FCC Part 15
EMI TEST REPORT

of

E.U.T. : Job Site Radio
Model : XRM06
FCC ID : BYG-XRM06A

for

APPLICANT : SANGEAN ELECTRONICS INC.
ADDRESS : NO.18, LANE 7, LI-DE STREET, CHUNG HO DISTRICT, NEW TAIPEI CITY, 23584, TAIWAN, R.O.C.

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 : 17-04-RBF-009-01

TEST REPORT CERTIFICATION

Applicant : SANGEAN ELECTRONICS INC.
NO.18, LANE 7, LI-DE STREET, CHUNG HO DISTRICT, NEW TAIPEI CITY, 23584, TAIWAN, R.O.C.

Manufacture : SANGEAN ELECTRONICS INC.
NO.18, LANE 7, LI-DE STREET, CHUNG HO DISTRICT, NEW TAIPEI CITY, 23584, TAIWAN, R.O.C.

Description of Device :

a) Type of EUT : Job Site Radio
b) Trade Name : MAKITA
c) Model No. : XRM06
d) Power Supply : AC power adaptor: DC12V/1200mA
Battery:UM-3 (AA size) x 2 for back up
Cluster battery: 7.2V – 10.8V
Slide battery: 14.4V - 18 V
Slide battery: 10.8V-12V(max)

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**
Hopping Channel Separation	**Pass**
Number of Hopping frequencies used	**Pass**
Hopping Channel Bandwidth	**Pass**
Dwell Time of each frequency	**Pass**
Output Power Requirement	**Pass**
100 kHz Bandwidth of Frequency Band Edges Requirement	**Pass**
Out-of-Band Conducted Emission Requirement	**Pass**
Duty Cycle	**N.A.**

Date Test Item Received	:	*Apr. 06, 2017*
Date Test Campaign Completed	:	*May 08, 2017*
Date of Issue	:	*May 18, 2017*

Test Engineer : Kazuma Ho

(Kazuma Ho , Engineer)

Approve & Authorized : S S Liou

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

Table of Contents Page

1 GENERAL INFORMATION

1.1 Product Description

a) Type of EUT : Job Site Radio
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Battery:UM-3 (AA size) x 2 for back up
Cluster battery: 7.2V – 10.8V
Slide battery: 14.4V - 18 V
Slide battery: 10.8V-12V(max)

1.2 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.

Measurement Software

Software	Version	Note
e3	Version 6.100618b	Radiated Emission Test
e3	Version 6.100421	Conducted Emission Test

1.3 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 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 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 boundary between the frequency ranges.

Frequency MHz	Quasi Peak dB μV	Average dB μV
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 MHz	Distance Meters	Radiated dB μV/m	Radiated μV/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 invastegated 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
Job Site Radio *	SANGEAN ELECTRONICS INC.	XRM06/ BYG-XRM06A	1.5m Unshielded AC Adaptor Power Line 1.6m Unshielded Audio Line*2 1.2m Shielded USB Line
iPod	Apple	A1051	1.0m Unshielded Line
iPod	Apple	A1446	1.0m Unshielded Line
Cement resistor	---	---	1.0m Unshielded USB Cable 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 (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

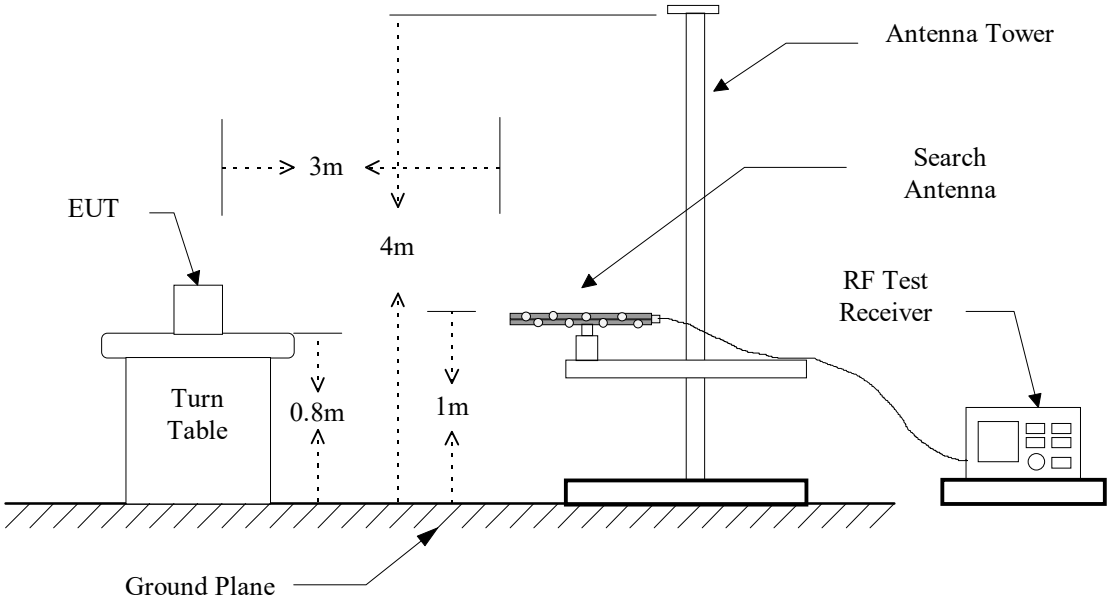
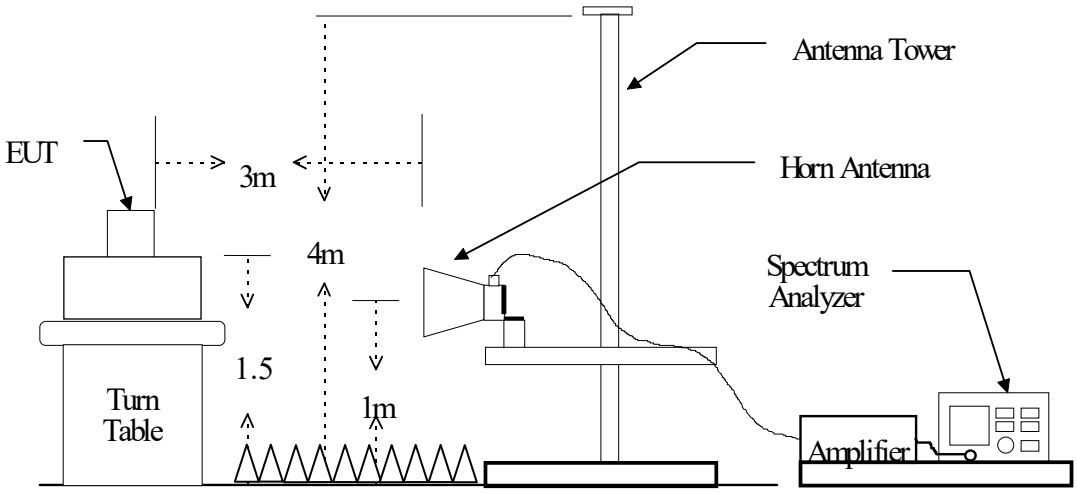


Figure 2 : Frequencies measured above 1 GHz configuration



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	2016/11/10	2017/11/09
Bi-Log Antenna	ETC	MCTD 2786	2016/07/15	2017/07/14
Horn Antenna	EMCO	3115	2016/10/05	2017/10/04
Horn Antenna	EMCO	3116	2016/10/05	2017/10/04
Amplifier	HP	8447D	2016/12/05	2017/12/04
Amplifier	HP	83051A	2016/07/18	2017/07/17
LOOP Antenna	EMCO	6512	2016/10/12	2017/10/11

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)

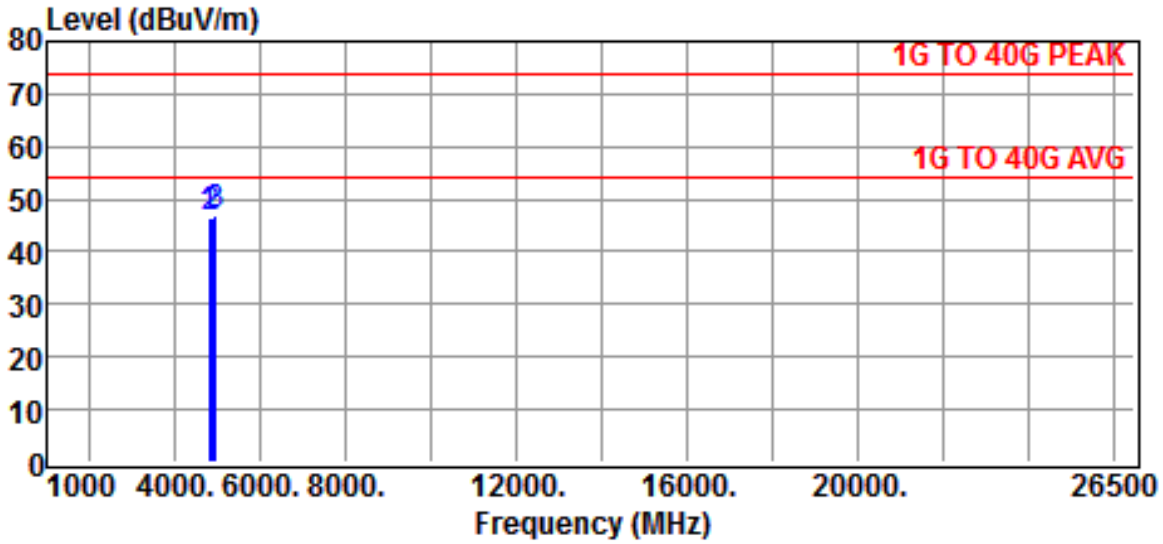
Note 1:
VBW = 10 Hz, when the duty cycle is no less than 98%.
VBW ≥ 1/T, when duty cycle is less than 98% where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

4.4 Radiated Emission Data

4.4.1 Tx Portion

A. Bluetooth BR

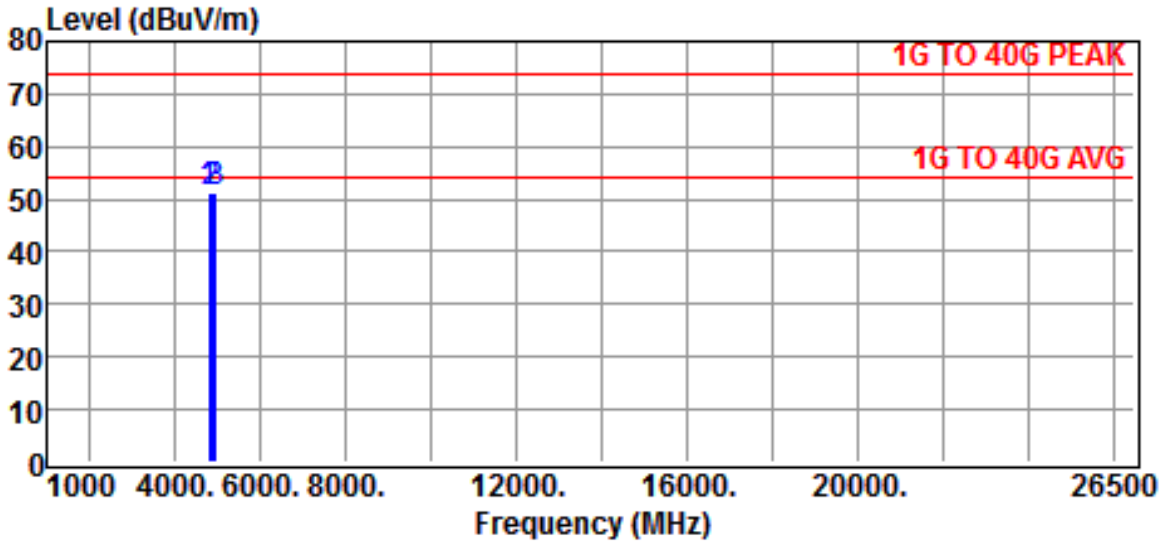
Test Date : May 04, 2017 Temperature : 26 °C Humidity : 53 %



Site	:Chamber #2	Date	:2017-05-04
Limit	:1G TO 40G PEAK	Ant. Pol.	:HORIZONTAL
EUT	:Job Site Radio	Model	:XRM06
Power Rating	:AC120V 60Hz	Temp.	:26˚C
Engineer	:Kazuma Ho	Humi.	:53 %
Test Mode	:BR		

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits dBµV/m	Over limit dB	Detector
4804.0000	45.32	1.25	46.57	74.00	-27.43	Peak
4882.0000	45.17	1.47	46.64	74.00	-27.36	Peak
4960.0000	44.97	1.74	46.71	74.00	-27.29	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	:2017-05-04
Limit	:1G TO 40G PEAK	Ant. Pol.	:VERTICAL
EUT	:Job Site Radio	Model	:XRM06
Power Rating	:AC120V 60Hz	Temp.	:26˚C
Engineer	:Kazuma Ho	Humi.	:53 %
Test Mode	:BR		

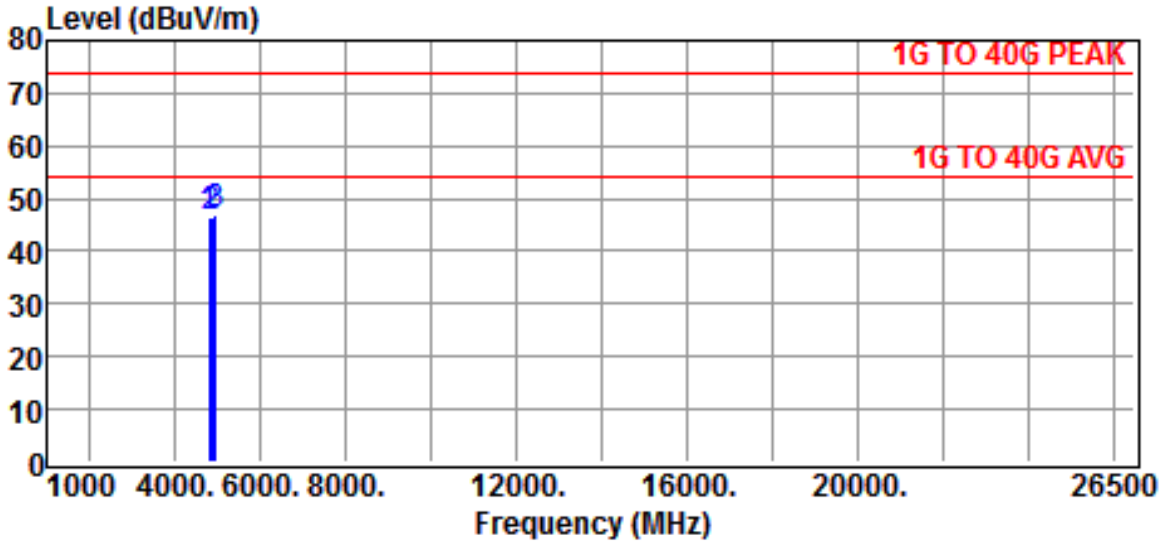
Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits dBµV/m	Over limit dB	Detector
4804.0000	49.97	1.25	51.22	74.00	-22.78	Peak
4882.0000	49.82	1.47	51.29	74.00	-22.71	Peak
4960.0000	49.68	1.74	51.42	74.00	-22.58	Peak

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 : May 04, 2017 Temperature : 26 °C Humidity : 53 %

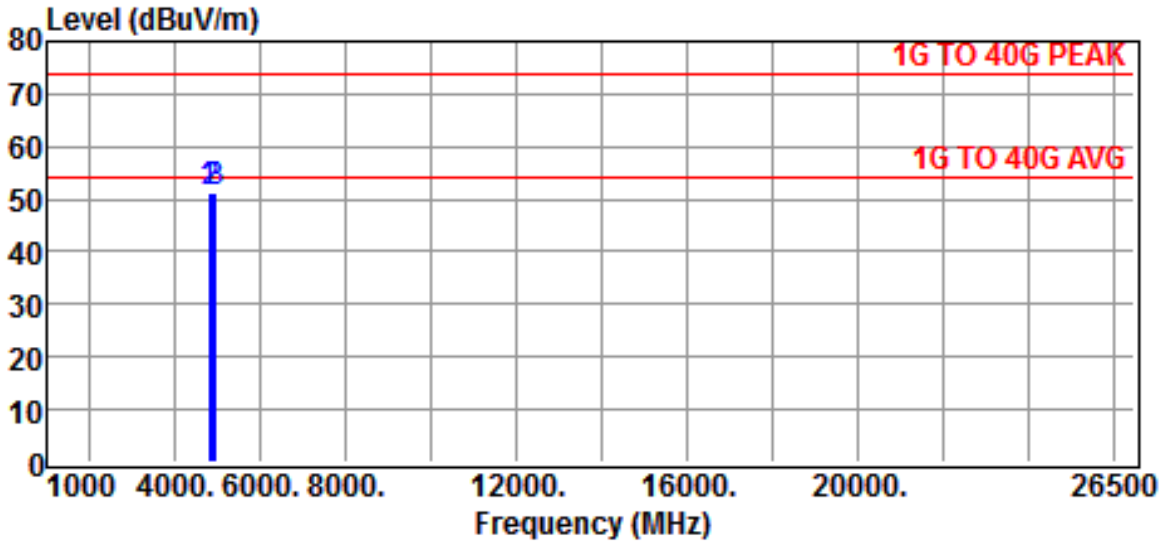


Site	:Chamber #2	Date	:2017-05-04
Limit	:1G TO 40G PEAK	Ant. Pol.	:HORIZONTAL
EUT	:Job Site Radio	Model	:XRM06
Power Rating	:AC120V 60Hz	Temp.	:26˚C
Engineer	:Kazuma Ho	Humi.	:53 %
Test Mode	:EDR		

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits dBµV/m	Over limit dB	Detector
4804.0000	45.35	1.25	46.60	74.00	-27.40	Peak
4882.0000	45.19	1.47	46.66	74.00	-27.34	Peak
4960.0000	45.00	1.74	46.74	74.00	-27.26	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	:2017-05-04
Limit	:1G TO 40G PEAK	Ant. Pol.	:VERTICAL
EUT	:Job Site Radio	Model	:XRM06
Power Rating	:AC120V 60Hz	Temp.	:26˚C
Engineer	:Kazuma Ho	Humi.	:53 %
Test Mode	:EDR		

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits dBµV/m	Over limit dB	Detector
4804.0000	49.99	1.25	51.24	74.00	-22.76	Peak
4882.0000	49.83	1.47	51.30	74.00	-22.70	Peak
4960.0000	49.70	1.74	51.44	74.00	-22.56	Peak

Note :

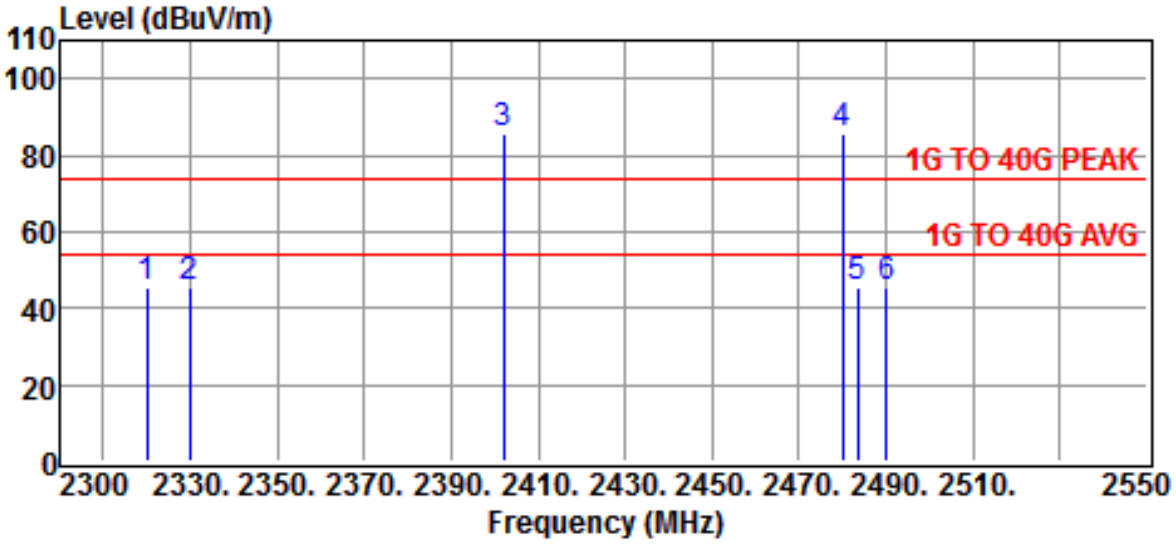
1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit - Result
4. Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

4.4.2 Radiated Emissions in Restricted Bands

Operation Mode : Bluetooth TX/RX

A. Bluetooth BR

Test Date : May 04, 2017 Temperature : 26 °C Humidity : 53 %

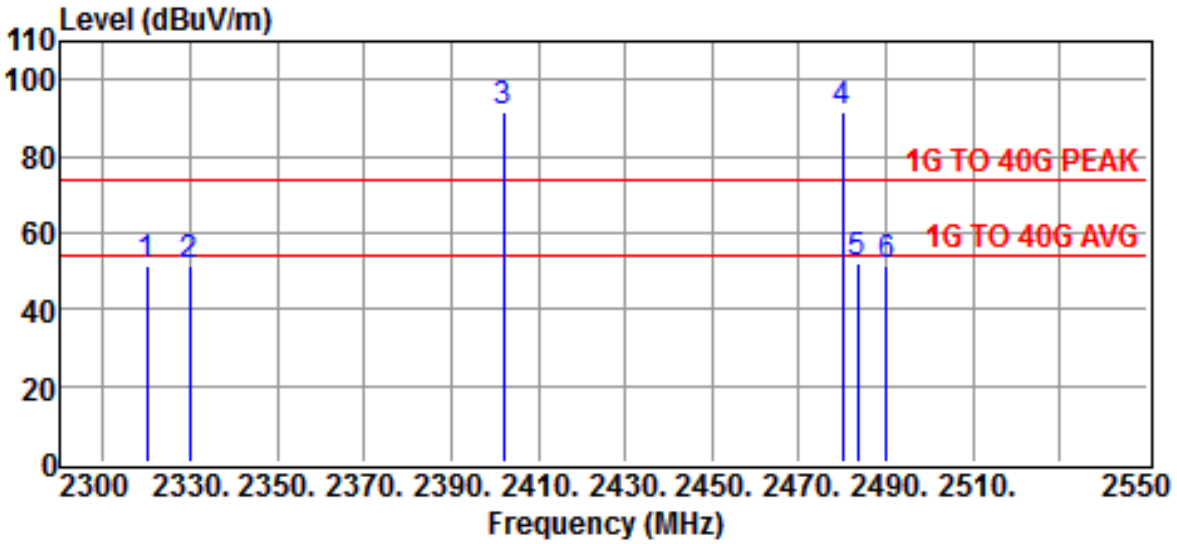


Site	:Chamber #2	Date	:2017-05-04
Limit	:1G TO 40G PEAK	Ant. Pol.	:HORIZONTAL
EUT	:Job Site Radio	Model	:XRM06
Power Rating	:AC120V 60Hz	Temp.	:26˚C
Engineer	:Kazuma Ho	Humi.	:53 %
Test Mode	:BR		

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits dBµV/m	Over limit dB	Detector
2320.0000	51.18	-5.76	45.42	74.00	-28.58	Peak
2330.0000	51.21	-5.76	45.45	74.00	-28.55	Peak
2402.0000	91.03	-5.61	85.42	----	----	Peak
2480.0000	90.93	-5.40	85.53	----	----	Peak
2483.5000	51.02	-5.40	45.62	74.00	-28.38	Peak
2490.0000	50.85	-5.36	45.49	74.00	-28.51	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. 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	:2017-05-04
Limit	:1G TO 40G PEAK	Ant. Pol.	:VERTICAL
EUT	:Job Site Radio	Model	:XRM06
Power Rating	:AC120V 60Hz	Temp.	:26˚C
Engineer	:Kazuma Ho	Humi.	:53 %
Test Mode	:BR		

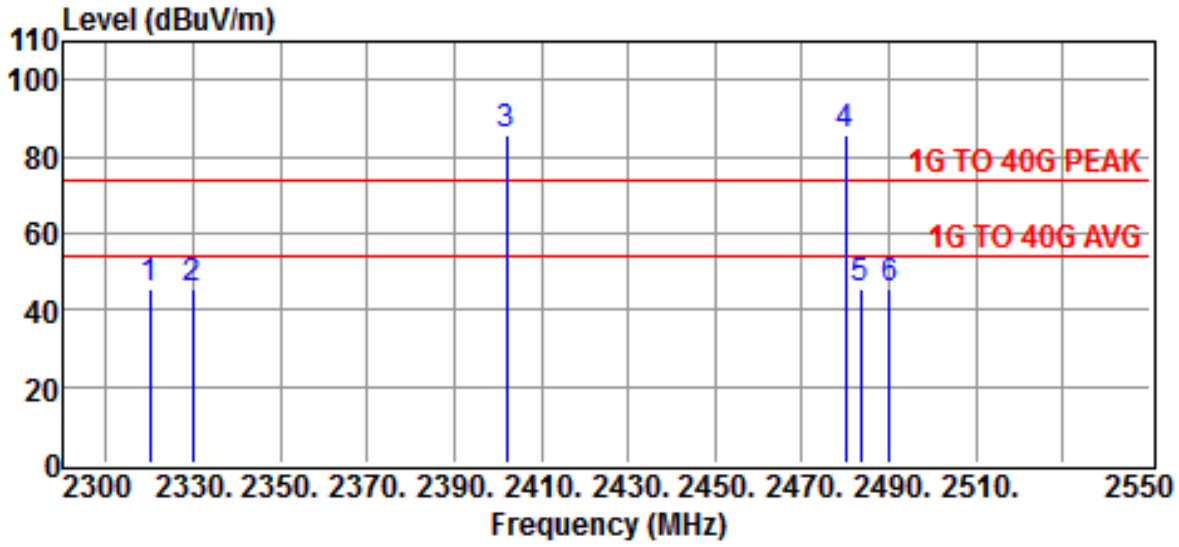
Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits dBµV/m	Over limit dB	Detector
2320.0000	56.92	-5.76	51.16	74.00	-22.84	Peak
2330.0000	56.87	-5.76	51.11	74.00	-22.89	Peak
2402.0000	97.11	-5.61	91.50	----	----	Peak
2480.0000	97.03	-5.40	91.63	----	----	Peak
2483.5000	57.32	-5.40	51.92	74.00	-22.08	Peak
2490.0000	56.56	-5.36	51.20	74.00	-22.80	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 : May 04, 2017 Temperature : 26 °C Humidity : 53 %

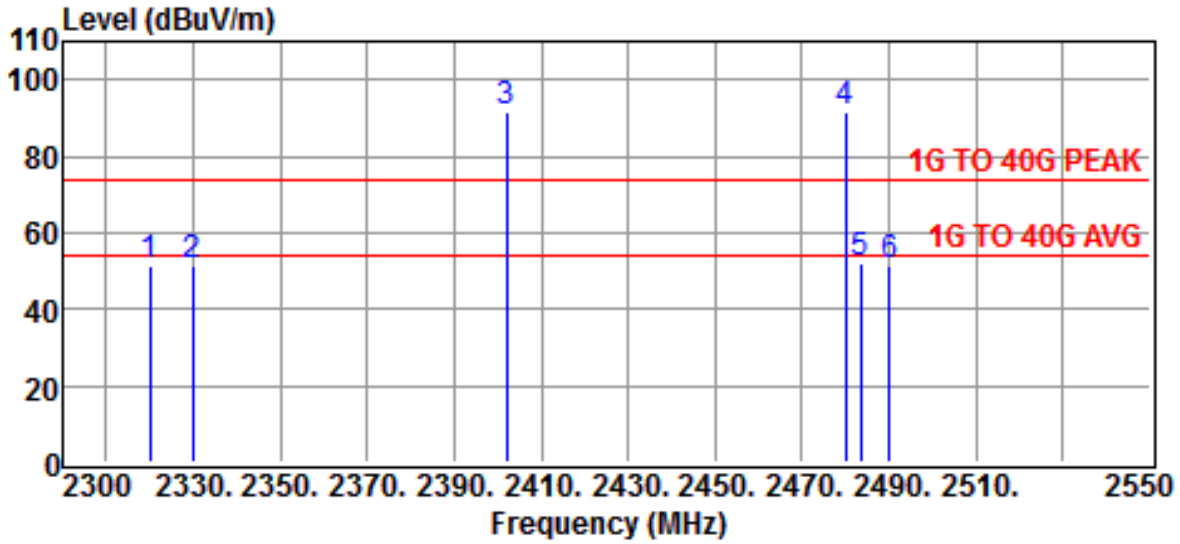


Site	:Chamber #2	Date	:2017-05-04
Limit	:1G TO 40G PEAK	Ant. Pol.	:HORIZONTAL
EUT	:Job Site Radio	Model	:XRM06
Power Rating	:AC120V 60Hz	Temp.	:26˚C
Engineer	:Kazuma Ho	Humi.	:53 %
Test Mode	:EDR		

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits dBµV/m	Over limit dB	Detector
2320.0000	51.19	-5.76	45.43	74.00	-28.57	Peak
2330.0000	51.23	-5.76	45.47	74.00	-28.53	Peak
2402.0000	91.07	-5.61	85.46	----	----	Peak
2480.0000	90.96	-5.40	85.56	----	----	Peak
2483.5000	51.03	-5.40	45.63	74.00	-28.37	Peak
2490.0000	50.84	-5.36	45.48	74.00	-28.52	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	:2017-05-04
Limit	:1G TO 40G PEAK	Ant. Pol.	:VERTICAL
EUT	:Job Site Radio	Model	:XRM06
Power Rating	:AC120V 60Hz	Temp.	:26˚C
Engineer	:Kazuma Ho	Humi.	:53 %
Test Mode	:EDR		

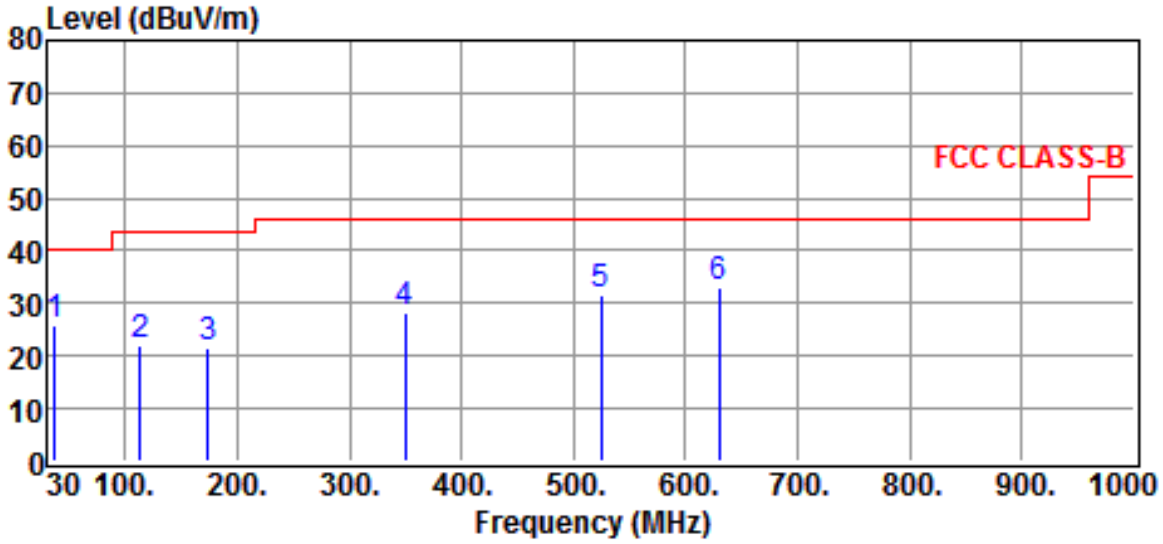
Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits dBµV/m	Over limit dB	Detector
2320.0000	56.94	-5.76	51.18	74.00	-22.82	Peak
2330.0000	56.89	-5.76	51.13	74.00	-22.87	Peak
2402.0000	97.13	-5.61	91.52	----	----	Peak
2480.0000	97.06	-5.40	91.66	----	----	Peak
2483.5000	57.33	-5.40	51.93	74.00	-22.07	Peak
2490.0000	56.55	-5.36	51.19	74.00	-22.81	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. 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

