TEST REPORT

Application No.:	SZCR2411004163AT
Applicant:	Shenzhen Mammotion Innovation Co., Limited
Address of Applicant:	9th Floor, Building A3, Nanshan Zhiyuan, No.1001 Xueyuan Avenue, Changyuan Community, Taoyuan Street, Nanshan District, Shenzhen
Manufacturer:	Shenzhen Mammotion Innovation Co., Limited
Address of Manufacturer:	9th Floor, Building A3, Nanshan Zhiyuan, No.1001 Xueyuan Avenue, Changyuan Community, Taoyuan Street, Nanshan District, Shenzhen
Factory:	Huizhou BYD Electronic Co., Ltd.
Address of Factory:	Daya Bay Economic and Technological Development Zone, Huizhou City
Equipment Under Test (EUT):	
EUT Name:	LUBA mini AWD
Model No.:	800, 1500, 800H, 1500H ♣
♣	Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.
Trade Mark:	MAMMOTION
FCC ID:	2BFWS-LUBAMINI
Standard(s) :	47 CFR Part 15, Subpart C 15.247
Date of Receipt:	2024-11-07
Date of Test:	2024-12-04 to 2024-12-12
Date of Issue:	2024-12-22
Test Result:	**Pass***

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

Keny Xu
EMC Laboratory Manager

No.1 Workshop, M-10, Middle Section, Science & Technology Park, Nanshan District, Shenzhen, Guangdong, China 518057 t (86-755) 26012053 f (86-755) 26710594 www.sgsgroup.com.cn
中国·广东·深圳市南山区科技园中区M-10栋1号厂房 邮编:518057 t (86-755) 26012053 f (86-755) 26710594 sgs.china@sgs.com

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2024-12-22		Original

Authorized for issue by:				
		Benson Wang		
		Benson Wang/Project Engineer		
		Eric Fu		
		Eric Fu/Reviewer		

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 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass
Radiated Emissions which fall in the restricted bands		ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions Below 1GHz		ANSI C63.10 (2013) Section 6.4,6.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions Above 1GHz		ANSI C63.10 (2013) Section 6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Conducted Peak Output Power		ANSI C63.10 (2013) Section 11.9.2	47 CFR Part 15, Subpart C 15.247(b)(3)	Pass
Minimum 6dB Bandwidth		ANSI C63.10 (2013) Section 11.8.1	47 CFR Part 15, Subpart C 15.247a(2)	Pass
Power Spectrum Density		ANSI C63.10 (2013) Section 11.10.2	47 CFR Part 15, Subpart C 15.247(e)	Pass
Conducted Band Edges Measurement		ANSI C63.10 (2013) Section 11.13.3.2	47 CFR Part 15, Subpart C 15.247(d)	Pass
Conducted Spurious Emissions		ANSI C63.10 (2013) Section 11.11	47 CFR Part 15, Subpart C 15.247(d)	Pass

Declaration of EUT Family Grouping:

Model No.: 800, 1500, 800H, 1500H

Only the model 1500 with battery 1 & Charge station model: CHG4300 was fully tested. The model 1500 with battery 2 was performed the Radiated emissions(30MHz-1GHz) test for discrepancy. According to the declaration from the applicant, the electrical circuit design, PCB layout, components used and internal wiring and functions were identical for the above models, with only difference on battery. The battery model which 1500/1500H use is MWBT06S02P-01; The battery model which 800/800H use is MWBT06S02P-03.

3 Contents

4 General Information

4.1 Details of E.U.T.

Power supply:	Powered by Rechargeable Li-ion Battery. Battery 1 information Model: MWBT06S02P-01 Nominal Voltage: 21.6Vdc Rated Capacity: 6.1Ah/131.76Wh Battery 2 information Model: MWBT06S02P-03 Nominal Voltage: 21.6Vdc Rated Capacity: 4.5Ah/97.2Wh Charging station information Model1: CHG4300 Model2: CHG4301 Input: 28Vdc, 60W Output: 28Vdc, 2.15A Charging station adapter information Model: TS-A060-2802151 Input: 100-240VAC, 50/60Hz 1.5A Max Output: 28.0Vdc, 2.15A, 60.2W
Cable(s):	AC cable of adapter: 185cm unshielded DC cable of adapter to EUT: 701cm unshielded DC Cable of charge station to RTK:221cm unshielded
Cable Loss (for RF conducted test):	0.5dB
Operation Frequency:	802.11b/g/n(HT20): 2412MHz to 2462MHz; 802.11n(HT40): 2422MHz to 2452MHz
Modulation Type:	802.11b: DSSS (CCK, DQPSK, DBPSK), 802.11g/n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Number of Channels:	802.11b/g/n(HT20):11 802.11n(HT40):7
Channel Spacing:	5MHz
Antenna Type:	PIFA
Antenna Gain:	2.5dBi

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.
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The EUT has been tested as an independent unit.			

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.	

4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch

No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Nanshan District, Shenzhen, Guangdong, China. 518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

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

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	2022-05-14	2025-05-13
EMI Test Receiver	Rohde&Schwarz	ESR	SZ-WRG-M-047	2024-01-30	2025-01-29
Measurement Software	AUDIX	e3 V8.2014-6-27a	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM024-01	2024-07-06	2025-07-05
LISN	Rohde&Schwarz	ENV216	SEM007-01	2024-08-15	2025-08-14
LISN	ETS-LINDGREN	3816/2	SEM007-02	2024-03-14	2025-03-13

Radiated Emissions which fall in the restricted bands					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
3m Fully-Anechoic Chamber	AUDIX	N/A	SEM001-02	2024-05-11	2027-05-10
Signal Analyzer	Rohde & Schwarz	FSV40	SEM008-04	2024-03-15	2025-03-14
Horn Antenna	Rohde&Schwarz	HF907	SEM003-07	2023-07-23	2025-07-22
Microwave system amplifier	Agilent	83017A	SEM005-25	2024-09-14	2025-09-13
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2024-07-06	2025-07-05
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	SEM003-15	2024-08-10	2025-08-09
Pre-Amplifier	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2024-03-15	2025-03-14

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	2024-08-14	2025-08-13
BiConiLog Antenna	ETS-LINDGREN	3142C	SEM003-01	2023-09-16	2025-09-15
Pre-Amplifier	Agilent Technologies	8447D	SEM005-01	2024-03-14	2025-03-13
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM025-01	2024-07-06	2025-07-05

No.1 Workshop, M-10, Middle Section, Science & Technology Park, Nanshan District, Shenzhen, Guangdong, China 518057 t (86-755) 26012053 f (86-755) 26710594 www.sgsgroup.com.cn
中国・广东・深圳市南山区科技园中区M-10栋1号厂房 邮编:518057 t (86-755) 26012053 f (86-755) 26710594 sgs.china@sgs.com

Radiated Spurious Emissions Above 1GHz					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
3m Fully-Anechoic Chamber	AUDIX	N/A	SEM001-02	2024-05-11	2027-05-10
Signal Analyzer	Rohde & Schwarz	FSV40	SEM008-04	2024-03-15	2025-03-14
Horn Antenna	Rohde&Schwarz	HF907	SEM003-07	2023-07-23	2025-07-22
Microwave system amplifier	Agilent	83017A	SEM005-25	2024-09-14	2025-09-13
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2024-07-06	2025-07-05
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	SEM003-15	2024-08-10	2025-08-09
Pre-Amplifier	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2024-03-15	2025-03-14

RF Conducted Test					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
Power Sensor	TST PASS	TSPS2023R	SEM009-26	2024-03-27	2025-03-26
Power Sensor	KEYSIGHT	U2021XA	SEM009-16	2024-03-14	2025-03-13
DC Power Supply	Chroma	62012P-80-60	SEM011-11	2024-08-14	2025-08-13
MXA Signal Analyzer	KEYSIGHT	N9020A	SEM004-19	2024-03-14	2025-03-13
Measurement Software	TST PASS	TST PASS V2.0	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-01	2024-07-06	2025-07-05
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	2024-03-27	2025-03-26

General used equipment					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
Humidity/ Temperature Indicator	deli	8838	SEM002-32	2024-07-24	2025-07-23
Humidity/ Temperature Indicator	deli	8838	SEM002-33	2024-07-24	2025-07-23
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2024-03-18	2025-03-17

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

15.203 requirement:

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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 2.9dBi

Antenna location: Refer to internal photos

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 (2013) 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		

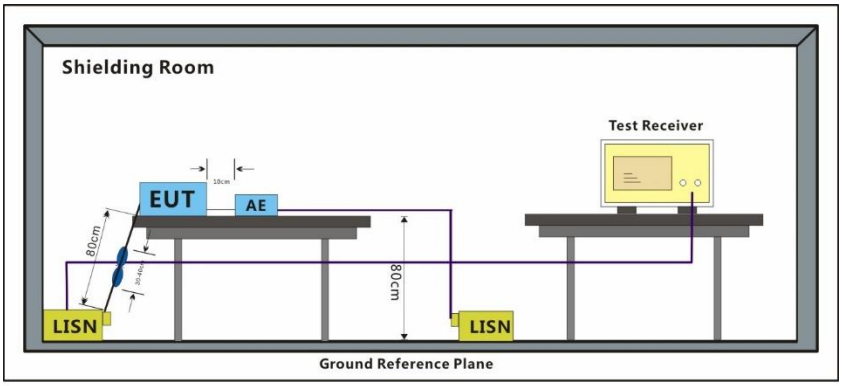
7.1.1 E.U.T. Operation

Operating Environment:
Temperature: 22.5 °C Humidity: 44.5 % RH Atmospheric Pressure: 1020 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	05	Charge + TX mode_Keep the EUT in charging and continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 1Mbps is the worst case of IEEE 802.11b; data rate @ 6Mbps is the worst case of IEEE 802.11g; data rate @ 6.5Mbps is the worst case of IEEE 802.11n(HT20); data rate @ 13.5Mbps is the worst case of IEEE 802.11n(HT40), final test modes are considering the modulation and worse data rates. Only the data of worst case is recorded in the report.

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.

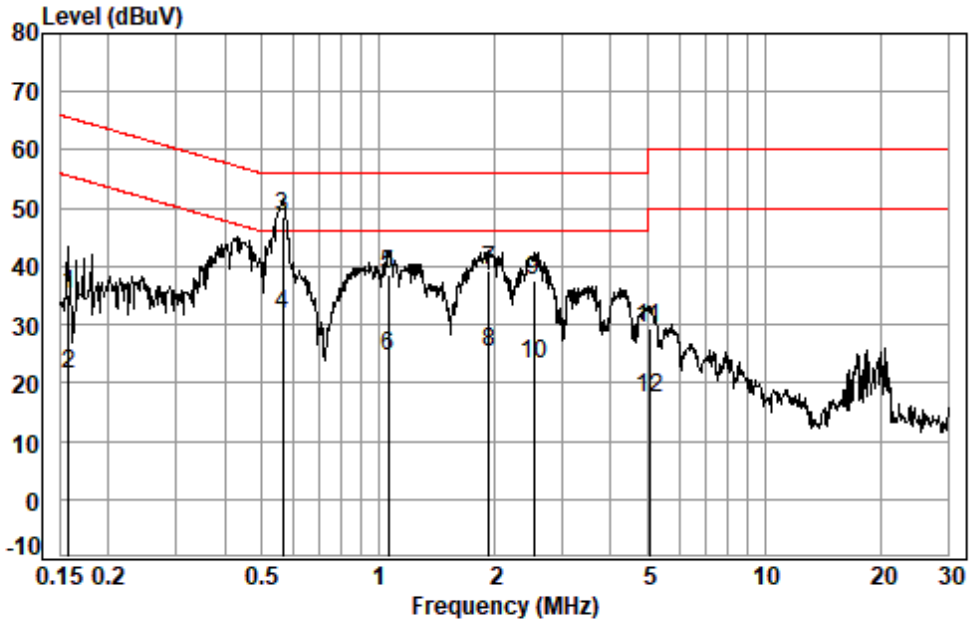
3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane.

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

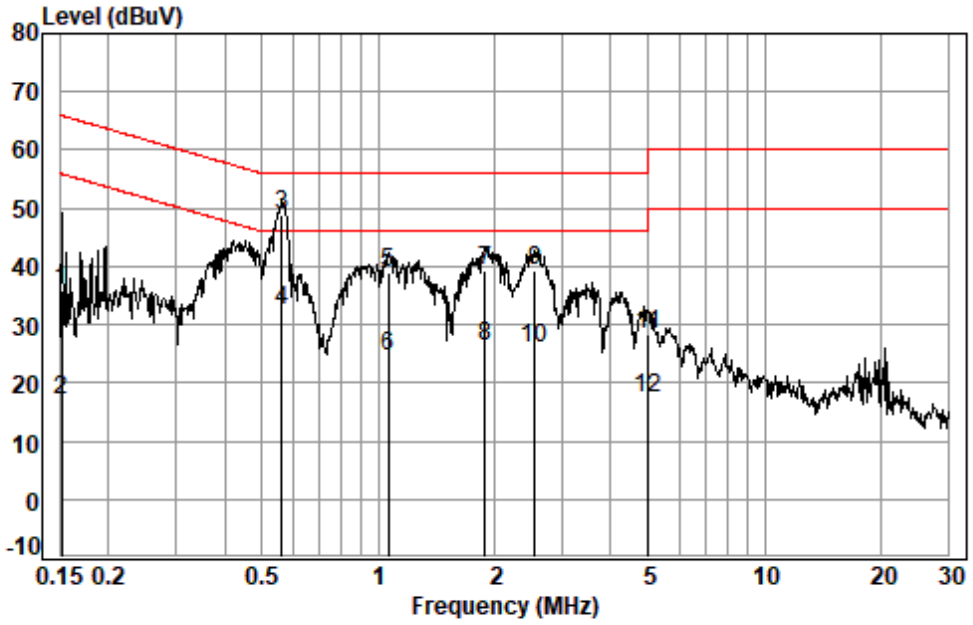
Test Mode: 05; Line: Live line



Site : Shielding Room
Condition: Line
Job No. : 04163AT
Test mode: 05

		Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
		MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1		0.1582	0.06	10.18	24.92	35.16	65.56	-30.40	QP
2		0.1582	0.06	10.18	11.40	21.64	55.56	-33.92	Average
3	*	0.5671	0.08	9.58	38.88	48.54	56.00	-7.46	QP
4	*	0.5671	0.08	9.58	22.13	31.79	46.00	-14.21	Average
5		1.0653	0.09	9.58	29.03	38.70	56.00	-17.30	QP
6		1.0653	0.09	9.58	14.75	24.42	46.00	-21.58	Average
7		1.9386	0.10	9.58	29.66	39.34	56.00	-16.66	QP
8		1.9386	0.10	9.58	15.52	25.20	46.00	-20.80	Average
9		2.5266	0.11	9.62	27.76	37.49	56.00	-18.51	QP
10		2.5266	0.11	9.62	13.47	23.20	46.00	-22.80	Average
11		5.0312	0.12	9.66	19.44	29.22	60.00	-30.78	QP
12		5.0312	0.12	9.66	7.60	17.38	50.00	-32.62	Average

Test Mode: 05; Line: Neutral Line



Site : Shielding Room
Condition: Neutral
Job No. : 04163AT
Test mode: 05

		Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
		MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1		0.1516	0.06	10.15	25.62	35.83	65.91	-30.08	QP
2		0.1516	0.06	10.15	6.83	17.04	55.91	-38.87	Average
3	*	0.5641	0.08	9.69	38.97	48.74	56.00	-7.26	QP
4	*	0.5641	0.08	9.69	22.55	32.32	46.00	-13.68	Average
5		1.0597	0.09	9.54	29.27	38.90	56.00	-17.10	QP
6		1.0597	0.09	9.54	14.84	24.47	46.00	-21.53	Average
7		1.8879	0.10	9.55	29.73	39.38	56.00	-16.62	QP
8		1.8879	0.10	9.55	16.45	26.10	46.00	-19.90	Average
9		2.5400	0.11	9.54	29.75	39.40	56.00	-16.60	QP
10		2.5400	0.11	9.54	16.34	25.99	46.00	-20.01	Average
11		5.0046	0.12	9.56	18.78	28.46	60.00	-31.54	QP
12		5.0046	0.12	9.56	7.71	17.39	50.00	-32.61	Average

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 (2013) 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.		

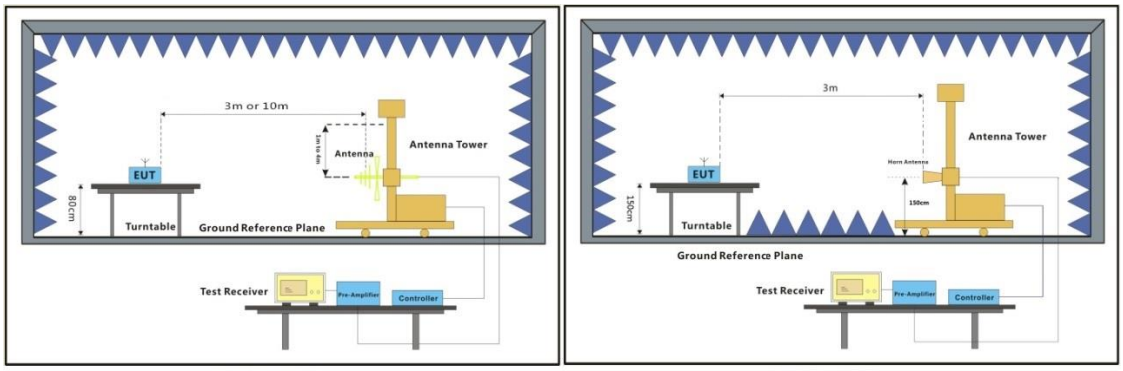
7.2.1 E.U.T. Operation

Operating Environment:
Temperature: 22.1 °C Humidity: 37.1 % RH Atmospheric Pressure: 1020 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode_Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 1Mbps is the worst case of IEEE 802.11b; data rate @ 6Mbps is the worst case of IEEE 802.11g; data rate @ 6.5Mbps is the worst case of IEEE 802.11n(HT20); data rate @ 13.5Mbps is the worst case of IEEE 802.11n(HT40), final test modes are considering the modulation and worse data rates. Only the data of worst case is recorded in the report.

7.2.3 Test Setup Diagram



30MHz-1GHz　　Above 1GHz

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 or 10 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 or 10 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.

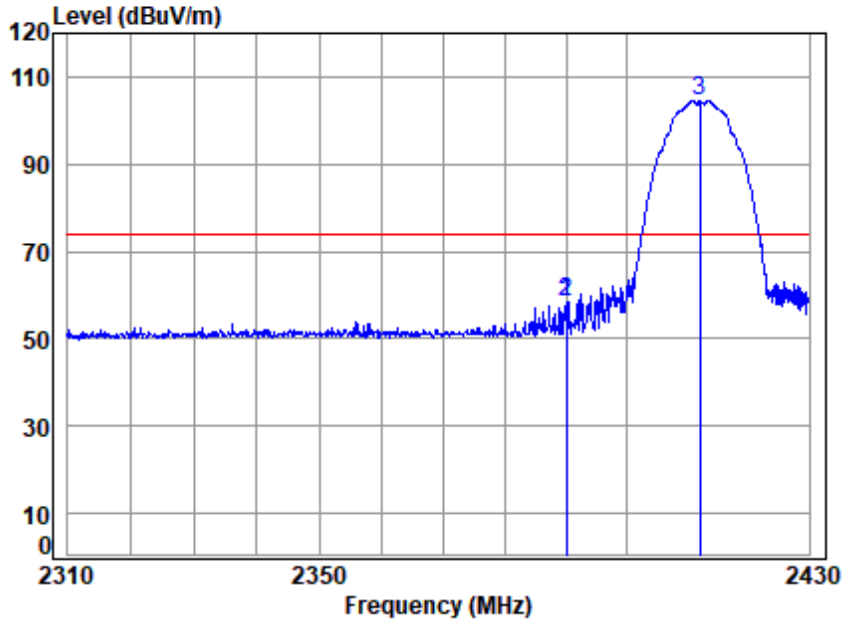
Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

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 ⩾1/T (Duty cycle＜98%) or 10Hz (Duty cycle⩾98%) for Average detection (AV) at frequency above 1GHz.

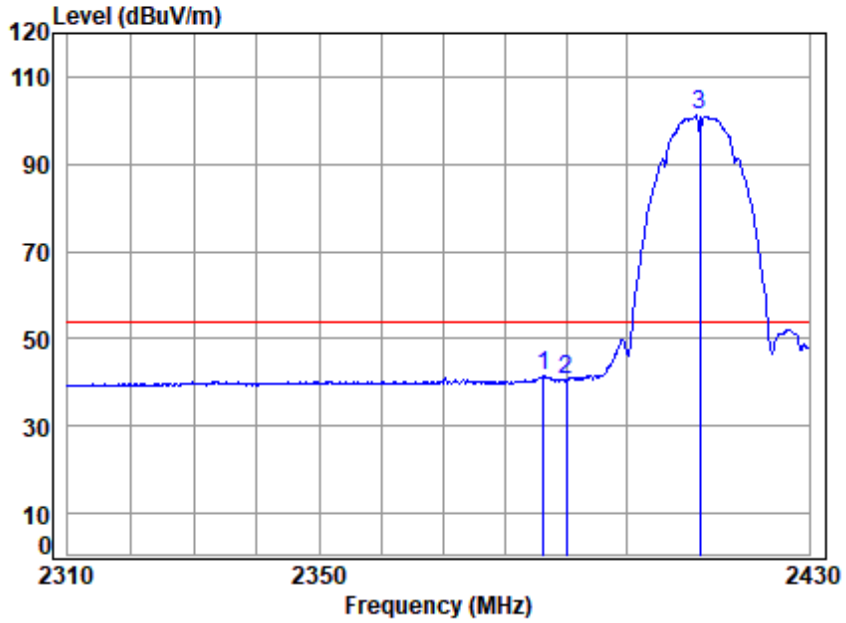
Test Mode: 04; Polarity: Horizontal; Modulation:802.11b; Bandwidth:20MHz; Channel:Low



Site : chamber
Condition: 3m HORIZONTAL
Job No : 04163AT\04164AT
Mode : 2412 Band edge
: 2.4G WIFI 11B

	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	2389.968	15.81	29.10	32.78	46.29	58.42	74.00	-15.58	peak
2	2390.000	15.81	29.10	32.78	46.29	58.42	74.00	-15.58	peak
3 p	2412.000	15.82	29.05	32.77	92.44	104.54	74.00	30.54	peak

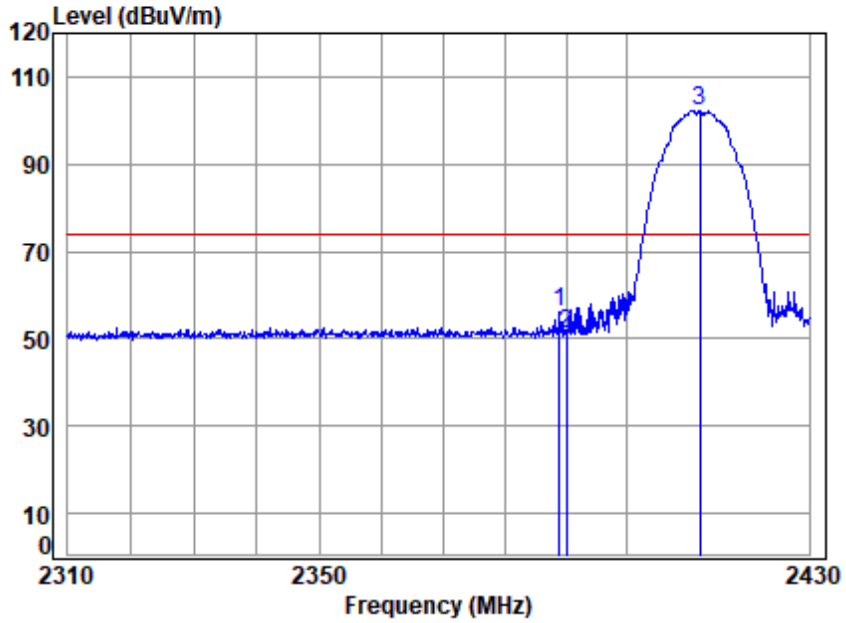
Test Mode: 04; Polarity: Horizontal; Modulation:802.11b; Bandwidth:20MHz; Channel:Low



Site : chamber
Condition: 3m HORIZONTAL
Job No : 04163AT\04164AT
Mode : 2412 Band edge
: 2.4G WIFI 11B

	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	2386.340	15.81	29.10	32.78	29.19	41.32	54.00	-12.68	Average
2	2390.000	15.81	29.10	32.78	28.39	40.52	54.00	-13.48	Average
3 q	2412.000	15.82	29.05	32.77	89.02	101.12	54.00	47.12	Average

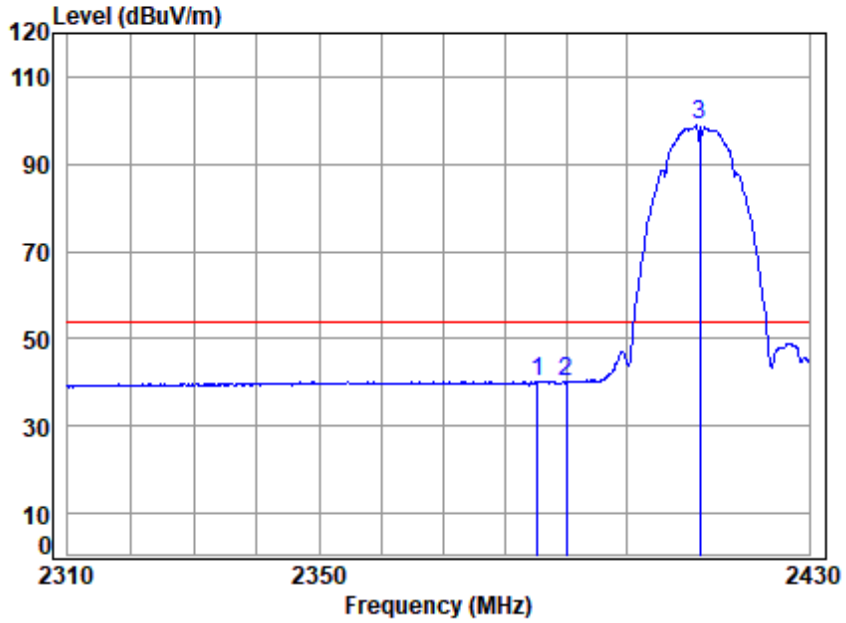
Test Mode: 04; Polarity: Vertical; Modulation:802.11b; Bandwidth:20MHz; Channel:Low



Site : chamber
Condition: 3m VERTICAL
Job No : 04163AT\04164AT
Mode : 2412 Band edge
: 2.4G WIFI 11B

	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	2388.879	15.81	29.10	32.78	43.82	55.95	74.00	-18.05	Peak
2	2390.000	15.81	29.10	32.78	39.18	51.31	74.00	-22.69	Peak
3 p	2412.000	15.82	29.05	32.77	90.23	102.33	74.00	28.33	Peak

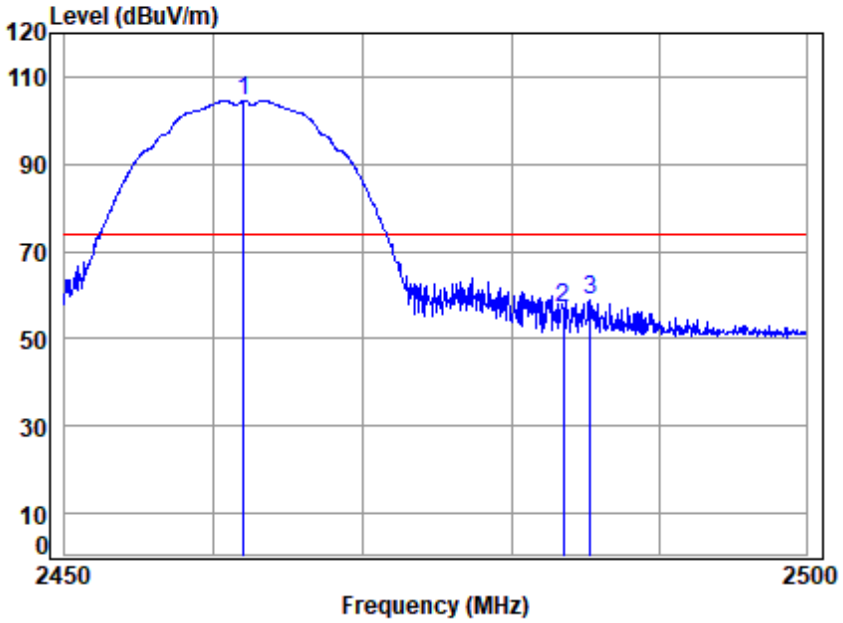
Test Mode: 04; Polarity: Vertical; Modulation:802.11b; Bandwidth:20MHz; Channel:Low



Site : chamber
Condition: 3m VERTICAL
Job No : 04163AT\04164AT
Mode : 2412 Band edge
: 2.4G WIFI 11B

	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	2385.373	15.81	29.10	32.78	28.20	40.33	54.00	-13.67	Average
2	2390.000	15.81	29.10	32.78	27.96	40.09	54.00	-13.91	Average
3 q	2412.000	15.82	29.05	32.77	86.70	98.80	54.00	44.80	Average

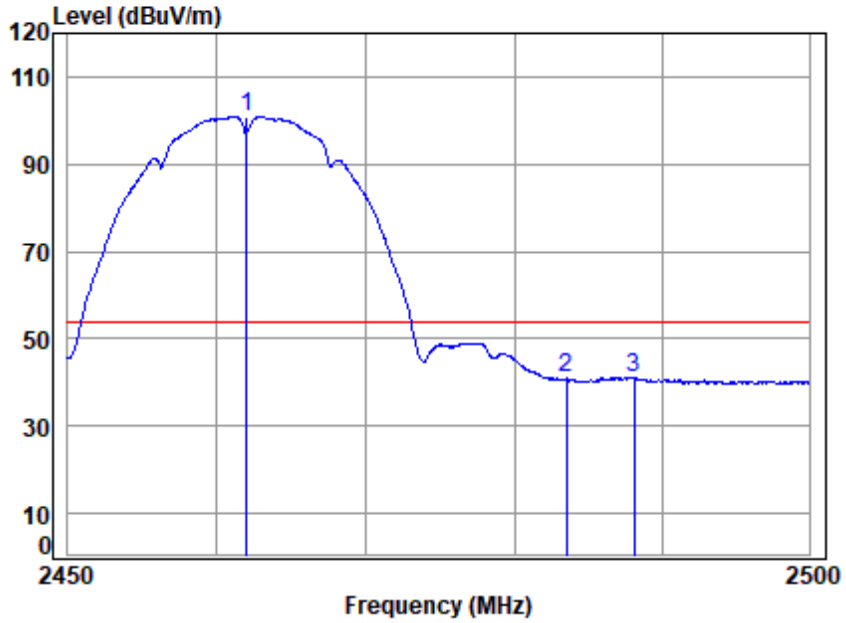
Test Mode: 04; Polarity: Horizontal; Modulation:802.11b; Bandwidth:20MHz; Channel:High



Site : chamber
Condition: 3m HORIZONTAL
Job No : 04163AT\04164AT
Mode : 2462 Band edge
: 2.4G WIFI 11B

	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 p	2462.000	15.85	28.90	32.74	92.55	104.56	74.00	30.56	peak
2	2483.500	15.86	28.90	32.73	45.13	57.16	74.00	-16.84	peak
3	2485.346	15.86	28.90	32.73	46.69	58.72	74.00	-15.28	peak

