

RADIO TEST REPORT

The device described below is tested by Dongguan Nore Testing Center Co., Ltd. to determine the maximum emission levels emanating from the device, the severe levels which the device can endure and E.U.T.'s performance criterion. The test results, data evaluation, test procedures, and equipment of configurations shown in this report were made in accordance with the procedures in ANSI C63.4(2014).

Applicant : Pro-Boards, LLC.
Address : 1201 Shorewood Blvd. Madison WI United States
Manufacturer /Factory : ShenZhen Jtech Electronics Co..Ltd
Address : Room 215-216 Biwan Building Biwan Road. Xixiang Town Bao'an District ,Shenzhen Guangdong China
E.U.T. : Wireless Receiver
Brand Name : N/A
Model No. : LW-001R
FCC ID : 2AS8E-LW001R
Measurement Standard : 47 CFR FCC Part 15, Subpart B
Date of Receiver : April 24, 2019
Date of Test : April 24, 2019 to June 11, 2019
Date of Report : June 28, 2019

This Test Report is Issued Under the Authority of :

Prepared by

Approved & Authorized Signer


Alina Guo / Engineer


Iori Fan / Authorized Signatory



This test report is for the customer shown above and their specific product only. This report applies to above tested sample only and shall not be reproduced in part without written approval of Dongguan Nore Testing Center Co., Ltd.



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1. GENERAL INFORMATION

1.1 Product Description for Equipment under Test

Product Name	: Wireless Receiver
Main model number	: LW-001R
Additional Model number	: N/A
Brand Name	: N/A
Model Difference Description	: N/A
Power Supply	: DC 5V From PC
Test Voltage	: AC 120V/50Hz (PC Input)
Hardware version	: A1
Software version	: A0
Note	: N/A

Technical Specification:

2.4G Function:

Frequency Range	: 2402~2480MHz
Modulation Type	: GFSK
Antenna Type	: PCB antenna (RX only)
Antenna Gain	: 2dBi (Declaration by manufacturer)

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: **2AS8E-LW001R** filing to comply with 47 CFR FCC Part 15, Subpart B.

1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.4 (2014). Radiated emission measurement was performed in semi-anechoic chamber and conducted emission measurement was performed in shield room. For radiated emission measurement, preliminary scans were performed in the semi-anechoic chamber only to determine the worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters.

1.4 Equipment Modifications

Not available for this EUT intended for grant.

1.5 Support Device

Notebook PC	: Manufacturer: Lenovo Model: TP00067A P/N: SL10G10768 S/N: PF-0DS3YC 15/12 CE, FCC: DOC
Adapter	: Manufacturer: Lenovo Model: ADLX65NLC3A I/P: AC 100-240V 50-60Hz, 1.8A O/P: DC 20V 3.25A
PC	: Manufacturer:DELL M/N:Vostro 3668 ST:GG49YM2 Power Cord: 1.8m Unshielded, with core CE, FCC: DOC
LCD Monitor	: Manufacturer: DELL M/N: S2240Tb S/N: CN-0FP53P-74261-3AL-0CYU Power Cord: 1.8m Unshielded, with core CE, FCC: DOC
Adapter (For monitor)	: Manufacturer: CWT M/N: KPL-050F-VI I/P:AC100-240V50/60Hz,1.7A O/P:12V4.17A 50W
Printer	: Manufacturer: Lenovo M/N: 3518 Data Cable: 1.5m Shielded Power Cord: 1.5m Unshielded with core CE, FCC: DOC

1.6 Test Facility and Location

Site Description

- EMC Lab : Listed by CNAS, August 13, 2018
The certificate is valid until August 13, 2024
The Laboratory has been assessed and proved to be in compliance with CNAS/CL01
The Certificate Registration Number is L5795.
- Listed by A2LA, November 01, 2017
The certificate is valid until December 31, 2019
The Laboratory has been assessed and proved to be in compliance with ISO17025
The Certificate Registration Number is 4429.01
- Listed by FCC, November 06, 2017
The Designation Number is CN1214
Test Firm Registration Number: 907417
- Listed by Industry Canada, June 08, 2017
The Certificate Registration Number. Is 46405-9743
- Name of Firm : Dongguan Nore Testing Center Co., Ltd.
(Dongguan NTC Co., Ltd.)
- Site Location : Building D, Gaosheng Science and Technology Park, Hongtu Road, Nancheng District, Dongguan City, Guangdong Province, China.



