

SPOT CHECK REPORT

FCC PART 90

FCC ID: XMR2020RM510QGL

Application: Quectel Wireless Solutions Company Limited

Application Type: Certification

Product: 5G Sub-6 GHz & mmWave M.2 Module

Model No.: RM510Q-GL

Brand Name: Quectel

FCC Rule Part(s): Part 90 Subpart S

Test Procedure(s): ANSI C63.26: 2015

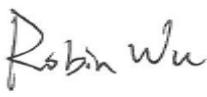
Test Date: December 09, 2020 ~ January 04, 2021

Reviewed By:



Sunny Sun

Approved By:



Robin Wu



The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.26-2015. Test results reported herein relate only to the item(s) tested.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

| Report No. | Version | Description | Issue Date | Note |
|---------------|---------|----------------|------------|-------|
| 2012RSU045-U4 | Rev. 01 | Initial Report | 03-03-2021 | Valid |
| | | | | |

Note: This application for certification is leveraging the data reuse procedures from KDB 484596 based on reference FCC ID: XMR2020RM502QAE to cover variant FCC ID: XMR2020RM510QGL.

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1. GENERAL INFORMATION

1.1. Applicant

Quectel Wireless Solutions Company Limited

Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233

1.2. Manufacturer

Quectel Wireless Solutions Company Limited

Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233

1.3. Testing Facility

| | |
|-------------------------------------|-------------------------------------------------------------------------------------------------|
| <input checked="" type="checkbox"/> | Test Site - MRT Suzhou Laboratory |
| | Laboratory Location (Suzhou - Wuzhong) |
| | D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China |
| | Laboratory Location (Suzhou - SIP) |
| | 4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China |
| | Laboratory Accreditations |
| | A2LA: 3628.01 |
| | CNAS: L10551 |
| | FCC: CN1166 |
| | ISED: CN0001 |
| | VCCI: R-20025, G-20034, C-20020, T-20020 |
| <input type="checkbox"/> | Test Site - MRT Shenzhen Laboratory |
| | Laboratory Location (Shenzhen) |
| | 1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China |
| | Laboratory Accreditations |
| | A2LA: 3628.02 |
| | CNAS: L10551 |
| | FCC: CN1284 |
| | ISED: CN0105 |
| <input type="checkbox"/> | Test Site - MRT Taiwan Laboratory |
| | Laboratory Location (Taiwan) |
| | No. 38, Fuxing 2 nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.) |
| | Laboratory Accreditations |
| | TAF: L3261-190725 |
| | FCC: 291082, TW3261 |
| | ISED: TW3261 |

2. PRODUCT INFORMATION

2.1. Equipment Description

| | |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product Name: | 5G Sub-6 GHz & mmWave M.2 Module |
| Model No.: | RM510Q-GL |
| Brand Name: | Quectel |
| IMEI: | 867034040010481, 867034040011117 |
| Operating Temperature: | -20 ~ 60 °C |
| Power Type: | 3.135 ~ 4.4Vdc, typical 3.7Vdc |
| UMTS Specification | |
| Single Band: | Band 2, 4, 5 |
| Modulation: | Uplink up to 16QAM, Downlink up to 64QAM |
| E-UTRA Specification | |
| Single Band: | Band 2, 4, 5, 7, 12, 13, 14, 17, 25, 26, 30, 38, 41, 48, 66, 71 |
| Intra-Band: | CA_2C, CA_5B, CA_7C, CA_38C, CA_41C, CA_66C |
| Modulation: | UL & DL up to 256QAM |
| 5G NR FR1 Specification | |
| SA Band: | n2, n5, n7, n12, n25, n41, n66, n71, n77 |
| SA UL MIMO Band: | n41 |
| EN-DC Band: | DC_5A_n2A, DC_12A_n2, DC_13A_n2A, DC_2A_n5A DC_30A_n5A, DC_66A_n5A, DC_5A_n7A, DC_12A_n7A DC_2A_n12A, DC_12A_n25A, DC_2A_n41A, DC_25A_n41A DC_26A_n41A, DC_66A_n41A, DC_5A_n66A, DC_12A_n66A DC_13A_n66A, DC_14A_n66A, DC_71A_n66A, DC_2A_n71A DC_7A_n71A, DC_66A_n71A |
| HPUE Band: | n41, n77 |
| SCS for NR cell: | FDD Band: 15kHz; TDD Band: 30kHz |
| Modulation: | UL & DL up to 256QAM |
| 5G NR FR2 Specification | |
| Band: | n260, n261 |
| SCS for NR cell: | 120kHz |

Note: The module without passive antenna.

