



FCC Test Report

APPLICANT : Nauto
EQUIPMENT : In-vehicle camera
BRAND NAME : Nauto
MODEL NAME : N4
FCC ID : 2AKJ5-N4
STANDARD : 47 CFR Part 15 Subpart B
CLASSIFICATION : Certification
TEST DATE(S) : Apr. 20, 2024

We, Sporton International Inc. (Kunshan), 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. (Kunshan), the test report shall not be reproduced except in full.

Jason Jia

Approved by: Jason Jia



Sporton International Inc. (Kunshan)

***No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300
People's Republic of China***



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FC3D2618	Rev. 01	Initial issue of report	May 14, 2024



SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
-	15.107	AC Conducted Emission	< 15.107 limits	Not Applicable	The Device is Vehicle Use
3.1	15.109	Radiated Emission	< 15.109 limits	PASS	Under limit 3.62 dB at 43.58 MHz

Conformity Assessment Condition:

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. Please refer to each test results 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.



1. General Description

1.1. Applicant

Nauto

1259 Reamwood Ave, Sunnyvale, CA 94089, USA

1.2. Manufacturer

Nauto

1259 Reamwood Ave, Sunnyvale, CA 94089, USA

1.3. Product Feature of Equipment Under Test

Product Feature	
Equipment	In-vehicle camera
Brand Name	Nauto
Model Name	N4
FCC ID	2AKJ5-N4
EUT supports Radios application	LTE / GNSS WLAN 2.4GHz 802.11b/g/n HT20/HT40 WLAN 2.4GHz 802.11ax HE20/HE40 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80/VHT160 WLAN 5GHz 802.11ax HE20/HE40/HE80/HE160 Bluetooth BR/EDR/LE
SN	Radiation: N40HTV6E10011BS
HW Version	V4
SW Version	NautoN4
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4. Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx Frequency	LTE Band 2 : 1850 MHz ~ 1910 MHz LTE Band 4 : 1710 MHz ~ 1755 MHz LTE Band 5 : 824 MHz ~ 849 MHz LTE Band 12 : 699 MHz ~ 716 MHz LTE Band 13 : 777 MHz ~ 787 MHz 802.11b/g/n/ax: 2400 MHz ~ 2483.5 MHz 802.11a/n/ac/ax: 5150 MHz ~ 5250 MHz; 5250 MHz ~ 5350 MHz; 5470 MHz ~ 5725 MHz 5725 MHz ~ 5850 MHz Bluetooth: 2400 MHz ~ 2483.5 MHz
Rx Frequency	LTE Band 2 : 1930 MHz ~ 1990 MHz LTE Band 4 : 2110 MHz ~ 2155 MHz LTE Band 5 : 869 MHz ~ 894 MHz LTE Band 12 : 729 MHz ~ 746 MHz LTE Band 13 : 746 MHz ~ 756 MHz 802.11b/g/n/ax: 2400 MHz ~ 2483.5 MHz 802.11a/n/ac/ax: 5150 MHz ~ 5250 MHz; 5250 MHz ~ 5350 MHz; 5470 MHz ~ 5725 MHz 5725 MHz ~ 5850 MHz Bluetooth: 2400 MHz ~ 2483.5 MHz GNSS : 1559 MHz ~ 1610 MHz
Antenna Type	WWAN : monopole Antenna WLAN : monopole Antenna Bluetooth : monopole Antenna GNSS: module Antenna
Type of Modulation	LTE: QPSK / 16QAM / 64QAM 802.11b: DSSS (DBPSK / DQPSK / CCK) 802.11a/g/n: OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ac: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM) 802.11ax: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM / 1024QAM) Bluetooth LE : GFSK Bluetooth (1Mbps) : GFSK Bluetooth (2Mbps) : $\pi/4$ -DQPSK Bluetooth (3Mbps) : 8-DPSK GNSS : BPSK

