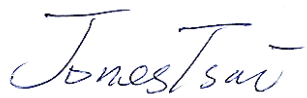
FCC EMI TEST REPORT

FCC ID	:	**LHJ-BL28NARD1**
Equipment	:	**BL28NA-RD1**
Brand Name	:	**BL28NA-RD1**
Model Name	:	**BL28NA-RD1**
Marketing Name	:	**BL28NA-RD1**
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**

The product was received on Mar. 14, 2019 and testing was started from Apr. 01, 2019 and completed on Apr. 10, 2019. 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 report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

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: Jones Tsai

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

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

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History of this test report

Report No.	Version	Description	Issued Date
FC931416	01	Initial issue of report	May 27, 2019

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
-	15.107	AC Conducted Emission	Pass	-
3.1	15.109	Radiated Emission	Pass	Under limit 3.31 dB at 195.220 MHz
Note: Not required means after assessing, test items are not necessary to carry out.				

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: Louis Wu

Report Producer: Elise Chang

1. General Description

1.1. Product Feature of Equipment Under Test

GSM/WCDMA/LTE and GNSS

Product Specification subjective to this standard	
Antenna Type	WWAN: Fixed External Antenna GPS/Glonass/BDS/Galileo/SBAS: Fixed External Antenna

1.2. Modification of EUT

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

1.3. Test Location

Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	**Sporton Site No.**
	03CH10-HY

Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No. 3, Lane 238, Kangle St., Neihu Chiu, Taipei, Taiwan 114, (R.O.C.) TEL : +886-2-2631-5551 FAX: +886-2-2631-9740
Test Site No.	**Sporton Site No.**
	OS03-NH

FCC Designation No. TW1094 and TW1098

1.4. 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
- ANSI C63.4-2014

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

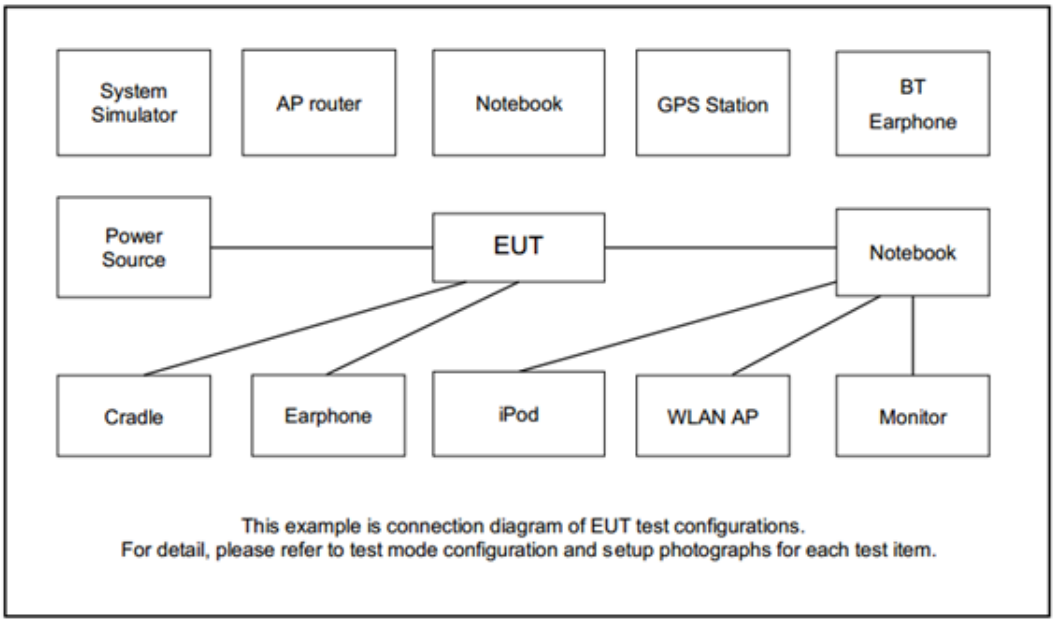
2. Test Configuration of Equipment Under Test

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

Test Items	Function Type
Radiated Emissions	Mode 1: GSM850 Idle + DC Adapter Mode 2: LTE Band 12 Idle + DC Adapter Mode 3: LTE Band 13 Idle + DC Adapter
Remark: The worst case of RE is mode 2; only the test data of this mode was reported.	

