



Report No.: TW2203321-02E
File reference No.: 2022-05-25

Applicant: Autel Robotics Co., Ltd.

Product: Live Deck 2

Model No.: Live Deck 2

Trademark: **AUTEL**
ROBOTICS

Test Standards: FCC Part 15.247

Test result: It is herewith confirmed and found to comply with the requirements set up by ANSI C63.10, FCC Part 15.247 for the evaluation of electromagnetic compatibility

Approved By

A handwritten signature in black ink that reads 'Terry Tang'.

Terry Tang

Manager

Dated: May 25, 2022

Results appearing herein relate only to the sample tested

The technical reports is issued errors and omissions exempt and is subject to withdrawal at

SHENZHEN TIMEWAY TESTING LABORATORIES

Zone C, 1st Floor, Block B, Jun Xiang Da Building, Zhongshan Park Road West, Tong Le Village, Nanshan District, Shenzhen, China

Tel (755) 83448688, Fax (755) 83442996, E-Mail:info@timeway-lab.com



Special Statement:

The testing quality ability of our laboratory meet with “Quality Law of People’s Republic of China” Clause 19.

The testing quality system of our laboratory meet with ISO/IEC-17025 requirements, which is approved by CNAL. This approval result is accepted by MRA of APLAC.

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

CNAL-LAB Code: L2292

The EMC Laboratory has been assessed and in compliance with CNAL/AC01:2002 accreditation criteria for testing Laboratories (identical to ISO 17025:2017 General Requirements) for the Competence of testing Laboratories.

FCC-Registration No.: 744189

The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission. The acceptance letter from the FCC is maintained in our files. Registration No.: 744189.

Industry Canada (IC) —Registration No.:5205A

The EMC Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 5205A.

A2LA (Certification Number:5013.01)

The EMC Laboratory has been accredited by the American Association for Laboratory Accreditation (A2LA). Certification Number:5013.01

CAB identifier: CN0033

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Test Report Conclusion

Content

1.0	General Details	4
1.1	Test Lab Details	4
1.2	Applicant Details	4
1.3	Description of EUT	4
1.4	Submitted Sample	5
1.5	Test Duration	5
1.6	Test Uncertainty	5
1.7	Test By	5
2.0	List of Measurement Equipment	6
3.0	Technical Details	12
3.1	Summary of Test Results	12
3.2	Test Standards	12
4.0	EUT Modification	12
5.0	Power Line Conducted Emission Test	13
5.1	Schematics of the Test	13
5.2	Test Method and Test Procedure	13
5.3	Configuration of the EUT	13
5.4	EUT Operating Condition	14
5.5	Conducted Emission Limit	14
5.6	Test Result	14
6.0	Radiated Emission test	17
6.1	Test Method and Test Procedure	17
6.2	Configuration of the EUT	18
6.3	EUT Operation Condition	18
6.4	Radiated Emission Limit	18
7.0	6dB Bandwidth Measurement	28
8.0	Maximum Output Power	33
9.0	Power Spectral Density Measurement	41
10.0	Out of Band Measurement	52
11.0	Antenna Requirement	66

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1.0 General Details


1.1 Test Lab Details

Name: SHENZHEN TIMEWAY TESTING LABORATORIES.
Address: Zone C, 1st Floor, Block B, Jun Xiang Da Building, Zhongshan Park Road West, Tong Le Village, Nanshan District, Shenzhen, China
Telephone: (755) 83448688
Fax: (755) 83442996
Site Listed with Federal Communications commission (FCC)
Registration Number: 744189
For 3m Anechoic Chamber
Site Listed with Industry Canada of Ottawa, Canada
Registration Number: IC: 5205A
For 3m Anechoic Chamber

1.2 Applicant Details

Applicant: Autel Robotics Co., Ltd.
Address: 9 Floor, Building B1, Zhiyuan, No.1001, Xueyuan Road, Xili Street, Nanshan District, Shenzhen, Guangdong, China
Telephone: --
Fax: --

1.3 Description of EUT

Product: Live Deck 2
Manufacturer: Autel Robotics Co., Ltd.
Address: 9 Floor, Building B1, Zhiyuan, No.1001, Xueyuan Road, Xili Street, Nanshan District, Shenzhen, Guangdong, China
Trademark: 
Model Number: Live Deck 2
Additional Model Number: N/A
Hardware Version: LD2L-MAIN-V3
Software Version: Modem_V7.2.1_MS_CP_128MB_20220428
Serial No.: SN202205250001
Rating: Input: DC5V/9/12V, 18W Max; USB OUT: DC5V, 0.5A
Modulation Technique: Spread spectrum
Modulation Type: QPSK, 16QAM
Frequency range: 2403.5MHz-2475.5MHz
Channel Spacing: 1MHz
Channel Number: 73

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Antenna: Two Integral antennas with SMA male antenna connector used. The gain of the antenna is 4.7dBi for each one (Get from the antenna specification)

1.4 Submitted Sample: 2 Samples

1.5 Test Duration
2022-03-23 to 2022-05-25

1.6 Test Uncertainty
Conducted Emissions Uncertainty =3.6dB
Radiated Emissions below 1GHz Uncertainty =4.7dB
Radiated Emissions above 1GHz Uncertainty =6.0dB
Conducted Power Uncertainty =6.0dB
Occupied Channel Bandwidth Uncertainty =5%
Note: The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.

1.7 Test Engineer

The sample tested by

A handwritten signature in blue ink that reads "Andy Xing".

Print Name: Andy Xing



2.0 Test Equipment					
Instrument Type	Manufacturer	Model	Serial No.	Date of Cal.	Due Date
ESPI Test Receiver	R&S	ESPI 3	100379	2021-06-18	2022-06-17
Impuls-Begrenzer	R&S	ESH3-Z2	100281	2021-06-18	2022-06-17
Loop Antenna	EMCO	6507	00078608	2021-06-18	2024-06-17
Spectrum	R&S	FSIQ26	100292	2021-06-18	2022-06-17
Horn Antenna	A-INFO	LB-180400-KF	ANT01060660	2021-07-02	2024-07-02
Horn Antenna	R&S	BBHA 9120D	9120D-631	2021-07-02	2024-07-02
Power meter	Anritsu	ML2487A	6K00003613	2021-06-18	2022-06-17
Power sensor	Anritsu	MA2491A	32263	2021-06-18	2022-06-17
Bilog Antenna	Schwarebeck	VULB9163	9163/340	2021-07-02	2024-07-01
9*6*6 Anechoic	--	--	N/A	2021-07-02	2022-07-01
EMI Test Receiver	RS	ESVB	826156/011	2021-06-18	2022-06-17
EMI Test Receiver	RS	ESH3	860904/006	2021-06-18	2022-06-17
Spectrum	HP/Agilent	ESA-L1500A	US37451154	2021-06-18	2022-06-17
Spectrum	HP/Agilent	E4407B	MY50441392	2021-06-18	2022-06-17
Spectrum	RS	FSP	1164.4391.38	2022-01-14	2023-01-13
RF Cable	Zhengdi	ZT26-NJ-NJ-8 M/FA	--	2021-06-18	2022-06-17
RF Cable	Zhengdi	7m	--	2021-06-18	2022-06-17
RF Switch	EM	EMSW18	060391	2021-06-18	2022-06-17
Pre-Amplifier	Schwarebeck	BBV9743	#218	2021-06-18	2022-06-17
Pre-Amplifier	HP/Agilent	8449B	3008A00160	2021-06-18	2022-06-17
LISN	SCHAFFNER	NNB42	00012	2022-01-05	2023-01-04
2.4G band-pass filter	Micro-Tronics	BRM50701	SN-041	2021-06-18	2022-06-17

2.2 Automation Test Software

For Conducted Emission Test

Name	Version
EZ-EMC	Ver.EMC-CON 3A1.1

For Radiated Emissions

Name	Version
EMI Test Software BL410-EV18.91	V18.905
EMI Test Software BL410-EV18.806 High Frequency	V18.06

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Description of Test Modes

The EUT had been tested under operating condition. There are three channels have been tested as following:

Channel	Frequency (MHz)
Low	2403.5
Middle	2439.5
High	2475.5

There are two modulation type provided to the EUT: QPSK and 16QAM. For radiated emission test and restricted band test, only the worst case was recorded in the test report. And QPSK modulation was the worst case.

Duty Cycle

Ant1							
Mode	TX Type	Frequency (MHz)	T_on (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	Max. DC Variation (%)
QPSK	MIMO	2403.5	0.503	1.000	50.30	2.98	0.00
		2439.5	0.503	1.000	50.30	2.98	0.00
		2475.5	0.504	1.000	50.40	2.98	0.00
16QAM	MIMO	2403.5	0.504	1.000	50.40	2.98	0.00
		2439.5	0.501	1.000	50.10	3.00	0.00
		2475.5	0.502	1.000	50.20	2.99	0.00

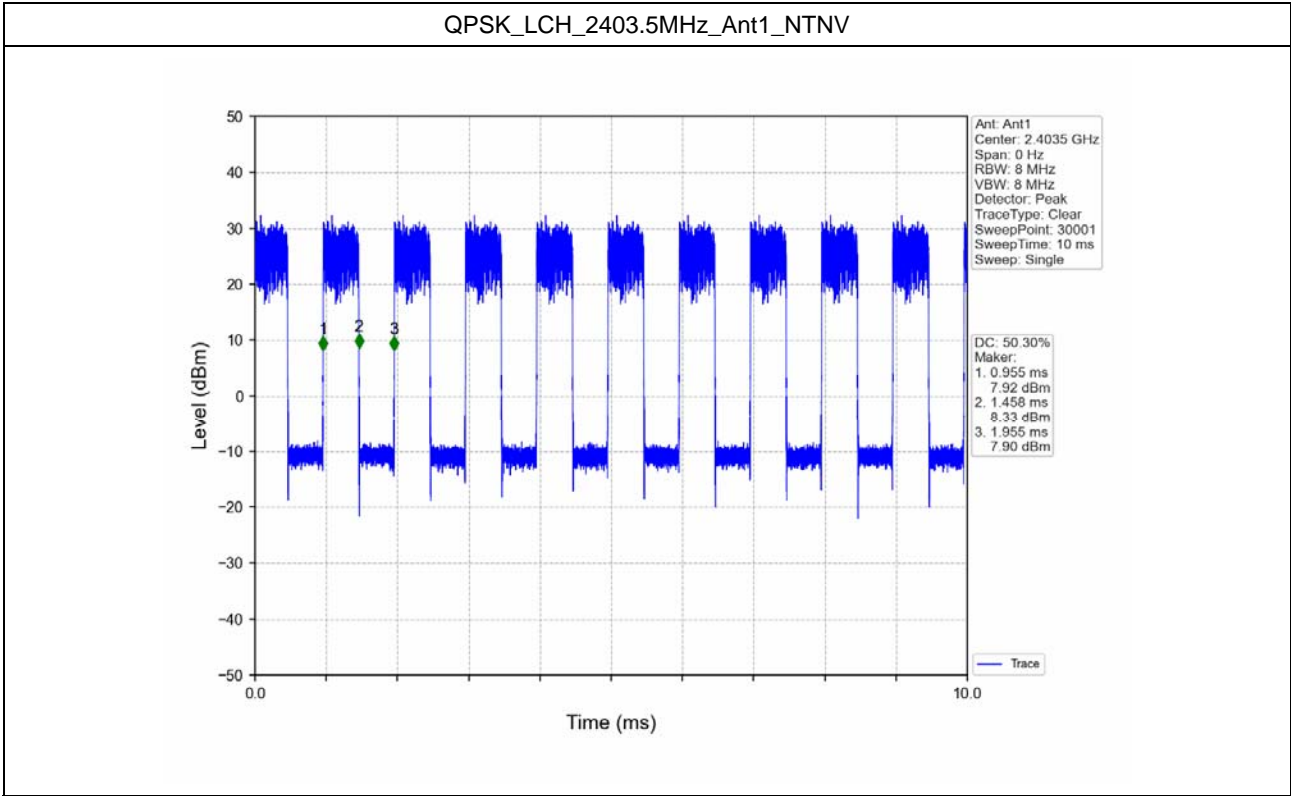
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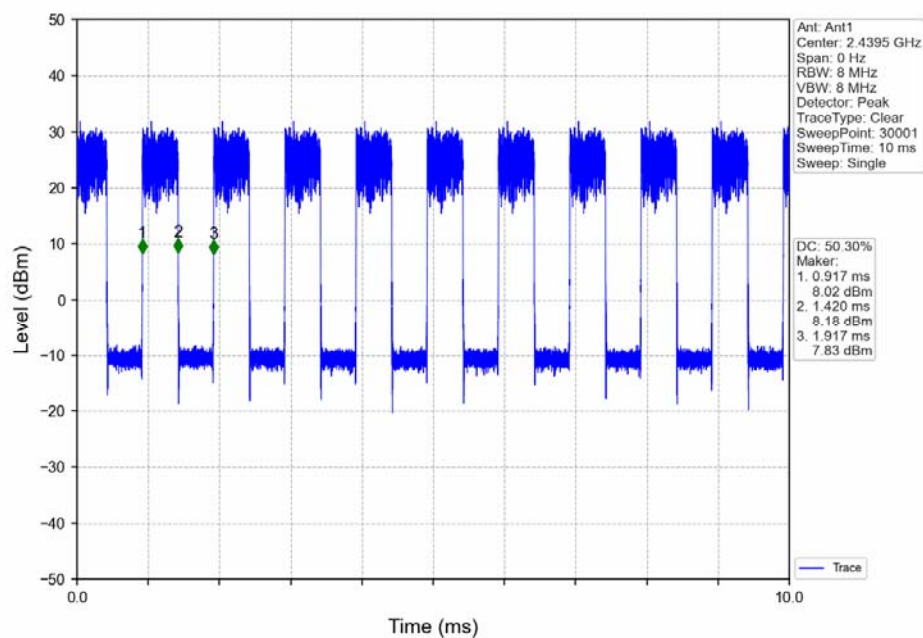
Test Graph



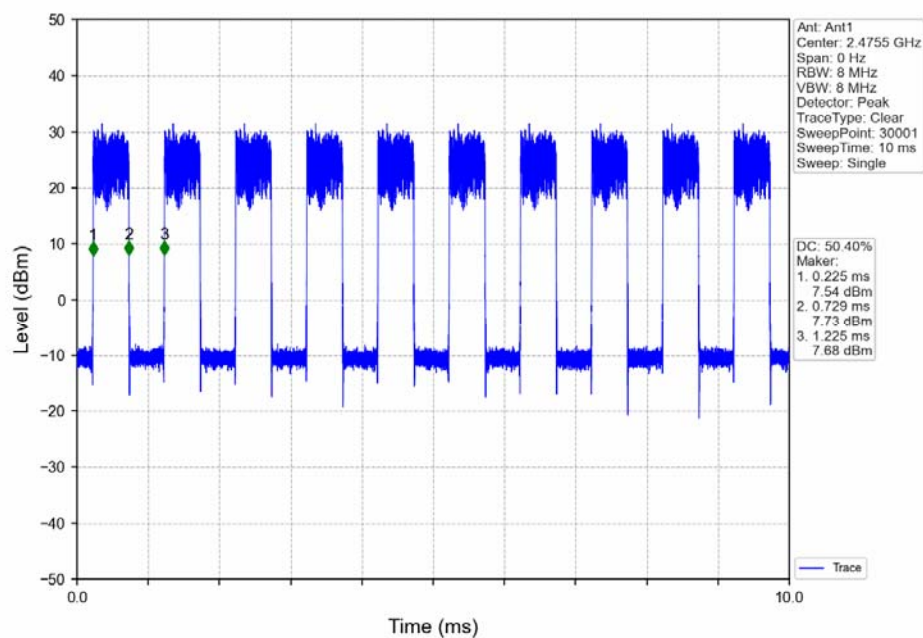
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QPSK_MCH_2439.5MHz_Ant1_NTNV



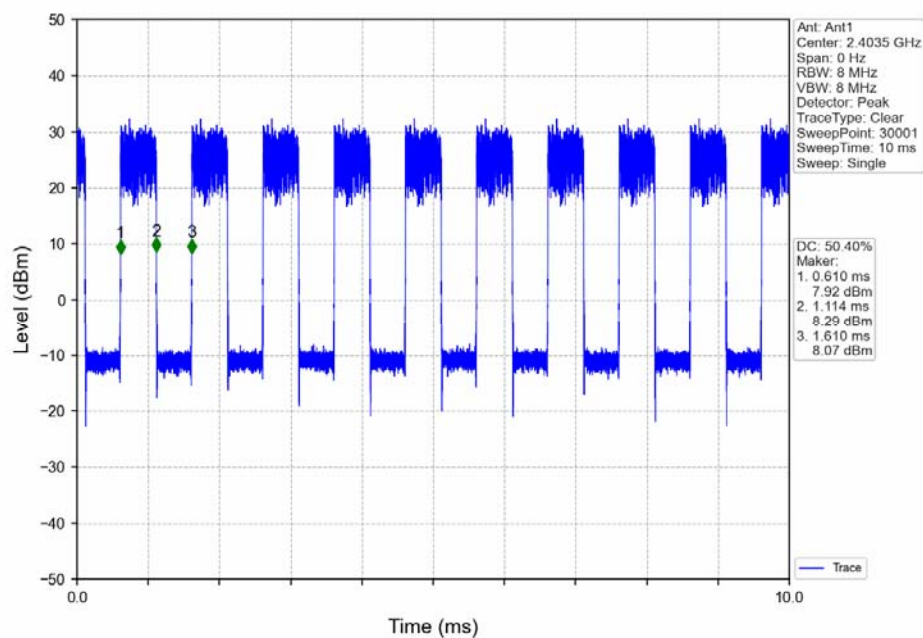
QPSK_HCH_2475.5MHz_Ant1_NTNV



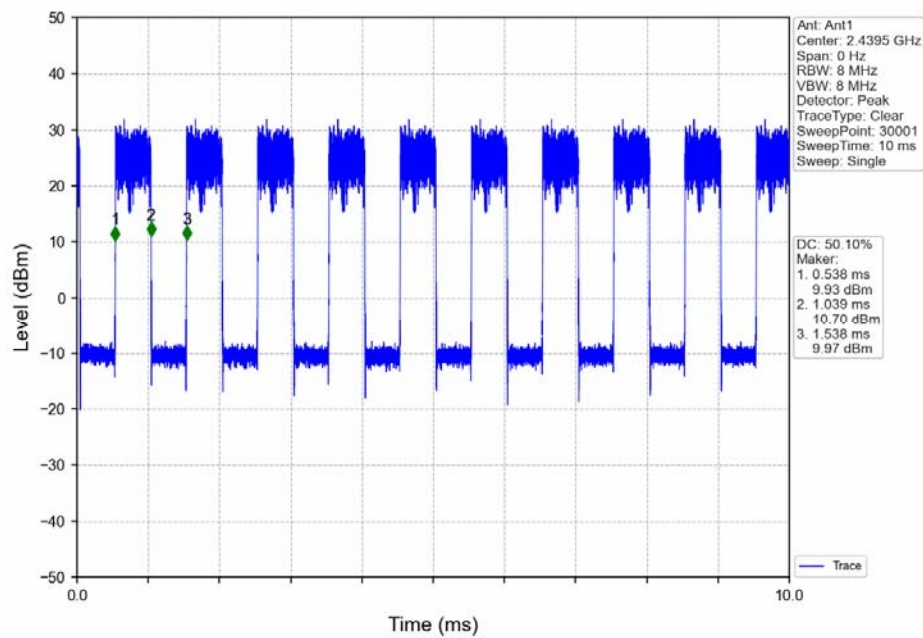
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16QAM_LCH_2403.5MHz_Ant1_NTNV



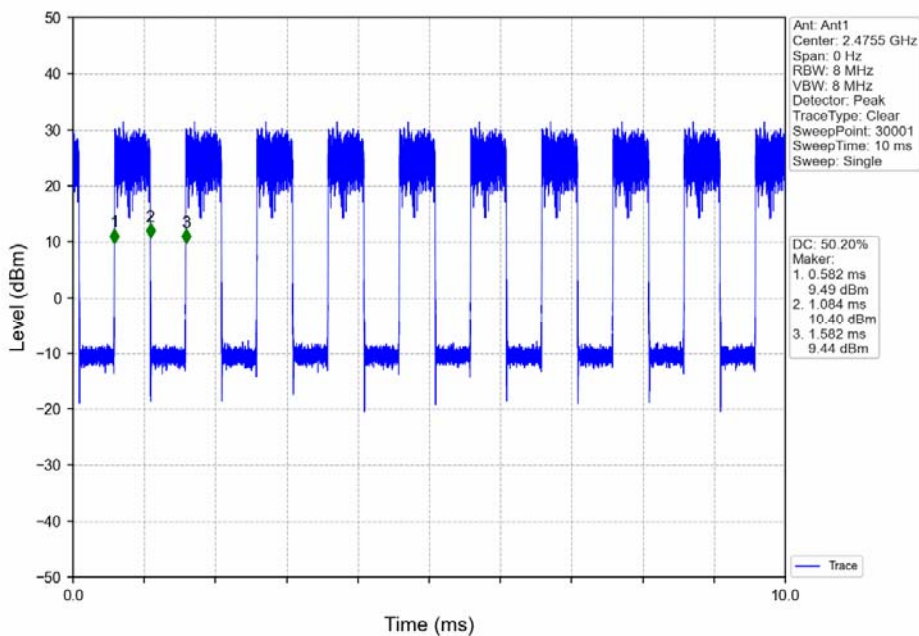
16QAM_MCH_2439.5MHz_Ant1_NTNV



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16QAM_HCH_2475.5MHz_Ant1_NTNV



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3.0 Technical Details

3.1 Summary of test results

The EUT has been tested according to the following specifications:			
Standard	Test Type	Result	Notes
FCC Part 15, Paragraph 15.203	Antenna Requirement	Pass	Complies
FCC Part 15, Paragraph 15.207	Conducted Emission Test	Pass	Complies
FCC Part 15 Subpart C Paragraph 15.247(a)(2) Limit	Spectrum bandwidth of a Orthogonal Frequency Division Multiplex System Limit: 6dB bandwidth > 500kHz	Pass	Complies
FCC Part 15, Paragraph 15.247(b)	Maximum peak output power Limit: max. 30dBm	Pass	Complies
FCC Part 15, Paragraph 15.109, 15.205 & 15.209	Transmitter Radiated Emission Limit: Table 15.209	Pass	Complies
FCC Part 15, Paragraph 15.247(e)	Power Spectral Density Limit: max. 8dBm/3kHz	Pass	Complies
FCC Part 15, Paragraph 15.247(d)	Out of Band Emission and Restricted Band Radiation Limit: 20dB less than peak value of fundamental frequency Restricted band limit: Table 15.209	Pass	Complies

3.2 Test Standards

FCC Part 15 Subpart & Subpart C, Paragraph 15.247

4.0 EUT Modification

No modification by SHENZHEN TIMEWAY TESTING LABORATORIES.

