

SPOT CHECK REPORT

FCC ID: XMR2022EM060KGL
Applicant: Quectel Wireless Solutions Co., Ltd
Product: LTE-A Cat 6 M.2 Module
Model No.: EM060K-GL
Brand Name: Quectel
FCC Rule(s): Part90 Subpart R
Result: Complies
Received Date: 2023-09-22
Test Date: 2023-09-25 ~ 2023-10-10

Reviewed By:

Sunny Sun

Approved By:

Robin Wu



The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.26-2015. Test results reported herein relate only to the item(s) tested.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date	Note
2309RSU052-U2	V01	Initial Report	2023-10-26	Valid

Note: This report is prepared for FCC Class II permissive supplement to FCC ID: XMR2022EM060KGL adding a new antenna & modify the tune up power and related data.

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1.4. Product Information

Product Name	LTE-A Cat 6 M.2 Module
Model No.	EM060K-GL
Brand Name	Quectel
IMEI	Conducted sample: 867228050091049 Radiated sample: 857228050091213
3GPP Specification	WCDMA Band II/IV/V LTE FDD Band 2, 4, 5, 7, 12, 13, 14, 17, 25, 26, 30, 66, 71 LTE TDD Band 38, 41, 42, 43, 46, 48
GNSS Specification	GPS, GLONASS, Bei Dou, Galileo
Temperature Operating Range	-25 ~ 75 °C
Power Supply Rating	3.135 ~ 4.4Vdc, typical 3.7Vdc
Remark:	The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.

1.5. Radio Specification under Test

E-UTRA Specification	
TX Frequency Range	Band 14: 788 ~ 798 MHz
RX Frequency Range	Band 14: 758 ~ 768 MHz
Modulation	UL up to 16QAM & DL up to 64QAM
Power Class	3

1.6. Description of Available Antennas

Technology	Frequency Range (MHz)	Antenna Type	Max Peak Gain (dBi)
LTE Band 2	1850 ~ 1910	Dipole PIFA	0.25
LTE Band 4	1710 ~ 1755		1.47
LTE Band 5	824 ~ 849		1.10
LTE Band 7	2500 ~ 2570		2.40
LTE Band 12	699 ~ 716		1.30
LTE Band 13	777 ~ 787		1.30
LTE Band 14	788 ~ 798		1.30
LTE Band 17	704 ~ 716		1.30
LTE Band 25	1850 ~ 1915		0.25
LTE Band 26	814 ~ 849		1.30
LTE Band 30	2305 ~ 2315		-3.00
LTE Band 38	2570 ~ 2620		2.40
LTE Band 41	2496 ~ 2690		2.40
LTE Band 42	3450 ~ 3550		-1.80
LTE Band 43	3700 ~ 3800		0.60
LTE Band 48	3550 ~ 3700		0.60
LTE Band 66	1710 ~ 1780		1.47
LTE Band 71	663 ~ 698		1.22

Note 1: All antenna information (Antenna type and Peak Gain) is provided by the manufacturer.

Note 2: The typical antennas used to calculate the ERP (EIRP).