2.2. Connection Diagram of Test System



2.3. Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m
2.	System Simulator	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m
3.	DC Power Supply	Topward	796711	N/A	N/A	Unshielded, 1.8 m
4.	DC power supply	GW	GPC-6030D	N/A	N/A	Unshielded, 1.8 m

2.4. EUT Operation Test Setup

The EUT was in GSM and LTE idle mode during the testing. 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 Radiated Emission Measurement

3.1.1. Limit of Radiated Emission

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

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
Above 960	500	3

Frequency (MHz)	Field Strength (dBuV/meter)	Measurement Distance (meters)
30 – 230	30	10
230 – 1000	37	10

Note: Measurement follows the CISPR 22 limit line as below：

15.109 (g) As an alternative to the radiated emission limits shown in paragraphs (a) and (b) of this section, digital devices may be shown to comply with the standards contained in Third Edition of the International Special Committee on Radio Interference (CISPR), Pub. 22, “Information Technology Equipment - Radio Disturbance Characteristics - Limits and Methods of Measurement”

3.1.2. Measuring Instruments

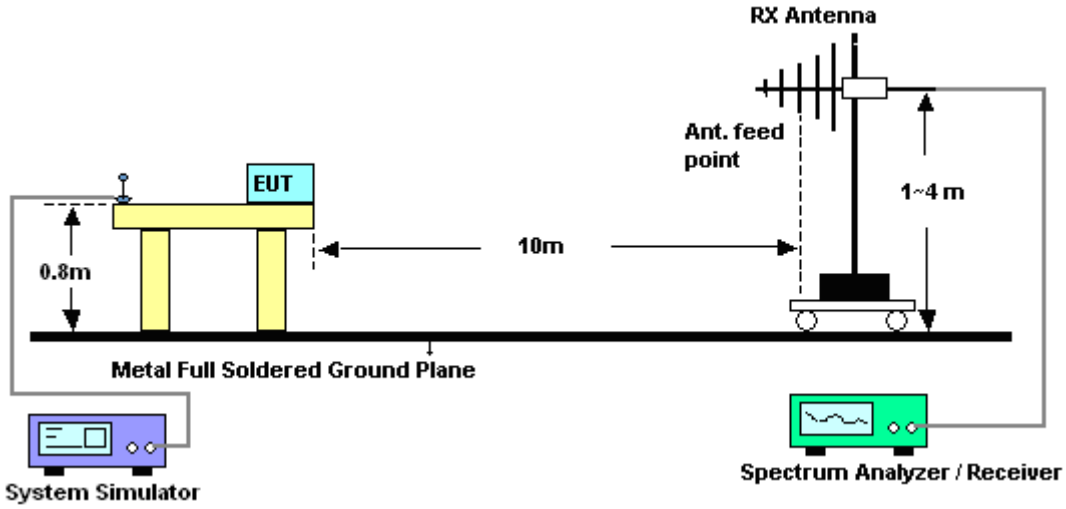
Refer a test equipment and calibration data table in this test report.

3.1.3. Test Procedures

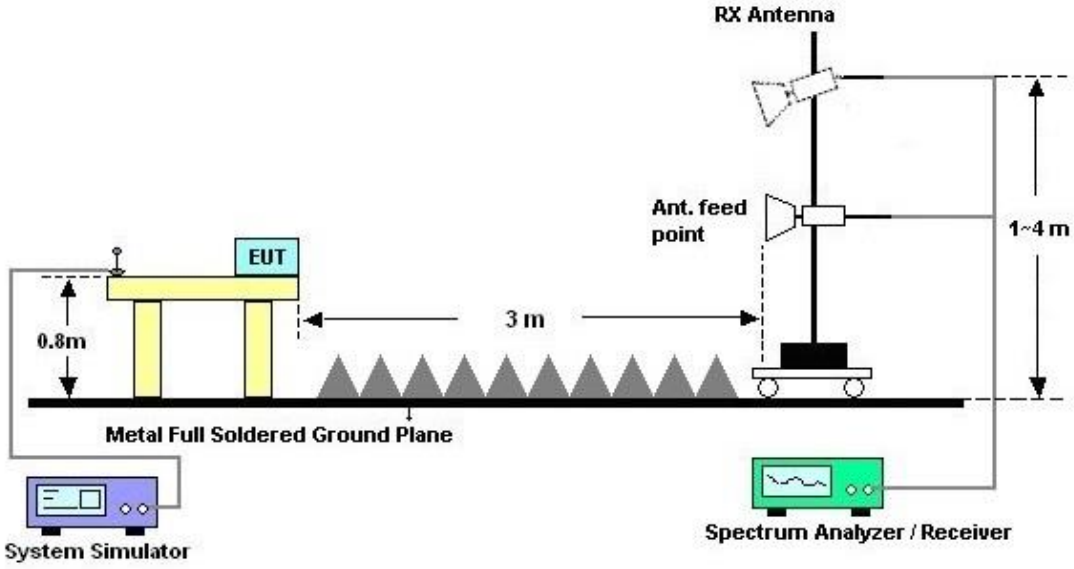
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 10 meters (30M~1G) and 3 meters (1G~ 13G) from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna 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=120kHz/VBW=300kHz for frequency below 1GHz; RBW=1MHz VBW=3MHz (Peak), RBW=1MHz/VBW=10Hz (Average) for frequency above 1GHz).
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

