

Quectel Wireless Solutions Co., Ltd.

UMTS/HSPA+ Module

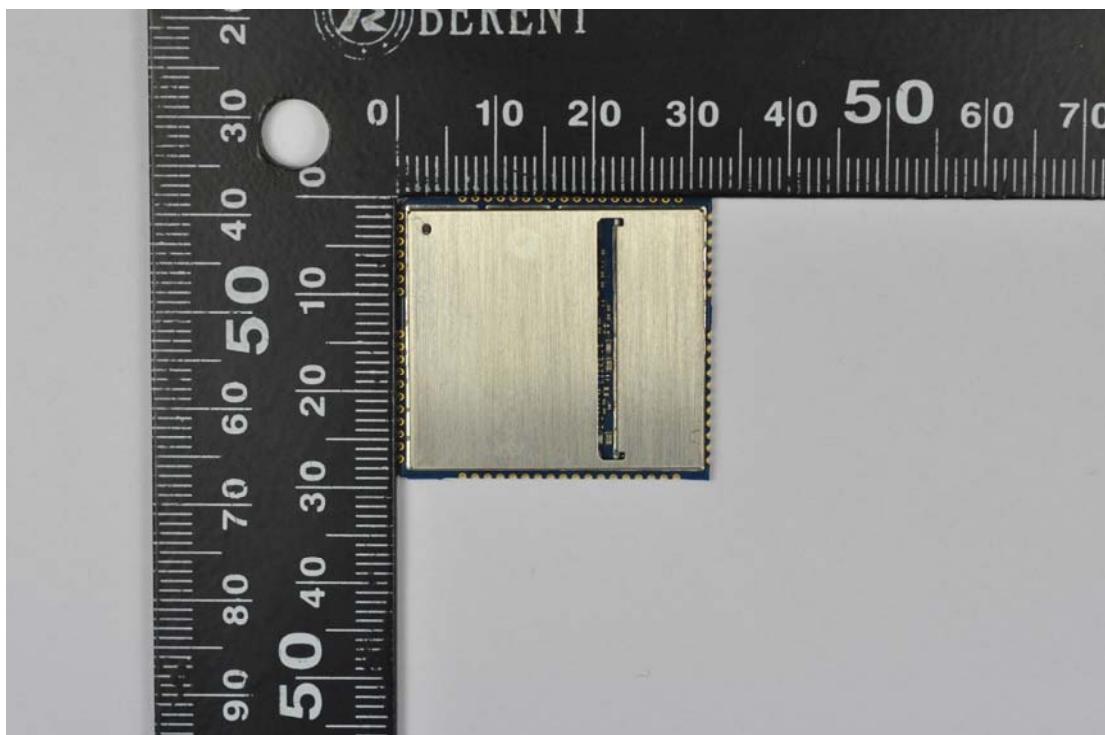
Main Model: UC20

Serial Model: UC20 Mini PCIe

May 31, 2016

Report No.: 16050016-FCC-H

(This report supersedes NONE)



Modifications made to the product : None

This Test Report is Issued Under the Authority of:

Winnie Zhang Compliance Engineer	David Huang Technical Manager	

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Test result presented in this test report is applicable to the representative sample only.**

RF Exposure Evaluation Report

To: FCC 1.1307 FCC 2.1091: 2015

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Title: RF Exposure Evaluation Report for UMTS/HSPA+ Module
Main Model: UC20
Serial Model: UC20 Mini PCIe
To: FCC Part 22(H) & FCC Part 24(E): 2015

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Laboratory 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 through out 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 , Telecom
Canada	EMC, RF/Wireless , Telecom
Taiwan	EMC, RF, Telecom , Safety
Hong Kong	RF/Wireless ,Telecom
Australia	EMC, RF, Telecom , Safety
Korea	EMI, EMS, RF , Telecom, Safety
Japan	EMI, RF/Wireless, Telecom
Singapore	EMC , RF , Telecom
Europe	EMC, RF, Telecom , Safety



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1. EXECUTIVE SUMMARY & EUT INFORMATION

The purpose of this test programme was to demonstrate compliance of the Quectel Wireless Solutions Co., Ltd., UMTS/HSPA+ Module and model: UC20 against the current Stipulated Standards. The UMTS/HSPA+ Module has demonstrated compliance with the FCC Part 22(H) & FCC Part 24(E): 2015.