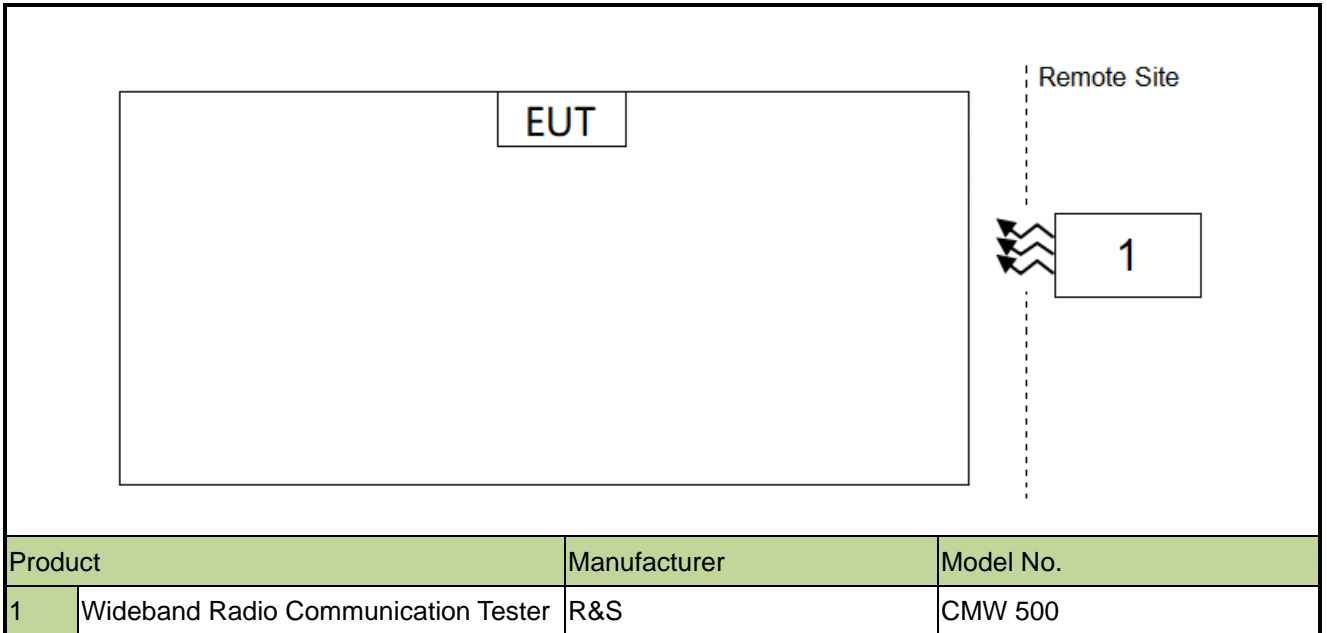
1.7. Test Methodology

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

- ANSI C63.26:2015
- FCC CFR 47 Part 90
- FCC KDB 971168 D01 v03r01: Power Meas License Digital Systems
- FCC KDB 971168 D02 v02r01: Misc Rev Approv License Devices
- FCC KDB 412172 D01 v01r01: Determining ERP and EIRP

2. Test Configuration

2.1. Test System Connection Diagram



2.2. Test Environment Condition

Ambient Temperature	15 ~ 35°C
Relative Humidity	20% ~ 75%RH

3. Measuring Instrument

Instrument	Manufacturer	Model No.	Asset No.	Cali. Interval	Cali. Due Date	Test Site
TRILOG Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2024-05-15	WZ-AC2
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2024-09-17	WZ-AC2
EMI Test Receiver	Agilent	N9038A	MRTSUE06125	1 year	2024-05-23	WZ-AC2
Thermohygrometer	Mingle	ETH529	MRTSUE06170	1 year	2023-11-27	WZ-AC2
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06171	1 year	2023-10-13	WZ-AC2
Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2024-05-07	WZ-AC2
Anechoic Chamber	RIKEN	WZ-AC2	MRTSUE06213	1 year	2024-04-20	WZ-AC2
Horn Antenna	ETS	3117	MRTSUE06257	1 year	2024-09-23	WZ-AC2
Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06597	1 year	2023-11-05	WZ-AC2
Preamplifier	EMCI	EMC184045SE	MRTSUE06640	1 year	2024-01-12	WZ-AC2
Preamplifier	EMCI	EMC051845SE	MRTSUE06987	1 year	2024-09-07	WZ-AC2
Thermohygrometer	testo	608-H1	MRTSUE11038	1 year	2023-11-01	WZ-AC2
Communication Tester	R&S	CMW500	MRTSUE06243	1 year	2024-09-27	SIP-SR1
Communication Tester	R&S	CMW500	MRTSUE06243	1 year	2023-10-08	SIP-SR1
Thermohygrometer	testo	622	MRTSUE06629	1 year	2024-01-03	SIP-SR1
Communication Tester	R&S	CMW500	MRTSUE06881	1 year	2024-05-23	SIP-SR1
DC POWER MODULE	Keysight	N6743B	MRTSUE06905	N/A	N/A	SIP-SR1
DC POWER MODULE	Keysight	N6743B	MRTSUE06906	N/A	N/A	SIP-SR1
Signal Analyzer	Keysight	N9021B	MRTSUE06915	1 year	2023-12-28	SIP-SR1
Temperature Chamber	BAOYT	BYG-80CL	MRTSUE06932	1 year	2024-02-12	SIP-SR1
Shielding Room	MIX-BEP	SIP-SR1	MRTSUE06948	N/A	N/A	SIP-SR1

