FCC Part 15.247

TEST REPORT

For

DozzyCozy Technology Co., Ltd.

15F-2, No.11, Section 2, Huannan Road, Pingzhen District, Taoyuan City, Taiwan 324

FCC ID: 2A6PCP10AR

Report Type: Original Report	**Product Type:** AirCozy Remote

Report Producer : Coco Lin

Report Number : RXZ211126001RF01

Report Date : 2022-06-02

Reviewed By: David Hsu David.Hsu

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Revision History

Revision	No.	Report Number	Issue Date	Description	Author/ Revised by
0.0	RXZ211126001	RXZ211126001RF01	2022-06-02	Original Report	Coco Lin

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1 General Information

1.1 Product Description for Equipment under Test (EUT)

Applicant	DozzyCozy Technology Co., Ltd.
	15F-2, No.11, Section 2, Huannan Road, Pingzhen District, Taoyuan City, Taiwan 324
Manufacturer	DozzyCozy Technology Co., Ltd.
	15F-2, No.11, Section 2, Huannan Road, Pingzhen District, Taoyuan City, Taiwan 324
Brand(Trade) Name	DozzyCozy, AirCozy
Product (Equipment)	AirCozy Remote
Main Model Name	AirCozy Remote_N_VA
Frequency Range	BLE(1M) / BLE(2M) : 2402 ~ 2480 MHz
Transmit Power	BLE(1M) Mode : -5.73 dBm BLE(2M) Mode : -5.77 dBm
Modulation Technique	BLE(1M) / BLE(2M) : GFSK
Channel Separation	BLE(1M) / BLE(2M) : 2 MHz
Power Operation (Voltage Range)	☐ AC ☐ Adapter I/P: ☐ By AC Power Cord ☐ PoE
	☒ DC Type ☒ Battery 1.5V*2 ☐ DC Power Supply: ☐ External from USB Cable ☐ External DC Adapter
	☐ Host System
Received Date	Nov. 17, 2021
Date of Test	Feb. 22, 2022 ~ Mar. 05, 2022

*All measurement and test data in this report was gathered from production sample serial number: RXZ211126001-01 (Assigned by BACL, New Taipei Laboratory).

1.2 Objective

This report is prepared on behalf of DozzyCozy Technology Co., Ltd. in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communication Commission's rules.
The objective is to determine compliance with FCC Part 15.247 rules for Output Power, Antenna Requirements, 6 dB Bandwidth, Power Spectral Density, 100 kHz Bandwidth of Band Edges Measurement, Conducted and Radiated Spurious Emissions.

1.3 Related Submittal(s)/Grant(s)

N/A.

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

1.5 Statement of Compliance

Decision Rule: No, (The test results do not include MU judgment)

It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (New Taipei Laboratory).
Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.
Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.
The determination of the test results does not require consideration of the uncertainty of the measurement, unless the assessment is required by customer agreement, regulation or standard document specification.
Bay Area Compliance Laboratories Corp. (New Taipei Laboratory) is not responsible for the authenticity of the information provided by the applicant that affects the test results.

1.6 Measurement Uncertainty

Parameter		Uncertainty
AC Mains		+/- 2.36 dB
RF output power, conducted		+/- 0.93 dB
Power Spectral Density, conducted		+/- 0.93 dB
Occupied Bandwidth		+/- 0.35 MHz
Unwanted Emissions, conducted		+/- 1.69 dB
Emissions, radiated	30 MHz~1GHz	+/- 5.22 dB
	1 GHz~18 GHz	+/- 6.12 dB
	18 GHz~40 GHz	+/- 4.99 dB
Temperature		+/- 1.27 °C
Humidity		+/- 3 %

1.7 Environmental Conditions

Test Site	Test Date	Temperature (℃)	Relative Humidity (%)	ATM Pressure (hPa)	Test Engineer
AC Line Conducted Emissions	2022/03/05	22.1	69	1010	Boris Kao
Radiation Spurious Emissions	2022/02/19	20.2	77	1010	Aaron Pan
Conducted Spurious Emissions	2022/02/22	19.8	71	1010	Howard Ho
6 dB Emission Bandwidth	2022/02/22	19.8	71	1010	Howard Ho
Maximum Output Power	2022/02/22	19.8	71	1010	Howard Ho
100 kHz Bandwidth of Frequency Band Edge	2022/02/22	19.8	71	1010	Howard Ho
Power Spectral Density	2022/02/22	19.8	71	1010	Howard Ho

1.8 Test Facility

The Test site used by Bay Area Compliance Laboratories Corp.(New Taipei Laboratory) to collect test data is located on

☒70, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.

Bay Area Compliance Laboratories Corp.(New Taipei Laboratory) is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 3732) and the FCC designation No.TW3732 under the Mutual Recognition Agreement (MRA) in FCC Test. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.10.

2 System Test Configuration

2.1 Description of Test Configuration

For BLE mode, there are totally 40 channels.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2442
1	2404	--	--
2	2406	--	--
3	2408	37	2476
--	--	38	2478
19	2440	39	2480

For BLE Modes were tested with channel 0, 19 and 39.

The system was configured for testing in engineering mode, which was provided by manufacturer.

2.2 Equipment Modifications

No modification was made to the EUT.

2.3 EUT Exercise Software

The test software was used “Putty.exe”

Test Frequency		Low	Mid	High
Power Level Setting	BLE 1M	Default	Default	Default
	BLE 2M	Default	Default	Default

2.4 Support Equipment List and Details

Description	Manufacturer	Model Number	S/N
NB	DELL	E6410	8N7PXN1
Fixture	Waveshare	FT232	N/A

2.5 External Cable List and Details

N/A

2.6 Test Mode

AC Line Conducted Emissions and Radiated Spurious Emissions

Mode 1: AirCozy Remote_N_VA.

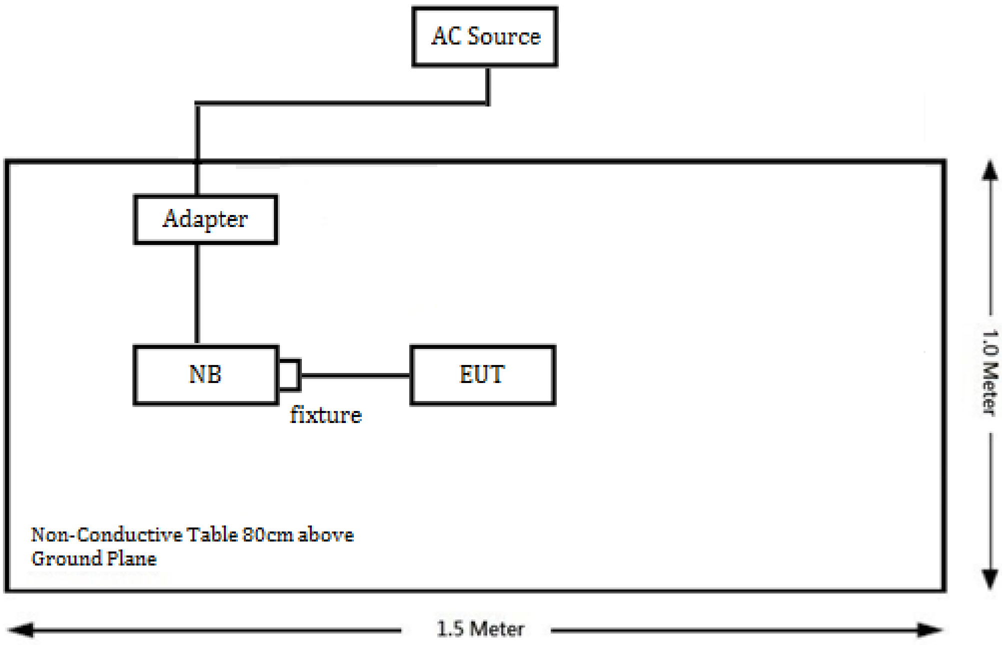
Worst case is the Model 1.

2.7 Block Diagram of Test Setup

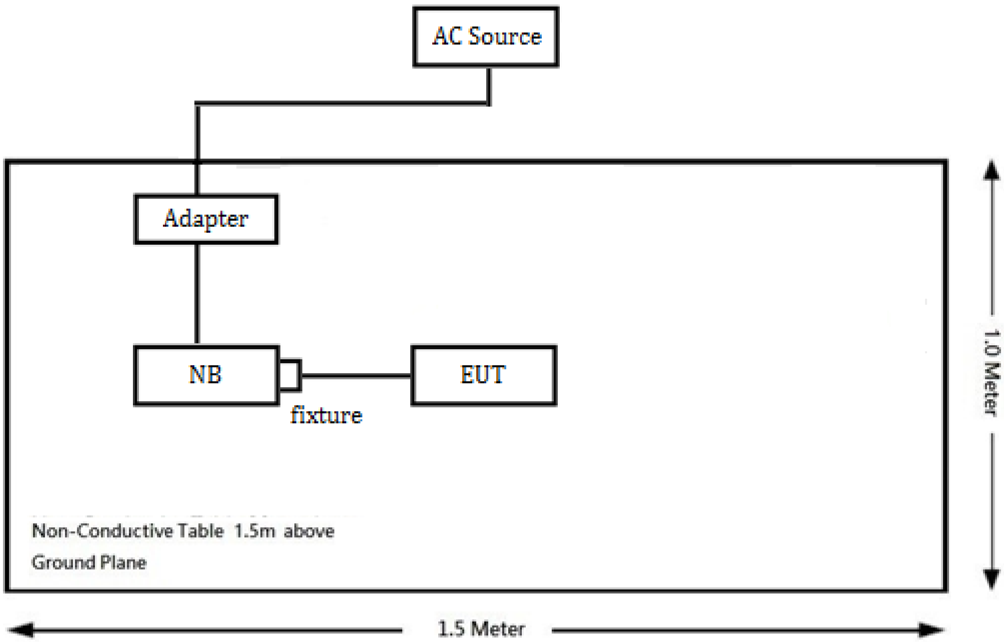
See test photographs attached in setup photos for the actual connections between EUT and support equipment.

Radiation:

Below 1GHz:



Above 1GHz:



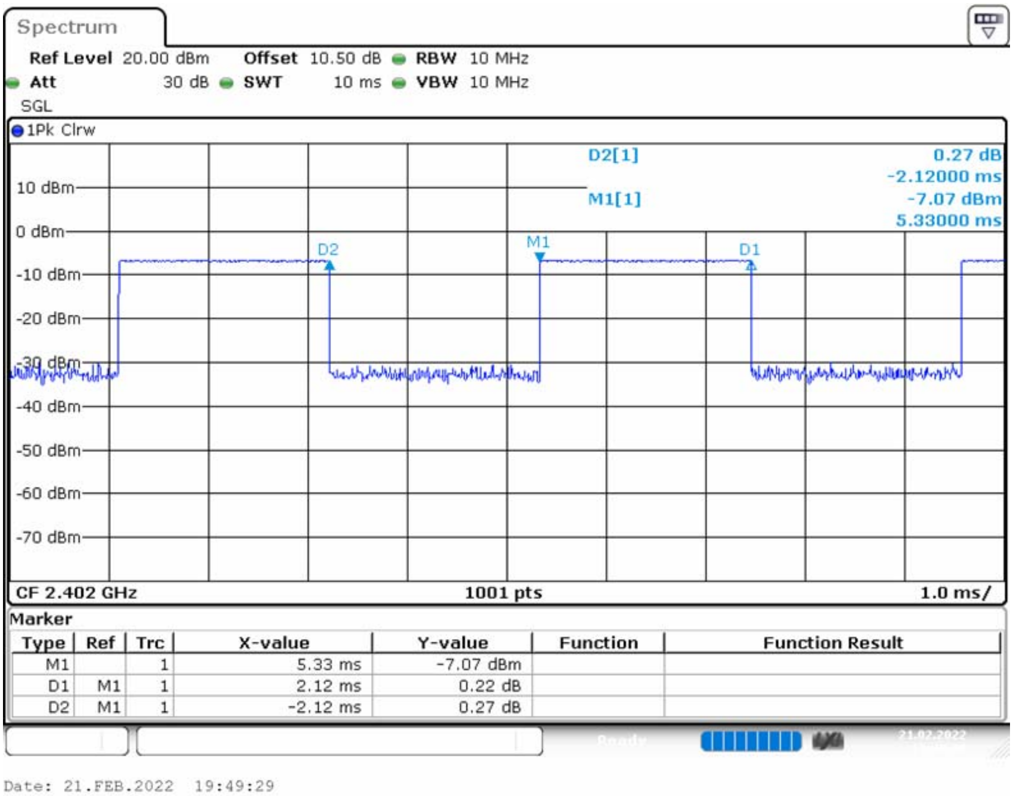
2.8 Duty Cycle

The duty cycle as below:

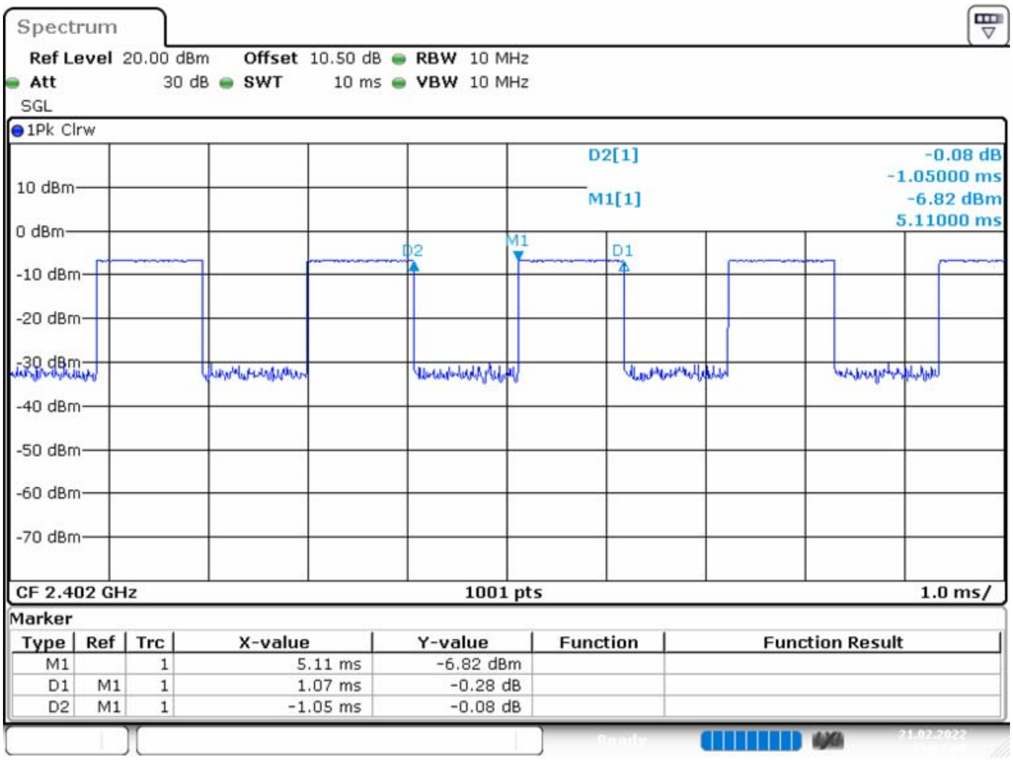
Radio Mode	Ton (ms)	Ton+Toff (ms)	Duty Cycle (%)
BLE 1M	2.12	4.24	50
BLE 2M	1.07	2.12	50

Please refer to the following plots.

