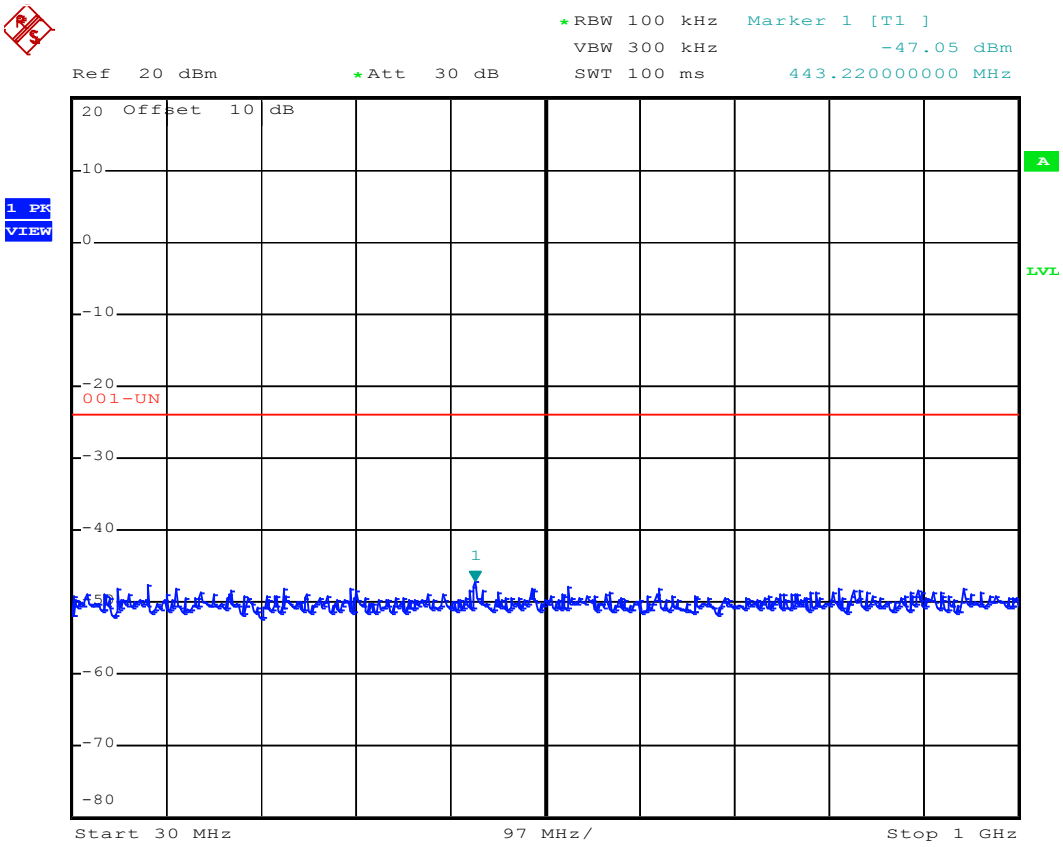



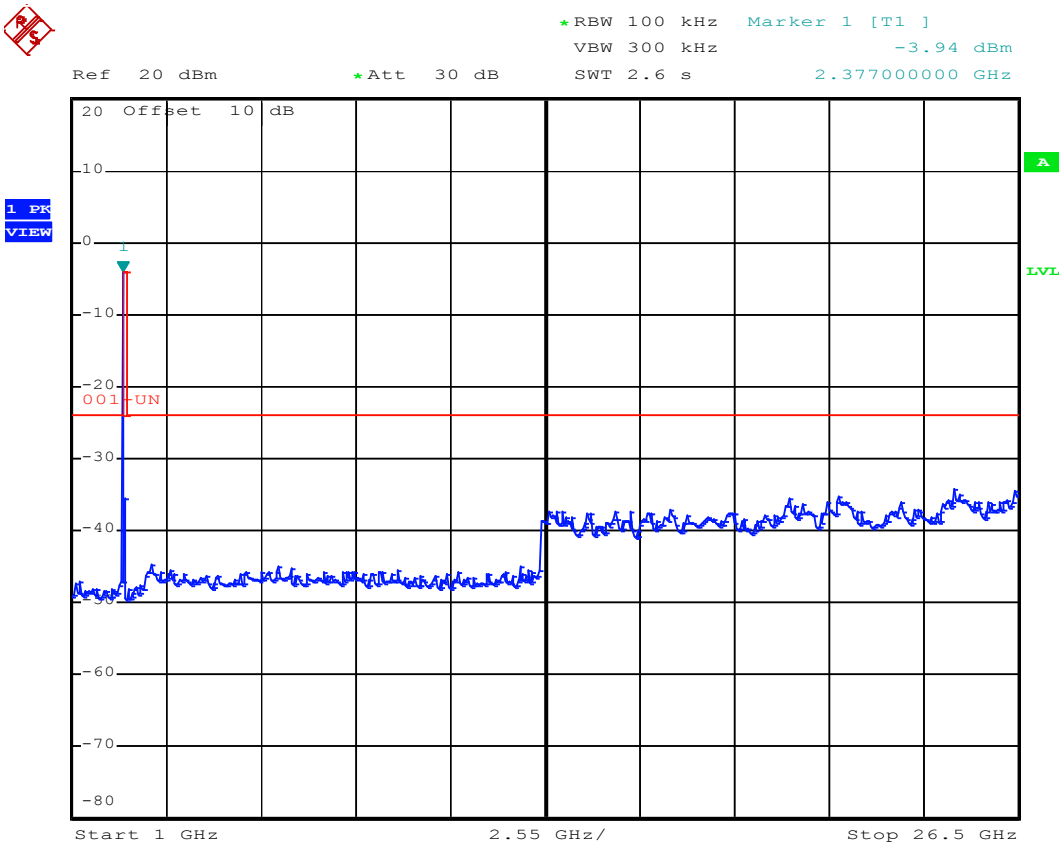
## 802.11g / Channel High



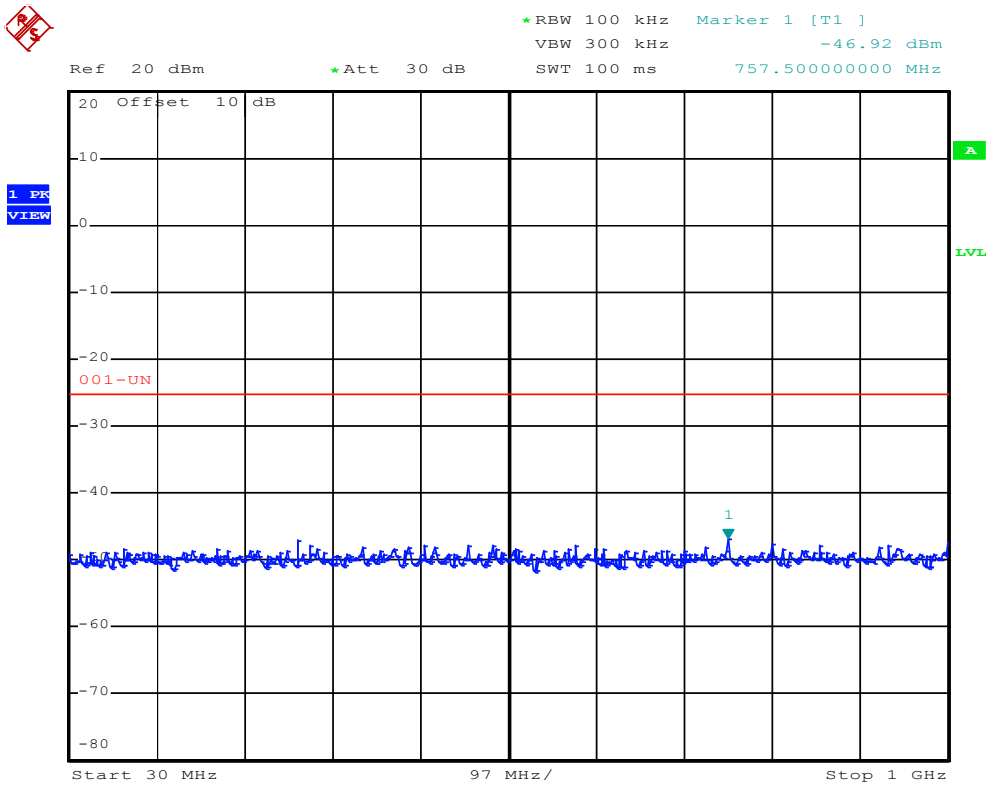



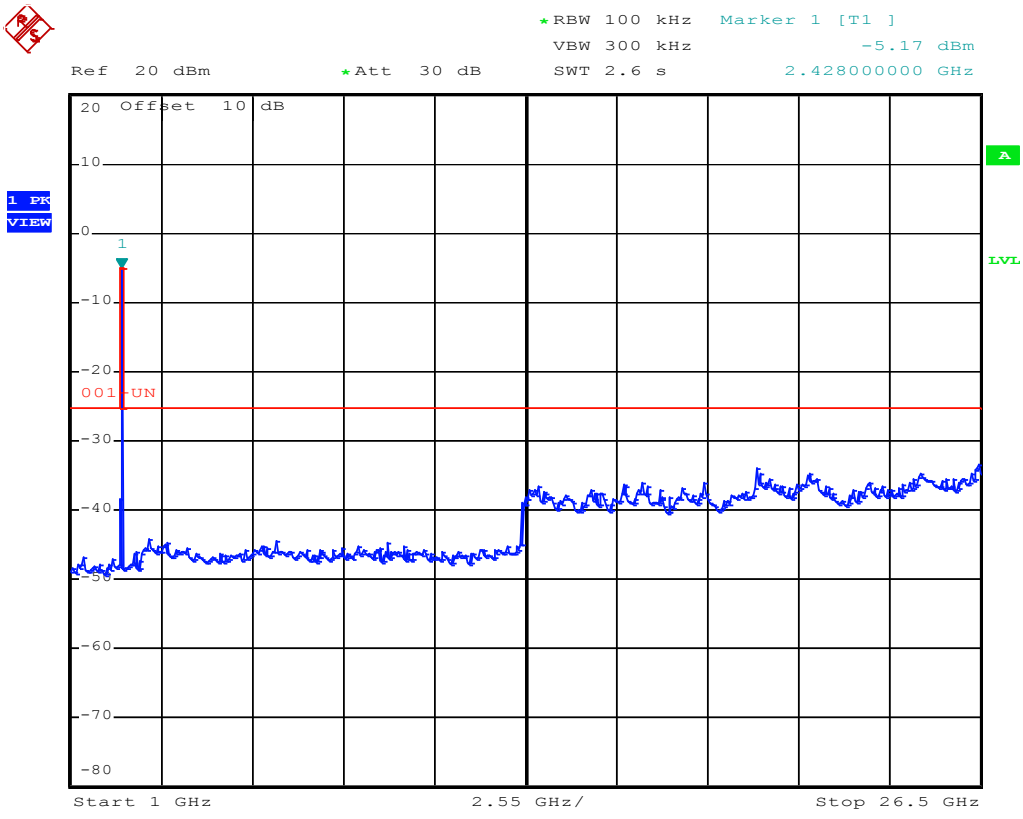
## 802.11n HT-20/ Channel Low



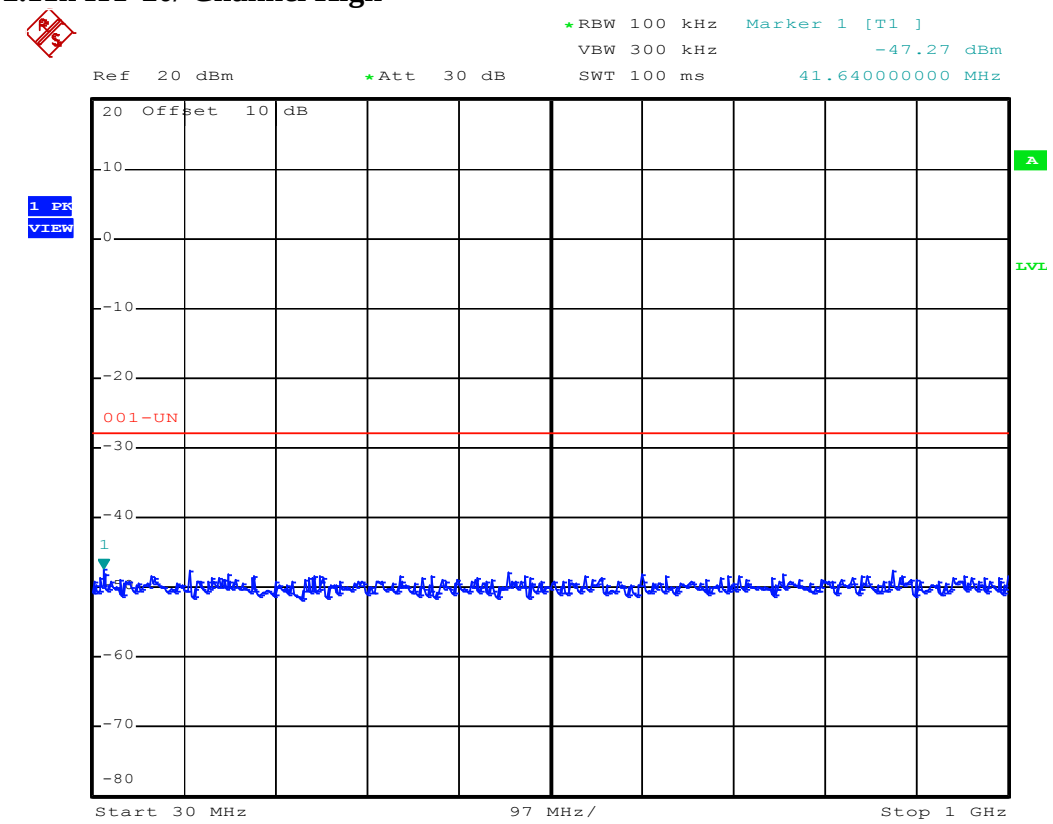



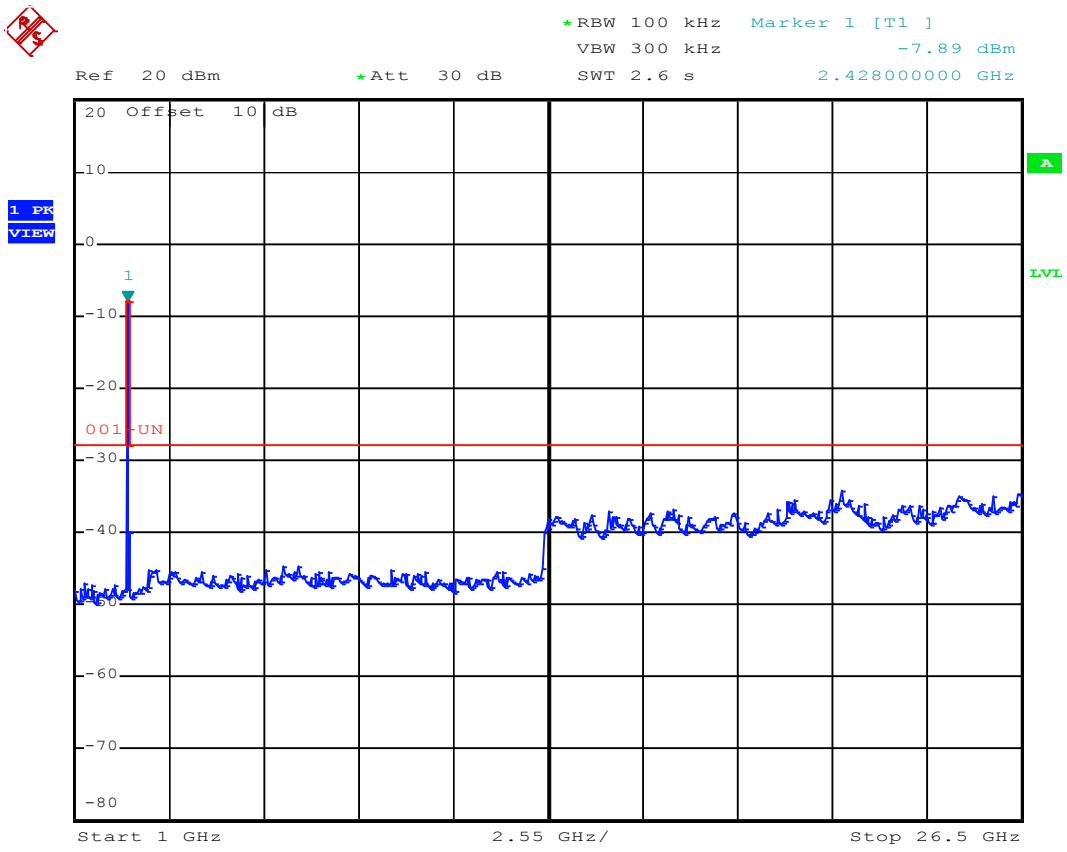
