



FCC EMI TEST REPORT

FCC ID : LHJ-FE5NAR110
Equipment : FE5NAR110, FE5NAR111
Brand Name : Continental
Model Name : FE5NAR110, FE5NAR111
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 Aug. 06, 2024 and testing was performed from Aug. 29, 2024 to Sep. 06, 2024. We, Sporton International Inc. Wensan 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. Wensan Laboratory, the test report shall not be reproduced except in full.

Louis Wu

Approved by: Louis Wu

Sporton International Inc. Wensan Laboratory

No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.)



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History of this test report

Report No.	Version	Description	Issue Date
FC480602	01	Initial issue of report	Sep. 18, 2024



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	6.96 dB under the limit at 34.59 MHz

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

Conformity Assessment Condition:

1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacture who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
2. The measurement uncertainty please refer to each test result in the section "Measurement Uncertainty".

Disclaimer:

The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Yun Huang

Report Producer: Emma Hsiao

1. General Description

1.1. Product Feature of Equipment Under Test

Product Feature	
Equipment	FE5NAR110, FE5NAR111
Brand Name	Continental
Model Name	FE5NAR110, FE5NAR111
FCC ID	LHJ-FE5NAR110
Installed into the Host	Equipment name: G12N51RG1, G12N50RG1 Brand name: Continental Model name: G12N51RG1, G12N50RG1
EUT supports Radios application	WCDMA/HSPA/LTE/5G NR/GNSS
EUT Stage	Identical Prototype

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

Sample Information			
Sample	TA-code	L2/L5 GNSS	Band Difference
1	FE5NAR110	Support	/
2	FE5NAR111	Not Support	BOM change: depopulated passive components from the GNSS RF front-end

1.2. Product Specification of Equipment Under Test

Product Specification is subject to this standard	
Tx Frequency	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 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 5G NR n78: 3455.01 MHz ~ 3795 MHz
Rx Frequency	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 29: 718.5 MHz ~ 726.5 MHz LTE Band 30: 2352.5 MHz ~ 2357.5 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: 3455.01 MHz ~ 3975 MHz 5G NR n78: 3455.01 MHz ~ 3795 MHz GNSS: 1559 MHz ~ 1610 MHz (L1/G1/E1/B1I) 1164 MHz ~ 1215 MHz (B2A/L5/E5a)

Product Specification is subject to this standard	
Antenna Type	WWAN: <Internal Antenna>: TCP Antenna <External Antenna (Composed by component PN: 85038208, 85038209, 85038210, 85732934)>: Glass antenna <External Antenna (Composed by component PN: 86784729, 86784728)>: Front fender antenna <External Antenna (Composed by component PN: 26464255)>: external sharkfin antenna, North America 5G L1 Only + XM <External Antenna (Composed by component PN: 26464260)>: external sharkfin antenna, North America 5G L1 Only + XM <External Antenna (Composed by component PN: 86783279)>: External Sharkfin Antenna + XM + Dual GNSS +5G GPS/Glonass/BDS/Galileo/SBAS: external sharkfin antenna, sharkfin NA 5G+Single GNSS+XM
Type of Modulation	WCDMA: QPSK (Uplink) HSDPA: 64QAM (Downlink) HSUPA : QPSK (Uplink) LTE: QPSK / 16QAM / 64QAM 5G NR: PI/2 BPSK / QPSK / 16QAM / 64QAM / 256QAM GPS/Glonass/BDS/Galileo/SBAS: BPSK

Remark: The EUT's information above is declared by manufacturer. Please refer to Disclaimer 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. Wensan Laboratory
Test Site Location	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
Test Site No.	Sporton Site No. 03CH10-HY

