

# **Partial FCC Test Report**

(PART 27)

Report No.: RF171212C20-2

FCC ID: XMR201706SC20A

Test Model: SC20-A

Received Date: Dec. 12, 2017

Test Date: Jan. 17, 2018

**Issued Date:** Mar. 05, 2018

Applicant: Quectel Wireless Solutions Co., Ltd.

Address: 7th Floor, Hongye Building, No. 1801 Hongmei Road, Xuhui District, Shanghai 200233, China

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

- Lab Address: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan (R.O.C)
- **Test Location (1):** No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.

FCC Registration / 788550 / TW0003

Designation Number:



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# **Release Control Record** Issue No. Description Date Issued Original Release Mar. 05, 2018 RF171212C20-2



#### **Certificate of Conformity** 1

Product: LTE Module Brand: Quectel Test Model: SC20-A Sample Status: Identical Prototype Applicant: Quectel Wireless Solutions Co., Ltd. Test Date: Jan. 17, 2018 Standards: FCC Part 27, Subpart C, L, H, F

The above equipment has been tested by Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Prepared by :

Vera Huang, Date: Mar. 05, 2018

Vera Huang / Specialist

Date: Mar. 05, 2018

Approved by :

get to

Dylan Chiou / Project Engineer



	Applied Standard: FCC Part 27 & Part 2 (WCDMA)				
FCC Test Item		Result	Remarks		
2.1046 27.50(d)(4)			Refer to Note		
2.1055 27.54	Erequency Stability		Refer to Note		
2.1049 27.53(h)	Occupied Bandwidth		Refer to Note		
27.50(d)(5) Peak to Average Ratio		N/A	Refer to Note		
27.53(h) Band Edge Measurements		N/A	Refer to Note		
2.1051 27.53(h) Conducted Spurious Emissions		N/A	Refer to Note		
2.1053 27.53(h)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -47.22 dB at 43.58 MHz.		

# 2 Summary of Test Results

	Applied Standard: FCC Part 27 & Part 2 (LTE 4)			
FCC Clause	Test Item		Remarks	
2.1046 27.50(d)(4)	Maximum Peak Output Power	N/A	Refer to Note	
2.1055 27.54	Frequency Stability		Refer to Note	
2.1049 27.53(h) Occupied Bandwidth		N/A	Refer to Note	
27.50(d)(5) Peak to Average Ratio		N/A	Refer to Note	
27.53(h) Band Edge Measurements		N/A	Refer to Note	
2.1051 27.53(h) Conducted Spurious Emissions		N/A	Refer to Note	
2.1053 27.53(h)	2.1053 Radiated Spurious Emissions		Meet the requirement of limit. Minimum passing margin is -47.35 dB at 54.25 MHz.	



Applied Standard: FCC Part 27 & Part 2 (LTE 12)				
FCC Test Item		Result	Remarks	
2.1046 27.50(c)(10)	Maximum Peak Output Power		Refer to Note	
2.1055 27.54	Erequency Stability		Refer to Note	
2.1049 27.53(g)	Occupied Bandwidth	N/A	Refer to Note	
27.50(d)(5) Peak to Average Ratio		N/A	Refer to Note	
27.53(g) Band Edge Measurements		N/A	Refer to Note	
2.1051 27.53(g)	Conducted Spurious Emissions	N/A	Refer to Note	
2.1053 27.53(g)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -46.27 dB at 43.58 MHz.	

	Applied Standard: FCC Part 27 & Part 2 (LTE 13)				
FCC Clause	Test Item		Remarks		
2.1046 27.50(b)(10)	D) Maximum Peak Output Power		Refer to Note		
2.1055 27.54	Frequency Stability		Refer to Note		
2.1049 27.53(g) Occupied Bandwidth		N/A	Refer to Note		
27.50(d)(5) Peak to Average Ratio		N/A	Refer to Note		
27.53(g) Band Edge Measurements		N/A	Refer to Note		
2.1051 27.53(g) Conducted Spurious Emissions		N/A	Refer to Note		
2.1053 27.53(g)(f)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -47.82 dB at 54.25 MHz.		

