Partial FCC Test Report

(PART 24)

Report No.: RF171212C20-1

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 / Designation Number: 788550 / TW0003

This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification. The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies.

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Release Control Record

Issue No.	Description	Date Issued
RF171212C20-1	Original Release	Mar. 05, 2018

1 Certificate of Conformity

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 24, Subpart E

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

Approved by : , **Date:** Mar. 05, 2018

Dylan Chiou / Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 24 & Part 2			
FCC Clause	**Test Item**	**Result**	**Remarks**
2.1046 24.232	Effective Isotropic Radiated Power	N/A	Refer to Note
2.1046 24.232(d)	Peak to Average Ratio	N/A	Refer to Note
2.1055 24.235	Frequency Stability	N/A	Refer to Note
2.1049 24.238(b)	Occupied Bandwidth	N/A	Refer to Note
24.238(b)	Band Edge Measurements	N/A	Refer to Note
2.1051 24.238	Conducted Spurious Emissions	N/A	Refer to Note
2.1053 24.238	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -45.76 dB at 43.77 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) (±)
Radiated Emissions up to 1 GHz	30 MHz ~ 200 MHz	2.93 dB
	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(RFC-SMS-100-SMS-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-8000&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	LTE Module	
Brand	Quectel	
Test Model	SC20-A	
Status of EUT	Identical Prototype	
Power Supply Rating	5.0 Vdc (adapter) 7.26 Vdc (Li-ion battery)	
Modulation Type	GSM/GPRS	GMSK
	EDGE	GMSK, 8PSK
	WCDMA	QPSK
	LTE	QPSK, 16QAM
Frequency Range	GSM/GPRS/EDGE	1850.2 ~ 1909.8 MHz
	WCDMA	1852.4 ~ 1907.6 MHz
	LTE Band 2 (Channel Bandwidth: 1.4 MHz)	1850.7 ~ 1909.3 MHz
	LTE Band 2 (Channel Bandwidth: 3 MHz)	1851.5 ~ 1908.5 MHz
	LTE Band 2 (Channel Bandwidth: 5 MHz)	1852.5 ~ 1907.5 MHz
	LTE Band 2 (Channel Bandwidth: 10 MHz)	1855.0 ~ 1905.0 MHz
	LTE Band 2 (Channel Bandwidth: 15 MHz)	1857.5 ~ 1902.5 MHz
	LTE Band 2 (Channel Bandwidth: 20 MHz)	1860.0 ~ 1900.0 MHz
	LTE Band 25 (Channel Bandwidth: 1.4 MHz)	1850.7 ~ 1914.3 MHz
	LTE Band 25 (Channel Bandwidth: 3 MHz)	1851.5 ~ 1913.5 MHz
	LTE Band 25 (Channel Bandwidth: 5 MHz)	1852.5 ~ 1912.5 MHz
	LTE Band 25 (Channel Bandwidth: 10 MHz)	1855.0 ~ 1910.0 MHz
	LTE Band 25 (Channel Bandwidth: 15 MHz)	1857.5 ~ 1907.5 MHz
	LTE Band 25 (Channel Bandwidth: 20 MHz)	1860.0 ~ 1905.0 MHz
Antenna Type	Dipole Antenna	
Accessory Device	Refer to Note as below	
Data Cable Supplied	Refer to Note as below	

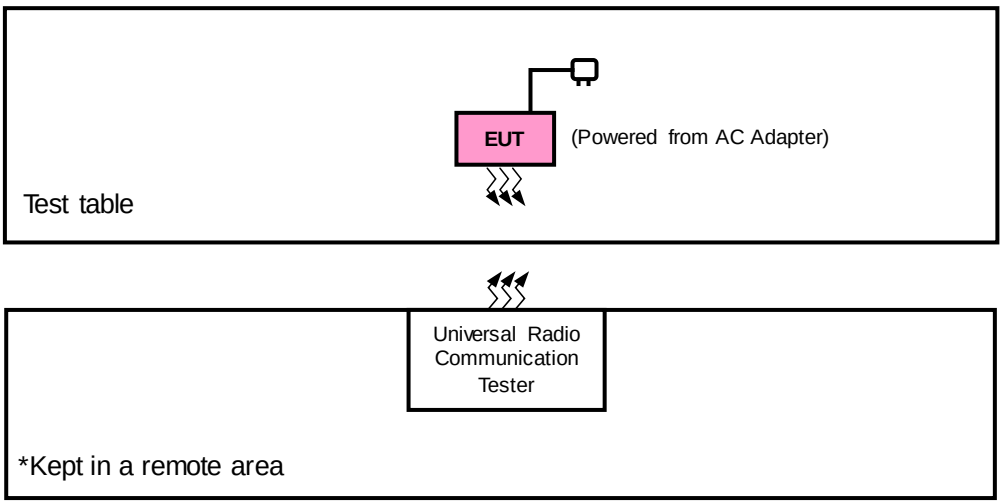
Note:

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 Configuration of System under Test



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
GSM	Y-axis
EDGE	Y-axis
WCDMA	Y-axis
LTE Band 2	Y-axis
LTE Band 25	Y-axis

GSM

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Mode
-	Radiated Emission	512 to 810	661	GSM
			512	EDGE

WCDMA

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Mode
-	Radiated Emission	9262 to 9538	9262	WCDMA

LTE Band 2

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	Radiated Emission	18700 to 19100	18900	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 25

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	Radiated Emission	26140 to 26590	26365	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.

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 24
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

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. The emission limit is equal to -13 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.

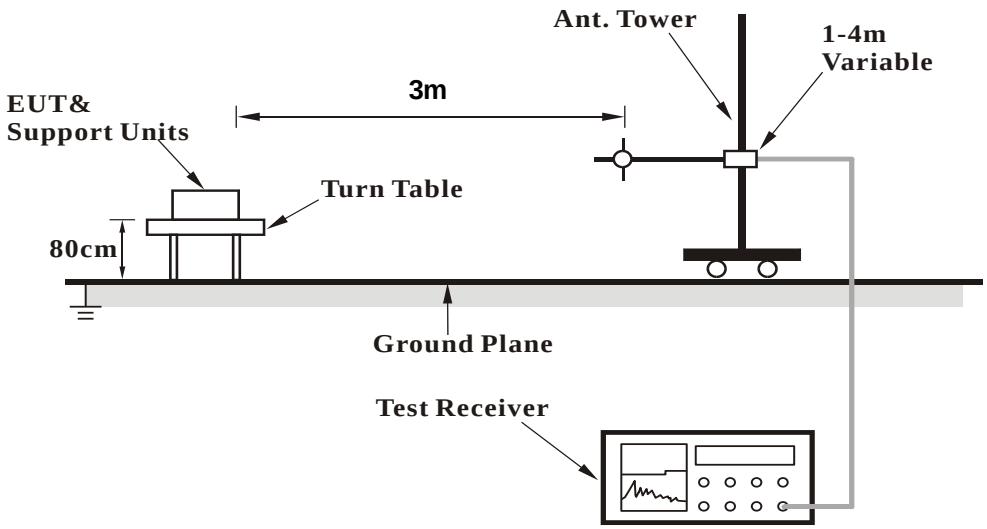
NOTE: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz/3 MHz.

4.1.3 Deviation from Test Standard

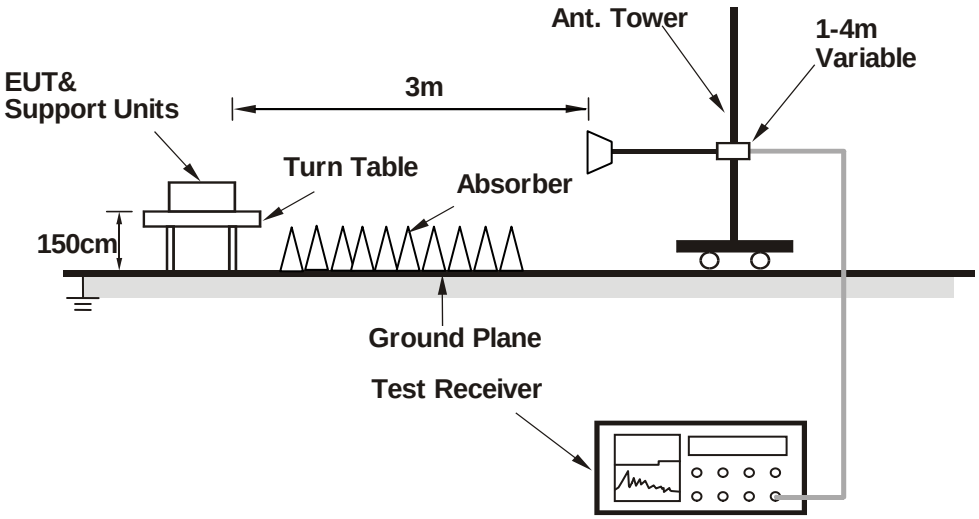
No deviation.

