



Report No:

TW2203321-03E

File reference No:

2022-05-25

Applicant:

Autel Robotics Co., Ltd.

Product:

Live Deck 2

Model No:

Live Deck 2

Trademark:



Test Standards:

FCC Part 15 Subpart E, Paragraph 15.407

Test result:

It is herewith confirmed and found to comply with the requirements set up by ANSI C63.10, FCC Part 15 Subpart C, Paragraph 15.407 regulations for the evaluation of electromagnetic compatibility

Approved By

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:

CNAS-LAB Code: L2292

The EMC Laboratory has been assessed and in compliance with CNAS-CL01 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

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Test Report Conclusion

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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: 
Additional Trademark: N/A
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: 5728-5847MHz
Channel Separation: 1MHz
Channel Number: 120
Antenna: Two Integral antennas with SMA male antenna connector used. The gain of the

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antennas is 2.9dBi 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

Andy Xing

Print Name: Andy Xing

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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
LISN	R&S	EZH3-Z5	100294	2021-06-18	2022-06-17
LISN	R&S	EZH3-Z5	100253	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	J211060660	2021-06-18	2022-06-17
Horn Antenna	R&S	BBHA 9120D	9120D-631	2021-07-02	2024-07-01
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

2.2 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

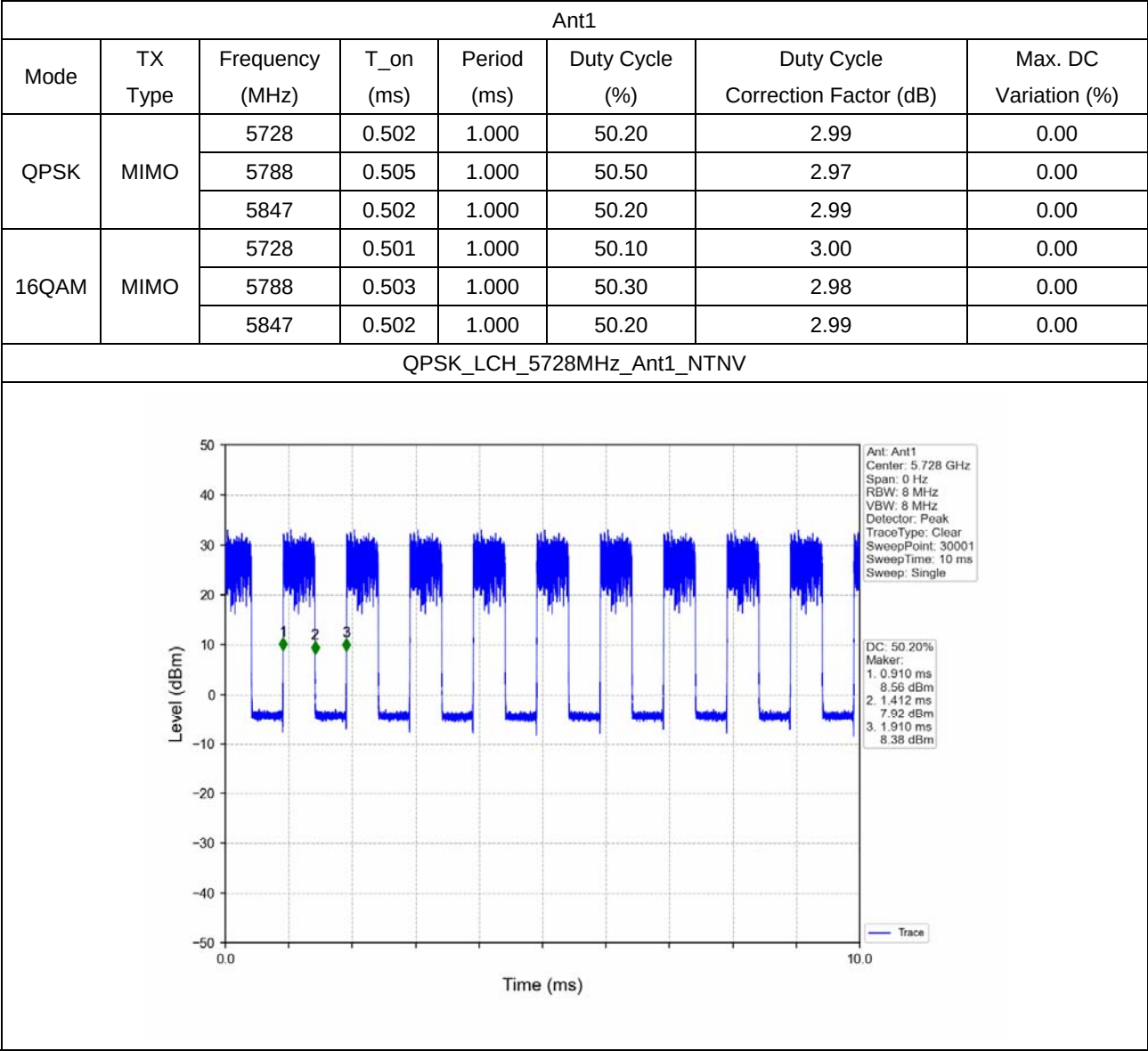
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Duty Cycle



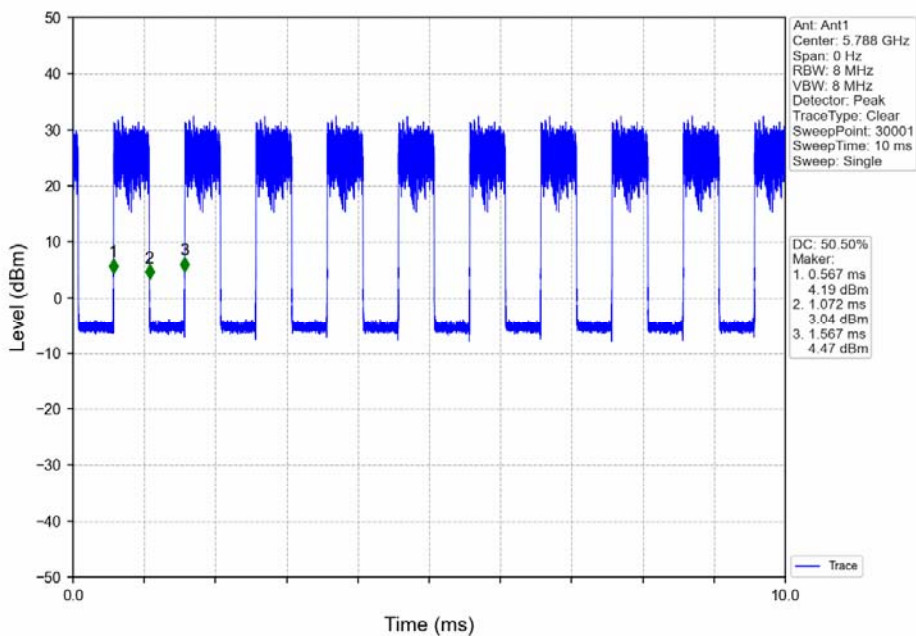
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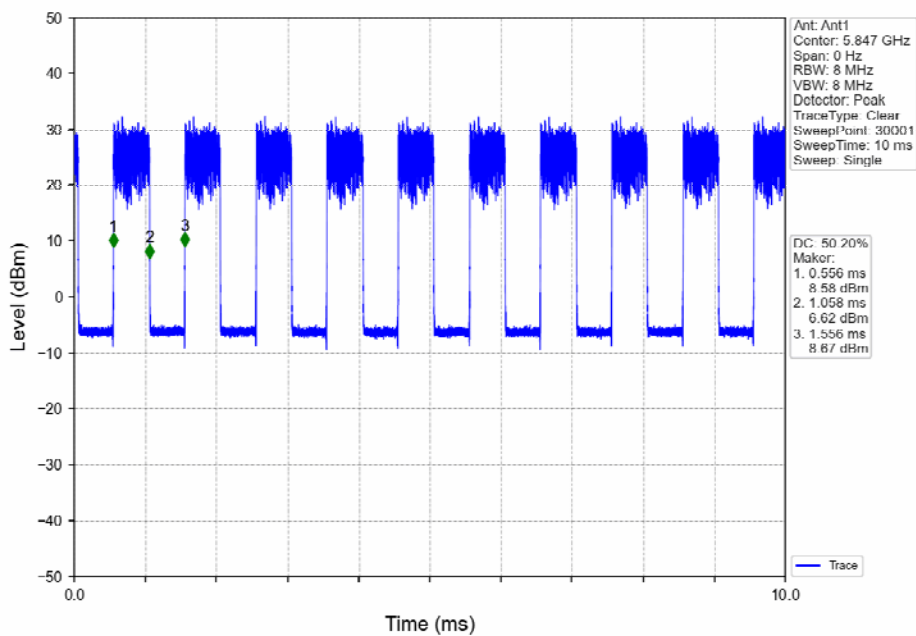
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QPSK_MCH_5788MHz_Ant1_NTNV



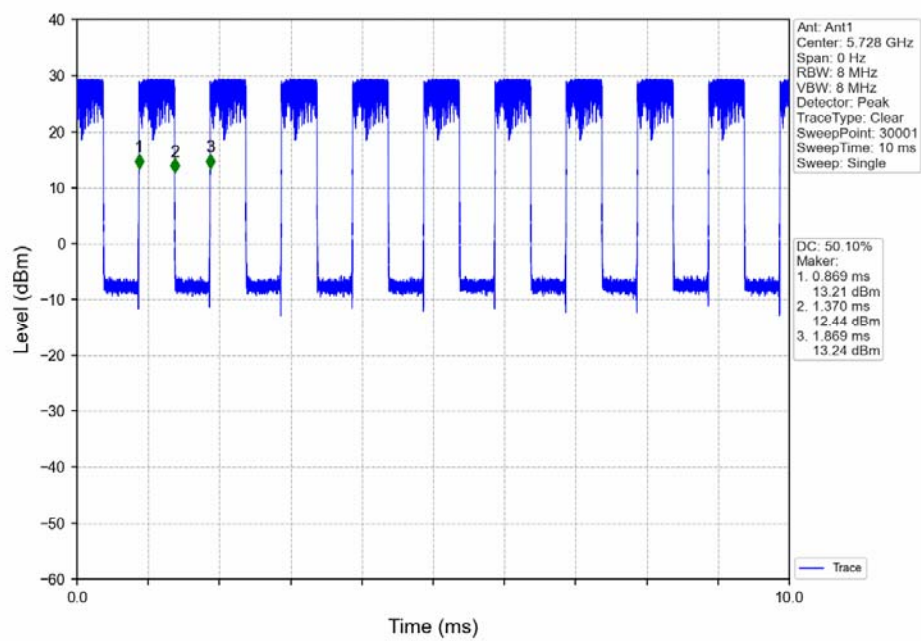
QPSK_HCH_5847MHz_Ant1_NTNV



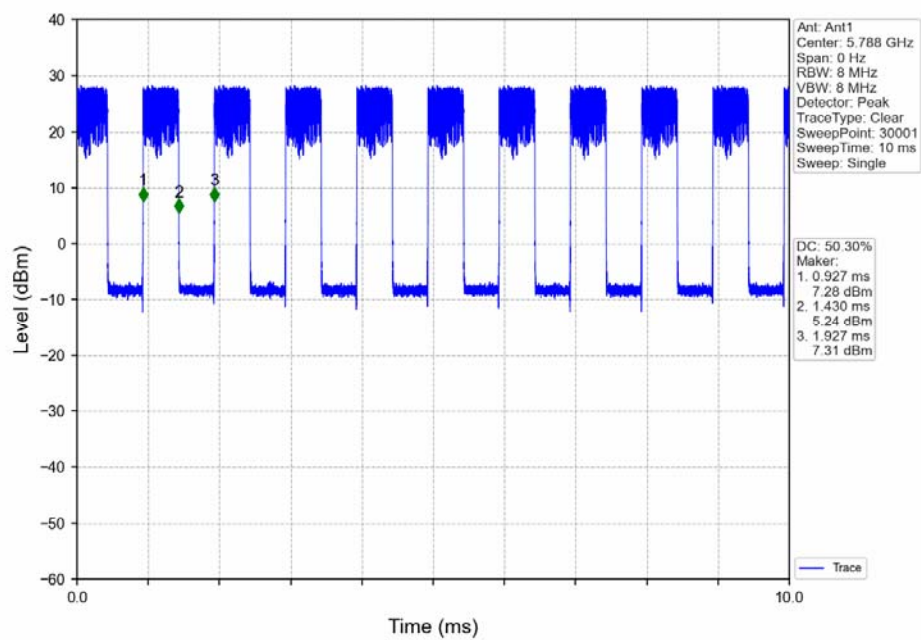
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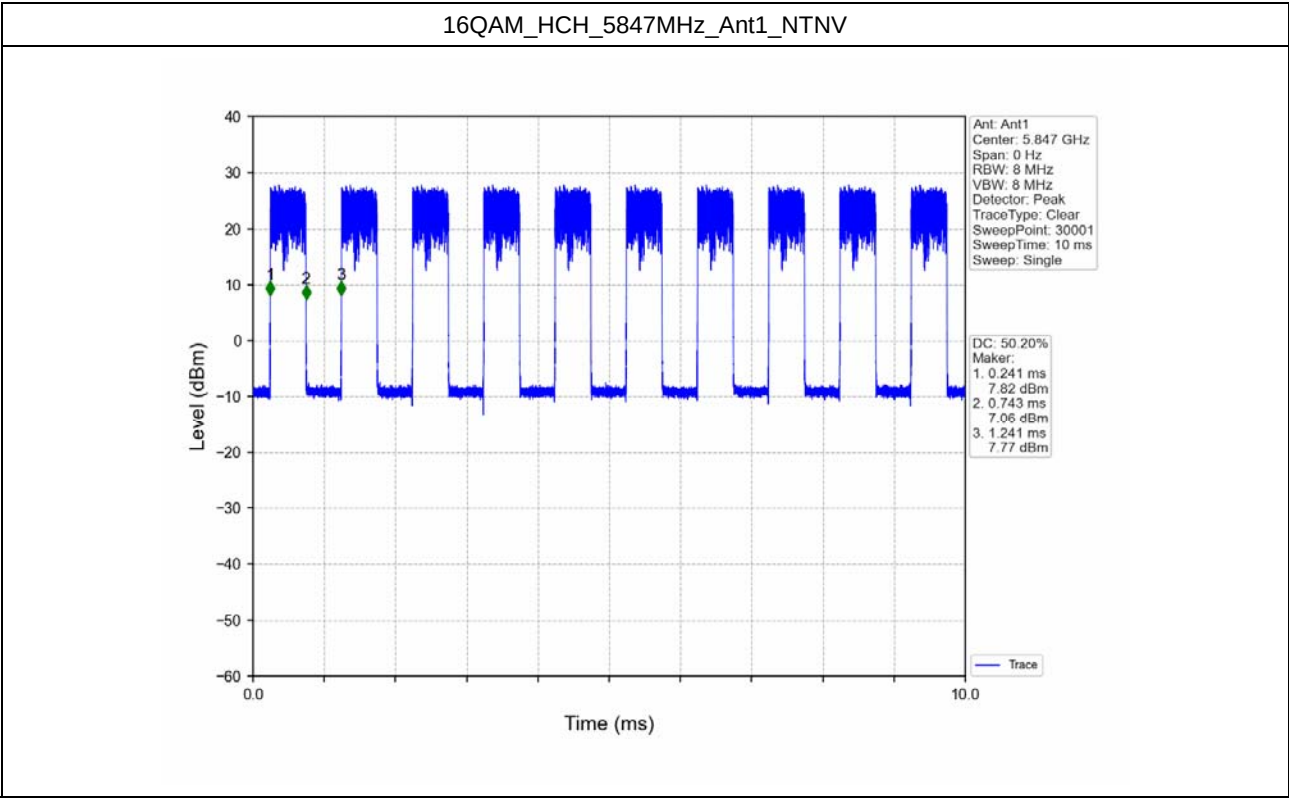
16QAM_LCH_5728MHz_Ant1_NTNV



16QAM_MCH_5788MHz_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 15.407	Conducted Emission Test	Pass	Complies
FCC Part 15 Subpart E Paragraph 15.407 (b1/4/5/6/7), Part 15.205 and Part 15.209	Undesirable Emission and Restrict band	Pass	Complies
FCC Part 15, Paragraph 15.407 (a1/2/3)	Peak Transmit Power	Pass	Complies
FCC Part 15, Paragraph 15.407 (a)(6)	Peak Power Excursion	Pass	Complies
FCC Part 15, Paragraph 15.407 (a1/2/3)	Peak Power Spectral Density	Pass	Complies
FCC Part 15, Paragraph 15.407(g)	Frequency Stability	Pass	Complies

3.2 Test Standards

FCC Part 15 Subpart & Subpart C, Paragraph 15.247, ANSI C63.10 :2013 and ANSI C63.4 :2014
789033 D02 General UNII Test Procedures New Rules v01r04

4.0 EUT Modification

No modification by SHENZHEN TIMEWAY TESTING LABORATORIES.

