EMC Test Report

Applicant:	Quectel Wireless Solutions Co., Ltd.
Address:	Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China, 200233
Product:	Wi-Fi & Bluetooth Module
Model No.:	FCM740D
Brand Name:	QUECTEL
FCC ID:	XMR2023FCM740D
Standards:	FCC CFR47 Part 15B
Result:	Complies
Report No.:	PD20230188EMC03
Issue Date:	2023/11/06

Reviewed By: Noah Zhang **Approved By:** Alec Yang

Hefei Panwin Technology Co., Ltd.

Floor 1, Zone E, Plant 2#, Mingzhu Industrial Park, No.106 Chuangxin Avenue, High-tech Zone, Hefei City, Anhui Province,China

TEL: +86-0551-63811775

Revision History

Report No.	Version	Description	Issue Date	Note
PD20230188EMC03	01	Initial Report	2023/11/06	Valid

CONTENTS

Test Summary

NO.	Test Item	Clause in FCC Rules	Results	Remarks
1	Radiated Emission	FCC Part 15.109, ANSI C63.4-2014	Pass	/
2	Conducted Emission	FCC Part 15.107, ANSI C63.4-2014	NA	Note 1

Date of Testing: 2023/10/29
Date of Sample Received: 2023/10/25

• We, Hefei Panwin Technology Co., Ltd., would like to declare that the tested sample has been evaluated in accordance with the procedures given in applied standard(s) in **Section 3** of this report and shown compliance with the applicable technical standards.

• All indications of PASS/FAIL in this report are based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only.

Note 1: This test is applicable for the AC power lines only.

1 General Information

1.1 Notes of the Test Report

This report is invalid without signature of auditor and approver or with any alterations. The report shall not be partially reproduced without written approval of the testing company. Entrusted test results are only responsible for incoming samples. If there is any objection to the testing report, it shall be raised to the testing company within 15 days from the date of receiving the report. In the test results, "NA" means "not applicable", and the test items marked with "*" are subcontracted projects.

1.2 Test Facility

FCC (Designation number: CN1361, Test Firm Registration Number: 473156)

Hefei Panwin Technology Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform measurements.

A2LA (Certificate Number: 6849.01)

Hefei Panwin Technology Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform measurement.

1.3 Testing Laboratory

Company Name	Hefei Panwin Technology Co., Ltd.
Address	Floor 1, Zone E, Plant 2#, Mingzhu Industrial Park, 106 Chuangxin Avenue, High-tech Zone, Hefei City, Anhui Province, China
Telephone	+86-0551-63811775
Post Code	230031

2 Description of Equipment under Test

Client Information

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

General Technologies

Product	Wi-Fi & Bluetooth Module		
Model	FCM740D		
Hardware Version	R1.0		
Software Version	NA		
Power Supply	External power supply, Typ. 3.3 V dc		
Antenna Type	PCB Antenna		
Frequency	**Band**	**TX(MHz)**	**RX(MHz)**
	Bluetooth LE	2402 to 2480	2402 to 2480
	Wi-Fi 802.11 b/g/n	2412 to 2472	2412 to 2472
Note: The EUT is sent from the applicant to Hefei Panwin Technology Co., Ltd., and the information of the EUT is declared by the applicant.			

3 Applied Standards

Test Standards

No.	Identity	Document Title
1	FCC CFR47 Part 15B	Unintentional Radiators
2	ANSI C63.4-2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

4 System Test Configuration

4.1 EUT Test Mode

The system was configured for testing in a typical Mode (as normally used by a typical user).

NO.	Test Mode
1	External power supply + EVB +BT/ Wi-Fi 2.4G Receiver
Note: During the test, the preliminary test was performed in all modes with all frequency bands, mode 1 was selected as the worst condition.	