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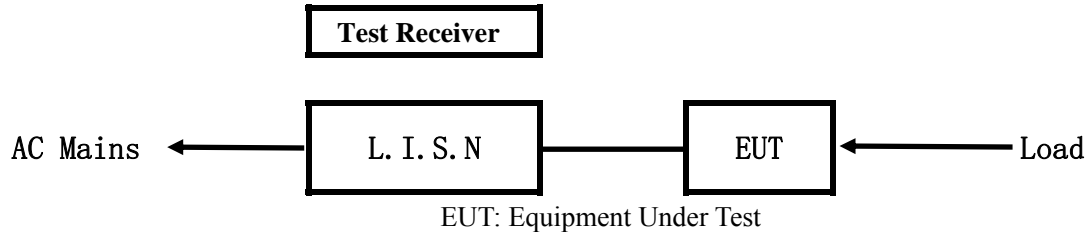
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5.0 Power Line Conducted Emission Test

5.1 Schematics of the test

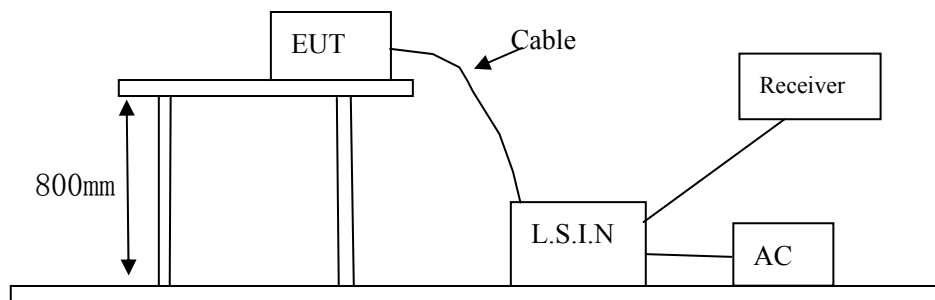


5.2 Test Method and test Procedure

The EUT was tested according to ANSI C63.10-2013. The Frequency spectrum From 0.15MHz to 30MHz was investigated. The LISN used was 50ohm/50uH as specified by section 5.1 of ANSI C63.10 –2013.

Test Voltage: DC48V, 60Hz

Block diagram of Test setup



5.3 Configuration of The EUT

The EUT was configured according to ANSI C63.10-2013. All interface ports were connected to the appropriate peripherals. All peripherals and cables are listed below.

A. EUT

Device	Manufacturer	Model	FCC ID
Live Deck 2	Autel Robotics Co., Ltd.	Live Deck 2	2AGNTLDK240958A

B. Internal Device

Device	Manufacturer	Model	FCC ID/DOC
N/A			

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C. Peripherals

Device	Manufacturer	Model	Rating
Power Supply	Autel	XY-PD030D32	Input: 100-240V~, 50/60Hz, 1A; Output: USB-C: DC5V, 3A; DC9V, 3A; DC12V, 2.5A; USB-A: DC5V, 3A, DC9V, 2A; DC12V, 1.5A; USB-C + USB-A: DC5V, 3.1A

5.4 EUT Operating Condition

Operating condition is according to ANSI C63.10-2013.

A Setup the EUT and simulators as shown on follow

B Enable AF signal and confirm EUT active to normal condition

5.5 Power line conducted Emission Limit according to Paragraph 15.207

Frequency (MHz)	Limits (dB μ V)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	66.0~56.0*	56.0~46.0*
0.50 ~ 5.00	56.0	46.0
5.00 ~ 30.00	60.0	50.0

- Notes:
1. *Decreasing linearly with logarithm of frequency.
 2. The tighter limit shall apply at the transition frequencies

5.6 Test Results

The frequency spectrum from 0.15MHz to 30MHz was investigated. All reading are quasi-peak values with a resolution bandwidth of 9kHz.

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A: Conducted Emission on Live Terminal (150kHz to 30MHz)

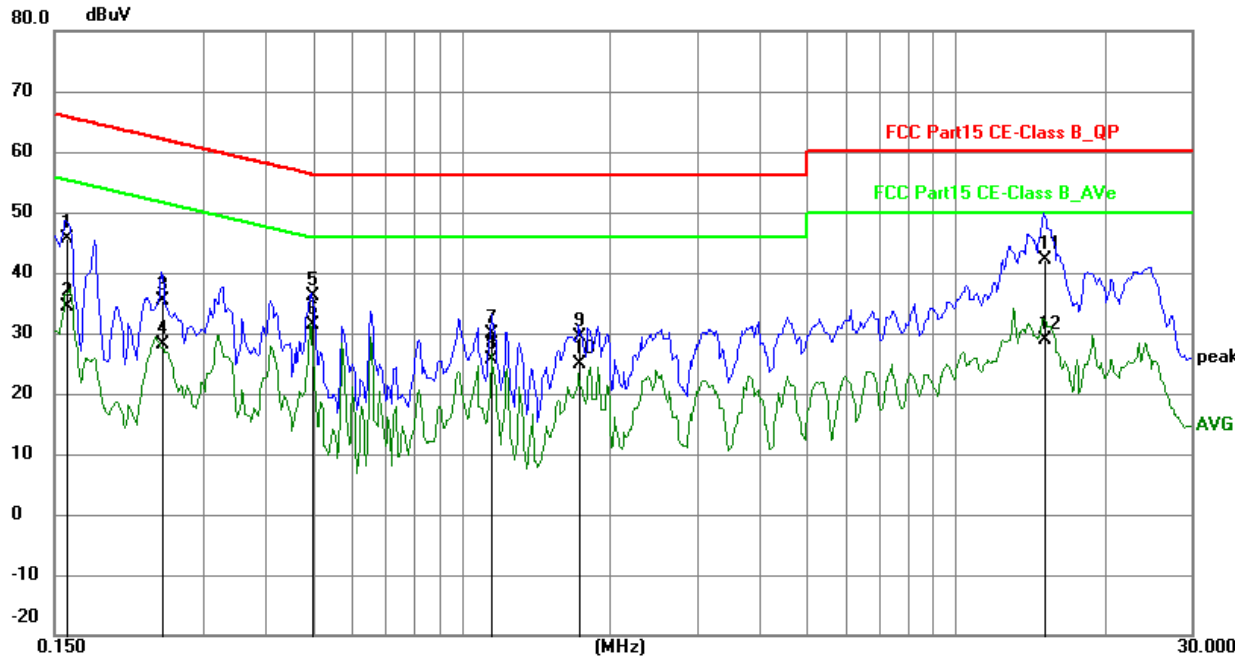
EUT Operating Environment

Temperature: 26°C Humidity: 65%RH Atmospheric Pressure: 101 kPa

EUT set Condition: Keep Transmitting

Results: Pass

Please refer to following diagram for individual



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.1582	35.78	9.78	45.56	65.56	-20.00	QP	P
2	0.1582	24.53	9.78	34.31	55.56	-21.25	AVG	P
3	0.2475	25.73	9.75	35.48	61.84	-26.36	QP	P
4	0.2475	18.36	9.75	28.11	51.84	-23.73	AVG	P
5	0.4971	26.36	9.77	36.13	56.05	-19.92	QP	P
6	0.4971	21.64	9.77	31.41	46.05	-14.64	AVG	P
7	1.1523	20.04	9.79	29.83	56.00	-26.17	QP	P
8	1.1523	15.78	9.79	25.57	46.00	-20.43	AVG	P
9	1.7334	19.57	9.80	29.37	56.00	-26.63	QP	P
10	1.7334	14.96	9.80	24.76	46.00	-21.24	AVG	P
11	15.1017	31.75	10.39	42.14	60.00	-17.86	QP	P
12	15.1017	18.50	10.39	28.89	50.00	-21.11	AVG	P

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B: Conducted Emission on Neutral Terminal (150kHz to 30MHz)

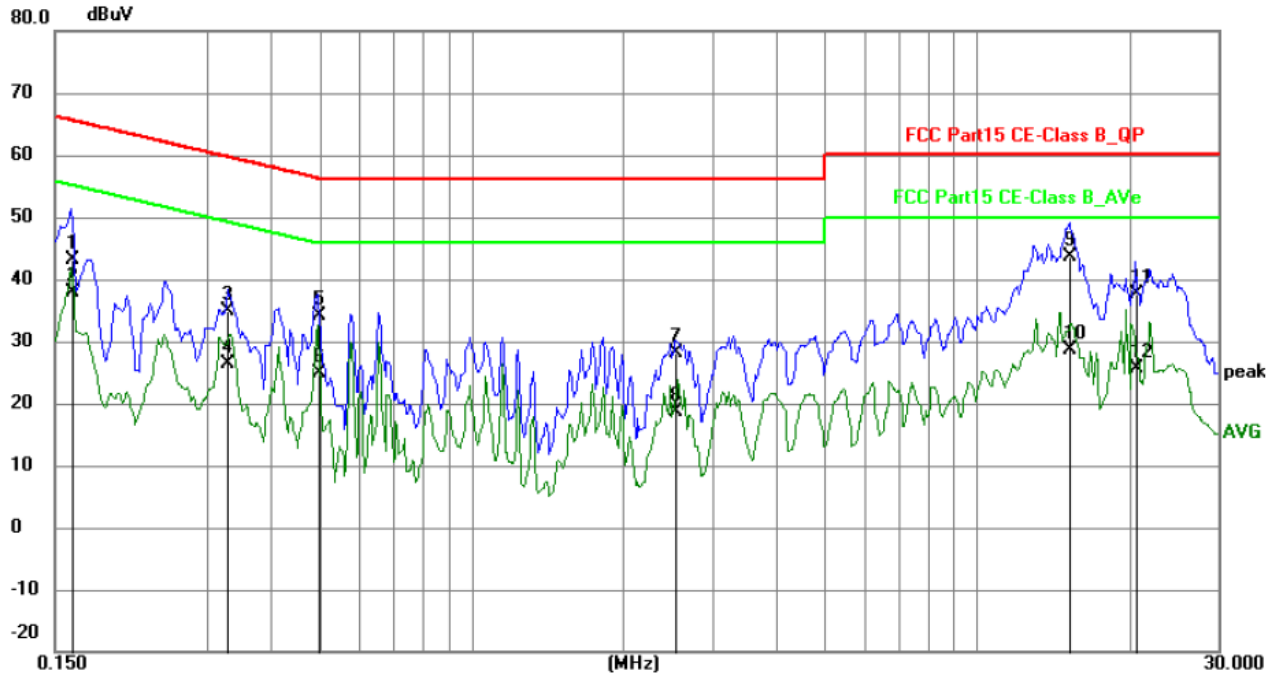
EUT Operating Environment

Temperature: 26°C Humidity: 65%RH Atmospheric Pressure: 101 kPa

EUT set Condition: Keep Transmitting

Results: Pass

Please refer to following diagram for individual



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.1617	33.25	9.78	43.03	65.38	-22.35	QP	P
2	0.1617	28.12	9.78	37.90	55.38	-17.48	AVG	P
3	0.3294	25.07	9.76	34.83	59.47	-24.64	QP	P
4	0.3294	16.52	9.76	26.28	49.47	-23.19	AVG	P
5	0.4971	24.44	9.77	34.21	56.05	-21.84	QP	P
6	0.4971	15.09	9.77	24.86	46.05	-21.19	AVG	P
7	2.5368	18.20	9.82	28.02	56.00	-27.98	QP	P
8	2.5368	8.77	9.82	18.59	46.00	-27.41	AVG	P
9	15.2616	33.25	10.40	43.65	60.00	-16.35	QP	P
10	15.2616	18.29	10.40	28.69	50.00	-21.31	AVG	P
11	20.6748	26.95	10.72	37.67	60.00	-22.33	QP	P
12	20.6748	14.96	10.72	25.68	50.00	-24.32	AVG	P

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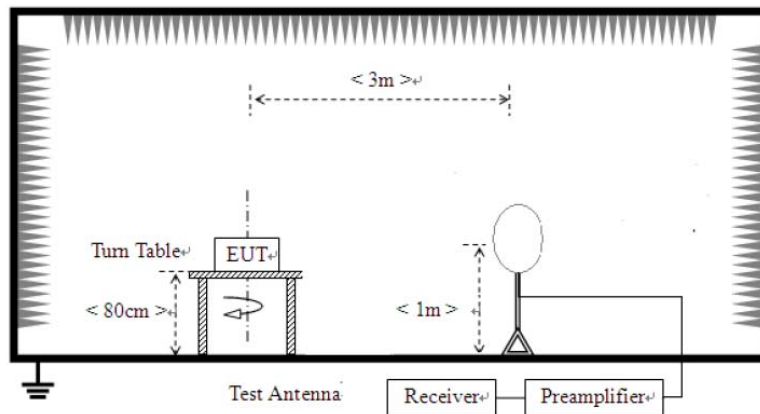
6 Radiated Emission Test

6.1 Test Method and test Procedure:

- (1) The EUT was tested according to ANSI C63.10-2013. The radiated test was performed at Timeway EMC Laboratory. This site is on file with the FCC laboratory division, Registration No. 744189
- (2) The EUT, peripherals were put on the turntable which table size is 1m x 1.5 m, table high 0.8 m. All set up is according to ANSI C63.10-2013.
- (3) The frequency spectrum from 30 MHz to 25 GHz was investigated. All readings from 30 MHz to 1 GHz are Quasi-peak values with a resolution bandwidth of 120 kHz. For measurement above 1GHz, peak values with RBW=1MHz VBW=3MHz and PK detector. AV value with RBW=1MHz, VBW=3MHz and RMS detector. Measurements were made at 3 meters.
- (4) The antenna high is varied from 1 m to 4 m high to find the maximum emission for each frequency.
- (5) Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB of specification limit), and are distinguished with a "QP" in the data table.
- (6) The antenna polarization: Vertical polarization and Horizontal polarization.

Block diagram of Test setup

For radiated emissions from 9kHz to 30MHz



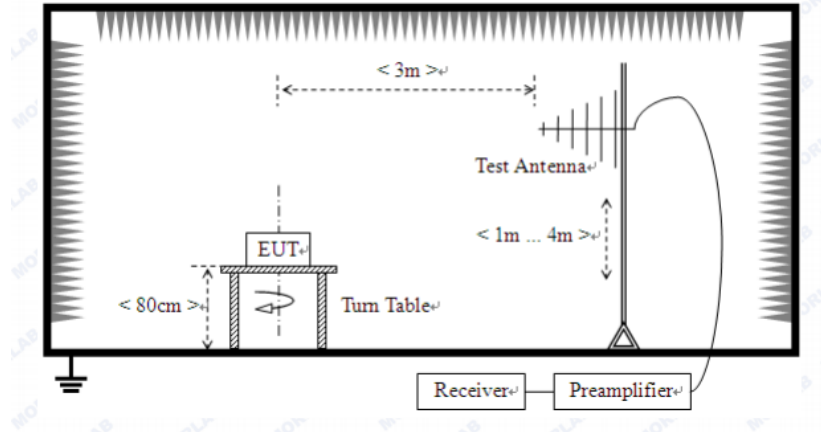
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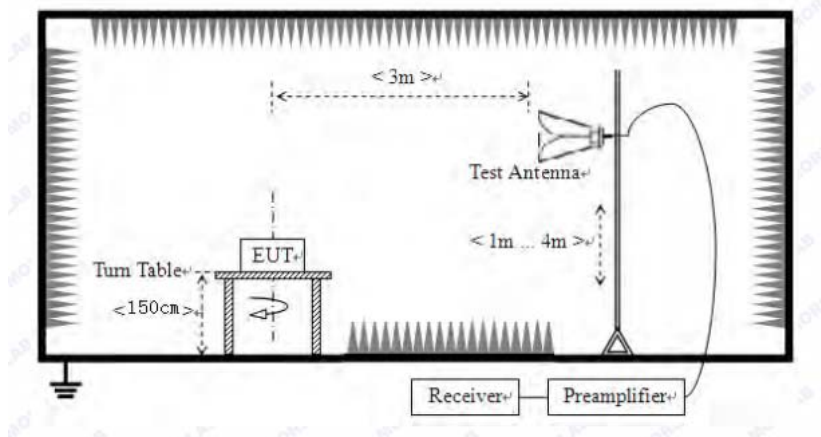
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For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



6.2 Configuration of The EUT

Same as section 5.3 of this report

6.3 EUT Operating Condition

Same as section 5.4 of this report.

6.4 Radiated Emission Limit

All emission from a digital device, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strength specified below:

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Frequencies in restricted band are complied to limit on Paragraph 15.209

Frequency Range (MHz)	Distance (m)	Field strength (dB μ V/m)
0.009-0.049	3	$20\log(2400/F(\text{kHz})) + 40\log(300/3)$
0.490-1.705	3	$20\log(24000/F(\text{kHz})) + 40\log(30/3)$
1.705-30	3	69.5
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

- Note:
1. RF Voltage (dBuV) = $20 \log$ RF Voltage (μ V)
 2. In the Above Table, the tighter limit applies at the band edges.
 3. Distance refers to the distance in meters between the measuring instrument antenna and the EUT
 4. All scanning using PK detector. And the final emission level was get using QP detector for frequency range from 30-1000MHz.As to 1G-25G, the final emission level got using PK. For fundamental measurement, PK detector used.
 5. For radiated emissions from 9kHz to 30MHz, the emission level is much less than the limit for more than 20dB. No necessary to take down the record.
 6. QPSK and 16QAM were tested and only the worst case was reported and QPSK modulation was the worst case

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Test result

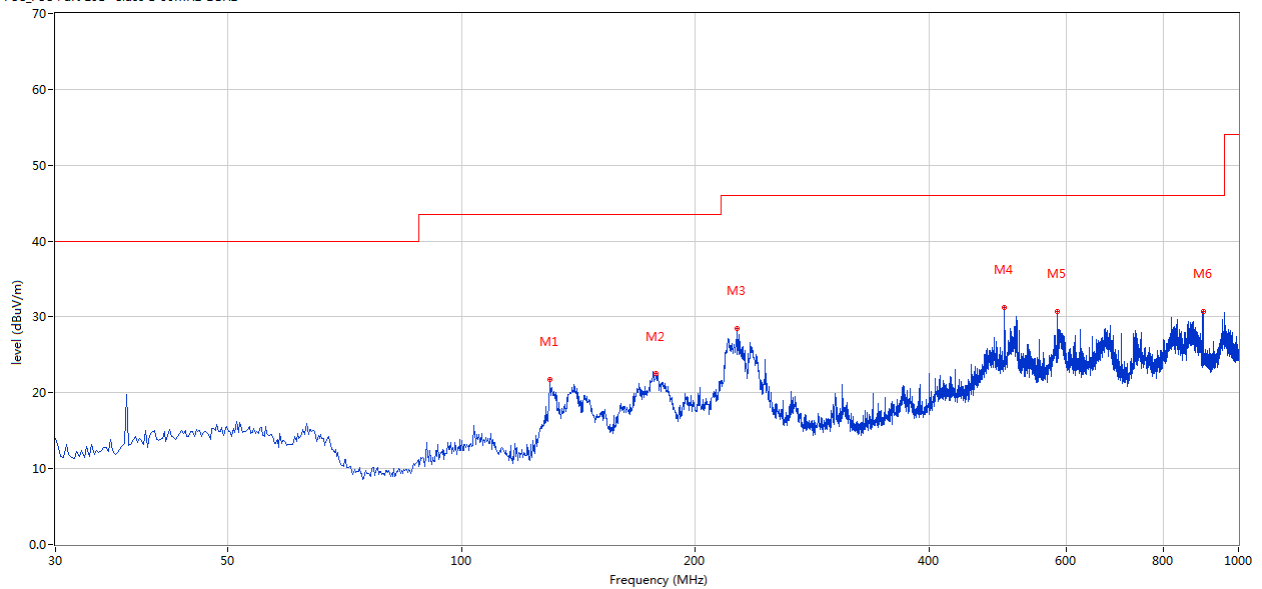
General Radiated Emission Data and Harmonics Radiated Emission Data

Radiated Emission In Horizontal (30MHz----1000MHz)

EUT set Condition: **Keep Transmitting**

Results: Pass

FCC_FCC Part 15B Class B 30MHz-1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	129.885	21.74	-16.79	40.0	-18.26	Peak	139.00	200	Horizontal	Pass
2	178.130	22.56	-15.51	40.0	-17.44	Peak	0.00	200	Horizontal	Pass
3	226.376	28.48	-12.81	40.0	-11.52	Peak	0.00	200	Horizontal	Pass
4	500.090	31.25	-6.91	47.0	-15.75	Peak	280.00	200	Horizontal	Pass
5	583.974	30.78	-5.52	47.0	-16.22	Peak	43.00	100	Horizontal	Pass
6	900.115	30.71	-1.86	47.0	-16.29	Peak	0.00	200	Horizontal	Pass

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Test result

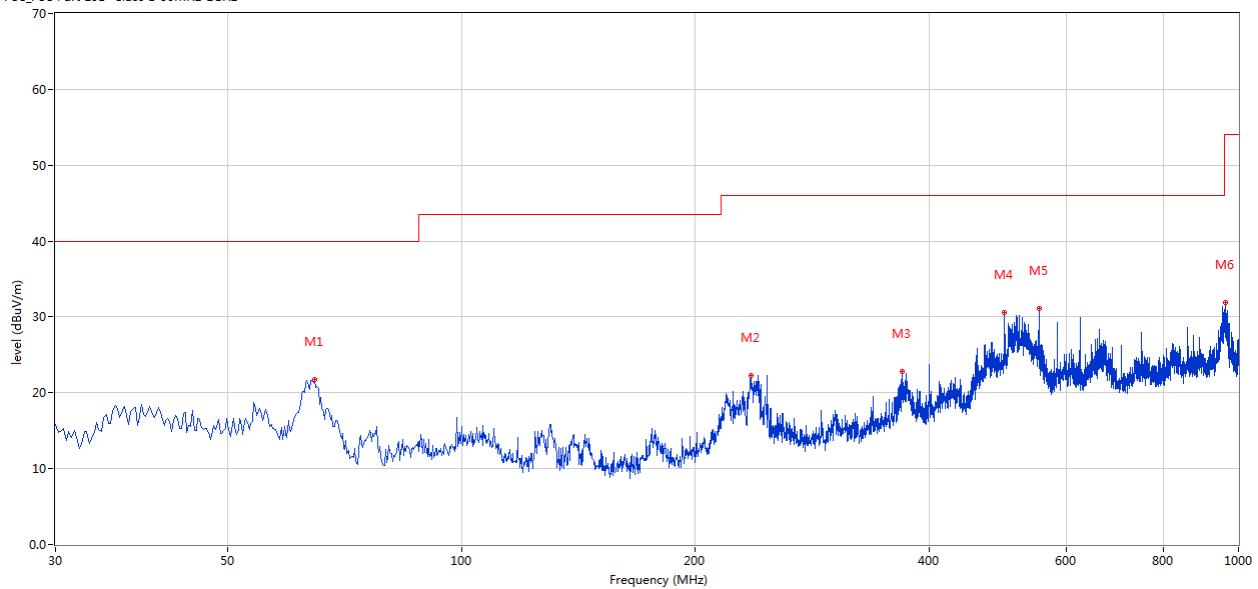
General Radiated Emission Data and Harmonics Radiated Emission Data

Radiated Emission In Vertical (30MHz----1000MHz)

EUT set Condition: **Keep Transmitting**

Results: **Pass**

FCC_FCC Part 15B Class B 30MHz-1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	64.669	21.73	-13.49	40.0	-18.27	Peak	197.00	100	Vertical	Pass
2	236.073	22.26	-12.42	47.0	-24.74	Peak	180.00	100	Vertical	Pass
3	368.930	22.75	-9.53	47.0	-24.25	Peak	172.00	100	Vertical	Pass
4	500.090	30.57	-6.91	47.0	-16.43	Peak	147.00	100	Vertical	Pass
5	553.427	31.09	-6.22	47.0	-15.91	Peak	172.00	100	Vertical	Pass
6	961.210	31.86	-1.62	47.0	-15.14	Peak	314.00	100	Vertical	Pass

The report refers only to the sample tested and does not apply to the bulk.

