SPONTON LAS, FCC RADIO TEST REPORT

Report No. : FR6N0506-03AA



FCC RADIO TEST REPORT

FCC ID	1	PPQ-WN3501M
Equipment	:	802.11n Dual Band Wireless Lan Module
Brand Name	:	LITE-ON
Model Name	:	WN3501M
Applicant	:	LITE-ON Technology Corp.
		Bldg. C, 90, Chien 1 Road, Chung Ho, New Taipei City 23585, Taiwan, R.O.C
Manufacturer		LITE-ON TECHNOLOGY (Changzhou) CO., LTD
		A9 Building,No.88 Yanghu Road, Wujin Hi-Tech Industrial Development Zone ,Changzhou City,
		Jiangsu Province 213100 China
Standard	8 11	47 CFR FCC Part 15.247

The product was received on Dec. 21, 2018, and testing was started from Dec. 27, 2018 and completed on Jan. 09, 2019. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 and shown compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The test results in this variant report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Approved by: Cliff Charles

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)

TEL : 886-3-656-9065 FAX : 886-3-656-9085 Report Template No.: CB Ver1.0 Page Number: 1 of 21Issued Date: Feb. 01, 2019Report Version: 01



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Appendix F. Test Photos

Photographs of EUT v01



History of this test report

Report No.	Version	Description	Issued Date
FR6N0506-03AA	01	Initial issue of report	Feb. 01, 2019



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
1.1.2	15.203	Antenna Requirement	PASS	-
3.1	15.247(a)	DTS Bandwidth	PASS	-
3.2	15.247(b)	Maximum Conducted Output Power	PASS	-
3.3	15.247(e)	Power Spectral Density	PASS	-
3.4	15.247(d)	Emissions in Non-restricted Frequency Bands	PASS	-
3.5	15.247(d)	Emissions in Restricted Frequency Bands	PASS	-

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Cliff Chang

Report Producer: Wendy Pan



1 General Description

1.1 Information

1.1.1 RF General Information

Frequency Range (MHz)	IEEE Std. 802.11	Ch. Frequency (MHz)	Channel Number
2400-2483.5	b, g, n (HT20)	2412-2462	1-11 [11]
2400-2483.5	n (HT40)	2422-2452	3-9 [7]

Band	Mode	BWch (MHz)	Nant
2.4-2.4835GHz	802.11b	20	1TX
2.4-2.4835GHz	802.11g	20	1TX
2.4-2.4835GHz	802.11n HT20	20	1TX
2.4-2.4835GHz	802.11n HT40	40	1TX

Note:

- 11b mode uses a combination of DSSS-DBPSK, DQPSK, CCK modulation.
- 11g, HT20 and HT40 use a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation.
- BWch is the nominal channel bandwidth.
- Nss-Min is the minimum number of spatial streams.
- Nant is the number of outputs. e.g., 2(2,3) means have 2 outputs for port 2 and port 3. 2 means have 2 outputs for port 1 and port 2.

1.1.2 Antenna Information

Ant.	Brand	Model Name	Antonno Tuno	Connector	Gain (dBi)		
Ant.	Dialiu		Antenna Type	Connector	2.4GHz	5GHz	
1	LITE-ON	WN3501M	Printed Antenna	N/A	0.95	3.22	
2	LITE-ON	WN3501M	Printed Antenna	N/A	0.60	3.10	

Note1: The EUT has two antennas. (1TX/1RX)

The EUT supports the antenna with TX and RX diversity functions.

Both Ant. 1 and Ant. 2 support transmit and receive functions, but only one of them will be used at one time.

The Ant. 1 generated the worst case, so it was selected to test and record in the report.

Note2: The above information was declared by manufacturer.



1.1.3 Mode Test Duty Cycle

Mode	DC	DCF(dB)	T(s)	VBW(Hz) ≥ 1/T
802.11b				
802.11g	1	0	n/a (DC>=0.98)	n/a (DC>=0.98)
802.11n HT20	1	0	n/a (DC>=0.98)	n/a (DC>=0.98)
802.11n HT40	1	0	n/a (DC>=0.98)	n/a (DC>=0.98)

Note:

• DC is Duty Cycle.

DCF is Duty Cycle Factor.

1.1.4 EUT Operational Condition

EUT Power Type	Fro	From host system				
Beamforming Function		□ With beamforming				
Function	Point-to-multipoint Depint-to-point					
Test Software Version	Dut	DutApiBRIDGEETH8782.exe				

Note: The above information was declared by manufacturer.

1.1.5 Table for Class II Change

This product is an extension of original one reported under Sporton project number: FR6N0506AA

Below is the table for the change of the product with respect to the original one.

Modifications	Performance Checking
	1. DTS Bandwidth
	2. Maximum Conducted Output Power
1. Changing the power source to "1.8V" from "3.3V".	3. Power Spectral Density
2. Changing the FFC connector.	4. Emissions in Non-restricted Frequency Bands
	5. Emissions in Restricted Frequency Bands
	Above 1GHz



1.2 Testing Applied Standards

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

- 47 CFR FCC Part 15
- ANSI C63.10-2013
- FCC KDB 558074 D01 v05

1.3 Testing Location Information

	Testing Location							
	HWA YA	ADD	:	No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)				
		TEL	:	886-3-327-3456 FAX : 886-3-327-0973				
\boxtimes	JHUBEI	ADD	:	No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C.				
		TEL	:	886-3-656-9065 FAX : 886-3-656-9085				

Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
RF Conducted	TH01-CB	Eason Chen	26°C / 53%	Dec. 31, 2018 ~ Jan. 07, 2019
Radiated	03CH01-CB	KJ Chang	26°C / 53%	Dec. 27, 2018 ~ Jan. 09, 2019

Test site Designation No. TW0006 with FCC.

Test site registered number IC 4086D with Industry Canada.

1.4 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

Test Items	Uncertainty	Remark	
Radiated Emission (1GHz ~ 18GHz)	3.7 dB	Confidence levels of 95%	
Radiated Emission (18GHz ~ 40GHz)	3.5 dB	Confidence levels of 95%	
Conducted Emission	1.7 dB	Confidence levels of 95%	
Output Power Measurement	1.33 dB	Confidence levels of 95%	
Power Density Measurement	1.27 dB	Confidence levels of 95%	
Bandwidth Measurement	9.74 x10 ⁻⁸	Confidence levels of 95%	



2 Test Configuration of EUT

2.1 Test Channel Mode

Mode	PowerSetting
802.11b_Nss1,(1Mbps)_1TX	-
2412MHz	16
2437MHz	15
2462MHz	15
802.11g_Nss1,(6Mbps)_1TX	-
2412MHz	15
2437MHz	20
2462MHz	14
802.11n HT20_Nss1,(MCS0)_1TX	-
2412MHz	14
2437MHz	20
2462MHz	13
802.11n HT40_Nss1,(MCS0)_1TX	-
2422MHz	10
2437MHz	14
2452MHz	11



2.2 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests		
Tests Item	DTS Bandwidth Maximum Conducted Output Power Power Spectral Density Emissions in Non-restricted Frequency Bands	
Test Condition Conducted measurement at transmit chains		

The Worst Case Mode for Following Conformance Tests		
Tests Item	Emissions in Restricted Frequency Bands	
Test Condition	Radiated measurement If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type.	
Operating Mode > 1GHz	СТХ	

For Radiated Emission

The EUT was performed at X axis, Y axis and Z axis and the worst case was found at X axis. So the measurement will follow this same test configuration.

