



RF Exposure Evaluation Declaration

FCC ID: XMR2020EM160RGL
Application: Quectel Wireless Solutions Company Limited
Application Type: Certification
Product: LTE-A Cat 16 M.2 Module
Model No.: EM160R-GL
Brand Name: Quectel
FCC Classification: PCS Licensed Transmitter (PCB)
Test Procedure(s): KDB 447498 D01v06

Reviewed By: 

Sunny Sun

Approved By: 

Robin Wu



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standards through the calibration of the equipment and evaluated measurement uncertainty herein.

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Revision History

Report No.	Version	Description	Issue Date	Note
2101RSU060-U6	Rev. 01	Initial Report	01-30-2021	Valid

2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name:	LTE-A Cat 16 M.2 Module
Model No.:	EM160R-GL
Brand Name:	Quectel
LTE Specification	
Single Band:	Band 2, 4, 5, 7, 12, 13, 14, 25, 26, 30, 38, 41, 48, 66
Intra-Band:	CA_41C
Category:	Category 16
UMTS Specification	
Single Band:	Band 2, 5
Category:	Category 6
Operating Temperature:	-25 ~ 75 °C
Power Type:	3.1 ~ 4.4Vdc, typical 3.7Vdc

3. RF Exposure Evaluation

3.1. Limits

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b)

Limits for Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time (Minutes)
(A) Limits for Occupational/ Control Exposures				
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/ Uncontrolled Exposures				
300-1500	--	--	f/1500	30
1500-100,000	--	--	1	30

f= Frequency in MHz

Calculation Formula: $Pd = (Pout \cdot G) / (4 \cdot \pi \cdot r^2)$

Where

Pd = power density in mW/cm²

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

r = distance between observation point and center of the radiator in cm

Pd is the limit of MPE, 1mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

3.2. Test Result of RF Exposure Evaluation

Product	LTE-A Cat 16 M.2 Module
Test Item	Standalone Power Density Evaluation

Test Mode	Frequency Band (MHz)	Maximum Conducted Power (dBm)	Antenna Gain (dBi)	ERP (EIRP) (dBm)	Power Density at 20cm (mW/cm ²)	Limit (mW/cm ²)
WCDMA B2	1850 ~ 1910	25.00	8.00	33.00	0.3969	1.0000
WCDMA B4	1710 ~ 1755	25.00	8.00	33.00	0.3969	1.0000
WCDMA B5	824 ~ 849	25.00	5.00	30.00	0.1989	0.5493
LTE B2	1850 ~ 1910	25.00	8.00	33.00	0.3969	1.0000
LTE B4	1710 ~ 1755	25.00	8.00	33.00	0.3969	1.0000
LTE B5	824 ~ 849	25.00	5.00	30.00	0.1989	0.5493
LTE B7	2500 ~ 2570	25.00	8.00	33.00	0.3969	1.0000
LTE B12	699 ~ 716	25.00	5.00	30.00	0.1989	0.4660
LTE B13	777 ~ 787	25.00	5.00	30.00	0.1989	0.5180
LTE B14	788 ~ 798	25.00	5.00	30.00	0.1989	0.5253
LTE B25	1850 ~ 1915	25.00	8.00	33.00	0.3969	1.0000
LTE B26	814 ~ 849	25.00	5.00	30.00	0.1989	0.5427
LTE B30	2305 ~ 2315	25.00	5.00	30.00	0.1989	1.0000
LTE B38	2570 ~ 2620	25.00	8.00	33.00	0.3969	1.0000
LTE B41	2496 ~ 2690	26.50	6.50	33.00	0.3969	1.0000
LTE B48	3550 ~ 3700	25.00	5.00	30.00	0.1989	1.0000
LTE B66	1710 ~ 1780	25.00	8.00	33.00	0.3969	1.0000