## 802.11n HT-20/ Channel Mid



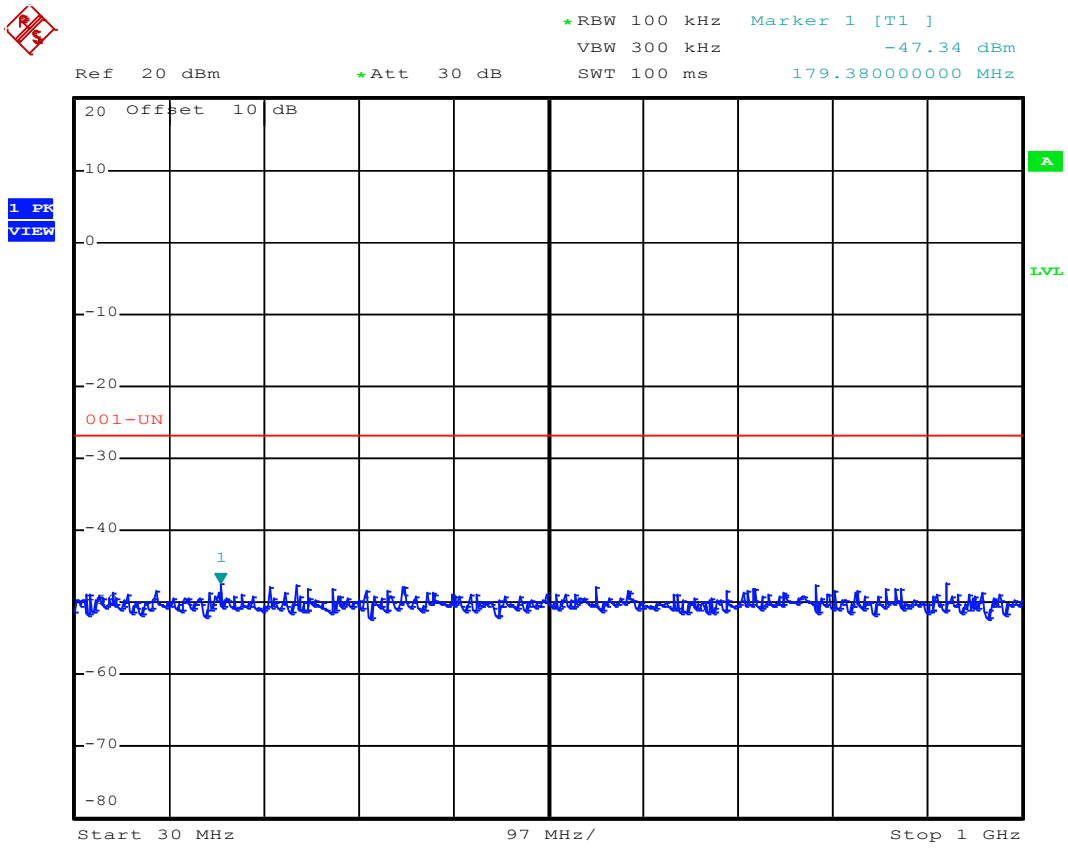



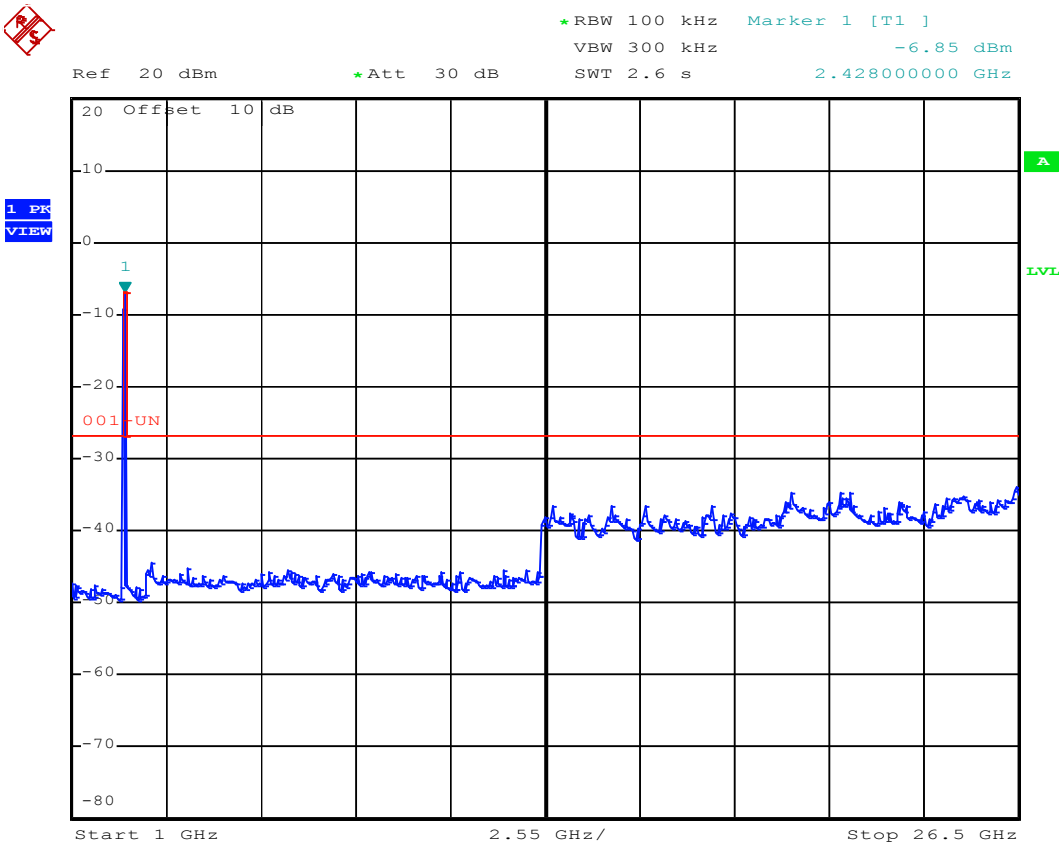
## 802.11n HT-20/ Channel High



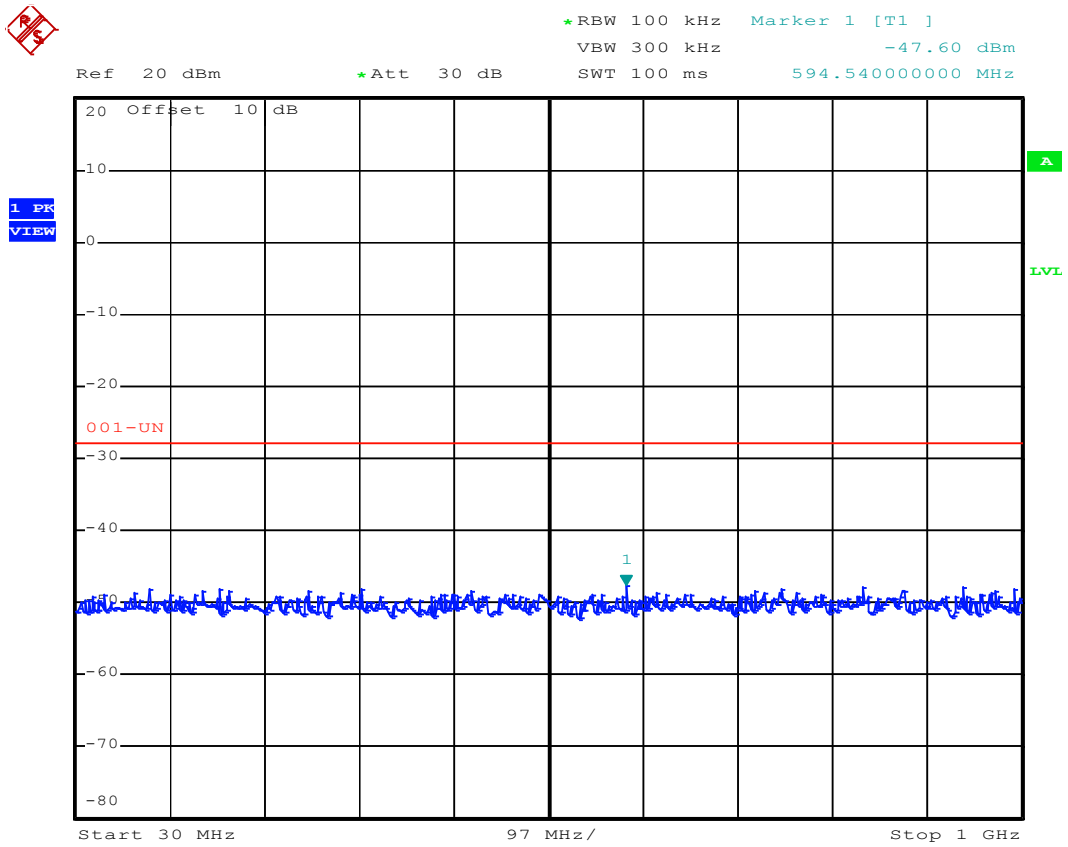



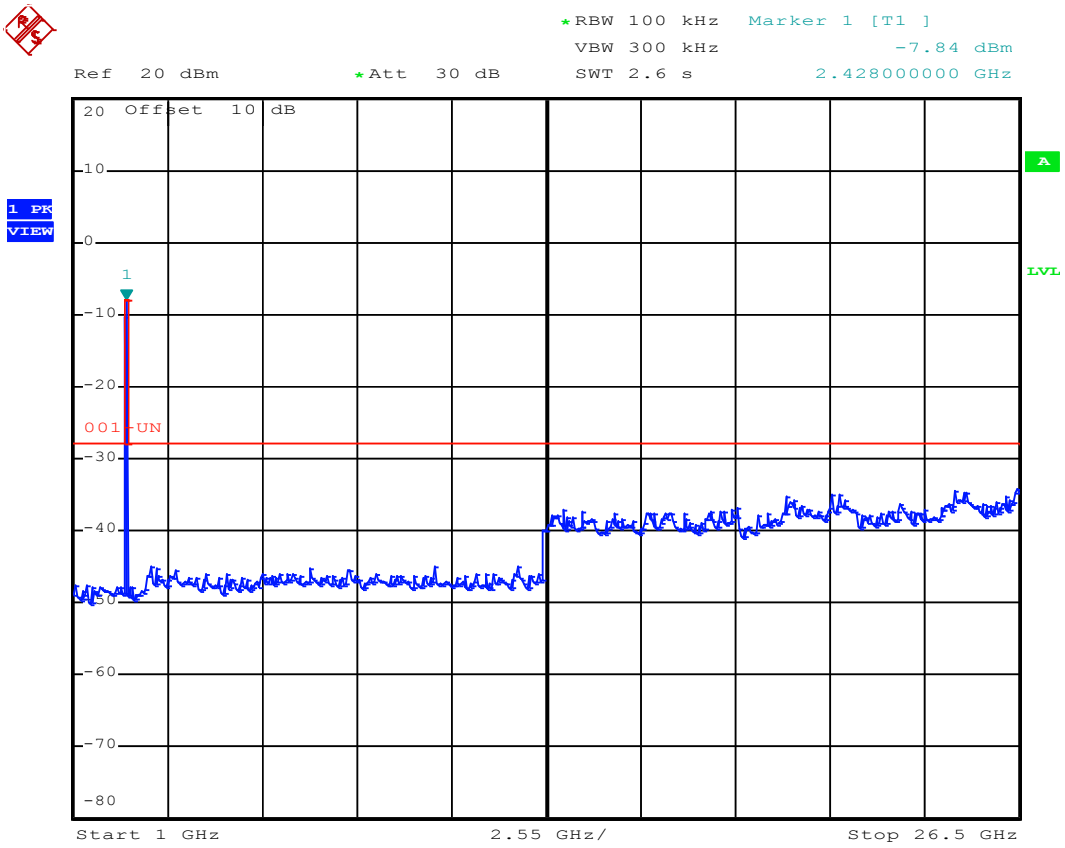
## 802.11n HT-40/ Channel Low



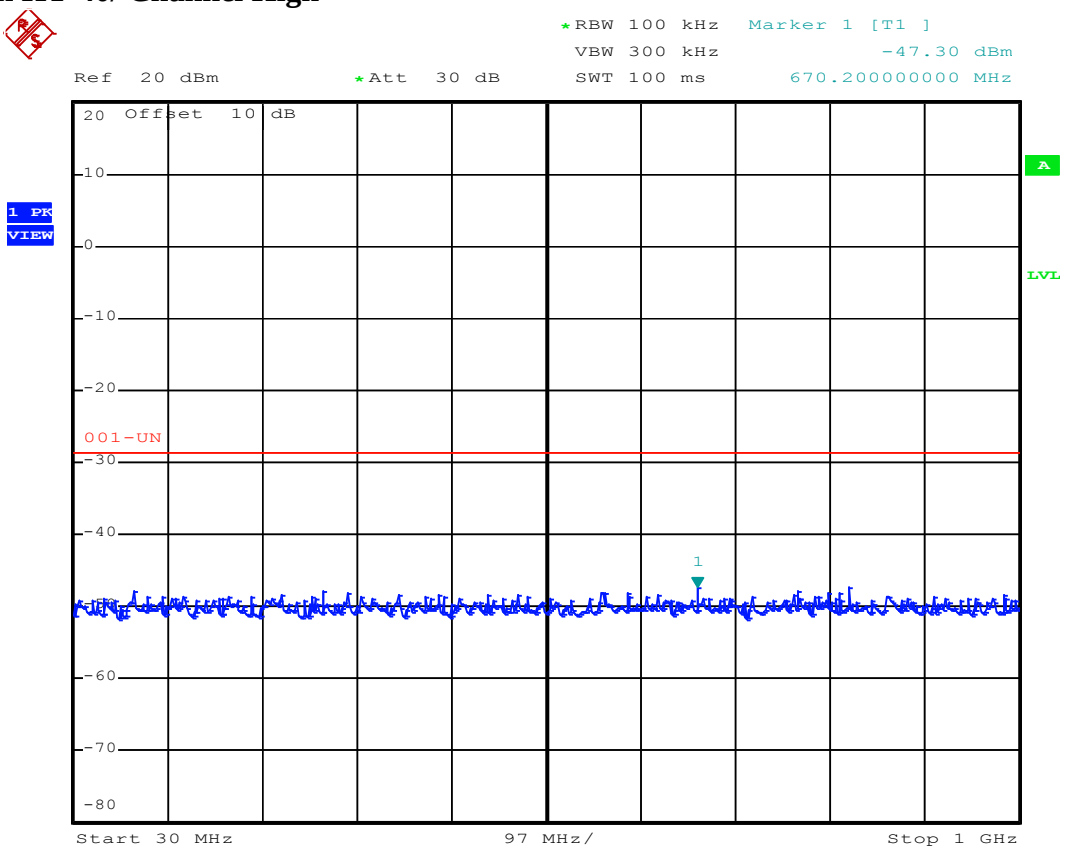



