FCC Test Report

APPLICANT	:	Quectel Wireless Solutions Co., Ltd.
EQUIPMENT	:	Wi-Fi & Bluetooth Module
BRAND NAME	:	QUECTEL
MODEL NAME	:	FCS851U
FCC ID	:	XMR2023FCS851U
STANDARD	:	47 CFR Part 15 Subpart B
CLASSIFICATION	:	Certification
TEST DATE(S)	:	Aug. 04, 2023 ~ Aug. 10, 2023

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

ACCREDITED Cert #5145.02

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
FC371207	Rev. 01	Initial issue of report	May 23, 2024

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.107	AC Conducted Emission	< 15.107 limits	PASS	Under limit 5.78 dB at 0.576 MHz
3.2	15.109	Radiated Emission	< 15.109 limits	PASS	Under limit 8.76 dB at 41.640 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/manufacturer 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

Quectel Wireless Solutions Co., Ltd.
Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai 200233, China

1.2. Manufacturer

Quectel Wireless Solutions Co., Ltd.
Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai 200233, China

1.3. Product Feature of Equipment Under Test

Product Feature	
Equipment	Wi-Fi & Bluetooth Module
Brand Name	QUECTEL
Model Name	FCS851U
FCC ID	XMR2023FCS851U
EUT supports Radios application	WLAN 2.4GHz 802.11b/g/n HT20/HT40 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE
SN Code	Conduction: E1N23FH06000133 Radiation: E1N23FH06000076
HW Version	R1.0
SW Version	N/A
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	802.11b/g/n: 2400 MHz ~ 2483.5 MHz 802.11a/n/ac: 5150 MHz ~ 5250 MHz; 5250 MHz ~ 5350 MHz; 5470 MHz ~ 5725 MHz 5725 MHz ~ 5850 MHz Bluetooth: 2400 MHz ~ 2483.5 MHz
Rx Frequency	802.11b/g/n: 2400 MHz ~ 2483.5 MHz 802.11a/n/ac: 5150 MHz ~ 5250 MHz; 5250 MHz ~ 5350 MHz; 5470 MHz ~ 5725 MHz 5725 MHz ~ 5850 MHz Bluetooth: 2400 MHz ~ 2483.5 MHz
Antenna Type	WLAN: Dipole Antenna Bluetooth: Dipole Antenna
Type of Modulation	802.11b: DSSS (DBPSK / DQPSK / CCK) 802.11a/g/n: OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ac: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM) Bluetooth LE : GFSK Bluetooth (1Mbps) : GFSK Bluetooth (2Mbps) :π/4-DQPSK Bluetooth (3Mbps) : 8-DPSK

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.**
	CO01-KS 03CH02-KS	CN1257	314309

1.7. Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH02-KS	AUDIX	E3	6.2009-8-24al
2.	CO01-KS	AUDIX	E3	6.2009-8-24

