FCC TEST REPORT

Product Name:	LP-M03 Series Industrial Wireless Switch
Trade Mark:	N/A
Model No.:	LP-M03
Add. Model No.:	N/A
Report Number:	24080713132RFC-1
Test Standards:	FCC 47 CFR Part 15 Subpart C
FCC ID:	2A8PY-MIOW03
Test Result:	PASS
Date of Issue:	September 30, 2024

Prepared for:

LP SENSOR TECHNOLOGY LLC
149 Silverado, Irvine, CA, 92618

Prepared by:

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Approved by: Robert Chen — Robert Chen, Assistant Manager

Date: September 30, 2024

Version

Version No.	Date	Description
V1.0	September 30, 2024	Original

CONTENTS

1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	LP SENSOR TECHNOLOGY LLC
Address of Applicant:	149 Silverado, Irvine, CA, 92618
Manufacturer:	LP SENSOR TECHNOLOGY LLC
Address of Manufacturer:	149 Silverado, Irvine, CA, 92618

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	LP-M03 Series Industrial Wireless Switch	
Model No.:	LP-M03	
Add. Model No.:	N/A	
Trade Mark:	N/A	
DUT Stage:	Production Unit	
EUT Supports Function: (Provided by the customer)	General 915MHz Technique	902.5 MHz to 914.9 MHz 903.0 MHz to 914.2 MHz
Power Supply:	Input: 100-480VAC 50/60Hz	
Software Version:	V2.06 (Provided by the customer)	
Hardware Version:	A (Provided by the customer)	
Sample Received Date:	August 7, 2024	
Sample Tested Date:	August 17, 2024 to August 23, 2024	
Remark: The above EUT's information was provided by customer. Please refer to the specifications or user's manual for more detailed description.		

1.2.2 Description of Accessories

None.

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

Frequency Band:	902 MHz to 915 MHz
Frequency Range:	902 MHz to 915 MHz
Modulation Technique:	General 915MHz Technique
Type of Modulation:	LoRa
Number of Channels:	63 channels for 125kHz Bandwidth in 902.5 MHz to 914.9 MHz 8 channels for 500kHz Bandwidth in 903.0 MHz to 914.2 MHz
Channel Separation:	200kHz for 125kHz Bandwidth in 902.5 MHz to 914.9 MHz 1.6MHz for 500kHz Bandwidth in 903.0 MHz to 914.2 MHz
Antenna Type:	Rod Antenna
Antenna Gain: (Provided by the customer)	4 dBi
Maximum Field Strength:	87.72 dBμV/m @3m
Normal Test Voltage:	120 VAC

1.4 OTHER INFORMATION

Channel List for 125kHz Bandwidth in 902.5 MHz to 914.9 MHz

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	902.5	**17**	905.7	**33**	908.9	**49**	912.1
2	902.7	**18**	905.9	**34**	909.1	**50**	912.3
3	902.9	**19**	906.1	**35**	909.3	**51**	912.5
4	903.1	**20**	906.3	**36**	909.5	**52**	912.7
5	903.3	**21**	906.5	**37**	909.7	**53**	912.9
6	903.5	**22**	906.7	**38**	909.9	**54**	913.1
7	903.7	**23**	906.9	**39**	910.1	**55**	913.3
8	903.9	**24**	907.1	**40**	910.3	**56**	913.5
9	904.1	**25**	907.3	**41**	910.5	**57**	913.7
10	904.3	**26**	907.5	**42**	910.7	**58**	913.9
11	904.5	**27**	907.7	**43**	910.9	**59**	914.1
12	904.7	**28**	907.9	**44**	911.1	**60**	914.3
13	904.9	**29**	908.1	**45**	911.3	**61**	914.5
14	905.1	**30**	908.3	**46**	911.5	**62**	914.7
15	905.3	**31**	908.5	**47**	911.7	**63**	914.9
16	905.5	**32**	908.7	**48**	911.9	**--**	---

Channel List for 500kHz Bandwidth in 903.0 MHz to 914.2 MHz

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	903.0	**3**	906.2	**5**	909.4	**7**	912.6
2	904.6	**4**	907.8	**6**	911.0	**8**	914.2

1.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested with associated equipment below.

1) Support Equipment

Description	Manufacturer	Model No.	Serial Number	Supplied by
Notebook	HUAWEI	NbDE-WXX9	X5LPM21C20000871	UnionTrust
Mouse	DELL	MS111	CN-011D3V-738	UnionTrust

2) Support Cable

Cable No.	Description	Connector	Length	Supplied by
1	Antenna Cable	SMA	0.30 Meter	UnionTrust
2	DC Power Cable	Detachable	1.5 Meter	UnionTrust

1.6 TEST LOCATION

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China 518109
Telephone: +86 (0) 755 2823 0888
Fax: +86 (0) 755 2823 0886

1.7 TEST FACILITY

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L9069
The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

A2LA-Lab Certificate No.: 4312.01
Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

ISED Wireless Device Testing Laboratories
CAB identifier: CN0032

FCC Accredited Lab.
Designation Number: CN1194
Test Firm Registration Number: 259480

1.8 DEVIATION FROM STANDARDS

None.

1.9 ABNORMALITIES FROM STANDARD CONDITIONS

None.

1.10 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

1.11 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Measurement Uncertainty
1	Conducted emission 9KHz-150KHz	±3.8 dB
2	Conducted emission 150KHz-30MHz	±3.4 dB
3	Radiated emission 9KHz-30MHz	±4.9 dB
4	Radiated emission 30MHz-1GHz	±4.7 dB
5	Radiated emission 1GHz-18GHz	±5.1 dB
6	Radiated emission 18GHz-26GHz	±5.2 dB
7	Radiated emission 26GHz-40GHz	±5.2 dB

2. TEST SUMMARY

FCC 47 CFR Part 15 Subpart C Test Cases			
Test Item	**Test Requirement**	**Test Method**	**Result**
Antenna Requirement	FCC 47 CFR Part 15 Subpart C Section 15.203	ANSI C63.10-2013	PASS
Conducted Emission	FCC 47 CFR Part 15 Subpart C Section 15.207	ANSI C63.10-2013	PASS
Radiated Emission	FCC 47 CFR Part 15 Subpart C Section 15.249 (a)/15.209/15.205	ANSI C63.10-2013	PASS
20dB Occupied Bandwidth	FCC 47 CFR Part 15 Subpart C Section 15.215 (c)	ANSI C63.10-2013	PASS
Disclaimer and Explanations: The declared of product specification and data (e.g., antenna gain, RF specification, etc) for EUT presented in the report are provided by the customer, and the customer takes all the responsibilities for the accuracy of product specification.			

3. EQUIPMENT LIST

Radiated Emission Test Equipment List						
Used	**Equipment**	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date**	**Cal. Due date**
☒	3M Chamber & Accessory Equipment	ETS-LINDGREN	3M	Euroshiedpn-CT001270-1317	11-Nov-2023	10-Nov-2026
☒	Receiver	R&S	ESIB26	100114	27-Oct-2023	26-Oct-2024
☒	Loop Antenna	ETS-LINDGREN	6502	00202525	30-Oct-2023	29-Oct-2024
☒	Broadband Antenna	ETS-LINDGREN	3142E	00201566	30-Oct-2023	29-Oct-2024
☒	6dB Attenuator	Talent	RA6A5-N-18	18103001	30-Oct-2023	29-Oct-2024
☒	Preamplifier	HP	8447F	2805A02960	31-Oct-2023	30-Oct-2024
☒	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201874	01-Apr-2024	31-Mar-2025
☒	Pre-amplifier	ETS-LINDGREN	00118385	00201874	31-Oct-2023	30-Oct-2024
☒	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
☒	Test Software	Audix	e3	Software Version: 9.160323		

RF Conducted Test Equipment List						
Used	**Equipment**	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date**	**Cal. Due date**
☒	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	29-Mar-2024	28-Mar-2025

AC Power Line Conducted Emission Test Equipment List						
Used	**Equipment**	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date**	**Cal. Due date**
☒	Receiver	R&S	ESR7	101181	27-Oct-2023	26-Oct-2024
☒	Pulse Limiter	R&S	ESH3-Z2	0357.8810.54	27-Oct-2023	26-Oct-2024
☒	LISN	R&S	ESH2-Z5	860014/024	27-Oct-2023	26-Oct-2024
☒	LISN	ETS-Lindgren	3816/2SH	00201088	27-Oct-2023	26-Oct-2024
☒	Shielding room	ETS-Lindgren	843	Euroshiedpn-CT001270-1246	5-Nov-2021	4-Nov-2024
☒	Test Software	EZ-EMC	EZ-CON	Software Version: EMC-CON 3A1.1		

4. TEST CONFIGURATION

4.1 ENVIRONMENTAL CONDITIONS FOR TESTING

4.1.1 Normal or Extreme Test Conditions

Environment Parameter	Selected Values During Tests		
Test Condition	Ambient		
	Temperature (°C)	Voltage (VAC)	Relative Humidity (%)
NT/NV	+15 to +35	120V AC	20 to 75
Remark: 1) NV: Normal Voltage; NT: Normal Temperature			

4.1.2 Record of Normal Environment and Test Sample

Test Item	Temp. (°C)	Relative Humidity (%)	Pressure (kPa)	Sample No.	Tested by
Conducted Emission	23.1	59.3	100.1	S202408074093-ZJA03/3	Linson Xie
Radiated Emission	25.6	54.5	100.1		Bowie zhang
20dB Occupied Bandwidth	23.9	48.9	100.1		Lucas Ouyang

4.2 TEST CHANNELS

Type of Modulation	Tx/Rx Frequency	Test RF Channel Lists		
		Lowest(L)	Middle(M)	Highest(H)
LoRa (Bandwidth=125kHz)	902.5 MHz to 914.9 MHz	Channel 1	Channel 31	Channel 63
		902.5 MHz	908.5 MHz	914.9 MHz

Type of Modulation	Tx/Rx Frequency	Test RF Channel Lists		
		Lowest(L)	Middle(M)	Highest(H)
LoRa (Bandwidth=500kHz)	903.0 MHz to 914.2 MHz	Channel 1	Channel 5	Channel 8
		903.0 MHz	909.4 MHz	914.2 MHz

4.3 EUT TEST STATUS

Modulation Mode	Tx Function	Description
LoRa	1Tx	Keep the EUT in continuously transmitting with modulation test single.