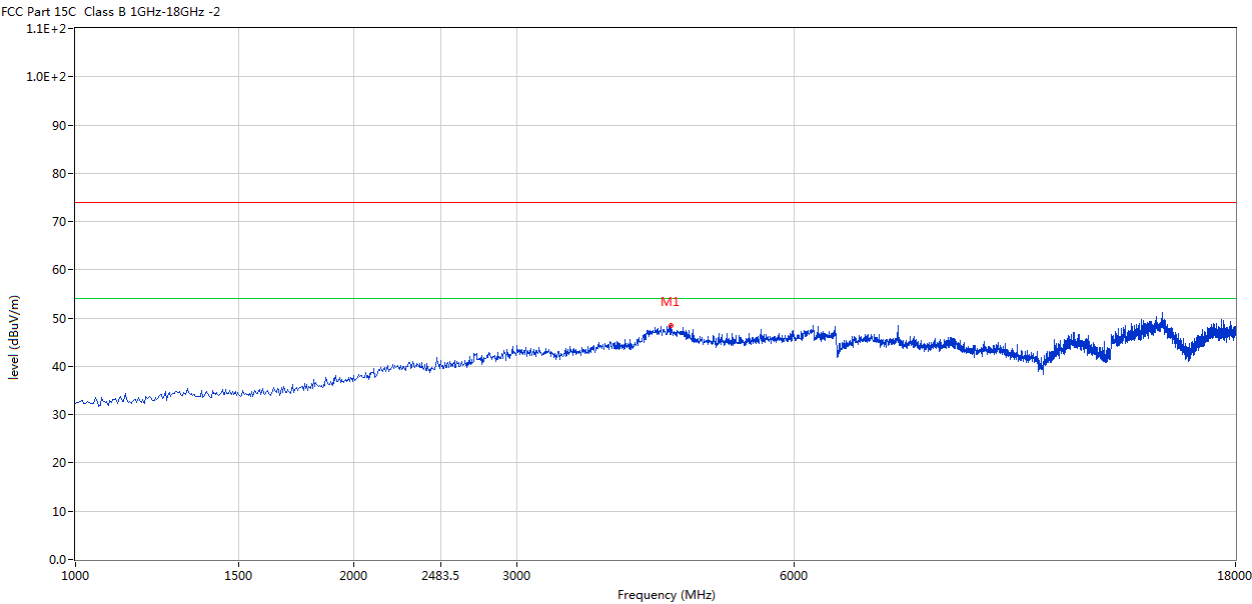
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Please refer to the following test plots for details:

Low Channel-2403.5MHz: Horizontal

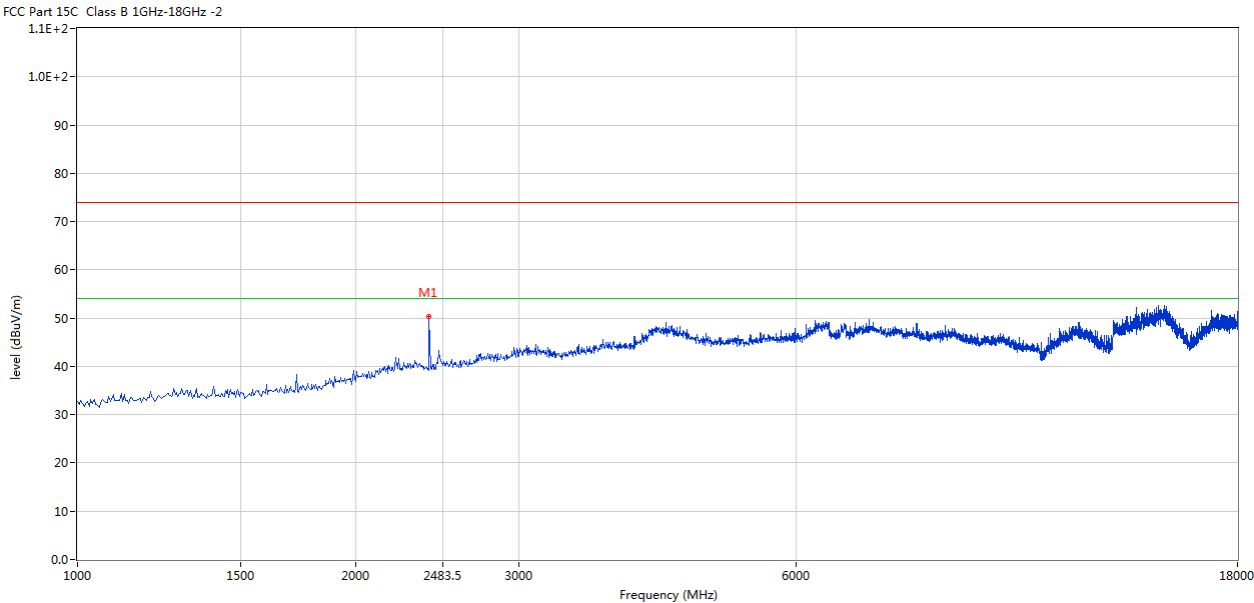


No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	4407.648	48.40	2.02	74.0	-25.60	Peak	192.00	100	Horizontal	Pass

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Low Channel-2403.5MHz: Vertical



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	2403.5	50.36	-3.57	74.0	-23.64	Peak	253.00	100	Vertical	Pass

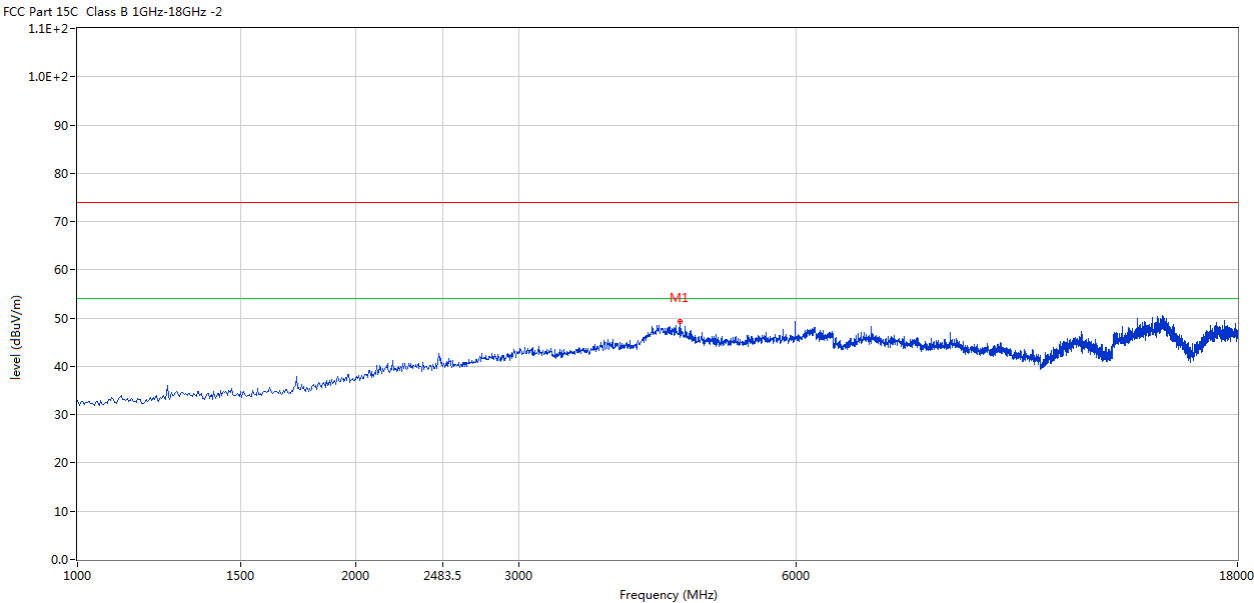
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Middle Channel-2439.5MHz: Horizontal



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	4484.129	49.32	2.18	74.0	-24.68	Peak	343.00	100	Horizontal	Pass

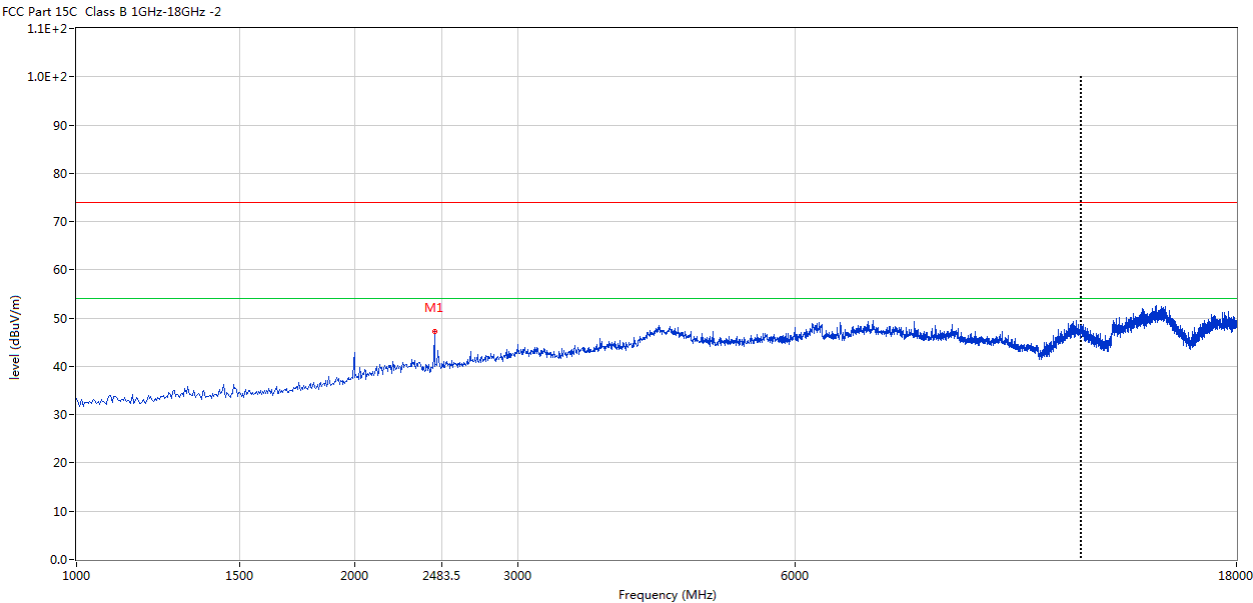
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Middle Channel-2439.5MHz: Vertical

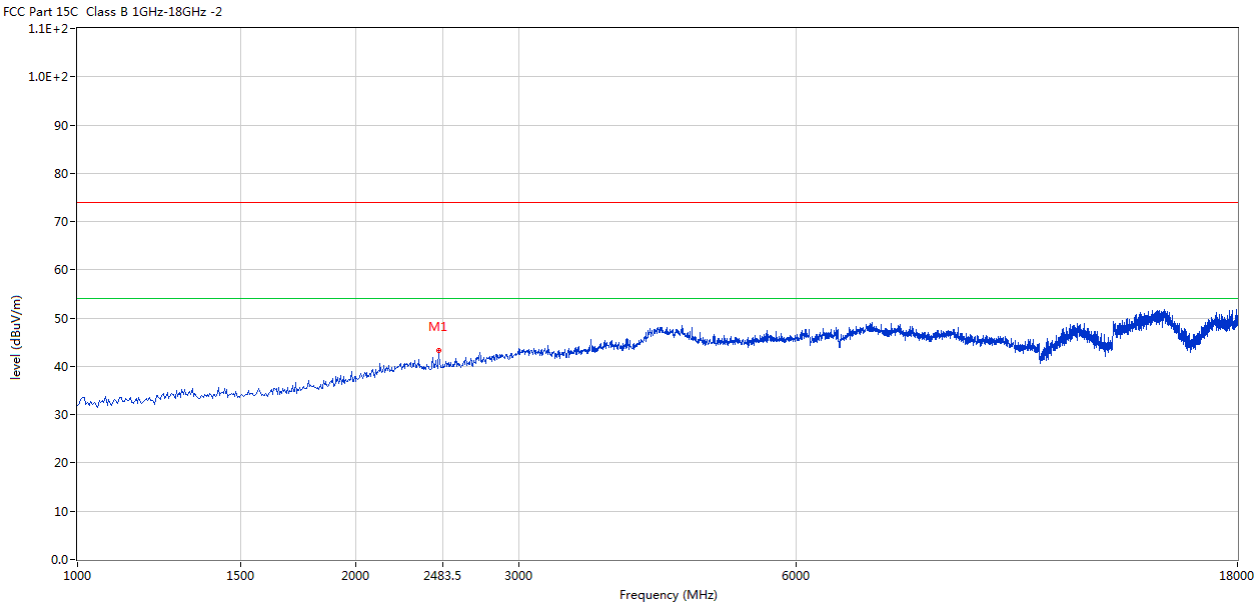


No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	2439.5	47.14	-3.57	74.0	-26.86	Peak	237.00	100	Vertical	Pass

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High Channel-2475.5MHz: Horizontal



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	2457.386	43.21	-3.57	74.0	-30.79	Peak	349.00	100	Horizontal	Pass

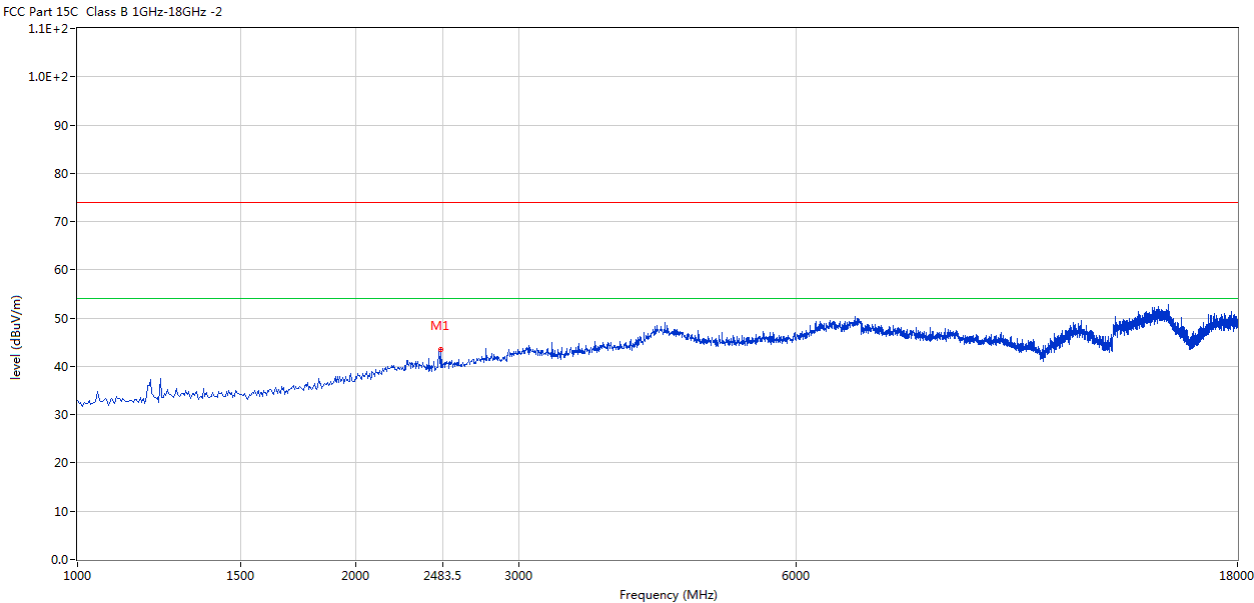
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High Channel-2475.5MHz: Vertical



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	2474.381	43.44	-3.57	74.0	-30.56	Peak	226.00	100	Vertical	Pass

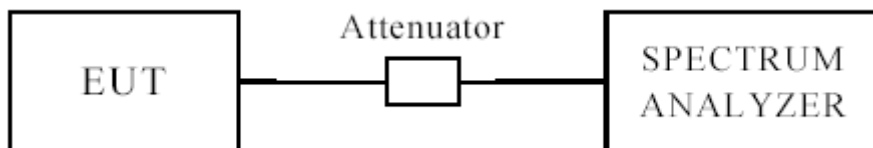
- Note: 1. Result Level = Reading + Factor
2. Factor= AF + Cable Loss- Preamp
3. Margin = Result– Limit
4. For radiated Emissions from 18-25GHz and below 30MHz, it is only the floor noise and less than the limit for more than 20dB. No necessary to take down.
5. Note: the final peak measurement results less than the AV limit. No necessary to take down the final AV measurement result
6. A 2.4G band-pass filter was used the radiated emissions test.

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7.0 6dB Bandwidth Measurement

7.1 Test Setup



7.2 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is >500 kHz

7.3 Test Procedure

1. Set resolution bandwidth (RBW) = 100 kHz
2. Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

7.4 Test Result

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6dB Occupied Bandwidth

Mode	TX Type	Frequency (MHz)	Ant	6dB Bandwidth (MHz)		Verdict
				Result	Limit	
QPSK	MIMO	2403.5	1	1.127	≥ 0.5	Pass
		2439.5	1	1.123	≥ 0.5	Pass
		2475.5	1	1.121	≥ 0.5	Pass
16QAM	MIMO	2403.5	1	1.126	≥ 0.5	Pass
		2439.5	1	1.123	≥ 0.5	Pass
		2475.5	1	1.120	≥ 0.5	Pass

Note: Two antennas (Ant1 & Ant2) were tested and only the worst cases were reported in the test report and Ant1 was the worst case.

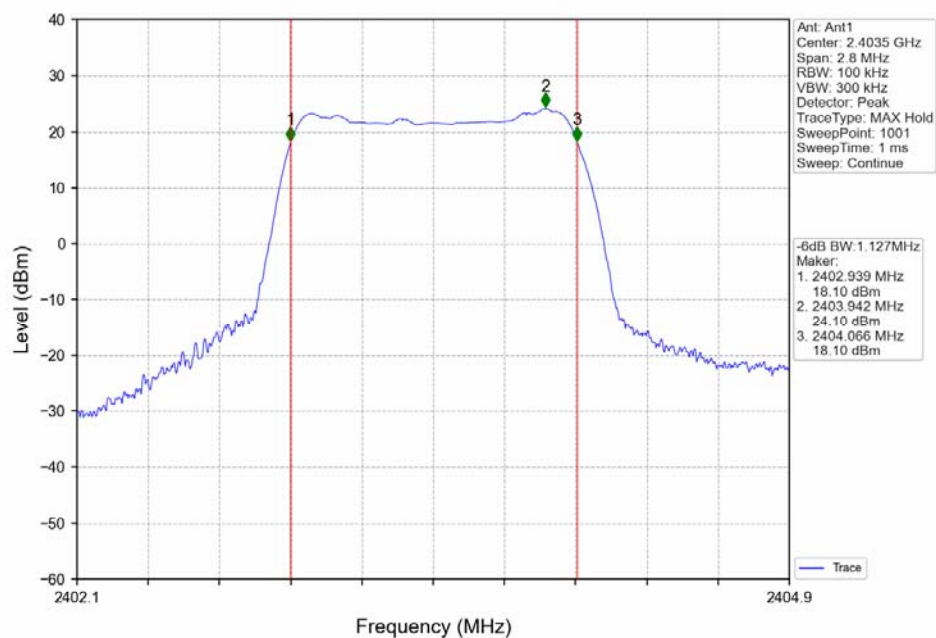
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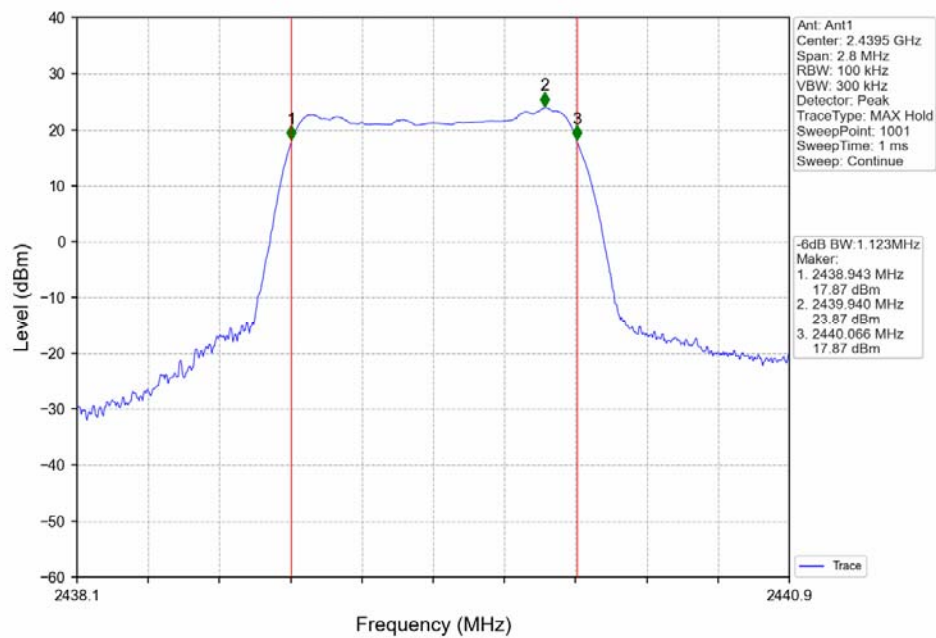
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QPSK_LCH_2403.5MHz_Ant1_NTNV



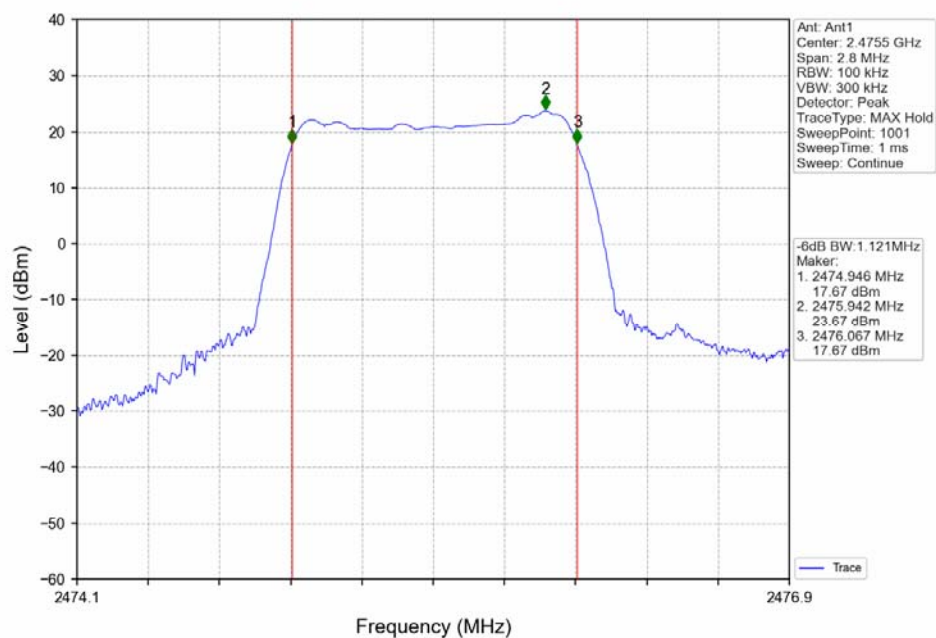
QPSK_MCH_2439.5MHz_Ant1_NTNV



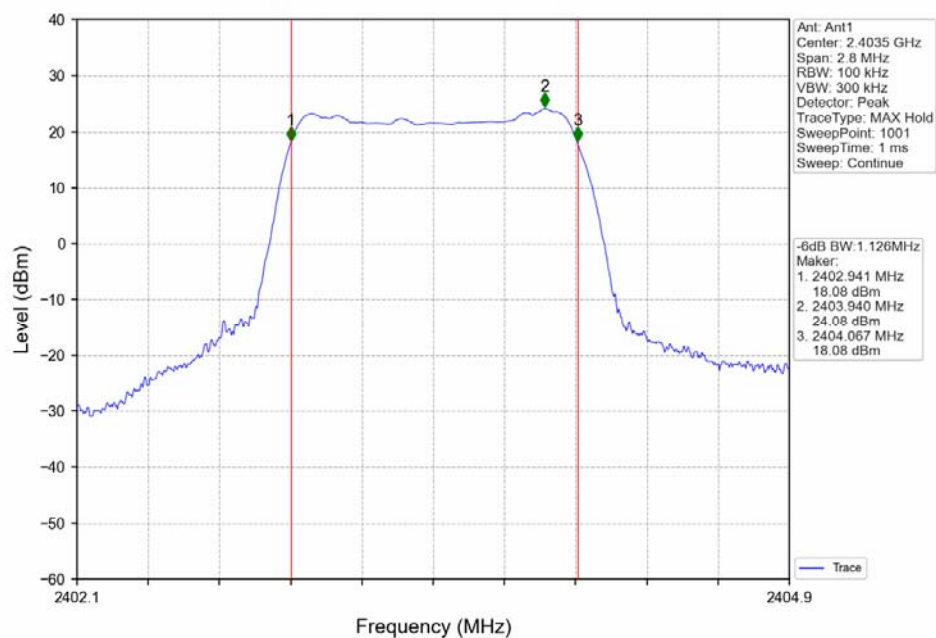
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QPSK_HCH_2475.5MHz_Ant1_NTNV