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

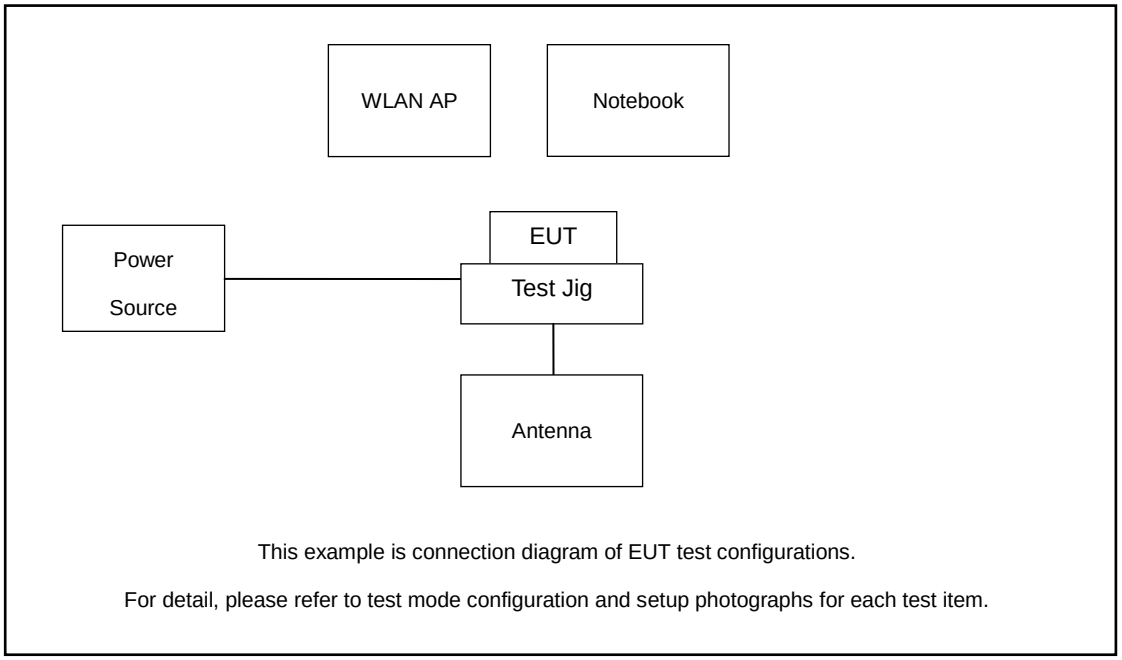
2.1. Test Mode

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

Test Items	Function Type
AC Conducted Emission	Mode 1 : WLAN (2.4G) Idle + Powered from Test Jig Mode 2 : WLAN (5G) Idle + Powered from Test Jig Mode 3 : Bluetooth Idle + Powered from Test Jig
Radiated Emissions	Mode 1 : WLAN (2.4G) Idle + Powered from Test Jig Mode 2 : WLAN (5G) Idle + Powered from Test Jig Mode 3 : Bluetooth Idle + Powered from Test Jig
Remark: **1.** The worst case of AC is mode 2; only the test data of this mode is reported. **2.** The worst case of RE is mode 1; only the test data of this mode is reported.	

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.	WLAN AP	D-link	DIR-655	KA21R655B1	N/A	Unshielded,1.8m
2.	WLAN AP	TP-Link	TL-WDR5600	N/A	N/A	Unshielded,1.8m
3.	Notebook	Lenovo	G480	QDS-BRCM1050I	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m
4.	Antenna	N/A	N/A	N/A	N/A	N/A
5.	Adapter	N/A	N/A	N/A	N/A	N/A
6.	Test Jig	N/A	N/A	N/A	N/A	N/A

2.4. EUT Operation Test Setup

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.

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 Limit>

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.

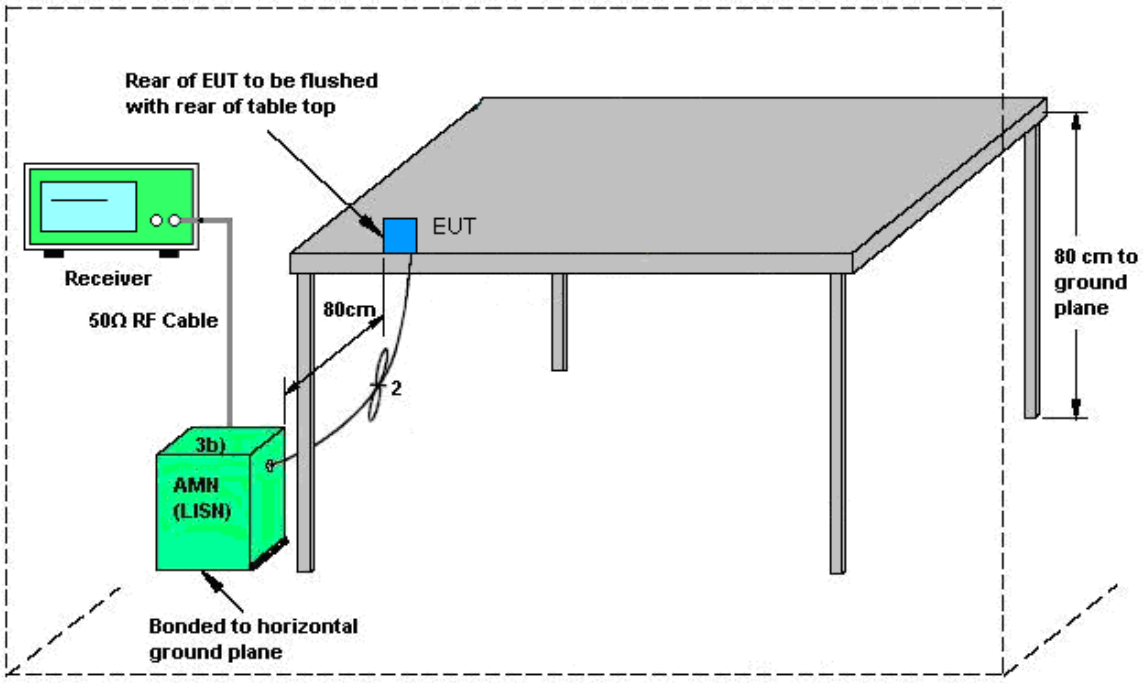
3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of 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 should 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.