Power Setting (Provided by the customer)		
Channel	125kHz Bandwidth (902.5 MHz to 914.9 MHz)	500kHz Bandwidth (903.0 MHz to 914.2 MHz)
L	-1	-1
M	-1	-1
H	-1	-1

Test Software (Provided by the customer)
Test software name: lpm03SettingTool_V2.03

4.4 TEST SETUP

4.4.1 For Radiated Emissions test setup

Figure 1. Below 30MHz

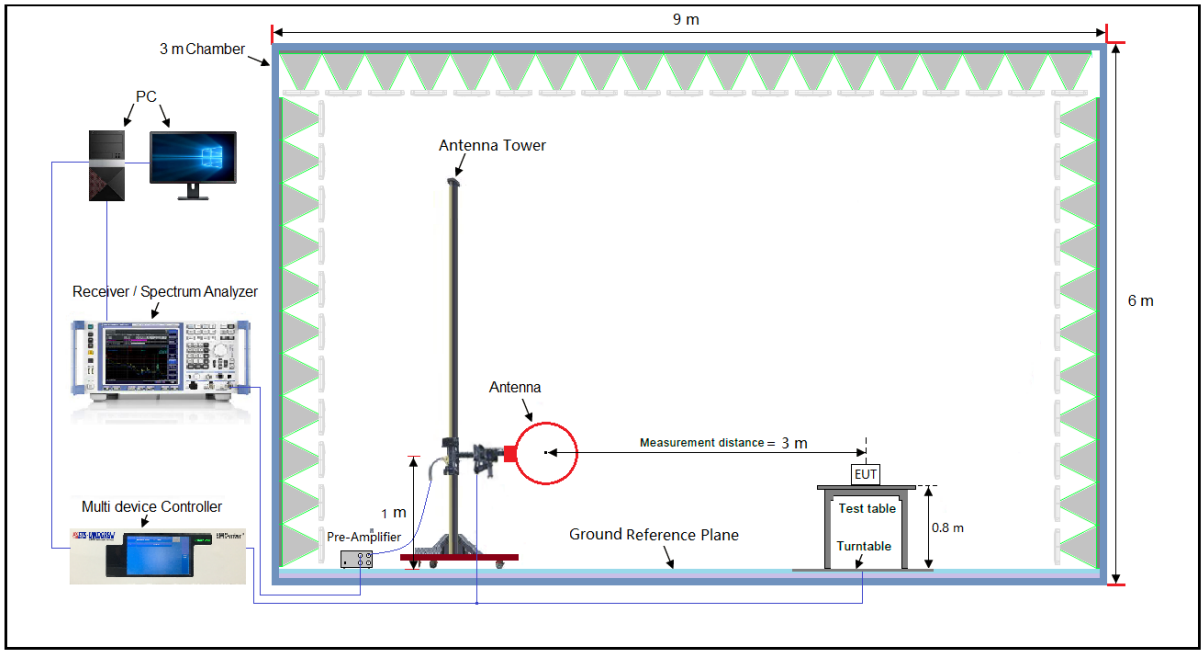


Figure 2. 30MHz to 1GHz

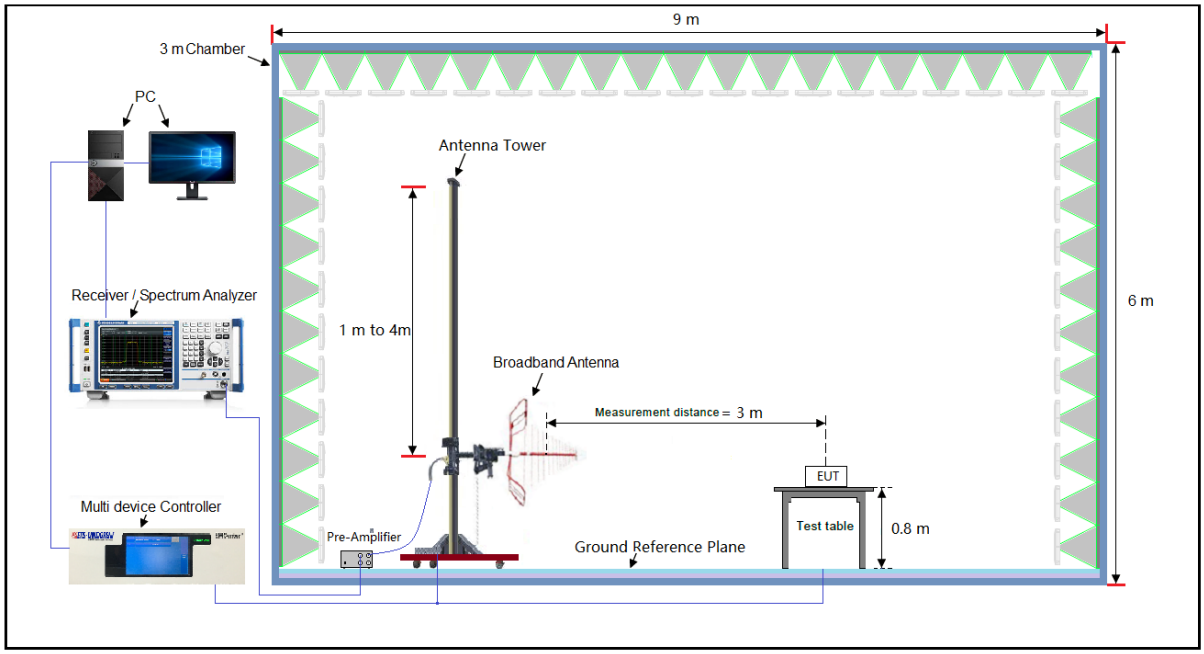
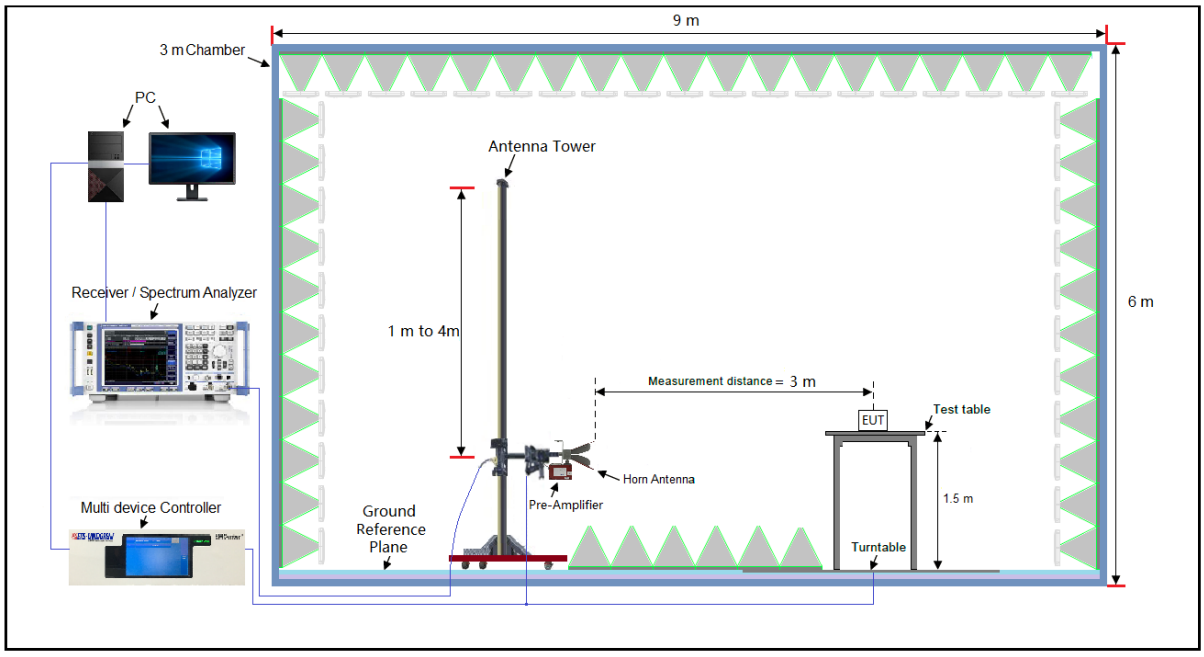
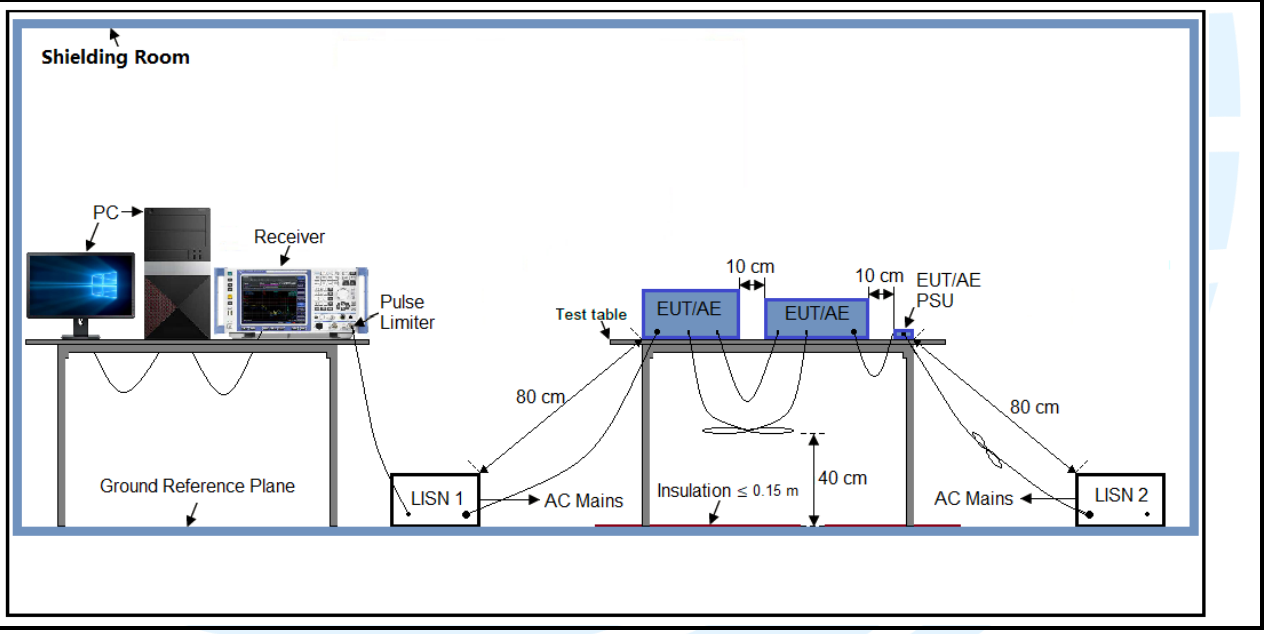