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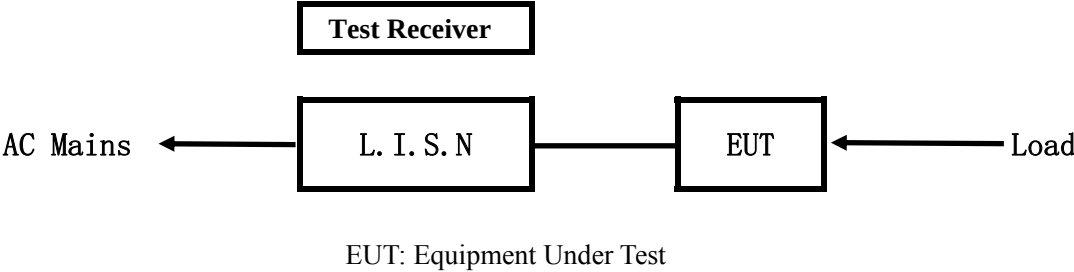
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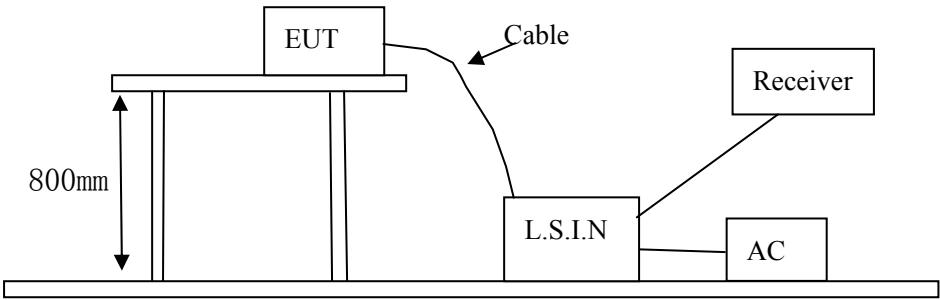
5. Power Line Conducted Emission Test

5.1 Schematics of the test



5.2 Test Method and test Procedure

The EUT was tested according to ANSI C63.10-2009. 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: 120V~, 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

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B. Internal Device

Device	Manufacturer	Model	Rating

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)

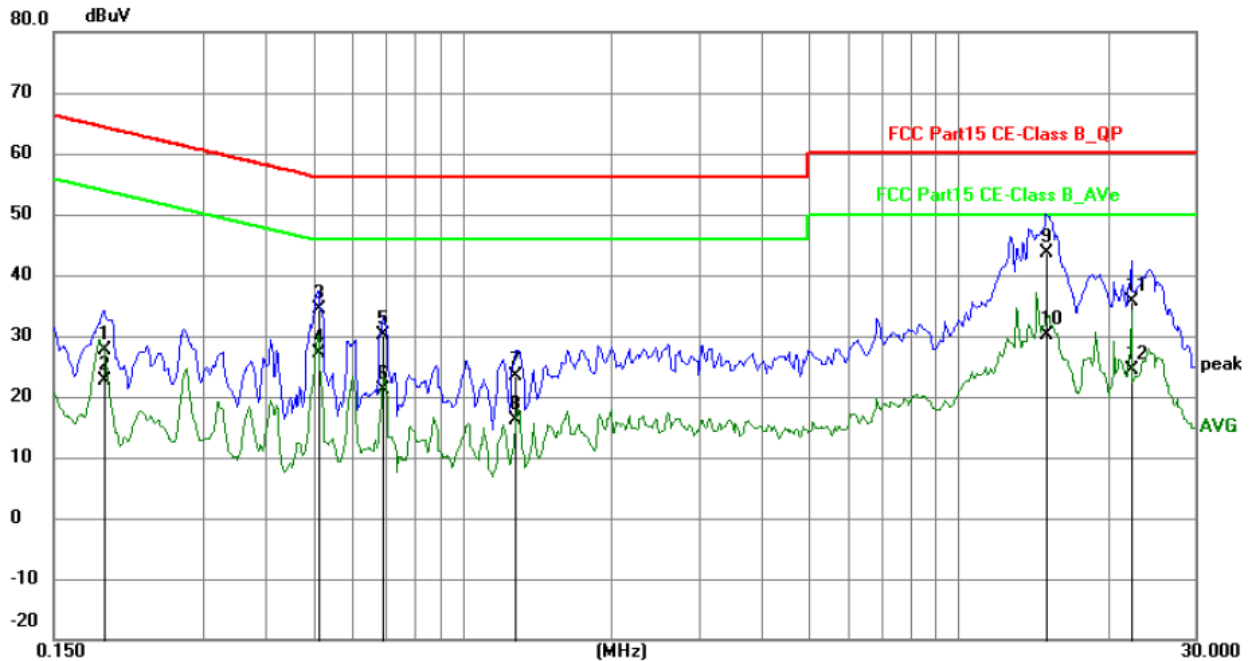
EUT Operating Environment

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

EUT set Condition: Keeping 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	0.1890	17.87	9.76	27.63	64.08	-36.45	QP	P
2	0.1890	12.99	9.76	22.75	54.08	-31.33	AVG	P
3	0.5127	24.63	9.77	34.40	56.00	-21.60	QP	P
4	0.5127	17.32	9.77	27.09	46.00	-18.91	AVG	P
5	0.6920	20.44	9.78	30.22	56.00	-25.78	QP	P
6	0.6920	11.30	9.78	21.08	46.00	-24.92	AVG	P
7	1.2810	13.58	9.79	23.37	56.00	-32.63	QP	P
8	1.2810	6.39	9.79	16.18	46.00	-29.82	AVG	P
9	15.0276	33.25	10.38	43.63	60.00	-16.37	QP	P
10	15.0276	19.72	10.38	30.10	50.00	-19.90	AVG	P
11	22.4103	24.69	10.83	35.52	60.00	-24.48	QP	P
12	22.4103	13.55	10.83	24.38	50.00	-25.62	AVG	P

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

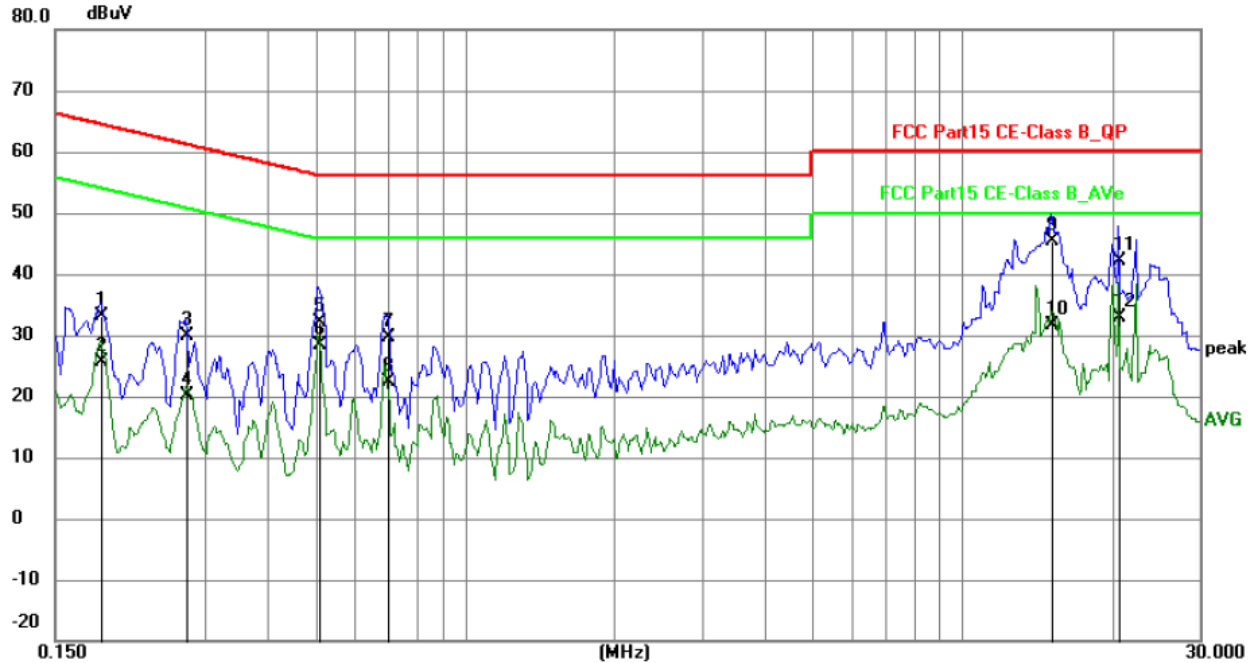
EUT Operating Environment

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

EUT set Condition: Keeping 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	0.1850	23.37	9.76	33.13	64.26	-31.13	QP	P
2	0.1850	15.79	9.76	25.55	54.26	-28.71	AVG	P
3	0.2748	20.11	9.75	29.86	60.97	-31.11	QP	P
4	0.2748	10.40	9.75	20.15	50.97	-30.82	AVG	P
5	0.5088	22.36	9.77	32.13	56.00	-23.87	QP	P
6	0.5088	18.57	9.77	28.34	46.00	-17.66	AVG	P
7	0.6999	19.88	9.78	29.66	56.00	-26.34	QP	P
8	0.6999	12.65	9.78	22.43	46.00	-23.57	AVG	P
9	15.1095	34.97	10.39	45.36	60.00	-14.64	QP	P
10	15.1095	21.24	10.39	31.63	50.00	-18.37	AVG	P
11	20.6787	31.49	10.72	42.21	60.00	-17.79	QP	P
12	20.6787	22.15	10.72	32.87	50.00	-17.13	AVG	P

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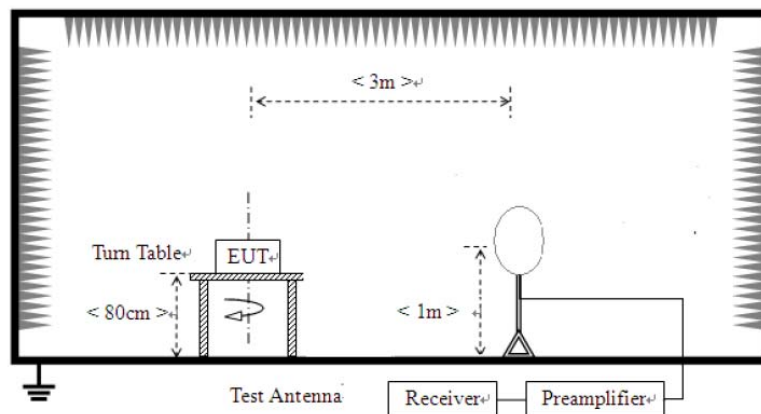
6 Undesirable Emission and Restrict band

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 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 40 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. 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



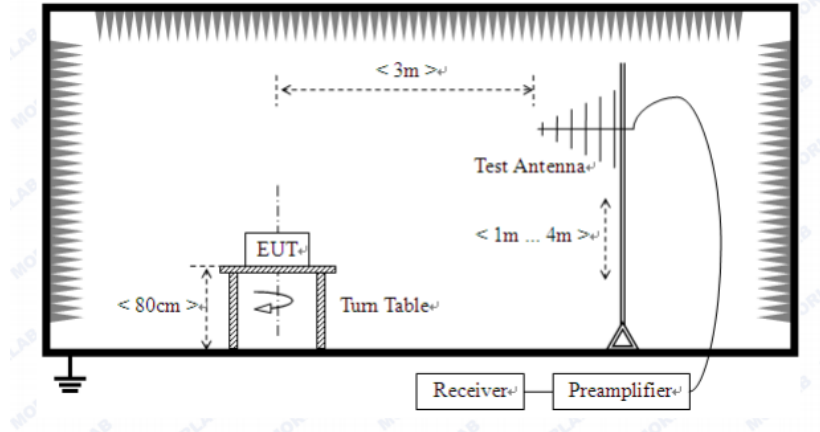
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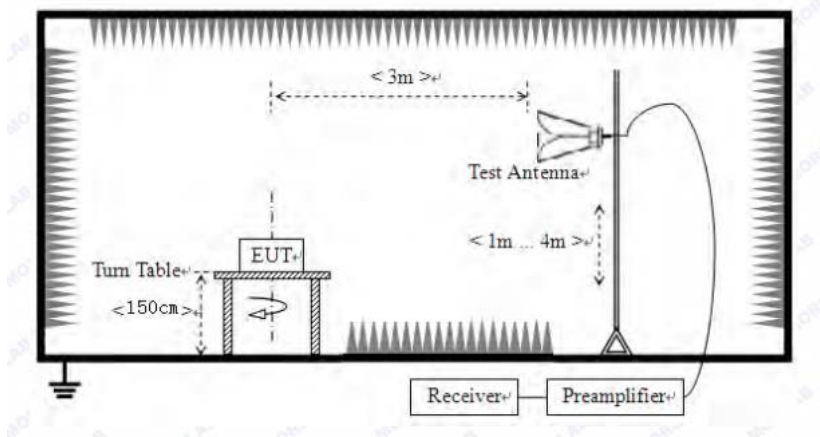
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For radiated emissions from 30MHz to 1GHz



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)
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

- (1) For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27dBm/MHz
- (2) For transmitters operating in the 5.725-5.825 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27dBm/MHz.

- Note:
1. RF Voltage (dBuV) = 20 log RF Voltage (μ V)
 2. In the Above Table, the higher limit applies at the band edges.
 3. Distance refers to the distance in meters between the measuring instrument antenna and the EUT
 4. 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: Keeping Transmitting

Results: Pass

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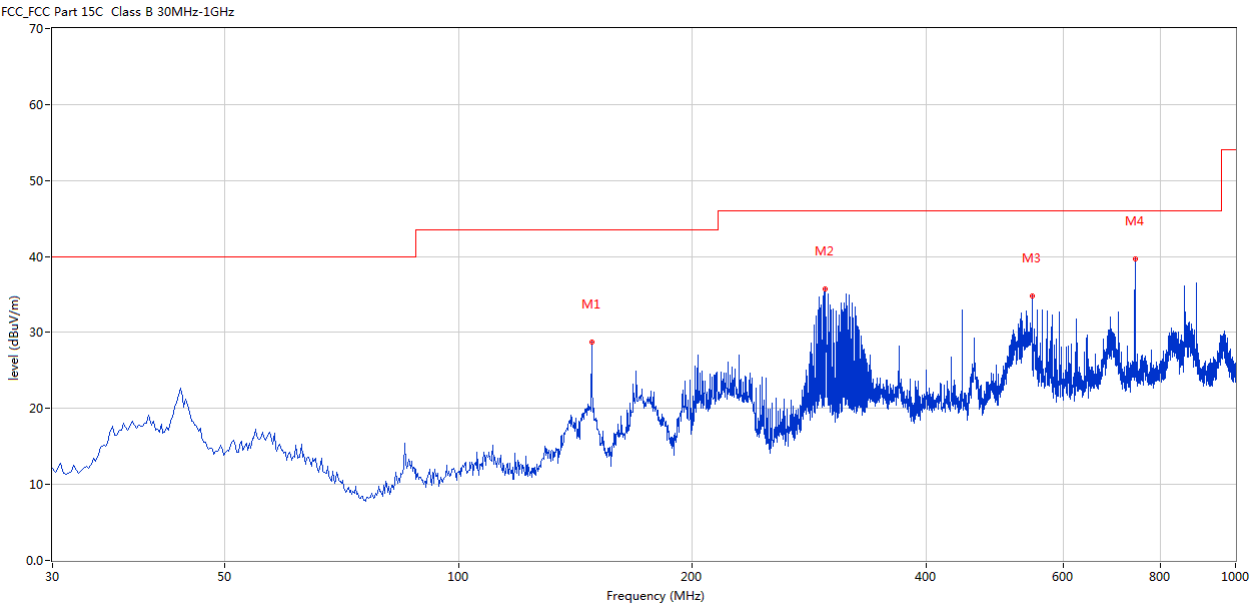
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Test Figure:

H



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	148.310	28.68	-17.16	43.5	-14.82	Peak	213.00	100	Horizontal	Pass
2	295.956	35.76	-11.09	46.0	-10.24	Peak	192.00	100	Horizontal	Pass
3	547.123	34.77	-6.23	46.0	-11.23	Peak	297.00	100	Horizontal	Pass
4	742.287	39.65	-3.44	46.0	-6.35	Peak	113.00	100	Horizontal	Pass

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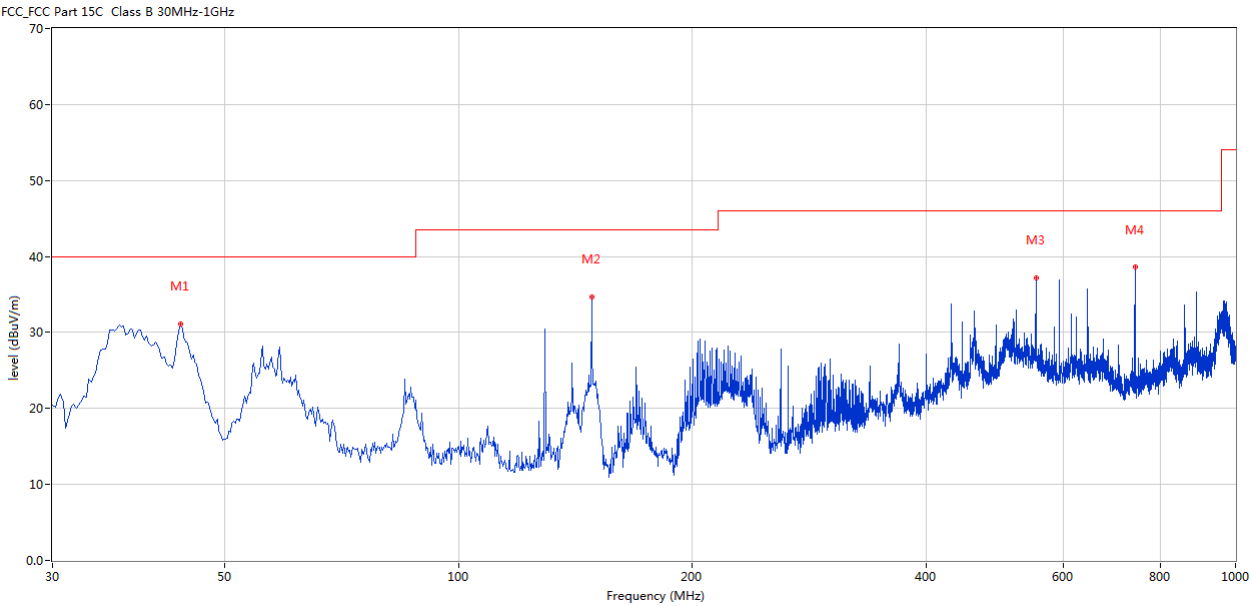
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Test Figure:

V



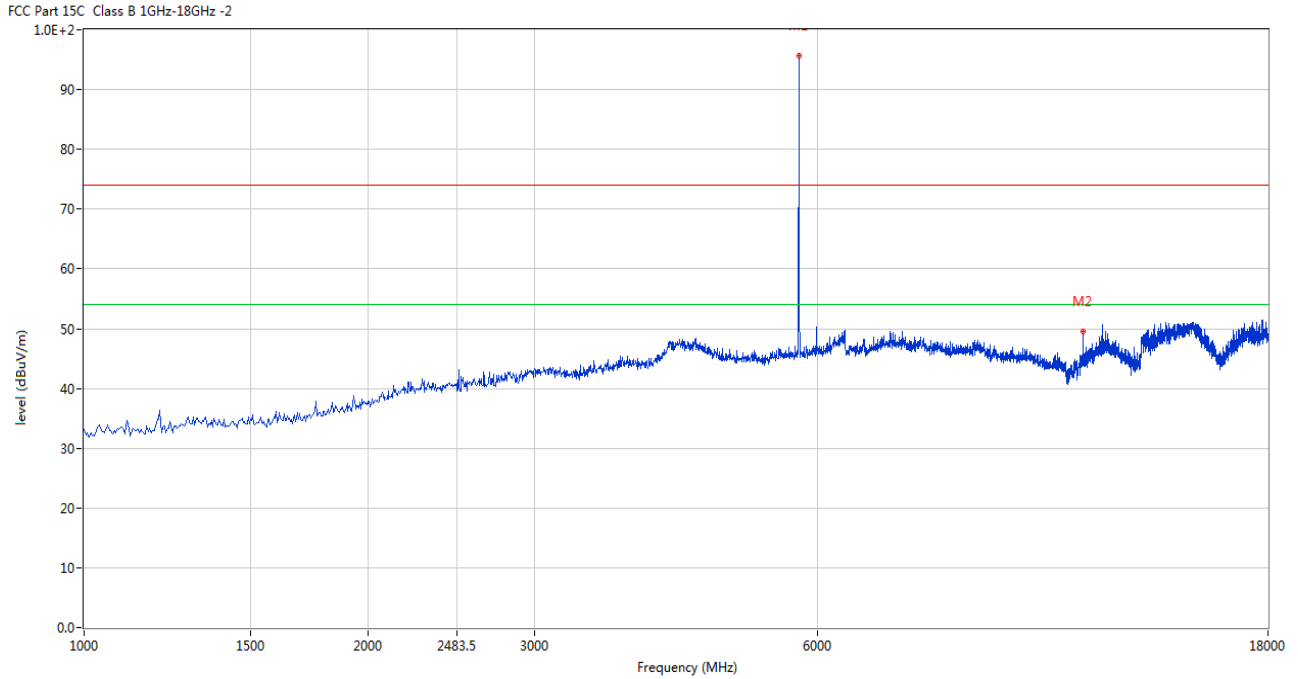
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	43.819	31.14	-11.48	40.0	-8.86	Peak	262.00	100	Vertical	Pass
2	148.310	34.68	-17.16	43.5	-8.82	Peak	53.00	100	Vertical	Pass
3	553.427	37.12	-6.22	46.0	-8.88	Peak	13.00	100	Vertical	Pass
4	742.287	38.56	-3.44	46.0	-7.44	Peak	191.00	100	Vertical	Pass

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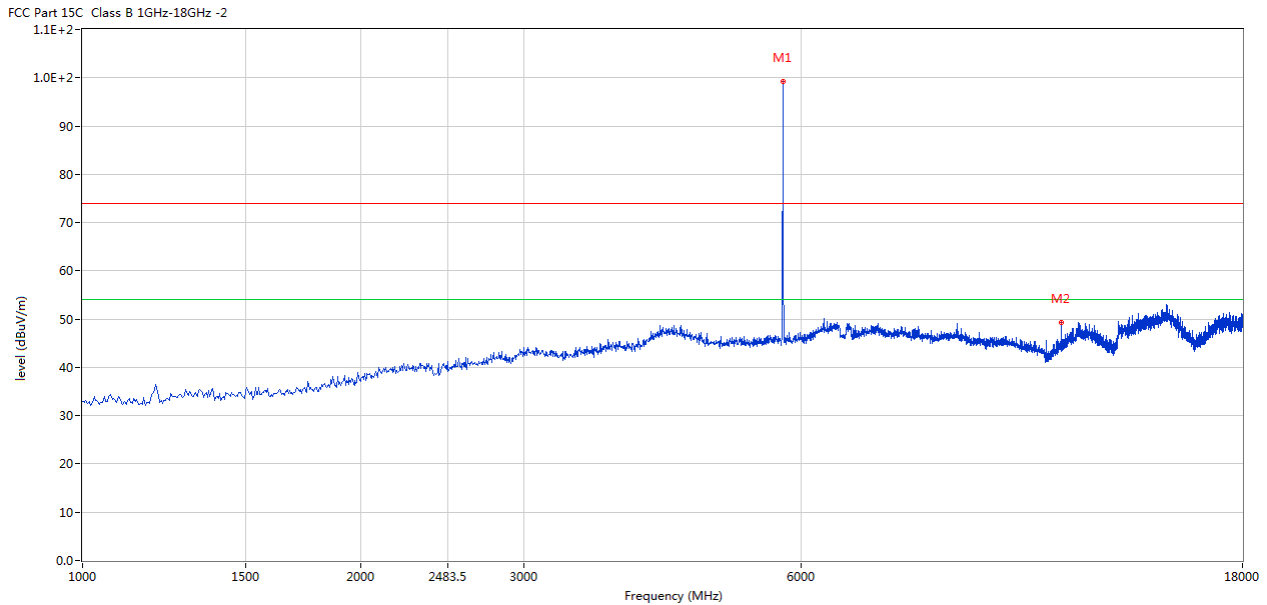


Please refer to the following test plots for details:

Low channel-5728MHz: Horizontal



Low channel-5728MHz: Vertical



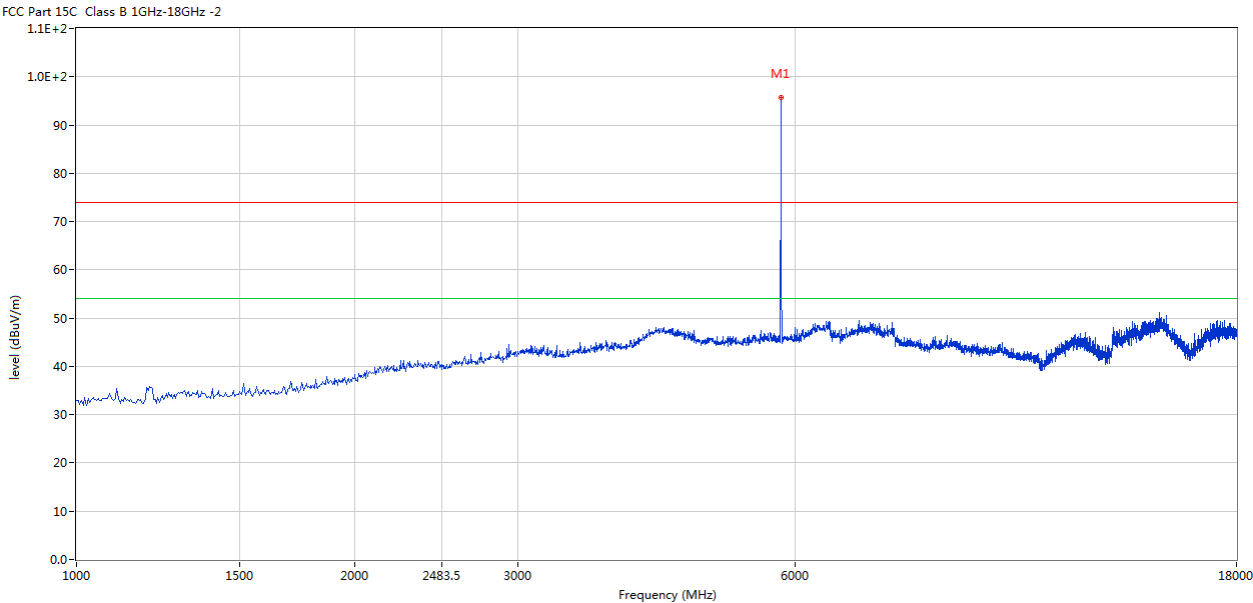
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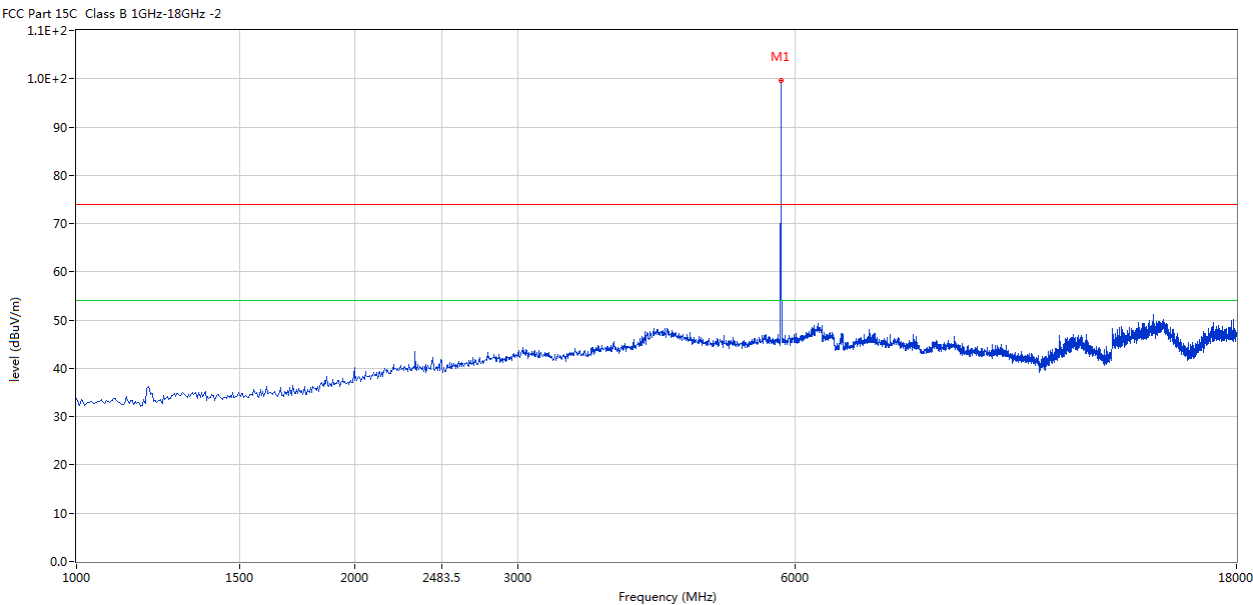
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Middle Channel-5788MHz: Horizontal



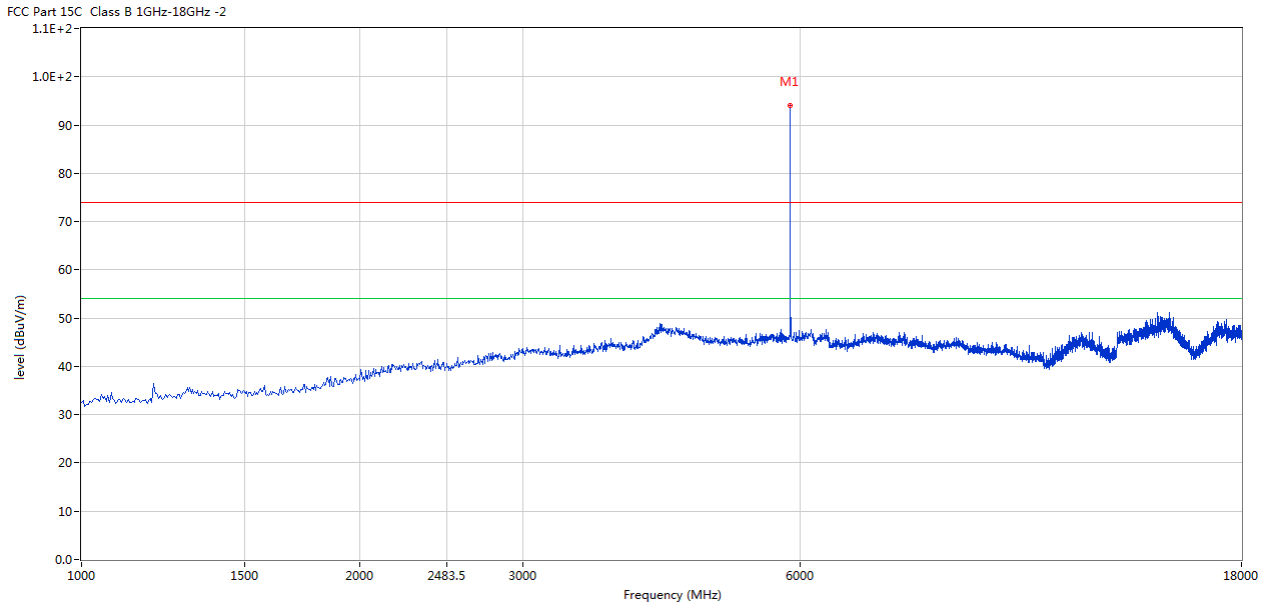
Middle Channel-5788MHz: Vertical



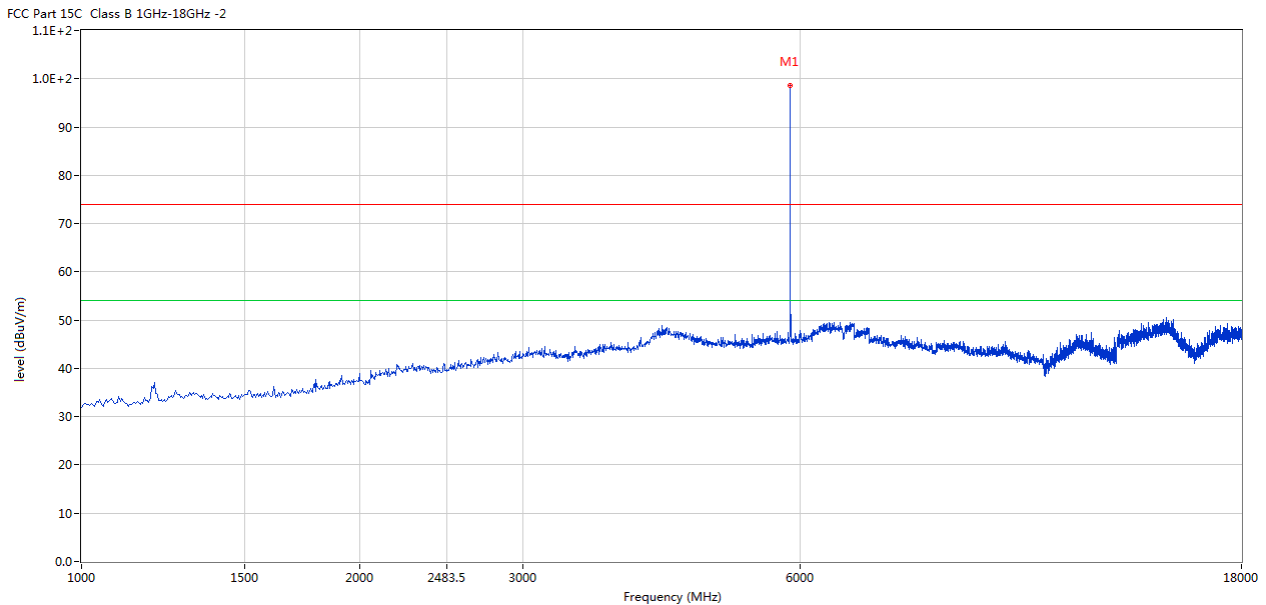
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High Channel-5847MHz: Horizontal



High Channel-5847MHz: Vertical



Note: 1. For radiated Emissions from 18-40GHz and below 30MHz, it is only the floor noise and less than the limit for more than 20dB. No necessary to take down.

