



PARTIAL FCC TEST REPORT (PART 27)

REPORT NO.: RF140820C14
MODEL NO.: TOBY-L200
FCC ID: XPYTOBYL200
RECEIVED: Aug. 20, 2014
TESTED: Aug. 26, 2014
ISSUED: Sep. 15, 2014

APPLICANT: u-blox GMBH

ADDRESS: Zürcherstrasse 68, CH-8800 Thalwil, Switzerland

ISSUED BY: Bureau Veritas Consumer Products Services
(H.K.) Ltd., Taoyuan Branch

LAB ADDRESS: No. 47, 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 Tsuen, Kwei
Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF140820C14	Original release	Sep. 15, 2014



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1 CERTIFICATION

PRODUCT: GSM/UMTS/HSPA/LTE Data Module
MODEL NO.: TOBY-L200
BRAND: ublox
APPLICANT: u-blox GMBH
TESTED: Aug. 26, 2014
TEST SAMPLE: Production Unit
TEST STANDARDS: **FCC Part 27, Subpart C, L**
FCC Part 2
ANSI C63.4-2003

The above equipment (model: TOBY-L200) 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 EMC characteristics under the conditions specified in this report.

PREPARED BY : Ivonne Wu , **DATE:** Sep. 15, 2014
Ivonne Wu / Supervisor

APPROVED BY : Sam Chen , **DATE:** Sep. 15, 2014
Sam Chen / Senior Project Engineer

2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

LTE Band 4			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK
2.1053 27.53(h)	Radiated Spurious Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -31.79dB at 47.28MHz.

LTE Band 17			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK
2.1053 27.53(g)	Radiated Spurious Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -30.37dB at 1420.00MHz.

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	UNCERTAINTY
Radiated emissions	30MHz ~ 200MHz	2.93 dB
	200MHz ~1000MHz	2.95 dB
	1GHz ~ 18GHz	2.26 dB
	18GHz ~ 40GHz	1.94 dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.



2.2 TEST SITE AND INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCI	100744	Apr. 15, 2014	Apr. 14, 2015
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Dec. 21, 2013	Dec. 20, 2014
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Feb. 27, 2014	Feb. 26, 2015
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-969	Feb. 19, 2014	Feb. 18, 2015
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Dec. 18, 2013	Dec. 17, 2014
Preamplifier EMCI	EMC 012645	980115	Dec. 26, 2013	Dec. 25, 2014
Preamplifier EMCI	EMC 184045	980116	Jan. 13, 2014	Jan. 12, 2015
Preamplifier EMCI	EMC 330H	980112	Dec. 27, 2013	Dec. 26, 2014
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	309219/4 2950114	Oct. 18, 2013	Oct. 17, 2014
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	250130/4	Oct. 18, 2013	Oct. 17, 2014
RF signal cable Worken	RG-213	NA	Nov. 07, 2013	Nov. 06, 2014
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
JFW 20dB attenuation	50HF-020-SMA	NA	NA	NA
Communications Tester-Wireless	E5515C	MY52102544	Sep. 05, 2012	Sep. 04, 2014
Radio Communication Analyzer	MT8820C	6201300640	Aug. 01, 2013	Jul. 31, 2015

- 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 HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
 4. The FCC Site Registration No. is 690701.
 5. The IC Site Registration No. is IC 7450F-10.



