



# FCC EMI TEST REPORT

**FCC ID** : LHJ-FE4RW0110  
**Equipment** : FE4RW0110  
**Brand Name** : Continental  
**Model Name** : FE4RW0110  
**Applicant** : Continental Automotive Systems, Inc.  
21440 W Lake Cook Rd.  
**Manufacturer** : Continental Automotive Systems, Inc.  
21440 W Lake Cook Rd.  
**Standard** : FCC 47 CFR FCC Part 15 Subpart B Class B

The product was received on May 06, 2021 and testing was started from May 15, 2021 and completed on May 18, 2021. We, Sporton International Inc. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI C63.4-2014 and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Approved by: Louis Wu

**Sporton International Inc. EMC & Wireless Communications Laboratory**

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)



## Table of Contents

History of this test report.....	3
Summary of Test Result.....	4
<b>1. General Description .....</b>	<b>5</b>
1.1. Product Feature of Equipment Under Test .....	5
1.2. Product Specification of Equipment Under Test .....	5
1.3. Modification of EUT .....	6
1.4. Test Location .....	7
1.5. Applicable Standards .....	7
<b>2. Test Configuration of Equipment Under Test .....</b>	<b>8</b>
2.1. Test Mode .....	8
2.2. Connection Diagram of Test System .....	9
2.3. Support Unit used in test configuration and system.....	9
2.4. EUT Operation Test Setup .....	9
<b>3. Test Result .....</b>	<b>10</b>
3.1. Test of AC Conducted Emission Measurement .....	10
3.2. Test of Radiated Emission Measurement .....	12
<b>4. List of Measuring Equipment.....</b>	<b>14</b>
<b>5. Uncertainty of Evaluation .....</b>	<b>15</b>
<b>Appendix A. AC Conducted Emission Test Result</b>	
<b>Appendix B. Radiated Emission Test Result</b>	
<b>Appendix C. Setup Photographs</b>	



### History of this test report

Report No.	Version	Description	Issued Date
FC150634-01	01	Initial issue of report	Jun. 07, 2021



### Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.107	AC Conducted Emission	Pass	Under limit 18.66 dB at 0.501 MHz
3.2	15.109	Radiated Emission	Pass	Under limit 12.70 dB at 958.290 MHz

**Declaration of Conformity:**

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

**Comments and Explanations:**

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

**Reviewed by:** Yun Huang

**Report Producer:** Lucy Wu



# 1. General Description

## 1.1. Product Feature of Equipment Under Test

Product Feature	
Equipment	FE4RW0110
Brand Name	Continental
Model Name	FE4RW0110
FCC ID	LHJ-FE4RW0110
EUT supports Radios application	GPRS/EGPRS/WCDMA/HSPA/LTE/GNSS
HW Version	P4
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer.

## 1.2. Product Specification of Equipment Under Test

Product Specification subjective to this standard	
<b>Tx Frequency</b>	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8 MHz WCDMA Band V: 826.4 MHz ~ 846.6 MHz WCDMA Band IV : 1712.4 MHz ~ 1752.6 MHz WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz LTE Band 2 : 1850.7 MHz ~ 1909.3 MHz LTE Band 4 : 1710.7 MHz ~ 1754.3 MHz LTE Band 5 : 824.7 MHz ~ 848.3 MHz LTE Band 7 : 2502.5 MHz ~ 2567.5 MHz LTE Band 38 : 2572.5 MHz ~ 2617.5 MHz LTE Band 41 : 2498.5 MHz ~ 2687.5 MHz
<b>Rx Frequency</b>	GSM850: 869.2 MHz ~ 893.8 MHz GSM1900: 1930.2 MHz ~ 1989.8 MHz WCDMA Band V: 871.4 MHz ~ 891.6 MHz WCDMA Band IV: 2112.4 MHz ~ 2152.6 MHz WCDMA Band II: 1932.4 MHz ~ 1987.6 MHz LTE Band 2 : 1930.7 MHz ~ 1989.3 MHz LTE Band 4 : 2110.7 MHz ~ 2154.3 MHz LTE Band 5 : 869.7 MHz ~ 893.3 MHz LTE Band 7 : 2622.5 MHz ~ 2687.5 MHz LTE Band 38 : 2572.5 MHz ~ 2617.5 MHz LTE Band 41 : 2498.5 MHz ~ 2687.5 MHz GNSS : 1.57542 GHz; 1176.45 MHz (GPS / Glonass / Galileo / BDS / SBAS)

Product Specification subjective to this standard	
<b>Antenna Type</b>	Fixed External Antenna Antenna Model name: SPDA24700/2700 Antenna Manufactory: Pulse electronics
<b>Antenna Gain</b>	698-960 MHz : 2dBi 1710-2170 MHz : 2dBi 2500-2700MHz : 2dBi
<b>Type of Modulation</b>	GSM/GPRS: GMSK EDGE(MCS 0-4): GMSK/(MCS 5-9): 8PSK WCDMA: QPSK (Uplink) HSDPA: 64QAM (Downlink) HSUPA : OPSK (Uplink) LTE: QPSK / 16QAM / 64QAM GNSS: BPSK

**Remark:** The above EUT's information was declared by manufacturer. Please refer to Comments and Explanations in report summary.

