



RF MEASUREMENT REPORT

FCC ID: HDC17600031F1

Applicant: Adtran Inc.

Application Type: Certification

Product: WiFi 5 Mesh AP

Model No.: 831-t5

FCC Classification: Digital Transmission System (DTS)

FCC Rule Part(s): Part 15 Subpart C (Section 15.247)

Test Date: August 19 ~ 27, 2021

Reviewed By:

Vincent Yu

Vincent Yu

Approved By:

Robin Wu

Robin Wu



The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013. Test results reported herein relate only to the item(s) tested.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date	Note
2108RSU047-U1	Rev. 01	Initial Report	11-20-2021	Valid

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1. General Information

1.1. Applicant

Adtran Inc.

901 Explorer Blvd NW Huntsville, AL 35806, USA

1.2. Manufacturer

Adtran Inc.

901 Explorer Blvd NW Huntsville, AL 35806, USA

1.3. Testing Facility

☒	Test Site – MRT Suzhou Laboratory				
	Laboratory Location (Suzhou - Wuzhong)				
	D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China				
	Laboratory Location (Suzhou - SIP)				
	4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China				
	Laboratory Accreditations				
A2LA: 3628.01		CNAS: L10551			
FCC: CN1166		ISED: CN0001			
VCCI:	☐ R-20025	☐ G-20034	☐ C-20020	☐ T-20020	
	☐ R-20141	☐ G-20134	☐ C-20103	☐ T-20104	
☒	Test Site – MRT Shenzhen Laboratory				
	Laboratory Location (Shenzhen)				
	1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China				
	Laboratory Accreditations				
	A2LA: 3628.02		CNAS: L10551		
	FCC: CN1284		ISED: CN0105		
☐	Test Site – MRT Taiwan Laboratory				
	Laboratory Location (Taiwan)				
	No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)				
	Laboratory Accreditations				
	TAF: L3261-190725		FCC: 291082, TW3261		
ISED: TW3261					

1.4. Product Information

Product Name	WiFi 5 Mesh AP
Model No.	831-t5
Serial No.	831t5A0719000001
Wi-Fi Specification	802.11a/b/g/n/ac, VHT
Antenna Information	Refer to section 1.7
Power Supply	AC/DC Adapter
Accessories	
Adapter	MODEL: S36B52-120A300-C4-6 INPUT: 100-240V~50/60Hz 1.0A OUTPUT: 12.0V DC, 3A, 36.0W
Remark: The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.	

1.5. Radio Specification

Frequency Range	802.11b/g/n-HT20, VHT20: 2412 ~ 2462MHz 802.11n-HT40, VHT40: 2422 ~ 2452MHz
Channel Number	802.11b/g/n-HT20, VHT20: 11 802.11n-HT40, VHT40: 7
Modulation	802.11b: DSSS 802.11g/n, VHT: OFDM
Data Rate	802.11b: 1/2/5.5/11Mbps 802.11g: 6/9/12/18/24/36/48/54Mbps 802.11n: up to 300Mbps VHT: up to 400Mbps

Note: For other features of this EUT, test report will be issued separately.

1.6. Working Frequencies

802.11b/g/n-HT20, VHT20

Channel	Frequency	Channel	Frequency	Channel	Frequency
01	2412 MHz	02	2417 MHz	03	2422 MHz
04	2427 MHz	05	2432 MHz	06	2437 MHz
07	2442 MHz	08	2447 MHz	09	2452 MHz
10	2457 MHz	11	2462 MHz	--	--

802.11n-HT40, VHT40

Channel	Frequency	Channel	Frequency	Channel	Frequency
03	2422 MHz	04	2427 MHz	05	2432 MHz
06	2437 MHz	07	2442 MHz	08	2447 MHz
09	2452 MHz	--	--	--	--

1.7. Antenna Details

Antenna Type	Frequency Band	Tx Paths	Max. Antenna Gain (dBi)	Beamforming Directional Gain (dBi)	CDD Directional Gain (dBi)	
					For Power	For PSD
PCB Antenna	2.4GHz Band	2	3.5	6.51	3.5	6.51
	5GHz Low Band	2	4.9	7.91	4.9	7.91
	5GHz High Band	4	5.5	11.52	5.5	11.52

Remark:

- The EUT supports Cyclic Delay Diversity (CDD) mode, and CDD signals are correlated.
If all antennas have the same gain, G_{ANT} , Directional gain = $G_{ANT} + \text{Array Gain}$, where Array Gain is as follows.
 - For power spectral density (PSD) measurements on all devices,
Array Gain = $10 \log (N_{ANT} / N_{SS})$ dB;
 - For power measurements on IEEE 802.11 devices,
Array Gain = 0 dB for $N_{ANT} \leq 4$;
- The EUT also supports Beam Forming mode, and the Beam Forming support 802.11n/ac and VHT, not include 802.11a/b/g. The conducted output power in the beamforming mode will be reduced below the conducted output power in the CDD mode by the amount in dB that the beamforming gain exceeds the maximum antenna gain.

2. Test Configuration

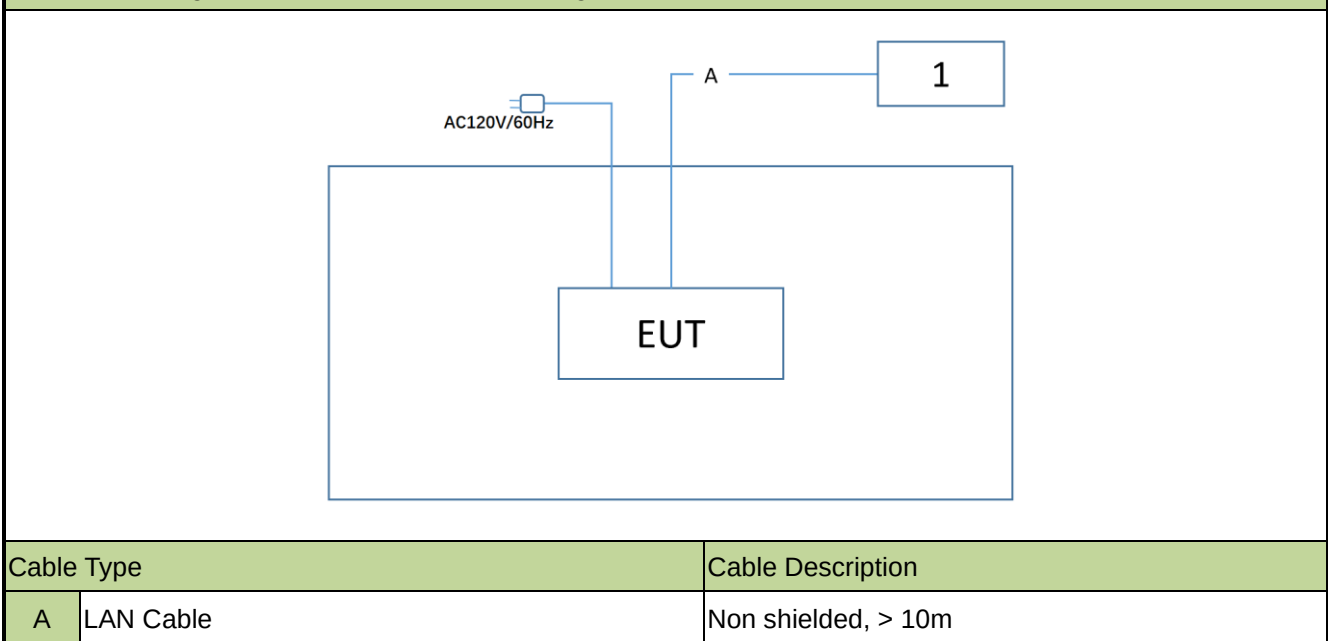
2.1. Test Mode

Mode 1: Transmit by 802.11b (1Mbps) (CDD mode)
Mode 2: Transmit by 802.11g (6Mbps) (CDD mode)
Mode 3: Transmit by 802.11n-HT20 (MCS0) (CDD mode)
Mode 4: Transmit by 802.11n-HT40 (MCS0) (CDD mode)
Mode 5: Transmit by VHT20 (MCS0) (CDD mode)
Mode 6: Transmit by VHT40 (MCS0) (CDD mode)

2.2. Test System Connection Diagram

The device was tested per the guidance ANSI C63.10: 2013 was used to reference the appropriate EUT setup for radiated emissions testing and AC line conducted testing.

Connection Diagram – Radiated Emission testing & AC Conducted Emissions



2.3. Test System Details

Product	Manufacturer	Model No.
1 Notebook	HP	735G5

2.4. Test Software

The test utility software used during testing was “MT7615 QA”, and the version was 1.90. Power parameter value refers to Operation Description.

2.5. Applied Standards

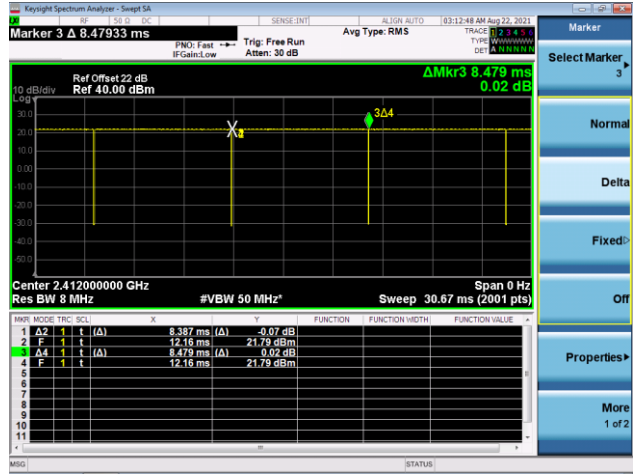
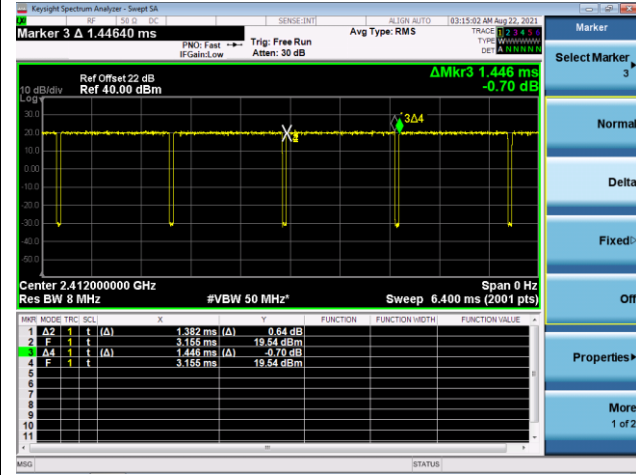
According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