1.5. Modification of EUT

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

1.6. Test Location

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Test Firm	Sporton International Inc. (Kunshan)		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	03CH02-KS	CN1257	314309

1.7. Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH02-KS	AUDIX	E3	6.2009-8-24al

1.8. Applicable Standards

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

- 47 CFR 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

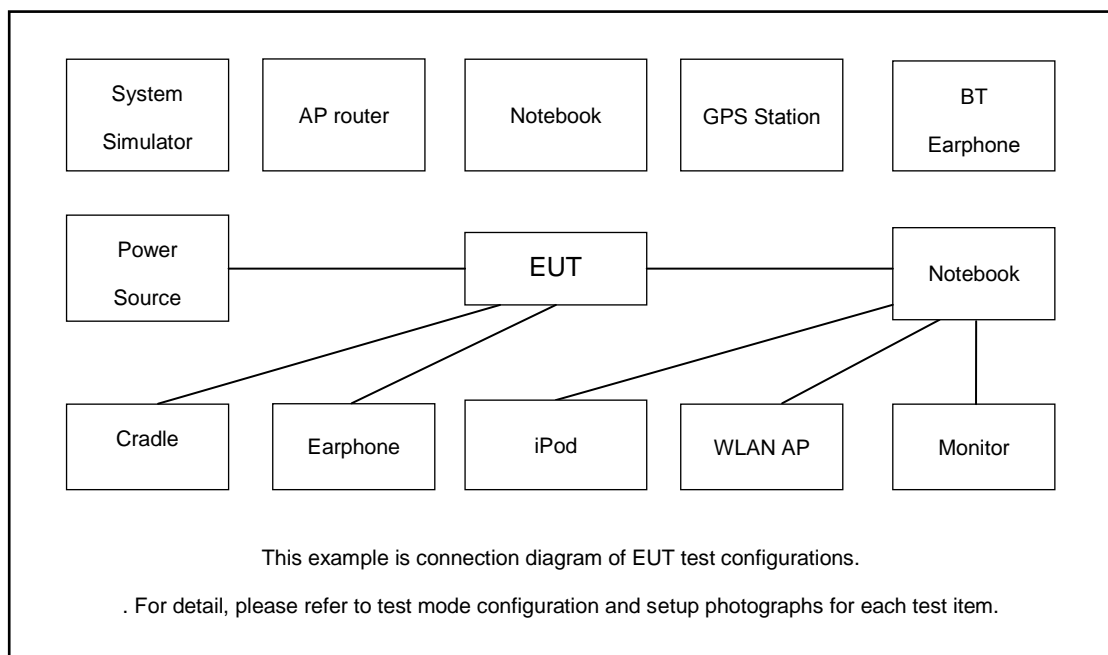
2.1. Test Mode

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 frequency or to 40 GHz, whichever is lower).

Test Items	Function Type
Radiated Emissions	Mode 1: LTE Band 5 Rx(Low) + Bluetooth Idle + WLAN (2.4G) Idle + Camera(Rear) + SIM + Charge with DC12V + USB Cable + EUT (eMMC) USB Data Link to Notebook
	Mode 2: LTE Band 12 Rx(Middle) + Bluetooth Idle + WLAN (5G) Idle + Camera(Front) + SIM + Charge with DC24V + USB Cable + Notebook USB Data Link to EUT (eMMC)
	Mode 3: LTE Band 13 Rx(High) + Bluetooth Idle + WLAN (2.4G) Idle + MPEG4 + SIM + Charge with DC12V + USB Cable + EUT (eMMC) USB Data Link to Notebook
	Mode 4: LTE Band 2 Rx + Bluetooth Idle + WLAN (5G) Idle + GNSS Rx + SIM + Charge with DC12V + USB Cable + EUT (eMMC) USB Data Link to Notebook
Remark: <ol style="list-style-type: none"> 1. The worst case of RE is mode 3; only the test data of this mode is reported. 2. Data Link with Notebook means data application transferred mode between EUT and Notebook. 3. Pre-scanned Low/Middle/High channel for LTE Band, the worst channel was recorded in this report. 	

