



FCC RF Test Report

APPLICANT : Quectel Wireless Solutions Co., Ltd.
EQUIPMENT : Smart LTE Module with Wi-Fi & Bluetooth
BRAND NAME : Quectel
MODEL NAME : SC20-AX
FCC ID : XMR202201SC20AX
STANDARD : 47 CFR Part 2, 22(H), 24(E), 27(L)
CLASSIFICATION : PCS Licensed Transmitter (PCB)
TEST DATE(S) : Jan. 20, 2022

We, Sporton International Inc. (Kunshan), would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.26-2015 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (Kunshan), the test report shall not be reproduced except in full.

Jason Jia

Reviewed by: Jason Jia / Supervisor

Alex Wang

Approved by: Alex Wang / Manager



Sporton International Inc. (Kunshan)

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG1D2404A	Rev. 01	Initial issue of report	Feb. 14, 2022



1 General Description

1.1 Applicant

Quectel Wireless Solutions Co., Ltd.

Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai 200233, China

1.2 Manufacturer

Quectel Wireless Solutions Co., Ltd.

Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai 200233, China

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Smart LTE Module with Wi-Fi & Bluetooth
Brand Name	Quectel
Model Name	SC20-AX
FCC ID	XMR202201SC20AX
HW Version	R1.0
SW Version	SC20AXPAR09A05
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx Frequency	GSM/GPRS/EDGE: 850: 824 MHz ~ 849 MHz 1900: 1850MHz ~ 1910MHz WCDMA: Band V: 824 MHz ~ 849 MHz Band II: 1850 MHz ~ 1910 MHz Band IV: 1710 MHz ~ 1755 MHz
Rx Frequency	GSM/GPRS/EDGE: 850: 869 MHz ~ 894 MHz 1900: 1930 MHz ~ 1990 MHz WCDMA: Band V: 869 MHz ~ 894 MHz Band II: 1930 MHz ~ 1990 MHz Band IV: 2110 MHz ~ 2155 MHz

Antenna Type	External Antenna
Antenna Gain	Cellular Band: 2.53 dBi PCS Band: 1.59 dBi AWS Band: 2.00 dBi
Type of Modulation	GSM: GMSK GPRS: GMSK EDGE: GMSK / 8PSK WCDMA : BPSK (Uplink) HSDPA/DC-HSDPA : QPSK (Uplink) HSUPA : QPSK (Uplink) HSPA+ : 16QAM (16QAM uplink is not supported) DC-HSDPA : 64QAM

1.5 Modification of EUT

No modifications are made to the EUT during all test items.

1.6 Re-use of Measured Data

1.6.1 Introduction Section

This application re-uses data collected on a similar device. The subject device of this application (Model: SC20-AX, FCC ID: XMR202201SC20AX) is electrically identical to the reference device (Model: SC20-AL, FCC ID: XMR201911SC20AL) for the portions of the circuitry corresponding to the data being re-used, as treated by KDB Publication 484596 D01.

The applicant takes full responsibility that the test data as referenced in this report represent compliance for this FCC ID: XMR202201SC20AX .

1.6.2 Difference Section

The **main** difference between FCC ID: XMR201911SC20AL and FCC ID: XMR202201SC20AX is as below:

- SC20-AX uses MCP memory while SC20-AL uses EMCP memory, so the layout of memory part is different
- SC20-AX added U1007 to optimize the Tx performance of B13
- U1502 changed the WiFi 2.4G SAW package size

Other differences and all the details of similarity and difference can be found in the confidential documents (SC20-AX _Operational Description of Product Equality Declaration).

**1.6.3 Reference detail Section:**

Rule Part	Equipment Class	Frequency Band (MHz)	Reference FCC ID(Parent)	Type Grant/ Permissive Change	Reference Title	FCC ID Filling (Variant)	Report Title/Section
22, 24, 27	PCB (GSM)	GSM 850/1900	XMR201911SC20AL	Original Grant	FG9N1435A	XMR202201SC20AX	All sections applicable except ERP/EIRP
	PCB (WCDMA)	Band II, IV, V	XMR201911SC20AL	Original Grant	FG9N1435A	XMR202201SC20AX	All sections applicable except ERP/EIRP

1.6.4 Spot Check Verification Data Section

In order to confirm hardware similarity of the subject device with the reference device, spot check measurements were performed on the subject device for the following test items, the test result were consistent with FCC ID: XMR201911SC20AL.

Summary for power and RSE spot check for each rule entry and technology is listed as below:

Test Item	Mode	XMR201911SC20AL Worst Result	XMR202201SC20AX Worst Result	Difference (dB)
Conducted Power(dBm)	GSM850	32.67	32.67	0
	GSM1900	30.45	30.45	0
	WCDMA B2	23.54	23.54	0
	WCDMA B4	23.76	23.76	0
	WCDMA B5	23.65	23.65	0
Radiated Spurious Emission(dBm)	GSM850-H	-30.73	-33.33	2.6
	WCDMA B4-M	-40.47	-40.47	0

Conclusion:

Radiated spurious emission test against the variant model based on the worst-case condition from the original model was performed in this filing to demonstrate the test data from original model remains representative for the variant model.

