

# SHENZHEN JOINT TECHNOLOGY CO., LTD

## Portable GPS Tracker

Model: JT600

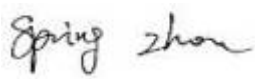
June 23, 2011

Report No.: 11020690-FCC-GSM  
(This report supersedes NONE)



Modifications made to the product : None

This Test Report is Issued Under the Authority of:

|                                                                                     |                                                                                      |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|  |  |
| Peter Cai<br>Compliance Engineer                                                    | Spring Zhou<br>Technical Director                                                    |

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All Test Data Presented in this report is only applicable to presented Test sample.

# RF Test Report

To: FCC Part 2, 22(H), 24(E)

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|----------------|------------------------|------------------------------------|
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| Canada         | IC, A2LA, NIST         | EMC, RF/Wireless , Telecom         |
| Taiwan         | BSMI , NCC , NIST      | EMC, RF, Telecom , Safety          |
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### Accreditations for Product Certifications

| Country   | Accreditation Body | Scope                 |
|-----------|--------------------|-----------------------|
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| EU        | NB, NIST           | EMC,RF,Safety,Telecom |

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## 1 Executive Summary & EUT information

The purpose of this test programmed was to demonstrate compliance of the SHENZHEN JOINT TECHNOLOGY CO., LTD Model: JT600 against the current Stipulated Standards. The Portable GPS Tracker have demonstrated compliance with the FCC 22(H):2010 , FCC 24(E):2010.

The test has demonstrated that this unit complies with stipulated standards.

### EUT Information

EUT  
Description : Portable GPS Tracker

Model No : JT600

Serial No : N/A

Input Power : 5VDC/1A

Maximum  
Conducted  
Output Power  
to Antenna : GSM850: 33.20 dBm  
GSM850(GPRS) (Class 4 ) : 32.96 dBm  
PCS1900: 30.10 dBm  
PCS1900(GPRS) (Class 1 ) : 29.80 dBm

Maximum  
Radiated  
ERP/EIRP : GSM850(Class 4 ) :1.38 W (31.4 dBm) / ERP  
PCS1900 (Class 1 ) :0.81 W (29.08 dBm) / EIRP

Classification  
Per Stipulated  
Test Standard : FCC 22(H):2010 , FCC 24(E):2010

## 2 TECHNICAL DETAILS

|                                 |                                                                                                                                                                                                      |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Purpose                         | Compliance testing of Portable GPS Tracker model JT600 with stipulated standard                                                                                                                      |
| Applicant / Client              | SHENZHEN JOINT TECHNOLOGY CO., LTD<br>RM518.404Bldg, Shangbu Industry Zone Futian District, Shenzhen, P.R.C.                                                                                         |
| Manufacturer                    | SHENZHEN JOINT TECHNOLOGY CO., LTD<br>RM518.404Bldg, Shangbu Industry Zone Futian District, Shenzhen, P.R.C.                                                                                         |
| Laboratory performing the tests | SIEMIC Nanjing (China) Laboratories<br>NO.2-1, Longcang Dadao, Yuhua Economic Development Zone,<br>Nanjing, China<br>Tel: +86(25)86730128/86730129<br>Fax: +86(25)86730127<br>Email: info@siemic.com |
| Test report reference number    | 11020690-FCC-GSM                                                                                                                                                                                     |
| Date EUT received               | June 23, 2011                                                                                                                                                                                        |
| Standard applied                | See Page 9                                                                                                                                                                                           |
| Dates of test (from – to)       | June 7, 2011                                                                                                                                                                                         |
| No of Units:                    | 1                                                                                                                                                                                                    |
| Equipment Category:             | PCE                                                                                                                                                                                                  |
| Trade Name:                     | Jointech                                                                                                                                                                                             |
| Model Name:                     | JT600                                                                                                                                                                                                |
| RF Operating Frequency (ies)    | GSM850 TX : 824 ~ 849 MHz RX : 869 ~ 894 MHz<br>PCS1900 TX : 1850 ~ 1910 MHz RX : 1930 ~ 1990 MHz                                                                                                    |
| Number of Channels:             | 300 (PCS1900) and 125 (PCS850)                                                                                                                                                                       |
| Modulation:                     | GSM / GPRS : GMSK                                                                                                                                                                                    |
| GPRS Multi-slot class           | 8/10                                                                                                                                                                                                 |
| FCC ID:                         | ZO8JT600                                                                                                                                                                                             |

### 3 MODIFICATION

NONE

## 4 TEST SUMMARY

The product was tested in accordance with the following specifications. All testing has been performed according to below product classification:

Mobile Device

### Test Results Summary

| Test Standard                                                                                     | Description                         | Pass / Fail |
|---------------------------------------------------------------------------------------------------|-------------------------------------|-------------|
| FCC 22(H):2010<br>FCC 24(E):2010                                                                  |                                     |             |
| 2.1046                                                                                            | Conducted Output Power              | Pass        |
| 22.913(a)(2)                                                                                      | Effective Radiated Power            | Pass        |
| 24.232(c)                                                                                         | Equivalent Isotropic Radiated Power | Pass        |
| 22.917(a)<br>24.238(a)                                                                            | Occupied Bandwidth                  | Pass        |
| 22.917(a)<br>24.238(a)                                                                            | Band Edge Measurement               | Pass        |
| 22.917(a)<br>24.238(a)                                                                            | Conducted Spurious Emission         | Pass        |
| 22.917(a)<br>24.238(a)                                                                            | Radiated Spurious Emission          | Pass        |
| 22.355<br>24.235                                                                                  | Frequency Stability                 | Pass        |
| N/A                                                                                               | Receiver Spurious Emissions         | Pass        |
| FCC Part 15.107(a)                                                                                | AC Power Line Conducted Emission    | Pass        |
| ANSI C63.4: 2003                                                                                  |                                     |             |
| PS: All measurement uncertainties are not taken into consideration for all presented test result. |                                     |             |

*Note : Testing was perform by configuring EUT to maximum output power status, the declared output power class for differnt*

## 5 MEASUREMENTS, EXAMINATION AND DERIVED RESULTS

### 5.1 Conducted Output Power

1. Conducted Measurement  
EUT was set for low , mid, high channel with modulated mode and highest RF output power.  
The spectrum analyzer was connected to the antenna terminal.
2. Conducted Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is  $\pm 1.5\text{dB}$ .
3. Environmental Conditions

|                      |          |
|----------------------|----------|
| Temperature          | 23°C     |
| Relative Humidity    | 50%      |
| Atmospheric Pressure | 1019mbar |
4. Test Date : June 22, 2011  
Tested By :Peter Cai

Standard Requirement: 47 CFR §2.1046

Procedures:

1. The transmitter output port was connected to base station.
2. Set EUT at maximum power through base station.
3. Select lowest, middle, and highest channels for each band and different test mode.