3.1.4. Test Setup of Radiated Emission

For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.1.5. Test Result of Radiated Emission

Please refer to Appendix A.

4. List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Amplifier	HP	8447D	2944A08292	0.1 MHz - 1.3 GHz	Jul. 03, 2018	Apr. 01, 2019	Jul. 02, 2019	Radiation (OS03-NH))
Receiver	R&S	ESCI	100497	9 kHz – 3 GHz	May 22, 2018	Apr. 01, 2019	May 21, 2019	Radiation (OS03-NH)
Bilog Antenna With 5dB Attenuator	CHASE	CBL6112D	25234	30 MHz - 2 GHz	Apr. 28, 2018	Apr. 01, 2019	Apr. 27, 2019	Radiation (OS03-NH)
Turn Table	EMCO	2080	9805-2065	0 - 360 degree	NCR	Apr. 01, 2019	NCR	Radiation (OS03-NH)
Antenna Mast	EMCO	2075	9804-2151	1 m - 4 m	NCR	Apr. 01, 2019	NCR	Radiation (OS03-NH)
RF Cable-R10m	HSCN	RG213U	2X11N	30 MHz - 1 GHz	Jul. 31, 2018	Apr. 01, 2019	Jul. 30, 2019	Radiation (OS03-NH)
Software	Audix	E3	Ver.4	-	NCR	Apr. 01, 2019	NCR	Radiation (OS03-NH)
AVR	ACPOWER	AFC-11003G	F318070103	-	NCR	Apr. 01, 2019	NCR	Radiation (OS03-NH)
Base Station	Anritsu	MT8820C	6201432817	GSM / GPRS /WCDMA / LTE FDD/TDD with 44)	Dec. 12, 2018	Apr. 10, 2019	Dec. 11, 2020	Radiation (03CH10-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1325	1GHz ~ 18GHz	Oct. 02, 2018	Apr. 10, 2019	Oct. 01, 2019	Radiation (03CH10-HY)
Preamplifier	Jet-Power	JAP00101800-30-10P	160118550004	1GHz~18GHz	Apr. 17, 2018	Apr. 10, 2019	Apr. 16, 2019	Radiation (03CH10-HY)
Spectrum Analyzer	Keysight	N9010A	MY54200485	10Hz ~ 44GHz	Nov. 02, 2018	Apr. 10, 2019	Nov. 01, 2019	Radiation (03CH10-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	N/A	Apr. 10, 2019	N/A	Radiation (03CH10-HY)
Turn Table	EMEC	TT 2200	N/A	0~360 Degree	N/A	Apr. 10, 2019	N/A	Radiation (03CH10-HY)
Software	Audix	E3 6.2009-8-24	RK-001042	N/A	N/A	Apr. 10, 2019	N/A	Radiation (03CH10-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY54130085	20Hz ~ 8.4GHz	Nov. 01, 2018	Apr. 10, 2019	Oct. 31, 2019	Radiation (03CH10-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104 / 102	MY11692/4PE, MY11693/4PE, MY2855/2	30M-1G	Nov. 08, 2018	Apr. 10, 2019	Nov. 07, 2019	Radiation (03CH10-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104 / 102	MY11692/4PE, MY11693/4PE, MY2855/2	1G-18G	Nov. 08, 2018	Apr. 10, 2019	Nov. 07, 2019	Radiation (03CH10-HY)

