



Report No.: TW2305190-03E

Applicant: Delta Electronics Incorporated

Product: NovoDS Digital Signage Solution

Model No.: DS210, DS110

Trademark: Vivitek

FCC ID: H79-023DS2

Test Standards: FCC Part 15.247

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

Approved By

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

Terry Tang

Manager

Dated: June 05, 2023

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/IEC 17025:2017 General Requirements) for the Competence of testing Laboratories.

FCC-Registration No.: 744189

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

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

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

A2LA (Certification Number:5013.01)

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

CAB identifier: CN0033

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Test Report Conclusion
Content

1.0	General Details	4
1.1	Test Lab Details	4
1.2	Applicant Details	4
1.3	Description of EUT	4
1.4	Submitted Sample	5
1.5	Test Duration	5
1.6	Test Uncertainty	5
1.7	Test By	5
2.0	List of Measurement Equipment	6
3.0	Technical Details	8
3.1	Summary of Test Results	8
3.2	Test Standards	8
4.0	EUT Modification	8
5.0	Power Line Conducted Emission Test	9
5.1	Schematics of the Test	9
5.2	Test Method and Test Procedure	9
5.3	Configuration of the EUT	9
5.4	EUT Operating Condition	10
5.5	Conducted Emission Limit	10
5.6	Test Result	10
6.0	Radiated Emission test	13
6.1	Test Method and Test Procedure	13
6.2	Configuration of the EUT	14
6.3	EUT Operation Condition	14
6.4	Radiated Emission Limit	14
7.0	6dB Bandwidth Measurement	20
8.0	Maximum Output Power	29
9.0	Power Spectral Density Measurement	31
10.0	Out of Band Measurement	40
11.0	Antenna Requirement	57
12.0	FCC ID Label	58
13.0	Photo of Test Setup and EUT View	59

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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: Delta Electronics Incorporated
Address: 3 Tungyung rd., Chungli Industrial Zone, Taoyuan County 32063 Taiwan
Telephone: --
Fax: --

1.3 Description of EUT

Product:	NovoDS Digital Signage Solution
Manufacturer:	Delta Electronics Incorporated
Address:	3 Tungyung rd., Chungli Industrial Zone, Taoyuan County 32063 Taiwan
Trademark:	Vivitek
Model Number:	DS210
Additional Model Number:	DS110
Hardware Version:	RKS221012
Software Version:	build number: 5.0.0.12
Serial No.:	N/A
Rating:	DC5V, 3.0A
Power Supply:	Model: CNXZX3015-050030SA Input: AC100-240V~, 50/60Hz, 0.4A; Output: DC5.0V, 3.0A, 15W
Type of Modulation	IEEE 802.11b: DSSS (CCK, QPSK, DBPSK) IEEE 802.11g/n (HT20, HT40): OFDM (64QAM, 16QAM, QPSK, BPSK)
Frequency range	IEEE 802.11b/g/n (HT20): 2412-2462MHz; IEEE 802.11n HT40: 2422-2452MHz
Channel Spacing	5MHz for IEEE 802.11b/g/n HT20, HT40
Air Data Rate	IEEE 802.11b: 11, 5.5, 2, 1 Mbps

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	IEEE 802.11g: 54, 48, 36, 24, 18, 12, 9, 6 Mbps
	IEEE 802.11n HT20/HT40: mcs0-mcs7
Frequency Selection	By software
Channel Number	IEEE 802.11b/g/n (HT20): 11 Channels; IEEE 802.11n (HT40): 7 Channels;
Antenna:	Two Dipole antenna used with reverse polarity antenna connectors. The gain of each antenna is 4.21dBi for 2.4G Band (Get from the antenna specification)
Rating:	Input: DC5V, 3.0A
Power Supply:	Model: CNXZX3015-050030SA
	Input: AC100-240V~, 50/60Hz, 0.4A; Output: DC5V, 3A, 15W

1.4 Submitted Sample: 2 Samples

1.5 Test Duration: 2023-05-15 to 2023-06-05

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	2022-07-15	2023-07-14
LISN	R&S	EZH3-Z5	100294	2022-07-18	2023-07-17
LISN	R&S	EZH3-Z5	100253	2022-07-18	2023-07-17
Impuls-Begrenzer	R&S	ESH3-Z2	100281	2022-07-18	2023-07-17
Loop Antenna	EMCO	6507	00078608	2022-07-18	2025-07-17
Spectrum	R&S	FSIQ26	100292	2022-07-15	2023-07-14
Spectrum	Keysight	N9020A	MY53300466	2023-03-05	2024-03-04
Horn Antenna	A-INFO	LB-180400-KF	J211060660	2022-07-18	2025-07-17
Horn Antenna	R&S	BBHA 9120D	9120D-631	2022-07-18	2024-07-17
Power meter	Anritsu	ML2487A	6K00003613	2022-07-18	2023-07-17
Power sensor	Anritsu	MA2491A	32263	2022-07-18	2023-07-17
Bilog Antenna	Schwarebeck	VULB9163	9163/340	2022-07-18	2025-07-17
9*6*6 Anechoic	--	--	N/A	2022-07-26	2025-07-25
EMI Test Receiver	RS	ESVB	826156/011	2022-07-15	2023-07-14
EMI Test Receiver	RS	ESCS 30	834115/006	2022-07-15	2023-07-14
Spectrum	HP/Agilent	E4407B	MY50441392	2022-07-15	2023-07-14
Spectrum	RS	FSP	1164.4391.38	2022-07-15	2023-07-14
RF Cable	Zhengdi	ZT26-NJ-NJ-8 M/FA	--	2022-07-15	2023-07-14
RF Cable	Zhengdi	7m	--	2022-07-15	2023-07-14
Pre-Amplifier	Schwarebeck	BBV9743	#218	2022-07-15	2023-07-14
Pre-Amplifier	HP/Agilent	8449B	3008A00160	2022-07-15	2023-07-14
LISN	SCHAFFNER	NNB42	00012	2022-08-18	2023-07-17
ESPI Test Receiver	R&S	ESPI 3	100379	2022-07-15	2023-07-14
LISN	R&S	EZH3-Z5	100294	2022-07-18	2023-07-17
LISN	R&S	EZH3-Z5	100253	2022-07-18	2023-07-17

2.2 Automation Test Software

For Conducted Emission Test

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

For Radiated Emissions

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

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3. DESCRIPTION OF TEST MODES

IEEE 802.11b, 802.11g, 802.11n (HT20) mode

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

Channel	Frequency (MHz)
Low	2412
Middle	2437
High	2462

IEEE 802.11b mode: 1Mbps data rate (worst case) was chosen for full testing. IEEE 802.11g mode: 6Mbps data rate (worst case) was chosen for full testing. IEEE 802.11n (HT20) mode: mcs0 (worst case) were chosen for full testing

IEEE 802.11n (HT40) mode

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

Channel	Frequency (MHz)
Low	2422
Middle	2437
High	2452

IEEE 802.11n (HT40) mode: mcs0 data rate (worst case) were chosen for full testing

Note: during the test, the duty cycle was set up to 100%.

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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 15.107 & 15.207	Conducted Emission Test	Pass	Complies
FCC Part 15 Subpart C Paragraph 15.247(a)(2) Limit	Spectrum bandwidth of a Orthogonal Frequency Division Multiplex System Limit: 6dB bandwidth>500kHz	Pass	Complies
FCC Part 15, Paragraph 15.247(b)	Maximum peak output power Limit: max. 30dBm	Pass	Complies
FCC Part 15, Paragraph 15.109,15.205 & 15.209	Transmitter Radiated Emission Limit: Table 15.209	Pass	Complies
FCC Part 15, Paragraph 15.247(e)	Power Spectral Density Limit: max. 8dBm	Pass	Complies
FCC Part 15, Paragraph 15.247(d)	Out of Band Emission and Restricted Band Radiation Limit: 20dB less than peak value of fundamental frequency Restricted band limit: Table 15.209	Pass	Complies

3.2 Test Standards

FCC Part 15 Subpart & Subpart C, Paragraph 15.247

4.0 EUT Modification

No modification by SHENZHEN TIMEWAY TESTING LABORATORIES.

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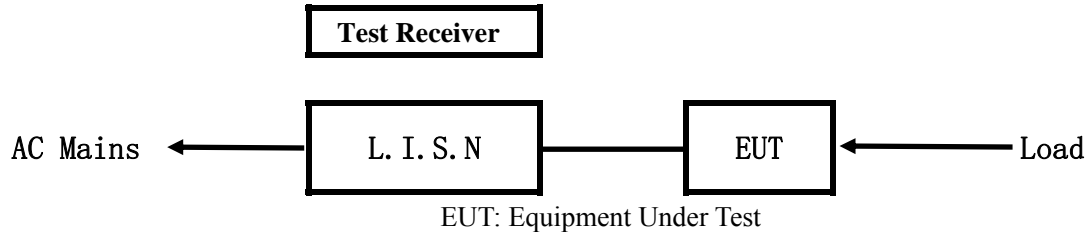
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5.0 Power Line Conducted Emission Test

5.1 Schematics of the test

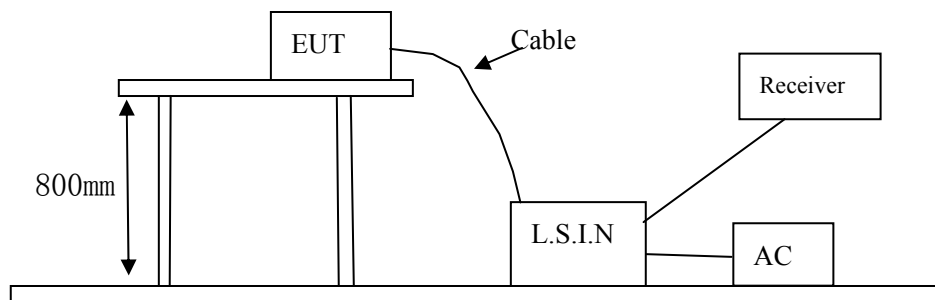


5.2 Test Method and test Procedure

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

Test Voltage: 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
NovoDS Digital Signage Solution	Delta Electronics Incorporated	DS210, DS110	H79-023DS2

B. Internal Device

Device	Manufacturer	Model	FCC ID/DOC
Adapter	Utech	CNXZX3015-0500305A	DOC

C. Peripherals

Device	Manufacturer	Model	Rating
LED Display	DELL	U2720QM	--

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5.4 EUT Operating Condition

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

A Setup the EUT and simulators as shown on follow

B Enable AF signal and confirm EUT active to normal condition

5.5 Power line conducted Emission Limit according to Paragraph 15.207

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

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

5.6 Test Results

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

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

EUT Operating Environment

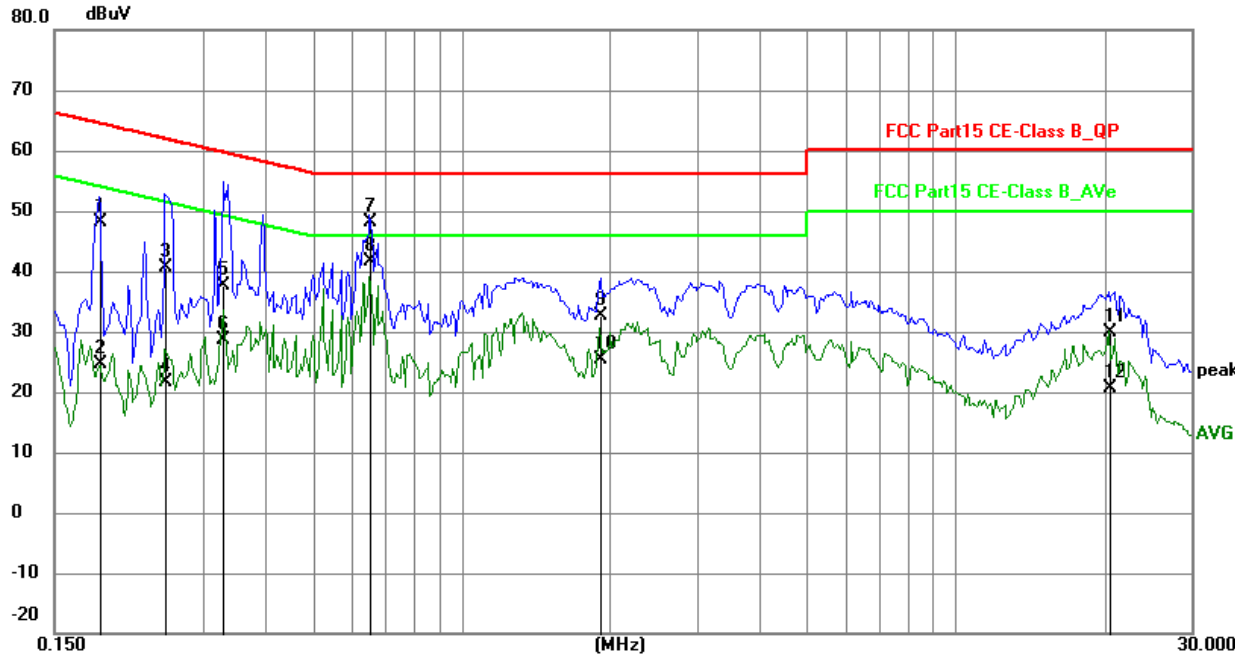
Temperature: 26°C Humidity: 65%RH Atmospheric Pressure: 101 kPa

EUT set Condition: Keep WIFI Transmitting

Results: Pass

Test Power: AC120V/60Hz

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	38.32	9.76	48.08	64.26	-16.18	QP	P
2	0.1850	14.97	9.76	24.73	54.26	-29.53	AVG	P
3	0.2514	30.84	9.75	40.59	61.71	-21.12	QP	P
4	0.2514	11.97	9.75	21.72	51.71	-29.99	AVG	P
5	0.3294	27.85	9.76	37.61	59.47	-21.86	QP	P
6	0.3294	18.80	9.76	28.56	49.47	-20.91	AVG	P
7	0.6531	38.36	9.78	48.14	56.00	-7.86	QP	P
8	0.6531	31.81	9.78	41.59	46.00	-4.41	AVG	P
9	1.9128	22.91	9.80	32.71	56.00	-23.29	QP	P
10	1.9128	15.52	9.80	25.32	46.00	-20.68	AVG	P
11	20.4291	19.14	10.71	29.85	60.00	-30.15	QP	P
12	20.4291	10.03	10.71	20.74	50.00	-29.26	AVG	P

