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Dates of Tests: Dec 01 2020 ~ Apr 22, 2021

Test Report S/N: LR500112104L

Test Site : LTA CO., LTD.

## CERTIFICATION OF COMPLIANCE

FCC ID

**2AWMDA712**

APPLICANT

**Apulse Technology Co., Ltd.**

<b>Equipment Class</b>	:	<b>Part 15 Spread Spectrum Transmitter (DSS)</b>
<b>Manufacturing Description</b>	:	<b>RFID Smart Reader</b>
<b>Manufacturer</b>	:	<b>Apulse Technology Co., Ltd.</b>
<b>Model name</b>	:	<b>a712</b>
<b>Test Device Serial No.:</b>	:	<b>Identical prototype</b>
<b>Rule Part(s)</b>	:	<b>FCC Part 15.247 Subpart C ; ANSI C63.10 - 2013</b>
<b>Frequency Range</b>	:	<b>2402 ~ 2480 MHz</b>
<b>RF power</b>	:	<b>Max -7.24 dBm - Conducted</b>
<b>Data of issue</b>	:	<b>April 23, 2021</b>

This test report is issued under the authority of:

*Ja-Beom.Koo*

Ja-Beom Koo, Manager

The test was supervised by:

*Eun-Hwan Jung*

Eun-Hwan Jung, Test Engineer

This test result only responds to the tested sample. It is not allowed to copy this report even partly without the allowance of the test laboratory. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

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NVLAP LAB Code.: 200723-0

## **TABLE OF CONTENTS**

1. GENERAL INFORMATION -----	3
2. INFORMATION ABOUT TEST ITEM -----	4
3. TEST REPORT -----	5
3.1 SUMMARY OF TESTS -----	5
3.2 FREQUENCY HOPPING SYSTEM REQUIREMENTS-----	6
3.3 TECHNICAL CHARACTERISTICS TEST -----	7
3.3.1 CARRIER FREQUENCY SEPARATION -----	7
3.3.2 NUMBER OF HOPPING FREQUENCIES -----	9
3.3.3 20 dB BANDWIDTH -----	11
3.3.4 TIME OF OCCUPANCY (Dwell Time) -----	18
3.3.5 TRANSMITTER OUTPUT POWER -----	21
3.3.6 BAND EDGE -----	25
3.3.7 CONDUCTED SPURIOUS EMISSIONS -----	28
3.3.8 RADIATED SPURIOUS EMISSIONS -----	32
 <b>APPENDIX</b>	
APPENDIX TEST EQUIPMENT USED FOR TESTS -----	42

## 1. General information

### 1-1 Test Performed

Company name : LTA Co., Ltd.  
 Address : 243, Jubug-ri, Yangji-Myeon, Youngin-Si, Kyunggi-Do, Korea. 449-822  
 Web site : <http://www.ltalab.com>  
 E-mail : [chahn@ltalab.com](mailto:chahn@ltalab.com)  
 Telephone : +82-31-323-6008  
 Facsimile : +82-31-323-6010

Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the “General requirements for the competents of calibration and testing laboratory”.

### 1-2 Accredited agencies

LTA Co., Ltd. is approved to perform EMC testing by the following agencies:

Agency	Country	Accreditation No.	Validity	Reference
NVLAP	U.S.A	200723-0	2021-09-30	ECT accredited Lab.
RRA	KOREA	KR0049	-	EMC accredited Lab.
FCC	U.S.A	649054	2021-04-11	FCC CAB
VCCI	JAPAN	C-4948,	2023-09-10	VCCI registration
VCCI	JAPAN	T-2416,	2023-09-10	VCCI registration
VCCI	JAPAN	R-4483(10 m),	2023-08-15	VCCI registration
VCCI	JAPAN	G-847	2021-12-13	VCCI registration
IC	CANADA	5799A-1	2021-06-16	IC filing
KOLAS	KOREA	NO.551	2021-08-20	KOLAS accredited Lab.

## 2. Information about test item

### 2-1 Client & Manufacturer

Client Company name : Apulse Technology Co., Ltd.  
 Address : A-1403, Gwangmyeongtechnopark, 60, Haan-ro, Gwangmyeong-si, Gyeonggi-do, Korea  
 Tel / Fax : +82-10-5526-0605 / +82-70-4222-5686  
 Manufacturer : Apulse Technology Co., Ltd.  
 Address : A-1403, Gwangmyeongtechnopark, 60, Haan-ro, Gwangmyeong-si, Gyeonggi-do, Korea  
 Tel / Fax : +82-10-5526-0605 / +82-70-4222-5686

### 2-2 Equipment Under Test (EUT)

Model name : a712  
 Serial number : Identical prototype  
 Date of receipt : Dec 01, 2020  
 EUT condition : Pre-production, not damaged  
 Antenna type : FPCB Antenna (Max Gain : 0.07 dBi)  
 Frequency Range : 2402 ~ 2480MHz  
 RF output power : Max -7.24 dBm – Conducted  
 Type of Modulation : Pi/4 DQPSK, 8DPSK  
 Power Source : DC 3.7 V  
 Firmware Version : V0.1

### 2-3 Tested frequency

Bluetooth	LOW	MID	HIGH
Frequency (MHz) BDR, EDR	2402	2441	2480

### 2-4 Ancillary Equipment

Equipment	Model No.	Serial No.	Manufacturer
Notebook	-	MS-1736	MSI

### 3. Test Report

#### 3.1 Summary of tests

FCC Part Section(s)	Parameter	Limit	Test Condition	Status (note 1)
15.247(a)	Carrier Frequency Separation	$\geq 2/3$ of 20dB BW	Conducted	C
15.247(a)	Number of Hopping Frequencies	$\geq 15$ channels		C
15.247(a)	20 dB Bandwidth 99% Bandwidth	—		C
15.247(a)	Dwell Time	$\leq 0.4$ seconds		C
15.247(b)	Transmitter Output Power	$\leq 1W$ for 1Mbps $\leq 125mW$ for 2,3Mbps		C
15.247(d)	Conducted Spurious emission	$> 20$ dBc		C
15.247(d)	Band Edge	$> 20$ dBc		C
15.249 / 15.209	Field Strength of Harmonics	$< 54$ dBuV (at 3m)	Radiated	C
15.109	Field Strength	—		C
15.207 /15.107	AC Conducted Emissions	EN 55022	Line Conducted	N/A
15.203	Antenna requirement	—	—	C

Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable

Note 2: This product operates only with battery and does not operate during charging.

#### Note 1: Antenna Requirement

Apulse Technology Co., Ltd. FCC ID: 2AWMDA712 unit complies with the requirement of §15.203.

The antenna type is FPCB Antenna

The sample was tested according to the following specification:

\*FCC Parts 15.247; ANSI C-63.4-2014;ANSI C-63.10-2013

\*FCC KDB Publication No. 558074 D01 v03r05

\*FCC TCB Workshop 2012, April

## 3.2 Frequency Hopping System Requirements

### 3.2.1 Standard Applicable

According to FCC Part 15.247(a)(1), The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

(g) Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

(h) The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

### 3.3 TECHNICAL CHARACTERISTIC TEST

#### 3.3.1 Carrier Frequency Separation

##### Procedure:

The test follows ANSI C63.10. The carrier frequency separation was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

After the trace being stable, the reading value between the peaks of the adjacent channels using the marker-delta function was recorded as the measurement results.

##### The spectrum analyzer is set to:

Span = 2~3 MHz (wide enough to capture the peaks of two adjacent channels)

RBW = 100 kHz (1% of the span or more)      Sweep = auto

VBW = 100 kHz                                      Detector function = peak

Trace = max hold

##### Measurement Data:

Test Results	
Carrier Frequency Separation (MHz)	Result
2.006 (BDR)	Complies
2.001 (EDR)	Complies

- See next pages for actual measured spectrum plots.

##### Minimum Standard:

The EUT shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or two-thirds of 20 dB bandwidth of the hopping channel, whichever is greater.

##### Measurement Setup

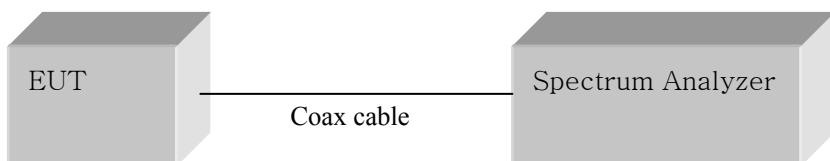
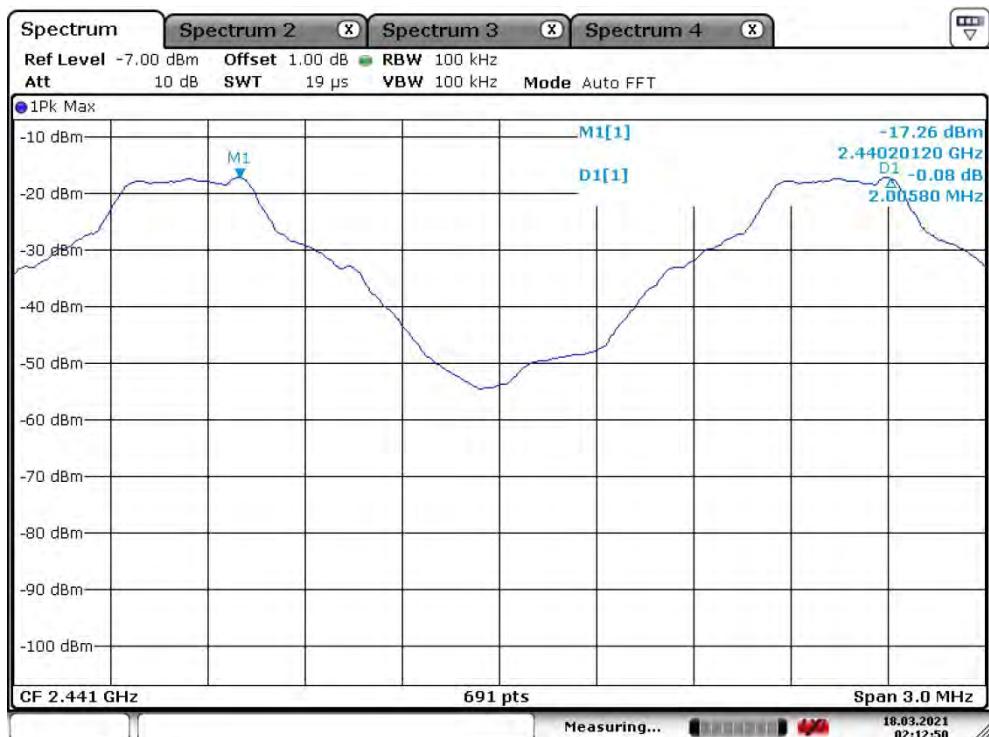


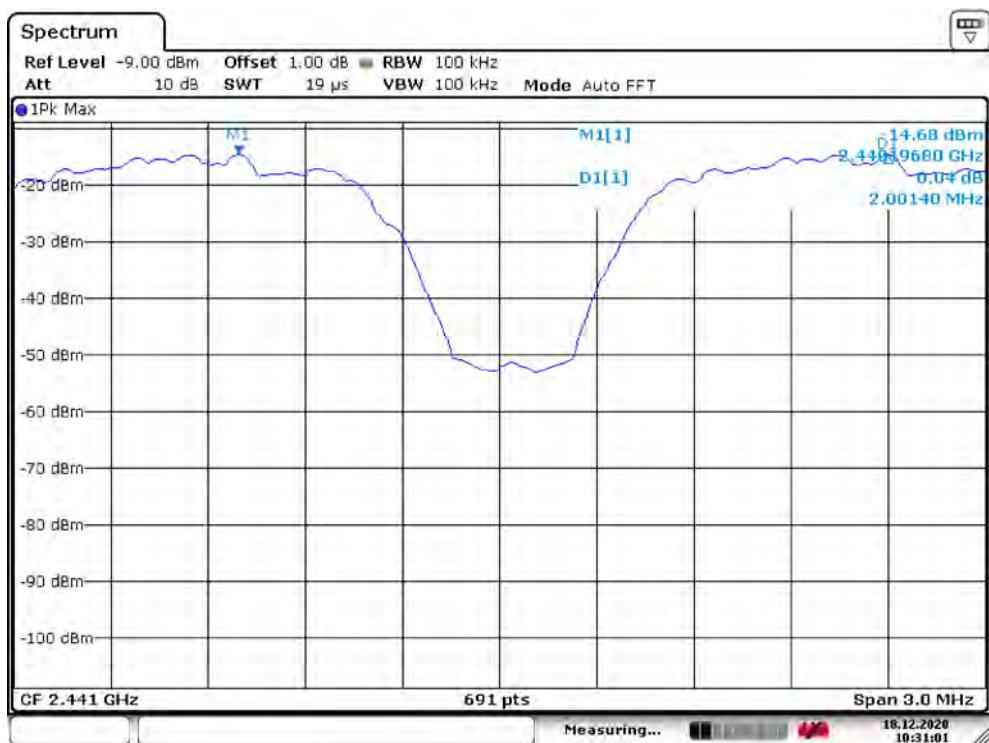
Figure 1: Measurement setup for the carrier frequency separation

## Carrier Frequency Separation

### BDR Mode



### EDR Mode



### 3.3.2 Number of Hopping Frequencies

#### Procedure:

The test follows ANSI C63.10. The number of hopping frequencies was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

To get higher resolution, four frequency ranges within the 2400 ~ 2483.5 MHz FH band were examined.

The spectrum analyzer is set to (Bluetooth):

Frequency range      Start = 2400.0 MHz,   Stop = 2483.5 MHz

RBW = 100 kHz (1% of the span or more)      Sweep = auto

VBW = 100 kHz (VBW  $\geq$  RBW)      Detector function = peak

Trace = max hold      Span > 40 MHz

#### Measurement Data : **Complies**

<b>Total number of Hopping Channels</b>	79 (Basic, EDR)
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- See next pages for actual measured spectrum plots.