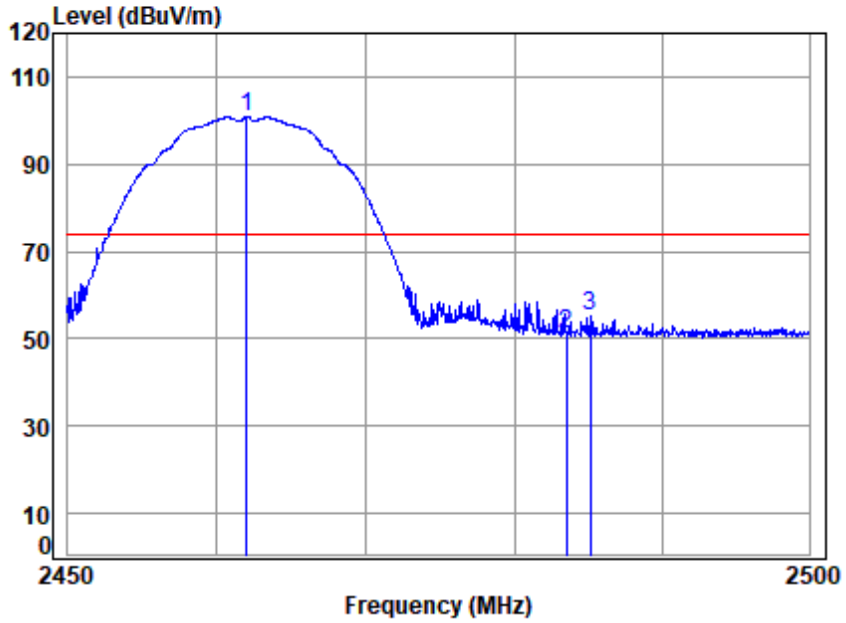
Test Mode: 04; Polarity: Horizontal; Modulation:802.11b; Bandwidth:20MHz; Channel:High



Site : chamber
Condition: 3m HORIZONTAL
Job No : 04163AT\04164AT
Mode : 2462 Band edge
: 2.4G WIFI 11B

	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 q	2462.000	15.85	28.90	32.74	89.03	101.04	54.00	47.04	Average
2	2483.500	15.86	28.90	32.73	28.81	40.84	54.00	-13.16	Average
3	2488.109	15.86	28.90	32.73	29.13	41.16	54.00	-12.84	Average

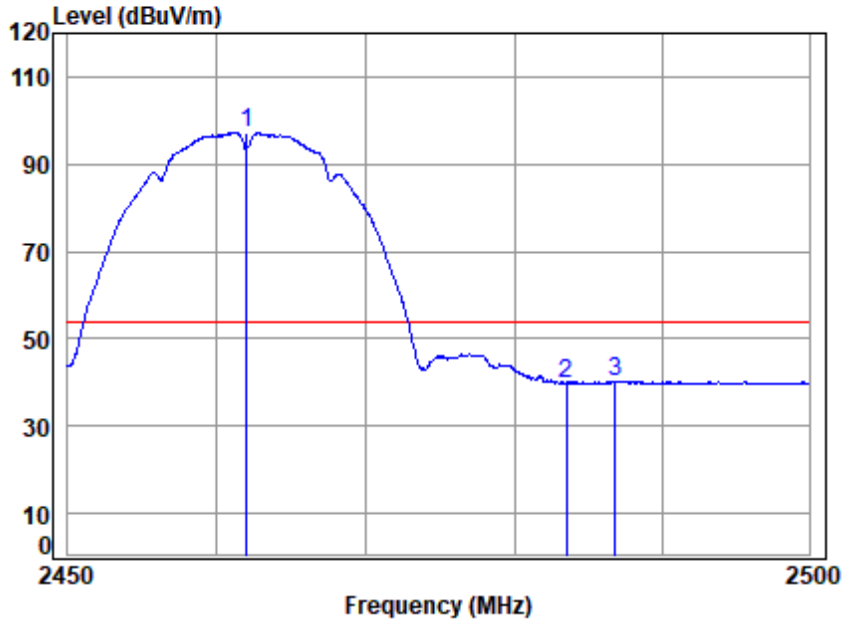
Test Mode: 04; Polarity: Vertical; Modulation:802.11b; Bandwidth:20MHz; Channel:High



Site : chamber
Condition: 3m VERTICAL
Job No : 04163AT\04164AT
Mode : 2462 Band edge
: 2.4G WIFI 11B

	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 p	2462.000	15.85	28.90	32.74	88.86	100.87	74.00	26.87	Peak
2	2483.500	15.86	28.90	32.73	39.26	51.29	74.00	-22.71	Peak
3	2485.145	15.86	28.90	32.73	43.33	55.36	74.00	-18.64	Peak

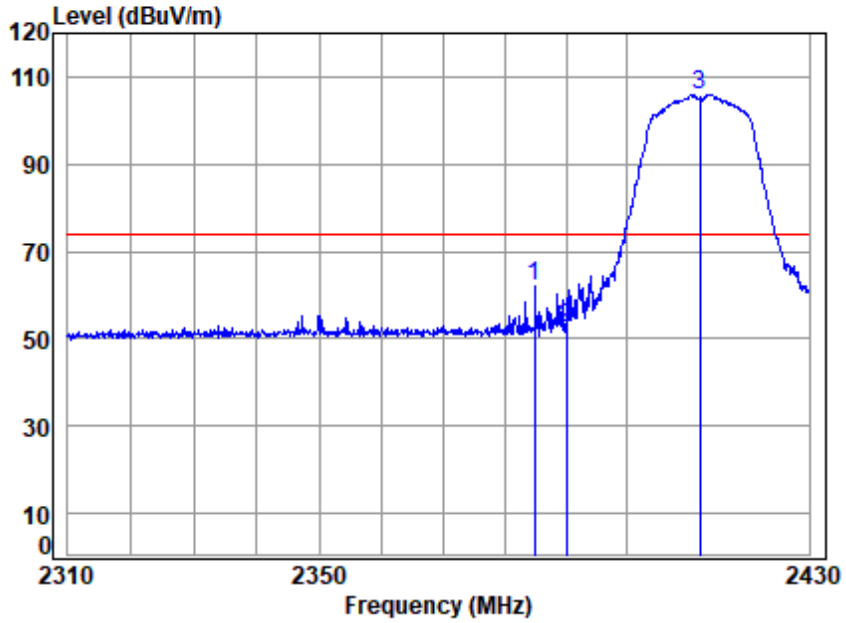
Test Mode: 04; Polarity: Vertical; Modulation:802.11b; Bandwidth:20MHz; Channel:High



Site : chamber
Condition: 3m VERTICAL
Job No : 04163AT\04164AT
Mode : 2462 Band edge
: 2.4G WIFI 11B

	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 q	2462.000	15.85	28.90	32.74	85.21	97.22	54.00	43.22	Average
2	2483.500	15.86	28.90	32.73	27.85	39.88	54.00	-14.12	Average
3	2486.853	15.86	28.90	32.73	28.32	40.35	54.00	-13.65	Average

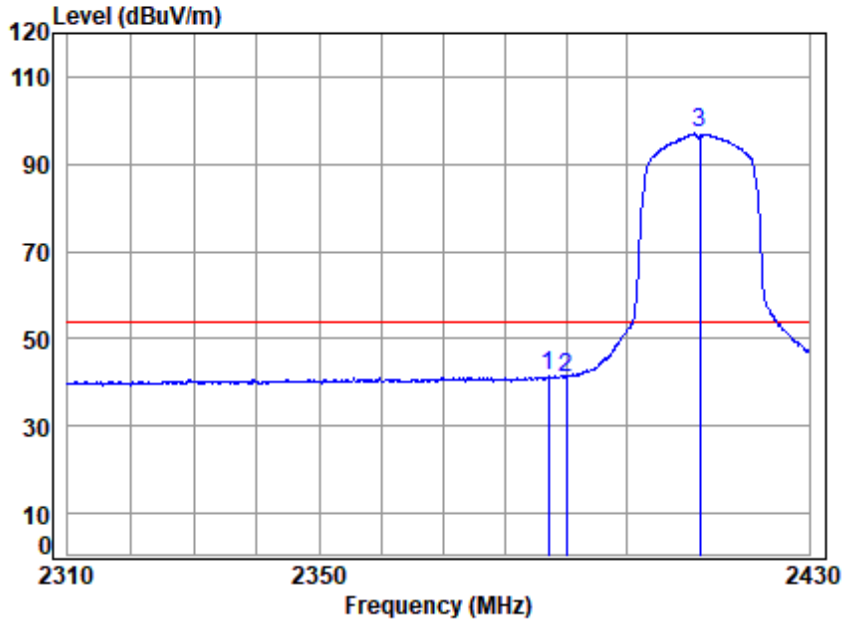
Test Mode: 04; Polarity: Horizontal; Modulation:802.11n; Bandwidth:20MHz; Channel:Low



Site : chamber
Condition: 3m HORIZONTAL
Job No : 04163AT\04164AT
Mode : 2412 Band edge
: 2.4G WIFI 11N20

	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	2384.890	15.81	29.10	32.78	49.84	61.97	74.00	-12.03	peak
2	2390.000	15.81	29.10	32.78	40.52	52.65	74.00	-21.35	peak
3 p	2412.000	15.82	29.05	32.77	93.93	106.03	74.00	32.03	peak

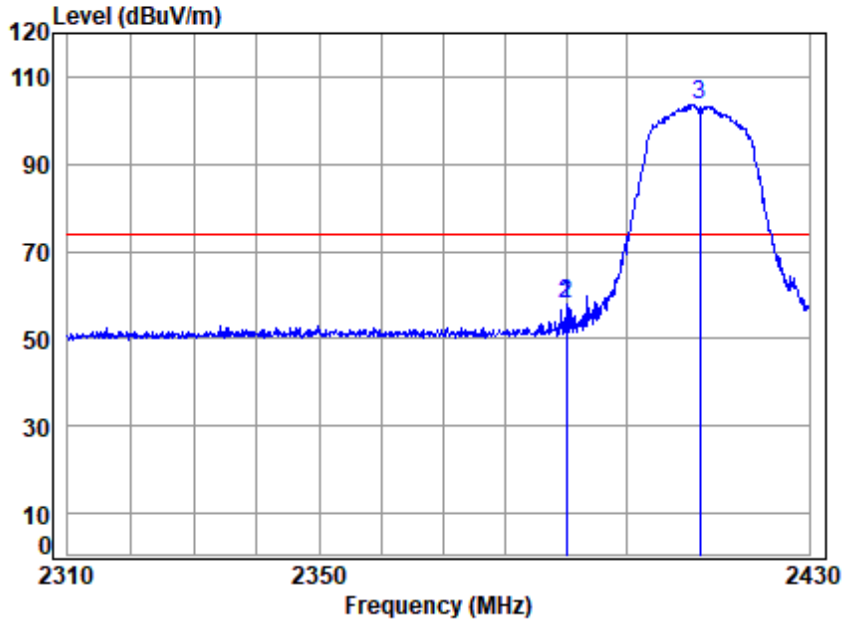
Test Mode: 04; Polarity: Horizontal; Modulation:802.11n; Bandwidth:20MHz; Channel:Low



Site : chamber
Condition: 3m HORIZONTAL
Job No : 04163AT\04164AT
Mode : 2412 Band edge
: 2.4G WIFI 11N20

	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	2387.065	15.81	29.10	32.78	29.36	41.49	54.00	-12.51	Average
2	2390.000	15.81	29.10	32.78	29.11	41.24	54.00	-12.76	Average
3 q	2412.000	15.82	29.05	32.77	84.87	96.97	54.00	42.97	Average

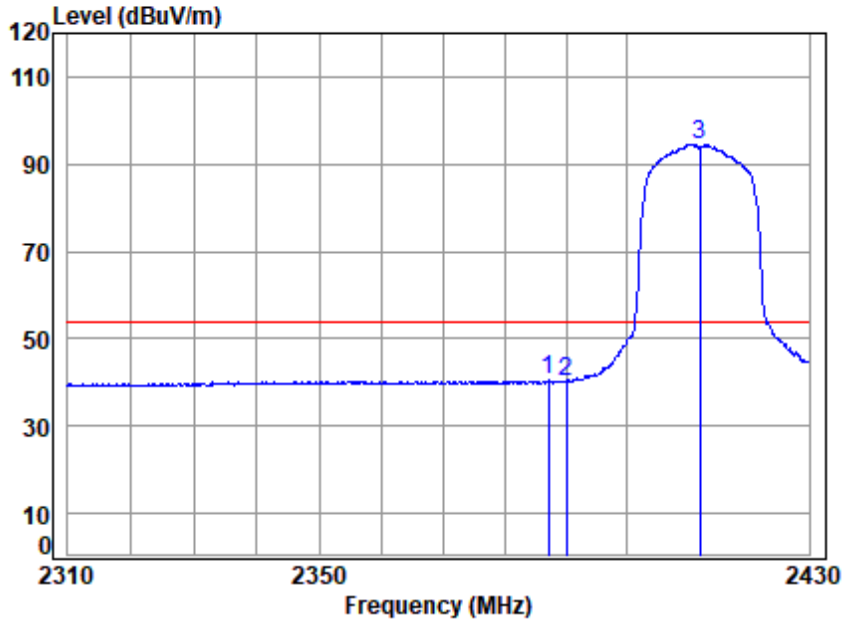
Test Mode: 04; Polarity: Vertical; Modulation:802.11n; Bandwidth:20MHz; Channel:Low



Site : chamber
Condition: 3m VERTICAL
Job No : 04163AT\04164AT
Mode : 2412 Band edge
: 2.4G WIFI 11N20

	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	2389.968	15.81	29.10	32.78	45.89	58.02	74.00	-15.98	Peak
2	2390.000	15.81	29.10	32.78	45.89	58.02	74.00	-15.98	Peak
3 p	2412.000	15.82	29.05	32.77	91.67	103.77	74.00	29.77	Peak

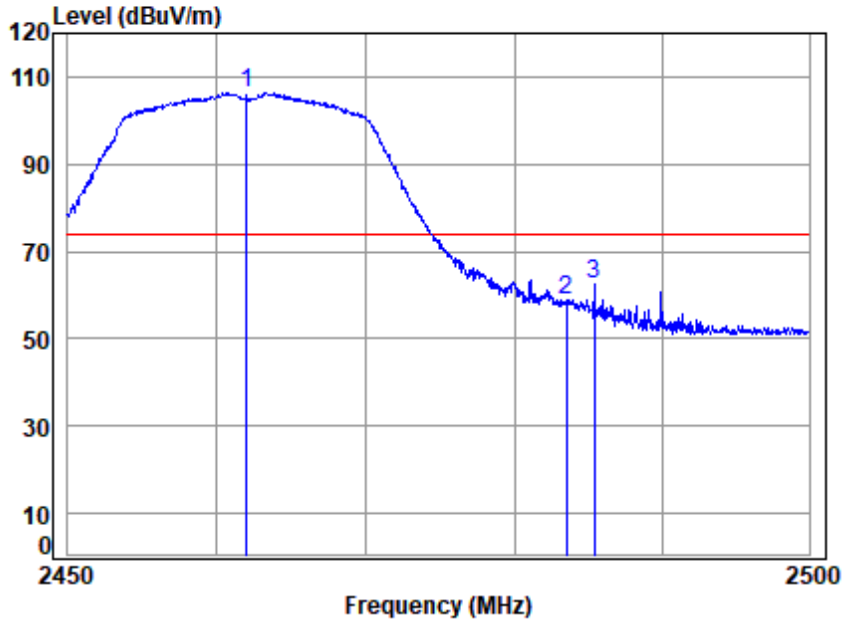
Test Mode: 04; Polarity: Vertical; Modulation:802.11n; Bandwidth:20MHz; Channel:Low



Site : chamber
Condition: 3m VERTICAL
Job No : 04163AT\04164AT
Mode : 2412 Band edge
: 2.4G WIFI 11N20

	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	2387.065	15.81	29.10	32.78	28.26	40.39	54.00	-13.61	Average
2	2390.000	15.81	29.10	32.78	28.19	40.32	54.00	-13.68	Average
3 q	2412.000	15.82	29.05	32.77	82.52	94.62	54.00	40.62	Average

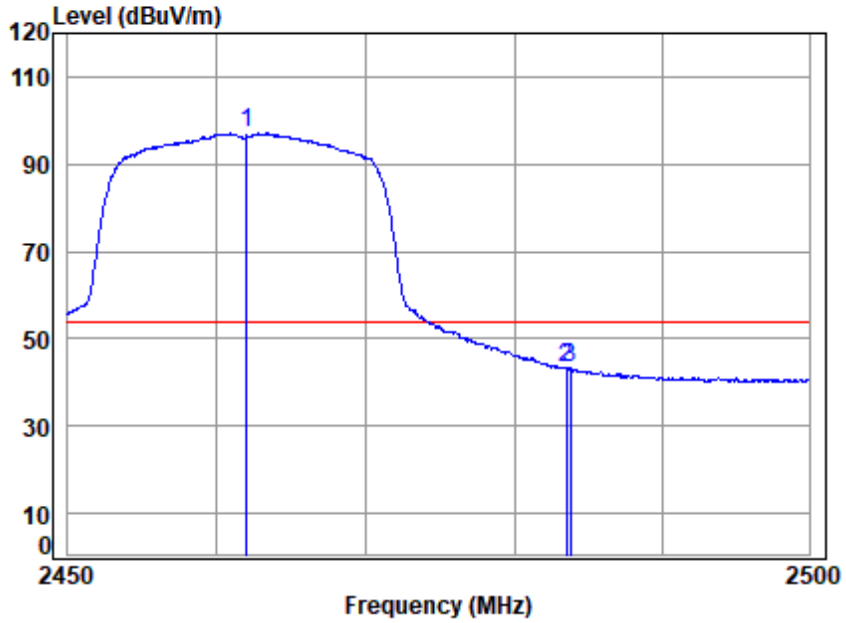
Test Mode: 04; Polarity: Horizontal; Modulation:802.11n; Bandwidth:20MHz; Channel:High



Site : chamber
Condition: 3m HORIZONTAL
Job No : 04163AT\04164AT
Mode : 2462 Band edge
: 2.4G WIFI 11N20

	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 p	2462.000	15.85	28.90	32.74	94.32	106.33	74.00	32.33	peak
2	2483.500	15.86	28.90	32.73	46.98	59.01	74.00	-14.99	peak
3	2485.396	15.86	28.90	32.73	50.43	62.46	74.00	-11.54	peak

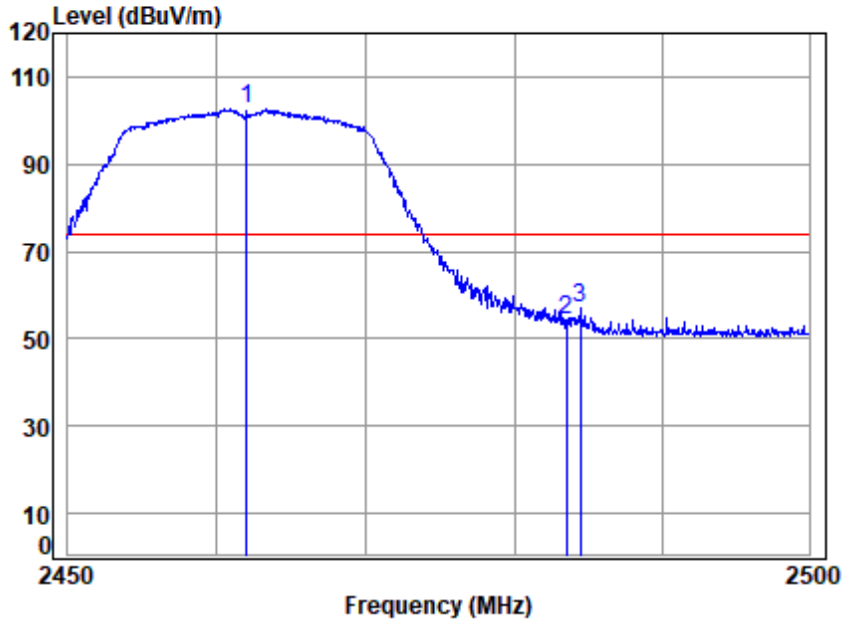
Test Mode: 04; Polarity: Horizontal; Modulation:802.11n; Bandwidth:20MHz; Channel:High



Site : chamber
Condition: 3m HORIZONTAL
Job No : 04163AT\04164AT
Mode : 2462 Band edge
: 2.4G WIFI 11N20

	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 q	2462.000	15.85	28.90	32.74	85.00	97.01	54.00	43.01	Average
2	2483.500	15.86	28.90	32.73	31.11	43.14	54.00	-10.86	Average
3	2483.790	15.86	28.90	32.73	31.15	43.18	54.00	-10.82	Average

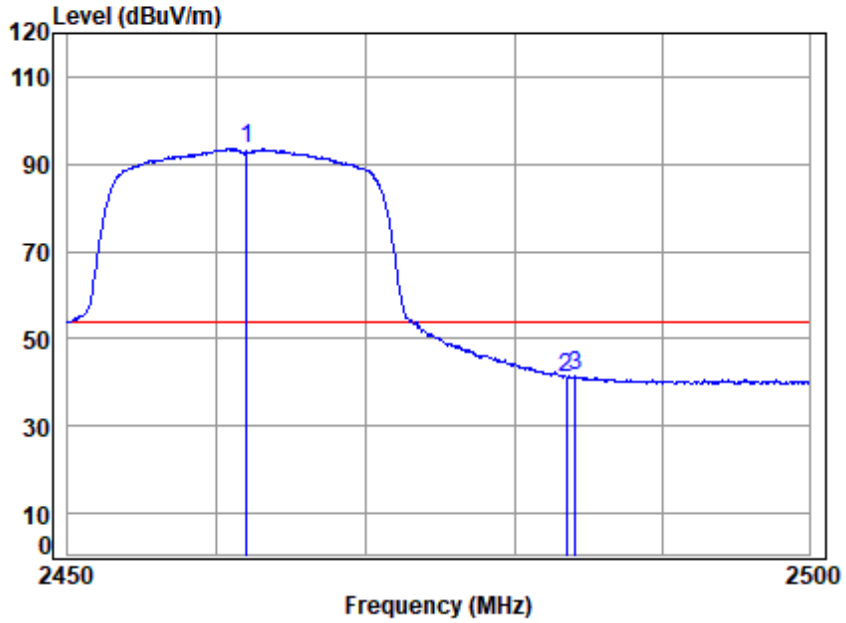
Test Mode: 04; Polarity: Vertical; Modulation:802.11n; Bandwidth:20MHz; Channel:High



Site : chamber
Condition: 3m VERTICAL
Job No : 04163AT\04164AT
Mode : 2462 Band edge
: 2.4G WIFI 11N20

	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 p	2462.000	15.85	28.90	32.74	90.63	102.64	74.00	28.64	Peak
2	2483.500	15.86	28.90	32.73	42.27	54.30	74.00	-19.70	Peak
3	2484.442	15.86	28.90	32.73	45.10	57.13	74.00	-16.87	Peak

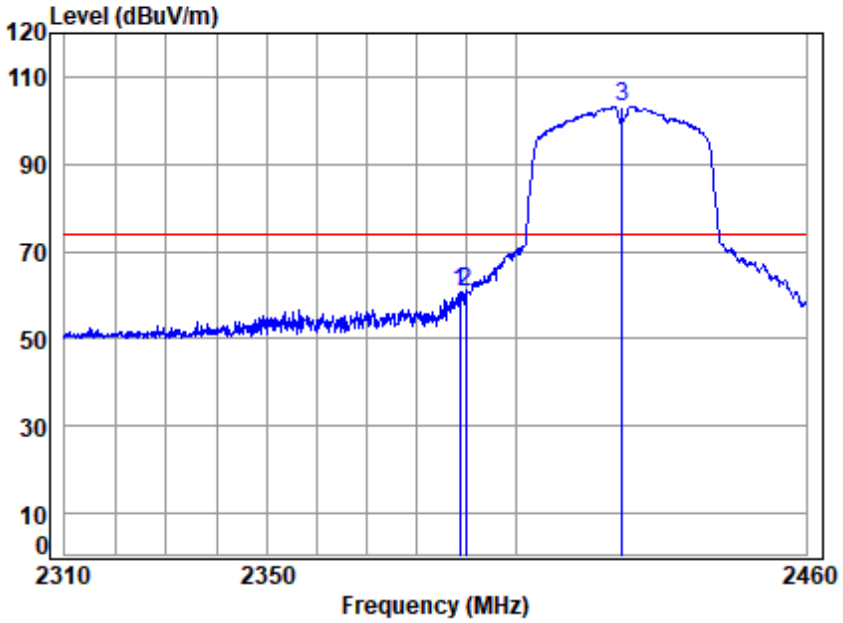
Test Mode: 04; Polarity: Vertical; Modulation:802.11n; Bandwidth:20MHz; Channel:High



Site : chamber
Condition: 3m VERTICAL
Job No : 04163AT\04164AT
Mode : 2462 Band edge
: 2.4G WIFI 11N20

	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 q	2462.000	15.85	28.90	32.74	81.42	93.43	54.00	39.43	Average
2	2483.500	15.86	28.90	32.73	29.25	41.28	54.00	-12.72	Average
3	2484.141	15.86	28.90	32.73	29.33	41.36	54.00	-12.64	Average

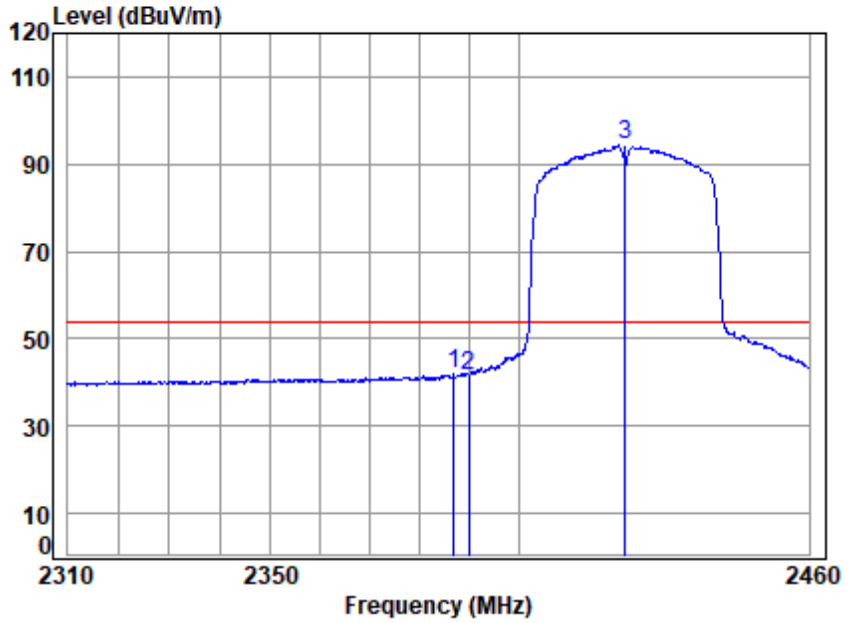
Test Mode: 04; Polarity: Horizontal; Modulation:802.11n; Bandwidth:40MHz; Channel:Low



Site : chamber
Condition: 3m HORIZONTAL
Job No : 04163AT\04164AT
Mode : 2422 Band edge
: 2.4G WIFI 11N40

	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	2388.775	15.81	29.10	32.78	48.77	60.90	74.00	-13.10	peak
2	2390.000	15.81	29.10	32.78	48.59	60.72	74.00	-13.28	peak
3 p	2422.000	15.83	29.01	32.76	91.19	103.27	74.00	29.27	peak

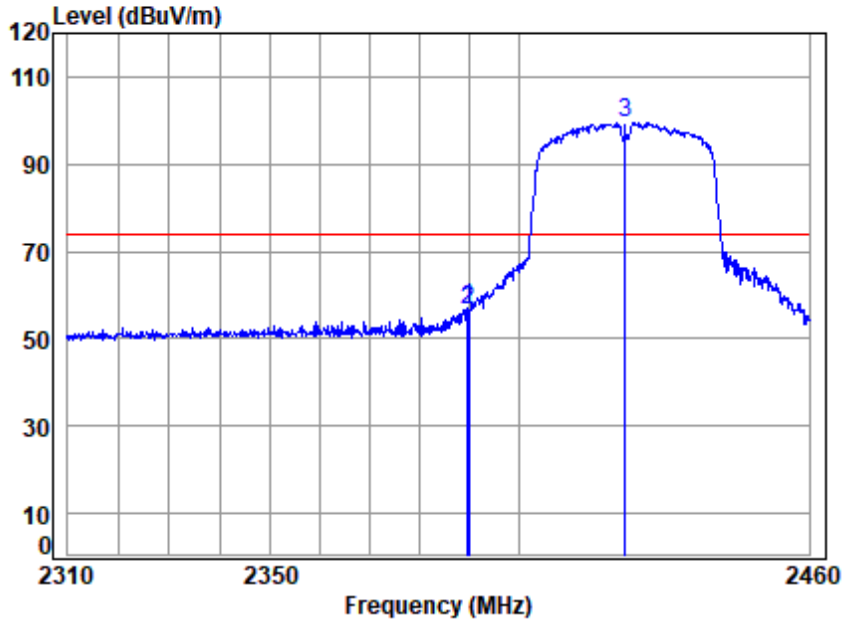
Test Mode: 04; Polarity: Horizontal; Modulation:802.11n; Bandwidth:40MHz; Channel:Low



Site : chamber
Condition: 3m HORIZONTAL
Job No : 04163AT\04164AT
Mode : 2422 Band edge
: 2.4G WIFI 11N40

	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	2386.972	15.81	29.10	32.78	29.79	41.92	54.00	-12.08	Average
2	2390.000	15.81	29.10	32.78	29.58	41.71	54.00	-12.29	Average
3 q	2422.000	15.83	29.01	32.76	82.19	94.27	54.00	40.27	Average

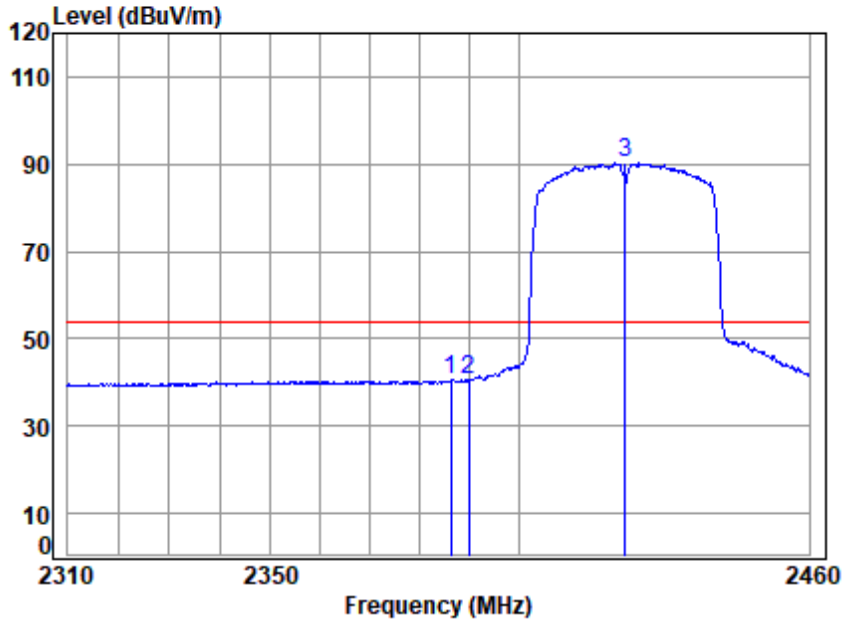
Test Mode: 04; Polarity: Vertical; Modulation:802.11n; Bandwidth:40MHz; Channel:Low



Site : chamber
Condition: 3m VERTICAL
Job No : 04163AT\04164AT
Mode : 2422 Band edge
: 2.4G WIFI 11N40

	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	2389.827	15.81	29.10	32.78	44.92	57.05	74.00	-16.95	Peak
2	2390.000	15.81	29.10	32.78	44.67	56.80	74.00	-17.20	Peak
3 p	2422.000	15.83	29.01	32.76	87.30	99.38	74.00	25.38	Peak

