



PARTIAL FCC TEST REPORT (PART 27)

REPORT NO.: RF130506C21-3

MODEL NO.: TP00042A

FCC ID: GKR-TP00042AKP

RECEIVED: May 05, 2013

TESTED: May 23, 2013

ISSUED: May 27, 2013

APPLICANT: COMPAL ELECTRONICS, INC.

ADDRESS: No. 581, Ruiguang RD., Neihu District, Taipei City
11492, Taiwan, R.O.C.

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 |
|---------------|-------------------|--------------|
| RF130506C21-3 | Original release | May 27, 2013 |



1 CERTIFICATION

PRODUCT: Convertible Tablet Computer, ThinkPad S230u

MODEL NO.: TP00042A

BRAND: Lenovo

APPLICANT: COMPAL ELECTRONICS, INC.

TESTED: May 23, 2013

TEST SAMPLE: ENGINEERING SAMPLE

TEST STANDARDS: FCC Part 27, Subpart C & M

The above equipment (model: TP00042A) 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 :** May 27, 2013
Ivonne Wu / Senior Specialist

APPROVED BY : Sam Chen , **DATE :** May 27, 2013
Sam Chen / Assistant Manager

2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

| APPLIED STANDARD: FCC PART 27 & Part 2 | | | |
|--|---|--------|---|
| STANDARD SECTION | TEST TYPE AND LIMIT | RESULT | REMARK |
| 2.1046 27.50(h)(2) | Equivalent isotropically radiated power | PASS | Meet the requirement of limit. |
| 2.1055 27.54 | Frequency Stability | NA | Refer to Note |
| 2.1049 27.53(m)(6) | Emission Bandwidth | NA | Refer to Note |
| 2.1051 27.53(m)(4)(6) | Band Edge Measurements | NA | Refer to Note |
| 2.1051 27.53(m)(4)(6) | Conducted Spurious Emissions | NA | Refer to Note |
| 2.1053 27.53(m)(4)(6) | Radiated Spurious Emissions | PASS | Meet the requirement of limit. Minimum passing margin is -21.78dB at 7779.00MHz. |

Note: Only the E.I.R.P. and radiated emission test was performed for this report. Other test data please refer to module report on FCC ID: PD9622ANXHU (File: R76838).

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 | 3.34 dB |
| | 200MHz ~1000MHz | 3.35 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, 2013 | Apr. 14, 2014 |
| Spectrum Analyzer ROHDE & SCHWARZ | FSU43 | 101261 | Dec. 17, 2012 | Dec. 16, 2013 |
| BILOG Antenna SCHWARZBECK | VULB9168 | 9168-472 | Mar. 25, 2013 | Mar. 24, 2014 |
| HORN Antenna SCHWARZBECK | BBHA 9120 D | 9120D-969 | Jan. 07, 2013 | Jan. 06, 2014 |
| HORN Antenna SCHWARZBECK | BBHA 9170 | 9170-480 | Dec. 25, 2012 | Dec. 24, 2013 |
| Loop Antenna | HFH2-Z2 | 100070 | Jan. 31, 2012 | Jan. 30, 2014 |
| Preamplifier EMCI | EMC 012645 | 980115 | Dec. 28, 2012 | Dec. 27, 2013 |
| Preamplifier EMCI | EMC 184045 | 980116 | Dec. 28, 2012 | Dec. 27, 2013 |
| Preamplifier EMCI | EMC 330H | 980112 | Dec. 28, 2012 | Dec. 27, 2013 |
| RF signal cable HUBER+SUHNNER | SUCOFLEX 104 | 309219/4 | Oct. 19, 2012 | Oct. 18, 2013 |
| RF signal cable HUBER+SUHNNER | SUCOFLEX 104 | 250130/4 | Oct. 19, 2012 | Oct. 18, 2013 |
| RF signal cable Worken | RG-213 | NA | Dec. 29, 2012 | Dec. 28, 2013 |
| 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 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

