

Report No. : FR091745AA



FCC RADIO TEST REPORT

FCC ID	:	2AXPF03218
Equipment	:	devolo Magic 2 WiFi next
Brand Name		devolo AG
Model Name	:	MT:3218
Applicant/ Manufacturer	1	devolo AG devolo AG
		Charlottenburger Allee 67 52068 Aachen, Germany
Standard	1	47 CFR FCC Part 15.247

The product was received on Sep. 28, 2020, and testing was started from Oct. 06, 2020 and completed on Dec. 09, 2020. 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 test results in this 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 Chang

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



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History of this test report

Report No.	Version	Description	Issued Date
FR091745AA	01	Initial issue of report	Feb. 08, 2021
FR091745AA	02	 Change model name to "MT:3218" from "MT: 3218". Change photographs of EUT version to "v2" from "v1". 	Feb. 18, 2021



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	15.207	AC Power-line Conducted Emissions	PASS	-
3.2	15.247(a)	DTS Bandwidth	PASS	-
3.3	15.247(b)	Maximum Conducted Output Power	PASS	-
3.4	15.247(e)	Power Spectral Density	PASS	-
3.5	15.247(d)	Emissions in Non-restricted Frequency Bands	PASS	-
3.6	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: Sam Chen Report Broducer: Viola Huan

Report Producer: Viola Huang



1 General Description

1.1 Information

1.1.1 **RF General Information**

Frequency Range (MHz)	uency Range (MHz) IEEE Std. 802.11 Ch.		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	2
2.4-2.4835GHz	802.11g	20	2
2.4-2.4835GHz	802.11n HT20	20	2
2.4-2.4835GHz	802.11n HT40	40	2

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.



1.1.2 Antenna Information

Ant	Dort	Brand	Model	Antenna	Connector		WLAN 2.4G	Hz Gain (dBi)
Ant.	Port	Бгапо	Name	Туре	Connector	Low chann	el Middle	channel	Highest channe
1	1	devolo	N/A	Printed	N/A	1.5	2	2.6	3.7
2	2	devolo	N/A	Printed	N/A	1.9		2.4	3.3
						WLAN 5GHz Gain (dBi)			Bi)
Ant.	Port	Brand	Model Name	Antenna Type	Connector	Freq.: 5150-5250 MHz	Freq.: 5250-5350 MHz	Freq. 5500-50 MHz	5620-5825
3	1	devolo	N/A	Printed	N/A	1.2	-0.1	1.4	3.3
4	2	devolo	N/A	Printed	N/A	-0.4	0.0	2.0	3.9

Note: The above information was declared by manufacturer.

For WLAN 2.4GHz function:

For IEEE 802.11b/g/n mode (2TX/2RX):

Port 1 and Port 2 can be used as transmitting/receiving antenna.

Port 1 and Port 2 could transmit/receive simultaneously.

For WLAN 5GHz function:

For IEEE 802.11a/n/ac mode (2TX/2RX):

Port 1 and Port 2 can be used as transmitting/receiving antenna.

Port 1 and Port 2 could transmit/receive simultaneously.

1.1.3 Mode Test Duty Cycle

Mode	DC	DCF(dB)	T(s)	VBW(Hz) ≥ 1/T
802.11b	0.991	0.04	n/a (DC>=0.98)	n/a (DC>=0.98)
802.11g	0.959	0.18	2.033m	1k
802.11n HT20	0.983	0.07	n/a (DC>=0.98)	n/a (DC>=0.98)
802.11n HT40	0.967	0.15	2.413m	1k

Note:

• DC is Duty Cycle.

DCF is Duty Cycle Factor.

1.1.4 EUT Operational Condition

EUT Power Type	Internal power supply				
Beamforming Function		With beamforming	\boxtimes	Without beamforming	
Function	\boxtimes	Point-to-multipoint		Point-to-point	
Test Software Version	QSPR Version 5.0-00188				

Note: The above information was declared by manufacturer.



1.2 Applicable 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

The following reference test guidance is not within the scope of accreditation of TAF.

- FCC KDB 558074 D01 v05r02
- FCC KDB 662911 D01 v02r01
- FCC KDB 414788 D01 v01r01

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, Ln. 724, Bo'ai St., Zhubei 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	TH02-CB	Nyle Chang	22.5~23.9°C / 54~57%	Nov. 11, 2020
Radiated below 1GHz	03CH01-CB	JN Tu	24.2~25.7°C / 54~56%	Dec. 09, 2020
Radiated above 1GHz	03CH02-CB	JN Tu	23.8~25.1°C / 55~58%	Nov. 11, 2020
AC Conduction	CO01-CB	Max Lin	21~22°C / 58~59%	Oct. 06, 2020~Nov. 06, 2020

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
Conducted Emission (150kHz ~ 30MHz)	2.0 dB	Confidence levels of 95%
Radiated Emission (9kHz ~ 30MHz)	3.8 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	5.6 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	5.0 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	4.9 dB	Confidence levels of 95%
Conducted Emission	2.8 dB	Confidence levels of 95%
Output Power Measurement	1.4 dB	Confidence levels of 95%
Power Density Measurement	2.8 dB	Confidence levels of 95%
Bandwidth Measurement	0.4%	Confidence levels of 95%



2 Test Configuration of EUT

2.1 Test Channel Mode

Mode	Power Setting
802.11b_Nss1,(1Mbps)_2TX	-
2412MHz	14
2437MHz	14
2462MHz	14
802.11g_Nss1,(6Mbps)_2TX	-
2412MHz	14
2437MHz	14
2462MHz	14
802.11n HT20_Nss1,(MCS0)_2TX	-
2412MHz	14
2437MHz	14
2462MHz	14
802.11n HT40_Nss1,(MCS0)_2TX	-
2422MHz	14
2437MHz	14
2452MHz	13



2.2 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests		
Tests Item AC power-line conducted emissions		
Condition AC power-line conducted measurement for line and neutral		
Operating Mode CTX		
1 EUT + WLAN 2.4GHz		
2 EUT + WLAN 5GHz		
For operating mode 2 is the worst case and it was record in this test report		

For operating mode 2 is the worst case and it was record in this test report.

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	CTX	
The EUT was performed at X axis, Y axis and Z axis position for Emissions in Restricted Frequency Bar above 1GHz test, and the worst case was found at Z axis for WLAN 2.4GHz and found at X axis for WLA 5GHz. So the measurement will follow this same test configuration.		
1 EUT in Z axis + WLAN 2.4GHz		
2	EUT in X axis + WLAN 5GHz	
For operating mode 1 is the worst case and it was record in this test report.		
Operating Mode > 1GHz CTX		
The EUT was performed a measurement will follow th	t X axis, Y axis and Z axis position, and the worst case was found at Z axis. So the is same test configuration.	
1	EUT in Z axis	



The Worst Case Mode for Following Conformance Tests		
Tests Item Simultaneous Transmission Analysis - Co-location RF Exposure Evaluation		
Operating Mode		
1 WLAN 2.4GHz + WLAN 5GHz		
Refer to Sporton Test Report No.: FA091745-01 for Co-location RF Exposure Evaluation.		

2.3 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

2.4 Accessories

Accessories

RJ-45 cable*1, non-shielded, 2m

2.5 Support Equipment

For AC Conduction:

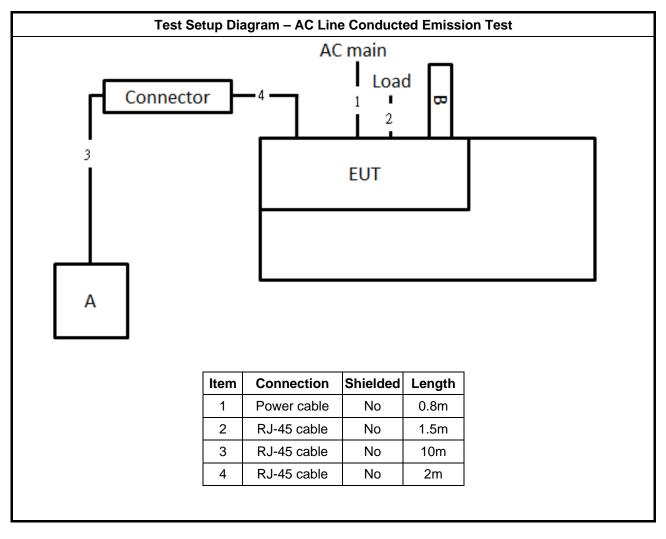
	Support Equipment			
No.	No. Equipment Brand Name Model Name FCC ID			
А	LAN NB	DELL	E6430	N/A
В	Lighting	Philips	N/A	N/A

For Radiated and RF Conducted:

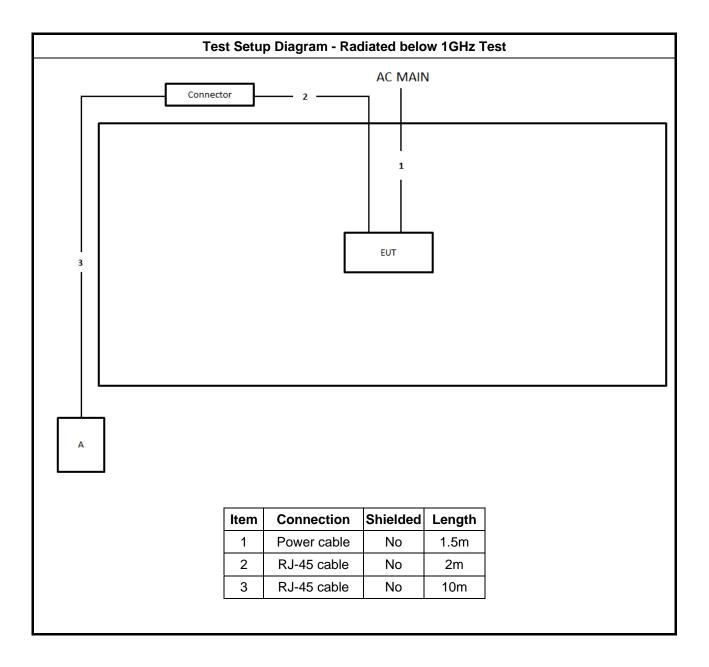
		Support Equ	ipment	
No. Equipment Brand Name Model Name FCC ID				
А	Notebook	DELL	E4300	N/A