1.7 Summary of Test Results

EMISSION				
Standard	Test Type	Result	Clause	Remarks
47 CFR FCC Part 15, Subpart B, Class B; ANSI C63.4-2014	Mains Terminal Disturbance Voltage Test	PASS	§15.107(a)	Uncertainty: ±2.70dB
	Radiated Emission Test (30-1000MHz)	PASS	§15.109(a)	Uncertainty: ±3.40dB
	Radiated Emission Test (1-12.5GHz)	PASS	§15.109(a)	Uncertainty: ±3.79dB

2. System Test Configuration

2.1 Special Accessories

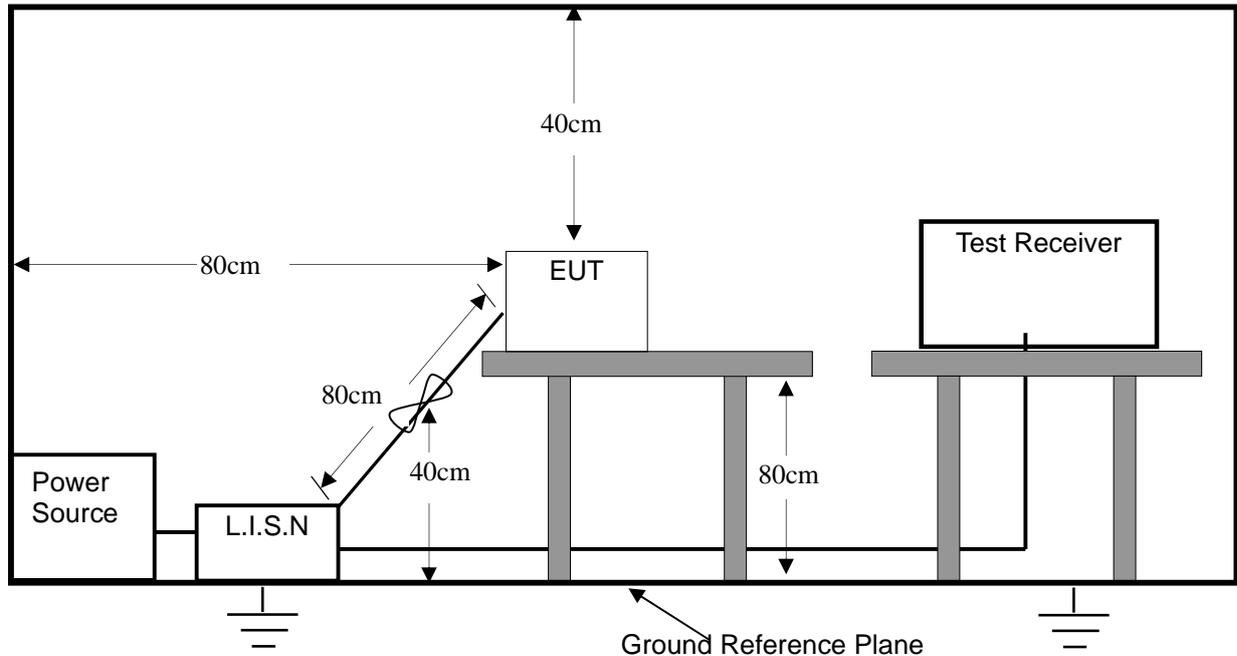
Not available for this EUT intended for grant.

2.2 Description of test modes

The EUT has been tested under operating condition.
Test mode: RX

3. Conducted Emissions Test

3.1 Test SET-UP (Block Diagram of Configuration)



3.2 Test Condition

Test Requirement: FCC Part 15.107

The E.U.T. is put on the 0.8 m high table and connected to the AC mains through a Artificial Mains Network (AMN). This provided a 50ohm coupling impedance for the tested equipments. Both sides of AC line are checked to find out the maximum conducted emission levels according to the FCC ANSI C63.4-2014 regulations during conducted emission test.

The bandwidth of the test receiver (R&S Test Receiver ESCI) is set at 9 KHz.

Sample of data calculate:

Level=Reading + Factor

Margin= Level-Limit

Factor=LF+CF+SWF

Where LF= L.I.S.N attenuation factor in dB
(L.I.S.N contain 10dB attenuator)

CF= Cable attenuation factor in dB

SWF= RF Switching Unit attenuation factor in dB

3.3 Measurement Results

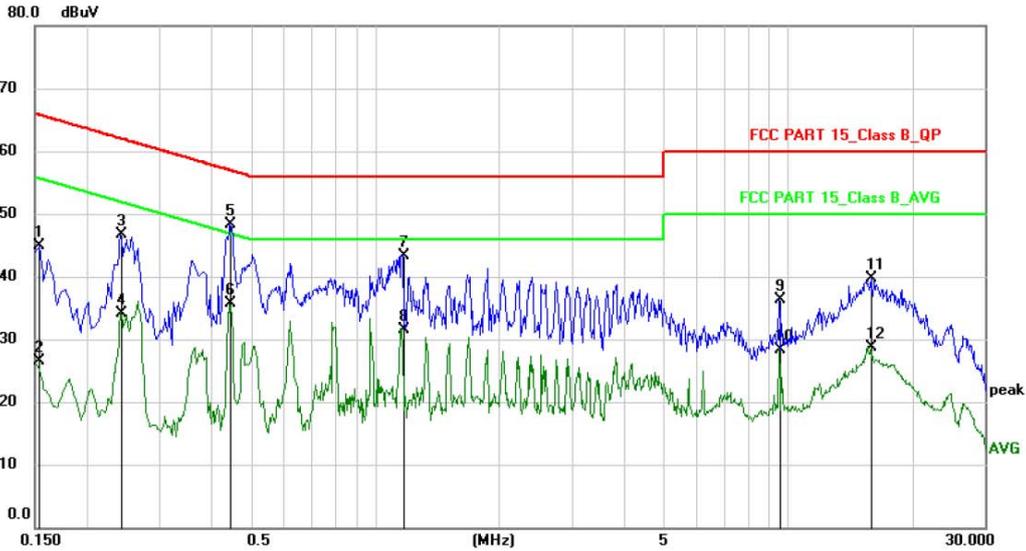
Please refer to following the test plots.