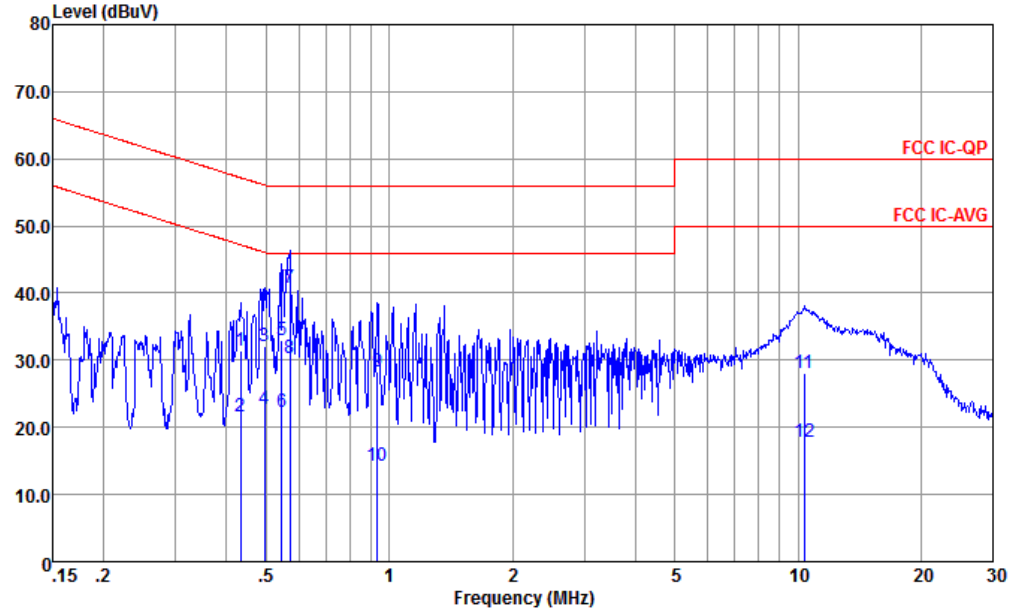
3.1.4 Test Setup



AMN = Artificial mains network (LISN)
AE = Associated equipment
EUT = Equipment under test
ISN = Impedance stabilization network

3.1.5 Test Result of AC Conducted Emission

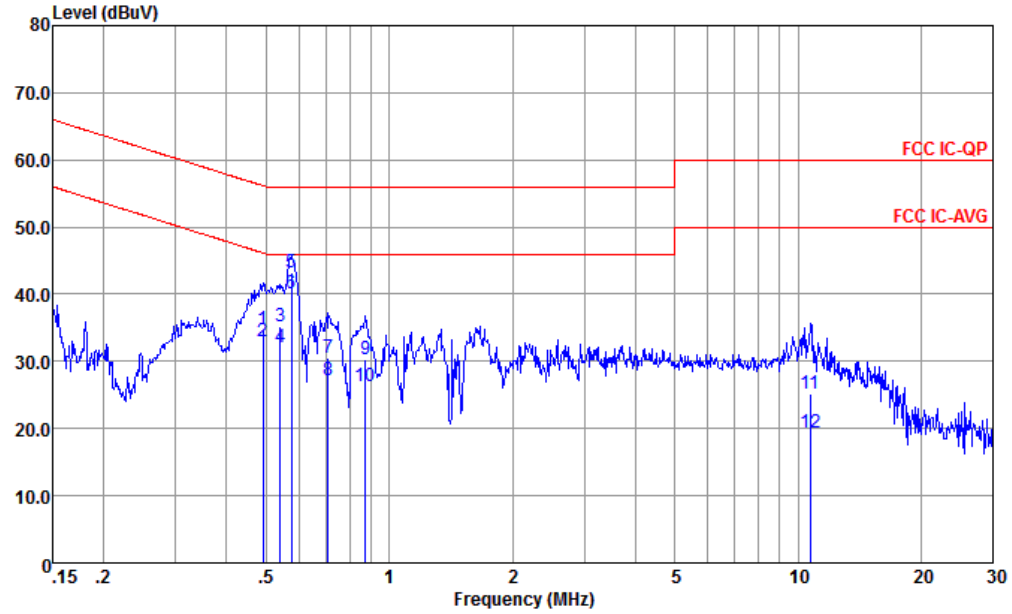
Test Engineer :	Amos Zhang	**Temperature :**	25.3~26.2℃
		Relative Humidity :	38~40%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-KS
Condition : FCC IC-QP LISN-060105-L 2023 LINE

