FCC RADIO TEST REPORT

FCC ID	:	**2AVC9-7448**
Equipment	:	**Digital Media Receiver**
Model Name	:	**V5S83A**
Applicant	:	**BROOKLYN EAST LLC** **41 University Drive, Suite 400** **Newtown, PA 18940**
Standard	:	**FCC Part 15 Subpart C §15.247**

The product was received on Feb. 24, 2021 and testing was started from Mar. 01, 2021 and completed on Mar. 26, 2021. We, Sporton International (USA) Inc., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in 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 (USA) Inc., the test report shall not be reproduced except in full.

Neil Kao

Approved by: Neil Kao

Sporton International (USA) Inc.
1175 Montague Expressway, Milpitas, CA 95035

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History of this test report

Report No.	Version	Description	Issued Date
FR210302003C	01	Initial issue of report	Apr. 01, 2021

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)
3.1	15.247(a)(2)	6dB Bandwidth	Pass
3.1	2.1049	99% Occupied Bandwidth	Reporting only
3.2	15.247(b)	Power Output Measurement	Pass
3.3	15.247(e)	Power Spectral Density	Pass
3.4	15.247(d)	Conducted Band Edges	Pass
		Conducted Spurious Emission	Pass
3.5	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	Pass
3.6	15.207	AC Conducted Emission	Pass
3.7	15.203 & 15.247(b)	Antenna Requirement	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.

1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
Equipment	Digital Media Receiver
Model Name	V5S83A
FCC ID	2AVC9-7448
EUT supports Radios application	WLAN 11b/g/n HT20 WLAN 11a/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE

1.2 Product Specification of Equipment Under Test

Product Specification subjective to this standard	
Tx/Rx Frequency Range	2412 MHz ~ 2472 MHz
Maximum Peak Output Power to antenna	**MIMO<Ant. 1 + 2>** 802.11b: 21.80 dBm / 0.1514 W 802.11g: 26.68 dBm / 0.4656 W 802.11n HT20: 26.83 dBm / 0.4819 W
Maximum Average Output Power to antenna	**MIMO<Ant. 1 + 2>** 802.11b: 21.12 dBm / 0.1294 W 802.11g: 20.95 dBm / 0.1245 W 802.11n HT20: 21.00 dBm / 0.1259 W
99% Occupied Bandwidth	**MIMO<Ant. 1>** 802.11b: 13.94 MHz 802.11g: 16.98 MHz 802.11n HT20: 18.08 MHz **MIMO<Ant. 2>** 802.11b: 13.64 MHz 802.11g: 16.93 MHz 802.11n HT20: 17.83 MHz
Antenna Type	Ant. 1 : PIFA Antenna Ant. 2 : Dual loop Antenna
Antenna Gain	Ant. 1 : 3.20 dBi Ant. 2 : 3.70 dBi
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)
Antenna Function Description	

	Ant. 1	Ant. 2
802.11 b/g/n MIMO	V	V

Note:

1. MIMO Ant. 1+2 is a calculated result from sum of the power MIMO Ant. 1 and MIMO Ant. 2.
2. For other wireless features of this EUT, test report will be issued separately.
3. The above EUT's information was declared by manufacturer. Please refer to Comments and Explanations in report summary.

1.3 Modification of EUT

No modifications are made to the EUT during all test items.

1.4 Testing Location

Test Site	Sporton International (USA) Inc
Test Site Location	1175 Montague Expressway Milpitas, CA 95035 TEL: 408-904-3300
Test Site No.	**Sporton Site No.**
	TH01-CA, CO01-CA, 03CH02-CA

1.5 Applicable Standards

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

- FCC Part 15 Subpart C §15.247
- FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05r02
- FCC KDB 414788 D01 Radiated Test Site v01r01.
- FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ANSI C63.10-2013

Remark: All test items were verified and recorded according to the standards and without any deviation during the test.

2 Test Configuration of Equipment Under Test

a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Y plane) were recorded in this report.

b. AC power line Conducted Emission was tested under maximum output power.

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	1	2412	8	2447
	2	2417	9	2452
	3	2422	10	2457
	4	2427	11	2462
	5	2432	12	2467
	6	2437	13	2472
	7	2442		

2.2 Test Mode

Final test modes are considering the modulation and worse data rates as below table.

MIMO Antenna

Modulation	Data Rate
802.11b	1 Mbps
802.11g	6 Mbps
802.11n HT20	MCS0

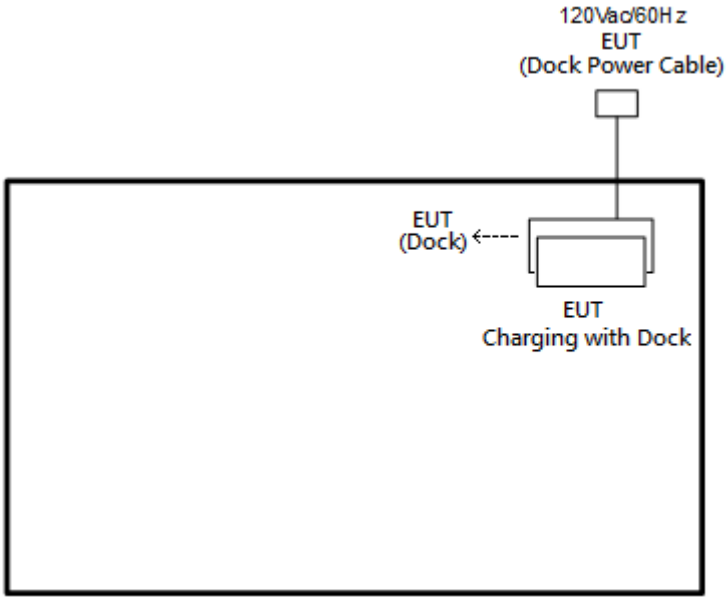
Test Cases	
AC Conducted Emission	Mode 1 :WLAN (2.4GHz) Tx+ Bluetooth Tx + Dock (Charging from Adapter)

Ch. #	2400-2483.5 MHz		
	802.11b	802.11g	802.11n HT20
Low	01	01	01
Middle	06	06	06
High	11	11	11
	12	12	12
	13	13	13

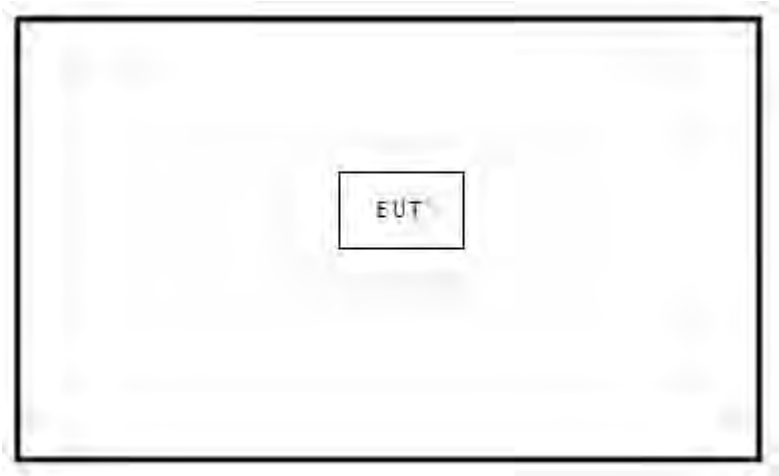
Remark: For radiation spurious emission, the final modulation and the worst data rate was reference the max RF conducted power.

2.3 Connection Diagram of Test System

<AC Conducted Emission Mode>



<WLAN Tx Mode>



2.4 EUT Operation Test Setup

The RF test items, utility "Compliance WiFi-BT-Zigbee V1.0.0.97" was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

2.5 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example:
The spectrum analyzer offset is derived from RF cable loss and attenuator factor.
Offset = RF cable loss + attenuator factor.
Following shows an offset computation example with cable loss 4.2 dB and 10 dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).
= 4.2 + 10 = 14.2 (dB)

3 Test Result

3.1 6dB and 99% Bandwidth Measurement

3.1.1 Limit of 6dB and 99% Bandwidth

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

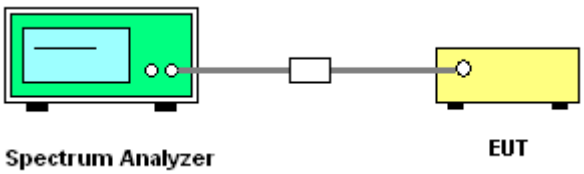
3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

3.1.3 Test Procedures

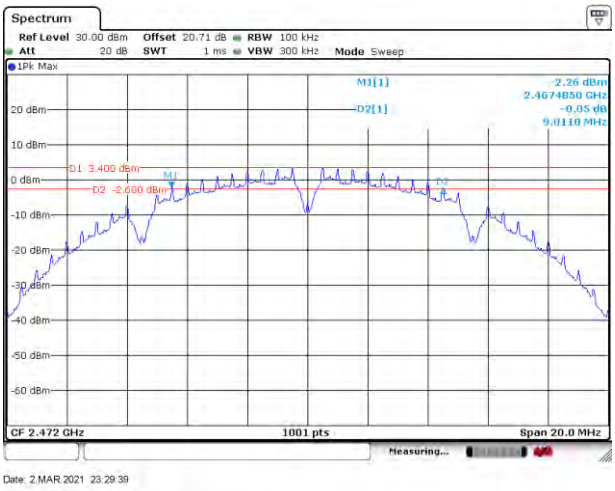
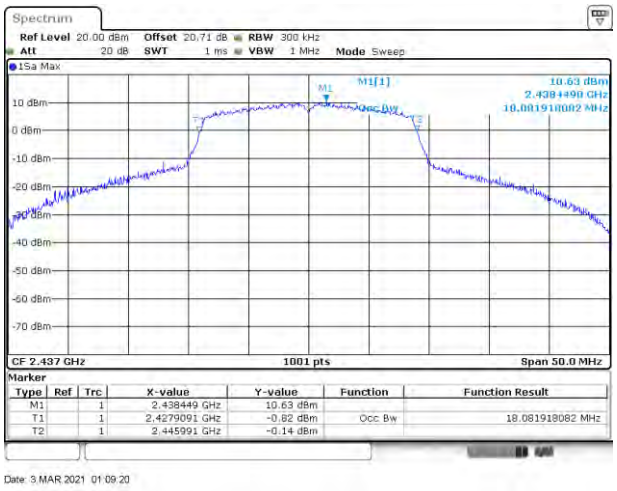
1. The testing follows the ANSI C63.10 Section 6.9.3 (OBW) and 11.8.1 (6dB BW).
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 kHz.
5. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 1-5% of the emission bandwidth and set the Video bandwidth (VBW) ≥ 3 * RBW.
6. Measure and record the results in the test report.

3.1.4 Test Setup



3.1.5 Test Result of 6dB and 99% Occupied Bandwidth

Please refer to Appendix A.

Minimum 6dB Bandwidth	Maximum 99% Occupied Bandwidth
	

Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

3.2 Output Power Measurement

3.2.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5 MHz, the limit for output power is 30 dBm. If transmitting antenna with directional gain greater than 6 dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

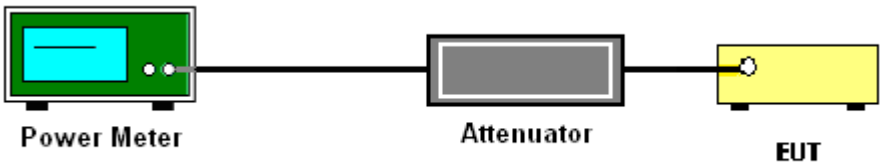
3.2.2 Measuring Instruments

See list of measuring equipment of this test report.

3.2.3 Test Procedures

1. For Peak Power, the testing follows ANSI C63.10 Section 11.9.1.3 PKPM1
2. For Average Power, the testing follows ANSI C63.10 Section 11.9.2.3.2 Method AVGPM-G
3. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
4. Set the maximum power setting and enable the EUT to transmit continuously.
5. Measure the conducted output power and record the results in the test report.
6. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

3.2.4 Test Setup



3.2.5 Test Result of Peak Output Power

Please refer to Appendix A.

3.2.6 Test Result of Average Output Power (Reporting Only)

Please refer to Appendix A.

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8 dBm in any 3 kHz band at any time interval of continuous transmission.

3.3.2 Measuring Instruments

See list of measuring equipment of this test report.

3.3.3 Test Procedures

1. The testing follows the ANSI C63.10 Section 11.10.2 Method PKPSD.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)
5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
6. Measure and record the results in the test report.
7. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

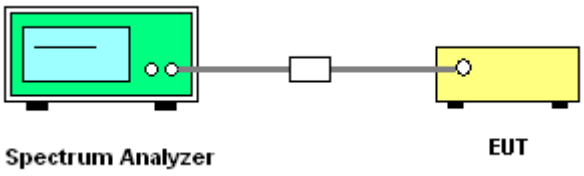
   If measurements performed using method (2) plus 10 log (N) exceeds the emission limit, the test should choose method (1) before declaring that the device fails the emission limit.

   Method (1): Measure and sum the spectra across the outputs.

   The total final Power Spectral Density is from a device with 2 transmitter outputs. The spectrum measurements of the individual outputs are all performed with the same span and number of points, the spectrum value in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 to obtain the value for the first frequency bin of the summed spectrum.

   Method (2): Measure and add 10 log (N) dB, where N is the number of outputs. (N=2)

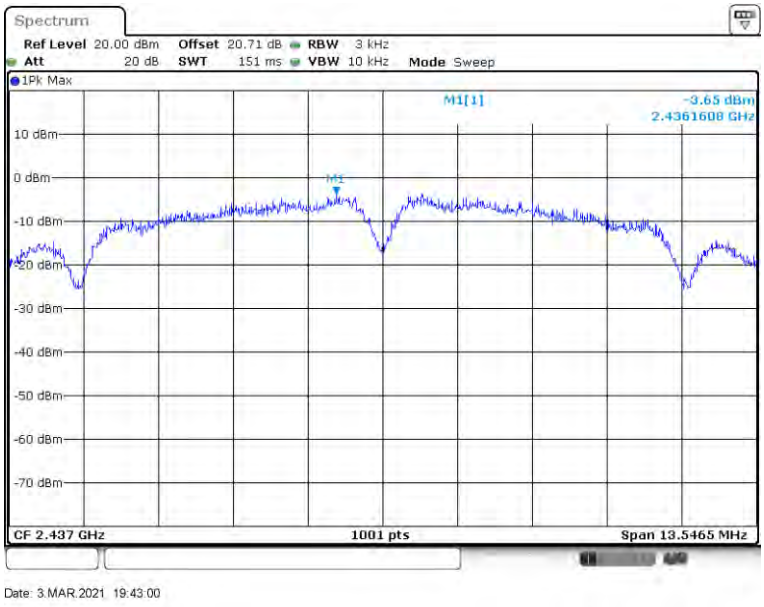
3.3.4 Test Setup



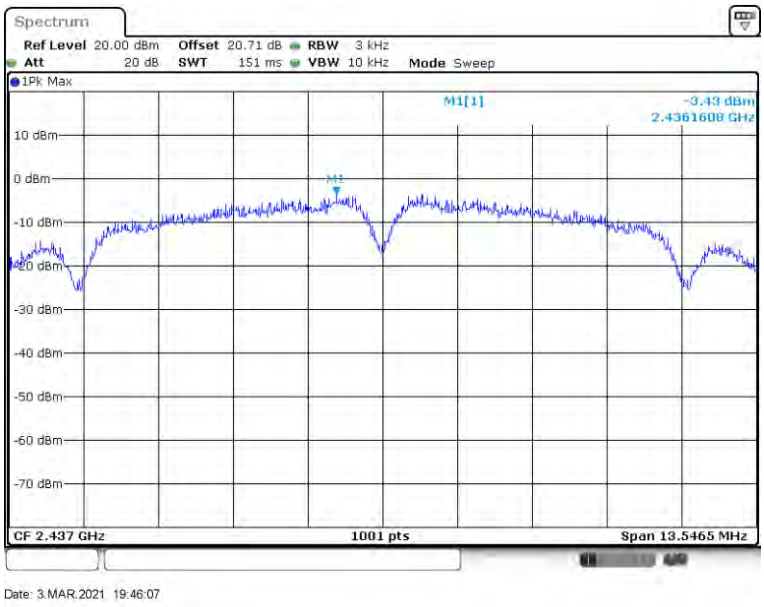
3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

Worst Case Power Density (dBm/3kHz) for MIMO Ant. 1



Worst Case Power Density (dBm/3kHz) for MIMO Ant. 2



3.4 Conducted Band Edges and Spurious Emission Measurement

3.4.1 Limit of Conducted Band Edges and Spurious Emission Measurement

In any 100 kHz bandwidth outside of the authorized frequency band, the emissions which fall in the non-restricted bands shall be attenuated at least 20 dB / 30dB relative to the maximum PSD level in 100 kHz by RF conducted measurement.

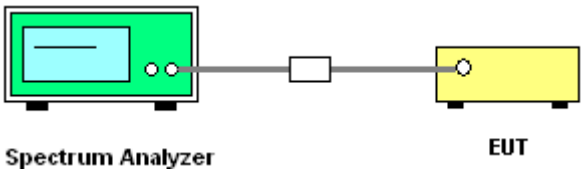
3.4.2 Measuring Instruments

See list of measuring equipment of this test report.

3.4.3 Test Procedures

1. The testing follows the ANSI C63.10 Section 11.11.3 Emission level measurement.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB per 15.247(d).
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

3.4.4 Test Setup

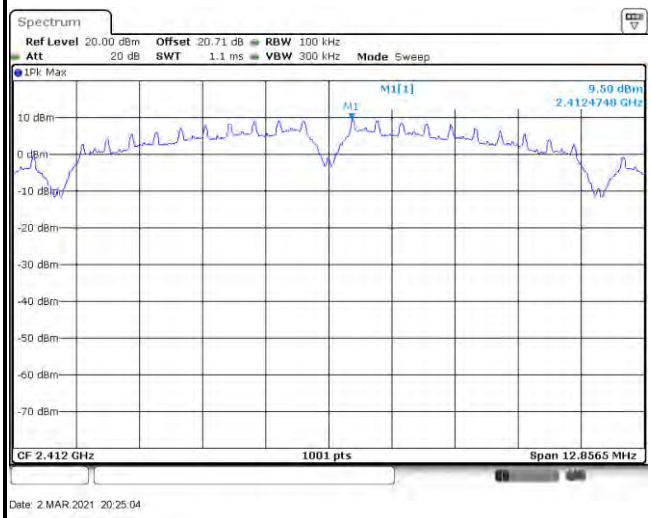
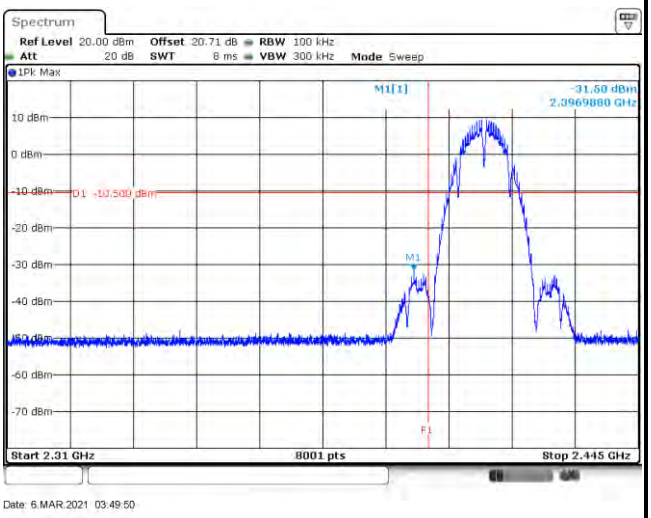
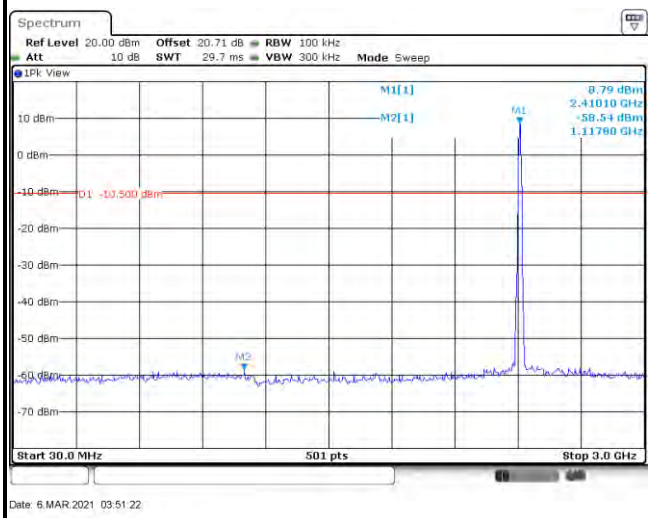
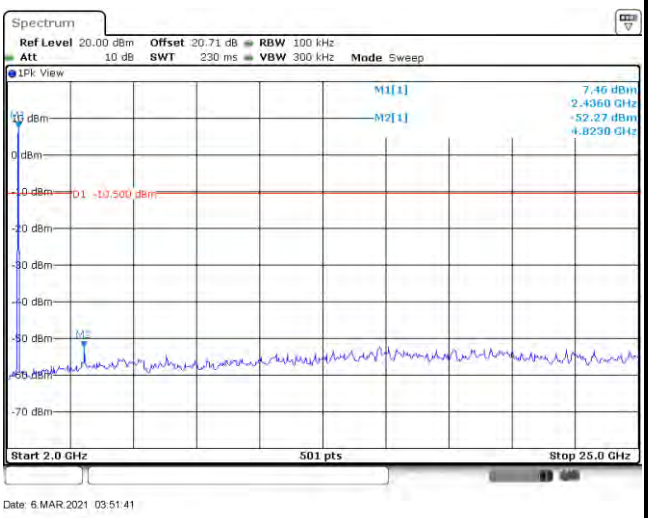


3.4.5 Test Result of Conducted Band Edges and Spurious Emission

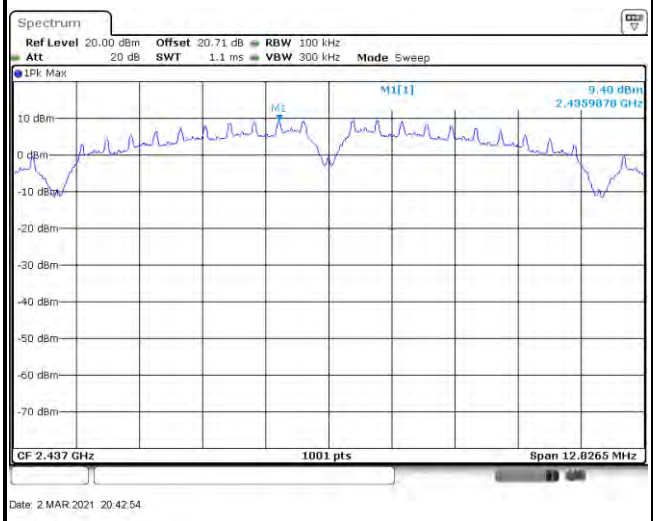
Test Engineer :	Andy Kao and Kaying Xiong	**Temperature :**	17~22.2℃
		Relative Humidity :	31~47.5%

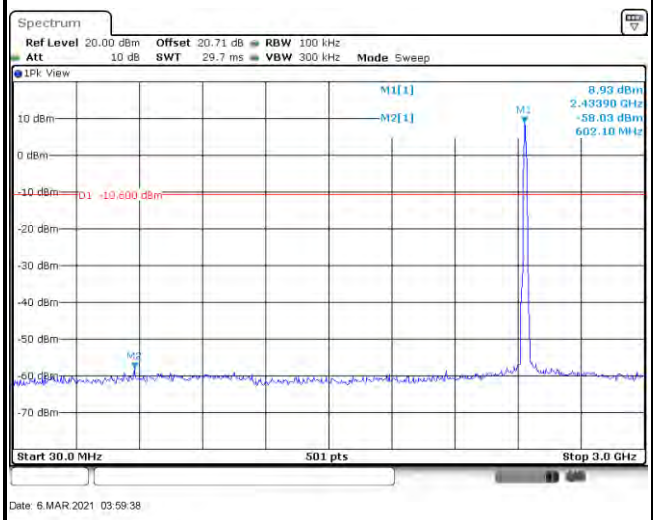
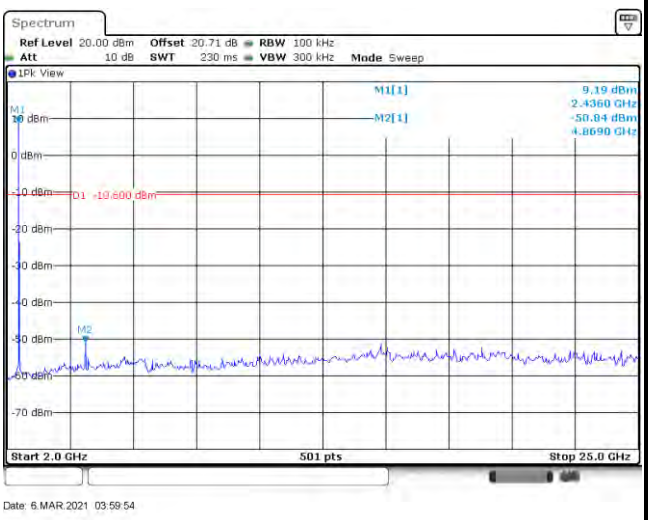
Number of TX = 2, Ant. 1 (Measured)

Test Mode :	802.11b	**Test Channel :**	01

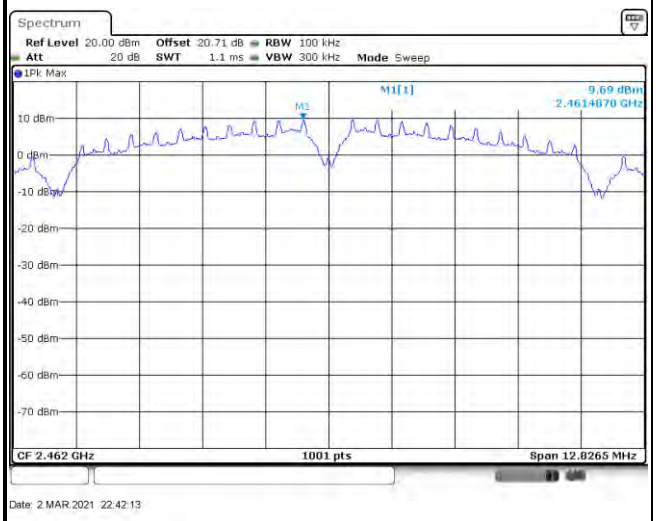
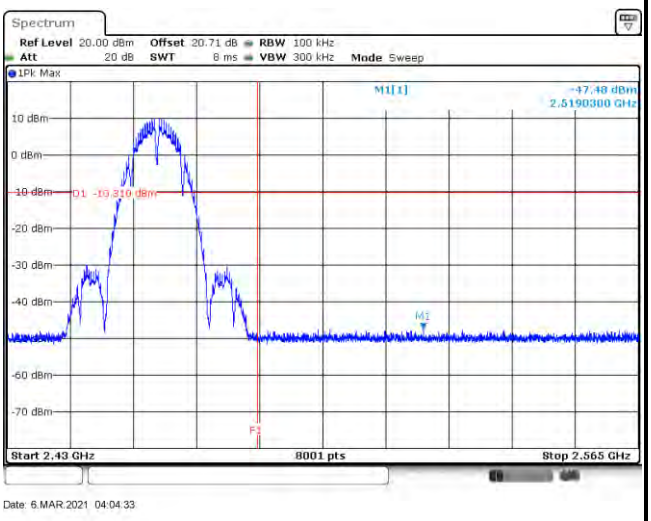
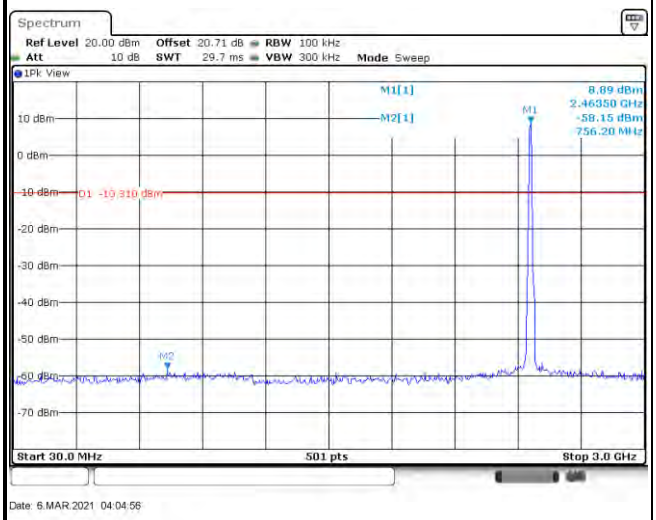
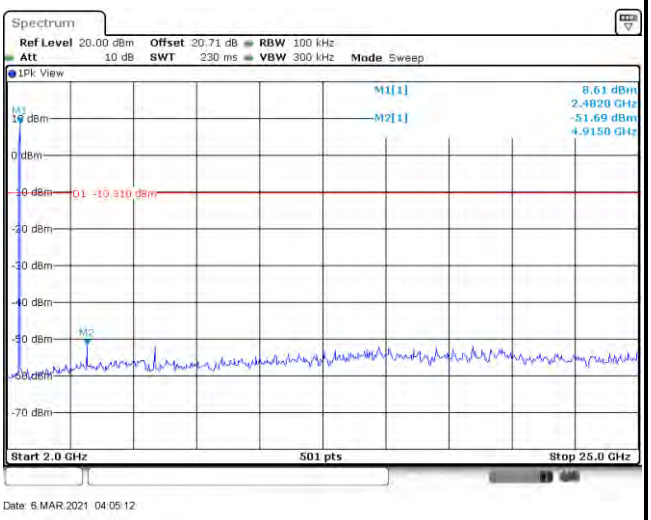
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11b	Test Channel :	06

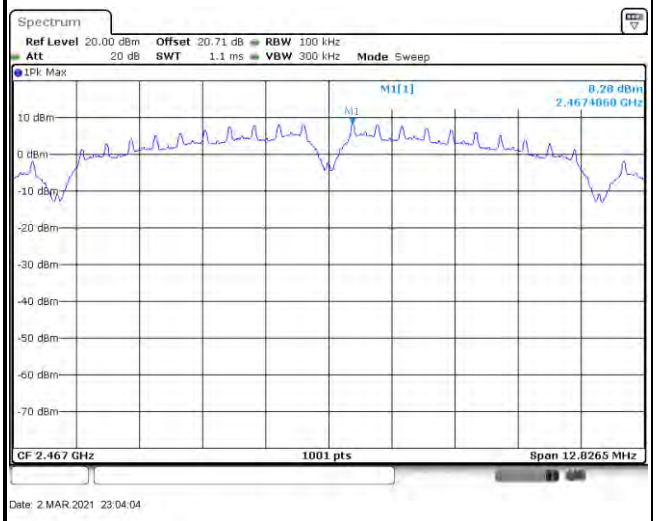
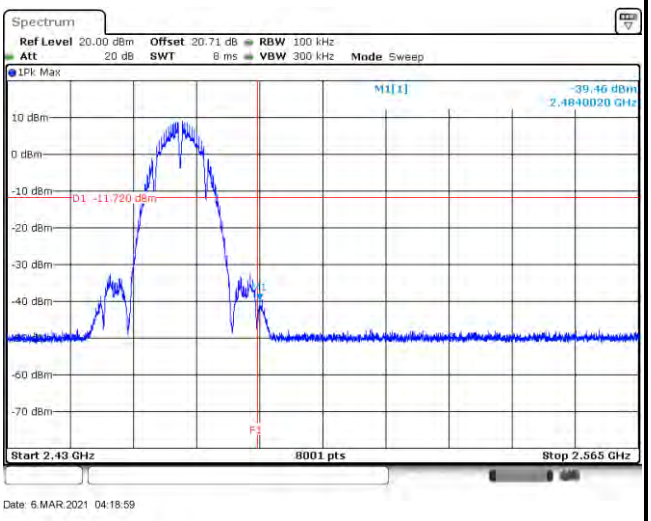
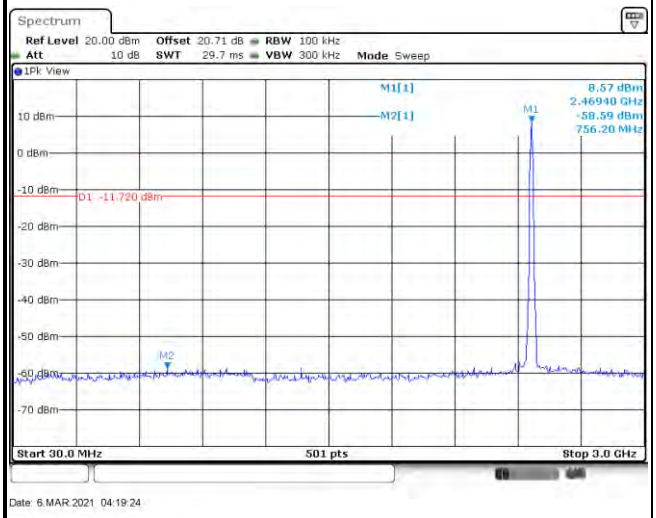
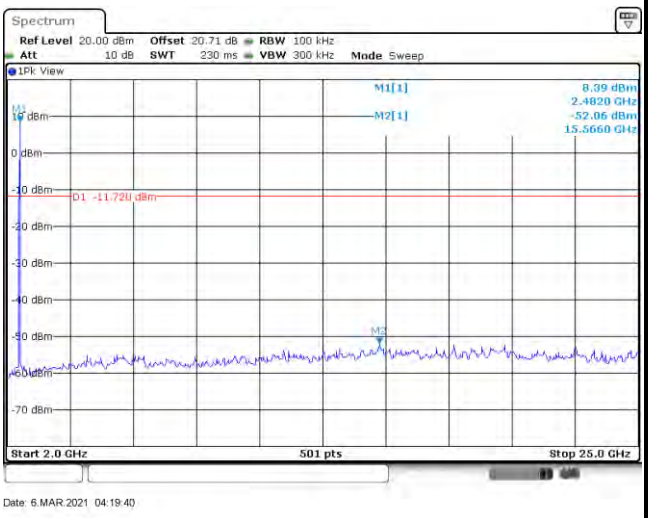
100kHz PSD reference Level	Channel Plot
	

Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	

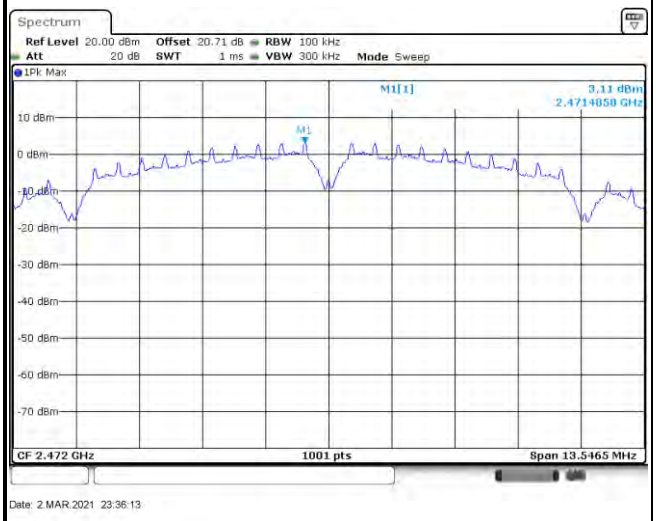
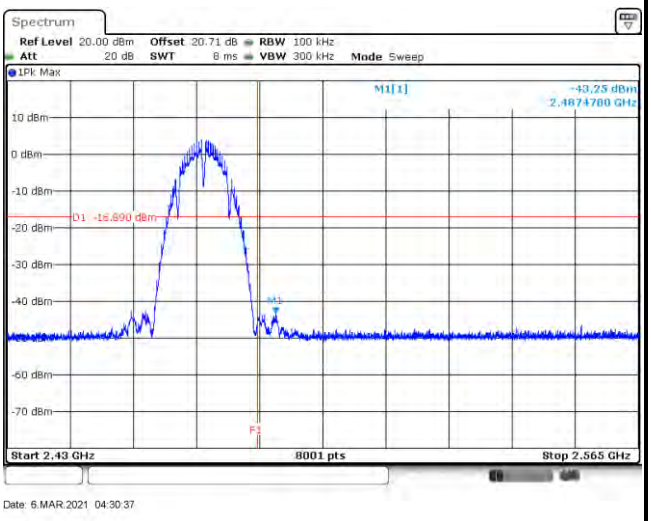
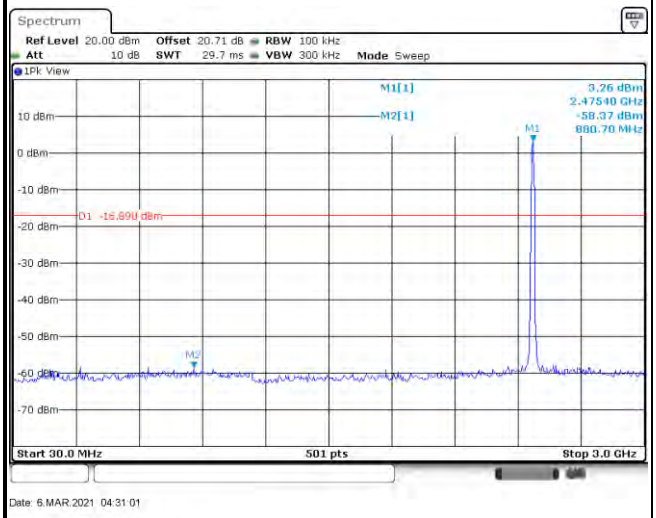
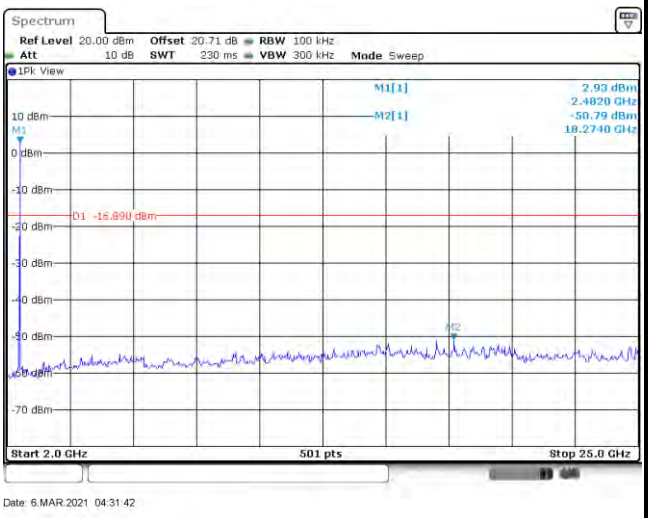
Test Mode :	802.11b	Test Channel :	11

100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

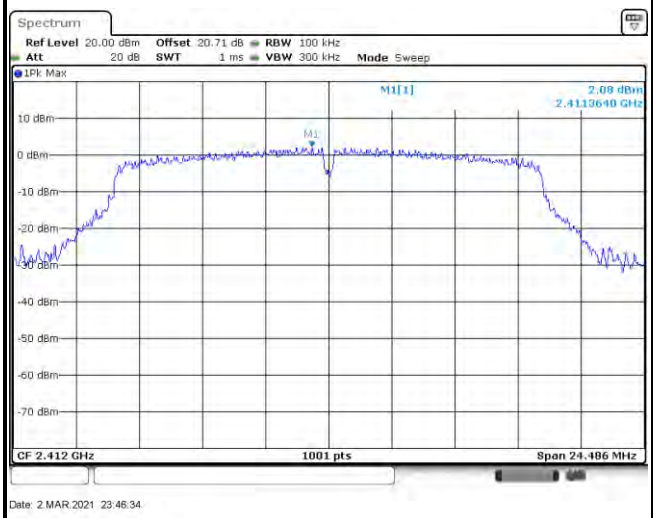
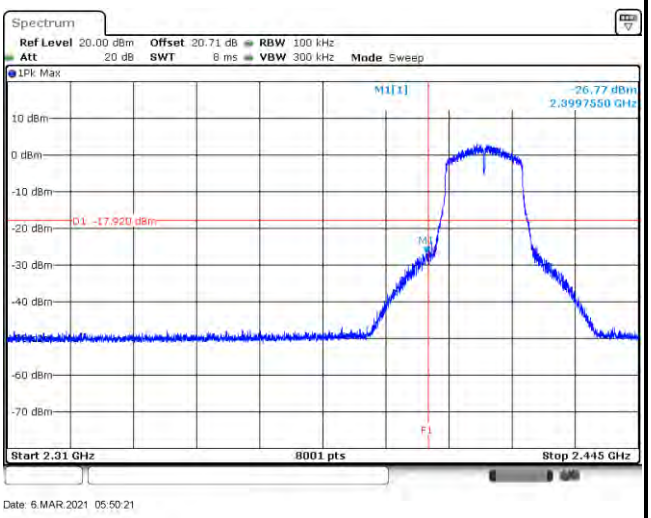
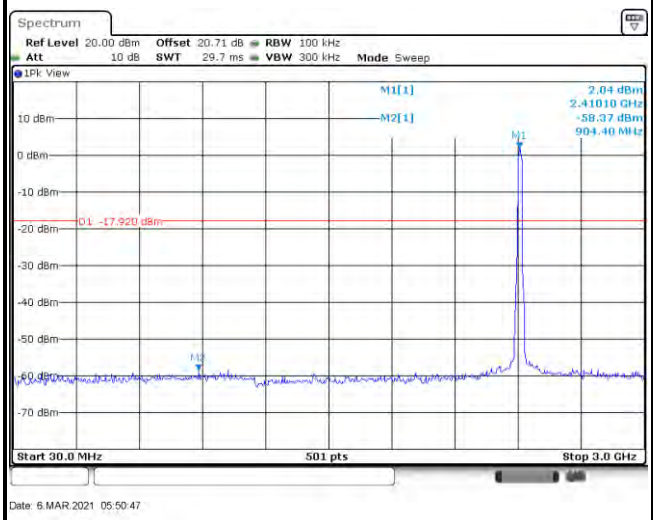
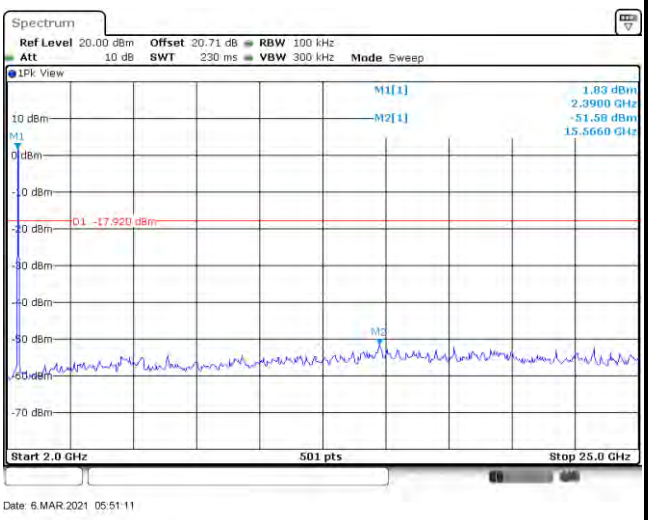
Test Mode :	802.11b	Test Channel :	12

100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

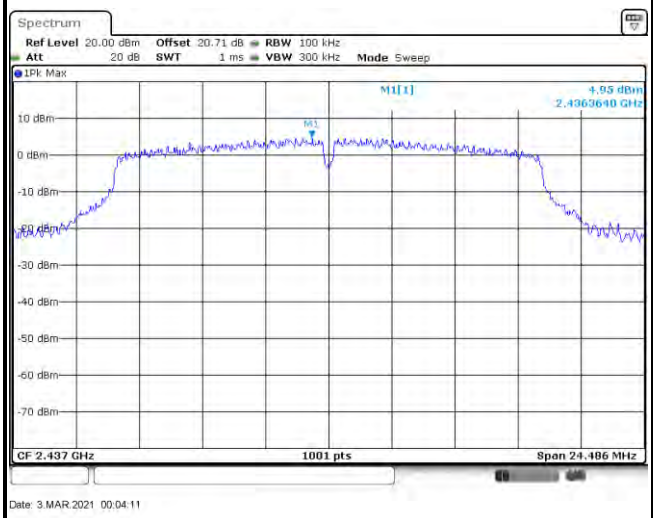
Test Mode :	802.11b	Test Channel :	13

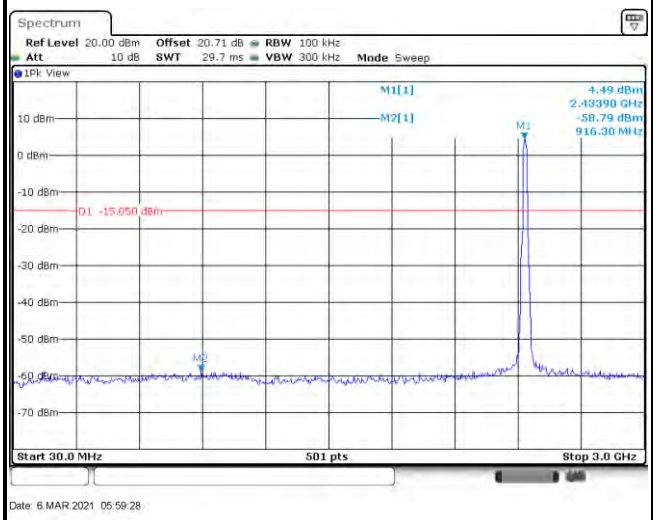
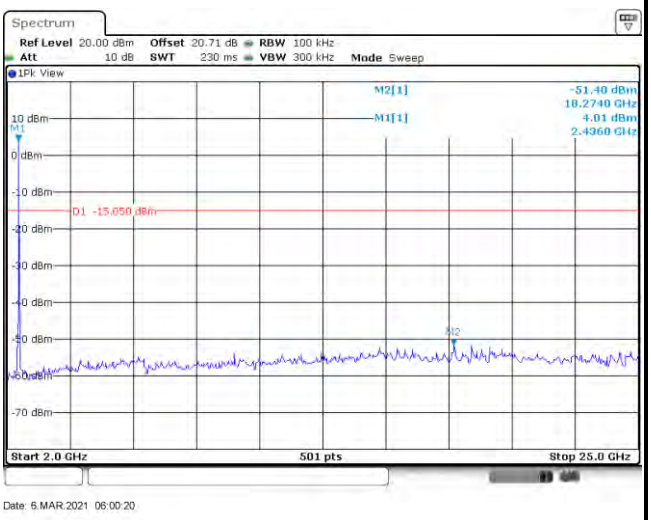
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11g	Test Channel :	01

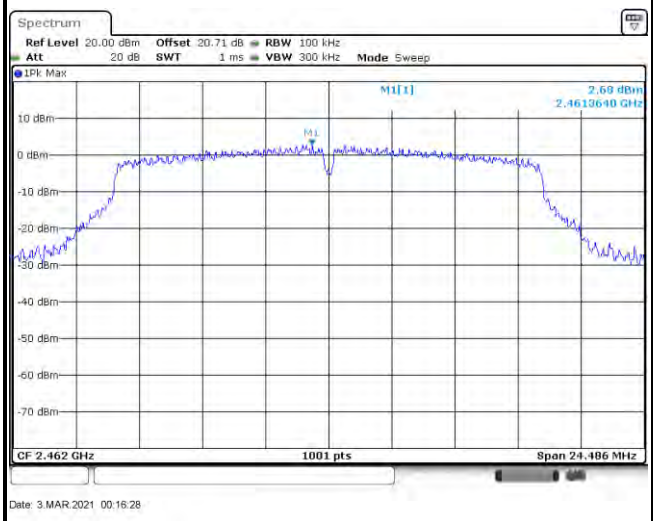
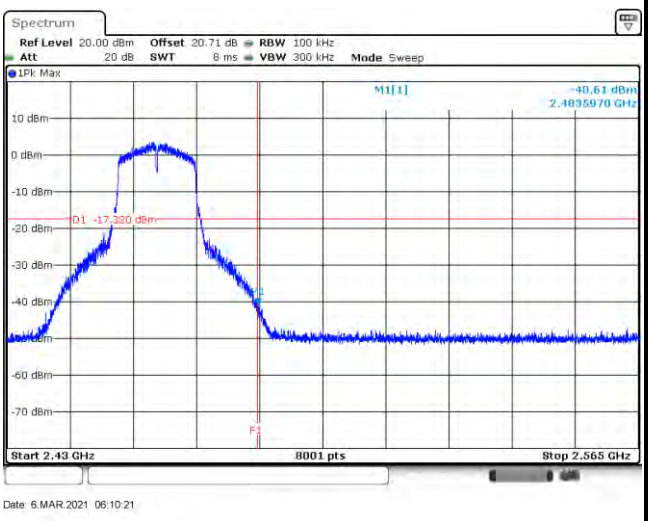
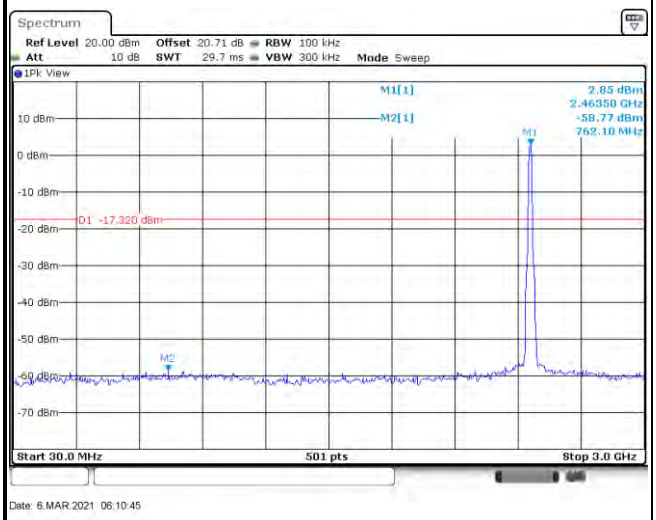
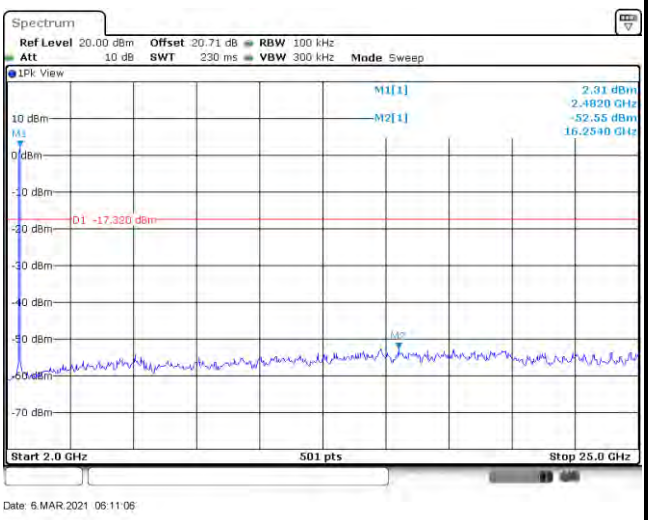
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11g	Test Channel :	06

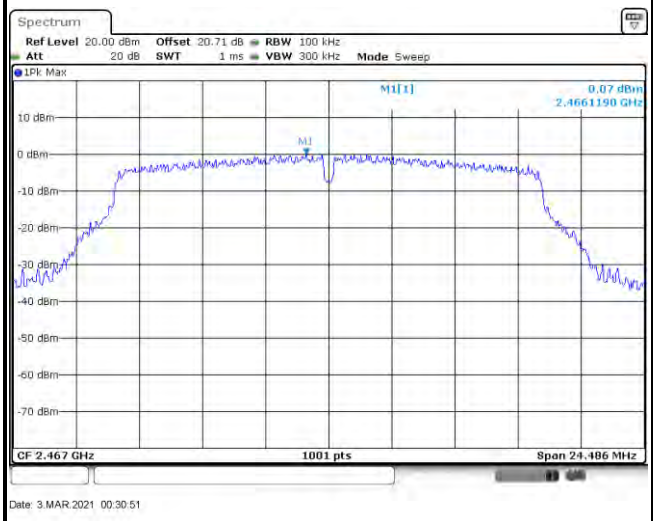
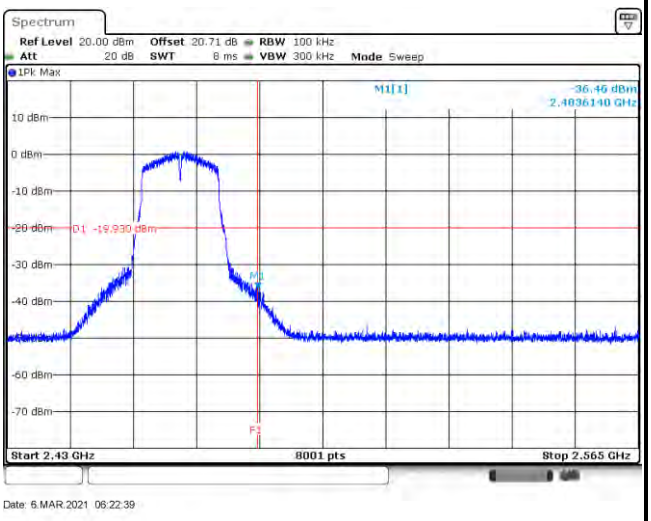
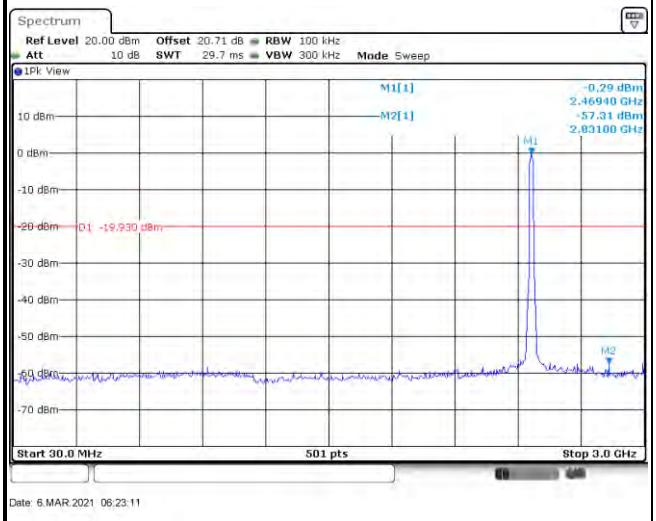
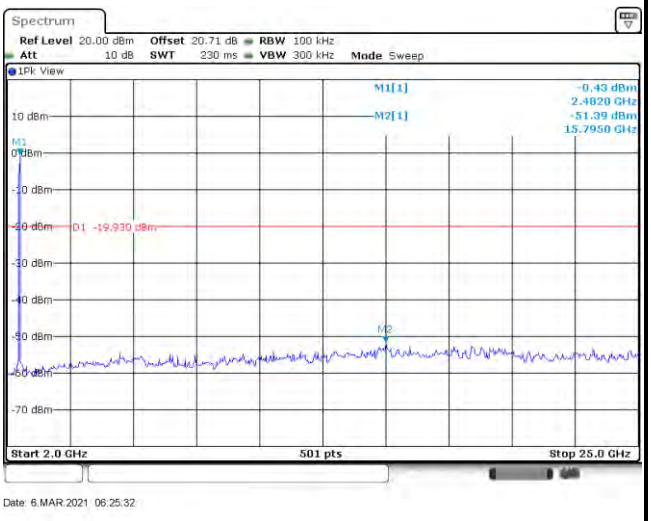
100kHz PSD reference Level	Channel Plot
	

Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	

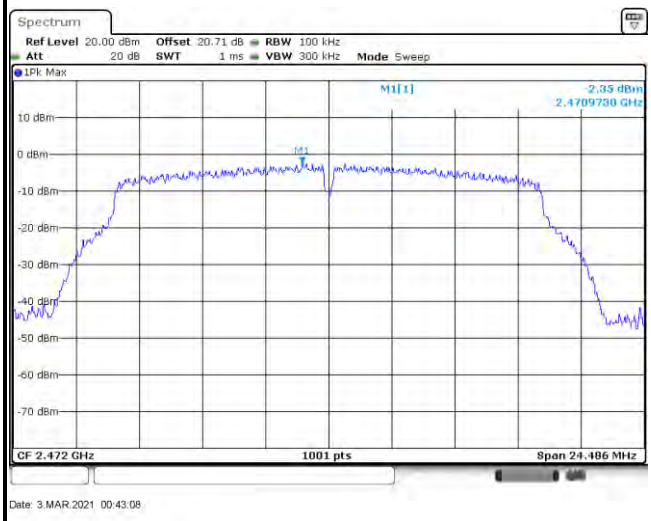
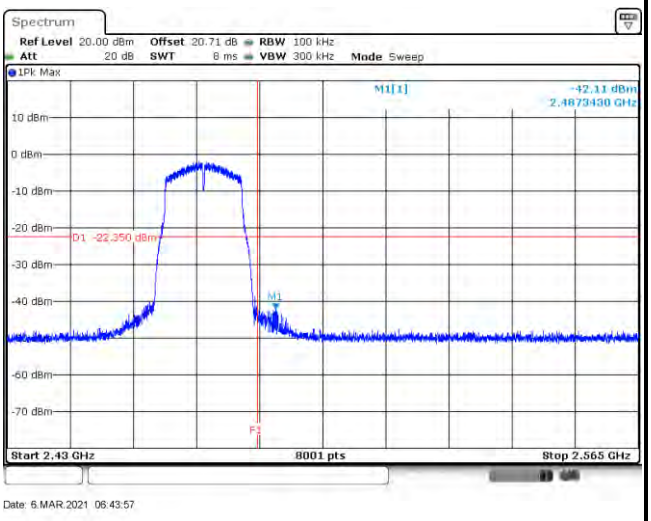
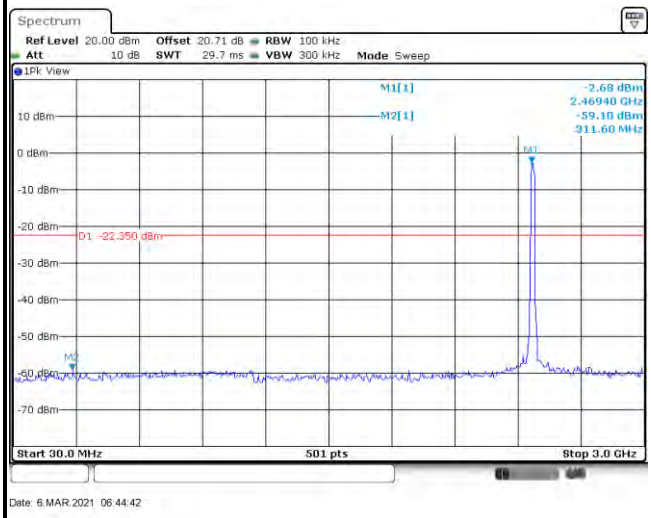
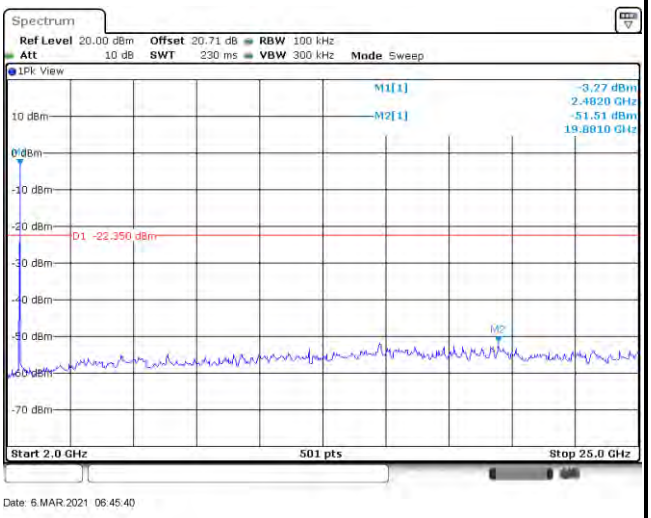
Test Mode :	802.11g	Test Channel :	11

100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

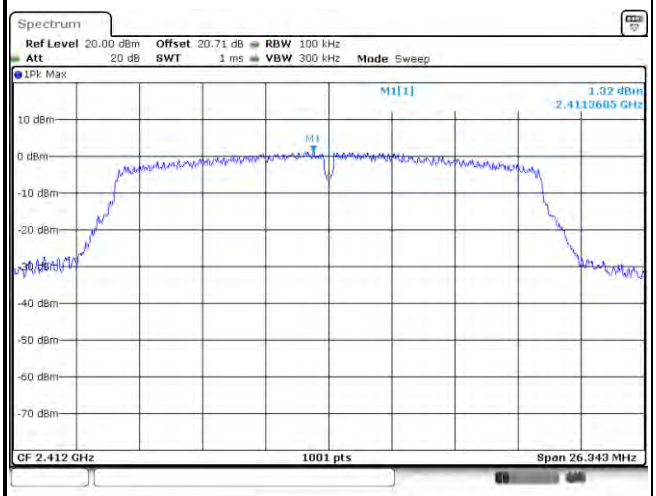
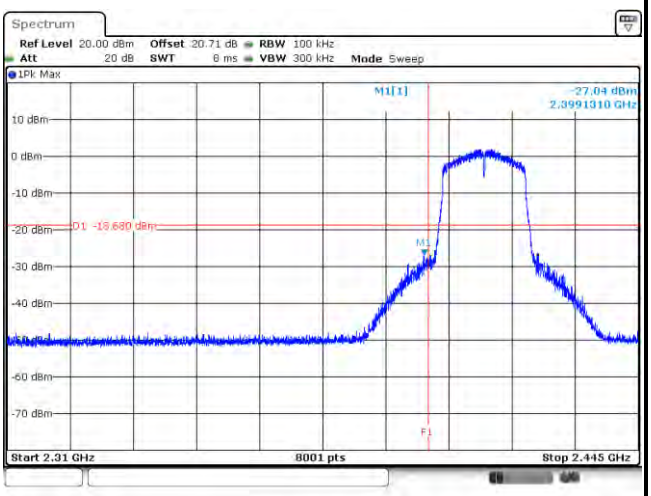
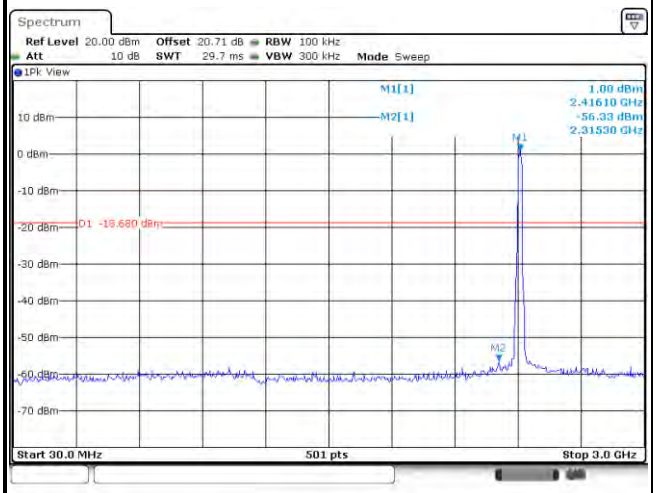
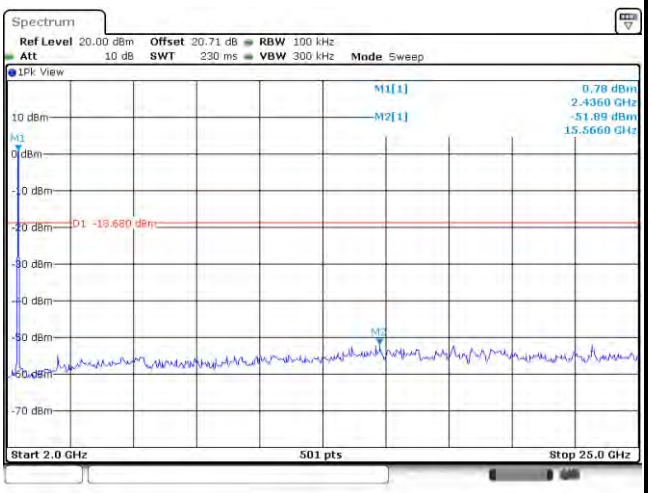
Test Mode :	802.11g	Test Channel :	12

100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

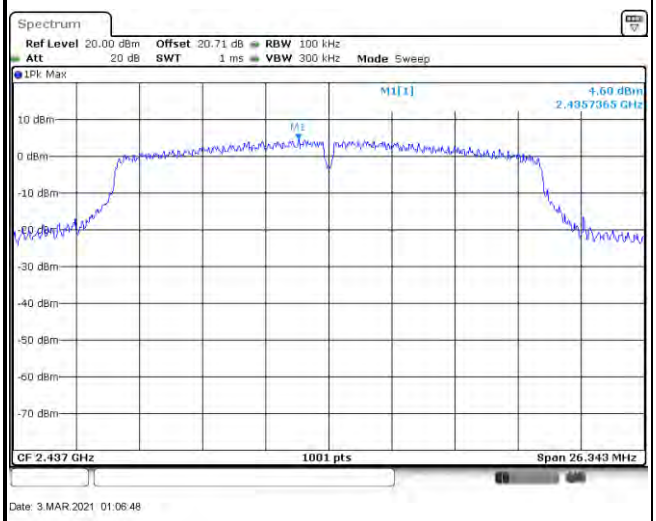
Test Mode :	802.11g	Test Channel :	13

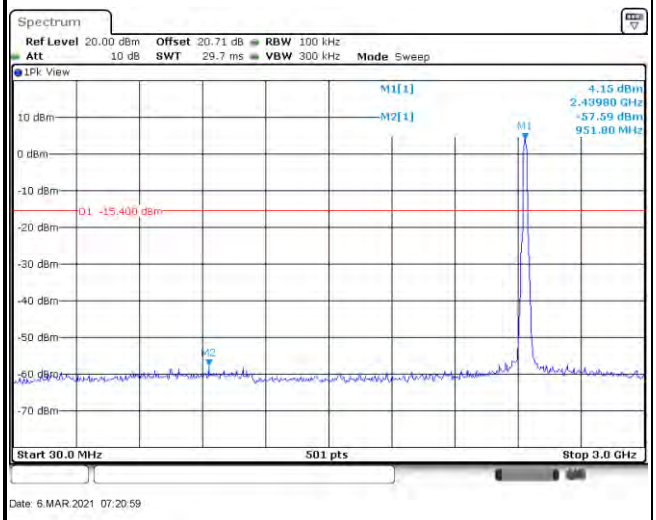
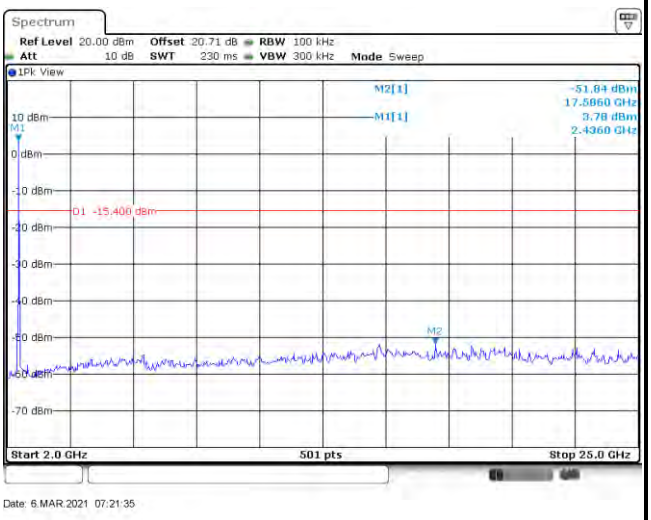
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11n HT20	Test Channel :	01

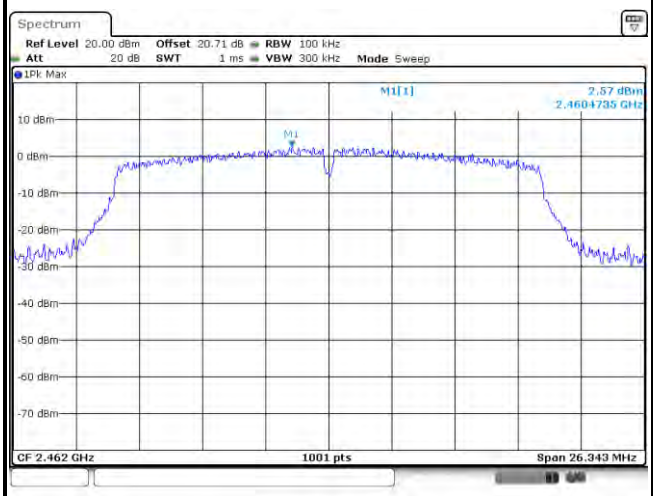
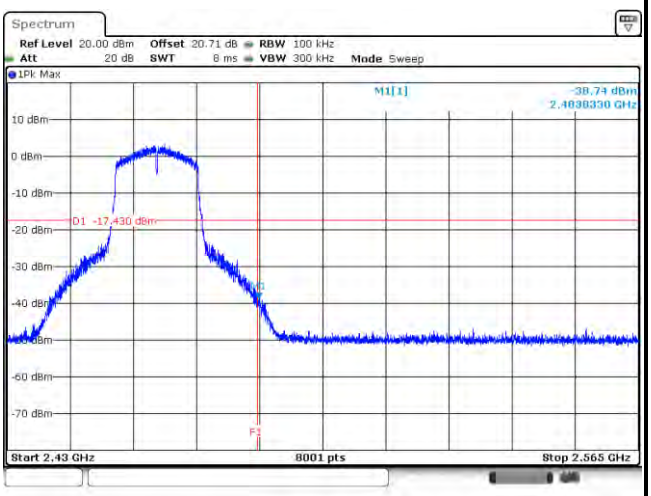
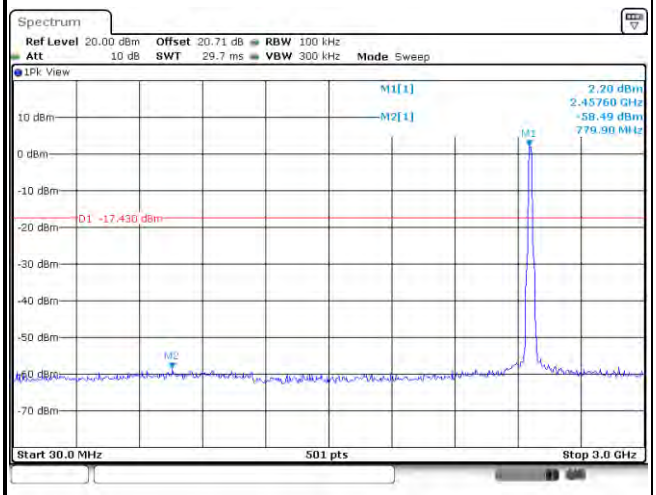
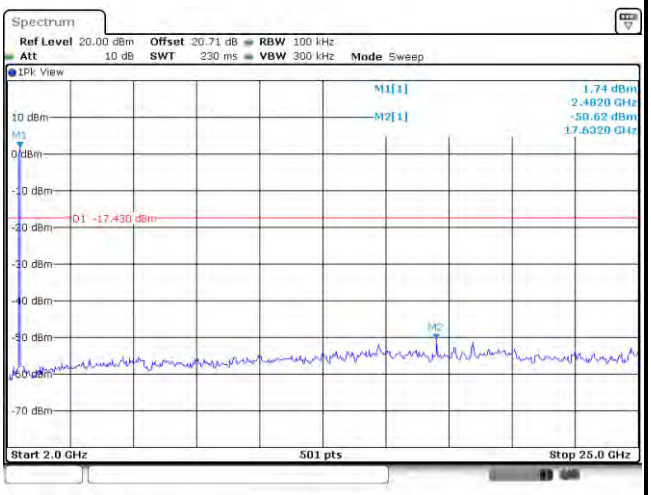
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11n HT20	Test Channel :	06