4.1.4 Test Setup

<Radiated Emission below or equal 1 GHz>



<Radiated Emission above 1 GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.5 Test Results

GSM:

Middle Channel

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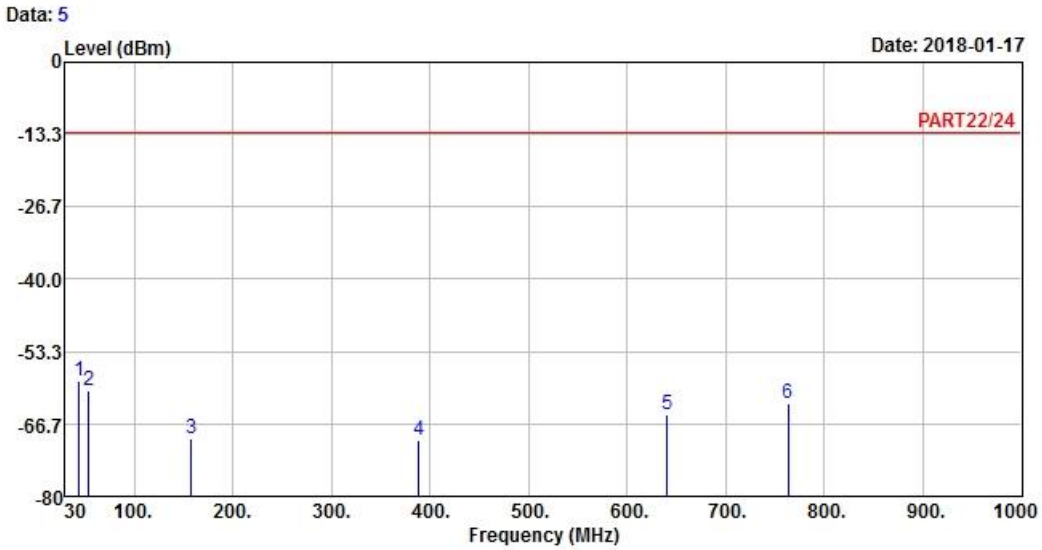
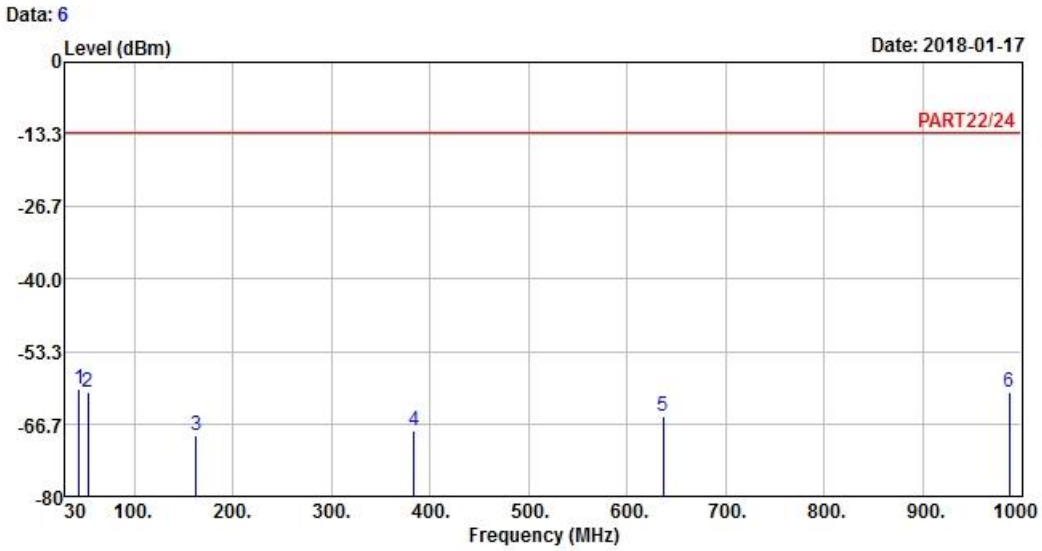