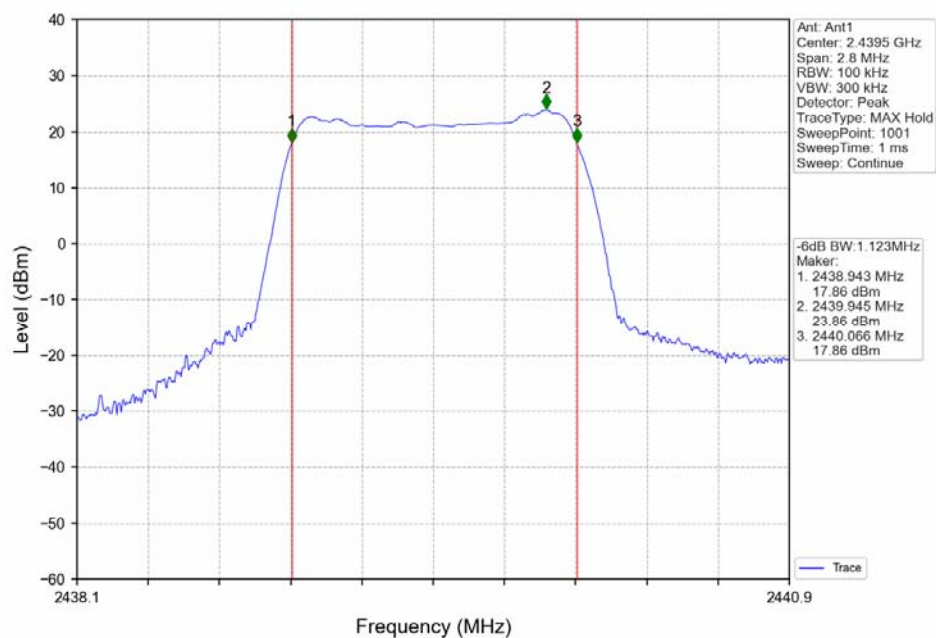
16QAM_LCH_2403.5MHz_Ant1_NTNV



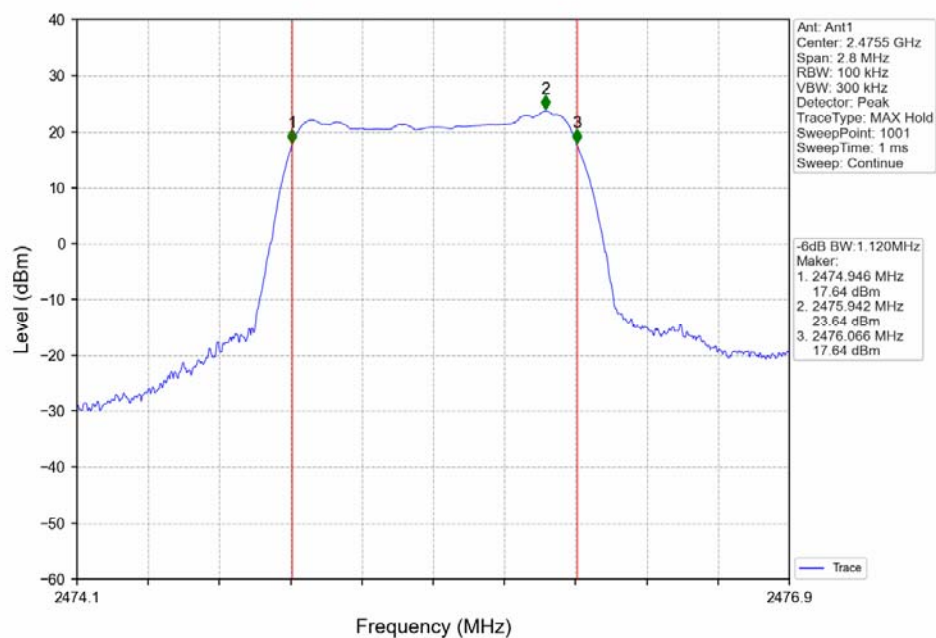
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16QAM_MCH_2439.5MHz_Ant1_NTNV



16QAM_HCH_2475.5MHz_Ant1_NTNV



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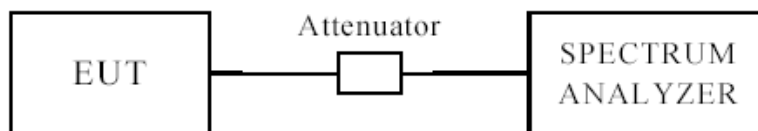
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8. Maximum Output Power

8.1 Test Setup



8.2 Limits of Maximum Output Power

The Maximum Output Power Measurement is 30dBm.

8.3 Test Procedure

The RF power output was measured with a Spectrum connected to the RF Antenna connector (conducted measurement) while EUT was operating in transmit mode at the appropriate centre frequency.

Note: the AV power were measured.

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8.4 Test Results

Mode	TX Type	Frequency (MHz)	Maximum Average Conducted Output Power (dBm)				Verdict
			Ant1	Ant2	MIMO	Limit	
QPSK	MIMO	2403.5	25.37	23.38	27.50	<=30	Pass
		2439.5	24.04	24.93	27.52	<=30	Pass
		2475.5	23.61	24.28	26.97	<=30	Pass
16QAM	MIMO	2403.5	23.94	22.27	26.20	<=30	Pass
		2439.5	23.87	21.90	26.01	<=30	Pass
		2475.5	23.73	21.03	25.60	<=30	Pass
Note1: Antenna Gain: Ant1: 4.70dBi; Ant2: 4.70dBi;							
Note2: Directional Gain: Uncorrelated (Directional Gain = Ant Gain)							

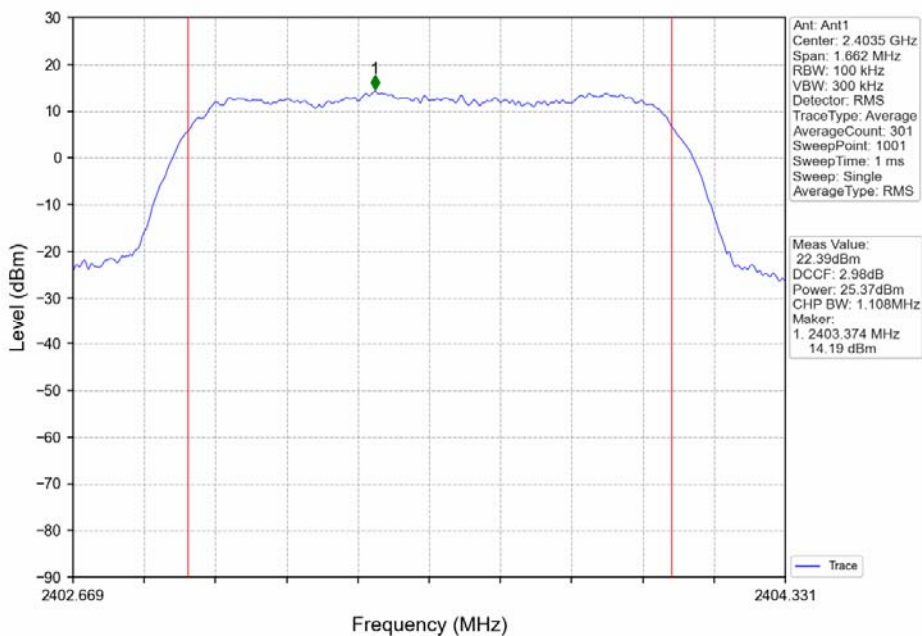
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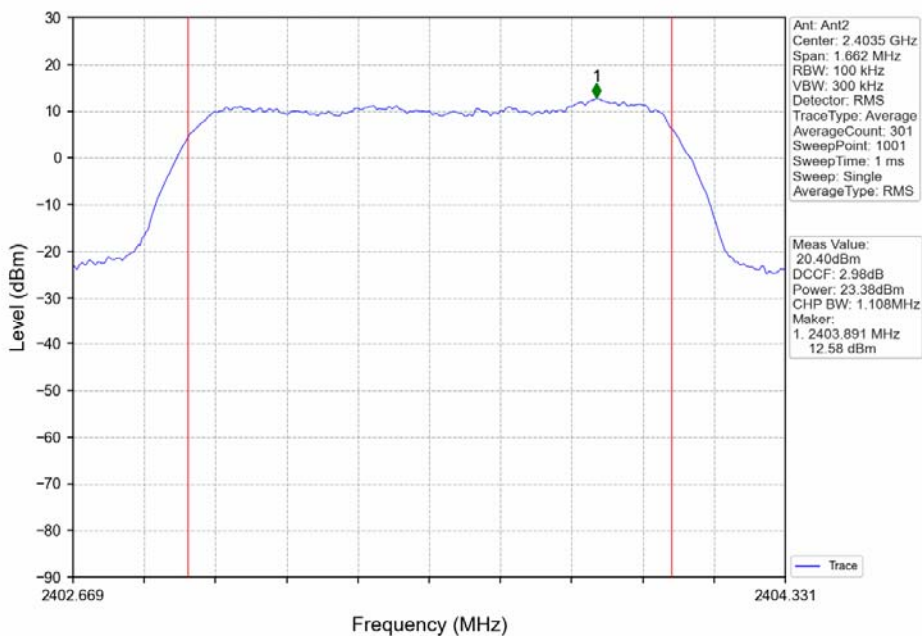
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QPSK_LCH_2403.5MHz_Ant1_NTNV



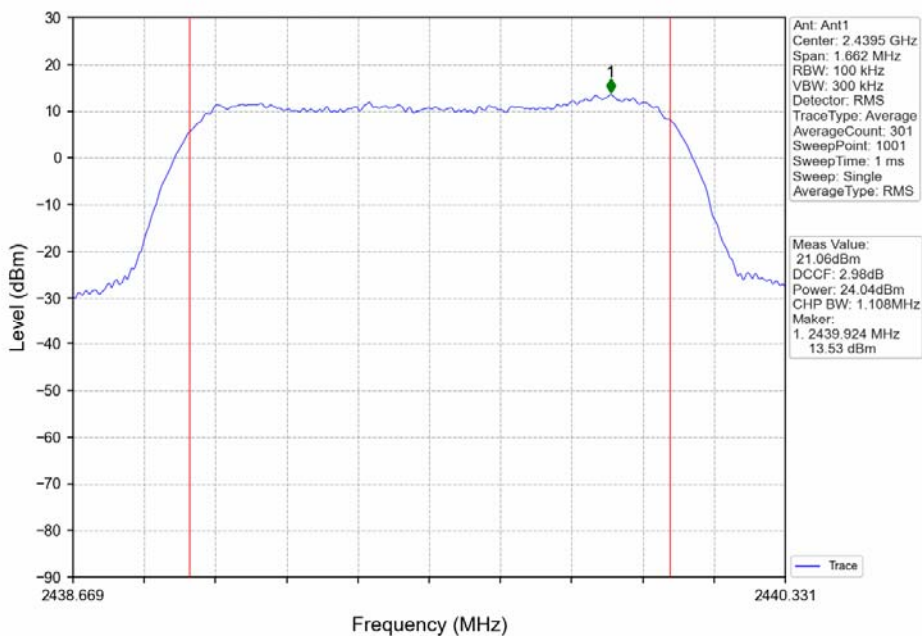
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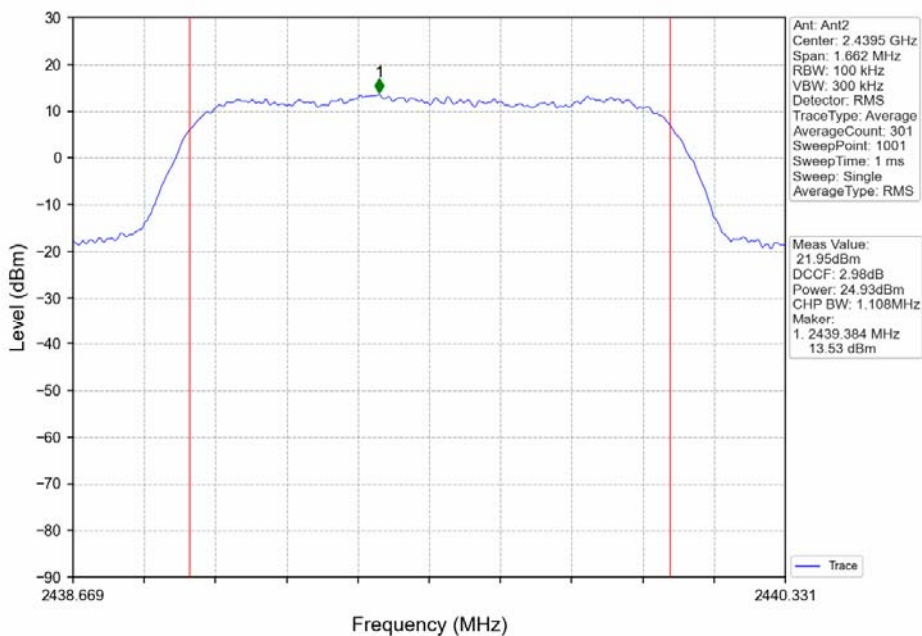
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QPSK_MCH_2439.5MHz_Ant1_NTNV



QPSK_MCH_2439.5MHz_Ant2_NTNV



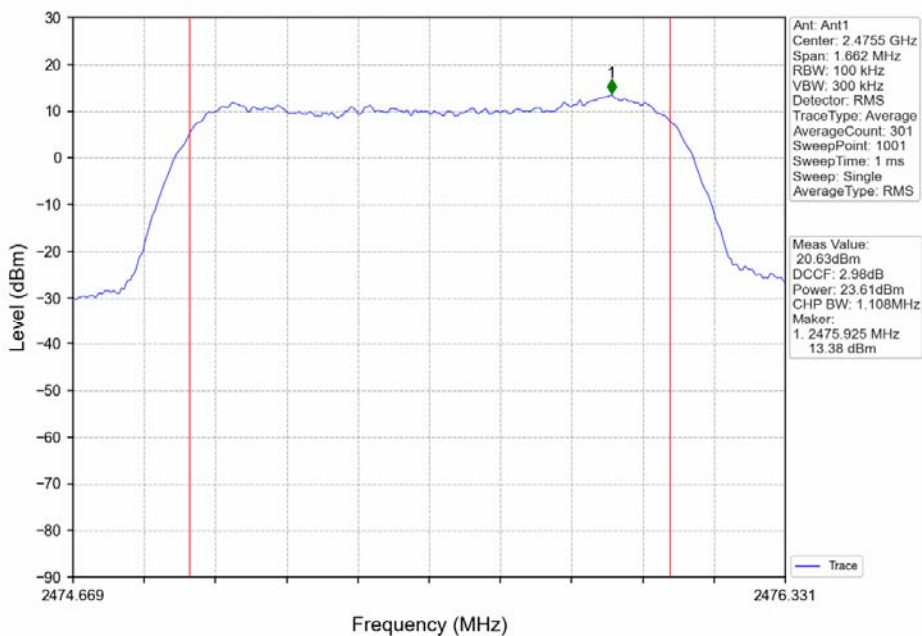
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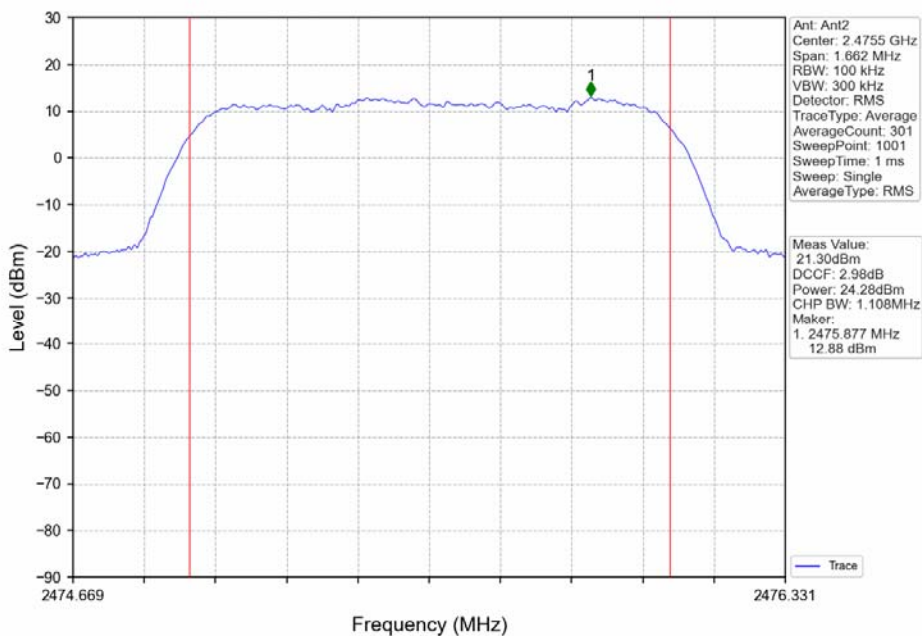
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QPSK_HCH_2475.5MHz_Ant1_NTNV



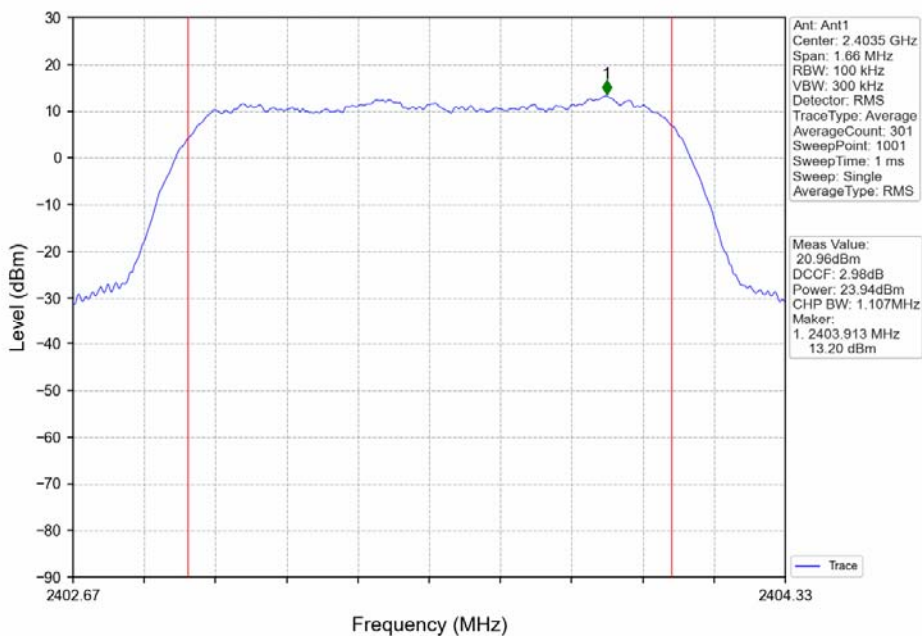
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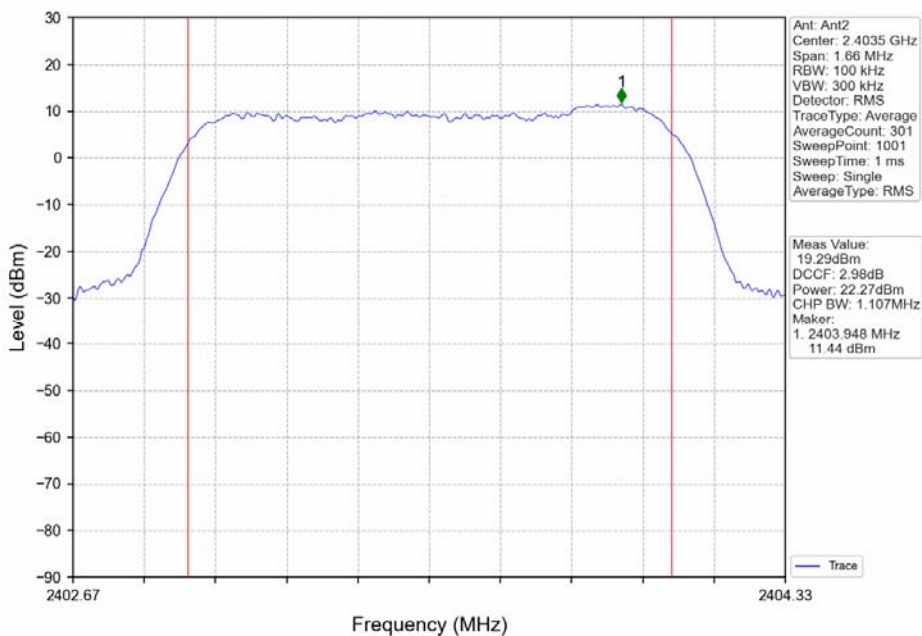
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16QAM_LCH_2403.5MHz_Ant1_NTNV



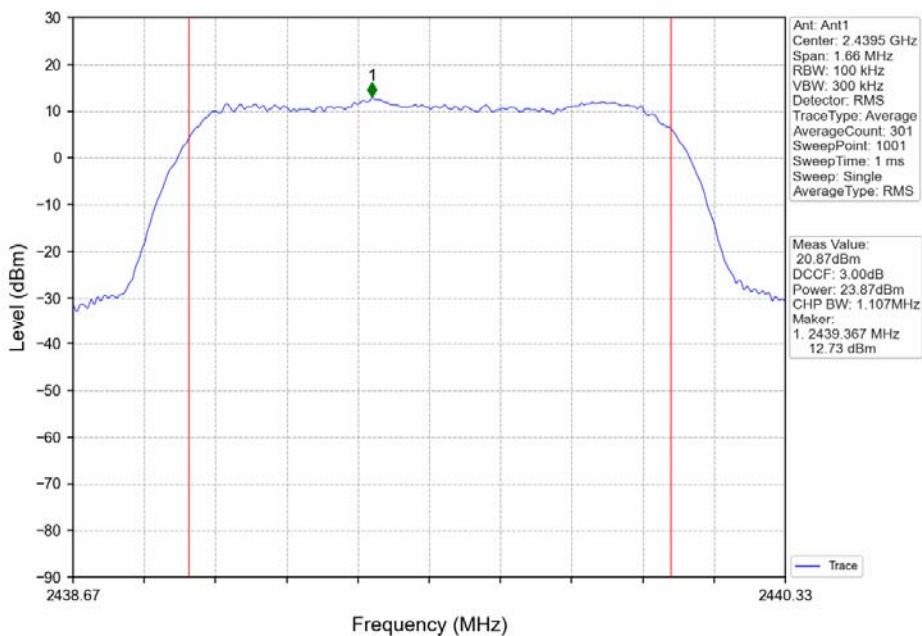
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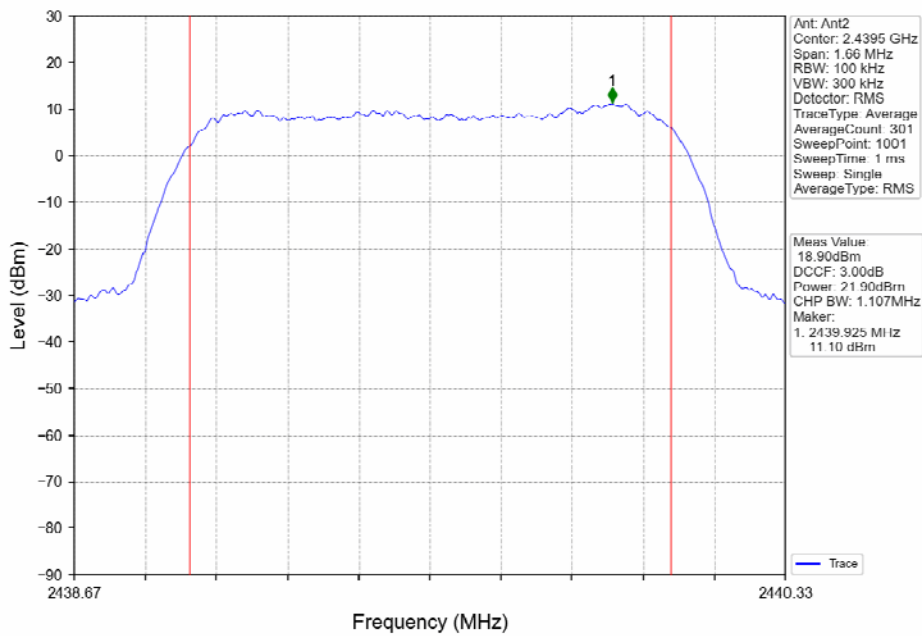
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16QAM_MCH_2439.5MHz_Ant1_NTNV