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Restricted band Measurement			
EUT	Live Deck 2		Test Mode: Low Channel-5728MHz
Mode	Keeping Transmitting		Input Voltage DC3.85V
Temperature	24 deg. C,		Humidity 56% RH
Test Result:	Pass		Detector PK
5725	PK (dBμV/m)	64.53 (PK)	Limit -17dBm/MHz
	EIRP (dBm)	-30.67	
Polarity	Horizontal		--

Remark: 1. According to KDB 789033 D02 General UNII Test Procedures New Rules v01 section G) d) (ii), for measurement above 1000MHz@3m distance, the limit of EIRP is calculated as follows:

$$\text{EIRP[dBm]} = \text{E[dB}\mu\text{V/m]} - 95.2$$

For Example, if $\text{E[dB}\mu\text{V/m]} = 64.53 \text{ dB}\mu\text{V/m}$,

$$\text{EIRP[dBm]} = \text{E[dB}\mu\text{V/m]} - 95.2 = 64.53 - 95.2 = -30.67 \text{ dBm}$$

2. RBW=1MHz, VBW=3MHz

Restricted band Measurement			
EUT	Live Deck 2		Test Mode: Low Channel-5728MHz
Mode	Keeping Transmitting		Input Voltage DC3.85V
Temperature	24 deg. C,		Humidity 56% RH
Test Result:	Pass		Detector PK
5725	PK (dBμV/m)	66.75(PK)	Limit -17dBm/MHz
	EIRP (dBm)	-28.45	
Polarity	Vertical		--

Remark: 1. According to KDB 789033 D02 General UNII Test Procedures New Rules v01 section G) d) (ii), for measurement above 1000MHz@3m distance, the limit of EIRP is calculated as follows:

$$\text{EIRP[dBm]} = \text{E[dB}\mu\text{V/m]} - 95.2$$

For Example, if $\text{E[dB}\mu\text{V/m]} = 66.75 \text{ dB}\mu\text{V/m}$,

$$\text{EIRP[dBm]} = \text{E[dB}\mu\text{V/m]} - 95.2 = 66.75 - 95.2 = -28.45 \text{ dBm}$$

2. RBW=1MHz, VBW=3MHz

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Restricted band Measurement			
EUT	Live Deck 2		Test Mode: High Channel-5847MHz
Mode	Keeping Transmitting		Input Voltage DC3.85V
Temperature	24 deg. C,		Humidity 56% RH
Test Result:	Pass		Detector PK
5850	PK (dBμV/m)	66.18(PK)	Limit -17dBm/MHz
	EIRP (dBm)	-29.02	
Polarity	Horizontal		--

Remark: 1. According to KDB 789033 D02 General UNII Test Procedures New Rules v01 section G) d) (ii), for measurement above 1000MHz@3m distance, the limit of EIRP is calculated as follows:

$$\text{EIRP[dBm]} = \text{E[dB}\mu\text{V/m]} - 95.2$$

For Example, if $\text{E[dB}\mu\text{V/m]} = 66.18\text{dB}\mu\text{V/m}$,

$$\text{EIRP[dBm]} = \text{E[dB}\mu\text{V/m]} - 95.2 = 66.18 - 95.2 = -29.02\text{dBm}$$

2. RBW=1MHz, VBW=3MHz

Restricted band Measurement			
EUT	Live Deck 2		Test Mode: High Channel-5847MHz
Mode	Keeping Transmitting		Input Voltage DC3.85V
Temperature	24 deg. C,		Humidity 56% RH
Test Result:	Pass		Detector PK
5850	PK (dBμV/m)	68.30 (PK)	Limit -17dBm/MHz
	EIRP (dBm)	-26.90	
Polarity	Vertical		--

Remark: 1. According to KDB 789033 D02 General UNII Test Procedures New Rules v01 section G) d) (ii), for measurement above 1000MHz@3m distance, the limit of EIRP is calculated as follows:

$$\text{EIRP[dBm]} = \text{E[dB}\mu\text{V/m]} - 95.2$$

For Example, if $\text{E[dB}\mu\text{V/m]} = 68.30\text{dB}\mu\text{V/m}$,

$$\text{EIRP[dBm]} = \text{E[dB}\mu\text{V/m]} - 95.2 = 68.30 - 95.2 = -26.90\text{dBm}$$

2. RBW=1MHz, VBW=3MHz

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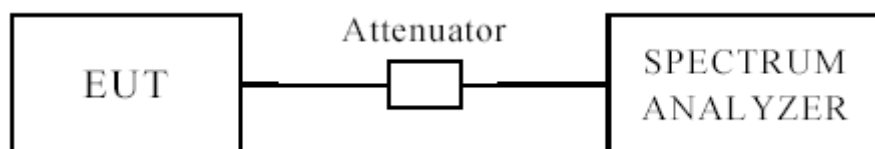
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7.0 Emission Bandwidth

7.1 Test Setup



7.3 Test Procedure for Emission Bandwidth

1. Set RBW = approximately 1% of the emission bandwidth.
2. Set VBW > 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 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

7.4 Test Procedure for Minimum Bandwidth for the Band 5725-5850MHz

1. Set RBW = 100 kHz.
2. Set $VBW \geq 3 \times RBW$.
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 frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

7.5 Test Procedure for 99% Bandwidth

1. Set center frequency to the nominal EUT channel center frequency
2. Set span = 1.5 times to 5.0 times OBW
3. Set RBW = 1% TO 5% of the OBW
4. Set $VBW \geq 3 \times RBW$
5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Other, peak detection and max mode (until trace stabilizes) shall be used.
6. Use the 99% power bandwidth function of the instrument

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7.6 Test Result

Mode	TX Type	Frequency (MHz)	Ant	99% Occupied Bandwidth (MHz)	Verdict
				Result	
QPSK	MIMO	5728	1	1.234	Pass
		5788	1	1.221	Pass
		5847	1	1.237	Pass
16QAM	MIMO	5728	1	1.457	Pass
		5788	1	1.269	Pass
		5847	1	1.264	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.

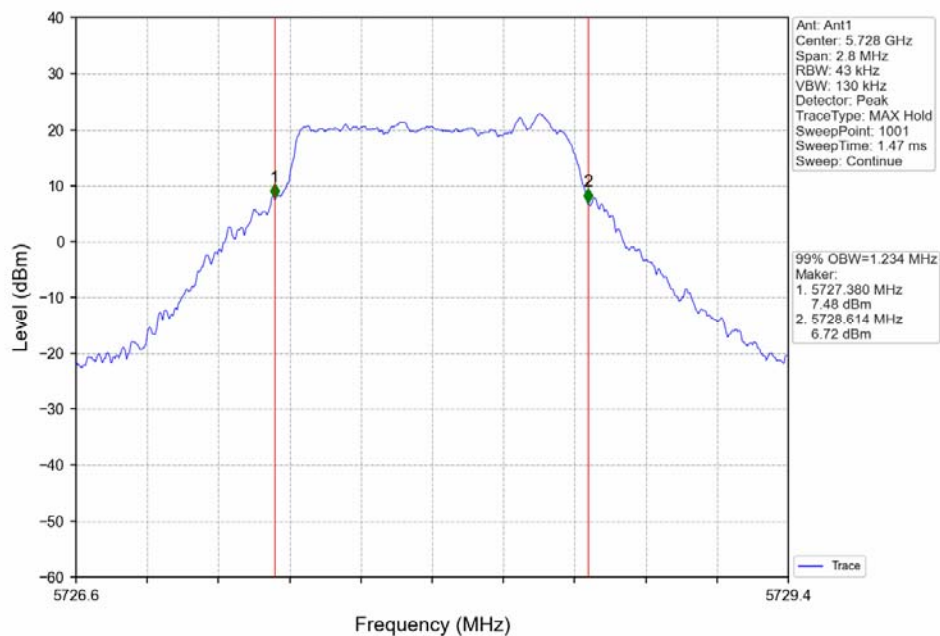
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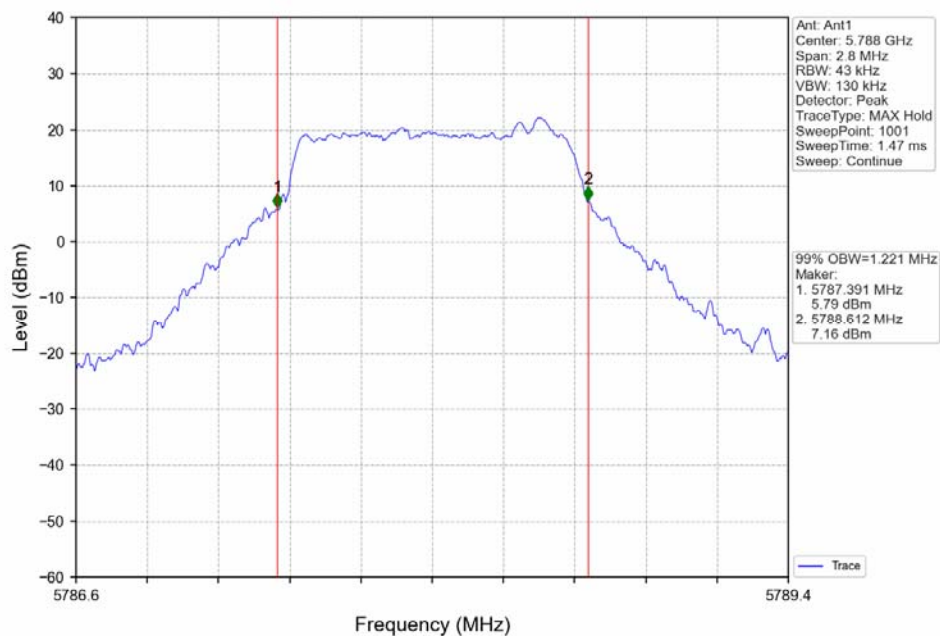
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QPSK_LCH_5728MHz_Ant1_NTNV



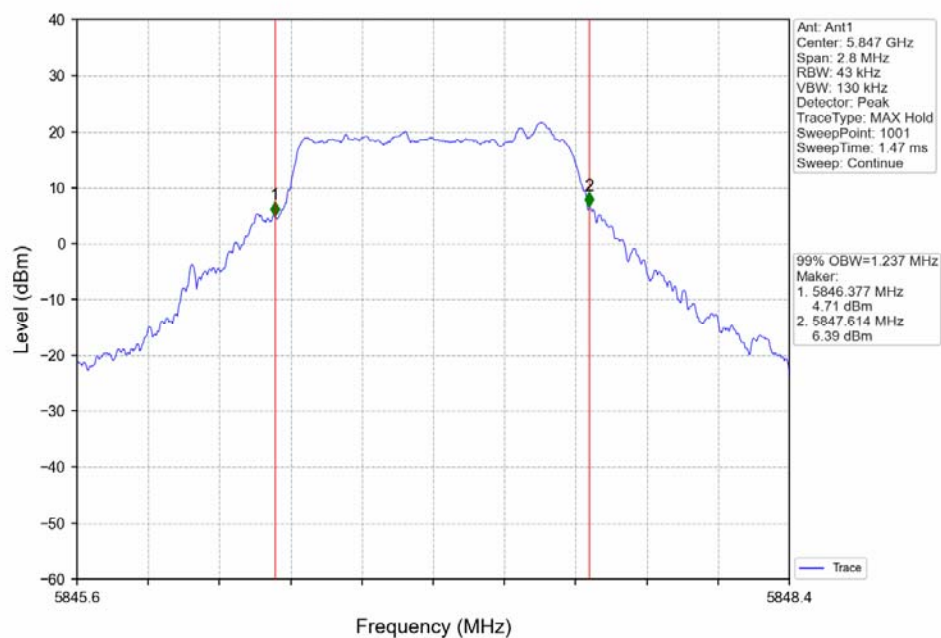
QPSK_MCH_5788MHz_Ant1_NTNV



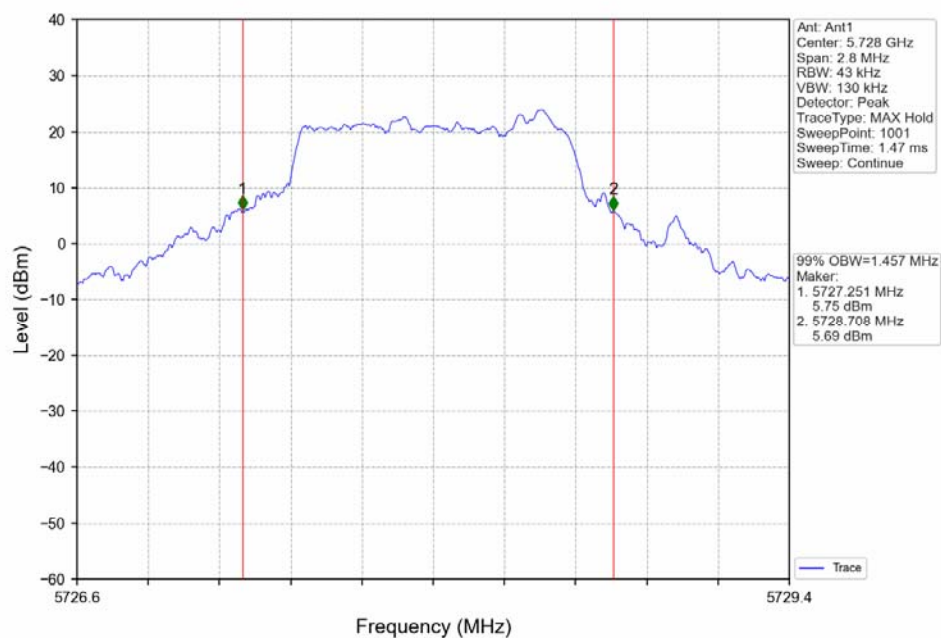
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QPSK_HCH_5847MHz_Ant1_NTNV



16QAM_LCH_5728MHz_Ant1_NTNV



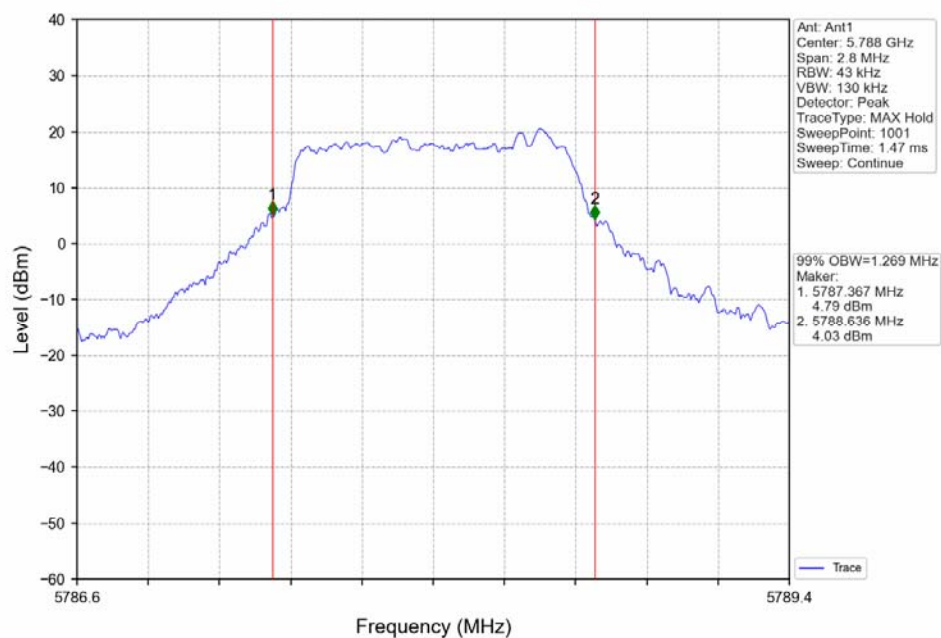
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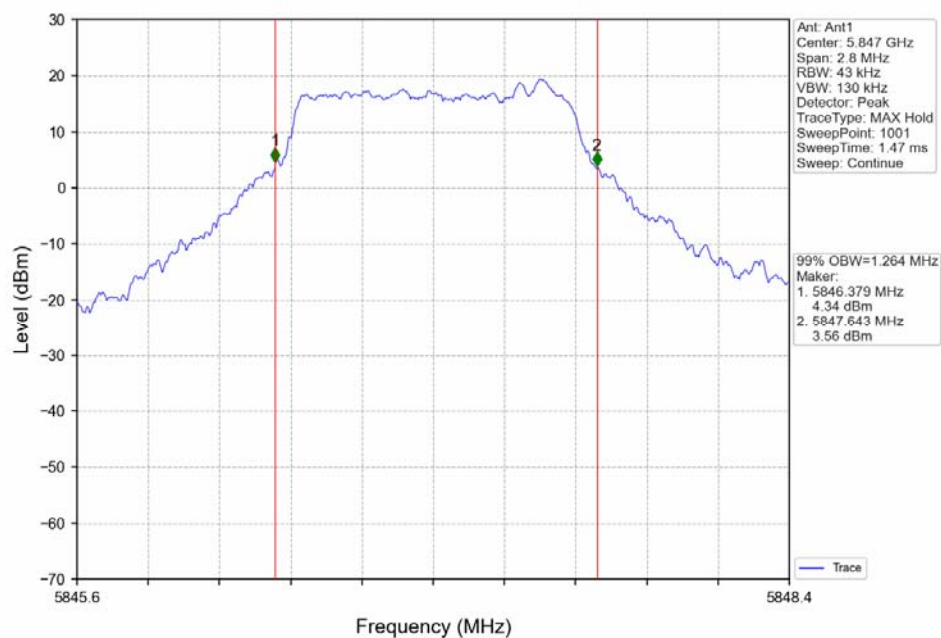
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16QAM_MCH_5788MHz_Ant1_NTNV



16QAM_HCH_5847MHz_Ant1_NTNV



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Mode	TX Type	Frequency (MHz)	Ant	6dB Bandwidth (MHz)		Verdict
				Result	Limit	
QPSK	MIMO	5728	1	1.159	≥ 0.5	Pass
		5788	1	1.155	≥ 0.5	Pass
		5847	1	1.158	≥ 0.5	Pass
16QAM	MIMO	5728	1	1.137	≥ 0.5	Pass
		5788	1	1.156	≥ 0.5	Pass
		5847	1	1.157	≥ 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.

