TEST REPORT

Applicant Name :	Signify (China) Investment Co., Ltd.
Address :	Building no.9, Lane 888, Tianlin Road, Minhang District, Shanghai, 200233, China
Report Number :	XMTN1211027-55093E-00A
FCC ID:	2AGBW9290023351AX

Test Standard (s)

FCC PART 15.247

Sample Description

Product:	LED Lamp
Tested Model:	9290023351A
Trademark:	N/A
Date Received:	2021-10-27
Date of Test:	2021-11-03 to 2022-02-22
Report Date:	2022-02-22

Test Result:	Pass*

* In the configuration tested, the EUT complied with the standards above.

Prepared and Checked By:

Ting Lü
EMC Engineer

Approved By:

Candy Li
EMC Engineer

Note: This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "★".
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	LED Lamp
Trademark	N/A
Tested Model	9290023351A
Frequency Range	BLE: 2402-2480MHz Zigbee: 2405-2480MHz
Maximum Conducted Peak Output Power	BLE 1M: 10.68dBm BLE 2M: 10.67dBm BLE 125k: 10.52dBm BLE 500k: 10.66dBm Zigbee: 10.99dBm
Modulation Technique	BLE: GFSK Zigbee: O-QPSK
Antenna Specification*	PCB Antenna: -0.78dBi (provided by the applicant)
Voltage Range	AC 120V/60Hz
Sample serial number	XMTN1211027-55093E -RF-S1
Sample/EUT Status	Good condition

Objective

This test report is in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commission's rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

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.

And KDB 558074 D01 15.247 Meas Guidance v05r02.

All emissions measurement was performed at Shenzhen Accurate Technology Co., Ltd. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		5%
RF Frequency		$0.082*10^{-7}$
RF output power, conducted		0.73dB
Unwanted Emission, conducted		1.6dB
AC Power Lines Conducted Emissions		2.72dB
Emissions, Radiated	9kHz - 30MHz	2.66dB
	30MHz - 1GHz	4.28dB
	1GHz - 18GHz	4.98dB
	18GHz - 26.5GHz	5.06dB
	26.5GHz - 40GHz	4.72dB
Temperature		1℃
Humidity		6%
Supply voltages		0.4%

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The test site used by Shenzhen Accurate Technology Co., Ltd. to collect test data is located on the 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 708358, the FCC Designation No.: CN1189. Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 429 7.01.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0016. The Registration Number is 5077A.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

For BLE mode, 40 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2442
1	2404	21	2444
2	2406	22	2446
3	2408	23	2448
4	2410	24	2450
5	2412	25	2452
6	2414	26	2454
7	2416	27	2456
8	2418	28	2458
9	2420	29	2460
10	2422	30	2462
11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2472
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	2440	39	2480

EUT was tested with Channel 0, 20 and 39.

For Zigbee mode, 16 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
11	2405	19	2445
12	2410	20	2450
13	2415	21	2455
14	2420	22	2460
15	2425	23	2465
16	2430	24	2470
17	2435	25	2475
18	2440	26	2480

EUT was tested with Channel 11, 19 and 26.

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

“UartAssist.exe”* software was used during test and power level is 10*.

Duty cycle

Test Result: Compliant. Please refer to the Appendix BLE/Zigbee.

Support Equipment List and Details

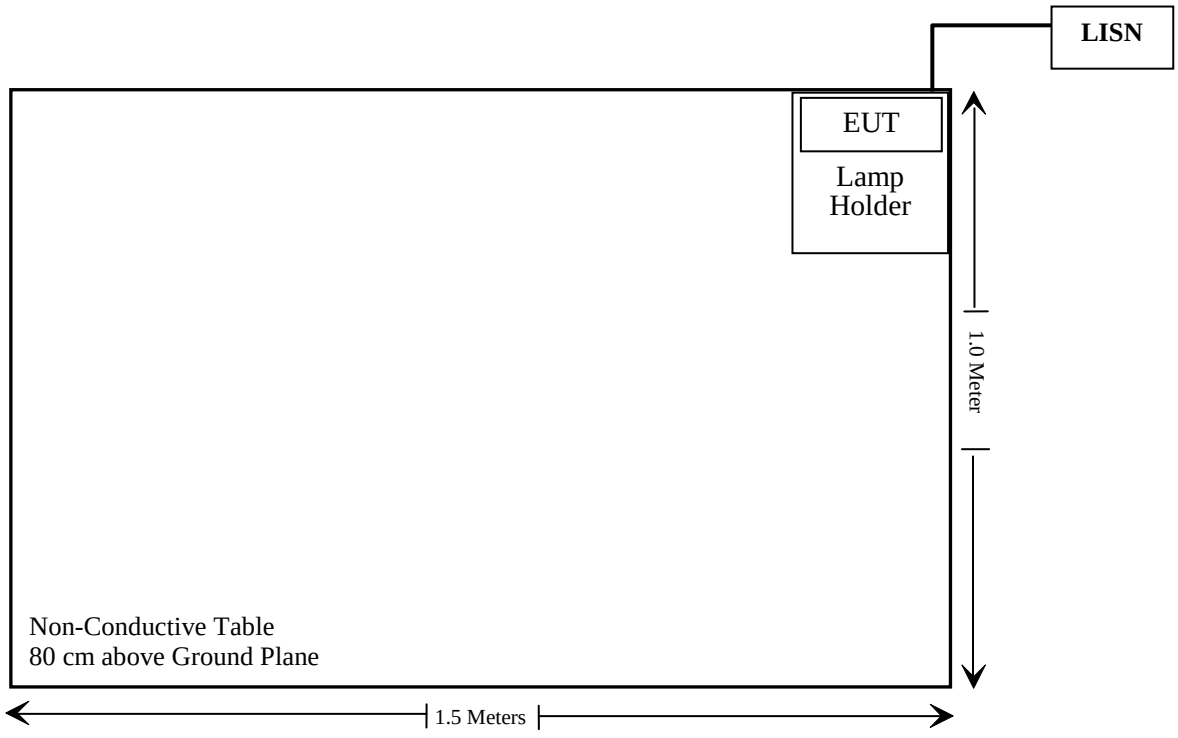
Manufacturer	Description	Model	Serial Number
De Li	Lamp Holder	DL-0027G	Unknown

External I/O Cable

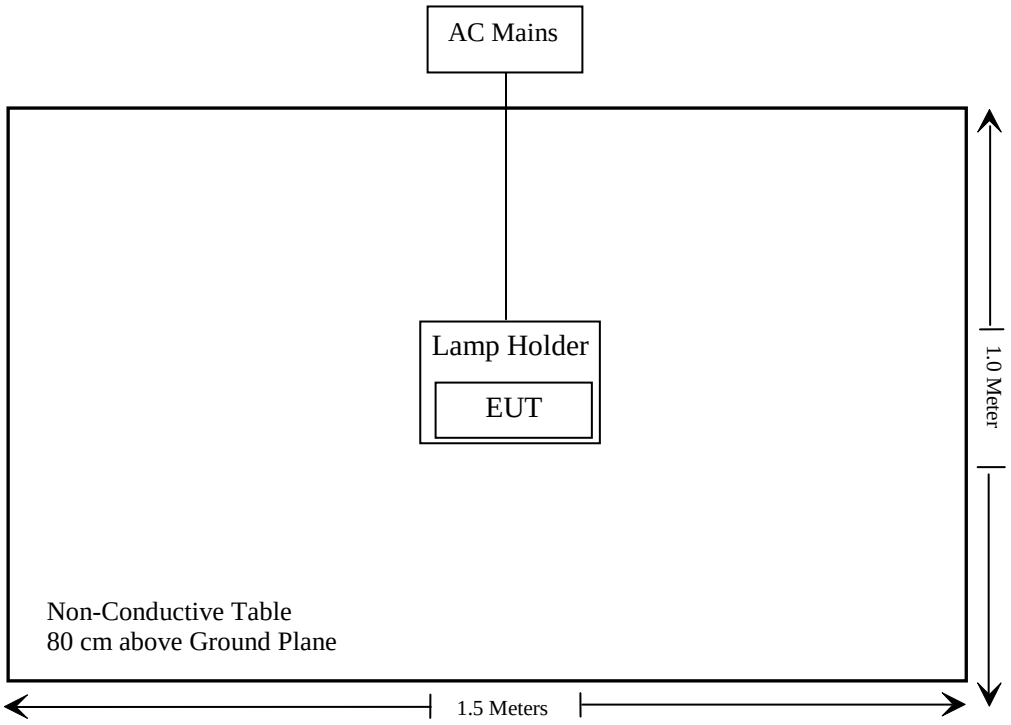
Cable Description	Length (m)	From Port	To
Unshielded Un-Detachable Power Cable	1.64	Lamp Holder	LISN

Block Diagram of Test Setup

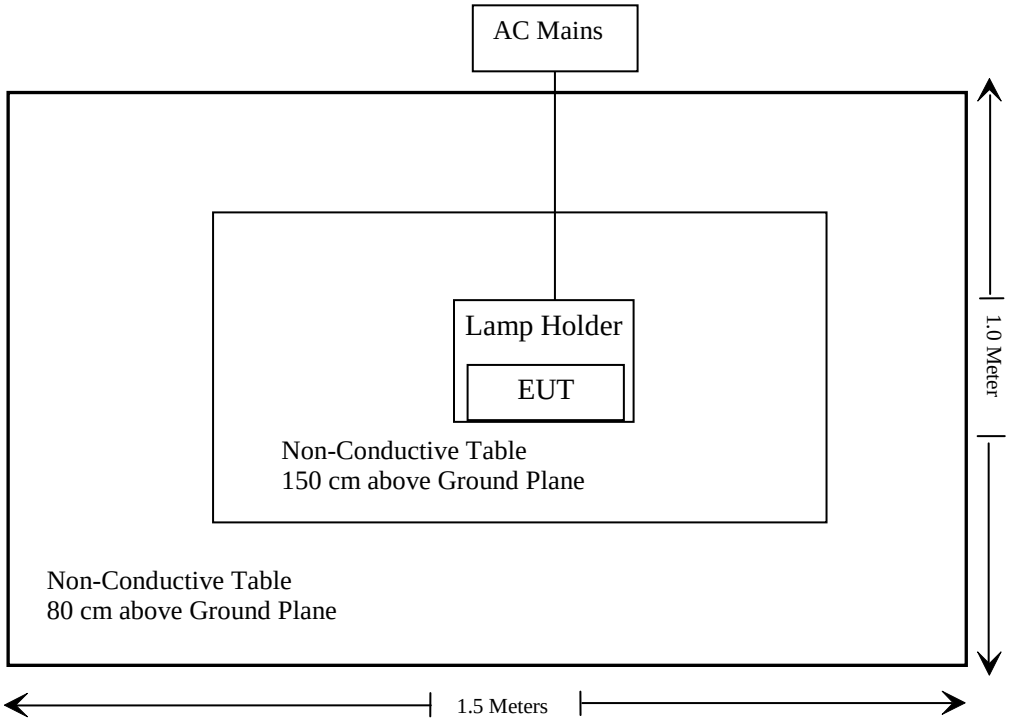
For conducted emission:



For radiated emission below 1GHz:



For radiated emission above 1GHz:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (I), §1.1310 & §2.1091	Maximum Permissible Exposure (MPE)	Compliant
§15.203	Antenna Requirement	Compliant
§15.207 (a)	AC Line Conducted Emissions	Compliant
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliant
§15.247 (a)(2)	6 dB Emission Bandwidth & Occupied Bandwidth	Compliant
§15.247(b)(3)	Maximum Conducted Output Power	Compliant
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliant
§15.247(e)	Power Spectral Density	Compliant

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde & Schwarz	EMI Test Receiver	ESCI	100784	2021/12/13	2022/12/12
R & S	L.I.S.N.	ENV216	101314	2021/12/13	2022/12/12
Anritsu Corp	50 Coaxial Switch	MP59B	6100237248	2021/12/13	2022/12/12
Unknown	RF Coaxial Cable	No.17	N0350	2021/12/14	2022/12/13
Conducted Emission Test Software: e3 19821b (V9)					
Radiated Emissions Test: Below 1GHz					
Rohde & Schwarz	Test Receiver	ESR	102725	2021/12/13	2022/12/12
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2021/07/06	2024/07/05
SONOMA INSTRUMENT	Amplifier	310 N	186131	2021/11/09	2022/11/08
Unknown	RF Coaxial Cable	No.12	N040	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.13	N300	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.14	N800	2021/12/14	2022/12/13
Radiated Emissions Test: Above 1GHz					
Rohde & Schwarz	Spectrum Analyzer	FSV-40	101495	2020/12/24	2021/12/23
A.H. Systems, inc.	Preamplifier	PAM-0118P	531	2021/07/08	2022/07/07
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-1067	2020/01/05	2023/01/04
Quinstar	Amplifier	QLW-18405536-J0	15964001002	2020/11/28	2021/11/27
Schwarzbeck	HORN ANTENNA	BBHA9170	9170-359	2020/01/05	2023/01/04
Anritsu Corp	50 Coaxial Switch	MP59B	6100237248	2020/12/25	2021/12/24
RF Coaxial Cable	Unknown	N-5m	No.4	2020/12/25	2021/12/24
RF Coaxial Cable	Unknown	N-1m	No.6	2020/12/25	2021/12/24
Wainwright	High Pass Filter	WHKX3.6/18G-10SS	5	2020/12/25	2021/12/24
Radiated Emission Test Software: e3 19821b (V9)					

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
Rohde & Schwarz	Spectrum Analyzer	FSV-40	101495	2020/12/24	2021/12/23
				2021/12/13	2022/12/12
Rohde & Schwarz	Open Switch and Control Unit	OSP120 + OSP-B157	101244 + 100866	2020/12/24	2021/12/23
				2021/12/13	2022/12/12
WEINSCHEL	10dB Attenuator	5324	AU 3842	Each time	
Unknown	RF Coaxial Cable	No.31	RF-01	Each time	

*** Statement of Traceability:** Shenzhen Accurate Technology Co., Ltd. attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC §1.1310 & §2.1091 –MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart §2.1091 and subpart §1.1310, 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.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (minutes)**
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f^2)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz; * = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculated Formulary:
Predication of MPE limit at a given distance
$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm^2);
P = power input to the antenna (in appropriate units, e.g., mW);
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

Calculated Data:

For worst case:

Mode	Frequency Range (MHz)	Antenna Gain		Tune-up Output Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
BLE	2402-2480	-0.78	0.84	11	12.59	20	0.0021	1.0
Zigbee	2405-2480	-0.78	0.84	11	12.59	20	0.0021	1.0

Note: 1. For BLE: The maximum conducted power which was provided by the manufacturer is (10 +1) dBm
For Zigbee: The maximum conducted power which was provided by the manufacturer is (10 +1) dBm
2. The BLE can't transmit at the same time with the Zigbee.

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Result: Compliant.

FCC §15.203 - ANTENNA REQUIREMENT

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. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.
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 exceeds 6 dBi.

Antenna Connector Construction

The EUT has one PCB Antenna arrangement which was permanently attached and the antenna gain is -0.78dBi, fulfill the requirement of this section. Please refer to the product photos.

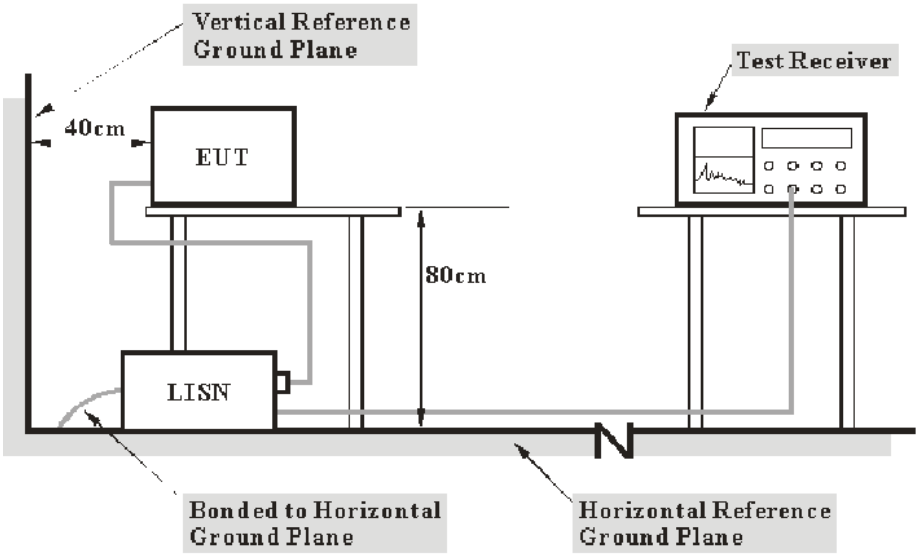
Result: Compliant.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207(a)

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The measurement procedure of EUT setup is according with ANSI C63.10-2013. The related limit was specified in FCC Part 15.207.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the device was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All final data was recorded in the Quasi-peak and average detection mode.

Factor & Margin Calculation

The factor is calculated by adding LISN VDF (Voltage Division Factor) and Cable Loss. The basic equation is as follows:

Factor = LISN VDF + Cable Loss

The "**Over limit**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, an Over limit of -7 dB means the emission is 7 dB below the limit. The equation for calculation is as follows:

Over Limit = Level – Limit
Level = Read Level + Factor

Test Data

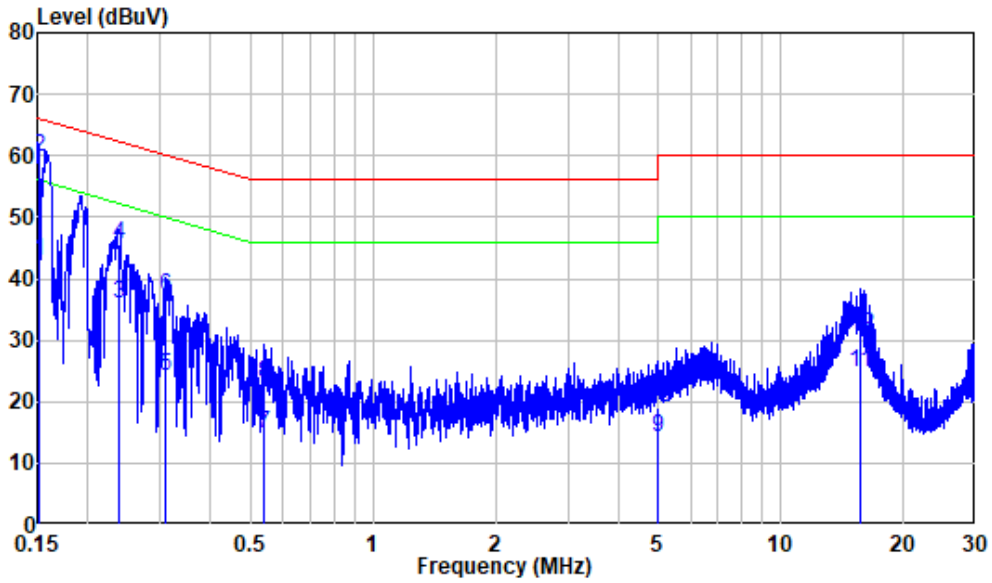
Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	64 %
ATM Pressure:	101.0 kPa

The testing was performed by Bin Duan on 2022-01-17.

EUT operation mode: Transmitting (Pre-scan all modes, and worst case is BLE 1M, low channel)

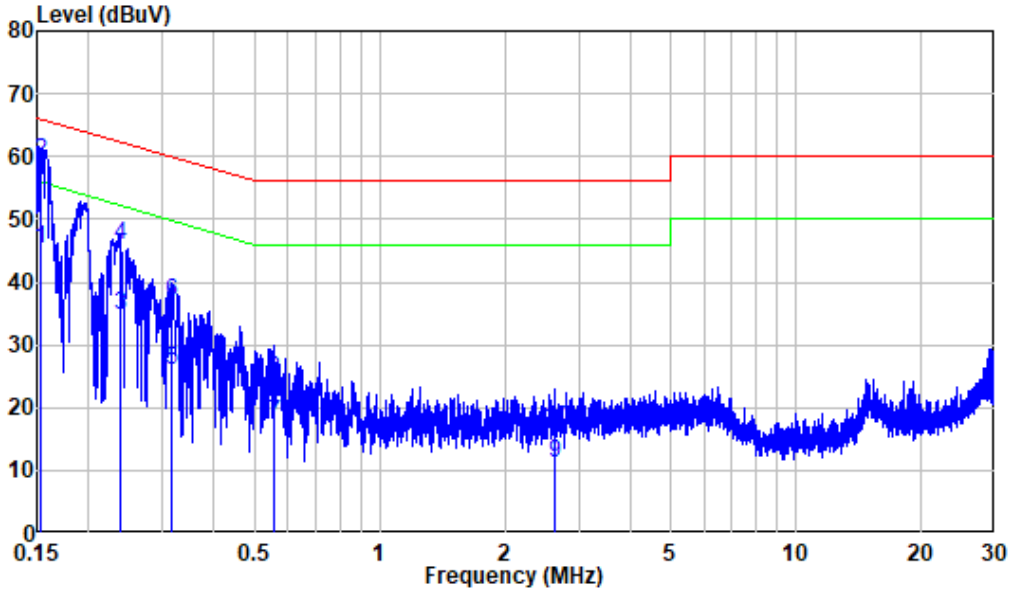
AC 120V/60 Hz, Line



Site : Shielding Room
Condition: Line
Test Mode: BLE 1M Transmitting
Power : AC 120V 60Hz

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.151	9.90	33.04	42.94	55.94	-13.00	Average
2	0.151	9.90	49.88	59.78	65.94	-6.16	QP
3	0.237	9.80	26.03	35.83	52.20	-16.37	Average
4	0.237	9.80	35.82	45.62	62.20	-16.58	QP
5	0.310	9.80	14.43	24.23	49.97	-25.74	Average
6	0.310	9.80	27.24	37.04	59.97	-22.93	QP
7	0.540	9.81	5.10	14.91	46.00	-31.09	Average
8	0.540	9.81	13.20	23.01	56.00	-32.99	QP
9	4.968	9.99	4.11	14.10	46.00	-31.90	Average
10	4.968	9.99	8.94	18.93	56.00	-37.07	QP
11	15.625	10.07	14.71	24.78	50.00	-25.22	Average
12	15.625	10.07	20.67	30.74	60.00	-29.26	QP

AC 120V/60 Hz, Neutral



Site : Shielding Room
Condition: Neutral
Test Mode: BLE 1M Transmitting
Power : AC 120V 60Hz

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.154	9.80	35.45	45.25	55.79	-10.54	Average
2	0.154	9.80	49.24	59.04	65.79	-6.75	QP
3	0.238	9.80	24.77	34.57	52.18	-17.61	Average
4	0.238	9.80	36.18	45.98	62.18	-16.20	QP
5	0.317	9.80	16.21	26.01	49.77	-23.76	Average
6	0.317	9.80	27.12	36.92	59.77	-22.85	QP
7	0.555	9.81	7.73	17.54	46.00	-28.46	Average
8	0.555	9.81	14.71	24.52	56.00	-31.48	QP
9	2.622	9.83	1.46	11.29	46.00	-34.71	Average
10	2.622	9.83	6.83	16.66	56.00	-39.34	QP
11	29.921	10.20	10.20	20.40	50.00	-29.60	Average
12	29.921	10.20	11.45	21.65	60.00	-38.35	QP

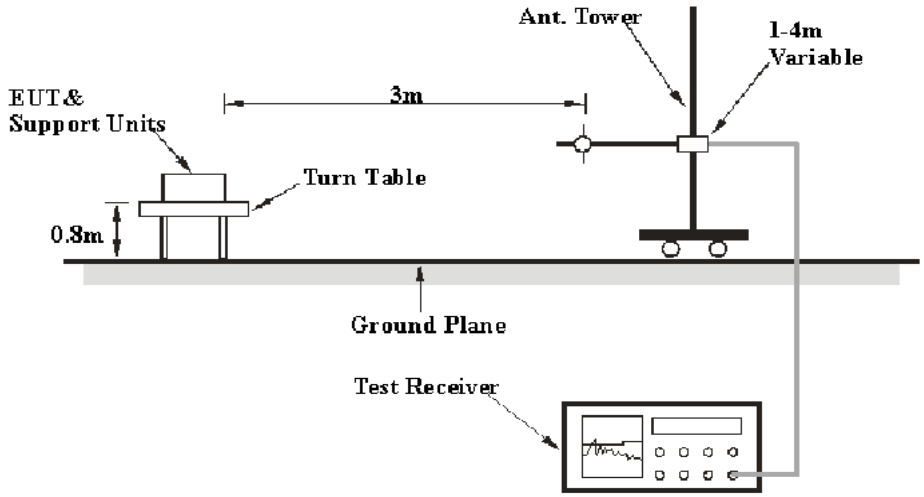
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

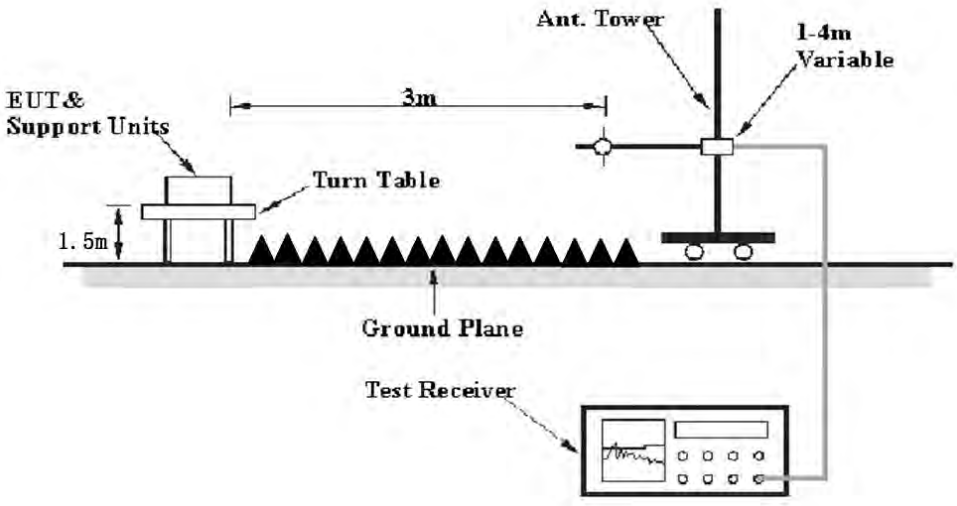
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

Below 1 GHz:



Above 1GHz:



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

EMI Test Receiver & Spectrum Analyzer Setup

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz Note 1	/	Average
	1MHz	＞1/T Note 2	/	Average

Note 1: when duty cycle is no less than 98%
Note 2: when duty cycle is less than 98%

Test Procedure

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

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

Factor & Margin Calculation

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

Factor = Antenna Factor + Cable Loss - Amplifier Gain

The "**Over Limit/Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, an Over Limit/margin of -7dB means the emission is 7dB below the limit. The equation for calculation is as follows:

Over Limit/Margin = Level / Corrected Amplitude – Limit
Level / Corrected Amplitude = Read Level + Factor

Test Data

Environmental Conditions

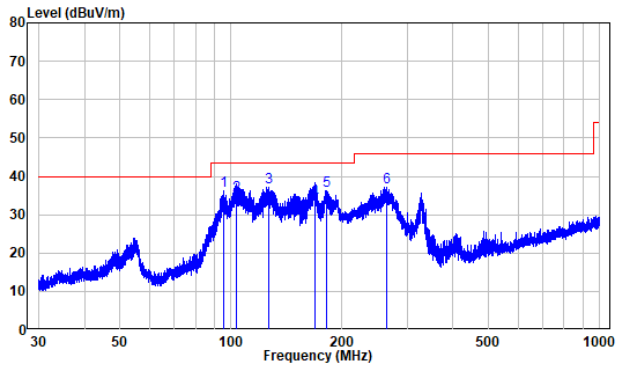
Temperature:	23 ℃
Relative Humidity:	48 %
ATM Pressure:	101.0 kPa

The testing was performed by Chao Mo on 2022-01-17 for below 1GHz, 2021-11-04 for 1-18GHz and 2021-11-04 for 18-25GHz.

EUT operation mode: Transmitting (Pre-scan all modes, and the worst case as below)

30 MHz~1 GHz: Worst case BLE 1M, low channel

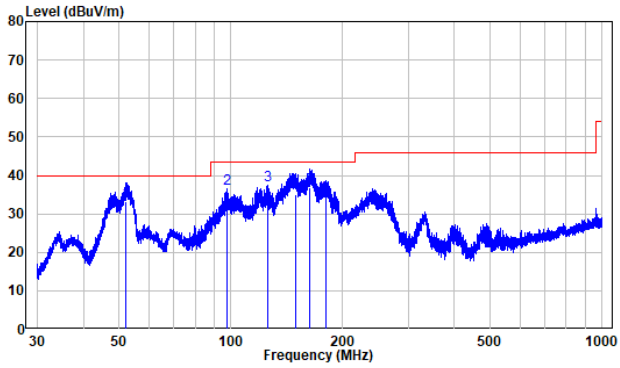
Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No. : XMTN1211027-55093E-RF
Test Mode: BLE 1M Transmitting

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	95.804	-12.34	48.60	36.26	43.50	-7.24	Peak
2	103.488	-11.70	46.59	34.89	43.50	-8.61	QP
3	126.163	-14.42	51.51	37.09	43.50	-6.41	Peak
4	168.783	-13.70	47.59	33.89	43.50	-9.61	QP
5	181.841	-12.56	48.84	36.28	43.50	-7.22	Peak
6	263.935	-10.48	47.64	37.16	46.00	-8.84	Peak

Vertical

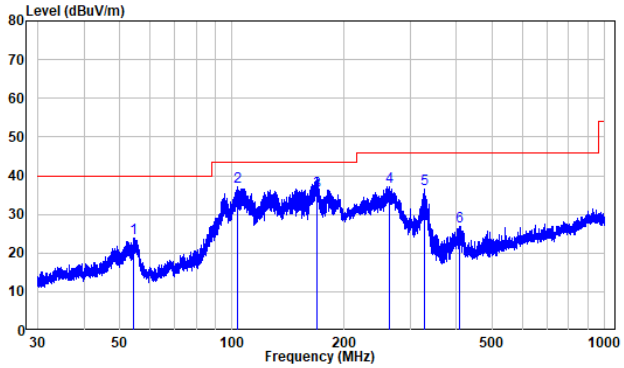


Site : chamber
Condition: 3m VERTICAL
Job No. : XMTN1211027-55093E-RF
Test Mode: BLE 1M Transmitting

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	51.934	-9.98	43.30	33.32	40.00	-6.68	QP
2	97.371	-12.27	48.80	36.53	43.50	-6.97	Peak
3	125.942	-14.40	51.83	37.43	43.50	-6.07	Peak
4	149.879	-15.28	50.19	34.91	43.50	-8.59	QP
5	163.468	-14.28	50.99	36.71	43.50	-6.79	QP
6	179.622	-12.81	47.59	34.78	43.50	-8.72	QP

30 MHz~1 GHz: Worst case Zigbee, low channel

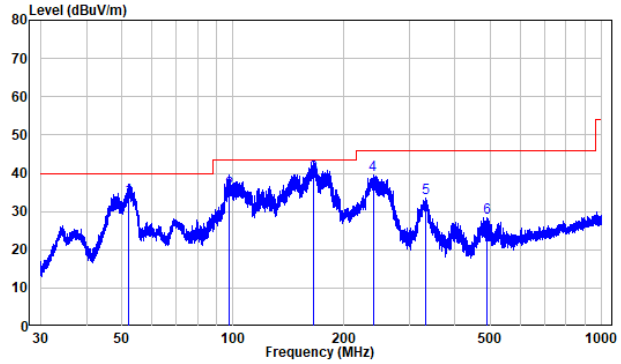
Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No. : XMTN1211027-55093E-RF
Mode : Zigbee Transmitting

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	54.213	-10.33	34.23	23.90	40.00	-16.10	Peak
2	103.488	-11.70	48.78	37.08	43.50	-6.42	Peak
3	168.783	-13.70	49.70	36.00	43.50	-7.50	QP
4	263.935	-10.48	47.64	37.16	46.00	-8.84	Peak
5	327.887	-8.11	44.76	36.65	46.00	-9.35	Peak
6	407.336	-6.54	33.54	27.00	46.00	-19.00	Peak

Vertical

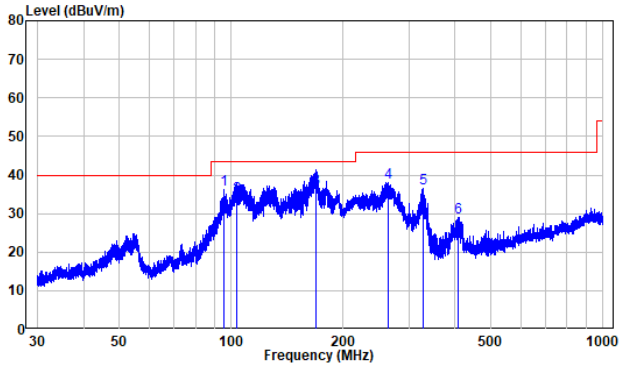


Site : chamber
Condition: 3m VERTICAL
Job No. : XMTN1211027-55093E-RF
Mode : Zigbee Transmitting

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	51.934	-9.98	43.50	33.52	40.00	-6.48	QP
2	97.371	-12.27	47.60	35.33	43.50	-8.17	QP
3	165.269	-14.10	53.71	39.61	43.50	-3.89	QP
4	239.777	-10.91	50.46	39.55	46.00	-6.45	Peak
5	333.248	-7.75	41.23	33.48	46.00	-12.52	Peak
6	486.888	-4.80	33.29	28.49	46.00	-17.51	Peak

30 MHz~1 GHz: Worst case 125k, low channel

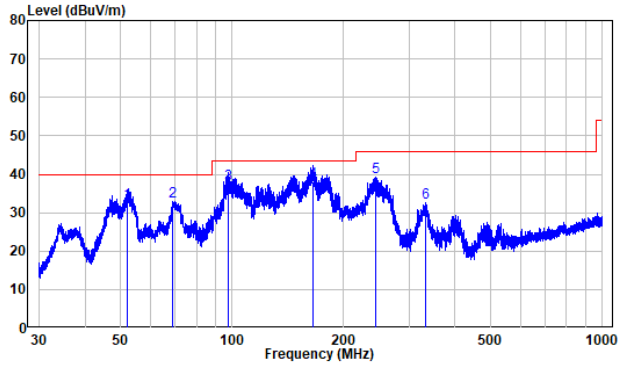
Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No. : XMTN1211027-55093E-RF
Mode : 125k Transmitting

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	95.804	-12.34	48.60	36.26	43.50	-7.24	Peak
2	103.488	-11.70	46.20	34.50	43.50	-9.00	QP
3	168.783	-13.70	50.20	36.50	43.50	-7.00	QP
4	263.935	-10.48	48.64	38.16	46.00	-7.84	Peak
5	327.887	-8.11	44.76	36.65	46.00	-9.35	Peak
6	407.336	-6.54	35.54	29.00	46.00	-17.00	Peak

