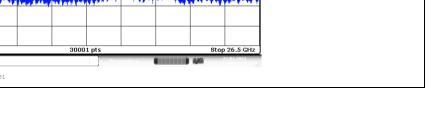
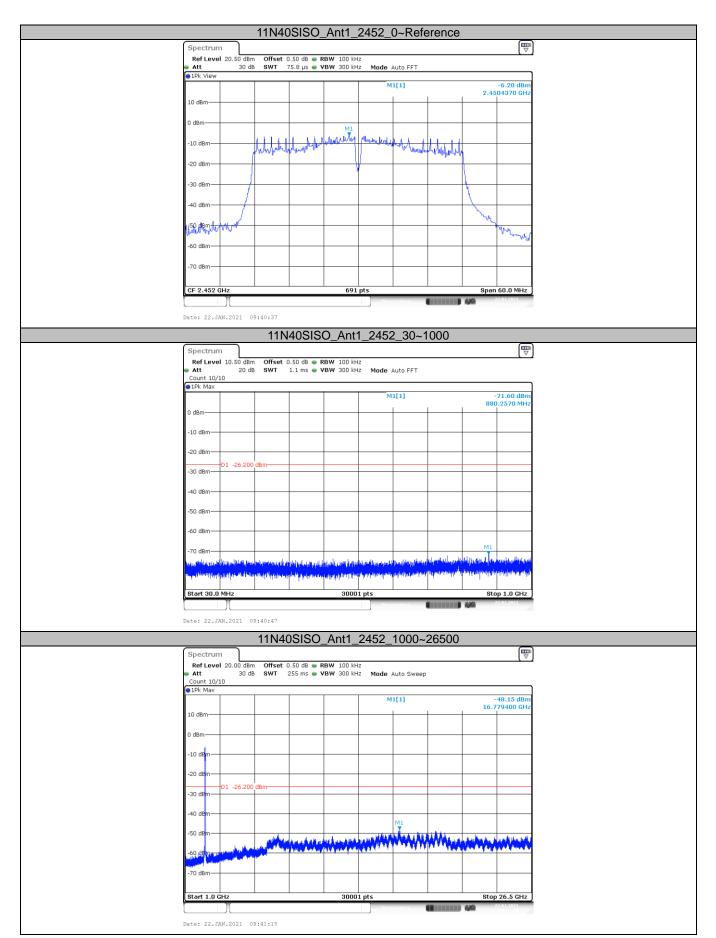




Report No.: CTC20210023E12 11N40SISO_Ant1_2437_0~Reference 10 dBn -10 dBn hus 70 dBn Date: 22.JAN.2021 09:36:54 11N40SISO_Ant1_2437_30~1000 Ref Level 10.50 dBn Mode Auto FFT 1Pk Max 0 dBm -10 dBm 40 dBn -50 dBn 11N40SISO_Ant1_2437_1000~26500 Spectrum Ref Level 20.00 dBm Att 30 dB Mode Auto Sweep Count 10/10 ●1Pk Max 0 dBr -10 di









3.3. Band Edge Emissions

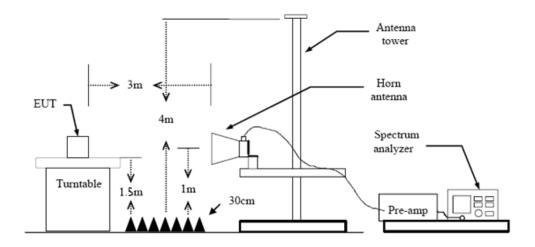
Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.247

Restricted Frequency Band	(dBuV/m)(at 3m)				
(MHz)	Peak	Average			
2310 ~2390	74	54			
2483.5 ~2500	74	54			

Conducted band edge limit: The highest point of the operating frequency waveform down 20dB

Test Configuration



Test Procedure

- 1. The EUT was setup and tested according to ANSI C63.10:2013 requirements.
- 2. The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
- 3. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
- 4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.
- 5. The receiver set as follow:

RBW=1MHz, VBW=3MHz Peak detector for Peak value.

RBW=1MHz, VBW see note 1 with Peak Detector for Average Value.

Note 1: For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector for average measurements. For the Duty Cycle please refer to clause 3.7 Duty Cycle.

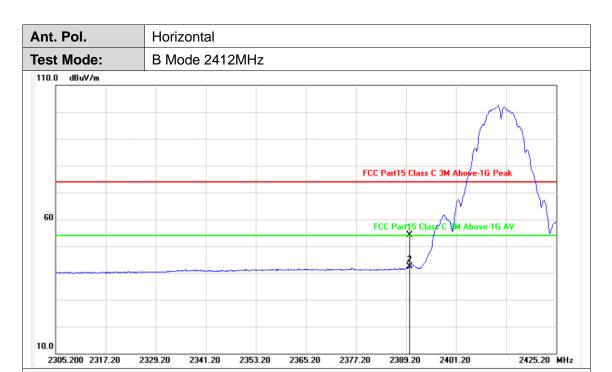
Test Mode

Please refer to the clause 2.3.

Test Results







No.	Frequency (MHz)			Level (dBuV/m)		Margin (dB)	Detector
1	2390.000	31.10	23.03	54.13	74.00	-19.87	peak
2	2390.000	31.10	11.20	42.30	54.00	-11.70	AVG

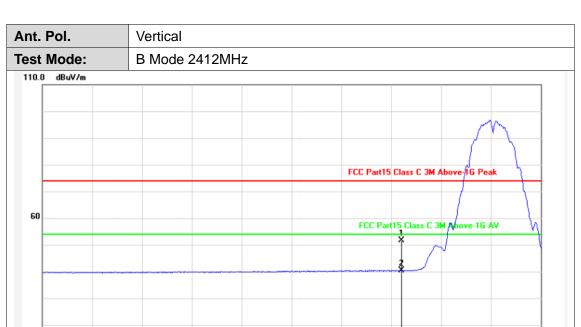
Remarks:

- 1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
- 2.Margin value = Level -Limit value

2399.50

2423.50 MHz





No.	Frequency (MHz)			Level (dBuV/m)		Margin (dB)	Detector
1	2390.000	31.10	20.44	51.54	74.00	-22.46	peak
2	2390.000	31.10	9.21	40.31	54.00	-13.69	AVG

2363.50

2375.50

2387.50

Remarks:

2303.500 2315.50

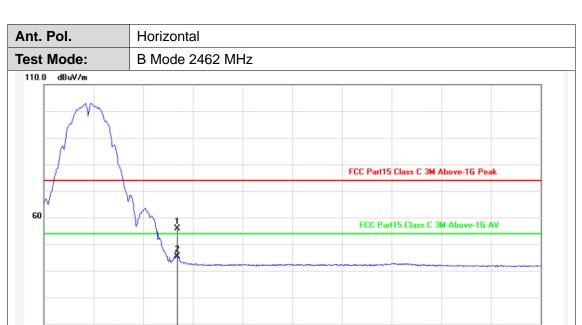
2339.50

2351.50

2327.50

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor





No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)		Margin (dB)	Detector
1	2483.500	31.50	24.35	55.85	74.00	-18.15	peak
2	2483.500	31.50	13.94	45.44	54.00	-8.56	AVG

2511.20

2523.20

2535.20

2547.20

2571.20 MHz

Remarks:

2451.200 2463.20

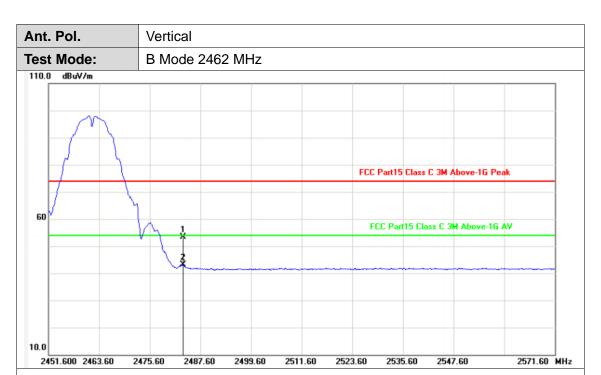
2475.20

2487.20

2499.20

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor



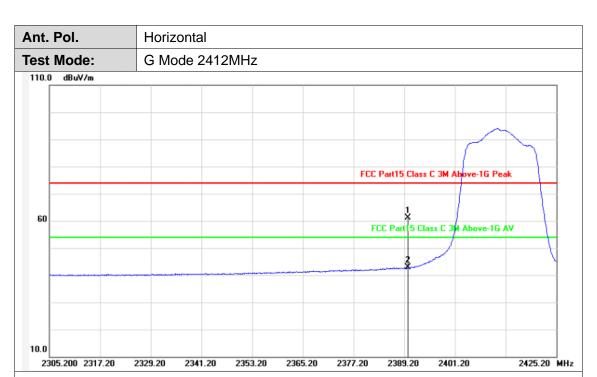


No.	Frequency (MHz)	Factor (dB/m)		Level (dBuV/m)		Margin (dB)	Detector
1	2483.500	31.50	21.79	53.29	74.00	-20.71	peak
2	2483.500	31.50	11.61	43.11	54.00	-10.89	AVG

Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor





No.	Frequency (MHz)			Level (dBuV/m)		Margin (dB)	Detector
1	2390.000	31.10	30.01	61.11	74.00	-12.89	peak
2	2390.000	31.10	11.73	42.83	54.00	-11.17	AVG

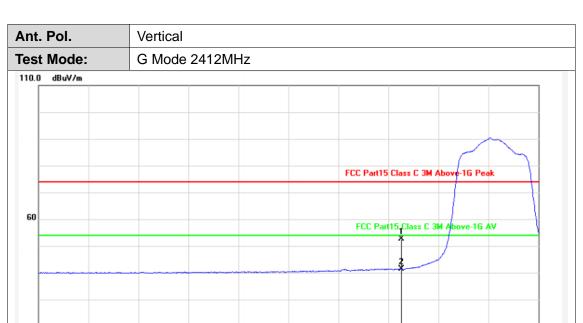
Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value

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No.	Frequency (MHz)			Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2390.000	31.10	21.61	52.71	74.00	-21.29	peak
2	2390.000	31.10	10.20	41.30	54.00	-12.70	AVG

2362.80

2374.80

2386.80

2398.80

2422.80 MHz

Remarks:

2302.800 2314.80

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value

2326.80

2338.80

2350.80

2544.80

2532.80

2568.80 MHz



Ant. Pol. Horizontal G Mode 2462MHz **Test Mode:** 110.0 dBuV/m FCC Part15 Class C 3M Above-1G Peak 60 FCC Part15 Class C 3M Above-1G AV

No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)		Margin (dB)	Detector
1	2483.500	31.50	32.05	63.55	74.00	-10.45	peak
2	2483.500	31.50	12.29	43.79	54.00	-10.21	AVG

2508.80

2520.80

Remarks:

10.0

2448.800 2460.80

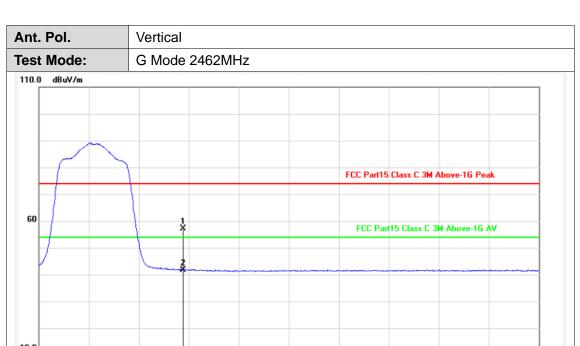
2472.80

2484.80

2496.80

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor





No.	Frequency (MHz)	Factor (dB/m)		Level (dBuV/m)			Detector
1	2483.500	31.50	25.59	57.09	74.00	-16.91	peak
2	2483.500	31.50	10.17	41.67	54.00	-12.33	AVG

2508.80

2520.80

2544.80

2568.80 MHz

Remarks:

2448.800 2460.80

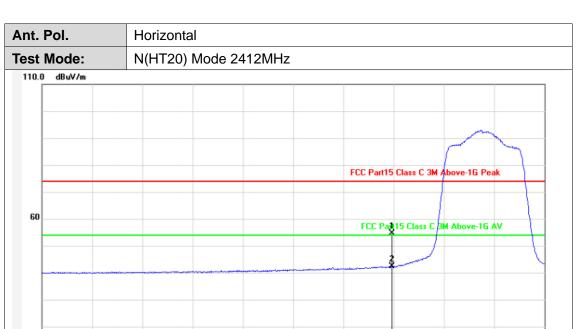
1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2496.80

2426.40 MHz

2402.40





No.	Frequency (MHz)			Level (dBuV/m)		Margin (dB)	Detector
1	2390.000	31.10	23.50	54.60	74.00	-19.40	peak
2	2390.000	31.10	11.19	42.29	54.00	-11.71	AVG

2366.40

2378.40

2390.40

Remarks:

2306.400 2318.40

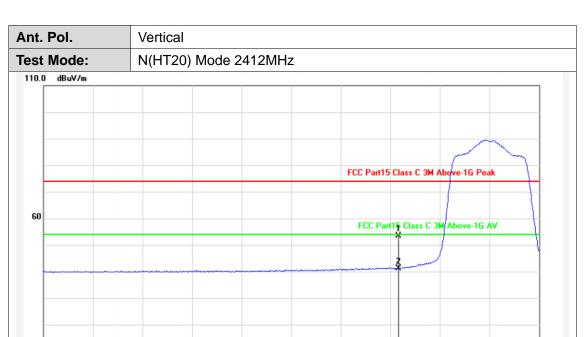
2330.40

2342.40

2354.40

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor





No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2390.000	31.10	22.24	53.34	74.00	-20.66	peak
2	2390.000	31.10	10.14	41.24	54.00	-12.76	AVG

2364.00

2376.00

2388.00

2400.00

2424.00 MHz

Remarks:

2304.000 2316.00

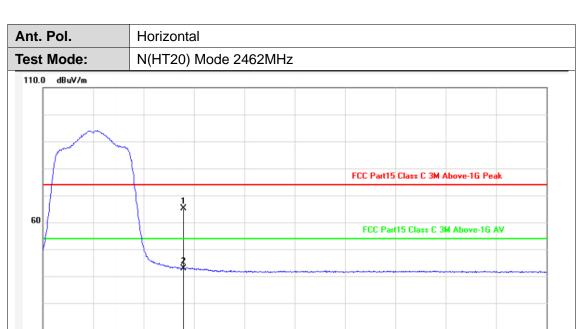
2328.00

2340.00

- 1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
- 2.Margin value = Level -Limit value

2570.00 MHz





No.	Frequency (MHz)	Factor (dB/m)	_	Level (dBuV/m)		Margin (dB)	Detector
1	2483.500	31.50	33.62	65.12	74.00	-8.88	peak
2	2483.500	31.50	11.26	42.76	54.00	-11.24	AVG

2510.00

2522.00

2534.00

2546.00

Remarks:

2450.000 2462.00

2474.00

2486.00

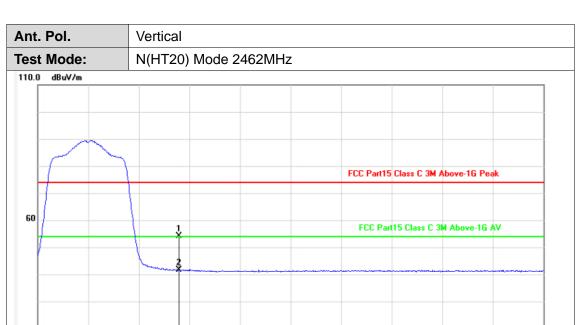
2498.00

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value

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No.	Frequency (MHz)	Factor (dB/m)		Level (dBuV/m)		Margin (dB)	Detector
1	2483.500	31.50	22.66	54.16	74.00	-19.84	peak
2	2483.500	31.50	10.11	41.61	54.00	-12.39	AVG