BLE(1M) Mode



BLE(2M) Mode



Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.11 ms	-6.82 dBm		
D1	M1	1	1.07 ms	-0.28 dB		
D2	M1	1	-1.05 ms	-0.08 dB		

Date: 21.FEB.2022 19:51:00

3 Summary of Test Results

FCC Rules	Description of Test	Results
§15.247(i), §1.1307(b)(3)(i)	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Not applicable
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247(a)(2)	6 dB Emission Bandwidth	Compliance
§15.247(b)(3)	Maximum Peak Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

Not applicable: The EUT is powered by batteries.

4 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Room (966-A)					
Bilog Antenna with 6 dB Attenuator	SUNOL SCIENCES & MINI-CIRCUITS	JB6/UNAT-6+	A050115/15542_01	2022/2/14	2023/2/13
EMI Test Receiver	Rohde & Schwarz	ESR7	101419	2021/11/9	2022/11/8
Horn Antenna	EMCO	SAS-571	1020	2021/4/23	2022/4/22
Horn Antenna	ETS-Lindgren	3116	62638	2021/8/11	2022/8/10
Preamplifier	Sonoma	310N	130602	2021/6/8	2022/6/7
Preamplifier	A.H. system Inc.	PAM-0118P	466	2021/11/4	2022/11/3
Microware Preamplifier	EM Electronics Corporation	EM18G40G	60656	2021/12/27	2022/12/26
Spectrum Analyzer	Rohde & Schwarz	FSV40	101435	2022/1/13	2023/1/12
Micro flex Cable	UTIFLEX	UFB197C-1-2362-70U-70U	225757-001	2022/1/24	2023/1/23
Coaxial Cable	COMMATE	PEWC	8Dr	2021/12/24	2022/12/23
Coaxial Cable	UTIFLEX	UFB311A-Q-1440-300300	220490-006	2022/1/24	2023/1/23
Coaxial Cable	JUNFLON	J12J102248-00-B-5	AUG-07-15-044	2021/12/24	2022/12/23
Cable	EMC	EMC105-SM-SM-10000	201003	2022/1/24	2023/1/23
Preamplifier	A.H. system Inc.	PAM-0118P	470	2021/3/15	2022/3/14
Software	Farad	EZ_EMC	BACL-03A1	N.C.R	N.C.R
Conducted Room					
Spectrum Analyzer	Rohde & Schwarz	FSU26	200268	2021/7/14	2022/7/13
Cable	UTIFLEX	UFA210A	9435	2021/10/5	2022/10/4
Attenuator	MINI-CIRCUITS	BW-S10W5+	1419	2022/2/11	2023/2/10

***Statement of Traceability:** BACL Corp. attests that all of the calibrations on the equipment items listed above were traceable to the SI System of Units via the R.O.C. Center for Measurement Standards of the Electronics Testing Center, Taiwan (ETC) or to another internationally recognized National Metrology Institute (NMI), and were compliant with the current Taiwan Accreditation Foundation (TAF) requirements

5 FCC §15.247(i), §1.1307(b)(3)(i) – RF Exposure

5.1 Applicable Standard

According to subpart 15.247(i) and subpart §1.1307(b)(3)(i), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

For single RF sources (*i.e.,* any single fixed RF source, mobile device, or portable device, as defined in paragraph (b)(2) of this section): A single RF source is exempt if:

(A) The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(ii)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(ii)(A);

(B) Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold *Pth* (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). *Pth* is given by:

$$P_{th}\ (\text{mW}) = \begin{cases} ERP_{20\ cm}(d/20\ \text{cm})^{x} & d \leq 20\ \text{cm} \\ ERP_{20\ cm} & 20\ \text{cm} < d \leq 40\ \text{cm} \end{cases}$$

Where

$$x = -\log_{10}\left(\frac{60}{ERP_{20\ cm}\sqrt{f}}\right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20\ cm}\ (\text{mW}) = \begin{cases} 2040f & 0.3\ \text{GHz} \leq f < 1.5\ \text{GHz} \\ 3060 & 1.5\ \text{GHz} \leq f \leq 6\ \text{GHz} \end{cases}$$

5.2 RF Exposure Evaluation Result

Project info

Band	Freq (MHz)	Tune-up Power (dBm)	Ant Gain (dBi)	Distances (mm)	Duty (%)	Tune-up Pow (mW)	ERP (dBm)	ERP (mW)
BLE	2480	-5.5	2	5	100%	0.28	-5.65	0.27

Option A

The available maximum time-averaged power is no more than 1 mW

Band	Freq (MHz)	Result Option A
BLE	2480	exempt

Option B

The available maximum time-averaged power or effective radiated power (ERP), whichever is greater.

This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive).

Band	Freq (MHz)	Pth (mW)	X	ERP 20cm (mW)	Ratio	Result Option B
BLE	2480	2.72	1.905	3060	0.10	exempt

Result: The device meets the exemption requirement.

6 FCC §15.203 – Antenna Requirements

6.1 Applicable Standard

According to § 15.203,

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna does not exceed 6dBi.

6.2 Antenna Information

Manufacturer	Model	Type	Antenna Gain
Walsin Technology Coporation	RFANT3216120A19F1T	Chip Antenna	2 dBi

Result: Compliance

7 FCC §15.209, §15.205 , §15.247(d) – Spurious Emissions

7.1 Applicable Standard

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1MHz.

As Per FCC §15.205(a) except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	608 – 614	4. 5 – 5. 15
0.495 – 0.505	16.69475 – 16.69525	960 – 1240	5. 35 – 5. 46
2.1735 – 2.1905	16.80425 – 16.80475	1300 – 1427	7.25 – 7.75
4.125 – 4.128	25.5 – 25.67	1435 – 1626.5	8.025 – 8.5
4.17725 – 4.17775	37.5 – 38.25	1645.5 – 1646.5	9.0 – 9.2
4.20725 – 4.20775	73 – 74.6	1660 – 1710	9.3 – 9.5
6.215 – 6.218	74.8 – 75.2	1718.8 – 1722.2	10.6 – 12.7
6.26775 – 6.26825	108 – 121.94	2200 – 2300	13.25 – 13.4
6.31175 – 6.31225	123 – 138	2310 – 2390	14.47 – 14.5
8.291 – 8.294	149.9 – 150.05	2483.5 – 2500	15.35 – 16.2
8.362 – 8.366	156.52475 – 156.52525	2690 – 2900	17.7 – 21.4
8.37625 – 8.38675	156.7 – 156.9	3260 – 3267	22.01 – 23.12
8.41425 – 8.41475	162.0125 –167.17	3.332 – 3.339	23.6 – 24.0
12.29 – 12.293	167.72 – 173.2	3 3458 – 3 358	31.2 – 31.8
12.51975 – 12.52025	240 – 285	3.600 – 4.400	36.43 – 36.5
12.57675 – 12.57725	322 – 335.4		Above 38.6
13.36 – 13.41	399.9 – 410		

As per FCC §15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

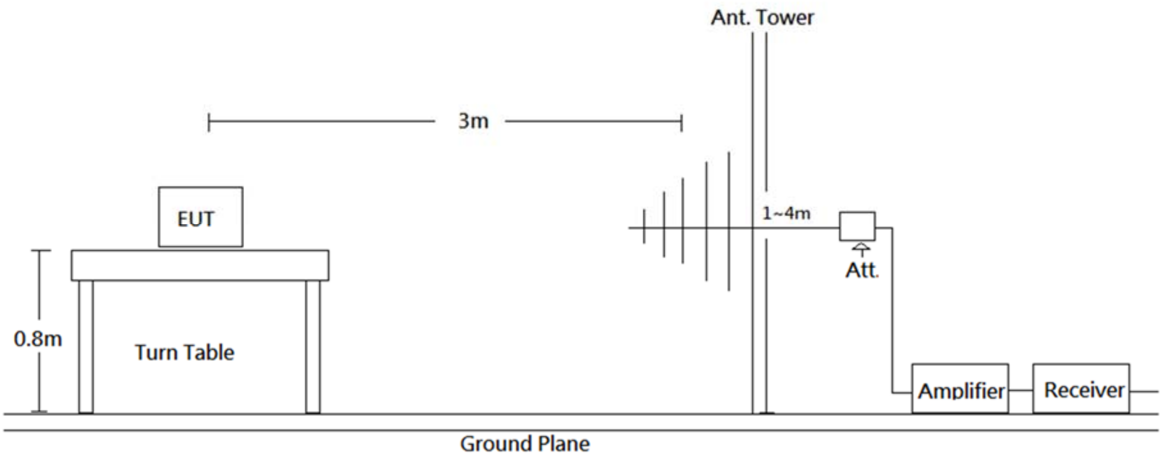
Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

** Except as provided in paragraph (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., Sections 15.231 and 15.241.

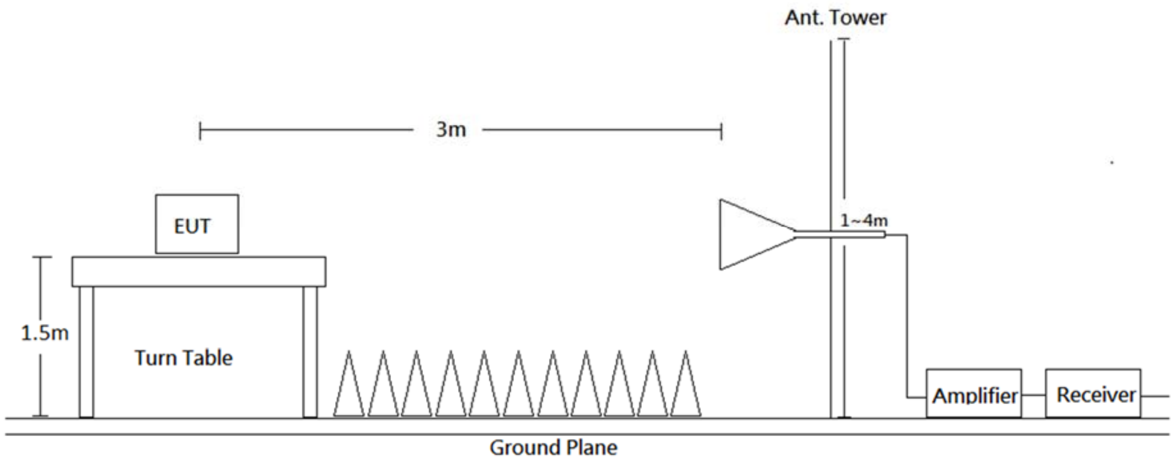
As per FCC §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c).

7.2 EUT Setup

Below 1 GHz:



Above 1 GHz:



Radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC Part 15.209 and FCC 15.247 Limits.

7.3 EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 26.5 GHz. During the radiated emission test, the EMI test receiver was set with the following configurations measurement method 6.3 in ANSI C63.10.

Frequency Range	RBW	VBW	Duty cycle	Measurement method
30-1000 MHz	120 kHz	/		QP
Above 1 GHz	1 MHz	3 MHz		PK
	1 MHz	10 Hz	>98%	Ave
	1 MHz	1/T	<98%	Ave

7.4 Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the Quasi-peak detector mode from 30 MHz to 1 GHz and PK and average detector modes for frequencies above 1 GHz.