FCC designation No.: TW1132

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
- ♦ ANSI C63.4a-2017

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

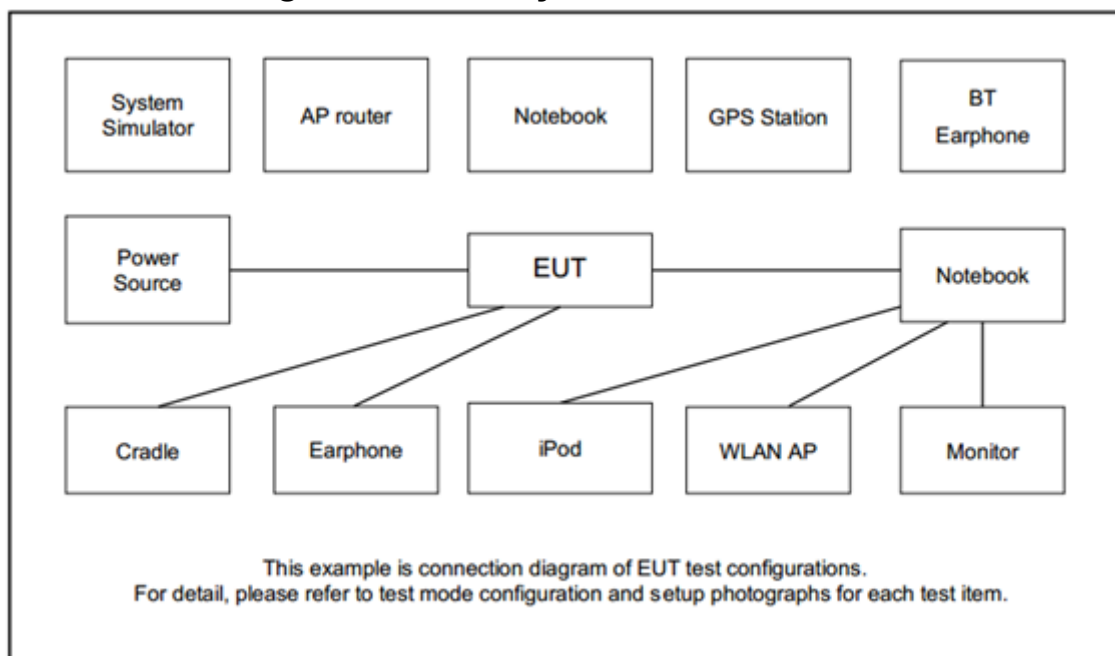
2. Test Configuration of Equipment Under Test

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: WCDMA Band V Idle (with Molex Sharkfin (26464260) + GPS Rx + TC + DC 12V for Sample 1
	Mode 2: LTE Band 12 Idle (with Hidden Antennas) + GPS Rx + TC + DC 12V for Sample 1
	Mode 3: LTE Band 14 Idle (with Internal Antenna) + GPS Rx + TC + DC 12V for Sample 1
Remark: - The worst case of RE is mode 1; only the test data of this mode was reported. - For Radiation Emission after pre-scanned the cellular band between 30MHz ~ 960MHz (WCDMA Band V/LTE Band 12/14); only the worst case for cellular band test data of this mode was - TC stands for test configuration, and consists of EUT, "Teddy Jr Load Box (X1 + X2), Sharkfin Antenna with metal plate (X3), Ethernet connector cable (X7), Battery", Teddy Jr Load Box, "Notebook (USB Cable *2), Adapter and DC Cable".	

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,1.8m
2.	GPS Station	Pendulum	GSG-54	N/A	N/A	Unshielded,1.8m
3.	DC Power Supply	GW Instek	GEU810960	FCC DoC	N/A	Unshielded,1.8m
4.	Teddy Jr Load Box	Continental	N/A	N/A	N/A	N/A
5.	Adapter	TePoo	PT-WC-03	N/A	N/A	N/A
6.	Metal Plate	N/A	N/A	N/A	N/A	N/A

2.4. EUT Operation Test Setup

The EUT is in WCDMA or LTE 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 following programs installed in the EUT are programmed during the test:

1. Execute "VisualGPSCe" 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

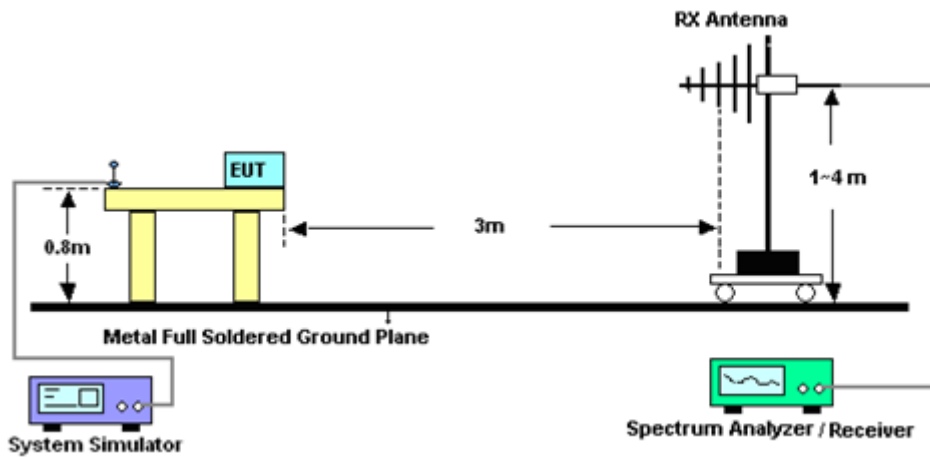
Please refer to the measuring equipment list in this test report.

3.1.3. Test Procedures

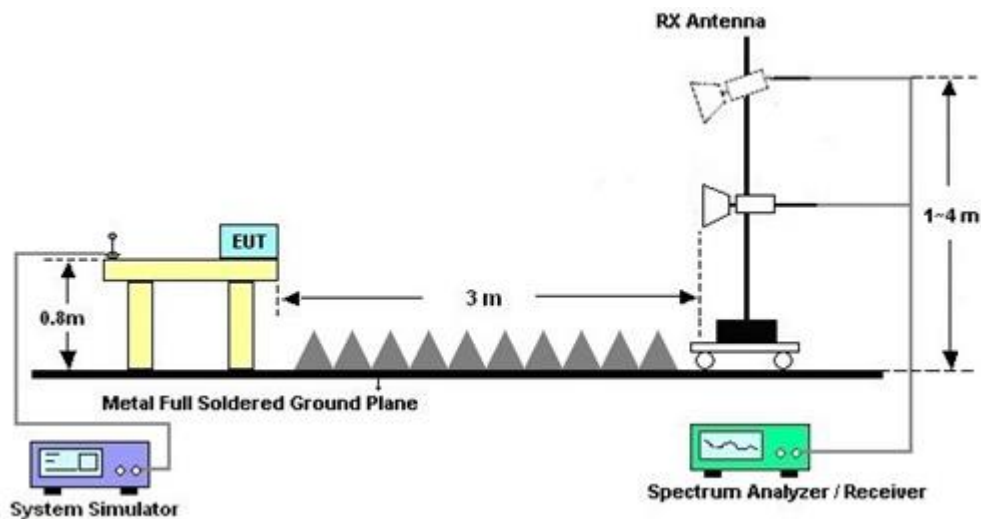
1. The EUT is placed on a turntable with 0.8 meter above ground.
2. The EUT is set 3 meters(30 M~18 G) and 1 meters (18 G~40 G) from the interference receiving antenna, which is mounted on the top of a variable height antenna tower.
3. The table is rotated 360 degrees to determine the position of the 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.

3.1.4. Test Setup of Radiated Emission

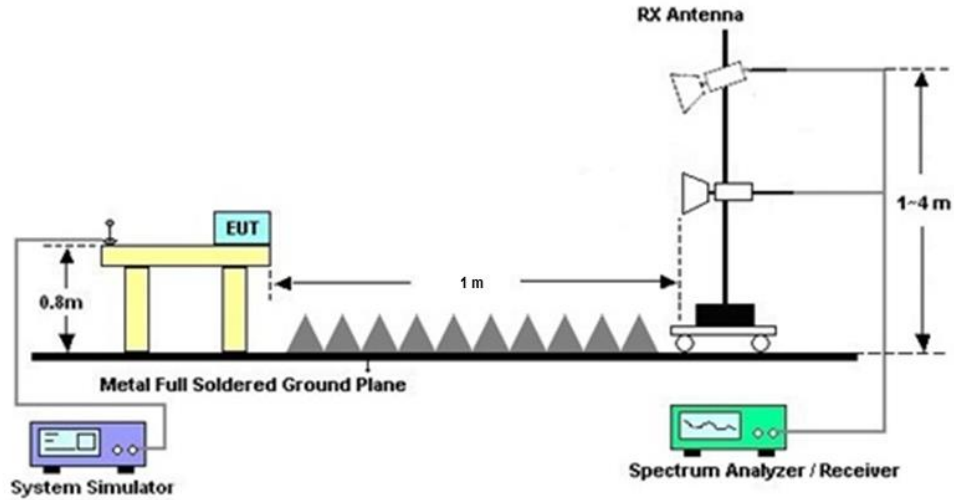
For Radiated Emissions from 30 MHz to 1 GHz



