FCC RADIO TEST REPORT

FCC ID	:	**2AF77-H2221540**
Equipment	:	**Communication Device**
Brand Name	:	**blink**
Model Name	:	**BSM00500U**
Applicant	:	**Immedia Semiconductor LLC. 100 Riverpark Drive Suite 125, North Reading, MA, United States 01864**
Manufacturer	:	**Immedia Semiconductor LLC. 100 Riverpark Drive Suite 125, North Reading, MA, United States 01864**
Standard	:	**FCC Part 15 Subpart C §15.247**

The product was received on Aug. 07, 2023 and testing was performed from Oct. 04, 2023 to Feb. 28, 2024. 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 from 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	Issue Date
FR230915002D	01	Initial issue of report	Mar. 11, 2024

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.247(a)(2)	6dB Bandwidth	Pass	-
3.1	2.1049	99% Occupied Bandwidth	Reporting only	-
3.2	15.247(b)(3)	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	3.13 dB under the limit at 8131.50 MHz
3.6	15.207	AC Conducted Emission	Pass	21.77 dB under the limit at 1.96 MHz
3.7	15.203 15.247(b)	Antenna Requirement	Pass	-

Conformity Assessment Condition:

1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
2. The measurement uncertainty please refer to each test result in the section “Measurement Uncertainty”.

Disclaimer:

The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature
General Specs Bluetooth-LE, Wi-Fi 2.4GHz 802.11b/g/n, SRD and 802.11ah. **Antenna Type** WLAN: Stamped Metal Antenna Bluetooth: Stamped Metal Antenna SRD: Stamped Metal Antenna 802.11ah: Stamped Metal Antenna

Antenna information		
903.5 MHz ~ 926.5 MHz	Peak Gain (dBi)	1.58

Remark: The EUT's information above is declared by manufacturer. Please refer to Disclaimer in report summary.

1.2 Modification of EUT

No modifications made to the EUT during the testing.

1.3 Testing Location

Test Site	Sporton International (USA) Inc.
Test Site Location	1175 Montague Expressway, Milpitas, CA 95035 TEL : 408 9043300
Test Site No.	**Sporton Site No.**
	03CH02-CA, CO01-CA, TH01-CA

Note: The test site complies with ANSI C63.4 2014 requirement.

FCC Designation No.: US1250

1.4 Applicable Standards

According to the specifications declared by 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 15.247 Meas Guidance v05r02
- FCC KDB 414788 D01 Radiated Test Site v01r01.
- ANSI C63.10-2013

Remark:

1. All the test items were validated and recorded in accordance with the standards without any modification during the testing.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

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, the measured emission level of the EUT was maximized by rotating the EUT on a turntable, adjusting the orientation of the EUT and EUT antenna in three orthogonal axis (X: flat, Y: portrait, Z: landscape), and adjusting the measurement antenna orientation, following C63.10 exploratory test procedures and only the worst case emissions were reported in this report.

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

2.1 Carrier Frequency and Channel

<1MHz>

Channel List	
The lowest channel	903.5 MHz
The middle channel	915 MHz
The highest channel	926.5 MHz

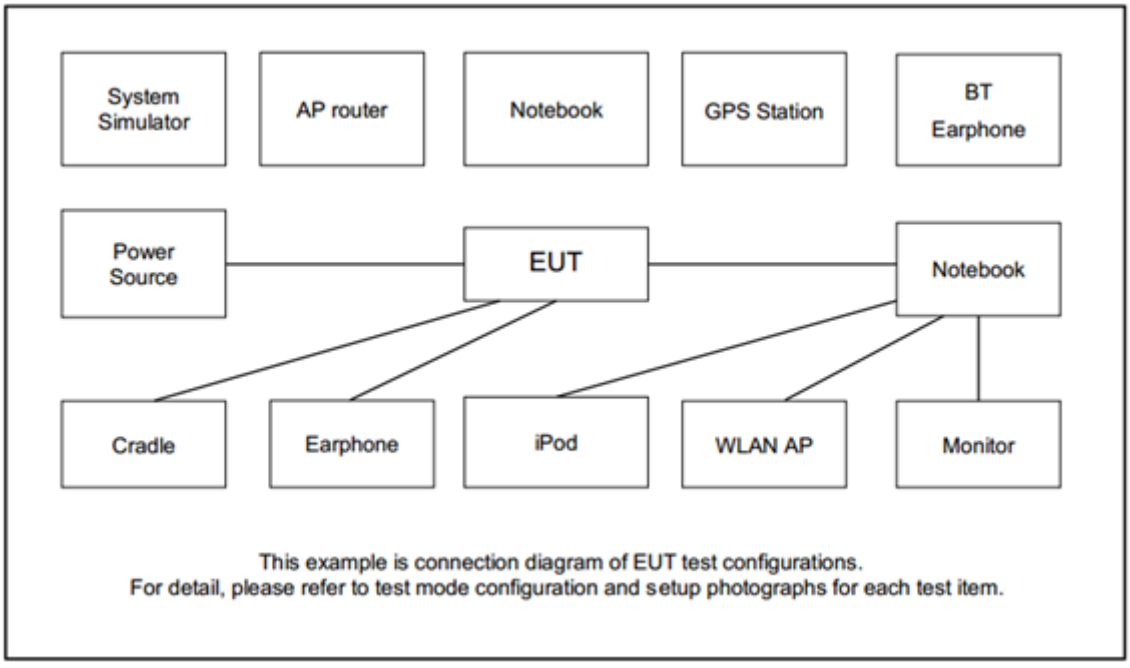
<2MHz>

Channel List	
The lowest channel	905 MHz
The middle channel	915 MHz
The highest channel	925 MHz

2.2 Test Mode

Summary table of Test Cases	
Test Item	**802.11ah/OFDM**
Conducted Test Cases	Mode 1: The lowest channel: 903.5 MHz_1MHz Mode 2: The middle channel: 915 MHz_1MHz Mode 3: The highest channel: 926.5 MHz_1MHz Mode 4: The lowest channel: 905 MHz_2MHz Mode 5: The middle channel: 915 MHz_2MHz Mode 6: The highest channel: 925 MHz_2MHz
Radiated Test Cases	Mode 1: The lowest channel: 903.5 MHz_1MHz Mode 2: The middle channel: 915 MHz_1MHz Mode 3: The highest channel: 926.5 MHz_1MHz Mode 4: The lowest channel: 905 MHz_2MHz Mode 5: The middle channel: 915 MHz_2MHz Mode 6: The highest channel: 925 MHz_2MHz
AC Conducted Emission	Mode 1 : 802.11ah Tx + USB Cable (Charging from Adapter)

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Adapter	Amazon	FANA7R	N/A	N/A	N/A
2.	USB Cable	Amazon	N/A	N/A	N/A	N/A

2.5 EUT Operation Test Setup

Writing commands onto the SD card, inserting the SD card into the EUT, and upon powering up, the EUT will automatically transmit signals.

2.6 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.

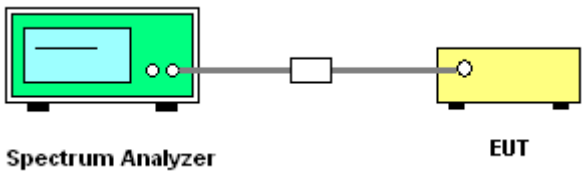
3.1.2 Measuring Instruments

Please refer to the measuring equipment list in 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 is connected to the spectrum analyzer by RF cable and attenuator. The path loss is 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.

3.2 Output Power Measurement

3.2.1 Limit of Output Power

Section 15.247(b)(3) For systems using digital modulation in the 902-928 MHz, the limit for peak output power is 1 watt.

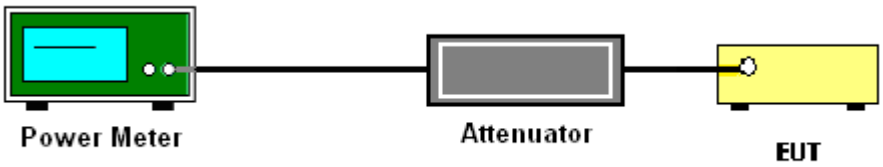
3.2.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

3.2.3 Test Procedures

1. For Average Power, the testing follows ANSI C63.10 Section 11.9.2.3.2 Method AVGPM-G
2. The RF output of EUT is connected to the power meter by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Measure the conducted output power and record the results in the test report.

3.2.4 Test Setup



3.2.5 Test Result of Average Output Power

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

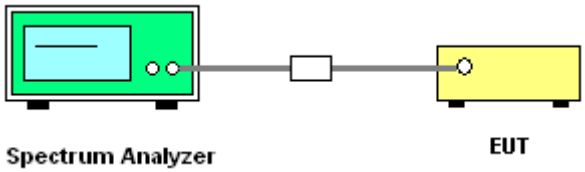
Please refer to the measuring equipment list in this test report.

3.3.3 Test Procedures

Method AVGPSD-2

1. The testing follows the ANSI C63.10 Section 11.10.5 Method AVGPSD-2.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is 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. Number of points in sweep ≥ 2 Span / RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins).
6. Detector = RMS, Sweep time = auto couple.
7. Trace average at least 100 traces in power averaging mode.
8. Add 10 log(1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times. For example, add 10 log(1/0.25) = 6 dB if the duty cycle is 25 percent.
9. Measure and record the results in the test report.

3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

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

Please refer to the measuring equipment list in 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 is connected to the spectrum analyzer by RF cable and attenuator. The path loss is 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

Please refer to Appendix A.

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 is 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

Please refer to the measuring equipment list in this test report.

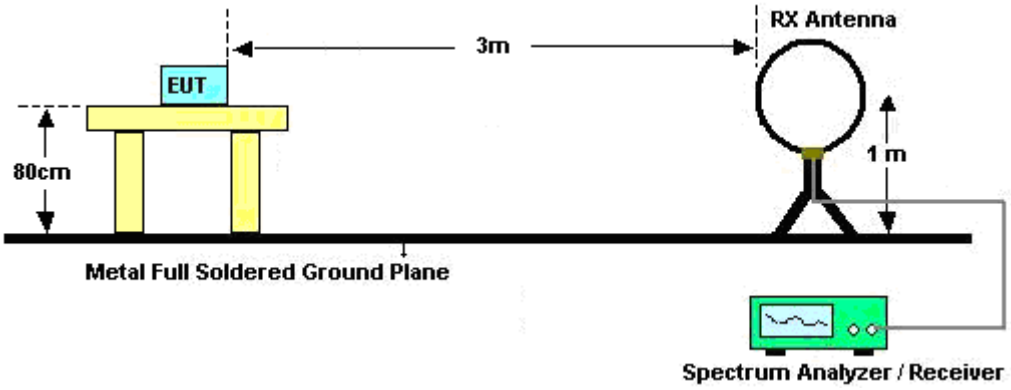
3.5.3 Test Procedures

1. The testing follows the ANSI C63.10 Section 11.12.1 Radiated emission measurements.
2. The EUT is 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 is 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 is set 3 meters away from the receiving antenna, which is mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. Radiated testing below 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading. When there is no suspected emission found and the emission level is with at least 6 dB margin against QP limit line, the position is marked as “-“.