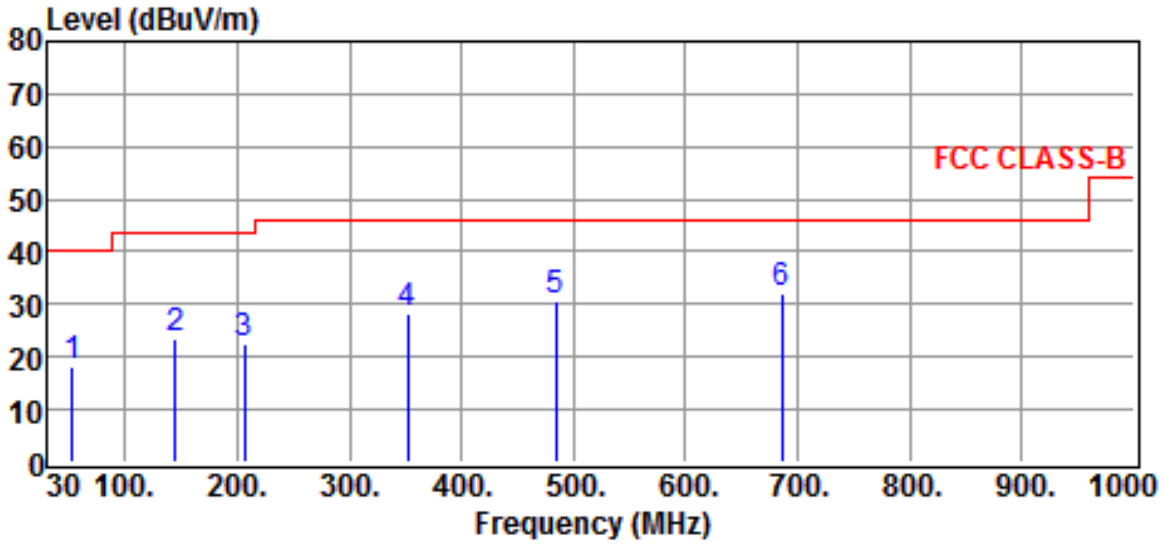
a) Emission frequencies below 1 GHz



Site	:Chamber #2	Date	:2017-04-10
Limit	:FCC CLASS-B	Ant. Pol.	:HORIZONTAL
EUT	:Job Site Radio	Model	:XRM06
Power Rating	:AC120V 60Hz	Temp.	:24˚C
Engineer	:Kazuma Ho	Humi.	:53 %
Test Mode	:Adapter + BT		

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits dBµV/m	Over limit dB	Detector
37.7600	31.48	-5.61	25.87	40.00	-14.13	QP
113.4200	30.14	-8.33	21.81	43.50	-21.69	QP
173.5600	30.33	-8.73	21.60	43.50	-21.90	QP
350.1000	31.03	-2.54	28.49	46.00	-17.51	QP
524.7000	31.27	0.16	31.43	46.00	-14.57	QP
629.4600	31.28	1.67	32.95	46.00	-13.05	QP

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

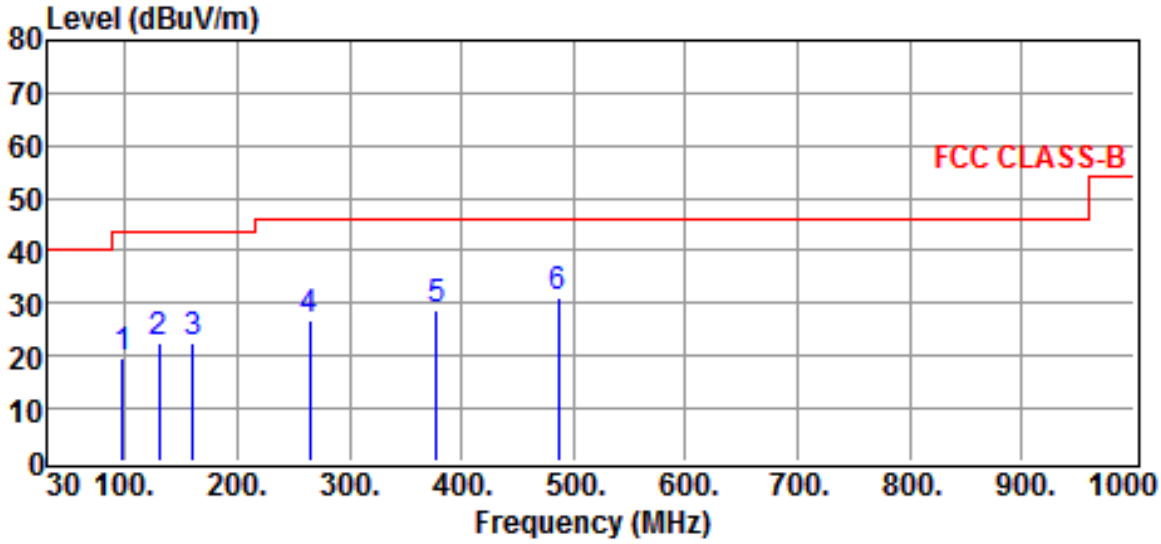


Site	:Chamber #2	Date	:2017-04-10
Limit	:FCC CLASS-B	Ant. Pol.	:VERTICAL
EUT	:Job Site Radio	Model	:XRM06
Power Rating	:AC120V 60Hz	Temp.	:24˚C
Engineer	:Kazuma Ho	Humi.	:53 %
Test Mode	:Adapter + BT		

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits dBµV/m	Over limit dB	Detector
53.2800	29.94	-11.81	18.13	40.00	-21.87	QP
144.4600	30.74	-7.23	23.51	43.50	-19.99	QP
206.5400	29.88	-7.21	22.67	43.50	-20.83	QP
352.0400	30.83	-2.51	28.32	46.00	-17.68	QP
483.9600	30.97	-0.42	30.55	46.00	-15.45	QP
685.7200	29.62	2.69	32.31	46.00	-13.69	QP

Note :

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

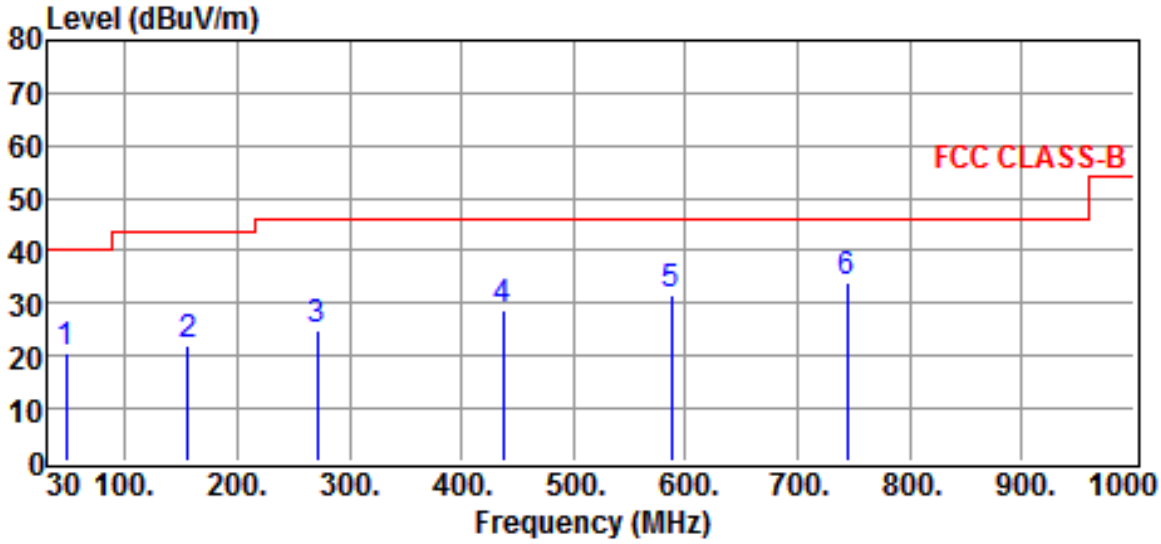


Site	:Chamber #2	Date	:2017-04-10
Limit	:FCC CLASS-B	Ant. Pol.	:HORIZONTAL
EUT	:Job Site Radio	Model	:XRM06
Power Rating	:DC14.4V Battery	Temp.	:24˚C
Engineer	:Kazuma Ho	Humi.	:53 %
Test Mode	:Battery1 + BT		

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits dBµV/m	Over limit dB	Detector
97.9000	29.74	-10.23	19.51	43.50	-23.99	QP
129.9100	30.07	-7.59	22.48	43.50	-21.02	QP
159.9800	30.33	-7.88	22.45	43.50	-21.05	QP
264.7400	31.82	-4.81	27.01	46.00	-18.99	QP
377.2600	30.71	-1.93	28.78	46.00	-17.22	QP
485.9000	31.43	-0.40	31.03	46.00	-14.97	QP

Note :

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



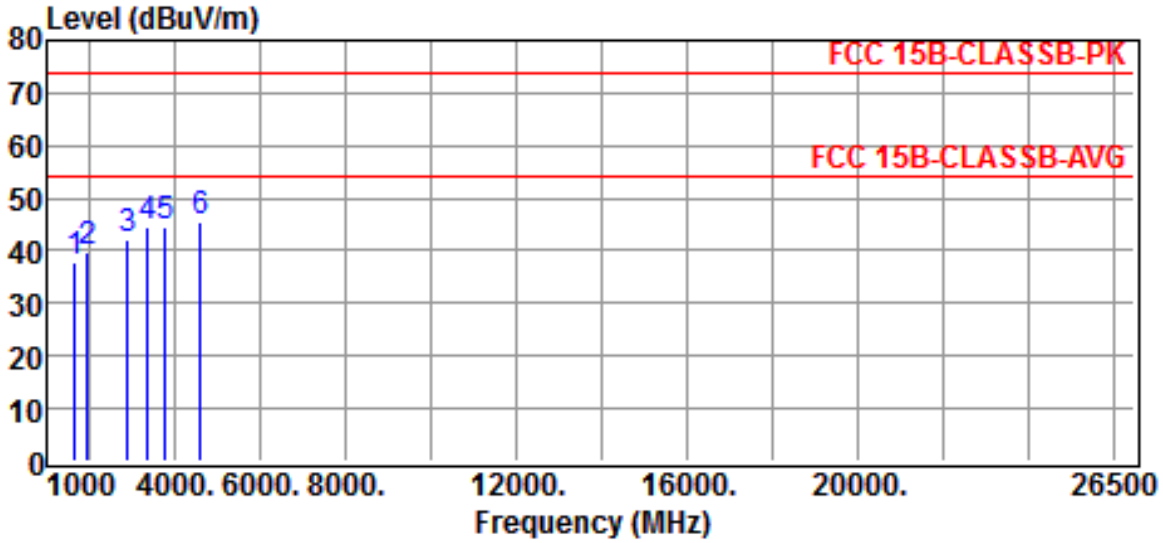
Site	:Chamber #2	Date	:2017-04-10
Limit	:FCC CLASS-B	Ant. Pol.	:VERTICAL
EUT	:Job Site Radio	Model	:XRM06
Power Rating	:DC14.4V Battery	Temp.	:24˚C
Engineer	:Kazuma Ho	Humi.	:53 %
Test Mode	:Battery1 + BT		

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits dBµV/m	Over limit dB	Detector
47.4600	29.79	-9.07	20.72	40.00	-19.28	QP
156.1000	29.72	-7.68	22.04	43.50	-21.46	QP
271.5300	29.58	-4.64	24.94	46.00	-21.06	QP
437.4000	29.96	-1.15	28.81	46.00	-17.19	QP
586.7800	30.80	0.97	31.77	46.00	-14.23	QP
743.9200	30.68	3.18	33.86	46.00	-12.14	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

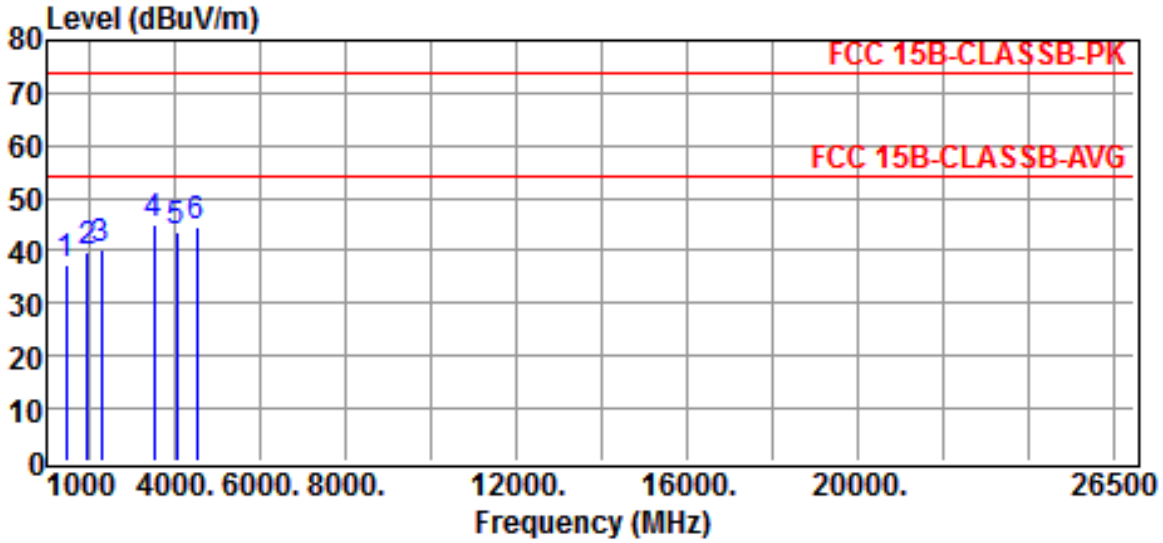


Site	:Chamber #2	Date	:2017-04-11
Limit	:FCC 1G TO 40G PEAK	Ant. Pol.	:HORIZONTAL
EUT	:Job Site Radio	Model	:XRM06
Power Rating	:AC120V 60Hz	Temp.	:22˚C
Engineer	:Kazuma Ho	Humi.	:56 %
Test Mode	:Adapter + BT		

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits dBµV/m	Over limit dB	Detector
1663.0000	46.44	-8.71	37.73	74.00	-36.27	Peak
1943.5000	46.46	-6.84	39.62	74.00	-34.38	Peak
2887.0000	45.96	-3.94	42.02	74.00	-31.98	Peak
3371.5000	46.66	-2.23	44.43	74.00	-29.57	Peak
3779.5000	45.47	-0.83	44.64	74.00	-29.36	Peak
4595.5000	45.14	0.58	45.72	74.00	-28.28	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.

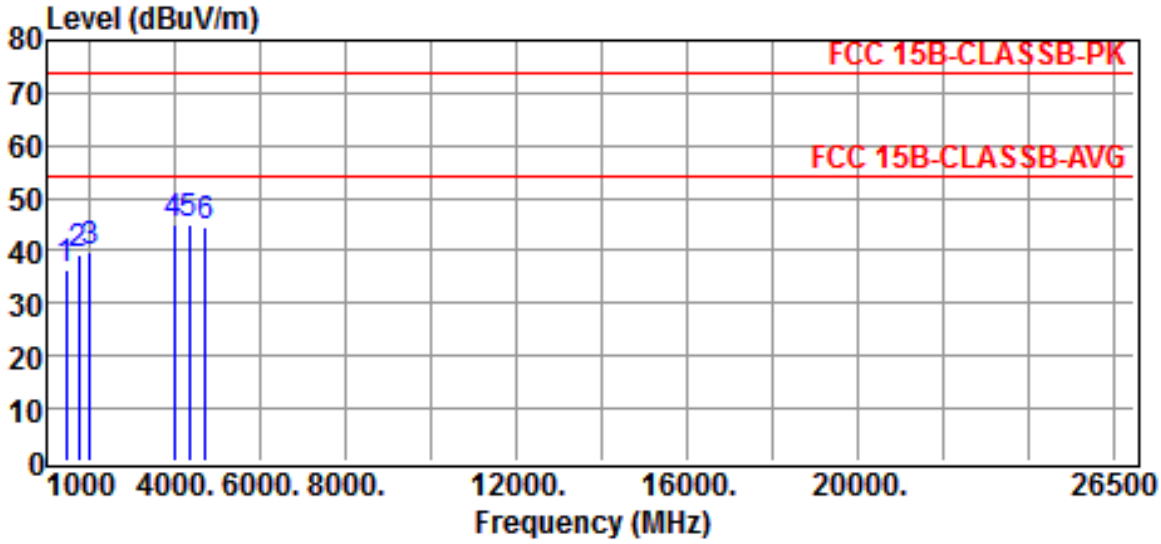


Site	:Chamber #2	Date	:2017-04-11
Limit	:FCC 1G TO 40G PEAK	Ant. Pol.	:VERTICAL
EUT	:Job Site Radio	Model	:XRM06
Power Rating	:AC120V 60Hz	Temp.	:22˚C
Engineer	:Kazuma Ho	Humi.	:56 %
Test Mode	:Adapter + BT		

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits dBµV/m	Over limit dB	Detector
1459.0000	47.15	-9.93	37.22	74.00	-36.78	Peak
1969.0000	46.45	-6.73	39.72	74.00	-34.28	Peak
2275.0000	46.19	-5.88	40.31	74.00	-33.69	Peak
3524.5000	46.85	-1.76	45.09	74.00	-28.91	Peak
4034.5000	43.75	-0.09	43.66	74.00	-30.34	Peak
4519.0000	44.04	0.31	44.35	74.00	-29.65	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. Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

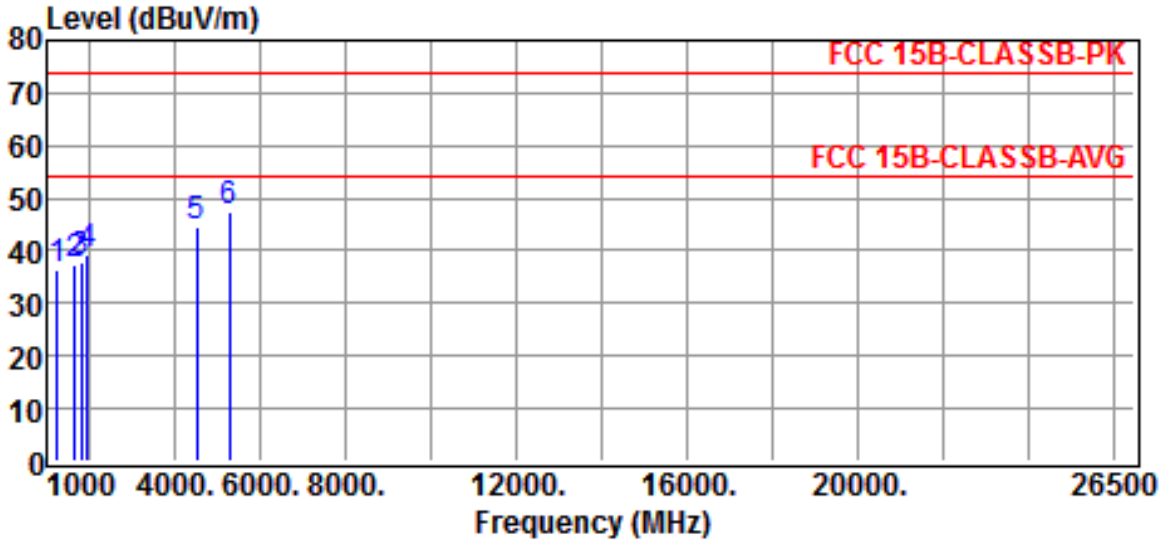


Site	:Chamber #2	Date	:2017-04-11
Limit	:FCC 1G TO 40G PEAK	Ant. Pol.	:HORIZONTAL
EUT	:Job Site Radio	Model	:XRM06
Power Rating	:DC14.4V Battery	Temp.	:22˚C
Engineer	:Kazuma Ho	Humi.	:56 %
Test Mode	:Battery1 + BT		

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits dBµV/m	Over limit dB	Detector
1459.0000	46.42	-9.93	36.49	74.00	-37.51	Peak
1739.5000	47.62	-8.16	39.46	74.00	-34.54	Peak
2020.0000	46.16	-6.47	39.69	74.00	-34.31	Peak
3983.5000	44.93	-0.12	44.81	74.00	-29.19	Peak
4340.5000	44.82	0.13	44.95	74.00	-29.05	Peak
4723.0000	43.38	0.97	44.35	74.00	-29.65	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. 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	:2017-04-11
Limit	:FCC 1G TO 40G PEAK	Ant. Pol.	:VERTICAL
EUT	:Job Site Radio	Model	:XRM06
Power Rating	: DC14.4V Battery	Temp.	:22˚C
Engineer	:Kazuma Ho	Humi.	:56 %
Test Mode	:Battery1 + BT		

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits dBµV/m	Over limit dB	Detector
1255.0000	47.09	-10.51	36.58	74.00	-37.42	Peak
1663.0000	45.94	-8.71	37.23	74.00	-36.77	Peak
1816.0000	45.43	-7.72	37.71	74.00	-36.29	Peak
1969.0000	46.25	-6.73	39.52	74.00	-34.48	Peak
4519.0000	44.23	0.31	44.54	74.00	-29.46	Peak
5284.0000	45.12	2.45	47.57	74.00	-26.43	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.

c) Emission frequencies below 30MHz (9kHz - 30MHz)

According to exploratory test no any obvious emission were detected from 9kHz to 30MHz. 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

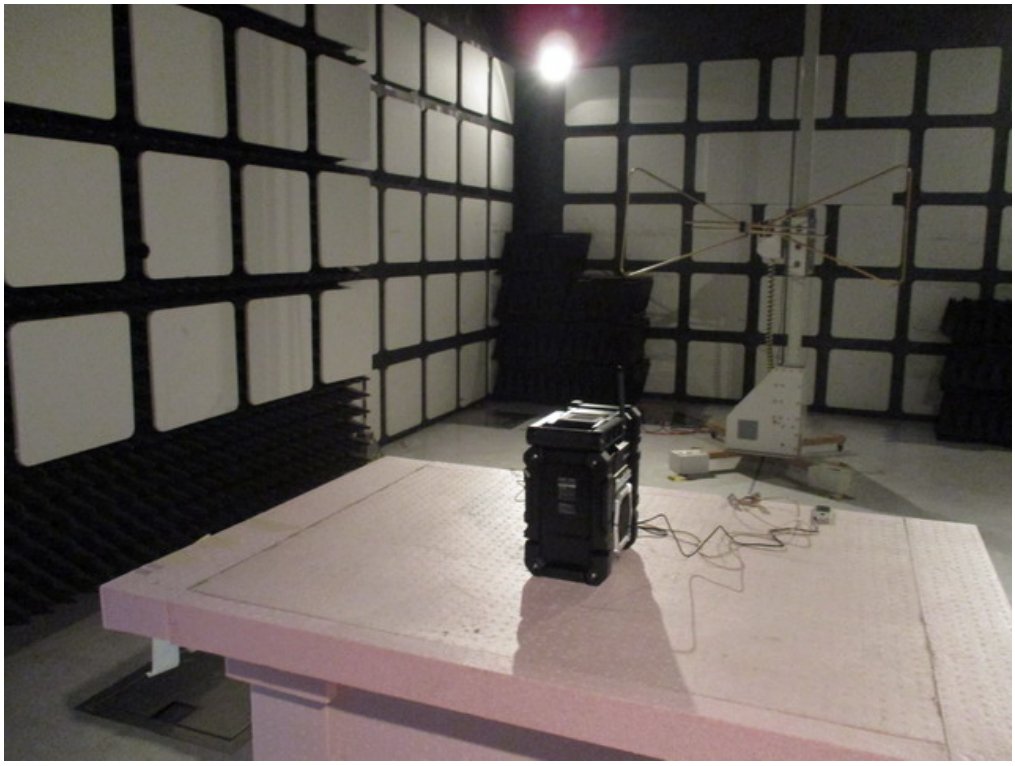
where Corrected Factor

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

4.6 Photos of Radiation Measuring Setup

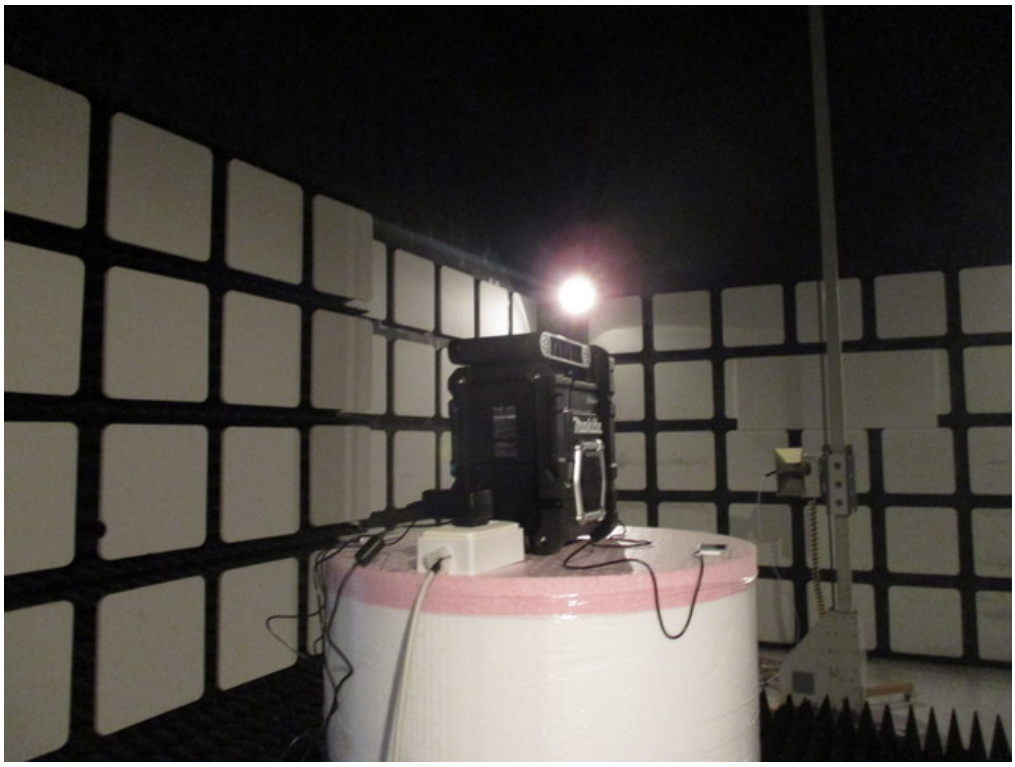
(Below 1GHz)
Adapter Mode

Battery Mode



(Above 1GHz)

Adapter Mode



Battery Mode

5 CONDUCTED EMISSION MEASUREMENT

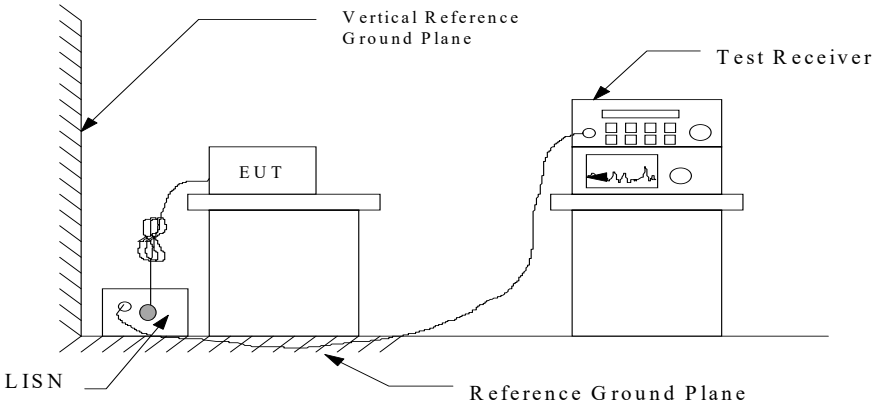
5.1 Standard Applicable

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.

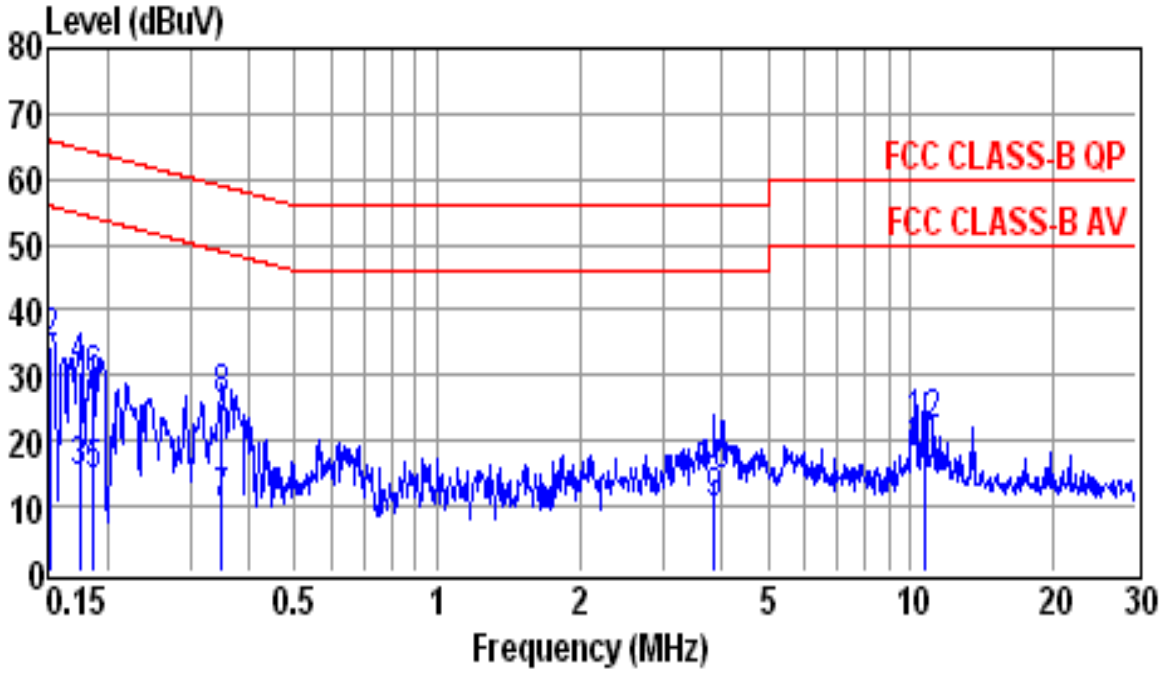
5.2 Measurement Procedure

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

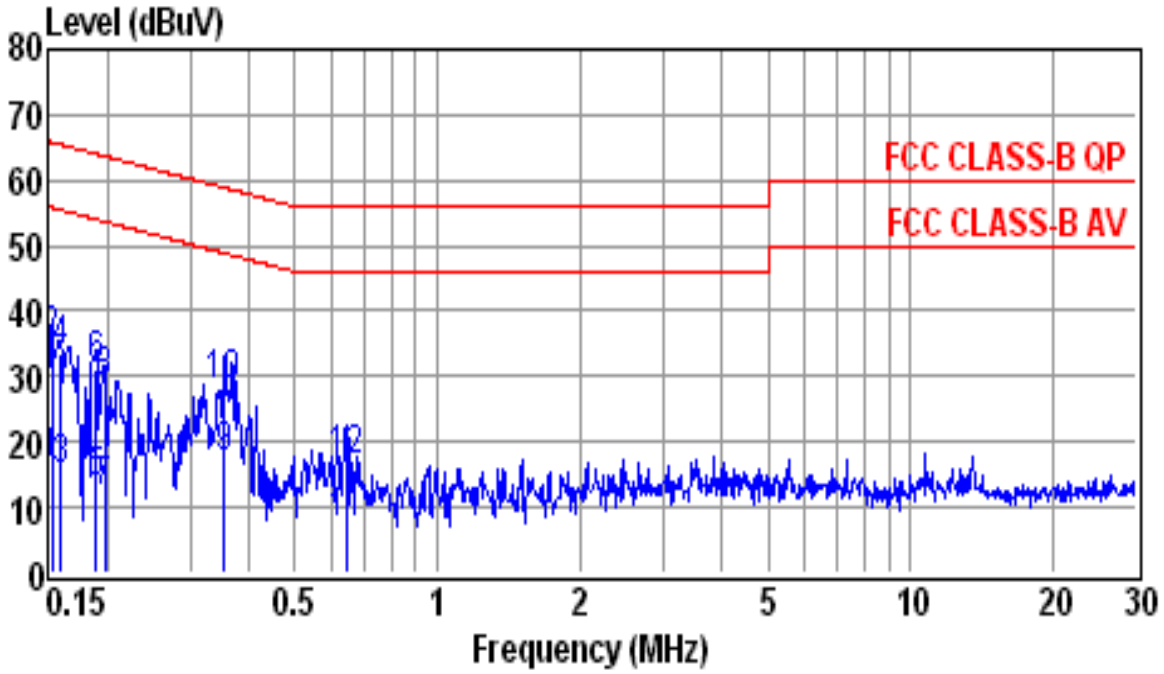


Site	: conducted #1	Date	: 04-10-2017
Condition	: FCC CLASS-B QP	LISN	: NEUTRAL
Tem / Hum	: 24 ℃ / 53%	Test Mode	: BT
EUT	: FM/AM radio with Bluetooth	Power Rating	: AC 120V60Hz
Memo	:	Memo	:

Freq (MHz)	Reading (dBμV)	Factor (dB)	Emission Level (dBμV)	Limit Line (dBμV)	Over Limit (dB)	Remark
0.1524	8.22	10.17	18.39	55.87	-37.48	Average
0.1524	24.24	10.17	34.41	65.87	-31.46	QP
0.1758	4.90	10.16	15.06	54.68	-39.62	Average
0.1758	20.72	10.16	30.88	64.68	-33.80	QP
0.1874	4.22	10.16	14.38	54.15	-39.77	Average
0.1874	18.58	10.16	28.74	64.15	-35.41	QP
0.3502	0.06	10.18	10.24	48.96	-38.72	Average
0.3502	15.52	10.18	25.70	58.96	-33.26	QP
3.8600	-0.50	10.35	9.85	46.00	-36.15	Average
3.8600	4.21	10.35	14.56	56.00	-41.44	QP
10.7900	7.55	10.67	18.22	50.00	-31.78	Average
10.7900	11.45	10.67	22.12	60.00	-37.88	QP

Note :

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



Site	: conducted #1	Date	: 04-10-2017
Condition	: FCC CLASS-B QP	LISN	: LINE
Tem / Hum	: 24 ℃ / 53%	Test Mode	: BT
EUT	: FM/AM radio with Bluetooth	Power Rating	: AC 120V60Hz
Memo	:	Memo	:

Freq (MHz)	Reading (dBμV)	Factor (dB)	Emission Level (dBμV)	Limit Line (dBμV)	Over Limit (dB)	Remark
0.1532	6.33	10.17	16.50	55.82	-39.32	Average
0.1532	24.85	10.17	35.02	65.82	-30.80	QP
0.1599	5.16	10.17	15.33	55.47	-40.14	Average
0.1599	23.60	10.17	33.77	65.47	-31.70	QP
0.1894	3.42	10.17	13.59	54.06	-40.47	Average
0.1894	20.84	10.17	31.01	64.06	-33.05	QP
0.1976	1.62	10.17	11.79	53.71	-41.92	Average
0.1976	18.46	10.17	28.63	63.71	-35.08	QP
0.3539	6.89	10.19	17.08	48.87	-31.79	Average
0.3539	17.85	10.19	28.04	58.87	-30.83	QP
0.6406	-3.24	10.21	6.97	46.00	-39.03	Average
0.6406	6.75	10.21	16.96	56.00	-39.04	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 μ V is obtained, and LISN Factor is 0.1 dB, then the total of disturbance voltage is 22.6 dB μ V.

