TEST REPORT

Application No.:	SZCR2509003862AT
Applicant:	AltoBeam Inc.
Address of Applicant:	B808, Tsinghua Tongfang Hi-Tech Plaza, Haidian, Beijing, 100080 China
Manufacturer:	AltoBeam Inc.
Address of Manufacturer:	B808, Tsinghua Tongfang Hi-Tech Plaza, Haidian, Beijing, 100080 China
Factory:	AltoBeam Inc.
Address of Factory:	C234, Research Institute of Tsinghua University, Shenzhen High-Tech Industrial Park, China
Equipment Under Test (EUT):	
EUT Name:	AB6031X-44PF-03 Wi-Fi and BLE module
Model No.:	AB6031X-44PF-03
Trade Mark:	AltoBeam
FCC ID:	2BAVS-031X44PF03
Standard(s) :	47 CFR Part 15, Subpart C 15.247
Date of Receipt:	2025-09-02
Date of Test:	2025-09-04 to 2025-09-15
Date of Issue:	2025-09-25
Test Result:	**Pass***

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

Keny Xu
EMC Laboratory Manager

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Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2025-09-25		Original

Authorized for issue by:				
		Bill Chen/Project Engineer		
		Eric Fu/Reviewer		

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2 Test Summary

Radio Spectrum Technical Requirement				
Item	**Standard**	**Method**	**Requirement**	**Result**
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)	Pass

Radio Spectrum Matter Part				
Item	**Standard**	**Method**	**Requirement**	**Result**
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2020) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass
Radiated Emissions which fall in the restricted bands		ANSI C63.10 (2020) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions Below 1GHz		ANSI C63.10 (2020) Section 6.4,6.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions Above 1GHz		ANSI C63.10 (2020) Section 6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Conducted Peak Output Power		ANSI C63.10 (2020) Section 11.9.1	47 CFR Part 15, Subpart C 15.247(b)(3)	Pass
Minimum 6dB Bandwidth		ANSI C63.10 (2020) Section 11.8.1	47 CFR Part 15, Subpart C 15.247a(2)	Pass
Power Spectrum Density		ANSI C63.10 (2020) Section 11.10.2	47 CFR Part 15, Subpart C 15.247(e)	Pass
Conducted Band Edges Measurement		ANSI C63.10 (2020) Section 6.10.4	47 CFR Part 15, Subpart C 15.247(d)	Pass
Conducted Spurious Emissions		ANSI C63.10 (2020) Section 11.11	47 CFR Part 15, Subpart C 15.247(d)	Pass

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4 General Information

4.1 Details of E.U.T.

Power supply:	DC 5V
Cable Loss (for RF conducted test):	0.7dB
Operation Frequency:	2402MHz to 2480MHz
Modulation Type:	GFSK
Number of Channels:	40
Channel Spacing:	2MHz
Rate data:	1Mbps and 2Mbps
Antenna Type:	PCB Antenna
Antenna Gain:	2.82dBi

Remark:The information in this section is provided by the applicant or manufacturer, SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Adapter	JINFENG	JF-0503	client supply

4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
Conducted Emissions at AC Power Line (150kHz-30MHz)	± 3.1dB
Radiated Emissions which fall in the restricted bands	± 6.0dB (Below 1GHz);± 4.6dB (Above 1GHz)
Radiated Spurious Emissions Below 1GHz	± 6.0dB for 3m; ± 5.0dB for 10m
Radiated Spurious Emissions Above 1GHz	± 4.6dB (1-18GHz);± 4.8dB (18-40GHz)
Conducted Peak Output Power	± 0.75dB
Minimum 6dB Bandwidth	± 3%
Power Spectrum Density	± 2.84dB
Conducted Band Edges Measurement	± 0.75dB
Conducted Spurious Emissions	± 0.75dB
Remark: The U_{lab} (lab Uncertainty) is less than $U_{cispr/ETSI}$ (CISPR/ETSI Uncertainty), so the test results – compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit; – non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.	

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4.4 Test Location

All tests were performed at:

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No tests were sub-contracted.

4.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• A2LA (Certificate No. 3816.01)

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• VCCI (Member No. 1937)

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen EMC laboratory have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

• FCC –Designation Number: CN1336

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1336. Test Firm Registration Number: 787754.

• Innovation, Science and Economic Development Canada

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

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5 Equipment List

Conducted Emissions at AC Power Line (150kHz-30MHz)					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
Shielding Room	ZhongYu Electron	GB-88	SEM001-06	2025-05-07	2028-05-06
EMI Test Receiver	Rohde&Schwarz	ESR	SZ-WRG-M-047	2025-01-08	2026-01-07
Measurement Software	AUDIX	e3 V8.2014-6-27a	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM024-01	2025-07-05	2026-07-04
LISN	Rohde&Schwarz	ENV216	SEM007-01	2025-07-25	2026-07-24
LISN	ETS-LINDGREN	3816/2	SEM007-02	2025-03-03	2026-03-02

Radiated Emissions which fall in the restricted bands					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
Signal & Spectrum Analyzer	Rohde & Schwarz	FSV	SZ-WRG-M-048	2025-01-07	2026-01-06
Low Noise Amplifier 30M-8GHz	Tonscend	TAP30M8G30	SZ-WRG-M-050	2025-01-07	2026-01-06
Double Ridge Horn Antenna 1GHz-18GHz	SCHWARZBECK	BBHA 9120 D	SZ-WRG-M-055	2023-12-21	2025-12-20
RSE Test Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Chamber	CRTSGSSAC966	N/A	SZ-WRG-C-063	2025-01-06	2028-01-05
Humidity and Temperature Indicator	deli	8838	SEM002-46	2025-07-23	2026-07-22

Radiated Spurious Emissions Below 1GHz					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
Loop Antenna	ETS-Lindgren	6502	SEM003-08	2023-11-20	2025-11-19
3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEM001-01	2023-06-19	2026-06-18
MXE EMI Receiver	Agilent Technologies	N9038A	SEM004-15	2025-07-25	2026-07-24
BiConiLog Antenna	ETS-LINDGREN	3142C	SEM003-01	2025-08-29	2027-08-28
Pre-Amplifier	Agilent Technologies	8447D	SEM005-01	2025-03-04	2026-03-03
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM025-01	2025-07-05	2026-07-04

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Radiated Spurious Emissions Above 1GHz					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
Signal & Spectrum Analyzer	Rohde & Schwarz	FSV	SZ-WRG-M-048	2025-01-07	2026-01-06
Low Noise Amplifier 1G-18GHz	Tonscend	TAP01018050	SZ-WRG-M-051	2025-01-07	2026-01-06
Low Noise Amplifier 18G-40GHz	Tonscend	TAP18040048	SZ-WRG-M-052	2025-01-08	2026-01-07
Double Ridge Horn Antenna 1GHz-18GHz	SCHWARZBECK	BBHA 9120 D	SZ-WRG-M-055	2023-12-21	2025-12-20
SHF-EHF Horn 15GHz-40GHz	SCHWARZBECK	BBHA 9170	SZ-WRG-M-056	2023-12-25	2025-12-24
RSE Test Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Chamber	CRTSGSSAC966	N/A	SZ-WRG-C-063	2025-01-06	2028-01-05
Humidity and Temperature Indicator	deli	8838	SEM002-46	2025-07-23	2026-07-22

RF Conducted Test					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
Power Sensor	TST PASS	TSPS2023R	SEM009-26	2025-03-04	2026-03-03
Power Sensor	KEYSIGHT	U2021XA	SEM009-16	2025-03-04	2026-03-03
DC Power Supply	Chroma	62012P-80-60	SEM011-11	2025-07-24	2026-07-23
MXA Signal Analyzer	KEYSIGHT	N9020A	SEM004-19	2025-03-04	2026-03-03
Measurement Software	TST PASS	TST PASS V2.0	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-01	2025-07-05	2026-07-04
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	2025-03-03	2026-03-02

General used equipment					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
Humidity/ Temperature Indicator	deli	8838	SEM002-32	2025-07-23	2026-07-22
Humidity/ Temperature Indicator	deli	8838	SEM002-33	2025-07-23	2026-07-22
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2025-03-03	2026-03-02

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6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)

6.1.2 Conclusion

Standard Requirement:

Measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level.When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 2.82dBi.

Antenna location: Refer to internal photos.

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7 Radio Spectrum Matter Test Results

7.1 Conducted Emissions at AC Power Line (150kHz-30MHz)

Test Requirement 47 CFR Part 15, Subpart C 15.207
Test Method: ANSI C63.10 (2020) Section 6.2

Limit:

Frequency of emission(MHz)	Conducted limit(dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
*Decreases with the logarithm of the frequency.		
Detector: Peak for pre-scan (9kHz resolution bandwidth) 0.15M to 30MHz		

7.1.1 E.U.T. Operation

Operating Environment:
Temperature: 25.3 °C Humidity: 40.5 % RH Atmospheric Pressure: 1020 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Pre-scan	01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.

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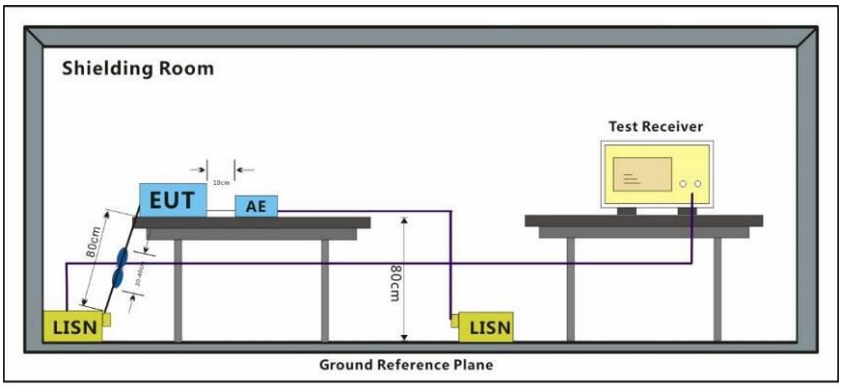
7.1.3 Test Setup Diagram



7.1.4 Measurement Procedure and Data

1) The mains terminal disturbance voltage test was conducted in a shielded room.

2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50μH + 5ohm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane.

4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.

5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Remark : Level=Read Level+ Cable Loss+ LISN Factor

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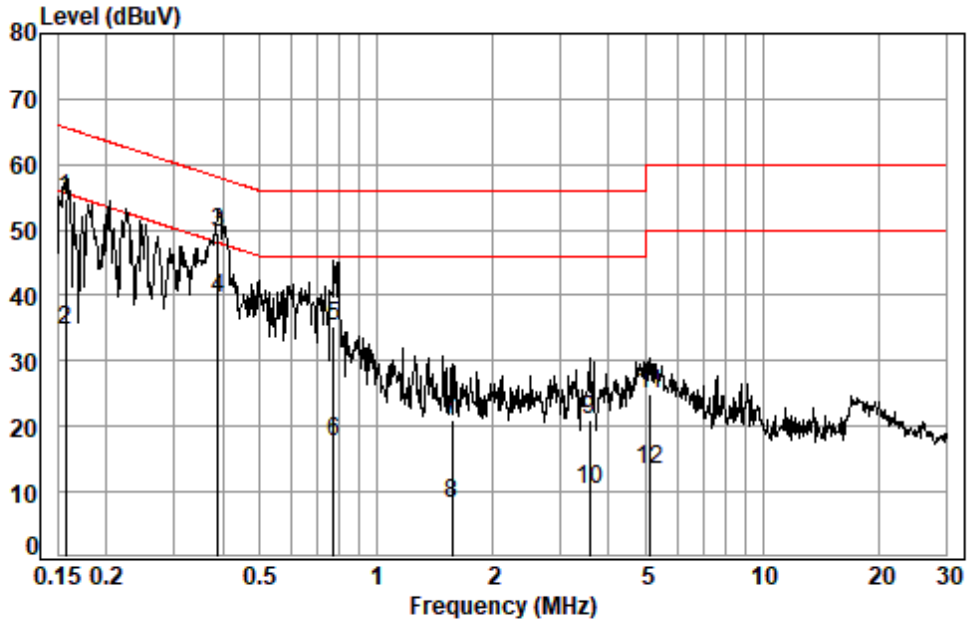
Test Mode: 00; Line: Live line



Site : Shielding Room
Condition: Line
Job No. : 03862AT/03863AT
Test mode: 00

		Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
		MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1		0.1573	0.05	10.18	44.63	54.86	65.60	-10.74	QP
2		0.1573	0.05	10.18	24.44	34.67	55.60	-20.93	Average
3	*	0.3893	0.08	9.69	39.85	49.62	58.08	-8.46	QP
4	*	0.3893	0.08	9.69	29.92	39.69	48.08	-8.39	Average
5		0.7752	0.09	9.63	25.56	35.28	56.00	-20.72	QP
6		0.7752	0.09	9.63	7.86	17.58	46.00	-28.42	Average
7		1.5684	0.11	9.58	11.20	20.89	56.00	-35.11	QP
8		1.5684	0.11	9.58	-1.46	8.23	46.00	-37.77	Average
9		3.5654	0.12	9.65	11.37	21.14	56.00	-34.86	QP
10		3.5654	0.12	9.65	0.57	10.34	46.00	-35.66	Average
11		5.1118	0.13	9.66	15.21	25.00	60.00	-35.00	QP
12		5.1118	0.13	9.66	3.47	13.26	50.00	-36.74	Average

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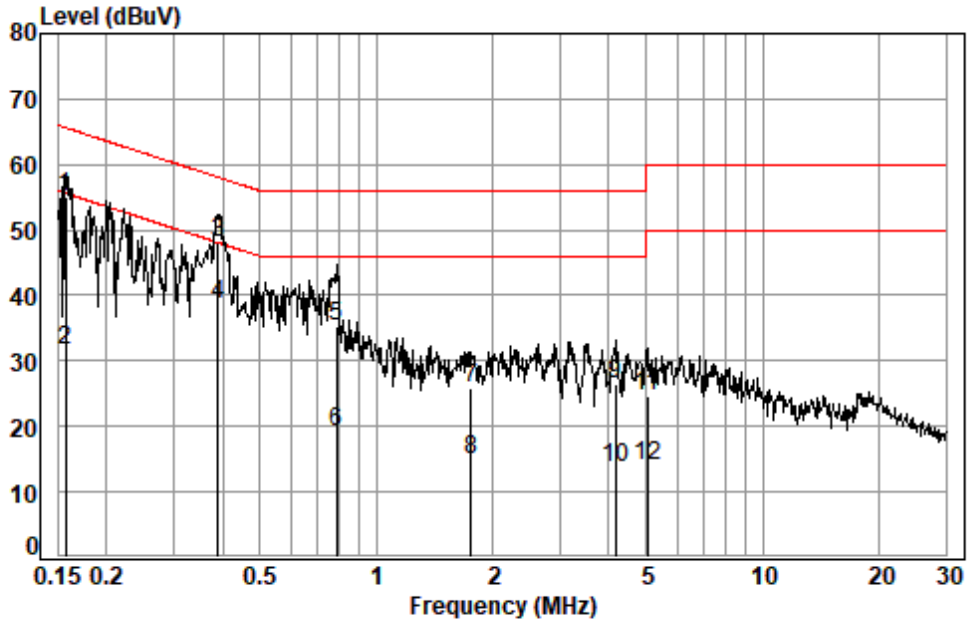
Test Mode: 00; Line: Neutral Line



Site : Shielding Room
Condition: Neutral
Job No. : 03862AT/03863AT
Test mode: 00

		Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
		MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1		0.1573	0.05	10.14	44.74	54.93	65.60	-10.67	QP
2		0.1573	0.05	10.14	21.43	31.62	55.60	-23.98	Average
3	*	0.3893	0.08	9.74	38.16	47.98	58.08	-10.10	QP
4	*	0.3893	0.08	9.74	28.82	38.64	48.08	-9.44	Average
5		0.7876	0.09	9.61	25.53	35.23	56.00	-20.77	QP
6		0.7876	0.09	9.61	9.40	19.10	46.00	-26.90	Average
7		1.7623	0.11	9.55	16.33	25.99	56.00	-30.01	QP
8		1.7623	0.11	9.55	5.15	14.81	46.00	-31.19	Average
9		4.1575	0.13	9.55	16.85	26.53	56.00	-29.47	QP
10		4.1575	0.13	9.55	4.01	13.69	46.00	-32.31	Average
11		5.0312	0.13	9.56	15.08	24.77	60.00	-35.23	QP
12		5.0312	0.13	9.56	4.38	14.07	50.00	-35.93	Average

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7.2 Radiated Emissions which fall in the restricted bands

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method: ANSI C63.10 (2020) Section 6.10.5
Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength(microvolts/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
Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.		

7.2.1 E.U.T. Operation

Operating Environment:
Temperature: 24.5 °C Humidity: 50.8 % RH Atmospheric Pressure: 1020 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.

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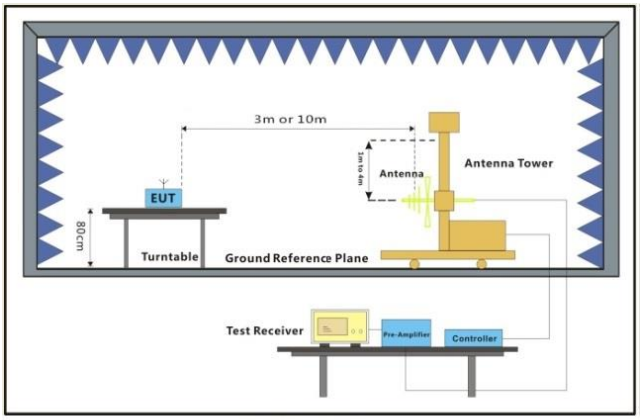
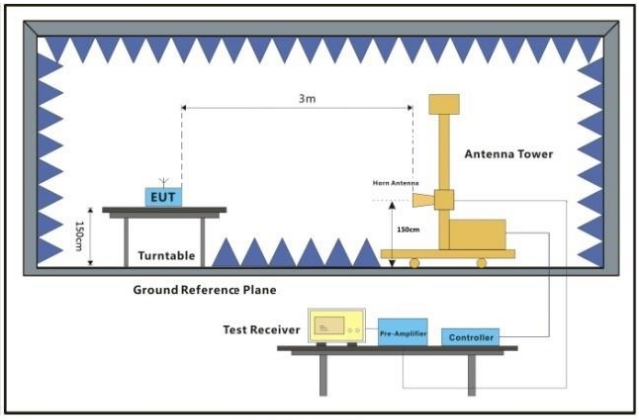
7.2.3 Test Setup Diagram



30MHz-1GHz



Above 1GHz

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7.2.4 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h. Test the EUT in the lowest channel, the middle channel, the Highest channel.

i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j. Repeat above procedures until all frequencies measured was complete.

Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

Remark 3: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for Peak detection (PK) and Average detection (AV) at frequency above 1GHz.

Remark 4:For fundamental and harmonic signal measurement, the resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geqslant$1/T (Duty cycle$<$98%) or 10Hz (Duty cycle$\geqslant$98%) for Average detection (AV) at frequency above 1GHz.