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

EUT Operating Environment

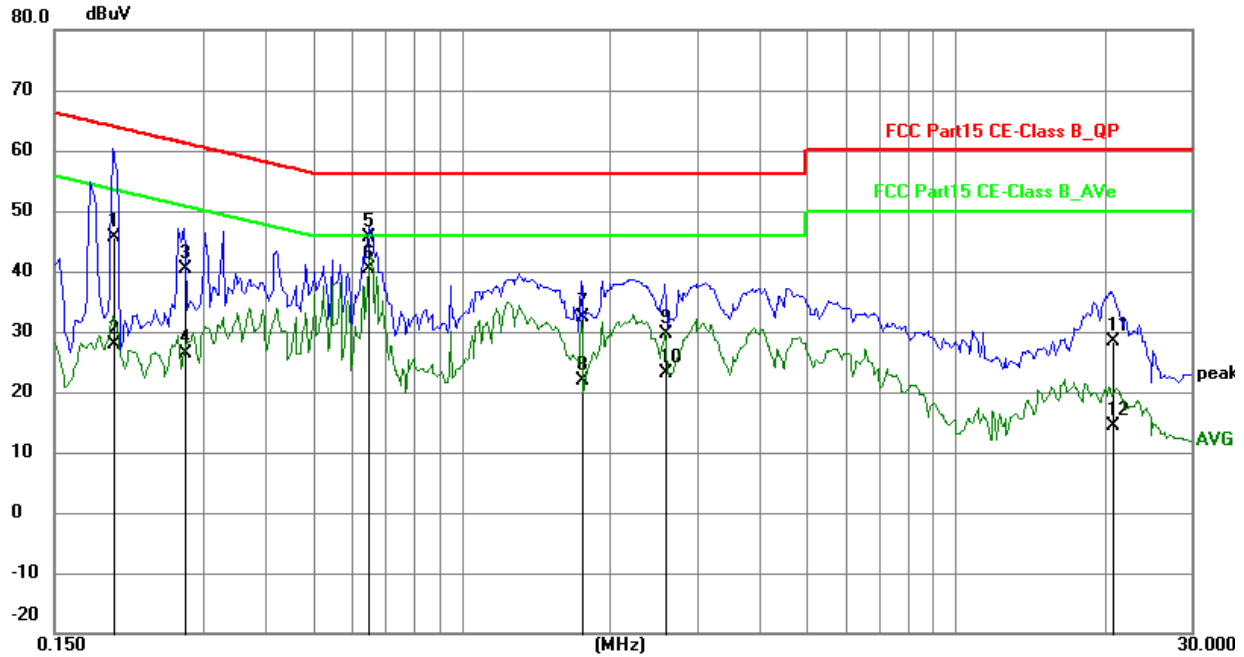
Temperature: 26°C Humidity: 65%RH Atmospheric Pressure: 101 kPa

EUT set Condition: Keep WIFI Transmitting

Results: Pass

Test Power: AC120V/60Hz

Please refer to following diagram for individual



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.1968	35.89	9.75	45.64	63.74	-18.10	QP	P
2	0.1968	18.20	9.75	27.95	53.74	-25.79	AVG	P
3	0.2748	30.67	9.75	40.42	60.97	-20.55	QP	P
4	0.2748	16.52	9.75	26.27	50.97	-24.70	AVG	P
5	0.6492	35.73	9.78	45.51	56.00	-10.49	QP	P
6	0.6492	30.51	9.78	40.29	46.00	-5.71	AVG	P
7	1.7490	22.65	9.80	32.45	56.00	-23.55	QP	P
8	1.7490	12.03	9.80	21.83	46.00	-24.17	AVG	P
9	2.5836	19.73	9.83	29.56	56.00	-26.44	QP	P
10	2.5836	13.37	9.83	23.20	46.00	-22.80	AVG	P
11	20.7099	17.58	10.72	28.30	60.00	-31.70	QP	P
12	20.7099	3.56	10.72	14.28	50.00	-35.72	AVG	P

Note: Both 240V and 120V voltages are tested, the data of the worst-case is shown in the report.

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6 Radiated Emission Test

6.1 Test Method and test Procedure:

- (1) The EUT was tested according to ANSI C63.10-2013. The radiated test was performed at Timeway EMC Laboratory. This site is on file with the FCC laboratory division, Registration No. 744189
- (2) The EUT, peripherals were put on the turntable which table size is 1m x 1.5 m, table high 0.8 m. All set up is according to ANSI C63.10-2013.

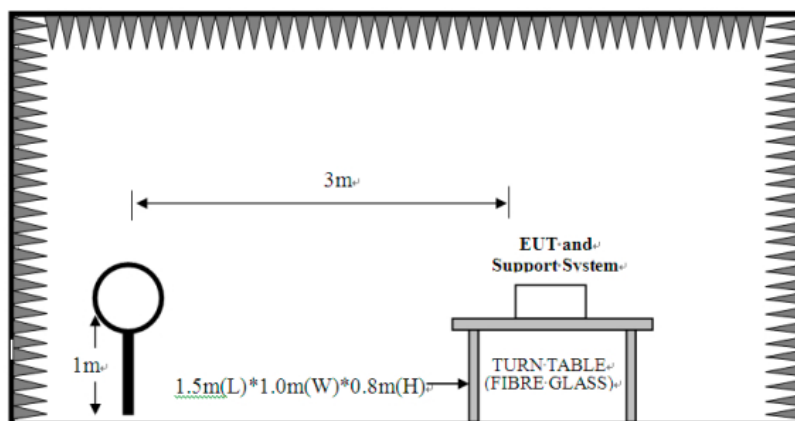
- (3) The frequency spectrum is set as follows:

Frequency	Detector	RBW	VBW	Value
9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak
150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak
30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

- (4) The antenna high is varied from 1 m to 4 m high to find the maximum emission for each frequency.
- (5) Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB of specification limit), and are distinguished with a “QP” in the data table.
- (6) The antenna polarization: Vertical polarization and Horizontal polarization.

Block diagram of Test setup

For radiated emissions from 9kHz to 30MHz



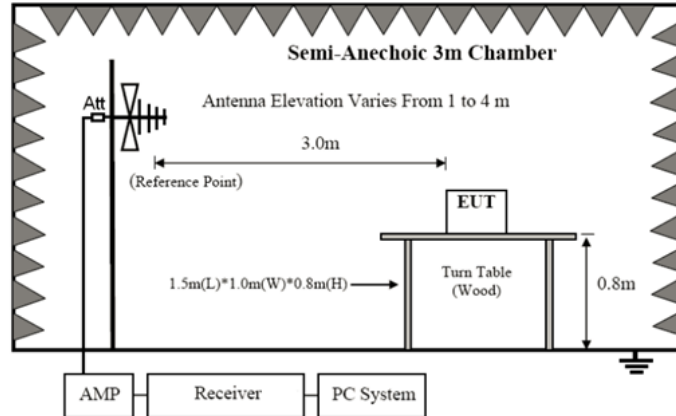
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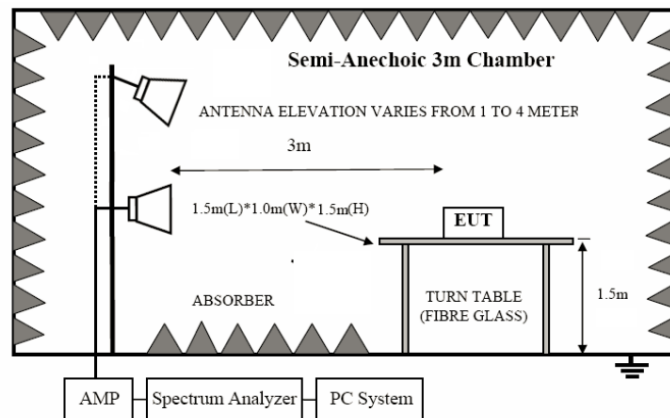
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For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



6.2 Configuration of The EUT

Same as section 5.3 of this report

6.3 EUT Operating Condition

Same as section 5.4 of this report.

6.4 Radiated Emission Limit

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

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Frequencies in restricted band are complied to limit on Paragraph 15.209

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

- Note:
1. RF Voltage (dBuV) = 20 log RF Voltage (uV)
 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. Worse case were recorded in the test report. 802.11n20 was the worst case.

Test result

General Radiated Emission Data and Harmonics Radiated Emission Data

Radiated Emission In Horizontal (9kHz---30MHz)

EUT set Condition: **Keep Transmitting**

Results: **Pass**

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	P
--	--	--	--	P

Note:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor = $20 \log(\text{specific distance/test distance})(\text{dB})$;

Limit line = specific limits(dBuv) + distance extrapolation factor

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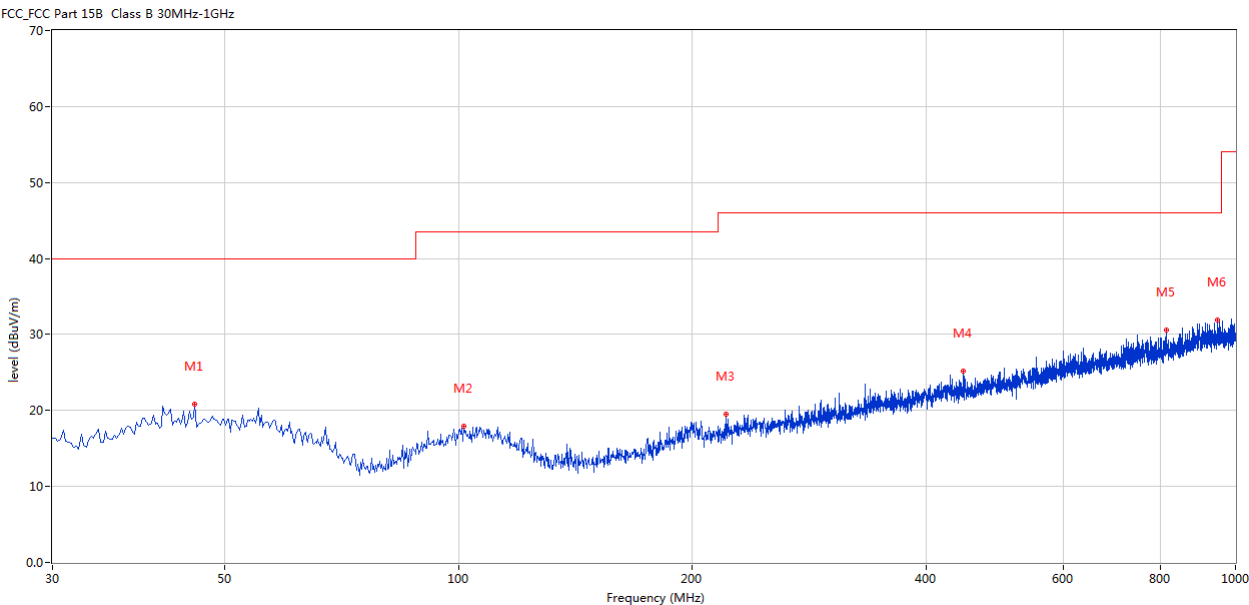
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Test result
General Radiated Emission Data and Harmonics Radiated Emission Data

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

EUT set Condition: Keep Transmitting
Results: Pass



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	45.759	20.83	-11.40	40.0	-19.17	Peak	164.00	100	Horizontal	Pass
2	101.520	17.91	-13.44	43.5	-25.59	Peak	81.00	100	Horizontal	Pass
3	221.042	19.49	-13.27	46.0	-26.51	Peak	142.00	100	Horizontal	Pass
4	446.268	25.21	-8.05	46.0	-20.79	Peak	34.00	100	Horizontal	Pass
5	814.049	30.55	-2.98	46.0	-15.45	Peak	91.00	100	Horizontal	Pass
6	946.663	31.89	-1.57	46.0	-14.11	Peak	145.00	100	Horizontal	Pass

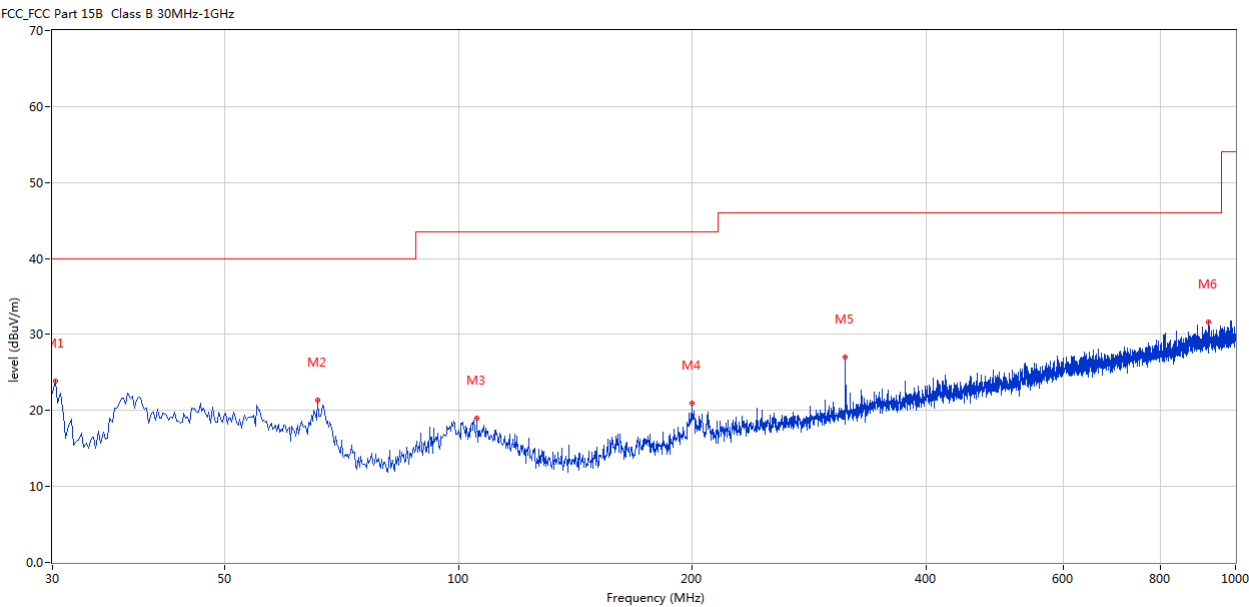
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Test result
General Radiated Emission Data and Harmonics Radiated Emission Data

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

EUT set Condition: Keep Transmitting
Results: Pass



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	30.000	22.25	-14.19	40.0	-17.75	Peak	92.00	100	Vertical	Pass
2	65.881	21.31	-13.87	40.0	-18.69	Peak	289.00	100	Vertical	Pass
3	105.641	19.04	-13.27	43.5	-24.46	Peak	98.00	100	Vertical	Pass
4	199.708	21.01	-13.47	43.5	-22.49	Peak	318.00	100	Vertical	Pass
5	314.624	27.07	-10.85	46.0	-18.93	Peak	305.00	100	Vertical	Pass
6	923.147	31.62	-1.80	46.0	-14.38	Peak	249.00	100	Vertical	Pass

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Operation Mode: Transmitting under CH01 for 802.11n20 mode

Frequency (MHz)	Level@3m (dB μ V/m)	Antenna Polarity	Limit@3m (dB μ V/m)
4824.00	58.3 (PK) / 41.9 (AV)	H	74(Peak)/ 54(AV)
4824.00	63.7 (PK) / 46.2 (AV)	V	74(Peak)/ 54(AV)
7236.00	--	H/V	74(Peak)/ 54(AV)
9648.00	--	H/V	74(Peak)/ 54(AV)
12060	--	H/V	74(Peak)/ 54(AV)
14472	--	H/V	74(Peak)/ 54(AV)
16884	--	H/V	74(Peak)/ 54(AV)
19296	--	H/V	74(Peak)/ 54(AV)
21708	--	H/V	74(Peak)/ 54(AV)
24120	--	H/V	74(Peak)/ 54(AV)

Operation Mode: Transmitting under CH06 for 802.11n20 mode

Frequency (MHz)	Level@3m (dB μ V/m)	Antenna Polarity	Limit@3m (dB μ V/m)
4874.00	58.1 (PK)/ 41.6 (AV)	H	74(Peak)/ 54(AV)
4874.00	62.6 (PK)/ 45.9(AV)	V	74(Peak)/ 54(AV)
7311.00	--	H/V	74(Peak)/ 54(AV)
9748.00	--	H/V	74(Peak)/ 54(AV)
12185	--	H/V	74(Peak)/ 54(AV)
14622	--	H/V	74(Peak)/ 54(AV)
17059	--	H/V	74(Peak)/ 54(AV)
19496	--	H/V	74(Peak)/ 54(AV)
21933	--	H/V	74(Peak)/ 54(AV)
24370	--	H/V	74(Peak)/ 54(AV)

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Operation Mode: Transmitting under CH11 for 802.11n20 mode

Frequency (MHz)	Level@3m (dB μ V/m)	Antenna Polarity	Limit@3m (dB μ V/m)
4924	59.3 (PK)/ 41.3 (AV)	H	74(Peak)/ 54(AV)
4924	64.1 (PK)/ 46.9 (AV)	V	74(Peak)/ 54(AV)
7368	--	H/V	74(Peak)/ 54(AV)
9848	--	H/V	74(Peak)/ 54(AV)
12310	--	H/V	74(Peak)/ 54(AV)
14772	--	H/V	74(Peak)/ 54(AV)
17234	--	H/V	74 (Peak)/ 54(AV)
19696	--	H/V	74(Peak)/ 54(AV)
22158	--	H/V	74(Peak)/ 54(AV)
24620	--	H/V	74(Peak)/ 54(AV)

Note: 1. Level = Reading + AF + Cable – Pre-amplifier

2. Remark “---” means that the emissions level is too low to be measured

3. For 802.11n20 mode at MCS0

4. For radiated Emissions from 18-25GHz and below 30MHz, it is only the floor noise and less than the limit for more than 20dB. No necessary to take down.