Test Result: Pass

## Conducted Output Power Test Result

### 5.1.1 GSM Mode

#### GSM(GMSK)

| Frequency Band | Channel No. | Frequency | Conducted Peak Power(dBm) | Conducted Average Power(dBm) |
|----------------|-------------|-----------|---------------------------|------------------------------|
| GSM850         | Low(128)    | 824.2     | 33.10                     | 33.03                        |
|                | Mid(190)    | 836.4     | 33.26                     | 33.20                        |
|                | High(251)   | 848.8     | 33.12                     | 33.03                        |
| PCS1900        | Low(512)    | 1850.2    | 29.81                     | 29.71                        |
|                | Mid(661)    | 1880.0    | 29.92                     | 29.82                        |
|                | High(810)   | 1909.8    | 30.15                     | 30.10                        |

#### GPRS (GMSK) – CS4

| Frequency Band | Channel No. | Frequency | Conducted Peak Power(dBm) | Conducted Average Power(dBm) |
|----------------|-------------|-----------|---------------------------|------------------------------|
| GSM850         | Low(128)    | 824.2     | 32.98                     | 32.96                        |
|                | Mid(190)    | 836.4     | 32.90                     | 32.88                        |
|                | High(251)   | 848.8     | 32.84                     | 32.80                        |
| PCS1900        | Low(512)    | 1850.2    | 29.61                     | 29.57                        |
|                | Mid(661)    | 1880.0    | 29.72                     | 29.62                        |
|                | High(810)   | 1909.8    | 29.85                     | 29.80                        |

## 5.2 Effective Radiated Power and Effective Isotropic Radiated Power

1. Conducted Measurement  
EUT was set for low , mid, high channel with modulated mode and highest RF output power.  
The spectrum analyzer was connected to the antenna terminal.
2. Conducted Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is  $\pm 1.5\text{dB}$ .
3. Environmental Conditions
 

|                      |          |
|----------------------|----------|
| Temperature          | 23°C     |
| Relative Humidity    | 50%      |
| Atmospheric Pressure | 1019mbar |
4. Test Date : June 22, 2011  
Tested By :Peter Cai

Standard Requirement: 47 CFR § 22.913(a)(2), §24.232(c);

Procedures:

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. Measurement was made at a distance of 3 m.
3. The measuring antenna was set to 1 meter away from the ground plain.
4. Maximization of the emissions was carried out by rotating the EUT, and adjusting the antenna azimuth.
5. The test was done in both horizontal and vertical antenna polarizations.
6. The measurement shall be made with the transmitter set to the lowest operating frequency and with the transmitter set to the highest operating frequency.

Sample Calculation: Corrected Amplitude = Raw Amplitude (dB $\mu\text{V/m}$ ) + ACF(dB) + Cable Loss(dB)

Test Result: Pass

#### Cellular Band ERP Test Result

| Test Mode / Frequency | Lower Channel<br>Calculated ERP<br>(dBm) | Middle Channel<br>Calculated ERP<br>(dBm) | High Channel<br>Calculated ERP<br>(dBm) | Limit<br>ERP (dBm) |
|-----------------------|------------------------------------------|-------------------------------------------|-----------------------------------------|--------------------|
| GSM850<br>(Class 10)  | 31.4                                     | 31.2                                      | 31.1                                    | 38.50              |

#### PCS Band EIRP Test Result

| Test Conditions       | Lower Channel<br>Calculated EIRP<br>(dBm) | Middle Channel<br>Calculated EIRP<br>(dBm) | High Channel<br>Calculated EIRP<br>(dBm) | Limit<br>EIRP (dBm) |
|-----------------------|-------------------------------------------|--------------------------------------------|------------------------------------------|---------------------|
| PCS1900<br>(Class 10) | 29.03                                     | 29.07                                      | 29.08                                    | 33.00               |

## 5.3 Occupied Bandwidth

1. Conducted Measurement  
 EUT was set for low , mid, high channel with modulated mode and highest RF output power.  
 The spectrum analyzer was connected to the antenna terminal.
2. Environmental Conditions
 

|                      |          |
|----------------------|----------|
| Temperature          | 23°C     |
| Relative Humidity    | 50%      |
| Atmospheric Pressure | 1019mbar |
3. Conducted Emissions Measurement Uncertainty  
 All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is  $\pm 1.5\text{dB}$ .
4. Test Date : June 22, 2011  
 Tested By :Peter Cai

Requirement(s): 47 CFR § 22.917(a), § 24.238(a)

### Procedures:

1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. The 99% and 26 dB occupied bandwidth (BW) of the middle channel for the highest RF powers

Results: Pass

### Cellular Band Test Result

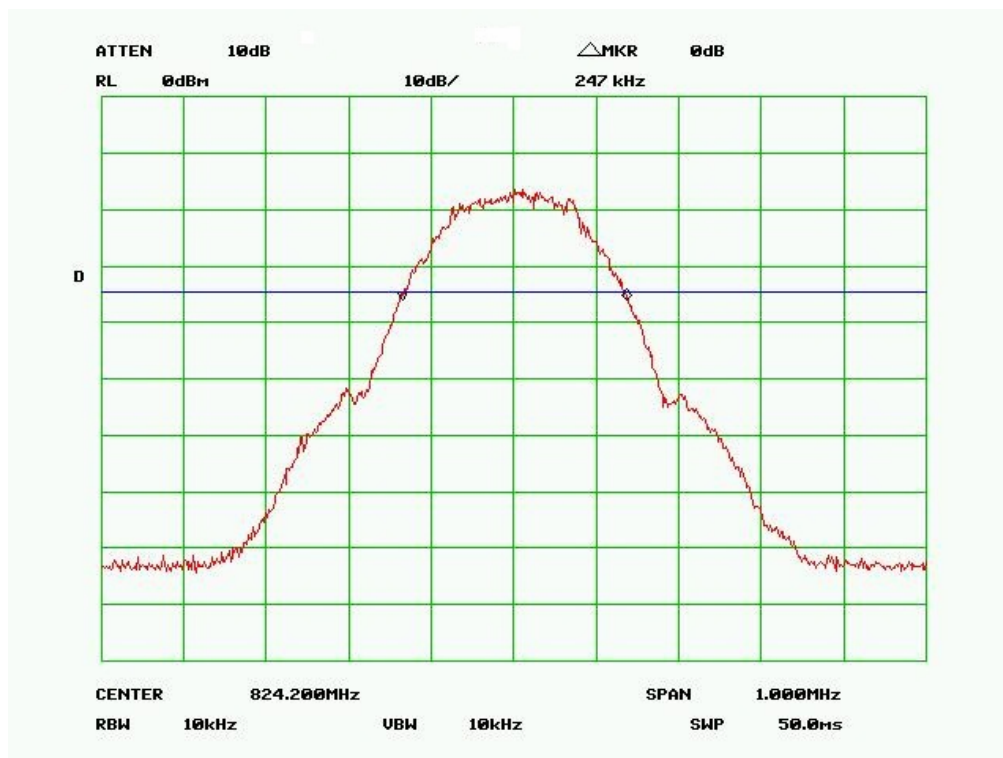
| Test Mode | Channel   | 99% Occupied Bandwidth |
|-----------|-----------|------------------------|
| GSM850    | Low(128)  | 247KHz                 |
| GSM850    | Mid(190)  | 245KHz                 |
| GSM850    | High(251) | 248KHz                 |

### PCS Band Test Result

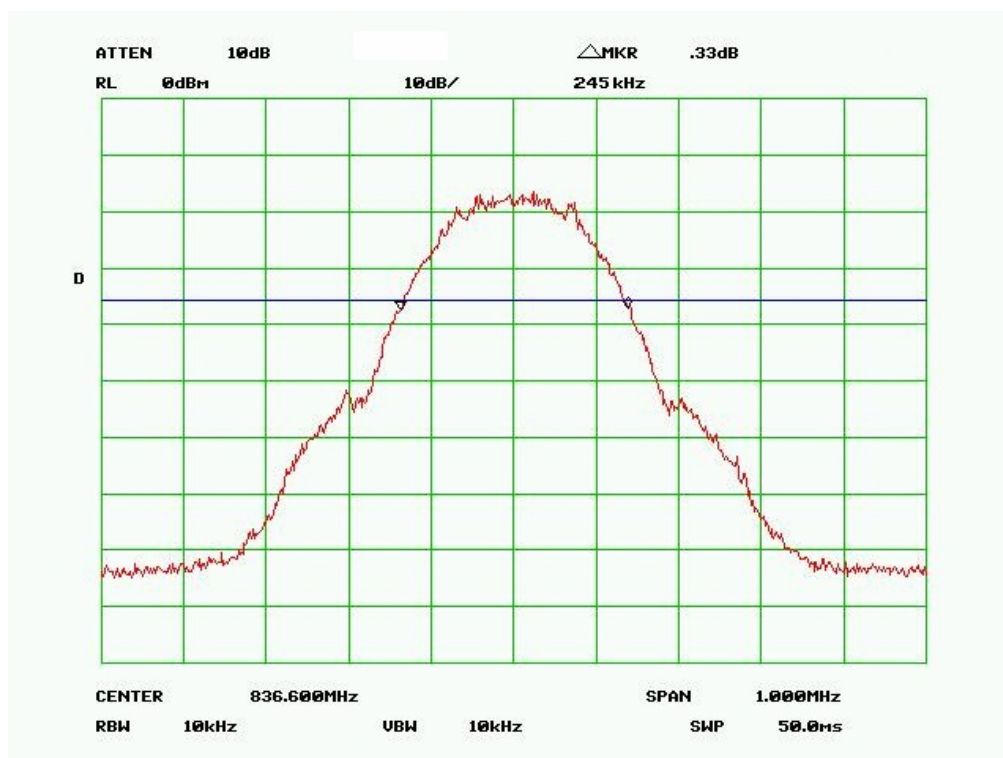
| Test Mode | Channel   | 99% Occupied Bandwidth |
|-----------|-----------|------------------------|
| PCS1900   | Low(512)  | 247KHz                 |
| PCS1900   | Mid(661)  | 248 KHz                |
| PCS1900   | High(810) | 247KHz                 |