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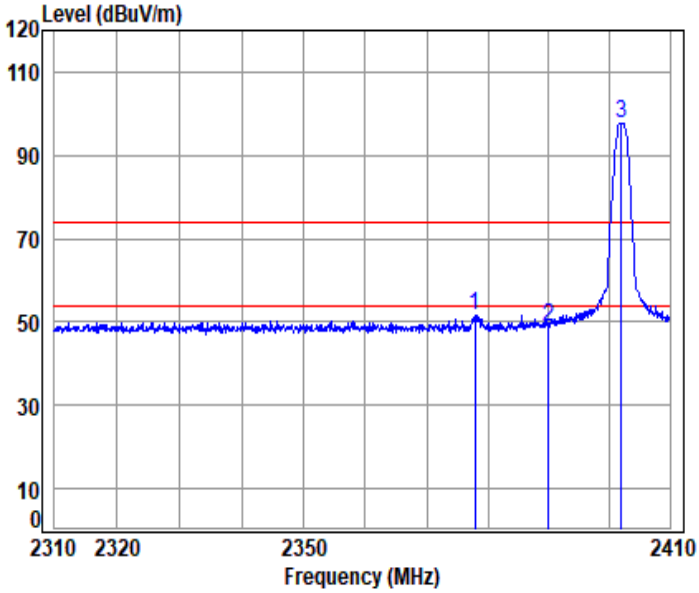
BLE_1M_TX_CH_00_Horizontal



Condition: 3m HORIZONTAL
Job No : 03862AT/03863AT
Mode : 2402 Band edge
: BLE 1M

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2377.840	6.82	27.41	30.69	48.09	51.63	74.00	-22.37	peak
2	2390.000	6.83	27.46	30.69	45.41	49.01	74.00	-24.99	peak
3 pp	2402.000	6.84	27.50	30.69	94.20	97.85	74.00	23.85	peak

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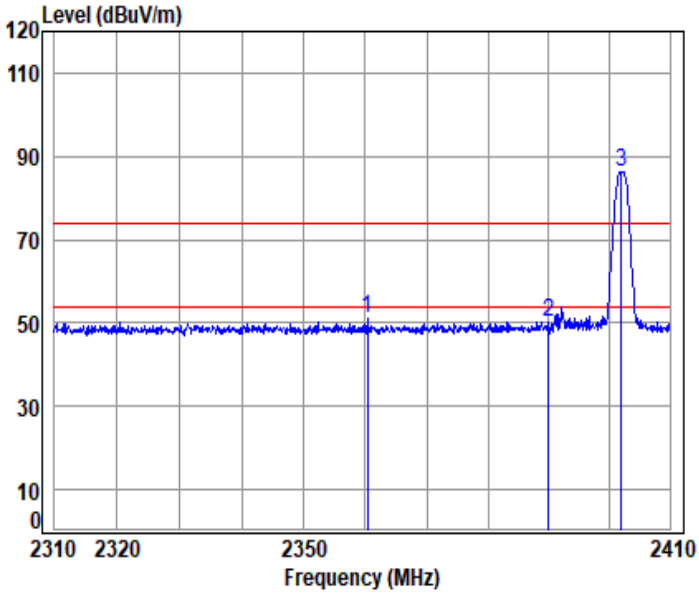
BLE_1M_TX_CH_00_Vertical



Condition: 3m VERTICAL
Job No : 03862AT/03863AT
Mode : 2402 Band edge
: BLE 1M

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2360.370	6.81	27.34	30.68	47.80	51.27	74.00	-22.73	peak
2	2390.000	6.83	27.46	30.69	46.40	50.00	74.00	-24.00	peak
3 pp	2402.000	6.84	27.50	30.69	82.53	86.18	74.00	12.18	peak

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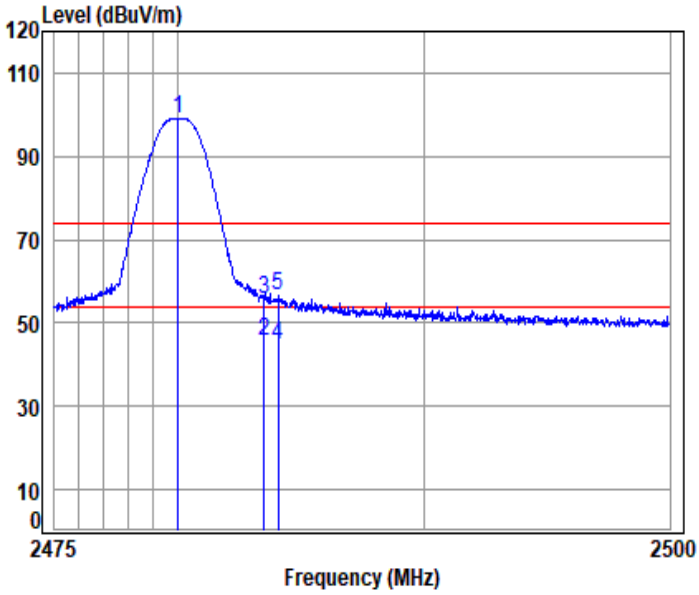
BLE_1M_TX_CH_39_Horizontal



Condition: 3m HORIZONTAL
Job No : 03862AT/03863AT
Mode : 2480 Band edge
: BLE 1M

		Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
		MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	pp	2480.000	7.38	27.78	30.71	94.59	99.04	74.00	25.04	peak
2	av	2483.500	7.40	27.80	30.71	41.31	45.80	54.00	-8.20	Average
3		2483.500	7.40	27.80	30.71	51.39	55.88	74.00	-18.12	peak
4		2484.071	7.40	27.80	30.71	40.11	44.60	54.00	-9.40	Average
5		2484.071	7.40	27.80	30.71	51.89	56.38	74.00	-17.62	peak

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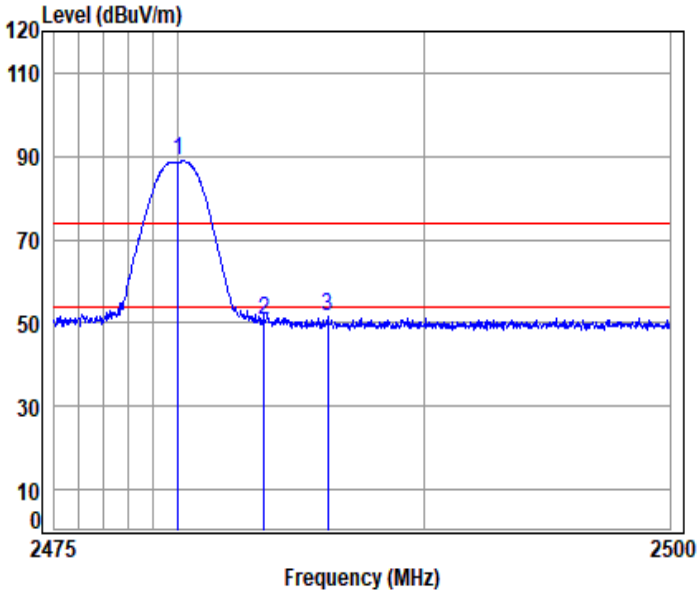
BLE_1M_TX_CH_39_Vertical



Condition: 3m VERTICAL
Job No : 03862AT/03863AT
Mode : 2480 Band edge
: BLE 1M

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 pp	2480.000	7.38	27.78	30.71	84.33	88.78	74.00	14.78	peak
2	2483.500	7.40	27.80	30.71	46.01	50.50	74.00	-23.50	peak
3	2486.069	7.42	27.82	30.71	46.90	51.43	74.00	-22.57	peak

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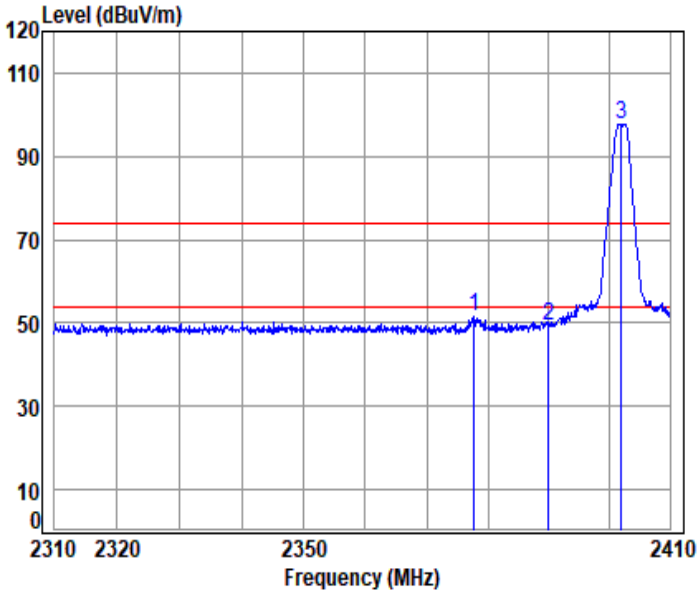

Condition: 3m HORIZONTAL
Job No : 03862AT/03863AT
Mode : 2402 Band edge
: BLE 2M

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2377.739	6.82	27.41	30.69	47.81	51.35	74.00	-22.65	peak
2	2390.000	6.83	27.46	30.69	45.82	49.42	74.00	-24.58	peak
3 pp	2402.000	6.84	27.50	30.69	94.00	97.65	74.00	23.65	peak

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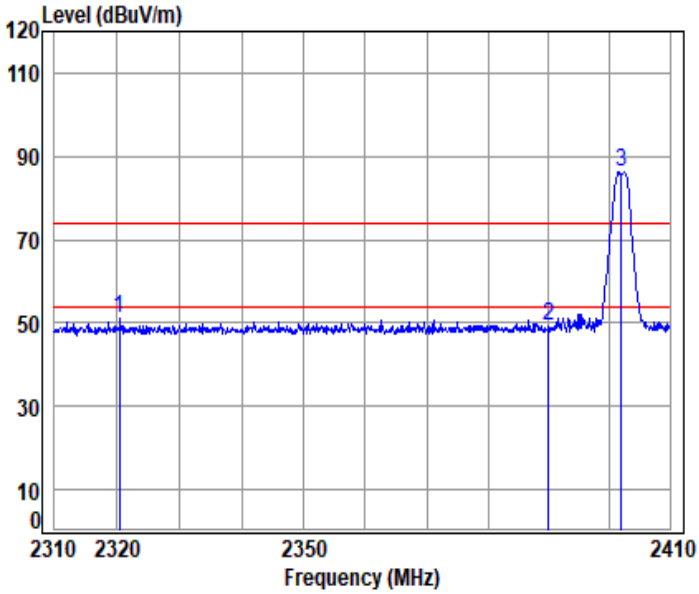
BLE_2M_TX_CH_00_Vertical



Condition: 3m VERTICAL
Job No : 03862AT/03863AT
Mode : 2402 Band edge
: BLE 2M

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2320.400	6.79	27.24	30.67	47.53	50.89	74.00	-23.11	peak
2	2390.000	6.83	27.46	30.69	45.62	49.22	74.00	-24.78	peak
3 pp	2402.000	6.84	27.50	30.69	82.58	86.23	74.00	12.23	peak

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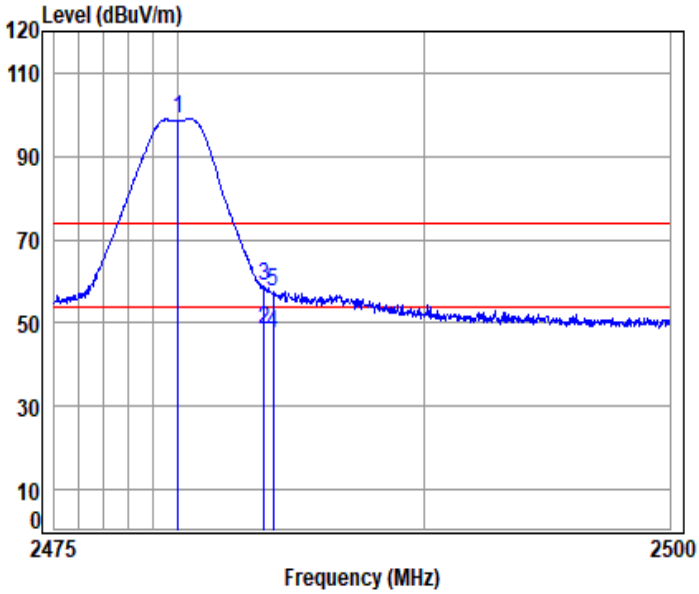
BLE_2M_TX_CH_39_Horizontal



Condition: 3m HORIZONTAL
Job No : 03862AT/03863AT
Mode : 2480 Band edge
: BLE 2M

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	pp 2480.000	7.38	27.78	30.71	94.52	98.97	74.00	24.97	peak
2	av 2483.500	7.40	27.80	30.71	43.94	48.43	54.00	-5.57	Average
3	2483.500	7.40	27.80	30.71	54.32	58.81	74.00	-15.19	peak
4	2483.846	7.40	27.80	30.71	42.79	47.28	54.00	-6.72	Average
5	2483.846	7.40	27.80	30.71	53.09	57.58	74.00	-16.42	peak

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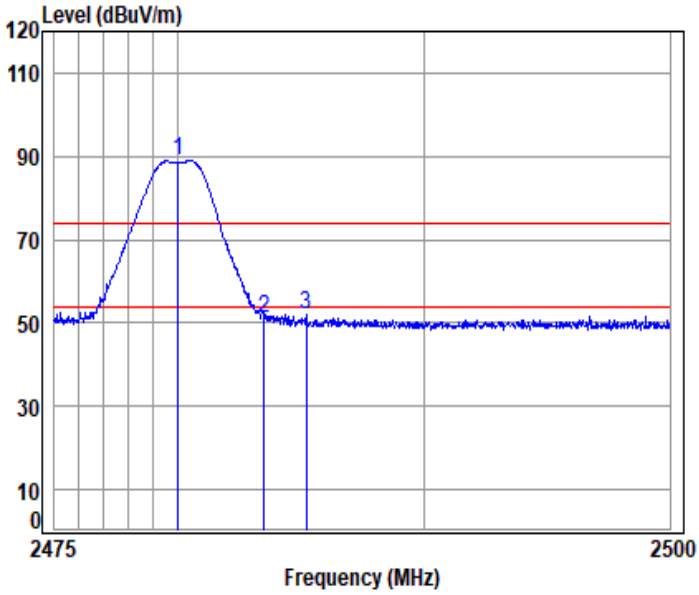
BLE_2M_TX_CH_39_Vertical



Condition: 3m VERTICAL
Job No : 03862AT/03863AT
Mode : 2480 Band edge
: BLE 2M

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 pp	2480.000	7.38	27.78	30.71	84.47	88.92	74.00	14.92	peak
2	2483.500	7.40	27.80	30.71	46.74	51.23	74.00	-22.77	peak
3	2485.195	7.41	27.81	30.71	47.61	52.12	74.00	-21.88	peak

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7.3 Radiated Spurious Emissions Below 1GHz

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2020) Section 6.4,6.5

Limit:

Frequency(MHz)	Field strength(microvolts/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
960-1000	500	3

7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 23.5 °C Humidity: 47.5 % RH Atmospheric Pressure: 1020 mbar

7.3.1 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Pre-scan	01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.

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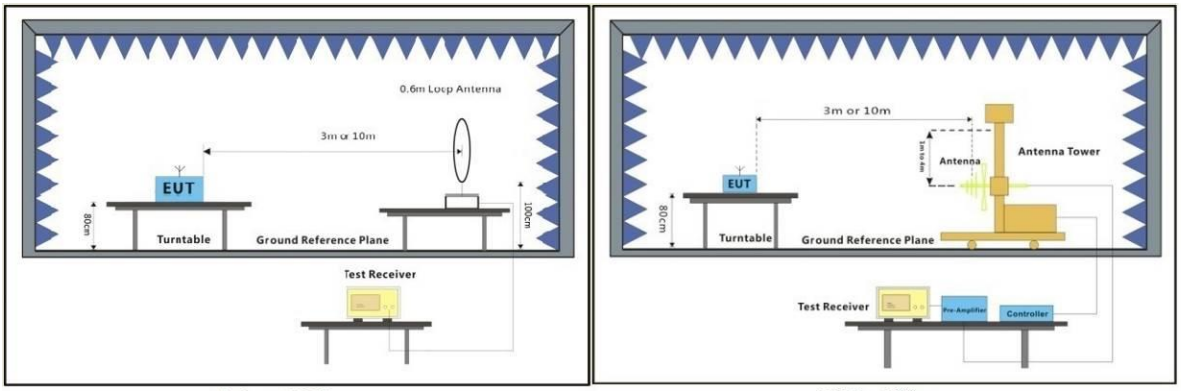
7.3.2 Test Setup Diagram



Below 30MHz　　30MHz-1GHz

7.3.3 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using quasi-peak method as specified and then reported in a data sheet.

g. Test the EUT in the lowest channel, the middle channel, the Highest channel.

h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

i. Repeat above procedures until all frequencies measured was complete.

Remark:

1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

2. Scan from 9kHz to 30MHz, the disturbance below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

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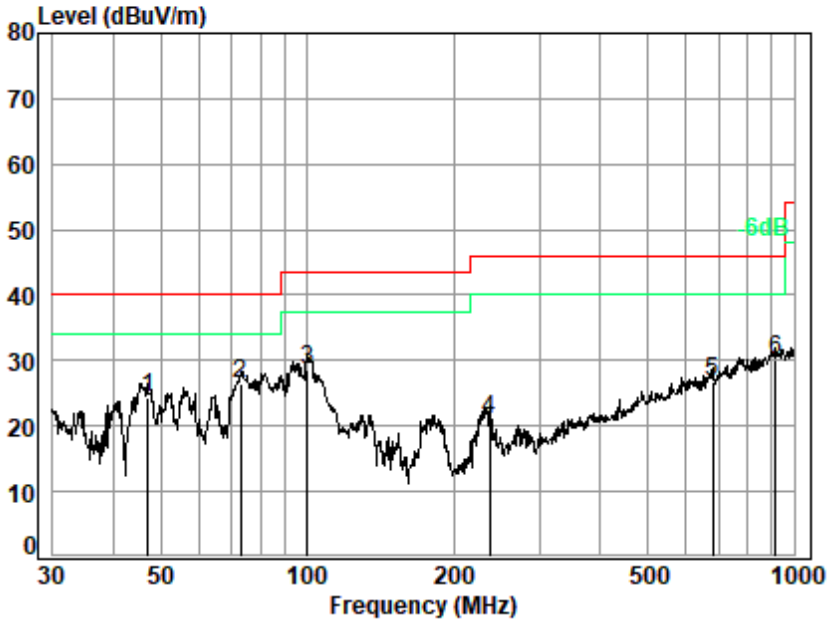
Test Mode: 00; Polarity: Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No. : 03862AT/03863AT
Test Mode: 00

	Freq	Ant Factor	Cable Loss	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB	
1	46.995	13.64	0.88	27.63	37.49	24.38	40.00	-15.62	QP
2 q	72.847	10.44	1.02	27.61	42.52	26.37	40.00	-13.63	QP
3	100.229	12.31	1.22	27.60	42.75	28.68	43.50	-14.82	QP
4	237.476	17.07	1.87	27.67	29.76	21.03	46.00	-24.97	QP
5	679.960	25.86	3.35	27.88	25.51	26.84	46.00	-19.16	QP
6	916.069	28.06	4.01	26.87	24.84	30.04	46.00	-15.96	QP