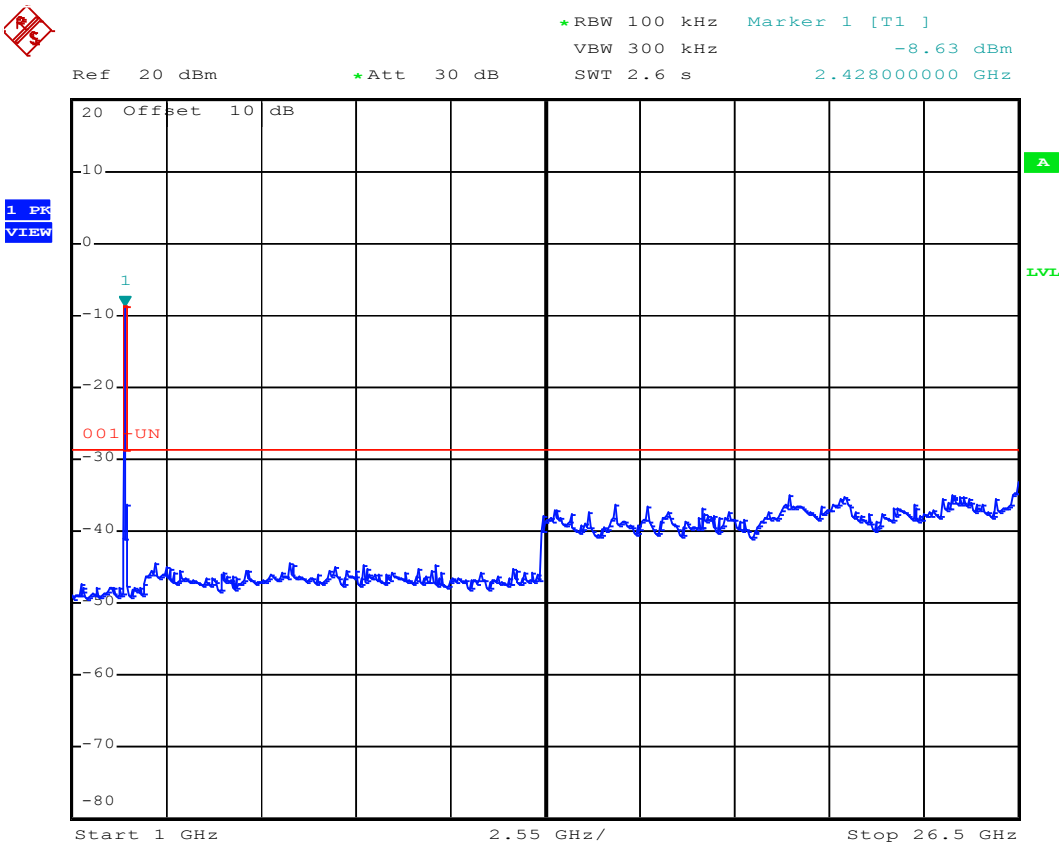
## 802.11n HT-40/ Channel Mid



## 802.11n HT-40/ Channel High



# 12. DUTY CYCLE

## 12.1 Standard Applicable

None. Reference only.

## 12.2 Measurement Equipment

| Equipment | Manufacturer | Model No. | Calibration Date | Next Cal. Date |