Refer to the attached plots

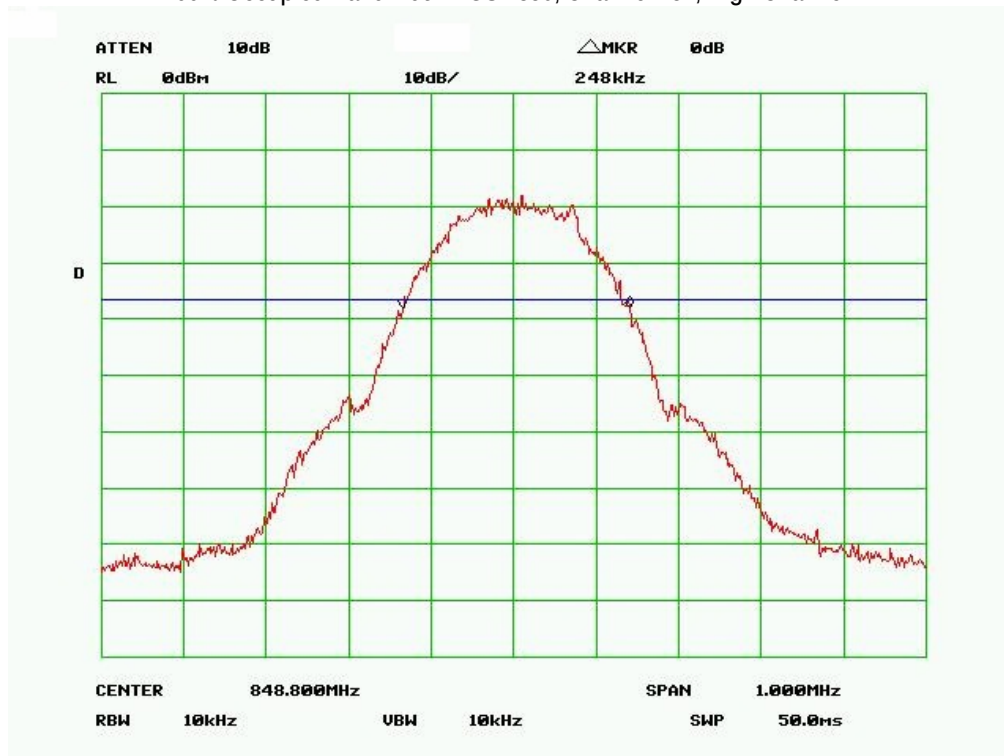
### 99% Occupied Bandwidth – GSM850, Channel 128, Low Channel



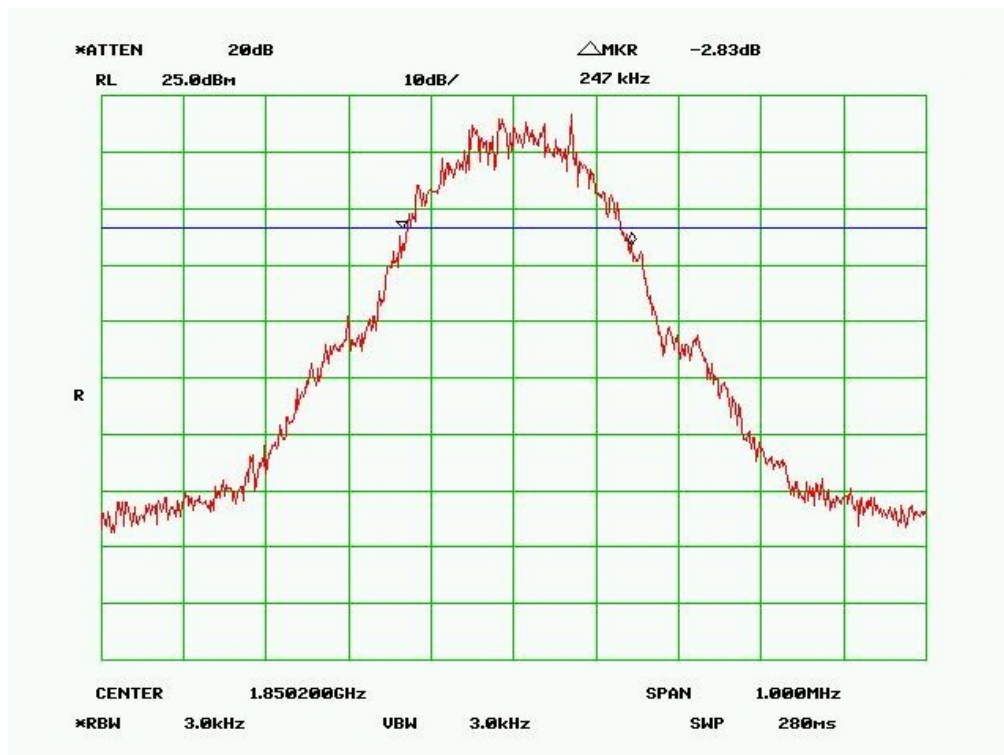
### 99% Occupied Bandwidth – GSM850, Channel 190, Mid Channel



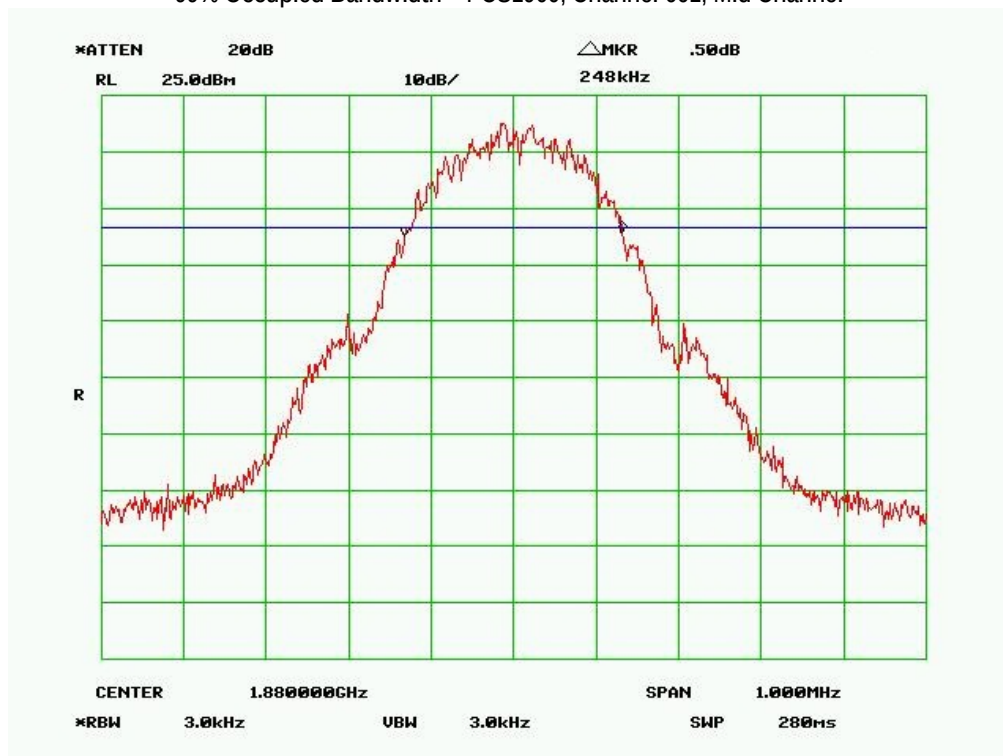
### 99% Occupied Bandwidth – GSM850, Channel 251, High Channel