Vertical

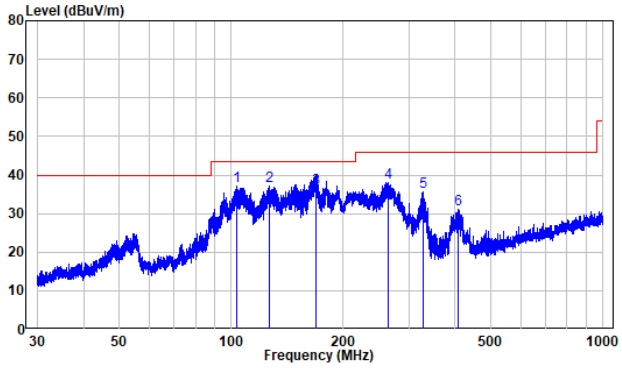


Site : chamber
Condition: 3m VERTICAL
Job No. : XMTN1211027-55093E-RF
Mode : 125k Transmitting

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	51.934	-9.98	42.60	32.62	40.00	-7.38	QP
2	69.114	-14.35	47.26	32.91	40.00	-7.09	Peak
3	97.371	-12.27	49.70	37.43	43.50	-6.07	QP
4	165.269	-14.10	52.11	38.01	43.50	-5.49	QP
5	243.697	-10.67	49.88	39.21	46.00	-6.79	Peak
6	333.248	-7.75	40.23	32.48	46.00	-13.52	Peak

30 MHz~1 GHz: Worst case 500k, low channel

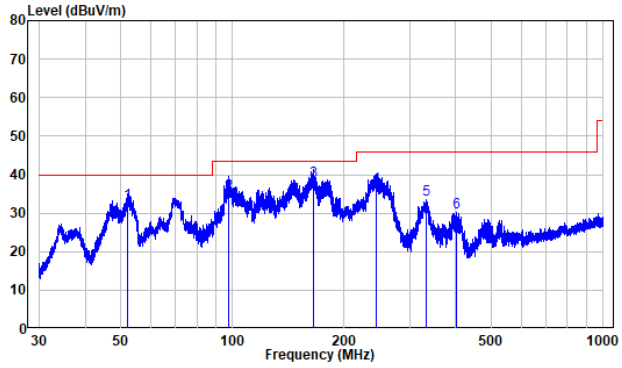
Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No. : XMTN1211027-55093E-RF
Mode : 500k Transmitting

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	103.488	-11.70	48.78	37.08	43.50	-6.42	Peak
2	126.163	-14.42	51.51	37.09	43.50	-6.41	Peak
3	168.783	-13.70	50.10	36.40	43.50	-7.10	QP
4	263.935	-10.48	48.64	38.16	46.00	-7.84	Peak
5	327.887	-8.11	43.76	35.65	46.00	-10.35	Peak
6	407.336	-6.54	37.54	31.00	46.00	-15.00	Peak

Vertical



Site : chamber
Condition: 3m VERTICAL
Job No. : XMTN1211027-55093E-RF
Mode : 500k Transmitting

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	51.934	-9.98	42.68	32.70	40.00	-7.30	QP
2	97.371	-12.27	47.30	35.03	43.50	-8.47	QP
3	165.269	-14.10	52.37	38.27	43.50	-5.23	QP
4	243.697	-10.67	47.51	36.84	46.00	-9.16	QP
5	333.248	-7.75	41.23	33.48	46.00	-12.52	Peak
6	402.367	-6.73	37.03	30.30	46.00	-15.70	Peak

Above 1 GHz:

Frequency (MHz)	Receiver		Turntable Angle Degree	Rx Antenna		Factor (dB/m)	Absolute Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
	Reading (dBuV)	PK/Ave		Height (m)	Polar (H/V)				
BLE 1M, Low Channel									
2310	47.66	PK	114	2.0	H	-7.23	40.43	74	-33.57
2310	48.13	PK	294	2.1	V	-7.23	40.9	74	-33.1
2390	54.28	PK	274	1.1	H	-7.21	47.07	74	-26.93
2390	55.62	PK	32	1.2	V	-7.21	48.41	74	-25.59
4804	55.12	PK	274	2.0	H	-3.52	51.6	74	-22.4
4804	54.69	PK	52	2.1	V	-3.52	51.17	74	-22.83
BLE 1M, Middle Channel									
4884	53.76	PK	316	1.3	H	-3.37	50.39	74	-23.61
4884	53.36	PK	17	1.2	V	-3.37	49.99	74	-24.01
BLE 1M, High Channel									
2483.5	59.17	PK	127	1.4	H	-7.2	51.97	74	-22.03
2483.5	56.68	PK	131	1.4	V	-7.2	49.48	74	-24.52
2500	59.93	PK	131	1.4	H	-7.18	52.75	74	-21.25
2500	61	PK	209	2.0	V	-7.18	53.82	74	-20.18
4960	51.6	PK	133	2.1	H	-3.01	48.59	74	-25.41
4960	52.14	PK	97	1.3	V	-3.01	49.13	74	-24.87
BLE 2M, Low Channel									
2310	48.82	PK	254	1.4	H	-7.23	41.59	74	-32.41
2310	49.38	PK	12	1.8	V	-7.23	42.15	74	-31.85
2390	55.8	PK	115	1.2	H	-7.21	48.59	74	-25.41
2390	57.05	PK	187	1.8	V	-7.21	49.84	74	-24.16
4804	54.47	PK	296	1.3	H	-3.52	50.95	74	-23.05
4804	52.91	PK	186	1.4	V	-3.52	49.39	74	-24.61
BLE 2M, Middle Channel									
4884	52.24	PK	117	2.1	H	-3.37	48.87	74	-25.13
4884	51.23	PK	178	1.1	V	-3.37	47.86	74	-26.14
BLE 2M, High Channel									
2483.5	58.22	PK	104	2.0	H	-7.2	51.02	74	-22.98
2483.5	57.53	PK	234	1.1	V	-7.2	50.33	74	-23.67
2500	58.67	PK	234	1.1	H	-7.18	51.49	74	-22.51
2500	59.77	PK	10	1.6	V	-7.18	52.59	74	-21.41
4960	51.27	PK	225	1.1	H	-3.01	48.26	74	-25.74
4960	51.14	PK	151	2.1	V	-3.01	48.13	74	-25.87

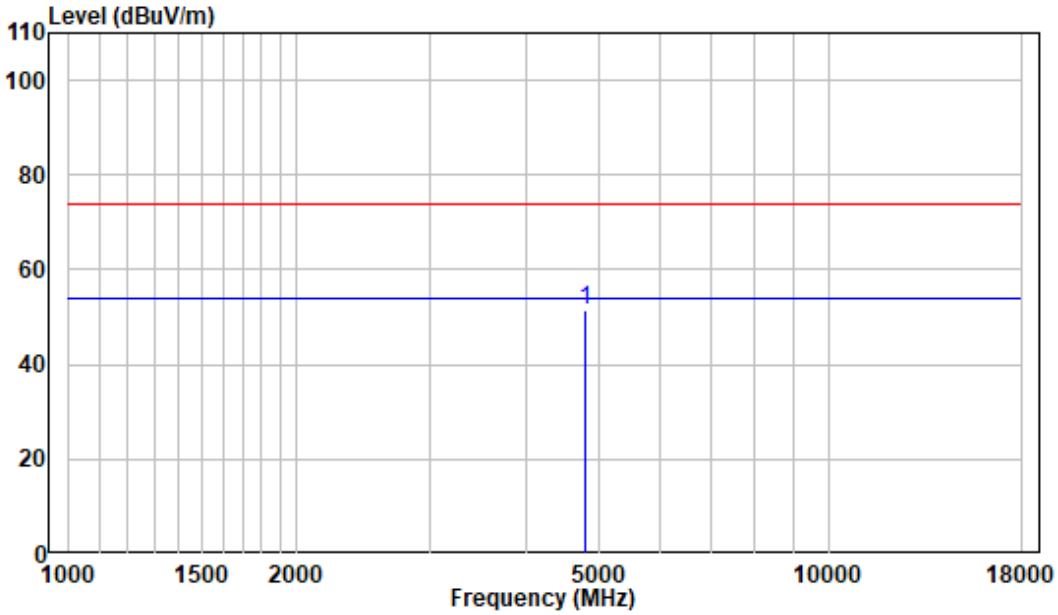
Frequency (MHz)	Receiver		Turntable Angle Degree	Rx Antenna		Factor (dB/m)	Absolute Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
	Reading (dBuV)	PK/Ave		Height (m)	Polar (H/V)				
BLE 125k, Low Channel									
2310	46.35	PK	129	1.1	H	-7.23	39.12	74	-34.88
2310	45.5	PK	341	2.1	V	-7.23	38.27	74	-35.73
2390	55.62	PK	68	1.3	H	-7.21	48.41	74	-25.59
2390	49.27	PK	248	2.0	V	-7.21	42.06	74	-31.94
4804	55.14	PK	20	2.2	H	-3.52	51.62	74	-22.38
4804	55.04	PK	311	1.8	V	-3.52	51.52	74	-22.48
BLE 125k, Middle Channel									
4884	53.92	PK	2	2.2	H	-3.37	50.55	74	-23.45
4884	53.5	PK	188	1.7	V	-3.37	50.13	74	-23.87
BLE 125k, High Channel									
2483.5	60.75	PK	137	1.8	H	-7.2	53.55	74	-20.45
2483.5	60.04	PK	342	2.2	V	-7.2	52.84	74	-21.16
2500	59.83	PK	342	2.2	H	-7.18	52.65	74	-21.35
2500	58.84	PK	306	1.2	V	-7.18	51.66	74	-22.34
4960	51.8	PK	171	2.0	H	-3.01	48.79	74	-25.21
4960	51.07	PK	27	1.0	V	-3.01	48.06	74	-25.94
BLE 500k, Low Channel									
2310	46.12	PK	160	1.4	H	-7.23	38.89	74	-35.11
2310	47.75	PK	53	1.2	V	-7.23	40.52	74	-33.48
2390	46.51	PK	107	1.4	H	-7.21	39.3	74	-34.7
2390	47.5	PK	84	1.9	V	-7.21	40.29	74	-33.71
4804	54.24	PK	152	1.4	H	-3.52	50.72	74	-23.28
4804	54.76	PK	58	2.2	V	-3.52	51.24	74	-22.76
BLE 500k, Middle Channel									
4884	53.89	PK	20	1.8	H	-3.37	50.52	74	-23.48
4884	53.27	PK	8	1.7	V	-3.37	49.9	74	-24.1
BLE 500k, High Channel									
2483.5	59.98	PK	305	1.3	H	-7.2	52.78	74	-21.22
2483.5	55.86	PK	45	1.5	V	-7.2	48.66	74	-25.34
2500	59.37	PK	45	1.5	H	-7.18	52.19	74	-21.81
2500	58.5	PK	219	2.0	V	-7.18	51.32	74	-22.68
4960	51.77	PK	128	1.7	H	-3.01	48.76	74	-25.24
4960	50.71	PK	93	1.3	V	-3.01	47.7	74	-26.3

Frequency (MHz)	Receiver		Turntable Angle Degree	Rx Antenna		Factor (dB/m)	Absolute Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
	Reading (dBuV)	PK/Ave		Height (m)	Polar (H/V)				
Zigbee, Low Channel									
2310	51.73	PK	99	1.7	H	-7.23	44.5	74	-29.5
2310	50.61	PK	339	2.1	V	-7.23	43.38	74	-30.62
2390	52.43	PK	45	1.8	H	-7.21	45.22	74	-28.78
2390	49.43	PK	102	2.1	V	-7.21	42.22	74	-31.78
4810	46.63	PK	66	1.8	H	-3.52	43.11	74	-30.89
4810	44.14	PK	90	1.3	V	-3.52	40.62	74	-33.38
Zigbee, Middle Channel									
4890	45.62	PK	298	1.4	H	-3.37	42.25	74	-31.75
4890	43.62	PK	42	1.1	V	-3.37	40.25	74	-33.75
Zigbee, High Channel									
2483.5	63.96	PK	51	1.9	H	-7.2	56.76	74	-17.24
2483.5	55.57	Ave	51	1.9	H	-7.2	48.37	54	-5.63
2483.5	62.38	PK	205	1.6	V	-7.2	55.18	74	-18.82
2483.5	53.07	Ave	205	1.6	V	-7.2	45.87	54	-8.13
2500	52.96	PK	205	2.1	H	-7.18	45.78	74	-28.22
2500	53.78	PK	165	1.5	V	-7.18	46.6	74	-27.4
4960	45.04	PK	245	1.7	H	-3.01	42.03	74	-31.97
4960	43.18	PK	149	1.8	V	-3.01	40.17	74	-33.83

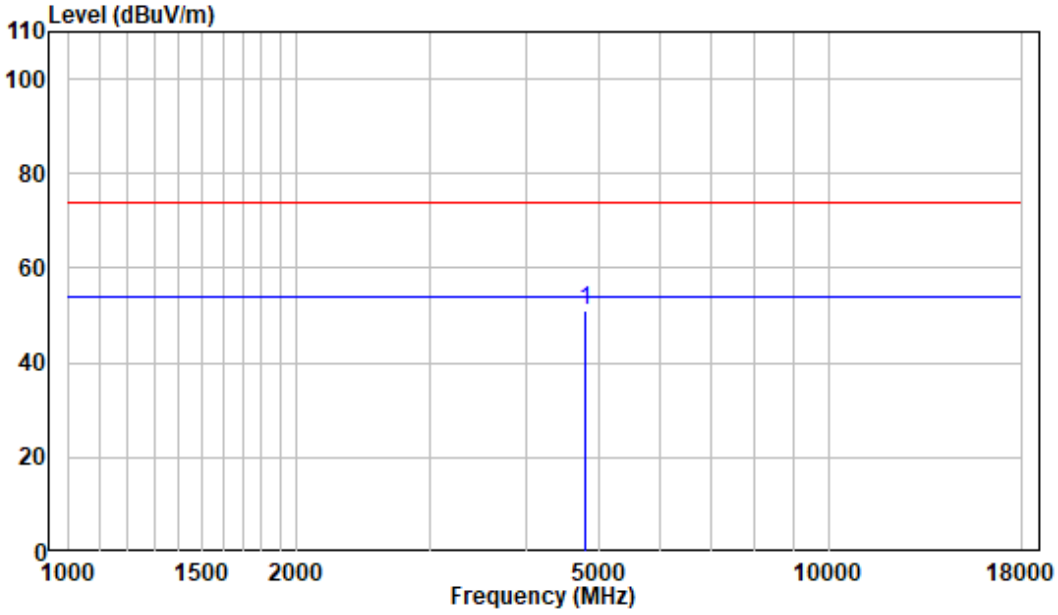
Note:
Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Absolute Level (Corrected Amplitude) = Factor + Reading
Margin = Absolute Level (Corrected Amplitude) – Limit
The other spurious emission which is in the noise floor level was not recorded.
For above 1GHz, the test result of peak was 20dB below to the limit of peak, which can be compliant to the average limit, so just peak value was recorded.

1-18 GHz:
Pre-scan plots:

BLE 1M Low Channel
Horizontal

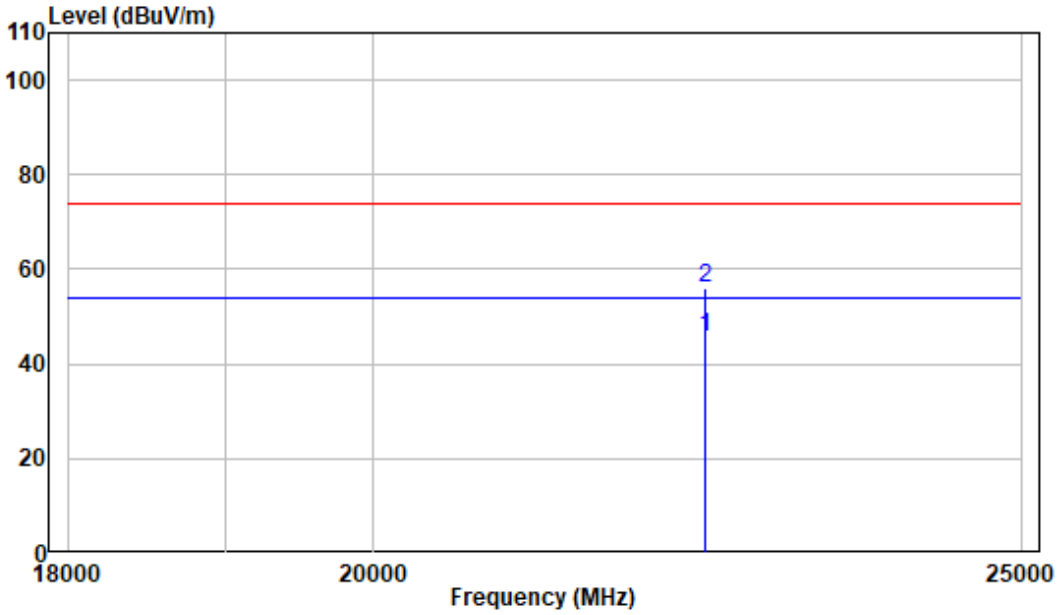


Vertical

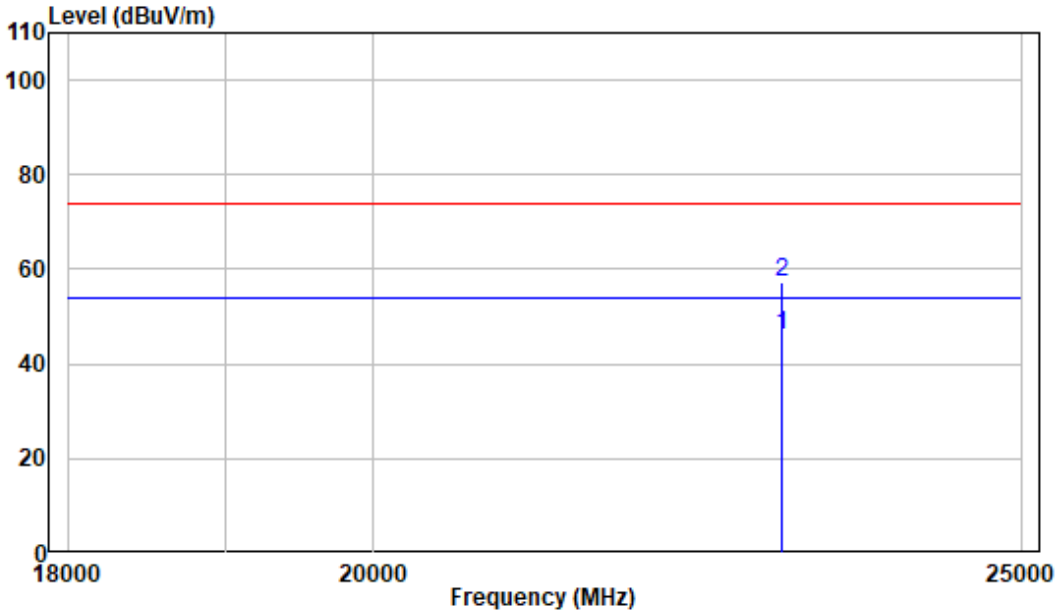


18-25GHz:
Pre-scan plots:

BLE 1M Low Channel
Horizontal

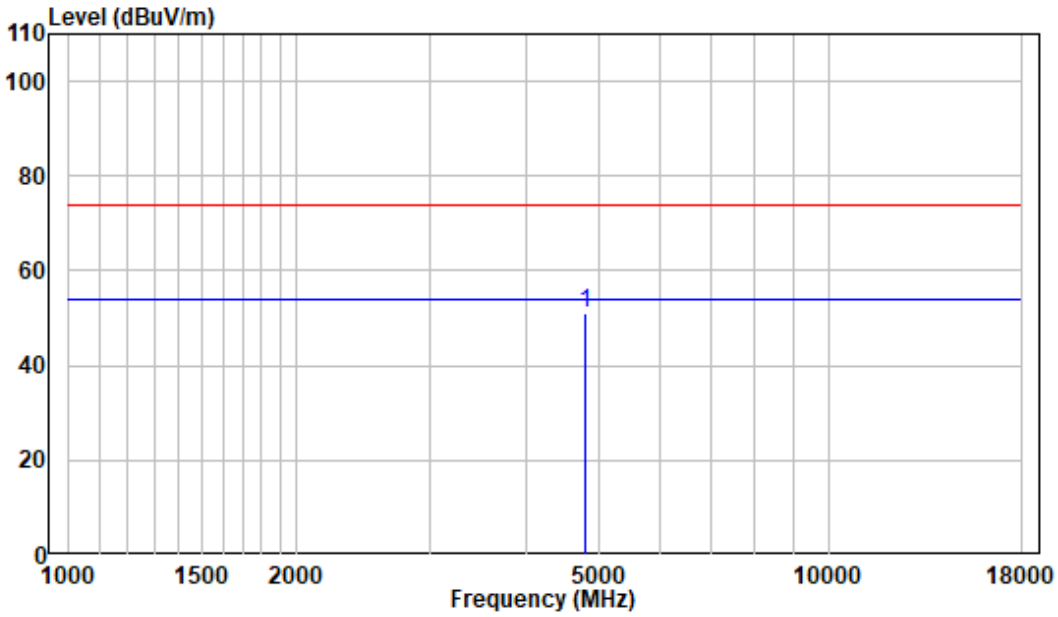


Vertical

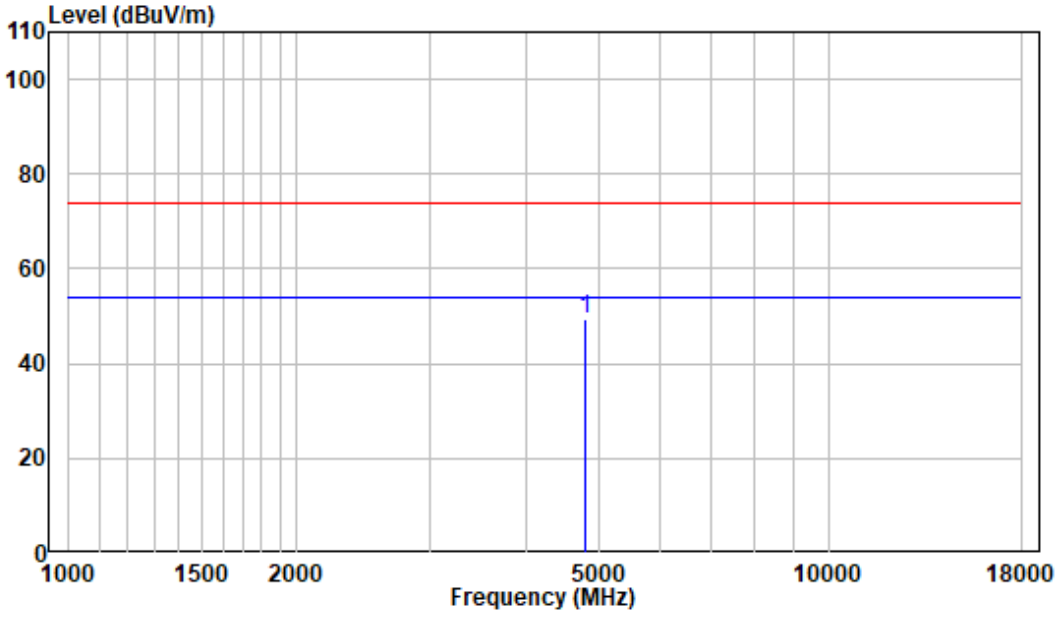


1-18 GHz:
Pre-scan plots:

BLE 2M Low Channel
Horizontal

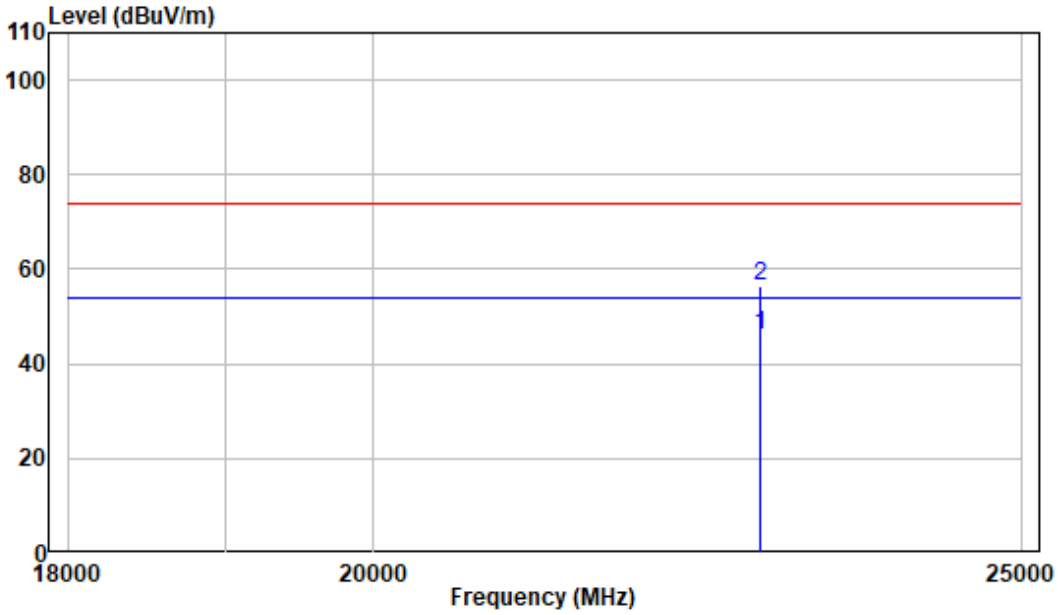


Vertical

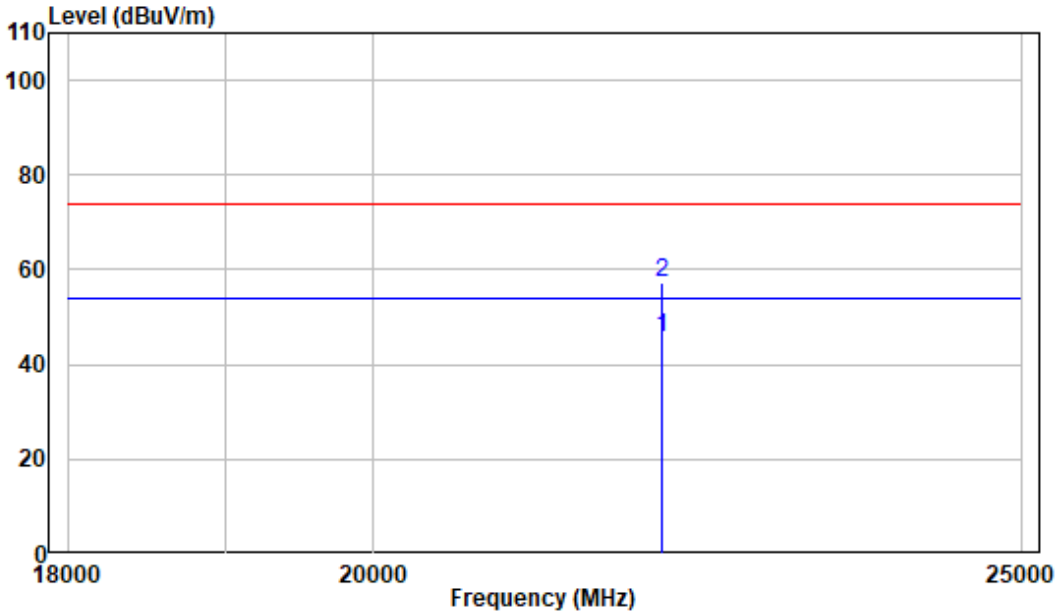


18-25GHz:
Pre-scan plots:

BLE 2M Low Channel
Horizontal

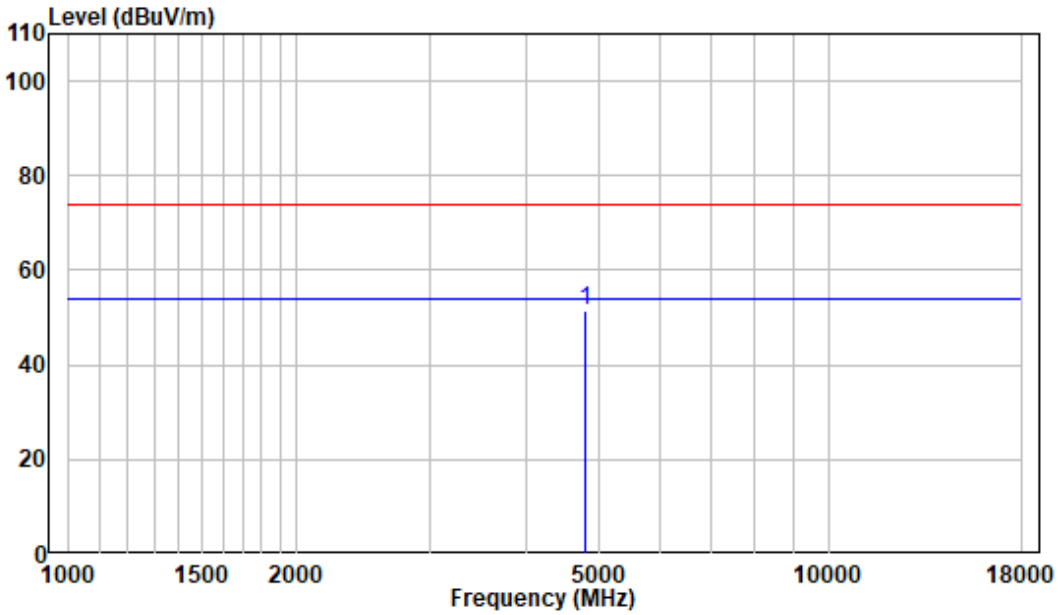


Vertical

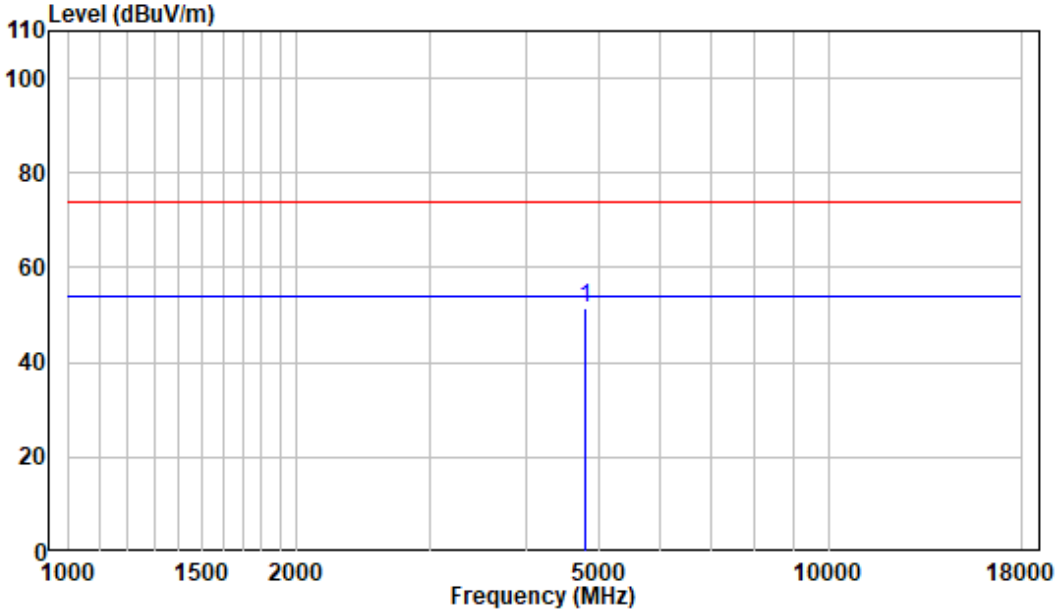


1-18 GHz:
Pre-scan plots:

BLE 125k Low Channel
Horizontal

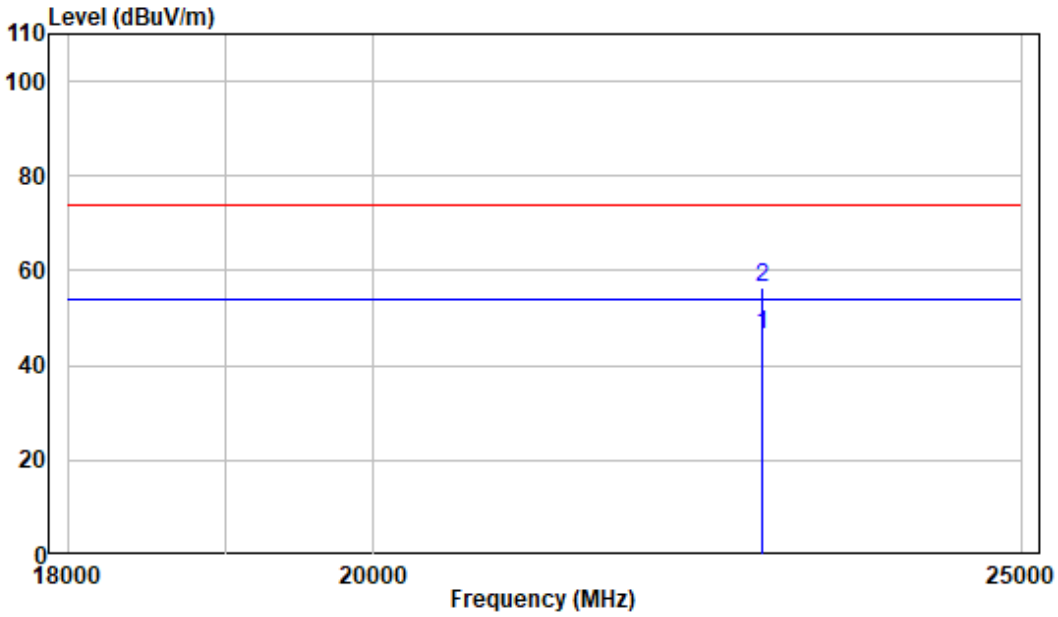


Vertical

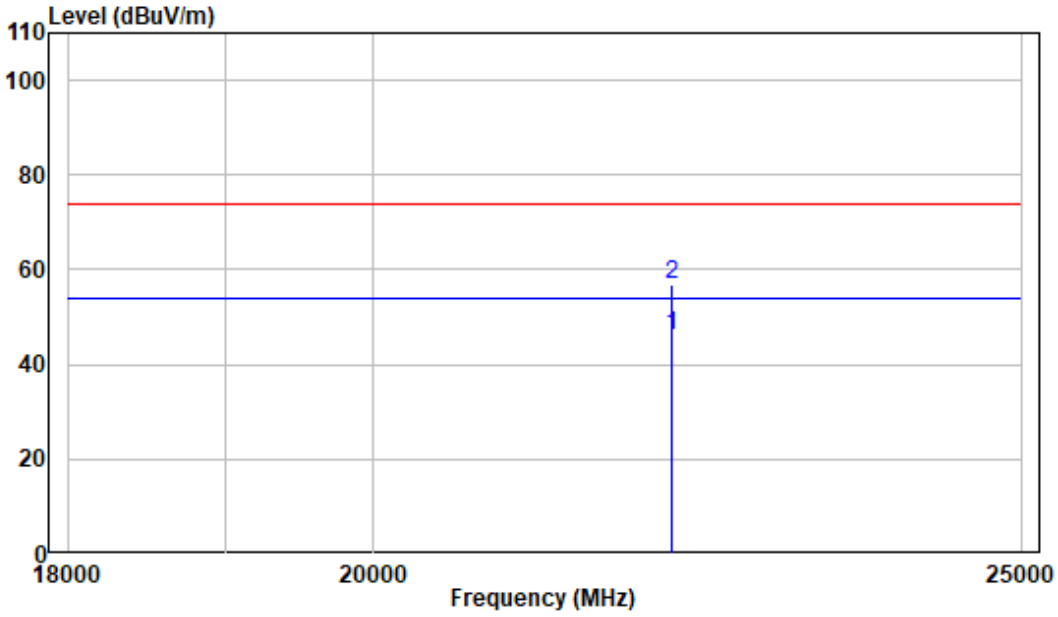


18-25 GHz:
Pre-scan plots:

BLE 125k Low Channel
Horizontal



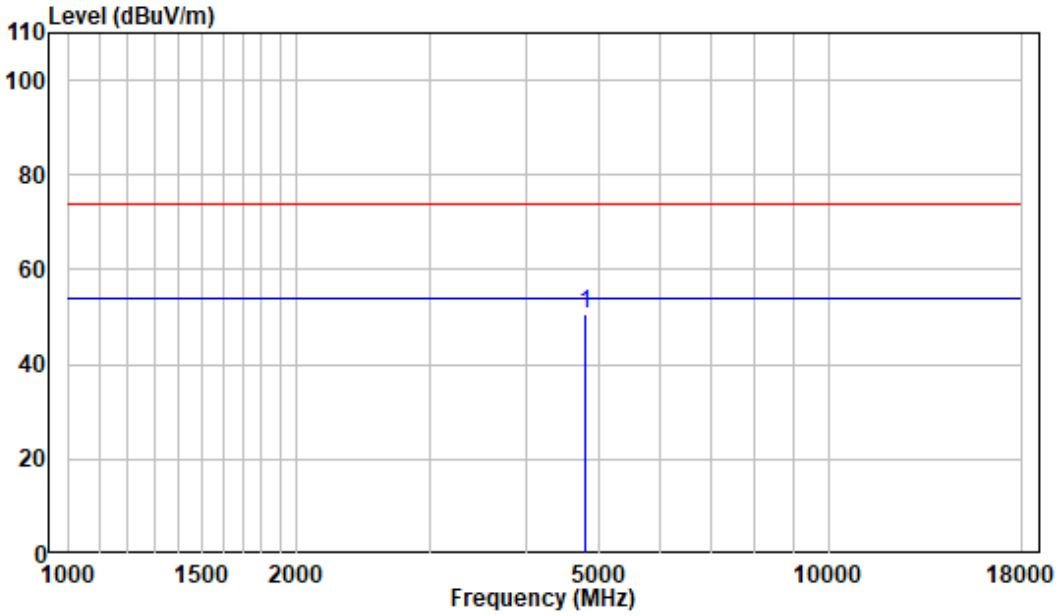
Vertical



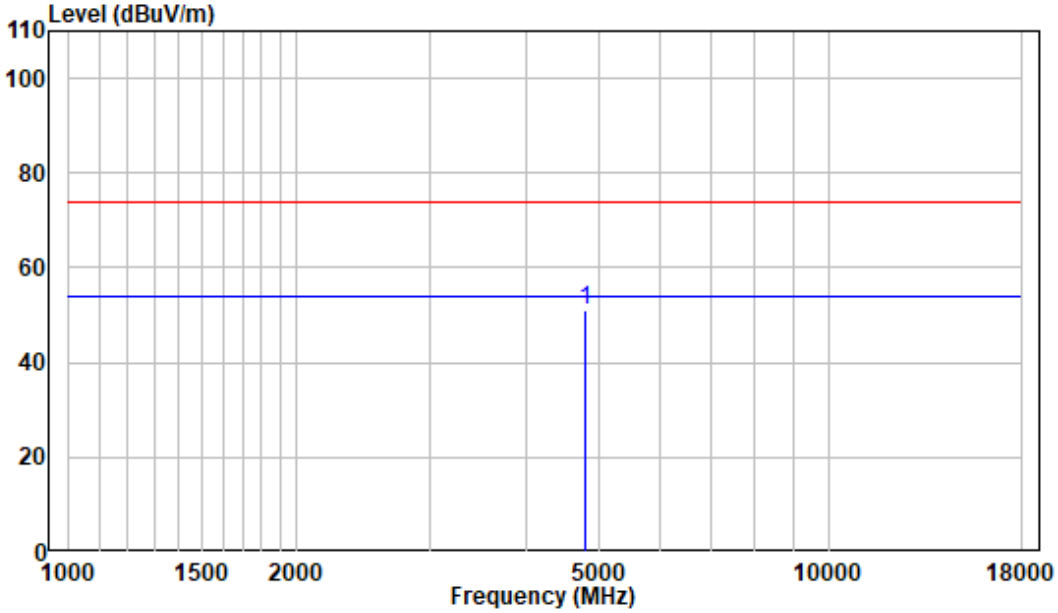
1-18GHz:

Pre-scan plots:

BLE 500k Low Channel
Horizontal

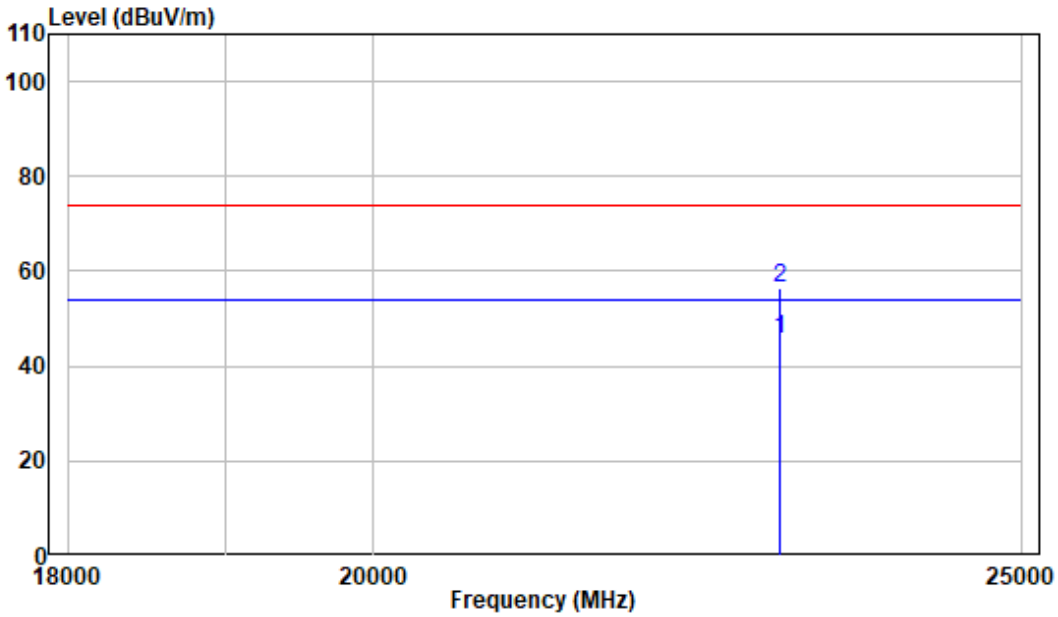


Vertical

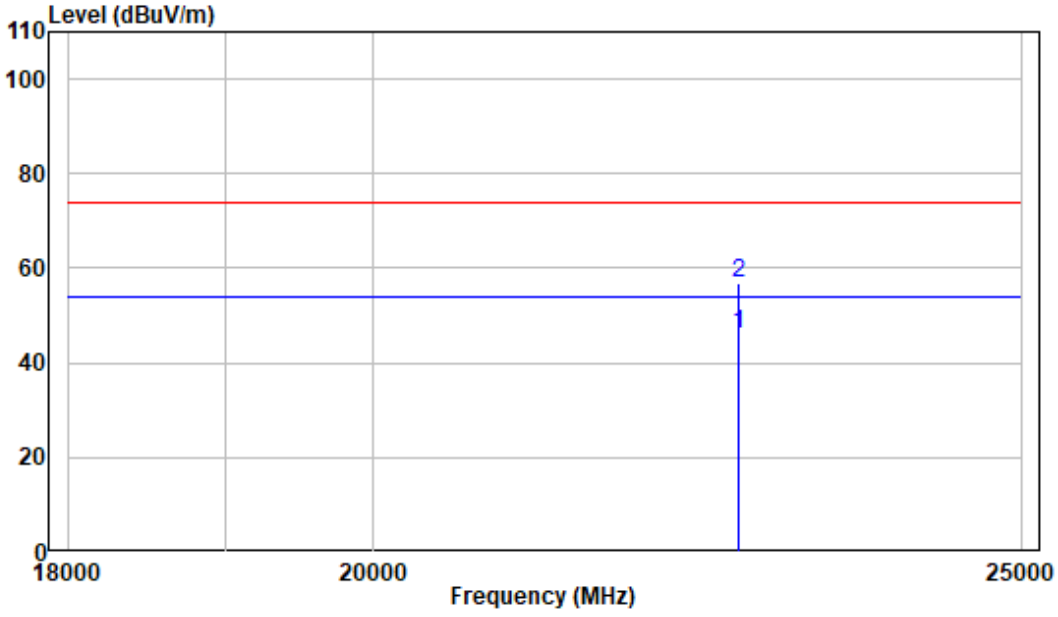


18-25 GHz:
Pre-scan plots:

BLE 500k Low Channel
Horizontal



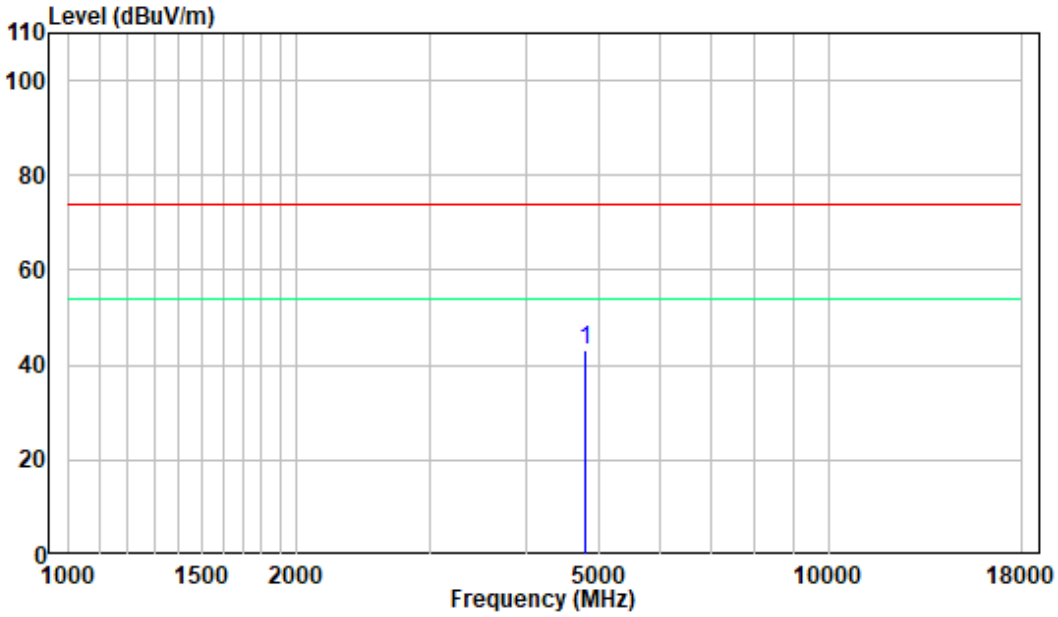
Vertical

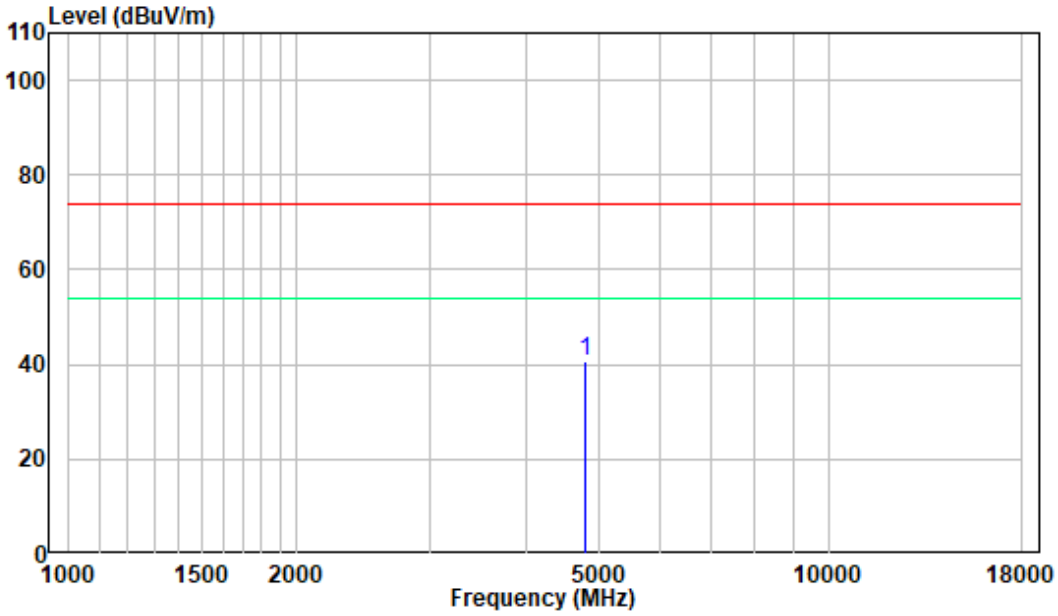


1-18GHz:

Pre-scan plots:

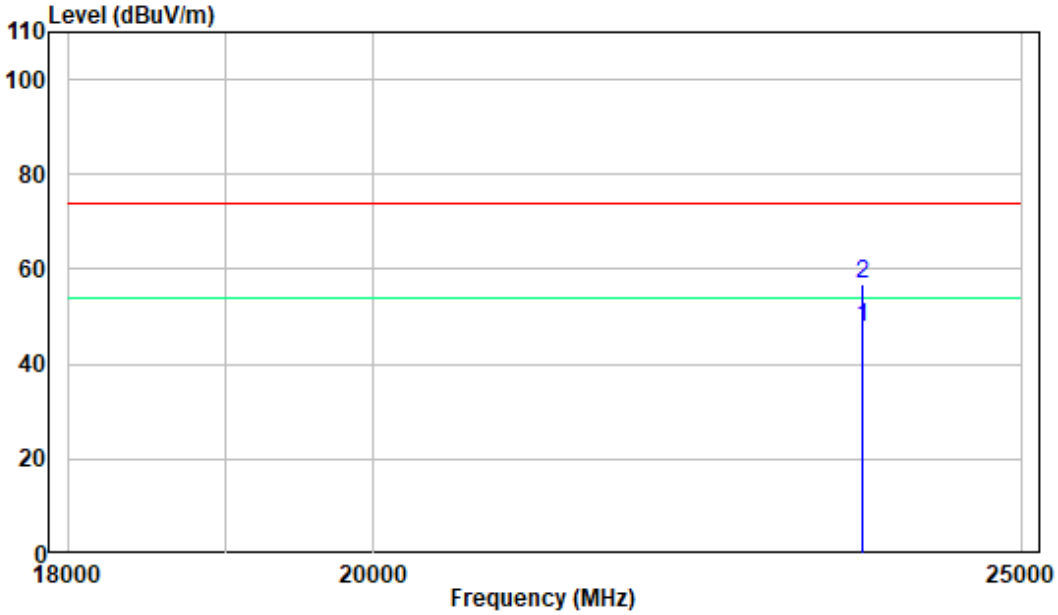
Zigbee Low Channel
Horizontal

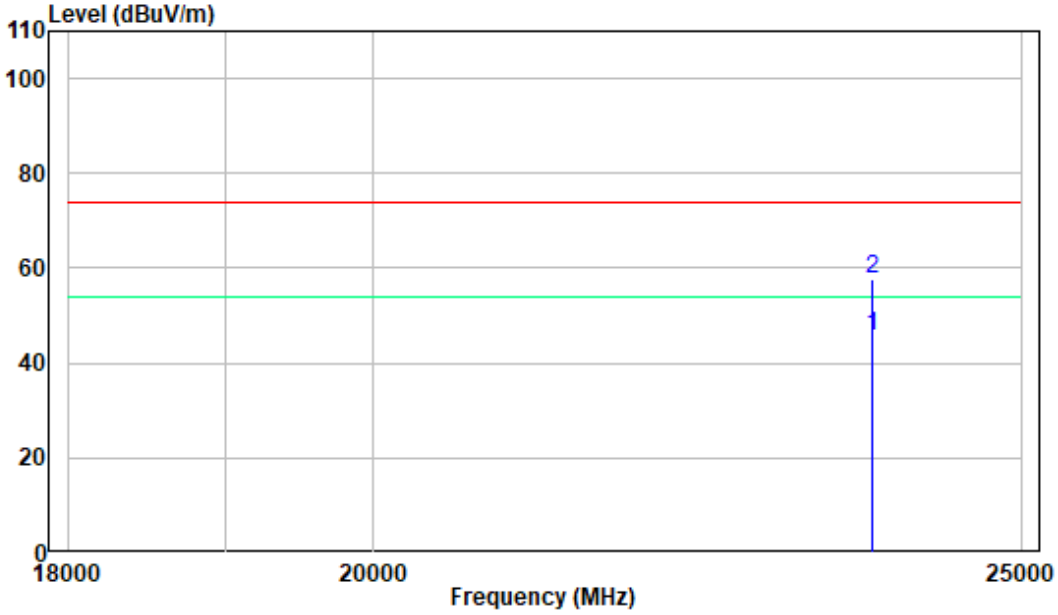




18-25 GHz:
Pre-scan plots:

Zigbee Low Channel
Horizontal





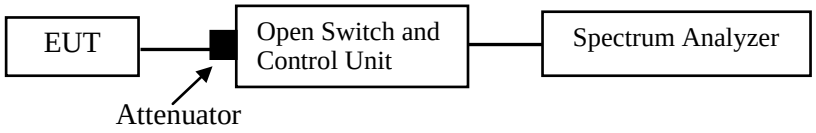
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH & OCCUPIED BANDWIDTH

Applicable Standard

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.

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 it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.



Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	47 %
ATM Pressure:	101.0 kPa

The testing was performed by Paul Liu from 2021-11-03 to 2022-02-22.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix BLE/Zigbee.

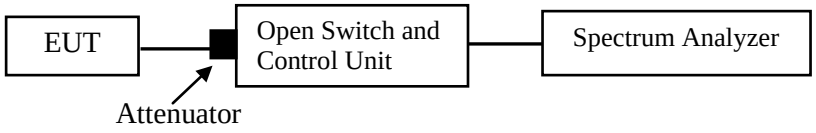
FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

Applicable Standard

According to FCC §15.247(b) (3), for 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.

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 one test equipment.
3. Add a correction factor to the display.



Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	47 %
ATM Pressure:	101.0 kPa

The testing was performed by Paul Liu from 2021-11-03 to 2022-02-22.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix BLE/Zigbee.

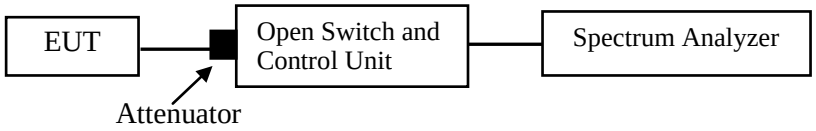
FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

Applicable Standard

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)).

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.



Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	47 %
ATM Pressure:	101.0 kPa

The testing was performed by Paul Liu from 2021-11-03 to 2022-02-22.

EUT operation mode: Transmitting

Test Result: Compliant.

Conducted Band Edge Result:

Please refer to the Appendix BLE/Zigbee.

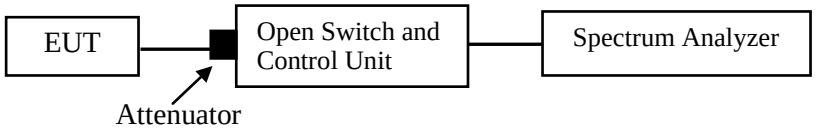
FCC §15.247(e) - POWER SPECTRAL DENSITY

Applicable Standard

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.

Test Procedure

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW to: 3kHz≤ RBW≤100 kHz.
3. Set the VBW ≥ 3×RBW.
4. Set the span to 1.5 times the DTS bandwidth.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.



Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	47 %
ATM Pressure:	101.0 kPa

The testing was performed by Paul Liu from 2021-11-03 to 2022-02-22.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix BLE/Zigbee.

APPENDIX BLE/Zigbee

Appendix A: 6dB Emission Bandwidth

Test Result

TestMode	Antenna	Channel	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.680	2401.664	2402.344	0.5	PASS
		2442	0.676	2441.664	2442.340	0.5	PASS
		2480	0.668	2479.672	2480.340	0.5	PASS
BLE_2M	Ant1	2402	1.124	2401.444	2402.568	0.5	PASS
		2442	1.120	2441.448	2442.568	0.5	PASS
		2480	1.120	2479.448	2480.568	0.5	PASS

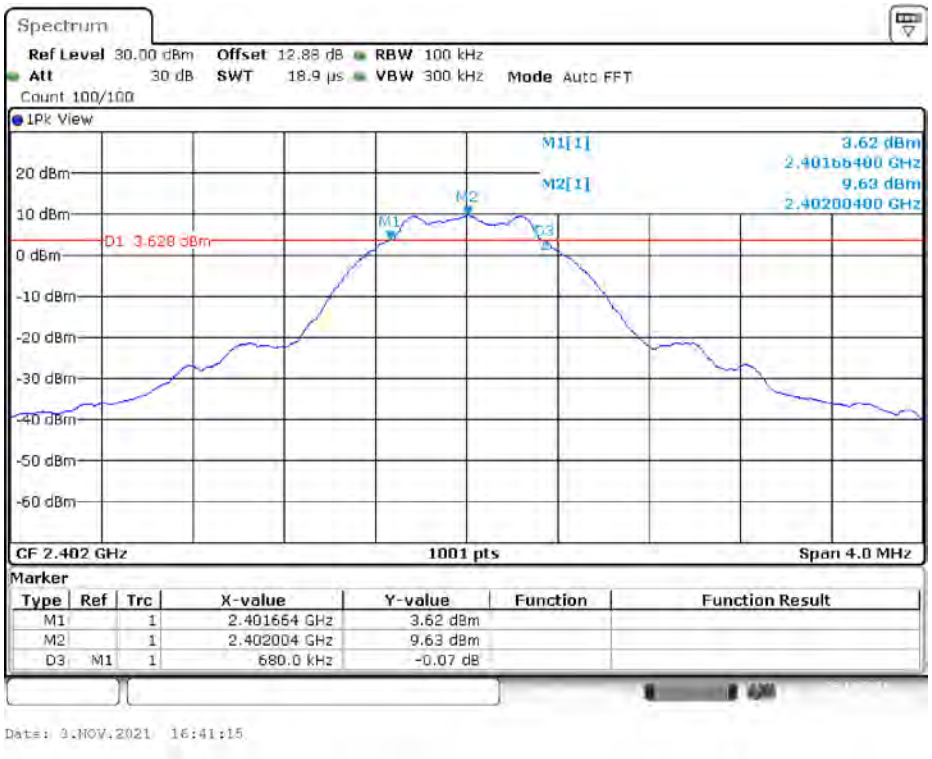
TestMode	Antenna	Channel	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE 125k	Ant1	2402	0.708	2401.648	2402.024	0.5	PASS
		2442	0.704	2441.648	2442.024	0.5	PASS
		2480	0.704	2479.648	2480.024	0.5	PASS

TestMode	Antenna	Channel	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE 500k	Ant1	2402	0.736	2401.628	2402.364	0.5	PASS
		2442	0.732	2441.628	2442.360	0.5	PASS
		2480	0.732	2479.628	2480.360	0.5	PASS

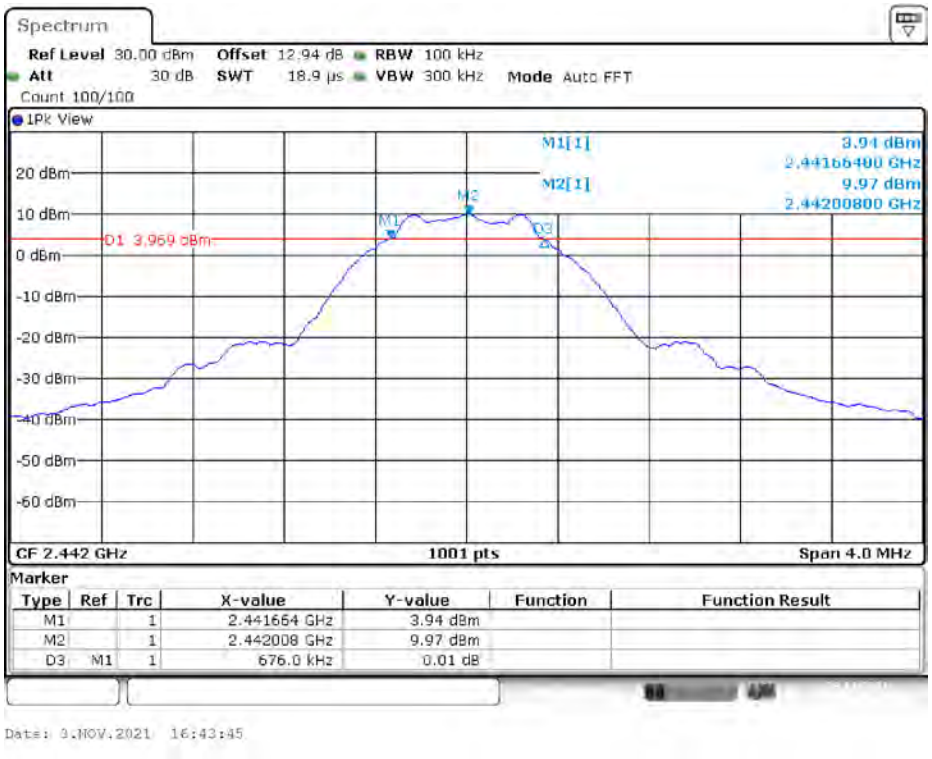
TestMode	Antenna	Channel	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
Zigbee	Ant1	2405	1.464	2404.320	2405.784	0.5	PASS
		2445	1.464	2444.320	2445.784	0.5	PASS
		2480	1.544	2479.252	2480.796	0.5	PASS