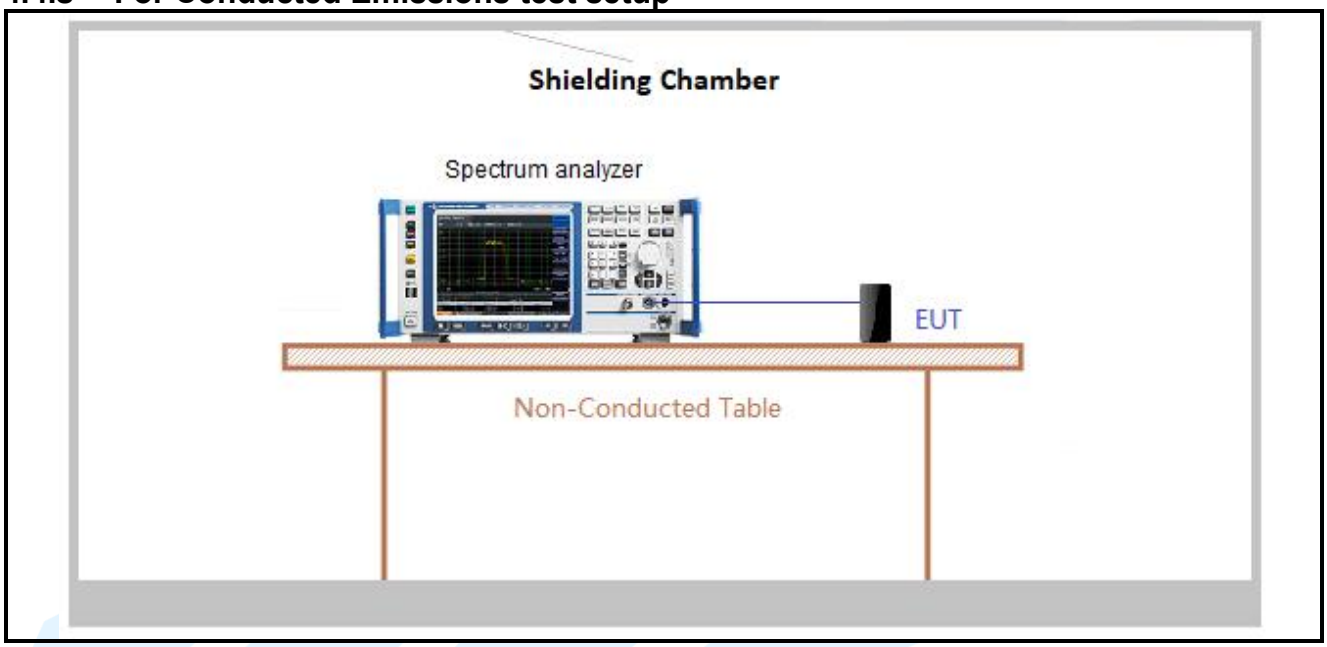
Figure 3. Above 1GHz



4.4.2 For Conducted Emissions test setup



4.4.3 For Conducted Emissions test setup



4.5 SYSTEM TEST CONFIGURATION

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, radiated emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario. It was powered by a 30Vdc DC Power. Only the worst case data were recorded in this test report.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. Therefore, all final radiated testing was performed with the EUT in orientation.

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000 MHz. The resolution is 1 MHz or greater for frequencies above 1000 MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

Radiated emission measurement were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

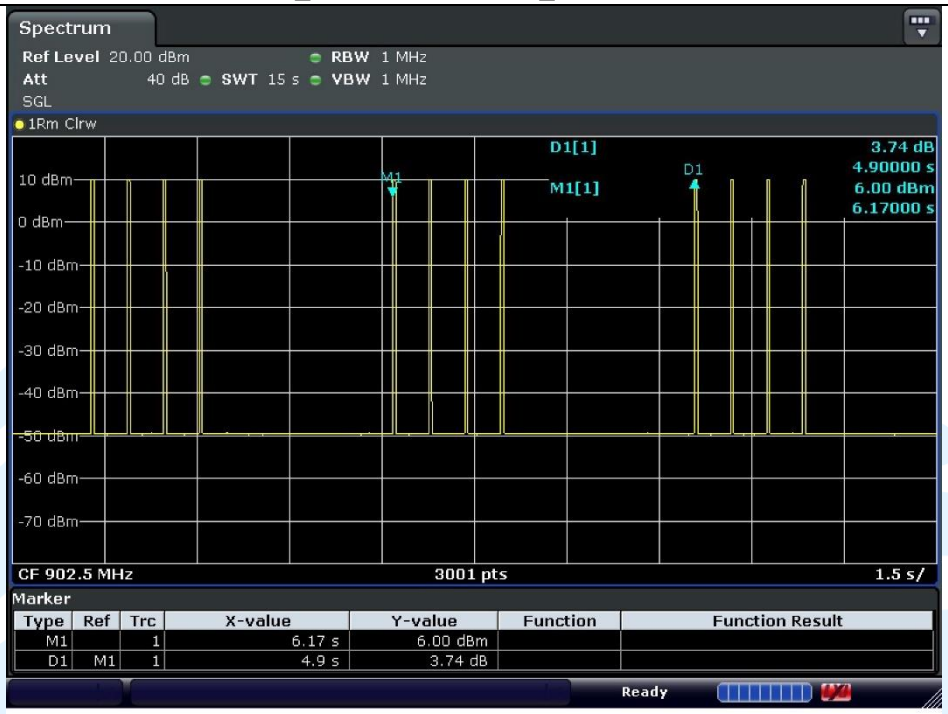
4.6 DUTY CYCLE

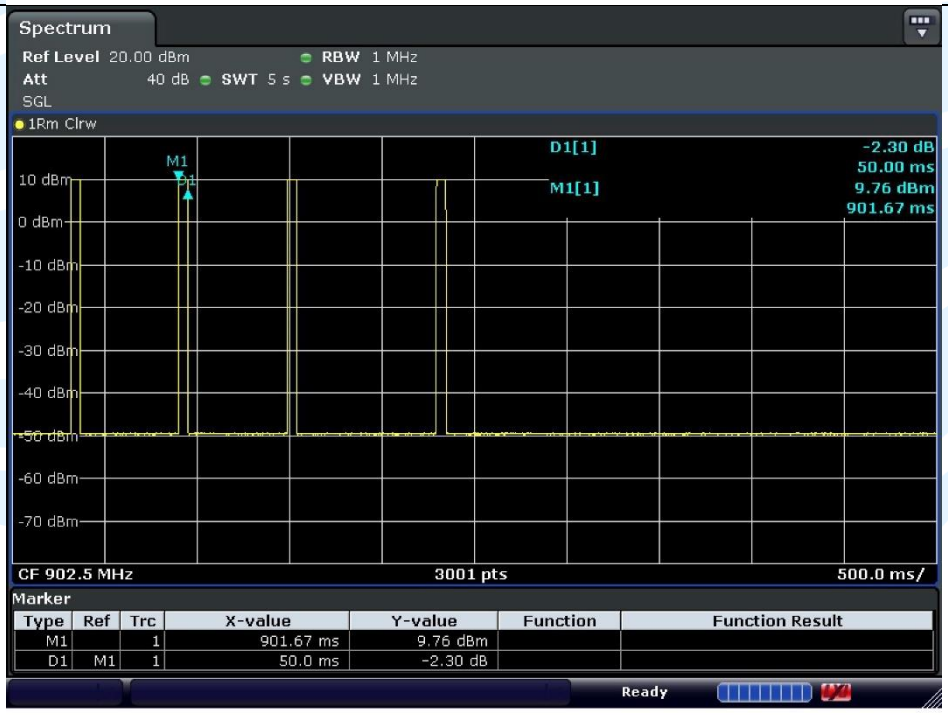
Type of Modulation	Bandwidth (kHz)	On Time (msec)	Period (msec)	Duty Cycle (linear)	Duty Cycle (%)	Average Factor (dB)
LoRa	125 (902.5 MHz to 914.9 MHz)	200	4900	0.04	4.08	-13.89
	500 (903.0 MHz to 914.2 MHz)	200	4900	0.04	4.08	-13.89

Remark:
1) Duty cycle= On Time/ Period;
2) Duty Cycle factor = 10 * log (1/ Duty cycle);
3) Average factor = 20 $\log_{10}$ Duty Cycle.