Site : 966 Chamber 5
Condition: PART22/24 HORIZONTAL
Remak : GPRS 1900 Link_M-CH
Tested by: Jisyong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	43.77	-58.76	-57.29	-13.00	-45.76	-1.47	Peak
2	53.49	-60.49	-54.68	-13.00	-47.49	-5.81	Peak
3	157.71	-69.25	-63.86	-13.00	-56.25	-5.39	Peak
4	388.90	-69.59	-63.58	-13.00	-56.59	-6.01	Peak
5	640.90	-64.93	-64.07	-13.00	-51.93	-0.86	Peak
6	763.40	-62.75	-63.59	-13.00	-49.75	0.84	Peak



Site : 966 Chamber 5
Condition: PART22/24 VERTICAL
Remak : GPRS 1900 Link_M-CH
Tested by: Jisyong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	44.04	-60.28	-58.81	-13.00	-47.28	-1.47	Peak
2	52.68	-60.82	-55.28	-13.00	-47.82	-5.54	Peak
3	163.11	-68.88	-63.83	-13.00	-55.88	-5.05	Peak
4	384.00	-68.04	-62.00	-13.00	-55.04	-6.04	Peak
5	636.70	-65.12	-64.27	-13.00	-52.12	-0.85	Peak
6	987.40	-60.83	-63.96	-13.00	-47.83	3.13	Peak

EDGE:

Low Channel

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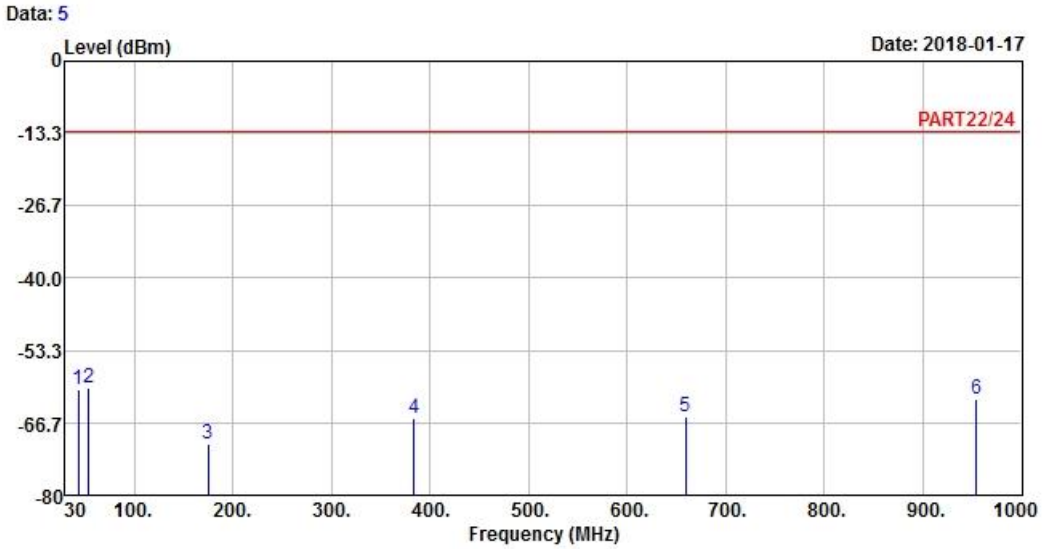
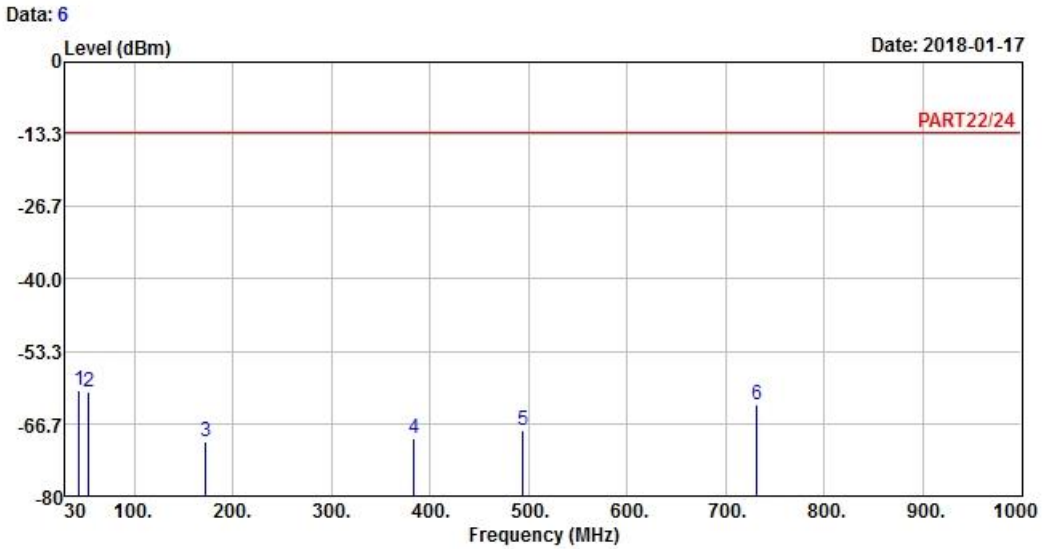