2510.00

2522.00

2534.00

2546.00

2570.00 MHz

Remarks:

10.0

2450.000 2462.00

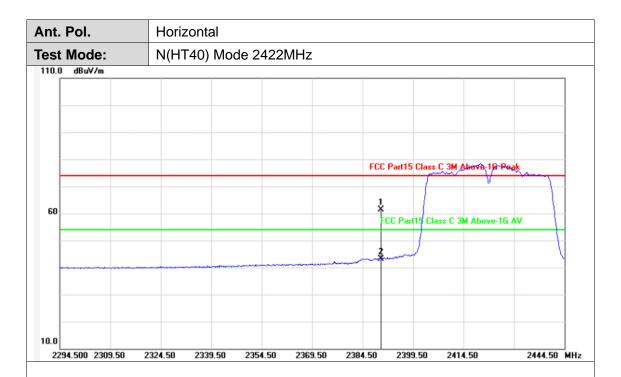
2474.00

2486.00

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2498.00



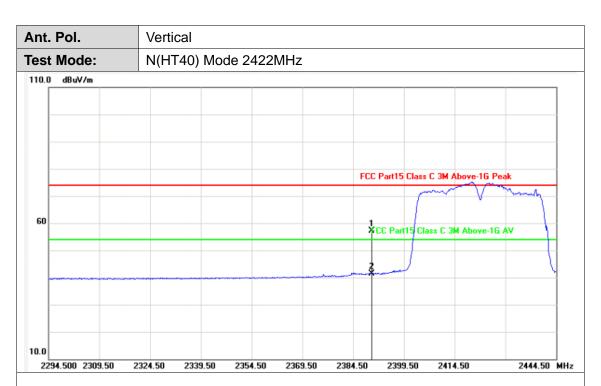


No.	Frequency (MHz)			Level (dBuV/m)		Margin (dB)	Detector
1	2390.000	31.10	30.23	61.33	74.00	-12.67	peak
2	2390.000	31.10	12.09	43.19	54.00	-10.81	AVG

Remarks:

- 1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
- 2.Margin value = Level -Limit value



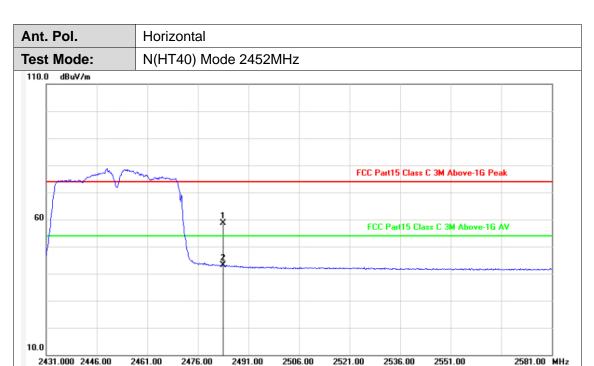


No.	Frequency (MHz)			Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2390.000	31.10	26.02	57.12	74.00	-16.88	peak
2	2390.000	31.10	10.22	41.32	54.00	-12.68	AVG

Remarks:

- 1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
- 2.Margin value = Level -Limit value



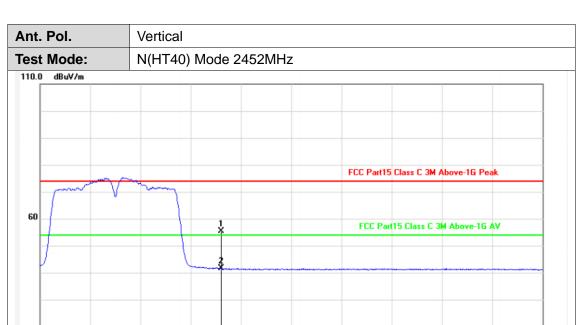


No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)		Margin (dB)	Detector
1	2483.500	31.50	27.25	58.75	74.00	-15.25	peak
2	2483.500	31.50	11.56	43.06	54.00	-10.94	AVG

Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor





No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)		Margin (dB)	Detector
1	2483.500	31.50	23.88	55.38	74.00	-18.62	peak
2	2483.500	31.50	10.03	41.53	54.00	-12.47	AVG

2504.50

2519.50

2534.50

2549.50

2579.50 MHz

Remarks:

2429.500 2444.50

2459.50

2474.50

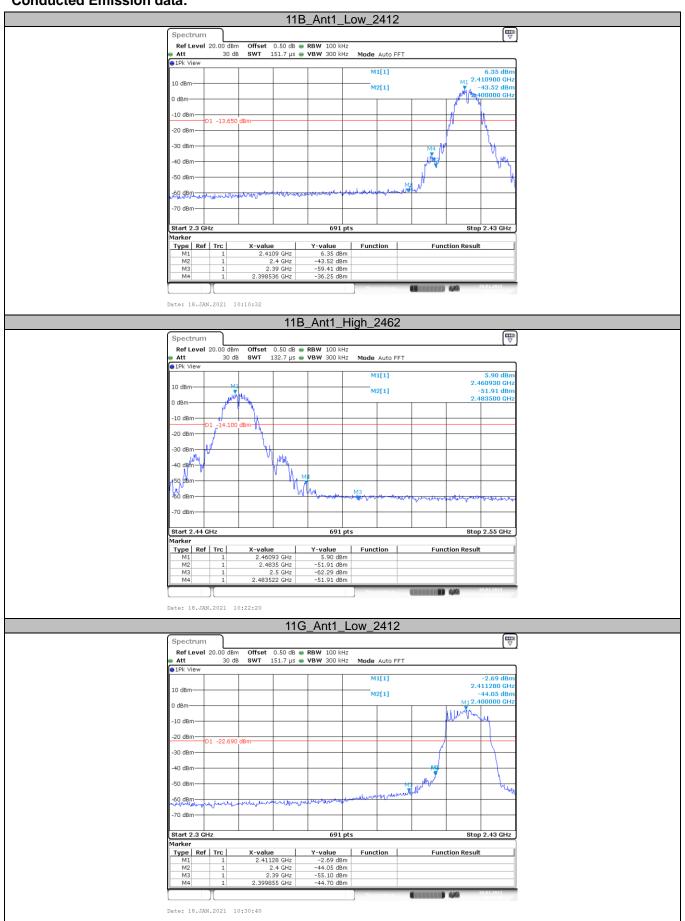
2489.50

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

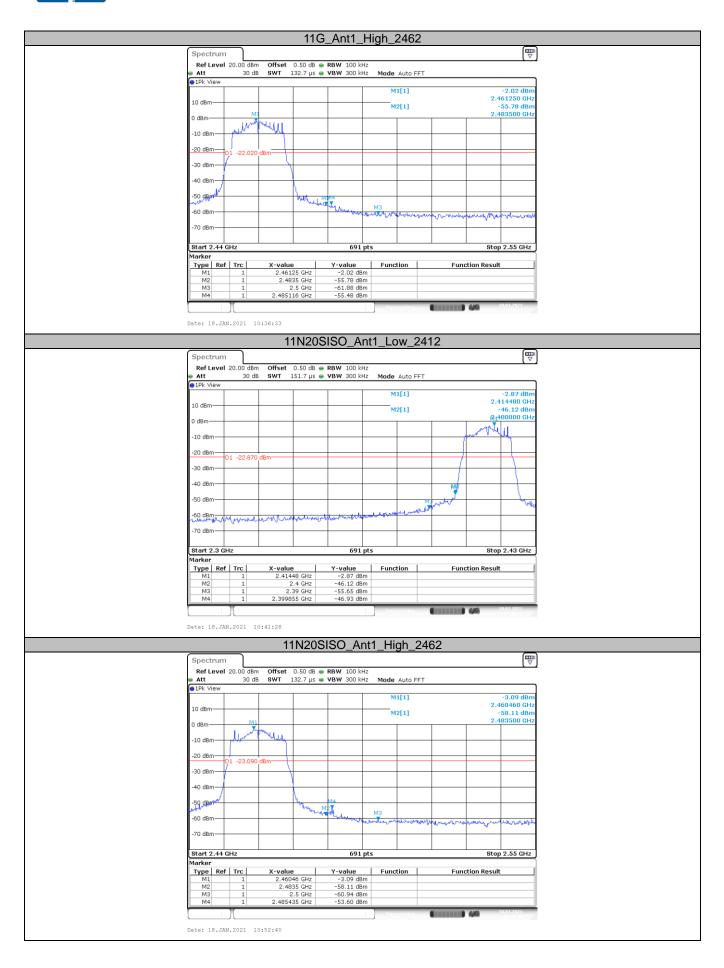




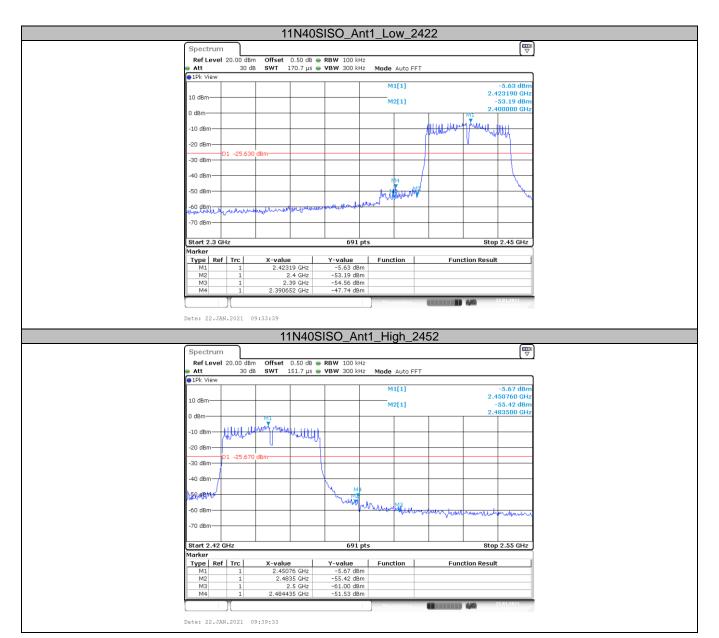
Conducted Emission data:













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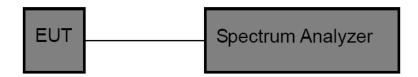
3.4. Bandwidth

Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(2)

Test Item	Limit	Frequency Range(MHz)
Bandwidth	>=500 KHz (6dB bandwidth)	2400~2483.5

Test Configuration



Test Procedure

- 1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- 2. DTS Spectrum Setting:
 - (1) Set RBW = 100 kHz.
 - (2) Set the video bandwidth (VBW) ≥ 3 RBW.
 - (3) Detector = Peak.
 - (4) Trace mode = Max hold.
 - (5) Sweep = Auto couple.
 - **OCB Spectrum Setting:**
 - (1) Set RBW = $1\% \sim 5\%$ occupied bandwidth.
 - (2) Set the video bandwidth (VBW) ≥ 3 RBW.
 - (3) Detector = Peak.
 - (4) Trace mode = Max hold.
 - (5) Sweep = Auto couple.

NOTE: The EUT was set to continuously transmitting in each mode and low, Middle and high channel for the test.

Test Mode

Please refer to the clause 2.3.



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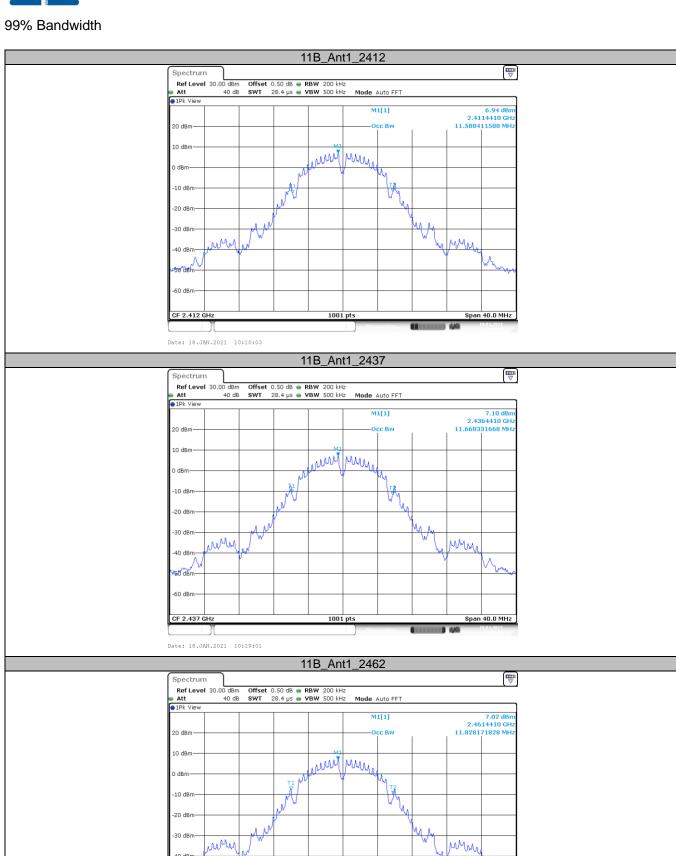
Test Results

Туре	Channel	99% Bandwidth (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result	
	01	11.588	8.120			
802.11b	06	11.668	8.120	≥500	Pass	
	11	11.828	7.160			
	01	17.183	15.480			
802.11g	2.11g 06	16.983	15.240	≥500	Pass	
	11	16.983	15.240			
	01	17.902	15.240			
802.11n(HT20)	06	17.822	15.800	≥500	Pass	
	11	18.142	15.240			
	03	36.044	35.360			
802.11n(HT40)	2.11n(HT40) 06		35.360	≥500	Pass	
	09	36.124	35.360			

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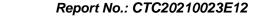


