



FCC RADIO TEST REPORT

FCC ID : 2AJN7-TP00130AUC
Equipment : Notebook Computer
Brand Name : Lenovo
Model Name : TP00130A, TP00130B
Applicant : LC Future Center Limited Taiwan Branch
7F., No. 780, Bei'an Rd., Zhongshan Dist.,
Taipei City 104, Taiwan
Manufacturer : LCFC (HeFei) Electronics Technology Co., Ltd.
No. 3188-1, Yungu Road (Hefei Export
Processing Zone), Hefei Economics &
Technology Development Area, Anhui, CHINA
Standard : FCC 47 CFR Part 2, 22(H), 24(E), 27(L)

Equipment: Foxconn T99W175 tested inside of Lenovo Notebook Computer

The product was received on Oct. 23, 2020 and testing was started from Nov. 06, 2020 and completed on Nov. 16, 2020. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI / TIA-603-E and has been in compliance with the applicable technical standards.

The test results in this partial report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Louis Wu

Approved by: Louis Wu

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
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History of this test report

| Report No. | Version | Description | Issued Date |
|------------|---------|-------------------------|---------------|
| FG002311A | 01 | Initial issue of report | Jan. 11, 2021 |
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Summary of Test Result

| Report Clause | Ref Std. Clause | Test Items | Result (PASS/FAIL) | Remark |
|---------------|---|---|--------------------|--|
| - | §2.1046 | Conducted Output Power | - | See Note |
| | §22.913 (a)(2) | Effective Radiated Power (WCDMA Band V) | | |
| | §24.232 (c) | Equivalent Isotropic Radiated Power (WCDMA Band II) | | |
| | §27.50 (d)(4) | Equivalent Isotropic Radiated Power (WCDMA Band IV) | | |
| - | §24.232 (d) | Peak-to-Average Ratio | - | See Note |
| - | §2.1049 §22.917 (b) §24.238 (b) §27.53 (g) | Occupied Bandwidth (WCDMA Band V) (WCDMA Band II) (WCDMA Band IV) | - | See Note |
| - | §2.1051 §22.917 (a) §24.238 (a) §27.53 (g) | Band Edge Measurement (WCDMA Band V) (WCDMA Band II) (WCDMA Band IV) | - | See Note |
| - | §2.1051 §22.917 (a) §24.238 (a) §27.53 (g) | Conducted Emission (WCDMA Band V) (WCDMA Band II) (WCDMA Band IV) | - | See Note |
| - | §2.1055 §22.355 §24.235 §27.54 | Frequency Stability Temperature & Voltage | - | See Note |
| 3.4 | §2.1053 §22.917 (a) §24.238 (a) §27.53 (h) | Field Strength of Spurious Radiation (WCDMA Band V) (WCDMA Band II) (WCDMA Band IV) | Pass | Under limit 14.55 dB at 3705.000 MHz |

Note: The module (Model: T99W175) makes no difference after verifying output power, this report reuses test data from the module report.

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

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.

Reviewed by: Wii Chang

Report Producer: Vivian Hsu

1 General Description

1.1 Product Feature of Equipment Under Test

| Product Feature | |
|---------------------------------|-----------------------------------|
| Equipment | Notebook Computer |
| Brand Name | Lenovo |
| Model Name | TP00130A, TP00130B |
| FCC ID | 2AJN7-TP00130AUC |
| EUT supports Radios application | WCDMA/HSPA/LTE/5G NR/GNSS/NFC/UWB |
| EUT Stage | Production Unit |

Remark:

1. The above EUT's information was declared by manufacturer.
2. Equipment: Foxconn T99W175 tested inside of Lenovo Notebook Computer.

| WWAN Antenna Information | | | | |
|--------------------------|--------------|-----------------------------|-----------------|------|
| Main Antenna | Manufacturer | Luxshare-ICT | Peak gain (dBi) | 1.90 |
| | Part number | DC33001R140 | Type | PIFA |
| | Manufacturer | Amphenol Taiwan Corporation | Peak gain (dBi) | 1.90 |
| | Part number | DC33001R840 | Type | PIFA |
| MIMO 2 Antenna | Manufacturer | Luxshare-ICT | Peak gain (dBi) | 1.80 |
| | Part number | DC33001R130 | Type | PIFA |
| | Manufacturer | Amphenol Taiwan Corporation | Peak gain (dBi) | 1.80 |
| | Part number | DC33001R830 | Type | PIFA |

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to Comments and Explanations in report summary.
2. All test items were performed with Main Antenna (Amphenol Taiwan Corporation).