3 GENERAL INFORMATION

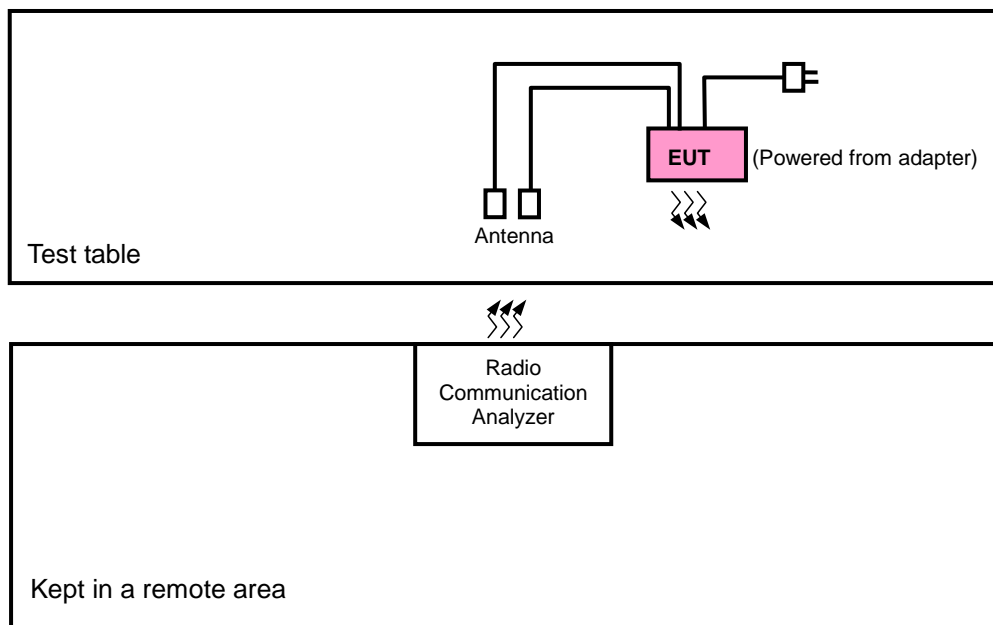
3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	GSM/UMTS/HSPA/LTE Data Module	
MODEL NO.	TOBY-L200	
POWER SUPPLY	12Vdc (adapter)	
MODULATION TECHNOLOGY	LTE Band 4	QPSK, 16QAM
	LTE Band 17	QPSK, 16QAM
FREQUENCY RANGE	LTE Band 4 Channel Bandwidth: 20MHz	1720.0MHz ~1745.0MHz
	LTE Band 17 Channel Bandwidth: 10MHz	709MHz ~ 711MHz
ANTENNA TYPE	PCB Antenna	
DATA CABLE	Refer to Note as below	
I/O PORTS	Refer to users' manual	
ACCESSORY DEVICES	Refer to Note as below	

NOTE:

1. 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



3.3 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	Antenna	N/A	N/A	N/A	N/A
2	Adapter	UNIFIVE	UUX324-1215	N/A	N/A
3	Radio Communication Analyzer	Anritsu	MT8820C	6201240431	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	N/A
2	1.55m cable

NOTE:

1. All power cords of the above support units are non shielded (1.8m).
2. Items 1&2 were provided by client.

3.4 DESCRIPTION OF TEST MODES

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. Following channel(s) was (were) selected for the final test as listed below:

LTE Band 4

EUT CONFIGURE MODE	TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	CHANNEL BANDWIDTH	MODULATION	MODE
-	RADIATED EMISSION	20050 to 20300	20175	20MHz	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 17

EUT CONFIGURE MODE	TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	CHANNEL BANDWIDTH	MODULATION	MODE
-	RADIATED EMISSION	23780 to 23800	23790	10MHz	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	25deg. C, 65%RH	120Vac, 60Hz	Will Chen

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

ANSI C63.4-2003

ANSI/TIA/EIA-603-C 2004

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 a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10}(P)$ dB. The limit of emission equal to -13dBm

4.1.2 TEST PROCEDURES

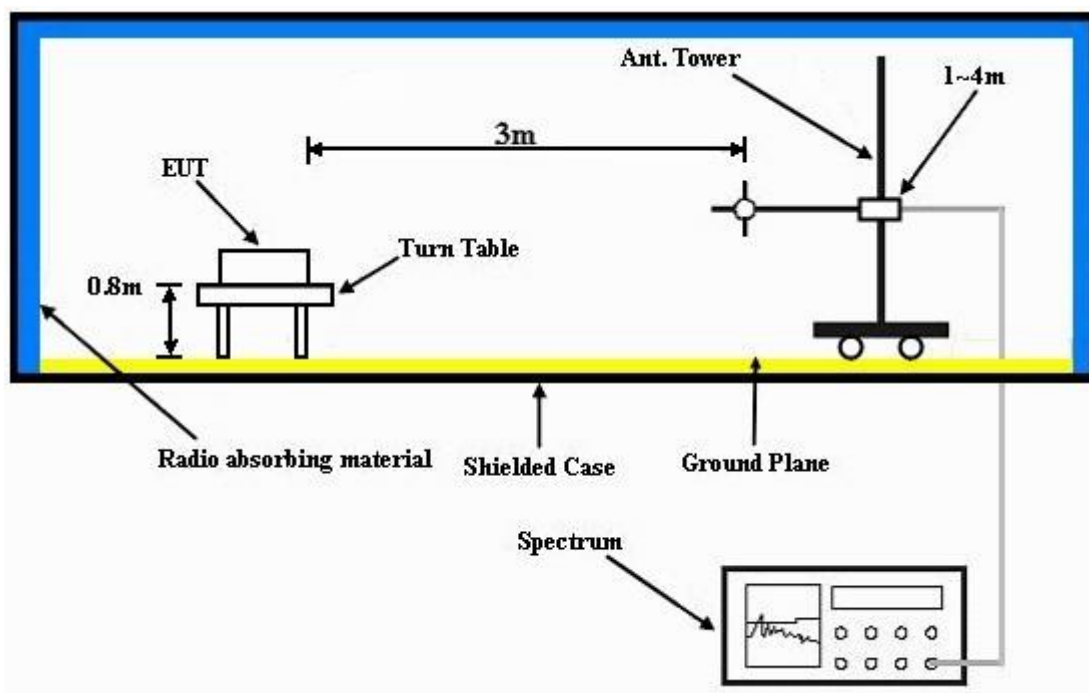
- a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m 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. $\text{EIRP} = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn.}$
- d. $\text{E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power} = \text{E.I.P.R power} - 2.15\text{dBi.}$