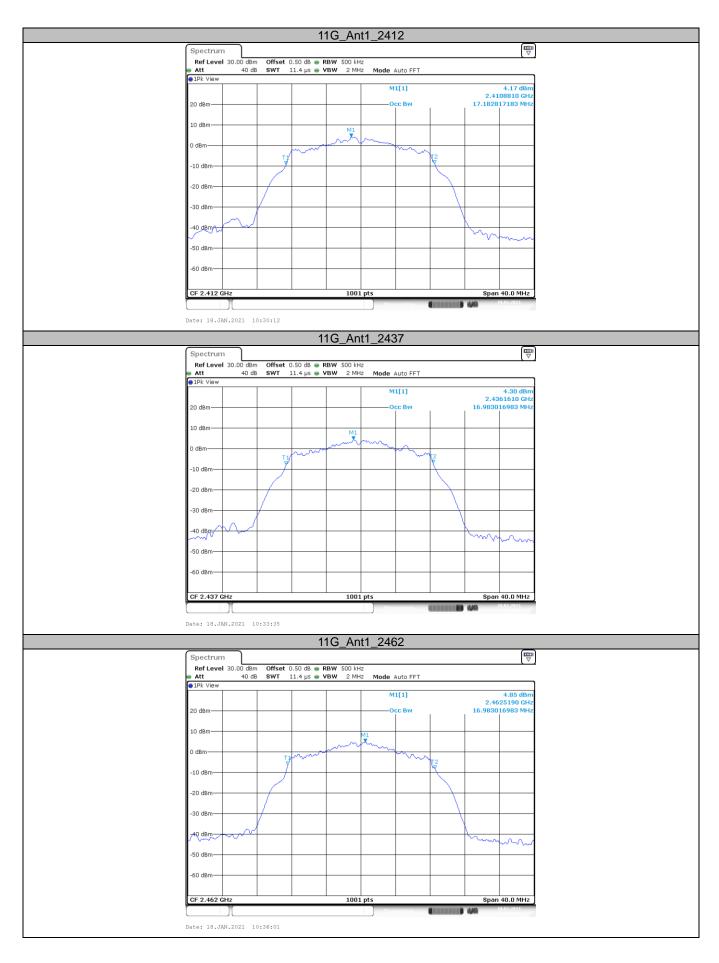




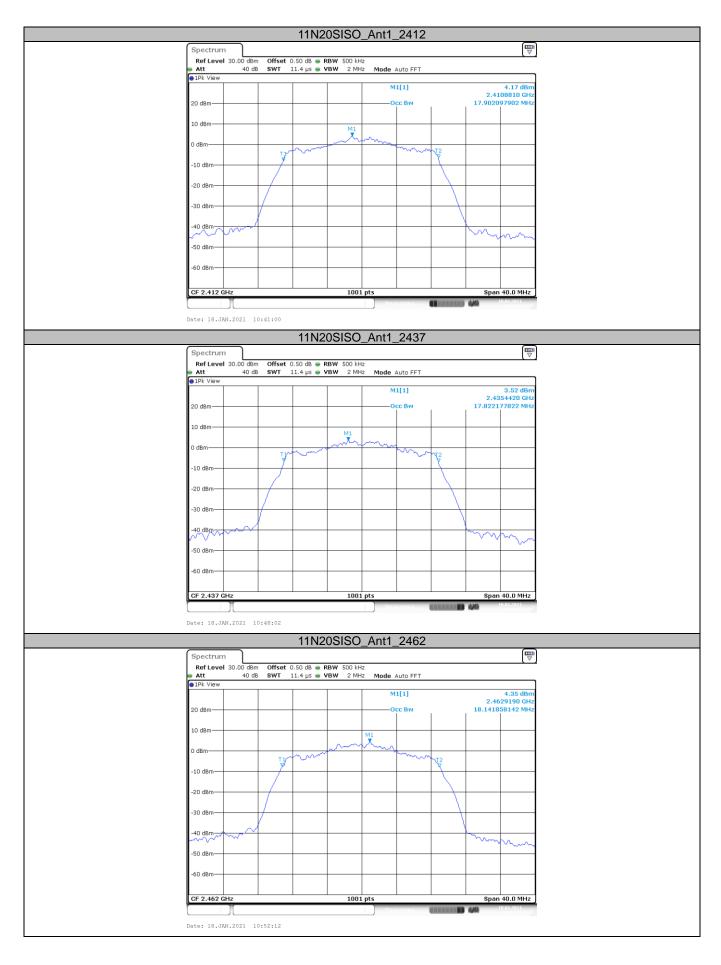
-60 dBm

Date: 18.JAN.2021 10:21:51

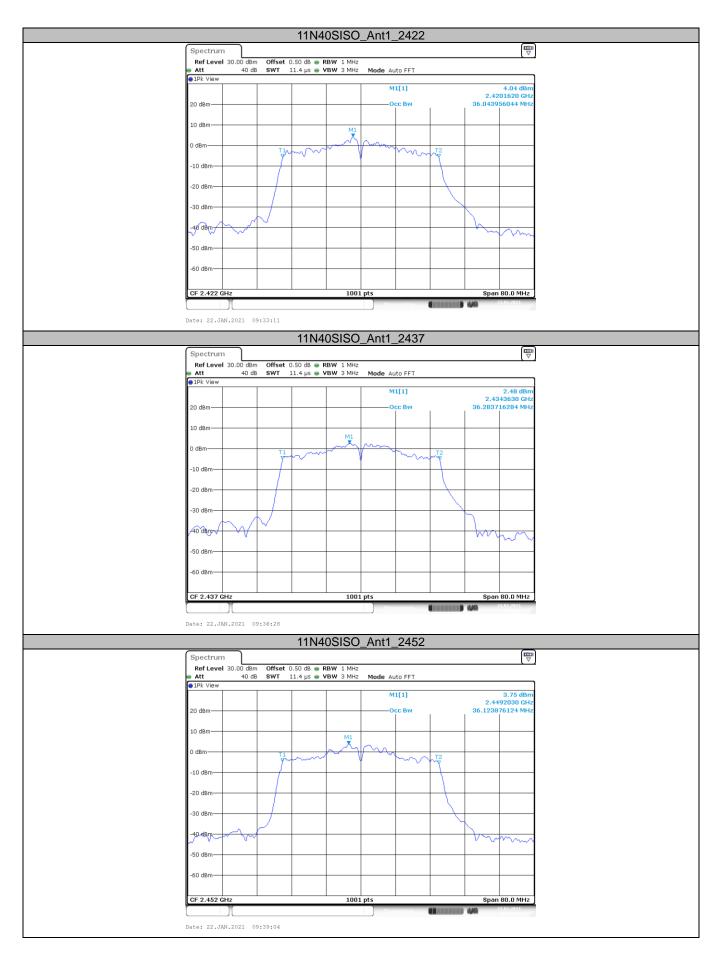




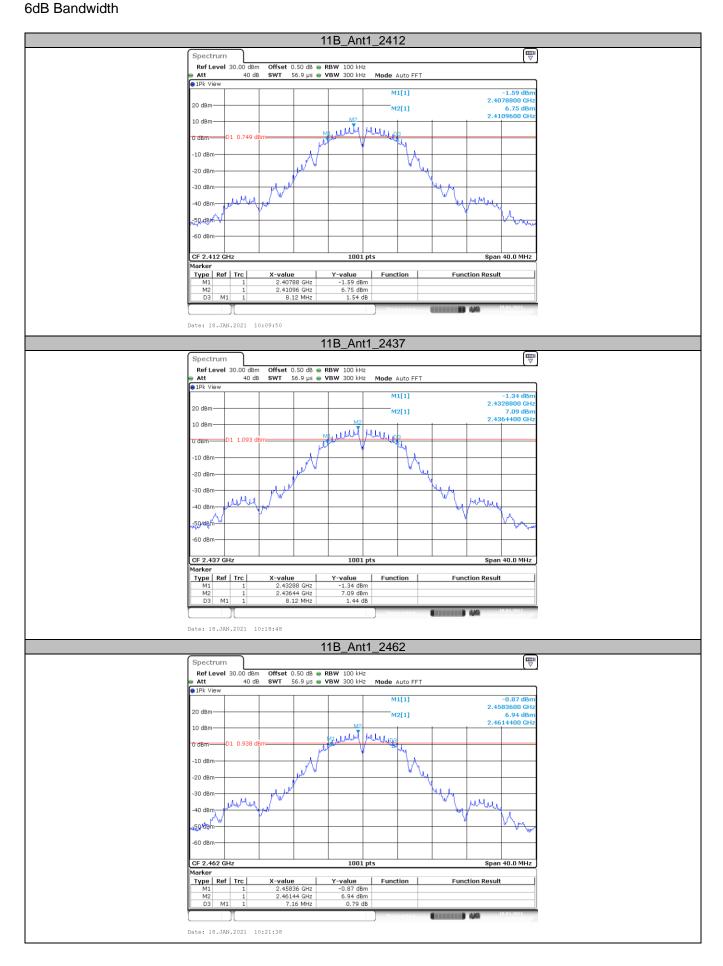












Offset 0.50 dB ● RBW 100 kHz SWT 56.9 µs ● VBW 300 kHz

11G_Ant1_2412

1001 pts

Y-value -8.49 dBm

-2.46 dBm -1.24 dB

11G_Ant1_2437

1001 pts

Y-value -9.37 dBm -2.15 dBm

0.14 dB

M1[1]