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.433	31.36	-25.84	57.20	21.10	-0.01	10.27	QP
2		0.433	21.56	-25.64	47.20	11.30	-0.01	10.27	Average
3		0.494	32.09	-24.01	56.10	21.91	-0.03	10.21	QP
4		0.494	22.69	-23.41	46.10	12.51	-0.03	10.21	Average
5		0.546	32.96	-23.04	56.00	22.80	-0.04	10.20	QP
6		0.546	22.36	-23.64	46.00	12.20	-0.04	10.20	Average
7	*	0.570	40.75	-15.25	56.00	30.61	-0.05	10.19	QP
8		0.570	30.35	-15.65	46.00	20.21	-0.05	10.19	Average
9		0.933	28.22	-27.78	56.00	18.19	-0.09	10.12	QP
10		0.933	14.22	-31.78	46.00	4.19	-0.09	10.12	Average
11		10.342	28.05	-31.95	60.00	17.51	-0.16	10.70	QP
12		10.342	17.75	-32.25	50.00	7.21	-0.16	10.70	Average

Test Engineer :	Amos Zhang	**Temperature :**	25.3~26.2℃
		Relative Humidity :	38~40%
Test Voltage :	120Vac / 60Hz	**Phase :**	Neutral
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-KS
Condition : FCC IC-QP LISN-060105-N 2023 NEUTRAL

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.491	34.75	-21.39	56.14	24.60	-0.07	10.22	QP
2		0.491	33.05	-13.09	46.14	22.90	-0.07	10.22	Average
3		0.541	35.23	-20.77	56.00	25.10	-0.07	10.20	QP
4		0.541	32.03	-13.97	46.00	21.90	-0.07	10.20	Average
5		0.576	43.32	-12.68	56.00	33.20	-0.07	10.19	QP
6	*	0.576	40.22	-5.78	46.00	30.10	-0.07	10.19	Average
7		0.708	30.59	-25.41	56.00	20.50	-0.07	10.16	QP
8		0.708	27.29	-18.71	46.00	17.20	-0.07	10.16	Average
9		0.876	30.24	-25.76	56.00	20.20	-0.09	10.13	QP
10		0.876	26.24	-19.76	46.00	16.20	-0.09	10.13	Average
11		10.733	25.09	-34.91	60.00	14.49	-0.18	10.78	QP
12		10.733	19.49	-30.51	50.00	8.89	-0.18	10.78	Average

Note:

1. Level(dBμV) = Read Level(dBμV) + LISN Factor(dB) + Cable Loss(dB)
2. Over Limit(dB) = Level(dBμV) – Limit Line(dBμV)

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 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

