FCC EMI TEST REPORT

FCC ID	:	**LHJ-FE5NA0D31**
Equipment	:	**FE5NA0D31**
Brand Name	:	**Continental**
Model Name	:	**FE5NA0D31**
Applicant	:	**Continental Automotive Systems, Inc.** **21440 W Lake Cook Rd., Deer Park, IL 60010, USA**
Manufacturer	:	**Continental Automotive Systems, Inc.** **21440 W Lake Cook Rd., Deer Park, IL 60010, USA**
Standard	:	**FCC 47 CFR FCC Part 15 Subpart B Class B**

The product was received on Nov. 26, 2021 and testing was performed from Dec. 20, 2021 to Dec. 21, 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 from Sporton International Inc. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Louis Wu

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.)

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History of this test report

Report No.	Version	Description	Issue Date
FC1N2419	01	Initial issue of report	May 17, 2022
FC1N2419	02	Revise Product Specification of Equipment Under Test	May 31, 2022

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
-	15.107	AC Conducted Emission	Not Required	-
3.1	15.109	Radiated Emission	Pass	11.64 dB under the limit at 51.870 MHz

Note: Not required means after assessing, test items are not necessary to carry out.

Declaration of Conformity:
1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers. It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results. 2. The measurement uncertainty please refer to this report "Uncertainty of Evaluation".
Comments and Explanations:
The product specifications of the EUT presented in the report are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Yun Huang

Report Producer: Rachel Hsieh

1. General Description

1.1. Product Feature of Equipment Under Test

Product Feature	
Equipment	FE5NA0D31
Brand Name	Continental
Model Name	FE5NA0D31
FCC ID	LHJ-FE5NA0D31
EUT supports Radios application	GPRS/EGPRS/HSPA/LTE/5G NR/GNSS
SW Version	MODEMSA515M_LE2.1_01.12.55
HW Version	P2
EUT Stage	Identical Prototype

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

1.2. Product Specification of Equipment Under Test

Product Specification is subject to this standard	
Tx Frequency	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 12: 699.7 MHz ~ 715.3 MHz LTE Band 13: 779.5 MHz ~ 784.5 MHz LTE Band 14 :790.5 MHz ~ 795.5 MHz LTE Band 17: 706.5 MHz ~ 713.5 MHz LTE Band 25: 1850.7 MHz ~ 1914.3 MHz LTE Band 26: 824.7 MHz ~ 848.3 MHz LTE Band 41: 2498.5 MHz ~ 2687.5 MHz LTE Band 66: 1710.7 MHz ~ 1754.3 MHz LTE Band 71: 665.5 MHz ~ 695.5 MHz 5G NR n2: 1852.5 MHz ~ 1907.5 MHz 5G NR n5: 826.5 MHz ~ 846.5 MHz 5G NR n25: 1852.5 MHz ~ 1912.5 MHz 5G NR n41: 2506.02 MHz ~ 2679.99 MHz 5G NR n66: 1712.5 MHz ~ 1777.5 MHz 5G NR n71: 668.0 MHz ~ 693.0 MHz 5G NR n77: 3700 MHz ~ 3980 MHz

Product Specification is subject to this standard	
Rx Frequency	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 12: 729.7 MHz ~ 745.3 MHz LTE Band 13: 748.5 MHz ~ 753.5 MHz LTE Band 14: 760.5 MHz ~ 765.5 MHz LTE Band 17: 736.5 MHz ~ 743.5 MHz LTE Band 25: 1930.7MHz ~ 1994.3 MHz LTE Band 26: 869.7MHz ~ 893.3MHz LTE Band 41: 2498.5 MHz ~ 2687.5 MHz LTE Band 66: 2110.7 MHz ~ 2154.3 MHz LTE Band 71: 619.5 MHz ~ 649.5 MHz 5G NR n2: 1932.5 MHz ~ 1987.5 MHz 5G NR n5: 871.5 MHz ~ 891.5 MHz 5G NR n25: 1932.5 MHz ~ 1992.5 MHz 5G NR n41: 2506.02 MHz ~ 2679.99 MHz 5G NR n66: 1712.5 MHz ~ 1777.5 MHz 5G NR n71: 668.0 MHz ~ 693.0 MHz 5G NR n77: 3700 MHz ~ 3980 MHz GNSS : 1.57542 GHz; 1176.45 MHz (GPS / Glonass / BDS / Galileo / SBAS)
Antenna Type	WWAN: Fixed External GNSS: Fixed External Antenna
Type of Modulation	GPRS: GMSK EDGE(MCS 0-4): GMSK/(MCS 5-9): 8PSK WCDMA: QPSK (Uplink) HSDPA: 64QAM (Downlink) HSUPA : QPSK (Uplink) LTE: QPSK / 16QAM / 64QAM 5G NR: 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 made to the EUT during the testing.