For Band Edge Emission

The EUT was performed at X axis, Y axis and Z axis and the worst case was found at Z axis. So the measurement will follow this same test configuration.

2.3 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

2.4 Accessories

N/A

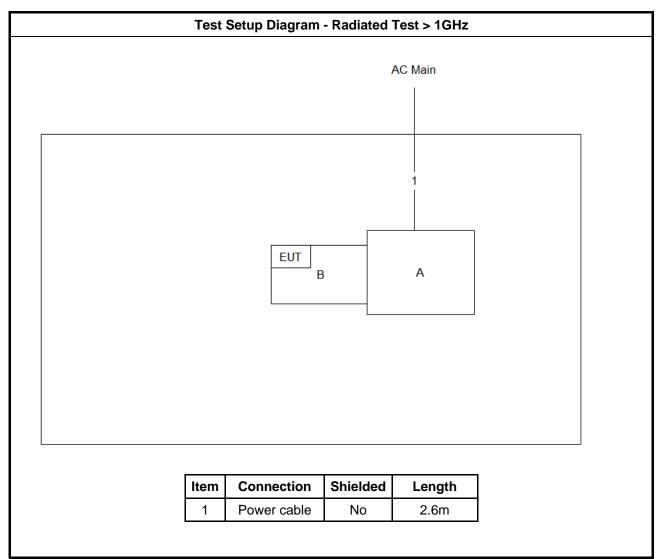
2.5 Support Equipment

For Test Site No: TH01-CB and 03CH01-CB

	Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID	
А	Notebook	Lenovo	TP00001A	N/A	
В	Test Fixture	Liteo	WN3501M_EVB	N/A	



2.6 Test Setup Diagram





3 Transmitter Test Result

3.1 DTS Bandwidth

3.1.1 6dB Bandwidth Limit

6dB Bandwidth Limit

Systems using digital modulation techniques:

6 dB bandwidth ≥ 500 kHz.

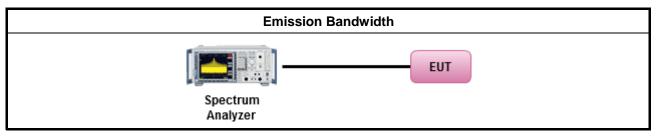
3.1.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

	Test Method					
•	For the emission bandwidth shall be measured using one of the options below:					
	Refer as FCC KDB 558074, clause 8.2 & C63.10 clause 11.8.1 Option 1 for 6 dB bandwind measurement.					
Refer as FCC KDB 558074, clause 8.2 & C63.10 clause 11.8.2 Option 2 for 6 measurement.						
	Refer as ANSI C63.10, clause 6.9.1 for occupied bandwidth testing.					

3.1.4 Test Setup



3.1.5 Test Result of Emission Bandwidth

Refer as Appendix A



3.2 Maximum Conducted Output Power

3.2.1 Maximum Conducted Output Power Limit

Maximum Conducted Output Power Limit					
		11 0			

•	If $G_{TX} \le 6$ dBi, then $P_{Out} \le 30$ dBm (1 W)	

- Point-to-multipoint systems (P2M): If $G_{TX} > 6 \text{ dBi}$, then $P_{Out} = 30 (G_{TX} 6) \text{ dBm}$
- Point-to-point systems (P2P): If $G_{TX} > 6$ dBi, then $P_{Out} = 30 (G_{TX} 6)/3$ dBm
- Smart antenna system (SAS):
 - Single beam: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 (G_{TX} 6)/3$ dBm
 - Overlap beam: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 (G_{TX} 6)/3$ dBm
 - Aggregate power on all beams: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 (G_{TX} 6)/3 + 8$ dB dBm

 P_{Out} = maximum peak conducted output power or maximum conducted output power in dBm, G_{TX} = the maximum transmitting antenna directional gain in dBi.

3.2.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

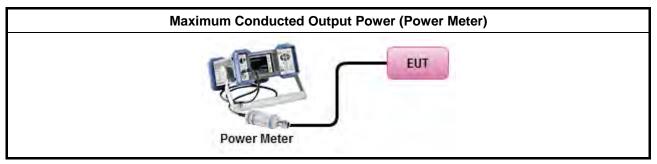


3.2.3 Test Procedures

		Test Method
•	Max	imum Peak Conducted Output Power
		Refer as FCC KDB 558074, clause 8.3.1.1 & C63.10 clause 11.9.1.1 (RBW ≥ EBW method).
		Refer as FCC KDB 558074, clause 8.3.1.3 & C63.10 clause 11.9.1.3 (peak power meter).
•	Max	imum Conducted Output Power
	[duty	/ cycle ≥ 98% or external video / power trigger]
		Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.2 Method AVGSA-1.
		Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.3 Method AVGSA-1A. (alternative)
	duty	cycle < 98% and average over on/off periods with duty factor
		Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.4 Method AVGSA-2.
		Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.5 Method AVGSA-2A (alternative)
		Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.6 Method AVGSA-3
		Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.7 Method AVGSA-3A (alternative)
	Mea	surement using a power meter (PM)
	\boxtimes	Refer as FCC KDB 558074, clause 8.3.2.3 & C63.10 clause 11.9.2.3.1 Method AVGPM (using an RF average power meter).
		Refer as FCC KDB 558074, clause 8.3.2.3 & C63.10 clause 11.9.2.3.2 Method AVGPM-G (using an gate RF average power meter).
•	For	conducted measurement.
		If the EUT supports multiple transmit chains using options given below: Refer as FCC KDB 662911, In-band power measurements. Using the measure-and-sum approach, measured all transmit ports individually. Sum the power (in linear power units e.g., mW) of all ports for each individual sample and save them.
	•	If multiple transmit chains, EIRP calculation could be following as methods: $P_{total} = P_1 + P_2 + + P_n$ (calculated in linear unit [mW] and transfer to log unit [dBm]) $EIRP_{total} = P_{total} + DG$