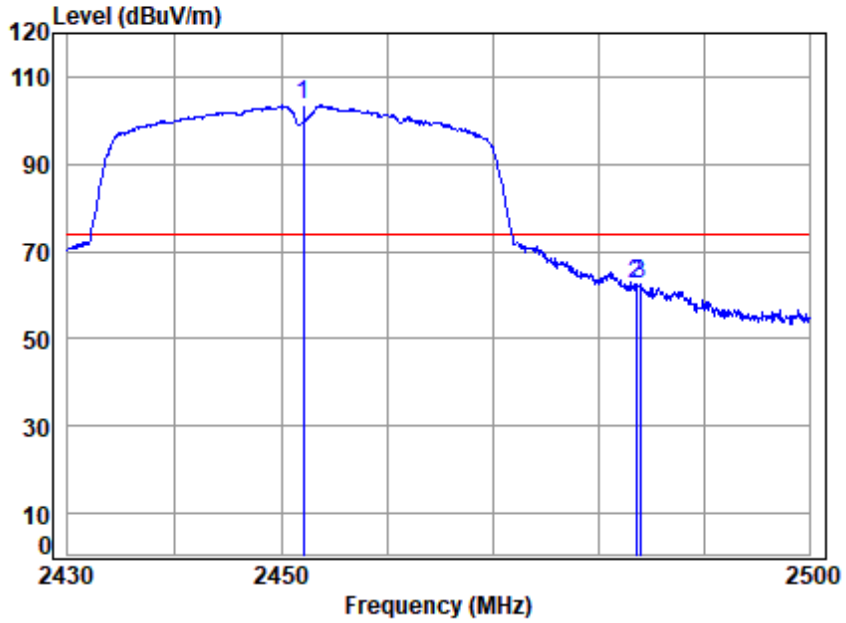
Test Mode: 04; Polarity: Vertical; Modulation:802.11n; Bandwidth:40MHz; Channel:Low



Site : chamber
Condition: 3m VERTICAL
Job No : 04163AT\04164AT
Mode : 2422 Band edge
: 2.4G WIFI 11N40

	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	2386.371	15.81	29.10	32.78	28.70	40.83	54.00	-13.17	Average
2	2390.000	15.81	29.10	32.78	28.27	40.40	54.00	-13.60	Average
3 q	2422.000	15.83	29.01	32.76	78.12	90.20	54.00	36.20	Average

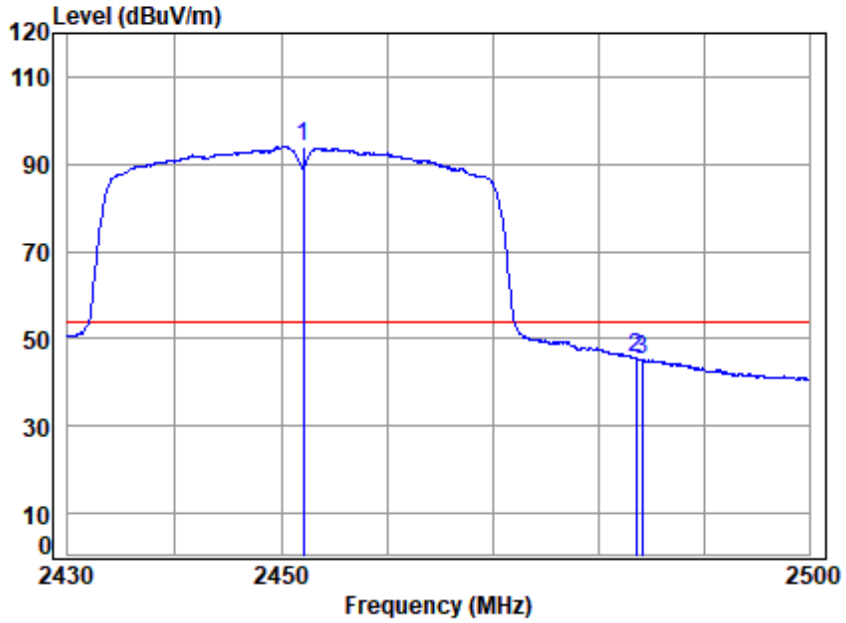
Test Mode: 04; Polarity: Horizontal; Modulation:802.11n; Bandwidth:40MHz; Channel:High



Site : chamber
Condition: 3m HORIZONTAL
Job No : 04163AT\04164AT
Mode : 2452 Band edge
: 2.4G WIFI 11N40

	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 p	2452.000	15.84	28.90	32.75	91.41	103.40	74.00	29.40	peak
2	2483.500	15.86	28.90	32.73	50.34	62.37	74.00	-11.63	peak
3	2483.865	15.86	28.90	32.73	50.29	62.32	74.00	-11.68	peak

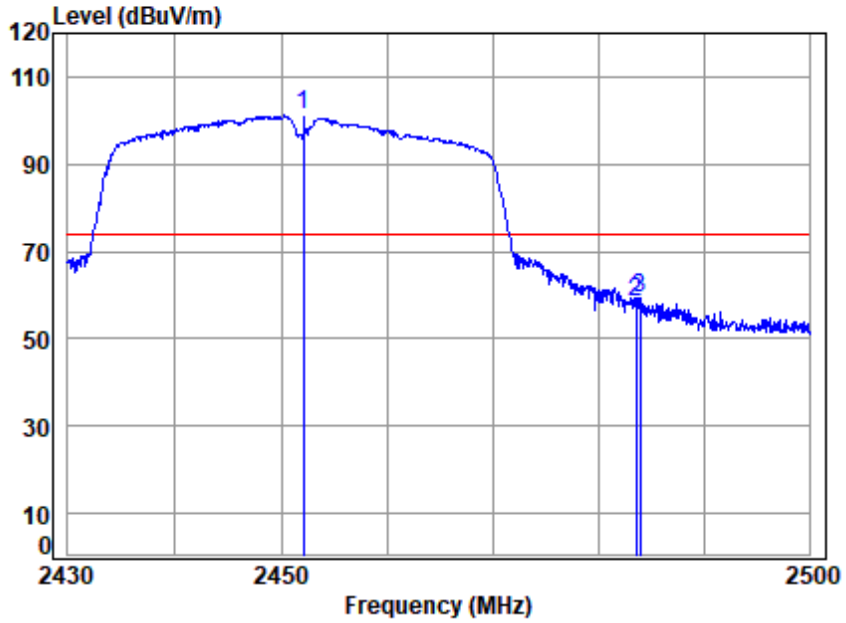
Test Mode: 04; Polarity: Horizontal; Modulation:802.11n; Bandwidth:40MHz; Channel:High



Site : chamber
Condition: 3m HORIZONTAL
Job No : 04163AT\04164AT
Mode : 2452 Band edge
: 2.4G WIFI 11N40

	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 q	2452.000	15.84	28.90	32.75	82.03	94.02	54.00	40.02	Average
2	2483.500	15.86	28.90	32.73	33.66	45.69	54.00	-8.31	Average
3	2484.076	15.86	28.90	32.73	33.23	45.26	54.00	-8.74	Average

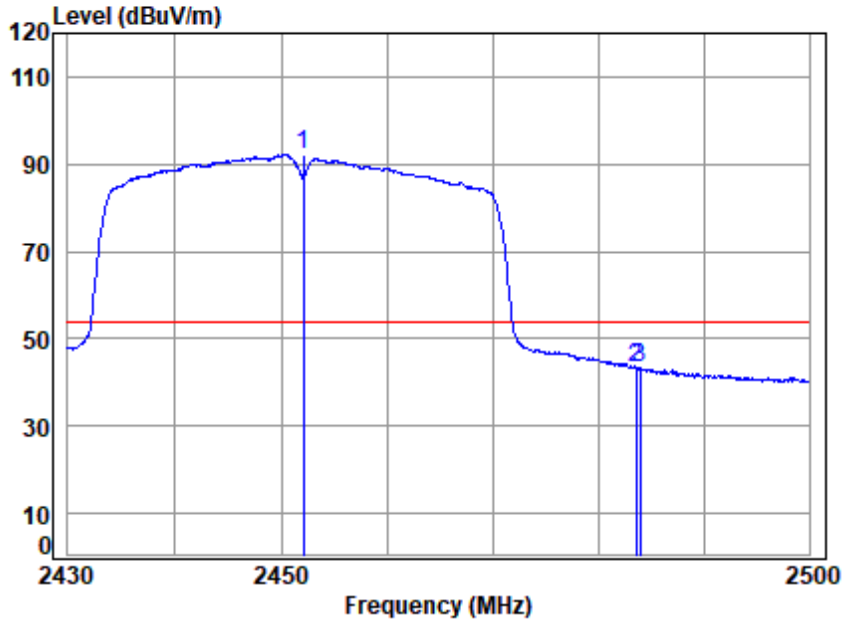
Test Mode: 04; Polarity: Vertical; Modulation:802.11n; Bandwidth:40MHz; Channel:High



Site : chamber
Condition: 3m VERTICAL
Job No : 04163AT\04164AT
Mode : 2452 Band edge
: 2.4G WIFI 11N40

	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 p	2452.000	15.84	28.90	32.75	89.18	101.17	74.00	27.17	Peak
2	2483.500	15.86	28.90	32.73	46.55	58.58	74.00	-15.42	Peak
3	2483.865	15.86	28.90	32.73	47.29	59.32	74.00	-14.68	Peak

Test Mode: 04; Polarity: Vertical; Modulation:802.11n; Bandwidth:40MHz; Channel:High



Site : chamber
Condition: 3m VERTICAL
Job No : 04163AT\04164AT
Mode : 2452 Band edge
: 2.4G WIFI 11N40

	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 q	2452.000	15.84	28.90	32.75	80.22	92.21	54.00	38.21	Average
2	2483.500	15.86	28.90	32.73	31.31	43.34	54.00	-10.66	Average
3	2483.865	15.86	28.90	32.73	31.14	43.17	54.00	-10.83	Average

7.3 Radiated Spurious Emissions Below 1GHz

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method: ANSI C63.10 (2013) Section 6.4,6.5
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
960-1000	500	3

7.3.1 E.U.T. Operation

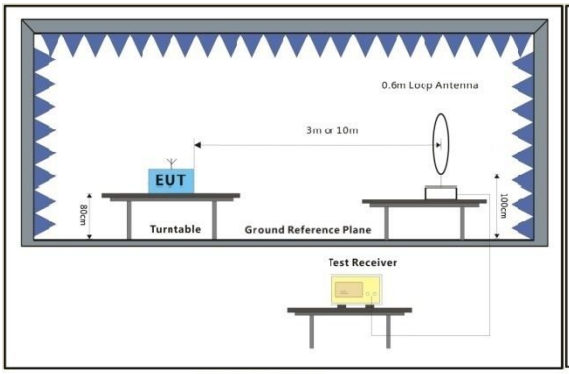
Operating Environment:
Temperature: 20.2 °C Humidity: 45.2 % RH Atmospheric Pressure: 1020 mbar

7.3.2 Test Mode Description

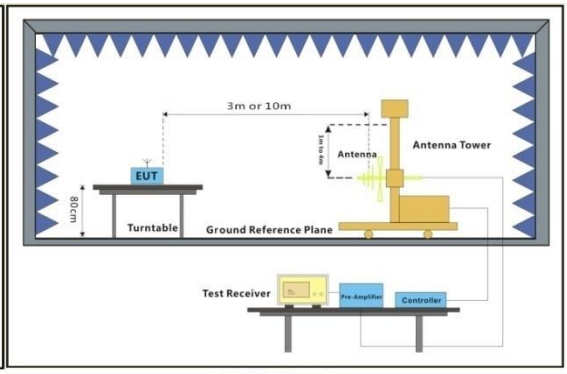
Pre-scan / Final test	Mode Code	Description
Pre-scan	04	TX mode_Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 1Mbps is the worst case of IEEE 802.11b; data rate @ 6Mbps is the worst case of IEEE 802.11g; data rate @ 6.5Mbps is the worst case of IEEE 802.11n(HT20); data rate @ 13.5Mbps is the worst case of IEEE 802.11n(HT40), final test modes are considering the modulation and worse data rates. Only the data of worst case is recorded in the report.
Final test	05	Charge + TX mode_Keep the EUT in charging and continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 1Mbps is the worst case of IEEE 802.11b; data rate @ 6Mbps is the worst case of IEEE 802.11g; data rate @ 6.5Mbps is the worst case of IEEE 802.11n(HT20); data rate @ 13.5Mbps is the worst case of IEEE 802.11n(HT40), final test modes are considering the modulation and worse data rates. Only the data of worst case is recorded in the report.
Pre-scan	35	TX mode_Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 1Mbps is the worst case of IEEE 802.11b; data rate @ 6Mbps is the worst case of IEEE 802.11g; data rate @ 6.5Mbps is the worst case of IEEE 802.11n(HT20); data rate @ 13.5Mbps is the worst case of IEEE 802.11n(HT40), final test modes are

		considering the modulation and worse data rates. Only the data of worst case is recorded in the report.
Pre-scan	36	Charge + TX mode_Keep the EUT in charging and continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 1Mbps is the worst case of IEEE 802.11b; data rate @ 6Mbps is the worst case of IEEE 802.11g; data rate @ 6.5Mbps is the worst case of IEEE 802.11n(HT20); data rate @ 13.5Mbps is the worst case of IEEE 802.11n(HT40), final test modes are considering the modulation and worse data rates. Only the data of worst case is recorded in the report.

7.3.3 Test Setup Diagram



Below 30MHz



30MHz-1GHz

7.3.4 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 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 or 10 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.

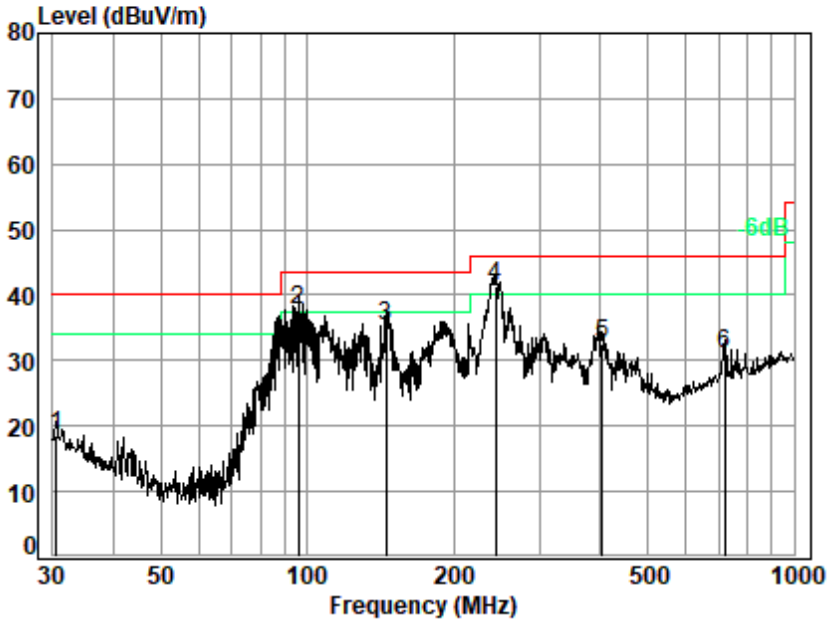
i. Repeat above procedures until all frequencies measured was complete.

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.

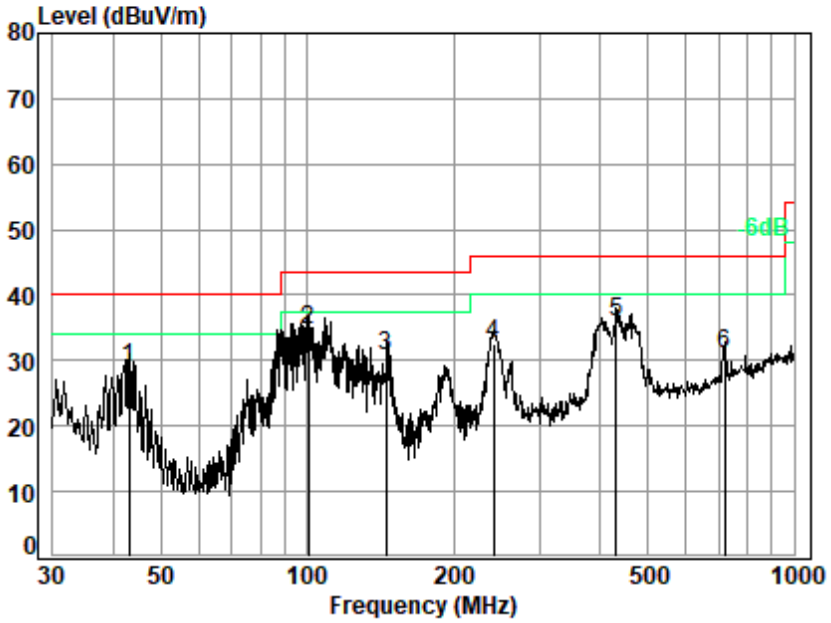
Test Mode: 05; Polarity: Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No. : 04163AT/04164AT
Mode : 05

	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	30.531	20.95	0.65	27.79	24.88	18.69	40.00	-21.31	QP
2	96.099	12.17	1.17	27.60	51.98	37.72	43.50	-5.78	QP
3	145.351	12.46	1.43	27.40	48.89	35.38	43.50	-8.12	QP
4 q	243.377	17.06	1.92	26.99	49.23	41.22	46.00	-4.78	QP
5	403.250	20.55	2.56	27.17	36.57	32.51	46.00	-13.49	QP
6	719.200	26.25	3.57	27.68	28.89	31.03	46.00	-14.97	QP

Test Mode: 05; Polarity: Vertical



Site : chamber
Condition: 3m VERTICAL
Job No. : 04163AT/04164AT
Mode : 05

	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	43.050	14.96	0.77	27.75	41.06	29.04	40.00	-10.96	QP
2 q	100.581	12.31	1.19	27.59	48.91	34.82	43.50	-8.68	QP
3	145.351	12.46	1.43	27.40	44.35	30.84	43.50	-12.66	QP
4	241.676	17.04	1.91	26.99	40.63	32.59	46.00	-13.41	QP
5	431.032	20.96	2.66	27.28	39.60	35.94	46.00	-10.06	QP
6	719.200	26.25	3.57	27.68	28.78	30.92	46.00	-15.08	QP

7.4 Radiated Spurious Emissions Above 1GHz

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method: ANSI C63.10 (2013) Section 6.6
Measurement Distance: 3m

Limit:

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

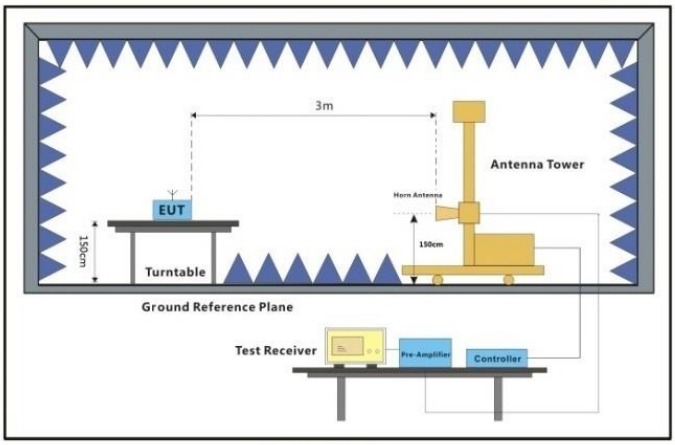
7.4.1 E.U.T. Operation

Operating Environment:
Temperature: 22.1 °C Humidity: 36.9 % RH Atmospheric Pressure: 1020 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode_Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 1Mbps is the worst case of IEEE 802.11b; data rate @ 6Mbps is the worst case of IEEE 802.11g; data rate @ 6.5Mbps is the worst case of IEEE 802.11n(HT20); data rate @ 13.5Mbps is the worst case of IEEE 802.11n(HT40), final test modes are considering the modulation and worse data rates. Only the data of worst case is recorded in the report.

7.4.3 Test Setup Diagram



Above 1GHz

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

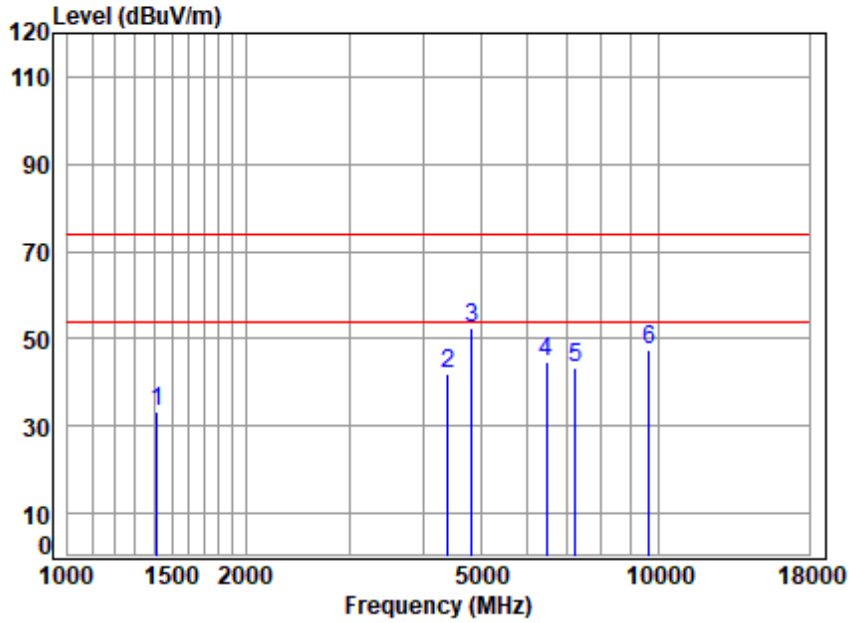
2. Scan from 1GHz to 25GHz, the disturbance above 18GHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit 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.

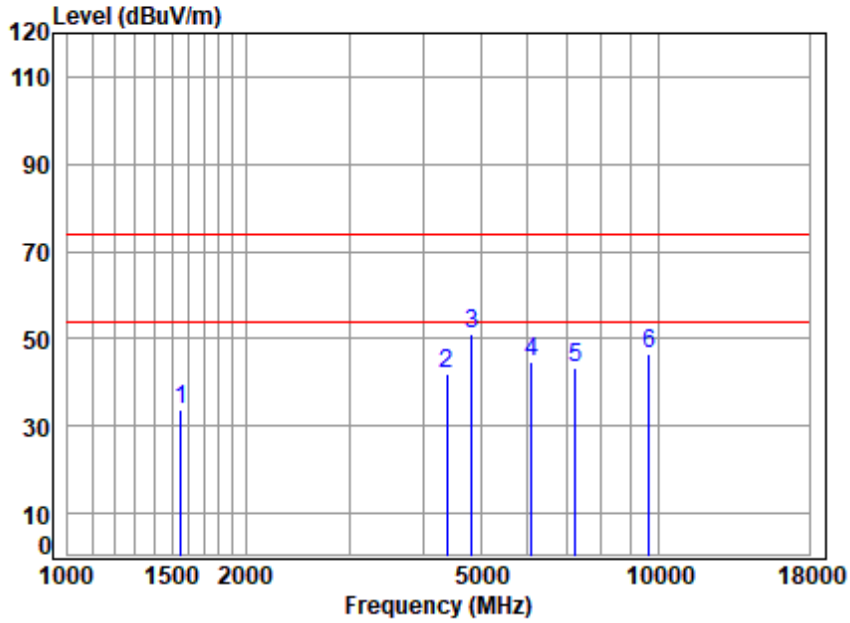
Test Mode: 04; Polarity: Horizontal; Modulation:802.11b; Bandwidth:20MHz; Channel:Low



Site : chamber
Condition: 3m HORIZONTAL
Job No : 04163AT\04164AT
Mode : 2412 TX RSE
: 2.4G WIFI 11B

	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	1414.597	5.04	24.83	54.75	58.18	33.30	74.00	-40.70	peak
2	4405.090	7.07	34.74	54.26	54.49	42.04	74.00	-31.96	peak
3 p	4824.000	7.47	34.40	54.22	64.74	52.39	74.00	-21.61	peak
4	6470.026	8.83	35.54	53.15	53.71	44.93	74.00	-29.07	peak
5	7236.000	8.53	35.70	53.18	52.18	43.23	74.00	-30.77	peak
6	9648.000	10.59	37.50	53.34	52.77	47.52	74.00	-26.48	peak

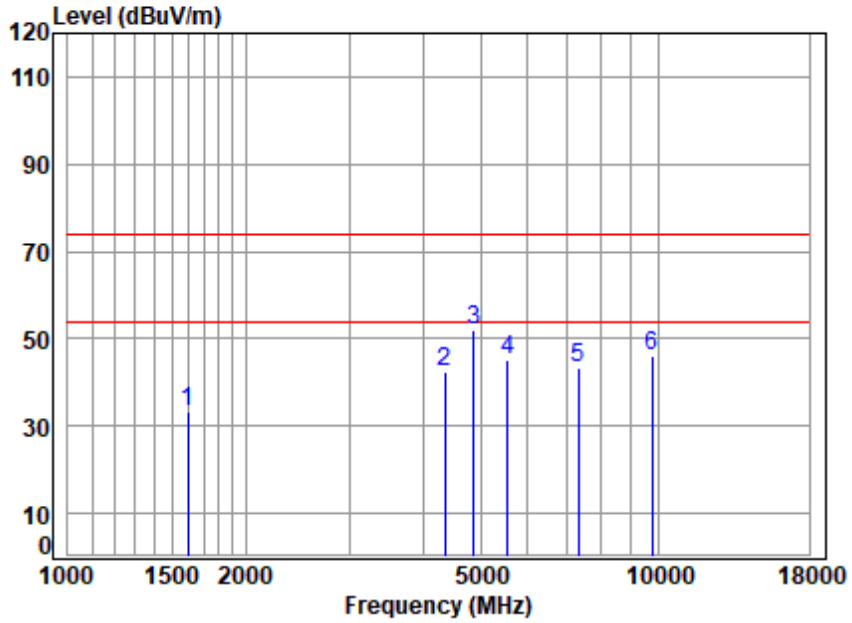
Test Mode: 04; Polarity: Vertical; Modulation:802.11b; Bandwidth:20MHz; Channel:Low



Site : chamber
Condition: 3m VERTICAL
Job No : 04163AT\04164AT
Mode : 2412 TX RSE
: 2.4G WIFI 11B

	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	1556.169	4.91	26.98	54.79	56.71	33.81	74.00	-40.19	peak
2	4392.376	7.06	34.74	54.26	54.41	41.95	74.00	-32.05	peak
3 p	4824.000	7.47	34.40	54.22	63.67	51.32	74.00	-22.68	peak
4	6106.616	8.78	35.07	53.11	54.18	44.92	74.00	-29.08	peak
5	7236.000	8.53	35.70	53.18	52.40	43.45	74.00	-30.55	peak
6	9648.000	10.59	37.50	53.34	51.96	46.71	74.00	-27.29	peak

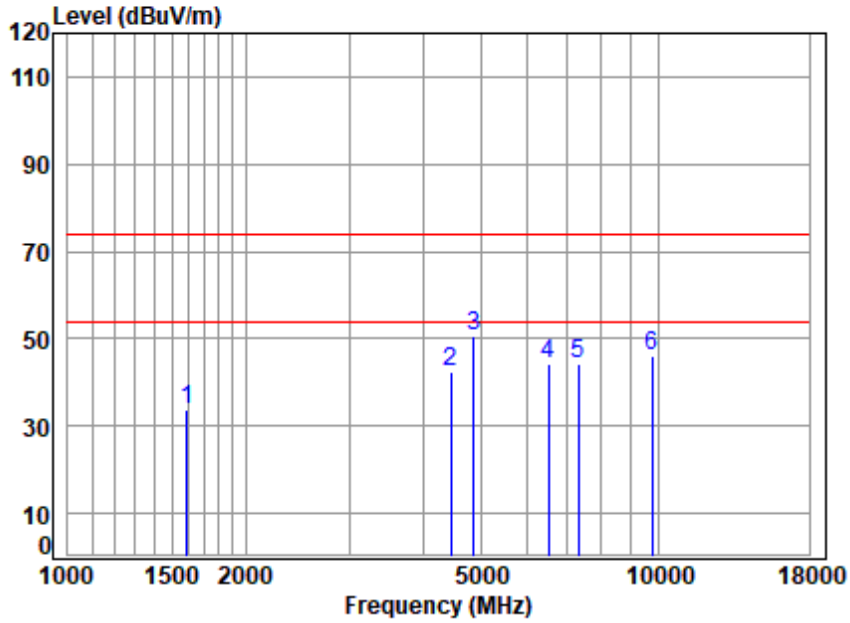
Test Mode: 04; Polarity: Horizontal; Modulation:802.11b; Bandwidth:20MHz; Channel:middle



Site : chamber
Condition: 3m HORIZONTAL
Job No : 04163AT\04164AT
Mode : 2437 TX RSE
: 2.4G WIFI 11B

	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	1597.181	4.93	26.81	54.80	56.58	33.52	74.00	-40.48	peak
2	4354.454	7.04	34.44	54.26	55.21	42.43	74.00	-31.57	peak
3 p	4874.000	7.52	34.60	54.21	64.32	52.23	74.00	-21.77	peak
4	5551.069	8.35	34.70	53.57	55.70	45.18	74.00	-28.82	peak
5	7311.000	8.50	35.70	53.17	52.26	43.29	74.00	-30.71	peak
6	9748.000	10.56	37.40	53.30	51.29	45.95	74.00	-28.05	peak

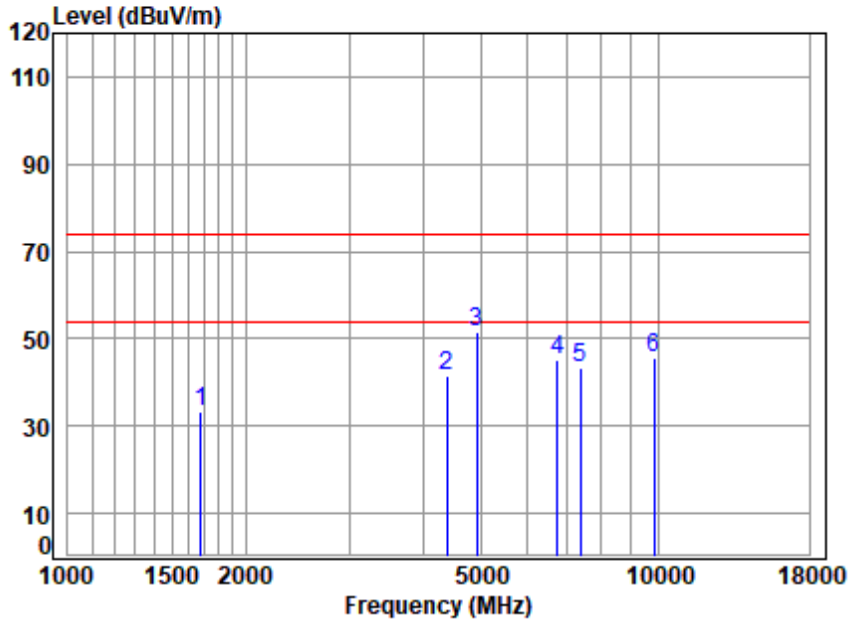
Test Mode: 04; Polarity: Vertical; Modulation:802.11b; Bandwidth:20MHz; Channel:middle



Site : chamber
Condition: 3m VERTICAL
Job No : 04163AT\04164AT
Mode : 2437 TX RSE
: 2.4G WIFI 11B

	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	1592.571	4.93	26.83	54.80	56.66	33.62	74.00	-40.38	peak
2	4456.315	7.11	34.12	54.25	55.49	42.47	74.00	-31.53	peak
3 p	4874.000	7.52	34.60	54.21	62.79	50.70	74.00	-23.30	peak
4	6526.373	8.82	35.55	53.15	53.08	44.30	74.00	-29.70	peak
5	7311.000	8.50	35.70	53.17	53.06	44.09	74.00	-29.91	peak
6	9748.000	10.56	37.40	53.30	51.51	46.17	74.00	-27.83	peak

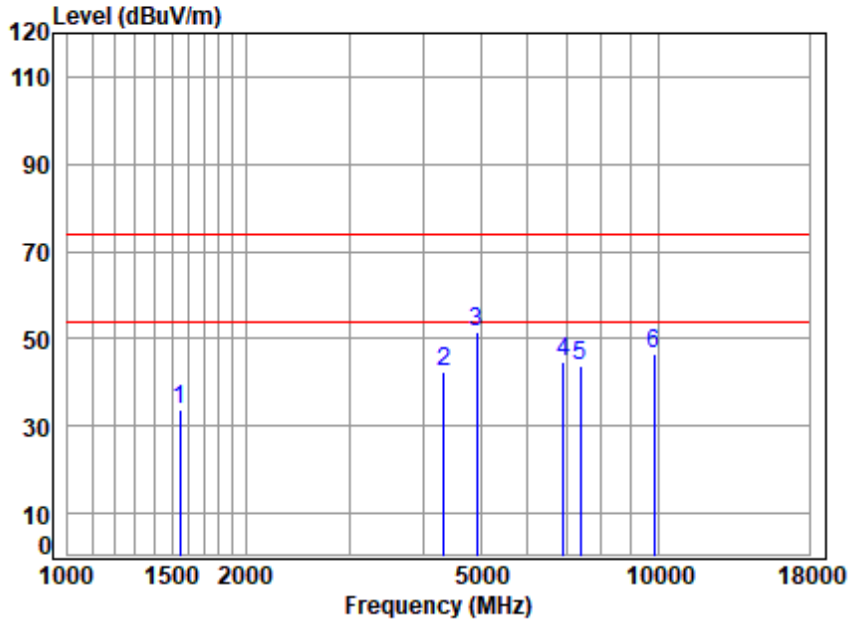
Test Mode: 04; Polarity: Horizontal; Modulation:802.11b; Bandwidth:20MHz; Channel:High