RESULT = 22.5 + 0.1 = 22.6 dB μ V
Level in μ V = Common Antilogarithm[(22.6 dB μ V)/20]
= 13.48 μ 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	2016/12/05	2017/12/05
LISN	Shibasoku	563	2016/05/16	2017/05/15
LISN	Rohde & Schwarz	ESH2-Z5	2016/05/05	2017/05/04

5.6 Photos of Conduction Measuring Setup

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 permanently mounted on main PCB, no consideration of replacement.
Please see internal photos and the antenna specifications.

7 HOPPING CHANNEL SEPARATION

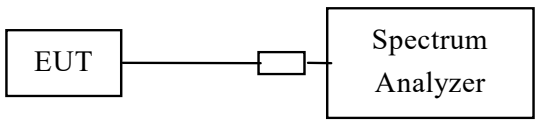
7.1 Standard Applicable

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) ≥ 1% of the span
   Video (or Average) Bandwidth (VBW) ≥ 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
Spectrum Analyzer	Rohde & Schwarz	FSP40	2016/10/03	2017/10/02
Attenuator	MINI-CIRCUITS	BW-S10W2+	2016/09/30	2017/09/29

7.4 Measurement Data

Test Date : May 04, 2017 Temperature : 27 °C Humidity : 53 %

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 1.000 MHz

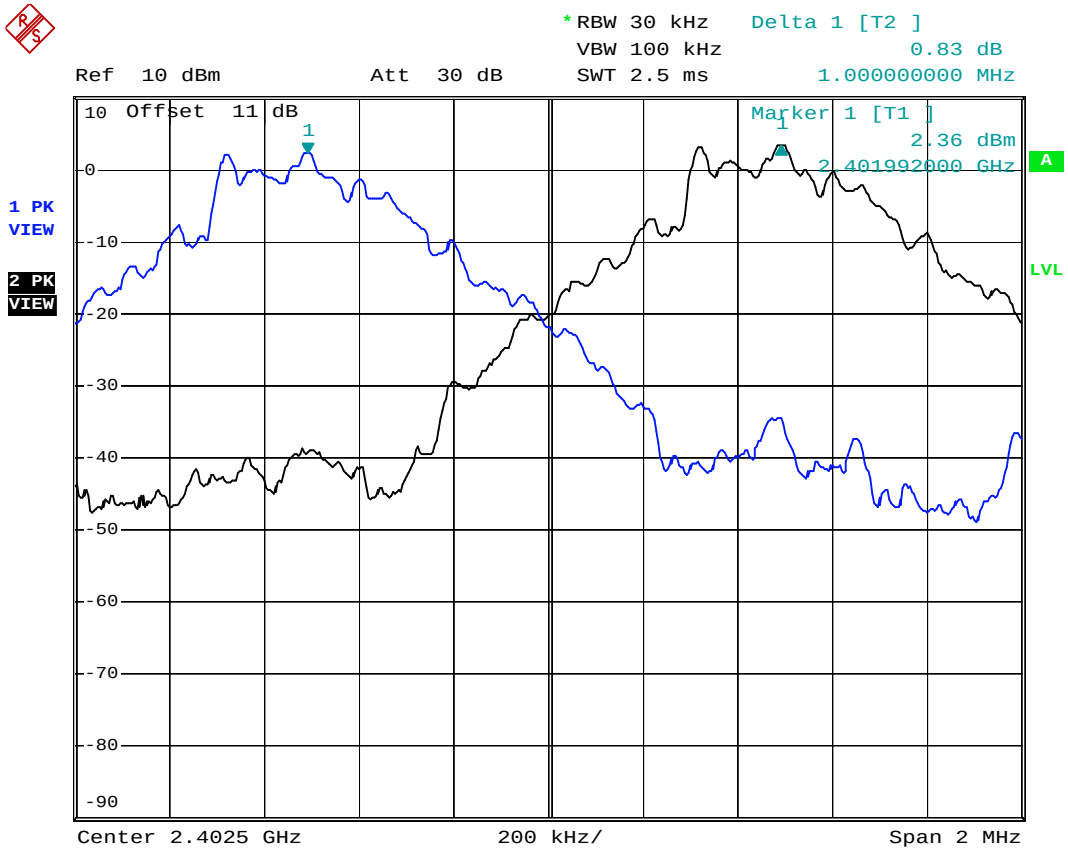
Mode: Bluetooth EDR

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

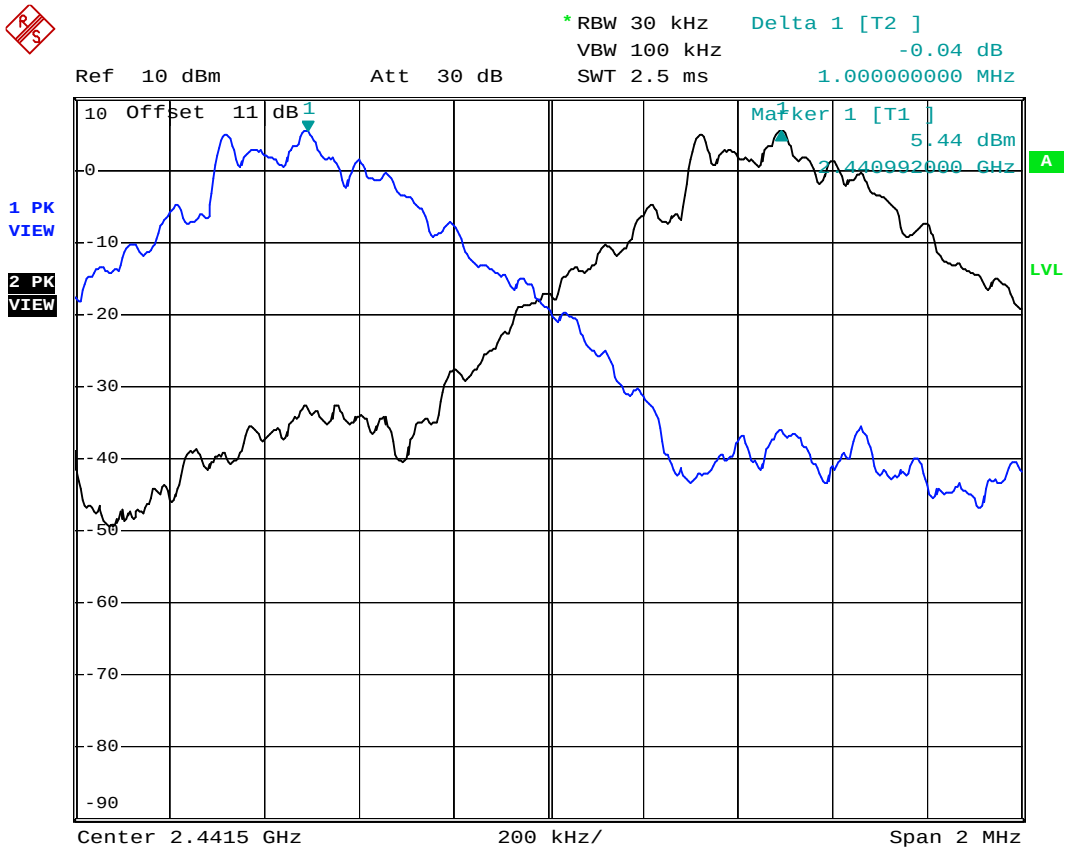
Note : The expanded uncertainty: frequency $\times 1.65 \times 10^{-6}$ (1 GHz $< f \leq$ 18 GHz).

Mode: Bluetooth BR

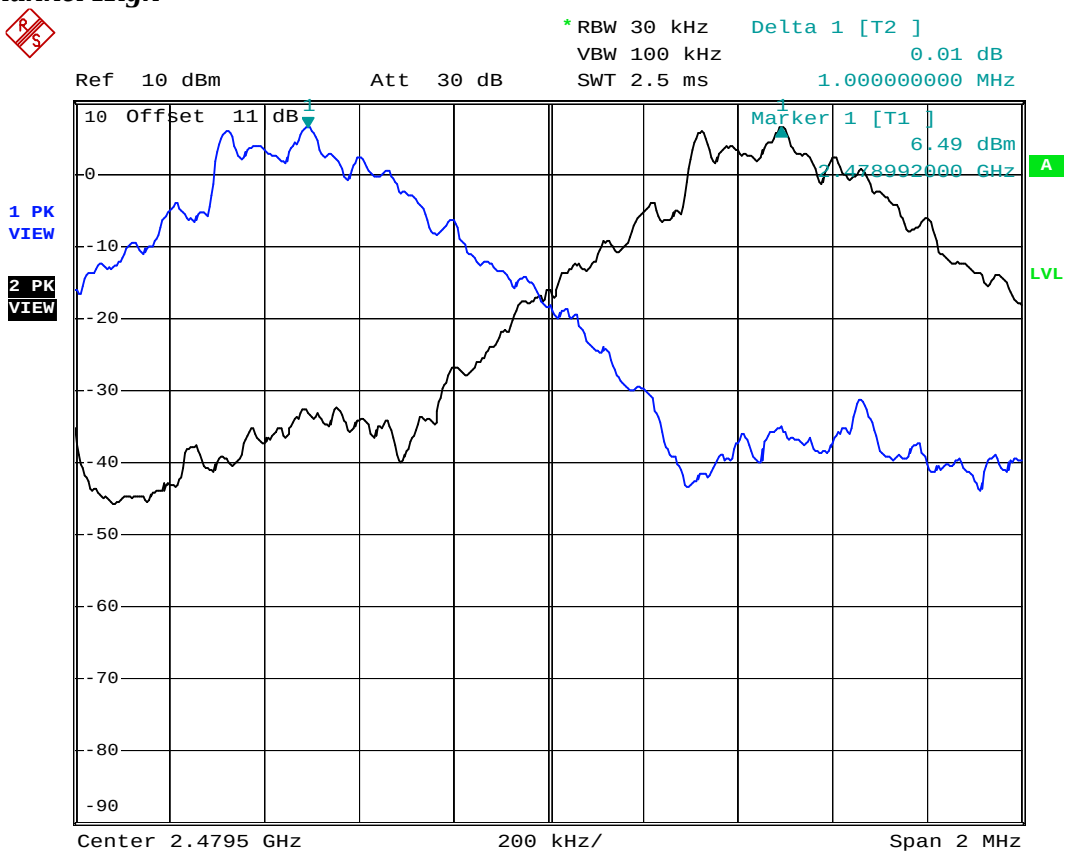
Channel Low



Channel Middle

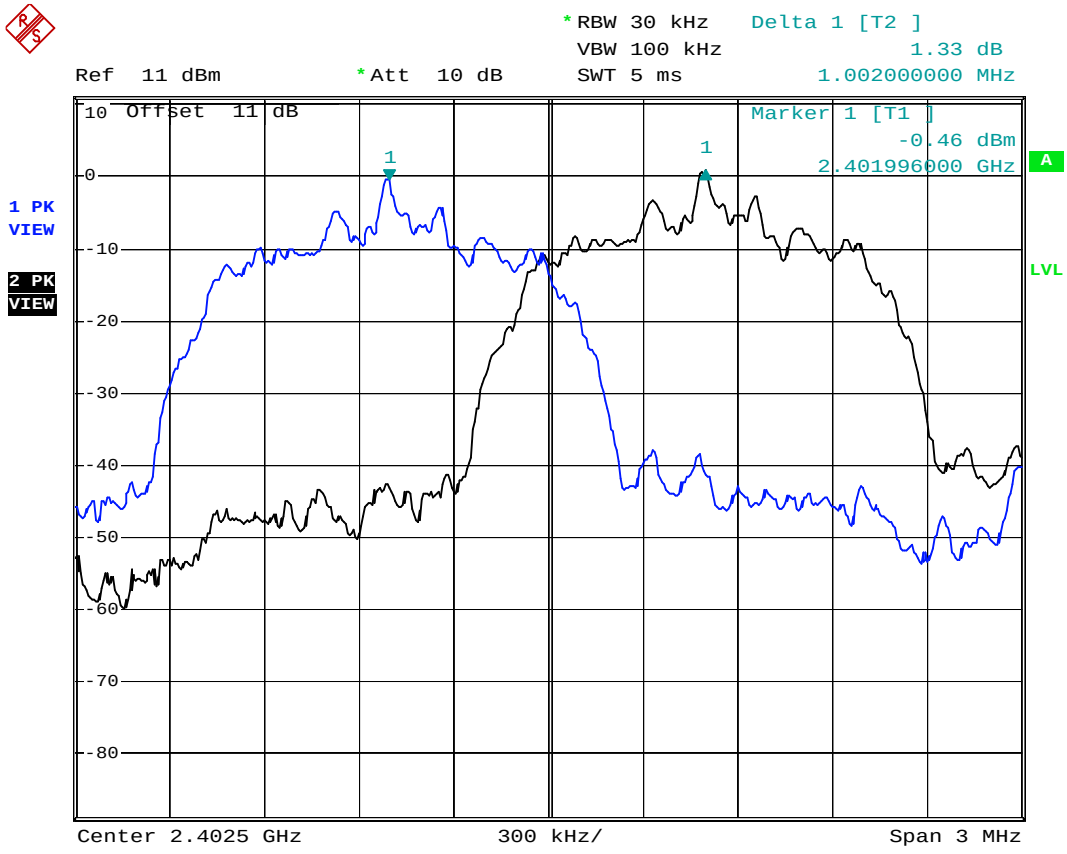


Channel High

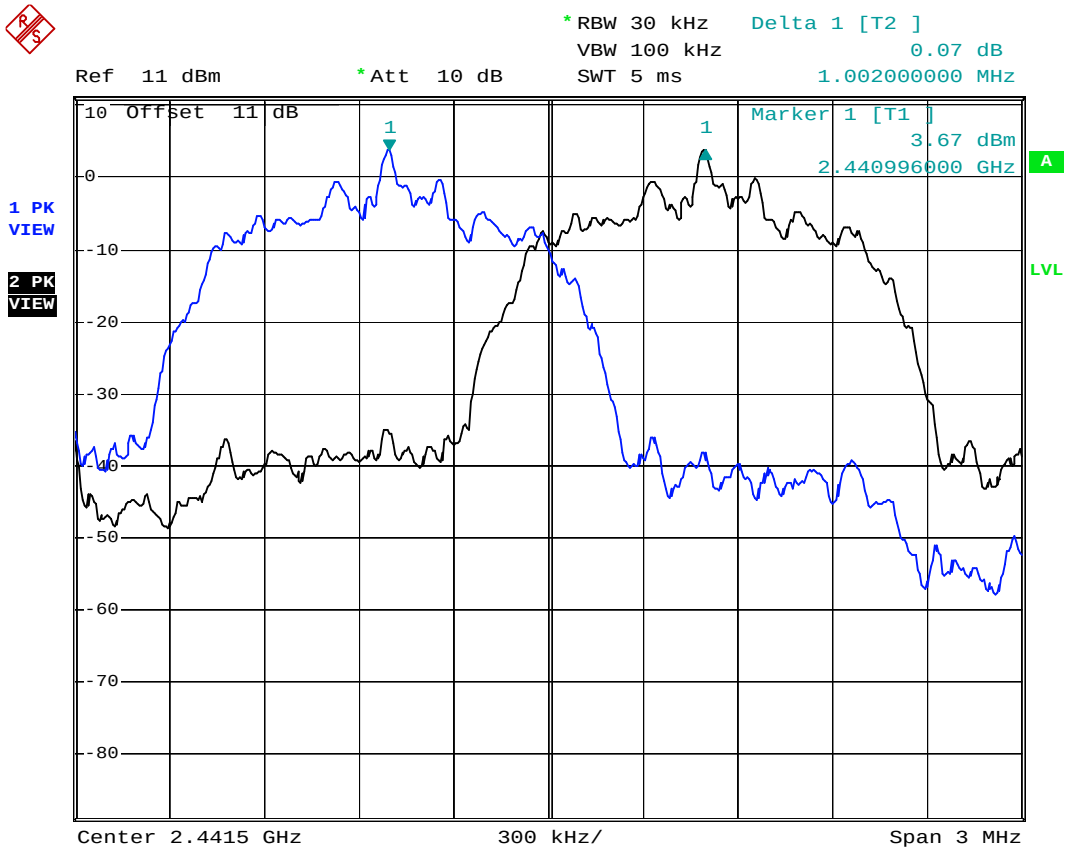


Mode: Bluetooth EDR

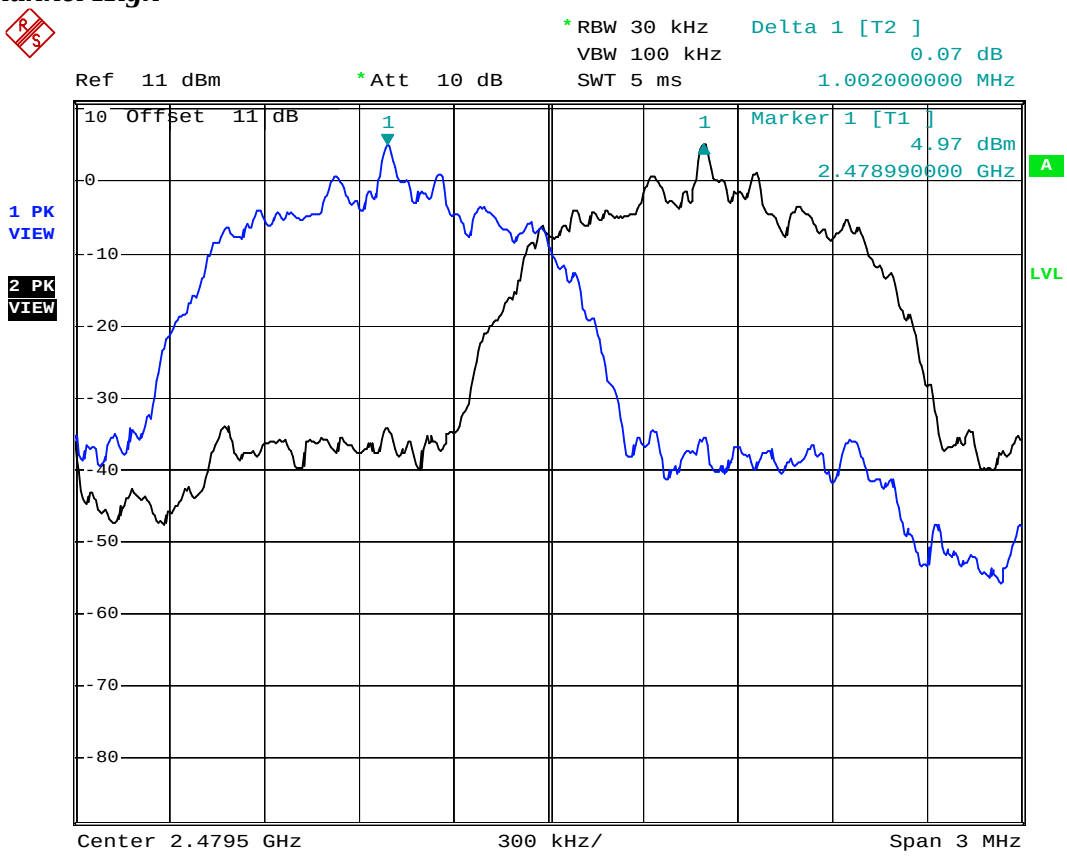
Channel Low



Channel Middle



Channel High



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 ≥ 1% of the span
   VBW ≥ 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
Spectrum Analyzer	Rohde & Schwarz	FSP40	2016/10/03	2017/10/02
Attenuator	MINI-CIRCUITS	BW-S10W2+	2016/09/30	2017/09/29

8.4 Measurement Data

Test Date : May 04, 2017 Temperature : 27 °C Humidity : 53 %

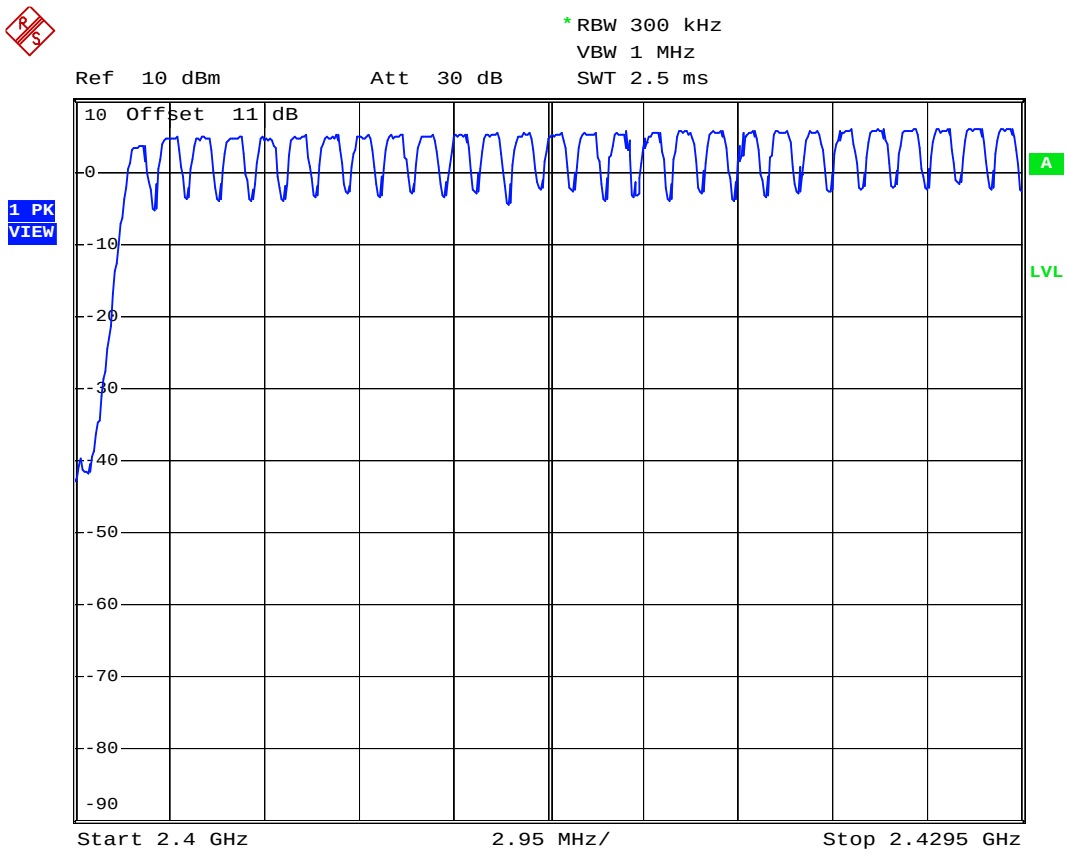
A. Bluetooth BR
There are 79 hopping frequencies used.

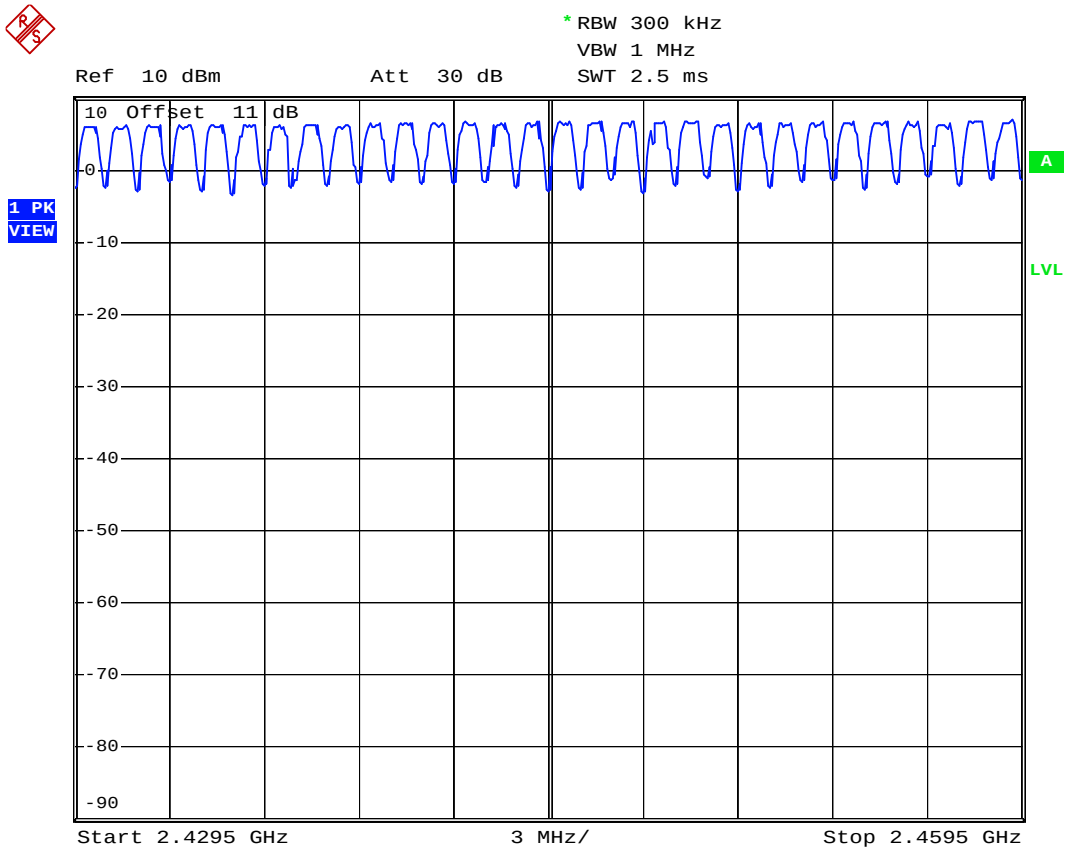
B. Bluetooth EDR
There are 79 hopping frequencies used.

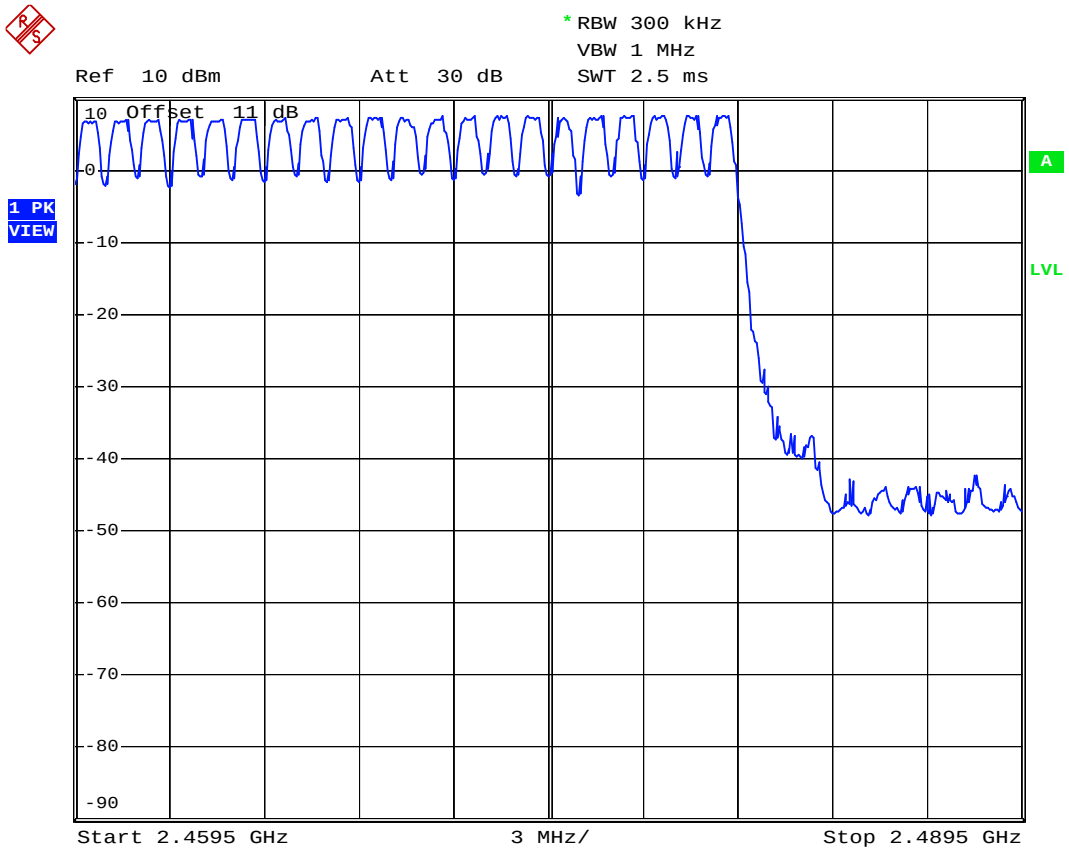
Justification on AFH mode:
Adaptive Frequency Hopping (AFH) means that a device can hop over a reduced set of frequencies. The frequencies hopped may reduced in AFH mode but at least 15 channels will be used, normally AFH mode has 20 channels.