3.2.4 Test Setup



3.2.5 Test Result of Maximum Conducted Output Power

Refer as Appendix B



3.3 **Power Spectral Density**

3.3.1 Power Spectral Density Limit

Power Spectral Density Limit

■ Power Spectral Density (PSD) ≤ 8 dBm/3kHz

3.3.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

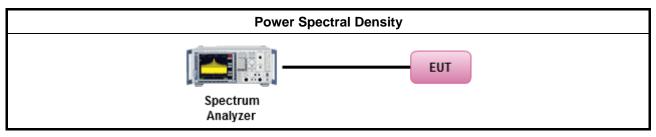
3.3.3 Test Procedures

	<u>.</u>	Test Method
	outp the c conc of th	k power spectral density procedures that the same method as used to determine the conducted ut power. If maximum peak conducted output power was measured to demonstrate compliance to butput power limit, then the peak PSD procedure below (Method PKPSD) shall be used. If maximum ducted output power was measured to demonstrate compliance to the output power limit, then one he average PSD procedures shall be used, as applicable based on the following criteria (the peak procedure is also an acceptable option).
	\boxtimes	Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.2 Method PKPSD.
	[duty	/ cycle ≥ 98% or external video / power trigger]
		Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.3 Method AVGPSD-1.
		Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.5 Method AVGPSD-2.
		Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.7 Method AVGPSD-3.
	duty	cycle < 98% and average over on/off periods with duty factor
		Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.4 Method AVGPSD-1A. (alternative).
		Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.6 Method AVGPSD-2A. (alternative)
		Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.8 Method AVGPSD-3A. (alternative)
•	For	conducted measurement.
	•	If The EUT supports multiple transmit chains using options given below:
		Option 1: Measure and sum the spectra across the outputs. Refer as FCC KDB 662911, In-band power spectral density (PSD). Sample all transmit ports simultaneously using a spectrum analyzer for each transmit port. Where the trace bin-by-bin of each transmit port summing can be performed. (i.e., in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 and that from the first spectral bin of output 3, and so on up to the NTX output to obtain the value for the first frequency bin of the summed spectrum.). Add up the amplitude (power) values for the different transmit chains and use this as the new data trace.
		□ Option 2: Measure and sum spectral maxima across the outputs. With this technique, spectra are measured at each output of the device at the required resolution bandwidth. The maximum value (peak) of each spectrum is determined. These maximum values are then summed mathematically in linear power units across the outputs. These operations shall be performed separately over frequency spans that have different out-of-band or spurious emission limits,
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Option 3: Measure and add 10 log(N) dB, where N is the number of transmit chains. Refer as FCC KDB 662911, In-band power spectral density (PSD). Performed at each transmit chains and each transmit chains shall be compared with the limit have been reduced with 10 log(N). Or each transmit chains shall be add 10 log(N) to compared with the limit.

3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Refer as Appendix C



3.4 Emissions in Non-restricted Frequency Bands

3.4.1 Emissions in Non-restricted Frequency Bands Limit

Un-restricted Band Emissions Limit		
Limit (dBc)		
20		
30		

Note 1: If the peak output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak PSD level.

Note 2: If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured in-band average PSD level.

3.4.2 Measuring Instruments

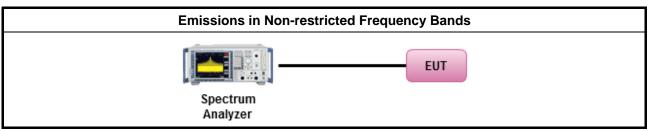
Refer a test equipment and calibration data table in this test report.

3.4.3 Test Procedures

Test Method

Refer as FCC KDB 558074, clause 8.5 for unwanted emissions into non-restricted bands.

3.4.4 Test Setup



3.4.5 Test Result of Emissions in Non-restricted Frequency Bands

Refer as Appendix D



3.5 Emissions in Restricted Frequency Bands

3.5.1 Emissions in Restricted Frequency Bands Limit

Restricted Band Emissions Limit					
Frequency Range (MHz)	Field Strength (dBuV/m)	Measure Distance (m)			
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300		
0.490~1.705	24000/F(kHz)	33.8 - 23	30		
1.705~30.0	30	29	30		
30~88	100	40	3		
88~216	150	43.5	3		
216~960	200	46	3		
Above 960	500	54	3		

Note 1: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

Note 2: Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below 30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.

Note 3: Using the distance of 1m during the test for above 18 GHz, and the test value to correct for the distance factor at 3m.

3.5.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

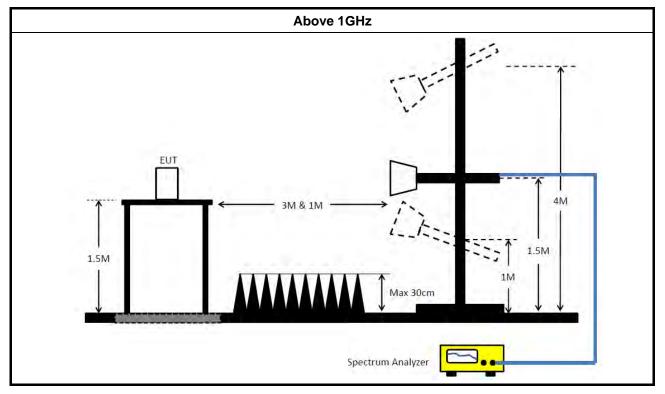


3.5.3 Test Procedures

	Test Method
•	The average emission levels shall be measured in [duty cycle \geq 98 or duty factor].
•	Refer as ANSI C63.10, clause 6.10.3 band-edge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band.
•	For the transmitter unwanted emissions shall be measured using following options below:
	 Refer as FCC KDB 558074, clause 8.6 for unwanted emissions into restricted bands.
	Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.1(trace averaging for duty cycle ≥98%).
	Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.2(trace averaging + duty factor).
	☐ Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.3(Reduced VBW≥1/T).
	□ Refer as ANSI C63.10, clause 11.12.2.5.3 (Reduced VBW). VBW \ge 1/T, where T is pulse time.
	Refer as ANSI C63.10, clause 7.5 average value of pulsed emissions.
	Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.4 measurement procedure peak limit.
•	For the transmitter band-edge emissions shall be measured using following options below:
	 Refer as FCC KDB 558074 clause 8.7 & C63.10 clause 11.13.1, When the performing peak or average radiated measurements, emissions within 2 MHz of the authorized band edge may be measured using the marker-delta method described below.
	 Refer as FCC KDB 558074, clause 8.7 (ANSI C63.10, clause 6.10.6) for marker-delta method for band-edge measurements.
	 Refer as FCC KDB 558074, clause 8.7 for narrower resolution bandwidth (100kHz) using the band power and summing the spectral levels (i.e., 1 MHz).
	 For conducted unwanted emissions into restricted bands (absolute emission limits). Devices with multiple transmit chains using options given below: (1) Measure and sum the spectra across the outputs or (2) Measure and add 10 log(N) dB
	 For FCC KDB 662911 The methodology described here may overestimate array gain, thereby resulting in apparent failures to satisfy the out-of-band limits even if the device is actually compliant. In such cases, compliance may be demonstrated by performing radiated tests around the frequencies at which the apparent failures occurred.



3.5.4 Test Setup



3.5.5 Emissions in Restricted Frequency Bands (Below 30MHz)

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

The radiated emissions were investigated from 9 kHz or the lowest frequency generated within the device, up to the 10 harmonic or 40 GHz, whichever is appropriate.

3.5.6 Test Result of Emissions in Restricted Frequency Bands

Refer as Appendix E



4 Test Equipment and Calibration Data

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
Horn Antenna	EMCO	3115	00075790	750MHz ~ 18GHz	Nov. 13, 2018	Nov. 12, 2019	Radiation (03CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Jun. 28, 2018	Jun. 27, 2019	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 09, 2018	Jan. 08, 2019	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 08, 2019	Jan. 07, 2020	Radiation (03CH01-CB)
Pre-Amplifier	MITEQ	TTA1840-35-H G	1864479	18GHz ~ 40GHz	Jul. 04, 2018	Jul. 03, 2019	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSP40	100080	9kHz~40GHz	Oct. 03, 2018	Oct. 02, 2019	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16	N/A	1 GHz ~ 18 GHz	Oct. 08, 2018	Oct. 07, 2019	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16+17	N/A	1 GHz ~ 18 GHz	Oct. 08, 2018	Oct. 07, 2019	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G#1	N/A	18GHz ~ 40 GHz	Jul. 27, 2018	Jul. 26, 2019	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G#2	N/A	18GHz ~ 40 GHz	Jul. 27, 2018	Jul. 26, 2019	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSV40	101027	9kHz~40GHz	Jun. 22, 2018	Jun. 21, 2019	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-06	1 GHz – 26.5 GHz	Oct. 08, 2018	Oct. 07, 2019	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-07	1 GHz –26.5 GHz	Oct. 08, 2018	Oct. 07, 2019	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-08	1 GHz –26.5 GHz	Oct. 08, 2018	Oct. 07, 2019	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-09	1 GHz –26.5 GHz	Oct. 08, 2018	Oct. 07, 2019	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-10	1 GHz –26.5 GHz	Oct. 08, 2018	Oct. 07, 2019	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-28	1 GHz –26.5 GHz	Nov. 19, 2018	Nov. 18, 2019	Conducted (TH01-CB)
Power Sensor	Agilent	U2021XA	MY53410001	50MHz~18GHz	Nov. 05, 2018	Nov. 04, 2019	Conducted (TH01-CB)

Note: Calibration Interval of instruments listed above is one year.



