

# FCC Part 15 EMI TEST REPORT

Part I – Bluetooth (FHSS)

of

E.U.T. : JRVCS1 Display Commander  
Model : JRVCS1DC  
FCC ID : HQXJRVCS1DC

for

APPLICANT : SYSGRATION LTD.  
ADDRESS : 6F-2.,No.1,Sec.1,Tiding Blvd., Neihu Dist.,  
Taipei City 114, Taiwan

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](mailto:emc@etc.org.tw)

Report Number : 15-05-RBF-037-01

# TEST REPORT CERTIFICATION

Applicant : SYSGRATION LTD.  
6F-2.,No.1,Sec.1,Tiding Blvd., Neihu Dist., Taipei City 114, Taiwan

Manufacture : SYSGRATION LTD.(Nan-Kang Factory)  
No.28,North Industry Rd., Nan-Kang Industrial Zone, Nan-Tou City,  
Nan-Tou County 540, Taiwan

Description of Device :

a) Type of EUT : JRVCS1 Display Commander  
b) Trade Name : JENSEN  
c) Model No. : JRVCS1DC  
d) Power Supply : DC 12V

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 C63.10-2009, 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                                     | <b>Pass</b> |
| Conducted Emission                                    | <b>N/A</b>  |
| Hopping Channel Separation                            | <b>Pass</b> |
| Number of Hopping frequencies used                    | <b>Pass</b> |
| Hopping Channel Bandwidth                             | <b>Pass</b> |
| Dwell Time of each frequency                          | <b>Pass</b> |
| Output Power Requirement                              | <b>Pass</b> |
| 100 kHz Bandwidth of Frequency Band Edges Requirement | <b>Pass</b> |
| Out-of-Band Conducted Emission Requirement            | <b>Pass</b> |

Date Test Item Received : May 28, 2015  
Date Test Campaign Completed : Jun. 02, 2015  
Date of Issue : Jun. 17, 2015

Test Engineer :                     Jiapeng Chen                      
(Jiapeng Chen , Engineer )

Approve & Authorized :                     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 : JRVCS1 Display Commander
- b) Trade Name : JENSEN
- c) Model No. : JRVCS1DC
- d) Power Supply : DC 12V

### 1.2 Test Methodology

Both conducted and radiated emissions were performed according to the procedures illustrated in ANSI C63.10-2009. Other required measurements were illustrated in separate sections of this test report for details.

Instead of 0.8m EUT height above 1GHz, 1.5m was allowed by FCC December 2014 TCB Conference call.

### 1.3 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the roof top of Building at No.34, Lin 5, Dingfu Vil., Linkou Dist., New Taipei City, Taiwan 24442, R.O.C.

This site is FCC 2.948 listed and accepted in a letter dated Jan. 29, 2014.

Registration Number: 90589

## 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 as shown in paragraphs (b) and (c) of this section, for an intentional radiator 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 30 MHz shall not exceed the limits in the following table, as measured using a 50 $\mu$ H/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 boundary between the frequency ranges.

| Frequency<br>MHz | Quasi Peak<br>dB $\mu$ V | Average<br>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

For intentional device, according to §15.207(a) Line Conducted Emission Limits is same as above table.

### (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<br>MHz | Distance<br>Meters | Radiated<br>dB $\mu$ V/m | Radiated<br>$\mu$ 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) Hopping Channel Separation**

According to 15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

**(5) Number of Hopping frequencies used**

According to 15.247(a)(1)(iii), frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

**(6) Hopping Channel Bandwidth**

For frequency hopping system operating in the 2400–2483.5 MHz band, there is no requirement for the maximum 20dB bandwidth of the hopping channel. The measurement of the hopping channel bandwidth is for the reference of the hopping channel separation requirement.

**(7) Dwell Time of each frequency**

According to 15.247(a)(1)(iii), for frequency hopping system operating in the 2400-2483.5 band, the average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

**(8) Output Power Requirement**

According to 15.247(b)(1), for frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

**(9) 100 kHz Bandwidth of Frequency Band Edges Requirement**

According to 15.247(d), 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, provided the

transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

### (10) Out-of-Band Conducted Emission Requirement

According to 15.247(d), 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

## 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 below 1 GHz, 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 transmitting antenna connected to EUT (if applicable) to maximize the emission from EUT.

For conducted and radiated emissions, whichever RF channel is operated, the digital circuits' function identically. As the reason, measurement of emissions from digital circuits is performed with the highest, middle and the lowest channel by transmitting mode.

The following modes were investigated and the worst cases (mode 1 and 3) were chosen for final test.

1. Basic Rate (BR) 1 Mbps uses GFSK modulation
2. Enhanced Data Rate (EDR) 2Mbps uses pi/4-DQPSK modulation
3. Enhanced Data Rate (EDR) 3Mbps uses 8DPSK modulation

#### 3.2 Devices for Tested System

| Device                     | Manufacture                       | Model / FCC ID.           | Description                   |
|----------------------------|-----------------------------------|---------------------------|-------------------------------|
| JRVCS1 Display Commander * | SYSGRATION LTD.(Nan-Kang Factory) | JRVCS1DC/<br>HQXJRVCS1DC  | 1.0m Unshielded DC Power Line |
| Battery                    | YUASA                             | YTX9-BS                   | ---                           |
| JRVCS1 Body Control Module | SYSGRATION LTD.(Nan-Kang Factory) | JRVCS1CM /<br>HQXJRVCS1CM | 1.0m Unshielded DC Power Line |

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 (d)

### 4.2 Measurement Procedure

#### A. Preliminary Measurement For Portable Devices

For portable devices, the following procedure was performed to determine the maximum emission axis of EUT:

1. With the receiving antenna is H polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
2. With the receiving antenna is V polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
3. Compare the results derived from above two steps. So, the axis of maximum emission from EUT was determined and the configuration was used to perform the final measurement.

#### B. Final Measurement

1. Setup the configuration per figure 1 and 2 for frequencies measured below and above 1 GHz respectively. Turn on EUT and make sure that it is in normal function.
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 (if any) associated with EUT to obtain the worse case and record the result.

Figure 1 : Frequencies measured below 1 GHz configuration

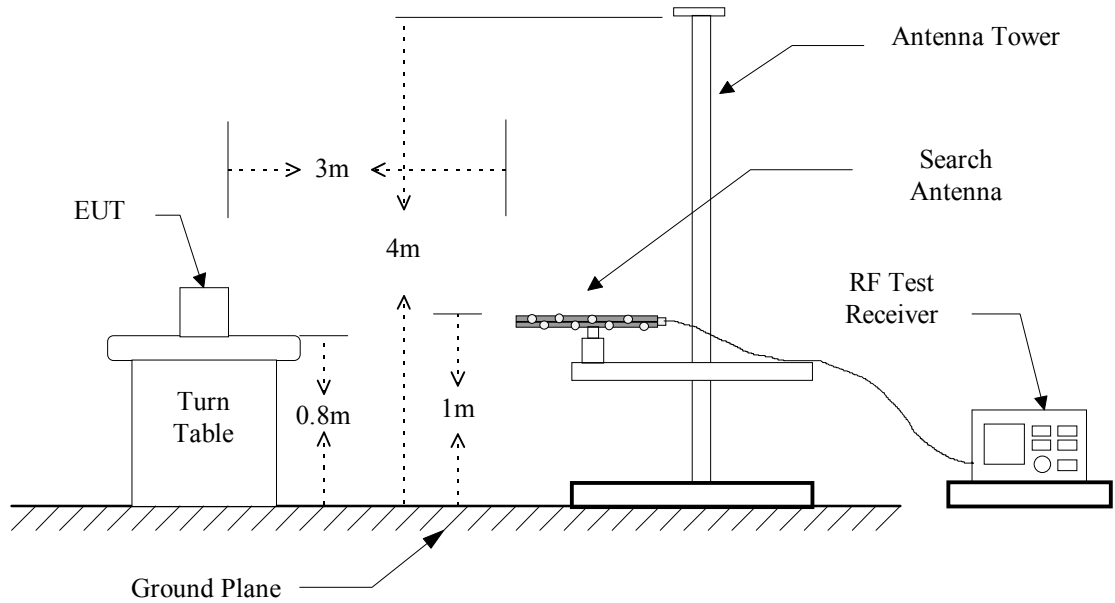
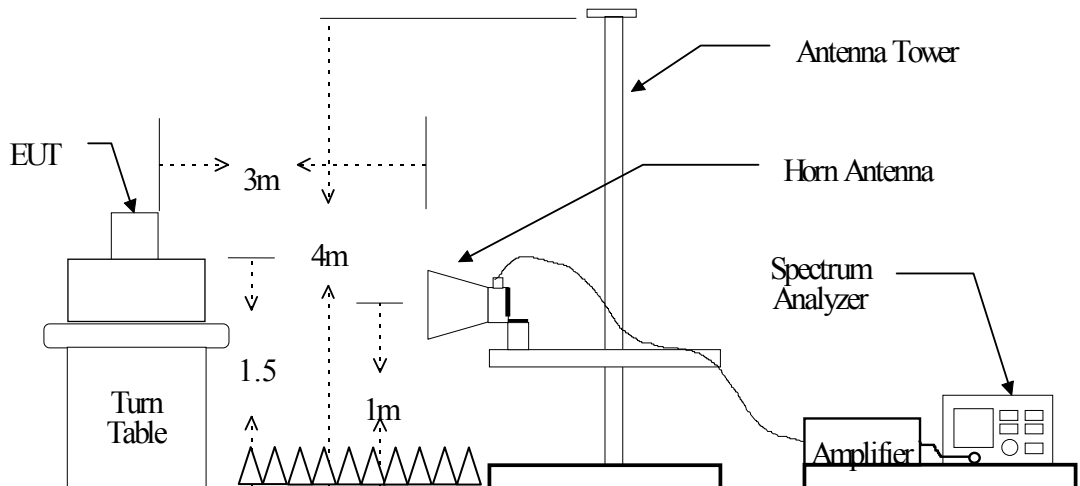


Figure 2 : Frequencies measured above 1 GHz configuration



### 4.3 Measuring Instrument

The following instrument are used for radiated emissions measurement:

| Equipment             | Manufacturer         | Model No. | Calibration Date | Next Cal. Date |
|-----------------------|----------------------|-----------|------------------|----------------|
| Test Receiver         | Rohde & Schwarz      | ESVS30    | 2015/05/29       | 2016/05/28     |
| Bi-Log Antenna        | ETC                  | MCTD 2786 | 2014/07/09       | 2015/07/08     |
| Log-periodic Antenna  | EMCO                 | 3146      | 2014/11/04       | 2015/11/03     |
| Biconical Antenna     | EMCO                 | 3110      | 2014/11/04       | 2015/11/03     |
| Horn Antenna          | EMCO                 | 3115      | 2014/08/18       | 2015/08/17     |
| Horn Antenna          | EMCO                 | 3116      | 2014/08/13       | 2015/08/12     |
| Horn Antenna          | ETS                  | 3160      | 2014/08/13       | 2015/08/12     |
| Spectrum              | R&S                  | FSP3      | 2014/09/26       | 2015/09/25     |
| Amplifier             | HP                   | 8447D     | 2014/11/10       | 2015/11/09     |
| EMI Test Receiver     | Rohde & Schwarz      | ESU 40    | 2014/08/15       | 2015/08/14     |
| Double Ridged Antenna | EMCO                 | 3115      | 2014/10/22       | 2015/10/21     |
| Attenuator            | WEINSCHL ENGINEERING | AY8986    | 2014/10/22       | 2015/10/21     |
| Amplifier             | HP                   | 83051A    | 2014/10/22       | 2015/10/21     |

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

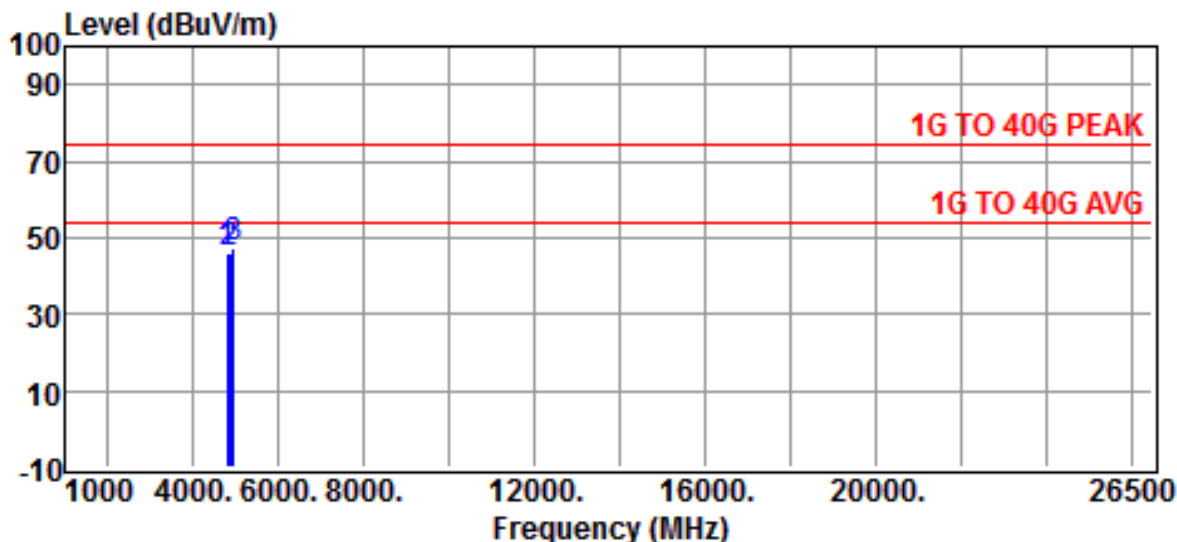
| Frequency Band (MHz) | Instrument        | Function   | Resolution bandwidth | Video Bandwidth |
|----------------------|-------------------|------------|----------------------|-----------------|
| 30 to 1000           | RF Test Receiver  | Quasi-Peak | 120 kHz              | N/A             |
|  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

### 4.4 Radiated Emission Data

#### 4.4.1 Tx Portion

A. Bluetooth BR

Test Date : Jun. 02, 2015      Temperature : 24 °C      Humidity : 60 %

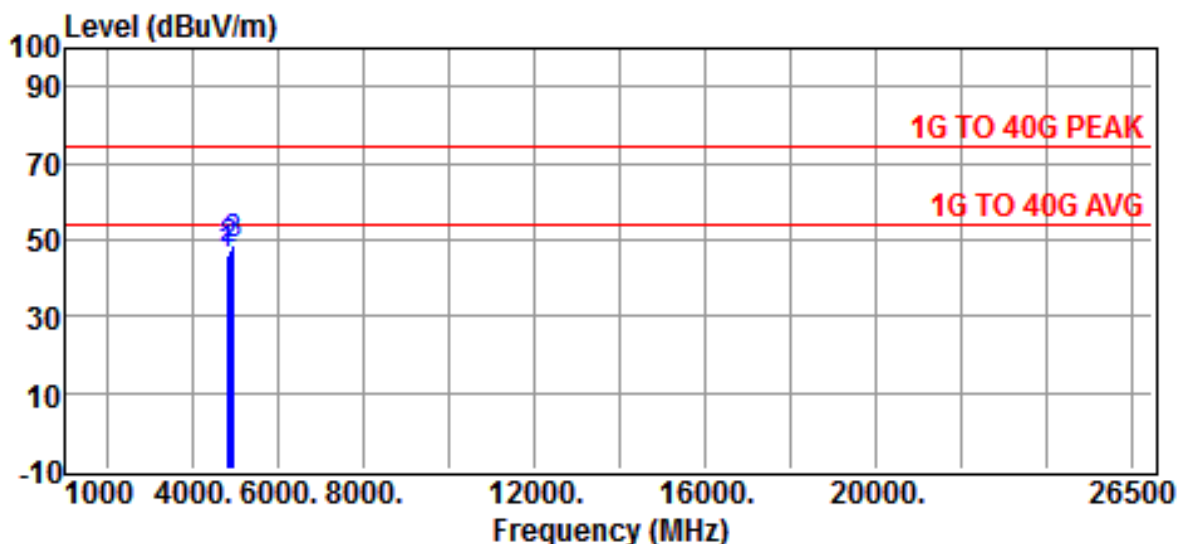


|              |                           |           |             |
|--------------|---------------------------|-----------|-------------|
| Site         | :CHAMBER #2               | Date      | :2015-06-02 |
| Limit        | :1G TO 40G PEAK           | Ant. Pol. | :HORIZONTAL |
| EUT          | :JRVCS1 Display Commander | Temp.     | :24°C       |
| Power Rating | :DC 12.0V                 | Humi.     | :60%        |
| Model        | :JRVCS1DC                 | Engineer. | :Jiapeng    |
| Test Mode    | :BR                       |           |             |
| Mode         | :EUT stands vertically    |           |             |

| Freq<br>MHz | Reading<br>dB $\mu$ V | Correction<br>Factor<br>dB | Result<br>dB $\mu$ V/m | Limits<br>(AVG)<br>dB $\mu$ V/m | Over limit<br>dB | Detector |
|-------------|-----------------------|----------------------------|------------------------|---------------------------------|------------------|----------|
| 4804.0000   | 44.7                  | 1.3                        | 46.0                   | 54.0                            | -8.0             | Peak     |
| 4882.0000   | 44.9                  | 1.4                        | 46.3                   | 54.0                            | -7.7             | Peak     |
| 4960.0000   | 45.3                  | 1.8                        | 47.1                   | 54.0                            | -6.9             | Peak     |

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. 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      | :2015-06-02 |
| Limit        | :1G TO 40G PEAK           | Ant. Pol. | :VERTICAL   |
| EUT          | :JRVCS1 Display Commander | Temp.     | :24°C       |
| Power Rating | :DC 12.0V                 | Humi.     | :60%        |
| Model        | :JRVCS1DC                 | Engineer. | :Jiapeng    |
| Test Mode    | :BR                       |           |             |
| Mode         | :EUT stands vertically    |           |             |

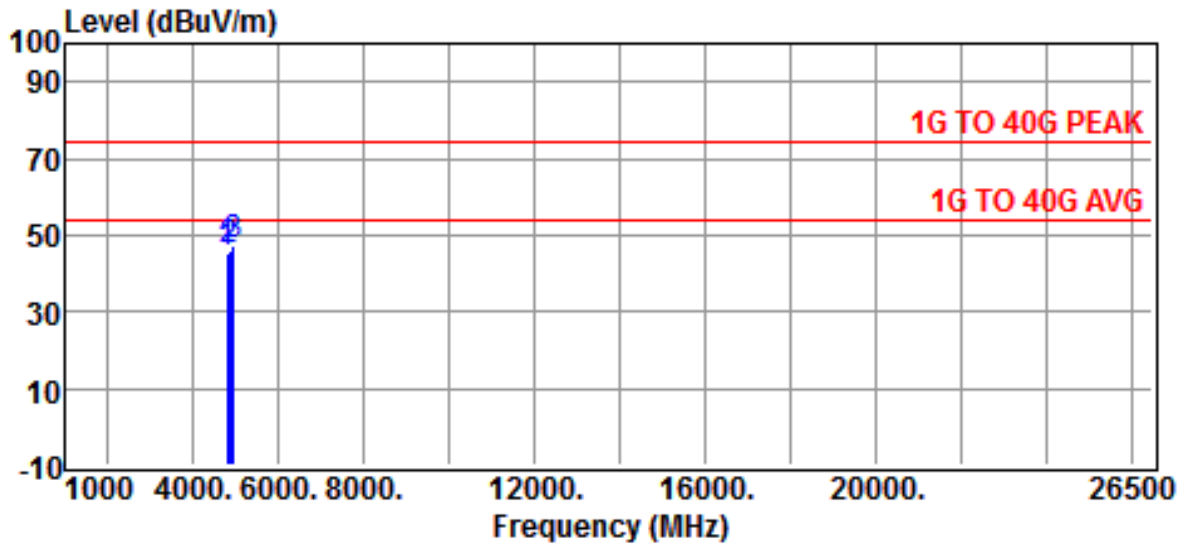
| Freq<br>MHz | Reading<br>dBμV | Correction<br>Factor<br>dB | Result<br>dBμV/m | Limits<br>(AVG)<br>dBμV/m | Over limit<br>dB | Detector |
|-------------|-----------------|----------------------------|------------------|---------------------------|------------------|----------|
| 4804.0000   | 44.8            | 1.3                        | 46.1             | 54.0                      | -7.9             | Peak     |
| 4882.0000   | 45.8            | 1.4                        | 47.2             | 54.0                      | -6.8             | Peak     |
| 4960.0000   | 46.8            | 1.8                        | 48.6             | 54.0                      | -5.4             | 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. Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

B. Bluetooth EDR

Test Date : Jun. 02, 2015      Temperature : 24 °C      Humidity : 60 %

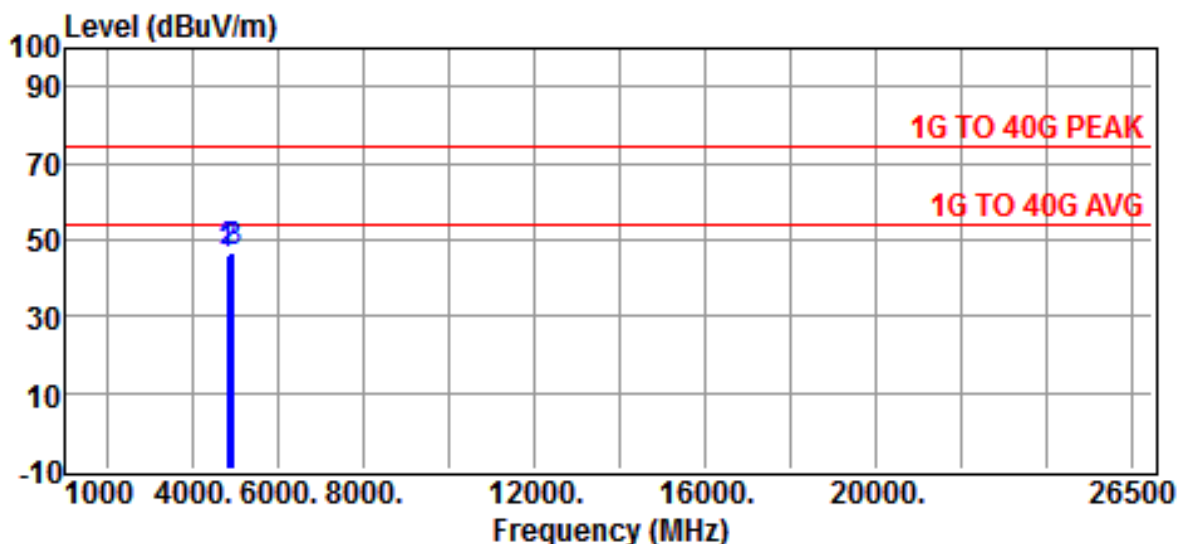


|              |                           |           |             |
|--------------|---------------------------|-----------|-------------|
| Site         | :CHAMBER #2               | Date      | :2015-06-02 |
| Limit        | :1G TO 40G PEAK           | Ant. Pol. | :HORIZONTAL |
| EUT          | :JRVCS1 Display Commander | Temp.     | :24°C       |
| Power Rating | :DC 12.0V                 | Humi.     | :60%        |
| Model        | :JRVCS1DC                 | Engineer. | :Jiapeng    |
| Test Mode    | :EDR                      |           |             |
| Mode         | :EUT stands vertically    |           |             |

| Freq<br>MHz | Reading<br>dB $\mu$ V | Correction<br>Factor<br>dB | Result<br>dB $\mu$ V/m | Limits<br>(AVG)<br>dB $\mu$ V/m | Over limit<br>dB | Detector |
|-------------|-----------------------|----------------------------|------------------------|---------------------------------|------------------|----------|
| 4804.0000   | 44.3                  | 1.3                        | 45.6                   | 54.0                            | -8.4             | Peak     |
| 4882.0000   | 44.7                  | 1.4                        | 46.1                   | 54.0                            | -7.9             | Peak     |
| 4960.0000   | 45.3                  | 1.8                        | 47.1                   | 54.0                            | -6.9             | 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. 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      | :2015-06-02 |
| Limit        | :1G TO 40G PEAK           | Ant. Pol. | :VERTICAL   |
| EUT          | :JRVCS1 Display Commander | Temp.     | :24°C       |
| Power Rating | :DC 12.0V                 | Humi.     | :60%        |
| Model        | :JRVCS1DC                 | Engineer. | :Jiapeng    |
| Test Mode    | :EDR                      |           |             |
| Mode         | :EUT stands vertically    |           |             |

| Freq<br>MHz | Reading<br>dBμV | Correction<br>Factor<br>dB | Result<br>dBμV/m | Limits<br>(AVG)<br>dBμV/m | Over limit<br>dB | Detector |
|-------------|-----------------|----------------------------|------------------|---------------------------|------------------|----------|
| 4804.0000   | 44.5            | 1.3                        | 45.8             | 54.0                      | -8.2             | Peak     |
| 4882.0000   | 45.0            | 1.4                        | 46.4             | 54.0                      | -7.6             | Peak     |
| 4960.0000   | 45.1            | 1.8                        | 46.9             | 54.0                      | -7.1             | Peak     |

Note :

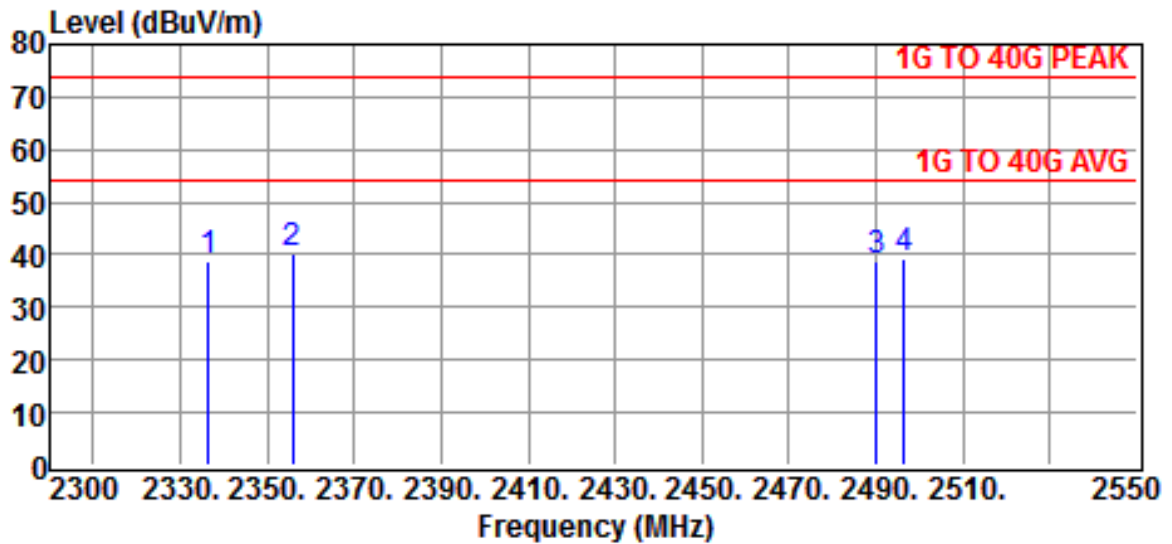
1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit - Result
4. Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