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Conducted Emission Measurement

File :LW-001 Data :#1 Date: 2019/4/26 Time: 21:12:40



Site: _____ Phase: **L1** Temperature: 26
 Limit: FCC PART 15_Class B_QP Power: AC120V/60Hz Humidity: 60 %
 EUT: Wireless Receiver
 M/N: LW-001R
 Mode: RX
 Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measurement dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1539	34.29	10.61	44.90	65.79	-20.89	QP	
2		0.1539	15.89	10.61	26.50	55.79	-29.29	AVG	
3		0.2420	36.09	10.61	46.70	62.03	-15.33	QP	
4		0.2420	23.59	10.61	34.20	52.03	-17.83	AVG	
5	*	0.4460	37.78	10.62	48.40	56.95	-8.55	QP	
6		0.4460	25.08	10.62	35.70	46.95	-11.25	AVG	
7		1.1660	32.75	10.65	43.40	56.00	-12.60	QP	
8		1.1660	20.95	10.65	31.60	46.00	-14.40	AVG	
9		9.5500	25.73	10.67	36.40	60.00	-23.60	QP	
10		9.5500	17.73	10.67	28.40	50.00	-21.60	AVG	
11		15.9260	29.13	10.67	39.80	60.00	-20.20	QP	
12		15.9260	18.13	10.67	28.80	50.00	-21.20	AVG	

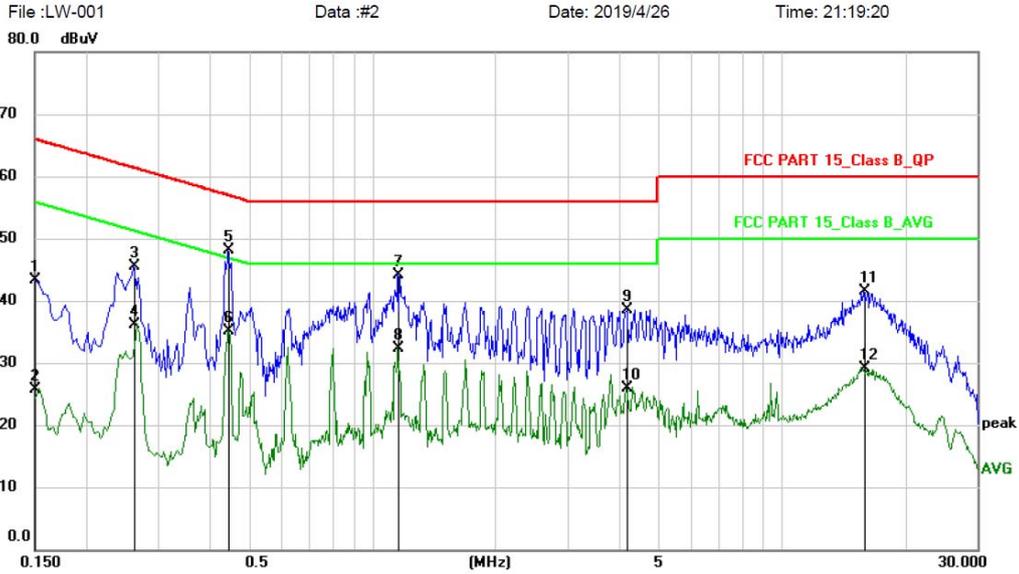
*:Maximum data x:Over limit !:over margin

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Conducted Emission Measurement



Site: Phase: **N** Temperature: 26
 Limit: FCC PART 15_Class B_QP Power: AC120V/60Hz Humidity: 60 %
 EUT: Wireless Receiver
 M/N: LW-001R
 Mode: RX
 Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.1500	32.79	10.61	43.40	66.00	-22.60	QP	
2		0.1500	15.19	10.61	25.80	56.00	-30.20	AVG	
3		0.2620	34.99	10.61	45.60	61.37	-15.77	QP	
4		0.2620	25.59	10.61	36.20	51.37	-15.17	AVG	
5	*	0.4460	37.48	10.62	48.10	56.95	-8.85	QP	
6		0.4460	24.58	10.62	35.20	46.95	-11.75	AVG	
7		1.1539	33.55	10.65	44.20	56.00	-11.80	QP	
8		1.1539	21.75	10.65	32.40	46.00	-13.60	AVG	
9		4.1820	27.84	10.66	38.50	56.00	-17.50	QP	
10		4.1820	15.34	10.66	26.00	46.00	-20.00	AVG	
11		15.8740	30.83	10.67	41.50	60.00	-18.50	QP	
12		15.8740	18.53	10.67	29.20	50.00	-20.80	AVG	