### 1.3. Modification of EUT

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



### 1.4. Test Location

<b>Test Site</b>	Sporton International Inc. EMC & Wireless Communications Laboratory
<b>Test Site Location</b>	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978
<b>Test Site No.</b>	<b>Sporton Site No.</b> CO05-HY
<b>Test Site</b>	Sporton International Inc. Wensan Laboratory
<b>Test Site Location</b>	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
<b>Test Site No.</b>	<b>Sporton Site No.</b> 03CH10-HY (TAF Code: 3786)
<b>Remark</b>	The Radiated Emission test item subcontracted to Sporton International Inc. Wensan Laboratory.

FCC designation No.: TW1093 and TW1132

### 1.5. Applicable Standards

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

- ♦ FCC 47 CFR FCC Part 15 Subpart B Class B
- ♦ ANSI C63.4-2014

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



## 2. Test Configuration of Equipment Under Test

### 2.1. Test Mode

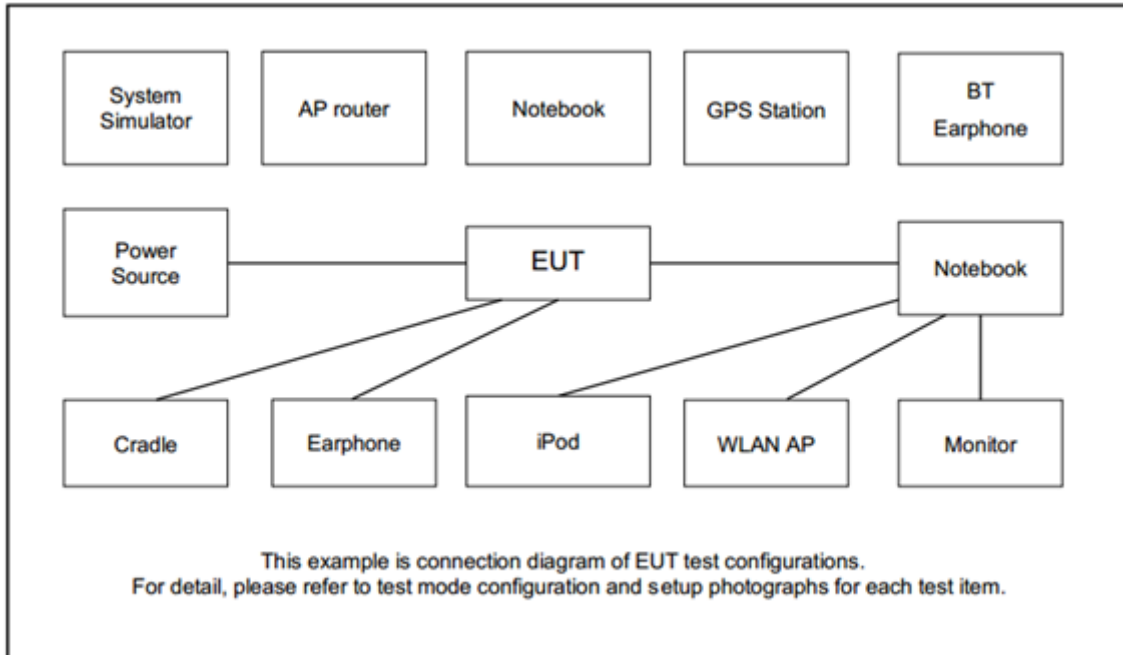
The EUT has been associated with peripherals pursuant to ANSI C63.4-2014 and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (30MHz to the 5th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