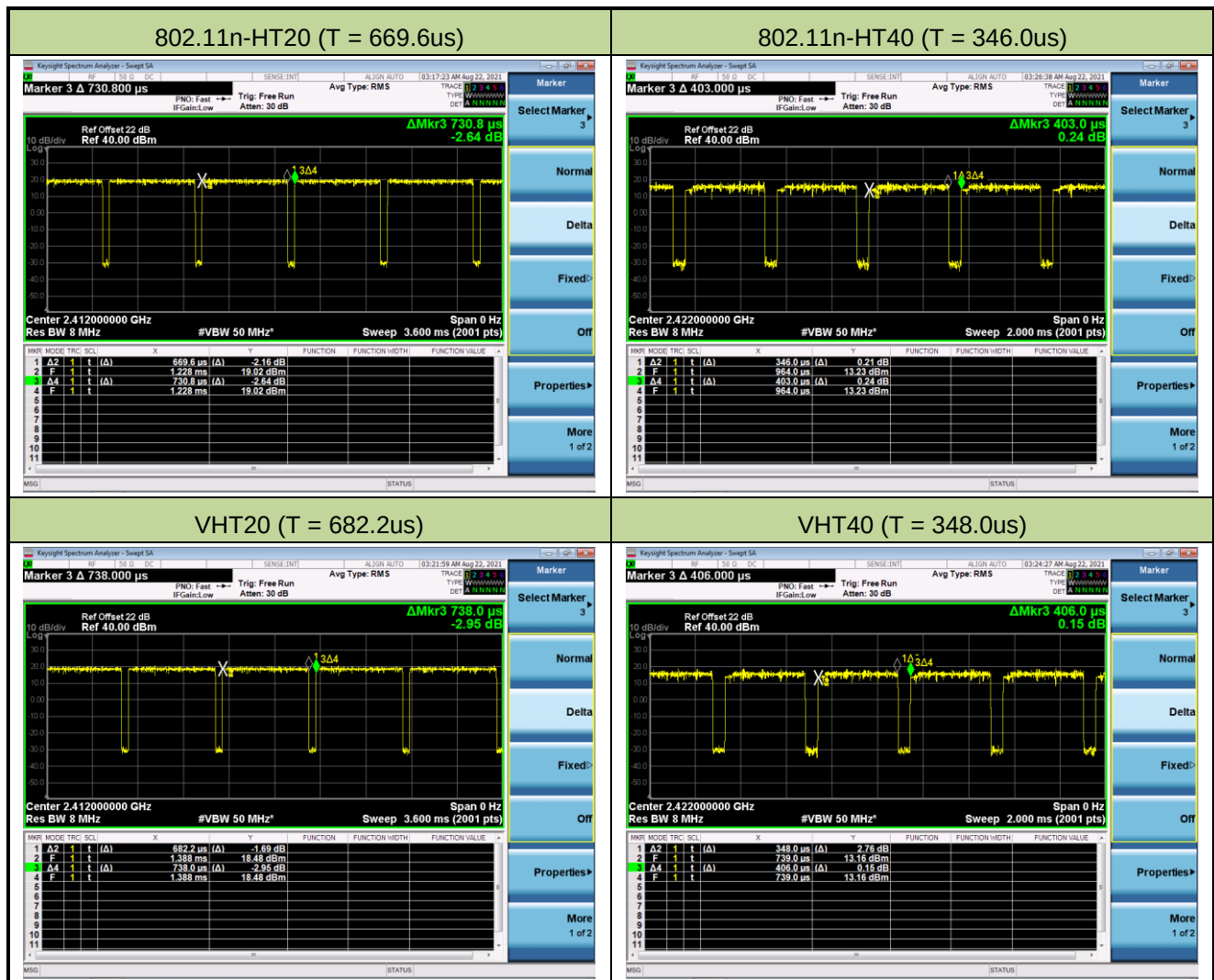
- FCC Part 15.247
- KDB 558074 D01v05r02
- KDB 662911 D01v02r01
- ANSI C63.10-2013

2.6. Duty Cycle

The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

Test Mode	Duty Cycle
802.11b	98.91%
802.11g	95.57%
802.11n-HT20	91.63%
802.11n-HT40	85.86%
VHT20	92.44%
VHT40	85.71%
Duty Cycle (T = Transmission Duration)	
802.11b (T = 8.387ms)	802.11g (T = 1.382ms)



2.7. Test Environment Condition

Ambient Temperature	15°C ~ 35°C
Relative Humidity	20%RH ~ 75%RH

3. Antenna Requirements

Excerpt from §15.203 of the FCC Rules/Regulations:

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

- The antenna of the device is **permanently attached**.
- There are no provisions for connection to an external antenna.

Conclusion:

The unit complies with the requirement of §15.203.

4. Measuring Instrument

No.	Instrument	Manufacturer	Model No.	Asset No.	Cali. Interval	Cali. Due Date	Test Site
1	Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06292	1 year	2021/10/24	NS-AC1
2	Anechoic Chamber	BOOMWAVE	NS-AC1	MRTSUE06496	1 year	2022/7/24	NS-AC1
3	Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06572	1 year	2022/3/14	NS-AC1
4	TRILOG Antenna	Schwarzbeck	VULB 9162	MRTSUE06573	1 year	2022/6/29	NS-AC1
5	Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06574	1 year	2022/7/12	NS-AC1
6	EMI Test Receiver	R&S	ESR3	MRTSUE06575	1 year	2022/6/27	NS-AC1
7	USB Power Sensor	Keysight	U2021XA	MRTSUE06581	1 year	2022/8/15	NS-TR2
8	Thermohygrometer	DELI	NO.8813	MRTSUE06588	1 year	2022/6/30	NS-AC1
9	Preamplifier	EMCI	EMC184045SE	MRTSUE06641	1 year	2022/1/14	NS-AC1
10	Thermohygrometer	DELI	NO.8813	MRTSUE06783	1 year	2022/5/9	NS-TR2
11	Temperature Chamber	OUKE	OK-TH-100C	MRTSUE06899	1 year	2021/11/27	NS-TR2
12	Signal Analyzer	Keysight	N9020A	MRTSUE10065	1 year	2022/6/17	NS-AC1/NS-TR2
13	Signal Analyzer	Agilent	N9010A	MRTSUE06195	1 year	2022/3/17	NS-AC1/NS-TR2
14	EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2022/1/4	WZ-AC1
15	Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2021/09/27	WZ-AC1
					1 year	2022/9/16	
16	Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/11/8	WZ-AC1
17	Preamplifier	Agilent	83017A	MRTSUE06076	1 year	2021/11/14	WZ-AC1
18	TRILOG Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2022/8/5	WZ-AC1
19	Thermohygrometer	Yuhua	HTC-2	MRTSUE06184	1 year	2022/8/10	WZ-AC1
20	Anechoic Chamber	TDK	WZ-AC1	MRTSUE06212	1 year	2022/4/29	WZ-AC1
21	Horn Antenna	ETS	3117	MRTSUE06257	1 year	2021/9/27	WZ-AC1
					1 year	2022/9/25	
22	Thermohygrometer	testo	608-H1	MRTSUE06403	1 year	2022/6/28	WZ-AC1
23	Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06597	1 year	2021/12/14	WZ-AC1
24	Signal Analyzer	Keysight	N9010B	MRTSUE06607	1 year	2022/1/6	WZ-AC1
25	Preamplifier	EMCI	EMC184045SE	MRTSUE06640	1 year	2022/1/14	WZ-AC1
26	Preamplifier	EMCI	EMC051845SE	MRTSUE06987	1 year	2021/9/10	WZ-AC1
					1 year	2022/9/9	
27	Attenuator	SHX	TS2-4dB-6G	MRTSUE06812	2022/6/30	2022/6/29	NS-TR2
28	Directional Coupler	narda	4226-10	MRTSUE06253	2021/3/16	2022/3/15	NS-TR2

Note: The test site with "WZ" code is in the MRT Suzhou laboratory, the test site with "NS" code is in the MRT Shenzhen Laboratory.

Software	Version	Function
EMI Software	V3	EMI Test Software

5. Measurement Uncertainty

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

AC Conducted Emission Measurement
Measurement Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 9kHz~150kHz: 3.74dB 150kHz~30MHz: 3.44dB
Radiated Emission Measurement
Measurement Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): Horizontal: 30MHz~300MHz: 5.04dB 300MHz~1GHz: 4.95dB 1GHz~40GHz: 6.40dB Vertical: 30MHz~300MHz: 5.24dB 300MHz~1GHz: 6.03dB 1GHz~40GHz: 6.40dB
Spurious Emissions, Conducted
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 0.78dB
Output Power
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 1.13dB
Power Spectrum Density
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 1.15dB
Occupied Bandwidth
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 0.28%

6. Test Result

6.1. Summary

FCC Section(s)	Test Description	Test Condition	Verdict
15.247(a)(2)	6dB Bandwidth	Conducted	Pass
15.247(b)(3)	Output Power		Pass
15.247(e)	Power Spectral Density		Pass
15.247(d)	Band Edge / Out-of-Band Emissions		Pass
15.205 15.209	General Field Strength (Restricted Bands and Radiated Emission)	Radiated	Pass
15.207	AC Conducted Emissions 150kHz - 30MHz	Line Conducted	Pass

Remark:

1. The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
2. Output power test was verified over all data rates of each mode (data refers to operational description), and then choose the maximum power output (low data rate) for final test of each channel.
3. For radiated emission tests, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst-case emissions.

6.2. 6dB Bandwidth

6.2.1. Test Limit

The minimum 6dB bandwidth shall be at least 500 kHz.

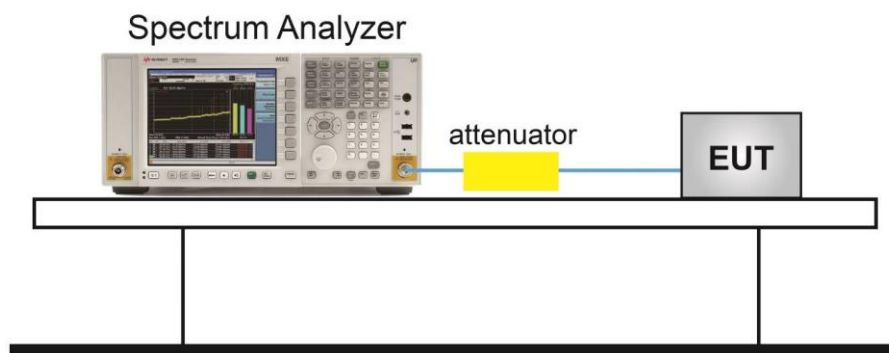
6.2.2. Test Procedure used

ANSI C63.10 - 2013 - Section 11.8

6.2.3. Test Setting

1. The Spectrum's automatic bandwidth measurement capability was used to perform the 6dB bandwidth measurement. The "X" dB bandwidth parameter was set to $X = 6$. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. Set RBW = 100 kHz
3. $VBW \geq 3 \times RBW$
4. Detector = Peak
5. Trace mode = Max hold
6. Sweep = Auto couple
7. Allow the trace to stabilize

6.2.4. Test Setup



6.2.5. Test Result

Refer to Appendix A.1.

6.3. Output Power

6.3.1. Test Limit

The maximum output power shall be less 1 Watt (30dBm).

The conducted output power limit specified in paragraph FCC Part 15.247(b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs FCC Part 15.247(b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

6.3.2. Test Procedure Used

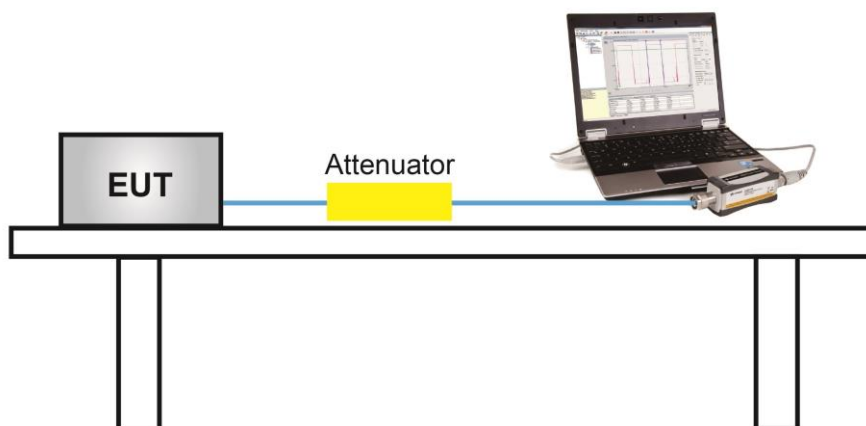
ANSI C63.10 - 2013 - Section 11.9.2.3.2

6.3.3. Test Setting

Average Power Measurement

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter.

6.3.4. Test Setup



6.3.5. Test Result

Refer to Appendix A.2.

6.4. Power Spectral Density

6.4.1. Test Limit

The maximum permissible power spectral density is 8dBm in any 3 kHz band.

The same method of determining the conducted output power shall be used to determine the power spectral density.