Test Graphs

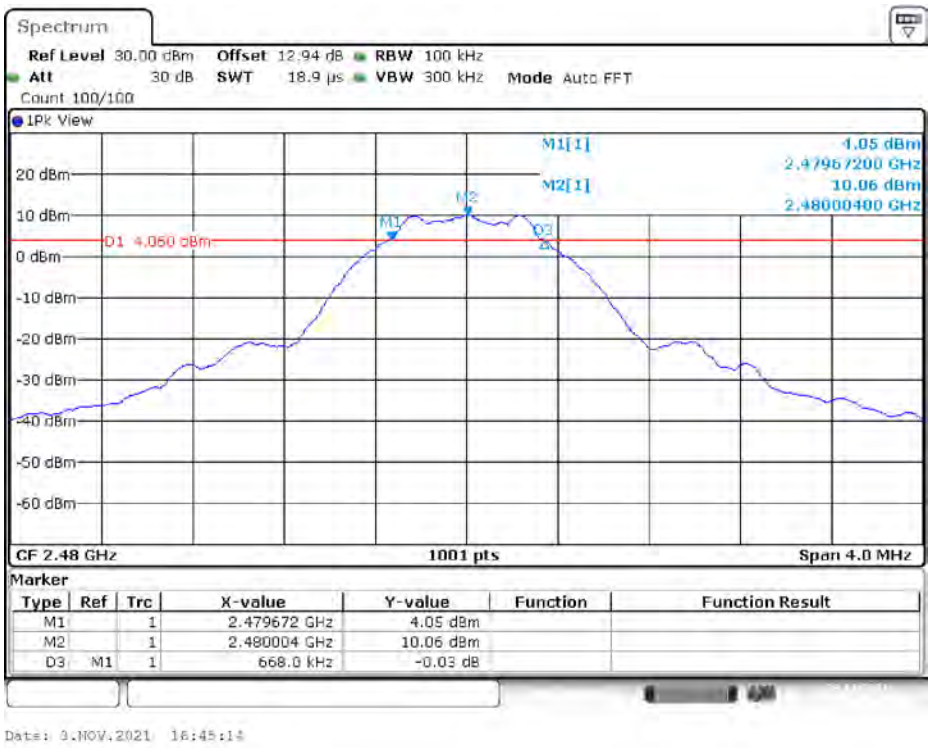
6dB Bandwidth, BLE 1M Low Channel



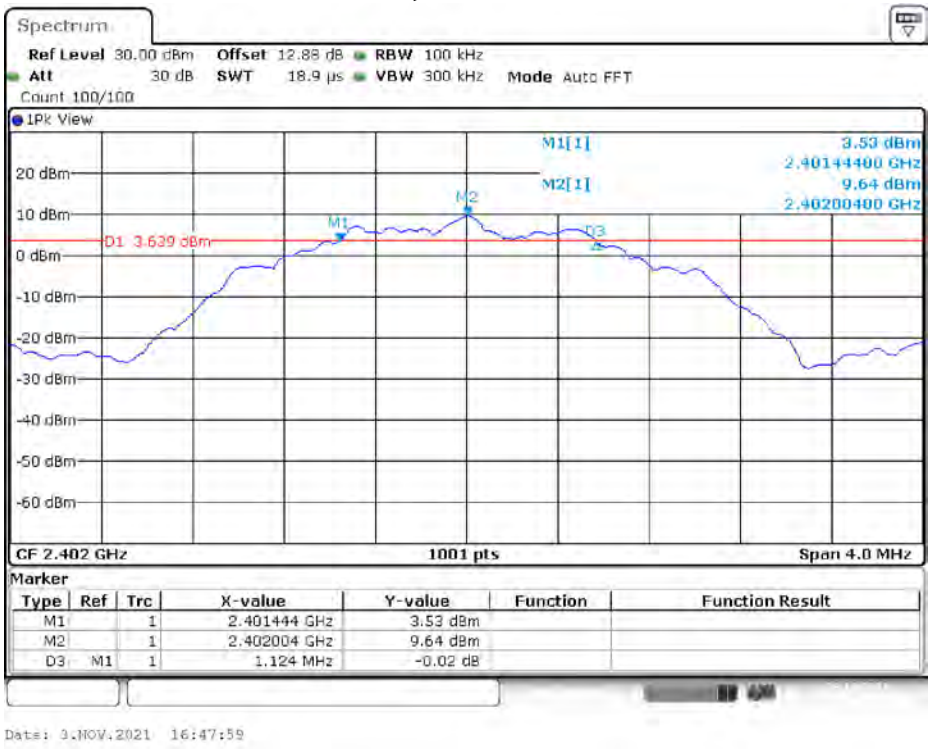
6dB Bandwidth, BLE 1M Middle Channel



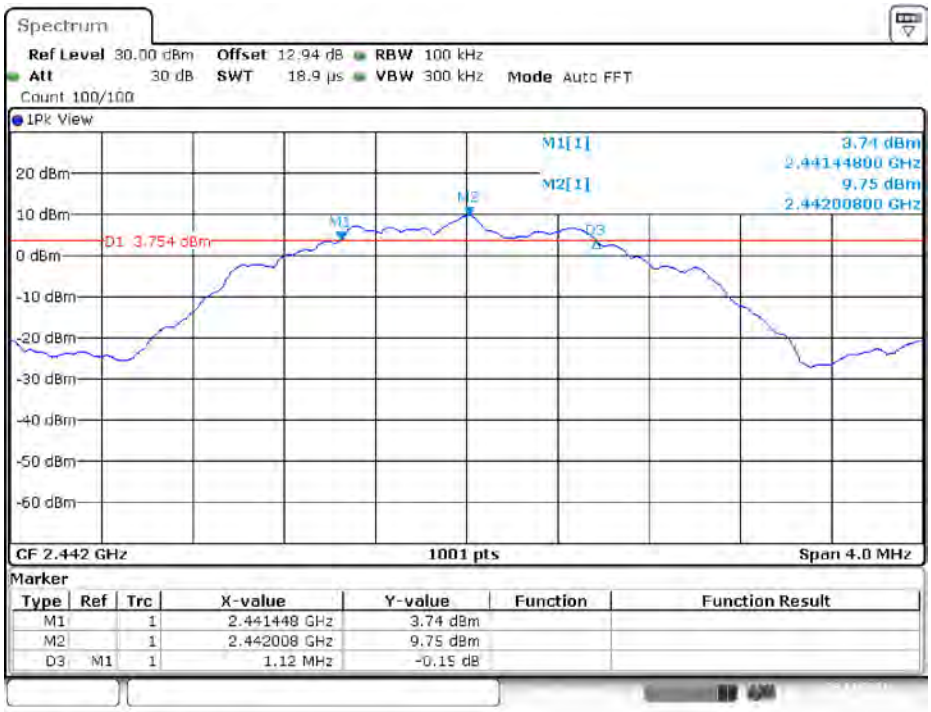
6dB Bandwidth, BLE 1M High Channel



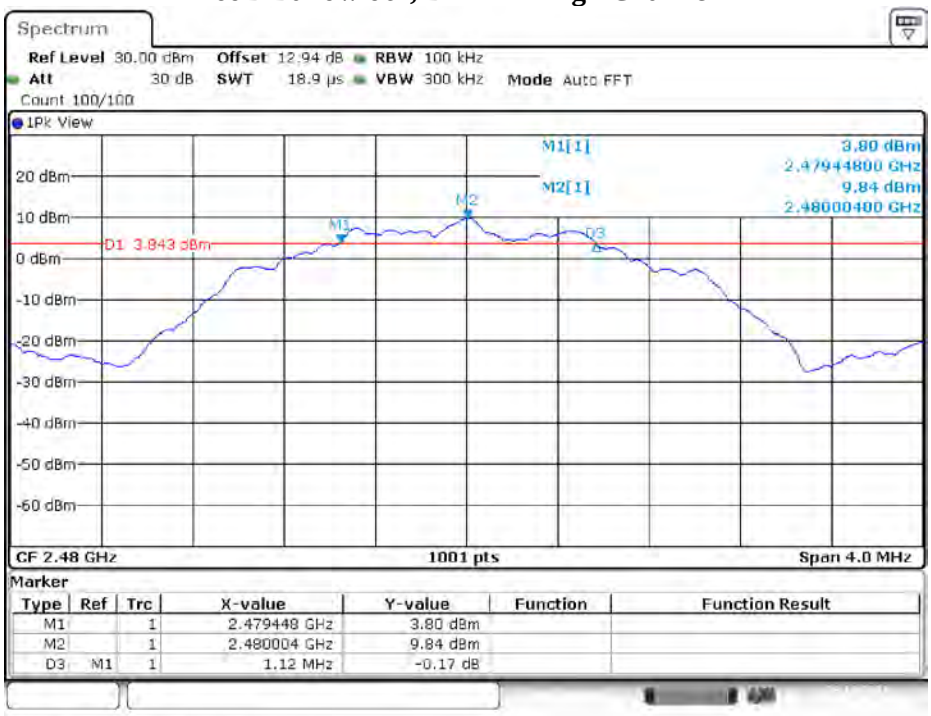
6dB Bandwidth, BLE 2M Low Channel



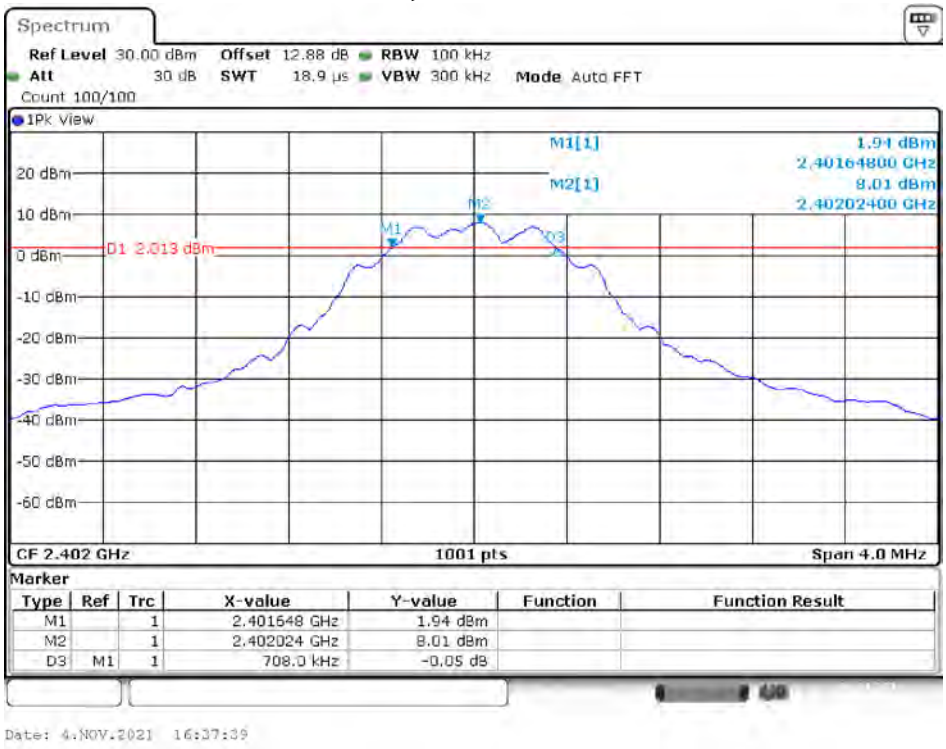
6dB Bandwidth, BLE 2M Middle Channel



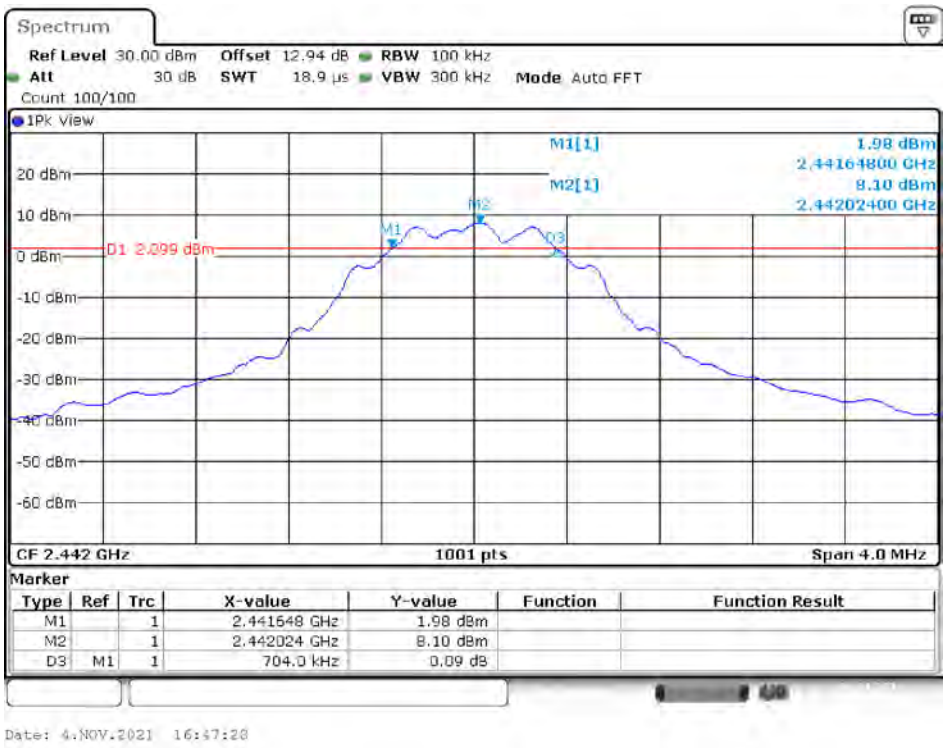
6dB Bandwidth, BLE 2M High Channel



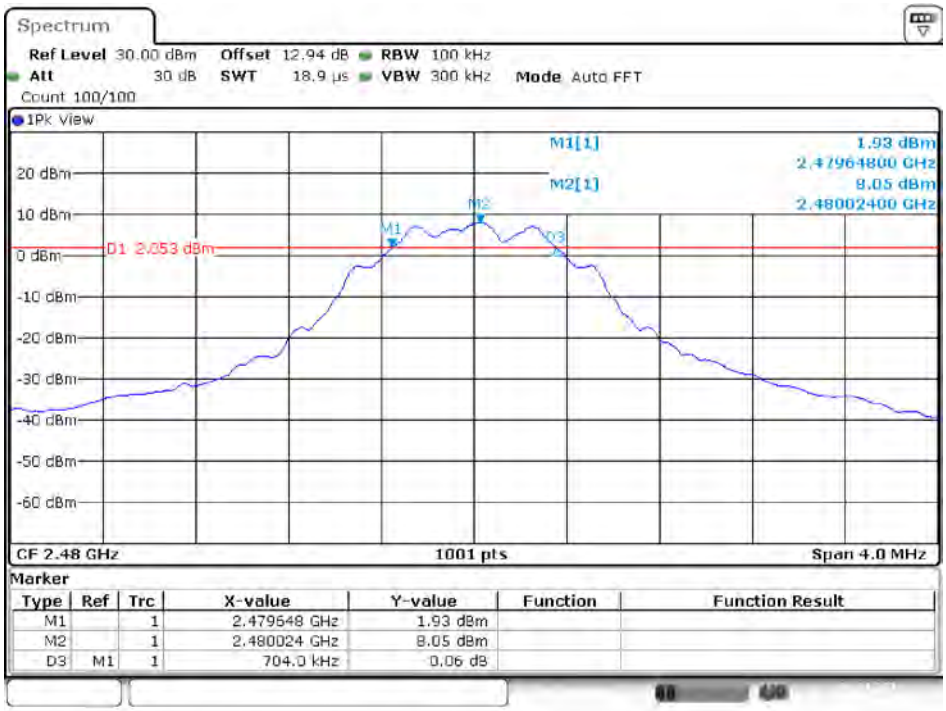
6dB Bandwidth, BLE 125k Low Channel



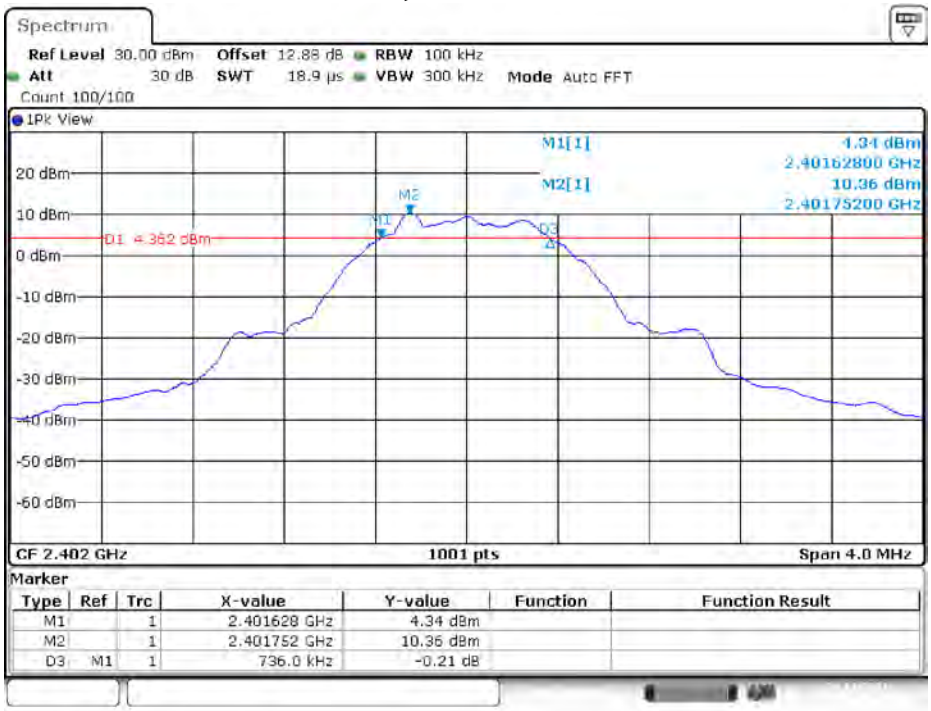
6dB Bandwidth, BLE 125k Middle Channel



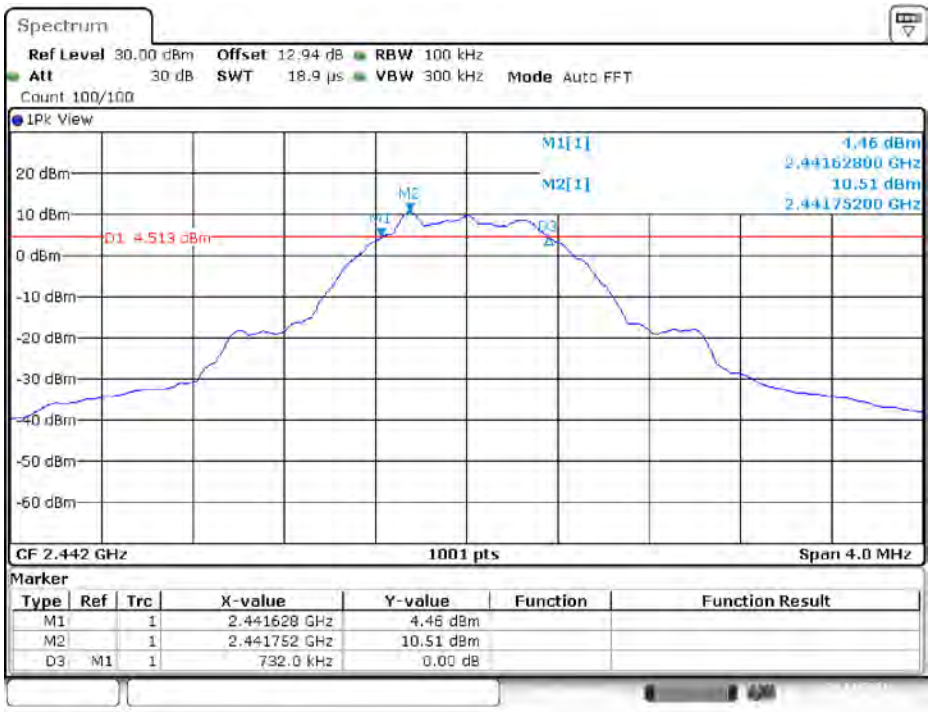
6dB Bandwidth, BLE 125k High Channel



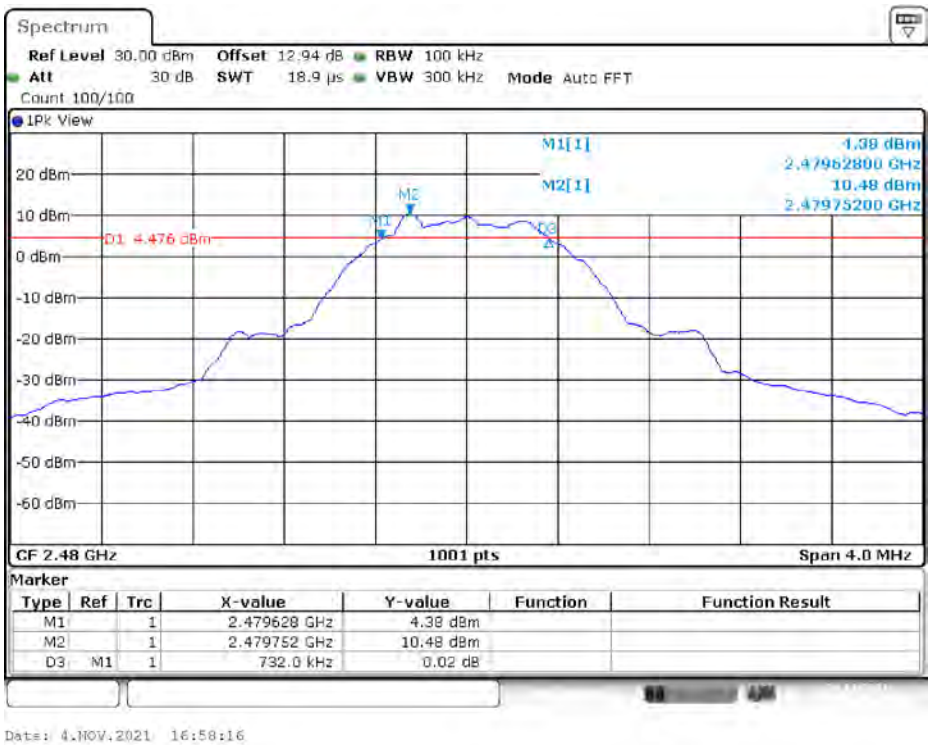
6dB Bandwidth, BLE 500k Low Channel



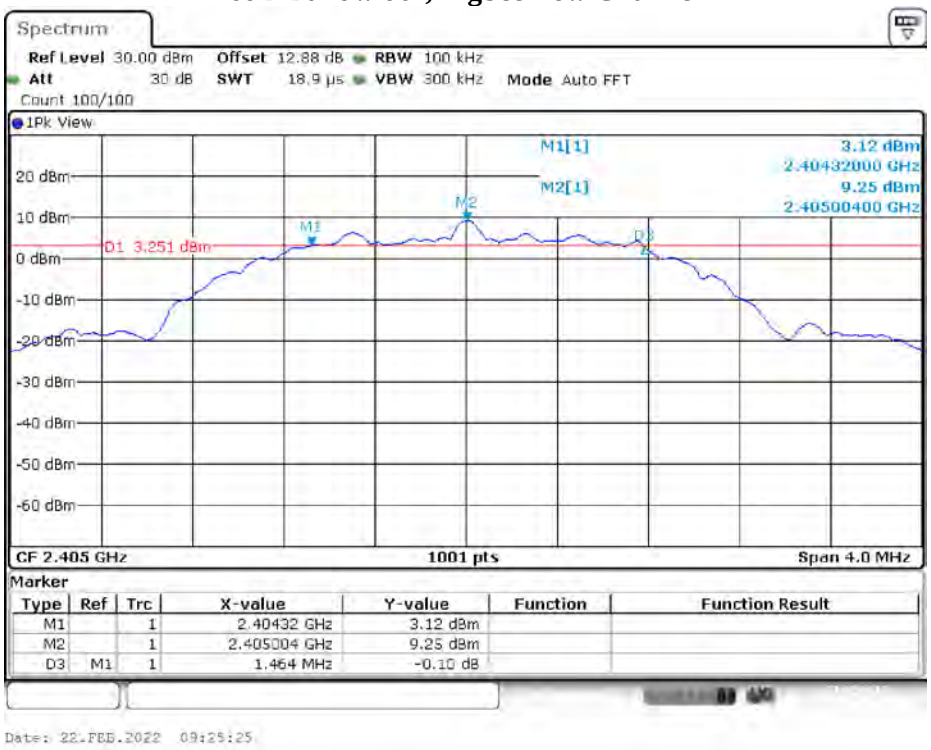
6dB Bandwidth, BLE 500k Middle Channel



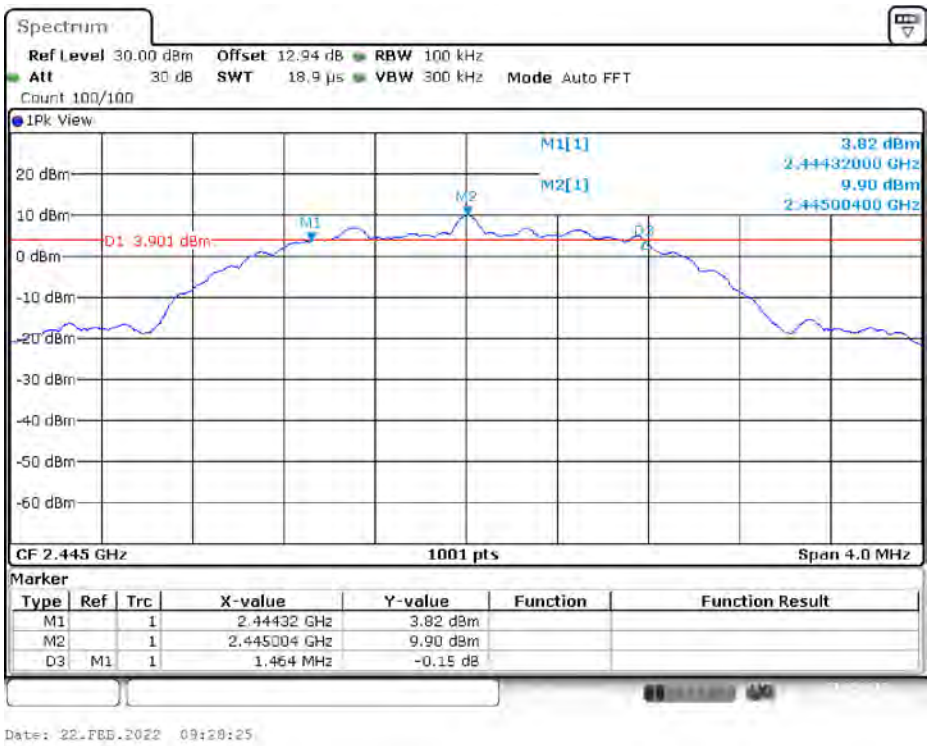
6dB Bandwidth, BLE 500k High Channel



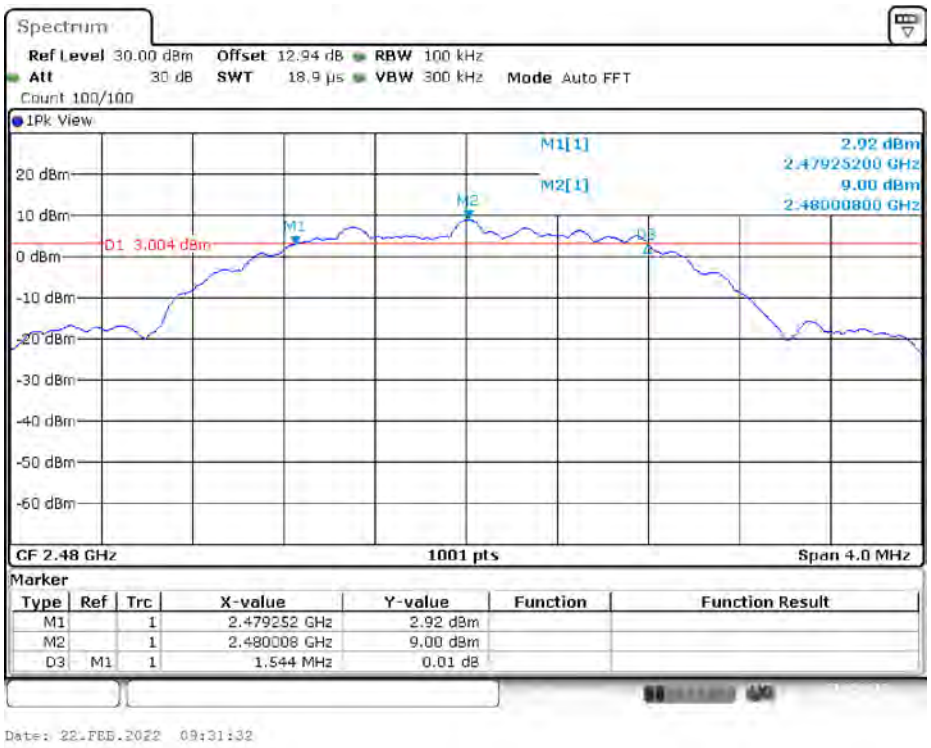
6dB Bandwidth, Zigbee Low Channel



6dB Bandwidth, Zigbee Middle Channel



6dB Bandwidth, Zigbee High Channel



Appendix B: Occupied Channel Bandwidth

Test Result

TestMode	Antenna	Channel	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	1.039	2401.489	2402.527	---	PASS
		2442	1.039	2441.489	2442.527	---	PASS
		2480	1.039	2479.489	2480.527	---	PASS
BLE_2M	Ant1	2402	2.082	2400.985	2403.067	---	PASS
		2442	2.09	2440.977	2443.067	---	PASS
		2480	2.09	2478.977	2481.067	---	PASS

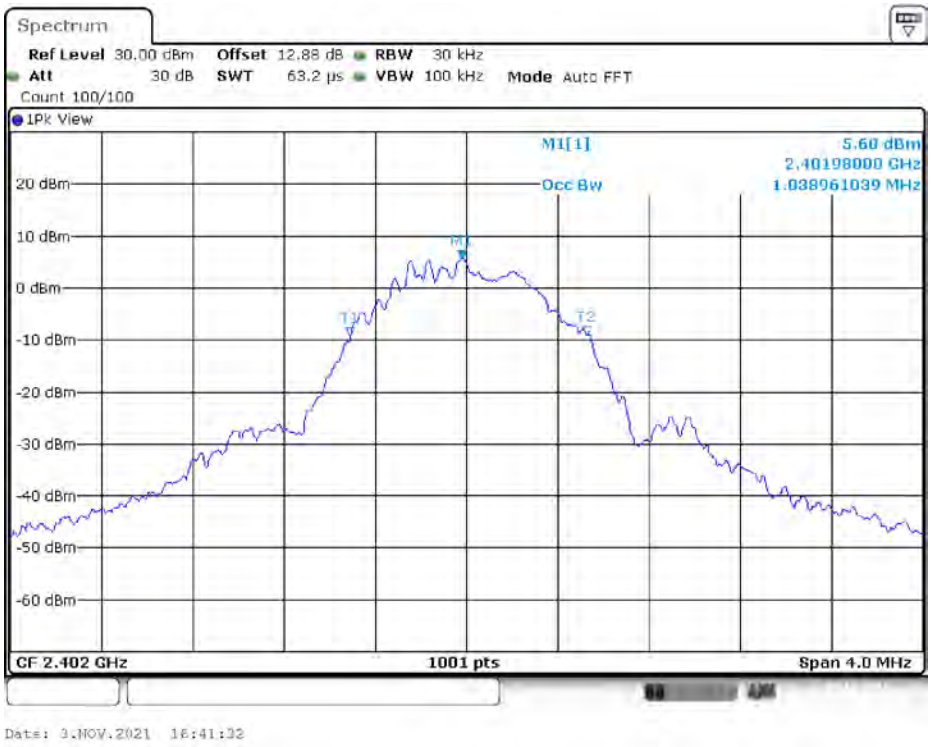
TestMode	Antenna	Channel	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE 125k	Ant1	2402	1.131	2401.489	2402.527	---	PASS
		2442	1.127	2441.489	2442.527	---	PASS
		2480	1.127	2479.489	2480.527	---	PASS

TestMode	Antenna	Channel	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE 500k	Ant1	2402	1.079	2401.465	2402.543	---	PASS
		2442	1.079	2441.465	2442.543	---	PASS
		2480	1.075	2479.465	2480.539	---	PASS

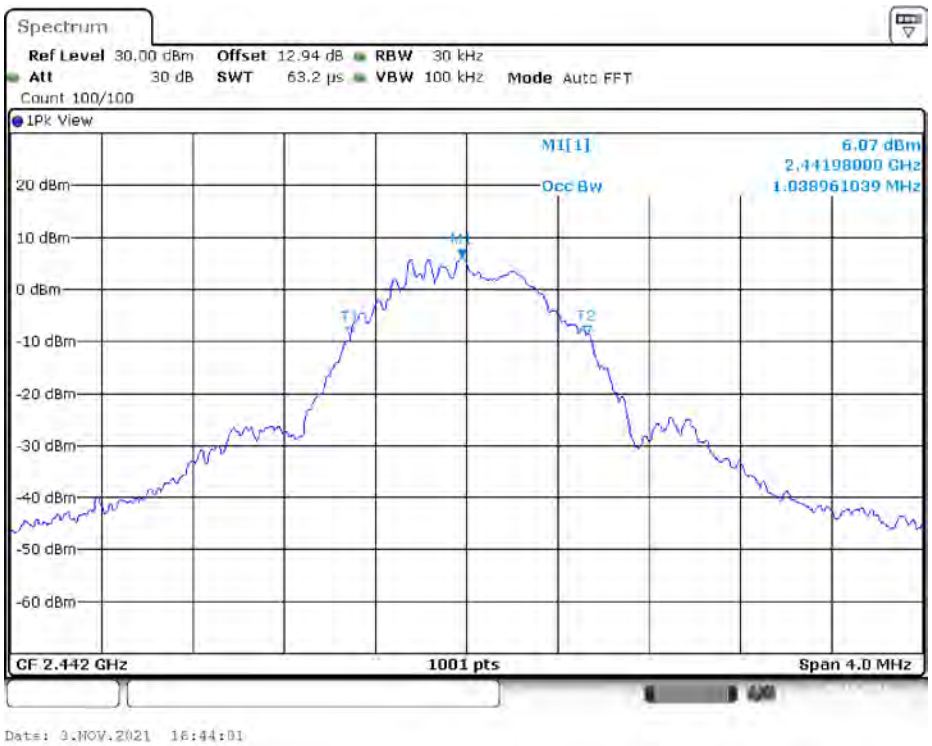
TestMode	Antenna	Channel	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
Zigbee	Ant1	2405	2.262	2403.861	2406.123	---	PASS
		2445	2.270	2443.853	2446.123	---	PASS
		2480	2.262	2478.857	2481.119	---	PASS

