

# 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.

This report should not be used by the client to claim  
product certification, approval, or endorsement by TAF  
or any government agencies.



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

## TABLE OF CONTENTS

|                                                                                              |    |
|----------------------------------------------------------------------------------------------|----|
| RELEASE CONTROL RECORD.....                                                                  | 3  |
| 1 CERTIFICATION .....                                                                        | 4  |
| 2 SUMMARY OF TEST RESULTS.....                                                               | 5  |
| 2.1 MEASUREMENT UNCERTAINTY .....                                                            | 5  |
| 2.2 TEST SITE AND INSTRUMENTS .....                                                          | 6  |
| 3 GENERAL INFORMATION .....                                                                  | 7  |
| 3.1 GENERAL DESCRIPTION OF EUT .....                                                         | 7  |
| 3.2 CONFIGURATION OF SYSTEM UNDER TEST .....                                                 | 8  |
| 3.3 DESCRIPTION OF SUPPORT UNITS .....                                                       | 8  |
| 3.4 DESCRIPTION OF TEST MODES .....                                                          | 9  |
| 3.5 GENERAL DESCRIPTION OF APPLIED STANDARDS .....                                           | 9  |
| 4 TEST TYPES AND RESULTS.....                                                                | 10 |
| 4.1 RADIATED EMISSION MEASUREMENT .....                                                      | 10 |
| 4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT .....                                          | 10 |
| 4.1.2 TEST PROCEDURES .....                                                                  | 10 |
| 4.1.3 DEVIATION FROM TEST STANDARD .....                                                     | 10 |
| 4.1.4 TEST SETUP .....                                                                       | 11 |
| 4.1.5 TEST RESULTS .....                                                                     | 12 |
| 5 INFORMATION ON THE TESTING LABORATORIES .....                                              | 16 |
| 6 APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT<br>BY THE LAB..... | 17 |



A D T

## RELEASE CONTROL RECORD

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

## 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<br>27.53(h) | Radiated Spurious Emissions | PASS   | Meet the requirement of limit.<br>Minimum passing margin is -31.79dB at 47.28MHz. |

| LTE Band 17        |                             |        |                                                                                     |
|--------------------|-----------------------------|--------|-------------------------------------------------------------------------------------|
| STANDARD SECTION   | TEST TYPE AND LIMIT         | RESULT | REMARK                                                                              |
| 2.1053<br>27.53(g) | Radiated Spurious Emissions | PASS   | Meet the requirement of limit.<br>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<br>ROHDE & SCHWARZ               | ESCI           | 100744              | Apr. 15, 2014       | Apr. 14, 2015           |
| Spectrum Analyzer<br>ROHDE & SCHWARZ           | FSU43          | 101261              | Dec. 21, 2013       | Dec. 20, 2014           |
| BILOG Antenna<br>SCHWARZBECK                   | VULB9168       | 9168-472            | Feb. 27, 2014       | Feb. 26, 2015           |
| HORN Antenna<br>SCHWARZBECK                    | BBHA 9120 D    | 9120D-969           | Feb. 19, 2014       | Feb. 18, 2015           |
| HORN Antenna<br>SCHWARZBECK                    | BBHA 9170      | 9170-480            | Dec. 18, 2013       | Dec. 17, 2014           |
| Preamplifier<br>EMCI                           | EMC 012645     | 980115              | Dec. 26, 2013       | Dec. 25, 2014           |
| Preamplifier<br>EMCI                           | EMC 184045     | 980116              | Jan. 13, 2014       | Jan. 12, 2015           |
| Preamplifier<br>EMCI                           | EMC 330H       | 980112              | Dec. 27, 2013       | Dec. 26, 2014           |
| RF signal cable<br>HUBER+SUHNNER               | SUCOFLEX 104   | 309219/4<br>2950114 | Oct. 18, 2013       | Oct. 17, 2014           |
| RF signal cable<br>HUBER+SUHNNER               | SUCOFLEX 104   | 250130/4            | Oct. 18, 2013       | Oct. 17, 2014           |
| RF signal cable<br>Worken                      | RG-213         | NA                  | Nov. 07, 2013       | Nov. 06, 2014           |
| Software<br>BV ADT                             | E3<br>6.120103 | NA                  | NA                  | NA                      |
| Antenna Tower<br>MF                            | MFA-440H       | NA                  | NA                  | NA                      |
| Turn Table<br>MF                               | MFT-201SS      | NA                  | NA                  | NA                      |
| Antenna Tower & Turn Table<br>Controller<br>MF | MF-7802        | NA                  | NA                  | NA                      |
| JFW 20dB attenuation                           | 50HF-020-SMA   | NA                  | NA                  | NA                      |
| Communications<br>Tester-Wireless              | E5515C         | MY52102544          | Sep. 05, 2012       | Sep. 04, 2014           |
| Radio Communication<br>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