1.2 Product Specification of Equipment Under Test

| Standards-related Product Specification | |
|---|--|
| Tx Frequency | WCDMA: Band V: 826.4 MHz ~ 846.6 MHz Band II: 1852.4 MHz ~ 1907.6 MHz Band IV: 1712.4 MHz ~ 1752.6 MHz |
| Rx Frequency | WCDMA: Band V: 871.4 MHz ~ 891.6 MHz Band II: 1932.4 MHz ~ 1987.6 MHz Band IV: 2112.4 MHz ~ 2152.6 MHz |
| Type of Modulation | WCDMA: BPSK (Uplink) HSDPA: 64QAM (Downlink) HSUPA: QPSK (Uplink) |

1.3 Modification of EUT

No modifications are made to the EUT during all test items.

1.4 Testing Location

| | |
|--------------------|---|
| Test Site | SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory |
| Test Site Location | No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City, Taiwan |
| Test Site No. | Sporton Site No. |
| | 03CH12-HY |
| Test Engineer | Jack Cheng, Lance Chiang and Chuan Chu |
| Temperature | 22.3~26.4℃ |
| Relative Humidity | 58~66% |

Note: The test site complies with ANSI C63.4 2014 requirement.

FCC Designation No.: TW0007

1.5 Applicable Standards

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

- ♦ ANSI C63.26-2015
- ♦ ANSI / TIA-603-E
- ♦ FCC 47 CFR Part 2, 22(H), 24(E), 27(L)
- ♦ FCC KDB 971168 D01 Power Meas. License Digital Systems v03r01
- ♦ FCC KDB 414788 D01 Radiated Test Site v01r01

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. The TAF code is not including all the FCC KDB listed without accreditation.

2 Test Configuration of Equipment Under Test

2.1 Test Mode

Antenna port conducted and radiated test items were performed according to KDB 971168 D01 Power Meas. License Digital Systems v03r01 with maximum output power.

Radiated emissions were investigated as following frequency range:

1. 30 MHz to 19100 MHz for WCDMA Band II

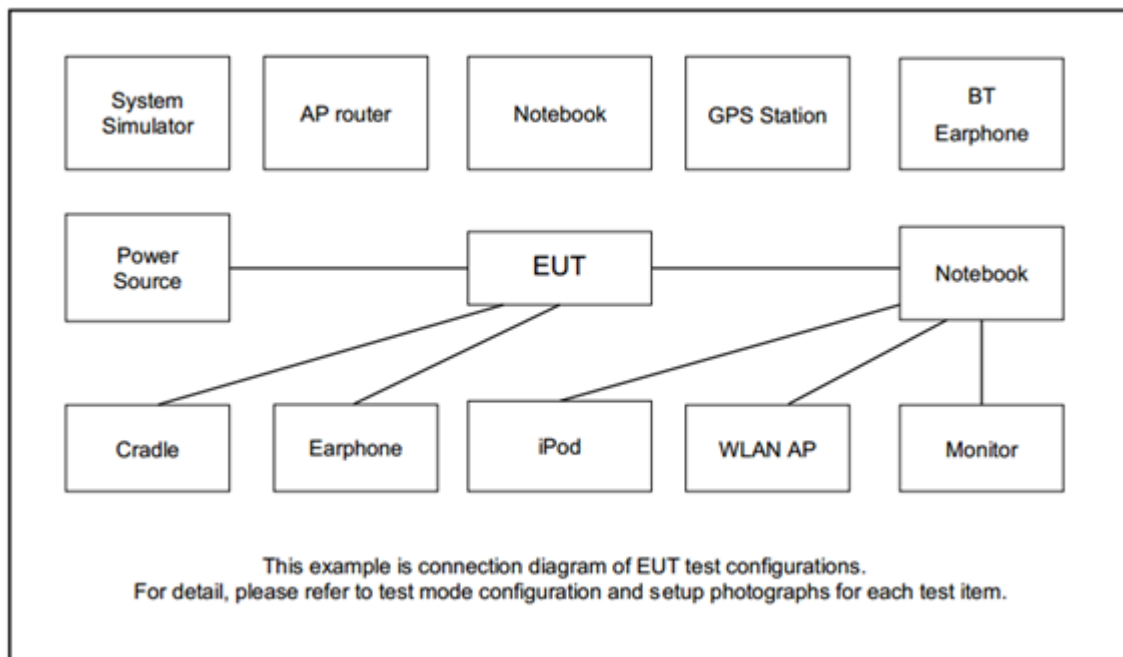
All modes and data rates and positions were investigated.

