FCC/ISED - TEST REPORT

Report Number	: 68.950.23.0971.01	Date of Issue:	2023-12-06
Model/HVIN	: EF-MT-H10-1		
Product Type	: EcoFlow PowerInsight		
Applicant	: EcoFlow Inc.		
Address	: 1st Floor, Building 1, Plant E, Jiehe Industrial City, Shuitian Community, Shiyan Street, Bao'an District, Shenzhen City, Guangdong 518000, China		
Manufacturer	: EcoFlow Inc.		
Address	: 1st Floor, Building 1, Plant E, Jiehe Industrial City, Shuitian Community, Shiyan Street, Bao'an District, Shenzhen City, Guangdong 518000, China		
Test Result	: ■ **Positive** ☐ Negative		
Total pages including Appendices	: 140		

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1 Table of Contents

1 Table of Contents 2
2 Details about the Test Laboratory 3
3 Description of the Equipment Under Test 4
4 Summary of Test Standards 5
5 Summary of Test Results 6
6 General Remarks 7
7 Test Setups 8
8 Systems Test Configuration 10
9 Technical Requirement 11
9.1 Conducted Emission 11
9.2 Conducted Output Power & EIRP 14
9.3 6dB Bandwidth and 99% Occupied Bandwidth 17
9.4 Power Spectral Density 43
9.5 Spurious RF Conducted Emissions 57
9.6 Band Edge 84
9.7 Spurious Radiated Emissions for Transmitter 94
10 Test Equipment List 139
11 System Measurement Uncertainty 140

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2 Details about the Test Laboratory

Details about the Test Laboratory
Test Site 1

Company name:	TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch Building 12 & 13, Zhiheng Wisdomland Business Park, Guankou Erlu, Nantou, Nanshan District, Shenzhen, Guangdong, China
Telephone:	86 755 8828 6998
Fax:	86 755 8828 5299
FCC Registration No.:	514049
FCC Designation Number:	CN5009
ISED CAB identifier	CN0077
IC Registration No.:	10320A

3 Description of the Equipment Under Test

Product:	EcoFlow PowerInsight
Model no.:	EF-MT-H10-1
Hardware Version Identification No. (HVIN)	EF-MT-H10-1
Product Marketing Name (PMN)	EcoFlow PowerInsight
Brand name:	ECOFLOW
FCC ID:	2A2P9-MTH101
IC:	27618-MTH101
Options and accessories:	USB Cable
Rating:	3.8VDC, 3000mAh, 11.4Wh rechargeable Li-ion battery or 5VDC, 2A supplied by external adapter or 5VDC, 2A supplied by charging base
RF Transmission Frequency:	2412MHz-2462MHz for 802.11b/g/n20/n40 (Wi-Fi) 2422MHz-2452MHz for 802.11n40 (Wi-Fi)
No. of Operated Channel:	11 for 802.11b/g/n20 (Wi-Fi) 7 for 802.11n40 (Wi-Fi)
Modulation:	DSSS, OFDM
Antenna Type:	For ESP32-S3-WROOM-1U Module: FPCB For MT7663BSN Module: FPCB
Antenna Type:	FPCB Antenna
Antenna A Gain:	1.36dBi (MT7663BSN Module Antenna, Antenna model number: X6-MAIN)
Antenna B Gain:	1.34dBi (MT7663BSN Module Antenna, Antenna model number: X4-AUX) Note: Antenna A and Antenna B support MIMO mode, so directional gain value as below: $DirectionalGain=10*log[(10^{1.36/20}+10^{1.34/20})^2/2]=4.36$
Antenna C Gain:	0.81dBi (ESP32-S3-WROOM-1U Module Antenna, Antenna model number: X4)
Description of the EUT:	The EUT is an EcoFlow PowerInsight. It has two wireless modules. The module ESP32-S3-WROOM-1U supports Bluetooth Low Energy, 2.4G Wi-Fi functions. And the module MT7663BSN supports Bluetooth Low Energy/Bluetooth BDR+EDR, 2.4G Wi-Fi & 5G Wi-Fi functions. Only 2.4GHz Wi-Fi included in this report.

NOTE 1: The above EUT's information is declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2021 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators
RSS-Gen Issue 5 April 2018 + Amendment 1 March 2019 + Amendment 2 February 2021	General Requirements for Compliance of Radio Apparatus
RSS-247 Issue 3 August 2023	Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSS) and License-Exempt Local Area Network (LE-LAN) Devices

All the test methods were according to KDB 558074 D01 15.247 Meas Guidance v05r02 Measurement Guidance and ANSI C63.10-2020.

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5 Summary of Test Results

Technical Requirements						
FCC Part 15 Subpart C/ RSS-247 Issue 3/RSS-Gen Issue 5						
Test Condition		Test Site	Test Result			Test Environment
			Pass	Fail	N/A	
§15.207 & RSS-GEN 8.8	Conducted emission AC power port	N/A	☐	☐	☒	--
§15.247 (b) (3) & RSS-247 5.4(d)	Conducted peak output power	Site 1	☒	☐	☐	T: 24.2℃ H: 52.9%
RSS-247 5.4(d)	Equivalent Isotropic Radiated Power	Site 1	☒	☐	☐	T: 24.2℃ H: 52.9%
§15.247(a)(2) & RSS-247 5.2(a) & RSS-GEN 6.7	6dB bandwidth and 99% Occupied Bandwidth	Site 1	☒	☐	☐	T: 24.2℃ H: 52.9%
§15.247(e) & RSS-247 5.2(b)	Power spectral density	Site 1	☒	☐	☐	T: 24.2℃ H: 52.9%
§15.247(d) & RSS-247 5.5	Spurious RF conducted emissions	Site 1	☒	☐	☐	T: 24.2℃ H: 52.9%
§15.247(d) & RSS-247 5.5	Band edge	Site 1	☒	☐	☐	T: 24.2℃ H: 52.9%
§15.247(d) & §15.209 & §15.205 & RSS-247 5.5 & RSS-Gen 6.13	Spurious radiated emissions for transmitter	Site 1	☒	☐	☐	T: 23.5℃ H: 48.7%
§15.203 & RSS-Gen 6.8	Antenna requirement	See note 2	☒	☐	☐	--

Note 1: N/A=Not Applicable.
Note 2: The EUT uses FPCB type antenna, in accordance to §15.203 & RSS-Gen 6.8, it is considered sufficiently to comply with the provisions of this section.
Note 3: T: Temperature, H: Humidity

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6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: 2A2P9-MTH101, IC: 27618-MTH101, complies with Section 15.205, 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C rules and RSS-247, RSS-GEN.

SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

☐ - **Not** Performed

The Equipment Under Test

■ - **Fulfills** the general approval requirements.

☐ - **Does not** fulfill the general approval requirements.