EUT Information

EUT Description	UMTS/HSPA+ Module
Main Model	UC20
Serial Model	UC20 Mini PCIe
Antenna Gain	UMTS-FDD Band V/GSM850: 1 dBi UMTS-FDD Band II/PCS1900: 1 dBi
Maximum Conducted AV Power to Antenna	UMTS-FDD Band V : 22.53 dBm UMTS-FDD Band II : 22.53 dBm
Maximum Radiated ERP/EIRP	UMTS-FDD Band V : 23.22dBm / ERP UMTS-FDD Band II : 23.33 dBm / EIRP
Temperature	-10°C - 55°C
Classification Per Stipulated Test Standard	FCC Part 22(H) & FCC Part 24(E): 2015

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2. TECHNICAL DETAILS

Purpose	Compliance testing of UMTS/HSPA+ Module with stipulated standard
Applicant / Client	Quectel Wireless Solutions Co., Ltd. Room 501, Building 13, No.99 TianZhouRoad,Xuhui District, Shanghai
Manufacturer	Quectel Wireless Solutions Co., Ltd. Room 501, Building 13, No.99 TianZhouRoad,Xuhui District, Shanghai
Laboratory performing the tests	SIEMIC (Shenzhen-China) LABORATORIES Zone A, Floor 1, Building 2 Wan Ye Long Technology Park South Side of Zhoushi Road, Bao'an District, Shenzhen, Guangdong China 518108
Test report reference number	16050016-FCC-H
Date EUT received	May 06, 2016
Standard applied	FCC Part 22(H) & FCC Part 24(E): 2015
Dates of test	May 23, 2016
No of Units	#1
Equipment Category	PCB
Trade Name	N/A
RF Operating Frequency (ies)	UMTS-FDD Band V TX : 826.4 ~ 846.6 MHz; RX : 871.4 ~ 891.6 MHz UMTS-FDD Band II TX : 1852.4 ~ 1907.6 MHz; RX : 1932.4 ~ 1987.6 MHz
Number of Channels	UMTS-FDD Band V : 102CH UMTS-FDD Band II : 277CH
Modulation	UMTS-FDD: QPSK
FCC ID	XMR201312UC20

3. MAXIMUM PERMISSIBLE EXPOSURE (MPE)

FCC §2.1091 - MAXIMUM PERMISSIBLE EXPOSURE (MPE)

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

Test Data

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/cm²)

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)

Conducted Power

UMTS Mode:

UMTS-FDD Band V

Band/ Time Slot configuration	Channel	Frequency	Peak power (dBm)	Average power (dBm)	Tune up Power tolerant
RMC 12.2kbps	4132	826.4	24.03	22.26	22.5 +/- 1 dBm
	4175	835	24.12	22.15	22.5 +/- 1 dBm
	4233	846.6	24.03	22.36	22.5 +/- 1 dBm
HSDPA Subtest1	4132	826.4	24.11	22.23	22.5 +/- 1 dBm
	4175	835	24.08	22.36	22.5 +/- 1 dBm
	4233	846.6	24.1	22.45	22.5 +/- 1 dBm
HSDPA Subtest2	4132	826.4	24.02	22.36	22.5 +/- 1 dBm
	4175	835	24.06	22.53	22.5 +/- 1 dBm
	4233	846.6	24.12	22.26	22.5 +/- 1 dBm
HSDPA Subtest3	4132	826.4	24.08	22.42	22.5 +/- 1 dBm
	4175	835	24.01	22.26	22.5 +/- 1 dBm
	4233	846.6	24.11	22.36	22.5 +/- 1 dBm
HSDPA Subtest4	4132	826.4	24.15	22.53	22.5 +/- 1 dBm
	4175	835	24.13	22.43	22.5 +/- 1 dBm
	4233	846.6	24.11	22.15	22.5 +/- 1 dBm
HSUPA Subtest1	4132	826.4	24.05	22.36	22.5 +/- 1 dBm
	4175	835	24.18	22.25	22.5 +/- 1 dBm
	4233	846.6	24.05	22.42	22.5 +/- 1 dBm
HSUPA Subtest2	4132	826.4	24.06	22.26	22.5 +/- 1 dBm
	4175	835	24.09	22.53	22.5 +/- 1 dBm
	4233	846.6	24.1	22.32	22.5 +/- 1 dBm
HSUPA Subtest3	4132	826.4	24.12	22.3	22.5 +/- 1 dBm
	4175	835	24.02	22.51	22.5 +/- 1 dBm
	4233	846.6	24.03	22.36	22.5 +/- 1 dBm
HSUPA Subtest4	4132	826.4	24.11	22.23	22.5 +/- 1 dBm
	4175	835	24.12	22.15	22.5 +/- 1 dBm
	4233	846.6	24.11	22.35	22.5 +/- 1 dBm
HSUPA Subtest5	4132	826.4	24.1	22.36	22.5 +/- 1 dBm
	4175	835	24.09	22.42	22.5 +/- 1 dBm
	4233	846.6	24.06	22.26	22.5 +/- 1 dBm