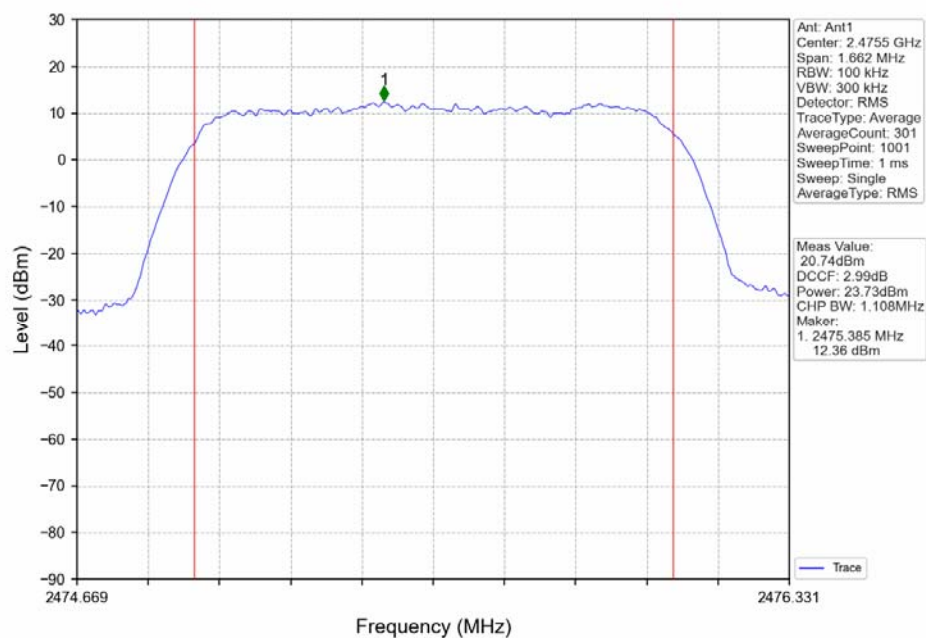
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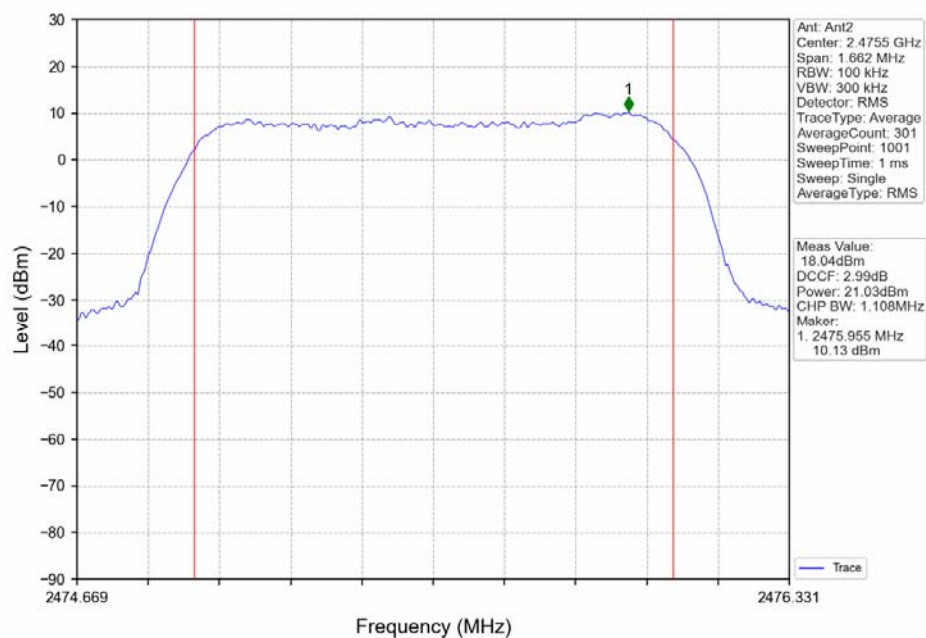
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16QAM_HCH_2475.5MHz_Ant1_NTNV



16QAM_HCH_2475.5MHz_Ant2_NTNV

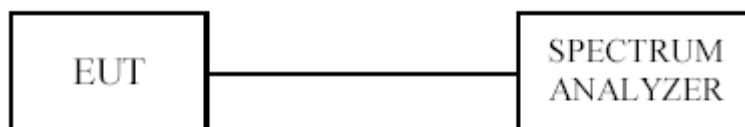


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9. Power Spectral Density Measurement

9.1 Test Setup



9.2 Limits of Power Spectral Density Measurement

The Maximum Power Spectral Density Measurement is 8dBm/3kHz.

9.3 Test Procedure

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW = 10 kHz.
3. Set the VBW \geq 30 kHz.
4. Set the span to 1.5 times the DTS channel bandwidth.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
11. The resulting peak PSD level must be \leq 8 dBm/3kHz.

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9.4 Test Result

Mode	TX Type	Frequency (MHz)	Maximum PSD (dBm/3kHz)				Verdict
			Ant1	Ant2	MIMO	Limit	
QPSK	MIMO	2403.5	4.21	4.81	7.33	<=8	Pass
		2439.5	3.69	4.22	6.81	<=8	Pass
		2475.5	3.58	3.80	6.46	<=8	Pass
16QAM	MIMO	2403.5	4.90	4.98	7.95	<=8	Pass
		2439.5	4.51	4.83	7.68	<=8	Pass
		2475.5	5.04	3.40	7.30	<=8	Pass
Note1: Antenna Gain: Ant1: 4.70dBi; Ant2: 4.70dBi;							

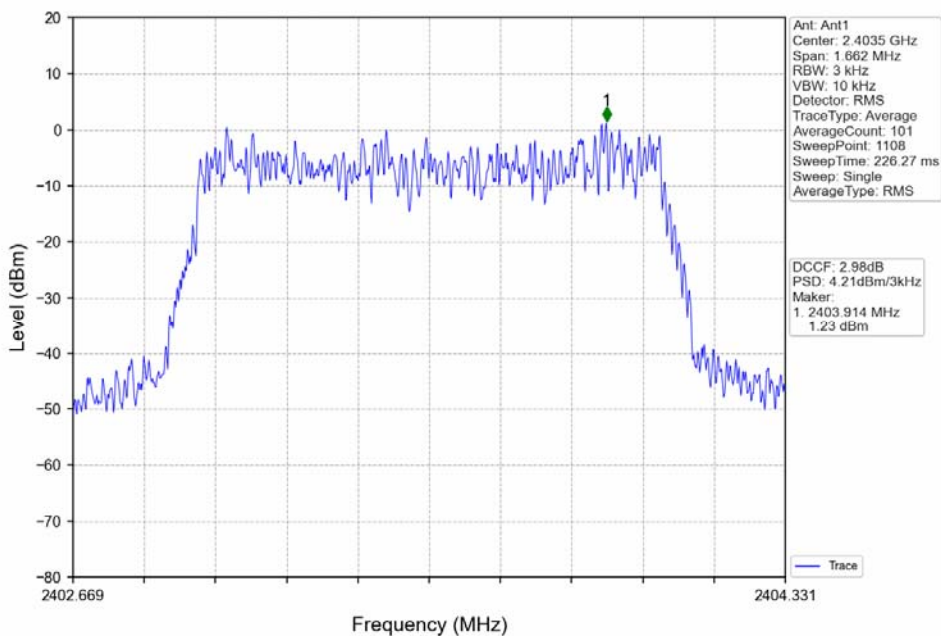
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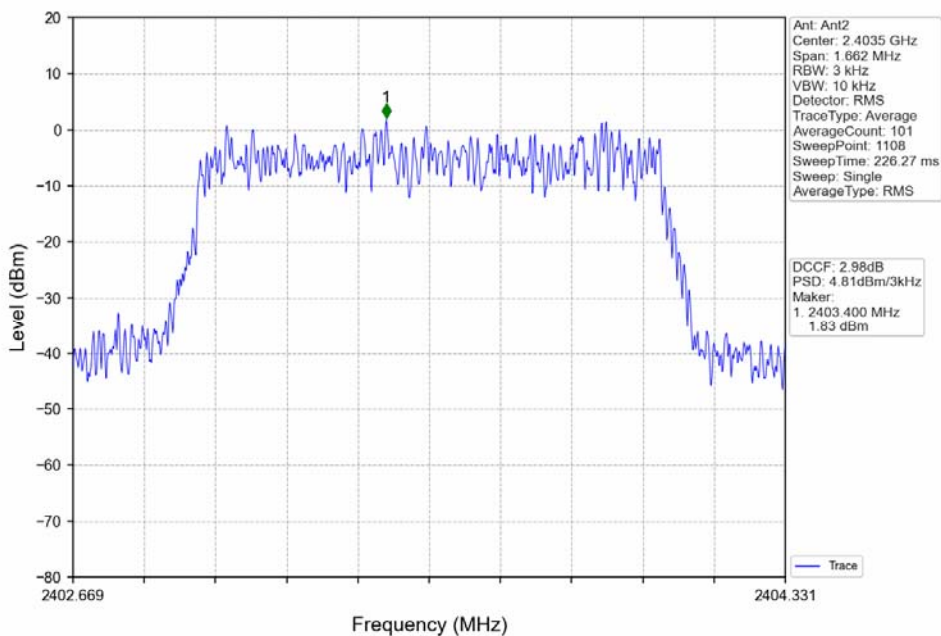
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QPSK_LCH_2403.5MHz_Ant1_NTNV



QPSK_LCH_2403.5MHz_Ant2_NTNV



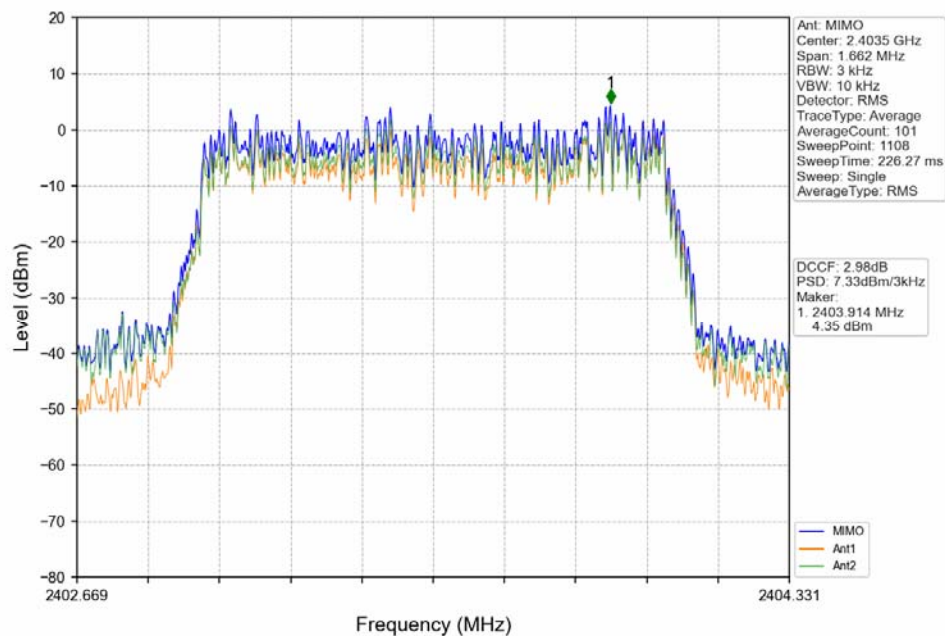
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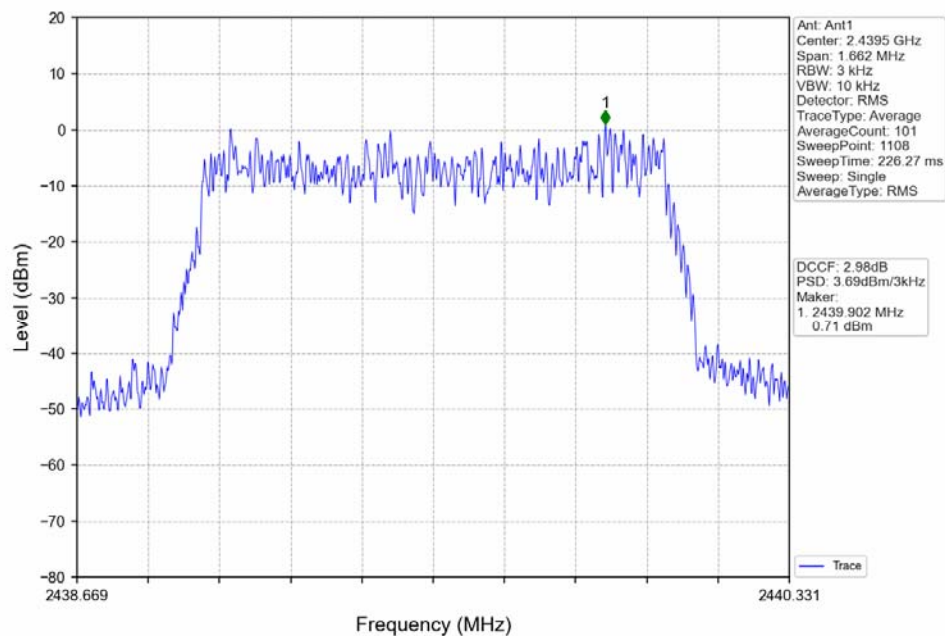
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QPSK_LCH_2403.5MHz_MIMO_NTNV



QPSK_MCH_2439.5MHz_Ant1_NTNV



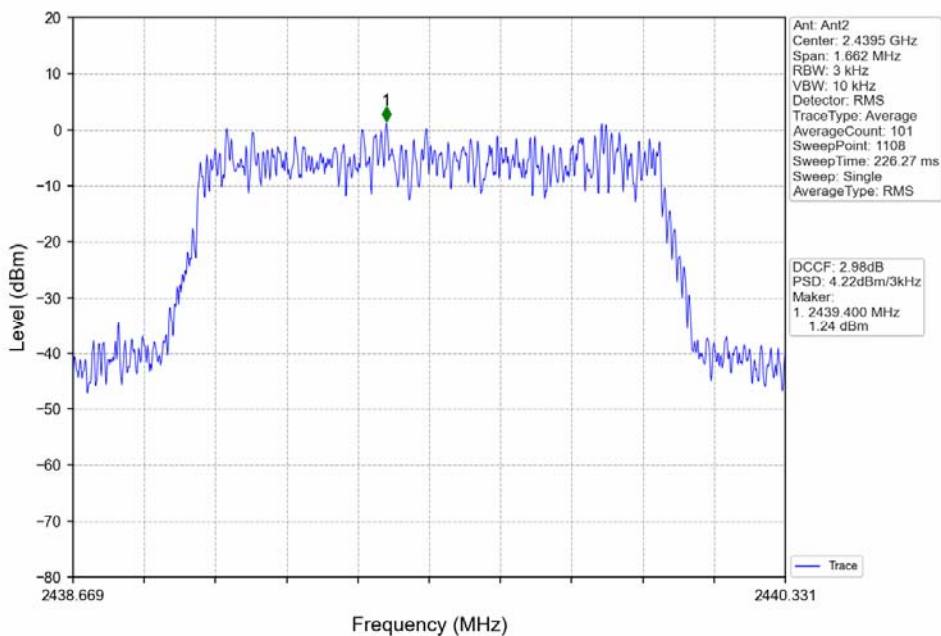
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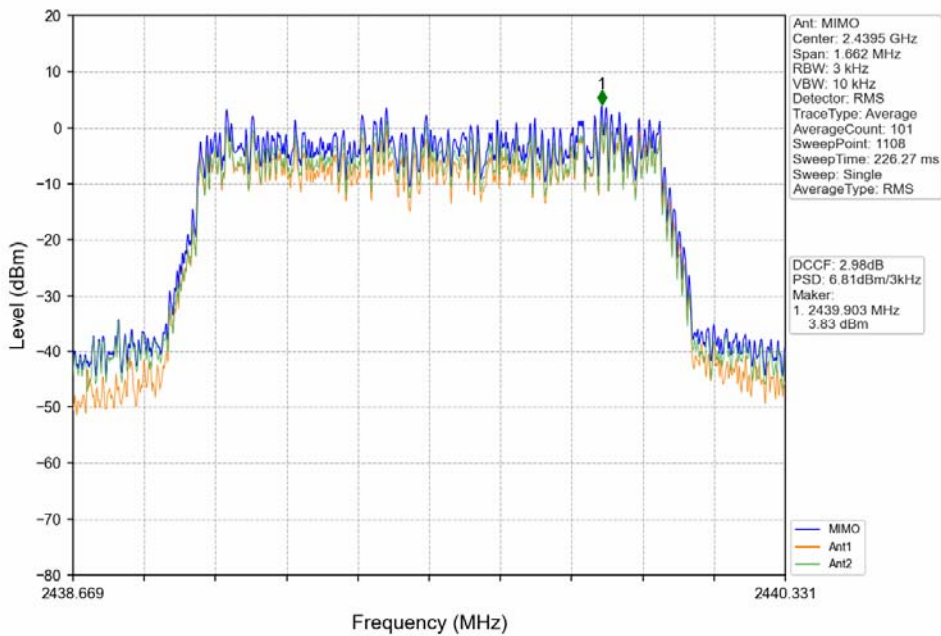
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QPSK_MCH_2439.5MHz_Ant2_NTNV



QPSK_MCH_2439.5MHz_MIMO_NTNV



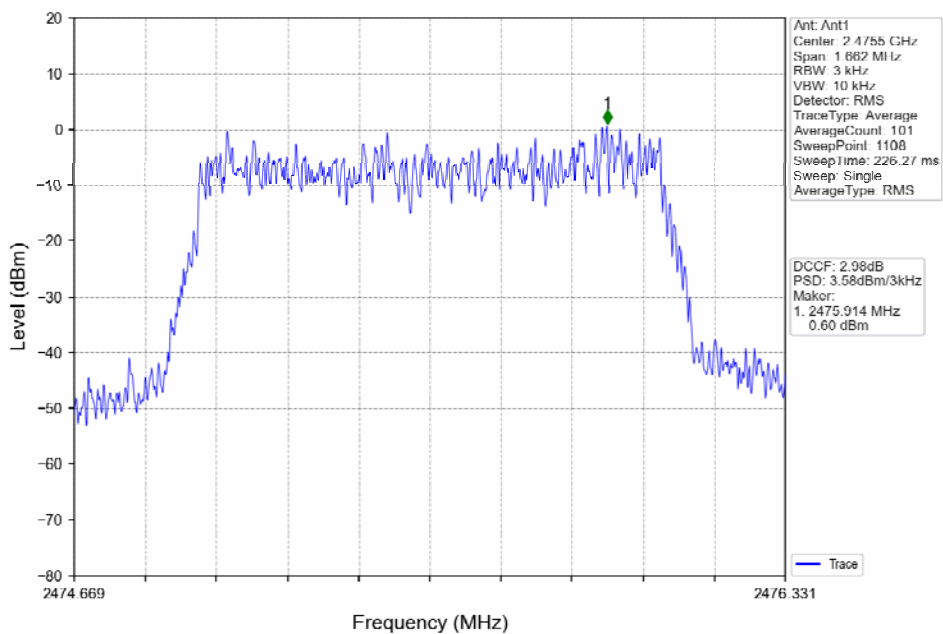
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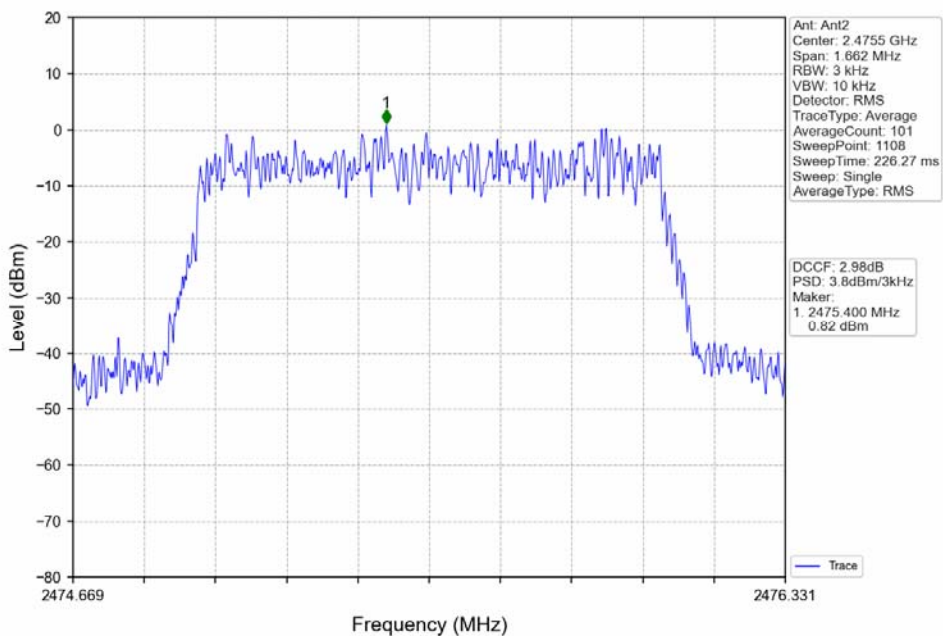
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QPSK_HCH_2475.5MHz_Ant1_NTNV