5. Note: the final peak measurement results less than the AV limit. No necessary to take down the final AV measurement result

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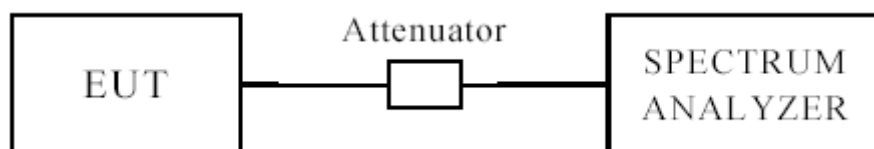
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7.0 6dB Bandwidth Measurement

7.1 Test Setup



7.2 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is >500 kHz

7.3 Test Procedure

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

7.4 Test Result

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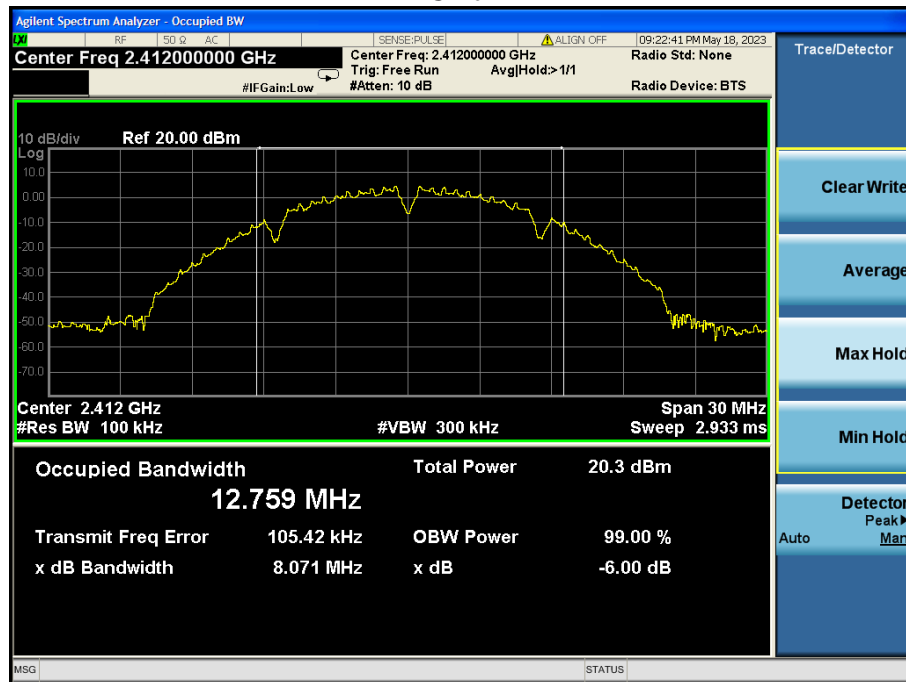
6dB Occupied Bandwidth

802.11b

Frequency	6dB Bandwidth (MHz) ANT 1	6dB Bandwidth (MHz) ANT 2	Limit (kHz)	Result
2412 MHz	8.071	8.013	≥ 500	Pass
2437 MHz	8.055	8.021	≥ 500	Pass
2462 MHz	7.607	7.522	≥ 500	Pass

Note: ANT 1(2) Represent the value of antenna 1 and 2, The worst data is Antenna 1, only shown Antenna 1 Plot.

CH01



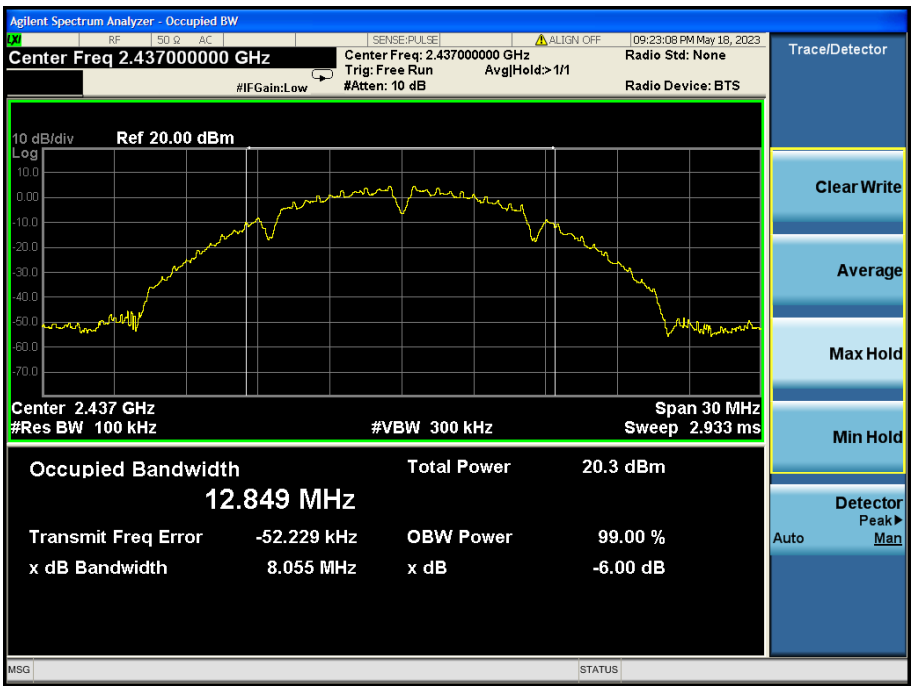
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CH06



CH11



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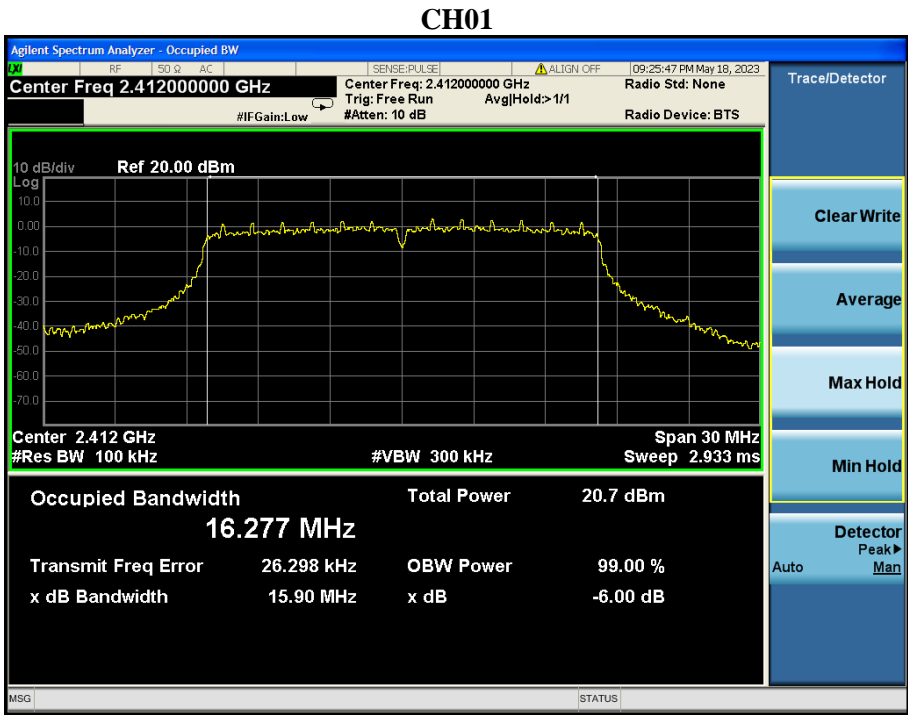


6dB Occupied Bandwidth

802.11g

Frequency	6dB Bandwidth (MHz)ANT 1	6dB Bandwidth (MHz) ANT 2	Limit (kHz)	Result
2412 MHz	15.90	15.71	≧ 500	Pass
2437 MHz	16.08	15.89	≧ 500	Pass
2462 MHz	15.95	15.57	≧ 500	Pass

Note: ANT 1(2) Represent the value of antenna 1 and 2, The worst data is Antenna 1, only shown Antenna 1 Plot.



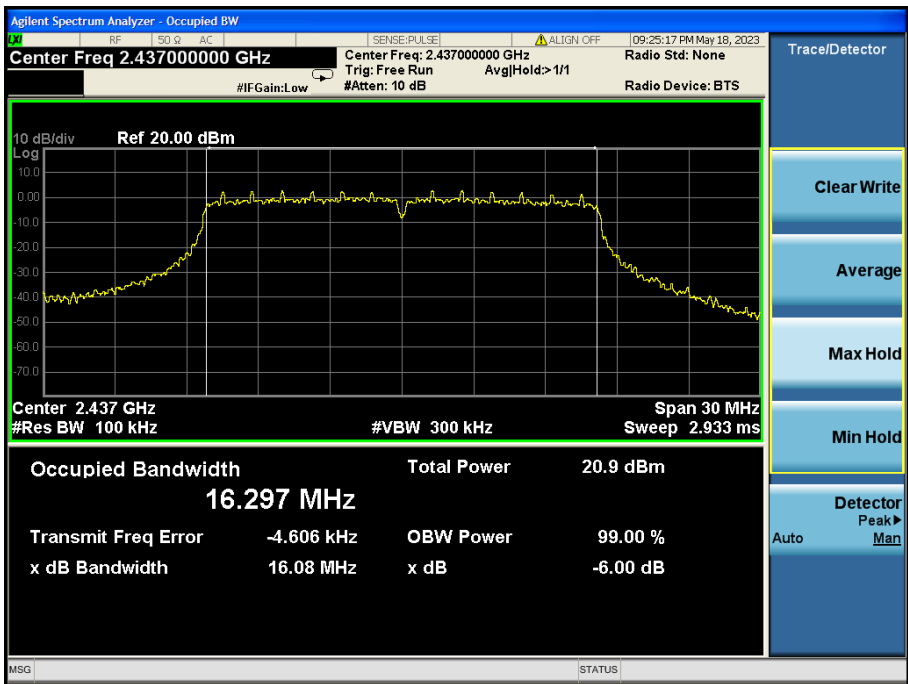
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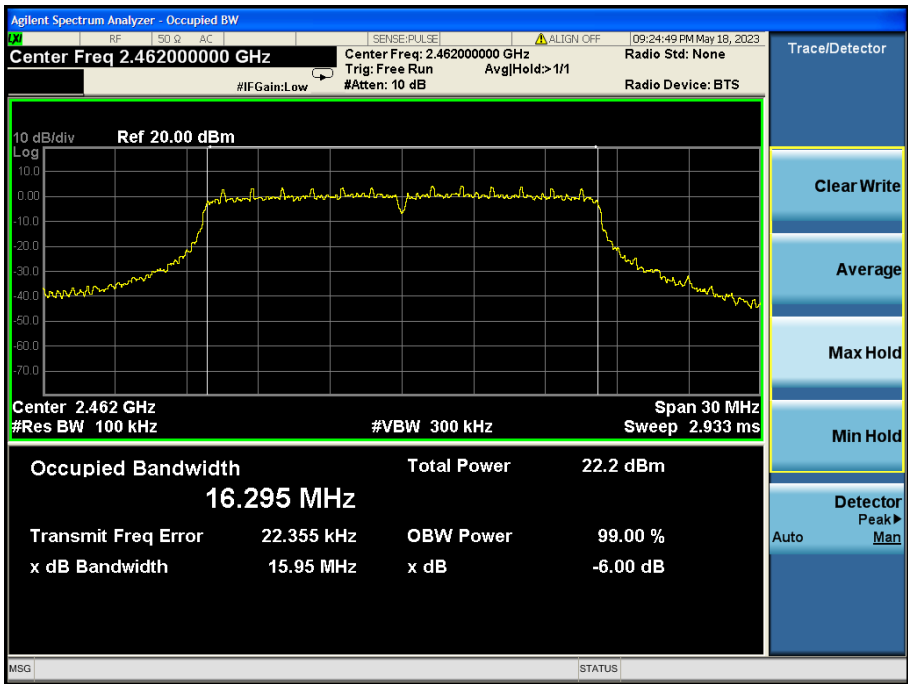
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CH06



CH11



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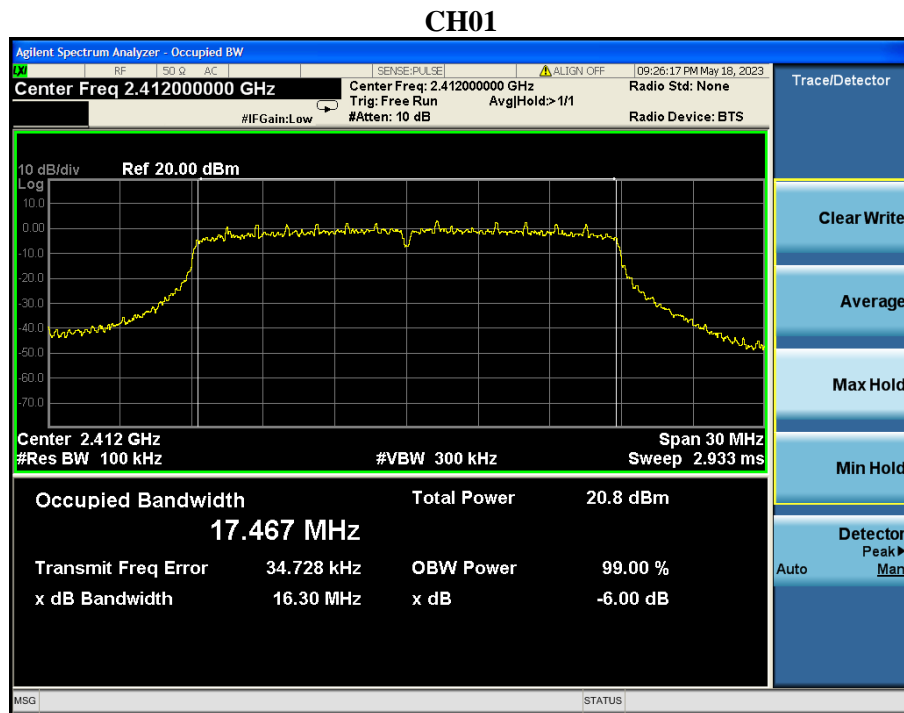


6dB Occupied Bandwidth

802.11n HT20

Frequency	6dB Bandwidth (MHz)ANT 1	6dB Bandwidth (MHz)ANT 2	Limit (kHz)	Result
2412 MHz	16.30	16.23	≥ 500	Pass
2437 MHz	17.18	17.03	≥ 500	Pass
2462 MHz	16.61	16.52	≥ 500	Pass

Note: ANT 1(2) Represent the value of antenna 1 and 2, The worst data is Antenna 1, only shown Antenna 1 Plot.