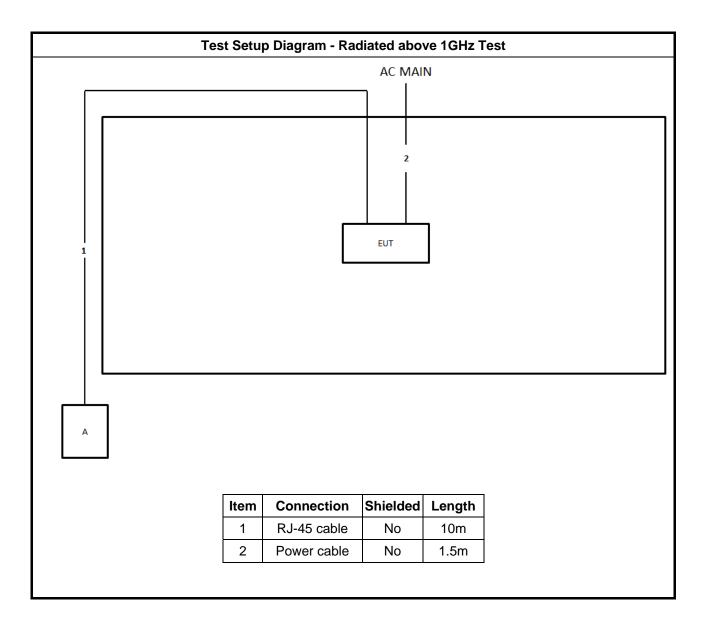
2.6 Test Setup Diagram













3 Transmitter Test Result

3.1 AC Power-line Conducted Emissions

3.1.1 AC Power-line Conducted Emissions Limit

AC Power-line Conducted Emissions Limit		Limit		
Frequency Emission (MHz) Quasi-Peak Average				
0.15-0.5 66 - 56 * 56 - 46 *				
0.5-5 56 46				
5-30 60 50				
Note 1: * Decreases with the logarithm of the frequency.				

5

3.1.2 Measuring Instruments

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

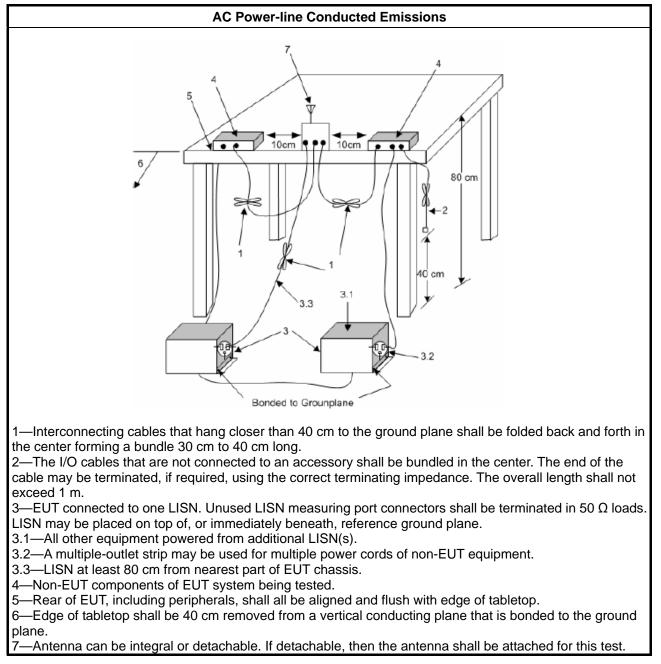
3.1.3 Test Procedures

Test Method

Refer as ANSI C63.10-2013, clause 6.2 for AC power-line conducted emissions.



3.1.4 Test Setup



3.1.5 Measurement Results Calculation

The measured Level is calculated using:

- a. Corrected Reading: LISN Factor (LISN) + Attenuator (AT/AUX) + Cable Loss (CL) + Read Level (Raw) = Level
- b. Margin = -Limit + Level

3.1.6 Test Result of AC Power-line Conducted Emissions

Refer as Appendix A



3.2 DTS Bandwidth

3.2.1 6dB Bandwidth Limit

6dB Bandwidth Limit
Systems using digital modulation techniques:
 6 dB bandwidth ≥ 500 kHz.

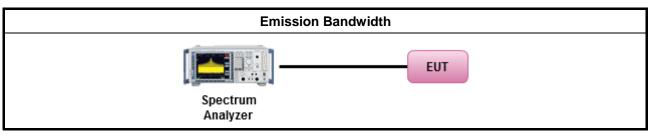
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

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

3.2.4 Test Setup



3.2.5 Test Result of Emission Bandwidth

Refer as Appendix B



3.3 Maximum Conducted Output Power

3.3.1 Maximum Conducted Output Power Limit

Maximum Conducted Output Power Limit	
--------------------------------------	--

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

•	Point-to-multipoint systems	(P2M): If $G_{TX} >$	6 dBi, then P _{Out} =	$30 - (G_{TX} - 6) dBm$

- 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 $G_{TX} > 6 \text{ dBi}$, then $P_{Out} = 30 (G_{TX} 6)/3 + 8 \text{dBm}$

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

3.3.2 Measuring Instruments

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

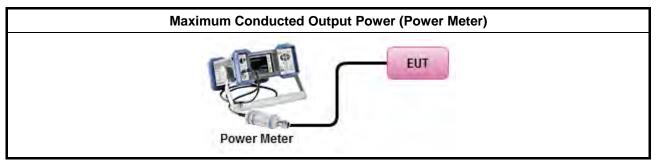


3.3.3 Test Procedures

		Test Method
•	Мах	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).
•	Мах	imum Conducted Output Power
	[dut	y 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)
		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



3.3.4 Test Setup



3.3.5 Test Result of Maximum Conducted Output Power

Refer as Appendix C



3.4 Power Spectral Density

3.4.1 Power Spectral Density Limit

Power Spectral Density Limit

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

3.4.2 Measuring Instruments

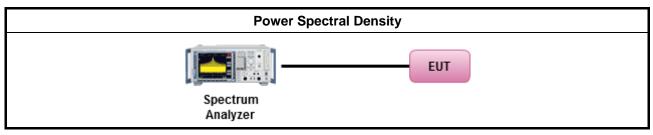
Refer a test equipment and calibration data table in this test report.

3.4.3 Test Procedures

	Test Method									
•	Peak power spectral density procedures that the same method as used to determine the conducted output power. If maximum peak conducted output power was measured to demonstrate compliance to the output power limit, then the peak PSD procedure below (Method PKPSD) shall be used. If maximum conducted output power was measured to demonstrate compliance to the output power limit, then one of the average PSD procedures shall be used, as applicable based on the following criteria (the peak PSD procedure is also an acceptable option).									
	\square	Ref	er as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10 Method Max. PSD.							
	For	cond	ucted measurement.							
	•	lf Tł	ne EUT supports multiple transmit chains using options given below:							
		\boxtimes	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,							
			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.							



3.4.4 Test Setup



3.4.5 Test Result of Power Spectral Density

Refer as Appendix D



3.5 Emissions in Non-restricted Frequency Bands

3.5.1 Emissions in Non-restricted Frequency Bands Limit

Un-restricted Band Emissions Limit					
RF output power procedure	Limit (dBc)				
Peak output power procedure	20				
Average output power procedure	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.

3.5.2 Measuring Instruments

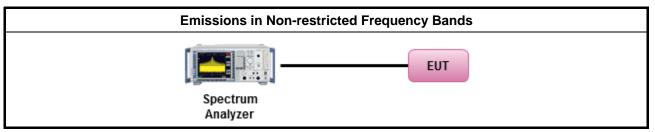
Refer a test equipment and calibration data table in this test report.

3.5.3 Test Procedures

Test Method

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

3.5.4 Test Setup



3.5.5 Test Result of Emissions in Non-restricted Frequency Bands

Refer as Appendix E



3.6 Emissions in Restricted Frequency Bands

3.6.1 Emissions in Restricted Frequency Bands Limit

	Restricted Band Emissions Limit									
Frequency Range (MHz)	Field Strength (uV/m)	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.