Test modes are chosen to be reported as the worst case configuration below:

| Test Modes | |
|---------------|---------------------|
| Band | Radiated TCs |
| WCDMA Band II | ■ RMC 12.2Kbps Link |

Remark: All the radiated test cases were performed with Adapter 1.

2.2 Connection Diagram of Test System



2.3 Support Unit used in test configuration

| Item | Equipment | Brand Name | Model No. | FCC ID | Data Cable | Power Cord |
|------|------------------|------------|-----------|--------------|-------------------|-------------------|
| 1. | System Simulator | R&S | CMU 200 | N/A | N/A | Unshielded, 1.8 m |
| 2. | iPod Earphone | Apple | N/A | Verification | Unshielded, 1.0 m | N/A |

2.4 Frequency List of Low/Middle/High Channels

| Frequency List | | | | |
|------------------|------------------------|--------|--------|---------|
| Band | Channel/Frequency(MHz) | Lowest | Middle | Highest |
| WCDMA Band II | Channel | 9262 | 9400 | 9538 |
| | Frequency | 1852.4 | 1880.0 | 1907.6 |

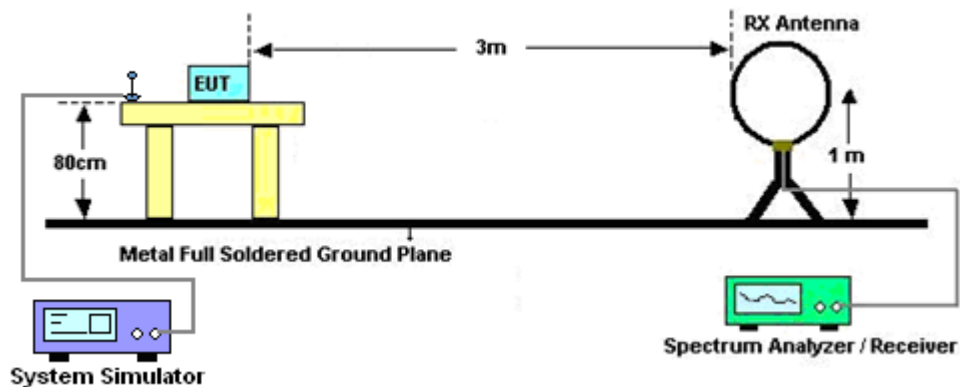
3 Radiated Test Items

3.1 Measuring Instruments

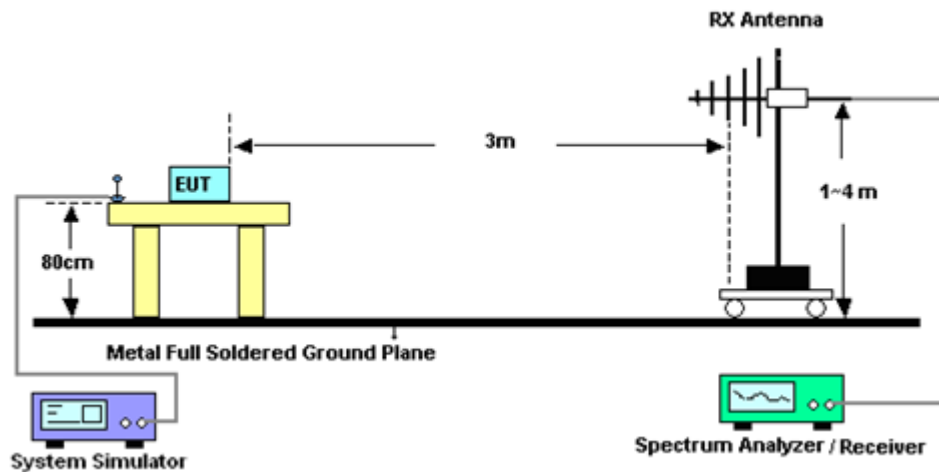
See list of measuring instruments of this test report.