Test Items	Function Type
<b>AC Conducted Emission</b>	Mode 1 : GSM850 (GPRS Class 8) Idle + WWAN Antenna *2 + Car Battery (DC 12V)
	Mode 2 : WCDMA Band II Idle + WWAN Antenna *2 + Car Battery (DC 12V)
	Mode 3 : LTE Band 41 Idle + WWAN Antenna *2 + Car Battery (DC 12V)
<b>Radiated Emissions</b>	Mode 1 : GSM850 (GPRS Class 8) Idle + WWAN Antenna *2 + Car Battery (DC 12V)
	Mode 2 : WCDMA Band II Idle + WWAN Antenna *2 + Car Battery (DC 12V)
	Mode 3 : LTE Band 41 Idle + WWAN Antenna *2 + Car Battery (DC 12V)
<b>Remark:</b>	
<ol style="list-style-type: none"><li>1. The worst case of AC is mode 2; only the test data of this mode was reported.</li><li>2. The worst case of RE is mode 2; only the test data of this mode was reported.</li><li>3. For radiation emission after pre-scanned the cellular band between 30MHz ~ 960MHz (GSM850); only the worst case for cellular band test data of this mode was reported.</li></ol>	



## 2.2. Connection Diagram of Test System



## 2.3. Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m
2.	Dipole Antenna	Larsen	SPDA24700/2700	N/A	N/A	N/A
3.	Car Battery	GS	65B24LS	N/A	N/A	N/A

## 2.4. EUT Operation Test Setup

The EUT was in GSM or WCDMA or LTE idle mode during the test. The EUT was synchronized with the BCCH, and had been continuous receiving mode by setting paging reorganization of the system simulator.



### 3. Test Result

#### 3.1. Test of AC Conducted Emission Measurement

##### 3.1.1. Limits 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.

<Class B>

Frequency of emission (MHz)	Conducted limit (dBuV)	
	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.

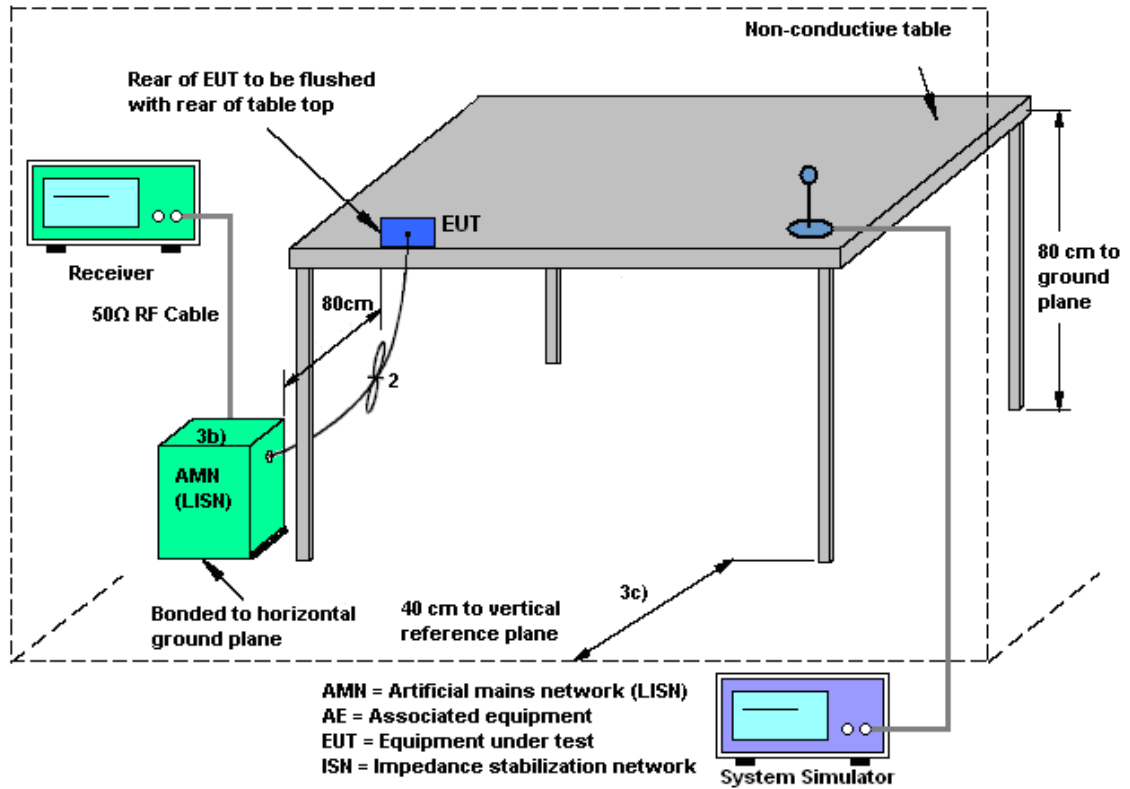
##### 3.1.2. Measuring Instruments

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

##### 3.1.3. Test Procedure

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

### 3.1.4. Test Setup



### 3.1.5. Test Result of AC Conducted Emission

Please refer to Appendix A.