Sample Received Date:	2023-11-17
Testing Start Date:	2023-11-17
Testing End Date:	2023-12-04

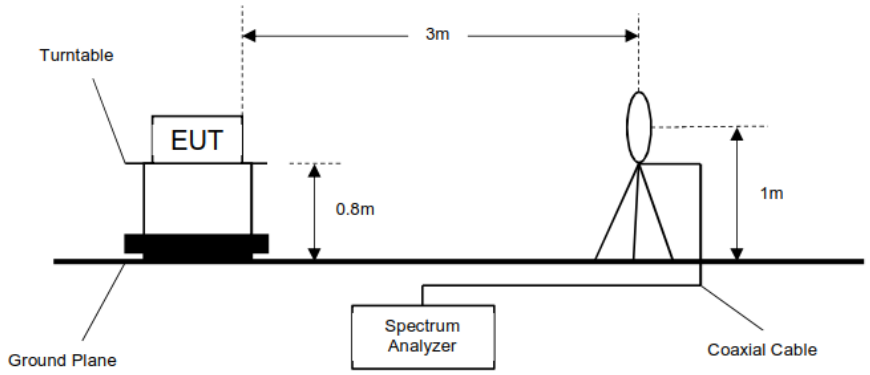
TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch

Reviewed by:	Prepared by:	Tested by:
John Zhi	Sanvin Zheng	Carry Cai
Project Manager	Project Engineer	Test Engineer

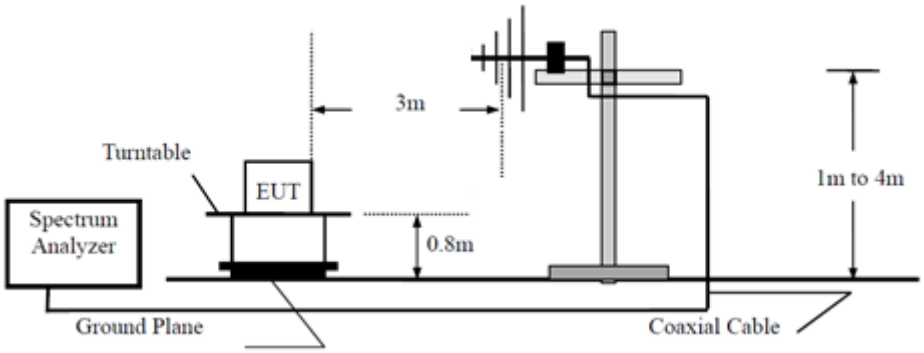
7 Test Setups

7.1 Radiated test setups

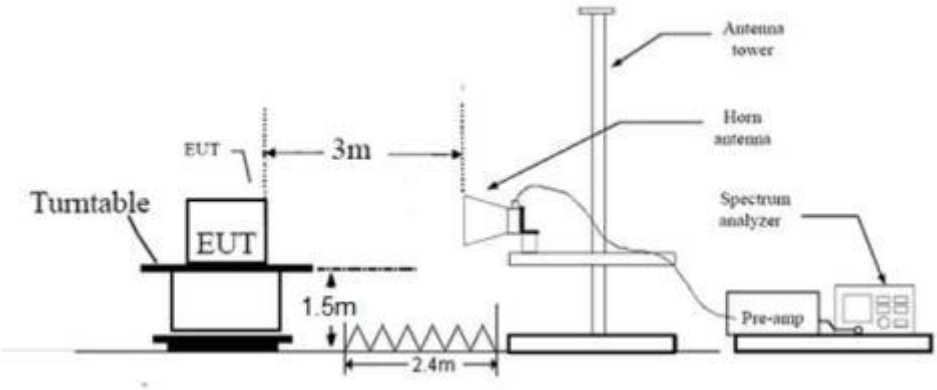
9KHz - 30MHz



30MHz - 1GHz



Above 1GHz



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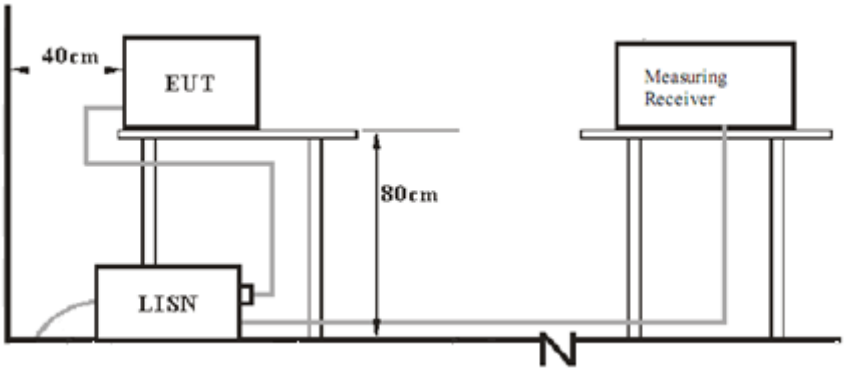
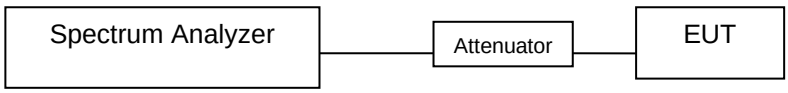
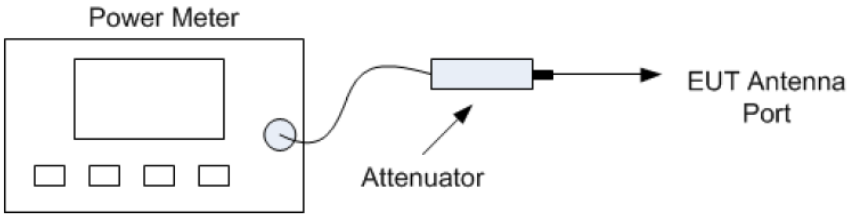
7.2 AC Power Line Conducted Emission test setups



7.3 Conducted RF test setups





Power meter conducted test setup

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8 Systems Test Configuration

Auxiliary Equipment Used during Test:

Description	Manufacturer	Model NO.	S/N
Notebook	LENOVO	X220	429044C

Cables Used During Test:

Cable	Length	Shielded/unshielded	With / without ferrite
USB cable	100cm	Unshielded	without ferrite

Test software information:

1. For MT7663BSN Module:

Test Software Version	cmd.exe		
Mode	Setting TX Power		Packet Type
	ANT_B	ANT_A	
802.11b	10	13	DSSS
802.11g	10	14	OFDM
802.11n20	14	14	OFDM
802.11n40	9	9	OFDM

2. For ESP32-S3-WROOM-1U Module:

Test Software Version	EspRFTestTool_v3.6_Manual.exe	
Mode	Setting TX Attenuation Level	Packet Type
802.11b	34	DSSS
802.11g	38	OFDM
802.11n20	38	OFDM
802.11n40	38	OFDM

The system was configured to non-hopping mode.

Non-hopping mode: The system was configured to operate at a signal channel transmitting. The test software allows the configuration and operation at the worst-case duty and the highest transmit power.

Through pre-scan all kind of modulation and all kind of rates, find the 1Mbps of rate is the worst case of 802.11b; the 6Mbps of rate is the worst case of 802.11g; the 6.5Mbps of rate is the worst case of 802.11n20 & 802.11n40, only the worst case transmitter rate data mode in recorded in the report.