Site : chamber
Condition: 3m HORIZONTAL
Job No : 04163AT\04164AT
Mode : 2462 TX RSE
: 2.4G WIFI 11B

	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	1682.477	4.96	26.24	54.83	57.11	33.48	74.00	-40.52	peak
2	4392.376	7.06	34.74	54.26	54.01	41.55	74.00	-32.45	peak
3 p	4924.000	7.57	34.65	54.21	63.63	51.64	74.00	-22.36	peak
4	6756.708	8.72	35.21	53.18	54.48	45.23	74.00	-28.77	peak
5	7386.000	8.48	35.77	53.16	52.15	43.24	74.00	-30.76	peak
6	9848.000	10.53	37.20	53.26	51.15	45.62	74.00	-28.38	peak

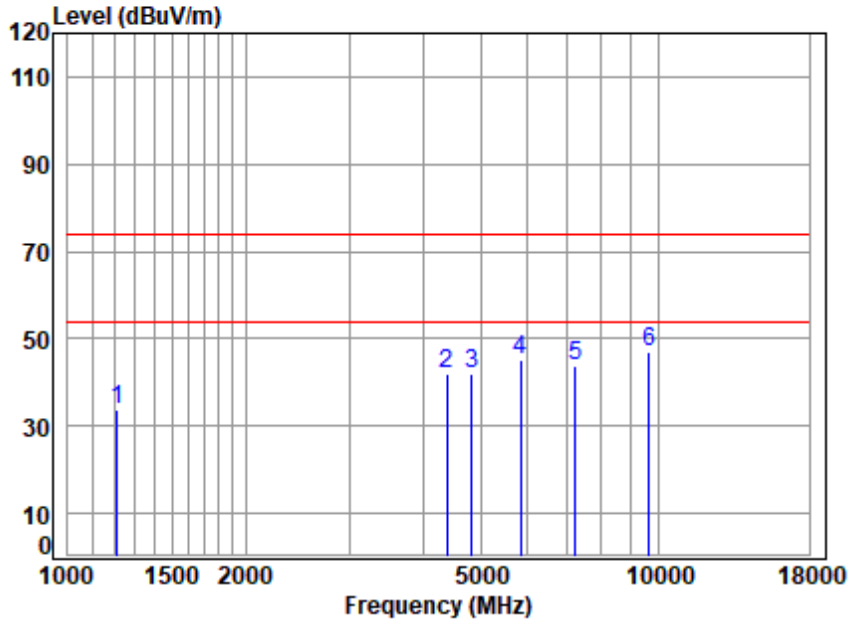
Test Mode: 04; Polarity: Vertical; Modulation:802.11b; Bandwidth:20MHz; Channel:High



Site : chamber
Condition: 3m VERTICAL
Job No : 04163AT\04164AT
Mode : 2462 TX RSE
: 2.4G WIFI 11B

	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	1547.199	4.91	26.99	54.79	56.83	33.94	74.00	-40.06	peak
2	4329.354	7.02	34.23	54.26	55.28	42.27	74.00	-31.73	peak
3 p	4924.000	7.57	34.65	54.21	63.74	51.75	74.00	-22.25	peak
4	6914.763	8.65	35.66	53.19	53.45	44.57	74.00	-29.43	peak
5	7386.000	8.48	35.77	53.16	52.55	43.64	74.00	-30.36	peak
6	9848.000	10.53	37.20	53.26	52.10	46.57	74.00	-27.43	peak

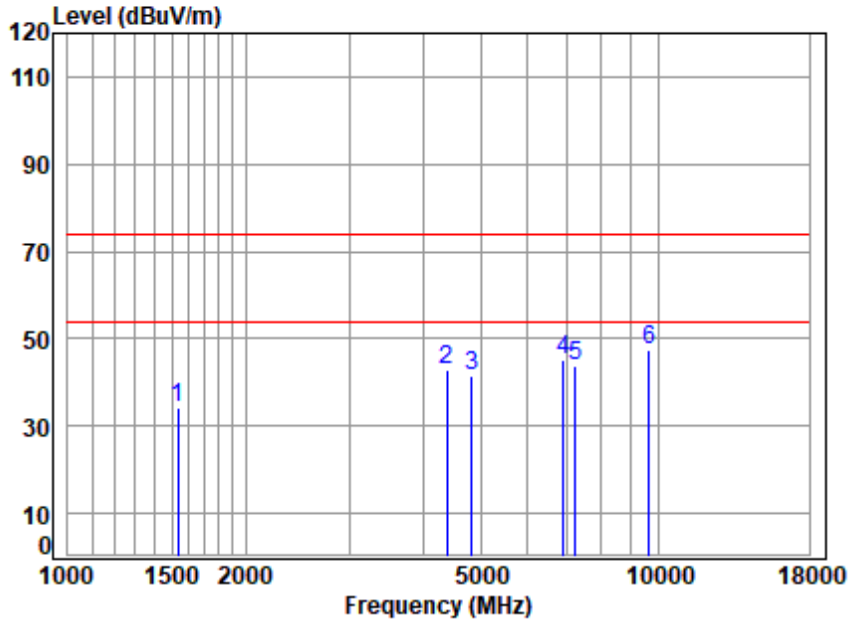
Test Mode: 04; Polarity: Horizontal; Modulation:802.11n; Bandwidth:20MHz; Channel:Low



Site : chamber
Condition: 3m HORIZONTAL
Job No : 04163AT\04164AT
Mode : 2412 TX RSE
: 2.4G WIFI 11N20

	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	1210.174	5.45	24.54	54.68	58.52	33.83	74.00	-40.17	peak
2	4392.376	7.06	34.74	54.26	54.55	42.09	74.00	-31.91	peak
3	4824.000	7.47	34.40	54.22	54.27	41.92	74.00	-32.08	peak
4	5847.517	8.63	34.40	53.26	55.44	45.21	74.00	-28.79	peak
5	7236.000	8.53	35.70	53.18	52.75	43.80	74.00	-30.20	peak
6 p	9648.000	10.59	37.50	53.34	52.23	46.98	74.00	-27.02	peak

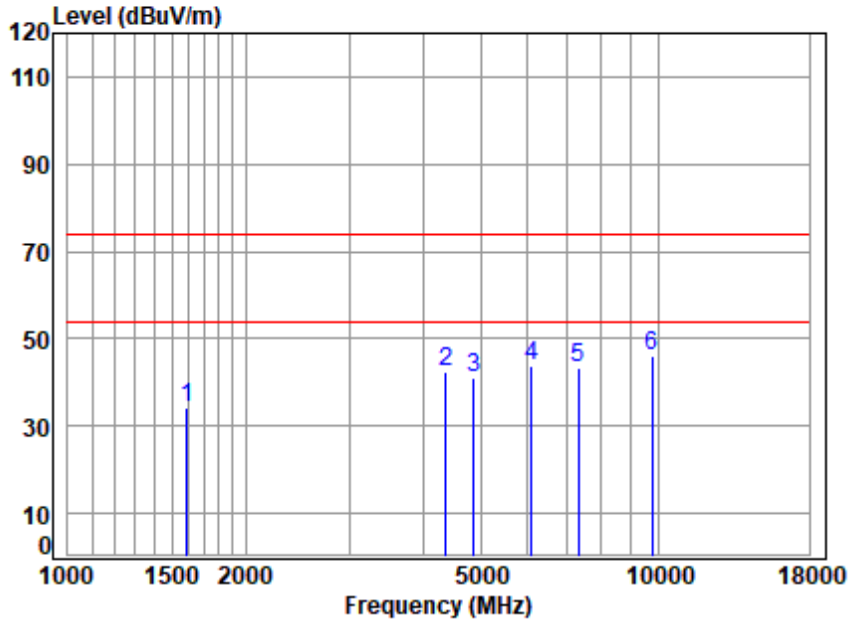
Test Mode: 04; Polarity: Vertical; Modulation:802.11n; Bandwidth:20MHz; Channel:Low



Site : chamber
Condition: 3m VERTICAL
Job No : 04163AT\04164AT
Mode : 2412 TX RSE
: 2.4G WIFI 11N20

	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	1538.281	4.90	26.95	54.79	57.09	34.15	74.00	-39.85	peak
2	4379.699	7.05	34.64	54.26	55.31	42.74	74.00	-31.26	peak
3	4824.000	7.47	34.40	54.22	54.08	41.73	74.00	-32.27	peak
4	6914.763	8.65	35.66	53.19	53.94	45.06	74.00	-28.94	peak
5	7236.000	8.53	35.70	53.18	52.53	43.58	74.00	-30.42	peak
6 p	9648.000	10.59	37.50	53.34	52.87	47.62	74.00	-26.38	peak

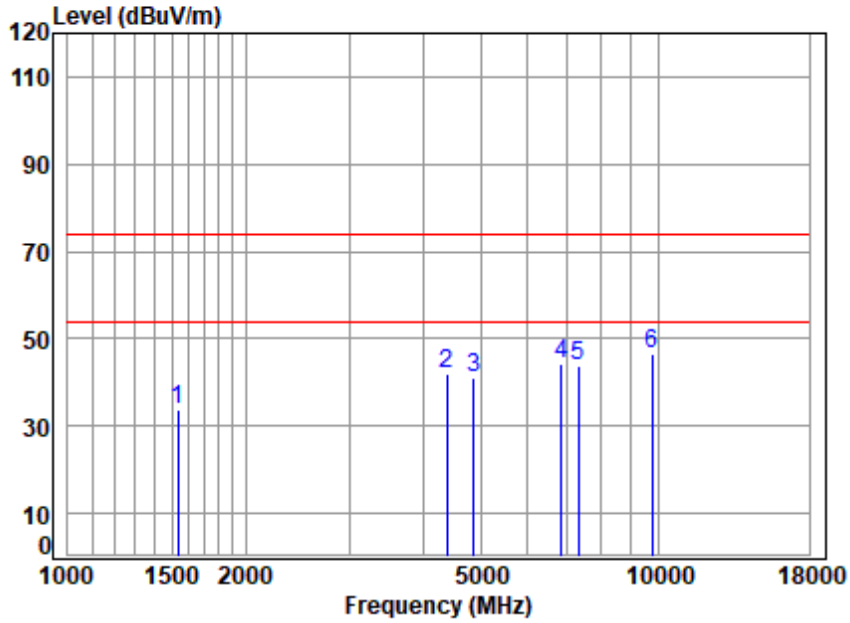
Test Mode: 04; Polarity: Horizontal; Modulation:802.11n; Bandwidth:20MHz; Channel:middle



Site : chamber
Condition: 3m HORIZONTAL
Job No : 04163AT\04164AT
Mode : 2437 TX RSE
: 2.4G WIFI 11N20

	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	1592.571	4.93	26.83	54.80	57.27	34.23	74.00	-39.77	peak
2	4367.058	7.05	34.54	54.26	55.23	42.56	74.00	-31.44	peak
3	4874.000	7.52	34.60	54.21	53.29	41.20	74.00	-32.80	peak
4	6106.616	8.78	35.07	53.11	53.26	44.00	74.00	-30.00	peak
5	7311.000	8.50	35.70	53.17	52.29	43.32	74.00	-30.68	peak
6 p	9748.000	10.56	37.40	53.30	51.38	46.04	74.00	-27.96	peak

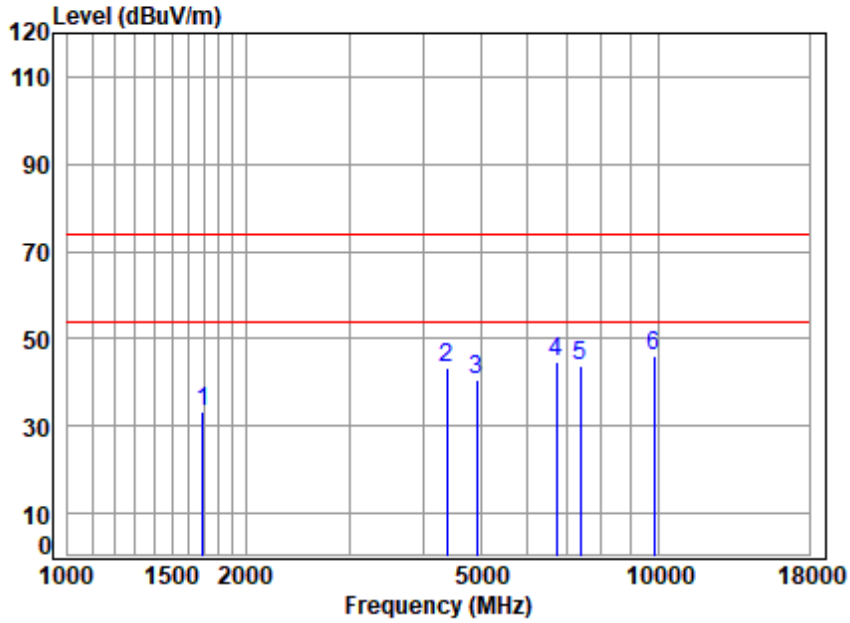
Test Mode: 04; Polarity: Vertical; Modulation:802.11n; Bandwidth:20MHz; Channel:middle



Site : chamber
Condition: 3m VERTICAL
Job No : 04163AT\04164AT
Mode : 2437 TX RSE
: 2.4G WIFI 11N20

	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	1533.841	4.90	26.94	54.79	56.85	33.90	74.00	-40.10	peak
2	4392.376	7.06	34.74	54.26	54.60	42.14	74.00	-31.86	peak
3	4874.000	7.52	34.60	54.21	53.14	41.05	74.00	-32.95	peak
4	6855.063	8.67	35.51	53.19	53.40	44.39	74.00	-29.61	peak
5	7311.000	8.50	35.70	53.17	52.66	43.69	74.00	-30.31	peak
6 p	9748.000	10.56	37.40	53.30	51.65	46.31	74.00	-27.69	peak

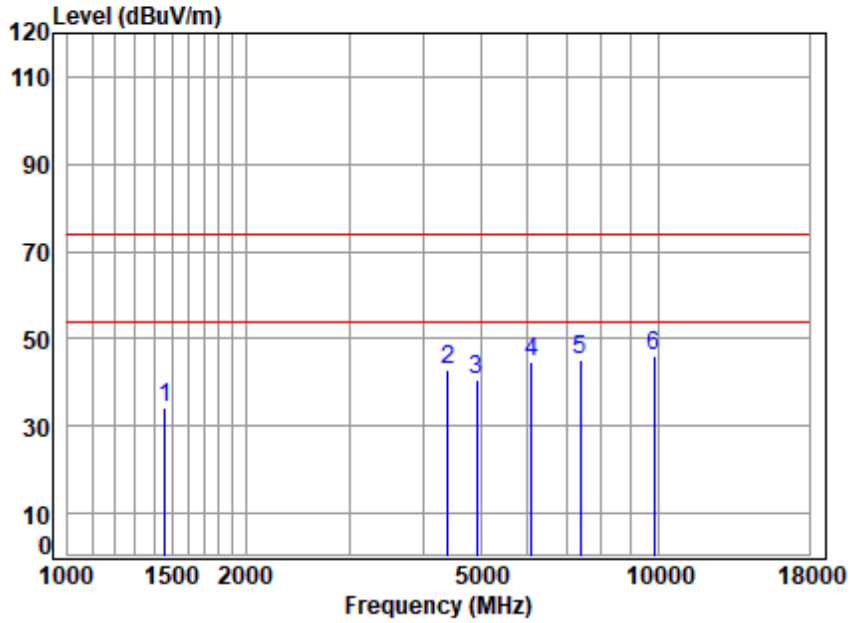
Test Mode: 04; Polarity: Horizontal; Modulation:802.11n; Bandwidth:20MHz; Channel:High



Site : chamber
Condition: 3m HORIZONTAL
Job No : 04163AT\04164AT
Mode : 2462 TX RSE
: 2.4G WIFI 11N20

	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	1692.231	4.96	26.22	54.83	56.77	33.12	74.00	-40.88	peak
2	4392.376	7.06	34.74	54.26	55.88	43.42	74.00	-30.58	peak
3	4924.000	7.57	34.65	54.21	52.51	40.52	74.00	-33.48	peak
4	6717.762	8.73	35.20	53.17	53.92	44.68	74.00	-29.32	peak
5	7386.000	8.48	35.77	53.16	52.66	43.75	74.00	-30.25	peak
6 p	9848.000	10.53	37.20	53.26	51.47	45.94	74.00	-28.06	peak

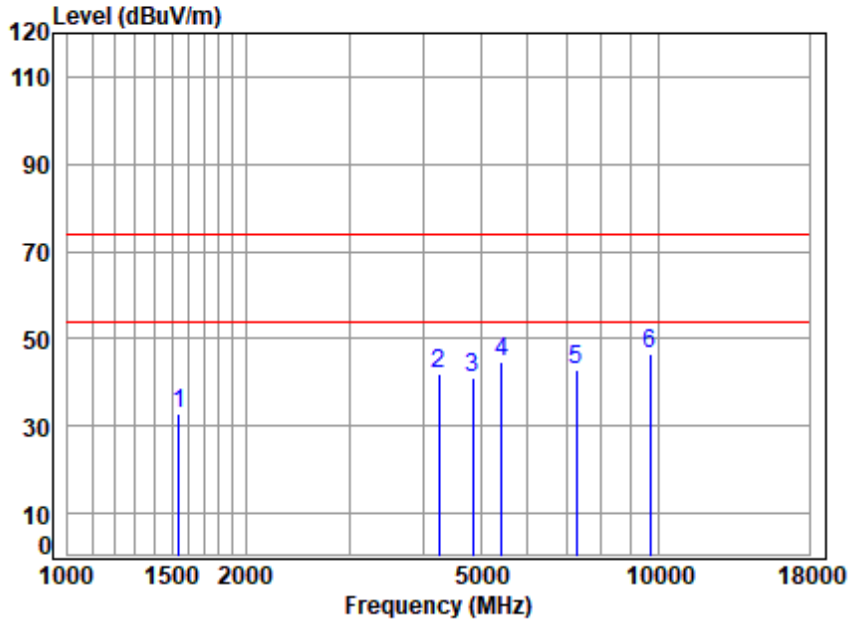
Test Mode: 04; Polarity: Vertical; Modulation:802.11n; Bandwidth:20MHz; Channel:High



Site : chamber
Condition: 3m VERTICAL
Job No : 04163AT\04164AT
Mode : 2462 TX RSE
: 2.4G WIFI 11N20

	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	1460.295	4.96	25.69	54.76	58.11	34.00	74.00	-40.00	peak
2	4405.090	7.07	34.74	54.26	55.15	42.70	74.00	-31.30	peak
3	4924.000	7.57	34.65	54.21	52.49	40.50	74.00	-33.50	peak
4	6088.991	8.78	35.08	53.11	54.00	44.75	74.00	-29.25	peak
5	7386.000	8.48	35.77	53.16	54.03	45.12	74.00	-28.88	peak
6 p	9848.000	10.53	37.20	53.26	51.52	45.99	74.00	-28.01	peak

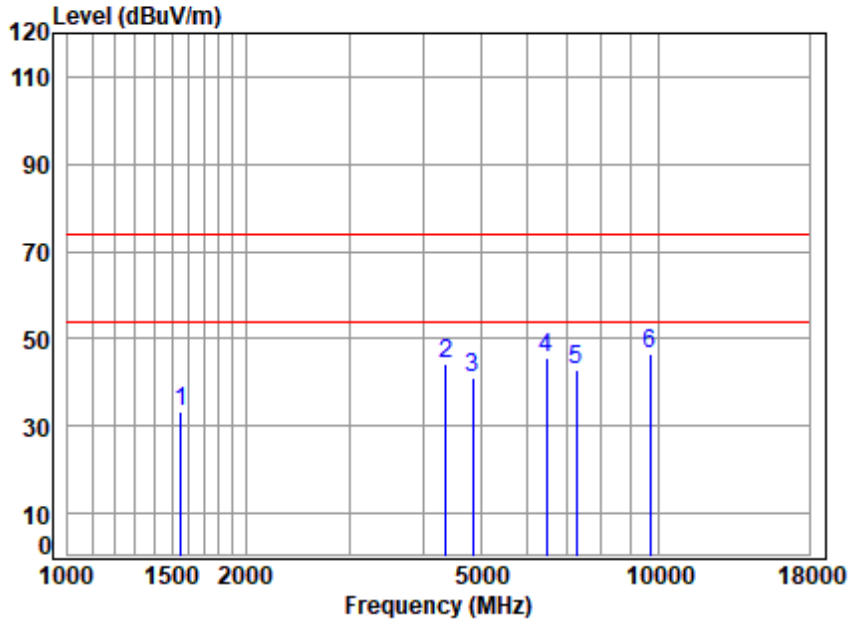
Test Mode: 04; Polarity: Horizontal; Modulation:802.11n; Bandwidth:40MHz; Channel:Low



Site : chamber
Condition: 3m HORIZONTAL
Job No : 04163AT\04164AT
Mode : 2422 TX RSE
: 2.4G WIFI 11N40

	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	1542.733	4.91	26.97	54.79	55.90	32.99	74.00	-41.01	peak
2	4242.641	6.95	33.80	54.27	55.56	42.04	74.00	-31.96	peak
3	4844.000	7.49	34.48	54.21	53.39	41.15	74.00	-32.85	peak
4	5424.184	8.20	34.65	53.71	55.40	44.54	74.00	-29.46	peak
5	7266.000	8.52	35.70	53.17	51.92	42.97	74.00	-31.03	peak
6 p	9688.000	10.58	37.50	53.32	51.68	46.44	74.00	-27.56	peak

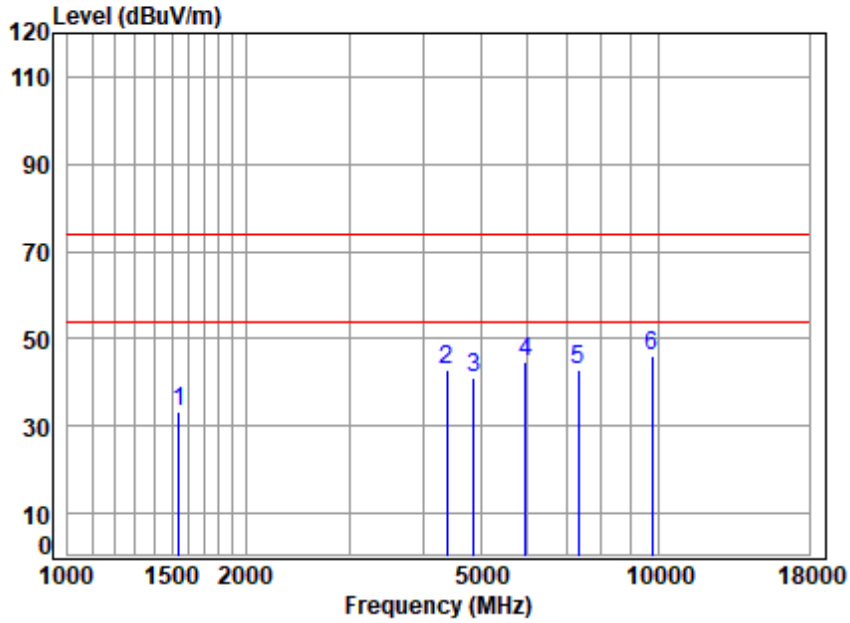
Test Mode: 04; Polarity: Vertical; Modulation:802.11n; Bandwidth:40MHz; Channel:Low



Site : chamber
Condition: 3m VERTICAL
Job No : 04163AT\04164AT
Mode : 2422 TX RSE
: 2.4G WIFI 11N40

	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	1556.169	4.91	26.98	54.79	56.13	33.23	74.00	-40.77	peak
2	4367.058	7.05	34.54	54.26	56.96	44.29	74.00	-29.71	peak
3	4844.000	7.49	34.48	54.21	53.48	41.24	74.00	-32.76	peak
4	6470.026	8.83	35.54	53.15	54.21	45.43	74.00	-28.57	peak
5	7266.000	8.52	35.70	53.17	51.94	42.99	74.00	-31.01	peak
6 p	9688.000	10.58	37.50	53.32	51.93	46.69	74.00	-27.31	peak

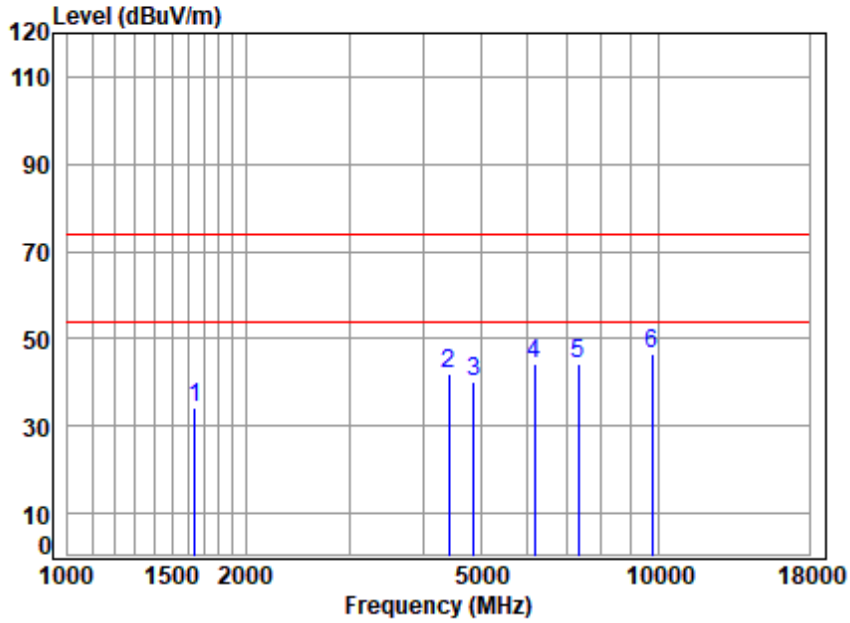
Test Mode: 04; Polarity: Horizontal; Modulation:802.11n; Bandwidth:40MHz; Channel:middle



Site : chamber
Condition: 3m HORIZONTAL
Job No : 04163AT\04164AT
Mode : 2437 TX RSE
: 2.4G WIFI 11N40

	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	1542.733	4.91	26.97	54.79	56.06	33.15	74.00	-40.85	peak
2	4379.699	7.05	34.64	54.26	55.49	42.92	74.00	-31.08	peak
3	4874.000	7.52	34.60	54.21	53.30	41.21	74.00	-32.79	peak
4	5949.811	8.72	34.70	53.15	54.57	44.84	74.00	-29.16	peak
5	7311.000	8.50	35.70	53.17	51.98	43.01	74.00	-30.99	peak
6 p	9748.000	10.56	37.40	53.30	51.20	45.86	74.00	-28.14	peak

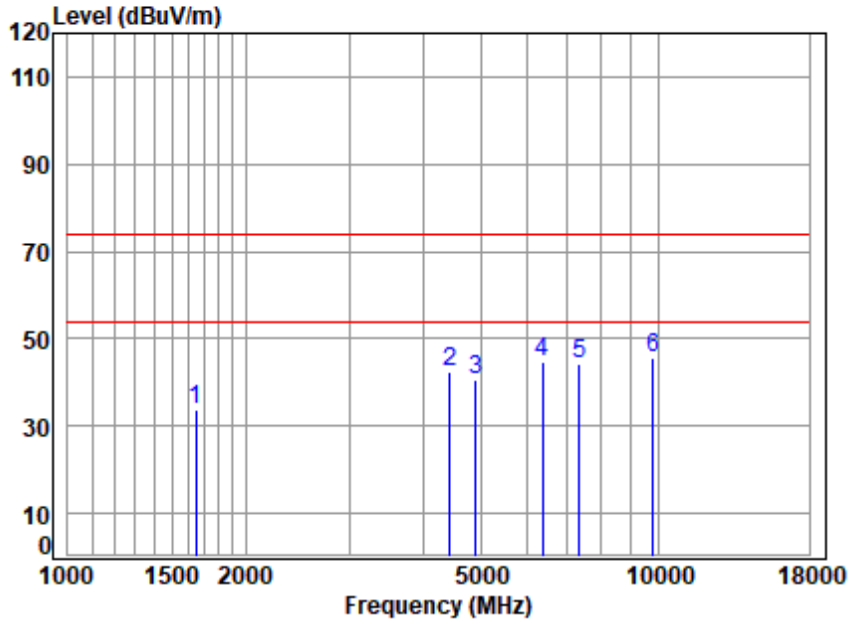
Test Mode: 04; Polarity: Vertical; Modulation:802.11n; Bandwidth:40MHz; Channel:middle



Site : chamber
Condition: 3m VERTICAL
Job No : 04163AT\04164AT
Mode : 2437 TX RSE
: 2.4G WIFI 11N40

	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	1639.274	4.94	26.41	54.81	57.71	34.25	74.00	-39.75	peak
2	4417.841	7.08	34.59	54.26	54.59	42.00	74.00	-32.00	peak
3	4874.000	7.52	34.60	54.21	52.30	40.21	74.00	-33.79	peak
4	6177.627	8.79	34.79	53.12	53.58	44.04	74.00	-29.96	peak
5	7311.000	8.50	35.70	53.17	53.39	44.42	74.00	-29.58	peak
6 p	9748.000	10.56	37.40	53.30	52.08	46.74	74.00	-27.26	peak

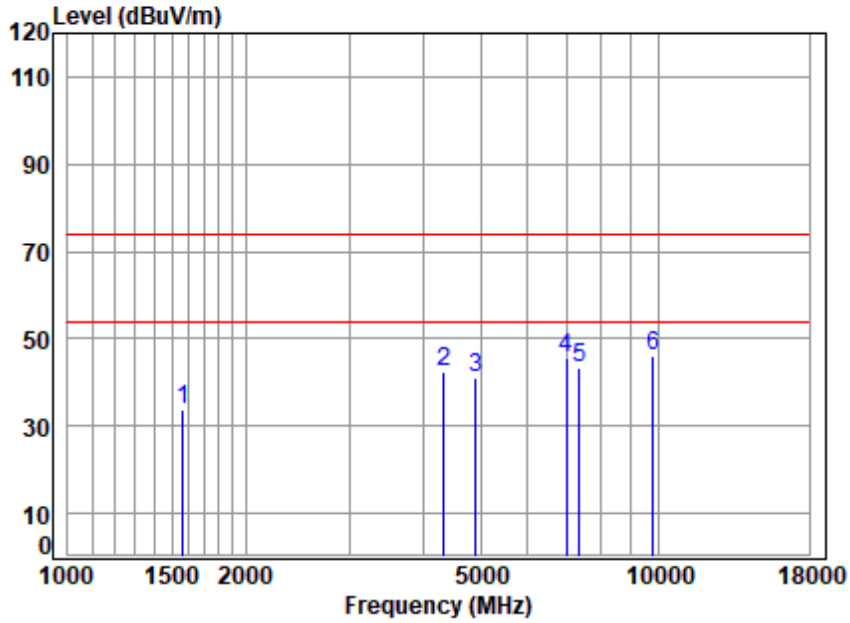
Test Mode: 04; Polarity: Horizontal; Modulation:802.11n; Bandwidth:40MHz; Channel:High



Site : chamber
Condition: 3m HORIZONTAL
Job No : 04163AT\04164AT
Mode : 2452 TX RSE
: 2.4G WIFI 11N40

	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	1648.778	4.95	26.31	54.82	57.24	33.68	74.00	-40.32	peak
2	4430.628	7.09	34.43	54.25	55.31	42.58	74.00	-31.42	peak
3	4904.000	7.55	34.69	54.21	52.75	40.78	74.00	-33.22	peak
4	6358.789	8.81	34.95	53.14	54.18	44.80	74.00	-29.20	peak
5	7356.000	8.49	35.71	53.16	53.30	44.34	74.00	-29.66	peak
6 p	9808.000	10.54	37.28	53.27	50.91	45.46	74.00	-28.54	peak

Test Mode: 04; Polarity: Vertical; Modulation:802.11n; Bandwidth:40MHz; Channel:High



Site : chamber
Condition: 3m VERTICAL
Job No : 04163AT\04164AT
Mode : 2452 TX RSE
: 2.4G WIFI 11N40

	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	1565.191	4.92	26.94	54.79	56.64	33.71	74.00	-40.29	peak
2	4329.354	7.02	34.23	54.26	55.29	42.28	74.00	-31.72	peak
3	4904.000	7.55	34.69	54.21	53.06	41.09	74.00	-32.91	peak
4	6974.982	8.62	35.75	53.20	54.27	45.44	74.00	-28.56	peak
5	7356.000	8.49	35.71	53.16	52.52	43.56	74.00	-30.44	peak
6 p	9808.000	10.54	37.28	53.27	51.39	45.94	74.00	-28.06	peak

7.5 Conducted Peak Output Power

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

Test Method: ANSI C63.10 (2013) Section 11.9.2

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

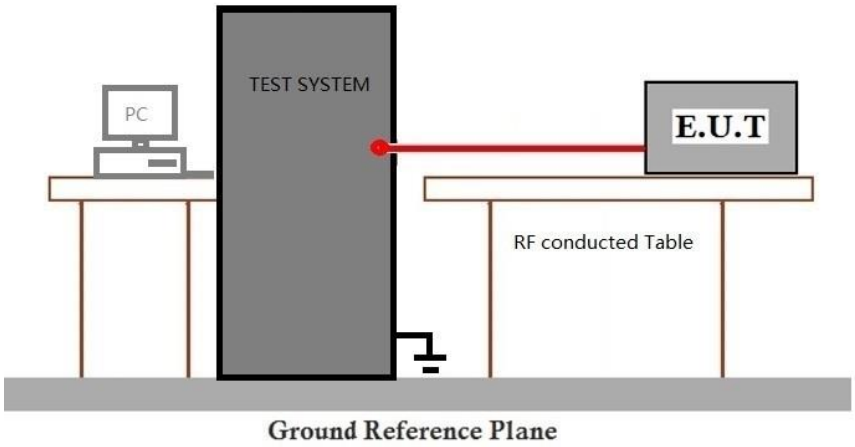
Operating Environment:

Temperature: 24.1 °C Humidity: 35.1 % RH Atmospheric Pressure: 1020 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode_Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 1Mbps is the worst case of IEEE 802.11b; data rate @ 6Mbps is the worst case of IEEE 802.11g; data rate @ 6.5Mbps is the worst case of IEEE 802.11n(HT20); data rate @ 13.5Mbps is the worst case of IEEE 802.11n(HT40), final test modes are considering the modulation and worse data rates. Only the data of worst case is recorded in the report.