| | |
|---|---|
| EUT | Convertible Tablet Computer, ThinkPad S230u |
| MODEL NO. | TP00042A |
| POWER SUPPLY | 20Vdc (adapter) |
| CODED TYPE/MODULATION/ CODING RATE | QPSK: 1/2, 3/4 16QAM: 1/2, 3/4 |
| MODULATION TECHNOLOGY | OFDMA |
| DUPLEX METHOD | TDD |
| OPERATING RANGE | Channel Bandwidth 5MHz: 2498.5MHz ~ 2687.5MHz Channel Bandwidth 10MHz: 2501.0MHz ~ 2685.0MHz |
| CHANNEL BANDWIDTH | 5MHz, 10MHz |
| MAX. EIRP POWER | Channel Bandwidth: 5MHz: 20.97dBm (124.91mW) Channel Bandwidth: 10MHz: 20.84dBm (121.38mW) |
| ANTENNA TYPE | Refer to Note as below |
| DATA CABLE | N/A |
| I/O PORTS | Refer to user's manual |
| ACCESSORY DEVICES | Adapter |

NOTE:

1. The module (Intel Centrion Advanced-N + WiMAX 6250, model: 622ANXHMW) is allocated in the EUT.
2. The antenna information is listed as below.

| Antenna Type | Brand Name | Parts Number | Antenna Gain |
|--------------|------------------------------|-----------------------------------|--------------|
| PIFA | Jess-Link Products CO., LTD. | Main Antenna: PANT11A00034-1 | -3.31 |
| | | Auxiliary Antenna: PANT11A00035-1 | -5.79 |

3. The EUT contains following accessory devices.

| ITEM | BRAND | MODEL | SPECIFICATION |
|---------|--------|---------|--|
| Adapter | lenovo | 45N0185 | I/P: 100-240Vac, 50/60Hz, 1.5A O/P: 20Vdc, 3.25A 1.8m non-shielded cable with ferrite core |

4. The above EUT information is declared by manufacturer and for more detailed feature description please refers to the manufacturer's specifications or User's Manual.

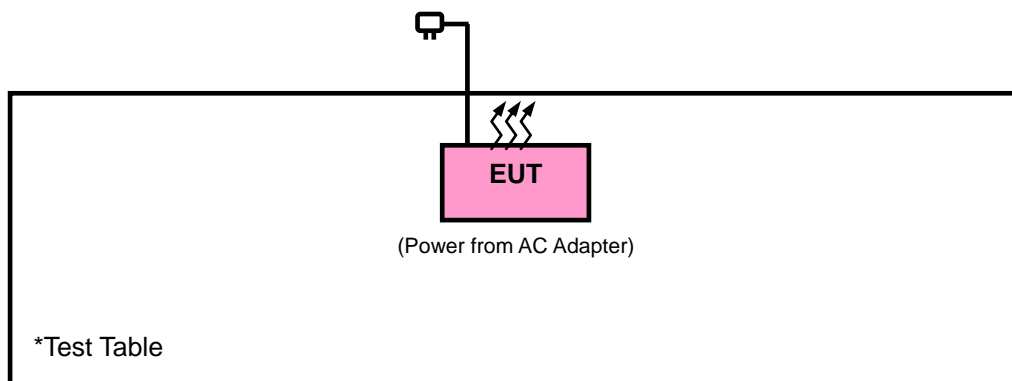
3.2 DESCRIPTION OF TEST MODES

Three channels of each channel bandwidth had been tested.