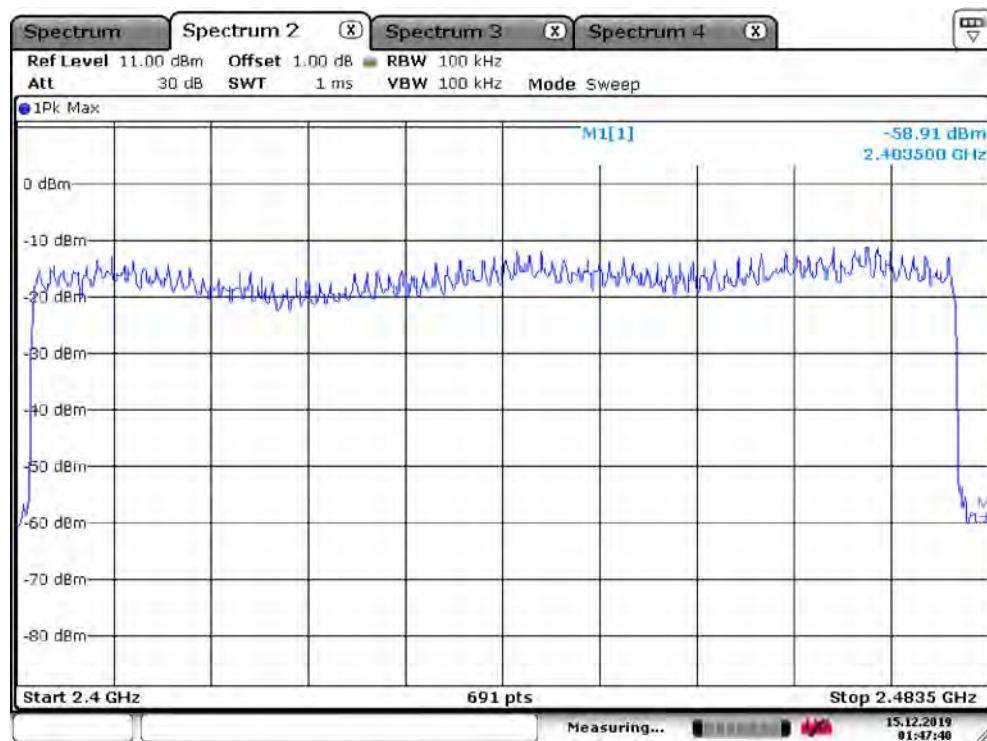
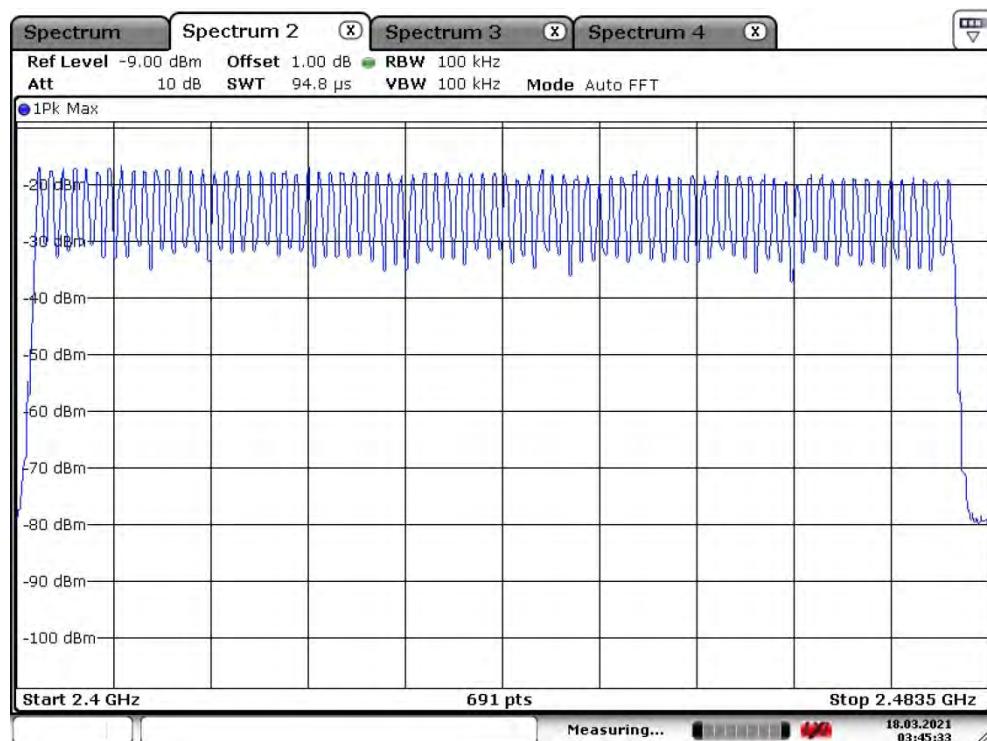
#### Minimum Standard:

At least 15 channels

#### Measurement Setup

Same as the Chapter 3.3.1 (Figure 1)

### Number of Hopping Frequencies (BDR, EDR)



### 3.3.3 20 dB Bandwidth

#### Procedure:

The bandwidth at 20 dB below the highest inband spectral density was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function disabled at the highest, middle and the lowest available channels..

After the trace being stable, 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.

The spectrum analyzer is set to (Bluetooth):

Center frequency = the highest, middle and the lowest channels

Span = 3 MHz (approximately 2 or 3 times of the 20 dB bandwidth)

RBW = 30 kHz

Sweep = auto

VBW = 30 kHz (VBW  $\geq$  RBW)

Detector function = peak

Trace = max hold

#### Measurement Data: BDR Mode

Frequency (MHz)	Channel No.	Test Results(MHz)	
		20dB Bandwidth	99% Bandwidth
2402	0	1.042	0.912
2441	39	1.081	0.912
2480	78	1.081	0.912

#### Measurement Data: EDR Mode

Frequency (MHz)	Channel No.	Test Results(MHz)	
		20dB Bandwidth	99% Bandwidth
2402	0	1.346	1.198
2441	39	1.350	1.203
2480	78	1.350	1.203

- See next pages for actual measured spectrum plots.

#### Minimum Standard:

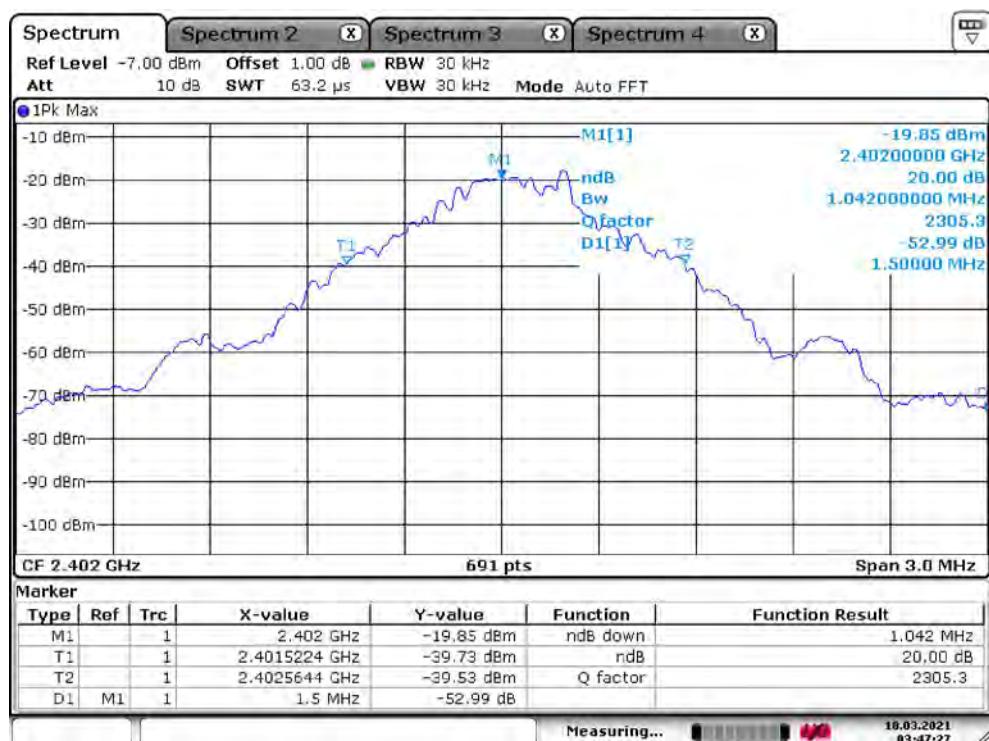
N/A

#### Measurement Setup

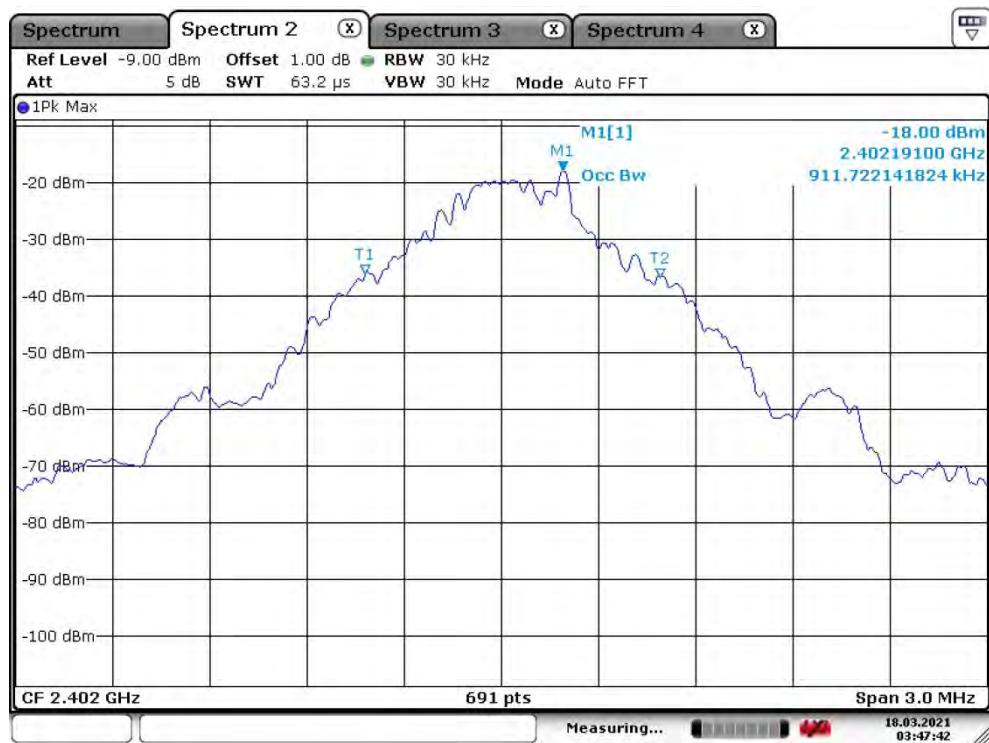
Same as the Chapter 3.3.1 (Figure 1)

