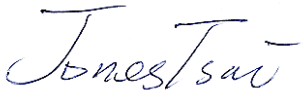
# FCC RF Test Report

| | | |
|---|---|---|
| APPLICANT | : | Honeywell International Inc. |
| EQUIPMENT | : | 99EX mobile computer |
| BRAND NAME | : | Honeywell |
| MODEL NAME | : | 99EXLF |
| MARKETING NAME | : | Dolphin 99EX |
| FCC ID | : | HD5-99EXLF |
| STANDARD | : | FCC 47 CFR Part 2, 22(H), 24(E) |
| CLASSIFICATION | : | PCS Licensed Transmitter (PCB) |

**The product was received on Aug. 20, 2015 and testing was completed on Sep. 30, 2015. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI / TIA / EIA-603-C-2004 and has been in compliance with the applicable technical standards.**

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

**Reviewed by: Joseph Lin / Supervisor**



**Approved by: Jones Tsai / Manager**

***SPORTON INTERNATIONAL INC.***
***No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C.***

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# REVISION HISTORY

| REPORT NO. | VERSION | DESCRIPTION | ISSUED DATE |
|---|---|---|---|
| FG0D0904-35 | Rev. 01 | Initial issue of report | Nov. 24, 2015 |
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# SUMMARY OF TEST RESULT

| Report Section | FCC Rule | Description | Limit | Result | Remark |
|---|---|---|---|---|---|
| 3.4 | §2.1046 | Conducted Output Power | N/A | PASS | - |
| 3.5 | §24.232(d) | Peak-to-Average Ratio | < 13 dB | PASS | - |
| 3.6 | §2.1049 | Occupied Bandwidth | N/A | PASS | - |
| 3.7 | §2.1051<br>§22.917(a)<br>§24.238(a) | Band Edge Measurement | < 43+10log10(P[Watts]) | PASS | - |
| 3.8 | §2.1051<br>§22.917(a)<br>§24.238(a) | Conducted Emission | < 43+10log10(P[Watts]) | PASS | - |
| 3.9 | §2.1055<br>§22.355 | Frequency Stability for Temperature & Voltage | < 2.5 ppm for Part 22<br>Within Authorized Band | PASS | - |
| | §2.1055<br>§24.235 | | | | |
| 4.4 | §22.913(a)(2) | Effective Radiated Power | < 7 Watts | PASS | - |
| | §24.232(c) | Equivalent Isotropic Radiated Power | < 2 Watts | PASS | - |
| 4.5 | §2.1053<br>§22.917(a)<br>§24.238(a) | Field Strength of Spurious Radiation | < 43+10log10(P[Watts]) | PASS | Under limit 3.14 dB at 3819.000 MHz |

**Remark:** The FG0D0904-35 report reuses test data from the FG0D0904-29 report.

# 1 General Description

## 1.1 Applicant

**Honeywell International Inc.**
9680 Old Bailes Road, Fort Mill, SC 29707 USA

## 1.2 Manufacturer

**Honeywell International Inc.**
9680 Old Bailes Road, Fort Mill, SC 29707 USA

## 1.3 Product Feature of Equipment Under Test

| Product Feature | |
|---|---|
| **Equipment** | 99EX mobile computer |
| **Brand Name** | Honeywell |
| **Model Name** | 99EXLF |
| **Marketing Name** | Dolphin 99EX |
| **FCC ID** | HD5-99EXLF |
| **EUT supports Radios application** | CDMA/EV-DO/GSM/EGPRS/WCDMA/HSPA<br>WLAN 11a/b/g/n HT20<br>Bluetooth v2.1 EDR |
| **HW Version** | 8 |
| **SW Version** | 26.07 |
| **EUT Stage** | Identical Prototype |

**Remark:** The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

## 1.4 Product Specification subjective to this standard

| Product Specification subjective to this standard | |
|---|---|
| **Tx Frequency** | **GSM/GPRS/EDGE:**<br>850: 824.2 MHz ~ 848.8 MHz<br>1900: 1850.2 MHz ~ 1909.8MHz<br>**WCDMA:**<br>Band V: 826.4 MHz ~ 846.6 MHz<br>Band II: 1852.4 MHz ~ 1907.6 MHz<br>**CDMA2000:**<br>BC0: 824.70 MHz ~ 848.31 MHz<br>BC1: 1851.25 MHz ~ 1908.75 MHz |
| **Rx Frequency** | **GSM/GPRS/EDGE:**<br>850: 869.2 MHz ~ 893.8 MHz<br>1900: 1930.2 MHz ~ 1989.8 MHz<br>**WCDMA:**<br>Band V: 871.4 MHz ~ 891.6 MHz<br>Band II: 1932.4 MHz ~ 1987.6 MHz<br>**CDMA2000:**<br>BC0: 869.70 MHz ~ 893.31 MHz<br>BC1: 1931.25 MHz ~ 1988.75 MHz |
| **Maximum Output Power to Antenna** | **GSM/GPRS/EDGE:**<br>850: 33.39 dBm<br>1900: 30.69 dBm<br>**WCDMA:**<br>Band V: 23.67 dBm<br>Band II: 24.20 dBm<br>**CDMA2000:**<br>BC0: 24.57 dBm<br>BC1: 24.43 dBm |
| **Antenna Type** | PIFA Antenna |
| **Type of Modulation** | GPRS: GMSK<br>EDGE: GMSK / 8PSK<br>WCDMA: QPSK (Uplink)<br>HSDPA: 16QAM (Downlink)<br>HSUPA: QPSK (Uplink)<br>CDMA2000 1xRTT: QPSK<br>CDMA2000 1xEV-DO: QPSK/8PSK |