3.6.2 Measuring Instruments

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

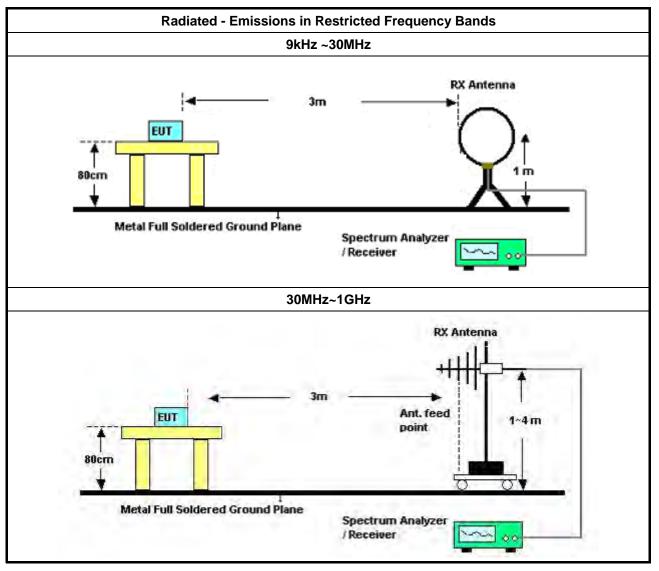


3.6.3 Test Procedures

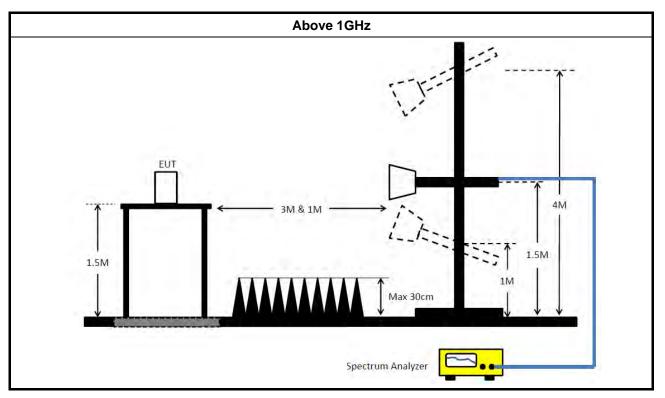
	Test Method
•	The average emission levels shall be measured in [duty cycle \geq 98 or duty factor].
•	Refer as ANSI C63.10, clause 6.10.3 band-edge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band.
•	For the transmitter unwanted 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.



3.6.4 Test Setup







3.6.5 Measurement Results Calculation

The measured Level is calculated using:

Corrected Reading: Antenna factor (AF) + Cable loss (CL) + Read level (Raw) - Preamp factor (PA)(if applicable) = Level.

3.6.6 Emissions in Restricted Frequency Bands (Below 30MHz)

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to KDB414788 Radiated Test Site, and the result came out very similar.

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 10th harmonic or 40 GHz, whichever is appropriate.

3.6.7 Test Result of Emissions in Restricted Frequency Bands

Refer as Appendix F



Test Equipment and Calibration Data 4

Instrument	Brand	Model No.	Serial No.	Characteristics	cteristics Calibration Date		Remark
EMI Receiver	Agilent	N9038A	My52260123	9kHz ~ 8.4GHz	Feb. 26, 2020	Feb. 25, 2021	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50 -16-2	04083	150kHz ~ 100MHz	MHz Dec. 25, 2019 Dec. 24, 2020		Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Feb. 25, 2020	Feb. 24, 2021	Conduction (CO01-CB)
Pulse Limiter	Rohde&Schwarz	ESH3-Z2	100430	9kHz ~ 30MHz	Jan. 31, 2020	Jan. 30, 2021	Conduction (CO01-CB)
COND Cable	Woken	Cable	Low cable-CO01	9kHz ~ 30MHz	May 20, 2020	May 19, 2021	Conduction (CO01-CB)
Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Conduction (CO01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Apr. 13, 2020	Apr. 12, 2021	Radiation (03CH01-CB)
3m Semi Anechoic Chamber NSA	TDK	SAC-3M	03CH01-CB	30 MHz ~ 1 GHz	30 MHz ~ 1 GHz Jan. 28, 2020		Radiation (03CH01-CB)
BILOG ANTENNA with 6dB Attenuator	TESEQ & EMCI	CBL6112D N-6-06	37880 & AT-N0609	20MHz ~ 2GHz	Feb. 28, 2020	Feb. 27, 2021	Radiation (03CH01-CB)
Pre-Amplifier	EMCI	EMC330N	980332	20MHz ~ 3GHz	Jul. 03, 2020	Jun. 02, 2021	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	Apr. 16, 2020 Apr. 15, 202		Radiation (03CH01-CB)
EMI Test Receiver	R&S	ESCS	826547/017	9kHz ~ 2.75GHz	May 13, 2020	May 12, 2021	Radiation (03CH01-CB)
RF Cable-low	Woken	RG402	Low Cable-16+17	30 MHz ~ 1 GHz	Oct. 05, 2020	Oct. 04, 2021	Radiation (03CH01-CB)
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Radiation (03CH01-CB)
3m Semi Anechoic Chamber VSWR	RIKEN	SAC-3M	03CH02-CB	1GHz ~18GHz 3m	Mar. 28, 2020	Mar. 27, 2021	Radiation (03CH02-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Apr. 13, 2020	Apr. 12, 2021	Radiation (03CH02-CB)
Horn Antenna	EMCO	3115	9610-4976	1GHz ~ 18GHz Apr. 21, 2020		Apr. 20, 2021	Radiation (03CH02-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	15GHz ~ 40GHz Jul. 21, 2020 Jul. 20, 2		Radiation (03CH02-CB)
Pre-Amplifier	Agilent	83017A	MY39501305	1GHz ~ 26.5GHz	Jul. 13, 2020	Jul. 12, 2021	Radiation (03CH02-CB)
Pre-Amplifier	MITEQ	TTA1840-35- HG	1864479	18GHz ~ 40GHz	Jul. 08, 2020	Jul. 07, 2021	Radiation (03CH02-CB)

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Instrument	Brand	Model No.	Serial No.	Characteristics Calibration Date		Calibration Due Date	Remark
Spectrum analyzer	R&S	FSU	100015	9kHz~26GHz Oct. 15, 2020		Oct. 14, 2021	Radiation (03CH02-CB)
RF Cable-high	Woken	RG402	High Cable-18	1GHz ~ 18GHz Oct. 05, 2020		Oct. 04, 2021	Radiation (03CH02-CB)
RF Cable-high	Woken	RG402	High Cable-18+19	1GHz ~ 18GHz	Oct. 05, 2020	Oct. 04, 2021	Radiation (03CH02-CB)
RF Cable-high	Woken	RG402	High Cable-40G#1	18GHz ~ 40 GHz	Jul. 16, 2020	Jul. 15, 2021	Radiation (03CH02-CB)
RF Cable-high	Woken	RG402	High Cable-40G#2	18GHz ~ 40 GHz	Jul. 16, 2020	Jul. 15, 2021	Radiation (03CH02-CB)
Test Software	SPORTON	SENSE	V5.10	- N.C.R.		N.C.R.	Radiation (03CH02-CB)
Spectrum analyzer	R&S	FSV40	100979	9kHz~40GHz	May 05, 2020	May 04, 2021	Conducted (TH02-CB)
RF Cable-high	Woken	RG402	High Cable-06	1 GHz– 26.5 GHz Oct. 05, 2020		Oct. 04, 2021	Conducted (TH02-CB)
RF Cable-high	Woken	RG402	High Cable-07	1 GHz –26.5 GHz	Oct. 05, 2020	Oct. 04, 2021	Conducted (TH02-CB)
RF Cable-high	Woken	RG402	High Cable-08	1 GHz –26.5 GHz	Oct. 05, 2020	Oct. 04, 2021	Conducted (TH02-CB)
RF Cable-high	Woken	RG402	High Cable-09	1 GHz –26.5 GHz	Oct. 05, 2020	Oct. 04, 2021	Conducted (TH02-CB)
RF Cable-high	Woken	RG402	High Cable-10	1 GHz –26.5 GHz	Oct. 05, 2020	Oct. 04, 2021	Conducted (TH02-CB)
RF Cable-high	Woken	RG402	High Cable-30	1 GHz –26.5 GHz	Oct. 05, 2020	Oct. 04, 2021	Conducted (TH02-CB)
Power Sensor	Agilent	E9327A	US40442088	50MHz~18GHz	Feb. 07, 2020	Feb. 06, 2021	Conducted (TH02-CB)
Power Meter	Agilent	E4416A	GB41291199	50MHz~18GHz	Feb. 07, 2020	Feb. 06, 2021	Conducted (TH02-CB)
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Conducted (TH02-CB)

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

N.C.R. means Non-Calibration required.



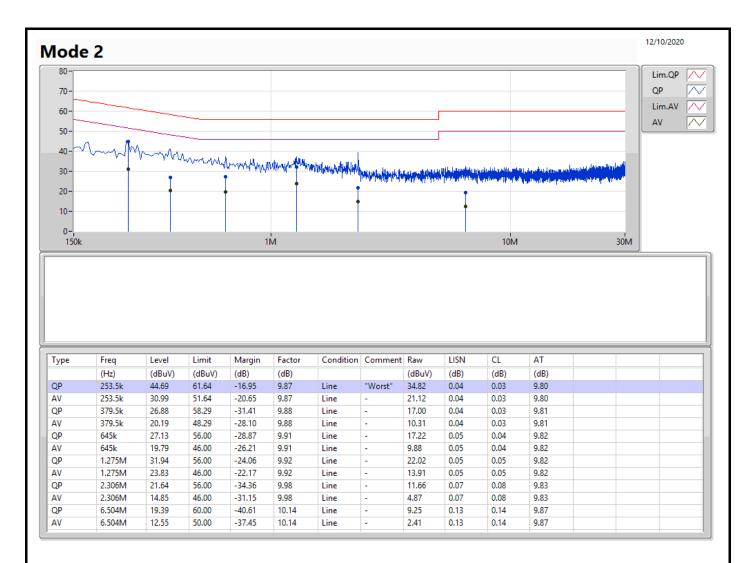
Conducted Emissions at Powerline

Appendix A

Summary	Summary										
Mode	Result	Туре	Freq	Level	Limit	Margin	Condition				
			(Hz)	(dBuV)	(dBuV)	(dB)					
Mode 2	Pass	QP	253.5k	44.69	61.64	-16.95	Line				