2.2. Product Specification Subjective to this Report

| | |
|-------------------------|------------------------|
| FDD Tx Frequency Range: | Band 26: 814 ~ 824 MHz |
| FDD Rx Frequency Range: | Band 26: 859 ~ 869 MHz |

Note 1: For other features of this EUT, test report will be issued separately.

Note 2: The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Note 3: LTE band 26 transmit frequency for part 90 rule is 814 ~ 824MHz and part 22 rule is 824 ~ 849MHz. ERP over 15MHz bandwidth complies the ERP limit line of part 22 rule, therefore ERP of the partial frequency spectrum which falls within part 22 also complies.

2.3. Description of Available Antennas

| Technology | Frequency Range (MHz) | Antenna Type | Max Peak Gain (dBi) |
|-------------|-----------------------|--------------|---------------------|
| LTE Band 2 | 1850 ~ 1910 | Dipole | 0.25 |
| LTE Band 4 | 1710 ~ 1755 | | 1.47 |
| LTE Band 5 | 824 ~ 849 | | 2.68 |
| LTE Band 7 | 2500 ~ 2570 | | 0.55 |
| LTE Band 12 | 699 ~ 716 | | -0.20 |
| LTE Band 13 | 777 ~ 787 | | 1.54 |
| LTE Band 14 | 788 ~ 798 | | 2.42 |
| LTE Band 17 | 704 ~ 716 | | -0.20 |
| LTE Band 25 | 1850 ~ 1915 | | 0.25 |
| LTE Band 26 | 814 ~ 849 | | 2.68 |
| LTE Band 30 | 2305 ~ 2315 | | -3.06 |
| LTE Band 38 | 2570 ~ 2620 | | 0.78 |
| LTE Band 41 | 2496 ~ 2690 | | 0.78 |
| LTE Band 48 | 3550 ~ 3700 | | -4.29 |
| LTE Band 66 | 1710 ~ 1780 | | 1.47 |
| LTE Band 71 | 663 ~ 698 | | 1.22 |

Note: All antenna information (Antenna type and Peak Gain) is provided by the manufacturer.

2.4. Test Methodology

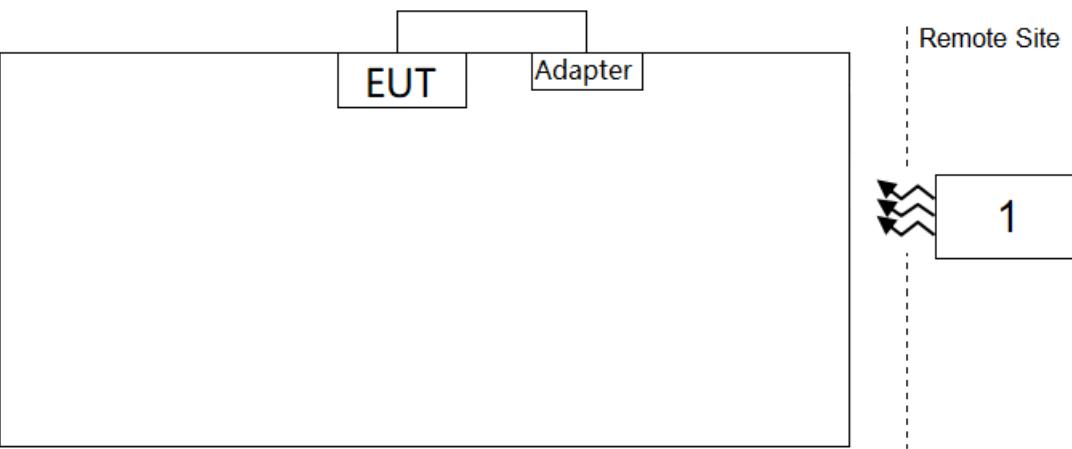
According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ANSI C63.26:2015
- FCC CFR 47 Part 90
- FCC KDB 971168 D01 v03r01: Power Meas License Digital Systems
- FCC KDB 971168 D02 v02r01: Misc Rev Approv License Devices
- FCC KDB 412172 D01 v01r01: Determining ERP and EIRP

2.5. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

2.6. Configuration of Tested System



| Product | Manufacturer | Model No. |
|-----------------------------------------|--------------|-----------|
| 1 Wideband Radio Communication Tester | R&S | CMW 500 |

2.7. Test Environment Condition

| | |
|---------------------|-------------|
| Ambient Temperature | 15 ~ 35°C |
| Relative Humidity | 20% ~ 75%RH |