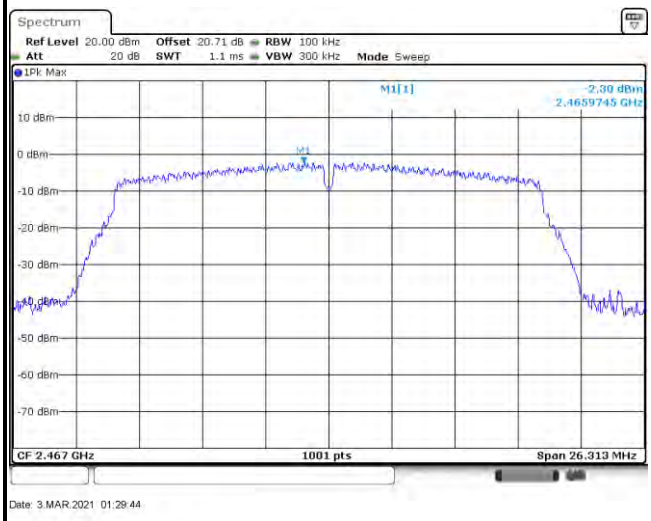
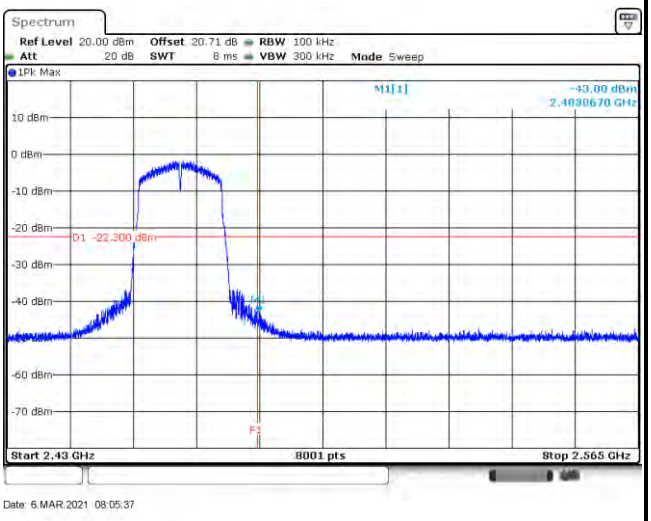
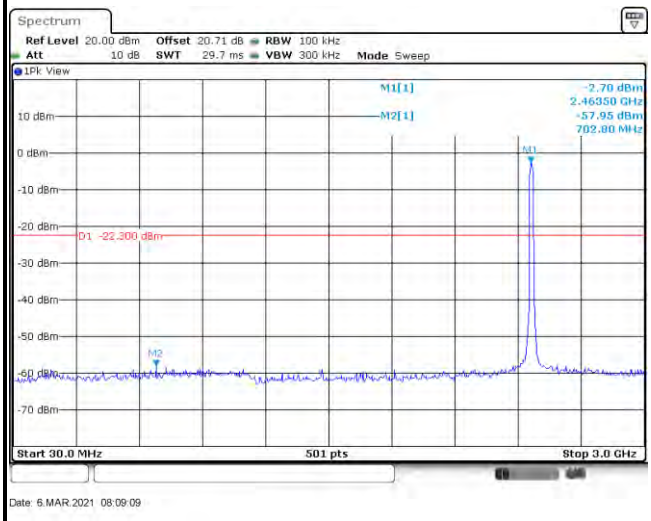
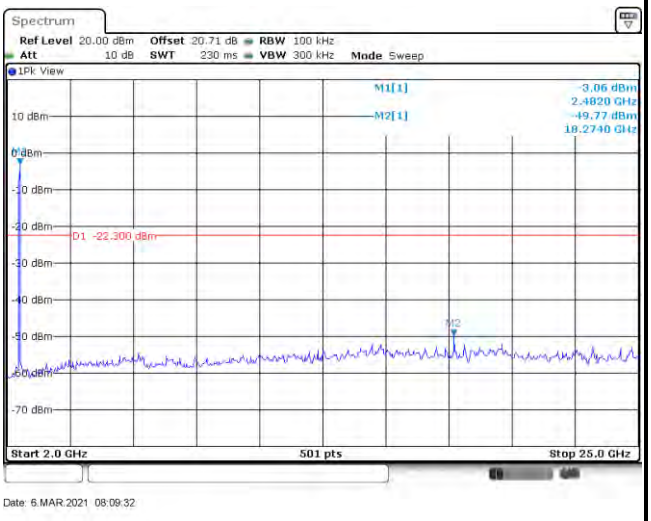
100kHz PSD reference Level	Channel Plot
	

Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	

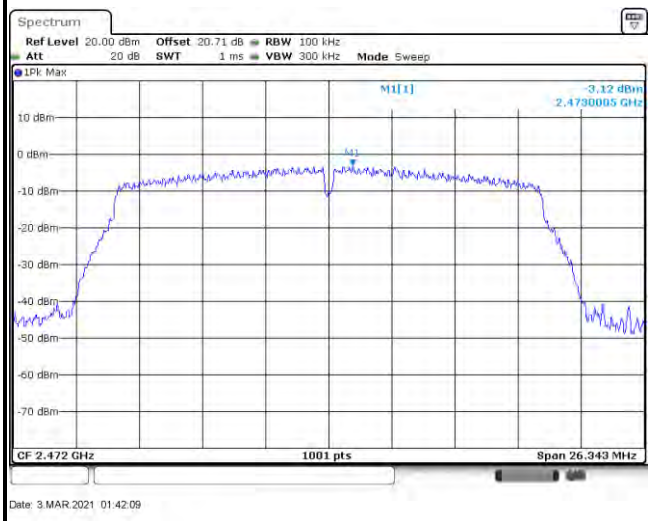
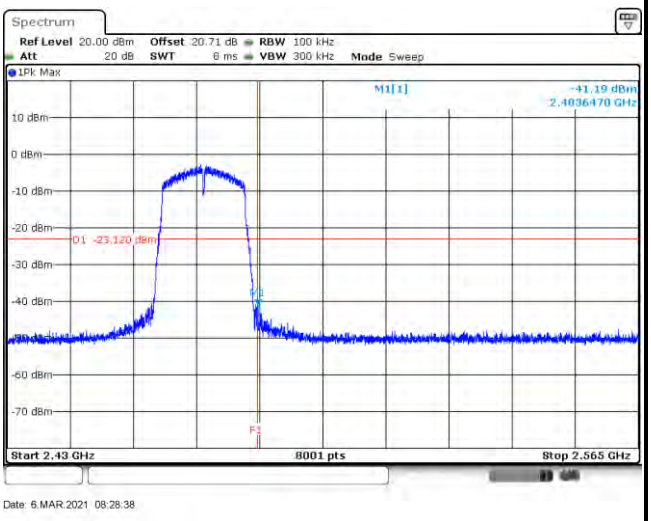
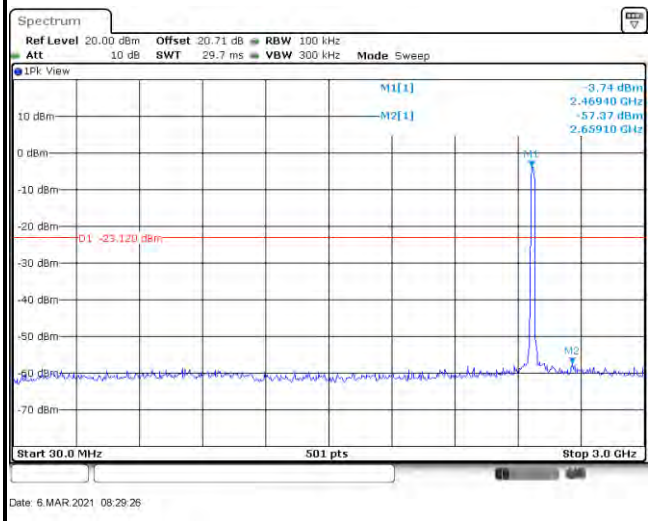
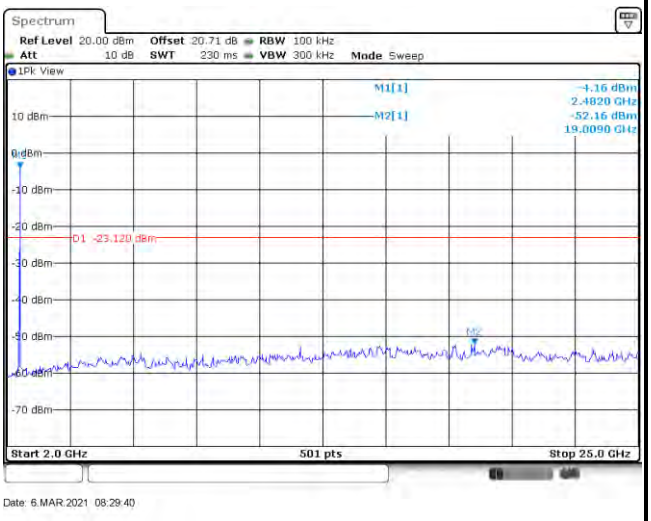
Test Mode :	802.11n HT20	Test Channel :	11

100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11n HT20	Test Channel :	12

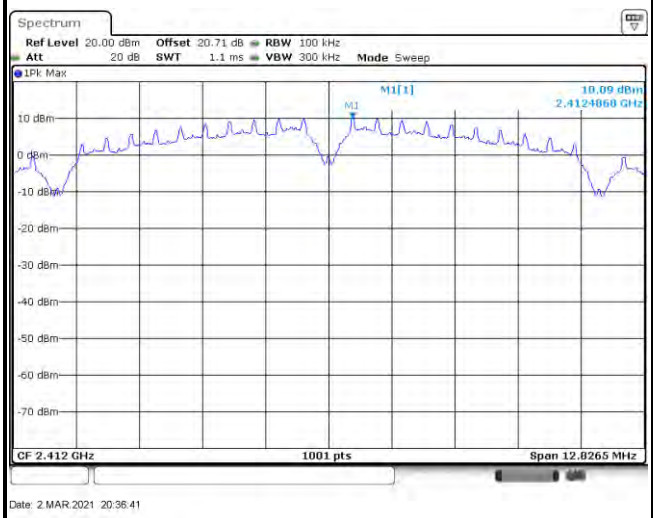
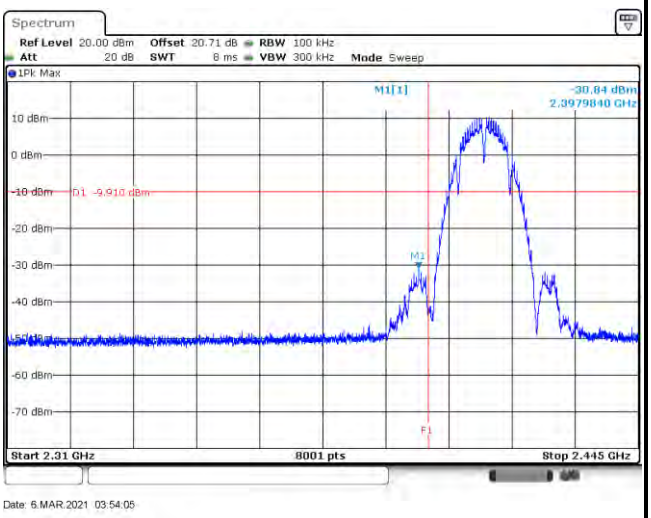
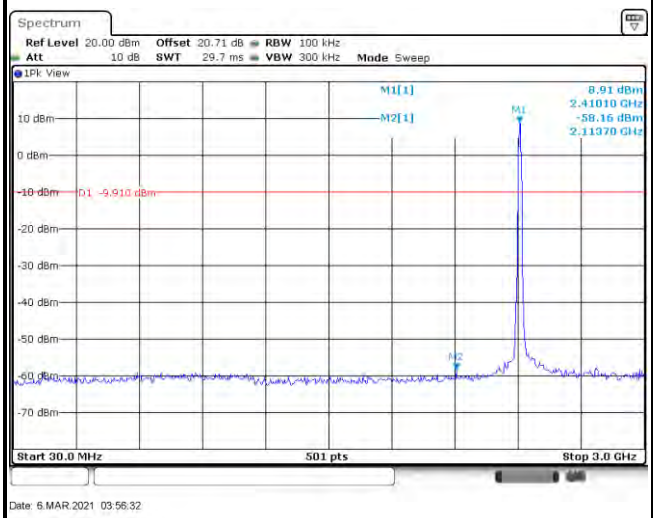
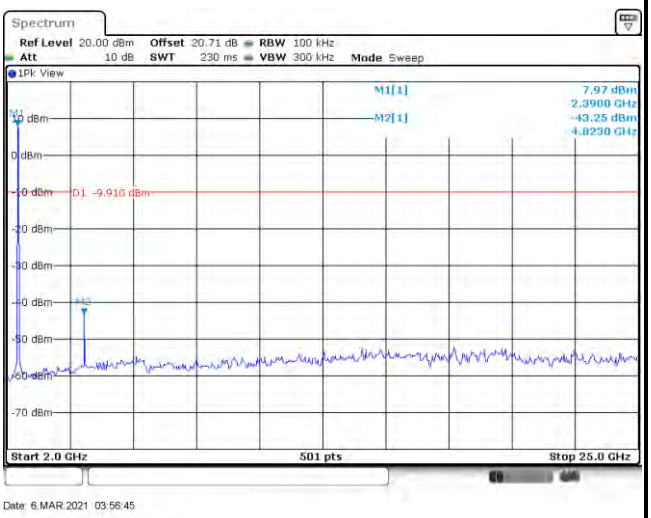
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11n HT20	Test Channel :	13

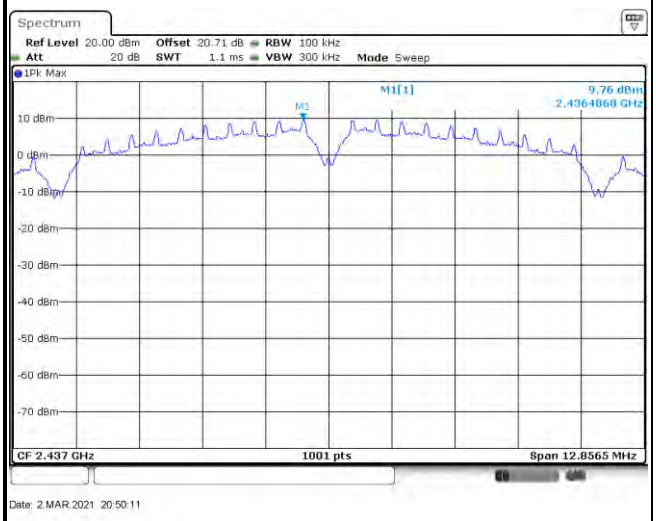
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

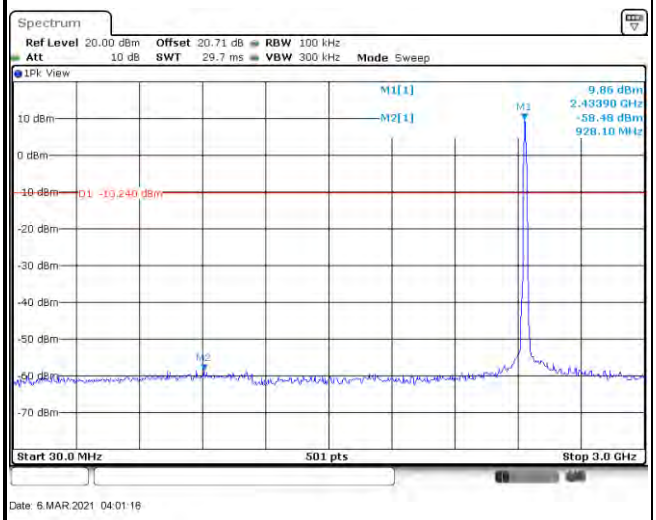
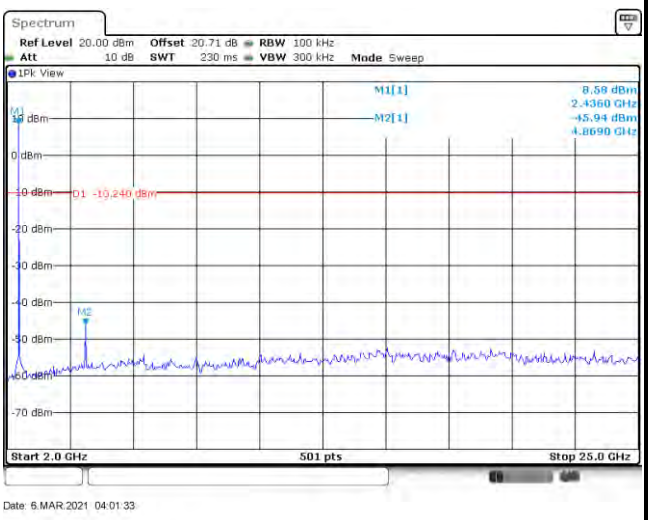
Number of TX = 2, Ant. 2 (Measured)

Test Mode :	802.11b	Test Channel :	01

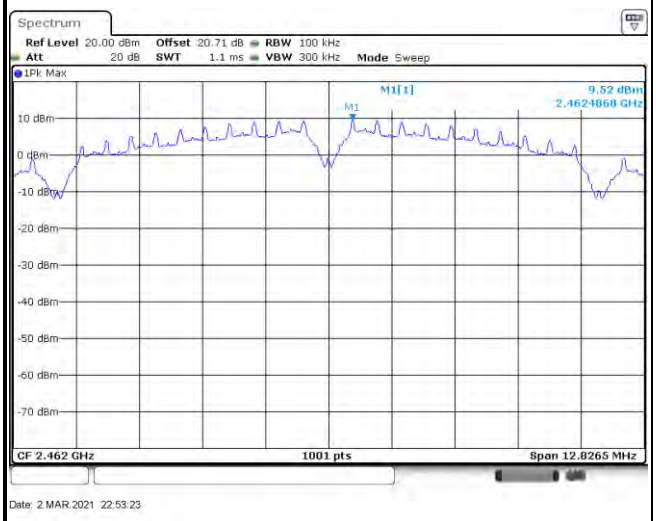
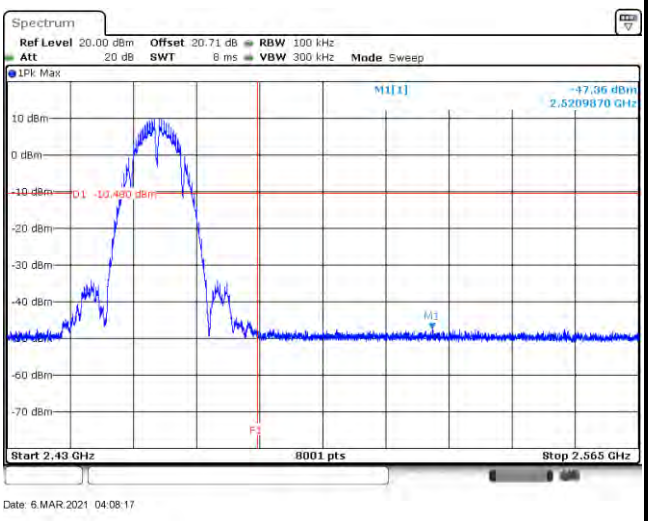
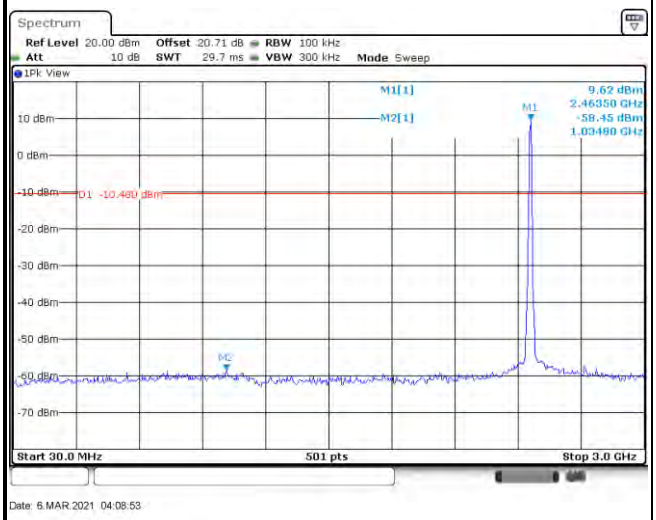
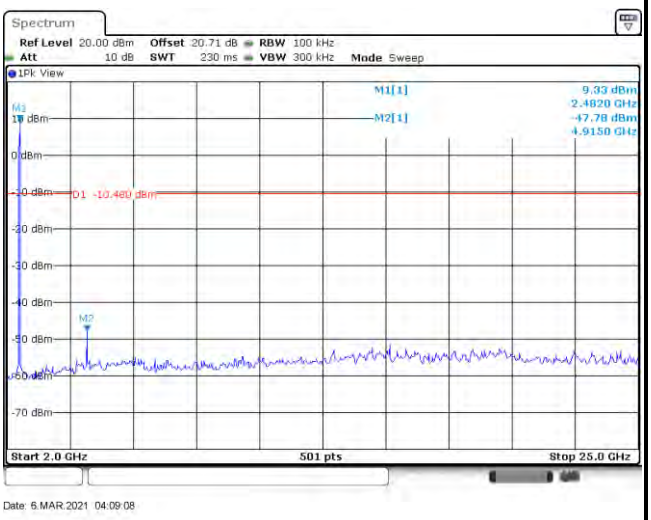
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11b	Test Channel :	06

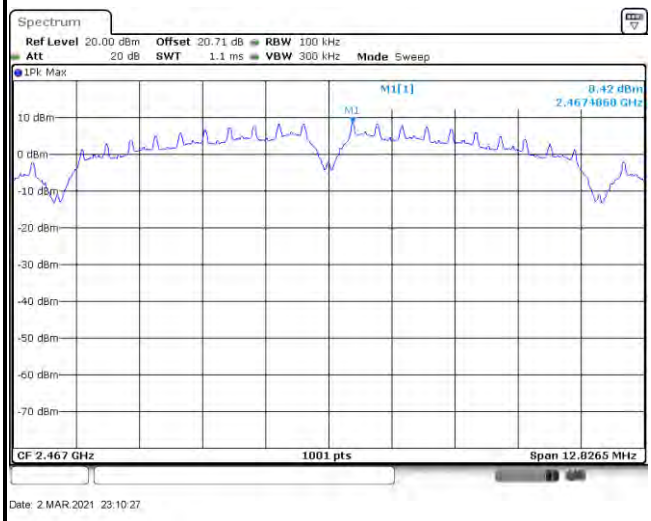
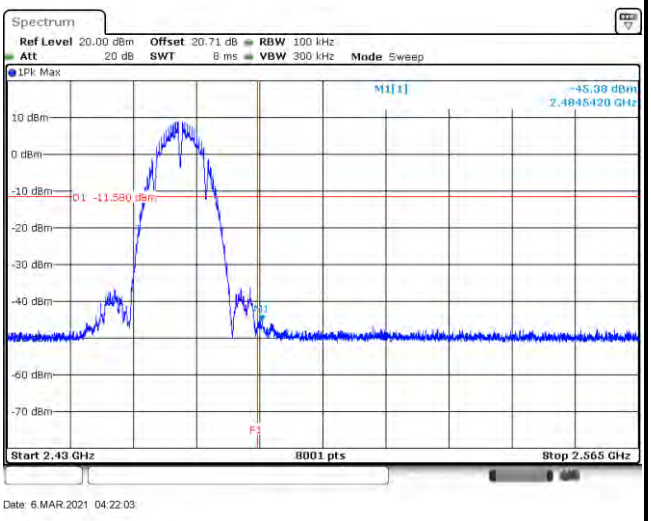
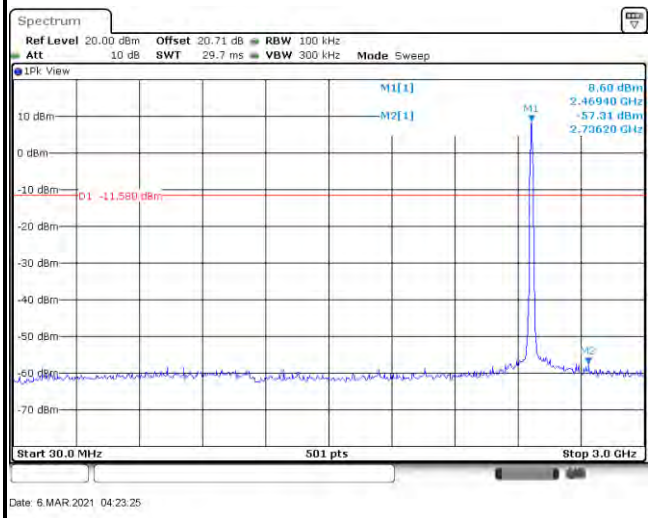
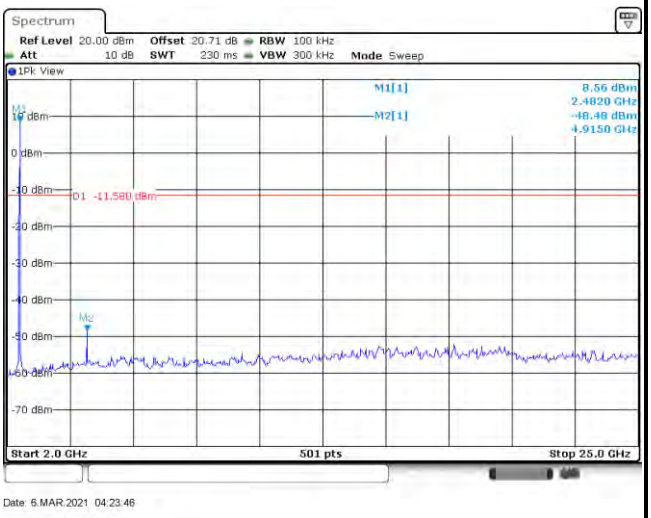
100kHz PSD reference Level	Channel Plot
	

Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	

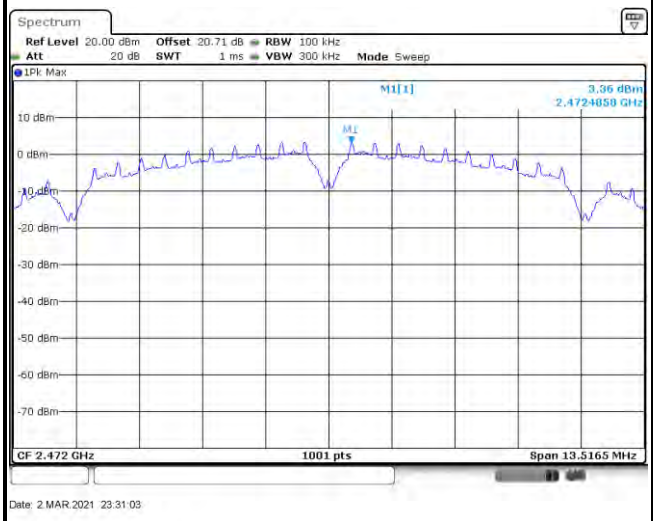
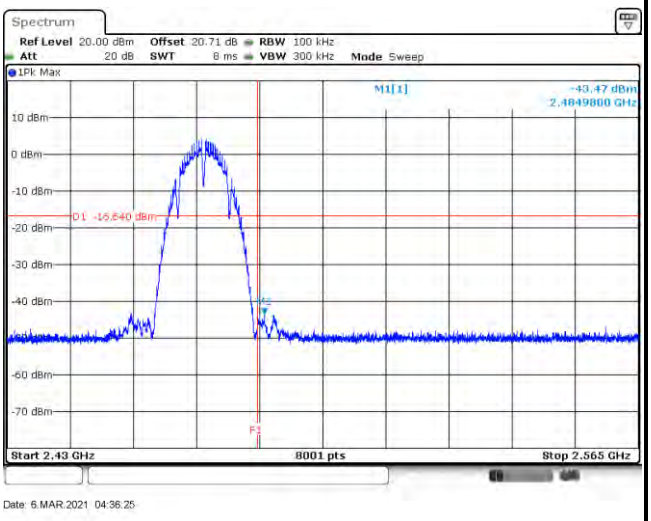
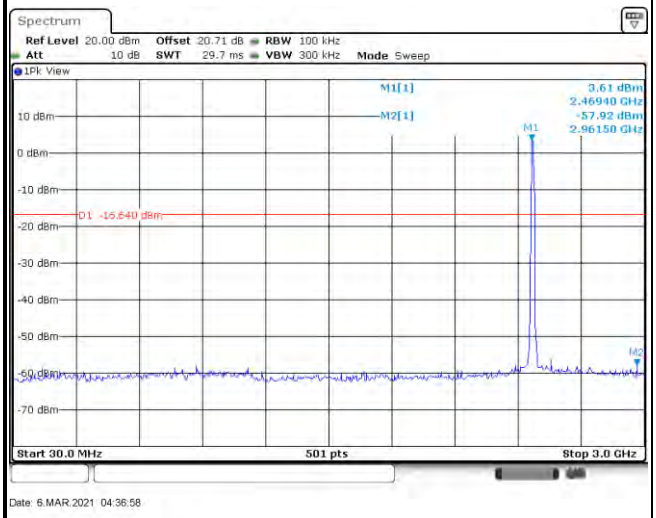
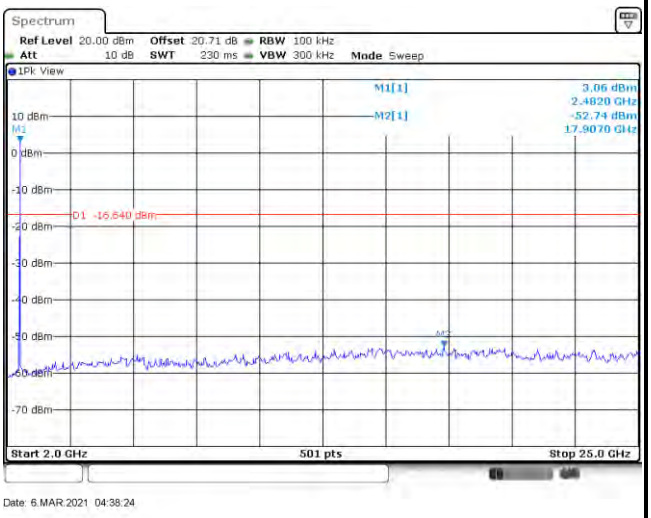
Test Mode :	802.11b	Test Channel :	11

100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

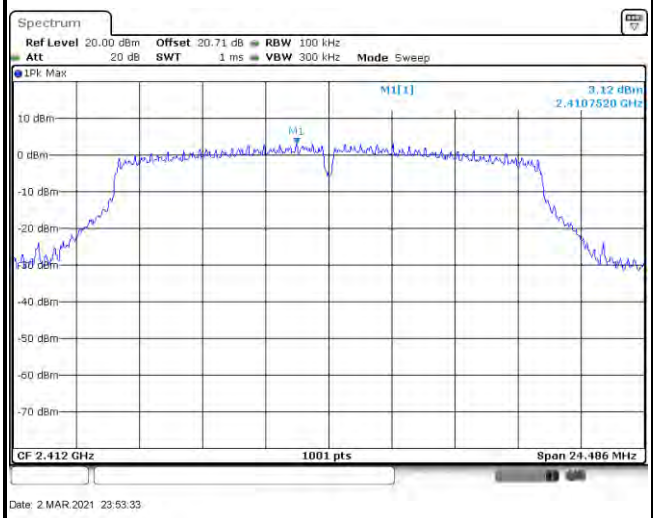
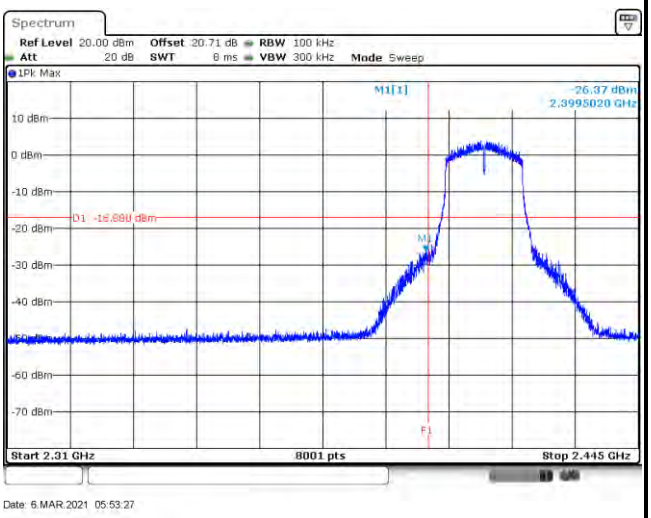
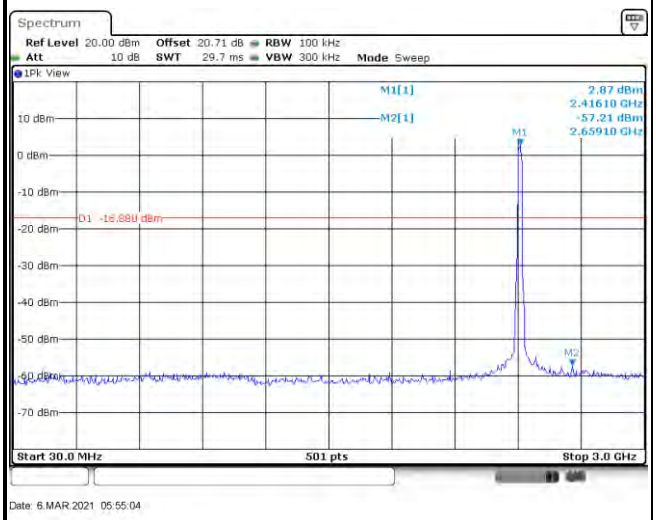
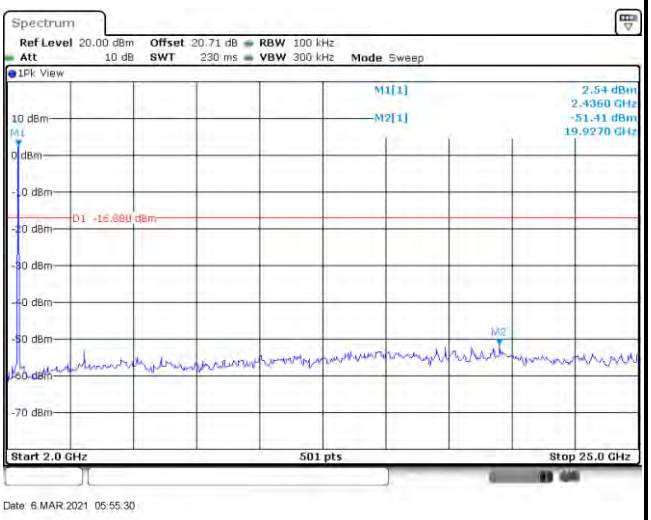
Test Mode :	802.11b	Test Channel :	12