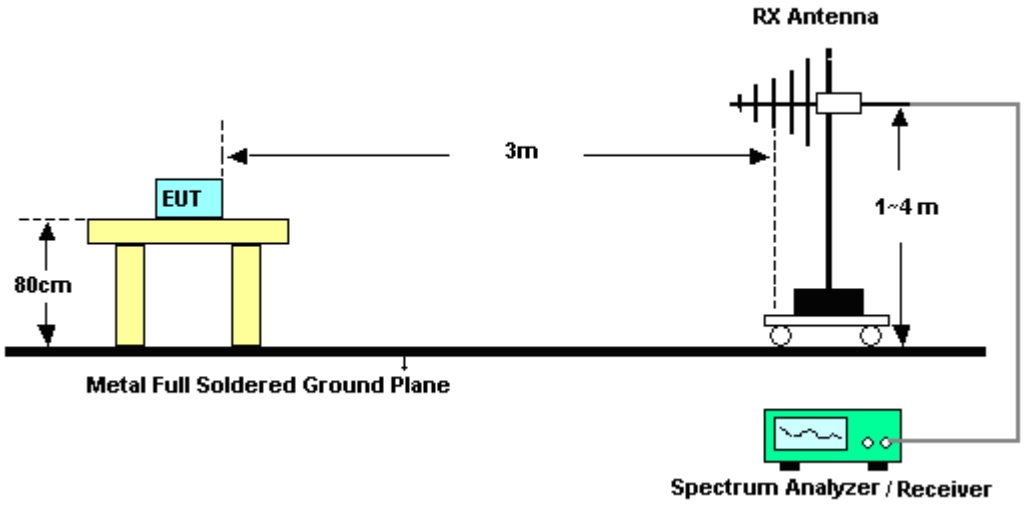
7. Radiated testing above 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading for scanning all frequencies. When there is no suspected emission found and the harmonic emission level is with at least 6 dB margin against average limit line, the position is marked as "-".
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

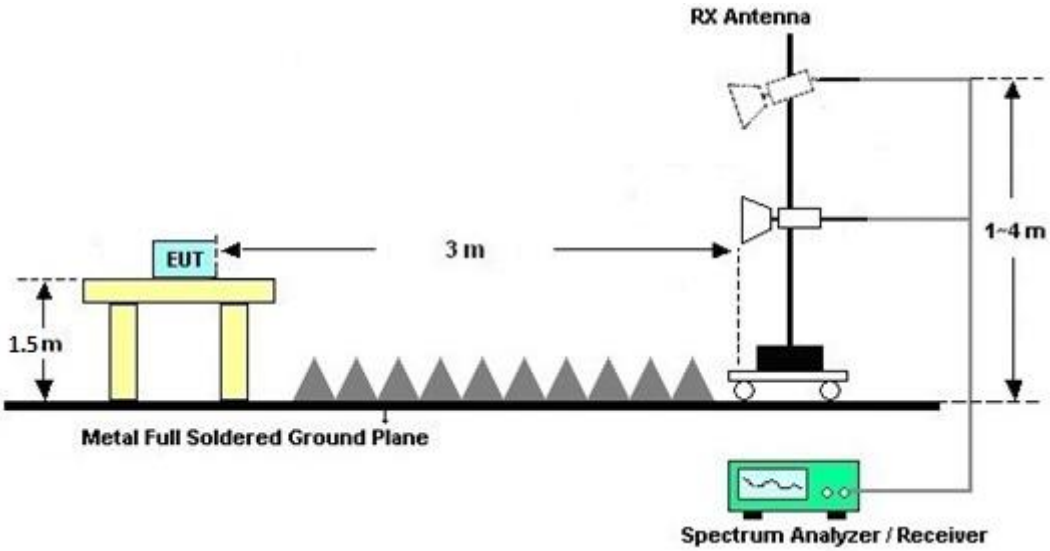
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated test above 1GHz



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

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

There is adequate comparison measurement of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result comes 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.

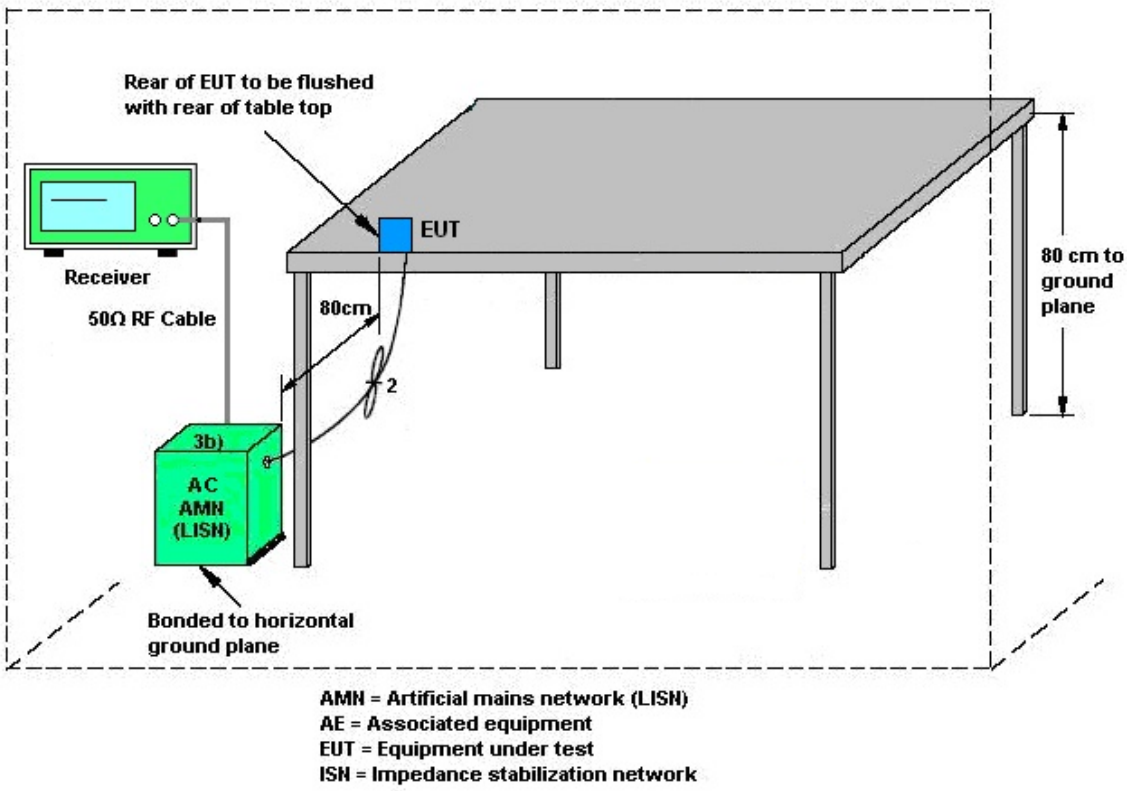
3.6.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

3.6.3 Test Procedures

1. The EUT is placed 0.4 meter away from the conducting wall of the shielding room, and is 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 Line and Neutral shall be tested in order to find out the maximum conducted emission.
7. The frequency range from 150 kHz to 30 MHz is scanned.
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



AMN = Artificial mains network (LISN)
AE = Associated equipment
EUT = Equipment under test
ISN = Impedance stabilization network

3.6.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

3.7 Antenna Requirements

3.7.1 Standard Applicable

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.

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. 29, 2023	Feb. 02, 2024~ Feb. 07, 2024	Jun. 28, 2024	Radiation (03CH02-CA)
Bilog Antenna	TESEQ	6111D	50392	30MHz~1GHz	Sep. 05, 2023	Feb. 02, 2024~ Feb. 07, 2024	Sep. 04, 2024	Radiation (03CH02-CA)
Horn Antenna	SCHWARZBECK	BBHA 9120D	02113	1GHz~18GHz	Jun. 07, 2023	Feb. 02, 2024~ Feb. 07, 2024	Jun. 06, 2024	Radiation (03CH02-CA)
Amplifier	SONOMA	300N	372240	N/A	May 03, 2023	Feb. 02, 2024~ Feb. 07, 2024	May 02, 2024	Radiation (03CH02-CA)
Preamplifier	Keysight	83017A	MY53270323	1GHz~26.5GHz	May 04, 2023	Feb. 02, 2024~ Feb. 07, 2024	May 03, 2024	Radiation (03CH02-CA)
Preamplifier	E-instrument	ERA-100M-18G-56-01-A70	EC1900252	1GHz~18GHz	May 23, 2023	Feb. 02, 2024~ Feb. 07, 2024	May 22, 2024	Radiation (03CH02-CA)
Preamplifier	EMEC	EMC18G40G	060725	18GHz~40GHz	May 04, 2023	Feb. 02, 2024~ Feb. 07, 2024	May 03, 2024	Radiation (03CH02-CA)
RF Cable	HUBER+SUHNER	SUCOFLEX 102	804209/2, 802406/2, 802875/2, 802952/2	N/A	Oct. 13, 2023	Feb. 02, 2024~ Feb. 07, 2024	Oct. 12, 2024	Radiation (03CH02-CA)
High Pass Filter	Wainwright	WHKX12-900-1000-15000-60ST	SN2	1G~15G	Jun. 05, 2023	Feb. 02, 2024~ Feb. 07, 2024	Jun. 04, 2024	Radiation (03CH02-CA)
Filter	Wainwright	WLK12-1200-1272-11000-40SS	SN2	1.2GHz Low Pass Filter	Jun. 05, 2023	Feb. 02, 2024~ Feb. 07, 2024	Jun. 04, 2024	Radiation (03CH02-CA)
Hygrometer	TESEO	608-H1	45142602	N/A	Aug. 30, 2023	Feb. 02, 2024~ Feb. 07, 2024	Aug. 29, 2024	Radiation (03CH02-CA)
Controller	ChainTek	EM-1000	060876	NA	N/A	Feb. 02, 2024~ Feb. 07, 2024	N/A	Radiation (03CH02-CA)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Feb. 02, 2024~ Feb. 07, 2024	N/A	Radiation (03CH02-CA)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Feb. 02, 2024~ Feb. 07, 2024	N/A	Radiation (03CH02-CA)
Software	Audix	E3	N/A	N/A	N/A	Feb. 02, 2024~ Feb. 07, 2024	N/A	Radiation (03CH02-CA)
Hygrometer	Testo	608-H1	45141354	N/A	Jul. 26, 2023	Oct. 04, 2023~ Feb. 28, 2024	Jul. 25, 2024	Conducted (TH01-CA)
Power Sensor	DARE!!	RPR3008W	RPR8W-1901027	10MHz-6GHz	May 01, 2023	Oct. 04, 2023~ Feb. 28, 2024	Apr. 30, 2024	Conducted (TH01-CA)
Spectrum Analyzer	Rohde & Schwarz	FSV40	101089	10Hz-40GHz	May 22, 2023	Oct. 04, 2023~ Feb. 28, 2024	May 21, 2024	Conducted (TH01-CA)
LISN	TESEQ	NNB51	47415	N/A	Jul. 31, 2023	Jan. 09, 2024	Jul. 30, 2024	Conduction (CO01-CA)
LISN	TESEQ	NNB51	47407	N/A	May 16, 2023	Jan. 09, 2024	May 15, 2024	Conduction (CO01-CA)
EMI Test Receiver	R&S	ESR7	102177	9kHz~7GHz	May 23, 2023	Jan. 09, 2024	May 22, 2024	Conduction (CO01-CA)
Pulse limiter with 10dB attenuation	R&S	VTSD 9561-F N	9561-F-N00412	N/A	Jun. 05, 2023	Jan. 09, 2024	Jun. 04, 2024	Conduction (CO01-CA)
Test Software	R&S	EMC32 V10.30.0	N/A	N/A	N/A	Jan. 09, 2024	N/A	Conduction (CO01-CA)

5 Measurement Uncertainty

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.7 dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.5 dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.9 dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.2 dB**

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Liliana Gonzalez/Vincent Lam	Temperature:	18.4~24.7	°C
Test Date:	2023/10/4~2024/02/28	Relative Humidity:	44.7~57.1	%

<1MHz>

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

Mod.	Data Rate	NTX	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
802.11ah	MCS0	1	903.5	0.965	0.859	0.50	Pass
802.11ah	MCS0	1	915	1.001	0.844	0.50	Pass
802.11ah	MCS0	1	926.5	0.989	0.846	0.50	Pass

TEST RESULTS DATA
Average Power Table

Mod.	Data Rate	NTX	Freq. (MHz)	Average Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
802.11ah	MCS0	1	903.5	21.08	30.00	1.58	22.66	36.00	Pass
802.11ah	MCS0	1	915	24.15	30.00	1.58	25.73	36.00	Pass
802.11ah	MCS0	1	926.5	23.65	30.00	1.58	25.23	36.00	Pass

TEST RESULTS DATA
Aversge Power Density

Mod.	Data Rate	NTX	Freq. (MHz)	Peak PSD (dBm /100kHz)	Aversge PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
802.11ah	MCS0	1	903.5	22.58	1.26	1.58	8.00	Pass
802.11ah	MCS0	1	915	24.93	3.46	1.58	8.00	Pass
802.11ah	MCS0	1	926.5	24.23	3.26	1.58	8.00	Pass

Note: PSD (dBm/ 100kHz) is a reference level used for Conducted Band Edges and Conducted Spurious Emission 30dBc limit.

<2MHz>

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

Mod.	Data Rate	NTX	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
802.11ah	MCS0	1	905	1.818	1.796	0.50	Pass
802.11ah	MCS0	1	915	1.814	1.792	0.50	Pass
802.11ah	MCS0	1	925	1.810	1.784	0.50	Pass

TEST RESULTS DATA
Average Power Table

Mod.	Data Rate	NTX	Freq. (MHz)	Average Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
802.11ah	MCS0	1	905	24.58	30.00	1.58	26.16	36.00	Pass
802.11ah	MCS0	1	915	24.15	30.00	1.58	25.73	36.00	Pass
802.11ah	MCS0	1	925	23.85	30.00	1.58	25.43	36.00	Pass

TEST RESULTS DATA
Aversge Power Density

Mod.	Data Rate	NTX	Freq. (MHz)	Peak PSD (dBm /100kHz)	Aversge PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
802.11ah	MCS0	1	905	22.65	0.02	1.58	8.00	Pass
802.11ah	MCS0	1	915	22.25	-0.34	1.58	8.00	Pass
802.11ah	MCS0	1	925	21.82	-1.10	1.58	8.00	Pass

Note: PSD (dBm/ 100kHz) is a reference level used for Conducted Band Edges and Conducted Spurious Emission 30dBc limit.