Mode	Max-N dB	Max-OBW	ITU-Code	Min-N dB	Min-OBW
	(Hz)	(Hz)		(Hz)	(Hz)
2.4-2.4835GHz	-	-	-	-	-
802.11b_Nss1,(1Mbps)_1TX	10.025M	13.768M	13M8G1D	10.025M	13.568M
802.11g_Nss1,(6Mbps)_1TX	16.575M	16.967M	17M0D1D	16.525M	16.517M
802.11n HT20_Nss1,(MCS0)_1TX	17.825M	17.991M	18M0D1D	17.8M	17.716M
802.11n HT40_Nss1,(MCS0)_1TX	36.5M	36.332M	36M3D1D	36.45M	36.232M

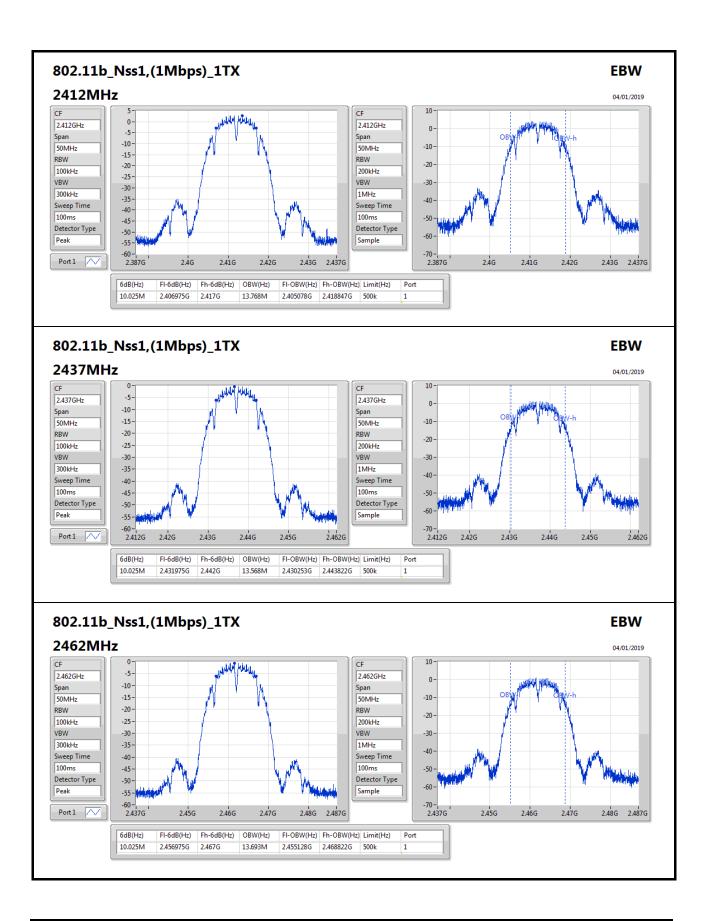
Max-N dB = Maximum 6dB down bandwidth; Max-OBW = Maximum 99% occupied bandwidth; Min-N dB = Minimum 6dB down bandwidth; Min-OBW = Minimum 99% occupied bandwidth;

Result

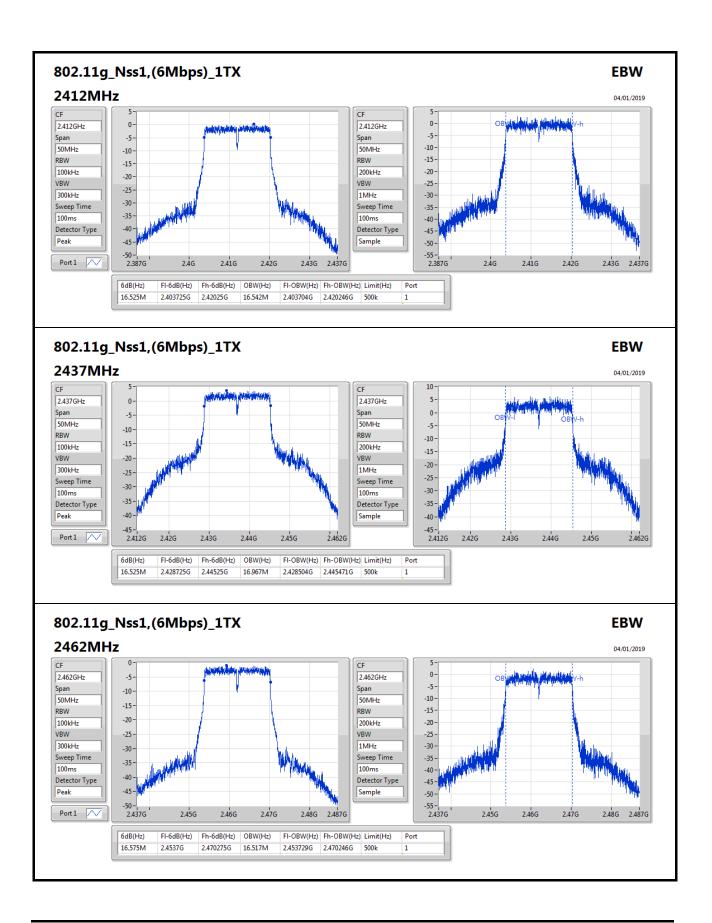
Mode	Result	Limit	Port 1-N dB	Port 1-OBW
		(Hz)	(Hz)	(Hz)
802.11b_Nss1,(1Mbps)_1TX	-	-	-	-
2412MHz	Pass	500k	10.025M	13.768M
2437MHz	Pass	500k	10.025M	13.568M
2462MHz	Pass	500k	10.025M	13.693M
802.11g_Nss1,(6Mbps)_1TX	-	-	-	-
2412MHz	Pass	500k	16.525M	16.542M
2437MHz	Pass	500k	16.525M	16.967M
2462MHz	Pass	500k	16.575M	16.517M
802.11n HT20_Nss1,(MCS0)_1TX	-	-	-	-
2412MHz	Pass	500k	17.825M	17.766M
2437MHz	Pass	500k	17.8M	17.991M
2462MHz	Pass	500k	17.8M	17.716M
802.11n HT40_Nss1,(MCS0)_1TX	-	-	-	-
2422MHz	Pass	500k	36.5M	36.232M
2437MHz	Pass	500k	36.45M	36.332M
2452MHz	Pass	500k	36.5M	36.332M