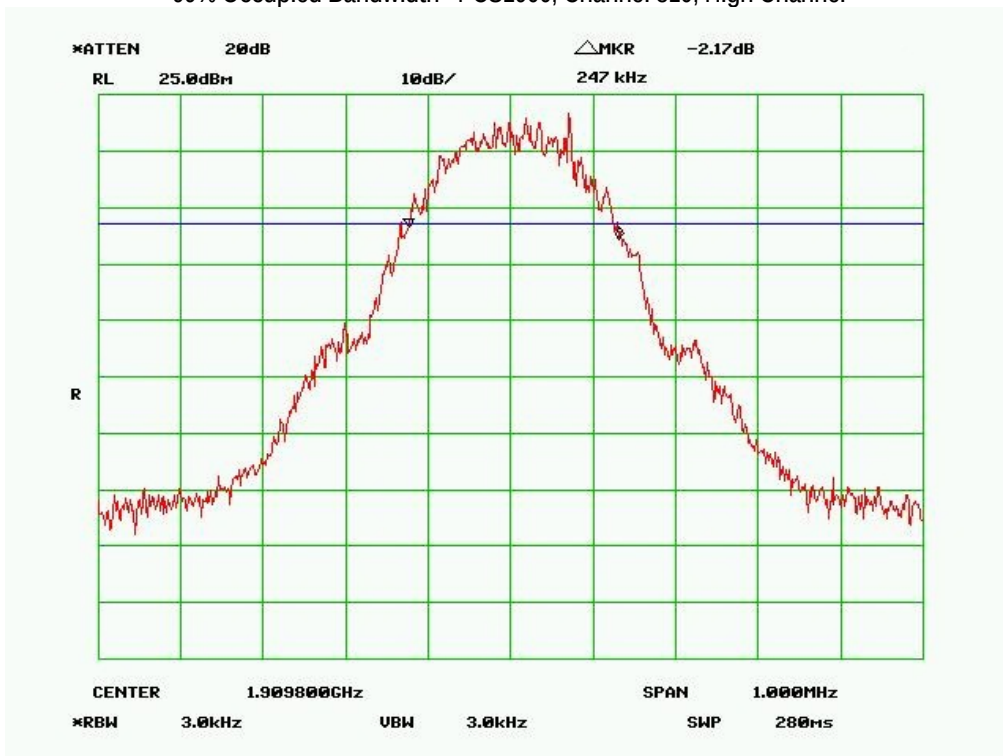
### 99% Occupied Bandwidth – PCS1900, Channel 512, Low Channel



### 99% Occupied Bandwidth – PCS1900, Channel 661, Mid Channel



### 99% Occupied Bandwidth –PCS1900, Channel 810, High Channel



## 5.4 Band Edge Test Result

1. Conducted Measurement  
EUT was set for low , mid, high channel with modulated mode and highest RF output power.  
The spectrum analyzer was connected to the antenna terminal.
2. Conducted Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is  $\pm 1.5\text{dB}$ .
3. Environmental Conditions

|                      |          |
|----------------------|----------|
| Temperature          | 23°C     |
| Relative Humidity    | 50%      |
| Atmospheric Pressure | 1019mbar |
4. Test Date : June 22, 2011  
Tested By :Peter Cai

Standard Requirement: 47 CFR § 22.917(a), § 24.238(a);

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.

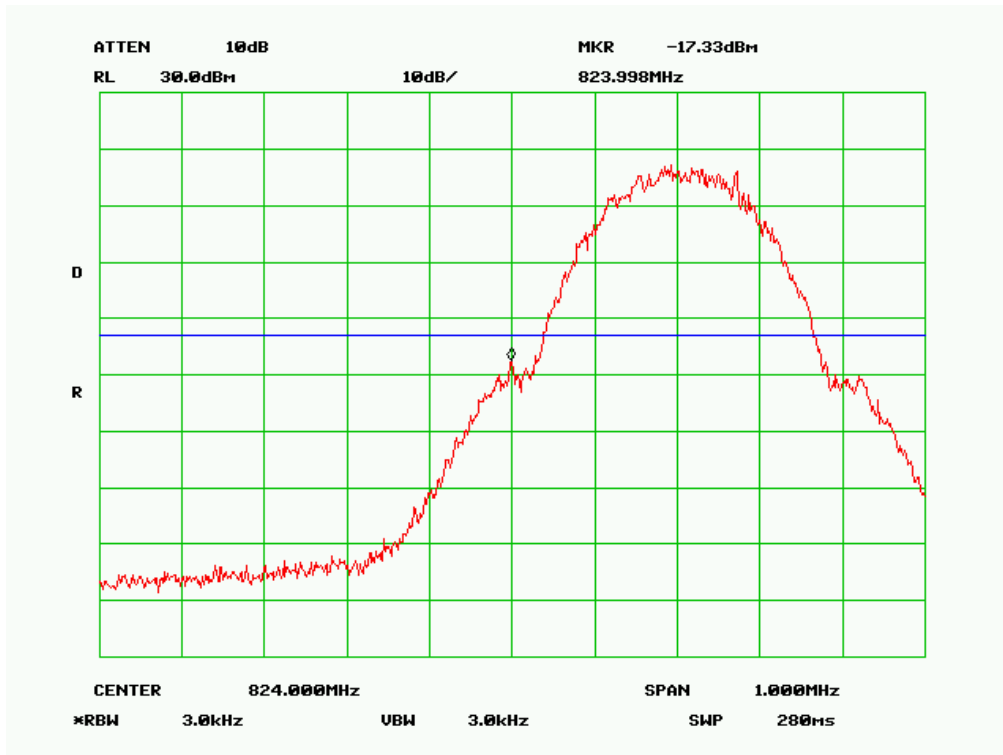
### Procedures:

1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. The Band Edges of low and high channels for the highest RF powers were measured. Setting RBW as roughly BW/100.

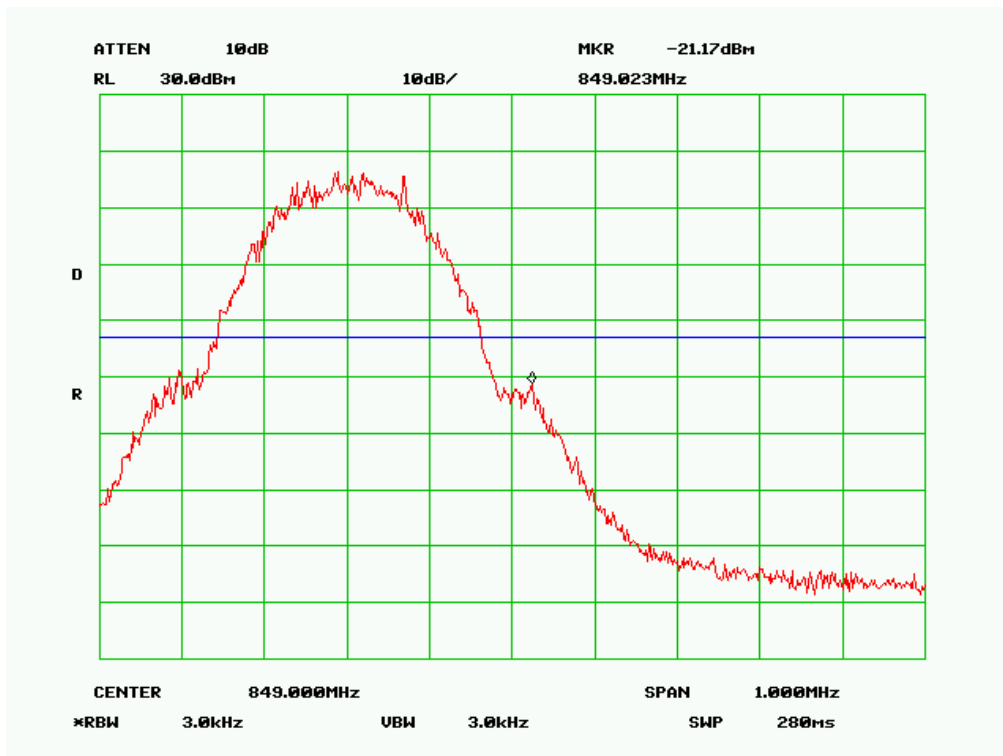
Test Result: Pass

Refer to the attached plots.