1.4. Test Location

Test Site	Sporton International Inc. EMC & Wireless Communications Laboratory
Test Site Location	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978
Test Site No.	**Sporton Site No.**
	03CH06-HY

FCC designation No.: TW1093

1.5. Applicable Standards

According to the specifications declared by 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

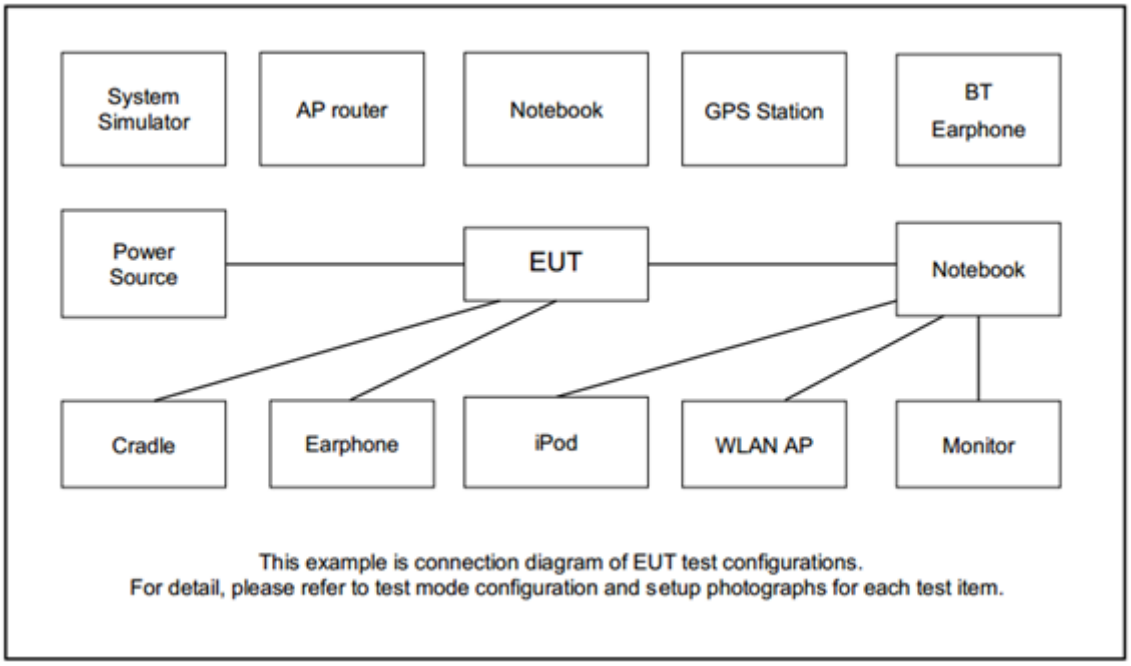
The EUT is tested along with the peripherals, operating under possible configurations in compliant with normal operation. The maximum emissions can be identified by a pre-scan carried out in different orientations of placement pursuant to ANSI C63.4-2014. Frequency range covered: Radiation Emission (30 MHz to the 5th harmonics of the highest fundamental frequency or to 40 GHz, whichever is lower).

Test Items	Functions Enabled
Radiated Emissions	Mode 1 : GSM850 (GPRS Class 8) Link + WWAN Antenna*4 + GPS Antenna + GPS Rx + DC 12V + SIM 1 Mode 2 : 5G NR n5 Link + WWAN Antenna*4 + GPS Antenna + GPS Rx + DC 12V + SIM 1

Remark:

1. For Radiation Emission after pre-scanned the cellular band between 30MHz ~ 960MHz (GSM850 / 5G NR n5); only the worst case for cellular band test data of this mode was reported.
2. The worst case of RE is mode 1; only the test data of this mode was reported.
3. For 5G NR test combination is EN-DC Band 2A-n5A.