**4.4.2 Radiated Emissions in Restricted Bands**

Operation Mode : Bluetooth TX/RX

A. Bluetooth BR

Test Date : Jun. 02, 2015 Temperature : 24 °C Humidity : 60 %

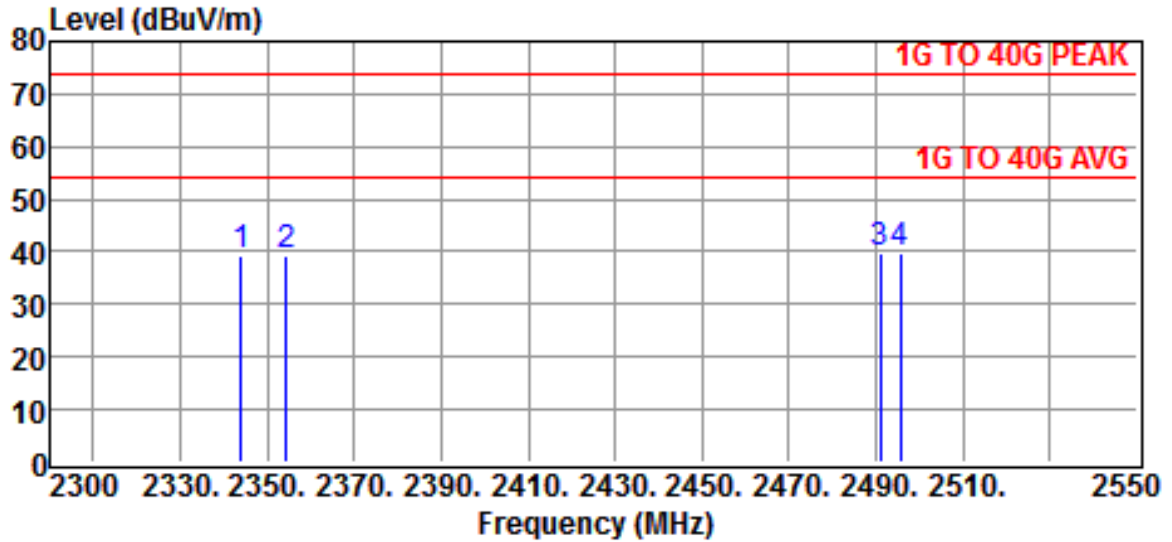


|              |                                |           |             |
|--------------|--------------------------------|-----------|-------------|
| Site         | :CHAMBER #2                    | Date      | :2015-06-02 |
| Limit        | :1G TO 40G PEAK                | Ant. Pol. | :HORIZONTAL |
| EUT          | :JRVCS1 Display Commander      | Temp.     | :24°C       |
| Power Rating | :DC 12.0V                      | Humi.     | :60%        |
| Model        | :JRVCS1DC                      | Engineer. | :Jiapeng    |
| Test Mode    | :CH LO & HI - Restricted Bands |           |             |
| Test Mode    | :BR                            |           |             |
| Mode         | :EUT stands vertically         |           |             |

| Freq<br>MHz | Reading<br>dBμV | Correction<br>Factor<br>dB | Result<br>dBμV/m | Limits<br>(AVG)<br>dBμV/m | Over limit<br>dB | Detector |
|-------------|-----------------|----------------------------|------------------|---------------------------|------------------|----------|
| 2336.5000   | 45.0            | -6.1                       | 38.9             | 54.0                      | -15.1            | Peak     |
| 2356.0000   | 46.3            | -6.1                       | 40.2             | 54.0                      | -13.8            | Peak     |
| 2490.0000   | 44.5            | -5.8                       | 38.7             | 54.0                      | -15.3            | Peak     |
| 2496.5000   | 44.9            | -5.8                       | 39.1             | 54.0                      | -14.9            | 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. 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      | :2015-06-02 |
| Limit        | :1G TO 40G PEAK                | Ant. Pol. | :VERTICAL   |
| EUT          | :JRVCS1 Display Commander      | Temp.     | :24°C       |
| Power Rating | :DC 12.0V                      | Humi.     | :60%        |
| Model        | :JRVCS1DC                      | Engineer. | :Jiapeng    |
| Test Mode    | :CH LO & HI - Restricted Bands |           |             |
| Test Mode    | :BR                            |           |             |
| Mode         | :EUT stands vertically         |           |             |

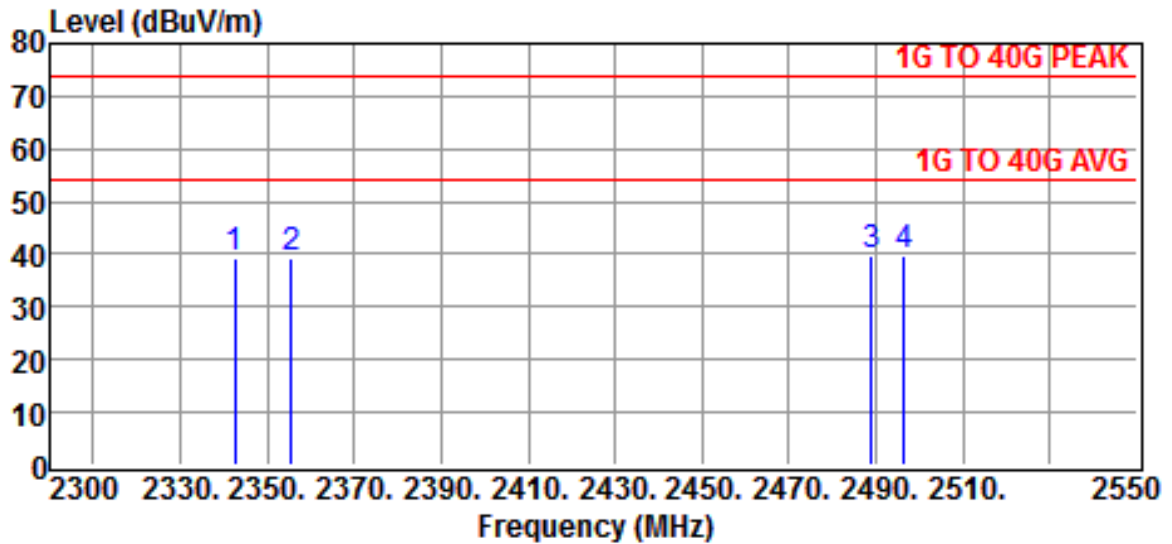
| Freq<br>MHz | Reading<br>dBμV | Correction<br>Factor<br>dB | Result<br>dBμV/m | Limits<br>(AVG)<br>dBμV/m | Over limit<br>dB | Detector |
|-------------|-----------------|----------------------------|------------------|---------------------------|------------------|----------|
| 2344.0000   | 45.5            | -6.1                       | 39.4             | 54.0                      | -14.6            | Peak     |
| 2354.5000   | 45.2            | -6.1                       | 39.1             | 54.0                      | -14.9            | Peak     |
| 2491.0000   | 45.4            | -5.8                       | 39.6             | 54.0                      | -14.4            | Peak     |
| 2495.5000   | 45.4            | -5.8                       | 39.6             | 54.0                      | -14.4            | 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. Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

B. Bluetooth EDR

Test Date : Jun. 02, 2015      Temperature : 24 °C      Humidity : 60 %

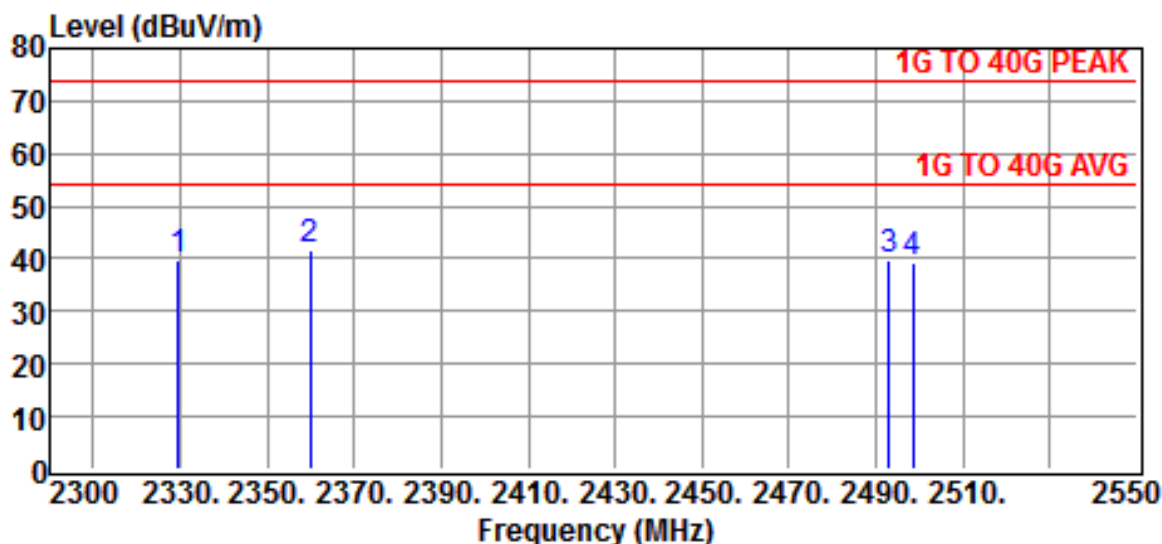


|              |                                |           |             |
|--------------|--------------------------------|-----------|-------------|
| Site         | :CHAMBER #2                    | Date      | :2015-06-02 |
| Limit        | :1G TO 40G PEAK                | Ant. Pol. | :HORIZONTAL |
| EUT          | :JRVCS1 Display Commander      | Temp.     | :24°C       |
| Power Rating | :DC 12.0V                      | Humi.     | :60%        |
| Model        | :JRVCS1DC                      | Engineer. | :Jiapeng    |
| Test Mode    | :CH LO & HI - Restricted Bands |           |             |
| Test Mode    | :EDR                           |           |             |
| Mode         | :EUT stands vertically         |           |             |

| Freq<br>MHz | Reading<br>dBμV | Correction<br>Factor<br>dB | Result<br>dBμV/m | Limits<br>(AVG)<br>dBμV/m | Over limit<br>dB | Detector |
|-------------|-----------------|----------------------------|------------------|---------------------------|------------------|----------|
| 2342.5000   | 45.3            | -6.1                       | 39.2             | 54.0                      | -14.8            | Peak     |
| 2355.5000   | 45.3            | -6.1                       | 39.2             | 54.0                      | -14.8            | Peak     |
| 2489.0000   | 45.6            | -5.8                       | 39.8             | 54.0                      | -14.2            | Peak     |
| 2496.5000   | 45.6            | -5.8                       | 39.8             | 54.0                      | -14.2            | 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. 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      | :2015-06-02 |
| Limit        | :1G TO 40G PEAK                | Ant. Pol. | :VERTICAL   |
| EUT          | :JRVCS1 Display Commander      | Temp.     | :24°C       |
| Power Rating | :DC 12.0V                      | Humi.     | :60%        |
| Model        | :JRVCS1DC                      | Engineer. | :Jiapeng    |
| Test Mode    | :CH LO & HI - Restricted Bands |           |             |
| Test Mode    | :EDR                           |           |             |
| Mode         | :EUT stands vertically         |           |             |

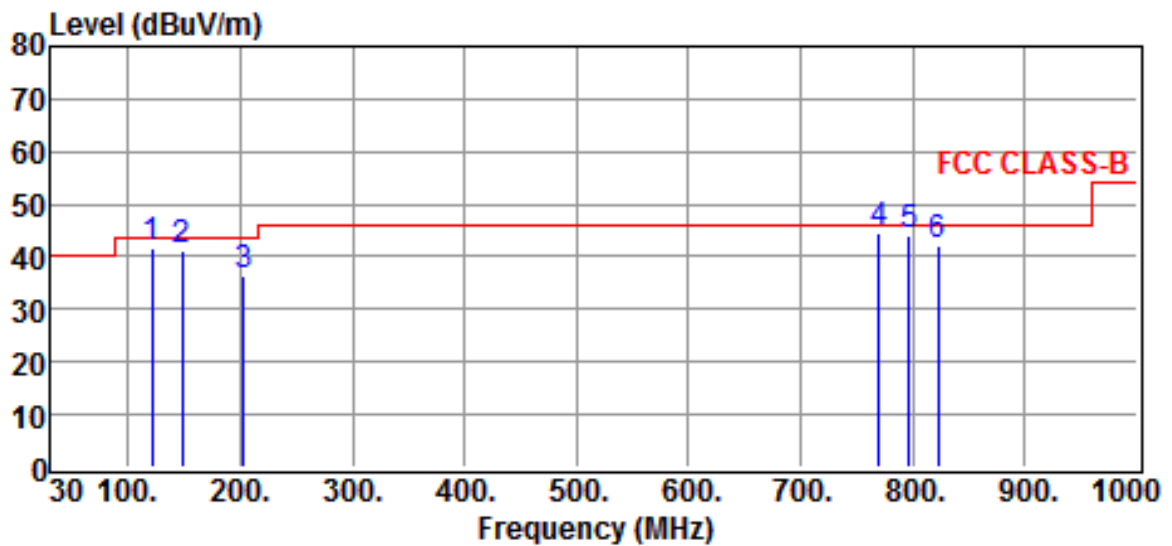
| Freq<br>MHz | Reading<br>dBμV | Correction<br>Factor<br>dB | Result<br>dBμV/m | Limits<br>(AVG)<br>dBμV/m | Over limit<br>dB | Detector |
|-------------|-----------------|----------------------------|------------------|---------------------------|------------------|----------|
| 2329.5000   | 45.8            | -6.1                       | 39.7             | 54.0                      | -14.3            | Peak     |
| 2360.0000   | 47.9            | -6.1                       | 41.8             | 54.0                      | -12.2            | Peak     |
| 2493.0000   | 45.4            | -5.8                       | 39.6             | 54.0                      | -14.4            | Peak     |
| 2498.5000   | 45.0            | -5.8                       | 39.2             | 54.0                      | -14.8            | 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. Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

### 4.4.3 Other Emissions

#### a) Emission frequencies below 1 GHz



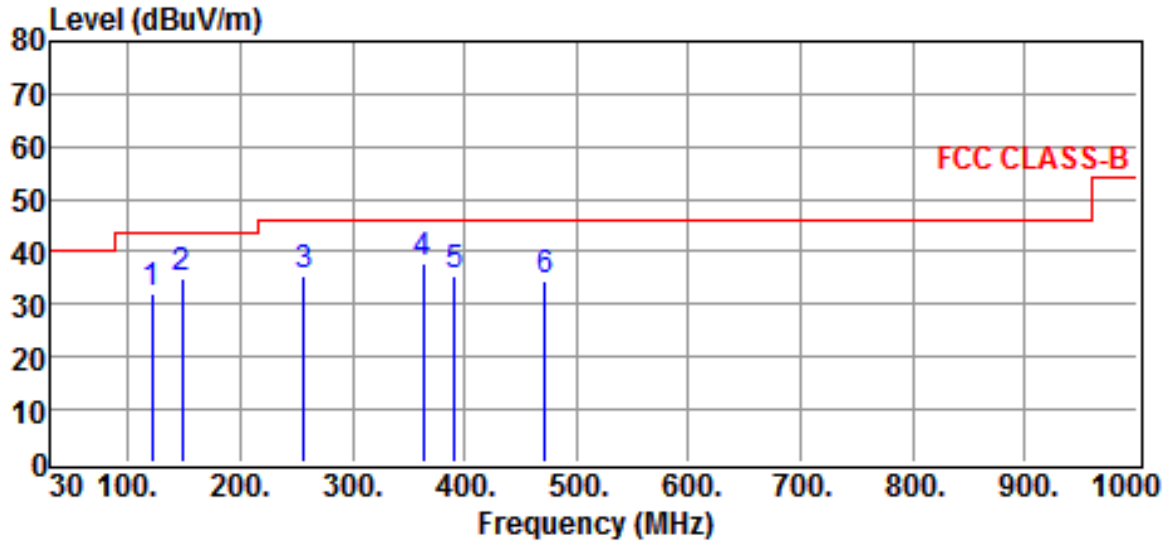
|              |                           |           |             |
|--------------|---------------------------|-----------|-------------|
| Site         | :Open Site                | Date      | :2015-06-02 |
| Limit        | :FCC CLASS-B              | Ant. Pol. | :HORIZONTAL |
| EUT          | :JRVCS1 Display Commander | Temp.     | :22°C       |
| Power Rating | :DC 12.0V                 | Humi.     | :60%        |
| Model        | :JRVCS1DC                 | Engineer. | :Jiapeng    |
| Test Mode    | :BT                       |           |             |
| Mode         | :EUT stands vertically    |           |             |

| Freq<br>MHz | Reading<br>dBμV | Correction<br>Factor<br>dB | Result<br>dBμV/m | Limits<br>dBμV/m | Over limit<br>dB | Detector |
|-------------|-----------------|----------------------------|------------------|------------------|------------------|----------|
| 121.6000    | 29.3            | 12.5                       | 41.8             | 43.5             | -1.7             | QP       |
| 148.7000    | 27.4            | 13.9                       | 41.3             | 43.5             | -2.2             | QP       |
| 202.9000    | 19.0            | 17.3                       | 36.3             | 43.5             | -7.2             | QP       |
| 769.7000    | 18.3            | 26.3                       | 44.6             | 46.0             | -1.4             | QP       |
| 797.0000    | 17.7            | 26.6                       | 44.3             | 46.0             | -1.7             | QP       |
| 822.9000    | 14.9            | 27.1                       | 42.0             | 46.0             | -4.0             | QP       |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss
3. The margin value=Limit - Result





|              |                           |           |             |
|--------------|---------------------------|-----------|-------------|
| Site         | :Open Site                | Date      | :2015-06-02 |
| Limit        | :FCC CLASS-B              | Ant. Pol. | :VERTICAL   |
| EUT          | :JRVCS1 Display Commander | Temp.     | :22°C       |
| Power Rating | :DC 12.0V                 | Humi.     | :60%        |
| Model        | :JRVCS1DC                 | Engineer. | :Jiapeng    |
| Test Mode    | :BT                       |           |             |
| Mode         | :EUT stands vertically    |           |             |

| Freq<br>MHz | Reading<br>dBμV | Correction<br>Factor<br>dB | Result<br>dBμV/m | Limits<br>dBμV/m | Over limit<br>dB | Detector |
|-------------|-----------------|----------------------------|------------------|------------------|------------------|----------|
| 121.6000    | 19.7            | 12.5                       | 32.2             | 43.5             | -11.3            | QP       |
| 148.7000    | 21.2            | 13.9                       | 35.1             | 43.5             | -8.4             | QP       |
| 256.2900    | 15.7            | 19.9                       | 35.6             | 46.0             | -10.4            | QP       |
| 363.7000    | 19.4            | 18.4                       | 37.8             | 46.0             | -8.2             | QP       |
| 391.0000    | 16.4            | 19.0                       | 35.4             | 46.0             | -10.6            | QP       |
| 472.2000    | 13.4            | 21.1                       | 34.5             | 46.0             | -11.5            | QP       |

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss
3. The margin value=Limit - Result

**b) Emission frequencies above 1 GHz**

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

**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:

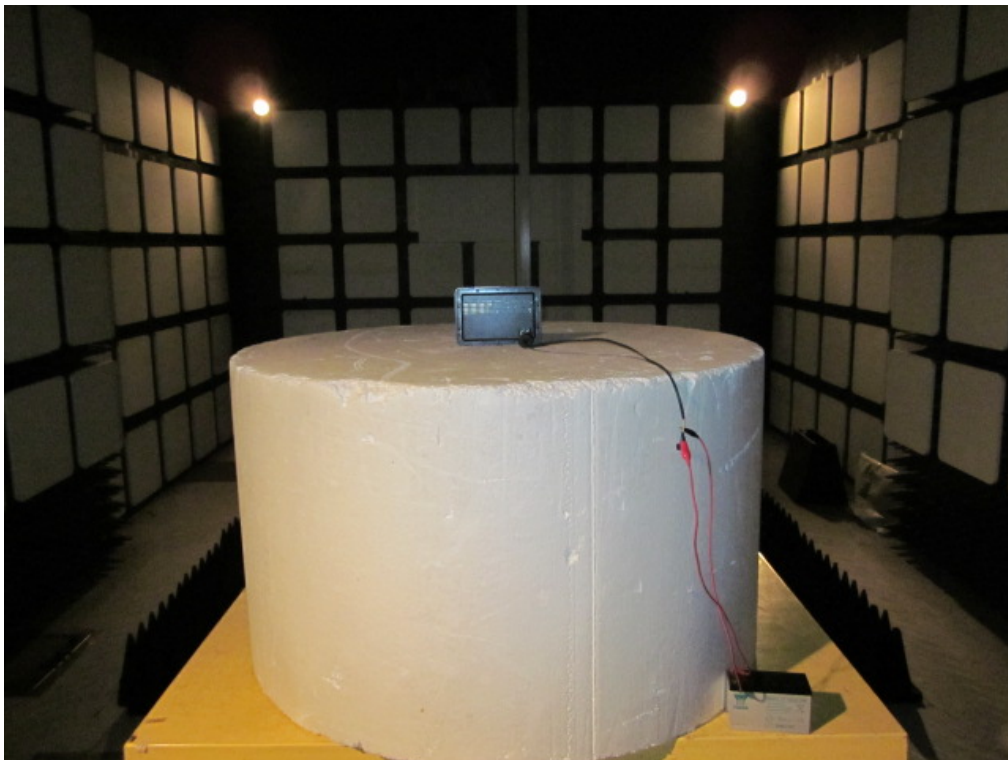
$$\mathbf{Result = Reading + Corrected Factor}$$

where Corrected Factor

$$= \text{Antenna FACTOR} + \text{Cable Loss} + \text{High Pass Filter Loss} - \text{Amplifier Gain}$$

### 4.6 Photos of Radiation Measuring Setup





## **5 CONDUCTED EMISSION MEASUREMENT**

### **5.1 Description**

This EUT is excused from investigation of conducted emission, for it is powered by DC battery only. According to §15.207 (d), measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.

## **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.

### **6.2 Antenna Construction**

The antenna is connected to the main PCB and installed inside the housing, no consideration of replacement. The antenna gain is 2.0dBi so there is no need to reduce the power. Please refer to the construction Photo for details.

## 7 HOPPING CHANNEL SEPARATION

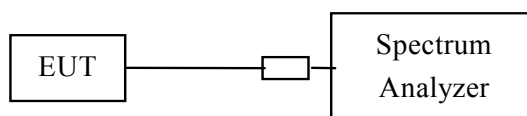
### 7.1 Standard Applicable

According to 15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

### 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. The EUT must have its hopping function enabled. Then set it to any one convenient frequency within its operating range.
3. Use the following spectrum analyzer settings:
  - Span = wide enough to capture the peaks of two adjacent channels
  - Resolution (or IF) Bandwidth (RBW)  $\geq 1\%$  of the span
  - Video (or Average) Bandwidth (VBW)  $\geq$  RBW
  - Sweep = auto
  - Detector function = peak
  - Trace = max hold
4. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. Plot the result on the screen of spectrum analyzer.
5. Repeat above procedures until all frequencies measured were complete.

Figure 4 : Measurement configuration.



### 7.3 Measurement Equipment

| Equipment         | Manufacturer             | Model No. | Calibration Date | Next Cal. Date |
|-------------------|--------------------------|-----------|------------------|----------------|
| EMI Test Receiver | Rohde & Schwarz          | ESU 40    | 2014/08/15       | 2015/08/14     |
| Attenuator        | Weinschel<br>Engineering | AY7602    | 2014/11/03       | 2015/11/02     |

### 7.4 Measurement Data

Test Date : Jun. 02, 2015      Temperature : 24 °C      Humidity : 60 %

#### Mode: Bluetooth BR

- a) Channel Low : Adjacent Hopping Channel Separation is 1.000 MHz
- b) Channel Middle : Adjacent Hopping Channel Separation is 1.000 MHz
- c) Channel High : Adjacent Hopping Channel Separation is 1.004 MHz

#### Mode: Bluetooth EDR

- a) Channel Low : Adjacent Hopping Channel Separation is 1.002 MHz
- b) Channel Middle : Adjacent Hopping Channel Separation is 1.002 MHz
- c) Channel High : Adjacent Hopping Channel Separation is 1.002 MHz

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

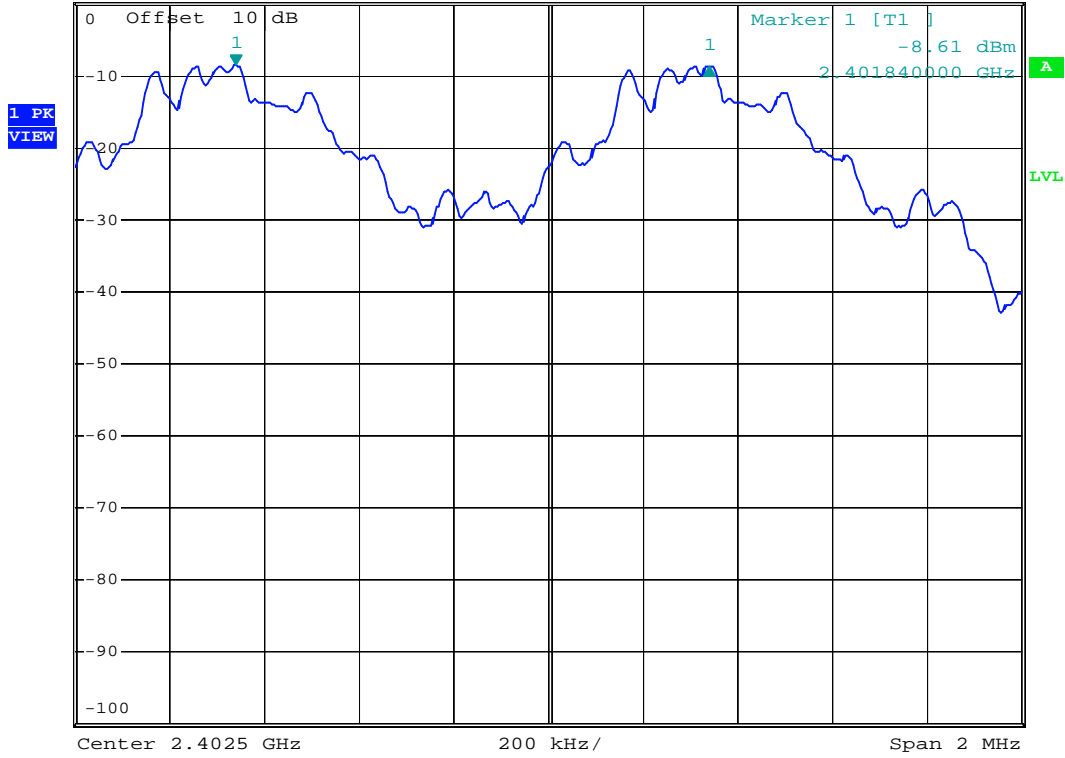


**Mode: Bluetooth BR**

**Channel Low**



Ref 0 dBm Att 20 dB \*RBW 30 kHz Delta 1 [T1 ]  
VBW 100 kHz -0.09 dB  
SWT 2.5 ms 1.000000000 MHz



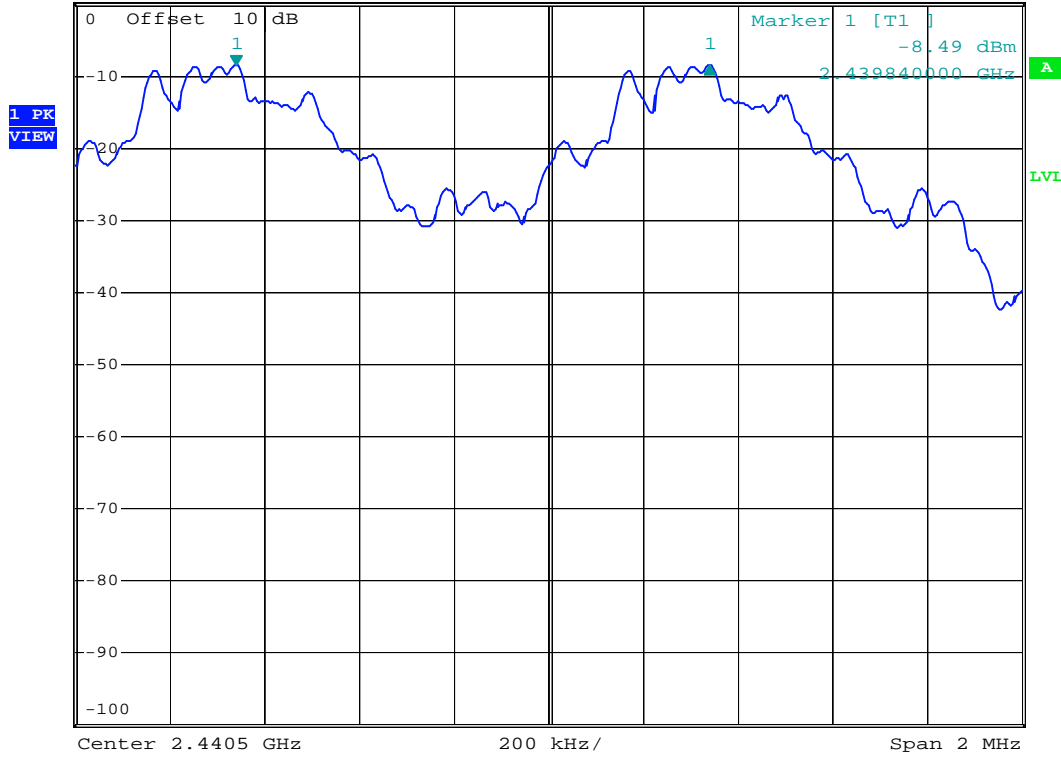
### Channel Middle



\*RBW 30 kHz    Delta 1 [T1 ]  
VBW 100 kHz    -0.06 dB  
SWT 2.5 ms    1.000000000 MHz

Ref 0 dBm

Att 20 dB



### Channel High

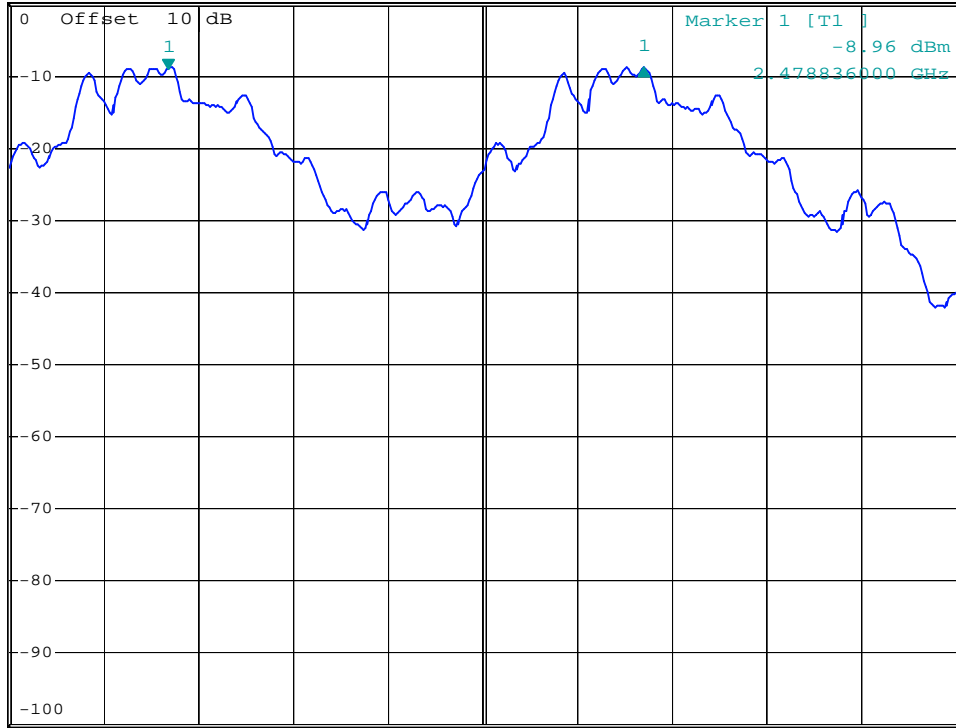


\*RBW 30 kHz    Delta 1 [T1 ]  
VBW 100 kHz    0.11 dB  
SWT 2.5 ms    1.004000000 MHz