Site : 966 Chamber 5
Condition: PART22/24 HORIZONTAL
Remak : EDGE 1900 Link_L-CH
Tested by: Jisyong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	43.23	-60.44	-58.97	-13.00	-47.44	-1.47	Peak
2 pp	54.03	-60.18	-54.11	-13.00	-47.18	-6.07	Peak
3	175.26	-70.69	-64.14	-13.00	-57.69	-6.55	Peak
4	384.00	-65.89	-59.85	-13.00	-52.89	-6.04	Peak
5	659.10	-65.64	-64.91	-13.00	-52.64	-0.73	Peak
6	954.50	-62.22	-64.19	-13.00	-49.22	1.97	Peak



Site : 966 Chamber 5
Condition: PART22/24 VERTICAL
Remak : EDGE 1900 Link_L-CH
Tested by: Jisyong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	44.04	-60.44	-58.97	-13.00	-47.44	-1.47	Peak
2	54.03	-60.87	-54.80	-13.00	-47.87	-6.07	Peak
3	172.56	-69.82	-63.78	-13.00	-56.82	-6.04	Peak
4	384.00	-69.33	-63.29	-13.00	-56.33	-6.04	Peak
5	493.90	-67.90	-63.16	-13.00	-54.90	-4.74	Peak
6	731.20	-63.09	-63.61	-13.00	-50.09	0.52	Peak

WCDMA:

Low Channel

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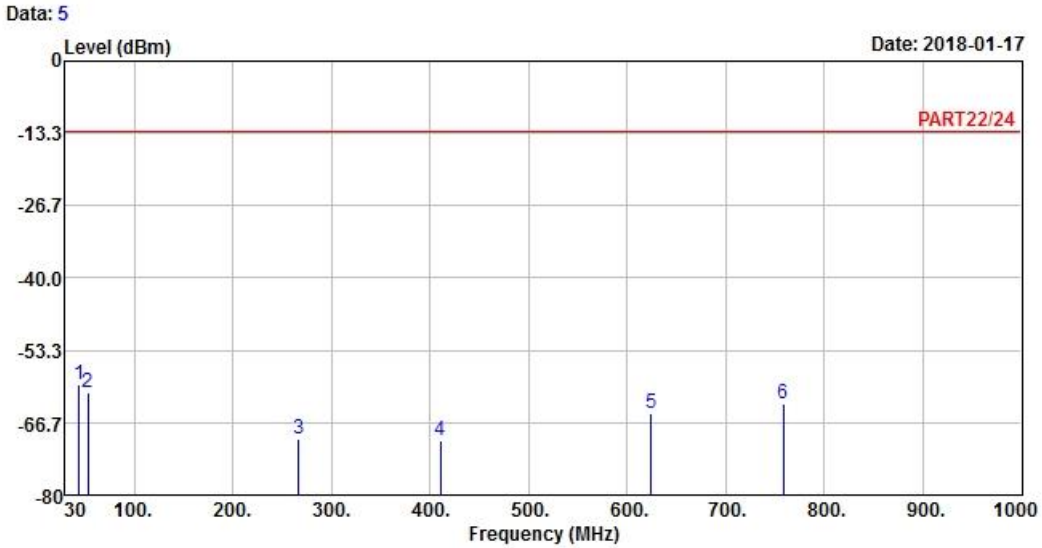

Site : 966 Chamber 5
Condition: PART22/24 HORIZONTAL
Remak : WCDMA Band 2 Link_L-CH
Tested by: Jisyong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	44.04	-59.67	-58.20	-13.00	-46.67	-1.47	Peak
2	52.95	-61.16	-55.35	-13.00	-48.16	-5.81	Peak
3	267.06	-69.75	-63.42	-13.00	-56.75	-6.33	Peak
4	410.60	-70.08	-64.22	-13.00	-57.08	-5.86	Peak
5	624.10	-65.04	-64.22	-13.00	-52.04	-0.82	Peak
6	758.50	-63.24	-64.09	-13.00	-50.24	0.85	Peak