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

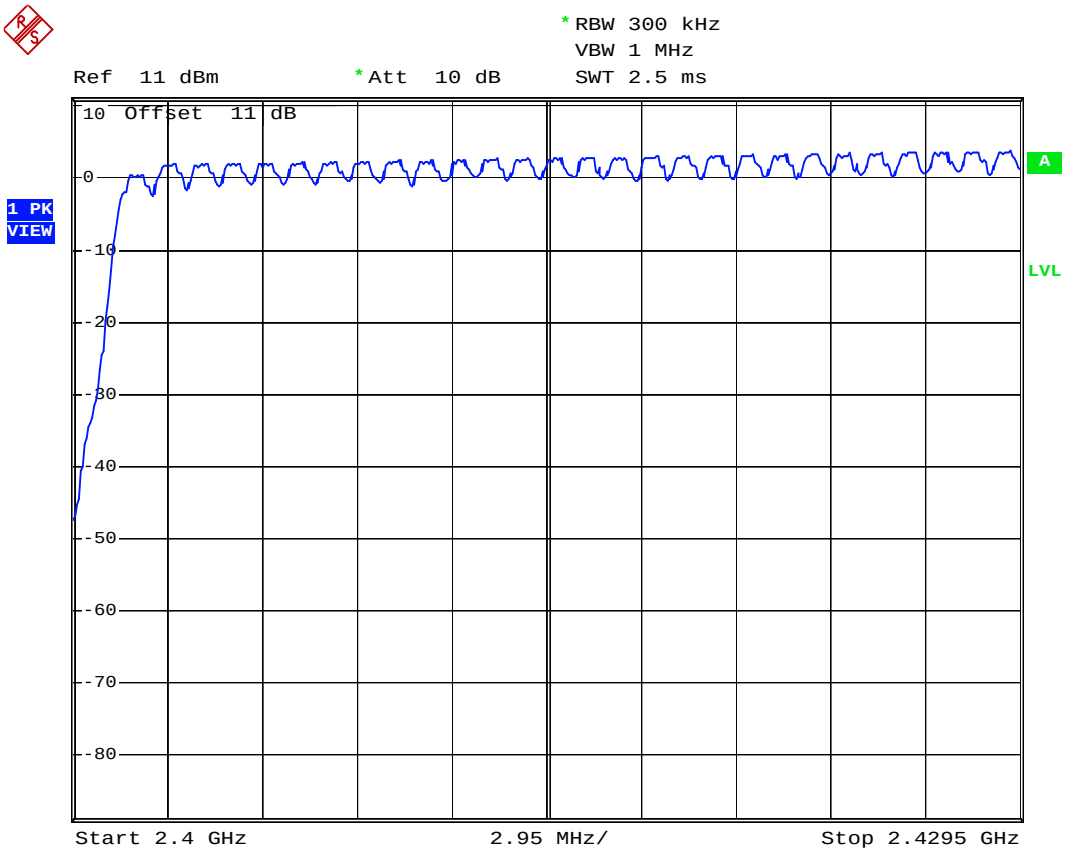
Mode: Bluetooth BR

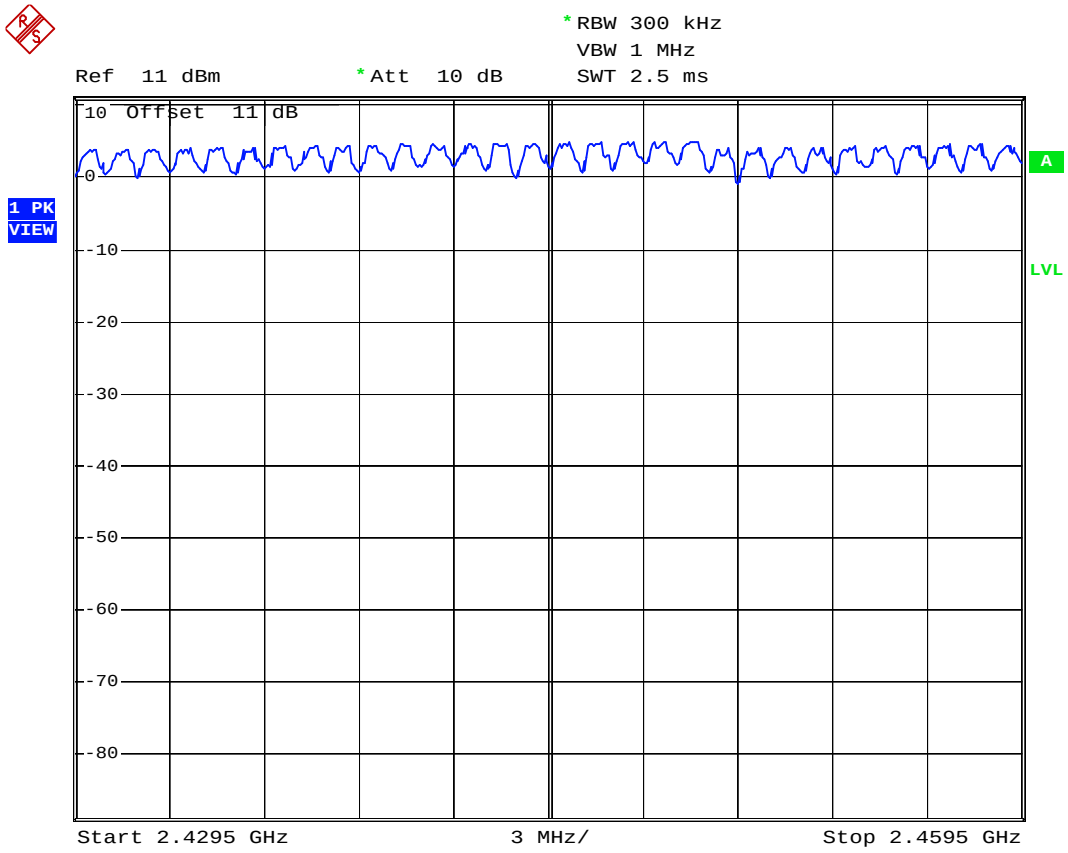


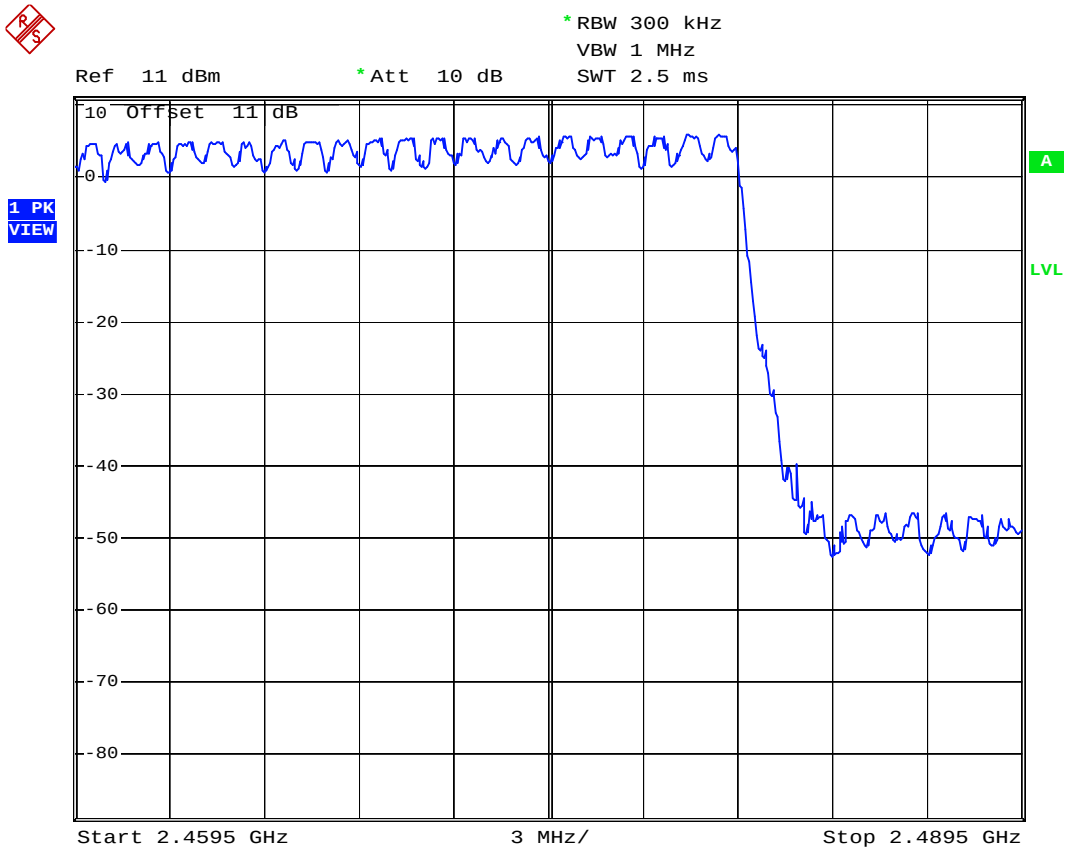

*RBW 300 kHz
VBW 1 MHz
SWT 2.5 ms
Ref 10 dBm
Att 30 dB
10 Offset 11 dB
1 PK
VIEW
A
LVL
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Start 2.4295 GHz
3 MHz/
Stop 2.4595 GHz


RBW 300 kHz
VBW 1 MHz
SWT 2.5 ms
Ref 10 dBm
Att 30 dB
Offset 11 dB
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
1 PK
VIEW
A
LVL
Start 2.4595 GHz
3 MHz/
Stop 2.4895 GHz

Mode: Bluetooth EDR




*RBW 300 kHz
VBW 1 MHz
Ref 11 dBm
*Att 10 dB
SWT 2.5 ms
10 Offset 11 dB
A
1 PK
VIEW
0
-10
-20
-30
-40
-50
-60
-70
-80
LVL
Start 2.4295 GHz
3 MHz/
Stop 2.4595 GHz


*RBW 300 kHz
VBW 1 MHz
Ref 11 dBm
*Att 10 dB
SWT 2.5 ms
10 Offset 11 dB
1 PK
VIEW
A
LVL
0
-10
-20
-30
-40
-50
-60
-70
-80
Start 2.4595 GHz
3 MHz/
Stop 2.4895 GHz

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 ≥ 1% of the 20 dB bandwidth
   VBW ≥ 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
Spectrum Analyzer	Rohde & Schwarz	FSP40	2016/10/03	2017/10/02
Attenuator	MINI-CIRCUITS	BW-S10W2+	2016/09/30	2017/09/29

9.4 Measurement Data

Test Date : May 04, 2017 Temperature : 27 °C Humidity : 53 %

Mode: Bluetooth BR

a) Channel Low : Channel Bandwidth is 0.920 MHz
b) Channel Middle : Channel Bandwidth is 0.860 MHz
c) Channel High : Channel Bandwidth is 0.884 MHz

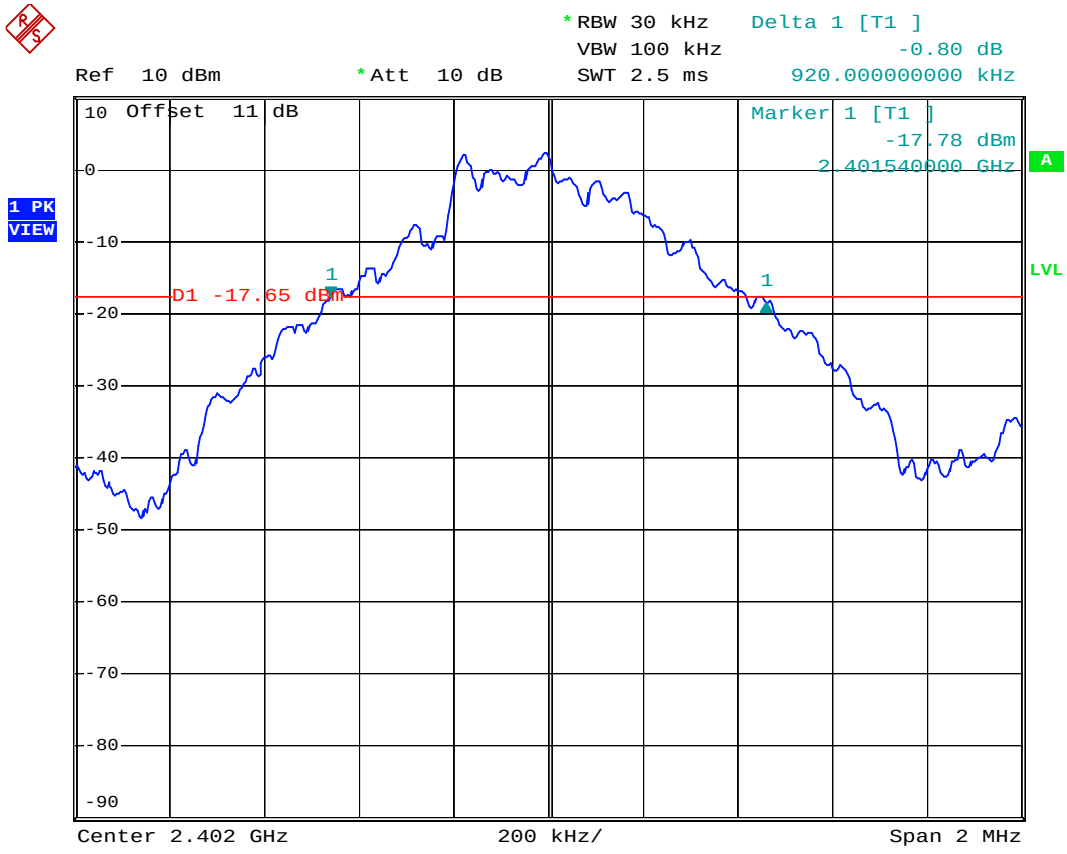
Mode: Bluetooth EDR

a) Channel Low : Channel Bandwidth is 1.208 MHz
b) Channel Middle : Channel Bandwidth is 1.220 MHz
c) Channel High : Channel Bandwidth is 1.212 MHz

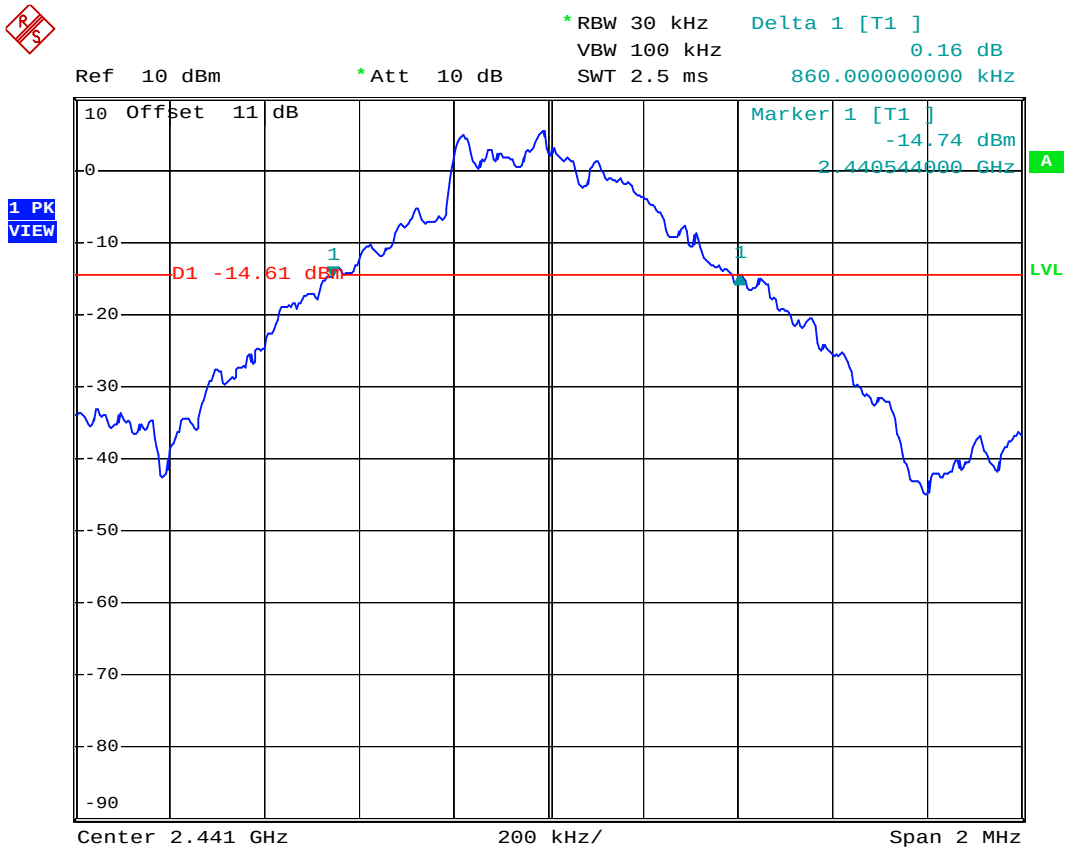
Note : The expanded uncertainty: frequency $\times 1.65 \times 10^{-6}$ (1 GHz $< f \leq$ 18 GHz).

Mode:Bluetooth BR

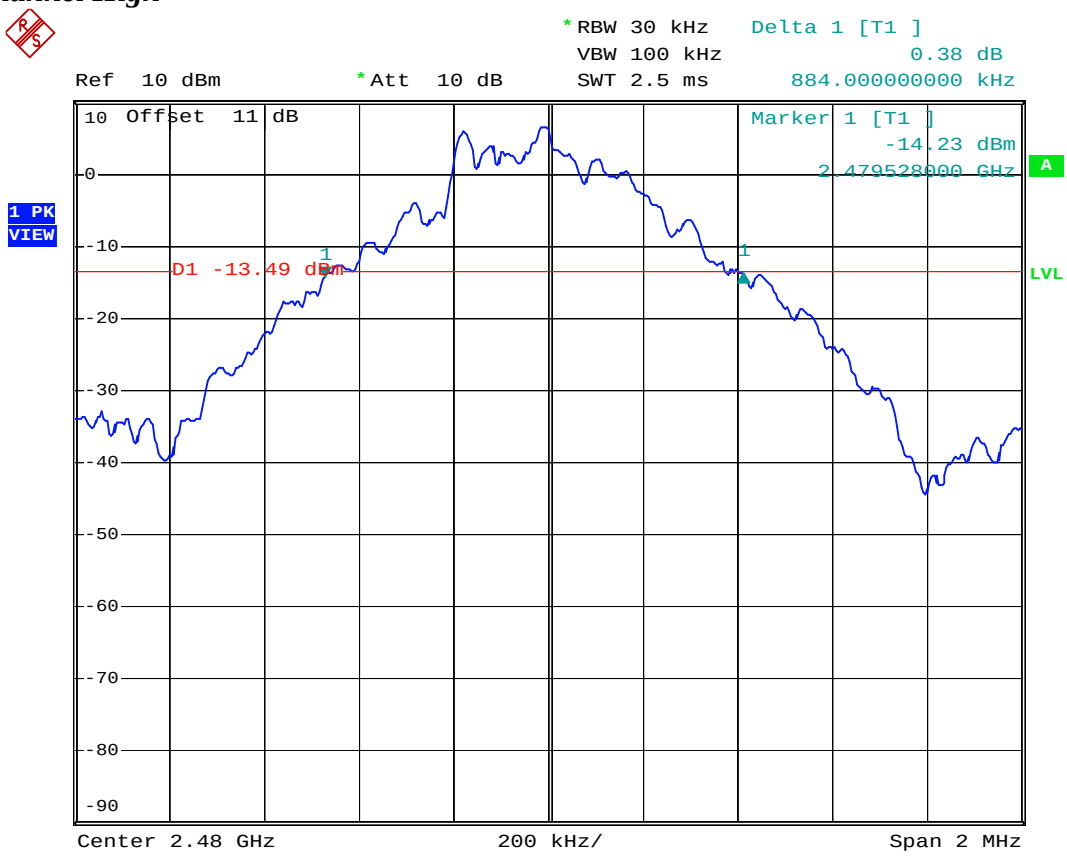
Channel Low



Channel Middle

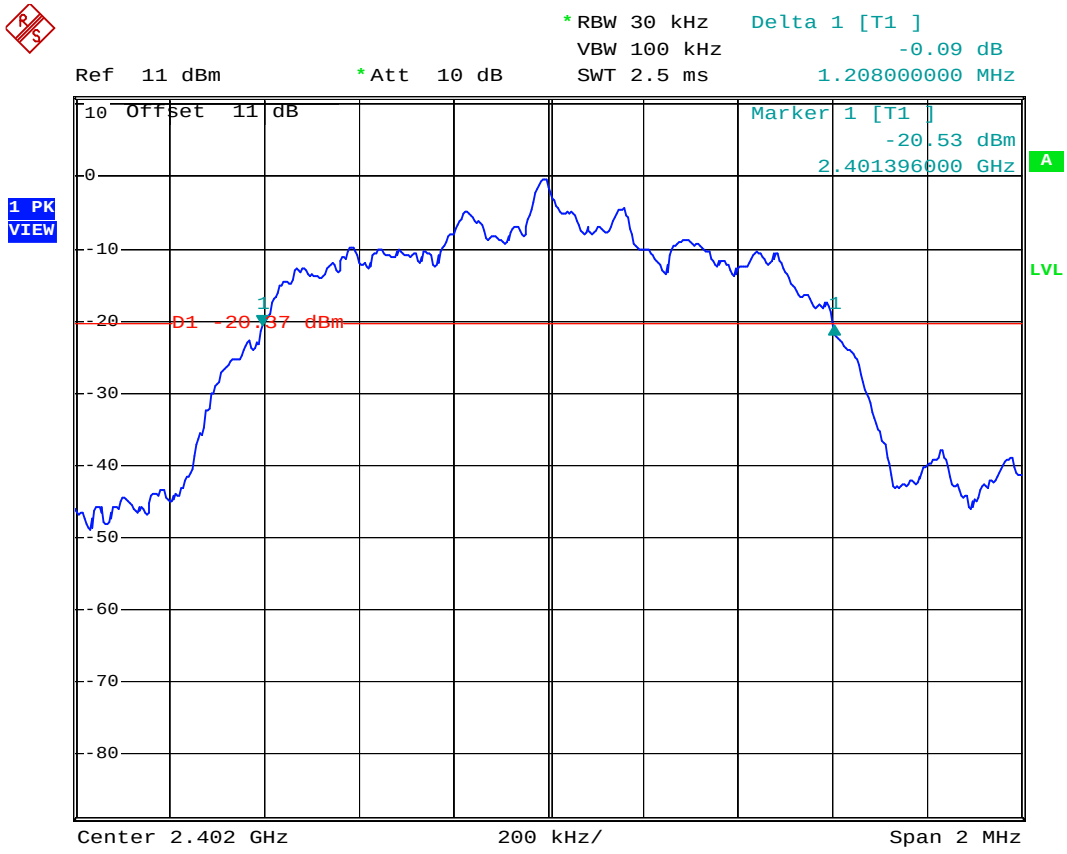


Channel High

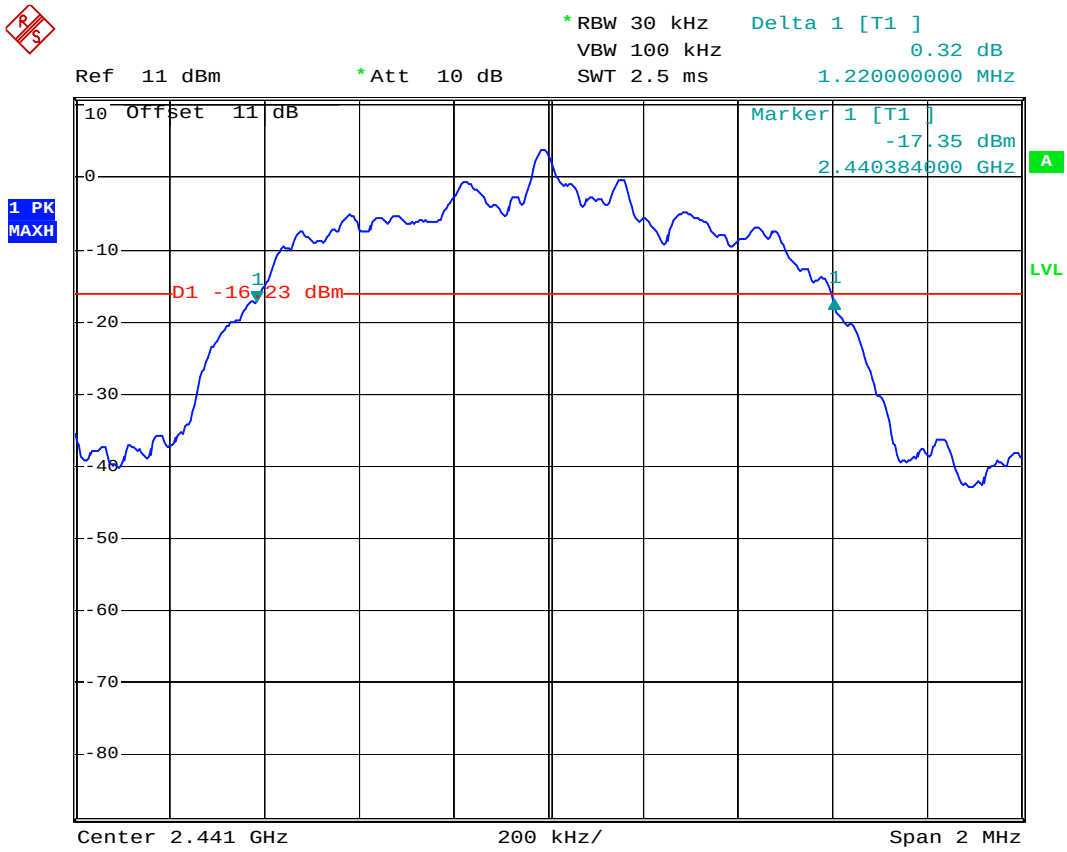


Mode: Bluetooth EDR

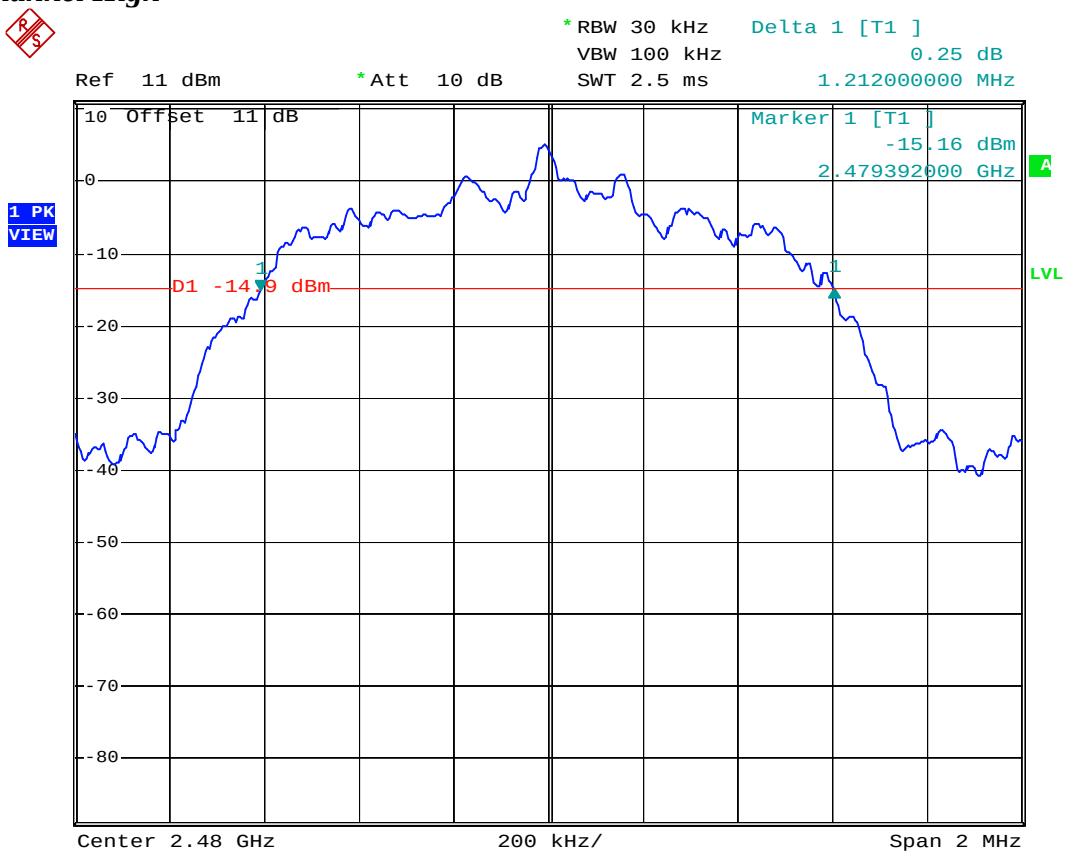
Channel Low



Channel Middle



Channel High



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 ≥ 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 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
Spectrum Analyzer	Rohde & Schwarz	FSP40	2016/10/03	2017/10/02
Attenuator	MINI-CIRCUITS	BW-S10W2+	2016/09/30	2017/09/29

10.4 Measurement Data

Test Mode: Bluetooth BR

Test Date : May 04, 2017 Temperature : 27 °C Humidity : 53 %

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 x 31.6 = 320.1 times of transmissions.

a) Channel Low : the dwell time is 0.47 ms x 320.1 = 150.447 ms
b) Channel Middle : the dwell time is 0.47 ms x 320.1 = 150.447 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 153.648ms 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 x 31.6 = 159.9 times of transmissions.

a) Channel Low : the dwell time is 1.78 ms x 159.9 = 284.622 ms
b) Channel Middle : the dwell time is 1.76 ms x 159.9 = 281.424 ms
c) Channel High : the dwell time is 1.78 ms x 159.9 = 284.622 ms

The maximum time of occupancy for a particular channel is 284.622ms 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 x 31.6 = 106.81 times of transmissions.

a) Channel Low : the dwell time is 3.02 ms x106.81 = 322.566 ms
b) Channel Middle : the dwell time is 3.04 ms x106.81 = 324.702 ms
c) Channel High : the dwell time is 3.00 ms x106.81 = 320.430 ms

The maximum time of occupancy for a particular channel is 324.702ms 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 : May 04, 2016 Temperature : 27 °C Humidity : 53 %

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 x 31.6 = 320.1 times of transmissions.

a) Channel Low : the dwell time is 0.48 ms x 320.1 = 153.648 ms
b) Channel Middle : the dwell time is 0.47 ms x 320.1 = 150.447 ms
c) Channel High : the dwell time is 0.46 ms x 320.1 = 147.246 ms

The maximum time of occupancy for a particular channel is 153.648ms 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 x 31.6 = 159.9 times of transmissions.

a) Channel Low : the dwell time is 1.74 ms x 159.9 = 278.226 ms
b) Channel Middle : the dwell time is 1.76 ms x 159.9 = 281.424 ms
c) Channel High : the dwell time is 1.74 ms x 159.9 = 278.226 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 x 31.6 = 106.81 times of transmissions.

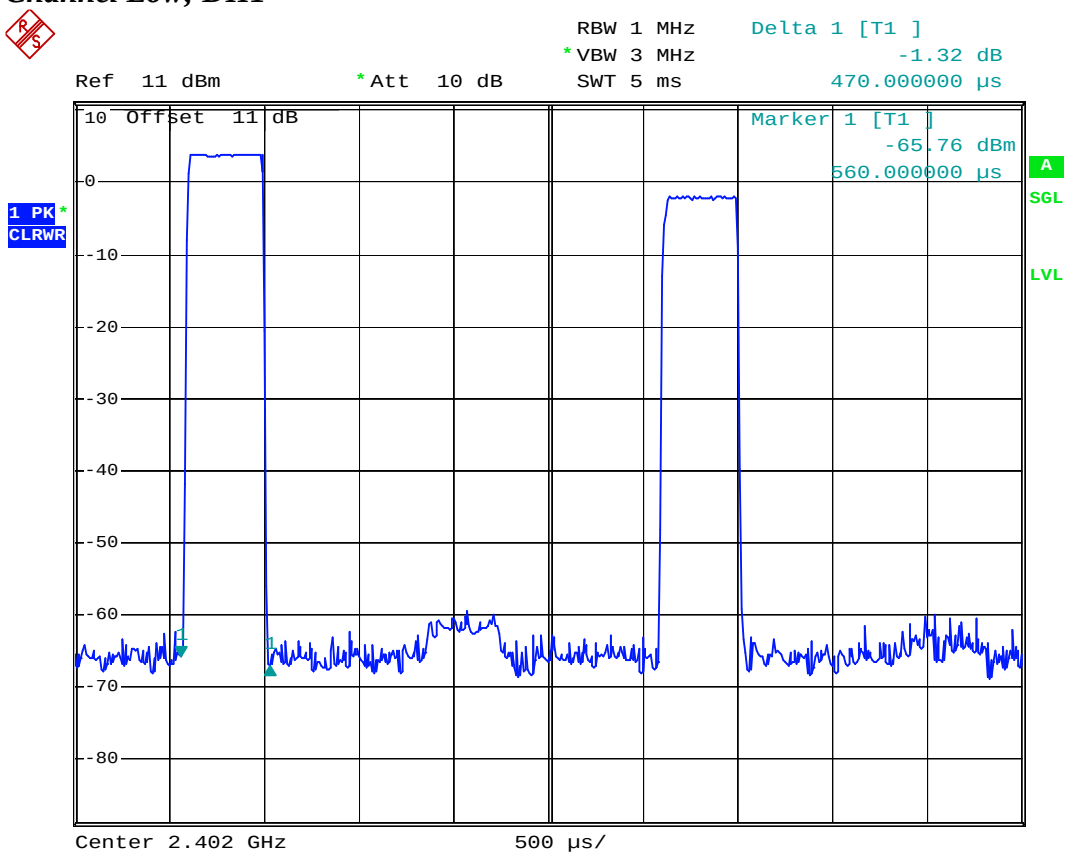
a) Channel Low : the dwell time is 3.00 ms x106.81 = 320.430 ms
b) Channel Middle : the dwell time is 3.04 ms x106.81 = 324.702 ms
c) Channel High : the dwell time is 3.02 ms x106.81 = 322.566 ms

The maximum time of occupancy for a particular channel is 324.702ms 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.

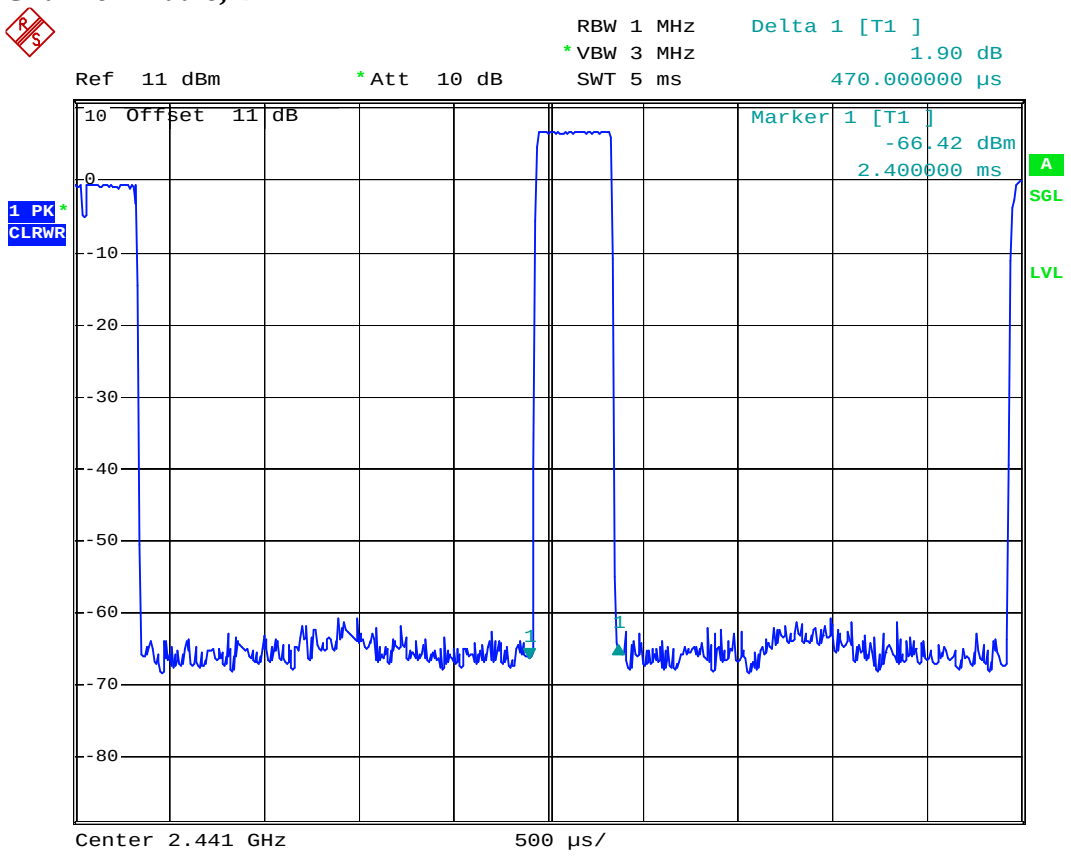
Note : The expanded uncertainty of dwell time on each channel tests is 2dB.