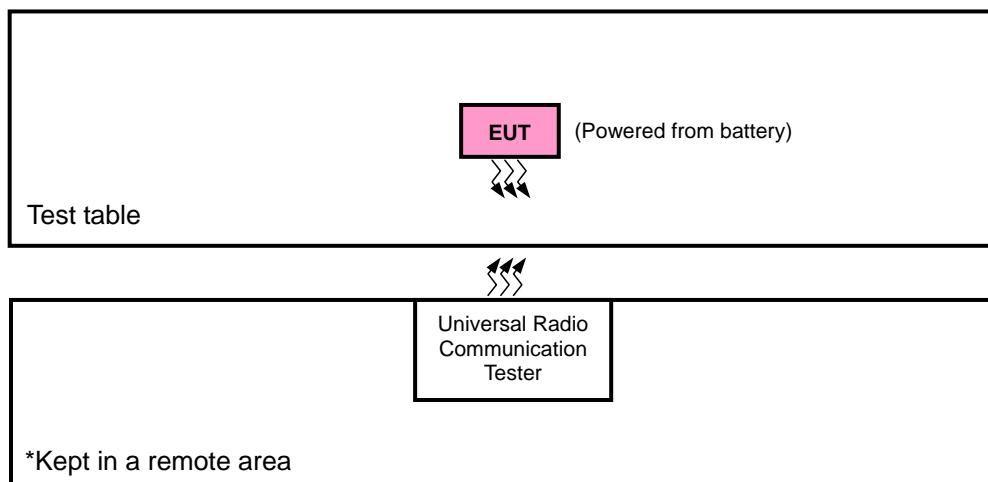
| CHANNEL (MHz) | CHANNEL BANDWIDTH | |
|---------------|-------------------|-----------|
| | 5.0 MHz | 10.0 MHz |
| LOW | 2498.5MHz | 2501.0MHz |
| MIDDLE | 2593.0MHz | 2593.0MHz |
| HIGH | 2687.5MHz | 2685.0MHz |

3.2.1 CONFIGURATION OF SYSTEM UNDER TEST

FOR RADIATION EMISSION TEST



FOR E.I.R.P. TEST





3.3 TEST ITEM AND TEST CONFIGURATION

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 on X-plane for EIRP for Pad Mode and Z-axis for radiated emission (NB mode). Following channel(s) was (were) selected for the final test as listed below:

| EUT CONFIGURE MODE | TEST ITEM | TESTED CHANNEL | CHANNEL BANDWIDTH | MODULATION TYPE | CODING RATE |
|--------------------|-------------------|---------------------|-------------------|-----------------|-------------|
| Pad Mode | EIRP | 20775, 21100, 21425 | 5MHz | QPSK, 16QAM | 1/2 |
| | | 20800, 21100, 21400 | 10MHz | QPSK, 16QAM | 1/2 |
| NB Mode | RADIATED EMISSION | 21100 | 5MHz | QPSK | 1/2 |

NOTE:

1. The system antenna type is the same as module antenna type, so Radiated Spurious Emission is re-tested on worst channel of the module report, which is FCC ID PD9622ANXHU.
2. The EUT had been pre tested on NB mode and Pad mode for all bands, and only the worst case was presented in this report.

TEST CONDITION:

| TEST ITEM | ENVIRONMENTAL CONDITIONS | INPUT POWER | TESTED BY |
|-------------------|--------------------------|--------------|--------------|
| ERP | 25deg. C, 65%RH | 120Vac, 60Hz | Howard Kao |
| RADIATED EMISSION | 25deg. C, 65%RH | 120Vac, 60Hz | Johnson Liao |

3.4 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a WiMAX 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/TIA/EIA-603-C-2004

NOTE: The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

3.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together.

4 TEST TYPES AND RESULTS

4.1 OUTPUT POWER MEASUREMENT

4.1.1 LIMITS OF OUTPUT POWER MEASUREMENT

The radiated peak output power shall be according to the specific rule Part 27.50(h)(2) that “User stations are limited to 2 watts” and 27.50(i) specific that “Peak transmit power must be measure over any interval of continuous transmission using instrumentation calibration in terms of rms-equivalent voltage.”

4.1.2 TEST PROCEDURES

EIRP MEASUREMENT:

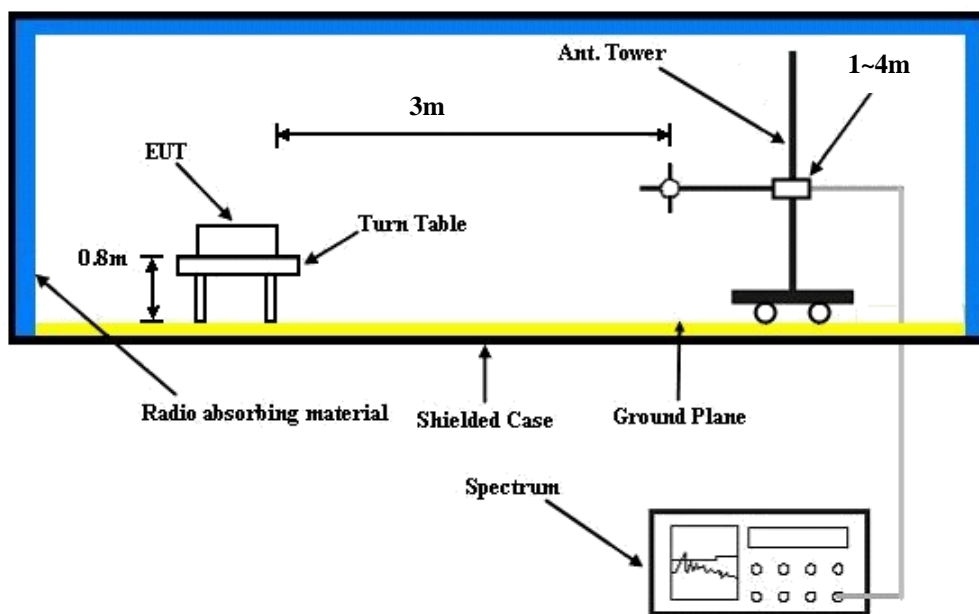
- a. The power was measured with R&S Spectrum Analyzer. All measurements were done at 3 channels (low, middle and high operational frequency range.)
- b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 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.
- 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. $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn.}$

CONDUCTED POWER MEASUREMENT:

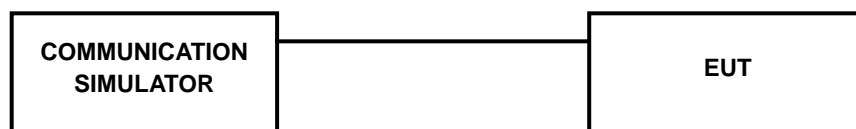
- a. The EUT was set up for the maximum power with LTE link data modulation and link up with simulator.
- b. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

4.1.3 TEST SETUP

EIRP MEASUREMENT:



CONDUCTED POWER MEASUREMENT:



4.1.4 TEST RESULTS

CONDUCTED POWER

| Modulation | Coding Rate | Frequency (MHz) | WiMAX | | |
|---------------------|-------------|-----------------|------------|---------------|------|
| | | | Peak Power | Average Power | PAPR |
| QPSK (BW 5MHz) | 1/2 | 2498.5 | 30.19 | 23.04 | 7.15 |
| | | 2593.0 | 30.14 | 23.06 | 7.08 |
| | | 2687.5 | 30.33 | 23.29 | 7.04 |
| | 3/4 | 2498.5 | 30.27 | 23.06 | 7.21 |
| | | 2593.0 | 30.23 | 23.05 | 7.18 |
| | | 2687.5 | 30.28 | 23.21 | 7.07 |
| 16QAM (BW 5MHz) | 1/2 | 2498.5 | 29.98 | 23.05 | 6.93 |
| | | 2593.0 | 29.96 | 23.02 | 6.94 |
| | | 2687.5 | 30.03 | 23.16 | 6.87 |
| | 3/4 | 2498.5 | 30.13 | 23.04 | 7.09 |
| | | 2593.0 | 30.08 | 23.00 | 7.08 |
| | | 2687.5 | 30.25 | 23.14 | 7.11 |
| QPSK (BW 10MHz) | 1/2 | 2501.0 | 30.19 | 22.97 | 7.22 |
| | | 2593.0 | 30.17 | 23.02 | 7.15 |
| | | 2685.0 | 30.23 | 23.12 | 7.11 |
| | 3/4 | 2501.0 | 30.16 | 23.06 | 7.10 |
| | | 2593.0 | 30.11 | 23.08 | 7.03 |
| | | 2685.0 | 30.19 | 23.11 | 7.08 |
| 16QAM (BW 10MHz) | 1/2 | 2501.0 | 30.16 | 22.97 | 7.19 |
| | | 2593.0 | 30.16 | 22.98 | 7.18 |
| | | 2685.0 | 30.26 | 23.09 | 7.17 |
| | 3/4 | 2501.0 | 30.17 | 23.02 | 7.15 |
| | | 2593.0 | 30.19 | 23.05 | 7.14 |
| | | 2685.0 | 30.24 | 23.06 | 7.18 |