2.2.Connection Diagram of Test System



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

2.3. Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Notebook	Acer	N20C5	N/A	N/A	N/A
2.	WLAN AP	HUAWEI	WS7100	N/A	N/A	N/A
3.	SD Card	SanDisk	Uitra	N/A	N/A	N/A
4.	Hard disk	KINGSHARE	KSP6120G	N/A	N/A	N/A
5.	Signal Generator	R&S	SMBV100A	N/A	N/A	N/A
6.	Base Station	Anritus	MT8820C	N/A	N/A	N/A
7.	DC power supply	TIANNENG	A6-DZF-12V	N/A	N/A	N/A

2.4. EUT Operation Test Setup

The EUT was in LTE idle mode during the testing. The EUT was synchronized to the BCCH, and is in continuous receiving mode by setting system simulator's paging reorganization.

At the same time, the EUT was attached to the WLAN AP, and the following programs installed in the EUT were programmed during the test.

1. Data application is transferred between notebook and EUT via USB cable.
2. Turn on camera to capture images.
3. Turn on MPEG4 function.
4. Turn on GNSS function to make the EUT receive continuous signals from GNSS 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 Limit>

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

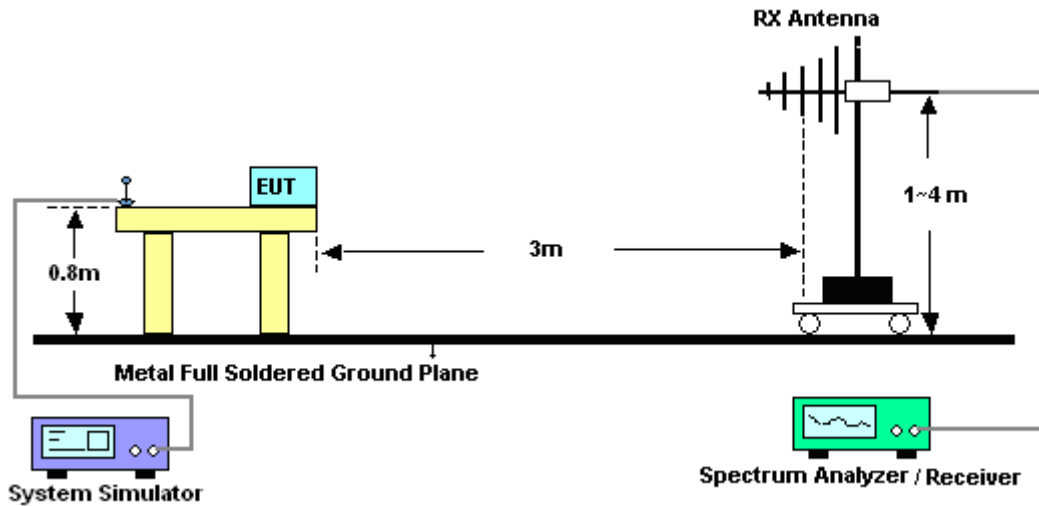
The measuring equipment is listed in the section 4 of this test report.