Product	LTE-A Cat 16 M.2 Module
Test Item	Collocated Power Density Evaluation

Test Mode	Frequency Band (MHz)	Maximum Conducted Power (dBm)	Antenna Gain (dBi)	ERP (EIRP) (dBm)	Power Density at 20cm (mW/cm ²)	Limit (mW/cm ²)	Power Density / Limit
WCDMA B2	1850 ~ 1910	25.00	8.00	33.00	0.3969	1.0000	0.3969
WCDMA B4	1710 ~ 1755	25.00	8.00	33.00	0.3969	1.0000	0.3969
WCDMA B5	824 ~ 849	25.00	5.00	30.00	0.1989	0.5493	0.3621
LTE B2	1850 ~ 1910	25.00	8.00	33.00	0.3969	1.0000	0.3969
LTE B4	1710 ~ 1755	25.00	8.00	33.00	0.3969	1.0000	0.3969
LTE B5	824 ~ 849	25.00	5.00	30.00	0.1989	0.5493	0.3621
LTE B7	2500 ~ 2570	25.00	8.00	33.00	0.3969	1.0000	0.3969
LTE B12	699 ~ 716	25.00	5.00	30.00	0.1989	0.4660	0.4268
LTE B13	777 ~ 787	25.00	5.00	30.00	0.1989	0.5180	0.3840
LTE B14	788 ~ 798	25.00	5.00	30.00	0.1989	0.5253	0.3786
LTE B25	1850 ~ 1915	25.00	8.00	33.00	0.3969	1.0000	0.3969
LTE B26	814 ~ 849	25.00	5.00	30.00	0.1989	0.5427	0.3665
LTE B30	2305 ~ 2315	25.00	5.00	30.00	0.1989	1.0000	0.1989
LTE B38	2570 ~ 2620	25.00	8.00	33.00	0.3969	1.0000	0.3969
LTE B41	2496 ~ 2690	26.50	6.50	33.00	0.3969	1.0000	0.3969
LTE B48	3550 ~ 3700	25.00	5.00	30.00	0.1989	1.0000	0.1989
LTE B66	1710 ~ 1780	25.00	8.00	33.00	0.3969	1.0000	0.3969
Wi-Fi 2.4GHz	2412 ~ 2462	20.00	5.00	25.00	0.0629	1.0000	0.0629
Wi-Fi 5GHz	5150 ~ 5825	25.00	5.00	30.00	0.1989	1.0000	0.1989
Bluetooth	2402 ~ 2480	15.00	5.00	20.00	0.0199	1.0000	0.0199

WWAN Power Density / Limit	Wi-Fi Power Density / Limit	Bluetooth Power Density / Limit	Σ (Power Density / Limit)
0.4268	0.1989	0.0199	0.6456

Note:

1. For collocation analysis, LTE Band 12 is chosen for summation due to the highest (power density / limit) among all WWAN wireless modes.
2. Σ (Power Density / Limit): This is a summation of [(power density for each transmitter / antenna included in the simultaneous transmission) / (corresponding MPE limit)], for WWAN + Wi-Fi + Bluetooth.
3. Considering the WWAN module collocation with the WLAN and Bluetooth transmitter of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and MPE of 3 collocated transmitters is compliant.

Conclusion

Based on 47 CFR § 2.1091 and FCC KDB 447498 D01 v06, the analysis concludes that this product when transmitting in standalone within a host device, is compliant with the FCC RF exposure requirements in mobile exposure condition, provided the conducted power and antenna gain do not exceed the limits for each given frequency band per technology as follow table:

Device	Band	Frequency Band (MHz)	Maximum Conducted Power (dBm)	Maximum Antenna Gain (dBi)
EM160R-GL	WCDMA B2	1850 ~ 1910	25.00	8.00
	WCDMA B4	1710 ~ 1755	25.00	8.00
	WCDMA B5	824 ~ 849	25.00	5.00
	LTE B2	1850 ~ 1910	25.00	8.00
	LTE B4	1710 ~ 1755	25.00	8.00
	LTE B5	824 ~ 849	25.00	5.00
	LTE B7	2500 ~ 2570	25.00	8.00
	LTE B12	699 ~ 716	25.00	5.00
	LTE B13	777 ~ 787	25.00	5.00
	LTE B14	788 ~ 798	25.00	5.00
	LTE B25	1850 ~ 1915	25.00	8.00
	LTE B26	814 ~ 849	25.00	5.00
	LTE B30	2305 ~ 2315	25.00	5.00
	LTE B38	2570 ~ 2620	25.00	8.00
	LTE B41	2496 ~ 2690	26.50	6.50
	LTE B48	3550 ~ 3700	25.00	5.00
LTE B66	1710 ~ 1780	25.00	8.00	
Collocated Transmitters	Wi-Fi 2.4GHz	2412 ~ 2462	20.00	5.00
	Wi-Fi 5GHz	5150 ~ 5825	25.00	5.00
	Bluetooth	2402 ~ 2480	15.00	5.00

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Appendix A – EUT Photograph

Refer to “2101RSU060-UE” file.