5. Uncertainty of Evaluation

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

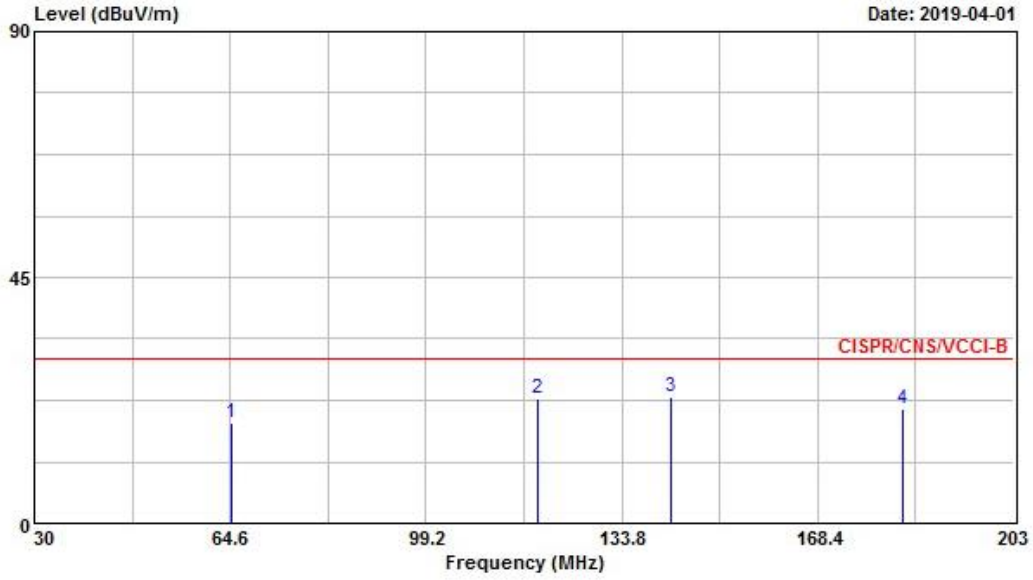
Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.0**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.9**

Appendix A. Radiated Emission Test Result

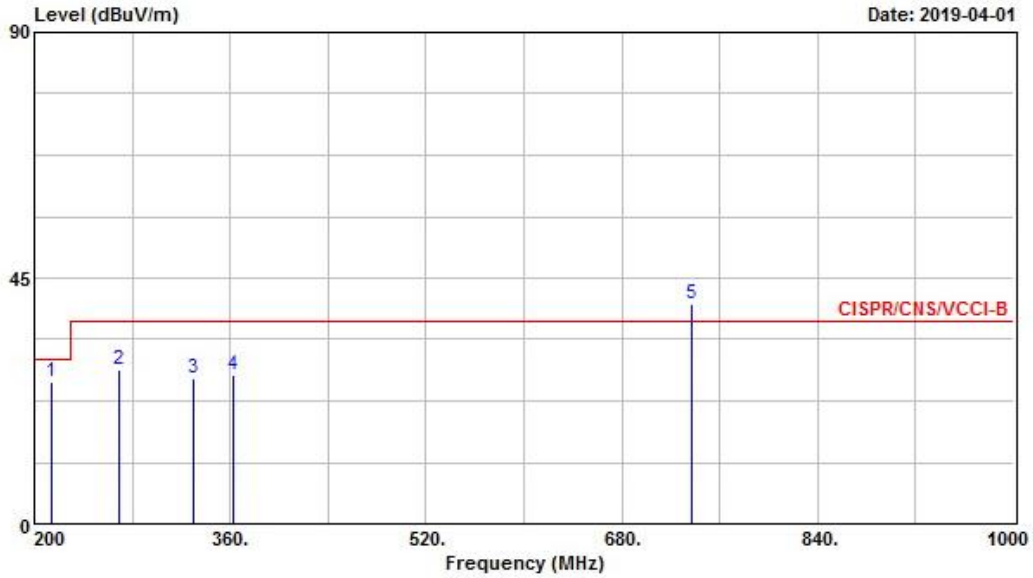
Test Engineer :	Louis Lin	**Temperature :**	20~21°C
		Relative Humidity :	55~56%
Test Distance :	10m	**Polarization :**	Horizontal



Site : OS03-NH
Condition : CISPR/CNS/VCCI-B 10m OS03-ANT-04-27-2018 HORIZONTAL
EUT : RF device
POWER : DC 12V
MEMO : MODE.2