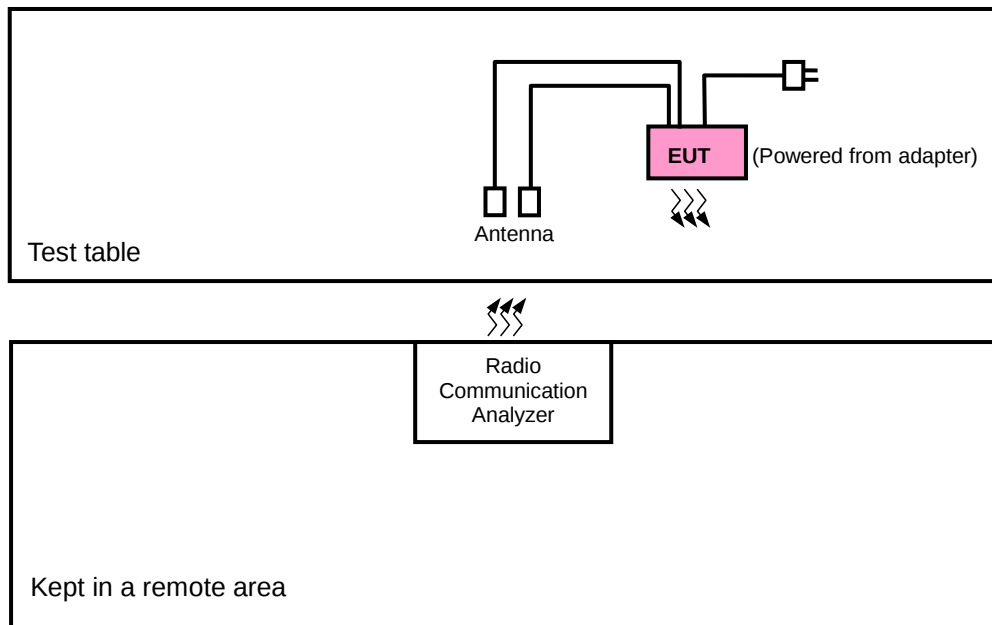
#### 3.1 GENERAL DESCRIPTION OF EUT

|                       |                                         |                      |
|-----------------------|-----------------------------------------|----------------------|
| 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<br>Channel Bandwidth: 20MHz  | 1720.0MHz ~1745.0MHz |
|                       | LTE Band 17<br>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  $-13\text{dBm}$

#### 4.1.2 TEST PROCEDURES

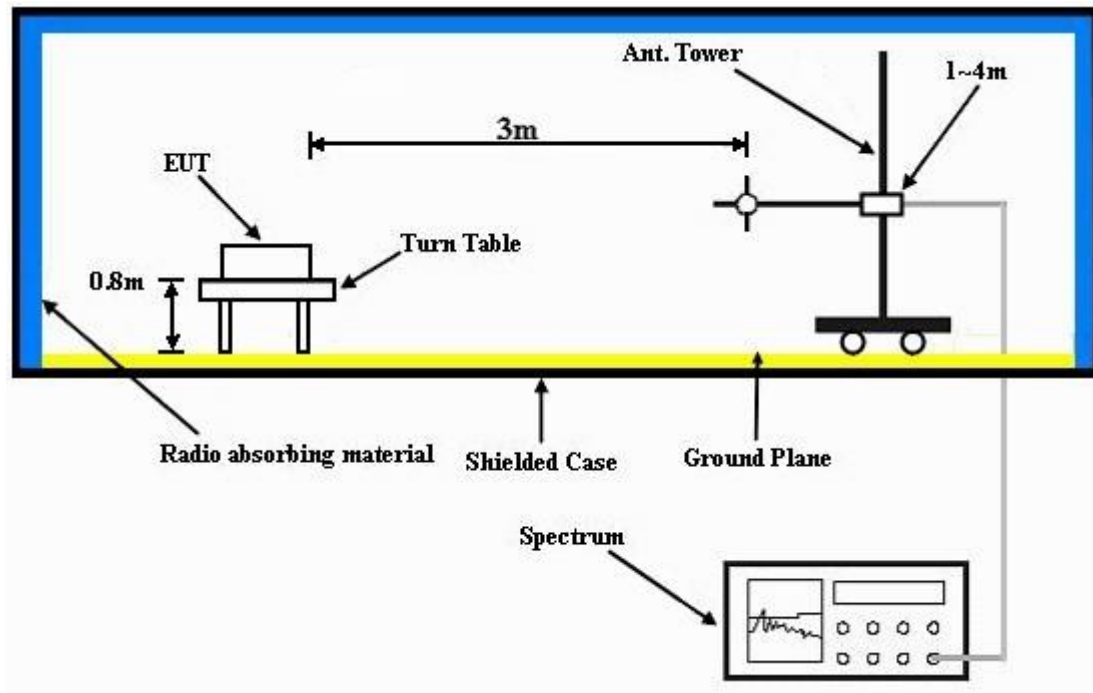
- a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from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

