



RF TEST REPORT

Applicant Quectel Wireless Solutions Co., Ltd
FCC ID XMR201609EC21V
Product LTE Module
Brand Quectel
Model EC21-V; EC21-V MINIPCIE
Report No. R1806A0295-R2
Issue Date August 6, 2018

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 2 (2017)/ FCC CFR47 Part 27C (2017)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

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Table of Contents

1	Test Laboratory.....	4
1.1	Notes of the Test Report.....	4
1.2	Test facility.....	4
1.3	Testing Location.....	5
2	General Description of Equipment under Test.....	6
3	Applied Standards.....	7
4	Test Configuration.....	8
5	Test Case Results.....	9
5.1	RF Power Output.....	9
5.2	Radiates Spurious Emission.....	13
6	Main Test Instruments.....	24
	ANNEX A: EUT Appearance and Test Setup.....	25
A.1	EUT Appearance.....	25
A.2	Test Setup.....	27
	ANNEX B: Product Change Description.....	28



Summary of Measurement Results

Number	Test Case	Clause in FCC rules	Verdict
1	RF power output	2.1046	PASS
2	Radiates Spurious Emission	2.1053 /27.53(h) /27.53(f)	PASS
Date of Testing: June 20, 2018 ~ July 13, 2018			
Note: PASS: The EUT complies with the essential requirements in the standard. FAIL: The EUT does not comply with the essential requirements in the standard.			

1 Test Laboratory

1.1 Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein .Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

1.2 Test facility

CNAS (accreditation number: L2264)

TA Technology (Shanghai) Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS).

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

IC (recognition number is 8510A)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

VCCI (recognition number is C-4595, T-2154, R-4113, G-10766)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

1.3 Testing Location

Company: TA Technology (Shanghai) Co., Ltd.
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2 General Description of Equipment under Test

Client Information

Applicant	Quectel Wireless Solutions Co., Ltd
Applicant address	7th Floor, Hongye Building, No.1801 Hongmei Road, Xuhui District, Shanghai 200233, China
Manufacturer	Quectel Wireless Solutions Co., Ltd
Manufacturer address	7th Floor, Hongye Building, No.1801 Hongmei Road, Xuhui District, Shanghai 200233, China

General information

EUT Description			
Model	EC21-V; EC21-V MINIPCIE		
IMEI	861108030344575		
Hardware Version	R1.1		
Software Version	EC21VGBR05A01M4G		
Power Supply	External Power Supply		
Antenna Type	The EUT don't have standard Antenna, The Antenna used for testing in this report is the after-market accessory (Dipole Antenna)		
Test Mode(s)	LTE Band 4; LTE Band 13		
Test Modulation	(LTE)QPSK 16QAM;		
LTE Category	1		
Maximum output power	LTE Band 4:	23.64dBm	
	LTE Band 13:	23.48dBm	
Rated Power Supply Voltage:	3.8V		
Extreme Voltage	Minimum: 3.3V Maximum: 4.3V		
Extreme Temperature	Lowest: -40°C Highest: +85°C		
Operating Frequency Range(s)	Mode	Tx (MHz)	Rx (MHz)
	LTE Band 4	1710 ~ 1755	2110 ~ 2155
	LTE Band 13	777 ~ 787	746 ~ 756
Note: 1. The information of the EUT is declared by the manufacturer. 2. For LTE, 16QAM only supports 25%RB.			

EC21-V; EC21-V MINIPCIE (Report No: R1805A0295-R2) is a variant model of EC21-V (Report No: RKS160812002-00A). There is only tested Conducted Power and Radiated Spurious Emissions for variant in this report. For other test items, please refer to EC21-V (Report No: RKS160812002-00A). The detailed product change description please refers to the ANNEX B.

3 Applied Standards

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

Test standards

FCC CFR47 Part 2 (2017)

FCC CFR47 Part 27C (2017)

ANSI/TIA-603-E (2016)

KDB 971168 D01 Power Meas License Digital Systems v03r01

4 Test Configuration

Radiated measurements are performed by rotating the EUT in three different orthogonal test planes. EUT stand-up position (Z axis), lie-down position (X, Y axis). Receiver antenna polarization (horizontal and vertical), the worst emission was found in position (Z axis, vertical polarization) and the worst case was recorded.

All mode and data rates and positions and RB size and modulations were investigated.

Subsequently, only the worst case emissions are reported.

The following testing in LTE is set based on the maximum RF Output Power.

The following testing in different Bandwidth is set to detail in the following table:

Test modes are chosen to be reported as the worst case configuration below for LTE Band 4/13:

Test items	Modes	Bandwidth (MHz)						Modulation		RB			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	1	50%	100%	L	M	H
RF power output	LTE 4	O	O	O	O	O	O	O	O	O	O	O	O	O	O
	LTE 13	-	-	O	O	-	-	O	O	O	O	O	O	O	O
Radiates Spurious Emission	LTE 4	O	-	-	O	-	O	O	-	O	-	-	O	O	O
	LTE 13	-	-	O	O	-	-	O	-	O	-	-	O	O	O
Note	1. The mark "O" means that this configuration is chosen for testing. 2. The mark "-" means that this configuration is not testing. 3. For LTE, 16QAM only supports 25%RB.														

5 Test Case Results

5.1 RF Power Output

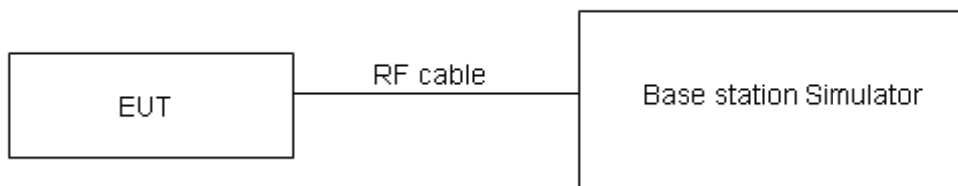
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

During the process of the testing, The EUT is controlled by the Base Station Simulator to ensure max power transmission and proper modulation.

Test Setup



The loss between RF output port of the EUT and the input port of the tester has been taken into consideration.

Limits

No specific RF power output requirements in part 2.1046.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U=0.4$ dB.