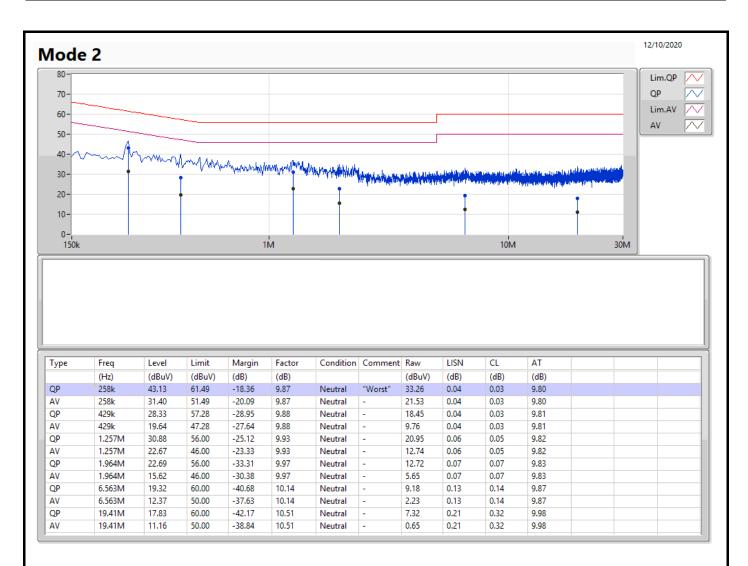


Appendix A











Summary

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)_2TX	8.525M	12.894M	12M9G1D	7.55M	12.594M	
802.11g_Nss1,(6Mbps)_2TX	16.325M	16.642M	16M6D1D	16.275M	16.592M	
802.11n HT20_Nss1,(MCS0)_2TX	17.625M	17.841M	17M8D1D	16.9M	17.741M	
802.11n HT40_Nss1,(MCS0)_2TX	36.35M	36.832M	36M8D1D	35.95M	36.582M	

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	Port 2-N dB	Port 2-OBW
		(Hz)	(Hz)	(Hz)	(Hz)	(Hz)
802.11b_Nss1,(1Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	500k	8.025M	12.844M	8.025M	12.744M
2437MHz	Pass	500k	8.025M	12.894M	8.025M	12.894M
2462MHz	Pass	500k	7.55M	12.594M	8.525M	12.744M
802.11g_Nss1,(6Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	500k	16.325M	16.642M	16.325M	16.592M
2437MHz	Pass	500k	16.3M	16.642M	16.325M	16.592M
2462MHz	Pass	500k	16.275M	16.642M	16.325M	16.592M
802.11n HT20_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2412MHz	Pass	500k	17.55M	17.816M	17.575M	17.841M
2437MHz	Pass	500k	17.55M	17.816M	17.575M	17.791M
2462MHz	Pass	500k	16.9M	17.741M	17.625M	17.791M
802.11n HT40_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2422MHz	Pass	500k	36.3M	36.732M	35.95M	36.632M
2437MHz	Pass	500k	36.35M	36.832M	36.3M	36.632M
2452MHz	Pass	500k	36.35M	36.682M	36.3M	36.582M

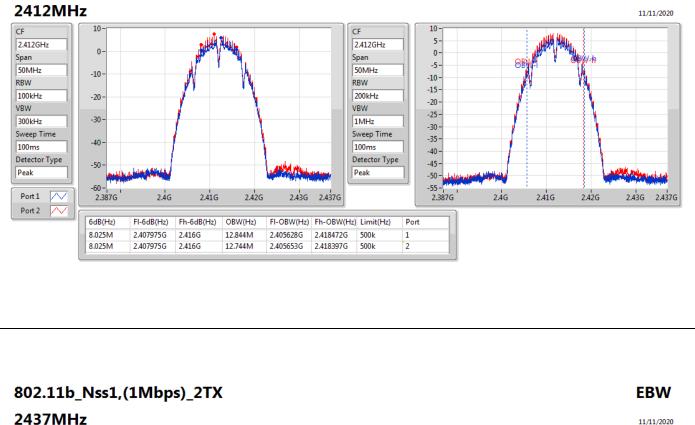
Port X-N dB = Port X 6dB down bandwidth; Port X-OBW = Port X 99% occupied bandwidth;

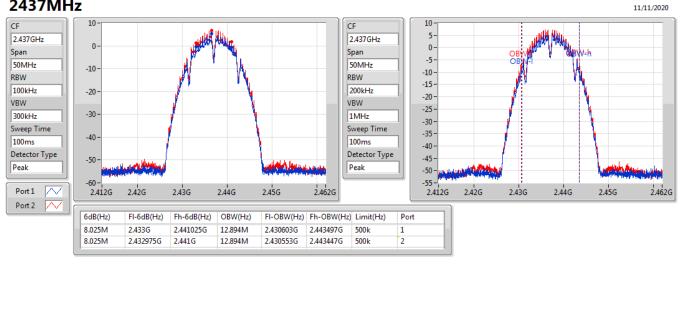
EBW



EBW

802.11b_Nss1,(1Mbps)_2TX

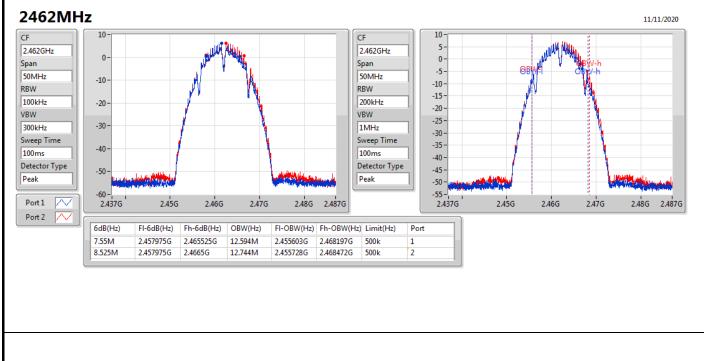




EBW

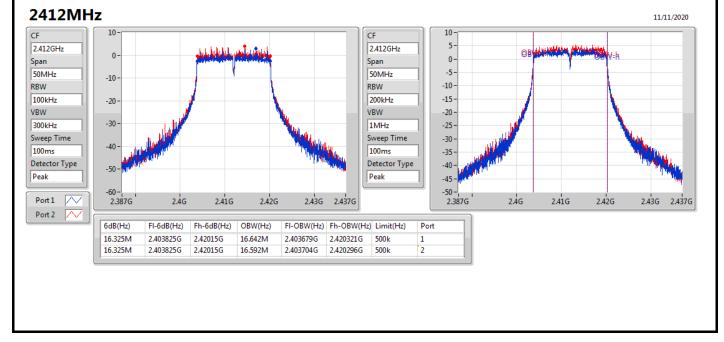


802.11b_Nss1,(1Mbps)_2TX



802.11g_Nss1,(6Mbps)_2TX

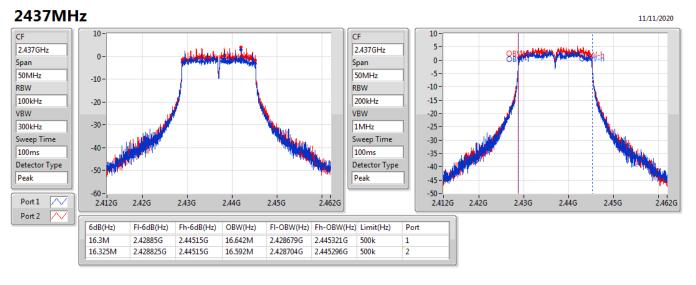
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EBW

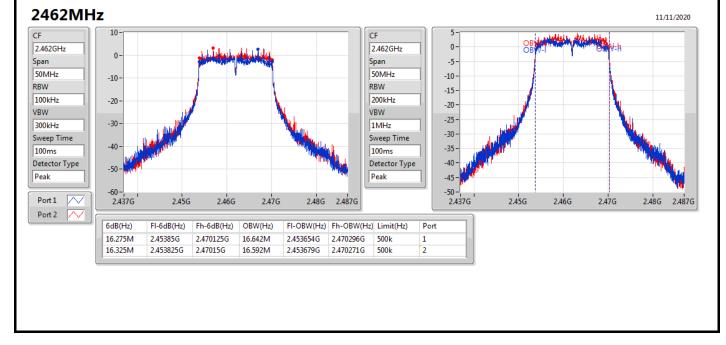


802.11g_Nss1,(6Mbps)_2TX



802.11g_Nss1,(6Mbps)_2TX

EBW

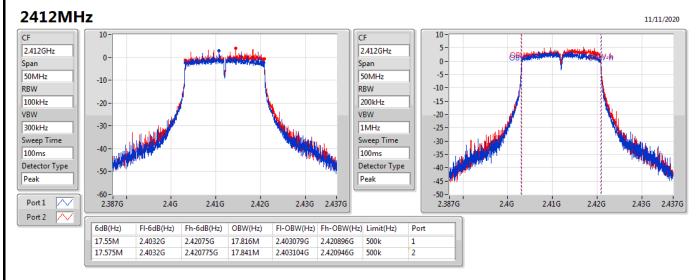


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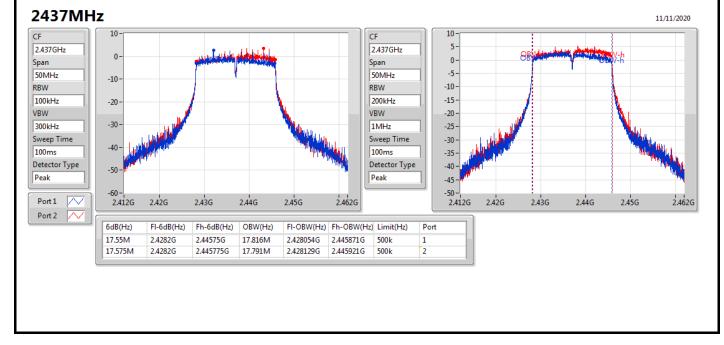
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802.11n HT20_Nss1,(MCS0)_2TX