Test Graphs

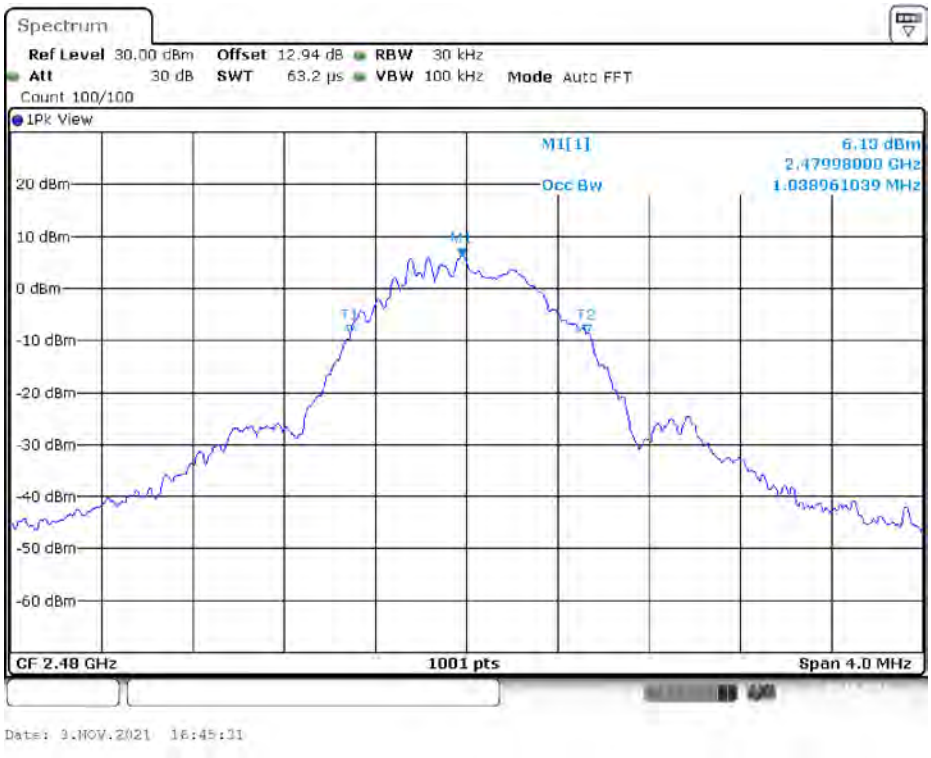
99% Bandwidth, BLE 1M Low Channel



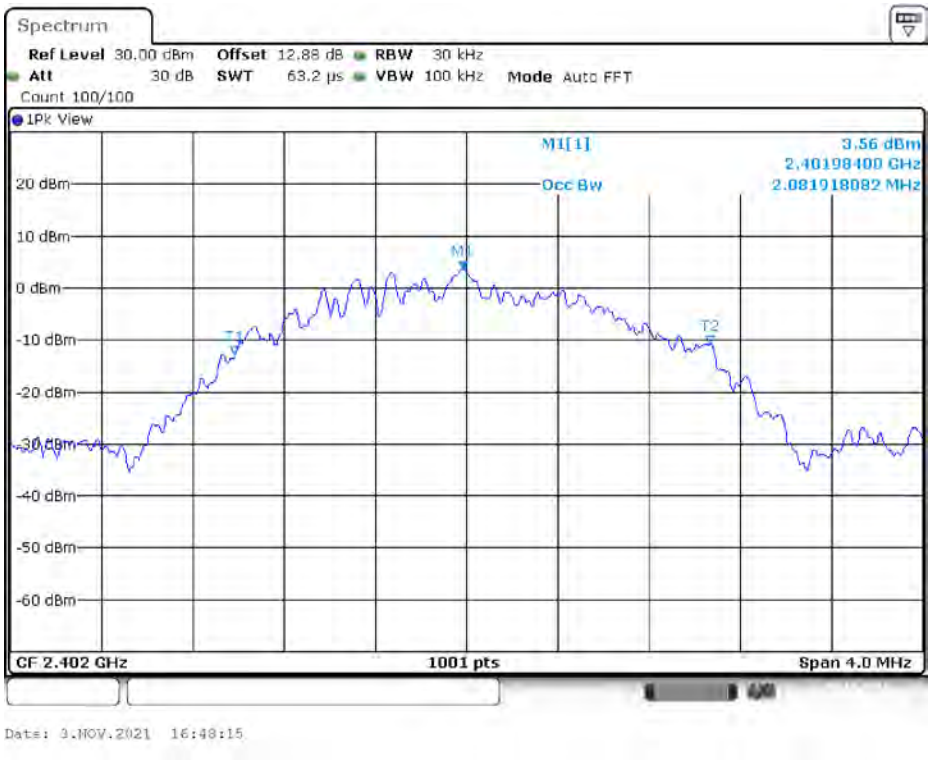
99% Bandwidth, BLE 1M Middle Channel



99% Bandwidth, BLE 1M High Channel

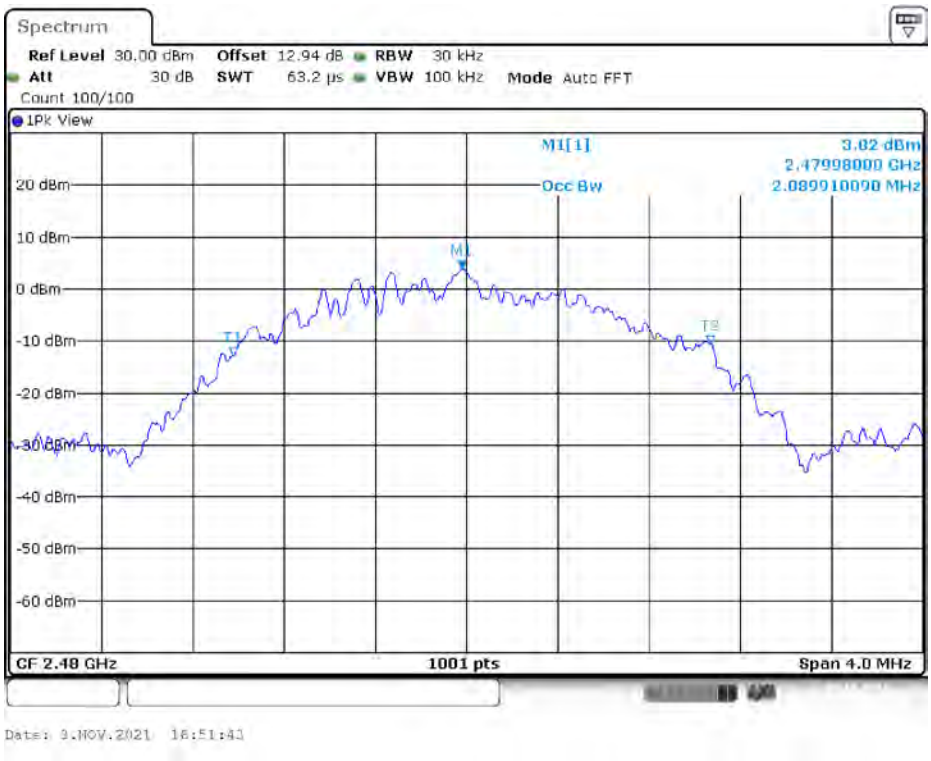


99% Bandwidth, BLE 2M Low Channel

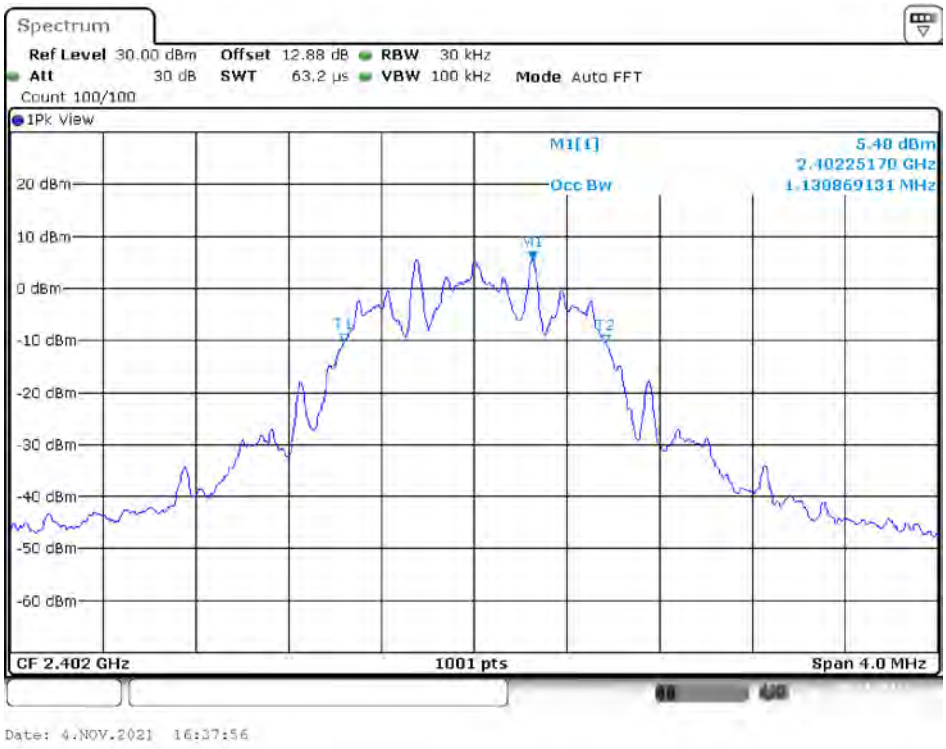


99% Bandwidth, BLE 2M Middle Channel

99% Bandwidth, BLE 2M High Channel

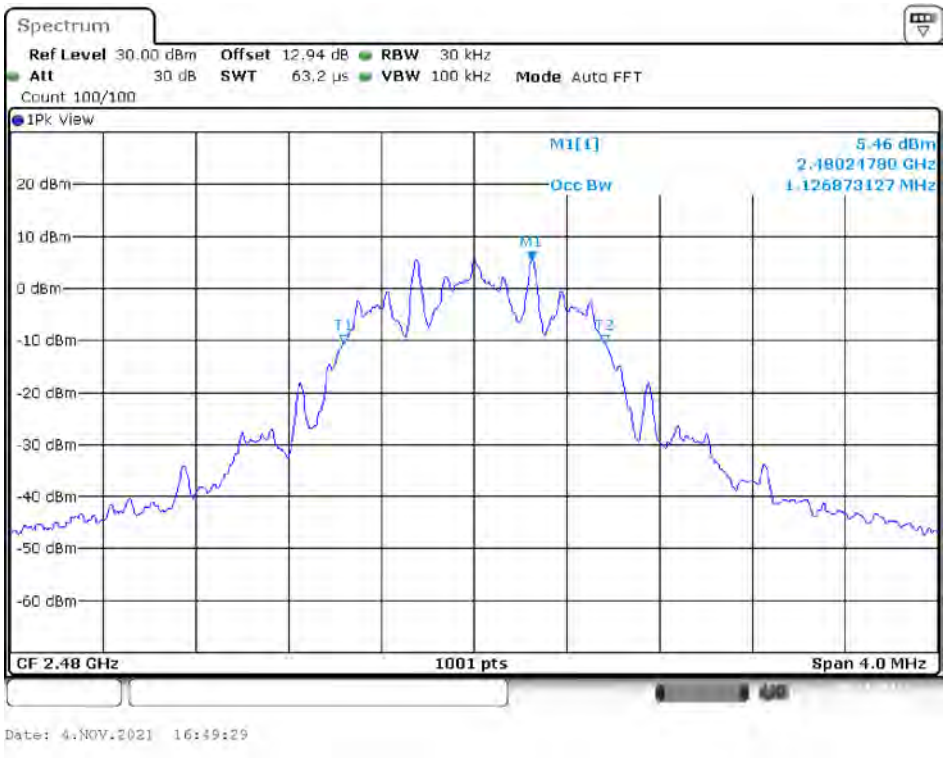


99% Bandwidth, BLE 125k Low Channel



99% Bandwidth, BLE 125k Middle Channel

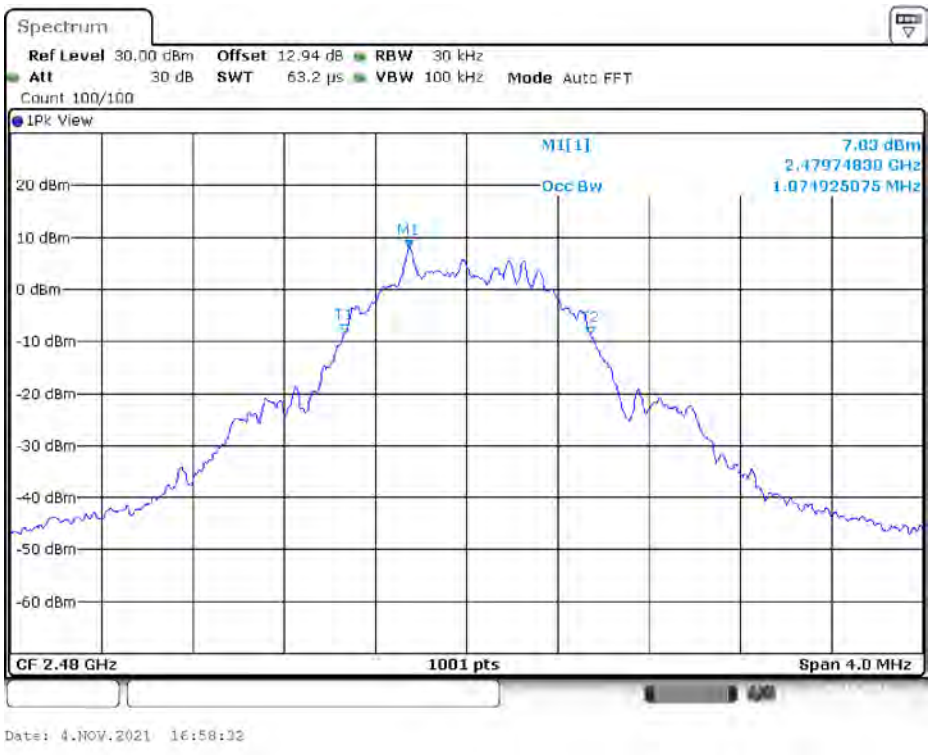
99% Bandwidth, BLE 125k High Channel



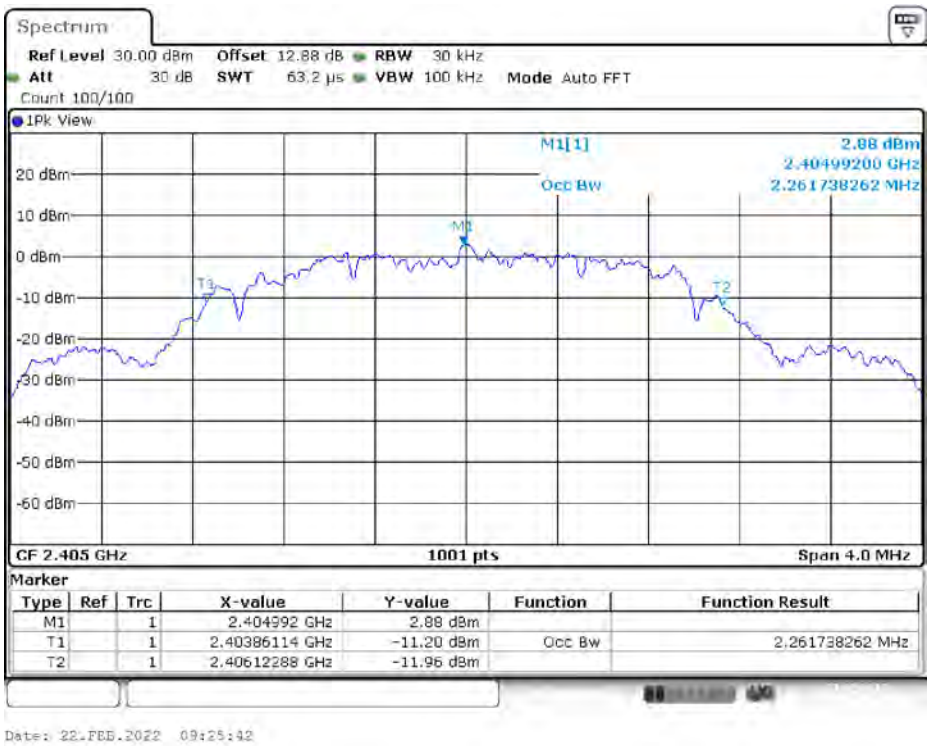
99% Bandwidth, BLE 500k Low Channel

99% Bandwidth, BLE 500k Middle Channel

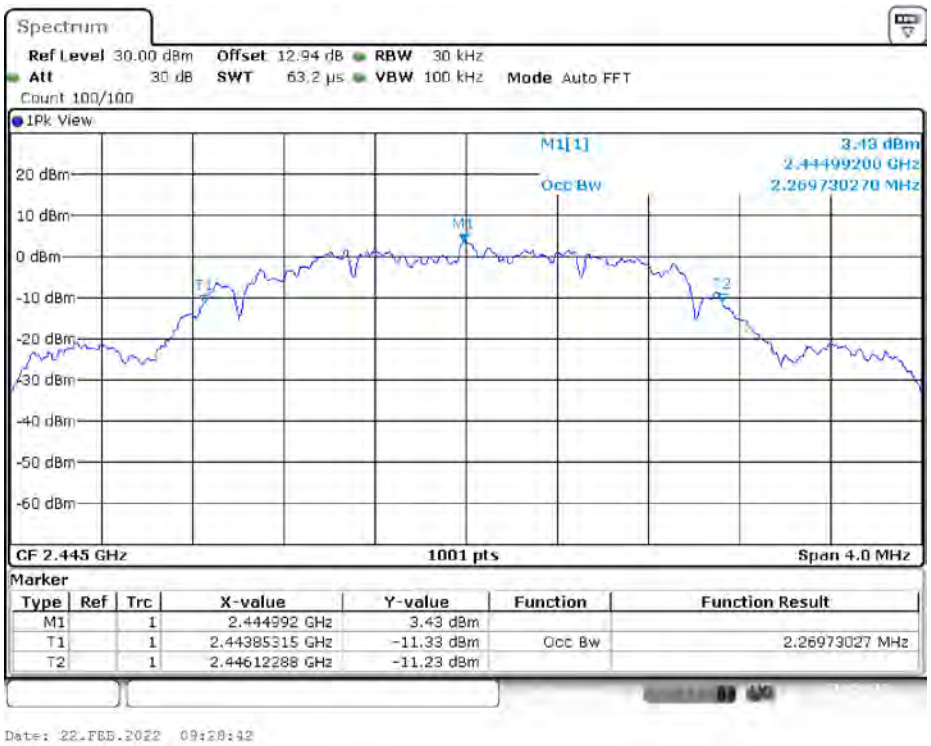
99% Bandwidth, BLE 500k High Channel



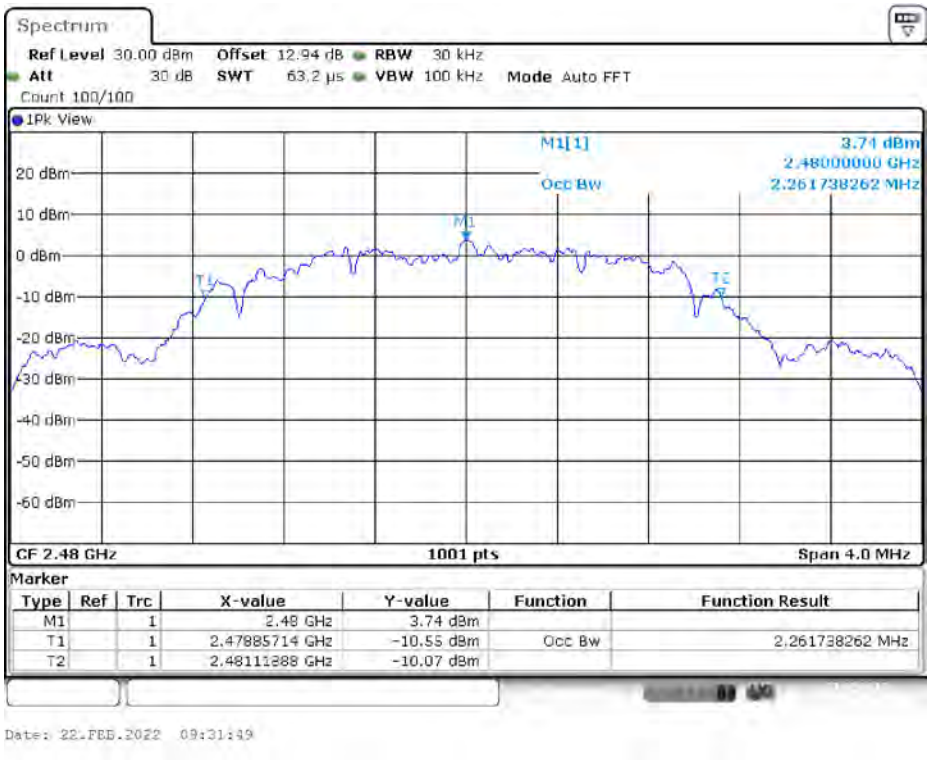
99% Bandwidth, Zigbee Low Channel



99% Bandwidth, Zigbee Middle Channel



99% Bandwidth, Zigbee High Channel



Appendix C: Maximum conducted Peak output power

Test Result

TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	10.34	<=30	PASS
		2442	10.63	<=30	PASS
		2480	10.68	<=30	PASS
BLE_2M	Ant1	2402	10.34	<=30	PASS
		2442	10.62	<=30	PASS
		2480	10.67	<=30	PASS

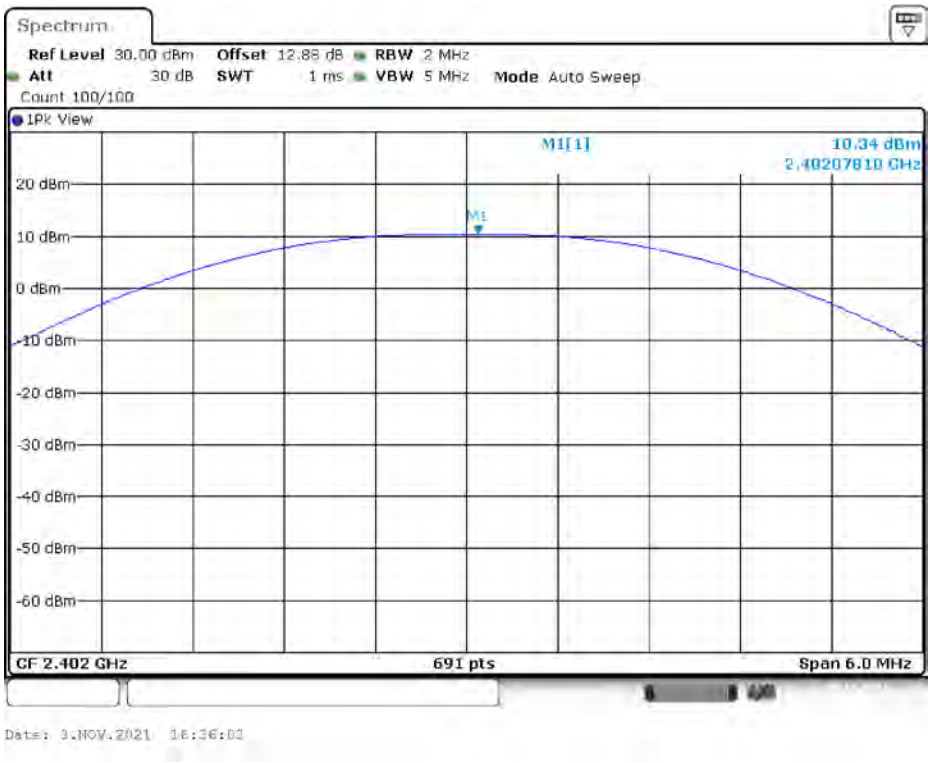
TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
BLE 125k	Ant1	2402	10.46	<=30	PASS
		2442	10.52	<=30	PASS
		2480	10.48	<=30	PASS

TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
BLE 500k	Ant1	2402	10.51	<=30	PASS
		2442	10.66	<=30	PASS
		2480	10.62	<=30	PASS

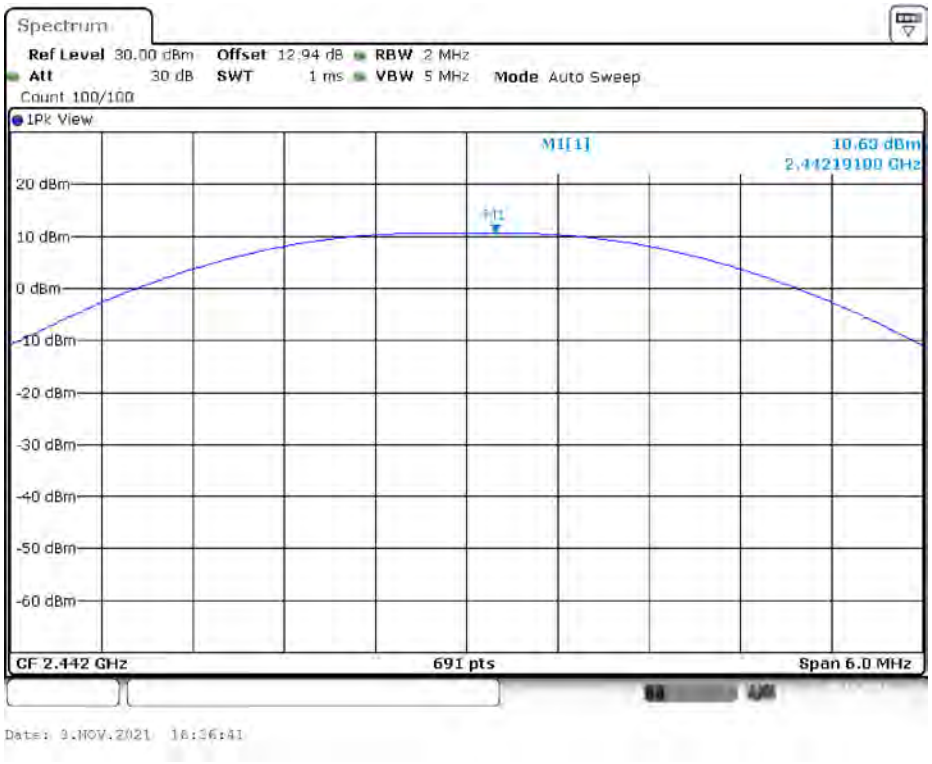
TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
Zigbee	Ant1	2405	10.09	<=30	PASS
		2445	10.69	<=30	PASS
		2480	10.99	<=30	PASS