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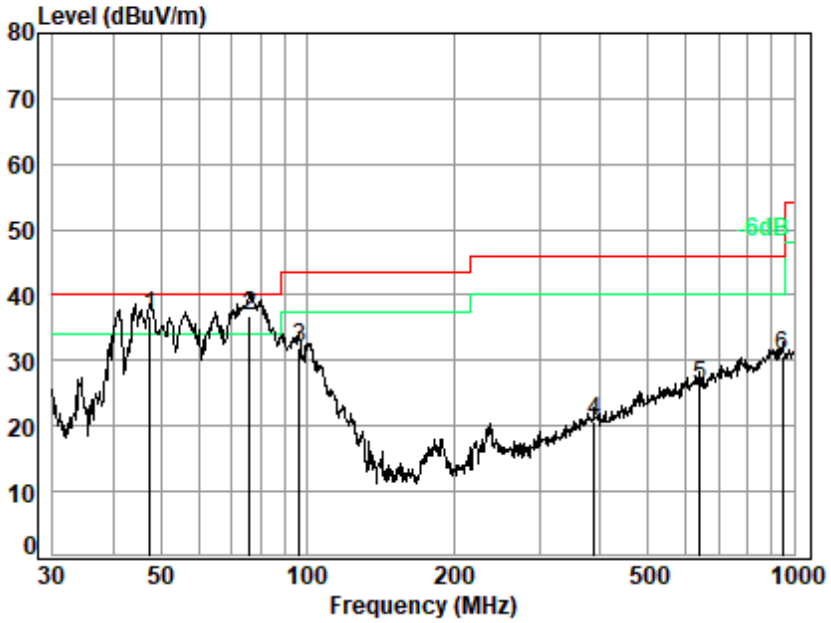
Test Mode: 00; Polarity: Vertical



Site : chamber
Condition: 3m VERTICAL
Job No. : 03862AT/03863AT
Test Mode: 00

	Freq	Ant Factor	Cable Loss	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB	
1	47.492	13.47	0.88	27.63	50.01	36.73	40.00	-3.27	QP
2 q	76.244	10.38	1.06	27.61	52.99	36.82	40.00	-3.18	QP
3	96.436	12.18	1.21	27.60	46.19	31.98	43.50	-11.52	QP
4	387.992	20.82	2.45	27.72	25.16	20.71	46.00	-25.29	QP
5	640.611	24.56	3.23	27.99	26.36	26.16	46.00	-19.84	QP
6	945.440	28.26	4.07	26.70	25.07	30.70	46.00	-15.30	QP

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7.4 Radiated Spurious Emissions Above 1GHz

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method: ANSI C63.10 (2020) Section 6.6
Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
Above 1000	500	3

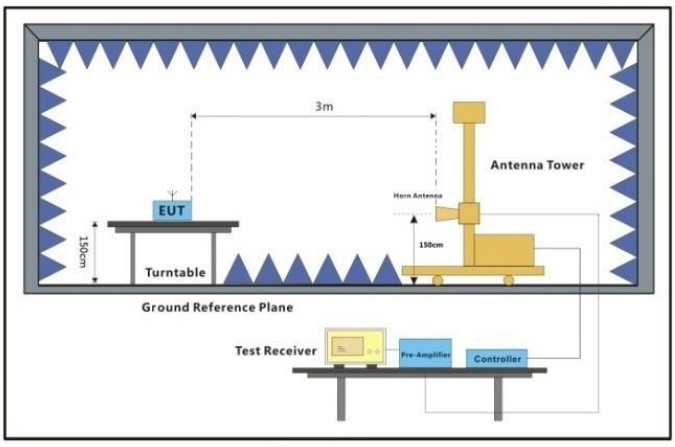
7.4.1 E.U.T. Operation

Operating Environment:
Temperature: 24.6 °C Humidity: 50.8 % RH Atmospheric Pressure: 1020 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.4.3 Test Setup Diagram



Above 1GHz

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7.4.4 Measurement Procedure and Data

a. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak or average method as specified and then reported in a data sheet.

g. Test the EUT in the lowest channel, the middle channel, the Highest channel.

h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

i. Repeat above procedures until all frequencies measured was complete.

Remark:

1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

2. Scan from 1GHz to 25GHz, the disturbance above 18GHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

3. As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

4: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for Peak detection (PK) and Average detection (AV) at frequency above 1GHz.

5:For fundamental and harmonic signal measurement, the resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ⩾1/T (Duty cycle＜98%) or 10Hz (Duty cycle⩾98%) for Average detection (AV) at frequency above 1GHz.

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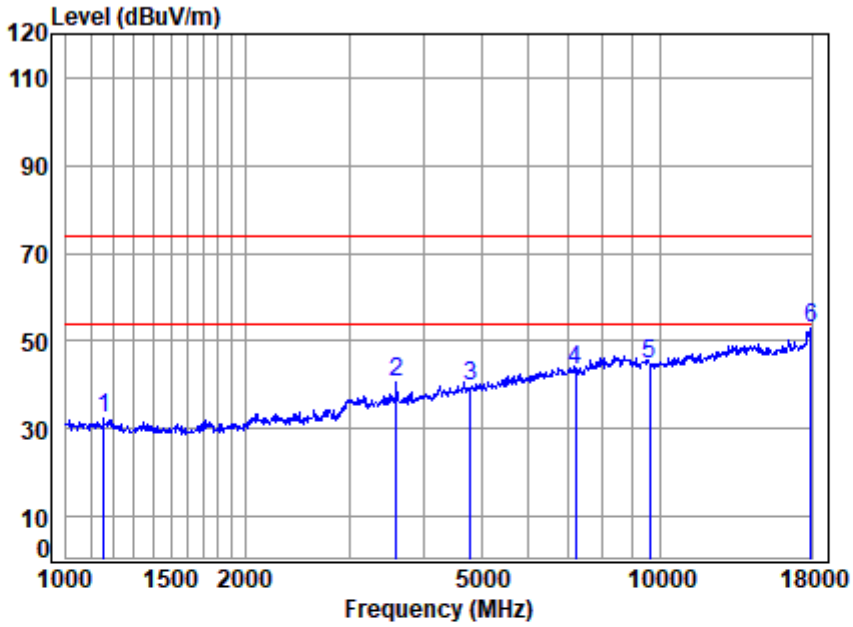
BLE_1M_TX_CH_00_Horizontal



Condition: 3m HORIZONTAL
Job No : 03862AT/03863AT
Mode : 2402 TX RSE
: BLE 1M

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1155.483	7.15	25.39	54.78	54.66	32.42	74.00	-41.58	peak
2	3598.203	7.76	29.90	54.96	57.84	40.54	74.00	-33.46	peak
3	4804.000	8.90	31.92	55.41	54.21	39.62	74.00	-34.38	peak
4	7206.000	11.10	36.60	56.73	52.45	43.42	74.00	-30.58	peak
5	9608.000	12.38	38.78	55.93	49.51	44.74	74.00	-29.26	peak
6	pp17948.050	18.75	43.44	54.20	44.73	52.72	74.00	-21.28	Peak

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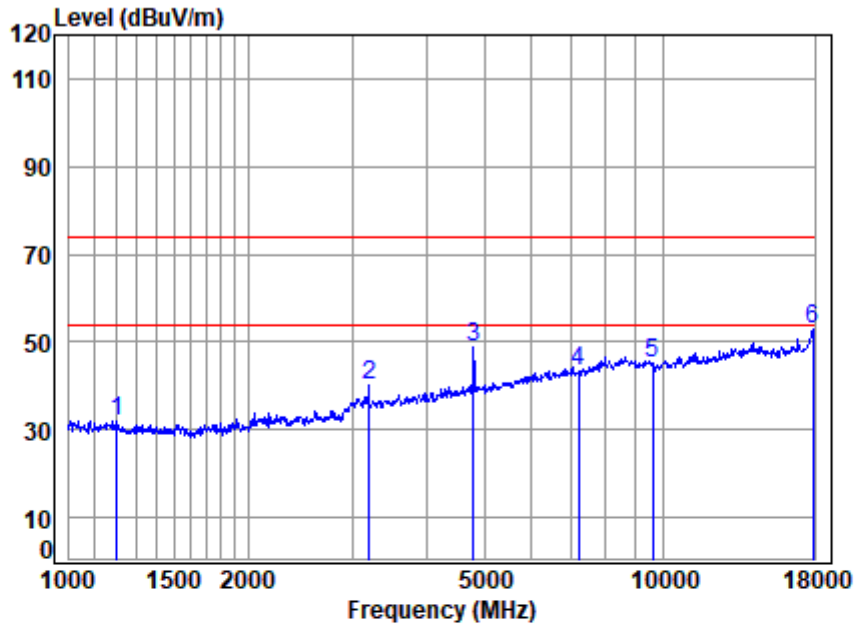
BLE_1M_TX_CH_00_Vertical



Condition: 3m VERTICAL
Job No : 03862AT/03863AT
Mode : 2402 TX RSE
: BLE 1M

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1203.199	7.19	25.30	54.77	54.27	31.99	74.00	-42.01	peak
2	3196.094	7.70	29.20	54.92	58.31	40.29	74.00	-33.71	peak
3	4804.000	8.90	31.92	55.41	63.27	48.68	74.00	-25.32	peak
4	7206.000	11.10	36.60	56.73	52.39	43.36	74.00	-30.64	peak
5	9608.000	12.38	38.78	55.93	49.91	45.14	74.00	-28.86	peak
6	pp17896.250	18.87	43.08	54.19	45.04	52.80	74.00	-21.20	Peak

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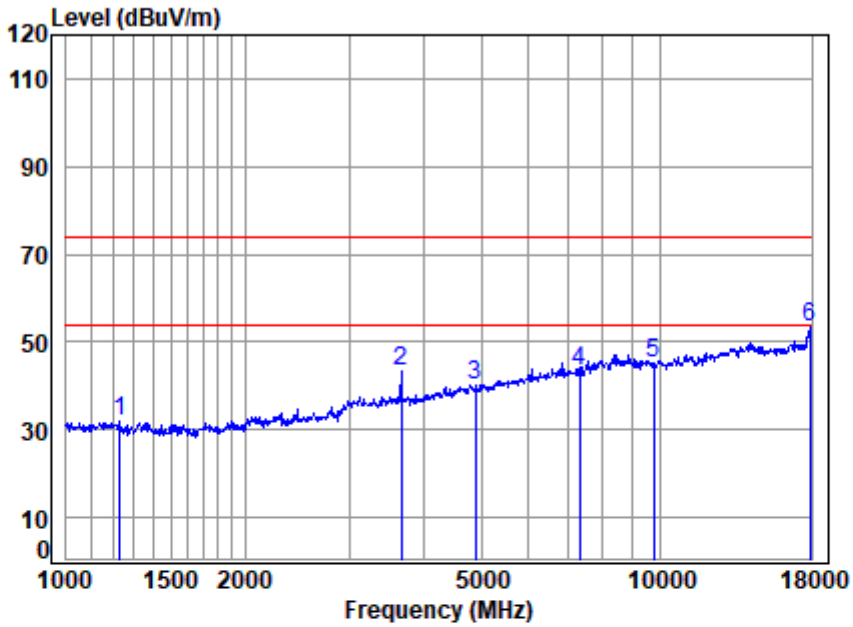
BLE_1M_TX_CH_19_Horizontal



Condition: 3m HORIZONTAL
Job No : 03862AT/03863AT
Mode : 2440 TX RSE
: BLE 1M

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1231.345	7.18	25.30	54.77	54.32	32.03	74.00	-41.97	peak
2	3661.149	7.84	29.80	54.97	60.69	43.36	74.00	-30.64	peak
3	4880.000	8.98	32.16	55.45	54.27	39.96	74.00	-34.04	peak
4	7320.000	11.12	36.74	56.70	52.41	43.57	74.00	-30.43	peak
5	9760.000	12.84	38.60	55.88	49.79	45.35	74.00	-28.65	peak
6	pp17896.250	18.87	43.08	54.19	45.47	53.23	74.00	-20.77	Peak

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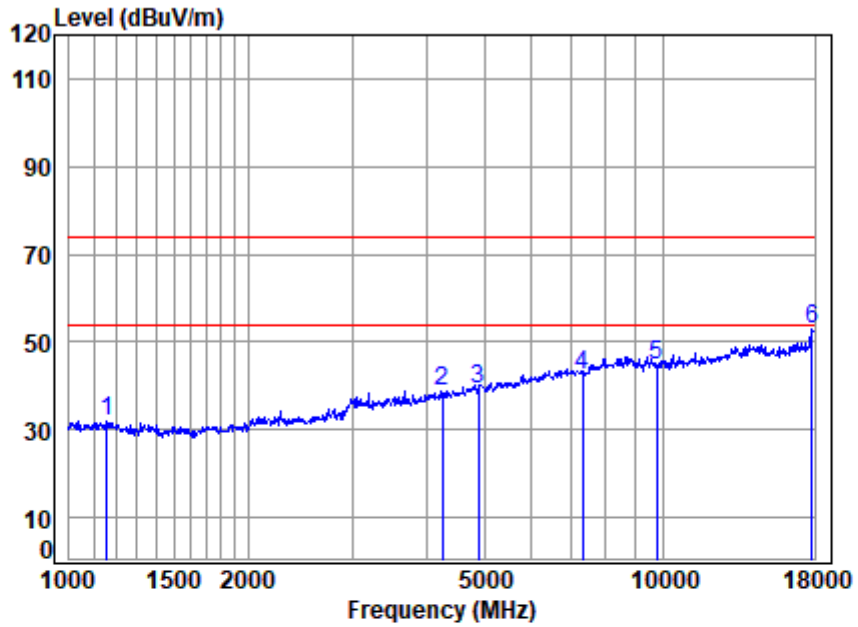

Condition: 3m VERTICAL
Job No : 03862AT/03863AT
Mode : 2440 TX RSE
: BLE 1M

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1155.483	7.15	25.39	54.78	53.95	31.71	74.00	-42.29	peak
2	4242.641	8.48	31.06	55.13	54.30	38.71	74.00	-35.29	peak
3	4880.000	8.98	32.16	55.45	53.67	39.36	74.00	-34.64	peak
4	7320.000	11.12	36.74	56.70	51.30	42.46	74.00	-31.54	peak
5	9760.000	12.84	38.60	55.88	49.06	44.62	74.00	-29.38	peak
6	pp17844.590	19.02	42.77	54.19	45.41	53.01	74.00	-20.99	Peak

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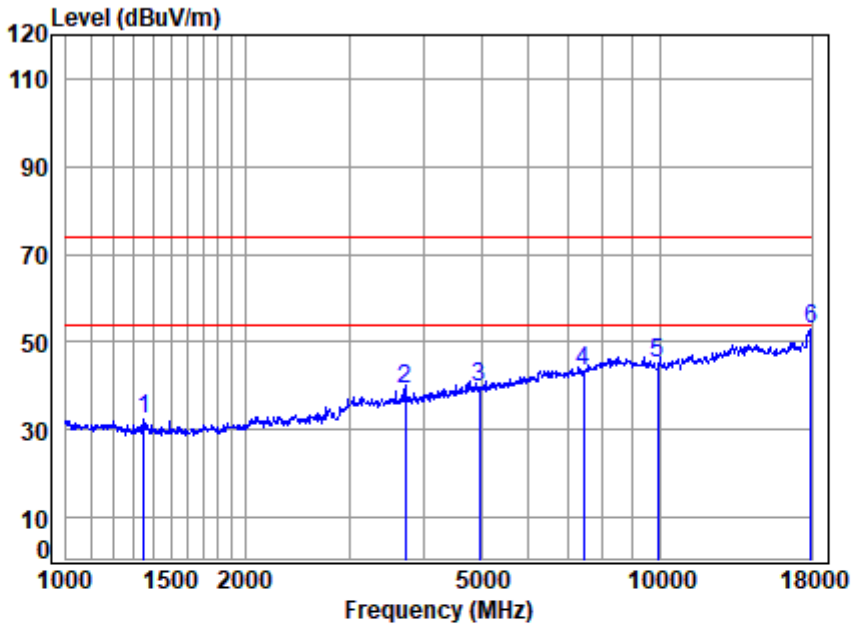
BLE_1M_TX_CH_39_Horizontal



Condition: 3m HORIZONTAL
Job No : 03862AT/03863AT
Mode : 2480 TX RSE
: BLE 1M

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1350.667	7.18	25.10	54.76	54.68	32.20	74.00	-41.80	peak
2	3725.195	7.92	29.85	54.98	56.46	39.25	74.00	-34.75	peak
3	4960.000	9.07	32.20	55.48	54.09	39.88	74.00	-34.12	peak
4	7440.000	11.08	36.78	56.66	52.18	43.38	74.00	-30.62	peak
5	9920.000	12.73	38.90	55.83	49.18	44.98	74.00	-29.02	peak
6	pp17948.050	18.75	43.44	54.20	44.83	52.82	74.00	-21.18	Peak

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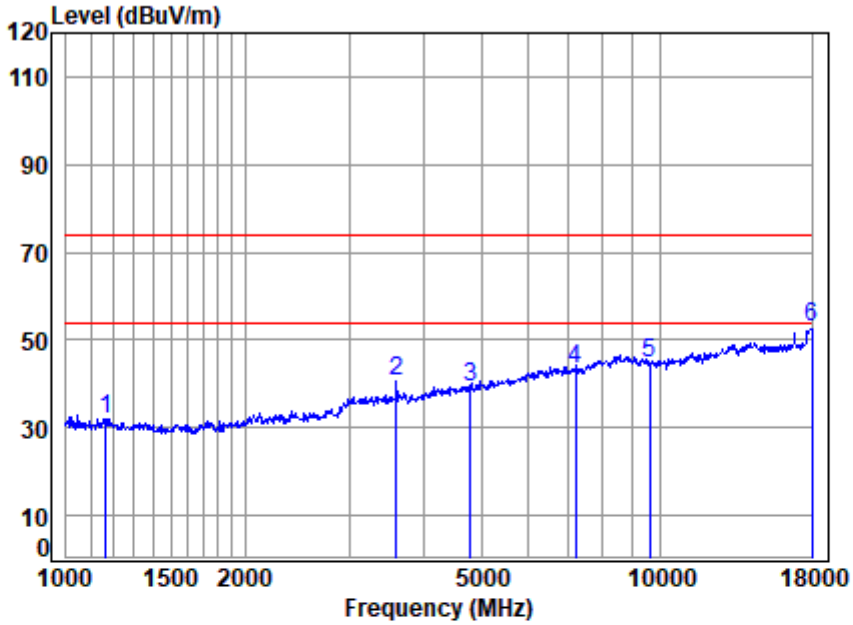
BLE_1M_TX_CH_39_Vertical



Condition: 3m HORIZONTAL
Job No : 03862AT/03863AT
Mode : 2402 TX RSE
: BLE 2M

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1165.546	7.16	25.37	54.78	54.32	32.07	74.00	-41.93	peak
2	3598.203	7.76	29.90	54.96	58.13	40.83	74.00	-33.17	peak
3	4804.000	8.90	31.92	55.41	53.90	39.31	74.00	-34.69	peak
4	7206.000	11.10	36.60	56.73	52.45	43.42	74.00	-30.58	peak
5	9608.000	12.38	38.78	55.93	49.64	44.87	74.00	-29.13	peak
6	pp18000.000	18.64	43.80	54.20	44.82	53.06	74.00	-20.94	Peak