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9 Technical Requirement

9.1 Conducted Emission

Test Method

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. Both sides of AC line were checked for maximum conducted interference.
6. The frequency range from 150 kHz to 30 MHz was searched.
7. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

Limit

According to §15.207 & RSS-GEN 8.8, conducted emissions limit as below:

Frequency MHz	QP Limit dBµV	AV Limit dBµV
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

Remark: “*” Decreasing linearly with logarithm of the frequency

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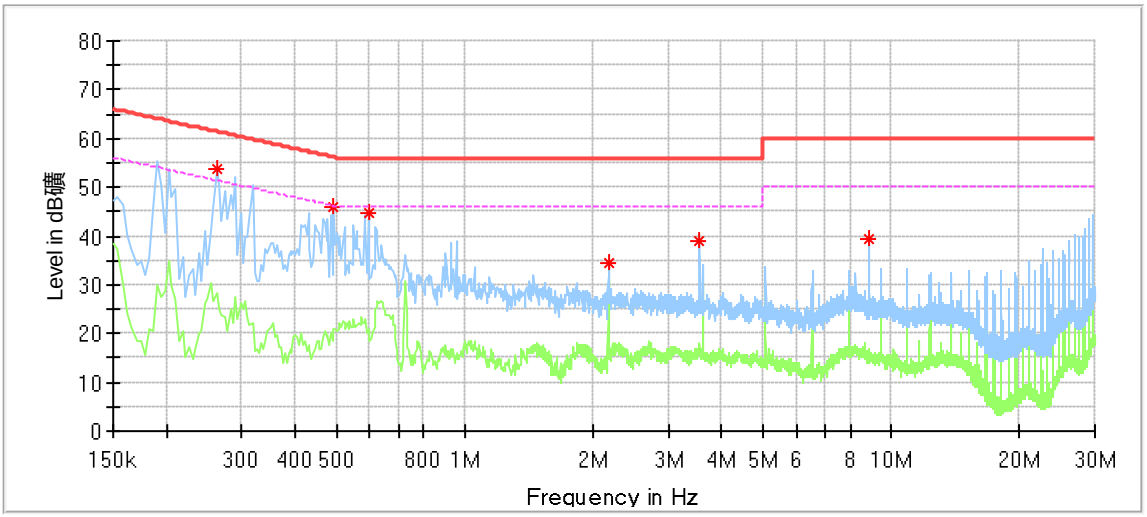
Conducted Emission

Product Type	:	EcoFlow PowerInsight
M/N	:	EF-MT-H10-1
Operating Condition	:	Transmitting mode
Test Specification	:	Line
Comment	:	AC 120V/60Hz



Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.262000	53.59	---	61.37	7.78	L1	9.56
0.494000	46.10	---	56.10	10.00	L1	9.59
0.594000	44.68	---	56.00	11.32	L1	9.60
2.174000	34.54	---	56.00	21.46	L1	9.62
3.558000	38.84	---	56.00	17.16	L1	9.68
8.862000	39.45	---	60.00	20.55	L1	9.91

Remark:
Max Peak/ Average=Reading Level + Correction Factor
Correction Factor=Cable Loss + LISN Factor
(The Reading Level is recorded by software which is not shown in the sheet)

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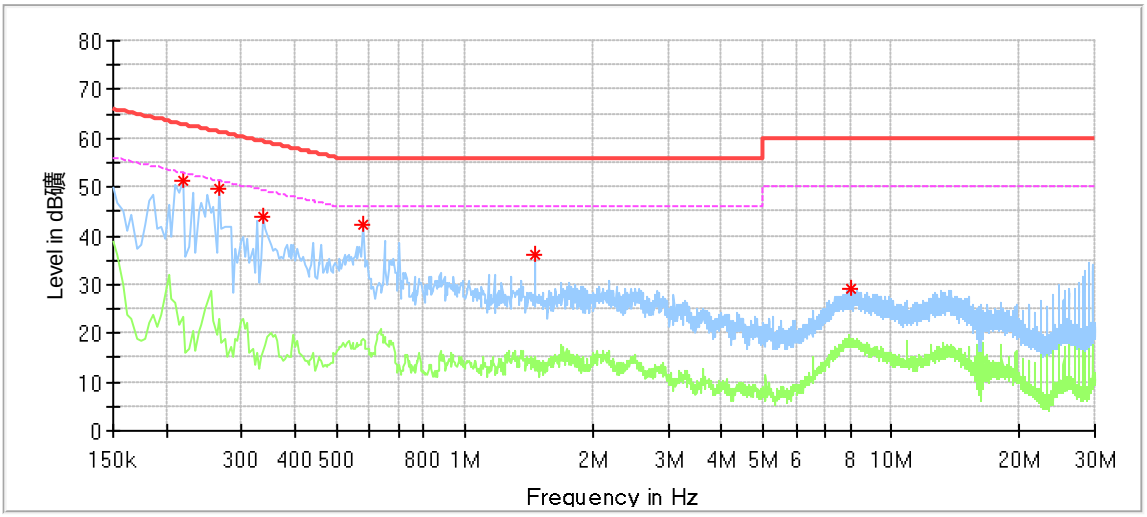
Conducted Emission

Product Type	:	EcoFlow PowerInsight
M/N	:	EF-MT-H10-1
Operating Condition	:	Transmitting mode
Test Specification	:	Neutral
Comment	:	AC 120V/60Hz



Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.218000	51.44	---	62.90	11.45	N	9.58
0.266000	49.73	---	61.24	11.51	N	9.59
0.338000	43.80	---	59.25	15.45	N	9.61
0.578000	42.08	---	56.00	13.92	N	9.63
1.462000	36.18	---	56.00	19.82	N	9.64
8.066000	29.00	---	60.00	31.00	N	9.90

Remark:
Max Peak/ Average=Reading Level + Correction Factor
Correction Factor=Cable Loss + LISN Factor
(The Reading Level is recorded by software which is not shown in the sheet)

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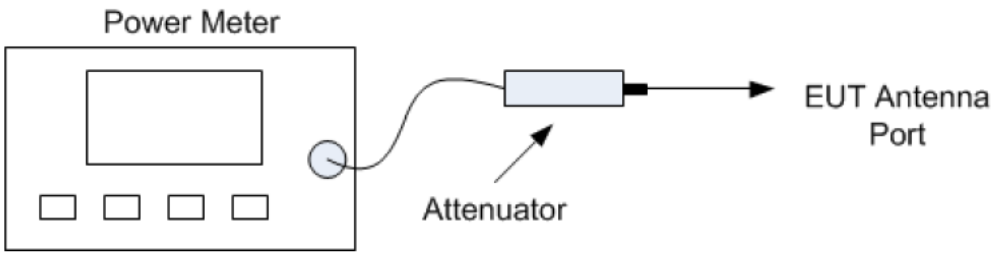
9.2 Conducted Output Power & EIRP

Test Method

1) The EUT is configured to transmit continuously, or to transmit with a constant duty cycle.
2) At all times when the EUT is transmitting, it shall be transmitting at its maximum power control level.
3) The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.

4) Measure the peak power of the transmitter. This measurement is a peak over both the ON and OFF periods of the transmitter.



Power meter conducted test setup

Limits

According to §15.247 (b) (3) & RSS-247 5.4(d), conducted peak output power limit as below:

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤1	≤30

According to & RSS-247 5.4(d), EIRP limit as below:

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤4	≤36

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Test result as below table

For MT7663BSN Module:

Test Mode	Test Channel	Ant	Conducted Output Power (dBm)	Limit [dBm]	EIRP (dBm)	Limit [dBm]	Verdict
11B	2412	ANT_B	11.40	30.0	12.74	36.0	Pass
11B	2412	ANT_A	14.50	30.0	15.86	36.0	Pass
11B	2437	ANT_B	11.80	30.0	13.14	36.0	Pass
11B	2437	ANT_A	15.10	30.0	16.46	36.0	Pass
11B	2462	ANT_B	11.70	30.0	13.04	36.0	Pass
11B	2462	ANT_A	14.70	30.0	16.06	36.0	Pass
11G	2412	ANT_B	10.70	30.0	12.04	36.0	Pass
11G	2412	ANT_A	15.10	30.0	16.46	36.0	Pass
11G	2437	ANT_B	10.70	30.0	12.04	36.0	Pass
11G	2437	ANT_A	15.10	30.0	16.46	36.0	Pass
11G	2462	ANT_B	10.80	30.0	12.14	36.0	Pass
11G	2462	ANT_A	**15.20**	30.0	**16.56**	36.0	Pass
11N20MIMO	2412	ANT_B	11.50	30.0	12.84	36.0	Pass
11N20MIMO	2412	ANT_A	12.10	30.0	13.46	36.0	Pass
11N20MIMO	2412	total	14.82	30.0	16.17	36.0	Pass
11N20MIMO	2437	ANT_B	11.50	30.0	12.84	36.0	Pass
11N20MIMO	2437	ANT_A	c	30.0	13.66	36.0	Pass
11N20MIMO	2437	total	14.93	30.0	16.28	36.0	Pass
11N20MIMO	2462	ANT_B	11.50	30.0	12.84	36.0	Pass
11N20MIMO	2462	ANT_A	12.20	30.0	13.56	36.0	Pass
11N20MIMO	2462	total	14.87	30.0	16.23	36.0	Pass
11N40MIMO	2422	ANT_B	9.00	30.0	10.34	36.0	Pass
11N40MIMO	2422	ANT_A	9.40	30.0	10.76	36.0	Pass
11N40MIMO	2422	total	12.21	30.0	13.57	36.0	Pass
11N40MIMO	2437	ANT_B	9.00	30.0	10.34	36.0	Pass
11N40MIMO	2437	ANT_A	9.40	30.0	10.76	36.0	Pass
11N40MIMO	2437	total	12.21	30.0	13.57	36.0	Pass
11N40MIMO	2452	ANT_B	9.10	30.0	10.44	36.0	Pass
11N40MIMO	2452	ANT_A	9.20	30.0	10.56	36.0	Pass
11N40MIMO	2452	total	12.16	30.0	13.51	36.0	Pass

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For ESP32-S3-WROOM-1U Module:

Test Mode	Test Channel	Ant	Conducted Output Power (dBm)	Limit [dBm]	EIRP (dBm)	Limit [dBm]	Verdict
11B	2412	ANT_C	9.8	30.0	10.61	36.0	Pass
11B	2437	ANT_C	**10.3**	30.0	**11.11**	36.0	Pass
11B	2462	ANT_C	10.0	30.0	10.81	36.0	Pass
11G	2412	ANT_C	8.4	30.0	9.21	36.0	Pass
11G	2437	ANT_C	8.9	30.0	9.71	36.0	Pass
11G	2462	ANT_C	8.5	30.0	9.31	36.0	Pass
11N20SISO	2412	ANT_C	7.2	30.0	8.01	36.0	Pass
11N20SISO	2437	ANT_C	7.0	30.0	7.81	36.0	Pass
11N20SISO	2462	ANT_C	7.1	30.0	7.91	36.0	Pass
11N40SISO	2422	ANT_C	7.3	30.0	8.11	36.0	Pass
11N40SISO	2437	ANT_C	7.6	30.0	8.41	36.0	Pass
11N40SISO	2452	ANT_C	7.4	30.0	8.21	36.0	Pass

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9.3 6dB Bandwidth and 99% Occupied Bandwidth

Test Method for 6 dB Bandwidth

1. The RF output of EUT was connected to the spectrum analyzer. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting, the instrument center frequency is set to the nominal EUT channel center frequency enable the EUT transmit continuously.
3. Use the following spectrum analyzer settings:
   RBW=100KHz, VBW≥3RBW, Sweep = auto, Detector function = peak, Trace = max hold
4. Use the automatic bandwidth measurement capability of an instrument, use the X dB bandwidth mode with X set to 6 dB.
5. Allow the trace to stabilize, record the 6 dB Bandwidth value.

Test Method for 99 % Bandwidth

1. Connect EUT test port to spectrum analyzer.
   Use the following spectrum analyzer settings:
   RBW=1% to 5% of the actual occupied, VBW≥3RBW, Sweep = auto,
   Detector function = peak, Trace = max hold
2. Use the occupied bandwidth measurement capability of test receiver.
3. Allow the trace to stabilize, record the occupied bandwidth value.

Limit

According to §15.247(a)(2) & RSS-247 5.2(a) & RSS-GEN 6.7, 6dB Bandwidth and 99% Occupied Bandwidth limit as below:

6dB bandwidth Limit [kHz]	99% bandwidth Limit [kHz]
≥500	--

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For MT7663BSN Module:

Mode	Frequency (MHz)	ANT	99% Occupied Bandwidth (MHz)	6dB bandwidth (MHz)	Limit (MHz)	Verdict
			Result	Result		
802.11b	2412	B	13.767	9.107	≥0.5	Pass
	2437	B	13.758	9.100	≥0.5	Pass
	2462	B	13.755	9.103	≥0.5	Pass
802.11g	2412	B	17.722	15.167	≥0.5	Pass
	2437	B	17.720	15.160	≥0.5	Pass
	2462	B	17.701	15.147	≥0.5	Pass
802.11n (HT20)	2412	B	18.310	15.166	≥0.5	Pass
	2437	B	18.305	15.169	≥0.5	Pass
	2462	B	18.266	15.167	≥0.5	Pass
802.11n (HT40)	2422	B	37.787	35.153	≥0.5	Pass
	2437	B	37.577	35.153	≥0.5	Pass
	2452	B	37.638	35.148	≥0.5	Pass
802.11b	2412	A	13.700	9.067	≥0.5	Pass
	2437	A	13.673	9.093	≥0.5	Pass
	2462	A	13.647	9.097	≥0.5	Pass
802.11g	2412	A	17.701	15.167	≥0.5	Pass
	2437	A	17.714	15.163	≥0.5	Pass
	2462	A	17.682	15.150	≥0.5	Pass
802.11n (HT20)	2412	A	18.148	15.749	≥0.5	Pass
	2437	A	18.140	15.754	≥0.5	Pass
	2462	A	18.120	15.162	≥0.5	Pass
802.11n (HT40)	2422	A	37.833	35.153	≥0.5	Pass
	2437	A	37.651	35.144	≥0.5	Pass
	2452	A	37.770	35.146	≥0.5	Pass

For ESP32-S3-WROOM-1U Module:

Mode	Frequency (MHz)	ANT	99% Occupied Bandwidth (MHz)	6dB bandwidth (MHz)	Limit (MHz)	Verdict
			Result	Result		
802.11b	2412	C	12.846	9.450	≥0.5	Pass
	2437	C	12.884	9.633	≥0.5	Pass
	2462	C	12.886	8.894	≥0.5	Pass
802.11g	2412	C	17.345	16.341	≥0.5	Pass
	2437	C	17.400	16.341	≥0.5	Pass
	2462	C	17.543	16.348	≥0.5	Pass
802.11n (HT20)	2412	C	17.745	16.356	≥0.5	Pass
	2437	C	17.775	16.365	≥0.5	Pass
	2462	C	17.804	16.321	≥0.5	Pass
802.11n (HT40)	2422	C	37.597	35.162	≥0.5	Pass
	2437	C	37.690	35.179	≥0.5	Pass
	2452	C	37.744	35.171	≥0.5	Pass

