

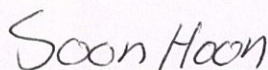
FCC EVALUATION REPORT FOR CERTIFICATION

Manufacturer: LG Electronics USA**1000 Sylvan Avenue,****Englewood Cliffs New Jersey United States 07632****Attn: Mr. Kyung-Su Han / Director****Date of Issue: April 12, 2017****Order Number: GETEC-C1-17-146****Test Report Number: GETEC-E3-17-009****Test Site: GUMI UNIVERSITY EMC CENTER****(Test firm Registration Number: 269701)****FCC ID. : BEJEBR844226****Applicant : LG Electronics USA**

Rule Part(s)	: FCC Part 15 Subpart C-Intentional Radiator § 15.247
Test Method	: ANSI C63.10 (2013)
Equipment Class	: Spread Spectrum Transmitter(DSS)
EUT Type	: BT AUX Module
Type of Authority	: Certification
Model Name	: EBR844226
Trade Mark	: LG Electronics

This equipment has been shown to be in compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10 (2013)

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the vest of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Tested by,**Reviewed by,**

**Soon-Hoon Jeong, Senior Engineer
GUMI UNIVERSITY EMC CENTER**



**Jae-Hoon Jeong, Technical Manager
GUMI UNIVERSITY EMC CENTER**



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Scope: Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and / or unintentional radiators for compliance with technical rules and regulations of the Federal Communications Commission.

1. General Information

Applicant: LG Electronics USA

Applicant Address: 1000 Sylvan Avenue, Englewood Cliffs New jersey United Sates 07632

Contact Person: Mr. Yung-Su Han / Director

Telephone Number: 201-472-2623

- **FCC ID.** BEJEBR844226
- **Equipment Class** Spread Spectrum Transmitter(DSS)
- **EUT Type** BT AUX Module
- **Model Name** EBR844226
- **Rule Part(s)** FCC Part 15 Subpart C-Intentional Radiator § 15.247
- **Test Method** ANSI C63.10 (2013)
- **Type of Authority** Certification
- **Test Procedure(s)** ANSI C63.10 (2013)
- **Dates of Test** March 21~ April 02, 2017
- **Place of Test** GUMI UNIVERSITY EMC CENTER (FCC Test firm Registration No.: 269701)
37 Yaeun-ro, Gumi-si, Gyeongsangbuk-do, 730-711, Republic of Korea
- **Test Report Number** GETEC-E3-17-009
- **Dates of Issue** April 12, 2017

EUT Type: BT AUX Module

FCC ID.: BEJEBR844226





2. Introduction

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Nose Emissions From Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2009) was used in determining radiated and conducted emissions emanating from **LG Electronics Inc. BT AUX Module (Model name: EBR844226)**

These measurement tests were conducted at **GUMI UNIVERSITY EMC CENTER**.

The site address is 37 Yaeun-ro, Gumi-si, Gyeongsangbuk-do, 730-711, Gyeongnam 641-713, Korea

This test site is one of the highest point of GUMI UNIVERSITY at about 200 kilometers away from Seoul city and 40 kilometers away from Daejeon city. It is located in the valley surrounded by mountains in all directions where ambient radio signal conditions are quiet and a favorable area to measure the radio frequency interference on open field test site for the computing and ISM devices manufactures. The detailed description of the measurement facility was found to be in compliance with the requirements of §2.948 according to ANSI C63.10 (2013)

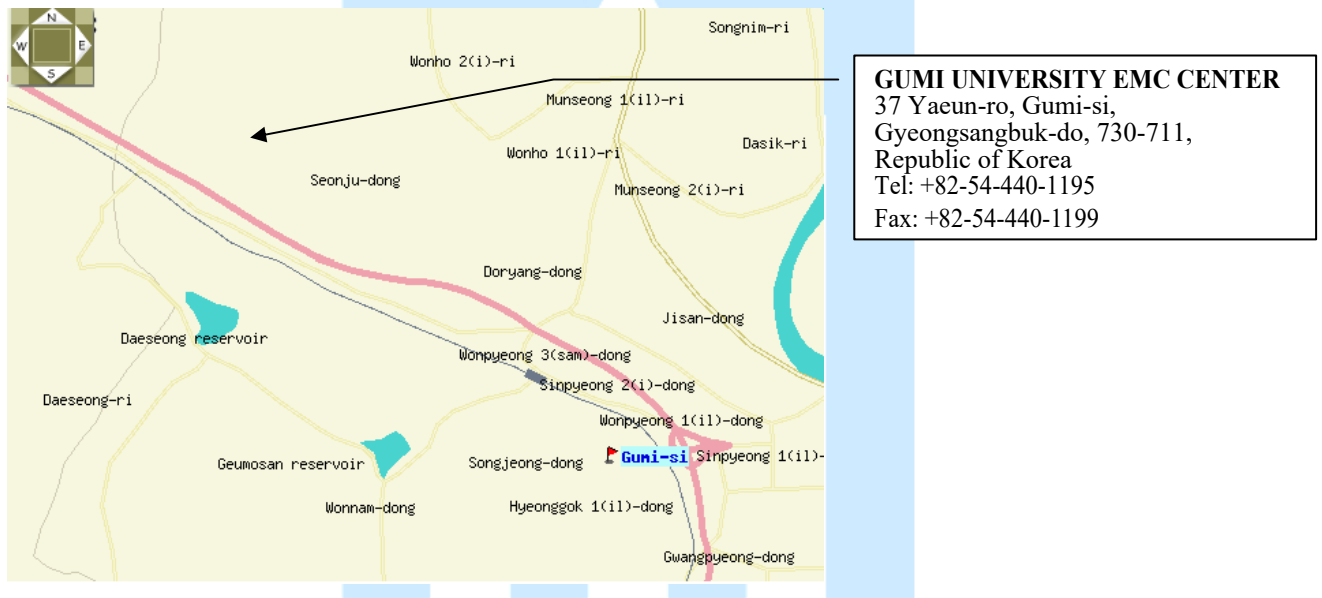


Fig 1. The map above shows the Gumi University in vicinity area.



3. Product Information

3.1 Description of EUT

The Equipment under Test (EUT) is the **LG Electronics Inc. BT AUX Module**
(Model Name: EBR844226) FCC ID.: BEJEBR844226

- Equipment	: BT AUX Module
- Model name	: EBR844226
- Brand name	: LG Electronics
- Serial number	: Proto type
- Electrical Rating	: DC 5.0 V
- Size	: 30mm x 45mm
- Manufacturer	: LG Electronics Inc.
- Channel Separations	: 1 MHz
- Type of Modulation	: GFSK, $\pi/4$ -DQPSK, 8DPSK
- Channel frequency	: 2 402 MHz ~ 2 480 MHz
- Number of channel	: 79
- Type of chain	: One
- Antenna specification	: Manufacturer: AMOTECH Co., Ltd. Antenna type : Chip antenna Gain : 3.3 dBi
- Hardware version	: LG_Refrigerator_Audio_BT_Dongle_Rev1.0
- Software version	: BT AUX Module firmware Rev1.0

3.2 Definition of models

-None.



3.3 Support Equipment / Cables used

3.3.1 Used Support Equipment

Description	Manufacturer	Model Name	S/N & FCC ID.
Notebook Computer ¹⁾	SAMSUNG	NT-Q45	S/N: CNBA4300168AI00682D5800 FCC ID.: N/A
Test Zig board	CSR	Proto type	S/N : None. FCC ID.: None.

Note)

1) The Support Equipment use only setting to the test mode.

3.3.2 System configuration

Description	Manufacturer	Model Name	S/N & FCC ID.
-	-	-	S/N : None. FCC ID.: None.

3.3.3 Used Cable(s)

Cable Name	Condition	Description
Power cable	Connected between EUT and DC Power supply	1.5 m Unshielded

3.4 Modification Item(s)

-. None



4. Antenna Requirement - §15.203

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the applicant can be used with the device. The use of permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with this requirement.

4.1 Description of Antenna

The **LG Electronics Inc. BT AUX Module**, comply with the requirement of §15.203 with a Chip antenna permanently attached to the transmitter.

5. Description of tests

5.1 Test Condition

The EUT was installed, arranged and operated in a manner that is most representative of equipment as typically used. The measurements were carried out while varying operating modes and cable positions within typically arrangement to determine maximum emission level.

The representative and worst test mode(s) were noted in the test report.

- Test Voltage / Frequency: 5.0 V / DC
- Operating condition during the test(s) :
 - Continuous RF transmitting mode with nominal maximum RF output power.
 - Operating channel frequency and modulation technology

Mode	Available channel	Frequency	Modulation Technology
BT Basic	0~78	2402 ~ 2480 MHz	GFSK
BT EDR 2M	0~78	2402 ~ 2480 MHz	π/4-DQPSK
BT EDR 3M	0~78	2402 ~ 2480 MHz	8DPSK

- EUT set condition (RF power setting value)

Test Software version	Channel	RF power setting value
BlueSuite 2.6.2.632	0~78	63

6. References Standards

- FCC Part 15 (2009) Subpart C-Intentional Radiator §15.247
- ANSI C 63.10 (2013): American National Standard for Testing Unlicensed Wireless Devices



7. SUMMARY OF TEST RESULTS

FCC Part Section(s)	Test Description	Test Result
§15.247(a)(1)	20 dB Bandwidth	Pass
§15.247(a)(1)	Carrier Frequency Separation	Pass
§15.247(a)(1)(iii)	Number of Hopping Frequencies	Pass
§15.247(a)(1)(iii)	Average Time of Occupancy	Pass
§15.247(b)(1)	Conducted Maximum Peak Output Power	Pass
§15.247(d)	Conducted Out of Band Emission Emissions	Pass
§15.207(a)	AC Power line Conducted Emissions	Pass
§15.205, 15.209	Radiated Spurious Emissions	Pass
§15.247(d), 15.205, 15.209	Radiated Restricted Band Edge	Pass

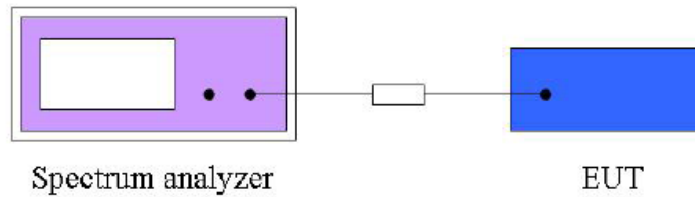


8. 20 dB Bandwidth Measurement

8.1 Operating environment

Temperature : 18.4 °C
Relative Humidity : 28.6 % R.H.

8.2 Test Set-up (Layout)



8.3 Limit

For frequency hopping systems, the minimum 20 dB bandwidth shall be at least 25 kHz

8.4 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - FSP	Rohde & Schwarz	Spectrum Analyzer	101431	Dec. 08, 2017
■ - 56-10	Weinschel	10 dB Attenuator	53184	Apr. 20, 2017

8.5 Test Test Procedure

- Set RBW = the range of 1% to 5% of the OBW.
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- Detector = Peak.
- Trace mode = max hold.
- Sweep time = auto couple.
- Span = between two times and five times the OBW
- Allow the trace to stabilize.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.



8.6 Test result

- Test Date : March 21, 2017
- Reference Standard : Part 15 Subpart C, Sec. 15.247(a)(1)
- Test Procedure(s) : ANSI C63.10 (2013)
- Operating Condition : RF transmitting mode (0 ch: 2 402 MHz, 39 ch: 2 440 MHz, 78 ch: 2 480 MHz)
- Power Source : DC 5.0 V

BDR

Frequency (MHz)	20 dB Bandwidth (kHz)	Min. Limit (kHz)	Result
2 402	900.0	25.0	Complies
2 440	894.0	25.0	Complies
2 480	894.0	25.0	Complies

EDR 2M

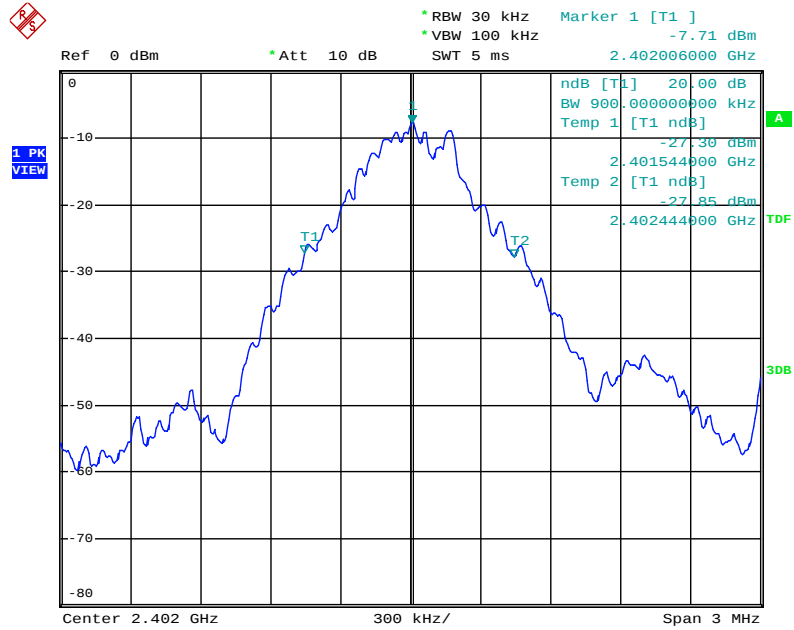
Frequency (MHz)	20 dB Bandwidth (kHz)	Min. Limit (kHz)	Result
2 402	1 266.0	25.0	Complies
2 440	1 242.0	25.0	Complies
2 480	1 242.0	25.0	Complies

EDR 3M

Frequency (MHz)	20 dB Bandwidth (kHz)	Min. Limit (kHz)	Result
2 402	1 230.0	25.0	Complies
2 440	1 266.0	25.0	Complies
2 480	1 266.0	25.0	Complies

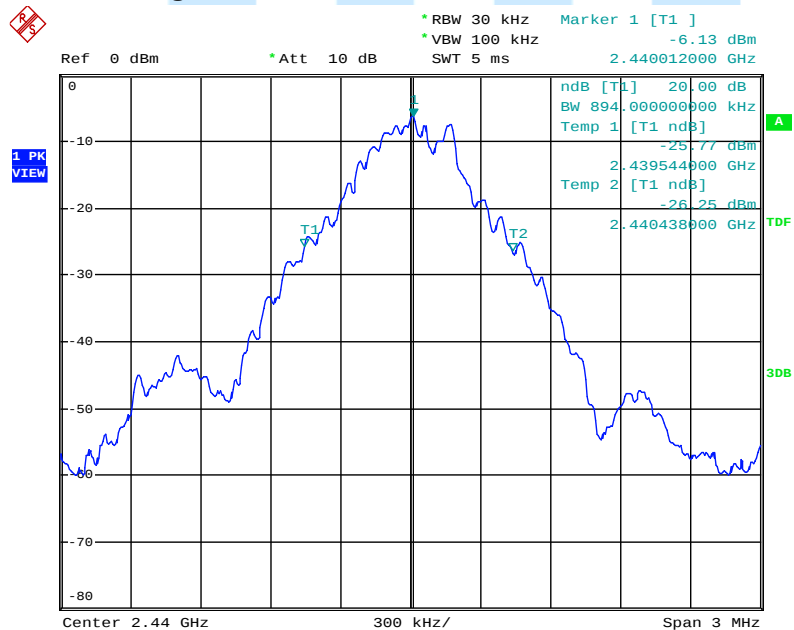


20 dB Bandwidth Plot on Configuration : BDR 0ch



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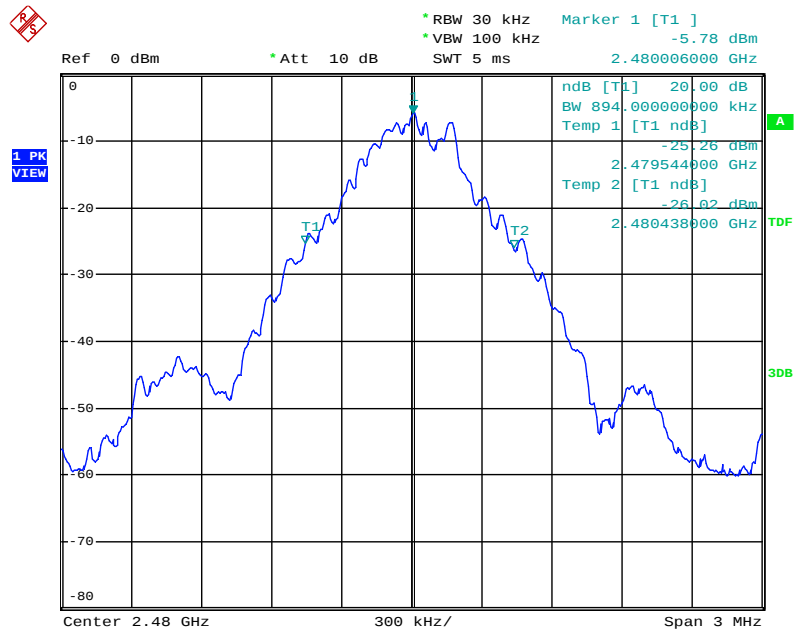
20 dB Bandwidth Plot on Configuration : BDR 39ch



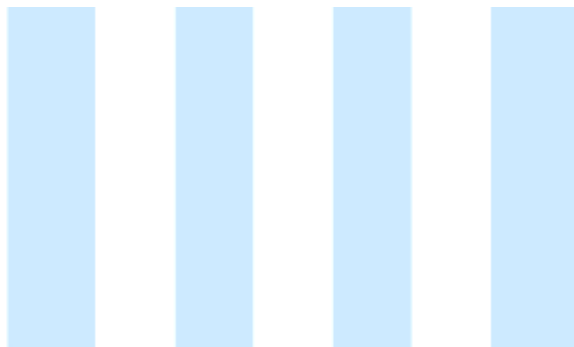
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20 dB Bandwidth Plot on Configuration : BDR 78ch

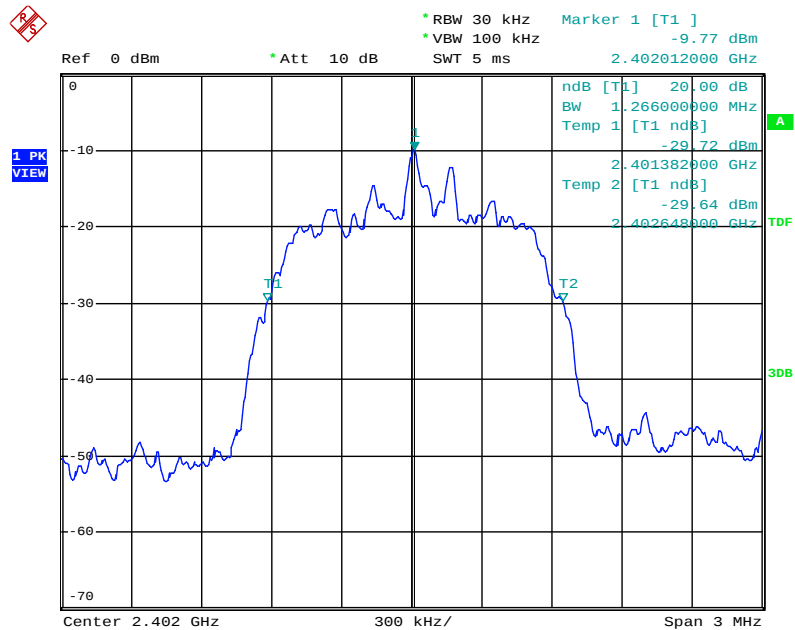


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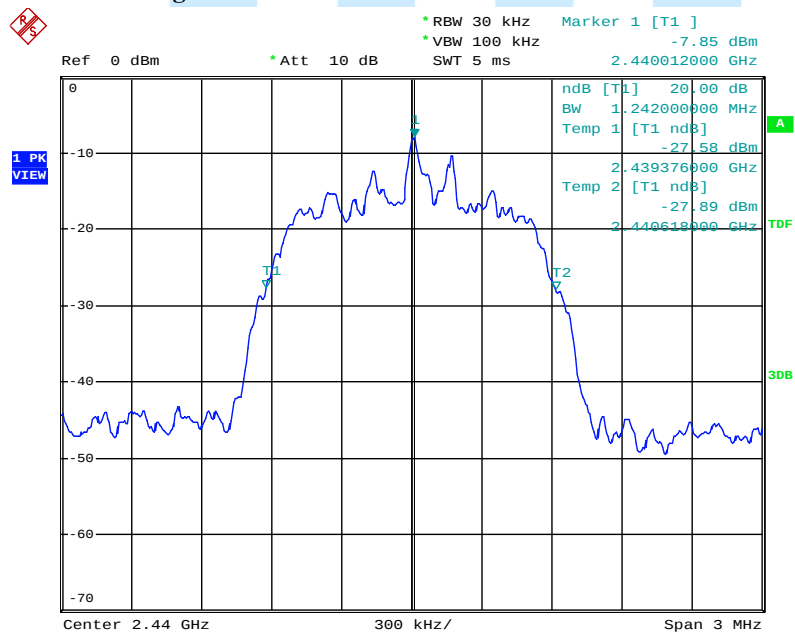


20 dB Bandwidth Plot on Configuration : EDR 2M 0ch



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20 dB Bandwidth Plot on Configuration : EDR 2M 39ch



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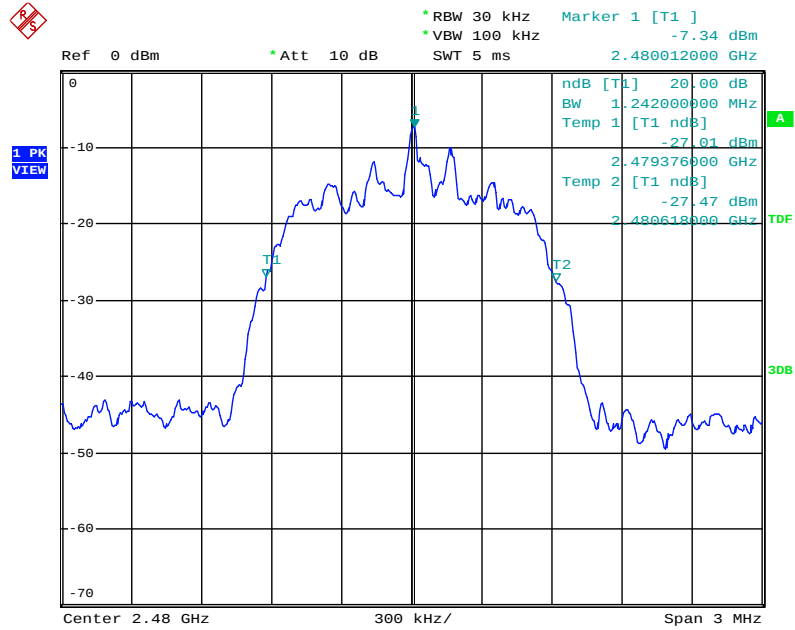
EUT Type: BT AUX Module