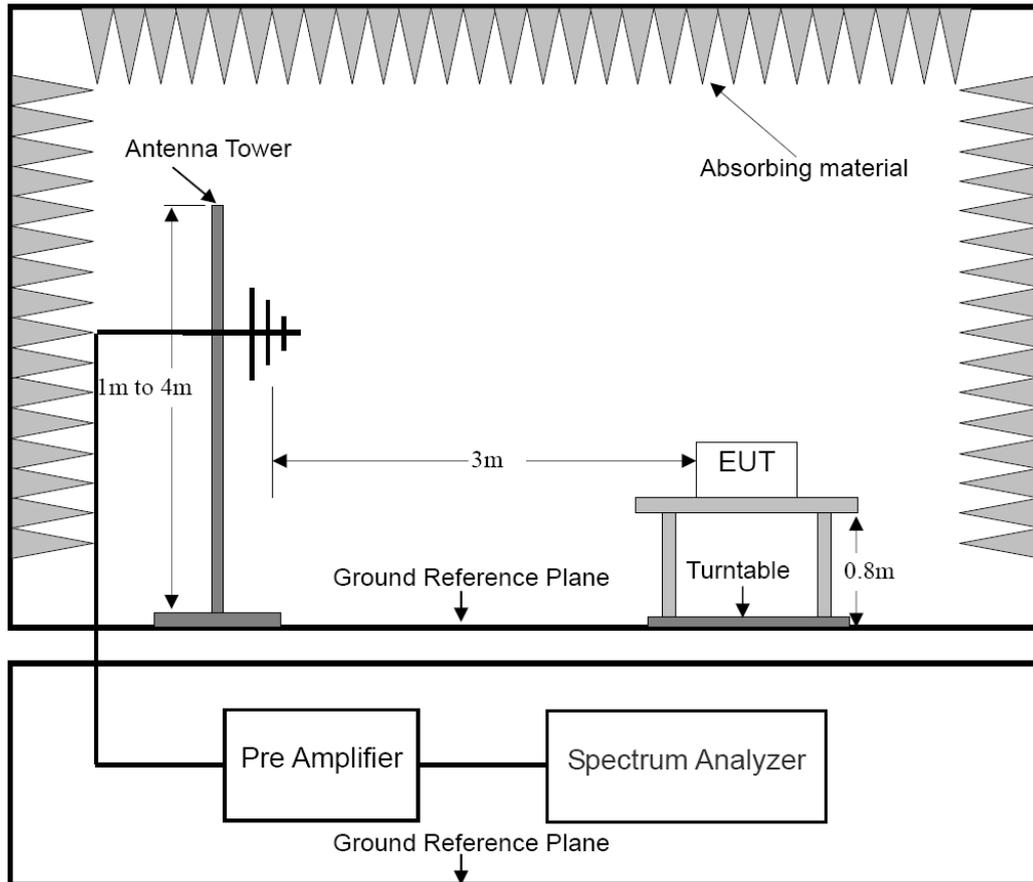
*:Maximum data x:Over limit !:over margin