Ref 0 dBm

Att 20 dB

1 PK  
VIEW



**Mode: Bluetooth EDR**

**Channel Low**



\*RBW 30 kHz    Delta 1 [T2 ]  
VBW 100 kHz                    0.01 dB  
SWT 5 ms                        1.002000000 MHz

Ref 0 dBm

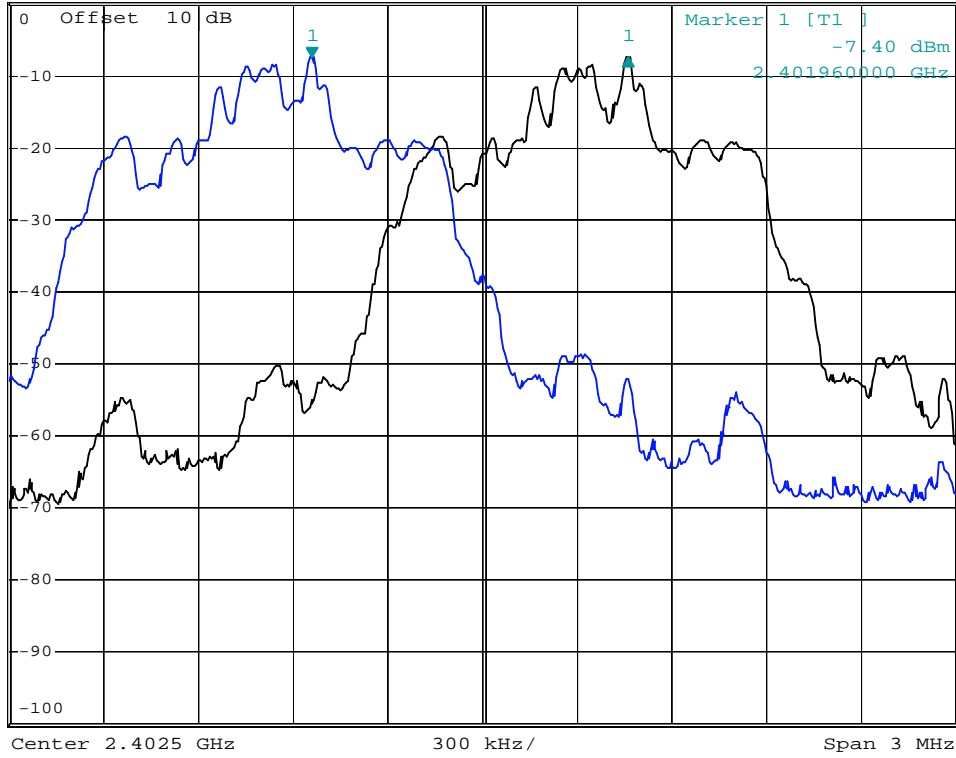
Att 20 dB

1 PK

VIEW

2 PK

VIEW



### Channel Middle



\*RBW 30 kHz    Delta 1 [T2 ]  
VBW 100 kHz    -0.02 dB  
SWT 5 ms        1.002000000 MHz

Ref 0 dBm

Att 20 dB

1 PK  
VIEW

2 PK  
VIEW



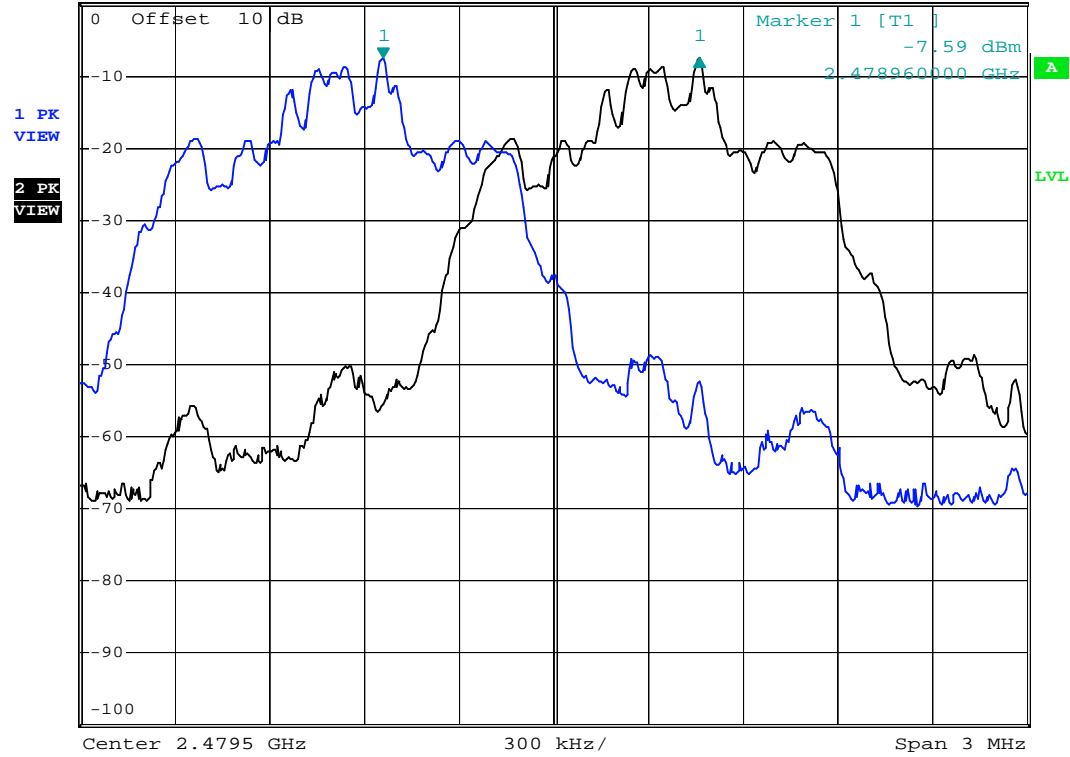
### Channel High



\*RBW 30 kHz Delta 1 [T2 ]  
VBW 100 kHz 0.00 dB  
SWT 5 ms 1.002000000 MHz

Ref 0 dBm

Att 20 dB



## 8 NUMBER OF HOPPING FREQUENCY USED

### 8.1 Standard Applicable

According to 15.247(a)(1)(iii), frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

### 8.2 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. The EUT must have its hopping function enabled.
3. Use the following spectrum analyzer settings:
  - Span = the frequency band of operation
  - RBW  $\geq$  1% of the span
  - VBW  $\geq$  RBW
  - Sweep = auto
  - Detector function = peak
  - Trace = max hold
4. Allow the trace to stabilize. Plot the result on the screen of spectrum analyzer.
5. Repeat above procedures until all frequencies measured were complete.

### 8.3 Measurement Equipment

| Equipment         | Manufacturer             | Model No. | Calibration Date | Next Cal. Date |
|-------------------|--------------------------|-----------|------------------|----------------|
| EMI Test Receiver | Rohde & Schwarz          | ESU 40    | 2014/08/15       | 2015/08/14     |
| Attenuator        | Weinschel<br>Engineering | AY7602    | 2014/11/03       | 2015/11/02     |

## 8.4 Measurement Data

Test Date : Jun. 02, 2015      Temperature : 24 °C      Humidity : 60 %

There are 79 hopping frequencies used.

### **Justification on AFH mode:**

Adaptive Frequency Hopping (AFH) means that a device can hop over a reduced set of frequencies. The frequencies hopped may be reduced in AFH mode but at least 15 channels will be used, normally AFH mode has 20 channels.

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



**Mode: Bluetooth BR**

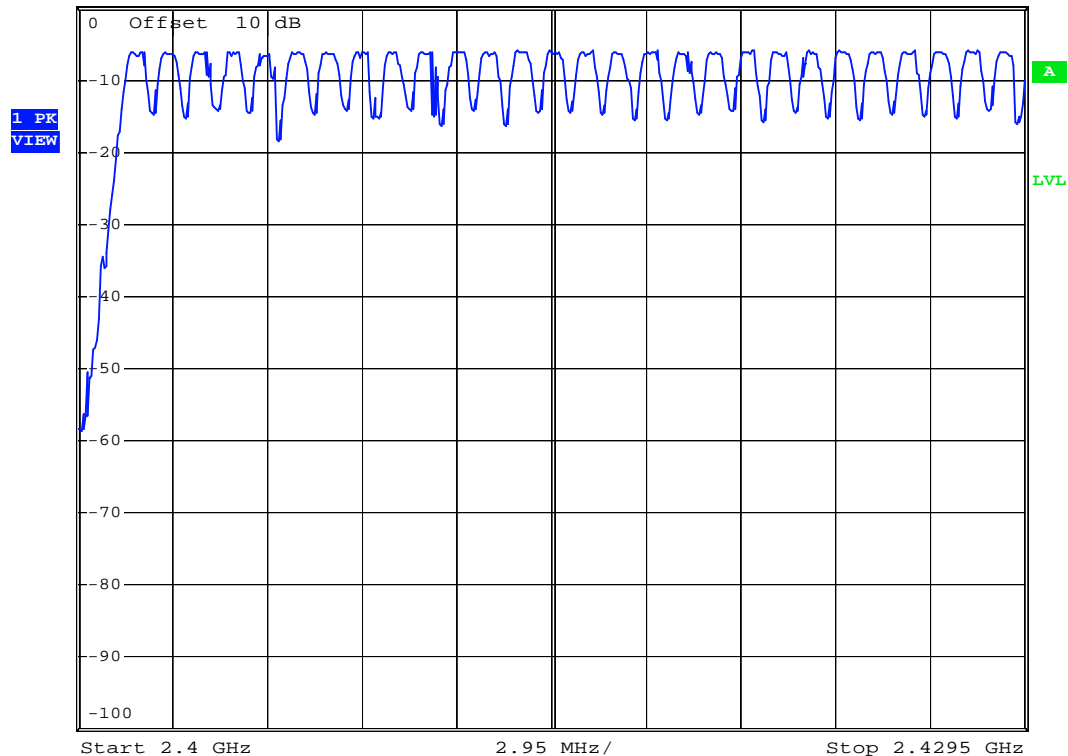


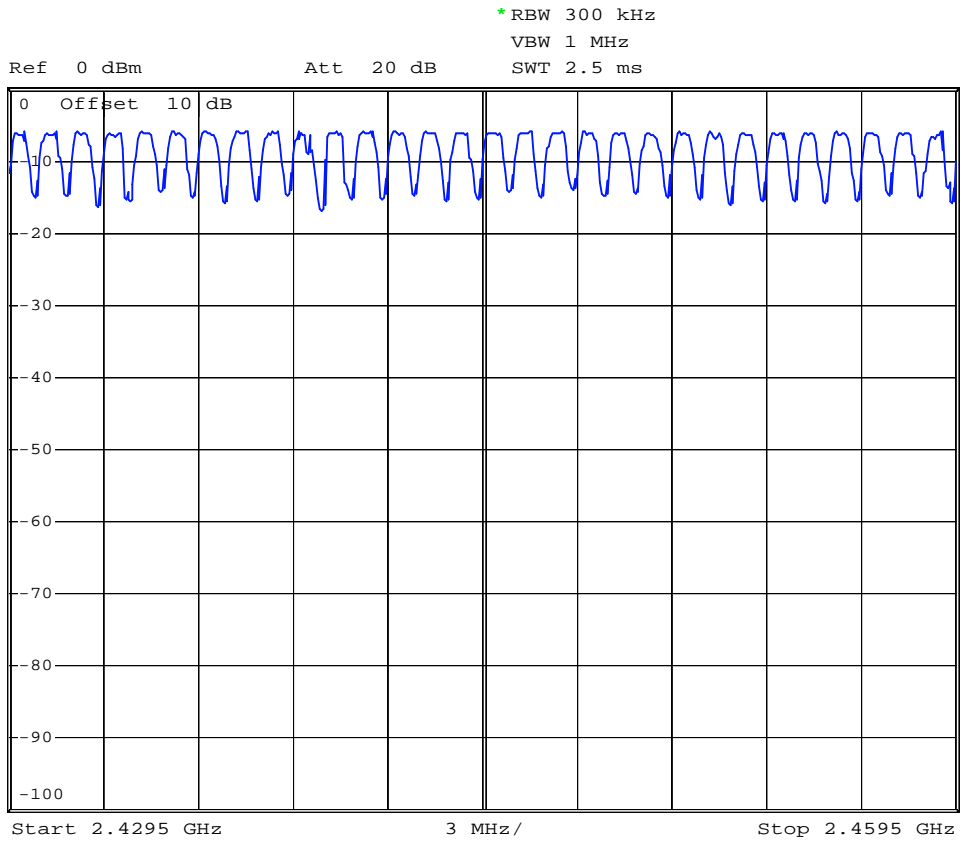
\*RBW 300 kHz  
VBW 1 MHz  
SWT 2.5 ms

Ref 0 dBm

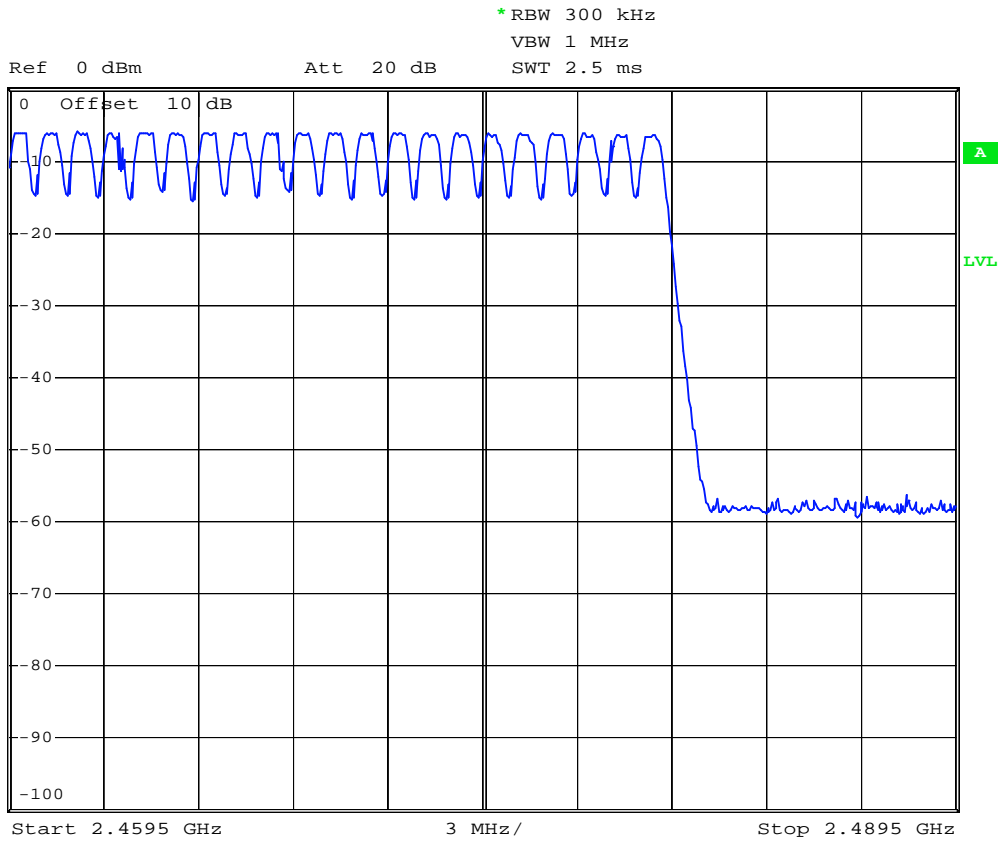
Att 20 dB

SWT 2.5 ms



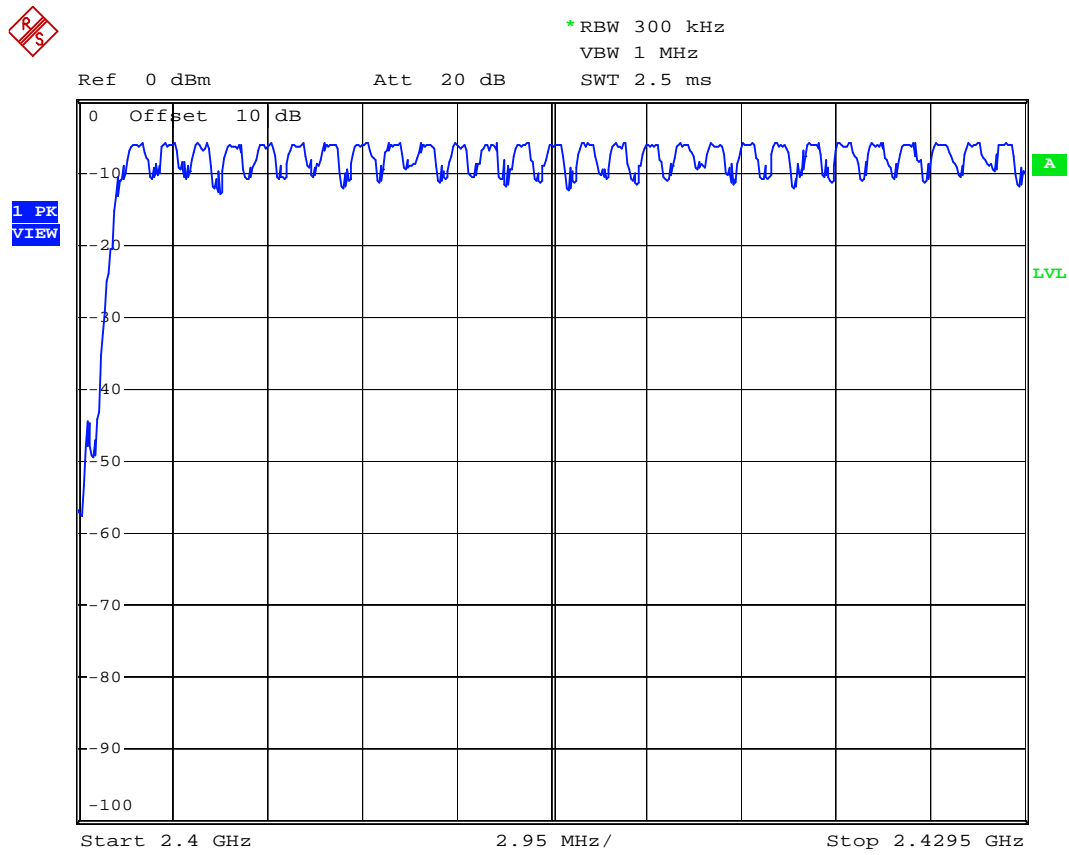


Date: 2.JUN.2015 10:39:27

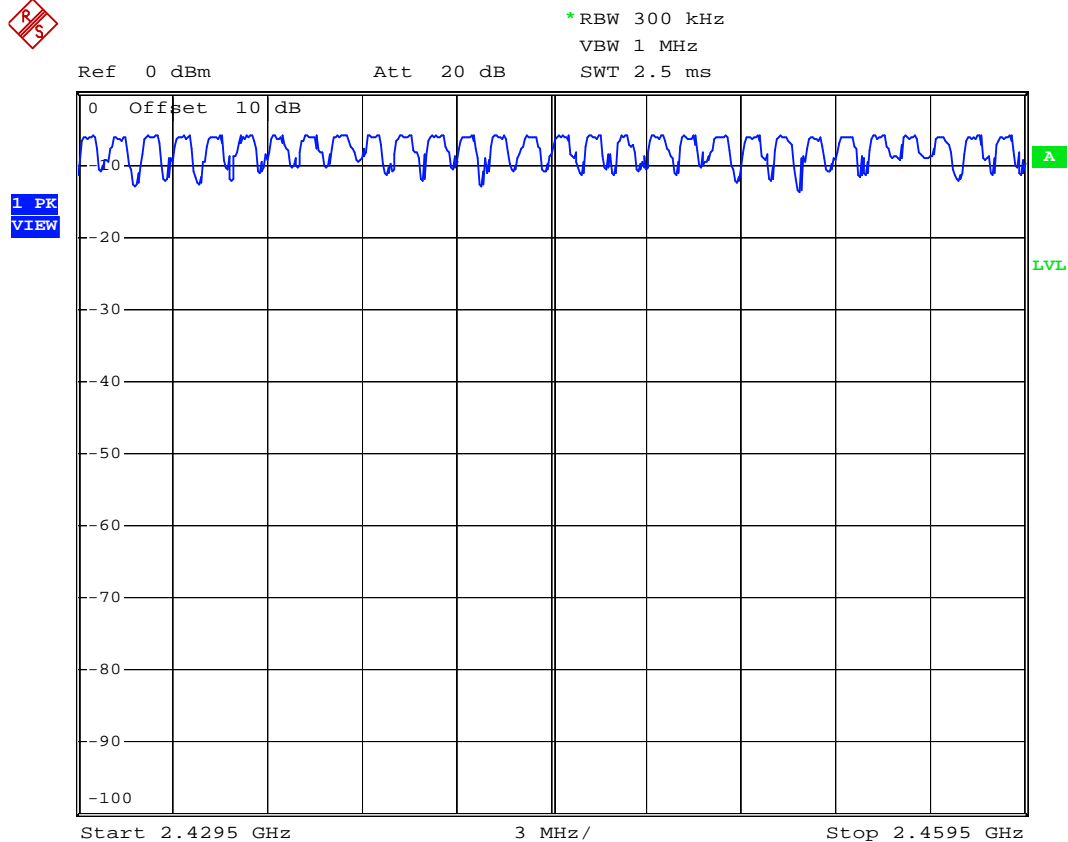


Date: 2.JUN.2015 10:42:01

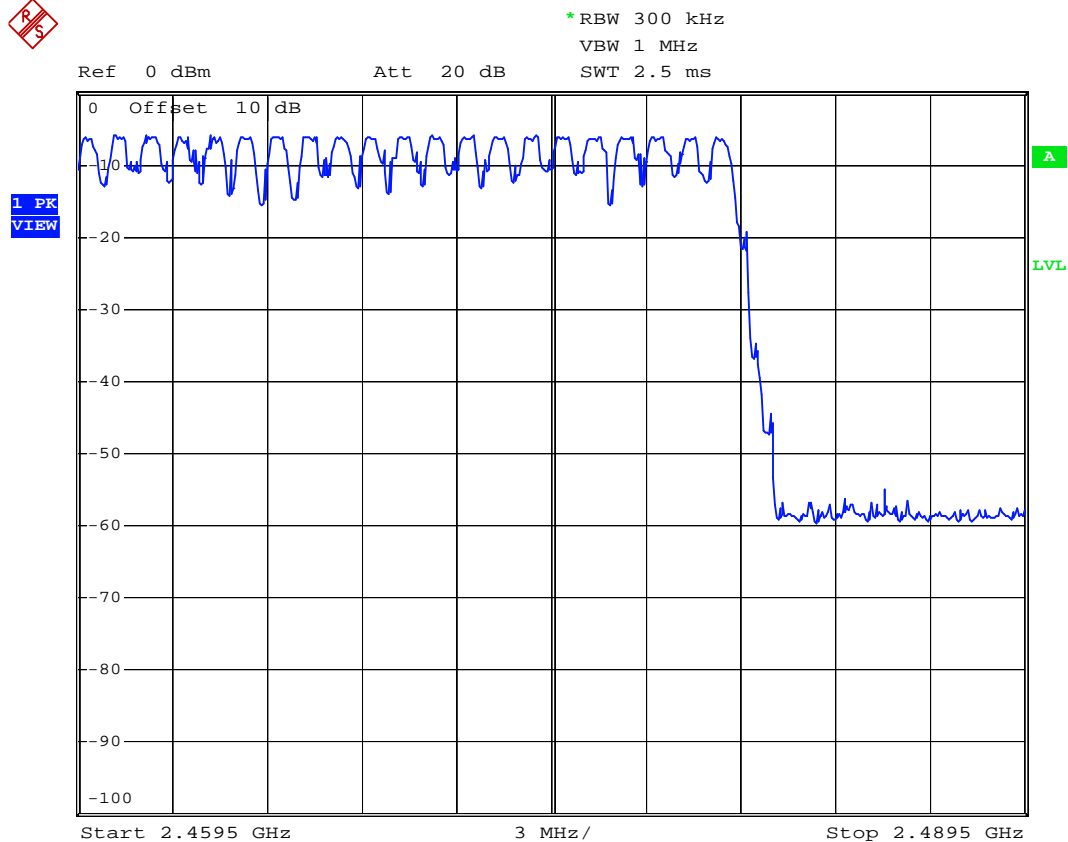
**Mode: Bluetooth EDR**



Date: 2.JUN.2015 11:58:20



Date: 2.JUN.2015 12:00:21



Date: 2.JUN.2015 12:01:33

## 9 CHANNEL BANDWIDTH

### 9.1 Standard Applicable

For frequency hopping system operating in the 2400–2483.5 MHz band, there is no requirement for the maximum 20dB bandwidth of the hopping channel. The measurement of the hopping channel bandwidth is for the reference of the hopping channel separation requirement.

### 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 it to measurement instrument. Then set it to any one convenient frequency within its operating range.
3. Use the following spectrum analyzer settings:
  - Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel
  - RBW  $\geq$  1% of the 20 dB bandwidth
  - VBW  $\geq$  RBW
  - Sweep = auto
  - Detector function = peak
  - Trace = max hold
4. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission. Plot the result on the screen of spectrum analyzer.
5. Repeat above procedures until all frequencies measured were complete.