3.1.3. Test Procedures

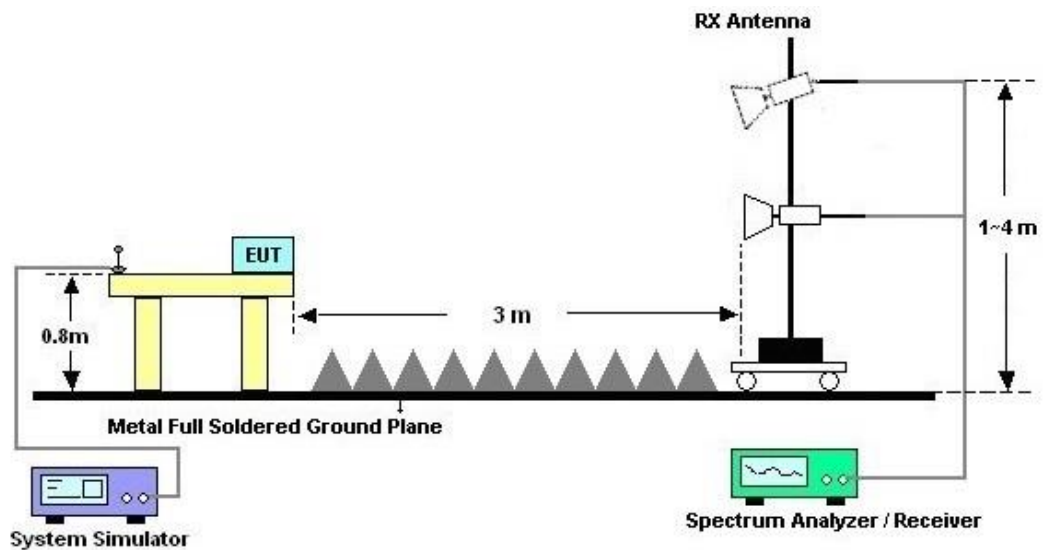
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
4. The table was rotated 360 degrees to determine the position of the highest radiation.
5. 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.
6. 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.
7. 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).
8. 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.
9. Emission level (dBμV/m) = 20 log Emission level (μV/m)
10. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
11. Exploratory radiated emissions testing of handheld and/or body-worn devices shall include rotation of the EUT through three orthogonal axes (X/Y/Z Plane) to determine the orientation (attitude) that maximizes the emissions.