3.2 Test Setup

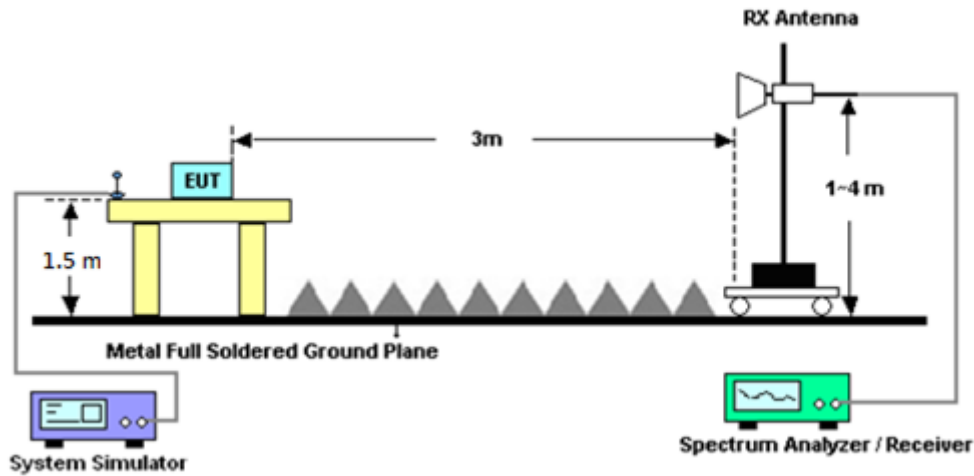
For radiated test below 30MHz



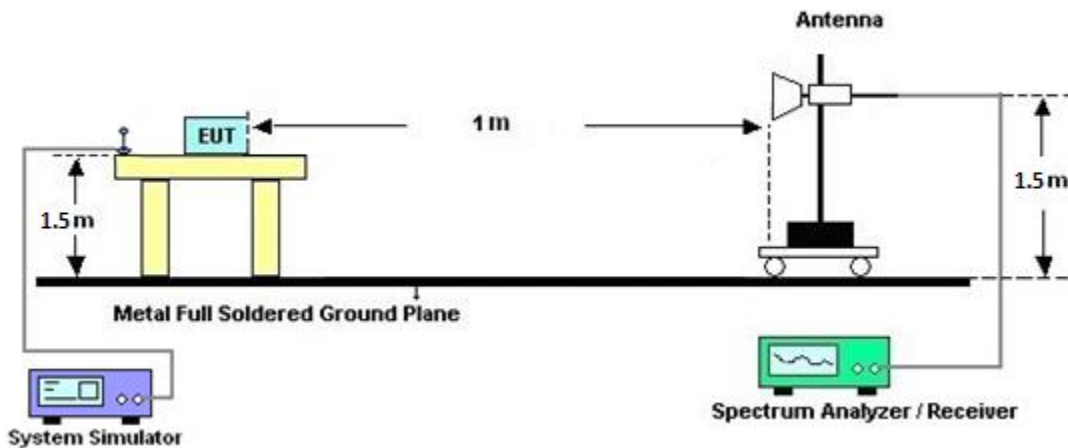
For radiated test from 30MHz to 1GHz



For radiated emissions from 1GHz to 18GHz



For radiated emissions above 18GHz



3.3 Test Result of Radiated Test

Please refer to Appendix A.

Note:

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.

3.4 Field Strength of Spurious Radiation Measurement

3.4.1 Description of Field Strength of Spurious Radiated Measurement

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB. The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

3.4.2 Test Procedures

The testing follows FCC KDB 971168 D01 v03r01 Section 7 and ANSI / TIA-603-E Section 2.2.12.

1. The EUT was placed on a rotatable wooden table 0.8 meters for frequency below 1GHz and 1.5 meter for frequency above 1GHz above the ground.
2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest spurious emission.
4. The height of the receiving antenna is varied between one meter and four meters to search for the maximum spurious emission for both horizontal and vertical polarizations.
5. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking record of maximum spurious emission.
6. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
7. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
8. Taking the record of output power at antenna port.
9. Repeat step 7 to step 8 for another polarization.
10. $EIRP \text{ (dBm)} = S.G. \text{ Power} - Tx \text{ Cable Loss} + Tx \text{ Antenna Gain}$
11. $ERP \text{ (dBm)} = EIRP - 2.15$
12. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
13. The limit line is derived from $43 + 10\log(P)$ dB below the transmitter power P(Watts)