Mode: Bluetooth BR

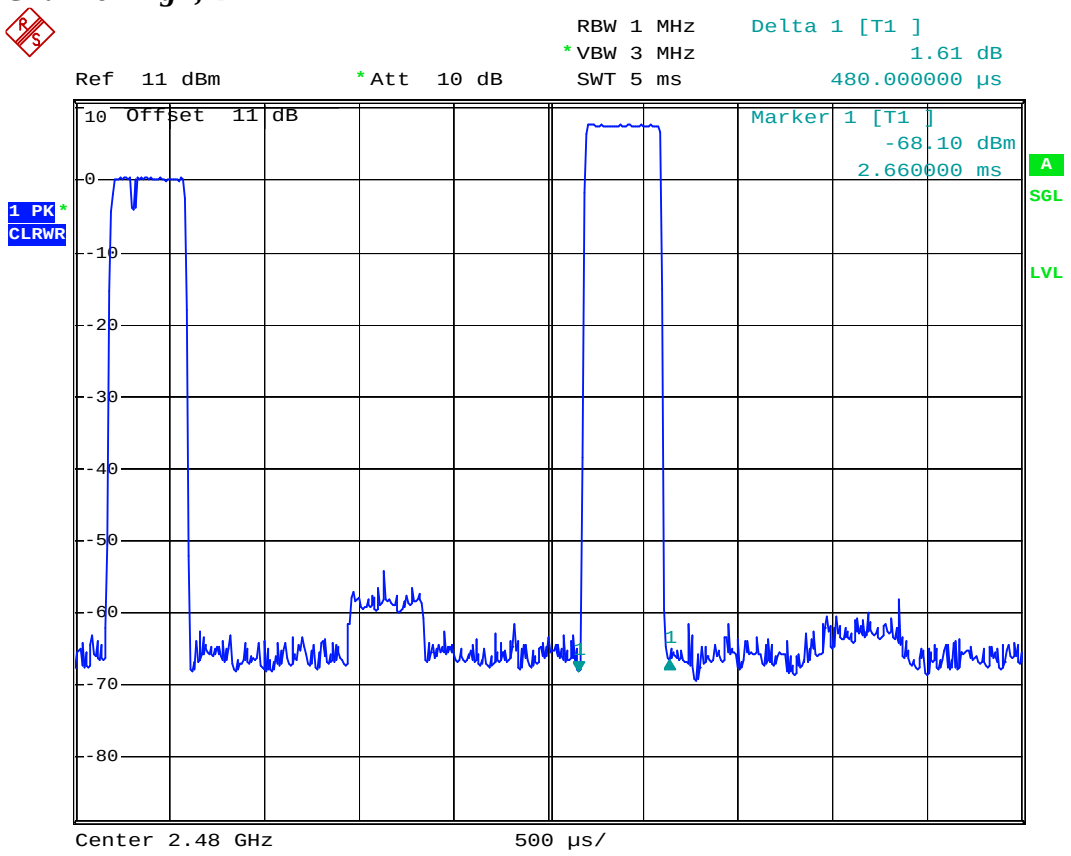
Channel Low; DH1



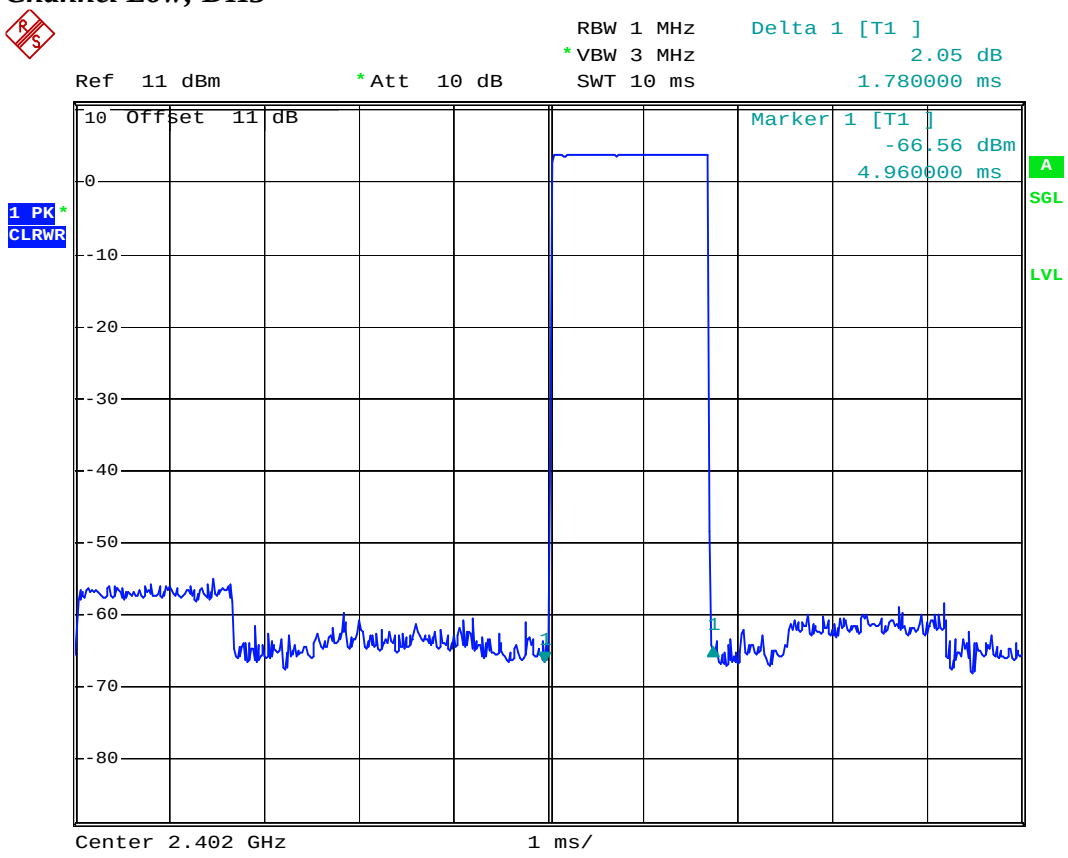
Channel Middle; DH1



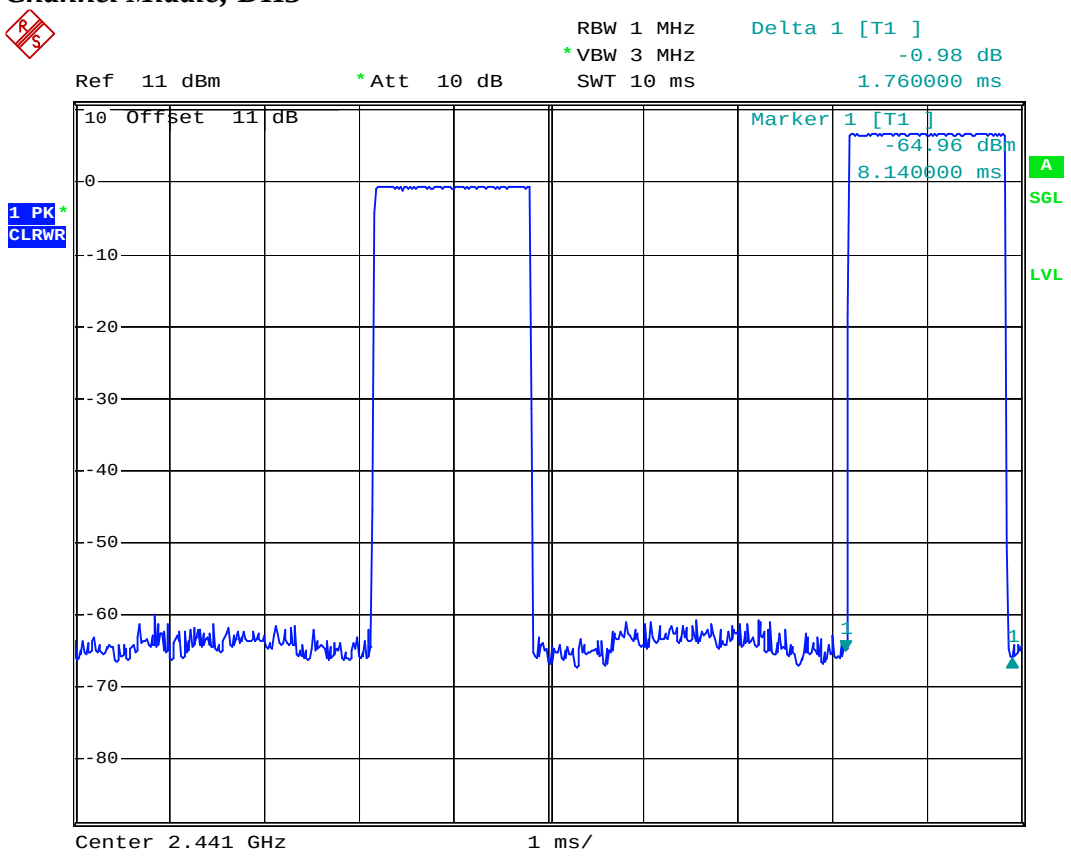
Channel High; DH1



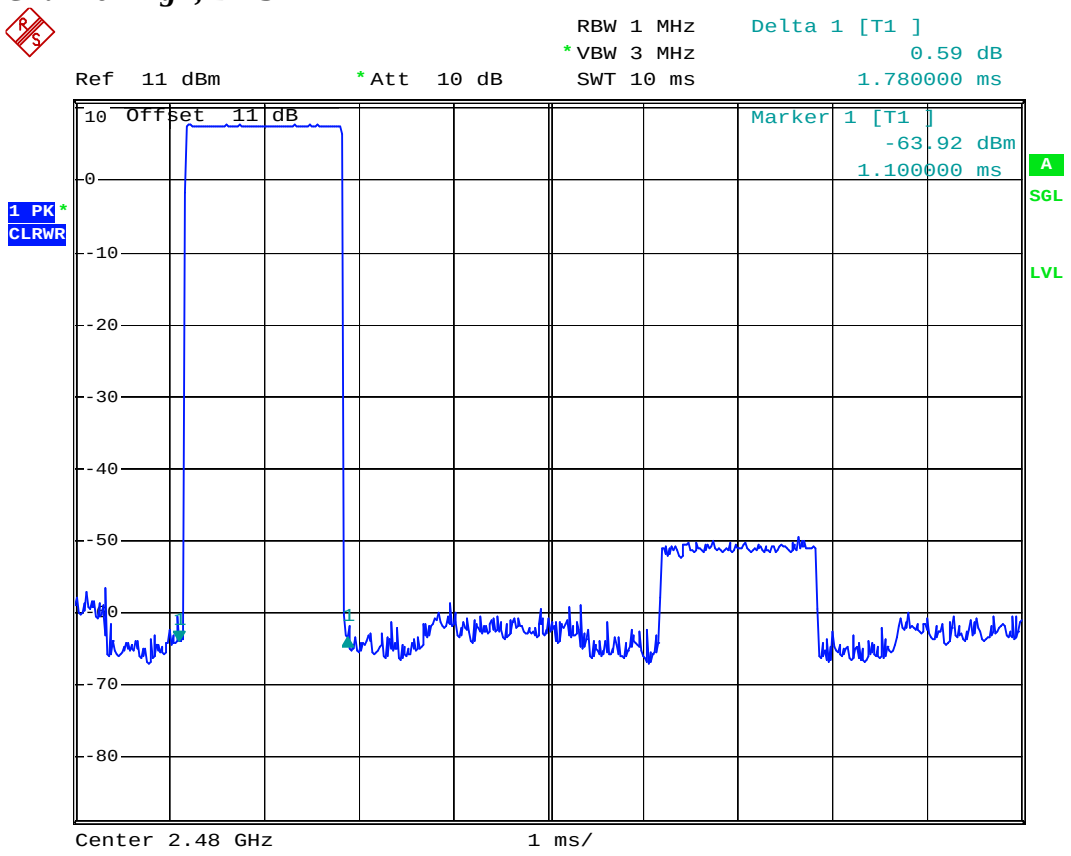
Channel Low; DH3



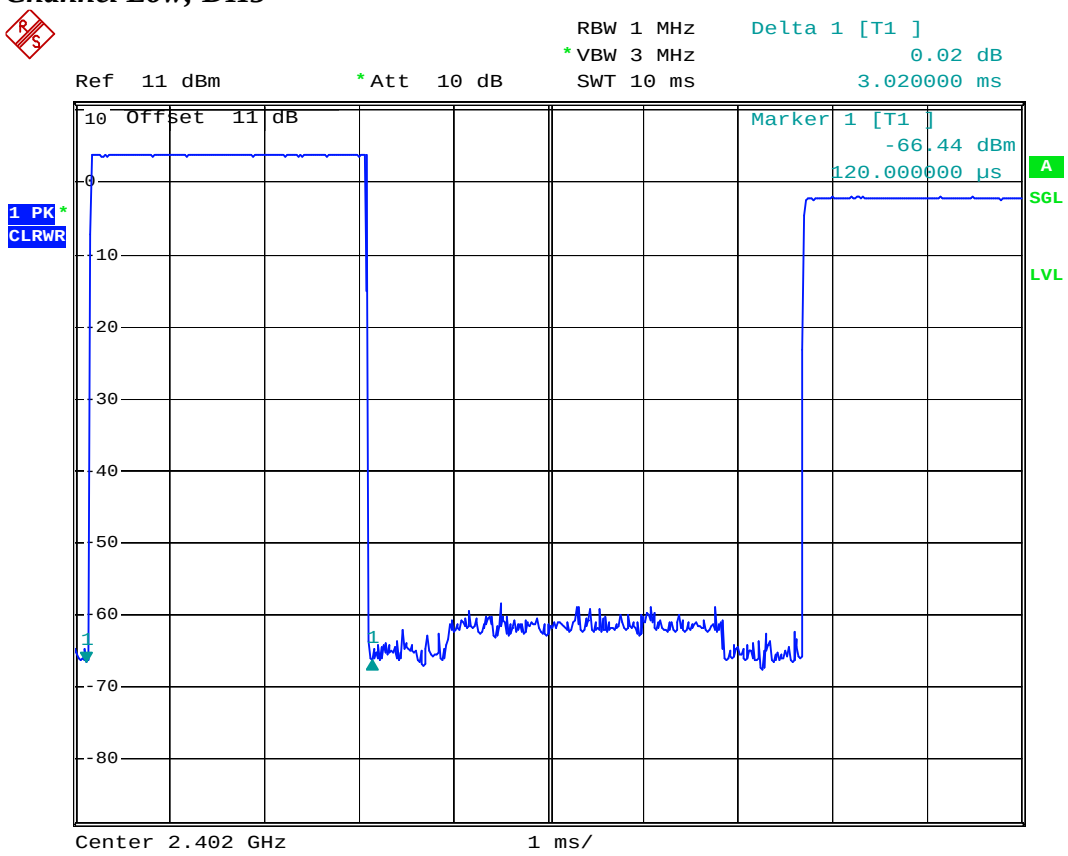
Channel Middle; DH3



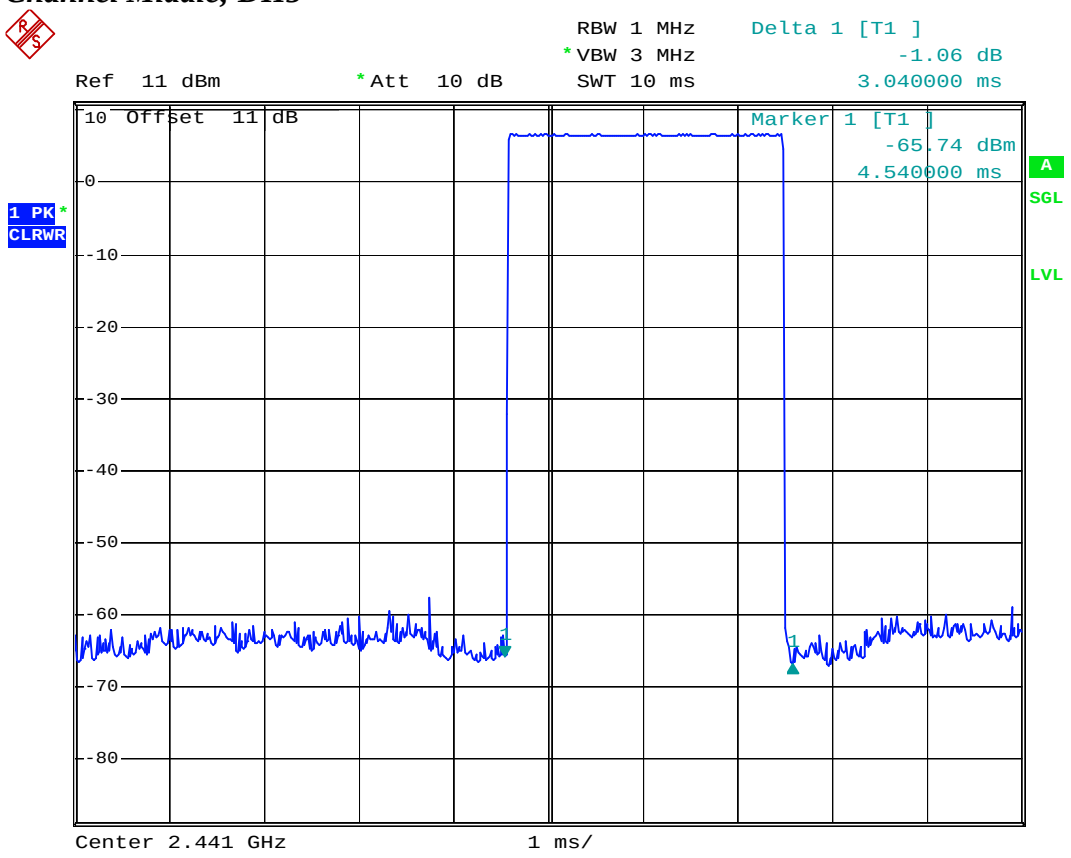
Channel High; DH3



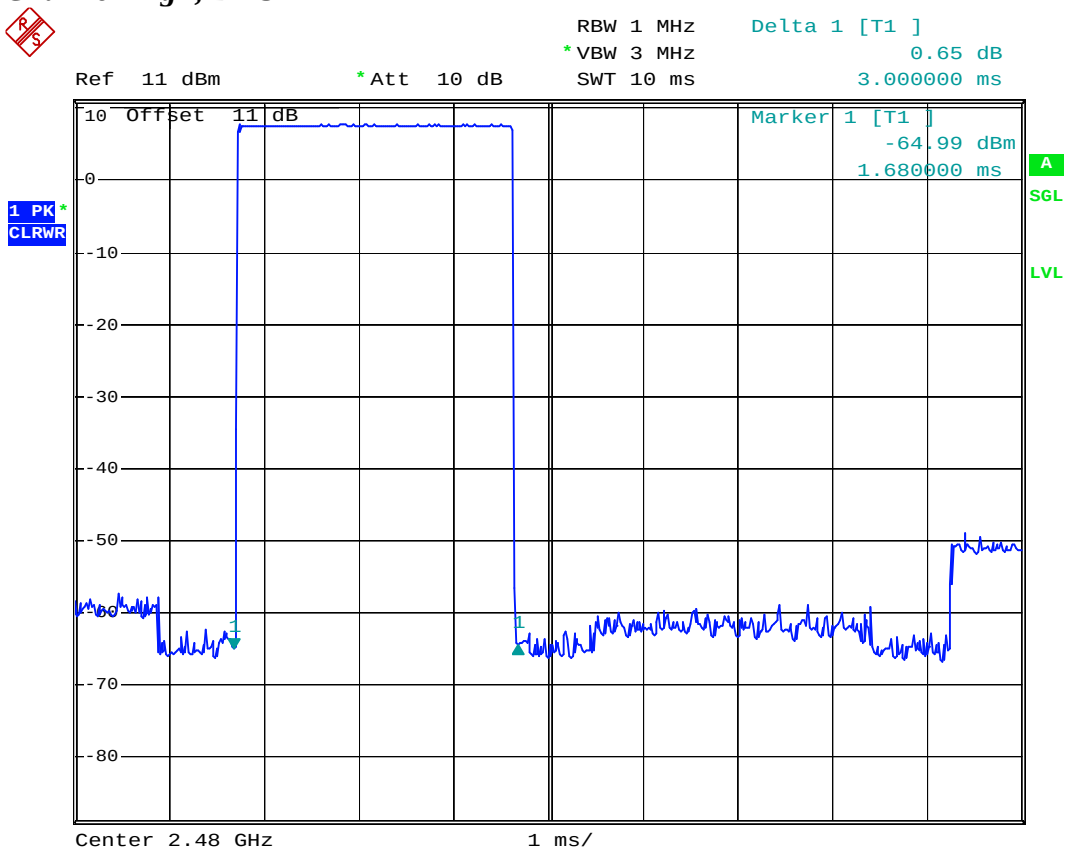
Channel Low; DH5



Channel Middle; DH5

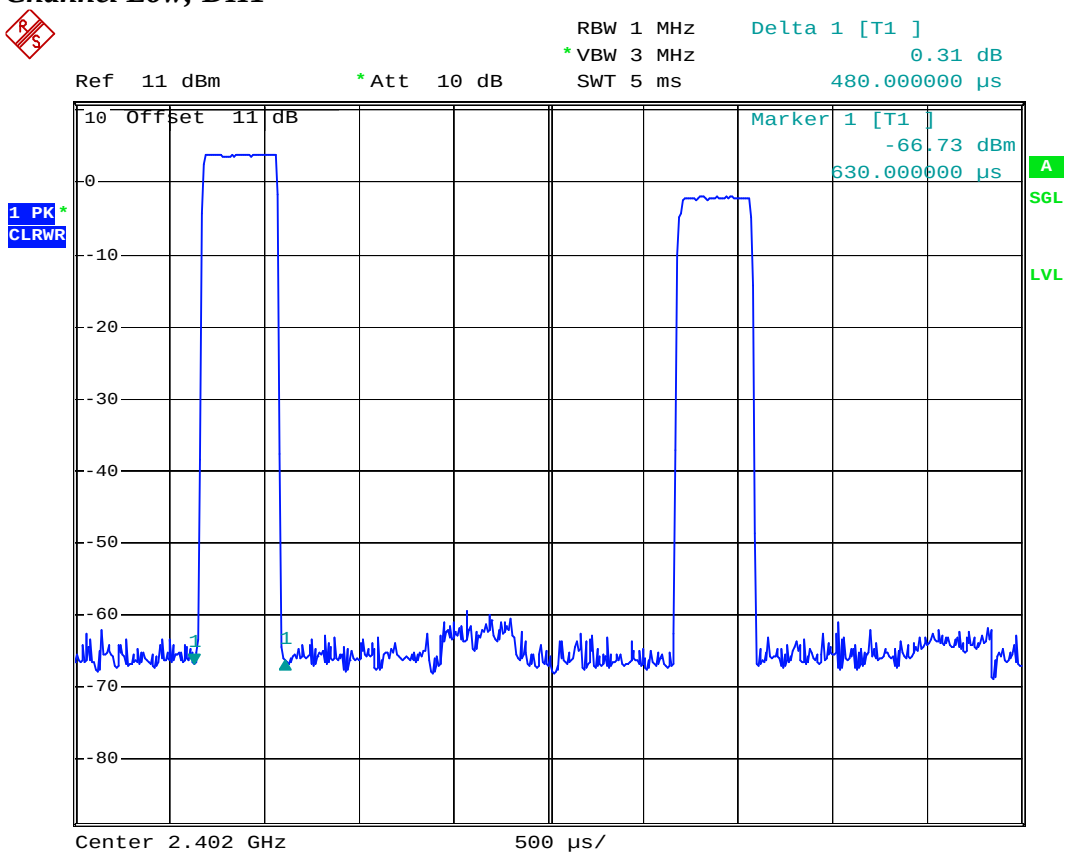


Channel High; DH5

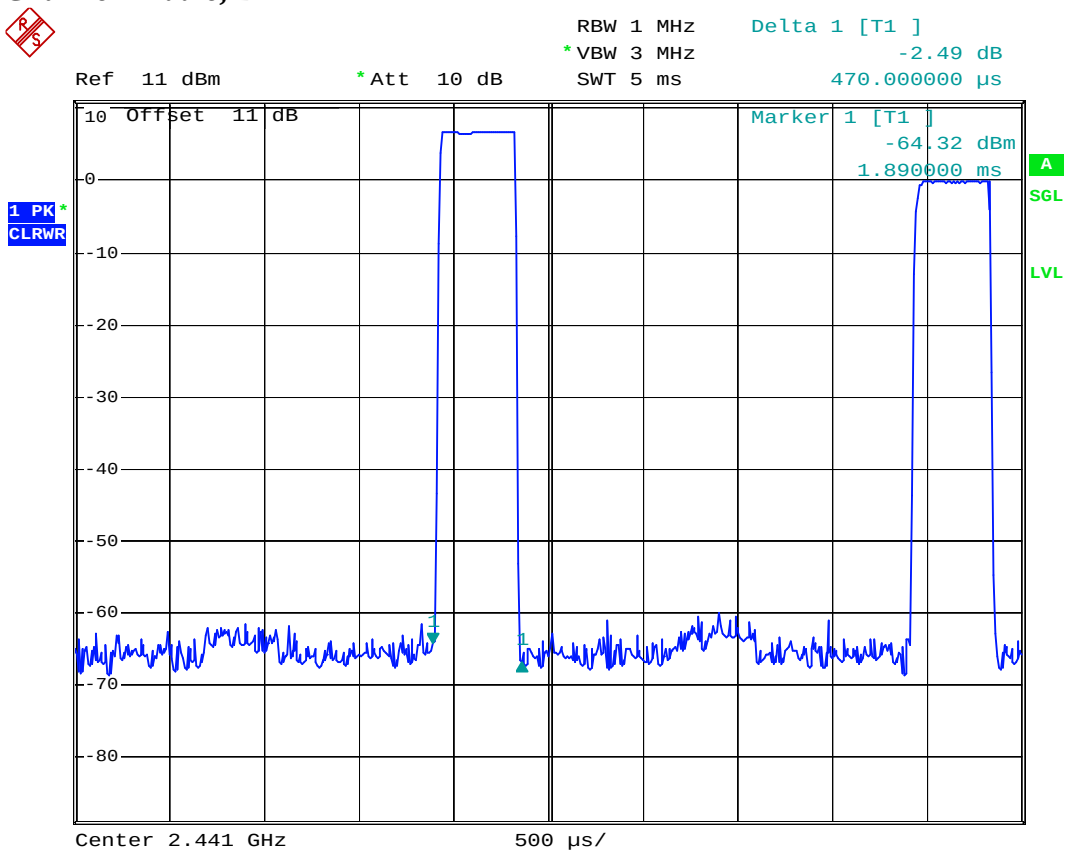


Mode: Bluetooth EDR

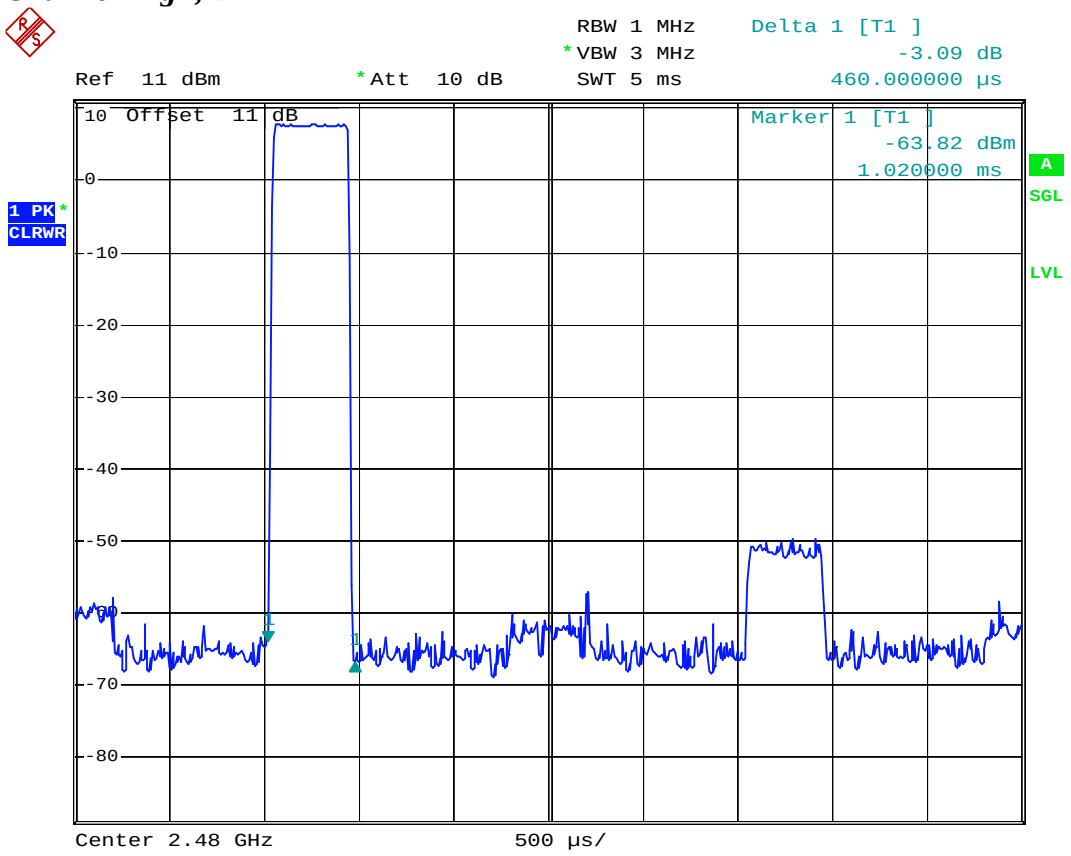
Channel Low; DH1



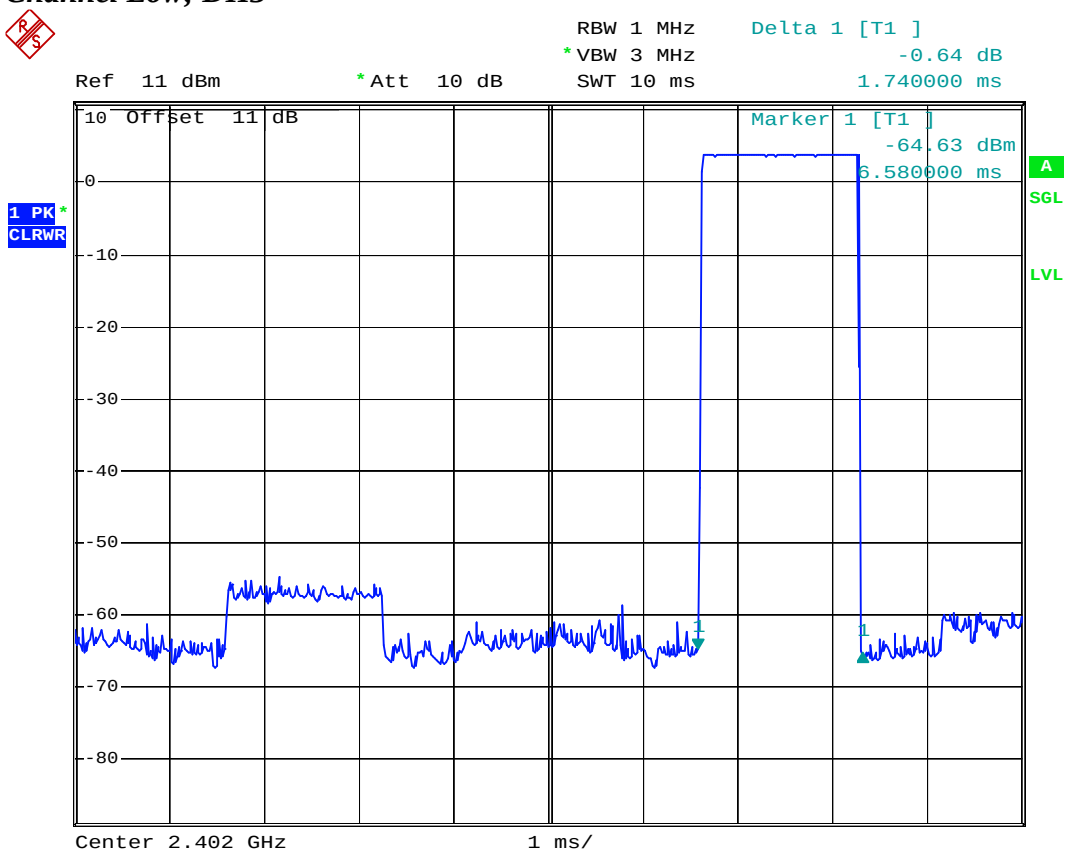
Channel Middle; DH1



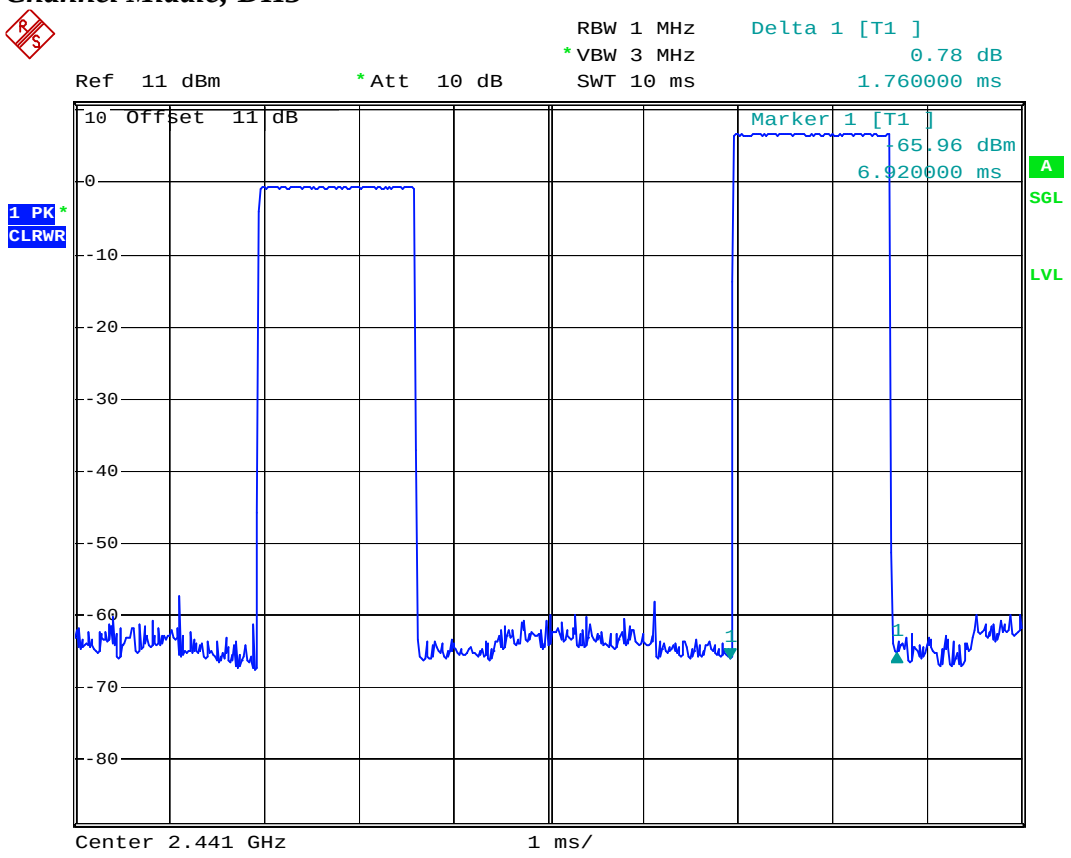
Channel High; DH1



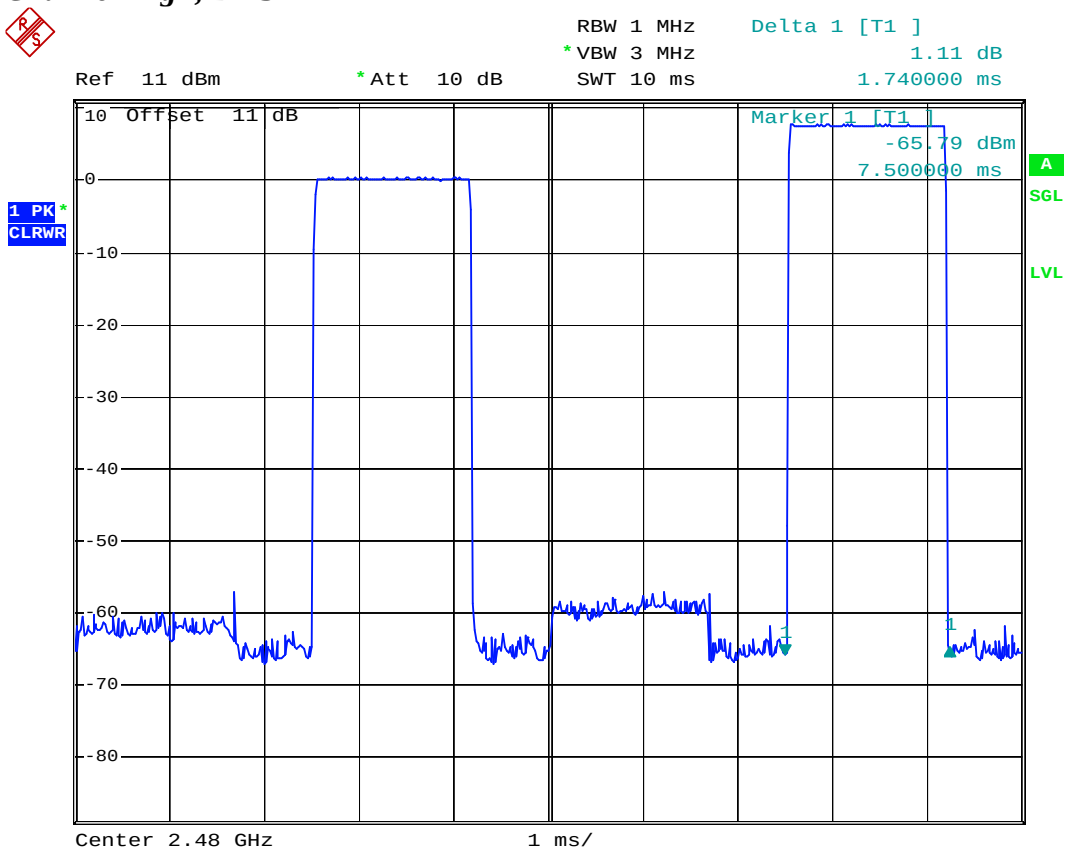
Channel Low; DH3



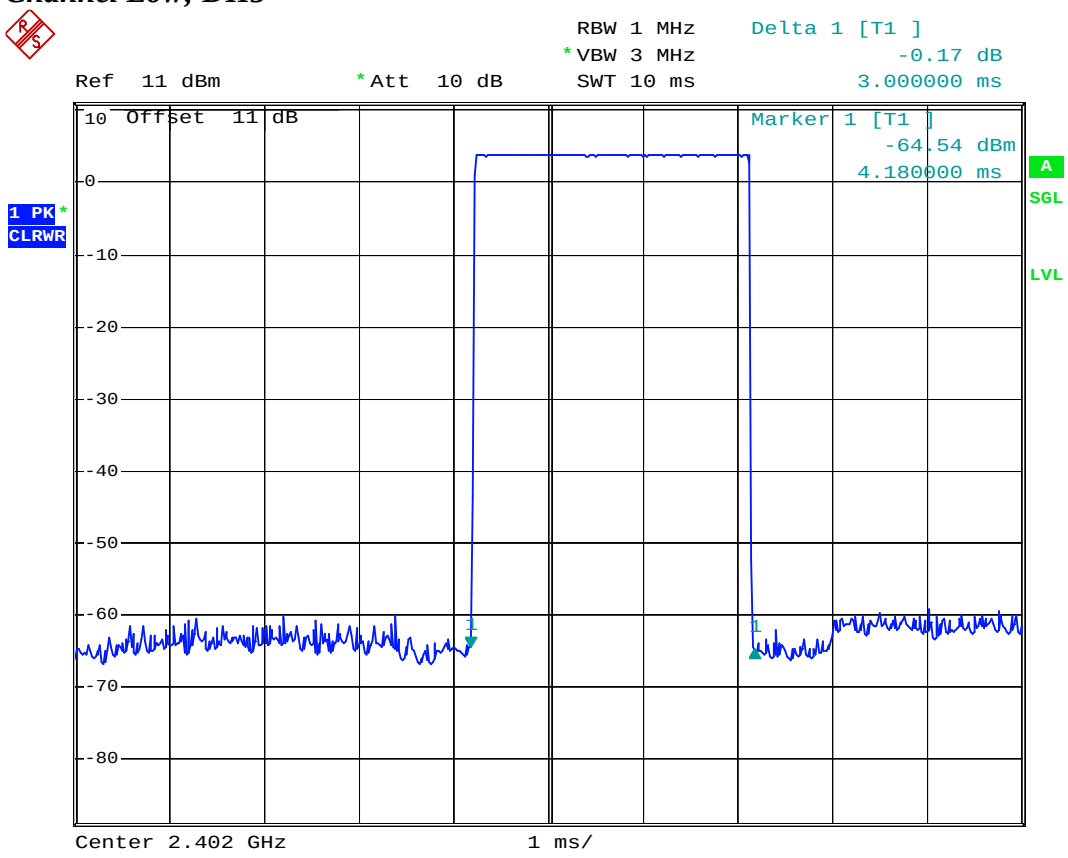
Channel Middle; DH3



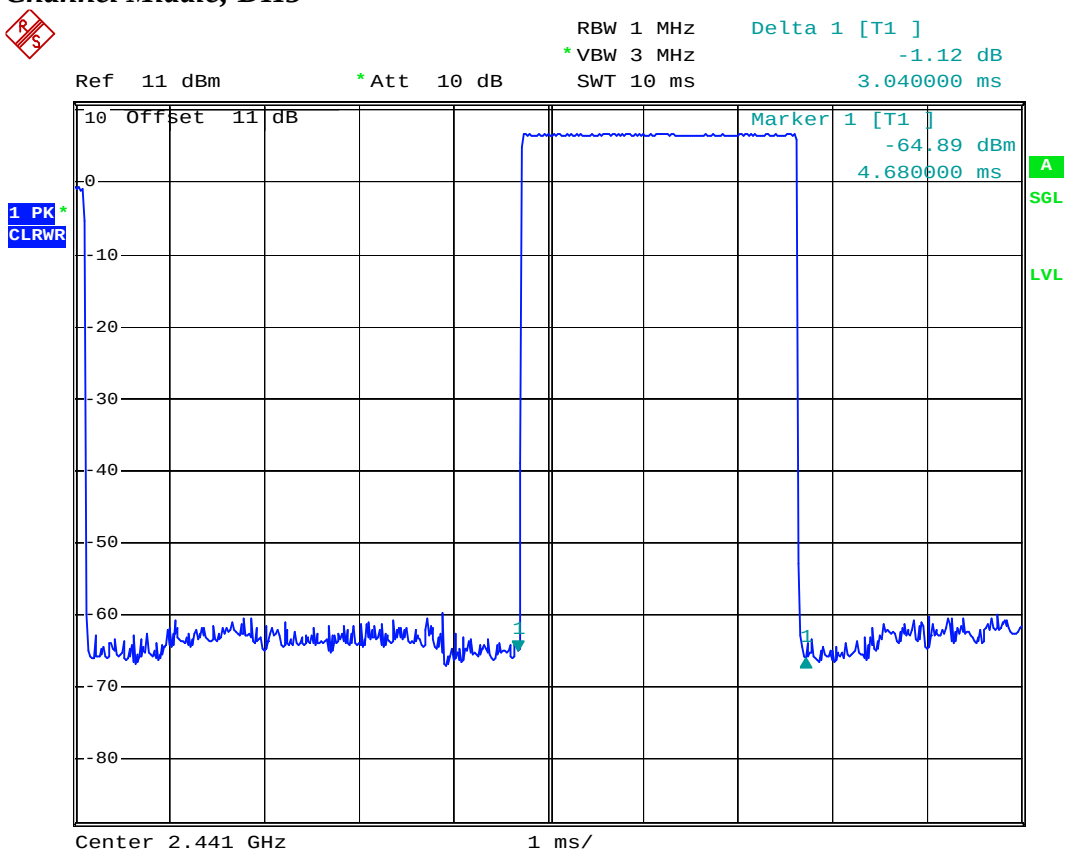
Channel High; DH3



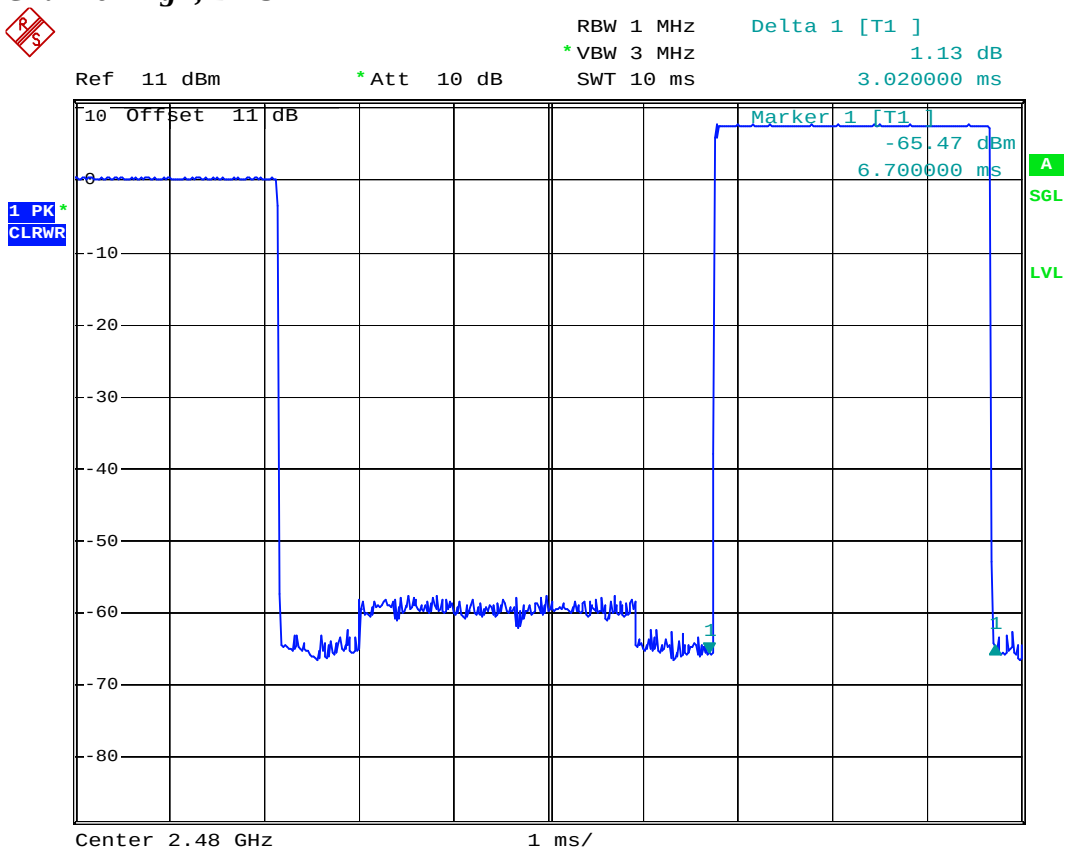
Channel Low; DH5



Channel Middle; DH5



Channel High; DH5



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 ≥ 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
Spectrum Analyzer	Rohde & Schwarz	FSP40	2016/10/03	2017/10/02
Attenuator	MINI-CIRCUITS	BW-S10W2+	2016/09/30	2017/09/29

11.4 Measurement Data

Test Date : May 04, 2017 Temperature : 27 °C Humidity : 53 %