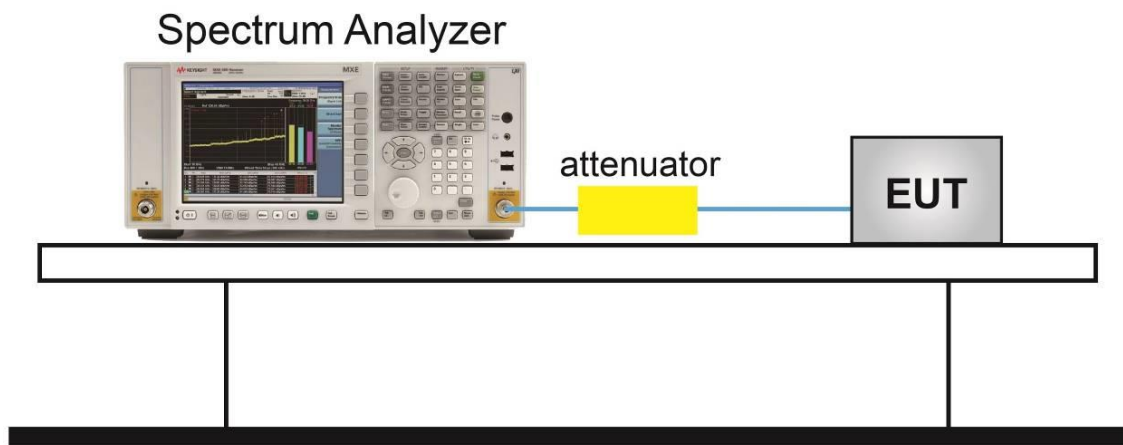
6.4.2. Test Procedure Used

ANSI C63.10 - 2013 - Section 11.10.5

6.4.3. Test Setting

1. Measure the duty cycle (x) of the transmitter output signal.
2. Set instrument center frequency to DTS channel center frequency.
3. Set span to at least 1.5 times the OBW.
4. RBW = 10 kHz.
5. VBW = 30 kHz.
6. Detector = RMS.
7. Ensure that the number of measurement points in the sweep $\geq 2 \times \text{span}/\text{RBW}$.
8. Sweep time = auto couple.
9. Don't use sweep triggering. Allow sweep to "free run".
10. Employ trace averaging (RMS) mode over a minimum of 100 traces.
11. Use the peak marker function to determine the maximum amplitude level.
12. Add $10 \log (1/x)$, where x is the duty cycle measured in step (a), to the measured PSD to compute the average PSD during the actual transmission time. If measured value exceeds requirement specified by regulatory agency, then reduce RBW (but no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span to meet the minimum measurement point requirement as the RBW is reduced).

6.4.4. Test Setup



6.4.5. Test Result

Refer to Appendix A.3.

6.5. Conducted Band Edge and Out-of-Band Emissions

6.5.1. Test Limit

The limit for out-of-band spurious emissions at the band edge is 30dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100 kHz bandwidth per the PSD procedure.

6.5.2. Test Procedure Used

ANSI C63.10-2013 - Section 11.11

6.5.3. Test Setting

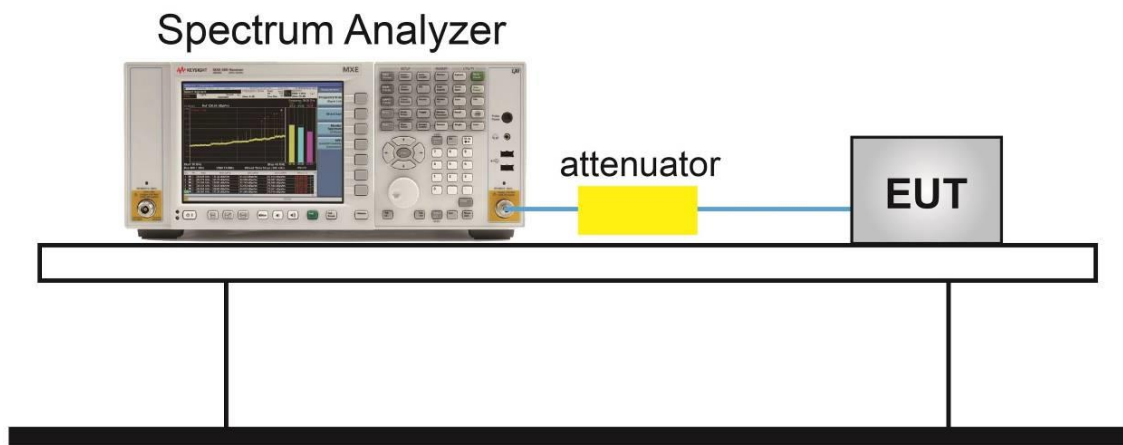
Reference level measurement

1. Set instrument center frequency to DTS channel center frequency
2. Set the span to ≥ 1.5 times the DTS bandwidth
3. Set the RBW = 100 kHz
4. Set the VBW $\geq 3 \times$ RBW
5. Detector = peak
6. Sweep time = auto couple
7. Trace mode = max hold
8. Allow trace to fully stabilize

Emission level measurement

1. Set the center frequency and span to encompass frequency range to be measured
2. RBW = 100kHz
3. VBW = 300kHz
4. Detector = Peak
5. Trace mode = max hold
6. Sweep time = auto couple
7. The trace was allowed to stabilize

6.5.4. Test Setup



6.5.5. Test Result

Refer to Appendix A.4.

6.6. Radiated Spurious Emission

6.6.1. Test Limit

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15 Subpart C Paragraph 15.209		
Frequency [MHz]	Field Strength [uV/m]	Measured Distance [Meters]
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

6.6.2. Test Procedure Used

ANSI C63.10 - 2013 - Section 11.11 & 11.12

ANSI C63.10 - 2013 - Section 6.3 (General Requirements)

ANSI C63.10 - 2013 - Section 6.4 (Standard test method below 30MHz)

ANSI C63.10 - 2013 - Section 6.5 (Standard test method above 30MHz to 1GHz)

ANSI C63.10 - 2013 - Section 6.6 (Standard test method above 1GHz)

6.6.3. Test Setting

Table 1 - RBW as a function of frequency

Frequency	RBW
9 ~ 150 kHz	200 ~ 300 Hz
0.15 ~ 30 MHz	9 ~ 10 kHz
30 ~ 1000 MHz	100 ~ 120 kHz
> 1000MHz	1MHz

Quasi-Peak Measurements below 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. Span was set greater than 1MHz
3. RBW = as specified in Table 1
4. Detector = CISPR quasi-peak
5. Sweep time = auto couple
6. Trace was allowed to stabilize

Peak Measurements above 1GHz

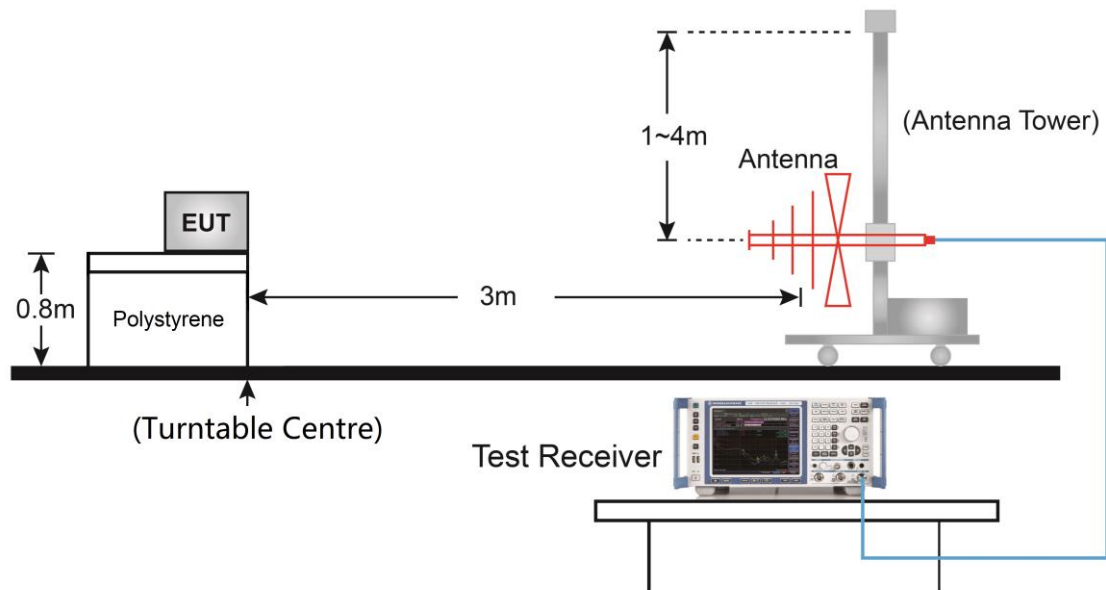
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

Average Measurements above 1GHz (Method VB)

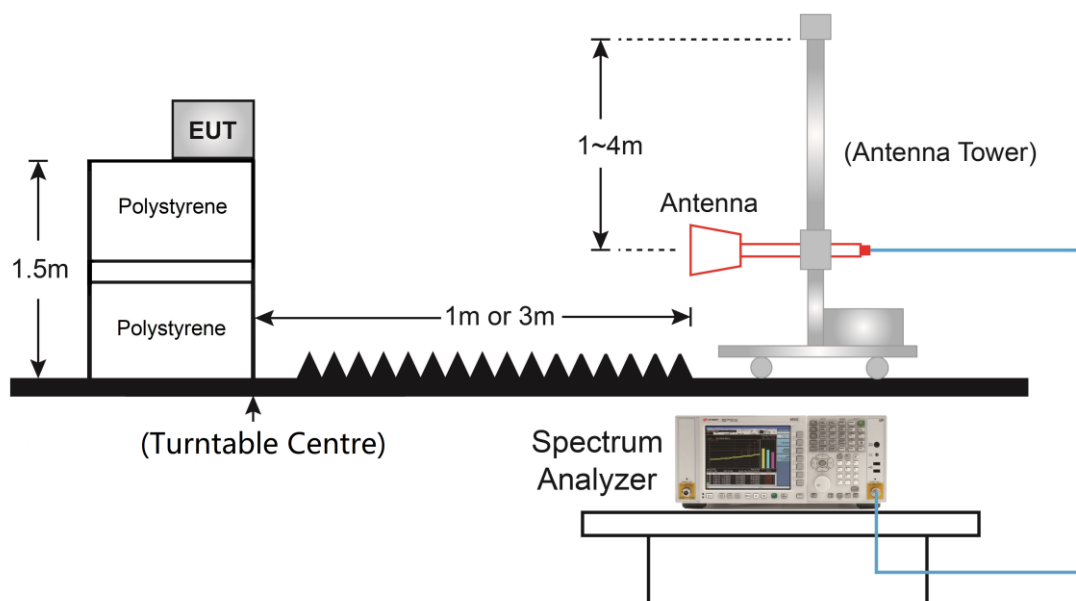
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW; If the EUT is configured to transmit with duty cycle $\geq 98\%$, set VBW = 10 Hz.
If the EUT duty cycle is $< 98\%$, set VBW $\geq 1/T$. T is the minimum transmission duration.
4. Detector = Peak
5. Sweep time = auto
6. Trace mode = max hold
7. Trace was allowed to stabilize

6.6.4. Test Setup

Below 1GHz Test Setup:



Above 1GHz Test Setup:



6.6.5. Test Result

Refer to Appendix A.5.

6.7. Radiated Restricted Band Edge

6.7.1. Test Limit

For 15.205 requirement:

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part 15, must also comply with the radiated emission limits specified in Section 15.209(a).

Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)
13.36 - 13.41	--	--	--

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15 Subpart C Paragraph 15.209		
Frequency [MHz]	Field Strength [uV/m]	Measured Distance [Meters]
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

6.7.2. Test Procedure Used

ANSI C63.10-2013 Section 6.3

ANSI C63.10-2013 Section 6.6

ANSI C63.10-2013 Section 11.13

6.7.3. Test Setting

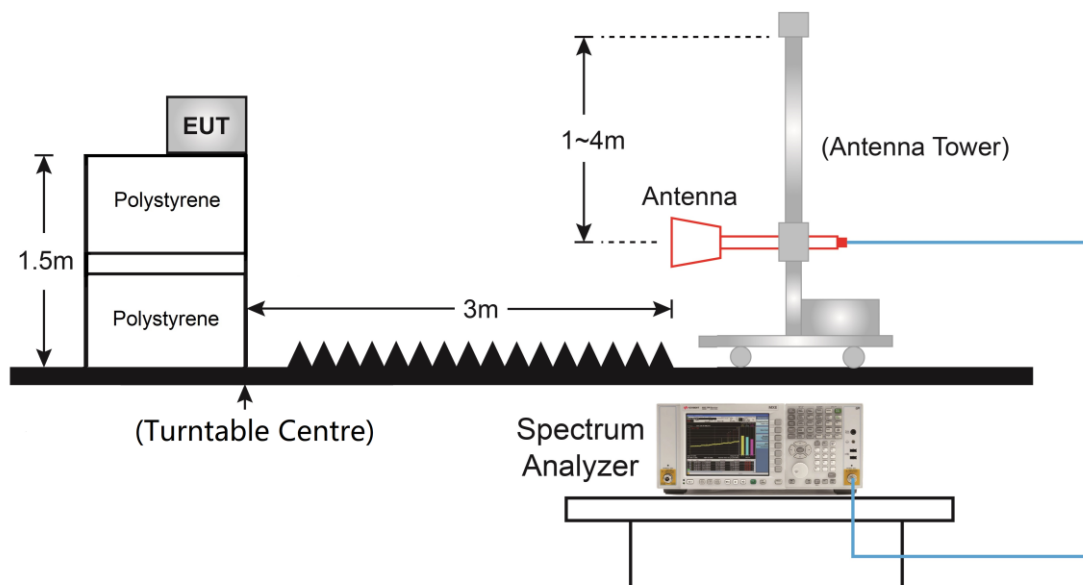
Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

Average Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW $\geq 1/T$
4. As an alternative, the instrument may be set to linear detector mode. Ensure that video filtering is applied in linear voltage domain (rather than in a log or dB domain). Some instruments require linear display mode in order to accomplish this. Others have a setting for Average-VBW Type, which can be set to "Voltage" regardless of the display mode
5. Detector = Peak
6. Sweep time = auto
7. Trace mode = max hold
8. Allow max hold to run for at least 50 times (1/duty cycle) traces

6.7.4. Test Setup



6.7.5. Test Result

Refer to Appendix A.6.

6.8. AC Conducted Emissions

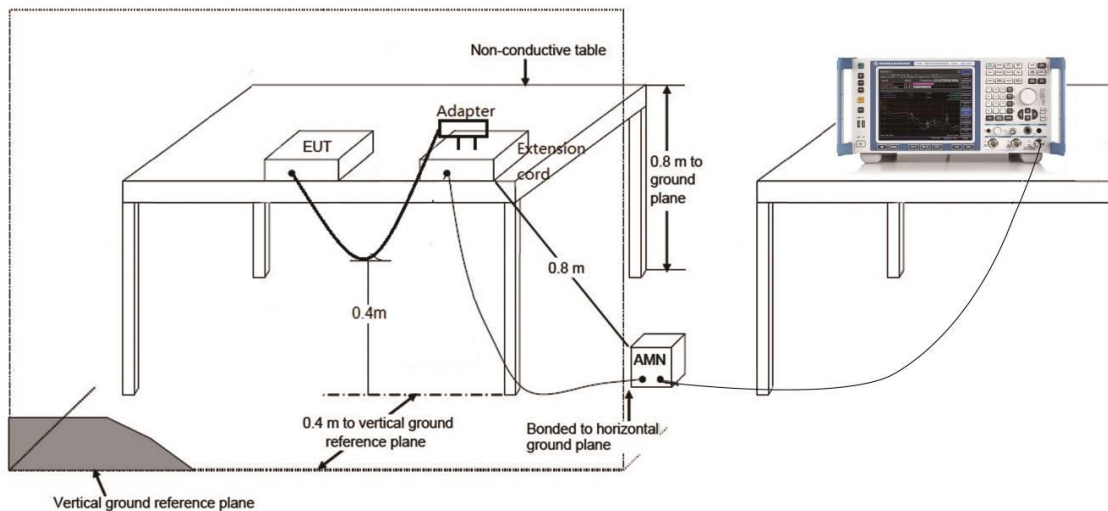
6.8.1. Test Limit

FCC Part 15 Subpart C Paragraph 15.207 Limits		
Frequency (MHz)	QP (dBuV)	AV (dBuV)
0.15 - 0.50	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

6.8.2. Test Setup



6.8.3. Test Result

Refer to Appendix A.7.

7. Conclusion

The data collected relate only the item(s) tested and show that the device is in compliance with Part 15C of the FCC rules.

The End

Appendix A - Test Result

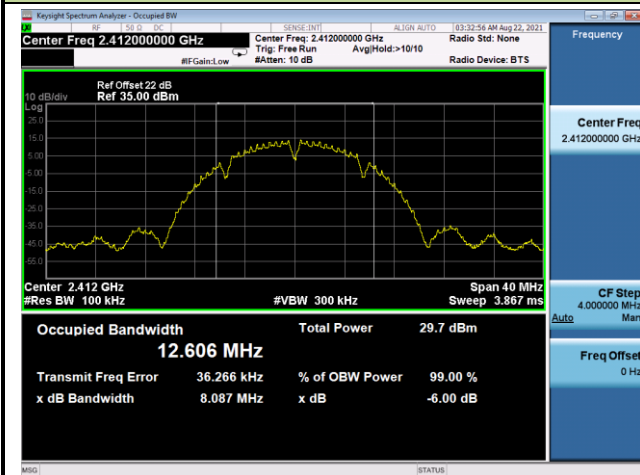
A.1 6dB Bandwidth Test Result

Test Site	NS-TR2	Test Engineer	Flay Yang
Test Date	2021/08/22		

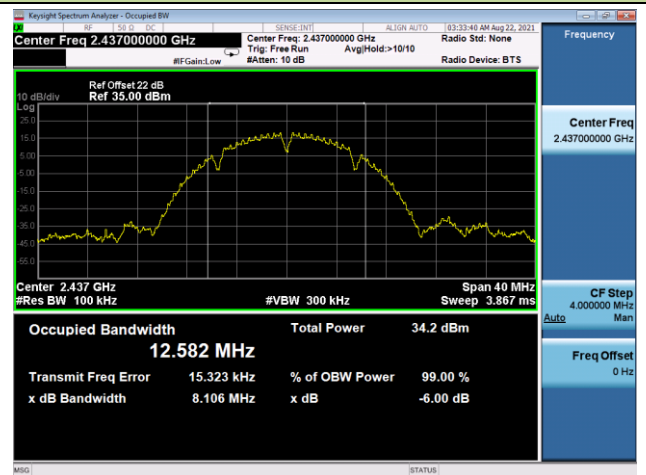
Test Mode	Data Rate / MCS	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)
11b	1Mbps	01	2412	8.09	≥ 0.5
11b	1Mbps	06	2437	8.11	≥ 0.5
11b	1Mbps	11	2462	7.61	≥ 0.5
11g	6Mbps	01	2412	15.14	≥ 0.5
11g	6Mbps	06	2437	15.15	≥ 0.5
11g	6Mbps	11	2462	15.13	≥ 0.5
11n-HT20	MCS0	01	2412	15.14	≥ 0.5
11n-HT20	MCS0	06	2437	15.13	≥ 0.5
11n-HT20	MCS0	11	2462	15.14	≥ 0.5
11n-HT40	MCS0	03	2422	35.15	≥ 0.5
11n-HT40	MCS0	06	2437	35.14	≥ 0.5
11n-HT40	MCS0	09	2452	35.15	≥ 0.5
VHT20	MCS0	01	2412	15.14	≥ 0.5
VHT20	MCS0	06	2437	15.14	≥ 0.5
VHT20	MCS0	11	2462	15.14	≥ 0.5
VHT40	MCS0	03	2422	35.15	≥ 0.5
VHT40	MCS0	06	2437	35.14	≥ 0.5
VHT40	MCS0	09	2452	35.15	≥ 0.5

11b 6dB Bandwidth

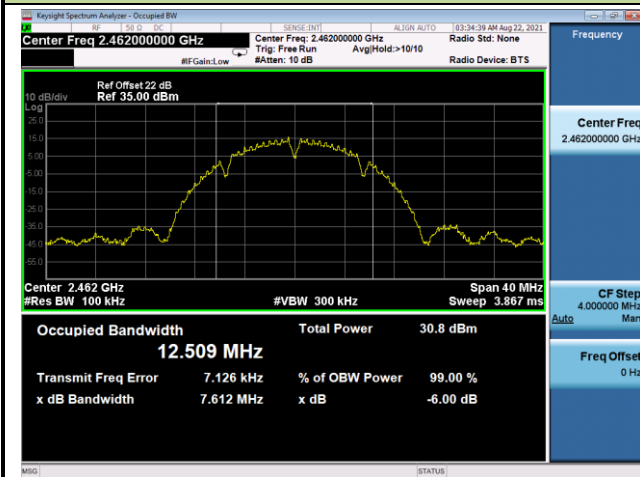
Channel 01 (2412MHz)



Channel 06 (2437MHz)

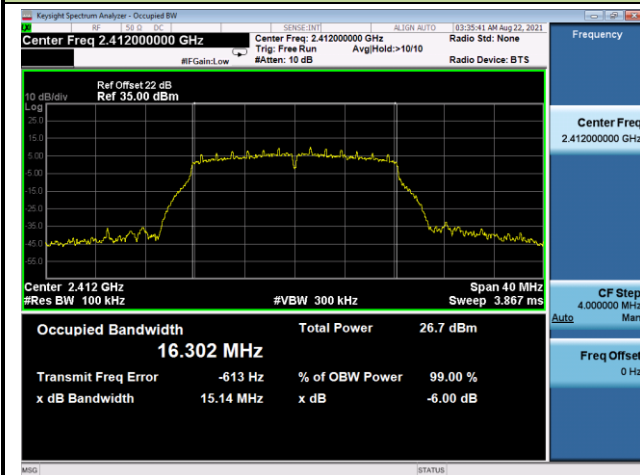


Channel 11 (2462MHz)

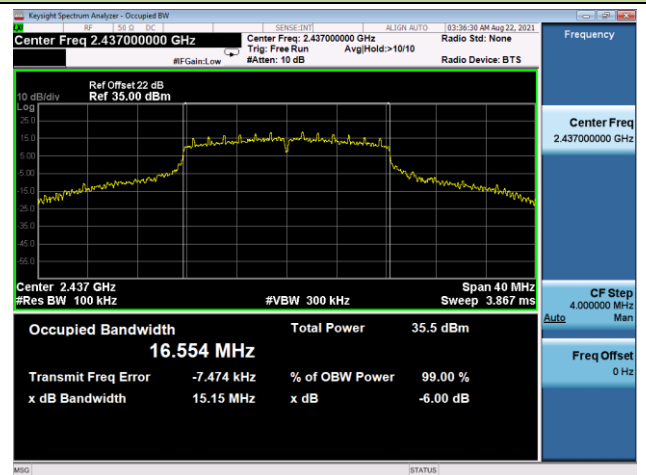


11g 6dB Bandwidth

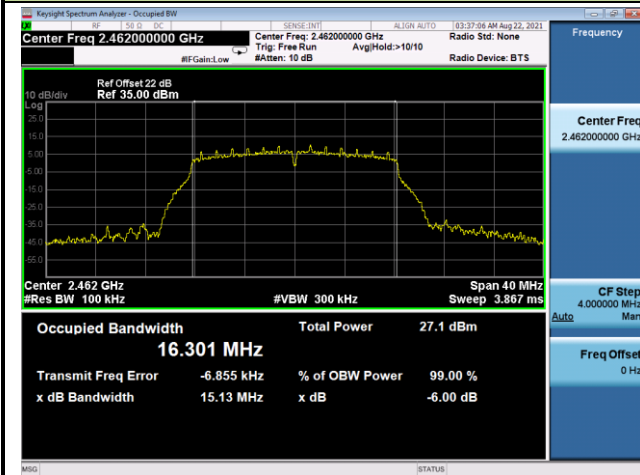
Channel 01 (2412MHz)