### 9.3 Measurement Equipment

| Equipment         | Manufacturer             | Model No. | Calibration Date | Next Cal. Date |
|-------------------|--------------------------|-----------|------------------|----------------|
| EMI Test Receiver | Rohde & Schwarz          | ESU 40    | 2014/08/15       | 2015/08/14     |
| Attenuator        | Weinschel<br>Engineering | AY7602    | 2014/11/03       | 2015/11/02     |

### 9.4 Measurement Data

Test Date : Jun. 02, 2015      Temperature : 24 °C      Humidity : 60 %

#### Mode: Bluetooth BR

- a) Channel Low : Channel Bandwidth is 0.736 MHz
- b) Channel Middle : Channel Bandwidth is 0.732 MHz
- c) Channel High : Channel Bandwidth is 0.732 MHz

#### Mode: Bluetooth EDR

- a) Channel Low : Channel Bandwidth is 1.148 MHz
- b) Channel Middle : Channel Bandwidth is 1.152 MHz
- c) Channel High : Channel Bandwidth is 1.148 MHz

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



**Mode:Bluetooth BR**

**Channel Low**

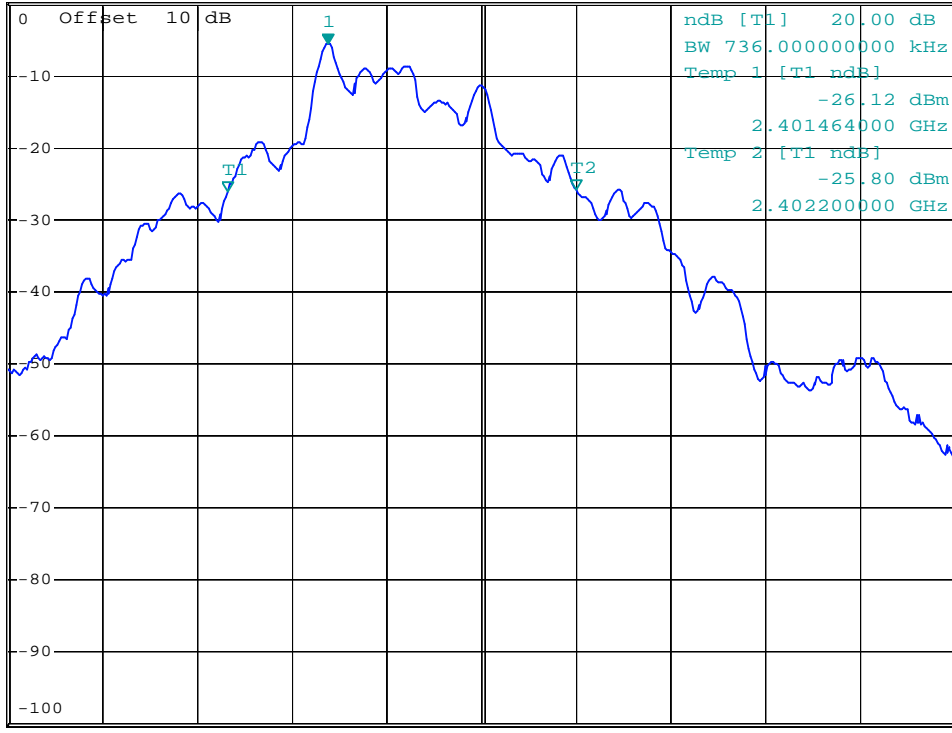


\*RBW 30 kHz    Marker 1 [T1 ]  
VBW 100 kHz                    -5.71 dBm  
SWT 2.5 ms                      2.401676000 GHz

Ref 0 dBm

Att 20 dB

1 PK  
VIEW



A

LVL

Center 2.402 GHz                    200 kHz/                    Span 2 MHz

### Channel Middle

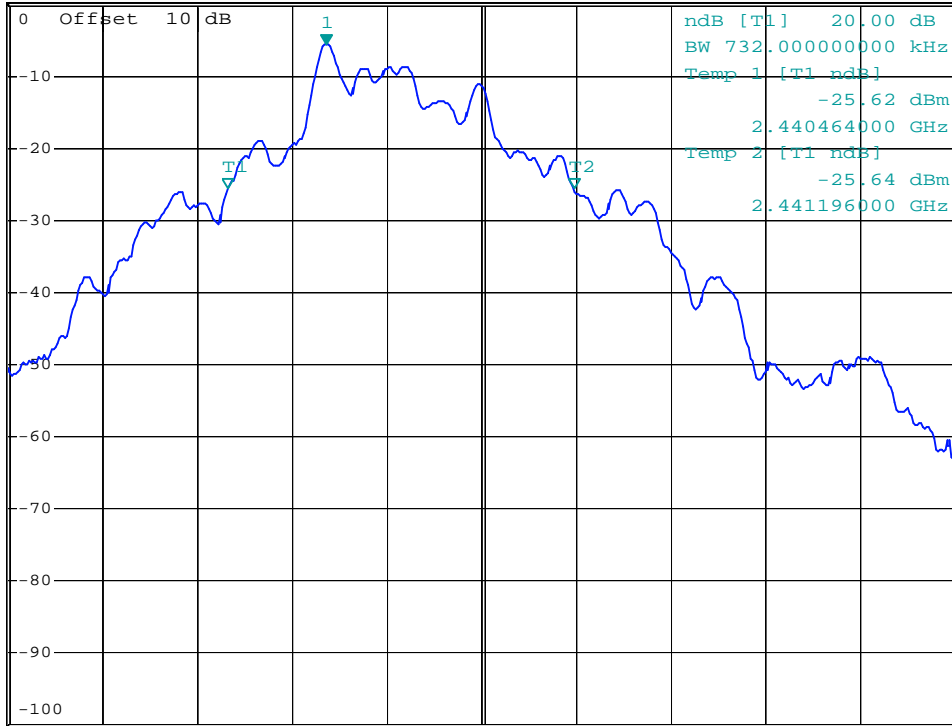


\*RBW 30 kHz    Marker 1 [T1 ]  
VBW 100 kHz                    -5.55 dBm  
SWT 2.5 ms                      2.440672000 GHz

Ref 0 dBm

Att 20 dB

1 PK  
VIEW



Center 2.441 GHz

200 kHz/

Span 2 MHz

### Channel High

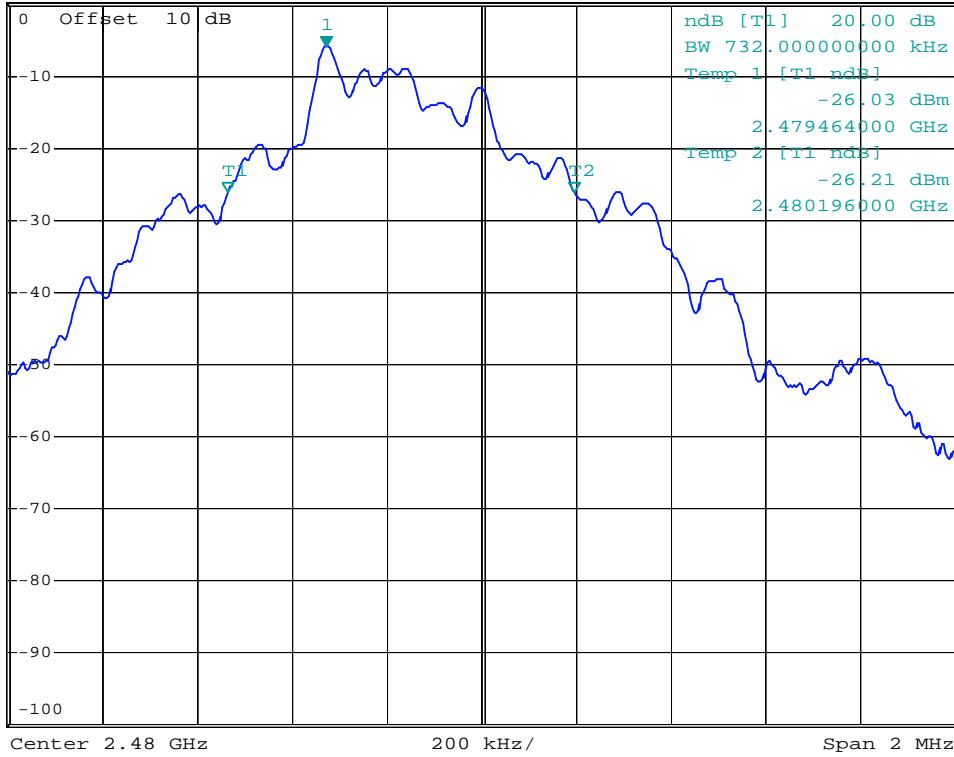


\*RBW 30 kHz    Marker 1 [T1 ]  
VBW 100 kHz                    -5.86 dBm  
SWT 2.5 ms                      2.479672000 GHz

Ref 0 dBm

Att 20 dB

1 PK  
VIEW



**Mode: Bluetooth EDR**

**Channel Low**

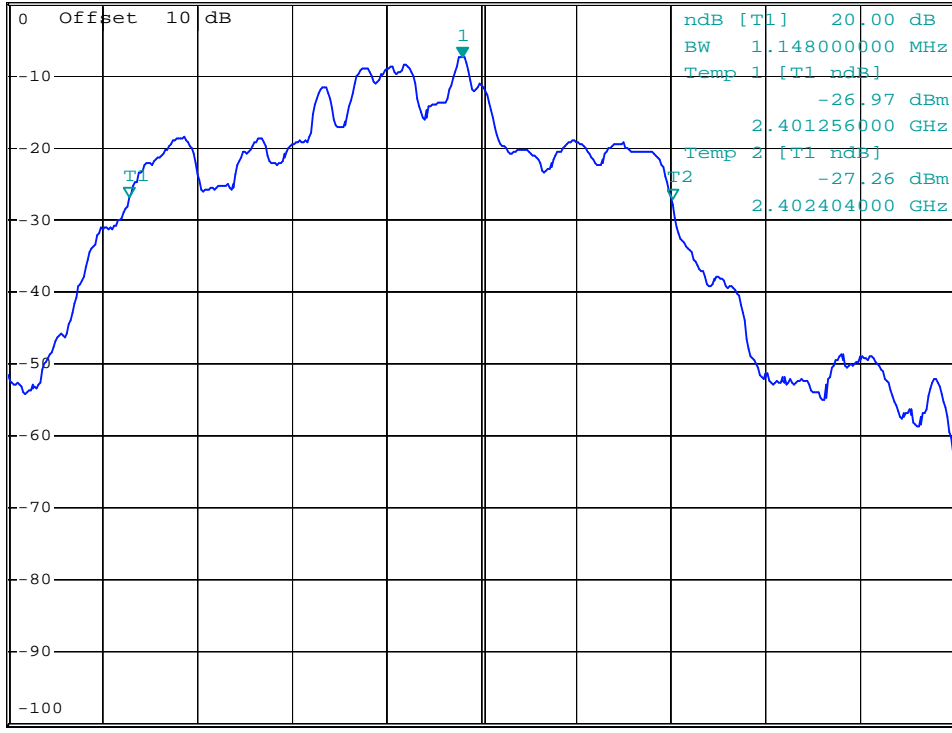


\*RBW 30 kHz    Marker 1 [T1 ]  
VBW 100 kHz                    -7.36 dBm  
SWT 2.5 ms                      2.401960000 GHz

Ref 0 dBm

Att 20 dB

1 PK  
VIEW



Center 2.402 GHz

200 kHz/

Span 2 MHz

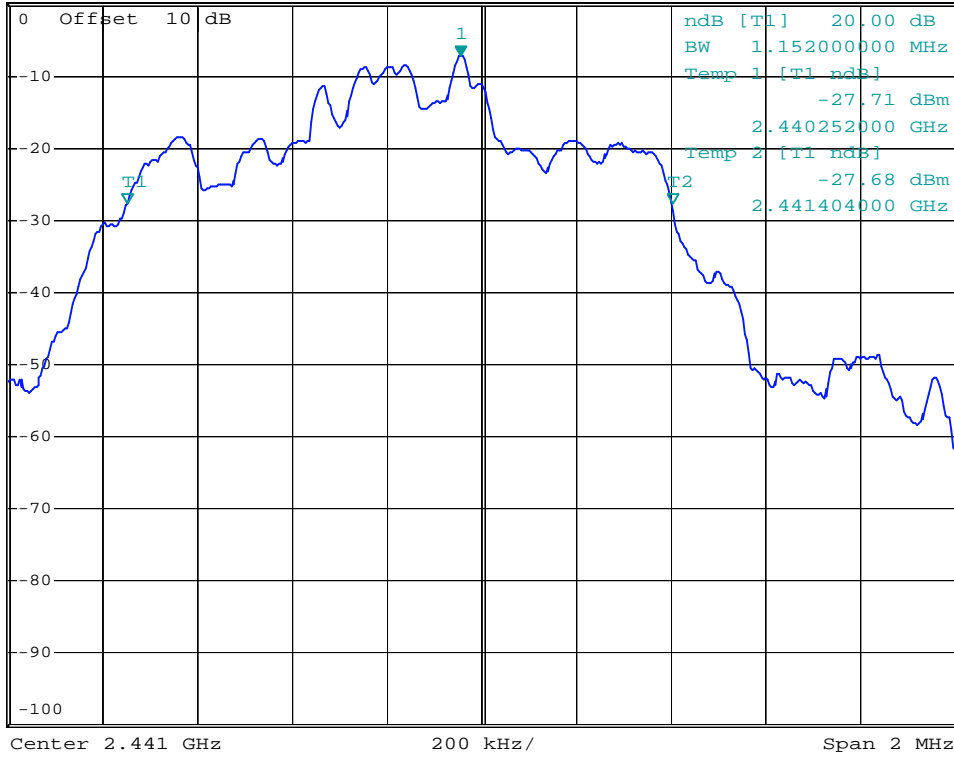
### Channel Middle



\*RBW 30 kHz    Marker 1 [T1]  
VBW 100 kHz    -7.20 dBm  
SWT 2.5 ms    2.440956000 GHz

Ref 0 dBm

Att 20 dB



### Channel High

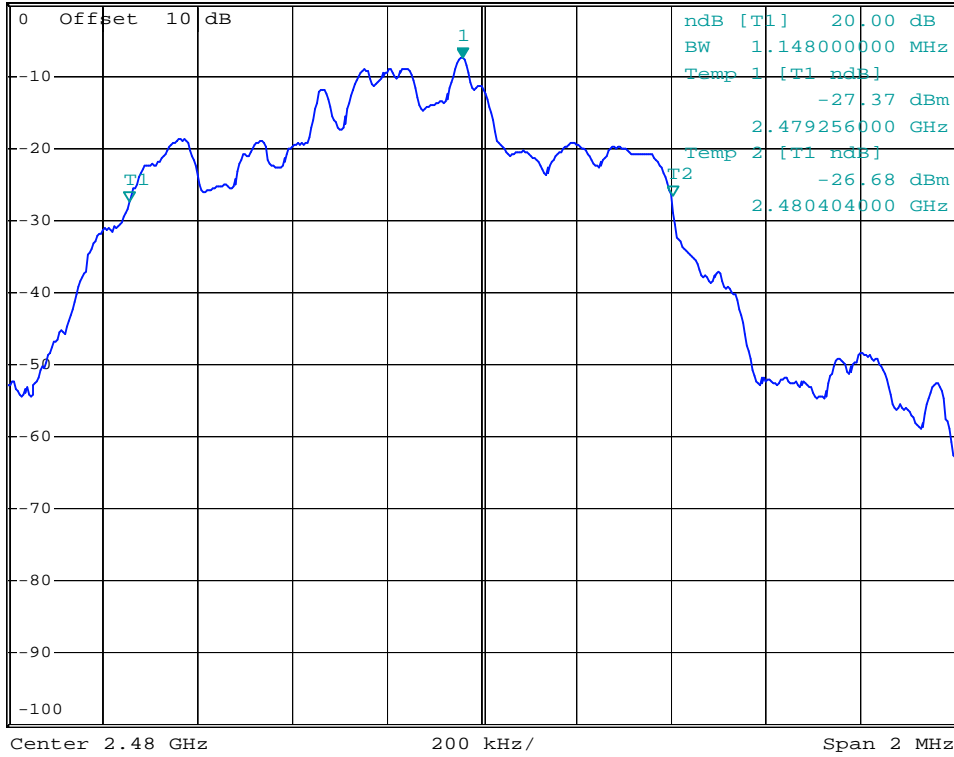


\*RBW 30 kHz    Marker 1 [T1 ]  
VBW 100 kHz                    -7.55 dBm  
SWT 2.5 ms                      2.479960000 GHz

Ref 0 dBm

Att 20 dB

1 PK  
VIEW



## 10 DWELL TIME ON EACH CHANNEL

### 10.1 Standard Applicable

According to 15.247(a)(1)(iii), for frequency hopping system operating in the 2400-2483.5 band, the average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

### 10.2 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. The EUT must have its hopping function enabled.
3. Use the following spectrum analyzer settings:
  - Span = zero span, centered on a hopping channel
  - RBW = 1 MHz
  - VBW  $\geq$  RBW
  - Sweep = as necessary to capture the entire dwell time per hopping channel
  - Detector function = peak
  - Trace = max hold
4. Use the marker-delta function to determine the dwell time. Plot the result on the screen of spectrum analyzer.
5. Repeat above procedures until all frequencies measured were complete.

#### Justification on AFH mode:

Adaptive Frequency Hopping (AFH) means that a device can hop over a reduced set of frequencies. The frequencies hopped may be reduced in AFH mode but at least 15 channels will be used, normally AFH mode has 20 channels.

### 10.3 Measurement Equipment

| Equipment         | Manufacturer             | Model No. | Calibration Date | Next Cal. Date |
|-------------------|--------------------------|-----------|------------------|----------------|
| EMI Test Receiver | Rohde & Schwarz          | ESU 40    | 2014/08/15       | 2015/08/14     |
| Attenuator        | Weinschel<br>Engineering | AY7602    | 2014/11/03       | 2015/11/02     |

## 10.4 Measurement Data

### Test Mode: Bluetooth BR

Test Date : Jun. 02, 2015      Temperature : 24 °C      Humidity : 60 %

**Period = 0.4(seconds) x 79(channels) = 31.6 seconds**

#### A. DH1 Mode

The Bluetooth system hops at a rate of 1600 times per second. This means there are 1600 timeslots in one second. The DH1 data rate operates on a one-slot transmission and one-slot receiving basis. Thus there are  $1600/(1+1) = 800$  transmissions per second. In one period for each particular channel there are  $10.13 \times 31.6 = 320.1$  times of transmissions.

- a) Channel Low : the dwell time is 0.50 ms x 320.1 = 160.050 ms
- b) Channel Middle : the dwell time is 0.48 ms x 320.1 = 153.648 ms
- c) Channel High : the dwell time is 0.48 ms x 320.1 = 153.648 ms

The maximum time of occupancy for a particular channel is 147.246ms in any 31.6 second period, which is less than the 400ms allowed by the rules; therefore, it meets the requirements of this section.

#### B. DH3 Mode

The Bluetooth system hops at a rate of 1600 times per second. This means there are 1600 timeslots in one second. The DH3 data rate operates on a three-slot transmission and one-slot receiving basis. Thus there are  $1600/(3+1) = 400$  transmissions per second. In one period for each particular channel there are  $5.06 \times 31.6 = 159.9$  times of transmissions.

- a) Channel Low : the dwell time is 1.80 ms x 159.9 = 287.820 ms
- b) Channel Middle : the dwell time is 1.86 ms x 159.9 = 297.414 ms
- c) Channel High : the dwell time is 1.86 ms x 159.9 = 297.414 ms

The maximum time of occupancy for a particular channel is 281.424ms in any 31.6 second period, which is less than the 400 ms allowed by the rules; therefore, it meets the requirements of this section.

#### C. DH5 Mode

The Bluetooth system hops at a rate of 1600 times per second. This means there are 1600 timeslots in one second. The DH5 data rate operates on a five-slot transmission and one-slot receiving basis. Thus there are  $1600/(5+1) = 266.7$  transmissions per second. In one period for each particular channel there are  $3.38 \times 31.6 = 106.81$  times of transmissions.

- a) Channel Low : the dwell time is 3.10 ms x 106.81 = 331.111 ms
- b) Channel Middle : the dwell time is 3.20 ms x 106.81 = 341.792 ms
- c) Channel High : the dwell time is 3.10 ms x 106.81 = 331.111 ms

The maximum time of occupancy for a particular channel is 326.838ms in any 31.6 second period, which is less than the 400 ms allowed by the rules; therefore, it meets the requirements of this section.

**Note : The expanded uncertainty of dwell time on each channel tests is 2dB.**



**Test Mode:Bluetooth EDR**

Test Date : Jun. 02, 2015      Temperature : 24 °C      Humidity : 60 %

**Period = 0.4(seconds) x 20(channels) = 8 seconds**

**A. DH1 Mode**

The Bluetooth system hops at a rate of 800 times per second. This means there are 800 timeslots in one second. The DH1 data rate operates on a one-slot transmission and one-slot receiving basis. Thus there are  $800/(1+1) = 400$  transmissions per second. In one period for each particular channel there are  $20 \times 8 = 160$  times of transmissions.

- a) Channel Low : the dwell time is  $0.48\text{ms} \times 160 = 76.8$  ms
- b) Channel Middle : the dwell time is  $0.50\text{ms} \times 160 = 80.0$  ms
- c) Channel Hi : the dwell time is  $0.50\text{ms} \times 160 = 80.0$  ms

The maximum time of occupancy for a particular channel is 75.2ms in any 8 second period, which is less than the 400ms allowed by the rules; therefore, it meets the requirements of this section.

**B. DH3 Mode**

The Bluetooth system hops at a rate of 800 times per second. This means there are 800 timeslots in one second. The DH3 data rate operates on a three-slot transmission and one-slot receiving basis. Thus there are  $800/(3+1) = 200$  transmissions per second. In one period for each particular channel there are  $10 \times 8 = 80$  times of transmissions.

- a) Channel Low : the dwell time is  $1.80\text{ms} \times 80 = 144.000$  ms
- b) Channel Middle : the dwell time is  $1.80\text{ms} \times 80 = 144.200$  ms
- c) Channel Hi : the dwell time is  $1.86\text{ms} \times 80 = 148.800$  ms

The maximum time of occupancy for a particular channel is 139.200ms in any 8 second period, which is less than the 400 ms allowed by the rules; therefore, it meets the requirements of this section.

**C. DH5 Mode**

The Bluetooth system hops at a rate of 800 times per second. This means there are 800 timeslots in one second. The DH5 data rate operates on a five-slot transmission and one-slot receiving basis. Thus there are  $800/(5+1) = 133.3$  transmissions per second. In one period for each particular channel there are  $6.665 \times 8 = 53.32$  times of transmissions.

- a) Channel Low : the dwell time is  $3.20\text{ms} \times 53.32 = 170.624$  ms
- b) Channel Middle : the dwell time is  $3.20\text{ms} \times 53.32 = 170.624$  ms
- c) Channel Hi : the dwell time is  $3.10\text{ms} \times 53.32 = 165.292$  ms

The maximum time of occupancy for a particular channel is 162.092ms in any 8 second period, which is less than the 400 ms allowed by the rules; therefore, it meets the requirements of this section.

***Note : The expanded uncertainty of dwell time on each channel tests is 2dB.***

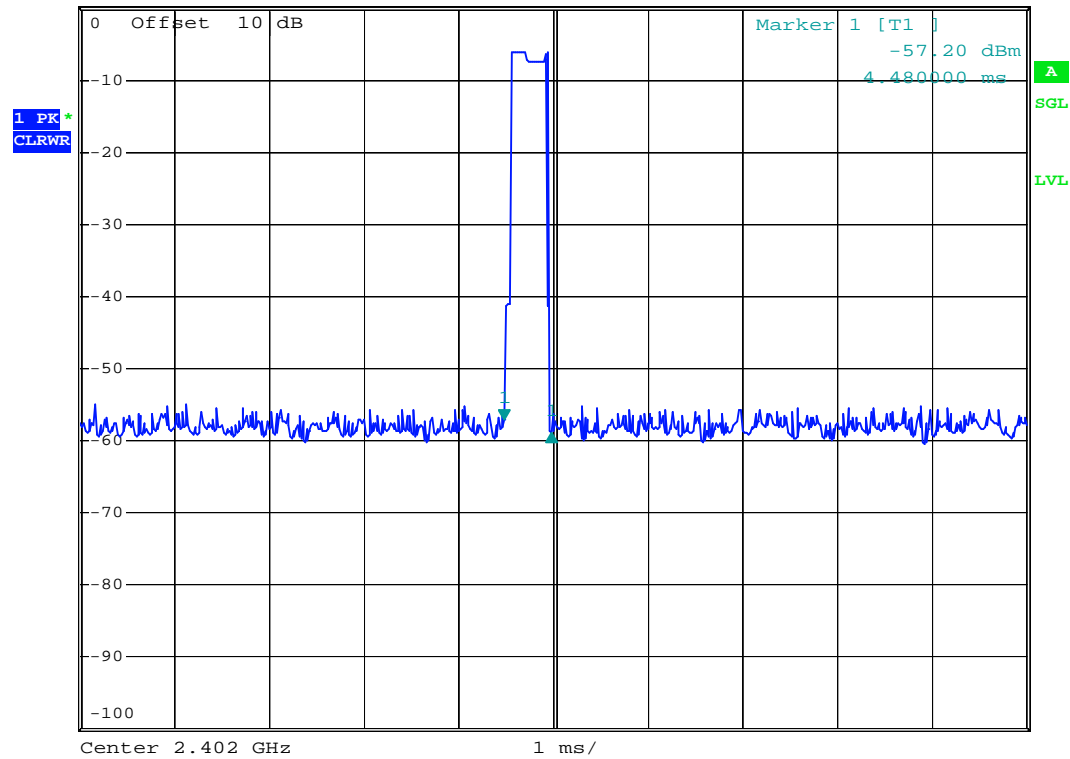
Mode: Bluetooth BR

Channel Low; DHI

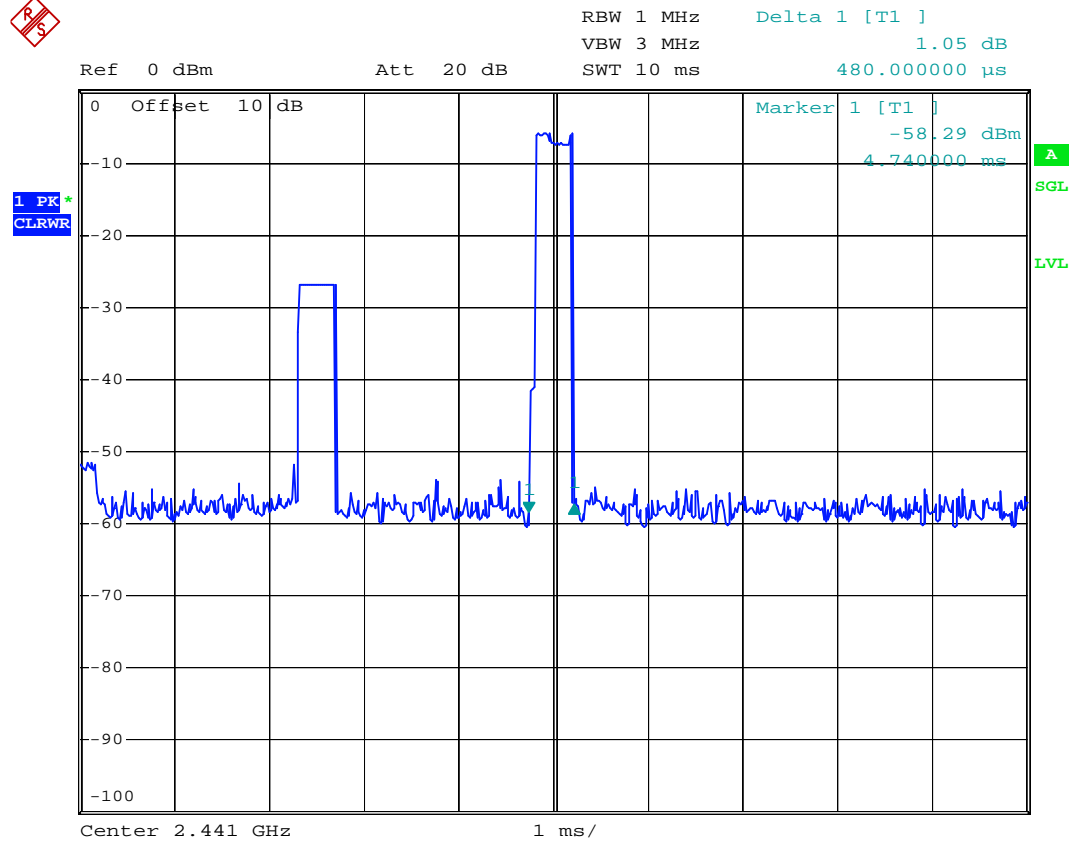


RBW 1 MHz      Delta 1 [T1 ]  
VBW 3 MHz      -1.83 dB  
SWT 10 ms      500.000000 µs