### 3.2. Test of Radiated Emission Measurement

#### 3.2.1. Limit of Radiated Emission

The emissions from an unintentional radiator shall not exceed the field strength levels specified in the following table:

<Class B>

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

#### 3.2.2. Measuring Instruments

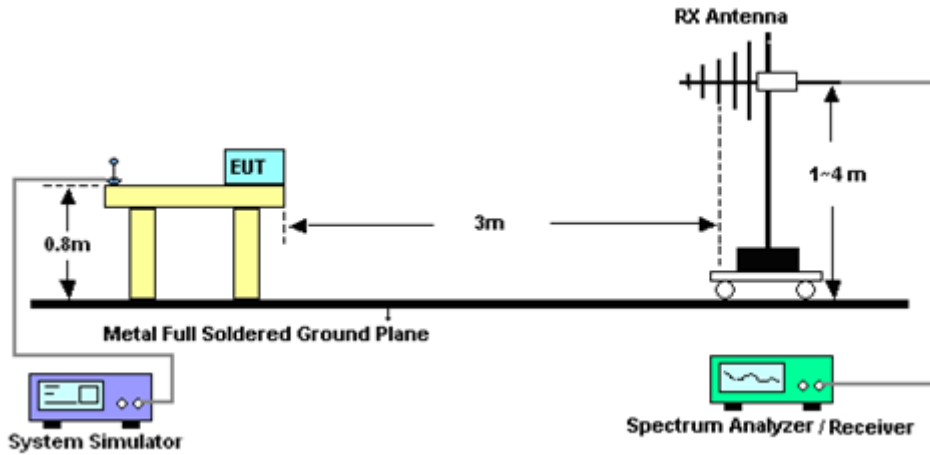
Refer a test equipment and calibration data table in this test report.

#### 3.2.3. Test Procedures

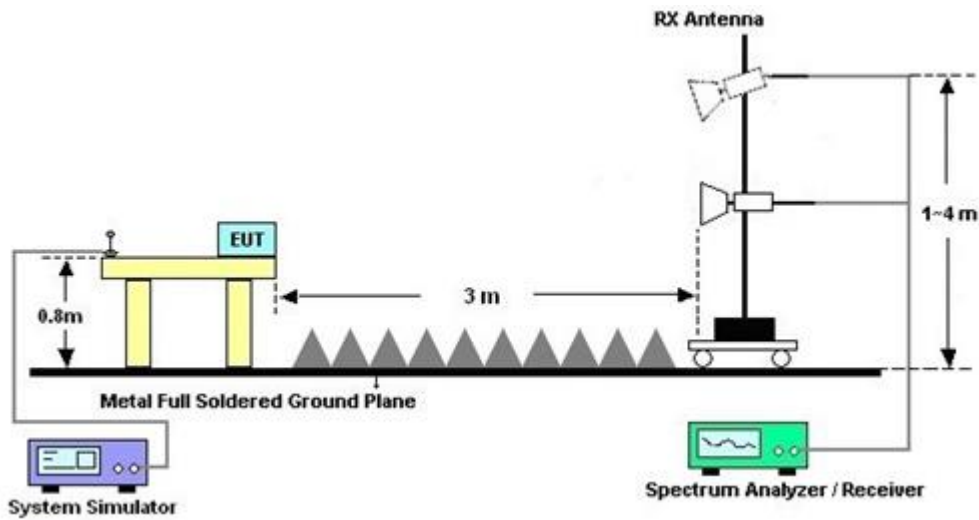
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna is a Bi-Log antenna and its height is adjusted between one to four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode (RBW=120 kHz/VBW=300 kHz for frequency below 1 GHz; RBW=1 MHz VBW=3 MHz (Peak), RBW=1 MHz/VBW=10 Hz (Average) for frequency above 1 GHz).
7. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, peak values of EUT will be reported. Otherwise, the emission will be repeated by using the quasi-peak method and reported.
8. Emission level (dBµV/m) = 20 log Emission level (µV/m)
9. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

### 3.2.4. Test Setup of Radiated Emission

For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



### 3.2.5. Test Result of Radiated Emission

Please refer to Appendix B.