3. TEST EQUIPMENT CALIBRATION DATE

Conducted Test Equipment (WZ-SR6, WZ-TR3)

| Instrument | Manufacturer | Type No. | Asset No. | Cali. Interval | Cali. Due Date |
|-------------------------------------|--------------|-----------|-------------|----------------|----------------|
| EXA Signal Analyzer | Agilent | N9020A | MRTSUE06106 | 1 year | 2021/04/15 |
| EXA Signal Analyzer | Keysight | N9010B | MRTSUE06452 | 1 year | 2021/07/11 |
| Signal Analyzer | R&S | FSV40 | MRTSUE06218 | 1 year | 2021/04/15 |
| Wideband Radio Communication Tester | R&S | CMW 500 | MRTSUE06243 | 1 year | 2021/11/07 |
| Power Meter | Agilent | U2021XA | MRTSUE06030 | 1 year | 2021/11/18 |
| DC Power Supply | GWINSTEK | DPS-3303C | MRTSUE06064 | N/A | N/A |
| True RMS Clamp Meter | Fluke | 319 | MRTSUE06080 | 1 year | 2021/05/06 |
| Directional Coupler | Agilent | 87301D | MRTSUE06082 | 1 year | 2021/03/25 |
| Dual Directional Coupler | Agilent | 7778D | MRTSUE06083 | 1 year | 2021/03/25 |
| Attenuator | MVE | 6dB | MRTSUE06534 | 1 year | 2021/12/12 |
| Attenuator | MVE | 10dB | MRTSUE06543 | 1 year | 2021/12/12 |
| Temperature & Humidity Chamber | BAOYT | BYH-150CL | MRTSUE06051 | 1 year | 2021/11/07 |
| Thermohygrometer | testo | 608-H1 | MRTSUE06401 | 1 year | 2021/08/08 |

4. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

| |
|-----------------------------------------------------------------------------------|
| Conducted Spurious Emissions |
| Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 0.78dB |
| Conducted Output Power |
| Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 1.13dB |

5. TEST RESULT

5.1. Summary

| FCC Part Section(s) | Test Description | Test Limit | Test Condition | Test Result | Reference |
|----------------------|------------------------|----------------------------------------|----------------|-------------|-------------|
| 90.635 | Conducted Output Power | < 100W | Conducted | Pass | Section 5.2 |
| 2.1051, 90.691(a) | Spurious Emission | < $43 + 10\log_{10} (P[\text{Watts}])$ | | Pass | Section 5.3 |

Notes:

- 1) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
- 2) The difference compared with the original report is only different DL CA bands. Output power and conducted spurious emissions verification worst test refer to original MRT Repor No. "2010RSU005-U4".

5.2. Conducted Output Power Measurement

5.2.1. Test Limit

The maximum output power of the transmitter for mobile stations is 100 watts (20dBw).

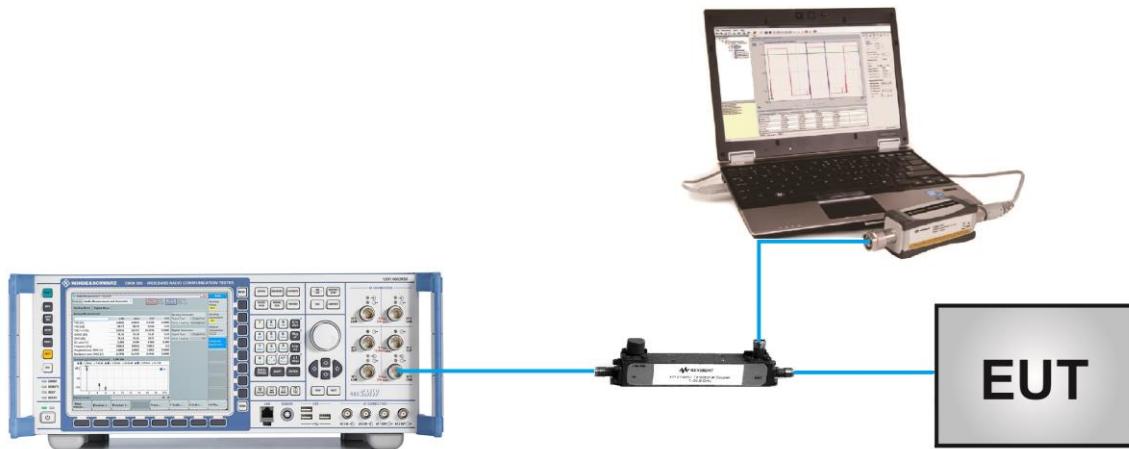
5.2.2. Test Procedures Used

ANSI C63.26-2015 - Section 5.2

5.2.3. Test Setting

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter.