For Radiated Emissions from 1GHz to 18GHz



For Radiated Emissions 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	187311	9kHz~1GHz	Oct. 16, 2023	Aug. 29, 2024~ Sep. 06, 2024	Oct. 15, 2024	Radiation (03CH10-HY)
Bilog Antenna	TESEQ	CBL6111D& 00802N1D01N- 06	55608 & 09	30MHz~1GHz	Oct. 20, 2023	Aug. 29, 2024~ Sep. 06, 2024	Oct. 19, 2024	Radiation (03CH10-HY)
Horn Antenna	SCHWARZBE CK	BBHA 9120 D	9120D-1325	1GHz~18GHz	Oct. 18, 2023	Aug. 29, 2024~ Sep. 06, 2024	Oct. 17, 2024	Radiation (03CH10-HY)
Preamplifier	Jet-Power	JAP00101800- 30-10P	160118550004	1GHz~18GHz	Feb. 26, 2024	Aug. 29, 2024~ Sep. 06, 2024	Feb. 25, 2025	Radiation (03CH10-HY)
Controller	EMEC	EM 1000	N/A	Control Turn table & Ant Mast	N/A	Aug. 29, 2024~ Sep. 06, 2024	N/A	Radiation (03CH10-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	N/A	Aug. 29, 2024~ Sep. 06, 2024	N/A	Radiation (03CH10-HY)
Turn Table	EMEC	TT 2200	N/A	0~360 Degree	N/A	Aug. 29, 2024~ Sep. 06, 2024	N/A	Radiation (03CH10-HY)
Software	Audix	E3 6.2009-8-24	RK-001042	N/A	N/A	Aug. 29, 2024~ Sep. 06, 2024	N/A	Radiation (03CH10-HY)
EMI Test Receiver	Keysight	N9038A	MY59053012	3Hz~26.5GHz	Nov. 08, 2023	Aug. 29, 2024~ Sep. 06, 2024	Nov. 07, 2024	Radiation (03CH10-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	519226/2, 804014/2, 804026/2	30MHz~40GHz	Nov. 01, 2023	Aug. 29, 2024~ Sep. 06, 2024	Oct. 31, 2024	Radiation (03CH10-HY)
SHF-EHF Horn Antenna	SCHWARZBE CK	BBHA9170	00993	18GHz~40GHz	Nov. 24, 2023	Aug. 29, 2024~ Sep. 06, 2024	Nov. 23, 2024	Radiation (03CH10-HY)
Signal Analyzer	Keysight	N9010B	MY60241055	10Hz~44GHz	Jul. 19, 2024	Aug. 29, 2024~ Sep. 06, 2024	Jul. 18, 2025	Radiation (03CH10-HY)
Preamplifier	EMEC	EM18G40G	060715	18GHz~40GHz	Dec. 07, 2023	Aug. 29, 2024~ Sep. 06, 2024	Dec. 06, 2024	Radiation (03CH10-HY)

5. Measurement Uncertainty

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	6.34 dB
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 6000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.68 dB
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Uncertainty of Radiated Emission Measurement (6000 MHz ~ 18000 MHz)