FCC ID.: BEJEBR844226

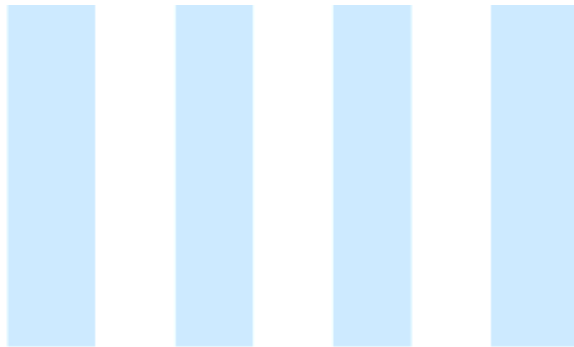




20 dB Bandwidth Plot on Configuration : EDR 2M 78ch

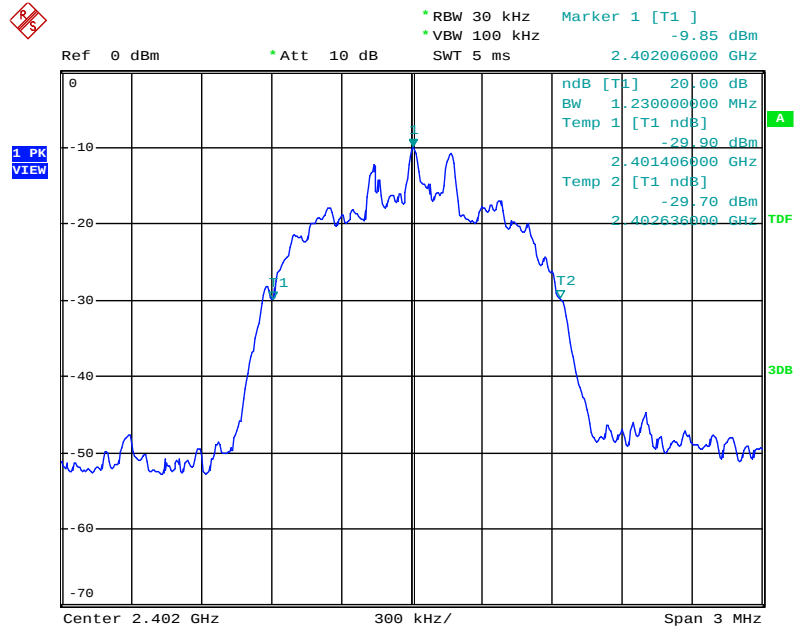


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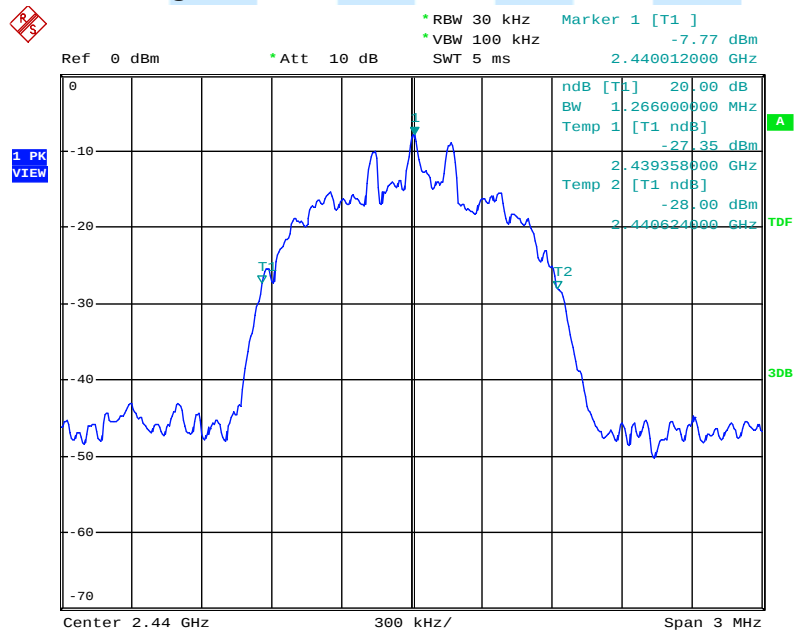


20 dB Bandwidth Plot on Configuration : EDR 3M 0ch



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20 dB Bandwidth Plot on Configuration : EDR 3M 39ch



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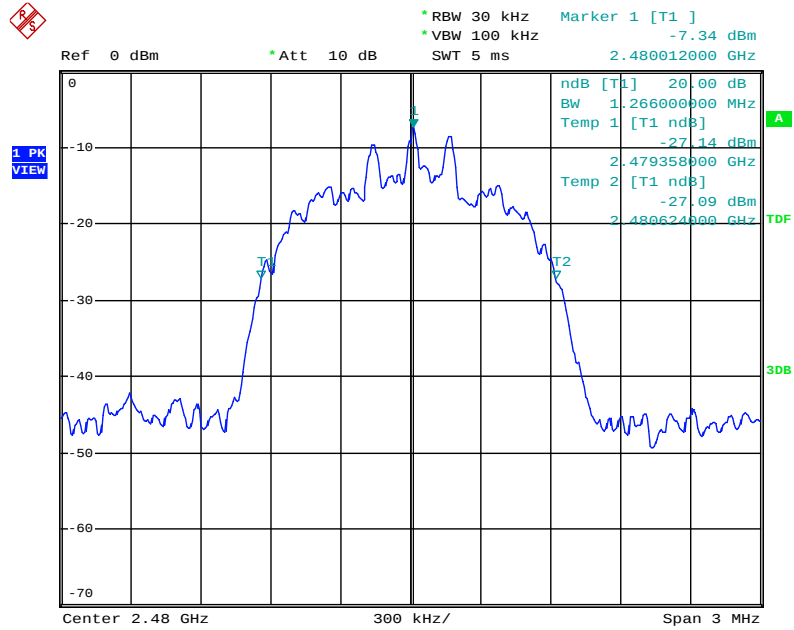
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FCC ID.: BEJEBR844226

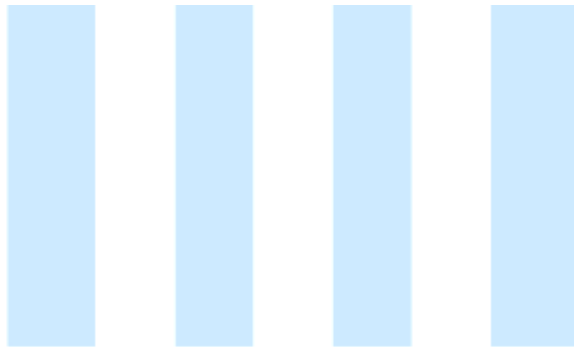




20 dB Bandwidth Plot on Configuration : EDR 3M 78ch



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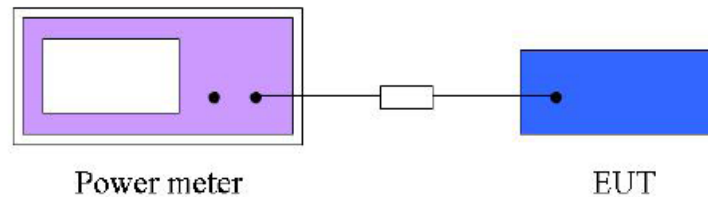


9. Conducted Maximum Peak Output Power Measurement

9.1 Operating environment

Temperature : 18.4 °C
Relative Humidity : 30.4 % R.H.

9.2 Test Set-up (Layout)



9.3 Limit

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band 0.125 watts.

9.4 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - FSP	Rohde & Schwarz	Spectrum Analyzer	101431	Dec. 08, 2017
■ - NRVS	Rohde & Schwarz	Single Channel Power Meter	101008	Apr 19, 2017
■ - NRP-Z51	Rohde & Schwarz	Power sensor	1138.0005.02	Apr. 20, 2017
■ - 56-10	Weinschel	10 dB Attenuator	53184	Apr. 20. 2017

9.5 Test Procedure

- span : Approximately five times the 20 dB bandwidth, centered on a hopping channel.
- RBW > 20 dB bandwidth of the emission being measured.
- VBW $\geq$ RBW
- Sweep : Auto.
- Detector function : Peak.
- Trace : Max hold.

Use the marker-to-peak function to set the marker to the peak of the emission.

The indicated level is the peak output power, after any corrections for external attenuators and cables.

A plot of the test results and setup description shall be included in the test report.



9.6 Test Result

- Test Date : March 21, 2017
- Reference Standard : Part 15 Subpart C, Sec. 15.247(b)(1)
- Test Procedure(s) : ANSI C63.10 (2013)
- Operating Condition : RF transmitting mode (0 ch: 2 402 MHz, 39 ch: 2 440 MHz, 78 ch: 2 480 MHz)
- Power Source : DC 5.0 V

BDR

Frequency (MHz)	Average Conducted Power ¹⁾ (dBm)	Peak Conducted Power (dBm)	Max. Limit (dBm)	Result
2 402	3.75	4.32	30.00	Complies
2 440	5.22	5.66	30.00	Complies
2 480	5.58	5.98	30.00	Complies

Note: 1) The Average output power is reference data for RF Exposure.

EDR 2M

Frequency (MHz)	Average Conducted Power ¹⁾ (dBm)	Peak Conducted Power (dBm)	Max. Limit (dBm)	Result
2 402	1.17	2.64	30.00	Complies
2 440	2.22	4.50	30.00	Complies
2 480	2.68	4.88	30.00	Complies

Note: 1) The Average output power is reference data for RF Exposure.

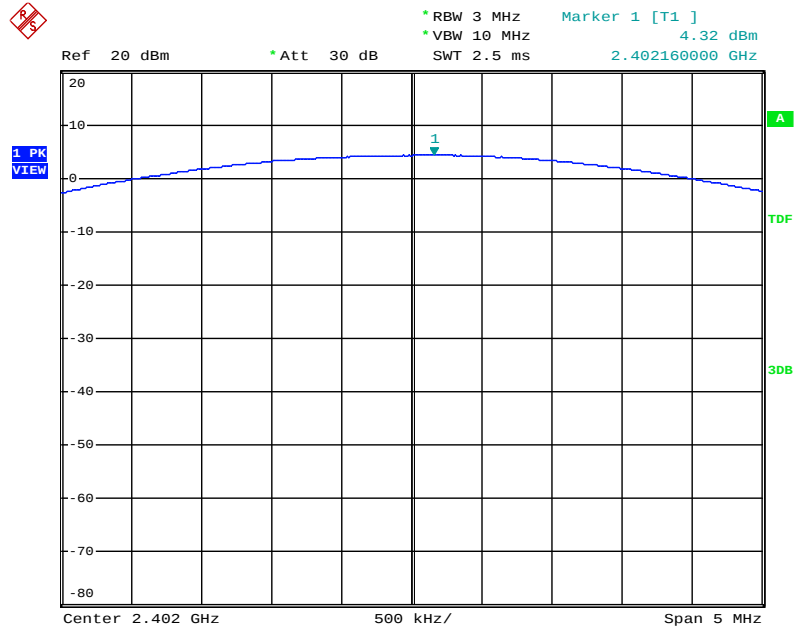
EDR 3M

Frequency (MHz)	Average Conducted Power ¹⁾ (dBm)	Peak Conducted Power (dBm)	Max. Limit (dBm)	Result
2 402	1.15	2.95	30.00	Complies
2 440	2.21	4.75	30.00	Complies
2 480	2.66	5.12	30.00	Complies

Note: 1) The Average output power is reference data for RF Exposure.

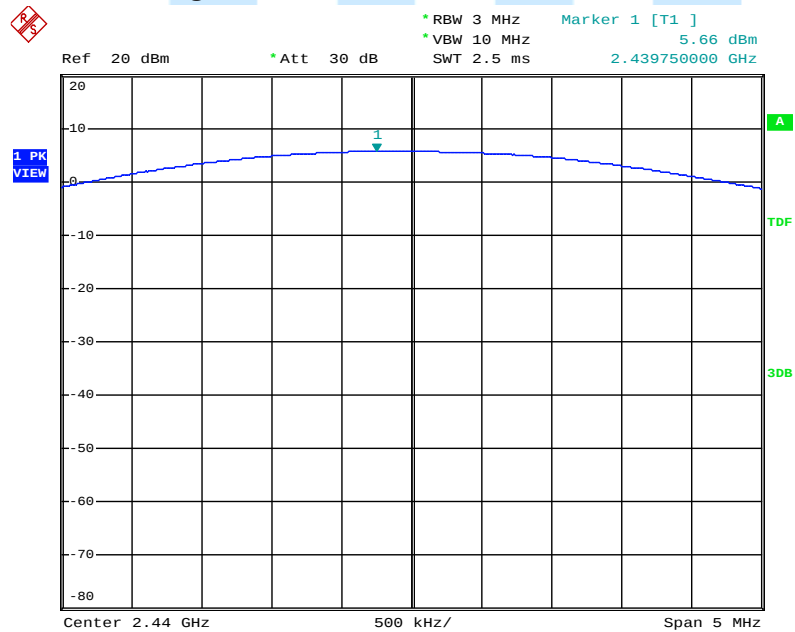


Peak output power Plot on Configuration : BDR 0ch



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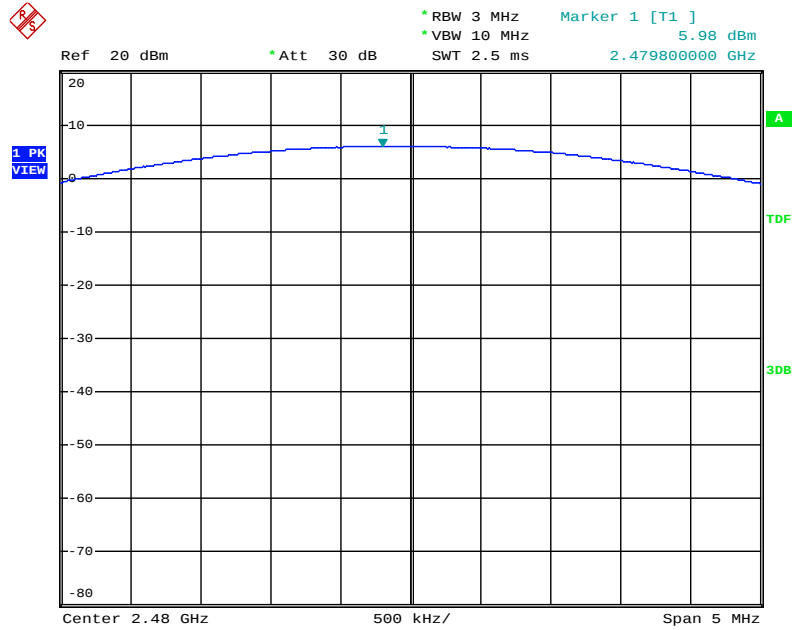
Peak output power Plot on Configuration : BDR 39ch



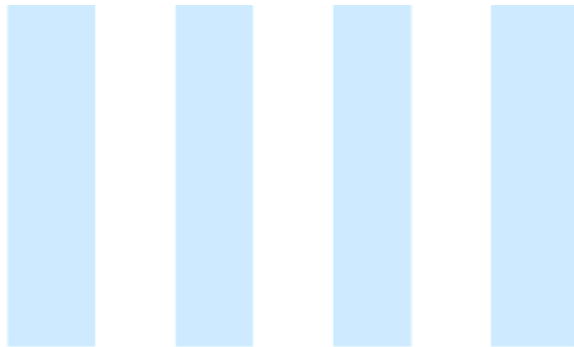
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Peak output power Plot on Configuration : BDR 78ch

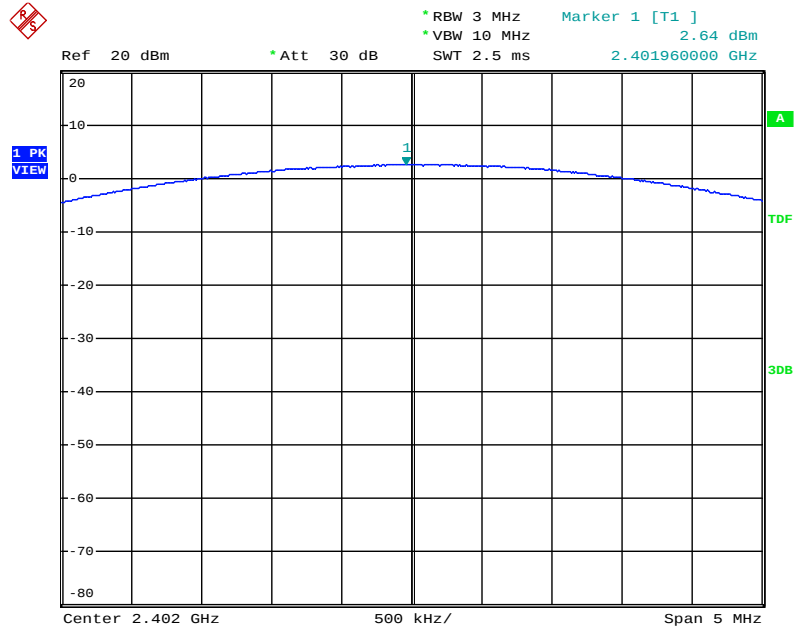


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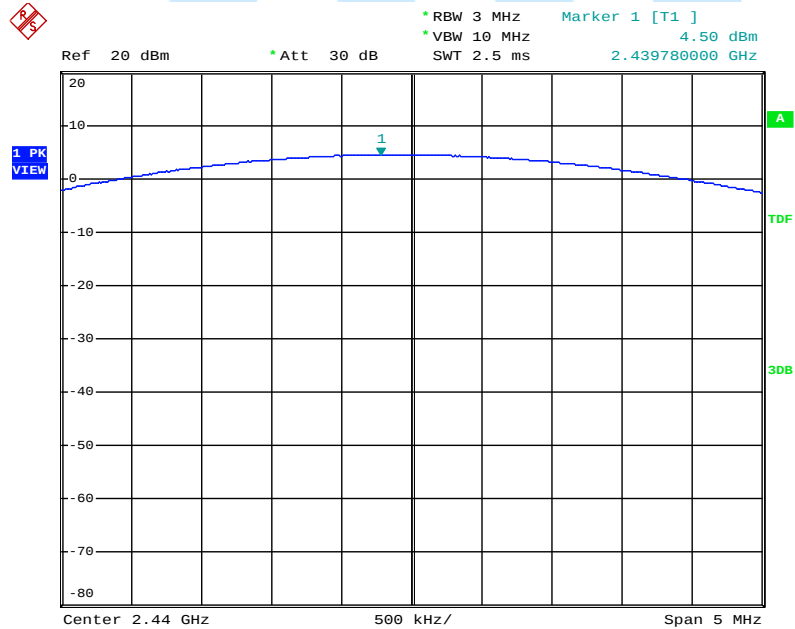


Peak output power Plot on Configuration : EDR 2M 0ch



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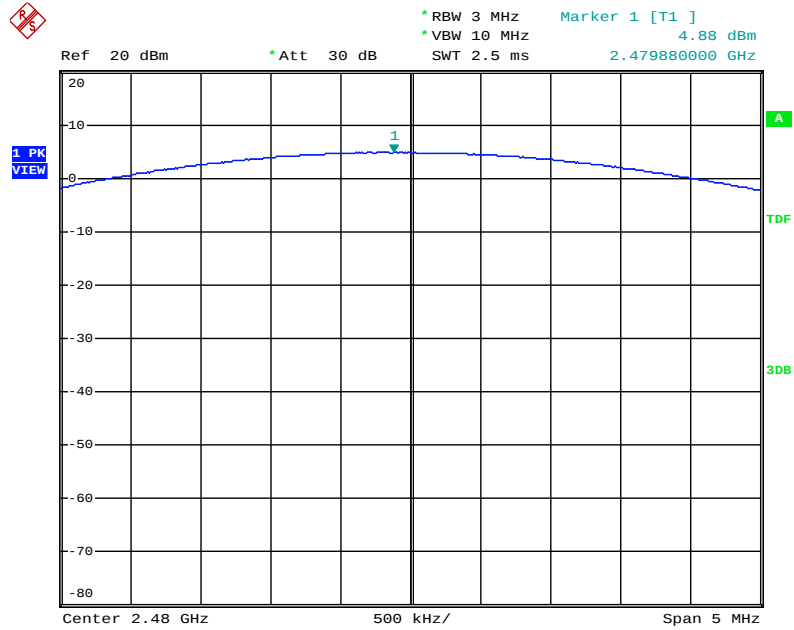
Peak output power Plot on Configuration : EDR 2M 39ch



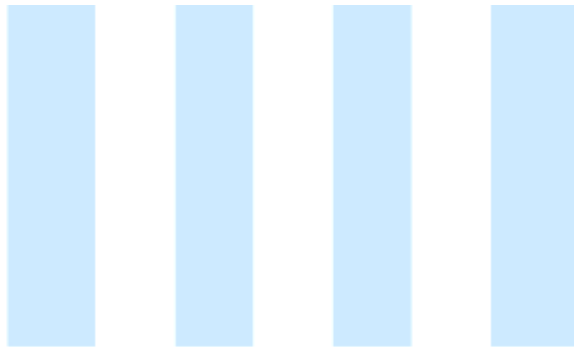
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Peak output power Plot on Configuration : EDR 2M 78ch

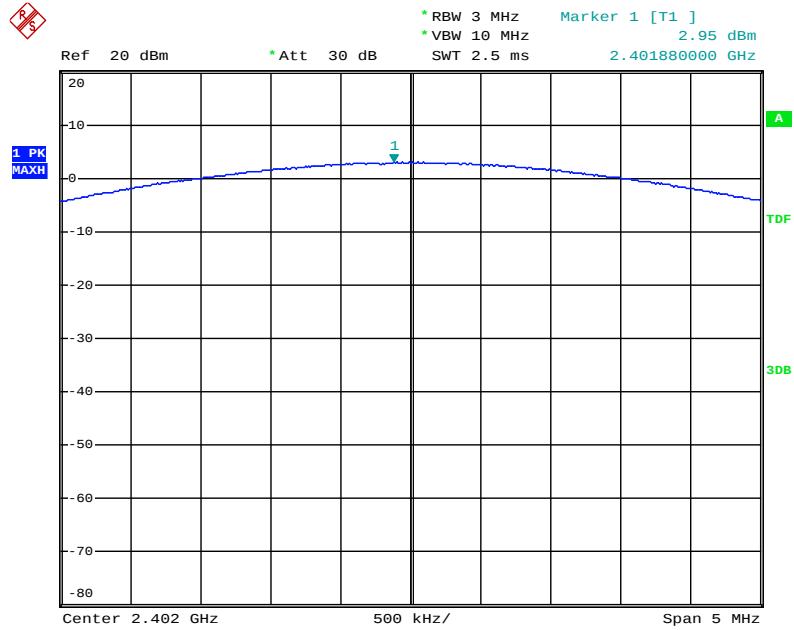


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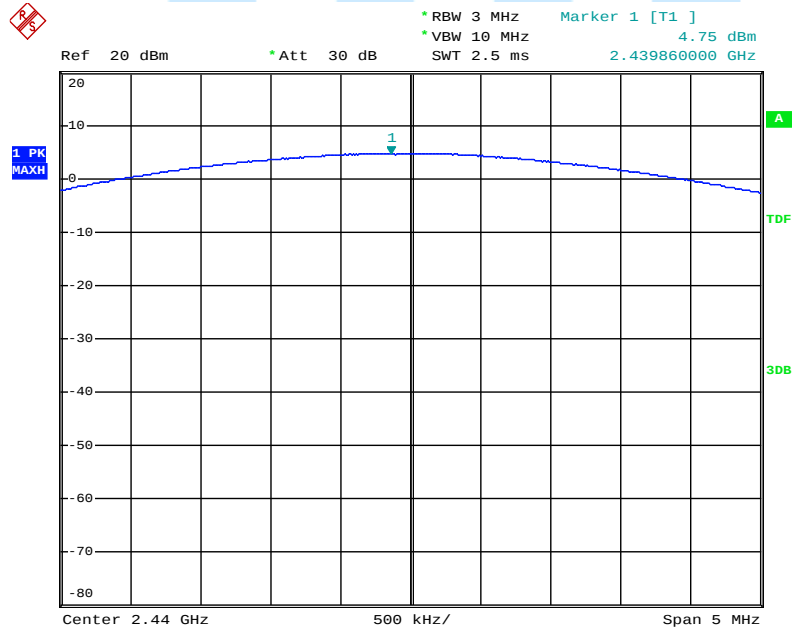


Peak output power Plot on Configuration : EDR 3M 0ch



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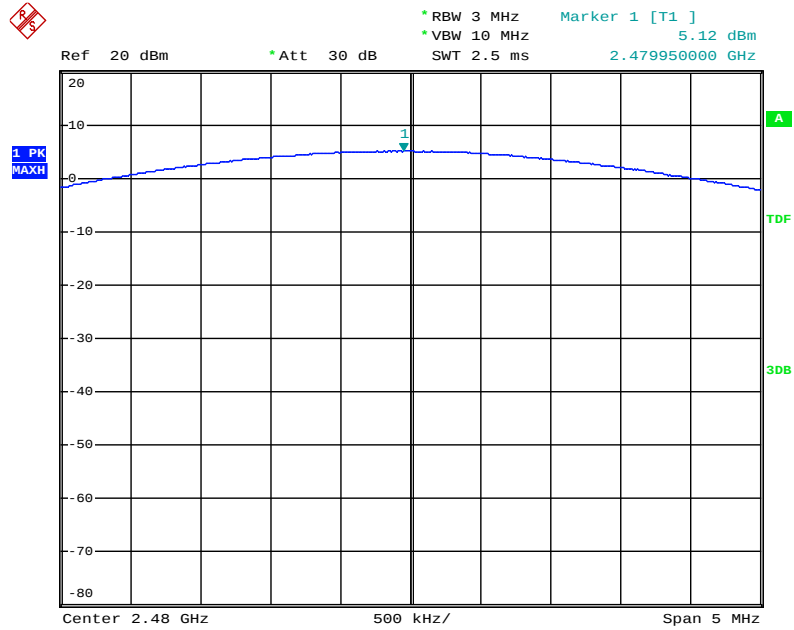
Peak output power Plot on Configuration : EDR 3M 39ch



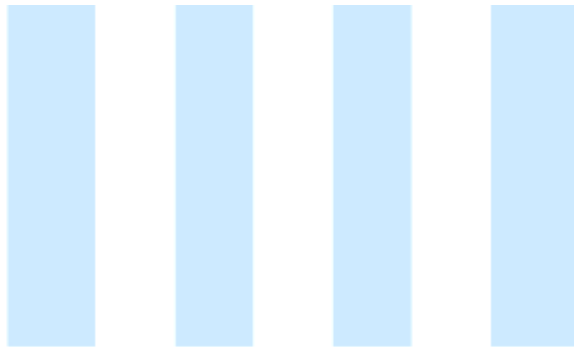
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Peak output power Plot on Configuration : EDR 3M 78ch



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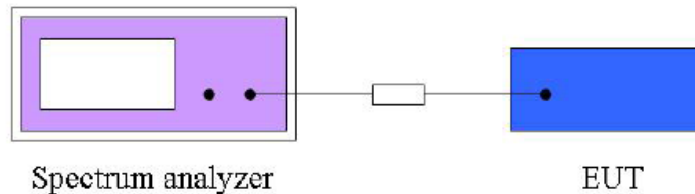


10. Carrier Frequency Separation Measurement

10.1 Operating Environment

Temperature : 18.4 °C
Relative Humidity : 33.8 % R.H.