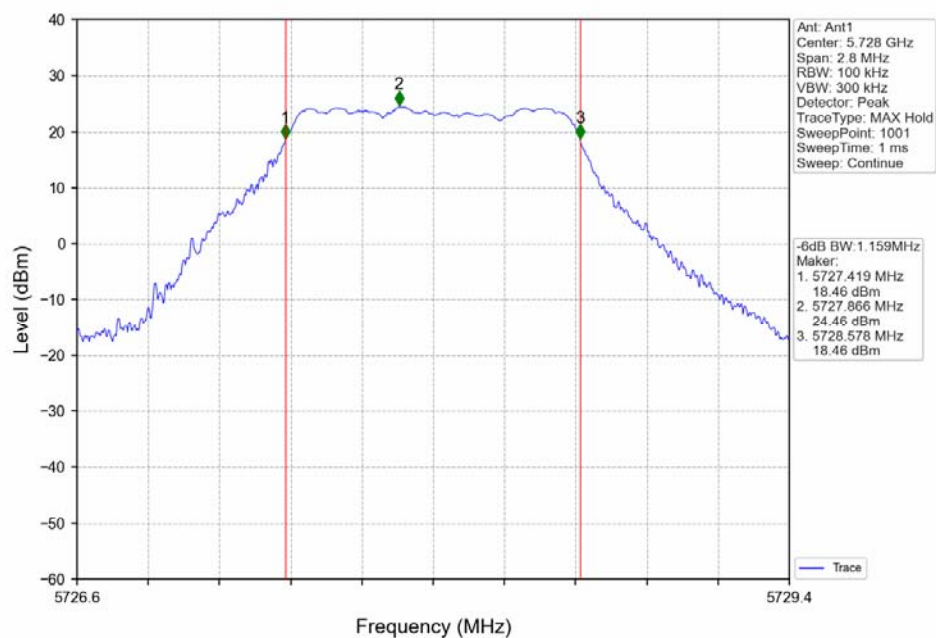
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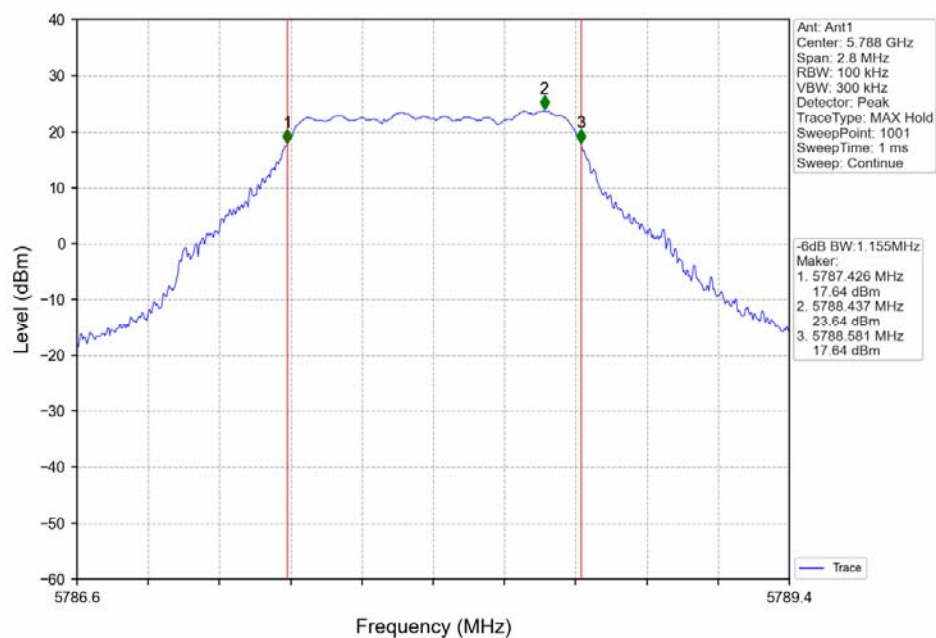
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QPSK_LCH_5728MHz_Ant1_NTNV



QPSK_MCH_5788MHz_Ant1_NTNV



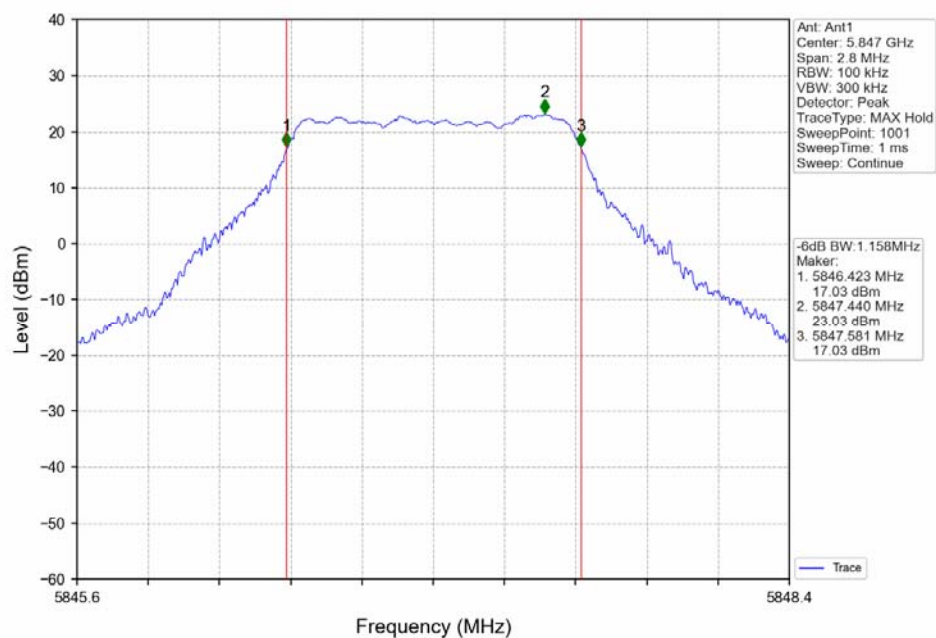
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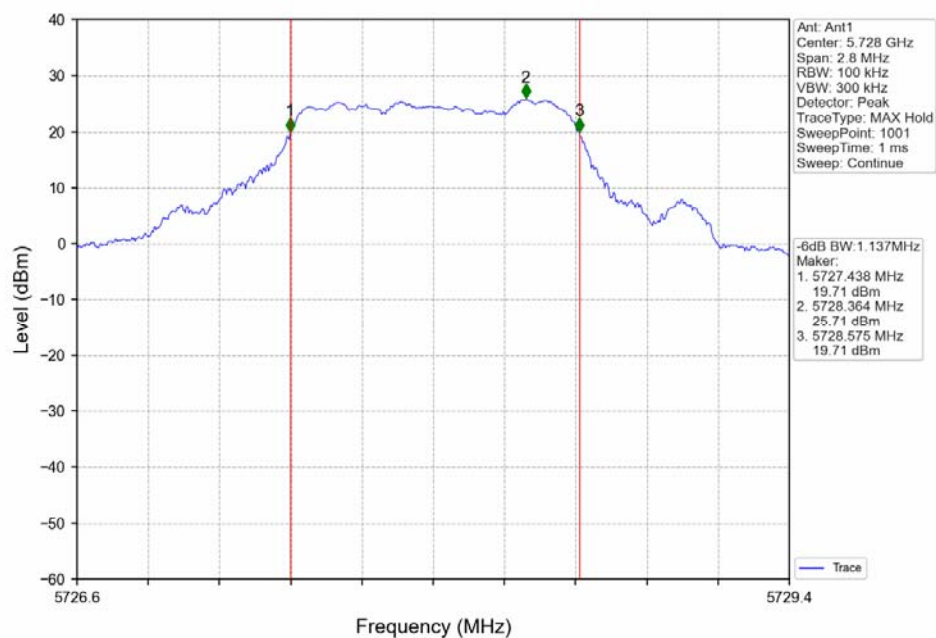
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QPSK_HCH_5847MHz_Ant1_NTNV



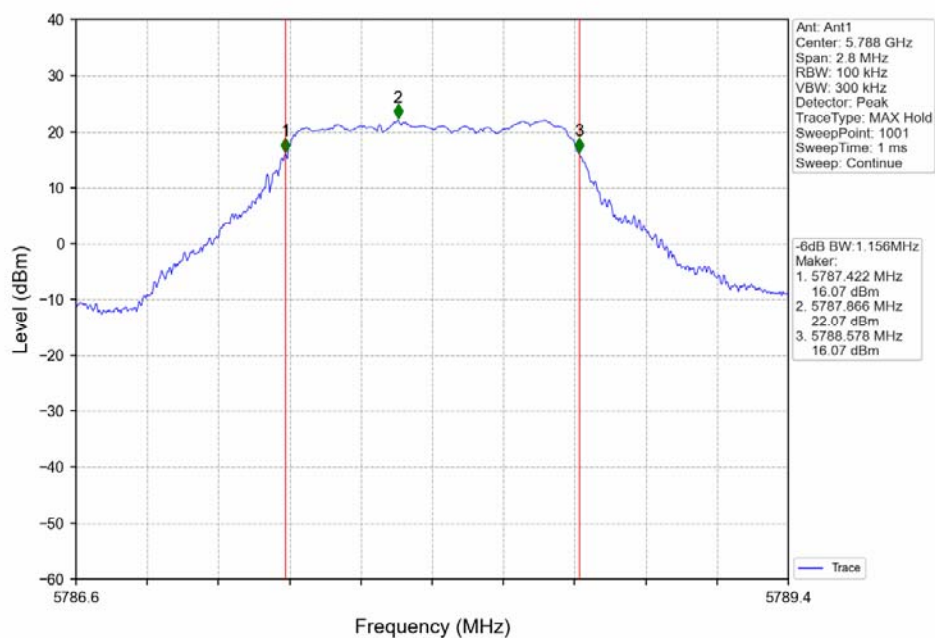
16QAM_LCH_5728MHz_Ant1_NTNV



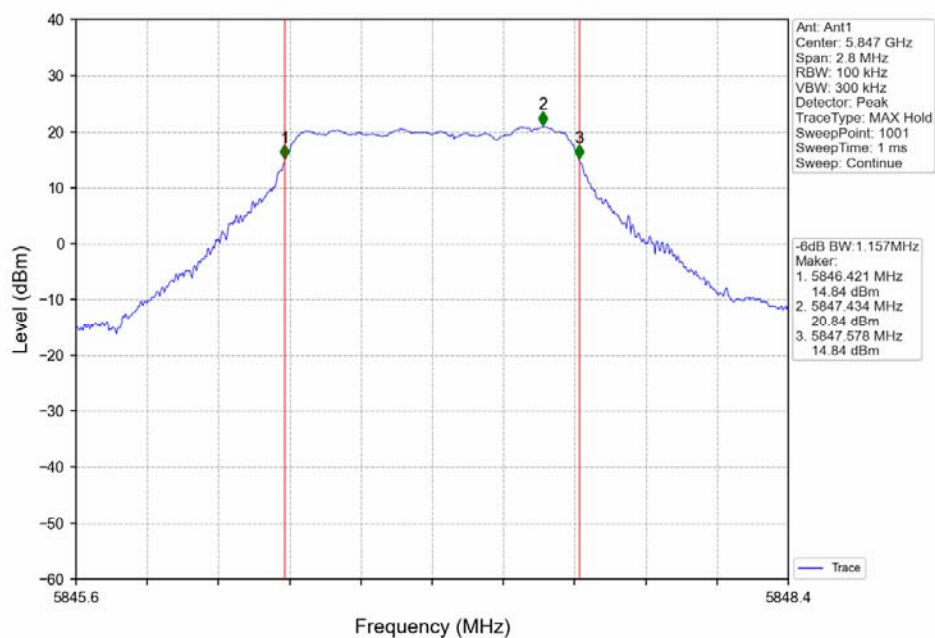
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16QAM_MCH_5788MHz_Ant1_NTNV



16QAM_HCH_5847MHz_Ant1_NTNV

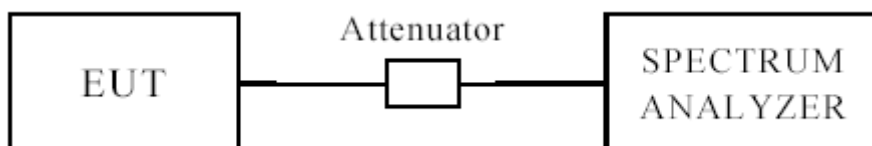


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8.0 Peak Transmit Power Measurement

8.1 Test Setup



8.2 Limits of Peak Transmit Power Measurement

Operation Band	EUT Category		Limit
U-NII-1		Outdoor Access Point	1 Watt (30 dBm) $\cong$ (Max. e.i.r.p 125mW (21 dBm) at any elevation angle above 30 degrees as measured from the horizon)
		Fixed point-to-point Access Point	1 Watt (30 dBm)
		Indoor Access Point	1 Watt (30 dBm)
	✓	Mobile and Portable client device	250mW (24 dBm)
U-NII-2A	--		250mW (24 dBm) or 11 dBm+10 log B*
U-NII-2C	--		250mW (24 dBm) or 11 dBm+10 log B*
U-NII-3	--		1 Watt (30 dBm)

Note: Where B is the 26dB emission bandwidth in MHz.

8.3 Test Procedure

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

Note: the average power was 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	5728	24.73	24.53	27.64	<=30	Pass
		5788	24.17	25.21	27.73	<=30	Pass
		5847	22.96	25.42	27.37	<=30	Pass
16QAM	MIMO	5728	23.85	24.50	27.20	<=30	Pass
		5788	24.31	23.72	27.04	<=30	Pass
		5847	22.23	23.14	25.72	<=30	Pass
Note1: Antenna Gain: Ant1: 2.90dBi; Ant2: 2.90dBi;							
Note2: Directional Gain: Uncorrelated(Directional Gain = Ant Gain)							

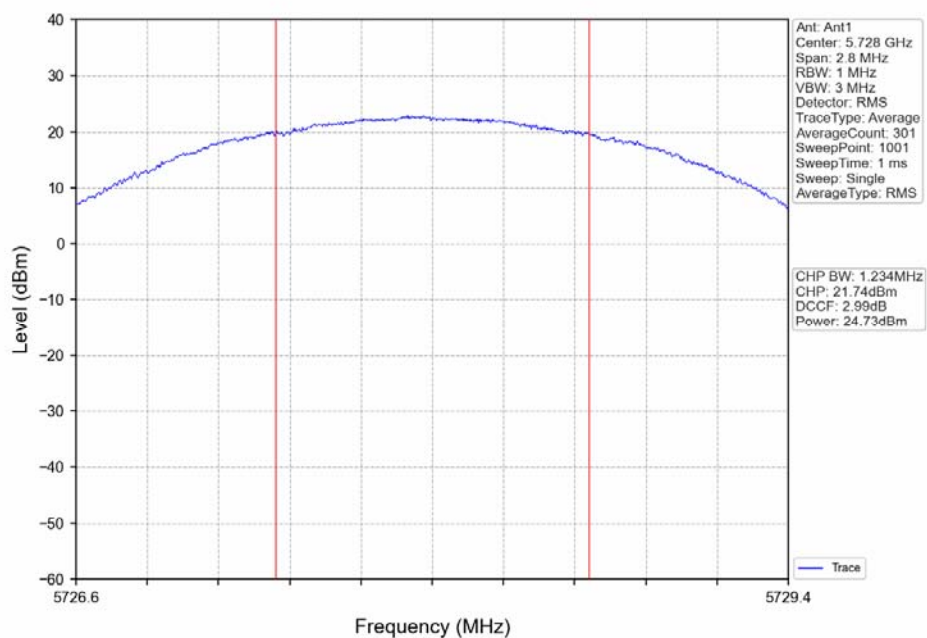
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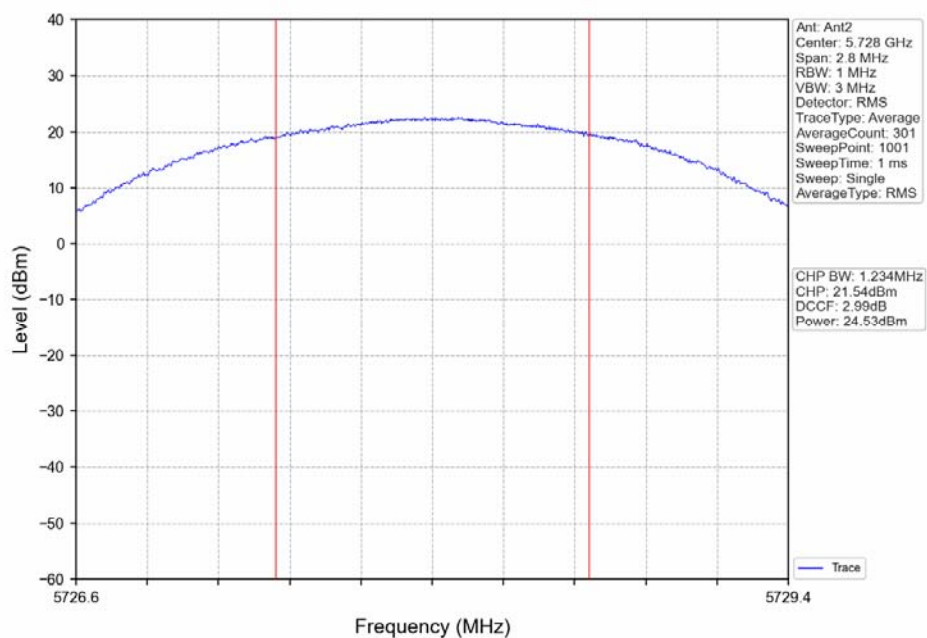
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QPSK_LCH_5728MHz_Ant1_NTNV



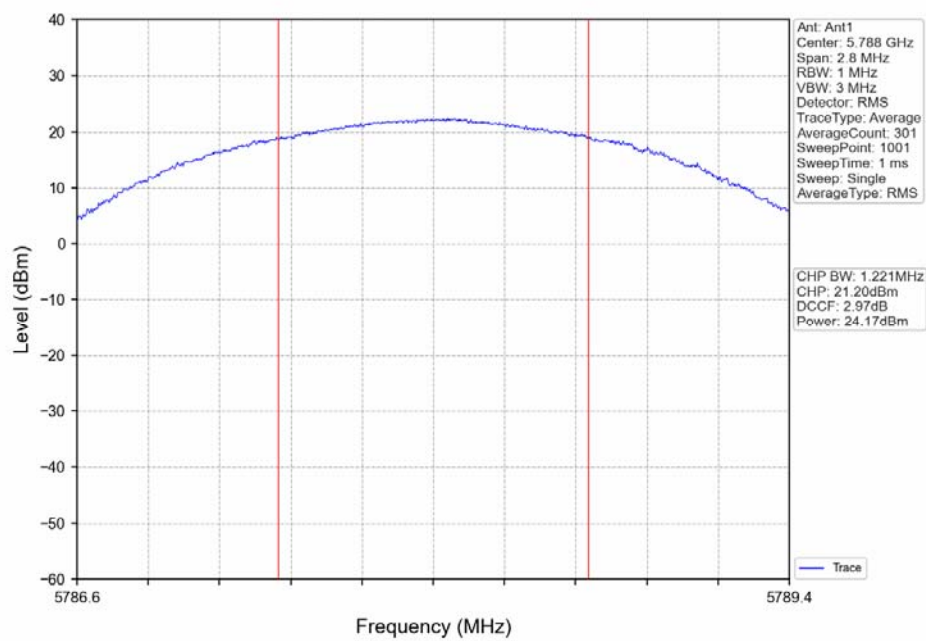
QPSK_LCH_5728MHz_Ant2_NTNV



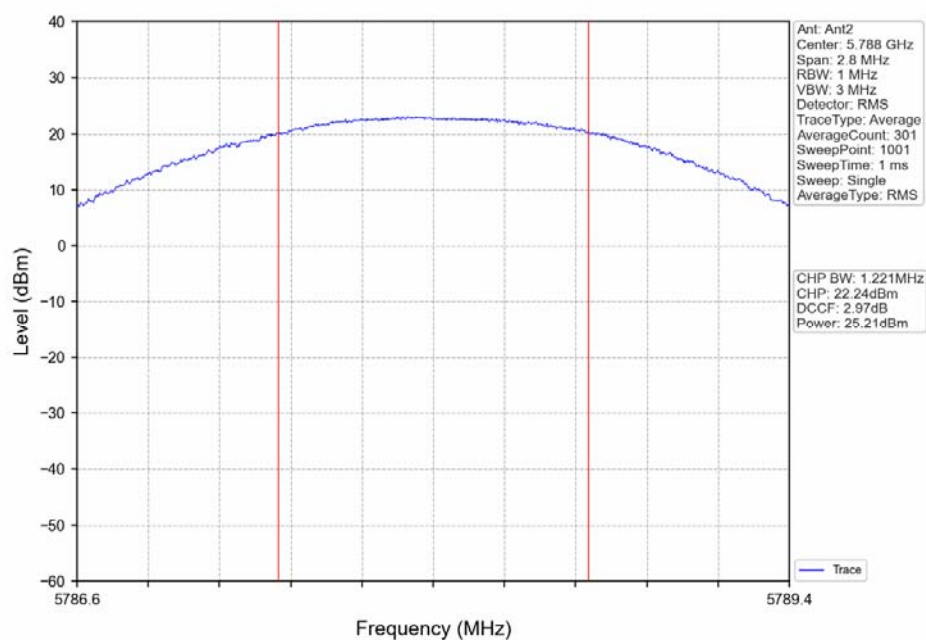
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QPSK_MCH_5788MHz_Ant1_NTNV