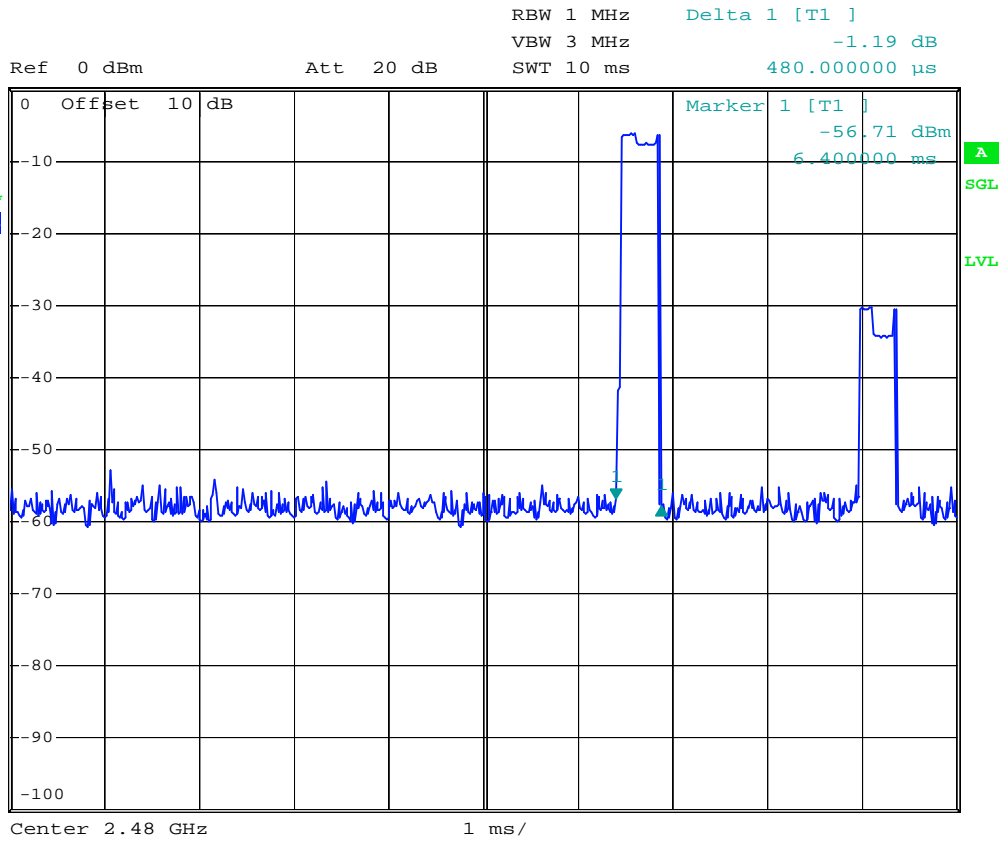
Ref 0 dBm      Att 20 dB



### Channel Middle; DH1



### Channel High; DH1

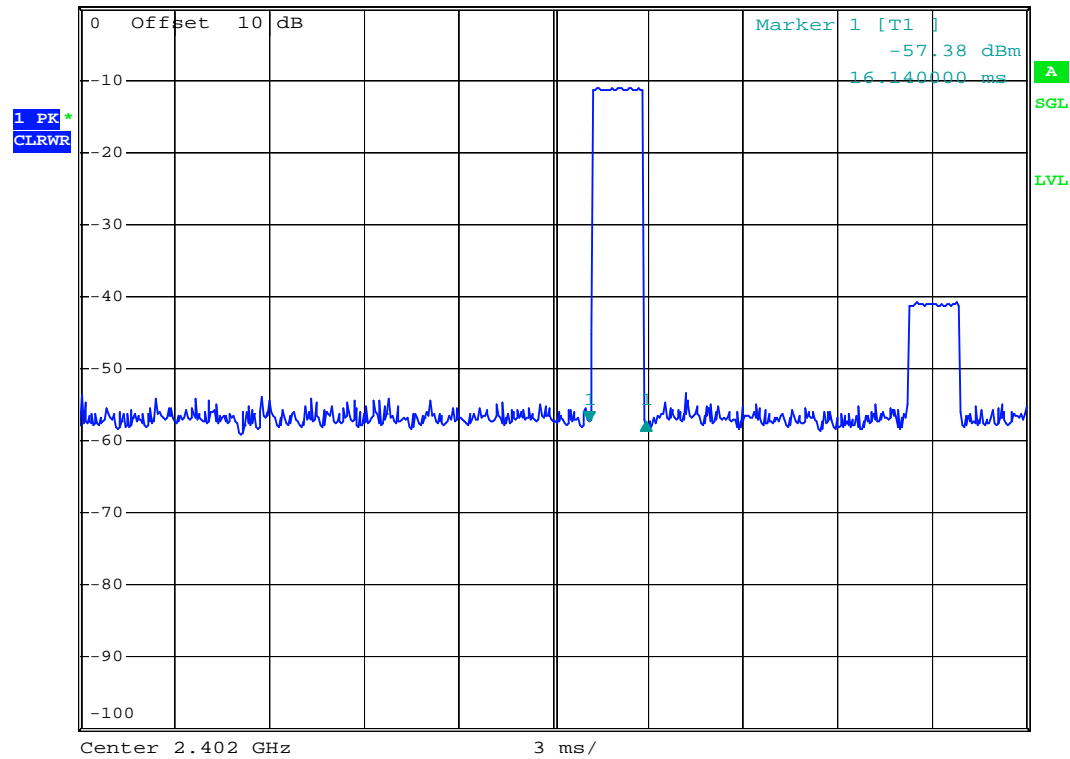


### Channel Low; DH3

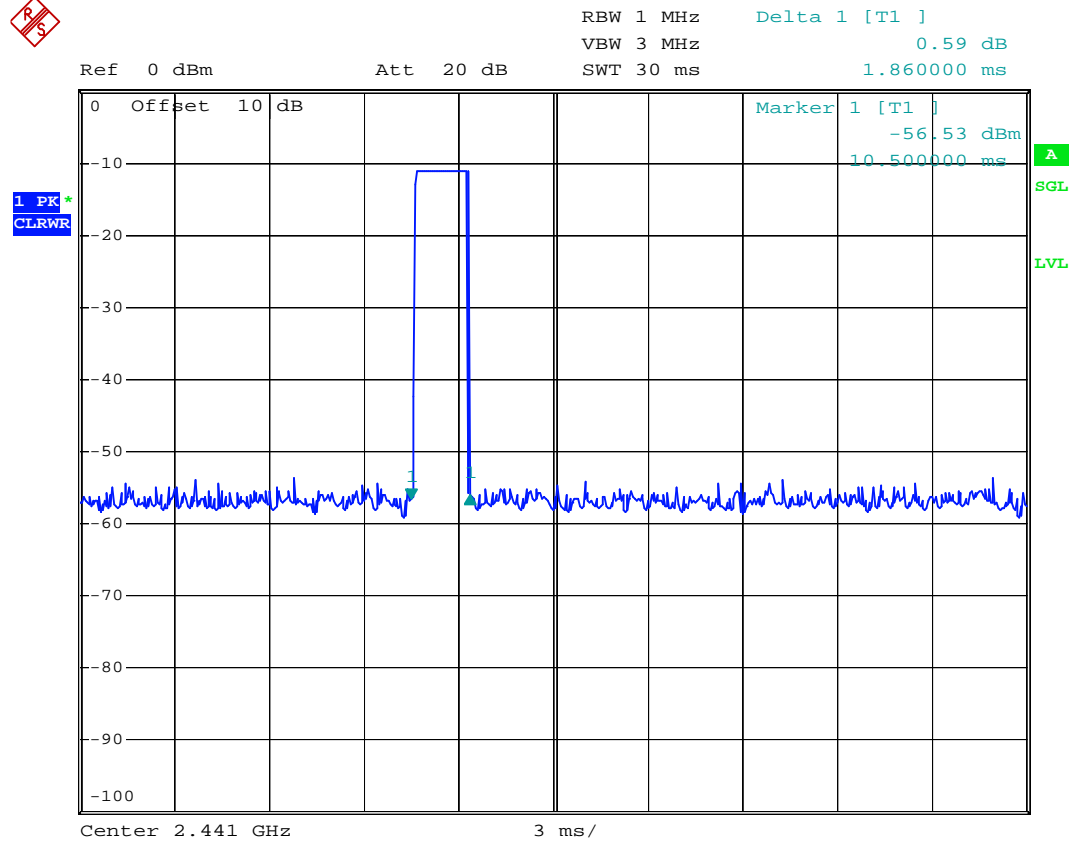


RBW 1 MHz    Delta 1 [T1 ]  
VBW 3 MHz    -0.01 dB  
SWT 30 ms    1.800000 ms

Ref 0 dBm    Att 20 dB



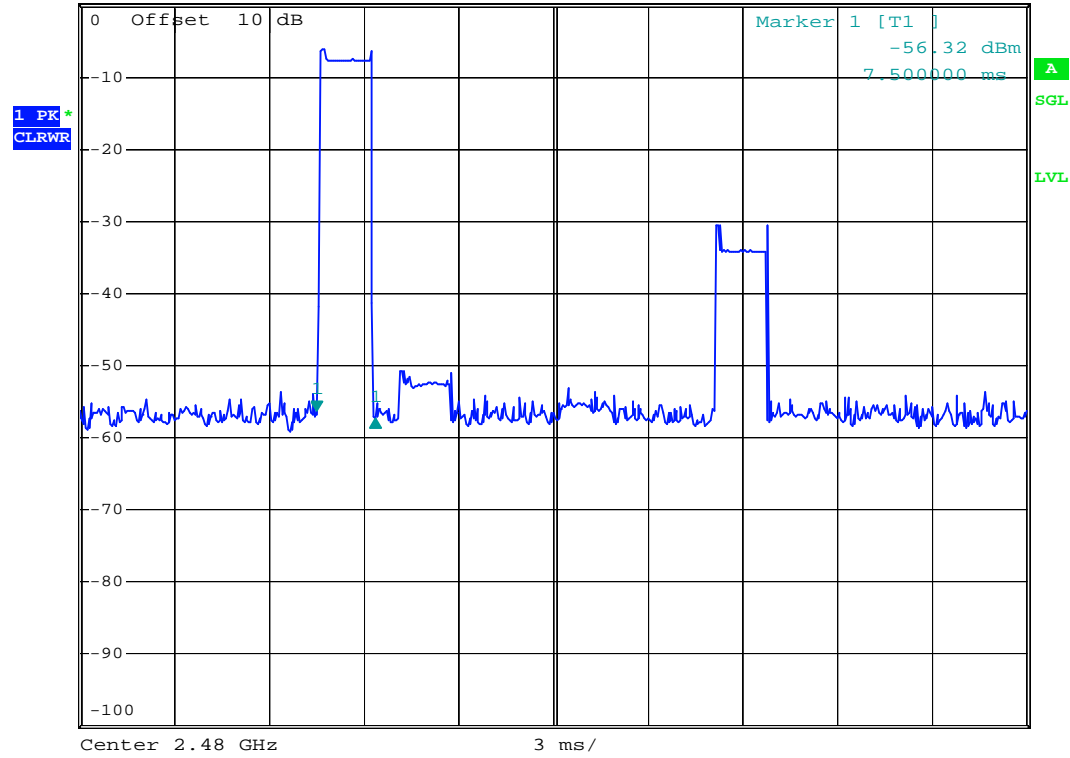
### Channel Middle; DH3



### Channel High; DH3



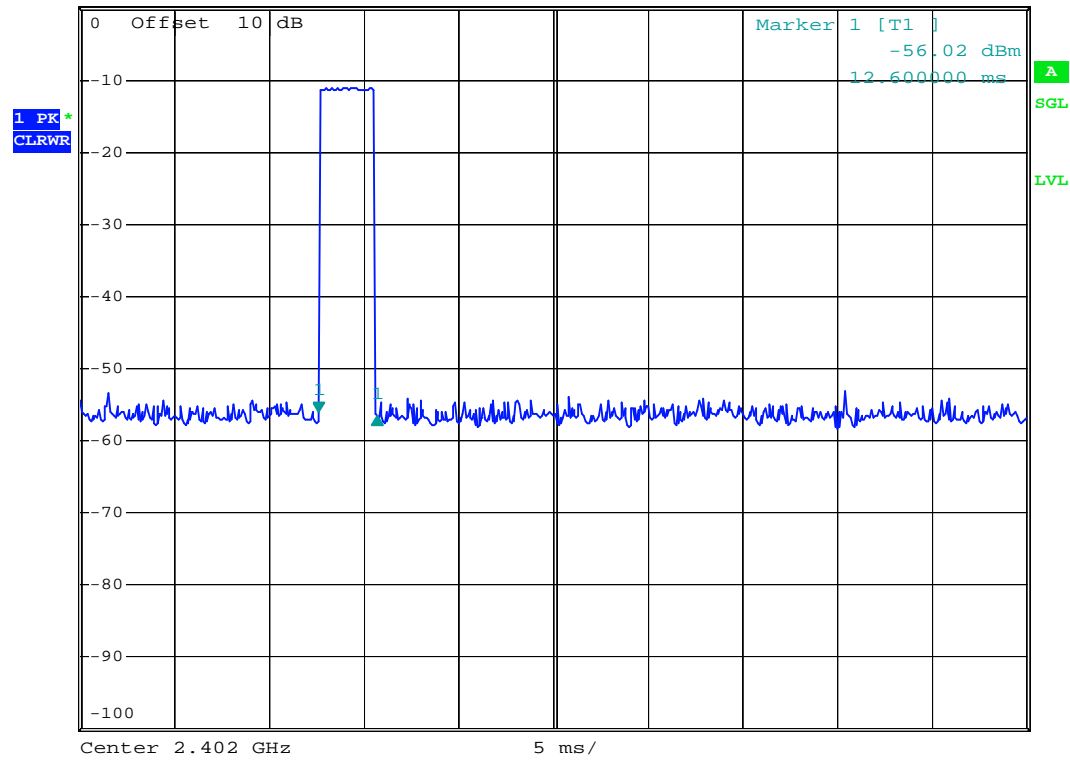
RBW 1 MHz      Delta 1 [T1 ]  
VBW 3 MHz      -0.98 dB  
Ref 0 dBm      Att 20 dB      SWT 30 ms      1.860000 ms



### Channel Low; DH5

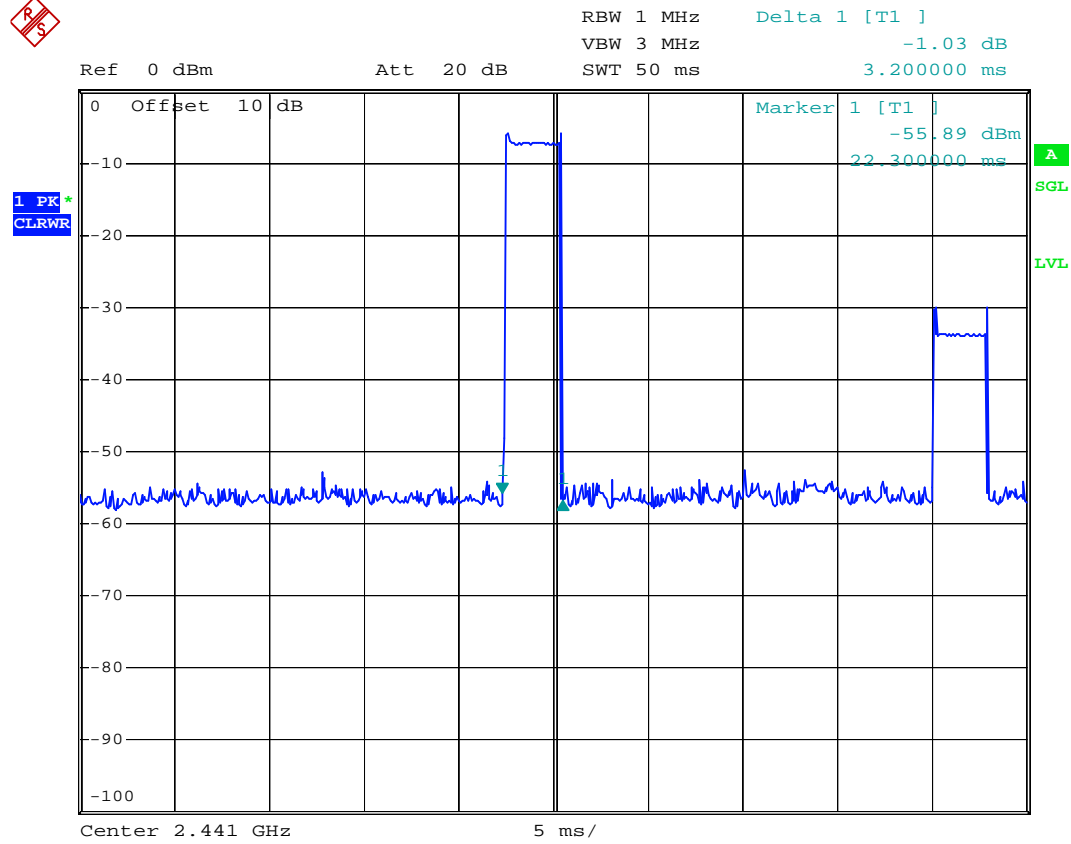


Ref 0 dBm Att 20 dB RBW 1 MHz Delta 1 [T1 ]  
VBW 3 MHz -0.61 dB  
SWT 50 ms 3.100000 ms

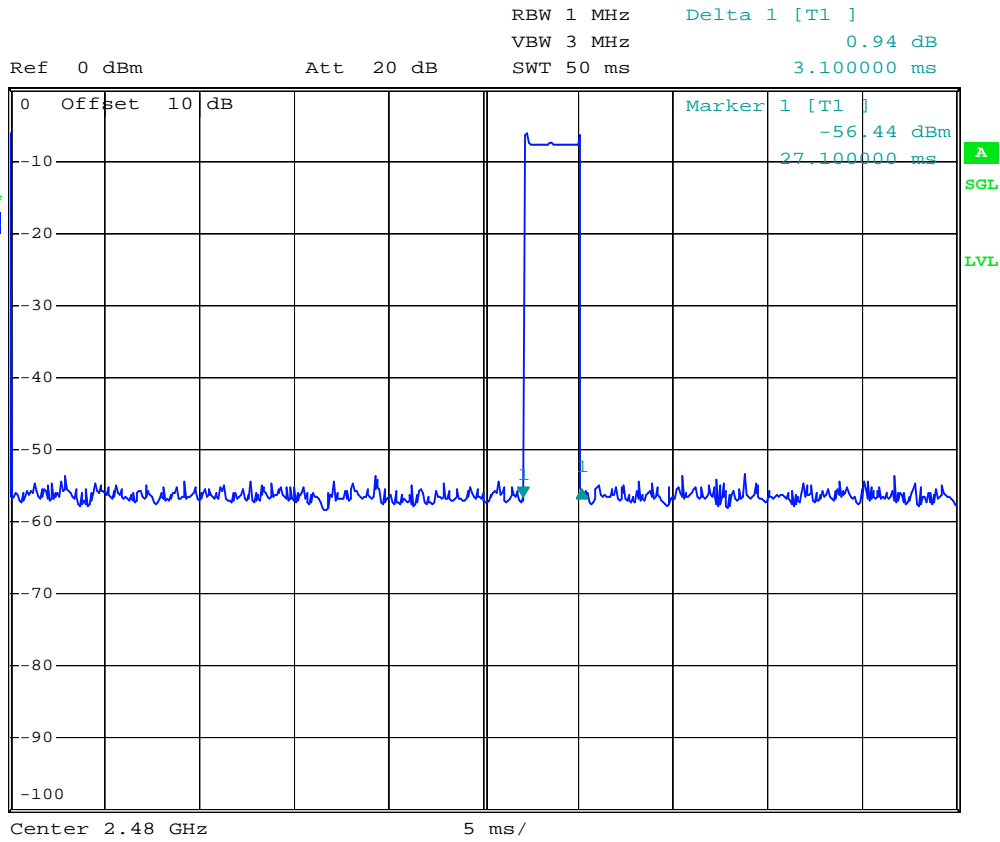




Channel Middle; DH5



### Channel High; DH5



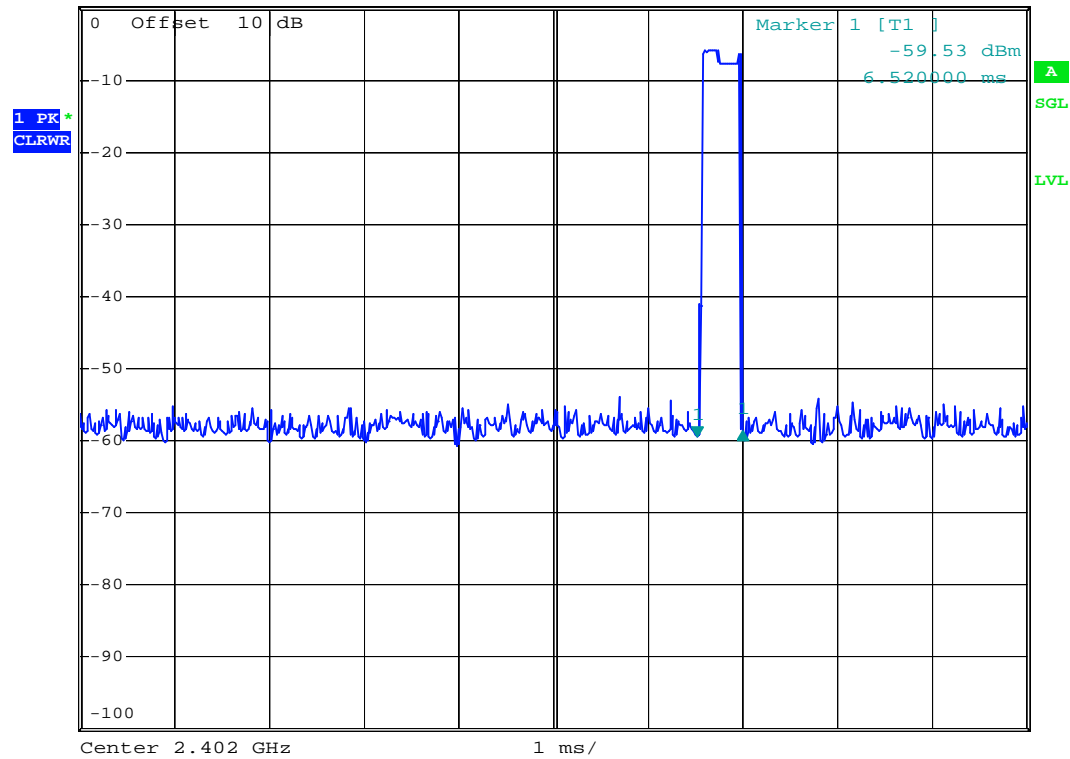
Mode: Bluetooth EDR

Channel Low; DHI

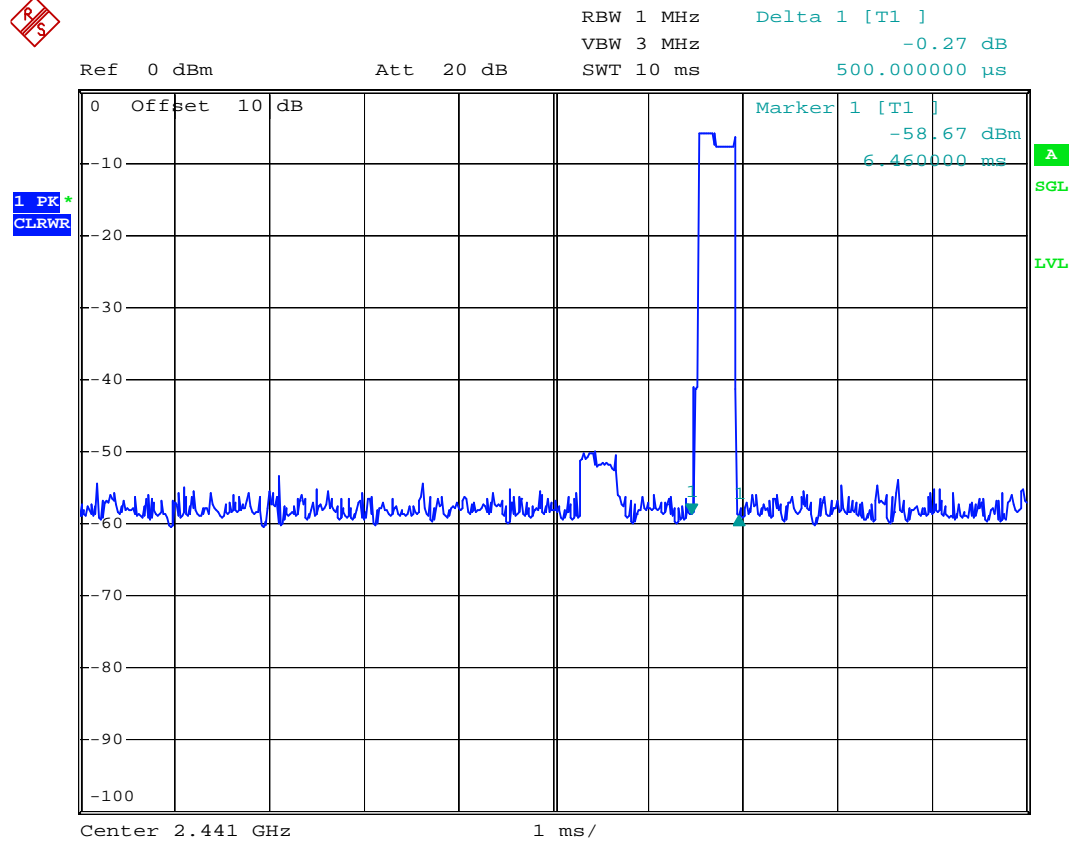


RBW 1 MHz      Delta 1 [T1 ]  
VBW 3 MHz      0.89 dB  
SWT 10 ms      480.000000 µs

Ref 0 dBm      Att 20 dB



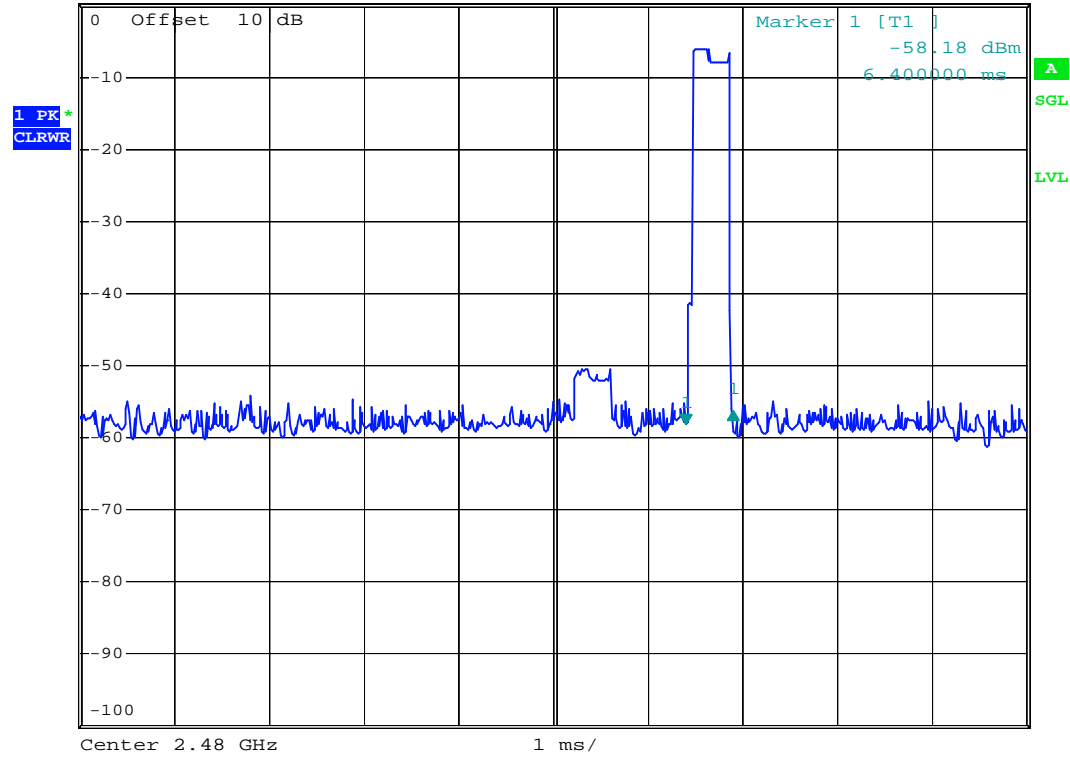
### Channel Middle; DH1



### Channel High; DH1



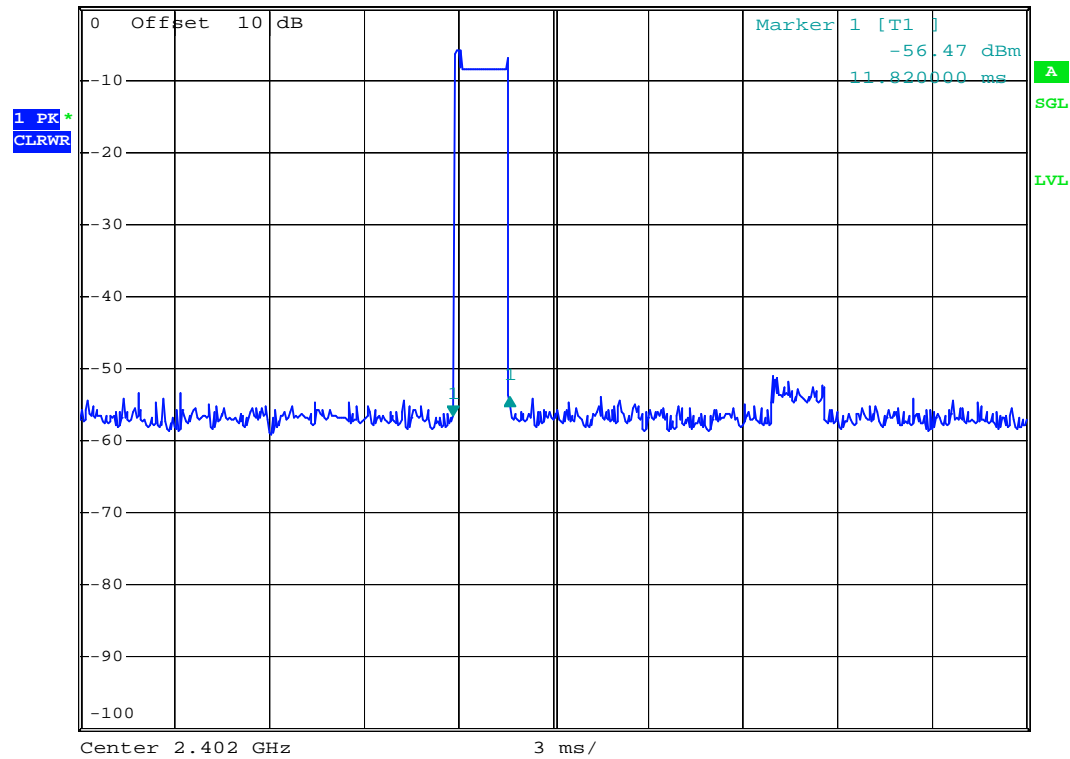
RBW 1 MHz      Delta 1 [T1 ]  
VBW 3 MHz      1.86 dB  
Ref 0 dBm      Att 20 dB      SWT 10 ms      500.000000 μs