|---|---|---|---|---|
| Spectrum Analyzer | Rohde & Schwarz | FSP40 | 2017/11/02 | 2018/11/01 |

## 12.3 Measurement Data

Test Date : July 05, 2018 Temperature : 23 ℃ Humidity : 55 %

**Duty Cycle Calculation**

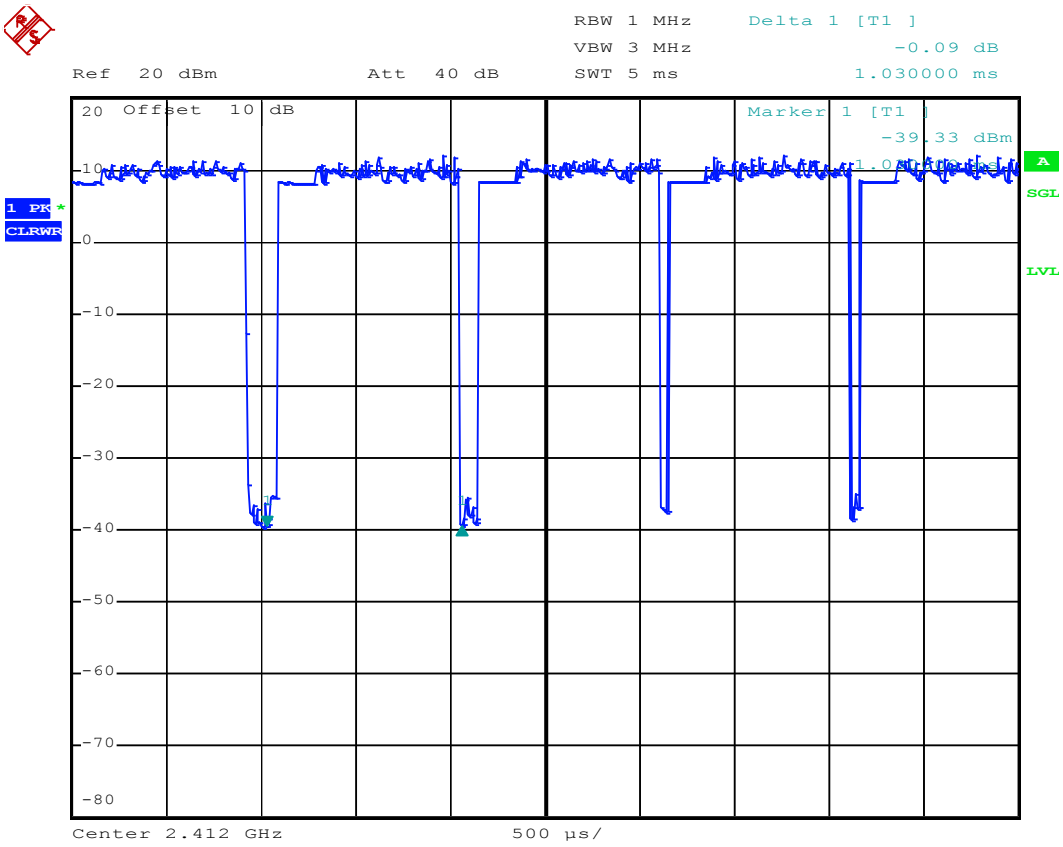
| Mode | Period (ms) | Transmission duration (T) (ms) | Duty Cycle (%) | 1/T (kHz) | VBW setting (kHz) |
|---|---|---|---|---|---|
| 802.11 b | 1.11 | 1.03 | 92.79% | 0.97 | 1 |
| 802.11 g | 0.28 | 0.22 | 78.57% | 4.54 | 5 |
| 802.11 HT-n20 | 0.32 | 0.2 | 62.50% | 5 | 5 |
| 802.11 HT-n40 | 0.22 | 0.124 | 56.36% | 8.06 | 10 |