## 1.5 Modification of EUT

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

## 1.6 Maximum ERP/EIRP Power, Frequency Tolerance, and Emission Designator

| FCC Rule | System | Type of Modulation | Maximum ERP/EIRP (W) | Frequency Tolerance (ppm) | Emission Designator |
|---|---|---|---|---|---|
| Part 22 | GSM850 GPRS class 8 | GMSK | 1.7022 | 0.0658 ppm | 247KGXW |
| Part 22 | GSM850 EDGE class 8 | 8PSK | 0.4508 | 0.1040 ppm | 249KG7W |
| Part 22 | WCDMA Band V RMC 12.2Kbps | QPSK | 0.1849 | 0.0359 ppm | 4M14F9W |
| Part 22 | CDMA2000 BC0 1xRTT | QPSK | 0.2871 | 0.0371 ppm | 1M28F9W |
| Part 24 | GSM1900 GPRS class 8 | GMSK | 1.6032 | 0.0122 ppm | 247KGXW |
| Part 24 | GSM1900 EDGE class 8 | 8PSK | 0.3999 | 0.0314 ppm | 246KG7W |
| Part 24 | WCDMA Band II RMC 12.2Kbps | QPSK | 0.2109 | 0.0298 ppm | 4M15F9W |
| Part 24 | CDMA2000 BC1 1xRTT | QPSK | 0.2958 | 0.0303 ppm | 1M28F9W |

## 1.7 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1022 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

| | |
|---|---|
| **Test Site** | SPORTON INTERNATIONAL INC. |
| **Test Site Location** | No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park,<br>Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C.<br>TEL: +886-3-327-3456<br>FAX: +886-3-328-4978 |
| **Test Site No.** | **Sporton Site No.** |
| | TH03-HY |

| | |
|---|---|
| **Test Site** | SPORTON INTERNATIONAL INC. |
| **Test Site Location** | No.58, Aly. 75, Ln. 564, Wenhua 3rd Rd. Guishan Dist,<br>Taoyuan City, Taiwan (R.O.C.)<br>TEL: +886-3-327-0868<br>FAX: +886-3-327-0855 |
| **Test Site No.** | **Sporton Site No.** |
| | 03CH10-HY |

## 1.8 Applicable Standards

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

- 47 CFR Part 2, 22(H), 24(E)
- ANSI / TIA / EIA-603-C-2004
- FCC KDB 971168 D01 Power Meas. License Digital Systems v02r02

**Remark:**

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

# 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 v02r02 with maximum output power.

Radiated measurements were performed with rotating EUT in different three orthogonal test planes to find the maximum emission.

Radiated emissions were investigated as following frequency range:

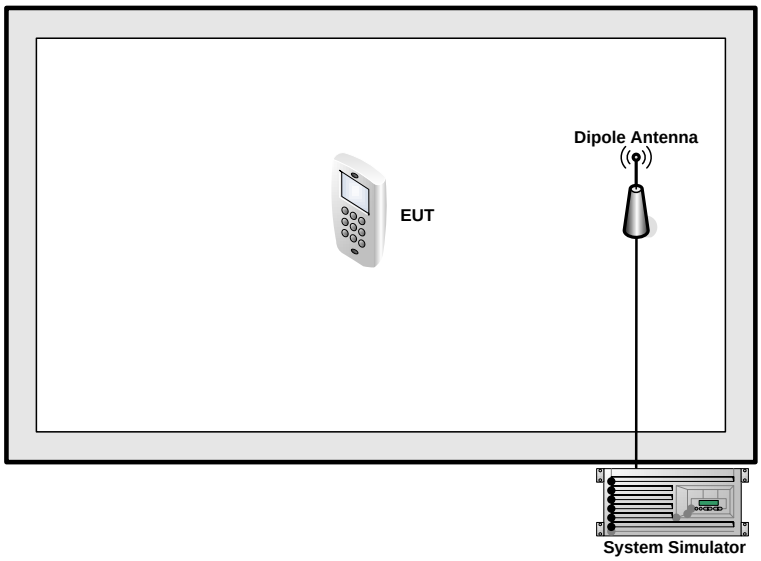
1. 30 MHz to 9000 MHz for GSM850 and WCDMA Band V and CDMA BC0.
2. 30 MHz to 19000 MHz for GSM1900 and WCDMA Band II and CDMA BC1.