10.2 Test Set-up (Layout)



10.3 Limit

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.

10.4 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - FSP	Rohde & Schwarz	Spectrum Analyzer	101431	Dec. 08, 2017
■ - 56-10	Weinschel	10 dB Attenuator	53184	Apr. 20, 2017

10.5 Test Procedure

- Span : Wide enough to capture the peaks of two adjacent channels.
- RBW : Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
- VBW $\geq$ RBW
- Sweep : Auto
- Detector = peak.
- Trace mode = max hold.
- Allow trace to fully stabilize.

Use the marker-delta function to determine the separation between the peaks of the adjacent channels. Compliance of EUT with the appropriate regulatory limit shall be determined. A plot of the data shall be included in the test report.



10.6 Test Result

- Test Date : March 21, 2017
- Reference Standard : Part 15 Subpart C, Sec. 15.247(a)(1)
- Test Procedure(s) : ANSI C63.10 (2013)
- Operating Condition : RF transmitting mode (0 ch: 2 402 MHz, 39 ch: 2 440 MHz, 78 ch: 2 480 MHz)
- Power Source : DC 5.0V

BDR

Frequency	Frequency Separation (MHz)	(2/3 of 20 dB BW) Limit (MHz)	Result
2 402 MHz	1.044	0.600	Complies
2 440 MHz	1.008	0.596	Complies
2 480 MHz	1.028	0.596	Complies

EDR 2M

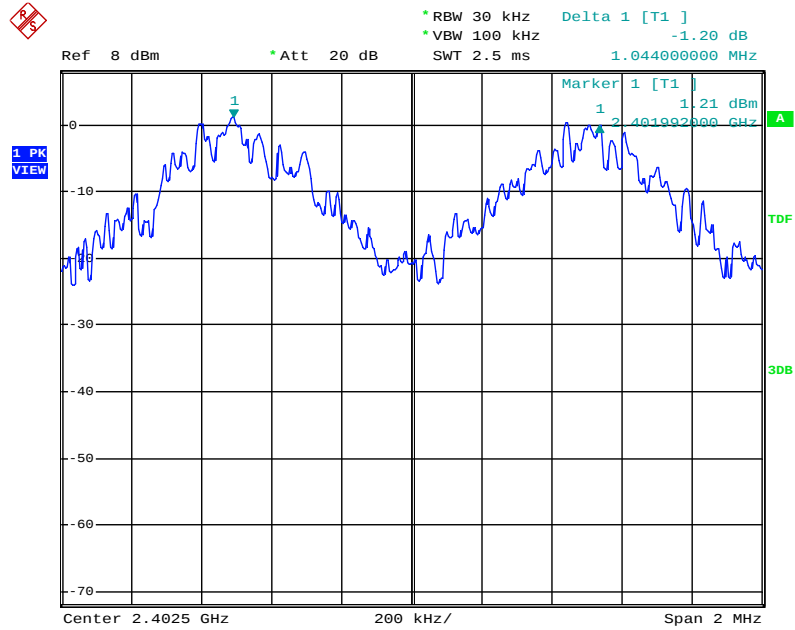
Frequency	Frequency Separation (MHz)	(2/3 of 20 dB BW) Limit (MHz)	Result
2 402 MHz	1.016	0.844	Complies
2 440 MHz	1.000	0.828	Complies
2 480 MHz	1.008	0.828	Complies

EDR 3M

Frequency	Frequency Separation (MHz)	(2/3 of 20 dB BW) Limit (MHz)	Result
2 402 MHz	1.000	0.820	Complies
2 440 MHz	1.004	0.844	Complies
2 480 MHz	1.000	0.844	Complies

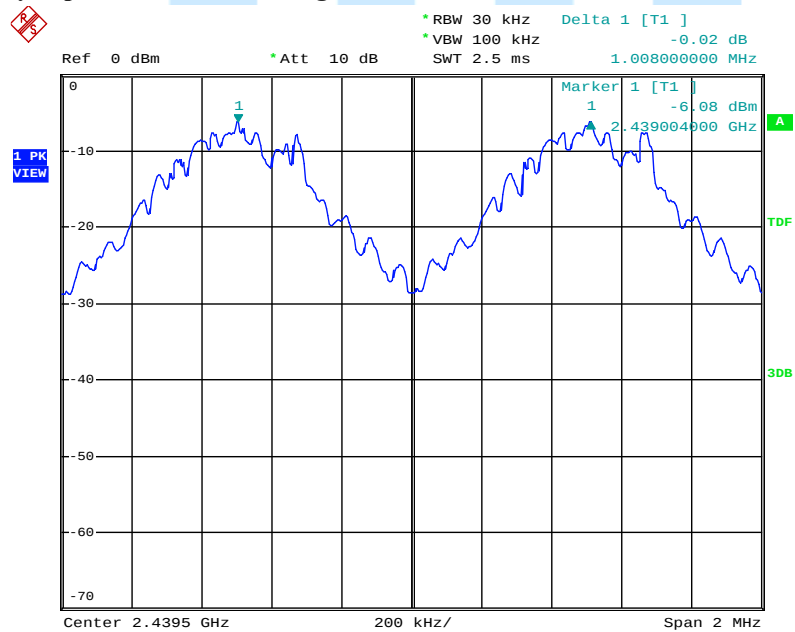


Carrier Frequency Separation Plot on configuration : BDR 0ch and 1ch



Date: 21.MAR.2017 20:02:54

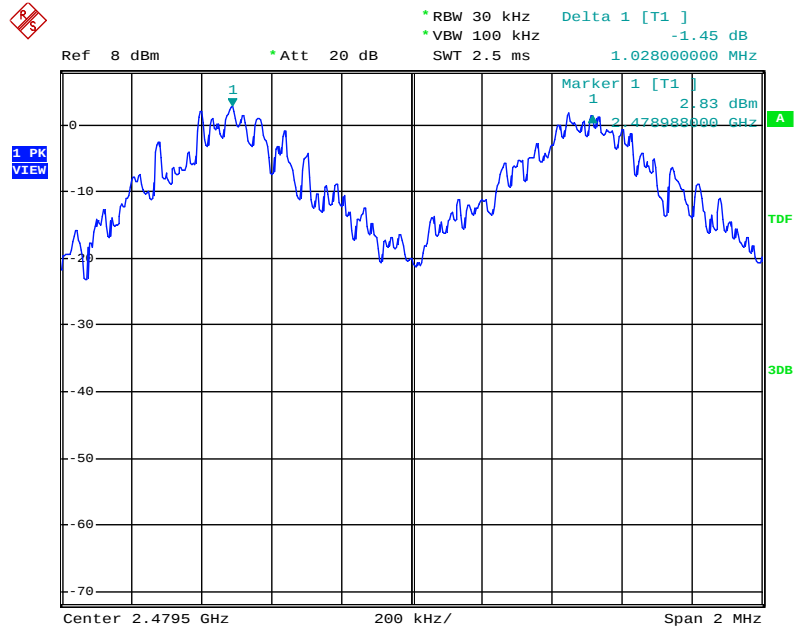
Carrier Frequency Separation Plot on configuration : BDR 39ch and 40ch



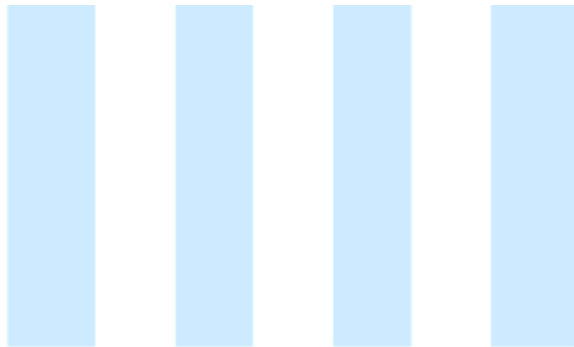
Date: 21.MAR.2017 18:26:20



Carrier Frequency Separation Plot on configuration : BDR 77ch and 78ch

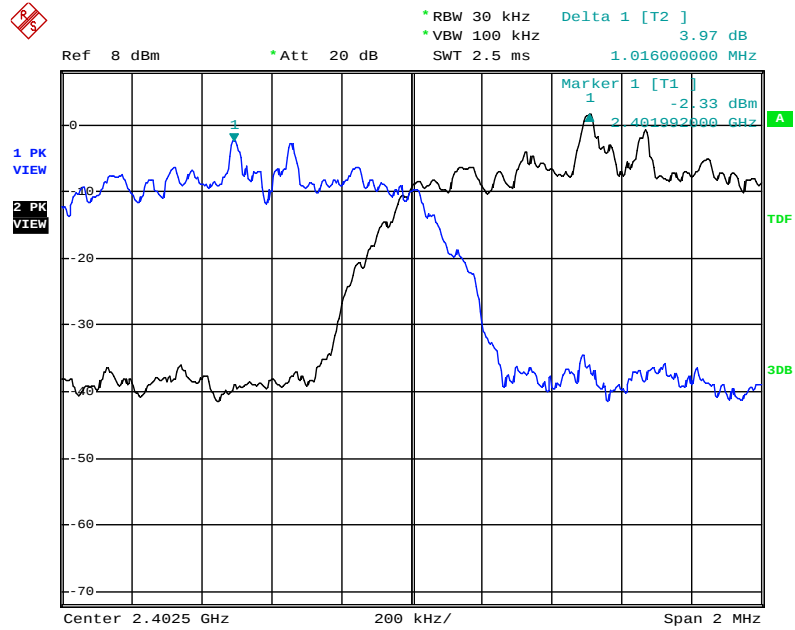


Date: 21.MAR.2017 20:09:08



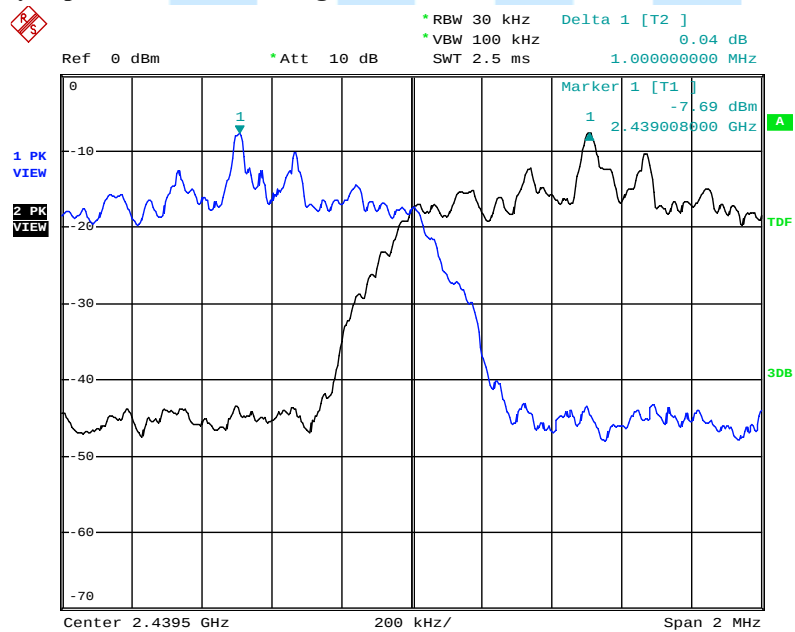


Carrier Frequency Separation Plot on configuration : EDR 2M 0ch and 1ch



Date: 21.MAR.2017 20:04:21

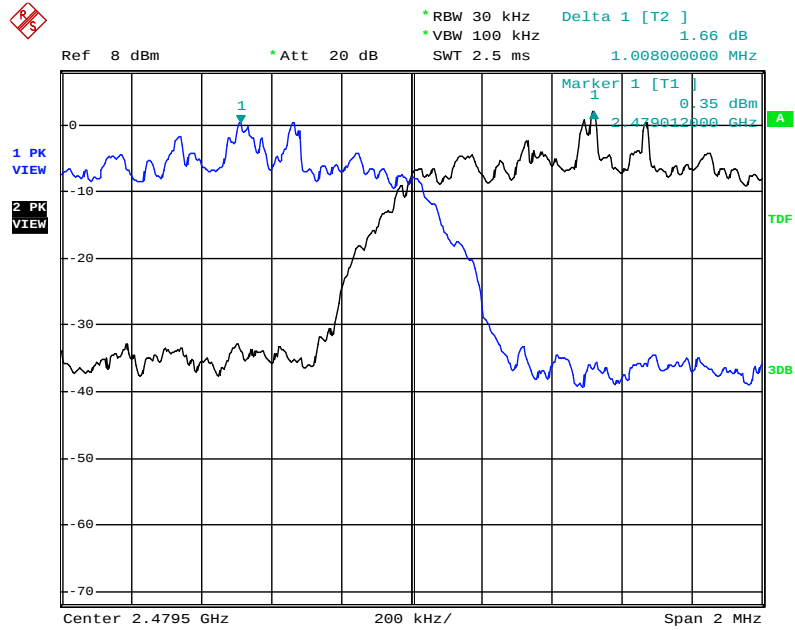
Carrier Frequency Separation Plot on configuration : EDR 2M 39ch and 40ch



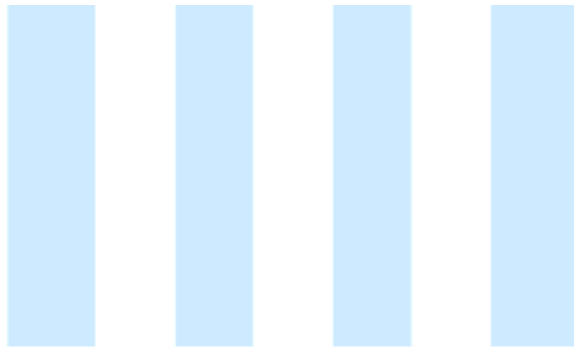
Date: 21.MAR.2017 18:29:06



Carrier Frequency Separation Plot on configuration : EDR 2M 77ch and 78ch

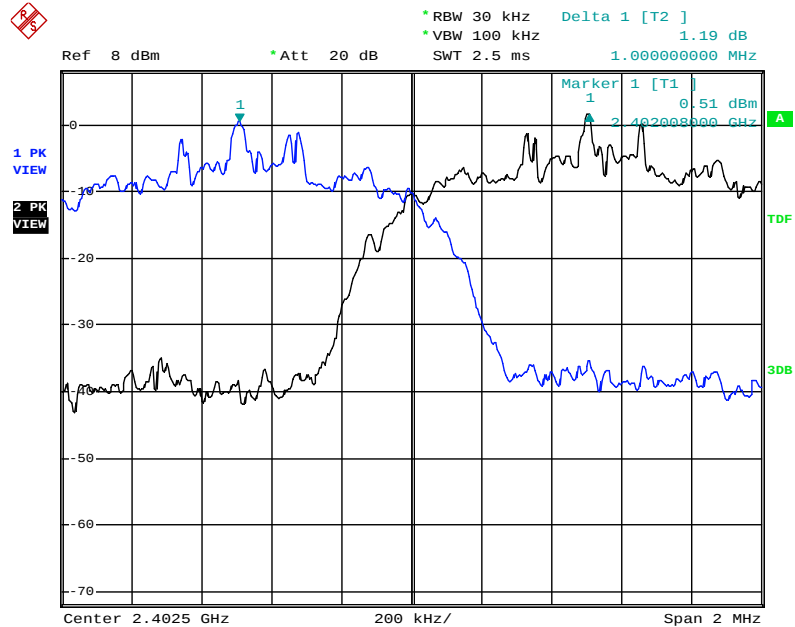


Date: 21.MAR.2017 20:07:04



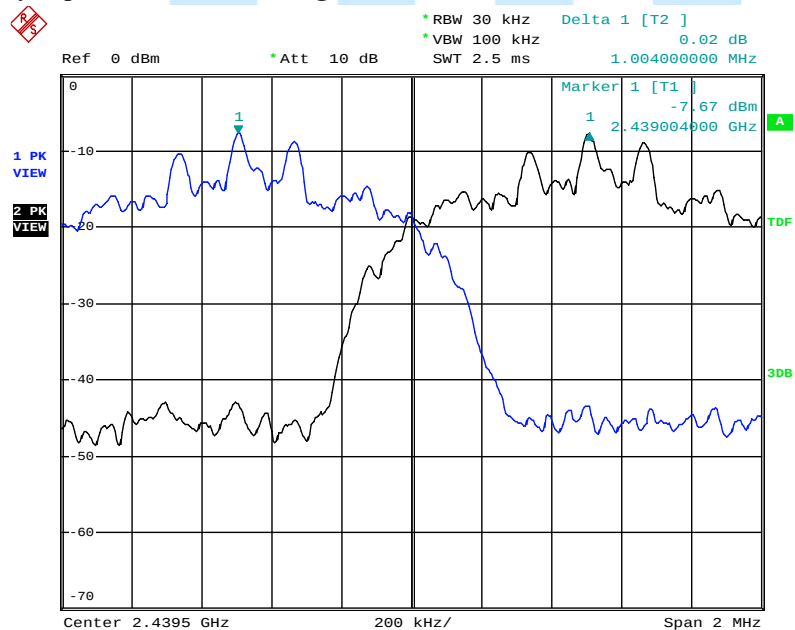


Carrier Frequency Separation Plot on configuration : EDR 3M 0ch and 1ch



Date: 21.MAR.2017 20:05:14

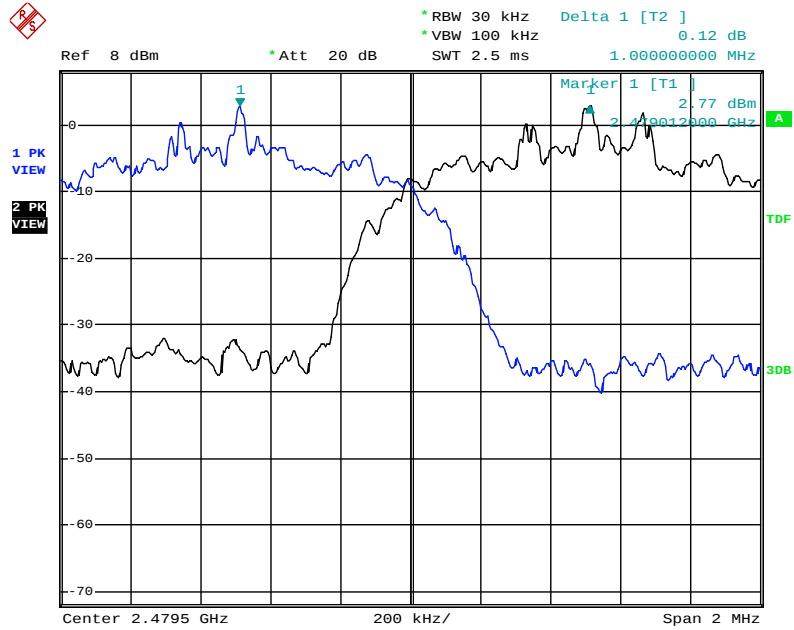
Carrier Frequency Separation Plot on configuration : EDR 3M 39ch and 40ch



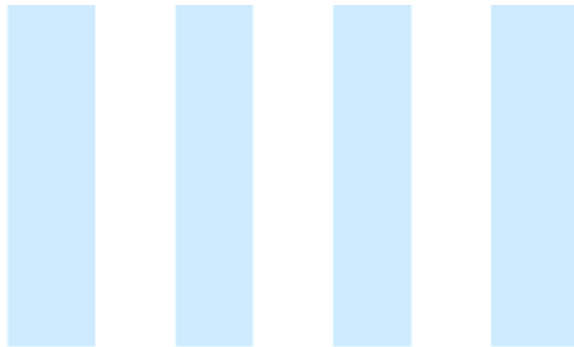
Date: 21.MAR.2017 18:31:43



Carrier Frequency Separation Plot on configuration : EDR 3M 77ch and 78ch



Date: 21.MAR.2017 20:06:17



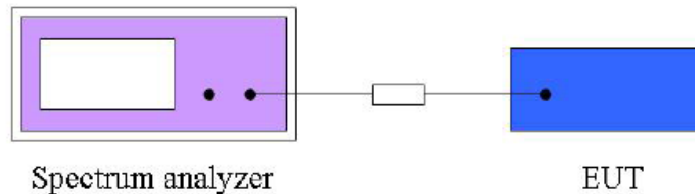


11. Number of Hopping Frequencies Measurement

11.1 Operating Environment

Temperature : 18.3 °C
Relative Humidity : 29.1 % R.H.

11.2 Test Set-up (Layout)



11.3 Limit

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

11.4 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - FSP	Rohde & Schwarz	Spectrum Analyzer	101431	Dec. 08, 2017
■ - 56-10	Weinschel	10 dB Attenuator	53184	Apr. 20, 2017

11.5 Test Procedure

- Span : The frequency band of operation. Depending on the number of channels the device supports, it may necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
- RBW : To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
- $VBW \geq RBW$
- Sweep : Auto
- Detector function : Peak
- Trace : Max hold
- Allow the trace to stabilize

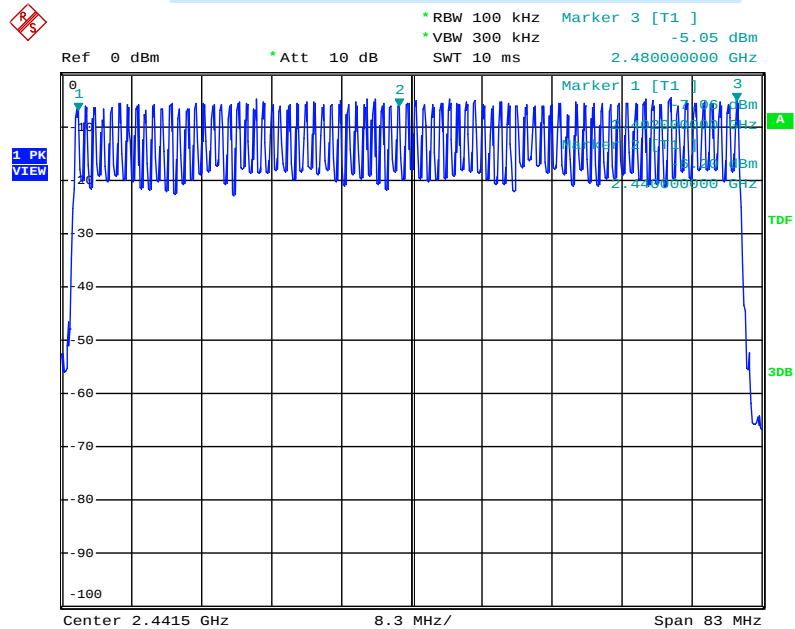


11.6 Test Result

- Test Date : March 21, 2017
- Reference Standard : Part 15 Subpart C, Sec. 15.247(a)(1)(iii)
- Test Procedure(s) : ANSI C63.10 (2013)
- Operating Condition : RF transmitting mode (0 ch: 2 402 MHz, 39 ch: 2 440 MHz, 78 ch: 2 480 MHz)
- Power Source : DC 5.0V

Number of Hopping Channel	Limit (Channel)	Result
79	>15	Complies

Number of Hopping Frequencies Plot on configuration



Date: 21.MAR.2017 18:37:17

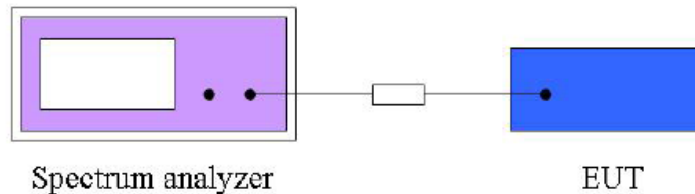


12. Average time of occupancy Measurement

12.1 Operating Environment

Temperature : 18.3 °C
Relative Humidity : 29.2 % R.H.