4 List of Measuring Equipment

| Instrument | Brand Name | Model No. | Serial No. | Characteristics | Calibration Date | Test Date | Due Date | Remark |
|-------------------------|-------------------|-----------------------------------|----------------------|----------------------------------|------------------|---------------------------------|---------------|--------------------------|
| Loop Antenna | Rohde & Schwarz | HFH2-Z2 | 100315 | 9 kHz~30 MHz | Dec. 26, 2019 | Nov. 06, 2020~ Nov. 16, 2020 | Dec. 25, 2020 | Radiation (03CH12-HY) |
| Bilog Antenna | TESEQ | CBL 6111D & 00800N1D01N -06 | 40103 & 07 | 30MHz~1GHz | Apr. 29, 2020 | Nov. 06, 2020~ Nov. 16, 2020 | Apr. 28, 2021 | Radiation (03CH12-HY) |
| Horn Antenna | SCHWARZBE CK | BBHA 9120 D | 9120D-1212 | 1GHz~18GHz | May 20, 2020 | Nov. 06, 2020~ Nov. 16, 2020 | May 19, 2020 | Radiation (03CH12-HY) |
| Horn Antenna | SCHWARZBE CK | BBHA 9120D | 9120D-1241 | 1GHz ~ 18GHz | Jul. 15, 2020 | Nov. 06, 2020~ Nov. 16, 2020 | Jul. 14, 2021 | Radiation (03CH12-HY) |
| SHF-EHF Horn Antenna | SCHWARZBE CK | BBHA 9170 | BBHA917058 4 | 18GHz~40GHz | Dec. 10, 2019 | Nov. 06, 2020~ Nov. 16, 2020 | Dec. 09, 2020 | Radiation (03CH12-HY) |
| SHF-EHF Horn Antenna | SCHWARZBE CK | BBHA 9170 | BBHA917098 0 | 18GHz ~ 40GHz | Jan. 10, 2020 | Nov. 06, 2020~ Nov. 16, 2020 | Jan. 09, 2021 | Radiation (03CH12-HY) |
| Preamplifier | COM-POWER | PA-103 | 161075 | 10MHz~1GHz | Mar. 25, 2020 | Nov. 06, 2020~ Nov. 16, 2020 | Mar. 24, 2021 | Radiation (03CH12-HY) |
| Preamplifier | Keysight | 83017A | MY57280120 | 1GHz~26.5GHz | Jul. 20, 2020 | Nov. 06, 2020~ Nov. 16, 2020 | Jul. 19, 2021 | Radiation (03CH12-HY) |
| Preamplifier | Jet-Power | JPA0118-55-3 03K | 1710001800 054002 | 1GHz~18GHz | Feb. 07, 2020 | Nov. 06, 2020~ Nov. 16, 2020 | Feb. 06, 2021 | Radiation (03CH12-HY) |
| Preamplifier | EMEC | EM18G40G | 060715 | 18GHz~40GHz | Dec. 13, 2019 | Nov. 06, 2020~ Nov. 16, 2020 | Dec. 12, 2020 | Radiation (03CH12-HY) |
| Spectrum Analyzer | Agilent | N9010A | MY54200485 | 10Hz~44GHz | Feb. 10, 2020 | Nov. 06, 2020~ Nov. 16, 2020 | Feb. 09, 2021 | Radiation (03CH12-HY) |
| Signal Generator | Anritsu | MG3694C | 163401 | 0.1Hz~40GHz | Feb. 15, 2020 | Nov. 06, 2020~ Nov. 16, 2020 | Feb. 14, 2021 | Radiation (03CH12-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 104 | MY9837/4PE | 9kHz~30MHz | Mar. 12, 2020 | Nov. 06, 2020~ Nov. 16, 2020 | Mar. 11, 2021 | Radiation (03CH12-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 126E | 0058/126E | 30MHz~18GHz | Dec. 12, 2019 | Nov. 06, 2020~ Nov. 16, 2020 | Dec. 11, 2020 | Radiation (03CH12-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 102 | 505134/2 | 30MHz~40GHz | Feb. 25, 2020 | Nov. 06, 2020~ Nov. 16, 2020 | Feb. 24, 2021 | Radiation (03CH12-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 102 | 800740/2 | 30MHz~40GHz | Feb. 25, 2020 | Nov. 06, 2020~ Nov. 16, 2020 | Feb. 24, 2021 | Radiation (03CH12-HY) |
| Hygrometer | TECPEL | DTM-303B | TP140349 | N/A | Oct. 02, 2020 | Nov. 06, 2020~ Nov. 16, 2020 | Oct. 01, 2021 | Radiation (03CH12-HY) |
| Controller | EMEC | EM1000 | N/A | Control Turn table & Ant Mast | N/A | Nov. 06, 2020~ Nov. 16, 2020 | N/A | Radiation (03CH12-HY) |
| Antenna Mast | EMEC | AM-BS-4500-B | N/A | 1m~4m | N/A | Nov. 06, 2020~ Nov. 16, 2020 | N/A | Radiation (03CH12-HY) |
| Turn Table | EMEC | TT2000 | N/A | 0~360 Degree | N/A | Nov. 06, 2020~ Nov. 16, 2020 | N/A | Radiation (03CH12-HY) |
| Software | Audix | E3 6.2009-8-24 | RK-000989 | N/A | N/A | Nov. 06, 2020~ Nov. 16, 2020 | N/A | Radiation (03CH12-HY) |