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

7.6 Minimum 6dB Bandwidth

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

Test Method: ANSI C63.10 (2013) Section 11.8.1

Limit:

≥500 kHz

7.6.1 E.U.T. Operation

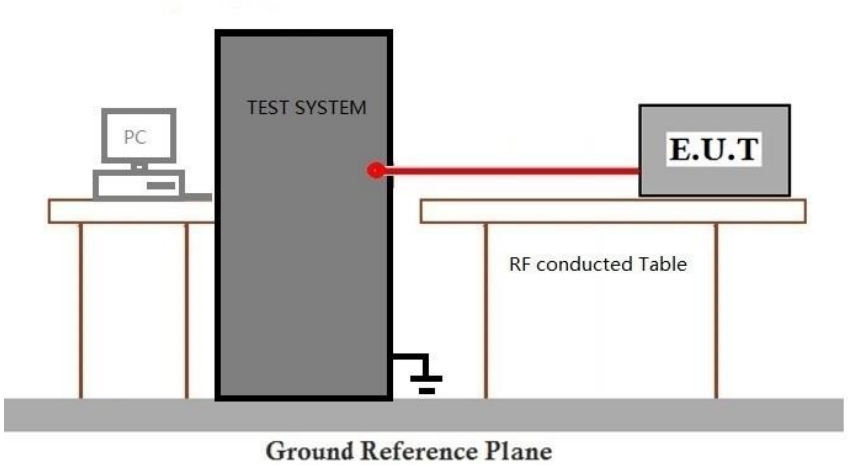
Operating Environment:

Temperature: 24.1 °C Humidity: 35.1 % RH Atmospheric Pressure: 1020 mbar

7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode_Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 1Mbps is the worst case of IEEE 802.11b; data rate @ 6Mbps is the worst case of IEEE 802.11g; data rate @ 6.5Mbps is the worst case of IEEE 802.11n(HT20); data rate @ 13.5Mbps is the worst case of IEEE 802.11n(HT40), final test modes are considering the modulation and worse data rates. Only the data of worst case is recorded in the report.

7.6.3 Test Setup Diagram



7.6.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.7 Power Spectrum Density

Test Requirement 47 CFR Part 15, Subpart C 15.247(e)
Test Method: ANSI C63.10 (2013) Section 11.10.2

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

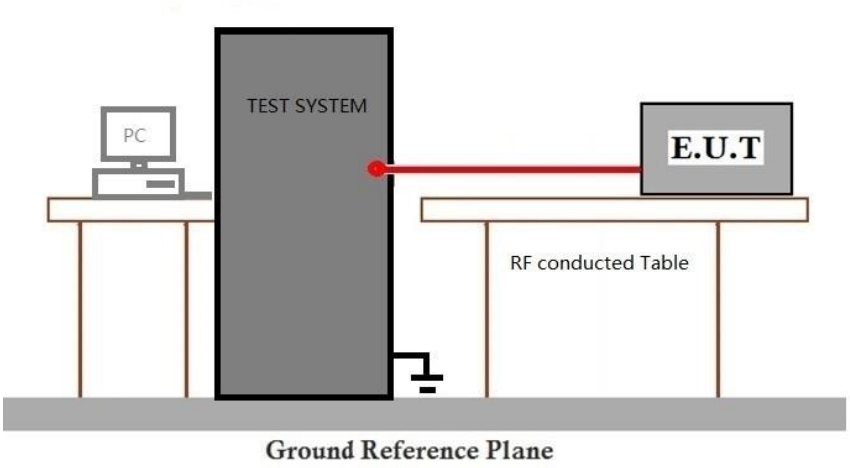
7.7.1 E.U.T. Operation

Operating Environment:
Temperature: 24.1 °C Humidity: 35.1 % RH Atmospheric Pressure: 1020 mbar

7.7.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode_Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 1Mbps is the worst case of IEEE 802.11b; data rate @ 6Mbps is the worst case of IEEE 802.11g; data rate @ 6.5Mbps is the worst case of IEEE 802.11n(HT20); data rate @ 13.5Mbps is the worst case of IEEE 802.11n(HT40), final test modes are considering the modulation and worse data rates. Only the data of worst case is recorded in the report.

7.7.3 Test Setup Diagram



7.7.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.8 Conducted Band Edges Measurement

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

Test Method: ANSI C63.10 (2013) Section 11.13.3.2

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

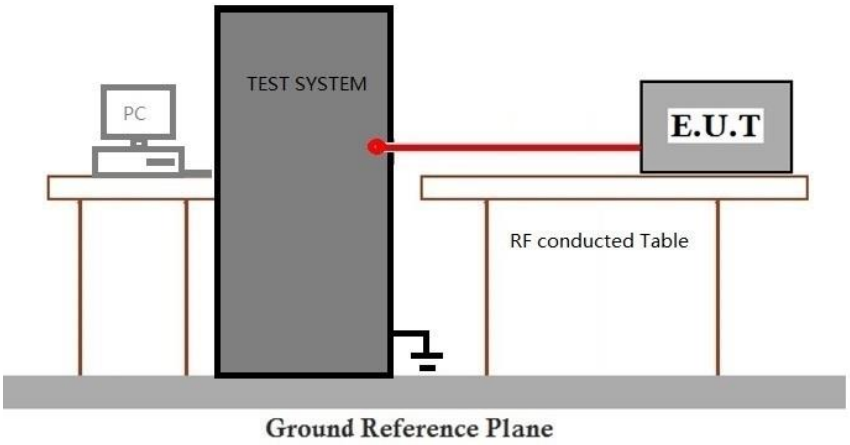
Operating Environment:

Temperature: 24.1 °C Humidity: 35.1 % RH Atmospheric Pressure: 1020 mbar

7.8.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode_Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 1Mbps is the worst case of IEEE 802.11b; data rate @ 6Mbps is the worst case of IEEE 802.11g; data rate @ 6.5Mbps is the worst case of IEEE 802.11n(HT20); data rate @ 13.5Mbps is the worst case of IEEE 802.11n(HT40), final test modes are considering the modulation and worse data rates. Only the data of worst case is recorded in the report.

7.8.3 Test Setup Diagram



7.8.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.9 Conducted Spurious Emissions

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

Test Method: ANSI C63.10 (2013) 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

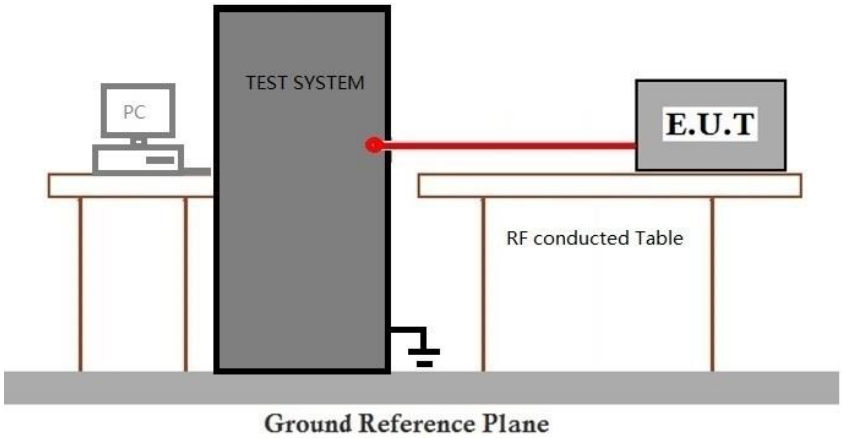
Operating Environment:

Temperature: 24.1 °C Humidity: 35.1 % RH Atmospheric Pressure: 1020 mbar

7.9.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode_Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 1Mbps is the worst case of IEEE 802.11b; data rate @ 6Mbps is the worst case of IEEE 802.11g; data rate @ 6.5Mbps is the worst case of IEEE 802.11n(HT20); data rate @ 13.5Mbps is the worst case of IEEE 802.11n(HT40), final test modes are considering the modulation and worse data rates. Only the data of worst case is recorded in the report.

7.9.3 Test Setup Diagram



7.9.4 Measurement Procedure and Data

Please Refer to Appendix for Details

8 Test Setup Photo

Refer to Setup Photo for SZCR2411004163AT

9 EUT Constructional Details (EUT Photos)

Refer to External and Internal Photos for SZCR2411004163AT

10 Appendix

1. Duty Cycle

1.1 Test Result

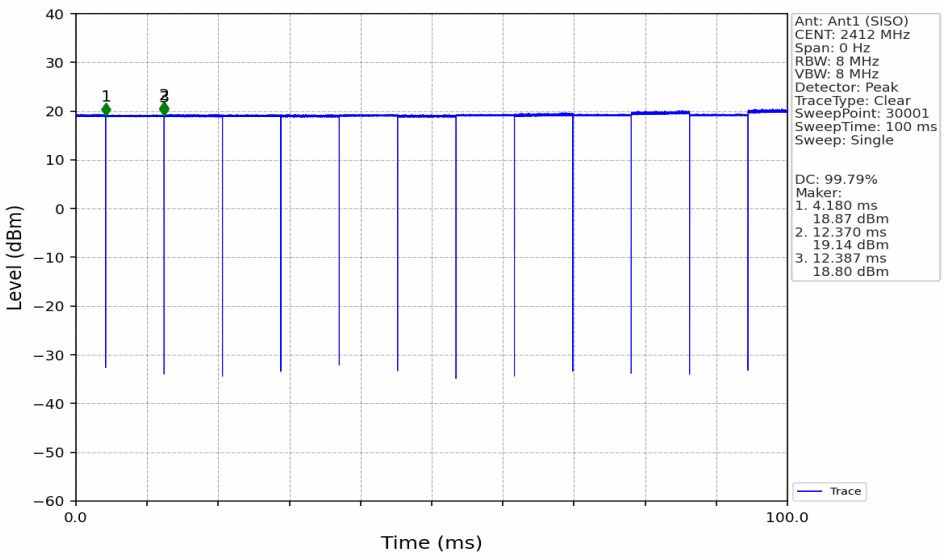
1.1.1 Ant1

Ant1							
Mode	TX Type	Frequency (MHz)	T_on (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	Max. DC Variation (%)
802.11b	SISO	2412	8.190	8.207	99.79	0.01	0.04
		2437	8.190	8.207	99.79	0.01	0.03
		2462	8.190	8.206	99.81	0.01	0.04
802.11g	SISO	2412	1.360	1.412	96.32	0.16	0.03
		2437	1.361	1.413	96.32	0.16	0.03
		2462	1.361	1.412	96.39	0.16	0.03
802.11n (HT20)	SISO	2412	1.272	1.324	96.07	0.17	0.04
		2437	1.273	1.324	96.15	0.17	0.04
		2462	1.272	1.324	96.07	0.17	0.04
802.11n (HT40)	SISO	2422	0.633	0.684	92.54	0.34	0.03
		2437	0.633	0.684	92.54	0.34	0.07
		2452	0.633	0.685	92.41	0.34	0.03

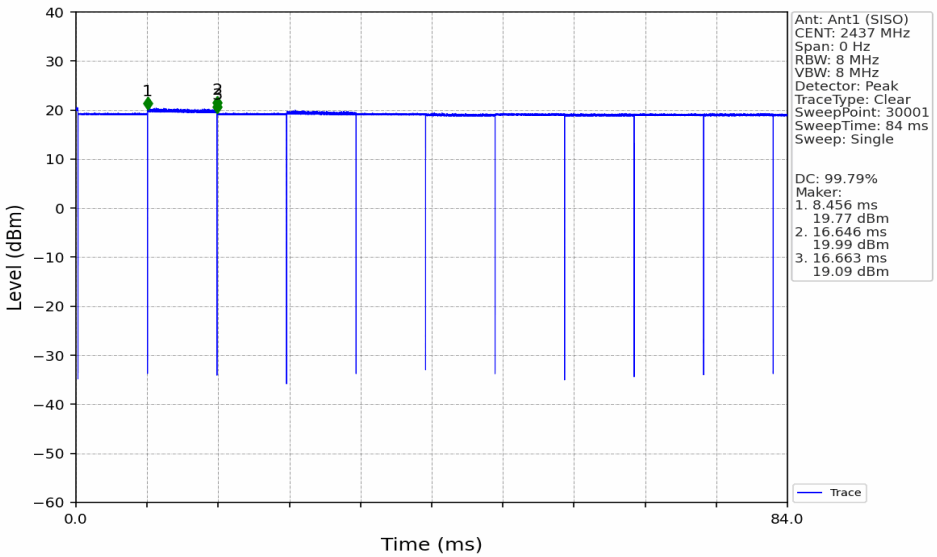
1.2 Test Graph

1.2.1 Ant1

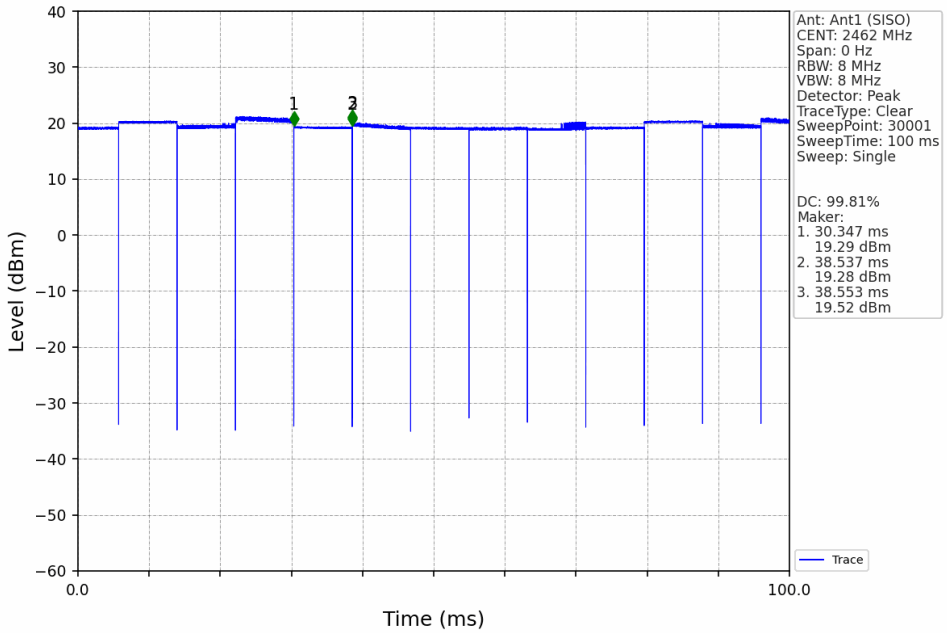
802.11b_LCH_2412MHz_Ant1 (SISO)_NTNV



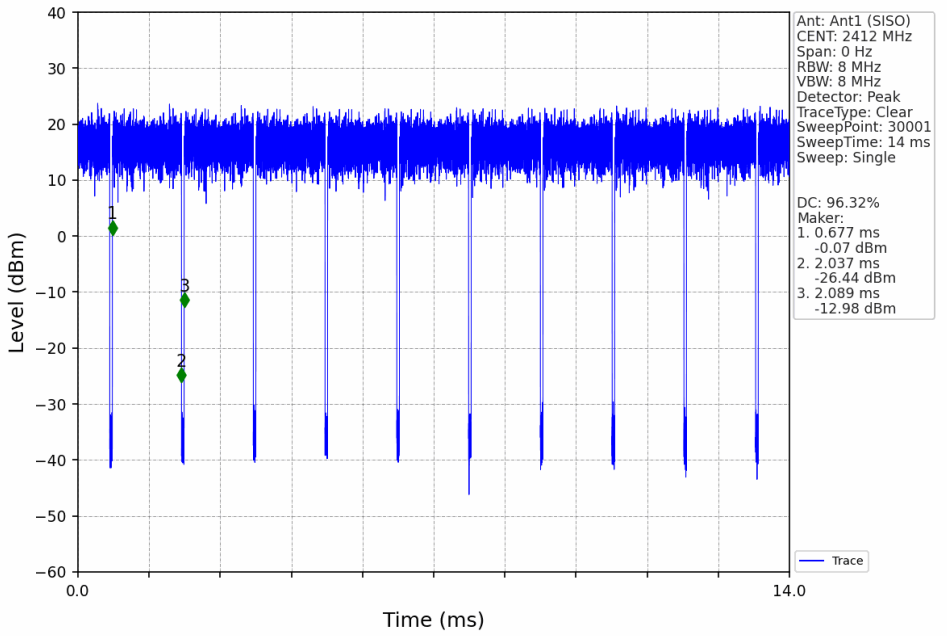
802.11b_MCH_2437MHz_Ant1 (SISO)_NTNV



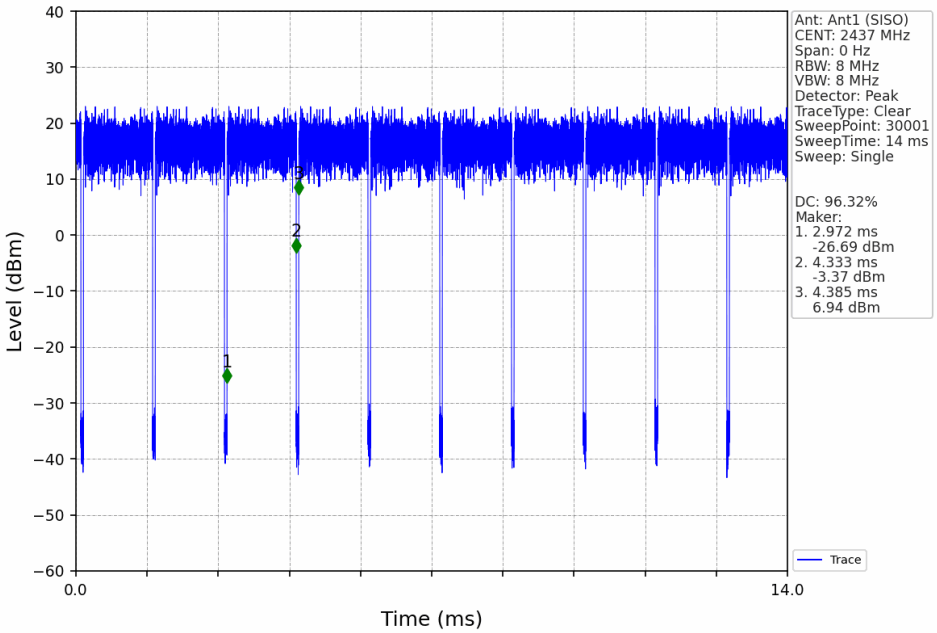
802.11b_HCH_2462MHz_Ant1 (SISO)_NTNV



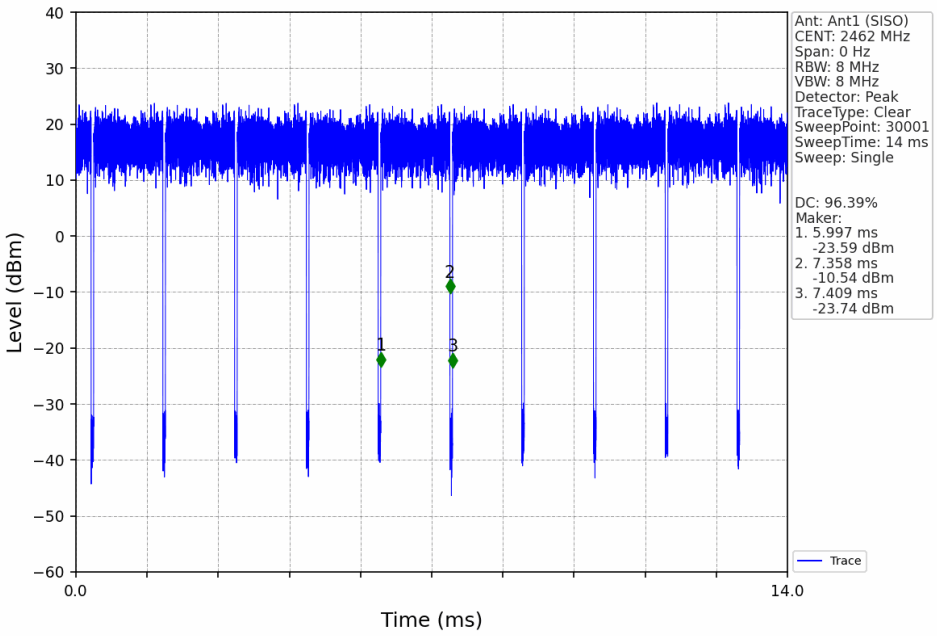
802.11g_LCH_2412MHz_Ant1 (SISO)_NTNV



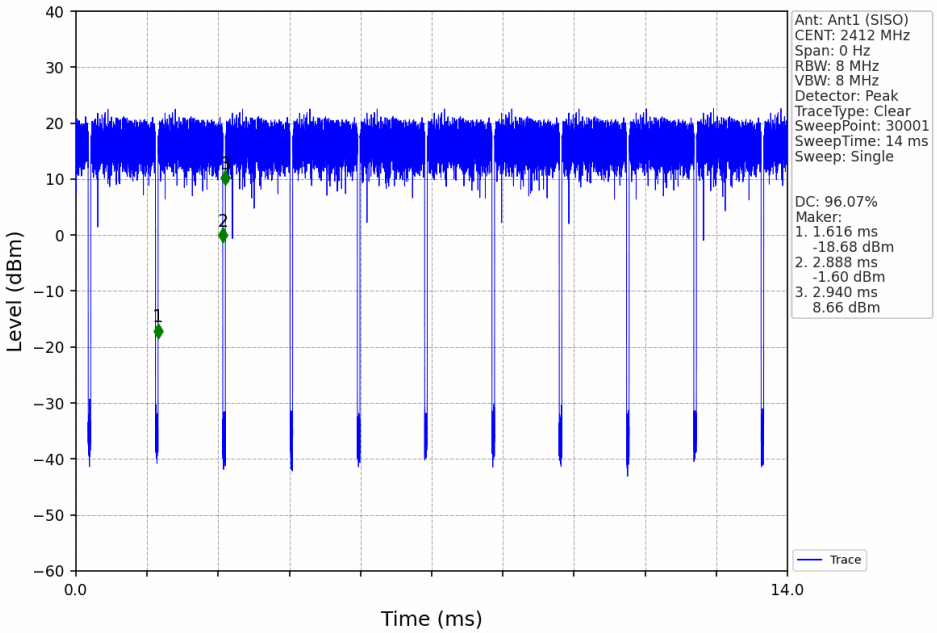
802.11g_MCH_2437MHz_Ant1 (SISO)_NTNV



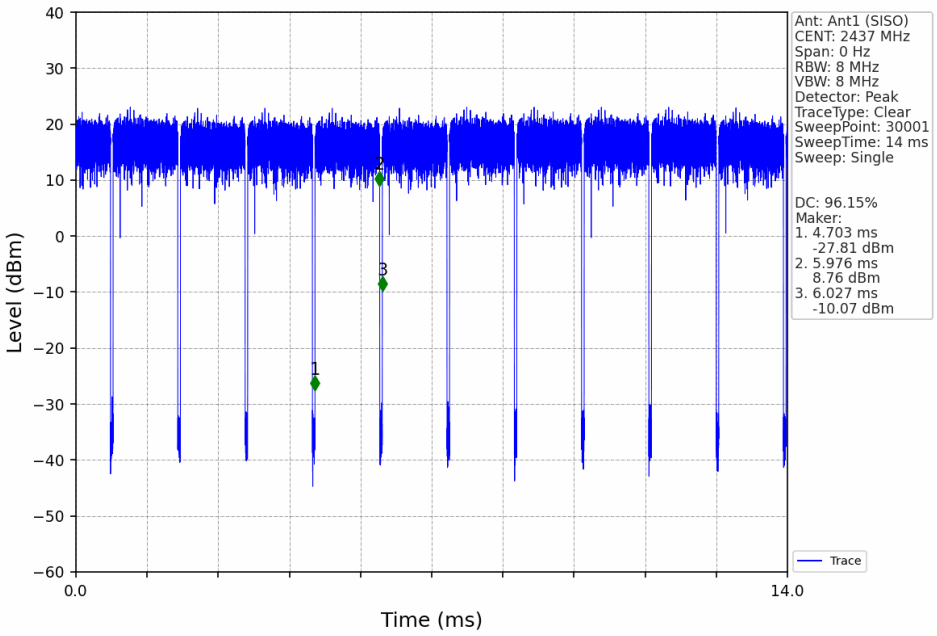
802.11g_HCH_2462MHz_Ant1 (SISO)_NTNV



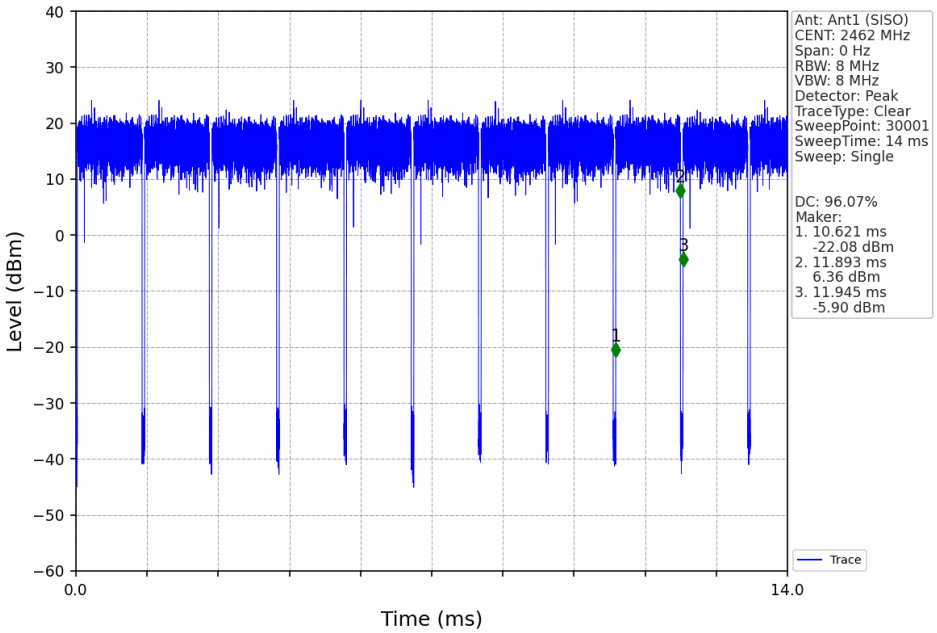
802.11n(HT20)_LCH_2412MHz_Ant1 (SISO)_NTNV



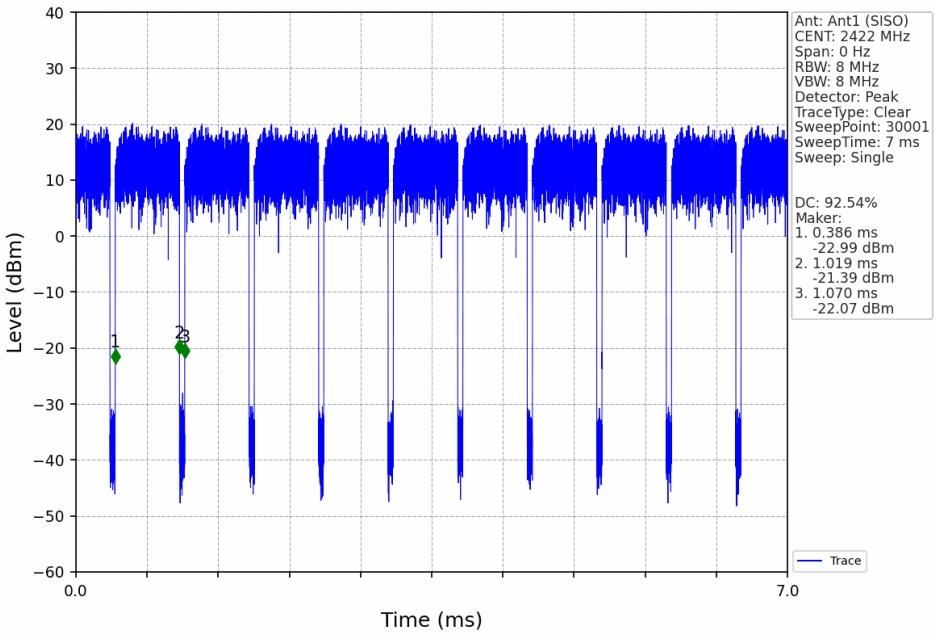
802.11n(HT20)_MCH_2437MHz_Ant1 (SISO)_NTNV