12.2 Test Set-up (Layout)



12.3 Limit

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.

12.4 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - FSP	Rohde & Schwarz	Spectrum Analyzer	101431	Dec. 08, 2017
■ - 56-10	Weinschel	10 dB Attenuator	53184	Apr. 20, 2017

12.5 Test Procedure

- Span : Zero span, centered on a hopping channel.
- RBW shall be $\leq$ channel spacing and where possible RBW should be set $\gg 1/T$, where T is the expected dwell time per channel.
- Sweep : As necessary to capture the entire dwell time per hopping channel.
- Detector function : Peak.
- Trace : Max hold.

Use the marker-delta function to determine the transmit time per hop.

The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements.



12.6 Test Result

- Test Date : March 21, 2017
- Reference Standard : Part 15 Subpart C, Sec. 15.247(a)(1)(iii)
- Test Procedure(s) : ANSI C63.10 (2013)
- Operating Condition : RF transmitting mode (0 ch: 2 402 MHz, 39 ch: 2 440 MHz, 78 ch: 2 480 MHz)
- Power Source : DC 5.0V

BDR

Frequency	On time of one cycle (ms)	Number of Hops in 5 seconds	Average Time of Occupancy (s)	Limit (s)	Result
2 402 MHz	2.9268	11	0.203	0.4	Complies
2 440 MHz	2.9160	11	0.203	0.4	Complies
2 480 MHz	2.9160	11	0.203	0.4	Complies

EDR 2M

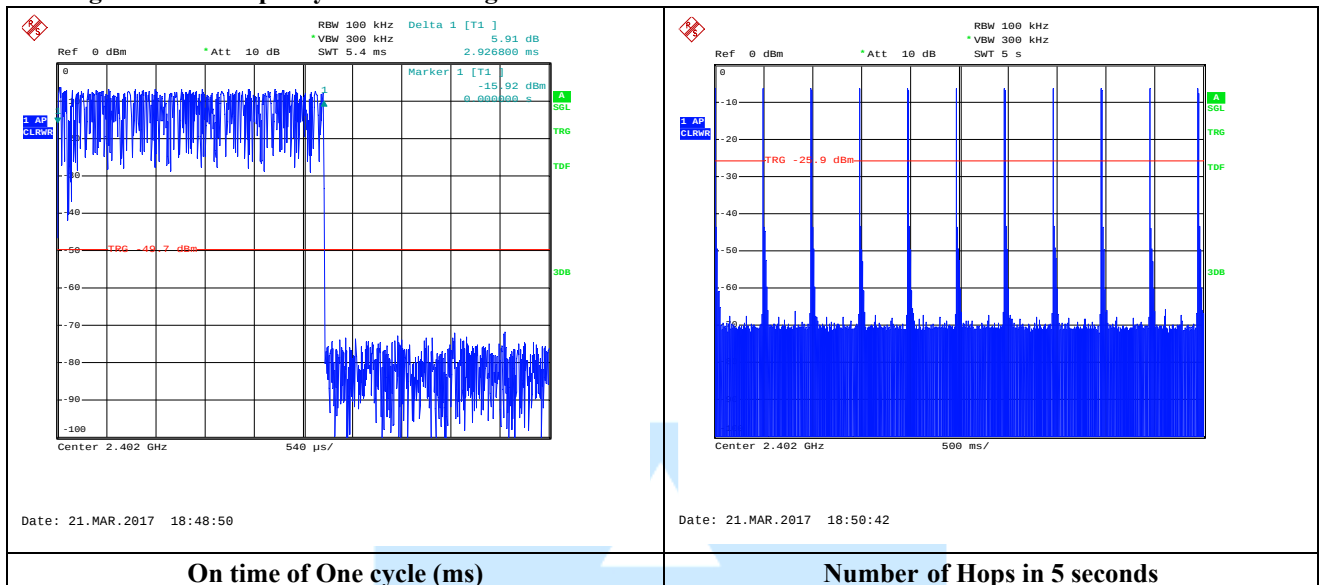
Frequency	On time of one cycle (ms)	Number of Hops in 5 seconds	Average Time of Occupancy (s)	Limit (s)	Result
2 402 MHz	2.9160	11	0.203	0.4	Complies
2 440 MHz	2.9160	11	0.203	0.4	Complies
2 480 MHz	2.9160	11	0.203	0.4	Complies

EDR 3M

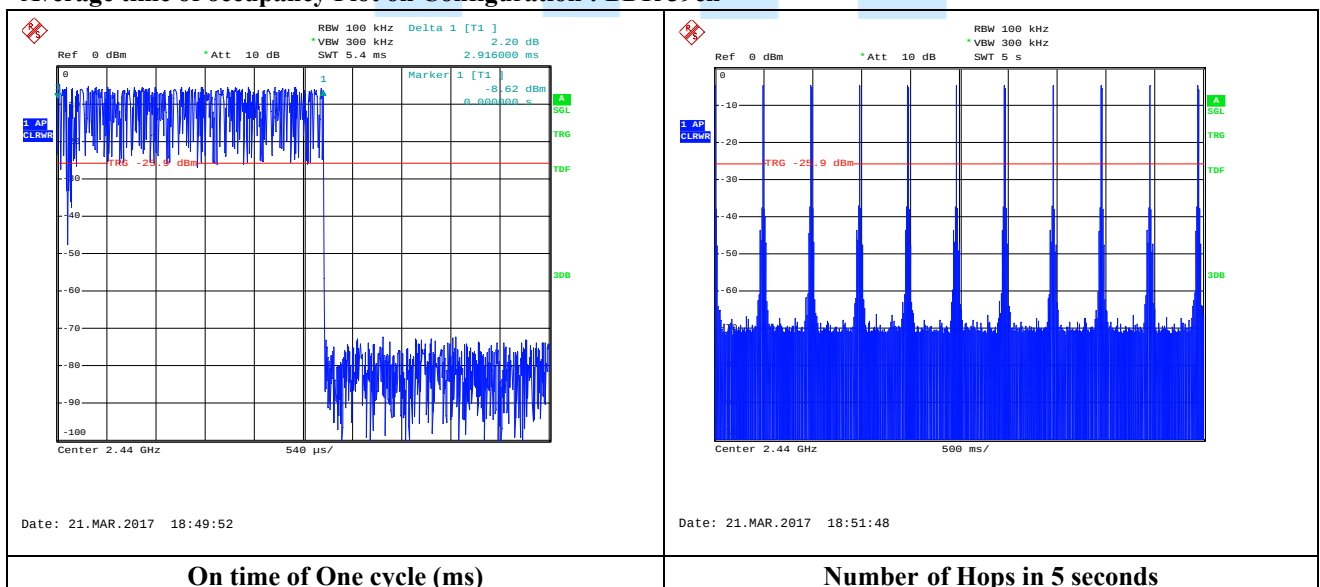
Frequency	On time of one cycle (ms)	Number of Hops in 5 seconds	Average Time of Occupancy (s)	Limit (s)	Result
2 402 MHz	2.9160	11	0.203	0.4	Complies
2 440 MHz	2.9160	11	0.203	0.4	Complies
2 480 MHz	2.9160	11	0.203	0.4	Complies



Average time of occupancy Plot on Configuration : BDR 0ch

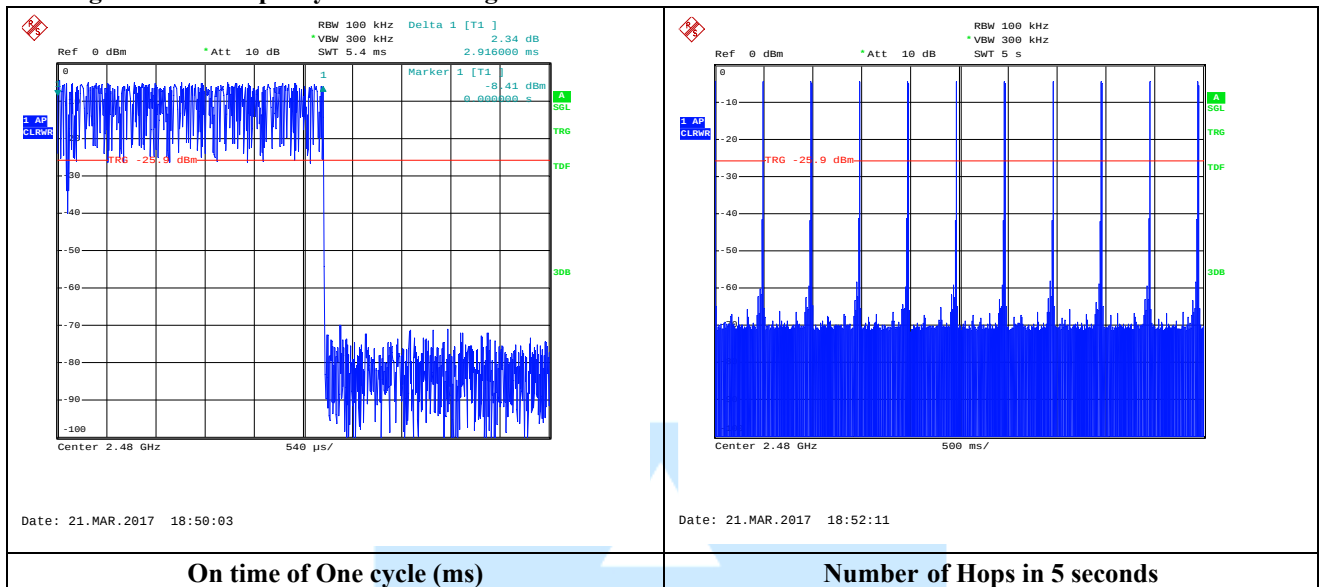


Average time of occupancy Plot on Configuration : BDR 39ch



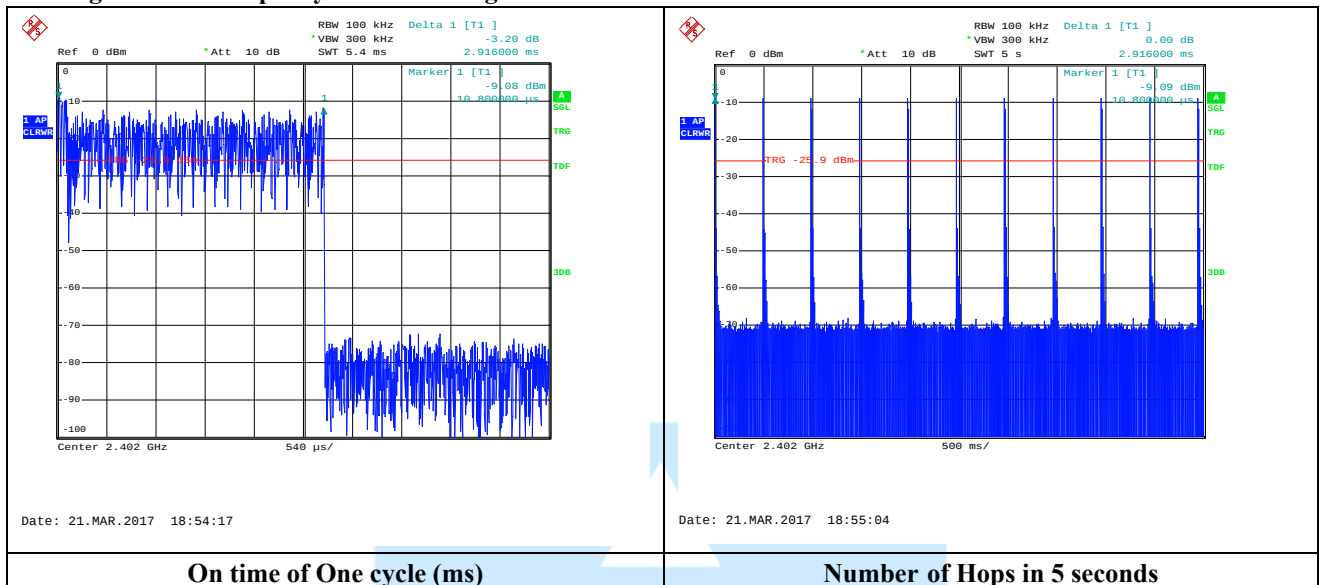


Average time of occupancy Plot on Configuration : BDR 78ch

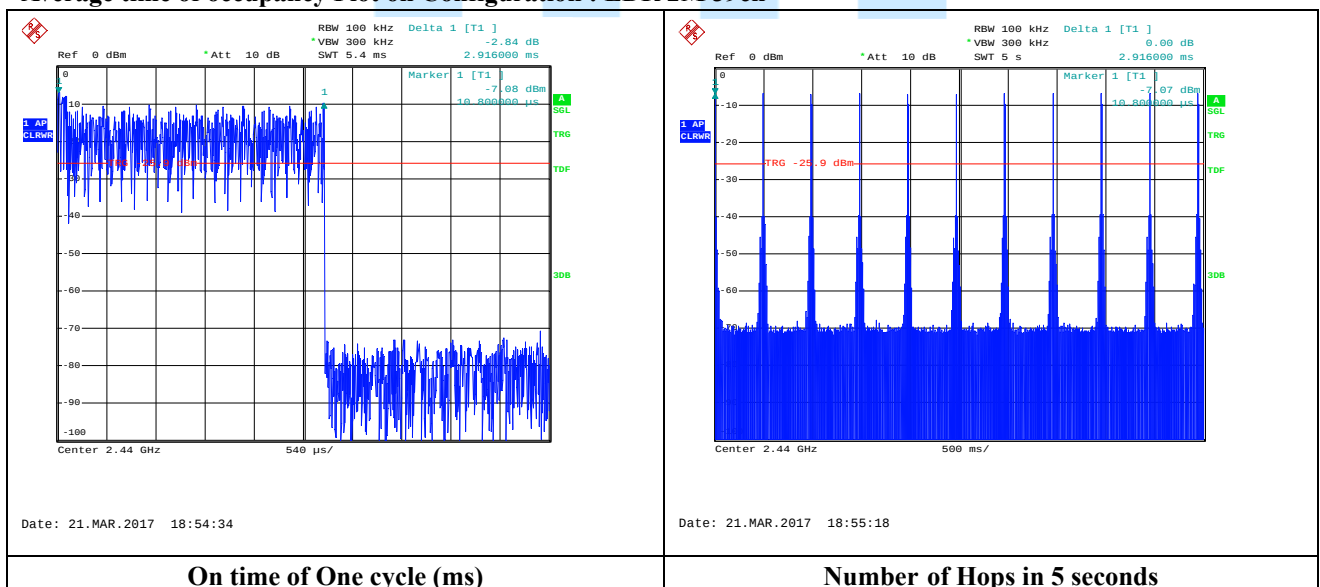




Average time of occupancy Plot on Configuration : EDR 2M 0ch

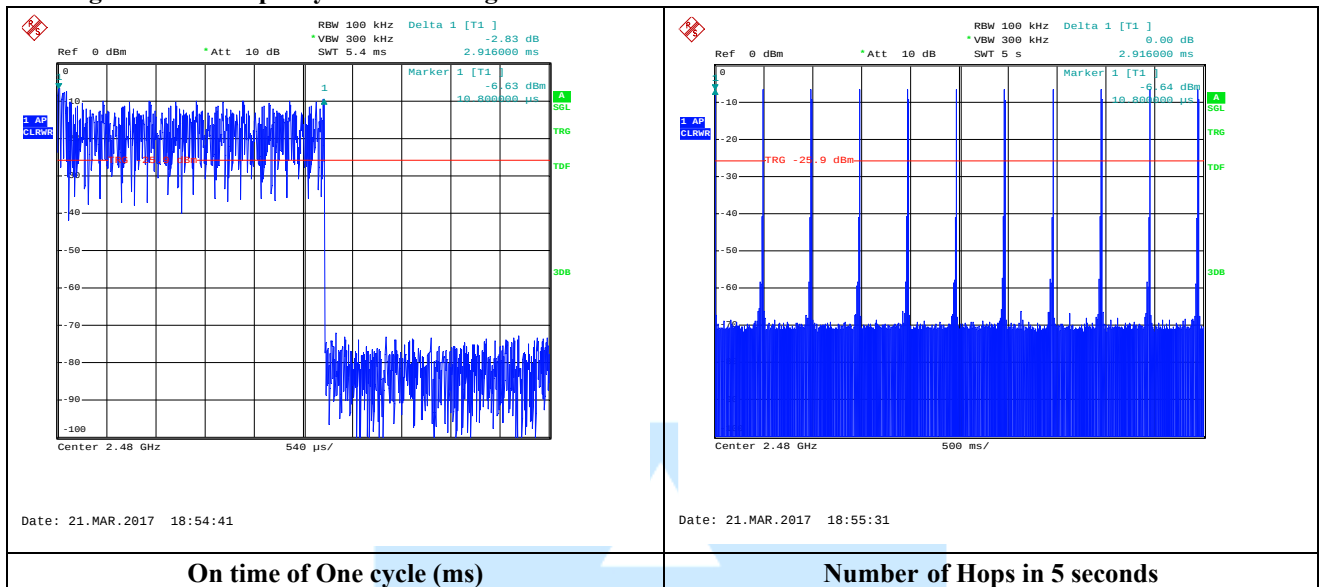


Average time of occupancy Plot on Configuration : EDR 2M 39ch



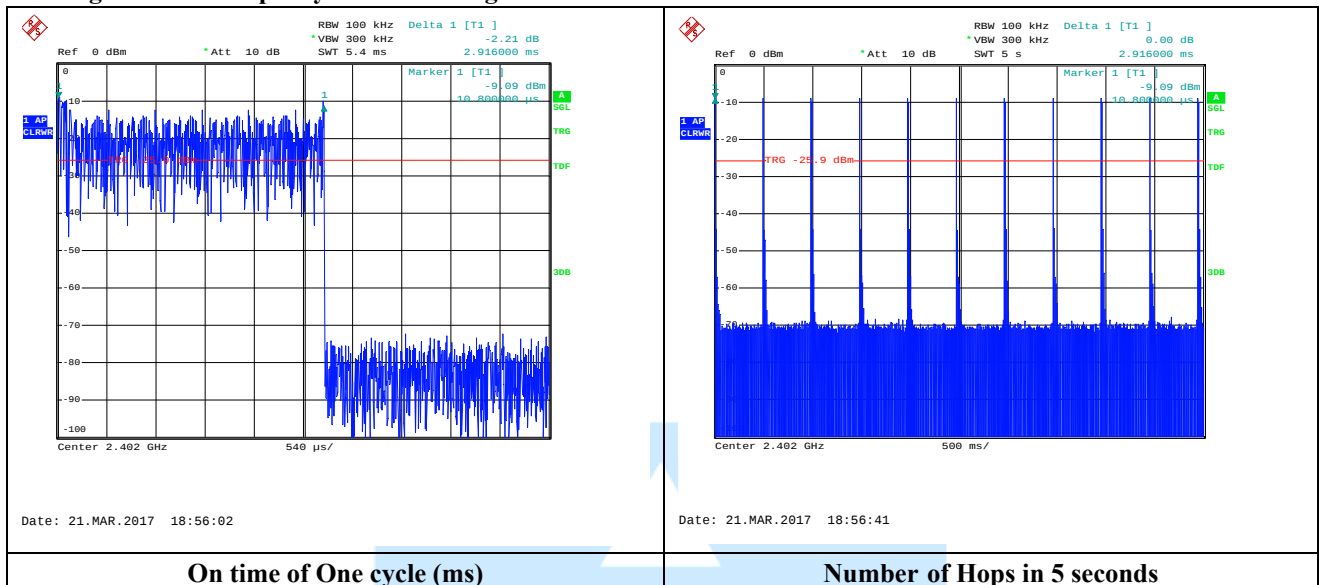


Average time of occupancy Plot on Configuration : EDR 2M 78ch

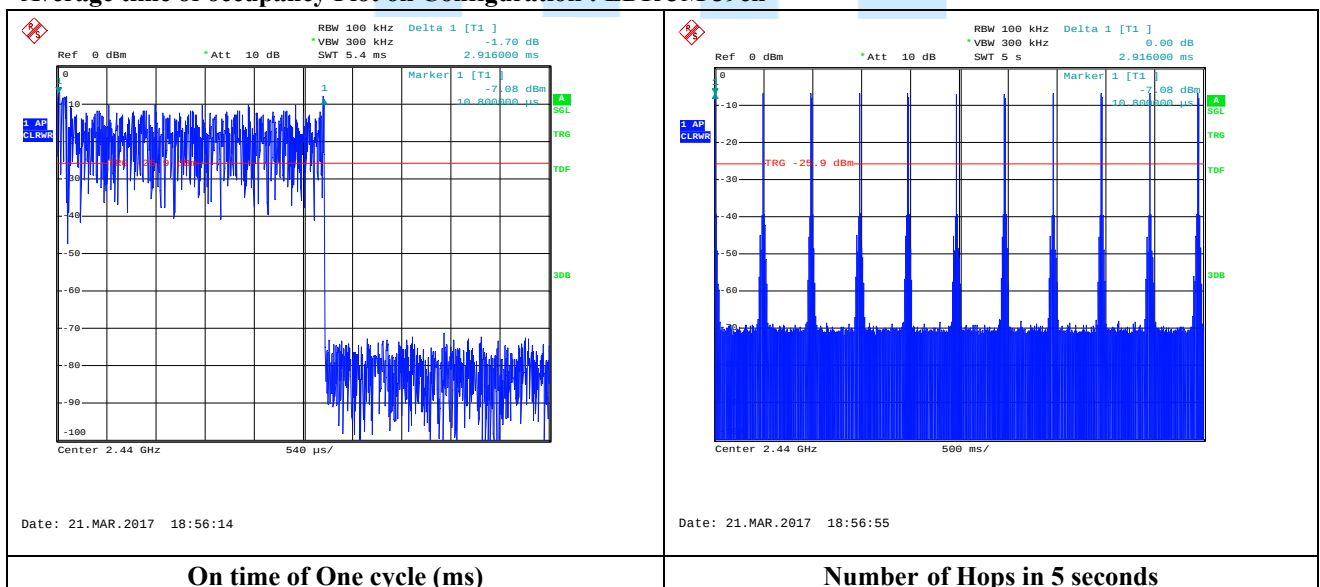




Average time of occupancy Plot on Configuration : EDR 3M 0ch

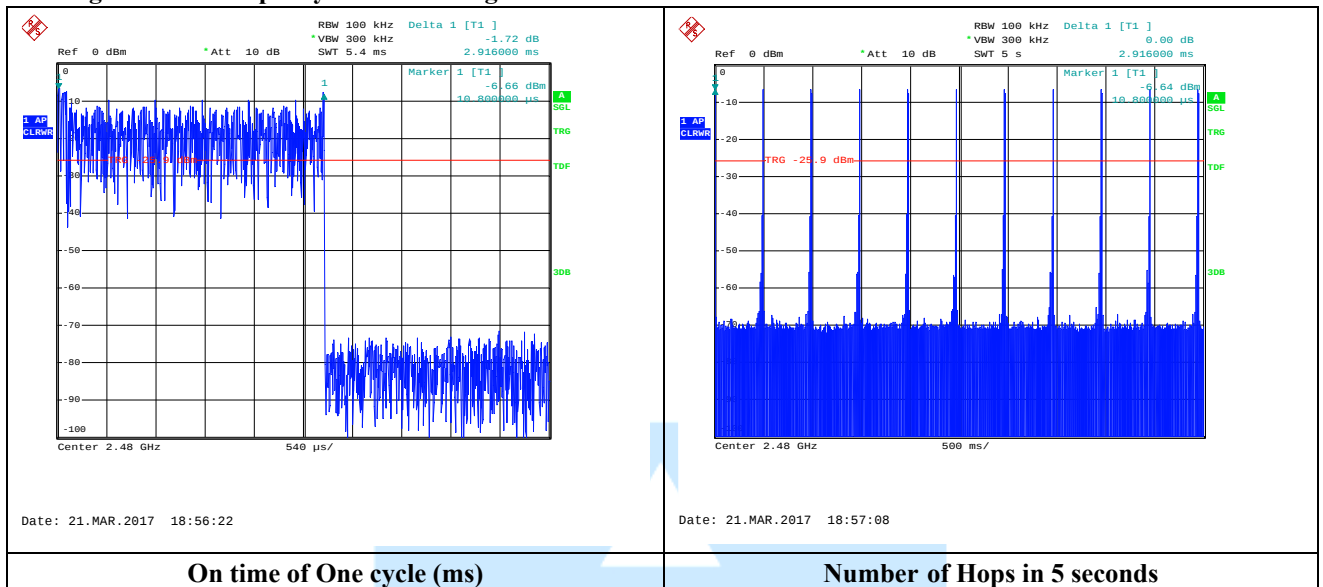


Average time of occupancy Plot on Configuration : EDR 3M 39ch





Average time of occupancy Plot on Configuration : EDR 3M 78ch



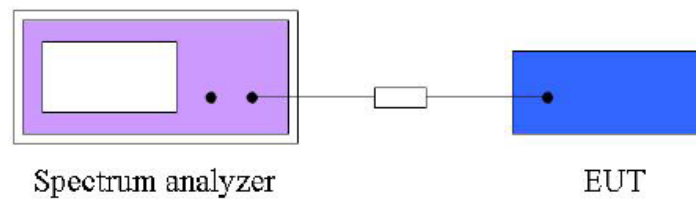


13. Conducted Spurious Emission & Out of Band Emission

13.1 Operating environment

Temperature : 18.3 °C
Relative Humidity : 34.3 % R.H.