802.11n HT20_Nss1,(MCS0)_2TX

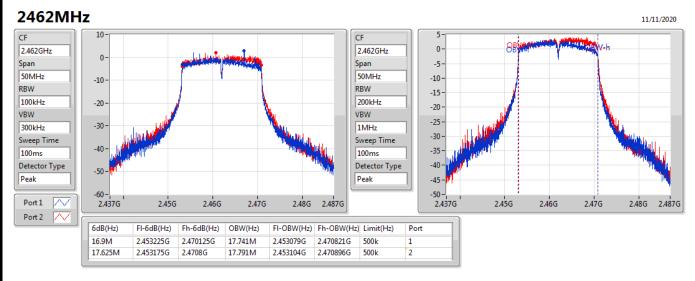
EBW



EBW

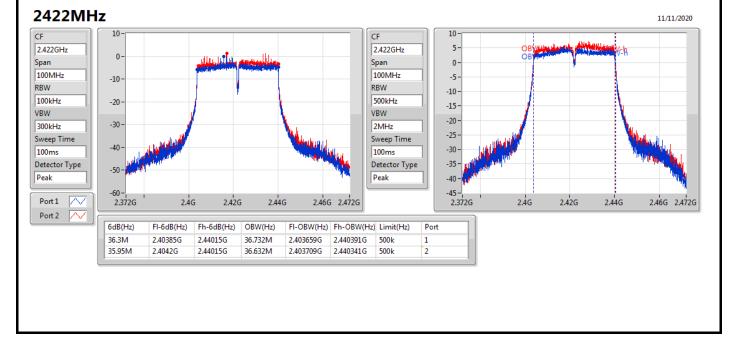


802.11n HT20_Nss1,(MCS0)_2TX



802.11n HT40_Nss1,(MCS0)_2TX

EBW

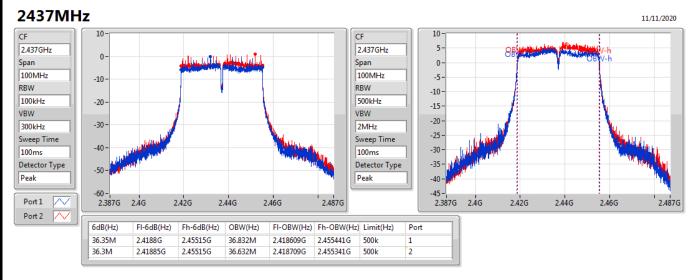


EBW

EBW



802.11n HT40_Nss1,(MCS0)_2TX



802.11n HT40_Nss1,(MCS0)_2TX

2452MHz 11/11/2020 10 10 CF CF 2.452GHz 5-2.452GHz ØB 0 0-1 Span uul. Span 100MHz 100MHz -5--10 --10 -RBW RBW 100kHz 500kHz -15--20 VBW VBW -20 --30 300kHz 2MHz -25 -Sweep Time Sweep Time -30 -40 100ms 100ms -35 Detector Type Detector Type -40 -50 Peak Peak -45 -50 -2.402G -60 Port 1 2.402G 2.42G 2.44G 2.46G 2.48G 2.42G 2.44G 2.46G 2.48G 2.502G 2.502G Port 2 6dB(Hz) FI-6dB(Hz) Fh-6dB(Hz) OBW(Hz) FI-OBW(Hz) Fh-OBW(Hz) Limit(Hz) Port 36.35M 2.4338G 2.47015G 36.682M 2.433659G 2.470341G 500k 1 36.3M 2.43385G 2.47015G 36.582M 2.433659G 2.470241G 500k 2

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory.



Summary

Mode	Total Power	Total Power		
	(dBm)	(W)		
2.4-2.4835GHz	-	-		
802.11b_Nss1,(1Mbps)_2TX	18.70	0.07413		
802.11g_Nss1,(6Mbps)_2TX	18.86	0.07691		
802.11n HT20_Nss1,(MCS0)_2TX	18.90	0.07762		
802.11n HT40_Nss1,(MCS0)_2TX	18.55	0.07161		



Average Power

Result

Mode	Result	DG (dBi)	Port 1 (dBm)	Port 2 (dBm)	Total Power (dBm)	Power Limit (dBm)
802.11b_Nss1,(1Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	1.90	14.82	16.41	18.70	30.00
2437MHz	Pass	2.60	14.29	15.93	18.20	30.00
2462MHz	Pass	3.70	14.76	15.52	18.17	30.00
802.11g_Nss1,(6Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	1.90	15.18	16.43	18.86	30.00
2437MHz	Pass	2.60	14.69	15.97	18.39	30.00
2462MHz	Pass	3.70	14.27	15.41	17.89	30.00
802.11n HT20_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2412MHz	Pass	1.90	15.33	16.39	18.90	30.00
2437MHz	Pass	2.60	14.96	16.12	18.59	30.00
2462MHz	Pass	3.70	14.46	15.56	18.06	30.00
802.11n HT40_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2422MHz	Pass	1.90	15.01	16.01	18.55	30.00
2437MHz	Pass	2.60	14.65	15.94	18.35	30.00
2452MHz	Pass	3.70	13.77	14.52	17.17	30.00

DG = Directional Gain; **Port X** = Port X output power



Summary

Mode	PD
	(dBm/RBW)
2.4-2.4835GHz	
802.11b_Nss1,(1Mbps)_2TX	-5.37
802.11g_Nss1,(6Mbps)_2TX	-7.23
802.11n HT20_Nss1,(MCS0)_2TX	-8.81
802.11n HT40_Nss1,(MCS0)_2TX	-10.26

RBW = 500 kHz for 5.725-5.85GHz band / 1MHz for other band;