100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

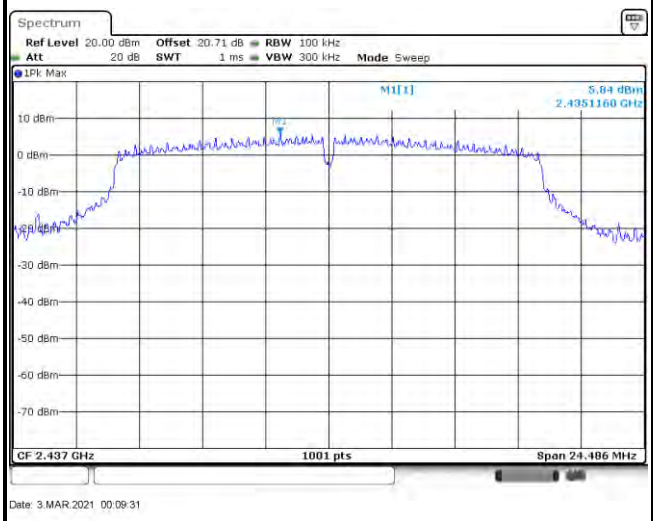
Test Mode :	802.11b	Test Channel :	13

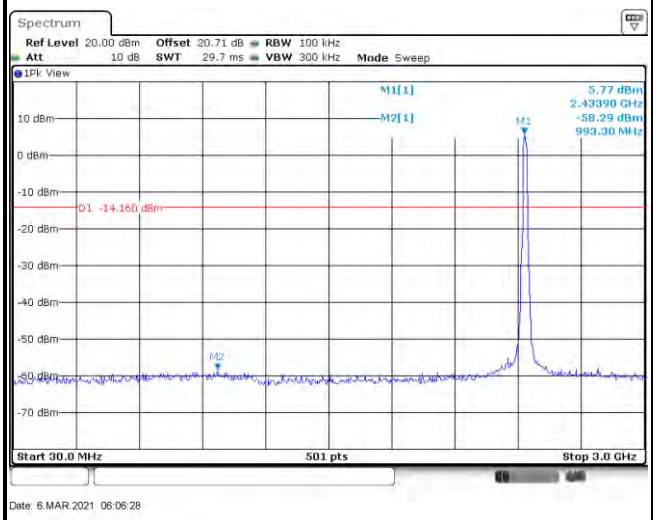
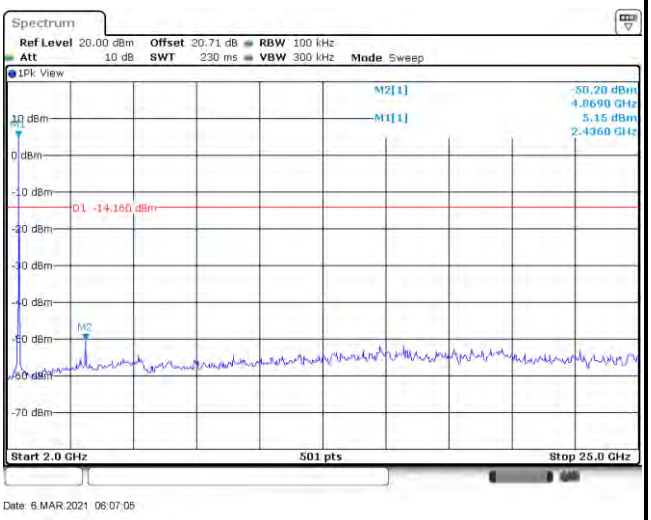
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11g	Test Channel :	01

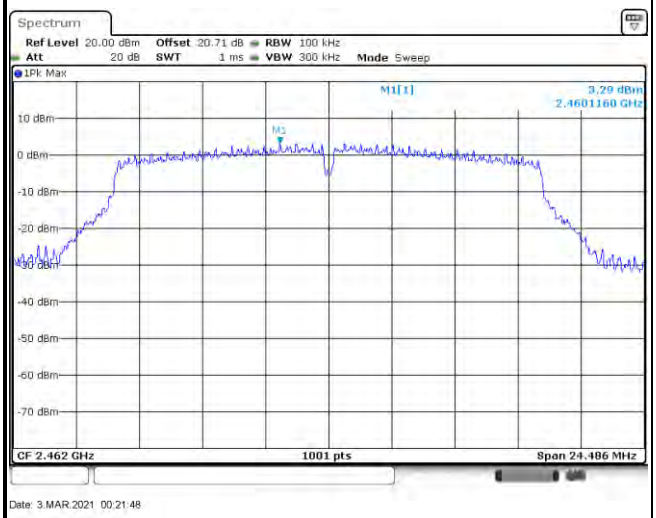
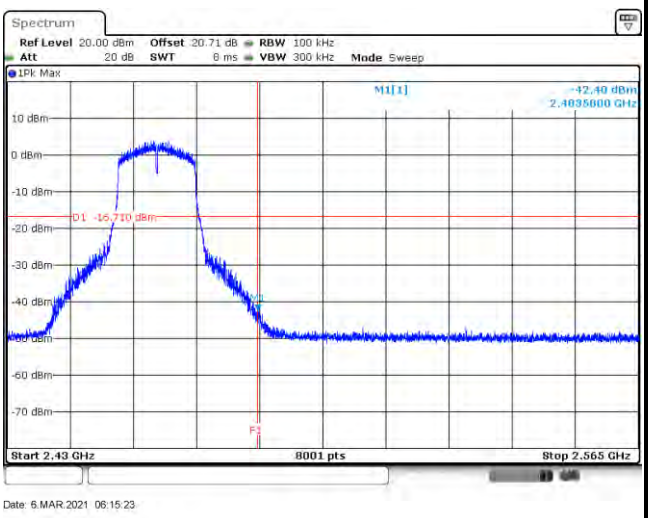
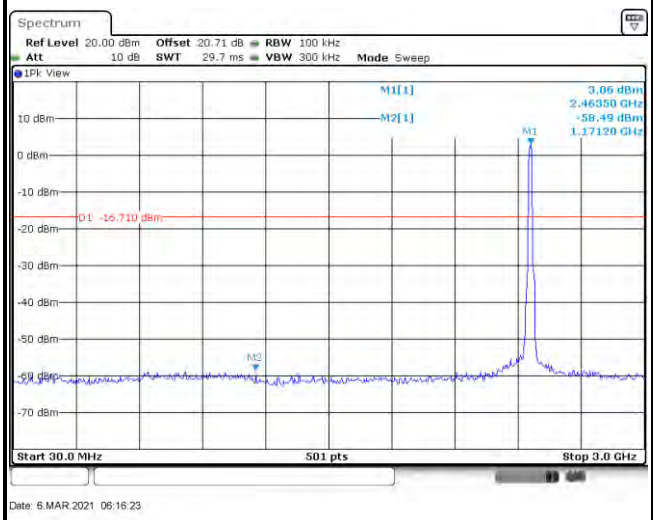
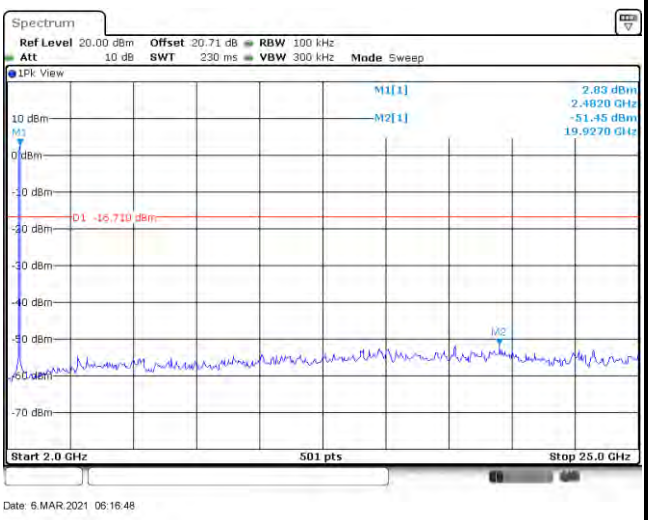
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11g	Test Channel :	06

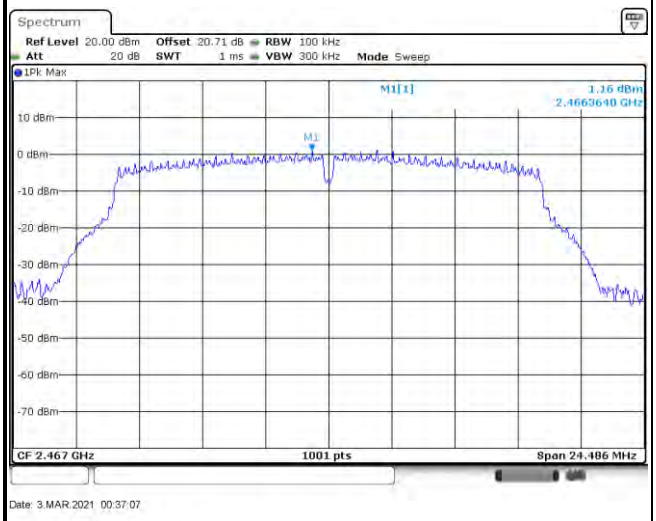
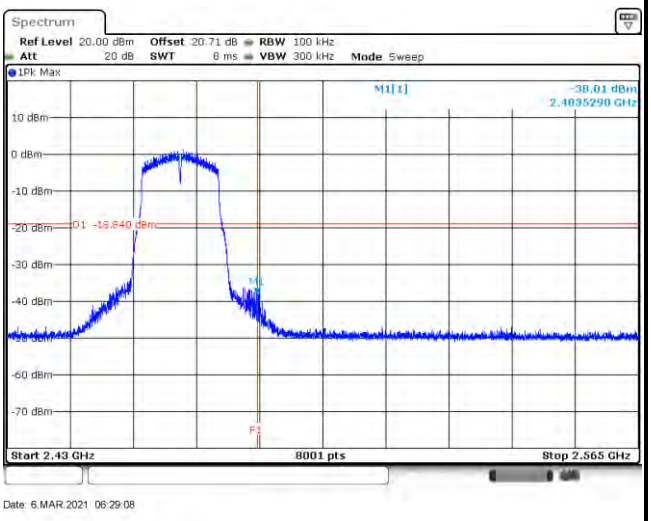
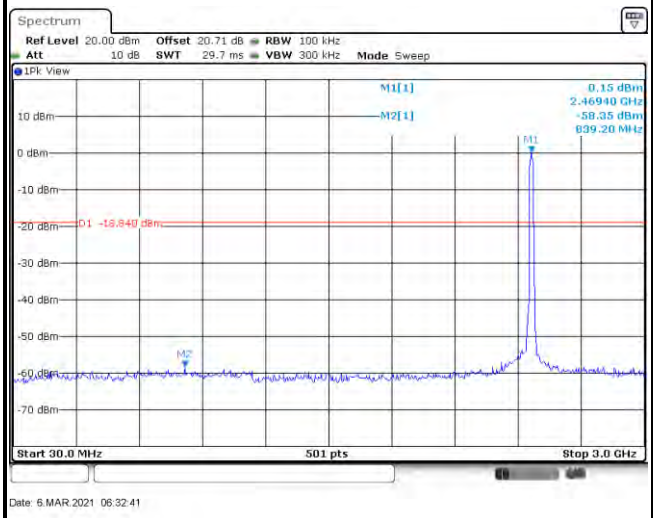
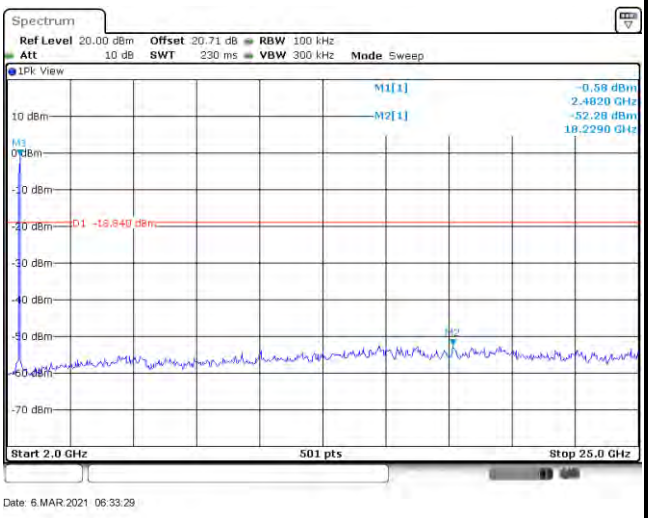
100kHz PSD reference Level	Channel Plot
	

Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	

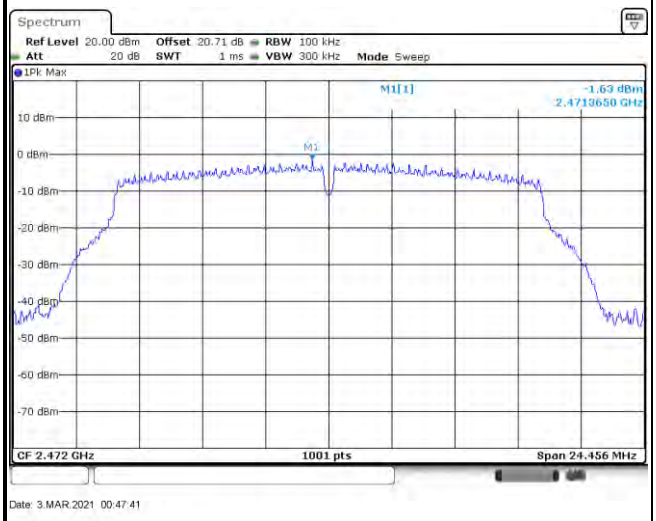
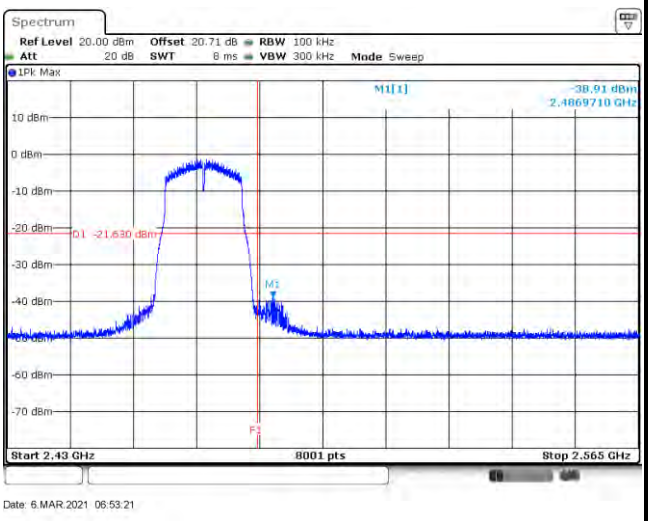
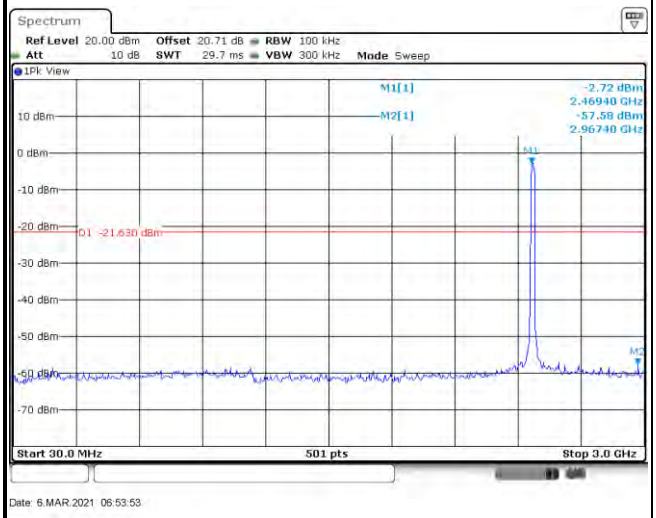
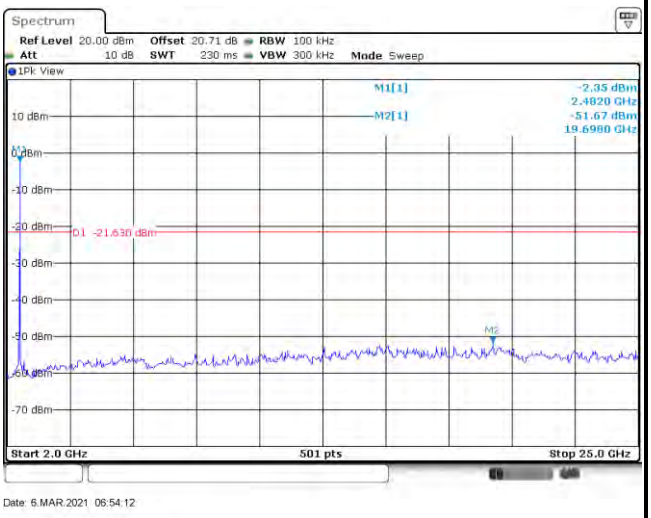
Test Mode :	802.11g	Test Channel :	11

100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

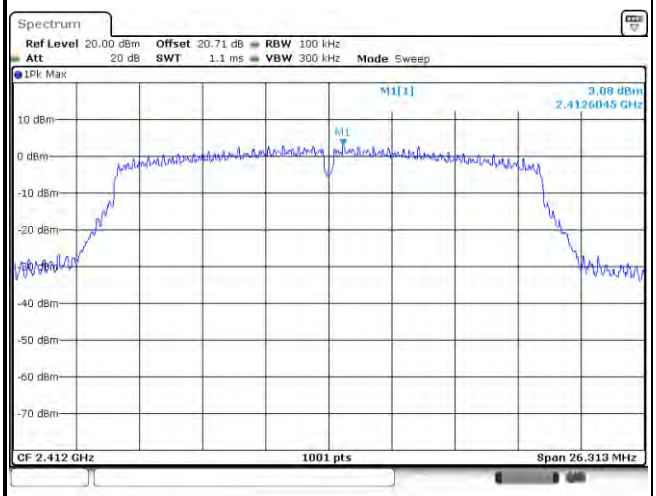
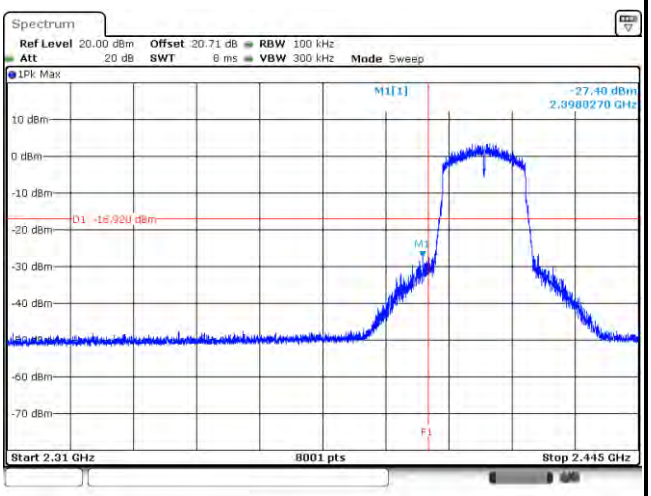
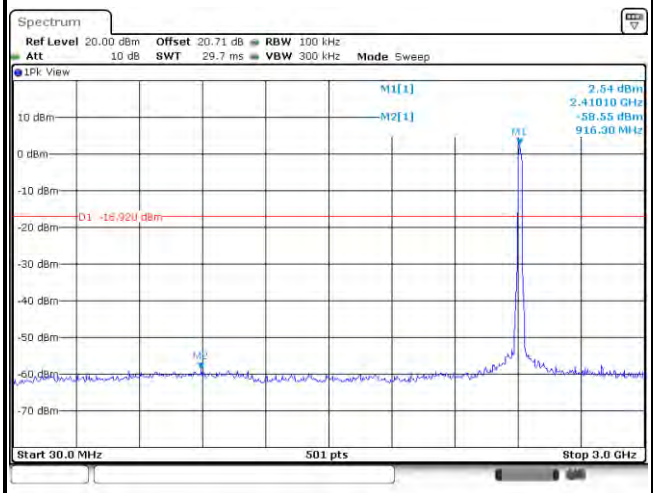
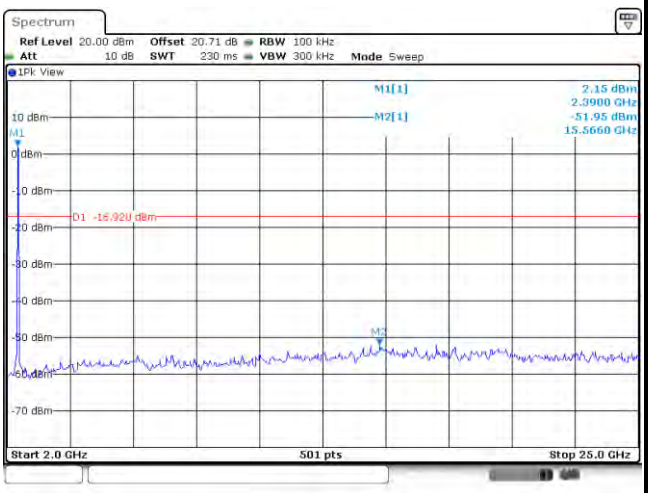
Test Mode :	802.11g	Test Channel :	12

100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

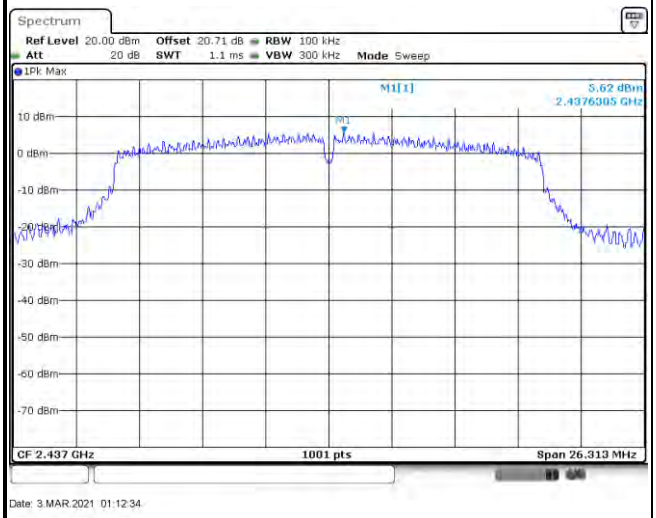
Test Mode :	802.11g	Test Channel :	13

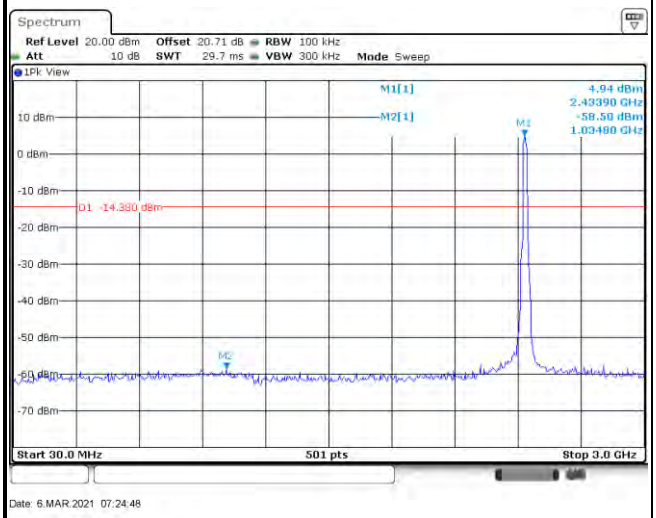
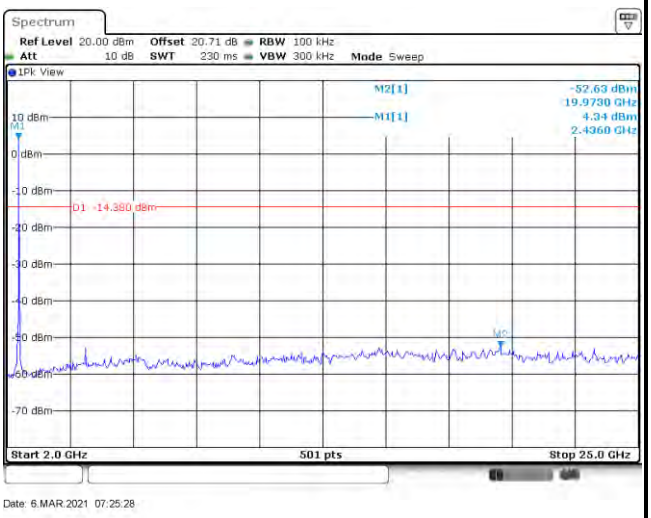
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11n HT20	Test Channel :	01

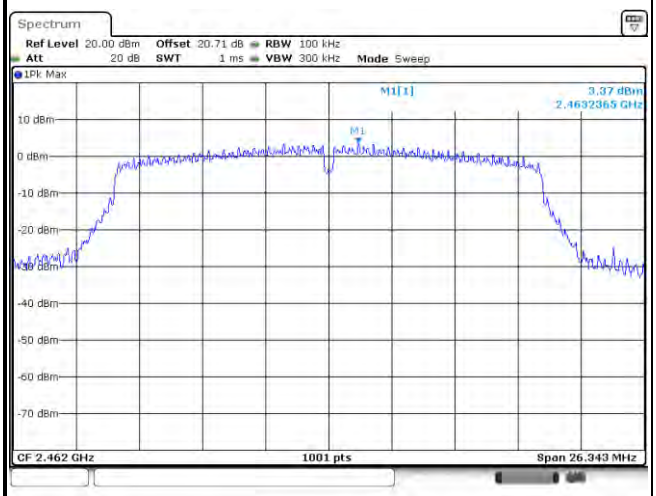
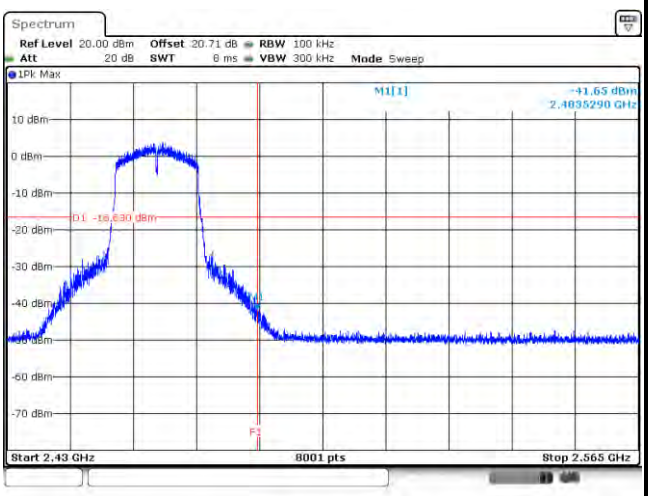
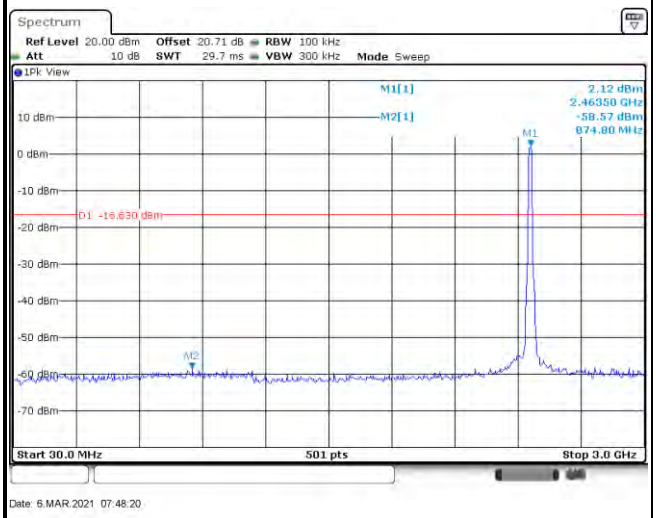
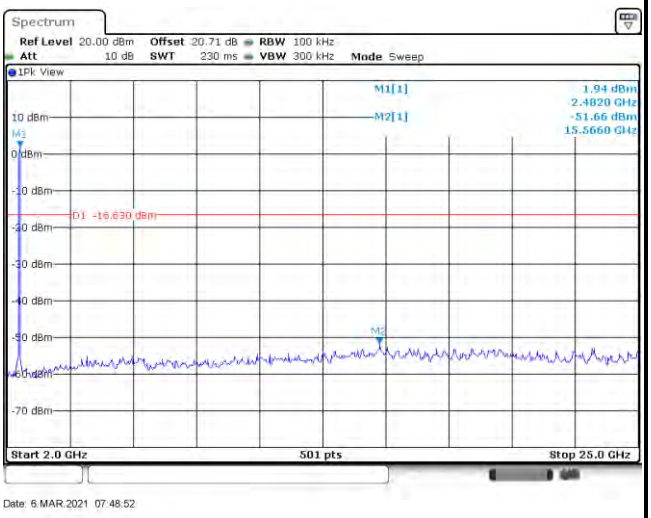
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	

Test Mode :	802.11n HT20	Test Channel :	06

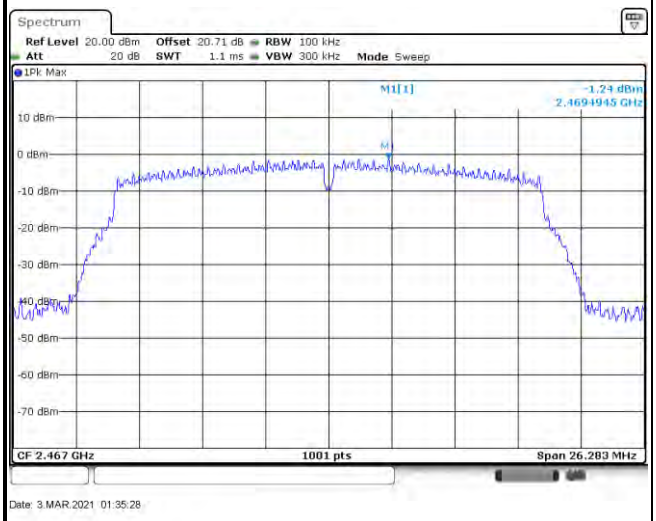
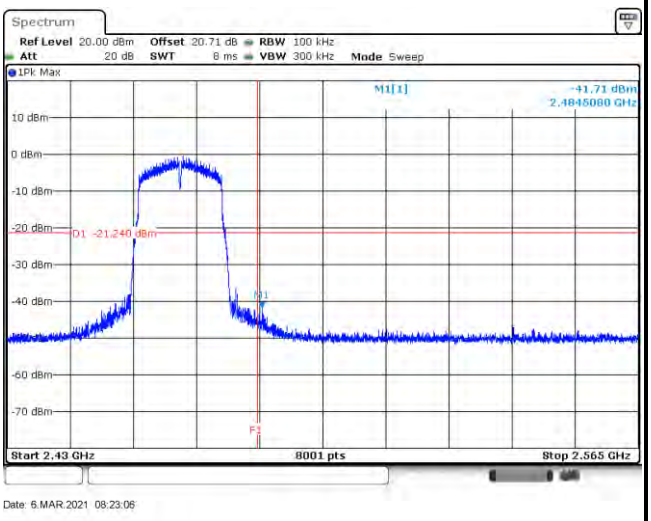
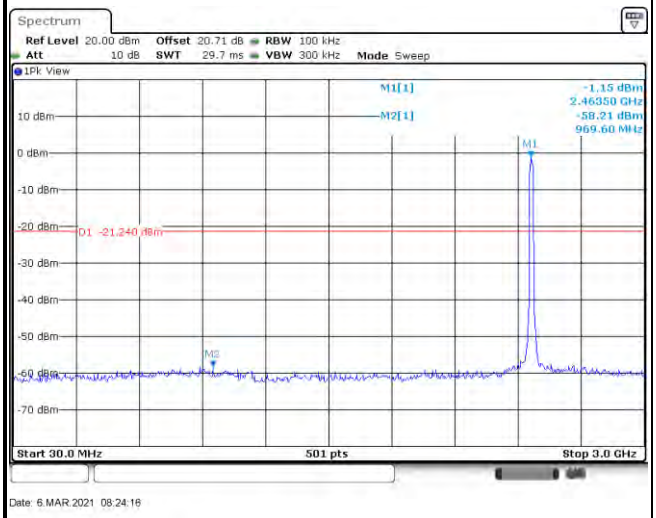
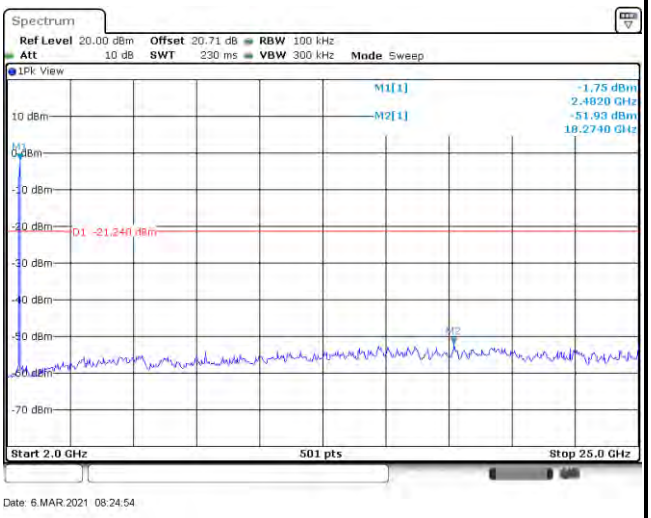
100kHz PSD reference Level	Channel Plot
	

Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	

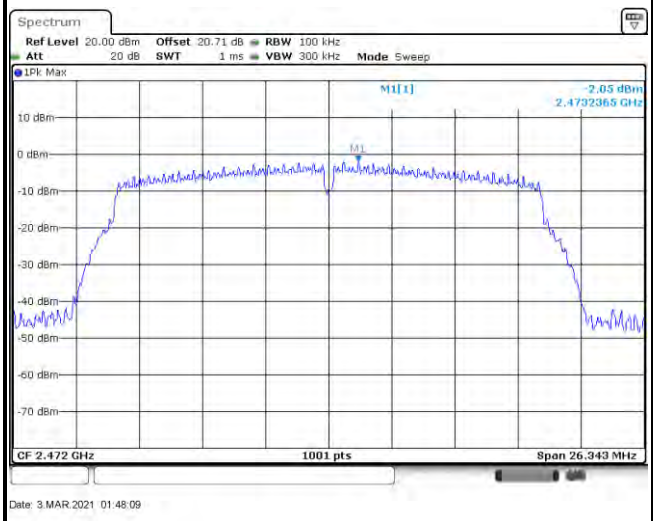
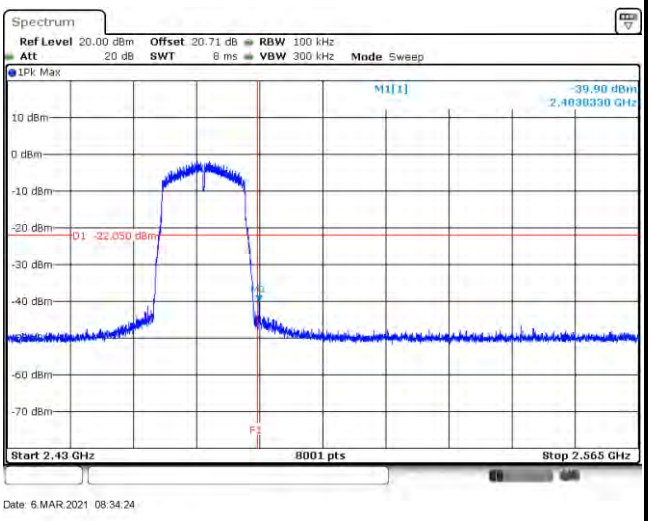
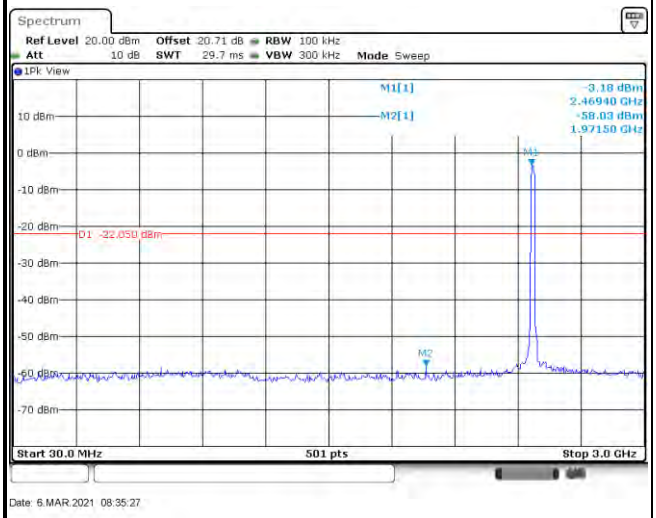
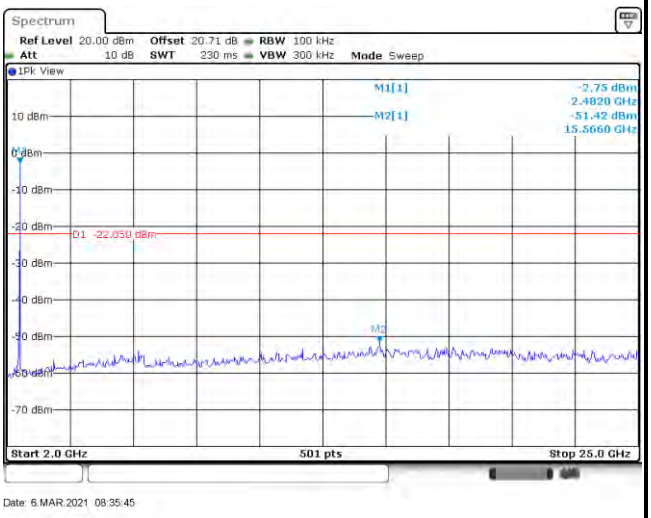
Test Mode :	802.11n HT20	Test Channel :	11

100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11n HT20	Test Channel :	12

100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11n HT20	Test Channel :	13

100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

3.5 Radiated Band Edges and Spurious Emission Measurement

3.5.1 Limit of Radiated band edge and Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.5.2 Measuring Instruments

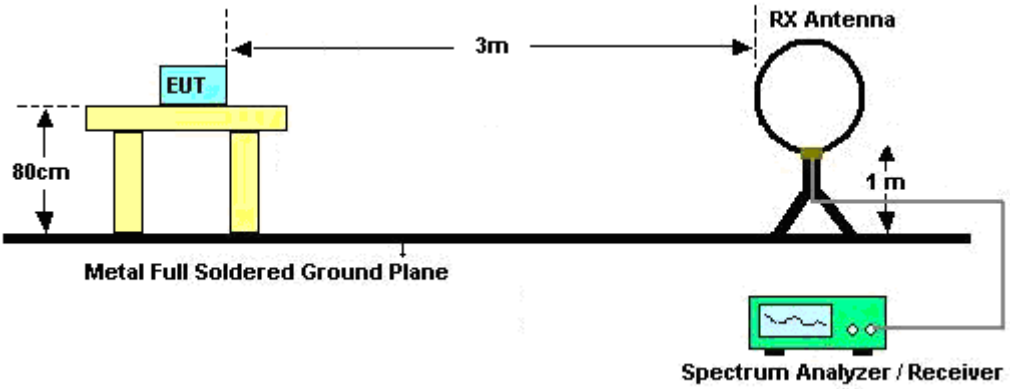
See list of measuring equipment of this test report.