13.2 Test set-up (Lay-out)



13.3 Limit

Below -20 dB of the highest emission level of operating band (in 100 kHz resolution band width)

13.4 Test equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - FSP	Rohde & Schwarz	Spectrum Analyzer	101431	Dec. 08, 2017
■ - 56-10	Weinschel	10 dB Attenuator	53184	Apr. 20, 2017

13.5 Test Procedure

- Span : 30 MHz to 10 times the operating frequency in GHz.
- Set the RBW to 100 kHz
- Set the VBW to 300 kHz
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.



13.6 Test Result

- Test Date : March 21, 2017
- Reference standard : Part 15 Subpart C, Sec. 15.247(d)
- Test Procedure(s) : ANSI C63.10 (2013)
- Operating condition : RF transmitting mode (0 ch: 2 402 MHz, 39 ch: 2 440 MHz, 78 ch: 2 480 MHz)
- Power Source : DC 5.0 V

Conducted Spurious Emission BDR

Operating Frequency	100 kHz PSD (dBm)	Spurious Level (dBm)	Deviation (dBc)	Limits (dBc)	Result
2 402 MHz	3.98	-39.65	-43.63	-20.00	Complies
2 440 MHz	5.33	-36.51	-41.84		Complies
2 480 MHz	5.67	-36.00	-41.67		Complies

EDR 2M

Operating Frequency	100 kHz PSD (dBm)	Spurious Level (dBm)	Deviation (dBc)	Limits (dBc)	Result
2 402 MHz	1.15	-41.10	-42.25	-20.00	Complies
2 440 MHz	3.24	-40.78	-44.02		Complies
2 480 MHz	3.60	-41.59	-45.19		Complies

EDR 3M

Operating Frequency	100 kHz PSD (dBm)	Spurious Level (dBm)	Deviation (dBc)	Limits (dBc)	Result
2 402 MHz	1.32	-40.50	-41.82	-20.00	Complies
2 440 MHz	3.32	-40.39	-43.71		Complies
2 480 MHz	3.71	-39.21	-42.92		Complies



**Conducted Out of Band(Band Edge) Emission
BDR**

Operating Frequency	100 kHz PSD (dBm)	Bandedge Level (dBm)	Deviation (dBc)	Limits (dBc)	Result
2 402 MHz	3.98	-37.79	-41.77	-20.00	Complies
2 480 MHz	5.67	-37.38	-43.05		Complies

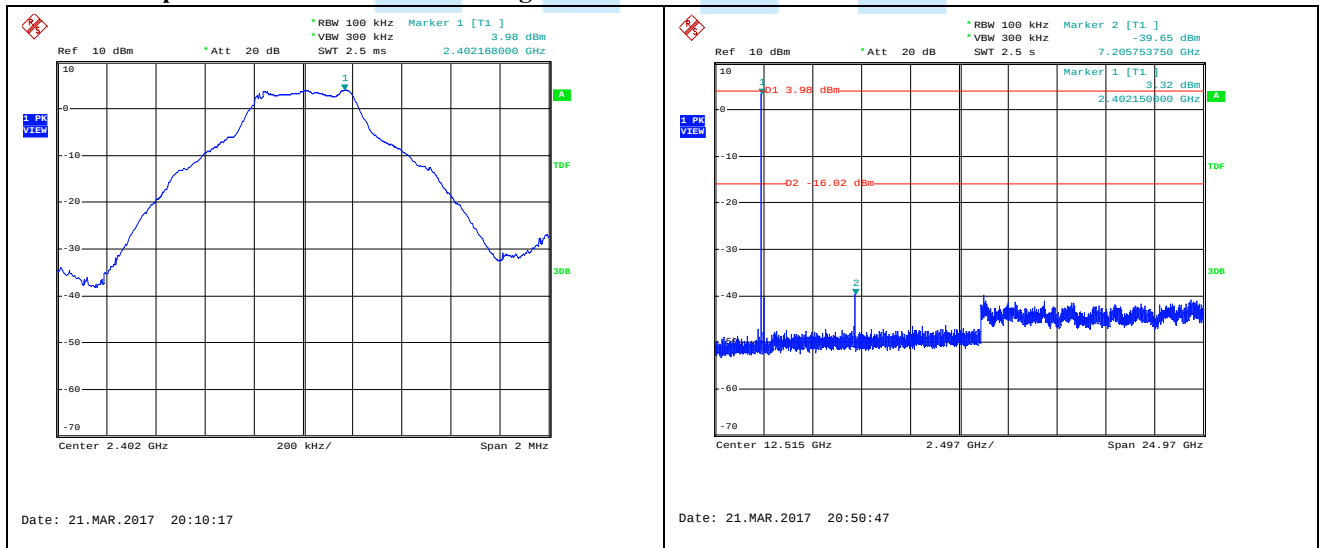
EDR 2M

Operating Frequency	100 kHz PSD (dBm)	Bandedge Level (dBm)	Deviation (dBc)	Limits (dBc)	Result
2 402 MHz	1.15	-37.90	-39.05	-20.00	Complies
2 480 MHz	3.60	-37.32	-40.92		Complies

EDR 3M

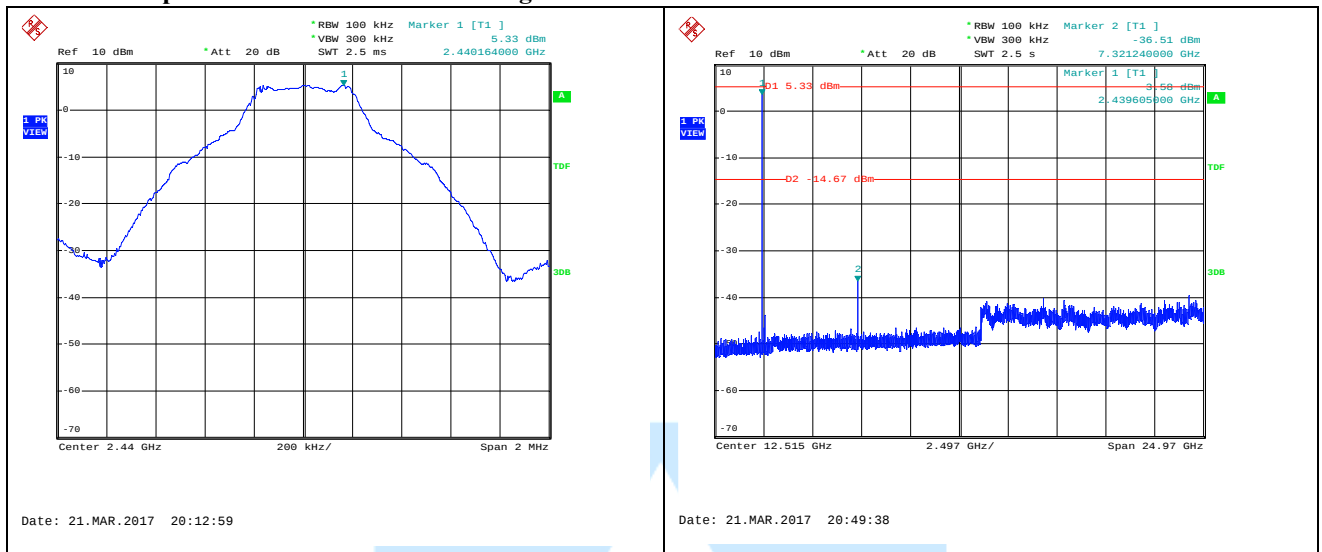
Operating Frequency	100 kHz PSD (dBm)	Bandedge Level (dBm)	Deviation (dBc)	Limits (dBc)	Result
2 402 MHz	1.32	-38.26	-39.58	-20.00	Complies
2 480 MHz	3.71	-37.76	-41.47		Complies