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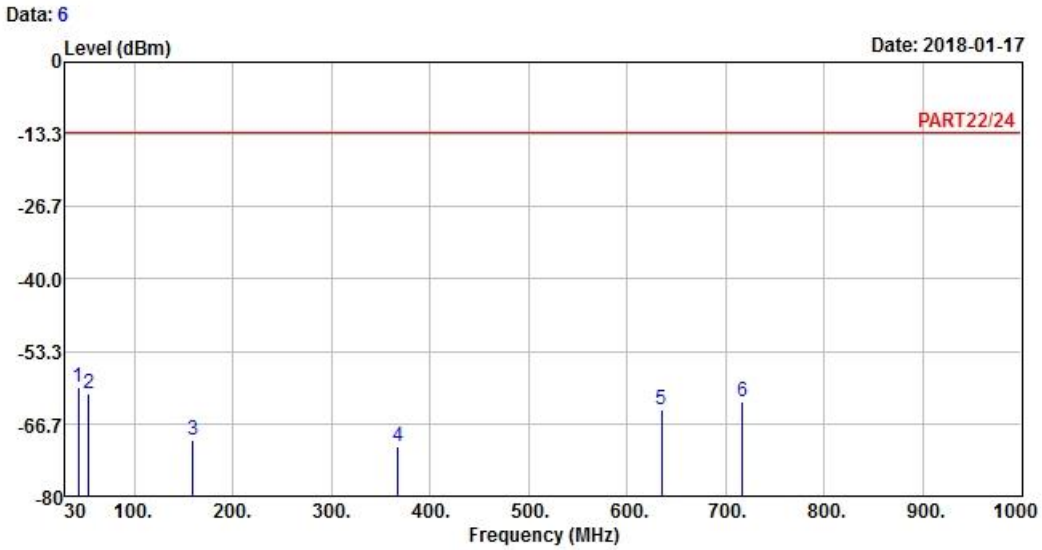

Site : 966 Chamber 5
Condition: PART22/24 VERTICAL
Remak : WCDMA Band 2 Link_L-CH
Tested by: Jisyong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	43.50	-59.93	-58.46	-13.00	-46.93	-1.47	Peak
2	53.49	-61.13	-55.32	-13.00	-48.13	-5.81	Peak
3	159.06	-69.75	-64.63	-13.00	-56.75	-5.12	Peak
4	367.20	-70.71	-64.57	-13.00	-57.71	-6.14	Peak
5	634.60	-64.19	-63.35	-13.00	-51.19	-0.84	Peak
6	717.20	-62.67	-62.90	-13.00	-49.67	0.23	Peak

LTE Band 2
Channel Bandwidth: 20 MHz / QPSK
Middle Channel

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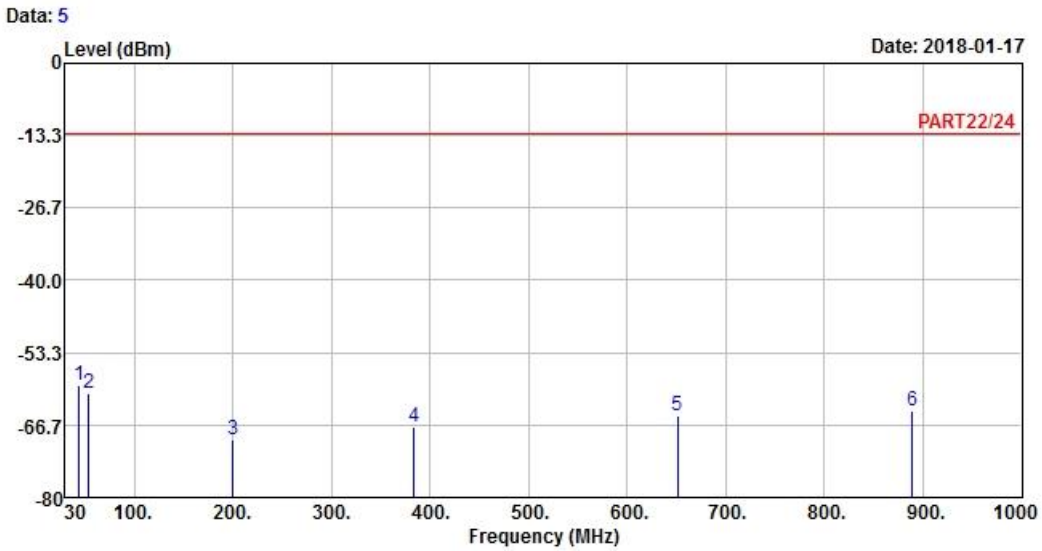