Test Results

LTE Band 4				AV Conducted Power(dBm)		
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				19957/1710.7	20175/1732.5	20393/1754.3
1.4MHz	QPSK	1	0	22.76	23.35	22.99
		1	2	23.06	23.27	23.39
		1	5	23.00	23.25	22.97
		3	0	22.90	23.13	22.76
		3	2	22.85	23.02	22.76
		3	3	23.01	23.24	22.78
	16QAM	6	0	21.87	22.27	21.90
		1	0	21.84	22.34	22.60
		1	2	21.97	22.33	22.57
		1	5	22.35	22.13	22.66
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				19965/1711.5	20175/1732.5	20385/1753.5
3MHz	QPSK	1	0	22.81	23.01	23.18
		1	7	22.90	22.97	23.17
		1	14	23.30	22.94	23.14
		8	0	21.85	22.15	21.89
		8	4	21.97	22.12	21.88
		8	7	22.01	22.11	21.88
	16QAM	15	0	21.90	22.12	21.93
		1	0	21.87	22.48	22.63
		1	7	22.00	22.64	22.61
		1	14	22.37	22.54	22.69
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				19975/1712.5	20175/1732.5	20375/1752.5
5MHz	QPSK	1	0	22.78	22.99	23.14
		1	13	22.88	22.93	23.14
		1	24	23.27	22.89	23.10
		12	0	21.82	22.10	21.85
		12	6	21.95	22.08	21.83
		12	13	21.99	22.09	21.84
	16QAM	25	0	21.88	22.11	21.91
		1	0	21.84	22.44	22.60
		1	13	21.97	22.62	22.58
		1	24	22.34	22.52	22.65
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				20000/1715	20175/1732.5	20350/1750
10MHz	QPSK	1	0	22.80	23.00	23.17
		1	25	22.91	22.98	23.18
		1	49	23.29	22.93	23.13



	16QAM	25	0	21.85	22.15	21.89
		25	13	21.98	22.13	21.87
		25	25	22.01	22.13	21.89
		50	0	21.96	22.13	21.95
		1	0	21.86	22.47	22.62
		1	25	22.00	22.66	22.61
		1	49	22.37	22.54	22.68
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				20025/1717.5	20175/1732.5	20325/1747.5
15MHz	QPSK	1	0	22.79	22.96	23.15
		1	38	22.89	22.97	23.15
		1	74	23.26	22.88	23.09
		36	0	21.83	22.11	21.86
		36	18	21.95	22.08	21.83
		36	39	21.98	22.10	21.85
		75	0	21.94	22.09	21.90
	16QAM	1	0	21.81	22.45	22.60
		1	38	21.98	22.63	22.59
		1	74	22.34	22.50	22.65
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				20050/1720	20175/1732.5	20300/1745
20MHz	QPSK	1	0	22.76	22.92	23.12
		1	50	22.88	22.93	23.13
		1	99	23.24	22.87	23.06
		50	0	21.80	22.06	21.82
		50	25	21.93	22.04	21.80
		50	50	21.95	22.05	21.81
		100	0	21.91	22.04	21.86
	16QAM	1	0	21.79	22.41	22.55
		1	50	21.94	22.61	22.55
		1	99	22.32	22.47	22.63
Note: 1) The following testing in worst case based on the maximum RF Output Power.						

LTE Band 13				Conducted Power(dBm)		
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				23205/779.5	23230/782	23255/784.5
5MHz	QPSK	1	0	23.09	23.05	23.13
		1	13	23.11	23.01	23.28
		1	24	23.10	23.32	23.32
		12	0	22.19	22.26	22.22
		12	6	22.22	22.24	22.21
		12	13	22.23	22.27	22.24
	25	0	22.24	22.23	22.39	
	16QAM	1	0	22.52	21.69	21.69
		1	13	22.39	21.75	21.95
1		24	22.46	21.81	22.01	
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				/	23230/782	/
10MHz	QPSK	1	0	/	23.07	/
		1	25	/	23.30	/
		1	49	/	23.33	/
		25	0	/	22.22	/
		25	13	/	22.28	/
		25	25	/	22.38	/
	50	0	/	22.27	/	
	16QAM	1	0	/	22.55	/
		1	25	/	22.25	/
1		49	/	22.35	/	

Note: 1) The following testing in worst case based on the maximum RF Output Power.

5.2 Radiates Spurious Emission

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

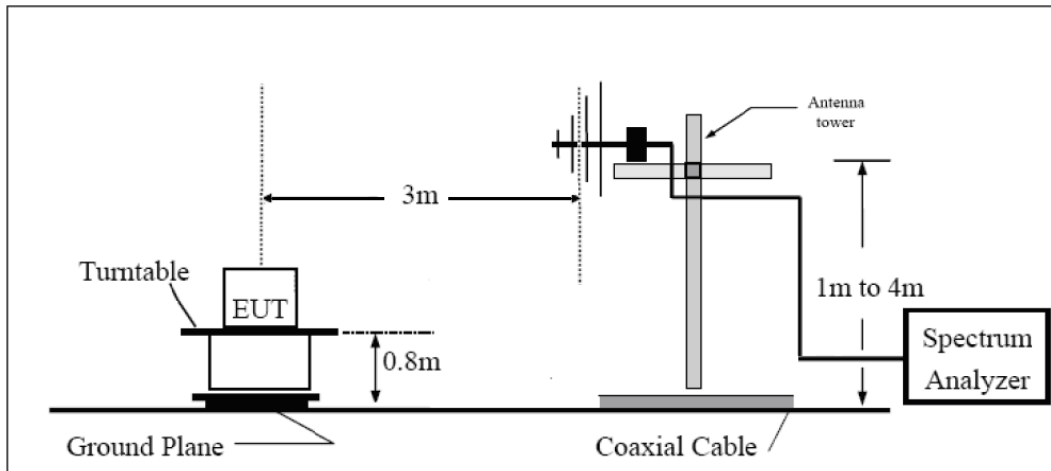
1. The testing follows FCC KDB 971168 D01 v03r01 Section 5.8 and ANSI/TIA-603-E (2016).
 2. The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).
 3. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
 4. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz, VBW=3MHz, And the maximum value of the receiver should be recorded as (Pr).
 5. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (PMea) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
 6. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (Pcl) ,the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test.
 7. The measurement results are obtained as described below:

$$\text{Power(EIRP)} = \text{PMea} - \text{PAg} - \text{Pcl} + \text{Ga}$$
 The measurement results are amend as described below:

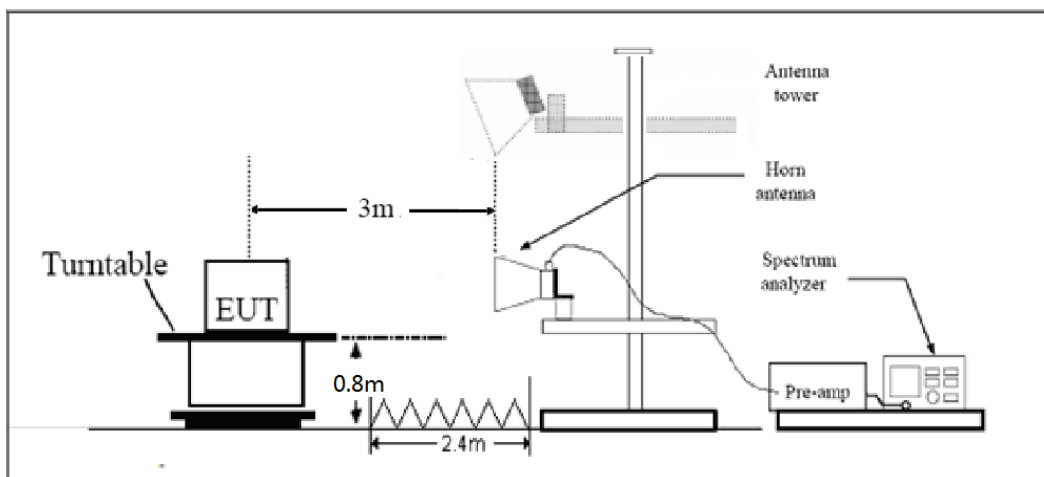
$$\text{Power(EIRP)} = \text{PMea} - \text{Pcl} + \text{Ga}$$
 8. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power. ERP can be calculated from EIRP by subtracting the gain of the dipole, $\text{ERP} = \text{EIRP} - 2.15\text{dBi}$.
- The modulation mode and RB allocation refer to section 5.1, using the maximum output power configuration.

Test setup

30MHz~~~ 1GHz



Above 1GHz



Note: Area side:2.4mX3.6m

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the worst case was recorded.

Limits

Rule Part 27.53(h) specifies that “for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10} (P)$ dB..”

Rule Part 27.53(f) For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW 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.



Part 27.53(h)Limit		-13 dBm
Part 27.53(f)Limit	Limit out of the band 1559-1610 MHz	-13 dBm
	Limit in the band 1559-1610 MHz	-40 dBm

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = \pm 1.96$, $U = \pm 3.55$ dB.

Test Result

Sweep the whole frequency band through the range from 30MHz to the 10th harmonic of the carrier, the emissions below the noise floor will not be recorded in the report.

LTE Band 4 QPSK 1.4MHz CH-Low, RB 1

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3421.4	-58.55	2.6	10.15	Horizontal	-51.0	-13.0	38.00	135
3	5131.1	-55.25	2.4	11.35	Horizontal	-46.3	-13.0	33.30	315
4	6842.8	-55.85	4.5	10.85	Horizontal	-49.5	-13.0	36.50	225
5	8553.5	-54.65	5.1	11.35	Horizontal	-48.4	-13.0	35.40	90
6	10264.2	-51.65	5.3	11.95	Horizontal	-45.0	-13.0	31.95	180
7	11974.9	-51.25	5.5	13.55	Horizontal	-43.2	-13.0	30.20	180
8	13685.6	-48.55	6.3	13.75	Horizontal	-41.1	-13.0	28.10	225
9	15396.3	-49.35	6.7	13.85	Horizontal	-42.2	-13.0	29.20	135
10	17107.0	-46.75	6.8	14.25	Horizontal	-39.3	-13.0	26.30	315

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2. The worst emission was found in the antenna is Horizontal position.

LTE Band 4 QPSK 1.4MHz CH-Middle, RB 1

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3464.3	-57.55	2.6	10.75	Horizontal	-49.4	-13.0	36.40	90
3	5197.5	-58.85	2.4	11.05	Horizontal	-50.2	-13.0	37.20	315
4	6930.0	-55.75	4.5	11.15	Horizontal	-49.1	-13.0	36.10	0
5	8662.5	-53.25	5.1	11.35	Horizontal	-47.0	-13.0	33.99	45
6	10395.0	-50.15	5.3	11.95	Horizontal	-43.5	-13.0	30.50	90
7	12127.5	-52.65	5.5	13.55	Horizontal	-44.6	-13.0	31.55	315
8	13860.0	-47.15	6.3	13.75	Horizontal	-39.7	-13.0	26.70	315
9	15592.5	-50.85	6.7	13.85	Horizontal	-43.7	-13.0	30.70	0
10	17325.0	-46.45	6.8	14.25	Horizontal	-39.0	-13.0	26.00	180

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2. The worst emission was found in the antenna is Horizontal position.

LTE Band 4 QPSK 1.4MHz CH-High, RB 1

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3507.8	-52.15	2.6	10.15	Horizontal	-44.6	-13.0	31.60	225
3	5261.6	-58.25	2.4	11.05	Horizontal	-49.6	-13.0	36.60	135
4	7017.2	-54.85	4.5	11.15	Horizontal	-48.2	-13.0	35.20	315
5	8771.5	-52.45	5.1	11.35	Horizontal	-46.2	-13.0	33.20	90
6	10525.8	-49.65	5.3	11.95	Horizontal	-43.0	-13.0	30.00	315
7	12280.1	-50.95	5.5	13.55	Horizontal	-42.9	-13.0	29.90	0
8	14034.4	-46.85	6.3	13.75	Horizontal	-39.4	-13.0	26.40	45
9	15788.7	-51.05	6.7	13.85	Horizontal	-43.9	-13.0	30.90	315
10	17543.0	-46.85	6.8	14.25	Horizontal	-39.4	-13.0	26.40	225

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst emission was found in the antenna is Horizontal position.