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	64.950	18.42	-11.58	30.00	34.04	11.38	1.37	28.37	Peak	---	---
2	118.920	22.88	-7.12	30.00	31.57	17.59	1.93	28.21	Peak	---	---
3	142.450	23.09	-6.91	30.00	33.06	15.99	2.16	28.12	Peak	---	---
4	183.450	20.76	-9.24	30.00	31.83	14.39	2.51	27.97	Peak	---	---

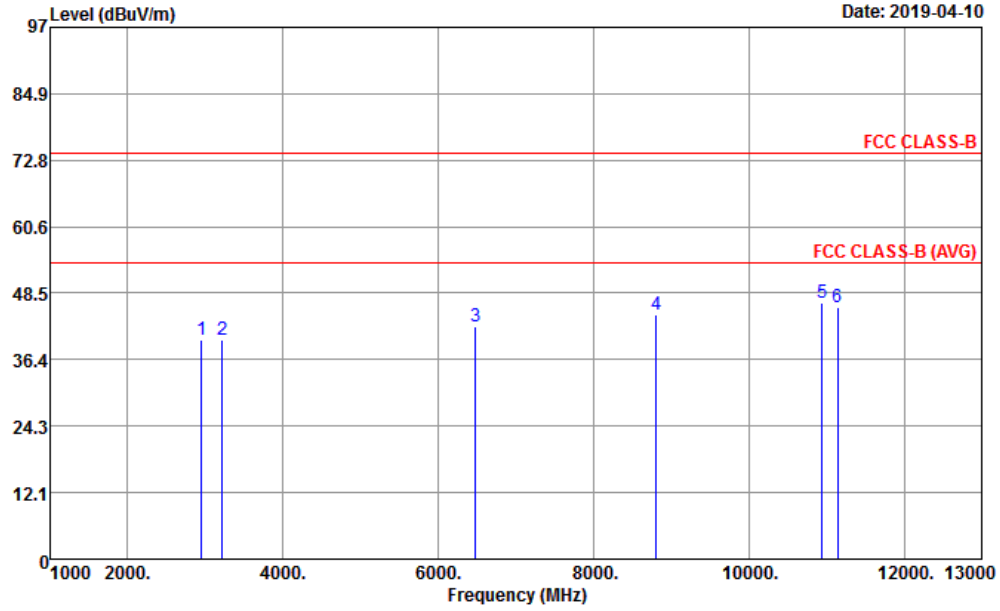
Test Engineer :	Louis Lin	**Temperature :**	20~21˚C
		Relative Humidity :	55~56%
Test Distance :	10m	**Polarization :**	Horizontal
Remark :	#5 is system simulator signal which can be ignored.		



Site : OS03-NH
Condition : CISPR/CNS/VCCI-B 10m OS03-ANT-04-27-2018 HORIZONTAL
EUT : RF device
POWER : DC 12V
MEMO : MODE.2
: Signal

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1 @	214.400	25.83	-4.17	30.00	36.62	14.32	2.78	27.89	Peak	400	181
2	268.800	28.13	-8.87	37.00	34.49	18.21	3.23	27.80	Peak	---	---
3	329.600	26.72	-10.28	37.00	32.11	18.77	3.80	27.96	Peak	---	---
4	362.400	27.38	-9.62	37.00	33.19	18.23	4.16	28.20	Peak	---	---
5 @	737.500	40.12			38.62	24.49	6.00	28.99	Peak	---	---