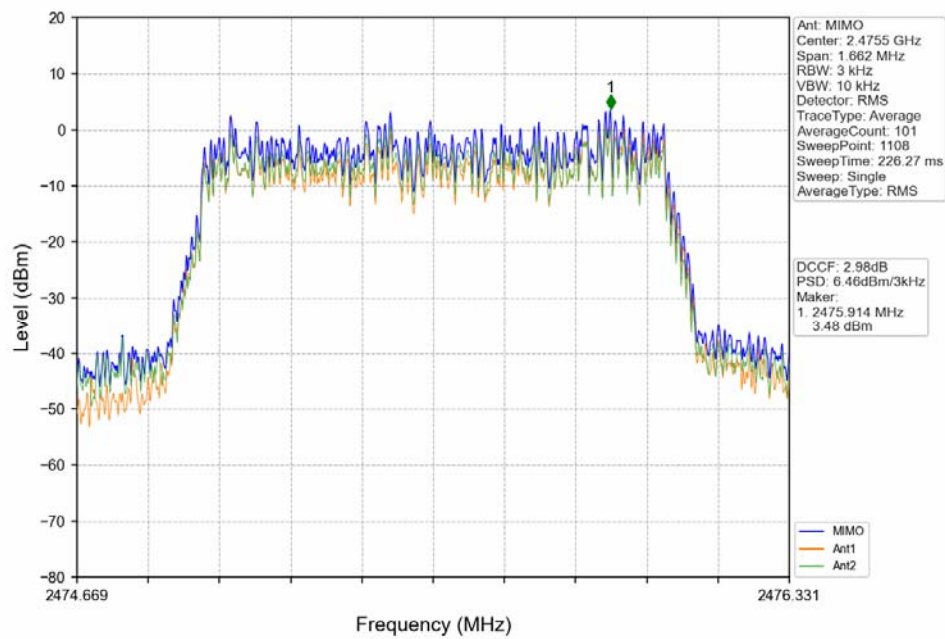
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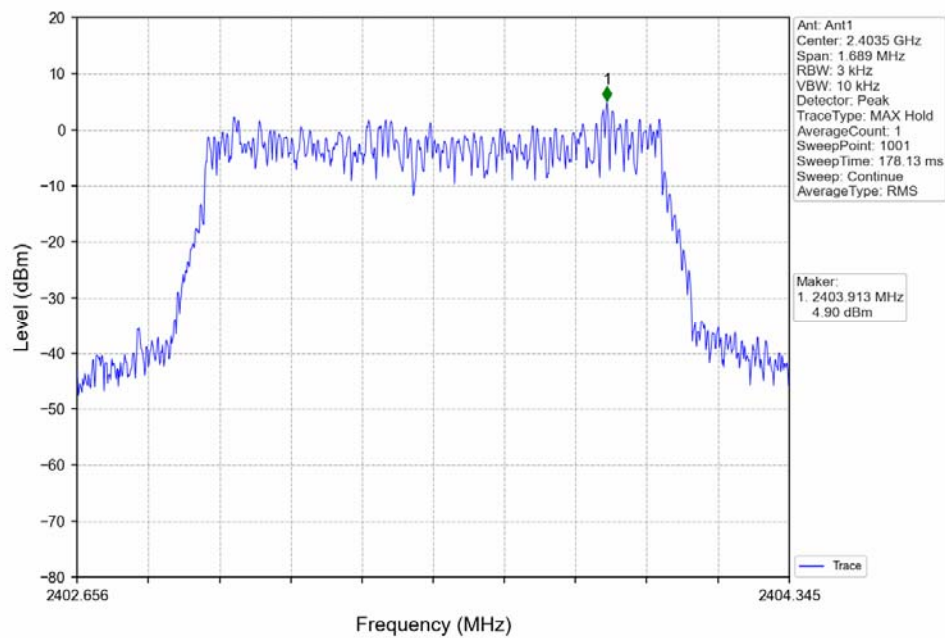
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QPSK_HCH_2475.5MHz_MIMO_NTNV



16QAM_LCH_2403.5MHz_Ant1_NTNV



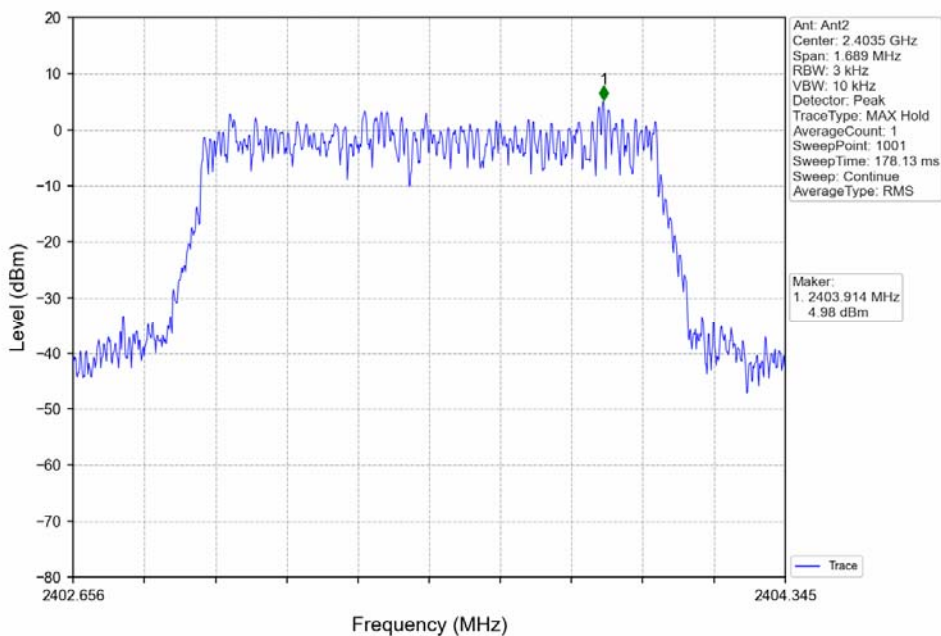
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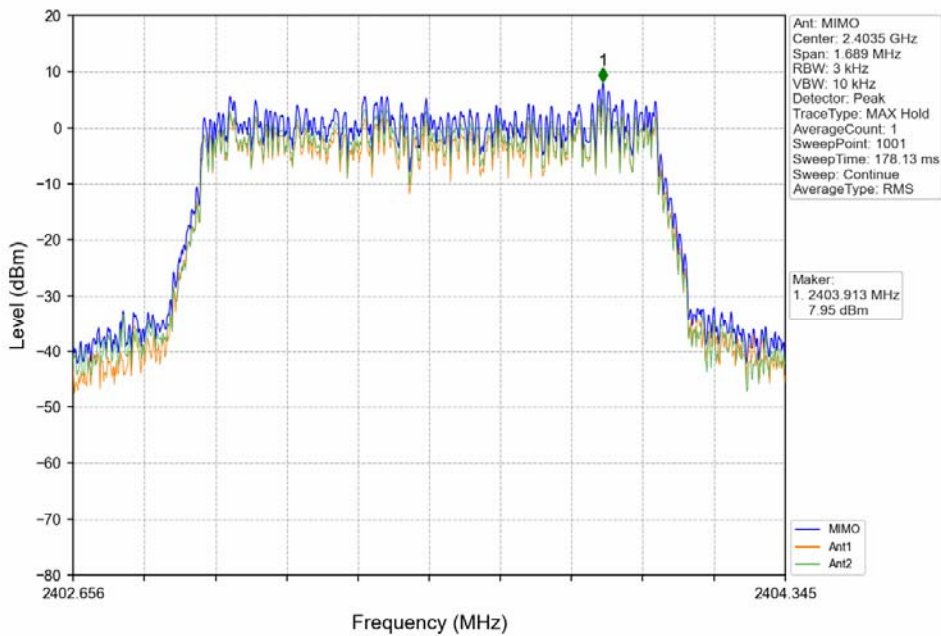
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16QAM_LCH_2403.5MHz_Ant2_NTNV



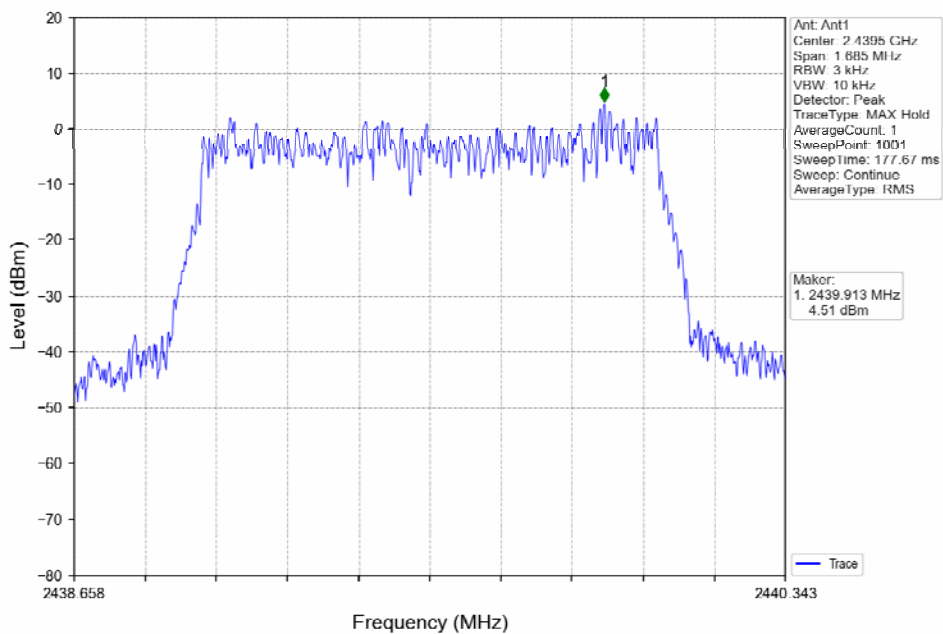
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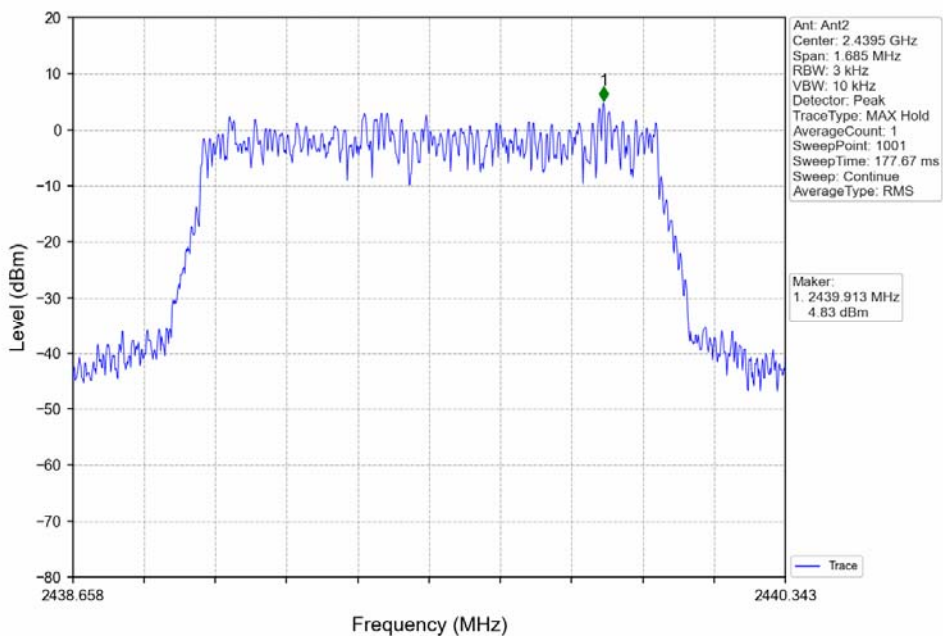
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16QAM_MCH_2439.5MHz_Ant1_NTNV



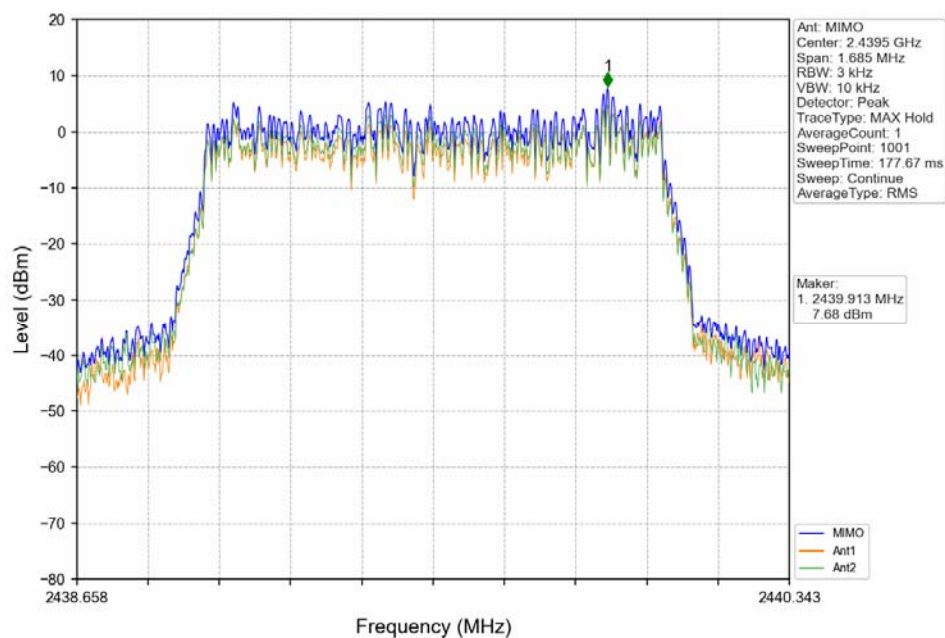
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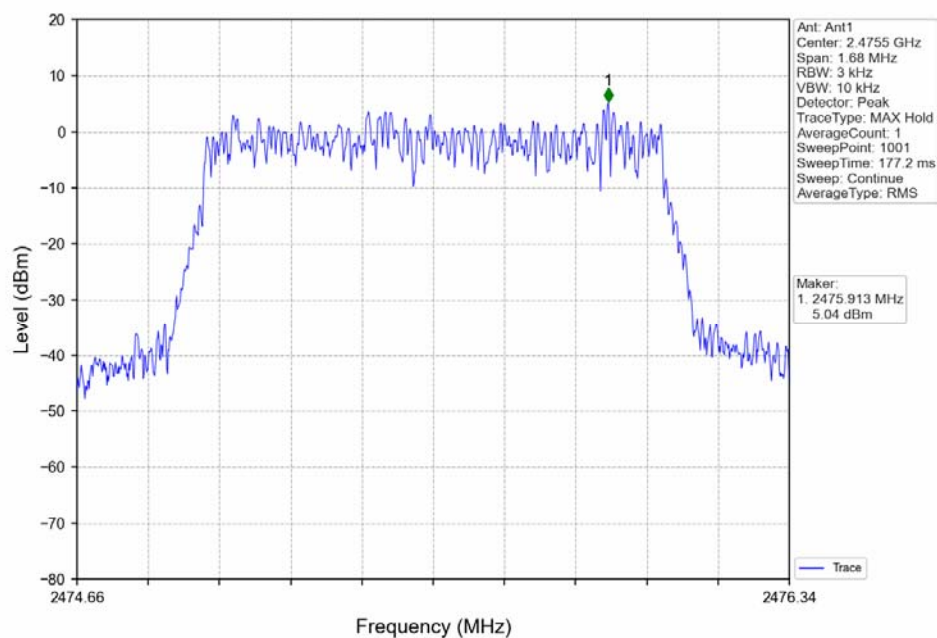
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16QAM_MCH_2439.5MHz_MIMO_NTNV



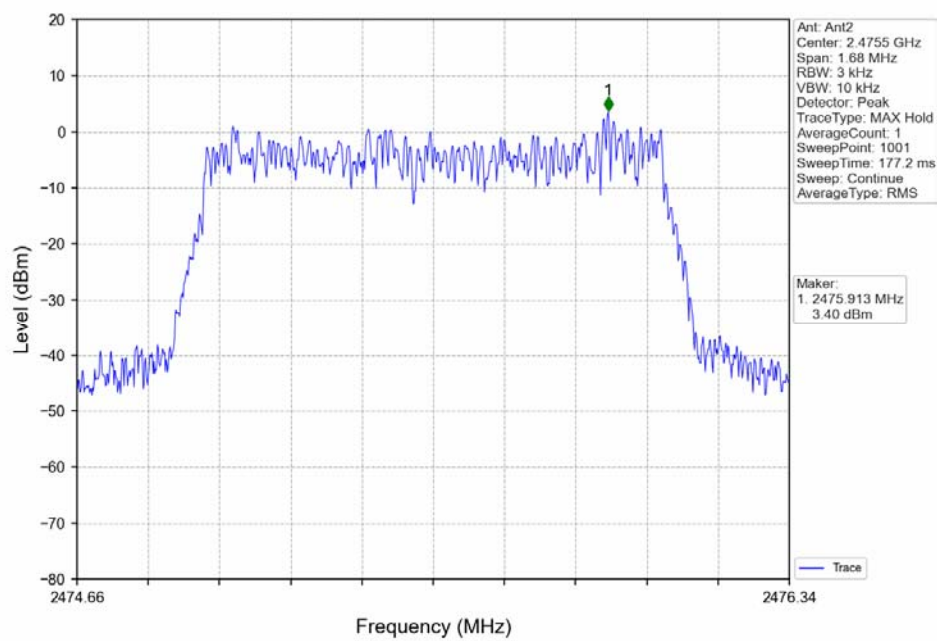
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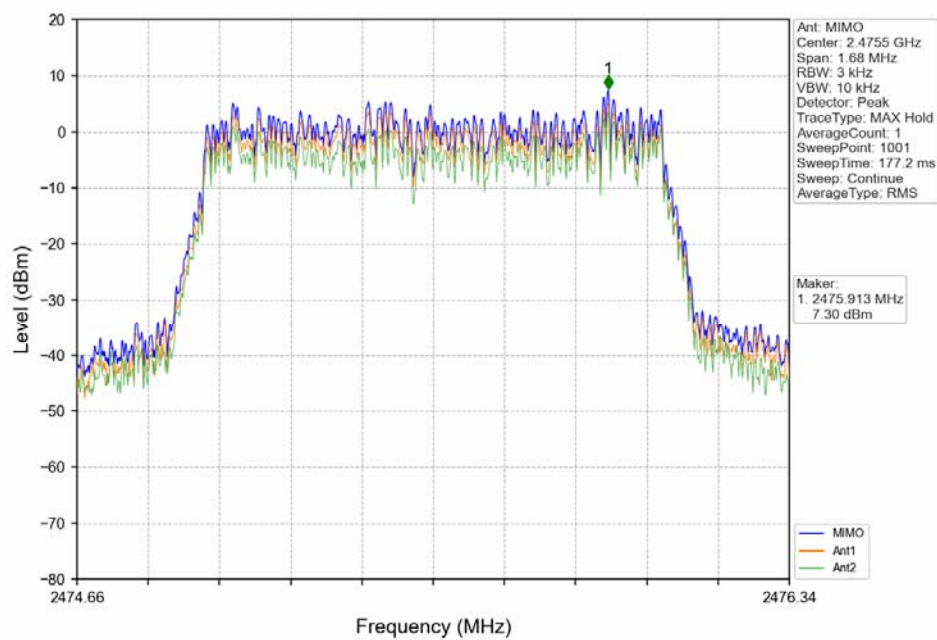
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16QAM_HCH_2475.5MHz_Ant2_NTNV



16QAM_HCH_2475.5MHz_MIMO_NTNV

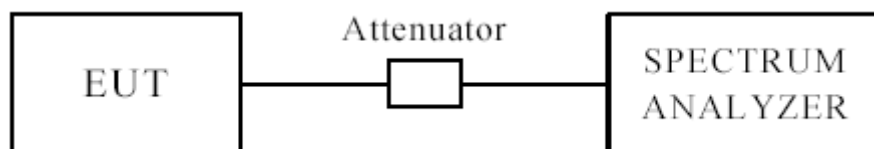


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10 Out of Band Measurement

10.1 Test Setup for band edge



The restricted band requirement based on radiated emission test; please see the clause 6 for the test setup

10.2 Limits of Out of Band Emissions Measurement

1. Below -20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

10.3 Test Procedure

For signals in the restricted bands above and below the 2.4-2.483GHz allocated band a measurement was made of radiated emission test. (Peak values with RBW=VBW=1MHz and PK detector. AV value with RBW=1MHz, VBW=10Hz and PK detector)

For bandage test, the spectrum set as follows: RBW=100, VBW=300 kHz. A conducted measurement used

10.4 Test Result

Please see next pages

Note: 1. for band-edge measurement, the frequency from 30MHz-25GHz was tested. And It met the FCC rule.

2.For restricted band measurement, QPSK and 16QAM were tested and only the worst case was reported and QPSK modulation was the worst case

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Mode	TX Type	Frequency (MHz)	Ant	Level of Reference (dBm)	Limit (dBm)	Verdict
QPSK	MIMO	2403.5	1	15.05	-14.95	Pass
			2	1.48	-28.52	Pass
		2439.5	1	15.05	-14.95	Pass
			2	1.48	-28.52	Pass
		2475.5	1	15.05	-14.95	Pass
			2	1.48	-28.52	Pass
16QAM	MIMO	2403.5	1	15.02	-14.98	Pass
			2	1.44	-28.56	Pass
		2439.5	1	15.02	-14.98	Pass
			2	1.44	-28.56	Pass
		2475.5	1	15.02	-14.98	Pass
			2	1.44	-28.56	Pass
Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2013, the channel contains the maximum PSD level was used to establish the reference level.						
Note2: RBW = 1MHz was used during the pre-test. The final test will be performed at RBW=100kHz while the margin is less than 3dB.						