Channel 06 (2437MHz)

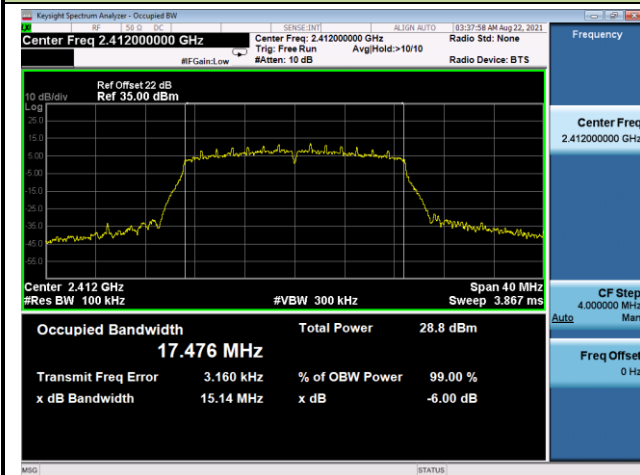


Channel 11 (2462MHz)



11n-HT20 6dB Bandwidth

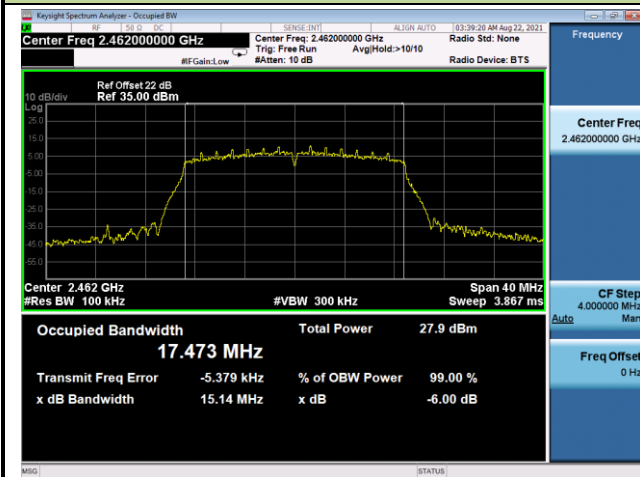
Channel 01 (2412MHz)



Channel 06 (2437MHz)

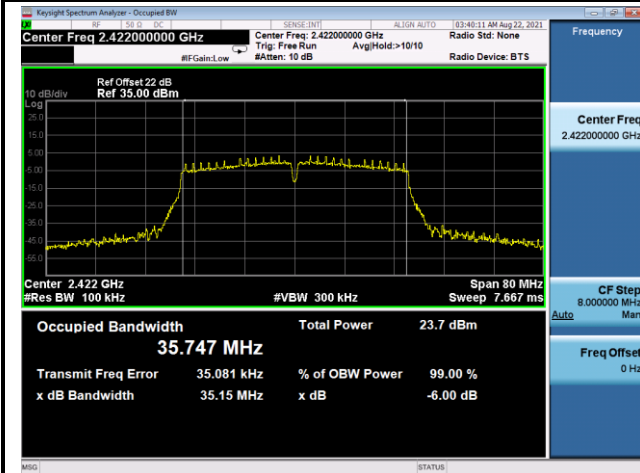


Channel 11 (2462MHz)

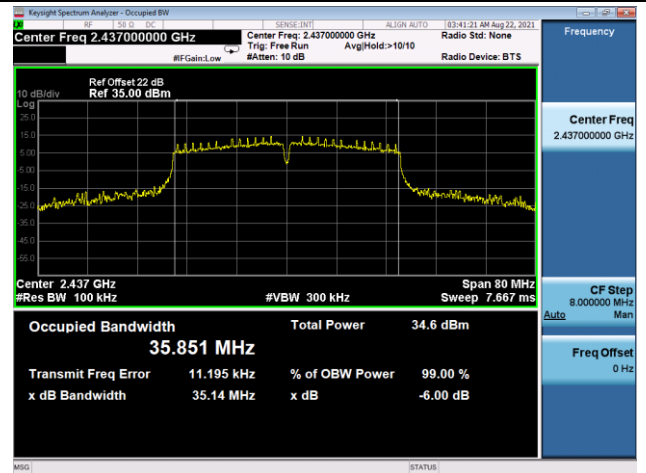


11n-HT40 6dB Bandwidth

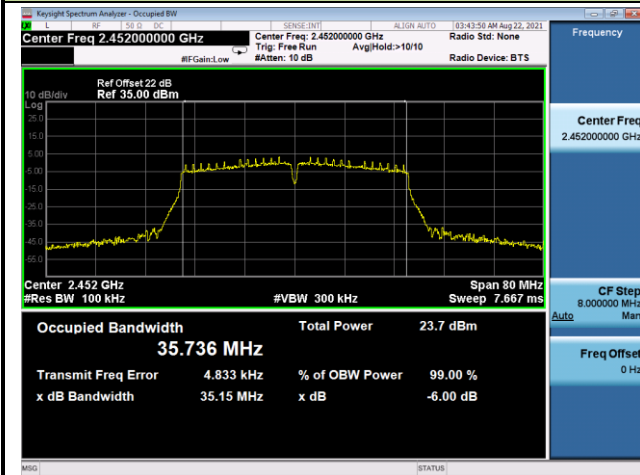
Channel 03 (2422MHz)



Channel 06 (2437MHz)

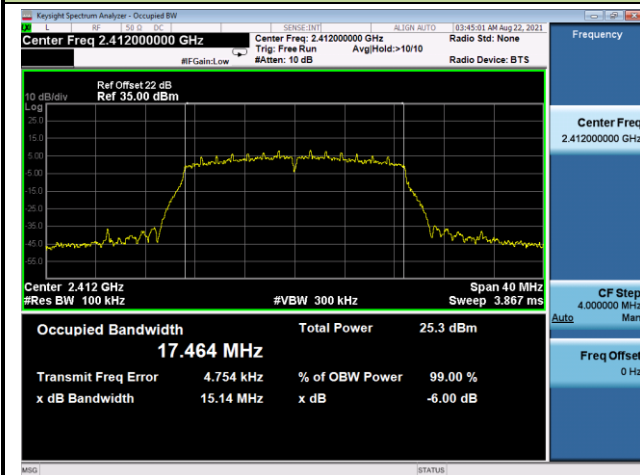


Channel 09 (2452MHz)

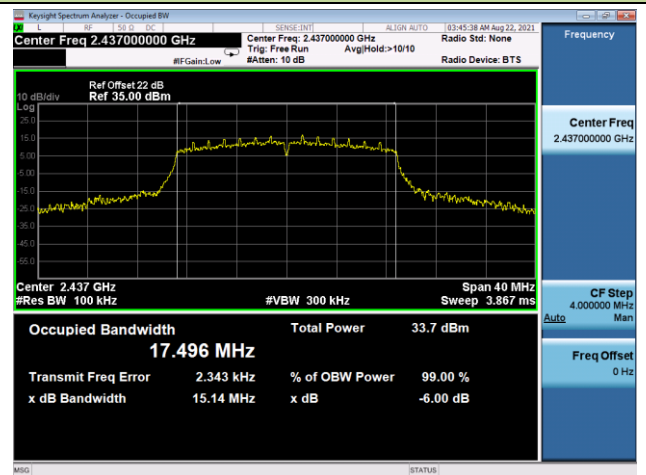


VHT20 6dB Bandwidth

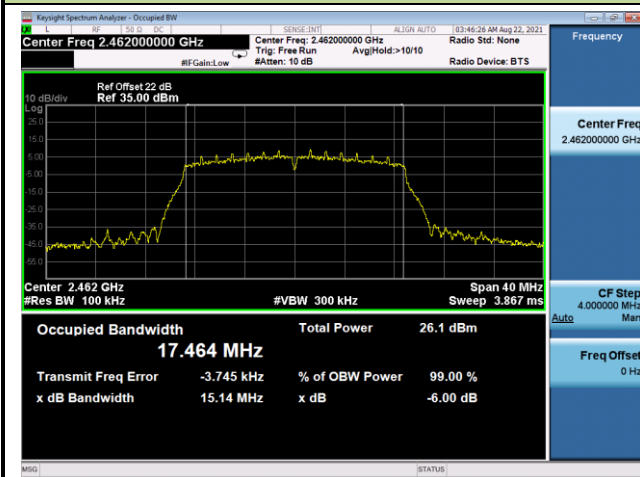
Channel 01 (2412MHz)



Channel 06 (2437MHz)

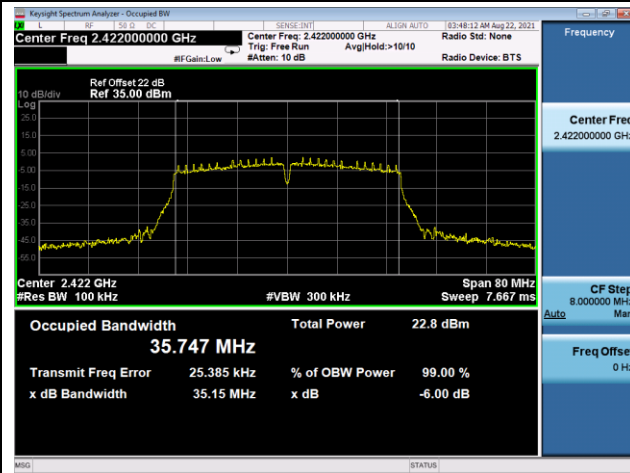


Channel 11 (2462MHz)

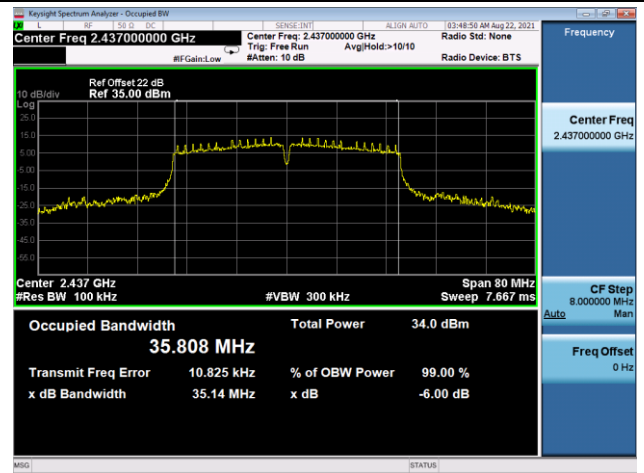


VHT40 6dB Bandwidth

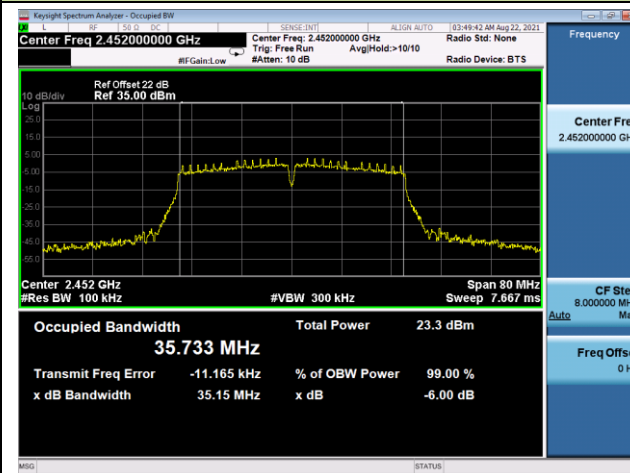
Channel 03 (2422MHz)



Channel 06 (2437MHz)



Channel 09 (2452MHz)



A.2 Output Power Test Result

Test Site	NS-TR2	Test Engineer	Flay Yang
Test Date	2021/08/22		

Pre-Test RF Output Power at various data rates for Ant 0. All modes of operation and data rates were investigated, so all RF test requirements shall be executed at low data rates.