3.2.2. Measuring Instruments

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

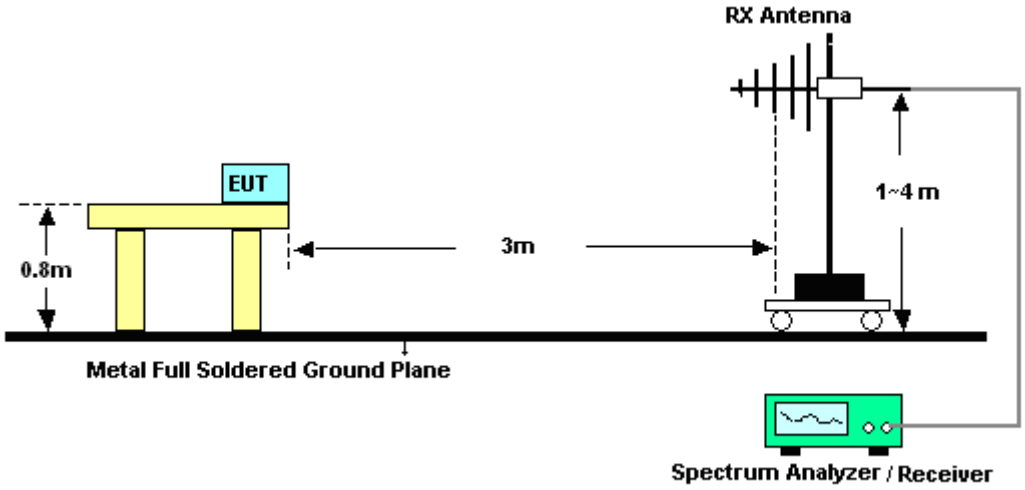
3.2.3. Test Procedures

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=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

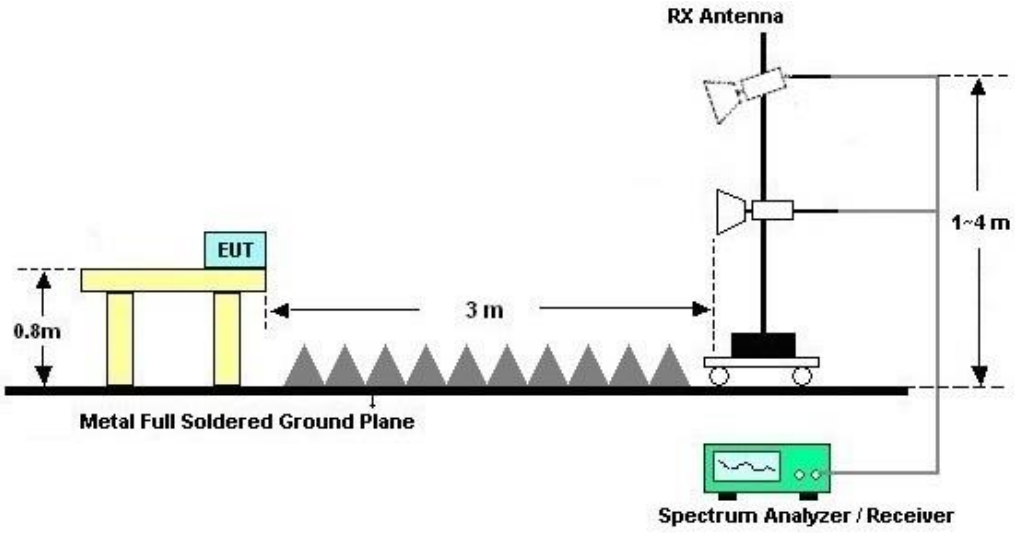
10. Exploratory radiated emissions testing of handheld and/or body-worn devices shall include rotation of the EUT through three orthogonal axes (X/Y/Z Plane) to determine the orientation (attitude) that maximizes the emissions.