**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).

#### 4.1.5 TEST RESULTS

##### LTE BAND 4

CHANNEL BANDWIDTH: 20MHz / QPSK

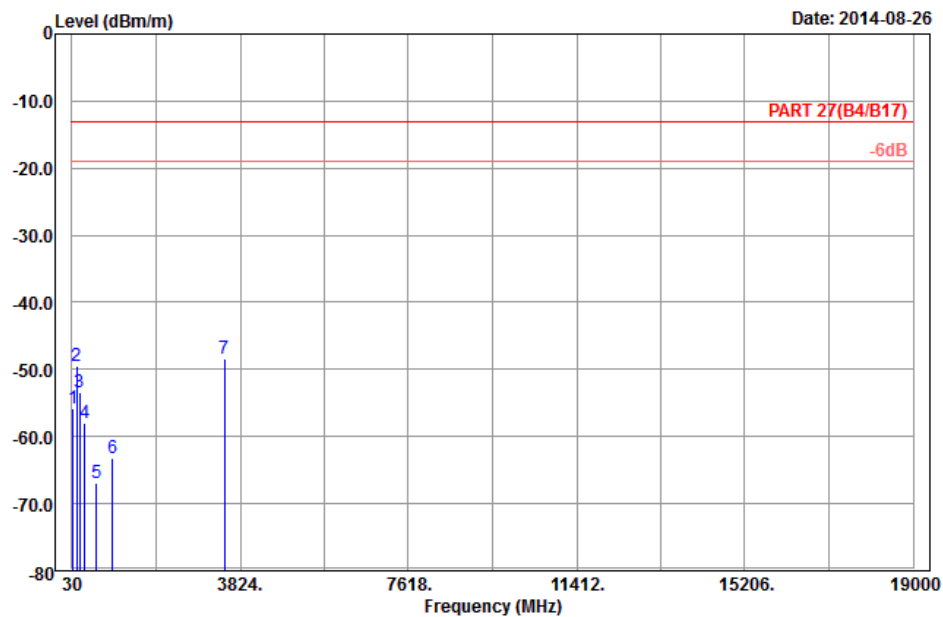


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

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   |



A D T

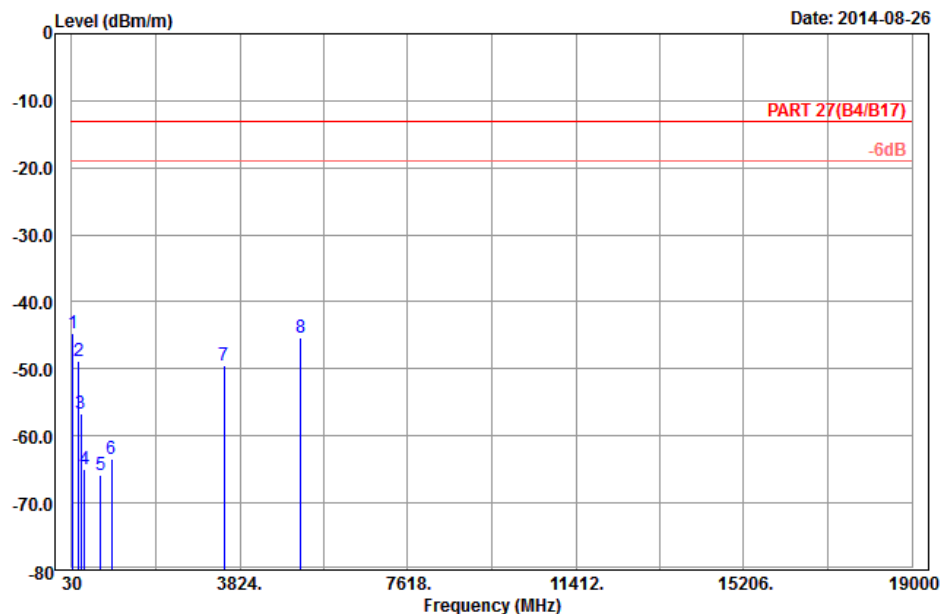


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

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

|   |      |         | Read   | Limit  | Over   |        |             |
|---|------|---------|--------|--------|--------|--------|-------------|
|   | Freq | Level   | Level  | Line   | Limit  | 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  |