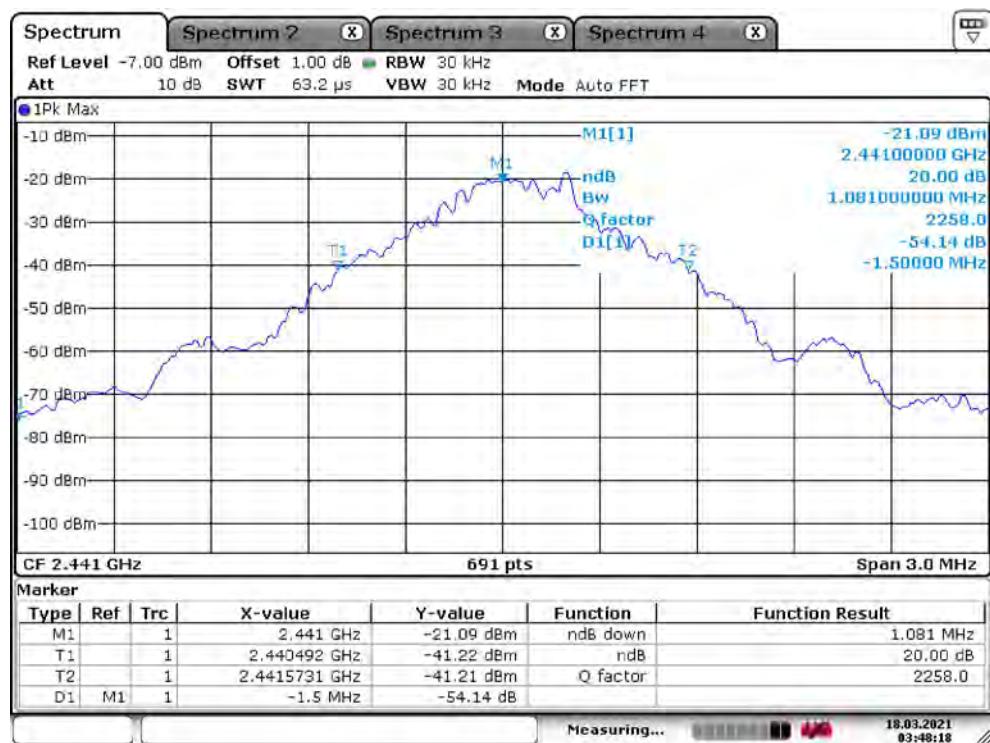
## Channel 1 of BDR mode

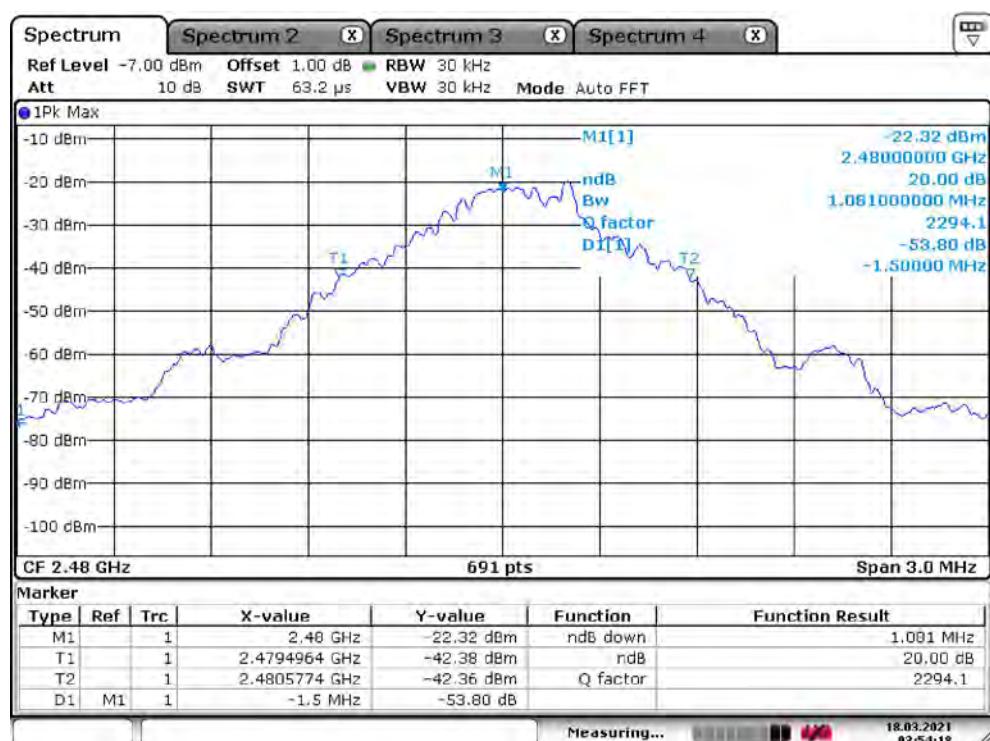
## 20 dB Bandwidth

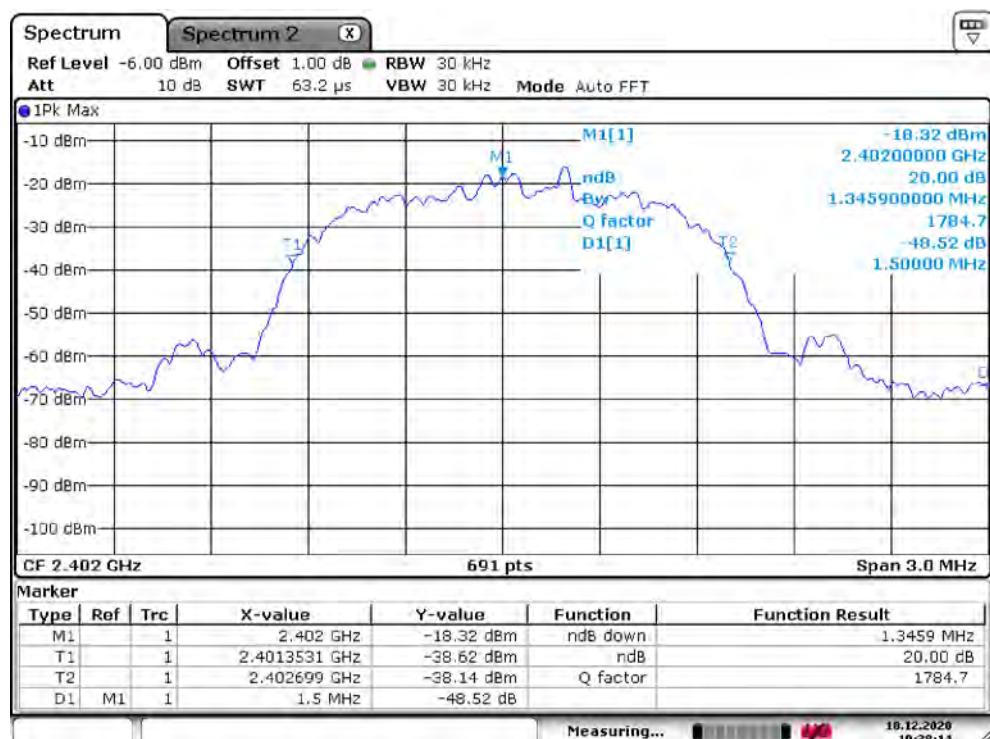


## 99% Bandwidth

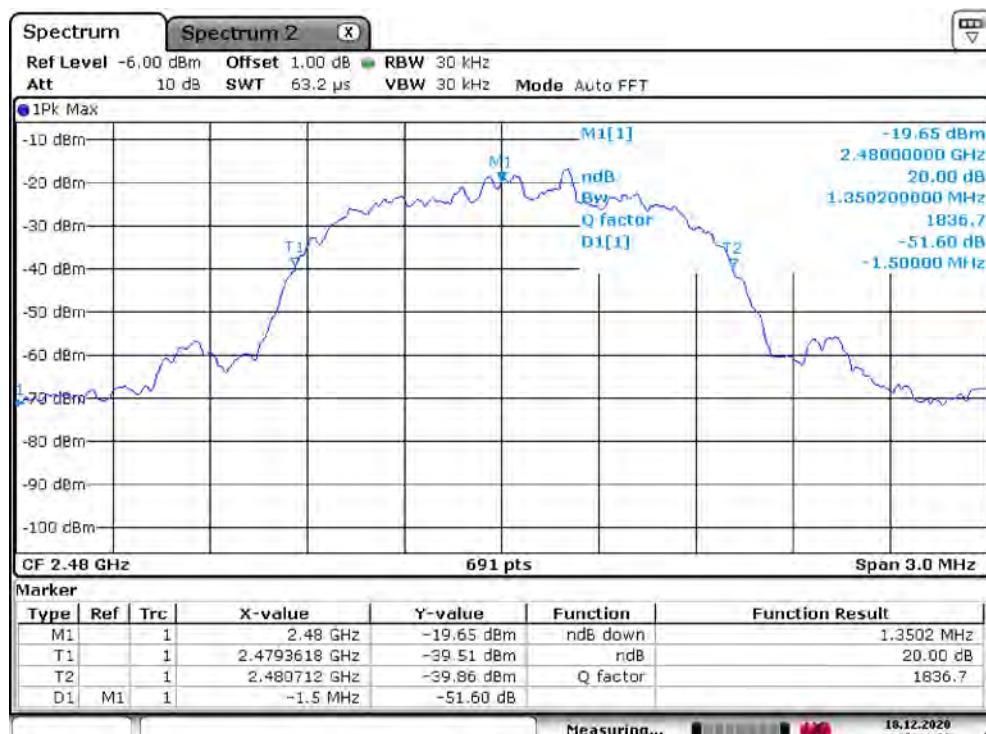


Channel 40 of BDR mode20 dB Bandwidth99% Bandwidth

Channel 79 of BDR mode20 dB Bandwidth99% Bandwidth

Channel 1 of EDR mode20 dB Bandwidth99% Bandwidth

**Channel 40 of EDR mode****20 dB Bandwidth****99% Bandwidth**

**Channel 79 of EDR mode****20 dB Bandwidth****99% Bandwidth**

### 3.3.4 Time of Occupancy (Dwell Time)

#### Procedure:

The test follows ANSI C63.10. The dwell time was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

The spectrum analyzer is set to :

Center frequency = 2441 MHz

Span = zero

RBW = 1 MHz

VBW = 1 MHz (VBW  $\geq$  RBW)

Trace = max hold

Detector function = peak

#### Measurement Data (Basic,EDR):

Mode	Number of transmission in a 31.6s ( 79Hopping*0.4)	Length of Transmission Time (msec)	Result (msec)	Limit (msec)
DH5	9(Times / 3sec) *10.533 = 157.995	2.862	271.31	400
3-DH5	7(Times / 3sec) *10.533 = 73.731	2.964	218.54	400

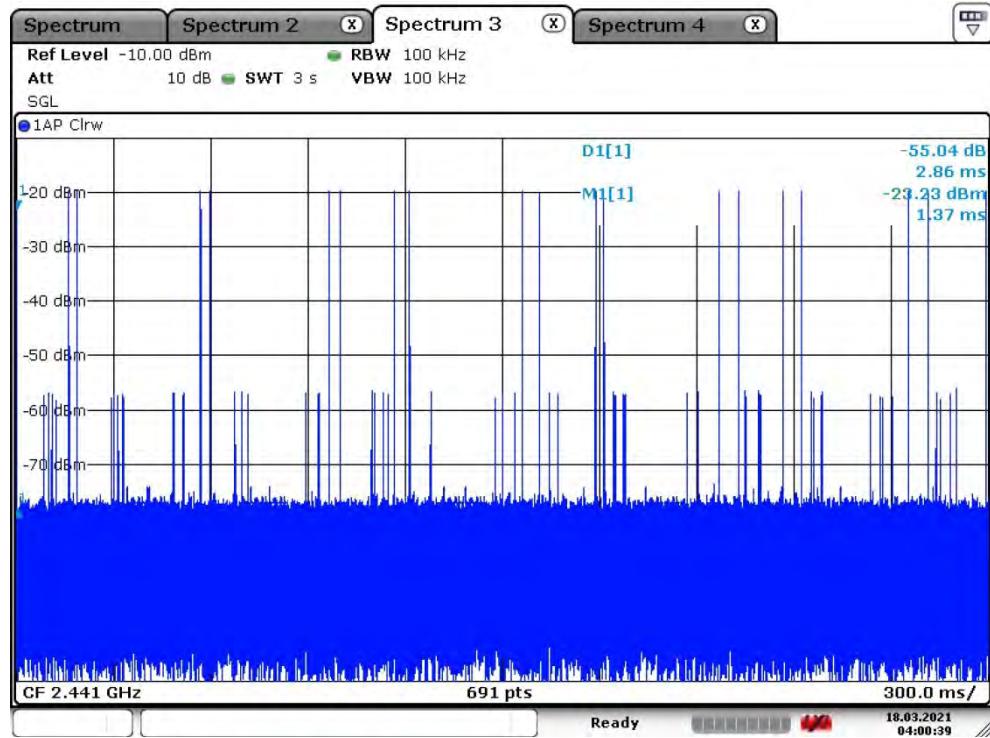
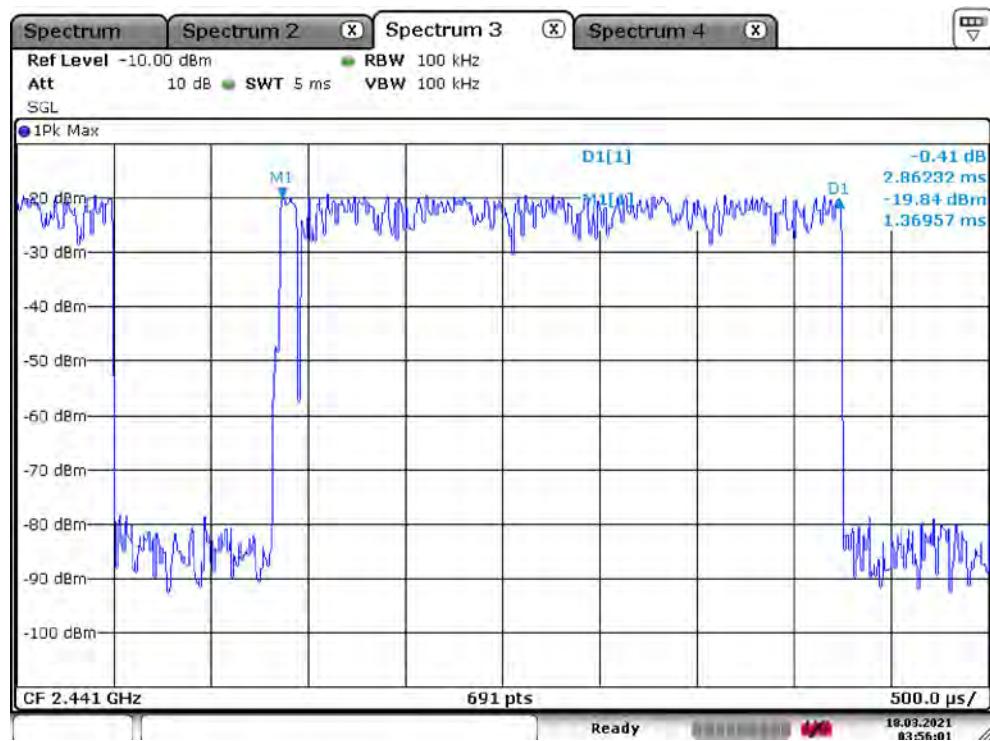
- See next pages for actual measured spectrum plots.
- dwell time = {(number of hopping per second / number of slot ) x duration time per channel} x 0.4 ms

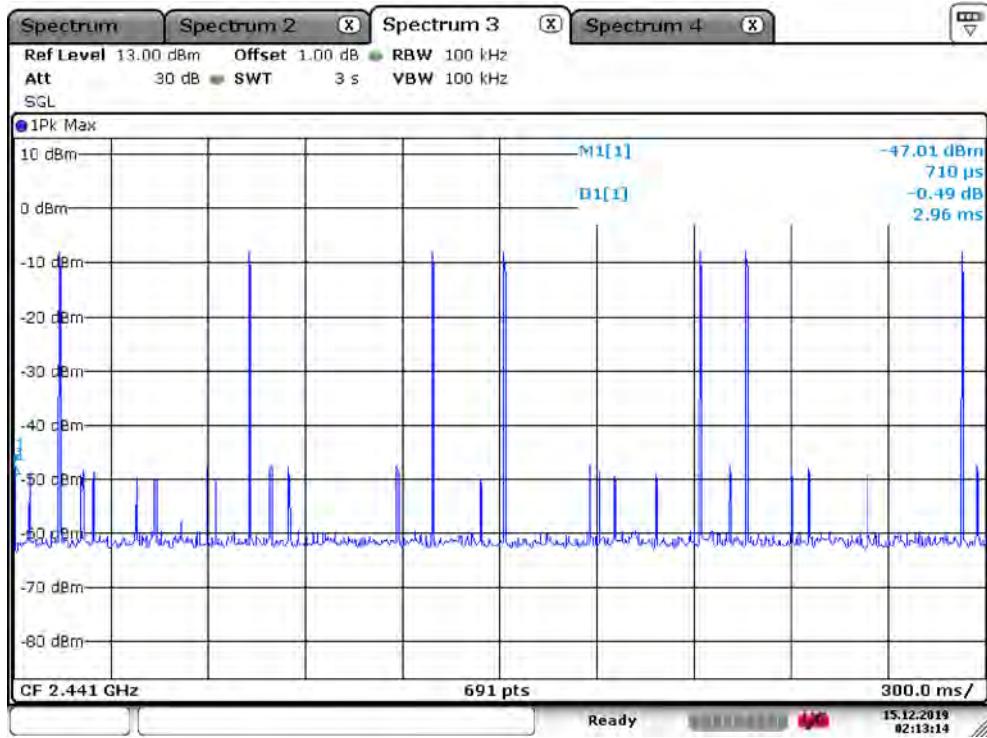
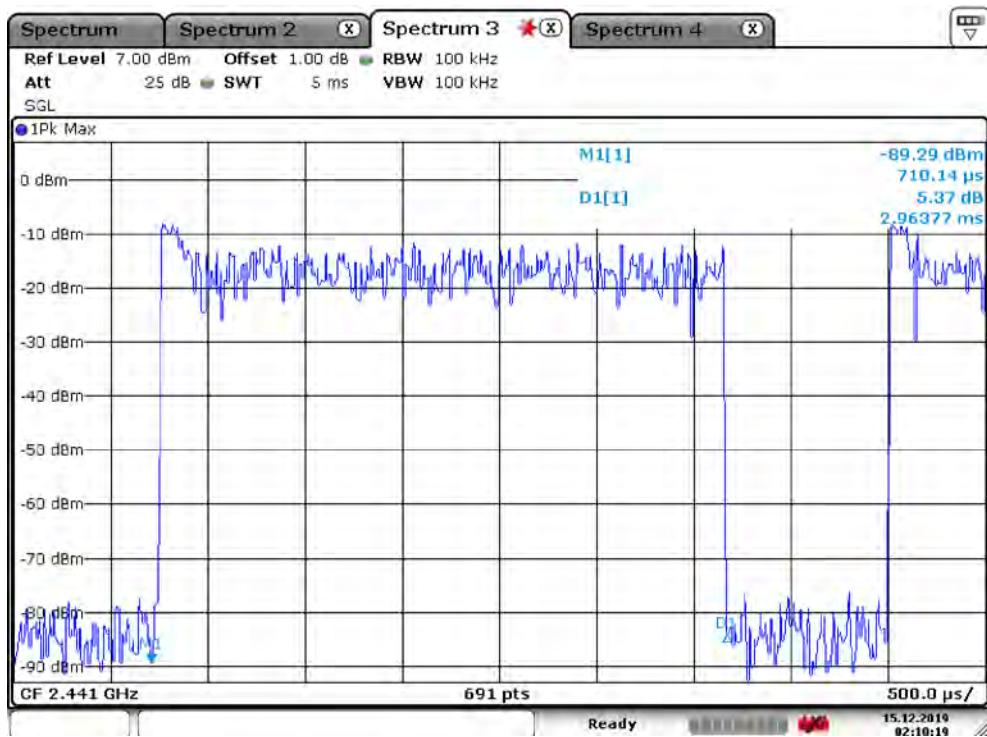
#### Minimum Standard:

0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed

#### Measurement Setup

Same as the Chapter 3.3.1 (Figure 1)

DH5 at BDR mode

**3-DH5 at EDR mode**

### 3.3.5 Transmitter Output Power

### Procedure:

The test follows ANSI C63.10. The peak output power was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function disabled at the highest, middle and the lowest available channels..

After the trace being stable, Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power.