6dB Bandwidth

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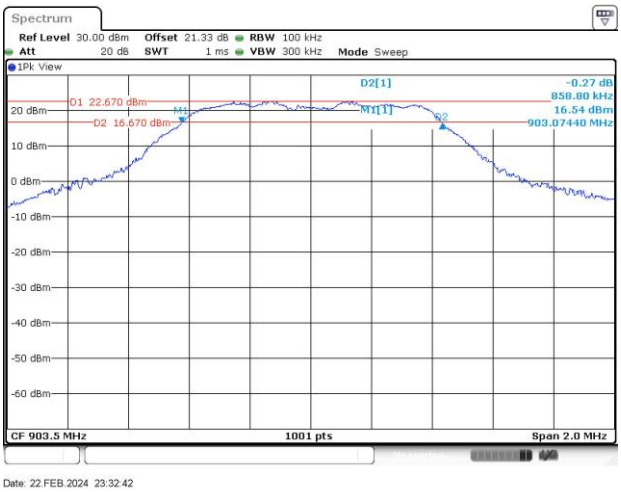
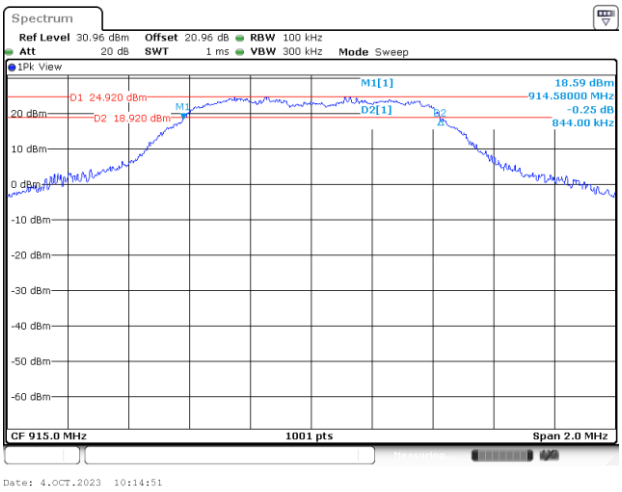
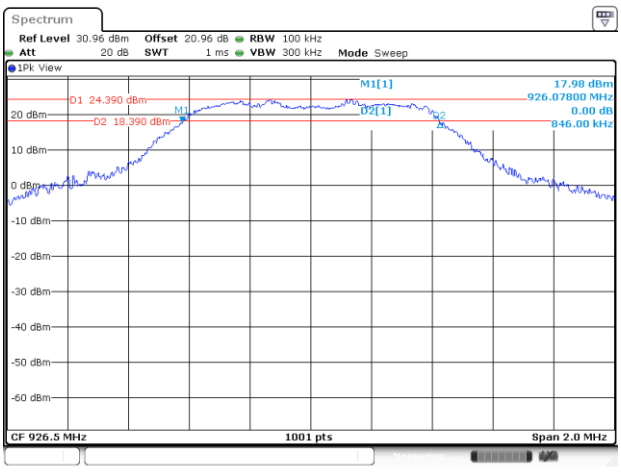
6 dB Bandwidth Plot on 903.5 MHz	**6 dB Bandwidth Plot on 915 MHz**
	
6 dB Bandwidth Plot on 926.5 MHz	
	

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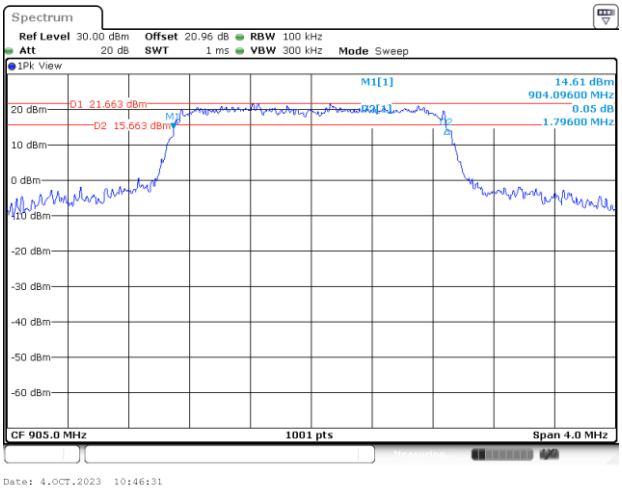
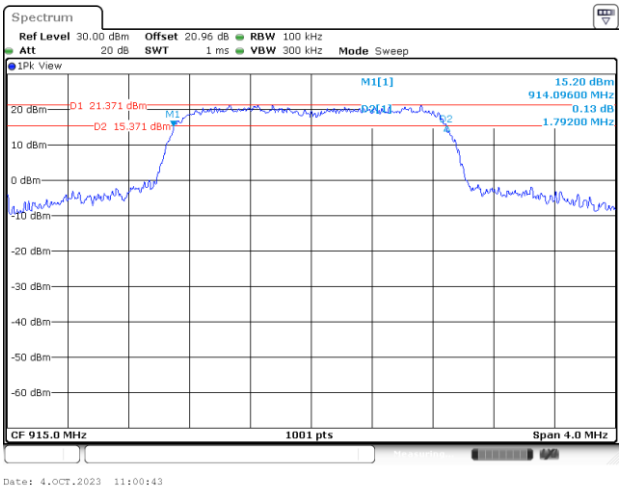
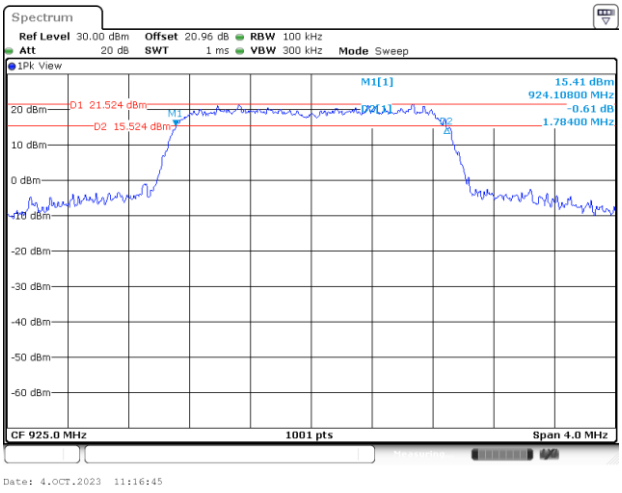
6 dB Bandwidth Plot on 905 MHz	**6 dB Bandwidth Plot on 915 MHz**
	
6 dB Bandwidth Plot on 925 MHz	
	

99% Occupied Bandwidth

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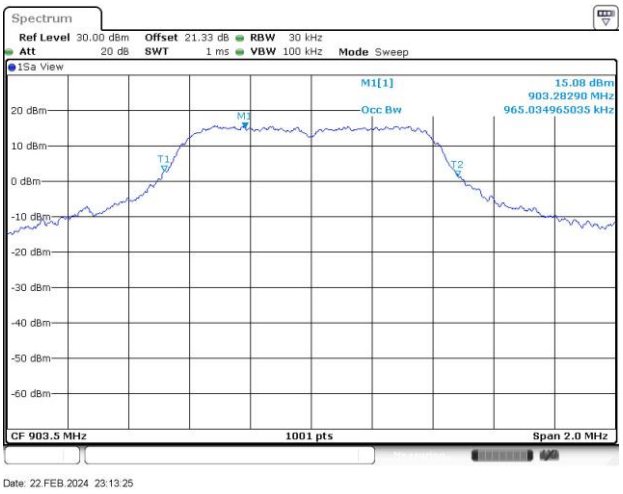
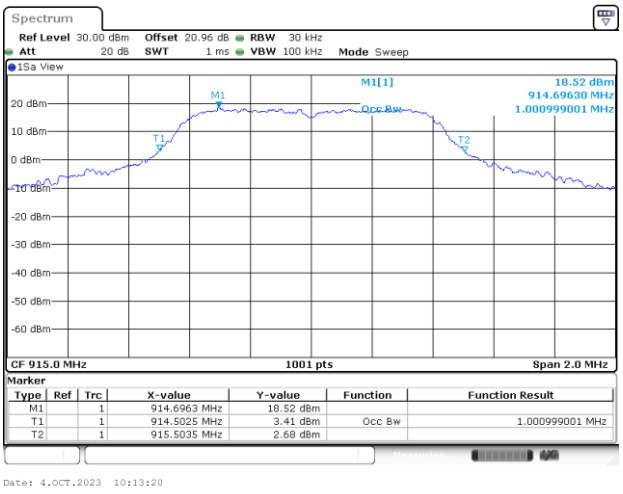
<tr><td> 
</td><td> 
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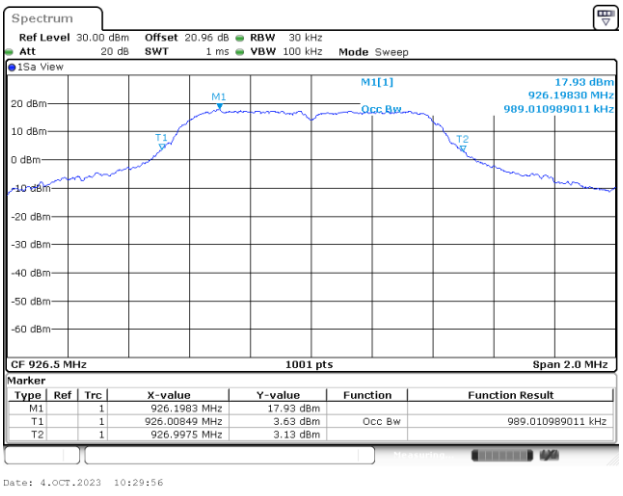
<tr><th>99% Occupied Bandwidth Plot on 926.5 MHz</th><th></th></tr>
<tr><td> 
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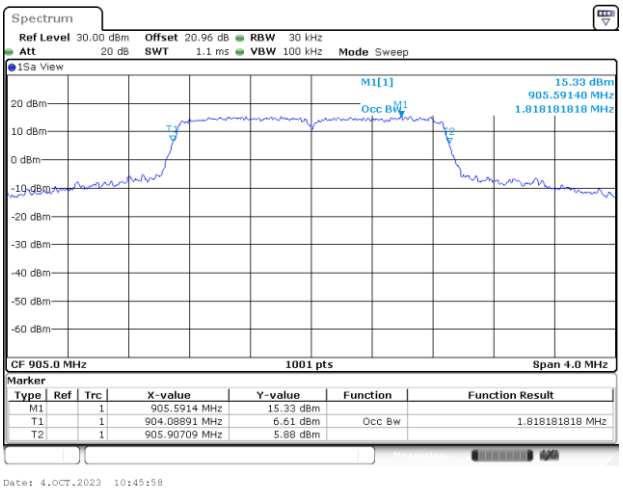
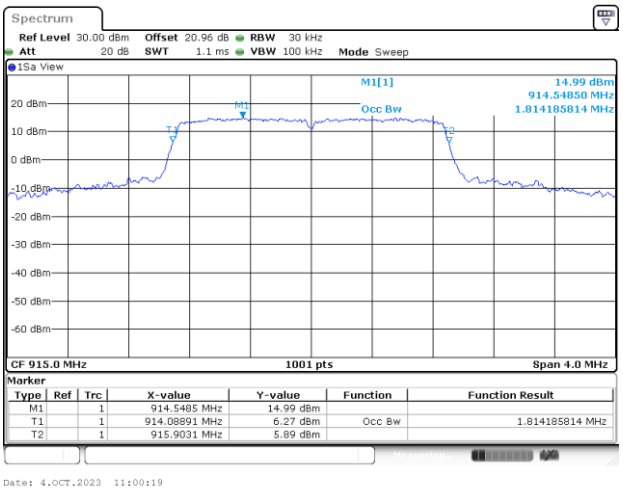
Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