3.5.3 Test Procedures

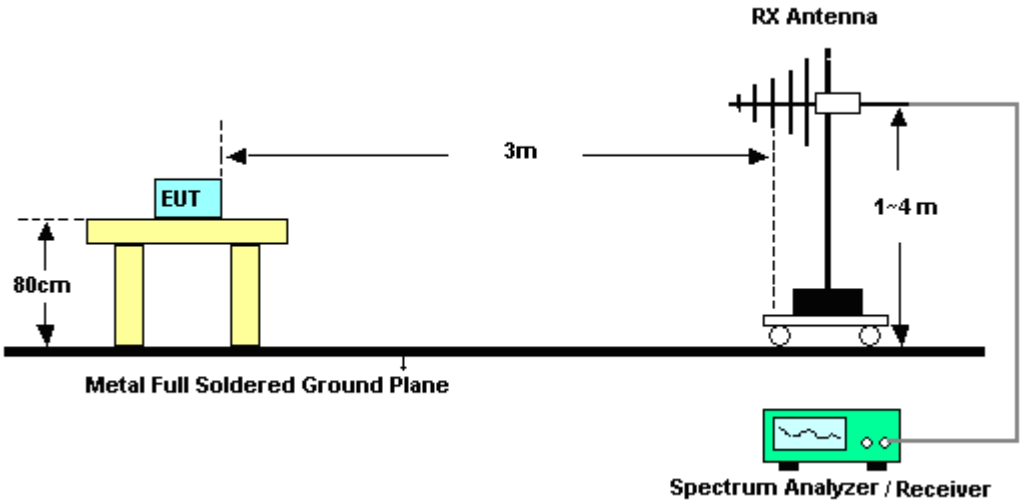
1. The testing follows the ANSI C63.10 Section 11.12.1 Radiated emission measurements.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter for frequency below 1 GHz and 1.5 meter for frequency above 1 GHz respectively above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For testing below 1 GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1 GHz, the emission level of the EUT in peak mode was 20 dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
8. Use the following spectrum analyzer settings:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW = 100 kHz for f < 1 GHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
   (3) Set RBW = 1 MHz, VBW= 3 MHz for f ≥ 1 GHz for peak measurement.
   For average measurement:
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

3.5.4 Test Setup

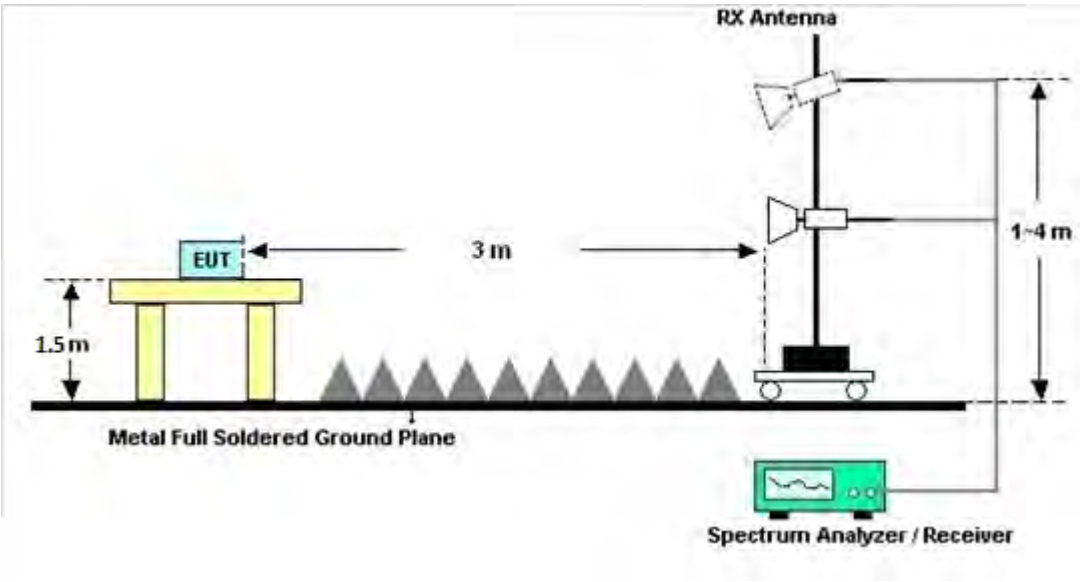
For radiated emissions below 30MHz



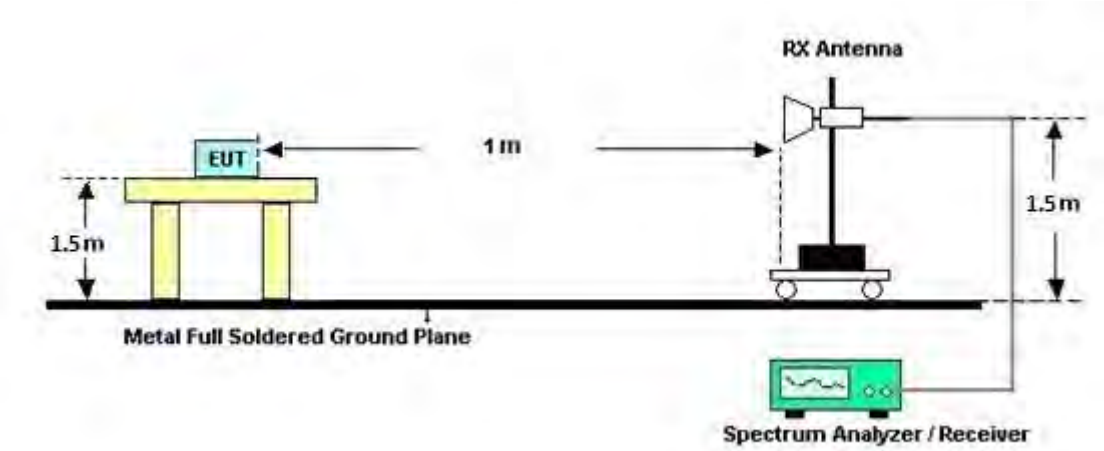
For radiated emissions from 30MHz to 1GHz



For radiated test from 1GHz to 18GHz



For radiated test above 18GHz



3.5.5 Test Results of Radiated Spurious Emissions (9kHz ~ 30MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.

3.5.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C and D.

3.5.7 Duty Cycle

Please refer to Appendix E.

3.5.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix C and D.

3.6 AC Conducted Emission Measurement

3.6.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

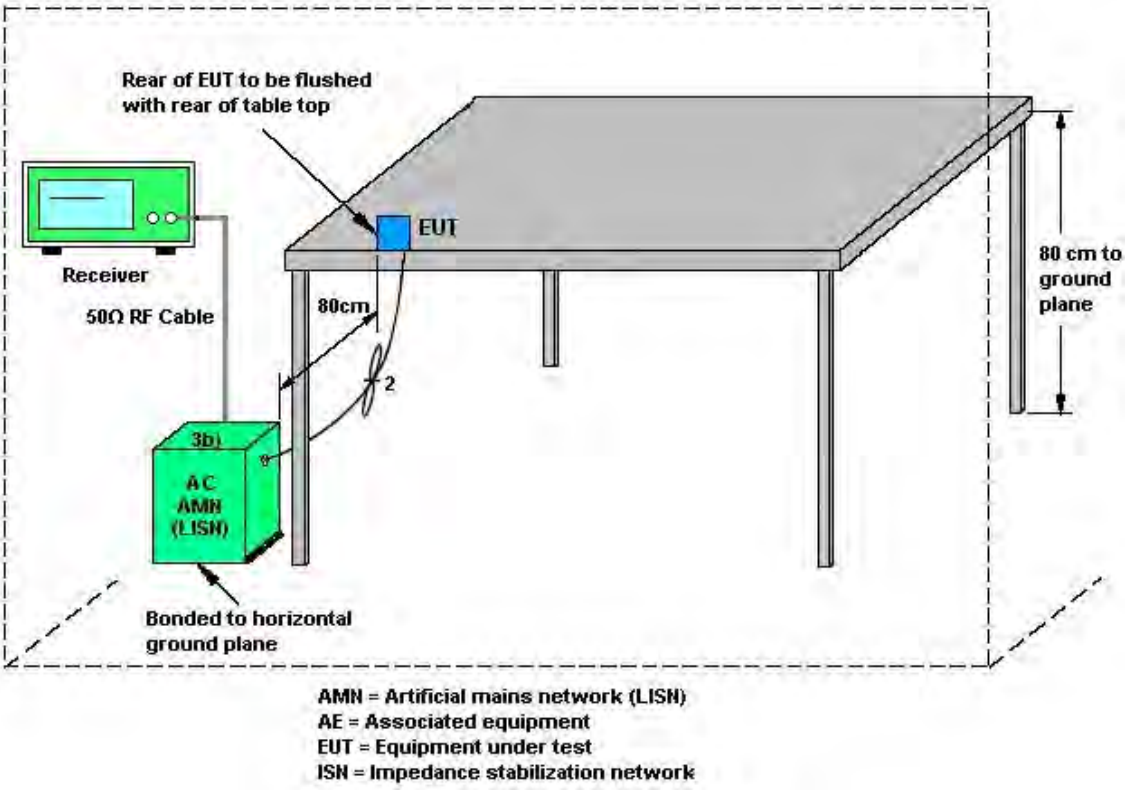
3.6.2 Measuring Instruments

See list of measuring equipment of this test report.

3.6.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN shall be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF bandwidth = 9kHz) with Maximum Hold Mode.

3.6.4 Test Setup



3.6.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

3.7 Antenna Requirements

3.7.1 Standard Applicable

If directional gain of transmitting Antennas is greater than 6 dBi, the power shall be reduced by the same level in dB comparing to gain minus 6 dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the rule.

3.7.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.7.3 Antenna Gain

<CDD Modes >

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

For CDD transmissions, directional gain is calculated as

Directional gain = G_{ANT} + Array Gain, where Array Gain is as follows.

For power spectral density (PSD) measurements on all devices,

Array Gain = 10 log(N_{ANT}/N_{SS}=1) dB.

For power measurements on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$.

Directional gain may be calculated by using the formulas applicable to equal gain antennas with G_{ANT} set equal to the gain of the antenna having the highest gain;

The EUT supports CDD mode.

For power, the directional gain G_{ANT} is set equal to the antenna having the highest gain, i.e., F)2)f)i).

For PSD, the directional gain calculation is following F)2)f)ii) of KDB 662911 D01 v02r01.

The power and PSD limit should be modified if the directional gain of EUT is over 6 dBi,

The directional gain “DG” is calculated as following table.

<CDD Modes>

	Ant. 1 (dBi)	Ant. 2 (dBi)	DG for Power (dBi)	DG for PSD (dBi)	Power Limit Reduction (dB)	PSD Limit Reduction (dB)
2.4 GHz	3.20	3.70	3.70	6.46	0.00	0.46

Power Limit Reduction = DG(Power) – 6dBi, (min = 0)

PSD Limit Reduction = DG(PSD) – 6dBi, (min = 0)

4 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Loop Antenna	R&S	HFH2-Z2E	100840	9kHz~30MHz	Jun. 16, 2020	Mar. 04, 2021~ Mar. 26, 2021	Jun. 15, 2021	Radiation (03CH02-CA)
Bilog Antenna	TESEQ	6111D	50392	30MHz~1GHz	Jul. 29, 2020	Mar. 04, 2021~ Mar. 26, 2021	Jul. 28, 2021	Radiation (03CH02-CA)
Horn Antenna	SCHWARZBECK	BBHA 9120D	01895	1GHz~18GHz	Aug. 28, 2020	Mar. 04, 2021~ Mar. 26, 2021	Aug. 27, 2021	Radiation (03CH02-CA)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA9170	00842	18GHz~40GHz	Jul. 27, 2020	Mar. 04, 2021~ Mar. 26, 2021	Jul. 26, 2021	Radiation (03CH02-CA)
Amplifier	SONOMA	310N	372240	N/A	Aug. 12, 2020	Mar. 04, 2021~ Mar. 26, 2021	Aug. 11, 2021	Radiation (03CH02-CA)
Preamplifier	Keysight	83017A	MY53270321	1GHz~26.5GHz	Jul. 28, 2020	Mar. 04, 2021~ Mar. 26, 2021	Jul. 27, 2021	Radiation (03CH02-CA)
Preamplifier	EMEC	EMC18G40G	060725	18G-40G	Aug. 07, 2020	Mar. 04, 2021~ Mar. 26, 2021	Aug. 06, 2021	Radiation (03CH02-CA)
Preamplifier	E-instrument	ERA-100M-18G-56-01-A70	EC1900251	1GHz~18GHz	Nov. 26, 2019	Mar. 04, 2021~ Mar. 26, 2021	Nov. 25, 2021	Radiation (03CH02-CA)
EMI Test Receiver	Rohde & Schwarz	ESR7	102177	9kHz~7GHz	Jul. 16, 2020	Mar. 04, 2021~ Mar. 26, 2021	Jul. 15, 2021	Radiation (03CH02-CA)
Spectrum Analyzer	Keysight	N9010A	MY57420221	10Hz~44GHz	Sep. 11, 2020	Mar. 04, 2021~ Mar. 26, 2021	Sep. 10, 2021	Radiation (03CH02-CA)
Filter	Wainwright	Whkx8-5872.5-6750-18000-40ST	SN8	6.75G Highpass	Jul. 24, 2020	Mar. 04, 2021~ Mar. 26, 2021	Jul. 23, 2021	Radiation (03CH02-CA)
Filter	Wainwright	WHKX12-2700-3000-18000-60ST	SN10	3G Highpass	Jul. 24, 2020	Mar. 04, 2021~ Mar. 26, 2021	Jul. 23, 2021	Radiation (03CH02-CA)
Filter	Wainwright	WLK12-1200-1272-11000-40SS	SN2	1.2G Low Pass	Jul. 24, 2020	Mar. 04, 2021~ Mar. 26, 2021	Jul. 23, 2021	Radiation (03CH02-CA)
Hygrometer	TESEO	608-H1	45142602	N/A	Aug. 05, 2020	Mar. 04, 2021~ Mar. 26, 2021	Aug. 04, 2021	Radiation (03CH02-CA)
Controller	ChainTek	3000-1	N/A	Control Turn table & Ant Mast	N/A	Mar. 04, 2021~ Mar. 26, 2021	N/A	Radiation (03CH02-CA)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Mar. 04, 2021~ Mar. 26, 2021	N/A	Radiation (03CH02-CA)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Mar. 04, 2021~ Mar. 26, 2021	N/A	Radiation (03CH02-CA)
Software	Audix	E3	N/A	N/A	N/A	Mar. 04, 2021~ Mar. 26, 2021	N/A	Radiation (03CH02-CA)
Hygrometer	Testo	608-H1	45142595	N/A	Aug. 05, 2020	Mar. 01, 2021~ Mar. 10, 2021	Aug. 04, 2021	Conducted (TH01-CA)
Power Sensor	DARE!!	RPR3006W	RPR6W-1901026	10MHz-6GHz	Jun. 24, 2020	Mar. 01, 2021~ Mar. 10, 2021	Jun. 23, 2021	Conducted (TH01-CA)
Spectrum Analyzer	Rohde & Schwarz	FSV40	101089	10Hz-40GHz	Sep. 14, 2020	Mar. 01, 2021~ Mar. 10, 2021	Sep. 13, 2021	Conducted (TH01-CA)
Switch Box & RF Cable	EM Electronics	EMSW26	1090304	N/A	Dec. 30, 2020	Mar. 01, 2021~ Mar. 10, 2021	Dec. 29, 2021	Conducted (TH01-CA)

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
LISN	TESEQ	NNB51	47407	N/A	Jul. 06, 2020	Mar. 12, 2021	Jul. 05, 2021	Conduction (CO01-CA)
EMI Test Receiver	R&S	ESR7	102177	9KHz~7GHz	Jul. 16, 2020	Mar. 12, 2021	Jul. 15, 2021	Conduction (CO01-CA)
Pulse limiter with 10dB attenuation	R&S	VTSD 9561-F N	9561-F-N00412	N/A	Jul. 08, 2020	Mar. 12, 2021	Jul. 07, 2021	Conduction (CO01-CA)
Test Software	R&S	EMC32 V10.30.0	N/A	N/A	N/A	Mar. 12, 2021	N/A	Conduction (CO01-CA)

5 Uncertainty of Evaluation

Uncertainty of Conducted Emission Measurement (150kHz ~ 30MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.2

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.50

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	6.10

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	6.50

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Andy Kao/Kaying Xiong	Temperature:	17~22.2	℃
Test Date:	2021/3/1~2021/3/10	Relative Humidity:	31~47.5	%

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

2.4GHz Band MIMO										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW (MHz)		6dB BW (MHz)		6dB BW Limit (MHz)	Pass/Fail
					Ant1	Ant2	Ant1	Ant2		
11b	1Mbps	2	1	2412	13.94	13.64	9.05	9.01	0.50	Pass
11b	1Mbps	2	6	2437	13.84	13.64	9.03	9.03	0.50	Pass
11b	1Mbps	2	11	2462	13.84	13.54	9.05	9.03	0.50	Pass
11b	1Mbps	2	12	2467	13.74	13.44	9.03	9.03	0.50	Pass
11b	1Mbps	2	13	2472	13.49	13.34	9.03	9.01	0.50	Pass
11g	6Mbps	2	1	2412	16.73	16.53	16.32	16.32	0.50	Pass
11g	6Mbps	2	6	2437	16.98	16.93	16.32	16.32	0.50	Pass
11g	6Mbps	2	11	2462	16.78	16.53	16.32	16.32	0.50	Pass
11g	6Mbps	2	12	2467	16.68	16.53	16.32	16.30	0.50	Pass
11g	6Mbps	2	13	2472	16.63	16.48	16.32	16.30	0.50	Pass
HT20	MCS0	2	1	2412	17.78	17.63	17.56	17.56	0.50	Pass
HT20	MCS0	2	6	2437	18.08	17.83	17.56	17.54	0.50	Pass
HT20	MCS0	2	11	2462	17.93	17.63	17.56	17.56	0.50	Pass
HT20	MCS0	2	12	2467	17.73	17.63	17.54	17.52	0.50	Pass
HT20	MCS0	2	13	2472	17.68	17.58	17.56	17.56	0.50	Pass

Report Number : FR210302003C

TEST RESULTS DATA
Peak Output Power

2.4GHz Band MIMO																	
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power (dBm)		EIRP Power Limit (dBm)		Pass /Fail
					Ant1	Ant2	SUM	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	
11b	1Mbps	2	1	2412	18.76	18.78	21.78	30.00		3.70		25.48		36.00		Pass
11b	1Mbps	2	6	2437	18.78	18.79	21.80	30.00		3.70		25.50		36.00		Pass
11b	1Mbps	2	11	2462	18.79	18.79	21.80	30.00		3.70		25.50		36.00		Pass
11b	1Mbps	2	12	2467	18.71	18.73	21.73	30.00		3.70		25.43		36.00		Pass
11b	1Mbps	2	13	2472	13.74	13.96	16.86	30.00		3.70		20.56		36.00		Pass
11g	6Mbps	2	1	2412	22.56	23.25	25.93	30.00		3.70		29.63		36.00		Pass
11g	6Mbps	2	6	2437	23.48	23.86	26.68	30.00		3.70		30.38		36.00		Pass
11g	6Mbps	2	11	2462	22.74	23.32	26.05	30.00		3.70		29.75		36.00		Pass
11g	6Mbps	2	12	2467	21.30	21.91	24.63	30.00		3.70		28.33		36.00		Pass
11g	6Mbps	2	13	2472	19.52	19.84	22.69	30.00		3.70		26.39		36.00		Pass
HT20	MCS0	2	1	2412	22.23	22.44	25.35	30.00		3.70		29.05		36.00		Pass
HT20	MCS0	2	6	2437	23.76	23.87	26.83	30.00		3.70		30.53		36.00		Pass
HT20	MCS0	2	11	2462	23.04	23.27	26.17	30.00		3.70		29.87		36.00		Pass
HT20	MCS0	2	12	2467	20.98	20.51	23.76	30.00		3.70		27.46		36.00		Pass
HT20	MCS0	2	13	2472	19.96	19.48	22.74	30.00		3.70		26.44		36.00		Pass

Note: Measured power (dBm) has offset with cable loss.

TEST RESULTS DATA
Average Output Power

2.4GHz Band MMO											
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)			DG (dBi)		EIRP Power (dBm)	
					Ant1	Ant2	SUM	Ant1	Ant2	Ant1	Ant2
11b	1Mbps	2	1	2412	17.69	18.49	21.12	3.70		24.82	
11b	1Mbps	2	6	2437	17.79	18.09	20.95	3.70		24.65	
11b	1Mbps	2	11	2462	17.89	17.79	20.85	3.70		24.55	
11b	1Mbps	2	12	2467	16.49	16.79	19.65	3.70		23.35	
11b	1Mbps	2	13	2472	11.49	11.49	14.50	3.70		18.20	
11g	6Mbps	2	1	2412	15.39	16.19	18.82	3.70		22.52	
11g	6Mbps	2	6	2437	17.79	18.09	20.95	3.70		24.65	
11g	6Mbps	2	11	2462	15.79	15.89	18.85	3.70		22.55	
11g	6Mbps	2	12	2467	13.39	13.29	16.35	3.70		20.05	
11g	6Mbps	2	13	2472	10.59	10.69	13.65	3.70		17.35	
HT20	MCS0	2	1	2412	14.29	15.29	17.83	3.70		21.53	
HT20	MCS0	2	6	2437	17.89	18.09	21.00	3.70		24.70	
HT20	MCS0	2	11	2462	15.89	15.79	18.85	3.70		22.55	
HT20	MCS0	2	12	2467	10.89	10.99	13.95	3.70		17.65	
HT20	MCS0	2	13	2472	9.99	9.99	13.00	3.70		16.70	

Note: Measured power (dBm) has offset with cable loss.

Report Number : FR210302003C

TEST RESULTS DATA
Peak Power Spectral Density

2.4GHz Band MIMO												
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD (dBm/3kHz)			DG (dBi)		Peak PSD Limit (dBm/3kHz)		Pass/Fail
					Ant1	Ant2	Worse + 3.01	Ant1	Ant2	Ant1	Ant2	
11b	1Mbps	2	1	2412	-3.71	-3.60	-0.59	6.46		7.54		Pass
11b	1Mbps	2	6	2437	-3.65	-3.43	-0.42	6.46		7.54		Pass
11b	1Mbps	2	11	2462	-3.66	-3.65	-0.64	6.46		7.54		Pass
11b	1Mbps	2	12	2467	-5.29	-4.56	-1.55	6.46		7.54		Pass
11b	1Mbps	2	13	2472	-10.46	-9.94	-6.93	6.46		7.54		Pass
11g	6Mbps	2	1	2412	-8.88	-8.14	-5.13	6.46		7.54		Pass
11g	6Mbps	2	6	2437	-6.40	-5.72	-2.71	6.46		7.54		Pass
11g	6Mbps	2	11	2462	-8.47	-7.63	-4.62	6.46		7.54		Pass
11g	6Mbps	2	12	2467	-10.91	-10.52	-7.51	6.46		7.54		Pass
11g	6Mbps	2	13	2472	-13.78	-13.72	-10.71	6.46		7.54		Pass
HT20	MCS0	2	1	2412	-9.99	-8.65	-5.64	6.46		7.54		Pass
HT20	MCS0	2	6	2437	-5.70	-5.54	-2.53	6.46		7.54		Pass
HT20	MCS0	2	11	2462	-7.24	-7.67	-4.23	6.46		7.54		Pass
HT20	MCS0	2	12	2467	-13.31	-12.56	-9.55	6.46		7.54		Pass
HT20	MCS0	2	13	2472	-13.84	-13.67	-10.66	6.46		7.54		Pass

Measured power density (dBm) has offset with cable loss.

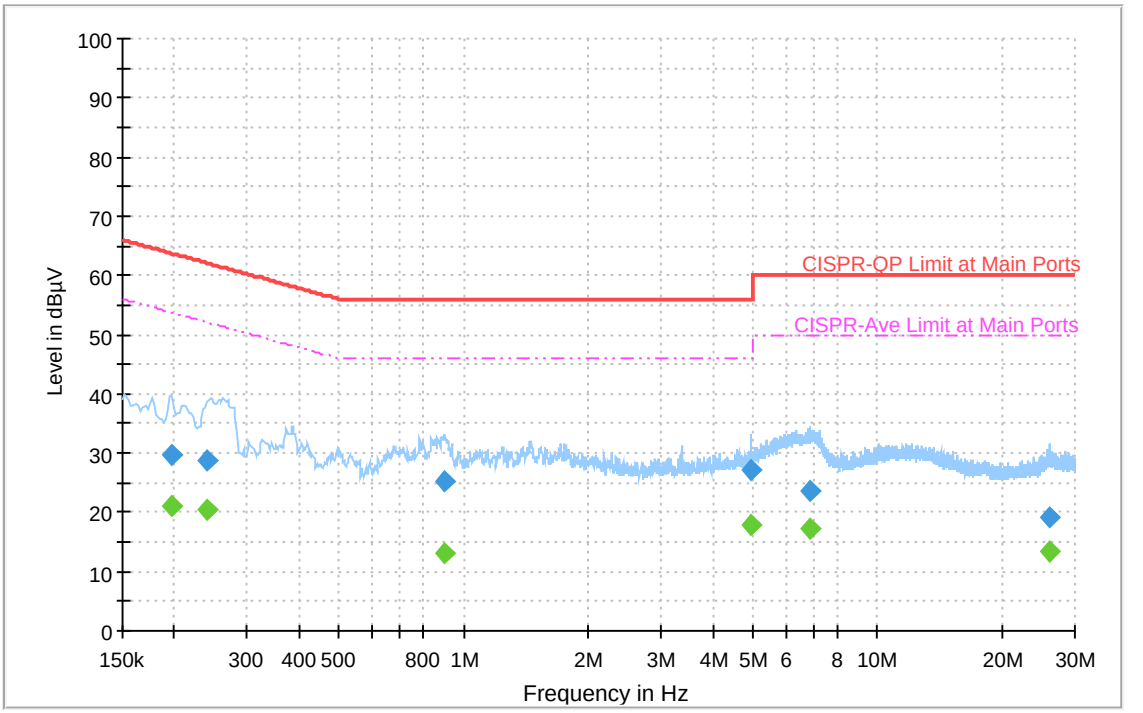
Appendix B. AC Conducted Emission Test Results

Test Engineer :	Janssen Wongso	**Temperature :**	18~21℃
		Relative Humidity :	40.6~44.8%

EUT Information

Site:	CO01-CA
Power:	120Vac/60Hz
Model:	Vesta
Mode:	1

Full Spectrum



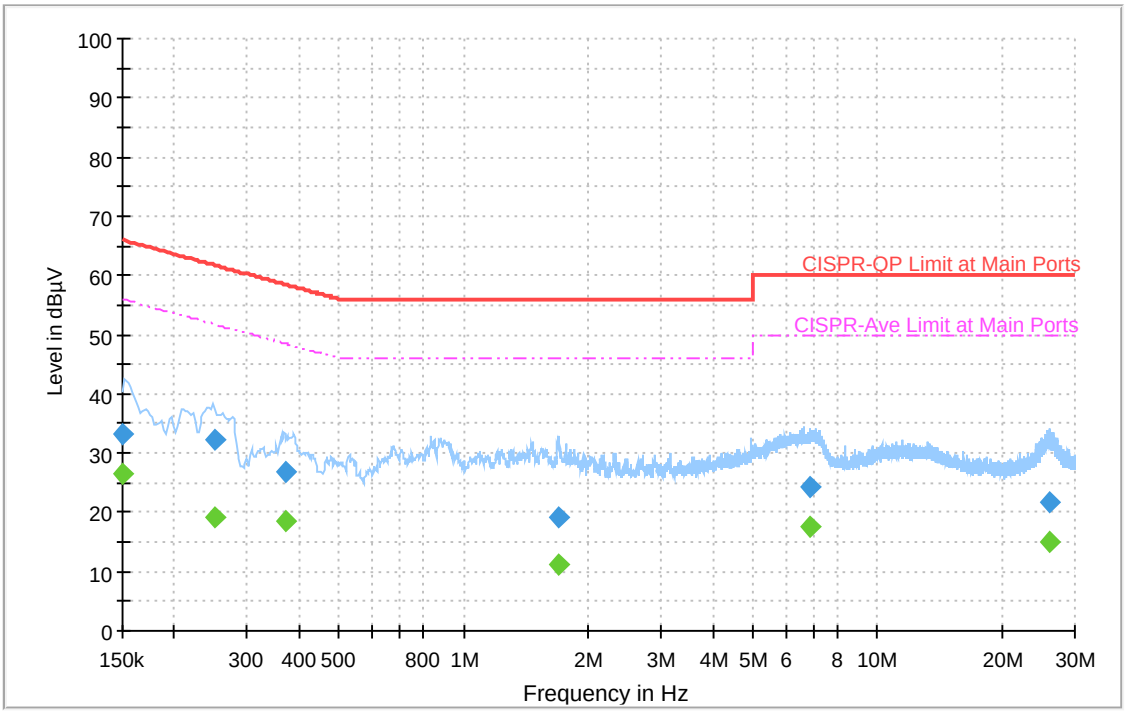
Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.197700	29.64	---	63.71	34.07	L1	OFF	20.0
0.197700	---	21.02	53.71	32.69	L1	OFF	20.0
0.240000	28.79	---	62.10	33.31	L1	OFF	20.0
0.240000	---	20.53	52.10	31.57	L1	OFF	20.0
0.904290	25.30	---	56.00	30.70	L1	OFF	20.0
0.904290	---	12.96	46.00	33.04	L1	OFF	20.0
4.933590	27.16	---	56.00	28.84	L1	OFF	20.1
4.933590	---	17.85	46.00	28.15	L1	OFF	20.1
6.859500	23.66	---	60.00	36.34	L1	OFF	20.1
6.859500	---	17.37	50.00	32.63	L1	OFF	20.1
26.133000	19.24	---	60.00	40.76	L1	OFF	20.6
26.133000	---	13.52	50.00	36.48	L1	OFF	20.6

EUT Information

Site:	CO01-CA
Power:	120Vac/60Hz
Model:	Vesta
Mode:	1

Full Spectrum



Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.150203	---	26.37	55.99	29.62	N	OFF	20.0
0.150203	33.38	---	65.99	32.61	N	OFF	20.0
0.251250	---	19.09	51.72	32.63	N	OFF	20.0
0.251250	32.38	---	61.72	29.34	N	OFF	20.0
0.372750	---	18.69	48.44	29.75	N	OFF	20.0
0.372750	26.77	---	58.44	31.67	N	OFF	20.0
1.693860	---	11.32	46.00	34.68	N	OFF	20.0
1.693860	19.06	---	56.00	36.94	N	OFF	20.0
6.852210	---	17.68	50.00	32.32	N	OFF	20.1
6.852210	24.19	---	60.00	35.81	N	OFF	20.1
26.142000	---	15.07	50.00	34.93	N	OFF	20.6
26.142000	21.79	---	60.00	38.21	N	OFF	20.6

Appendix C. Radiated Spurious Emission

Test Engineer :	Calvin Wu and Michael Bui	Temperature :	19~24°C
		Relative Humidity :	40~46%

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Band Edge @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2366.28	55.32	-18.68	74	41.66	27.68	17.37	31.39	206	63	P	H
		2386.125	45.15	-8.85	54	31.48	27.64	17.4	31.37	206	63	A	H
	*	2412	111.74	-	-	98.06	27.6	17.44	31.36	206	63	P	H
	*	2412	109.18	-	-	95.5	27.6	17.44	31.36	206	63	A	H
		2386.65	57.47	-16.53	74	43.8	27.64	17.4	31.37	100	256	P	V
		2386.23	47.14	-6.86	54	33.47	27.64	17.4	31.37	100	256	A	V
	*	2412	112.43	-	-	98.81	27.54	17.44	31.36	100	256	P	V
	*	2412	109.89	-	-	96.27	27.54	17.44	31.36	100	256	A	V
802.11b CH 06 2437MHz		2382.96	55.98	-18.02	74	42.33	27.64	17.39	31.38	106	64	P	H
		2385.68	43.92	-10.08	54	30.25	27.64	17.4	31.37	106	64	A	H
	*	2437	109.84	-	-	96.13	27.59	17.48	31.36	106	64	P	H
	*	2437	107.29	-	-	93.58	27.59	17.48	31.36	106	64	A	H
		2486.16	55.16	-18.84	74	41.39	27.56	17.56	31.35	106	64	P	H
		2486.24	44.19	-9.81	54	30.42	27.56	17.56	31.35	106	64	A	H
		2319.76	56.02	-17.98	74	42.33	27.83	17.28	31.42	248	237	P	V
		2388.72	44.59	-9.41	54	30.93	27.63	17.4	31.37	248	237	A	V
	*	2437	112.24	-	-	98.66	27.46	17.48	31.36	248	237	P	V
	*	2437	109.71	-	-	96.13	27.46	17.48	31.36	248	237	A	V
		2494.88	55.99	-18.01	74	42.36	27.39	17.58	31.34	248	237	P	V
		2488.56	44.9	-9.1	54	31.28	27.39	17.57	31.34	248	237	A	V