LTE Band 4 QPSK 10MHz CH-Low, RB 1

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3430.0	-59.65	2.6	10.15	Horizontal	-52.1	-13.0	39.10	90
3	5131.9	-53.65	2.4	11.35	Horizontal	-44.7	-13.0	31.70	180
4	6860.0	-55.85	4.5	10.85	Horizontal	-49.5	-13.0	36.50	180
5	8575.0	-52.85	5.1	11.35	Horizontal	-46.6	-13.0	33.60	225
6	10290.0	-50.95	5.3	11.95	Horizontal	-44.3	-13.0	31.30	135
7	12005.0	-51.55	5.5	13.55	Horizontal	-43.5	-13.0	30.50	315
8	13720.0	-47.65	6.3	13.75	Horizontal	-40.2	-13.0	27.20	90
9	15435.0	-49.25	6.7	13.85	Horizontal	-42.1	-13.0	29.10	315
10	17150.0	-47.95	6.8	14.25	Horizontal	-40.5	-13.0	27.50	0

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst emission was found in the antenna is Horizontal position.

LTE Band 4 QPSK 10MHz CH-Middle, RB 1

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3456.0	-55.35	2.6	10.75	Horizontal	-47.2	-13.0	34.20	45
3	5184.4	-56.05	2.4	11.05	Horizontal	-47.4	-13.0	34.40	315
4	6930.0	-55.35	4.5	11.15	Horizontal	-48.7	-13.0	35.70	225
5	8662.5	-53.75	5.1	11.35	Horizontal	-47.5	-13.0	34.50	180
6	10395.0	-49.95	5.3	11.95	Horizontal	-43.3	-13.0	30.30	180
7	12127.5	-50.35	5.5	13.55	Horizontal	-42.3	-13.0	29.30	225
8	13860.0	-47.15	6.3	13.75	Horizontal	-39.7	-13.0	26.70	135
9	15592.5	-50.05	6.7	13.85	Horizontal	-42.9	-13.0	29.90	315
10	17325.0	-47.25	6.8	14.25	Horizontal	-39.8	-13.0	26.80	90

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst emission was found in the antenna is Horizontal position.

LTE Band 4 QPSK 10MHz CH-High, RB 1

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3490.9	-55.05	2.6	10.15	Horizontal	-47.5	-13.0	34.50	315
3	5236.9	-53.95	2.4	11.05	Horizontal	-45.3	-13.0	32.30	135
4	7000.0	-54.25	4.5	11.15	Horizontal	-47.6	-13.0	34.60	315
5	8750.0	-53.25	5.1	11.35	Horizontal	-47.0	-13.0	33.98	90
6	10500.0	-48.85	5.3	11.95	Horizontal	-42.2	-13.0	29.20	315
7	12250.0	-51.85	5.5	13.55	Horizontal	-43.8	-13.0	30.80	0
8	14000.0	-48.15	6.3	13.75	Horizontal	-40.7	-13.0	27.70	45
9	15750.0	-50.75	6.7	13.85	Horizontal	-43.6	-13.0	30.60	315
10	17500.0	-47.85	6.8	14.25	Horizontal	-40.4	-13.0	27.40	225

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst emission was found in the antenna is Horizontal position.

LTE Band 4 QPSK 20MHz CH-Low, RB 1

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3440.0	-59.75	2.6	10.15	Horizontal	-52.2	-13.0	39.20	180
3	5133.4	-53.25	2.4	11.35	Horizontal	-44.3	-13.0	31.30	180
4	6880.0	-55.75	4.5	10.85	Horizontal	-49.4	-13.0	36.40	225
5	8600.0	-53.25	5.1	11.35	Horizontal	-47.0	-13.0	34.00	315
6	10320.0	-50.95	5.3	11.95	Horizontal	-44.3	-13.0	31.30	90
7	12040.0	-51.75	5.5	13.55	Horizontal	-43.7	-13.0	30.70	315
8	13760.0	-49.95	6.3	13.75	Horizontal	-42.5	-13.0	29.50	135
9	15480.0	-50.95	6.7	13.85	Horizontal	-43.8	-13.0	30.80	315
10	17200.0	-47.65	6.8	14.25	Horizontal	-40.2	-13.0	27.20	90

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2. The worst emission was found in the antenna is Horizontal position.

LTE Band 4 QPSK 20MHz CH-Middle, RB 1

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3465.0	-57.75	2.6	10.75	Horizontal	-49.6	-13.0	36.60	90
3	5170.9	-53.45	2.4	11.05	Horizontal	-44.8	-13.0	31.80	180
4	6930.0	-55.05	4.5	11.15	Horizontal	-48.4	-13.0	35.40	180
5	8662.5	-53.35	5.1	11.35	Horizontal	-47.1	-13.0	34.10	225
6	10395.0	-50.05	5.3	11.95	Horizontal	-43.4	-13.0	30.40	135
7	12127.5	-51.65	5.5	13.55	Horizontal	-43.6	-13.0	30.60	315
8	13860.0	-45.55	6.3	13.75	Horizontal	-38.1	-13.0	25.10	90
9	15592.5	-51.85	6.7	13.85	Horizontal	-44.7	-13.0	31.70	315
10	17325.0	-47.25	6.8	14.25	Horizontal	-39.8	-13.0	26.80	315

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2. The worst emission was found in the antenna is Horizontal position.

LTE Band 4 QPSK 20MHz CH-High, RB 1

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3490.0	-58.15	2.6	10.15	Horizontal	-50.6	-13.0	37.60	135
3	5208.4	-55.85	2.4	11.05	Horizontal	-47.2	-13.0	34.20	315
4	6980.0	-55.35	4.5	11.15	Horizontal	-48.7	-13.0	35.70	90
5	8725.0	-52.25	5.1	11.35	Horizontal	-46.0	-13.0	33.00	90
6	10470.0	-49.85	5.3	11.95	Horizontal	-43.2	-13.0	30.20	180
7	12215.0	-50.25	5.5	13.55	Horizontal	-42.2	-13.0	29.20	180
8	13960.0	-47.55	6.3	13.75	Horizontal	-40.1	-13.0	27.10	225
9	15705.0	-49.95	6.7	13.85	Horizontal	-42.8	-13.0	29.80	0
10	17450.0	-46.85	6.8	14.25	Horizontal	-39.4	-13.0	26.40	0

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst emission was found in the antenna is Horizontal position.