Test Mode	Bandwidth (MHz)	Channel No.	Frequency (MHz)	Data Rate / MCS	Average Power (dBm)
11b	20	6	2437	1Mbps	22.12
				5.5Mbps	22.09
				11Mbps	21.78
11g	20	6	2437	6Mbps	21.06
				24Mbps	20.51
				54Mbps	19.63
11n	20	6	2437	MCS0	20.72
				MCS3	20.13
				MCS7	17.88
11n	40	6	2437	MCS0	18.77
				MCS3	18.44
				MCS7	16.97
VHT	20	6	2437	MCS0	20.26
				MCS3	19.85
				MCS7	18.57
VHT	40	6	2437	MCS0	17.90
				MCS3	17.42
				MCS7	16.68

Test Site	NS-TR2	Test Engineer	Flay Yang
Test Date	2021/08/22		

Test Mode	Data Rate / MCS	Channel No.	Freq. (MHz)	Average Power (dBm)		Total Average Power (dBm)	Limit (dBm)	Result
				Ant 0	Ant 1			
11b	1Mbps	01	2412	22.56	22.08	25.34	≤ 30.00	Pass
11b	1Mbps	06	2437	22.12	22.10	25.12	≤ 30.00	Pass
11b	1Mbps	11	2462	23.45	23.54	26.51	≤ 30.00	Pass
11g	6Mbps	01	2412	19.25	18.50	21.90	≤ 30.00	Pass
11g	6Mbps	06	2437	21.06	21.03	24.06	≤ 30.00	Pass
11g	6Mbps	11	2462	20.58	19.54	23.10	≤ 30.00	Pass
11n-HT20	MCS0	01	2412	17.52	17.85	20.70	≤ 30.00	Pass
11n-HT20	MCS0	06	2437	20.72	20.85	23.80	≤ 30.00	Pass
11n-HT20	MCS0	11	2462	20.71	19.61	23.21	≤ 30.00	Pass
11n-HT40	MCS0	03	2422	15.47	15.07	18.28	≤ 30.00	Pass
11n-HT40	MCS0	06	2437	18.77	18.62	21.71	≤ 30.00	Pass
11n-HT40	MCS0	09	2452	17.62	17.12	20.39	≤ 30.00	Pass
VHT20	MCS0	01	2412	18.86	18.22	21.56	≤ 30.00	Pass
VHT20	MCS0	06	2437	20.26	19.64	22.97	≤ 30.00	Pass
VHT20	MCS0	11	2462	19.64	18.51	22.12	≤ 30.00	Pass
VHT40	MCS0	03	2422	15.66	15.31	18.50	≤ 30.00	Pass
VHT40	MCS0	06	2437	17.90	18.43	21.18	≤ 30.00	Pass
VHT40	MCS0	09	2452	15.83	14.57	18.26	≤ 30.00	Pass

Note: Total Average Power (dBm) = $10 \cdot \log \{10^{(\text{Ant 0 Average Power} / 10)} + 10^{(\text{Ant 1 Average Power} / 10)}\}$ (dBm).

A.3 Power Spectral Density Test Result

Test Site	NS-TR2	Test Engineer	Flay Yang
Test Date	2021/08/22 ~ 2021/08/24		

Test Mode	Data Rate/ MCS	Channel No.	Freq. (MHz)	AVG PSD (dBm/10kHz)		Duty Cycle (%)	Total AVG PSD (dBm/10kHz)	Limit (dBm/3kHz)	Result
				Ant 0	Ant 1				
11b	1Mbps	01	2412	-4.19	-4.40	98.91	-1.28	≤ 7.49	Pass
11b	1Mbps	06	2437	-3.22	-3.63	98.91	-0.41	≤ 7.49	Pass
11b	1Mbps	11	2462	-2.96	-2.64	98.91	0.21	≤ 7.49	Pass
11g	6Mbps	01	2412	-8.60	-9.40	95.57	-5.77	≤ 7.49	Pass
11g	6Mbps	06	2437	-7.00	-6.89	95.57	-3.74	≤ 7.49	Pass
11g	6Mbps	11	2462	-7.41	-8.23	95.57	-4.59	≤ 7.49	Pass
11n-HT20	MCS0	01	2412	-10.05	-10.07	91.63	-6.67	≤ 7.49	Pass
11n-HT20	MCS0	06	2437	-7.06	-7.19	91.63	-3.73	≤ 7.49	Pass
11n-HT20	MCS0	11	2462	-7.38	-8.16	91.63	-4.36	≤ 7.49	Pass
11n-HT40	MCS0	03	2422	-14.99	-14.89	85.86	-11.27	≤ 7.49	Pass
11n-HT40	MCS0	06	2437	-11.60	-11.70	85.86	-7.97	≤ 7.49	Pass
11n-HT40	MCS0	09	2452	-12.54	-13.15	85.86	-9.16	≤ 7.49	Pass
VHT20	MCS0	01	2412	-9.71	-9.58	92.44	-6.29	≤ 7.49	Pass
VHT20	MCS0	06	2437	-7.76	-8.71	92.44	-4.86	≤ 7.49	Pass
VHT20	MCS0	11	2462	-7.75	-8.91	92.44	-4.94	≤ 7.49	Pass
VHT40	MCS0	03	2422	-15.11	-15.22	85.71	-11.48	≤ 7.49	Pass
VHT40	MCS0	06	2437	-11.58	-10.96	85.71	-7.58	≤ 7.49	Pass
VHT40	MCS0	09	2452	-13.42	-13.43	85.71	-9.75	≤ 7.49	Pass

Note:

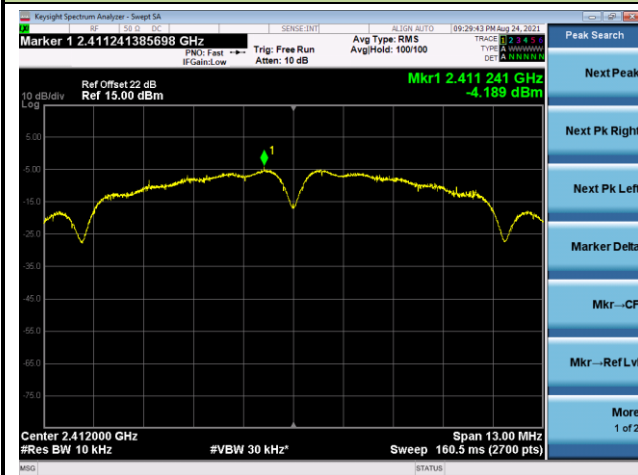
When EUT duty cycle > 98%, Total AVG PSD = $10 \cdot \log \{10^{(\text{Ant 0 AVG PSD}/10)} + 10^{(\text{Ant 1 AVG PSD}/10)}\}$

When EUT duty cycle ≤ 98%, Total AVG PSD = $10 \cdot \log \{10^{(\text{Ant 0 AVG PSD}/10)} + 10^{(\text{Ant 1 AVG PSD}/10)}\} + 10 \cdot \log (1/\text{Duty Cycle})$.

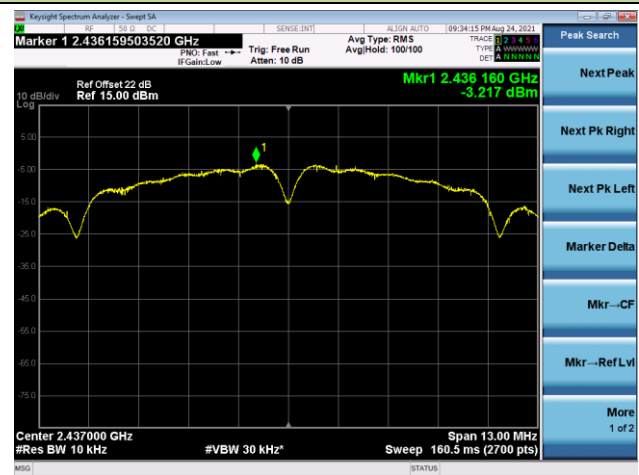
PSD Limit (dBm/3kHz) = 8 - (6.51 - 6) = 7.49 (dBm/3kHz)

11b AVGPSP - Ant 0

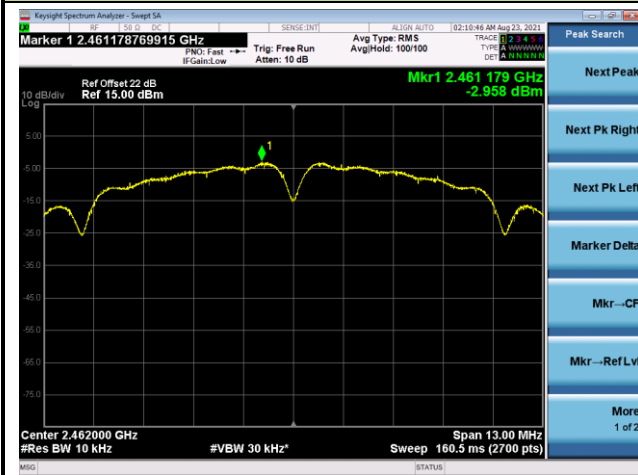
Channel 01 (2412MHz)



Channel 06 (2437MHz)

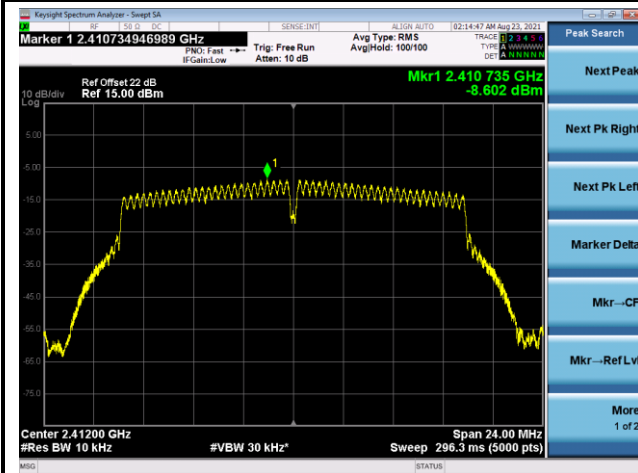


Channel 11 (2462MHz)

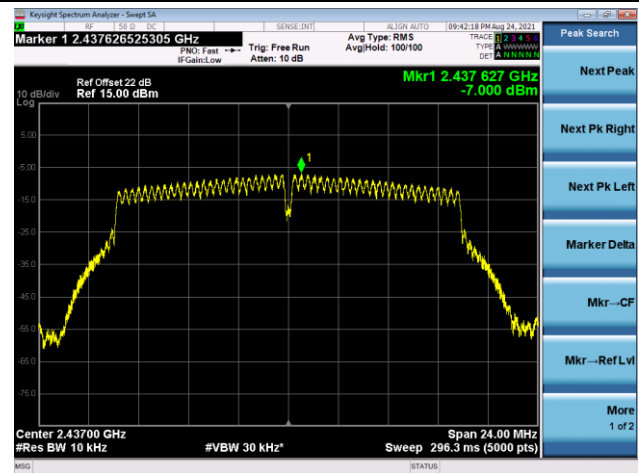


11g AVGPSPD - Ant 0

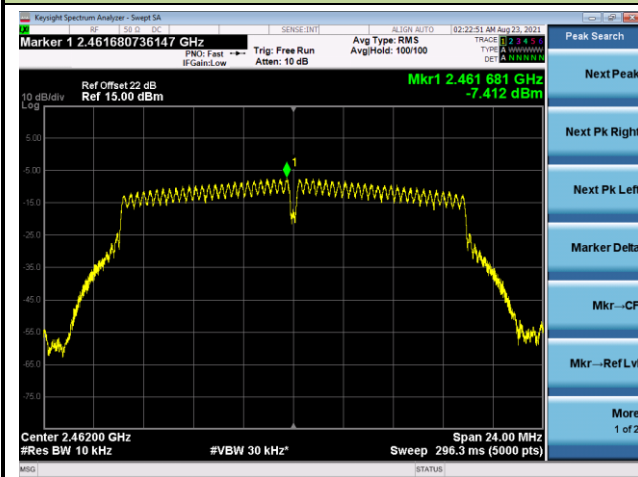
Channel 01 (2412MHz)