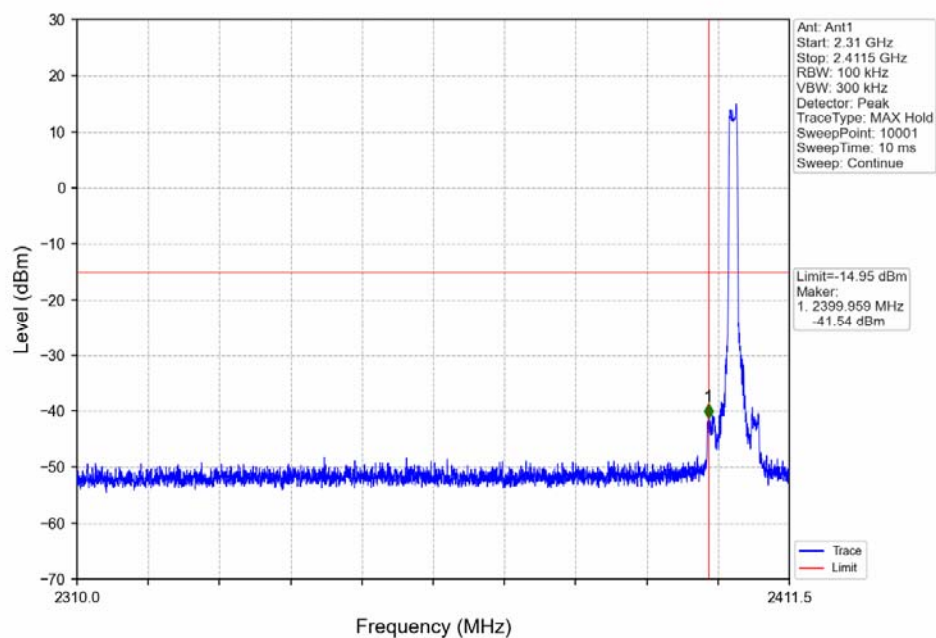
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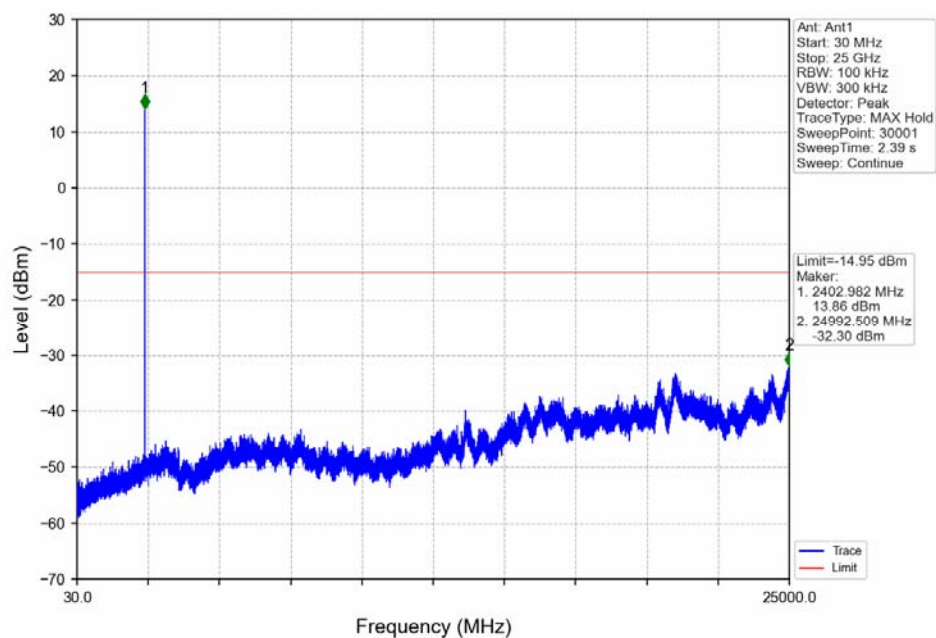
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QPSK_LCH_2403.5MHz_Ant1_NTNV



QPSK_LCH_2403.5MHz_Ant1_NTNV



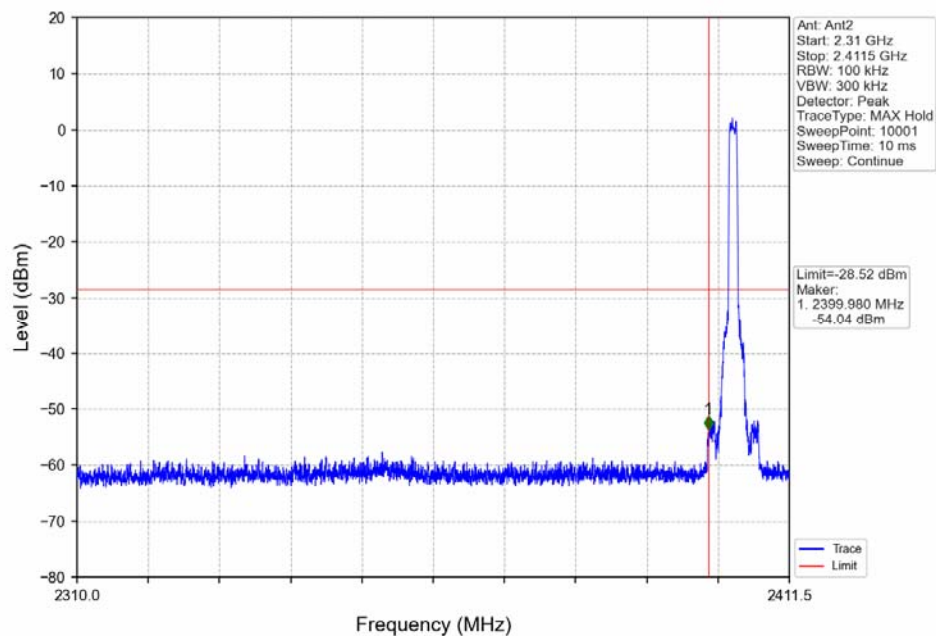
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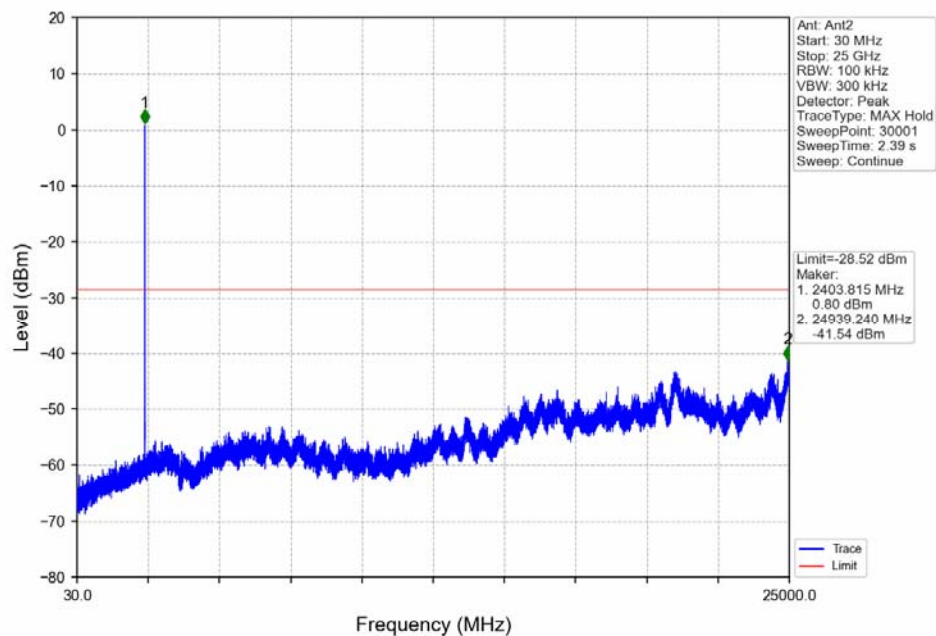
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QPSK_LCH_2403.5MHz_Ant2_NTNV



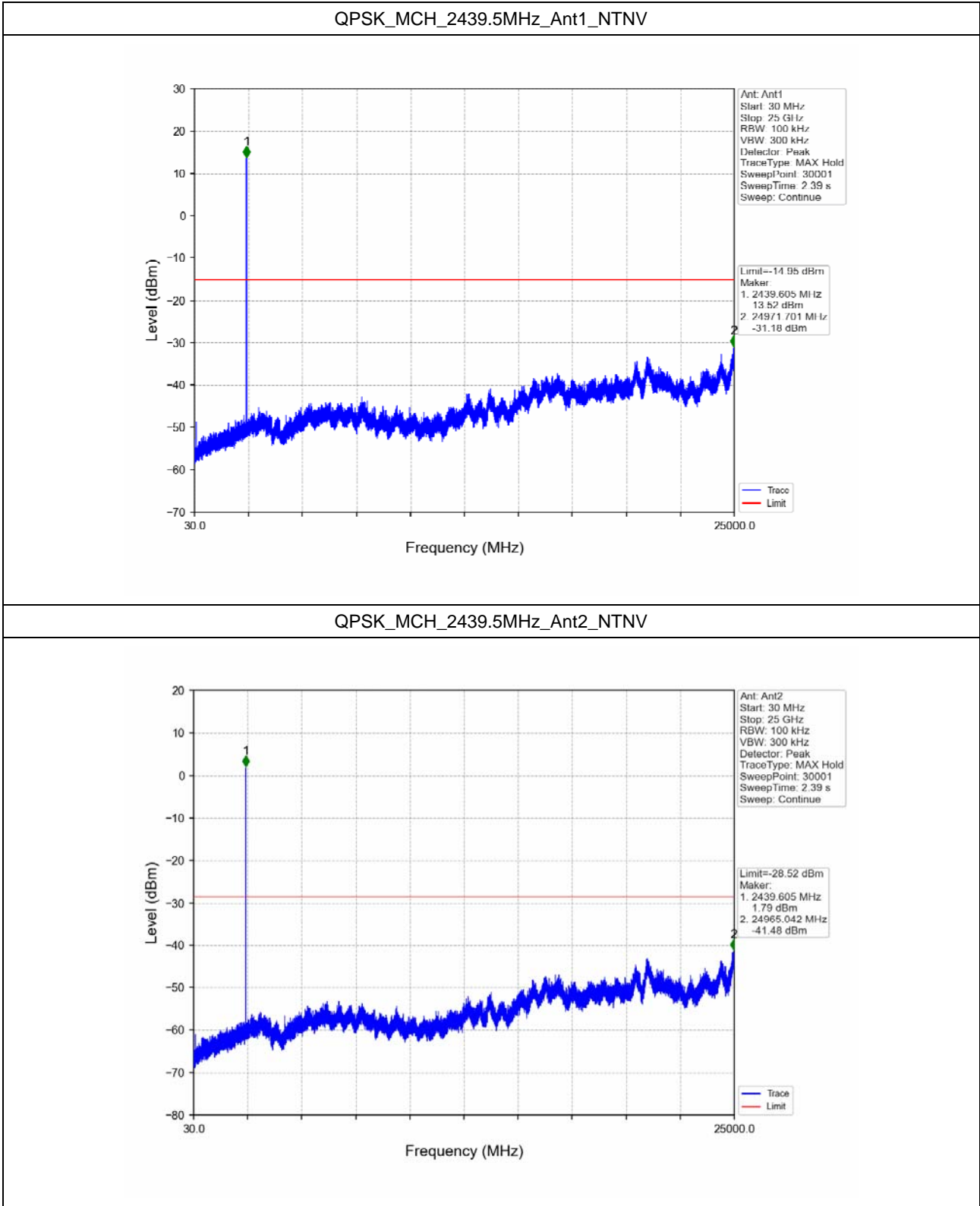
QPSK_LCH_2403.5MHz_Ant2_NTNV



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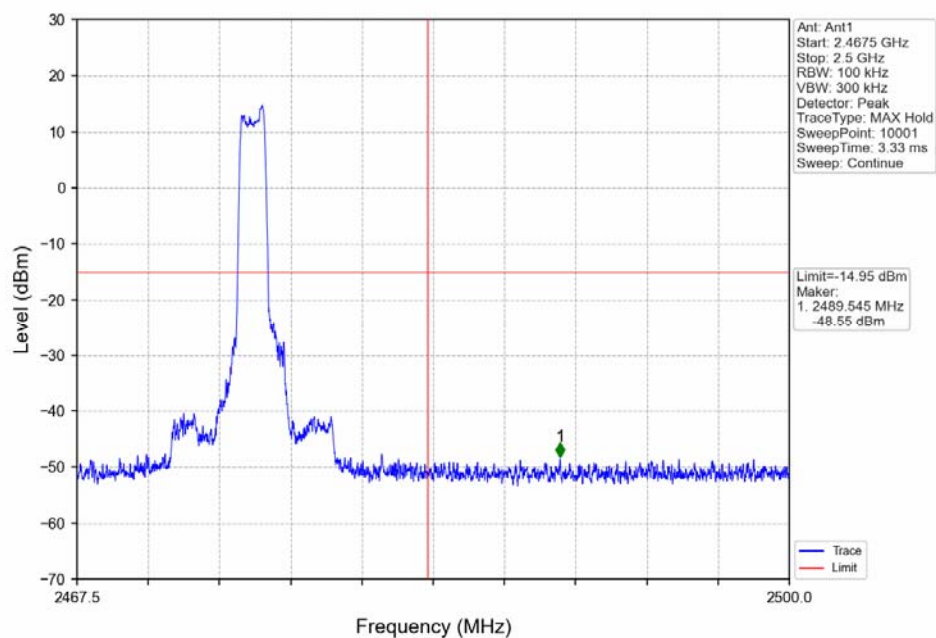
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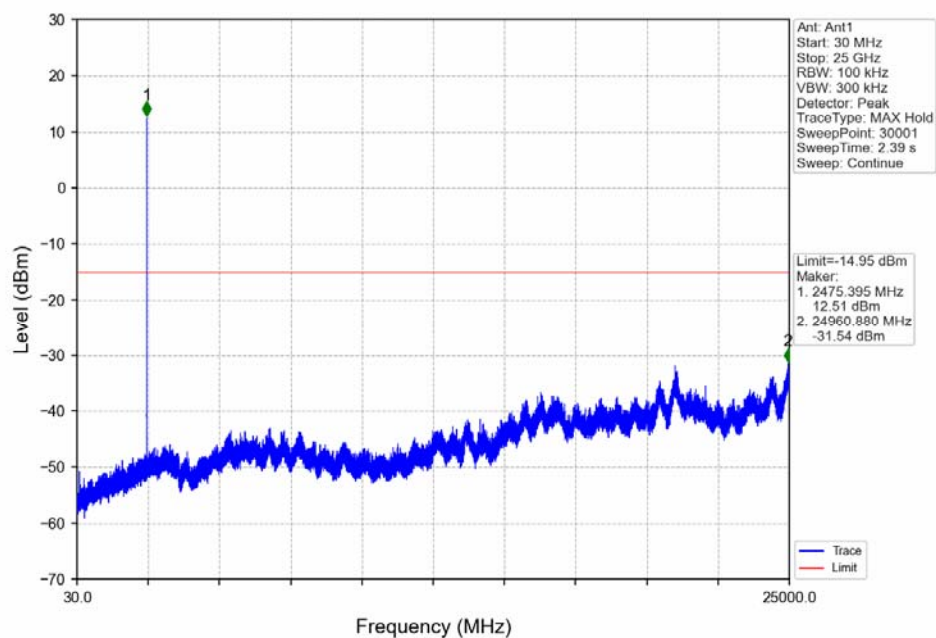
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QPSK_HCH_2475.5MHz_Ant1_NTNV



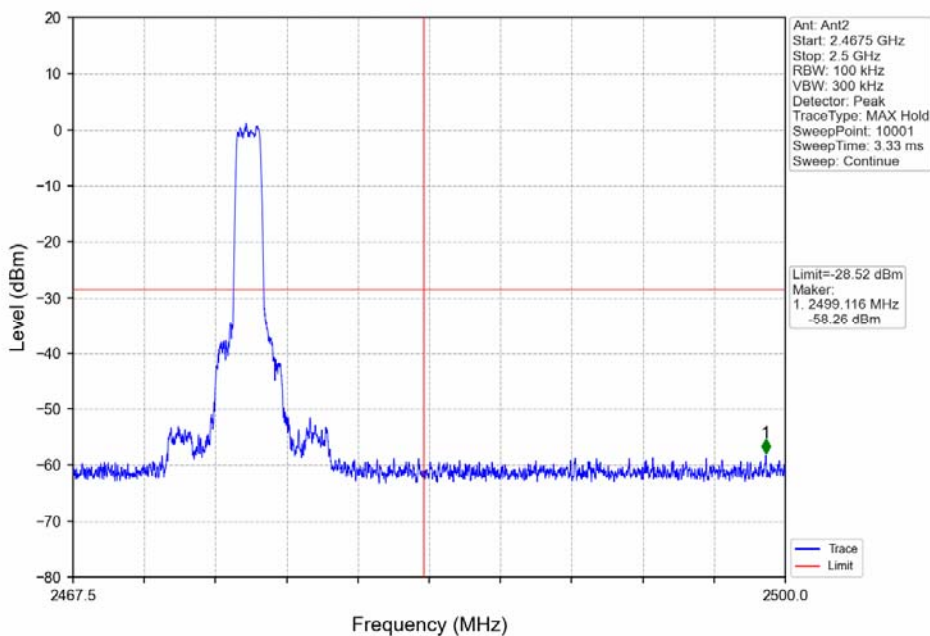
QPSK_HCH_2475.5MHz_Ant1_NTNV



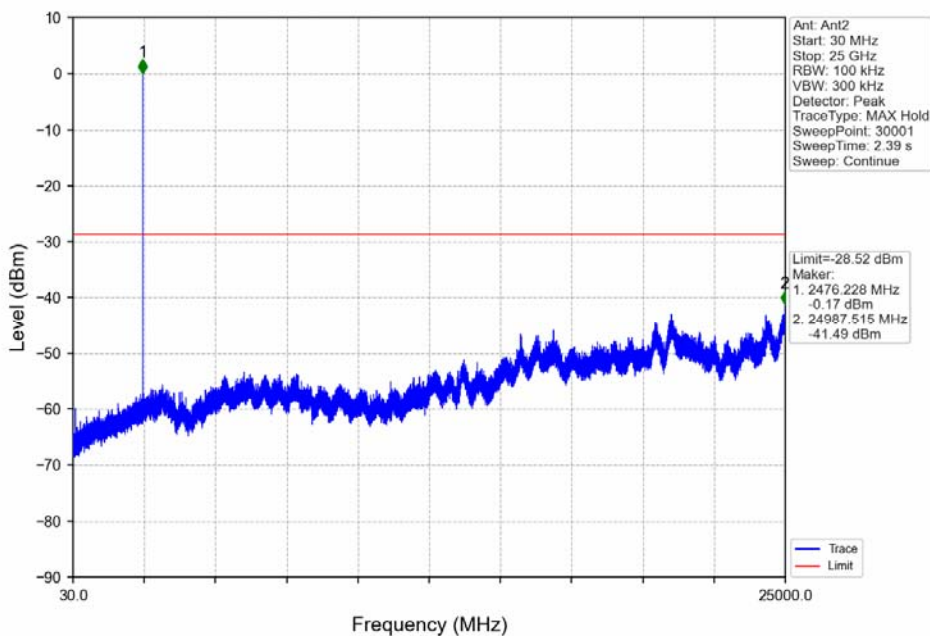
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QPSK_HCH_2475.5MHz_Ant2_NTNV



QPSK_HCH_2475.5MHz_Ant2_NTNV



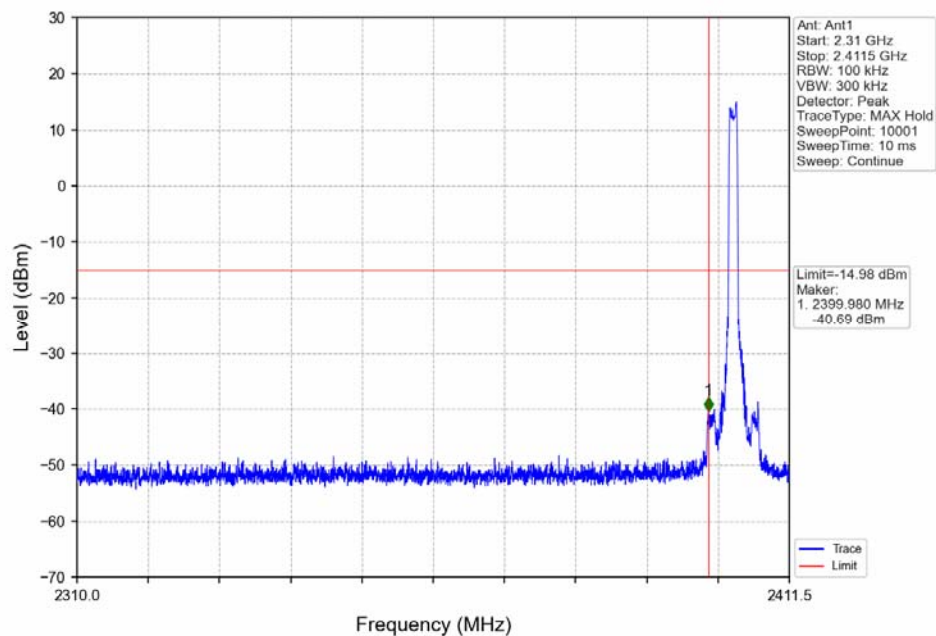
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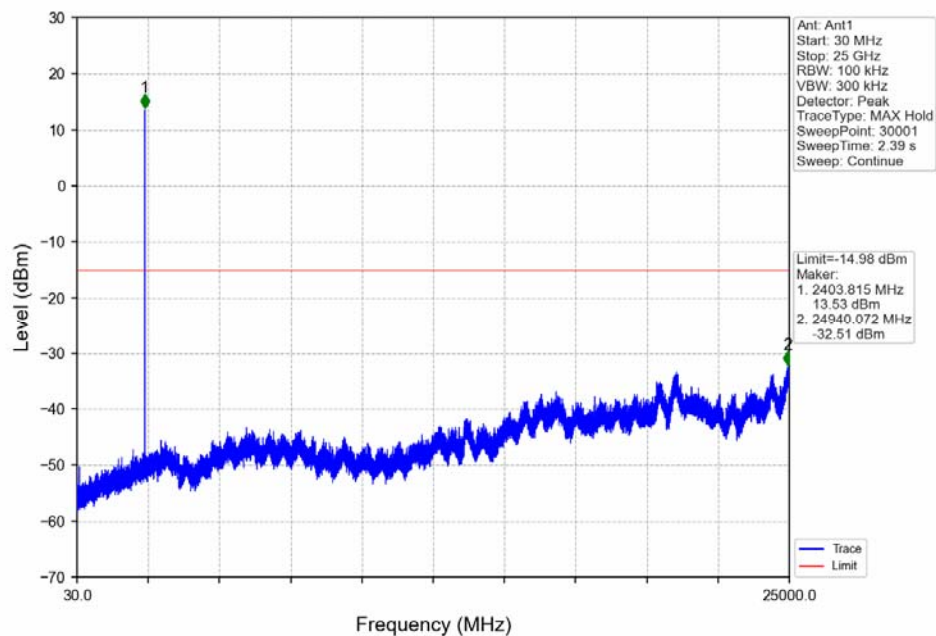
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16QAM_LCH_2403.5MHz_Ant1_NTNV



16QAM_LCH_2403.5MHz_Ant1_NTNV



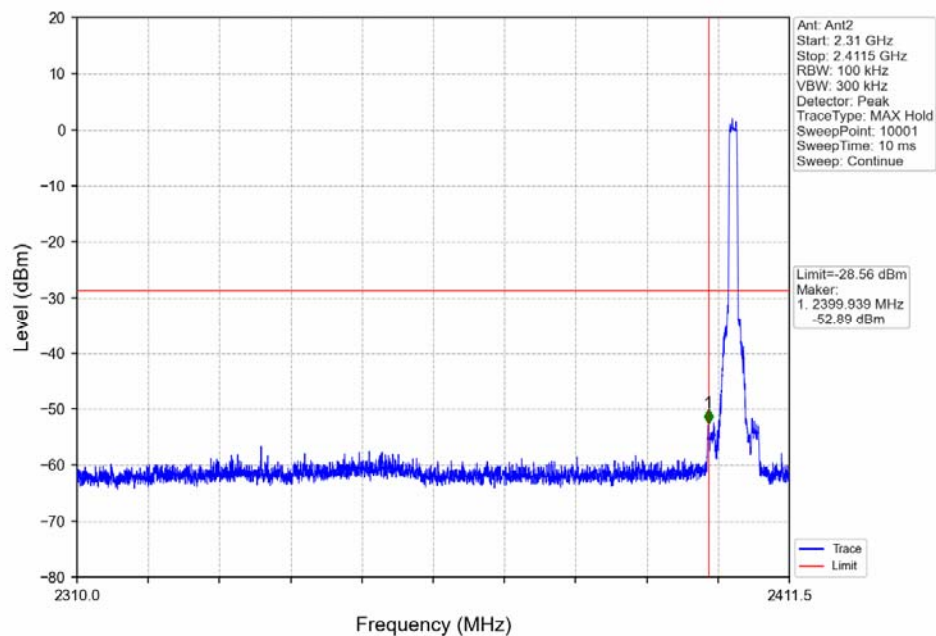
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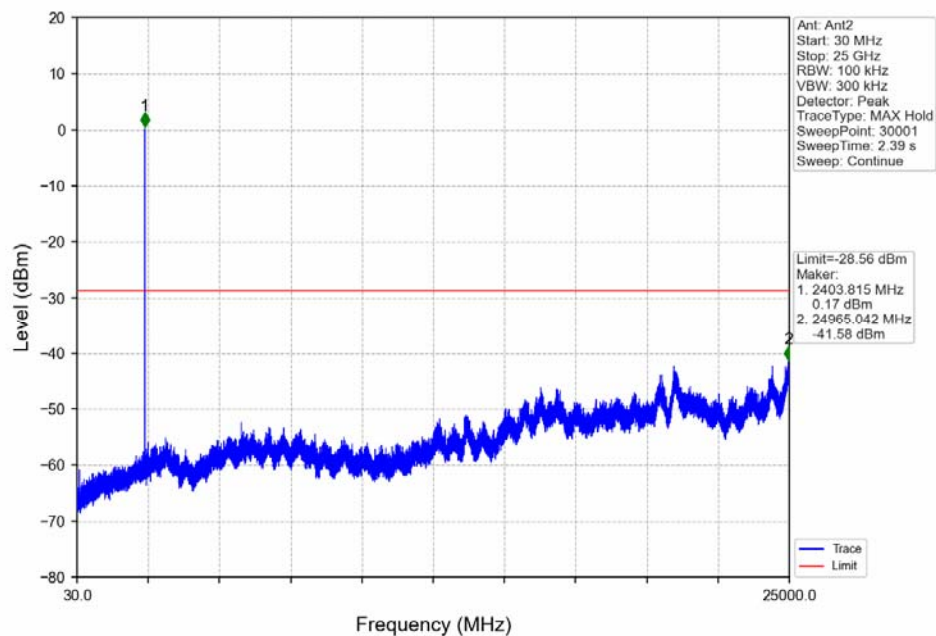
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16QAM_LCH_2403.5MHz_Ant2_NTNV