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** | **Conducted TCs** |
| **GSM 850** | ■ GPRS class 8 Link<br>■ EDGE class 8 Link | ■ GPRS class 8 Link<br>■ EDGE class 8 Link |
| **GSM 1900** | ■ GPRS class 8 Link<br>■ EDGE class 8 Link | ■ GPRS class 8 Link<br>■ EDGE class 8 Link |
| **WCDMA Band V** | ■ RMC 12.2Kbps Link | ■ RMC 12.2Kbps Link |
| **WCDMA Band II** | ■ RMC 12.2Kbps Link | ■ RMC 12.2Kbps Link |
| **CDMA BC0** | ■ 1xRTT Link | ■ 1xRTT Link |
| **CDMA BC1** | ■ 1xRTT Link | ■ 1xRTT Link |

## 2.2 Connection Diagram of Test System




## 2.3 Support Unit used in test configuration

| Item | Equipment | Trade 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. | Charging Base | Honeywell | 99EX-HB | Verification | NA | Unshielded, 1.8 m |

## 2.4 Measurement Results Explanation Example

**For all conducted test items:**

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between RF conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level will be exactly the RF output level.

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

*Offset = RF cable loss + attenuator factor.*

The following shows an offset computation example with RF cable loss 4.2 dB and a 10dB attenuator.

Example :

*Offset(dB) = RF cable loss(dB) + attenuator factor(dB).*

= 4.2 + 10 = 14.2 (dB)

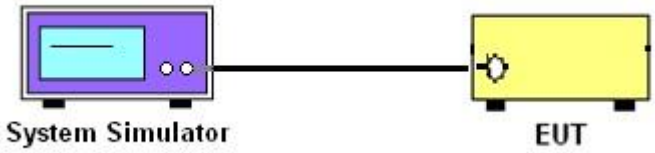
# 3 Conducted Test Result

## 3.1 Measuring Instruments

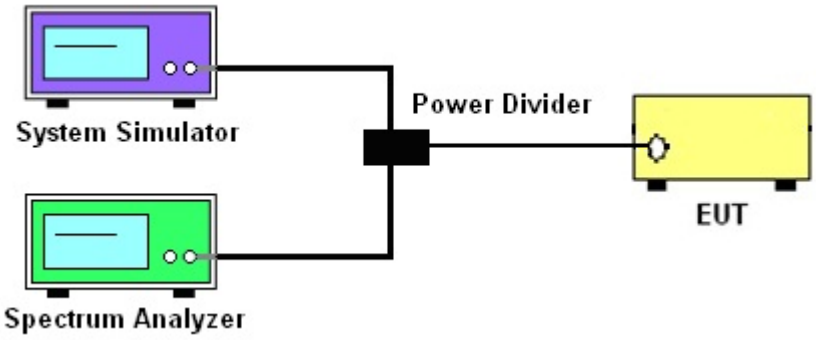
See list of measuring instruments of this test report.

## 3.2 Test Setup

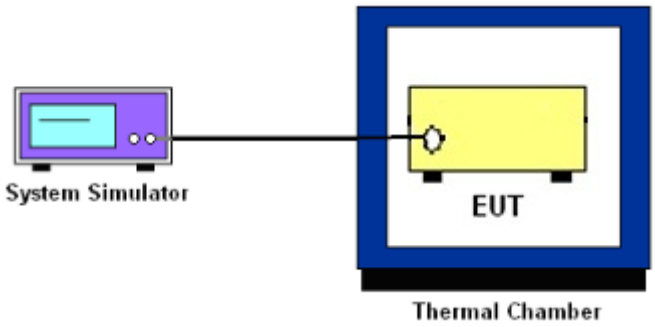
### 3.2.1 Conducted Output Power




### 3.2.2 Peak-to-Average Ratio, Occupied Bandwidth, Conducted Band-Edge and Conducted Spurious Emission




### 3.2.3 Frequency Stability




## 3.3 Test Result of Conducted Test

Please refer to Appendix A.

# 3.4 Conducted Output Power

## 3.4.1 Description of the Conducted Output Power

A system simulator was used to establish communication with the EUT. Its parameters were set to enforce EUT transmitting at the maximum power. The measured power in the radio frequency on the transmitter output terminals shall be reported.

## 3.4.2 Test Procedures

1. The transmitter output port was connected to the system simulator.
2. Set EUT at maximum power through system simulator.
3. Select lowest, middle, and highest channels for each band and different modulation.
4. Measure the maximum burst average power for GSM and maximum average power for other modulation signal.

# 3.5 Peak-to-Average Ratio

## 3.5.1 Description of the PAR Measurement

The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

## 3.5.2 Test Procedures

1. The testing follows FCC KDB 971168 D01 v02r02 Section 5.7.1.
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. Set EUT to transmit at maximum output power.
4. When the duty cycle is less than 98%, then signal gating will be implemented on the spectrum analyzer by triggering from the system simulator.
5. Set the CCDF (Complementary Cumulative Distribution Function) option of the spectrum analyzer.
6. Record the maximum PAPR level associated with a probability of 0.1%.

# 3.6 99% Occupied Bandwidth and 26dB Bandwidth Measurement

## 3.6.1 Description of 99% Occupied Bandwidth and 26dB Bandwidth Measurement

The 99% occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean transmitted power.