UMTS-FDD Band II

Band/ Time Slot configuration	Channel	Frequency	Peak power (dBm)	Average power (dBm)	Tune up Power tolerant
RMC 12.2kbps	9262	1852.4	24.06	22.36	22.5+-1 dBm
	9400	1880	24.11	22.42	22.5+-1 dBm
	9538	1907.6	24.1	22.35	22.5+-1 dBm
HSDPA Subtest1	9262	1852.4	24.06	22.52	22.5+-1 dBm
	9400	1880	24.12	22.43	22.5+-1 dBm
	9538	1907.6	24.09	22.36	22.5+-1 dBm
HSDPA Subtest2	9262	1852.4	24.11	22.36	22.5+-1 dBm
	9400	1880	24.12	22.35	22.5+-1 dBm
	9538	1907.6	24.09	22.45	22.5+-1 dBm
HSDPA Subtest3	9262	1852.4	24.11	22.53	22.5+-1 dBm
	9400	1880	24.05	22.35	22.5+-1 dBm
	9538	1907.6	24.12	22.42	22.5+-1 dBm
HSDPA Subtest4	9262	1852.4	24.05	22.36	22.5+-1 dBm
	9400	1880	24.08	22.53	22.5+-1 dBm
	9538	1907.6	24.11	22.42	22.5+-1 dBm
HSUPA Subtest1	9262	1852.4	24.12	22.35	22.5+-1 dBm
	9400	1880	24.08	22.53	22.5+-1 dBm
	9538	1907.6	24.03	22.36	22.5+-1 dBm
HSUPA Subtest2	9262	1852.4	24.08	22.45	22.5+-1 dBm
	9400	1880	24.06	22.47	22.5+-1 dBm
	9538	1907.6	24.11	22.4	22.5+-1 dBm
HSUPA Subtest3	9262	1852.4	24.08	22.39	22.5+-1 dBm
	9400	1880	24.11	22.52	22.5+-1 dBm
	9538	1907.6	24.12	22.36	22.5+-1 dBm
HSUPA Subtest4	9262	1852.4	24.05	22.48	22.5+-1 dBm
	9400	1880	24.03	22.25	22.5+-1 dBm
	9538	1907.6	24.11	22.31	22.5+-1 dBm
HSUPA Subtest5	9262	1852.4	24.08	22.48	22.5+-1 dBm
	9400	1880	24.03	22.52	22.5+-1 dBm
	9538	1907.6	24.12	22.45	22.5+-1 dBm

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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)
WCDMA band V	23.5	38.45	14.95
WCDMA band II	23.5	33.00	9.5

Step 2 MPE calculate:

Frequency bands	Max Turn-up Conducted power (dBm)	Max Turn-up Conducted power (mW)	Distance (cm)	Power Density Limit (mW/cm ²)	Max allow antenna gain (dBi)
WCDMA band V	23.5	223.872	20	0.551	10.92
WCDMA band II	23.5	223.872	20	1	13.51

Step 3:

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

Frequency bands	Max allow antenna gain (dBi)
WCDMA band V	10.92
WCDMA band II	9.5

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 10.92dBi of frequency band 826.4 ~ 846.6MHz and 9.5dBi of frequency band 1852.4 ~ 1907.6MHz 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.

MPE:

Frequency bands	Max. Turn-up Conducted power (dBm)	Max. allow antenna gain (dBi)	Max. ERP/EIRP	Exemption Limit of RF Exposure Evaluation	Result(if Exemption or not)
WCDMA band V	23.5	10.92	34.42	31.76	NO
WCDMA band II	23.5	9.5	33.00	34.77	Yes

FCC Part 2.1091 Radiofrequency radiation exposure evaluation: mobile devices.

(c)(1) Mobile devices that operate in the Commercial Mobile Radio Services pursuant to part 20 of this chapter; the Cellular Radiotelephone Service pursuant to part 22 of this chapter; the Personal Communications Services pursuant to part 24 of this chapter; the Satellite Communications Services pursuant to part 25 of this chapter; the Miscellaneous Wireless Communications Services pursuant to part 27 of this chapter; the Maritime Services (ship earth station devices only) pursuant to part 80 of this chapter; the Specialized Mobile Radio Service, and the 3650 MHz Wireless Broadband Service pursuant to part 90 of this chapter; and the Citizens Broadband Radio Service pursuant to part 96 of this chapter are subject to routine environmental evaluation for RF exposure prior to equipment authorization or use if:

- (i) They operate at frequencies of 1.5 GHz or below and their effective radiated power (ERP) is 1.5 watts or more, or
- (ii) They operate at frequencies above 1.5 GHz and their ERP is 3 watts or more

WCDMA

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

Band V

Maximum peak output power at antenna input terminal: 22.53(dBm)

Maximum peak output power at antenna input terminal: 179.061 (mW)

The Max Tune up power output at antenna input terminal: $22.5 + 1 = 23.5$ dBm = 223.872 mW

Prediction distance: >20 (cm)

Predication frequency: 826.4(MHz) lowest frequency

Antenna Gain (typical): 10.92 (dBi)

Antenna Gain (typical): 12.36 (numeric)

The worst case is power density at predication frequency at 20 cm: 0.551(mW/cm²)

MPE limit for general population exposure at prediction frequency: 0.551 (mW/cm²)

$$0.551 \text{ (mW/cm}^2\text{)} = 0.551 \text{ (mW/cm}^2\text{)}$$