Test Graphs

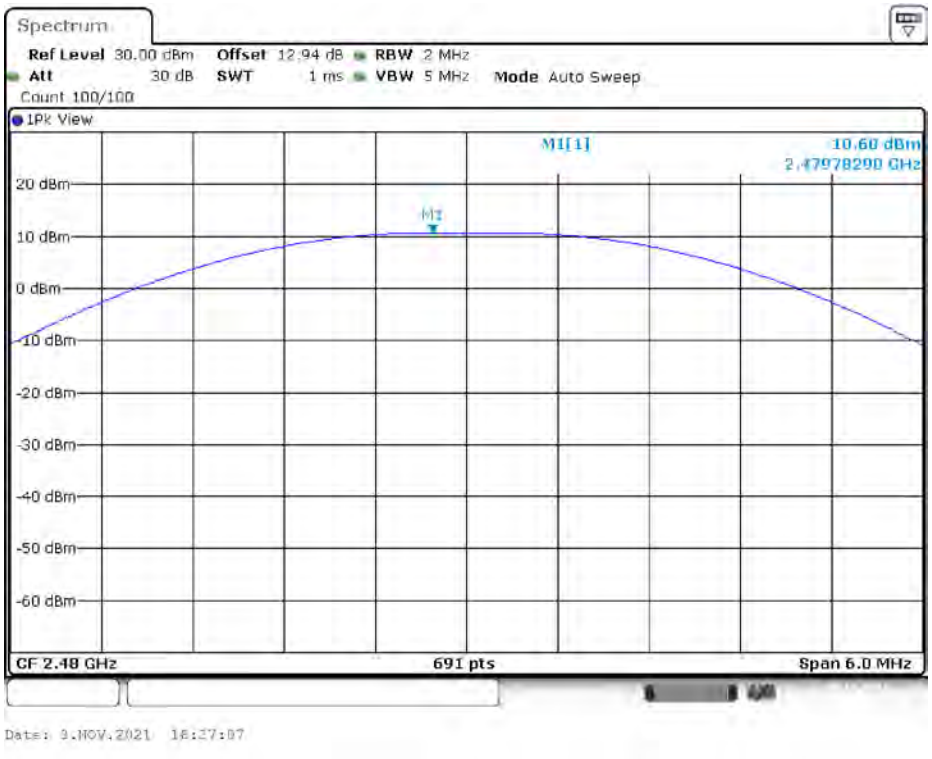
BLE 1M Low Channel



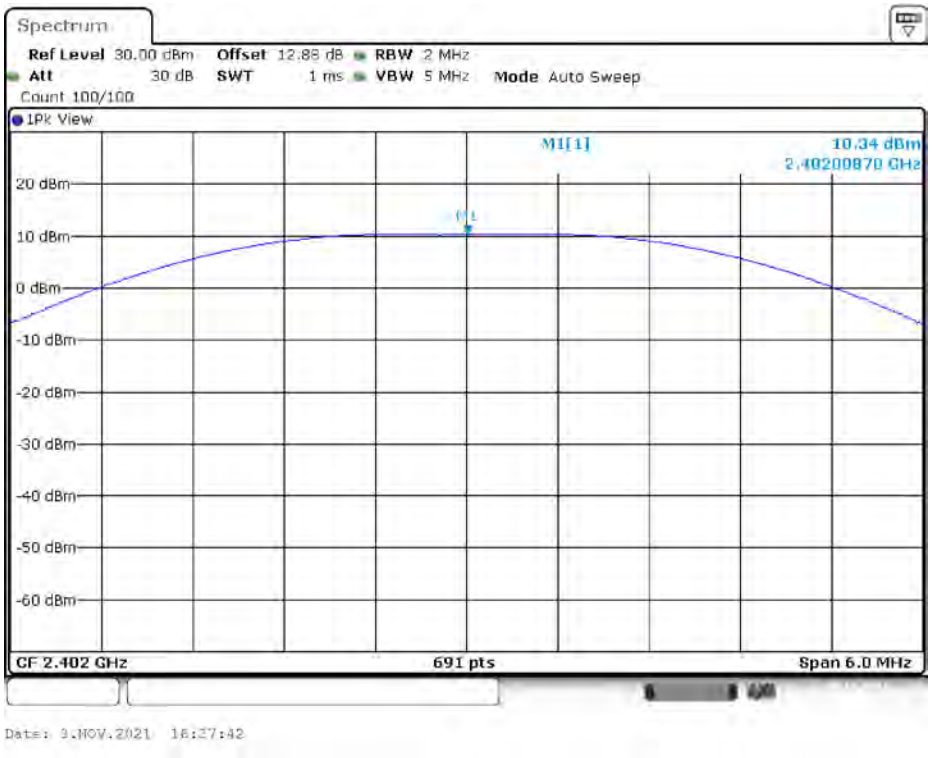
BLE 1M Middle Channel



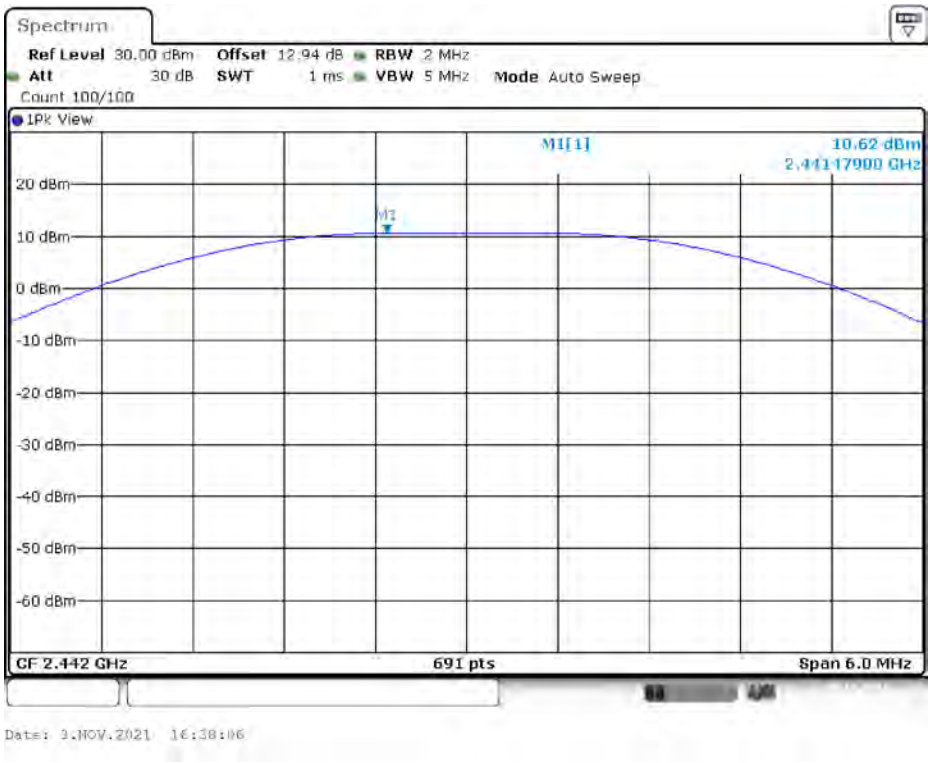
BLE 1M High Channel



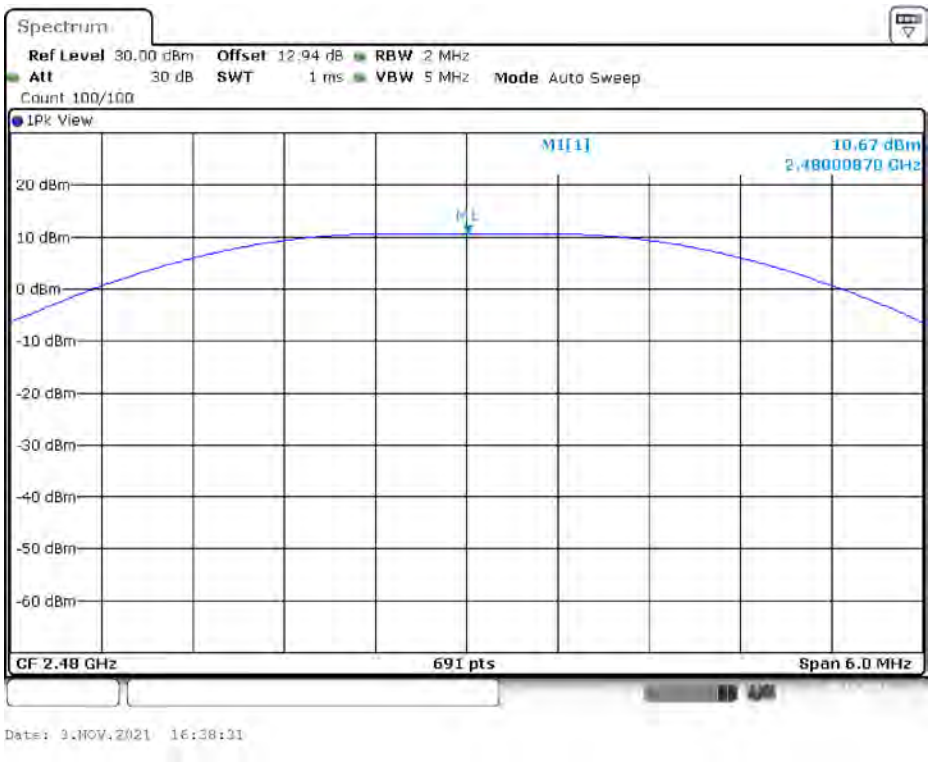
BLE 2M Low Channel



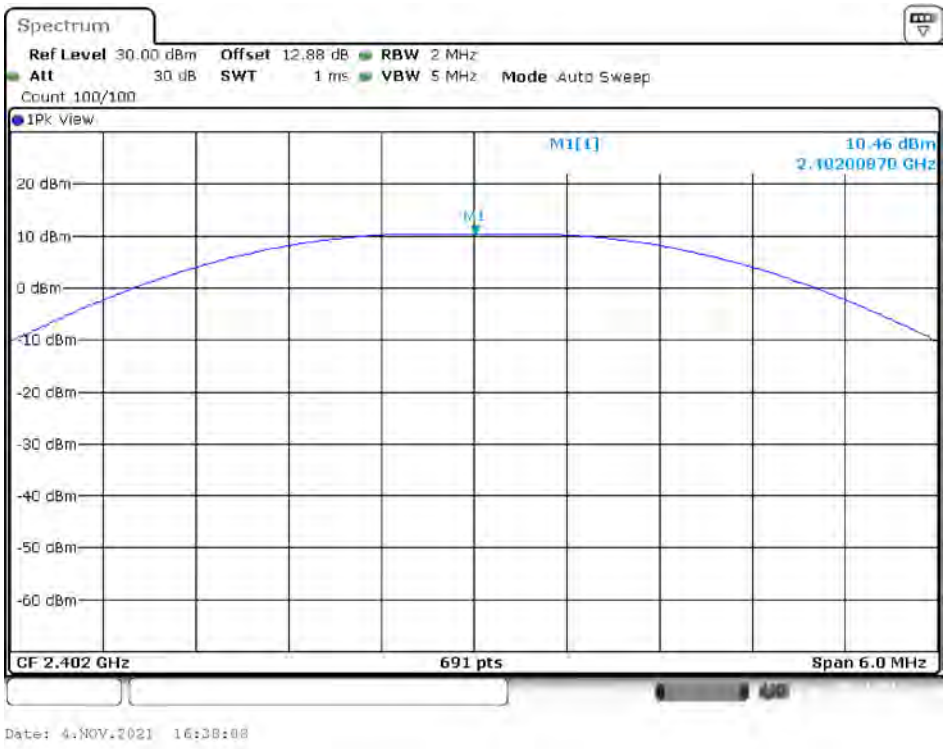
BLE 2M Middle Channel



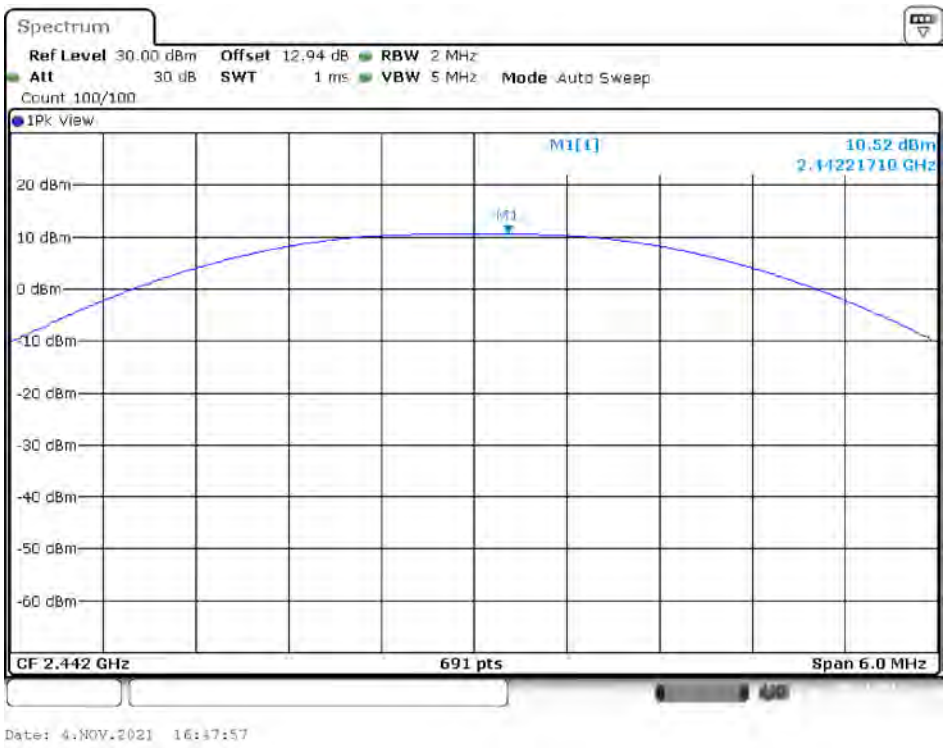
BLE 2M High Channel



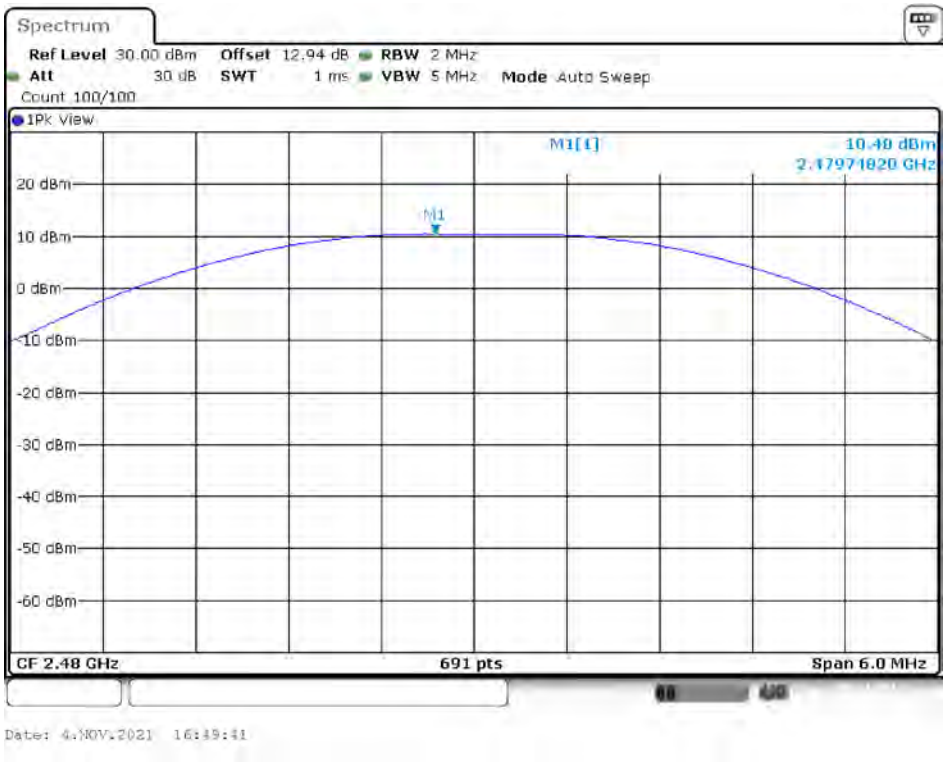
BLE 125k Low Channel



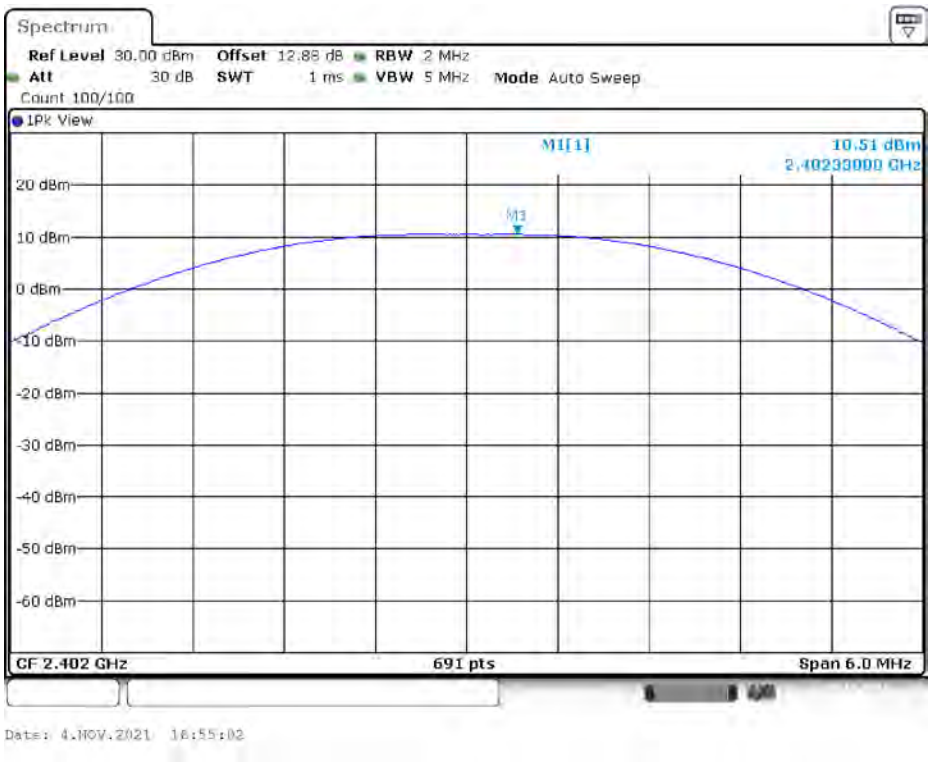
BLE 125k Middle Channel



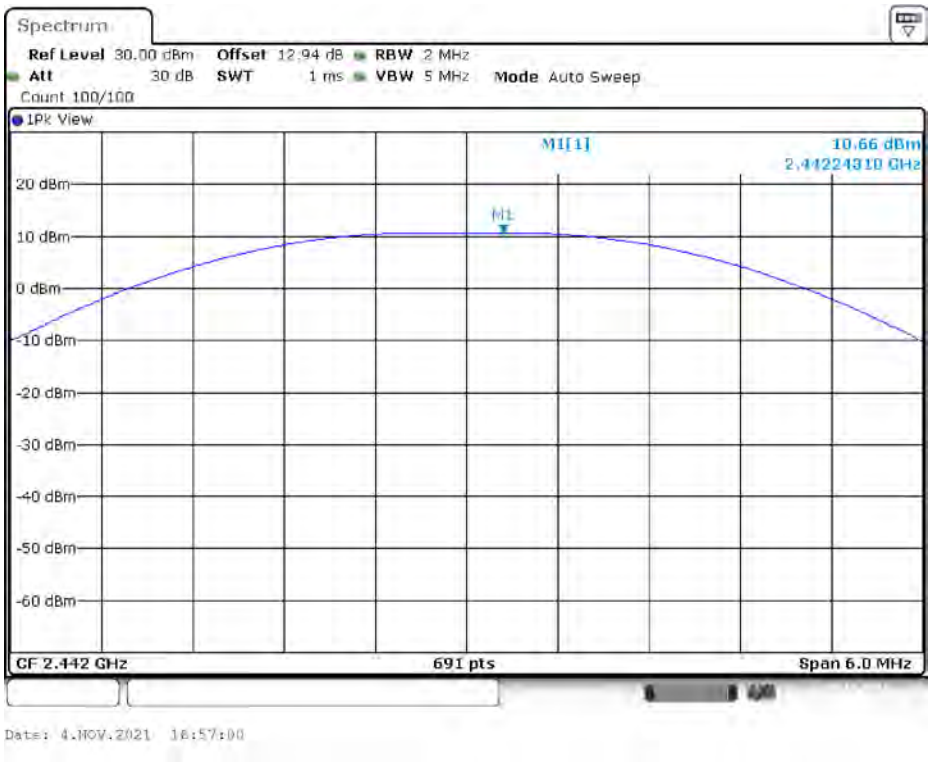
BLE 125k High Channel



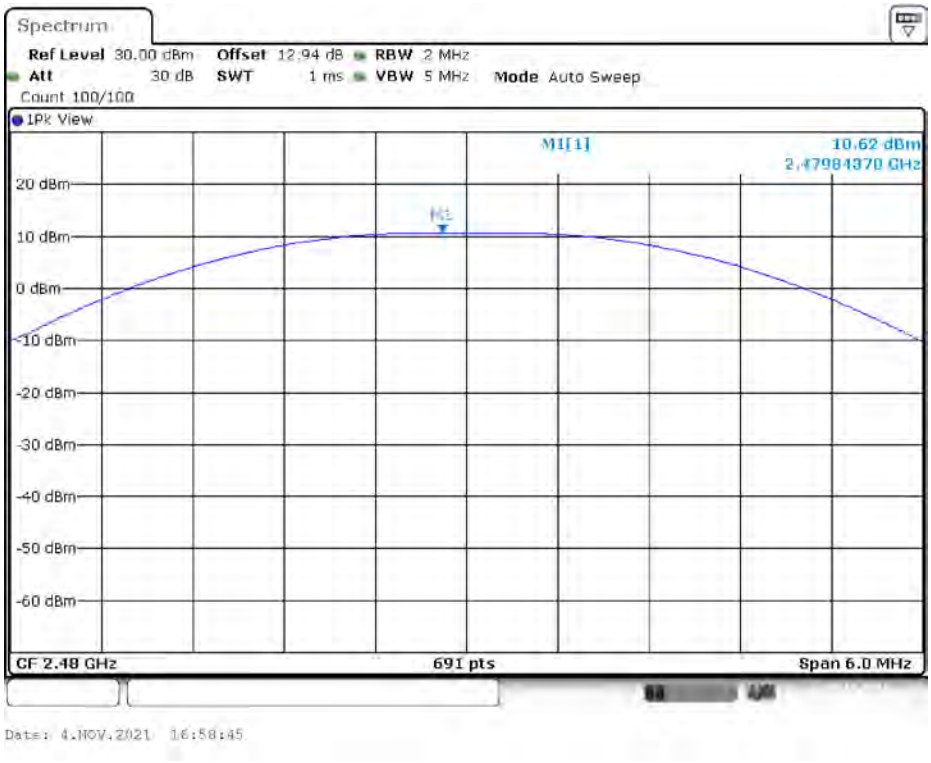
BLE 500k Low Channel



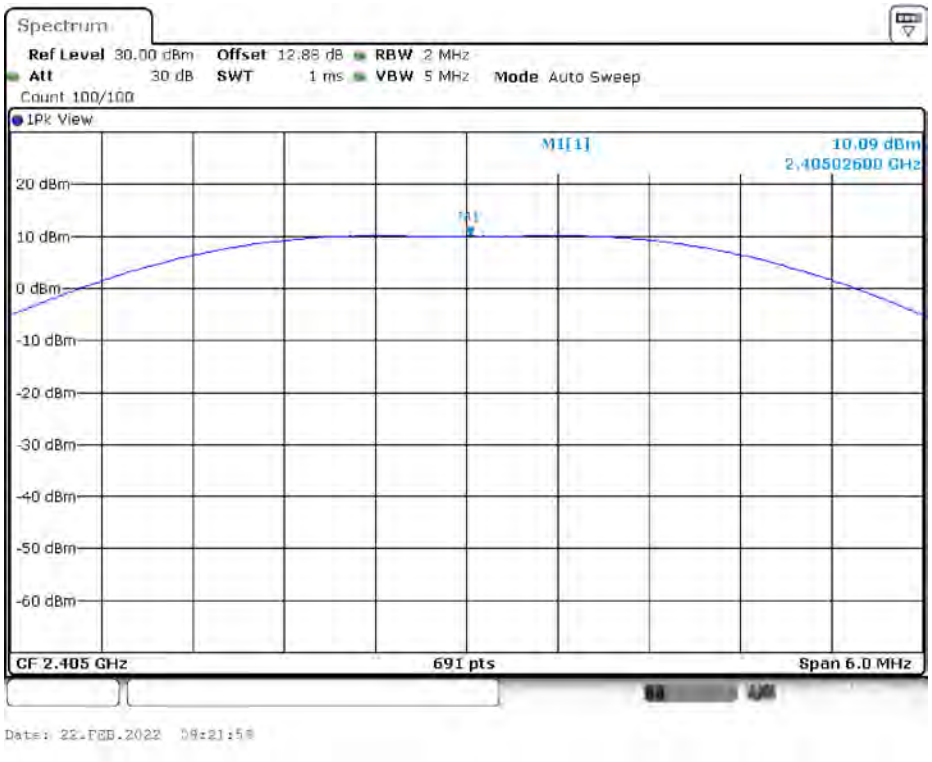
BLE 500k Middle Channel



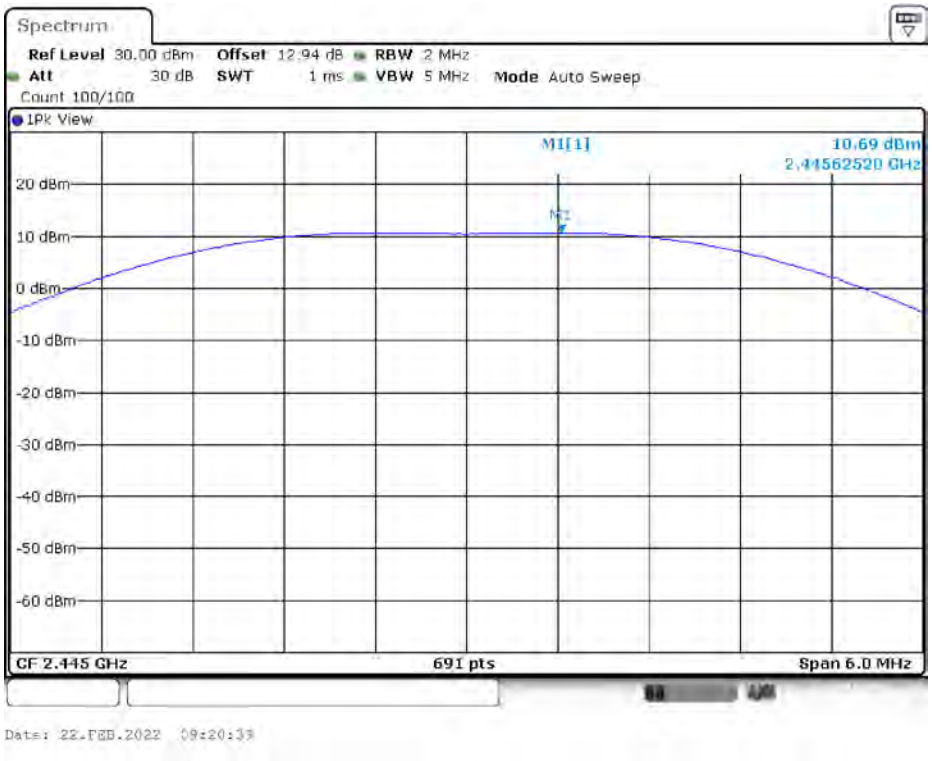
BLE 500k High Channel



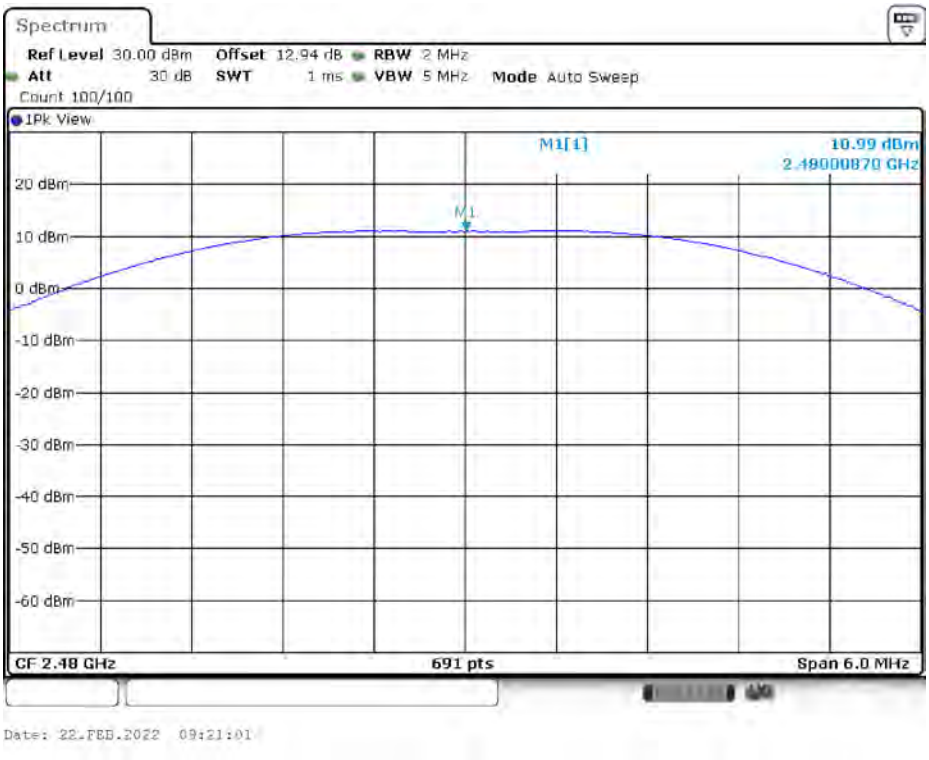
Zigbee Low Channel



Zigbee Middle Channel



Zigbee High Channel



Appendix D: Power spectral density

Test Result

TestMode	Antenna	Channel	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-5.03	<=8	PASS
		2442	-4.68	<=8	PASS
		2480	-4.61	<=8	PASS
BLE_2M	Ant1	2402	-6.06	<=8	PASS
		2442	-5.9	<=8	PASS
		2480	-5.85	<=8	PASS

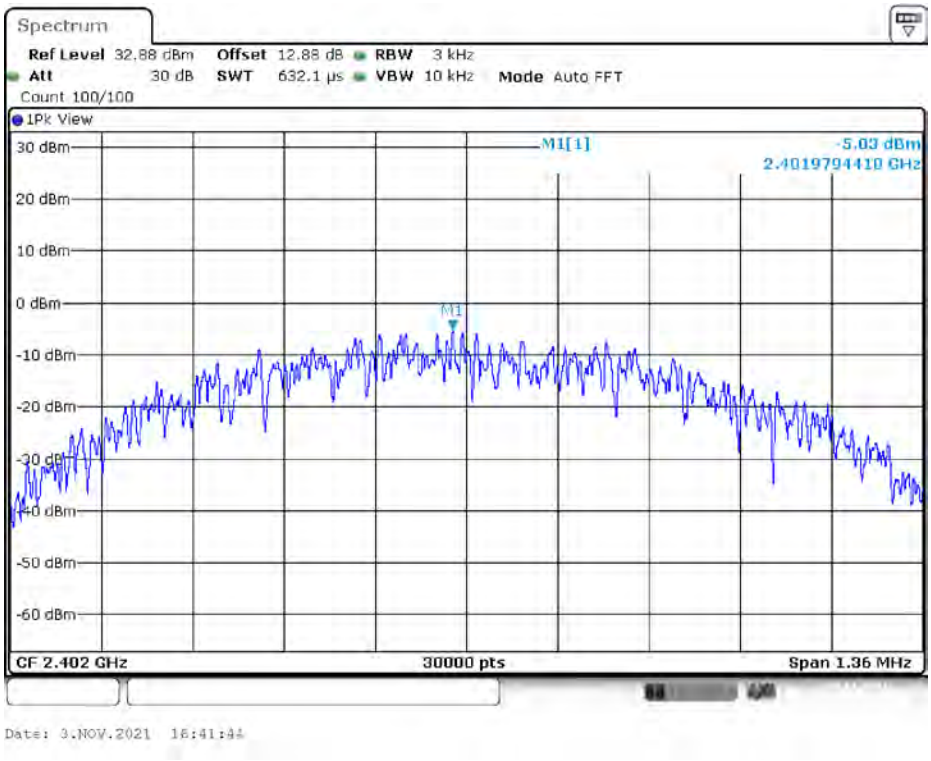
TestMode	Antenna	Channel	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE 125k	Ant1	2402	4.84	<=8	PASS
		2442	4.89	<=8	PASS
		2480	4.82	<=8	PASS

TestMode	Antenna	Channel	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE 500k	Ant1	2402	4.66	<=8	PASS
		2442	4.81	<=8	PASS
		2480	4.75	<=8	PASS

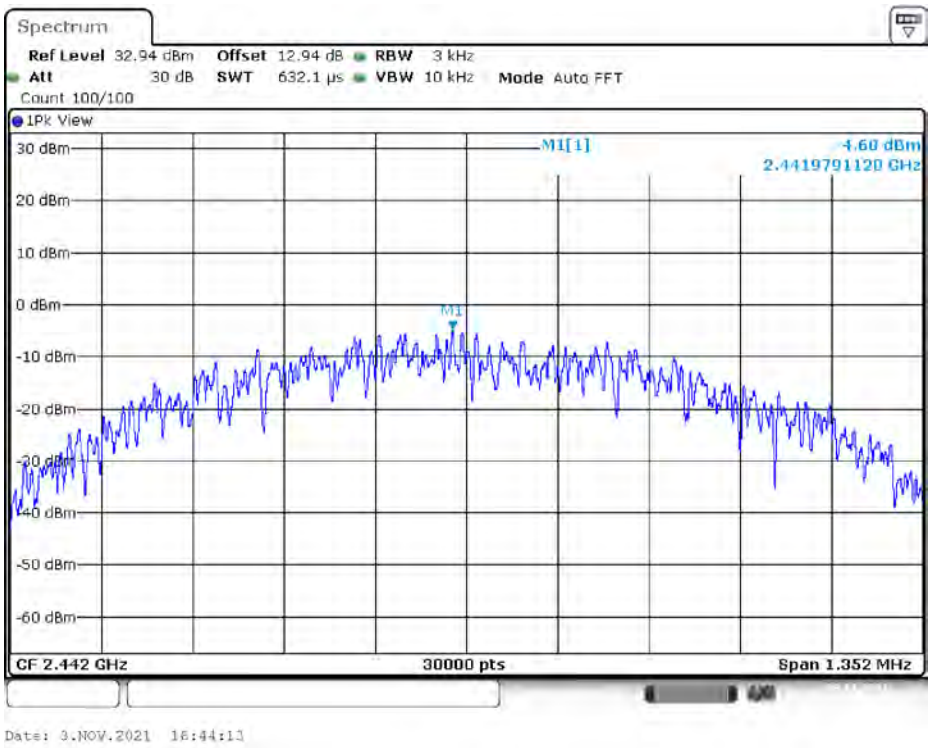
TestMode	Antenna	Channel	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
Zigbee	Ant1	2405	-2.99	<=8	PASS
		2445	-2.47	<=8	PASS
		2480	-1.96	<=8	PASS

Test Graphs

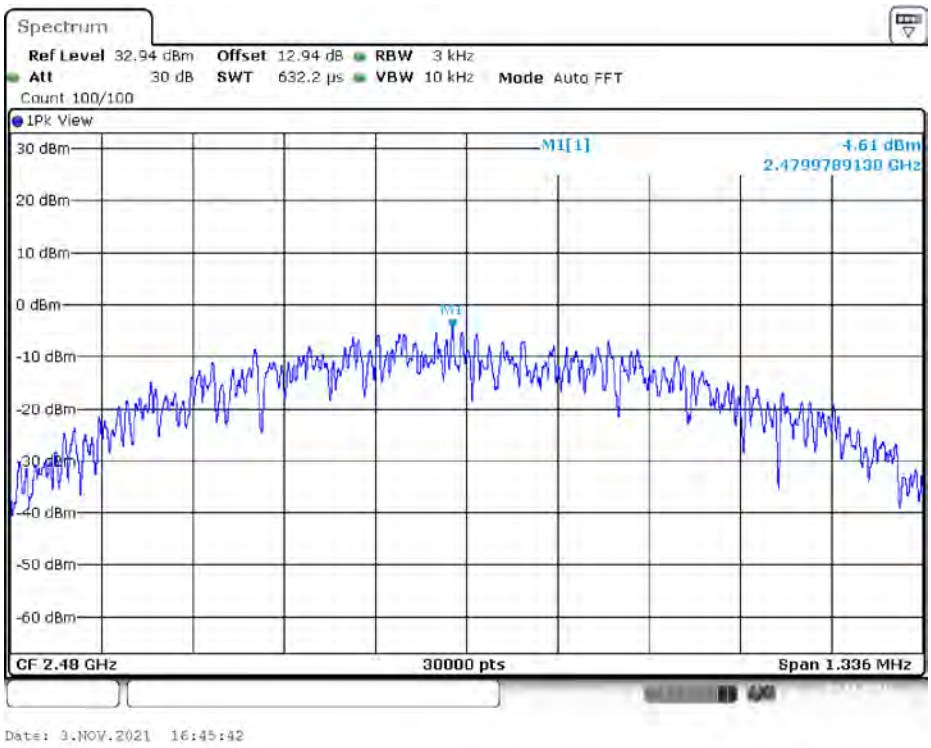
Power Spectral Density, BLE 1M Low Channel



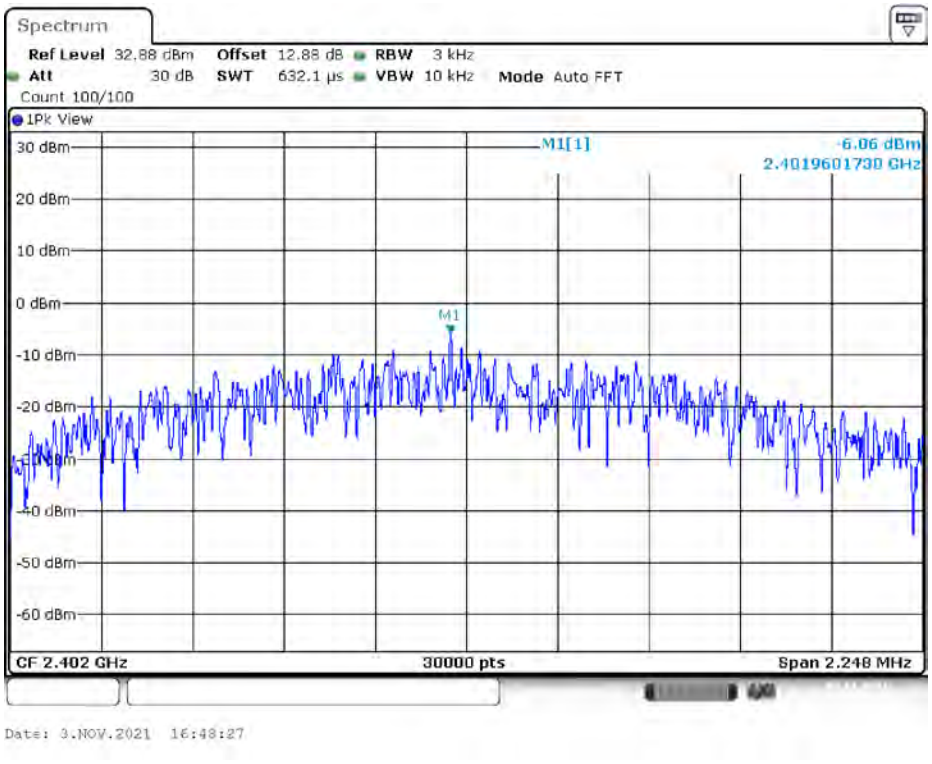
Power Spectral Density, BLE 1M Middle Channel



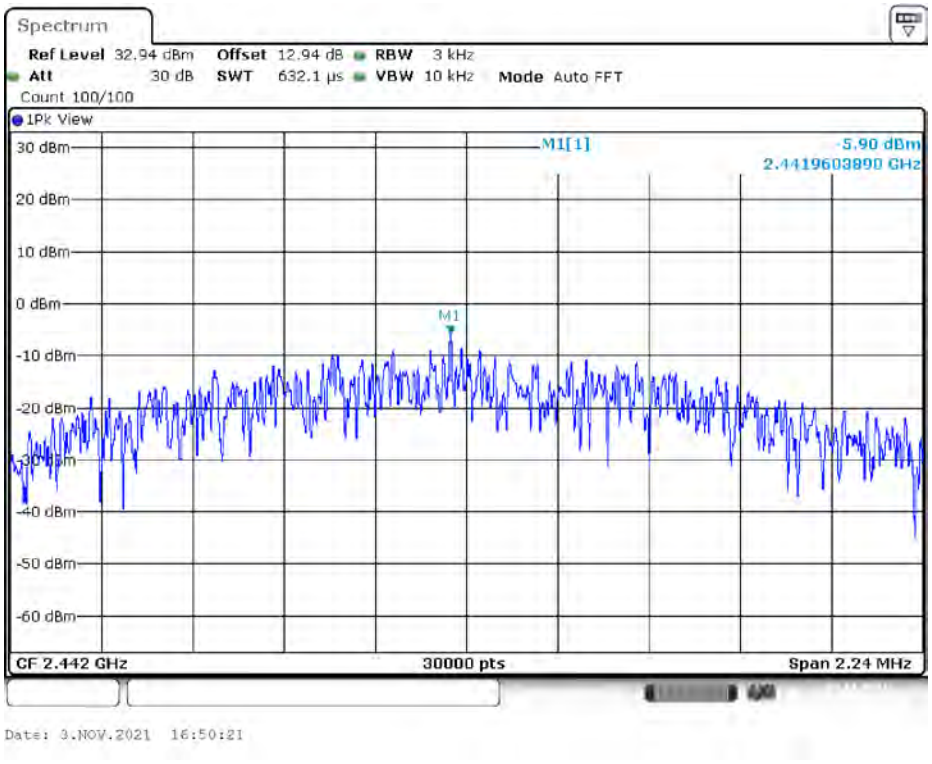
Power Spectral Density, BLE 1M High Channel



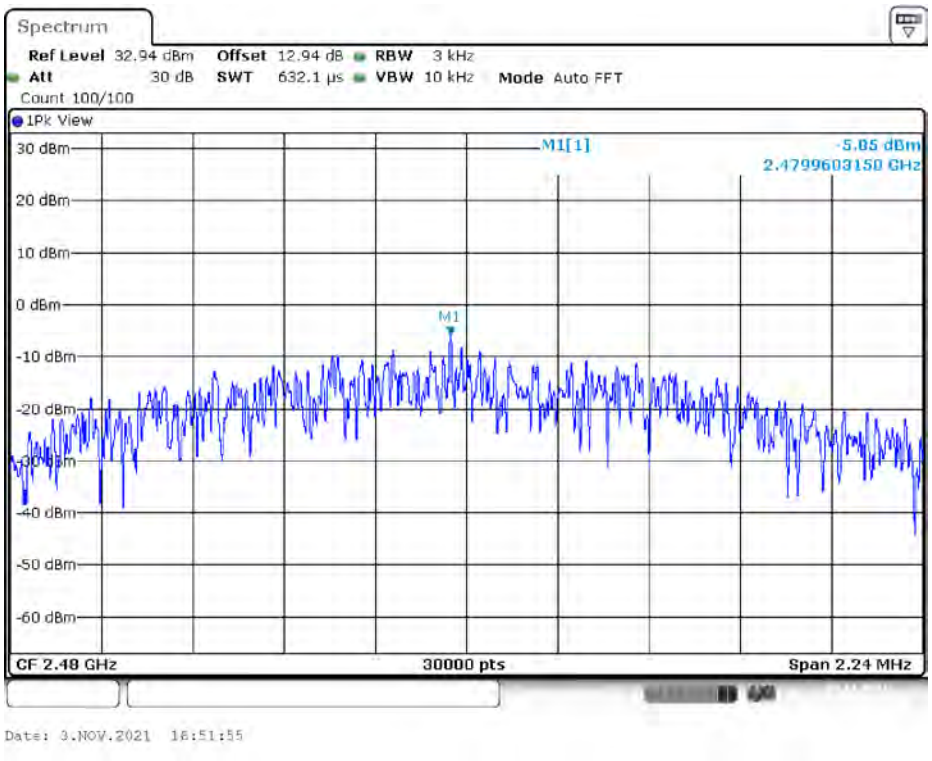
Power Spectral Density, BLE 2M Low Channel



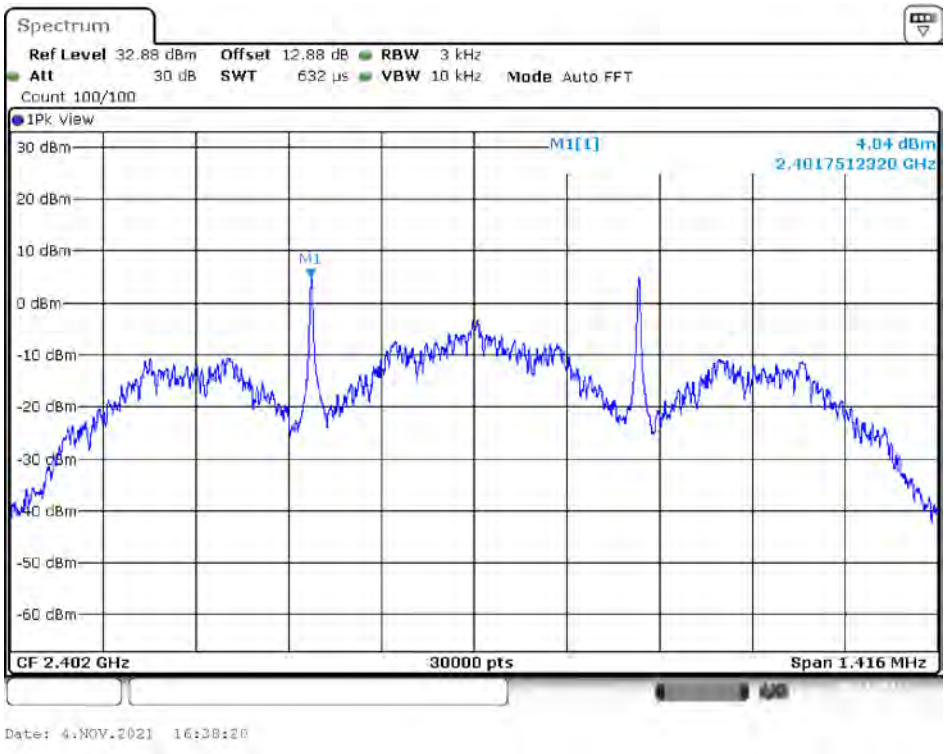
Power Spectral Density, BLE 2M Middle Channel



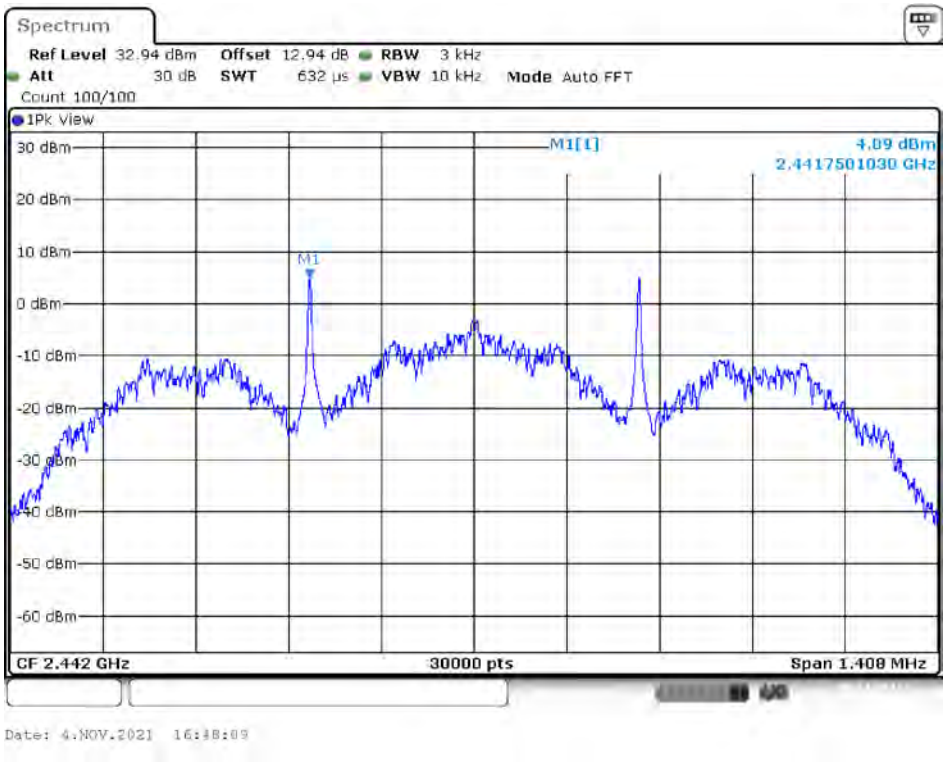
Power Spectral Density, BLE 2M High Channel



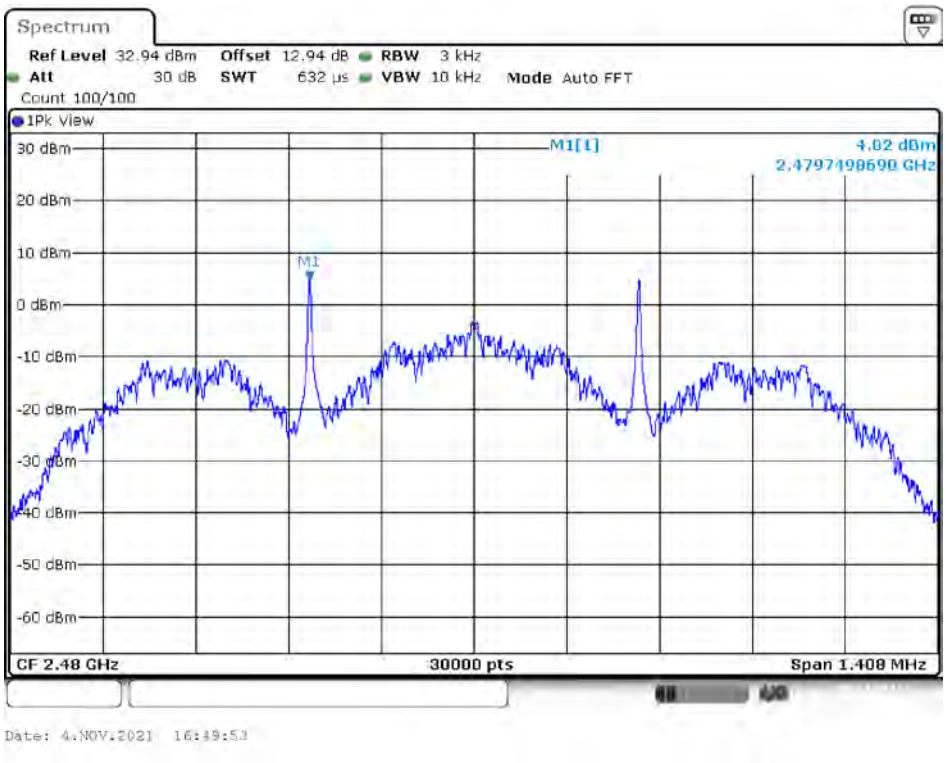
Power Spectral Density, BLE 125k Low Channel



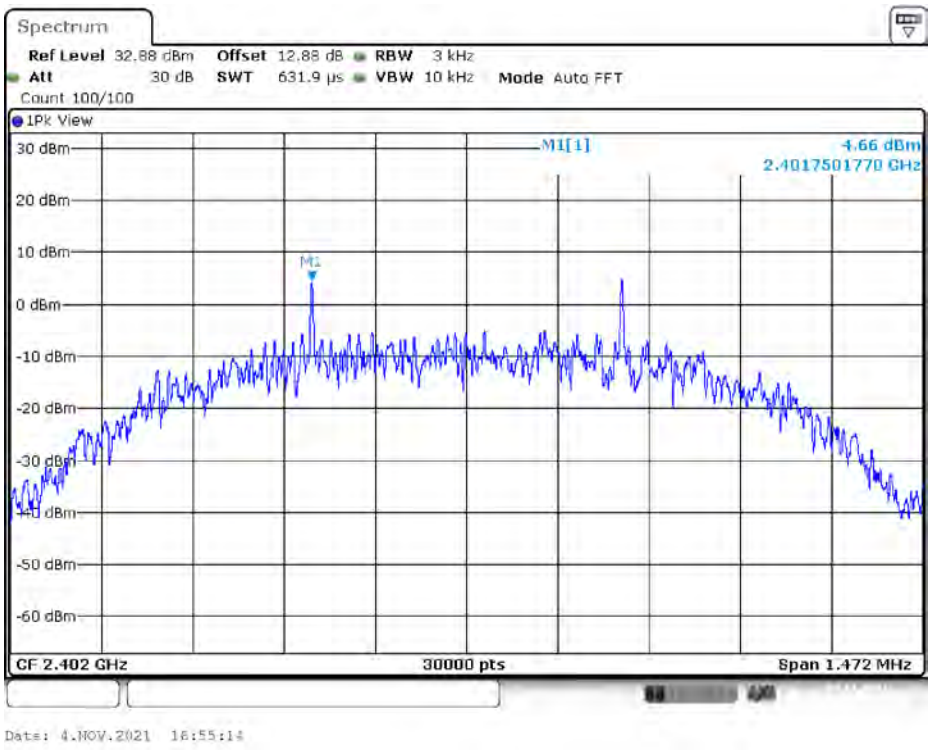
Power Spectral Density, BLE 125k Middle Channel