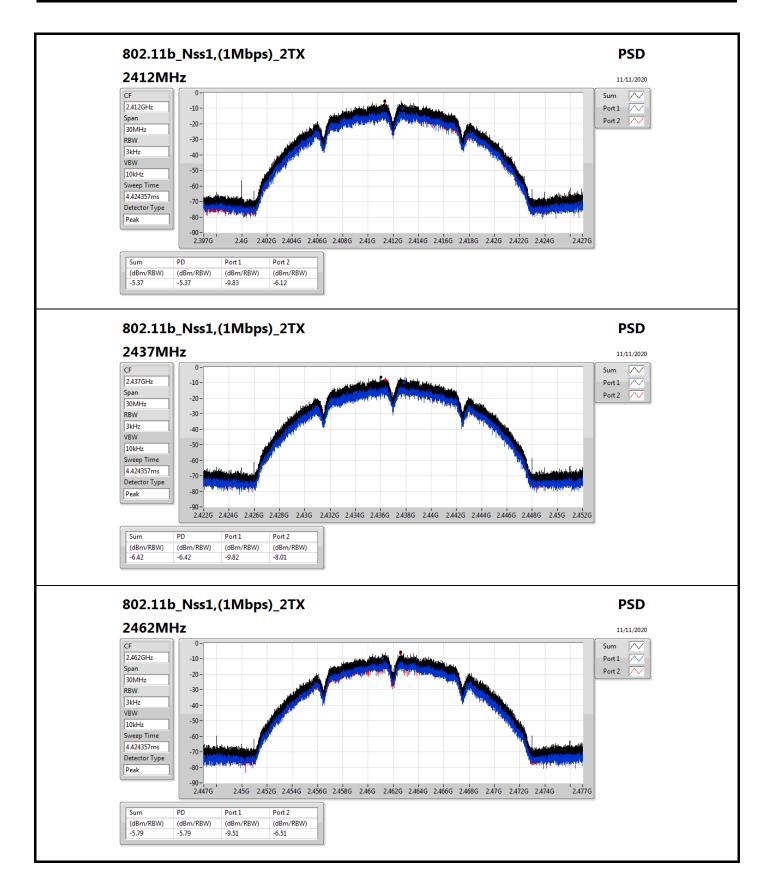


Result

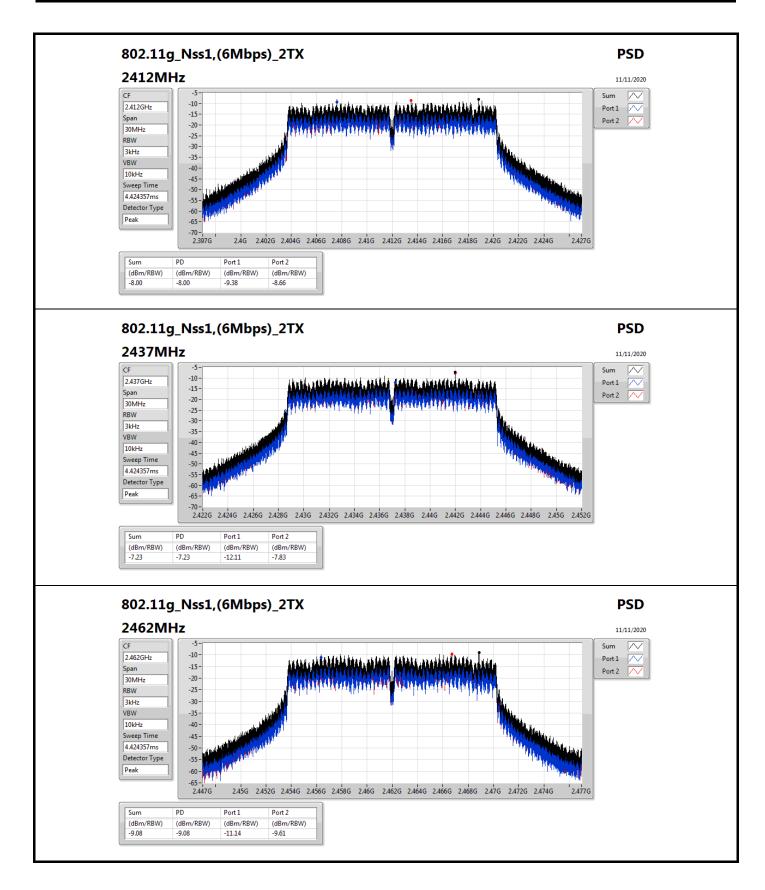
Mode	Result	DG	Port 1	Port 2	PD	PD Limit
		(dBi)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
802.11b_Nss1,(1Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	4.71	-9.83	-6.12	-5.37	8.00
2437MHz	Pass	5.51	-9.82	-8.01	-6.42	8.00
2462MHz	Pass	6.51	-9.51	-6.51	-5.79	7.49
802.11g_Nss1,(6Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	4.71	-9.38	-8.66	-8.00	8.00
2437MHz	Pass	5.51	-12.11	-7.83	-7.23	8.00
2462MHz	Pass	6.51	-11.14	-9.61	-9.08	7.49
802.11n HT20_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2412MHz	Pass	4.71	-11.33	-9.63	-8.81	8.00
2437MHz	Pass	5.51	-11.37	-9.76	-9.01	8.00
2462MHz	Pass	6.51	-11.45	-11.02	-8.91	7.49
802.11n HT40_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2422MHz	Pass	4.71	-12.75	-12.40	-10.26	8.00
2437MHz	Pass	5.51	-14.12	-13.81	-12.16	8.00
2452MHz	Pass	6.51	-15.29	-14.22	-12.88	7.49

DG = Directional Gain; **RBW** = 500 kHz for 5.725-5.85GHz band / 1MHz for other band; **PD** = trace bin-by-bin of each transmits port summing can be performed maximum power density; **Port X** = Port X power density;

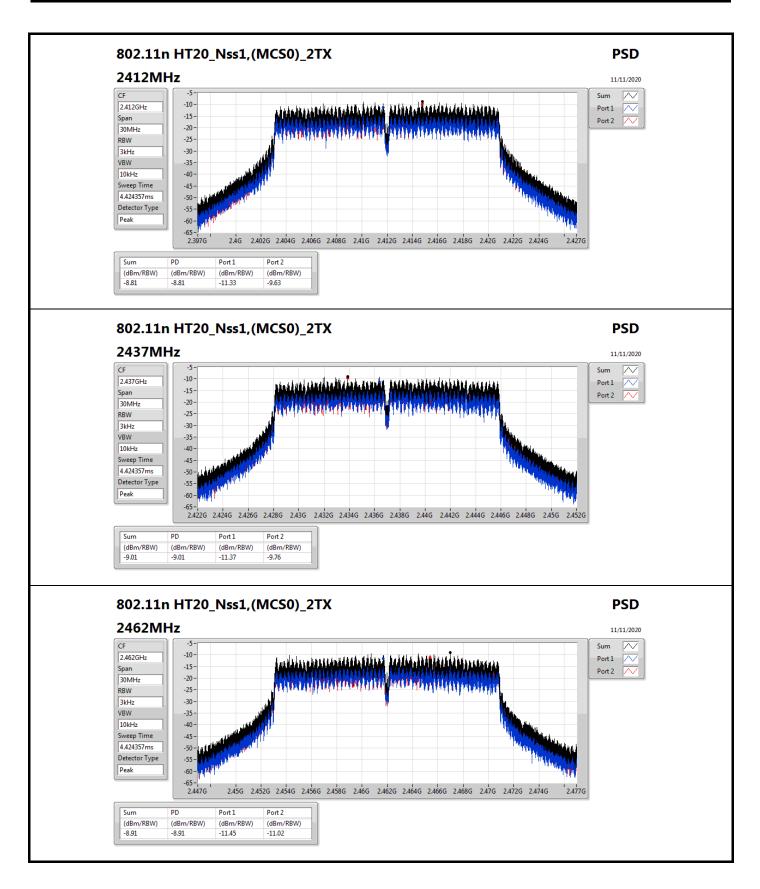




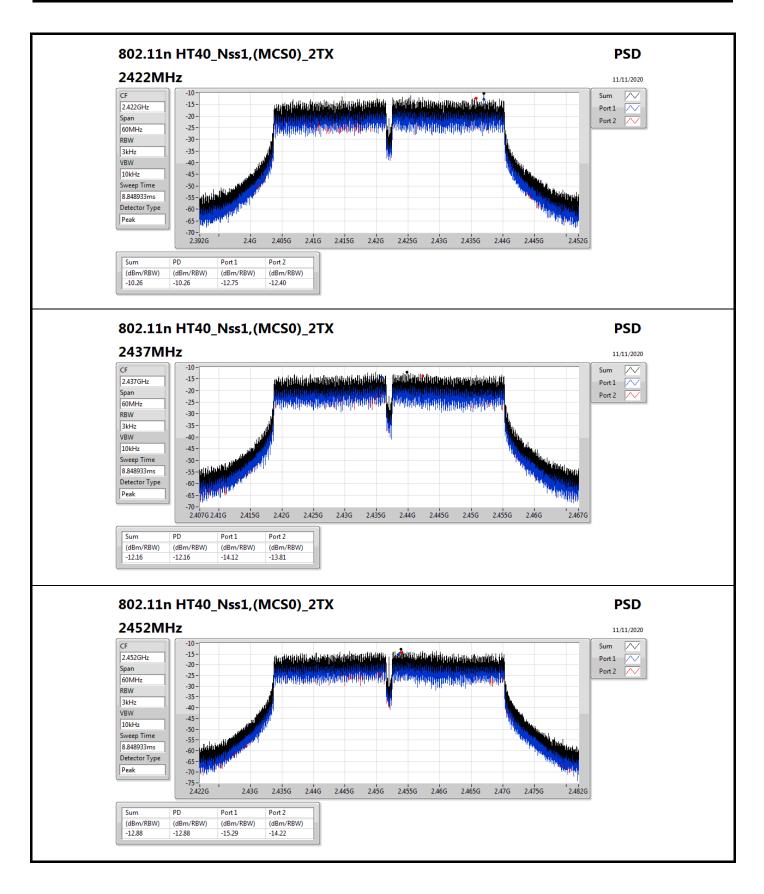














Appendix E

Summary

Mode	Result	Ref	Ref	Limit	Frea	Level	Frea	Level	Freq	Level	Frea	Level	Frea	Level	Port
		(Hz)	(dBm)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	
2.4-2.4835GHz	-	-	-	-	-	-	-	-		-	-		-	-	-
802.11b_Nss1,(1Mbps)_2TX	Pass	2.41298G	7.09	-22.91	857.73M	-53.19	2.39746G	-50.20	2.4G	-54.03	2.51532G	-51.64	23.2946G	-43.34	2
802.11g_Nss1,(6Mbps)_2TX	Pass	2.41695G	4.14	-25.86	2.09059G	-53.14	2.39998G	-29.22	2.4G	-27.95	2.49594G	-50.80	17.63333G	-43.95	1
802.11n HT20_Nss1,(MCS0)_2TX	Pass	2.40822G	3.71	-26.29	159.9M	-53.17	2.39924G	-27.53	2.4G	-29.09	2.49744G	-51.74	23.3255G	-43.52	2
802.11n HT40_Nss1,(MCS0)_2TX	Pass	2.43699G	1.36	-28.64	731.31M	-53.46	2.39992G	-30.54	2.4G	-32.25	2.48414G	-50.26	17.6212G	-43.79	2



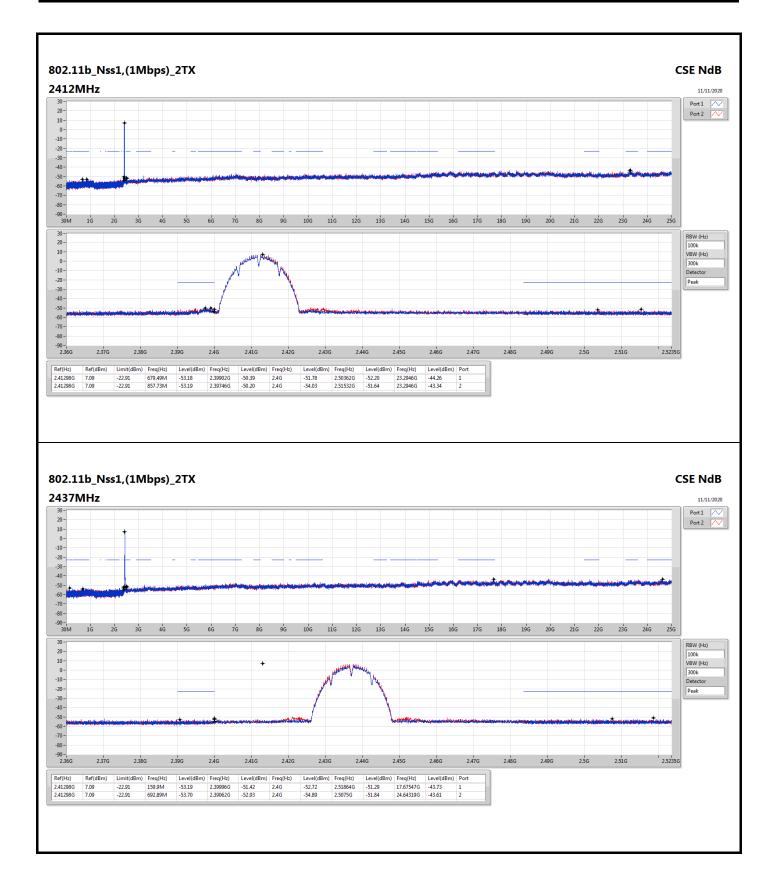
CSE(Non-restricted Band)