Software	Version	Function
EMI Software	V3.0.0	EMI Test Software
Controller_MF 7802	2.03C	RE Antenna & Turntable

4. Decision Rules and Measurement Uncertainty

4.1. Decision Rules

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4: 2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

4.2. Measurement Uncertainty

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

Radiated Spurious Emissions	
The maximum measurement uncertainty is evaluated as:	
Coaxial:	9kHz~30MHz: 2.59dB
Coplanar:	9kHz~30MHz: 2.60dB
Horizontal:	30MHz~200MHz: 3.85dB
	200MHz~1GHz: 4.36dB
	1GHz~40GHz: 4.98dB
Vertical:	30MHz~200MHz: 4.06dB
	200MHz~1GHz: 5.28dB
	1GHz~40GHz: 4.91dB
Output Power	
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$):	
1.5dB	

5. Test Result

5.1. Summary

FCC Part Section(s)	Test Description	Test Condition	Test Result
90.542(a)(7)	Equivalent Radiated Power	Conducted	Pass
2.1053, 90.543(e)(3) (f)	Transmitter Spurious Emission	Radiated	Pass

Notes:

- 1) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
- 2) For radiated emission tests, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst-case emissions.

5.2. Equivalent Isotropically Radiated Power Measurement

5.2.1. Test Limit

Control stations and mobile stations transmitting in the 758-768 MHz band and the 788-798 MHz band are limited to 30 watts ERP.

5.2.2. Test Procedure

ANSI C63.26-2015 - Section 5.2

5.2.3. Test Setting

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter.

The relevant equation for determining the maximum ERP or EIRP from the measured RF output power is given in Equation (1) as follows:

$$\text{ERP or EIRP} = P_{\text{Meas}} + G_{\text{T}}$$

where

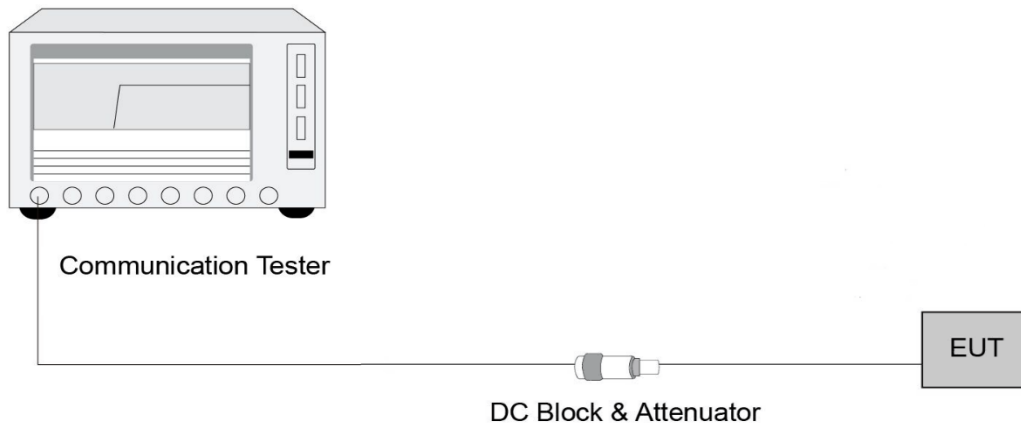
ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as P_{Meas} , e.g., dBm or dBW)

P_{Meas} measured transmitter output power or PSD, in dBm or dBW

G_{T} gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

$$\text{ERP} = \text{EIRP} - 2.15$$

5.2.4. Test Setup



5.2.5. Test Result

Refer to Appendix A.1.