The spectrum analyzer is set to :

Center frequency = the highest, middle and the lowest channels

Span = 10 MHz (approximately 5 times of the 20 dB bandwidth)

RBW = 3 MHz (greater than the 20 dB bandwidth of the emission being measured)

VBW = 3 MHz (VBW  $\geq$  RBW)

Detector function = peak

Trace = max hold

Sweep = auto

## Measurement Data : BDR Mode

Frequency (MHz)	Ch.	Test Results		
		dBm	mW	Result
2402	1	<b>-7.24</b>	<b>0.189</b>	Complies
2441	40	<b>-7.62</b>	<b>0.173</b>	Complies
2480	79	<b>-8.70</b>	<b>0.135</b>	Complies

## Measurement Data : EDR Mode

Frequency (MHz)	Ch.	Test Results		
		dBm	mW	Result
2402	1	<b>-11.86</b>	<b>0.065</b>	Complies
2441	40	<b>-11.72</b>	<b>0.067</b>	Complies
2480	79	<b>-12.62</b>	<b>0.055</b>	Complies

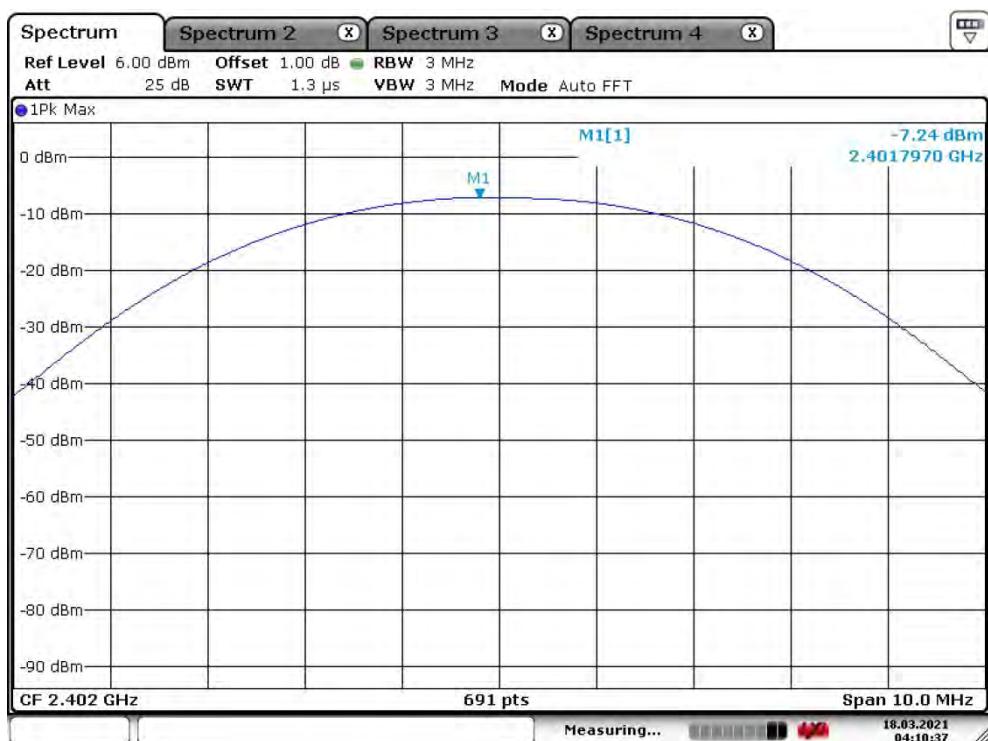
- See next pages for actual measured spectrum plots.

<b>Minimum Standard:</b>	For frequency hopping systems with at least 75 non-overlapping hopping channels: 1 watt. For all other frequency hopping systems: 0.125 W.
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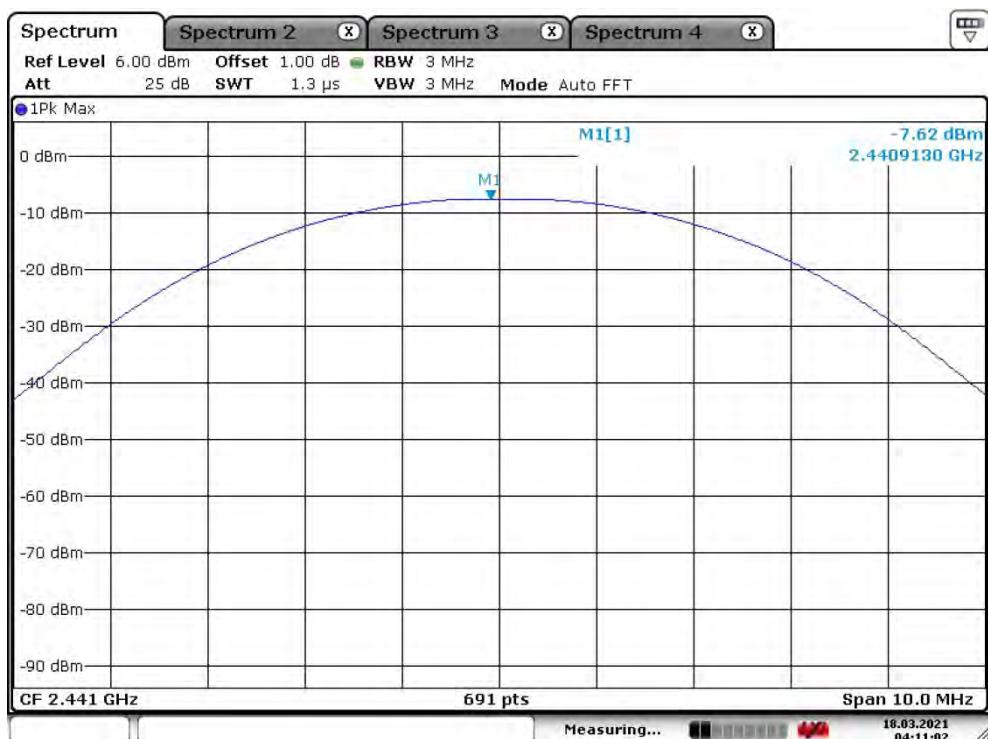
## Measurement Setup

Same as the Chapter 3.3.1 (Figure 1)

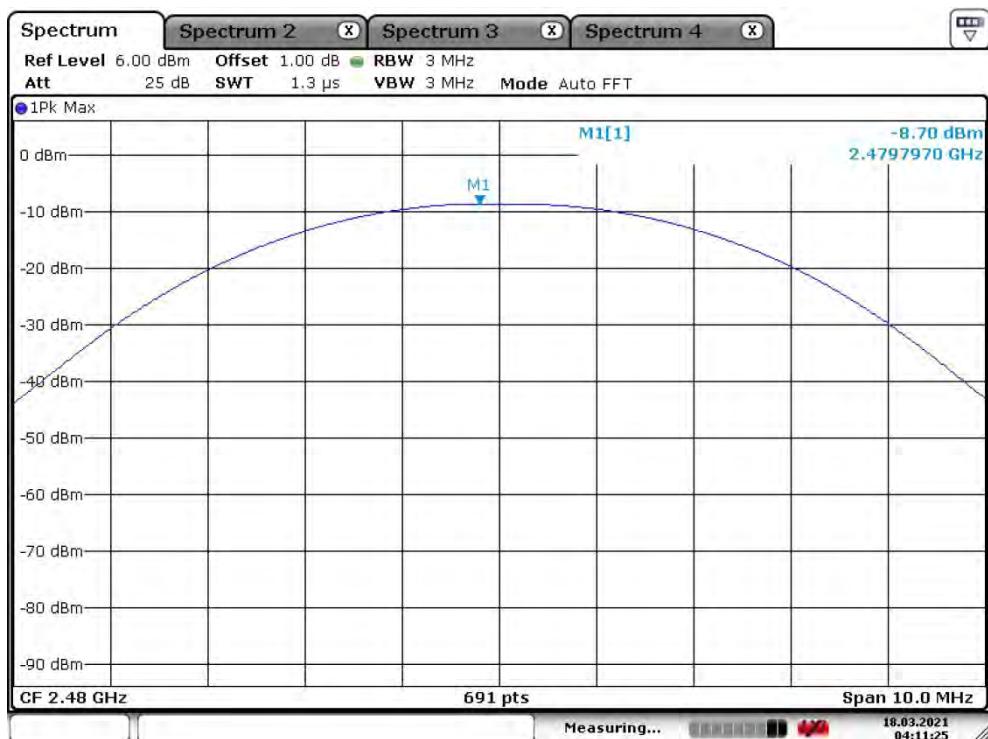
**Channel 1**  
**BDR mode**



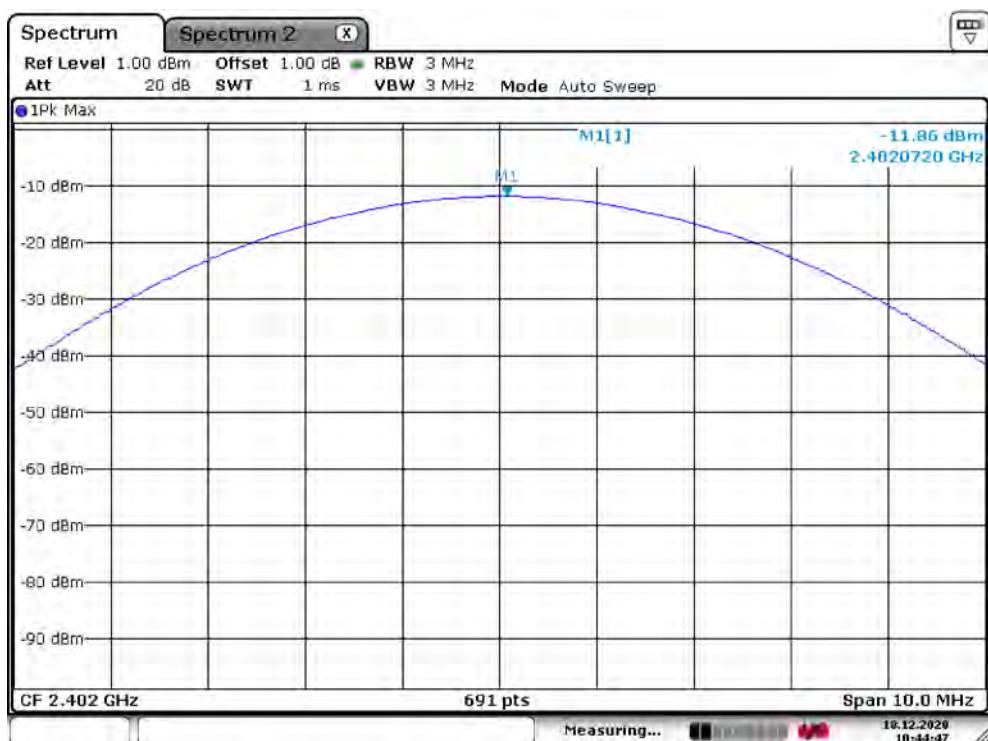
**Channel 40**  
**BDR mode**



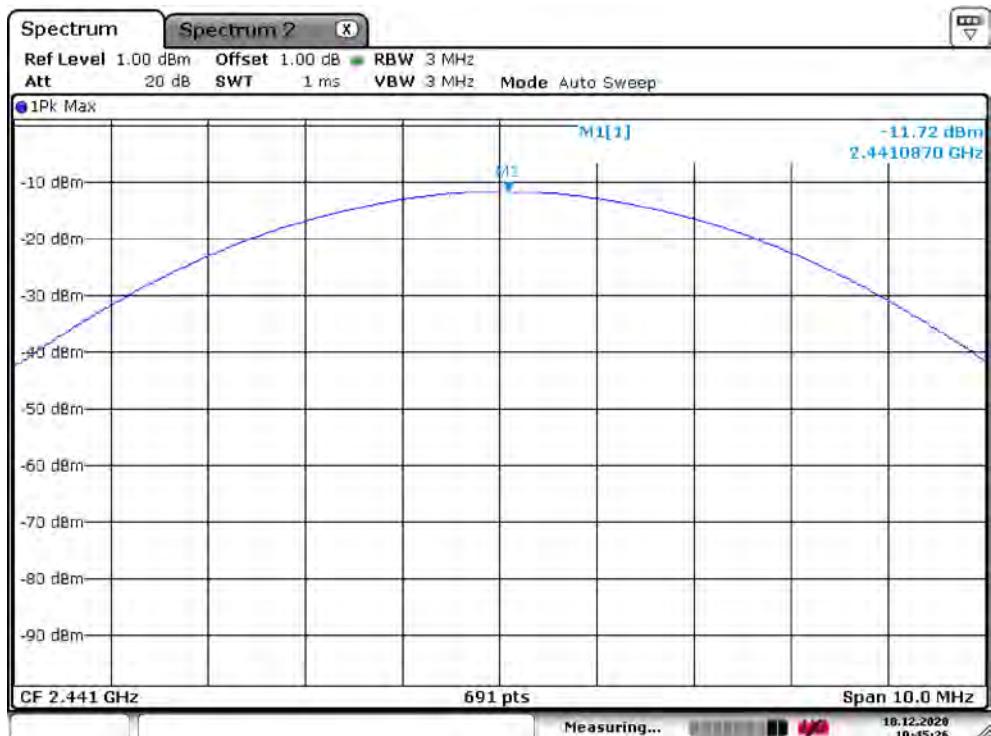
**Channel 79**  
**BDR mode**



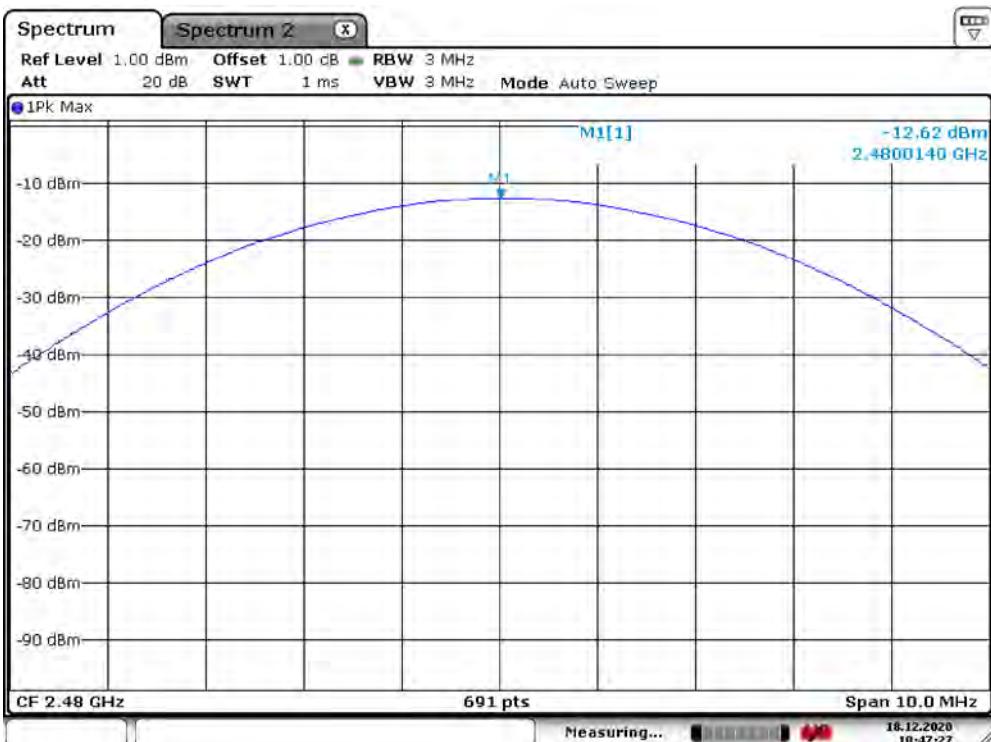
**Channel 1**  
**EDR mode**



**Channel 40**  
**EDR mode**



**Channel 79**  
**EDR mode**



### 3.3.6 Band Edge

### Procedure:

The bandwidth at 20 dB down from the highest inband spectral density is measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function disabled at the highest, middle and the lowest available channels.