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	MT8821C	N/A	N/A	Unshielded, 1.8 m
2.	5G Wireless Test Platform	Anritsu	MT8000A	N/A	N/A	Unshielded, 1.8 m
3.	GPS Station	Pendulum	GSG-54	N/A	N/A	Unshielded, 1.8 m
4.	DC Power Supply	GW Instek	GEU810960	FCC DoC	N/A	N/A
5.	Antenna	Taoglas	TG.55.8113	N/A	N/A	N/A
6.	GPS Antenna	Tallysman	33-7972-00-3000	N/A	N/A	N/A

2.4. EUT Operation Test Setup

The EUT is in GSM or 5G NR idle mode during the test. The EUT is synchronized with the BCCH, and has been continuous receiving mode by setting paging reorganization of the system simulator.

At the same time, the EUT are programmed during the test:

1. Execute “GPS Test” to make the EUT receive continuous signals from GPS station.

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:

<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

3.1.2. Measuring Instruments

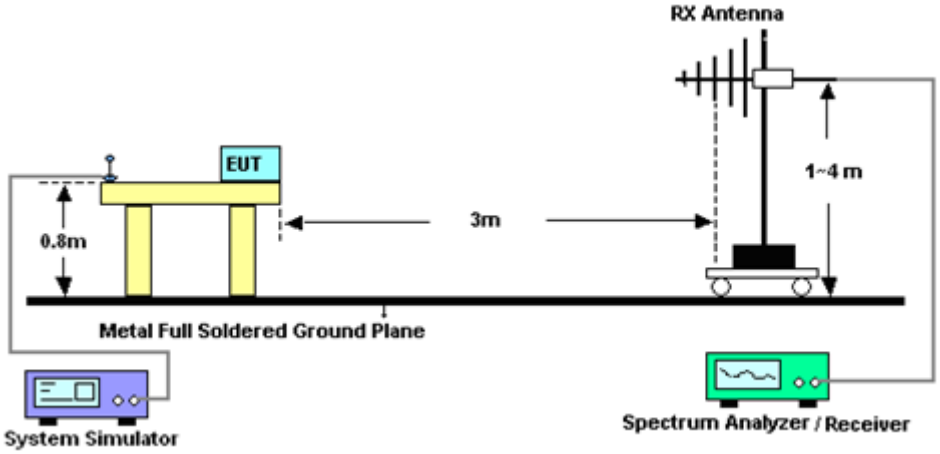
Please refer to the measuring equipment list in this test report.

3.1.3. Test Procedures

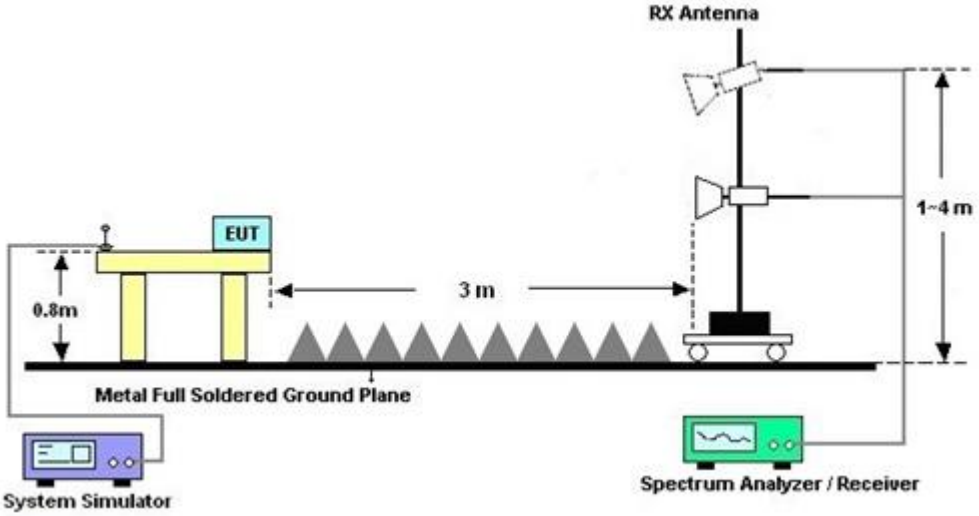
1. The EUT is placed on a turntable with 0.8 meter above ground.
2. The EUT is set 3 meters from the interference receiving antenna, which is mounted on the top of a variable height antenna tower.
3. The table is rotated 360 degrees to determine the position of the highest radiation.
4. The antenna is 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 is arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
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 is 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