<2MHz>

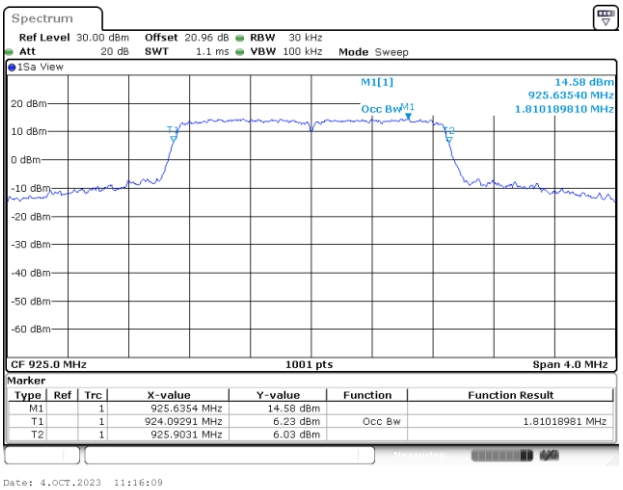
99% Occupied Bandwidth Plot on 905 MHz



99% Occupied Plot Bandwidth on 915 MHz

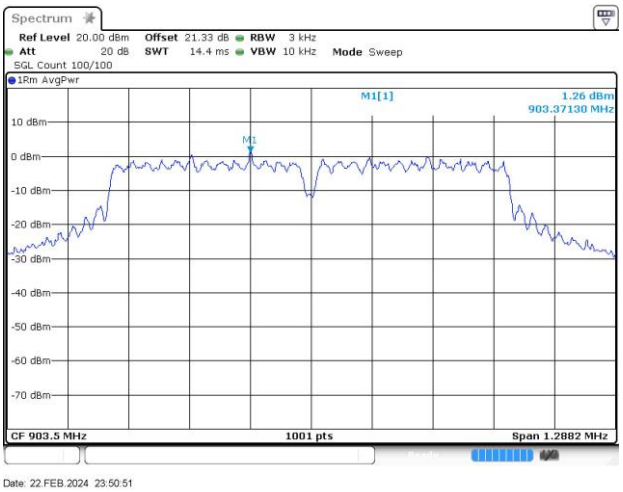
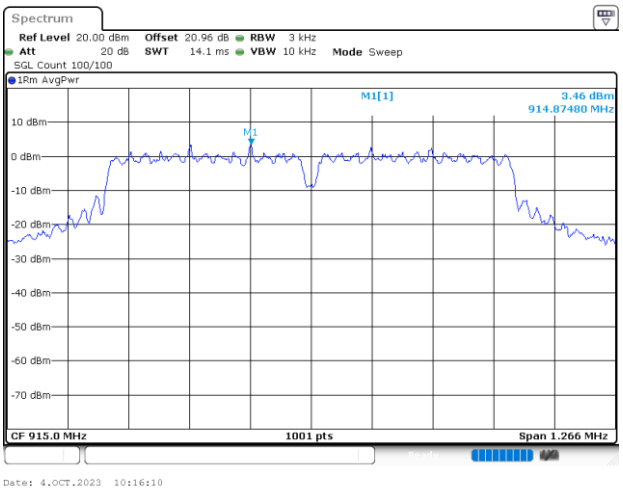
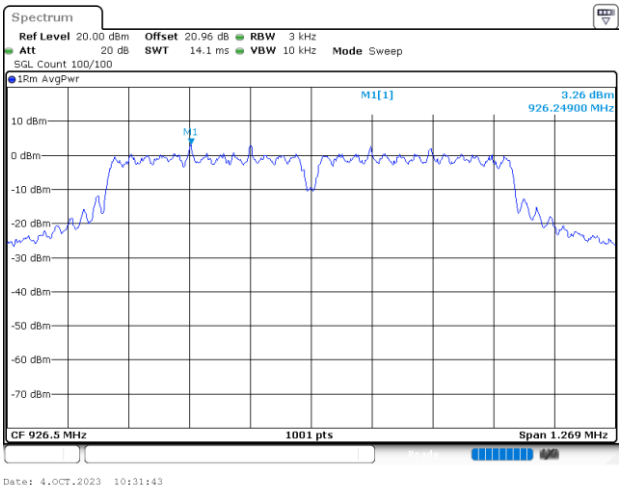


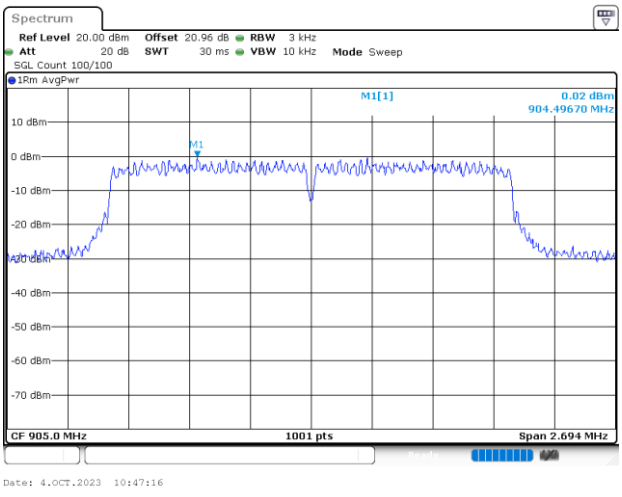
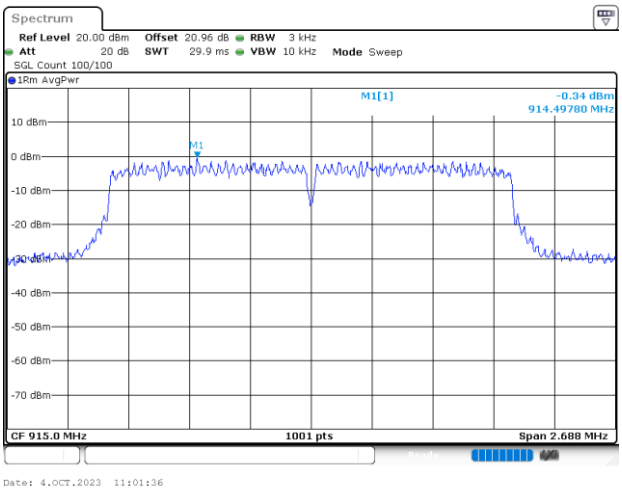
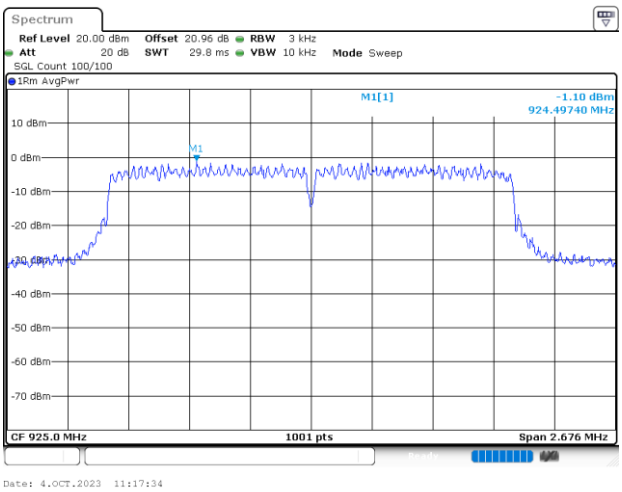
99% Occupied Bandwidth Plot on 925 MHz



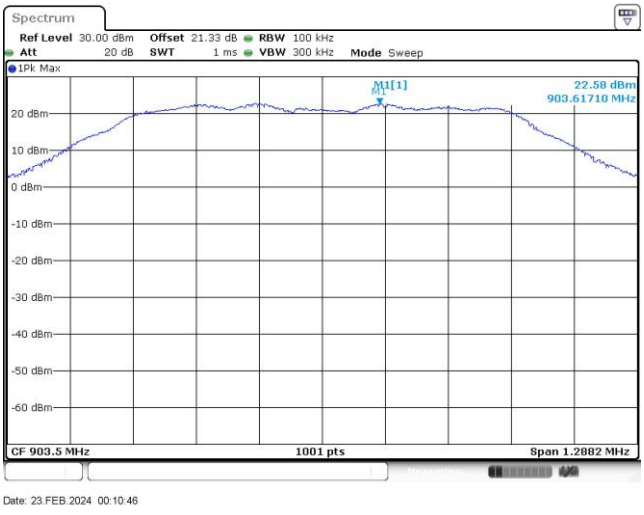
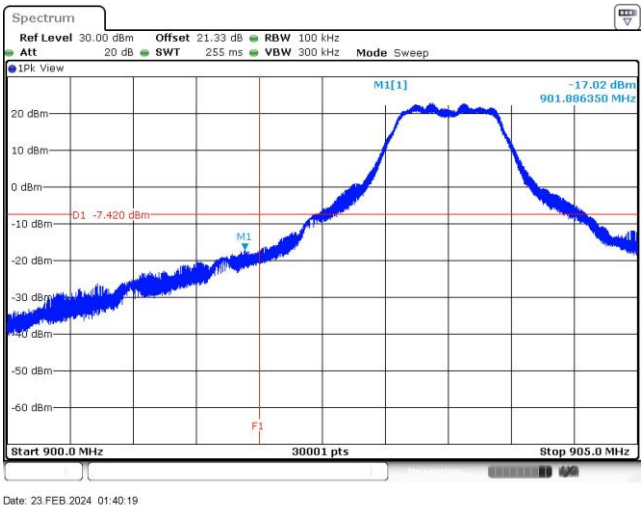
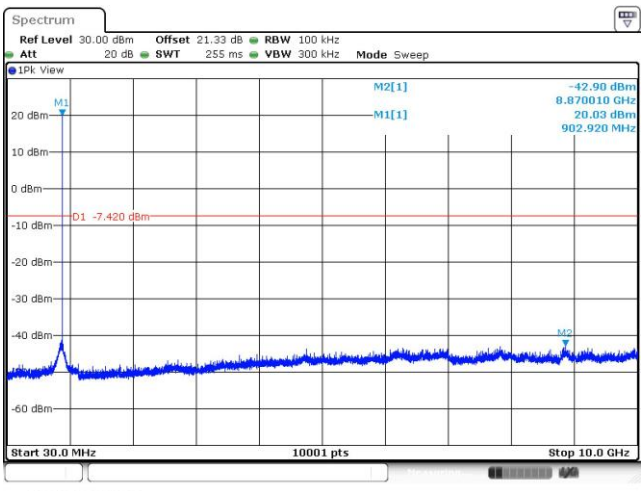
Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

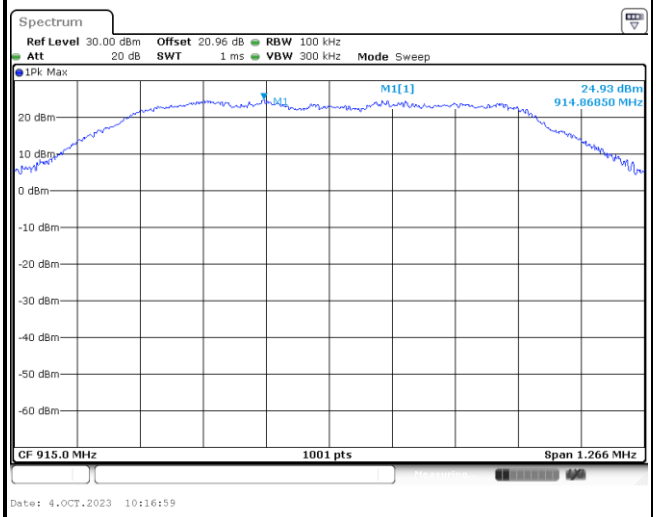
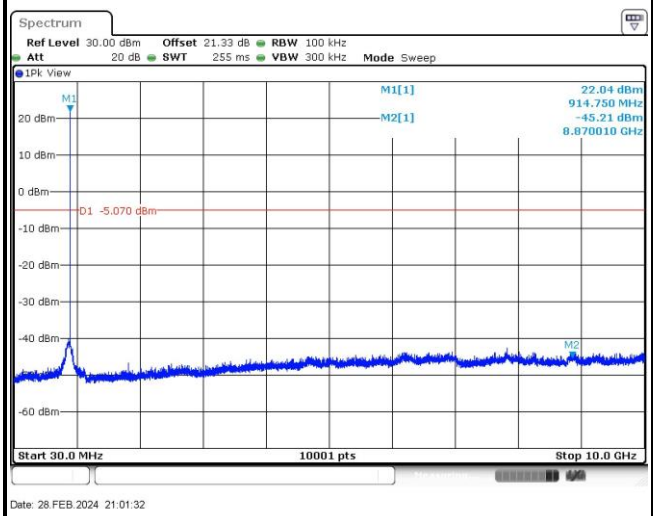
Power Spectral Density (dBm/3kHz)