Channel 06 (2437MHz)

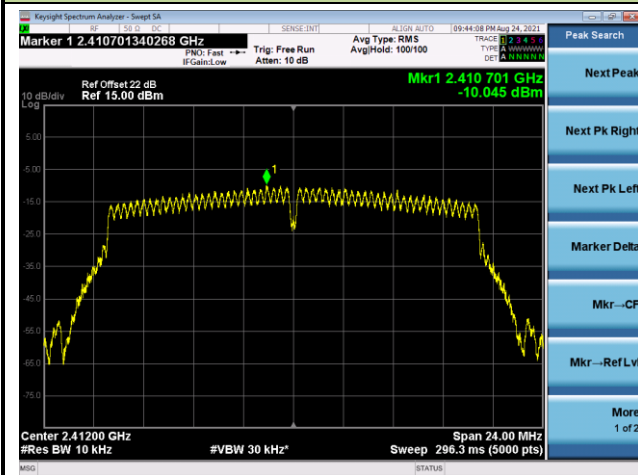


Channel 11 (2462MHz)

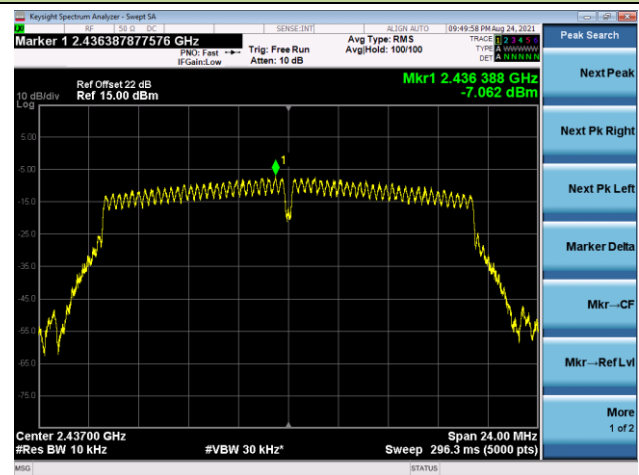


11n-HT20 AVGPDS - Ant 0

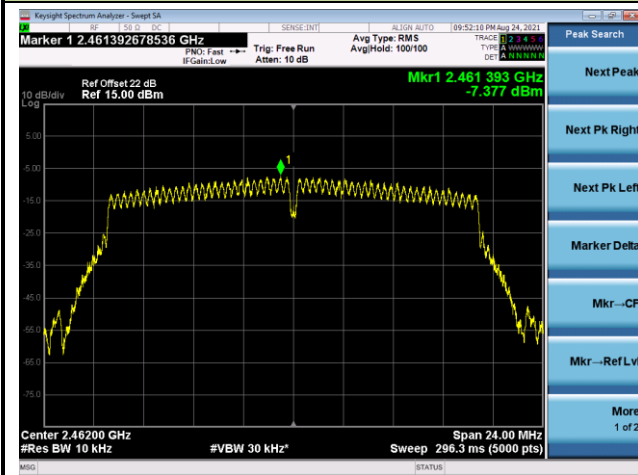
Channel 01 (2412MHz)



Channel 06 (2437MHz)

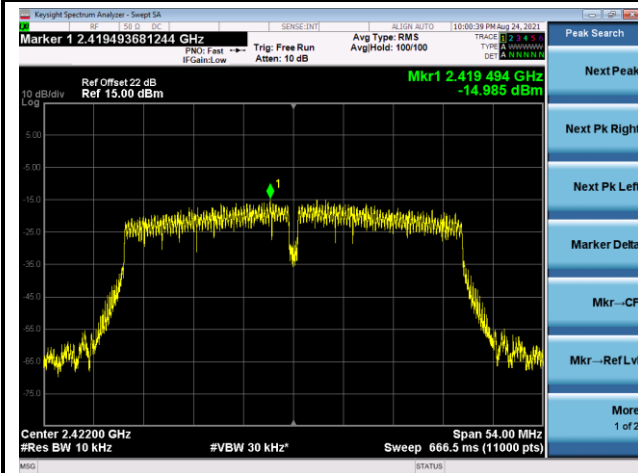


Channel 11 (2462MHz)

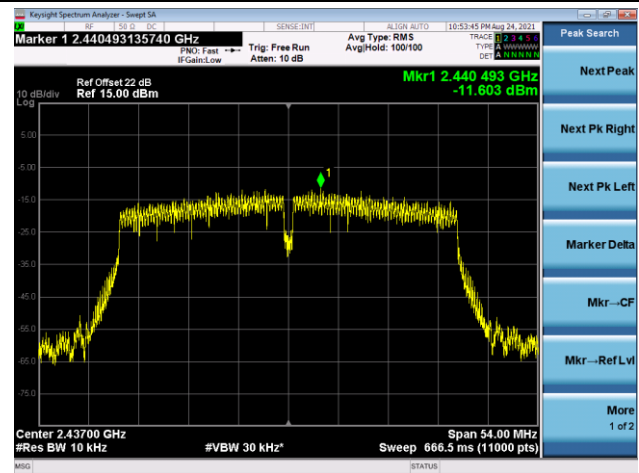


11n-HT40 AVGPDS - Ant 0

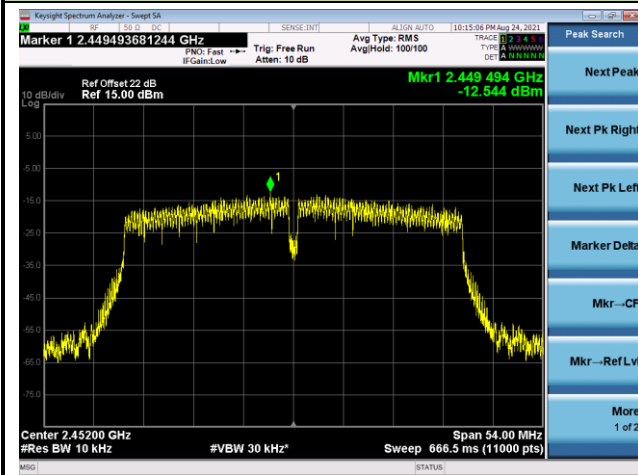
Channel 03 (2422MHz)



Channel 06 (2437MHz)

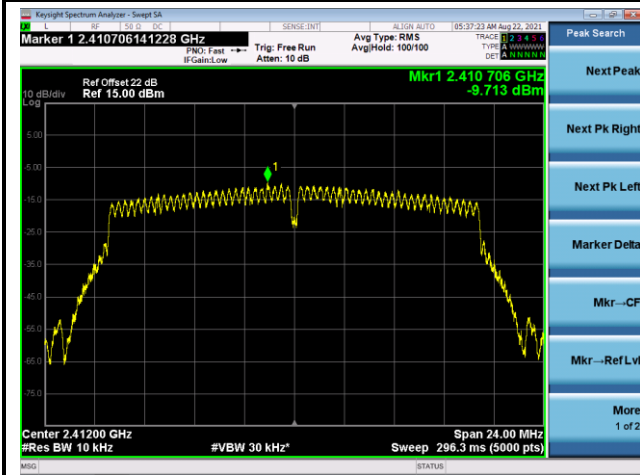


Channel 09 (2452MHz)

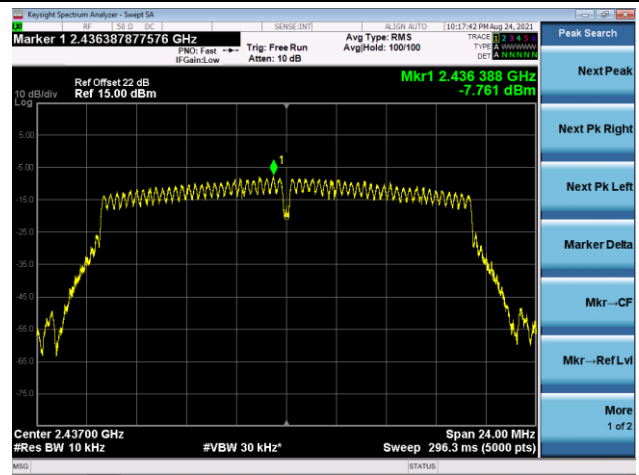


VHT20 AVGPDS - Ant 0

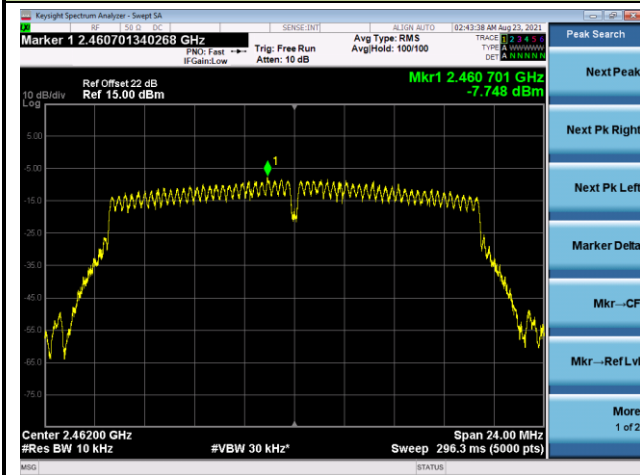
Channel 01 (2412MHz)



Channel 06 (2437MHz)

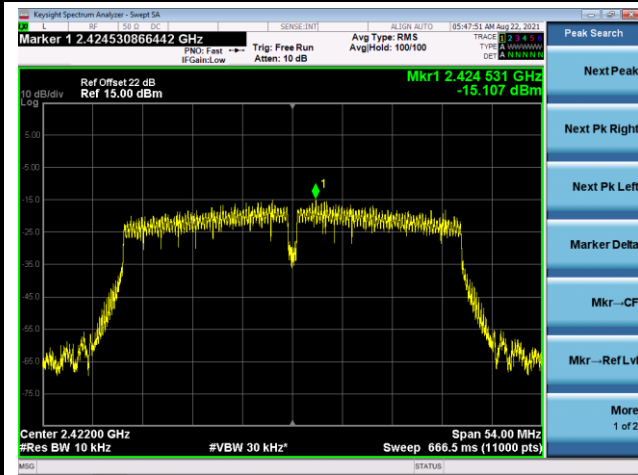


Channel 11 (2462MHz)

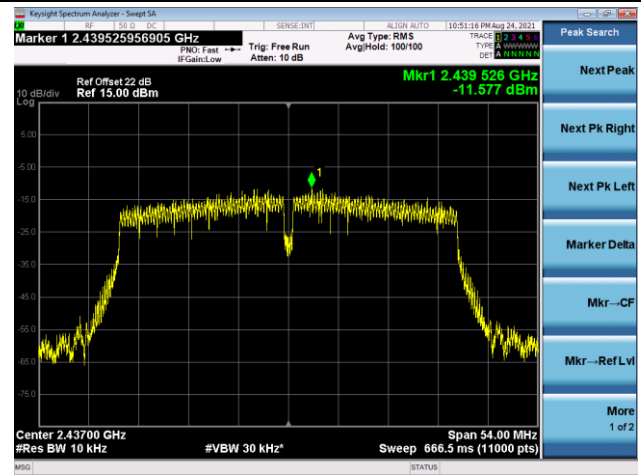


VHT40 AVGPDS - Ant 0

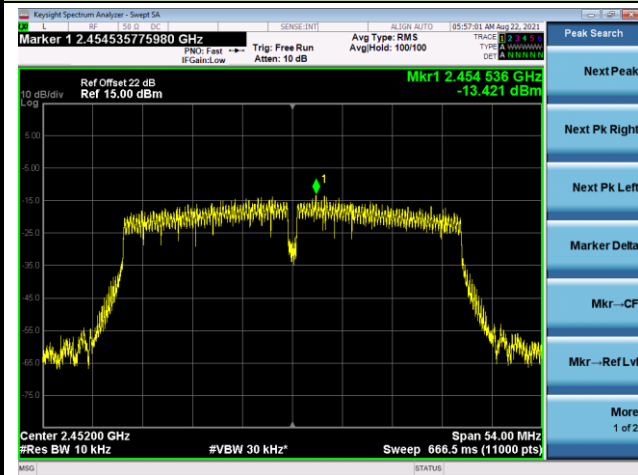
Channel 03 (2422MHz)