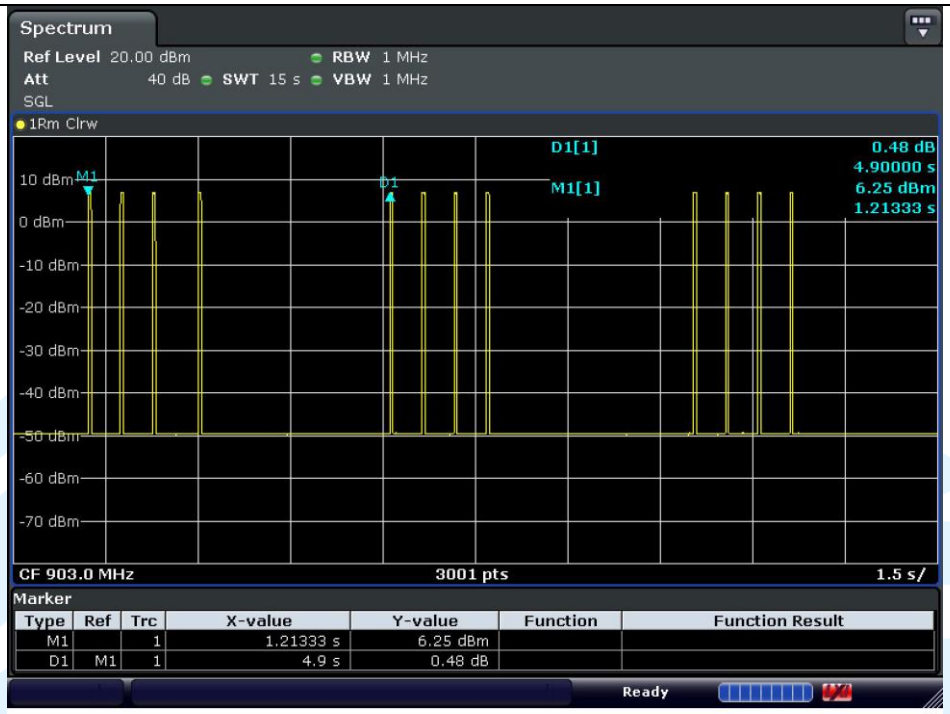
The test plot as follows

LoRa_125kHz Bandwidth _ Low Channel





LoRa_500kHz Bandwidth _ Low Channel



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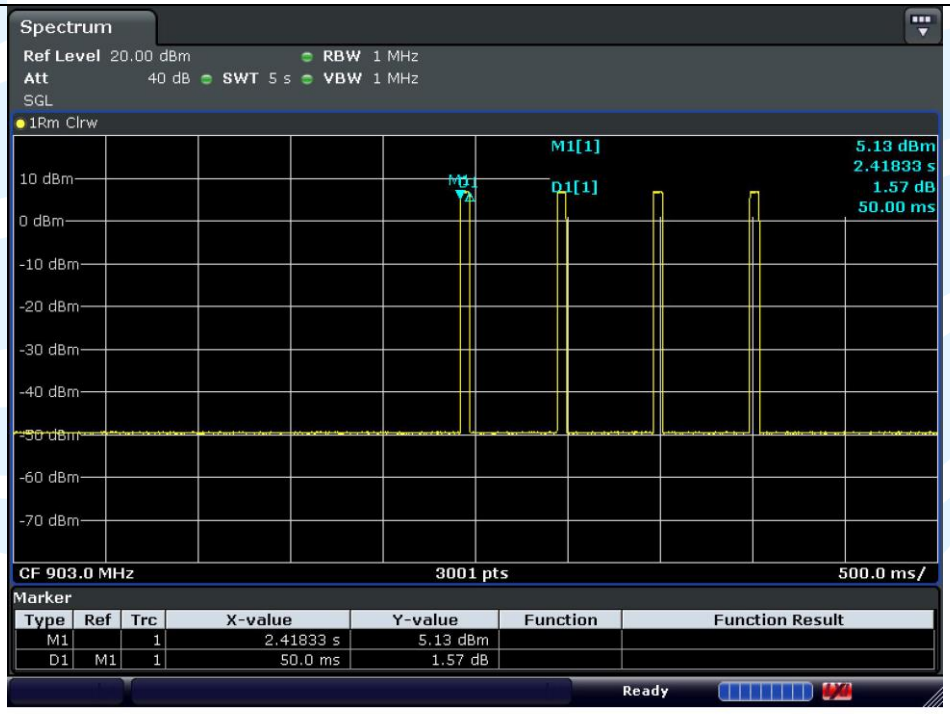

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5. RADIO TECHNICAL REQUIREMENTS SPECIFICATION

5.1 REFERENCE DOCUMENTS FOR TESTING

No.	Identity	Document Title
1	FCC 47 CFR Part 15	Radio Frequency Devices
2	ANSI C63.10-2013	American National Standard for Testing Unlicesed Wireless Devices

5.2 ANTENNA REQUIREMENT

Standard Requirement
15.203 Requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.
EUT Antenna:
The EUT has a permanently and irreplaceable attached antenna. The gain of the antenna is 4 dBi.

5.3 RADIATED EMISSION

Test Requirement: FCC 47 CFR Part 15.205,15.209 and 15.249

Test Method: ANSI C63.10-2013 Section 6.6.4.3

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
0.009 MHz-0.090 MHz	Peak	10 kHz	30 KHz	Peak
0.009 MHz-0.090 MHz	Average	10 kHz	30 KHz	Average
0.090 MHz-0.110 MHz	Quasi-peak	10 kHz	30 KHz	Quasi-peak
0.110 MHz-0.490 MHz	Peak	10 kHz	30 KHz	Peak
0.110 MHz-0.490 MHz	Average	10 kHz	30 KHz	Average
0.490 MHz -30 MHz	Quasi-peak	10 kHz	30 kHz	Quasi-peak
30 MHz-1 GHz	Quasi-peak	100 kHz	300 KHz	Quasi-peak
Above 1 GHz	Peak	1 MHz	3 MHz	Peak
	Peak	1 MHz	10 Hz	Average

Limits:

Field strength of the fundamental signal

As per 47 CFR Part 15.249(a), except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

As per 47 CFR Part 15.249(c), Field strength limits are specified at a distance of 3 meters.

Spurious Emissions

47 CFR Part 15.249(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

Frequency	Field strength (microvolt/meter)	Limit (dBμV/m)	Remark	Measurement distance (m)
0.009 MHz-0.490 MHz	2400/F(kHz)	--	--	300
0.490 MHz-1.705 MHz	24000/F(kHz)	--	--	30
1.705 MHz-30 MHz	30	--	--	30
30 MHz-88 MHz	100	40.0	Quasi-peak	3
88 MHz-216 MHz	150	43.5	Quasi-peak	3
216 MHz-960 MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1 GHz	500	54.0	Average	3

Remark:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

Test Setup: Refer to section 4.4.1 for details.

Test Procedures:

1. From 30 MHz to 1GHz test procedure as below:

1) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3) The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rota table table was turned from 0 degrees to 360 degrees to find the maximum reading.
5) The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6) If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

2. Above 1GHz test procedure as below:

1) Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter (Above 18GHz the distance is 1 meter and table is 1.5 meter).
2) Test the EUT in the lowest channel, middle channel, the Highest channel
3) The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the Y axis positioning which it is worse case.
4) Repeat above procedures until all frequencies measured was complete.

Equipment Used: Refer to section 3 for details.

Test Result: Pass

The measurement data as follows:

For 125kHz Bandwidth (902.5 MHz to 914.9 MHz):

Field Strength of the Fundamental Signal and Bandedge

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
Lowest Channel_902.5MHz								
1	902.435	74.31	4.75	79.06	94.00	-14.94	QP	Horizontal
2	902.000	25.95	4.74	30.69	46.00	-15.31	QP	Horizontal
3	902.493	82.11	4.75	86.86	94.00	-7.14	QP	Vertical
4	902.000	25.51	4.74	30.25	46.00	-15.75	QP	Vertical
Middle Channel_908.5MHz								
1	908.493	76.36	4.86	81.22	94.00	-12.78	QP	Horizontal
2	908.525	82.24	4.86	87.10	94.00	-6.90	QP	Vertical
Highest Channel_914.9MHz								
1	914.928	76.05	4.73	80.78	94.00	-13.22	QP	Horizontal
2	928.000	25.01	5.24	30.25	46.00	-15.75	QP	Horizontal
3	914.930	81.86	4.73	86.59	94.00	-7.41	QP	Vertical
4	928.000	24.69	5.24	29.93	46.00	-16.07	QP	Vertical

For 500kHz Bandwidth (903.0 MHz to 914.2 MHz):

Field Strength of the Fundamental Signal and Bandedge

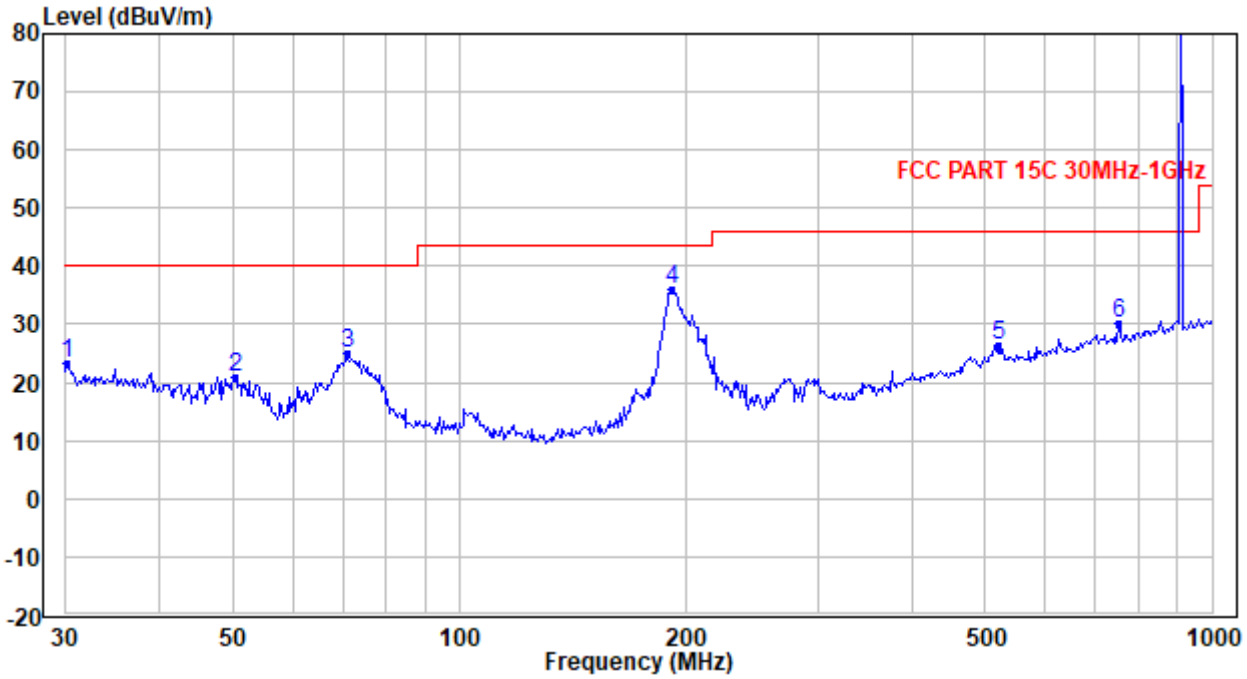
No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
Lowest Channel_903.0MHz								
1	902.753	76.27	4.75	81.02	94.00	-12.98	QP	Horizontal
2	902.000	23.52	4.74	28.26	46.00	-17.74	QP	Horizontal
3	903.222	82.97	4.75	87.72	94.00	-6.28	QP	Vertical
4	902.000	24.48	4.74	29.22	46.00	-16.78	QP	Vertical
Middle Channel_909.4MHz								
1	909.275	76.40	4.88	81.28	94.00	-12.72	QP	Horizontal
2	909.159	81.70	4.88	86.58	94.00	-7.42	QP	Vertical
Highest Channel_914.2MHz								
1	914.367	75.00	4.75	79.75	94.00	-14.25	QP	Horizontal
2	928.000	23.55	5.24	28.79	46.00	-17.21	QP	Horizontal
3	914.018	81.74	4.76	86.50	94.00	-7.50	QP	Vertical
4	928.000	23.64	5.24	28.88	46.00	-17.12	QP	Vertical