802.11b CH 11 2462MHz	*	2462	110.36	-	-	96.61	27.58	17.53	31.36	365	146	P	H
	*	2462	107.8	-	-	94.05	27.58	17.53	31.36	365	146	A	H
		2485.08	55.64	-18.36	74	41.87	27.56	17.56	31.35	365	146	P	H
		2488	44.49	-9.51	54	30.7	27.56	17.57	31.34	365	146	A	H
	*	2462	111.98	-	-	98.4	27.41	17.53	31.36	220	237	P	V
	*	2462	109.39	-	-	95.81	27.41	17.53	31.36	220	237	A	V
		2487.76	57.22	-16.78	74	43.6	27.39	17.57	31.34	220	237	P	V
		2487.64	48.47	-5.53	54	34.85	27.39	17.57	31.34	220	237	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11b CH 12 2467MHz	*	2467	109.82	-	-	96.06	27.58	17.53	31.35	191	62	P	H
	*	2467	107.3	-	-	93.54	27.58	17.53	31.35	191	62	A	H
		2483.88	60.1	-13.9	74	46.33	27.56	17.56	31.35	191	62	P	H
		2484.08	53.35	-0.65	54	39.58	27.56	17.56	31.35	191	62	A	H
	*	2467	110.55	-	-	96.97	27.4	17.53	31.35	100	243	P	V
	*	2467	108.03	-	-	94.45	27.4	17.53	31.35	100	243	A	V
		2483.92	57.12	-16.88	74	43.52	27.39	17.56	31.35	100	243	P	V
		2483.76	49.16	-4.84	54	35.56	27.39	17.56	31.35	100	243	A	V
802.11b CH 13 2472MHz	*	2472	104.26	-	-	90.5	27.57	17.54	31.35	191	64	P	H
	*	2472	101.76	-	-	88	27.57	17.54	31.35	191	64	A	H
		2487.4	56.96	-17.04	74	43.18	27.56	17.57	31.35	191	64	P	H
		2487.4	48.9	-5.1	54	35.12	27.56	17.57	31.35	191	64	A	H
	*	2472	106.14	-	-	92.55	27.4	17.54	31.35	251	240	P	V
	*	2472	103.6	-	-	90.01	27.4	17.54	31.35	251	240	A	V
		2484.08	59.27	-14.73	74	45.67	27.39	17.56	31.35	251	240	P	V
		2484.92	52.6	-1.4	54	39	27.39	17.56	31.35	251	240	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Harmonic @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11b CH 01 2412MHz		3435	48.52	-25.48	74	75.7	28.43	9.89	65.5	100	0	P	H
		4824	48.45	-25.55	74	71.99	31.39	11.32	66.25	100	0	P	H
		11760	56.45	-17.55	74	66.08	39.35	17.72	66.7	202	15	P	H
		11760	47.33	-6.67	54	56.96	39.35	17.72	66.7	202	15	A	H
		18000	63.52	-10.48	74	60.92	48.43	21.97	67.8	355	127	P	H
		18000	51.11	-2.89	54	48.51	48.43	21.97	67.8	355	127	A	H
		3375	43.44	-30.56	74	70.88	28.19	9.89	65.5	100	0	P	V
		4824	47.63	-26.37	74	71.16	31.4	11.32	66.25	100	0	P	V
		11760	56.4	-17.6	74	65.99	39.39	17.72	66.7	321	337	P	V
		11760	47.03	-6.97	54	56.62	39.39	17.72	66.7	321	337	A	V
		18000	62.82	-11.18	74	60.17	48.48	21.97	67.8	186	5	P	V
		18000	51.02	-2.98	54	48.37	48.48	21.97	67.8	186	5	A	V
802.11b CH 06 2437MHz		4874	49.67	-24.33	74	73.04	31.36	11.42	66.15	100	0	P	H
		7311	45.46	-28.54	74	61.1	36.35	13.87	65.86	100	0	P	H
		11760	55.3	-18.7	74	64.93	39.35	17.72	66.7	204	17	P	H
		11760	46.46	-7.54	54	56.09	39.35	17.72	66.7	204	17	A	H
		18000	63.14	-10.86	74	60.54	48.43	21.97	67.8	200	1	P	H
		18000	50.95	-3.05	54	48.35	48.43	21.97	67.8	200	1	A	H
		4874	49.22	-24.78	74	72.64	31.31	11.42	66.15	100	0	P	V
		7311	45.07	-28.93	74	60.67	36.39	13.87	65.86	100	0	P	V
		11760	56.06	-17.94	74	65.65	39.39	17.72	66.7	322	339	P	V
		11760	47.17	-6.83	54	56.76	39.39	17.72	66.7	322	339	A	V
		18000	62.62	-11.38	74	59.97	48.48	21.97	67.8	181	313	P	V
		18000	50.92	-3.08	54	48.27	48.48	21.97	67.8	181	313	A	V

802.11b CH 11 2462MHz		4924	49.32	-24.68	74	72.48	31.37	11.52	66.05	100	0	P	H
		7386	46.25	-27.75	74	61.67	36.47	13.99	65.88	100	0	P	H
		11760	56.12	-17.88	74	65.75	39.35	17.72	66.7	203	16	P	H
		11760	47.04	-6.96	54	56.67	39.35	17.72	66.7	203	16	A	H
		18000	62.26	-11.74	74	59.66	48.43	21.97	67.8	118	96	P	H
		18000	50.99	-3.01	54	48.39	48.43	21.97	67.8	118	96	A	H
		4924	49.82	-24.18	74	73.08	31.27	11.52	66.05	100	0	P	V
		7386	45.58	-28.42	74	60.91	36.56	13.99	65.88	100	0	P	V
		11760	56.99	-17.01	74	66.58	39.39	17.72	66.7	313	338	P	V
		11760	46.97	-7.03	54	56.56	39.39	17.72	66.7	313	338	A	V
		18000	63.15	-10.85	74	60.5	48.48	21.97	67.8	331	308	P	V
		18000	51.15	-2.85	54	48.5	48.48	21.97	67.8	331	308	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11b CH 12 2467MHz		4934	47.86	-26.14	74	70.96	31.39	11.54	66.03	100	0	P	H
		7401	45.58	-28.42	74	60.96	36.49	14.01	65.88	100	0	P	H
		11760	55.72	-18.28	74	65.35	39.35	17.72	66.7	202	16	P	H
		11760	46.91	-7.09	54	56.54	39.35	17.72	66.7	202	16	A	H
		18000	62.09	-11.91	74	59.49	48.43	21.97	67.8	148	26	P	H
		18000	51.07	-2.93	54	48.47	48.43	21.97	67.8	148	26	A	H
		4934	48.37	-25.63	74	71.57	31.29	11.54	66.03	100	0	P	V
		7401	45.93	-28.07	74	61.24	36.56	14.01	65.88	100	0	P	V
		11760	56.04	-17.96	74	65.63	39.39	17.72	66.7	320	338	P	V
		11760	46.89	-7.11	54	56.48	39.39	17.72	66.7	320	338	A	V
		18000	62.08	-11.92	74	59.43	48.48	21.97	67.8	349	186	P	V
		18000	50.93	-3.07	54	48.28	48.48	21.97	67.8	349	186	A	V
802.11b CH 13 2472MHz		4944	41.29	-32.71	74	64.33	31.41	11.56	66.01	100	0	P	H
		7416	45.83	-28.17	74	61.19	36.5	14.02	65.88	100	0	P	H
		11760	56.05	-17.95	74	65.68	39.35	17.72	66.7	209	16	P	H
		11760	47.14	-6.86	54	56.77	39.35	17.72	66.7	209	16	A	H
		18000	62.71	-11.29	74	60.11	48.43	21.97	67.8	239	60	P	H
		18000	51.34	-2.66	54	48.74	48.43	21.97	67.8	239	60	A	H
		4944	42.86	-31.14	74	65.99	31.32	11.56	66.01	100	0	P	V
		7416	45.41	-28.59	74	60.74	36.53	14.02	65.88	100	0	P	V
		11760	55.48	-18.52	74	65.07	39.39	17.72	66.7	204	39	P	V
		11760	46.14	-7.86	54	55.73	39.39	17.72	66.7	204	39	A	V
		18000	63.43	-10.57	74	60.78	48.48	21.97	67.8	300	282	P	V
		18000	51.37	-2.63	54	48.72	48.48	21.97	67.8	300	282	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11g (Band Edge @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11g CH 01 2412MHz		2389.59	66.57	-7.43	74	52.91	27.63	17.4	31.37	230	64	P	H
		2390	52.21	-1.79	54	38.55	27.63	17.4	31.37	230	64	A	H
	*	2412	110.27	-	-	96.59	27.6	17.44	31.36	230	64	P	H
	*	2412	103.42	-	-	89.74	27.6	17.44	31.36	230	64	A	H
		2389.8	66.53	-7.47	74	52.88	27.62	17.4	31.37	231	242	P	V
		2390	52.54	-1.46	54	38.89	27.62	17.4	31.37	231	242	A	V
	*	2412	113.1	-	-	99.48	27.54	17.44	31.36	231	242	P	V
	*	2412	105.1	-	-	91.48	27.54	17.44	31.36	231	242	A	V
802.11g CH 06 2437MHz		2326.8	55.42	-18.58	74	41.73	27.82	17.29	31.42	218	67	P	H
		2390	44.36	-9.64	54	30.7	27.63	17.4	31.37	218	67	A	H
	*	2437	112.03	-	-	98.32	27.59	17.48	31.36	218	67	P	H
	*	2437	105.11	-	-	91.4	27.59	17.48	31.36	218	67	A	H
		2494.32	55.33	-18.67	74	41.53	27.56	17.58	31.34	218	67	P	H
		2484.64	44.38	-9.62	54	30.61	27.56	17.56	31.35	218	67	A	H
		2385.68	56.71	-17.29	74	43.04	27.64	17.4	31.37	249	238	P	V
		2390	45.62	-8.38	54	31.97	27.62	17.4	31.37	249	238	A	V
	*	2437	114.08	-	-	100.5	27.46	17.48	31.36	249	238	P	V
	*	2437	106.93	-	-	93.35	27.46	17.48	31.36	249	238	A	V
		2486.8	56.33	-17.67	74	42.73	27.39	17.56	31.35	249	238	P	V
		2483.76	45.03	-8.97	54	31.43	27.39	17.56	31.35	249	238	A	V

802.11g CH 11 2462MHz	*	2462	110.13	-	-	96.38	27.58	17.53	31.36	209	65	P	H
	*	2462	102.96	-	-	89.21	27.58	17.53	31.36	209	65	A	H
		2483.5	64.09	-9.91	74	50.31	27.57	17.56	31.35	209	65	P	H
		2483.5	50.17	-3.83	54	36.39	27.57	17.56	31.35	209	65	A	H
	*	2462	112.48	-	-	98.9	27.41	17.53	31.36	217	236	P	V
	*	2462	104.62	-	-	91.04	27.41	17.53	31.36	217	236	A	V
		2483.6	66.85	-7.15	74	53.25	27.39	17.56	31.35	217	236	P	V
		2483.52	51.67	-2.33	54	38.07	27.39	17.56	31.35	217	236	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11g CH 12 2467MHz	*	2467	107.35	-	-	93.59	27.58	17.53	31.35	191	64	P	H
	*	2467	100.56	-	-	86.8	27.58	17.53	31.35	191	64	A	H
		2484	69.98	-4.02	74	56.21	27.56	17.56	31.35	191	64	P	H
		2483.64	52.24	-1.76	54	38.46	27.57	17.56	31.35	191	64	A	H
	*	2467	110.26	-	-	96.68	27.4	17.53	31.35	220	239	P	V
	*	2467	102.43	-	-	88.85	27.4	17.53	31.35	220	239	A	V
		2484.8	71.4	-2.6	74	57.8	27.39	17.56	31.35	220	239	P	V
		2483.64	52.97	-1.03	54	39.37	27.39	17.56	31.35	220	239	A	V
802.11g CH 13 2472MHz	*	2472	104.47	-	-	90.71	27.57	17.54	31.35	126	67	P	H
	*	2472	97.55	-	-	83.79	27.57	17.54	31.35	126	67	A	H
		2487.8	64.85	-9.15	74	51.06	27.56	17.57	31.34	126	67	P	H
		2483.5	47.84	-6.16	54	34.06	27.57	17.56	31.35	126	67	A	H
	*	2472	107.89	-	-	94.3	27.4	17.54	31.35	253	237	P	V
	*	2472	99.99	-	-	86.4	27.4	17.54	31.35	253	237	A	V
		2487.12	73.19	-0.81	74	59.58	27.39	17.57	31.35	253	237	P	V
		2483.72	51.22	-2.78	54	37.62	27.39	17.56	31.35	253	237	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11g (Harmonic @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11g CH 01 2412MHz		4824	45.08	-28.92	74	68.62	31.39	11.32	66.25	100	0	P	H
		11760	57.27	-16.73	74	66.9	39.35	17.72	66.7	207	15	P	H
		11760	47.79	-6.21	54	57.42	39.35	17.72	66.7	207	15	A	H
		18000	62.72	-11.28	74	60.12	48.43	21.97	67.8	400	149	P	H
		18000	50.72	-3.28	54	48.12	48.43	21.97	67.8	400	149	A	H
		4824	45.5	-28.5	74	69.03	31.4	11.32	66.25	100	0	P	V
		11760	56.6	-17.4	74	66.19	39.39	17.72	66.7	322	338	P	V
		11760	47.69	-6.31	54	57.28	39.39	17.72	66.7	322	338	A	V
		18000	62.31	-11.69	74	59.66	48.48	21.97	67.8	177	248	P	V
		18000	50.75	-3.25	54	48.1	48.48	21.97	67.8	177	248	A	V
802.11g CH 06 2437MHz		4874	49.42	-24.58	74	72.79	31.36	11.42	66.15	100	0	P	H
		7311	45.43	-28.57	74	61.07	36.35	13.87	65.86	100	0	P	H
		11760	56.81	-17.19	74	66.44	39.35	17.72	66.7	285	10	P	H
		11760	47.62	-6.38	54	57.25	39.35	17.72	66.7	285	10	A	H
		18000	62.54	-11.46	74	59.94	48.43	21.97	67.8	100	293	P	H
		18000	50.66	-3.34	54	48.06	48.43	21.97	67.8	100	293	A	H
		3410	44.11	-29.89	74	71.53	28.21	9.87	65.5	100	0	P	V
		4874	48.97	-25.03	74	72.39	31.31	11.42	66.15	100	0	P	V
		7311	45.95	-28.05	74	61.55	36.39	13.87	65.86	100	0	P	V
		11760	56.9	-17.1	74	66.49	39.39	17.72	66.7	321	337	P	V
		11760	47.99	-6.01	54	57.58	39.39	17.72	66.7	321	337	A	V
		18000	61.97	-12.03	74	59.32	48.48	21.97	67.8	169	343	P	V
		18000	50.84	-3.16	54	48.19	48.48	21.97	67.8	169	343	A	V

802.11g CH 11 2462MHz		4924	52.43	-21.57	74	75.59	31.37	11.52	66.05	247	113	P	H
		4924	40.38	-13.62	54	63.54	31.37	11.52	66.05	247	113	A	H
		7386	45.79	-28.21	74	61.21	36.47	13.99	65.88	100	0	P	H
		11760	56.33	-17.67	74	65.96	39.35	17.72	66.7	203	15	P	H
		11760	47.2	-6.8	54	56.83	39.35	17.72	66.7	203	15	A	H
		18000	62.24	-11.76	74	59.64	48.43	21.97	67.8	200	128	P	H
		18000	51.42	-2.58	54	48.82	48.43	21.97	67.8	200	128	A	H
		4924	51.75	-22.25	74	75.01	31.27	11.52	66.05	285	235	P	V
		4924	41.28	-12.72	54	64.54	31.27	11.52	66.05	285	235	A	V
		7386	46.25	-27.75	74	61.58	36.56	13.99	65.88	100	0	P	V
		11760	55.86	-18.14	74	65.45	39.39	17.72	66.7	192	37	P	V
		11760	46.41	-7.59	54	56	39.39	17.72	66.7	192	37	A	V
		18000	61.66	-12.34	74	59.01	48.48	21.97	67.8	200	279	P	V
		18000	51.47	-2.53	54	48.82	48.48	21.97	67.8	200	279	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11g CH 12 2467MHz		4934	44.03	-29.97	74	67.13	31.39	11.54	66.03	100	0	P	H
		7401	45.4	-28.6	74	60.78	36.49	14.01	65.88	100	0	P	H
		11760	57.03	-16.97	74	66.66	39.35	17.72	66.7	200	17	P	H
		11760	47.6	-6.4	54	57.23	39.35	17.72	66.7	200	17	A	H
		18000	63.11	-10.89	74	60.51	48.43	21.97	67.8	181	237	P	H
		18000	50.3	-3.7	54	47.7	48.43	21.97	67.8	181	237	A	H
		4934	44.98	-29.02	74	68.18	31.29	11.54	66.03	100	0	P	V
		7401	46.27	-27.73	74	61.58	36.56	14.01	65.88	100	0	P	V
		11760	55.65	-18.35	74	65.24	39.39	17.72	66.7	102	352	P	V
		11760	46.39	-7.61	54	55.98	39.39	17.72	66.7	102	352	A	V
		18000	62.99	-11.01	74	60.34	48.48	21.97	67.8	379	219	P	V
		18000	50.33	-3.67	54	47.68	48.48	21.97	67.8	379	219	A	V
802.11g CH 13 2472MHz		4944	43.08	-30.92	74	66.12	31.41	11.56	66.01	100	0	P	H
		7416	45.91	-28.09	74	61.27	36.5	14.02	65.88	100	0	P	H
		11760	56.34	-17.66	74	65.97	39.35	17.72	66.7	205	15	P	H
		11760	47.31	-6.69	54	56.94	39.35	17.72	66.7	205	15	A	H
		18000	62.66	-11.34	74	60.06	48.43	21.97	67.8	156	12	P	H
		18000	51.38	-2.62	54	48.78	48.43	21.97	67.8	156	12	A	H
		4944	44.31	-29.69	74	67.44	31.32	11.56	66.01	100	0	P	V
		7416	45.15	-28.85	74	60.48	36.53	14.02	65.88	100	0	P	V
		11760	55.96	-18.04	74	65.55	39.39	17.72	66.7	214	78	P	V
		11760	46.34	-7.66	54	55.93	39.39	17.72	66.7	214	78	A	V
		18000	63.75	-10.25	74	61.1	48.48	21.97	67.8	234	151	P	V
		18000	51.17	-2.83	54	48.52	48.48	21.97	67.8	234	151	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11n HT20 (Band Edge @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 01 2412MHz		2390	71.45	-2.55	74	57.79	27.63	17.4	31.37	111	67	P	H
		2390	51.83	-2.17	54	38.17	27.63	17.4	31.37	111	67	A	H
	*	2412	108.7	-	-	95.02	27.6	17.44	31.36	111	67	P	H
	*	2412	101.55	-	-	87.87	27.6	17.44	31.36	111	67	A	H
		2389.695	71.13	-2.87	74	57.47	27.63	17.4	31.37	230	243	P	V
		2390	53.5	-0.5	54	39.85	27.62	17.4	31.37	230	243	A	V
	*	2412	111.73	-	-	98.11	27.54	17.44	31.36	230	243	P	V
	*	2412	103.68	-	-	90.06	27.54	17.44	31.36	230	243	A	V
802.11n HT20 CH 06 2437MHz		2344.88	55.55	-18.45	74	41.9	27.74	17.32	31.41	217	69	P	H
		2389.68	44.31	-9.69	54	30.65	27.63	17.4	31.37	217	69	A	H
	*	2437	111.84	-	-	98.13	27.59	17.48	31.36	217	69	P	H
	*	2437	104.53	-	-	90.82	27.59	17.48	31.36	217	69	A	H
		2489.2	55.61	-18.39	74	41.82	27.56	17.57	31.34	217	69	P	H
		2484.24	44.38	-9.62	54	30.61	27.56	17.56	31.35	217	69	A	H
		2388.4	56.12	-17.88	74	42.46	27.63	17.4	31.37	250	237	P	V
		2389.68	45.58	-8.42	54	31.92	27.63	17.4	31.37	250	237	A	V
	*	2437	114.82	-	-	101.24	27.46	17.48	31.36	250	237	P	V
	*	2437	106.59	-	-	93.01	27.46	17.48	31.36	250	237	A	V
		2494.88	55.92	-18.08	74	42.29	27.39	17.58	31.34	250	237	P	V
		2483.6	45.04	-8.96	54	31.44	27.39	17.56	31.35	250	237	A	V

802.11n HT20 CH 11 2462MHz	*	2462	109.86	-	-	96.11	27.58	17.53	31.36	192	67	P	H
	*	2462	102.29	-	-	88.54	27.58	17.53	31.36	192	67	A	H
		2483.72	70.04	-3.96	74	56.26	27.57	17.56	31.35	192	67	P	H
		2483.5	52.56	-1.44	54	38.78	27.57	17.56	31.35	192	67	A	H
	*	2462	112.1	-	-	98.52	27.41	17.53	31.36	235	239	P	V
	*	2462	104.31	-	-	90.73	27.41	17.53	31.36	235	239	A	V
		2483.5	70.55	-3.45	74	56.95	27.39	17.56	31.35	235	239	P	V
		2483.5	53.35	-0.65	54	39.75	27.39	17.56	31.35	235	239	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 12 2467MHz	*	2467	104.8	-	-	91.04	27.58	17.53	31.35	118	71	P	H
	*	2467	97.33	-	-	83.57	27.58	17.53	31.35	118	71	A	H
		2485.48	66.66	-7.34	74	52.89	27.56	17.56	31.35	118	71	P	H
		2483.5	46.69	-7.31	54	32.91	27.57	17.56	31.35	118	71	A	H
	*	2467	107.99	-	-	94.41	27.4	17.53	31.35	222	239	P	V
	*	2467	100.12	-	-	86.54	27.4	17.53	31.35	222	239	A	V
		2483.76	71.24	-2.76	74	57.64	27.39	17.56	31.35	222	239	P	V
		2483.5	50.82	-3.18	54	37.22	27.39	17.56	31.35	222	239	A	V
802.11n HT20 CH 13 2472MHz	*	2472	103.87	-	-	90.11	27.57	17.54	31.35	126	71	P	H
	*	2472	96.35	-	-	82.59	27.57	17.54	31.35	126	71	A	H
		2484.88	67.49	-6.51	74	53.72	27.56	17.56	31.35	126	71	P	H
		2483.5	47.98	-6.02	54	34.2	27.57	17.56	31.35	126	71	A	H
	*	2472	107.69	-	-	94.1	27.4	17.54	31.35	219	238	P	V
	*	2472	99.34	-	-	85.75	27.4	17.54	31.35	219	238	A	V
		2483.96	71.21	-2.79	74	57.61	27.39	17.56	31.35	219	238	P	V
		2483.5	50.93	-3.07	54	37.33	27.39	17.56	31.35	219	238	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11n HT20 (Harmonic @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 01 2412MHz		4824	42.93	-31.07	74	66.47	31.39	11.32	66.25	100	0	P	H
		11760	56.32	-17.68	74	65.95	39.35	17.72	66.7	195	15	P	H
		11760	47.4	-6.6	54	57.03	39.35	17.72	66.7	195	15	A	H
		18000	62.75	-11.25	74	60.15	48.43	21.97	67.8	224	343	P	H
		18000	50.88	-3.12	54	48.28	48.43	21.97	67.8	224	343	A	H
		4824	43.85	-30.15	74	67.38	31.4	11.32	66.25	100	0	P	V
		11760	56.74	-17.26	74	66.33	39.39	17.72	66.7	323	339	P	V
		11760	47.35	-6.65	54	56.94	39.39	17.72	66.7	323	339	A	V
		18000	63.02	-10.98	74	60.37	48.48	21.97	67.8	176	208	P	V
		18000	51.02	-2.98	54	48.37	48.48	21.97	67.8	176	208	A	V
802.11n HT20 CH 06 2437MHz		4874	48.33	-25.67	74	71.7	31.36	11.42	66.15	100	0	P	H
		7311	44.94	-29.06	74	60.58	36.35	13.87	65.86	100	0	P	H
		11760	57.36	-16.64	74	66.99	39.35	17.72	66.7	295	15	P	H
		11760	47.62	-6.38	54	57.25	39.35	17.72	66.7	295	15	A	H
		18000	63.16	-10.84	74	60.56	48.43	21.97	67.8	245	278	P	H
		18000	51.42	-2.58	54	48.82	48.43	21.97	67.8	245	278	A	H
		4874	46.3	-27.7	74	69.72	31.31	11.42	66.15	100	0	P	V
		7311	47.98	-26.02	74	63.58	36.39	13.87	65.86	100	0	P	V
		11760	56.89	-17.11	74	66.48	39.39	17.72	66.7	324	341	P	V
		11760	47.37	-6.63	54	56.96	39.39	17.72	66.7	324	341	A	V
		18000	63.74	-10.26	74	61.09	48.48	21.97	67.8	158	222	P	V
		18000	51.48	-2.52	54	48.83	48.48	21.97	67.8	158	222	A	V

802.11n HT20 CH 11 2462MHz		4924	46.48	-27.52	74	69.64	31.37	11.52	66.05	100	0	P	H
		7386	45.72	-28.28	74	61.14	36.47	13.99	65.88	100	0	P	H
		11760	56.99	-17.01	74	66.62	39.35	17.72	66.7	205	16	P	H
		11760	47.87	-6.13	54	57.5	39.35	17.72	66.7	205	16	A	H
		18000	62.79	-11.21	74	60.19	48.43	21.97	67.8	211	94	P	H
		18000	50.82	-3.18	54	48.22	48.43	21.97	67.8	211	94	A	H
		4924	47.15	-26.85	74	70.41	31.27	11.52	66.05	100	0	P	V
		7386	45.93	-28.07	74	61.26	36.56	13.99	65.88	100	0	P	V
		11760	56.79	-17.21	74	66.38	39.39	17.72	66.7	192	78	P	V
		11760	47.1	-6.9	54	56.69	39.39	17.72	66.7	192	78	A	V
		18000	62.77	-11.23	74	60.12	48.48	21.97	67.8	356	286	P	V
		18000	50.66	-3.34	54	48.01	48.48	21.97	67.8	356	286	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 12 2467MHz		4934	44.3	-29.7	74	67.4	31.39	11.54	66.03	100	0	P	H
		7401	46.7	-27.3	74	62.08	36.49	14.01	65.88	100	0	P	H
		11760	56.27	-17.73	74	65.9	39.35	17.72	66.7	190	16	P	H
		11760	46.85	-7.15	54	56.48	39.35	17.72	66.7	190	16	A	H
		18000	63.17	-10.83	74	60.57	48.43	21.97	67.8	134	224	P	H
		18000	51.36	-2.64	54	48.76	48.43	21.97	67.8	134	224	A	H
		4934	44.94	-29.06	74	68.14	31.29	11.54	66.03	100	0	P	V
		7401	46.13	-27.87	74	61.44	36.56	14.01	65.88	100	0	P	V
		11760	55.79	-18.21	74	65.38	39.39	17.72	66.7	201	40	P	V
		11760	46.48	-7.52	54	56.07	39.39	17.72	66.7	201	40	A	V
		18000	63.3	-10.7	74	60.65	48.48	21.97	67.8	228	167	P	V
		18000	51.46	-2.54	54	48.81	48.48	21.97	67.8	228	167	A	V
802.11n HT20 CH 13 2472MHz		4944	42.76	-31.24	74	65.8	31.41	11.56	66.01	100	0	P	H
		7416	44.94	-29.06	74	60.3	36.5	14.02	65.88	100	0	P	H
		11760	56.68	-17.32	74	66.31	39.35	17.72	66.7	194	16	P	H
		11760	47.4	-6.6	54	57.03	39.35	17.72	66.7	194	16	A	H
		18000	62.78	-11.22	74	60.18	48.43	21.97	67.8	328	300	P	H
		18000	50.58	-3.42	54	47.98	48.43	21.97	67.8	328	300	A	H
		4944	42.75	-31.25	74	65.88	31.32	11.56	66.01	100	0	P	V
		7416	45.87	-28.13	74	61.2	36.53	14.02	65.88	100	0	P	V
		11760	56.2	-17.8	74	65.79	39.39	17.72	66.7	181	79	P	V
		11760	46.89	-7.11	54	56.48	39.39	17.72	66.7	181	79	A	V
		18000	62.77	-11.23	74	60.12	48.48	21.97	67.8	286	164	P	V
		18000	50.45	-3.55	54	47.8	48.48	21.97	67.8	286	164	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Emission above 18GHz

2.4GHz WIFI 802.11n HT20 (SHF)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
2.4GHz 802.11n HT20 SHF		23754	39.35	-34.65	74	36.85	38.72	15.16	51.38	150	0	P	H
		23103	39.39	-34.61	74	37.39	38.83	14.78	51.61	150	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

Emission below 1GHz

2.4GHz WIFI 802.11n HT20 (LF)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
2.4GHz 802.11n HT20 LF		30.97	21.97	-18.03	40	28.8	24.71	0.9	32.44	-	-	P	H
		120.21	36	-7.5	43.5	49.08	17.6	1.73	32.41	-	-	P	H
		136.7	34.94	-8.56	43.5	47.83	17.6	1.92	32.41	-	-	P	H
		167.74	36.32	-7.18	43.5	50.7	15.93	2.1	32.41	100	0	P	H
		241.46	32.13	-13.87	46	44.55	17.45	2.54	32.41	-	-	P	H
		623.64	36.61	-9.39	46	39.02	26.15	4.06	32.62	-	-	P	H
		30.97	22.38	-17.62	40	29.21	24.71	0.9	32.44	-	-	P	V
		120.21	32.92	-10.58	43.5	46	17.6	1.73	32.41	100	0	P	V
		136.7	31.68	-11.82	43.5	44.57	17.6	1.92	32.41	-	-	P	V
		146.4	30.95	-12.55	43.5	44.08	17.3	1.98	32.41	-	-	P	V
		253.1	30.6	-15.4	46	41.51	18.91	2.59	32.41	-	-	P	V
		631.4	32.06	-13.94	46	34.19	26.4	4.09	32.62	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

Note symbol

*	**Fundamental Frequency** which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is **over limit** line.
P/A	**P**eak or **A**verage
H/V	**H**orizontal or **V**ertical

A calculation example for radiated spurious emission is shown as below:

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBμV/m) =

Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

3. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is “PASS”.

Appendix D. Radiated Spurious Emission Plots

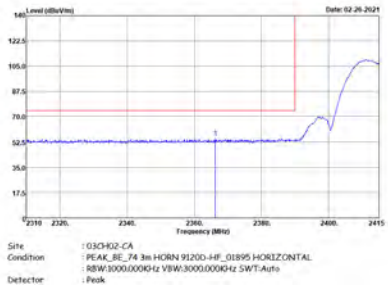
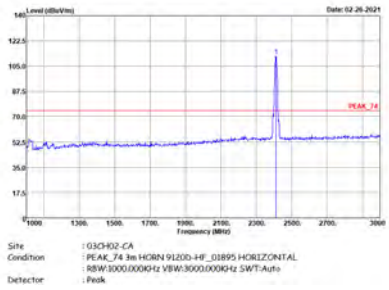
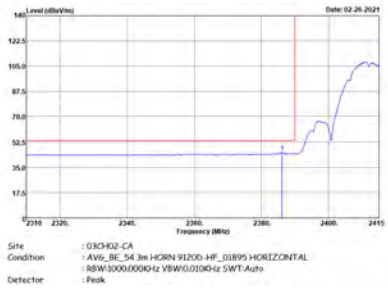
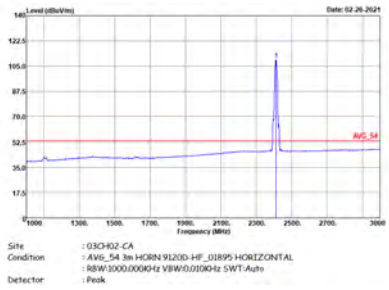
Test Engineer :	Calvin Wu and Michael Bui	**Temperature :**	19 – 24°C
		Relative Humidity :	40~46%

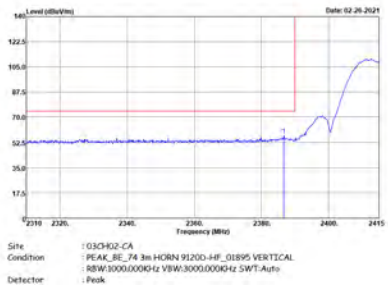
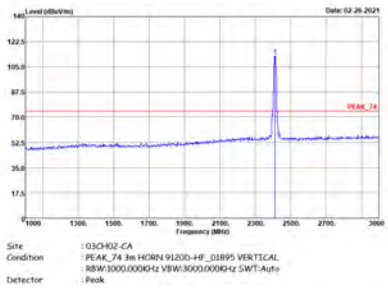
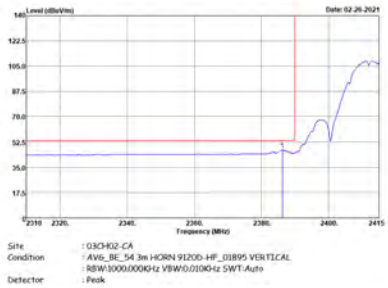
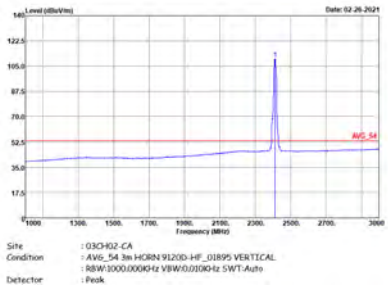
Note symbol

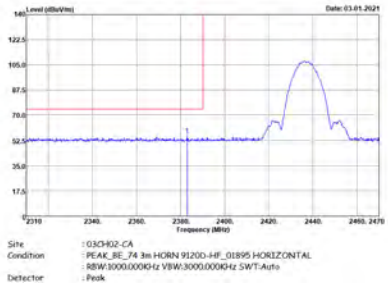
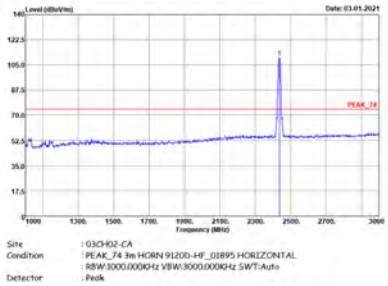
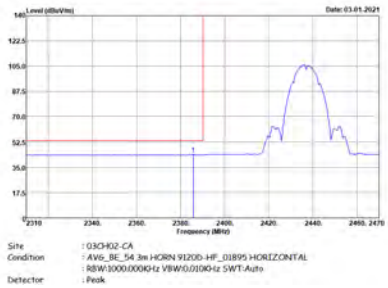
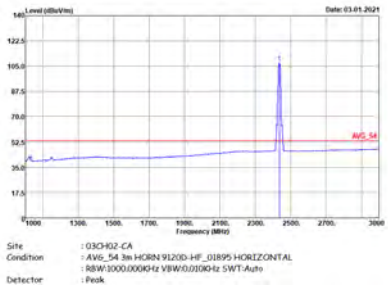
-L	**Low channel location**
-R	**High channel location**

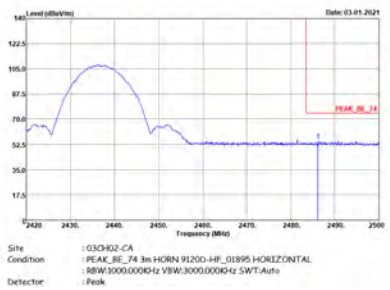
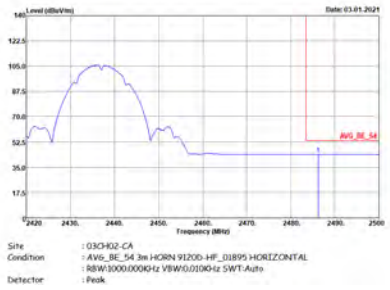
2.4GHz 2400~2483.5MHz

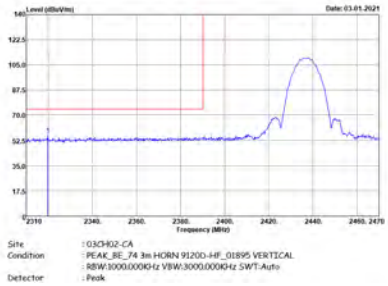
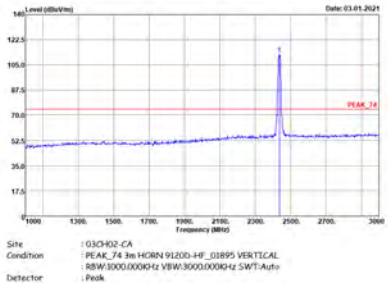
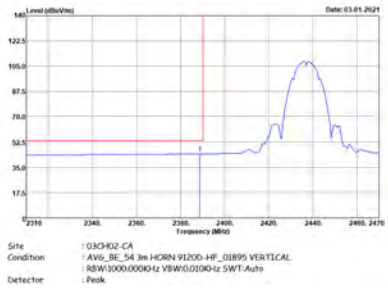
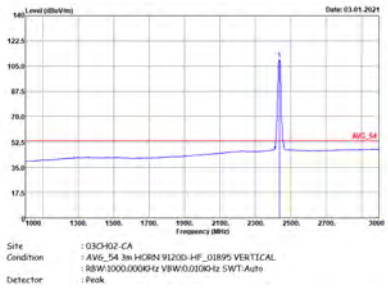
WIFI 802.11b (Band Edge @ 3m)

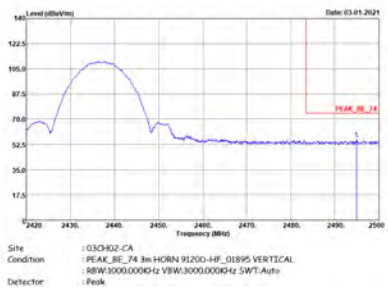
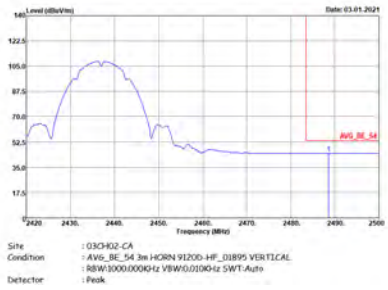
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH01 2412MHz	
1+2	Horizontal	Fundamental
Peak		
Avg.		