#### Note:

Only test item for radiated emissions test was performed for this report. For other test data, please refer to Sporton Report No.: FG741007A and FG741007B for module (Name: Quectel, Model: SC20-A).



#### 2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expended Uncertainty (k=2) (±)
Redicted Emissions up to 1 CHz	30 MHz ~ 200 MHz	2.93 dB
Radiated Emissions up to 1 GHz	200 MHz ~ 1000 MHz	2.95 dB



#### 2.2 Test Site and Instruments

Description & Manaufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent	N9038A	MY51210203	Feb. 17, 2017	Feb. 16, 2018
Spectrum Analyzer Agilent	N9010A	MY52220314	Nov. 24, 2017	Nov. 23, 2018
Double Ridge Guide Horn Antenna EMCO	3115	5619	Nov. 30, 2017	Nov. 29, 2018
BILOG Antenna SCHWARZBECK	VULB 9168	9168-153	Dec. 06, 2017	Dec. 05, 2018
RF signal cable ETS-LINDGREN	5D-FB	Cable-CH1-01(R FC-SMS-100-SM S-120+RFC-SMS -100-SMS-400)	Jun. 23, 2017	Jun. 22, 2018
MXG Vector signal generator Agilent	N5182B	MY53050430	Oct. 24, 2017	Oct. 23, 2018
Loop Antenna	EM-6879	269	Aug. 11, 2017	Aug. 10, 2018
Preamplifier EMCI	EMC001340	980201	Nov. 01, 2017	Oct. 30, 2018
Preamplifier EMCI	EMC 012645	980115	Oct. 20, 2017	Oct. 19, 2018
Preamplifier EMCI	EMC 184045	980116	Oct. 20, 2017	Oct. 19, 2018
Preamplifier EMCI	EMC 330H	980112	Oct. 13, 2017	Oct. 12, 2018
RF Coaxial Cable HUBER+SUHNNER	EMC104-SM-SM-8 000&3000	140811+170717	Oct. 20, 2017	Oct. 19, 2018
RF Coaxial Cable HUBER+SUHNNER	SUCOFLEX 104	EMC104-SM-SM- 1000(140807)	Oct. 20, 2017	Oct. 19, 2018
RF Coaxial Cable Worken	8D-FB	Cable-Ch10-01	Oct. 20, 2017	Oct. 19, 2018
Software BV ADT	E3 6.120103	NA	NA	NA
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	NA	NA	NA
Antenna Tower &Turn Table Controller MF	MF-7802	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 / 24 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in HwaYa Chamber 10.

- 3. The horn antenna and preamplifier (model: EMC 184045) are used only for the measurement of emission frequency above 1 GHz if tested.
- 4. The IC Site Registration No. is IC7450F-10.



#### 3 General Information

#### 3.1 General Description of EUT

Product				
Brand	Quectel			
Test Model	SC20-A			
Status of EUT	Identical Prototype			
Dewer Cumply Deting	5.0 Vdc (adapter)			
Power Supply Rating	7.26 Vdc (Li-ion battery)			
Madulation Truca	WCDMA	QPSK		
Modulation Type	LTE	QPSK, 16QAM		
	WCDMA	1712.4 ~ 1752.6 MHz		
	LTE Band 4 (Channel Bandwidth: 1.4 MHz)	1710.7 ~ 1754.3 MHz		
	LTE Band 4 (Channel Bandwidth: 3 MHz)	1711.5 ~ 1753.5 MHz		
	LTE Band 4 (Channel Bandwidth: 5 MHz)	1712.5 ~ 1752.5 MHz		
	LTE Band 4 (Channel Bandwidth: 10 MHz)	1715.0 ~ 1750.0 MHz		
	LTE Band 4 (Channel Bandwidth: 15 MHz) 1717.5 ~ 1747.5 MHz			
Frequency Range	LTE Band 4 (Channel Bandwidth: 20 MHz)	1720.0 ~ 1745.0 MHz		
	LTE Band 12 (Channel Bandwidth: 1.4 MHz)	699.7 ~ 715.3 MHz		
	LTE Band 12 (Channel Bandwidth: 3 MHz)	700.5 ~ 714.5 MHz		
	LTE Band 12 (Channel Bandwidth: 5 MHz)	701.5 ~ 713.5 MHz		
	LTE Band 12 (Channel Bandwidth: 10 MHz)	704.0 ~ 711.0 MHz		
	LTE Band 13 (Channel Bandwidth: 5 MHz)	779.5 ~ 784.5 MHz		
	LTE Band 13 (Channel Bandwidth: 10 MHz) 782.0 MHz			
Antenna Type	Dipole Antenna			
Accessory Device	Refer to Note as below			
Data Cable Supplied	Refer to Note as below			