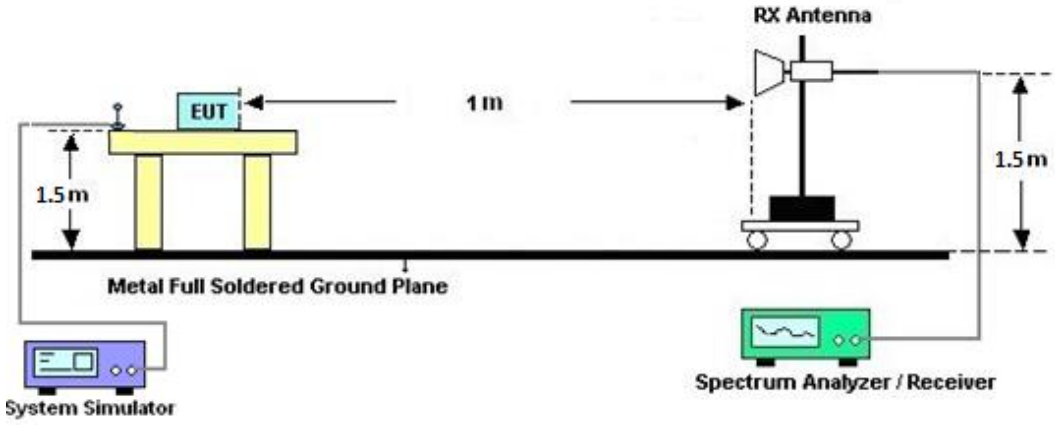
For Radiated Emissions from 30 MHz to 1 GHz



For Radiated Emissions from 1 GHz to 18GHz



For radiated test above 18GHz



3.1.5. Test Result of Radiated Emission

Please refer to Appendix A.

4. List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Amplifier	SONOMA	310N	186713	9kHz~1GHz	Apr. 29, 2021	Dec. 20, 2021~ Dec. 21, 2021	Apr. 28, 2022	Radiation (03CH06-HY)
Bilog Antenna	Schaffner	CBL 6111C & N-6-06	2725 & AT-N0601	30MHz~1GHz	Nov. 11, 2021	Dec. 20, 2021~ Dec. 21, 2021	Nov. 10, 2022	Radiation (03CH06-HY)
EMI Test Receiver	Rohde & Schwarz	ESU26	100472	20Hz~26.5GHz	Feb. 03, 2021	Dec. 20, 2021~ Dec. 21, 2021	Feb. 02, 2022	Radiation (03CH06-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1156	1GHz~18GHz	Sep. 27, 2021	Dec. 20, 2021~ Dec. 21, 2021	Sep. 26, 2022	Radiation (03CH06-HY)
Preamplifier	Jet-Power	JPA00101800-30-10P	1601180001	1GHz~18GHz	Jul. 19, 2021	Dec. 20, 2021~ Dec. 21, 2021	Jul. 18, 2022	Radiation (03CH06-HY)
RF Cable	HUBER + SUHNER	SF102_7000mm	532299/2	30MHz to 40GHz	Jul. 05, 2021	Dec. 20, 2021~ Dec. 21, 2021	Jul. 04, 2022	Radiation (03CH06-HY)
RF Cable	HUBER + SUHNER	SF102_3000mm	532422/2	30MHz to 40GHz	Jul. 05, 2021	Dec. 20, 2021~ Dec. 21, 2021	Jul. 04, 2022	Radiation (03CH06-HY)
RF Cable	HUBER + SUHNER	SF102_2000mm	532421/2	30MHz to 40GHz	Jul. 05, 2021	Dec. 20, 2021~ Dec. 21, 2021	Jul. 04, 2022	Radiation (03CH06-HY)
RF Cable	HUBER + SUHNER	SF104	802433/4	30Mhz to 18Ghz	Aug. 19, 2021	Dec. 20, 2021~ Dec. 21, 2021	Aug. 18, 2022	Radiation (03CH06-HY)
Controller	INN-CO	EM1000	060782	Control Turn table & Ant Mast	N/A	Dec. 20, 2021~ Dec. 21, 2021	N/A	Radiation (03CH06-HY)
Antenna Mast	MF	MF-7802	MF780208212	1m~4m	N/A	Dec. 20, 2021~ Dec. 21, 2021	N/A	Radiation (03CH06-HY)
Turn Table	INN-CO	DS2000	420/650/00	0-360 degree	N/A	Dec. 20, 2021~ Dec. 21, 2021	N/A	Radiation (03CH06-HY)
Software	Audix	E3 6.2009-8-24(k5)	N/A	N/A	N/A	Dec. 20, 2021~ Dec. 21, 2021	N/A	Radiation (03CH06-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	18GHz~40GHz	Nov. 30, 2021	Dec. 20, 2021~ Dec. 21, 2021	Nov. 29, 2022	Radiation (03CH06-HY)
Preamplifier	EMEC	EM18G40G	0600789	18-40GHz	Jul. 23, 2021	Dec. 20, 2021~ Dec. 21, 2021	Jul. 22, 2022	Radiation (03CH06-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	801606/2	9KHz ~ 40GHz	Apr. 03, 2021	Dec. 20, 2021~ Dec. 21, 2021	Apr. 02, 2022	Radiation (03CH06-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))	**5.2 dB**