## 4. List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Amplifier	SONOMA	310N	187311	9kHz~1GHz	Oct. 21, 2020	May 15, 2021	Oct. 20, 2021	Radiation (03CH10-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01N-06	35413 & 02	30MHz~1GHz	Feb. 10, 2021	May 15, 2021	Feb. 09, 2022	Radiation (03CH10-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-02114	1GHz~18GHz	Aug. 04, 2020	May 15, 2021	Aug. 03, 2021	Radiation (03CH10-HY)
Preamplifier	Jet-Power	JAP00101800-30-10P	160118550004	1GHz~18GHz	Mar. 01, 2021	May 15, 2021	Feb. 28, 2022	Radiation (03CH10-HY)
Spectrum Analyzer	Keysight	N9010A	MY53470118	10Hz~44GHz	Jan. 15, 2021	May 15, 2021	Jan. 14, 2022	Radiation (03CH10-HY)
Controller	EMEC	EM 1000	N/A	Control Turn table & Ant Mast	N/A	May 15, 2021	N/A	Radiation (03CH10-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	N/A	May 15, 2021	N/A	Radiation (03CH10-HY)
Turn Table	EMEC	TT 2200	N/A	0~360 Degree	N/A	May 15, 2021	N/A	Radiation (03CH10-HY)
Software	Audix	E3 6.2009-8-24	RK-001042	N/A	N/A	May 15, 2021	N/A	Radiation (03CH10-HY)
EMI Test Receiver	Agilent	N9038A(MXE)	MY55420170	20MHz~8.4GHz	May 21, 2020	May 15, 2021	May 20, 2021	Radiation (03CH10-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104 / 102	MY11692/4PE, MY11693/4PE, MY2855/2	30MHz~1GHz	Nov. 06, 2020	May 15, 2021	Nov. 05, 2021	Radiation (03CH10-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104 / 102	MY11692/4PE, MY11693/4PE, MY2855/2	1GHz~18GHz	Nov. 06, 2020	May 15, 2021	Nov. 05, 2021	Radiation (03CH10-HY)
DC- LISN	ROLF HEINE	LN-KFZ/200	03/10219	100kHz – 108MHz	Nov. 18, 2020	May 18, 2021	Nov. 17, 2021	Conduction (CO05-HY)
DC- LISN	ROLF HEINE	LN-KFZ/200	03/10220	100kHz – 108MHz	Nov. 18, 2020	May 18, 2021	Nov. 17, 2021	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Nov. 30, 2020	May 18, 2021	Nov. 29, 2021	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Nov. 18, 2020	May 18, 2021	Nov. 17, 2021	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	May 18, 2021	N/A	Conduction (CO05-HY)
ISN Cable	MVE	RG-400	200260	N/A	Dec. 31, 2020	May 18, 2021	Dec. 30, 2021	Conduction (CO05-HY)
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100851	N/A	Feb. 25, 2021	May 18, 2021	Feb. 24, 2022	Conduction (CO05-HY)



## 5. Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	2.3
---	-----

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

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	4.7
---	-----

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

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	5.1
---	-----



## Appendix A. AC Conducted Emission Test Results

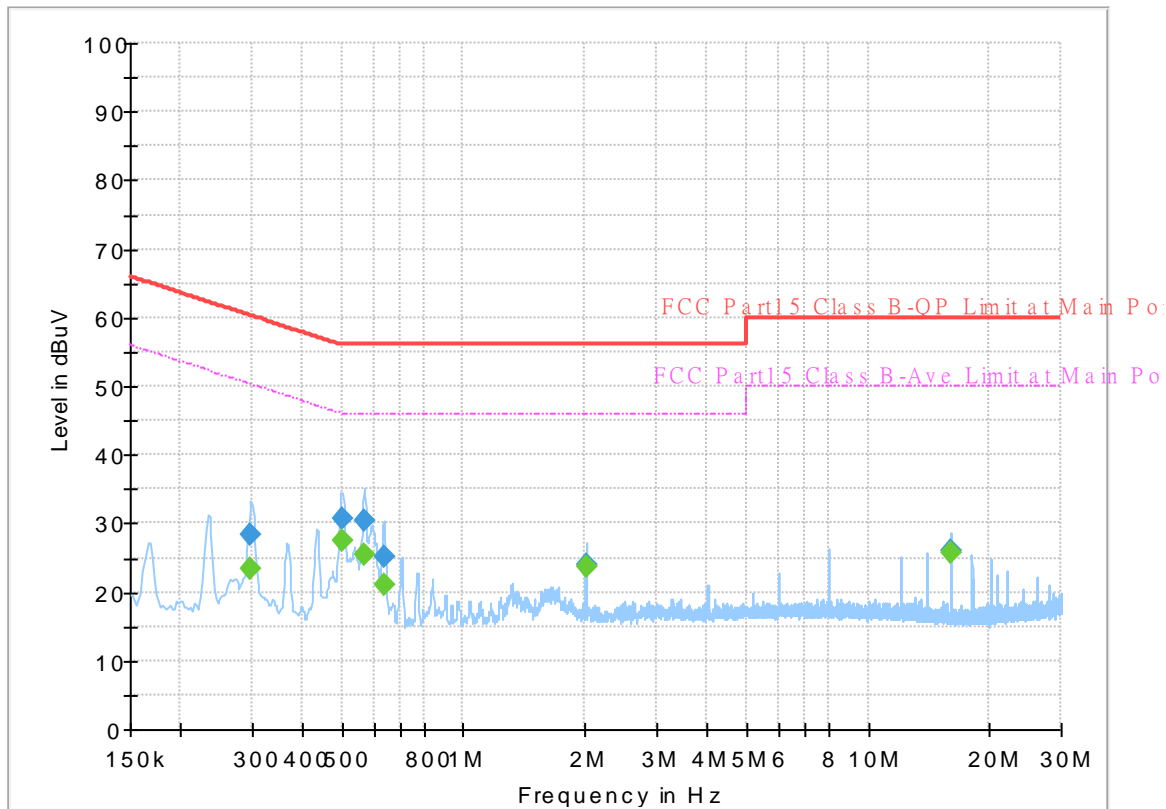
Test Engineer :	Tom Lee	Temperature :	23~26°C
		Relative Humidity :	40~50%