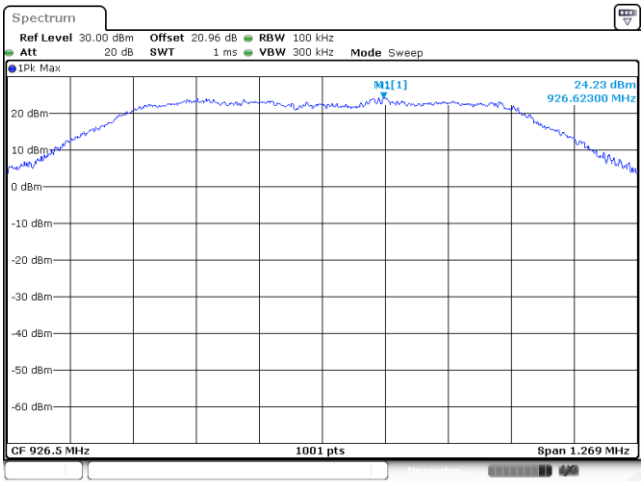
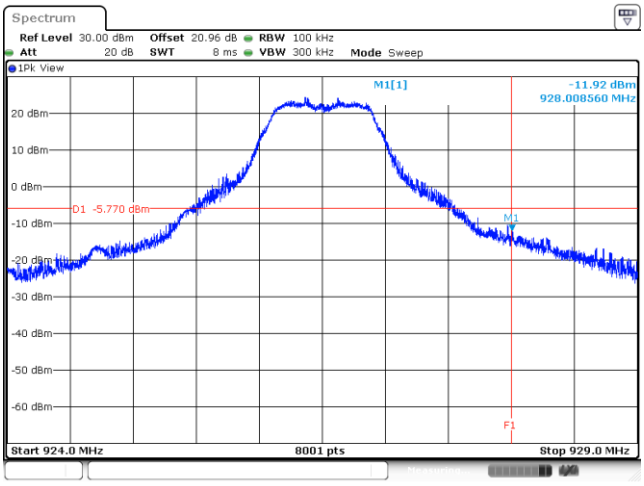
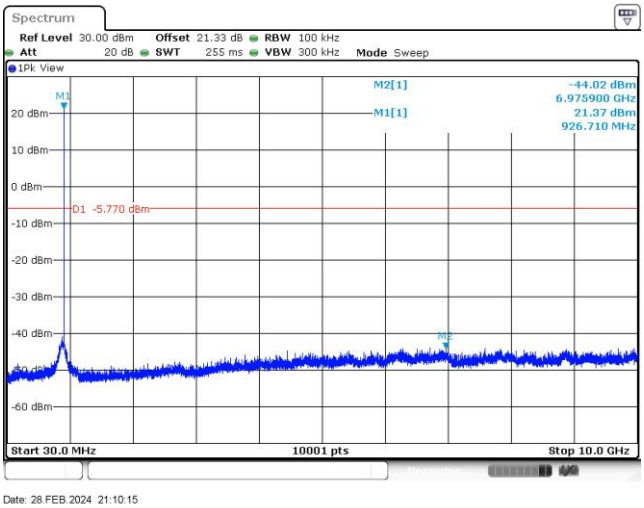
<1MHz>	
Power Density (dBm/3kHz) Plot on 903.5 MHz	**Power Density (dBm/3kHz) Plot on 915 MHz**
	
Power Density (dBm/3kHz Plot on 926.5 MHz	
	

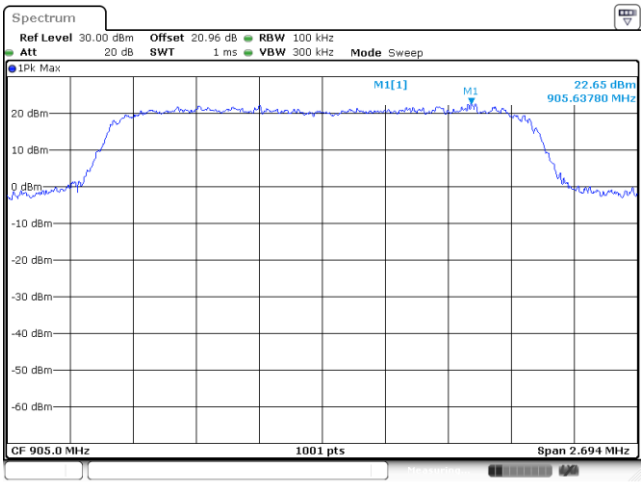
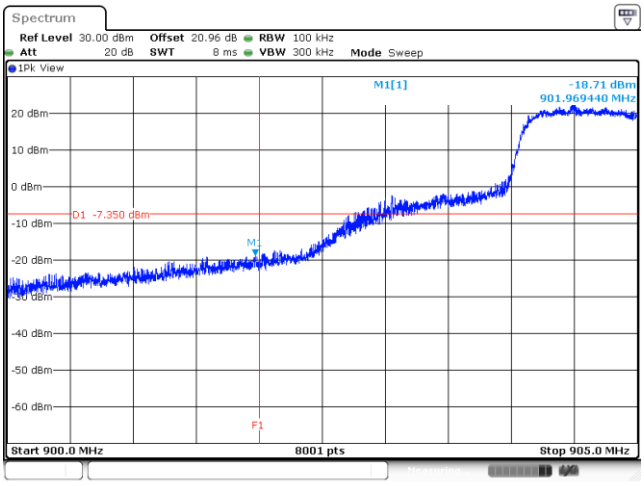
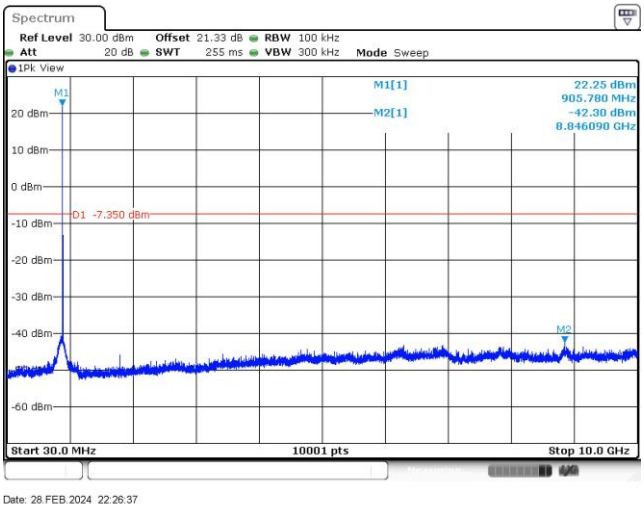
<2MHz>	
Power Density (dBm/3kHz) Plot on 905 MHz	**Power Density (dBm/3kHz) Plot on 915 MHz**
	
Power Density (dBm/3kHz Plot on 925 MHz	
	

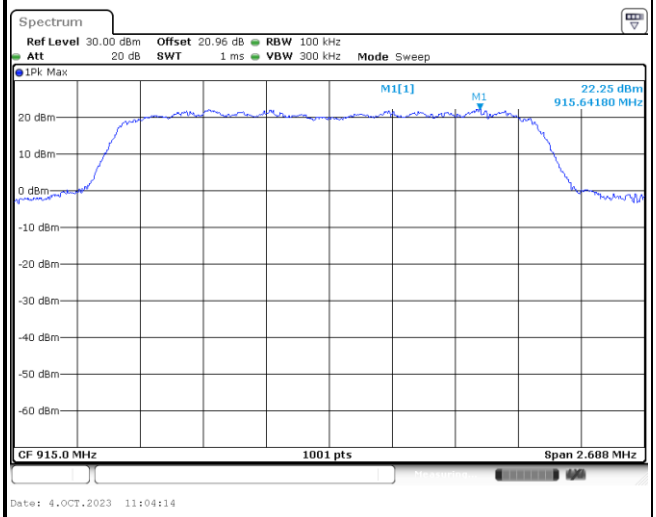
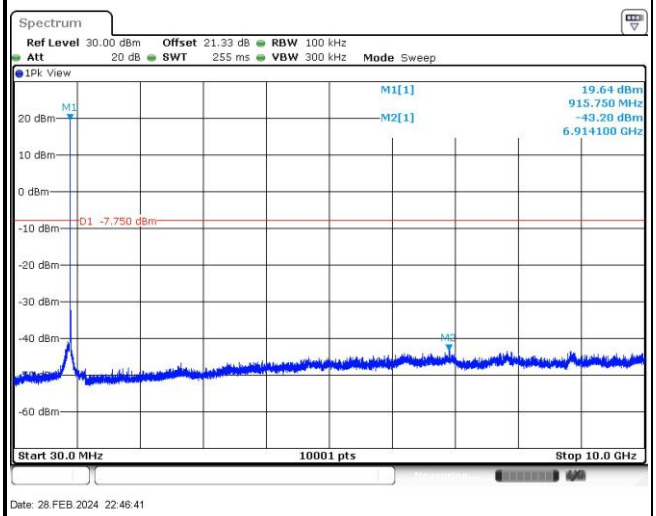
Band Edge and Spurious Emission

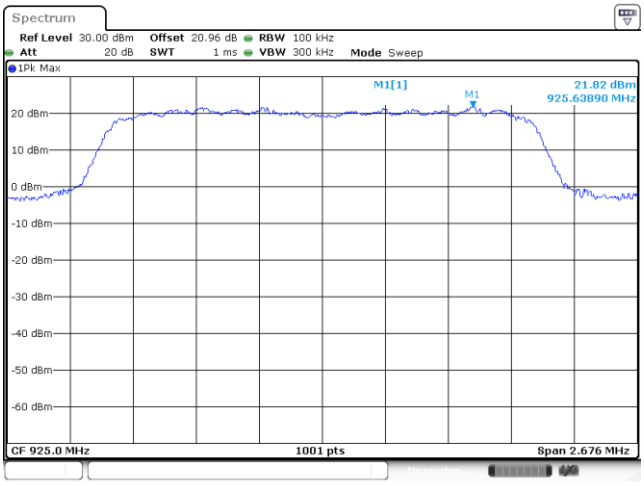
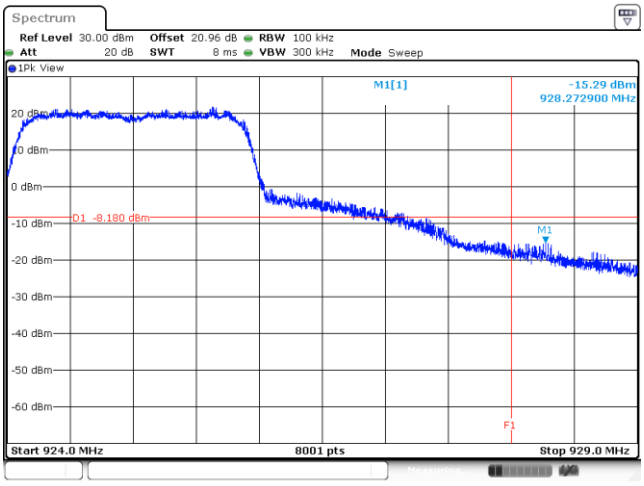
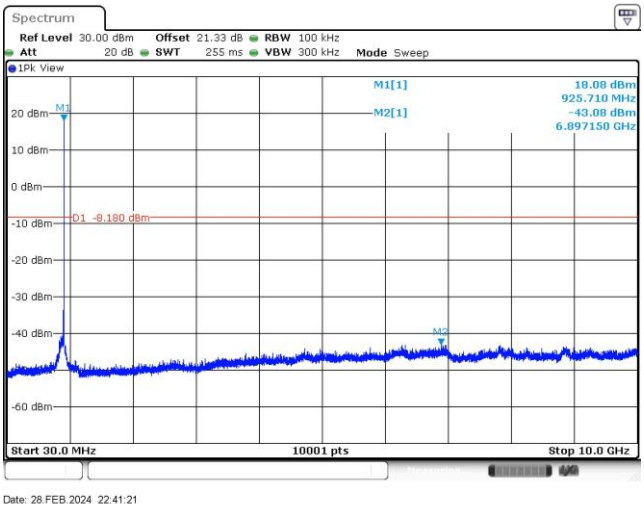
<1MHz> 903.5 MHz	
100kHz PSD reference Level Plot	**Low Channel Plot**
	