Port X-N dB = Port X 6dB down bandwidth; Port X-OBW = Port X 99% occupied bandwidth;

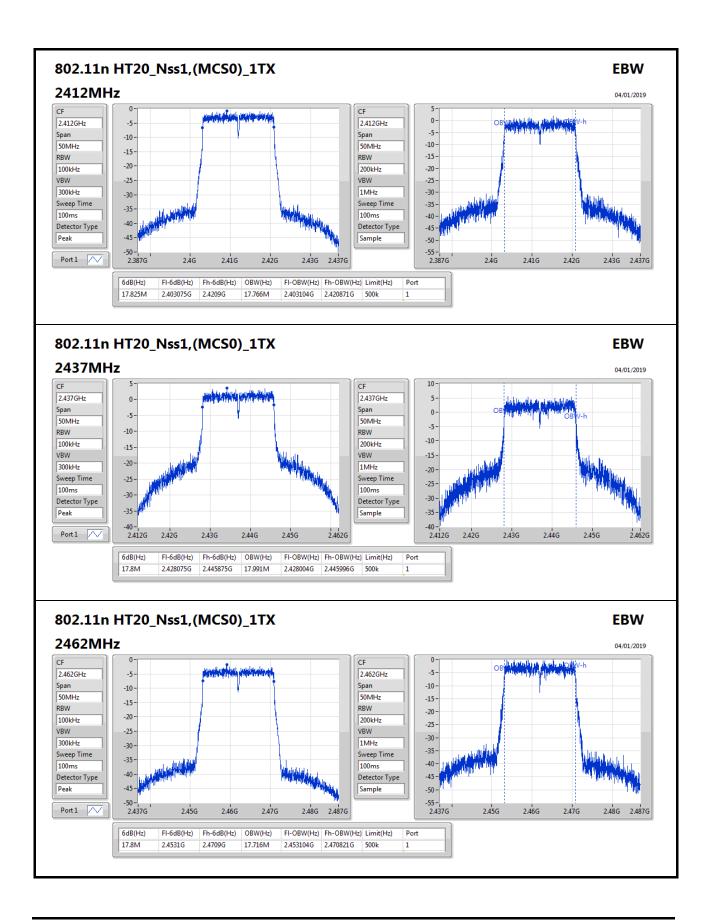




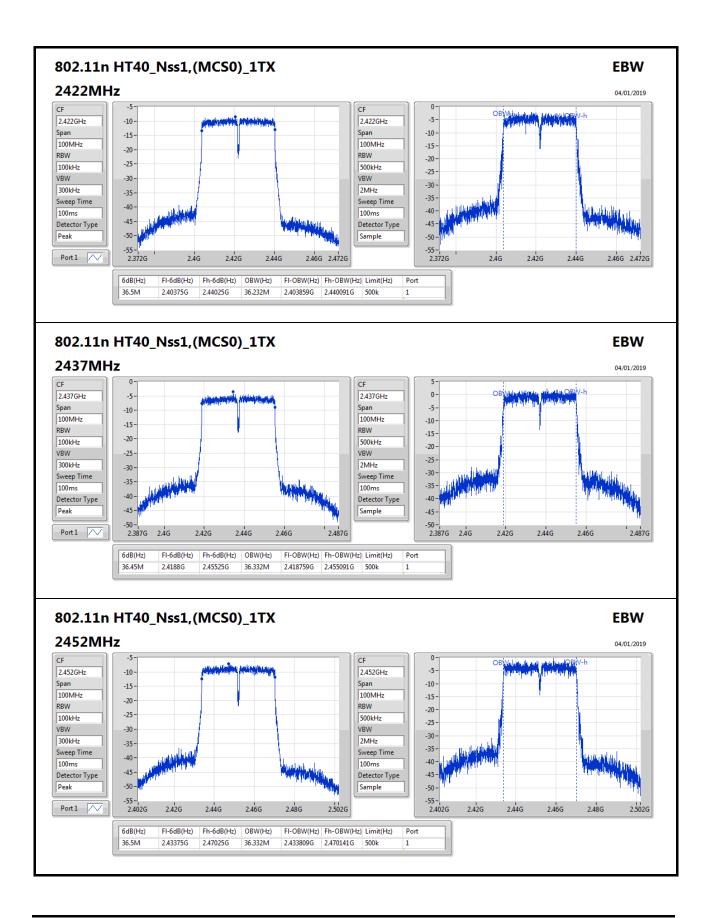














Mode	Total Power	Total Power
	(dBm)	(W)
2.4-2.4835GHz	-	-
802.11b_Nss1,(1Mbps)_1TX	13.50	0.02239
802.11g_Nss1,(6Mbps)_1TX	17.61	0.05768
802.11n HT20_Nss1,(MCS0)_1TX	17.61	0.05768
802.11n HT40_Nss1,(MCS0)_1TX	13.82	0.02410

Result

Mode	Result	DG	Port 1	Total Power	Power Limit
		(dBi)	(dBm)	(dBm)	(dBm)
802.11b_Nss1,(1Mbps)_1TX	-	-	-	-	-
2412MHz	Pass	0.95	13.50	13.50	30.00
2437MHz	Pass	0.95	11.10	11.10	30.00
2462MHz	Pass	0.95	10.65	10.65	30.00
802.11g_Nss1,(6Mbps)_1TX	-	-	-	-	-
2412MHz	Pass	0.95	14.71	14.71	30.00
2437MHz	Pass	0.95	17.61	17.61	30.00
2462MHz	Pass	0.95	13.68	13.68	30.00
802.11n HT20_Nss1,(MCS0)_1TX	-	-	-	-	-
2412MHz	Pass	0.95	13.75	13.75	30.00
2437MHz	Pass	0.95	17.61	17.61	30.00
2462MHz	Pass	0.95	13.09	13.09	30.00
802.11n HT40_Nss1,(MCS0)_1TX	-	-	-	-	-
2422MHz	Pass	0.95	9.15	9.15	30.00
2437MHz	Pass	0.95	13.82	13.82	30.00
2452MHz	Pass	0.95	10.91	10.91	30.00

DG = Directional Gain; Port X = Port X output power Note : Conducted average output power is for reference only



Mode	PD
	(dBm/RBW)
2.4-2.4835GHz	-
802.11b_Nss1,(1Mbps)_1TX	-15.50
802.11g_Nss1,(6Mbps)_1TX	-10.09
802.11n HT20_Nss1,(MCS0)_1TX	-10.04
802.11n HT40_Nss1,(MCS0)_1TX	-15.34

RBW=3kHz.