Conducted spurious Emission Plot on Configuration : BDR 0ch

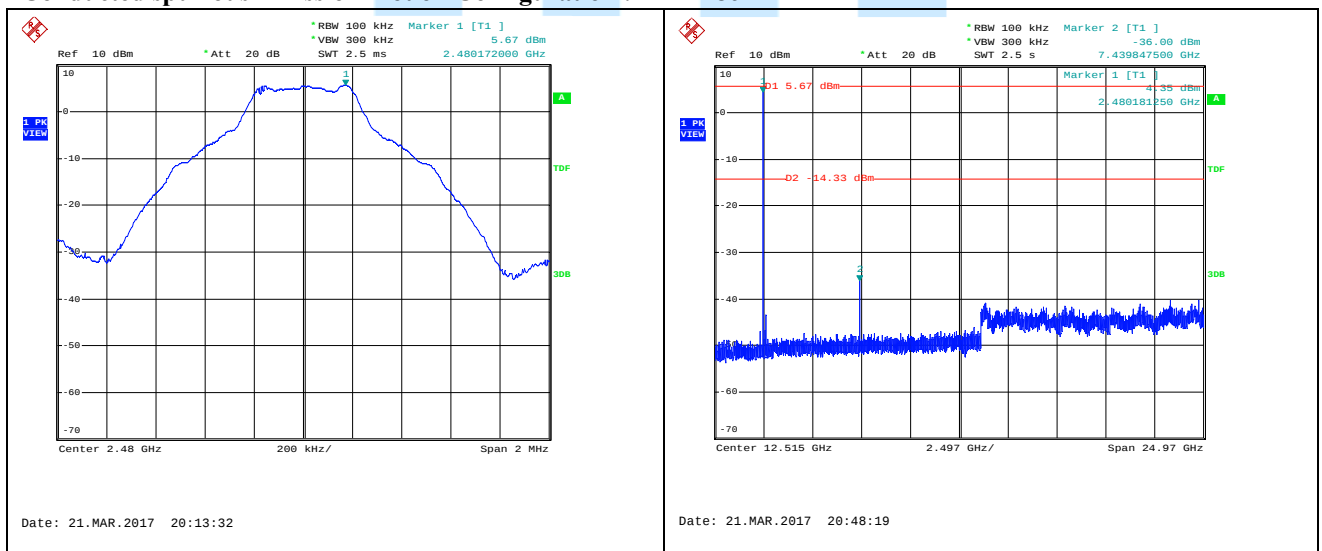




Conducted spurious Emission Plot on Configuration : BDR 39ch

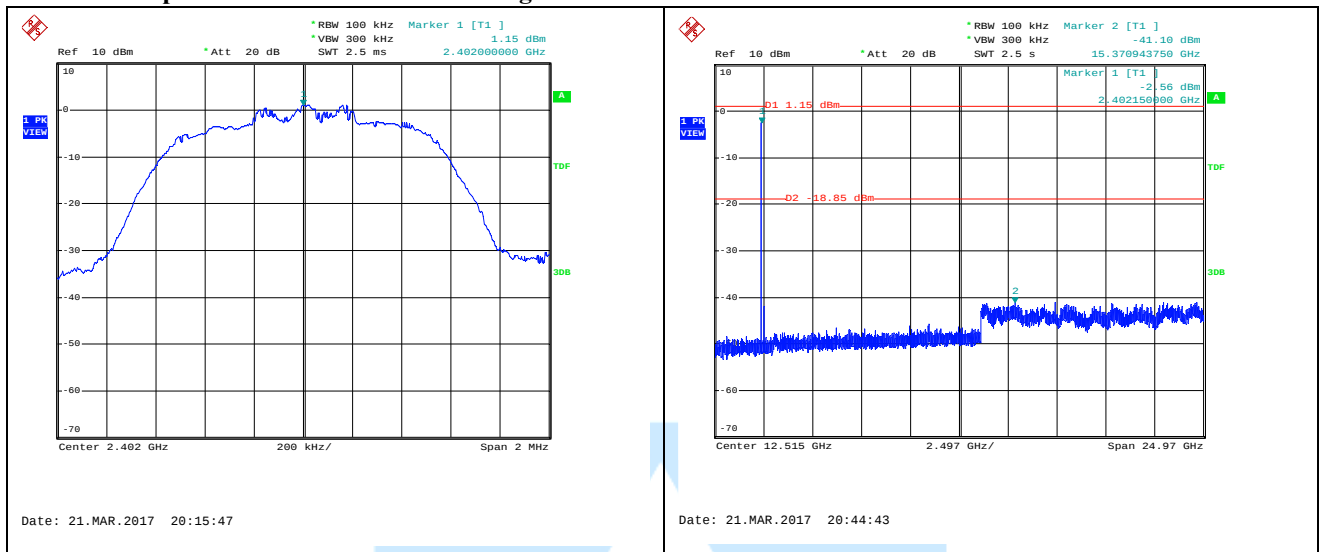


Conducted spurious Emission Plot on Configuration : BDR 78ch

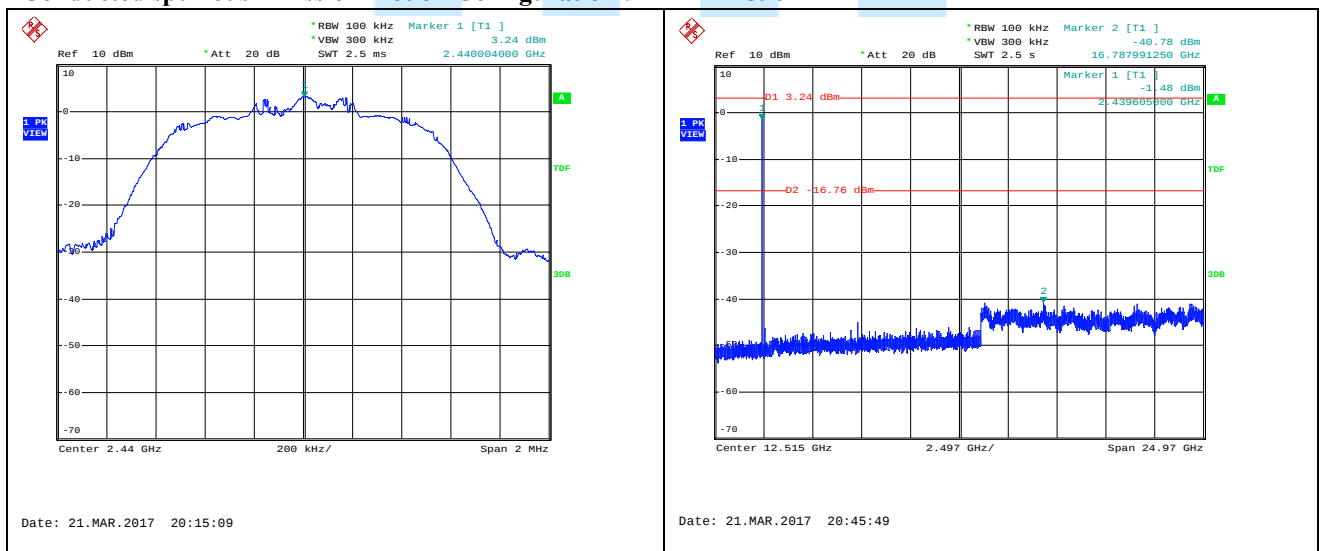




Conducted spurious Emission Plot on Configuration : EDR 2M 0ch

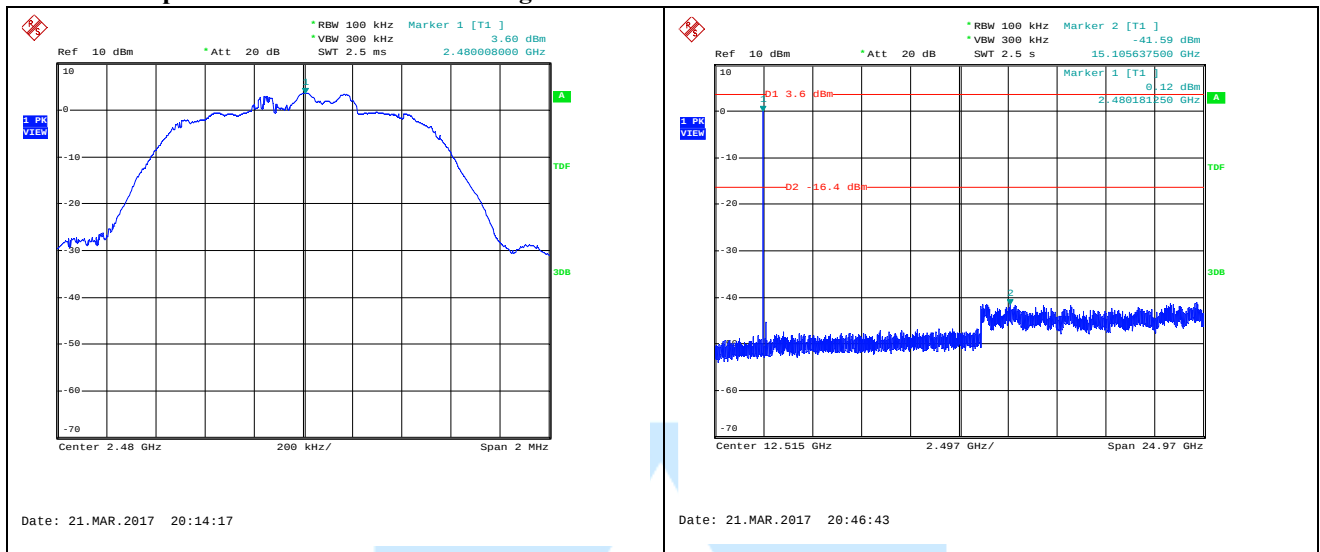


Conducted spurious Emission Plot on Configuration : EDR 2M 39ch

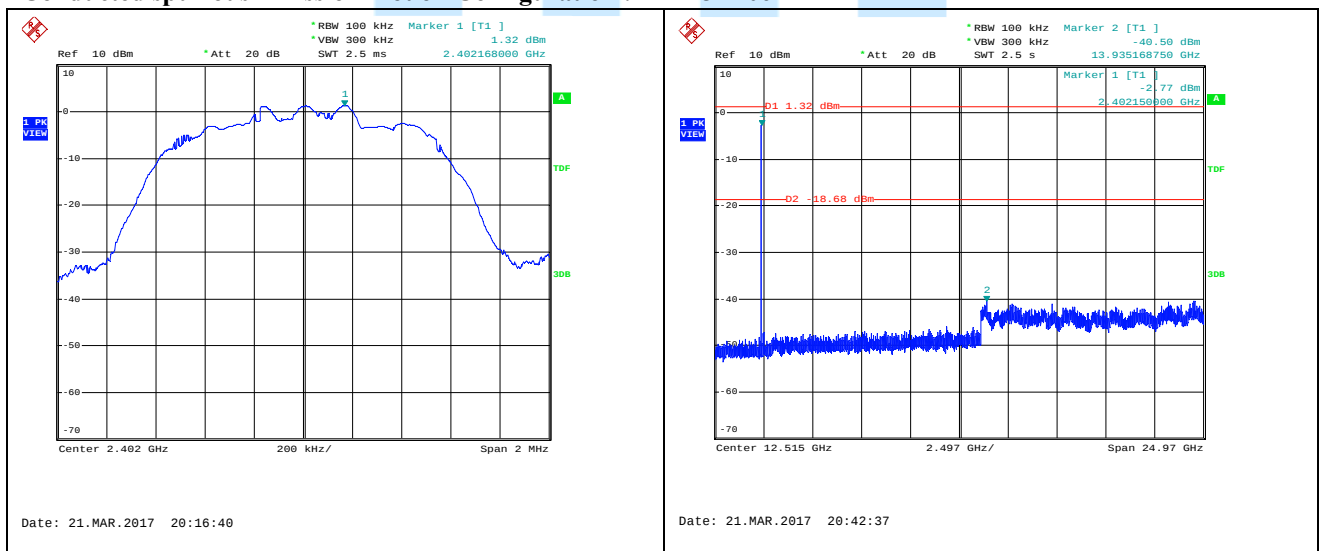




Conducted spurious Emission Plot on Configuration : EDR 2M 78ch

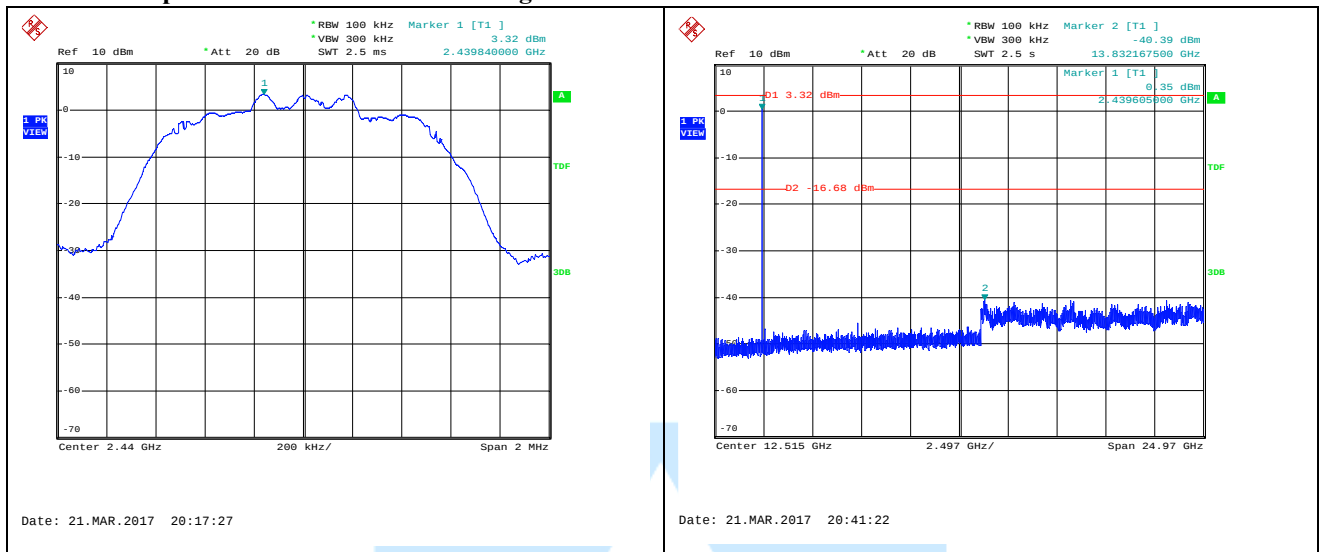


Conducted spurious Emission Plot on Configuration : EDR 3M 0ch

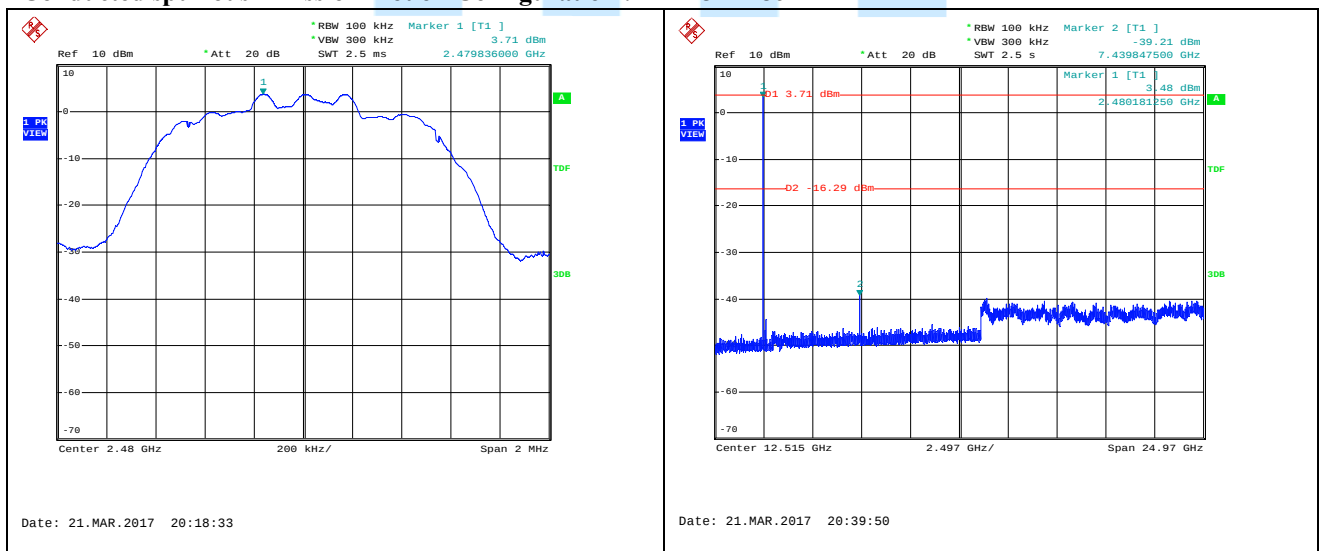




Conducted spurious Emission Plot on Configuration : EDR 3M 39ch

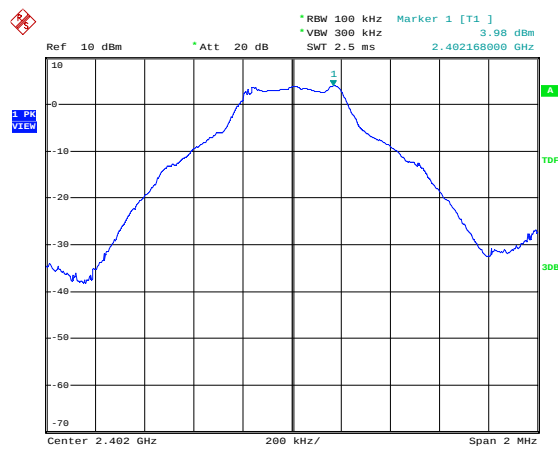


Conducted spurious Emission Plot on Configuration : EDR 3M 78ch

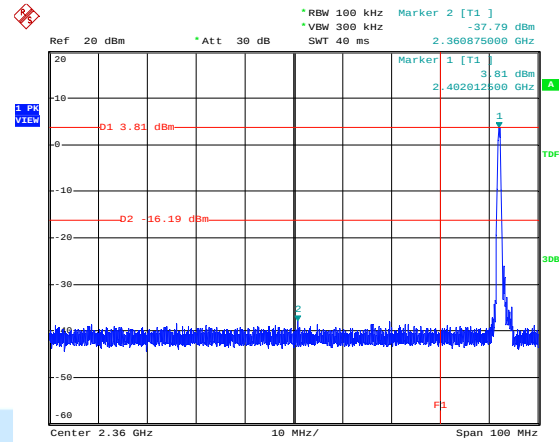




Low Band Edge Plot on Configuration : BDR 0ch



Date: 21.MAR.2017 20:10:17

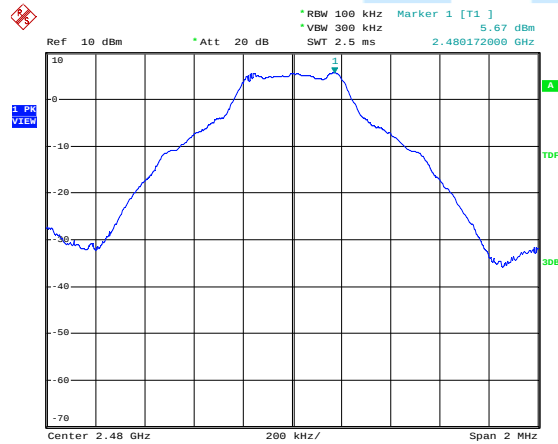


Date: 21.MAR.2017 19:29:48

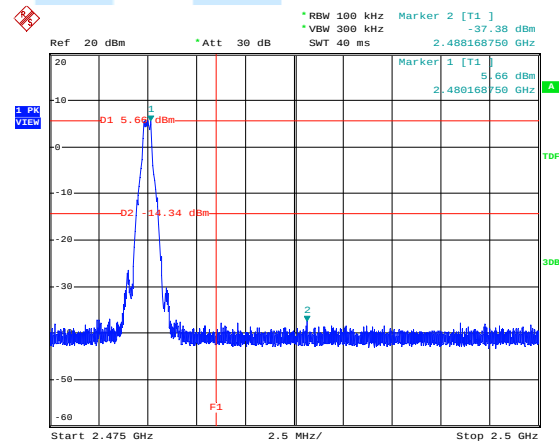
Frequency Line(F1): 2310 MHz

Frequency Line(F2): 2390 MHz

High Band Edge Plot on Configuration : BDR 78ch



Date: 21.MAR.2017 20:13:32



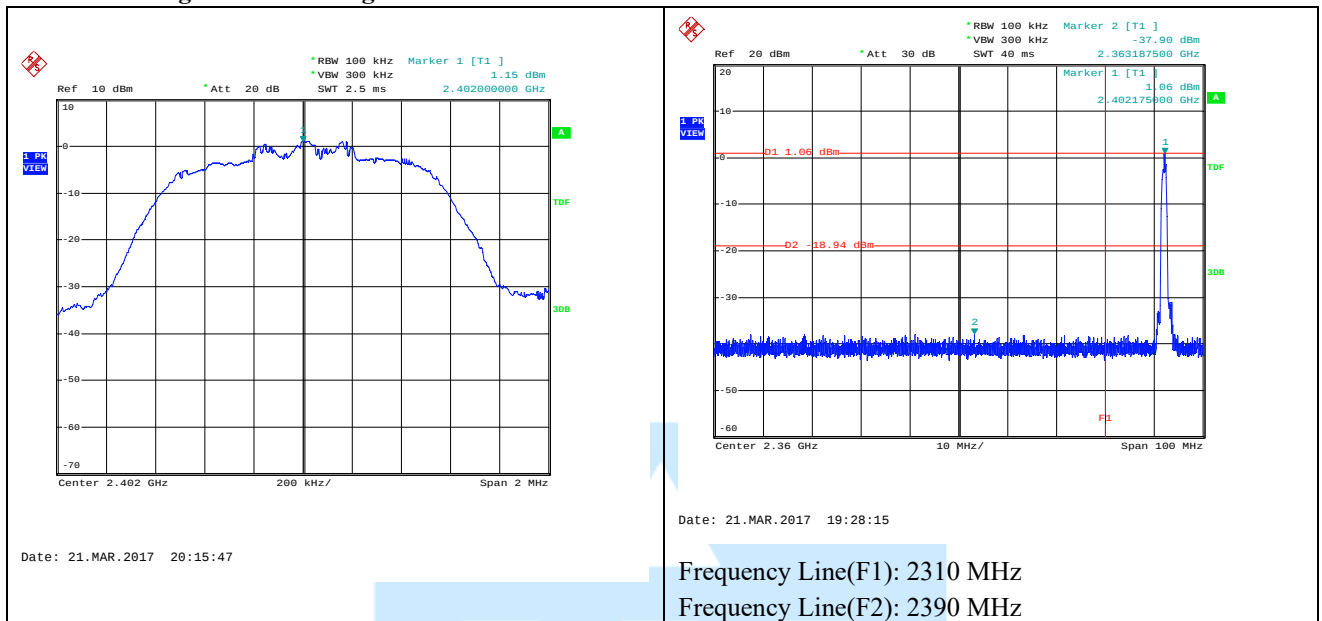
Date: 21.MAR.2017 19:17:39

Frequency Line(F1): 2483.5 MHz

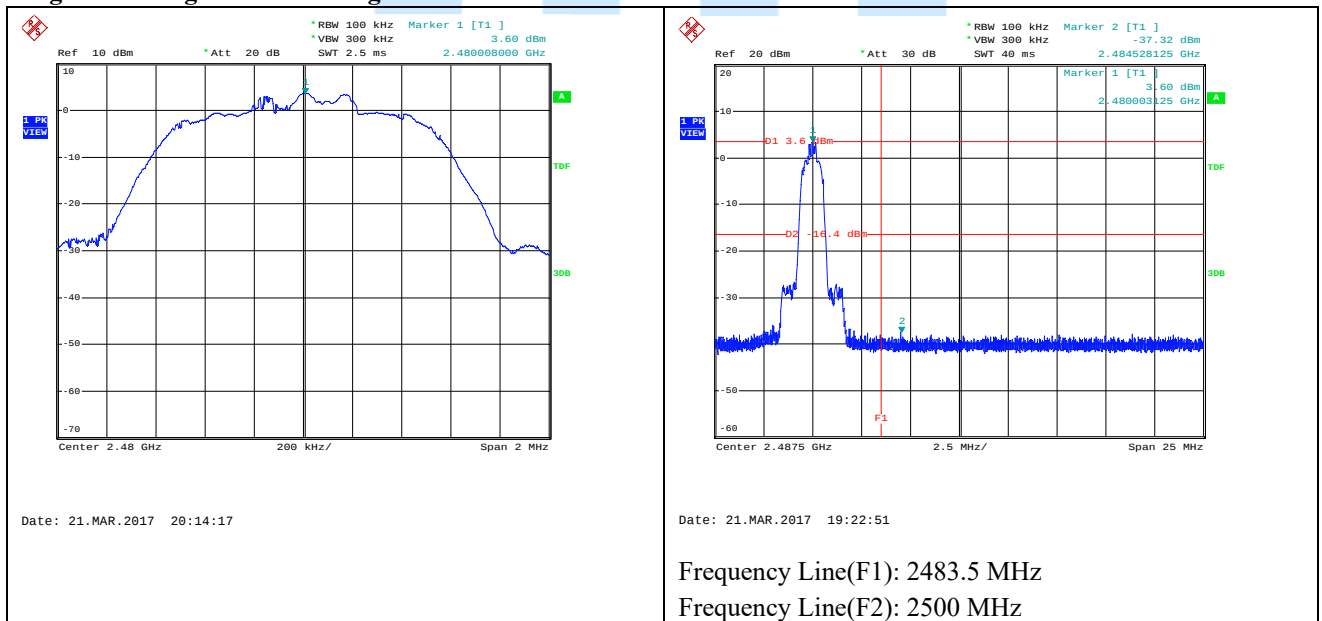
Frequency Line(F2): 2500 MHz



Low Band Edge Plot on Configuration : EDR 2M 0ch

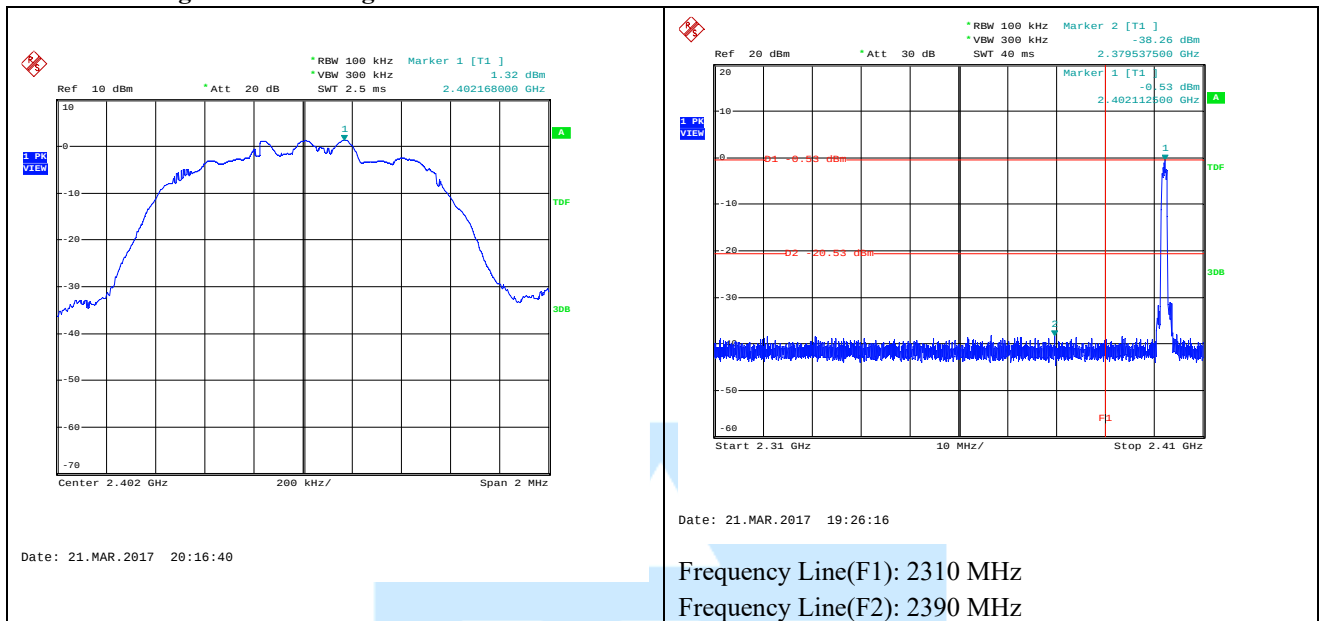


High Band Edge Plot on Configuration : EDR 2M 78ch

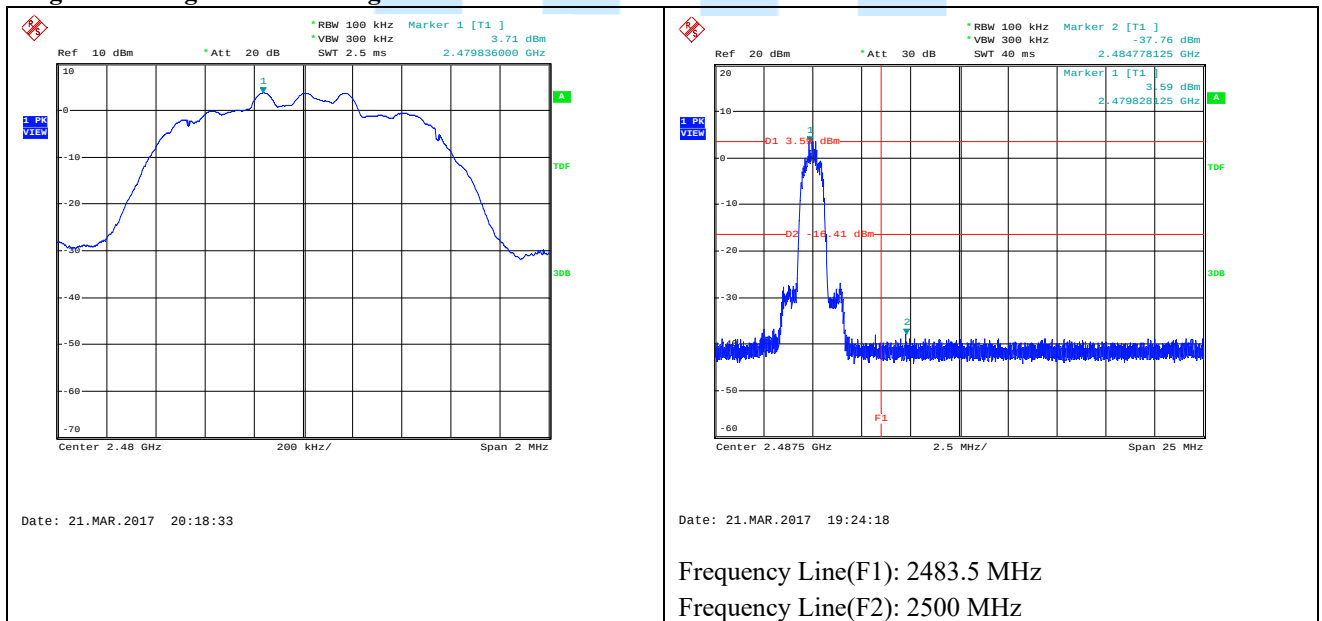




Low Band Edge Plot on Configuration : EDR 3M 0ch

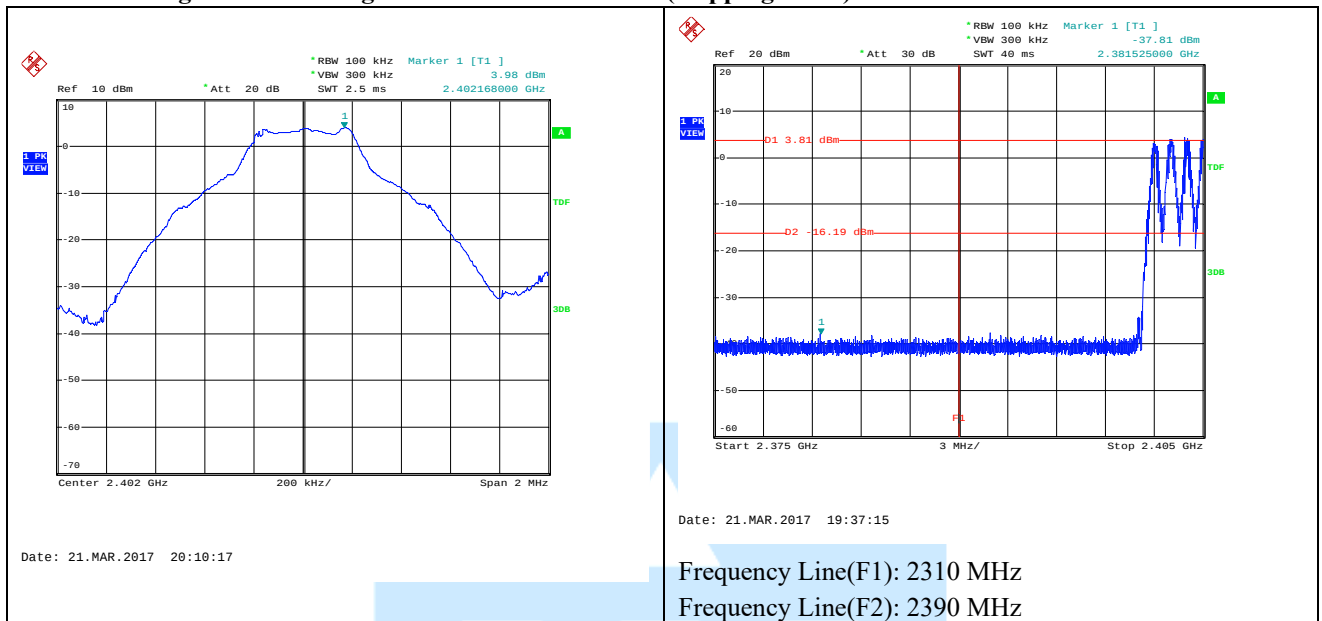


High Band Edge Plot on Configuration : EDR 3M 78ch

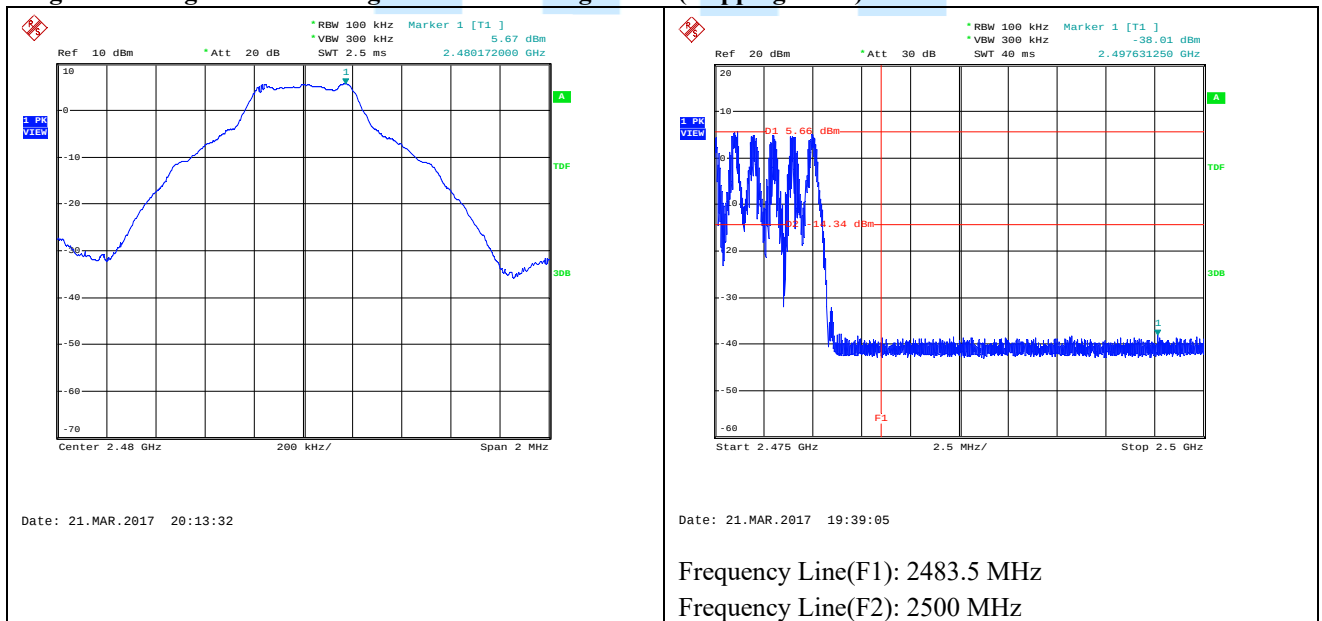




Low Band Edge Plot on Configuration : BDR Low band (Hopping mode)

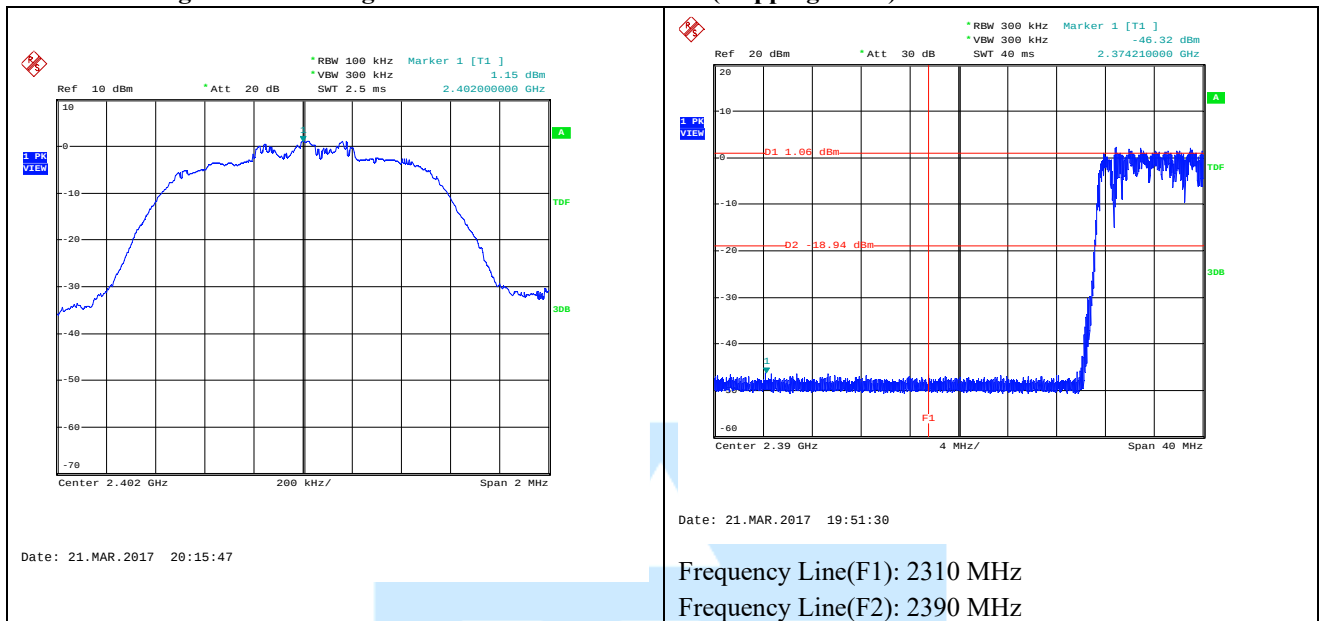


High Band Edge Plot on Configuration : BDR High band (Hopping mode)