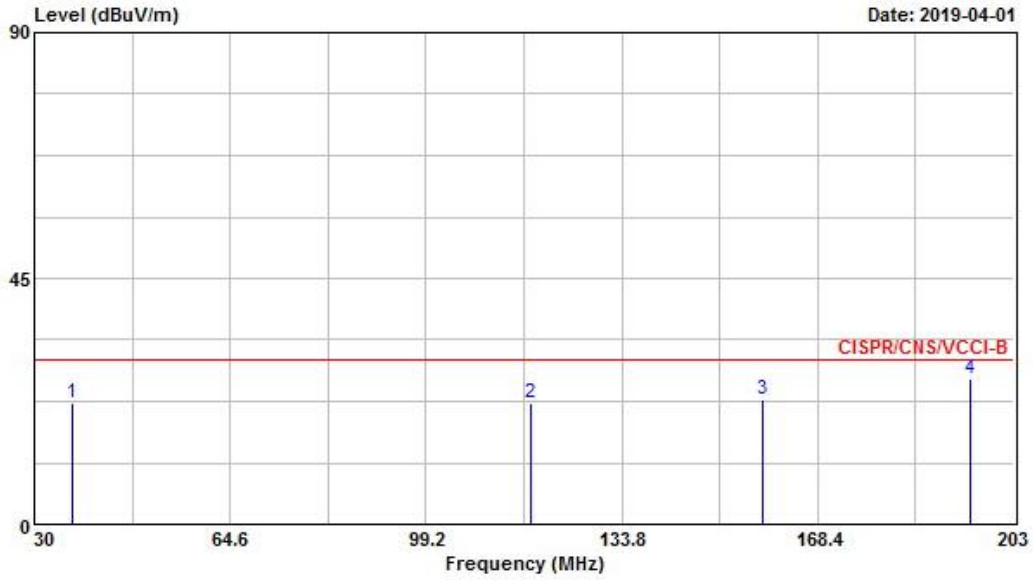
Test Engineer :	Leo Liu	**Temperature :**	20~23°C
		Relative Humidity :	51~53%
Test Distance :	3m	**Polarization :**	Horizontal



Site : 03CH10-HY
Condition : FCC CLASS-B 3m HORN 9120D-HF HORIZONTAL
Project : 931416
Power : DC 12V
Mode : 2

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2946.00	40.04	-33.96	74.00	66.00	28.29	7.64	61.89	---	---	Peak
2	3220.00	40.11	-33.89	74.00	65.69	28.52	7.93	62.03	---	---	Peak
3	6482.00	42.49	-31.51	74.00	61.33	34.09	10.07	63.00	---	---	Peak
4	8808.00	44.65	-29.35	74.00	59.63	37.70	11.79	64.47	---	---	Peak
5	10946.00	46.74	-27.26	74.00	57.37	40.05	13.18	63.86	100	0	Peak
6	11148.00	46.03	-27.97	74.00	57.03	39.50	13.33	63.83	---	---	Peak

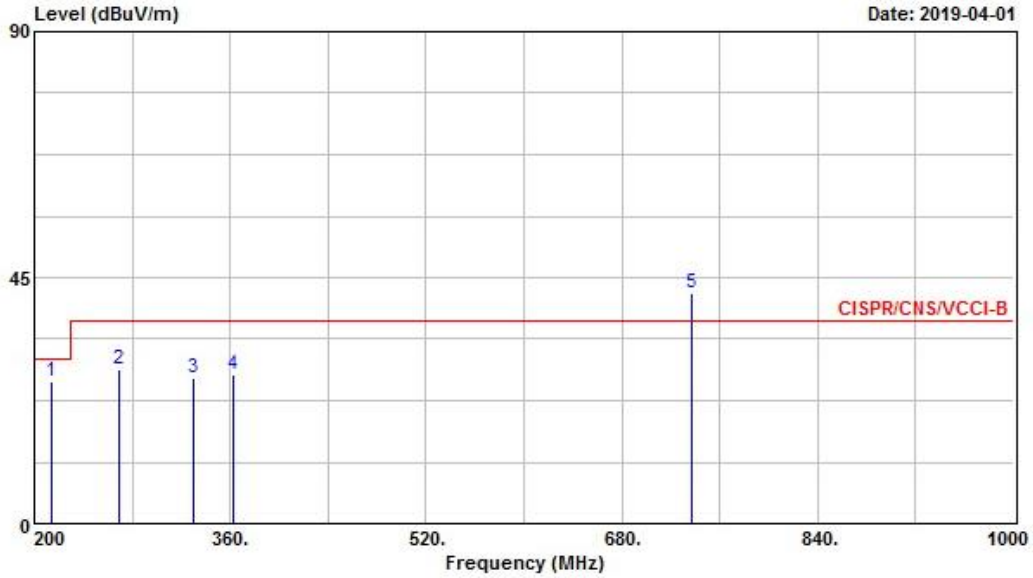
Test Engineer :	Louis Lin	**Temperature :**	20~21˚C
		Relative Humidity :	55~56%
Test Distance :	10m	**Polarization :**	Vertical



Site : OS03-NH
Condition : CISPR/CNS/VCCI-B 10m OS03-ANT-04-27-2018 VERTICAL
EUT : RF device
POWER : DC 12V
MEMO : MODE.2