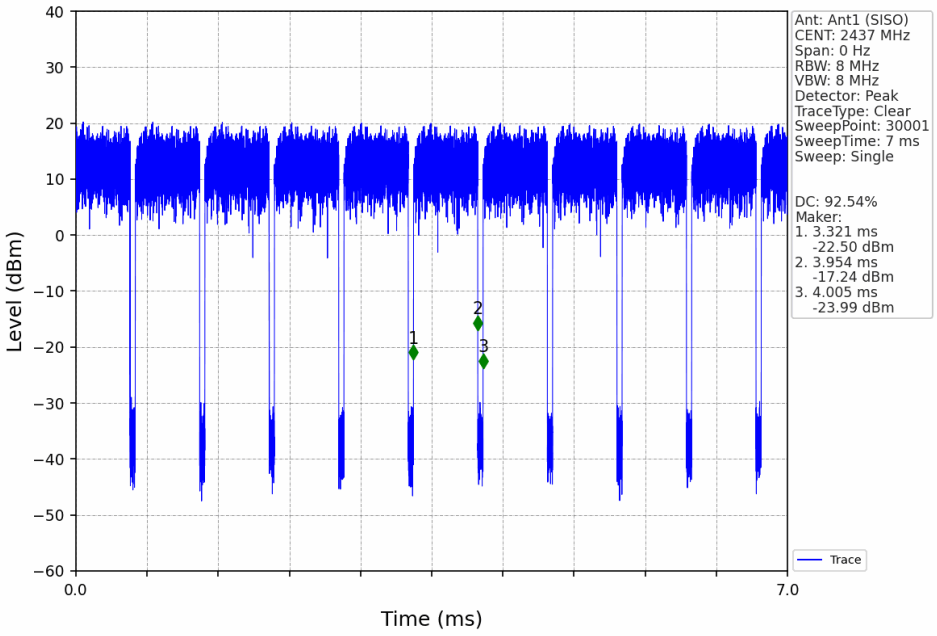
802.11n(HT20)_HCH_2462MHz_Ant1 (SISO)_NTNV



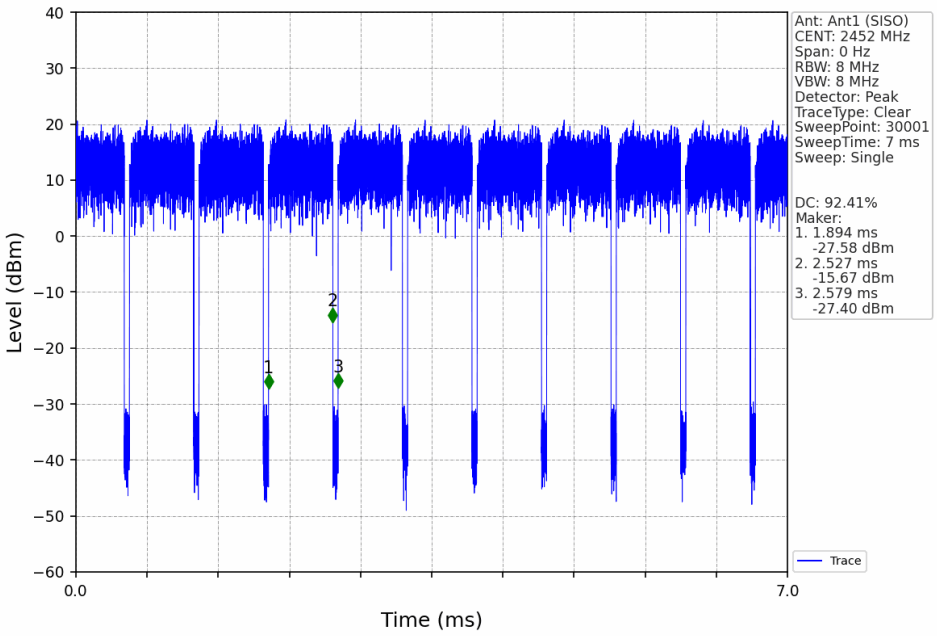
802.11n(HT40)_LCH_2422MHz_Ant1 (SISO)_NTNV



802.11n(HT40)_MCH_2437MHz_Ant1 (SISO)_NTNV



802.11n(HT40)_HCH_2452MHz_Ant1 (SISO)_NTNV



2. Bandwidth

2.1 Test Result

2.1.1 OBW

Mode	TX Type	Frequency (MHz)	ANT	99% Occupied Bandwidth (MHz)		Verdict
				Result	Limit	
802.11b	SISO	2412	1	13.884	/	Pass
		2437	1	13.890	/	Pass
		2462	1	13.888	/	Pass
802.11g	SISO	2412	1	16.777	/	Pass
		2437	1	16.765	/	Pass
		2462	1	16.816	/	Pass
802.11n (HT20)	SISO	2412	1	17.777	/	Pass
		2437	1	17.786	/	Pass
		2462	1	17.809	/	Pass
802.11n (HT40)	SISO	2422	1	35.194	/	Pass
		2437	1	35.175	/	Pass
		2452	1	35.196	/	Pass

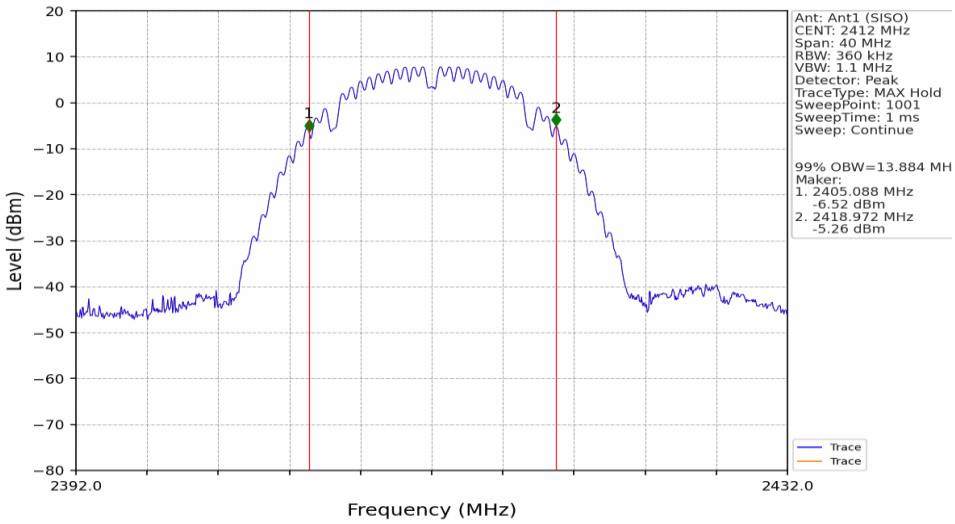
2.1.2 6dB BW

Mode	TX Type	Frequency (MHz)	ANT	6dB Bandwidth (MHz)		Verdict
				Result	Limit	
802.11b	SISO	2412	1	9.569	>=0.5	Pass
		2437	1	9.565	>=0.5	Pass
		2462	1	9.118	>=0.5	Pass
802.11g	SISO	2412	1	15.117	>=0.5	Pass
		2437	1	15.084	>=0.5	Pass
		2462	1	15.101	>=0.5	Pass
802.11n (HT20)	SISO	2412	1	13.914	>=0.5	Pass
		2437	1	15.085	>=0.5	Pass
		2462	1	15.105	>=0.5	Pass
802.11n (HT40)	SISO	2422	1	31.305	>=0.5	Pass
		2437	1	31.294	>=0.5	Pass
		2452	1	31.352	>=0.5	Pass

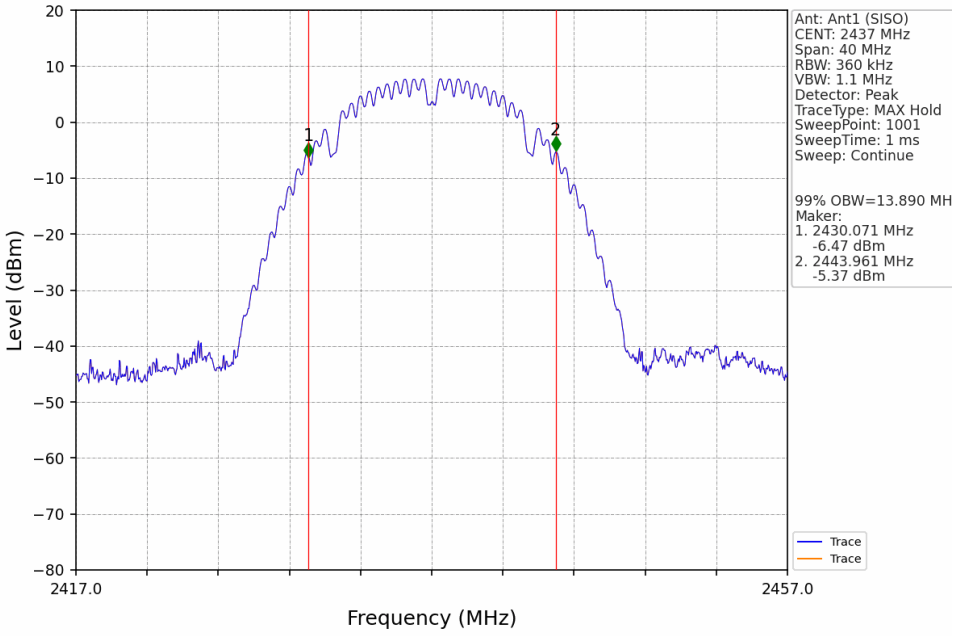
2.2 Test Graph

2.2.1 OBW

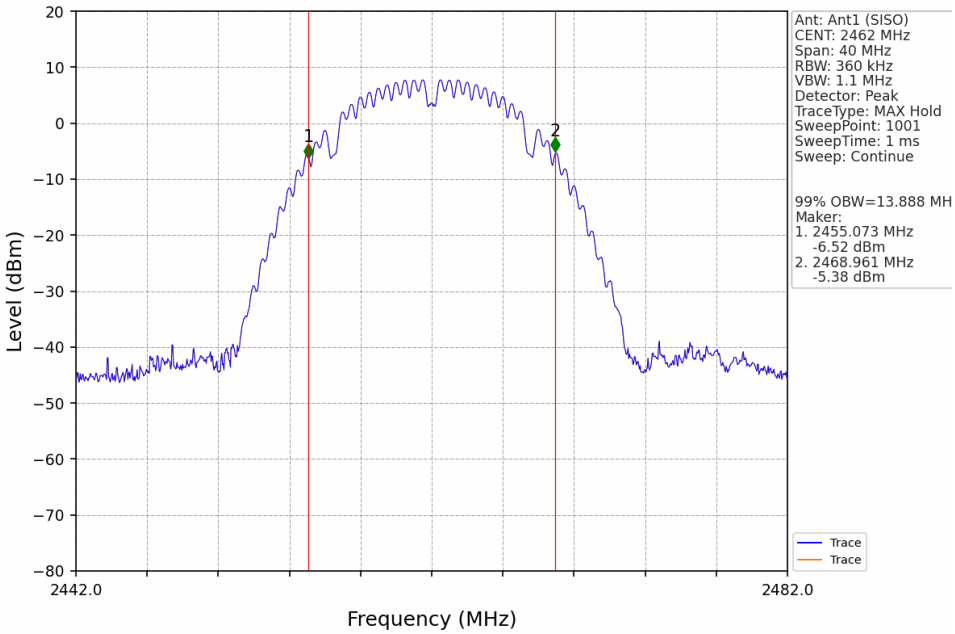
802.11b_LCH_2412MHz_Ant1 (SISO)_NTNV



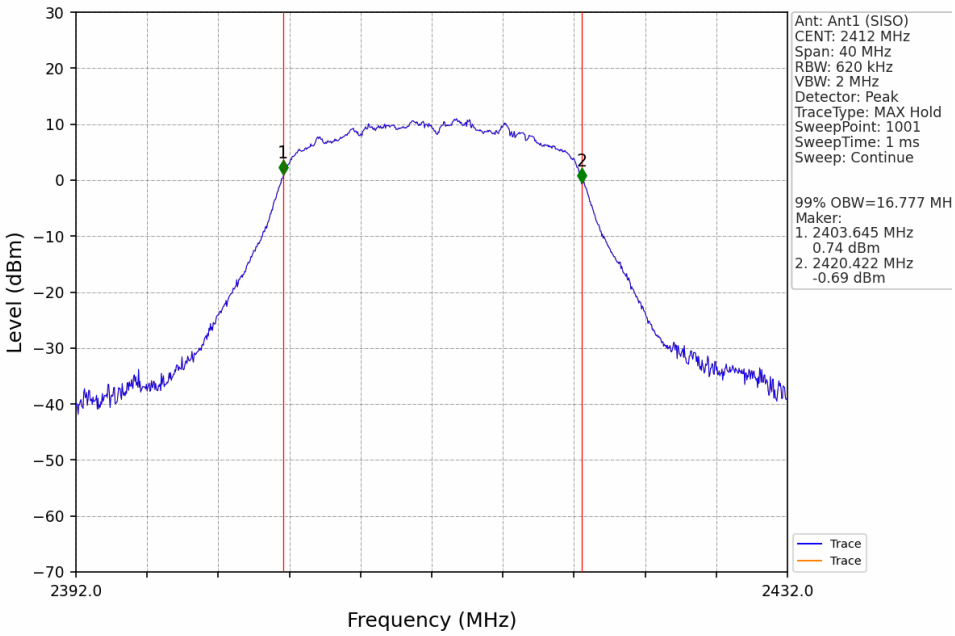
802.11b_MCH_2437MHz_Ant1 (SISO)_NTNV



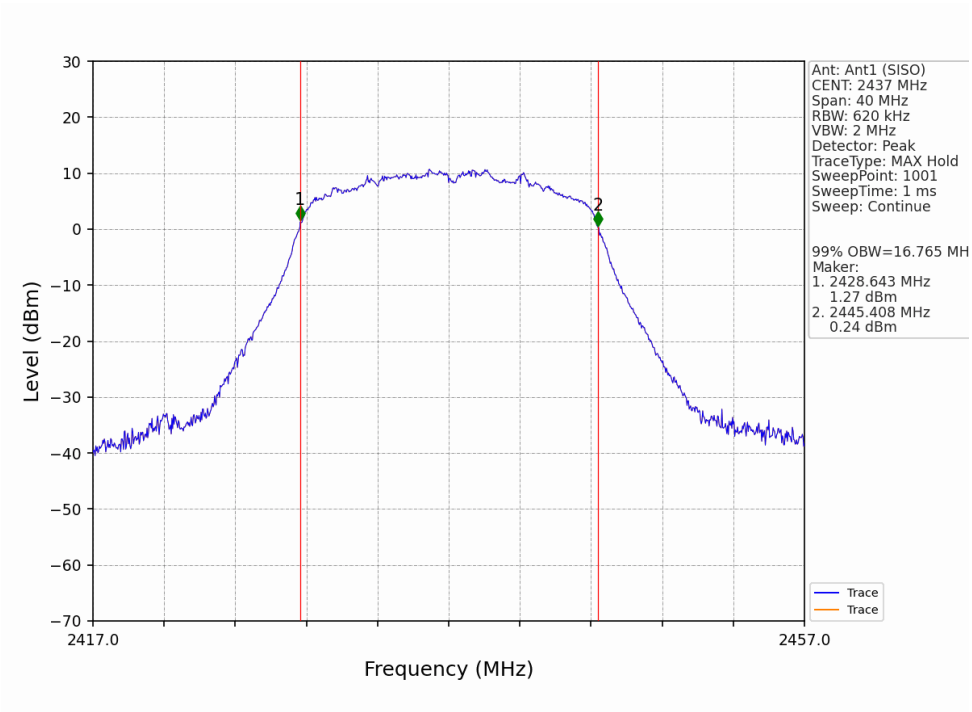
802.11b_HCH_2462MHz_Ant1 (SISO)_NTNV



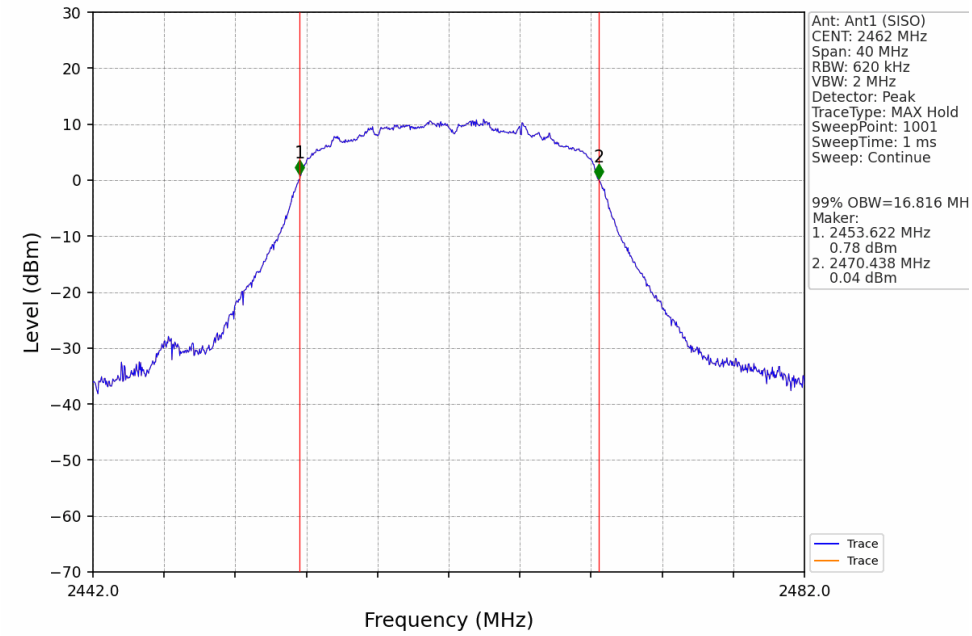
802.11g_LCH_2412MHz_Ant1 (SISO)_NTNV



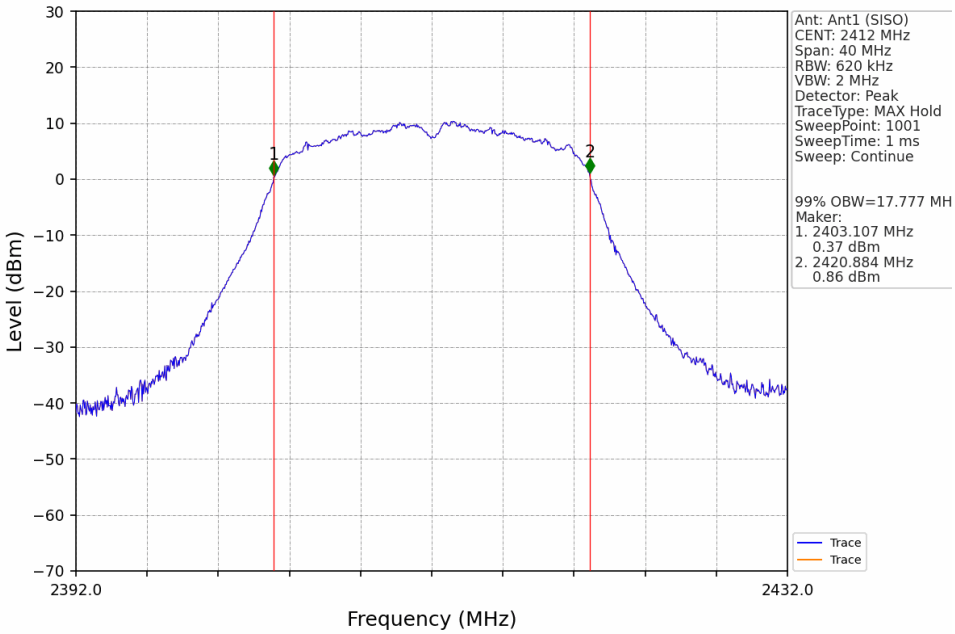
802.11g_MCH_2437MHz_Ant1 (SISO)_NTNV



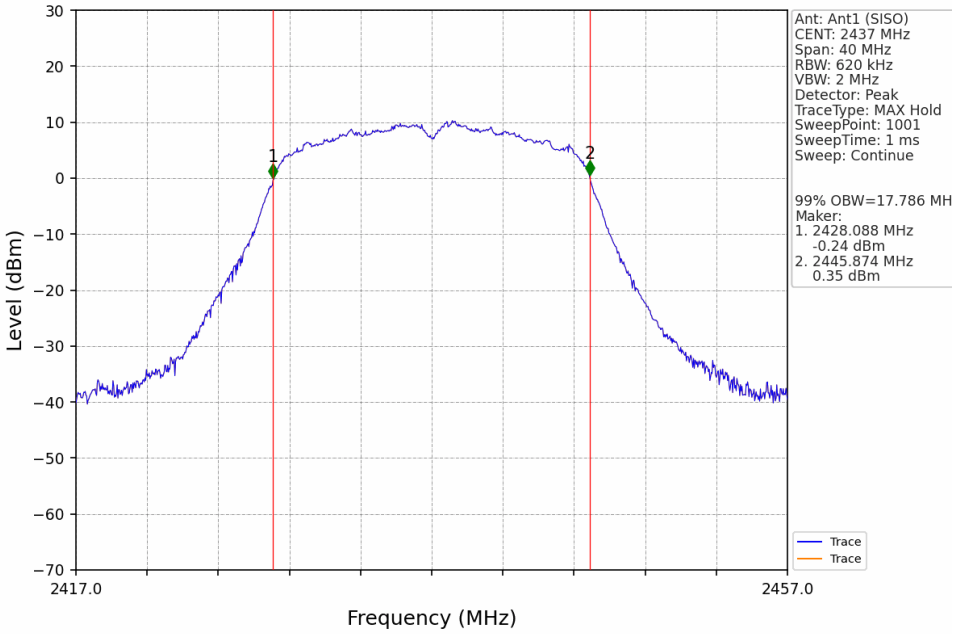
802.11g_HCH_2462MHz_Ant1 (SISO)_NTNV



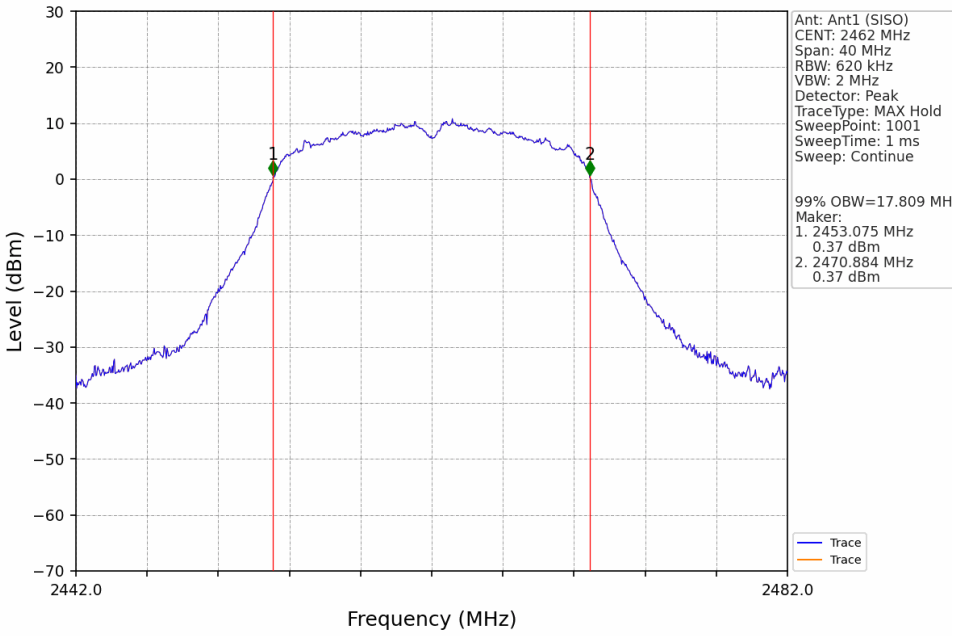
802.11n(HT20)_LCH_2412MHz_Ant1 (SISO)_NTNV



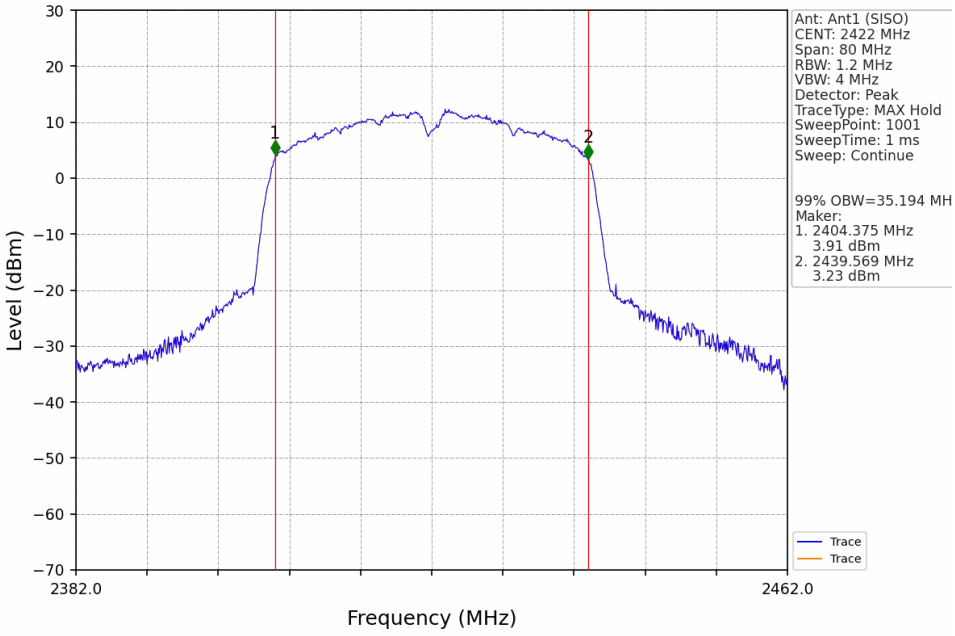
802.11n(HT20)_MCH_2437MHz_Ant1 (SISO)_NTNV



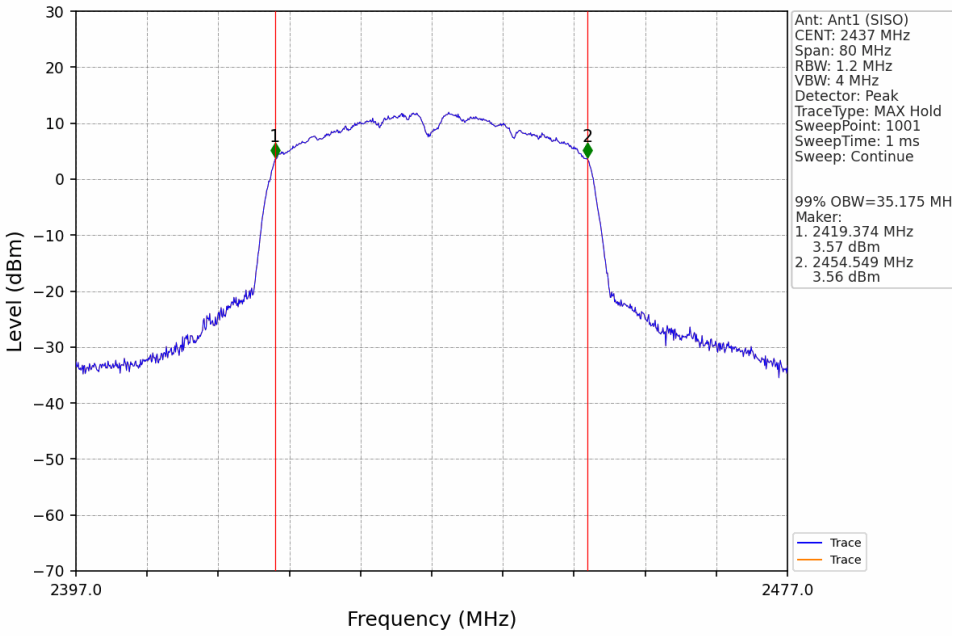
802.11n(HT20)_HCH_2462MHz_Ant1 (SISO)_NTNV



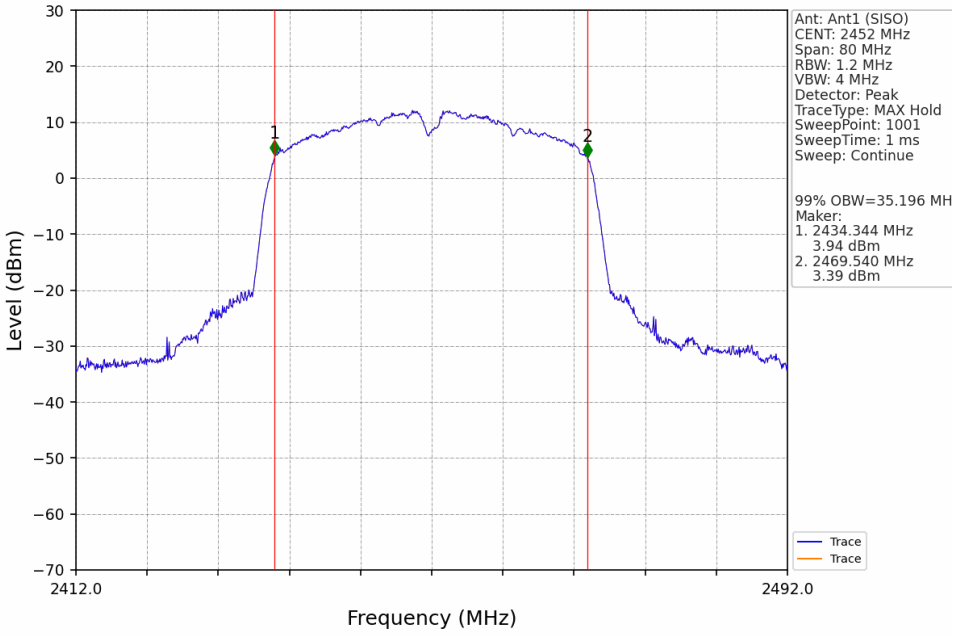
802.11n(HT40)_LCH_2422MHz_Ant1 (SISO)_NTNV