Based on the spot check test result, the test data from the original model is representative for the variant model. The power level and RSE spot check are shown within expected level compliant to limit line.

We are using power measurements from the original parent model reports to list on the grant.

We confirm that the test data reuse policy of FCC KDB 484596 D01 Referencing Test Data v01 has been followed and the test data as referenced from the parent model report represents compliance with new FCC ID.



1.7 Maximum Conducted Power, and Emission Designator

FCC Rule	Frequency Band	Frequency Range (MHz)	Type of Modulation	Maximum Conducted power (W)	Emission Designator
Part 22	GSM850 (GPRS)	824.2 ~ 848.8	GMSK	1.8493	-
Part 22	GSM850 (EDGE)	824.2 ~ 848.8	8PSK	0.4920	-
Part 22	WCDMA Band V	826.4 ~ 846.6	BPSK	0.2317	-
Part 24	GSM1900 (GPRS)	1850.2 ~ 1909.8	GMSK	1.1092	-
Part 24	GSM1900 (EDGE)	1850.2 ~ 1909.8	8PSK	0.4335	-
Part 24	WCDMA Band II	1852.4 ~ 1907.6	BPSK	0.2259	-
Part 27	WCDMA Band IV	1712.4 ~ 1752.6	BPSK	0.2377	-

1.8 Testing Location

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Test Firm	Sporton International Inc. (Kunshan)		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	03CH04-KS TH01-KS	CN1257	314309

1.9 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH04-KS	AUDIX	E3	6.2009-8-24a



1.10 Applicable Standards

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

- 47 CFR Part 2, 22(H), 24(E), 27(L)
- ANSI C63.26-2015
- FCC KDB 971168 D01 Power Meas. License Digital Systems v03r01
- FCC KDB 412172 D01 Determining ERP and EIRP v01r01

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

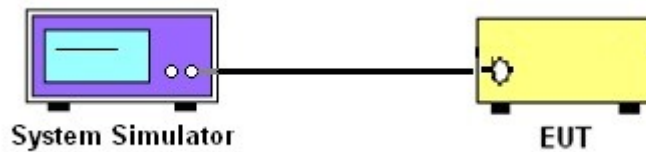
2 Conducted Test Result

2.1 Measuring Instruments

See list of measuring instruments of this test report.

2.2 Test Setup

2.2.1 Conducted Output Power



2.3 Test Result of Conducted Test

Please refer to Appendix A.

2.4 Conducted Output Power and ERP/EIRP

2.4.1 Description of the Conducted Output Power and ERP/EIRP

A system simulator was used to establish communication with the EUT. Its parameters were set to enforce EUT transmitting at the maximum power. The measured power in the radio frequency on the transmitter output terminals shall be reported.

The ERP of mobile transmitters must not exceed 7 Watts for GSM850 and WCDMA Band V.

The EIRP of mobile transmitters must not exceed 2 Watts for GSM1900 and WCDMA Band II.

The EIRP of mobile transmitters must not exceed 1 Watts for WCDMA Band IV.

According to KDB 412172 D01 Power Approach,

$EIRP = P_T + G_T - L_C$, $ERP = EIRP - 2.15$, where

P_T = transmitter output power in dBm

G_T = gain of the transmitting antenna in dBi

L_C = signal attenuation in the connecting cable between the transmitter and antenna in dB

2.4.2 Test Procedures

1. The testing follows ANSI C63.26 Section 5.2
2. The transmitter output port was connected to the system simulator.
3. Set EUT at maximum power through the system simulator.
4. Select lowest, middle, and highest channels for each band and different modulation.
5. Measure and record the power level from the system simulator.