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	36.750	22.26	-7.74	30.00	30.59	19.10	1.01	28.44	Peak	---	---
2	117.710	22.11	-7.89	30.00	30.96	17.46	1.91	28.22	Peak	---	---
3	158.540	22.74	-7.26	30.00	33.39	15.11	2.30	28.06	Peak	---	---
4 @	195.220	26.69	-3.31	30.00	37.72	14.28	2.62	27.93	Peak	100	185

Test Engineer :	Louis Lin	**Temperature :**	20~21˚C
		Relative Humidity :	55~56%
Test Distance :	10m	**Polarization :**	Vertical
Remark :	#5 is system simulator signal which can be ignored.		



Site : OS03-NH
Condition : CISPR/CNS/VCCI-B 10m OS03-ANT-04-27-2018 VERTICAL
EUT : RF device
POWER : DC 12V
MEMO : MODE.2
: Signal

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1 @	214.400	25.83	-4.17	30.00	36.62	14.32	2.78	27.89	Peak	---	---
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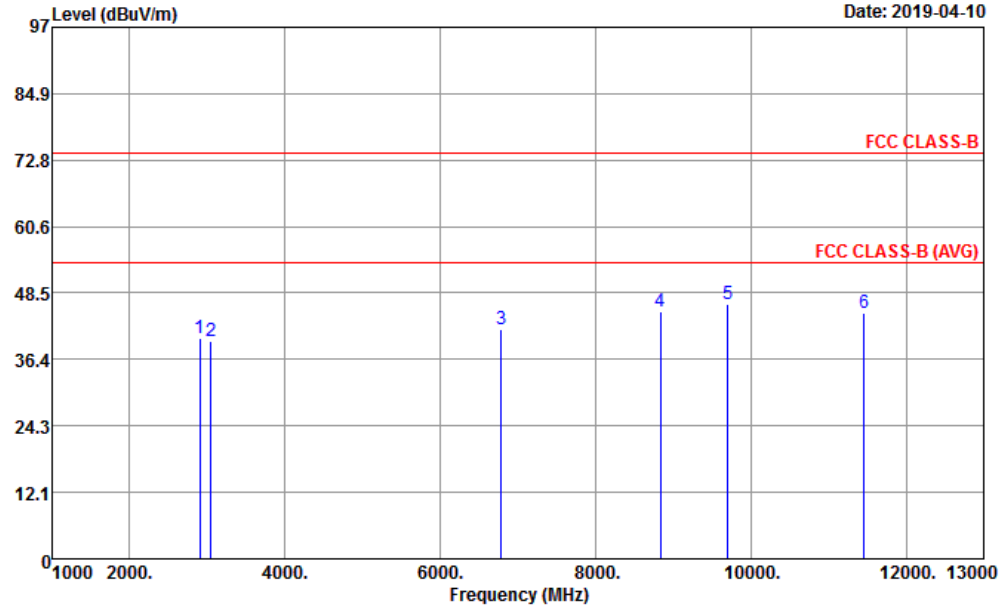
3	329.600	26.72	-10.28	37.00	32.11	18.77	3.80	27.96	Peak	---	---
4	362.400	27.38	-9.62	37.00	33.19	18.23	4.16	28.20	Peak	---	---
5 @	737.500	42.12			40.62	24.49	6.00	28.99	Peak	---	---

Test Engineer :	Leo Liu	**Temperature :**	20~23°C
		Relative Humidity :	51~53%
Test Distance :	3m	**Polarization :**	Vertical



Site : 03CH10-HY
Condition : FCC CLASS-B 3m HORN 9120D-HF VERTICAL
Project : 931416
Power : DC 12V
Mode : 2

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2904.00	40.17	-33.83	74.00	66.29	28.21	7.55	61.88	---	---	Peak
2	3050.00	39.74	-34.26	74.00	65.37	28.50	7.80	61.93	---	---	Peak
3	6782.00	41.76	-32.24	74.00	60.10	34.53	10.47	63.34	---	---	Peak
4	8834.00	45.21	-28.79	74.00	60.21	37.70	11.80	64.50	---	---	Peak
5	9702.00	46.35	-27.65	74.00	60.34	38.61	12.14	64.74	100	0	Peak
6	11462.00	44.87	-29.13	74.00	55.68	39.50	13.58	63.89	---	---	Peak