LTE Band 13 QPSK 5MHz CH-Low, RB 1

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1555.8	-57.70	2.00	10.15	Horizontal	-51.7	-40.0	11.70	135
3	2338.5	-59.90	2.50	11.35	Horizontal	-53.2	-13.0	40.20	135
4	3118.0	-61.30	4.20	10.85	Horizontal	-56.8	-13.0	43.80	270
5	3897.5	-46.90	5.20	11.35	Horizontal	-42.9	-13.0	29.90	0
6	4677.0	-54.90	5.50	11.95	Horizontal	-50.6	-13.0	37.60	180
7	5456.5	-58.50	5.70	13.55	Horizontal	-52.8	-13.0	39.80	225
8	6236.0	-56.60	6.30	13.75	Horizontal	-51.3	-13.0	38.30	135
9	7015.5	-52.80	6.80	13.85	Horizontal	-47.9	-13.0	34.90	90
10	7795.0	-52.80	6.90	14.25	Horizontal	-47.6	-13.0	34.60	315

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst emission was found in the antenna is Horizontal position.

LTE Band 13 QPSK 5MHz CH-Middle, RB 1

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1564.0	-51.00	2.00	10.75	Horizontal	-44.4	-40.0	4.40	270
3	2346.0	-60.99	2.51	11.05	Horizontal	-54.6	-13.0	41.60	90
4	3128.0	-62.20	4.20	11.15	Horizontal	-57.4	-13.0	44.40	315
5	3910.0	-46.10	5.20	11.15	Horizontal	-42.3	-13.0	29.30	270
6	4692.0	-57.90	5.50	11.95	Horizontal	-53.6	-13.0	40.60	0
7	5474.0	-58.30	5.70	13.55	Horizontal	-52.6	-13.0	39.60	180
8	6256.0	-56.00	6.30	13.75	Horizontal	-50.7	-13.0	37.70	45
9	7038.0	-52.30	6.80	13.85	Horizontal	-47.4	-13.0	34.40	0
10	7820.0	-52.80	6.90	14.25	Horizontal	-47.6	-13.0	34.60	180

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2. The worst emission was found in the antenna is Horizontal position.

LTE Band 13 QPSK 5MHz CH-High, RB 1

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1569.0	-61.50	2.00	10.15	Horizontal	-55.5	-40.0	15.50	270
3	2353.5	-59.09	2.51	11.05	Horizontal	-52.7	-13.0	39.70	45
4	3138.0	-61.70	4.20	11.15	Horizontal	-56.9	-13.0	43.90	225
5	3922.5	-45.60	5.20	11.15	Horizontal	-41.8	-13.0	28.80	135
6	4707.0	-57.30	5.50	11.95	Horizontal	-53.0	-13.0	40.00	90
7	5491.5	-59.10	5.70	13.55	Horizontal	-53.4	-13.0	40.40	270
8	6276.0	-57.00	6.30	13.75	Horizontal	-51.7	-13.0	38.70	0
9	7060.5	-52.50	6.80	13.85	Horizontal	-47.6	-13.0	34.60	180
10	7845.0	-53.00	6.90	14.25	Horizontal	-47.8	-13.0	34.80	45

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2. The worst emission was found in the antenna is Horizontal position.

LTE Band 13 QPSK 10MHz CH-Low, RB 1

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1556.5	-54.80	2.00	10.15	Horizontal	-48.8	-40.0	8.80	180
3	2346.0	-61.69	2.51	11.35	Horizontal	-55.0	-13.0	42.00	0
4	3128.0	-60.80	4.20	10.85	Horizontal	-56.3	-13.0	43.30	0
5	3910.0	-48.50	5.20	11.35	Horizontal	-44.5	-13.0	31.50	225
6	4692.0	-55.50	5.50	11.95	Horizontal	-51.2	-13.0	38.20	135
7	5474.0	-58.30	5.70	13.55	Horizontal	-52.6	-13.0	39.60	90
8	6256.0	-53.90	6.30	13.75	Horizontal	-48.6	-13.0	35.60	270
9	7038.0	-52.40	6.80	13.85	Horizontal	-47.5	-13.0	34.50	0
10	7820.0	-52.40	6.90	14.25	Horizontal	-47.2	-13.0	34.20	0

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2. The worst emission was found in the antenna is Horizontal position.

LTE Band 13 QPSK 10MHz CH-Middle, RB 1

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1564.0	-55.10	2.00	10.75	Horizontal	-48.5	-40.0	8.50	135
3	2346.0	-57.69	2.51	11.05	Horizontal	-51.3	-13.0	38.30	0
4	3128.0	-61.50	4.20	11.15	Horizontal	-56.7	-13.0	43.70	180
5	3910.0	-47.30	5.20	11.15	Horizontal	-43.5	-13.0	30.50	45
6	4692.0	-55.60	5.50	11.95	Horizontal	-51.3	-13.0	38.30	0
7	5474.0	-58.40	5.70	13.55	Horizontal	-52.7	-13.0	39.70	225
8	6256.0	-54.80	6.30	13.75	Horizontal	-49.5	-13.0	36.50	135
9	7038.0	-52.60	6.80	13.85	Horizontal	-47.7	-13.0	34.70	90
10	7820.0	-52.50	6.90	14.25	Horizontal	-47.3	-13.0	34.30	270

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2. The worst emission was found in the antenna is Horizontal position.