After the trace being stable, Use the marker-to-peak function to measure 20 dB down both sides of the intentional emission.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

Span = 10~30 MHz      Detector function = peak

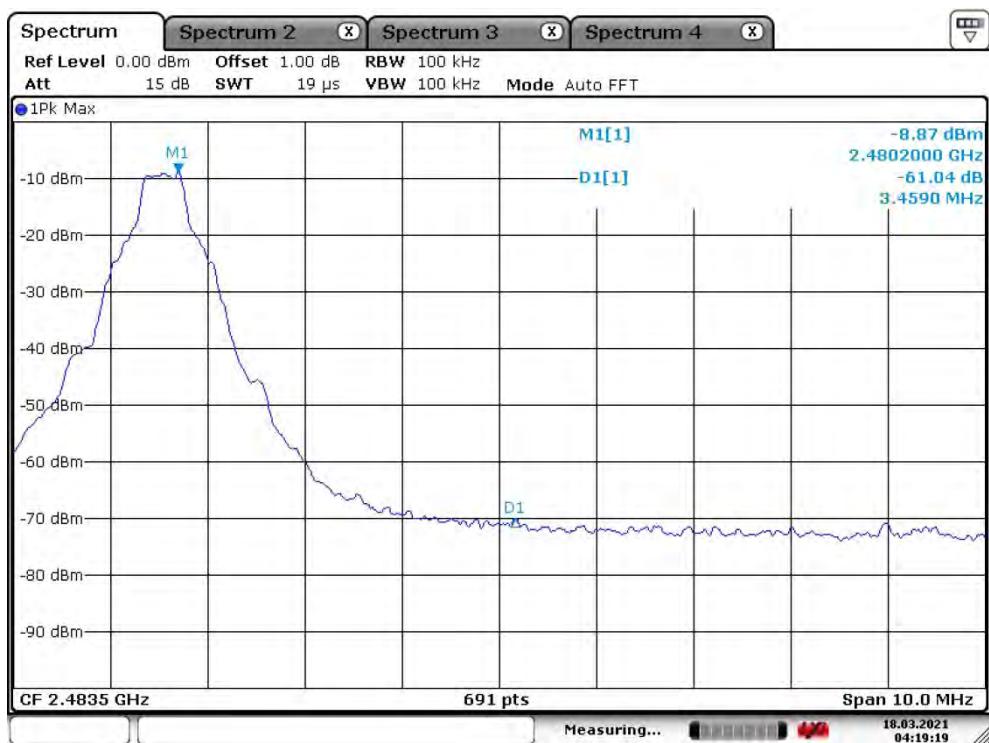
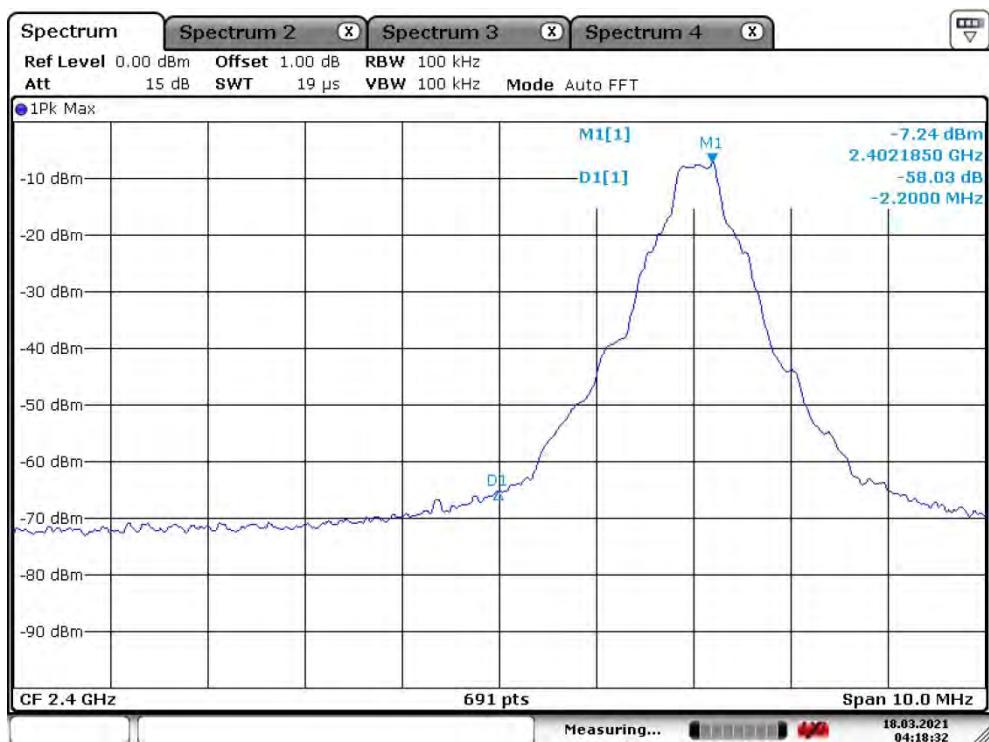
### Measurement Data: **Complies**

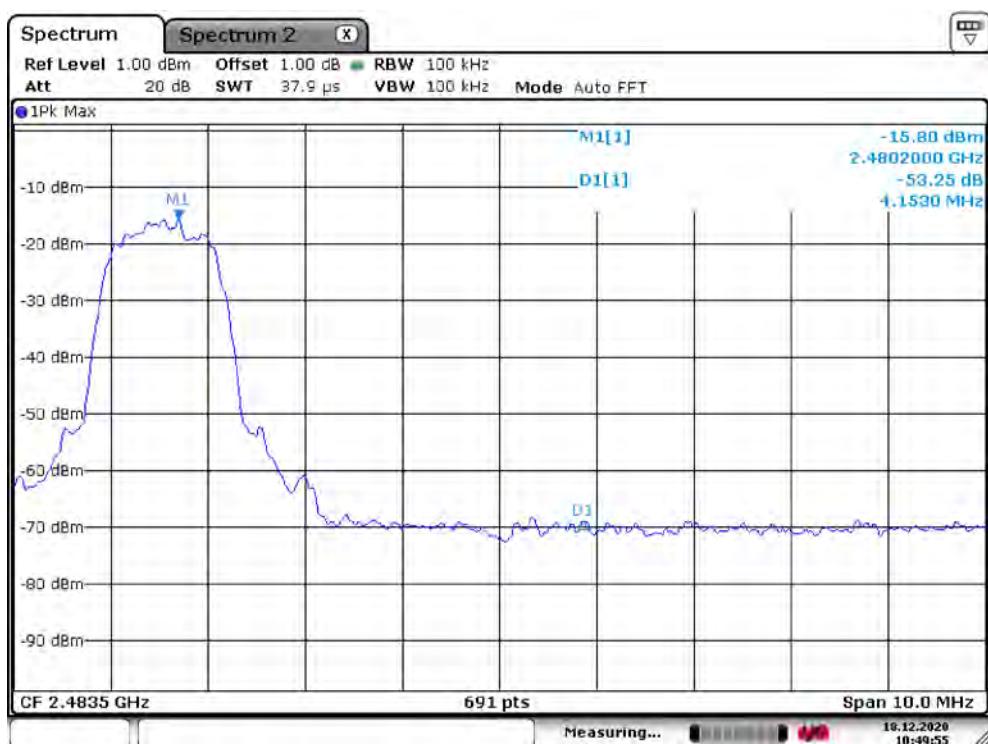
- All conducted emission in any 100 kHz bandwidth outside of the spread spectrum band was at least 20 dB lower than the highest inband spectral density. Therefore the applying equipment meets the requirement.
- See next pages for actual measured spectrum plots.

<b>Minimum Standard:</b>	> 20 dBc
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## Measurement Setup

Same as the Chapter 3.3.1 (Figure 1)

**BDR**

EDR

**Note : This EUT was tested in 3 orthogonal positions and the worst-case data was presented.**

### 3.3.7 Conducted Spurious Emissions

### **Procedure:**

The test follows ANSI C63.10. The conducted spurious emissions were measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function disabled at the highest, middle and the lowest available channels..

After the trace being stable, set the marker on the peak of any spurious emission recorded.

The spectrum analyzer is set to:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions

RBW = 100 kHz Sweep = auto

VBW = 100 kHz      Detector function = peak

Trace = max hold

**Measurement Data: Complies**

- All conducted emission in any 100 kHz bandwidth outside of the spread spectrum band was at least 20 dB lower than the highest inband spectral density. Therefore the applying equipment meets the requirement.
- See next pages for actual measured spectrum plots.

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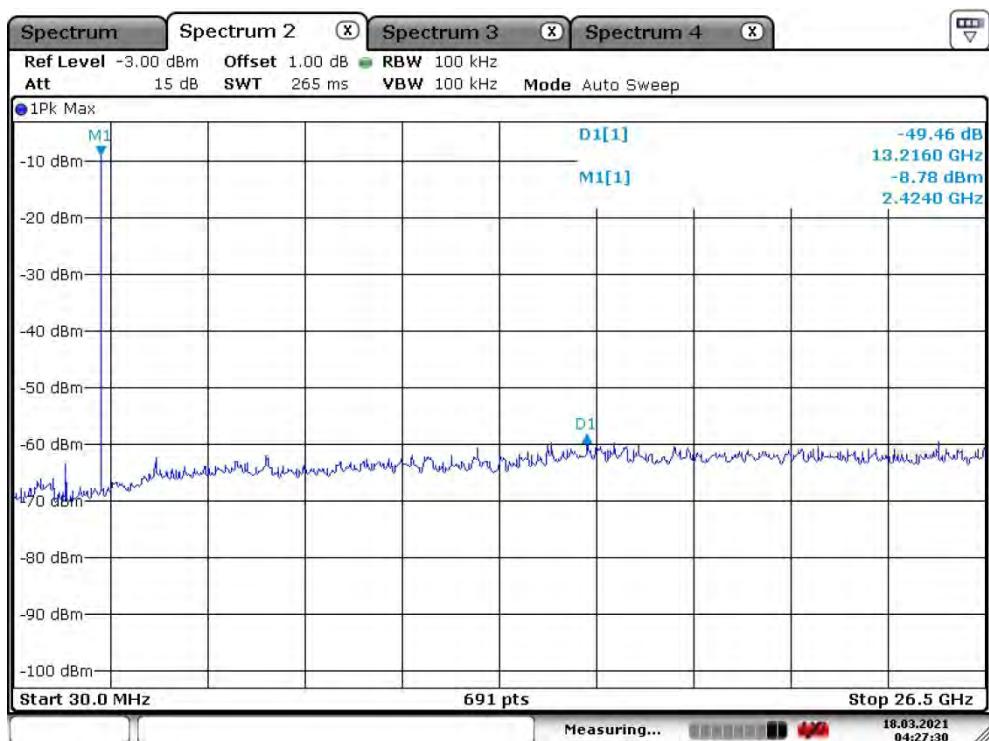
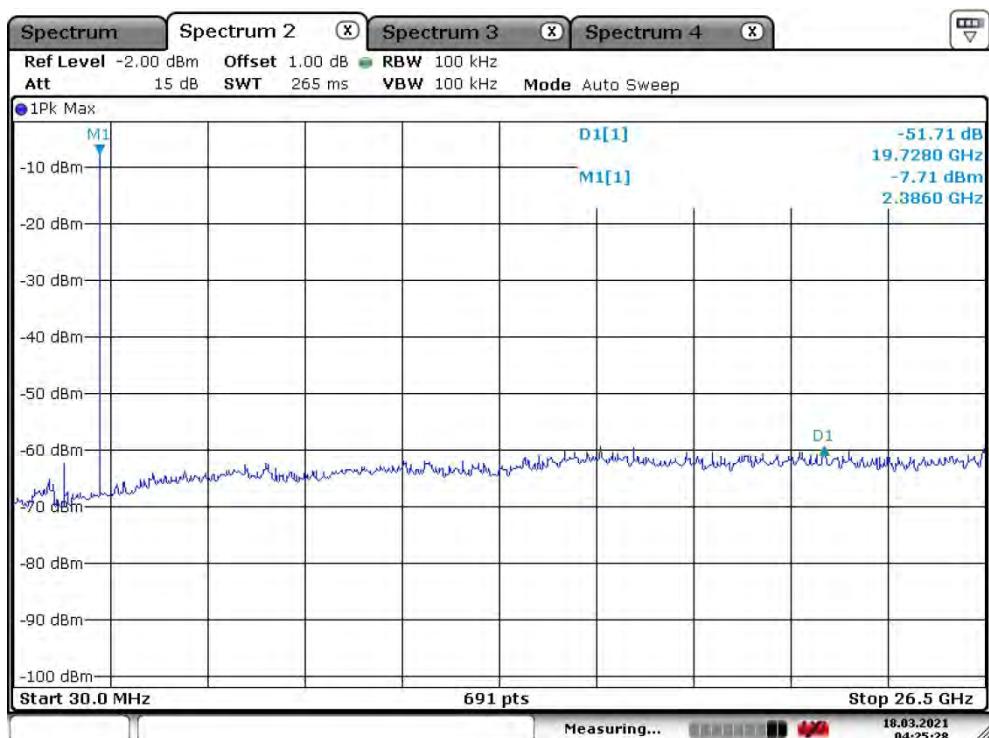
<b>Minimum Standard:</b>	> 20 dBc
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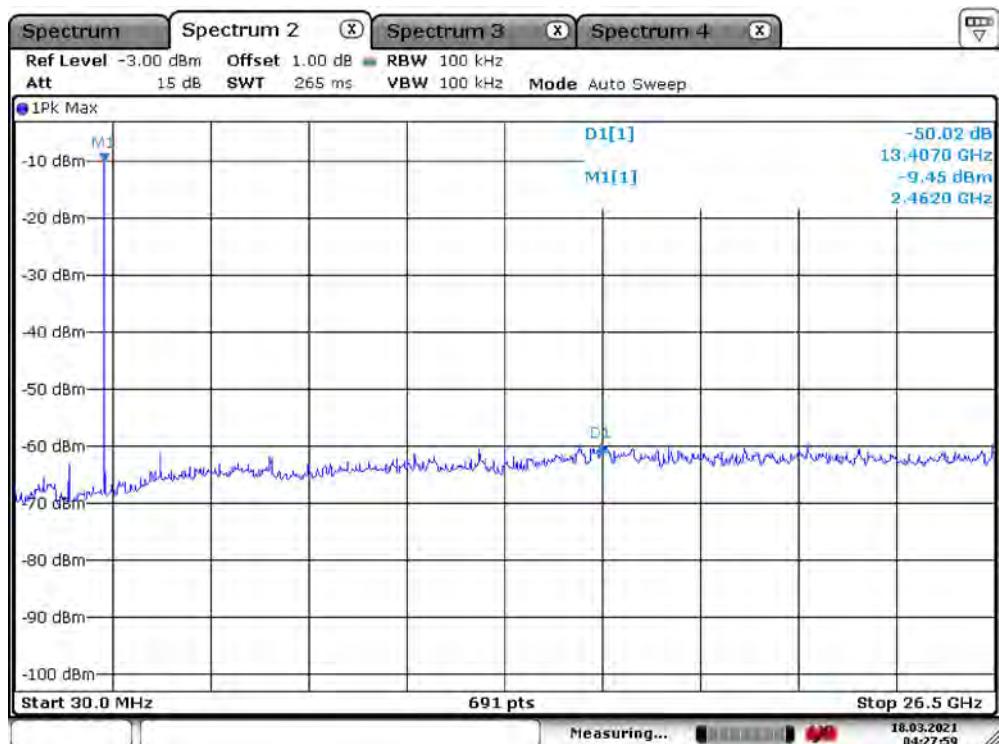
## Measurement Setup