Remark:

1. Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain, the value was added to Original Receiver Reading by the software automatically.
2. Result = Reading + Correct Factor.
3. Margin = Result – Limit

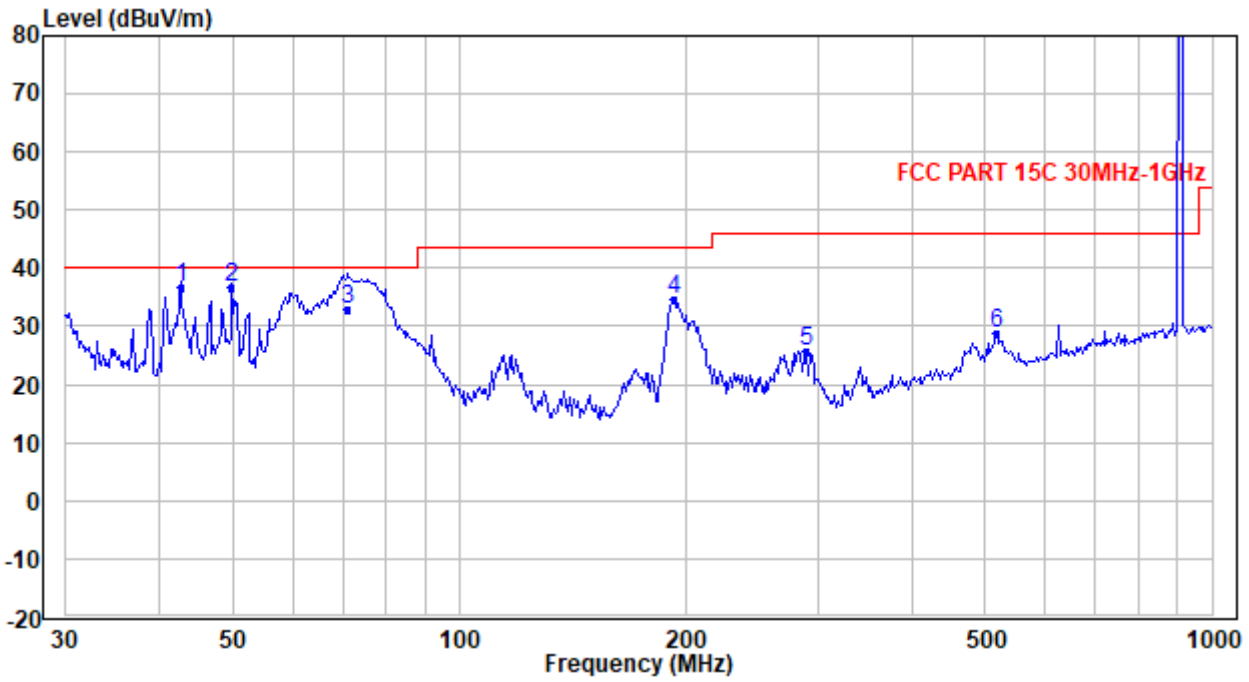
Radiated Emission Test Data (30 kHz ~ 1G):
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

Below 1GHz (Quasi Peak):
Horizontal



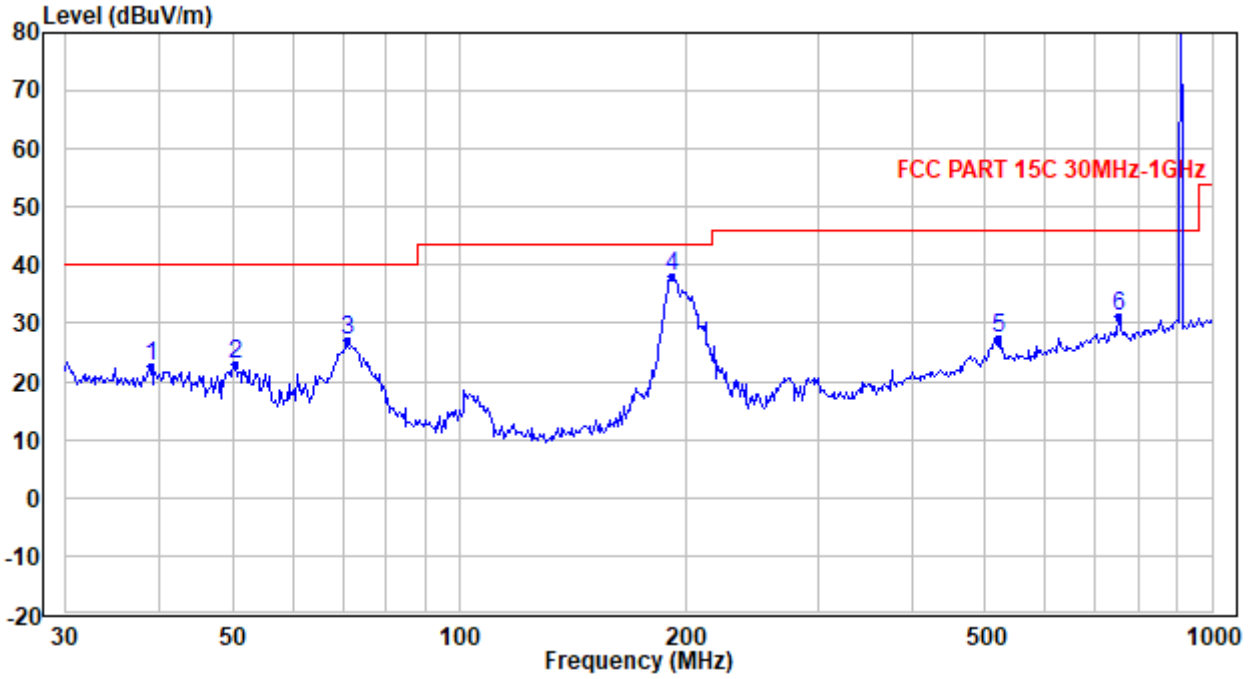
No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	30.153	27.77	-4.37	23.40	40.00	-16.60	QP
2	50.378	34.58	-13.72	20.86	40.00	-19.14	QP
3	70.814	42.84	-17.78	25.06	40.00	-14.94	QP
4	191.735	47.64	-11.69	35.95	43.50	-7.55	QP
5	521.789	28.32	-1.87	26.45	46.00	-19.55	QP
6	752.323	28.13	2.05	30.18	46.00	-15.82	QP

Vertical



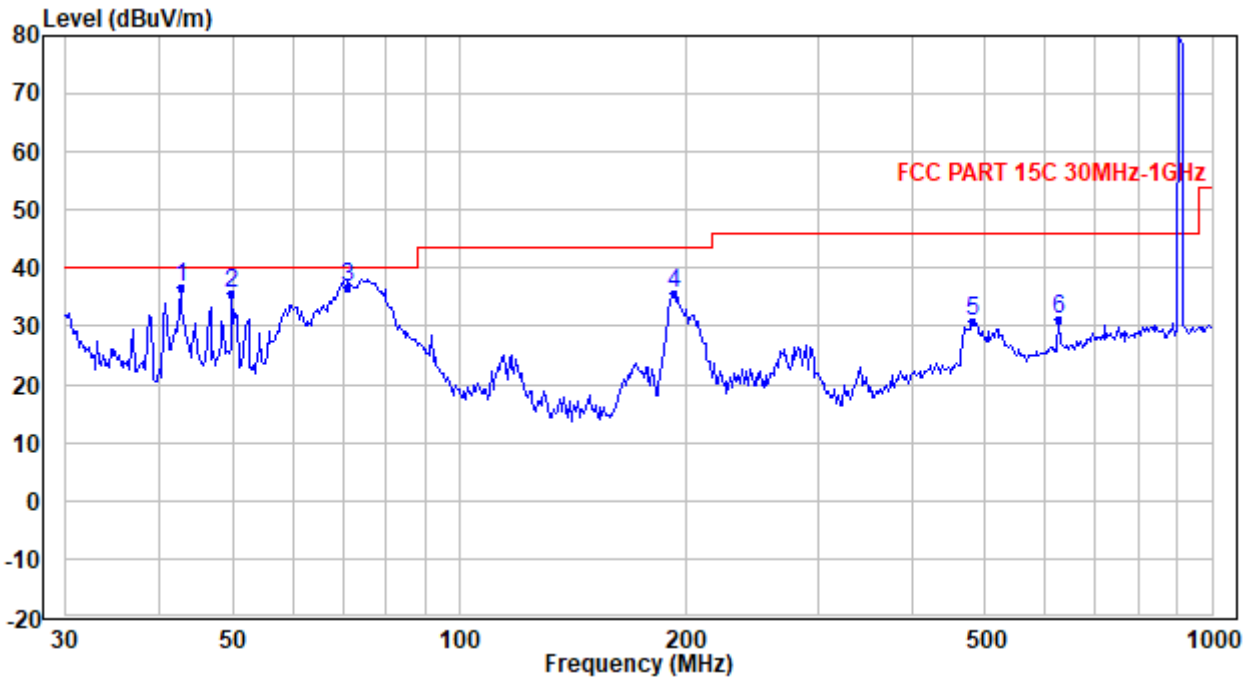
No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	42.600	46.56	-9.98	36.58	40.00	-3.42	QP
2	49.869	50.10	-13.57	36.53	40.00	-3.47	QP
3	71.174	50.87	-17.82	33.05	40.00	-6.95	QP
4	192.712	46.19	-11.48	34.71	43.50	-8.79	QP
5	289.384	34.95	-9.28	25.67	46.00	-20.33	QP
6	516.512	30.65	-2.02	28.63	46.00	-17.37	QP

