

MEASUREMENT REPORT

FCC PART 90

FCC ID: XMR2020EM160RGL

Application: Quectel Wireless Solutions Company Limited

Application Type: Class II Permissive Change

Product: LTE-A Cat 16 M.2 Module

Model No.: EM160R-GL


Brand Name: Quectel

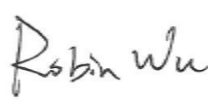
FCC Rule Part(s): Part 90 Subpart R

Classification: PCB Licensed Transmitter (PCB)

Test Procedure(s): ANSI C63.26-2015

Test Date: January 10 ~ 20, 2021

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
2101RSU060-U3	Rev. 01	Initial Report	01-30-2021	Valid

Note: This report is prepared for FCC Class II permissive supplement to MRT Original report No. 2006RSU008-U3 adding antenna and related data.

CONTENTS

Description	Page
1. GENERAL INFORMATION	4
1.1. Applicant	4
1.2. Manufacturer	4
1.3. Testing Facility.....	4
2. PRODUCT INFORMATION	5
2.1. Equipment Description	5
2.2. Product Specification Subjective to this Report	5
2.3. Test Methodology	5
2.4. EMI Suppression Device(s)/Modifications.....	5
2.5. Configuration of Tested System	6
2.6. Test Environment Condition.....	6
3. TEST EQUIPMENT CALIBRATION DATE.....	7
4. MEASUREMENT UNCERTAINTY	8
5. TEST RESULT	9
5.1. Summary.....	9
5.2. Radiated Spurious Emissions Measurements	10
5.2.1. Test Limit	10
5.2.2. Test Procedure Used	10
5.2.3. Test Setting.....	10
5.2.4. Test Setup	11
5.2.5. Test Result.....	12
6. CONCLUSION	13
Appendix A - Test Setup Photograph.....	14
Appendix B - EUT Photograph.....	15

2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name:	LTE-A Cat 16 M.2 Module
Model No.:	EM160R-GL
Brand Name:	Quectel
IMEI:	864292050003514
Single Band:	Band 2, 4, 5, 7, 12, 13, 14, 25, 26, 30, 38, 41, 48, 66
Intra-Band:	CA_41C
Category:	Category 16
Operating Temperature:	-25 ~ 75 °C
Power Type:	3.1 ~ 4.4Vdc, typical 3.7Vdc

2.2. Product Specification Subjective to this Report

FDD Tx Frequency Range:	Band 14: 788 ~ 798 MHz
FDD Rx Frequency Range:	Band 14: 758 ~ 768 MHz
Type of Modulation:	QPSK, 16QAM, 64QAM, 256QAM (DL)

Note 1: For other features of this EUT, test report will be issued separately.

Note 2: The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

2.3. Test Methodology

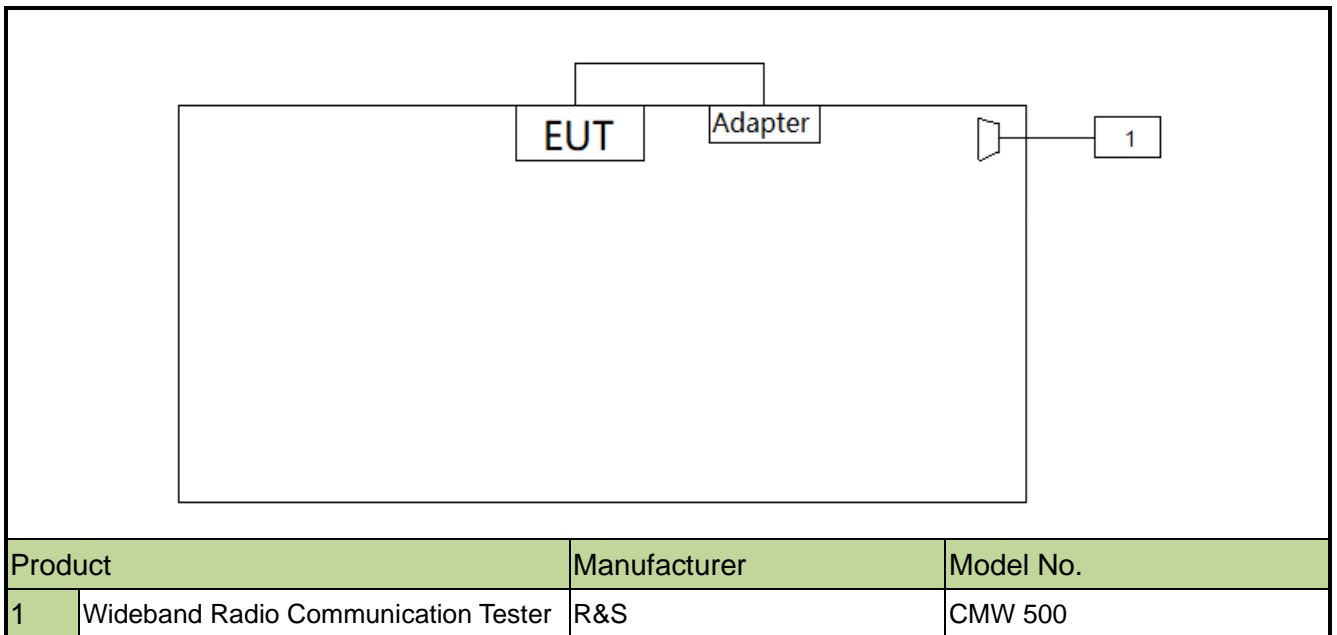
According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 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