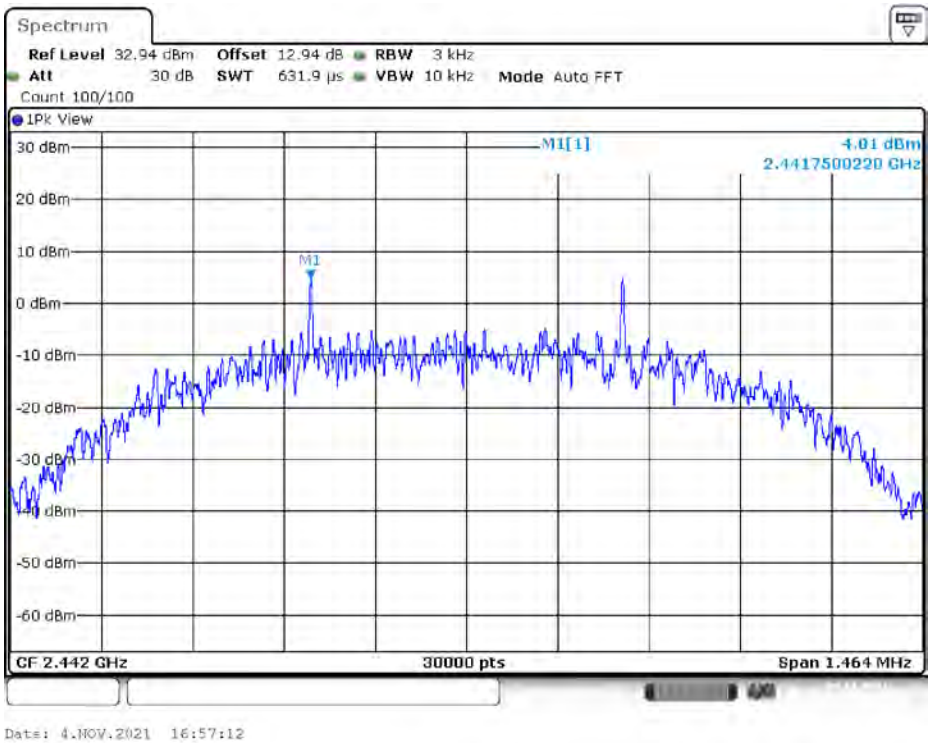
Power Spectral Density, BEL 125k High Channel



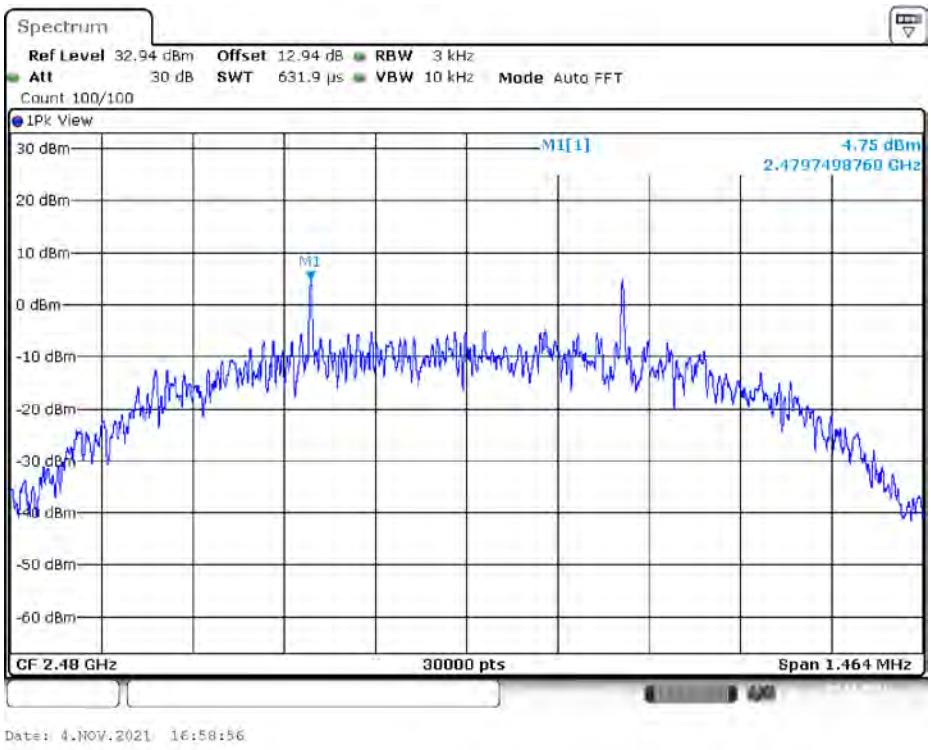
Power Spectral Density, BLE 500k Low Channel



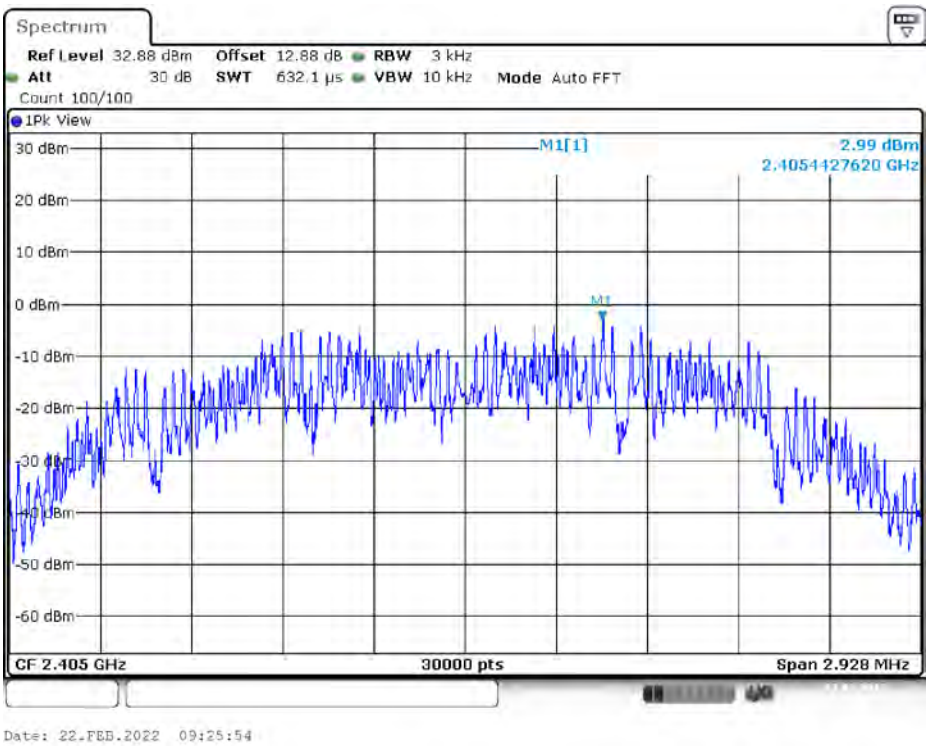
Power Spectral Density, BLE 500k Middle Channel



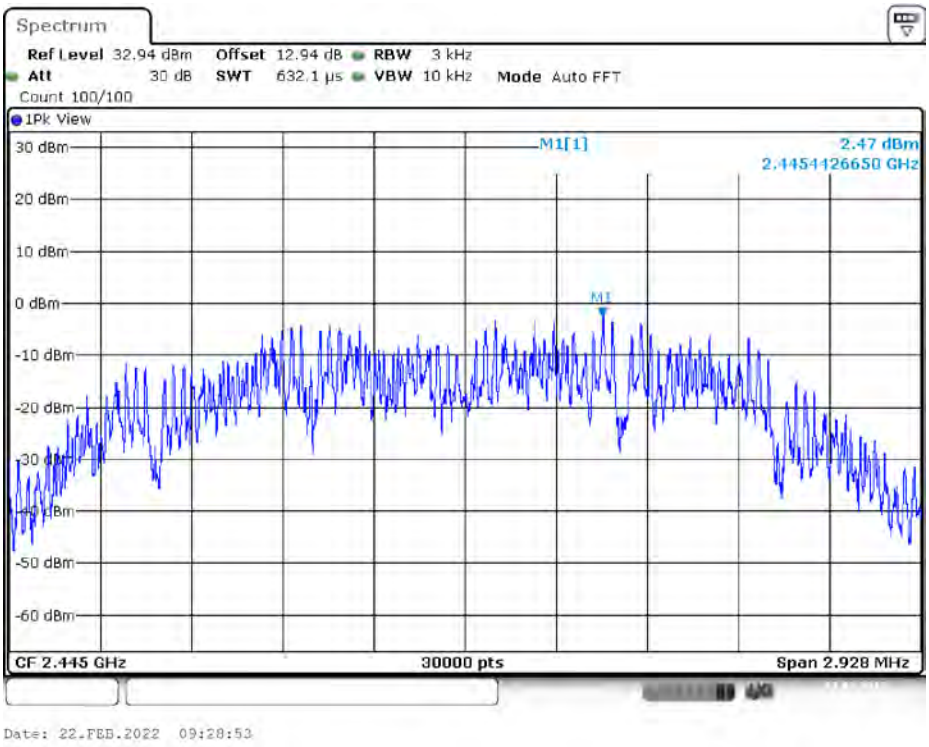
Power Spectral Density, BLE 500k High Channel



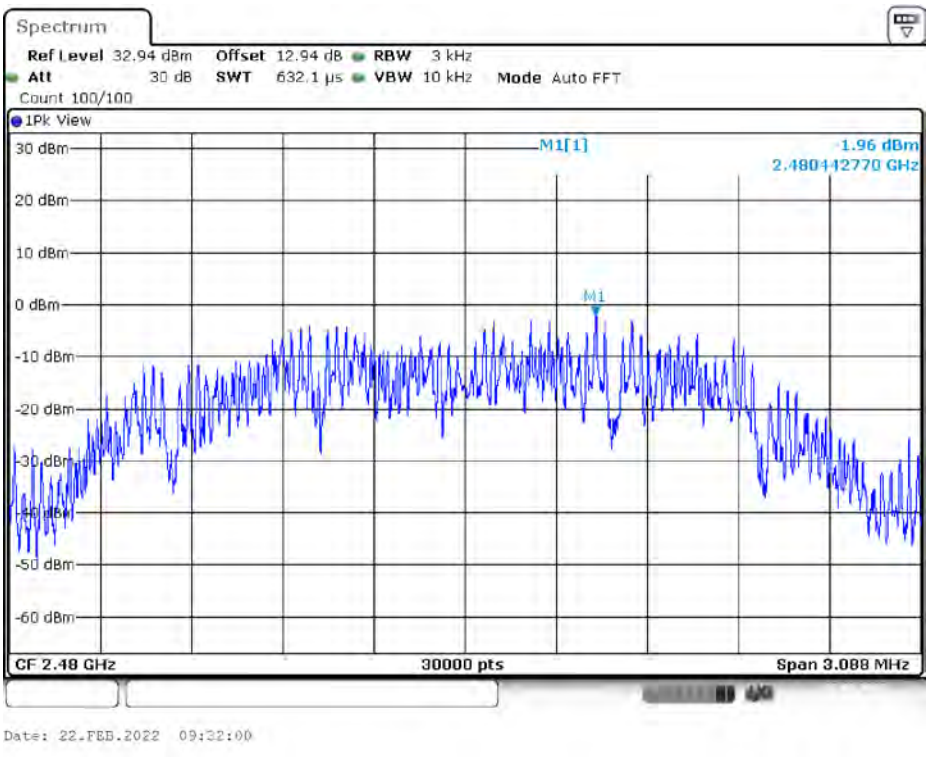
Power Spectral Density, Zigbee Low Channel



Power Spectral Density, Zigbee Middle Channel



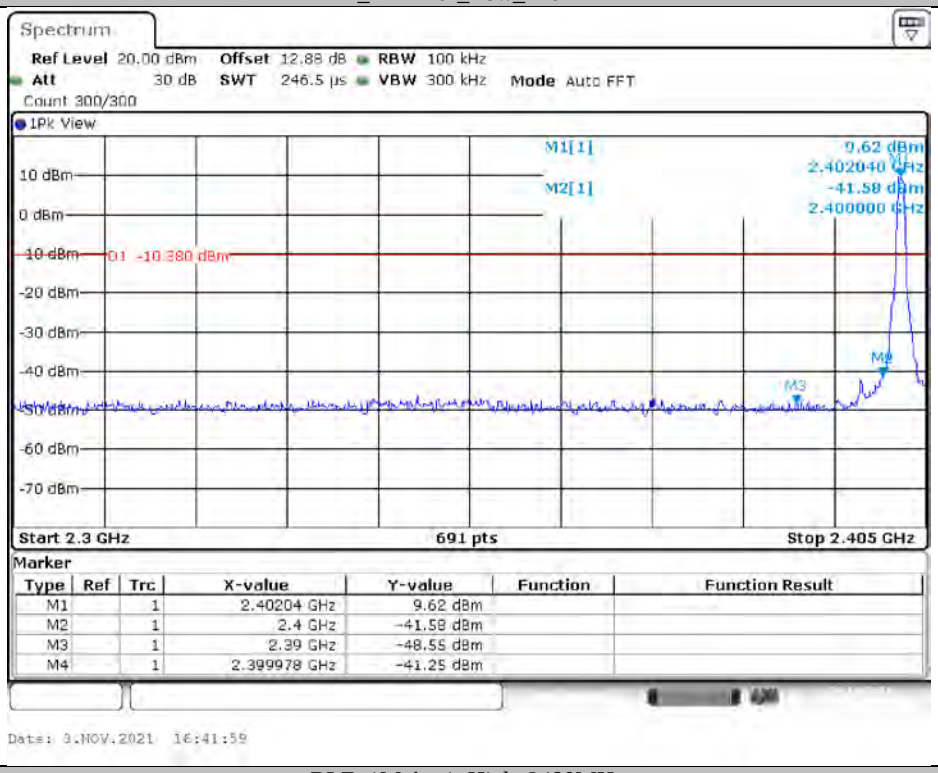
Power Spectral Density, Zigbee High Channel



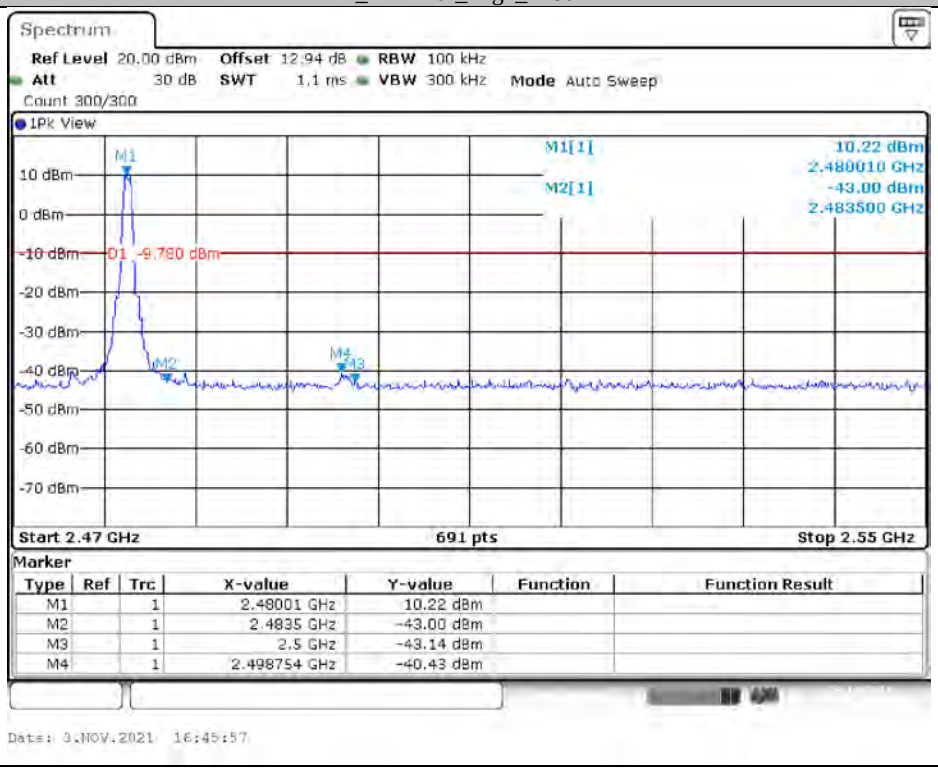
Appendix E: Band edge measurements

Test Graphs

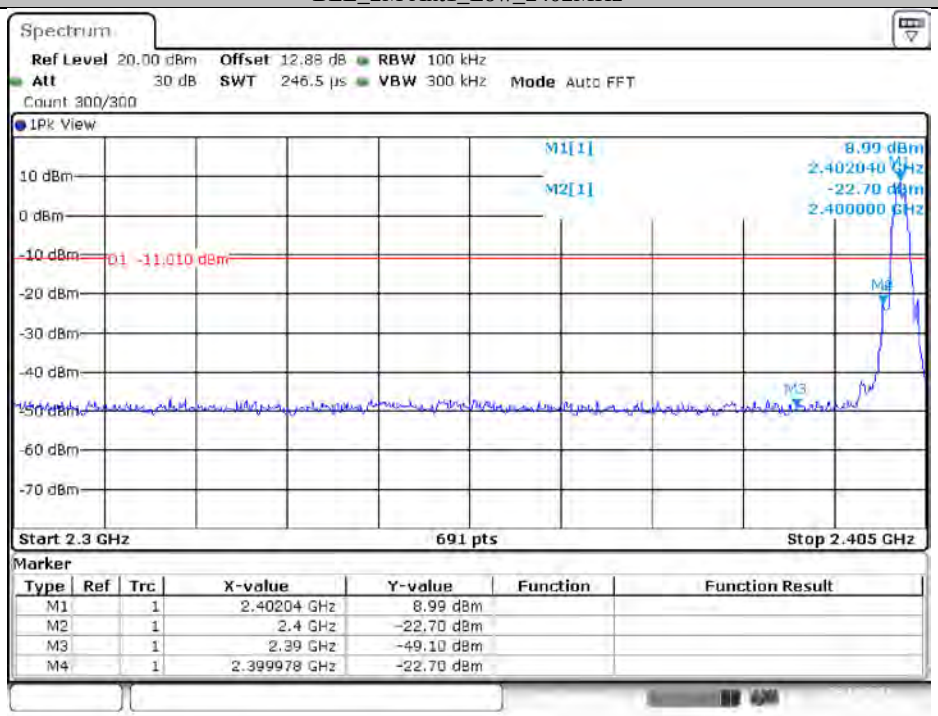
BLE_1M Ant1_Low_2402MHz



BLE_1M Ant1_High_2480MHz



BLE_2M Ant1_Low_2402MHz

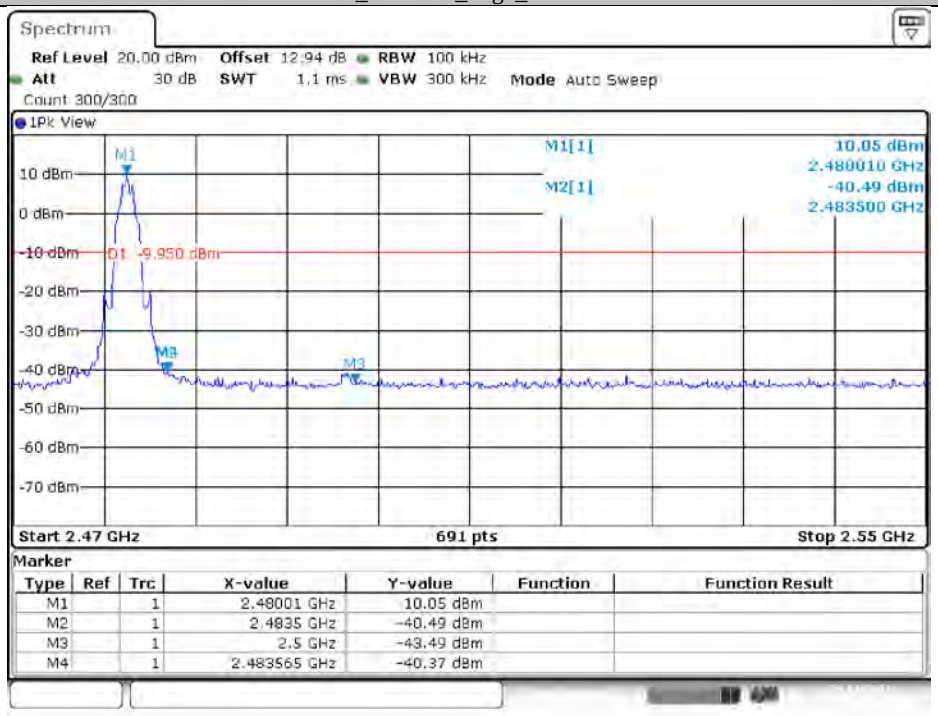


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40204 GHz	8.99 dBm		
M2		1	2.4 GHz	-22.70 dBm		
M3		1	2.39 GHz	-49.10 dBm		
M4		1	2.399978 GHz	-22.70 dBm		

Date: 3.NOV.2021 16:48:42

BLE_2M Ant1_High_2480MHz

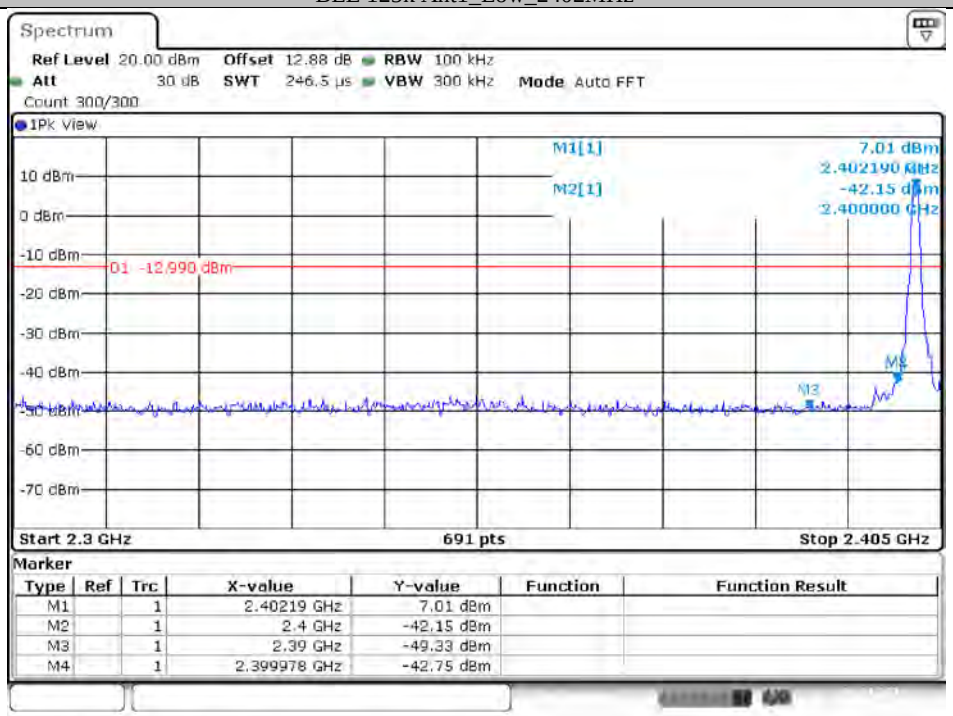


Marker

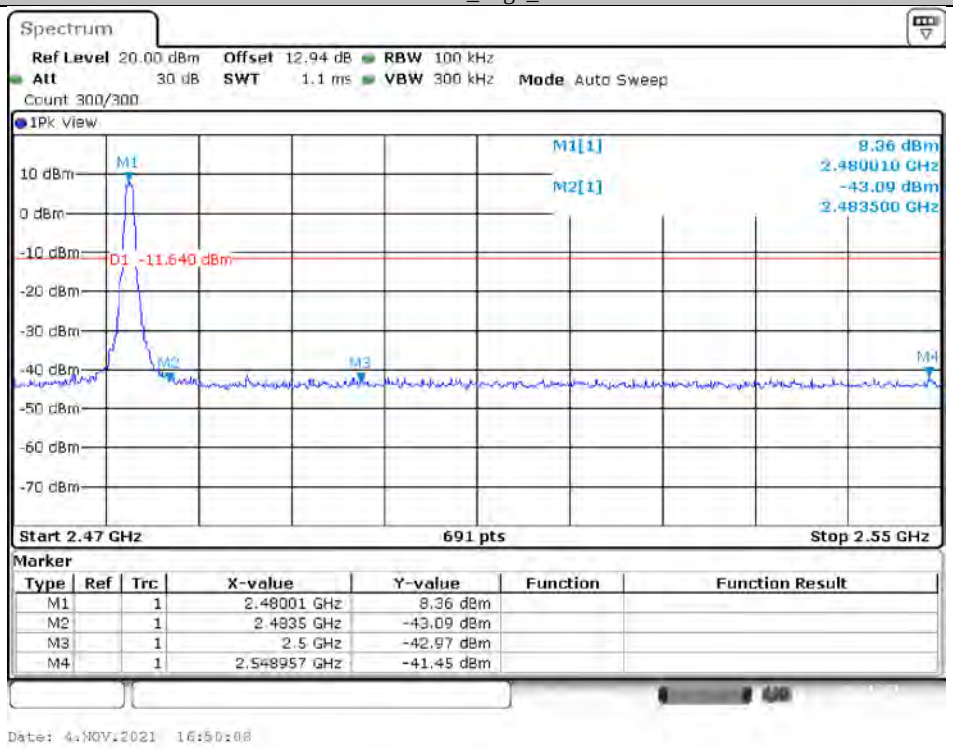
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.48001 GHz	10.05 dBm		
M2		1	2.4835 GHz	-40.49 dBm		
M3		1	2.5 GHz	-43.49 dBm		
M4		1	2.483565 GHz	-40.37 dBm		

Date: 3.NOV.2021 16:52:10

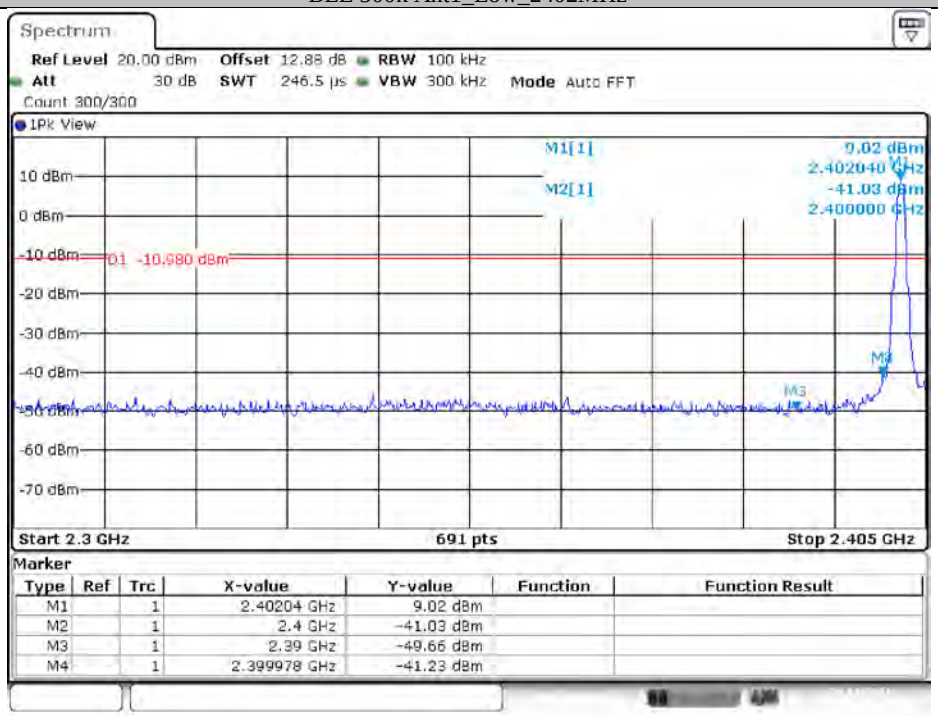
BLE 125k Ant1_Low_2402MHz



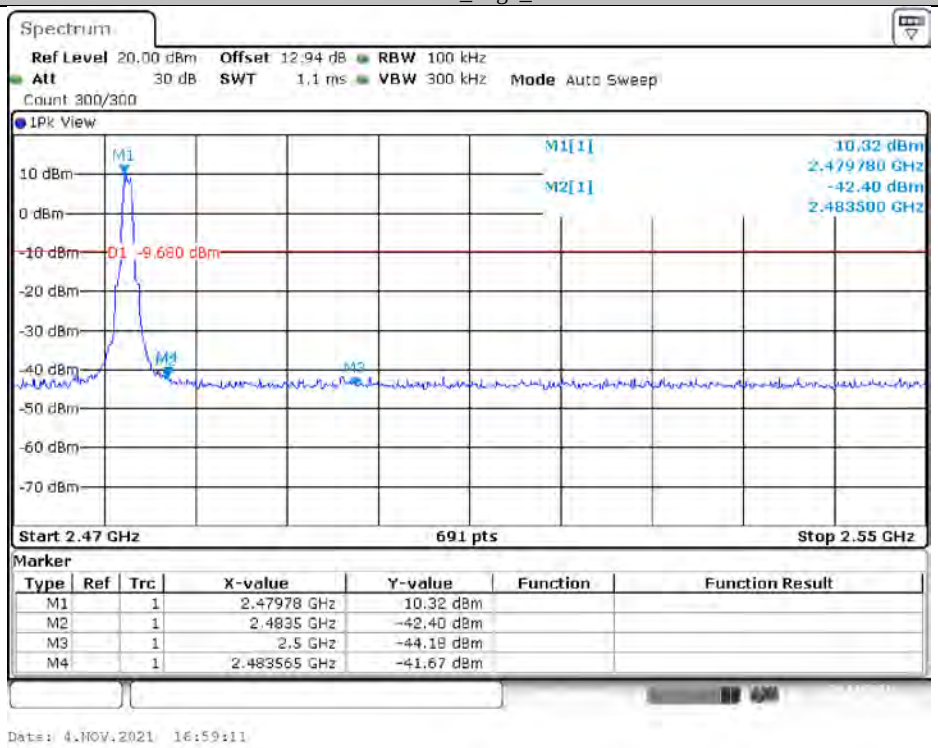
BLE 125k Ant1_High_2480MHz



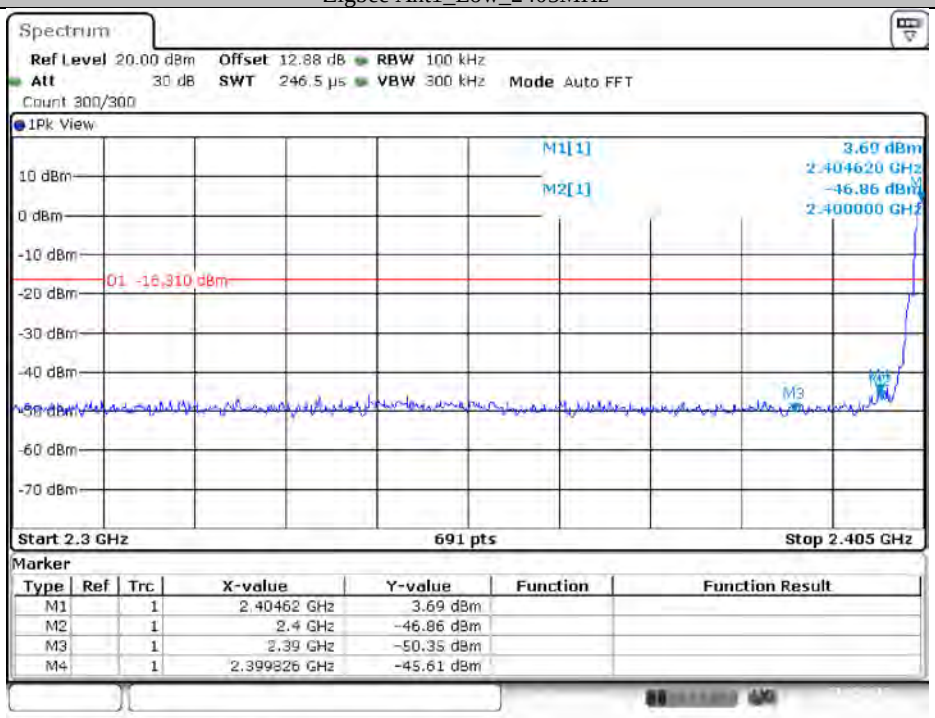
BLE 500k Ant1_Low_2402MHz



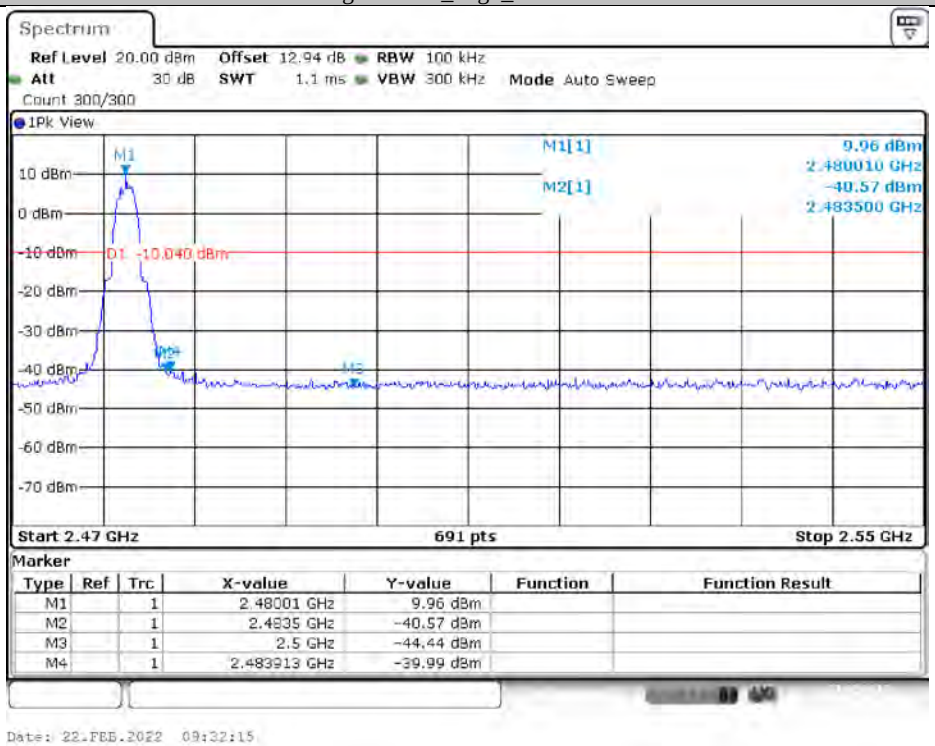
BLE 500k Ant1_High_2480MHz



Zigbee Ant1_Low_2405MHz



Zigbee Ant1_High_2480MHz



Appendix F: Duty Cycle

Test Result

TestMode	Antenna	Channel	TransmissionDuration [ms]	Transmission Period [ms]	Duty Cycle [%]
BLE_1M	Ant1	2402	0.38	0.62	61.48
		2442	0.38	0.62	61.48
		2480	0.38	0.62	61.50
BLE_2M	Ant1	2402	0.20	0.62	31.98
		2442	0.20	0.62	31.91
		2480	0.20	0.62	31.88