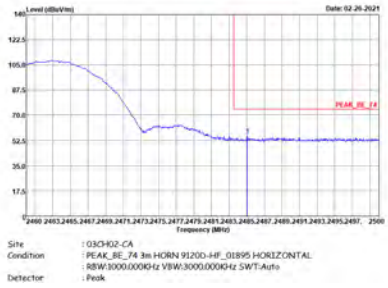
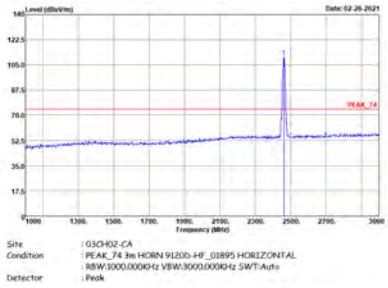
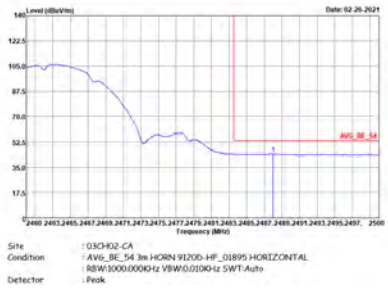
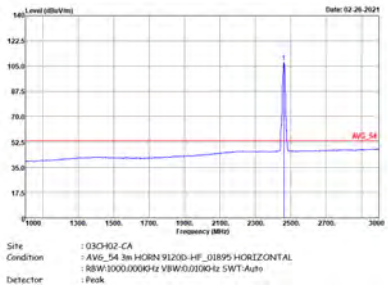
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH01 2412MHz	
1+2	Vertical	Fundamental
Peak		
Avg.		

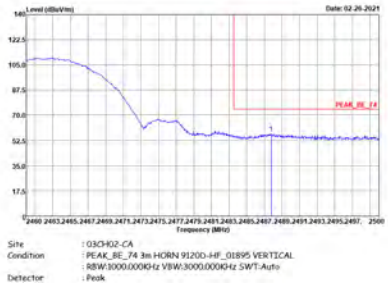
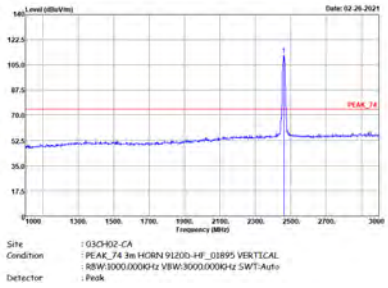
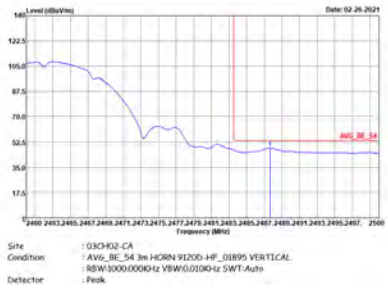
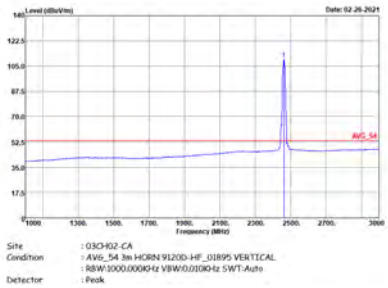
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH06 2437MHz - L	
1+2	Horizontal	Fundamental
Peak		
Avg.		

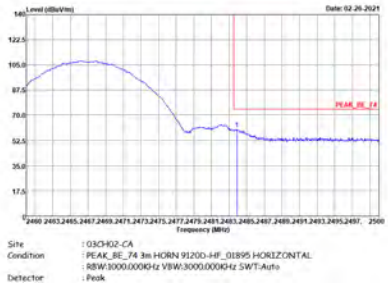
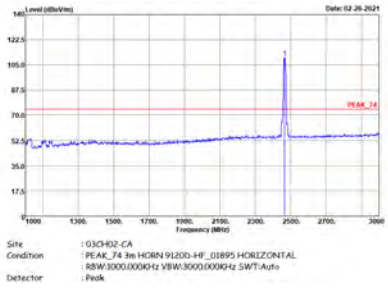
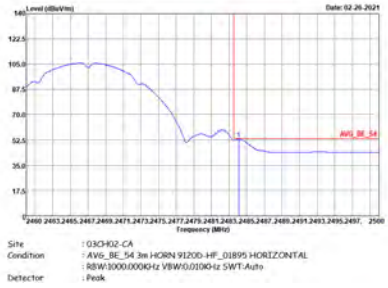
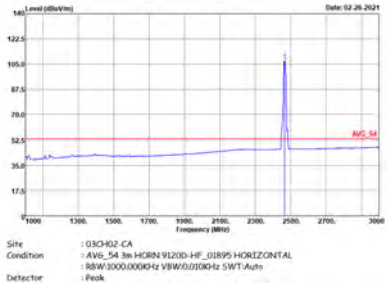
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH06 2437MHz - R	
1+2	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

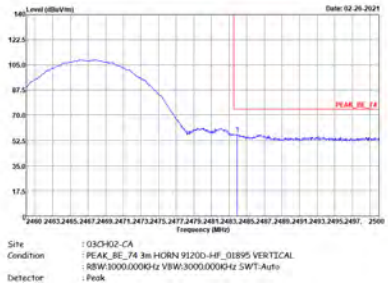
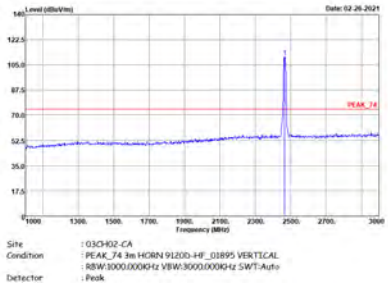
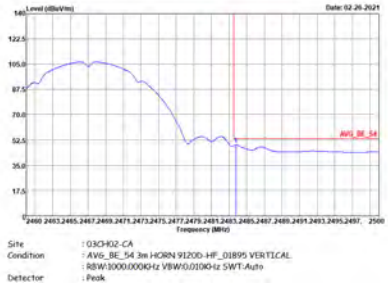
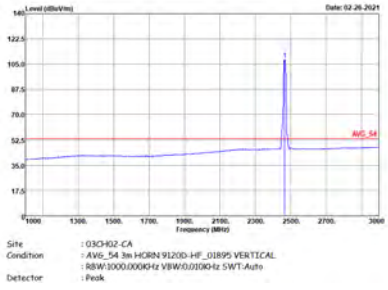
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH06 2437MHz - L	
1+2	Vertical	Fundamental
Peak		
Avg.		

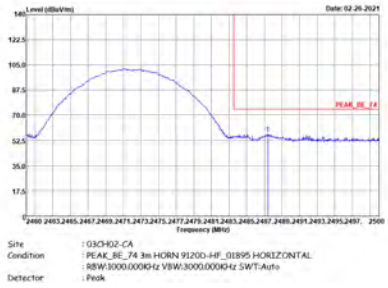
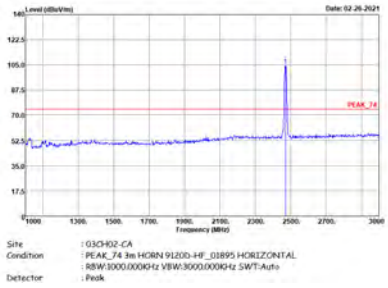
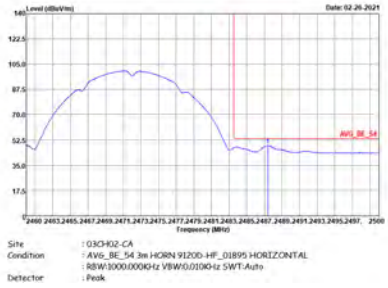
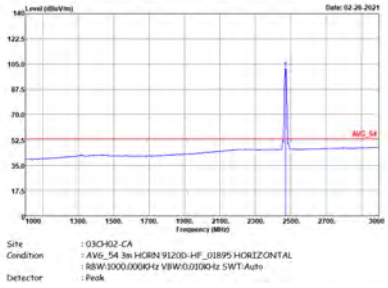
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH06 2437MHz - R	
1+2	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

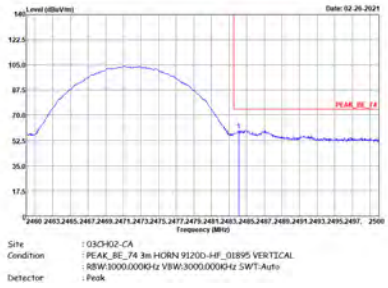
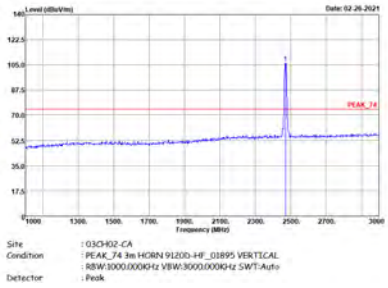
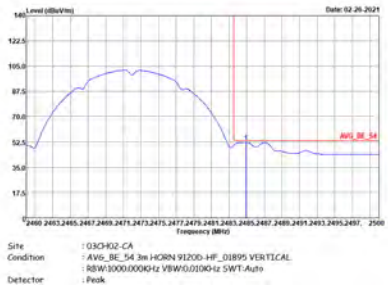
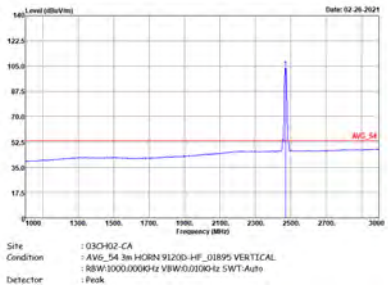
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH11 2462MHz	
1+2	Horizontal	Fundamental
Peak		
Avg.		

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH11 2462MHz	
1+2	Vertical	Fundamental
Peak		
Avg.		

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH12 2467MHz	
1+2	Horizontal	Fundamental
Peak		
Avg.		

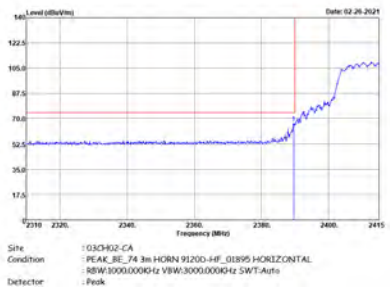
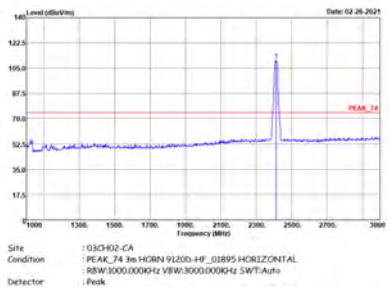
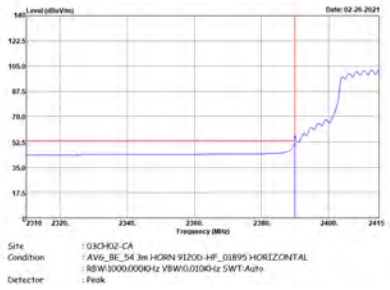
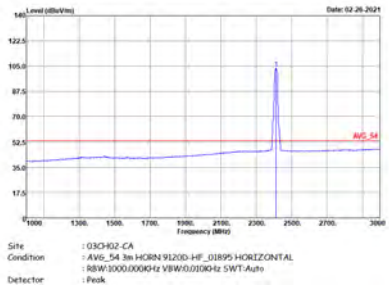
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH12 2467MHz	
1+2	Vertical	Fundamental
Peak		
Avg.		

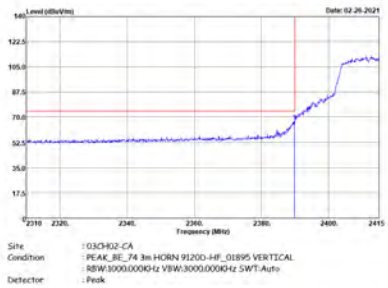
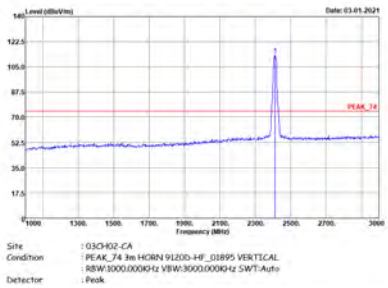
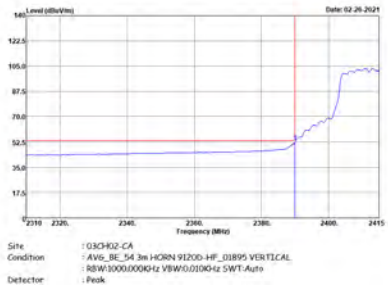
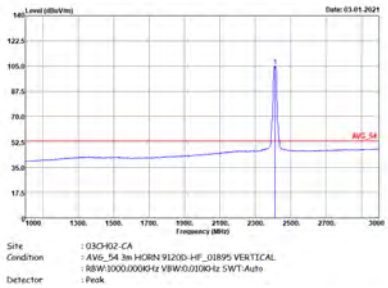
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH13 2472MHz	
1+2	Horizontal	Fundamental
Peak		
Avg.		

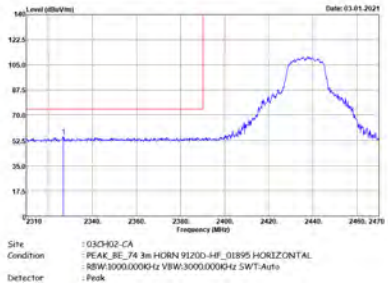
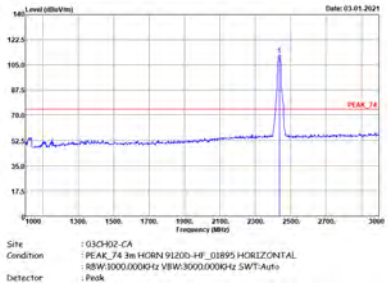
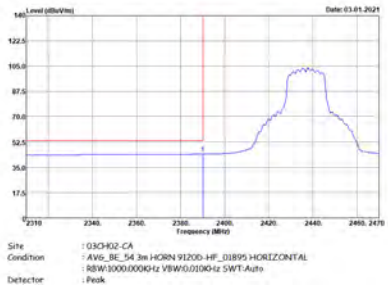
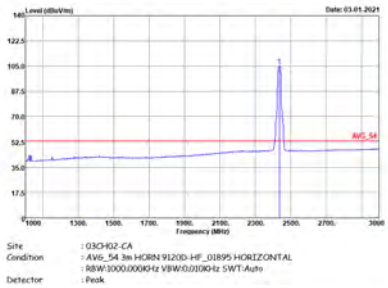
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH13 2472MHz	
1+2	Vertical	Fundamental
Peak		
Avg.		

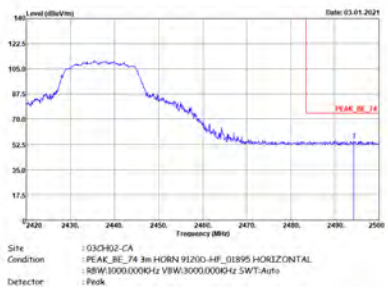
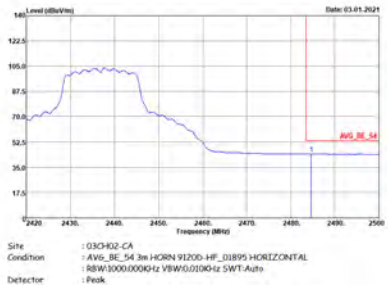
2.4GHz 2400~2483.5MHz

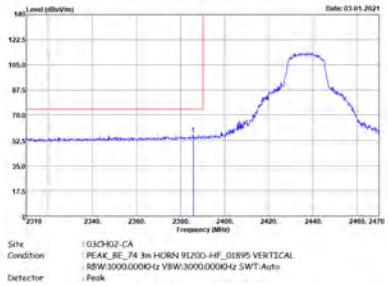
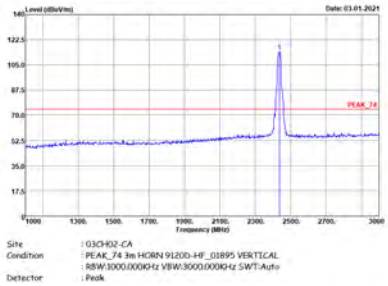
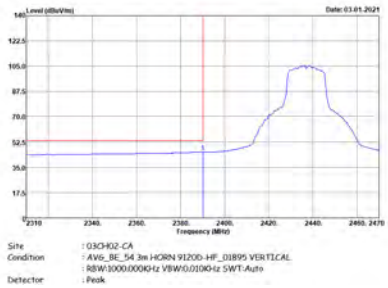
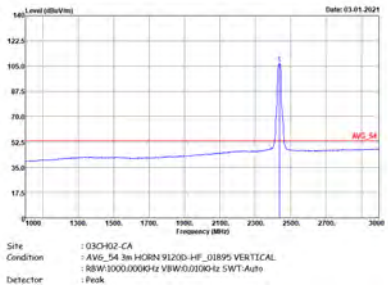
WIFI 802.11g (Band Edge @ 3m)

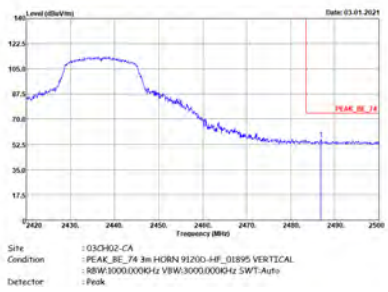
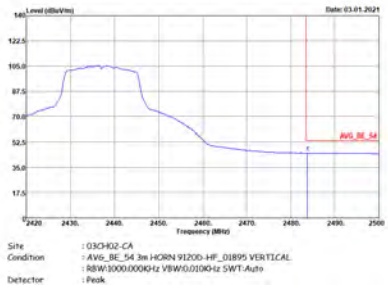
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH01 2412MHz	
1+2	Horizontal	Fundamental
Peak		
Avg.		

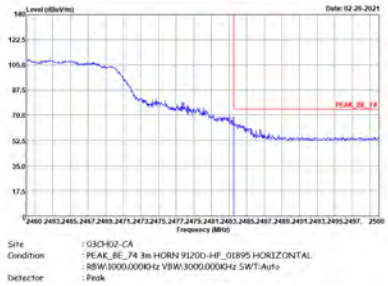
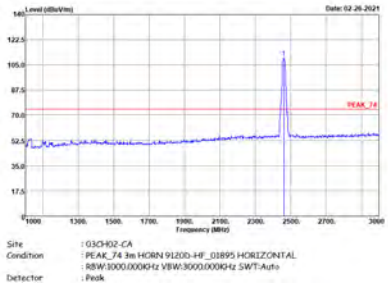
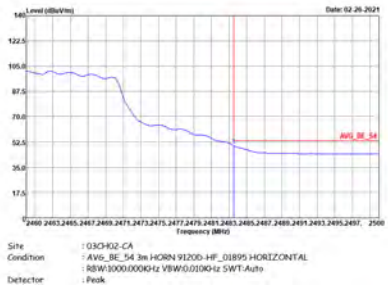
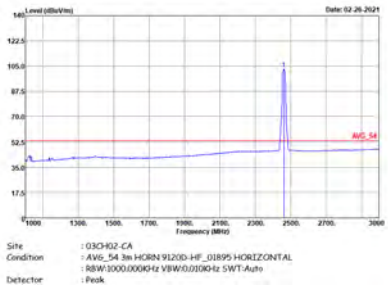
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH01 2412MHz	
1+2	Vertical	Fundamental
Peak		
Avg.		

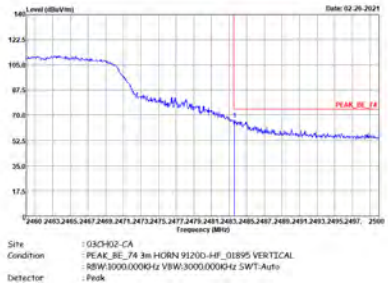
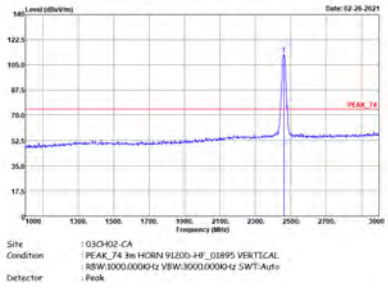
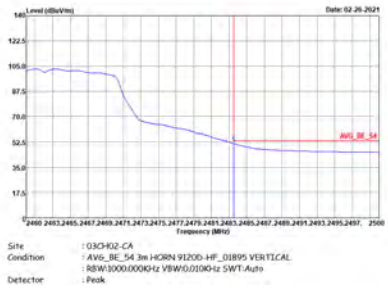
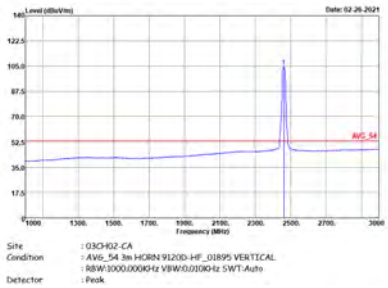
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH06 2437MHz - L	
1+2	Horizontal	Fundamental
Peak		
Avg.		

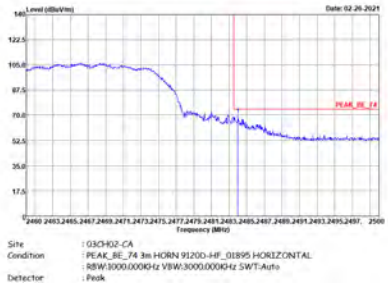
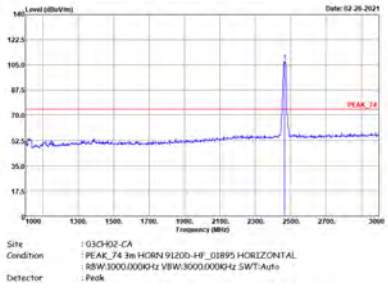
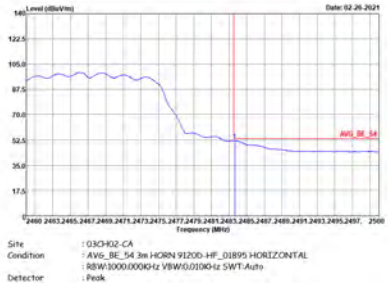
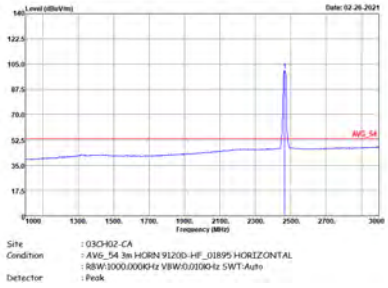
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH06 2437MHz - R	
1+2	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

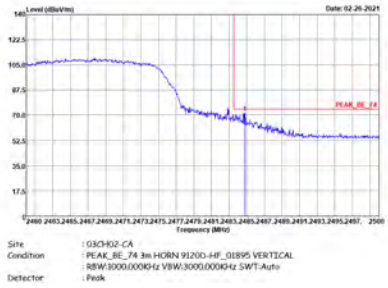
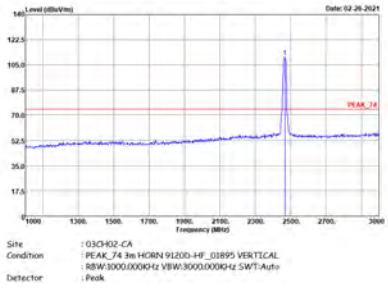
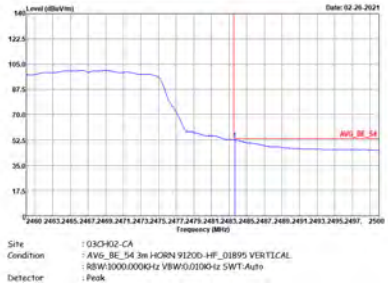
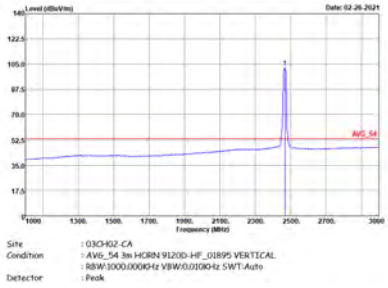
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH06 2437MHz - L	
1+2	Vertical	Fundamental
Peak		
Avg.		

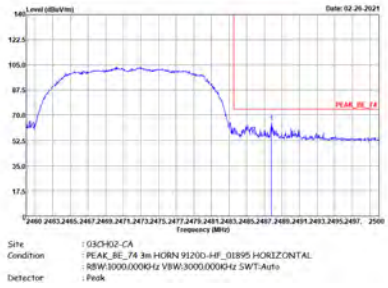
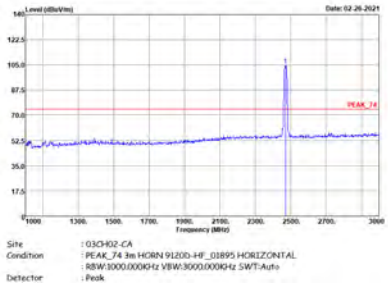
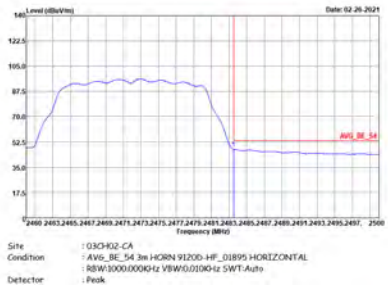
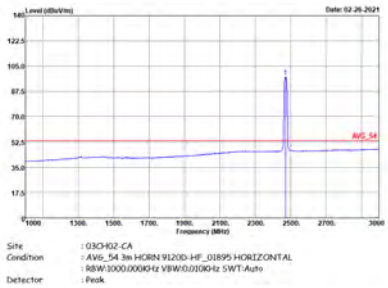
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH06 2437MHz - R	
1+2	Vertical	Fundamental
Peak		Left Blank
Avg.		Left Blank

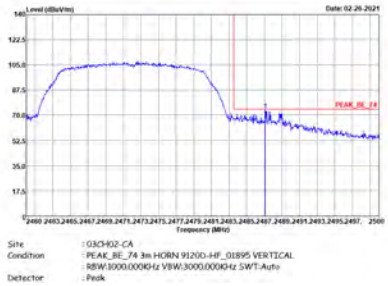
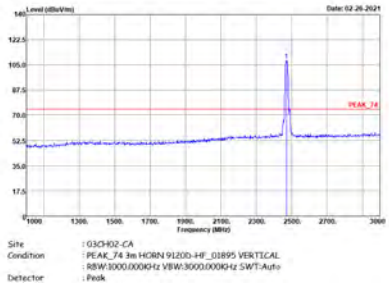
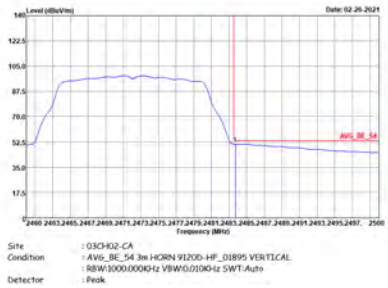
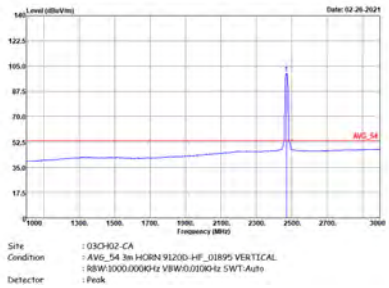
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH11 2462MHz	
1+2	Horizontal	Fundamental
Peak		
Avg.		

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH11 2462MHz	
1+2	Vertical	Fundamental
Peak		
Avg.		

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH12 2467MHz	
1+2	Horizontal	Fundamental
Peak		
Avg.		

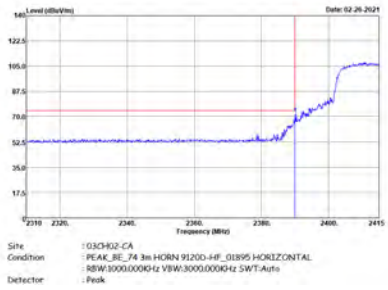
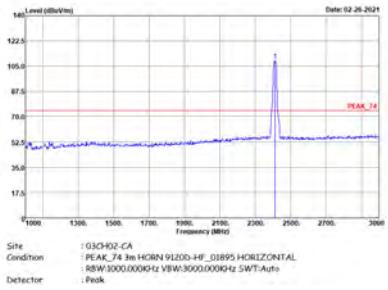
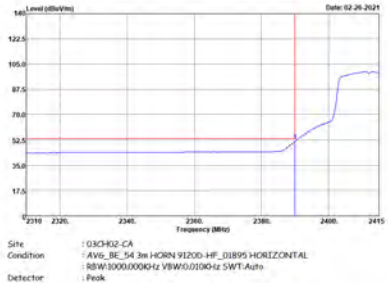
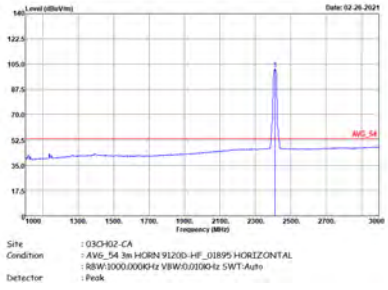
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH12 2467MHz	
1+2	Vertical	Fundamental
Peak		
Avg.		

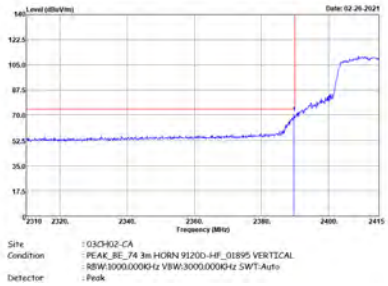
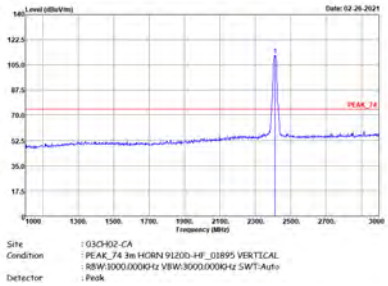
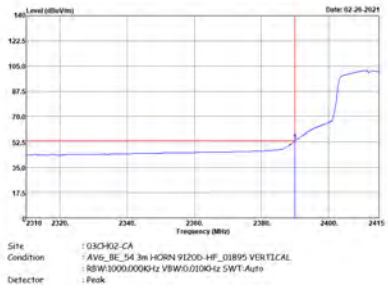
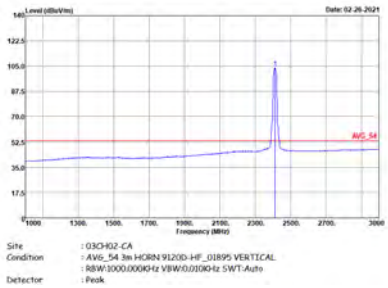
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH13 2472MHz	
1+2	Horizontal	Fundamental
Peak		
Avg.		

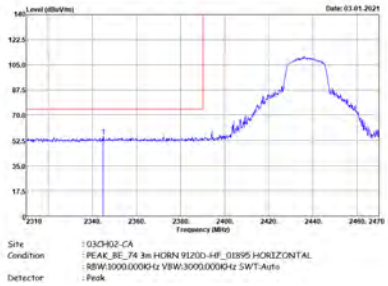
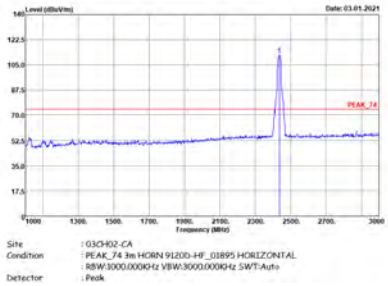
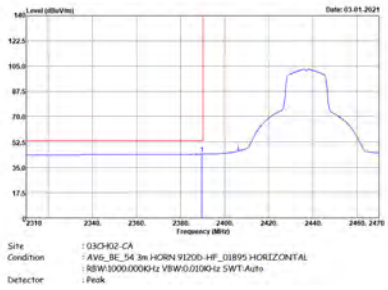
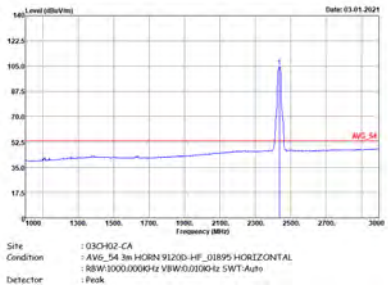
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH13 2472MHz	
1+2	Vertical	Fundamental
Peak		
Avg.		