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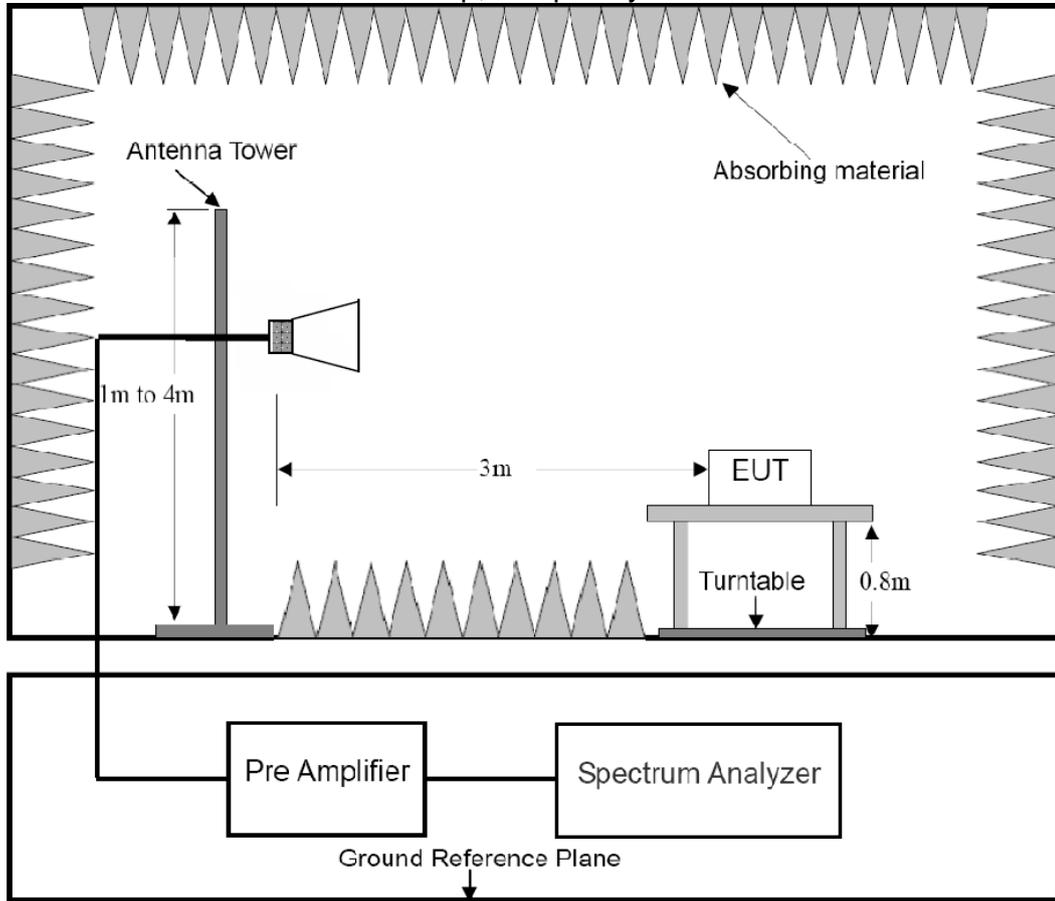
4. Radiated Emission Test

4.1 Test SET-UP (Block Diagram of Configuration)

4.1.1 Radiated Emission Test Set-Up, Frequency Below 30MHz



4.1.2 Radiated Emission Test Set-Up, Frequency above 1GHz



4.2 Measurement Procedure

E.U.T. and its simulators are placed on a turntable, which is 0.8 meter high above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. E.U.T. is set 3.0 meters away from the receiving antenna, which is mounted on a antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bilog antenna) is used as receiving antenna. Both horizontal and vertical polarization of the antenna is set on measurement. In order to find the maximum emission levels, all of the interface cables must be manipulated according to FCC ANSI C63.4-2014 on radiated emission measurement.

Class B on radiated emission measurement.

Below 1GHz, the bandwidth of the EMI test is set at 120 KHz.

Above 1GHz, the bandwidth of the EMI test is set at 1MHz.

The frequency range from 30 MHz to 1 GHz
 and 1 GHz to 12.5 GHz is checked

Sample of data calculate:

Level=Reading + Factor; Margin= Level-Limit

Factor=CF+AF+AG

Where CF=Cable attenuation factor in dB

AF= Antenna factor in dB

AG=Amplifier Gain in dB

4.3 Limit

Below 1GHz:

Frequency range MHz	Distance Meters	Field Strengths Limit	
		$\mu\text{V}/\text{m}$	$\text{dB}(\mu\text{V})/\text{m}$
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0

Remark: (1) Emission level $(\text{dB})\mu\text{V} = 20 \log \text{Emission level } \mu\text{V}/\text{m}$

(2) The smaller limit shall apply at the cross point between two frequency bands.

(3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.

Above 1GHz:

Frequency range GHz	Average limit dB(μ V/m)	Peak limit dB(μ V/m)
Above 1000	54	74

Note: The highest internal source of an EUT is defined as the highest frequency generated or used within the EUT or on which the EUT operates or tunes.

- (1) If the highest frequency of the internal sources of the EUT is less than 108MHz, the measurement shall only be made up to 1GHz.
- (2) If the highest frequency of the internal sources of the EUT is between 108MHz and 500MHz, the measurement shall only be made up to 2GHz.
- (3) If the highest frequency of the internal sources of the EUT is between 500MHz and 1GHz, the measurement shall only be made up to 5GHz.
- (4) If the highest frequency of the internal sources of the EUT is above 1GHz, the measurement shall be made up to 5 times the highest frequency or 40GHz, whichever is less.