The emission bandwidth is defined as the width of the signal between two points, located at the two sides of the carrier frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

## 3.6.2 Test Procedures

1. The testing follows FCC KDB 971168 D01 v02r02 Section 4.2.
2. The EUT was connected to the spectrum analyzer and system simulator via a power divider.
3. The RF output of the EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
4. The 99% occupied bandwidth were measured, set RBW= 1% of span, VBW= 3*RBW, sample detector, trace maximum hold.
5. The 26dB bandwidth were measured, set RBW= 1% of EBW, VBW= 3*RBW, peak detector, trace maximum hold.

# 3.7 Conducted Band Edge

## 3.7.1 Description of Conducted Band Edge Measurement

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least 43 + 10 log (P) dB.

## 3.7.2 Test Procedures

1. The testing follows FCC KDB 971168 D01 v02r02 Section 6.0.
2. The EUT was connected to the spectrum analyzer and system simulator via a power divider.
3. The RF output of EUT was connected to the spectrum analyzer by an RF cable and attenuator. The path loss was compensated to the results for each measurement.
4. The band edges of low and high channels for the highest RF powers were measured.
5. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
6. The limit line is derived from 43 + 10log(P) dB below the transmitter power P(Watts)
   = P(W) - [43 + 10log(P) ] (dB)
   = [30 + 10log(P)] (dBm) - [43 + 10log(P) ] (dB)
   = -13dBm.

# 3.8 Conducted Spurious Emission

## 3.8.1 Description of Conducted Spurious Emission Measurement

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least 43 + 10 log (P) dB.

It is measured by means of a calibrated spectrum analyzer and scanned from 30 MHz up to a frequency including its $10^{th}$ harmonic.

## 3.8.2 Test Procedures

1. The testing follows FCC KDB 971168 D01 v02r02 Section 6.0.
2. The EUT was connected to the spectrum analyzer and system simulator via a power divider.
3. The RF output of EUT was connected to the spectrum analyzer by an RF cable and attenuator. The path loss was compensated to the results for each measurement.
4. The middle channel for the highest RF power within the transmitting frequency was measured.
5. The conducted spurious emission for the whole frequency range was taken.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
7. The limit line is derived from 43 + 10log(P) dB below the transmitter power P(Watts)
   = P(W) - [43 + 10log(P)] (dB)
   = [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)
   = -13dBm.

## 3.9 Frequency Stability

### 3.9.1 Description of Frequency Stability Measurement

The frequency stability shall be measured by variation of ambient temperature and variation of primary supply voltage to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5ppm) of the center frequency.

### 3.9.2 Test Procedures for Temperature Variation

1. The testing follows FCC KDB 971168 D01 v02r02 Section 9.0.
2. The EUT was set up in the thermal chamber and connected with the system simulator.
3. With power OFF, the temperature was decreased to -30°C and the EUT was stabilized before testing. Power was applied and the maximum change in frequency was recorded within one minute.
4. With power OFF, the temperature was raised in 10°C steps up to 50°C. The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute.

### 3.9.3 Test Procedures for Voltage Variation

1. The testing follows FCC KDB 971168 D01 v02r02 Section 9.0.
2. The EUT was placed in a temperature chamber at 25±5° C and connected with the system simulator.
3. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value measured at the input to the EUT.
4. The variation in frequency was measured for the worst case.