10 dBm

40 dBm

CF 2.412 GHz

M2 D3

Type Ref Trc

Ref Level 30.00 Att 4

1Pk Viev

10 dBm

-10 dBm -20 dBr

Type Ref Trc

M2

Date: 18.JAN.2021 10:29:59

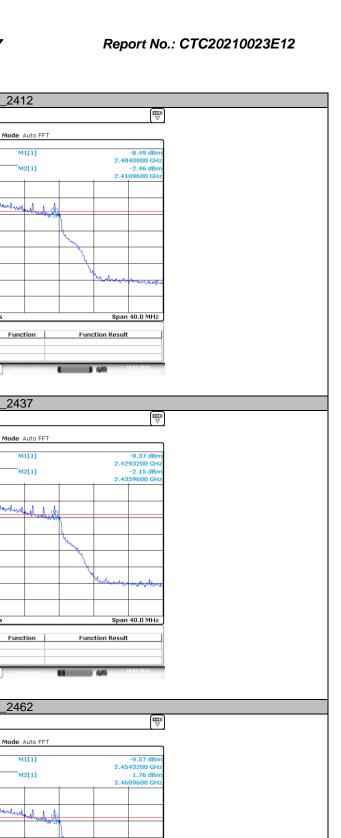
moulder

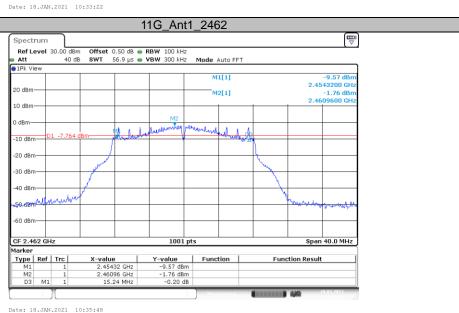
2 40408 GHz

2.41096 GHz 15.48 MHz

10 dBm Offset 0.50 dB RBW 100 kHz 40 dB SWT 56.9 µs VBW 300 kHz

X-value 2.42932 GHz 2.43596 GHz 15.24 MHz





CTC Laboratories, Inc.

M1[1]

1001 pts

Y-value -9.62 dBm -2.71 dBm -0.10 dB

X-value 2.40432 GHz

2.41444 GHz 15.24 MHz

X-value 2.42876 GHz 2.43944 GHz

Offset 0.50 dB • RBW 100 kHz SWT 56.9 μs • VBW 300 kHz



1Pk Viev

10 dBm

40 dBm

CF 2.412 GHz

M2 D3

Type Ref Trc

Ref Level 30.00 Att 4

●1Pk Viev

10 dBm

-10 dBm -20 dBr

Type Ref Trc

Tel.: (86)755-27521059

FN 中国国家认证认可监督管理委员会

M2

Date: 18.JAN.2021 10:40:46

Report No.: CTC20210023E12 11N20SISO_Ant1_2412 Span 40.0 MHz **Function Result** 11N20SISO_Ant1_2437 Mode Auto FFT **Function Result**



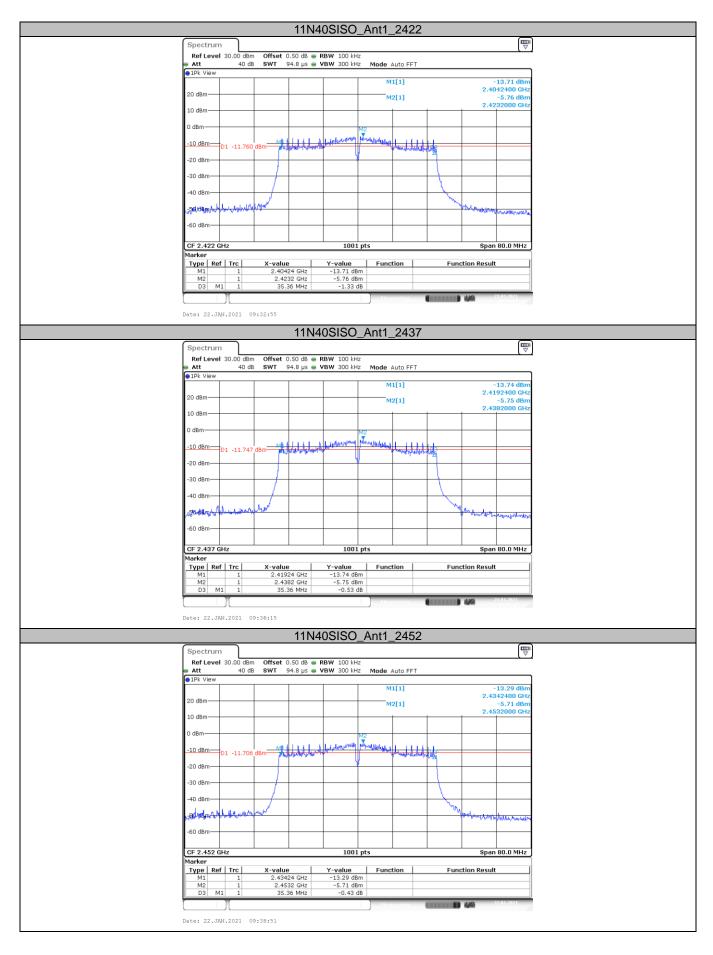
1001 pts

Y-value -9.44 dBm -2.40 dBm

-0.12 dB

CTC Laboratories, Inc. 1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China





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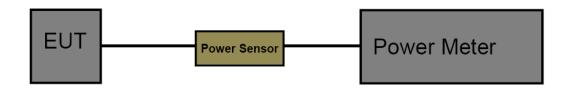
3.5. Peak Output Power

Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (b)(3)

Section	Test Item	Limit	Frequency Range(MHz)
CFR 47 FCC 15.247(b)(3)	Maximum conducted output power	1 Watt or 30dBm	2400~2483.5
ISED RSS-247 5.4 d EIRP		4 Watt or 36dBm	2400~2483.5

Test Configuration



Test Procedure

- 1. The maximum conducted output power may be measured using a broadband Peak RF power meter.
- Peak 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.
- 3. 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.
- 4. Record the measurement data.

Test Mode

Please refer to the clause 2.3

Test Result







Test Mode	Antenna	Channel	Result [dBm]	Limit [dBm]	Verdict
		2412	17.13	<=30	PASS
11B	Ant1	2437	17.33	<=30	PASS
		2462	17.03	<=30	PASS
		2412	16.13	<=30	PASS
11G	Ant1	2437	16.26	<=30	PASS
		2462	16.51	<=30	PASS
	Ant1	2412	15.38	<=30	PASS
11N20SISO		2437	15.76	<=30	PASS
		2462	15.83	<=30	PASS
		2422	14.40	<=30	PASS
11N40SISO	Ant1	2437	14.47	<=30	PASS
		2452	14.52	<=30	PASS

Note: Test results increased RF cable loss by 0.5dB.

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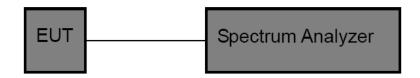
3.6. Power Spectral Density

Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (e)/ RSS-247 5.2 b:

Test Item	Limit	Frequency Range(MHz)
Power Spectral Density	8dBm(in any 3 kHz)	2400~2483.5

Test Configuration



Test Procedure

- 1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- 2. The EUT was directly connected to the Spectrum Analyzer and antenna output port as show in the block diagram above. The measurement according to section 10.2 of KDB 558074 D01 DTS Meas Guidance v05r02.
- 3. Spectrum Setting:

Set analyzer center frequency to DTS channel center frequency.

Set the span to 1.5 times the DTS bandwidth.

Set the RBW to: 3 kHz Set the VBW to: 10 kHz

Detector: peak Sweep time: auto

Allow trace to fully stabilize. Then use the peak marker function to determine the maximum amplitude level.

