RF EXPOSURE REPORT

Report No.: 15050058-FCC-H

Applicant	Quectel Wireless Solutions Co., Ltd.
Product Name	GSM/GPRS Module
Model No.	M95
Serial No.	N/A
Test Standard	FCC 2.1091.2014
Test Date	December 19 to December 31, 2015
Issue Date	December 31, 2015
Test Result	☑ Pass ☐ Fail
Equipment complied with the specification	☑
Equipment did not comply with the specification	☐

Winnie Zhang	David Huang	
Winnie Zhang Test Engineer	David Huang Checked By	

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Test result presented in this test report is applicable to the tested sample only

Issued by:

SIEMIC (SHENZHEN-CHINA) LABORATORIES

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Laboratories Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.

In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

Accreditations for Conformity Assessment

Country/Region	Scope
USA	EMC, RF/Wireless, SAR, Telecom
Canada	EMC, RF/Wireless, SAR, Telecom
Taiwan	EMC, RF, Telecom, SAR, Safety
Hong Kong	RF/Wireless, SAR, Telecom
Australia	EMC, RF, Telecom, SAR, Safety
Korea	EMI, EMS, RF, SAR, Telecom, Safety
Japan	EMI, RF/Wireless, SAR, Telecom
Singapore	EMC, RF, SAR, Telecom
Europe	EMC, RF, SAR, Telecom, Safety

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1. Report Revision History

Report No.	Report Version	Description	Issue Date
15050058-FCC-H	NONE	Original	December 31, 2015

2. Customer information

Applicant Name	Quectel Wireless Solutions Co., Ltd.
Applicant Add	RM501,Building 13,No.99 TianZhou Road,Xuhui District,Shanghai,China
Manufacturer	Quectel Wireless Solutions Co., Ltd.
Manufacturer Add	RM501,Building 13,No.99 TianZhou Road,Xuhui District,Shanghai,China

3. Test site information

Lab performing tests	SIEMIC (Shenzhen-China) LABORATORIES
Lab Address	Zone A, Floor 1, Building 2 Wan Ye Long Technology Park South Side of Zhoushi Road, Bao' an District, Shenzhen, Guangdong China 518108
FCC Test Site No.	718246
IC Test Site No.	4842E-1
Test Software	Labview of SIEMIC version 2.0

4. Equipment under Test (EUT) Information

Description of EUT:	GSM/GPRS Module
Main Model:	M95
Serial Model:	N/A
Equipment Category :	PCB
Antenna Gain:	GSM850: 1dBi PCS1900: 1dBi
Input Power:	Spec: DC 4.0V
Trade Name :	Quectel
FCC ID:	XMR201512M95
Type of Modulation:	GSM / GPRS: GMSK
RF Operating Frequency (ies):	GSM850 TX: 824.2 ~ 848.8 MHz; RX: 869.2 ~ 893.8 MHz PCS1900 TX: 1850.2 ~ 1909.8 MHz; RX: 1930.2 ~ 1989.8 MHz
Number of Channels:	GSM 850: 124CH PCS1900: 299CH

5. FCC §2.1091 - Maximum Permissible exposure (MPE)

6.1 Applicable Standard

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission' s guidelines.

According to §1.1310 and §2.1091 RF exposure is calculated.

Limits for General Population/Uncontrolled Exposure

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

6.2 Test Result

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

Where: S = power density (in appropriate units, e.g. mW/cm^2)

P = power input to the antenna (in appropriate units, e.g., mW).

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

GSM Mode:

Burst Average Power (dBm);								
Band	GSM850				PCS1900			
Channel	128	190	251	Tune up Power tolerant	512	661	810	Tune up Power tolerant
Frequency (MHz)	824.2	836.6	848.8	/	1850.2	1880	1909.8	/
GSM Voice (1 uplink),GMSK	**32.08**	32.08	32.07	32.5±1	29.21	**29..22**	29.21	29.5±1
GPRS Multi-Slot Class 8 (1 uplink),GMSK	32.07	32.05	32.07	32.5±1	29.09	29.14	28.91	29.5±1
GPRS Multi-Slot Class 10 (2 uplink) GMSK	31.98	31.99	31.93	32.5±1	29.02	29.1	28.91	29.5±1
GPRS Multi-Slot Class 12 (4 uplink) GMSK	29.59	29.61	29.73	29.5±1	28.85	28.96	28.88	29.5±1

Remark :

GPRS, CS1 coding scheme.