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



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



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4.1.5 TEST RESULTS

LTE BAND 4

CHANNEL BANDWIDTH: 20MHz / QPSK

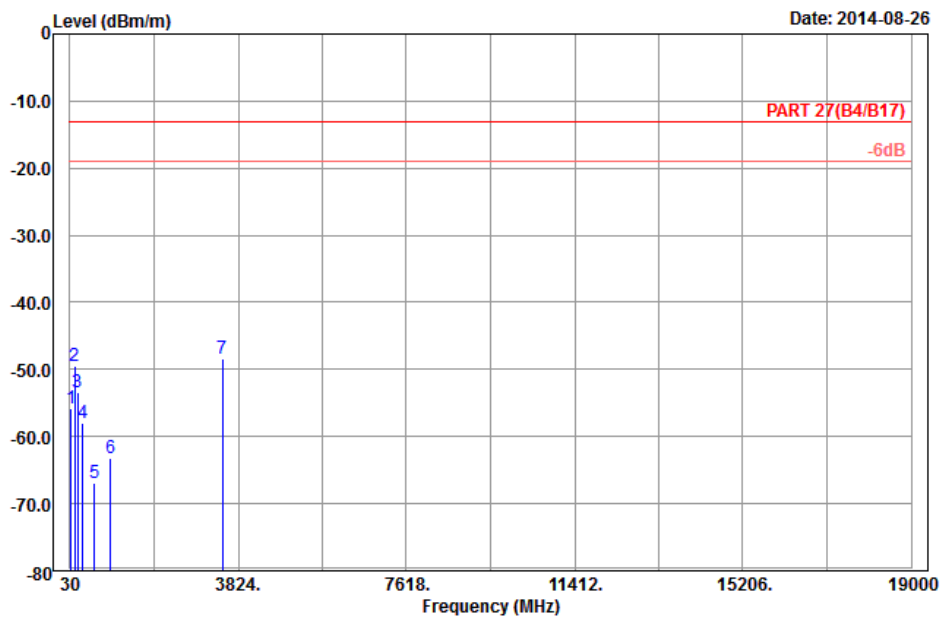


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Data: 13

Date: 2014-08-26



Site : 966 chamber 5
 Condition: PART 27(B4/B17) 3m Horizontal
 Remark : LTE_Band 4_QPSK(1,0)_20M_CH20175
 Tested by: Will Chen

	Read	Limit	Over				
Freq	Level	Level	Line	Limit	Factor	Remark	
MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1	58.35	-55.86	-41.80	-13.00	-42.86	-14.06	Peak
2	133.95	-49.55	-41.89	-13.00	-36.55	-7.66	Peak
3	195.51	-53.32	-47.32	-13.00	-40.32	-6.00	Peak
4	325.90	-57.94	-52.28	-13.00	-44.94	-5.66	Peak
5	586.30	-66.97	-66.83	-13.00	-53.97	-0.14	Peak
6	937.70	-63.32	-67.90	-13.00	-50.32	4.58	Peak
7 pp	3465.00	-48.31	-62.65	-13.00	-35.31	14.34	Peak