## EUT Information

Report NO : 150634-01  
 Test Mode : Mode 2  
 Test Voltage : 12V DC  
 Phase : Positive

Full Spectrum



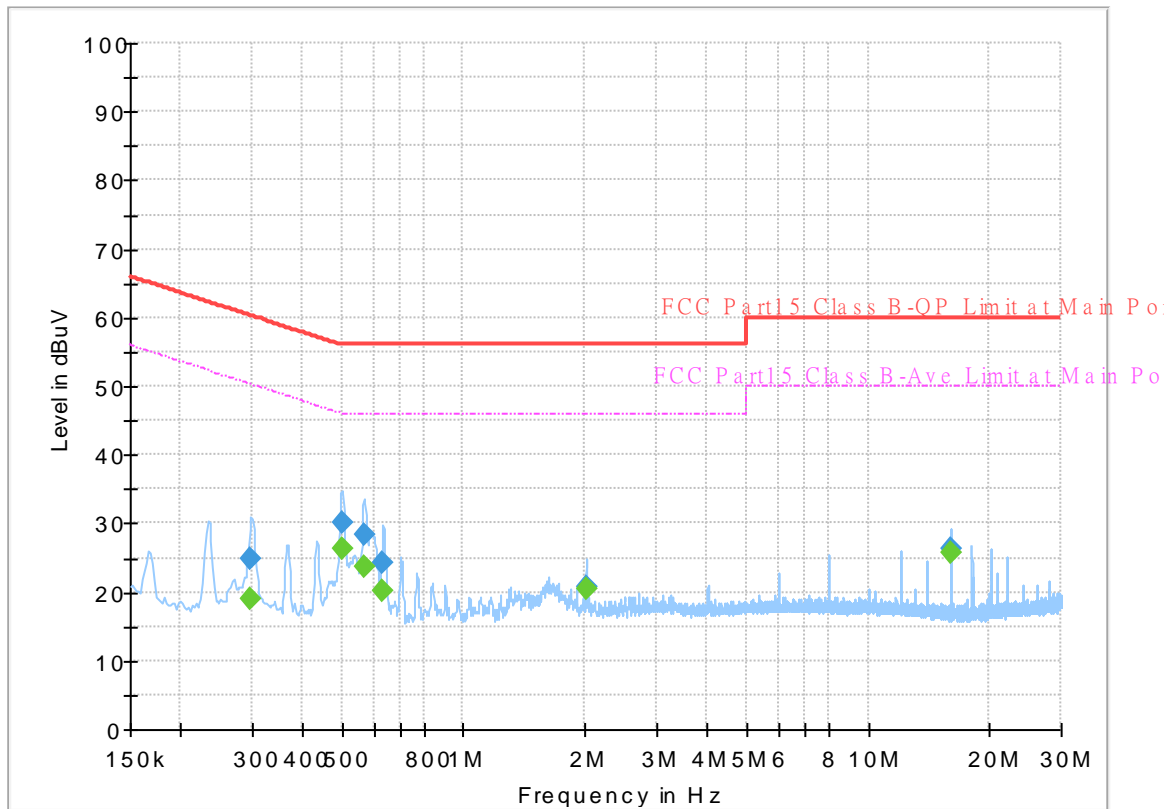
## Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Corr. (dB)
0.298320	28.50	---	60.29	31.79	Positive	10.0
0.298320	---	23.32	50.29	26.97	Positive	10.0
0.500820	30.68	---	56.00	25.32	Positive	10.1
0.500820	---	27.34	46.00	18.66	Positive	10.1
0.567150	30.38	---	56.00	25.62	Positive	10.1
0.567150	---	25.58	46.00	20.42	Positive	10.1
0.636090	25.08	---	56.00	30.92	Positive	10.2
0.636090	---	20.98	46.00	25.02	Positive	10.2
2.006430	23.86	---	56.00	32.14	Positive	10.3
2.006430	---	23.79	46.00	22.21	Positive	10.3
16.055880	25.96	---	60.00	34.04	Positive	10.4
16.055880	---	25.75	50.00	24.25	Positive	10.4