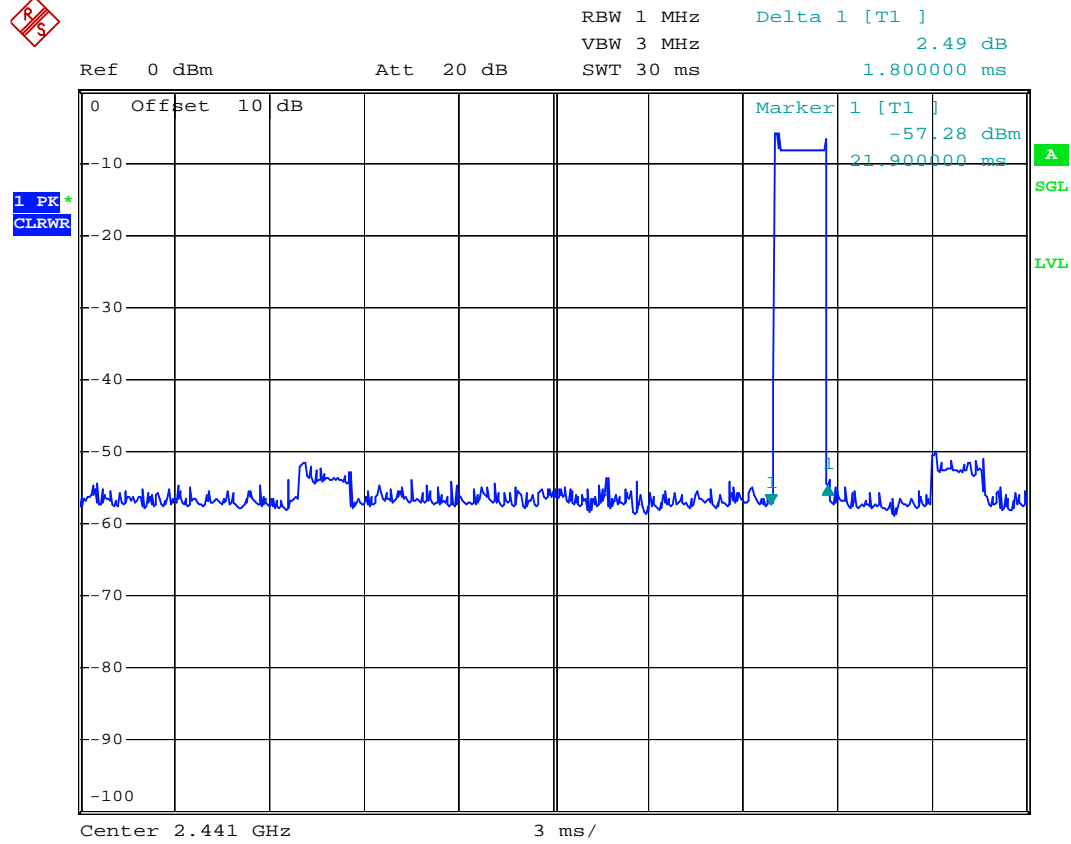
### Channel Low; DH3



RBW 1 MHz    Delta 1 [T1 ]  
VBW 3 MHz    2.45 dB  
SWT 30 ms    1.800000 ms  
Ref 0 dBm    Att 20 dB



### Channel Middle; DH3

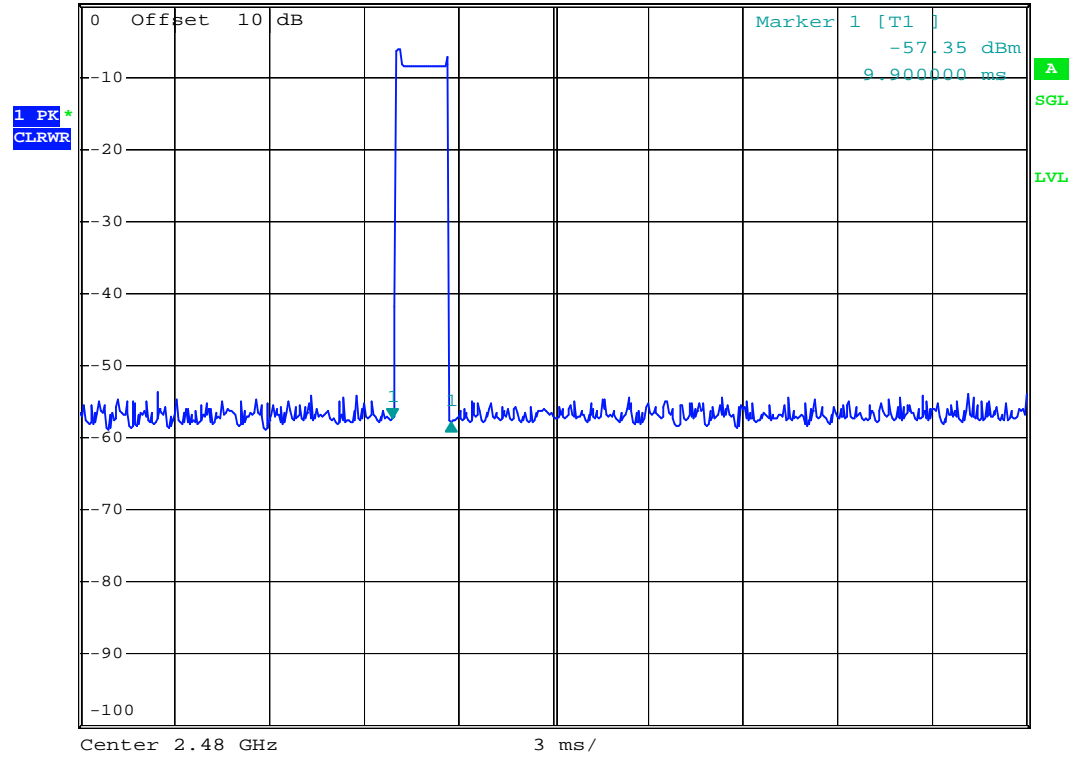


### Channel High; DH3



RBW 1 MHz      Delta 1 [T1 ]  
VBW 3 MHz      -0.60 dB  
SWT 30 ms      1.860000 ms

Ref 0 dBm      Att 20 dB



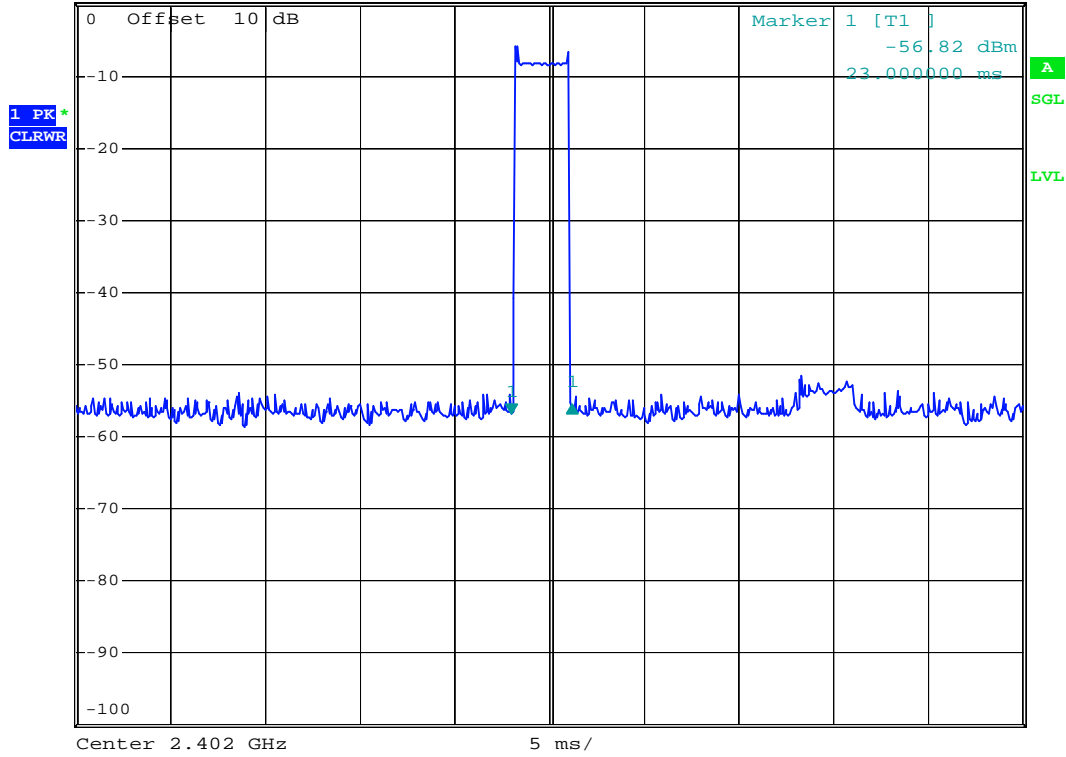


### Channel Low; DH5

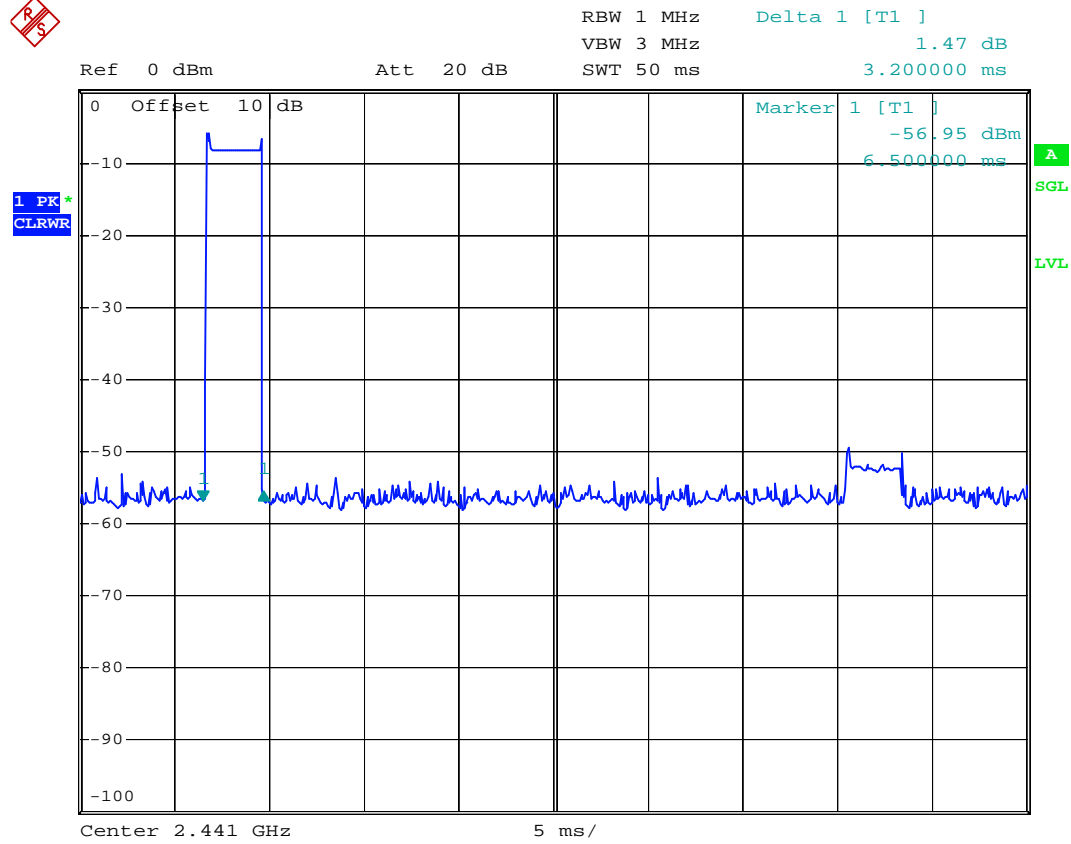


RBW 1 MHz    Delta 1 [T1 ]  
VBW 3 MHz    1.39 dB  
SWT 50 ms    3.200000 ms

Ref 0 dBm    Att 20 dB



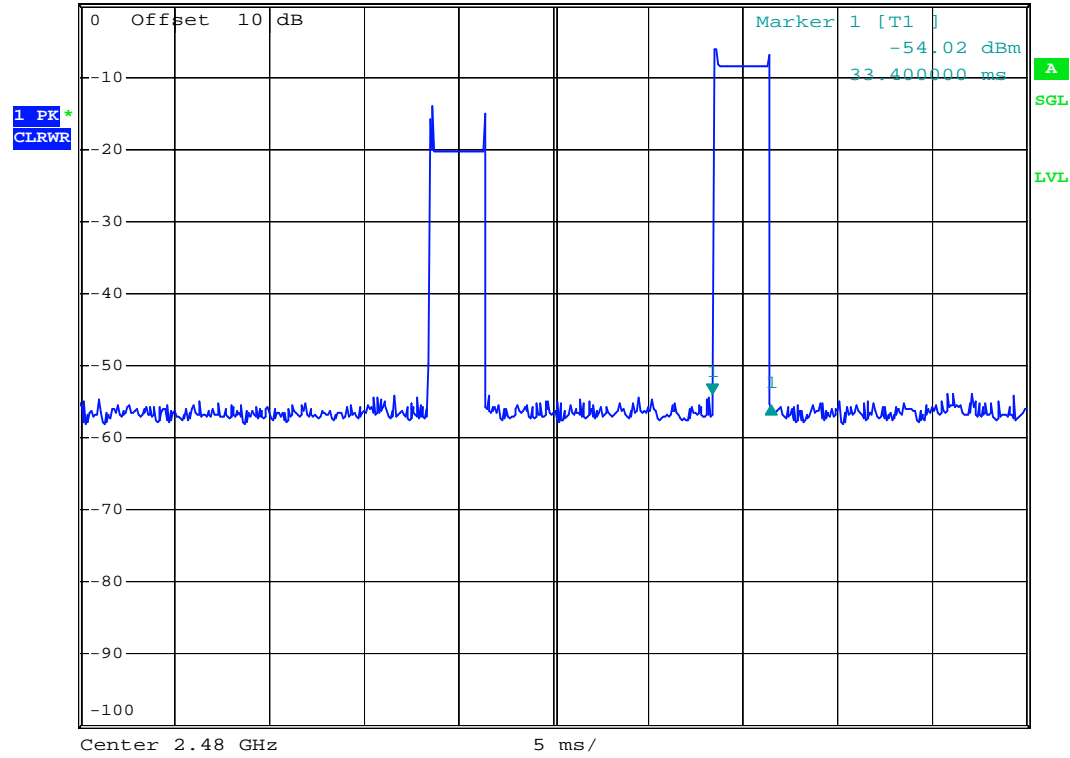
**Channel Middle; DH5**



### Channel High; DH5



RBW 1 MHz    Delta 1 [T1 ]  
VBW 3 MHz    -1.54 dB  
Ref 0 dBm    Att 20 dB    SWT 50 ms    3.100000 ms



## 11 OUTPUT POWER MEASUREMENT

### 11.1 Standard Applicable

According to 15.247(b)(1), for frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

### 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 = approximately 5 times the 20 dB bandwidth, centered on a hopping channel
  - RBW > the 20 dB bandwidth of the emission being measured
  - VBW  $\geq$  RBW
  - Sweep = auto
  - Detector function = peak
  - Trace = max hold
4. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power. Plot the result on the screen of spectrum analyzer.
5. Repeat above procedures until all frequencies measured were complete.

### 11.3 Measurement Equipment

| Equipment         | Manufacturer             | Model No. | Calibration Date | Next Cal. Date |
|-------------------|--------------------------|-----------|------------------|----------------|
| EMI Test Receiver | Rohde & Schwarz          | ESU 40    | 2014/08/15       | 2015/08/14     |
| Attenuator        | Weinschel<br>Engineering | AY7602    | 2014/11/03       | 2015/11/02     |

## 11.4 Measurement Data

Test Date : Jun. 02, 2015      Temperature : 24 °C      Humidity : 60 %

### Mode: Bluetooth BR

- a) Channel Low : Output Peak Power is -6.10 dBm or 0.245 mW ◦
- b) Channel Middle : Output Peak Power is -5.93 dBm or 0.255 mW ◦
- c) Channel High : Output Peak Power is -6.26 dBm or 0.237 mW ◦

### Mode: Bluetooth EDR

- a) Channel Low : Output Peak Power is -5.43 dBm or 0.286 mW ◦
- b) Channel Middle : Output Peak Power is -5.27 dBm or 0.297 mW ◦
- c) Channel High : Output Peak Power is -5.55 dBm or 0.279 mW ◦

### Justification on AFH mode:

Adaptive Frequency Hopping (AFH) means that a device can hop over a reduced set of frequencies. The frequencies hopped may be reduced in AFH mode but at least 15 channels will be used. Hence the output power limit is 125mW.

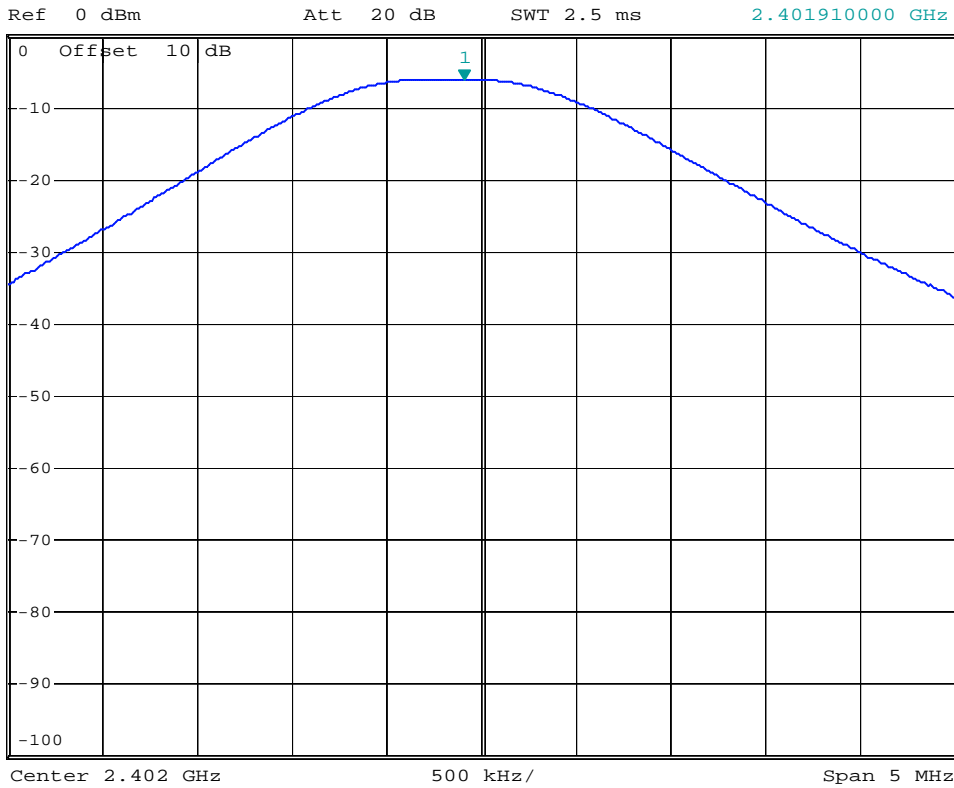
*Note : The expanded uncertainty: 2dB.*

**Mode: Bluetooth BR**

**Channel Low**



\*RBW 1 MHz    Marker 1 [T1 ]  
VBW 3 MHz    -6.10 dBm  
SWT 2.5 ms    2.401910000 GHz



### Channel Middle

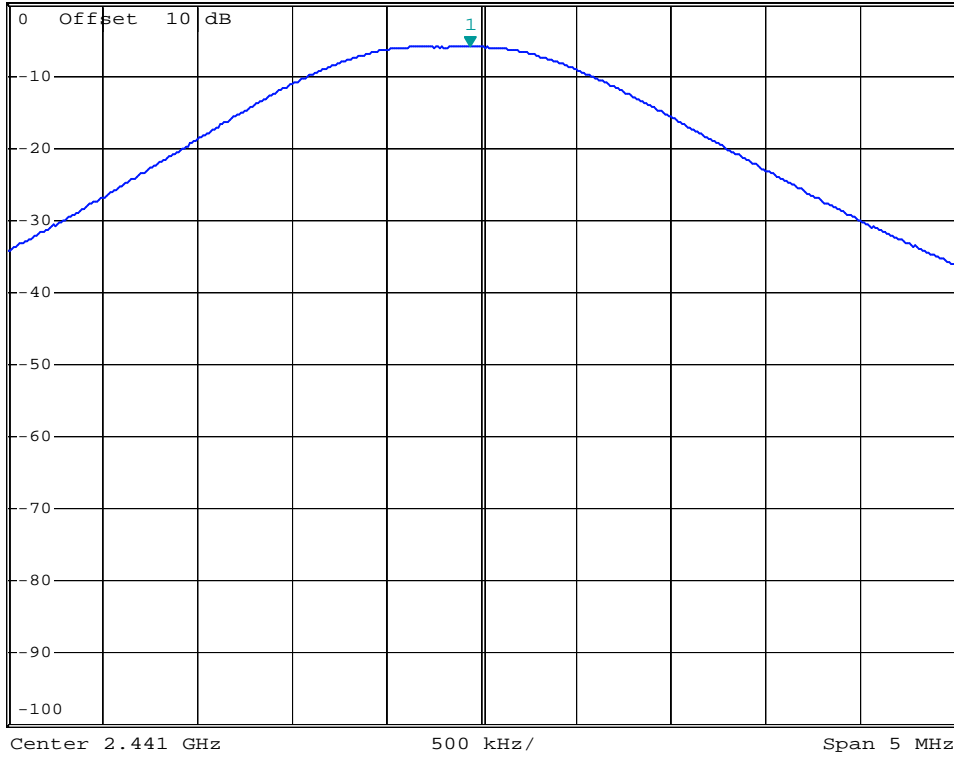


\*RBW 1 MHz      Marker 1 [T1 ]  
VBW 3 MHz      -5.93 dBm  
SWT 2.5 ms      2.440940000 GHz

Ref 0 dBm

Att 20 dB

1 PK  
VIEW



### Channel High

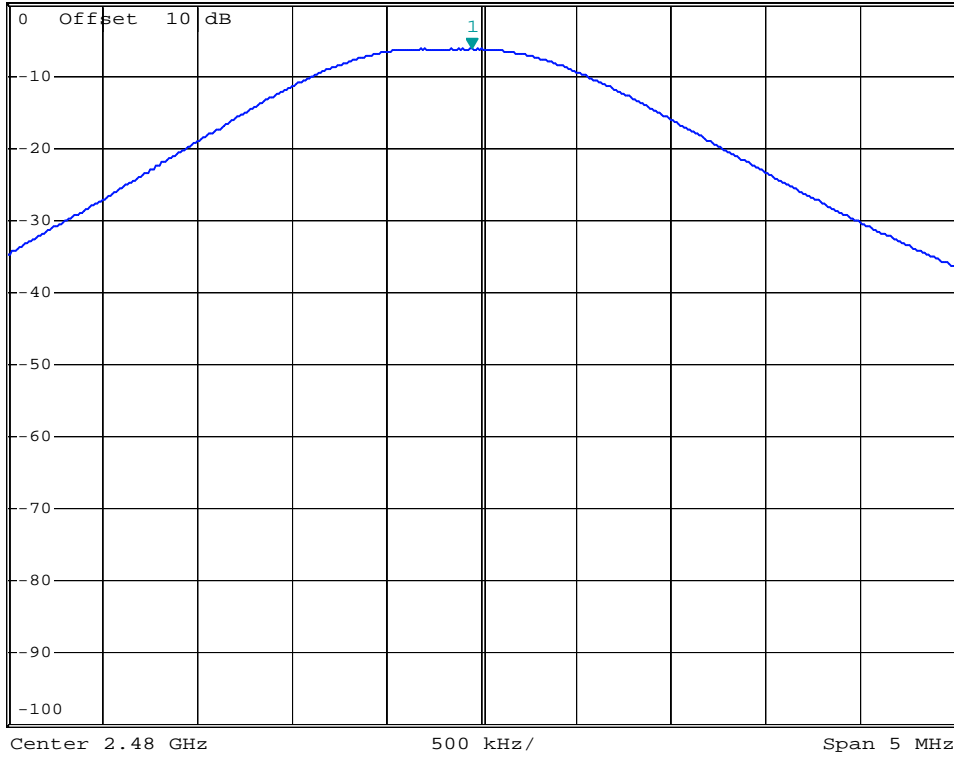


\*RBW 1 MHz      Marker 1 [T1 ]  
VBW 3 MHz      -6.26 dBm  
SWT 2.5 ms      2.479950000 GHz

Ref 0 dBm

Att 20 dB

1 PK  
VIEW



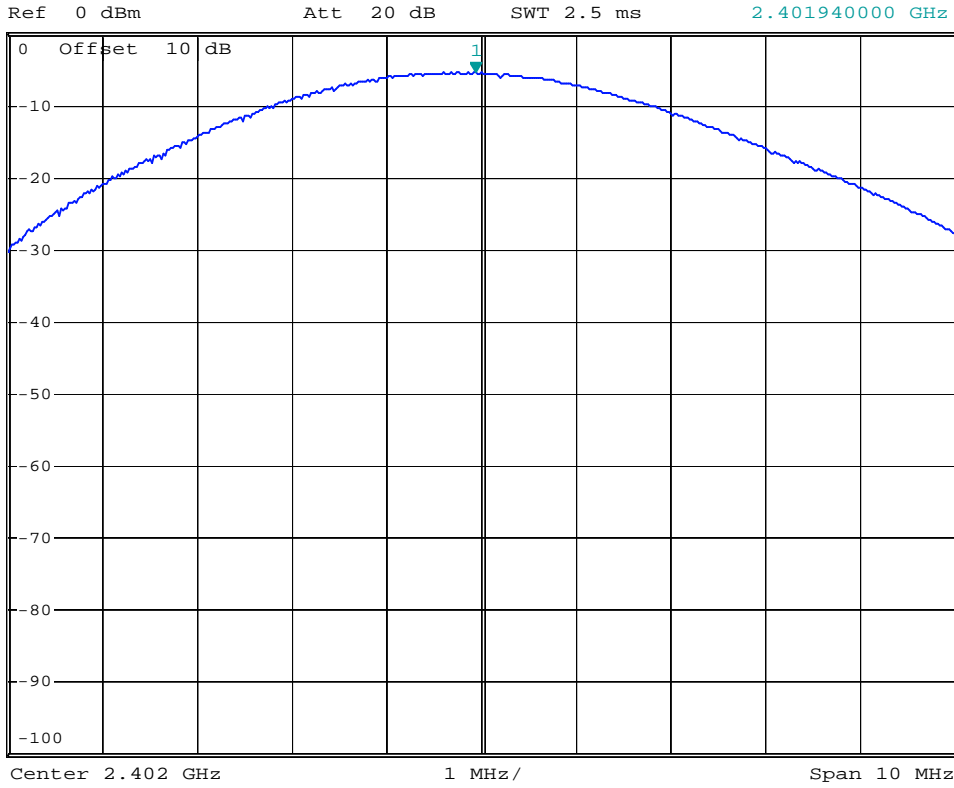


**Mode: Bluetooth EDR**

**Channel Low**



\*RBW 3 MHz    Marker 1 [T1 ]  
VBW 10 MHz    -5.43 dBm  
SWT 2.5 ms    2.401940000 GHz



### Channel Middle

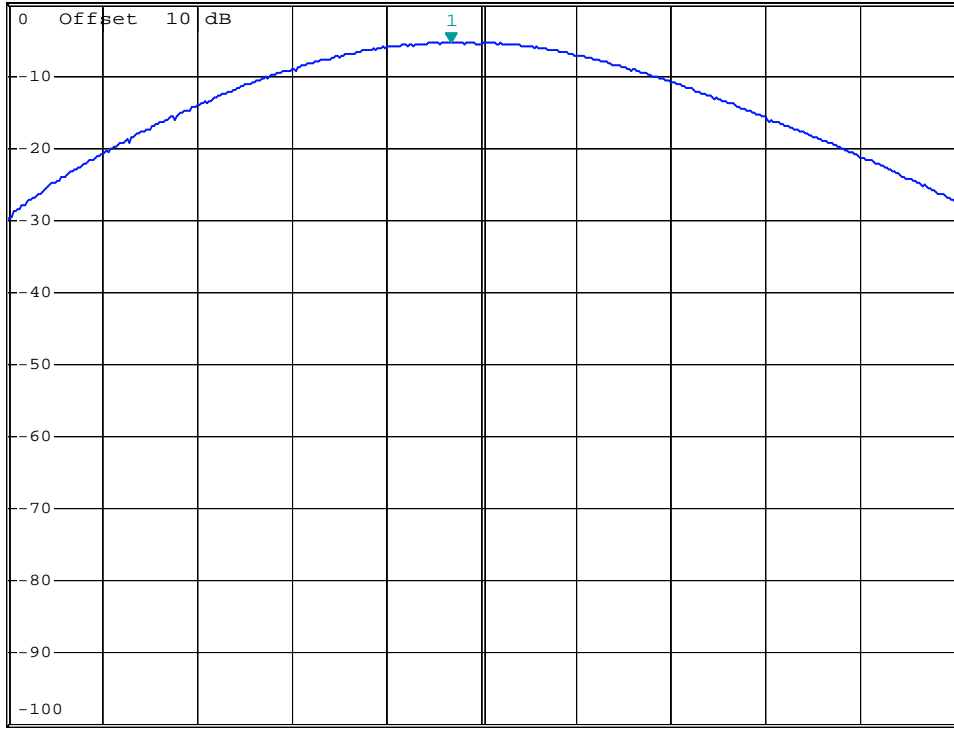


\*RBW 3 MHz      Marker 1 [T1 ]  
VBW 10 MHz      -5.27 dBm  
SWT 2.5 ms      2.440680000 GHz

Ref 0 dBm

Att 20 dB

1 PK  
VIEW



### Channel High

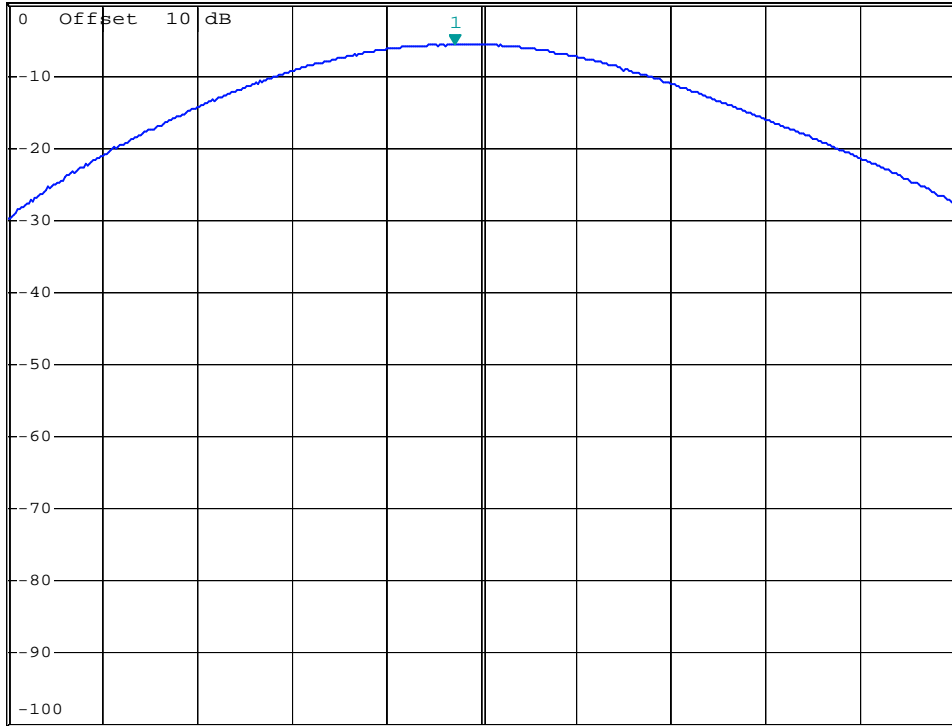


\*RBW 3 MHz    Marker 1 [T1 ]  
VBW 10 MHz    -5.55 dBm  
SWT 2.5 ms    2.479720000 GHz

Ref 0 dBm

Att 20 dB

1 PK  
VIEW



Center 2.48 GHz

1 MHz/

Span 10 MHz

## 12 100 kHz BANDWIDTH OF BAND EDGES MEASUREMENT

### 12.1 Standard Applicable

According to 15.247(d), 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

### 12.2 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 emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation
  - RBW  $\geq$  1% of the span
  - VBW  $\geq$  RBW
  - Sweep = auto
  - Detector function = peak
  - Trace = max hold
4. Allow the trace to stabilize. Set the marker on the emission at the bandedge, or on the highest modulation product outside of the band, if this level is greater than that at the bandedge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. Plot the result on the screen of spectrum analyzer.
5. Repeat above procedures until all measured frequencies were complete.