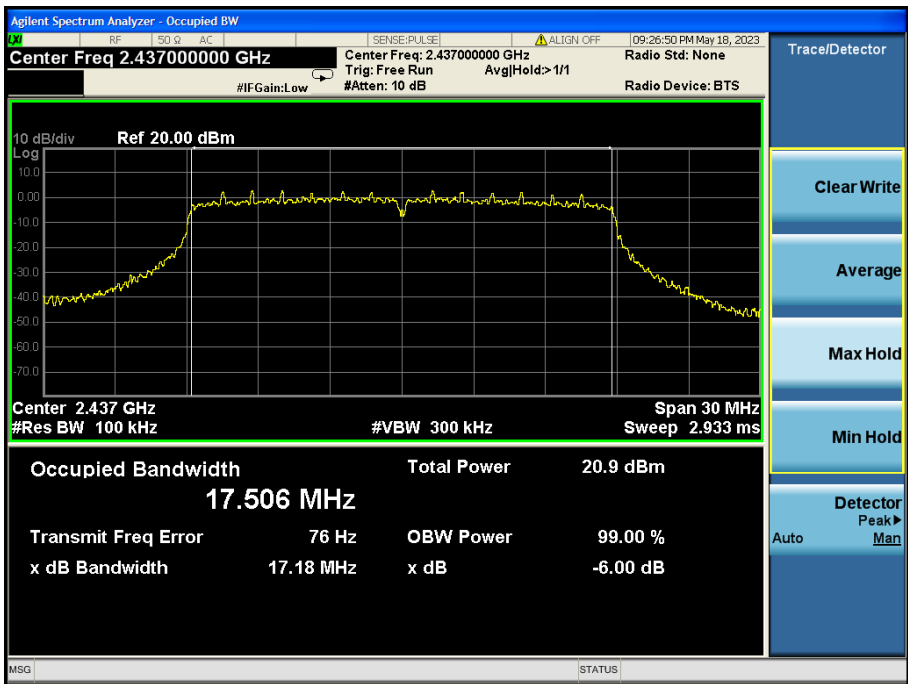
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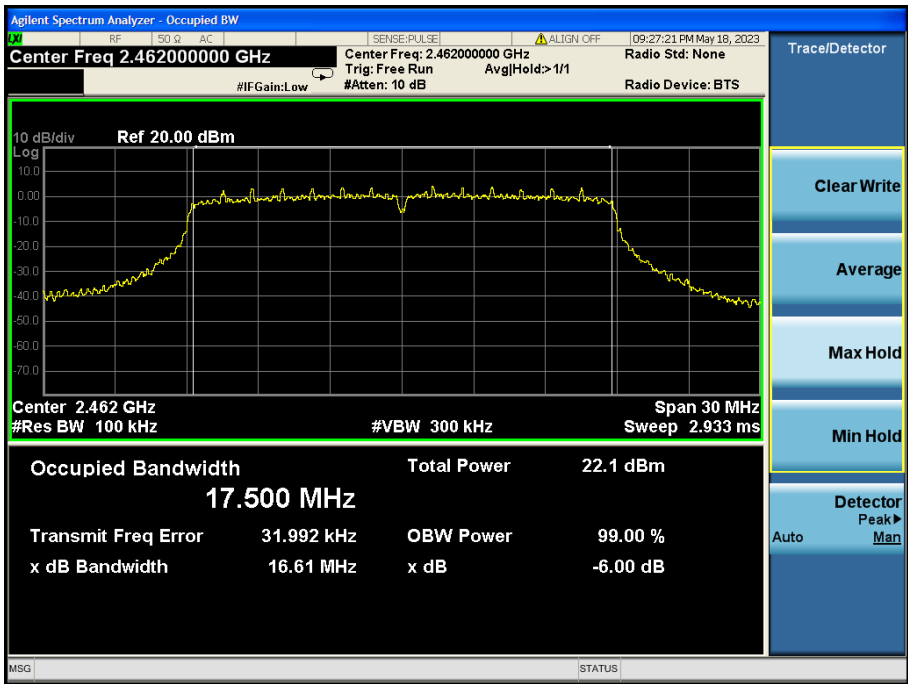
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CH06



CH11



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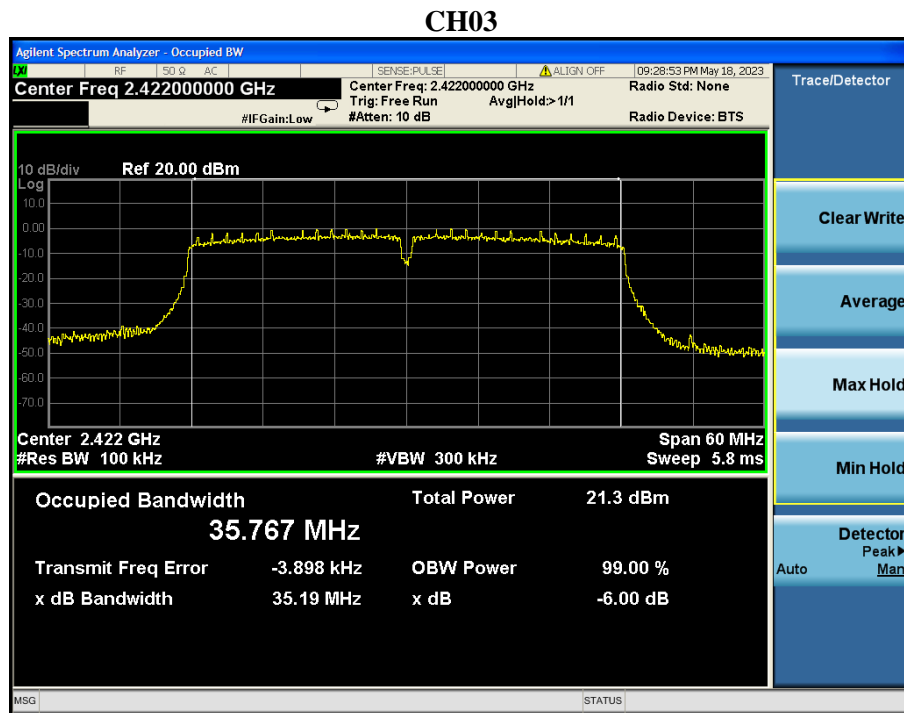


6dB Occupied Bandwidth

802.11n HT40

Frequency	6dB Bandwidth (MHz)ANT 1	6dB Bandwidth (MHz)ANT 2	Limit (kHz)	Result
2422 MHz	35.19	35.05	≥ 500	Pass
2437 MHz	35.55	35.35	≥ 500	Pass
2452 MHz	36.29	36.07	≥ 500	Pass

Note: ANT 1(2) Represent the value of antenna 1 and 2, The worst data is Antenna 1, only shown Antenna 1 Plot.



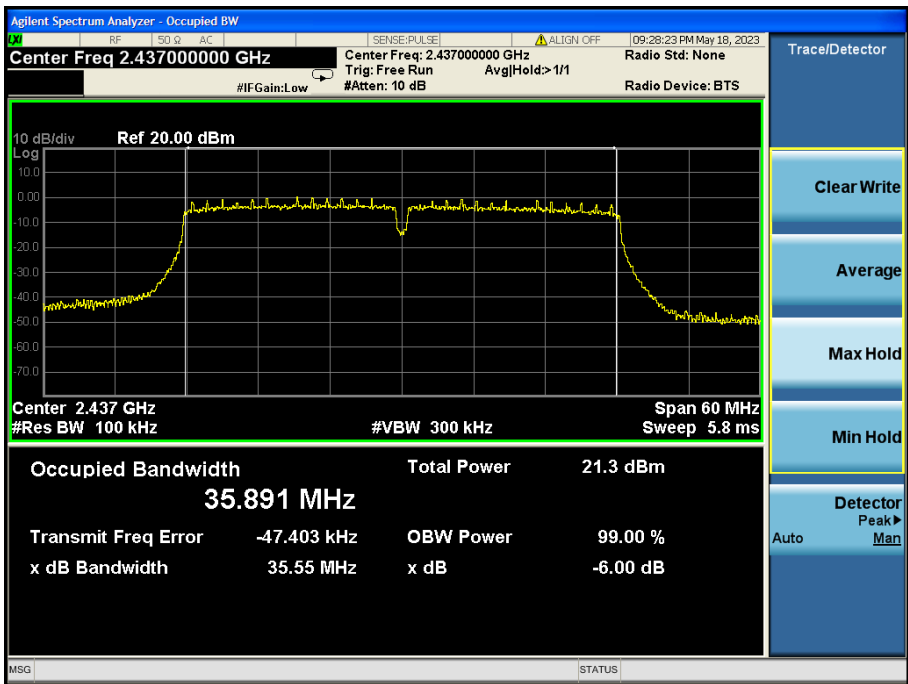
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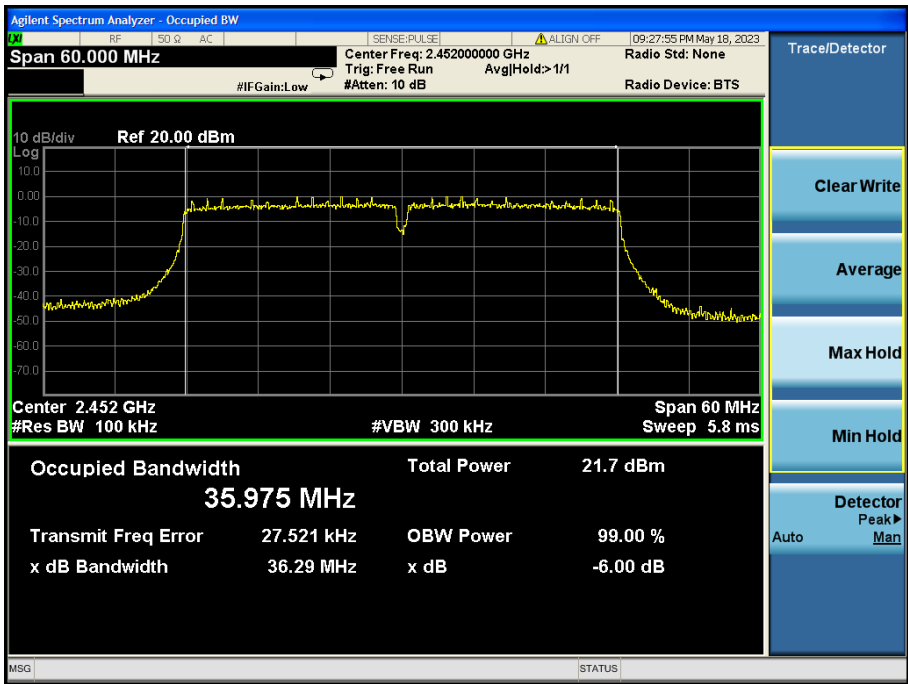
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CH06



CH09



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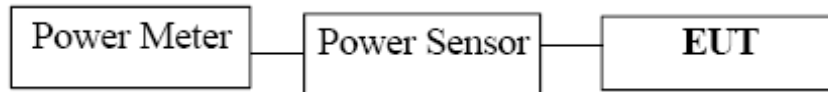
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8. Maximum Output Power

8.1 Test Setup



8.2 Limits of Maximum Output Power

The Maximum Output Power Measurement is 30dBm.

8.3 Test Procedure

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

Note: The Peak power was measured

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8.4 Test Results

802.11b

Test Channel	Frequency (MHz)	Output Power (dBm)ANT 1	Output Power (dBm)ANT 2	Limit (dBm)	Limit (W)
CH01	2412 MHz	17.02	16.72	30	1
CH06	2437MHz	16.92	16.75	30	1
CH11	2462 MHz	16.87	16.82	30	1

802.11g

Test Channel	Frequency (MHz)	Output Power (dBm)ANT 1	Output Power (dBm)ANT 2	Limit (dBm)	Limit (W)
CH01	2412 MHz	16.35	16.11	30	1
CH06	2437MHz	16.41	16.02	30	1
CH11	2462 MHz	16.39	16.06	30	1

802.11n HT20

Test Channel	Frequency (MHz)	Output Power (dBm)ANT 1	Output Power (dBm)ANT 2	Total Power (dBm)	Limit (dBm)	Limit (W)
CH01	2412 MHz	15.88	15.47	18.69	27.99	1
CH06	2437MHz	15.72	15.38	18.56	27.99	1
CH11	2462 MHz	15.59	15.39	18.50	27.99	1

Note: For MIMO mode: Directional gain= $G_{ANT} + 10\log(N)$ dBi =7.22dBi
Limit = $30 - 7.22 + 6 = 28.78$ dBm.

802.11n HT40

Test Channel	Frequency (MHz)	Output Power (dBm)ANT 1	Output Power (dBm)ANT 2	Total Power (dBm)	Limit (dBm)	Limit (W)
CH03	2422 MHz	15.02	14.65	17.85	28.78	1
CH06	2437MHz	14.79	14.82	17.82	28.78	1
CH09	2452 MHz	15.11	14.77	17.95	28.78	1

Note: For MIMO mode: Directional gain= $G_{ANT} + 10\log(N)$ dBi =7.22dBi
Limit = $30 - 7.22 + 6 = 28.78$ dBm.

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9. Power Spectral Density Measurement

9.1 Test Setup



9.2 Limits of Power Spectral Density Measurement

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

9.3 Test Procedure

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

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9.4 Test Result

Note: ANT 1(2) Represent the value of antenna 1 and 2, The worst data is Antenna 1, only shown Antenna 1 Plot.