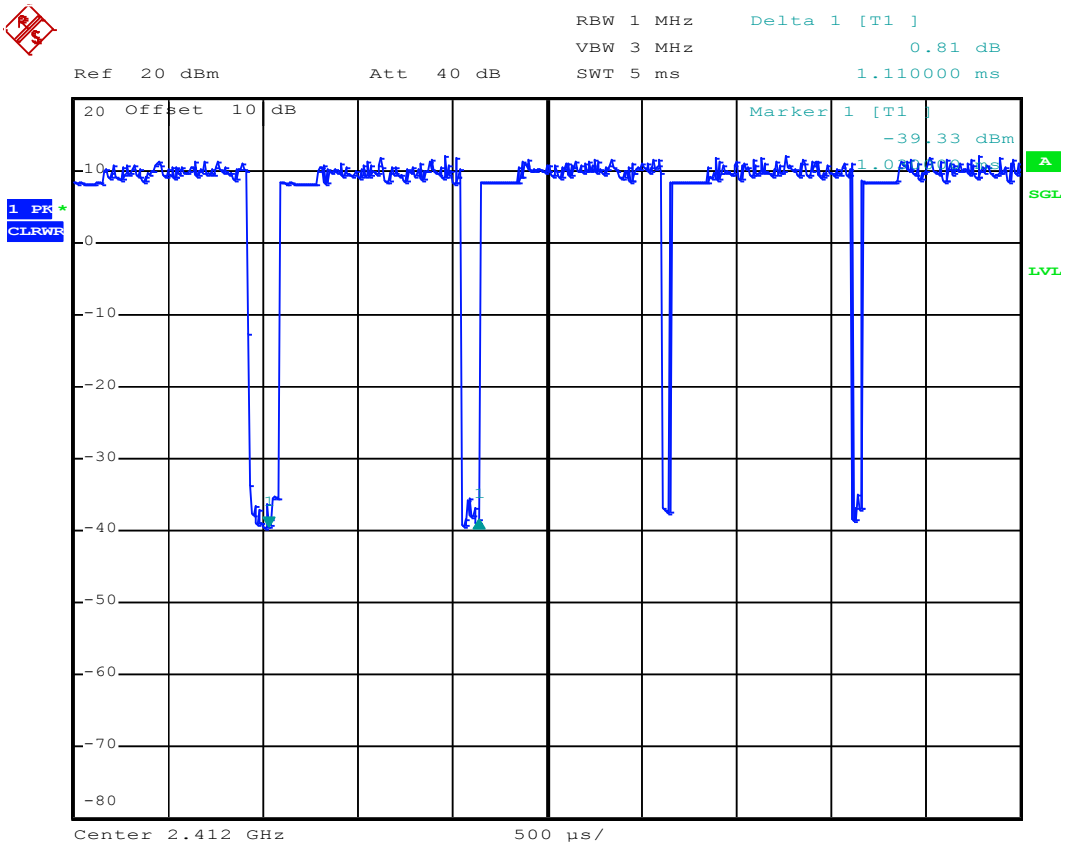
Note:

1. When the duty cycle is less than 98%, for the average measurement of the radiated emission test, the VBW setting is >1/T where the T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

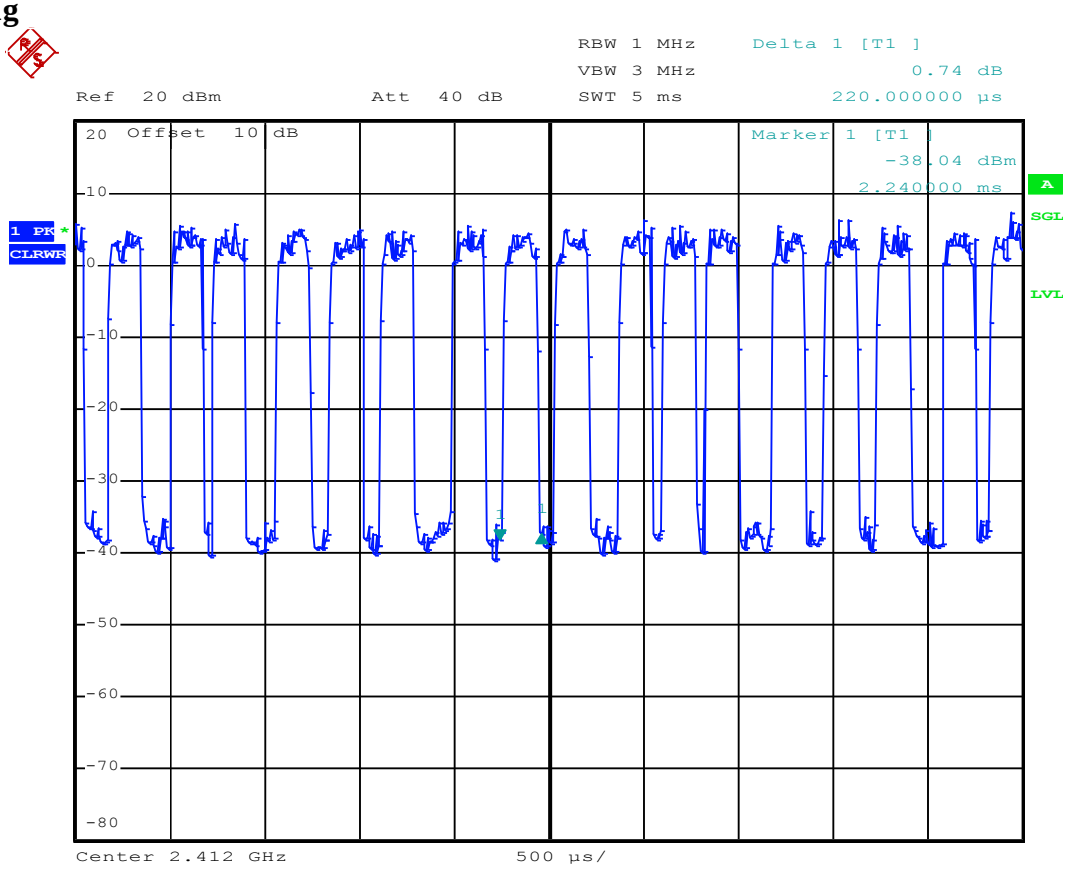
Refer to the following page for data plots.