Test Mode

Please refer to the clause 2.3







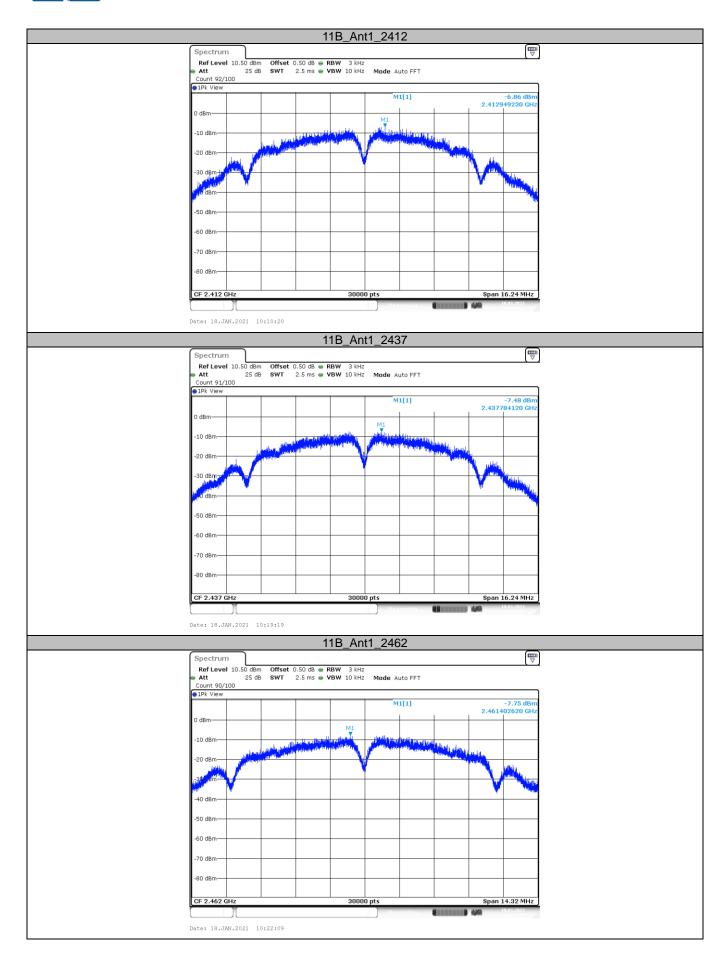
Test Result

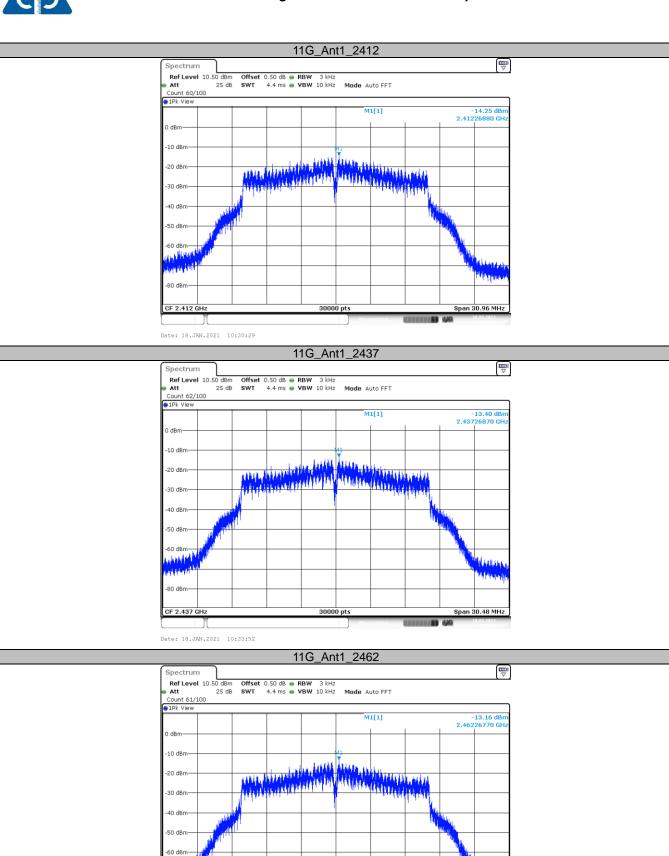
Туре	Channel	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
	01	-6.86		
802.11b	06	-7.48	≤8.00	Pass
	11	-7.75		
	01	-14.25		
802.11g	06	-13.4	≤8.00	Pass
	11	-13.16		
	01	-14.89		
802.11n(HT20)	06	-14.27	≤8.00	Pass
	11	-14.46		
	03	-19.42		
802.11n(HT40)	06	-19.41	≤8.00	Pass
	09	-19.88		

Note : Duty Cycle Correction Factor = $10*log(1/duty\ cycle)$

The Duty Cycle Correction Factor is compensated in the graph.