Spurious Emission 30MHz~10GHz Plot	
	

<1MHz> 915 MHz	
100kHz PSD reference Level Plot	**Mid Channel Plot**
	
Spurious Emission 30MHz~10GHz Plot	
	

<1MHz> 926.5 MHz	
100kHz PSD reference Level Plot	**High Channel Plot**
	
Spurious Emission 30MHz~10GHz Plot	
	

<2MHz> 905 MHz	
100kHz PSD reference Level Plot	**Low Channel Plot**
	
Spurious Emission 30MHz~10GHz Plot	
	

<2MHz> 915 MHz	
100kHz PSD reference Level Plot	**Mid Channel Plot**
	
Spurious Emission 30MHz~10GHz Plot	
	

<2MHz> 925 MHz	
100kHz PSD reference Level Plot	**High Channel Plot**
	
Spurious Emission 30MHz~10GHz Plot	
	

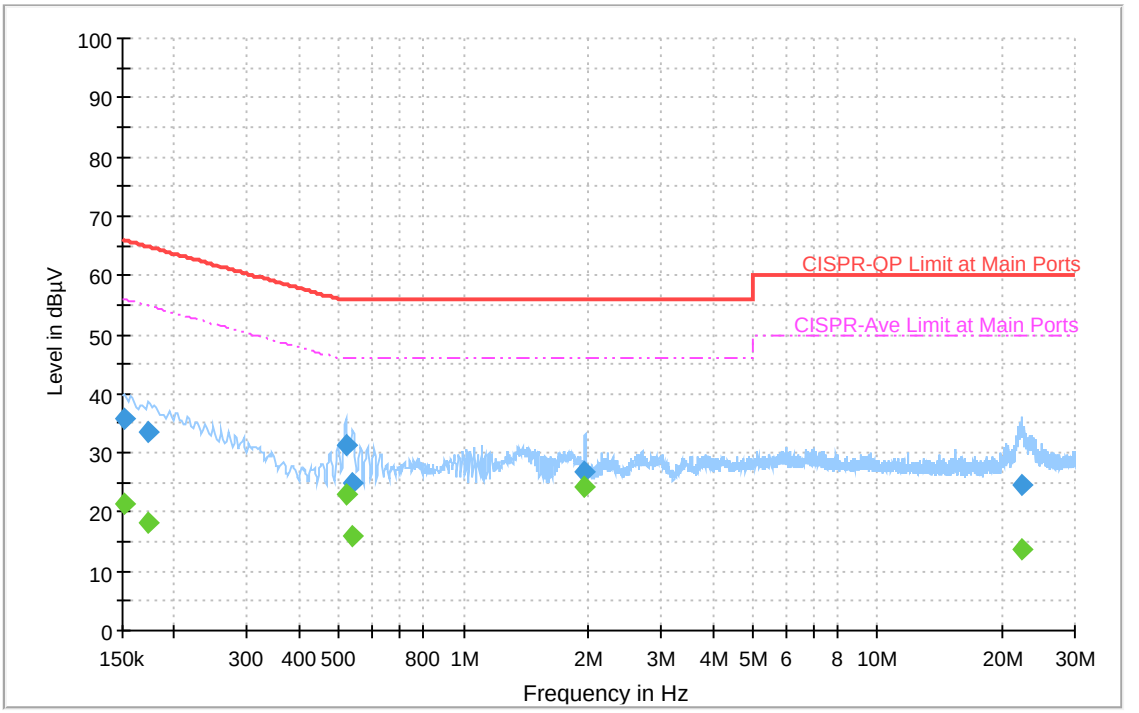
Appendix B. AC Conducted Emission Test Results

Test Engineer :	Leo Liu	**Temperature :**	20.5~22.6℃
		Relative Humidity :	39.7~42.3%

EUT Information

Test Site Location :	CO01-CA
Project	230915002
Power:	120Vac/60Hz
	Line

Full Spectrum



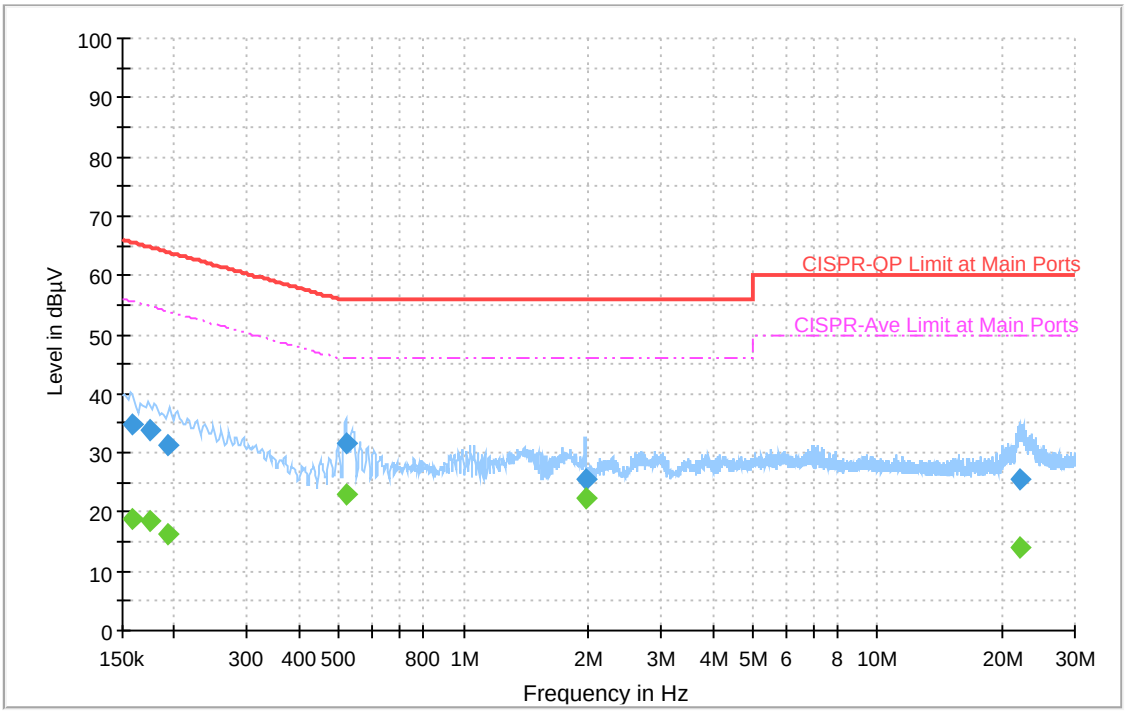
Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152331	35.88	---	65.87	29.99	L1	OFF	20.2
0.152331	---	21.31	55.87	34.56	L1	OFF	20.2
0.173004	33.63	---	64.82	31.18	L1	OFF	20.3
0.173004	---	18.19	54.82	36.62	L1	OFF	20.3
0.520260	31.16	---	56.00	24.84	L1	OFF	20.3
0.520260	---	22.99	46.00	23.01	L1	OFF	20.3
0.536919	24.77	---	56.00	31.23	L1	OFF	20.3
0.536919	---	15.97	46.00	30.03	L1	OFF	20.3
1.964211	26.95	---	56.00	29.05	L1	OFF	20.3
1.964211	---	24.23	46.00	21.77	L1	OFF	20.3
22.356087	24.50	---	60.00	35.50	L1	OFF	21.2
22.356087	---	13.62	50.00	36.38	L1	OFF	21.2

EUT Information

Test Site Location :	CO01-CA
Project	230915002
Power:	120Vac/60Hz
	Neutral

Full Spectrum



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.158775	34.74	---	65.53	30.79	N	OFF	20.2
0.158775	---	18.79	55.53	36.74	N	OFF	20.2
0.174102	33.74	---	64.76	31.02	N	OFF	20.2
0.174102	---	18.46	54.76	36.30	N	OFF	20.2
0.193389	31.32	---	63.89	32.57	N	OFF	20.2
0.193389	---	16.18	53.89	37.71	N	OFF	20.2
0.518874	31.62	---	56.00	24.38	N	OFF	20.2
0.518874	---	23.15	46.00	22.85	N	OFF	20.2
1.966425	25.64	---	56.00	30.36	N	OFF	20.3
1.966425	---	22.37	46.00	23.63	N	OFF	20.3
21.999282	25.50	---	60.00	34.50	N	OFF	21.2
21.999282	---	14.08	50.00	35.92	N	OFF	21.2

Appendix C. Radiated Spurious Emission

Test Engineer :	Thinh Hoang	Temperature :	16.2-17.2°C
		Relative Humidity :	60-66%

802.11ah 1M 902~928MHz

802.11ah 1M (Band Edge @ 3m)

802.11ah	Note	Frequency	Level	Margin	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11ah 1M 903.5MHz		39.7	28.25	-11.75	40	28.73	20.96	11.01	32.45	-	-	P	H
		121.18	29.29	-14.21	43.5	32.24	17.72	11.81	32.48	-	-	P	H
		233.7	29.95	-16.05	46	32.52	17.32	12.57	32.46	-	-	P	H
		635.28	38.06	-7.94	46	29.94	26.31	14.35	32.54	-	-	P	H
	*	903.5	120.02	-	-	106.79	29.43	15.31	31.51	-	-	P	H
		967.99	47.92	-6.08	54	32.77	30.46	15.56	30.87	-	-	P	H
													H
													H
													H
		38.73	29.98	-10.02	40	30.13	21.29	11.01	32.45	-	-	P	V
		105.66	32.91	-10.59	43.5	36.54	17.03	11.82	32.48	-	-	P	V
		484.93	35.19	-10.81	46	29.53	24.3	13.87	32.51	-	-	P	V
		718.7	39.12	-6.88	46	29.04	27.75	14.79	32.46	-	-	P	V
	*	903.5	117.73	-	-	104.5	29.43	15.31	31.51	-	-	P	V
		967.99	48.48	-5.52	54	33.33	30.46	15.56	30.87	-	-	P	V
													V
													V
													V

802.11ah	Note	Frequency (MHz)	Level (dBµV/m)	Margin (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)
		121.18	30.24	-13.26	43.5	33.19	17.72	11.81	32.48	-	-	P	H
		237.58	29.78	-16.22	46	31.94	17.71	12.61	32.48	-	-	P	H
		486.87	35.03	-10.97	46	29.42	24.26	13.87	32.52	-	-	P	H
		713.85	39.44	-6.56	46	29.62	27.53	14.77	32.48	-	-	P	H
	*	915	121.02	-	-	107.49	29.6	15.35	31.42	-	-	P	H
		963.14	48.35	-5.65	54	33.35	30.4	15.54	30.94	-	-	P	H
													H
													H
													H
													H
													H
802.11ah 1M 915MHz													H
		46.49	30.06	-9.94	40	34.42	16.96	11.11	32.43	-	-	P	V
		115.36	32.68	-10.82	43.5	35.66	17.69	11.8	32.47	-	-	P	V
		535.37	35.51	-10.49	46	29.1	24.99	14	32.58	-	-	P	V
		651.77	38.78	-7.22	46	30.55	26.3	14.42	32.49	-	-	P	V
	*	915	117.78	-	-	104.25	29.6	15.35	31.42	-	-	P	V
		962.17	50.56	-3.44	54	35.57	30.4	15.54	30.95	-	-	P	V
													V
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													V
													V
													V

802.11ah	Note	Frequency (MHz)	Level (dBµV/m)	Margin (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)
		30.97	33.41	-6.59	40	29.58	25.32	10.97	32.46	-	-	P	H
		235.64	30.11	-15.89	46	32.52	17.48	12.58	32.47	-	-	P	H
		439.34	34.11	-11.89	46	29.98	22.97	13.68	32.52	-	-	P	H
		719.67	38.78	-7.22	46	28.64	27.79	14.8	32.45	-	-	P	H
	*	926.5	120	-	-	106.1	29.86	15.39	31.35	-	-	P	H
		960.23	49.24	-4.76	54	34.29	30.4	15.52	30.97	-	-	P	H
													H
													H
													H
													H
													H
802.11ah 1M 926.5MHz													H
		36.79	29.46	-10.54	40	28.4	22.52	10.99	32.45	-	-	P	V
		114.39	33.06	-10.44	43.5	36.03	17.68	11.81	32.46	-	-	P	V
		488.81	34.96	-11.04	46	29.37	24.22	13.89	32.52	-	-	P	V
		720.64	39.64	-6.36	46	29.47	27.8	14.81	32.44	-	-	P	V
	*	926.5	117.86	-	-	103.96	29.86	15.39	31.35	-	-	P	V
		961.2	49.86	-4.14	54	34.89	30.4	15.53	30.96	-	-	P	V
													V
													V
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													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against limit line.
3. Non restricted band limit is radio frequency level down 20db

802.11ah 1M 902~928MHz

802.11ah 1M (Harmonic @ 3m)

802.11ah	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11ah 1M 903.5MHz		1000	55.73	-18.27	74	90.55	25.45	7.85	68.12	114	36	P	H
		1000	44.2	-9.8	54	79.02	25.45	7.85	68.12	114	36	A	H
		1807	52.17	-21.83	74	87.01	25.41	7.64	67.89	-	-	P	H
		2710.5	54.96	-19.04	74	84.22	28.47	9.6	67.33	100	332	P	H
		2710.5	43.73	-10.27	54	72.99	28.47	9.6	67.33	100	332	A	H
		6324.5	47.42	-26.58	74	63.18	34.62	13.86	64.24	-	-	P	H
		7228	50.75	-23.25	74	63.83	36.86	14.77	64.71	-	-	P	H
		8131.5	64.06	-9.94	74	77.67	37.02	15.72	66.35	100	123	P	H
		8131.5	50.87	-3.13	54	64.48	37.02	15.72	66.35	100	123	A	H
		9035	63.83	-10.17	74	76.66	38.1	16.61	67.54	100	120	P	H
		9035	50.86	-3.14	54	63.69	38.1	16.61	67.54	100	120	A	H
		1000	50.72	-23.28	74	85.47	25.52	7.85	68.12	102	337	P	V
		1000	35.91	-18.09	54	70.66	25.52	7.85	68.12	102	337	A	V
		1807	46.87	-27.13	74	81.67	25.45	7.64	67.89	-	-	P	V
		2710.5	58.78	-15.22	74	88.22	28.29	9.6	67.33	100	5	P	V
		2710.5	43.01	-10.99	54	72.45	28.29	9.6	67.33	100	5	A	V
		8131.5	57.53	-16.47	74	71.12	37.04	15.72	66.35	100	88	P	V
		8131.5	44.64	-9.36	54	58.23	37.04	15.72	66.35	100	88	A	V
		9035	55.47	-18.53	74	68.24	38.16	16.61	67.54	101	139	P	V
		9035	45.46	-8.54	54	58.23	38.16	16.61	67.54	101	139	A	V
													V
													V