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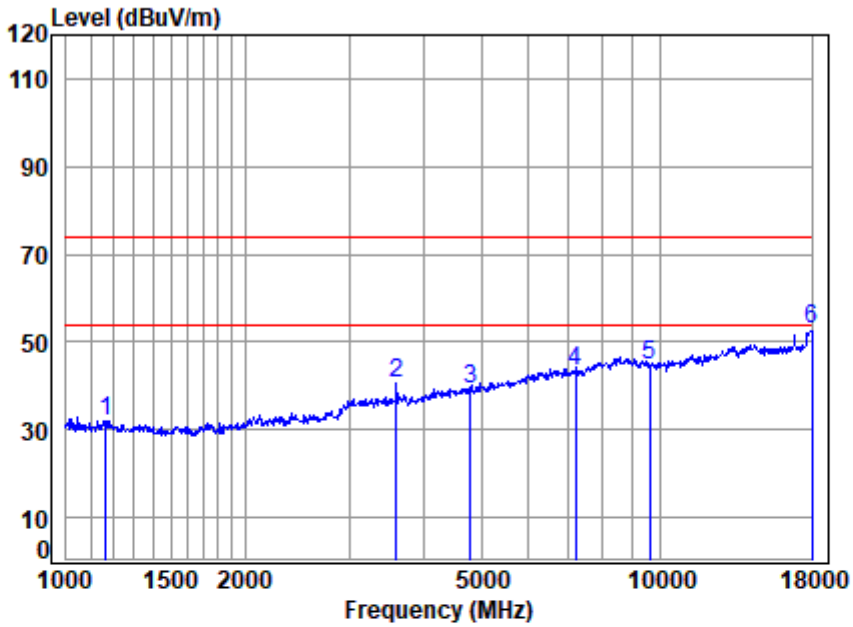
BLE_2M_TX_CH_00_Horizontal



Condition: 3m HORIZONTAL
Job No : 03862AT/03863AT
Mode : 2402 TX RSE
: BLE 2M

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1165.546	7.16	25.37	54.78	54.32	32.07	74.00	-41.93	peak
2	3598.203	7.76	29.90	54.96	58.13	40.83	74.00	-33.17	peak
3	4804.000	8.90	31.92	55.41	53.90	39.31	74.00	-34.69	peak
4	7206.000	11.10	36.60	56.73	52.45	43.42	74.00	-30.58	peak
5	9608.000	12.38	38.78	55.93	49.64	44.87	74.00	-29.13	peak
6	pp18000.000	18.64	43.80	54.20	44.82	53.06	74.00	-20.94	Peak

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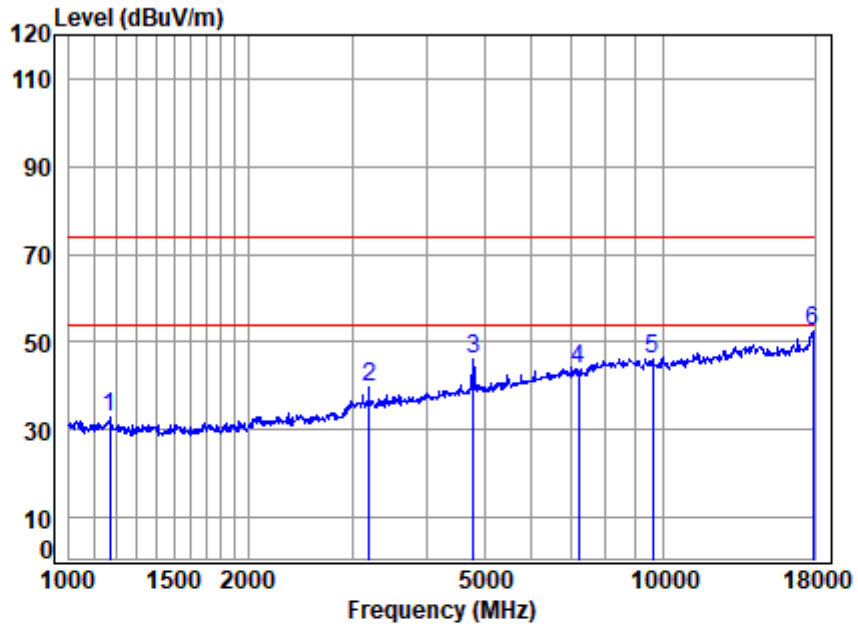
BLE_2M_TX_CH_00_Vertical



Condition: 3m VERTICAL
Job No : 03862AT/03863AT
Mode : 2402 TX RSE
: BLE 2M

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1168.920	7.16	25.36	54.78	54.94	32.68	74.00	-41.32	peak
2	3196.094	7.70	29.20	54.92	57.94	39.92	74.00	-34.08	peak
3	4804.000	8.90	31.92	55.41	60.83	46.24	74.00	-27.76	peak
4	7206.000	11.10	36.60	56.73	52.65	43.62	74.00	-30.38	peak
5	9608.000	12.38	38.78	55.93	50.97	46.20	74.00	-27.80	peak
6	pp17896.250	18.87	43.08	54.19	44.58	52.34	74.00	-21.66	Peak

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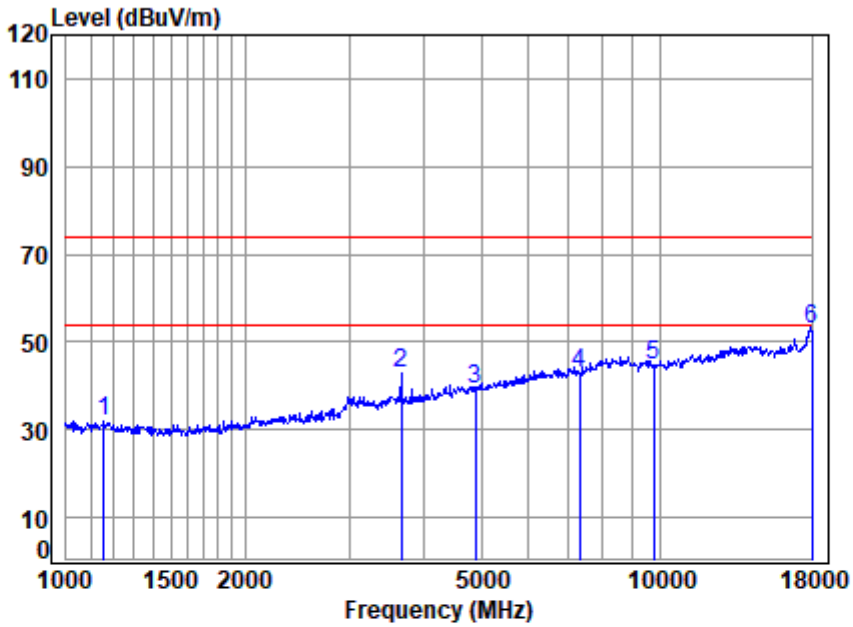
BLE_2M_TX_CH_19_Horizontal



Condition: 3m HORIZONTAL
Job No : 03862AT/03863AT
Mode : 2440 TX RSE
: BLE 2M

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1158.828	7.15	25.38	54.78	54.24	31.99	74.00	-42.01	peak
2	3661.149	7.84	29.80	54.97	60.06	42.73	74.00	-31.27	peak
3	4880.000	8.98	32.16	55.45	53.48	39.17	74.00	-34.83	peak
4	7320.000	11.12	36.74	56.70	51.92	43.08	74.00	-30.92	peak
5	9760.000	12.84	38.60	55.88	48.93	44.49	74.00	-29.51	peak
6	pp18000.000	18.64	43.80	54.20	44.89	53.13	74.00	-20.87	Peak

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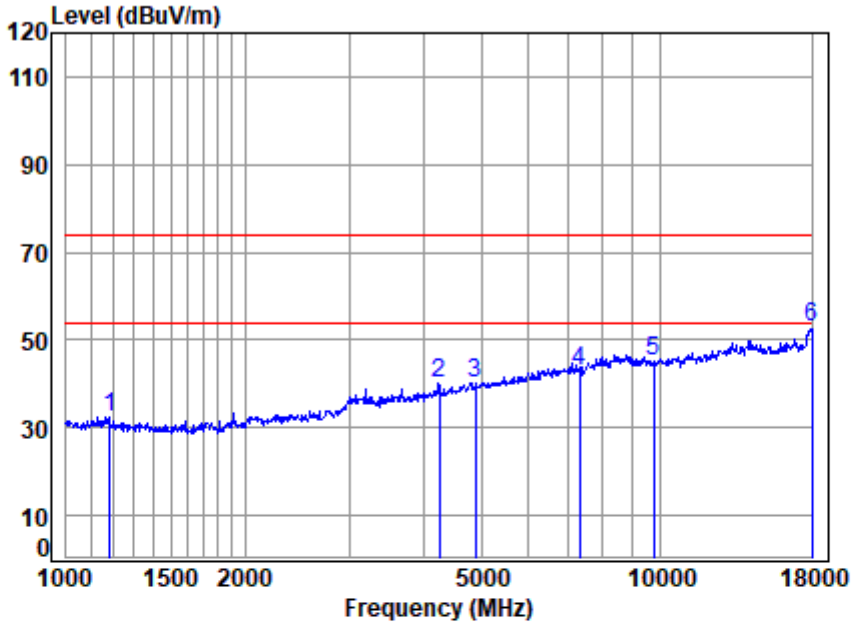

Condition: 3m VERTICAL
Job No : 03862AT/03863AT
Mode : 2440 TX RSE
: BLE 2M

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1182.513	7.17	25.33	54.78	54.81	32.53	74.00	-41.47	peak
2	4242.641	8.48	31.06	55.13	55.55	39.96	74.00	-34.04	peak
3	4880.000	8.98	32.16	55.45	54.36	40.05	74.00	-33.95	peak
4	7320.000	11.12	36.74	56.70	51.65	42.81	74.00	-31.19	peak
5	9760.000	12.84	38.60	55.88	49.57	45.13	74.00	-28.87	peak
6	pp18000.000	18.64	43.80	54.20	44.52	52.76	74.00	-21.24	Peak

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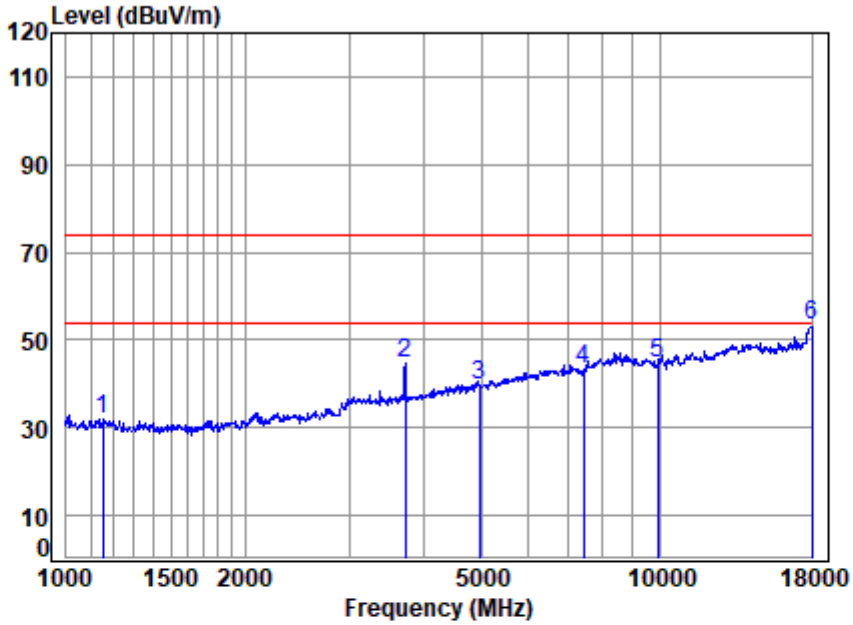
BLE_2M_TX_CH_39_Horizontal



Condition: 3m HORIZONTAL
Job No : 03862AT/03863AT
Mode : 2480 TX RSE
: BLE 2M

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1152.148	7.15	25.40	54.78	54.06	31.83	74.00	-42.17	peak
2	3725.195	7.92	29.85	54.98	61.98	44.77	74.00	-29.23	peak
3	4960.000	9.07	32.20	55.48	53.93	39.72	74.00	-34.28	peak
4	7440.000	11.08	36.78	56.66	52.23	43.43	74.00	-30.57	peak
5	9920.000	12.73	38.90	55.83	49.03	44.83	74.00	-29.17	peak
6	pp18000.000	18.64	43.80	54.20	45.00	53.24	74.00	-20.76	Peak

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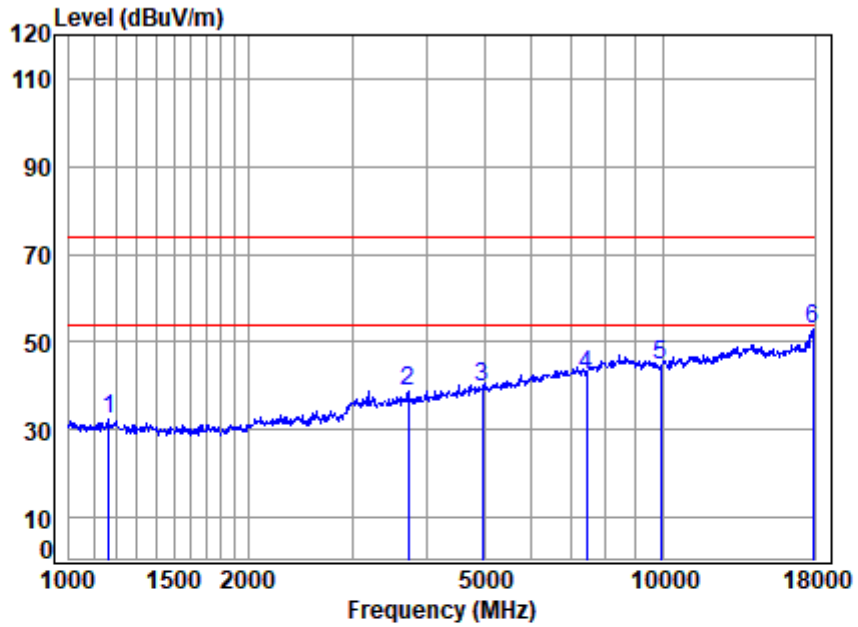
BLE_2M_TX_CH_39_Vertical



Condition: 3m VERTICAL
Job No : 03862AT/03863AT
Mode : 2480 TX RSE
: BLE 2M

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1165.546	7.16	25.37	54.78	54.48	32.23	74.00	-41.77	peak
2	3725.195	7.92	29.85	54.98	56.13	38.92	74.00	-35.08	peak
3	4960.000	9.07	32.20	55.48	53.86	39.65	74.00	-34.35	peak
4	7440.000	11.08	36.78	56.66	51.42	42.62	74.00	-31.38	peak
5	9920.000	12.73	38.90	55.83	49.09	44.89	74.00	-29.11	peak
6	pp17896.250	18.87	43.08	54.19	45.19	52.95	74.00	-21.05	Peak

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检验检测专用章 Inspection & Testing Services

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7.5 Conducted Peak Output Power

Test Requirement 47 CFR Part 15, Subpart C 15.247(b)(3)

Test Method: ANSI C63.10 (2020) Section 11.9.1

Limit:

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for ≥50 hopping channels
	0.25 for 25≤ hopping channels <50
	1 for digital modulation
2400-2483.5	1 for ≥75 non-overlapping hopping channels
	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850	1 for frequency hopping systems and digital modulation

7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 26.0 °C Humidity: 42.3 % RH Atmospheric Pressure: 1020 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.

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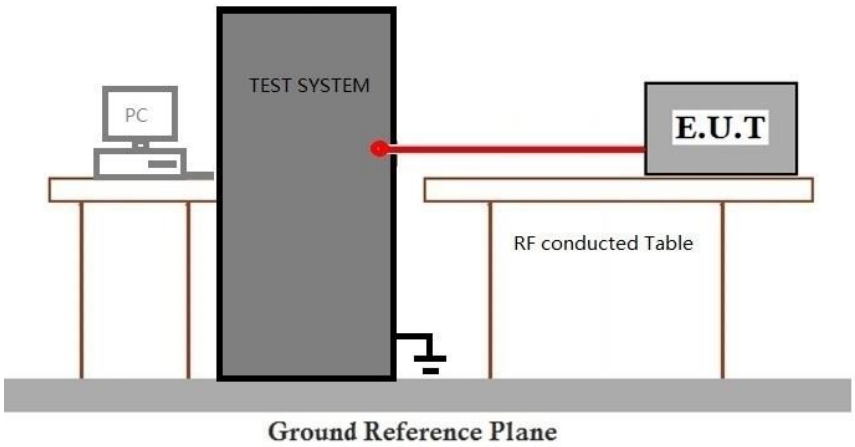
7.5.3 Test Setup Diagram



7.5.4 Measurement Procedure and Data

Note: Since the verify power the same operating range bandwidth and smaller power can be covered by the higher power.

Please Refer to Appendix for Details

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7.6 Minimum 6dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.247a(2)

Test Method: ANSI C63.10 (2020) Section 11.8.1

Limit:

≥500 kHz

7.6.1 E.U.T. Operation

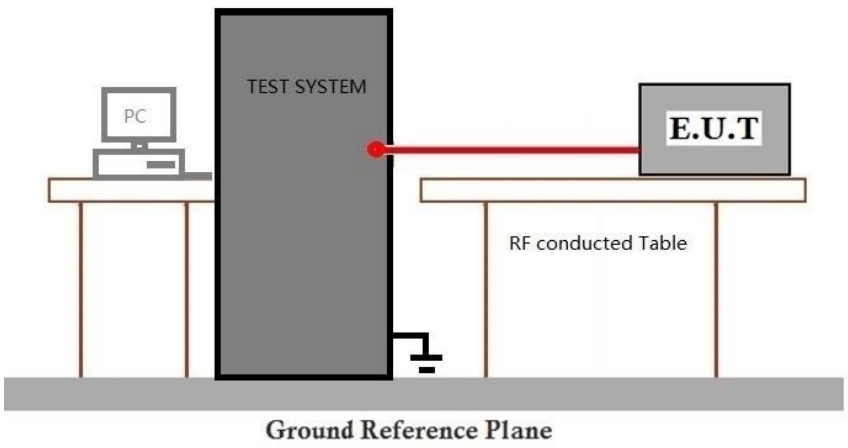
Operating Environment:

Temperature: 26.0 °C Humidity: 42.3 % RH Atmospheric Pressure: 1020 mbar

7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.6.3 Test Setup Diagram



7.6.4 Measurement Procedure and Data

Please Refer to Appendix for Details

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7.7 Power Spectrum Density

Test Requirement 47 CFR Part 15, Subpart C 15.247(e)

Test Method: ANSI C63.10 (2020) Section 11.10.2

Limit:

≤8dBm in any 3 kHz band during any time interval of continuous transmission

7.7.1 E.U.T. Operation

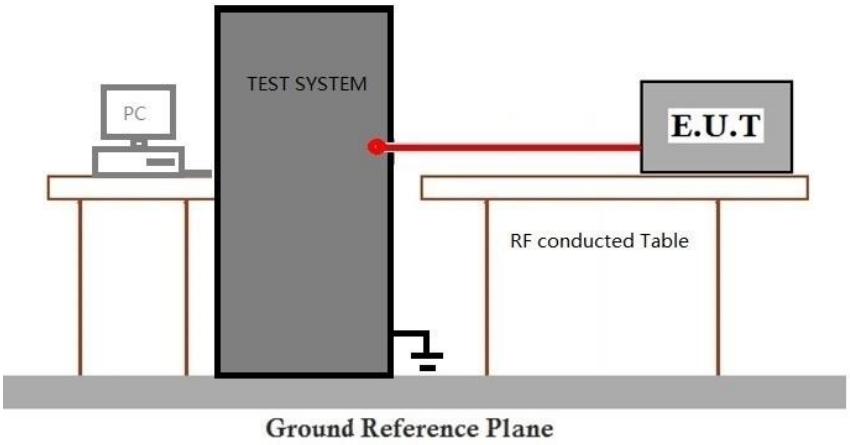
Operating Environment:

Temperature: 26.0 °C Humidity: 42.3 % RH Atmospheric Pressure: 1020 mbar

7.7.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.7.3 Test Setup Diagram



7.7.4 Measurement Procedure and Data

Please Refer to Appendix for Details

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7.8 Conducted Band Edges Measurement

Test Requirement 47 CFR Part 15, Subpart C 15.247(d)

Test Method: ANSI C63.10 (2020) Section 6.10.4

Limit:

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).