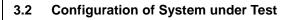
Note:

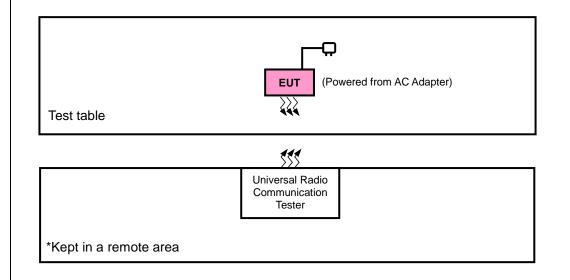
1. The EUT was installed in POS Terminal (Brand: CASTLES TECHNOLOGY, Model: SATURN1000).

2. The EUT contains following accessory devices.

Product	Brand	Model	Description
Battery	CHENG UEI PRECISION INDUSTRY CO., LTD.	S1-26H	7.26 Vdc, 2600 mAh
USB Cable	TAYU	2000007X	1m shielded cable w/o core

3. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.





#### 3.2.1 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Product	Brand	Model No.	Serial No.	FCC ID
1.	Adapter	FSP	FSP010-FPDN	N/A	N/A

NO.	Signal Cable Description Of The Above Support Units
1. N/A	

Note:

1. All power cords of the above support units are non-shielded (1.8m).

2. Item 1 was provided by client.



### 3.3 Test Mode Applicability and Tested Channel Detail

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis, and antenna ports

The worst case was found when positioned as the table below. Following channel(s) was (were) selected for the final test as listed below:

Band	Radiated Emission
WCDMA	Y-axis
LTE Band 4	Y-axis
LTE Band 12	Y-axis
LTE Band 13	Y-axis

#### WCDMA

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Mode
-	Radiated Emission	1312 to 1513	1413	WCDMA

#### LTE Band 4

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	Radiated Emission	20050 to 20300	20175	20 MHz	QPSK	1 RB / 0 RB Offset

**Note:** This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation.

#### LTE Band 12

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	Radiated Emission	23060 to 23130	23095	10 MHz	QPSK	1 RB / 0 RB Offset

**Note:** This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation.

#### LTE Band 13

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	Radiated Emission	23230	23230	10 MHz	QPSK	1 RB / 0 RB Offset

**Note:** This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation.



#### **Test Condition:**

Test Item	Environmental Conditions	Input Power	Tested By
Radiated Emission	25 deg. C, 65 % RH	120 Vac, 60 Hz	Jisyong Wang

#### 3.4 EUT Operating Conditions

The EUT makes a call to the communication simulator. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency

#### 3.5 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC 47 CFR Part 2 FCC 47 CFR Part 27 KDB 971168 D01 Power Meas License Digital Systems v02r02 ANSI/TIA/EIA-603-E 2016 ANSI 63.26-2015

Note: All test items have been performed and recorded as per the above standards.



#### 4 Test Types and Results

#### 4.1 Radiated Emission Measurement

- 4.1.1 Limits of Radiated Emission Measurement
- a. The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 43 +10 log10(P) dB. The limit of emission is equal to -13 dBm.
- b. For operations in the 775-788 MHz, emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz. The limit of emissions is equal to -40 dBm.