7.5 Corrected Factor & Margin Calculation

The Correct Factor is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

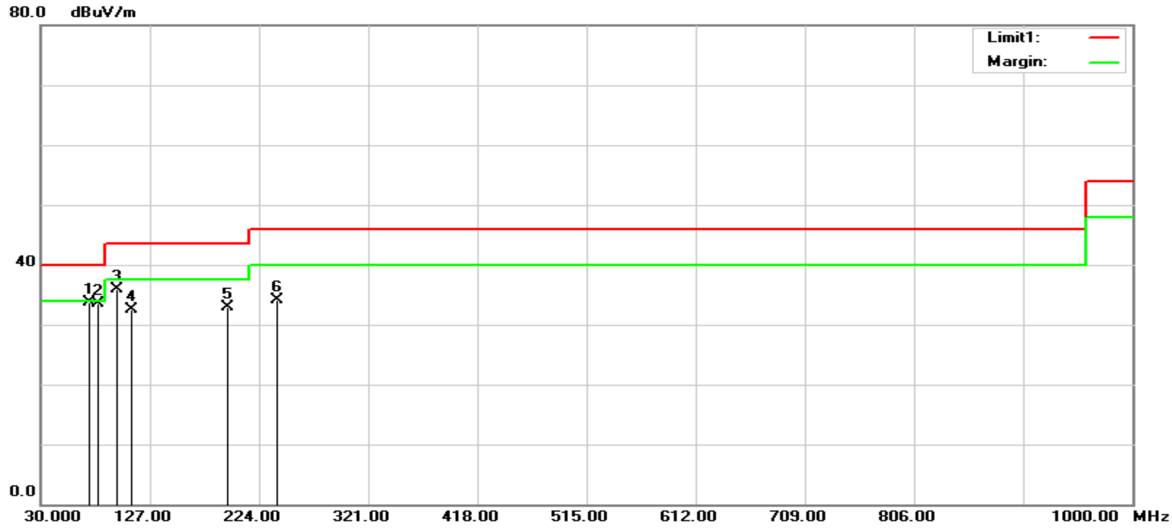
Margin = Result – Limit

7.6 Test Results

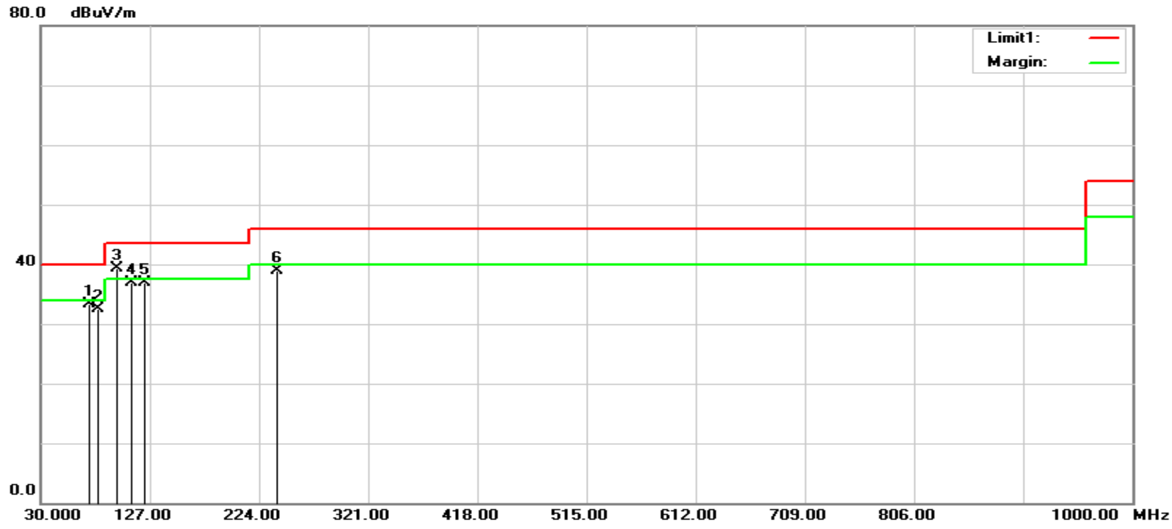
Test Mode: Transmitting (Pre-scan with three orthogonal axis, and worse case as X axis.)

30MHz-1GHz: (worst case is BLE 1M mode high channel)

Horizontal



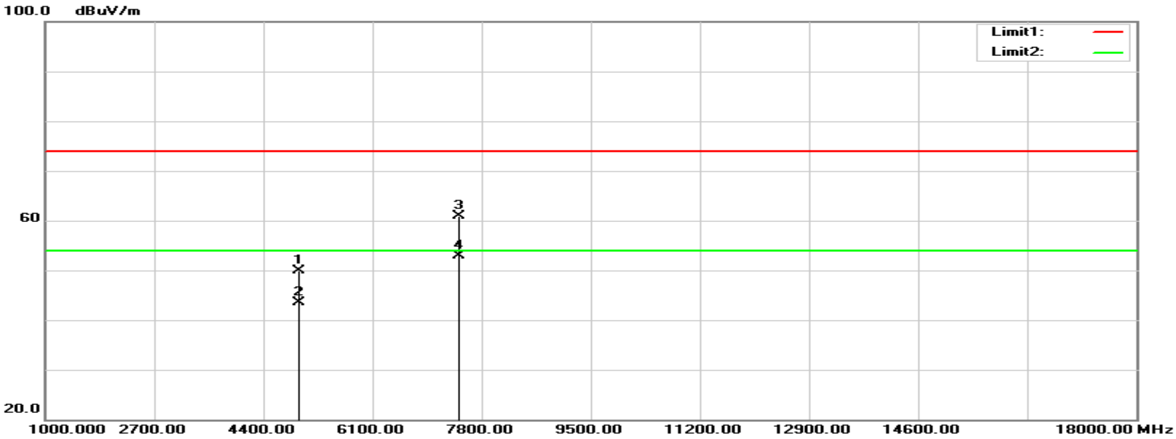
Vertical



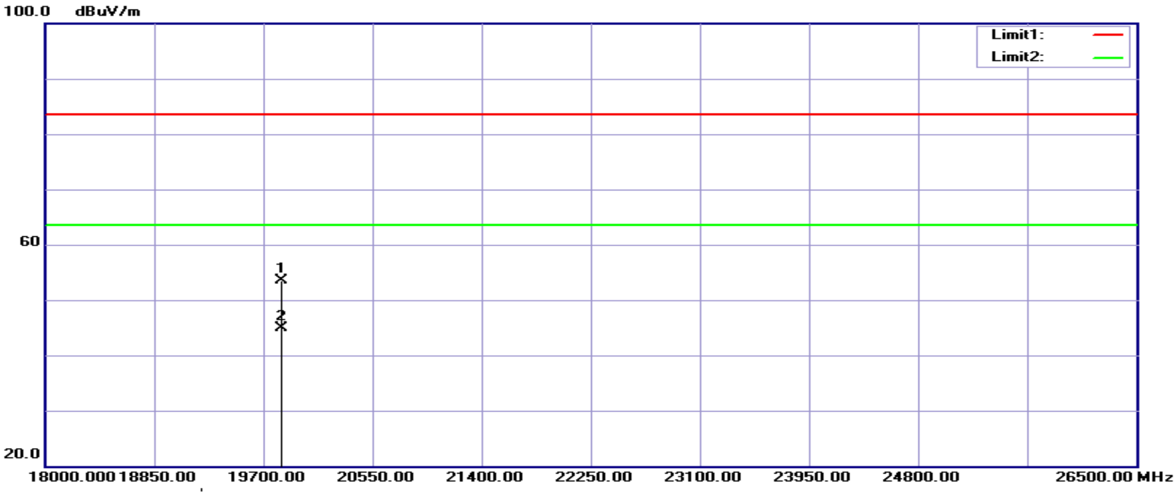
BLE(1M) Mode (Pre-scan with three orthogonal axis, and worse case as X axis.)

Horizontal (worst case is high channel)

1GHz-18GHz:

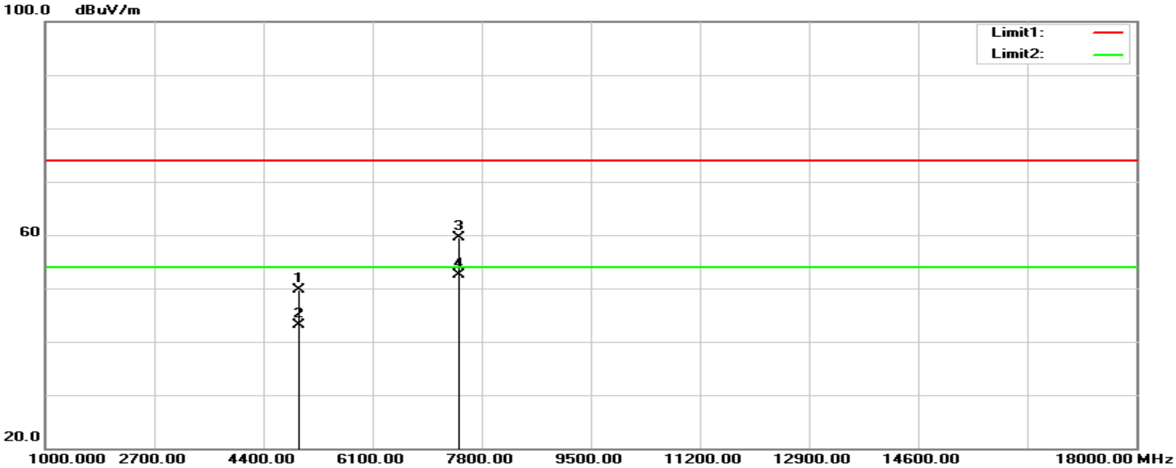


18GHz-26.5GHz:



Vertical (worst case is high channel)

1GHz-18GHz:

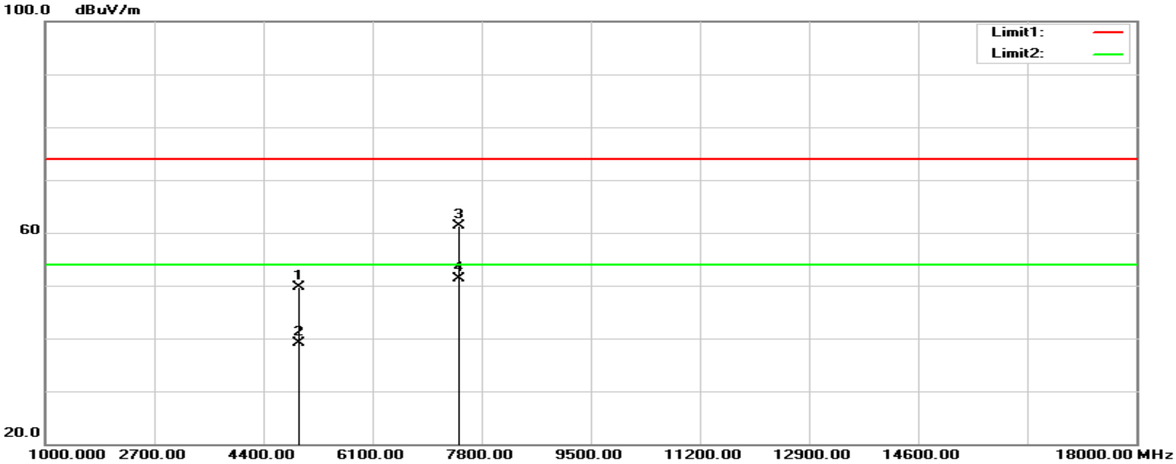


18GHz-26.5GHz:

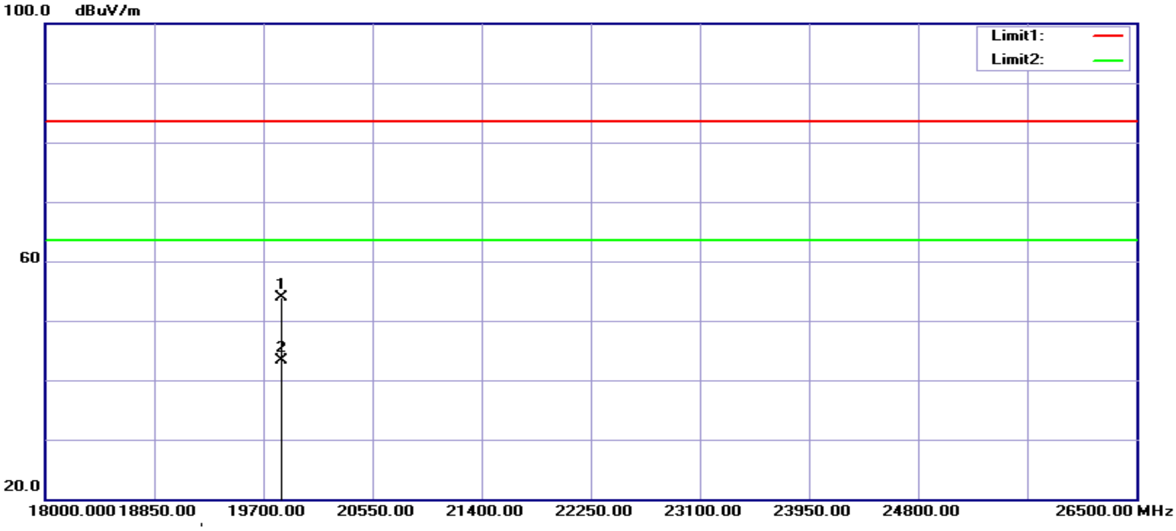
BLE(2M) Mode (Pre-scan with three orthogonal axis, and worse case as X axis.)