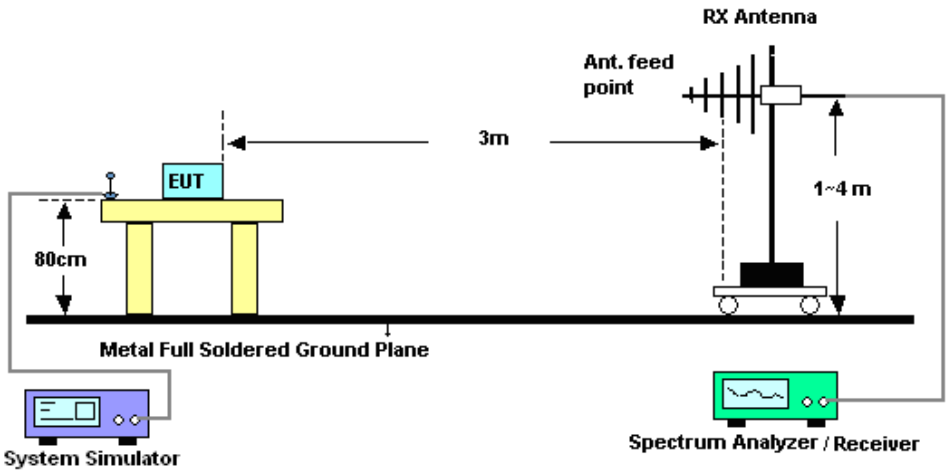
# 4 Radiated Test Items

## 4.1 Measuring Instruments

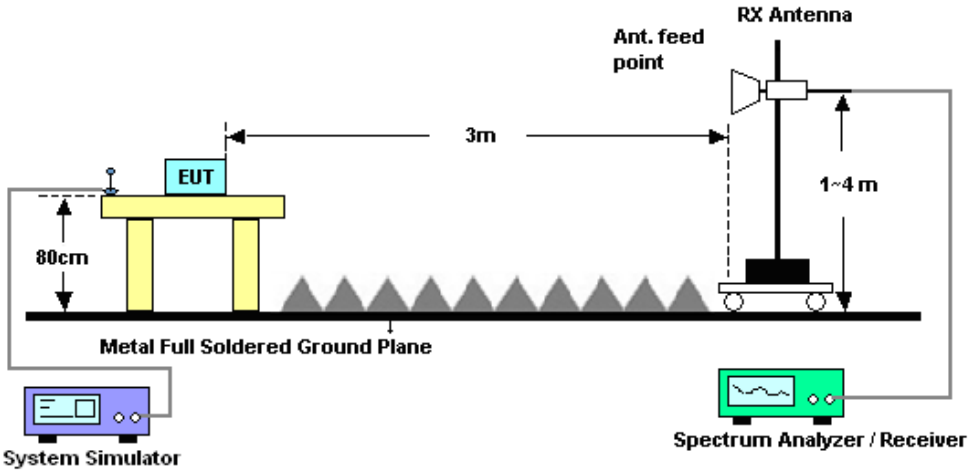
See list of measuring instruments of this test report.

## 4.2 Test Setup

### 4.2.1 For radiated test from 30MHz to 1GHz




### 4.2.2 For radiated test above 1GHz




## 4.3 Test Result of Radiated Test

Please refer to Appendix B.

# 4.4 Effective Radiated Power and Effective Isotropic Radiated Power Measurement

## 4.4.1 Description of the ERP/EIRP Measurement

The substitution method, in ANSI / TIA / EIA-603-C-2004, was used for ERP/EIRP measurement, and the spectrum analyzer configuration follows KDB 971168 D01 Power Meas. License Digital Systems v02r02. The ERP of mobile transmitters must not exceed 7 Watts (Cellular Band) and the EIRP of mobile transmitters are limited to 2 Watts (PCS Band).

## 4.4.2 Test Procedures

1. The testing follows FCC KDB 971168 D01 v02r02 Section 5.2.1. (for CDMA/WCDMA), Section 5.2.2.2 (for GSM/GPRS/EDGE) and ANSI / TIA-603-C-2004 Section 2.2.17.
2. The EUT was placed on a non-conductive rotating platform 0.8 meters high in a semi-anechoic chamber. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and a spectrum analyzer with RMS detector per section 5. of KDB 971168 D01.
3. During the measurement, the system simulator parameters were set to force the EUT transmitting at maximum output power. The maximum emission was recorded from analyzer power level (LVL) from the 360 degrees rotation of the turntable and the test antenna raised and lowered over a range from 1 to 4 meters in both horizontally and vertically polarized orientations.
4. Effective Isotropic Radiated Power (EIRP) was measured by substitution method according to TIA/EIA-603-C. The EUT was replaced by the substitution antenna at same location, and then a known power from S.G. was applied into the dipole antenna through a Tx cable, and then recorded the maximum Analyzer reading through raised and lowered the test antenna. The correction factor (in dB) = S.G. - Tx Cable loss + Substitution antenna gain - Analyzer reading. Then the EUT's EIRP was calculated with the correction factor, EIRP = LVL + Correction factor and ERP = EIRP - 2.15. Take the record of the output power at substitution antenna.

| | GSM/GPRS/EDGE | WCDMA/HSPA |
|---|---|---|
| SPAN | 500kHz | 10MHz |
| RBW | 10kHz | 100kHz |
| VBW | 30kHz | 300kHz |
| Detector | RMS | RMS |
| Trace | Average | Average |
| Average Type | Power | Power |
| Sweep Count | 100 | 100 |

# 4.5 Field Strength of Spurious Radiation Measurement

## 4.5.1 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.

## 4.5.2 Test Procedures

1. The testing follows FCC KDB 971168 D01 v02r02 Section 5.8 and ANSI / TIA-603-C-2004 Section 2.2.12.
2. The EUT was placed on a rotatable wooden table 0.8 meters above the ground.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
4. The table was rotated 360 degrees to determine the position of the highest spurious emission.
5. 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.
6. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking record of maximum spurious emission.
7. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
8. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
9. Taking the record of output power at antenna port.
10. Repeat step 7 to step 8 for another polarization.
11. EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain
12. ERP (dBm) = EIRP - 2.15
13. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
14. The limit line is derived from 43 + 10log(P) dB below the transmitter power P(Watts)
    = P(W) - [43 + 10log(P)] (dB)
    = [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)
    = -13dBm.