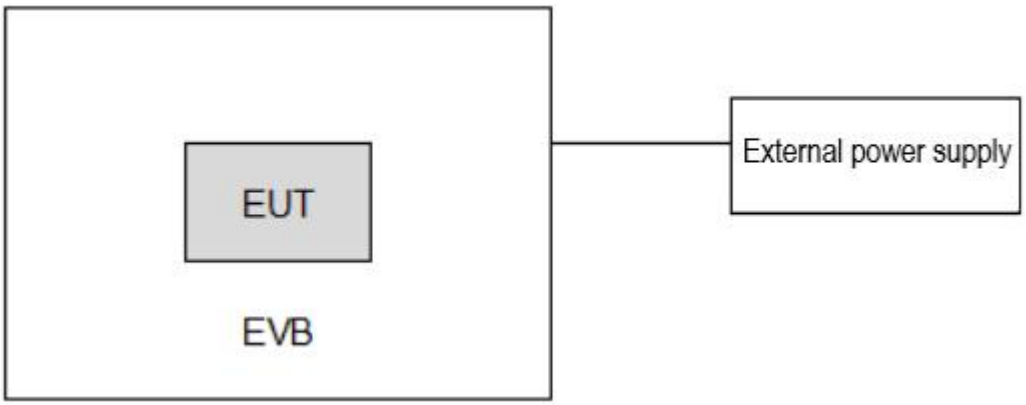
4.2 Support Equipment List

Equipment	Manufacturer	Description	Model	Serial Number
Base Station Simulator	R&S	NA	CMW500	PWC0012
EVB	QUECTEL	NA	NA	NA

4.3 Equipment Classification

☐	Class A
☑	Class B

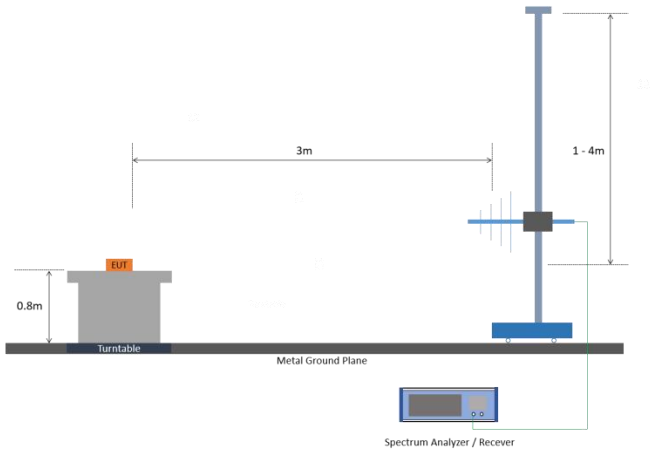
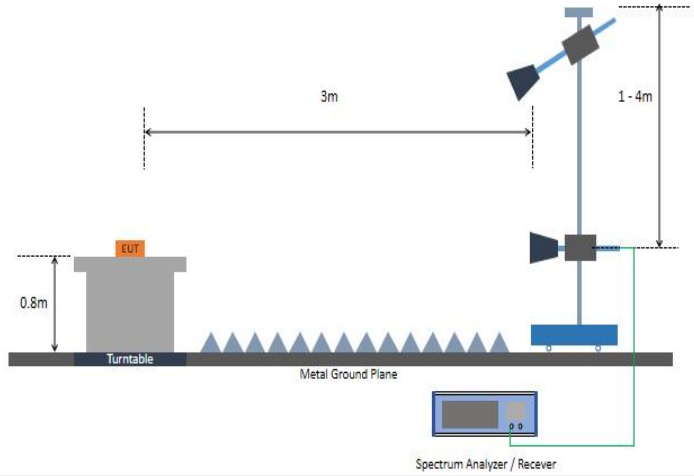
4.4 Block Diagram of Test Setup



5 Emission Test

5.1 Radiated Emission

5.1.1 Test System Diagram

30MHz to 1000MHz	Above 1000MHz
	

Antenna Tower meets ANSI C63.4 requirements for measurements above 1 GHz by keeping the antenna aimed at the EUT during the antenna's ascent/ descent along the antenna mast.

5.1.2 Test Equipment

Instrument	Manufacturer	Model	Asset No.	Cal. Interval	Cal. Due Date
EMI Test Receiver	R&S	ESR7	PWB0023	1 Year	2024/10/11
TRILOG Broadband Antenna	Schwarzbeck	VULB9162	PWB0029	1 Year	2024/10/14
Double-Ridged Guide Antenna	ETS-Lindgren	3117	PWB0031	1 Year	2024/10/12
3m Semi Anechoic Chamber	ETS.LINDGREN	Fact 3-2m	PWB0003	3 Years	2024/08/28
Pre-Amplifier	R&S	SCU08F1	PWB0030	1 Year	2024/10/11
Pre-Amplifier	R&S	OSP220 (OSP-B155G)	PWB0042	1 Year	2024/10/13
Test Software	R&S	ELEKTRA V4.20.2	NA	NA	NA

5.1.3 Limits

Class B limit

Frequency range (MHz)	Quasi-peak limits (dBμV/m)	Measurement distance (m)
30 to 88	40	3
88 to 216	43.5	3
216 to 960	46	3
960 to 1000	54	3
Note 1: The lower limit shall apply at the transition frequency. Note 2: Additional provisions may be required for cases where interference occurs.		