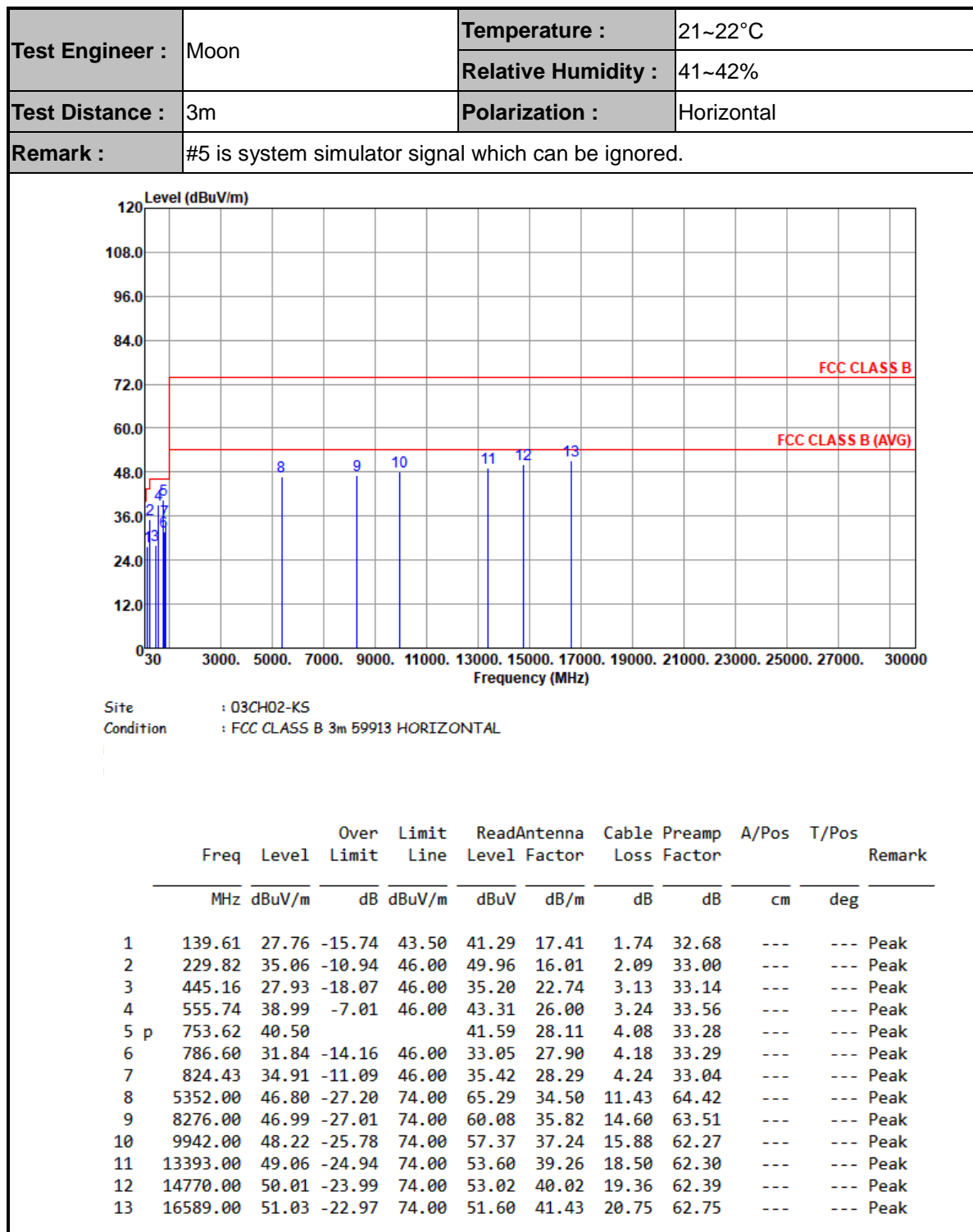
3.1.4. Test Setup of Radiated Emission

For radiated emissions from 30MHz to 1GHz



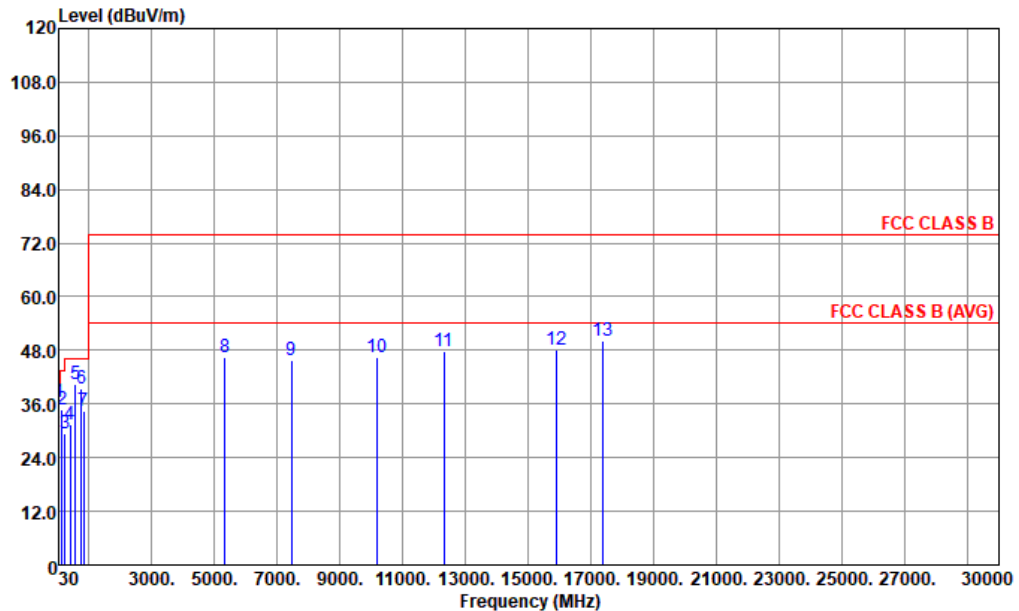
For radiated emissions above 1GHz



3.1.5. Test Result of Radiated Emission




Test Engineer :	Moon	Temperature :	21~22°C
		Relative Humidity :	41~42%
Test Distance :	3m	Polarization :	Vertical
Remark :	#6 is system simulator signal which can be ignored.		