#### 4.1.2 Test Procedure

- a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- b. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value" of step a. Record the power level of S.G.
- c. EIRP = Output power level of S.G TX cable loss + Antenna gain of substitution horn.
- d. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.P.R power 2.15 dBi.

Note: The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz.

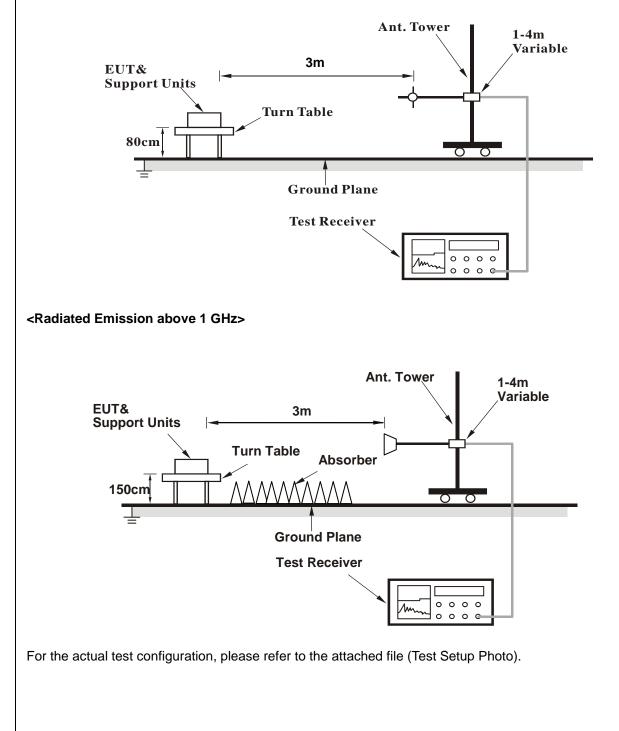
#### 4.1.3 Deviation from Test Standard

No deviation.



#### 4.1.4 Test Setup

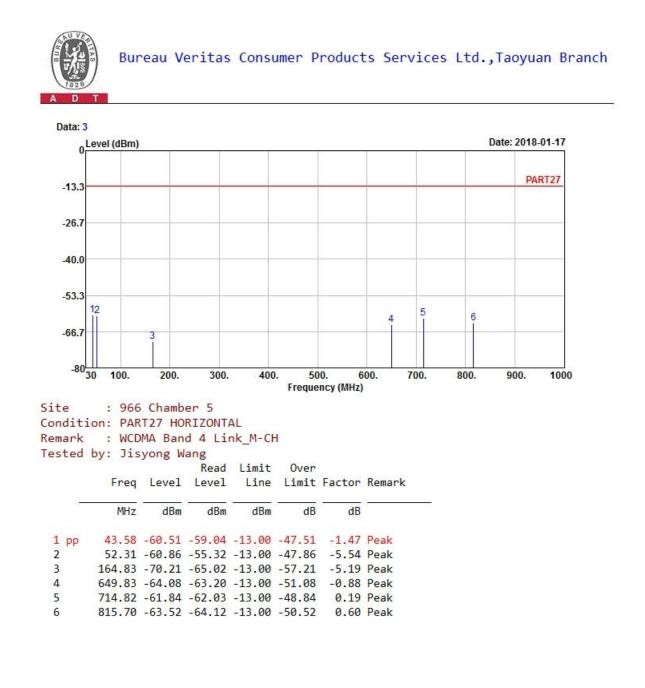
### <Radiated Emission below or equal 1 GHz>