802.11b

Test Channel	Frequency (MHz)	Power Density (dBm/3kHz) ANT 1	Power Density (dBm/3kHz) ANT 2	Total Power Density (dBm/3kHz)	Limit (dBm/3kHz)
CH01	2412 MHz	-9.965	-9.956	--	8
CH06	2437 MHz	-8.753	-8.884	--	8
CH11	2462 MHz	-9.388	-9.722	--	8

CH01



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CH06



CH11



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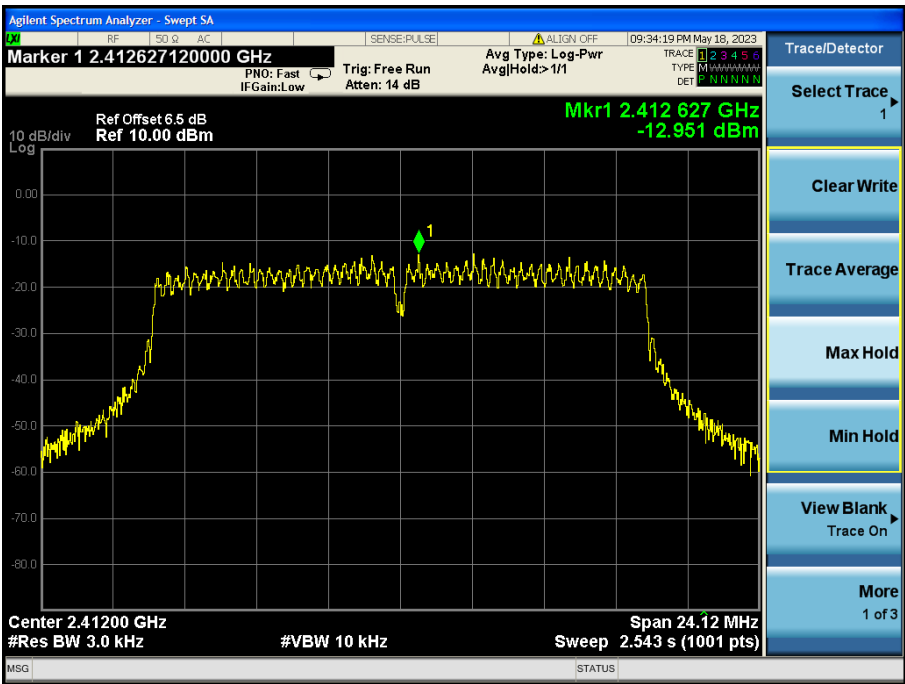
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802.11g

Test Channel	Frequency (MHz)	Power Density (dBm/3kHz) ANT 1	Power Density (dBm/3kHz) ANT 2	Total Power Density (dBm/3kHz)	Limit (dBm/3kHz)
CH01	2412 MHz	-12.951	-12.995	--	8
CH06	2437 MHz	-13.191	-13.413	--	8
CH11	2462 MHz	-11.500	-11.356	--	8

CH01



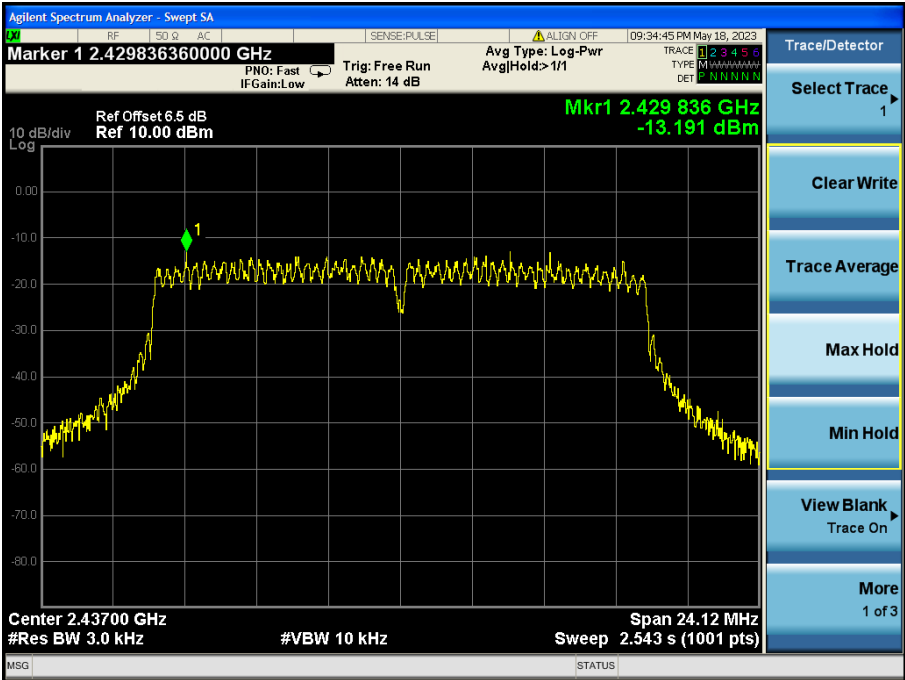
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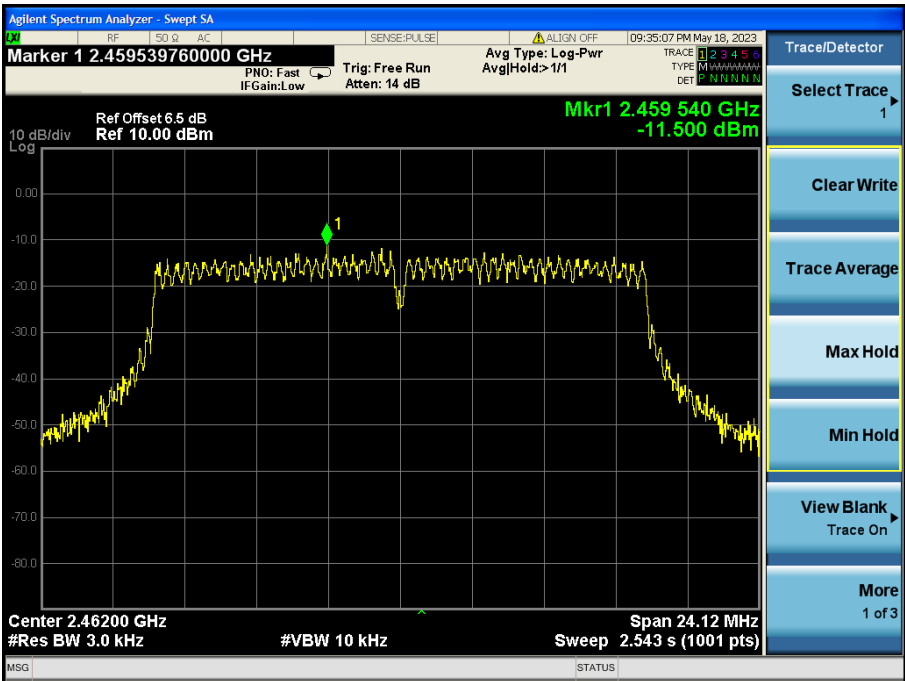
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CH06



CH11



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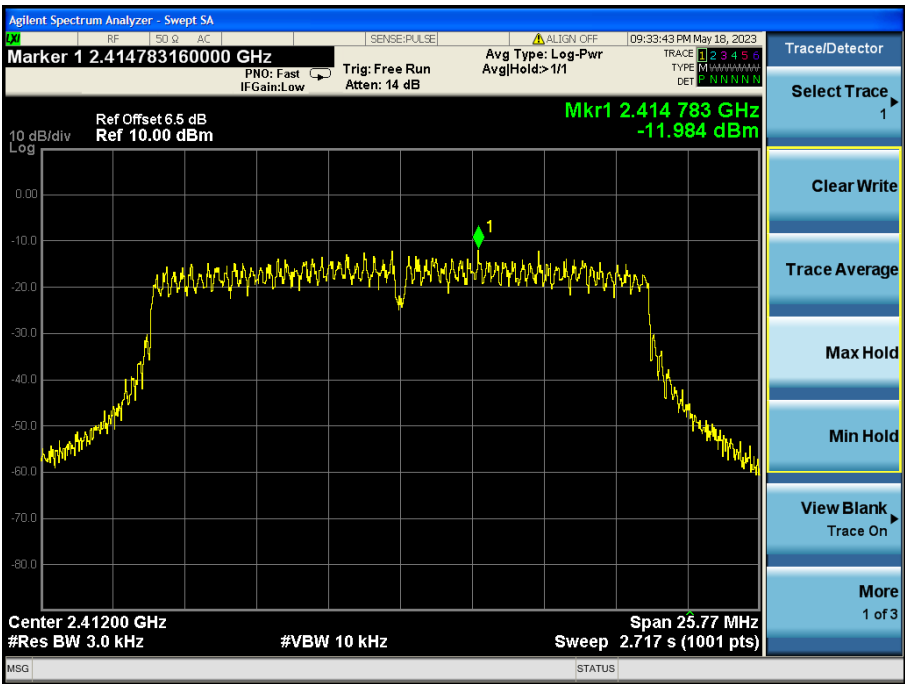


802.11n HT20

Test Channel	Frequency (MHz)	Power Density (dBm/3kHz) ANT 1	Power Density (dBm/3kHz) ANT 2	Total Power Density (dBm/3kHz)	Limit (dBm/3kHz)
CH01	2412 MHz	-11.984	-12.023	-8.99	6.78
CH06	2437 MHz	-11.086	-11.247	-8.16	6.78
CH11	2462 MHz	-11.108	-11.145	-8.12	6.78

Note: For MIMO mode: Directional gain=GANT +10log(N)dBi =7.22 dBi
Limit =8-7.22+6=6.78 dBm.

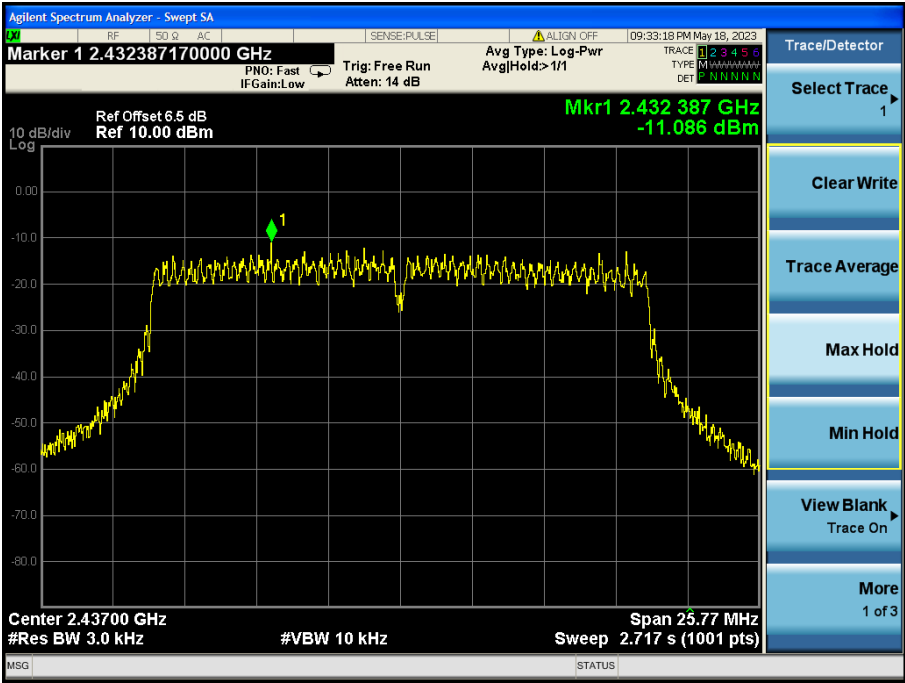
CH01



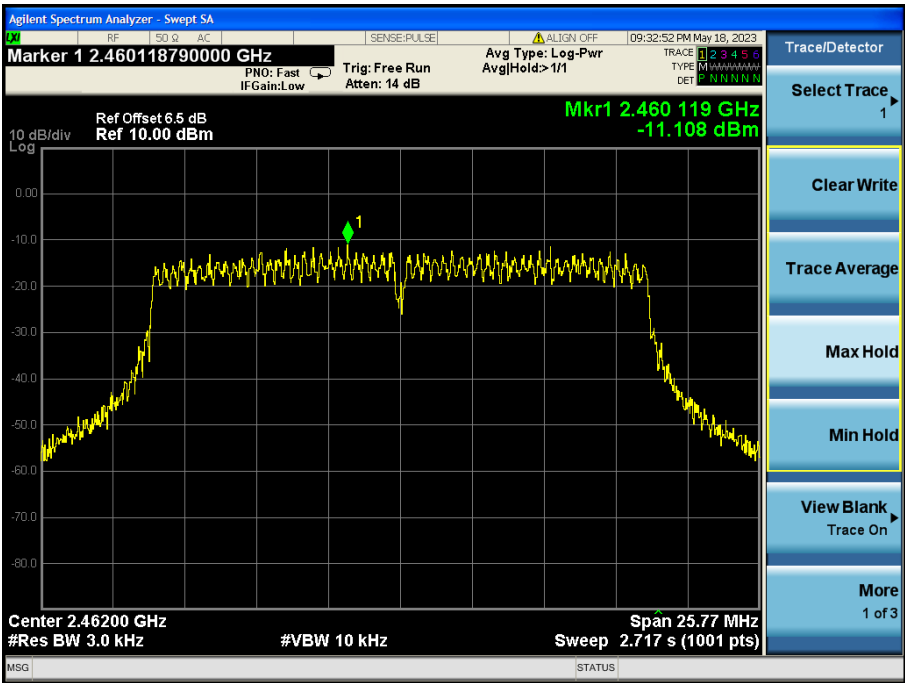
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CH06



CH11



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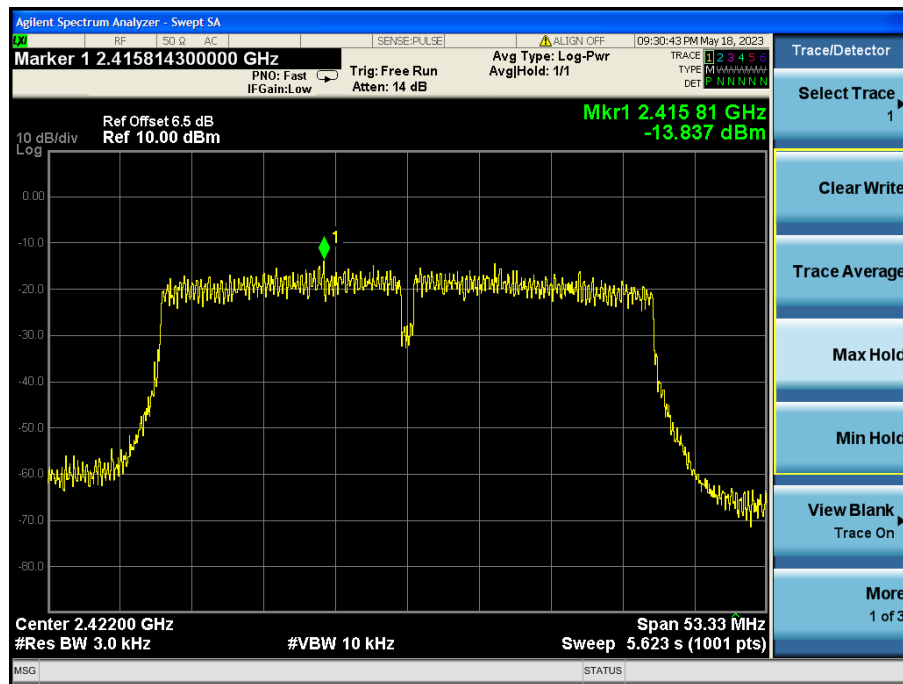


802.11n HT40

Test Channel	Frequency (MHz)	Power Density (dBm/3kHz) ANT 1	Power Density (dBm/3kHz) ANT 2	Total Power Density (dBm/3kHz)	Limit (dBm/3kHz)
CH03	2422 MHz	-13.837	-13.972	-10.89	6.78
CH06	2437 MHz	-15.169	-15.242	-12.20	6.78
CH09	2452 MHz	-14.637	-14.663	-11.64	6.78