7.8.1 E.U.T. Operation

Operating Environment:

Temperature: 26.0 °C Humidity: 42.3 % RH Atmospheric Pressure: 1020 mbar

7.8.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.

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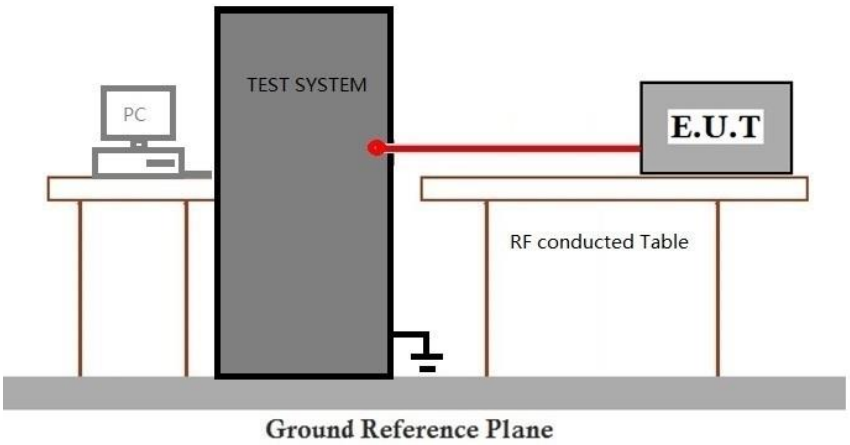
7.8.3 Test Setup Diagram



7.8.4 Measurement Procedure and Data

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7.9 Conducted Spurious Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.247(d)

Test Method: ANSI C63.10 (2020) Section 11.11

Limit:

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).

7.9.1 E.U.T. Operation

Operating Environment:

Temperature: 26.0 °C Humidity: 42.3 % RH Atmospheric Pressure: 1020 mbar

7.9.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.

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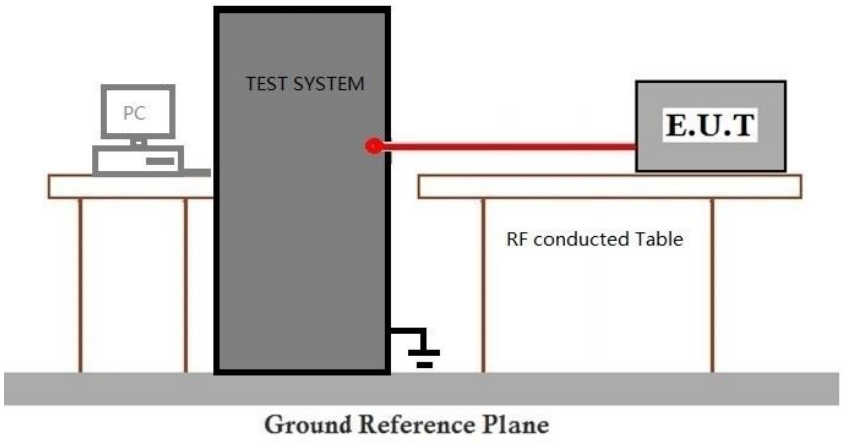
7.9.3 Test Setup Diagram



7.9.4 Measurement Procedure and Data

Please Refer to Appendix for Details

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8 Test Setup Photo

Refer to Appendix - Test Setup Photo for SZCR2509003862AT

9 EUT Constructional Details (EUT Photos)

Refer to Appendix - External and Internal Photos for SZCR2509003862AT

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10 Appendix

1. Duty Cycle

1.1 Test Result

1.1.1 Ant1

Ant1							
Mode	TX Type	Frequency (MHz)	T_on (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	Max. DC Variation (%)
1M	SISO	2402	0.381	1.550	24.58	6.09	0.03
		2440	0.381	1.549	24.60	6.09	0.05
		2480	0.381	1.550	24.58	6.09	0.03
2M	SISO	2402	0.194	0.925	20.97	6.78	0.03
		2440	0.194	0.925	20.97	6.78	0.03
		2480	0.196	0.925	21.19	6.74	0.03

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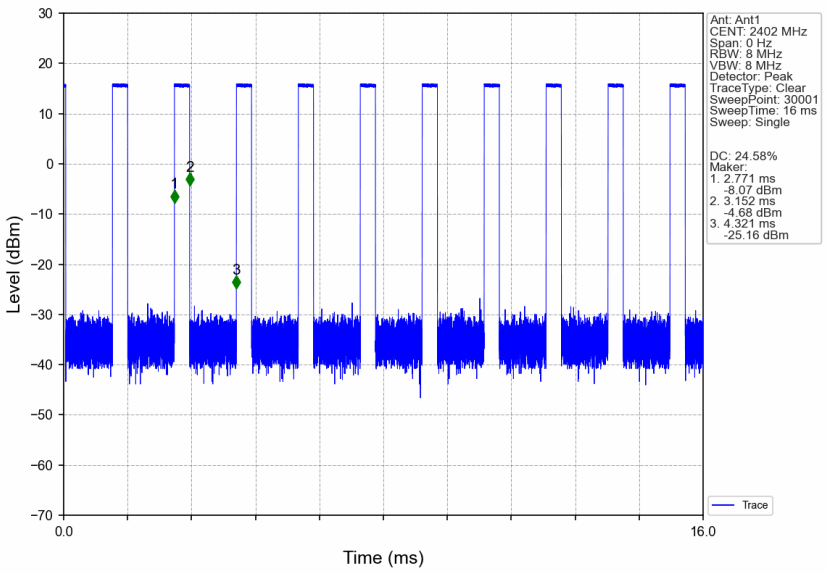
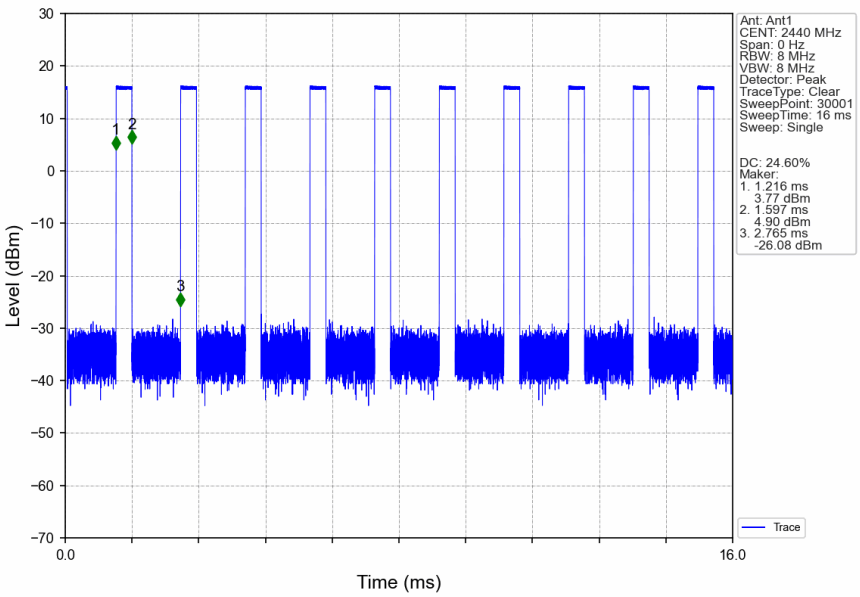
1.2 Test Graph

1.2.1 Ant1

1M_LCH_2402MHz_Ant1_NTNV



1M_MCH_2440MHz_Ant1_NTNV



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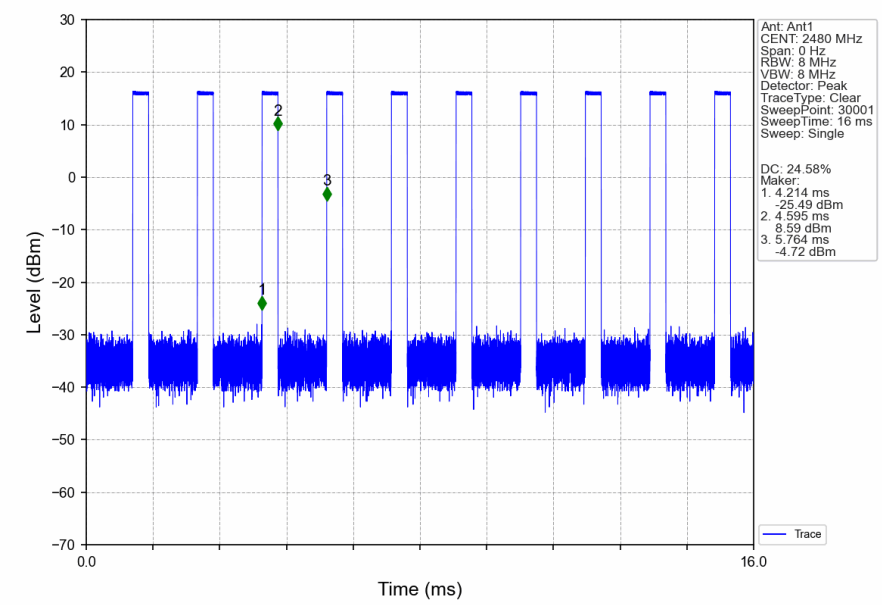
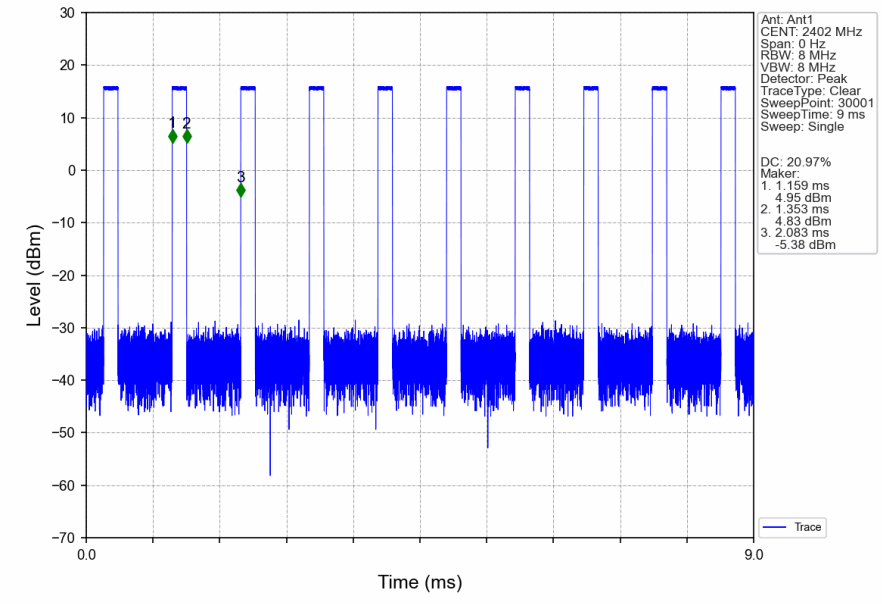
1M_HCH_2480MHz_Ant1_NTNV



2M_LCH_2402MHz_Ant1_NTNV



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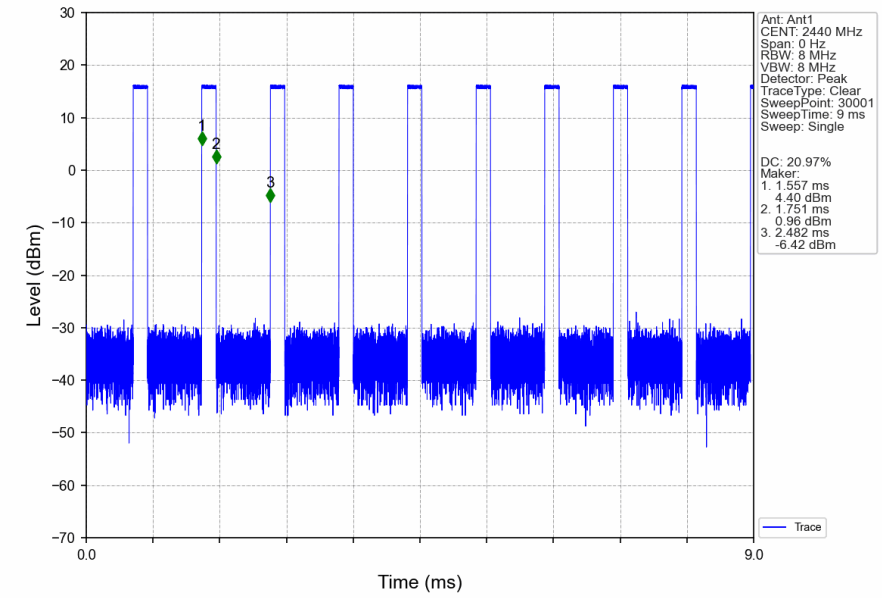
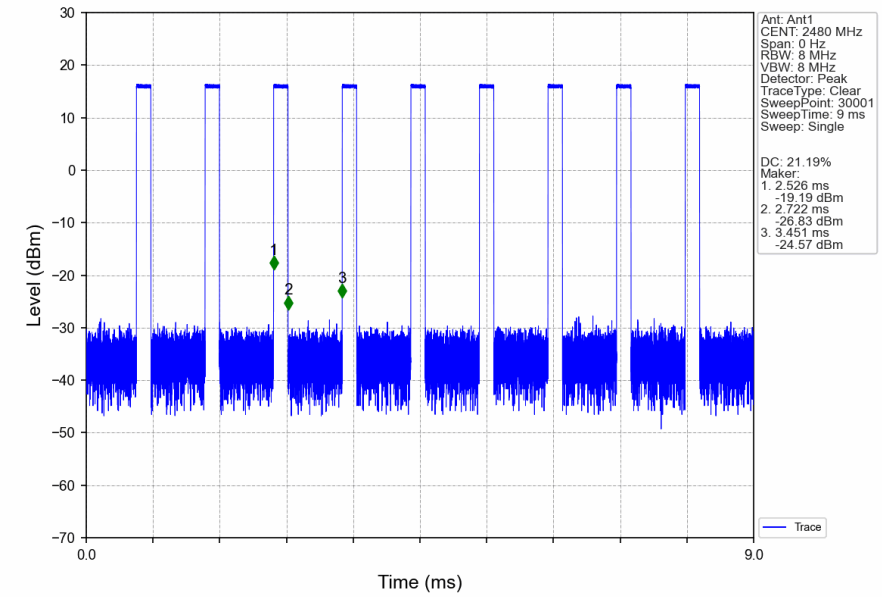
2M_MCH_2440MHz_Ant1_NTNV



2M_HCH_2480MHz_Ant1_NTNV



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2. Bandwidth

2.1 Test Result

2.1.1 OBW

Mode	TX Type	Frequency (MHz)	ANT	99% Occupied Bandwidth (MHz)		Verdict
				Result	Limit	
1M	SISO	2402	1	1.030	/	Pass
		2440	1	1.029	/	Pass
		2480	1	1.030	/	Pass
2M	SISO	2402	1	2.064	/	Pass
		2440	1	2.062	/	Pass
		2480	1	2.061	/	Pass

2.1.2 6dB BW

Mode	TX Type	Frequency (MHz)	ANT	6dB Bandwidth (MHz)		Verdict
				Result	Limit	
1M	SISO	2402	1	0.672	>=0.5	Pass
		2440	1	0.662	>=0.5	Pass
		2480	1	0.670	>=0.5	Pass
2M	SISO	2402	1	1.167	>=0.5	Pass
		2440	1	1.189	>=0.5	Pass
		2480	1	1.193	>=0.5	Pass

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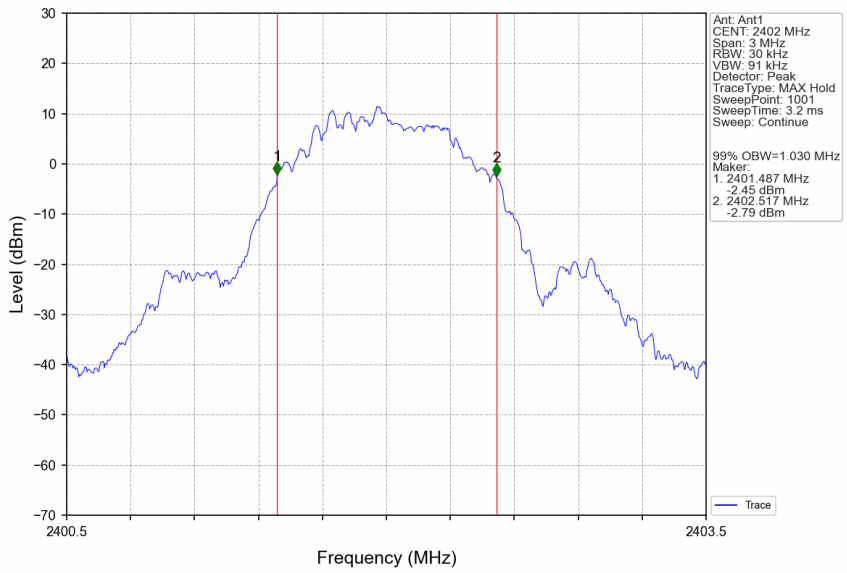
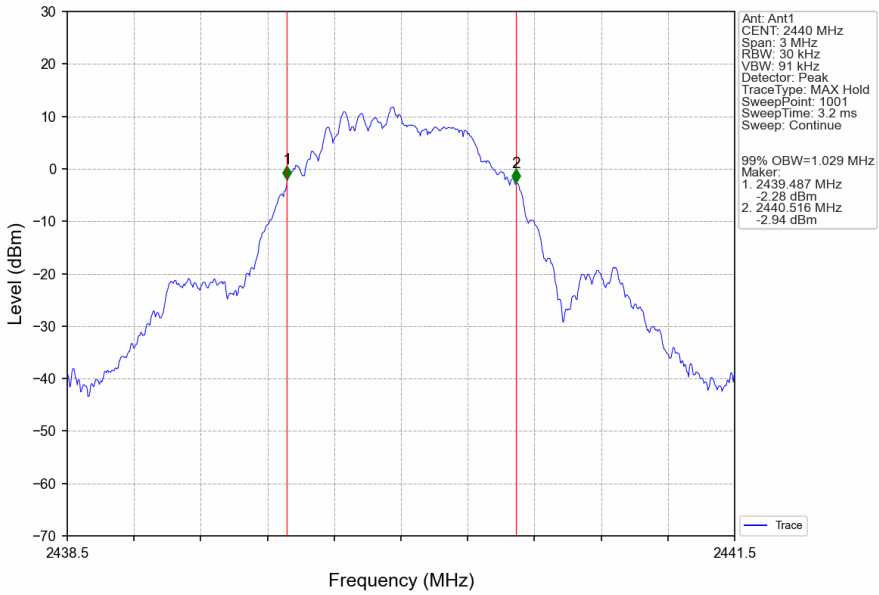
2.2 Test Graph