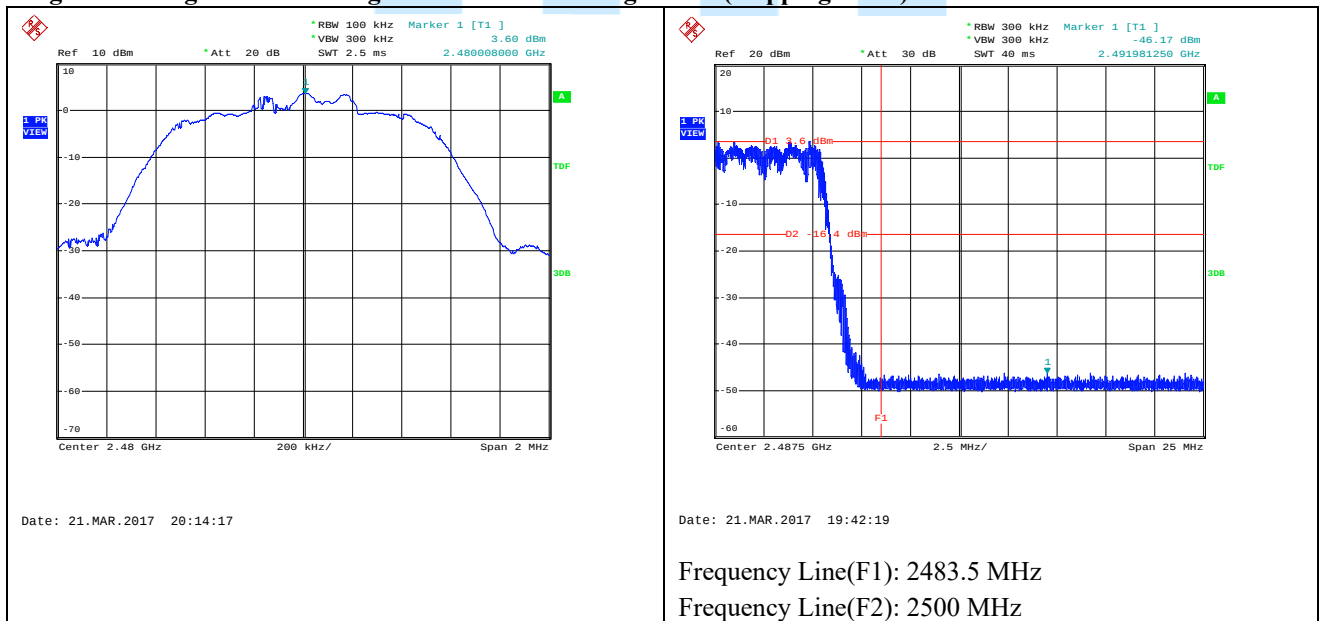




Low Band Edge Plot on Configuration : EDR 2M Low band (Hopping mode)

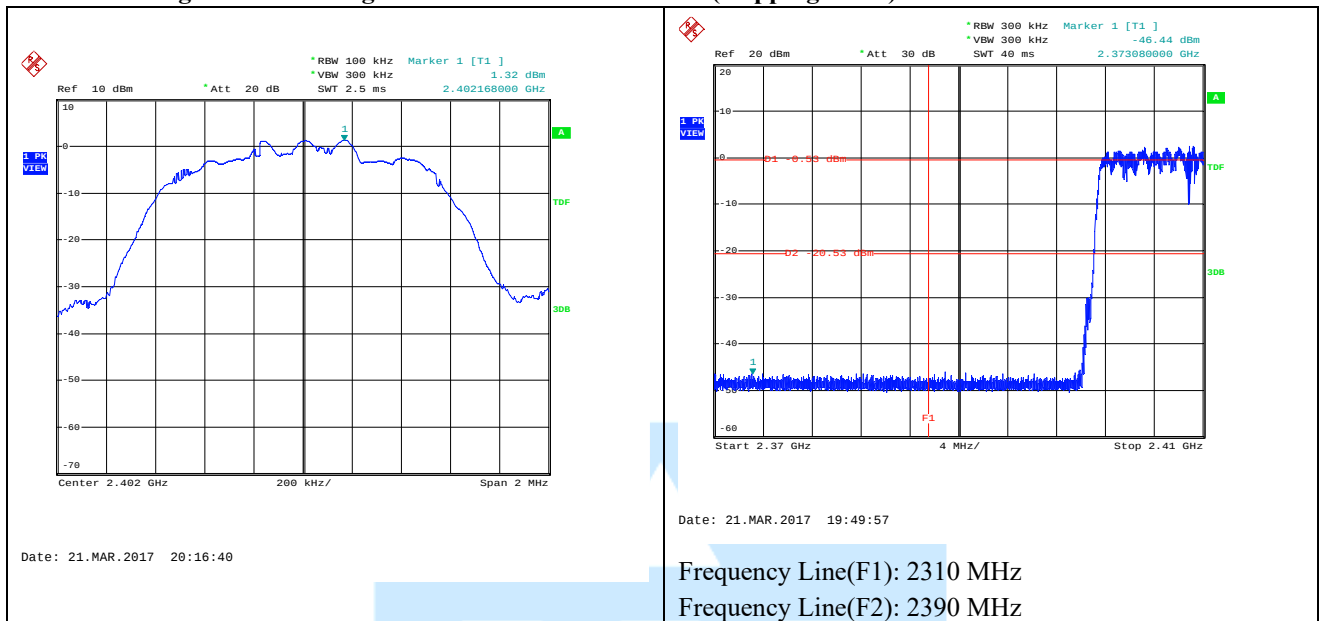


High Band Edge Plot on Configuration : EDR 2M High band (Hopping mode)

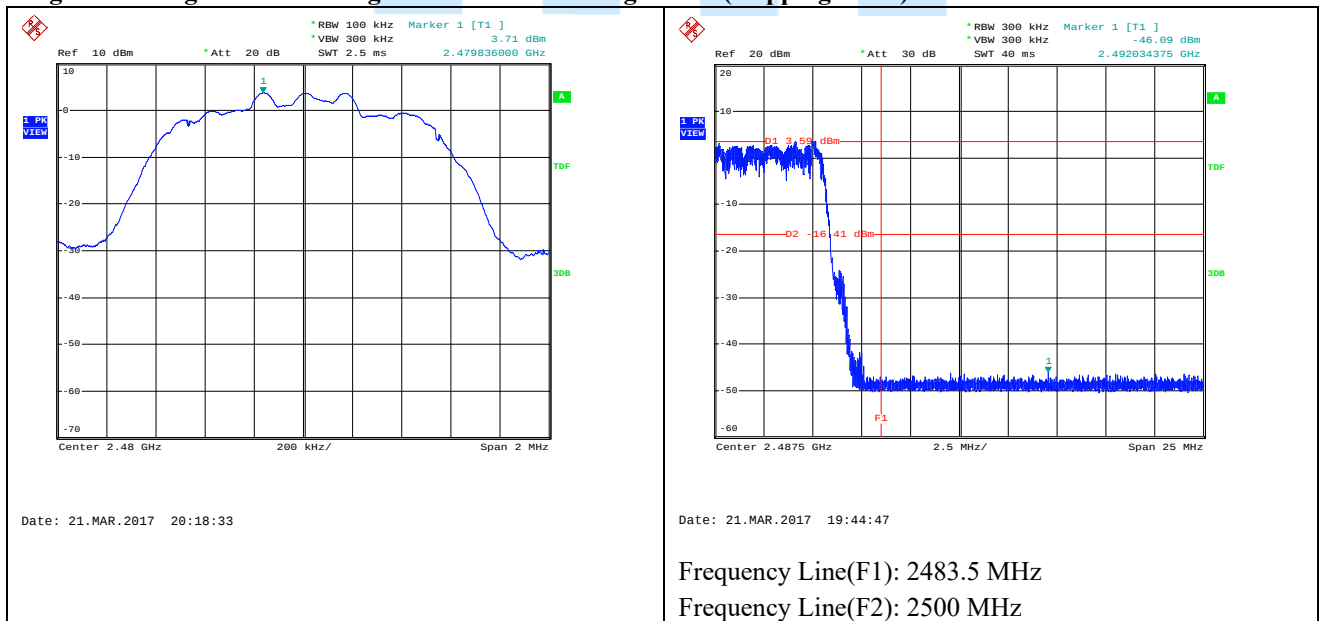




Low Band Edge Plot on Configuration : EDR 3M Low band (Hopping mode)



High Band Edge Plot on Configuration : EDR 3M High band (Hopping mode)





12. AC Power line Conducted emission

-Test Description

The Line conducted emission test facility is inside a 4 m × 8 m × 2.5 m shielded enclosure. (Test firm Registration Number: 269701)

The EUT was placed on a non-conducting 1.0 m by 1.5 m table, which is 0.8 m in height and 0.4 m away from the vertical wall of the shielded enclosure.

The EUT is powered from the Rohde & Schwarz LISN (ENV216) and the support equipment is powered from the Rohde & Schwarz LISN (ENV216). Powers to the LISN are filtered by high-current high insertion loss power line filter.

Sufficient time for EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.

The RF output of the LISN was connected to the EMI test receiver (Rohde & Schwarz, ESCI).

Exploratory measurements were conducted to identify the highest emission by operating the EUT in a range of typical modes of operation, cable positions, system configuration and arrangement.

Based on exploratory measurements, the final measurements were conducted at the worst test conditions.

Exploratory measurements were scanned using Peak mode of EMI Test receiver from 150 kHz to 30 MHz with 20 ms sweep time. The final measurements were measured with Quasi-Peak and Average mode.

The bandwidth of EMI Test Receiver was set to 9 kHz. Interface cables were connected to the available interface ports of the test unit. Excess cable lengths were bundled at center with 30 cm ~ 40 cm.

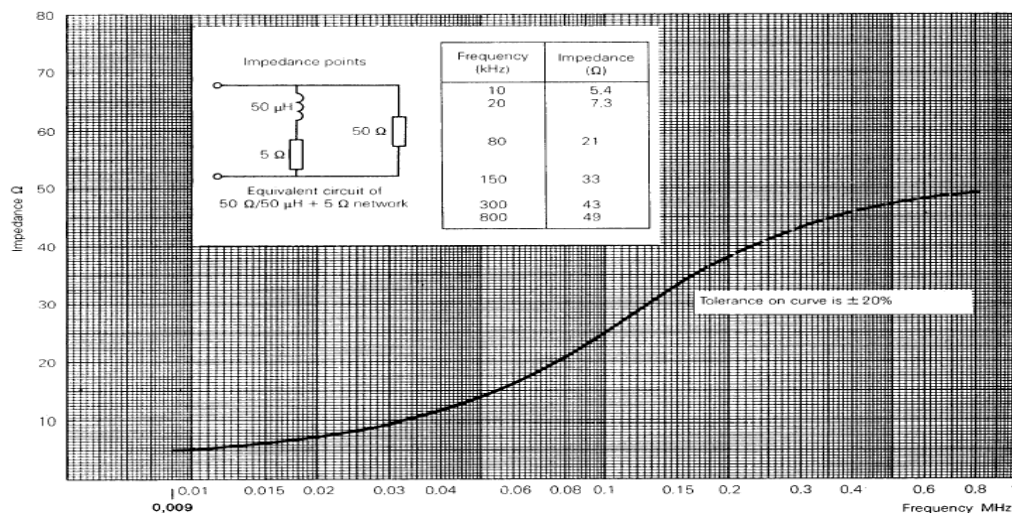


Fig 2. Impedance of LISN



12.1 Operating Environment

Temperature : 25.9 °C
Relative Humidity : 41.1 % R.H.

12.2 Test Set-up

The conducted emission measurements were performed in the shielded room.

The EUT was placed on wooden table, 0.8 m heights above the floor, 0.4 m from the reference ground plane (GRP) wall and 0.8 m from AMN & ISN.

AMN is bonded on horizontal reference ground plane.

The ground plane, which was electrically bonded to the shield room, ground system and all power lines entering the shield room, were filtered.

12.3 Measurement Uncertainty

The measurement uncertainty was calculated in accordance with ISO "Guide to the expression of uncertainty in measurement."

The measurement uncertainty was given with a confidence of 95 %.

Test Items	Uncertainty	Remark
Conducted emission (9 kHz ~ 150 kHz)	3.85 dB	Confidence level of approximately 95 % ($k = 2$)
Conducted emission (150 kHz ~ 30 MHz)	3.32 dB	Confidence level of approximately 95 % ($k = 2$)

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

The listed uncertainties are the worst case uncertainty for the entire range of measurement. please note that the uncertainty values are provided for informational purposes only are not used in determining the PASS/FAIL results



12.4 Limit

RFI Conducted	FCC Limit(dBμV/m) Class B	
Freq. Range	Quasi-Peak	Average
150 kHz ~ 0.5 MHz	66 ~ 56*	56 ~ 46*
0.5 MHz ~ 5 MHz	56	46
5 MHz ~ 30 MHz	60	50
*Limits decreases linearly with the logarithm of frequency.		

12.5 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■- ESCI	Rohde & Schwarz	EMI test receiver	100237	Apr 18. 2017
■- ENV216	Rohde & Schwarz	LISN	100172	Apr 19. 2017
□- ENV216	Rohde & Schwarz	LISN	100173	Apr 19. 2017
□ - ISN T8	TESEQ. GmbH	ISN	24568	Apr 22. 2017
■- EMC 32	Rohde & Schwarz	Testing Software	VER8.53	N/A

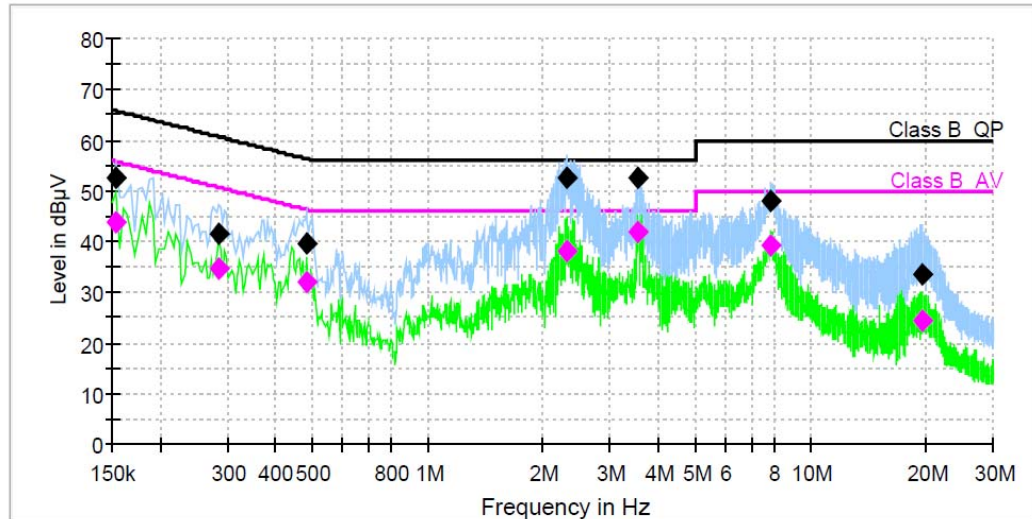
12.6 Test data for Conducted Emission

- Test Date	: April 05, 2017
- Reference Standard	: Part 15 Subpart C, Sec. 15.207
- Test Procedure(s)	: ANSI C63.10 (2013)
- Operating Condition	: RF transmitting mode
- Power Source	: AC 120 V / 60 Hz
- Frequency rage	: 0.15 MHz ~ 30 MHz
- Line	: AC Power line(Live with Neutral)
- Comment	: N/A



12.7 Test Result

Test Condition : BDR



Class B_QP
Preview Result 2-AVG
Class B_AV
Final Result 1-QPK
Preview Result 1-PK+
Final Result 2-CAV

Final Result 1

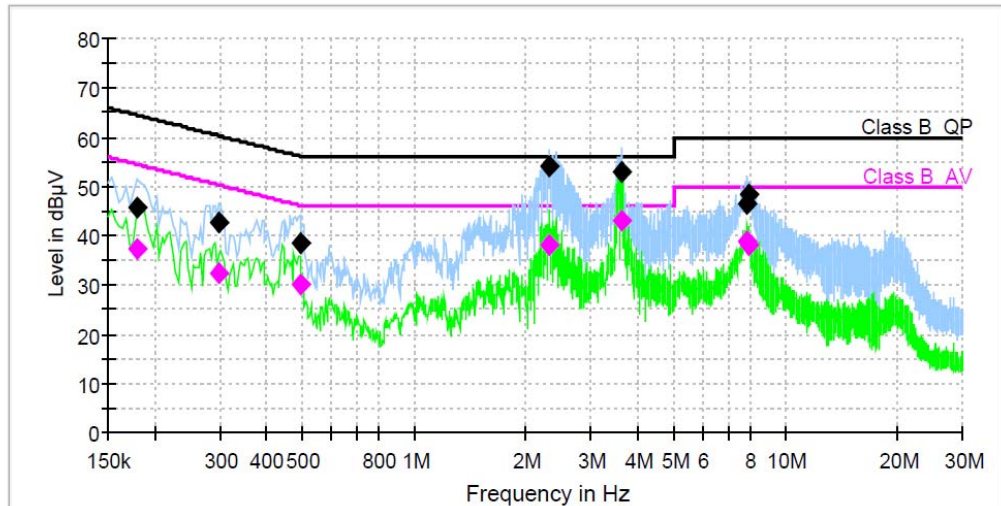
Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.153731	52.4	200.0	9.000	Off	L1	9.6	13.4	65.8	
0.284325	41.4	200.0	9.000	Off	L1	9.6	19.3	60.7	
0.482081	39.5	200.0	9.000	Off	L1	9.6	16.8	56.3	
2.302931	52.5	200.0	9.000	Off	L1	9.7	3.5	56.0	
3.545438	52.6	200.0	9.000	Off	L1	9.8	3.4	56.0	
7.843838	48.1	200.0	9.000	Off	N	9.9	11.9	60.0	
19.649513	33.6	200.0	9.000	Off	L1	10.0	26.4	60.0	

Final Result 2

Frequency (MHz)	CAverage (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.153731	43.9	200.0	9.000	Off	L1	9.6	11.9	55.8	
0.284325	34.5	200.0	9.000	Off	L1	9.6	16.2	50.7	
0.482081	31.9	200.0	9.000	Off	L1	9.6	14.4	46.3	
2.302931	38.3	200.0	9.000	Off	L1	9.7	7.7	46.0	
3.545438	42.0	200.0	9.000	Off	L1	9.8	4.0	46.0	
7.843838	39.3	200.0	9.000	Off	N	9.9	10.7	50.0	
19.649513	24.3	200.0	9.000	Off	L1	10.0	25.7	50.0	



Test Condition : EDR2M



Class B_QP
Preview Result 2-AVG
Class B_AV
Final Result 1-QPK
Preview Result 1-PK+
Final Result 2-CAV

Final Result 1

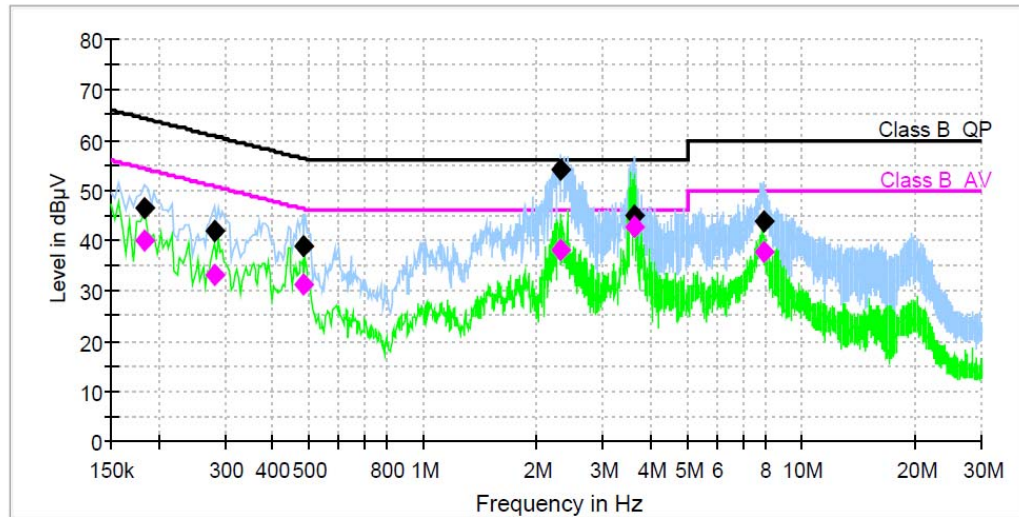
Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.179850	45.7	200.0	9.000	Off	N	9.6	18.8	64.5	
0.299250	42.8	200.0	9.000	Off	L1	9.6	17.4	60.3	
0.493275	38.3	200.0	9.000	Off	N	9.7	17.8	56.1	
2.306663	54.0	200.0	9.000	Off	N	9.7	2.0	56.0	
3.608869	53.1	200.0	9.000	Off	N	9.8	2.9	56.0	
7.907269	46.6	200.0	9.000	Off	N	9.9	13.4	60.0	
7.978163	48.5	200.0	9.000	Off	L1	9.8	11.5	60.0	

Final Result 2

Frequency (MHz)	CAverage (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.179850	37.4	200.0	9.000	Off	N	9.6	17.1	54.5	
0.299250	32.2	200.0	9.000	Off	L1	9.6	18.0	50.3	
0.493275	29.9	200.0	9.000	Off	N	9.7	16.2	46.1	
2.306663	38.1	200.0	9.000	Off	N	9.7	7.9	46.0	
3.608869	43.0	200.0	9.000	Off	N	9.8	3.0	46.0	
7.907269	38.7	200.0	9.000	Off	N	9.9	11.3	50.0	
7.978163	38.2	200.0	9.000	Off	L1	9.8	11.8	50.0	



Test Condition : EDR3M



Class B_QP Class B_AV Preview Result 1-PK+
Preview Result 2-AVG Final Result 1-QPK Final Result 2-CAV

Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.183581	46.4	200.0	9.000	Off	N	9.6	17.9	64.3	
0.280594	41.8	200.0	9.000	Off	L1	9.6	19.0	60.8	
0.482081	39.0	200.0	9.000	Off	L1	9.6	17.3	56.3	
2.306663	54.1	200.0	9.000	Off	L1	9.7	1.9	56.0	
3.605138	45.0	200.0	9.000	Off	L1	9.8	11.0	56.0	
7.925925	43.8	200.0	9.000	Off	N	9.9	16.2	60.0	

Final Result 2

Frequency (MHz)	CAverage (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.183581	40.2	200.0	9.000	Off	N	9.6	14.2	54.3	
0.280594	33.2	200.0	9.000	Off	L1	9.6	17.6	50.8	
0.482081	31.1	200.0	9.000	Off	L1	9.6	15.2	46.3	
2.306663	38.0	200.0	9.000	Off	L1	9.7	8.0	46.0	
3.605138	42.5	200.0	9.000	Off	L1	9.8	3.5	46.0	
7.925925	37.8	200.0	9.000	Off	N	9.9	12.2	50.0	

13. Radiated Spurious & Restricted Band Edge Emission

Exploratory Radiated measurements were conducted at the 3m semi anechoic chamber in order to identify the highest emission by operating the EUT in a range of typical modes of operation, cable positions, system configuration and arrangement.

Based on exploratory measurements, the final measurements were conducted at the worst test conditions.

Final measurements of below 1GHz were made at 3m or 10 m Chamber that complies with CISPR 16/ANSI C63.10. Above 1GHz final measurements were conducted at the 3m Chamber only.

For measurements above 1GHz, the bottom side of 3m chamber was installed with absorbers in order to meet SVSWR Limit.

Exploratory measurements were scanned using Peak mode of EMI Test receiver and final measurements were measured with Quasi-Peak mode (Below 1GHz) and Peak & Average mode (Above 1GHz).

The measurements were performed by rotating the EUT 360° and adjusting the receive antenna height from 1.0 m to 4.0 m. All frequencies were investigated in both horizontal and vertical antenna polarity.

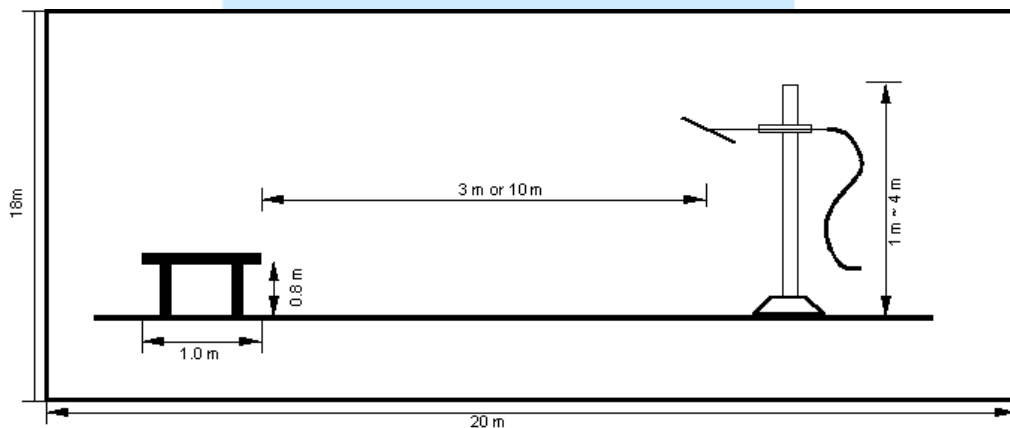


Fig 3. Dimensions of test site (Below 1GHz)

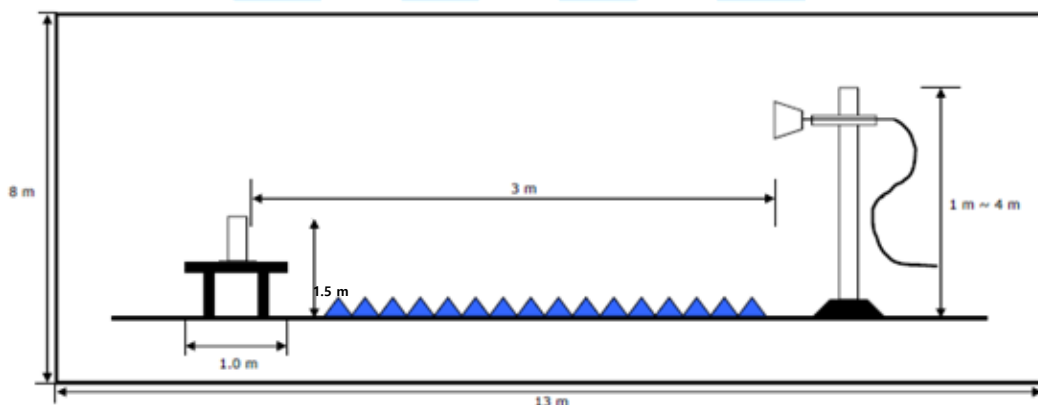


Fig 4. Dimensions of test site (Above 1GHz)



13.1 Operating environment

Temperature : 22.4 °C
Relative humidity : 54.3 % R.H.