QPSK_MCH_5788MHz_Ant2_NTNV



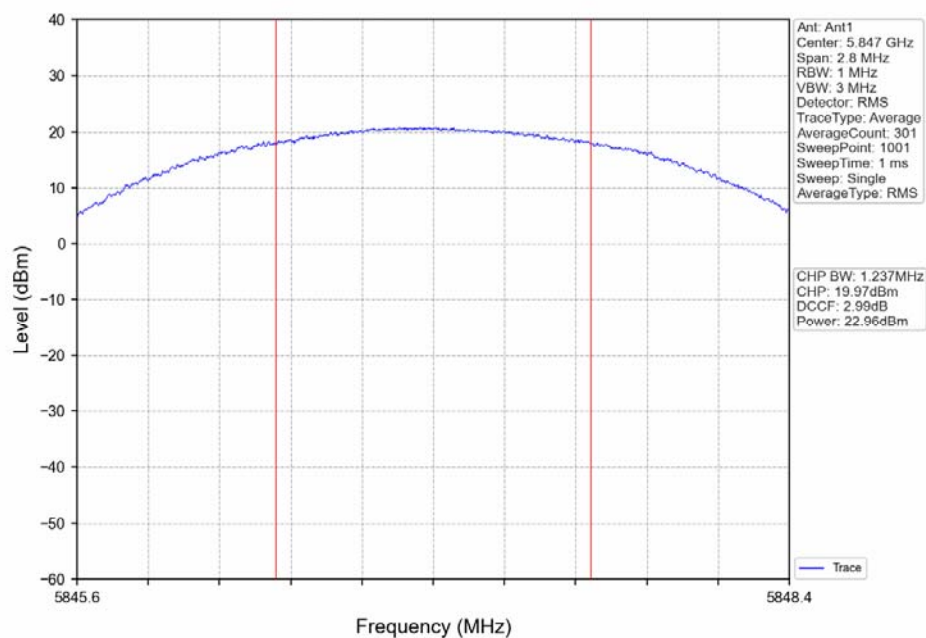
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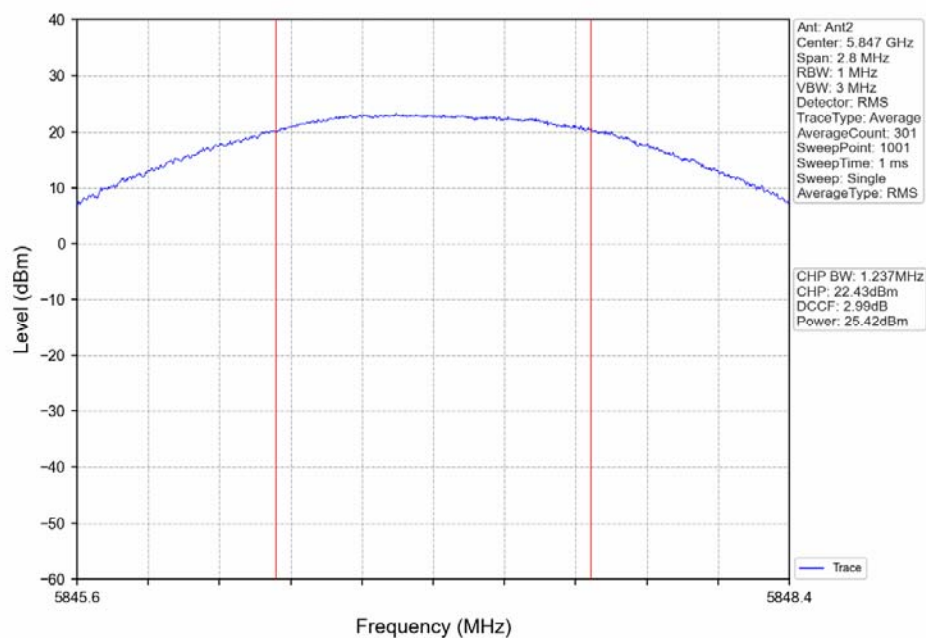
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QPSK_HCH_5847MHz_Ant1_NTNV



QPSK_HCH_5847MHz_Ant2_NTNV



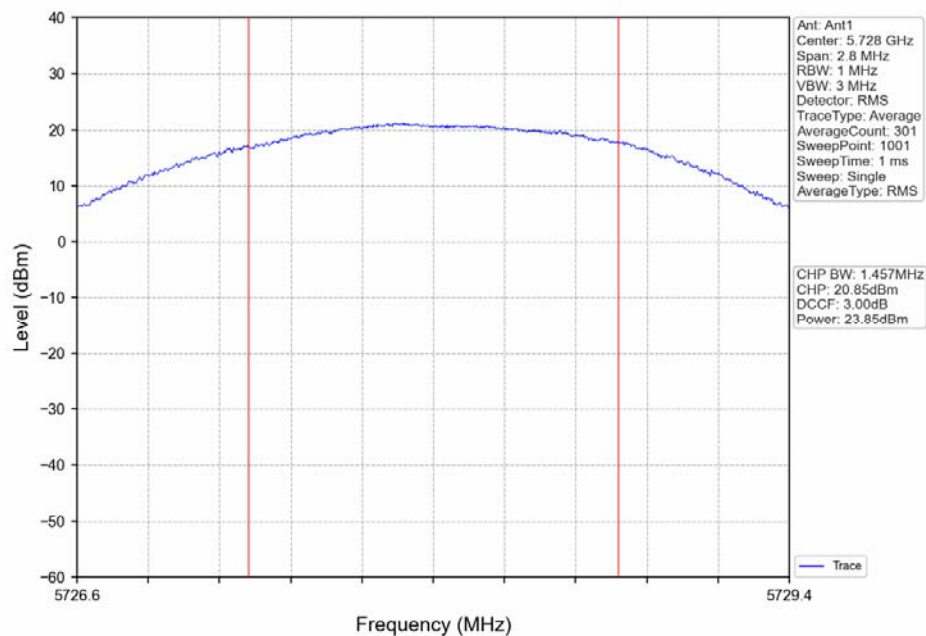
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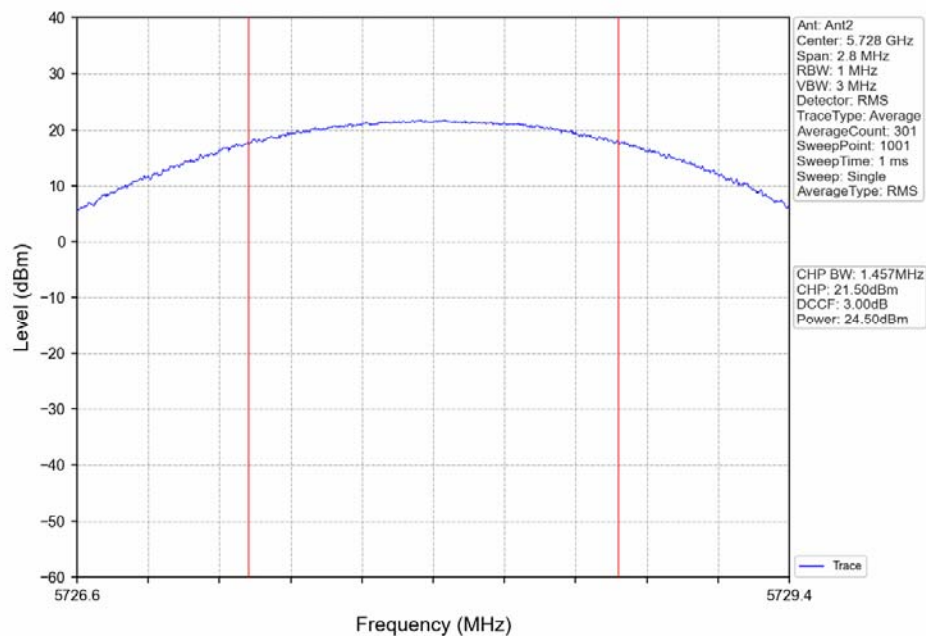
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16QAM_LCH_5728MHz_Ant1_NTNV



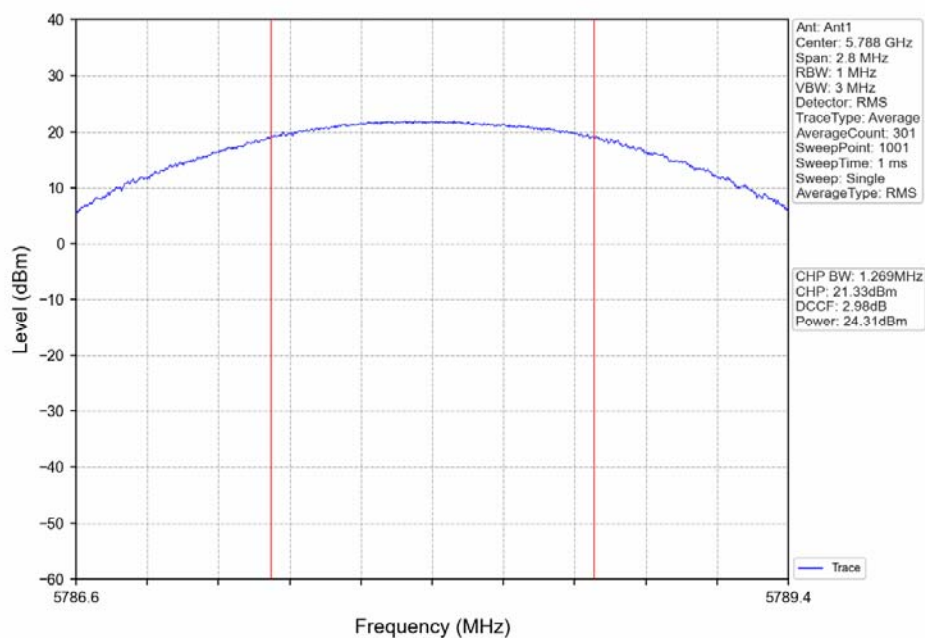
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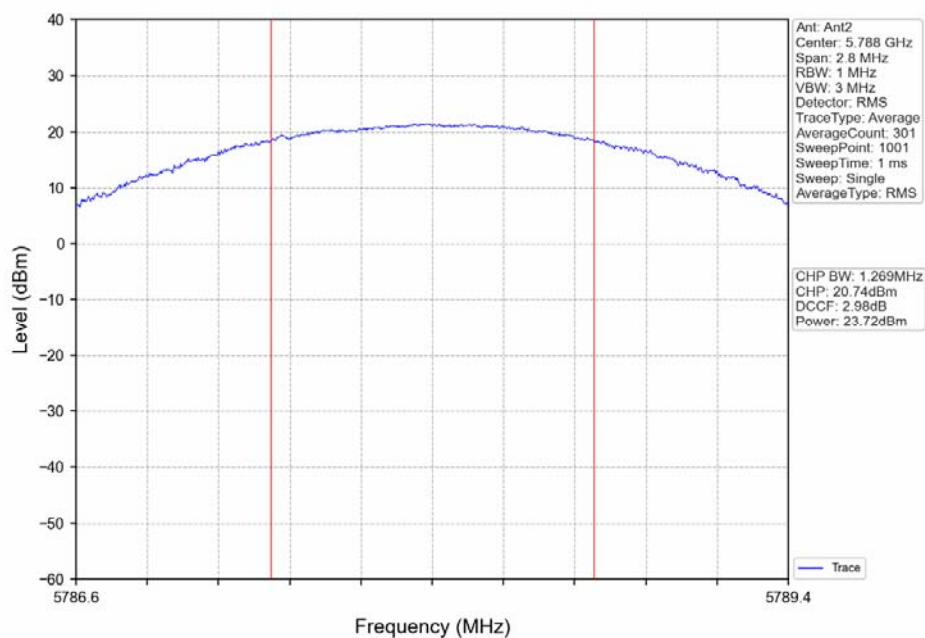
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16QAM_MCH_5788MHz_Ant1_NTNV



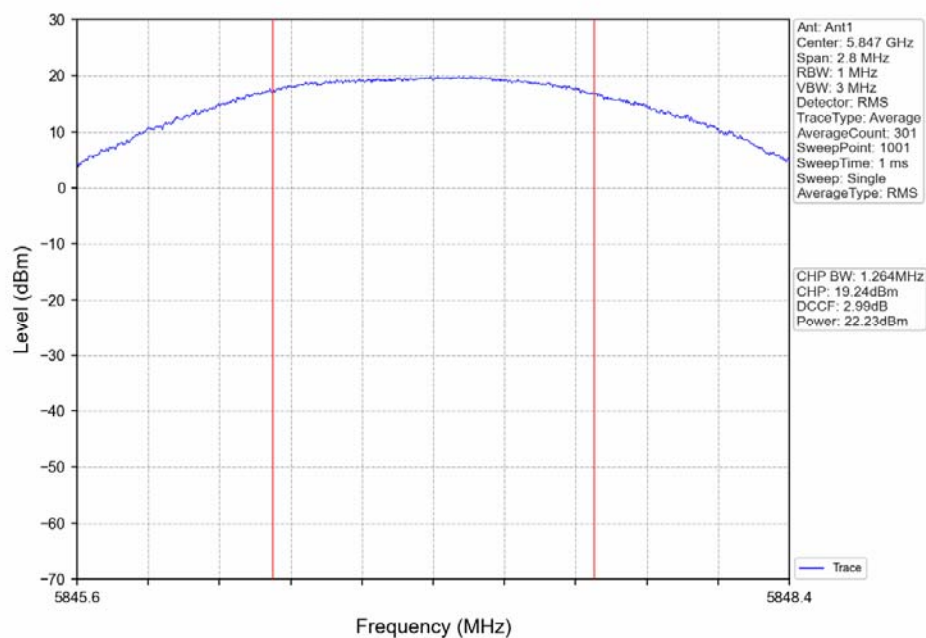
16QAM_MCH_5788MHz_Ant2_NTNV



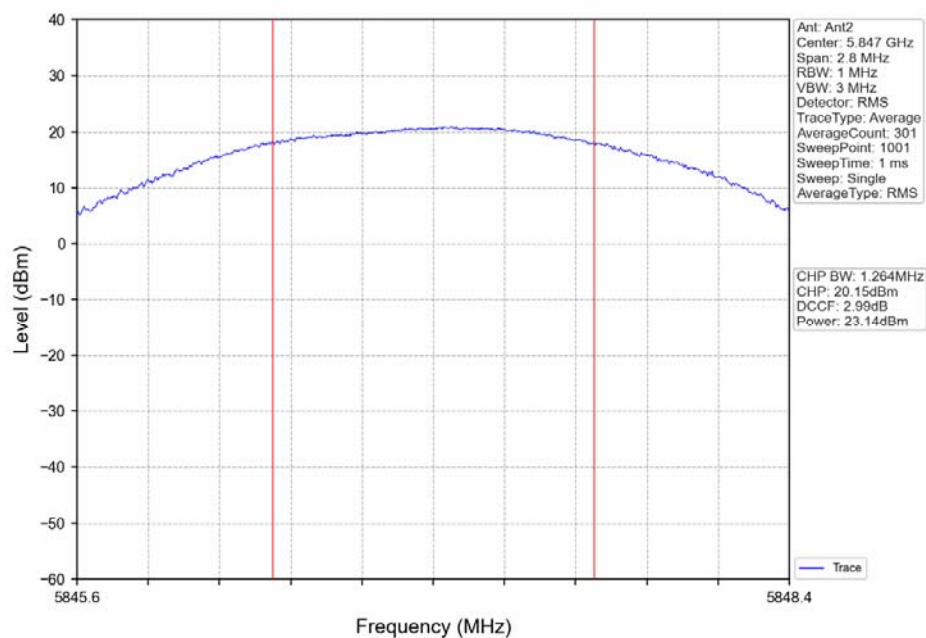
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16QAM_HCH_5847MHz_Ant1_NTNV



16QAM_HCH_5847MHz_Ant2_NTNV



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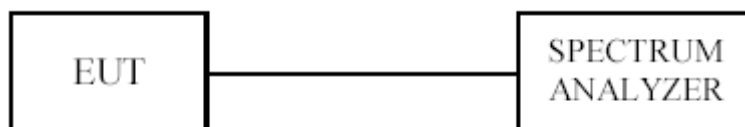
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9. Power Spectral Density Measurement

9.1 Test Setup



9.2 Limits of Power Spectral Density Measurement

Operation Band	EUT Category		Limit
U-NII-1		Outdoor Access Point	17dBm/MHz
		Fixed point-to-point Access Point	
		Indoor Access Point	
	√	Mobile and Portable client device	11dBm/MHz
U-NII-2A	--		11dBm/MHz
U-NII-2C	--		11dBm/MHz
U-NII-3	--		30dBm/500kHz

9.3 Test Procedure

1. The EUT was directly connected to the spectrum analyzer
2. Set the RBW = 300kHz
3. Set the VBW = 1MHz
4. Set the span to encompass the entire emissions bandwidth (EBW) of the signal
5. Detector = RMS
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.