Below 1GHz (Quasi Peak):
Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	38.876	30.57	-7.86	22.71	40.00	-17.29	QP
2	50.378	36.58	-13.72	22.86	40.00	-17.14	QP
3	70.814	44.84	-17.78	27.06	40.00	-12.94	QP
4	191.735	49.64	-11.69	37.95	43.50	-5.55	QP
5	521.789	29.32	-1.87	27.45	46.00	-18.55	QP
6	752.323	29.13	2.05	31.18	46.00	-14.82	QP

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	42.600	46.56	-9.98	36.58	40.00	-3.42	QP
2	49.869	49.10	-13.57	35.53	40.00	-4.47	QP
3	71.174	54.36	-17.82	36.54	40.00	-3.46	QP
4	192.712	47.19	-11.48	35.71	43.50	-7.79	QP
5	481.041	34.10	-3.07	31.03	46.00	-14.97	QP
6	626.541	31.35	-0.23	31.12	46.00	-14.88	QP

Radiated Emission Test Data:
For 125kHz Bandwidth (902.5 MHz to 914.9 MHz):

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
Lowest Channel_902.5MHz								
1	1816.082	50.68	-10.39	40.29	54.00	-13.71	Average	Horizontal
2	1816.082	62.78	-10.39	52.39	74.00	-21.61	Peak	Horizontal
3	2725.673	53.77	-6.06	47.71	54.00	-6.29	Average	Horizontal
4	2725.673	67.69	-6.06	61.63	74.00	-12.37	Peak	Horizontal
5	3633.563	46.71	-2.87	43.84	54.00	-10.16	Average	Horizontal
6	3633.563	56.71	-2.87	53.84	74.00	-20.16	Peak	Horizontal
7	1816.082	58.21	-10.39	47.82	54.00	-6.18	Average	Vertical
8	1816.082	71.93	-10.39	61.54	74.00	-12.46	Peak	Vertical
9	2725.673	54.27	-6.06	48.21	54.00	-5.79	Average	Vertical
10	2725.673	67.63	-6.06	61.57	74.00	-12.43	Peak	Vertical
11	3633.563	46.93	-2.87	44.06	54.00	-9.94	Average	Vertical
12	3633.563	51.41	-2.87	48.54	74.00	-25.46	Peak	Vertical
Middle Channel_908.5MHz								
1	1804.180	47.38	-10.42	36.96	54.00	-17.04	Average	Horizontal
2	1804.180	59.28	-10.42	48.86	74.00	-25.14	Peak	Horizontal
3	2706.971	50.39	-6.10	44.29	54.00	-9.71	Average	Horizontal
4	2706.971	63.86	-6.10	57.76	74.00	-16.24	Peak	Horizontal
5	3609.761	48.65	-2.94	45.71	54.00	-8.29	Average	Horizontal
6	3609.761	56.02	-2.94	53.08	74.00	-20.92	Peak	Horizontal
7	9024.803	42.36	3.95	46.31	54.00	-7.69	Average	Horizontal
8	9024.803	54.69	3.95	58.64	74.00	-15.36	Peak	Horizontal
9	1804.180	69.71	-10.42	59.29	54.00	5.29	Average	Vertical
10	1804.180	73.82	-10.42	63.40	74.00	-10.60	Peak	Vertical
11	2706.971	51.56	-6.10	45.46	54.00	-8.54	Average	Vertical
12	2706.971	63.14	-6.10	57.04	74.00	-16.96	Peak	Vertical
13	3609.761	46.61	-2.94	43.67	54.00	-10.33	Average	Vertical
14	3609.761	55.06	-2.94	52.12	74.00	-21.88	Peak	Vertical
15	4512.551	46.57	-1.28	45.29	54.00	-8.71	Average	Vertical
16	4512.551	52.64	-1.28	51.36	74.00	-22.64	Peak	Vertical
17	8122.012	46.59	2.24	48.83	54.00	-5.17	Average	Vertical
18	8122.012	54.80	2.24	57.04	74.00	-16.96	Peak	Vertical
19	9024.803	44.75	3.95	48.70	54.00	-5.30	Average	Vertical
20	9024.803	51.68	3.95	55.63	74.00	-18.37	Peak	Vertical

Highest Channel_914.9MHz								
1	1827.983	49.45	-10.35	39.10	54.00	-14.90	Average	Horizontal
2	1829.800	59.38	-10.34	49.04	74.00	-24.96	Peak	Horizontal
3	2742.674	51.93	-6.04	45.89	54.00	-8.11	Average	Horizontal
4	2744.700	65.51	-6.04	59.47	74.00	-14.53	Peak	Horizontal
5	3657.366	45.66	-2.78	42.88	54.00	-11.12	Average	Horizontal
6	3657.366	55.17	-2.78	52.39	74.00	-21.61	Peak	Horizontal
7	8230.823	42.31	2.47	44.78	54.00	-9.22	Average	Horizontal
8	8230.823	49.36	2.47	51.83	74.00	-22.17	Peak	Horizontal
9	9145.515	43.74	3.85	47.59	54.00	-6.41	Average	Horizontal
10	9145.515	51.74	3.85	55.59	74.00	-18.41	Peak	Horizontal
11	1827.983	49.45	-10.35	39.10	54.00	-14.90	Average	Horizontal
12	1829.800	59.38	-10.34	49.04	74.00	-24.96	Peak	Horizontal
13	1827.983	53.57	-10.35	43.22	54.00	-10.78	Average	Vertical
14	1827.983	65.52	-10.35	55.17	74.00	-18.83	Peak	Vertical
15	2742.674	54.76	-6.04	48.72	54.00	-5.28	Average	Vertical
16	2742.674	67.76	-6.04	61.72	74.00	-12.28	Peak	Vertical
17	3657.366	47.48	-2.78	44.70	54.00	-9.30	Average	Vertical
18	3657.366	56.50	-2.78	53.72	74.00	-20.28	Peak	Vertical
19	4572.057	45.68	-1.24	44.44	54.00	-9.56	Average	Vertical
20	4572.057	57.61	-1.24	56.37	74.00	-17.63	Peak	Vertical
21	8230.823	45.39	2.47	47.86	54.00	-6.14	Average	Vertical
22	8230.823	55.71	2.47	58.18	74.00	-15.82	Peak	Vertical
23	9145.515	45.17	3.85	49.02	54.00	-4.98	Average	Vertical
24	9145.515	58.20	3.85	62.05	74.00	-11.95	Peak	Vertical

For 500kHz Bandwidth (903.0 MHz to 914.2 MHz):

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
Lowest Channel_903.0MHz								
1	1806.000	44.36	-10.43	33.93	54.00	-20.07	Average	Horizontal
2	1806.000	57.46	-10.43	47.03	74.00	-26.97	Peak	Horizontal
3	2709.000	45.79	-6.10	39.69	54.00	-14.31	Average	Horizontal
4	2709.000	56.79	-6.10	50.69	74.00	-23.31	Peak	Horizontal
5	3611.461	46.70	-2.94	43.76	54.00	-10.24	Average	Horizontal
6	3611.461	51.69	-2.94	48.75	74.00	-25.25	Peak	Horizontal
7	1806.000	59.66	-10.43	49.23	54.00	-4.77	Average	Vertical
8	1806.000	73.02	-10.43	62.59	74.00	-11.41	Peak	Vertical
9	2709.000	47.30	-6.10	41.20	54.00	-12.80	Average	Vertical
10	2709.000	59.52	-6.10	53.42	74.00	-20.58	Peak	Vertical
11	3611.461	48.97	-2.94	46.03	54.00	-7.97	Average	Vertical
12	3611.461	58.32	-2.94	55.38	74.00	-18.62	Peak	Vertical
Middle Channel_909.4MHz								
1	1818.800	49.69	-10.38	39.31	54.00	-14.69	Average	Horizontal
2	1818.800	61.18	-10.38	50.80	74.00	-23.20	Peak	Horizontal
3	2727.373	50.72	-6.06	44.66	54.00	-9.34	Average	Horizontal
4	2727.373	61.86	-6.06	55.80	74.00	-18.20	Peak	Horizontal
5	3638.664	45.57	-2.84	42.73	54.00	-11.27	Average	Horizontal
6	3638.664	57.93	-2.84	55.09	74.00	-18.91	Peak	Horizontal
7	9096.210	42.83	3.89	46.72	54.00	-7.28	Average	Horizontal
8	9096.210	49.81	3.89	53.70	74.00	-20.30	Peak	Horizontal
9	1818.800	56.64	-10.38	46.26	54.00	-7.74	Average	Vertical
10	1818.800	70.83	-10.38	60.45	74.00	-13.55	Peak	Vertical
11	2728.200	49.65	-6.06	43.59	54.00	-10.41	Average	Vertical
12	2728.200	62.42	-6.06	56.36	74.00	-17.64	Peak	Vertical
13	4546.555	44.96	-1.26	43.70	54.00	-10.30	Average	Vertical
14	4546.555	54.84	-1.26	53.58	74.00	-20.42	Peak	Vertical
15	5323.532	42.43	-0.45	41.98	54.00	-12.02	Average	Vertical
16	5323.532	49.05	-0.45	48.60	74.00	-25.40	Peak	Vertical
17	8186.619	42.57	2.38	44.95	54.00	-9.05	Average	Vertical
18	8186.619	55.85	2.38	58.23	74.00	-15.77	Peak	Vertical
19	9094.510	43.68	3.89	47.57	54.00	-6.43	Average	Vertical
20	9094.510	54.68	3.89	58.57	74.00	-15.43	Peak	Vertical