5 Uncertainty of Evaluation

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

| | |
|--|------|
| Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$) | 3.07 |
|--|------|

Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)

| | |
|--|------|
| Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$) | 3.21 |
|--|------|

Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)

| | |
|--|------|
| Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$) | 3.80 |
|--|------|

Appendix A. Test Results of Radiated Test

WCDMA 1900

| WCDMA 1900 | | | | | | | | | |
|------------|----------------------|-----------------|------------------|-------------------------|-------------------------|--------------------------|----------------------------|-----------------------------|-----------------------|
| Channel | Frequency (MHz) | EIRP (dBm) | Limit (dBm) | Over Limit (dB) | SPA Reading (dBm) | S.G. Power (dBm) | TX Cable loss (dB) | TX Antenna Gain (dBi) | Polarization (H/V) |
| Lowest | 3705 | -27.55 | -13 | -14.55 | -45.51 | -38.76 | 1.41 | 12.62 | H |
| | 5557 | -33.81 | -13 | -20.81 | -56.96 | -45.37 | 1.74 | 13.30 | H |
| | 7410 | -48.05 | -13 | -35.05 | -74.84 | -57.35 | 1.94 | 11.24 | H |
| | | | | | | | | | H |
| | | | | | | | | | H |
| | | | | | | | | | H |
| | 3705 | -31.58 | -13 | -18.58 | -49.68 | -42.79 | 1.41 | 12.62 | V |
| | 5557 | -39.26 | -13 | -26.26 | -61.96 | -50.82 | 1.74 | 13.30 | V |
| | 7410 | -47.95 | -13 | -34.95 | -74.59 | -57.25 | 1.94 | 11.24 | V |
| | | | | | | | | | V |
| | | | | | | | | | V |
| | | | | | | | | | V |
| Middle | 3760 | -28.97 | -13 | -15.97 | -47.16 | -40.20 | 1.43 | 12.66 | H |
| | 5640 | -36.87 | -13 | -23.87 | -60.09 | -48.44 | 1.73 | 13.30 | H |
| | 7520 | -48.35 | -13 | -35.35 | -74.62 | -57.46 | 1.99 | 11.10 | H |
| | | | | | | | | | H |
| | | | | | | | | | H |
| | | | | | | | | | H |
| | 3760 | -31.14 | -13 | -18.14 | -49.55 | -42.37 | 1.43 | 12.66 | V |
| | 5640 | -40.86 | -13 | -27.86 | -63.67 | -52.43 | 1.73 | 13.30 | V |
| | 7520 | -48.74 | -13 | -35.74 | -74.97 | -57.85 | 1.99 | 11.10 | V |
| | | | | | | | | | V |
| | | | | | | | | | V |
| | | | | | | | | | V |



| | | | | | | | | | |
|---------|------|--------|-----|--------|--------|--------|------|-------|---|
| Highest | 3815 | -33.00 | -13 | -20.00 | -51.4 | -44.25 | 1.44 | 12.69 | H |
| | 5722 | -41.42 | -13 | -28.42 | -65.07 | -52.99 | 1.73 | 13.30 | H |
| | 7630 | -48.24 | -13 | -35.24 | -74.09 | -57.36 | 2.01 | 11.13 | H |
| | | | | | | | | | H |
| | | | | | | | | | H |
| | | | | | | | | | H |
| | 3815 | -33.76 | -13 | -20.76 | -52.4 | -45.01 | 1.44 | 12.69 | V |
| | 5722 | -42.82 | -13 | -29.82 | -65.84 | -54.39 | 1.73 | 13.30 | V |
| | 7630 | -48.47 | -13 | -35.47 | -74.24 | -57.59 | 2.01 | 11.13 | V |
| | | | | | | | | | V |
| | | | | | | | | | V |
| | | | | | | | | | V |

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.