2.2.1 OBW

1M_LCH_2402MHz_Ant1_NTNV



1M_MCH_2440MHz_Ant1_NTNV



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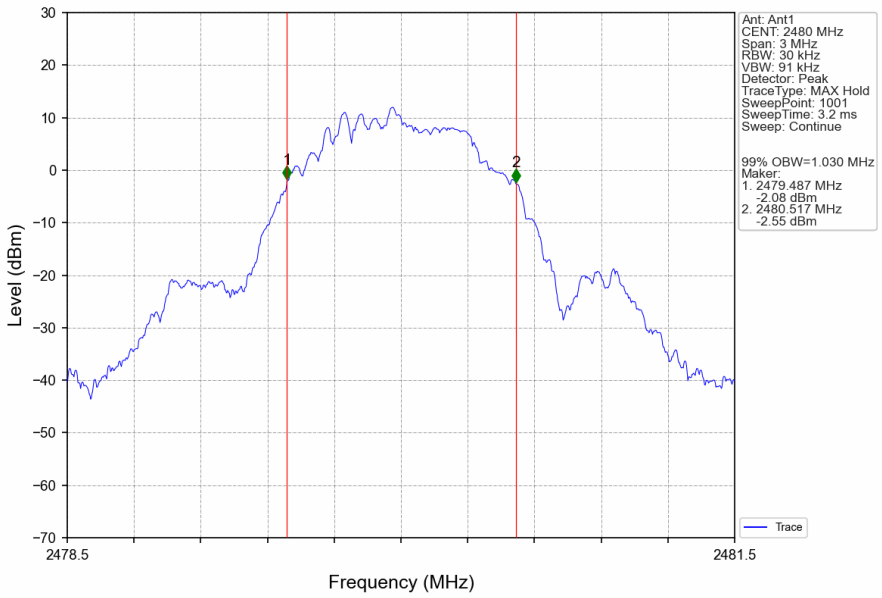
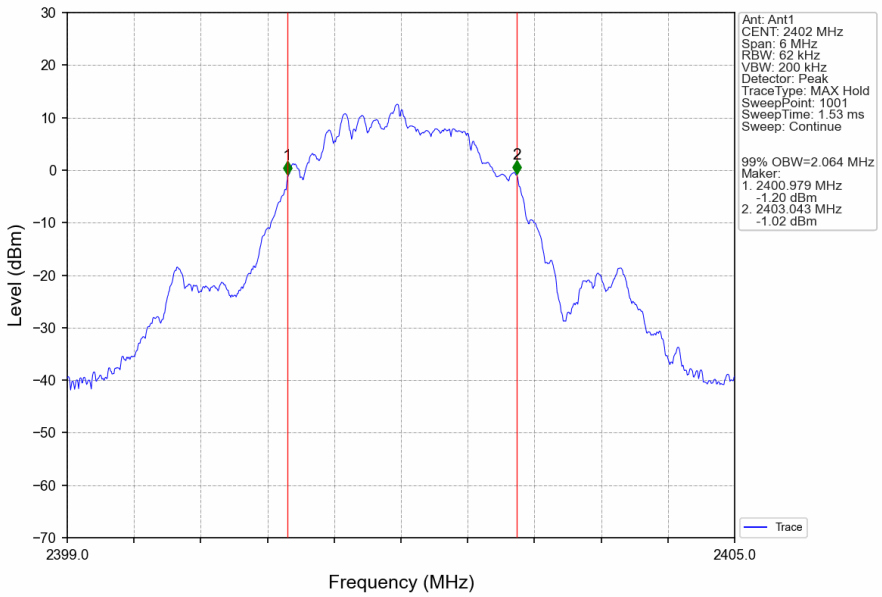
1M_HCH_2480MHz_Ant1_NTNV



2M_LCH_2402MHz_Ant1_NTNV



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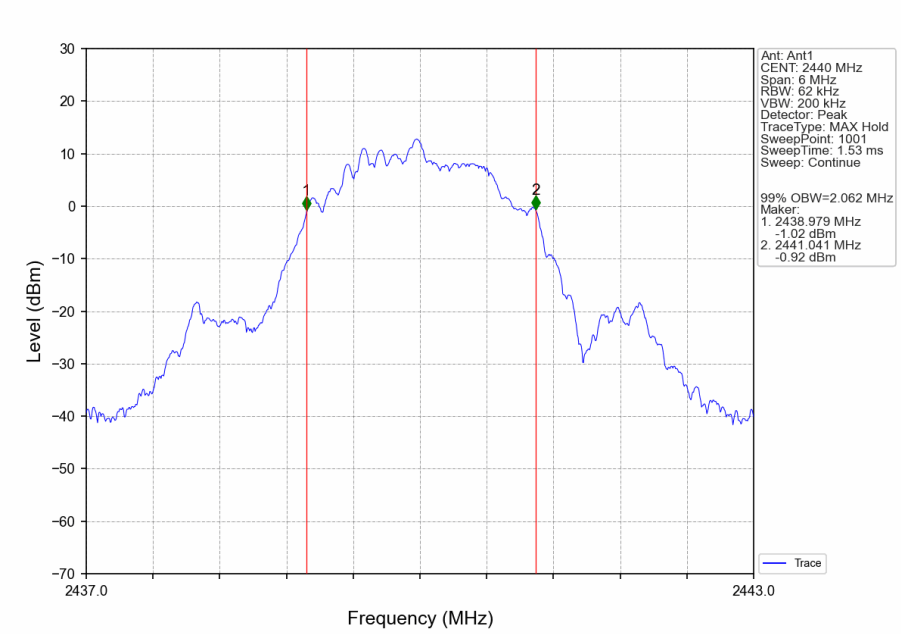
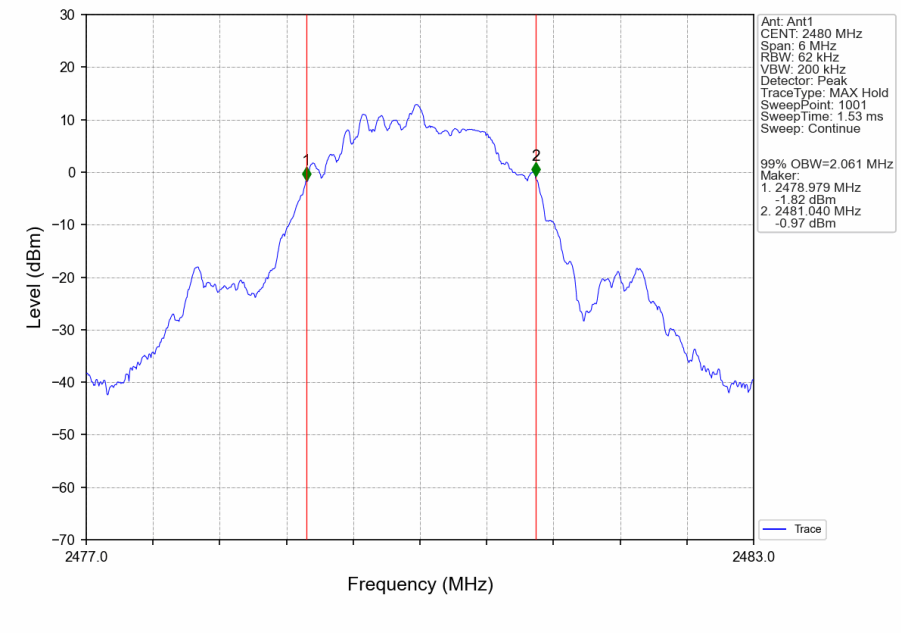
2M_MCH_2440MHz_Ant1_NTNV



2M_HCH_2480MHz_Ant1_NTNV



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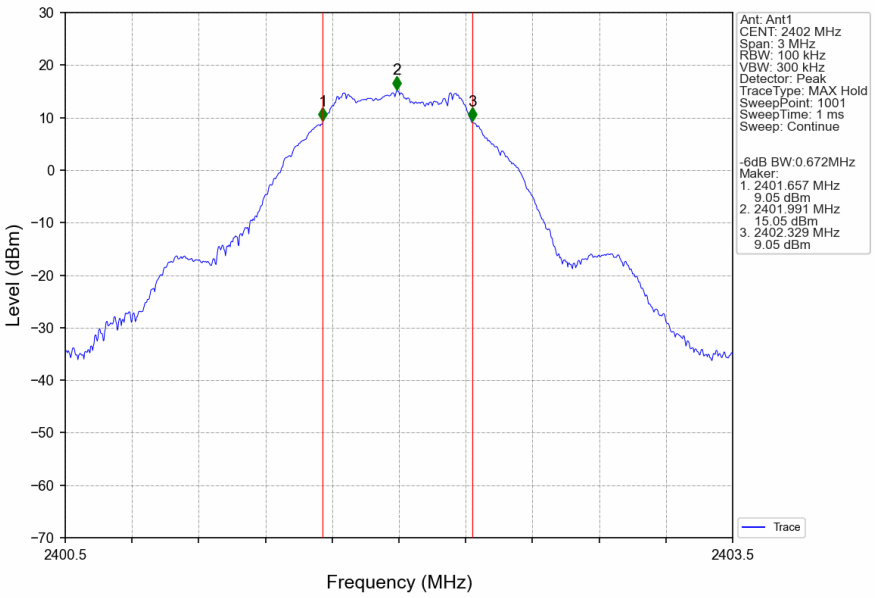
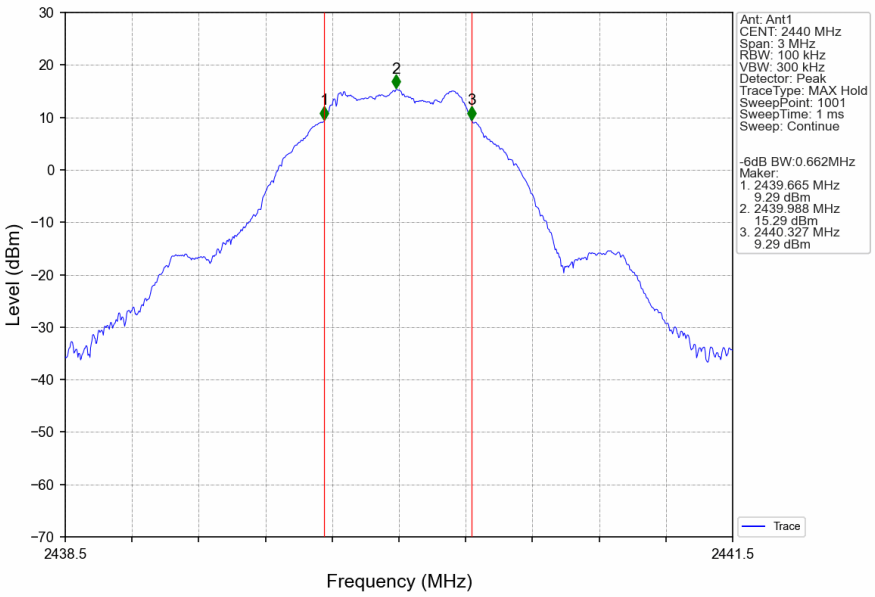
2.2.2 6dB BW

1M_LCH_2402MHz_Ant1_NTNV



1M_MCH_2440MHz_Ant1_NTNV



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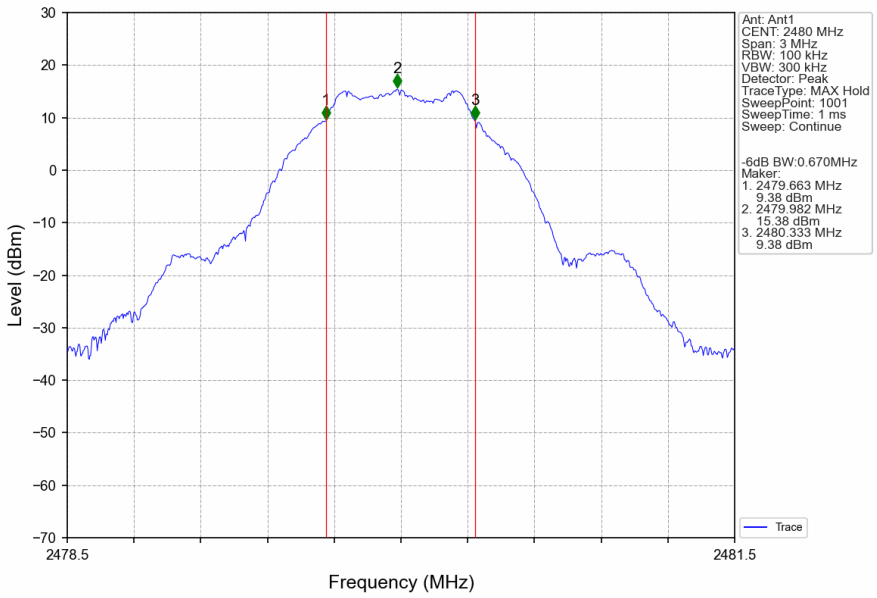
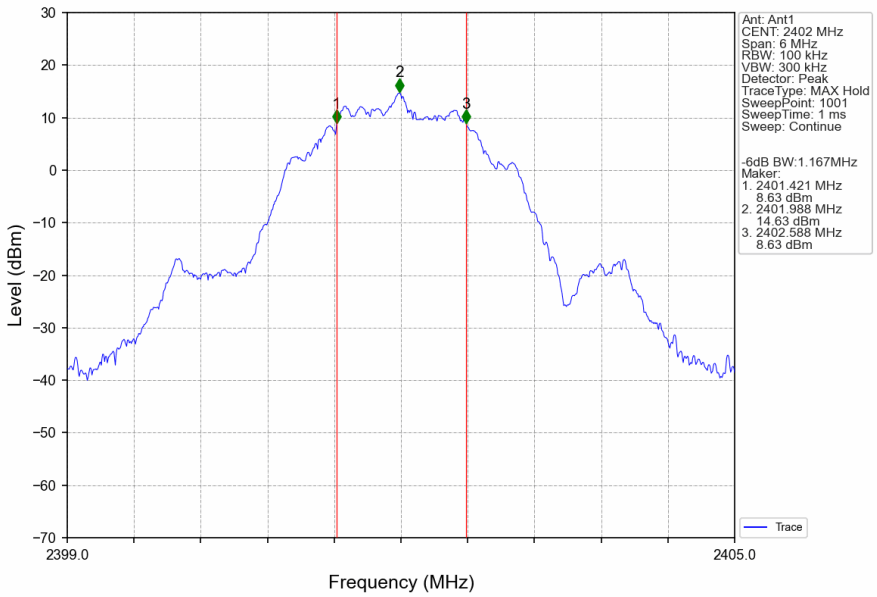
1M_HCH_2480MHz_Ant1_NTNV



2M_LCH_2402MHz_Ant1_NTNV



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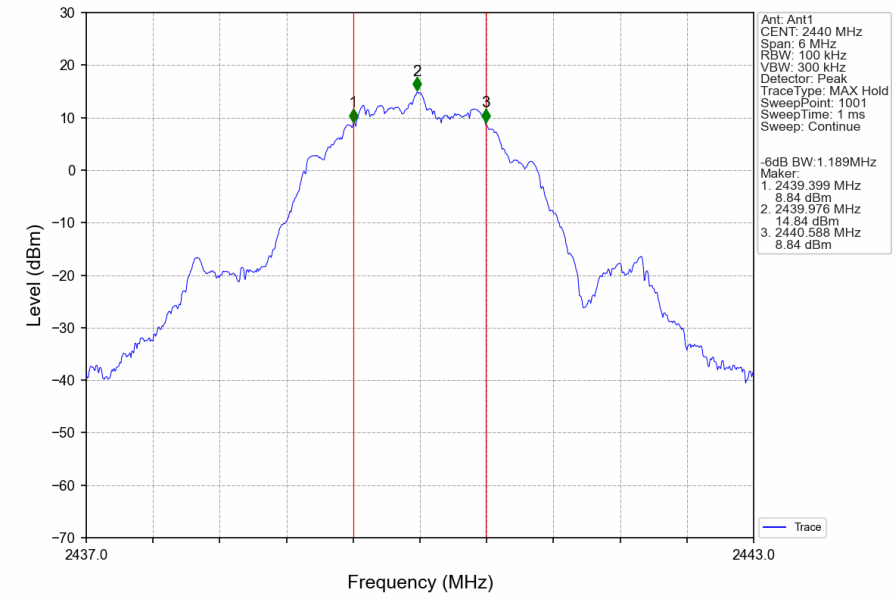
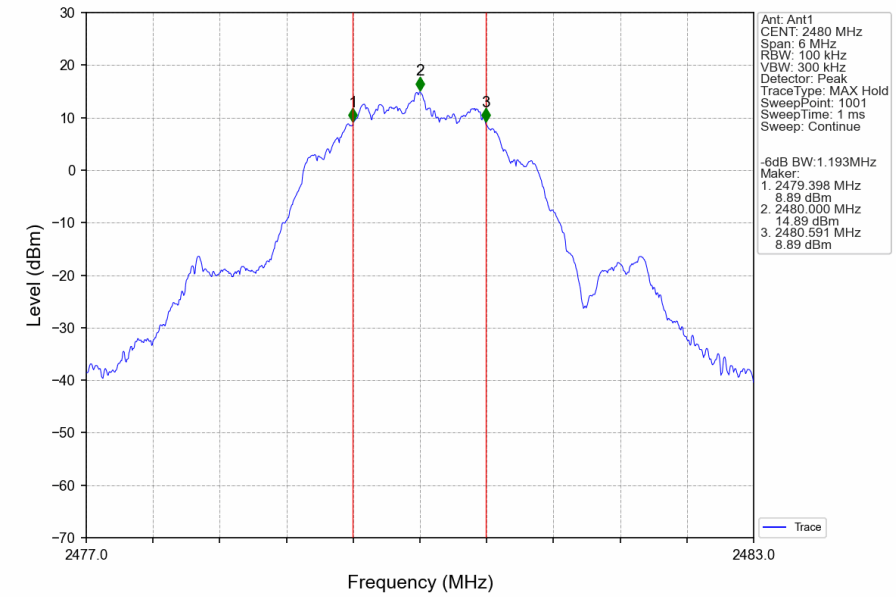
2M_MCH_2440MHz_Ant1_NTNV



2M_HCH_2480MHz_Ant1_NTNV



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3. Maximum Conducted Output Power

3.1 Test Result

3.1.1 Power

Mode	TX Type	Frequency (MHz)	Maximum Peak Conducted Output Power (dBm)		Verdict
			ANT1	Limit	
1M	SISO	2402	15.84	<=30	Pass
		2440	16.08	<=30	Pass
		2480	16.22	<=30	Pass
2M	SISO	2402	15.86	<=30	Pass
		2440	16.13	<=30	Pass
		2480	16.24	<=30	Pass
Note1: Antenna Gain: Ant1: 2.82dBi;					

4. Maximum Power Spectral Density

4.1 Test Result

4.1.1 PSD

Mode	TX Type	Frequency (MHz)	Maximum PSD (dBm/3kHz)		Verdict
			ANT1	Limit	
1M	SISO	2402	0.53	<=8	Pass
		2440	0.76	<=8	Pass
		2480	0.90	<=8	Pass
2M	SISO	2402	-1.48	<=8	Pass
		2440	-1.31	<=8	Pass
		2480	-1.13	<=8	Pass
Note1: Antenna Gain: Ant1: 2.82dBi;					