Site : 966 Chamber 5
Condition: PART22/24 HORIZONTAL
Remak : LTE Band 2 QPSK_20M Link_M-CH
Tested by: Jisyong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	44.04	-59.29	-57.82	-13.00	-46.29	-1.47	Peak
2	53.49	-60.71	-54.90	-13.00	-47.71	-5.81	Peak
3	200.10	-69.43	-61.41	-13.00	-56.43	-8.02	Peak
4	384.00	-66.99	-60.95	-13.00	-53.99	-6.04	Peak
5	651.40	-64.81	-63.96	-13.00	-51.81	-0.85	Peak
6	889.40	-63.97	-64.48	-13.00	-50.97	0.51	Peak

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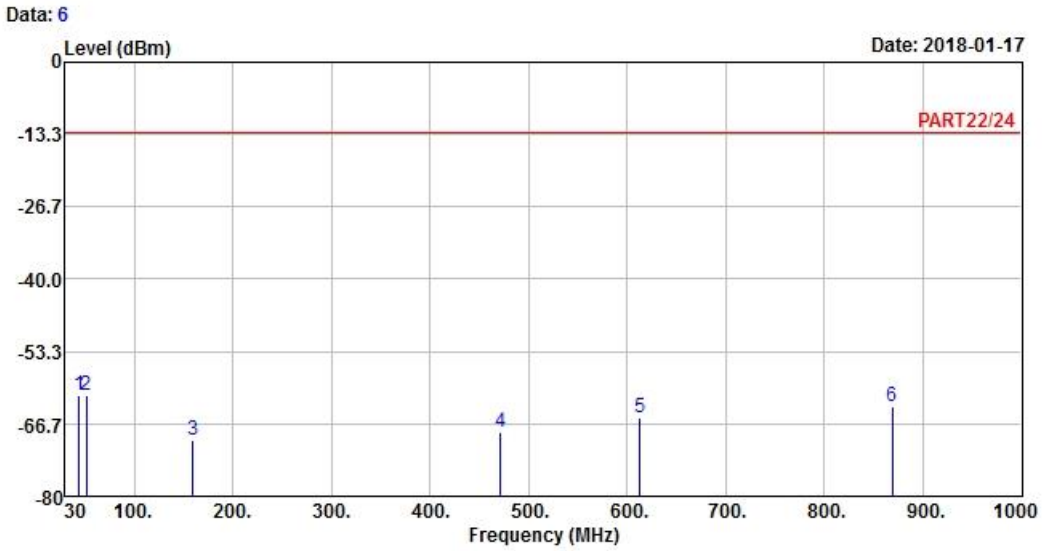

Site : 966 Chamber 5
Condition: PART22/24 VERTICAL
Remak : LTE Band 2 QPSK_20M Link_M-CH
Tested by: Jisyong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	44.04	-61.41	-59.94	-13.00	-48.41	-1.47	Peak
2 pp	51.60	-61.39	-56.11	-13.00	-48.39	-5.28	Peak
3	159.06	-69.55	-64.43	-13.00	-56.55	-5.12	Peak
4	471.50	-68.11	-62.96	-13.00	-55.11	-5.15	Peak
5	612.90	-65.53	-64.74	-13.00	-52.53	-0.79	Peak
6	869.10	-63.57	-63.97	-13.00	-50.57	0.40	Peak