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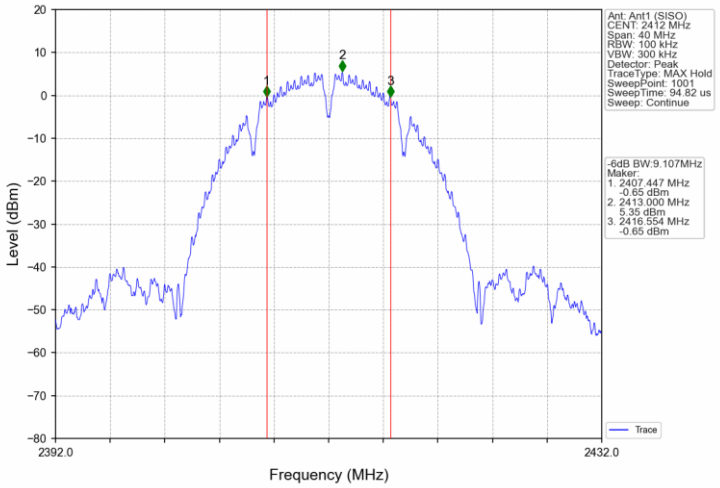
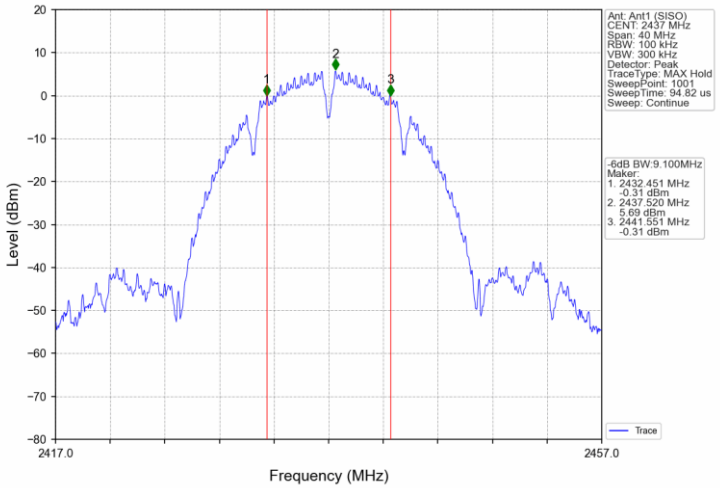
6 dB Bandwidth

For MT7663BSN Module:

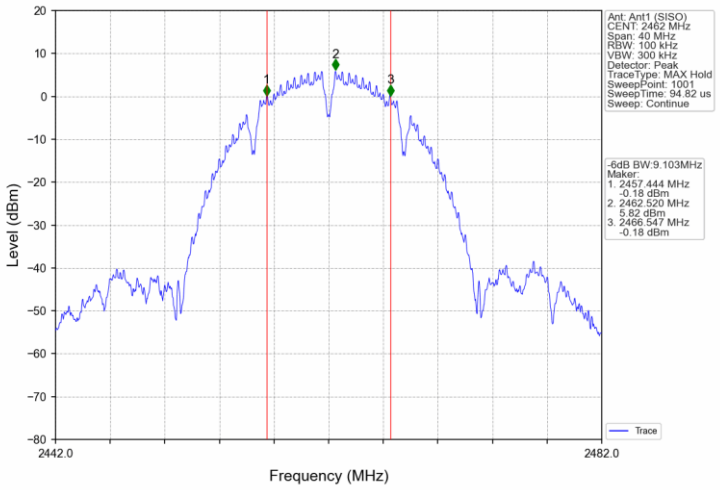
802.11b_LCH_2412MHz_ANT_B (SISO)_NTNV



802.11b_MCH_2437MHz_ANT_B (SISO)_NTNV



802.11b_HCH_2462MHz_ANT_B (SISO)_NTNV



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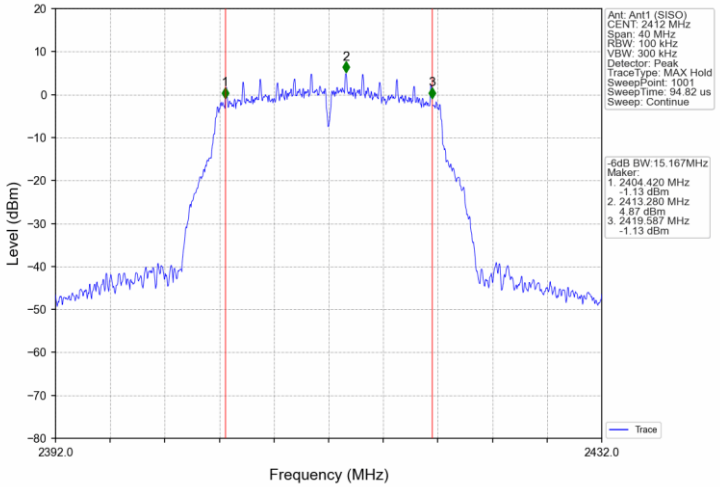
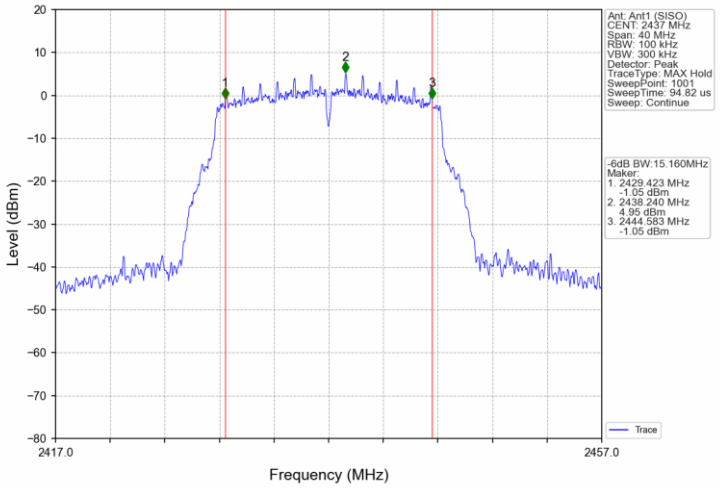
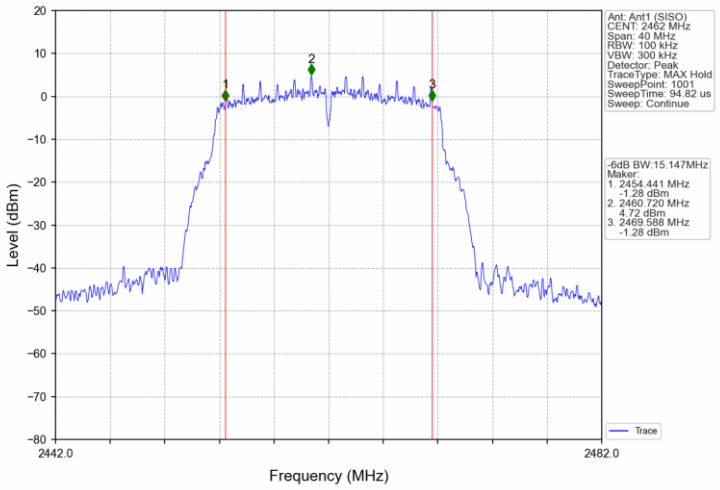
802.11g_LCH_2412MHz_ANT_B (SISO)_NTNV