Same as the Chapter 3.3.1 (Figure 1)

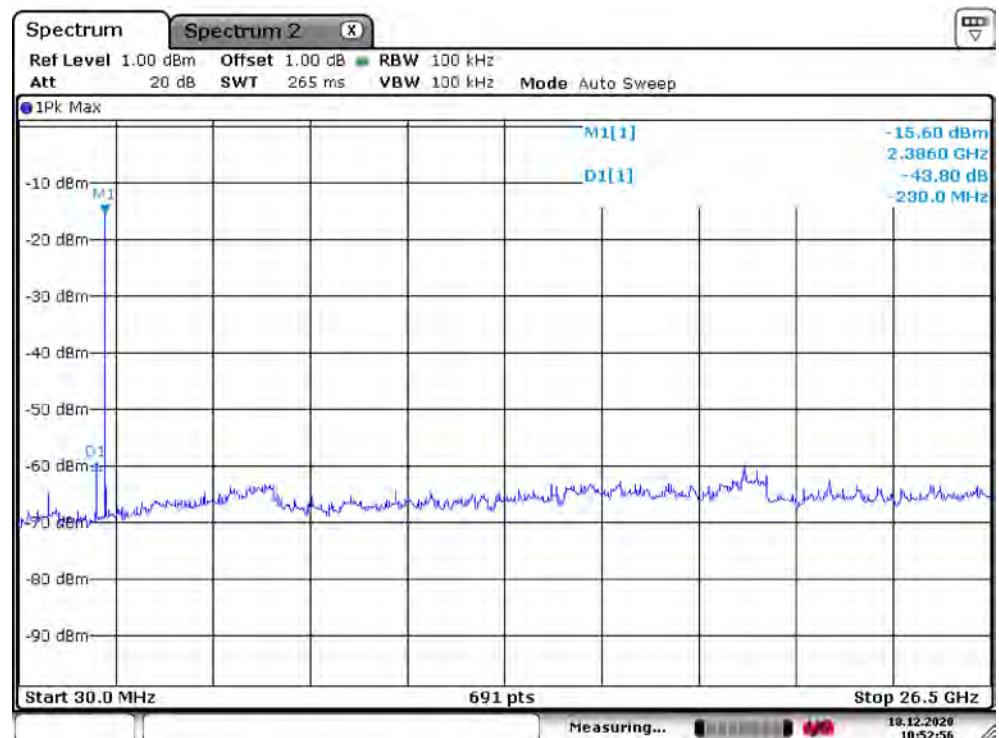
Unwanted Emission BDR – Low, Middle, High

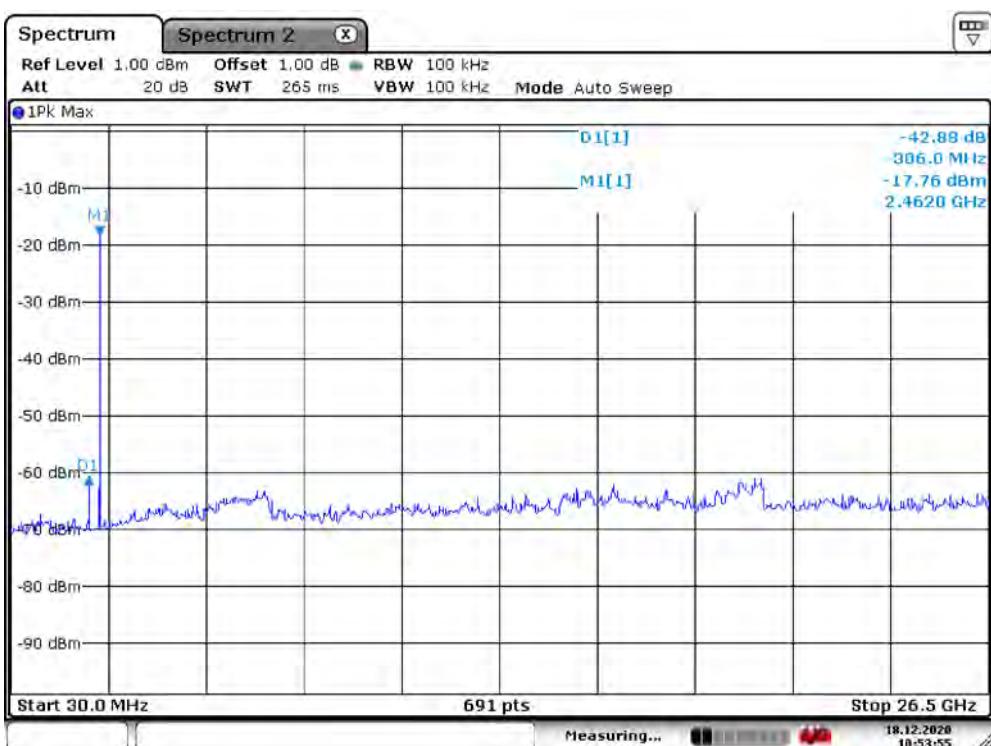
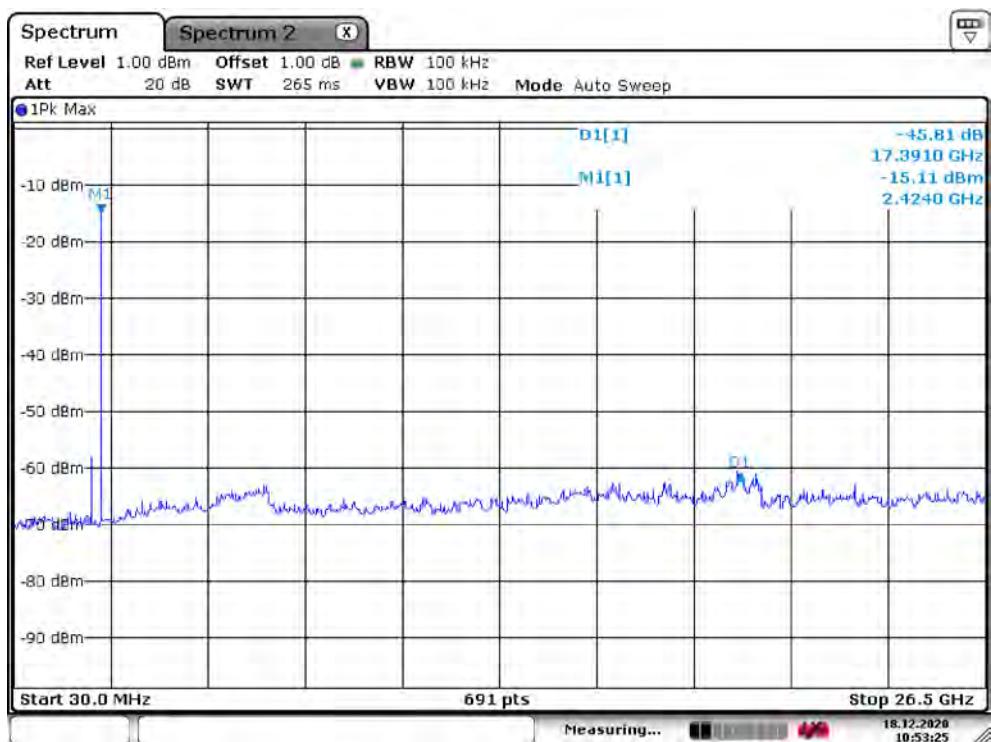
Frequency Range = 30 MHz ~ 26.5 GHz





**Unwanted Emission EDR – Low, Middle, High**  
**Frequency Range = 30 MHz ~ 26.5 GHz**





### 3.3.8 Radiated Spurious Emissions

#### Procedure:

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.10. The EUT was placed on a 0.8 m high wooden table inside a shielded enclosure. An antenna was placed near the EUT and measurements of frequencies and amplitudes of field strengths were recorded for reference during final measurements. For final radiated testing, measurements were performed in OATS. Measurements were performed with the EUT oriented in 3 orthogonal axis and rotated 360 degrees to determine worst-case orientation for maximum emissions.

- (a) In the frequency range of 9 kHz to 30 MHz, magnetic field is measured with Loop Test Antenna. The Test Antenna is positioned with its plane vertical at 3 m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
- (b) In the frequency range above 30 MHz, Bi-Log Test Antenna (30 MHz to 1 GHz) and Horn Test Antenna (above 1 GHz) are used. Test Antenna is 3 m away from the EUT. Test Antenna height is carried from 1 m to 4m above the ground to determine the maximum value of the field strength. The emission levels at both horizontal and vertical polarizations should be tested.

The spectrum analyzer is set to:

Center frequency = the worst channel

Frequency Range = 9 kHz ~ 10<sup>th</sup> harmonic.

RBW = 120 kHz ( 30 MHz ~ 1 GHz)

VBW  $\geq$  RBW

= 1 MHz ( 1 GHz ~ 10<sup>th</sup> harmonic )

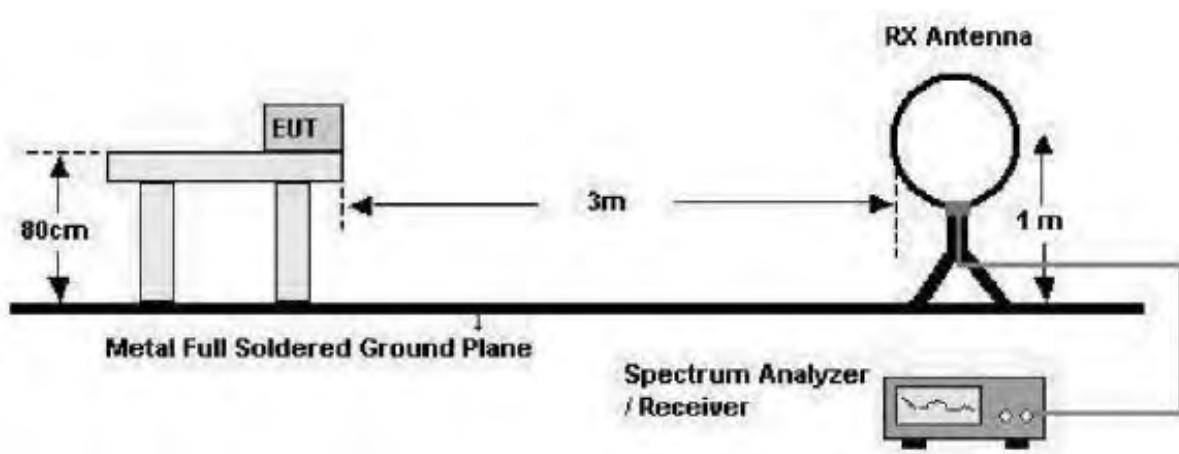
Span = 100 MHz

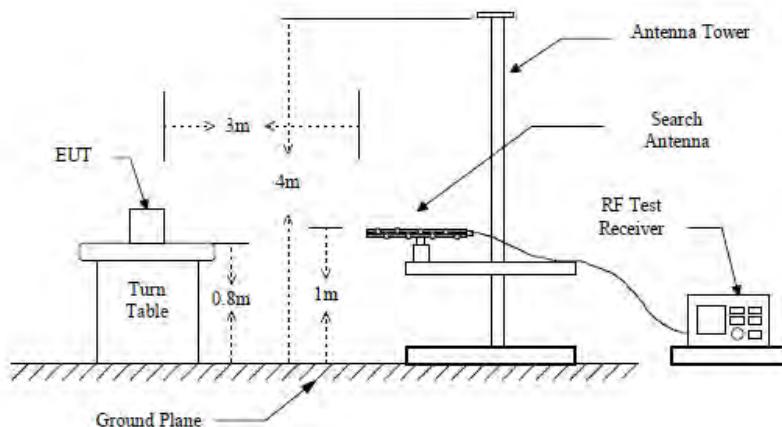
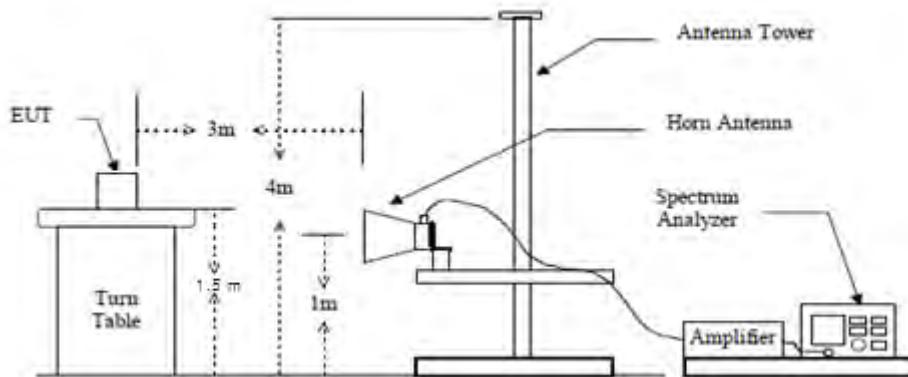
Detector function = peak

Trace = max hold

Sweep = auto

**below 30 MHz**



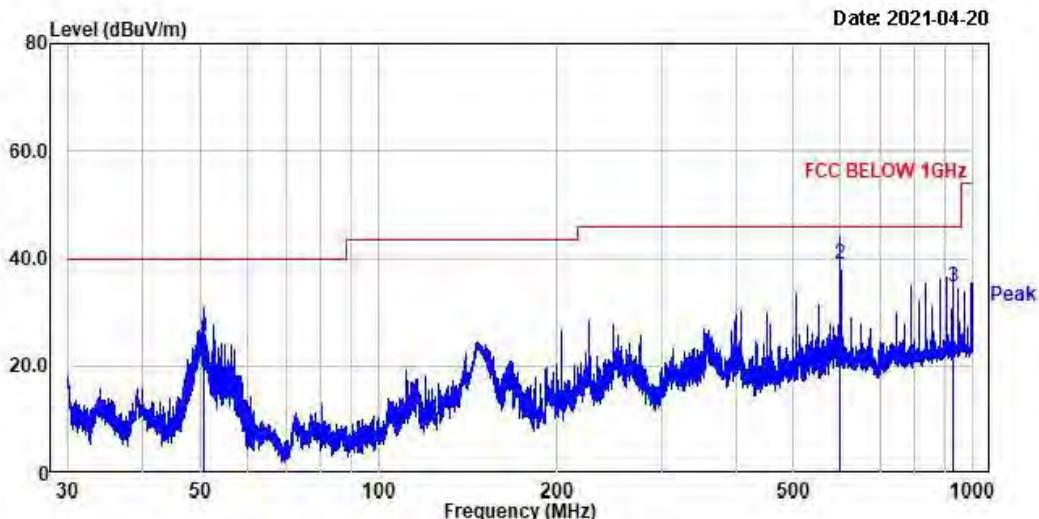
**below 1 GHz (30 MHz to 1 GHz)****above 1 GHz****Measurement Data: Complies**

- See next pages for actual measured data.
- No other emissions were detected at a level greater than 20 dB below limit include from 9 kHz to 30 MHz.
- The test results for the worst of the various operating modes are presented in accordance with 6.3.4 of ANSI C63.10.
- Checked with a red circle is the fundamental frequency.