LTE Band 25
Channel Bandwidth: 20 MHz / QPSK
Middle Channel

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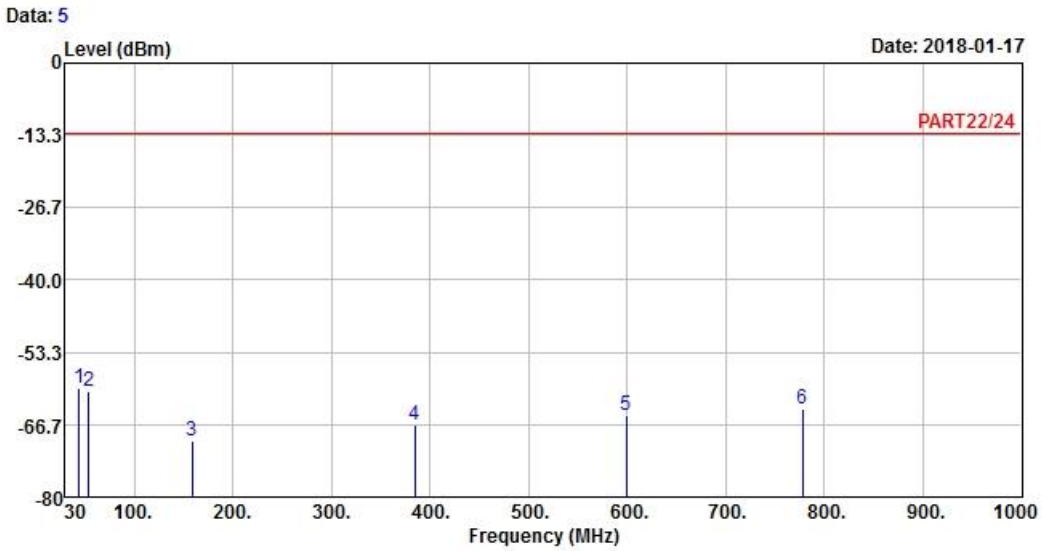
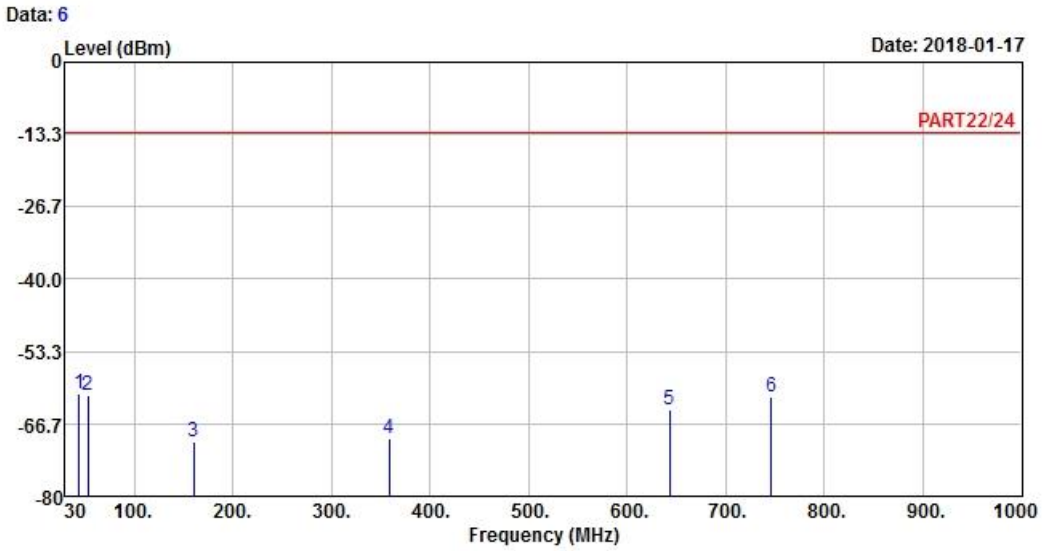


Site : 966 Chamber 5
Condition: PART22/24 HORIZONTAL
Remak : LTE Band 25 QPSK_20M Link_M-CH
Tested by: Jisyong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	43.77	-59.93	-58.46	-13.00	-46.93	-1.47	Peak
2	54.03	-60.49	-54.42	-13.00	-47.49	-6.07	Peak
3	158.52	-69.62	-64.23	-13.00	-56.62	-5.39	Peak
4	384.70	-66.80	-60.77	-13.00	-53.80	-6.03	Peak
5	598.90	-65.07	-64.24	-13.00	-52.07	-0.83	Peak
6	778.10	-63.65	-64.45	-13.00	-50.65	0.80	Peak

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART22/24 VERTICAL
Remak : LTE Band 25 QPSK_20M Link_M-CH
Tested by: Jisyong Wang

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	43.77	-61.22	-59.75	-13.00	-48.22	-1.47	Peak
2	53.22	-61.52	-55.71	-13.00	-48.52	-5.81	Peak
3	159.87	-69.83	-64.99	-13.00	-56.83	-4.84	Peak
4	358.80	-69.35	-63.16	-13.00	-56.35	-6.19	Peak
5	643.00	-63.94	-63.07	-13.00	-50.94	-0.87	Peak
6	746.60	-61.78	-62.60	-13.00	-48.78	0.82	Peak

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

Hwa Ya EMC/RF/Safety
Tel: 886-3-3183232
Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com
Web Site: www.bureauveritas-adt.com

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

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