Note: For MIMO mode: Directional gain= $G_{ANT} + 10\log(N)$ dBi = 7.22 dBi
Limit = $8 - 7.22 + 6 = 6.78$ dBm

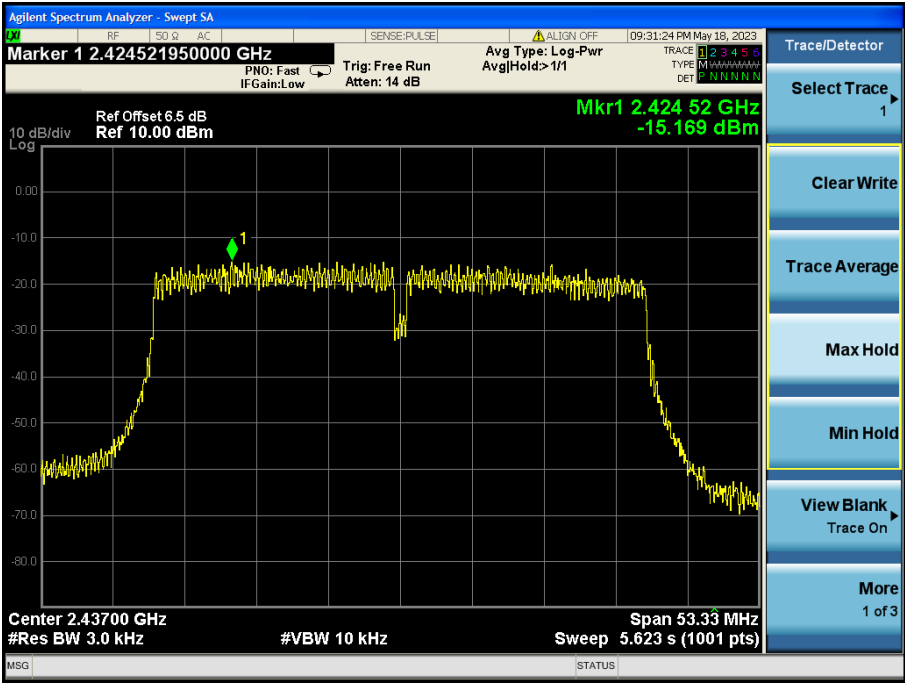
CH03



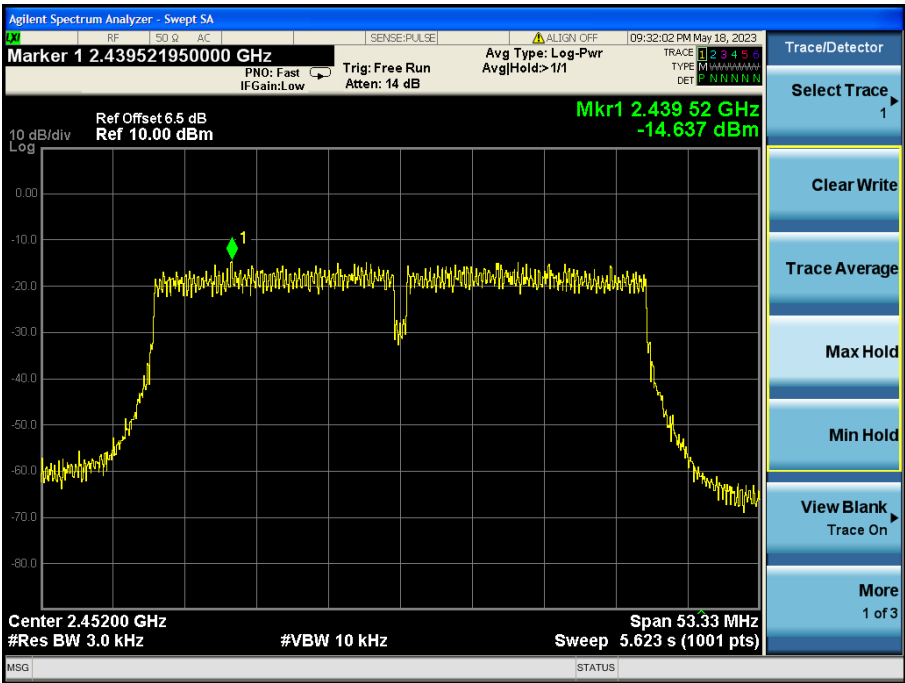
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CH06



CH09



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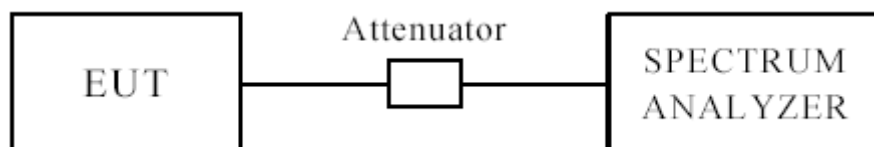
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10 Out of Band Measurement

10.1 Test Setup for band edge



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

10.2 Limits of Out of Band Emissions Measurement

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

10.3 Test Procedure

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

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

10.4 Test Result

Please see next pages

- Note: 1. For band-edge measurement, the frequency from 30MHz-25GHz was tested. And It met the FCC rule.
2. Two antennas were tested and only the worst case was recorded in the test report. Ant 1 was the worst case.

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

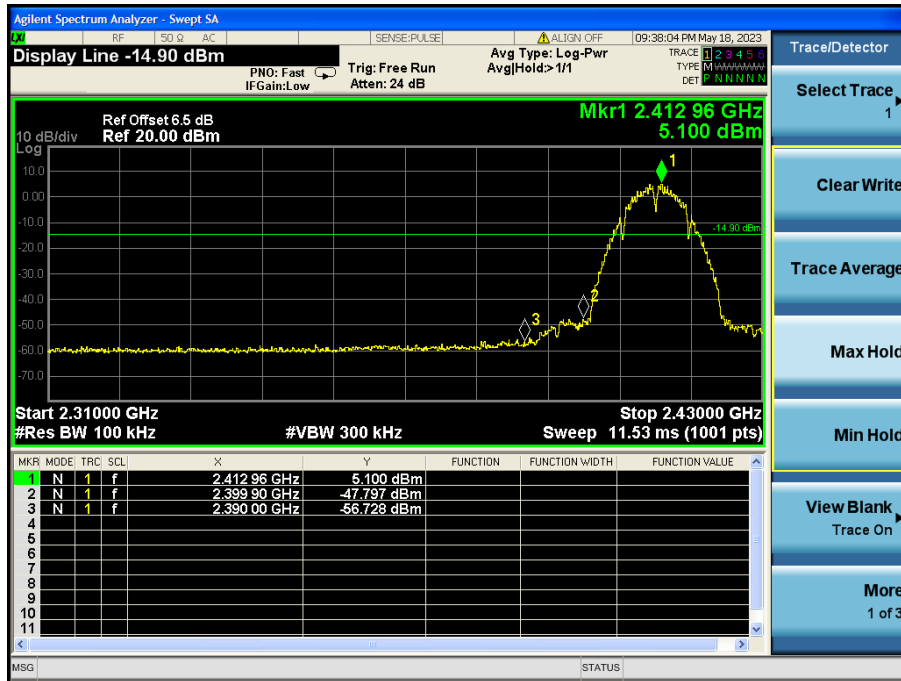
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Band-edge Measurement
For 802.11b mode

CH01 (Lower)



CH 11(Upper)



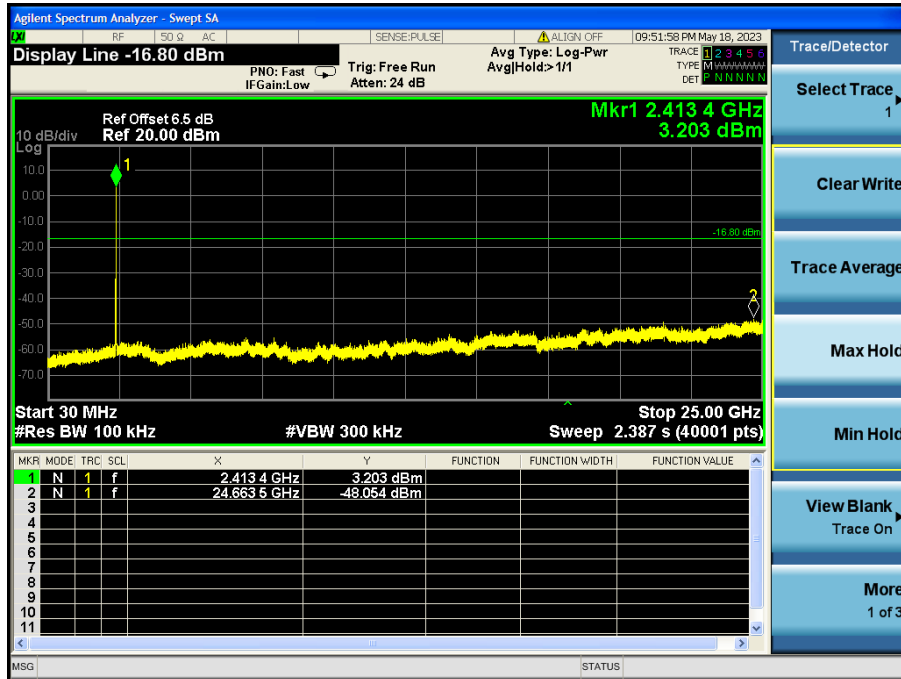
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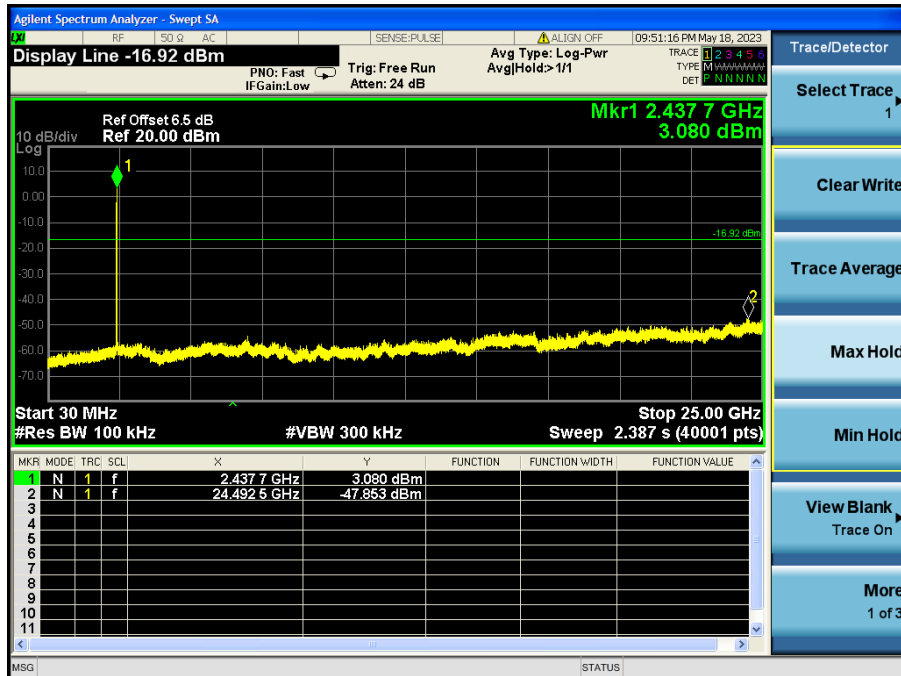
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CH01



CH06



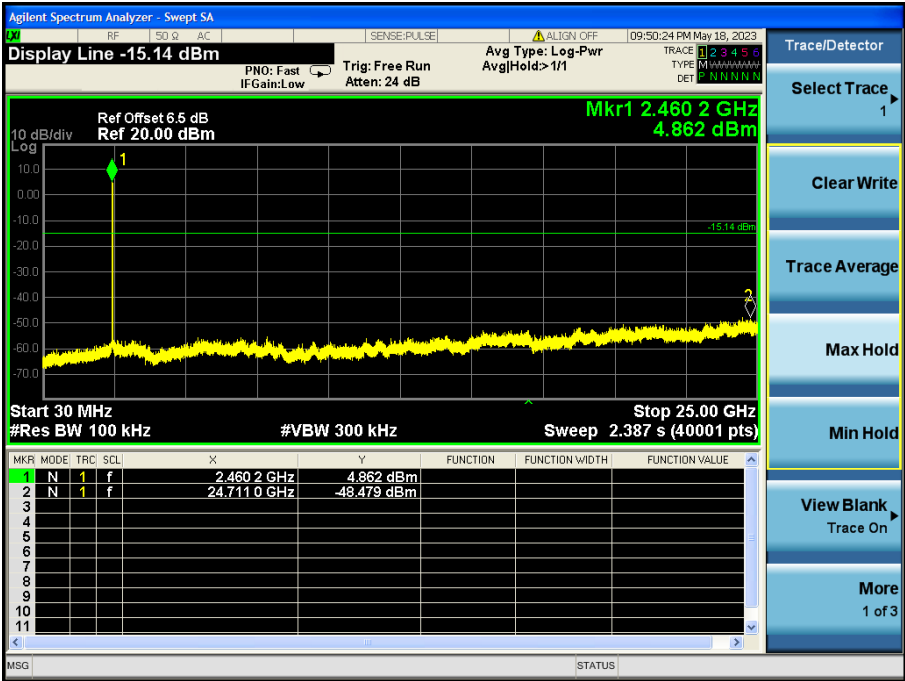
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CH11



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For 802.11g mode

CH01 (Lower)



CH 11(Upper)