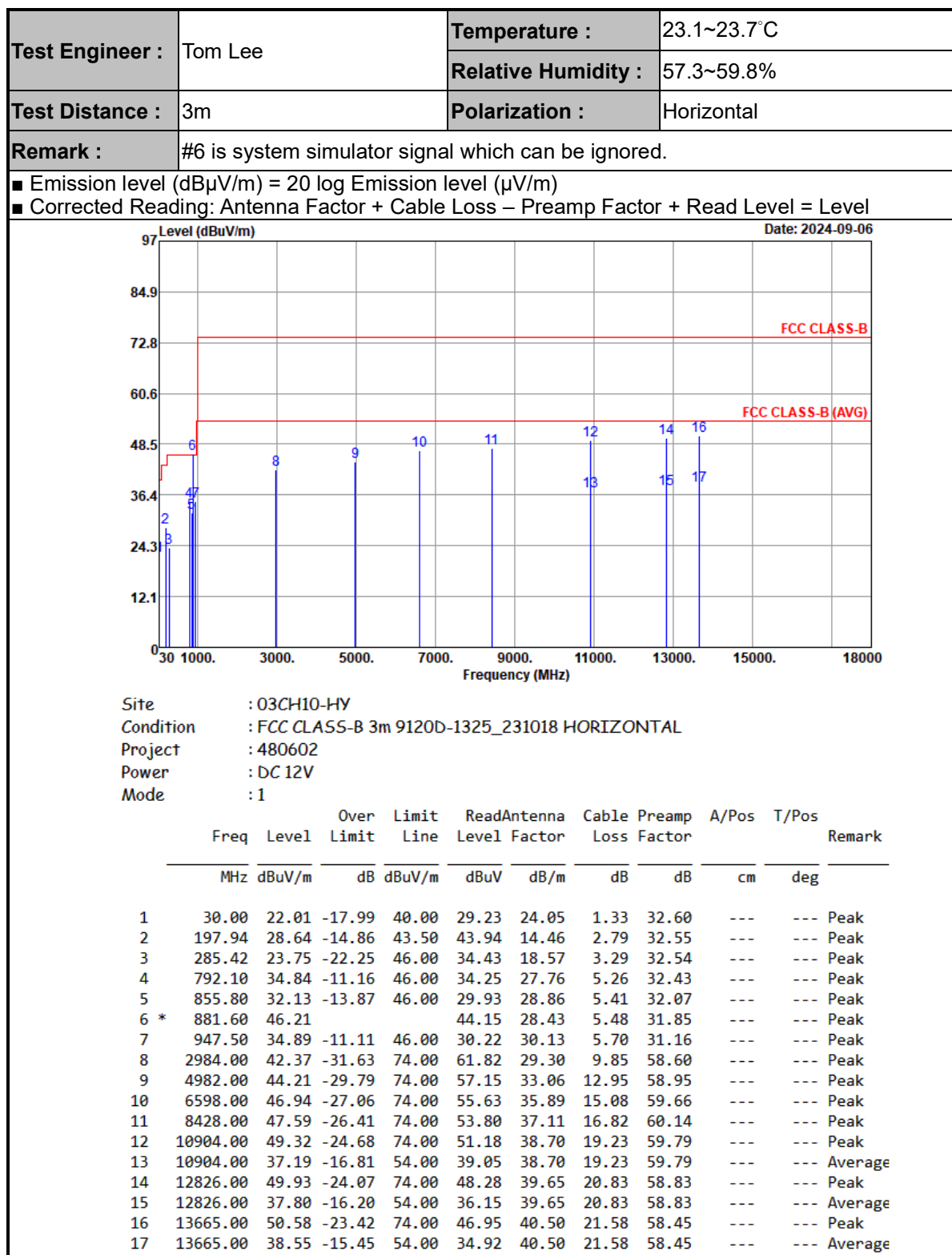
Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.3 dB
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Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.96 dB
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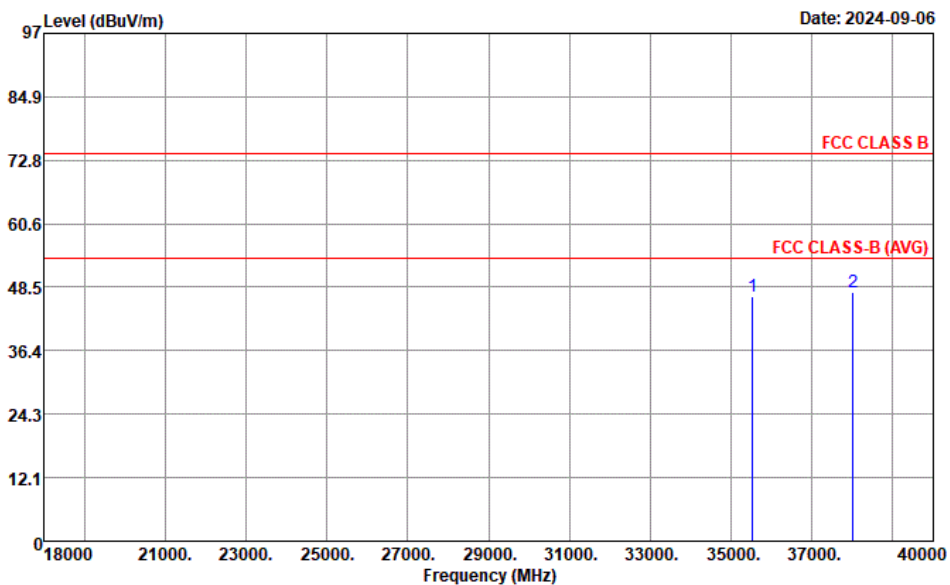
Appendix A. Radiated Emission Test Result