3.2.4. Test Setup of Radiated Emission

For radiated emissions from 30MHz to 1GHz

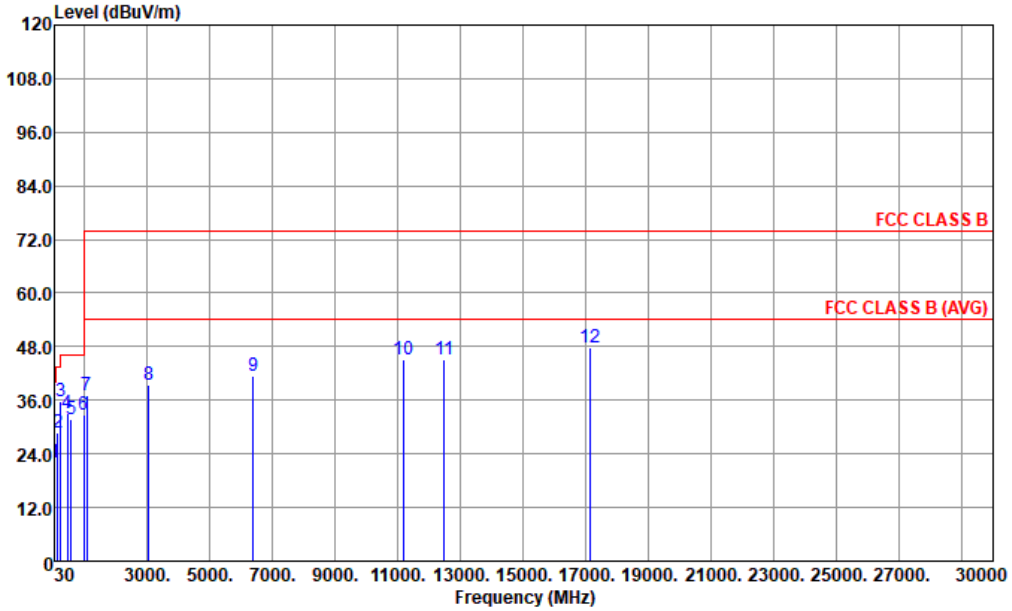


For radiated emissions above 1GHz



3.2.5. Test Result of Radiated Emission

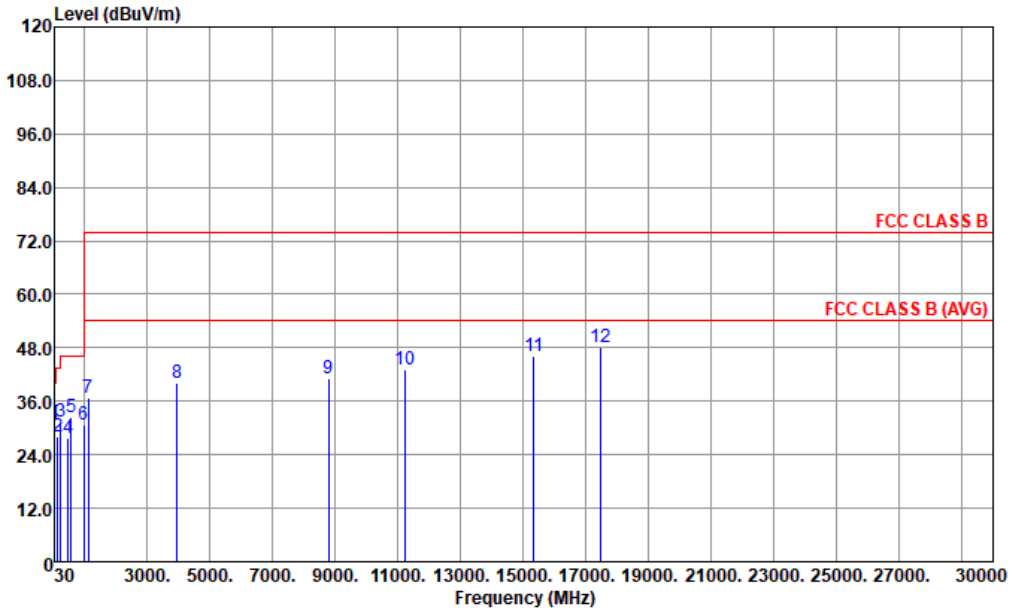
Test Engineer :	Moon	Temperature :	21~22°C
		Relative Humidity :	41~42%
Test Distance :	3m	Polarization :	Horizontal



Site : 03CH02-KS
Condition : FCC CLASS B 3m 6111D 59913 HORIZONTAL

		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		30.00	22.05	-17.95	40.00	29.16	25.08	0.76	32.95	---	---	Peak
2		144.46	28.59	-14.91	43.50	42.18	17.30	1.77	32.66	---	---	Peak
3	p	239.52	35.89	-10.11	46.00	49.76	17.08	2.09	33.04	---	---	Peak
4		455.83	32.93	-13.07	46.00	40.00	22.94	3.14	33.15	---	---	Peak
5		560.59	31.86	-14.14	46.00	36.03	26.10	3.29	33.56	---	---	Peak
6		960.23	32.74	-21.26	54.00	29.05	30.88	4.61	31.80	---	---	Peak
7		1068.00	37.11	-36.89	74.00	41.20	27.57	4.84	36.50	---	---	Peak
8		3040.00	39.57	-34.43	74.00	34.10	32.80	8.41	35.74	---	---	Peak
9		6372.00	41.44	-32.56	74.00	29.51	35.50	12.52	36.09	---	---	Peak
10		11183.00	44.99	-29.01	74.00	27.13	37.98	16.79	36.91	---	---	Peak
11		12475.00	45.23	-28.77	74.00	25.45	38.98	17.86	37.06	---	---	Peak
12		17150.00	47.86	-26.14	74.00	22.99	41.25	21.08	37.46	---	---	Peak