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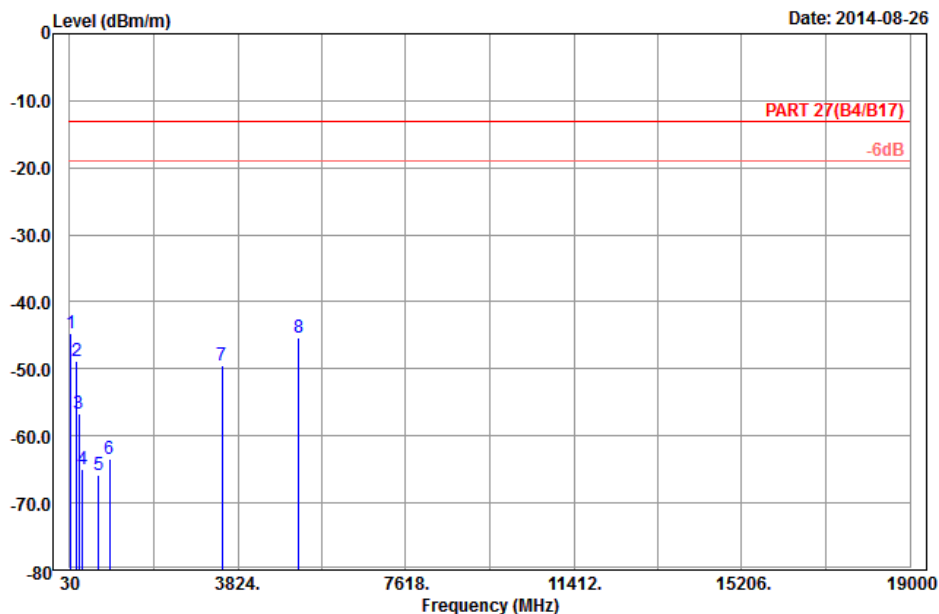


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Data: 14

Date: 2014-08-26



Site : 966 chamber 5
 Condition: PART 27(B4/B17) 3m Vertical
 Remark : LTE_Band 4_QPSK(1,0)_20M_CH20175
 Tested by: Will Chen

	Freq	Level	Read Level	Limit	Over	Factor	Remark
	MHz	dBm/m	dBm	dBm/m	dB	dB/m	
1	pp	47.28	-44.79	-31.68	-13.00	-31.79	-13.11 Peak
2		182.01	-48.73	-43.12	-13.00	-35.73	-5.61 Peak
3		237.90	-56.68	-51.00	-13.00	-43.68	-5.68 Peak
4		325.90	-64.86	-59.20	-13.00	-51.86	-5.66 Peak
5		676.60	-65.79	-65.52	-13.00	-52.79	-0.27 Peak
6		930.00	-63.51	-67.75	-13.00	-50.51	4.24 Peak
7		3465.00	-49.40	-63.74	-13.00	-36.40	14.34 Peak
8		5197.50	-45.37	-65.49	-13.00	-32.37	20.12 Peak



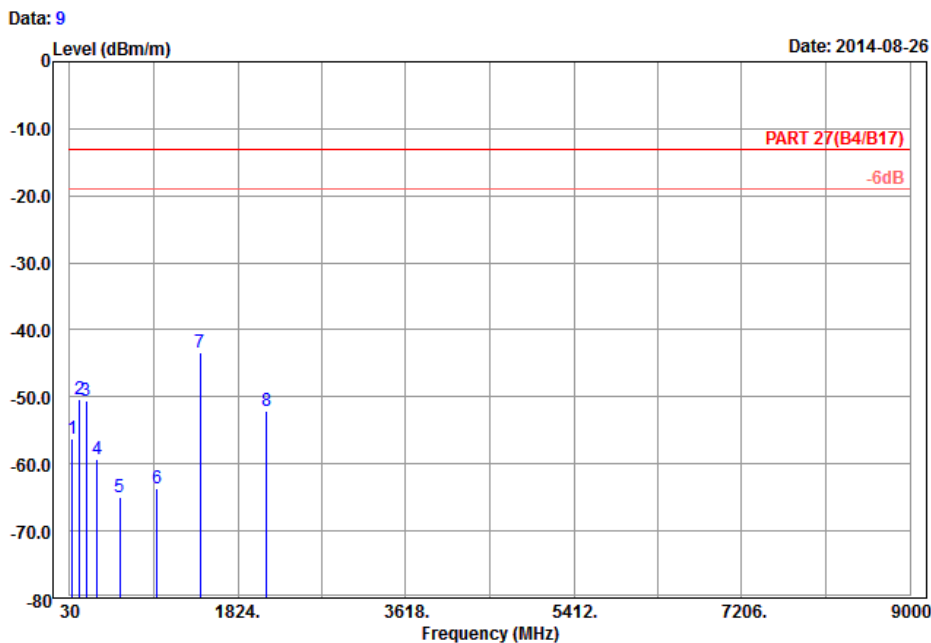
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LTE BAND 17
CHANNEL BANDWIDTH: 10MHz / QPSK