2.4. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

2.5. Configuration of Tested System



2.6. Test Environment Condition

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

3. TEST EQUIPMENT CALIBRATION DATE

Radiated Emission (WZ-AC1)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2021/08/01
Wideband Radio Communication Tester	R&S	CMW 500	MRTSUE06243	1 year	2021/11/07
PXA Signal Analyzer	Keysight	9030B	MRTSUE06395	1 year	2021/09/03
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/11/10
Bilog Period Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2021/03/31
Broad Band Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2021/10/13
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06597	1 year	2021/02/23
Microwave System Amplifier	Agilent	83017A	MRTSUE06076	1 year	2021/11/15
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2021/06/11
Thermohygrometer	Testo	608-H1	MRTSUE06403	1 year	2021/08/08
Anechoic Chamber	TDK	Chamber-AC1	MRTSUE06212	1 year	2021/04/30

Radiated Emission (WZ-AC2)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Keysight	N9038A	MRTSUE06125	1 year	2021/08/01
Wideband Radio Communication Tester	R&S	CMW 500	MRTSUE06243	1 year	2021/11/07
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/11/10
Bilog Period Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2021/10/13
Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06171	1 year	2021/10/27
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06597	1 year	2021/02/23
Broad Band Coaxial Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2021/11/15
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2021/06/11
Temperature/Humidity Meter	Minggao	ETH529	MRTSUE06170	1 year	2021/12/15
Anechoic Chamber	RIKEN	Chamber-AC2	MRTSUE06213	1 year	2021/04/30

Software	Version	Function
EMI Software	V3	EMI Test Software

4. 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 Emission Measurement

Measurement Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$):

Horizontal: 9kHz~300MHz: 5.04dB

300MHz~1GHz: 4.95dB

1GHz~40GHz: 6.40dB

Vertical: 9kHz~300MHz: 5.24dB

300MHz~1GHz: 6.03dB

1GHz~40GHz: 6.40dB

5. TEST RESULT

5.1. Summary

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
2.1053, 90.543(e)(3) 90.543(f)	Spurious Emissions	$> 43 + 10\log_{10} (P_{\text{Watts}})$	Radiated	Pass	Section 5.2

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) Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations the worst-case was found.
- 3) This report is based on the original application to change antenna and evaluate the radiated spurious emission.

5.2. Radiated Spurious Emissions Measurements

5.2.1. 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.