# EUT Information

Report NO : 150634-01  
 Test Mode : Mode 2  
 Test Voltage : 12V DC  
 Phase : Negative

Full Spectrum



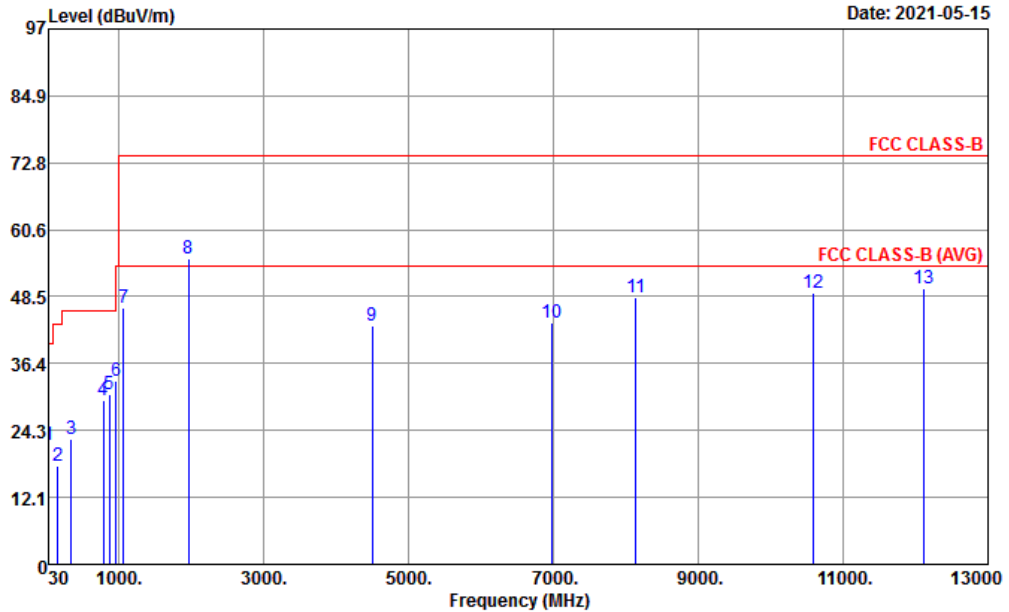
## Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Corr. (dB)
0.298500	---	18.89	50.28	31.39	Negative	10.0
0.298500	24.80	---	60.28	35.48	Negative	10.0
0.501000	---	26.22	46.00	19.78	Negative	10.1
0.501000	30.01	---	56.00	25.99	Negative	10.1
0.566250	---	23.62	46.00	22.38	Negative	10.2
0.566250	28.43	---	56.00	27.57	Negative	10.2
0.633750	---	20.09	46.00	25.91	Negative	10.2
0.633750	24.35	---	56.00	31.65	Negative	10.2
2.006250	---	20.45	46.00	25.55	Negative	10.4
2.006250	20.74	---	56.00	35.26	Negative	10.4
16.053000	---	25.62	50.00	24.38	Negative	10.4
16.053000	26.40	---	60.00	33.60	Negative	10.4



## Appendix B. Radiated Emission Test Result

Test Engineer :	Johnny Hsieh	Temperature :	22.2~23.4°C
		Relative Humidity :	59.9~61.4%
Test Distance :	3m	Polarization :	Horizontal
Remark :	#8 is system simulator signal which can be ignored.		