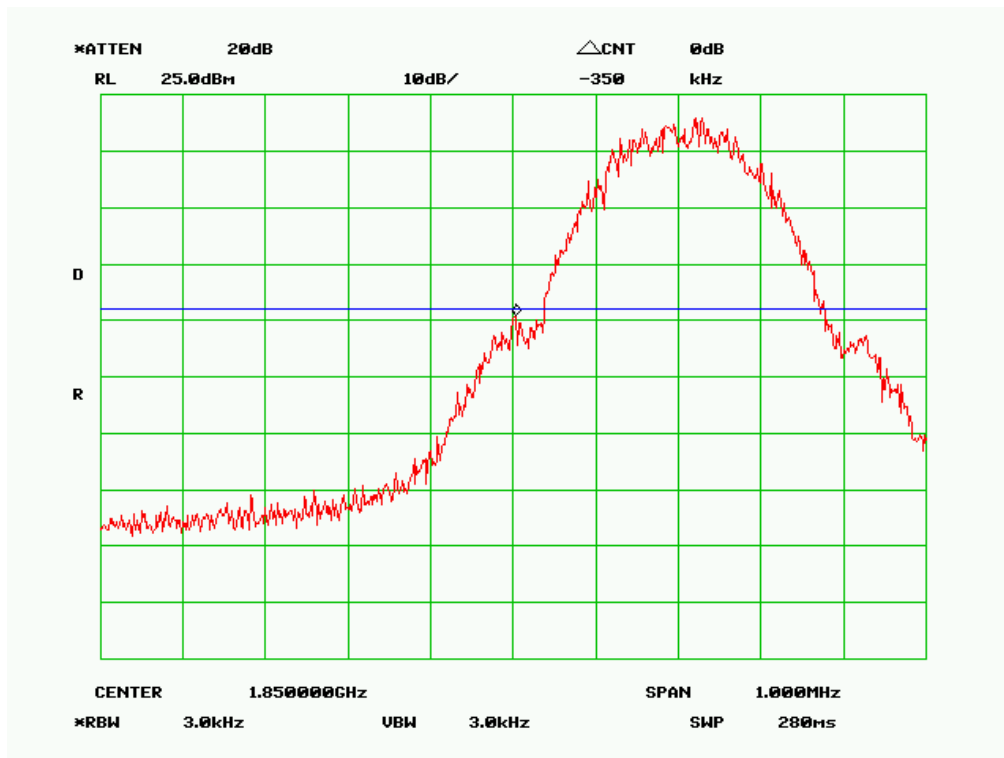
Lower Band Edge Plot – GSM850, Channel 128, Low Channel



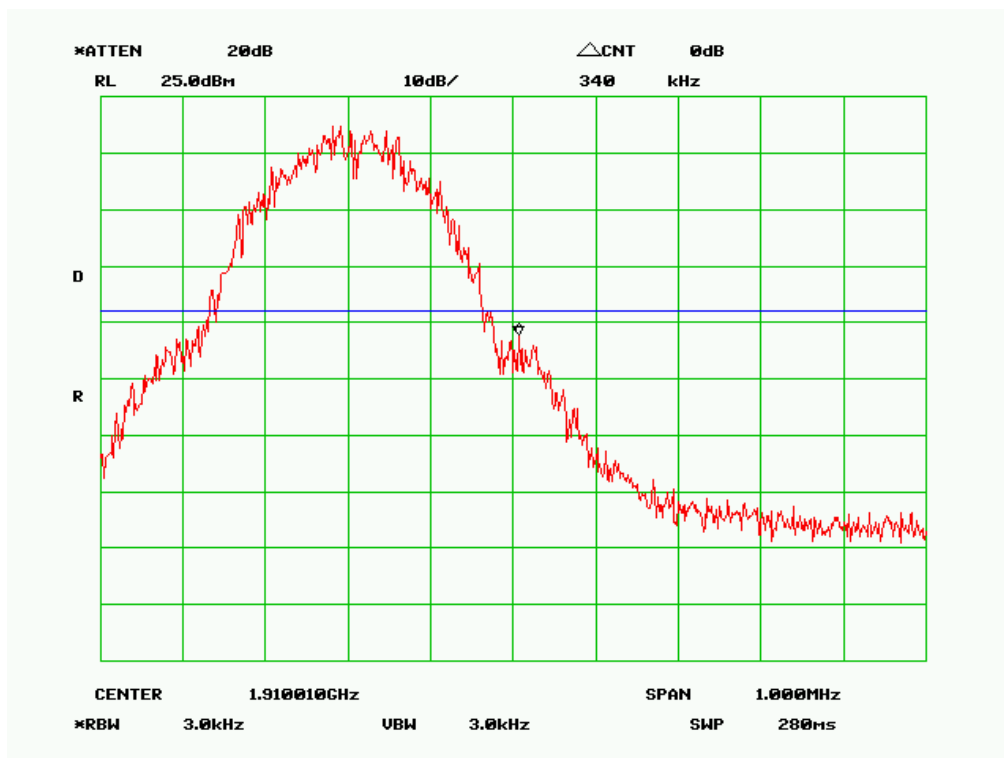
Higher Band Edge Plot – GSM850, Channel 251, High Channel



### Lower Band Edge Plot – PCS1900, Channel 512, Low Channel



### Higher Band Edge Plot – PCS1900, Channel 810, High Channel



## 5.5 Antenna Port Emission

1. Conducted Measurement  
EUT was set for low , mid, high channel with modulated mode and highest RF output power.  
The spectrum analyzer was connected to the antenna terminal.
2. Conducted Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is  $\pm 1.5\text{dB}$ .
3. Environmental Conditions

|                      |          |
|----------------------|----------|
| Temperature          | 23°C     |
| Relative Humidity    | 50%      |
| Atmospheric Pressure | 1019mbar |
4. Test Date : June 22, 2011  
Tested By :Peter Cai

Standard Requirement: 47 CFR § 22.917(a), § 24.238(a)

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 10th harmonic.