# 5 List of Measuring Equipment

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Test Date | Due Date | Remark |
|---|---|---|---|---|---|---|---|---|
| Spectrum Analyzer | Rohde & Schwarz | FSP30 | 101329 | 9kHz~30GHz | Jun. 24, 2015 | Sep. 07, 2015~ Sep. 30, 2015 | Jun. 23, 2016 | Conducted (TH02-HY) |
| Programmable Power Supply | GW Instek | PSS-2005 | EL883644 | Voltage:0~20V; Current:0~5A | Dec. 01, 2014 | Sep. 07, 2015~ Sep. 30, 2015 | Nov. 30, 2015 | Conducted (TH02-HY) |
| Temperature Chamber | ESPEC | SU-641 | 92013721 | -30 70 degree | Dec. 01, 2014 | Sep. 07, 2015~ Sep. 30, 2015 | Nov. 30, 2015 | Conducted (TH02-HY) |
| Amplifier | SONOMA | 310N | 187311 | 9kHz~1GHz | Nov. 24, 2014 | Sep. 05, 2015~ Sep. 24, 2015 | Nov. 23, 2015 | Radiation (03CH10-HY) |
| Bilog Antenna | TESEQ | CBL 6111D | 35413 | 30MHz~1GHz | Oct. 24, 2014 | Sep. 05, 2015~ Sep. 24, 2015 | Oct. 23, 2015 | Radiation (03CH10-HY) |
| EMI Test Receiver | Keysight | N9038A | MY54130085 | 20Hz ~ 8.4GHz | Nov. 05, 2014 | Sep. 05, 2015~ Sep. 24, 2015 | Nov. 04, 2015 | Radiation (03CH10-HY) |
| Horn Antenna | SCHWARZBECK | BBHA 9120 D | 9120D-1325 | 1GHz ~ 18GHz | Oct. 03, 2014 | Sep. 05, 2015~ Sep. 24, 2015 | Oct. 02, 2015 | Radiation (03CH10-HY) |
| Preamplifier | Keysight | 83017A | MY53270078 | 1GHz~26.5GHz | Nov. 20, 2014 | Sep. 05, 2015~ Sep. 24, 2015 | Nov. 19, 2015 | Radiation (03CH10-HY) |
| Spectrum Analyzer | Keysight | N9010A | MY54200485 | 10Hz ~ 44GHZ | Oct. 14, 2014 | Sep. 05, 2015~ Sep. 24, 2015 | Oct. 13, 2015 | Radiation (03CH10-HY) |
| Antenna Mast | EMEC | AM-BS-4500-B | N/A | 1~4m | N/A | Sep. 05, 2015~ Sep. 24, 2015 | N/A | Radiation (03CH10-HY) |
| Turn Table | EMEC | TT 2200 | N/A | 0-360 degree | N/A | Sep. 05, 2015~ Sep. 24, 2015 | N/A | Radiation (03CH10-HY) |
| SHF-EHF Horn Antenna | SCHWARZBECK | BBHA 9170 | BBHA9170576 | 18GHz ~40GHz | Apr. 20, 2015 | Sep. 05, 2015~ Sep. 24, 2015 | Apr. 19, 2016 | Radiation (03CH10-HY) |

# 6 Uncertainty of Evaluation

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

| | |
|---|---|
| **Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))** | **4.9** |

# Appendix A. Test Results of Conducted Test

## Conducted Output Power(Average power)

| Conducted Power (*Unit: dBm) | | | | | | |
|---|---|---|---|---|---|---|
| Band | GSM850 | | | GSM1900 | | |
| Channel | 128 | 189 | 251 | 512 | 661 | 810 |
| Frequency | 824.2 | 836.4 | 848.8 | 1850.2 | 1880.0 | 1909.8 |
| GPRS class 8 | 33.39 | 33.30 | 33.19 | 30.31 | 30.69 | 30.66 |
| GPRS class 10 | 33.22 | 33.12 | 33.06 | 30.17 | 30.59 | 30.58 |
| EGPRS class 8 | 26.94 | 26.92 | 26.98 | 26.27 | 26.34 | 26.34 |
| EGPRS class 10 | 26.34 | 26.33 | 26.73 | 26.17 | 26.19 | 26.24 |
| EGPRS class 11 | 26.16 | 26.07 | 26.20 | 26.06 | 26.08 | 26.06 |
| EGPRS class 12 | 26.15 | 25.99 | 26.14 | 25.88 | 25.90 | 25.92 |

| Conducted Power (*Unit: dBm) | | | | | | |
|---|---|---|---|---|---|---|
| Band | WCDMA Band V | | | WCDMA Band II | | |
| Channel | 4132 | 4182 | 4233 | 9262 | 9400 | 9538 |
| Frequency | 826.4 | 836.4 | 846.6 | 1852.4 | 1880 | 1907.6 |
| RMC 12.2K | 23.64 | 23.56 | 23.67 | 24.20 | 24.00 | 23.91 |
| HSDPA Subtest-1 | 23.11 | 23.12 | 23.52 | 23.92 | 23.93 | 23.85 |
| HSDPA Subtest-2 | 23.26 | 23.13 | 23.23 | 23.99 | 23.85 | 23.81 |
| HSDPA Subtest-3 | 22.74 | 22.75 | 22.83 | 23.57 | 23.60 | 23.44 |
| HSDPA Subtest-4 | 22.70 | 22.71 | 22.75 | 23.48 | 23.51 | 23.35 |
| HSUPA Subtest-1 | 22.75 | 22.65 | 22.83 | 23.68 | 23.61 | 23.55 |
| HSUPA Subtest-2 | 20.79 | 20.73 | 20.94 | 21.74 | 21.69 | 21.64 |
| HSUPA Subtest-3 | 21.83 | 21.78 | 21.86 | 22.80 | 22.75 | 22.70 |
| HSUPA Subtest-4 | 21.13 | 21.00 | 21.19 | 21.94 | 21.85 | 21.75 |
| HSUPA Subtest-5 | 22.84 | 22.81 | 23.00 | 23.83 | 23.72 | 23.50 |