Site : 03CH02-KS
Condition : FCC CLASS B 3m 59913 VERTICAL

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Factor	Preamplifier Loss	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg
1 p	43.58	36.38	-3.62	40.00	51.06	17.37	0.93	32.98	100	111 Peak
2	138.64	34.66	-8.84	43.50	48.17	17.43	1.74	32.68	---	---
3	232.73	29.43	-16.57	46.00	44.02	16.33	2.09	33.01	---	---
4	400.54	31.37	-14.63	46.00	39.95	21.73	3.00	33.31	---	---
5	555.74	40.40	-5.60	46.00	44.72	26.00	3.24	33.56	100	291 Peak
6	753.62	39.28			40.37	28.11	4.08	33.28	---	---
7	824.43	34.47	-11.53	46.00	34.98	28.29	4.24	33.04	---	---
8	5335.00	46.47	-27.53	74.00	65.00	34.50	11.40	64.43	---	---
9	7460.00	45.94	-28.06	74.00	60.55	35.77	13.57	63.95	---	---
10	10197.00	46.63	-27.37	74.00	55.16	37.50	16.10	62.13	---	---
11	12322.00	47.88	-26.12	74.00	52.12	39.07	17.78	61.09	---	---
12	15909.00	48.05	-25.95	74.00	49.88	40.61	20.27	62.71	---	---
13	17354.00	50.08	-23.92	74.00	50.34	41.39	21.14	62.79	---	---

Note:

- Level(dBuV/m) = Read Level(dBuV) + Antenna Factor(dB/m) + Cable Loss(dB) - Preamp Factor(dB)
- Over Limit(dB) = Level(dBuV/m) - Limit Line(dBuV/m)



4. List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
EMI Test Receiver	R&S	ESR7	101403	9kHz~7GHz;Max 30dBm	Oct. 10, 2023	Apr. 20, 2024	Oct. 09, 2024	Radiation (03CH02-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55370528	10Hz-44G,MAX 30dB	Oct. 10, 2023	Apr. 20, 2024	Oct. 09, 2024	Radiation (03CH02-KS)
Bilog Antenna	TeseQ	CBL6111D	44483	30MHz-1GHz	Dec. 21, 2023	Apr. 20, 2024	Dec. 20, 2024	Radiation (03CH02-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75957	1GHz~18GHz	Nov. 23, 2024	Apr. 20, 2024	Nov. 22, 2024	Radiation (03CH02-KS)
SHF-EHF Horn	Com-power	AH-840	101070	18GHz~40GHz	Jan. 05, 2024	Apr. 20, 2024	Jan. 04, 2025	Radiation (03CH02-KS)
Amplifier	SONOMA	310N	380826	9KHz-1GHz	Jul 06, 2023	Apr. 20, 2024	Jul 05, 2024	Radiation (03CH02-KS)
Amplifier	EM	EM01G18G	060806	1GHz~18GHz	Oct. 10, 2023	Apr. 20, 2024	Oct. 09, 2024	Radiation (03CH02-KS)
Amplifier	EM	EM18G40GGA	060852	18~40GHz	Jan. 05, 2024	Apr. 20, 2024	Jan. 04, 2025	Radiation (03CH02-KS)
AC Power Source	Chroma	61601	616010002473	N/A	NCR	Apr. 20, 2024	NCR	Radiation (03CH02-KS)
Turn Table	MF	MF7802	N/A	0~360 degree	NCR	Apr. 20, 2024	NCR	Radiation (03CH02-KS)
Antenna Mast	MF	MF7802	N/A	1 m~4 m	NCR	Apr. 20, 2024	NCR	Radiation (03CH02-KS)

NCR: No Calibration Required.

5. Measurement Uncertainty

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	6.04 dB
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.16 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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----- THE END -----