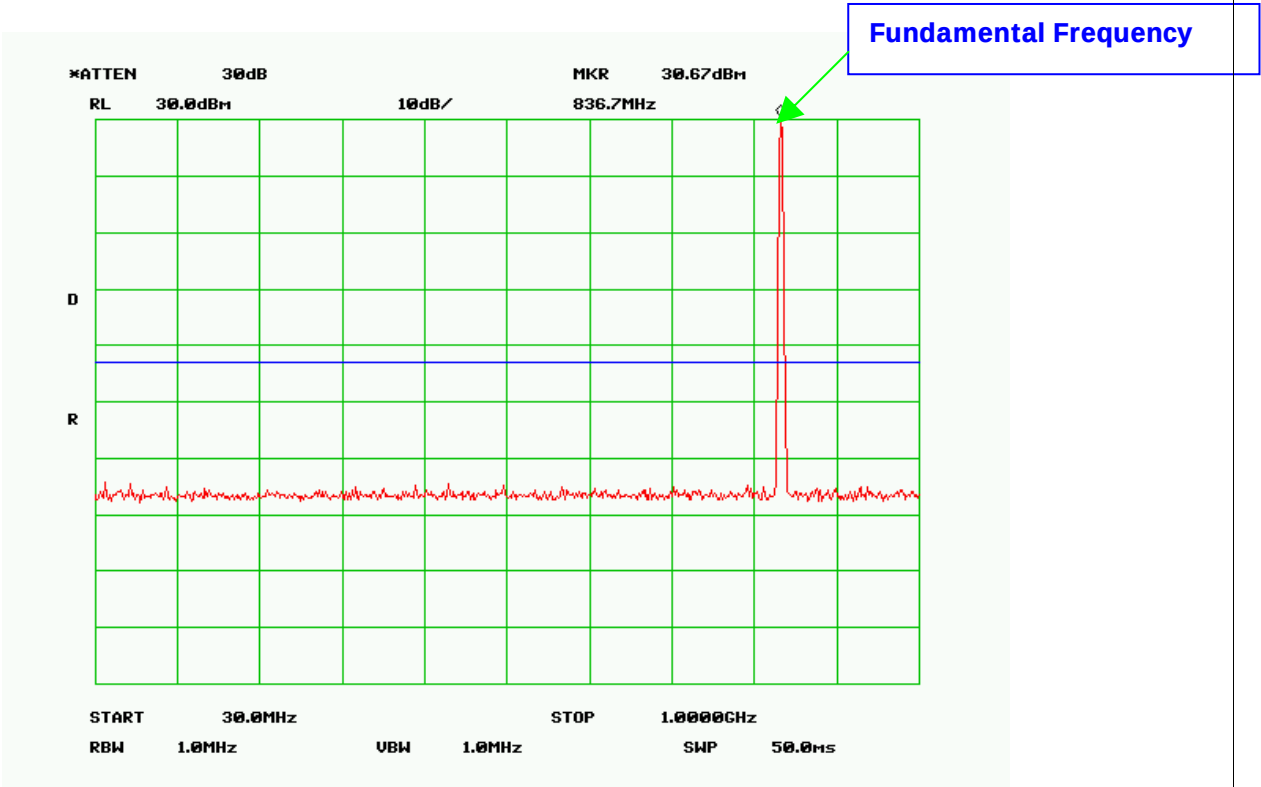
### Procedures:

1. The EUT was connected to spectrum analyzer and base station via power divider.
2. The middle channel for the highest RF power within the transmitting frequency was measured.
3. The conducted spurious emission for the whole frequency range was taken.

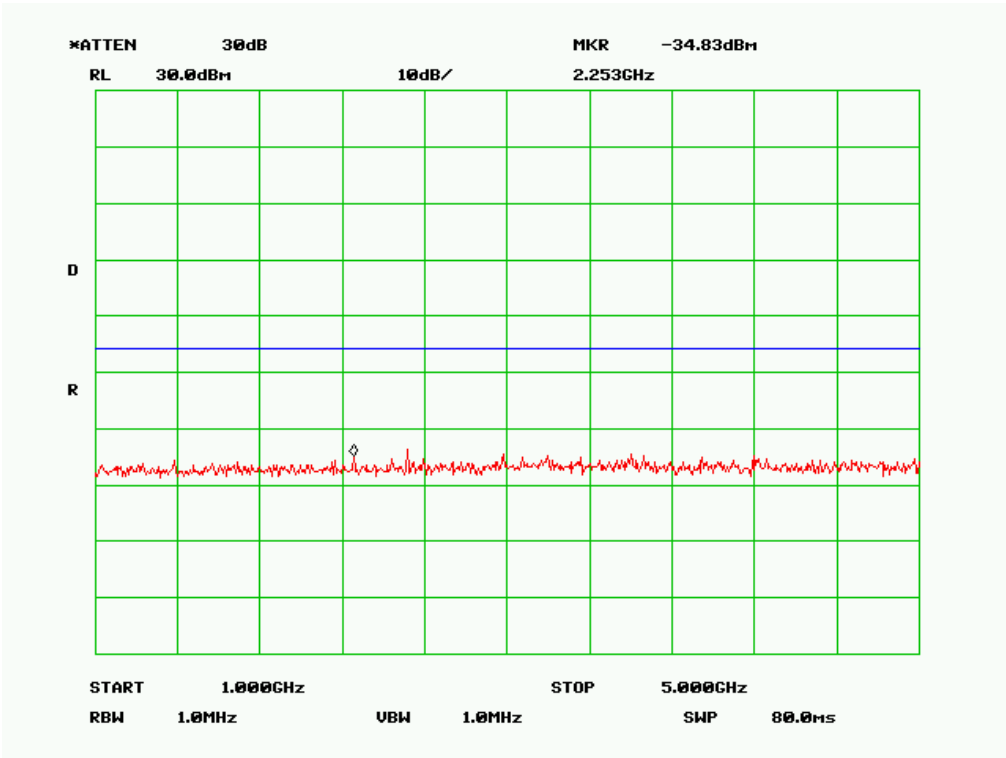
Test Result: Pass

Refer to the attached plots.

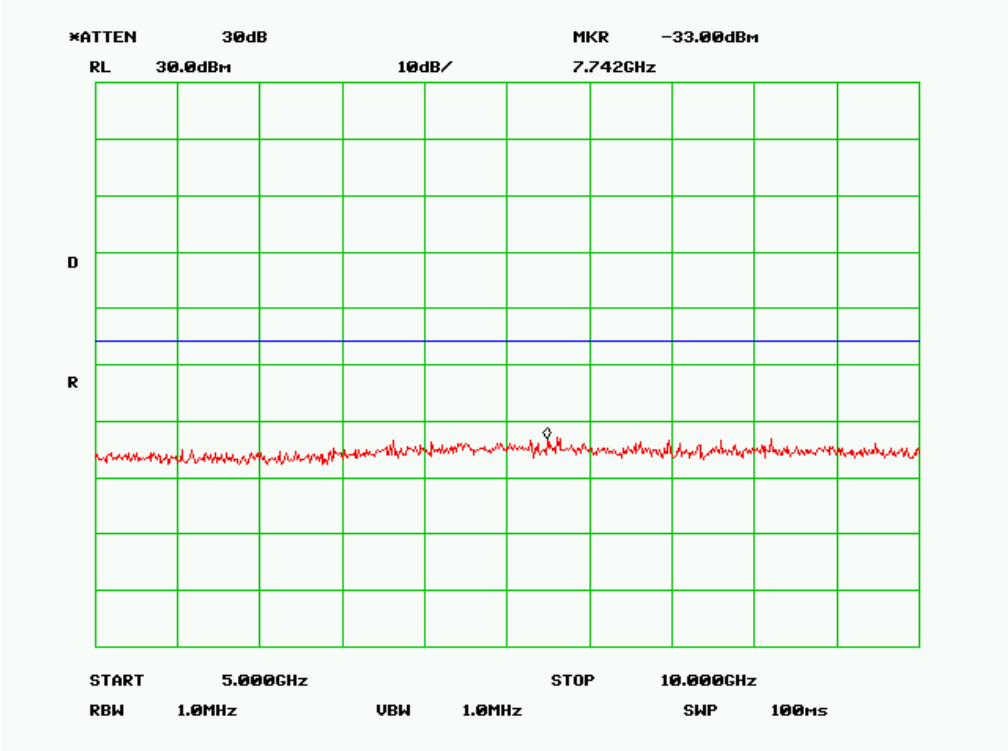
Configuration Mode: GSM850, Channel 190, Mid channel