Appendix E

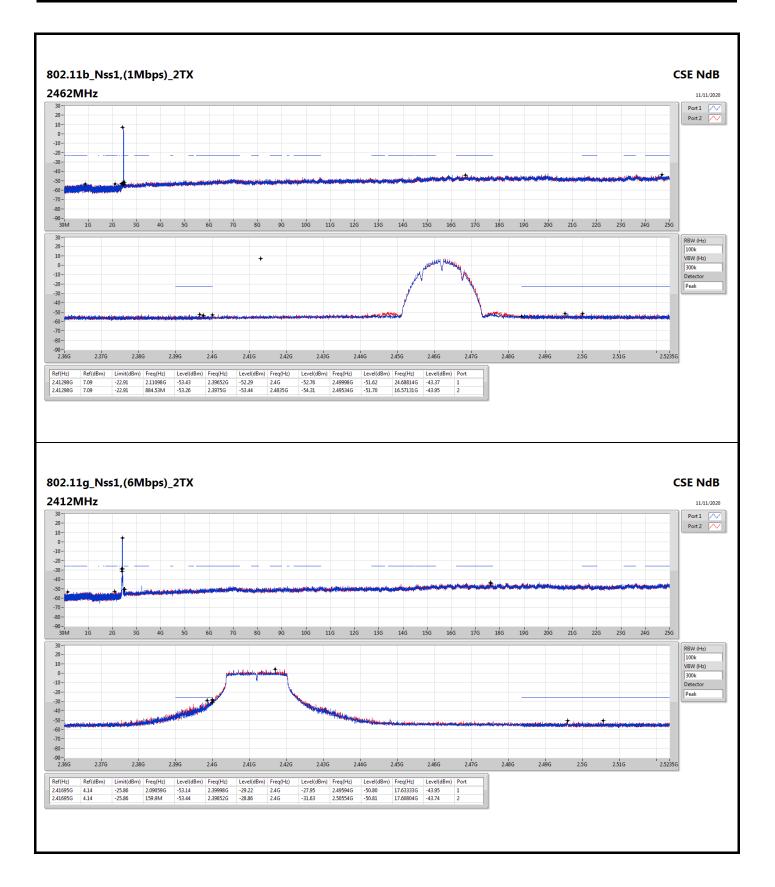
Result

Mode	Result	Ref	Ref	Limit	Freq	Level	Freq	Level	Freq	Level	Freq	Level	Freq	Level	Port
		(Hz)	(dBm)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	
802.11b_Nss1,(1Mbps)_2TX	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2412MHz	Pass	2.41298G	7.09	-22.91	679.49M	-53.18	2.39902G	-50.39	2.4G	-51.78	2.50362G	-52.20	23.2946G	-44.26	1
2412MHz	Pass	2.41298G	7.09	-22.91	857.73M	-53.19	2.39746G	-50.20	2.4G	-54.03	2.51532G	-51.64	23.2946G	-43.34	2
2437MHz	Pass	2.41298G	7.09	-22.91	159.9M	-53.19	2.39996G	-51.42	2.4G	-52.72	2.51864G	-51.29	17.67547G	-43.73	1
2437MHz	Pass	2.41298G	7.09	-22.91	692.89M	-53.70	2.39062G	-52.93	2.4G	-54.89	2.5075G	-51.84	24.64319G	-43.61	2
2462MHz	Pass	2.41298G	7.09	-22.91	2.11098G	-53.43	2.39652G	-52.29	2.4G	-52.76	2.49998G	-51.62	24.68814G	-43.37	1
2462MHz	Pass	2.41298G	7.09	-22.91	884.53M	-53.26	2.3975G	-53.44	2.4835G	-54.31	2.49534G	-51.70	16.57131G	-43.95	2
802.11g_Nss1,(6Mbps)_2TX	-	-			-	-	-	-	-	-	-	-	-	-	-
2412MHz	Pass	2.41695G	4.14	-25.86	2.09059G	-53.14	2.39998G	-29.22	2.4G	-27.95	2.49594G	-50.80	17.63333G	-43.95	1
2412MHz	Pass	2.41695G	4.14	-25.86	159.9M	-53.44	2.39852G	-28.86	2.4G	-31.63	2.50554G	-50.81	17.60804G	-43.74	2
2437MHz	Pass	2.41695G	4.14	-25.86	387.36M	-52.96	2.4G	-47.12	2.4G	-48.07	2.49594G	-51.46	23.36764G	-43.27	1
2437MHz	Pass	2.41695G	4.14	-25.86	159.9M	-53.06	2.39948G	-52.45	2.4G	-54.87	2.48504G	-51.13	24.98314G	-43.10	2
2462MHz	Pass	2.41695G	4.14	-25.86	1.94701G	-52.95	2.39996G	-48.31	2.4835G	-46.33	2.48384G	-42.00	17.63052G	-44.11	1
2462MHz	Pass	2.41695G	4.14	-25.86	159.9M	-53.29	2.39522G	-52.71	2.4835G	-44.44	2.48352G	-42.48	16.84103G	-44.23	2
802.11n HT20_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-	-		-	-	-		-	-
2412MHz	Pass	2.40822G	3.71	-26.29	159.9M	-52.57	2.3985G	-28.19	2.4G	-28.67	2.49598G	-50.49	24.78366G	-43.64	1
2412MHz	Pass	2.40822G	3.71	-26.29	159.9M	-53.17	2.39924G	-27.53	2.4G	-29.09	2.49744G	-51.74	23.3255G	-43.52	2
2437MHz	Pass	2.40822G	3.71	-26.29	826.57M	-53.16	2.39994G	-47.36	2.4G	-48.10	2.5G	-51.13	23.57555G	-44.65	1
2437MHz	Pass	2.40822G	3.71	-26.29	159.9M	-52.64	2.3992G	-51.41	2.4835G	-53.80	2.51824G	-51.95	24.71904G	-43.88	2
2462MHz	Pass	2.40822G	3.71	-26.29	1.9106G	-52.78	2.39668G	-51.80	2.4835G	-41.96	2.48422G	-39.78	24.74152G	-43.04	1
2462MHz	Pass	2.40822G	3.71	-26.29	159.9M	-52.13	2.39636G	-52.14	2.4835G	-41.96	2.48382G	-39.85	24.62914G	-43.94	2
802.11n HT40_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-	-		-	-	-	-	-	-
2422MHz	Pass	2.43699G	1.36	-28.64	782.27M	-52.50	2.3994G	-32.35	2.4G	-31.67	2.48358G	-49.00	24.61577G	-44.40	1
2422MHz	Pass	2.43699G	1.36	-28.64	731.31M	-53.46	2.39992G	-30.54	2.4G	-32.25	2.48414G	-50.26	17.6212G	-43.79	2
2437MHz	Pass	2.43699G	1.36	-28.64	159.96M	-53.32	2.397G	-40.29	2.4G	-41.62	2.48382G	-46.49	16.62277G	-43.65	1
2437MHz	Pass	2.43699G	1.36	-28.64	321.69M	-53.45	2.39732G	-38.91	2.4G	-42.38	2.48422G	-42.69	16.61716G	-43.79	2
2452MHz	Pass	2.43699G	1.36	-28.64	159.96M	-52.47	2.4G	-49.45	2.4835G	-46.80	2.4851G	-41.34	23.33409G	-43.68	1
2452MHz	Pass	2.43699G	1.36	-28.64	1.9848G	-52.79	2.39836G	-51.44	2.4835G	-42.42	2.48914G	-40.25	23.28922G	-43.44	2