Test Engineer :	Moon	Temperature :	21~22°C
		Relative Humidity :	41~42%
Test Distance :	3m	Polarization :	Vertical



Site : 03CH02-KS
Condition : FCC CLASS B 3m 6111D 59913 VERTICAL

	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 p	41.64	31.24	-8.76	40.00	44.83	18.51	0.90	33.00	---	---	Peak
2	140.58	28.12	-15.38	43.50	41.63	17.41	1.75	32.67	---	---	Peak
3	239.52	31.57	-14.43	46.00	45.44	17.08	2.09	33.04	---	---	Peak
4	478.14	27.60	-18.40	46.00	34.32	23.40	3.14	33.26	---	---	Peak
5	560.59	32.42	-13.58	46.00	36.59	26.10	3.29	33.56	---	---	Peak
6	978.66	30.90	-23.10	54.00	27.25	30.57	4.64	31.56	---	---	Peak
7	1119.00	36.77	-37.23	74.00	40.56	27.70	4.96	36.45	---	---	Peak
8	3941.00	39.99	-34.01	74.00	32.92	33.40	9.64	35.97	---	---	Peak
9	8786.00	41.16	-32.84	74.00	26.69	36.00	14.74	36.27	---	---	Peak
10	11217.00	43.08	-30.92	74.00	25.16	38.00	16.82	36.90	---	---	Peak
11	15331.00	46.28	-27.72	74.00	24.19	39.80	19.75	37.46	---	---	Peak
12	17473.00	47.98	-26.02	74.00	22.88	41.10	21.18	37.18	---	---	Peak

Note:

1. Level(dBμV/m) = Read Level(dBμV) + Antenna Factor(dB/m) + Cable Loss(dB) - Preamp Factor(dB)
2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

4. List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	May 16, 2023	Aug. 10, 2023	May 15, 2024	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060103	9kHz~30MHz	Oct. 13, 2022	Aug. 10, 2023	Oct. 12, 2023	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060105	9kHz~30MHz	May 16, 2023	Aug. 10, 2023	May 15, 2024	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	AC 0V~300V, 45Hz~1000Hz	Oct. 12, 2022	Aug. 10, 2023	Oct. 11, 2023	Conduction (CO01-KS)
EMI Test Receiver	R&S	ESR7	101403	9kHz~7GHz;Max 30dBm	Oct. 12, 2022	Aug. 04, 2023	Oct. 11, 2023	Radiation (03CH02-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55370528	10Hz-44G,MAX 30dB	Oct. 12, 2022	Aug. 04, 2023	Oct. 11, 2023	Radiation (03CH02-KS)
Bilog Antenna	TeseQ	CBL6111D	44483	30MHz-1GHz	Dec. 23, 2022	Aug. 04, 2023	Dec. 22, 2023	Radiation (03CH02-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75957	1GHz~18GHz	Nov. 15, 2022	Aug. 04, 2023	Nov. 14, 2023	Radiation (03CH02-KS)
SHF-EHF Horn	Com-power	AH-840	101070	18GHz~40GHz	Jan. 08, 2023	Aug. 04, 2023	Jan. 07, 2024	Radiation (03CH02-KS)
Amplifier	EM	EM18G40GGA	060852	18~40GHz	Jan. 05, 2023	Aug. 04, 2023	Jan. 04, 2024	Radiation (03CH02-KS)
Amplifier	SONOMA	310N	380826	9KHz-1GHz	Jul. 06, 2023	Aug. 04, 2023	Jul. 05, 2024	Radiation (03CH02-KS)
Amplifier	EM	EM01G18G	060806	1GHz~18GHz	Oct. 12, 2022	Aug. 04, 2023	Oct. 11, 2023	Radiation (03CH02-KS)
AC Power Source	Chroma	61601	6160100024733	N/A	NCR	Aug. 04, 2023	NCR	Radiation (03CH02-KS)
Turn Table	MF	MF7802	N/A	0~360 degree	NCR	Aug. 04, 2023	NCR	Radiation (03CH02-KS)
Antenna Mast	MF	MF7802	N/A	1 m~4 m	NCR	Aug. 04, 2023	NCR	Radiation (03CH02-KS)

NCR: No Calibration Required

5. Measurement Uncertainty

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.84dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**6.04dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.16dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.96dB**