16QAM_LCH_2403.5MHz_Ant2_NTNV



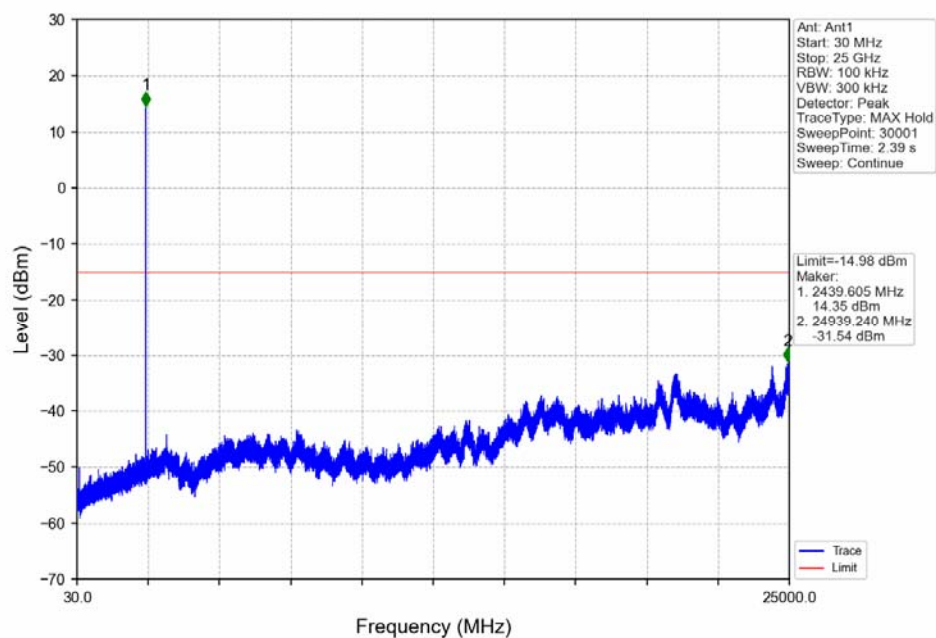
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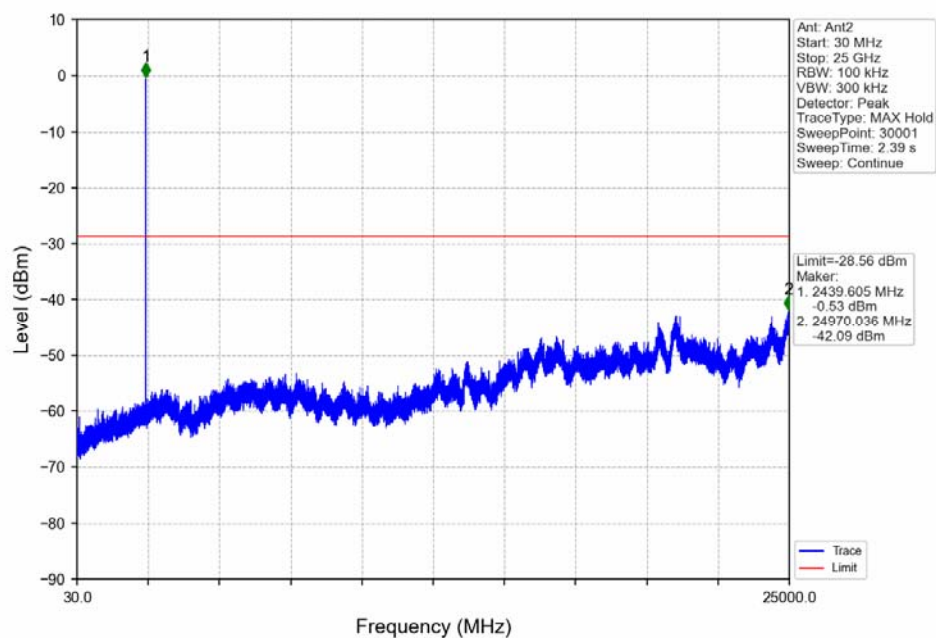
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16QAM_MCH_2439.5MHz_Ant1_NTNV



16QAM_MCH_2439.5MHz_Ant2_NTNV



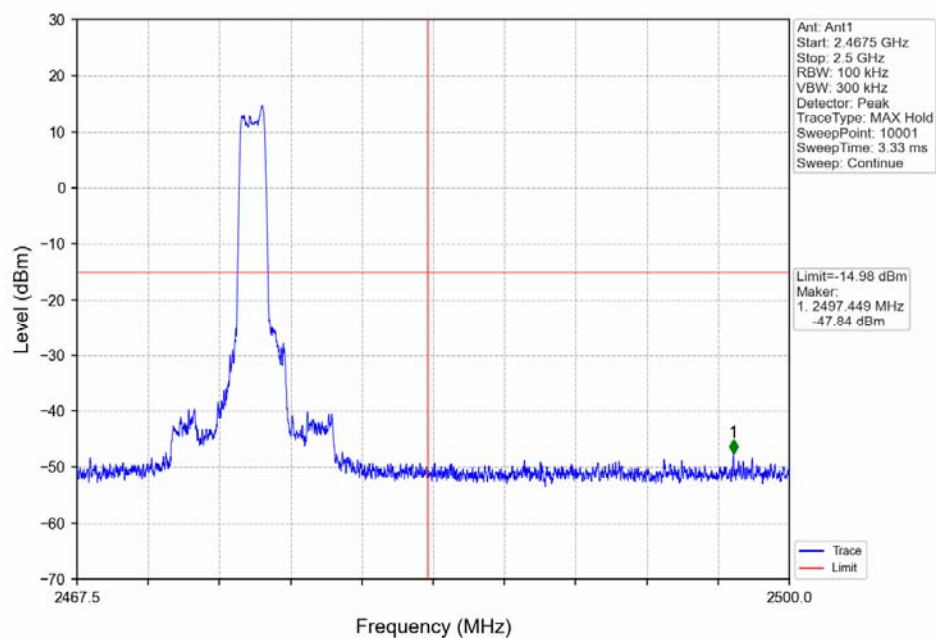
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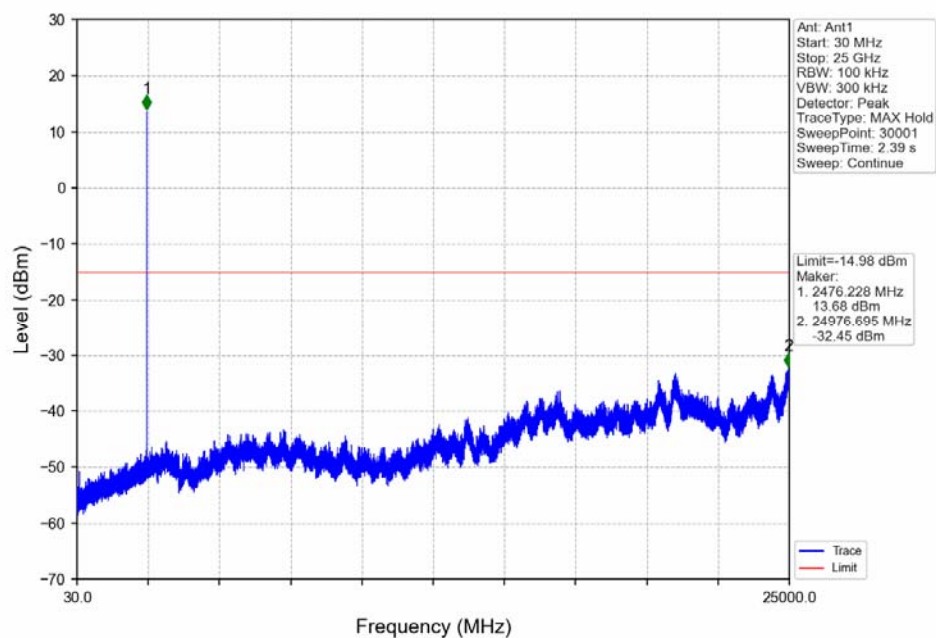
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16QAM_HCH_2475.5MHz_Ant1_NTNV



16QAM_HCH_2475.5MHz_Ant1_NTNV



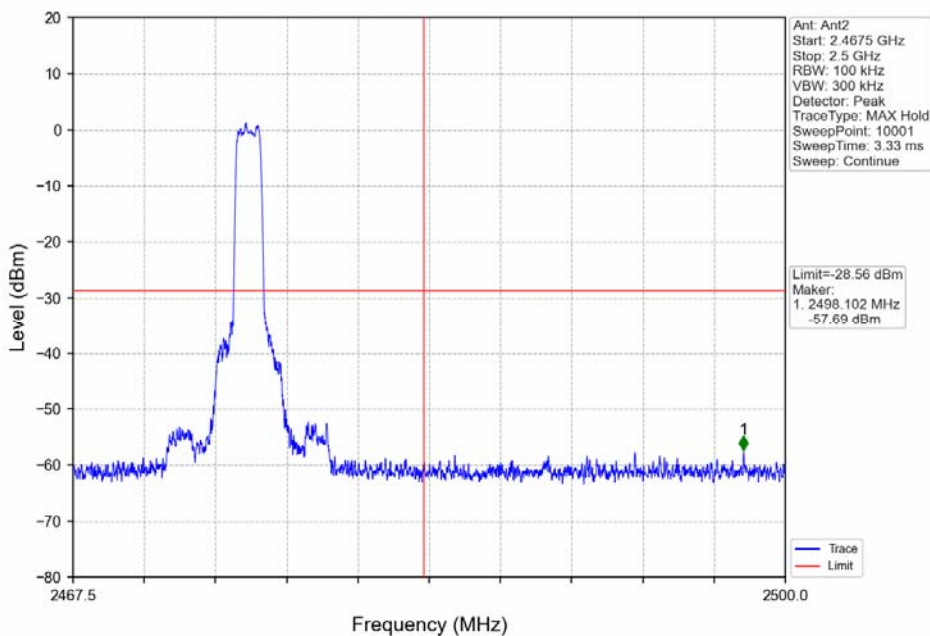
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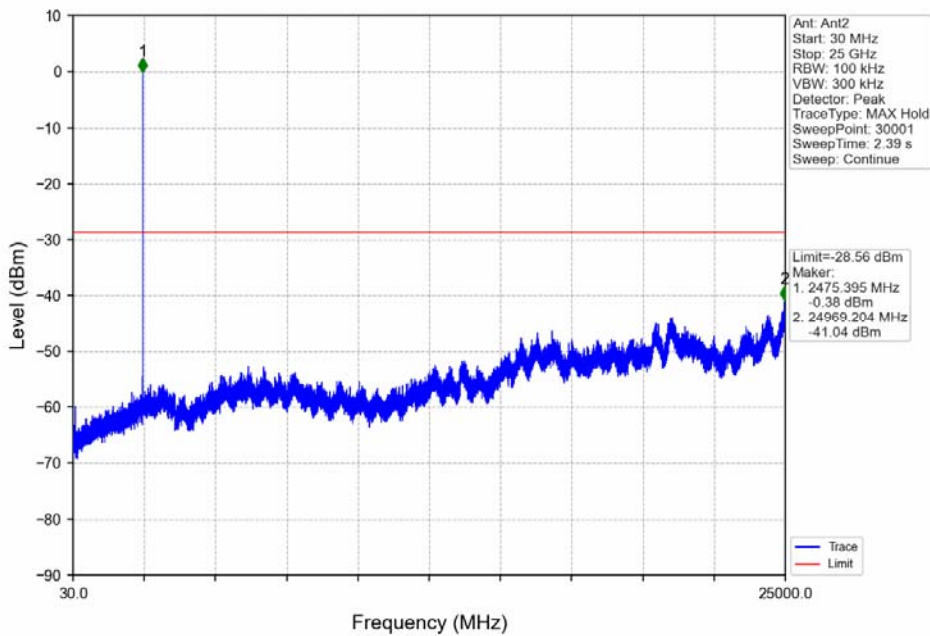
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16QAM_HCH_2475.5MHz_Ant2_NTNV



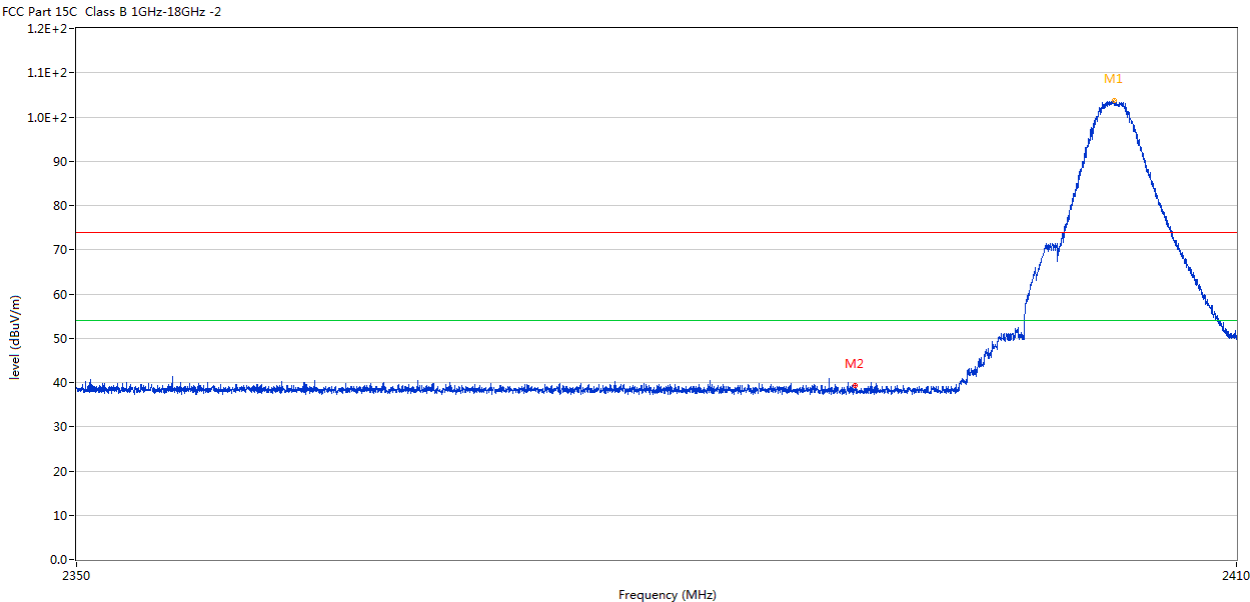
16QAM_HCH_2475.5MHz_Ant2_NTNV



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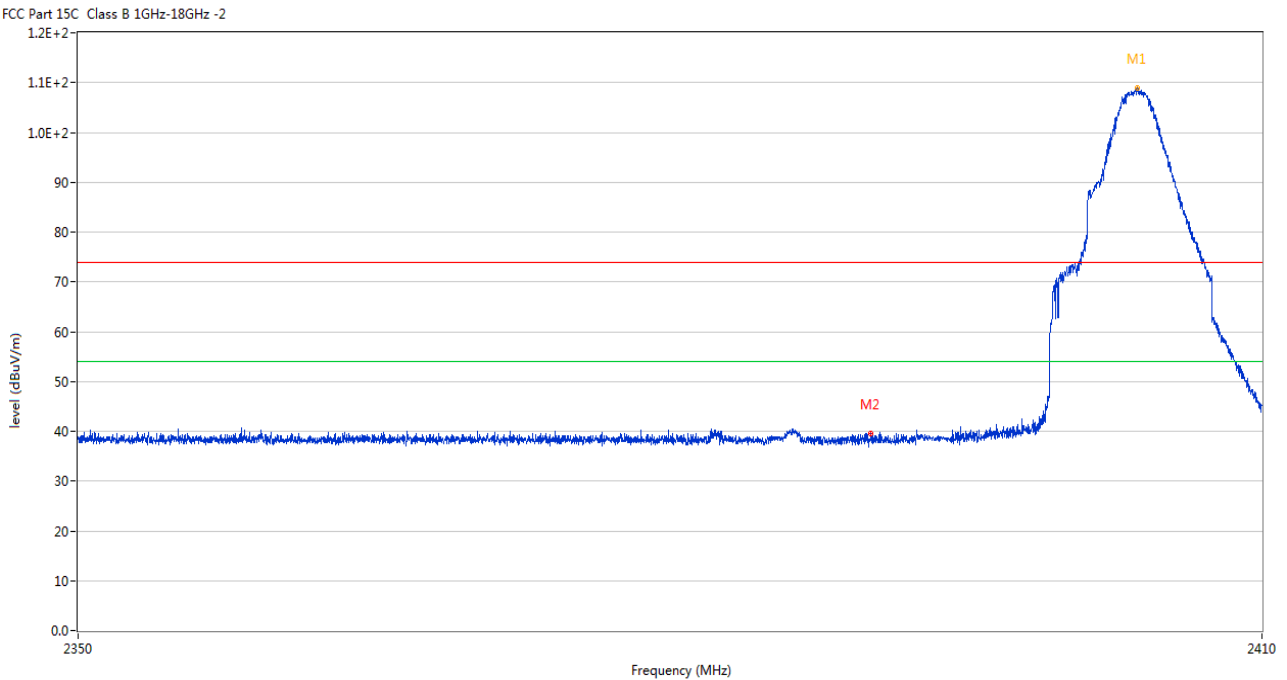


10.5 Restricted band Measurement



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	2403.597	103.70	-3.57	74.0	29.70	Peak	226.00	100	Horizontal	N/A
2	2390.085	39.27	-3.53	74.0	-34.73	Peak	290.00	100	Horizontal	Pass

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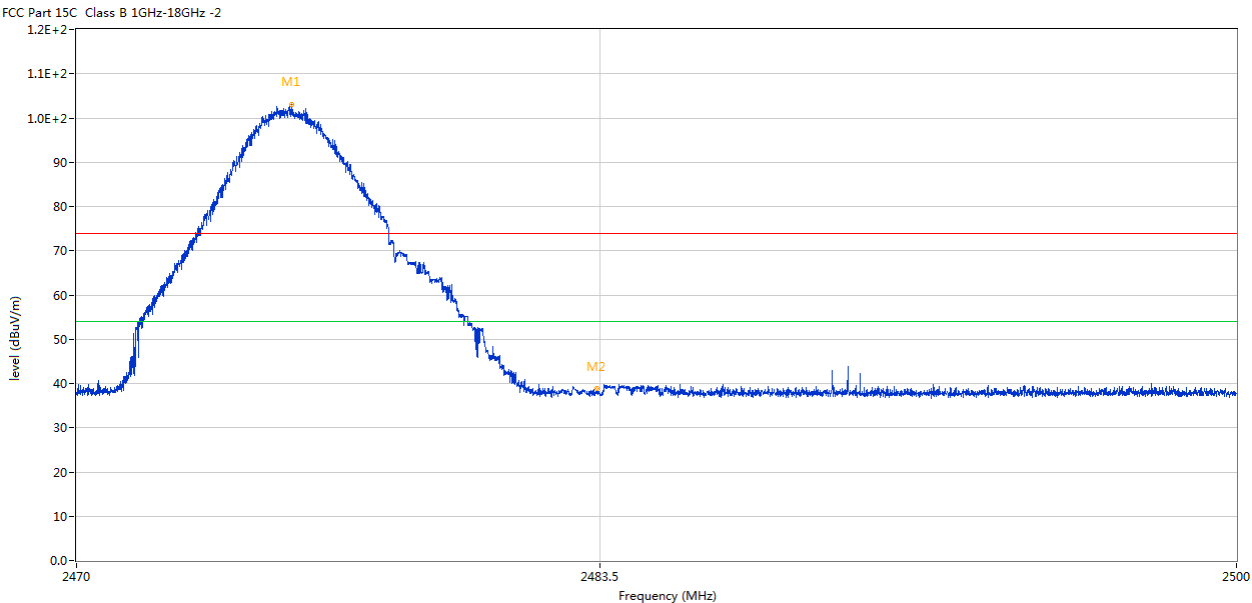


No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	2403.597	108.98	-3.57	74.0	34.98	Peak	349.00	100	Vertical	N/A
2	2390.025	39.51	-3.53	74.0	-34.49	Peak	101.00	100	Vertical	Pass

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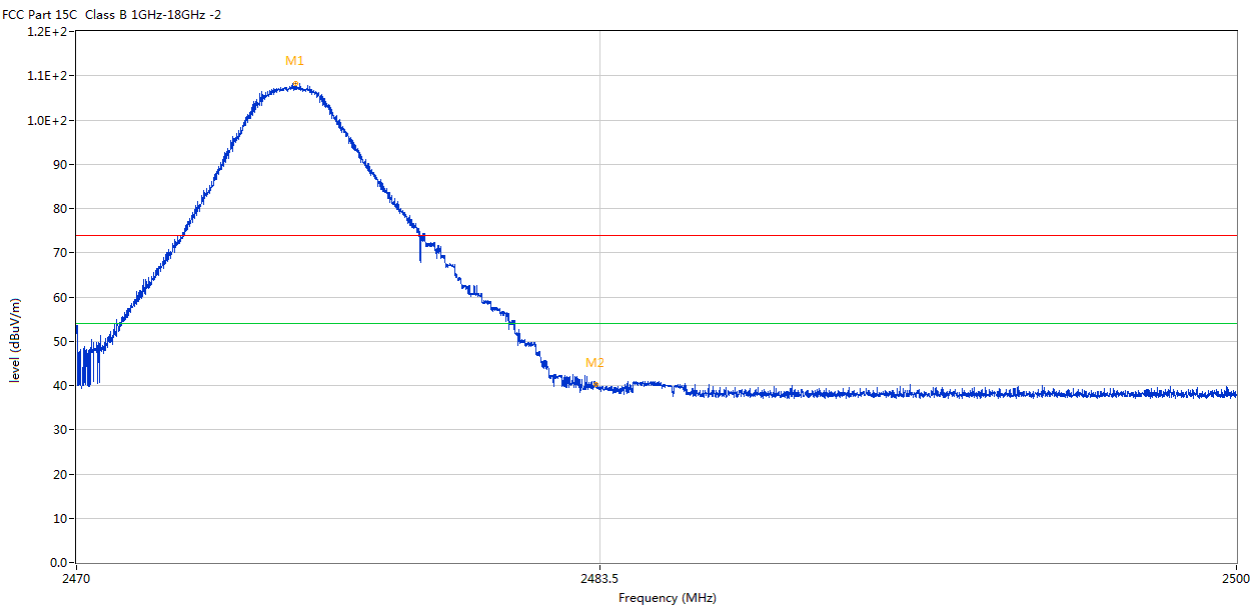


No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	2475.526	102.94	-3.57	74.0	28.94	Peak	149.00	100	Horizontal	N/A
2	2483.417	38.94	-3.57	74.0	-35.06	Peak	1.00	100	Horizontal	Pass

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No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	2475.631	108.33	-3.57	74.0	34.33	Peak	135.00	100	Vertical	N/A
2	2483.377	40.31	-3.57	74.0	-33.69	Peak	239.00	100	Vertical	Pass

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11.0 Antenna Requirement

11.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (b), if transmitter antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

11.2 Antenna Connected construction

Two Integral antennas with SMA male antenna connector used. The gain of the antennas is 4.7dBi for each one (Get from the antenna specification)

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