#### 4.1.5 Test Results

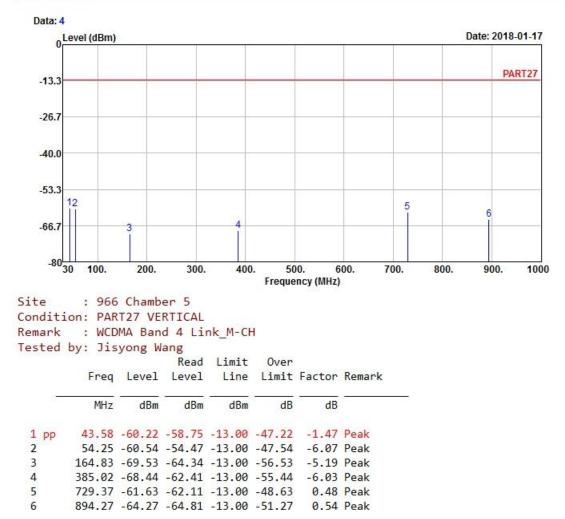
# WCDMA: Middle Channel







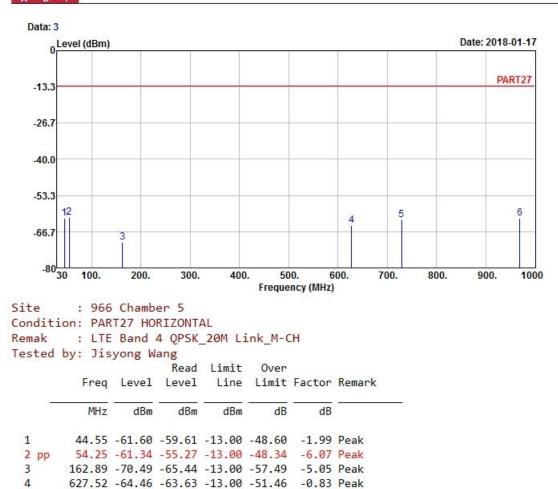
Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch





# LTE Band 4 Channel Bandwidth: 20 MHz / QPSK Middle Channel

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729.37 -62.38 -62.86 -13.00 -49.38

968.96 -61.58 -64.06 -13.00 -48.58

5

6

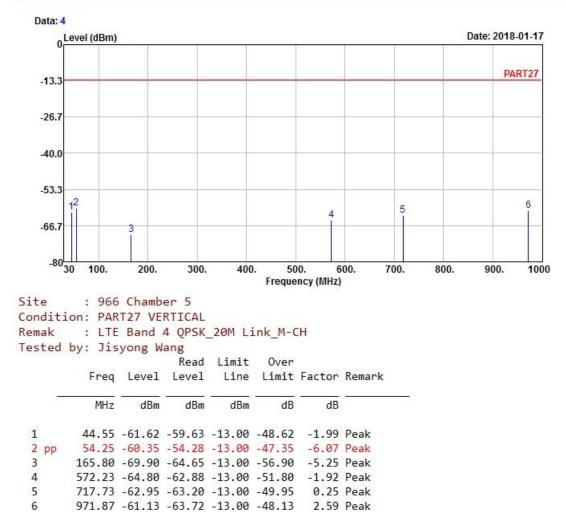
0.48 Peak

2.48 Peak





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# LTE Band 12 Channel Bandwidth: 10 MHz / QPSK Middle Channel

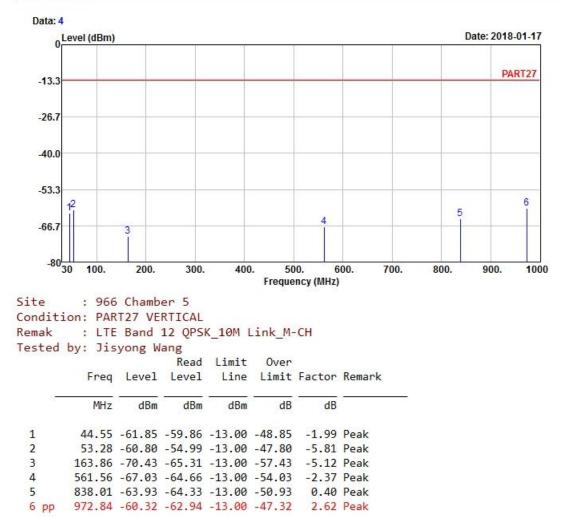
Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch Data: 3 0 Level (dBm) Date: 2018-01-17 PART27 -13.3 -26.7 -40.0 -53.3 12 6 -66.7 -80 100. 200. 300. 500. 600. 700. 800. 900. 1000 400. Frequency (MHz) Site : 966 Chamber 5 Condition: PART27 HORIZONTAL Remak : LTE Band 12 QPSK\_10M Link\_M-CH Tested by: Jisyong Wang Read Limit Over Freq Level Level Line Limit Factor Remark MHz dBm dBm dB dB dBm