Mode: Bluetooth BR

a)	Channel Low	:	Output Peak Power is	3.88	dBm or	2.443	mW。
b)	Channel Middle	:	Output Peak Power is	6.61	dBm or	4.581	mW。
c)	Channel High	:	Output Peak Power is	7.63	dBm or	5.794	mW。

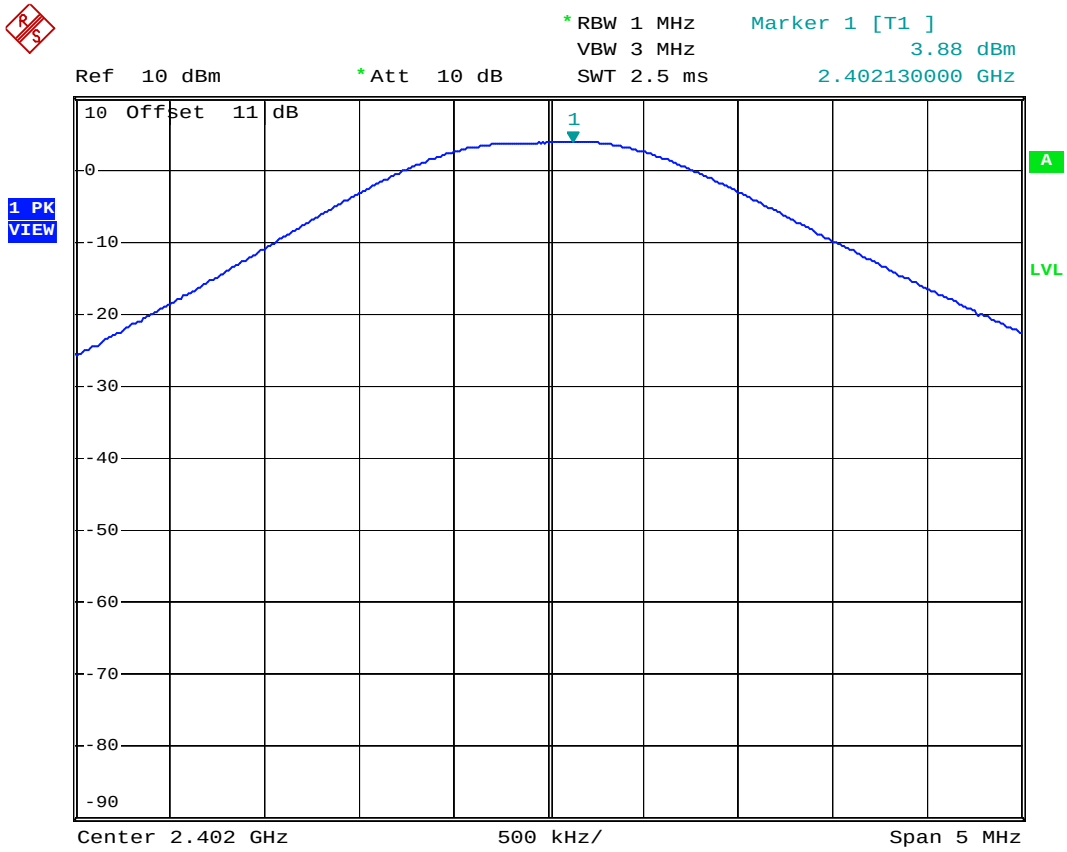
Mode: Bluetooth EDR

a)	Channel Low	:	Output Peak Power is	2.42	dBm or	1.746	mW。
b)	Channel Middle	:	Output Peak Power is	5.93	dBm or	3.917	mW。
c)	Channel High	:	Output Peak Power is	7.09	dBm or	5.117	mW。

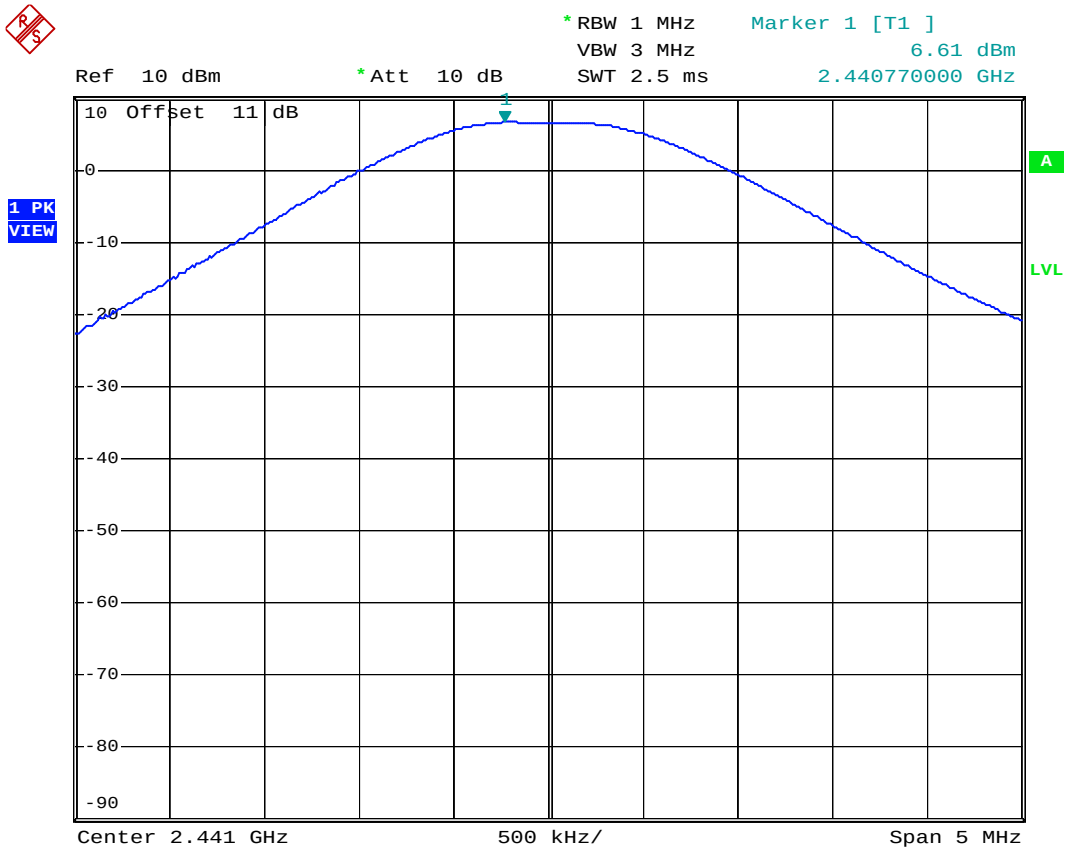
Note : The expanded uncertainty: 2dB.

Mode: Bluetooth BR

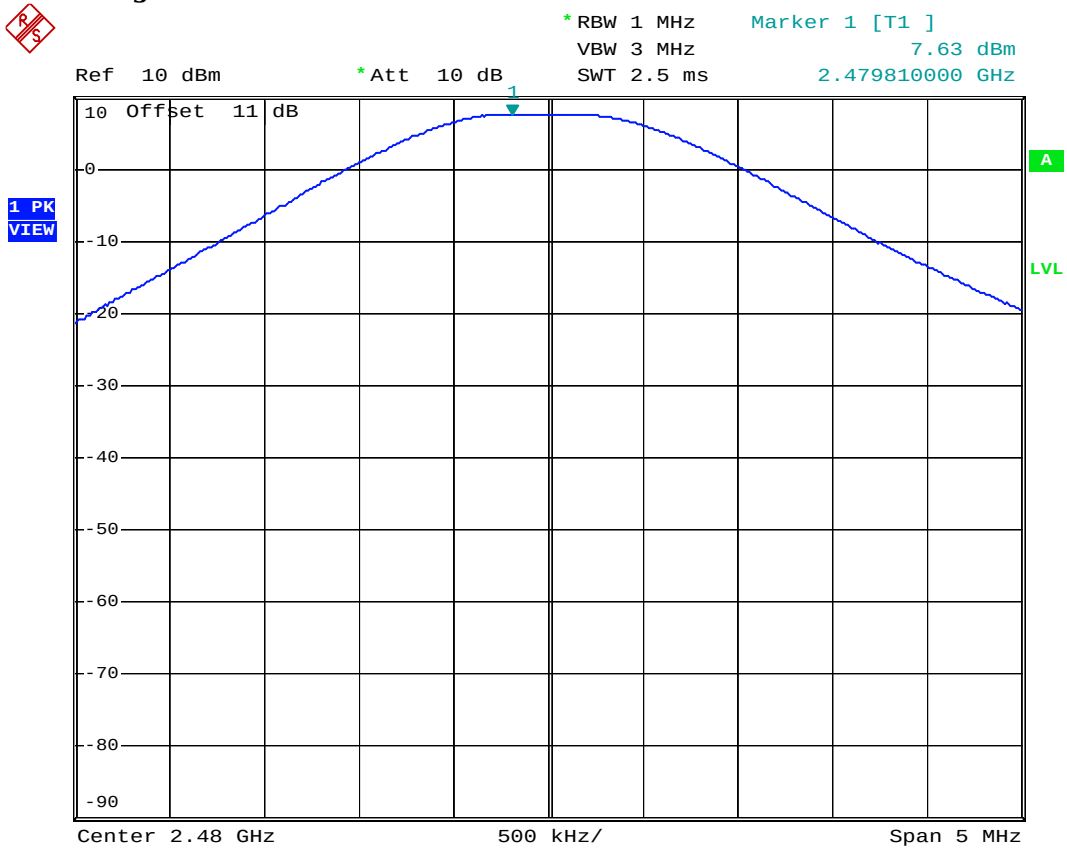
Channel Low



Channel Middle

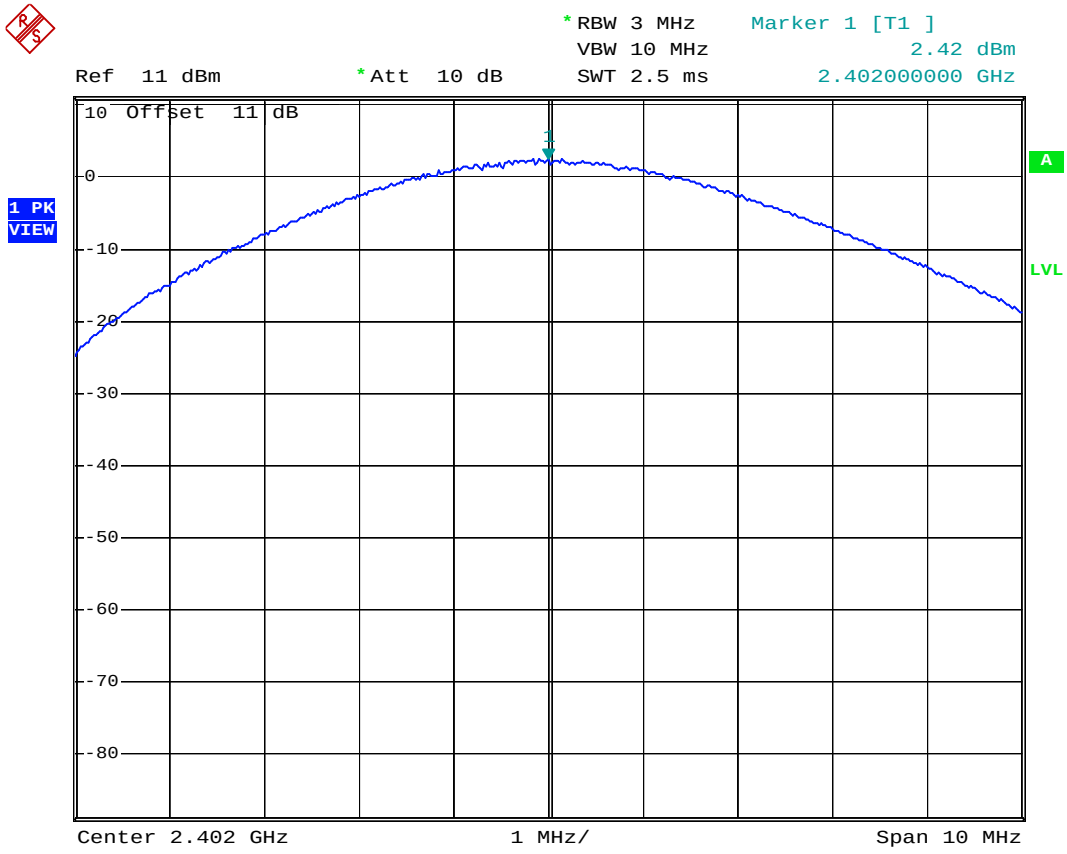


Channel High

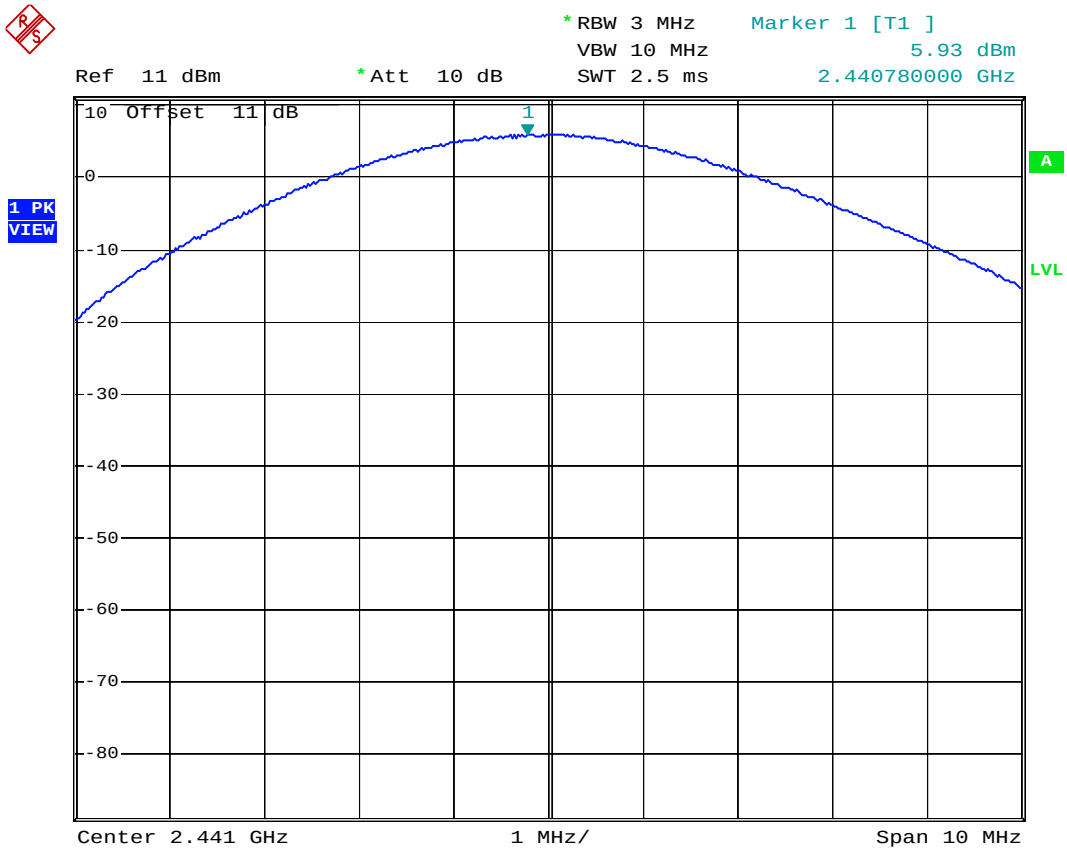


Mode: Bluetooth EDR

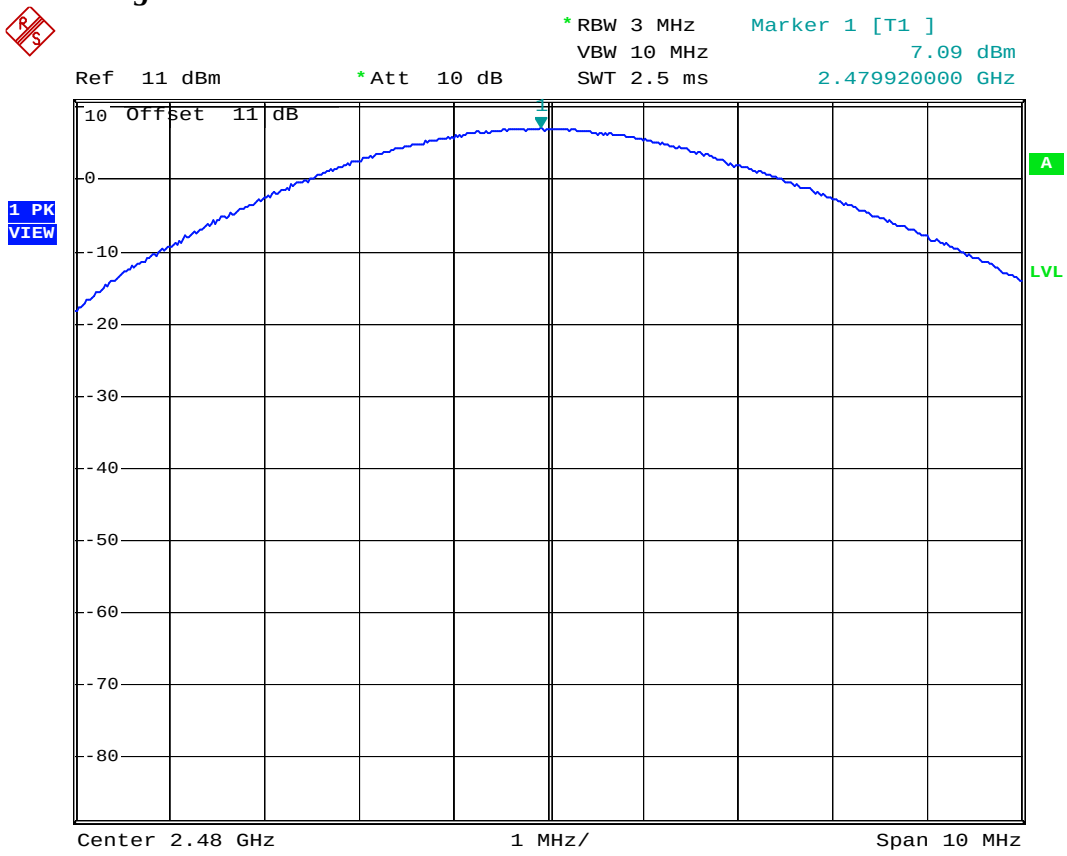
Channel Low



Channel Middle



Channel High



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 FM RDS/AM DIGITAL TUNING CLOCK RADIO WITH BLUETOOTH PLAYBACK 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 ≥ 1% of the span
   VBW ≥ 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
Spectrum Analyzer	Rohde & Schwarz	FSP40	2016/10/03	2017/10/02
Attenuator	MINI-CIRCUITS	BW-S10W2+	2016/09/30	2017/09/29

12.4 Measurement Data

Test Date : May 04, 2017 Temperature : 27 °C Humidity : 53 %

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.