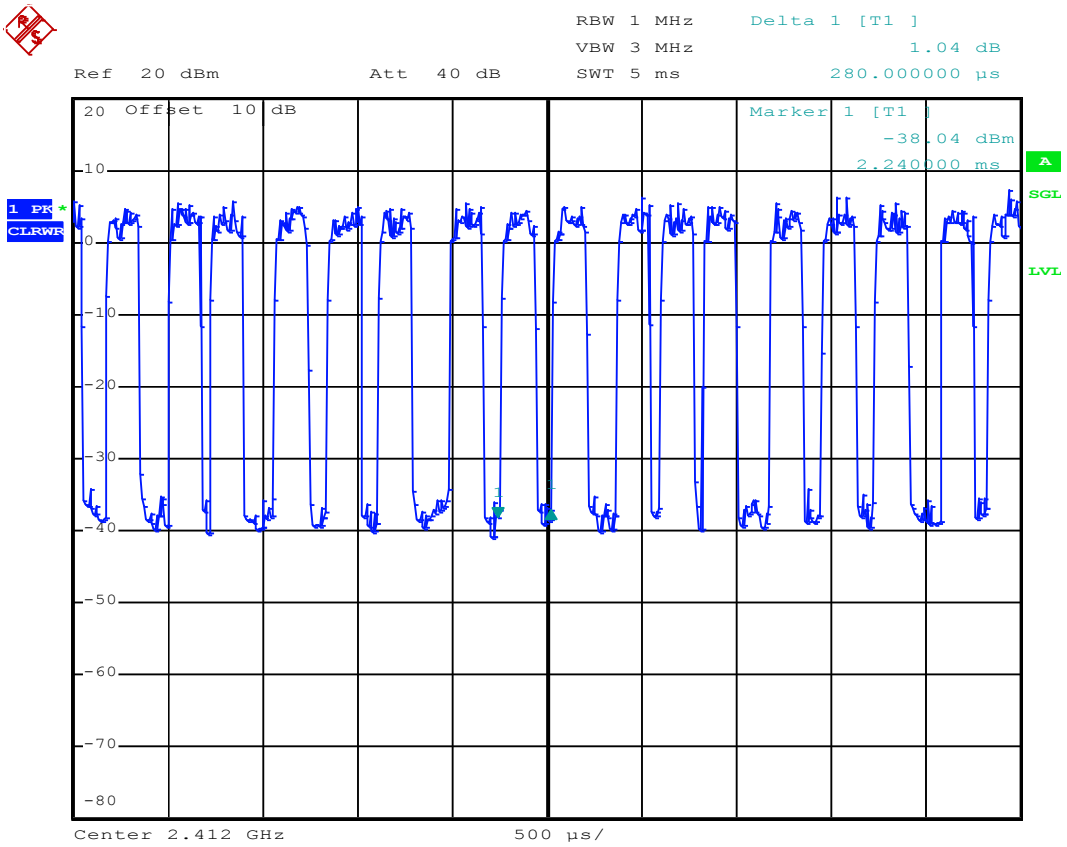
## 802.11b


RBW 1 MHz
VBW 3 MHz
SWT 5 ms
Delta 1 [T1 ]
-0.09 dB
1.030000 ms
Ref 20 dBm
Att 40 dB
20 Offset 10 dB
Marker 1 [T1 ]
-39.33 dBm
1 PK
CLRWR
A
SGL
LVL
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.412 GHz
500 µs/

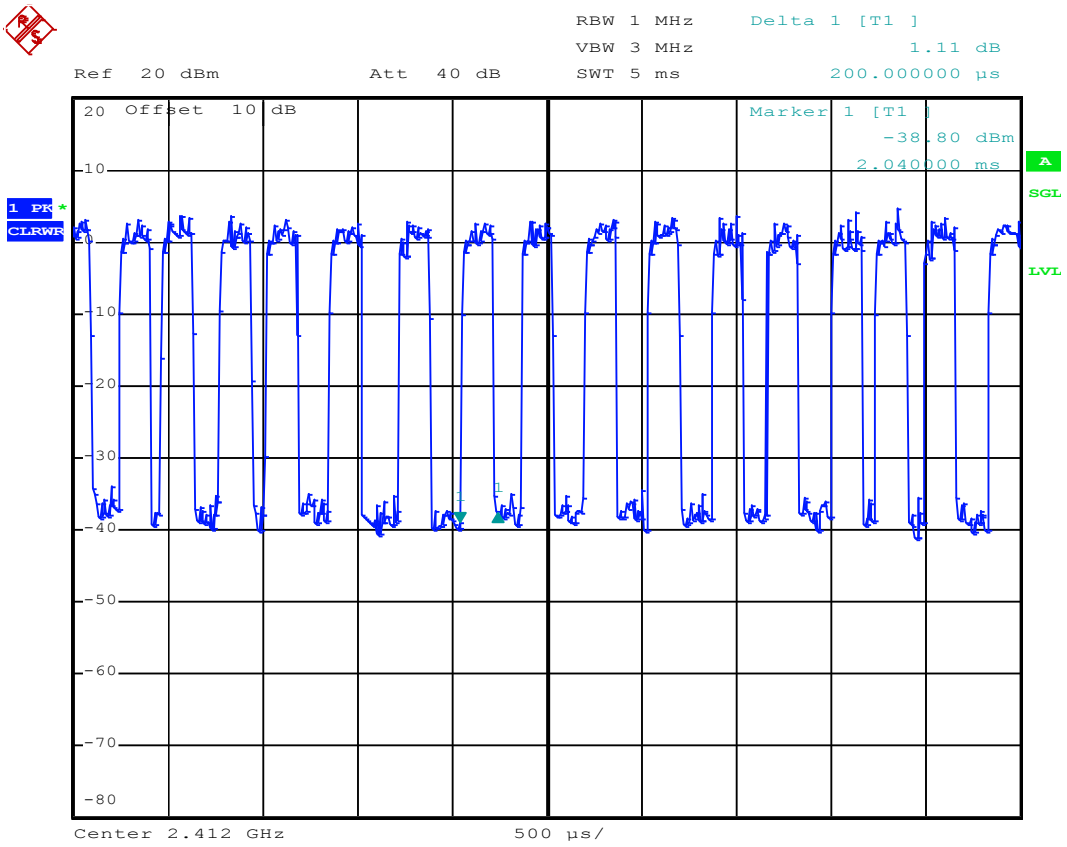

RBW 1 MHz
VBW 3 MHz
SWT 5 ms
Delta 1 [T1 ]
0.81 dB
1.110000 ms
Ref 20 dBm
Att 40 dB
20 Offset 10 dB
Marker 1 [T1 ]
-39.33 dBm
1 PK
CLRWR
A
SGL
LVL
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.412 GHz
500 µs/

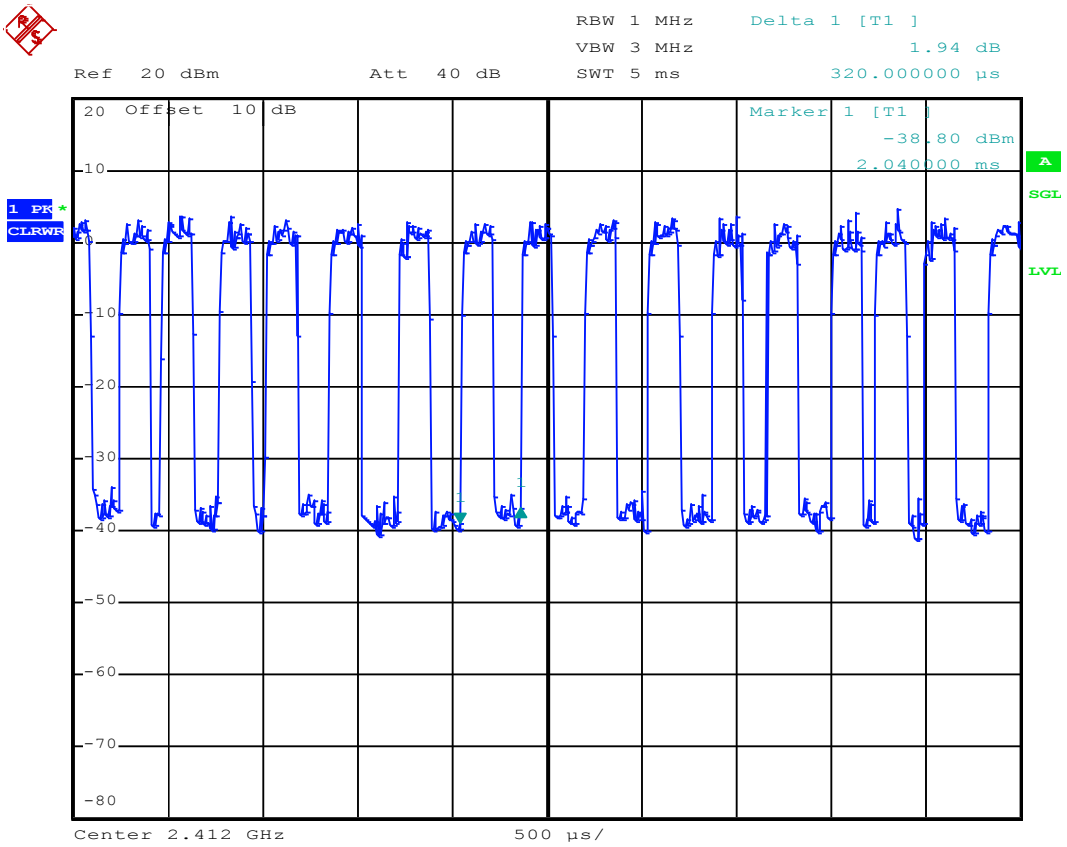
**802.11g**


RBW 1 MHz
VBW 3 MHz
SWT 5 ms
Delta 1 [T1 ]
0.74 dB
220.000000 µs
Ref 20 dBm
Att 40 dB
20 Offset 10 dB
Marker 1 [T1 ]
-38.04 dBm
2.240000 ms
1 PK
CLRWR
A
SGL
LVL
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.412 GHz
500 µs/