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9.4 Test Result

Mode	TX Type	Frequency (MHz)	Maximum PSD (dBm/500kHz)				Verdict
			Ant1	Ant2	MIMO	Limit	
QPSK	MIMO	5728	24.21	24.17	26.94	<=30	Pass
		5788	23.15	24.20	26.52	<=30	Pass
		5847	22.31	24.37	26.25	<=30	Pass
16QAM	MIMO	5728	23.11	23.16	25.84	<=30	Pass
		5788	22.79	23.98	26.23	<=30	Pass
		5847	22.18	25.35	26.83	<=30	Pass
Note1: Antenna Gain: Ant1: 2.90dBi; Ant2: 2.90dBi;							

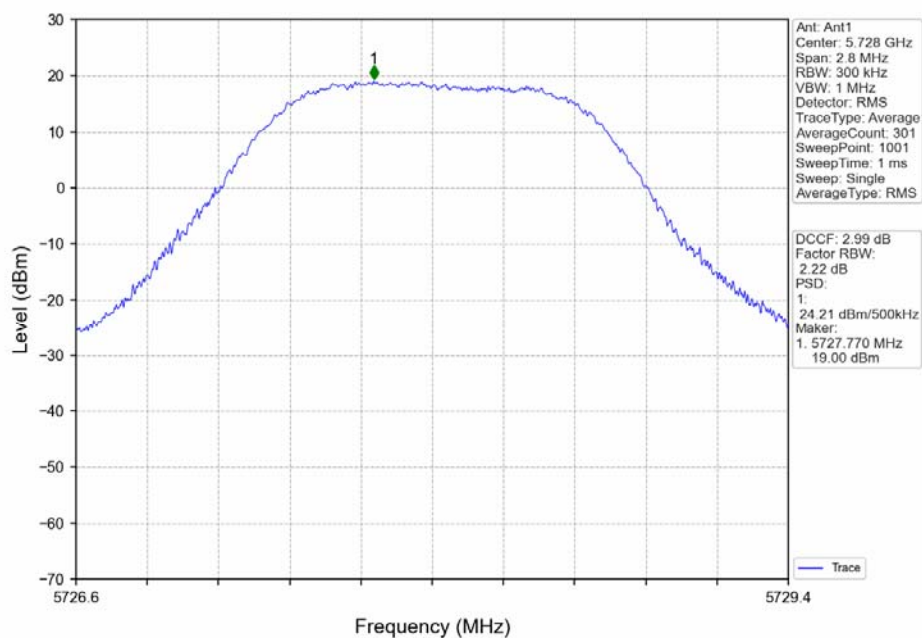
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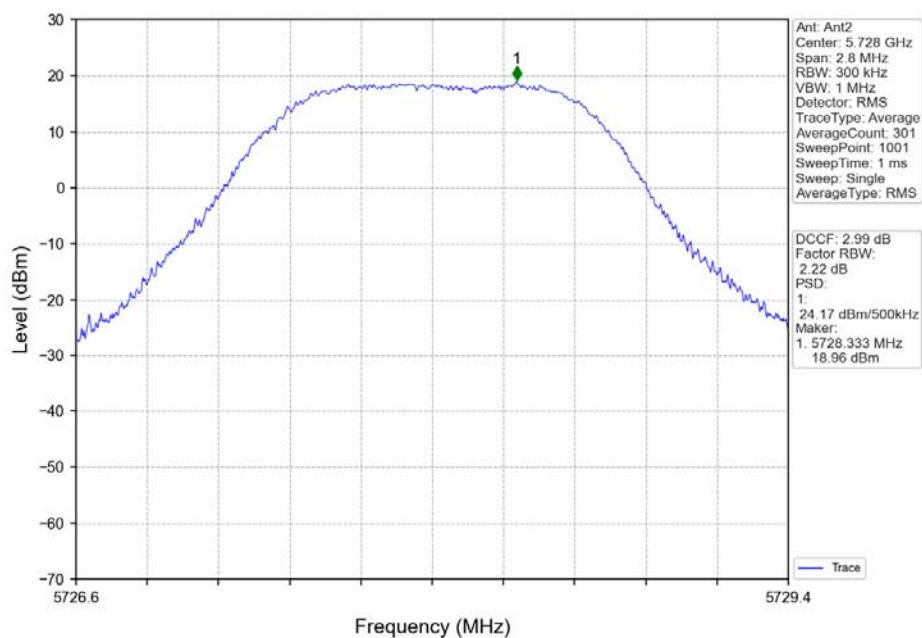
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QPSK_LCH_5728MHz_Ant1_NTNV



QPSK_LCH_5728MHz_Ant2_NTNV



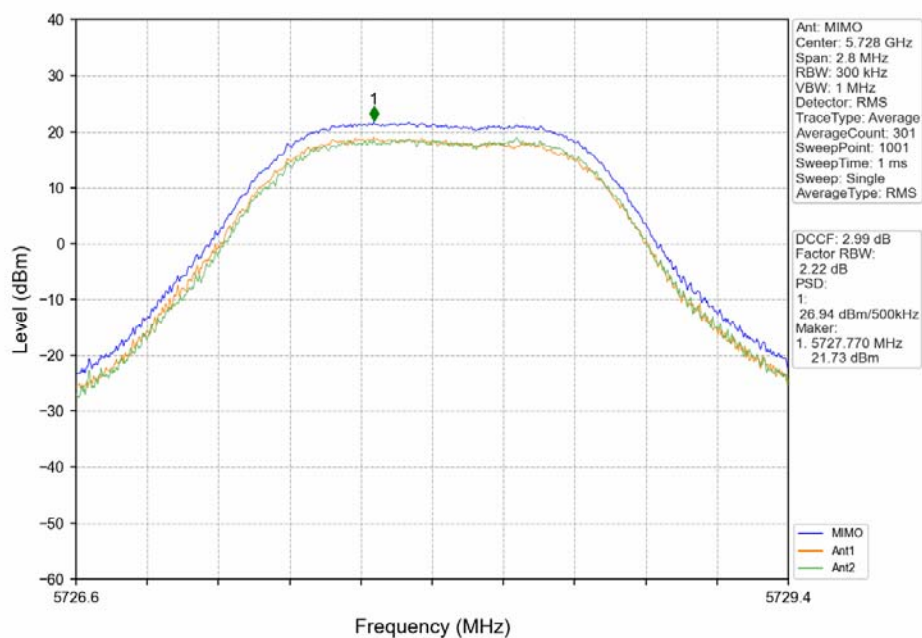
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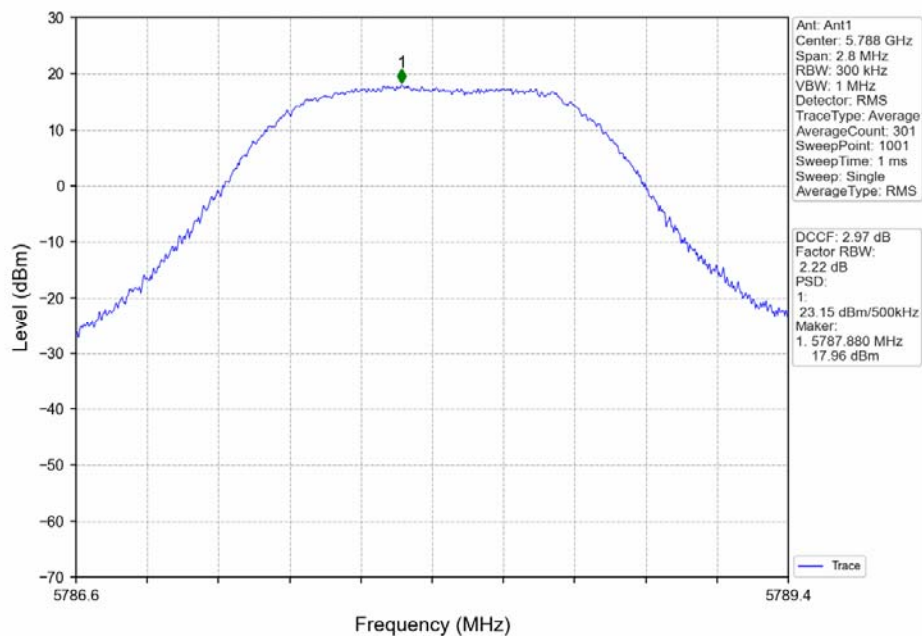
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QPSK_LCH_5728MHz_MIMO_NTNV



QPSK_MCH_5788MHz_Ant1_NTNV



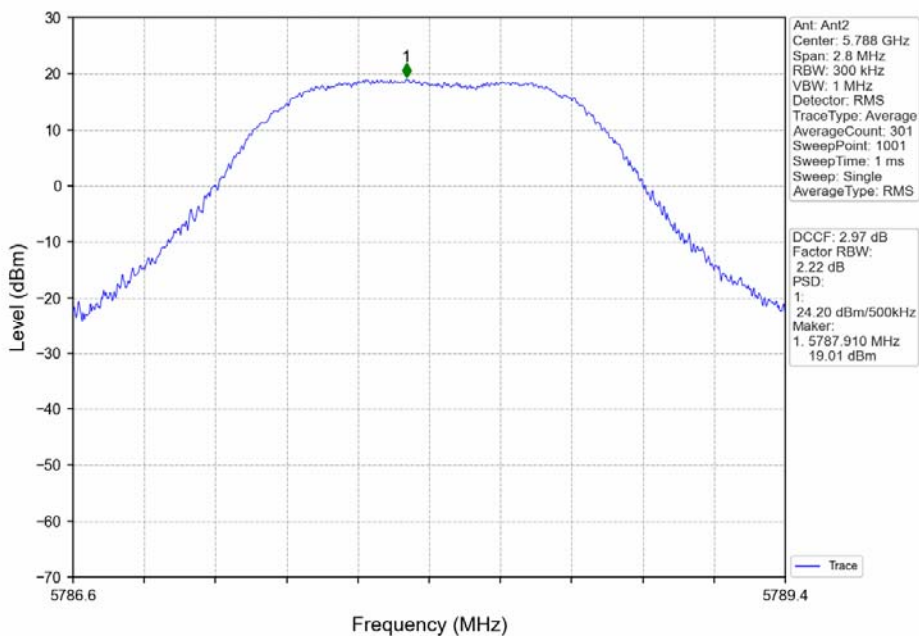
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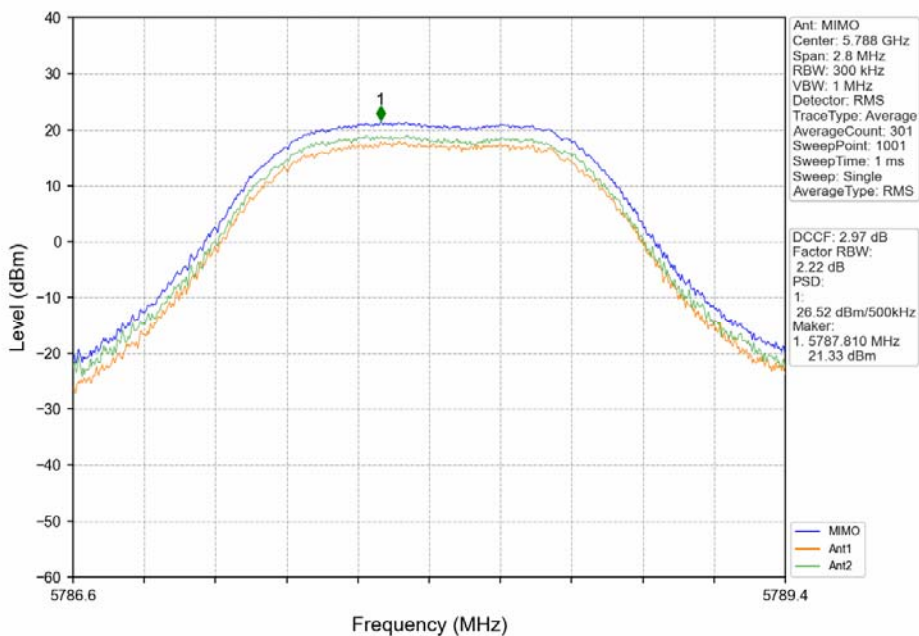
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QPSK_MCH_5788MHz_Ant2_NTNV



QPSK_MCH_5788MHz_MIMO_NTNV



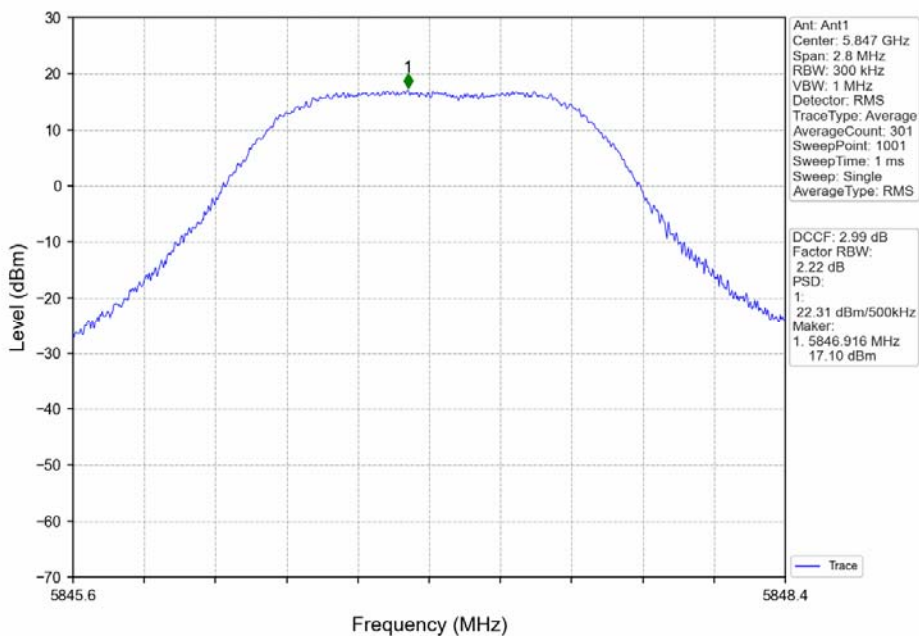
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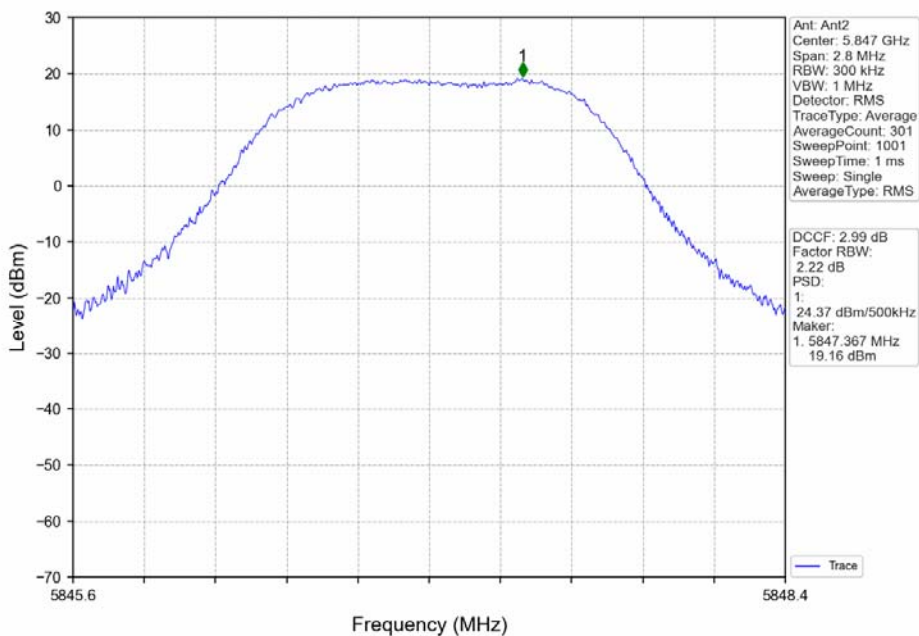
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QPSK_HCH_5847MHz_Ant1_NTNV



QPSK_HCH_5847MHz_Ant2_NTNV



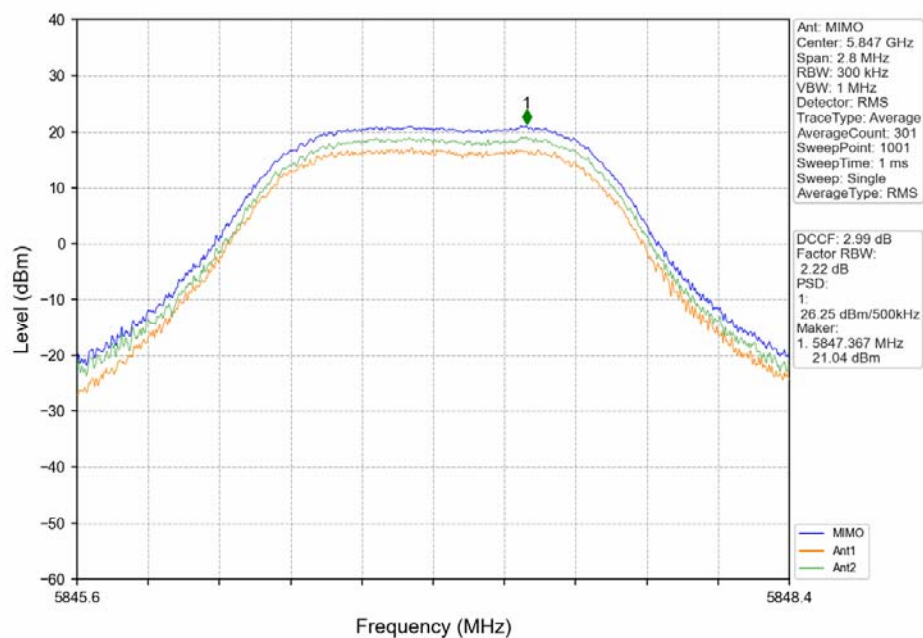
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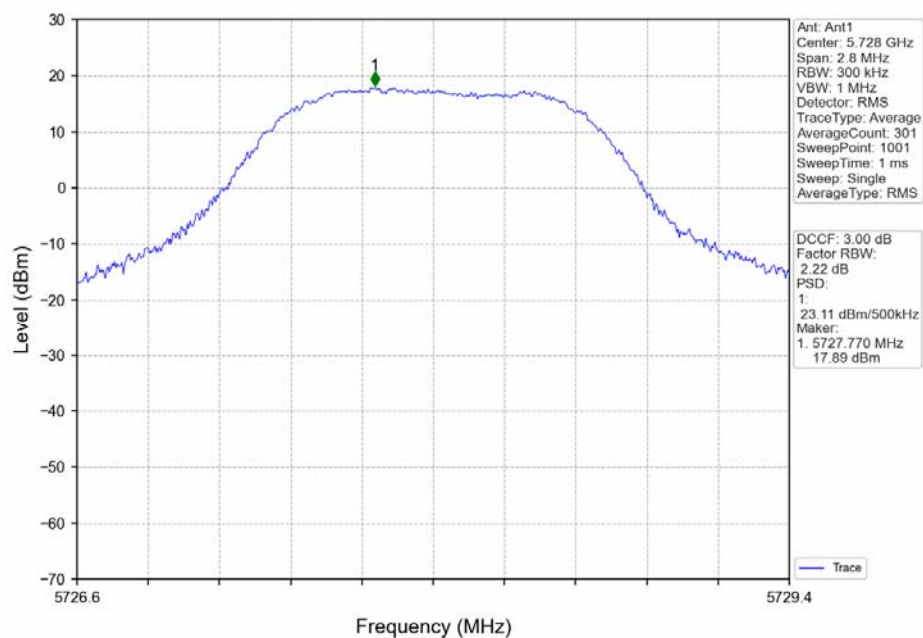
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QPSK_HCH_5847MHz_MIMO_NTNV



