

Variant FCC Test Report

(PART 24)

Report No.: RF171114D13B

FCC ID: P27-TPM10

Test Model: TPM10

Received Date: Oct. 02, 2018

Test Date: Oct. 19, 2018

Issued Date: Nov. 01, 2018

Applicant: Sercomm Corp.

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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: No. 19, Hwa Ya 2nd Rd, Wen Hwa Vil, Kwei Shan Dist., Taoyuan City 33383, Taiwan (R.O.C)

FCC Registration / 788550 / TW0003

Designation Number:



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Release Control Record

Issue No.	Description	Date Issued
RF171114D13B	Original Release	Nov. 01, 2018



1 Certificate of Co	onformity		
Product:	Cat-M1 Module		
Brand:	Sercomm		
Test Model:	TPM10		
Sample Status:	Identical Prototype		
Applicant:	Sercomm Corp.		
Test Date:	Oct. 19, 2018		
Standards:	FCC Part 24, Subpart E		
This report is issued a used by combining wi	is a supplementary report to BV CPS repor th its original report.	t no.: RF1711	14D13. This report shall be
Prepared by :	Gina Liu / Specialist	, Date:	Nov. 01, 2018
Approved by :	Dylan Chiou / Project Engineer	, Date:	Nov. 01, 2018



Applied Standard: FCC Part 24 & Part 2					
FCC Test Item		Result	Remarks		
2.1046 24.232	Effective Isotropic Radiated Power 1 Pass		Meet the requirement of limit.		
2.1046 24.232(d)Peak to Average RatioN/ARefer to ori		Refer to original report			
2.1055 24.235	Erequency Stability		Refer to original report		
			Refer to original report		
24.238(b)	Band Edge Measurements	N/A	Refer to original report		
2.1051 24.238	Conducted Spurious Emissions		Refer to original report		
2.1053 24.238	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -38.82 dB at 3760 MHz.		

2 Summary of Test Results

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) (±)
Padiated 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
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.26 dB
	18 GHz ~ 40 GHz	1.94 dB



2.2 **Test Site and Instruments**

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent	N9038A	MY51210203	Mar. 16, 2018	Mar. 15, 2019
Spectrum Analyzer Agilent	N9010A	MY52220314	Nov. 24, 2017	Nov. 23, 2018
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Jan. 11, 2018	Jan. 10, 2019
BILOG Antenna SCHWARZBECK	VULB 9168	9168-153	Dec. 06, 2017	Dec. 05, 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(RF C-SMS-100-SMS- 120+RFC-SMS-1 00-SMS-400)	Jun. 19, 2018	Jun. 19, 2019
MXG Vector signal generator Agilent	N5182B	MY53050430	Oct. 24, 2017	Oct. 23, 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. 12, 2018	Oct. 11, 2019
RF Coaxial Cable HUBER+SUHNNER	EMC104-SM-SM-800 0&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	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
HORN Antenna Schwarzbeck	BBHA 9170	9170-480	Dec. 01, 2017	Nov. 30, 2018

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.