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Site : 966 chamber 5
 Condition: PART 27(B4/B17) 3m Horizontal
 Remark : LTE_Band 17_QPSK(1,0)_10M_CH23790
 Tested by: Will Chen

	Read	Limit	Over				
Freq	Level	Level	Line	Limit	Factor	Remark	
MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1	58.62	-56.15	-42.09	-13.00	-43.15	-14.06	Peak
2	133.68	-50.30	-42.64	-13.00	-37.30	-7.66	Peak
3	202.53	-50.51	-44.37	-13.00	-37.51	-6.14	Peak
4	318.90	-59.25	-53.51	-13.00	-46.25	-5.74	Peak
5	568.10	-64.88	-63.98	-13.00	-51.88	-0.90	Peak
6	964.30	-63.61	-68.76	-13.00	-50.61	5.15	Peak
7 pp	1420.00	-43.37	-49.73	-13.00	-30.37	6.36	Peak
8	2130.00	-52.07	-63.35	-13.00	-39.07	11.28	Peak



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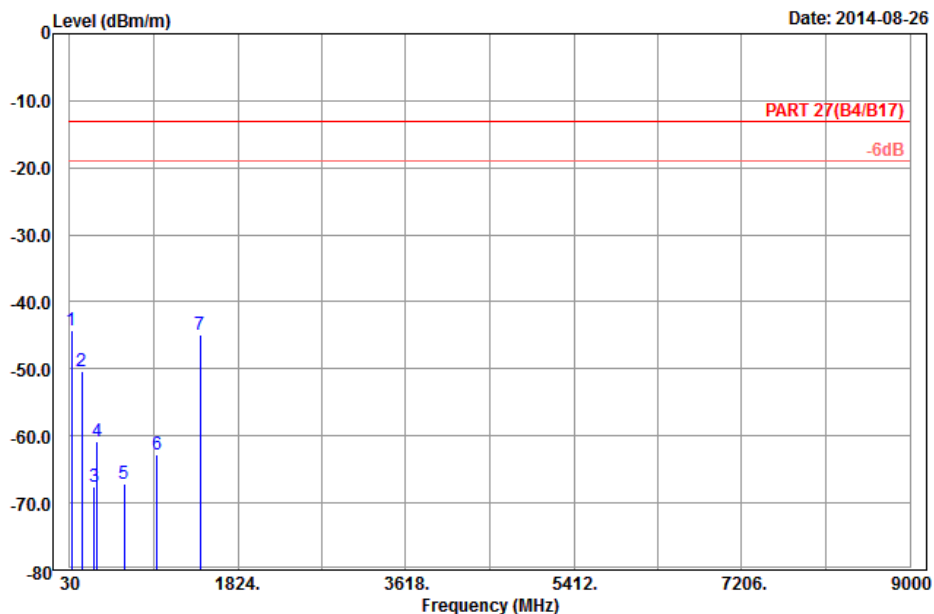


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Data: 10

Date: 2014-08-26



Site : 966 chamber 5
 Condition: PART 27(B4/B17) 3m Vertical
 Remark : LTE_Band 17_QPSK(1,0)_10M_CH23790
 Tested by: Will Chen

	Freq	Level	Read Level	Limit	Over	Factor	Remark
	MHz	dBm/m	dBm	dBm/m	dB	dB/m	
1	pp	46.20	-44.34	-31.54	-13.00	-31.34	-12.80 Peak
2		161.22	-50.26	-42.69	-13.00	-37.26	-7.57 Peak
3		293.25	-67.59	-61.69	-13.00	-54.59	-5.90 Peak
4		318.90	-60.92	-55.18	-13.00	-47.92	-5.74 Peak
5		612.20	-67.07	-67.36	-13.00	-54.07	0.29 Peak
6		962.90	-62.83	-67.98	-13.00	-49.83	5.15 Peak
7		1420.00	-44.85	-51.21	-13.00	-31.85	6.36 Peak



5 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 accredited and approved according to ISO/IEC 17025.

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

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Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab:

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Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.adt.com.tw

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



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6 APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No modifications were made to the EUT by the lab during the test.

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