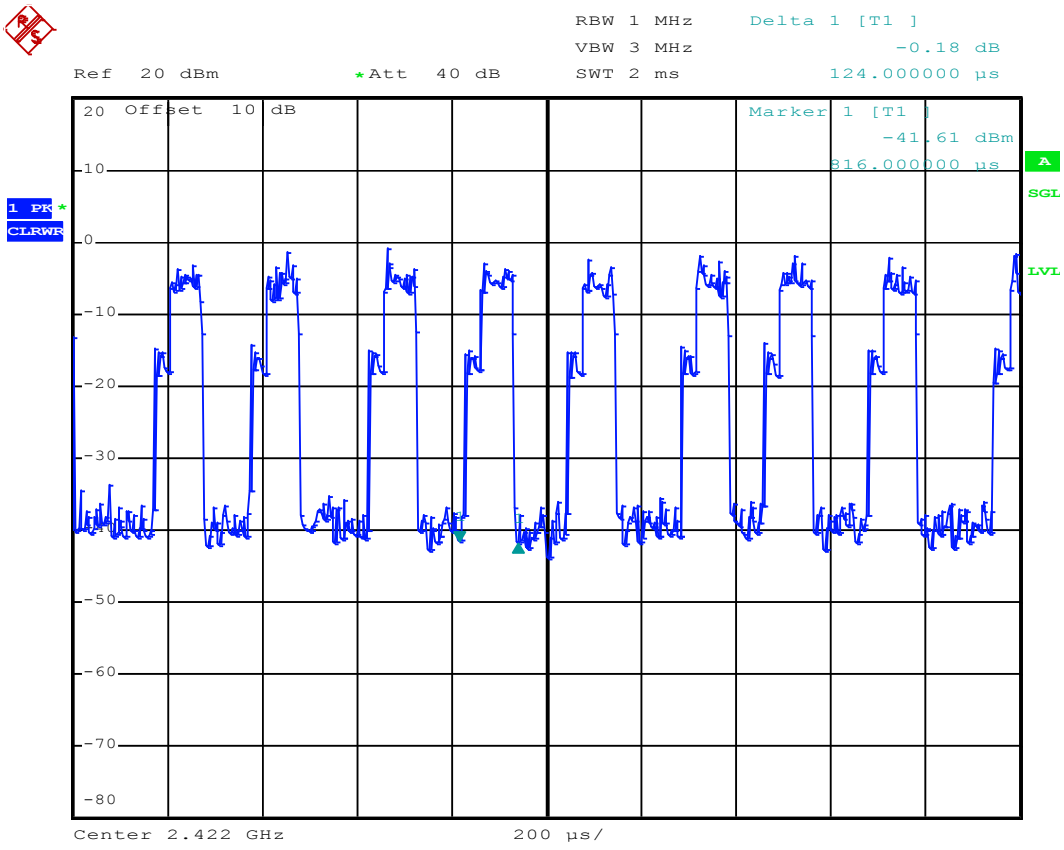

RBW 1 MHz
VBW 3 MHz
SWT 5 ms
Delta 1 [T1 ]
1.04 dB
280.000000 µs
Ref 20 dBm
Att 40 dB
20 Offset 10 dB
Marker 1 [T1 ]
-38.04 dBm
2.240000 ms
1 PK
CLRWR
A
SGL
LVL
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.412 GHz
500 µs/

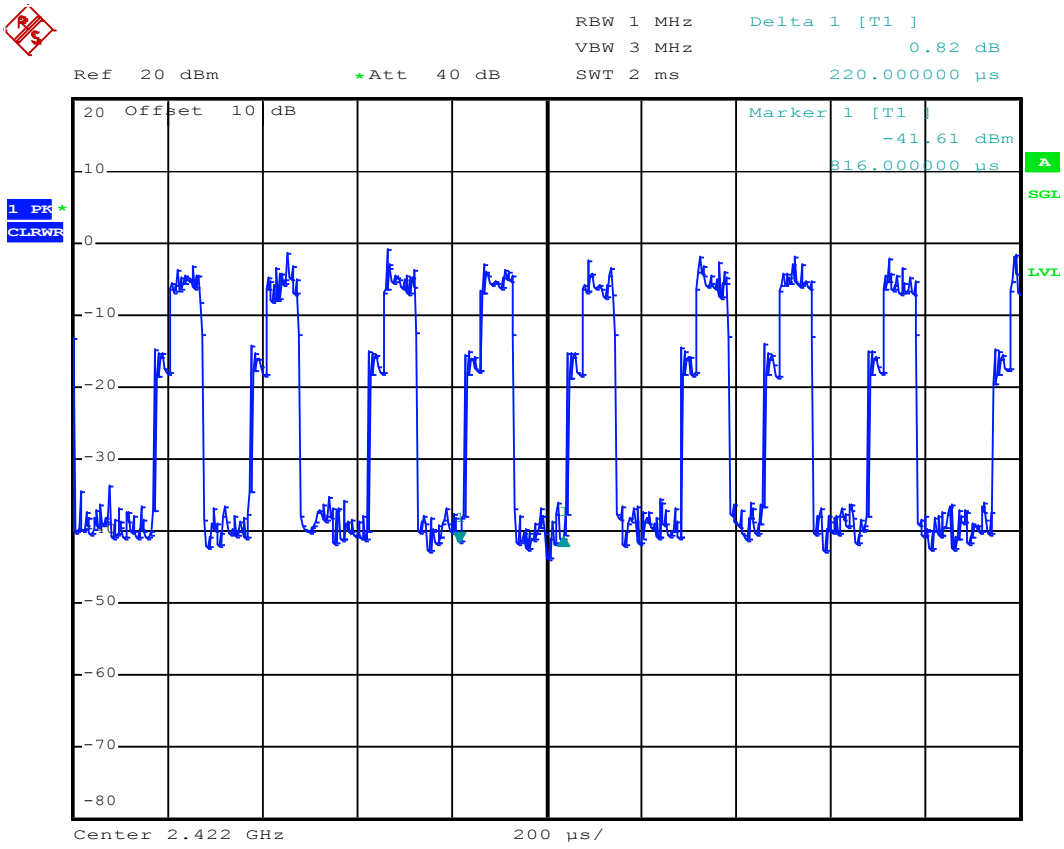
## 802.11n HT-20


RBW 1 MHz
VBW 3 MHz
SWT 5 ms
Delta 1 [T1 ]
1.11 dB
200.000000 µs
Ref 20 dBm
Att 40 dB
20 Offset 10 dB
Marker 1 [T1 ]
-38.80 dBm
2.040000 ms
1 PK
CLRWR
A
SGL
LVL
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.412 GHz
500 µs/


RBW 1 MHz
VBW 3 MHz
SWT 5 ms
Delta 1 [T1 ]
1.94 dB
320.000000 µs
Ref 20 dBm
Att 40 dB
20 Offset 10 dB
Marker 1 [T1 ]
-38.80 dBm
2.040000 ms
1 PK
CLRWR
A
SGL
LVL
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.412 GHz
500 µs/

## 802.11n HT-40


RBW 1 MHz
VBW 3 MHz
SWT 2 ms
Delta 1 [T1 ]
-0.18 dB
124.000000 µs
Ref 20 dBm
Att 40 dB
Offset 10 dB
Marker 1 [T1 ]
-41.61 dBm
816.000000 µs
1 PK
CLRWR
A
SGL
LVL
20
10
0
-10
-20
-30
-50
-60
-70
-80
Center 2.422 GHz
200 µs/


RBW 1 MHz
VBW 3 MHz
SWT 2 ms
Delta 1 [T1 ]
0.82 dB
220.000000 µs
Ref 20 dBm
Att 40 dB
Offset 10 dB
Marker 1 [T1 ]
-41.61 dBm
816.000000 µs
1 PK
CLRWR
A
SGL
LVL
20
10
0
-10
-20
-30
-50
-60
-70
-80
Center 2.422 GHz
200 µs/