**Minimum Standard: FCC Part 15.209(a)**

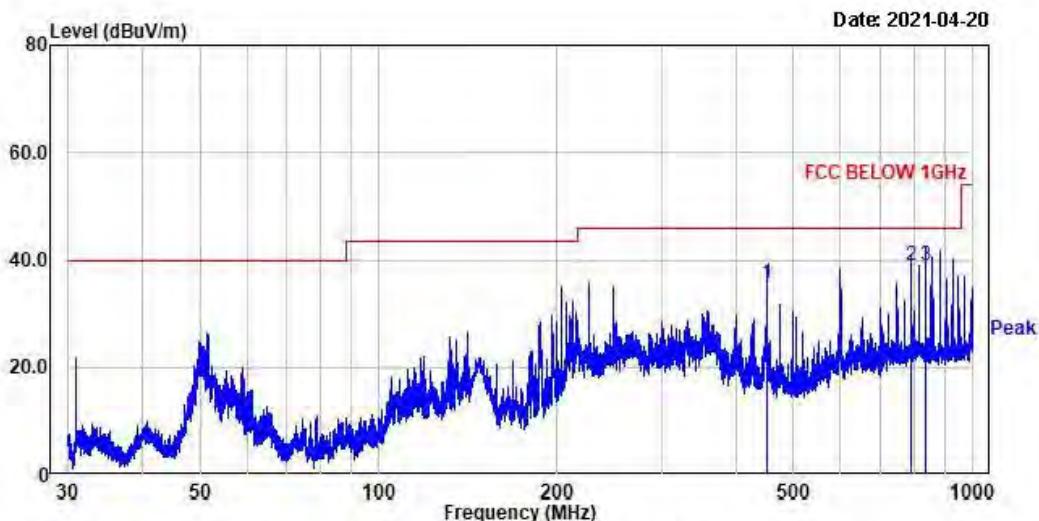
Frequency (MHz)	Limit (uV/m) @ 3m
0.009 ~ 0.490	2400/F(kHz) (@ 300m)
0.490 ~ 1.705	24000/F(kHz) (@ 30m)
1.705 ~ 30	30(@ 30m)
30 ~ 88	100 **
88 ~ 216	150 **
216 ~ 960	200 **
Above 960	500

\*\* Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

Radiated Emissions-BDR

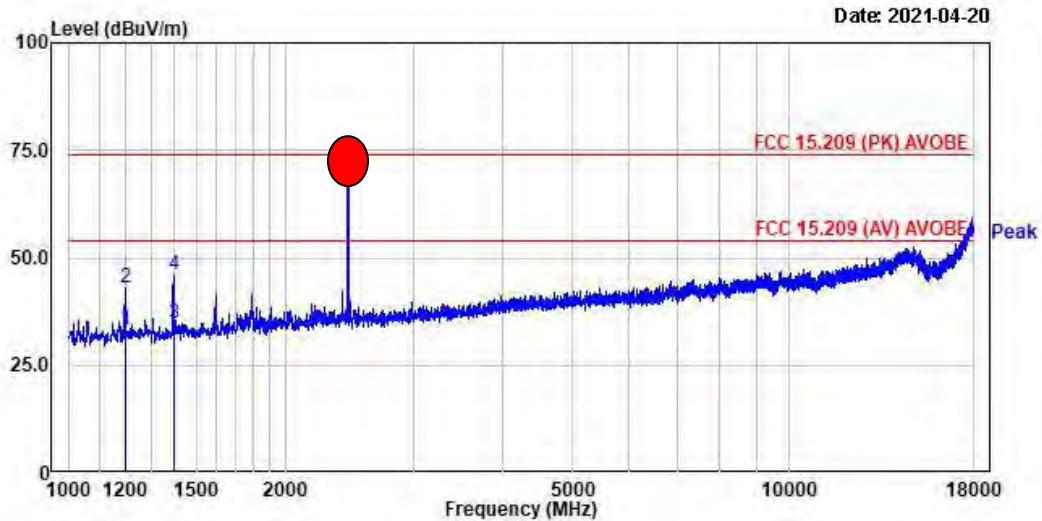
No.	Freq	Reading	C.F	Result	Limit	Margin	Height	Angle	Polarity
	MHz	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB	cm	deg	
1.	50.65	43.59	-18.30	25.29	40.00	14.71	100	0	horizontal
2.	600.11	47.20	-8.28	38.92	46.00	7.08	100	165	horizontal
3.	926.16	38.20	-3.37	34.83	46.00	11.17	100	165	horizontal

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain



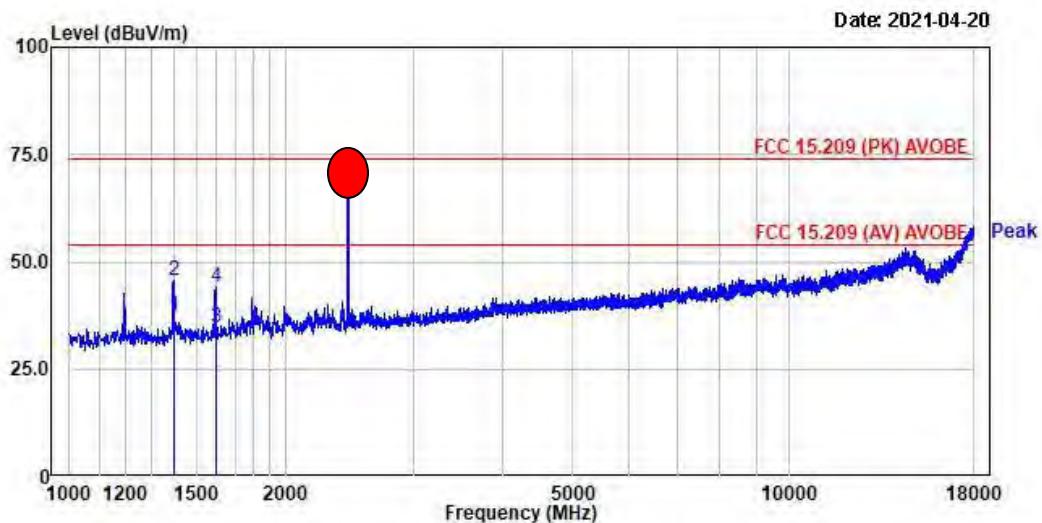
No.	Freq	Reading	C.F	Result	Limit	Margin	Height	Angle	Polarity
	MHz	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB	cm	deg	
1.	450.15	47.60	-12.03	35.57	46.00	10.43	100	360	vertical
2.	798.62	43.90	-5.01	38.89	46.00	7.11	100	132	vertical
3.	835.88	43.20	-4.39	38.81	46.00	7.19	100	147	vertical

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain



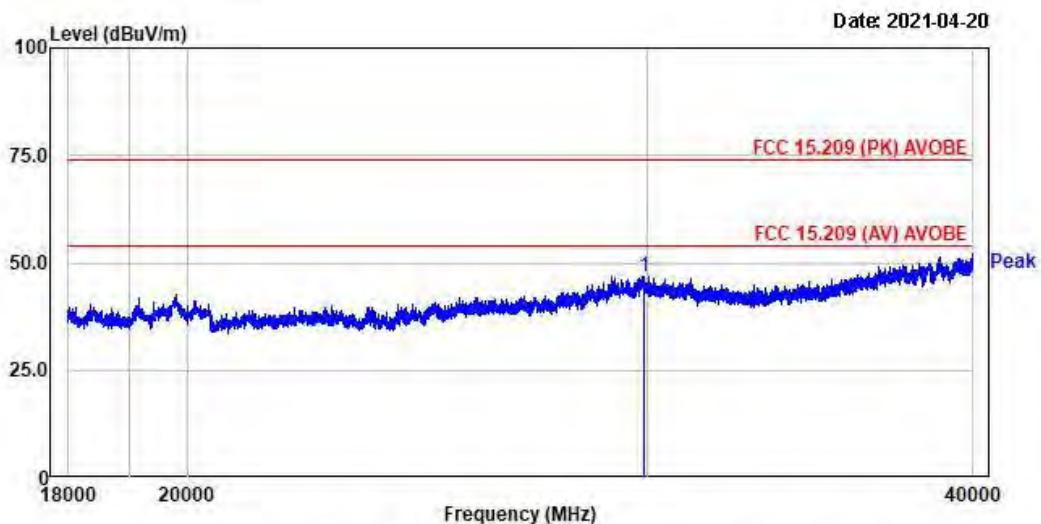
No.	Freq	RD	RD	C.F	Result		Result		Limit		Margin		Margin	Height	Angle	Polarity
					PK	AV	PK	AV	PK	AV	PK	AV				
MHz	dB $\mu$ V	dB $\mu$ V	dB	dB $\mu$ V	dB $\mu$ V	dB	dB $\mu$ V	dB $\mu$ V	dB	dB	dB	dB	cm	deg		
2.	1197.63	54.20	44.29	-11.87	43.13	33.22	74.00	54.00	30.87	20.78	210	203	horizontal			
4.	1397.38	56.19	44.80	-9.97	46.22	34.83	74.00	54.00	27.78	19.17	28	14	horizontal			

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain



No.	Freq	RD	RD	C.F	Result		Result		Limit		Margin		Margin	Height	Angle	Polarity
					PK	AV	PK	AV	PK	AV	PK	AV				
MHz	dB $\mu$ V	dB $\mu$ V	dB	dB $\mu$ V	dB $\mu$ V	dB	dB $\mu$ V	dB $\mu$ V	dB	dB	dB	dB	cm	deg		
2.	1395.25	55.51	47.30	-9.98	45.53	37.32	74.00	54.00	28.47	16.68	8	8	vertical			
4.	1597.13	52.91	43.30	-8.76	44.15	34.54	74.00	54.00	29.85	19.46	8	8	vertical			

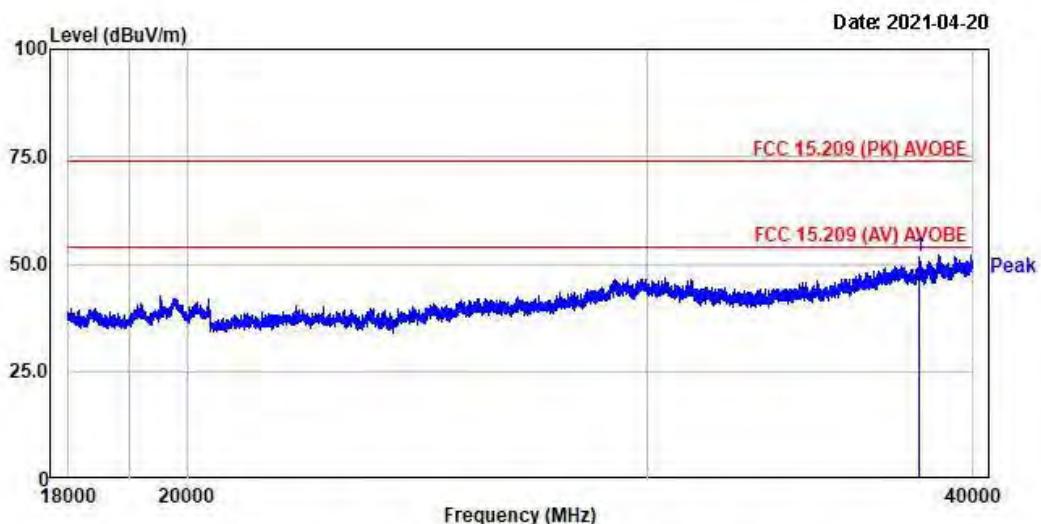
Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain



No.	Freq	RD	RD	C.F	Result	Result	Limit	Limit	Margin	Margin	Height	Angle	Polarity
	MHz	PK	AV		PK	AV	PK	AV	PK	AV	cm	deg	
		dB $\mu$ V	dB $\mu$ V		dB	dB $\mu$ V	dB $\mu$ V	dB $\mu$ V	dB	dB			

1. 29926.75 24.93 ----- 21.55 46.88 ----- 74.00 ----- 27.12 ----- 288 286 horizontal

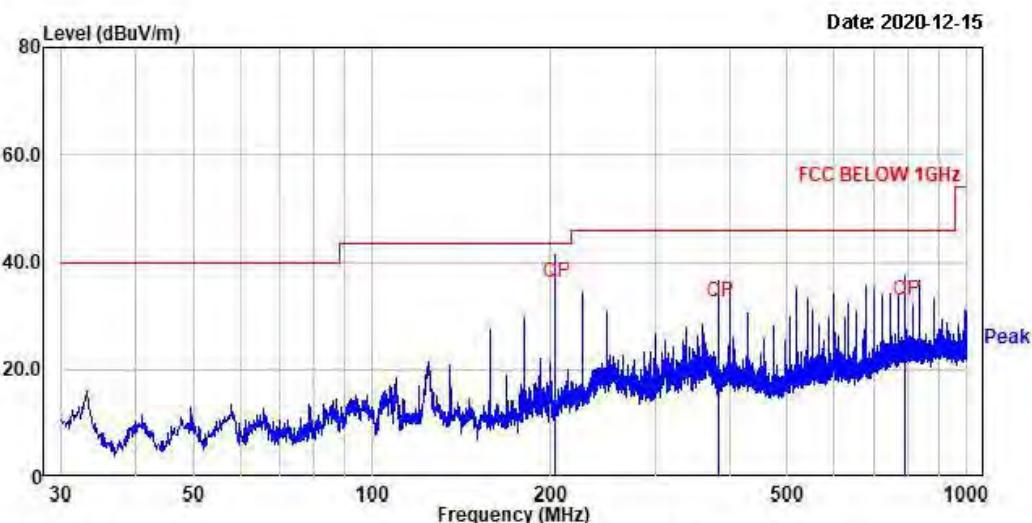
Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain



No.	Freq	RD	RD	C.F	Result	Result	Limit	Limit	Margin	Margin	Height	Angle	Polarity
	MHz	PK	AV		PK	AV	PK	AV	PK	AV	cm	deg	
		dB $\mu$ V	dB $\mu$ V		dB	dB $\mu$ V	dB $\mu$ V	dB $\mu$ V	dB	dB			