| Conducted Power (*Unit: dBm) | | | | | | |
|---|---|---|---|---|---|---|
| Band | CDMA 2000 BC0 | | | CDMA 2000 BC1 | | |
| Channel | 1013 | 384 | 777 | 25 | 600 | 1175 |
| Frequency | 824.7 | 836.52 | 848.31 | 1851.25 | 1880 | 1908.75 |
| 1xRTT RC1 SO55 | 24.57 | 24.52 | 24.56 | 24.39 | 24.41 | 24.43 |
| 1xRTT RC3 SO55 | 24.56 | 24.50 | 24.55 | 24.37 | 24.40 | 24.41 |
| 1xRTT RC3 SO32 (+ F-SCH) | 24.54 | 24.49 | 24.54 | 24.38 | 24.42 | 24.39 |
| 1xRTT RC3 SO32 (+SCH) | 24.54 | 24.51 | 24.56 | 24.39 | 24.39 | 24.42 |
| 1xEVDO RTAP 153.6Kbps | 24.53 | 24.50 | 24.56 | 24.39 | 24.36 | 24.41 |
| 1xEVDO RETAP 4096Bits | 24.52 | 24.49 | 24.54 | 24.36 | 24.37 | 24.39 |

# Appendix B. Test Results of Radiated Test

## ERP/EIRP

| Channel | Mode | Horizontal | | Vertical | |
|---|---|---|---|---|---|
| | | ERP(dBm) | ERP(W) | ERP(dBm) | ERP(W) |
| Lowest | GSM850 GPRS class 8 | 32.30 | 1.6982 | 28.07 | 0.6412 |
| Middle | | 32.31 | 1.7022 | 28.63 | 0.7295 |
| Highest | | 32.07 | 1.6106 | 28.47 | 0.7031 |
| Lowest | GSM850 EDGE class 8 | 26.54 | 0.4508 | 22.19 | 0.1656 |
| Middle | | 26.18 | 0.4150 | 22.33 | 0.1710 |
| Highest | | 25.39 | 0.3459 | 22.13 | 0.1633 |
| Lowest | WCDMA Band V RMC 12.2Kbps | 21.34 | 0.1361 | 17.13 | 0.0516 |
| Middle | | 22.41 | 0.1742 | 18.53 | 0.0713 |
| Highest | | 22.67 | 0.1849 | 19.21 | 0.0834 |
| Lowest | CDMA BC0 1xRTT | 23.01 | 0.2000 | 18.69 | 0.0740 |
| Middle | | 23.98 | 0.2500 | 20.03 | 0.1007 |
| Highest | | 24.58 | 0.2871 | 20.82 | 0.1208 |
| Limit | ERP < 7W | Result | | PASS | |

| Channel | Mode | Horizontal | | Vertical | |
|---|---|---|---|---|---|
| | | EIRP(dBm) | EIRP(W) | EIRP(dBm) | EIRP(W) |
| Lowest | GSM1900 GPRS class 8 | 31.77 | 1.5031 | 30.90 | 1.2303 |
| Middle | | 31.65 | 1.4622 | 30.94 | 1.2417 |
| Highest | | 32.05 | 1.6032 | 30.90 | 1.2303 |
| Lowest | GSM1900 EDGE class 8 | 25.76 | 0.3767 | 25.29 | 0.3381 |
| Middle | | 25.79 | 0.3793 | 25.34 | 0.3420 |
| Highest | | 26.02 | 0.3999 | 24.76 | 0.2992 |
| Lowest | WCDMA Band II RMC 12.2Kbps | 22.56 | 0.1803 | 22.48 | 0.1770 |
| Middle | | 22.89 | 0.1945 | 22.50 | 0.1778 |
| Highest | | 23.24 | 0.2109 | 22.16 | 0.1644 |
| Lowest | CDMA BC1 1xRTT | 24.71 | 0.2958 | 24.33 | 0.2710 |
| Middle | | 24.61 | 0.2891 | 24.06 | 0.2547 |
| Highest | | 24.43 | 0.2773 | 23.32 | 0.2148 |
| Limit | EIRP < 2W | Result | | PASS | |