Horizontal (worst case is high channel)

1GHz-18GHz:

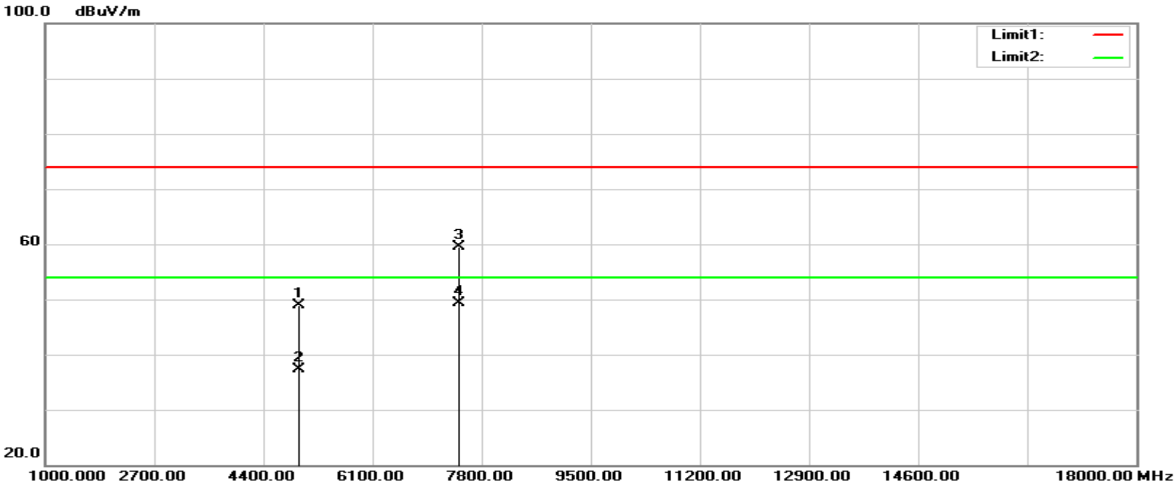


18GHz-26.5GHz:

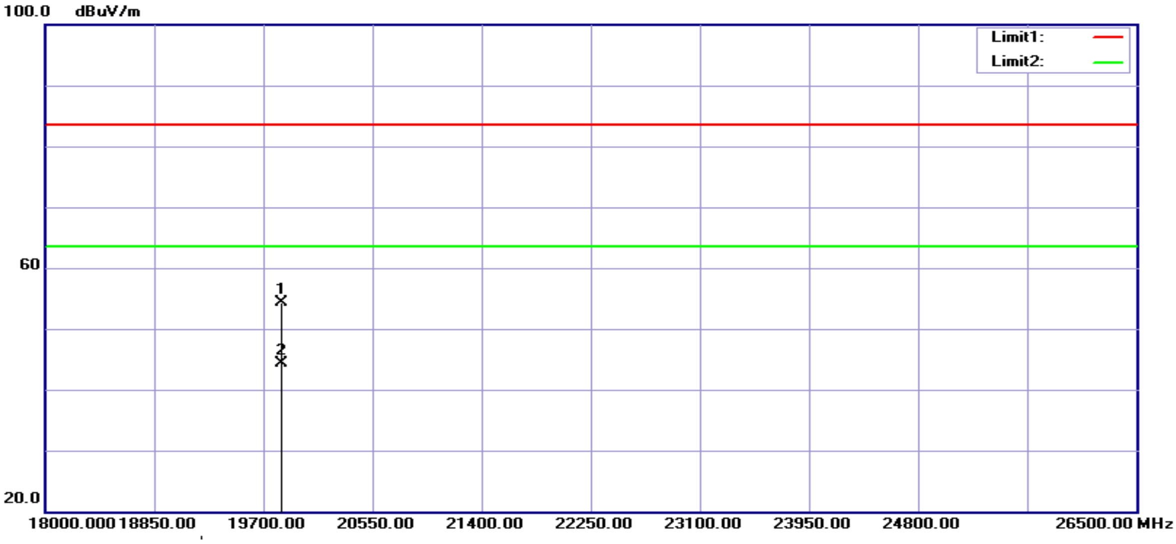


Vertical (worst case is high channel)

1GHz-18GHz:



18GHz-26.5GHz:



Below 1GHz

Horizontal

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
73.6500	49.92	-16.29	33.63	40.00	-6.37	100	136	QP
81.4100	50.10	-16.62	33.48	40.00	-6.52	100	236	QP
97.9000	50.66	-14.71	35.95	43.50	-7.55	100	293	peak
110.5100	44.15	-11.66	32.49	43.50	-11.01	100	207	peak
195.8700	44.53	-11.70	32.83	43.50	-10.67	100	281	peak
239.5200	46.34	-12.25	34.09	46.00	-11.91	100	13	peak

Vertical

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
73.6500	49.64	-16.29	33.35	40.00	-6.65	100	318	QP
81.4100	49.22	-16.62	32.60	40.00	-7.40	100	202	QP
97.9000	53.92	-14.71	39.21	43.50	-4.29	100	14	QP
110.5100	48.58	-11.66	36.92	43.50	-6.58	100	108	peak
122.1500	47.54	-10.72	36.82	43.50	-6.68	100	158	peak
239.5200	51.18	-12.25	38.93	46.00	-7.07	100	360	QP

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

BLE(1M) Mode

Above 1GHz

Horizontal

Frequency	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Height**	**Degree**	**Remark**
(MHz)	**(dBµV)**	**Factor(dB/m)**	**(dBµV/m)**	**(dBµV/m)**	**(dB)**	**(cm)**	**(°)**	
Low channel								
2338.000	58.08	-9.80	48.28	74.00	-25.72	126	125	peak
2338.000	49.00	-9.80	39.20	54.00	-14.80	126	125	AVG
4804.000	54.37	-2.17	52.20	74.00	-21.80	117	114	peak
4804.000	48.50	-2.17	46.33	54.00	-7.67	117	114	AVG
7206.000	50.28	4.18	54.46	74.00	-19.54	142	188	peak
7206.000	41.66	4.18	45.84	54.00	-8.16	142	188	AVG
Middle channel								
4880.000	51.31	-1.88	49.43	74.00	-24.57	105	350	peak
4880.000	44.66	-1.88	42.78	54.00	-11.22	105	350	AVG
7320.000	51.23	5.10	56.33	74.00	-17.67	113	141	peak
7320.000	42.96	5.10	48.06	54.00	-5.94	113	141	AVG
High channel								
2499.820	56.03	-8.21	47.82	74.00	-26.18	145	168	peak
2499.820	42.17	-8.21	33.96	54.00	-20.04	145	168	AVG
4960.000	51.49	-1.49	50.00	74.00	-24.00	150	50	peak
4960.000	44.90	-1.49	43.41	54.00	-10.59	150	50	AVG
7440.000	55.72	5.23	60.95	74.00	-13.05	110	104	peak
7440.000	47.62	5.23	52.85	54.00	-1.15	110	104	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Vertical

Frequency (MHz)	Reading (dBμV)	Correct Factor(dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
Low channel								
2366.500	56.34	-9.65	46.69	74.00	-27.31	106	222	peak
2366.500	42.74	-9.65	33.09	54.00	-20.91	106	222	AVG
4804.000	54.13	-2.17	51.96	74.00	-22.04	112	171	peak
4804.000	49.39	-2.17	47.22	54.00	-6.78	112	171	AVG
7206.000	52.02	4.18	56.20	74.00	-17.80	111	238	peak
7206.000	43.47	4.18	47.65	54.00	-6.35	111	238	AVG
Middle channel								
4880.000	52.38	-1.88	50.50	74.00	-23.50	104	169	peak
4880.000	46.32	-1.88	44.44	54.00	-9.56	104	169	AVG
7320.000	52.82	5.10	57.92	74.00	-16.08	103	200	peak
7320.000	45.05	5.10	50.15	54.00	-3.85	103	200	AVG
High channel								
2497.930	55.51	-8.24	47.27	74.00	-26.73	140	218	peak
2497.930	42.04	-8.24	33.80	54.00	-20.20	140	218	AVG
4960.000	51.11	-1.49	49.62	74.00	-24.38	109	164	peak
4960.000	44.65	-1.49	43.16	54.00	-10.84	109	164	AVG
7440.000	54.31	5.23	59.54	74.00	-14.46	136	246	peak
7440.000	47.25	5.23	52.48	54.00	-1.52	136	246	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

BLE(2M) Mode

Above 1GHz

Horizontal

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
Low channel								
2337.600	58.06	-9.80	48.26	74.00	-25.74	125	124	peak
2337.600	48.00	-9.80	38.20	54.00	-15.80	125	124	AVG
4804.000	54.29	-2.17	52.12	74.00	-21.88	117	119	peak
4804.000	44.49	-2.17	42.32	54.00	-11.68	117	119	AVG
7206.000	50.18	4.18	54.36	74.00	-19.64	105	184	peak
7206.000	39.66	4.18	43.84	54.00	-10.16	105	184	AVG
Middle channel								
4880.000	51.14	-1.88	49.26	74.00	-24.74	146	332	peak
4880.000	41.20	-1.88	39.32	54.00	-14.68	146	332	AVG
7320.000	52.97	5.10	58.07	74.00	-15.93	110	123	peak
7320.000	42.76	5.10	47.86	54.00	-6.14	110	123	AVG
High channel								
2496.820	56.21	-8.26	47.95	74.00	-26.05	124	166	peak
2496.820	42.49	-8.26	34.23	54.00	-19.77	124	166	AVG
4960.000	51.10	-1.49	49.61	74.00	-24.39	115	206	peak
4960.000	40.66	-1.49	39.17	54.00	-14.83	115	206	AVG
7440.000	56.12	5.23	61.35	74.00	-12.65	110	98	peak
7440.000	45.98	5.23	51.21	54.00	-2.79	110	98	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Vertical

Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
(MHz)	(dBμV)	Factor(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	(cm)	(°)	
Low channel								
2344.600	56.49	-9.80	46.69	74.00	-27.31	119	314	peak
2344.600	43.11	-9.80	33.31	54.00	-20.69	119	314	AVG
4804.000	54.49	-2.17	52.32	74.00	-21.68	113	174	peak
4804.000	45.69	-2.17	43.52	54.00	-10.48	113	174	AVG
7206.000	51.97	4.18	56.15	74.00	-17.85	111	229	peak
7206.000	41.97	4.18	46.15	54.00	-7.85	111	229	AVG
Middle channel								
4880.000	51.98	-1.88	50.10	74.00	-23.90	105	164	peak
4880.000	42.36	-1.88	40.48	54.00	-13.52	105	164	AVG
7320.000	52.42	5.10	57.52	74.00	-16.48	101	203	peak
7320.000	42.61	5.10	47.71	54.00	-6.29	101	203	AVG
High channel								
2499.490	55.92	-8.22	47.70	74.00	-26.30	140	220	peak
2499.490	42.25	-8.22	34.03	54.00	-19.97	140	220	AVG
4960.000	50.40	-1.49	48.91	74.00	-25.09	207	334	peak
4960.000	38.73	-1.49	37.24	54.00	-16.76	207	334	AVG
7440.000	54.25	5.23	59.48	74.00	-14.52	136	248	peak
7440.000	44.01	5.23	49.24	54.00	-4.76	136	248	AVG

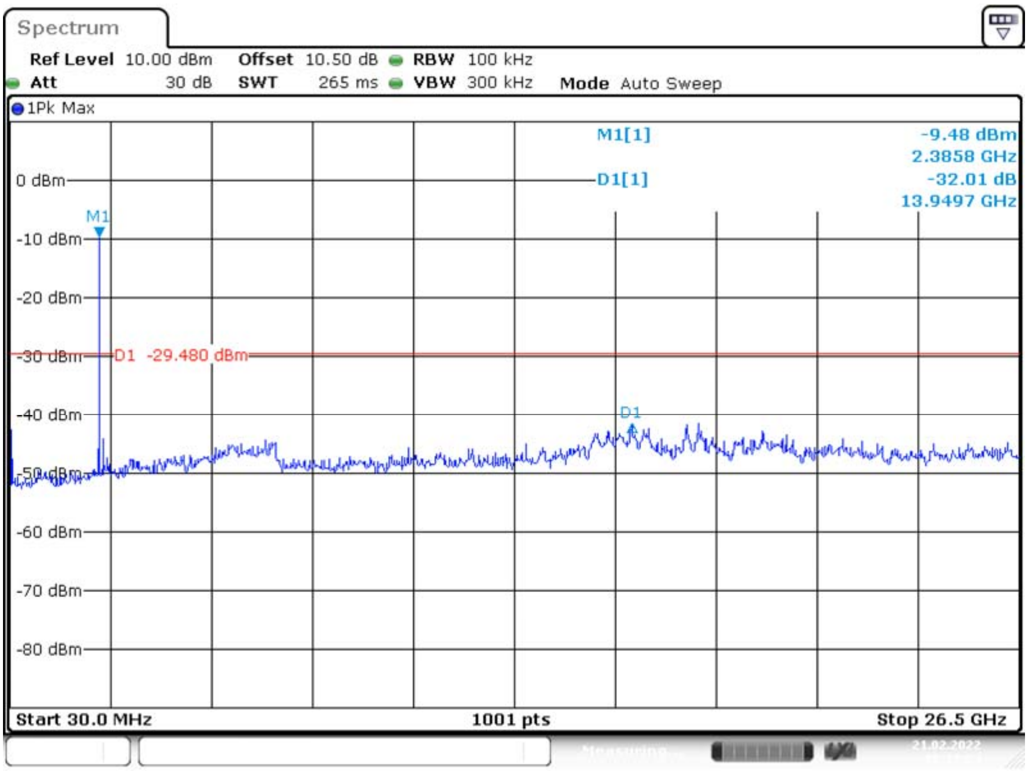
Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Conducted Spurious Emissions:

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
BLE(1M) Mode				
Low	2402	32.01	≥ 20	PASS
Mid	2441	30.02	≥ 20	PASS
High	2480	31.42	≥ 20	PASS
BLE(2M) Mode				
Low	2402	30.90	≥ 20	PASS
Mid	2441	31.12	≥ 20	PASS
High	2480	29.86	≥ 20	PASS