A D T

# LTE BAND 17

CHANNEL BANDWIDTH: 10MHz / QPSK

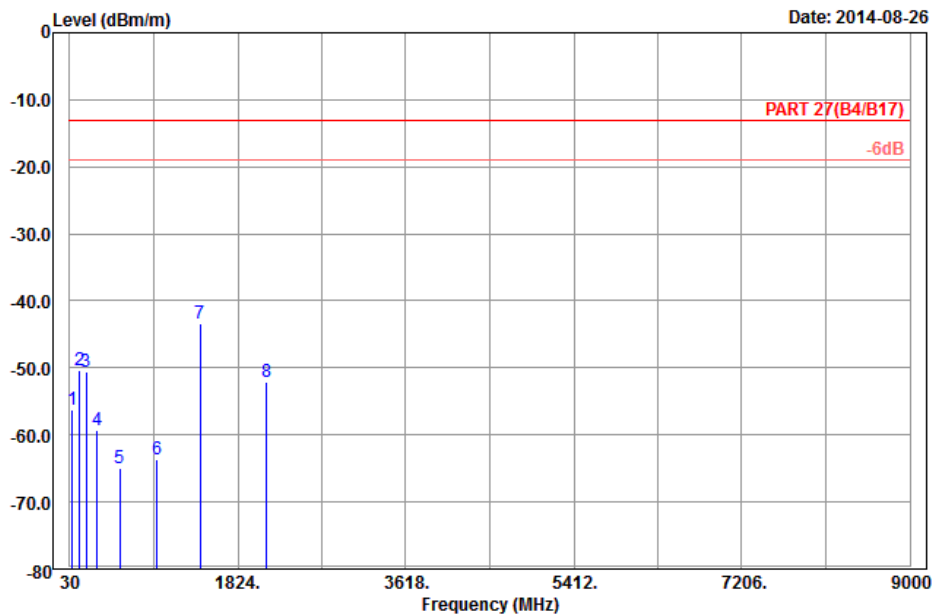


Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

A D T

Data: 9

Date: 2014-08-26



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    |



A D T

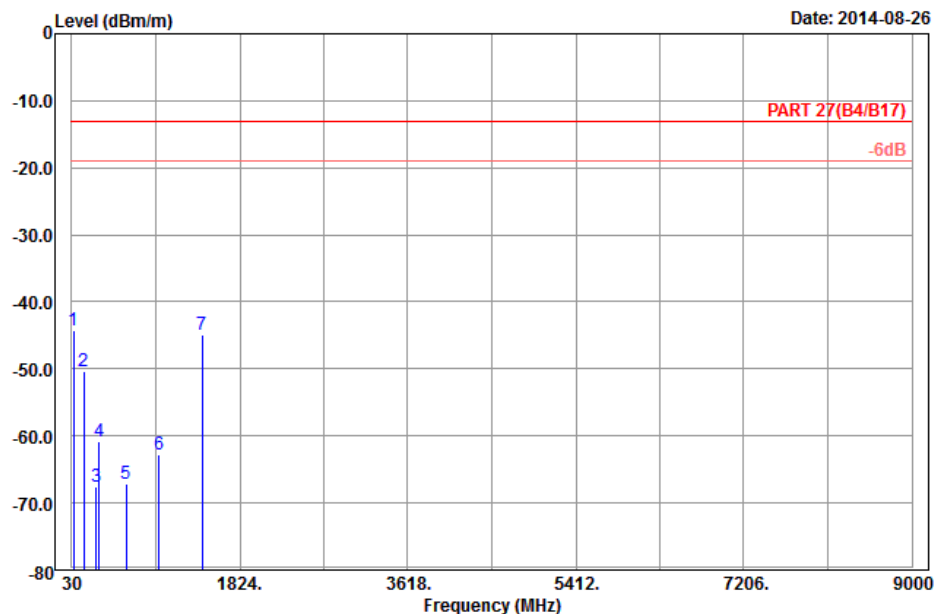


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

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

|      |         | Read   | Limit  | Over   |        |               |
|------|---------|--------|--------|--------|--------|---------------|
|      | Freq    | Level  | Level  | Line   | Limit  | 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:

**Linko EMC/RF Lab:**

Tel: 886-2-26052180

Fax: 886-2-26051924

**Hsin Chu EMC/RF/Telecom Lab:**

Tel: 886-3-5935343

Fax: 886-3-5935342

**Hwa Ya EMC/RF/Safety Lab:**

Tel: 886-3-3183232

Fax: 886-3-3270892

**Email:** [service.adt@tw.bureauveritas.com](mailto:service.adt@tw.bureauveritas.com)

**Web Site:** [www.adt.com.tw](http://www.adt.com.tw)

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

## **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.

---END---