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EIRP POWER

CHANNEL BANDWIDTH: 5MHz_QPSK

| Plane | Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW) | Polarization (H/V) |
|-------|---------|-----------------|-----------|-----------------------|-----------|----------|--------------------|
| X | 20775 | 2498.5 | -20.10 | 41.07 | 20.97 | 124.91 | H |
| | 21100 | 2593.0 | -20.52 | 40.81 | 20.29 | 106.91 | |
| | 21425 | 2687.5 | -20.94 | 41.59 | 20.65 | 116.08 | |
| | 20775 | 2498.5 | -26.18 | 41.41 | 15.23 | 33.34 | V |
| | 21100 | 2593.0 | -26.10 | 41.19 | 15.09 | 32.28 | |
| | 21425 | 2687.5 | -26.68 | 41.68 | 15.00 | 31.62 | |

CHANNEL BANDWIDTH: 5MHz_16QAM

| Plane | Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW) | Polarization (H/V) |
|-------|---------|-----------------|-----------|-----------------------|-----------|----------|--------------------|
| X | 20775 | 2498.5 | -20.48 | 41.07 | 20.59 | 114.45 | H |
| | 21100 | 2593.0 | -20.27 | 40.81 | 20.54 | 113.24 | |
| | 21425 | 2687.5 | -21.29 | 41.59 | 20.30 | 107.09 | |
| | 20775 | 2498.5 | -25.52 | 41.41 | 15.89 | 38.82 | V |
| | 21100 | 2593.0 | -25.53 | 41.19 | 15.66 | 36.81 | |
| | 21425 | 2687.5 | -26.01 | 41.68 | 15.67 | 36.90 | |



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CHANNEL BANDWIDTH: 10MHz_QPSK

| Plane | Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW) | Polarization (H/V) |
|-------|---------|-----------------|-----------|-----------------------|-----------|----------|--------------------|
| X | 20800 | 2501.0 | -20.60 | 40.84 | 20.24 | 105.72 | H |
| | 21100 | 2593.0 | -20.56 | 40.81 | 20.25 | 105.93 | |
| | 21400 | 2685.0 | -21.21 | 41.44 | 20.23 | 105.35 | |
| | 20800 | 2501.0 | -25.64 | 41.22 | 15.58 | 36.14 | V |
| | 21100 | 2593.0 | -26.16 | 41.19 | 15.03 | 31.84 | |
| | 21400 | 2685.0 | -26.53 | 41.63 | 15.10 | 32.36 | |

CHANNEL BANDWIDTH: 10MHz_16QAM

| Plane | Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW) | Polarization (H/V) |
|-------|---------|-----------------|-----------|-----------------------|-----------|----------|--------------------|
| X | 20800 | 2501.0 | -20.00 | 40.84 | 20.84 | 121.38 | H |
| | 21100 | 2593.0 | -20.26 | 40.81 | 20.55 | 113.50 | |
| | 21400 | 2685.0 | -20.88 | 41.44 | 20.56 | 113.67 | |
| | 20800 | 2501.0 | -25.70 | 41.22 | 15.52 | 35.65 | V |
| | 21100 | 2593.0 | -26.03 | 41.19 | 15.16 | 32.81 | |
| | 21400 | 2685.0 | -25.94 | 41.63 | 15.69 | 37.07 | |

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 equal to -13dBm .