Result

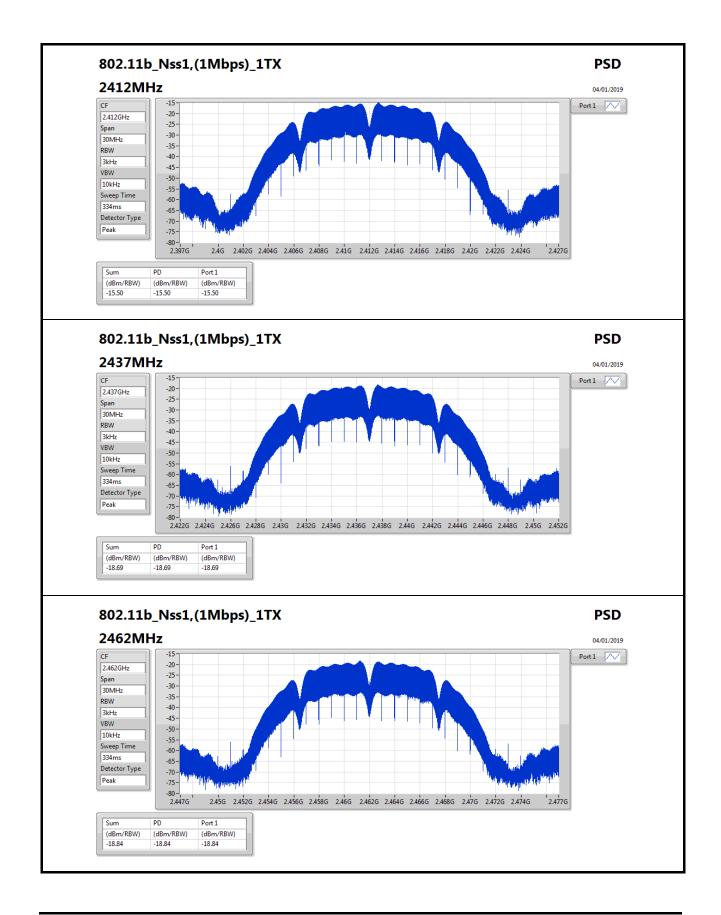
Mode	Result	DG	Port 1	PD	PD Limit
		(dBi)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
802.11b_Nss1,(1Mbps)_1TX	-	-	-	-	-
2412MHz	Pass	0.95	-15.50	-15.50	8.00
2437MHz	Pass	0.95	-18.69	-18.69	8.00
2462MHz	Pass	0.95	-18.84	-18.84	8.00
802.11g_Nss1,(6Mbps)_1TX	-	-	-	-	-
2412MHz	Pass	0.95	-13.95	-13.95	8.00
2437MHz	Pass	0.95	-10.09	-10.09	8.00
2462MHz	Pass	0.95	-15.38	-15.38	8.00
802.11n HT20_Nss1,(MCS0)_1TX	-	-	-	-	-
2412MHz	Pass	0.95	-14.63	-14.63	8.00
2437MHz	Pass	0.95	-10.04	-10.04	8.00
2462MHz	Pass	0.95	-14.19	-14.19	8.00
802.11n HT40_Nss1,(MCS0)_1TX	-	-	-	-	-
2422MHz	Pass	0.95	-19.97	-19.97	8.00
2437MHz	Pass	0.95	-15.34	-15.34	8.00
2452MHz	Pass	0.95	-19.67	-19.67	8.00

DG = Directional Gain; RBW=3kHz;

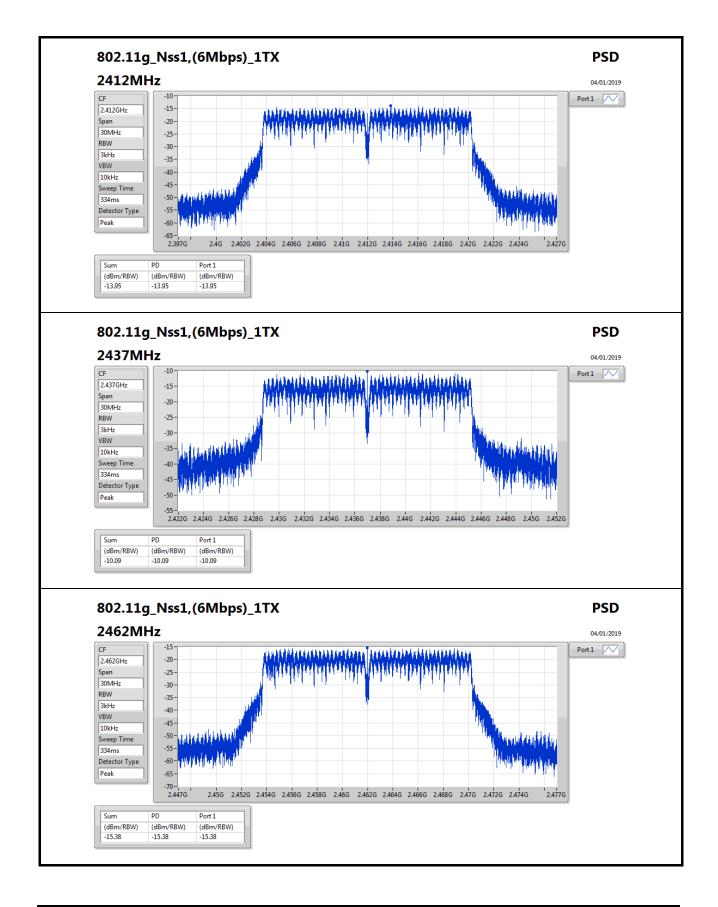
PD = trace bin-by-bin of each transmits port summing can be performed maximum power density; Port X = Port Xpower density;