802.11n(HT40)_MCH_2437MHz_Ant1 (SISO)_NTNV

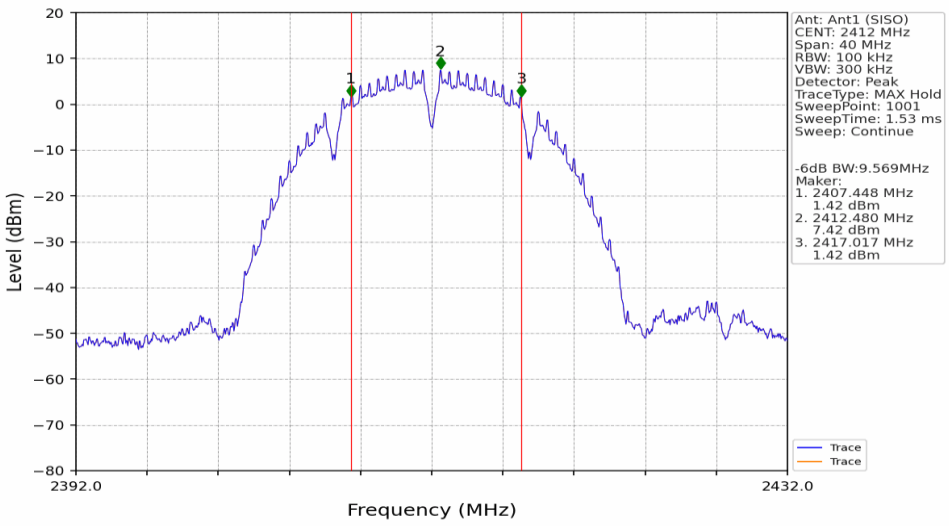


802.11n(HT40)_HCH_2452MHz_Ant1 (SISO)_NTNV

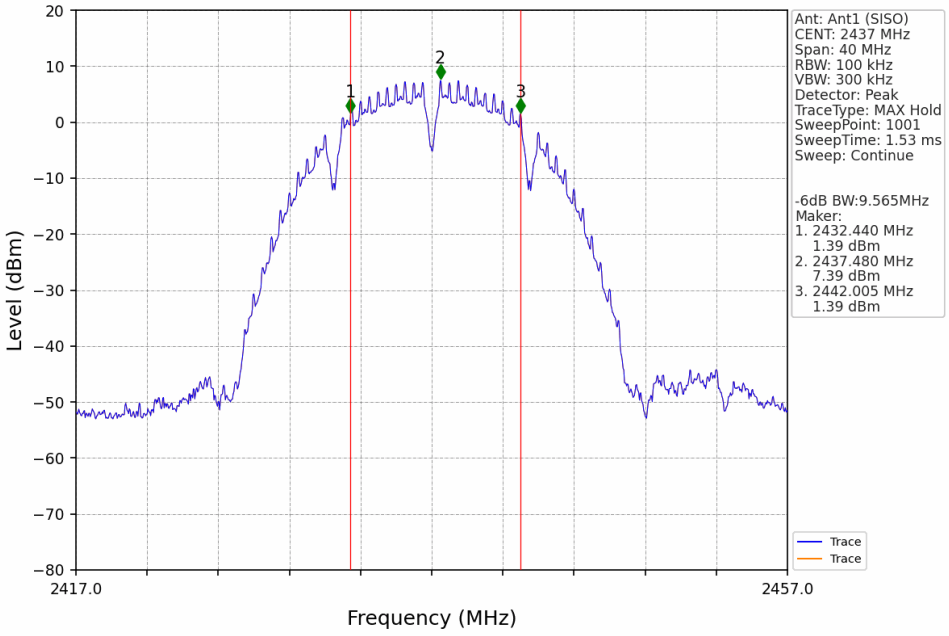


2.2.2 6dB BW

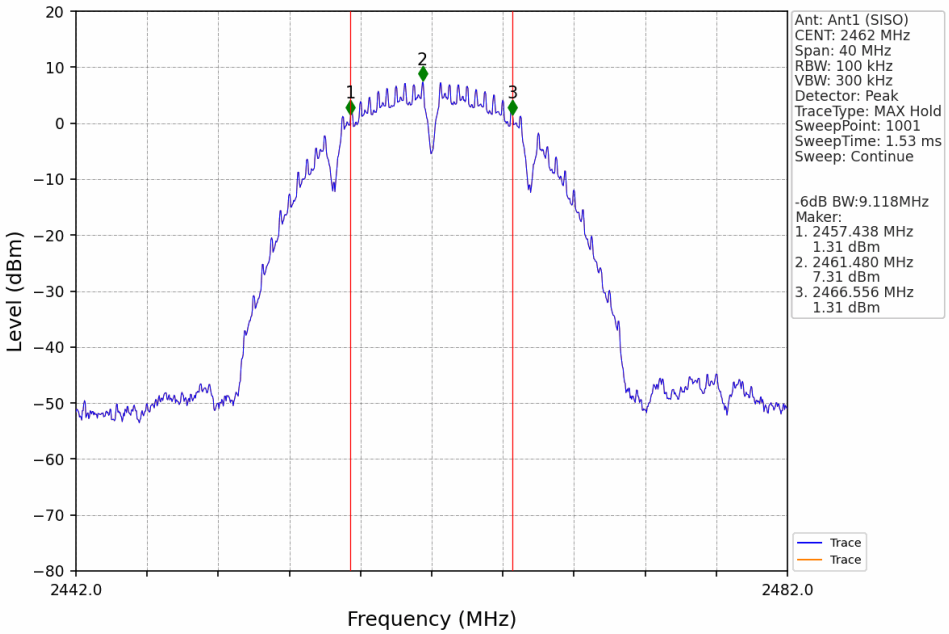
802.11b_LCH_2412MHz_Ant1 (SISO)_NTNV



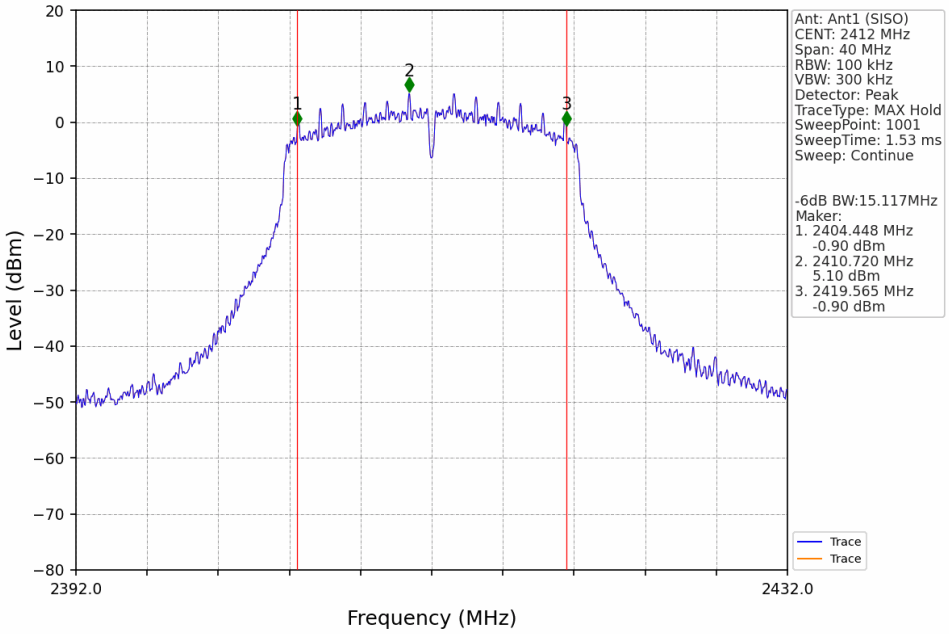
802.11b_MCH_2437MHz_Ant1 (SISO)_NTNV



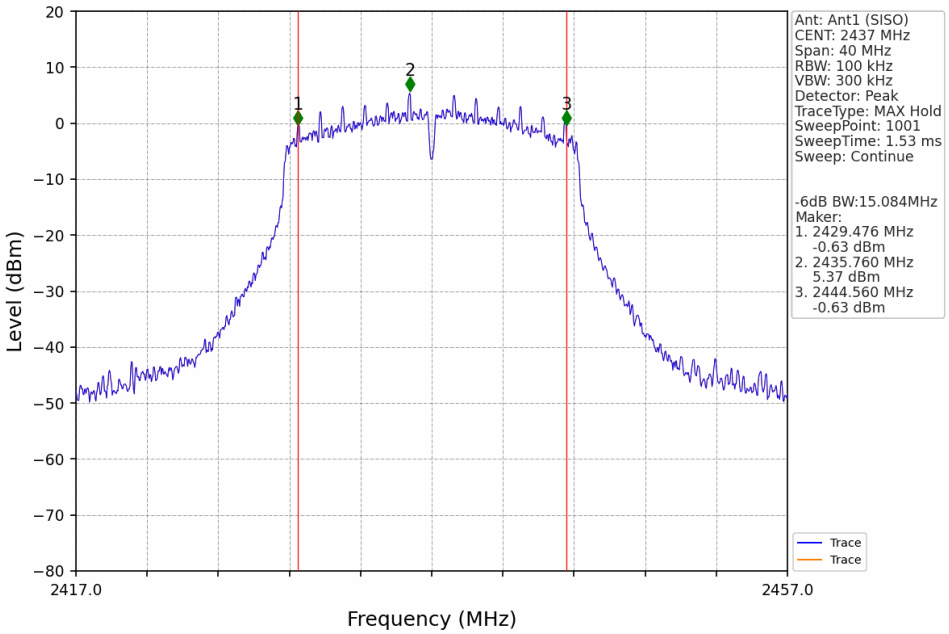
802.11b_HCH_2462MHz_Ant1 (SISO)_NTNV



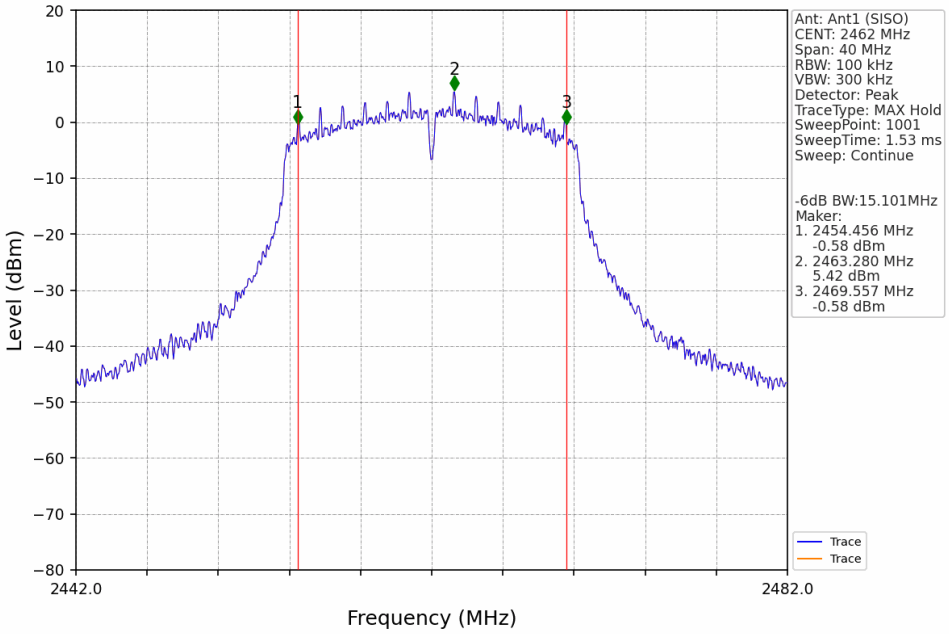
802.11g_LCH_2412MHz_Ant1 (SISO)_NTNV



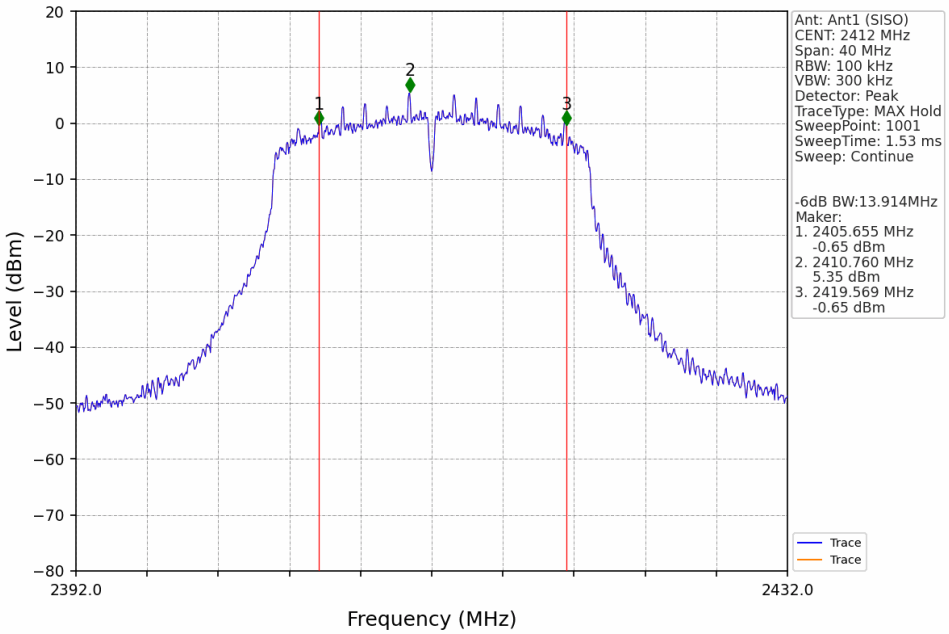
802.11g_MCH_2437MHz_Ant1 (SISO)_NTNV



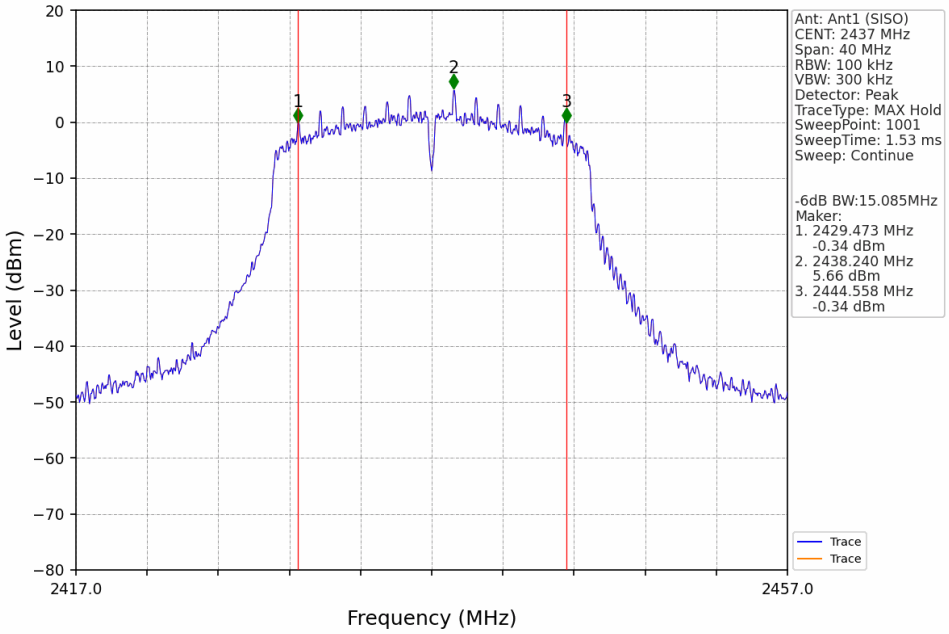
802.11g_HCH_2462MHz_Ant1 (SISO)_NTNV



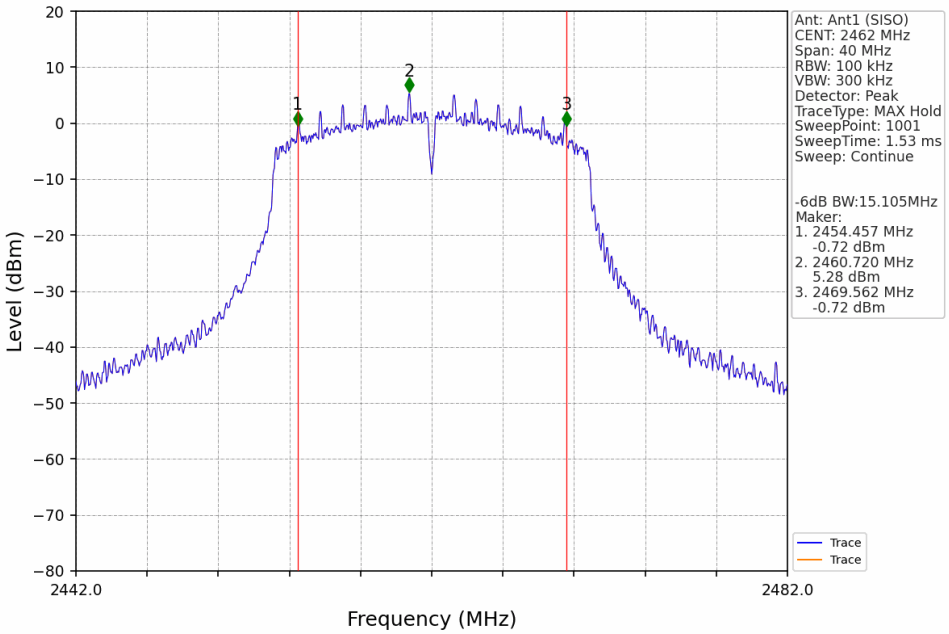
802.11n(HT20)_LCH_2412MHz_Ant1 (SISO)_NTNV



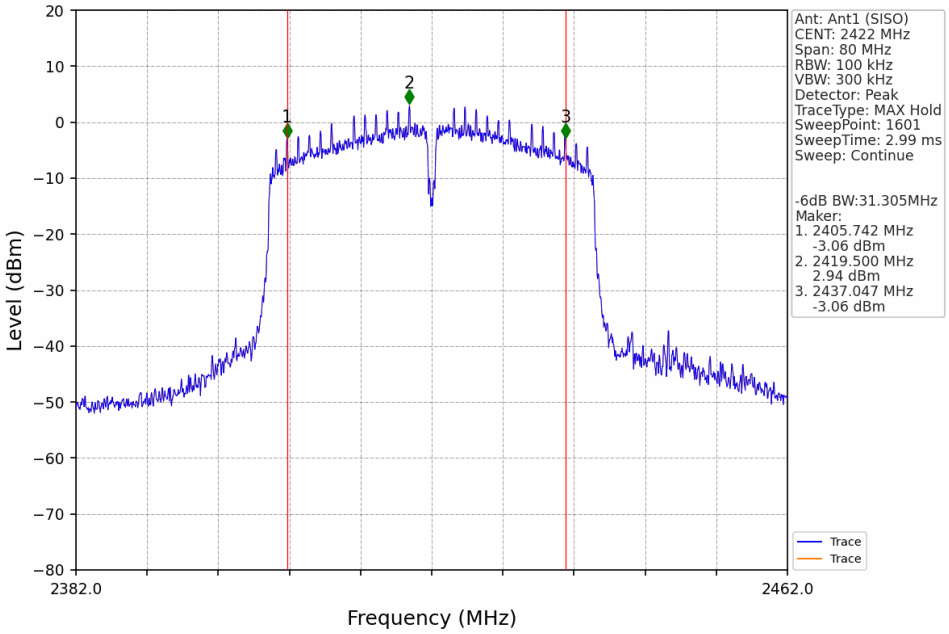
802.11n(HT20)_MCH_2437MHz_Ant1 (SISO)_NTNV



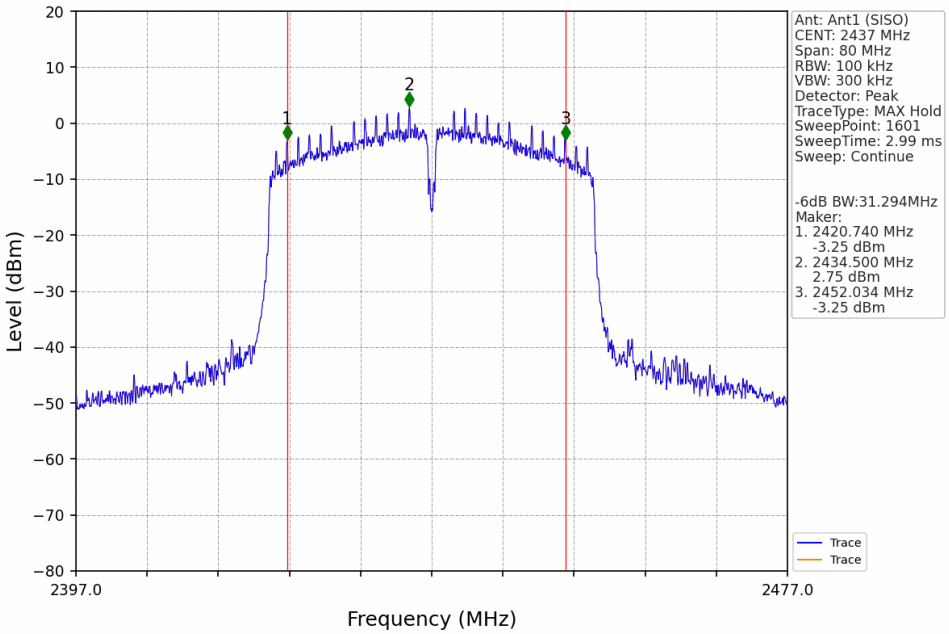
802.11n(HT20)_HCH_2462MHz_Ant1 (SISO)_NTNV



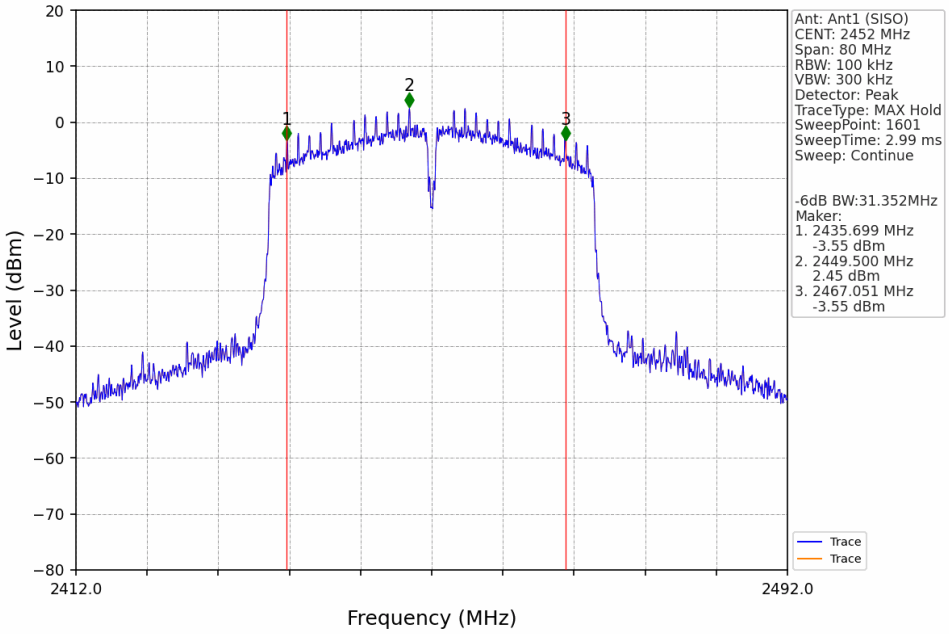
802.11n(HT40)_LCH_2422MHz_Ant1 (SISO)_NTNV



802.11n(HT40)_MCH_2437MHz_Ant1 (SISO)_NTNV



802.11n(HT40)_HCH_2452MHz_Ant1 (SISO)_NTNV



3. Maximum Conducted Output Power

3.1 Test Result

3.1.1 Power

Mode	TX Type	Frequency (MHz)	Maximum Average Conducted Output Power (dBm)		Verdict
			ANT1	Limit	
802.11b	SISO	2412	16.32	<=30	Pass
		2437	16.24	<=30	Pass
		2462	16.21	<=30	Pass
802.11g	SISO	2412	15.16	<=30	Pass
		2437	15.03	<=30	Pass
		2462	15.14	<=30	Pass
802.11n (HT20)	SISO	2412	14.94	<=30	Pass
		2437	14.81	<=30	Pass
		2462	14.95	<=30	Pass
802.11n (HT40)	SISO	2422	15.04	<=30	Pass
		2437	14.89	<=30	Pass
		2452	14.94	<=30	Pass

4. Maximum Power Spectral Density

4.1 Test Result

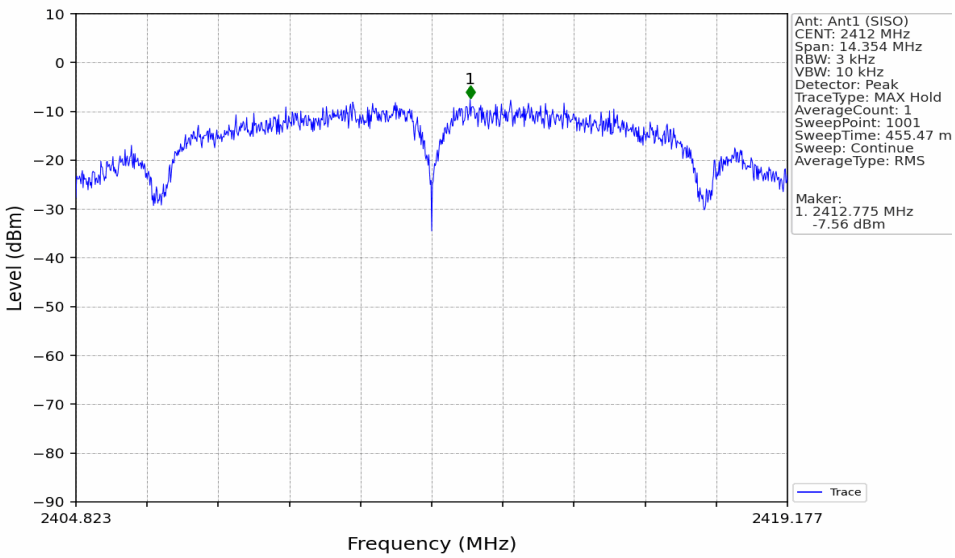
4.1.1 PSD

Mode	TX Type	Frequency (MHz)	Maximum PSD (dBm/3kHz)		Verdict
			ANT1	Limit	
802.11b	SISO	2412	-7.56	<=8	Pass
		2437	-6.90	<=8	Pass
		2462	-7.00	<=8	Pass
802.11g	SISO	2412	-9.73	<=8	Pass
		2437	-10.14	<=8	Pass
		2462	-10.00	<=8	Pass
802.11n (HT20)	SISO	2412	-9.31	<=8	Pass
		2437	-8.96	<=8	Pass
		2462	-10.00	<=8	Pass
802.11n (HT40)	SISO	2422	-12.36	<=8	Pass
		2437	-12.39	<=8	Pass
		2452	-12.55	<=8	Pass