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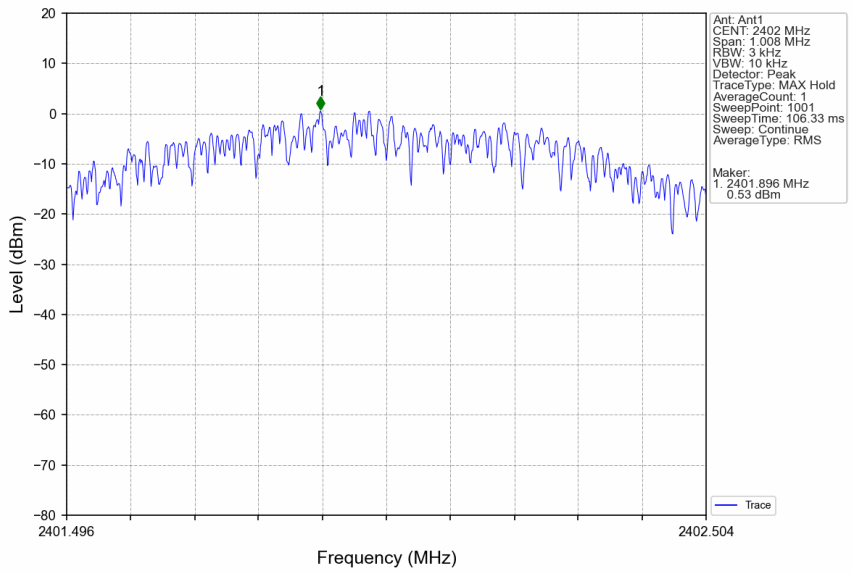
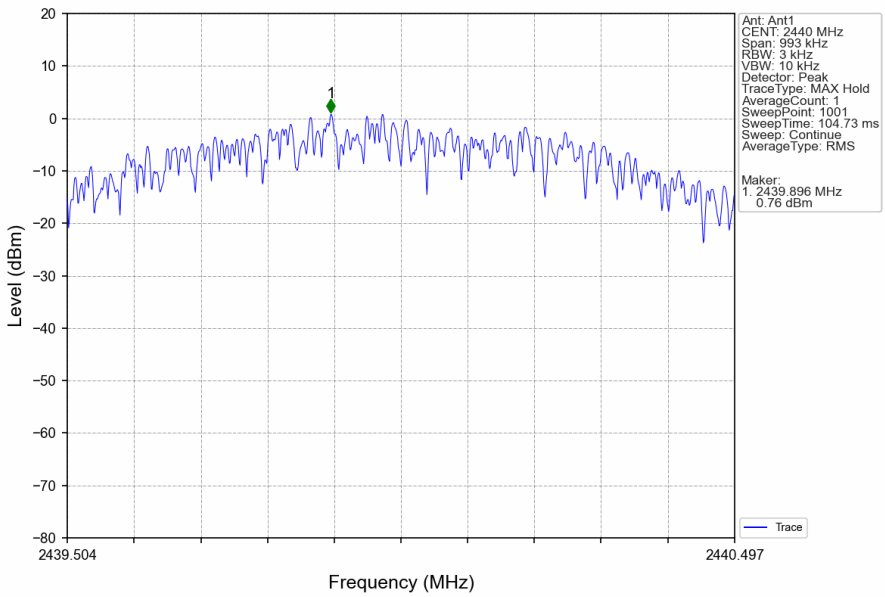
4.2 Test Graph

4.2.1 PSD

1M_LCH_2402MHz_Ant1_NTNV



1M_MCH_2440MHz_Ant1_NTNV



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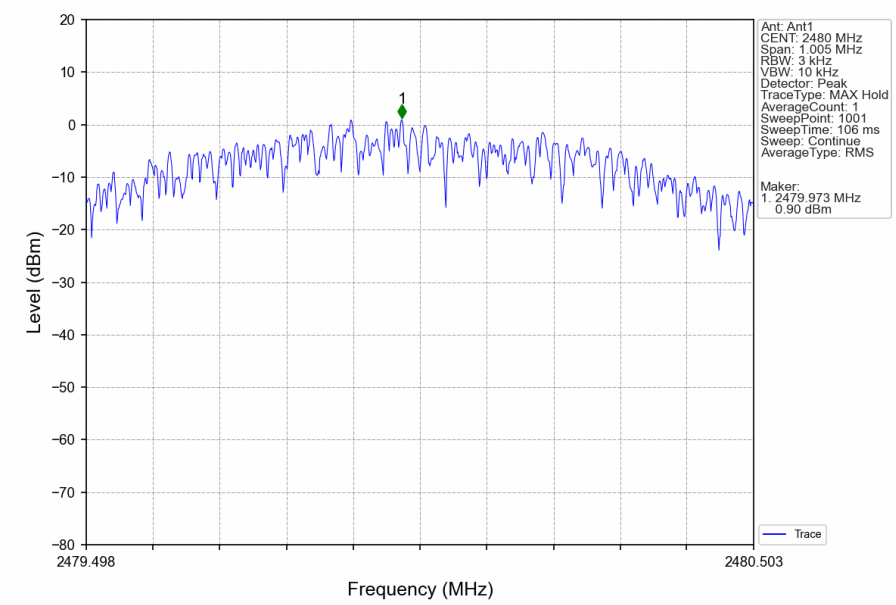
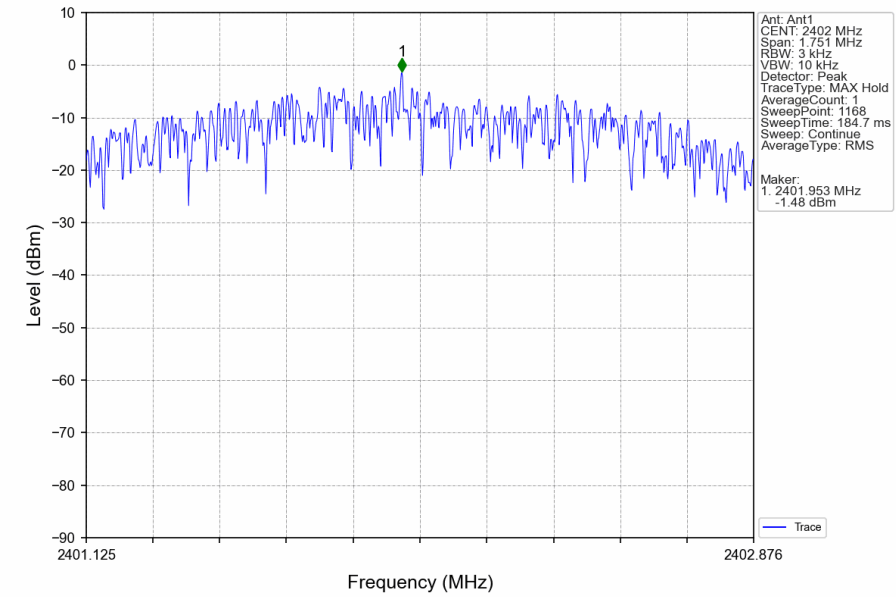
1M_HCH_2480MHz_Ant1_NTNV



2M_LCH_2402MHz_Ant1_NTNV



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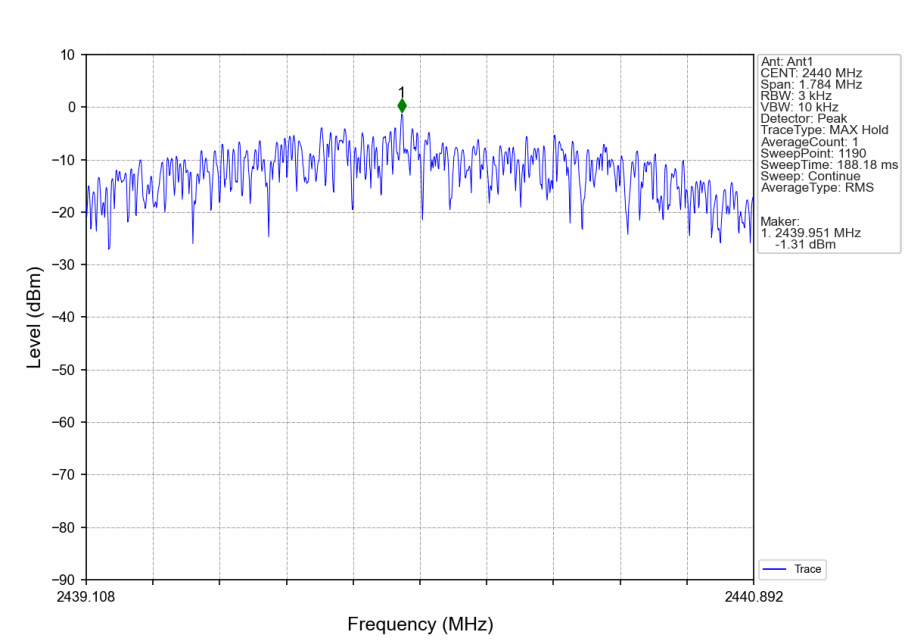
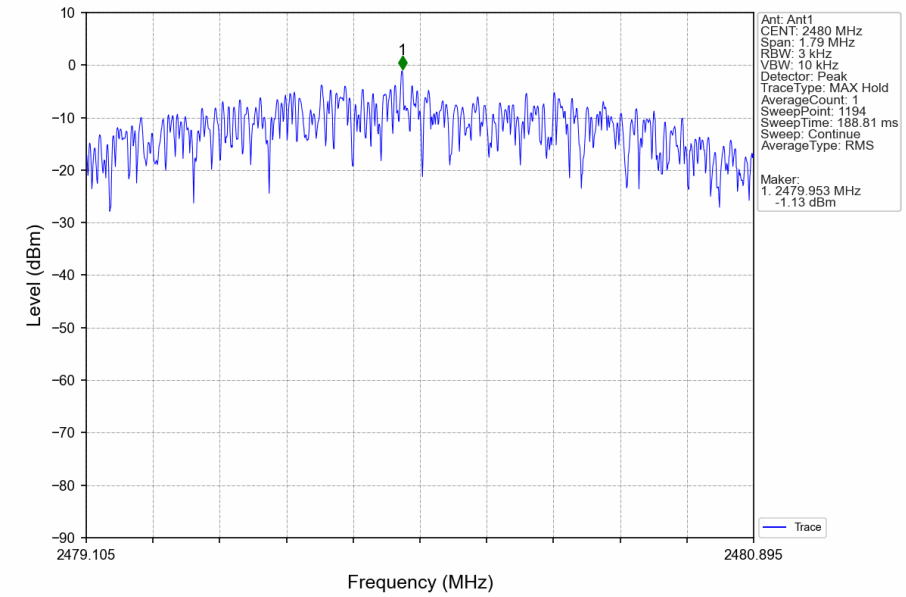
2M_MCH_2440MHz_Ant1_NTNV



2M_HCH_2480MHz_Ant1_NTNV



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5. Unwanted Emissions In Non-restricted Frequency Bands

5.1 Test Result

5.1.1 Ref

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)
1M	SISO	2402	1	15.05
		2440	1	15.28
		2480	1	15.42
2M	SISO	2402	1	14.64
		2440	1	14.91
		2480	1	15.02
Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2020, the channel contains the maximum PSD level was used to establish the reference level.				

5.1.2 CSE

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
1M	SISO	2402	1	15.42	-4.58	Pass
		2440	1	15.42	-4.58	Pass
		2480	1	15.42	-4.58	Pass
2M	SISO	2402	1	15.02	-4.98	Pass
		2440	1	15.02	-4.98	Pass
		2480	1	15.02	-4.98	Pass
Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2020, the channel contains the maximum PSD level was used to establish the reference level.						

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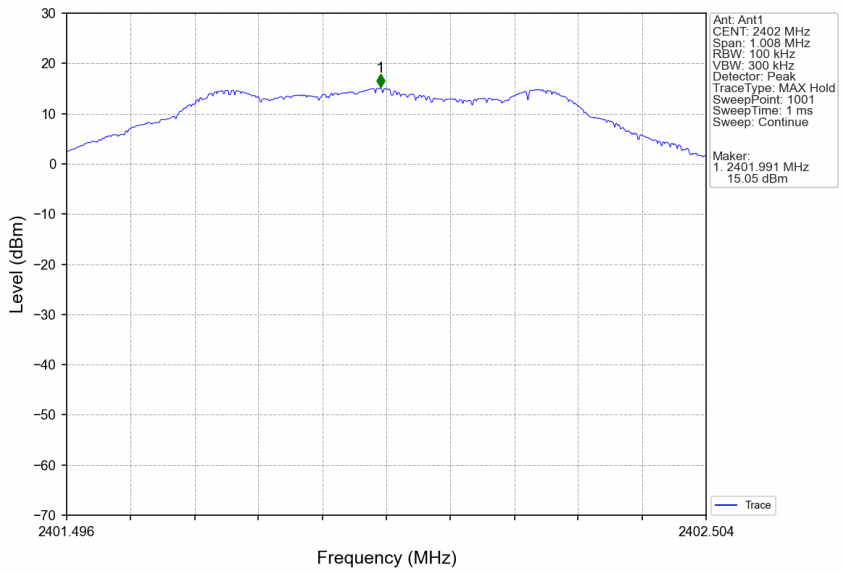
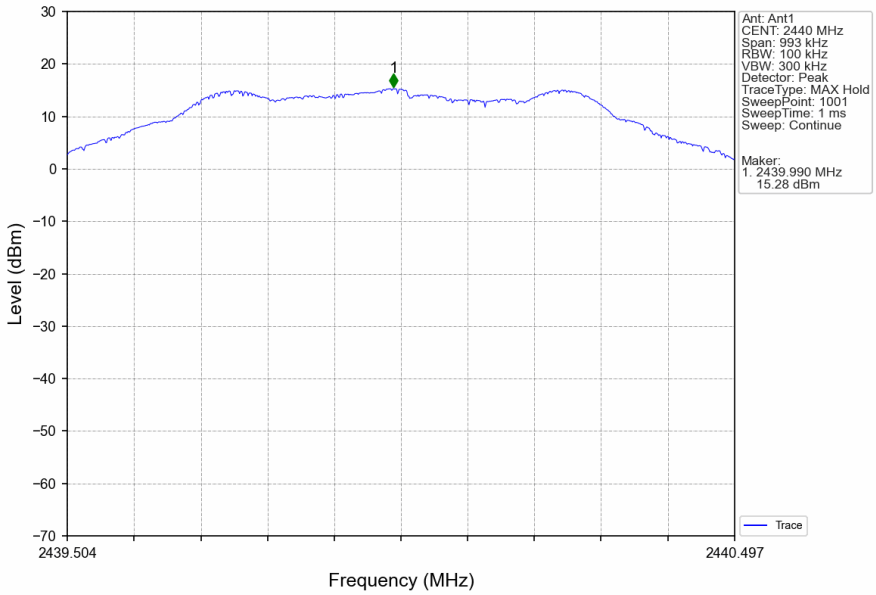
5.2 Test Graph

5.2.1 Ref

1M_LCH_2402MHz_Ant1_NTNV



1M_MCH_2440MHz_Ant1_NTNV



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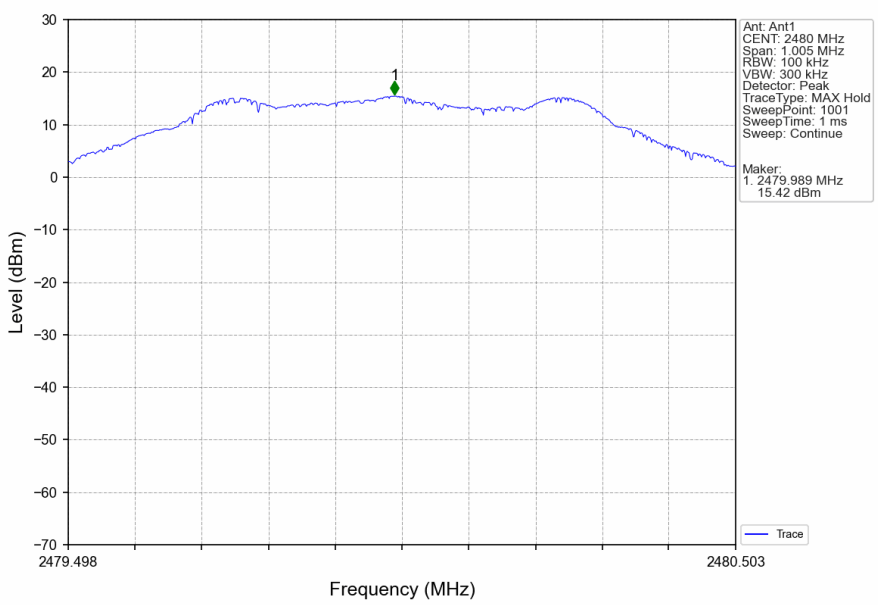
1M_HCH_2480MHz_Ant1_NTNV



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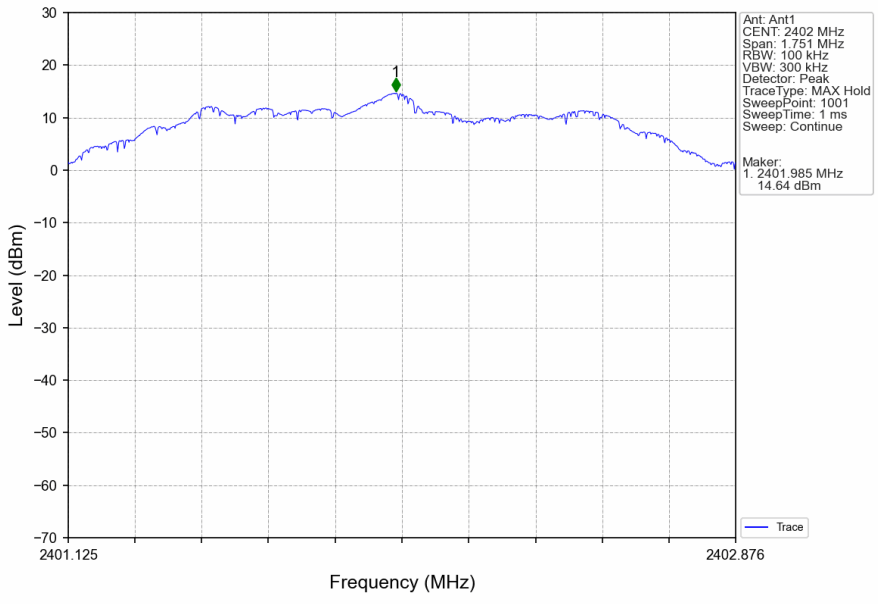

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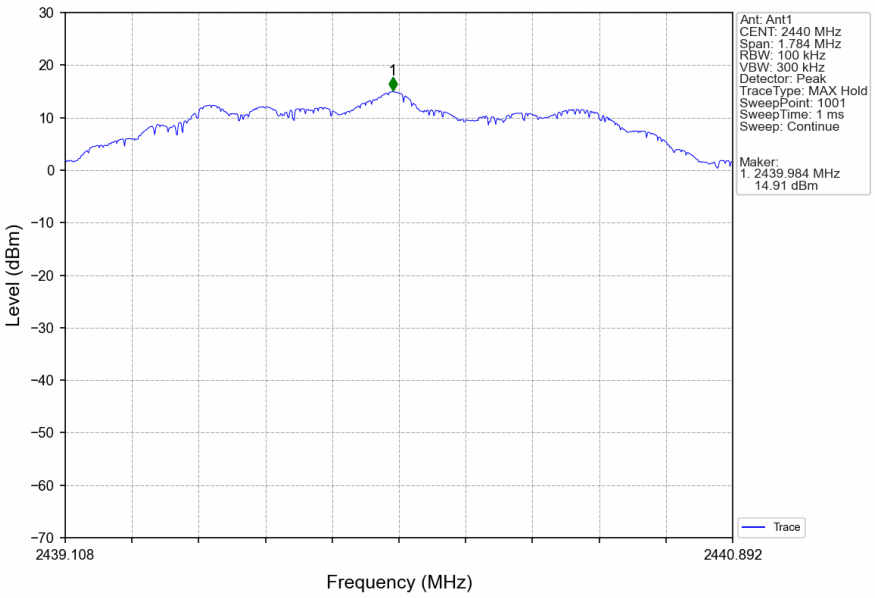
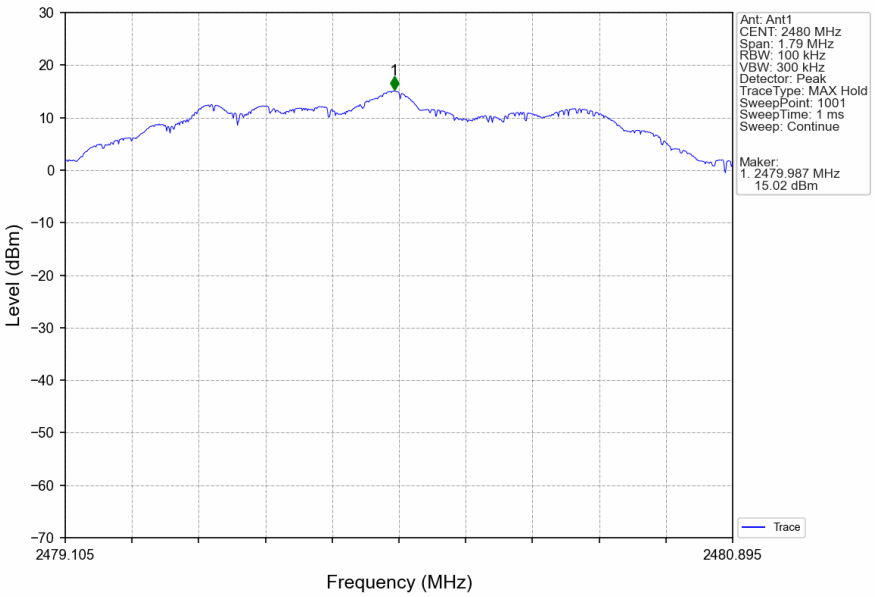
2M_MCH_2440MHz_Ant1_NTNV