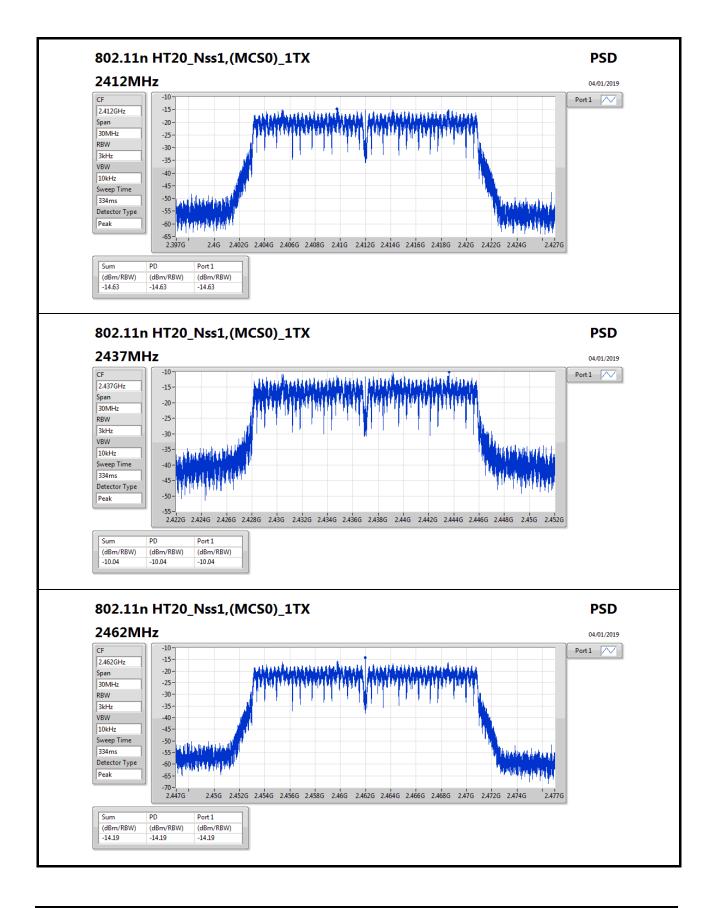




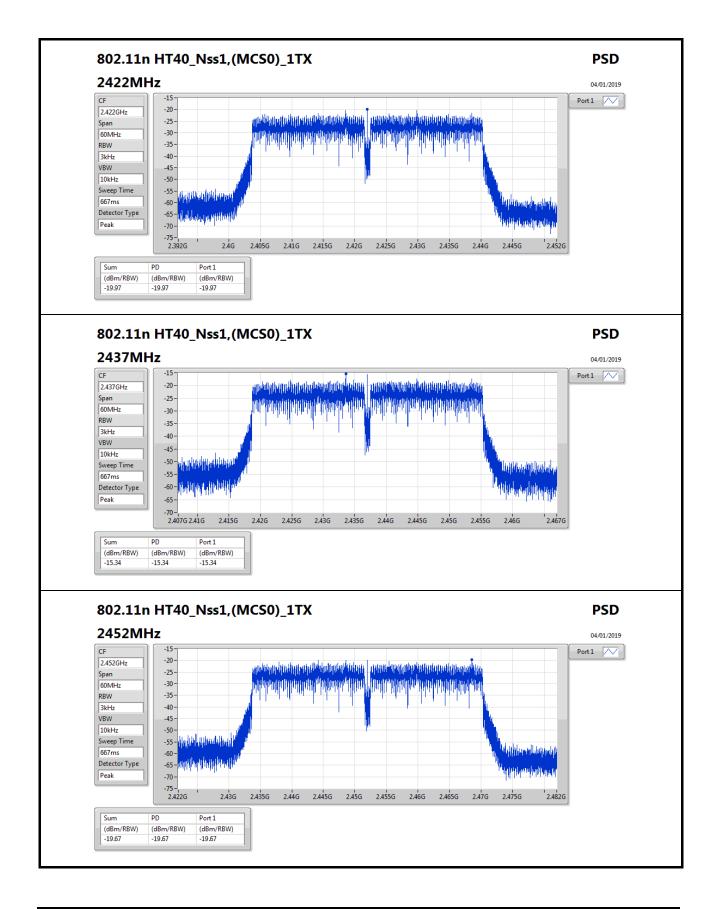












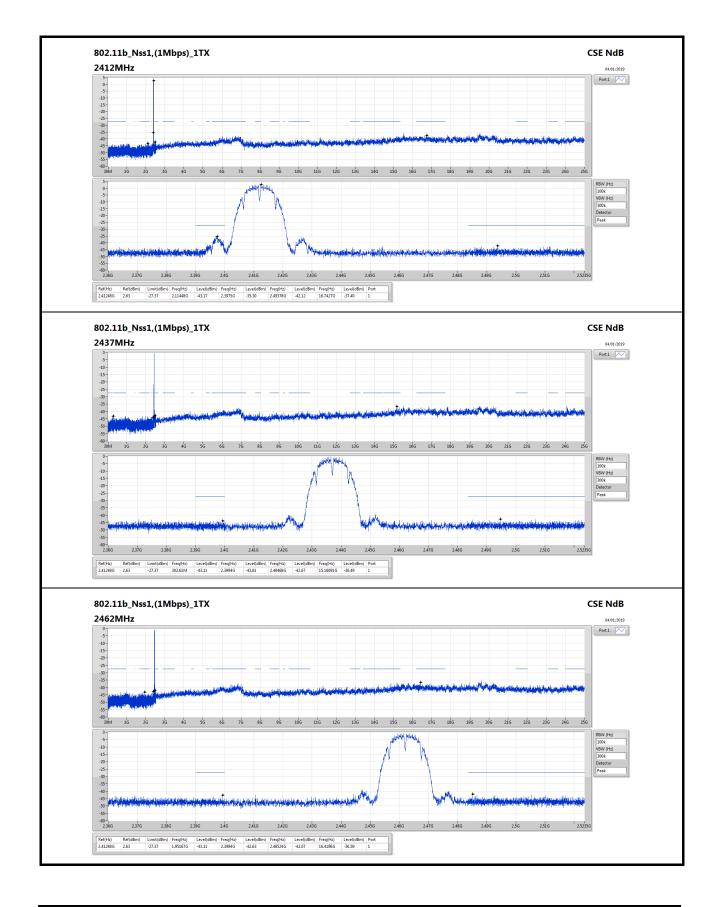


Carrinary													
Mode	Result	Ref	Ref	Limit	Freq	Level	Freq	Level	Freq	Level	Freq	Level	Port
		(Hz)	(dBm)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-	-
802.11b_Nss1,(1Mbps)_1TX	Pass	2.41248G	2.63	-27.37	2.11448G	-43.17	2.3975G	-35.30	2.49378G	-42.12	16.7427G	-37.40	1
802.11g_Nss1,(6Mbps)_1TX	Pass	2.43261G	2.96	-27.04	2.09322G	-42.28	2.39966G	-30.00	2.51214G	-43.05	6.14222G	-36.75	1
802.11n HT20_Nss1,(MCS0)_1TX	Pass	2.44451G	2.92	-27.08	719.39M	-43.14	2.39798G	-32.32	2.48458G	-42.24	16.22574G	-37.47	1
802.11n HT40_Nss1,(MCS0)_1TX	Pass	2.44659G	-4.60	-34.60	1.9891G	-43.16	2.3988G	-36.42	2.48386G	-40.34	17.53145G	-36.71	1