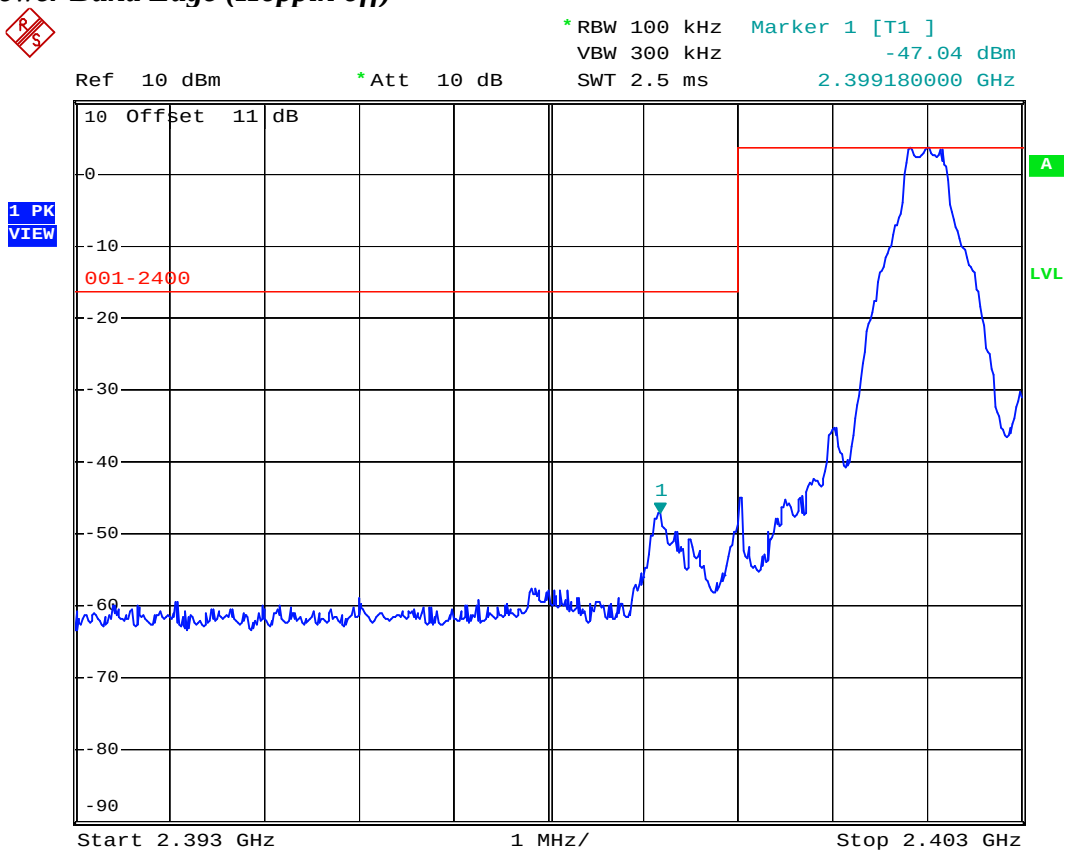
Mode: Bluetooth EDR

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.

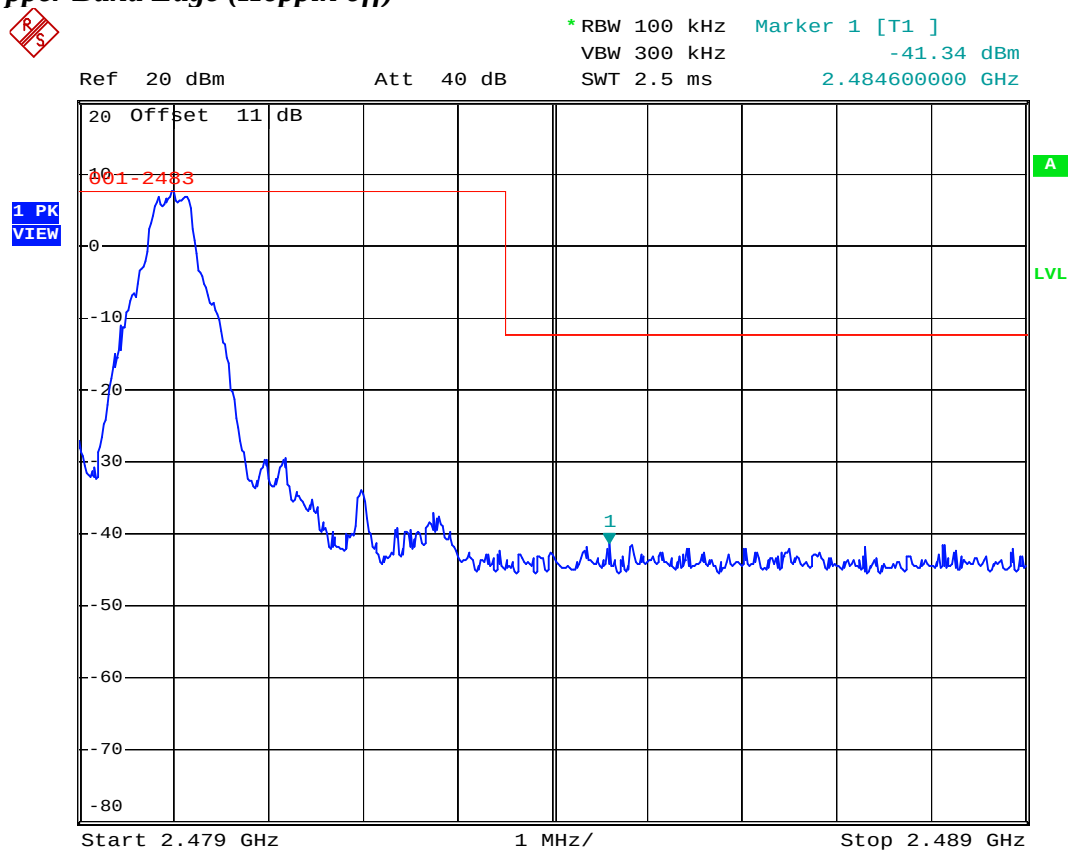
Note : The expanded uncertainty: 2dB.

Mode: Bluetooth BR

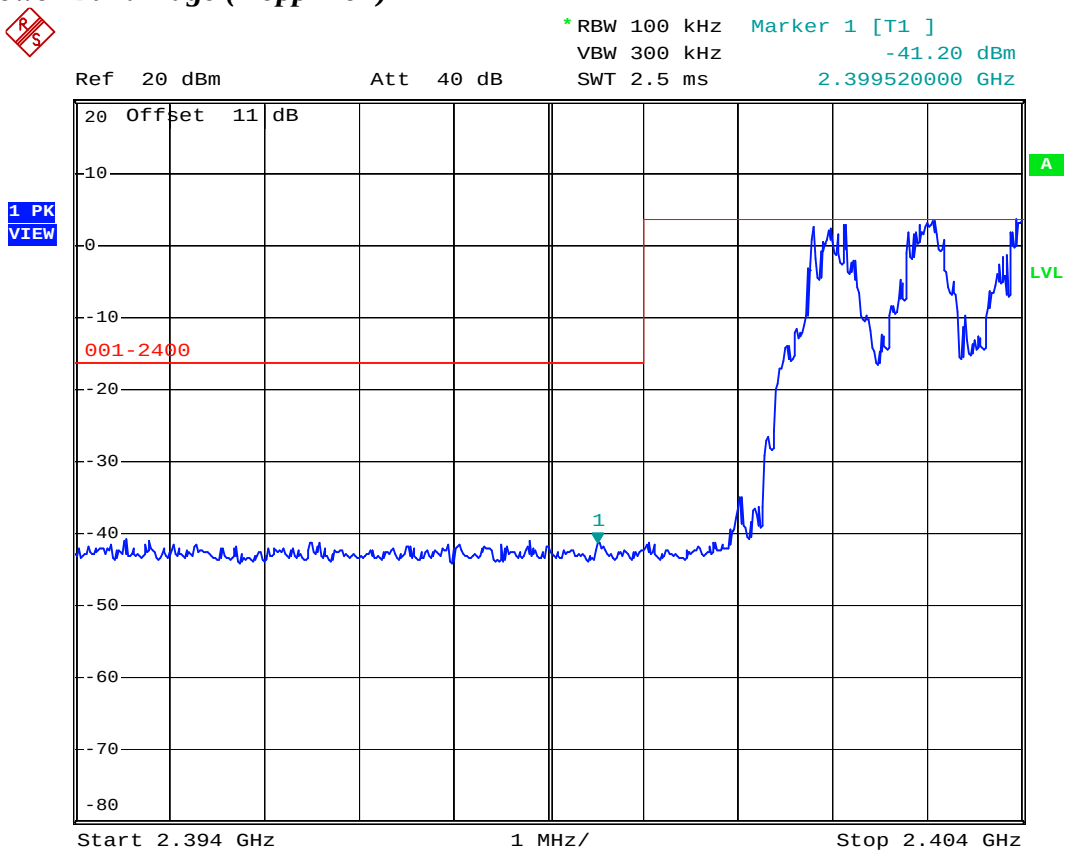
Lower Band Edge (Hoppin off)



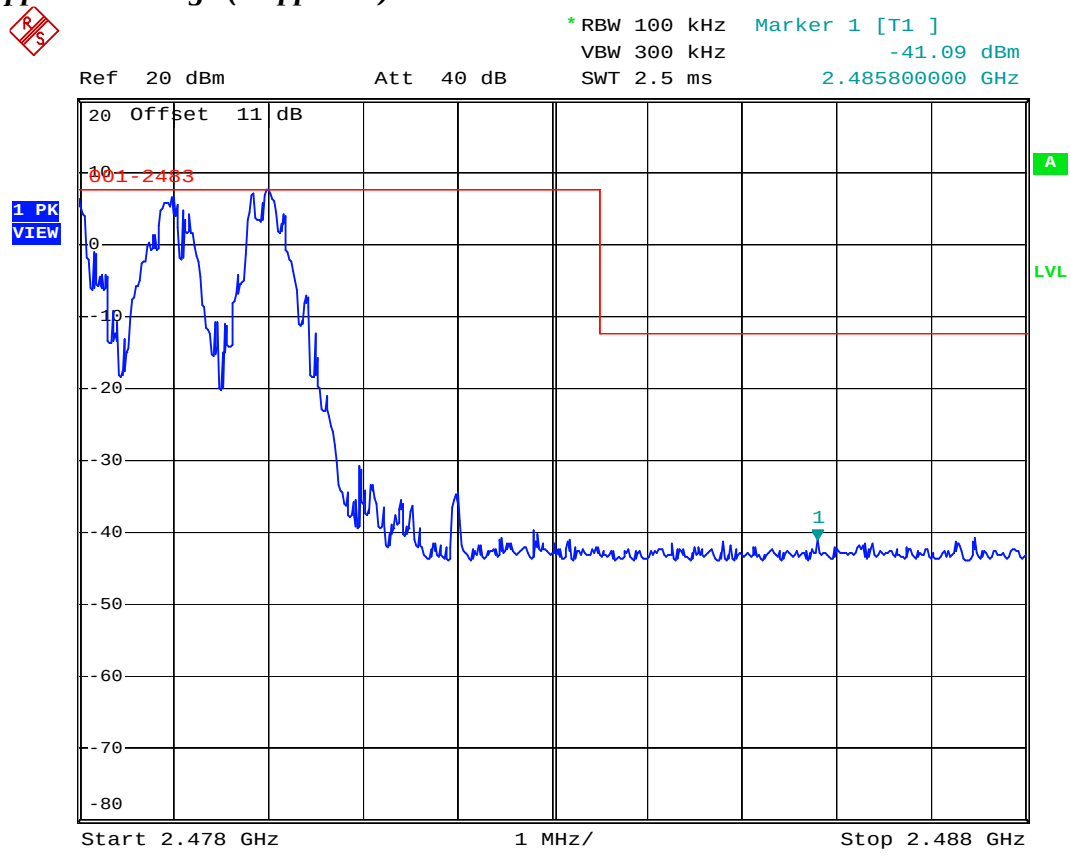
Upper Band Edge (Hoppin off)



Lower Band Edge (Hoppin on)

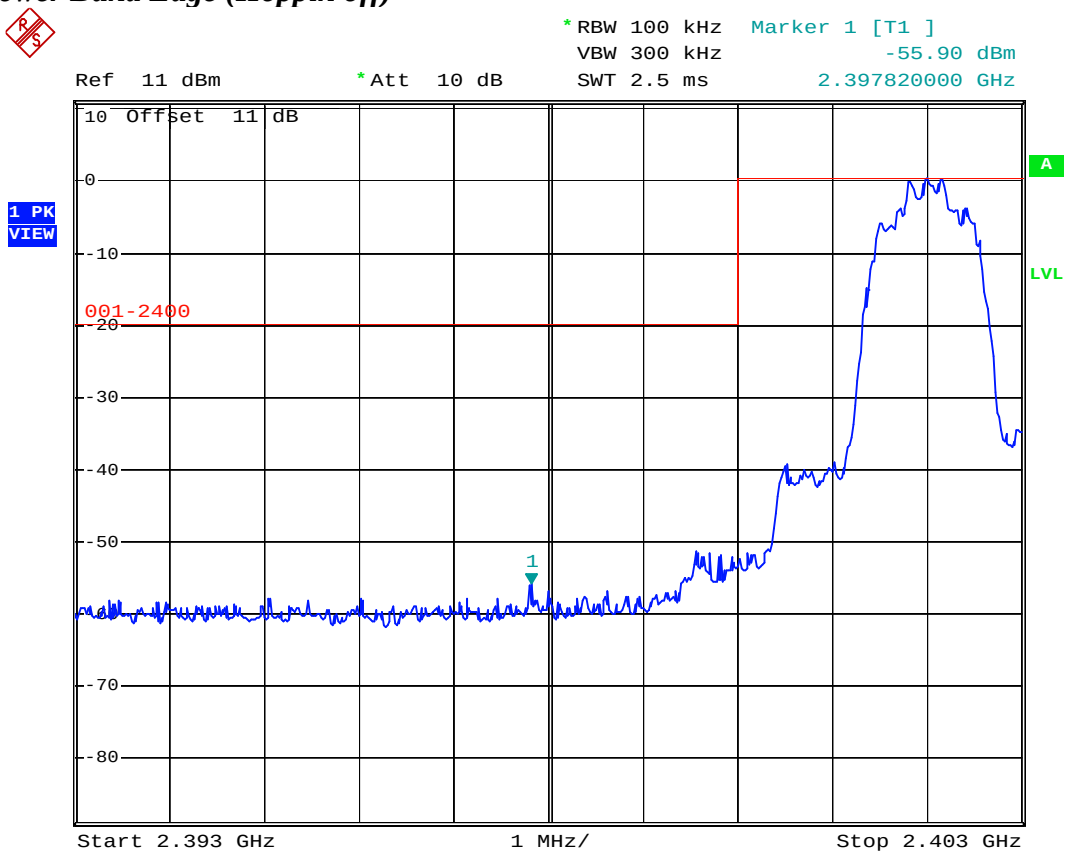


Upper Band Edge (Hoppin on)

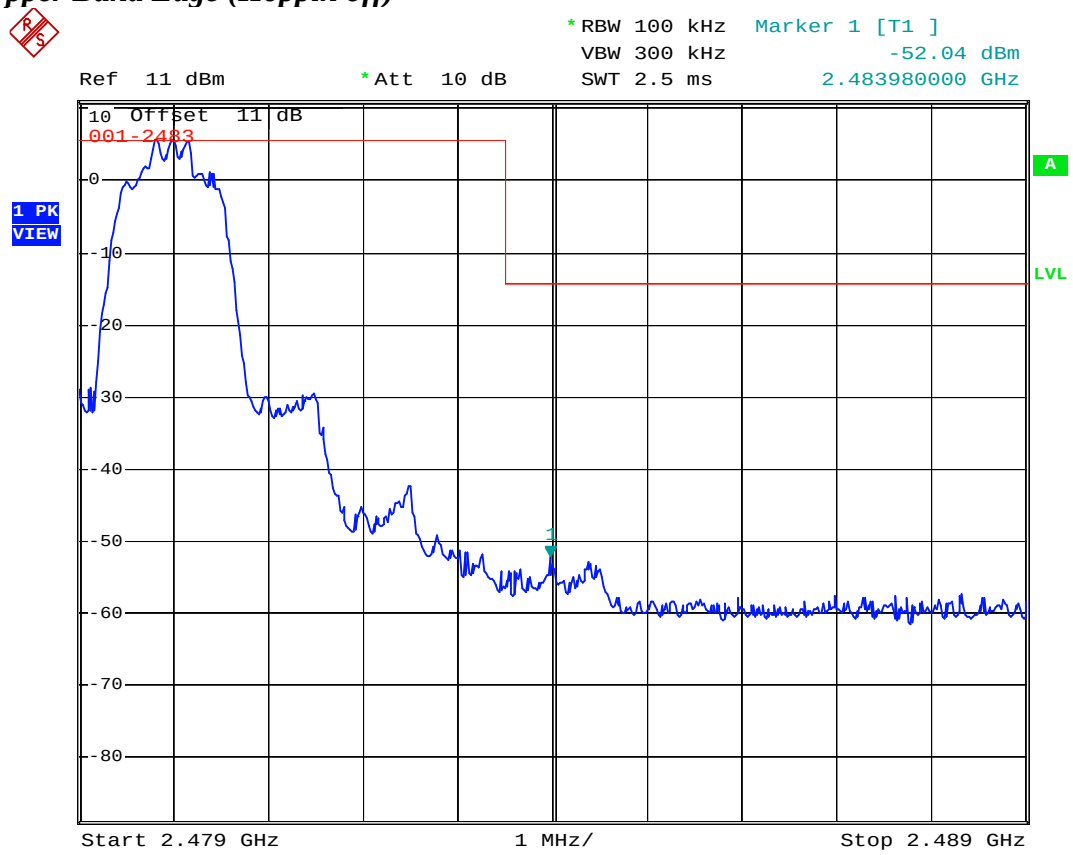


Mode: Bluetooth EDR

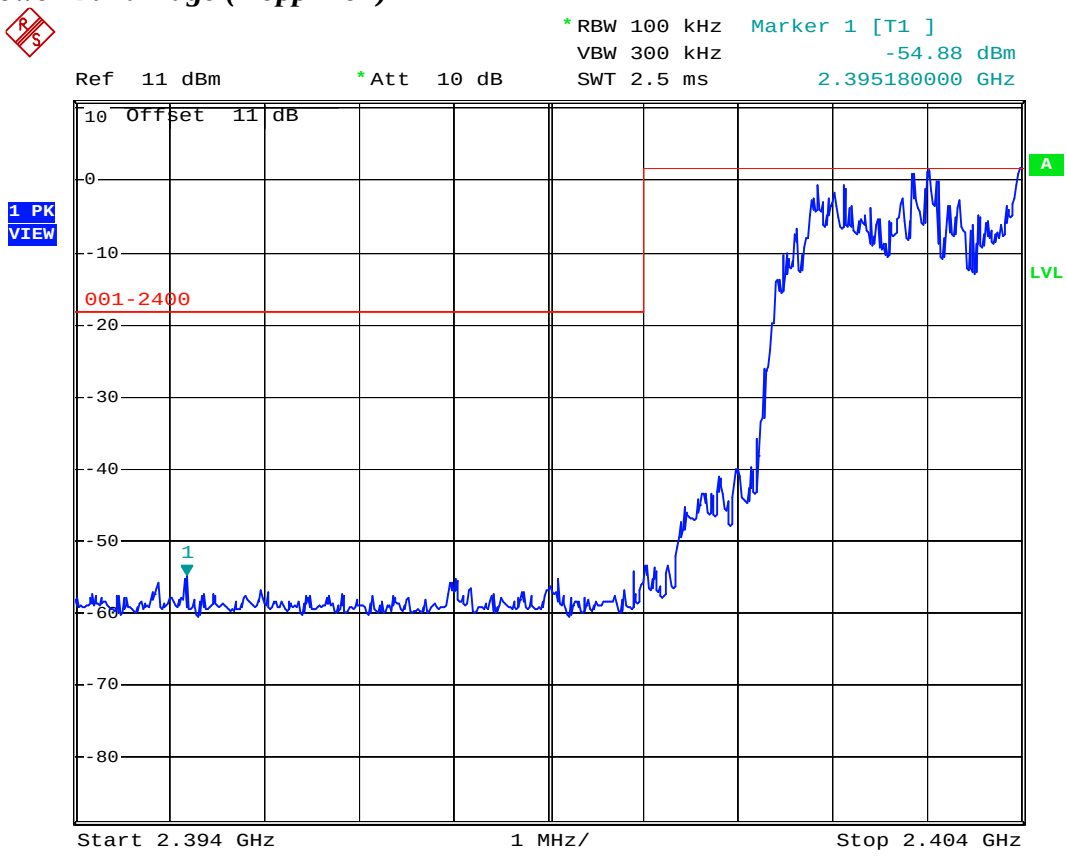
Lower Band Edge (Hoppin off)



Upper Band Edge (Hoppin off)



Lower Band Edge (Hoppin on)



Upper Band Edge (Hoppin on)

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 FM RDS/AM DIGITAL TUNING CLOCK RADIO WITH BLUETOOTH PLAYBACK 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 ≥ 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
Spectrum Analyzer	Rohde & Schwarz	FSP40	2016/10/03	2017/10/02
Attenuator	MINI-CIRCUITS	BW-S10W2+	2016/09/30	2017/09/29

13.4 Measurement Data

Test Date : May 04, 2017 Temperature : 27 °C Humidity : 53 %

Mode: Bluetooth BR
Mode : Low Channel/ Mid Channel/ Hi Channel

a) 1 GHz to 25 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.

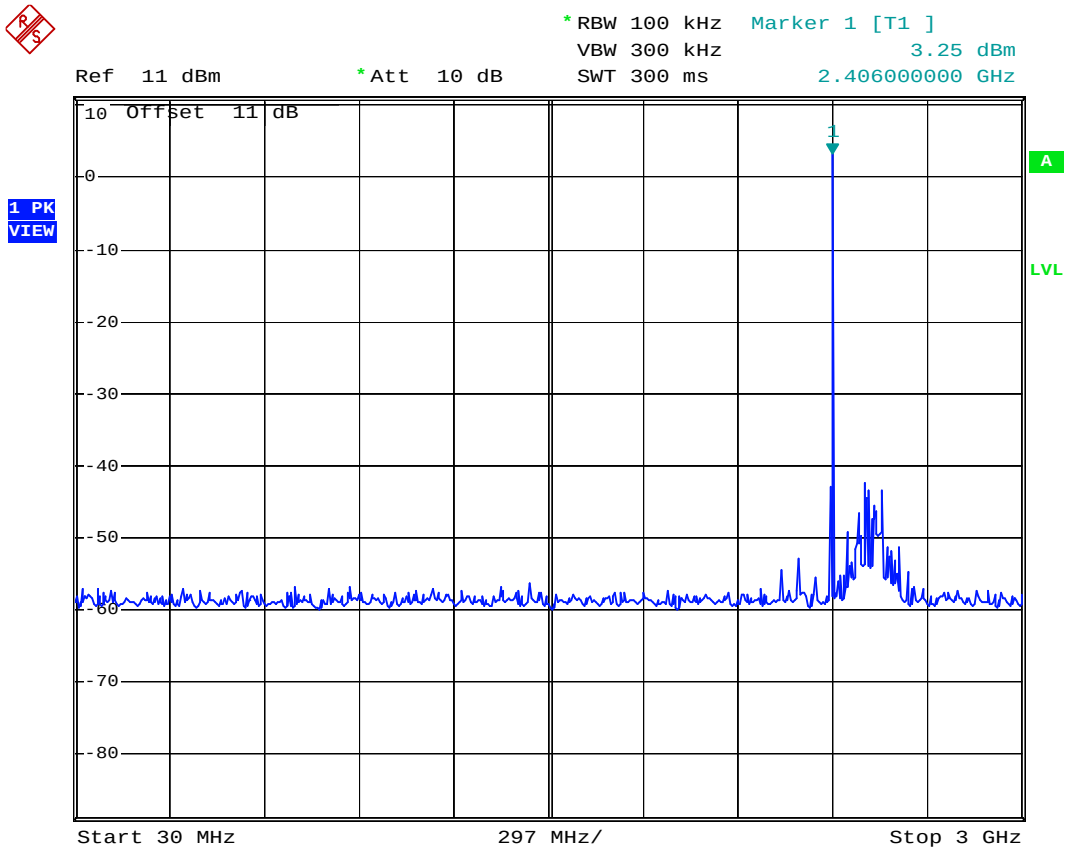
Mode: Bluetooth EDR
Mode : Low Channel/ Mid Channel/ Hi Channel

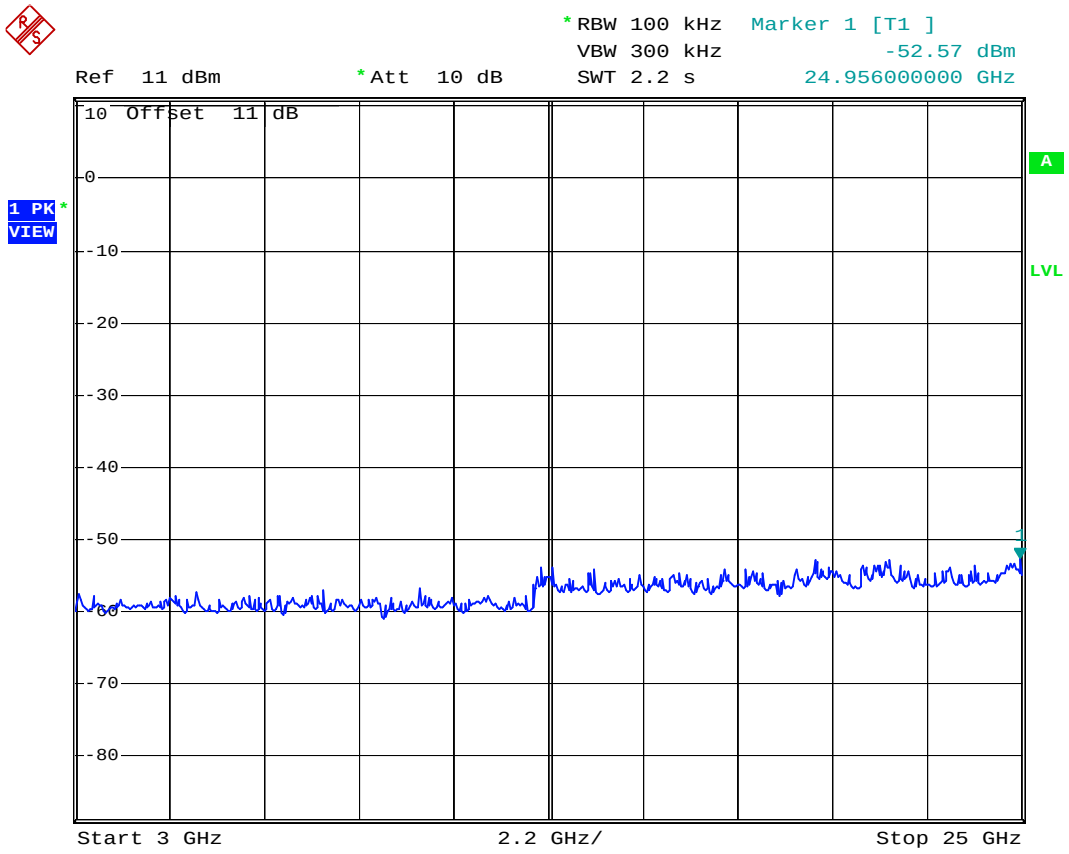
a) 1 GHz to 25 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.

Note : The expanded uncertainty: 2dB.