Highest Channel_914.2MHz								
1	1828.400	46.58	-10.35	36.23	54.00	-17.77	Average	Horizontal
2	1828.400	56.78	-10.35	46.43	74.00	-27.57	Peak	Horizontal
3	2742.600	51.76	-6.04	45.72	54.00	-8.28	Average	Horizontal
4	2742.600	65.67	-6.04	59.63	74.00	-14.37	Peak	Horizontal
5	3655.666	46.52	-2.78	43.74	54.00	-10.26	Average	Horizontal
6	3655.666	53.52	-2.78	50.74	74.00	-23.26	Peak	Horizontal
7	4572.057	43.27	-1.24	42.03	54.00	-11.97	Average	Horizontal
8	4572.057	50.26	-1.24	49.02	74.00	-24.98	Peak	Horizontal
9	9140.414	43.43	3.86	47.29	54.00	-6.71	Average	Horizontal
10	9140.414	51.56	3.86	55.42	74.00	-18.58	Peak	Horizontal
11	1828.400	59.38	-10.35	49.03	54.00	-4.97	Average	Vertical
12	1828.400	63.27	-10.35	52.92	74.00	-21.08	Peak	Vertical
13	2742.600	50.26	-6.04	44.22	54.00	-9.78	Average	Vertical
14	2742.600	62.03	-6.04	55.99	74.00	-18.01	Peak	Vertical
15	3657.366	48.65	-2.78	45.87	54.00	-8.13	Average	Vertical
16	3657.366	54.80	-2.78	52.02	74.00	-21.98	Peak	Vertical
17	4570.357	48.59	-1.24	47.35	54.00	-6.65	Average	Vertical
18	4570.357	56.15	-1.24	54.91	74.00	-19.09	Peak	Vertical
19	5485.048	42.47	-0.21	42.26	54.00	-11.74	Average	Vertical
20	5485.048	48.44	-0.21	48.23	74.00	-25.77	Peak	Vertical
21	9140.414	43.56	3.86	47.42	54.00	-6.58	Average	Vertical
22	9140.414	49.80	3.86	53.66	74.00	-20.34	Peak	Vertical

Remark:

1. Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain, the value was added to Original Receiver Reading by the software automatically.
2. Result = Reading + Correct Factor.
3. Margin = Result – Limit
4. As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.

5.4 20DB OCCUPIED BANDWIDTH

Test Requirement: FCC 47 CFR Part 15.215
Test Method: ANSI C63.10-2013
Test Setup: Refer to section 4.4.3 for details.
Limits: N/A
Equipment Used: Refer to section 3 for details.
Test Result: Pass
The measurement procedure shall be as follows:

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
Use the following spectrum analyzer settings:

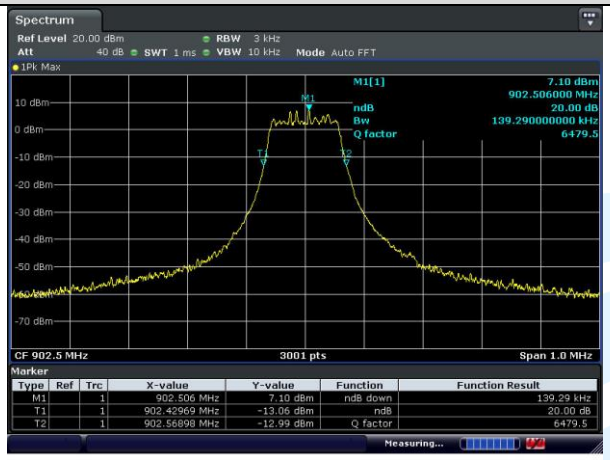
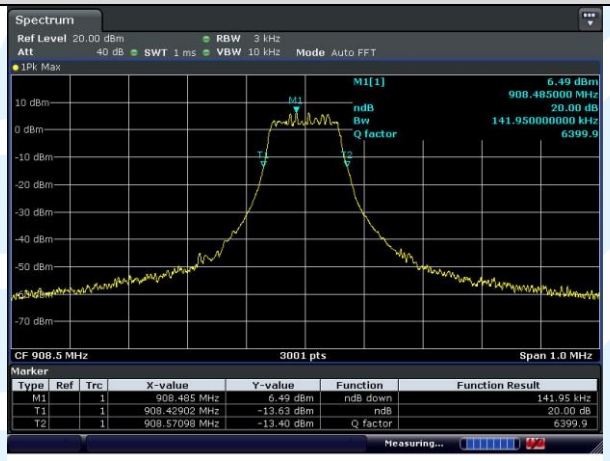
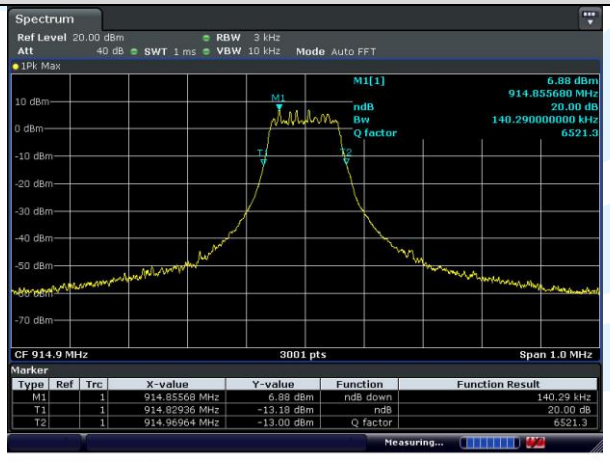
a) Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel
b) RBW ≥ 1% of the 20 dB bandwidth
c) VBW ≥ RBW
d) Sweep = auto;
e) Detector function = peak
f) Trace = max hold
g) All the trace to stabilize, use the marker-to-peak function to set the marker to the peak of the emission, use the marker-delta function to measure and record the 20dB down bandwidth of the emission.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Result: Pass
The measurement data as follows:

Bandwidth	Test Channel	Test Frequency (MHz)	20 dB Bandwidth (kHz)
125kHz	Lowest	902.5	139.29
	Middle	908.5	141.95
	Highest	914.9	140.29
500kHz	Lowest	903.0	598.30
	Middle	909.4	588.80
	Highest	914.2	608.80

The test plot as follows:

125kHz Bandwidth	500kHz Bandwidth
Lowest Channel	
	
Middle Channel	
	
Highest Channel	
	

5.5 CONDUCTED EMISSION

Test Requirement: FCC 47 CFR Part 15.207

Test Method: ANSI C63.10-2013 Section 6.2

Limits:

Frequency range (MHz)	Limits (dB(μV))	
	Quasi-peak	Average
0,15 to 0,50	66 to 56	56 to 46
0,50 to 5	56	46
5 to 30	60	50

Remark:

1. The lower limit shall apply at the transition frequencies.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 to 0.50 MHz.

Test Setup: Refer to section 4.4.2 for details.

Test Procedures:

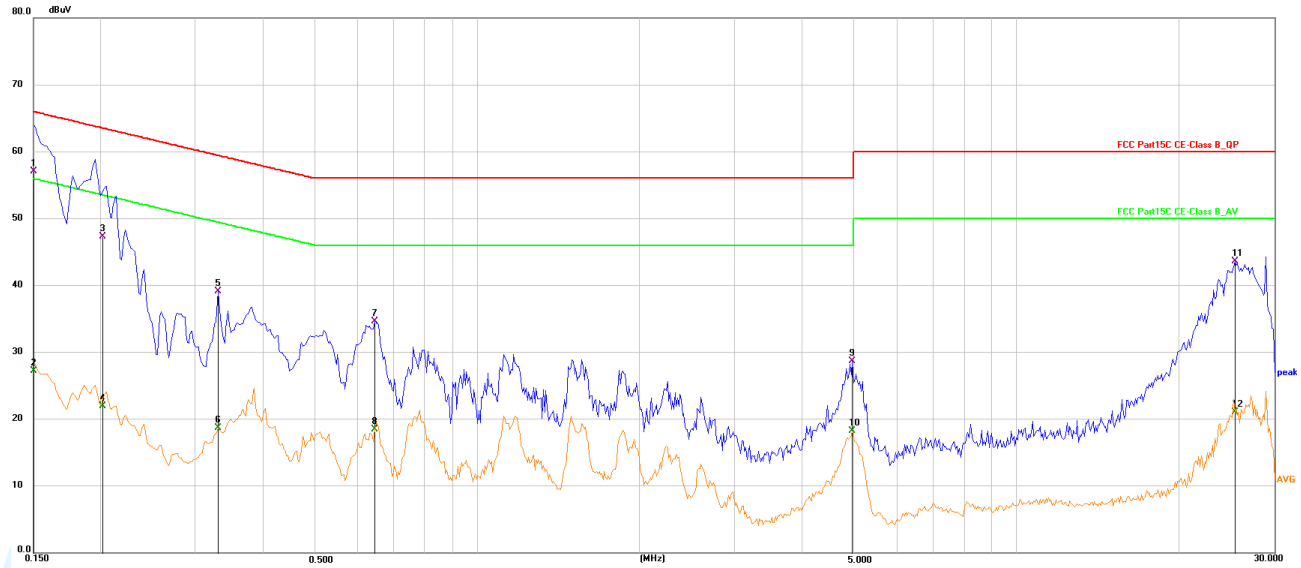
1) The Product was placed on a nonconductive table 0.8 m above the horizontal ground reference plane, and 0.4 m from the vertical ground reference plane, and connected to the main through Line Impedance Stability Network (L.I.S.N).
2) The RBW of the receiver was set at 9 kHz in 150 kHz ~ 30MHz with Peak and AVG detector in Max Hold mode. Run the receiver's pre-scan to record the maximum disturbance generated from Product in all power lines in the full band.
3) For each frequency whose maximum record was higher or close to limit, measure its QP and AVG values and record.