802.11g_MCH_2437MHz_ANT_B (SISO)_NTNV



802.11g_HCH_2462MHz_ANT_B (SISO)_NTNV



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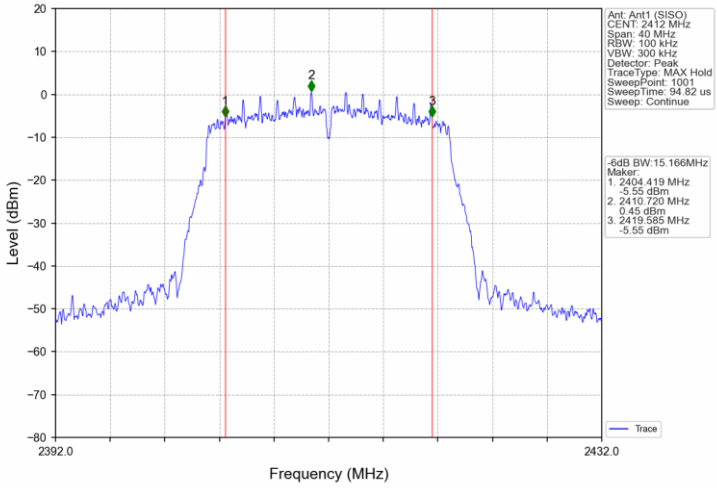
802.11n(HT20)_LCH_2412MHz_ANT_B (SISO)_NTNV



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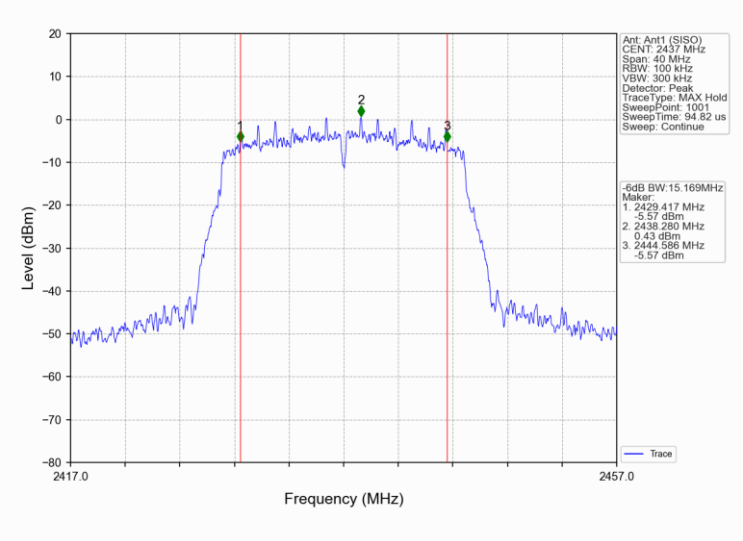
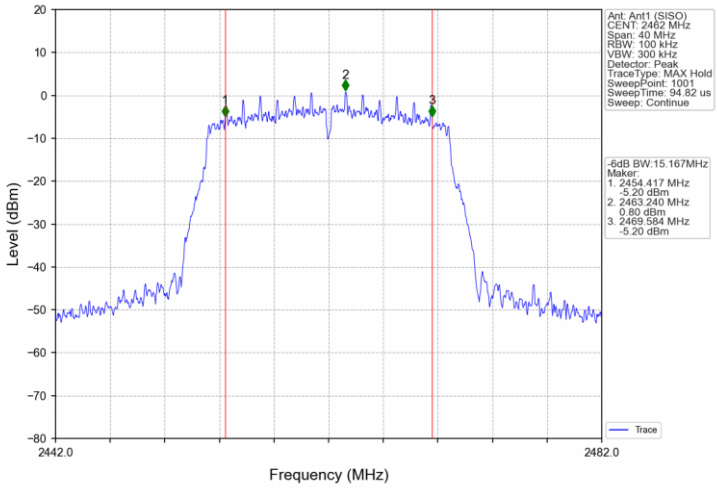


802.11n(HT20)_HCH_2462MHz_ANT_B (SISO)_NTNV



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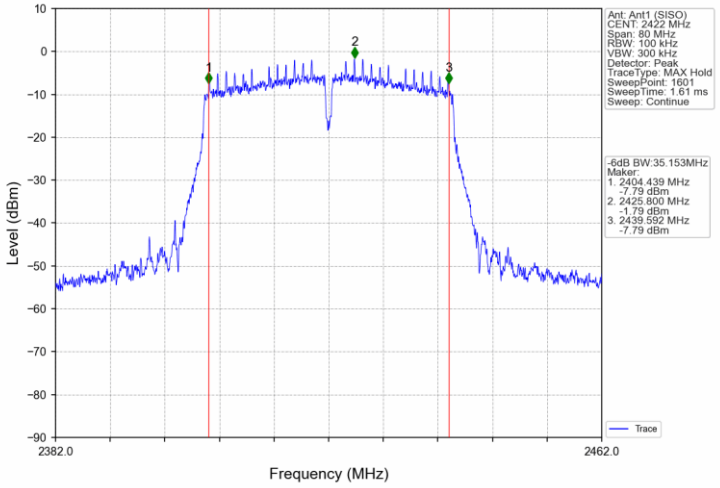
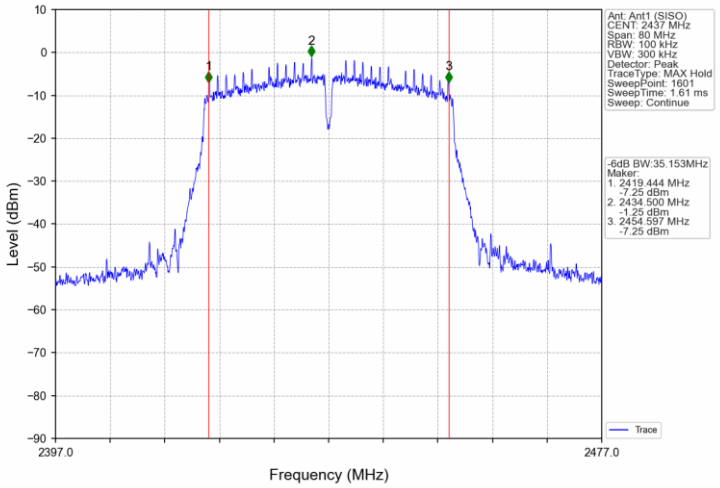
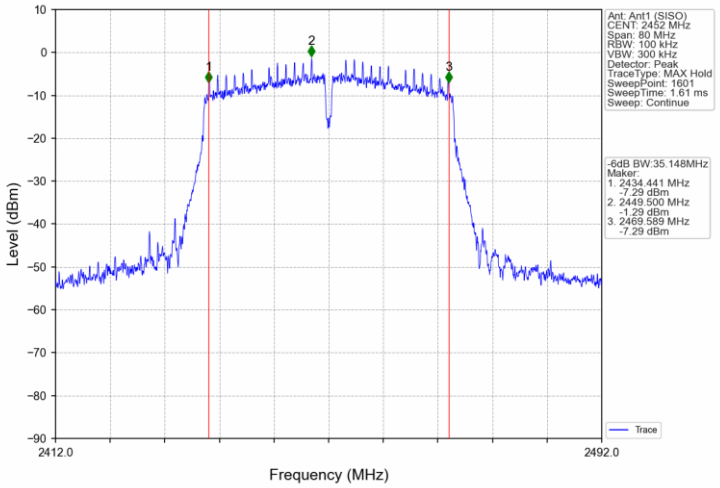
802.11n(HT40)_LCH_2422MHz_ANT_B (SISO)_NTNV