# Radiated Spurious Emission

| GSM850 (GPRS class 8) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Channel | Frequency ( MHz ) | ERP ( 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 | 1651 | -43.56 | -13 | -30.56 | -52.95 | -45.31 | 0.98 | 4.88 | H |
| | 2476 | -55.80 | -13 | -42.80 | -68.69 | -57.69 | 1.28 | 5.33 | H |
| | 3296 | -60.51 | -13 | -47.51 | -77.14 | -63.92 | 1.54 | 7.10 | H |
| | 1651 | -45.63 | -13 | -32.63 | -53.2 | -47.38 | 0.98 | 4.88 | V |
| | 2476 | -58.93 | -13 | -45.93 | -74.05 | -60.82 | 1.28 | 5.33 | V |
| | 3295 | -61.74 | -13 | -48.74 | -77.07 | -65.15 | 1.54 | 7.10 | V |
| Middle | 1675 | -42.15 | -13 | -29.15 | -51.25 | -43.82 | 0.99 | 4.81 | H |
| | 2512 | -53.86 | -13 | -40.86 | -67.09 | -55.83 | 1.29 | 5.41 | H |
| | 3349 | -58.68 | -13 | -45.68 | -74.82 | -62.31 | 1.56 | 7.34 | H |
| | 1675 | -46.68 | -13 | -33.68 | -53.5 | -48.35 | 0.99 | 4.81 | V |
| | 2512 | -51.42 | -13 | -38.42 | -66.64 | -53.39 | 1.29 | 5.41 | V |
| | 3349 | -60.45 | -13 | -47.45 | -75.61 | -64.08 | 1.56 | 7.34 | V |
| Highest | 1702 | -46.48 | -13 | -33.48 | -55.67 | -48.06 | 1.00 | 4.73 | H |
| | 2548 | -51.91 | -13 | -38.91 | -65.55 | -53.89 | 1.31 | 5.44 | H |
| | 3397 | -58.52 | -13 | -45.52 | -74.9 | -62.34 | 1.57 | 7.55 | H |
| | 1702 | -53.58 | -13 | -40.58 | -61.11 | -55.16 | 1.00 | 4.73 | V |
| | 2548 | -49.41 | -13 | -36.41 | -64.64 | -51.39 | 1.31 | 5.44 | V |
| | 3397 | -60.40 | -13 | -47.40 | -76.11 | -64.22 | 1.57 | 7.55 | V |

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

| GSM1900 (GPRS class 8) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 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 | 3700 | -32.46 | -13 | -19.46 | -51.06 | -39.03 | 1.67 | 8.24 | H |
| | 5548 | -43.92 | -13 | -30.92 | -67.62 | -50.99 | 2.65 | 9.72 | H |
| | 7403 | -34.63 | -13 | -21.63 | -63.54 | -43.78 | 2.46 | 11.61 | H |
| | 9251 | -39.03 | -13 | -26.03 | -69.94 | -49.09 | 2.54 | 12.60 | H |
| | 3700 | -29.29 | -13 | -16.29 | -47.78 | -35.86 | 1.67 | 8.24 | V |
| | 5548 | -45.67 | -13 | -32.67 | -67.87 | -52.74 | 2.65 | 9.72 | V |
| | 7403 | -39.76 | -13 | -26.76 | -68.03 | -48.91 | 2.46 | 11.61 | V |
| | 9251 | -43.27 | -13 | -30.27 | -73.62 | -53.33 | 2.54 | 12.60 | V |
| Middle | 3763 | -39.74 | -13 | -26.74 | -58.92 | -46.37 | 1.69 | 8.32 | H |
| | 5639 | -43.74 | -13 | -30.74 | -67.49 | -50.79 | 2.71 | 9.76 | H |
| | 7522 | -43.67 | -13 | -30.67 | -73.29 | -53.06 | 2.42 | 11.81 | H |
| | 9398 | -36.57 | -13 | -23.57 | -67.91 | -46.54 | 2.57 | 12.54 | H |
| | 3763 | -35.38 | -13 | -22.38 | -53.92 | -42.01 | 1.69 | 8.32 | V |
| | 5639 | -49.03 | -13 | -36.03 | -71.32 | -56.08 | 2.71 | 9.76 | V |
| | 7522 | -43.47 | -13 | -30.47 | -71.74 | -52.86 | 2.42 | 11.81 | V |
| | 9398 | -38.98 | -13 | -25.98 | -68.13 | -48.95 | 2.57 | 12.54 | V |
| Highest | 3819 | -36.45 | -13 | -23.45 | -56.07 | -43.13 | 1.70 | 8.38 | H |
| | 5730 | -49.11 | -13 | -36.11 | -73.14 | -56.14 | 2.76 | 9.79 | H |
| | 7641 | -46.94 | -13 | -33.94 | -75.35 | -56.44 | 2.38 | 11.88 | H |
| | 9552 | -44.35 | -13 | -31.35 | -75.96 | -54.22 | 2.60 | 12.47 | H |
| | 3819 | -36.62 | -13 | -23.62 | -55.31 | -43.3 | 1.70 | 8.38 | V |
| | 5730 | -49.52 | -13 | -36.52 | -72.61 | -56.55 | 2.76 | 9.79 | V |
| | 7641 | -48.07 | -13 | -35.07 | -76 | -57.57 | 2.38 | 11.88 | V |
| | 9552 | -42.42 | -13 | -29.42 | -76.07 | -52.29 | 2.60 | 12.47 | V |

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