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

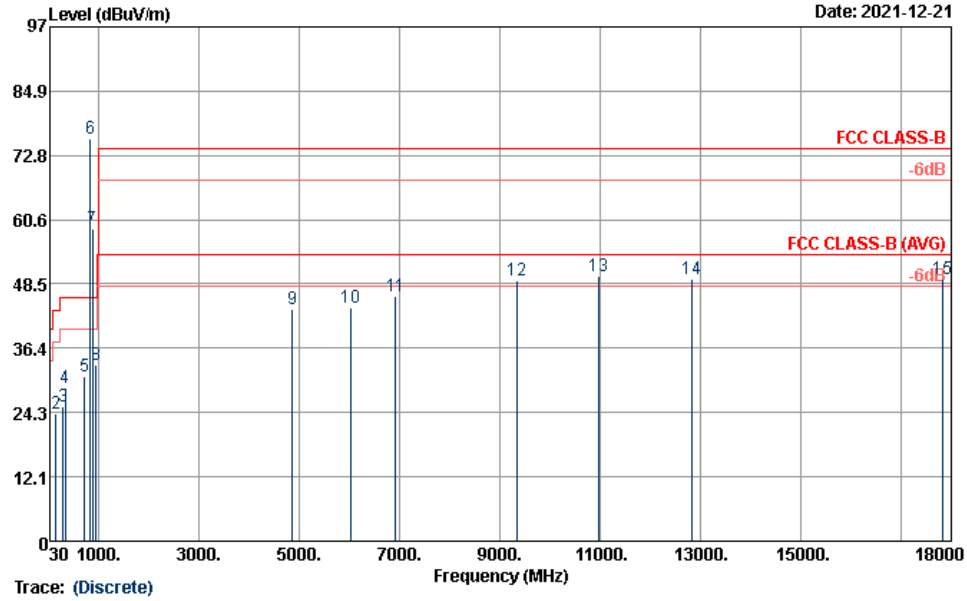
Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.4 dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.3 dB**

Appendix A. Radiated Emission Test Result

Test Engineer :	Nick Yu, You Xian Chen	**Temperature :**	24~25°C
		Relative Humidity :	46~48%
Test Distance :	3m	**Polarization :**	Horizontal
Remark :	#6 is mobile station signal which can be ignored. #7 is system simulator signal which can be ignored.		