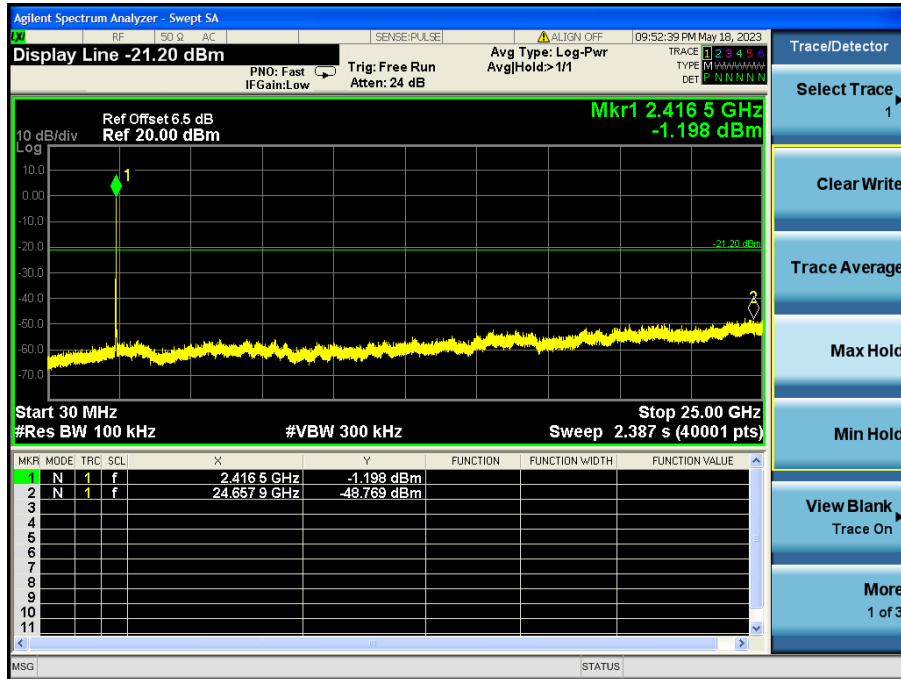
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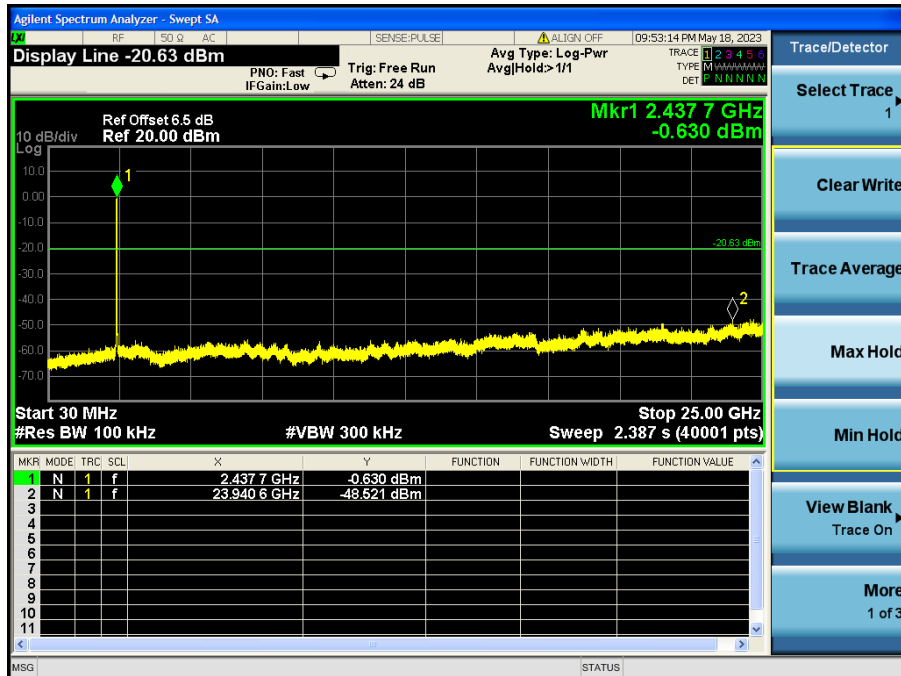
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CH01



CH06



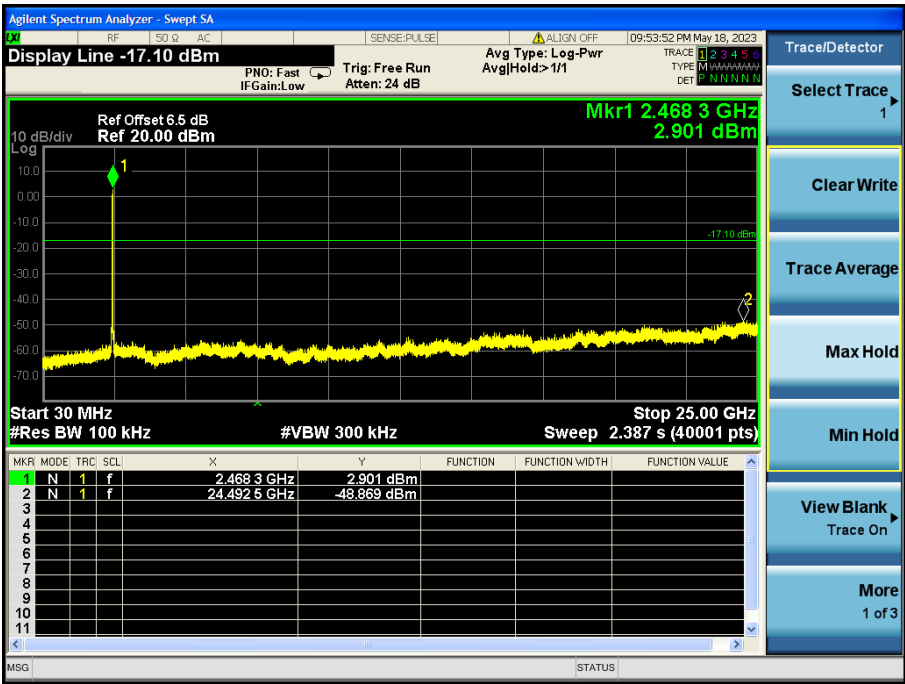
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CH11



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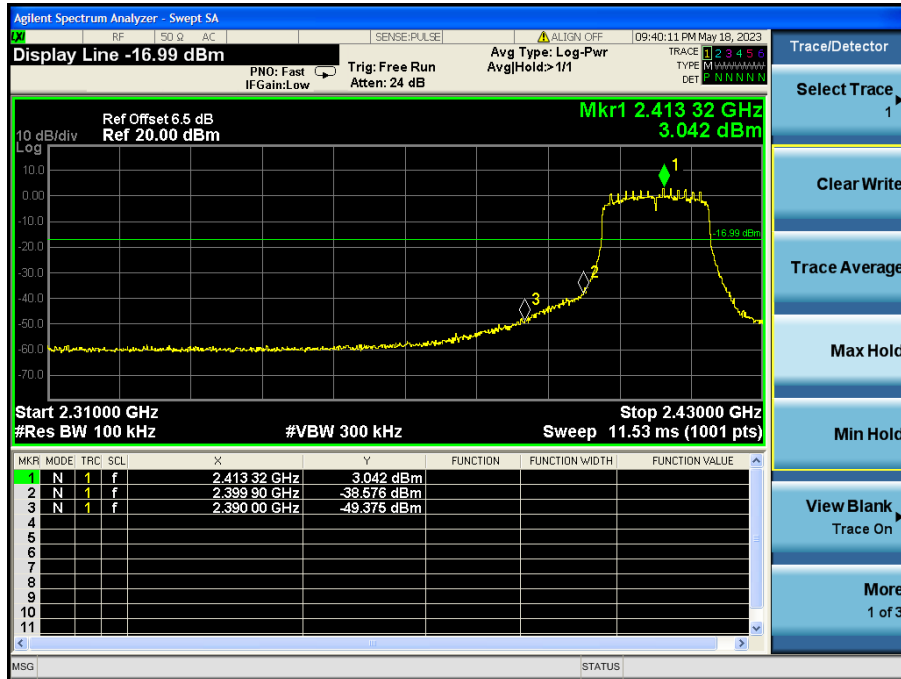
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For 802.11n (HT20) mode

CH01 (Lower)



CH 11(Upper)



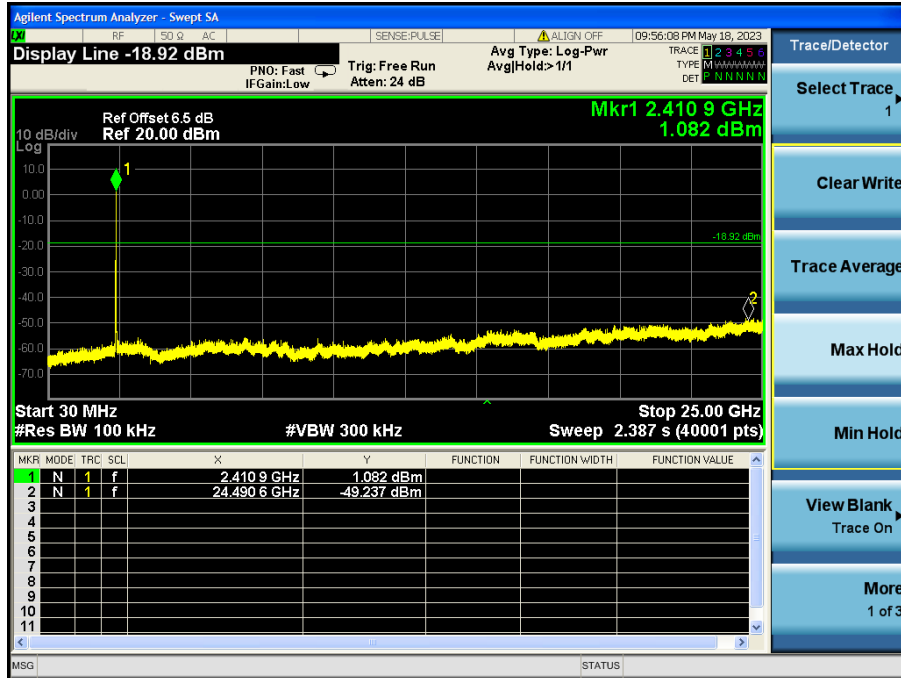
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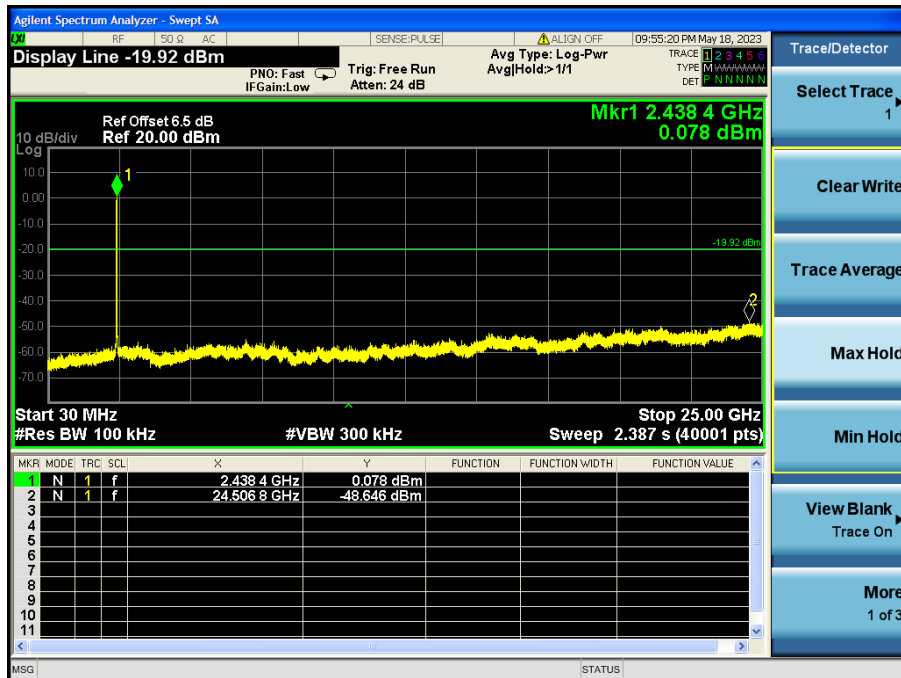
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CH01



CH06



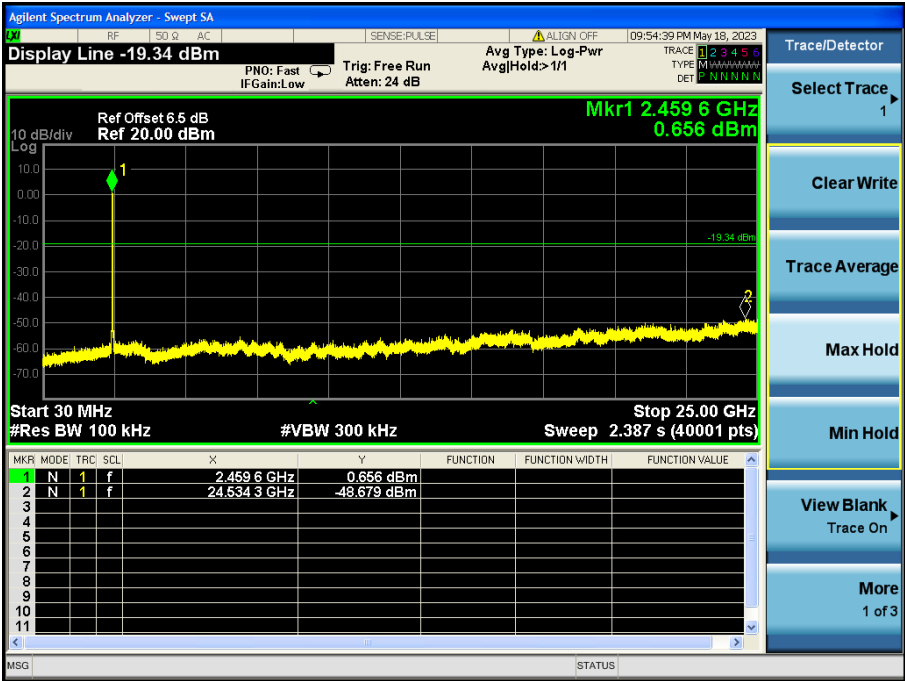
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CH11



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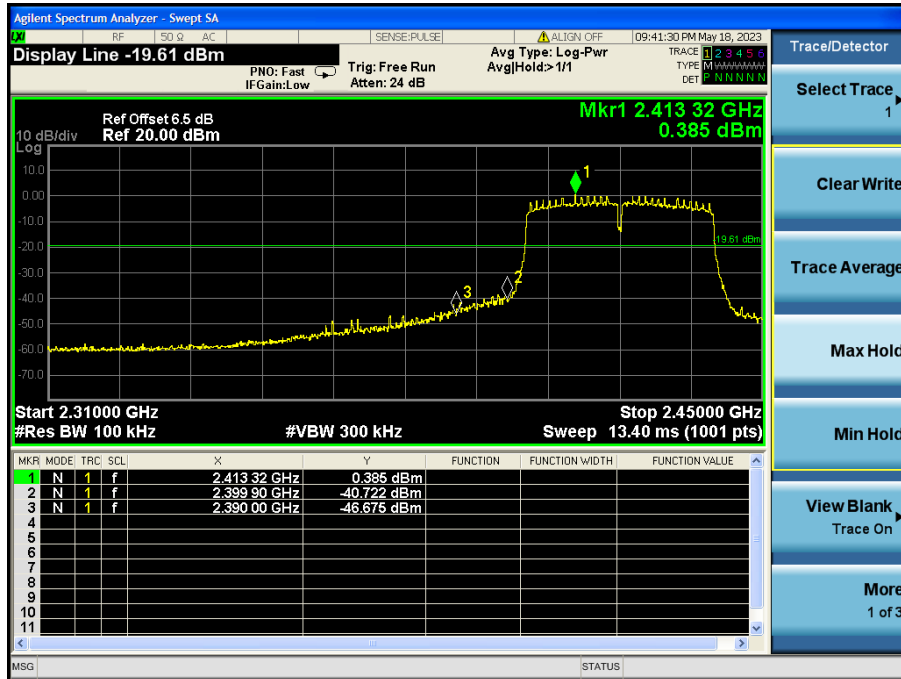
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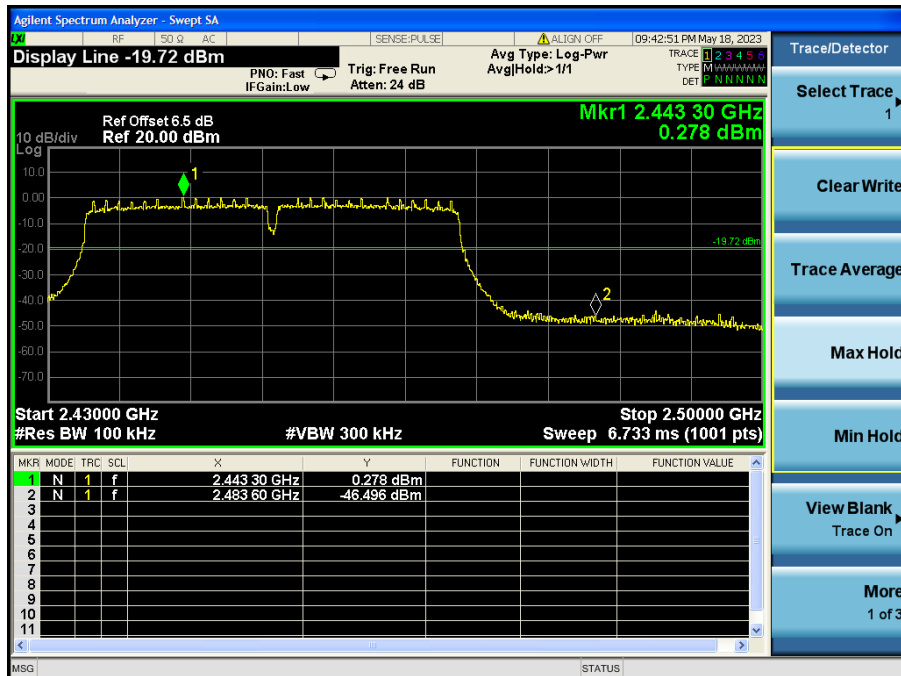