5.2.4. Test Setup



5.2.5. Test Result

| | | | |
|---------------|----------------------------------|-----------|-------------------------|
| Product | 5G Sub-6 GHz & mmWave M.2 Module | Test Site | WZ-SR6 |
| Test Engineer | Larry Yan | Test Date | 2021/01/04 ~ 2021/01/06 |

| Channel No. | Frequency (MHz) | Channel Bandwidth (MHz) | RB Size | RB Offset | Output Power (dBm) | Output Power (W) | Limit (W) |
|-------------|-----------------|-------------------------|---------|-----------|--------------------|------------------|-----------|
| QPSK | | | | | | | |
| 26697 | 814.7 | 1.4 | 1 | 0 | 22.86 | 0.1932 | < 100 |
| 26740 | 819.0 | | | | 22.74 | 0.1879 | < 100 |
| 26783 | 823.3 | | | | 22.8 | 0.1906 | < 100 |
| 26697 | 814.7 | 1.4 | 1 | 2 | 22.92 | 0.1959 | < 100 |
| 26740 | 819.0 | | | | 22.65 | 0.1841 | < 100 |
| 26783 | 823.3 | | | | 22.83 | 0.1919 | < 100 |
| 26697 | 814.7 | 1.4 | 1 | 6 | 22.83 | 0.1919 | < 100 |
| 26740 | 819.0 | | | | 22.68 | 0.1854 | < 100 |
| 26783 | 823.3 | | | | 22.71 | 0.1866 | < 100 |
| 26697 | 814.7 | 1.4 | 6 | 0 | 21.88 | 0.1542 | < 100 |
| 26740 | 819.0 | | | | 21.83 | 0.1524 | < 100 |
| 26783 | 823.3 | | | | 21.87 | 0.1538 | < 100 |
| 26705 | 815.5 | 3 | 1 | 0 | 22.99 | 0.1991 | < 100 |
| 26740 | 819.0 | | | | 22.88 | 0.1941 | < 100 |
| 26775 | 822.5 | | | | 22.63 | 0.1832 | < 100 |
| 26705 | 815.5 | 3 | 1 | 7 | 22.96 | 0.1977 | < 100 |
| 26740 | 819.0 | | | | 22.86 | 0.1932 | < 100 |
| 26775 | 822.5 | | | | 22.71 | 0.1866 | < 100 |
| 26705 | 815.5 | 3 | 1 | 14 | 22.83 | 0.1919 | < 100 |
| 26740 | 819.0 | | | | 22.84 | 0.1923 | < 100 |
| 26775 | 822.5 | | | | 22.63 | 0.1832 | < 100 |
| 26705 | 815.5 | 3 | 15 | 0 | 21.96 | 0.1570 | < 100 |
| 26740 | 819.0 | | | | 22.86 | 0.1932 | < 100 |
| 26775 | 822.5 | | | | 22.74 | 0.1879 | < 100 |

| Channel No. | Frequency (MHz) | Channel Bandwidth (MHz) | RB Size | RB Offset | Output Power (dBm) | Output Power (W) | Limit (W) |
|-------------|-----------------|-------------------------|---------|-----------|--------------------|------------------|-----------|
| QPSK | | | | | | | |
| 26715 | 816.5 | 5 | 1 | 0 | 21.86 | 0.1535 | < 100 |
| 26740 | 819.0 | | | | 21.9 | 0.1549 | < 100 |
| 26765 | 821.5 | | | | 23.07 | 0.2028 | < 100 |
| 26715 | 816.5 | 5 | 1 | 12 | 22.99 | 0.1991 | < 100 |
| 26740 | 819.0 | | | | 22.85 | 0.1928 | < 100 |
| 26765 | 821.5 | | | | 23.04 | 0.2014 | < 100 |
| 26715 | 816.5 | 5 | 1 | 24 | 23.02 | 0.2005 | < 100 |
| 26740 | 819.0 | | | | 22.89 | 0.1945 | < 100 |
| 26765 | 821.5 | | | | 22.89 | 0.1945 | < 100 |
| 26715 | 816.5 | 5 | 25 | 0 | 22.92 | 0.1959 | < 100 |
| 26740 | 819.0 | | | | 22.81 | 0.1910 | < 100 |
| 26765 | 821.5 | | | | 21.98 | 0.1578 | < 100 |
| 26740 | 819.0 | 10 | 1 | 0 | 21.94 | 0.1563 | < 100 |
| | | | 1 | 24 | 21.87 | 0.1538 | < 100 |
| | | | 1 | 49 | 22.82 | 0.1914 | < 100 |
| | | | 50 | 0 | 22.66 | 0.1845 | < 100 |
| 26765 | 821.5 | 15 | 1 | 0 | 22.71 | 0.1866 | < 100 |
| | | | 1 | 36 | 21.93 | 0.1560 | < 100 |
| | | | 1 | 74 | 22.65 | 0.1841 | < 100 |
| | | | 75 | 0 | 22.59 | 0.1816 | < 100 |