3 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Oct. 14, 2021	Jan. 20, 2022	Oct. 13, 2022	Conducted (TH01-KS)
Power divider	STI	STI08-0055	-	0.5~40GHz	Aug. 26, 2021	Jan. 20, 2022	Aug. 25, 2022	Conducted (TH01-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150244	10Hz~44G,MAX 30dB	Apr. 13, 2021	Jan. 20, 2022	Apr. 12, 2022	Radiation (03CH04-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 30, 2021	Jan. 20, 2022	Oct. 29, 2022	Radiation (03CH04-KS)
Bilog Antenna	TeseQ	CBL6111D	49922	30MHz~1GHz	May 30, 2021	Jan. 20, 2022	May 29, 2022	Radiation (03CH04-KS)
Horn Antenna	Schwarzbeck	BBHA9120 D	1356	1GHz~18GHz	Apr. 18, 2021	Jan. 20, 2022	Apr. 17, 2022	Radiation (03CH04-KS)
SHF-EHF Horn	Com-power	AH-840	101115	18GHz~40GHz	Jan. 05, 2022	Jan. 20, 2022	Jan. 04, 2023	Radiation (03CH04-KS)
Amplifier	SONOMA	310N	187289	9KHz~1GHz	Jan. 05, 2022	Jan. 20, 2022	Jan. 04, 2023	Radiation (03CH04-KS)
Amplifier	MITEQ	EM18G40G GA	060728	18~40GHz	Jan. 05, 2022	Jan. 20, 2022	Jan. 04, 2023	Radiation (03CH04-KS)
high gain Amplifier	MITEQ	AMF-7D-00 101800-30-10P	2025788	1Ghz~18Ghz	Jan. 05, 2022	Jan. 20, 2022	Jan. 04, 2023	Radiation (03CH04-KS)
Amplifier	Keysight	83017A	MY57280106	500MHz~26.5G Hz	Oct. 13, 2021	Jan. 20, 2022	Oct. 12, 2022	Radiation (03CH04-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Jan. 20, 2022	NCR	Radiation (03CH04-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Jan. 20, 2022	NCR	Radiation (03CH04-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Jan. 20, 2022	NCR	Radiation (03CH04-KS)

NCR: No Calibration Required.

4 Uncertainty of Evaluation

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.26-2015. All the measurement uncertainty value were shown with a coverage $K=2$ to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	3.3dB
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Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.8dB
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Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.8dB
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----- THE END -----



Appendix A. Test Results of Conducted Test

Test Engineer :	Carl Ni	Temperature :	22~23°C
		Relative Humidity :	41~42%

Conducted Output Power(Average power) and ERP/EIRP

GSM850 ($G_T - L_C = 2.53\text{dB}$)			
Channel	128	189	251
	(Low)	(Mid)	(High)
Frequency	824.2	836.4	848.8
(MHz)			
Conducted Power (dBm)	32.55	32.66	32.67
Conducted Power (Watts)	1.7989	1.8450	1.8493
ERP(dBm)	32.93	33.04	33.05
ERP(Watts)	1.9634	2.0137	2.0184

EDGE850 ($G_T - L_C = 2.53\text{ dB}$)			
Channel	128	189	251
	(Low)	(Mid)	(High)
Frequency	824.2	836.4	848.8
(MHz)			
Conducted Power (dBm)	26.84	26.87	26.92
Conducted Power (Watts)	0.4831	0.4864	0.4920
ERP(dBm)	27.22	27.25	27.30
ERP(Watts)	0.5272	0.5309	0.5370



GSM1900 ($G_T - L_C = 1.59$ dB)			
Channel	512	661	810
	(Low)	(Mid)	(High)
Frequency	1850.2	1880	1909.8
(MHz)			
Conducted Power (dBm)	30.03	30.45	30.42
Conducted Power (Watts)	1.0069	1.1092	1.1015
EIRP(dBm)	31.62	32.04	32.01
EIRP(Watts)	1.4521	1.5996	1.5885

EDGE1900 ($G_T - L_C = 1.59$ dB)			
Channel	512	661	810
	(Low)	(Mid)	(High)
Frequency	1850.2	1880	1909.8
(MHz)			
Conducted Power (dBm)	26.08	26.15	26.37
Conducted Power (Watts)	0.4055	0.4121	0.4335
EIRP(dBm)	27.67	27.74	27.96
EIRP(Watts)	0.5848	0.5943	0.6252



WCDMA Band V ($G_T - L_C = 2.53$ dB)			
Channel	4132	4182	4233
	(Low)	(Mid)	(High)
Frequency	826.4	836.4	846.6
(MHz)			
Conducted Power (dBm)	23.61	23.55	23.65
Conducted Power (Watts)	0.2296	0.2265	0.2317
ERP(dBm)	23.99	23.93	24.03
ERP(Watts)	0.2506	0.2472	0.2529

WCDMA Band II ($G_T - L_C = 1.59$ dB)			
Channel	9262	9400	9538
	(Low)	(Mid)	(High)
Frequency	1852.4	1880	1907.6
(MHz)			
Conducted Power (dBm)	23.52	23.54	23.54
Conducted Power (Watts)	0.2249	0.2259	0.2259
EIRP(dBm)	25.11	25.13	25.13
EIRP(Watts)	0.3243	0.3258	0.3258

WCDMA Band IV ($G_T - L_C = 2.00$ dB)			
Channel	1312	1413	1513
	(Low)	(Mid)	(High)
Frequency	1712.4	1732.6	1752.6
(MHz)			
Conducted Power (dBm)	23.76	23.65	23.61
Conducted Power (Watts)	0.2377	0.2317	0.2296
EIRP(dBm)	25.76	25.65	25.61
EIRP(Watts)	0.3767	0.3673	0.3639