LTE Band 13 QPSK 10MHz CH-High, RB 1

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1564.0	-54.80	2.00	10.15	Horizontal	-48.8	-40.0	8.80	135
3	2346.0	-61.09	2.51	11.05	Horizontal	-54.7	-13.0	41.70	270
4	3128.0	-60.40	4.20	11.15	Horizontal	-55.6	-13.0	42.60	0
5	3910.0	-47.40	5.20	11.15	Horizontal	-43.6	-13.0	30.60	0
6	4692.0	-55.50	5.50	11.95	Horizontal	-51.2	-13.0	38.20	180
7	5474.0	-57.60	5.70	13.55	Horizontal	-51.9	-13.0	38.90	45
8	6256.0	-54.00	6.30	13.75	Horizontal	-48.7	-13.0	35.70	315
9	7038.0	-52.00	6.80	13.85	Horizontal	-47.1	-13.0	34.10	270
10	7820.0	-52.00	6.90	14.25	Horizontal	-46.8	-13.0	33.80	135

Note: 1. The other Spurious RF Radiated emissions level is no more than noise floor.
 2. The worst emission was found in the antenna is Horizontal position.

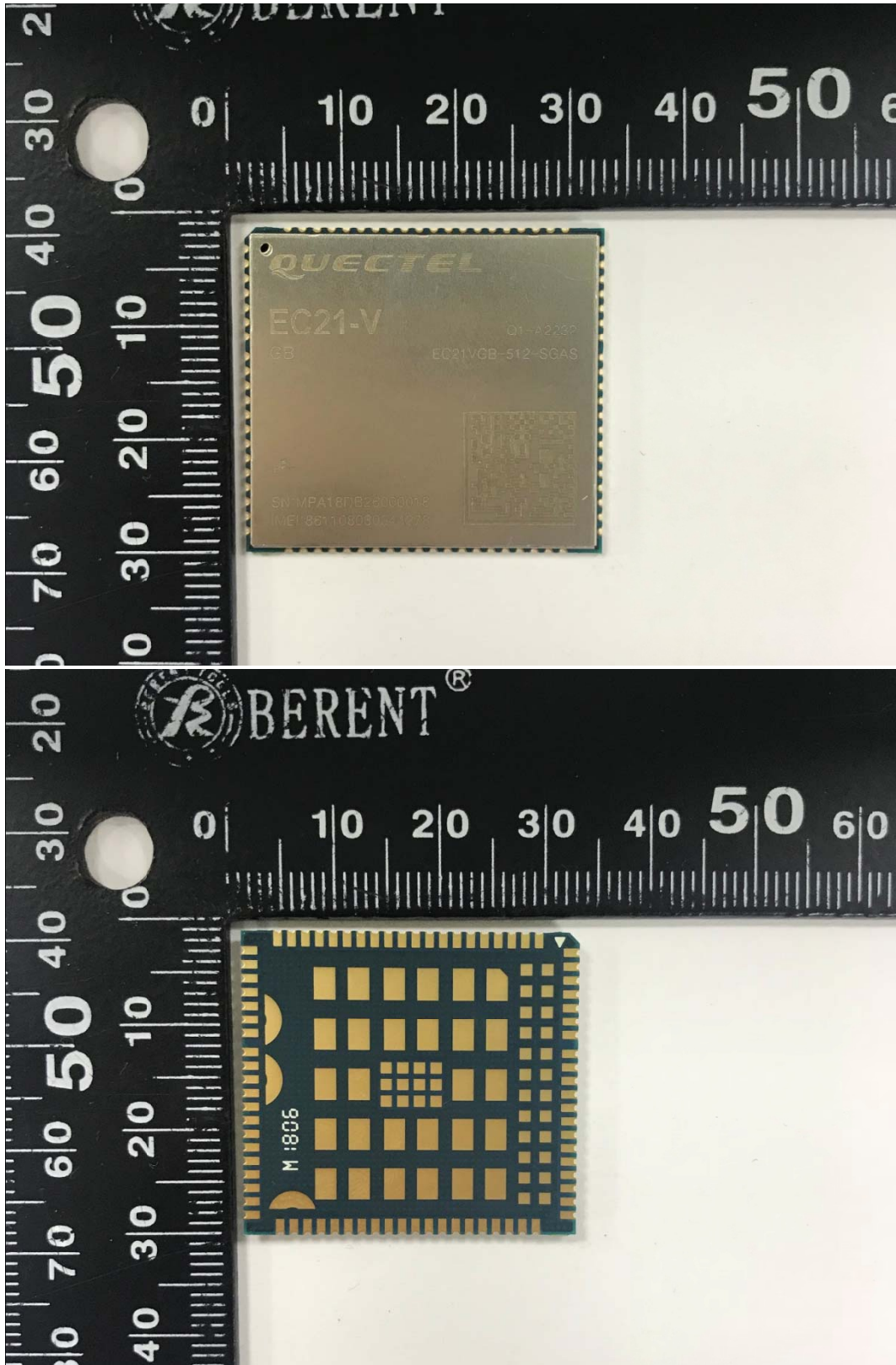
6 Main Test Instruments

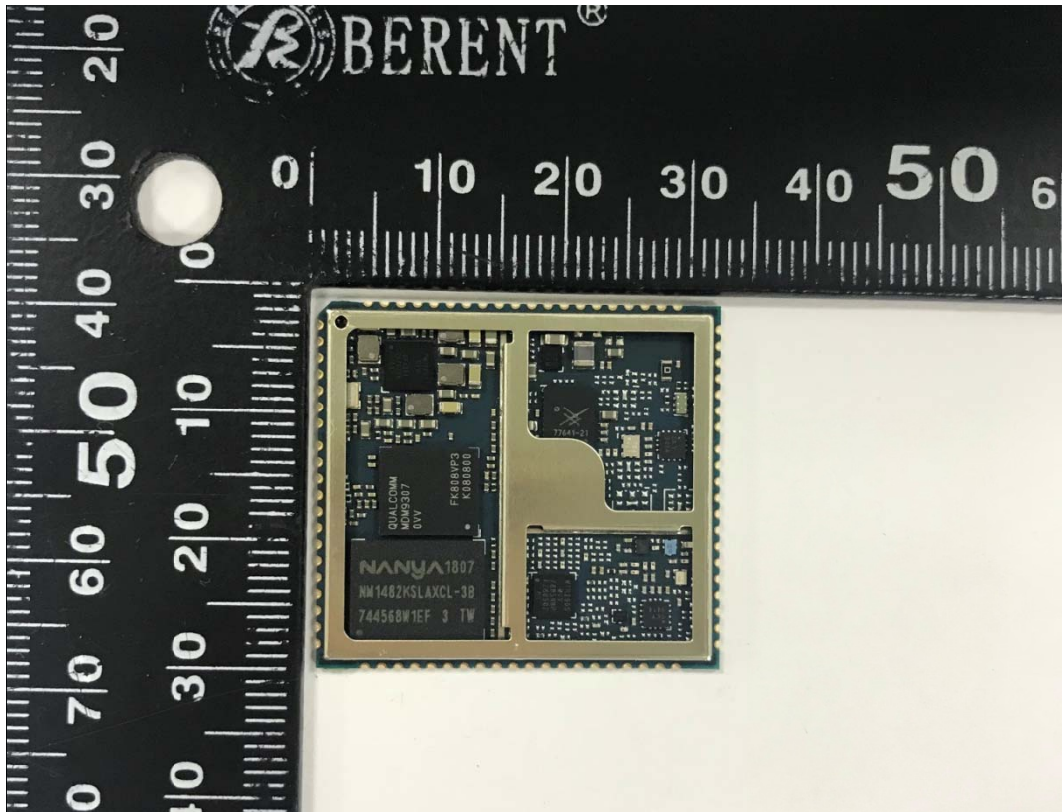
Name	Manufacturer	Type	Serial Number	Calibration Date	Expiration Date
Base Station Simulator	R&S	CMW500	113645	2018-05-20	2019-05-19