Plot-1

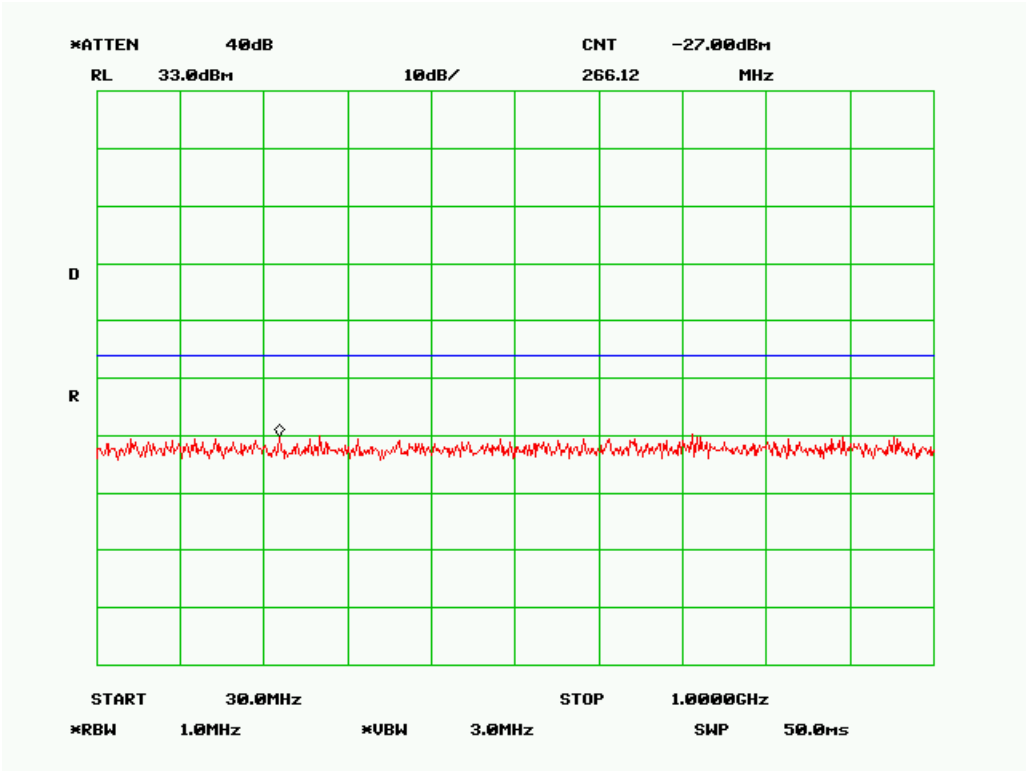


Plot-2

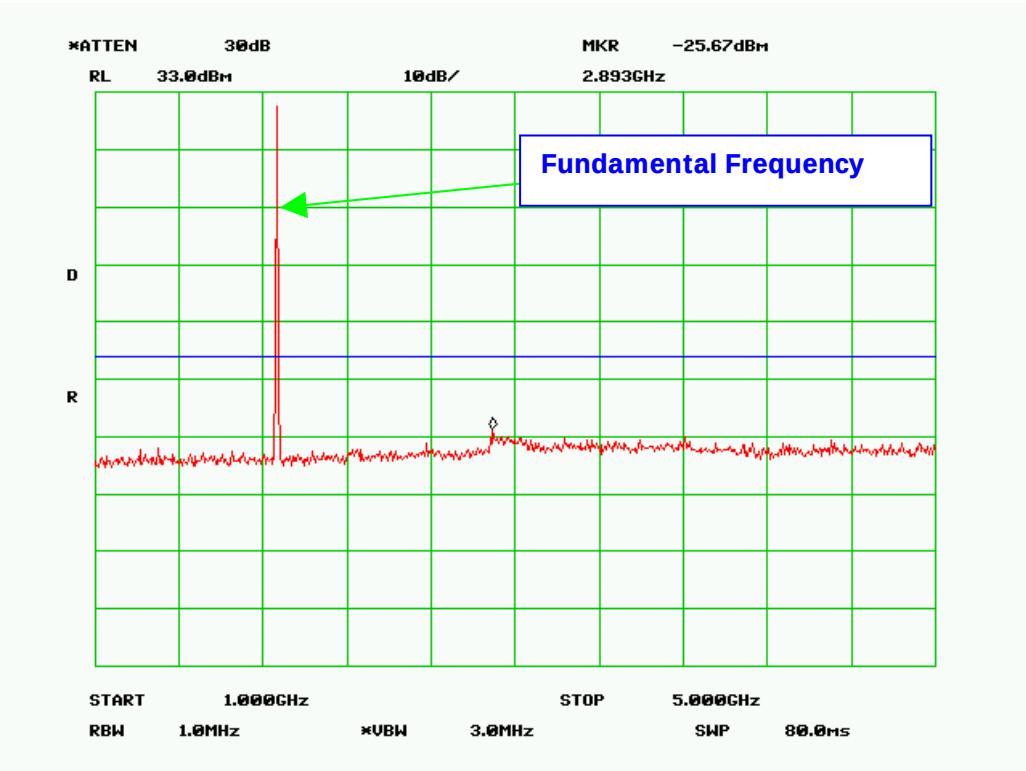


Plot-3

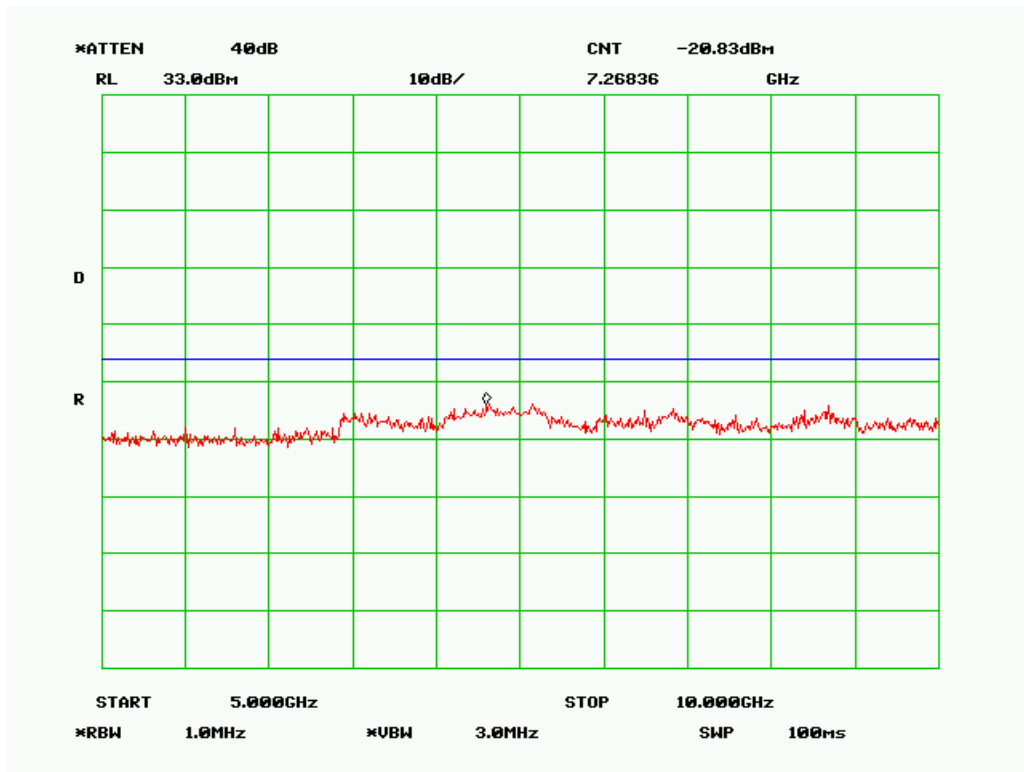
Configuration Mode: PCS 1900, Channel 661, Mid channel