For 802.11n (HT40) mode

CH03 (Lower)



CH 09(Upper)



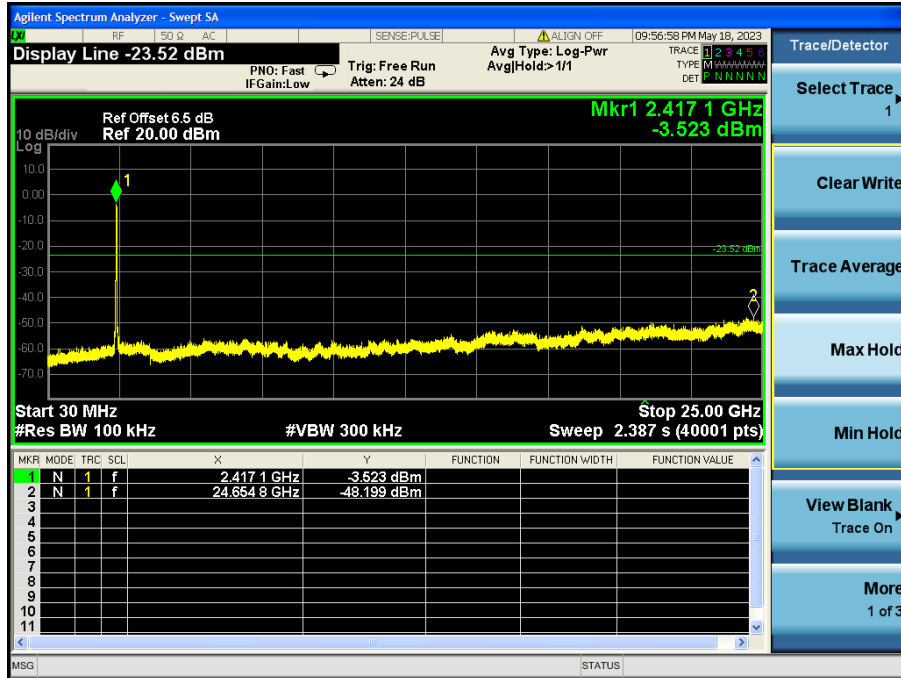
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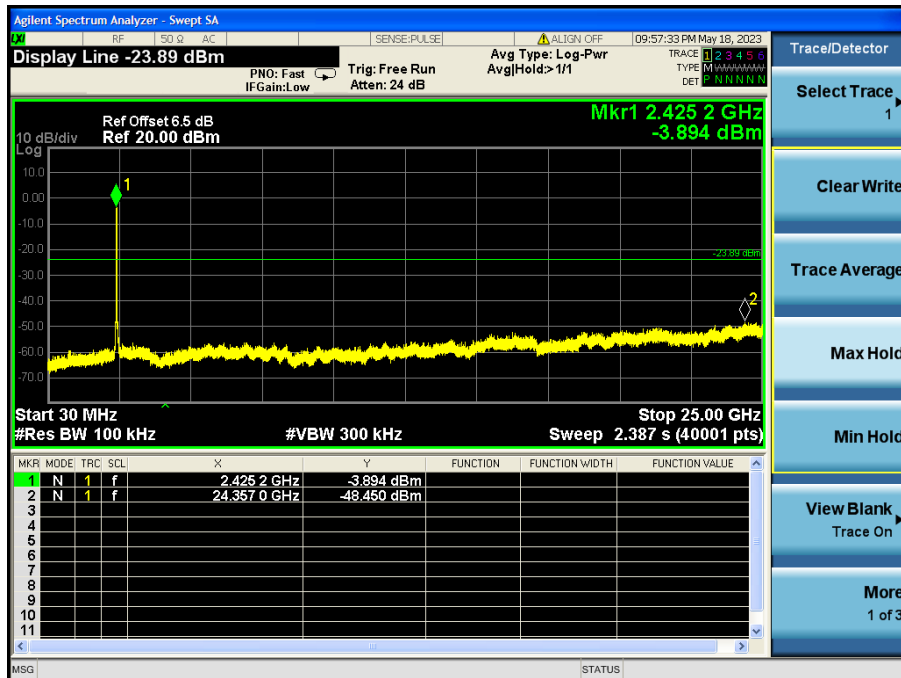
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CH03



CH06



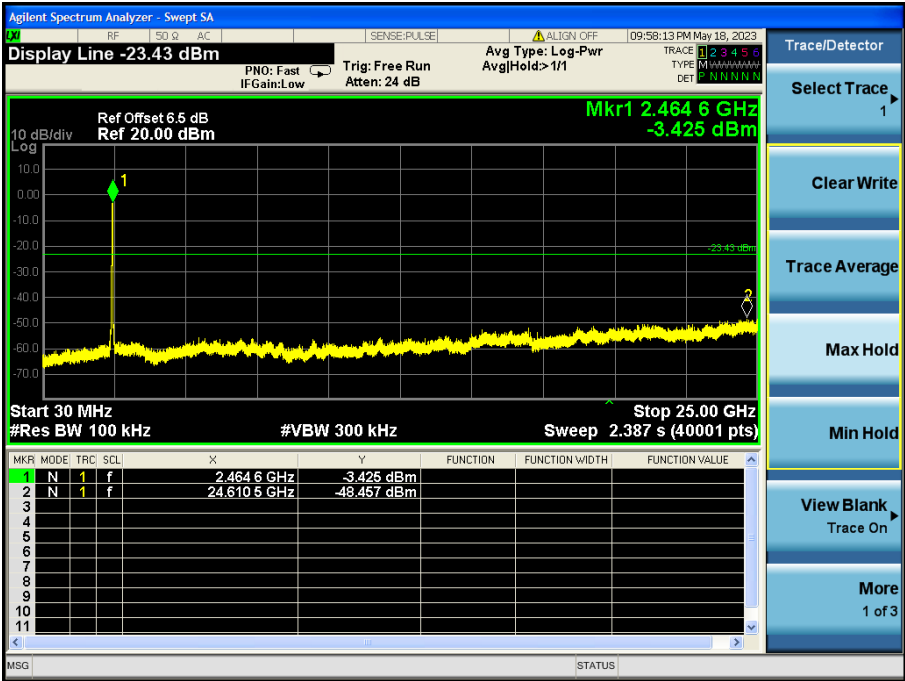
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CH09



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10.5 Restricted band Measurement

EUT	NovoDS Digital Signage Solution			Model	DS210
Mode	Keeping Transmitting			Test Voltage	120V~
Temperature	24 deg. C,			Humidity	56% RH
Test Result:	Pass			Detector	PK
802.11b mode, Low Channel, Horizontal					
2390	PK (dBμV/m)	41.86	Limit	74(dBμV/m)	
	AV (dBμV/m)	--		54(dBμV/m)	
802.11b mode, Low Channel, Vertical					
2390	PK (dBμV/m)	47.37	Limit	74(dBμV/m)	
	AV (dBμV/m)	--		54(dBμV/m)	

10.5 Restricted band Measurement

EUT	NovoDS Digital Signage Solution		Model	DS210
Mode	Keeping Transmitting		Test Voltage	120V~
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
802.11b mode, High Channel, Horizontal				
2483.5	PK (dBμV/m)	44.31	Limit	74(dBμV/m)
	AV (dBμV/m)	--		54(dBμV/m)
802.11b mode, High Channel, Vertical				
2483.5	PK (dBμV/m)	49.25	Limit	74(dBμV/m)
	AV (dBμV/m)	--		54(dBμV/m)

Note: ANT 1(2) Represent the value of antenna 1 and 2, The worst data is Antenna 1, only shown Antenna 1 Plot.

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10.5 Restricted band Measurement

EUT	NovoDS Digital Signage Solution			Model	DS210
Mode	Keeping Transmitting			Test Voltage	120V~
Temperature	24 deg. C,			Humidity	56% RH
Test Result:	Pass			Detector	PK
802.11g mode, Low Channel, Horizontal					
2390	PK (dBμV/m)	44.36	Limit	74(dBμV/m)	
	AV (dBμV/m)	--		54(dBμV/m)	
802.11g mode, Low Channel, Vertical					
2390	PK (dBμV/m)	49.20	Limit	74(dBμV/m)	
	AV (dBμV/m)	--		54(dBμV/m)	

10.5 Restricted band Measurement

EUT	NovoDS Digital Signage Solution			Model	DS210
Mode	Keeping Transmitting			Test Voltage	120V~
Temperature	24 deg. C,			Humidity	56% RH
Test Result:	Pass			Detector	PK
802.11g mode, High Channel, Horizontal					
2483.5	PK (dBμV/m)	47.61	Limit	74(dBμV/m)	
	AV (dBμV/m)	--		54(dBμV/m)	
802.11g mode, High Channel, Vertical					
2483.5	PK (dBμV/m)	53.36	Limit	74(dBμV/m)	
	AV (dBμV/m)	36.28		54(dBμV/m)	

Note: ANT 1(2) Represent the value of antenna 1 and 2, The worst data is Antenna 1, only shown Antenna 1 Plot.

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10.5 Restricted band Measurement

EUT	NovoDS Digital Signage Solution		Model	DS210
Mode	Keeping Transmitting		Test Voltage	120V~
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
802.11n HT20 MIMO mode, Low Channel, Horizontal				
2390	PK (dBμV/m)	45.05	Limit	74(dBμV/m)
	AV (dBμV/m)	--		54(dBμV/m)
802.11n HT20 MIMO mode, Low Channel, Vertical				
2390	PK (dBμV/m)	49.75	Limit	74(dBμV/m)
	AV (dBμV/m)	--		54(dBμV/m)

10.5 Restricted band Measurement

EUT	NovoDS Digital Signage Solution			Model	DS210
Mode	Keeping Transmitting			Test Voltage	120V~
Temperature	24 deg. C,			Humidity	56% RH
Test Result:	Pass			Detector	PK
802.11n HT20 MIMO mode, High Channel, Horizontal					
2483.5	PK (dBμV/m)	48.12	Limit	74(dBμV/m)	
	AV (dBμV/m)	--		54(dBμV/m)	
802.11n HT20 MIMO mode, High Channel, Vertical					
2483.5	PK (dBμV/m)	55.32	Limit	74(dBμV/m)	
	AV (dBμV/m)	37.41		54(dBμV/m)	

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10.5 Restricted band Measurement

EUT	NovoDS Digital Signage Solution		Model	DS210
Mode	Keeping Transmitting		Test Voltage	120V~
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
802.11n HT40 MIMO mode, Low Channel, Horizontal				
2390	PK (dBμV/m)	46.34	Limit	74(dBμV/m)
	AV (dBμV/m)	--		54(dBμV/m)
802.11n HT40 MIMO mode, Low Channel Vertical				
2390	PK (dBμV/m)	53.15	Limit	74(dBμV/m)
	AV (dBμV/m)	-37.25		54(dBμV/m)

10.5 Restricted band Measurement

EUT	NovoDS Digital Signage Solution		Model	DS210
Mode	Keeping Transmitting		Test Voltage	120V~
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
802.11n HT40 MMO mode, High Channel, Horizontal				
2483.5	PK (dBμV/m)	51.46	Limit	74(dBμV/m)
	AV (dBμV/m)	--		54(dBμV/m)
802.11n HT40 MIMO mode, High Channel, Vertical				
2483.5	PK (dBμV/m)	60.71	Limit	74(dBμV/m)
	AV (dBμV/m)	44.92		54(dBμV/m)

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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 Dipole antenna used with reverse polarity antenna connectors. The gain of each antenna is 4.21dBi for 2.4G Band (Get from the antenna specification)

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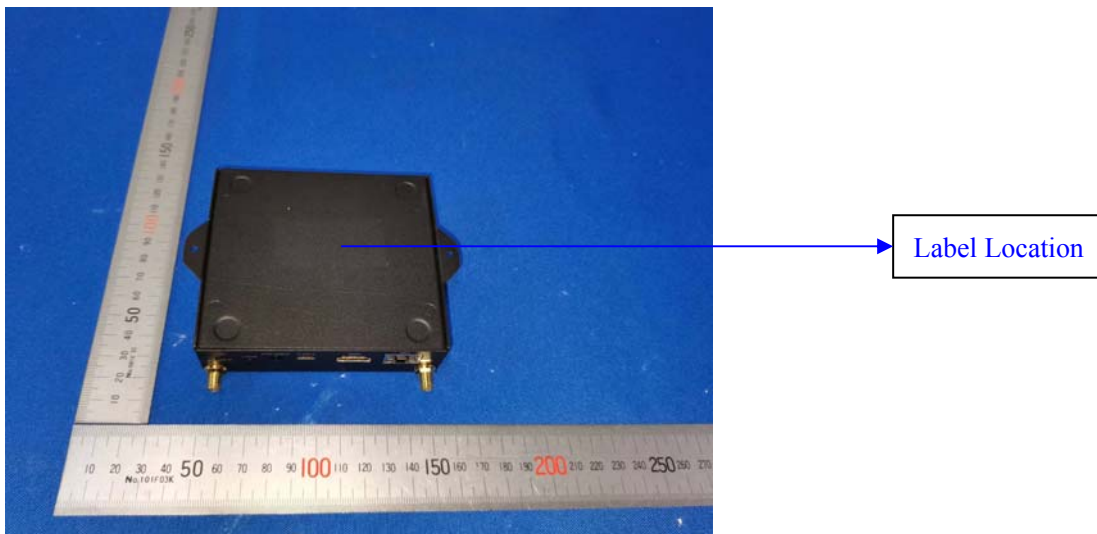
12.0 FCC ID Label

FCC ID: H79-023DS2

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The label must not be a stick-on paper label. The label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

Mark Location:



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13.0 Photo of testing

Conducted Emission Test Setup:



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Radiated Emission Test Setup:



Photos of EUT

Please see test report TW2305190-01E

End of the report

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