### 12.3 Measurement Equipment

| Equipment         | Manufacturer             | Model No. | Calibration Date | Next Cal. Date |
|-------------------|--------------------------|-----------|------------------|----------------|
| EMI Test Receiver | Rohde & Schwarz          | ESU 40    | 2014/08/15       | 2015/08/14     |
| Attenuator        | Weinschel<br>Engineering | AY7602    | 2014/11/03       | 2015/11/02     |

### 12.4 Measurement Data

Test Date : Jun. 02, 2015      Temperature : 24 °C      Humidity : 60 %

**Mode: Bluetooth BR**

- 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.

**Mode: Bluetooth EDR**

- 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.

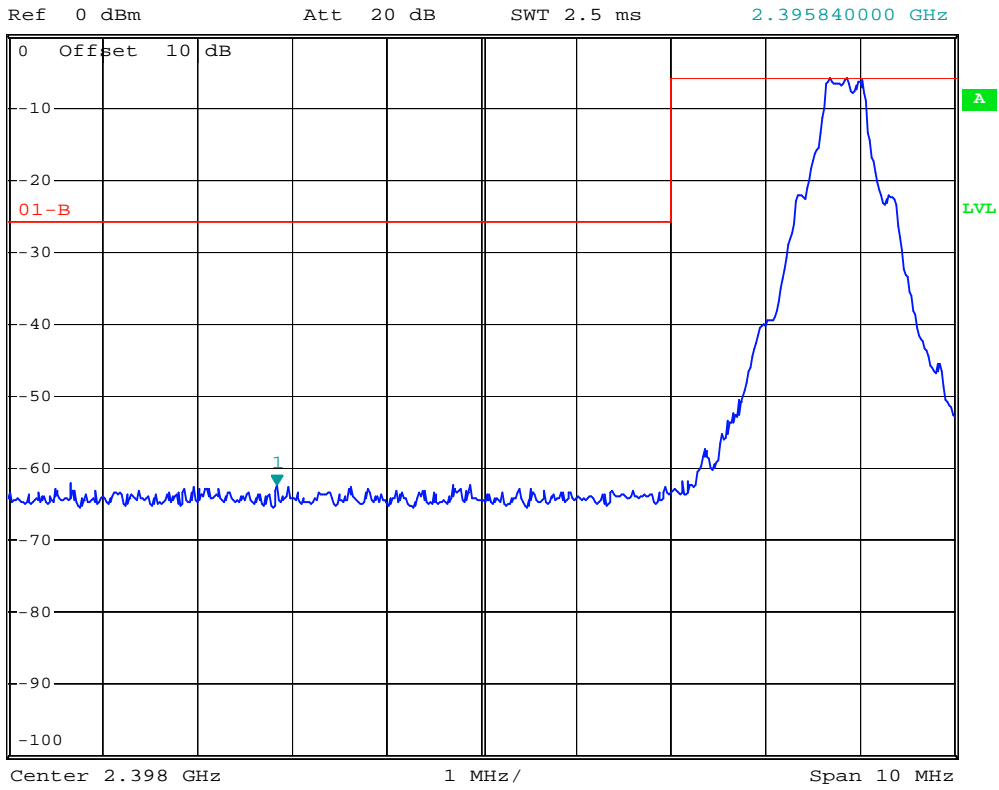
*Note : The expanded uncertainty: 2dB.*

**Mode: Bluetooth BR**

**Lower Band Edge (Hoppin off)**



\*RBW 100 kHz    Marker 1 [T1 ]  
VBW 300 kHz                    -62.45 dBm  
SWT 2.5 ms                      2.395840000 GHz



### Upper Band Edge (Hoppin off)

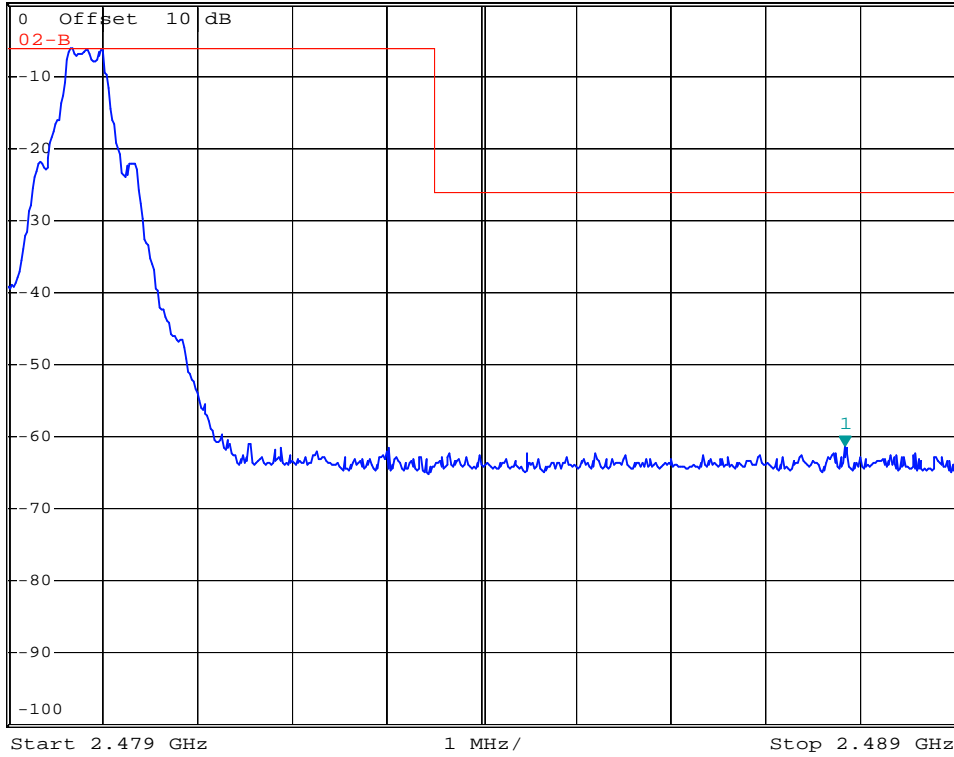


\*RBW 100 kHz    Marker 1 [T1 ]  
VBW 300 kHz                    -61.30 dBm  
SWT 2.5 ms                      2.487840000 GHz

Ref 0 dBm

Att 20 dB

1 PK  
VIEW



**Lower Band Edge (Hoppin on)**

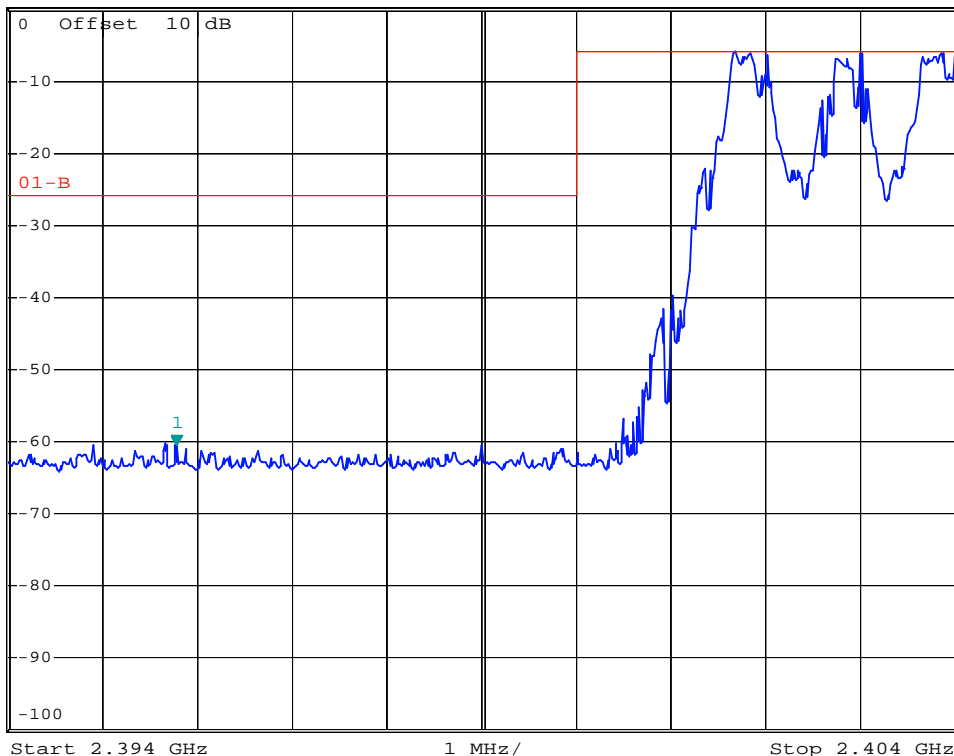


\*RBW 100 kHz Marker 1 [T1 ]  
 VBW 300 kHz -60.60 dBm  
 SWT 2.5 ms 2.395780000 GHz

Ref 0 dBm

Att 20 dB

1 PK  
 VIEW





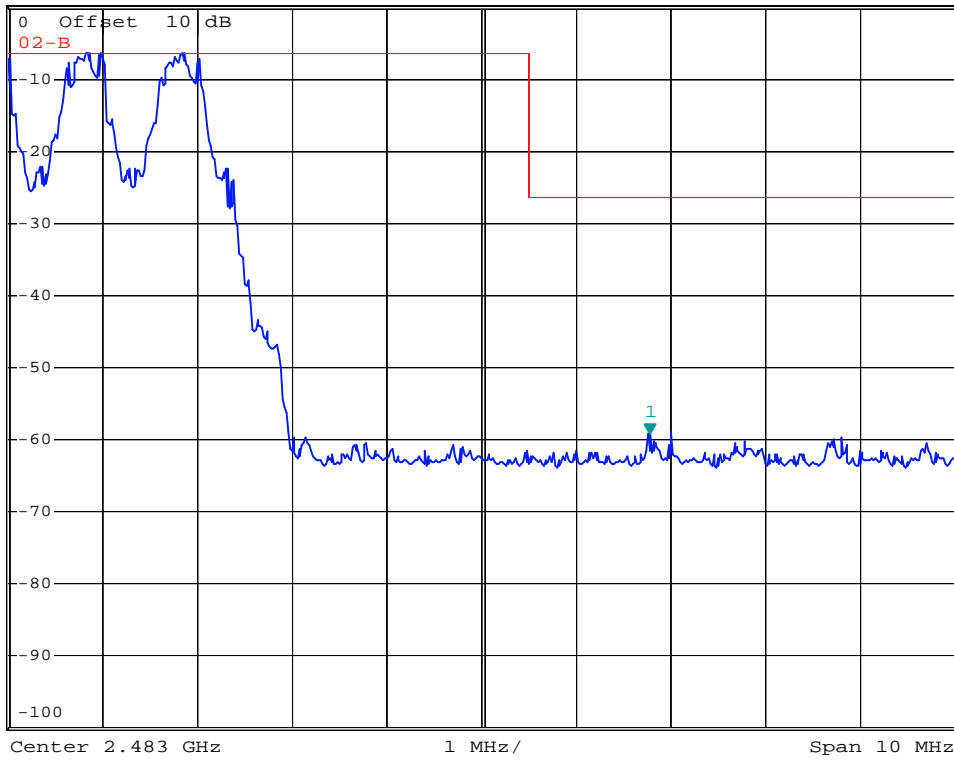
### Upper Band Edge (Hoppin on)



\*RBW 100 kHz    Marker 1 [T1 ]  
VBW 300 kHz        -59.30 dBm  
SWT 2.5 ms         2.484780000 GHz

Ref 0 dBm

Att 20 dB

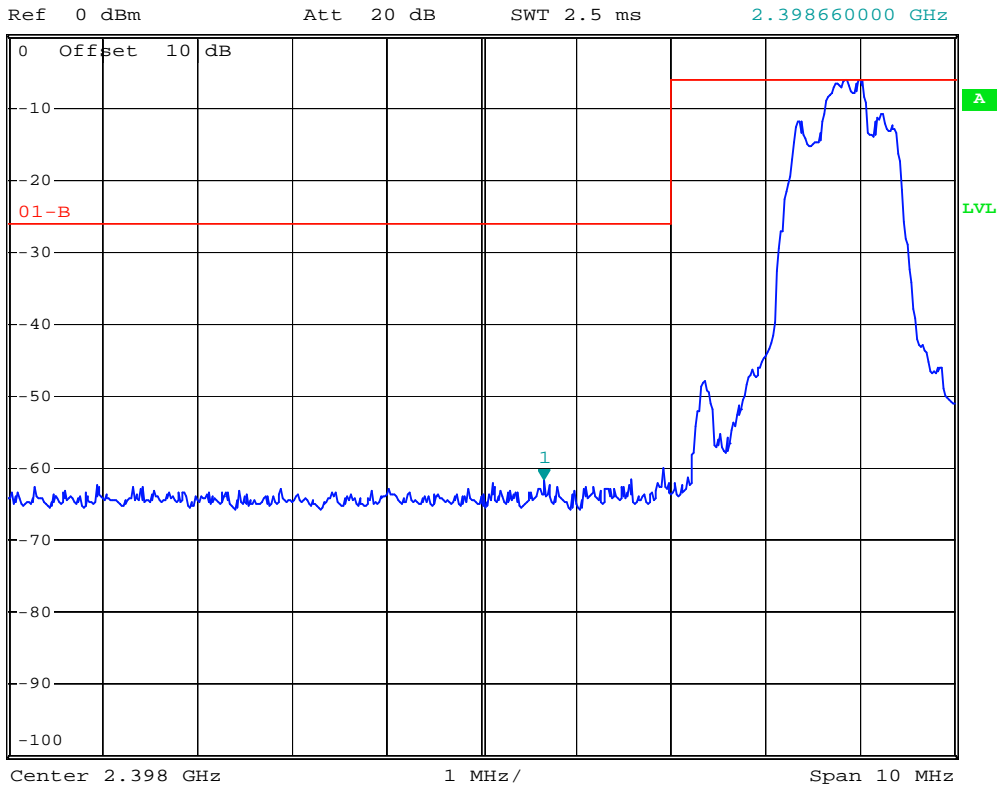


**Mode: Bluetooth EDR**

**Lower Band Edge (Hoppin off)**



\*RBW 100 kHz    Marker 1 [T1 ]  
VBW 300 kHz        -61.57 dBm  
SWT 2.5 ms         2.398660000 GHz





### Lower Band Edge (Hoppin on)

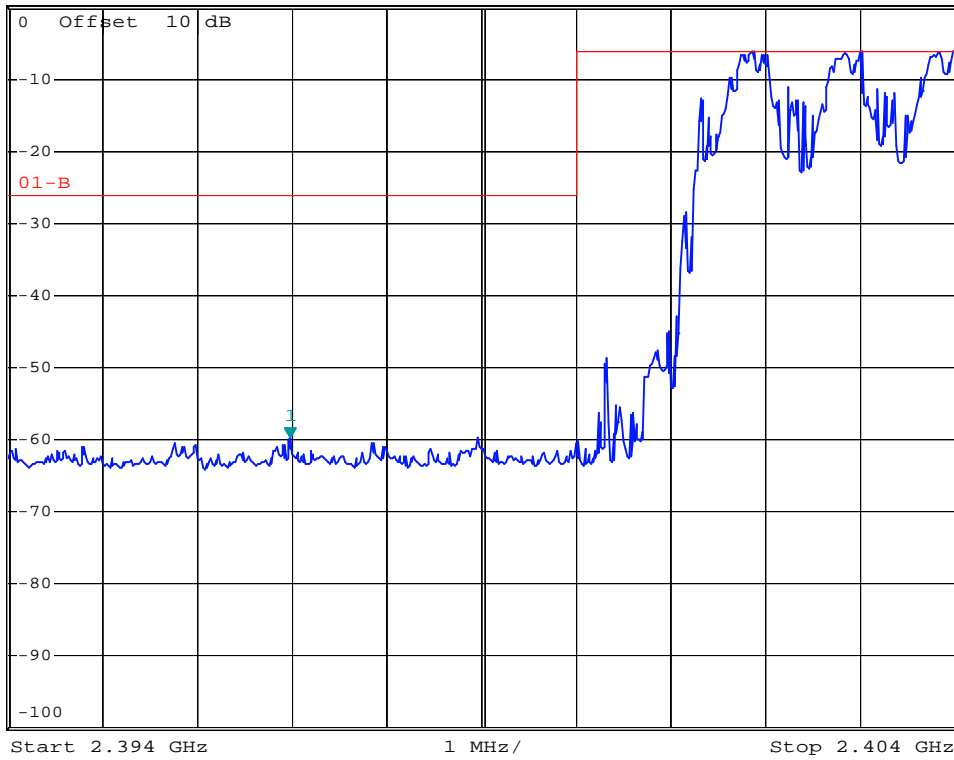


\*RBW 100 kHz    Marker 1 [T1 ]  
VBW 300 kHz                    -59.65 dBm  
SWT 2.5 ms                      2.396980000 GHz

Ref 0 dBm

Att 20 dB

1 PK  
VIEW





## 13 CONDUCTED SPURIOUS EMISSION MEASUREMENT

### 13.1 Standard Applicable

According to 15.247(d), 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

### 13.2 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  $\geq$  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.

### 13.3 Measurement Equipment

| Equipment         | Manufacturer             | Model No. | Calibration Date | Next Cal. Date |
|-------------------|--------------------------|-----------|------------------|----------------|
| EMI Test Receiver | Rohde & Schwarz          | ESU 40    | 2014/08/15       | 2015/08/14     |
| Attenuator        | Weinschel<br>Engineering | AY7602    | 2014/11/03       | 2015/11/02     |

### 13.4 Measurement Data

Test Date : Jun. 02, 2015      Temperature : 24 °C      Humidity : 60 %

**Mode: Bluetooth BR**

**Mode : Low Channel/ Mid Channel/ Hi Channel**

- a) 30 MHz to 1 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.
- b) 1 GHz to 26.5 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.

**Mode: Bluetooth EDR**

**Mode : Low Channel/ Mid Channel/ Hi Channel**

- a) 30 MHz to 1 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.
- b) 1 GHz to 26.5 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.

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

### Mode: Bluetooth BR

### Mode : 30MHz to 1 GHz

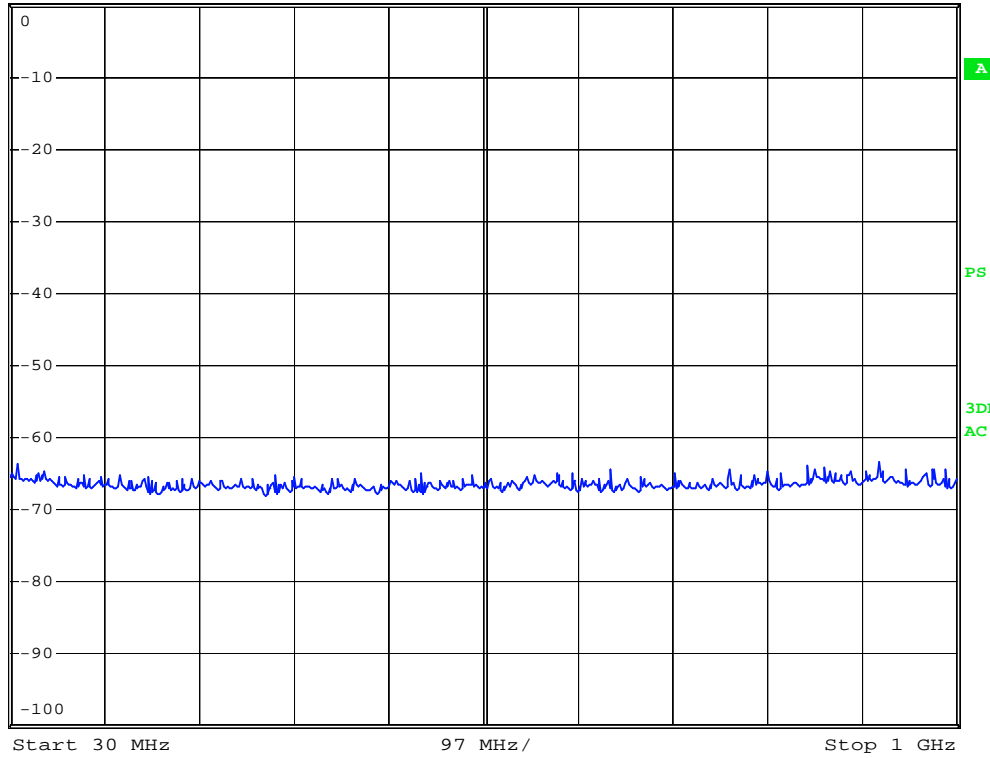


\*RBW 100 kHz  
VBW 300 kHz  
SWT 100 ms

Ref 0 dBm

Att 30 dB

1 PK  
VIEW





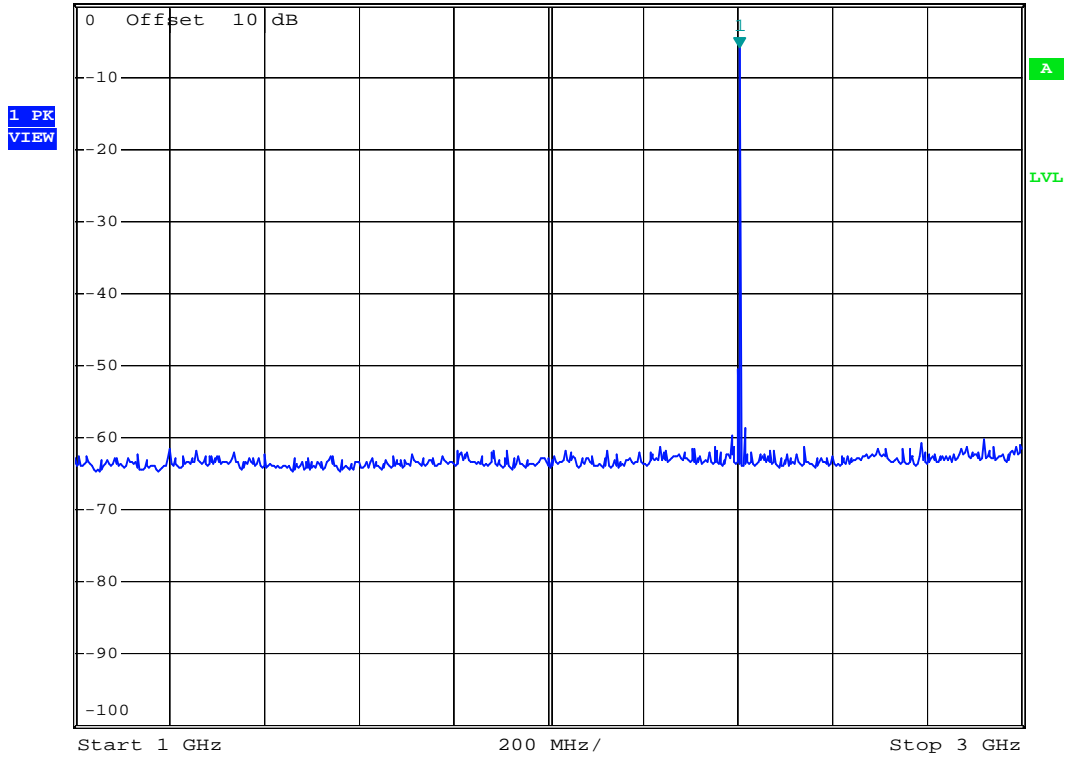
**Mode: Bluetooth BR**

Above 1 GHz

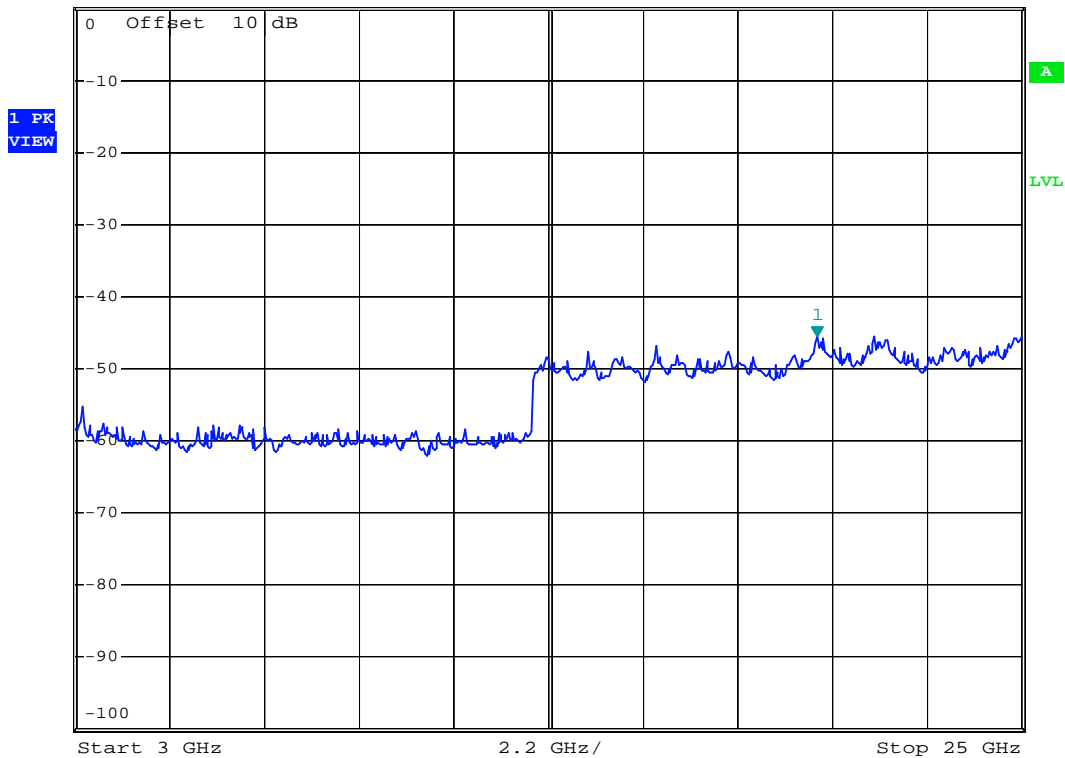
**Mode : Low Channel**



Ref 0 dBm Att 20 dB \*RBW 100 kHz Marker 1 [T1 ]  
VBW 300 kHz -5.81 dBm  
SWT 200 ms 2.404000000 GHz