5.3. Radiated Spurious Emissions Measurement

5.3.1. Test Limit

Out of band emissions: The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. The emission limit equal to -13dBm.

For operations in the 758-775 MHz and 788-805 MHz bands, all emissions including harmonics in the band 1559-1610 MHz shall be limited to -70 dBW/MHz (-40 dBm/MHz) equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW (-50 dBm) EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

E (dB μ V/m) = EIRP (dBm) - $20 \log D$ + 104.8; where D is the measurement distance in meters. The emission limit equal to 82.3dB μ V/m or 55.3dB μ V/m.

5.3.2. Test Procedure

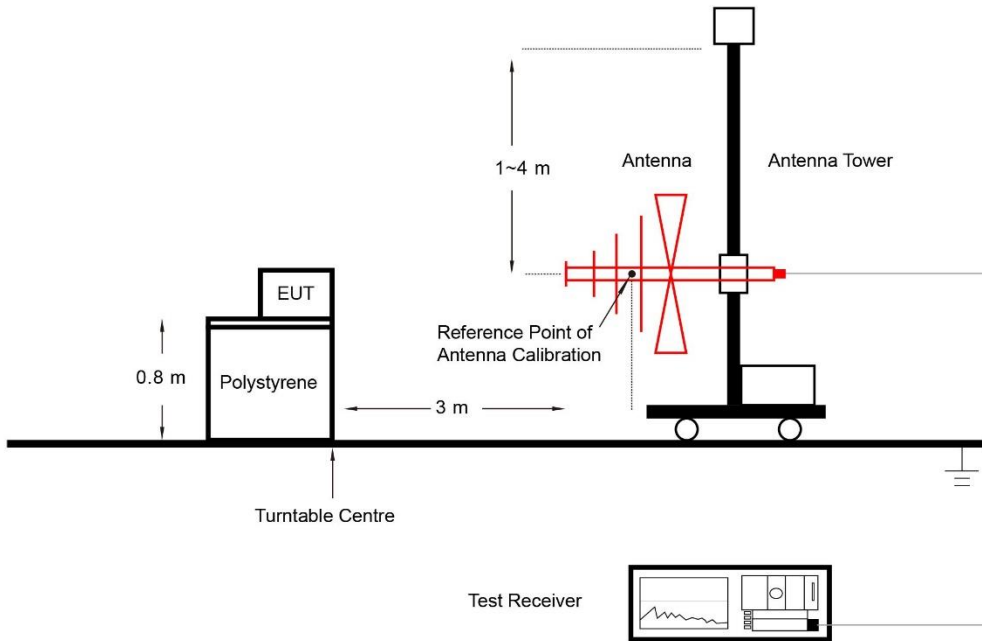
ANSI C63.26-2015 - Section 5.2.7 & 5.5

5.3.3. Test Setting

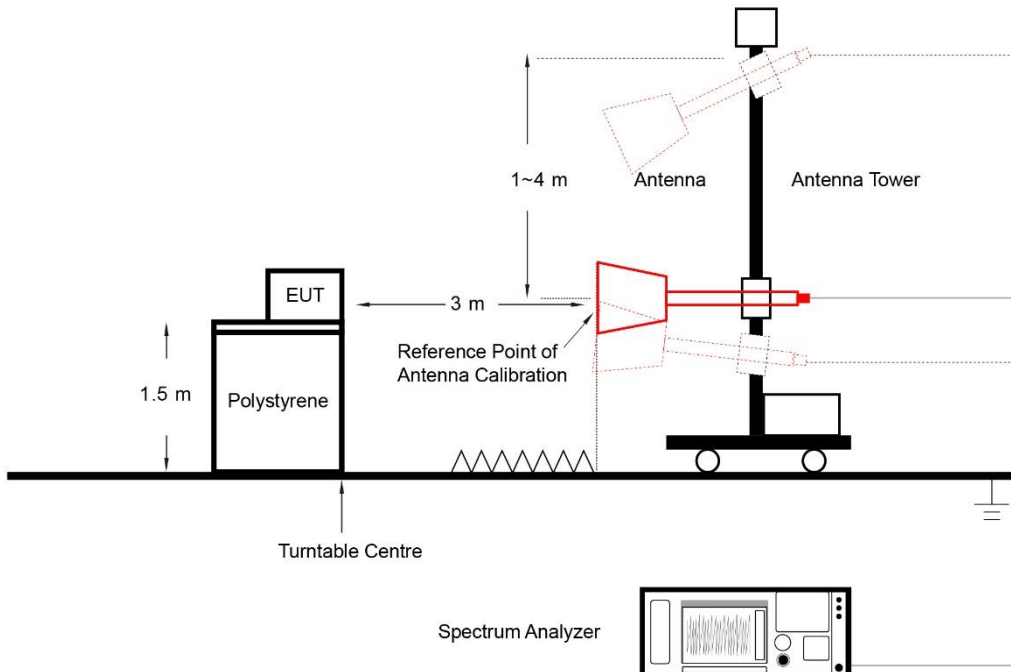
1. RBW = 1MHz
2. VBW ≥ 3 *RBW
3. Sweep time $\geq 10 \times$ (number of points in sweep) \times (transmission symbol period)
4. Detector = Peak
5. Trace mode = max hold
6. The trace was allowed to stabilize

5.3.4. Test Setup

Below 1GHz Test Setup:



Above 1GHz Test Setup:



5.3.5. Test Result

Refer to Appendix A.2.

Appendix A - Test Result

A.1 Equivalent Isotropically Radiated Power Test Result

Test Site	SIP-SR1	Test Engineer	Yoniter Yang
Test Date	2023-09-25 ~ 2023-10-10	Test Band	Band 14

Frequency (MHz)	Channel Bandwidth (MHz)	RB Size	RB Offset	Output Power (dBm)	ERP (dBm)	Limit (dBm)