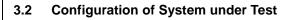
3 General Information

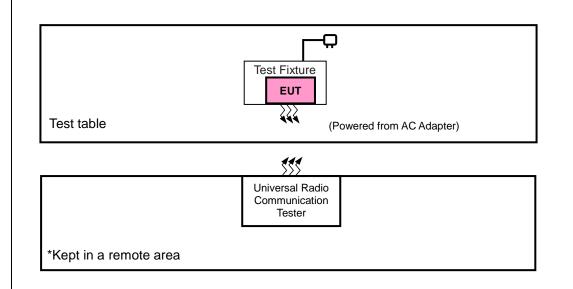
3.1 General Description of EUT

Product	Cat-M1 Module			
Brand	Sercomm			
Test Model	TPM10			
Status of EUT	Identical Prototype			
Power Supply Rating	5.0 Vdc (adapter)			
Modulation Type	LTE	QPSK, 16QAM		
	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		
Frequency Range	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 2 (Channel Bandwidth: 1.4 MHz)	98.04 mW		
	LTE Band 2 (Channel Bandwidth: 3 MHz)	103.13 mW		
Max. EIRP Power	LTE Band 2 (Channel Bandwidth: 5 MHz)	108.99 mW		
Max. EIRP Power	LTE Band 2 (Channel Bandwidth: 10 MHz)	115.72 mW		
	LTE Band 2 (Channel Bandwidth: 15 MHz)	122.29 mW		
	LTE Band 2 (Channel Bandwidth: 20 MHz)	129.54 mW		
Antenna Type	PIFA Antenna with 1.96 dBi gain			
Accessory Device	N/A			
Data Cable Supplied	N/A			

Note:

- 1. This report is issued as a supplementary report to BV CPS report no. RF171114D13. The difference compared with original report is adding new antenna. Therefore, only radiated emissions test and EIRP has been verified and recorded in this report.
- 2. The above EUT information is declared by manufacturer and for more detailed features description, please refers 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	LINKSYS	MT10-1050200-A1	N/A	N/A
2.	Test Fixture	N/A	N/A	N/A	N/A

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

Note:

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

2. Item 1-2 were 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	EIRP	Radiated Emission	
LTE Band 2	X-plane	X-axis	

LTE Band 2

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
		18607 to 19193	18607, 18900, 19193	1.4 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
	EIRP	18615 to 19185	18615, 18900, 19185	3 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		18625 to 19175	18625, 18900, 19175	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
-		18650 to 19150	18650, 18900, 19150	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		18675 to 19125	18675, 18900, 19125	15 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		18700 to 19100	18700, 18900, 19100	20 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
-	Radiated Emission	18700 to 19100	18700, 18900, 19100	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
EIRP	26 deg. C, 58 % RH	120 Vac, 60 Hz	Jisyong Wang
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 v03r01 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 Output Power Measurement

4.1.1 Limits of Output Power Measurement

Mobile / Portable station are limited to 2 watts e.i.r.p.

4.1.2 Test Procedures

EIRP / ERP Measurement:

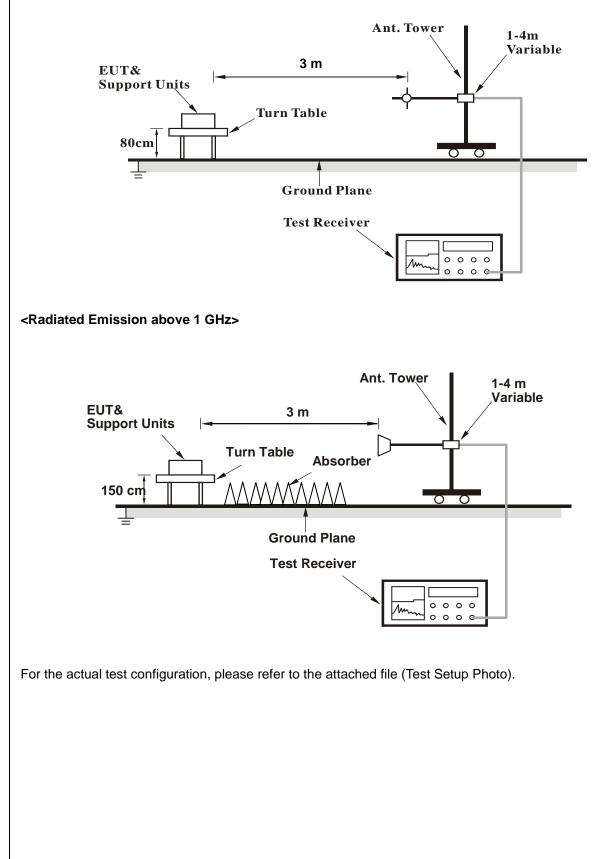
- All measurements were done at low, middle and high operational frequency range. RBW and VBW is 10 MHz for LTE mode.
- b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, 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.
- c. 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 b. Record the power level of S.G.
- d. EIRP = Output power level of S.G TX cable loss + Antenna gain of substitution horn. 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.R.P power 2.15 dB.