Power Splitter	Hua Xiang	SHX-GF2-2-13	10120101	2018-05-20	2019-05-19
Spectrum Analyzer	Key sight	N9010A	MY50210259	2018-05-20	2019-05-19
Signal Analyzer	R&S	FSV30	100815	2017-12-17	2018-12-16
Signal generator	R&S	SMB 100A	102594	2018-05-20	2019-05-19
EMI Test Receiver	R&S	ESCI	100948	2018-05-20	2019-05-19
Loop Antenna	SCHWARZBECK	FMZB1519	1519-047	2014-12-06	2019-12-05
Trilog Antenna	SCHWARZBECK	VUBL 9163	9163-201	2017-11-18	2020-11-17
Horn Antenna	R&S	HF907	100126	2014-12-06	2019-12-05
Horn Antenna	ETS-Lindgren	3160-09	00102643	2015-01-30	2020-01-29
Climatic Chamber	Re Ce	PT-30B	20101891	2015-07-18	2018-07-17
RF Cable	Agilent	SMA 15cm	0001	NA	NA
Preamplifier	R&S	SCU18	102327	2018-05-20	2019-05-19
MOB COMMS DC SUPPLY	Keysight	66319D	MY43004105	2018-05-20	2019-05-19
Software	R&S	EMC32	V9.26.0	NA	NA

*****END OF REPORT *****

ANNEX A: EUT Appearance and Test Setup

A.1 EUT Appearance

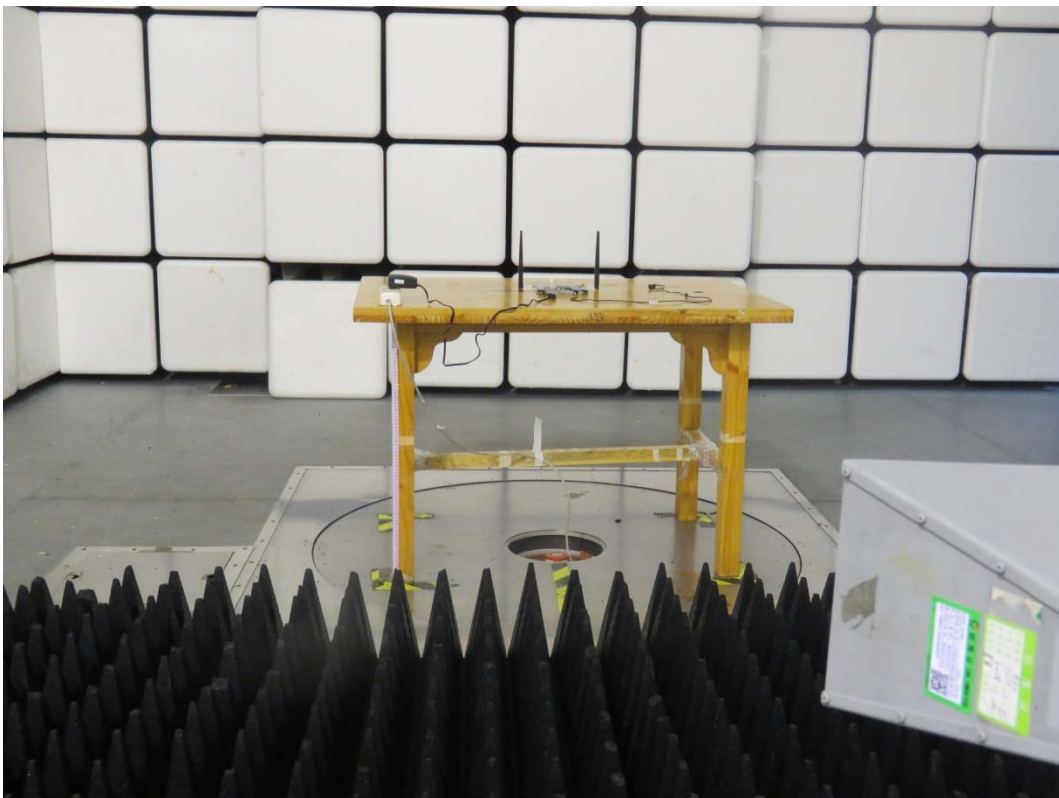
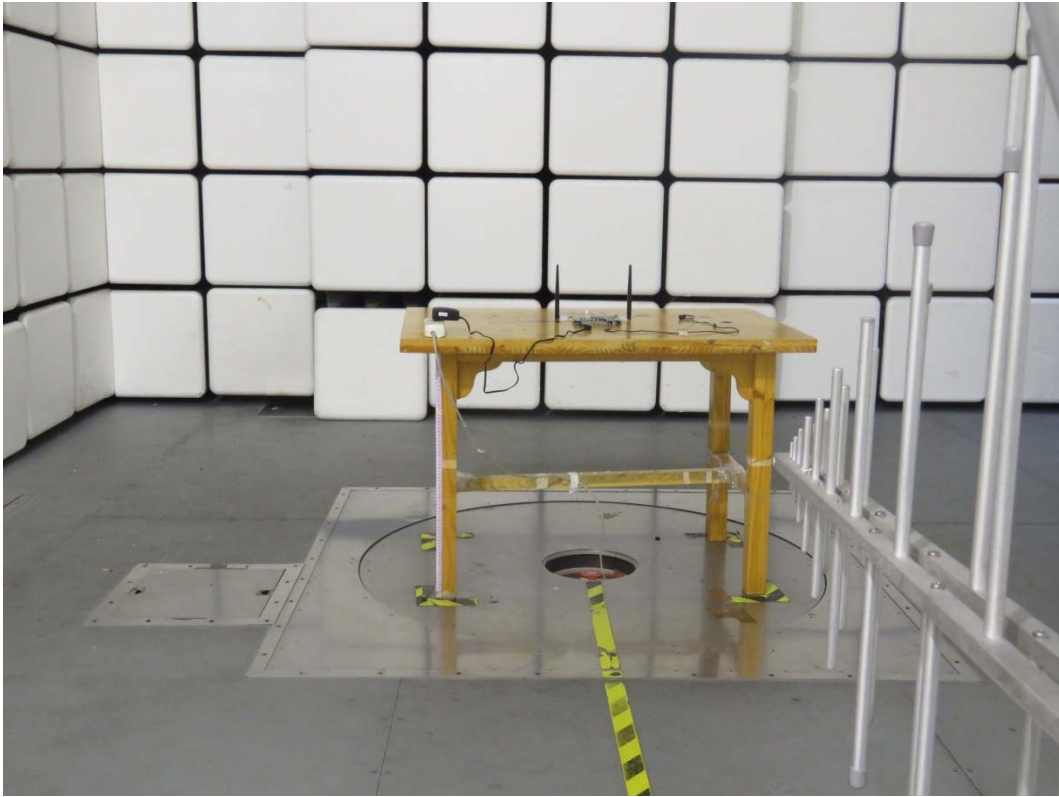