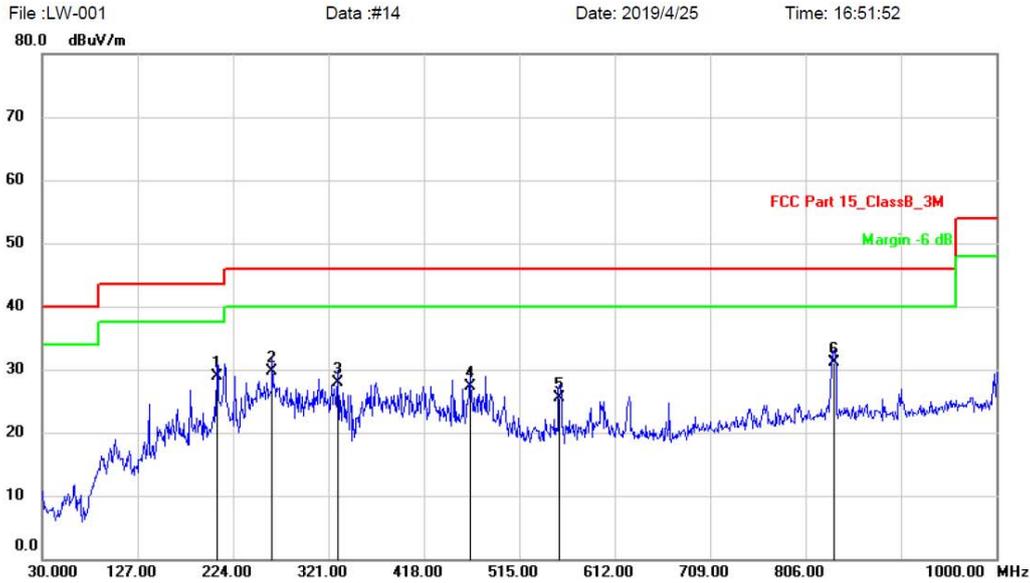
4.4 Measurement Results

Please refer to following the test plots.



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Radiated Emission Measurement



Site: 3m Chamber Polarization: *Horizontal* Temperature: 26
 Limit: FCC Part 15_ClassB_3M Power: AC120V/60Hz Humidity: 47 %
 EUT: Wireless Receiver Distance: 3m
 M/N: LW-001R
 Mode: RX
 Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	cm	degree	
1	*	207.5100	42.19	-13.29	28.90	43.50	-14.60	QP		
2		263.7700	41.14	-11.34	29.80	46.00	-16.20	QP		
3		330.7000	37.50	-9.60	27.90	46.00	-18.10	QP		
4		464.5600	34.92	-7.62	27.30	46.00	-18.70	QP		
5		555.7400	31.87	-6.37	25.50	46.00	-20.50	QP		
6		835.1000	32.47	-1.37	31.10	46.00	-14.90	QP		

*:Maximum data x:Over limit !:over margin

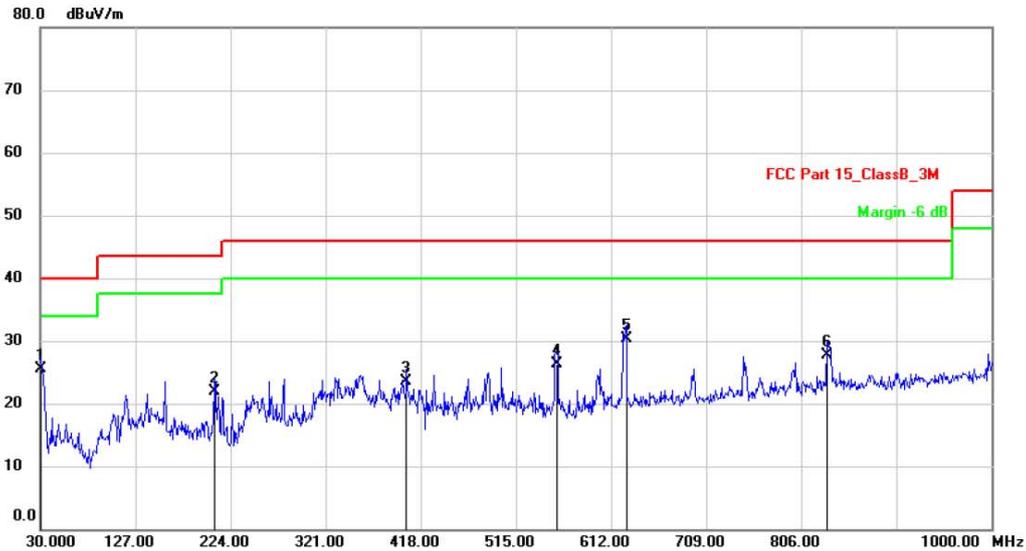
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Radiated Emission Measurement

File :LW-001 Data :#13 Date: 2019/4/25 Time: 16:44:40



Site: 3m Chamber Polarization: **Vertical** Temperature: 26
 Limit: FCC Part 15_ClassB_3M Power: AC120V/60Hz Humidity: 47 %
 EUT: Wireless Receiver Distance: 3m
 M/N: LW-001R
 Mode: RX
 Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	cm	degree	Comment
1	*	30.9700	41.43	-15.83	25.60	40.00	-14.40	QP		
2		207.5100	38.19	-16.29	21.90	43.50	-21.60	QP		
3		403.4500	34.80	-11.20	23.60	46.00	-22.40	QP		
4		556.7100	34.73	-8.33	26.40	46.00	-19.60	QP		
5		627.5200	37.11	-6.71	30.40	46.00	-15.60	QP		
6		832.1900	29.21	-1.41	27.80	46.00	-18.20	QP		