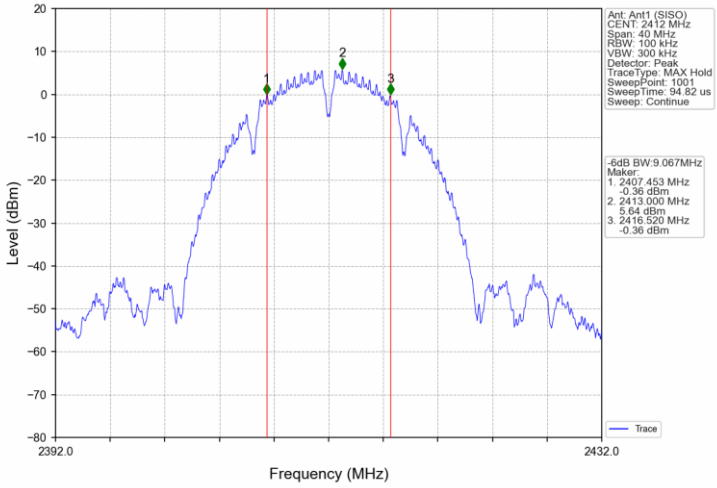
802.11n(HT40)_MCH_2437MHz_ANT_B (SISO)_NTNV



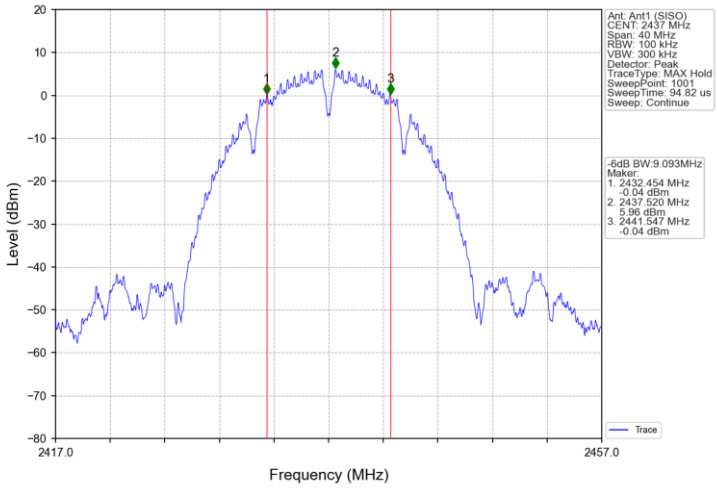
802.11n(HT40)_HCH_2452MHz_ANT_B (SISO)_NTNV



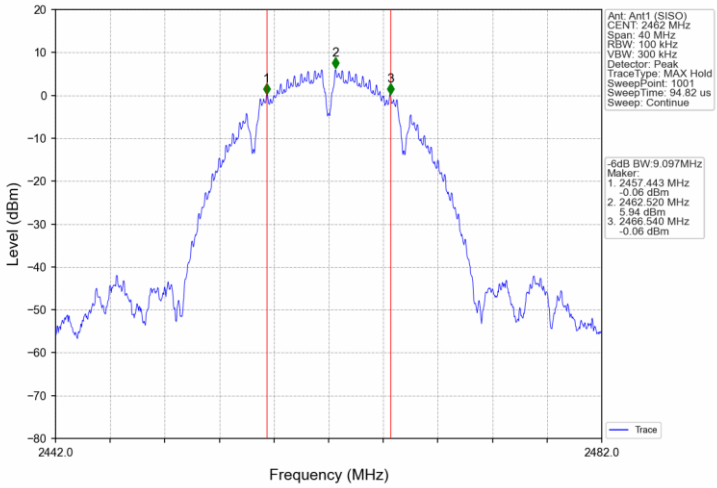
802.11b_LCH_2412MHz_ANT_A (SISO)_NTNV



802.11b_MCH_2437MHz_ANT_A (SISO)_NTNV



802.11b_HCH_2462MHz_ANT_A (SISO)_NTNV



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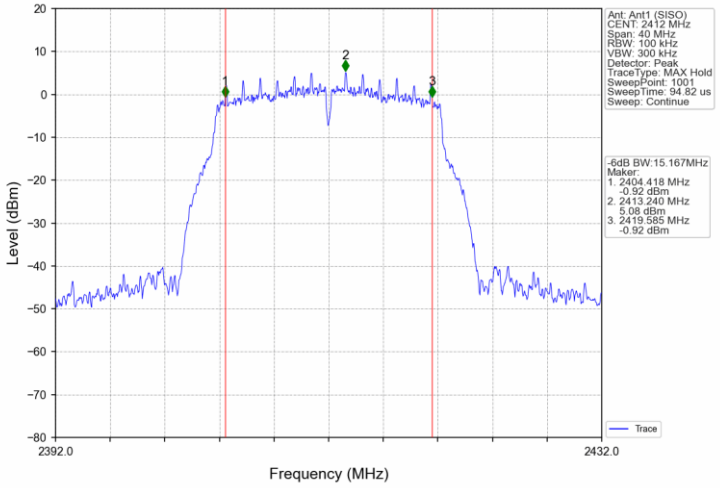
802.11g_LCH_2412MHz_ANT_A (SISO)_NTNV



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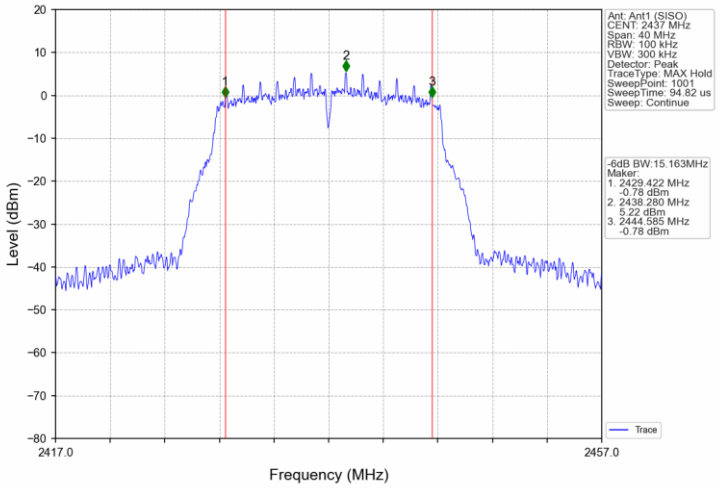
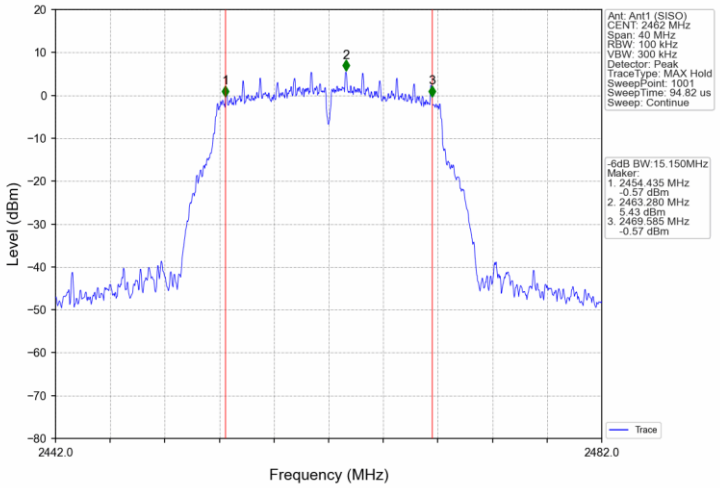