Multi-Slot Class 8 , Support Max 4 downlink, 1 uplink , 5 working link

Multi-Slot Class 10 , Support Max 4 downlink, 2 uplink , 5 working link

Multi-Slot Class 12 , Support Max 4 downlink, 4 uplink , 5 working link

	Source Based time Average Power (dBm)									
Band	GSM850					PCS1900				
Channel	128	190	251	Time Average factor	Tune up Power tolerant	512	661	810	Time Average factor	Tune up Power tolerant
Frequency (MHz)	824.2	836.6	848.8	/	/	1850.2	1880	1909.8	/	/
GSM Voice (1 uplink),GMSK	23.05	23.05	23.04	-9.03	23.5±1	20.18	20.19	20.18	-9.03	20.5±1
GPRS Multi-Slot Class 8 (1 uplink) GMSK	23.04	23.02	23.04	-9.03	23.5±1	20.06	20.11	19.88	-9.03	20.5±1
GPRS Multi-Slot Class 10 (2 uplink) GMSK	25.96	25.97	25.91	-6.02	26.5±1	23.00	23.08	22.89	-6.02	23.5±1
GPRS Multi-Slot Class 12 (4 uplink) GMSK	26.58	26.6	26.72	-3.01	26.5±1	25.84	25.95	25.87	-3.01	26.5±1

Remark :

GPRS, CS1 coding scheme.

Multi-Slot Class 8 , Support Max 4 downlink, 1 uplink , 5 working link

Multi-Slot Class 10 , Support Max 4 downlink, 2 uplink , 5 working link

Multi-Slot Class 12 , Support Max 4 downlink, 4 uplink , 5 working link

GSM850

For the antenna manufacturer provide only used limited to ERP/EIRP or radiated spurious emission test. The MPE evaluation as below:

Maximum output power at antenna input terminal: 27.5(dBm)
Maximum output power at antenna input terminal: 562.34(mW)
Prediction distance: >20 (cm)
Predication frequency: 824.2 MHz) Low frequency
Antenna Gain (typical): 1 (dBi)
Antenna Gain (typical): 1.259 (numeric)
The worst case is power density at predication frequency at 20 cm: 0.14(mW/cm^2)

MPE limit for general population exposure at prediction frequency: 0.55(mW/cm^2)

0.14(mW/cm^2) < 0.55 (mW/cm^2)

PCS1900

For the antenna manufacturer provide only used limited to ERP/EIRP or radiated spurious emission test. The MPE evaluation as below:

Maximum output power at antenna input terminal: 27.5 (dBm)
Maximum output power at antenna input terminal: 562.34(mW)
Prediction distance: >20 (cm)
Predication frequency: 1909.8 (MHz) High frequency
Antenna Gain (typical): 1 (dBi)
Antenna Gain (typical): 1.259 (numeric)
The worst case is power density at predication frequency at 20 cm: 0.14(mW/cm^2)

MPE limit for general population exposure at prediction frequency: 1.0 (mW/cm^2)

0.14(mW/cm^2) < 1.0 (mW/cm^2)

Additional: (For Max allowed antenna calculate)

Step 1 ERP/EIRP calculate:

Frequency bands	Max Turn-up Conducted power (dBm)	ERP/EIRP Limit (dBm)	Margin (dB)
GSM 850	33.5	38.45	4.95
PCS 1900	30.5	33.00	2.5

Step 2 MPE calculate:

Frequency bands	Max Turn-up Conducted Source Based time Average Power (dBm)	Max Turn-up Conducted Source Based time Average Power (mw)	Distance (cm)	Power Density Limit (mW/cm2)	Max allow antenna gain (dBi)
GSM 850	27.5	562.34	20	0.549	6.91
PCS 1900	27.5	562.34	20	1	9.51

Step 3:
If meet above step 1 and 2, the Max allows antenna gain show is below:

Frequency bands	Max allow antenna gain (dBi)
GSM 850	4.95
PCS 1900	2.5

Note:
Single Modular Approval.
Output power is conducted. This device is to be used in mobile or fixed applications only. Antenna gain including cable loss must not exceed 4.95 dBi of GSM 850 and 2.5 dBi of PCS 1900 for the purpose of satisfying the requirements of 2.1043 and 2.1091. The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20cm from all persons and must not be co-located or operated in conjunction with any antenna or transmitter not described under this FCC ID. The final product operating with this transmitter must include operating instructions and antenna installation instructions, for end-users and installers to satisfy RF exposure compliance requirements. Compliance of this device in all final product configurations is the responsibility of the Grantee. Installation of this device into specific final products may require the submission of a Class II permissive change application containing data pertinent to RF Exposure, spurious emissions, ERP/EIRP, and host/module authentication, or new application if appropriate. Installation of this device into specific final products may require the submission of a Class II permissive change application containing data pertinent to RF Exposure, spurious emissions, ERP/EIRP, and host/module authentication, or new application if appropriate.