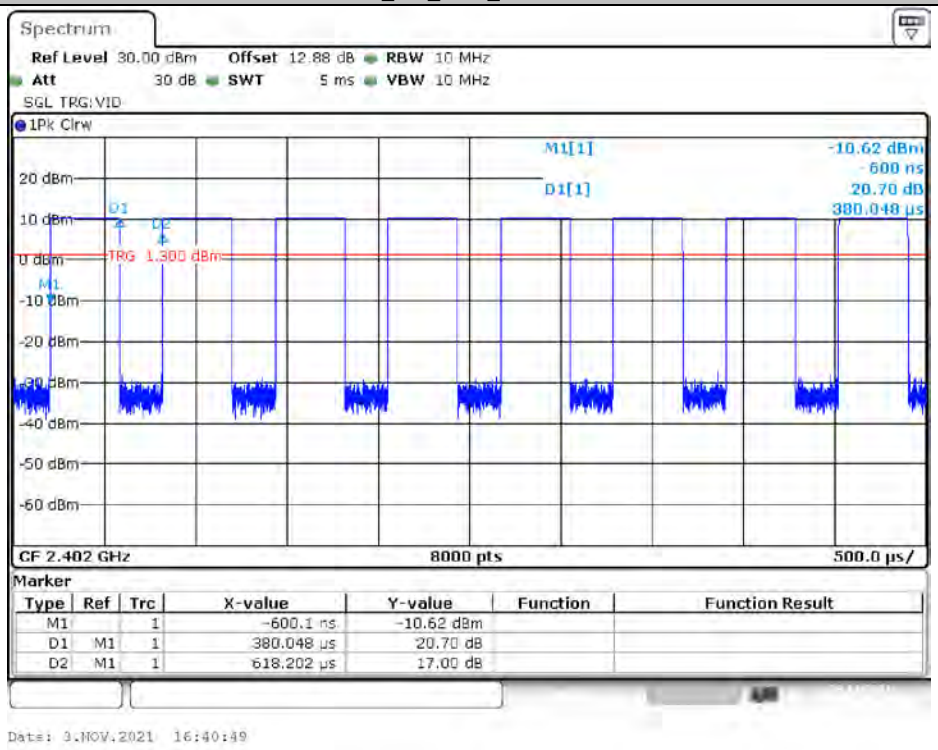
TestMode	Antenna	Channel	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]
BLE 125k	Ant1	2402	3.16	3.80	83.16
		2442	3.16	3.77	83.82
		2480	3.16	3.74	84.49

TestMode	Antenna	Channel	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]
BLE 500k	Ant1	2402	1.05	1.85	56.65
		2442	1.05	1.85	56.63
		2480	1.05	1.85	56.67

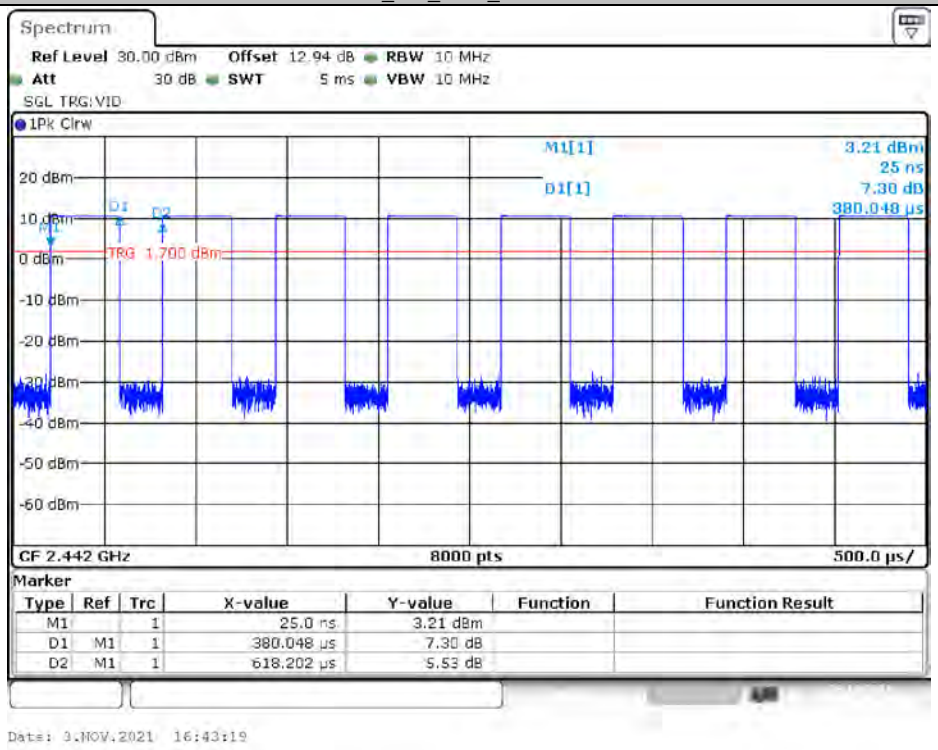
TestMode	Antenna	Channel	TransmissionDuration [ms]	Transmission Period [ms]	Duty Cycle [%]
Zigbee	Ant1	2405	2.81	20.88	13.47
		2445	2.81	20.79	13.53
		2480	2.81	20.79	13.53

Test Graphs

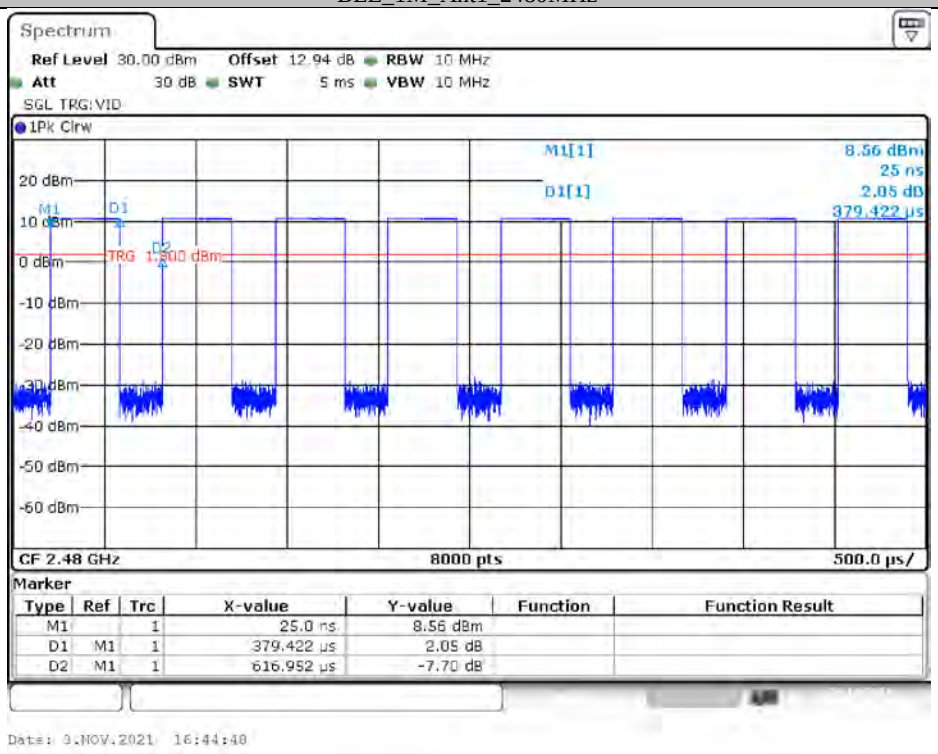
BLE_1M_Ant1_2402MHz



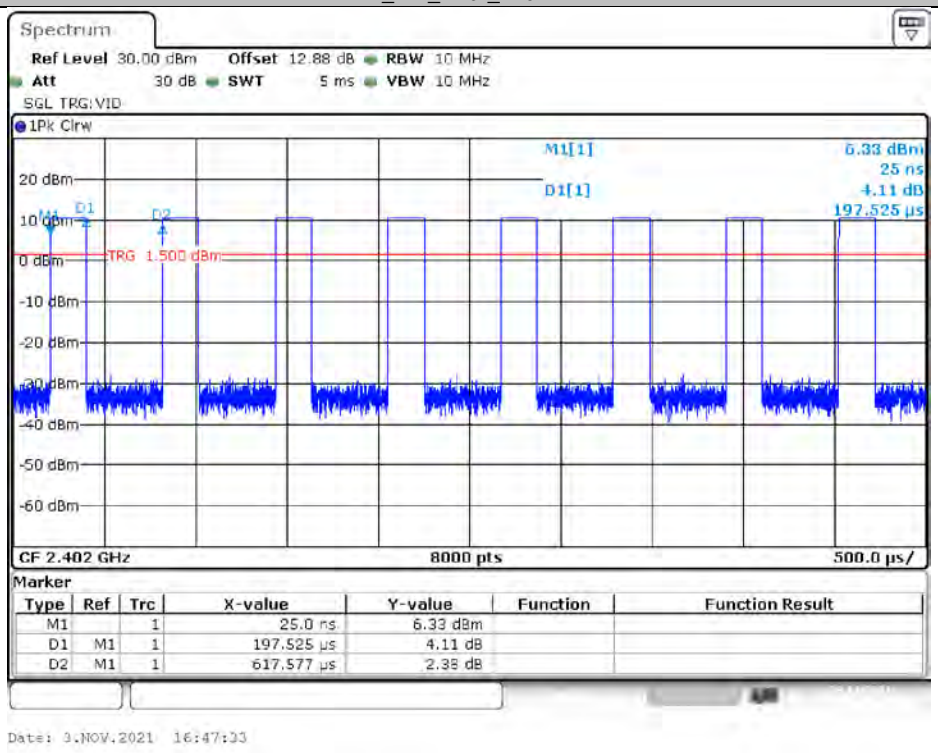
BLE_1M_Ant1_2442MHz



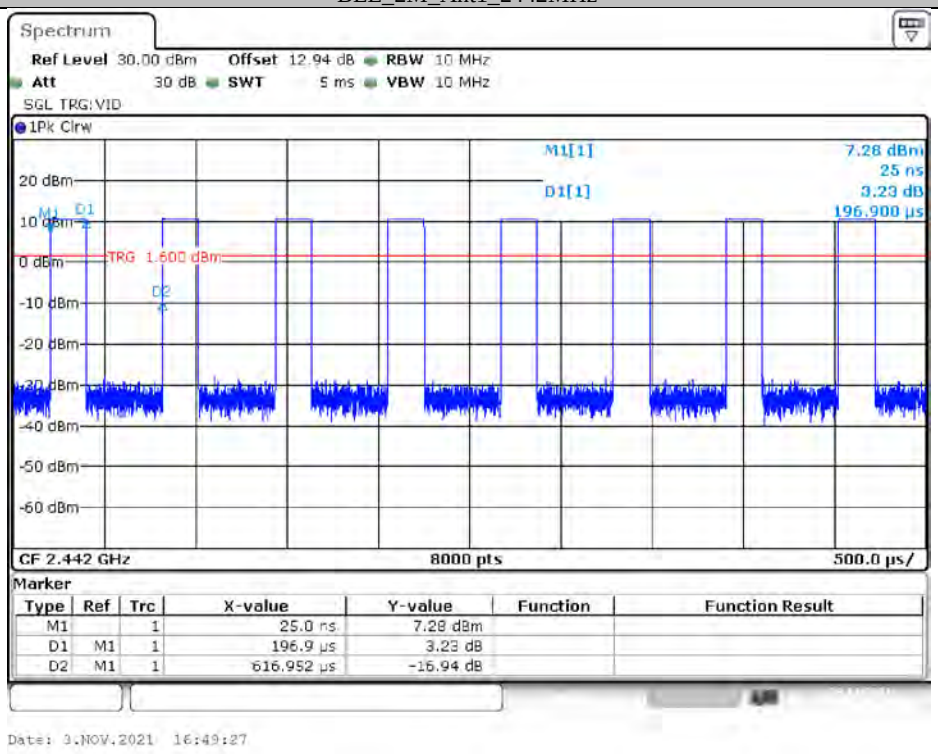
BLE_1M_Ant1_2480MHz



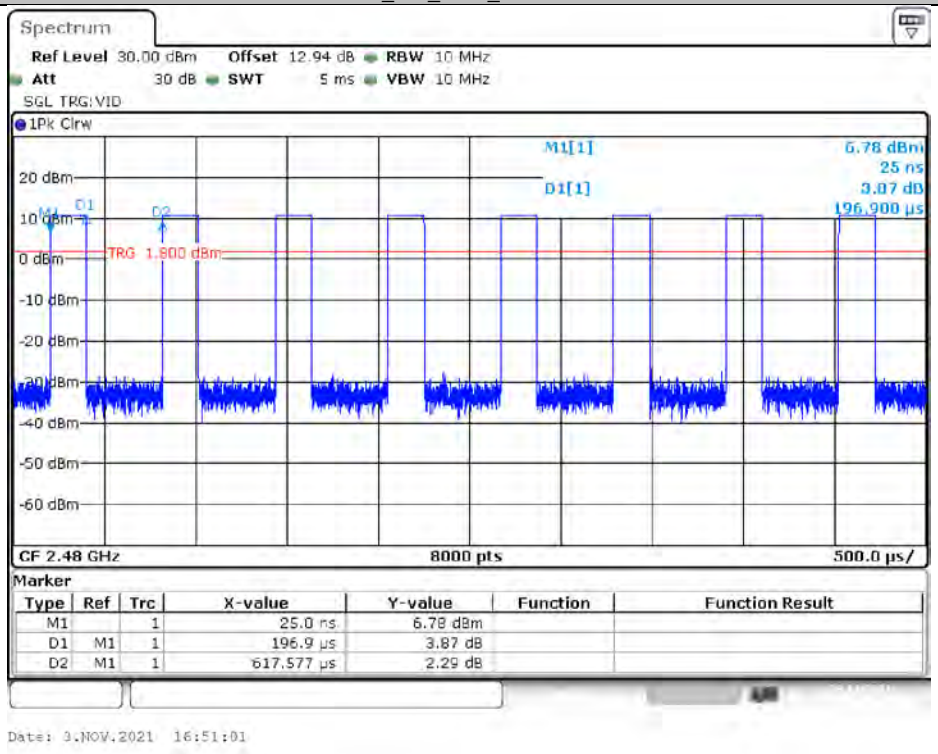
BLE_2M_Ant1_2402MHz



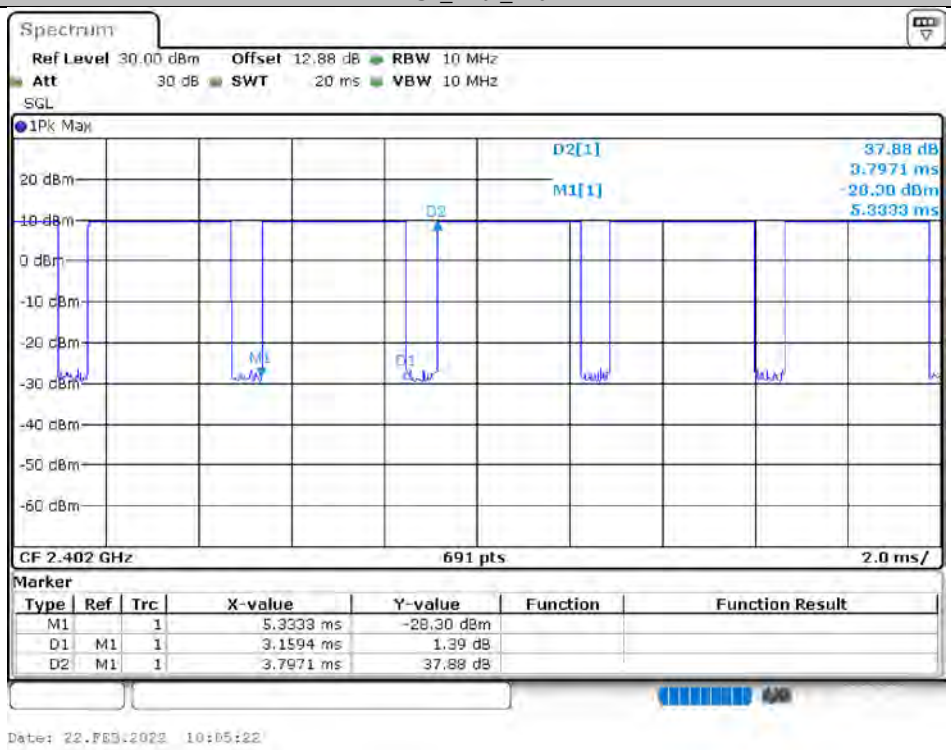
BLE_2M_Ant1_2442MHz



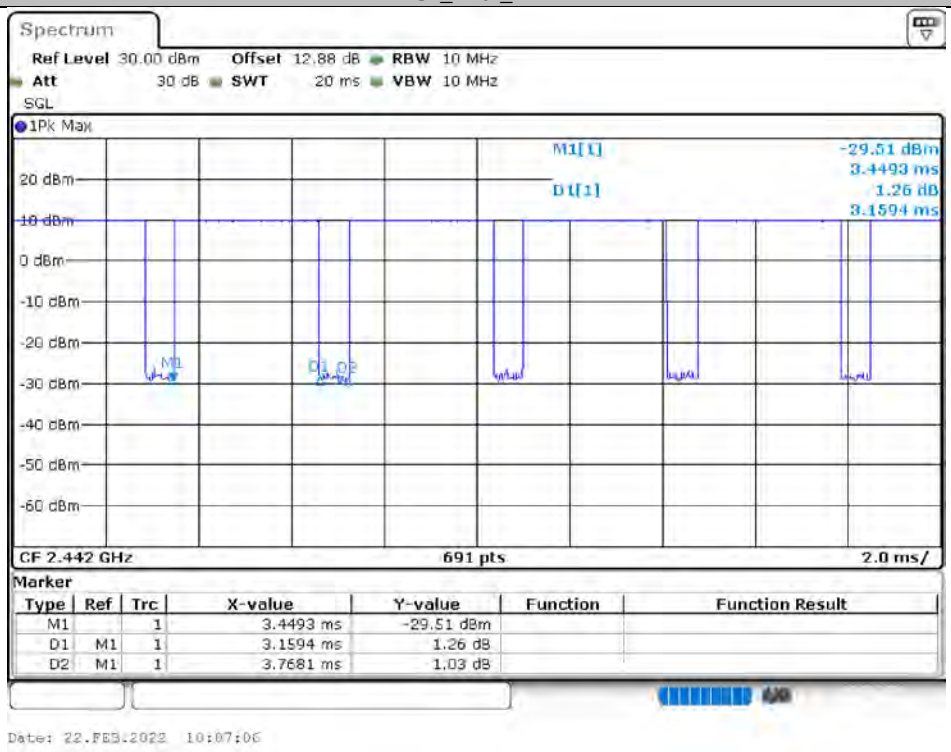
BLE_2M_Ant1_2480MHz



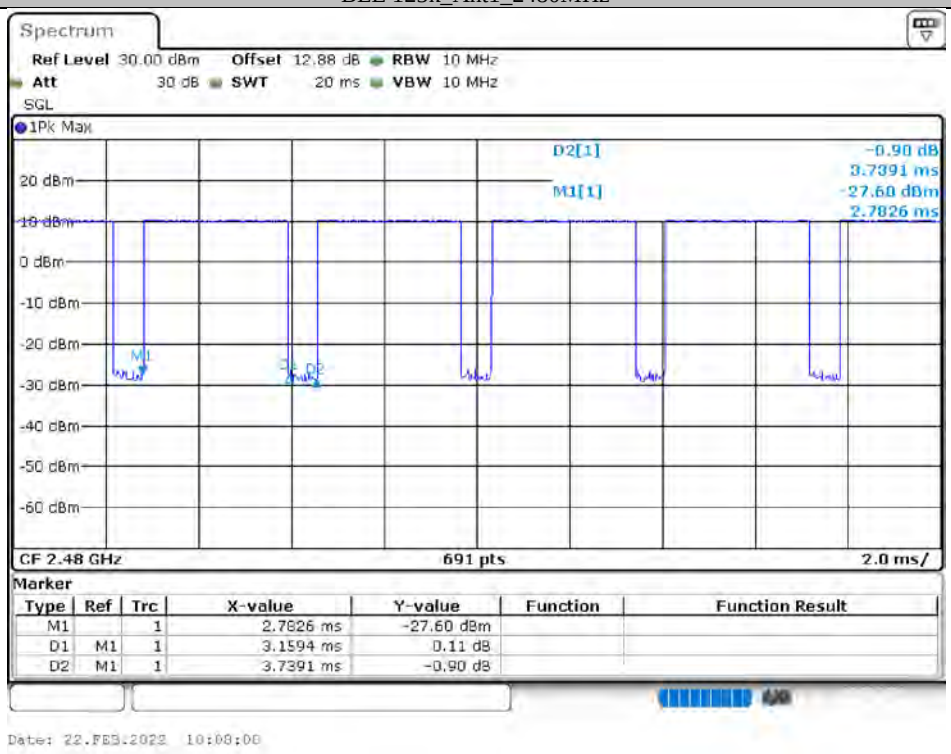
BLE 125k_Ant1_2402MHz



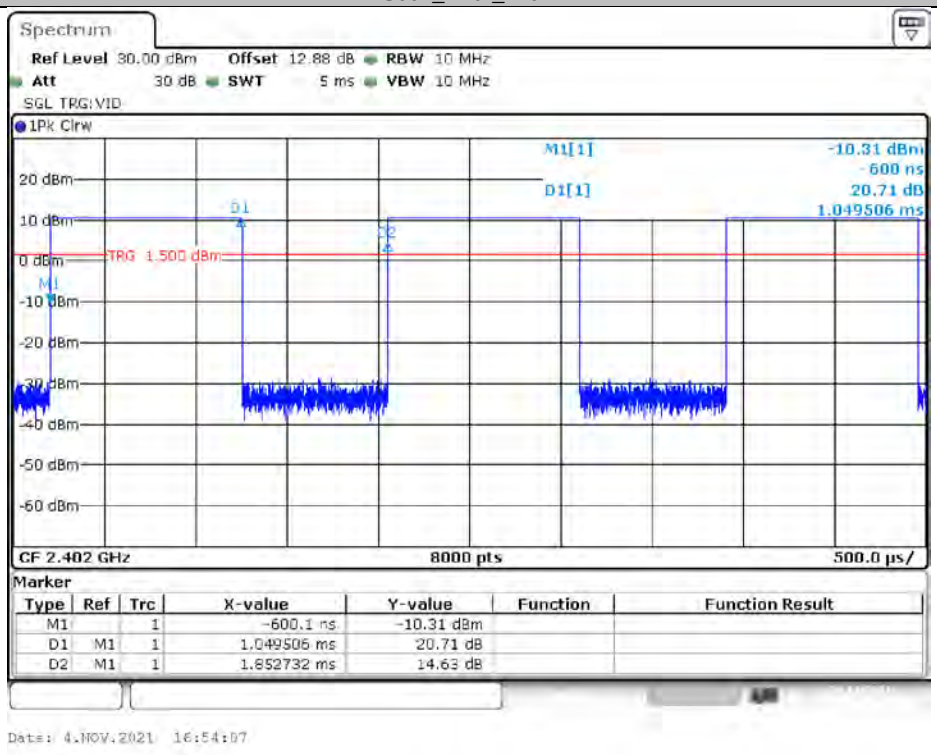
BLE 125k_Ant1_2442MHz



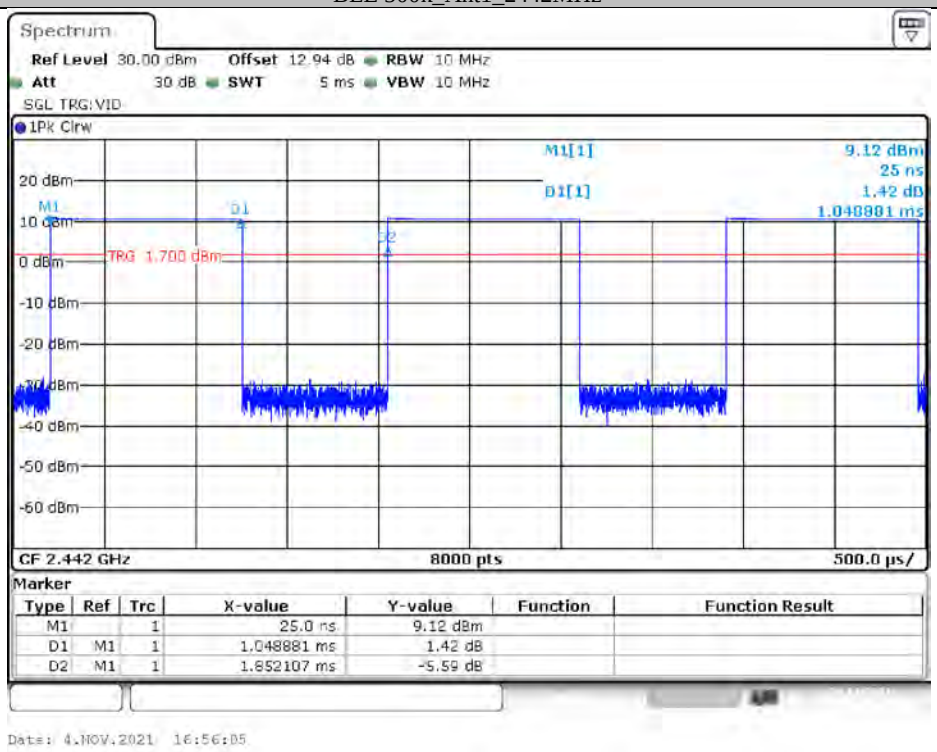
BLE 125k_Ant1_2480MHz



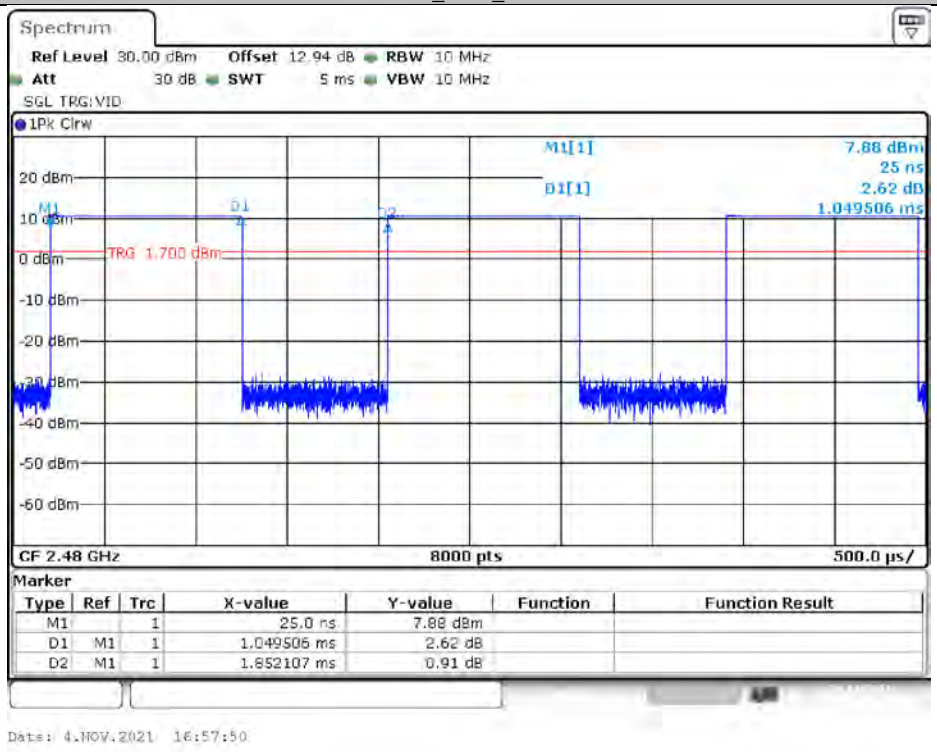
BLE 500k_Ant1_2402MHz



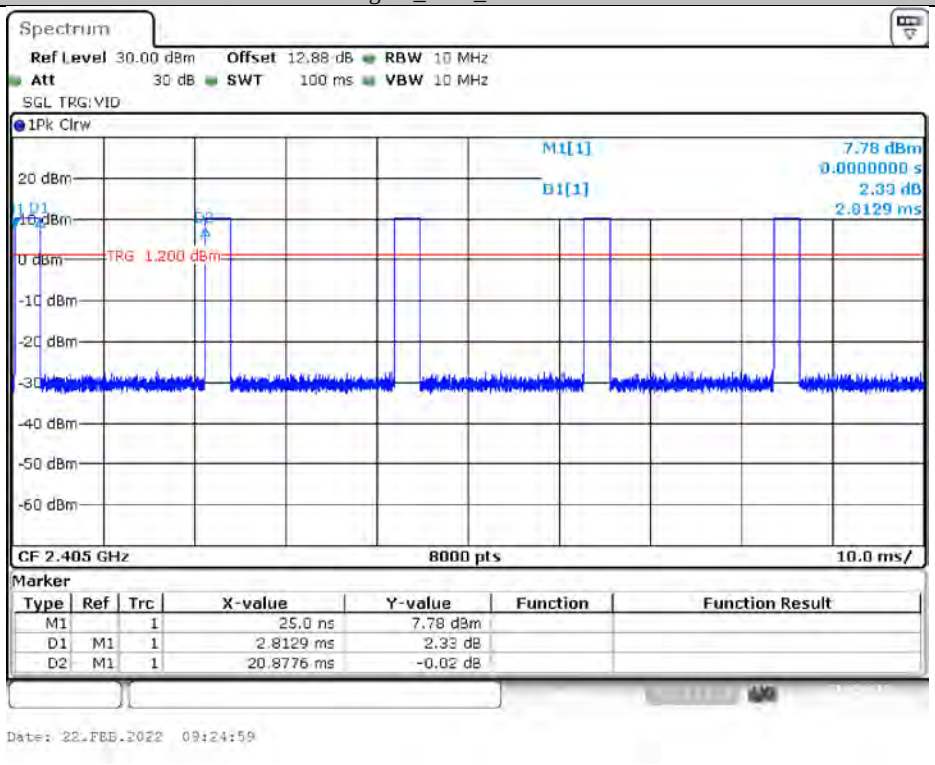
BLE 500k_Ant1_2442MHz



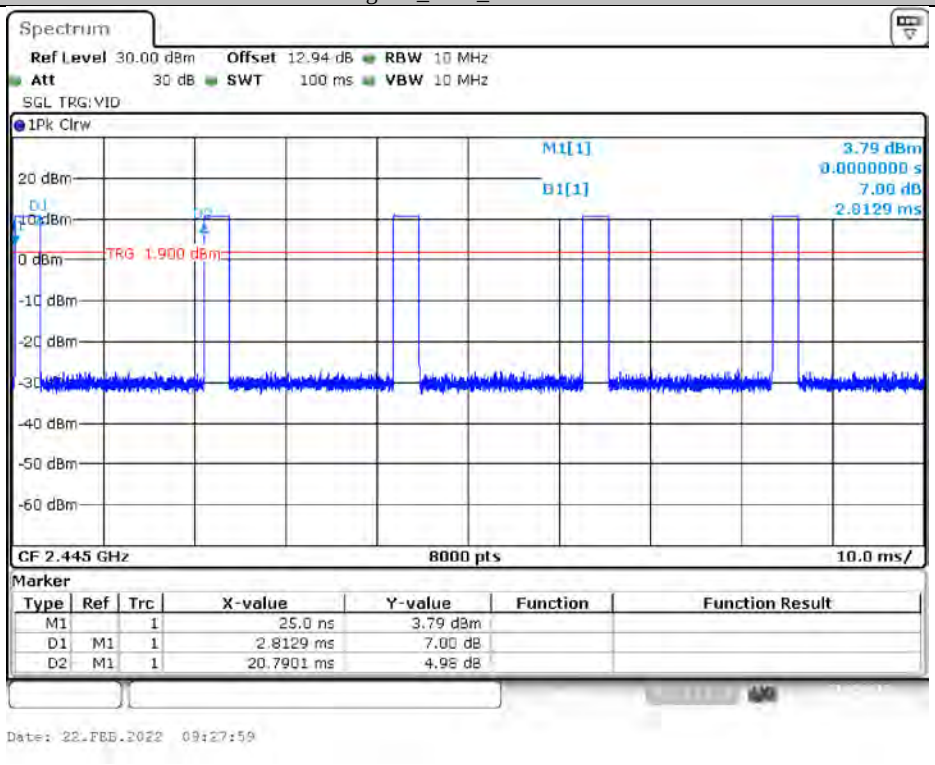
BLE 500k_Ant1_2480MHz



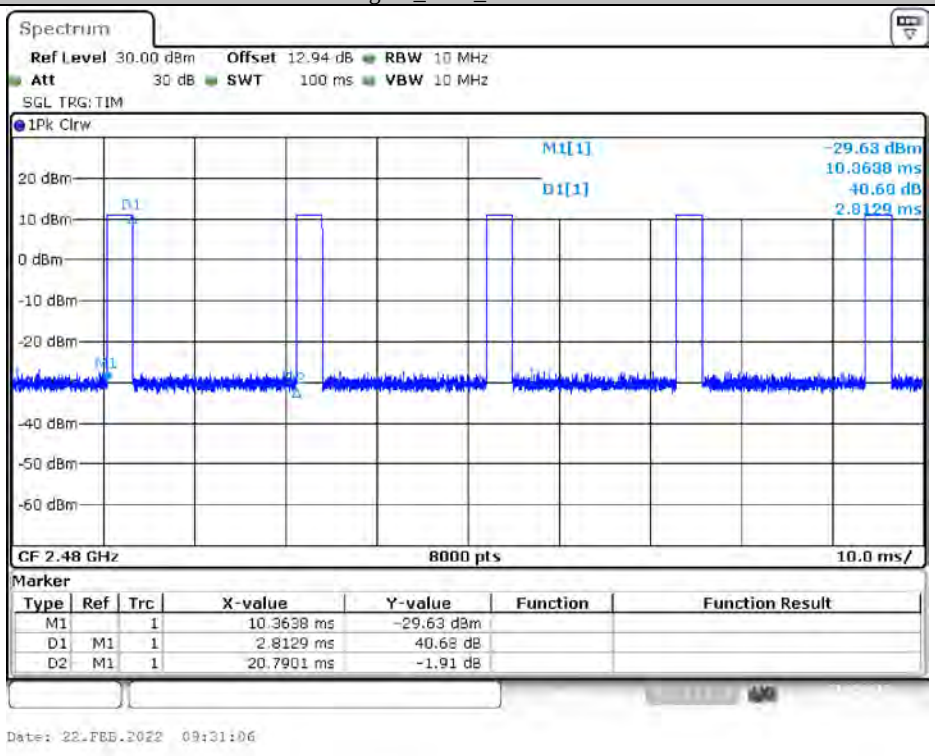
Zigbee_Ant1_2405MHz



Zigbee _Ant1_2445MHz



Zigbee_Ant1_2480MHz



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