1 pp	43.58	-59.27	-57.80	-13.00	-46.27	-1.47 Peak
2	53.28	-60.71	-54.90	-13.00	-47.71	-5.81 Peak
3	256.01	-69.76	-63.65	-13.00	-56.76	-6.11 Peak
4	524.70	-68.18	-64.43	-13.00	-55.18	-3.75 Peak
5	702.21	-64.12	-64.06	-13.00	-51.12	-0.06 Peak
6	917.55	-64.10	-65.10	-13.00	-51.10	1.00 Peak



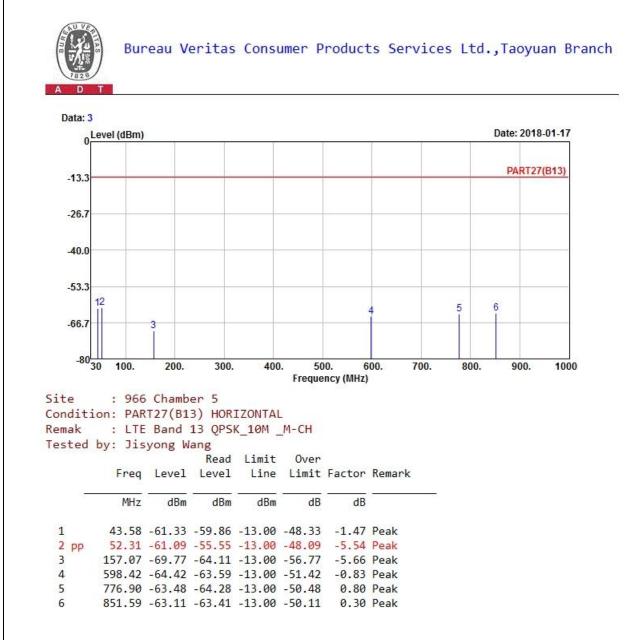


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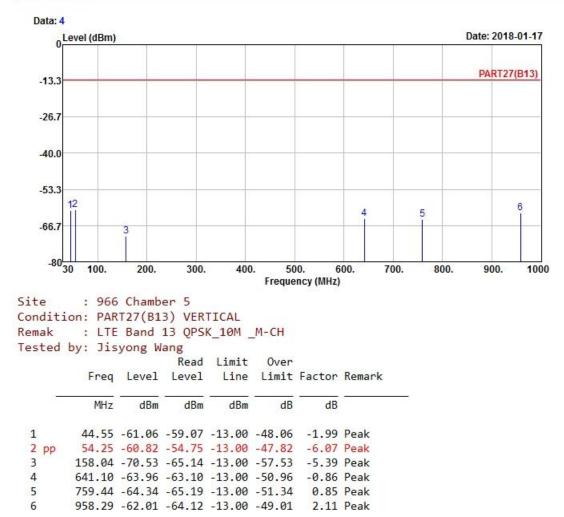
# LTE Band 13 Channel Bandwidth: 10 MHz / QPSK







Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch





# 5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).



#### Appendix – Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab Tel: 886-2-26052180 Fax: 886-2-26051924 Hsin Chu EMC/RF/Telecom Lab Tel: 886-3-6668565 Fax: 886-3-6668323

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Email: <u>service.adt@tw.bureauveritas.com</u> Web Site: <u>www.bureauveritas-adt.com</u>

The address and road map of all our labs can be found in our web site also.

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