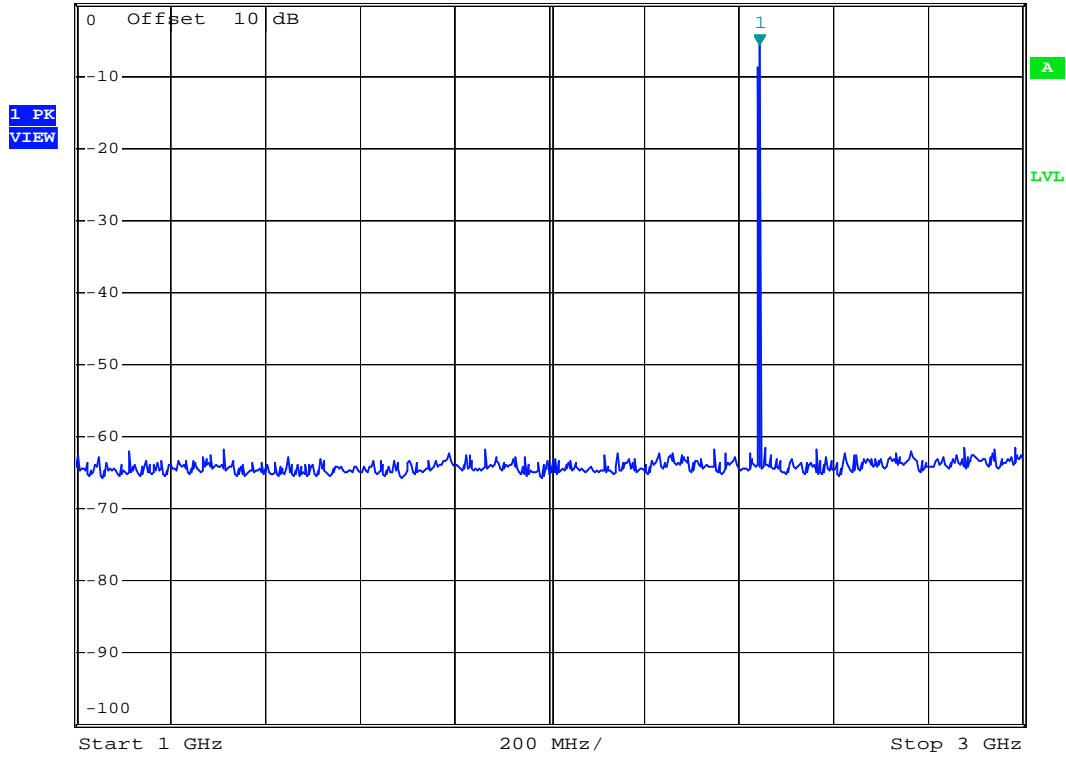
Ref 0 dBm Att 20 dB \*RBW 100 kHz Marker 1 [T1 ]  
VBW 300 kHz -45.42 dBm  
SWT 2.2 s 20.248000000 GHz



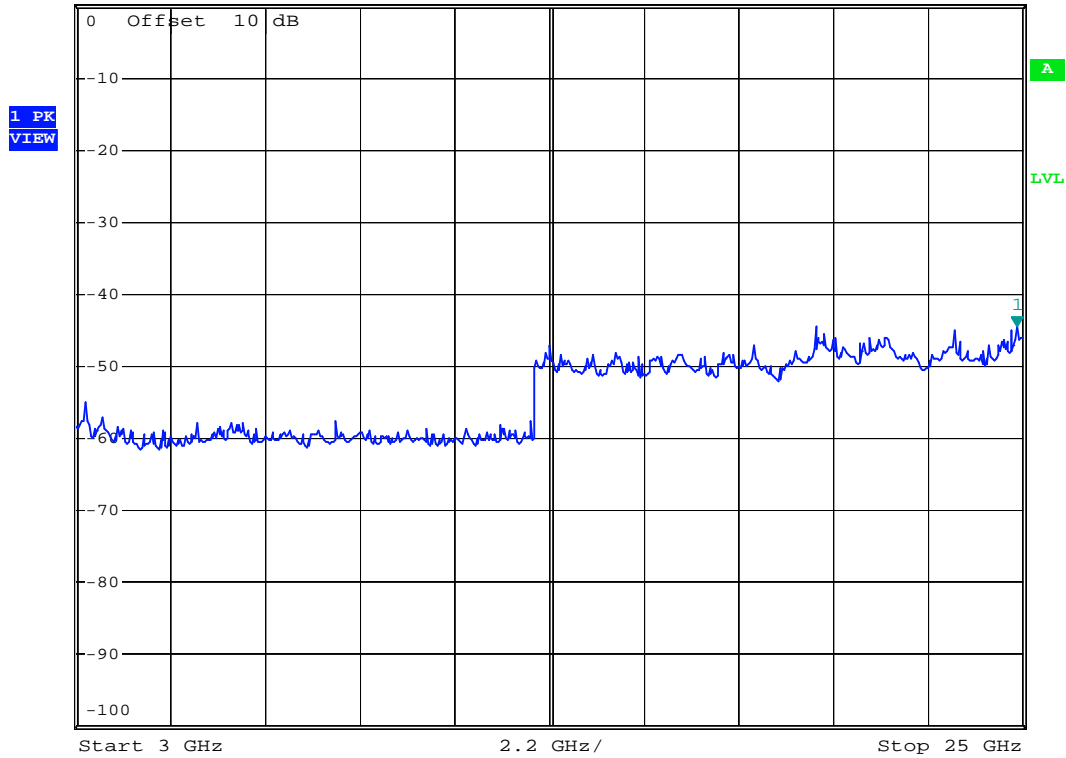
### Mode : Mid Channel



Ref 0 dBm Att 20 dB \*RBW 100 kHz Marker 1 [T1 ]  
VBW 300 kHz -5.60 dBm  
SWT 200 ms 2.444000000 GHz



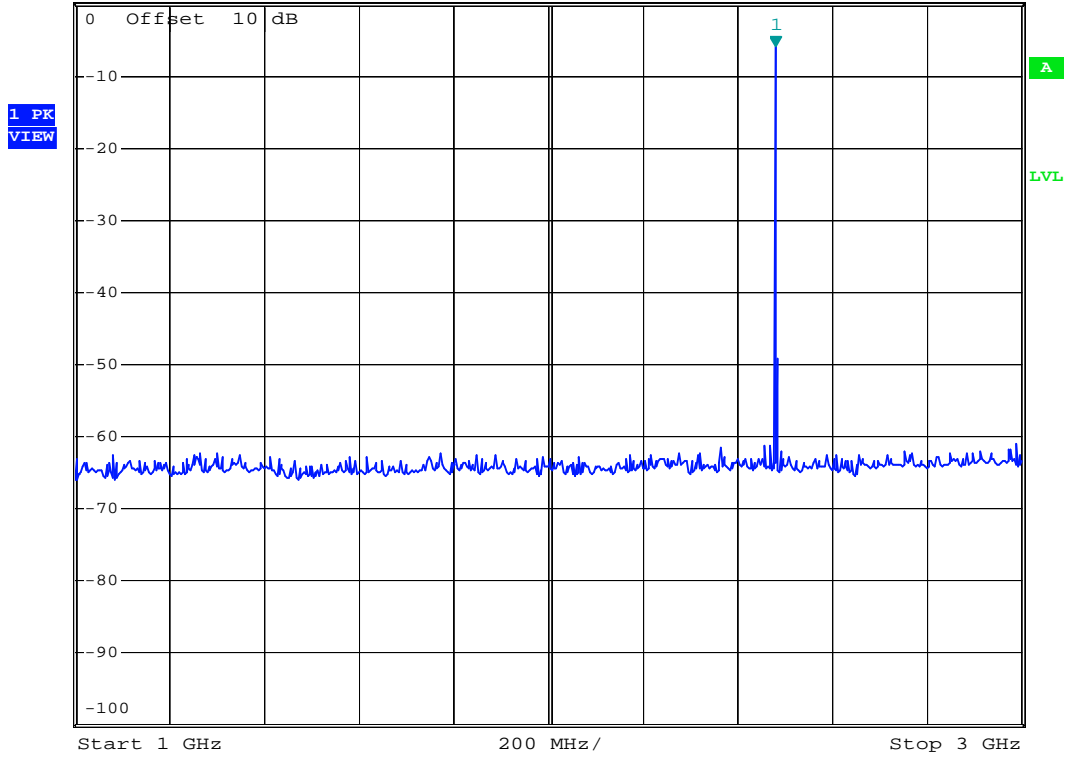
Ref 0 dBm Att 20 dB \*RBW 100 kHz Marker 1 [T1 ]  
VBW 300 kHz -44.40 dBm  
SWT 2.2 s 24.868000000 GHz



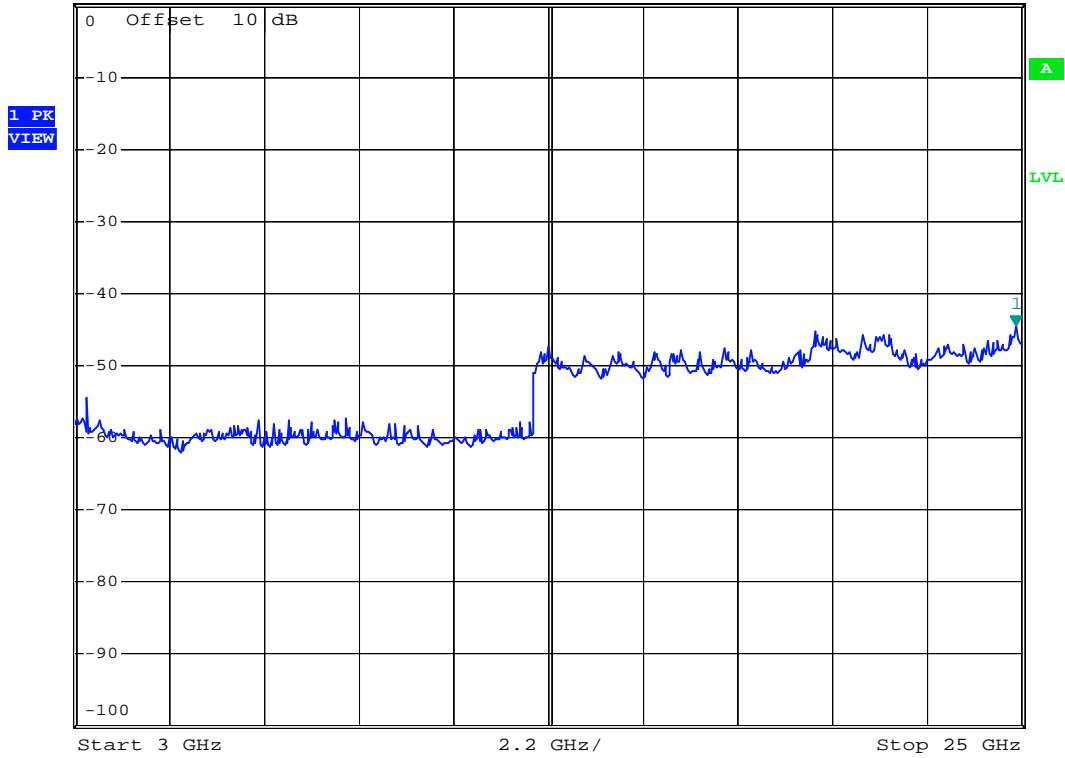
### Mode : Hi Channel



Ref 0 dBm Att 20 dB \*RBW 100 kHz Marker 1 [T1 ]  
VBW 300 kHz -5.97 dBm  
SWT 200 ms 2.480000000 GHz



Ref 0 dBm Att 20 dB \*RBW 100 kHz Marker 1 [T1 ]  
VBW 300 kHz -44.60 dBm  
SWT 2.2 s 24.868000000 GHz



**Mode: Bluetooth EDR**

**Mode : 30MHz to 1 GHz**

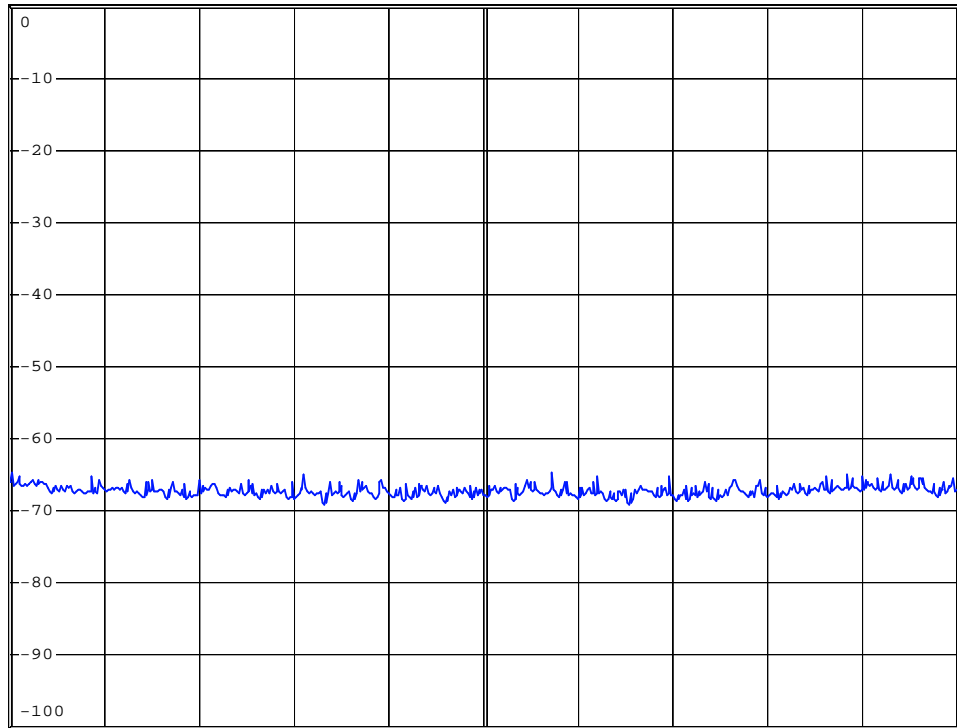


\*RBW 100 kHz  
VBW 300 kHz  
SWT 100 ms

Ref 0 dBm

Att 30 dB

1 PK  
VIEW



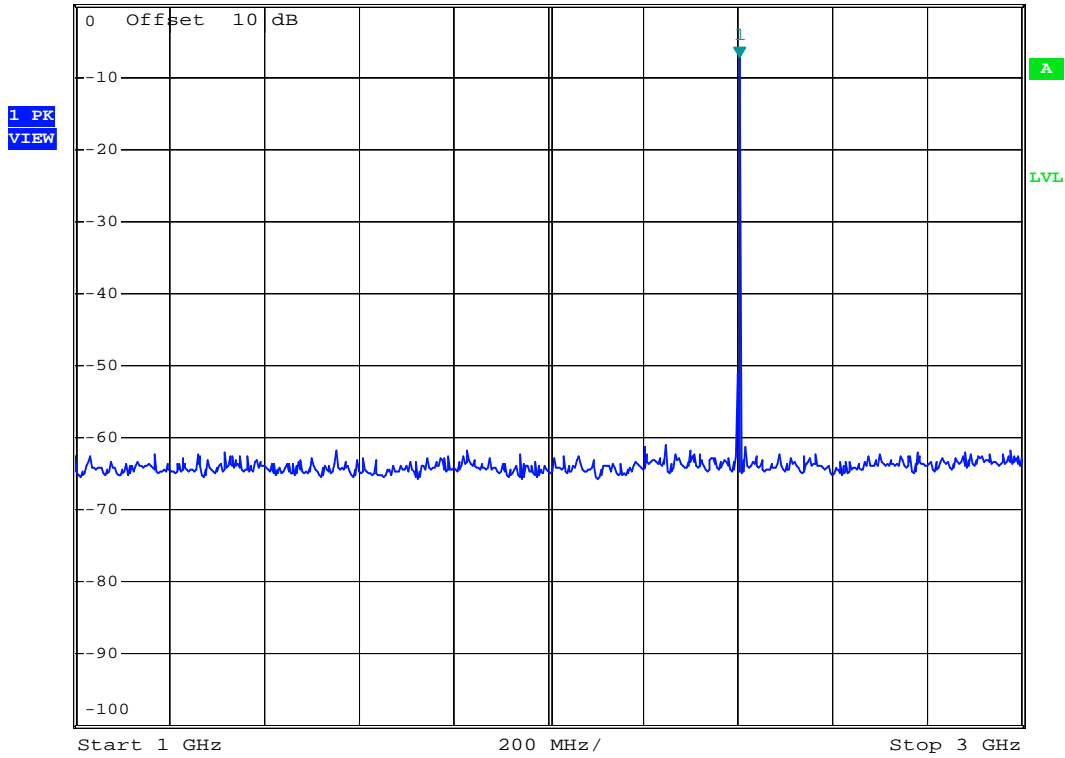
**Mode: Bluetooth EDR**

Above 1 GHz

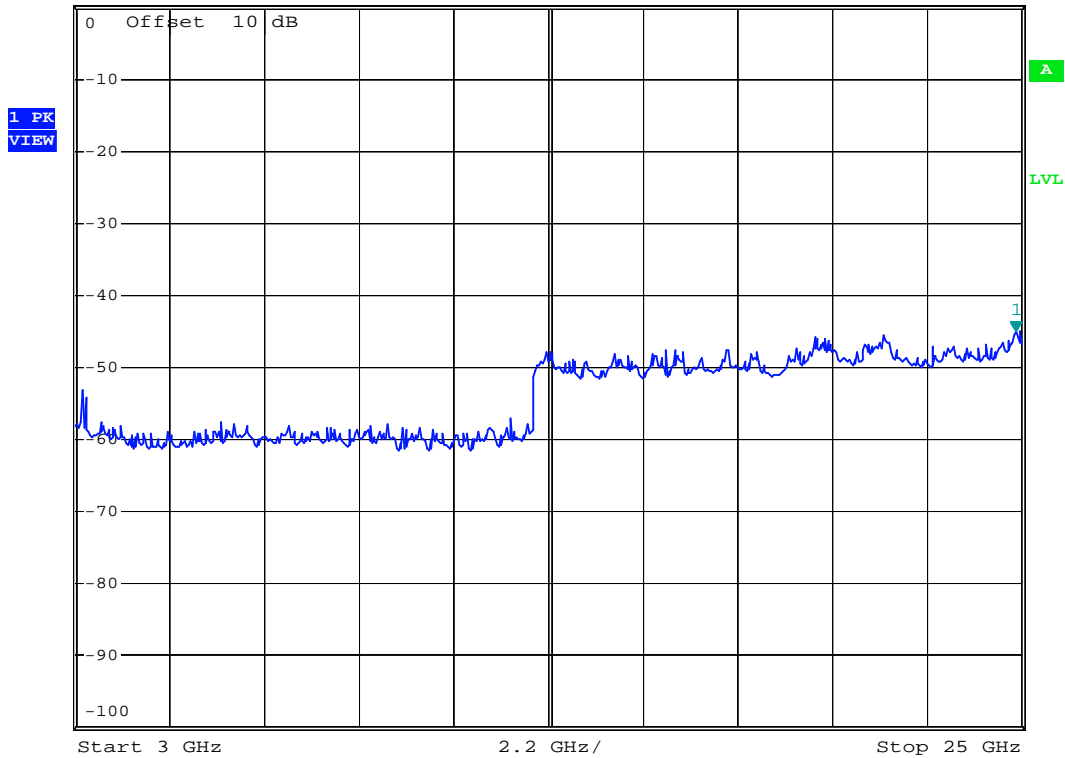
**Mode : Low Channel**



Ref 0 dBm Att 20 dB \*RBW 100 kHz Marker 1 [T1 ]  
VBW 300 kHz -7.25 dBm  
SWT 200 ms 2.404000000 GHz



Ref 0 dBm Att 20 dB \*RBW 100 kHz Marker 1 [T1 ]  
VBW 300 kHz -44.97 dBm  
SWT 2.2 s 24.868000000 GHz



Mode : Mid Channel

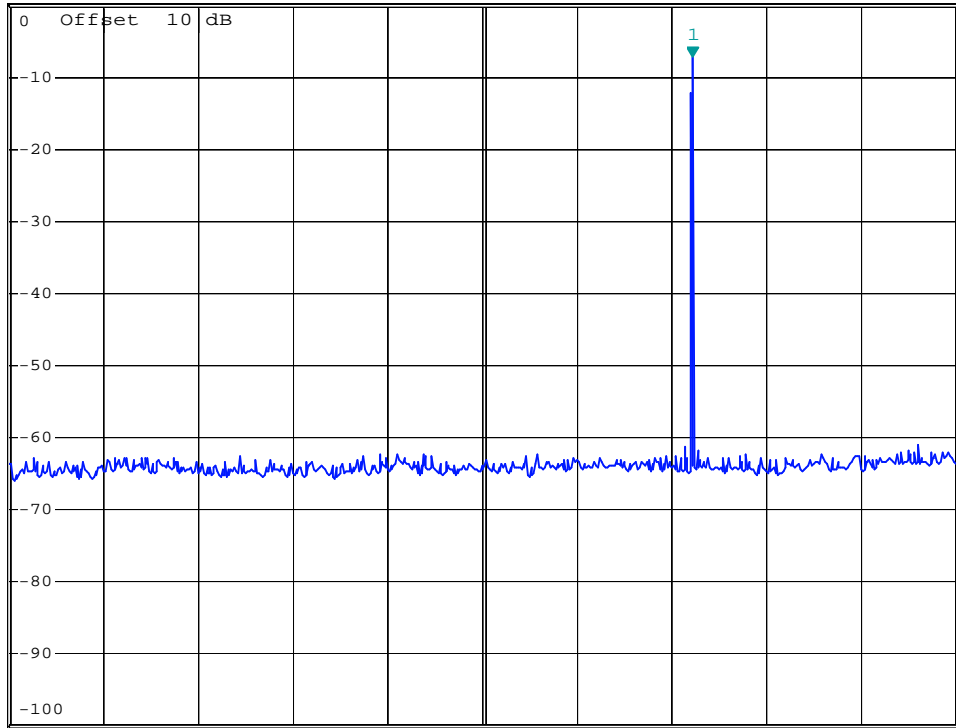


\*RBW 100 kHz Marker 1 [T1 ]  
VBW 300 kHz -7.34 dBm  
SWT 200 ms 2.444000000 GHz

Ref 0 dBm

Att 20 dB

1 PK  
VIEW



Start 1 GHz

200 MHz/

Stop 3 GHz

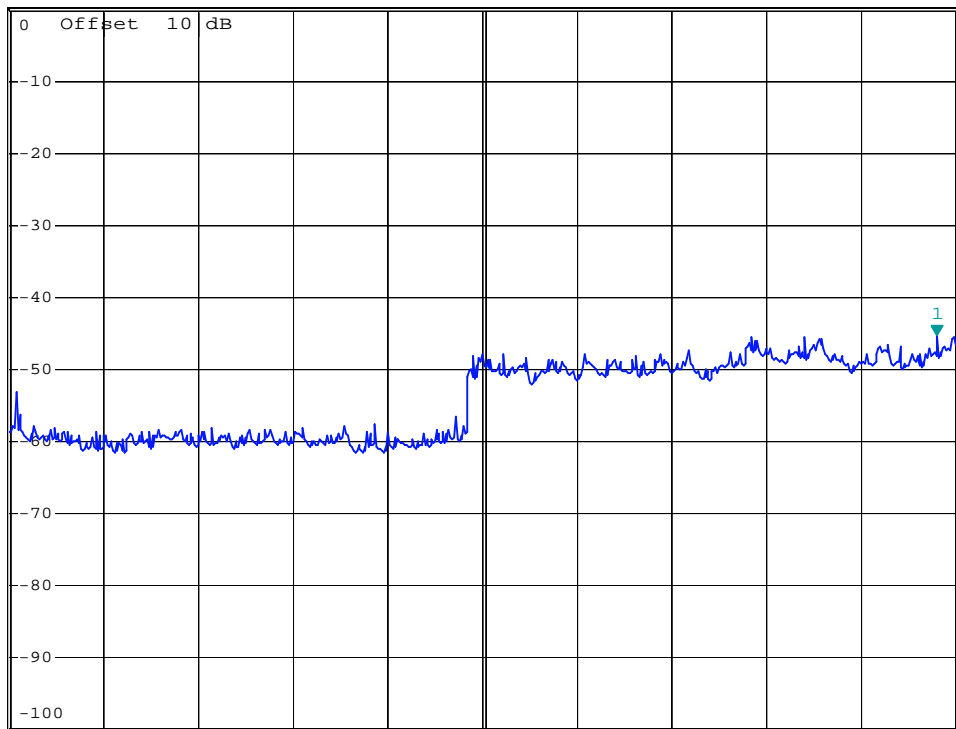


\*RBW 100 kHz Marker 1 [T1 ]  
VBW 300 kHz -45.28 dBm  
SWT 2.2 s 24.560000000 GHz

Ref 0 dBm

Att 20 dB

1 PK  
VIEW



Start 3 GHz

2.2 GHz/

Stop 25 GHz

Mode : Hi Channel

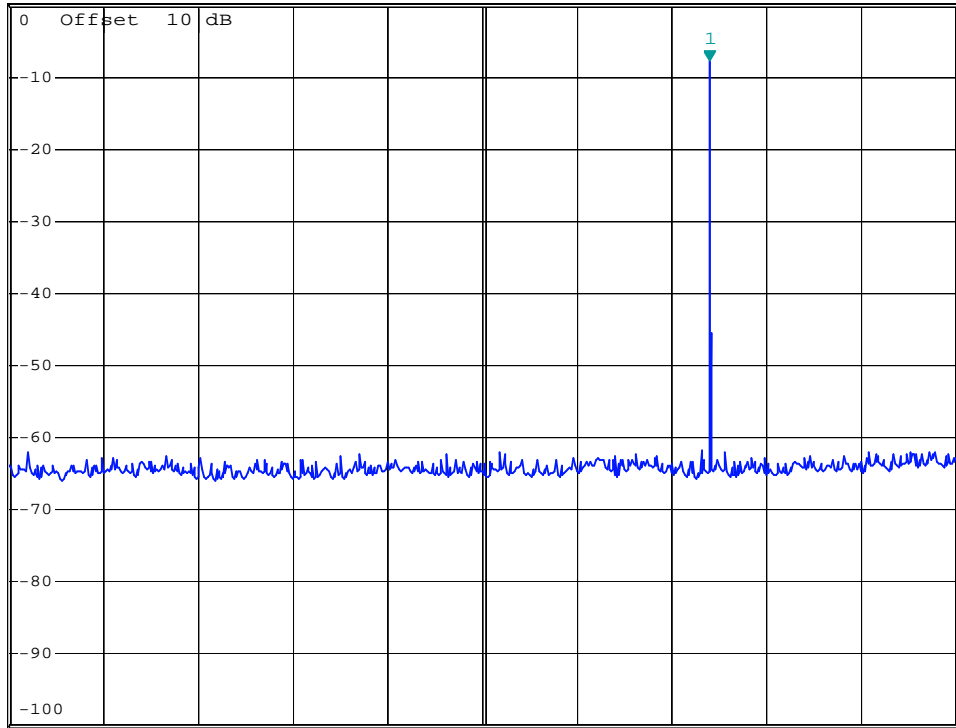


\*RBW 100 kHz Marker 1 [T1 ]  
VBW 300 kHz -7.66 dBm  
SWT 200 ms 2.48000000 GHz

Ref 0 dBm

Att 20 dB

1 PK  
VIEW



Start 1 GHz

200 MHz/

Stop 3 GHz

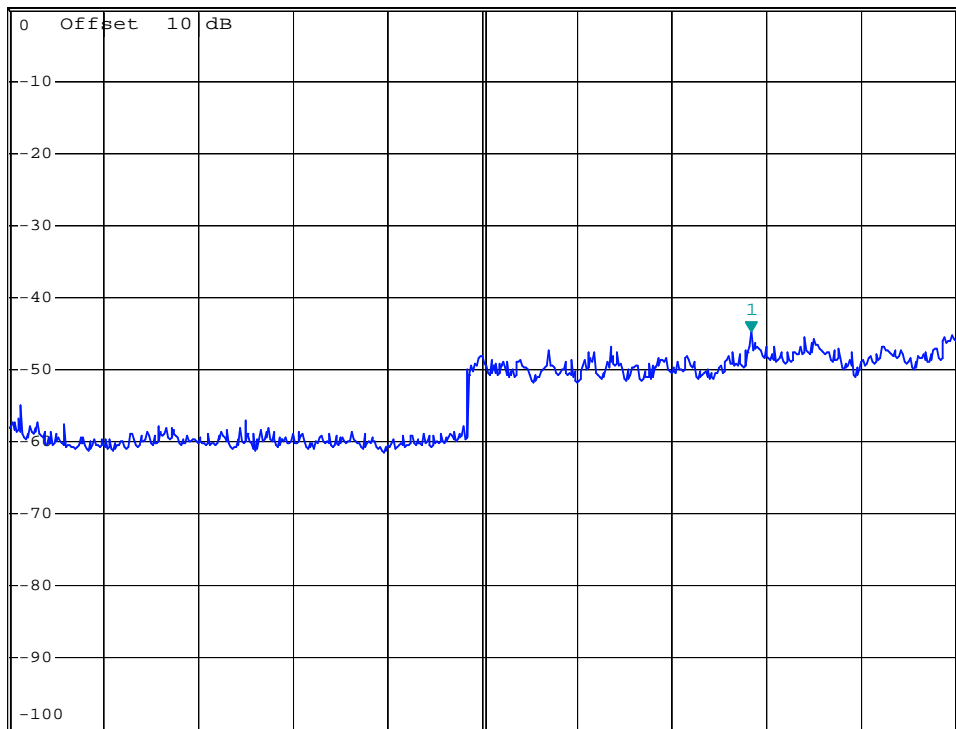


\*RBW 100 kHz Marker 1 [T1 ]  
VBW 300 kHz -44.88 dBm  
SWT 2.2 s 20.24800000 GHz

Ref 0 dBm

Att 20 dB

1 PK  
VIEW



Start 3 GHz

2.2 GHz/

Stop 25 GHz