802.11ah 1M 915MHz		1000	56.76	-17.24	74	91.58	25.45	7.85	68.12	100	41	P	H
		1000	46.26	-7.74	54	81.08	25.45	7.85	68.12	100	41	A	H
		1830	46.13	-27.87	74	80.69	25.53	7.67	67.76	-	-	P	H
		2745	44.61	-29.39	74	73.44	28.51	9.7	67.04	-	-	P	H
		6405	47.68	-26.32	74	63.9	34.83	13.94	64.99	-	-	P	H
		8235	59.82	-14.18	74	74.02	37.11	15.8	67.11	100	134	P	H
		8235	47.97	-6.03	54	62.17	37.11	15.8	67.11	100	134	A	H
		9150	62.48	-11.52	74	75.37	38.28	16.69	67.86	100	117	P	H
		9150	50.31	-3.69	54	63.2	38.28	16.69	67.86	100	117	A	H
		1000	49.78	-24.22	74	84.53	25.52	7.85	68.12	300	60	P	V
		1000	38.79	-15.21	54	73.54	25.52	7.85	68.12	300	60	A	V
		1830	44.88	-29.12	74	79.34	25.63	7.67	67.76	-	-	P	V
		2745	47.57	-26.43	74	76.56	28.35	9.7	67.04	-	-	P	V
		6405	46.07	-27.93	74	62.25	34.87	13.94	64.99	-	-	P	V
		8235	53.84	-20.16	74	68.08	37.07	15.8	67.11	100	91	P	V
		8235	42.66	-11.34	54	56.9	37.07	15.8	67.11	100	91	A	V
		9150	56.07	-17.93	74	69.06	38.18	16.69	67.86	100	57	P	V
		9150	43	-11	54	55.99	38.18	16.69	67.86	100	57	A	V

802.11ah 1M 926.5MHz		1000	57.47	-16.53	74	92.29	25.45	7.85	68.12	100	40	P	H
		1000	46.24	-7.76	54	81.06	25.45	7.85	68.12	100	40	A	H
		1853	53.37	-20.63	74	87.59	25.7	7.71	67.63	100	35	P	H
		2779.5	45.71	-28.29	74	74.17	28.58	9.79	66.83	-	-	P	H
		7412	47.34	-26.66	74	62.4	36.47	14.96	66.49	-	-	P	H
		8338.5	60.52	-13.48	74	74.64	37.26	15.89	67.27	100	119	P	H
		8338.5	46.69	-7.31	54	60.81	37.26	15.89	67.27	100	119	A	H
		9265	59.96	-14.04	74	72.94	38.31	16.74	68.03	200	284	P	H
		1000	57.78	-16.22	74	92.53	25.52	7.85	68.12	300	59	P	V
		1000	46.62	-7.38	54	81.37	25.52	7.85	68.12	300	59	A	V
		1853	47.9	-26.1	74	81.95	25.87	7.71	67.63	300	49	P	V
		2779.5	47.68	-26.32	74	76.2	28.52	9.79	66.83	-	-	P	V
		4632.5	43.56	-30.44	74	67.31	31.74	11.93	67.42	-	-	P	V
		8338.5	54.53	-19.47	74	68.67	37.24	15.89	67.27	100	93	P	V
		8338.5	41.11	-12.89	54	55.25	37.24	15.89	67.27	100	93	A	V
		9265	52.15	-21.85	74	65.13	38.31	16.74	68.03	200	143	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line. 3. Non restricted band limit is radio frequency level down 20db 4. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.												

802.11ah 2M 902~928MHz

802.11ah 2M (Band Edge @ 3m)

802.11ah	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11ah 2M 905MHz		30	33.99	-6.01	40	29.58	25.9	10.97	32.46	-	-	P	H
		146.4	30.76	-12.74	43.5	33.2	17.94	12.03	32.41	-	-	P	H
		262.8	29.36	-16.64	46	29	20.01	12.76	32.41	-	-	P	H
		482.99	35.48	-10.52	46	29.85	24.26	13.86	32.49	-	-	P	H
	*	905	120.11	-	-	106.9	29.4	15.32	31.51	-	-	P	H
		961.2	49.42	-4.58	54	34.45	30.4	15.53	30.96	-	-	P	H
													H
													H
													H
													H
													H
													H
		30	34.42	-5.58	40	30.01	25.9	10.97	32.46	-	-	P	V
		174.53	30.26	-13.24	43.5	34.59	15.85	12.2	32.38	-	-	P	V
		454.86	33.49	-12.51	46	28.88	23.3	13.77	32.46	-	-	P	V
		632.37	39.05	-6.95	46	31.01	26.25	14.34	32.55	-	-	P	V
	*	905	113.63	-	-	100.42	29.4	15.32	31.51	-	-	P	V
		970.9	47.18	-6.82	54	31.92	30.52	15.58	30.84	-	-	P	V
													V
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													V
													V
													V
													V

802.11ah	Note	Frequency (MHz)	Level (dBµV/m)	Margin (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)
		30	32.13	-7.87	40	27.72	25.9	10.97	32.46	-	-	P	H
		146.4	29.9	-13.6	43.5	32.34	17.94	12.03	32.41	-	-	P	H
		240.49	30.01	-15.99	46	31.82	18.04	12.62	32.47	-	-	P	H
		531.49	35.34	-10.66	46	29.03	24.93	13.99	32.61	-	-	P	H
	*	915	120.33	-	-	106.8	29.6	15.35	31.42	-	-	P	H
		965.08	48.34	-5.66	54	33.29	30.4	15.56	30.91	-	-	P	H
													H
													H
													H
													H
													H
802.11ah 2M 915MHz													H
		105.66	32.91	-10.59	43.5	36.54	17.03	11.82	32.48	-	-	P	V
		266.68	30.58	-15.42	46	30.27	19.9	12.79	32.38	-	-	P	V
		482.99	35.4	-10.6	46	29.77	24.26	13.86	32.49	-	-	P	V
		630.43	37.94	-8.06	46	29.97	26.21	14.33	32.57	-	-	P	V
	*	915	114.69	-	-	101.16	29.6	15.35	31.42	-	-	P	V
		972.84	49.18	-4.82	54	33.86	30.56	15.59	30.83	-	-	P	V
													V
													V
													V
													V
													V
													V

802.11ah	Note	Frequency (MHz)	Level (dBµV/m)	Margin (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)
		30.97	32.39	-7.61	40	28.56	25.32	10.97	32.46	-	-	P	H
		121.18	29.49	-14.01	43.5	32.44	17.72	11.81	32.48	-	-	P	H
		239.52	30.31	-15.69	46	32.22	17.94	12.62	32.47	-	-	P	H
		535.37	35.27	-10.73	46	28.86	24.99	14	32.58	-	-	P	H
	*	925	117.29	-	-	103.46	29.8	15.39	31.36	-	-	P	H
		963.14	49.58	-4.42	54	34.58	30.4	15.54	30.94	-	-	P	H
													H
													H
													H
													H
													H
													H
802.11ah 2M 925MHz		49.4	31.18	-8.82	40	37.11	15.36	11.15	32.44	-	-	P	V
		115.36	32.13	-11.37	43.5	35.11	17.69	11.8	32.47	-	-	P	V
		293.84	31.66	-14.34	46	31.43	19.7	12.96	32.43	-	-	P	V
		623.64	39.3	-6.7	46	31.45	26.1	14.3	32.55	-	-	P	V
	*	925	113.78	-	-	99.95	29.8	15.39	31.36	-	-	P	V
		961.2	50.6	-3.4	54	35.63	30.4	15.53	30.96	-	-	P	V
													V
													V
													V
													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against limit line.
3. Non restricted band limit is radio frequency level down 20db

802.11ah 2M 902~928MHz

802.11ah 2M (Harmonic @ 3m)

802.11ah	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11ah 2M 905MHz		1009	53.7	-20.3	74	88.51	25.54	7.8	68.15	100	350	P	H
		1009	42.76	-11.24	54	77.57	25.54	7.8	68.15	100	350	A	H
		1810	50.93	-23.07	74	85.74	25.42	7.64	67.87	100	7	P	H
		1810	41.47	-12.53	54	76.28	25.42	7.64	67.87	100	7	A	H
		2715	52.17	-21.83	74	81.38	28.47	9.61	67.29	387	35	P	H
		2715	43.17	-10.83	54	72.38	28.47	9.61	67.29	387	35	A	H
		8145	59.97	-14.03	74	73.69	37	15.73	66.45	100	124	P	H
		8145	47.24	-6.76	54	60.96	37	15.73	66.45	100	124	A	H
		9050	55.83	-18.17	74	68.65	38.11	16.62	67.55	400	306	P	H
		9050	43.73	-10.27	54	56.55	38.11	16.62	67.55	400	306	A	H
													H
		1000	54.09	-19.91	74	88.84	25.52	7.85	68.12	300	75	P	V
		1000	42.03	-11.97	54	76.78	25.52	7.85	68.12	300	75	A	V
		1810	47.77	-26.23	74	82.52	25.48	7.64	67.87	-	-	P	V
		2715	56.51	-17.49	74	85.91	28.28	9.61	67.29	324	44	P	V
		2715	47.01	-6.99	54	76.41	28.28	9.61	67.29	324	44	A	V
		8145	54.04	-19.96	74	67.72	37.04	15.73	66.45	100	109	P	V
		8145	41.63	-12.37	54	55.31	37.04	15.73	66.45	100	109	A	V
		9050	56.19	-17.81	74	68.96	38.16	16.62	67.55	400	306	P	V
		9050	43.81	-10.19	54	56.58	38.16	16.62	67.55	400	306	A	V
													V
													V

		1830	45.77	-28.23	74	80.33	25.53	7.67	67.76	-	-	P	H
		2745	44.16	-29.84	74	72.99	28.51	9.7	67.04	-	-	P	H
		6405	45.69	-28.31	74	61.91	34.83	13.94	64.99	-	-	P	H
		7320	47.95	-26.05	74	62.29	36.75	14.86	65.95	-	-	P	H
		8235	58.19	-15.81	74	72.39	37.11	15.8	67.11	100	118	P	H
		8235	45.3	-8.7	54	59.5	37.11	15.8	67.11	100	118	A	H
		9150	60.89	-13.11	74	73.78	38.28	16.69	67.86	100	115	P	H
		9150	46.37	-7.63	54	59.26	38.28	16.69	67.86	100	115	A	H
802.11ah 2M 915MHz													H
		1830	44.94	-29.06	74	79.4	25.63	7.67	67.76	-	-	P	V
		2745	47.14	-26.86	74	76.13	28.35	9.7	67.04	-	-	P	V
		8235	51.89	-22.11	74	66.13	37.07	15.8	67.11	100	115	P	V
		8235	39.2	-14.8	54	53.44	37.07	15.8	67.11	100	115	A	V
		9150	53.74	-20.26	74	66.73	38.18	16.69	67.86	100	62	P	V
		9150	41.56	-12.44	54	54.55	38.18	16.69	67.86	100	62	A	V
													V
													V
													V

		1850	46.07	-27.93	74	80.34	25.69	7.7	67.66	-	-	P	H
		2775	43.94	-30.06	74	72.45	28.58	9.78	66.87	-	-	P	H
		7400	51.08	-22.92	74	66.15	36.5	14.95	66.52	100	121	P	H
		7400	41.36	-12.64	54	56.43	36.5	14.95	66.52	100	121	A	H
		8325	58.4	-15.6	74	72.58	37.23	15.88	67.29	100	128	P	H
		8325	43.85	-10.15	54	58.03	37.23	15.88	67.29	100	128	A	H
		9250	57.88	-16.12	74	70.89	38.3	16.74	68.05	100	108	P	H
		9250	43.85	-10.15	54	56.86	38.3	16.74	68.05	100	108	A	H
802.11ah		1850	43.17	-30.83	74	77.28	25.85	7.7	67.66	-	-	P	V
2M		2775	45.4	-28.6	74	74	28.49	9.78	66.87	-	-	P	V
925MHz		8325	48.97	-25.03	74	63.15	37.23	15.88	67.29	100	115	P	V
		8325	38.95	-15.05	54	53.13	37.23	15.88	67.29	100	115	A	V
		9250	52.11	-21.89	74	65.09	38.33	16.74	68.05	100	144	P	V
		9250	39.37	-14.63	54	52.35	38.33	16.74	68.05	100	144	A	V
													V
													V

Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line. 3. Non restricted band limit is radio frequency level down 20db 4. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.