Please refer to the following plots

BLE(1M) Mode
Low Channel



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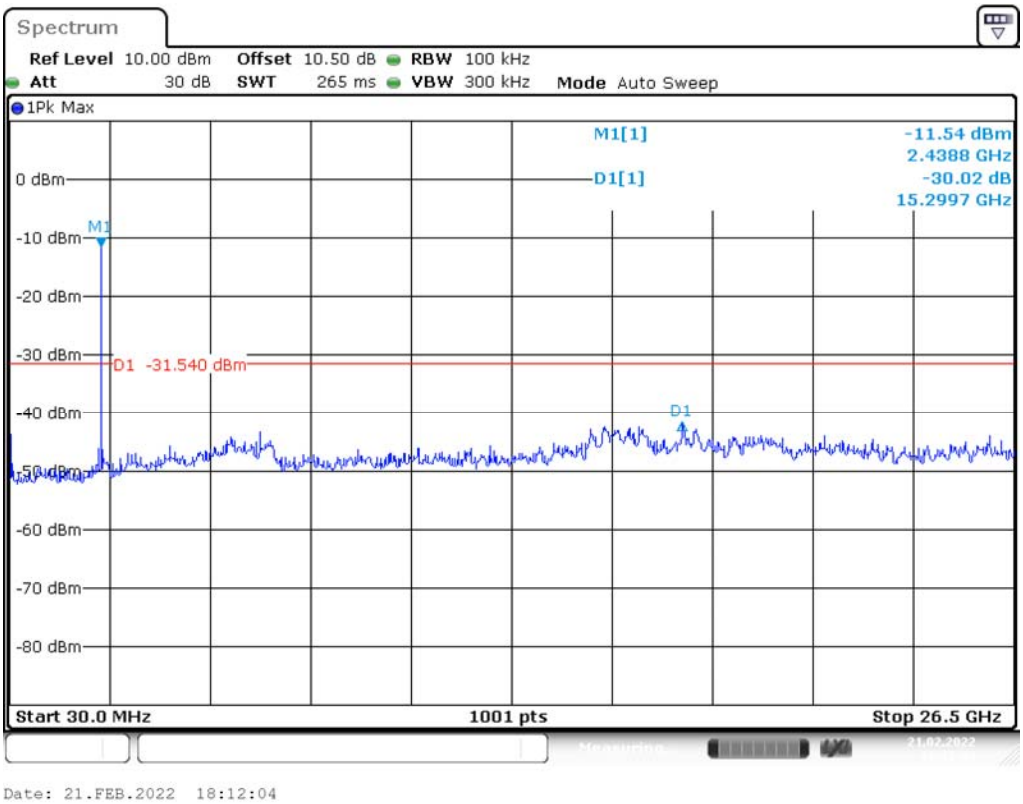
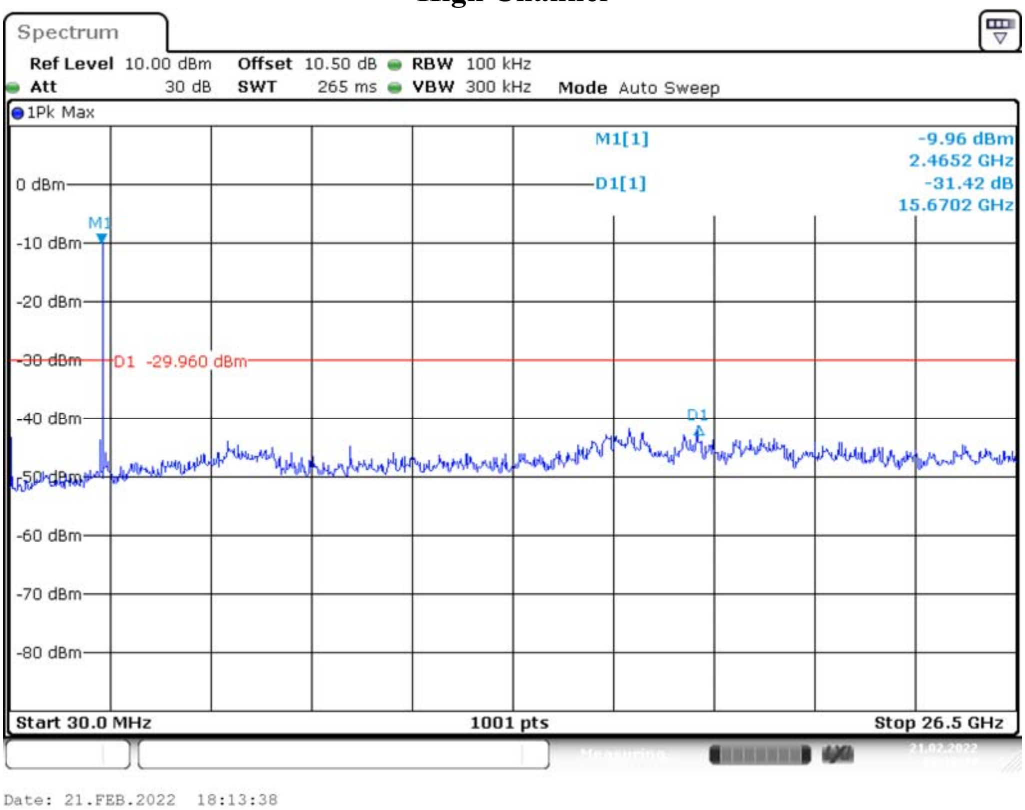
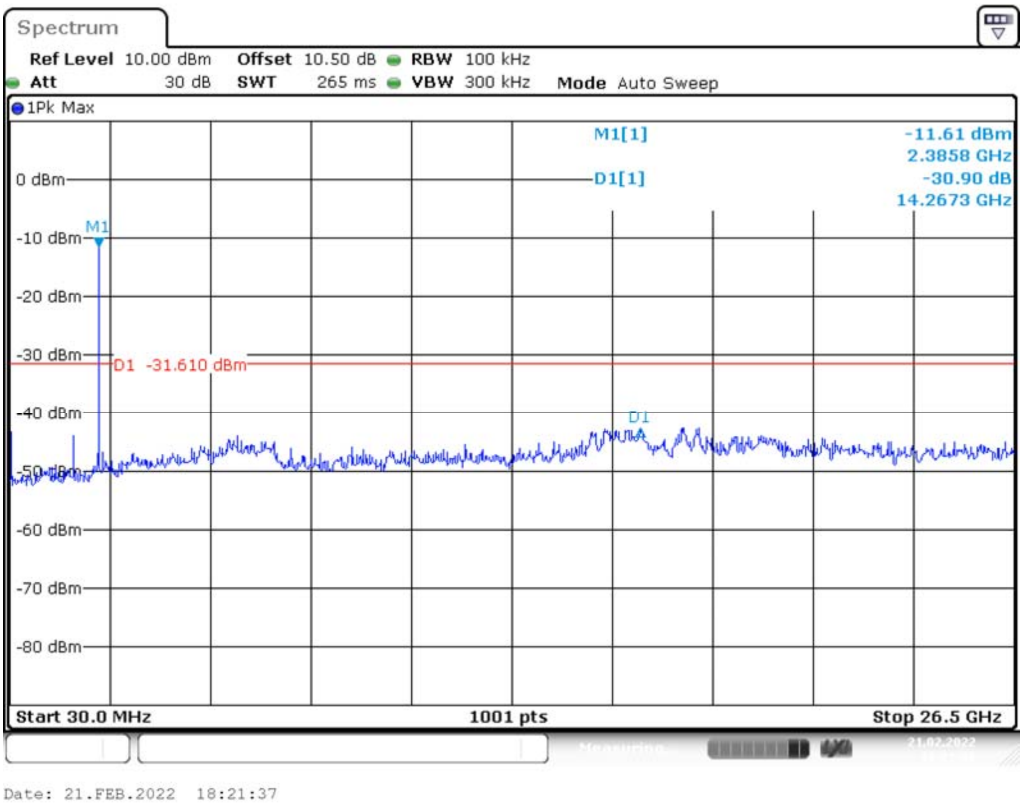
Middle Channel



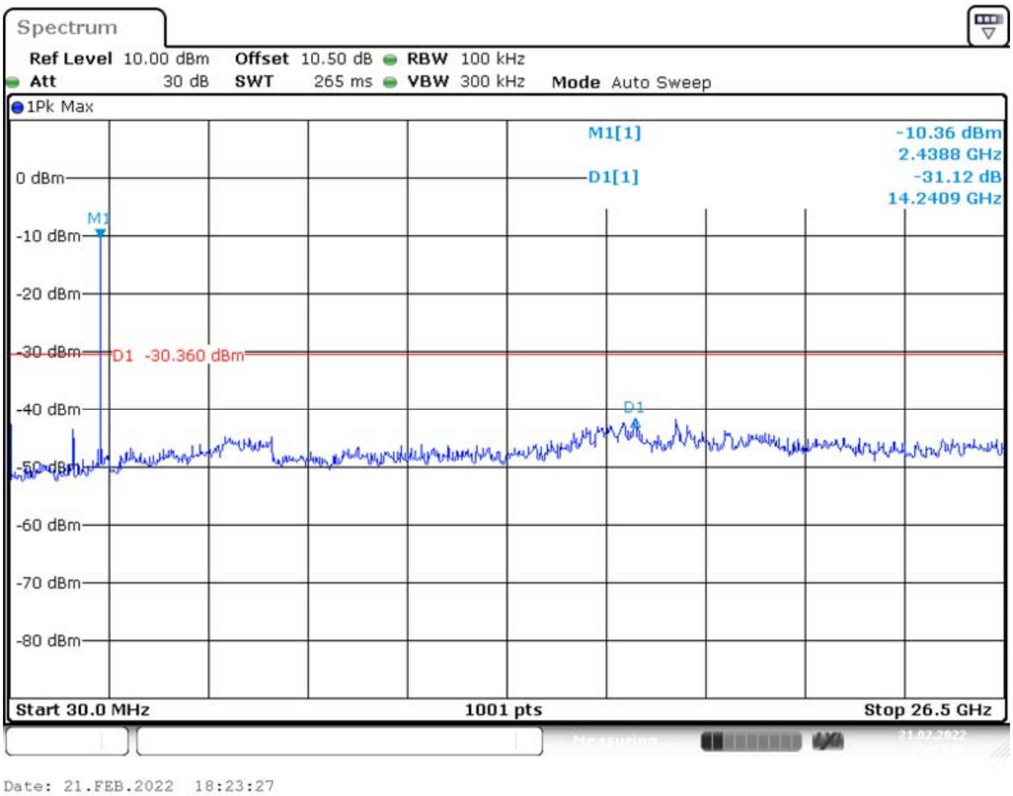
High Channel



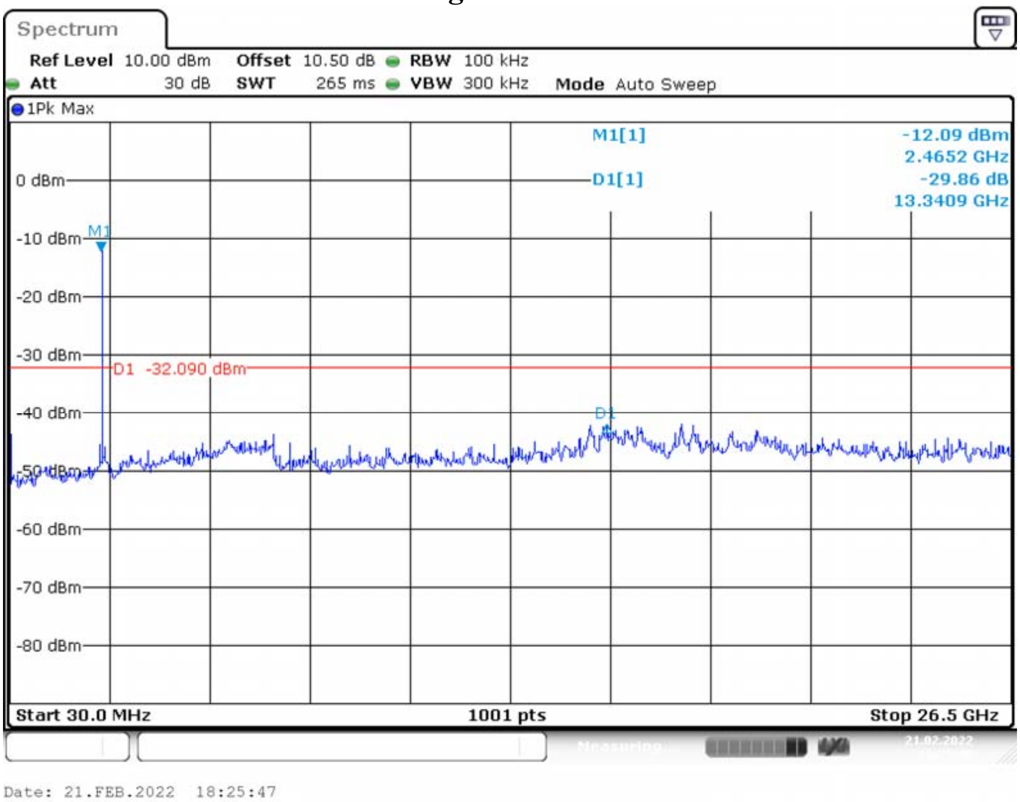
BLE(2M) Mode
Low Channel



Middle Channel



High Channel



8 FCC §15.247(a)(2) – 6 dB Emission Bandwidth

8.1 Applicable Standard

According to FCC §15.247(a)(2).

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

8.2 Test Procedure

The steps for the first option are as follows:

a) Set RBW = 100 kHz.

b) Set the VBW ≥ [3 × RBW].

c) Detector = peak.

d) Trace mode = max hold.

e) Sweep = auto couple.

f) Allow the trace to stabilize.