4.1.3 Test Setup

EIRP / ERP Measurement:

<Radiated Emission below or equal 1 GHz>





4.1.4 Test Results

EIRP Power (dBm)

LTE Band 2									
Channel Bandwidth: 1.4 MHz / QPSK									
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)		
	18607	1850.7	-16.80	36.57	19.77	94.89	н		
	18900	1880.0	-17.31	37.22	19.91	98.04			
x	19193	1909.3	-17.35	37.18	19.83	96.21			
^	18607	1850.7	-27.92	37.65	9.73	9.40	V		
	18900	1880.0	-27.76	37.58	9.82	9.60			
	19193	1909.3	-27.72	37.48	9.76	9.46			
		Cha	annel Bandwi	dth: 1.4 MHz	/ 16QAM				
	18607	1850.7	-17.72	36.57	18.85	76.77			
	18900	1880.0	-18.23	37.22	18.99	79.32	Н		
v	19193	1909.3	-18.27	37.18	18.91	77.84			
Х	18607	1850.7	-28.84	37.65	8.81	7.61			
	18900	1880.0	-28.68	37.58	8.90	7.77	V		
	19193	1909.3	-28.64	37.48	8.84	7.66			

LTE Band 2									
Channel Bandwidth: 3 MHz / QPSK									
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)		
	18615	1851.5	-16.58	36.57	19.99	99.82			
	18900	1880.0	-17.09	37.22	20.13	103.13	Н		
x	19185	1908.5	-17.13	37.18	20.05	101.20			
^	18615	1851.5	-27.70	37.65	9.95	9.89			
	18900	1880.0	-27.54	37.58	10.04	10.10	V		
	19185	1908.5	-27.50	37.48	9.98	9.95			
-		Ch	nannel Bandw	/idth: 3 MHz /	16QAM				
	18615	1851.5	-17.49	36.57	19.08	80.95			
	18900	1880.0	-18.00	37.22	19.22	83.64	Н		
v	19185	1908.5	-18.04	37.18	19.14	82.07			
Х	18615	1851.5	-28.61	37.65	9.04	8.02			
	18900	1880.0	-28.45	37.58	9.13	8.19	V		
	19185	1908.5	-28.41	37.48	9.07	8.07			



			LTI	E Band 2						
Channel Bandwidth: 5 MHz / QPSK										
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)			
	18625	1852.5	-16.34	36.57	20.23	105.49				
	18900	1880.0	-16.85	37.22	20.37	108.99	Н			
v	19175	1907.5	-16.89	37.18	20.29	106.95				
Х	18625	1852.5	-27.46	37.65	10.19	10.45	V			
	18900	1880.0	-27.30	37.58	10.28	10.67				
	19175	1907.5	-27.26	37.48	10.22	10.52				
		Ch	annel Bandw	/idth: 5 MHz /	16QAM					
	18625	1852.5	-17.28	36.57	19.29	84.96				
	18900	1880.0	-17.79	37.22	19.43	87.78	н			
v	19175	1907.5	-17.83	37.18	19.35	86.14				
Х	18625	1852.5	-28.40	37.65	9.25	8.42				
	18900	1880.0	-28.24	37.58	9.34	8.60	V			
	19175	1907.5	-28.20	37.48	9.28	8.47				

LTE Band 2									
Channel Bandwidth: 10 MHz / QPSK									
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)		
	18650	1855.0	-16.08	36.57	20.49	112.00			
	18900	1880.0	-16.59	37.22	20.63	115.72	н		
x	19150	1905.0	-16.63	37.18	20.55	113.55			
^	18650	1855.0	-27.20	37.65	10.45	11.09			
	18900	1880.0	-27.04	37.58	10.54	11.33	V		
	19150	1905.0	-27.00	37.48	10.48	11.17			
-		Ch	annel Bandw	idth: 10 MHz /	16QAM				
	18650	1855.0	-17.04	36.57	19.53	89.78			
	18900	1880.0	-17.55	37.22	19.67	92.77	н		
v	19150	1905.0	-17.59	37.18	19.59	91.03			
Х	18650	1855.0	-28.16	37.65	9.49	8.89			
	18900	1880.0	-28.00	37.58	9.58	9.08	V		
	19150	1905.0	-27.96	37.48	9.52	8.95			