Equipment Used: Refer to section 3 for details.

Test Result: N/A.

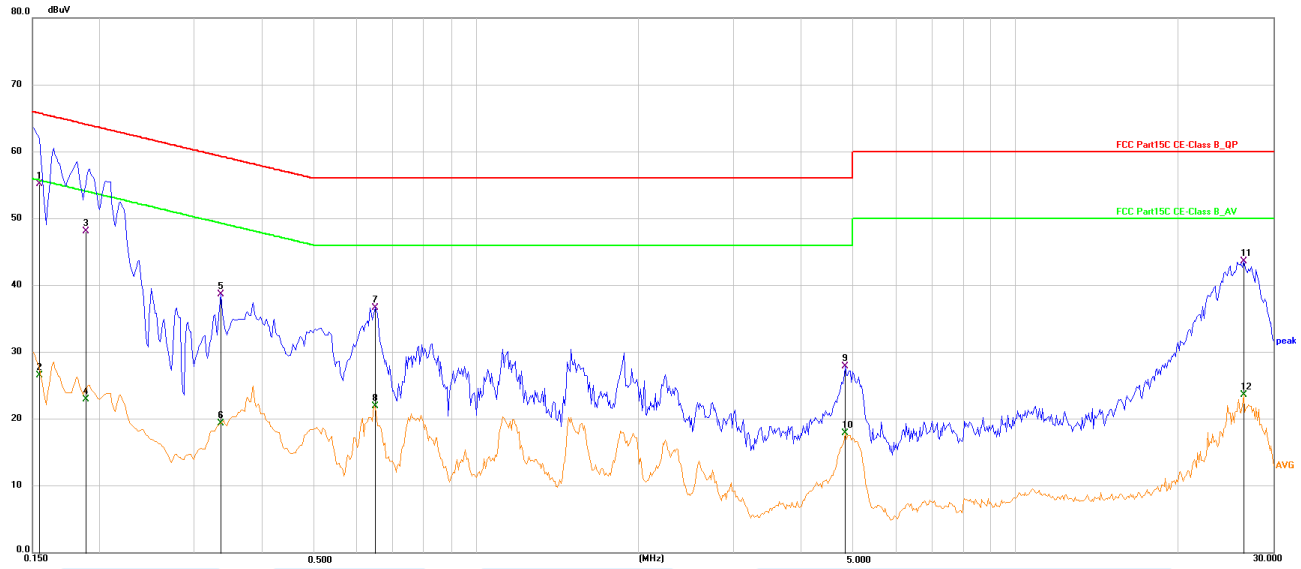
The worst measurement data as follows:
Quasi Peak and Average:
125kHz:

Live Line



No.	Frequency (MHz)	Reading (dBµV)	Correction factor (dB)	Result (dBµV)	Limit (dBµV)	Margin (dB)	Detector
1	0.1503	46.89	10.20	57.09	65.98	-8.89	QP
2	0.1503	17.00	10.20	27.20	55.98	-28.78	AVG
3	0.2024	37.14	10.16	47.30	63.51	-16.21	QP
4	0.2024	11.79	10.16	21.95	53.51	-31.56	AVG
5	0.3300	28.88	10.19	39.07	59.45	-20.38	QP
6	0.3300	8.47	10.19	18.66	49.45	-30.79	AVG
7	0.6450	24.44	10.19	34.63	56.00	-21.37	QP
8	0.6450	8.30	10.19	18.49	46.00	-27.51	AVG
9	4.9650	18.41	10.23	28.64	56.00	-27.36	QP
10	4.9650	7.99	10.23	18.22	46.00	-27.78	AVG
11	25.3680	32.70	10.84	43.54	60.00	-16.46	QP
12	25.3680	10.19	10.84	21.03	50.00	-28.97	AVG

Neutral Line



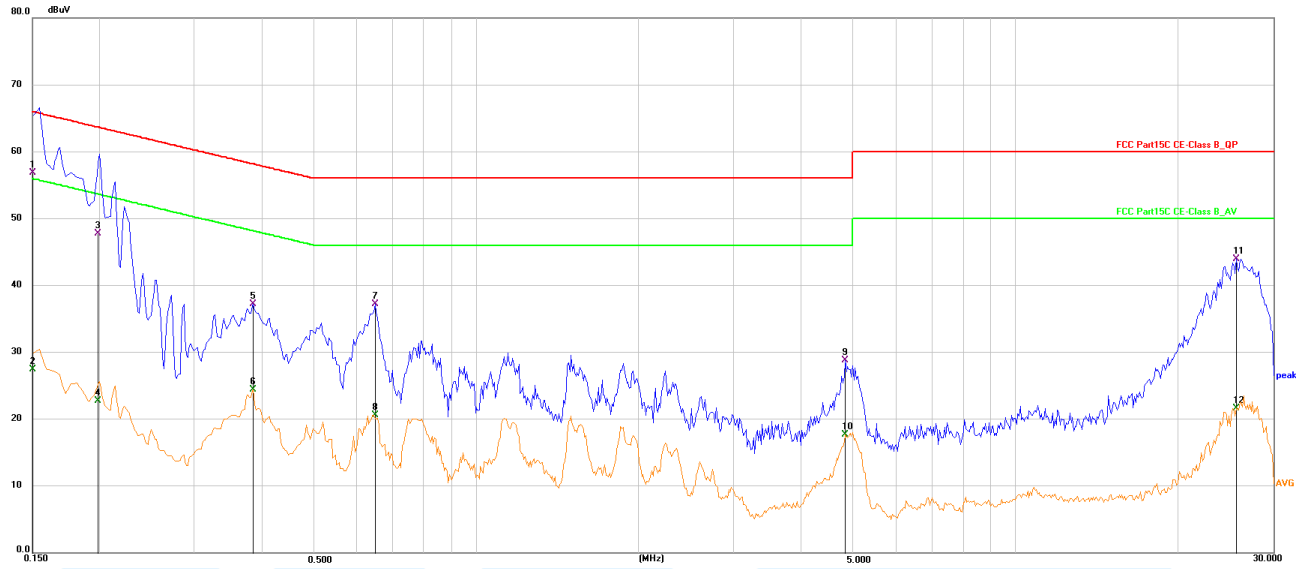
No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Detector
1	0.1549	44.99	10.18	55.17	65.73	-10.56	QP
2	0.1549	16.39	10.18	26.57	55.73	-29.16	AVG
3	0.1884	38.05	10.08	48.13	64.11	-15.98	QP
4	0.1884	12.86	10.08	22.94	54.11	-31.17	AVG
5	0.3345	28.50	10.13	38.63	59.34	-20.71	QP
6	0.3345	9.26	10.13	19.39	49.34	-29.95	AVG
7	0.6493	26.44	10.25	36.69	56.00	-19.31	QP
8	0.6493	11.68	10.25	21.93	46.00	-24.07	AVG
9	4.8345	17.66	10.27	27.93	56.00	-28.07	QP
10	4.8345	7.58	10.27	17.85	46.00	-28.15	AVG
11	26.5470	32.73	10.82	43.55	60.00	-16.45	QP
12	26.5470	12.81	10.82	23.63	50.00	-26.37	AVG

Quasi Peak and Average:
500kHz:

Live Line

No.	Frequency (MHz)	Reading (dBµV)	Correction factor (dB)	Result (dBµV)	Limit (dBµV)	Margin (dB)	Detector
1	0.1513	46.74	10.20	56.94	65.93	-8.99	QP
2	0.1513	16.68	10.20	26.88	55.93	-29.05	AVG
3	0.1643	41.33	10.19	51.52	65.24	-13.72	QP
4	0.1643	14.13	10.19	24.32	55.24	-30.92	AVG
5	0.2850	27.39	10.20	37.59	60.67	-23.08	QP
6	0.2850	4.23	10.20	14.43	50.67	-36.24	AVG
7	0.6450	25.30	10.19	35.49	56.00	-20.51	QP
8	0.6450	9.21	10.19	19.40	46.00	-26.60	AVG
9	4.9424	17.01	10.23	27.24	56.00	-28.76	QP
10	4.9424	6.94	10.23	17.17	46.00	-28.83	AVG
11	26.8125	33.72	10.86	44.58	60.00	-15.42	QP
12	26.8125	10.75	10.86	21.61	50.00	-28.39	AVG

Neutral Line



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Detector
1	0.1503	46.68	10.19	56.87	65.98	-9.11	QP
2	0.1503	17.24	10.19	27.43	55.98	-28.55	AVG
3	0.1990	37.67	10.05	47.72	63.65	-15.93	QP
4	0.1990	12.68	10.05	22.73	53.65	-30.92	AVG
5	0.3840	27.03	10.17	37.20	58.19	-20.99	QP
6	0.3840	14.28	10.17	24.45	48.19	-23.74	AVG
7	0.6493	26.91	10.25	37.16	56.00	-18.84	QP
8	0.6493	10.38	10.25	20.63	46.00	-25.37	AVG
9	4.8480	18.54	10.27	28.81	56.00	-27.19	QP
10	4.8480	7.45	10.27	17.72	46.00	-28.28	AVG
11	25.6424	33.14	10.81	43.95	60.00	-16.05	QP
12	25.6424	10.79	10.81	21.60	50.00	-28.40	AVG

APPENDIX 1 PHOTOS OF TEST SETUP

See test photos attached in Appendix 1 for the actual connections between Product and support equipment.

APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal photos.

*** End of Report ***