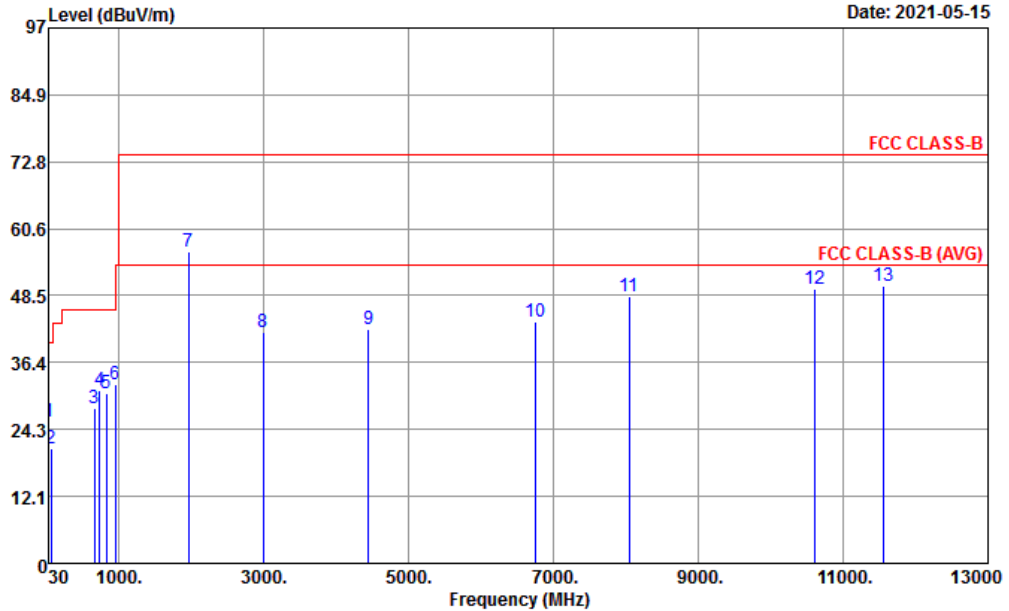


Site : 03CH10-HY  
 Condition : FCC CLASS-B 3m HORN 9120D-HF HORIZONTAL  
 Project : 150634-01  
 Power : DC 12V  
 Mode : 2

	Freq	Level	Over Limit	Limit	Antenna Line Factor	Read Level	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dBuV	dB	dB	cm	deg	
1	30.97	21.50	-18.50	40.00	23.84	29.66	0.64	32.64	---	---	Peak
2	162.89	17.91	-25.59	43.50	16.11	32.89	1.44	32.53	---	---	Peak
3	340.40	22.79	-23.21	46.00	20.11	33.02	2.06	32.40	---	---	Peak
4	784.66	29.79	-16.21	46.00	28.52	30.47	3.17	32.37	---	---	Peak
5	867.11	30.71	-15.29	46.00	29.14	30.22	3.30	31.95	---	---	Peak
6	958.29	33.30	-12.70	46.00	31.02	29.93	3.49	31.14	100	0	Peak
7	1062.00	46.50	-27.50	74.00	24.38	76.80	3.68	58.36	---	---	Peak
8	1960.00	55.38			25.74	82.86	5.10	58.32	---	---	Peak
9	4498.00	43.36	-30.64	74.00	30.39	63.15	8.21	58.39	---	---	Peak
10	6972.00	43.79	-30.21	74.00	35.09	57.27	11.09	59.66	---	---	Peak
11	8138.00	48.30	-25.70	74.00	36.92	59.15	11.59	59.36	---	---	Peak
12	10594.00	49.09	-24.91	74.00	39.50	55.92	13.19	59.52	---	---	Peak
13	12122.00	50.11	-23.89	74.00	38.78	56.70	14.41	59.78	100	0	Peak



Test Engineer :	Johnny Hsieh	Temperature :	22.2~23.4°C
		Relative Humidity :	59.9~61.4%
Test Distance :	3m	Polarization :	Vertical
Remark :	#7 is system simulator signal which can be ignored.		



Site : 03CH10-HY  
 Condition : FCC CLASS-B 3m HORN 9120D-HF VERTICAL  
 Project : 150634-01  
 Power : DC 12V  
 Mode : 2

	Freq	Level	Over Limit	Limit	Antenna Line	Read Level	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dBuV	dB	dB	cm	deg	
1	30.00	25.65	-14.35	40.00	24.38	33.29	0.63	32.65	---	---	Peak
2	64.92	20.68	-19.32	40.00	11.87	40.51	0.92	32.62	---	---	Peak
3	660.50	28.09	-17.91	46.00	26.57	31.15	2.88	32.51	---	---	Peak
4	741.01	31.21	-14.79	46.00	28.41	32.17	3.06	32.43	---	---	Peak
5	828.31	30.88	-15.12	46.00	28.72	31.10	3.24	32.18	---	---	Peak
6	948.59	32.41	-13.59	46.00	30.58	29.59	3.48	31.24	100	0	Peak
7	1960.00	56.36			25.74	83.84	5.10	58.32	---	---	Peak
8	2990.00	42.01	-31.99	74.00	28.38	65.24	6.53	58.14	---	---	Peak
9	4452.00	42.34	-31.66	74.00	30.21	62.34	8.20	58.41	---	---	Peak
10	6752.00	43.70	-30.30	74.00	34.20	58.55	10.53	59.58	---	---	Peak
11	8044.00	48.42	-25.58	74.00	37.00	59.24	11.49	59.31	---	---	Peak
12	10604.00	49.80	-24.20	74.00	39.50	56.60	13.20	59.50	---	---	Peak
13	11554.00	50.30	-23.70	74.00	39.59	55.51	13.95	58.75	100	0	Peak