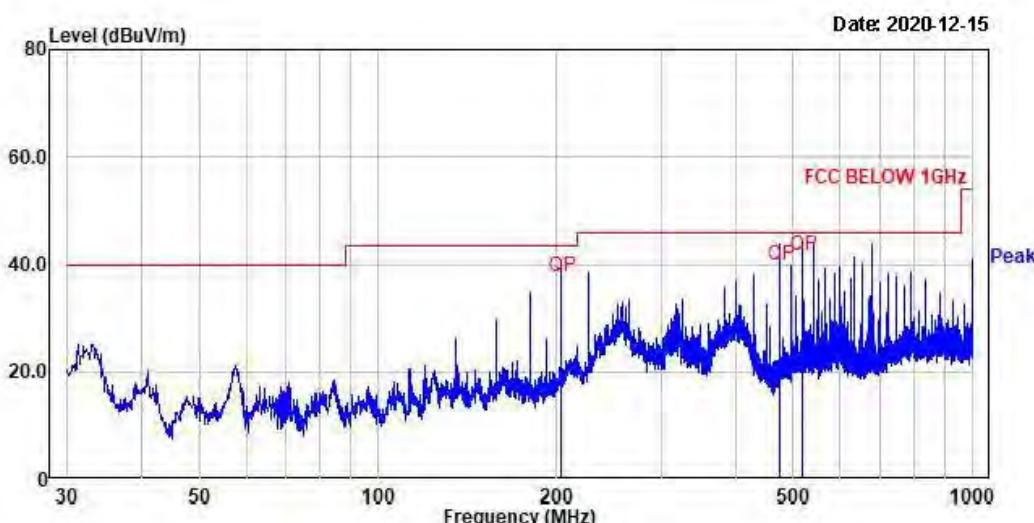
1. 38154.75 29.38 ----- 22.15 51.53 ----- 74.00 ----- 22.47 ----- 388 388 vertical

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

Radiated Emissions-EDR

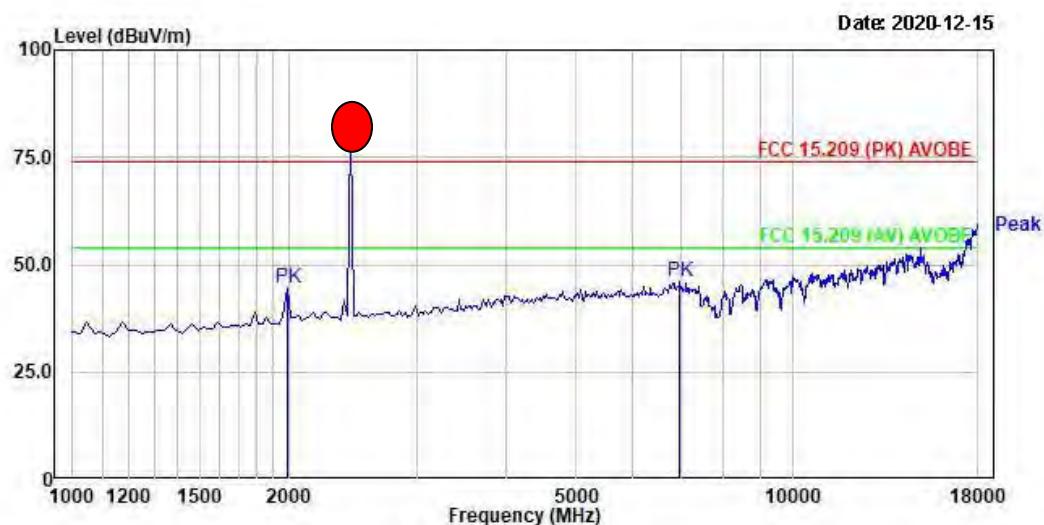
No.	Freq	Reading	C.F	Result	Limit	Margin	Height	Angle	Polarity
	MHz	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB	cm	deg	
1.	203.15	55.89	-19.52	36.37	43.50	7.13	100	81	horizontal
2.	383.81	45.60	-13.01	32.59	46.00	13.41	100	131	horizontal
3.	790.36	37.10	-4.13	32.97	46.00	13.03	100	145	horizontal

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain



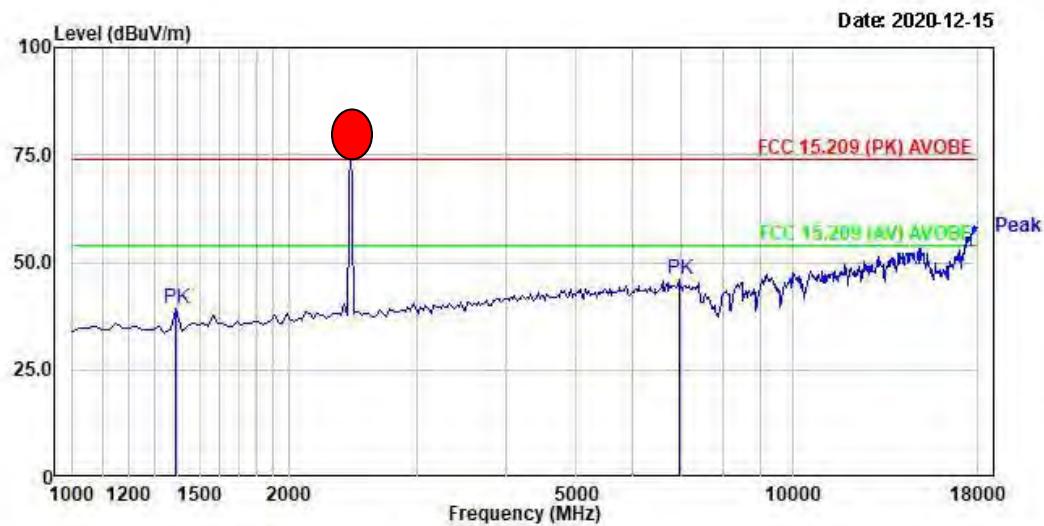
No.	Freq	Reading	C.F	Result	Limit	Margin	Height	Angle	Polarity
	MHz	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB	cm	deg	
1.	203.15	57.29	-19.52	37.77	43.50	5.73	100	259	vertical
2.	474.14	50.40	-10.67	39.73	46.00	6.27	100	3	vertical
3.	519.37	51.20	-9.51	41.59	46.00	4.31	100	95	vertical

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain



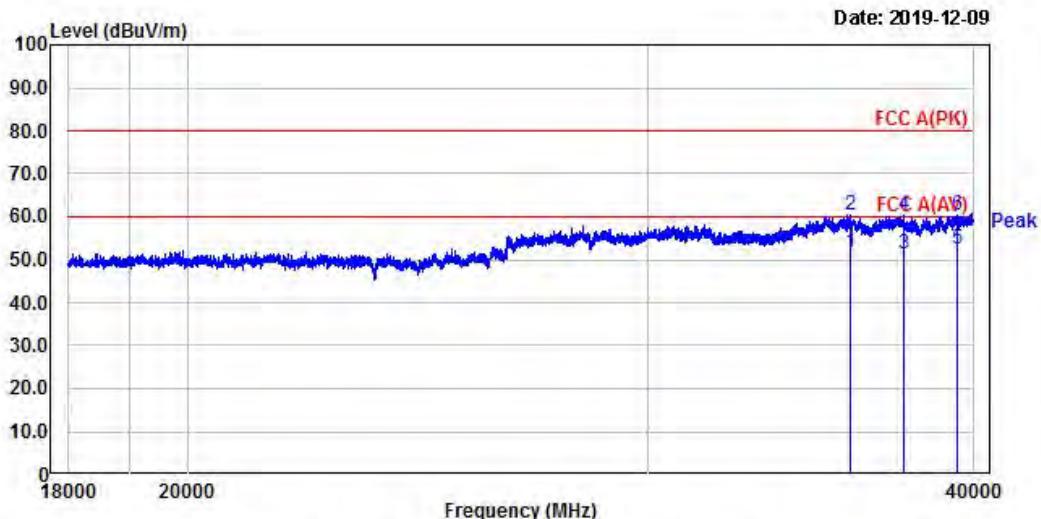
No.	Freq	RD	RD	C.F	Result	Result	Limit	Limit	Margin	Margin	Height	Angle	Polarity
	MHz	PK	AV		PK	AV	PK	AV	PK	AV	cm	deg	
1.	1985.51	50.66	-----	-6.19	44.47	-----	74.00	-----	29.53	-----	170	175	horizontal
2.	6962.32	38.76	-----	7.42	46.18	-----	74.00	-----	27.82	-----	321	326	horizontal

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain



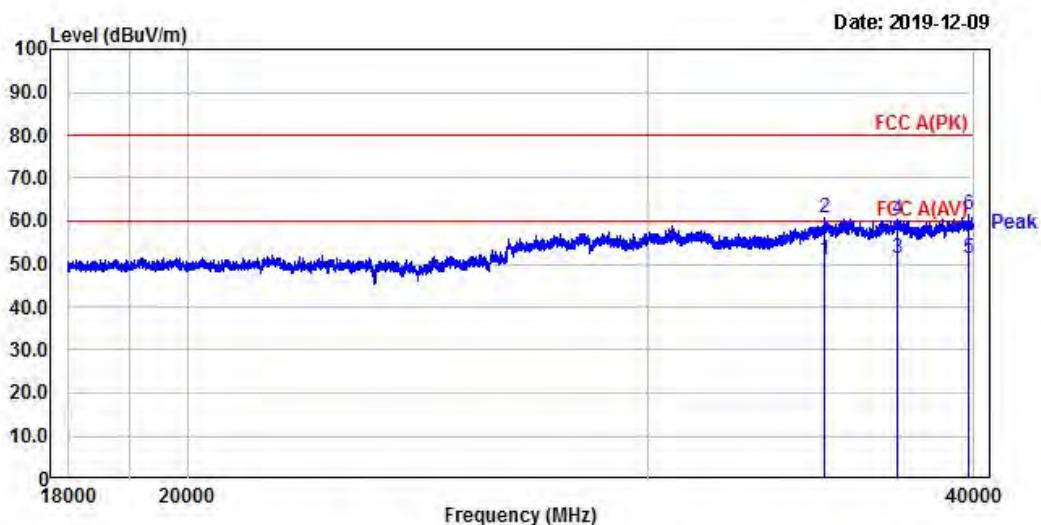
No.	Freq	RD	RD	C.F	Result	Result	Limit	Limit	Margin	Margin	Height	Angle	Polarity
	MHz	PK	AV		PK	AV	PK	AV	PK	AV	cm	deg	
1.	1394.20	49.14	-----	-9.99	39.15	-----	74.00	-----	34.85	-----	276	271	vertical
2.	6937.68	38.87	-----	7.35	46.22	-----	74.00	-----	27.78	-----	368	360	vertical

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain



No.	Freq	RD	RD	C.F		Result		Result		Limit		Limit		Margin		Margin		Height		Angle		Polarity	
				MHz	PK	AV	PK	AV	PK	AV	PK	AV	PK	dB	AV	cm	deg						
2.	35083.25	37.20	28.70	23.32	68.52	51.52	80.00	60.00	19.48	8.48	100	100	50	horizontal									
4.	37629.50	36.53	27.53	23.66	68.19	51.19	80.00	60.00	19.81	8.81	100	100	7	horizontal									
6.	39447.25	36.40	28.40	23.88	68.28	52.28	80.00	60.00	19.72	7.72	100	100	96	horizontal									

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain



No.	Freq	RD	RD	C.F		Result		Result		Limit		Limit		Margin		Margin		Height		Angle		Polarity	
				MHz	PK	AV	PK	AV	PK	AV	PK	AV	PK	dB	AV	cm	deg						
2.	35083.00	38.48	28.48	22.30	68.78	50.78	80.00	60.00	19.22	9.22	100	100	124	vertical									
4.	37428.50	36.51	27.51	23.74	68.25	51.25	80.00	60.00	19.75	8.75	100	100	155	vertical									
6.	39837.75	37.13	27.13	24.34	61.47	51.47	80.00	60.00	18.53	8.53	100	100	285	vertical									

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

### 3.3.9 AC Conducted Emissions

#### Procedure:

AC power line conducted emissions from the EUT were measured according to the dictates of ANSI C63.4:2003.

The conducted emissions are measured in the shielded room with a spectrum analyzer in peak hold. While the measurement, EUT had its hopping function disabled at the middle channels in line with Section 15.31(m). Emissions closest to the limit are measured in the quasi-peak mode (QP) with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation and Exerciser operation. The highest emissions relative to the limit are listed.

#### Measurement Data: N/A

#### Minimum Standard: FCC Part 15.207(a)/EN 55022

Frequency Range	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

\* Note: This product operates only with battery and does not operate during charging.

## APPENDIX

## TEST EQUIPMENT USED FOR TESTS

	Use	Description	Model No.	Serial No.	Manufacturer	Interval	Next Cal. Date
1	■	Signal Analyzer (9 kHz ~ 30 GHz)	FSV30	100757	R&S	1 year	2021-09-07
2	■	Signal Generator (~3.2 GHz)	8648C	3623A02597	HP	1 year	2022-03-16
3		SYNTHESIZED CW GENERATOR	83711B	US34490456	HP	1 year	2022-03-16
4		Attenuator (3 dB)	8491A	37822	HP	1 year	2021-09-07
5		Attenuator (10 dB)	8491A	63196	HP	1 year	2021-09-07
6	■	EMI Test Receiver (~7 GHz)	ESCI7	100722	R&S	1 year	2021-09-07
7		RF Amplifier (~1.3 GHz)	8447D OPT 010	2944A07684	HP	1 year	2021-09-07
8		RF Amplifier (1~26.5 GHz)	8449B	3008A02126	HP	1 year	2022-03-16
9	■	Horn Antenna (1~18 GHz)	3115	00114105	ETS	2 year	2022-09-10
10		DRG Horn (Small)	3116B	81109	ETS-Lindgren	2 year	2022-03-18
11		DRG Horn (Small)	3116B	133350	ETS-Lindgren	2 year	2022-03-18
12	■	TRILOG Antenna	VULB 9160	9160-3237	SCHWARZBECK	2 year	2023-03-20
13		Temp.Humidity Data Logger	SK-L200TH II A	00801	SATO	1 year	2022-03-16
14		Splitter (SMA)	ZFSC-2-2500	SF617800326	Mini-Circuits	-	-
15	■	DC Power Supply	6674A	3637A01657	Agilent	-	-
17	■	Power Meter	EPM-441A	GB32481702	HP	1 year	2022-03-16
18	■	Power Sensor	8481A	3318A94972	HP	1 year	2021-09-07
19		Audio Analyzer	8903B	3729A18901	HP	1 year	2021-09-07
20		Moduleation Analyzer	8901B	3749A05878	HP	1 year	2021-09-07
21		TEMP & HUMIDITY Chamber	YJ-500	LTAS06041	JinYoung Tech	1 year	2021-09-07
22		Stop Watch	HS-3	812Q08R	CASIO	2 year	2022-03-18
23		LISN	KNW-407	8-1430-1	Kyoritsu	1 year	2022-03-16
24		Two-Lime V-Network	ESH3-Z5	893045/017	R&S	1 year	2022-03-16
25		UNIVERSAL RADIO COMMUNICATION TESTER	CMU200	106243	R&S	1 year	2022-03-16
26		Highpass Filter	WHKX1.5/15G-10SS	74	Wainwright Instruments	1 year	2022-03-16
27		Highpass Filter	WHKX3.0/18G-10SS	118	Wainwright Instruments	1 year	2022-03-16
28		OSP120 BASE UNIT	OSP120	101230	R&S	1 year	2022-03-16
29		Signal Generator(100 kHz ~ 40 GHz)	SMB100A03	177621	R&S	1 year	2022-03-16
30		Signal Analyzer (10 Hz ~ 40 GHz)	FSV40	101367	R&S	1 year	2022-03-16
31	■	Active Loop Antenna	FMZB 1519	1519-031	SCHWARZBECK	2 year	2021-09-07