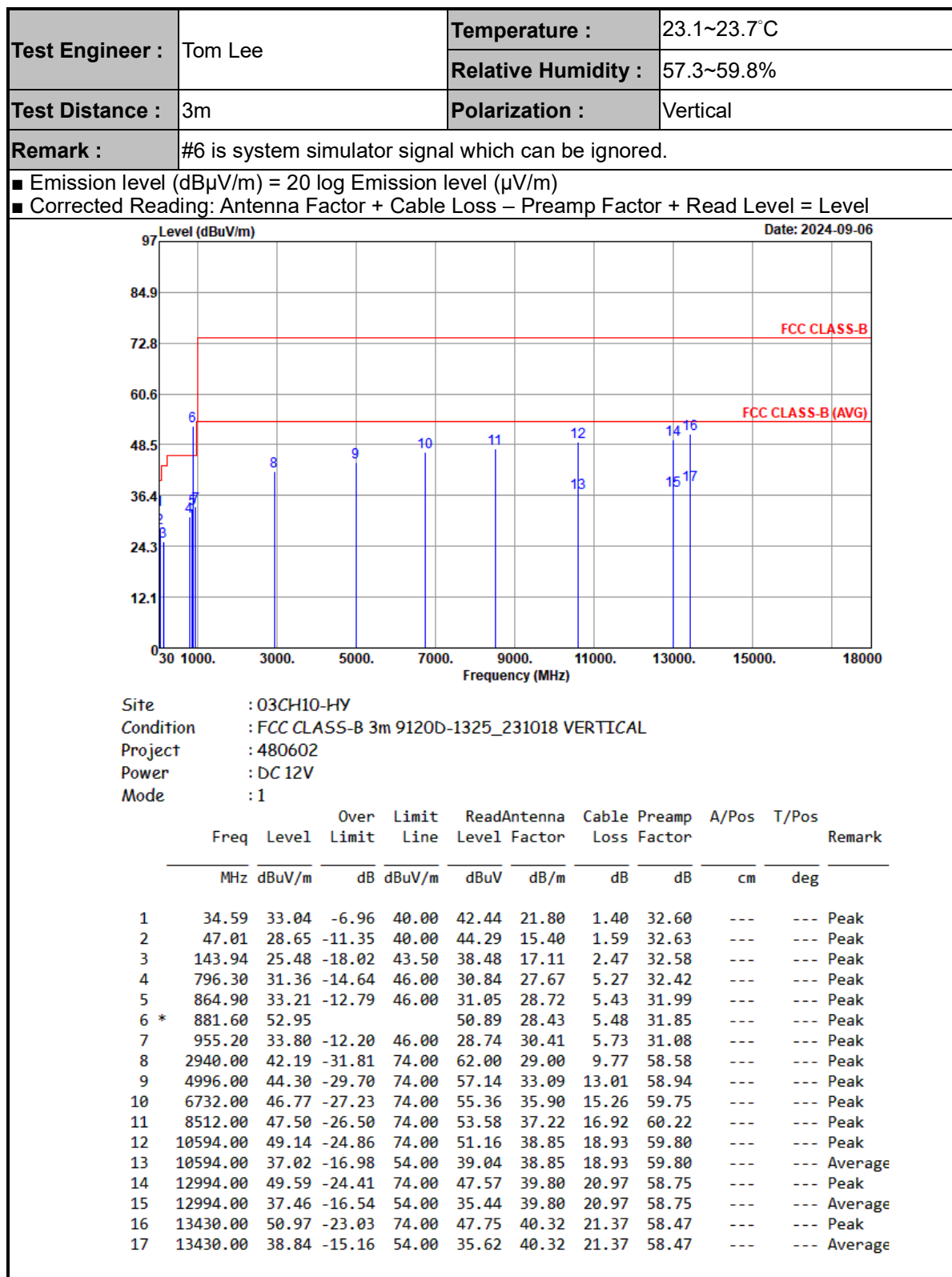
Test Engineer :	Tom Lee	Temperature :	23.1~23.7°C
		Relative Humidity :	57.3~59.8%
Test Distance :	1m	Polarization :	Horizontal