*:Maximum data x:Over limit !:over margin

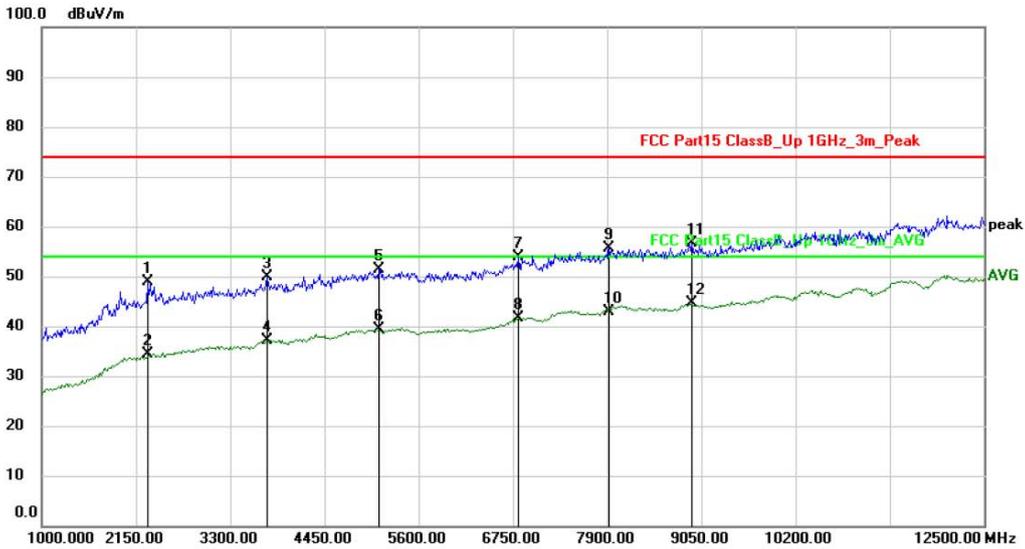
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Radiated Emission Measurement

File :LW-001 Data :#53 Date: 2019/5/20 Time: 19:58:13



Site: 3m Chamber Polarization: **Horizontal** Temperature: 26
 Limit: FCC Part15 ClassB_Up 1GHz_3m_Peak Power: AC120V/60Hz Humidity: 47 %
 EUT: Wireless Receiver Distance: 3m
 M/N: LW-001R
 Mode: RX
 Note:

No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB/m	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree degree	Comment
1	2293.750	49.15	-0.17	48.98	74.00	-25.02	peak			
2	2293.750	34.67	-0.17	34.50	54.00	-19.50	AVG			
3	3745.625	46.71	3.24	49.95	74.00	-24.05	peak			
4	3745.625	33.93	3.24	37.17	54.00	-16.83	AVG			
5	5111.250	44.39	6.95	51.34	74.00	-22.66	peak			
6	5111.250	32.39	6.95	39.34	54.00	-14.66	AVG			
7	6821.875	44.64	9.27	53.91	74.00	-20.09	peak			
8	6821.875	32.44	9.27	41.71	54.00	-12.29	AVG			
9	7928.750	44.33	11.27	55.60	74.00	-18.40	peak			
10	7928.750	31.59	11.27	42.86	54.00	-11.14	AVG			
11	8935.000	44.86	11.73	56.59	74.00	-17.41	peak			
12 *	8935.000	32.90	11.73	44.63	54.00	-9.37	AVG			

*:Maximum data x:Over limit !:over margin

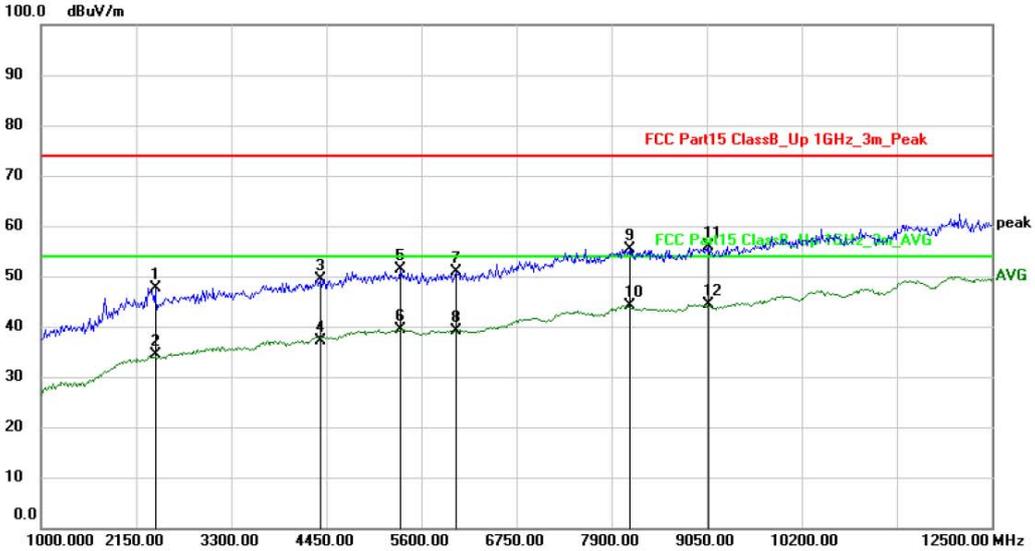
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Radiated Emission Measurement