			LTI	E Band 2						
Channel Bandwidth: 15 MHz / QPSK										
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)			
	18675	1857.5	-15.84	36.57	20.73	118.36				
	18900	1880.0	-16.35	37.22	20.87	122.29	н			
х	19125	1902.5	-16.39	37.18	20.79	120.01				
^	18675	1857.5	-26.96	37.65	10.69	11.72	V			
	18900	1880.0	-26.80	37.58	10.78	11.98				
	19125	1902.5	-26.76	37.48	10.72	11.80				
		Ch	annel Bandw	idth: 15 MHz /	16QAM					
	18675	1857.5	-16.81	36.57	19.76	94.67				
	18900	1880.0	-17.32	37.22	19.90	97.81	н			
х	19125	1902.5	-17.36	37.18	19.82	95.98				
X	18675	1857.5	-27.93	37.65	9.72	9.38				
	18900	1880.0	-27.77	37.58	9.81	9.58	V			
	19125	1902.5	-27.73	37.48	9.75	9.44				

LTE Band 2									
Channel Bandwidth: 20 MHz / QPSK									
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)		
	18700	1860.0	-15.59	36.57	20.98	125.37			
	18900	1880.0	-16.10	37.22	21.12	129.54	Н		
x	19100	1900.0	-16.14	37.18	21.04	127.12			
^	18700	1860.0	-26.71	37.65	10.94	12.42			
	18900	1880.0	-26.55	37.58	11.03	12.69	V		
	19100	1900.0	-26.51	37.48	10.97	12.50			
-		Ch	annel Bandw	idth: 20 MHz /	16QAM				
	18700	1860.0	-16.60	36.57	19.97	99.36			
	18900	1880.0	-17.11	37.22	20.11	102.66	Н		
v	19100	1900.0	-17.15	37.18	20.03	100.74			
Х	18700	1860.0	-27.72	37.65	9.93	9.84			
	18900	1880.0	-27.56	37.58	10.02	10.05	V		
	19100	1900.0	-27.52	37.48	9.96	9.91			



4.2 Radiated Emission Measurement

4.2.1 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.

4.2.2 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.R.P power 2.15 dB.

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

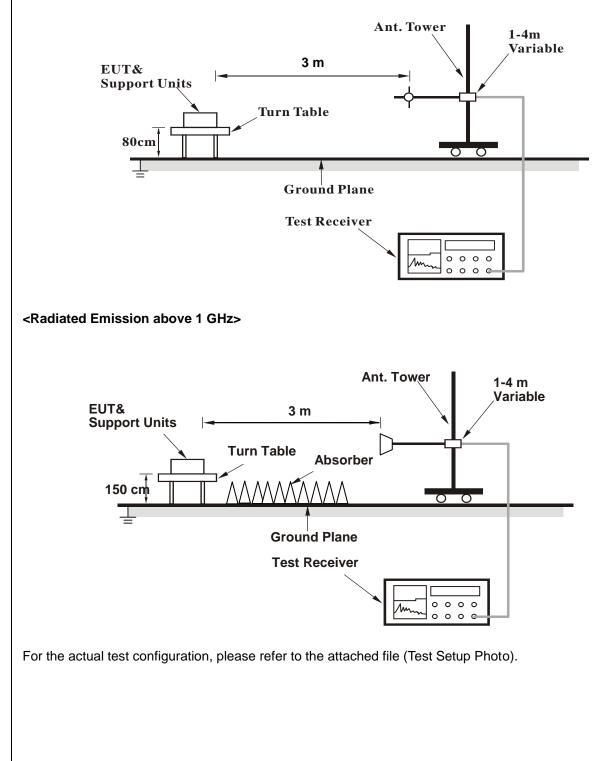
4.2.3 Deviation from Test Standard

No deviation.