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:

802.11ah	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11ah		8119.8	49.02	-24.98	74	55.96	37.1	14.37	58.41	100	189	P	V
2M 902.2MHz		8119.8	44.97	-9.03	54	51.91	37.1	14.37	58.41	100	189	A	V

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

For Peak Limit @ 8119.8MHz:

1. Level(dBμV/m)

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

= 37.1(dB/m) + 14.37(dB) + 55.96(dBμV) – 58.41 (dB)

= 49.02 (dBμV/m)

2. Margin(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 49.02(dBμV/m) – 74(dBμV/m)

= -24.98(dB)

For Average Limit @ 8119.8MHz:

1. Level(dBμV/m)

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

= 37.1(dB/m) + 14.37(dB) +51.91(dBμV) – 58.41 (dB)

= 44.97 (dBμV/m)

2. Margin(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 44.97(dBμV/m) – 54(dBμV/m)

= -9.03(dB)

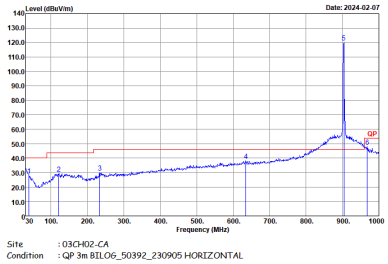
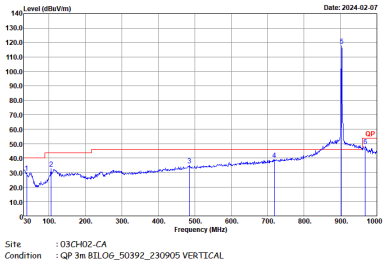
Both peak and average measured complies with the limit line, so test result is “PASS”.

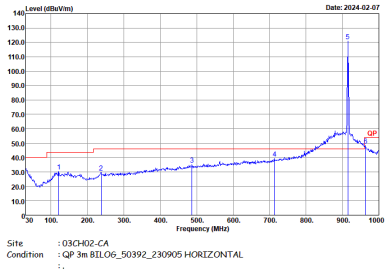
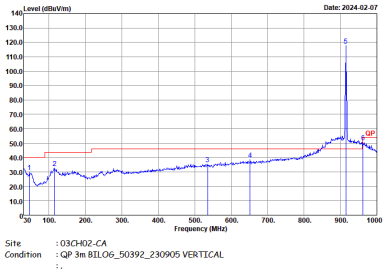
Appendix D. Radiated Spurious Emission Plots

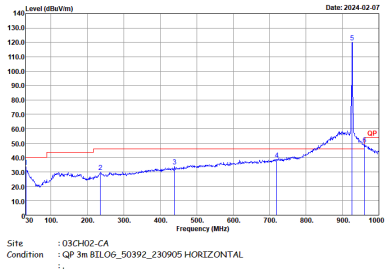
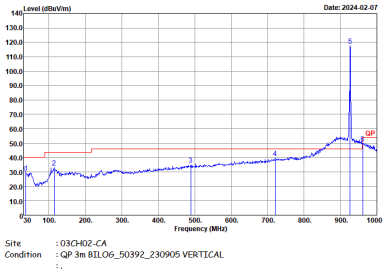
Test Engineer :	Thinh Hoang	Temperature :	16.2-17.2°C
		Relative Humidity :	60-66%

802.11ah 1M 902~928MHz

802.11ah 1M (Band Edge @ 3m)

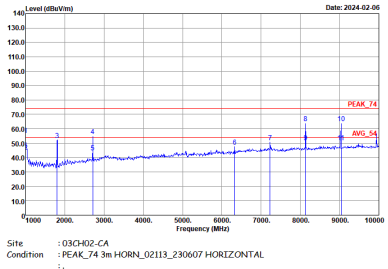
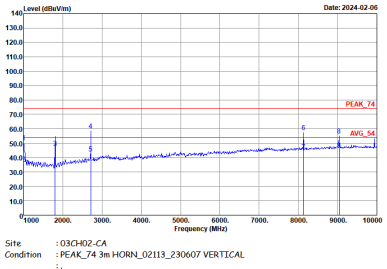
802.11ah	802.11ah 1M 902~928MHz	
	802.11ah 1M CH 903.5Mhz	
	Horizontal	Vertical
QP / Peak		

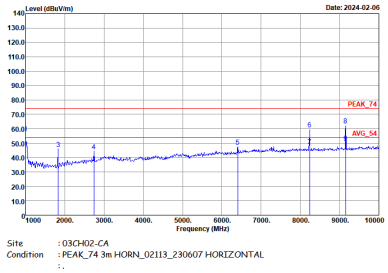
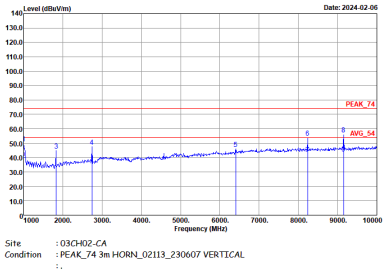
802.11ah	802.11ah 1M 902~928MHz	
	802.11ah 1M CH 915Mhz	
	Horizontal	Vertical
QP / Peak		

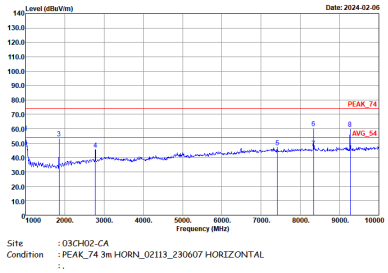
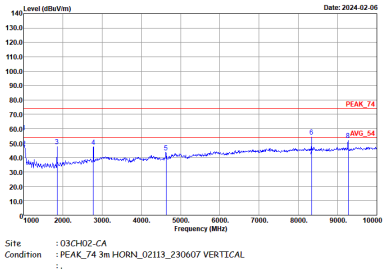
802.11ah	802.11ah 1M 902~928MHz	
	802.11ah 1M CH 926.5Mhz	
	Horizontal	Vertical
Peak Avg.		

802.11ah 1M 902~928MHz

802.11ah 1M (Harmonic @ 3m)

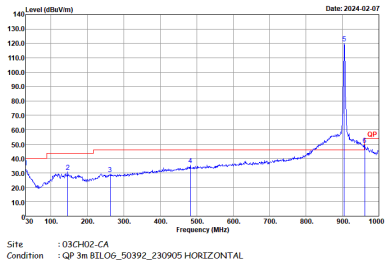
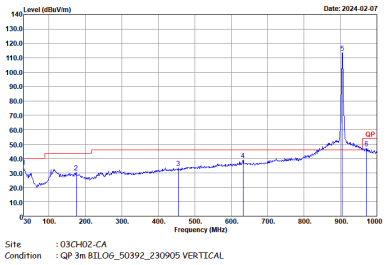
802.11ah	802.11ah 1M 902~928MHz	
	802.11ah 1M CH 903.5Mhz	
	Horizontal	Vertical
Peak Avg.		

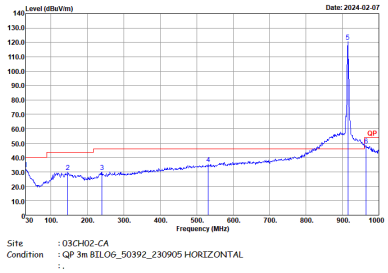
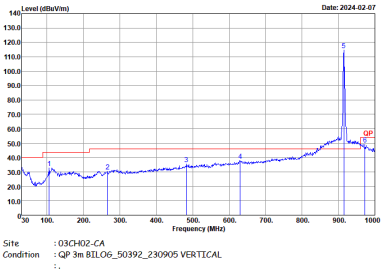
802.11ah	802.11ah 1M 902~928MHz	
	802.11ah 1M CH 915Mhz	
	Horizontal	Vertical
Peak Avg.		

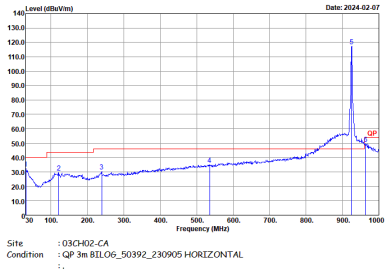
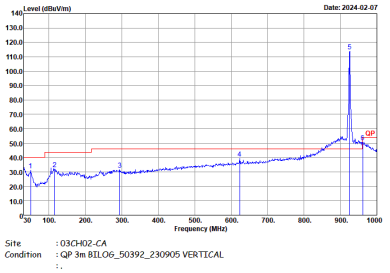
802.11ah	802.11ah 1M 902~928MHz	
	802.11ah 1M CH 926.5Mhz	
	Horizontal	Vertical
Peak Avg.		

802.11ah 2M 902~928MHz

802.11ah 2M (Band Edge @ 3m)

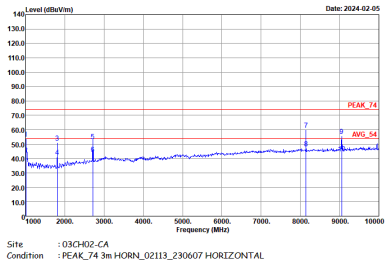
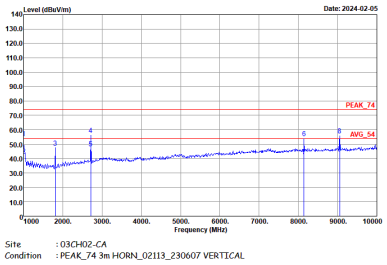
802.11ah	802.11ah 2M 902~928MHz	
	802.11ah 2M CH 905Mhz	
	Horizontal	Vertical
QP / Peak		

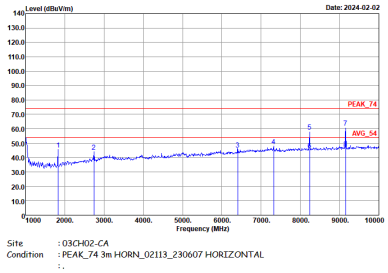
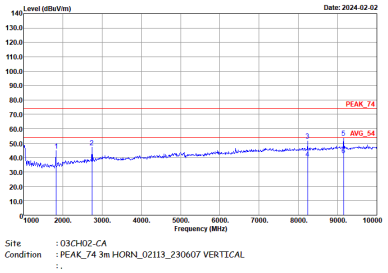
802.11ah	802.11ah 2M 902~928MHz	
	802.11ah 2M CH 915Mhz	
	Horizontal	Vertical
QP / Peak		

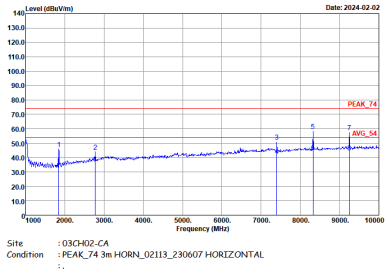
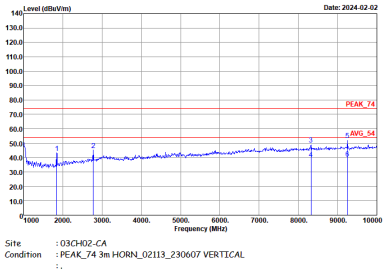
802.11ah	802.11ah 2M 902~928MHz	
	802.11ah 2M CH 925Mhz	
	Horizontal	Vertical
Peak Avg.		

802.11ah 2M 902~928MHz

802.11ah 2M (Harmonic @ 3m)

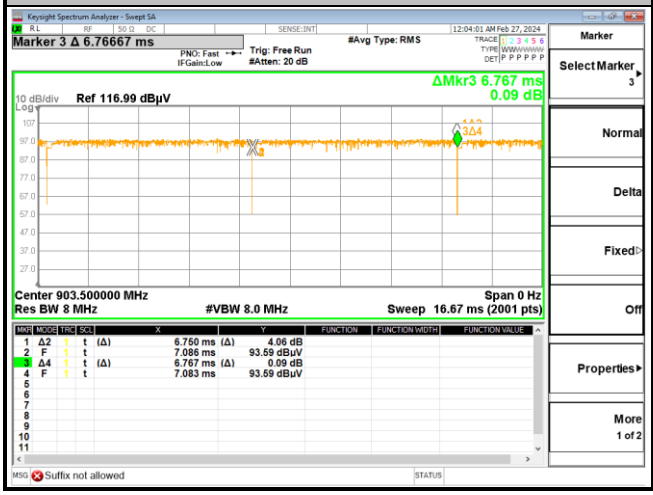
802.11ah	802.11ah 2M 902~928MHz	
	802.11ah 2M CH 905Mhz	
	Horizontal	Vertical
Peak Avg.		

802.11ah	802.11ah 2M 902~928MHz	
	802.11ah 2M CH 915Mhz	
	Horizontal	Vertical
Peak Avg.		

802.11ah	802.11ah 2M 902~928MHz	
	802.11ah 2M CH 925Mhz	
	Horizontal	Vertical
Peak Avg.		

Appendix E. Duty Cycle Plots

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
802.11ah for 1MHz	99.75	-	-	10Hz
802.11ah for 2MHz	99.36	-	-	10Hz

802.11ah for 1MHz	802.11ah for 2MHz
	

————THE END————