File :LW-001 Data :#54 Date: 2019/5/20 Time: 20:03:11



Site: 3m Chamber Polarization: **Vertical** Temperature: 26
 Limit: FCC Part15 ClassB_Up 1GHz_3m_Peak Power: AC120V/60Hz Humidity: 47 %
 EUT: Wireless Receiver Distance: 3m
 M/N: LW-001R
 Mode: RX
 Note:

No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB/m	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree degree	Comment
1	2380.000	47.54	0.07	47.61	74.00	-26.39	peak			
2	2380.000	34.28	0.07	34.35	54.00	-19.65	AVG			
3	4378.125	44.64	4.82	49.46	74.00	-24.54	peak			
4	4378.125	32.38	4.82	37.20	54.00	-16.80	AVG			
5	5341.250	44.49	6.82	51.31	74.00	-22.69	peak			
6	5341.250	32.46	6.82	39.28	54.00	-14.72	AVG			
7	6016.875	43.83	7.10	50.93	74.00	-23.07	peak			
8	6016.875	32.10	7.10	39.20	54.00	-14.80	AVG			
9	8115.625	44.12	11.34	55.46	74.00	-18.54	peak			
10	8115.625	32.72	11.34	44.06	54.00	-9.94	AVG			
11	9078.750	43.93	11.88	55.81	74.00	-18.19	peak			
12 *	9078.750	32.52	11.88	44.40	54.00	-9.60	AVG			

*:Maximum data x:Over limit !:over margin

(Reference Only)

8. Test Equipment List

No.	Equipment	Manufacturer	Model No.	Serial No.	Characteristics	Last Cal.	Cal. Interval
1.	Test Receiver	Rohde & Schwarz	ESCI7	100837	9KHz~7GHz	Mar. 14, 2019	Mar. 13, 2020
2.	Antenna	Schwarzbeck	VULB9162	9162-010	30MHz~7GHz	Mar. 23, 2019	Mar. 22, 2020
3.	Spectrum Analyzer	Rohde & Schwarz	FSU26	200409/026	20Hz~26.5GHz	Mar. 14, 2019	Mar. 13, 2020
4.	Spectrum Analyzer	Keysight	N9020A	MY54200831	20Hz~26.5GHz	Apr. 24, 2019	Apr. 23, 2020
5.	Spectrum Analyzer	Rohde & Schwarz	FSV40	101003	10Hz~40GHz	Apr. 24, 2019	Apr. 23, 2020
6.	Horn Antenna	Schwarzbeck	BBHA9170	9170-372	15GHz~40GHz	Mar. 23, 2019	Mar. 22, 2020
7.	Pre-Amplifier	EMCI	EMC 184045	980102	18GHz~40GHz	Apr. 24, 2019	Apr. 23, 2020
8.	Power Sensor	DARE	RPR3006W	15I00041SN064	100MHz~6GHz	Mar. 14, 2019	Mar. 13, 2020
9.	Communication Tester	Rohde & Schwarz	CMW500	149004	70MHz~6GHz	Mar. 14, 2019	Mar. 13, 2020
10.	Horn Antenna	COM-Power	AH-118	071078	500MHz~18GHz	Mar. 23, 2019	Mar. 22, 2020
11.	Pre-Amplifier	HP	HP 8449B	3008A00964	1GHz~26.5GHz	Mar. 14, 2019	Mar. 13, 2020
12.	Pre-Amplifier	HP	HP 8447D	1145A00203	100KHz~1.3GHz	Mar. 14, 2019	Mar. 13, 2020
13.	Loop Antenna	Schwarzbeck	FMZB 1513	1513-272	9KHz~30MHz	Apr. 24, 2019	Apr. 23, 2020
14.	Temperature & Humidity Chamber	REMAFEE	SYHR225L	N/A	-40~150℃	Apr. 24, 2019	Apr. 23, 2020
15.	DC Source	MY	MY8811	N/A	0~30V	Mar. 23, 2019	Mar. 22, 2020
16.	Temporary antenna connector	TESCOM	SS402	N/A	9KHz~25GHz	N/A	N/A
17.	Test Receiver	Rohde & Schwarz	ESCI	101152	9KHz~3GHz	Mar. 14, 2019	Mar. 13, 2020
18.	L.I.S.N	Rohde & Schwarz	ENV 216	101317	N/A	Mar. 14, 2019	Mar. 13, 2020
19.	L.I.S.N	Schwarzbeck	NNLK8129	8129212	N/A	Mar. 07, 2019	Mar. 06, 2020
20.	RF Switching Unit	Compliance Direction Systems Inc.	RSU-M2	38311	N/A	Mar. 14, 2019	Mar. 13, 2020
21.	Test Software	EZ	EZ_EMCC	N/A	N/A	N/A	N/A

Note: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

---End---