a: EUT

Picture 1 EUT and Accessory

A.2 Test Setup



Picture 2: Radiated Spurious Emissions Test setup

ANNEX B: Product Change Description

Statement

We Quetcel Wireless Solutions Co., Ltd declare the following models.

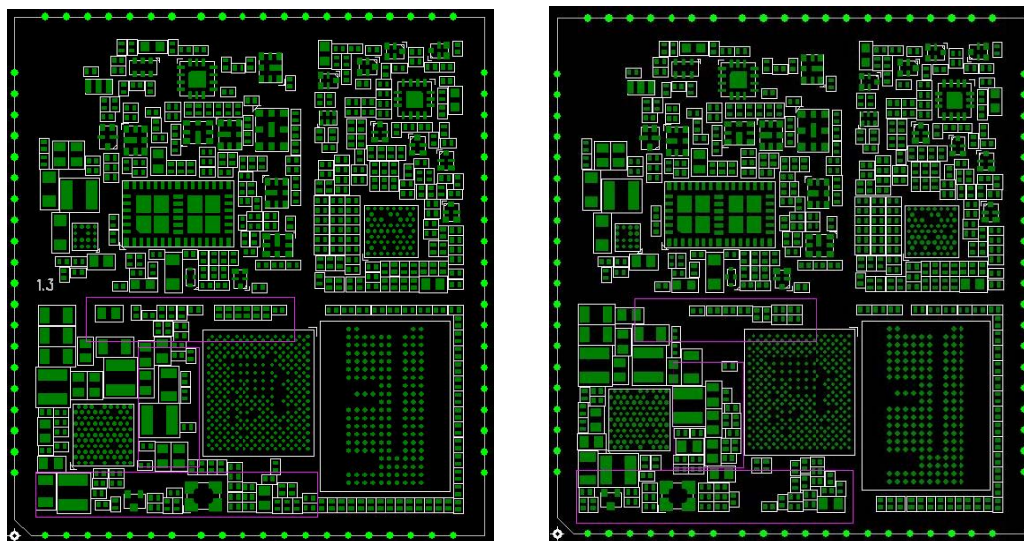
Product Name: LTE Module

Model Number: EC21-V, EC21-V MINIPCIE,

Hardware version: Refer to below table

Model	Certified HW Version A	New HW Version B
EC21-V, EC21-V MINIPCIE	R1.0	R1.1

All above series models share the same hardware and software design. Here we need to update the hardware to improve power supply. There are some differences between **Certified HW Version A** and **New HW Version B** on PCB design which are some capacitors and resistors' location which used for BB. The details are shown as following pictures and table.



Designator	R1.0 Position (mm, mm)	R1.1 Position (mm, mm)
C0301	(5.8, 13.7)	(9.7,6.89)
C0306	(7.475, 13.75)	(10.84,7.81)
C0310	-	(8.707, 13.847)
C0307	(10.85, 11.1)	-
C0328	(8.85, 12.78)	-
C0227	(8.085, 11.15)	-



R0501	(16.35, 13.9)	(19.08, 13.91)
C0340	-	(9.23, 1.7)
C0402	-	(12.37, 4.25)
C0227	(8.085, 11.15)	(4.45, 13.58)
C0330	(9.1, 11.375)	(9.66, 5.12)
C0211	(2.575, 11.03)	(2.42, 12.35)
L0201	(2.35, 9.15)	(2.32, 10.45)
L0202	(8.925, 7.1)	(8.15, 7.94)
C0214	(1.91, 2.73)	(1.89, 4.05)
L0204	(3.62, 2.64)	(3.78, 3.97)
Y0101	(11.61, 2.45)	(7.45, 2.39)
Q0101	(7.36, 2.125)	(3.32, 2.12)
C0317	(15.46, 2.3)	(17.01, 1.87)

We hereby state that there is no any other internal difference between them and the change is layout part of power supply BB which won't affect the RF portions and the original RF data can be re-used.

Your assistance on this matter is highly appreciated.

Sincerely,

Name: Jean Hu

Title: Certification Section