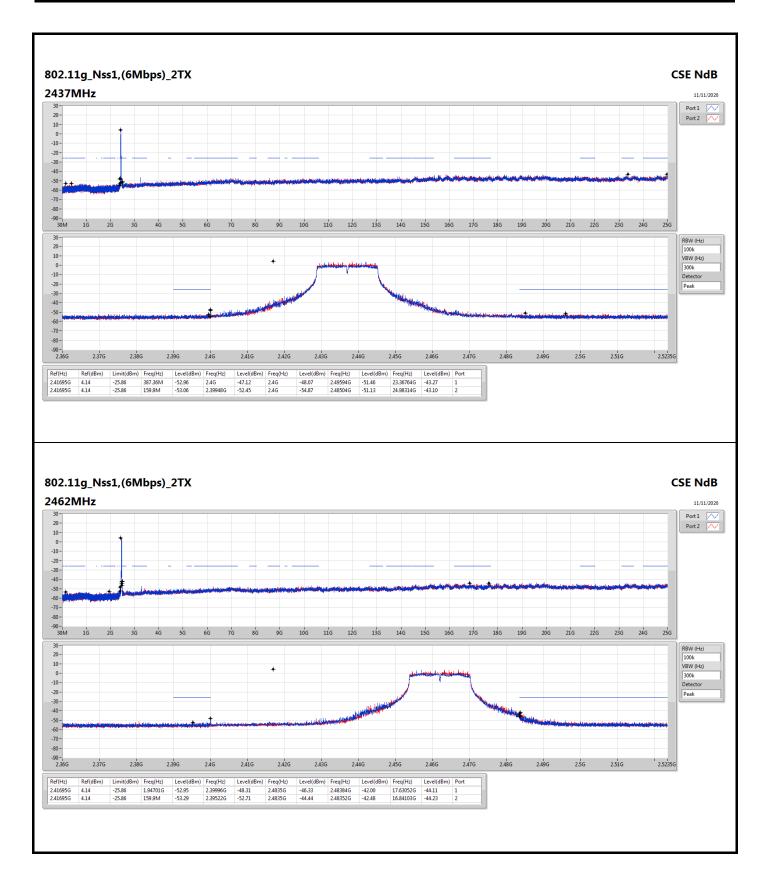




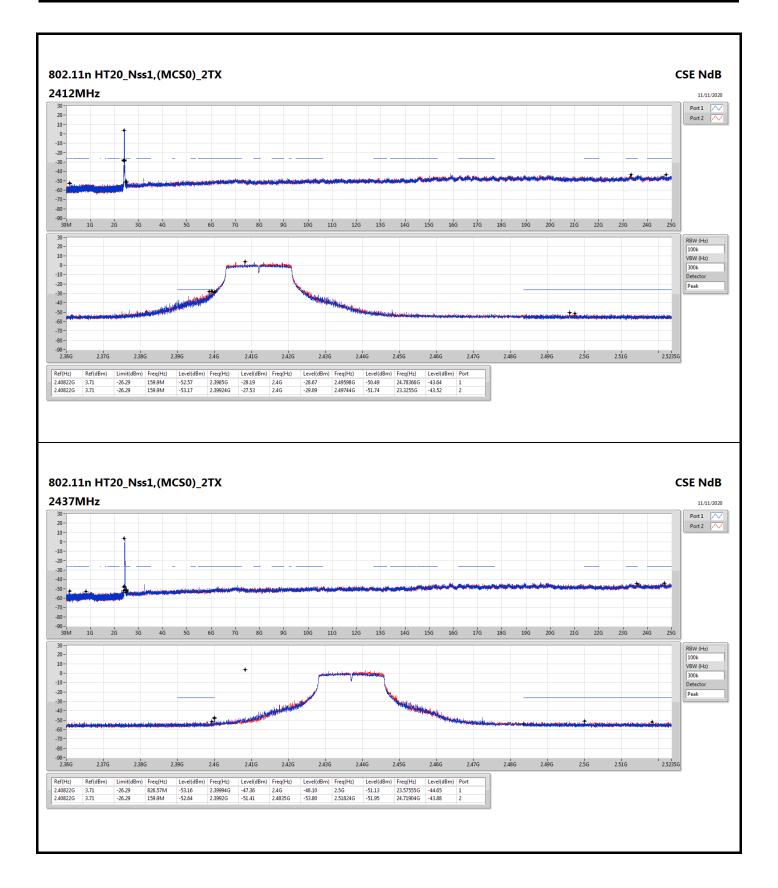




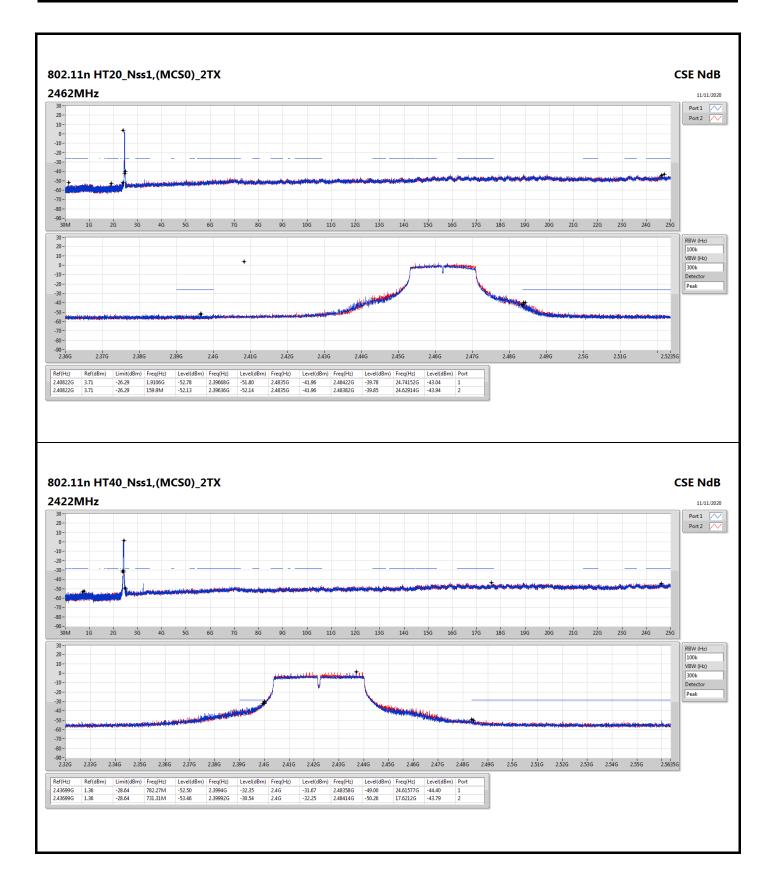




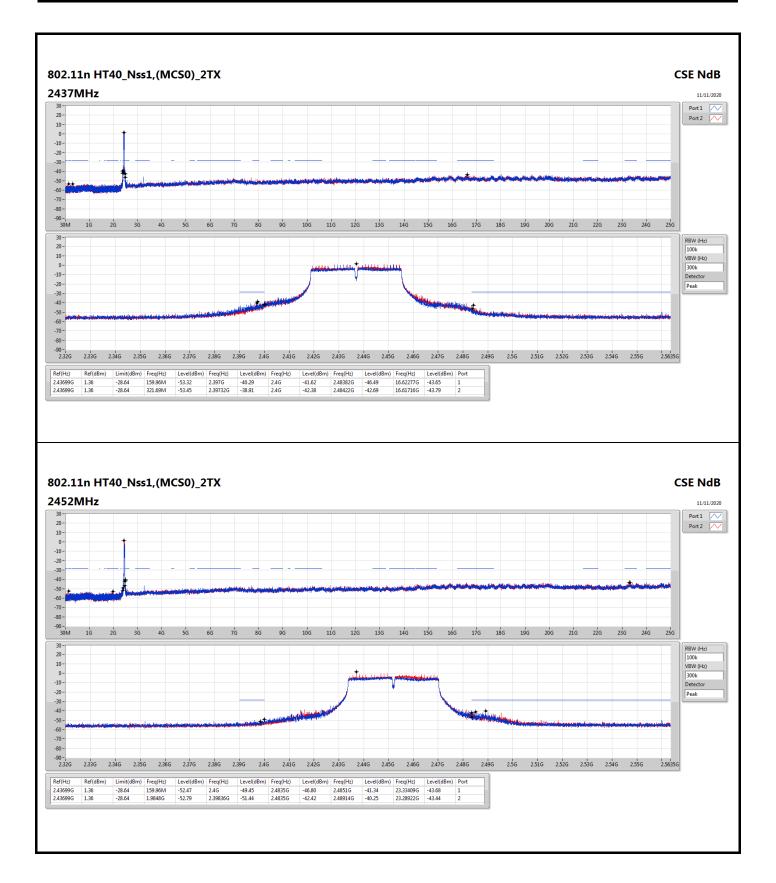














Radiated Emissions below 1GHz

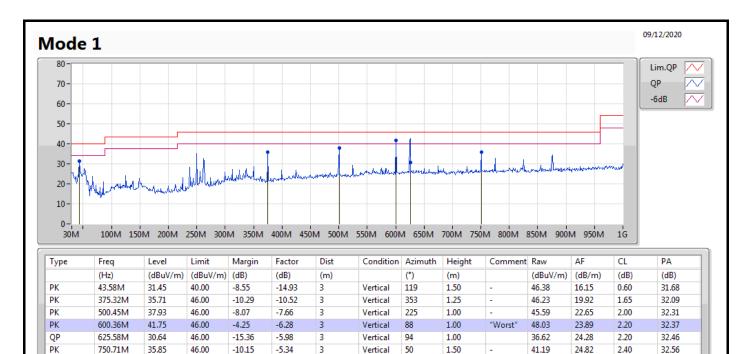
Appendix F.1

Summary	Summary													
Mode	Result	Туре	Freq	Level	Limit	Margin	Condition							
			(Hz)	(dBuV/m)	(dBuV/m)	(dB)								
Mode 1	Pass	РК	600.36	41.75	46.00	-4.25	Vertical							



Radiated Emissions below 1GHz

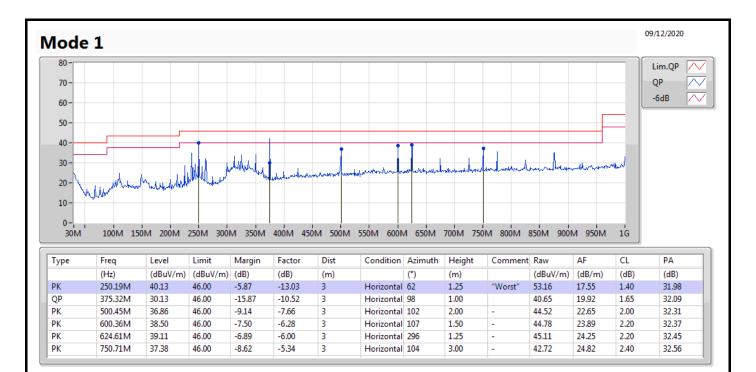
Appendix F.1





Radiated Emissions below 1GHz

Appendix F.1





Appendix F.2

Summary

Mode	Result	Туре	Freq	Level	Limit	Margin	Dist	Condition	Azimuth	Height	Comments
			(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(m)		(°)	(m)	
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-
802.11n HT40_Nss1,(MCS0)_2TX	Pass	PK	2.39G	73.75	74.00	-0.25	3	Horizontal	287	2.80	-