4.2.2 TEST PROCEDURES

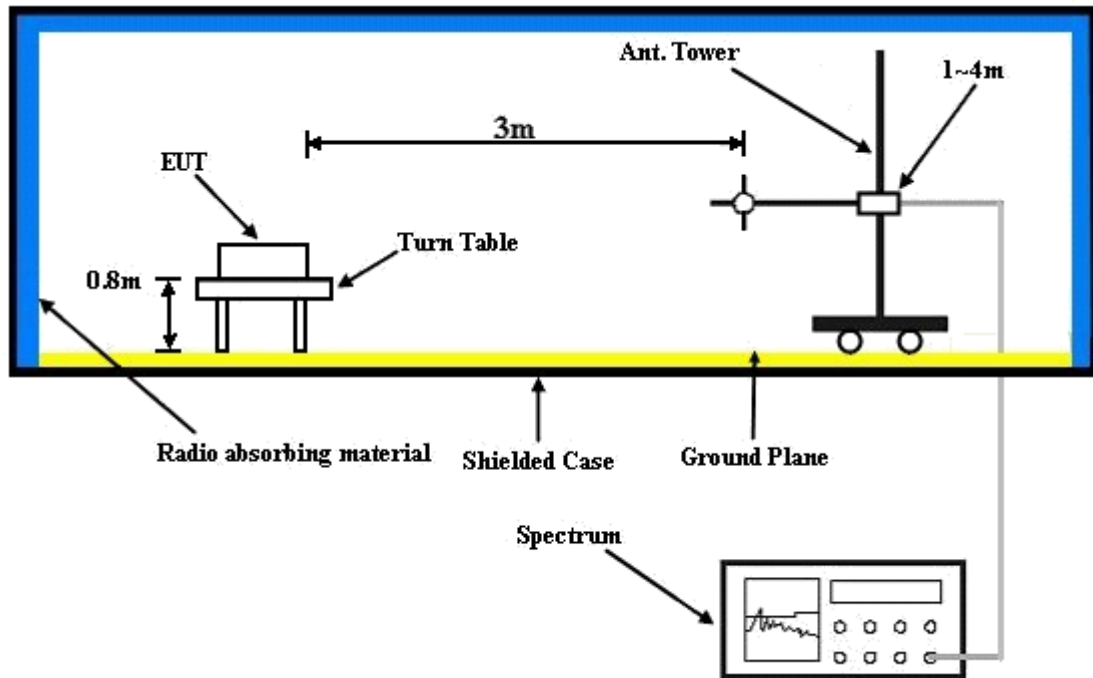
- a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from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

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

4.2.3 DEVIATION FROM TEST STANDARD

No deviation

4.2.4 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.



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4.2.5 TEST RESULTS

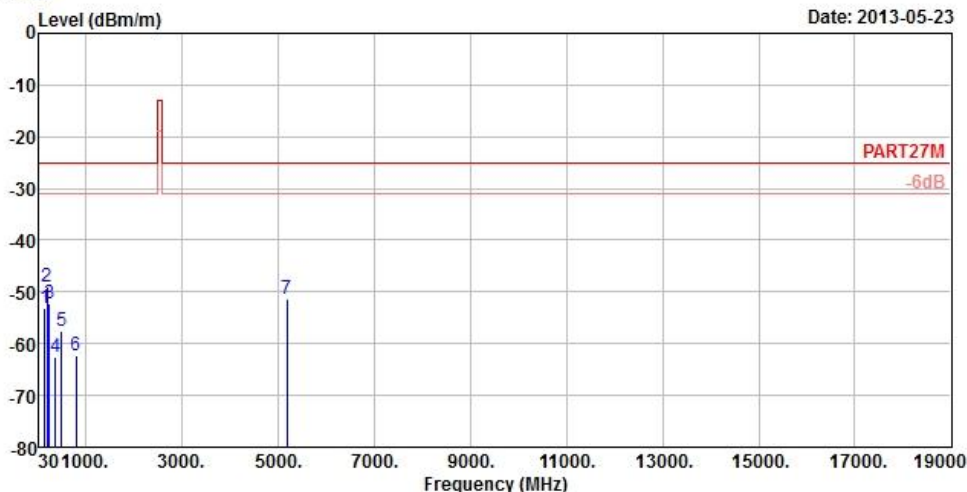


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

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Data: 15

Date: 2013-05-23



Site : 966 Chamber 5
 Condition : PART27M 3m HORIZONTAL
 Brand/Model: TN-NOTE
 Remark : QPSK 5M 1/2 2593 Link
 Tested by : Johnson Liao
 Temperature : 25°C
 Humidity : 65%
 Plane : Z (Note MODE)