4.2.4 Test Setup

<Radiated Emission below or equal 1 GHz>





4.2.5 Test Results LTE Band 2 Channel Bandwidth: 20 MHz / QPSK Low Channel





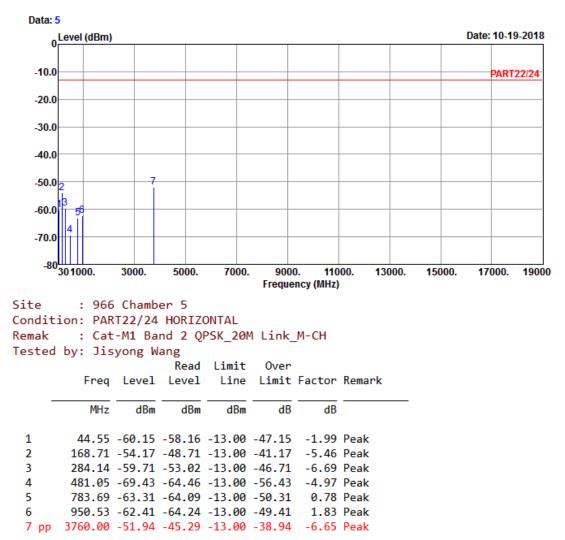






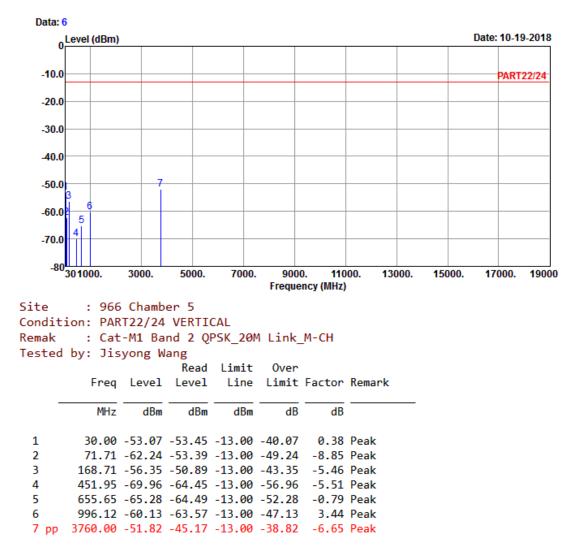
Middle Channel







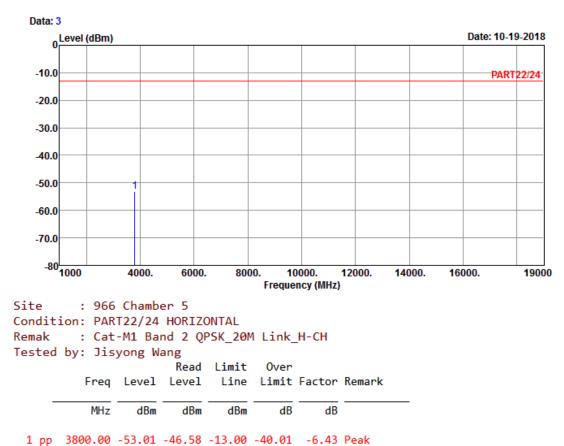






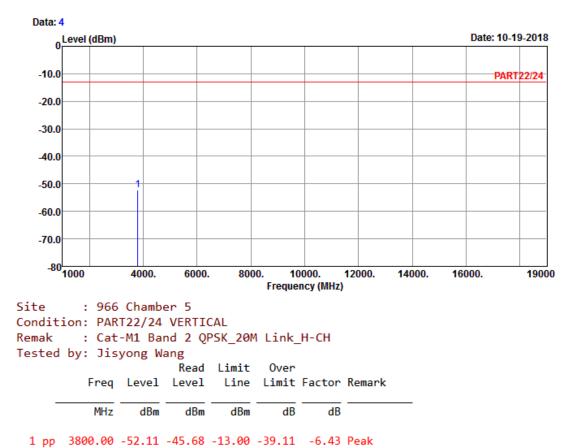
High Channel













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: <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.

---- END ----