Frequency range (GHz)	Average limit (dBμV/m)	Peak limit (dBμV/m)	Measurement distance(m)
1 to 5th harmonic of the highest frequency or 40GHz, witch is lower	54	74	3
Note 1: The lower limit shall apply at the transition frequency. Note 2: Additional provisions may be required for cases where interference occurs.			

Remark: E field strength (dBμV/m) = 20 log E field strength (μV/m)

5.1.4 Test Procedure

The EUT is placed on a non-metallic table 0.8m above the horizontal metal reference ground plane.The distance between EUT and receive antenna should be 3 meters. During the test, the EUT was operating in its typical mode. The test method is according to ANSI C63.4-2014. Sweep the whole frequency Band through the range from 30MHz to 5th harmonic of the carrier. During the test, the height of receive antenna shall be moved from 1 to 4 meters, and the antenna shall be performed under horizontal and vertical polarization. The turn table shall be rotated from 0 to 360 degrees for detecting the maximum of radiated signal level.

The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing. During the test, the EUT is worked at maximum output power.

Below 1GHz, RBW is set to 100 kHz and VBW is set to 300kHz. Above 1GHz, RBW is set to 1MHz and VBW is set to 3MHz.

Required highest frequency for radiated measurement

Highest internal frequency (F_x)	Highest measured frequency
$F_x \leq 1.705$ MHz	30 MHz
1.705 MHz < $F_x \leq$ 108 MHz	1000 MHz
108 MHz < $F_x \leq$ 500 MHz	2000 MHz
500 MHz < $F_x \leq$ 1 GHz	5000 MHz
1 GHz < F_x	5th harmonic of the highest frequency or 40GHz, which is lower
NOTE 1: F_x is highest fundamental frequency generated or used within the EUT or highest frequency at which it operates.	

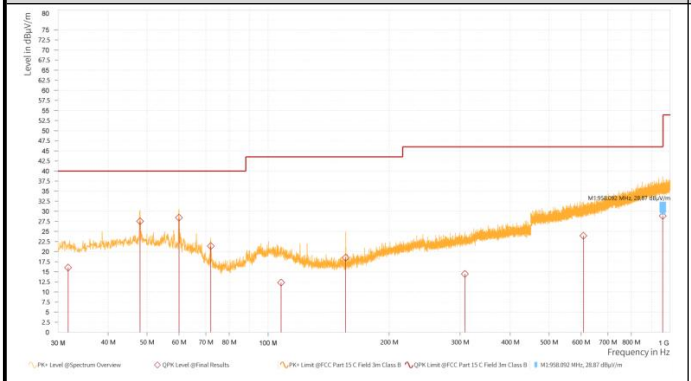
5.1.5 Test Result

Test Site	3m Semi Anechoic Chamber	Test Time	2023/10/29
Engineer	Kane sun	Test Mode	Mode 1

Ambient condition

Temperature	Relative humidity	Pressure
25.5℃	55%RH	101.55kPa

Test Graph

Radiated Emission 30MHz to 1GHz	Radiated Emission 1GHz to 18GHz
	

Signals caused by radio equipment are not required.

Test Data

Radiated Emission 30MHz to 1GHz

Frequency [MHz]	QPK Level [dBμV/m]	QPK Limit [dBμV/m]	QPK Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]
31.800	16.04	40.00	23.96	-18.07	V	358.6
48.000	27.54	40.00	12.46	-15.48	V	256.8
60.000	28.43	40.00	11.57	-16.83	V	64.1
72.000	21.39	40.00	18.61	-20.72	V	360.1
107.700	12.34	43.50	31.16	-17.73	H	103.3
155.940	18.55	43.50	24.95	-20.49	V	180.6
308.580	14.46	46.00	31.54	-14.19	H	0
608.065	23.95	46.00	22.05	-0.84	V	160.6
958.092	28.87	46.00	17.13	4.82	H	276.5

Remark:

1. Correction Factor =Antenna factor + Insertion loss (cable loss + amplifier gain)
2. Margin = Limit - Quasi-Peak

Radiated Emission 1GHz to 18GHz

Frequency [MHz]	PK+ Level [dBμV/m]	PK+ Limit [dBμV/m]	PK+ Margin [dB]	AVG Level [dBμV/m]	AVG Limit [dBμV/m]	AVG Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]
1,030.000	42.06	74.00	31.94	29.83	53.90	24.07	0.66	H	3.8
1,327.000	43.76	74.00	30.24	30.96	53.90	22.94	4.42	V	358.7
1,564.000	43.50	74.00	30.50	30.61	53.90	23.29	4.42	V	1.4
1,785.000	45.68	74.00	28.32	33.47	53.90	20.43	6.81	H	288.6
2,316.500	49.43	74.00	24.57	36.89	53.90	17.01	11.69	H	0.7
2,958.500	50.60	74.00	23.40	37.71	53.90	16.19	13.39	H	103.4
3,398.500	51.62	74.00	22.38	38.29	53.90	15.61	14.01	V	0
3,865.500	52.10	74.00	21.90	39.84	53.90	14.06	15.24	V	316.2
5,017.500	54.17	74.00	19.83	41.78	53.90	12.12	18.31	V	207.7
6,217.500	57.91	74.00	16.09	44.44	53.90	9.46	21.52	V	0
16,871.000	53.60	74.00	20.40	41.04	53.90	12.86	21.73	H	360

Remark:

1. Correction Factor =Antenna factor + Insertion loss (cable loss + amplifier gain)
2. Margin = Limit - (PK+) or CAV

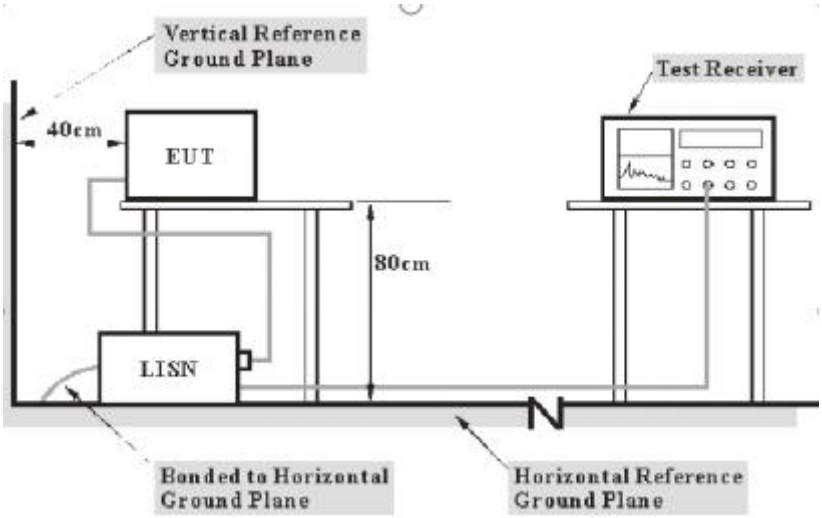
5.1.6 Uncertainty Measurement

Where relevant,the following measurement uncertainty levels have been estimated for tests performed on the EUT. The listed uncertainties are the worst case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

CASE	Uncertainty
Radiated Emission	30MHz to 1GHz: 4.88 dB 1GHz to 6GHz: 5.12 dB

5.2 Conducted Emission

5.2.1 Test System Diagram



5.2.2 Test Equipment

Instrument	Manufacturer	Model	Asset No.	Cal. Interval	Cal. Due Date
EMI Test Receiver	R&S	ESR 3	PWB0061	1 Year	2024/10/11
LISN	R&S	ENV216	PWB0062	1 Year	2024/10/11
Test Software	R&S	ELEKTRA V4.20.2	NA	NA	NA

5.2.3 Limits

Class B limit (AC port)

Frequency range (GHz)	Quasi Peak limit dBμV	Average limit dBμV
0.15MHz – 0.50MHz	66 to 56	56 to 46
0.50MHz – 5MHz	56	46
5MHz – 30MHz	60	50
Note : The lower limit shall apply at the transition frequency.		

5.2.4 Test Procedure

The EUT is placed on a non-metallic table of 80cm height above the horizontal metal reference ground plane. During the test, the EUT was operating in its typical mode. The test method is according to ANSI C63.4-2014. Connect the AC power line of the EUT to the L.I.S.N. Use EMI receiver to detect the average and Quasi-peak value. The measurement result should include both L line and N line.

The frequency Band range is from 150 kHz to 30MHz. RBW is set to 9 kHz and VBW is set to 30 kHz on test receiver.

5.2.5 Test Result

NA

5.2.6 Uncertainty Measurement

Where relevant,the following measurement uncertainty levels have been estimated for tests performed on the EUT.

The listed uncertainties are the worst case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

CASE	Uncertainty
Continuous Emission (AC port)	2.92 dB

Appendix A – The EUT Photograph

Refer to “Attachment 1: External Photograph” and “ Attachment 2: Internal Photograph” file.

Appendix B – Test Setup Photograph

Refer to “Attachment 6: EMC Test Setup Photograph” file.

****** End of the Report ******