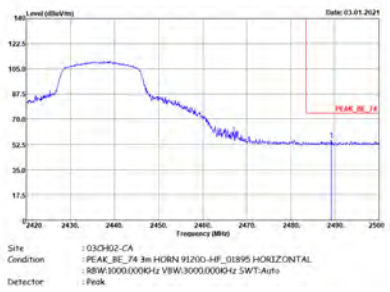
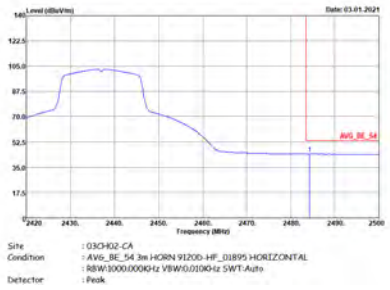
2.4GHz 2400~2483.5MHz

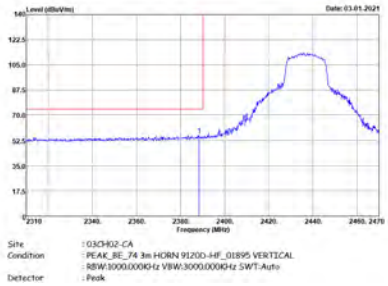
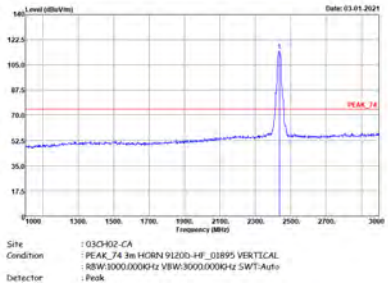
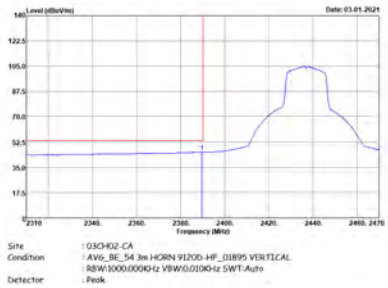
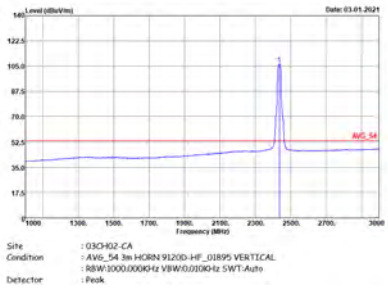
WIFI 802.11n HT20 (Band Edge @ 3m)

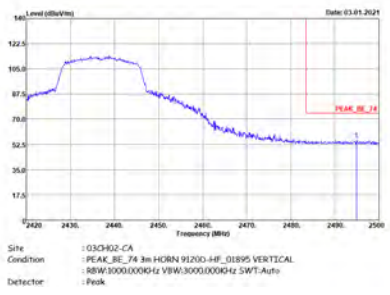
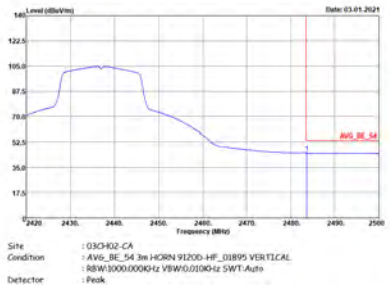
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT20 CH01 2412MHz	
1+2	Horizontal	Fundamental
Peak		
Avg.		

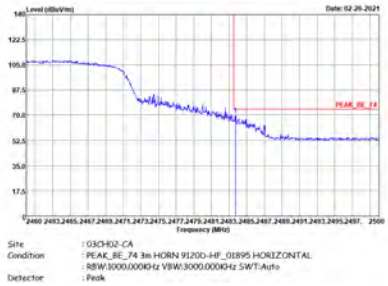
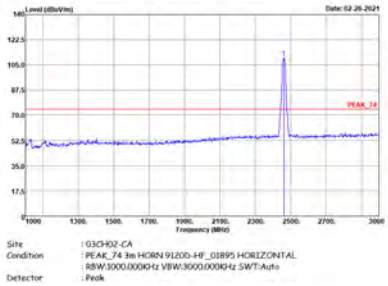
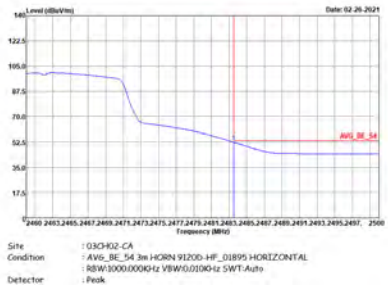
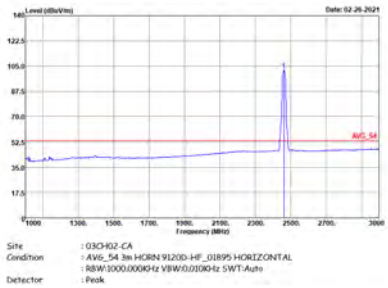
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT20 CH01 2412MHz	
1+2	Vertical	Fundamental
Peak		
Avg.		

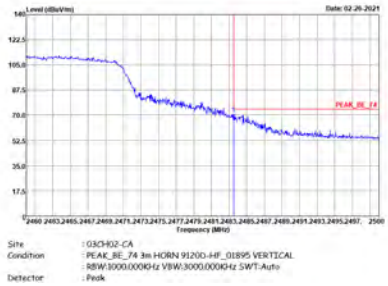
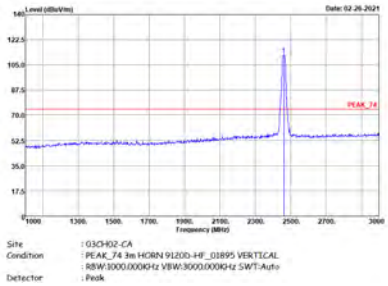
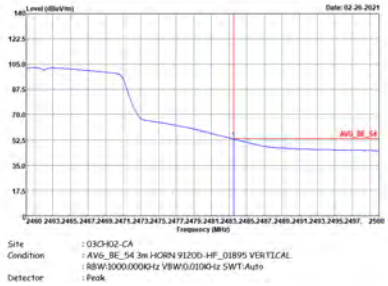
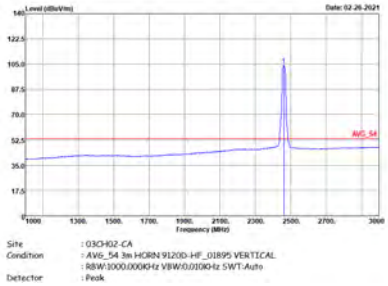
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT20 CH06 2437MHz - L	
1+2	Horizontal	Fundamental
Peak		
Avg.		

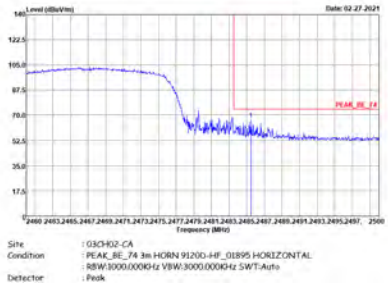
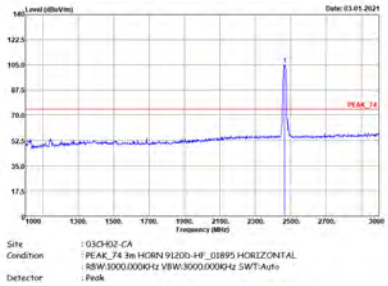
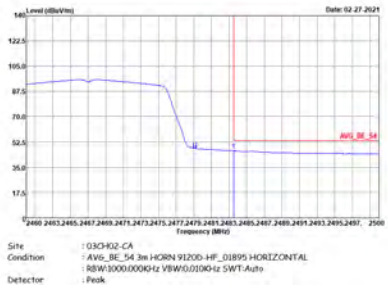
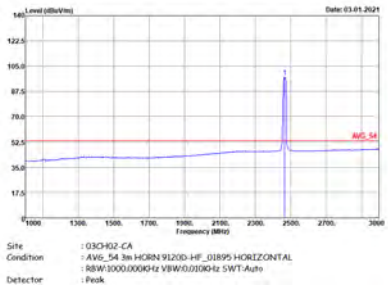
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT20 CH06 2437MHz - R	
1+2	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

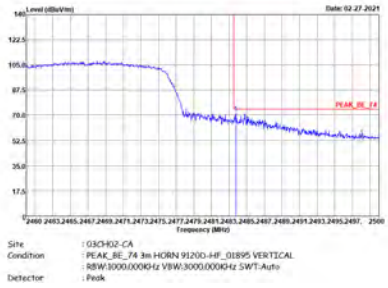
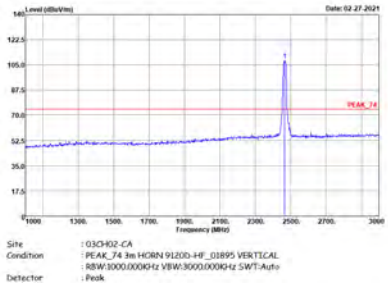
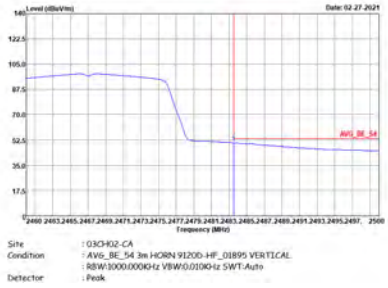
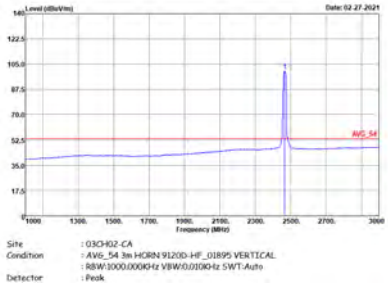
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT20 CH06 2437MHz - L	
1+2	Vertical	Fundamental
Peak		
Avg.		

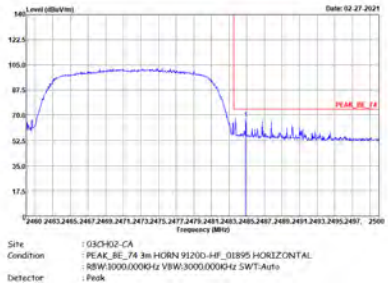
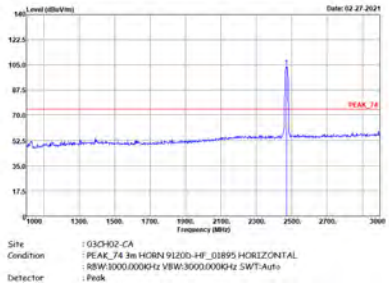
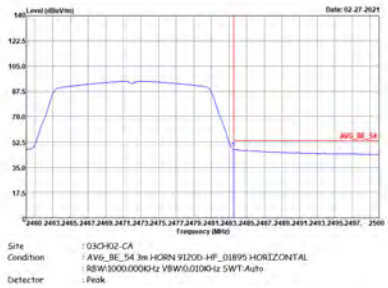
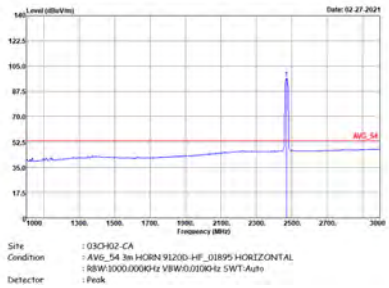
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT20 CH06 2437MHz - R	
1+2	Vertical	Fundamental
Peak		Left Blank
Avg.		Left Blank

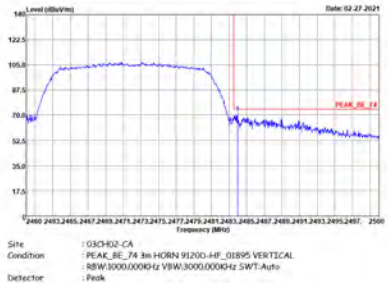
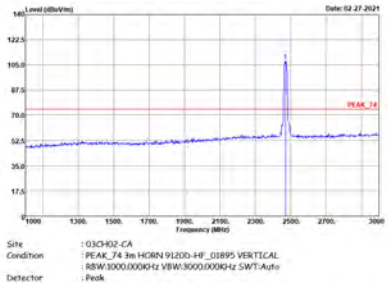
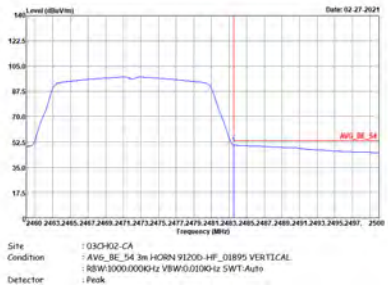
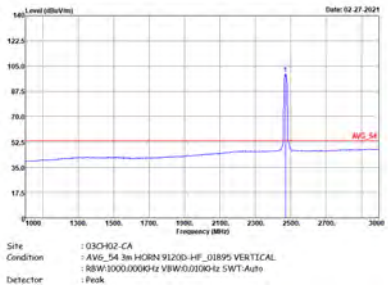
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT20 CH11 2462MHz	
1+2	Horizontal	Fundamental
Peak		
Avg.		

WIFI	2.4GHz 2400~2483.5MHz Fundamental @ 3m	
ANT	802.11n HT20 CH11 2462MHz	
1+2	Vertical	Fundamental
Peak		
Avg.		

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT20 CH12 2467MHz	
1+2	Horizontal	Fundamental
Peak		
Avg.		

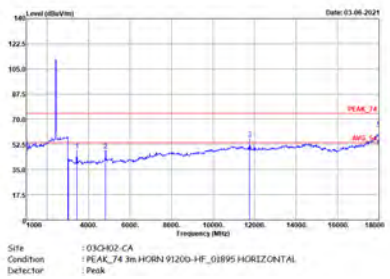
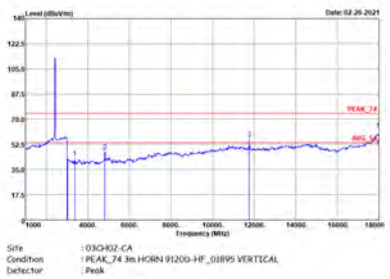
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT20 CH12 2467MHz	
1+2	Vertical	Fundamental
Peak		
Avg.		

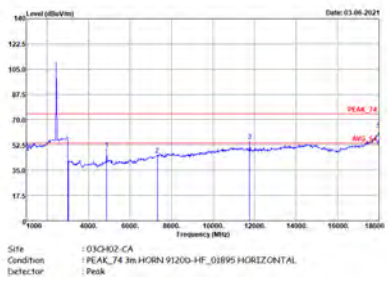
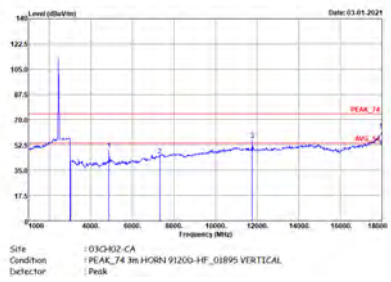
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT20 CH13 2472MHz	
1+2	Horizontal	Fundamental
Peak		
Avg.		

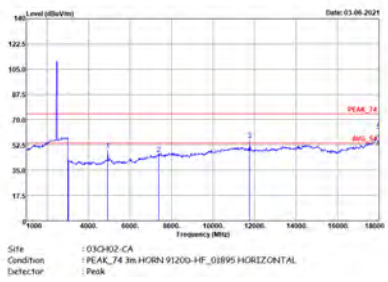
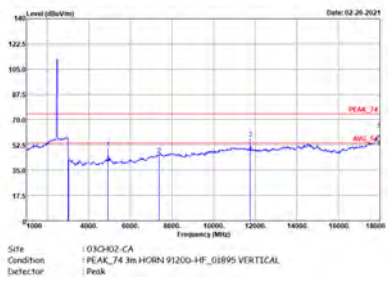
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT20 CH13 2472MHz	
1+2	Vertical	Fundamental
Peak		
Avg.		

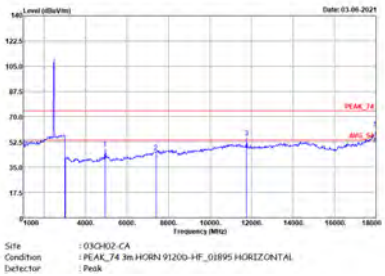
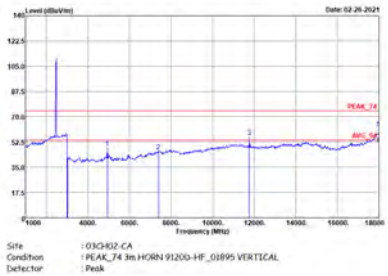
2.4GHz 2400~2483.5MHz

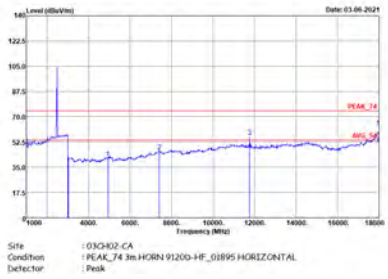
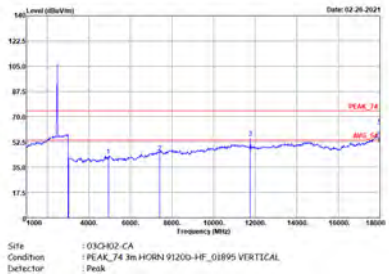
WIFI 802.11b (Harmonic @ 3m)

WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11b CH01 2412MHz	
1+2	Horizontal	Vertical
Peak Avg.		

WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11b CH06 2437MHz	
1+2	Horizontal	Vertical
Peak Avg.		

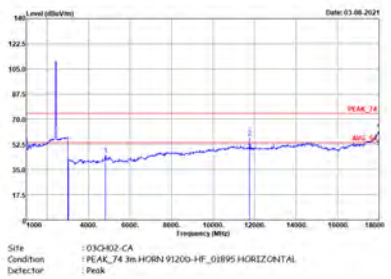
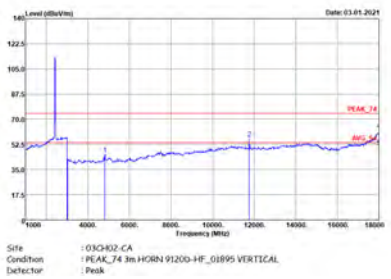
WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11b CH11 2462MHz	
1+2	Horizontal	Vertical
Peak Avg.		

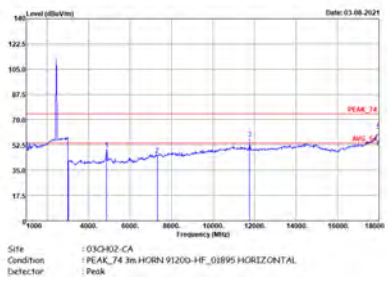
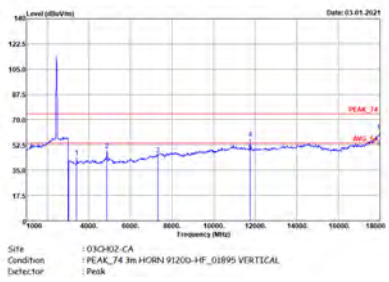
WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11b CH12 2467MHz	
1+2	Horizontal	Vertical
Peak Avg.		

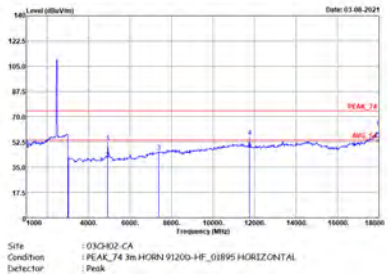
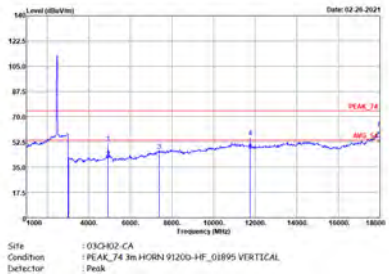
WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11b CH13 2472MHz	
1+2	Horizontal	Vertical
Peak Avg.		

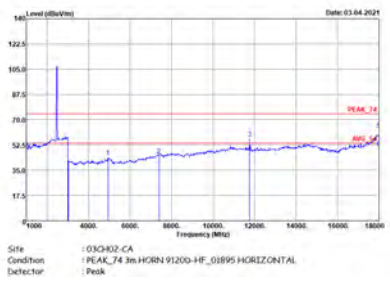
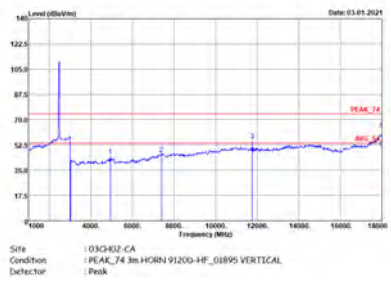
2.4GHz 2400~2483.5MHz

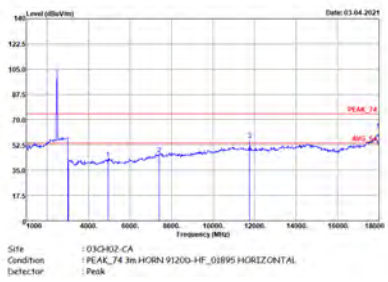
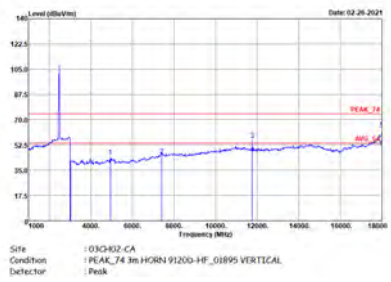
WIFI 802.11g (Harmonic @ 3m)

WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11g CH01 2412MHz	
1+2	Horizontal	Vertical
Peak Avg.		

WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11g CH06 2437MHz	
1+2	Horizontal	Vertical
Peak Avg.		

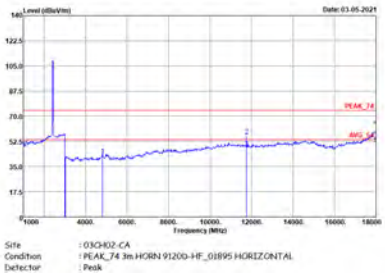
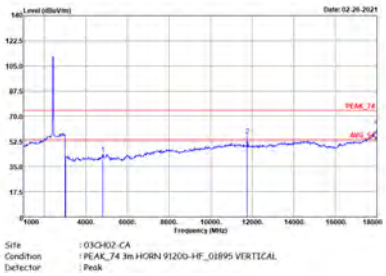
WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11g CH11 2462MHz	
1+2	Horizontal	Vertical
Peak Avg.		

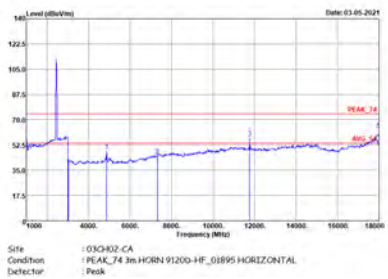
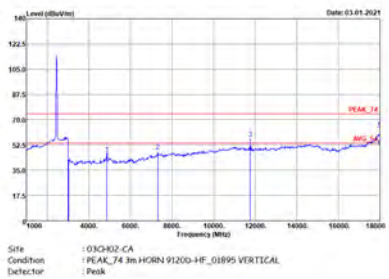
WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11g CH12 2467MHz	
1+2	Horizontal	Vertical
Peak Avg.		

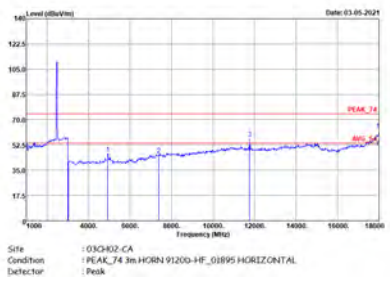
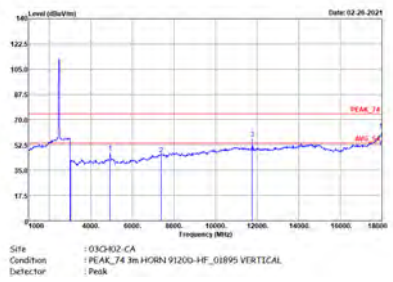
WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11g CH13 2472MHz	
1+2	Horizontal	Vertical
Peak Avg.		

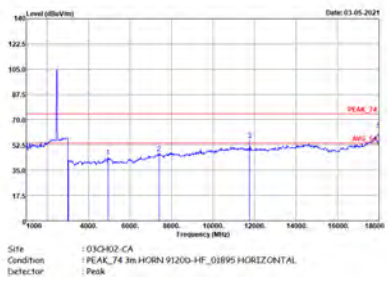
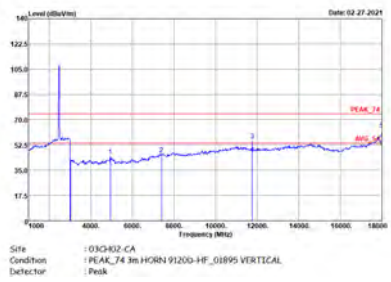
2.4GHz 2400~2483.5MHz

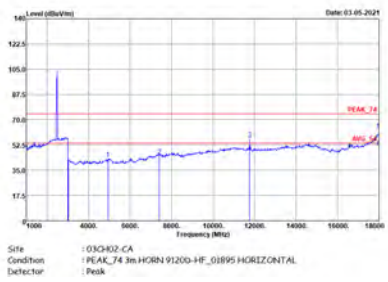
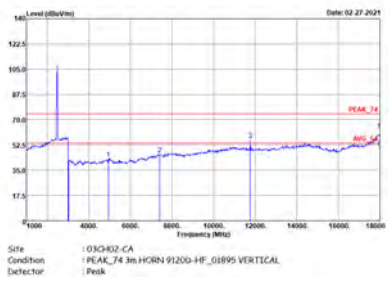
WIFI 802.11n HT20 (Harmonic @ 3m)

WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11n HT20 CH01 2412MHz	
1+2	Horizontal	Vertical
Peak Avg.		

WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11n HT20 CH06 2437MHz	
1+2	Horizontal	Vertical
Peak Avg.		

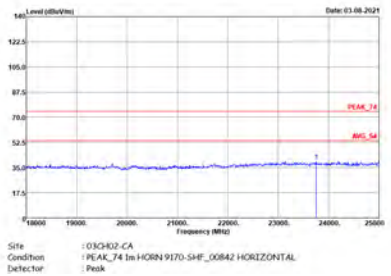
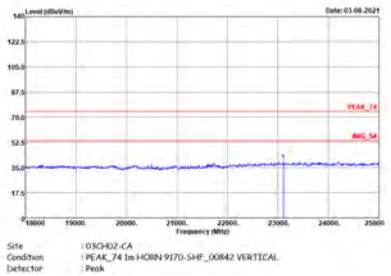
WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11n HT20 CH11 2462MHz	
1+2	Horizontal	Vertical
Peak Avg.		

WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11n HT20 CH12 2462MHz	
1+2	Horizontal	Vertical
Peak Avg.		

WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11n HT20 CH13 2472MHz	
1+2	Horizontal	Vertical
Peak Avg.		

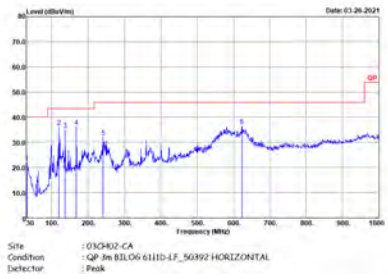
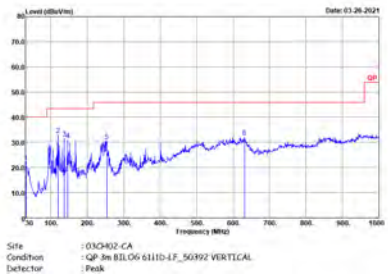
Emission above 18GHz

2.4GHz WIFI 802.11n HT20 (SHF)

WIFI	2.4GHz 2400~2483.5MHz	
ANT	802.11n HT20 SHF	
1+2	Horizontal	Vertical
Peak Avg.		

Emission below 1GHz

2.4GHz WIFI 802.11n HT20 (LF)

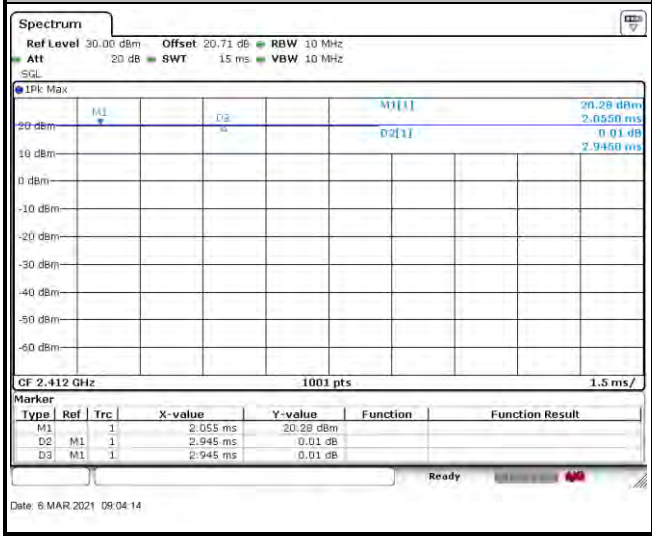
WIFI	2.4GHz 2400~2483.5MHz	
ANT	802.11n HT20 LF	
1+2	Horizontal	Vertical
QP / Peak		

Appendix E. Duty Cycle Plots

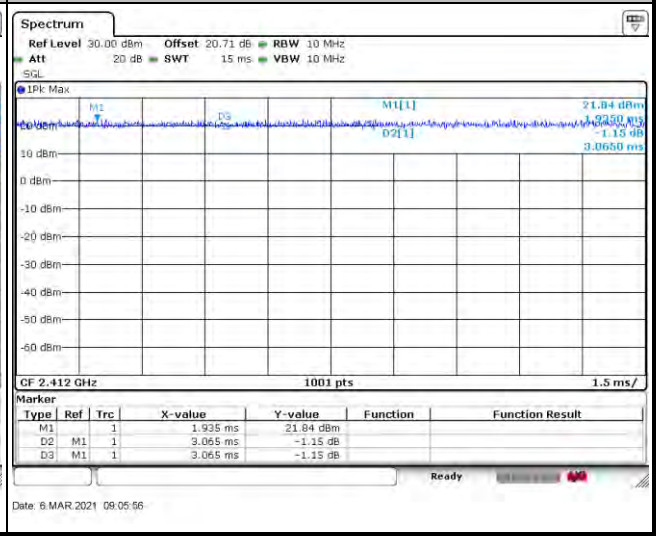
Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting	Duty Factor(dB)
1+2	802.11b for Ant. 1	100.00	-	-	10Hz	0.00
1+2	802.11b for Ant. 2	100.00	-	-	10Hz	0.00
1+2	802.11g for Ant. 1	100.00	-	-	10Hz	0.00
1+2	802.11g for Ant. 2	100.00	-	-	10Hz	0.00
1+2	2.4GHz 802.11n HT20 for Ant. 1	100.00	-	-	10Hz	0.00
1+2	2.4GHz 802.11n HT20 for Ant. 2	100.00	-	-	10Hz	0.00

MIMO <Ant. 1>

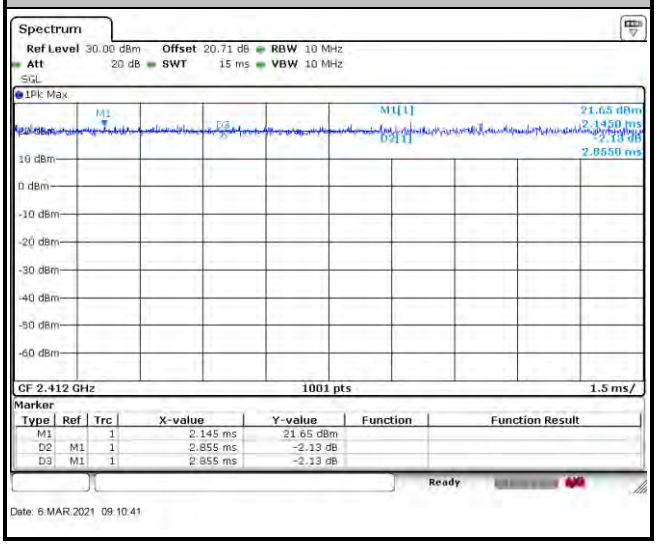
802.11b



802.11g

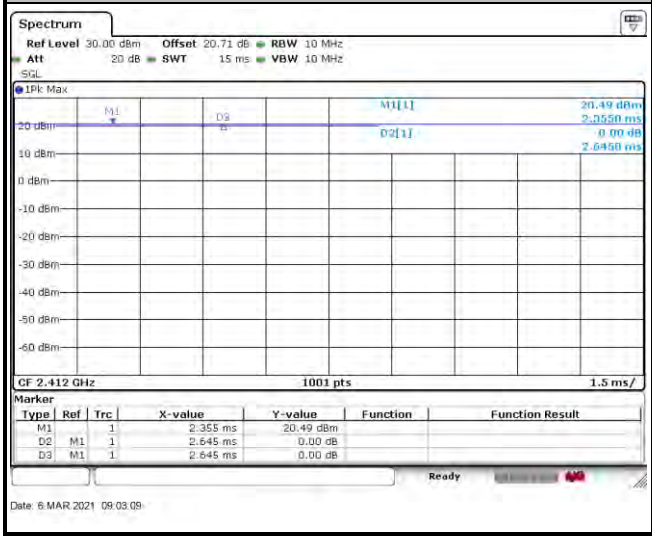


802.11n HT20

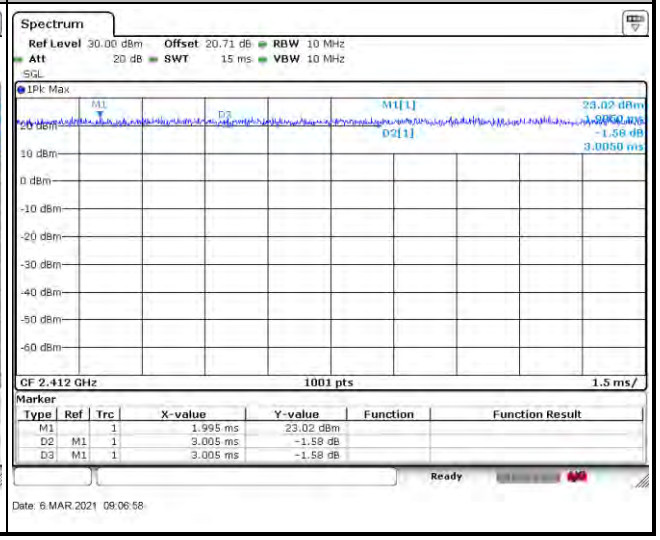


MIMO <Ant. 2>

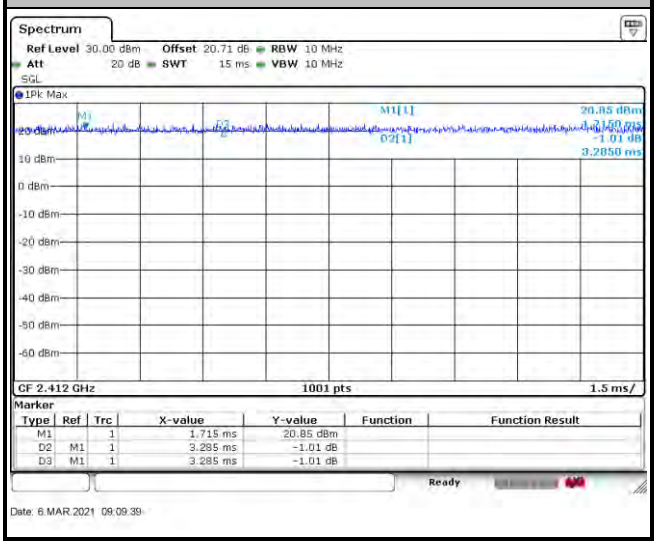
802.11b



802.11g



802.11n HT20



———THE END———