Channel 06 (2437MHz)

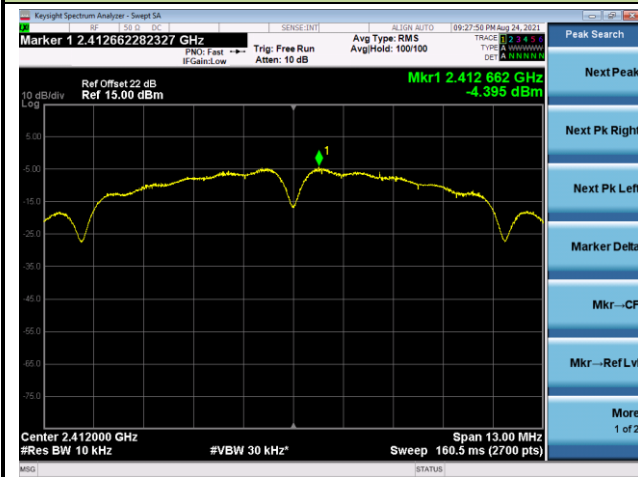


Channel 09 (2452MHz)

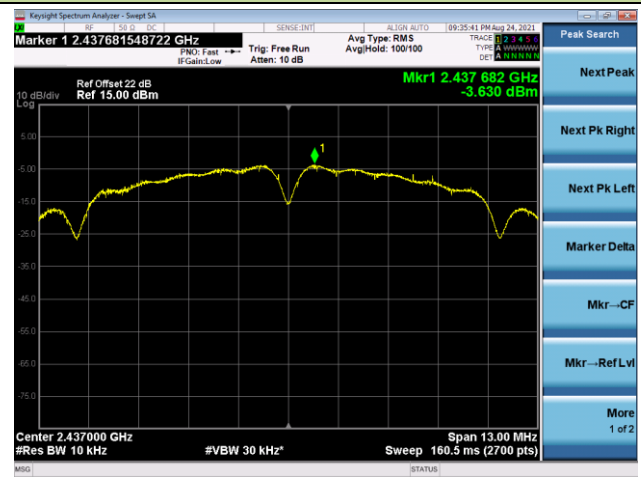


11b AVGPSP - Ant 1

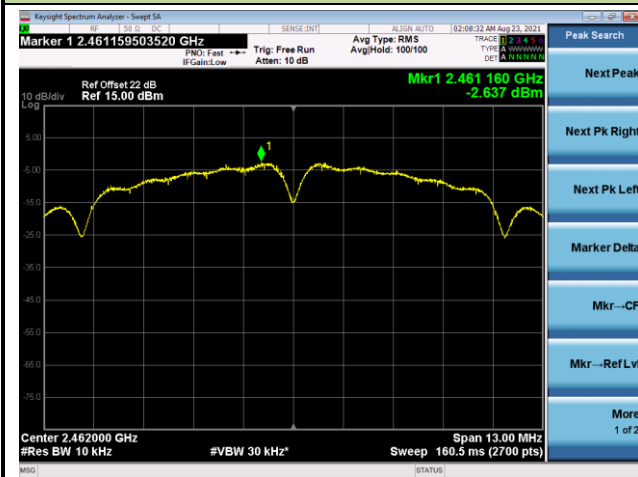
Channel 01 (2412MHz)



Channel 06 (2437MHz)

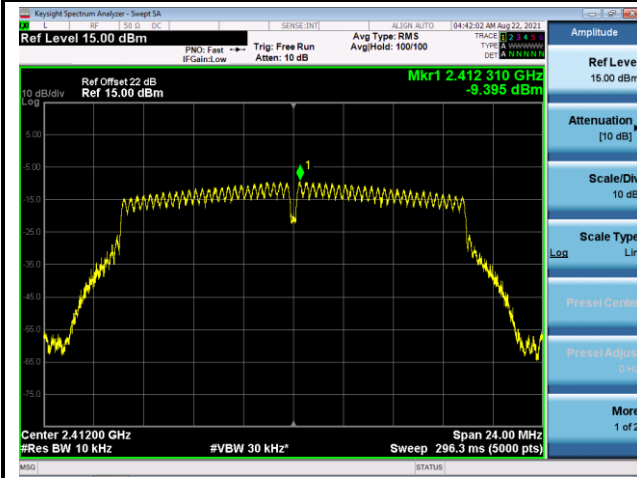


Channel 11 (2462MHz)

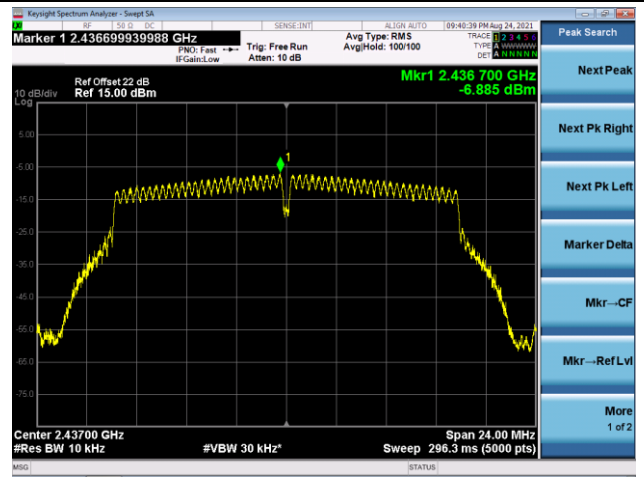


11g AVGPSPD - Ant 1

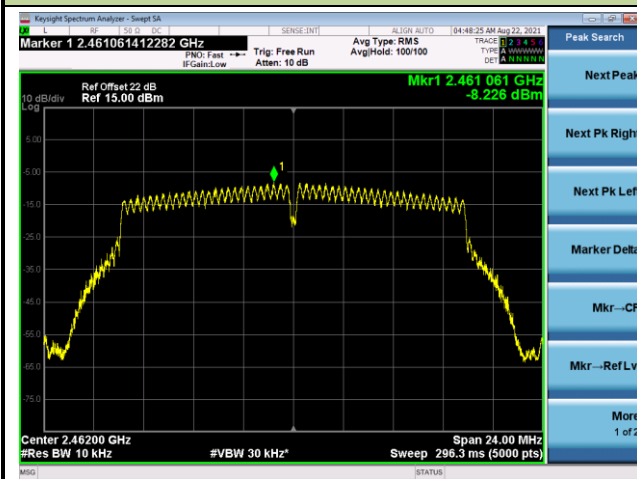
Channel 01 (2412MHz)



Channel 06 (2437MHz)

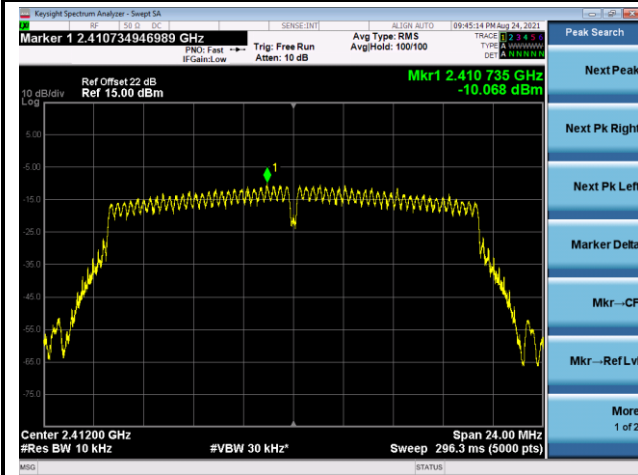


Channel 11 (2462MHz)

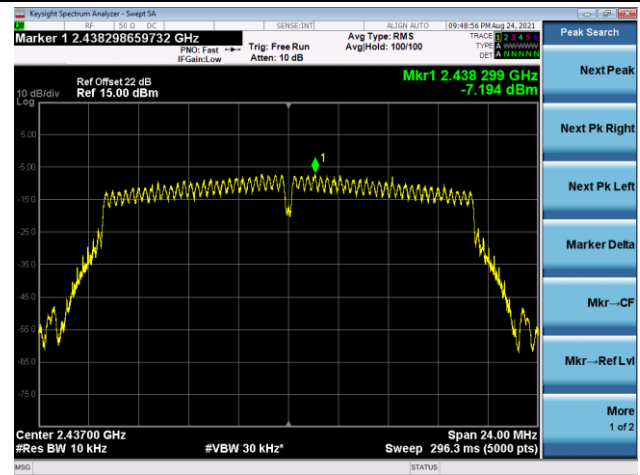


11n-HT20 AVGPDS - Ant 1

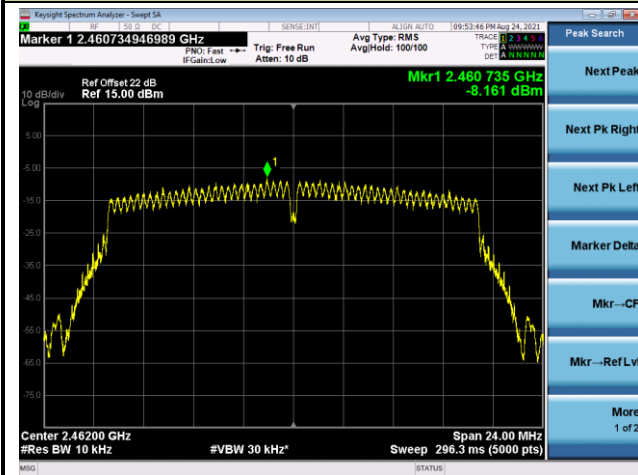
Channel 01 (2412MHz)



Channel 06 (2437MHz)

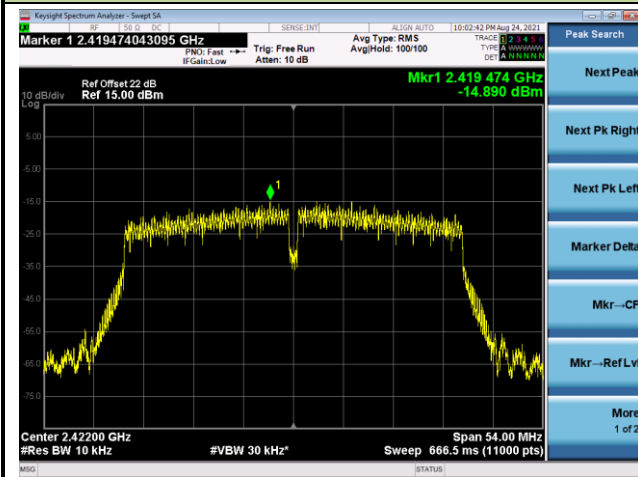


Channel 11 (2462MHz)

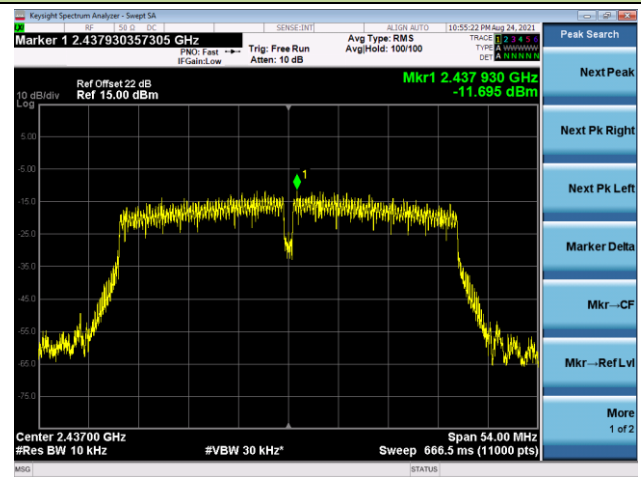


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Channel 03 (2422MHz)



Channel 06 (2437MHz)



Channel 09 (2452MHz)