Result

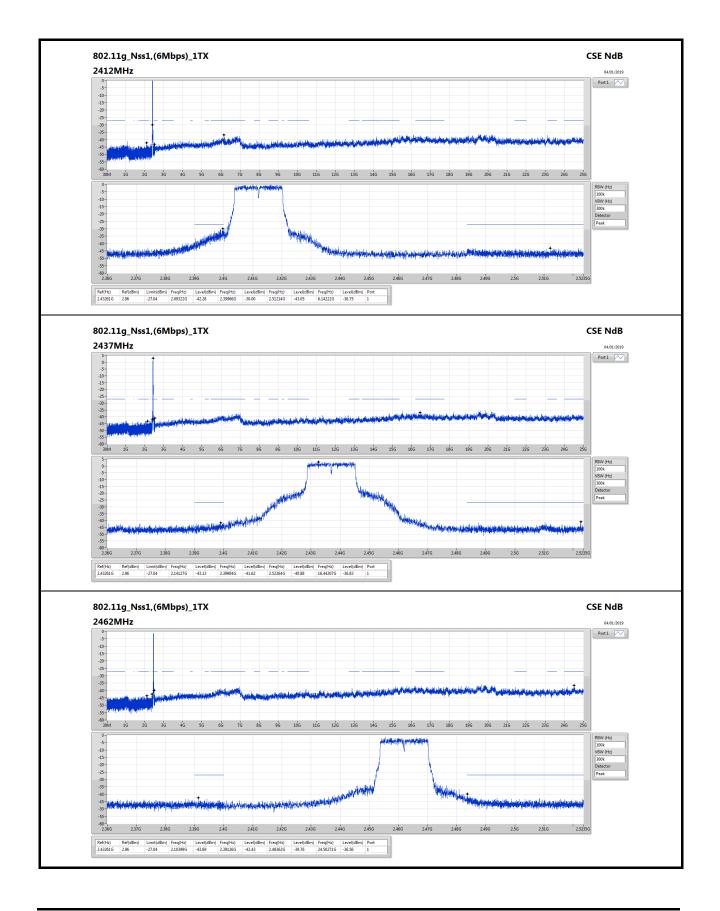
Mode	Result	Ref	Ref	Limit	Freq	Level	Freq	Level	Freq	Level	Freq	Level	Port
		(Hz)	(dBm)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	
802.11b_Nss1,(1Mbps)_1TX	-	-	-	-	-	-	-	-	-	-	-	-	-
2412MHz	Pass	2.41248G	2.63	-27.37	2.11448G	-43.17	2.3975G	-35.30	2.49378G	-42.12	16.7427G	-37.40	1
2437MHz	Pass	2.41248G	2.63	-27.37	302.61M	-43.11	2.3994G	-43.81	2.49468G	-42.67	15.16091G	-36.49	1
2462MHz	Pass	2.41248G	2.63	-27.37	1.95167G	-43.11	2.3994G	-42.63	2.48524G	-42.07	16.4196G	-36.59	1
802.11g_Nss1,(6Mbps)_1TX	-		-	-	-	-		-	-	-		-	-
2412MHz	Pass	2.43261G	2.96	-27.04	2.09322G	-42.28	2.39966G	-30.00	2.51214G	-43.05	6.14222G	-36.75	1
2437MHz	Pass	2.43261G	2.96	-27.04	2.14127G	-43.13	2.39904G	-41.62	2.52264G	-40.88	16.44207G	-36.83	1
2462MHz	Pass	2.43261G	2.96	-27.04	2.10399G	-43.69	2.39126G	-42.43	2.48362G	-39.76	24.50271G	-36.56	1
802.11n HT20_Nss1,(MCS0)_1TX	-		-	-	-	-		-	-	-		-	-
2412MHz	Pass	2.44451G	2.92	-27.08	719.39M	-43.14	2.39798G	-32.32	2.48458G	-42.24	16.22574G	-37.47	1
2437MHz	Pass	2.44451G	2.92	-27.08	1.79468G	-43.78	2.39982G	-38.77	2.48554G	-42.05	16.79889G	-35.97	1
2462MHz	Pass	2.44451G	2.92	-27.08	2.18146G	-43.38	2.39074G	-43.70	2.48512G	-40.20	16.82136G	-36.70	1
802.11n HT40_Nss1,(MCS0)_1TX		-	-	-	-	-	-	-		-	-	-	-
2422MHz	Pass	2.44659G	-4.60	-34.60	944.57M	-43.07	2.39984G	-38.81	2.48846G	-42.57	15.2289G	-36.93	1
2437MHz	Pass	2.44659G	-4.60	-34.60	1.9891G	-43.16	2.3988G	-36.42	2.48386G	-40.34	17.53145G	-36.71	1
2452MHz	Pass	2.44659G	-4.60	-34.60	957.16M	-42.58	2.39536G	-44.39	2.48414G	-40.70	16.75739G	-36.73	1



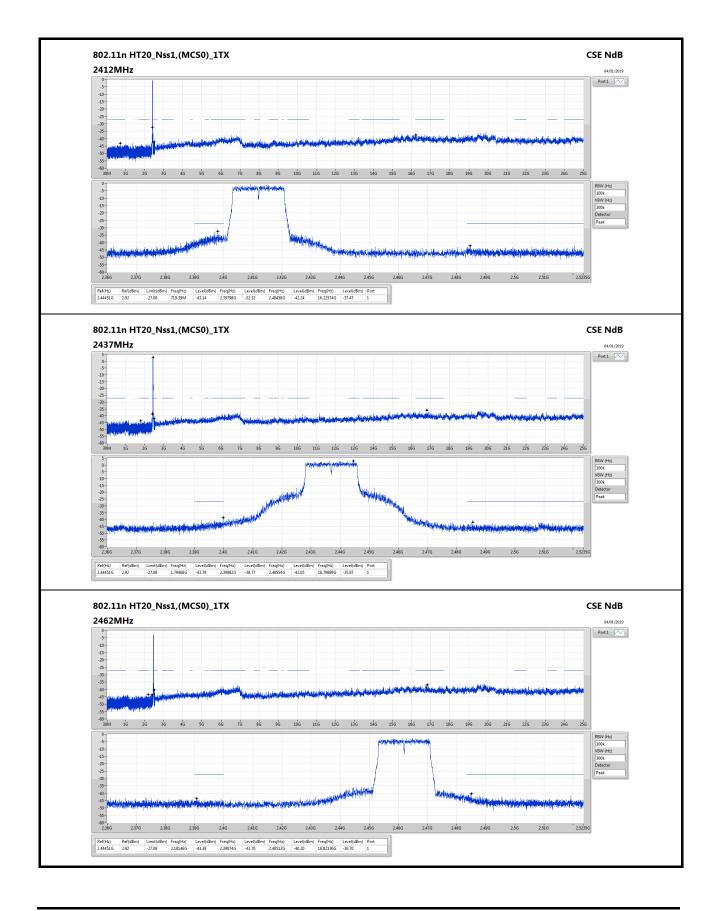




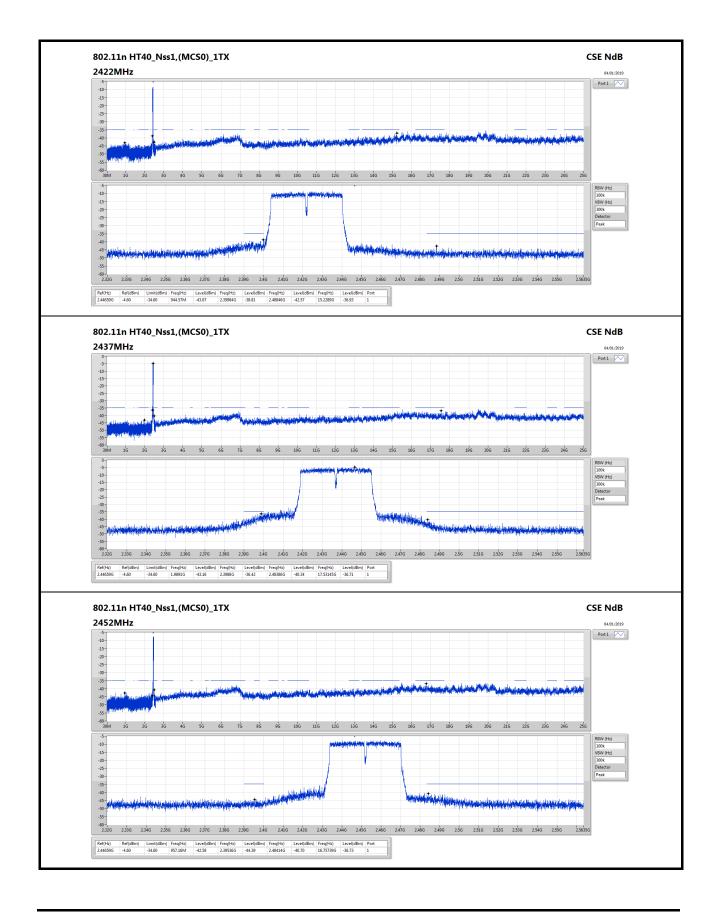














RSE TX above 1GHz Result

Appendix E

Summary

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	Mode	Result	Туре	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments	
				(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		
	2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-	
	802.11n HT20_Nss1,(MCS0)_1TX	Pass	AV	2.39G	53.57	54.00	-0.43	33.08	3	Horizontal	229	1.09	-	