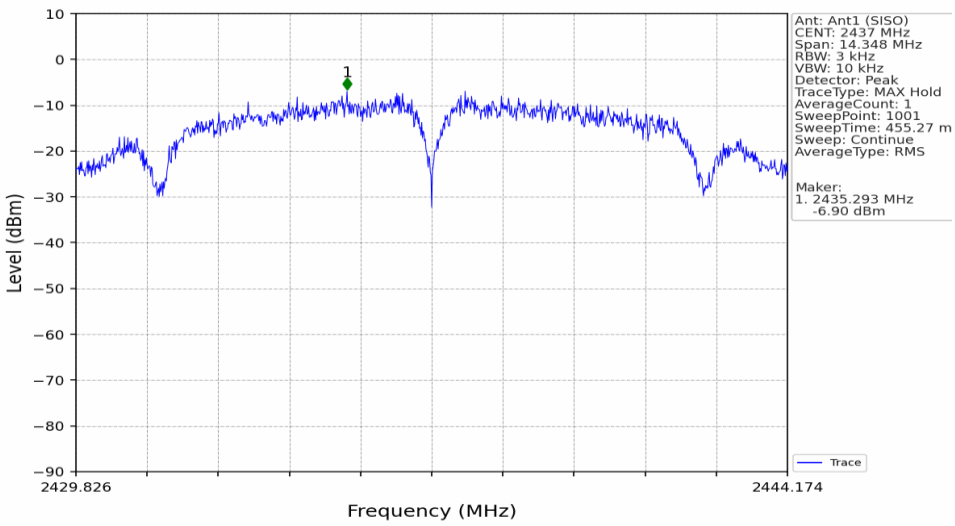
4.2 Test Graph

4.2.1 PSD

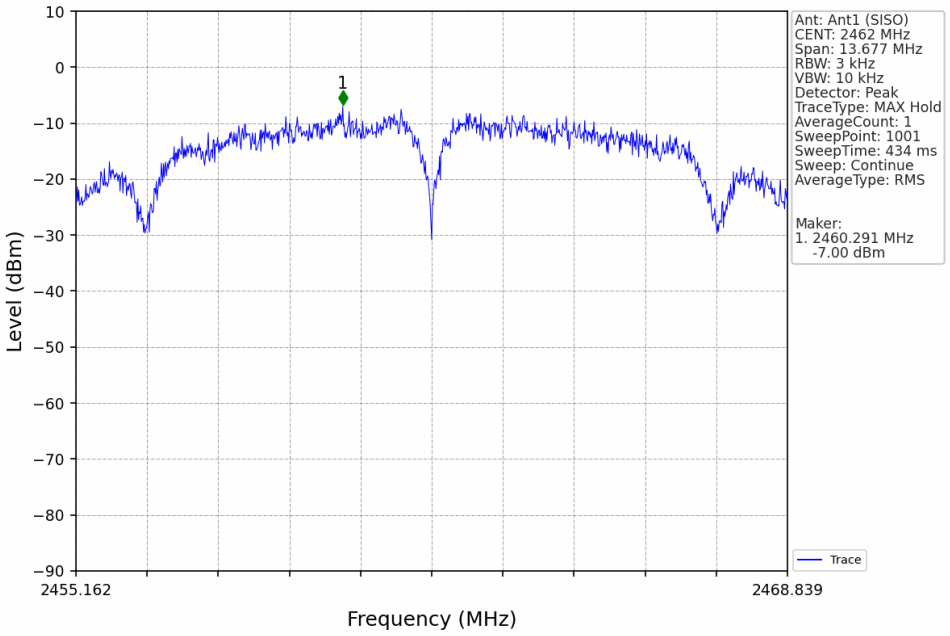
802.11b_LCH_2412MHz_Ant1 (SISO)_NTNV



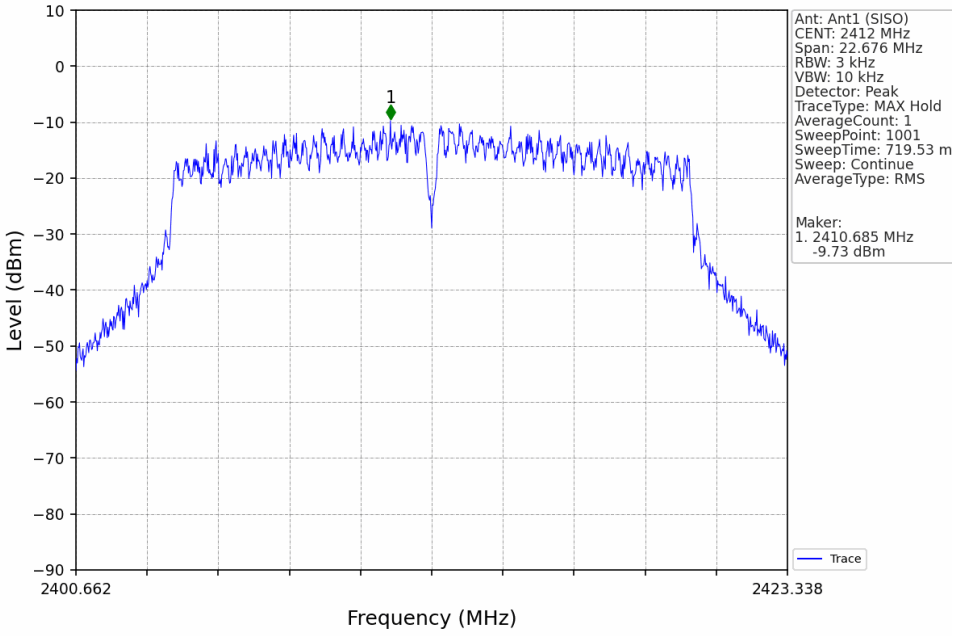
802.11b_MCH_2437MHz_Ant1 (SISO)_NTNV



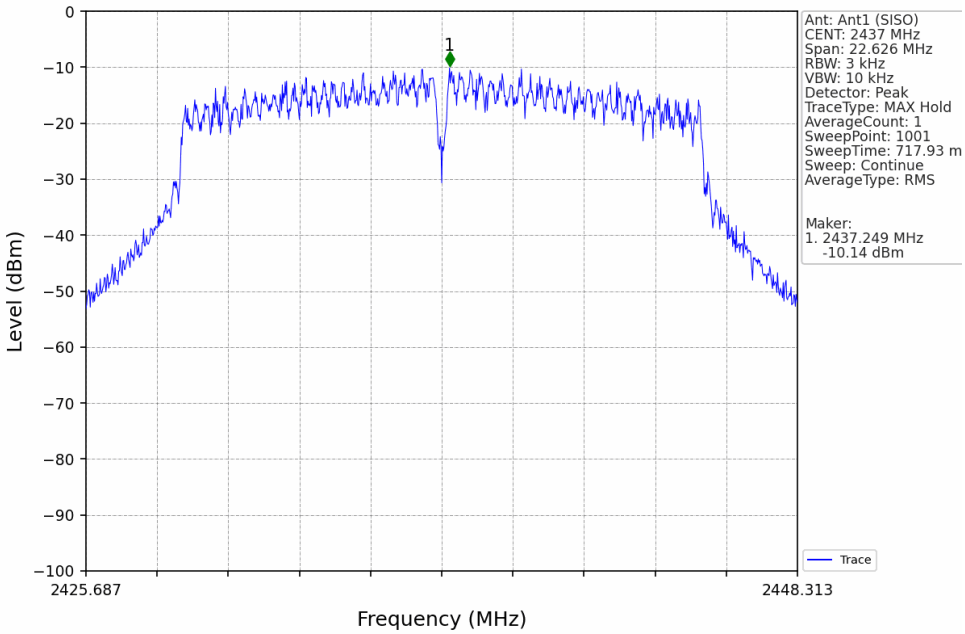
802.11b_HCH_2462MHz_Ant1 (SISO)_NTNV



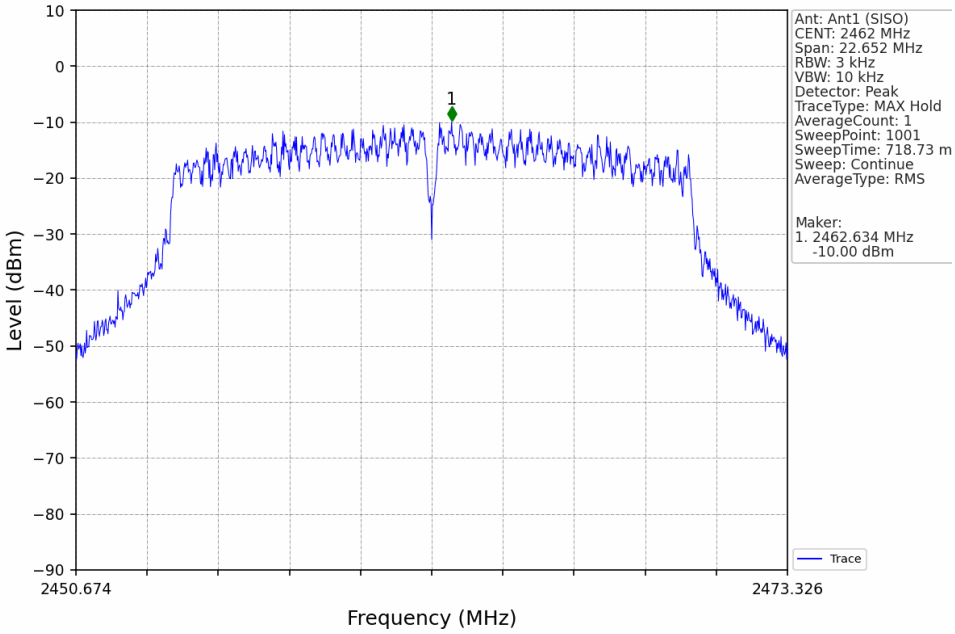
802.11g_LCH_2412MHz_Ant1 (SISO)_NTNV



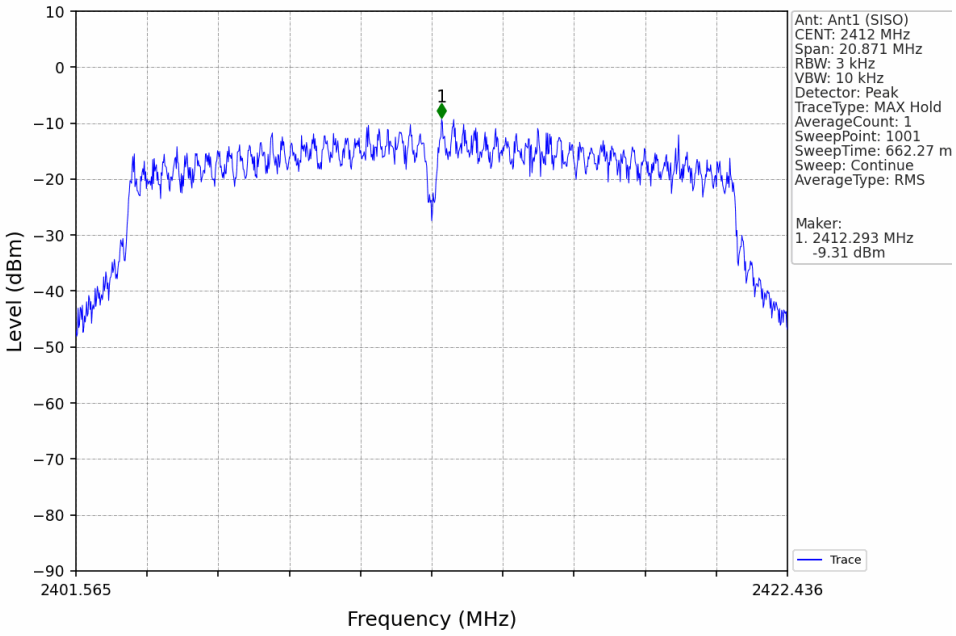
802.11g_MCH_2437MHz_Ant1 (SISO)_NTNV



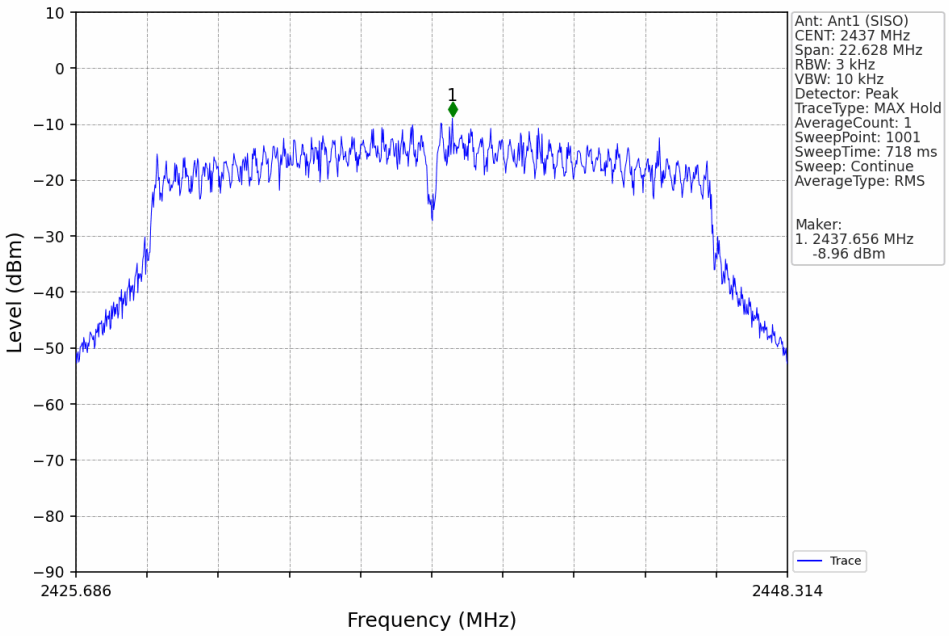
802.11g_HCH_2462MHz_Ant1 (SISO)_NTNV



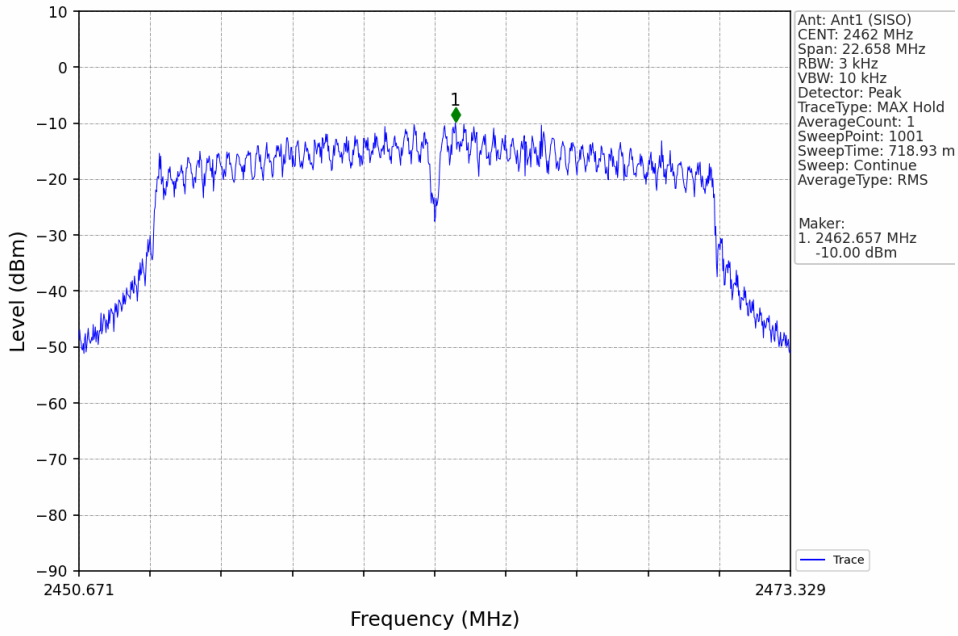
802.11n(HT20)_LCH_2412MHz_Ant1 (SISO)_NTNV



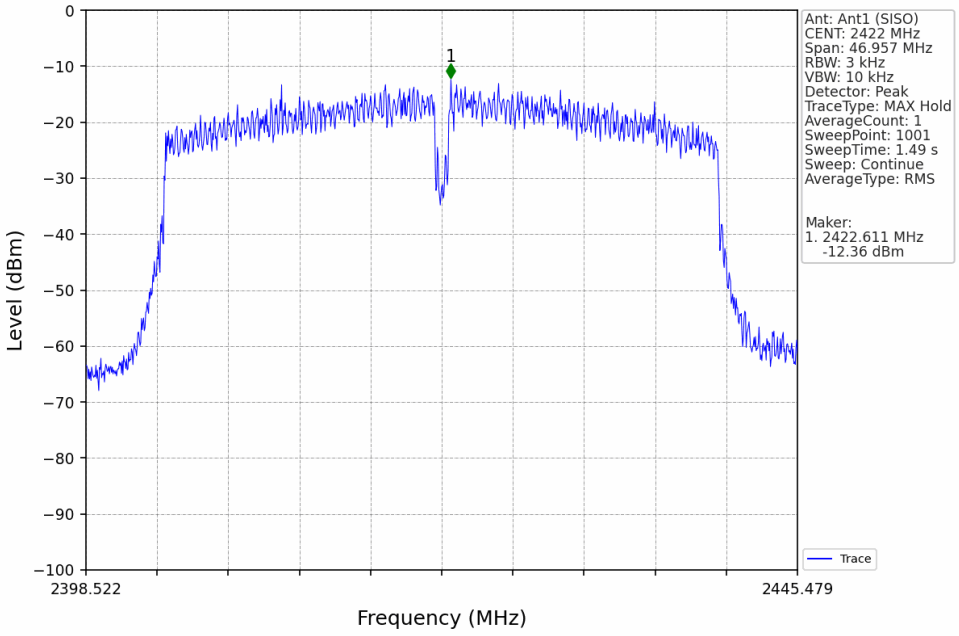
802.11n(HT20)_MCH_2437MHz_Ant1 (SISO)_NTNV



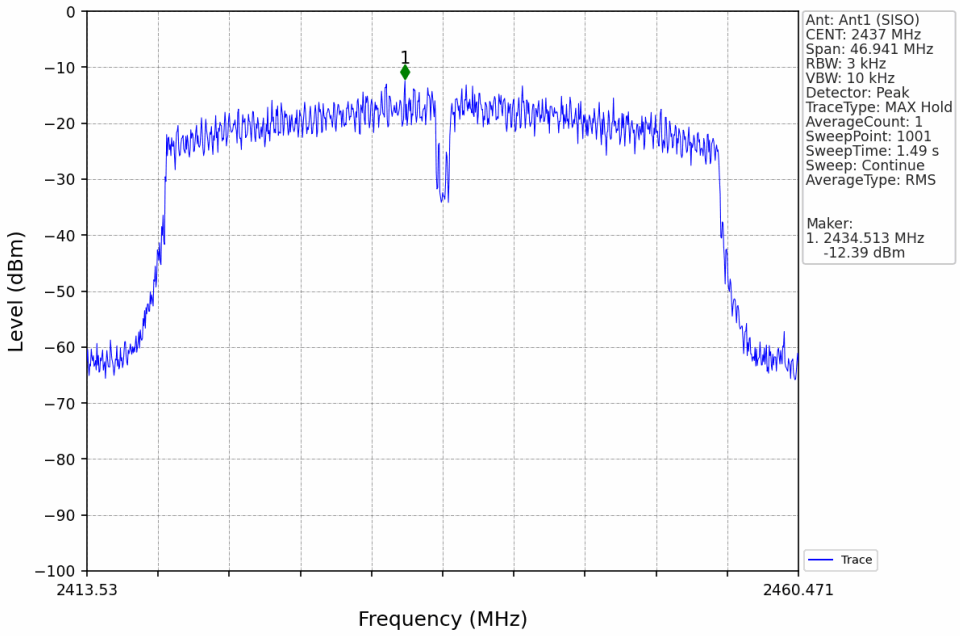
802.11n(HT20)_HCH_2462MHz_Ant1 (SISO)_NTNV



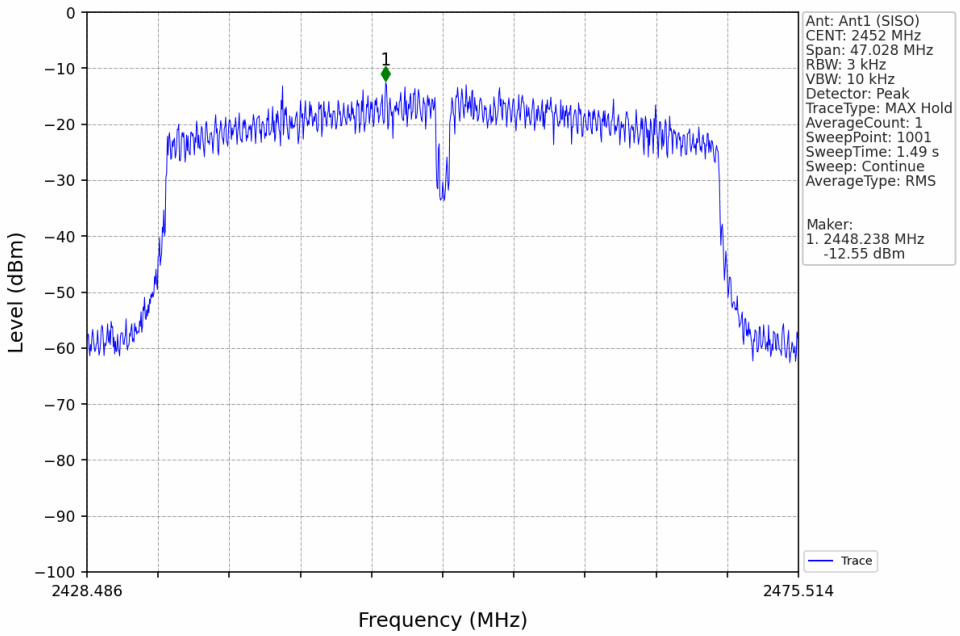
802.11n(HT40)_LCH_2422MHz_Ant1 (SISO)_NTNV



802.11n(HT40)_MCH_2437MHz_Ant1 (SISO)_NTNV



802.11n(HT40)_HCH_2452MHz_Ant1 (SISO)_NTNV



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)
802.11b	SISO	2412	1	7.23
		2437	1	7.29
		2462	1	7.02
802.11g	SISO	2412	1	5.24
		2437	1	5.12
		2462	1	5.30
802.11n (HT20)	SISO	2412	1	4.90
		2437	1	4.93
		2462	1	4.91
802.11n (HT40)	SISO	2422	1	2.85
		2437	1	2.46
		2452	1	2.45

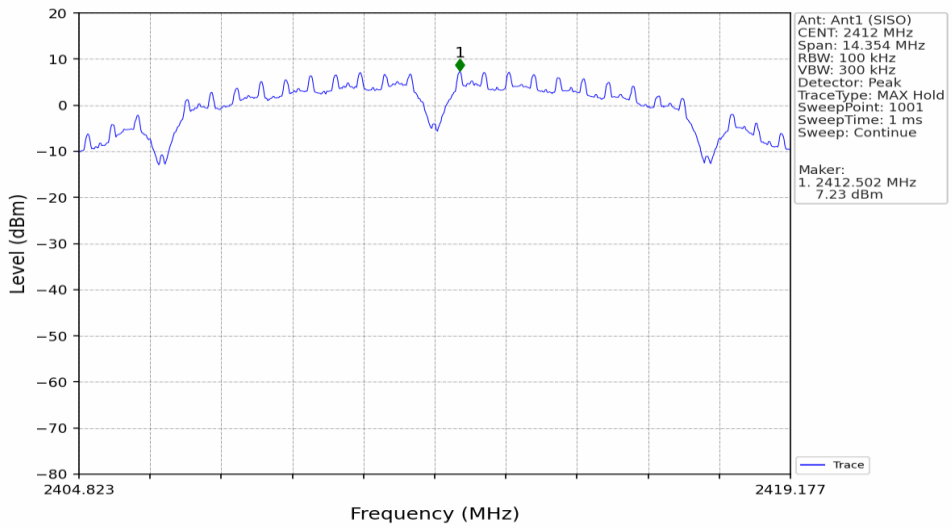
5.1.2 CSE

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
802.11b	SISO	2412	1	7.29	-22.71	Pass
		2437	1	7.29	-22.71	Pass
		2462	1	7.29	-22.71	Pass
802.11g	SISO	2412	1	5.30	-24.70	Pass
		2437	1	5.30	-24.70	Pass
		2462	1	5.30	-24.70	Pass
802.11n (HT20)	SISO	2412	1	4.93	-25.07	Pass
		2437	1	4.93	-25.07	Pass
		2462	1	4.93	-25.07	Pass
802.11n (HT40)	SISO	2422	1	2.85	-27.15	Pass
		2437	1	2.85	-27.15	Pass
		2452	1	2.85	-27.15	Pass

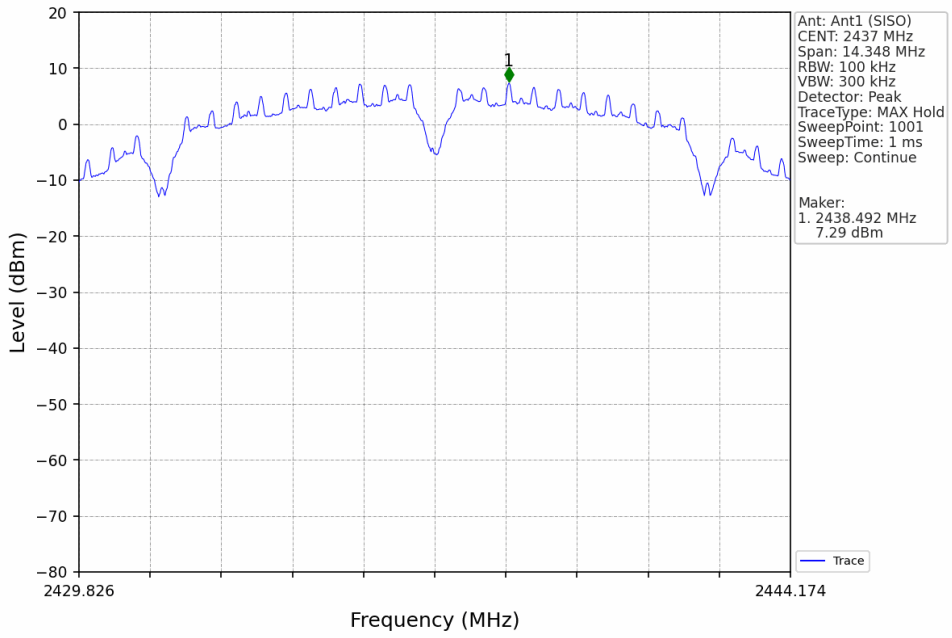
5.2 Test Graph

5.2.1 Ref

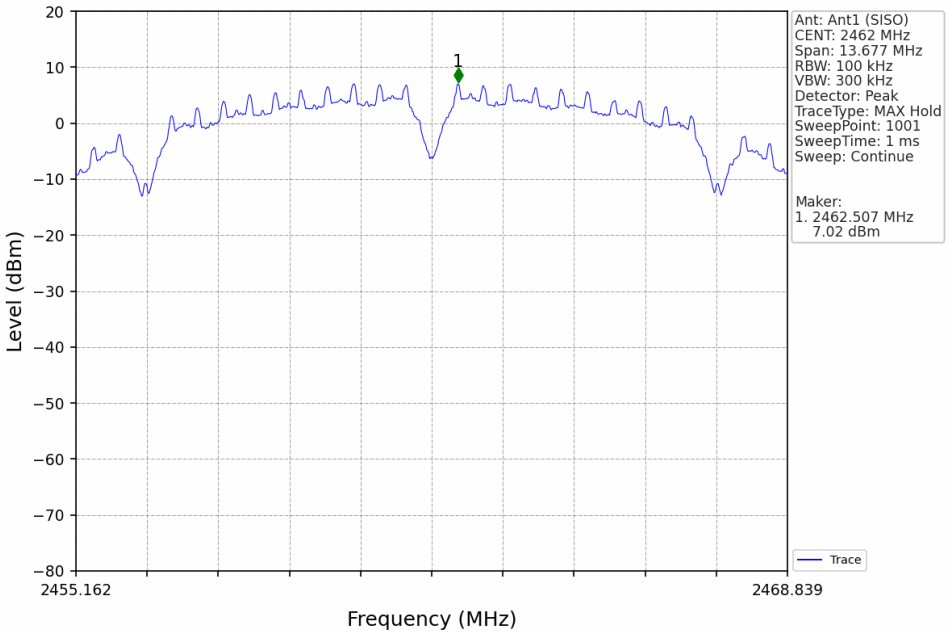
802.11b_LCH_2412MHz_Ant1 (SISO)_NTNV



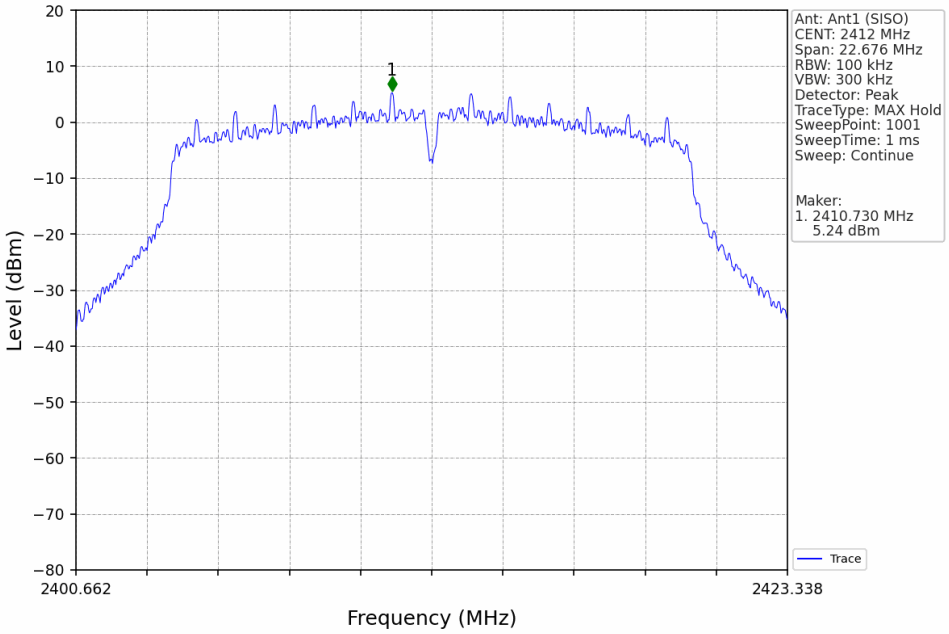
802.11b_MCH_2437MHz_Ant1 (SISO)_NTNV



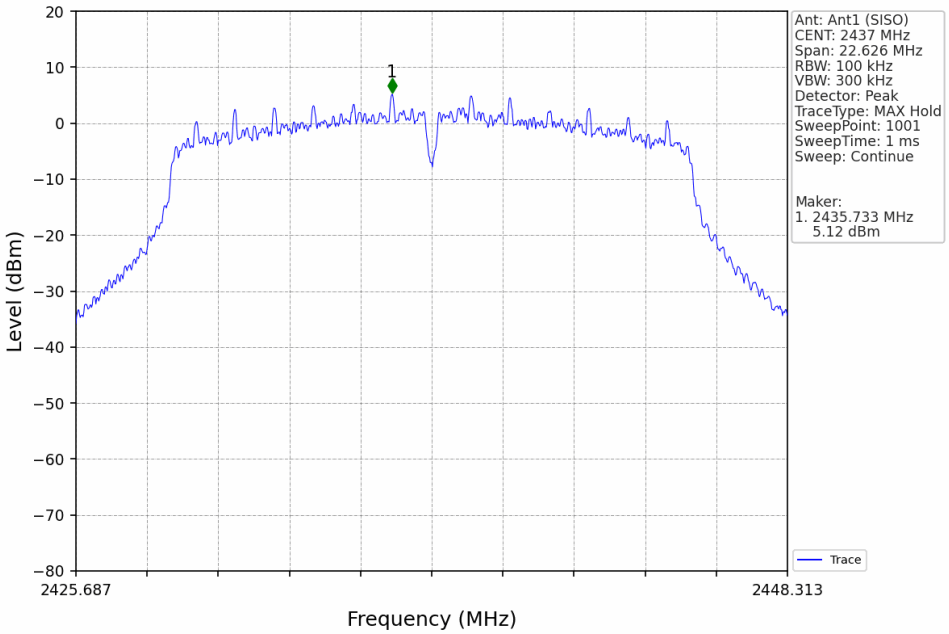
802.11b_HCH_2462MHz_Ant1 (SISO)_NTNV



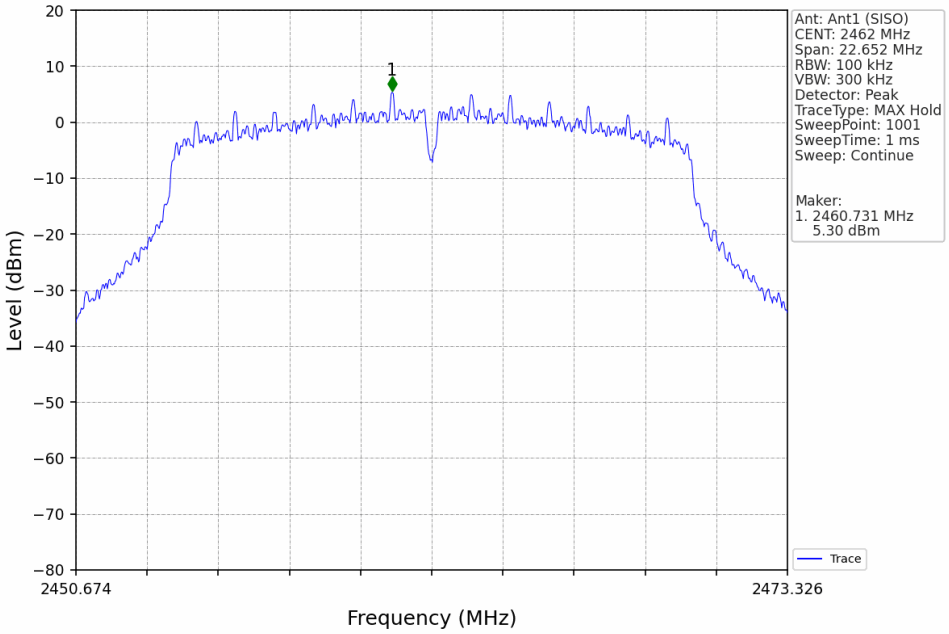
802.11g_LCH_2412MHz_Ant1 (SISO)_NTNV



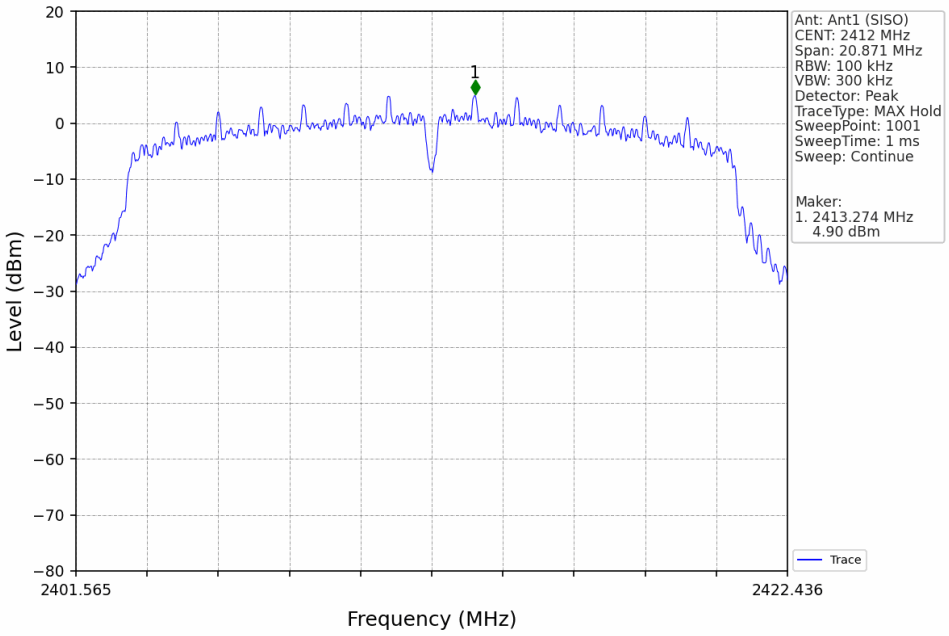
802.11g_MCH_2437MHz_Ant1 (SISO)_NTNV



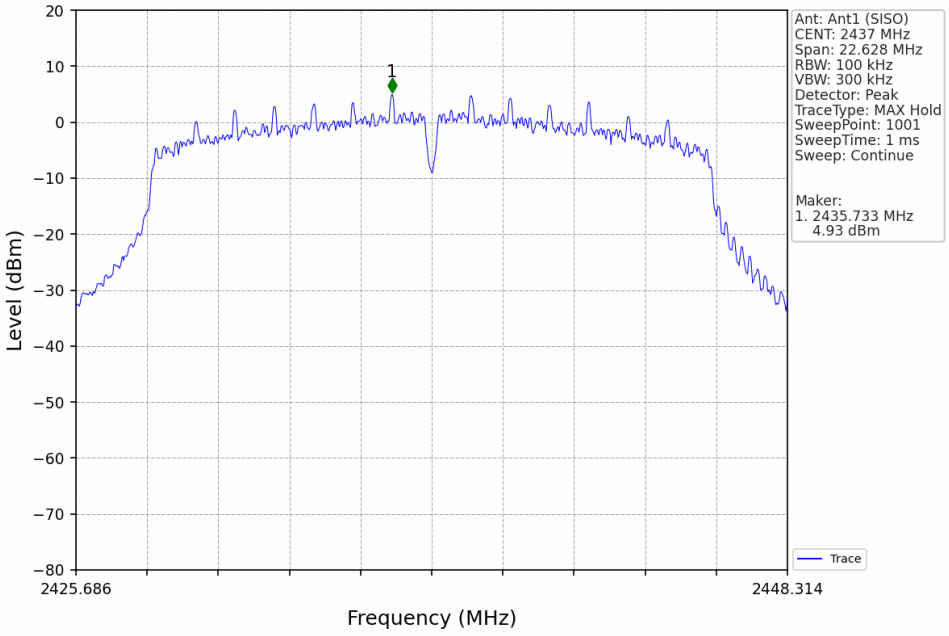
802.11g_HCH_2462MHz_Ant1 (SISO)_NTNV



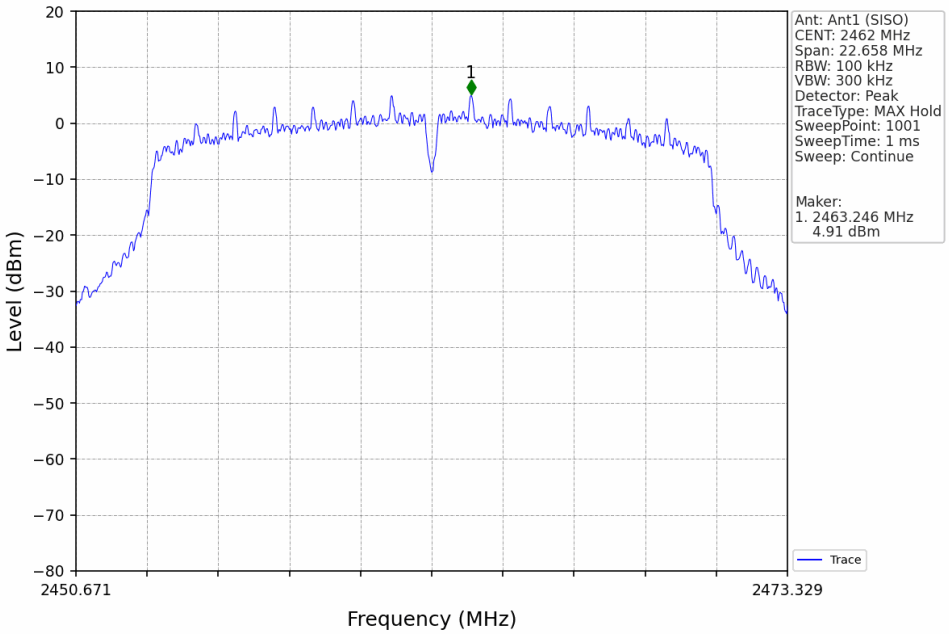
802.11n(HT20)_LCH_2412MHz_Ant1 (SISO)_NTNV



802.11n(HT20)_MCH_2437MHz_Ant1 (SISO)_NTNV



802.11n(HT20)_HCH_2462MHz_Ant1 (SISO)_NTNV



802.11n(HT40)_LCH_2422MHz_Ant1 (SISO)_NTNV