5.3. Conducted Spurious Emissions

5.3.1. Test Limit

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst-case configuration. All modes of operation were investigated, and the worst-case configuration results are reported in this section.

For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $43 + 10\log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

5.3.2. Test Procedure Used

ANSI C63.26-2015 - Section 5.7

5.3.3. Test Setting

1. Set the analyzer frequency to low, mid, high channel.
2. RBW = 1MHz
3. VBW $\geq 3 \times$ RBW
4. Sweep time = auto
5. Detector = power averaging (rms)
6. Set sweep trigger to "free run."
7. User gate triggered such that the analyzer only sweeps when the device is transmitting at full power.
8. Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple.

To accurately determine the average power over the on and off time of the transmitter, it can be necessary to increase the number of traces to be averaged above 100, or if using a manually configured sweep time, increase the sweep time.

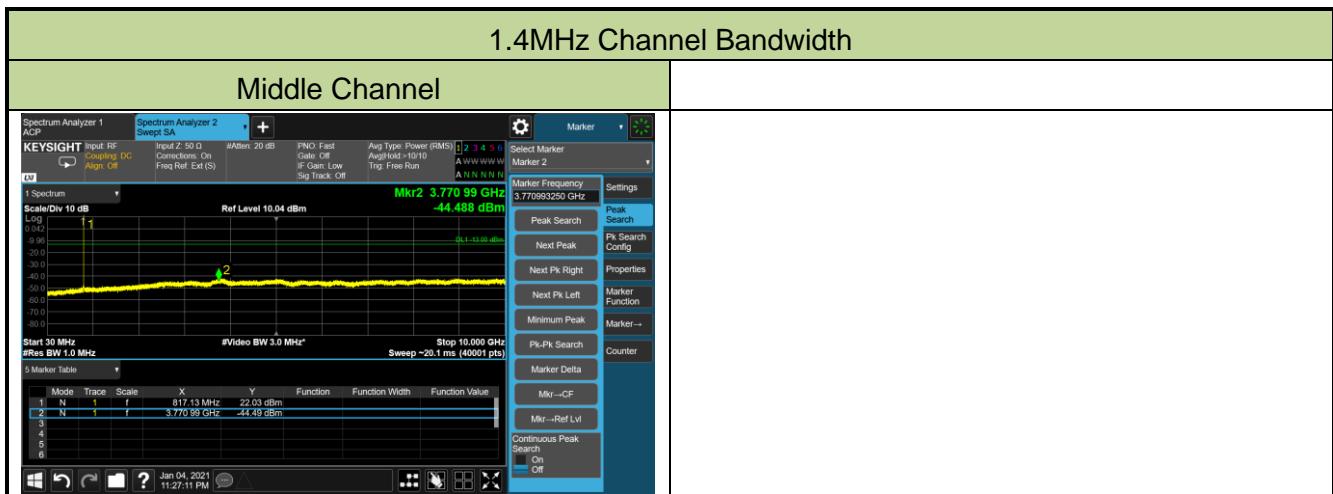
5.3.4. Test Setup



5.3.5. Test Result

| | | | |
|---------------|----------------------------------|-----------|------------|
| Product | 5G Sub-6 GHz & mmWave M.2 Module | Test Site | WZ-SR6 |
| Test Engineer | Edgar Ma | Test Date | 2021/01/05 |

| Channel | Frequency (MHz) | Channel Bandwidth (MHz) | Frequency Range (MHz) | Max Spurious Emissions (dBm) | Limit (dBm) | Result |
|-------------|-----------------|-------------------------|-----------------------|------------------------------|-------------|--------|
| QPSK | | | | | | |
| 26740 | 819.0 | 1.4 | 30 ~ 10000 | -44.49 | ≤ -13.00 | Pass |



6. CONCLUSION

The data collected relate only the item(s) tested and show that unit is compliance with FCC Rules.

Appendix A - Test Setup Photograph

Refer to "2012RSU045-UT" file.

Appendix B - EUT Photograph

Refer to "2012RSU045-UE" file.

Appendix C - Reference Test Report