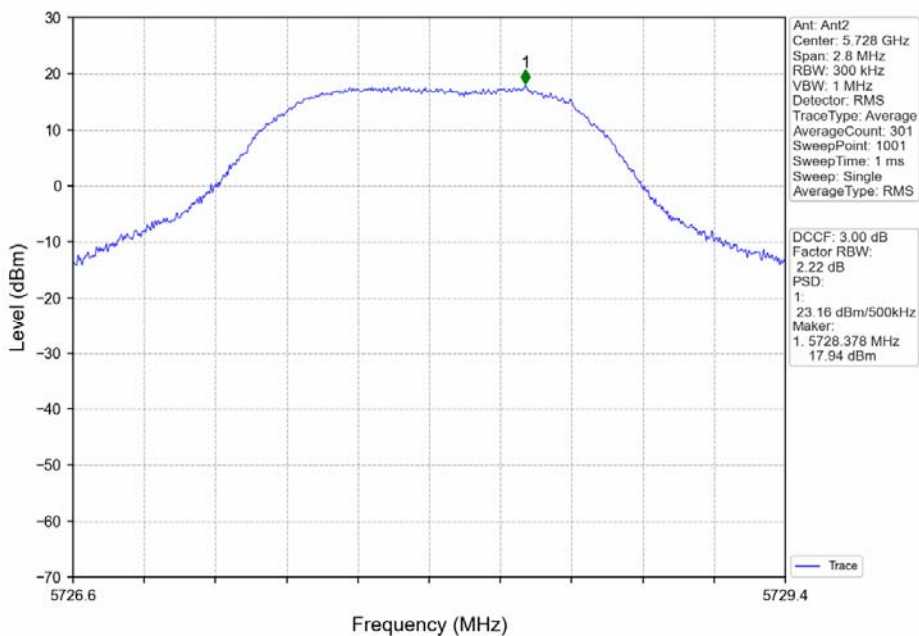
16QAM_LCH_5728MHz_Ant1_NTNV



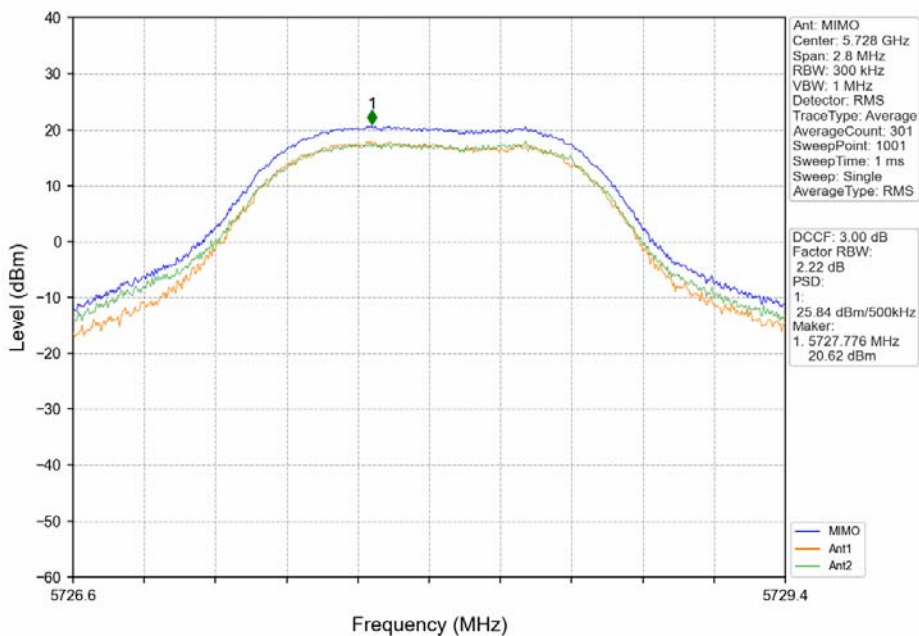
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16QAM_LCH_5728MHz_Ant2_NTNV



16QAM_LCH_5728MHz_MIMO_NTNV



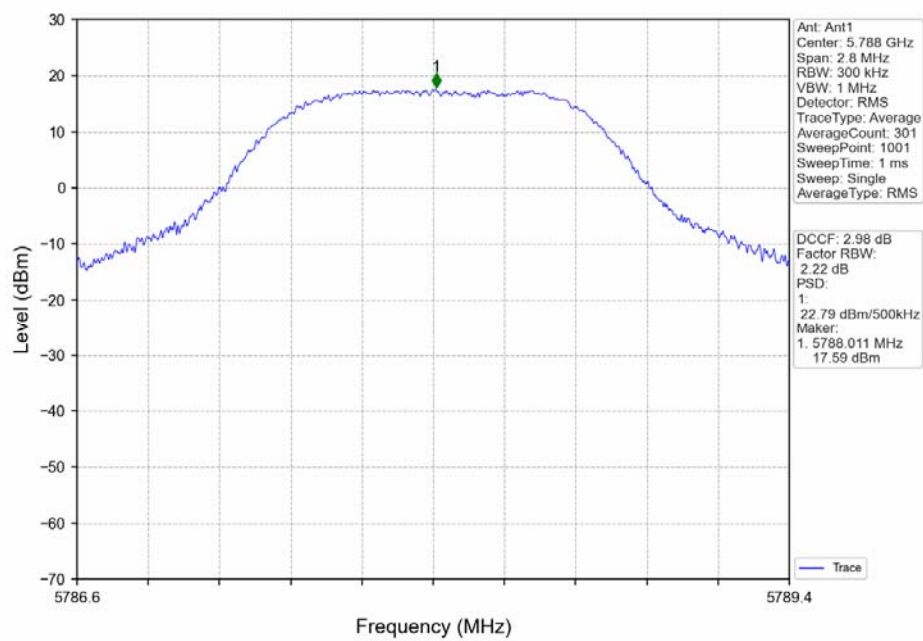
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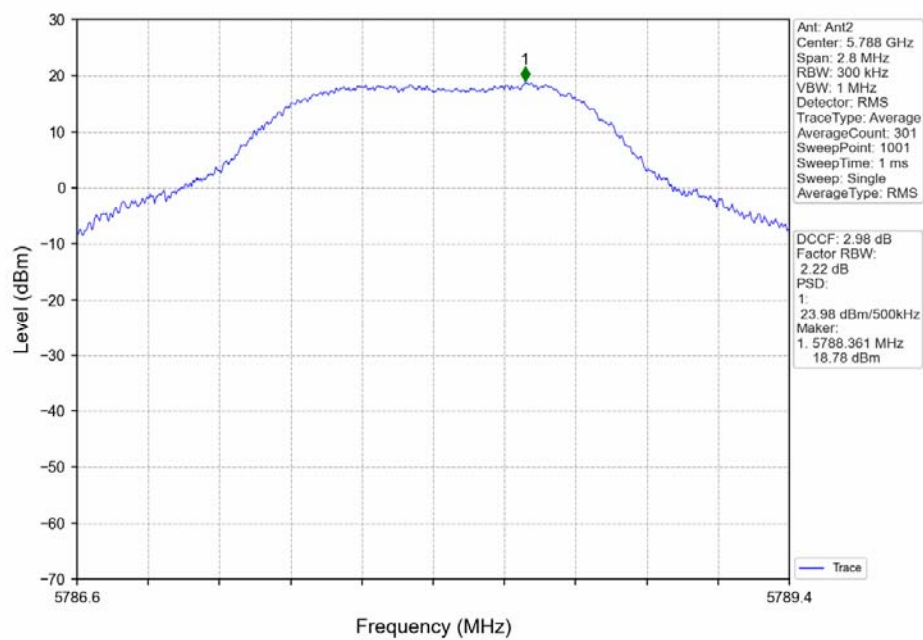
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16QAM_MCH_5788MHz_Ant1_NTNV



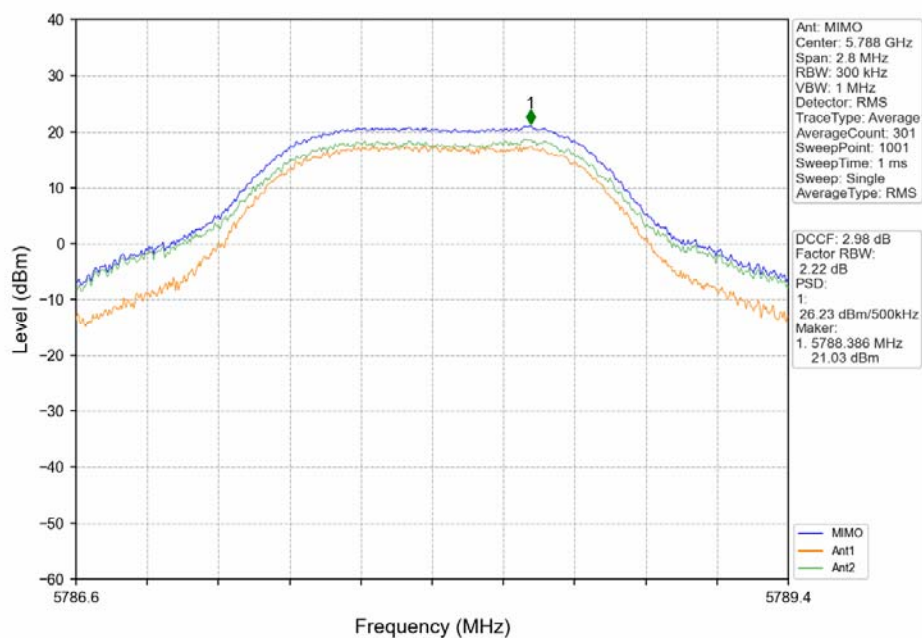
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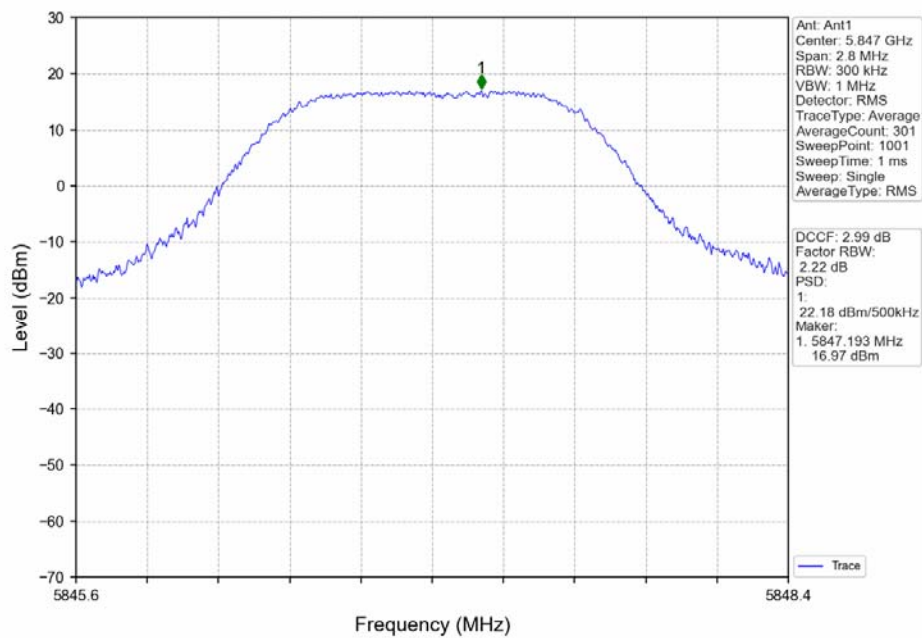
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16QAM_MCH_5788MHz_MIMO_NTNV



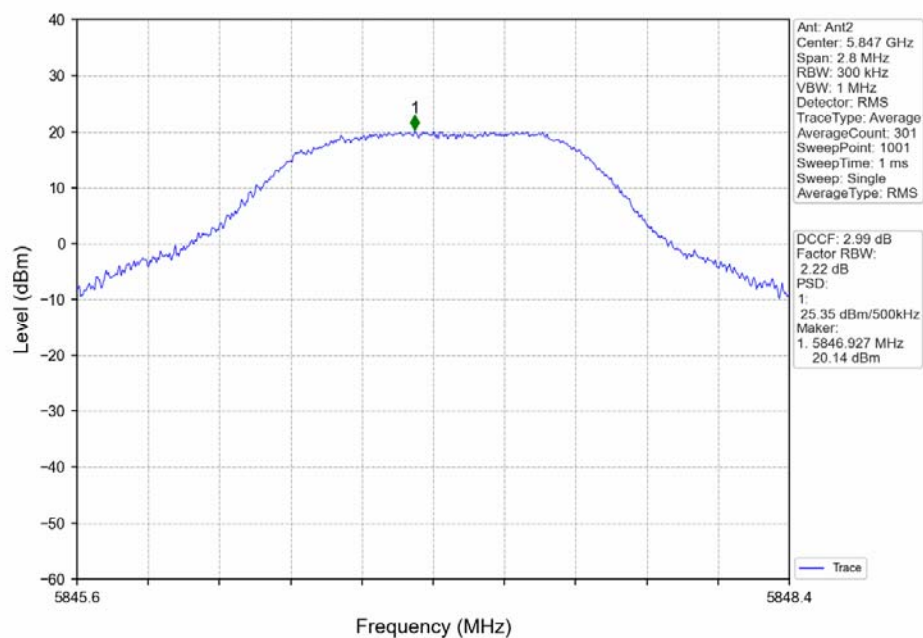
16QAM_HCH_5847MHz_Ant1_NTNV



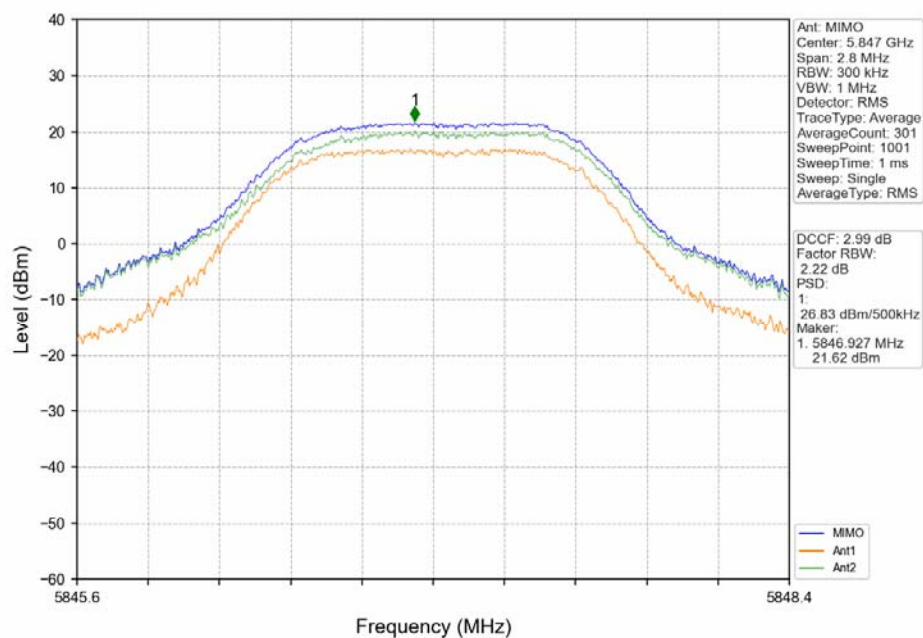
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16QAM_HCH_5847MHz_Ant2_NTNV



16QAM_HCH_5847MHz_MIMO_NTNV



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10.0 Frequency Stability

10.1 Limits of Frequency Stability Measurement

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.02\%$ of the operating frequency over a temperature variation of -30 degrees to 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees

10.2 Test Procedure

1. The EUT was placed inside the environmental test chamber and powered by nominal DC voltage.
2. Turn the EUT on and couple its output to a spectrum analyzer.
3. Turn the EUT off and set the chamber to the highest temperature specified.
4. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.
5. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
6. The test chamber was allowed to stabilize at $+20$ degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

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10.3 Test Result

Test Frequency: 5788MHz

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)
3.85V	5788.0546
3.3V	5788.0539
4.2V	5788.0552
Max. Deviation (MHz)	0.0552
Max. Deviation (ppm)	9.537

Rated working voltage: DC3.85V

Temperature vs. Frequency Stability

Temperature (°C)	Measurement Frequency (MHz)
-30	5788.0563
-20	5788.0559
-10	5788.0548
0	5788.0537
10	5788.0546
20	5788.0551
30	5788.0538
40	5788.0550
50	5788.0543
Max. Deviation (MHz)	0.0563
Max. Deviation (ppm)	9.727

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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 2.9dBi for each one (Get from the antenna specification)

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