5.2.2. Test Procedure Used

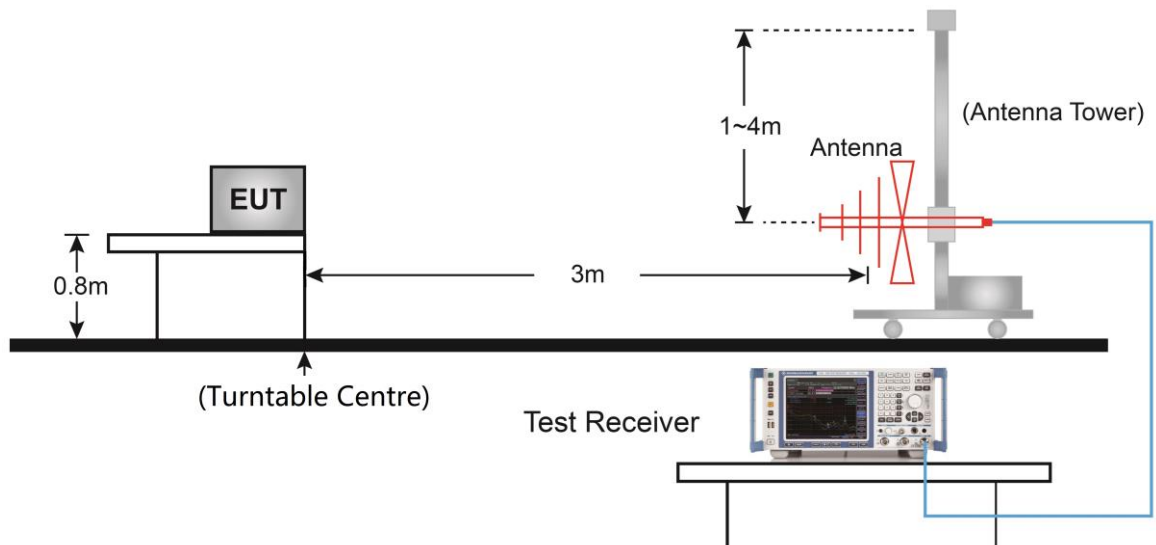
ANSI C63.26-2015 - Section 5.2.7 & 5.5

5.2.3. Test Setting

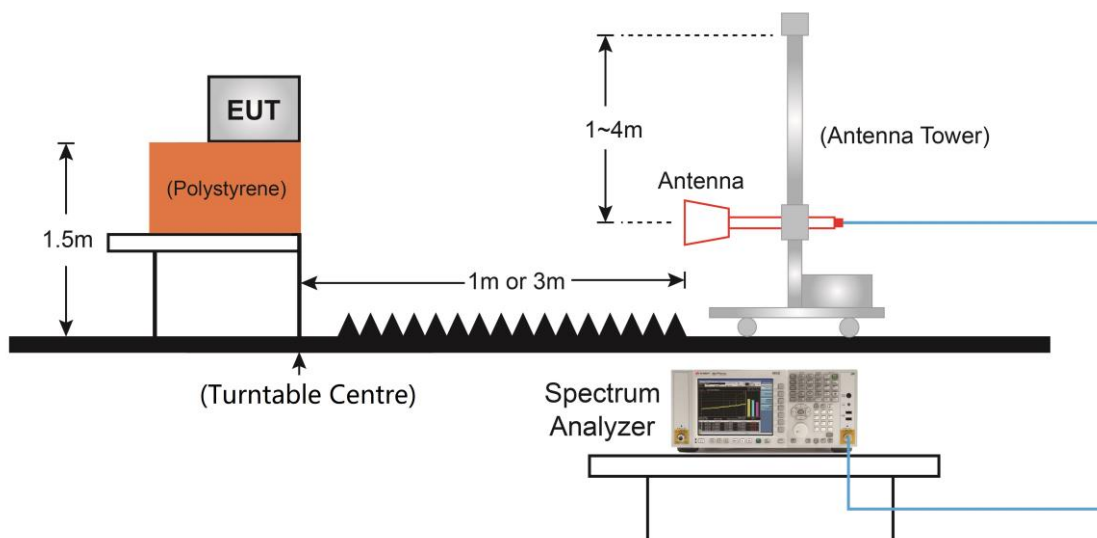
1. RBW = 1MHz
2. VBW ≥ 3 *RBW
3. Sweep time $\geq 10 \times$ (number of points in sweep) \times (transmission symbol period)
4. Detector = Peak
5. Trace mode = max hold
6. The trace was allowed to stabilize

5.2.4. Test Setup

Below 1GHz Test Setup:



Above 1GHz Test Setup:



5.2.5. Test Result

Product	LTE-A Cat 16 M.2 Module	Test Site	WZ-AC2
Test Engineer	Buter Shi	Test Date	2021/01/16
Test Band	LTE Band 14 - 5MHz Bandwidth, 1RB, QPSK		

Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
Bottom CH 23305 (790.5MHz)							
2411.0	38.4	-0.8	37.6	82.3	-44.7	Peak	Horizontal
8072.0	32.3	12.7	45.0	82.3	-37.3	Peak	Horizontal
2411.0	38.6	-0.8	37.8	82.3	-44.5	Peak	Vertical
7553.5	32.4	12.3	44.7	82.3	-37.6	Peak	Vertical
Middle CH 23330 (793.0MHz)							
2411.0	38.2	-0.8	37.4	82.3	-44.9	Peak	Horizontal
8038.0	32.7	12.6	45.3	82.3	-37.0	Peak	Horizontal
2411.0	39.8	-0.8	39.0	82.3	-43.3	Peak	Vertical
7171.0	33.4	11.9	45.3	82.3	-37.0	Peak	Vertical
Top CH 23355 (795.5MHz)							
2411.0	37.4	-0.8	36.6	82.3	-45.7	Peak	Horizontal
6550.5	33.1	8.8	41.9	82.3	-40.4	Peak	Horizontal
2411.0	38.9	-0.8	38.1	82.3	-44.2	Peak	Vertical
9738.0	33.2	15.2	48.4	82.3	-33.9	Peak	Vertical
Note: Measure Level (dBm) = Reading Level (dBm) + Factor (dB).							

6. CONCLUSION

The data collected relate only the item(s) tested and show that unit is compliance with FCC Rules.

Appendix A - Test Setup Photograph

Refer to "2101RSU060-UT" file.

Appendix B - EUT Photograph

Refer to "2101RSU060-UE" file.