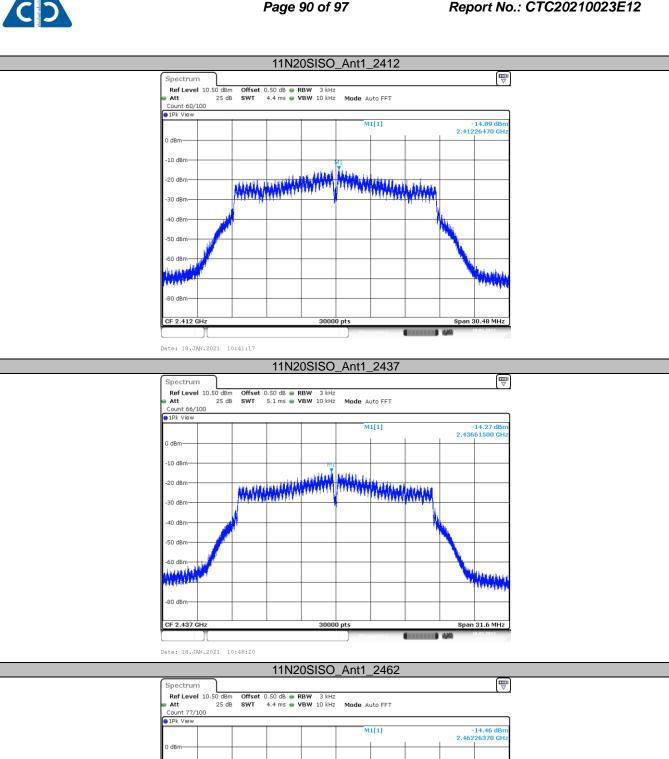


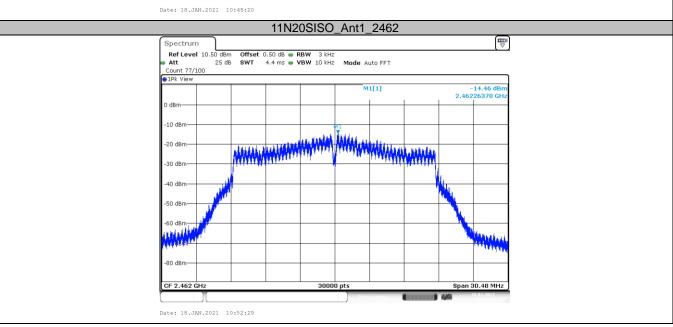




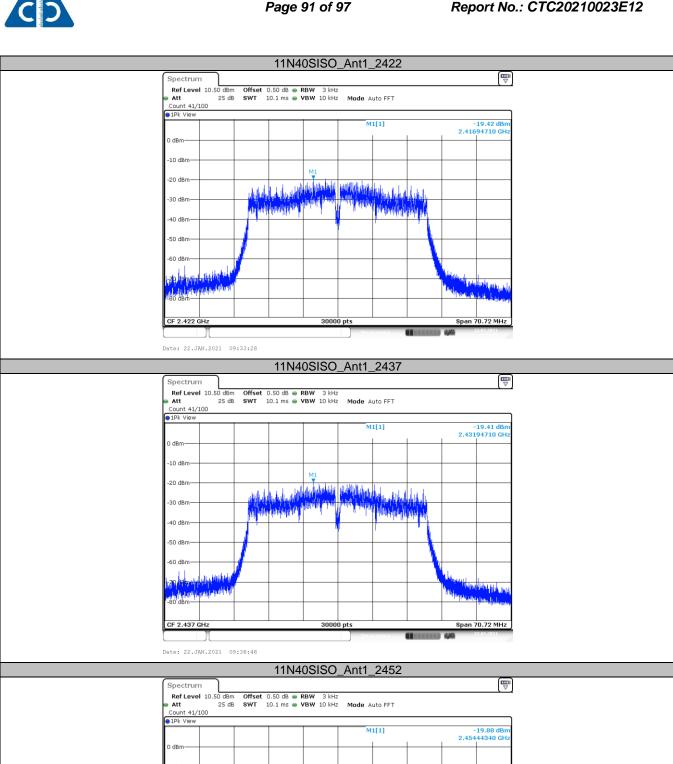
-80 dBm

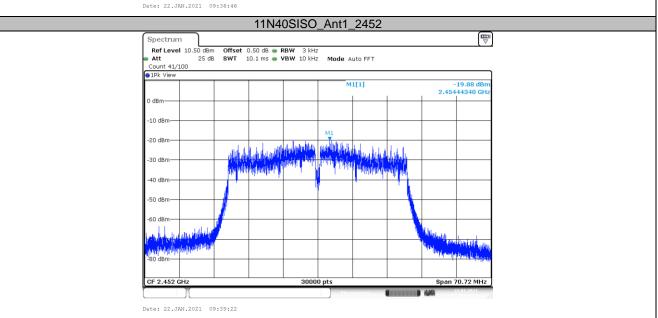












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3.7. Duty Cycle

Limit

None, for report purposes only.

Test Configuration



Test Procedure

- 1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- 2. The EUT was directly connected to the Spectrum Analyzer and antenna output port as show in the block diagram above. The measurement according to section 10.2 of KDB 558074 D01 DTS Meas Guidance v05r02.
- 3. Spectrum Setting:

Set analyzer center frequency to DTS channel center frequency.

Set the span to 0Hz Set the RBW to 10MHz Set the VBW to 10MHz

Detector: peak Sweep time: auto

Allow trace to fully stabilize. Then use the peak marker function to determine the maximum amplitude level.

Test Mode

Please refer to the clause 2.3

Test Result

Test Mode	Antenna	Channel	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]
		2412	8.39	8.49	98.82
11B	Ant1	2437	8.39	8.49	98.82
		2462	8.39	8.49	98.82
		2412	1.39	1.49	92.95
11G	Ant1	2437	1.39	1.49	93.03
		2462	1.39	1.49	92.95
		2412	1.30	1.40	92.51
11N20SISO	Ant1	2437	1.30	1.40	92.51
		2462	1.30	1.40	92.60
		2422	0.10	0.14	68.14
11N40SISO	Ant1	2437	0.10	0.14	68.42
		2452	0.10	0.14	68.42

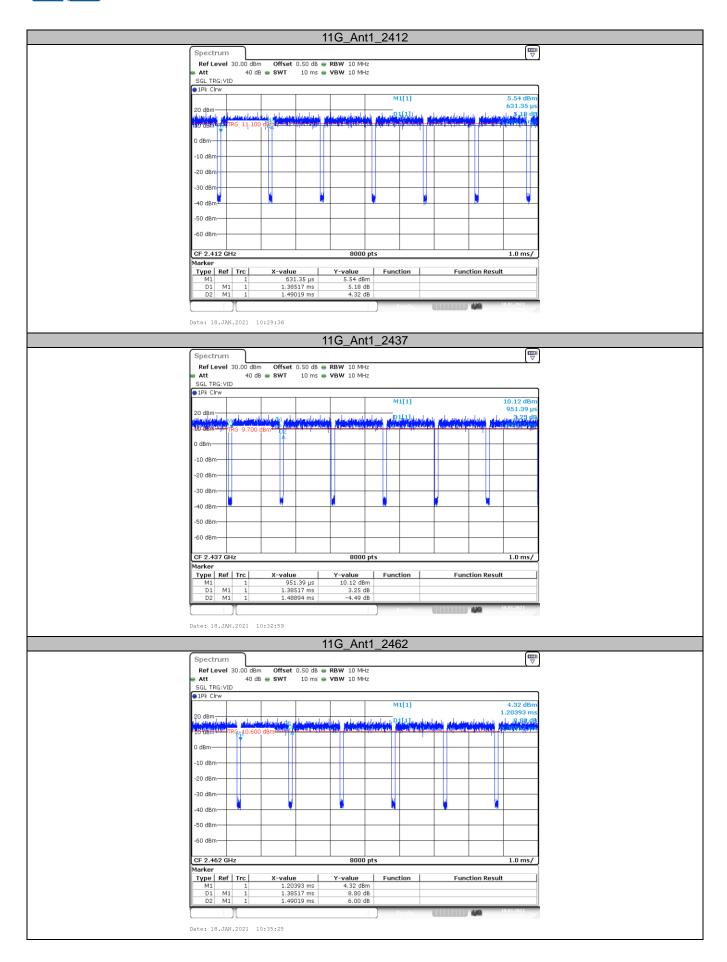
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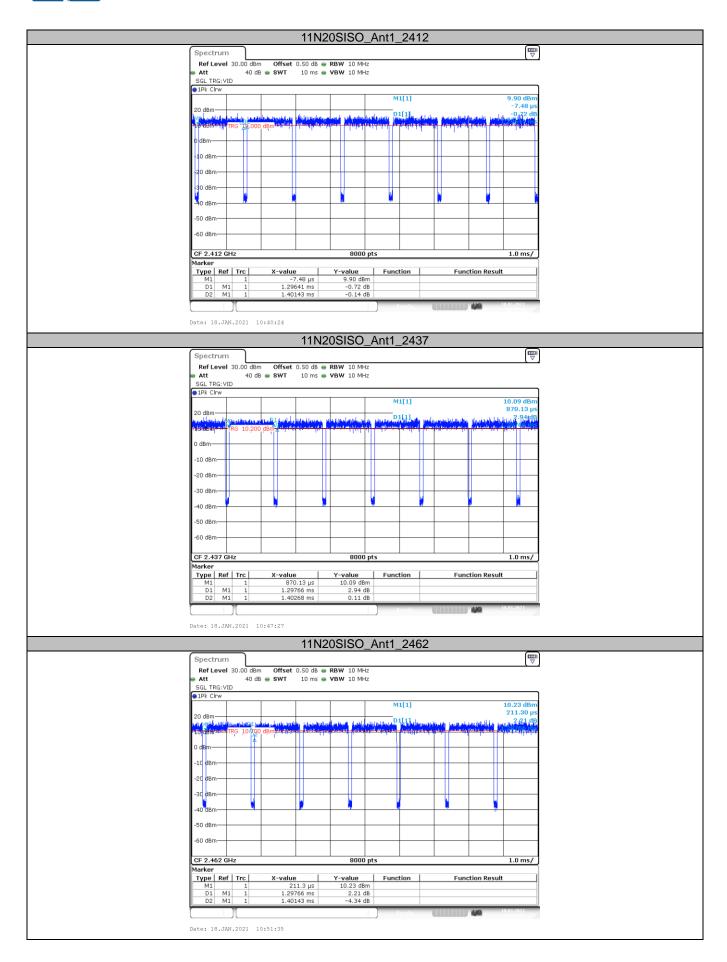


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3.8. Antenna requirement

Requirement

FCC CFR Title 47 Part 15 Subpart C 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. The use of a permanently attached antenna or of antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1)(i):

(i) Systems operating in the 2400~2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

Test Result

The directional gain of the antenna less than 6dBi, please refer to the EUT internal photographs antenna photo.