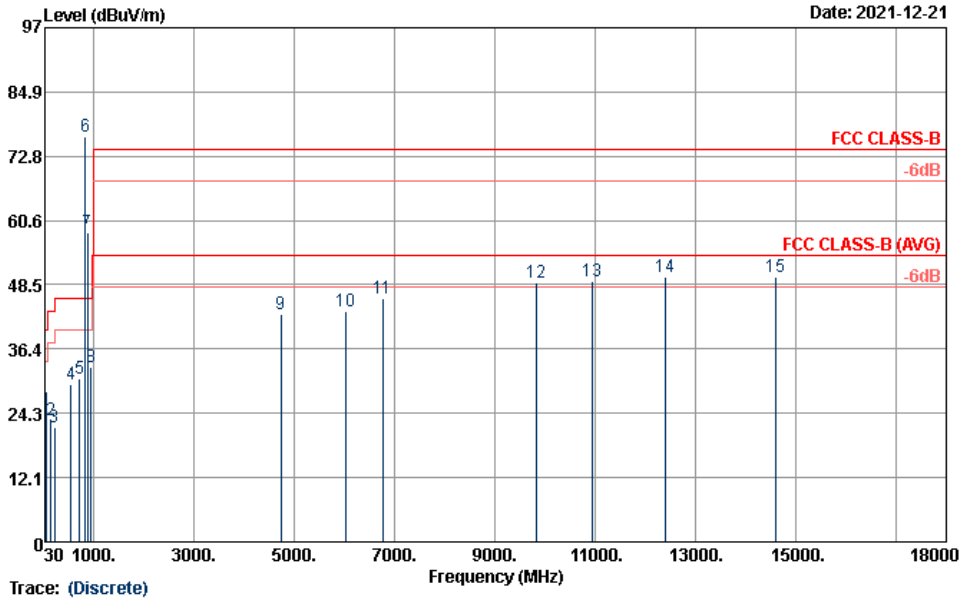


Site : 03CH06-HY
Condition : FCC CLASS-B 3m 9120D_1156_200915 HORIZONTAL

Power : DC12V
Memo : Mode 1
: X

		Freq	Level	Over Limit	Limit Line	Read Level	Factor	A/Pos	T/Pos	Remark
		MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	cm	deg	
1		43.23	25.73	-14.27	40.00	38.99	-13.26	---	---	Peak
2		152.04	24.09	-19.41	43.50	36.57	-12.48	---	---	Peak
3		292.71	25.46	-20.54	46.00	34.84	-9.38	---	---	Peak
4		332.20	28.93	-17.07	46.00	37.49	-8.56	---	---	Peak
5		726.30	31.10	-14.90	46.00	30.73	0.37	---	---	Peak
6	*	836.40	75.82			73.55	2.27	---	---	Peak
7	*	881.40	59.01			56.36	2.65	---	---	Peak
8		956.60	33.13	-12.87	46.00	27.84	5.29	---	---	Peak
9		4870.00	43.73	-30.27	74.00	62.63	-18.90	---	---	Peak
10		6034.00	43.98	-30.02	74.00	61.40	-17.42	---	---	Peak
11		6928.00	46.26	-27.74	74.00	60.64	-14.38	---	---	Peak
12		9340.00	49.14	-24.86	74.00	57.45	-8.31	---	---	Peak
13		10966.00	49.89	-24.11	74.00	55.02	-5.13	---	---	Peak
14		12820.00	49.39	-24.61	74.00	54.78	-5.39	---	---	Peak
15		17835.00	49.55	-24.45	74.00	41.59	7.96	---	---	Peak

Test Engineer :	Nick Yu, You Xian Chen	**Temperature :**	24~25°C
		Relative Humidity :	46~48%
Test Distance :	3m	**Polarization :**	Vertical
Remark :	#6 is mobile station signal which can be ignored. #7 is system simulator signal which can be ignored.		



Trace: (Discrete)

Site : 03CH06-HY
Condition : FCC CLASS-B 3m 9120D_1156_200915 VERTICAL

Power : DC12V
Memo : Mode 1
: X

		Freq	Level	Over Limit	Limit Line	Read Level	Factor	A/Pos	T/Pos	Remark
		MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	cm	deg	
1		51.87	28.36	-11.64	40.00	45.18	-16.82	---	---	Peak
2		152.04	22.99	-20.51	43.50	35.47	-12.48	---	---	Peak
3		222.51	21.74	-24.26	46.00	35.23	-13.49	---	---	Peak
4		544.30	29.84	-16.16	46.00	32.82	-2.98	---	---	Peak
5		726.30	30.75	-15.25	46.00	30.38	0.37	---	---	Peak
6	*	836.40			46.00	74.32	2.27	---	---	Peak
7	*	881.40			46.00	55.60	2.65	---	---	Peak
8		955.90	32.83	-13.17	46.00	27.53	5.30	---	---	Peak
9		4738.00	43.06	-30.94	74.00	62.47	-19.41	---	---	Peak
10		6022.00	43.53	-30.47	74.00	61.01	-17.48	---	---	Peak
11		6772.00	45.97	-28.03	74.00	60.59	-14.62	---	---	Peak
12		9820.00	48.96	-25.04	74.00	57.14	-8.18	---	---	Peak
13		10948.00	49.13	-24.87	74.00	54.30	-5.17	---	---	Peak
14		12406.00	49.93	-24.07	74.00	55.67	-5.74	---	---	Peak
15		14595.00	49.92	-24.08	74.00	50.72	-0.80	---	---	Peak