2M_HCH_2480MHz_Ant1_NTNV



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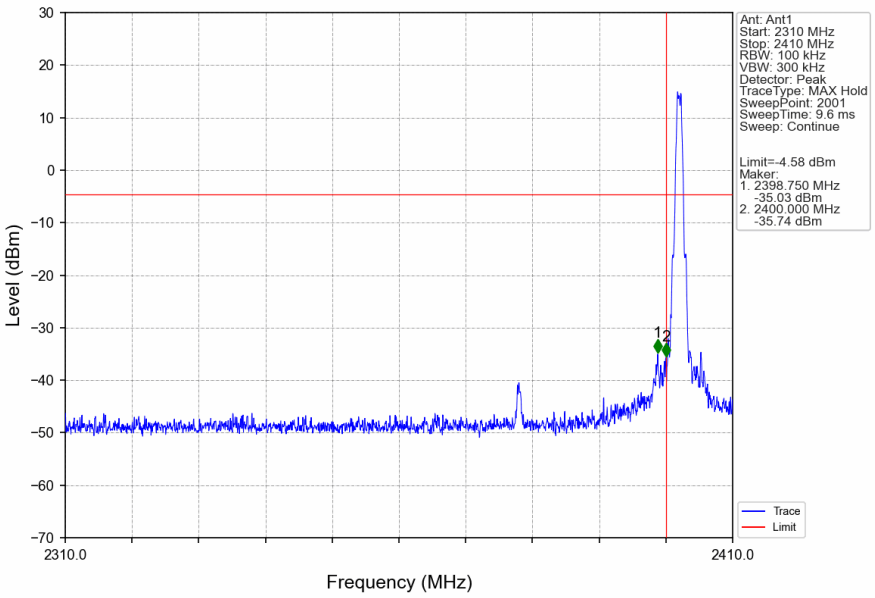
5.2.2 CSE

1M_LCH_2402MHz_Ant1_NTNV

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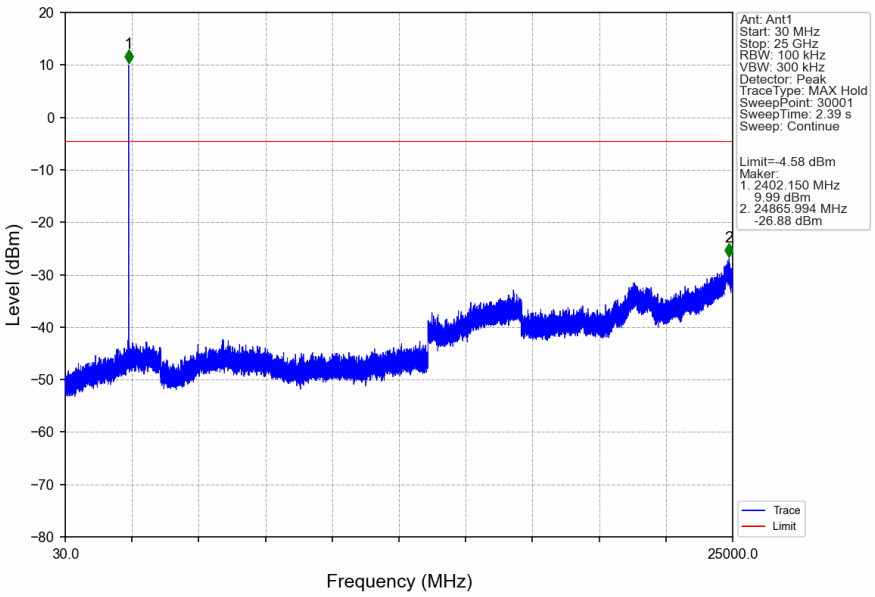

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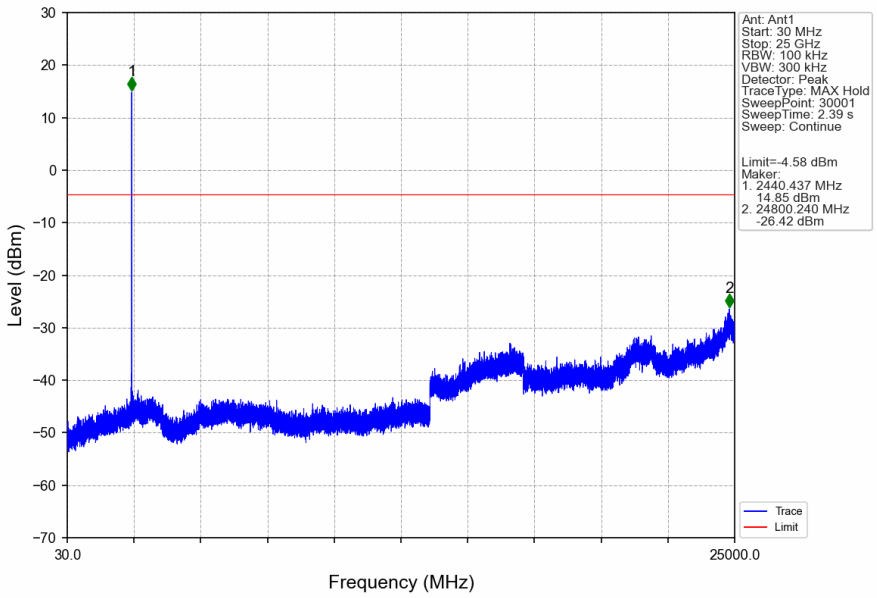
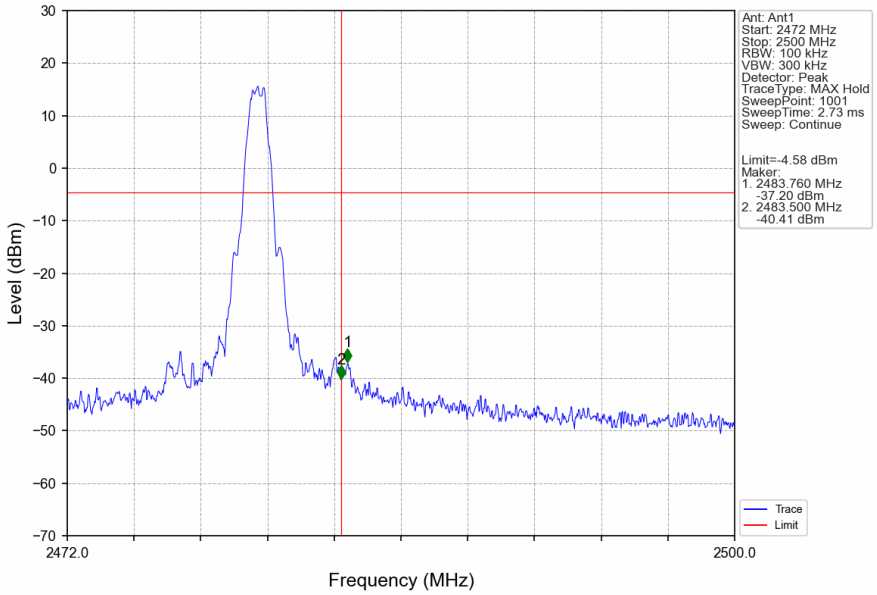
1M_MCH_2440MHz_Ant1_NTNV



1M_HCH_2480MHz_Ant1_NTNV



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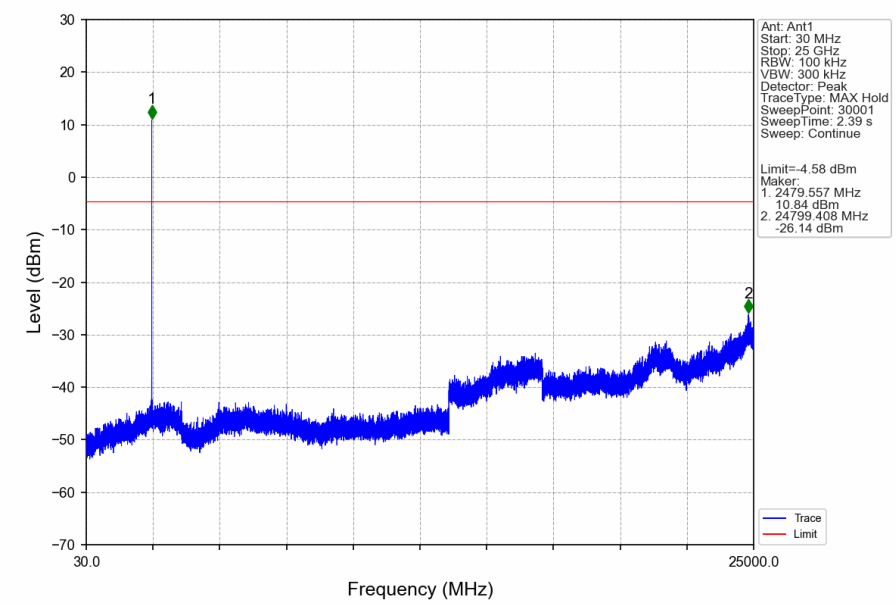
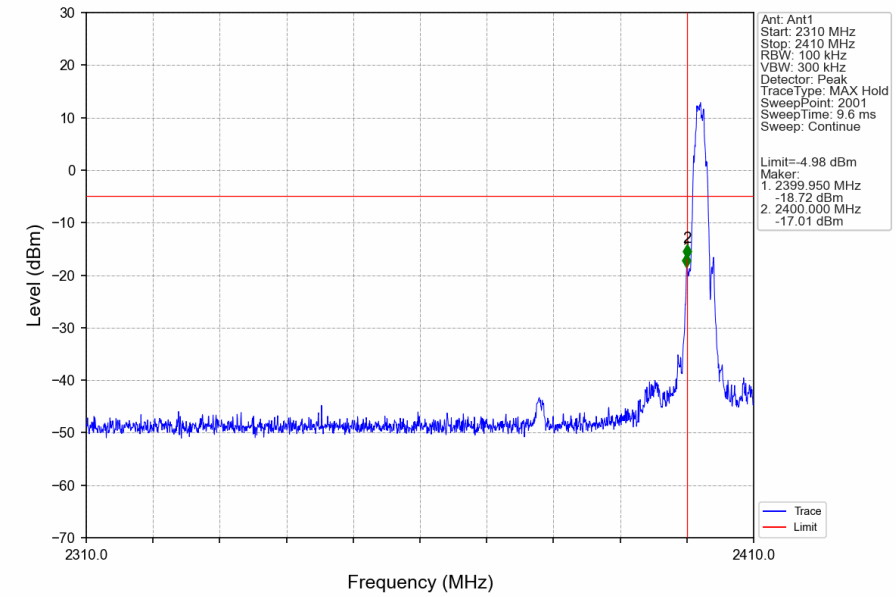
1M_HCH_2480MHz_Ant1_NTNV



2M_LCH_2402MHz_Ant1_NTNV



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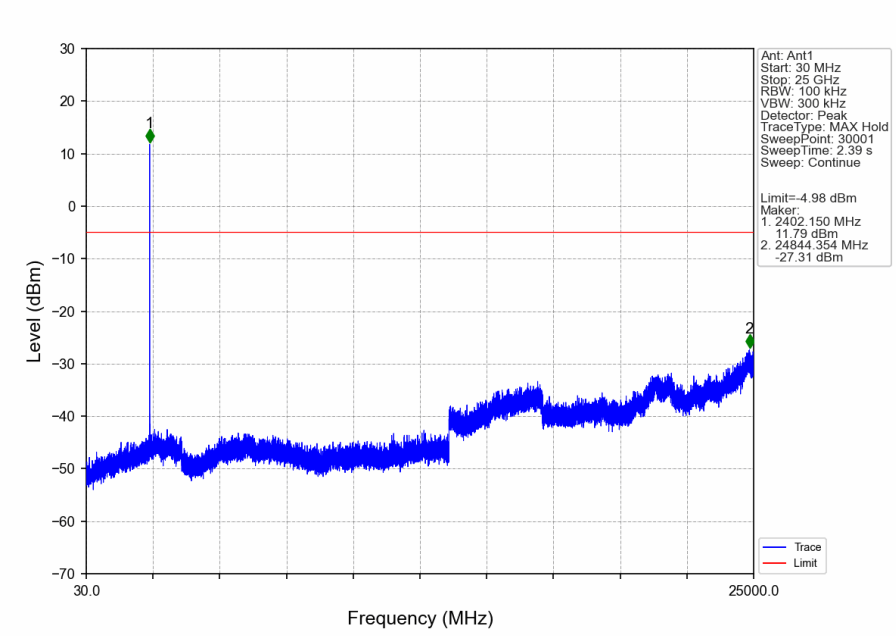
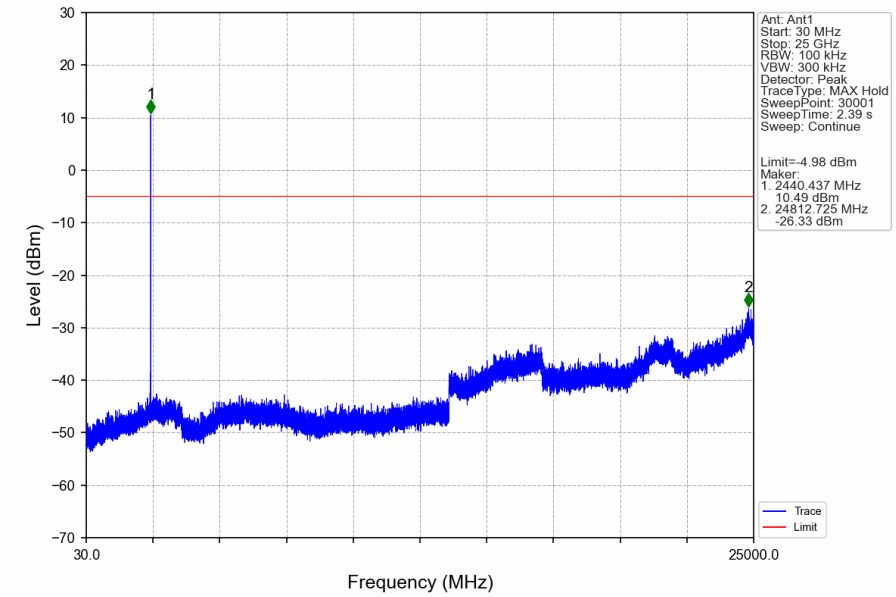
2M_LCH_2402MHz_Ant1_NTNV



2M_MCH_2440MHz_Ant1_NTNV



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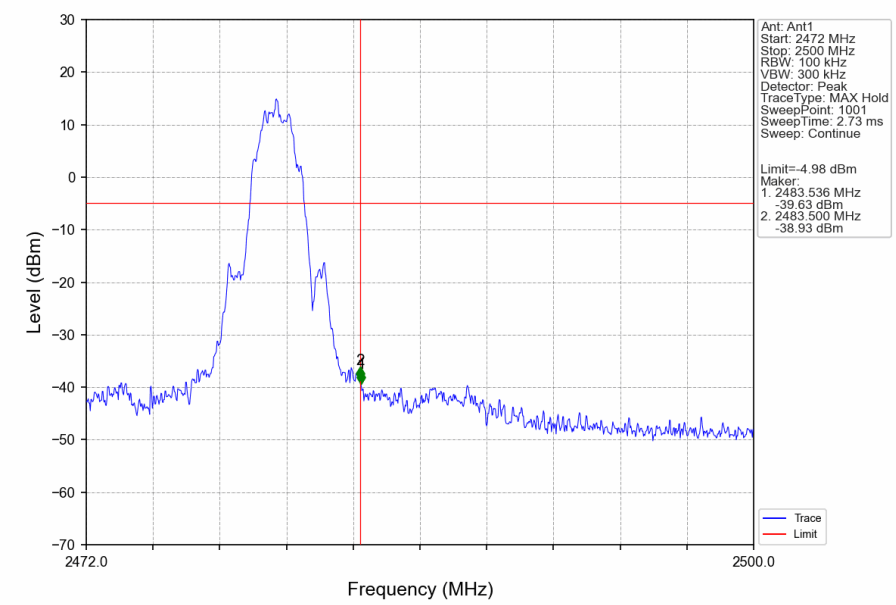
2M_HCH_2480MHz_Ant1_NTNV



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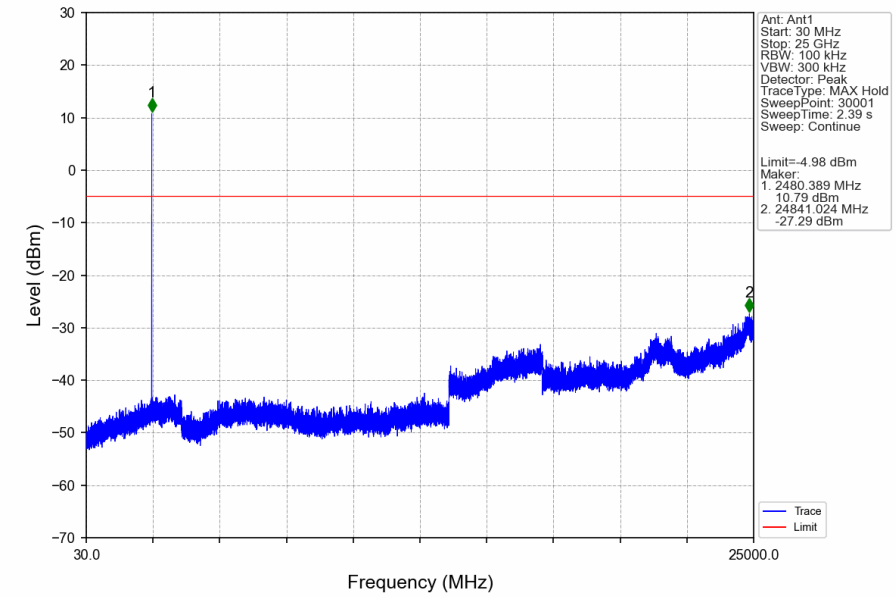

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