802.11g_HCH_2462MHz_ANT_A (SISO)_NTNV



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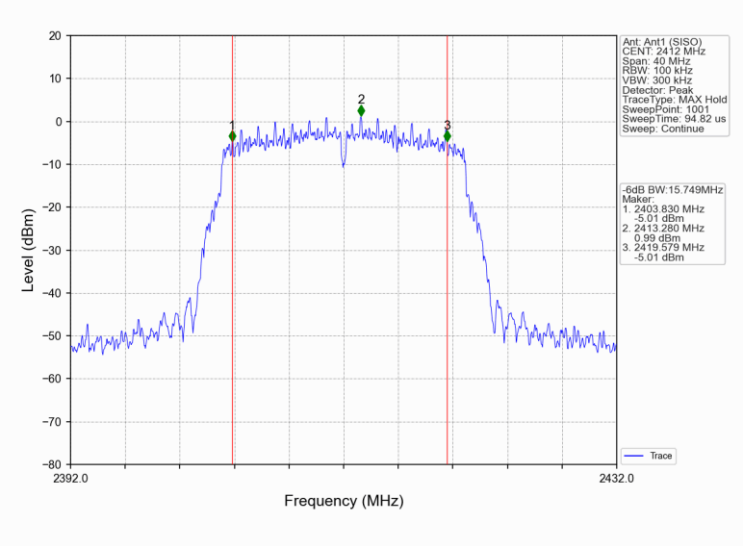
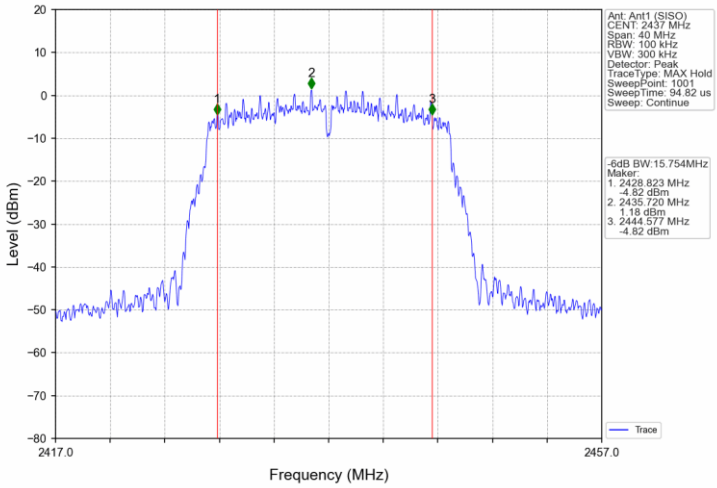
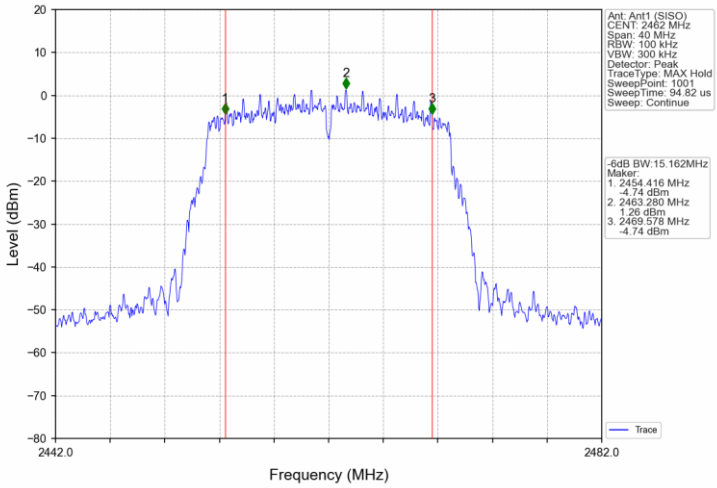
802.11n(HT20)_LCH_2412MHz_ANT_A (SISO)_NTNV



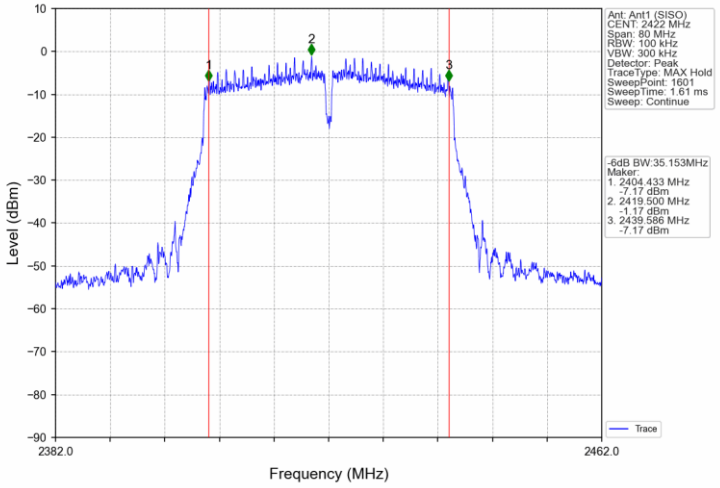
802.11n(HT20)_MCH_2437MHz_ANT_A (SISO)_NTNV



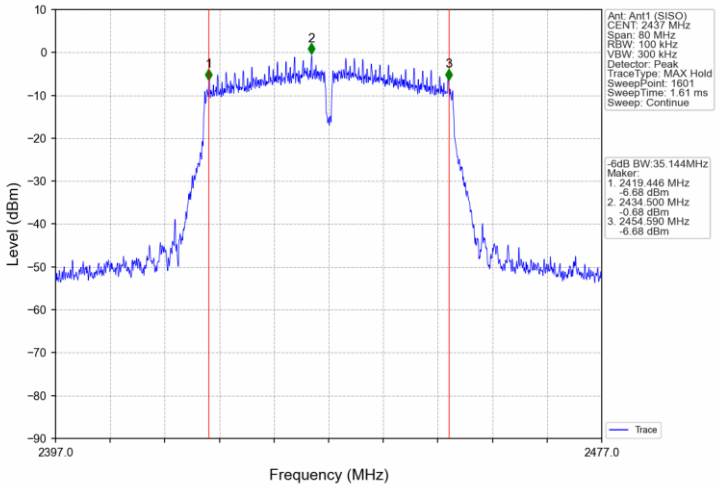
802.11n(HT20)_HCH_2462MHz_ANT_A (SISO)_NTNV



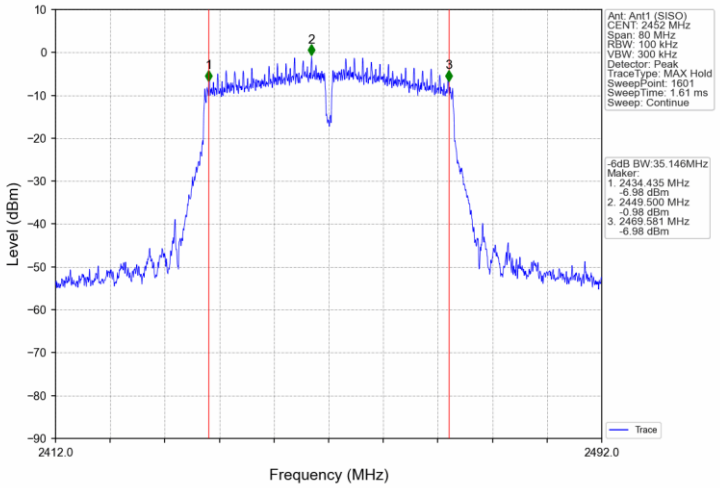
802.11n(HT40)_LCH_2422MHz_ANT_A (SISO)_NTNV



802.11n(HT40)_MCH_2437MHz_ANT_A (SISO)_NTNV



802.11n(HT40)_HCH_2452MHz_ANT_A (SISO)_NTNV



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