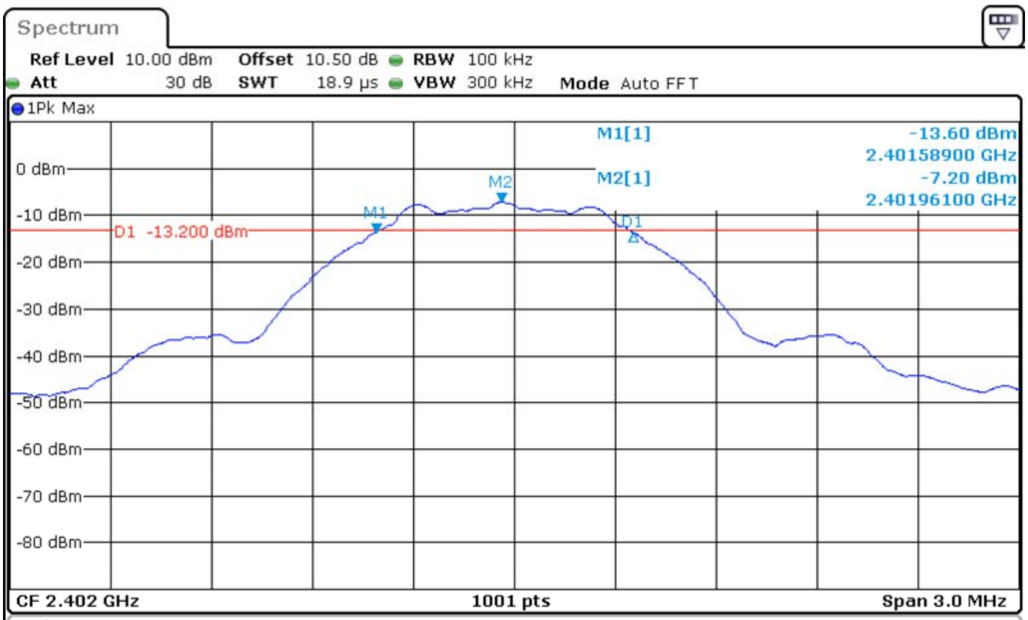
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

8.3 Test Results

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (kHz)	Result
BLE(1M) Mode				
Low	2402	0.76	> 500	Compliance
Middle	2440	0.77	> 500	Compliance
High	2480	0.77	> 500	Compliance
BLE(2M) Mode				
Low	2402	1.33	> 500	Compliance
Middle	2440	1.30	> 500	Compliance
High	2480	1.28	> 500	Compliance

Please refer to the following plots

BLE(1M) Mode
Low Channel



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.401589 GHz	-13.60 dBm		
D1	M1	1	762.0 kHz	0.01 dB		
M2		1	2.401961 GHz	-7.20 dBm		

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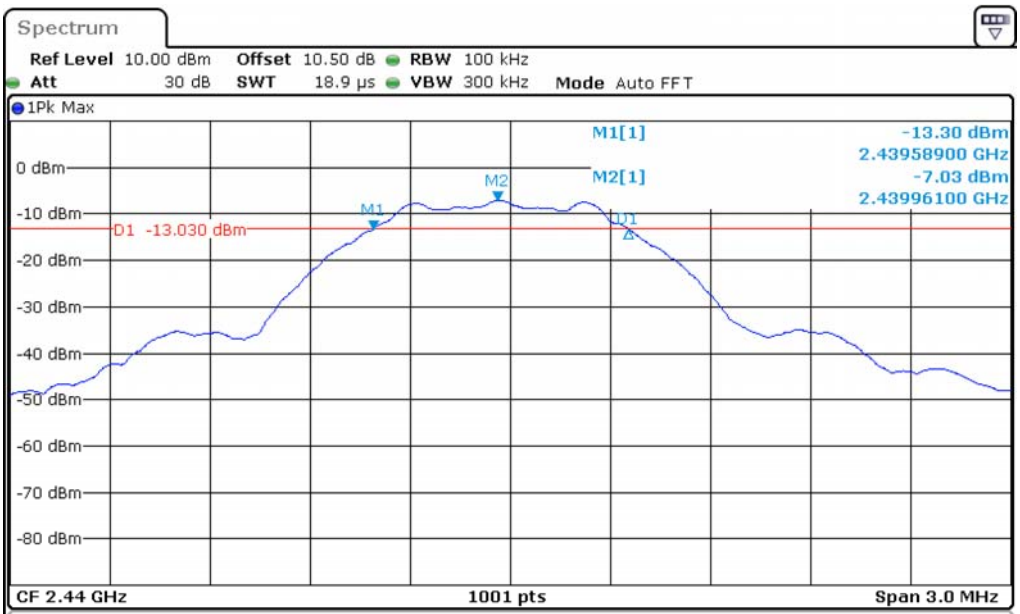
Middle Channel

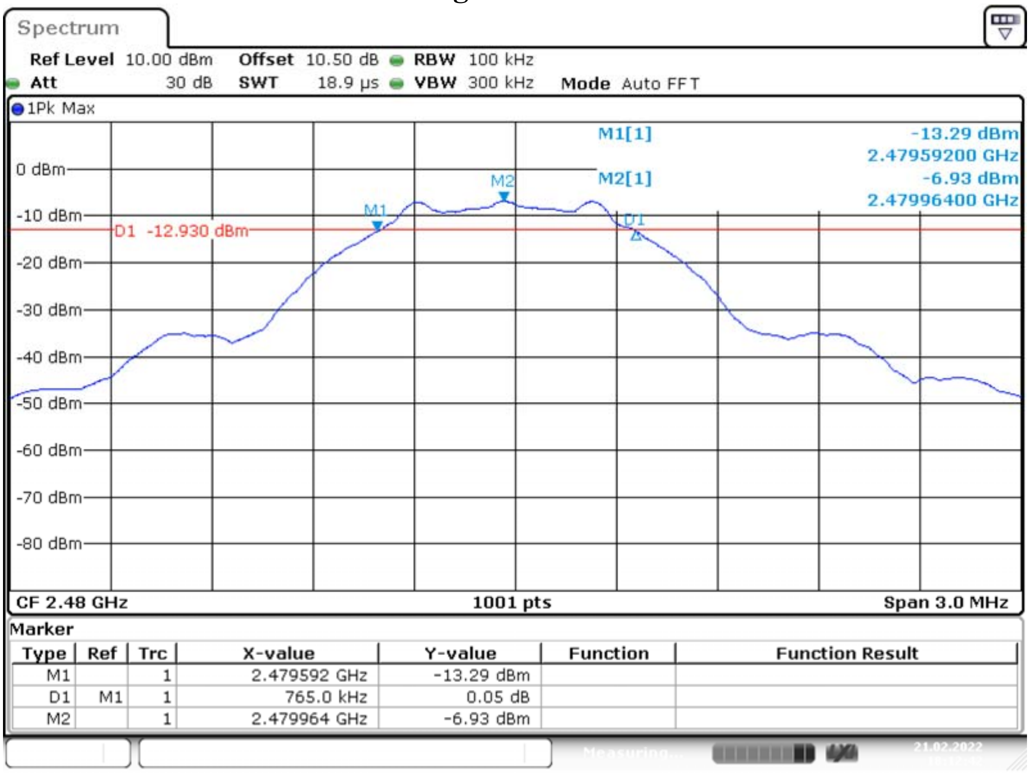


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.439589 GHz	-13.30 dBm		
D1	M1	1	765.0 kHz	-0.01 dB		
M2		1	2.439961 GHz	-7.03 dBm		

Date: 21.FEB.2022 18:11:24

High Channel



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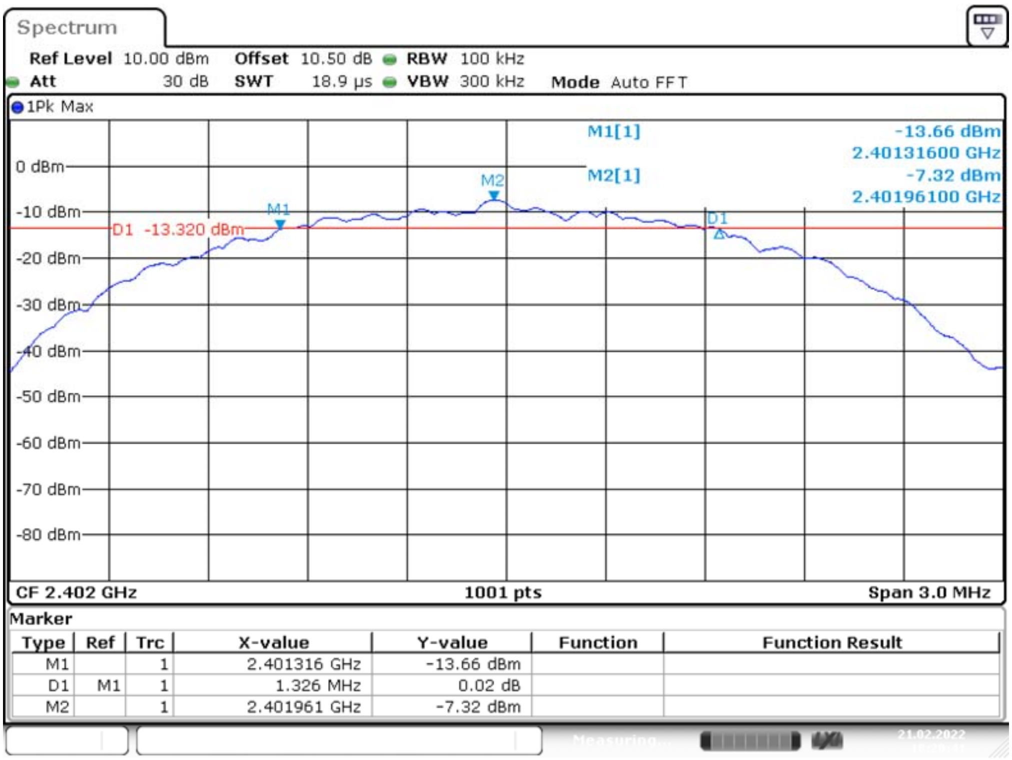
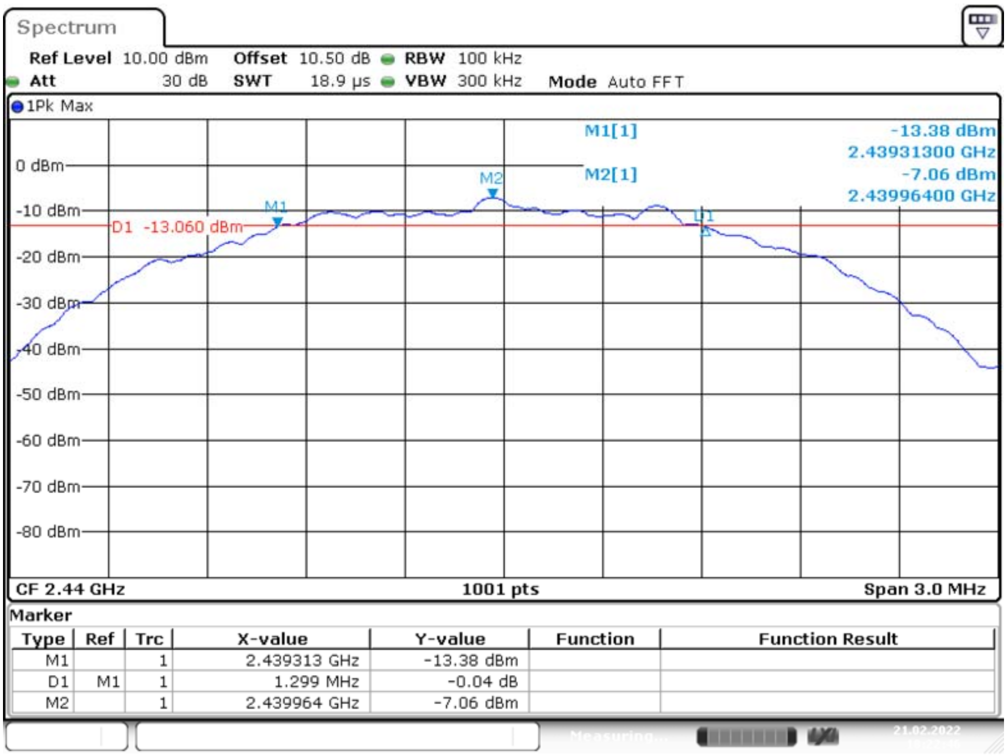
BLE(2M) Mode
Low Channel



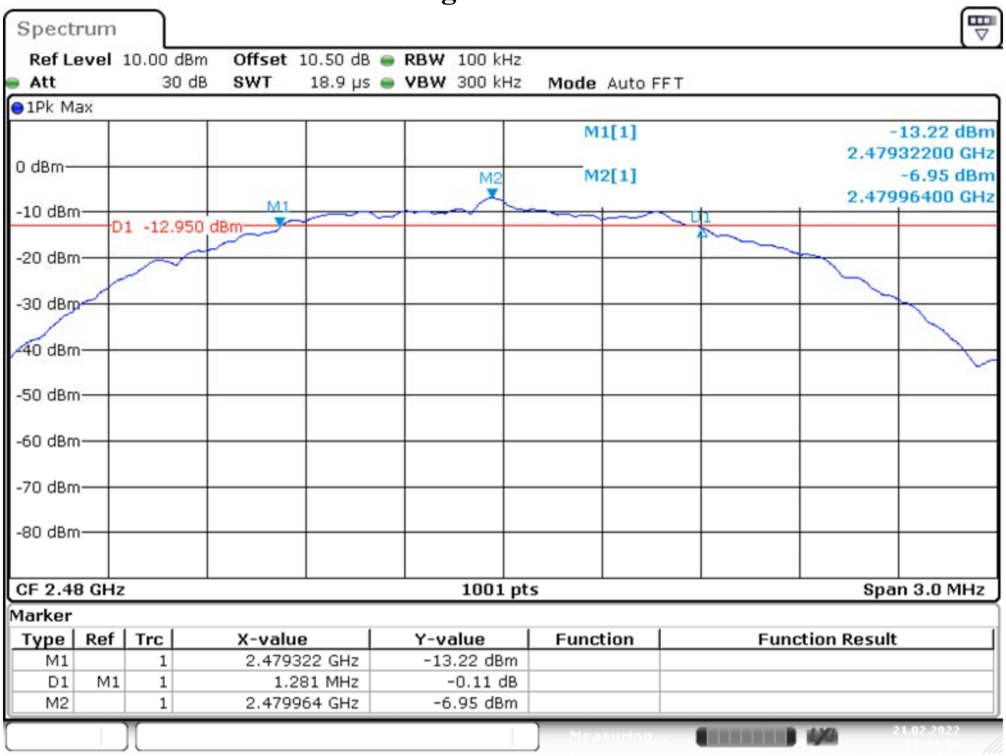
Date: 21.FEB.2022 18:20:41

Middle Channel



Date: 21.FEB.2022 18:22:47

High Channel



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9 FCC §15.247(b)(3) – Maximum Output Power

9.1 Applicable Standard

According to FCC §15.247(b) (3).

Systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

9.2 Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.

2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to measuring equipment.

9.3 Test Results

Channel	Frequency	Maximum peak Conducted Output Power		Limit	Result
	(MHz)	(dBm)	(W)	(W)	
BLE(1M) Mode					
Low	2402	-6.05	0.00025	1	PASS
Middle	2440	-5.88	0.00026	1	PASS
High	2480	-5.73	0.00027	1	PASS
BLE(2M) Mode					
Low	2402	-6.07	0.00025	1	PASS
Middle	2440	-5.87	0.00026	1	PASS
High	2480	-5.77	0.00026	1	PASS

10 FCC§15.247(d) – 100 kHz Bandwidth of Frequency Band Edge

10.1 Applicable Standard

According to FCC §15.247(d).