- Emission level (dBμV/m) = 20 log Emission level (μV/m)
- Distance extrapolation factor = 20 log (specific distance / test distance) (dB)
- EX.: Distance extrapolation factor = 20 log (3/1) = 9.54 (dB)
- Corrected Reading: Antenna Factor + Cable Loss – Preamp Factor - Distance extrapolation factor + Read Level = Level



Site : 03CH10-HY
Condition : FCC CLASS B 1m SHF_00993_231124 HORIZONTAL
Project : 480602
Power : DC 12V
Mode : 1

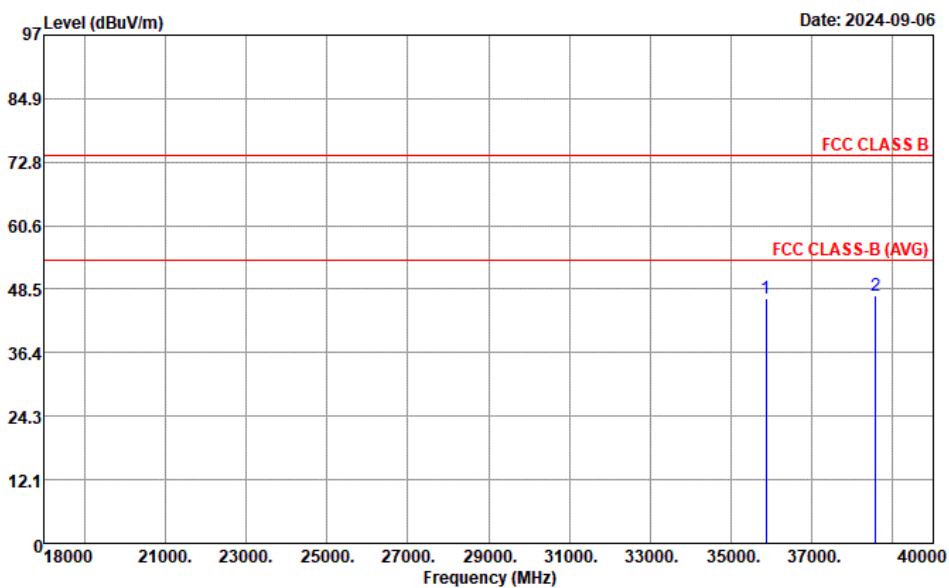
Frequency	Level	Distance extrapolation	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak
(MHz)	(dBuV/m)	Factor	Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Average
(MHz)	(dBuV/m)	(dB)	(dB)	(dBuV/m)	(dBuV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)
35534	46.81	9.54	33.78	74	24.24	42.23	34.77	54.43			P
38020	47.68	9.54	30.17	74	20.63	43.68	35.75	52.38			P





Test Engineer :	Tom Lee	Temperature :	23.1~23.7°C
		Relative Humidity :	57.3~59.8%
Test Distance :	1m	Polarization :	Vertical

- Emission level (dBμV/m) = 20 log Emission level (μV/m)
- Distance extrapolation factor = 20 log (specific distance / test distance) (dB)
- EX.: Distance extrapolation factor = 20 log (3/1) = 9.54 (dB)
- Corrected Reading: Antenna Factor + Cable Loss – Preamp Factor - Distance extrapolation factor + Read Level = Level



Site : 03CH10-HV
Condition : FCC CLASS B 1m SHF_00993_231124 VERTICAL
Project : 480602
Power : DC 12V
Mode : 1

Frequency	Level	Distance extrapolation	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak
		Factor	Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Average
(MHz)	(dBuV/m)	(dB)	(dB)	(dBuV/m)	(dBuV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)
35864	46.69	9.54	33.01	74	23.47	42.94	34.97	54.69			P
38570	47.41	9.54	29.29	74	19.75	43.4	36.12	51.86			P