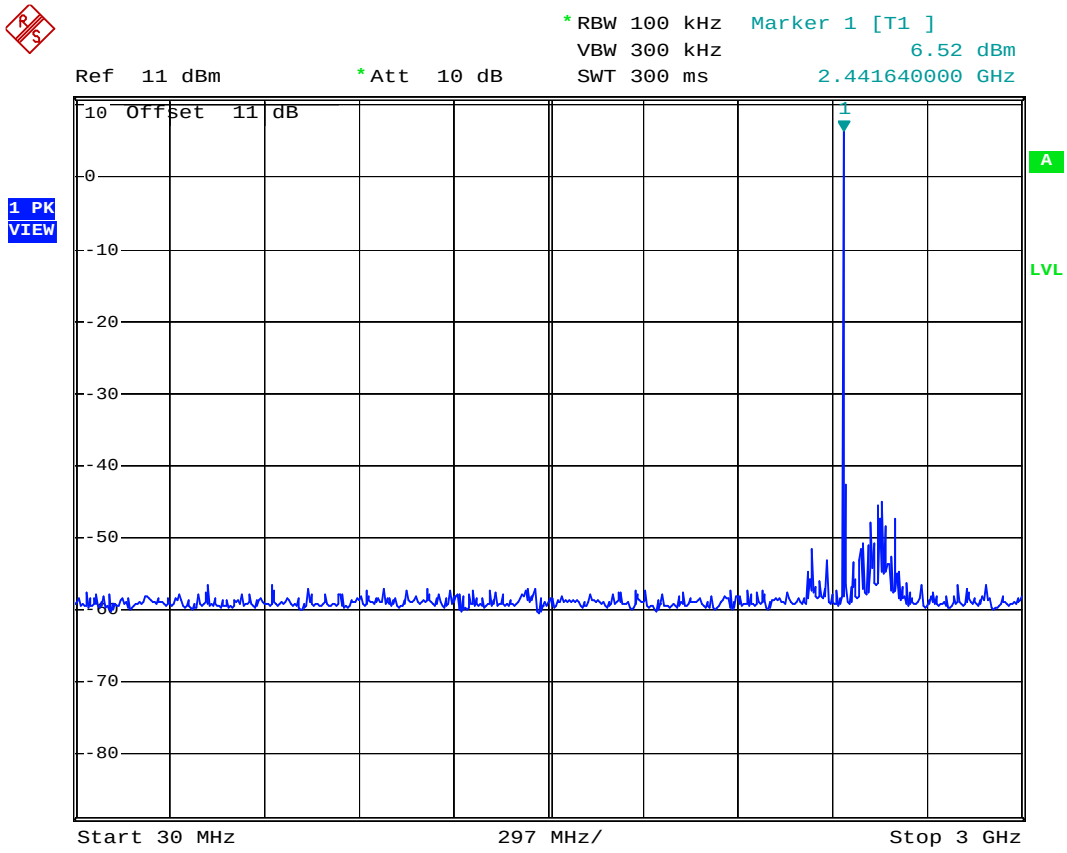
Mode: Bluetooth BR

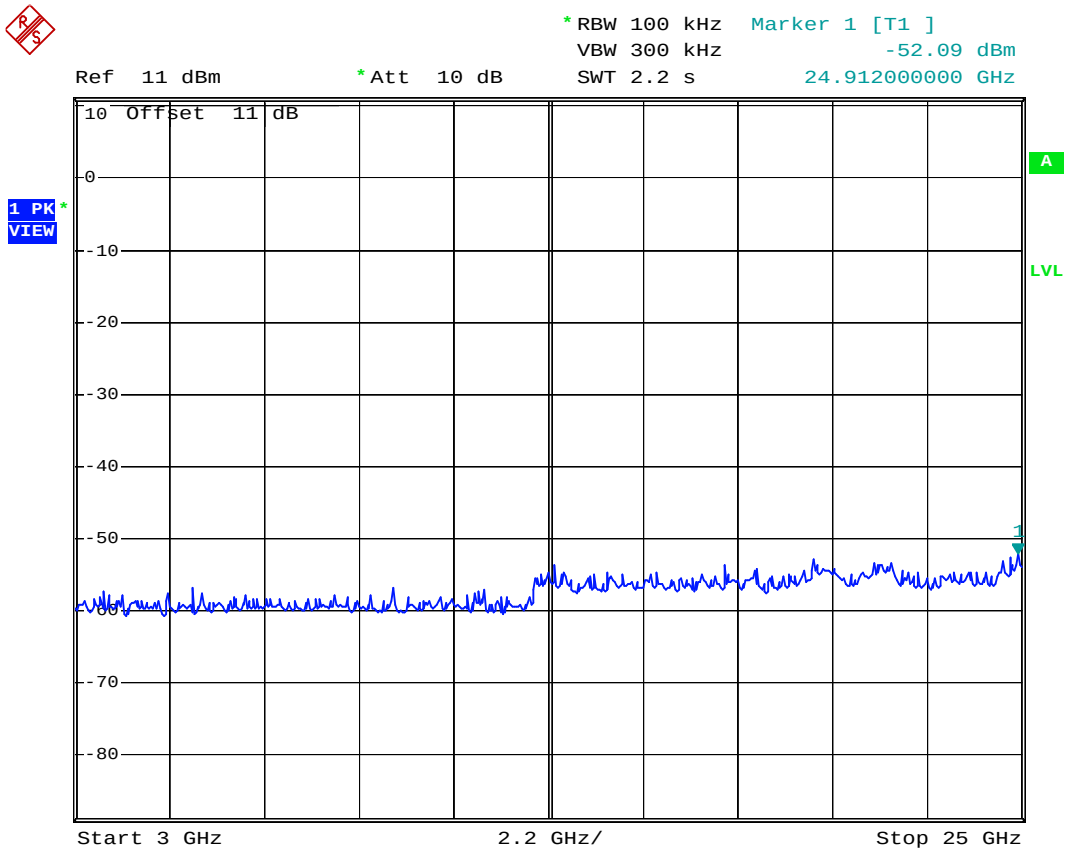
Mode : Low Channel



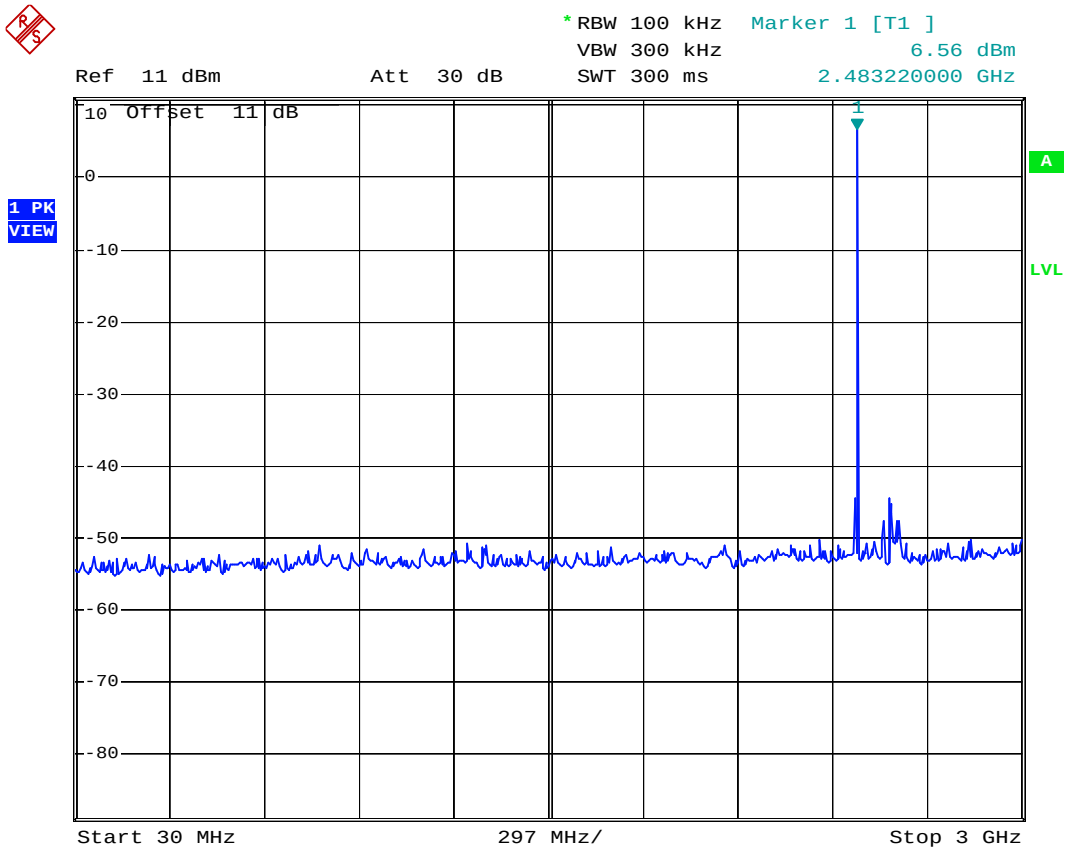


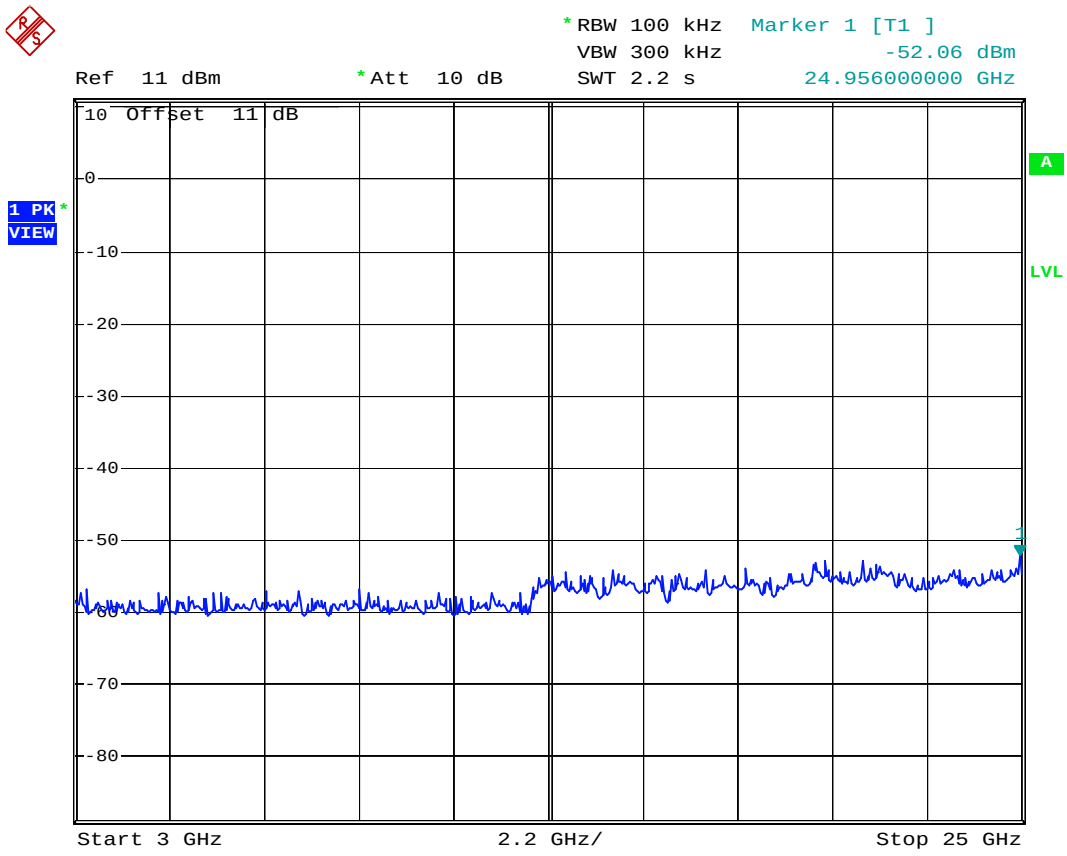
Mode : Mid Channel





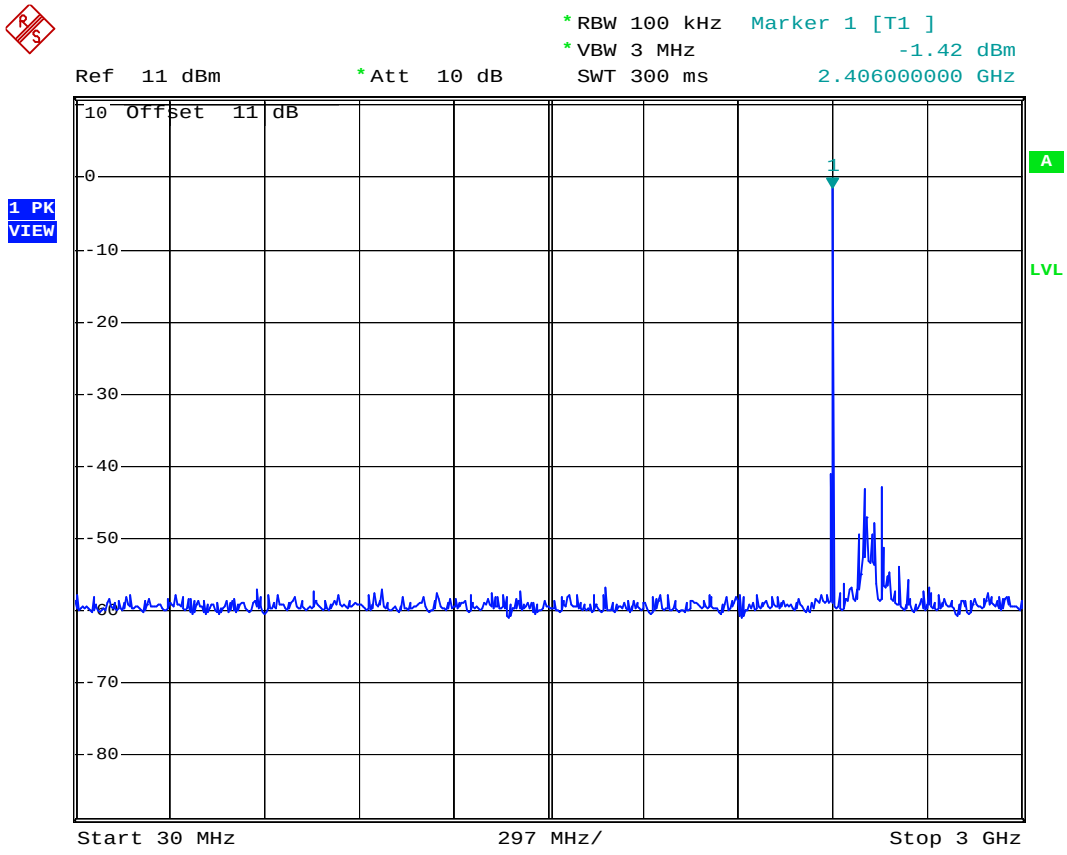
Mode : Hi Channel

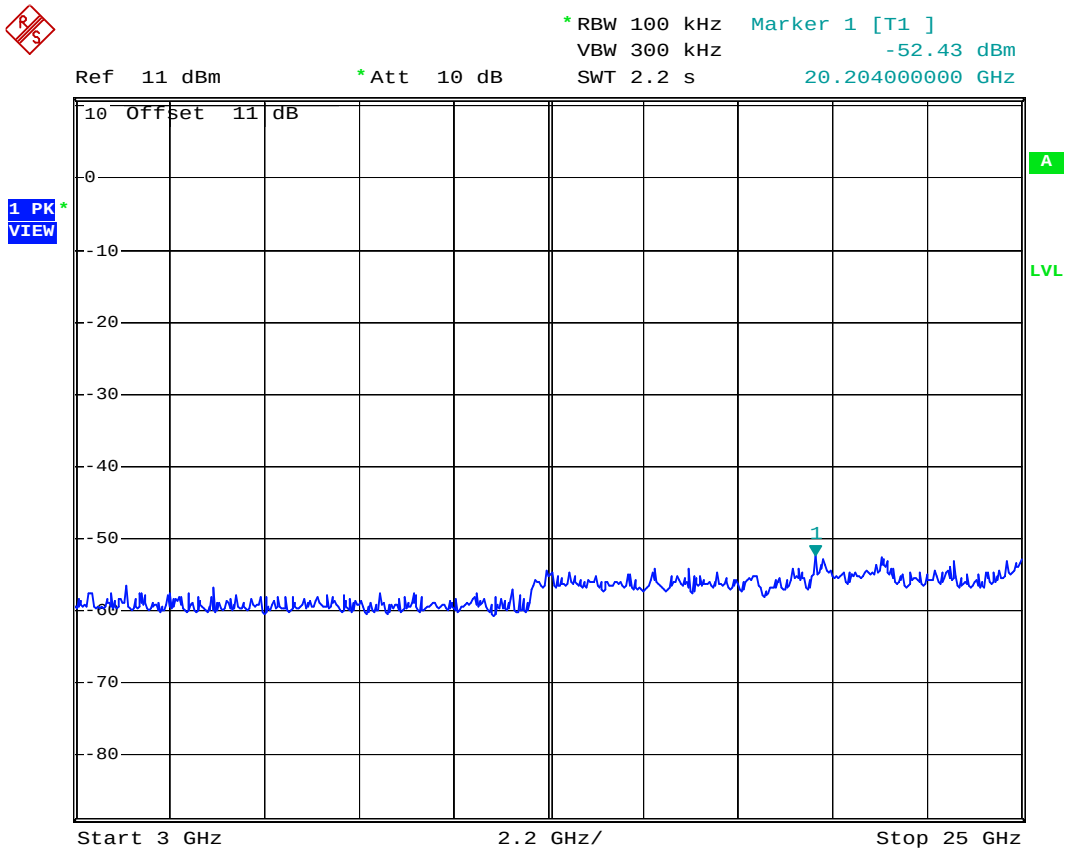




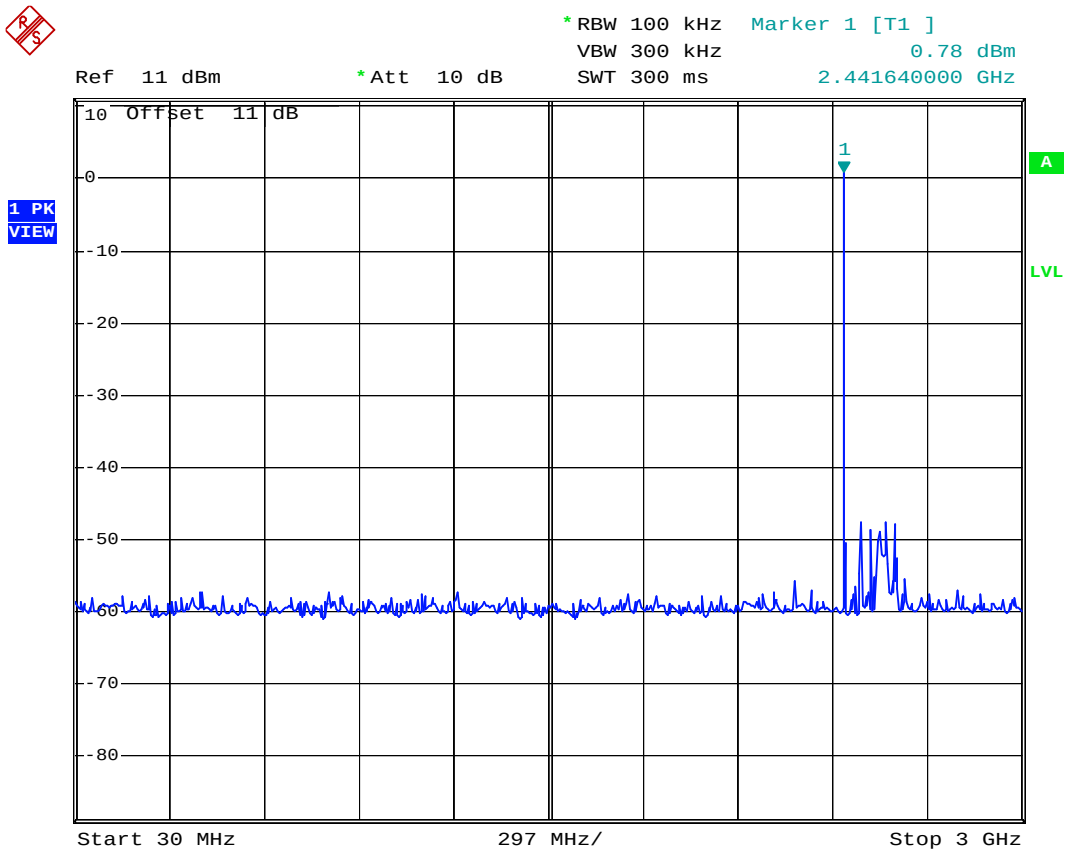
Mode: Bluetooth EDR

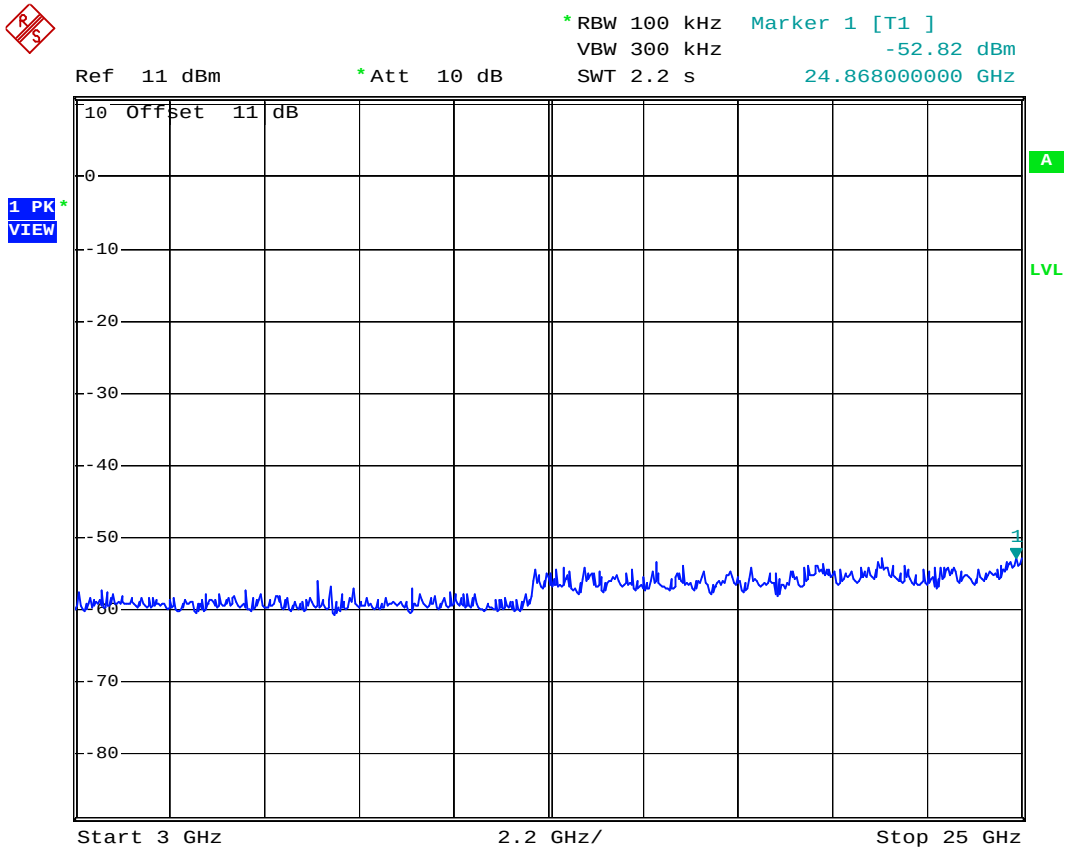
Mode : Low Channel



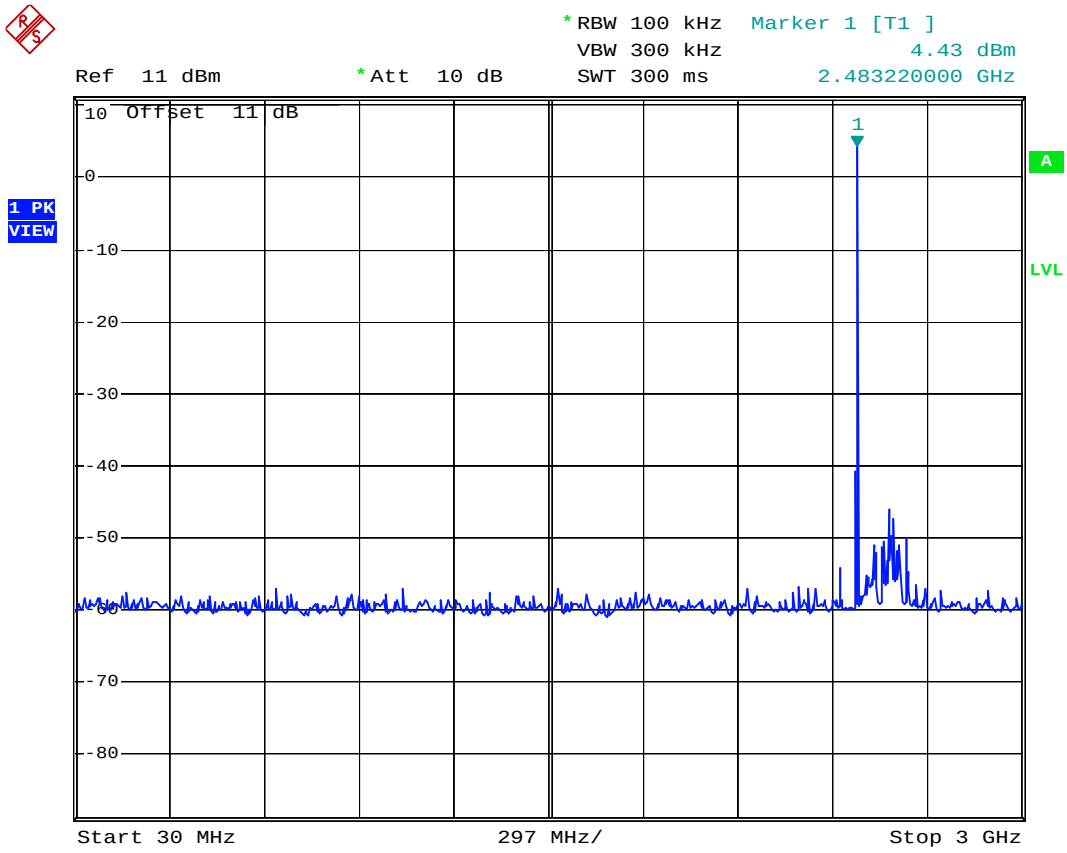


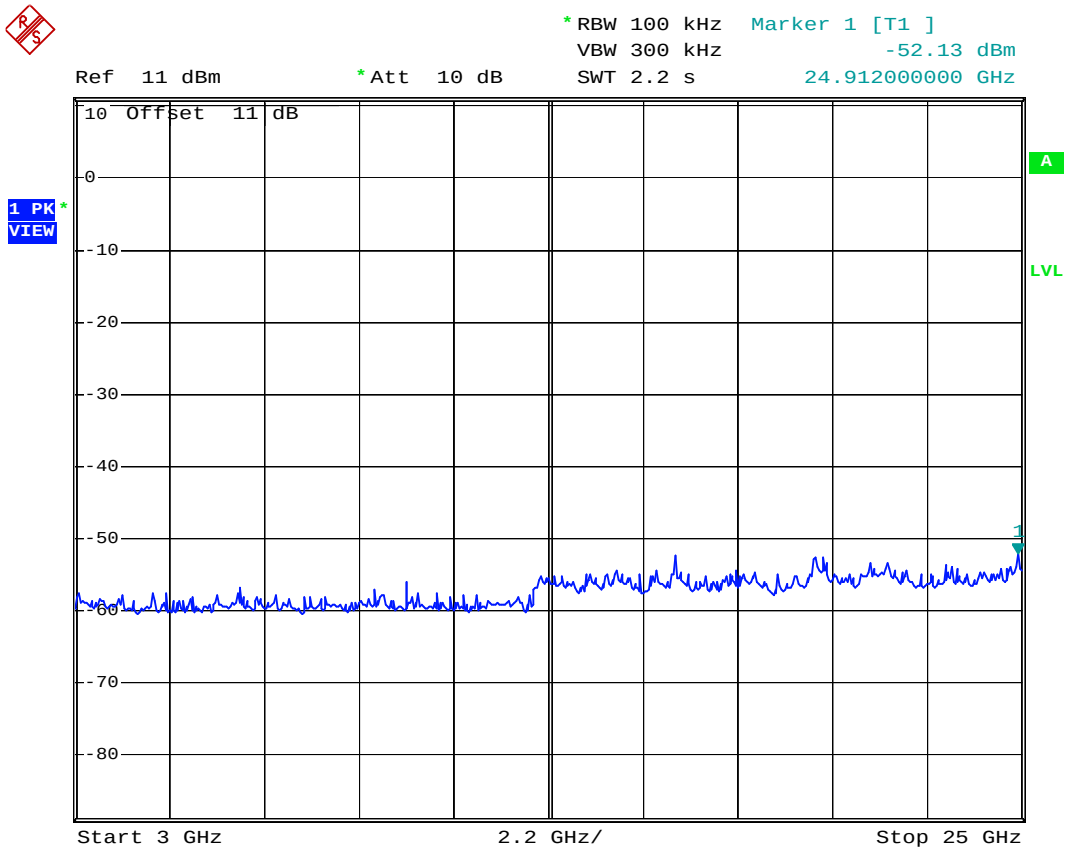
Mode : Mid Channel





Mode : Hi Channel





14. DUTY CYCLE

14.1 Standard Applicable

None. Refereency only.

14.2 Measurement Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Spectrum Analyzer	Rohde & Schwarz	FSP40	2016/10/03	2017/10/02
Attenuator	MINI-CIRCUITS	BW-S10W2+	2016/09/30	2017/09/29

14.3 Measurement Data

Test Date : May 04, 2017 Temperature : 27 °C Humidity : 53 %

Duty Cycle Calculation

Mode	Period (ms)	Transmission duration (T) (ms)	Duty Cycle (%)	1/T (kHz)	VBW setting (kHz)
BR / DH5	1.27	0.47	37.0	2.128	3
EDR / DH5	1.25	0.48	38.4	2.083	3

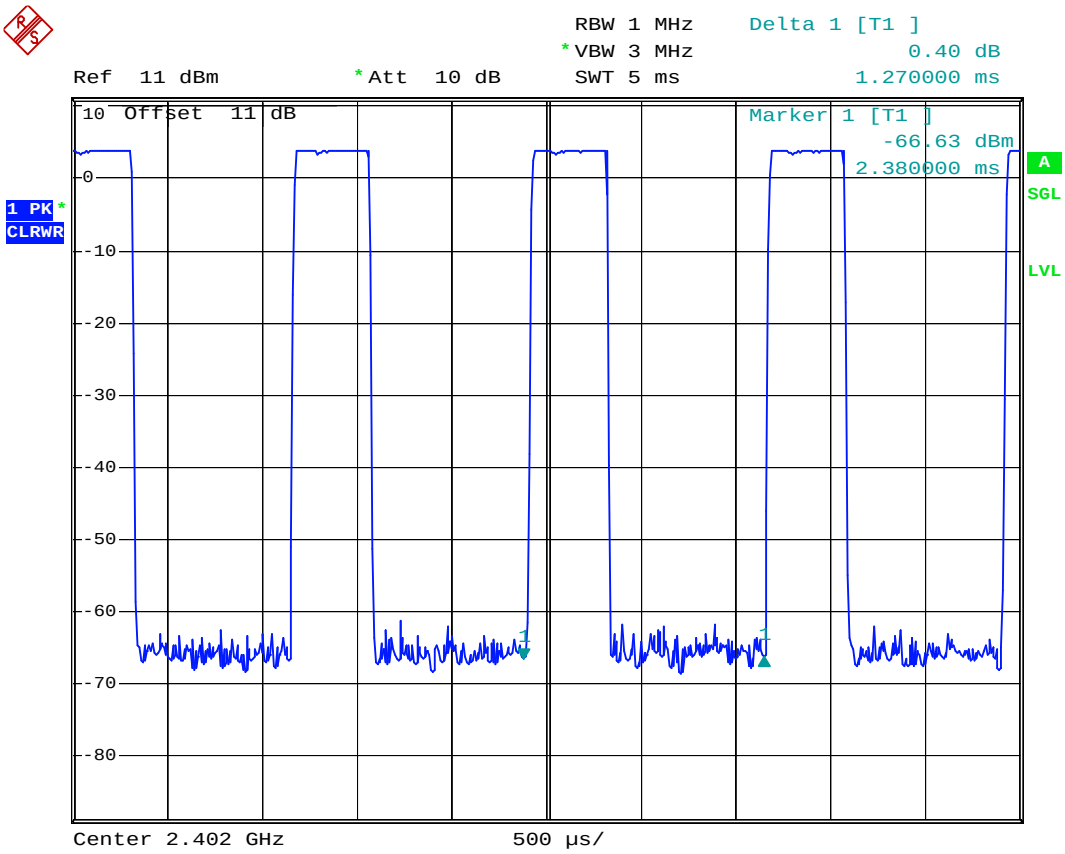
Note:

1. DH5 has the highest duty cycle worst case and is reported.
2. 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.

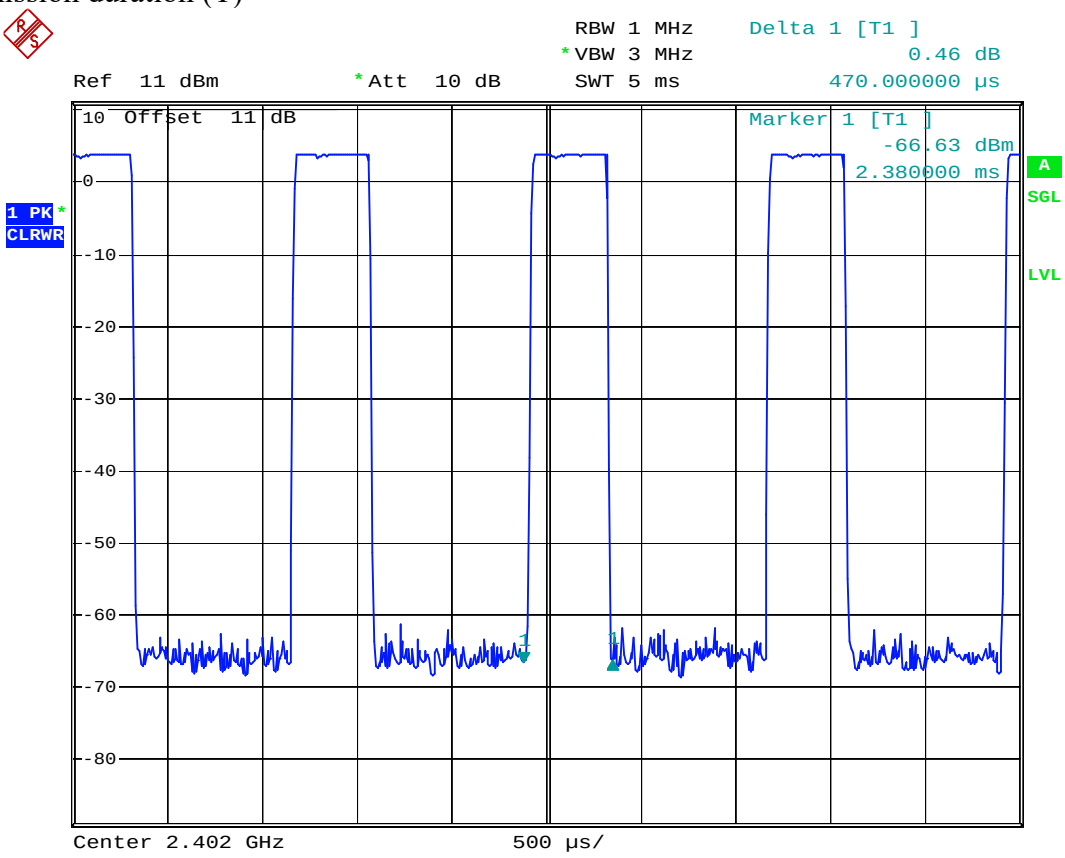
Refer to the following page for data plots.

BR / DH5

Period

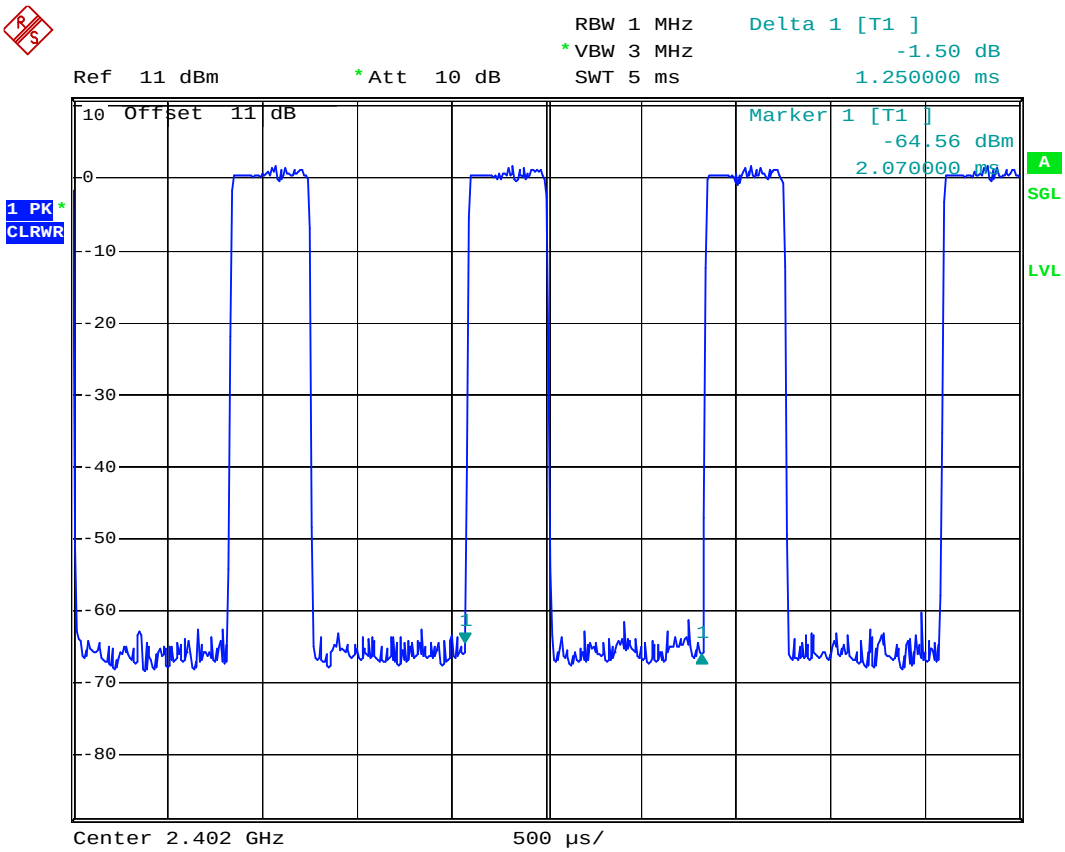


Transmission duration (T)



EDR / DH5

Period



Transmission duration (T)