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

10.2 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

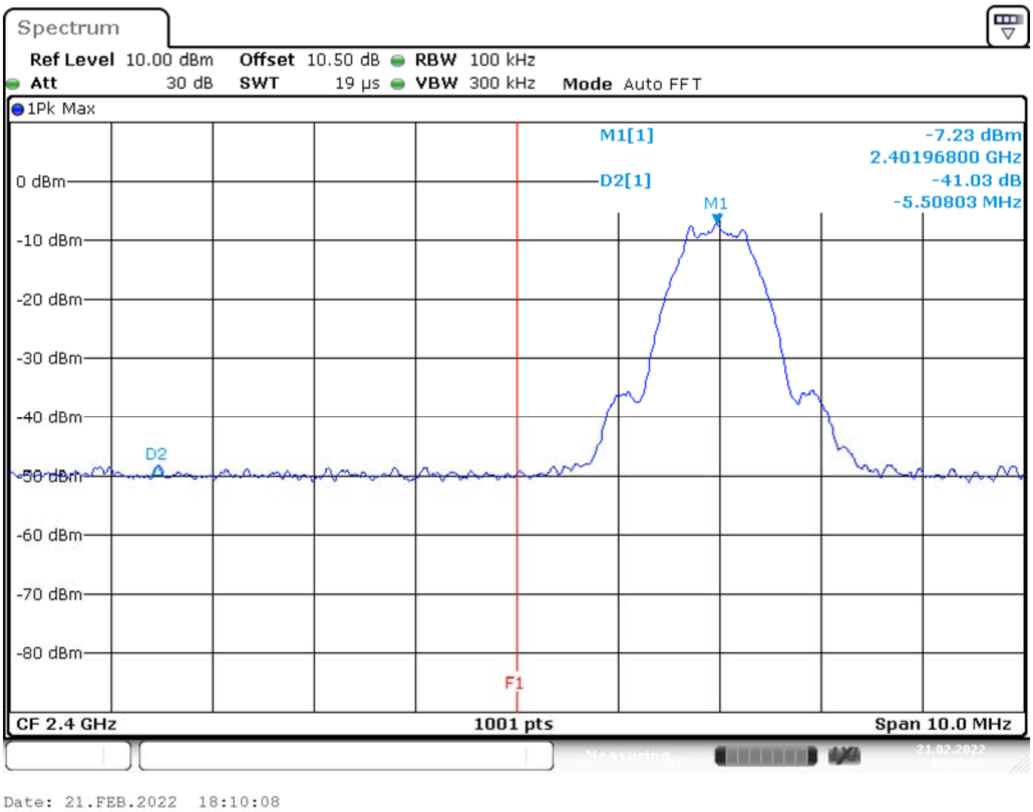
10.3 Test Results

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
BLE(1M) Mode				
Low	2402	41.03	≥ 20	PASS
High	2480	41.23	≥ 20	PASS
BLE(2M) Mode				
Low	2402	30.90	≥ 20	PASS
High	2480	41.59	≥ 20	PASS

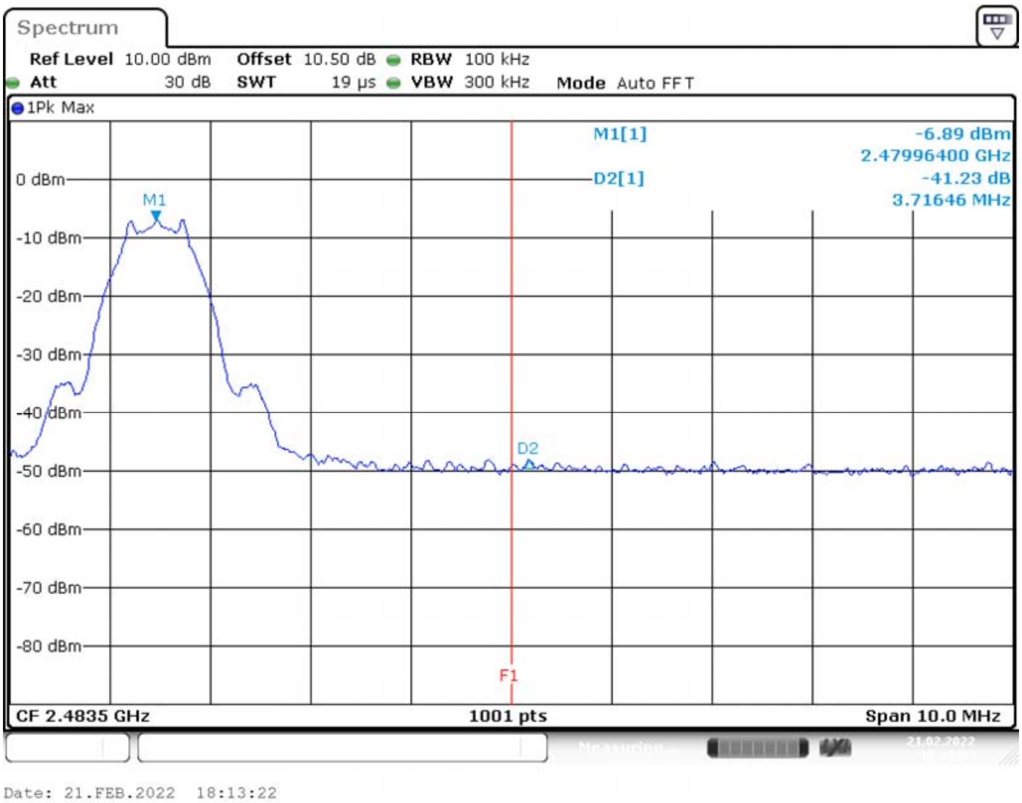
Please refer to the following plots

BLE(1M) Mode

Band Edge, Left Side

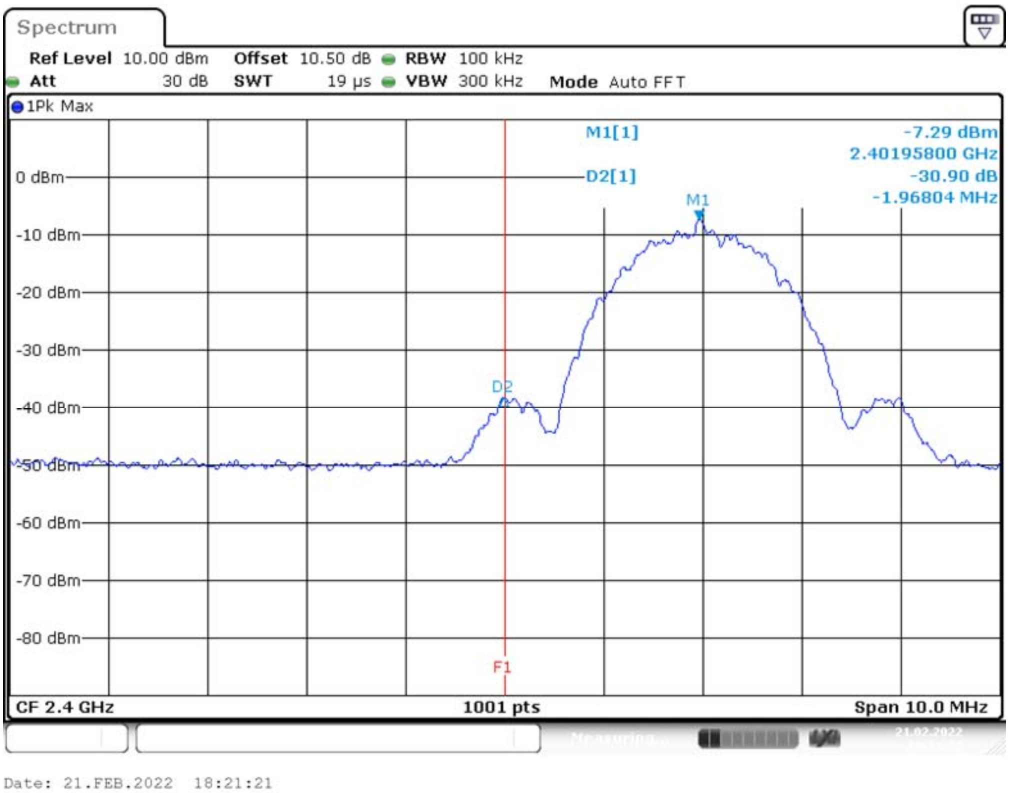


Band Edge, Right Side

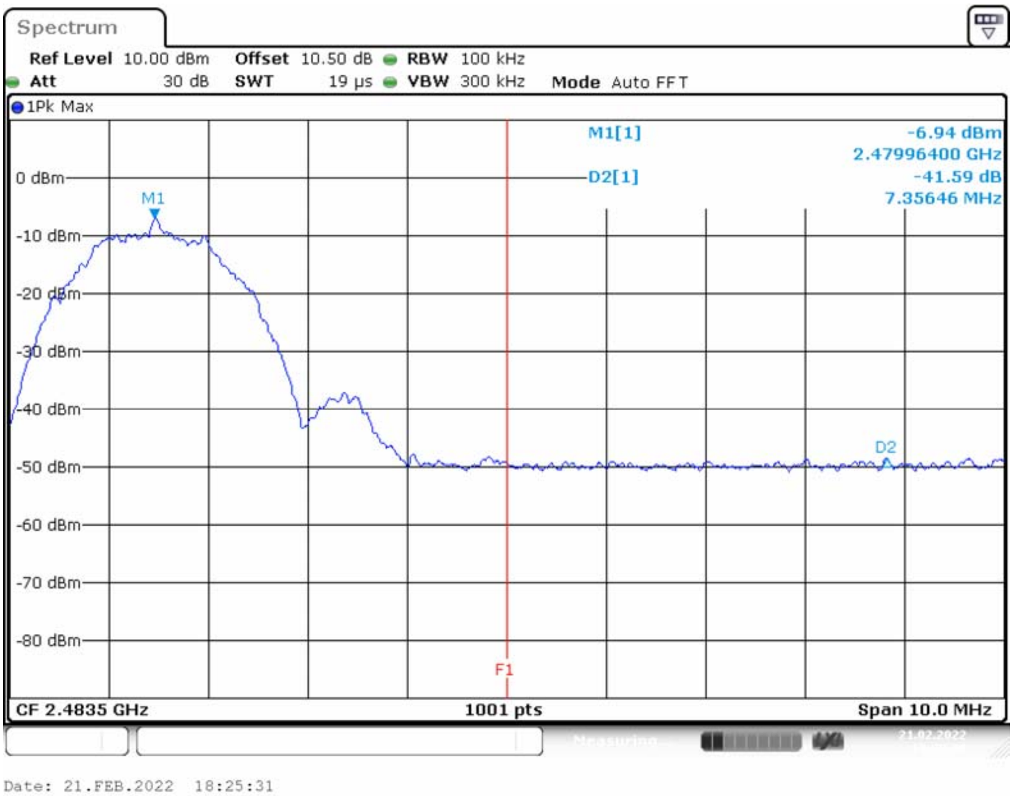


BLE(2M) Mode

Band Edge, Left Side



Band Edge, Right Side



11 FCC §15.247(e) – Power Spectral Density

11.1 Applicable Standard

According to FCC §15.247(e).

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

11.2 Test Procedure

According to ANSI C63.10-2013

a) Set analyzer center frequency to DTS channel center frequency.

b) Set the span to 1.5 times the DTS bandwidth.

c) Set the RBW to 3 kHz ≤ RBW ≤ 100 kHz.

d) Set the VBW ≥ [3 × RBW].

e) Detector = peak.

f) Sweep time = auto couple.

g) Trace mode = max hold.

h) Allow trace to fully stabilize.

i) Use the peak marker function to determine the maximum amplitude level within the RBW.

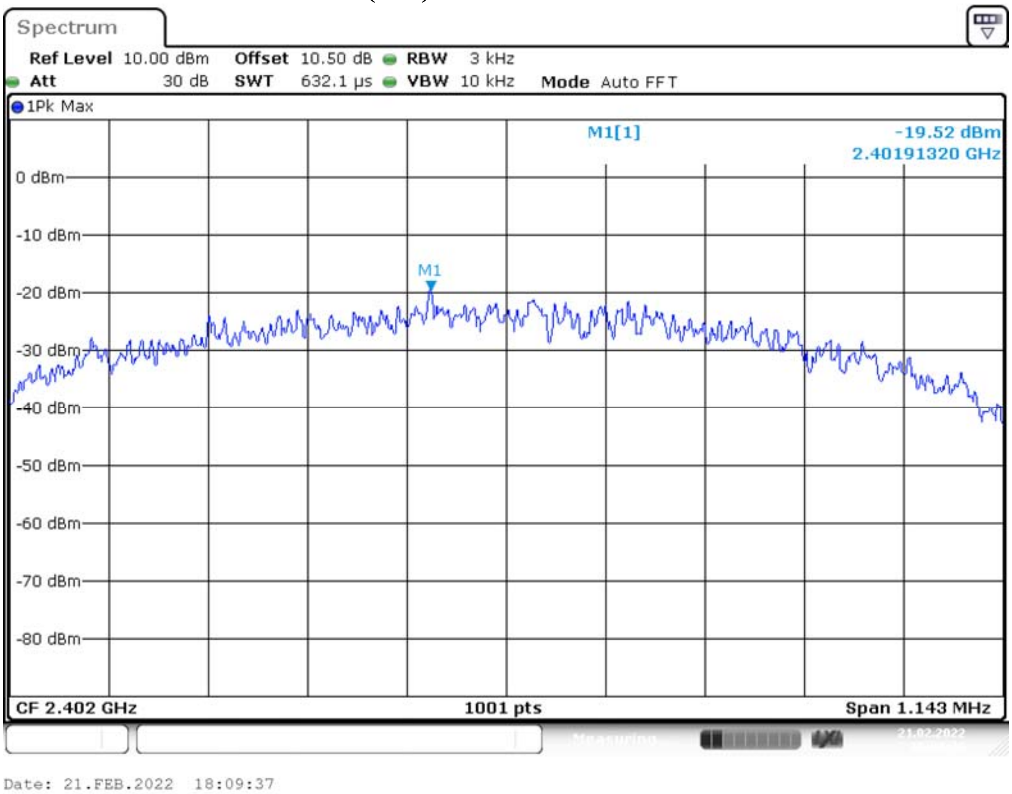
j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat

11.3 Test Results

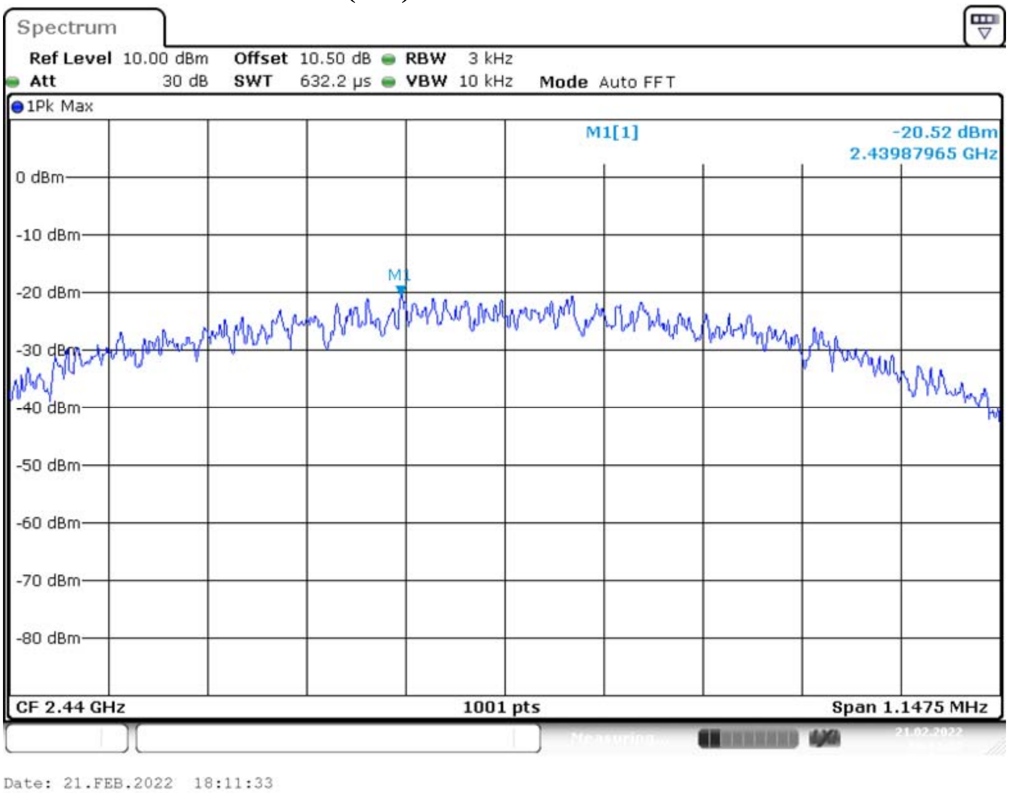
Channel	Frequency (MHz)	Power Spectral Density (dBm/3 kHz)	Limit (dBm/3 kHz)	Result
BLE(1M) Mode				
Low	2402	-19.52	8	Compliance
Middle	2440	-20.52	8	Compliance
High	2480	-20.02	8	Compliance
BLE(2M) Mode				
Low	2402	-23.94	8	Compliance
Middle	2440	-22.78	8	Compliance
High	2480	-23.08	8	Compliance

Please refer to the following plots

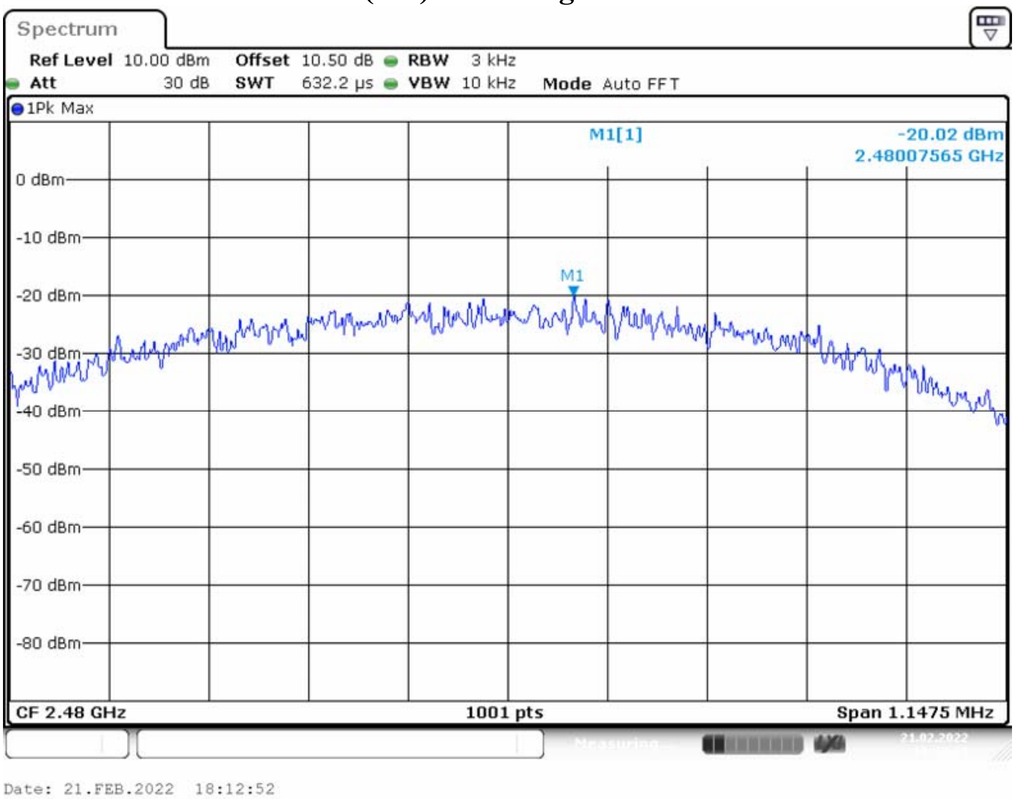
BLE(1M) Mode Low Channel



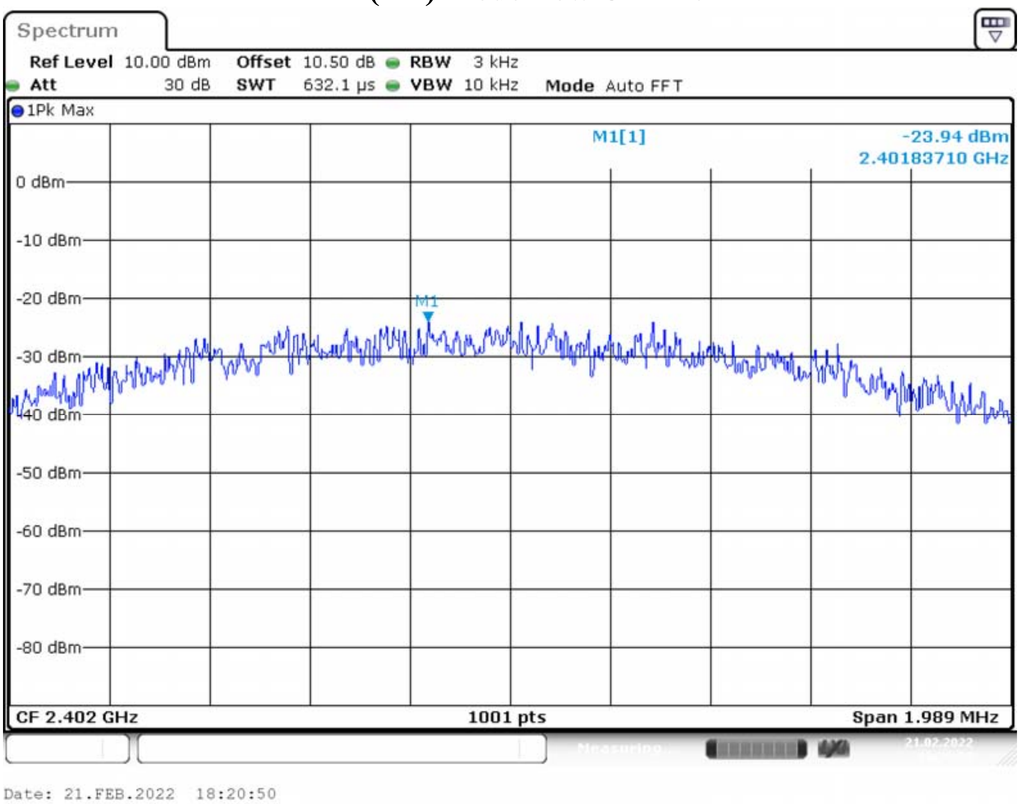
BLE(1M) Mode Middle Channel



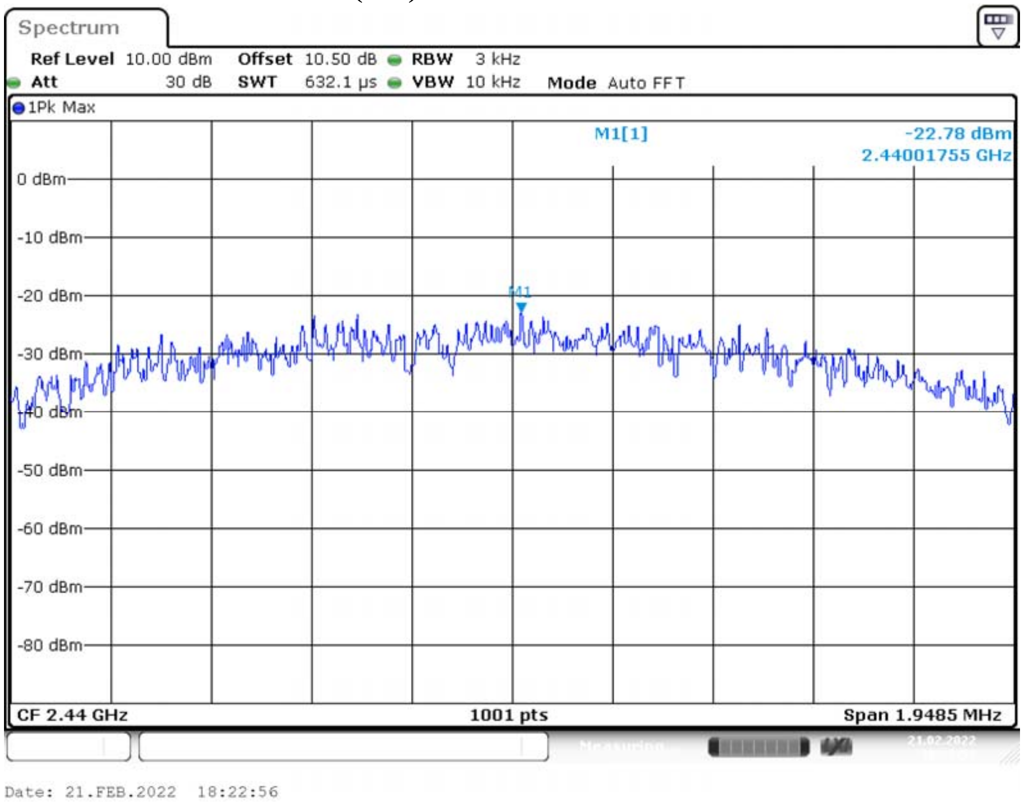
BLE(1M) Mode High Channel



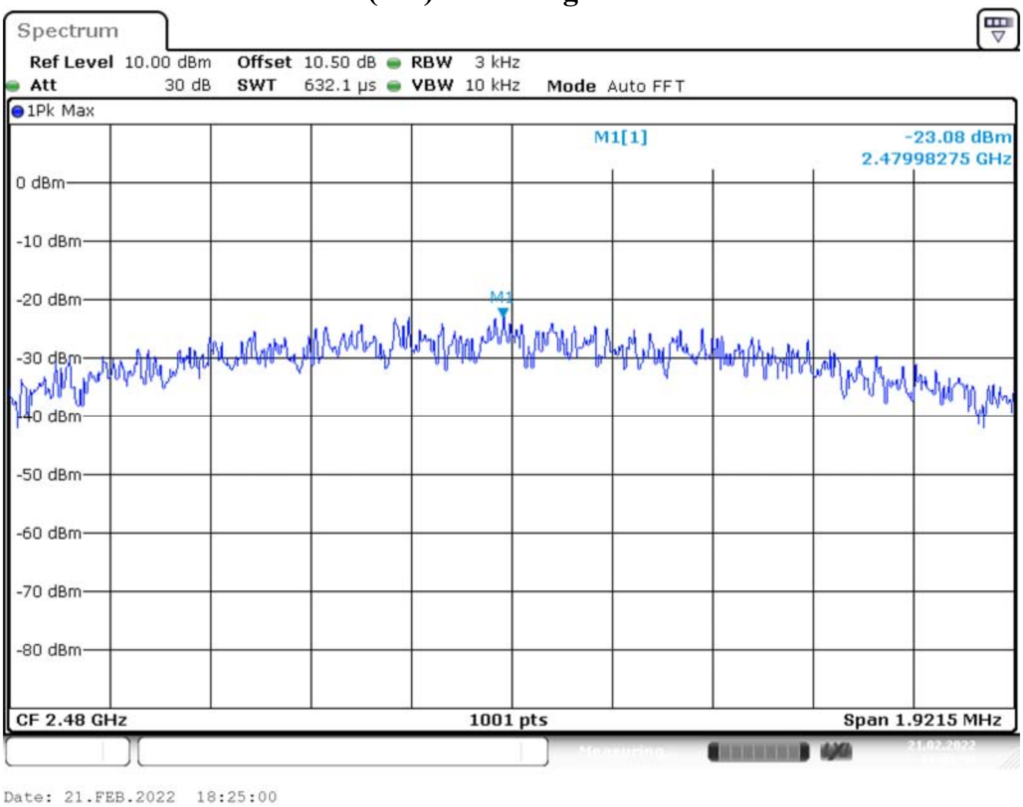
BLE(2M) Mode Low Channel



BLE(2M) Mode Middle Channel



BLE(2M) Mode High Channel



******* END OF REPORT *******