13.2 Test set-up

A preliminary and final measurement was at 3 m anechoic chamber.

The EUT was placed on a non-conducting table.

For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane.

For emission measurements above 1 GHz, the table height is 1.5 m above the reference ground plane.

The turntable with EUT was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels.

This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

13.3 Measurement uncertainty

The measurement uncertainty was calculated in accordance with ISO “Guide to the expression of uncertainty in measurement”.

The measurement uncertainty was given with a confidence of 95 %.

Test items(Anechoic Chamber)	Uncertainty	Remark
Radiated emission (30 MHz ~ 300 MHz, 3 m, Vertical)	4.78 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (30 MHz ~ 300 MHz, 3 m, Horizontal)	4.77 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Vertical)	5.06 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Horizontal)	5.03 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (1 000 MHz ~ 6 000 MHz, 3 m, V/H)	5.42 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (6 000 MHz ~ 18 000 MHz, 3 m, V/H)	5.64 dB	Confidence level of approximately 95 % ($k = 2$)

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

The listed uncertainties are the worst case uncertainty for the entire range of measurement. please note that the uncertainty values are provided for informational purposes only are not used in determining the PASS/FAIL results



13.4 Limit

20 dB in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (microvolt/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2 400/F (kHz)	300
0.490 ~ 1.705	2 400/F (kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

13.5 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESU40	Rohde & Schwarz	EMI Test Receiver	100266	Jul. 20, 2017
■ - HFH2-Z2	Rohde & Schwarz	Loop Antenna	100041	Dec. 21, 2017
■ - VULB9160	Schwarzbeck	Broadband Test Antenna	3099	Aug. 03. 2017
■ - BBHA9120D	Schwarzbeck	Horn Antenna	207	Oct. 14. 2017
■ - 3160-09	Schwarzbeck	Horn Antenna	LM3981	Oct. 27. 2017
■ - MCU066	maturo GmbH	Position Controller	1390306	N/A
■ - TT2.5SI	maturo GmbH	Turntable	1390307	N/A
■ - AM 4.0	maturo GmbH	Antenna Mast	1390308	N/A
■ - AFS 44 00101800-25-10P-44	MITEQ	Preamplifier	1258943	Dec. 06. 2017
■ - SCU-F1826-G47-BZ42-CSS	BONN Elektronik	Preamplifier	10003	Dec. 09. 2017
■ - WHKX3.0/18G-10SS	WAINWRIGHT INSTRUMENTS	High pass filter	SN31	Apr. 19, 2017
■- EMC 32	Rohde & Schwarz	Testing Software	VER9.15	N/A



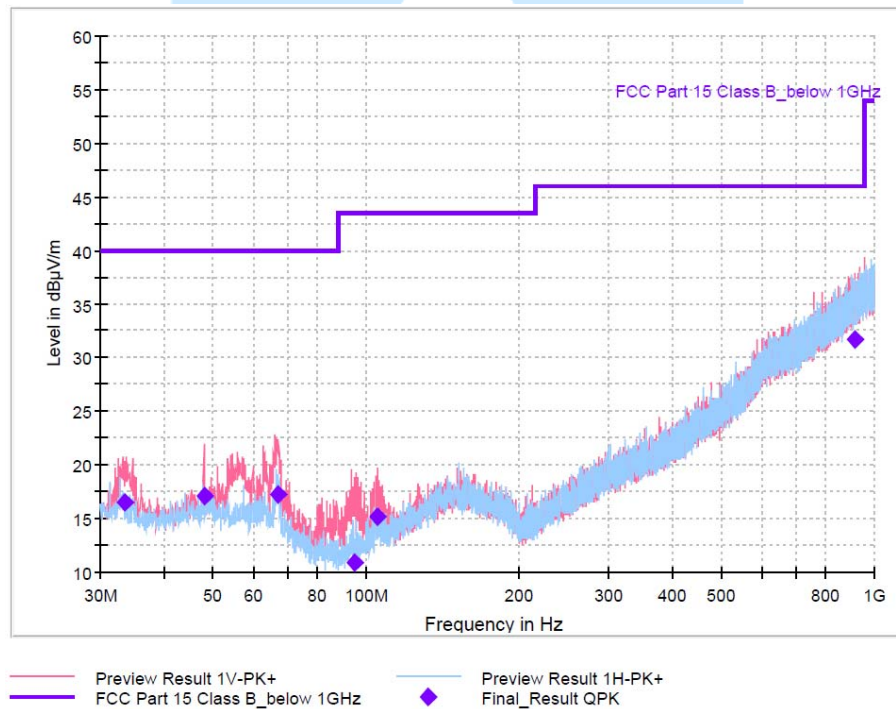
13.6 Test data for Radiated Spurious Emission

- Test Date : March. 31~ April. 02, 2017
- Reference Standard : Part 15 Subpart C, Sec. 15.247(d)
- Measuring Distance : 3 m
- Resolution Bandwidth : 200 Hz, 9 kHz(Below 30 MHz) / 120 kHz(30 MHz ~ 1GHz) / 1 MHz(Above 1GHz)
- Detector mode : Quasi Peak detector mode / Peak detector mode / Average detector mode
- Power Source : DC 5 V
- Note :

Radiated Spurious Emission (9 kHz to 30 MHz)

※ The emission level was not found.

Radiated Spurious Emission (30 MHz to 1 000 MHz)



Final Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
33.438750	16.48	40.00	23.52	1000.0	120.000	100.0	V	-7.0	12.6
48.025000	17.05	40.00	22.95	1000.0	120.000	181.0	V	198.0	13.4
67.101250	17.16	40.00	22.84	1000.0	120.000	109.0	V	113.0	11.9
95.116250	10.89	43.50	32.61	1000.0	120.000	106.0	V	18.0	10.4
105.296250	15.14	43.50	28.36	1000.0	120.000	325.0	V	272.0	11.6
918.192500	31.62	46.00	14.38	1000.0	120.000	225.0	V	15.0	32.0



Radiated Spurious Emission (1 GHz to 25 GHz): BDR0ch

Frequency (MHz)	Measurement Level							Limit (dBμV/m)		Margin (dB)		Positioning System		
	Reading Value (dBμV/m)		AF (dB/m)	AMP / CL (dB)	Duty Cycle collection (dB)	Test Result (dBμV/m)						PoL (H/V)	Height (cm)	Angle (°)
	Peak	Average				Peak	Average	Peak	Average					
2246.41	51.47	40.88	26.44	-37.11	-	40.80	30.21	74.00	54.00	33.20	23.79	H	106	7
2298.11	53.83	44.10	26.61	-37.11	-	43.33	33.60	74.00	54.00	30.67	20.40	H	150	155
2532.03	62.51	53.26	27.31	-36.97	-	52.85	43.60	74.00	54.00	21.15	10.40	H	153	146
2558.17	65.24	56.63	27.35	-36.86	-	55.73	47.12	74.00	54.00	18.27	6.88	H	109	167
4804.40	53.90	41.89	30.70	-34.83	-	49.77	37.76	74.00	54.00	24.23	16.24	V	151	118
7206.50	52.11	39.42	35.75	-34.10	-	53.76	41.07	74.00	54.00	20.24	12.93	H	185	237

Radiated Spurious Emission (1 GHz to 25 GHz): BDR 39ch

Frequency (MHz)	Measurement Level							Limit (dBµV/m)		Margin (dB)		Positioning System		
	Reading Value (dBµV/m)		AF	AMP / CL	Duty Cycle collection	Test Result (dBµV/m)						Pol.	Height	Angle
	Peak	Average	(dB/m)	(dB)	(dB)	Peak	Average	Peak	Average	Peak	Average	(H/V)	(cm)	(°)
1500.87	46.31	33.99	25.04	-37.53	-	33.82	21.50	74.00	54.00	40.18	32.50	H	125	95
1725.40	47.49	34.51	25.31	-37.46	-	35.34	22.36	74.00	54.00	38.66	31.64	V	106	12
2247.04	46.97	34.38	26.45	-37.11	-	36.31	23.72	74.00	54.00	37.69	30.28	H	165	39
2570.05	58.76	50.19	27.37	-36.86	-	49.27	40.70	74.00	54.00	24.73	13.30	H	139	231
2595.78	60.89	51.79	27.41	-36.86	-	51.44	42.34	74.00	54.00	22.56	11.66	H	146	233
4879.60	51.09	39.29	30.81	-34.83	-	47.07	35.27	74.00	54.00	26.93	18.73	H	175	143
7319.50	56.00	43.29	35.96	-34.10	-	57.86	45.15	74.00	54.00	16.14	8.85	V	125	11

Radiated Spurious Emission (1 GHz to 25 GHz): BDR 78ch

Frequency (MHz)	Measurement Level							Limit (dBµV/m)		Margin (dB)		Positioning System		
	Reading Value (dBµV/m)		AF	AMP / CL	Duty Cycle collection	Test Result (dBµV/m)						Pol.	Height	Angle
	Peak	Average	(dB/m)	(dB)	(dB)	Peak	Average	Peak	Average	Peak	Average	(H/V)	(cm)	(°)
1715.15	46.96	34.47	25.30	-37.46	-	34.80	22.31	74.00	54.00	39.20	31.69	H	106	16
2323.89	57.81	49.07	26.69	-36.94	-	47.56	38.82	74.00	54.00	26.44	15.18	H	106	294
2610.00	57.08	48.30	27.43	-36.87	-	47.64	38.86	74.00	54.00	26.36	15.14	H	146	121
2636.14	58.57	49.65	27.47	-36.87	-	49.17	40.25	74.00	54.00	24.83	13.75	H	147	234
4959.60	51.89	40.10	30.93	-34.50	-	48.32	36.53	74.00	54.00	25.68	17.47	H	166	213
7439.60	58.79	47.41	36.19	-34.10	-	60.88	49.50	74.00	54.00	13.12	4.50	H	225	282
12399.10	57.29	43.46	38.47	-34.10	-	61.66	47.83	74.00	54.00	12.34	6.17	H	168	74

Note:

If the maximized peak measured value complies with the average limit, then it is unnecessary to perform an average measurement.

Test result = Reading: + AF+AMP / CL

Where, AF : Antenna Collection Factor,

AMP / CL = Cable loss + Preamplifier gain + High Pass filter.

※ High Pass filter use to range of 3 GHz to 18 GHz

Pol.: H(Horizontal), V(Vertical)



Radiated Spurious Emission (1 GHz to 25 GHz): EDR2M 0ch

Frequency (MHz)	Measurement Level							Limit (dBμV/m)		Margin (dB)		Positioning System		
	Reading Value (dBμV/m)		AF	AMP / CL	Duty Cycle collection	Test Result (dBμV/m)						Pol	Height	Angle
	Peak	Average	(dB/m)	(dB)	(dB)	Peak	Average	Peak	Average	Peak	Average	(H/V)	(cm)	(°)
1501.79	55.29	34.16	25.04	-37.53	-	42.80	21.67	74.00	54.00	31.20	32.33	V	106	117
2123.54	62.29	35.01	26.05	-37.04	-	51.30	24.02	74.00	54.00	22.70	29.98	V	100	334
2532.22	60.59	49.91	27.31	-36.97	-	50.93	40.25	74.00	54.00	23.07	13.75	H	100	42
2557.85	62.17	51.91	27.35	-36.86	-	52.66	42.40	74.00	54.00	21.34	11.60	H	125	65
7206.40	50.25	36.15	35.75	-34.10	-	51.90	37.80	74.00	54.00	22.10	16.20	H	216	280
10880.50	45.55	32.33	39.69	-34.10	-	51.14	37.92	74.00	54.00	22.86	16.08	V	175	235

Radiated Spurious Emission (1 GHz to 25 GHz): EDR2M 39ch

Frequency (MHz)	Measurement Level							Limit (dBμV/m)		Margin (dB)		Positioning System		
	Reading Value (dBμV/m)		AF	AMP / CL	Duty Cycle collection	Test Result (dBμV/m)						Pol	Height	Angle
	Peak	Average	(dB/m)	(dB)	(dB)	Peak	Average	Peak	Average	Peak	Average	(H/V)	(cm)	(°)
2284.10	53.40	42.43	26.57	-37.11	-	42.86	31.89	74.00	54.00	31.14	22.11	H	153	245
2309.79	54.42	42.74	26.65	-36.94	-	44.13	32.45	74.00	54.00	29.87	21.55	H	153	122
2570.16	57.27	46.69	27.37	-36.86	-	47.78	37.20	74.00	54.00	26.22	16.80	H	171	112
2596.18	59.41	48.57	27.41	-36.86	-	49.96	39.12	74.00	54.00	24.04	14.88	H	146	226
4960.30	48.96	36.03	30.93	-34.51	-	45.38	32.45	74.00	54.00	28.62	21.55	H	168	222
7439.60	52.47	38.36	36.19	-34.10	-	54.56	40.45	74.00	54.00	19.44	13.55	V	109	319

Radiated Spurious Emission (1 GHz to 25 GHz): EDR2M 78ch

Frequency (MHz)	Measurement Level							Limit (dBμV/m)		Margin (dB)		Positioning System		
	Reading Value (dBμV/m)		AF	AMP / CL	Duty Cycle collection	Test Result (dBμV/m)						Pol	Height	Angle
	Peak	Average				(dB/m)	(dB)	(dB)	Peak	Average	Peak			
1717.74	50.62	34.52	25.30	-37.46	-	38.46	22.36	74.00	54.00	35.54	31.64	V	107	236
2324.10	56.80	46.34	26.70	-36.94	-	46.56	36.10	74.00	54.00	27.44	17.90	H	107	243
2609.88	55.63	44.75	27.43	-36.87	-	46.19	35.31	74.00	54.00	27.81	18.69	H	175	288
2636.06	28.40	48.36	27.47	-36.87	-	19.00	38.96	74.00	54.00	55.00	15.04	H	138	234
4960.30	48.96	36.03	30.93	-34.51	-	45.38	32.45	74.00	54.00	28.62	21.55	H	168	222
7439.60	52.47	38.36	36.19	-34.10	-	54.56	40.45	74.00	54.00	19.44	13.55	V	109	319

Note:

If the maximized peak measured value complies with the average limit, then it is unnecessary to perform an average measurement.

Test result = Reading: + AF+AMP / CL

Where, AF : Antenna Collection Factor,

AMP / CL = Cable loss + Preamplifier gain + High Pass filter.

※ High Pass filter use to range of 3 GHz to 18 GHz

Pol.: H(Horizontal), V(Vertical)



Radiated Spurious Emission (1 GHz to 25 GHz): EDR3M 0ch

Frequency (MHz)	Measurement Level							Limit (dBμV/m)		Margin (dB)		Positioning System		
	Reading Value (dBμV/m)		AF (dB/m)	AMP / CL (dB)	Duty Cycle collection (dB)	Test Result (dBμV/m)						PoL (H/V)	Height (cm)	Angle (°)
	Peak	Average				Peak	Average	Peak	Average					
2297.88	51.78	39.62	26.61	-37.11	-	41.28	29.12	74.00	54.00	32.72	24.88	H	153	163
2531.95	60.45	50.18	27.31	-36.97	-	50.79	40.52	74.00	54.00	23.21	13.48	H	106	44
2557.98	63.15	53.21	27.35	-36.86	-	53.64	43.70	74.00	54.00	20.36	10.30	H	100	37
2584.02	55.06	43.41	27.39	-36.86	-	45.59	33.94	74.00	54.00	28.41	20.06	H	125	171
7206.10	48.93	35.22	35.75	-34.10	-	50.58	36.87	74.00	54.00	23.42	17.13	H	175	294
12116.30	45.14	32.41	38.89	-34.10	-	49.93	37.20	74.00	54.00	24.07	16.80	V	175	166

Radiated Spurious Emission (1 GHz to 25 GHz): EDR3M 39ch

Frequency (MHz)	Measurement Level							Limit (dBμV/m)		Margin (dB)		Positioning System		
	Reading Value (dBμV/m)		AF	AMP / CL	Duty Cycle collection	Test Result (dBμV/m)						Pol	Height	Angle
	Peak	Average	(dB/m)	(dB)	(dB)	Peak	Average	Peak	Average	Peak	Average	(H/V)	(cm)	(°)
2283.98	53.43	42.59	26.57	-37.11	-	42.89	32.05	74.00	54.00	31.11	21.95	H	100	-10
2309.90	54.18	43.32	26.65	-36.94	-	43.89	33.03	74.00	54.00	30.11	20.97	H	138	0
2569.81	57.49	47.06	27.37	-36.86	-	48.00	37.57	74.00	54.00	26.00	16.43	H	106	39
2596.03	58.58	48.21	27.41	-36.86	-	49.13	38.76	74.00	54.00	24.87	15.24	H	106	41
4879.70	48.44	35.80	30.81	-34.83	-	44.42	31.78	74.00	54.00	29.58	22.22	H	175	139
7320.50	50.79	36.57	35.96	-34.10	-	52.65	38.43	74.00	54.00	21.35	15.57	V	125	294

Radiated Spurious Emission (1 GHz to 25 GHz): EDR3M 78ch

Frequency (MHz)	Measurement Level							Limit (dBµV/m)		Margin (dB)		Positioning System		
	Reading Value (dBµV/m)		AF	AMP / CL	Duty Cycle collection	Test Result (dBµV/m)						Pol	Height	Angle
	Peak	Average				(dB/m)	(dB)	(dB)	Peak	Average	Peak			
2324.05	57.74	47.40	26.69	-36.94	-	47.49	37.15	74.00	54.00	26.51	16.85	H	106	355
2349.90	57.41	46.70	26.78	-36.94	-	47.25	36.54	74.00	54.00	26.75	17.46	H	110	15
2610.04	57.50	46.85	27.43	-36.87	-	48.06	37.41	74.00	54.00	25.94	16.59	H	100	48
2635.71	56.95	46.00	27.47	-36.87	-	47.55	36.60	74.00	54.00	26.45	17.40	H	125	157
4960.00	49.24	36.99	30.93	-34.51	-	45.66	33.41	74.00	54.00	28.34	20.59	V	125	241
7440.10	54.10	40.36	36.19	-34.10	-	56.19	42.45	74.00	54.00	17.81	11.55	H	200	234

Note:

If the maximized peak measured value complies with the average limit, then it is unnecessary to perform an average measurement.

Test result = Reading: + AF+AMP / CL

Where, AF : Antenna Collection Factor,

AMP / CL = Cable loss + Preamplifier gain + High Pass filter.

※ High Pass filter use to range of 3 GHz to 18 GHz

Pol.: H(Horizontal), V(Vertical)



13.7 Test data for Radiated Restricted Band Edge Emission

- Test Date : March. 31~ April. 02, 2017
- Reference Standard : Part 15 Subpart C, Sec. 15.247(d)
- Measuring Distance : 3 m
- Resolution Bandwidth : 1 MHz
- Detector mode : Peak detector mode / Average detector mode
- Power Source : DC 5 V
- Note : Through three orthogonal axes were investigated and the worst case is report

BDR (0ch, 78ch)

Frequency (MHz)	Measurement Level						Limit (dBμV/m)		Margin (dB)		Positioning System			
	Reading Value (dBμV/m)		AF	AMP / CL	Duty Cycle collection	Test Result (dBμV/m)					PoL	Height	Angle	
	Peak	Average				(dB/m)	(dB)	(dB)	Peak	Average				Peak
2389.93	48.33	35.92	26.91	-36.99	-	38.25	25.84	74.00	54.00	35.75	28.16	H	125	148

Frequency (MHz)	Measurement Level						Limit (dBµV/m)		Margin (dB)		Positioning System			
	Reading Value (dBµV/m)		AF	AMP / CL	Duty Cycle collection	Test Result (dBµV/m)					PoL	Height	Angle	
	Peak	Average				(dB/m)	(dB)	(dB)	Peak	Average				Peak
2483.52	57.54	43.68	27.21	-36.95	-	47.80	33.94	74.00	54.00	26.20	20.06	H	121	289

EDR2M (0ch, 78ch)

Frequency (MHz)	Measurement Level						Limit (dBμV/m)		Margin (dB)		Positioning System			
	Reading Value (dBμV/m)		AF	AMP / CL	Duty Cycle collection	Test Result (dBμV/m)					Pol.	Height	Angle	
	Peak	Average				(dB/m)	(dB)	(dB)	Peak	Average				(H/V)
2389.97	47.44	34.94	26.91	-36.99	-	37.36	24.86	74.00	54.00	36.64	29.14	V	171	40

Frequency (MHz)	Measurement Level						Limit (dBμV/m)		Margin (dB)		Positioning System			
	Reading Value (dBμV/m)		AF	AMP / CL	Duty Cycle collection	Test Result (dBμV/m)					Pol.	Height	Angle	
	Peak	Average				(dB/m)	(dB)	(dB)	Peak	Average				(H/V)
2483.51	57.56	40.94	27.21	-36.95	-	47.82	31.20	74.00	54.00	26.18	22.80	H	190	134

EDR3M (0ch, 78ch)

Frequency (MHz)	Measurement Level						Limit (dBμV/m)		Margin (dB)		Positioning System			
	Reading Value (dBμV/m)		AF	AMP / CL	Duty Cycle collection	Test Result (dBμV/m)					PoL	Height	Angle	
	Peak	Average				(dB/m)	(dB)	(dB)	Peak	Average				(H/V)
2382.58	47.70	34.87	26.88	-36.95	-	37.63	24.80	74.00	54.00	36.37	29.20	H	109	6

Frequency (MHz)	Measurement Level						Limit (dBμV/m)		Margin (dB)		Positioning System			
	Reading Value (dBμV/m)		AF	AMP / CL	Duty Cycle collection	Test Result (dBμV/m)					PoL	Height	Angle	
	Peak	Average				(dB/m)	(dB)	(dB)	Peak	Average				(H/V)
2483.50	59.41	41.41	27.21	-36.95	-	49.67	31.67	74.00	54.00	24.33	22.33	H	112	44

Note:

Test result = Reading: + Transducer Factor.

Where, ACF : Antenna Collection Factor,

CL = Cable loss + Preamplifier gain + High Pass filter

※ High Pass filter use to range of 3 GHz to 18 GHz

Pol.: H(Horizontal), V(Vertical)



14. Sample Calculations

$$\begin{aligned} \text{dB}\mu\text{V} &= 20 \text{ Log}_{10}(\mu\text{V}/\text{m}) \\ \text{dB}\mu\text{V} &= \text{dBm} + 107 \\ \mu\text{V} &= 10^{(\text{dB}\mu\text{V}/20)} \end{aligned}$$

14.1 Example 1 :

■ 20.3 MHz

Class B Limit	= 250 μV = 48 dB μV
Reading	= 39.2 dB μV
$10^{(39.2\text{dB}\mu\text{V}/20)}$	= 91.2 μV
Margin	= 48 dB μV - 39.2 dB μV = 8.8 dB

14.2 Example 2 :

■ 66.7 MHz

Class B Limit	= 100 $\mu\text{V}/\text{m}$ = 40.0 dB $\mu\text{V}/\text{m}$
Reading	= 31.0 dB μV
Antenna Factor + Cable Loss	= 5.8 dB
Total	= 36.8 dB $\mu\text{V}/\text{m}$
Margin	= 40.0 dB $\mu\text{V}/\text{m}$ - 36.8 dB $\mu\text{V}/\text{m}$ = 3.2 dB



15. Recommendation & Conclusion

The data collected shows that the **LG Electronics Inc. BT AUX Module (Model Name: EBR844226)** was complies with §15.247 of the FCC Rules.

- The end -