QPSK						
790.5	5	1	0	23.61	22.76	<34.77
793.0				23.58	22.73	<34.77
795.5				23.61	22.76	<34.77
790.5	5	1	12	23.67	22.82	<34.77
793.0				23.65	22.80	<34.77
795.5				23.65	22.80	<34.77
790.5	5	1	24	23.57	22.72	<34.77
793.0				23.55	22.70	<34.77
795.5				23.61	22.76	<34.77
790.5	5	25	0	22.69	21.84	<34.77
793.0				22.65	21.80	<34.77
795.5				22.66	21.81	<34.77
793.0	10	1	0	23.63	22.78	<34.77
793.0			24	23.61	22.76	<34.77
793.0			49	23.56	22.71	<34.77
793.0	10	50	0	22.65	21.80	<34.77

Note: The ERP (dBm) = Output Power (dBm) + Antenna Gain (dBi) - 2.15

A.2 Radiated Spurious Emissions Test Result

Test Site	WZ-AC2	Test Engineer	Carl Jiang
Test Date	2023-09-29 ~ 2023-09-30	Test Band	LTE Band 14, 1RB, QPSK

Frequency (MHz)	Reading Level (dB μ V)	Factor (dB/m)	Measure Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector	Polarization
Middle Channel							
1578.000	36.6	-5.3	31.3	55.3	-24.0	Peak	Horizontal
15025.000	33.4	19.3	52.7	82.3	-29.6	Peak	Horizontal
1595.000	37.6	-5.4	32.2	55.3	-23.1	Peak	Vertical
1765.000	56.2	-5.3	50.9	82.3	-31.4	Peak	Vertical

Note: Measure Level (dB μ V/m) = Reading Level (dB μ V) + Factor (dB/m)

Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Appendix B - Test Setup Photograph

Refer to "2309RSU052-UT" file.

Appendix C - EUT Photograph

Refer to "2309RSU052-UE" file.

————— The End —————