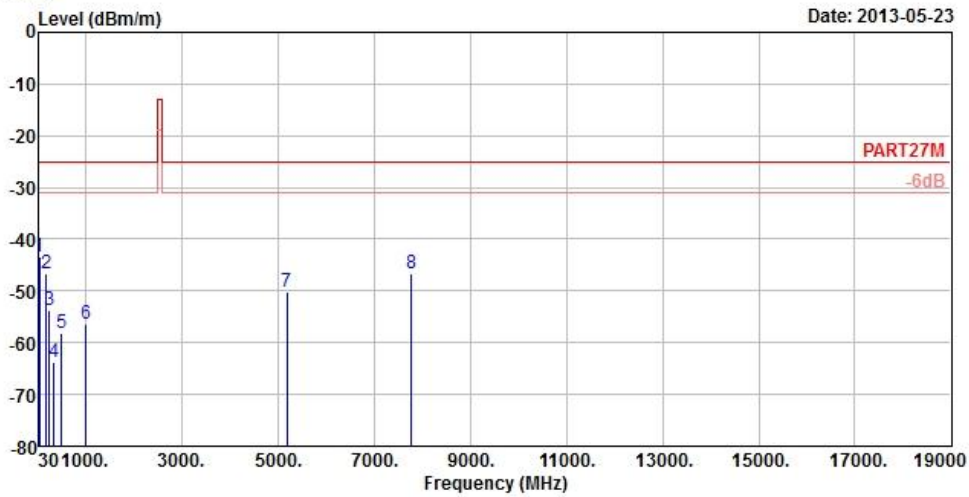
| | Read | Limit | Over | | | |
|------|---------|--------|--------|--------|--------|------------|
| Freq | Level | Level | Line | Limit | Factor | Remark |
| MHz | dBm/m | dBm | dBm/m | dB | dB/m | |
| 1 | 151.50 | -53.27 | -46.89 | -13.00 | -40.27 | -6.38 Peak |
| 2 | 189.57 | -49.00 | -42.19 | -13.00 | -36.00 | -6.81 Peak |
| 3 | 243.57 | -52.22 | -46.23 | -13.00 | -39.22 | -5.99 Peak |
| 4 | 362.30 | -62.70 | -56.79 | -13.00 | -49.70 | -5.91 Peak |
| 5 | 499.50 | -57.51 | -54.40 | -13.00 | -44.51 | -3.11 Peak |
| 6 | 795.60 | -62.19 | -64.29 | -13.00 | -49.19 | 2.10 Peak |
| 7 pp | 5186.00 | -51.34 | -50.26 | -25.00 | -26.34 | -1.08 Peak |



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

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Data: 16



Site : 966 Chamber 5
 Condition : PART27M 3m VERTICAL
 Brand/Model: TN-NOTE
 Remark : QPSK 5M 1/2 2593 Link
 Tested by : Johnson Liao
 Temperature : 25°C
 Humidity : 65%
 Plane : Z (Note MODE)

| | Freq | Level | Read Level | Limit Line | Over Limit | Factor | Remark |
|------|---------|--------|------------|------------|------------|--------|--------|
| | MHz | dBm/m | dBm | dBm/m | dB | dB/m | |
| 1 | 31.35 | -43.28 | -43.62 | -13.00 | -30.28 | 0.34 | Peak |
| 2 | 184.44 | -46.58 | -40.45 | -13.00 | -33.58 | -6.13 | Peak |
| 3 | 238.17 | -53.74 | -47.54 | -13.00 | -40.74 | -6.20 | Peak |
| 4 | 329.40 | -63.66 | -57.50 | -13.00 | -50.66 | -6.16 | Peak |
| 5 | 498.80 | -58.23 | -55.09 | -13.00 | -45.23 | -3.14 | Peak |
| 6 | 997.90 | -56.38 | -61.01 | -13.00 | -43.38 | 4.63 | Peak |
| 7 | 5186.00 | -50.29 | -49.21 | -25.00 | -25.29 | -1.08 | Peak |
| 8 pp | 7779.00 | -46.78 | -53.48 | -25.00 | -21.78 | 6.70 | Peak |



5 PHOTOGRAPHS OF THE TEST CONFIGURATION

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



6 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.

Copies of accreditation and authorization certificates of our laboratories obtained from approval agencies can be downloaded from our web site: www.adt.com.tw/index.5.phtml. 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 Lab:

Tel: 886-3-5935343

Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety/Telecom Lab:

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

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