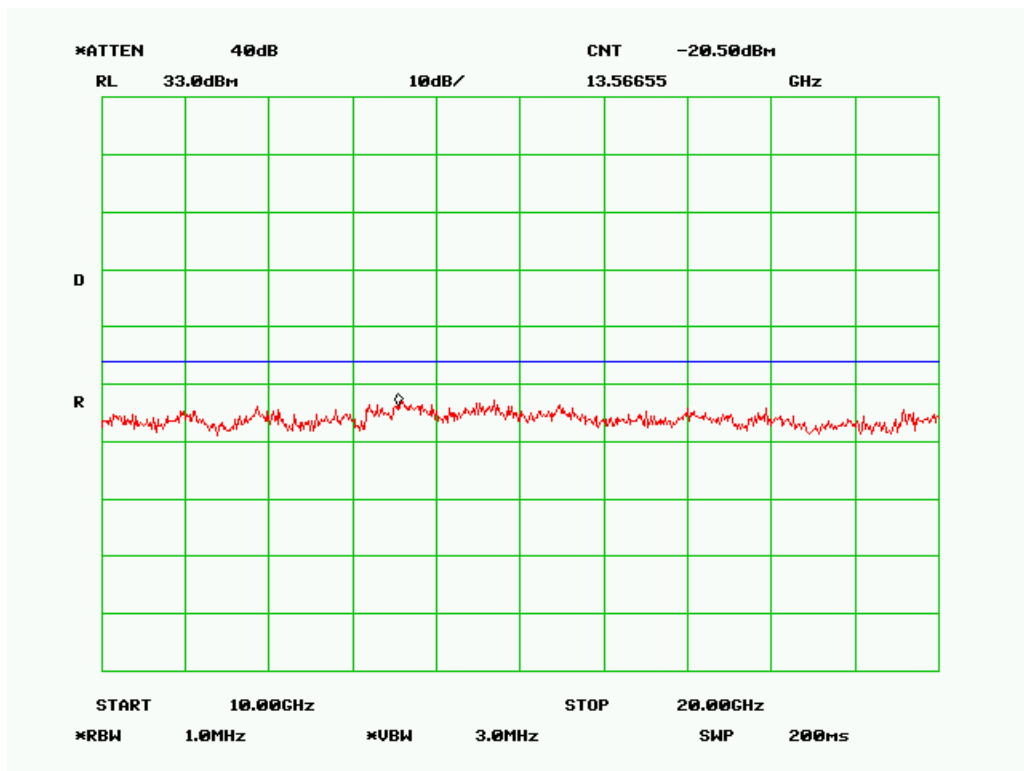
Plot-1



Plot-2



Plot-3



Plot-4

## 5.6 Radiated Spurious Emissions

- All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
- A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
- Radiated Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 1GHz – 40GHz is +6.0dB (for EUTs < 0.5m X 0.5m X 0.5m).
- |                          |                      |          |
|--------------------------|----------------------|----------|
| Environmental Conditions | Temperature          | 23°C     |
|                          | Relative Humidity    | 50%      |
|                          | Atmospheric Pressure | 1019mbar |

Test Date : June 22, 2011  
Tested By :Peter Cai

Standard Requirement: 47 CFR § 22.917(a), § 24.238(a).

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.

**Procedures:** Equipment was setup in a semi-anechoic chamber. For measurements above 1 GHz an average measurement was taken with a 10Hz video bandwidth. The EUT was tested at low, mid and high with the highest output power. An emission was scan up to 10<sup>th</sup> harmonic of the operating frequency.

**Sample Calculation:**

EUT Field Strength = Raw Amplitude (dBμV/m) – Amplifier Gain (dB) + Antenna Factor (dB) + Cable Loss (dB) + Filter Attenuation (dB, if used)

**Test Result:** Pass

**Configuration Mode: GSM850, Channel 190, Mid channel**

| Frequency (GHz) | Reading (dBm) | Direction (degree) | Height (m) | Polarity (H/V) | Antenna Loss (dB) | Cable Loss (dB) | Amplifier (dB) | Corrected Reading (dBm) | Limit (dBm) | Margin (dB) |
|-----------------|---------------|--------------------|------------|----------------|-------------------|-----------------|----------------|-------------------------|-------------|-------------|
| 1.648           | -76.62        | 131                | 1.0        | H              | 25.70             | 2.52            | 0              | -48.40                  | -13         | -35.40      |
| 6.663           | -74.06        | 119                | 1.0        | H              | 34.50             | 6.19            | 0              | -33.37                  | -13         | -20.37      |
| 7.131           | -73.89        | 215                | 1.0        | H              | 35.10             | 6.18            | 0              | -32.61                  | -13         | -19.61      |
| 8.802           | -74.93        | 157                | 1.1        | V              | 37.80             | 6.54            | 0              | -30.59                  | -13         | -17.59      |

Note: Emission was scanned up to 9GHz; no emissions were detected above the noise floor which was at least 20dB below the specification limit

**Configuration Mode: PCS1900, Channel 661, Mid channel**

| Frequency (GHz) | Reading (dBm) | Direction (degree) | Height (m) | Polarity (H/V) | Antenna Loss (dB) | Cable Loss (dB) | Amplifier (dB) | Corrected Reading (dBm) | Limit (dBm) | Margin (dB) |
|-----------------|---------------|--------------------|------------|----------------|-------------------|-----------------|----------------|-------------------------|-------------|-------------|
| 1.481           | -73.28        | 249                | 188        | H              | 24.8              | 2.64            | 0              | -45.84                  | -13         | -32.84      |
| 2.411           | -65.81        | 128                | 141        | H              | 27.5              | 2.91            | 0              | -35.4                   | -13         | -22.4       |
| 3.222           | -57.28        | 304                | 131        | H              | 30.3              | 3.59            | 0              | -23.39                  | -13         | -10.39      |
| 5.832           | -60.85        | 306                | 133        | H              | 33.4              | 5.27            | 0              | -22.18                  | -13         | -9.18       |

Note: Emission was scanned up to 20GHz; no emissions were detected above the noise floor which was at least 20dB below the specification limit

## 5.7 Frequency Stability

Requirement(s): 47 CFR §22.355, §22.235

Procedures: A communication link was established between EUT and base station. The frequency error was monitored and measured by base station under variation of ambient temperature and variation of primary supply voltage..

Limit: The frequency stability of the transmitter shall be maintained within  $\pm 0.00025\%$  ( $\pm 2.5\text{ppm}$ ) of the center frequency.

|                          |                      |            |
|--------------------------|----------------------|------------|
| Environmental Conditions | Temperature          | -10 ~ 50°C |
|                          | Relative Humidity    | 50%        |
|                          | Atmospheric Pressure | 1019mbar   |

Test Date : June 22, 2011

Tested By : Peter Cai

Results: Pass

**Frequency Stability versus Temperature:** The Frequency tolerance of the carrier signal shall be maintained within  $\pm 0.00025\%$  of the operating frequency over a temperature variation of  $-10^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  at normal supply voltage.

**Test Result for GSM850, Channel 190 (mid channel)**

| Temperature<br>( $^{\circ}\text{C}$ ) | Freq. Drift<br>(Hz) | Freq. Deviation<br>(Limit: ppm) | Pass/Fail |
|---------------------------------------|---------------------|---------------------------------|-----------|
| 50                                    | -43                 | <2.5                            | Pass      |
| 40                                    | -34                 | <2.5                            | Pass      |
| 30                                    | -15                 | <2.5                            | Pass      |
| 20                                    | 10                  | <2.5                            | Pass      |
| 10                                    | 13                  | <2.5                            | Pass      |
| 0                                     | 2                   | <2.5                            | Pass      |
| -10                                   | 19                  | <2.5                            | Pass      |
| -20                                   | 36                  | <2.5                            | Pass      |
| -25                                   | 74                  | <2.5                            | Pass      |

Note : Manufacturer declares that operating temperature range of EUT is  $-25 \sim +50^{\circ}\text{C}$ .

**Frequency Stability versus Input Voltage:** The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.00025\%$  of the operating frequency, the frequency of the transmitter was measured at 85% and at 115% of the rated power supply voltage at  $20^{\circ}\text{C}$  environmental temperature.

| Measured Voltage<br>$\pm 15\%$ of nominal<br>(DC) | Freq. Drift<br>(Hz) | Freq. Deviation<br>(Limit: 0.01%) | Pass/Fail |
|---------------------------------------------------|---------------------|-----------------------------------|-----------|
| 5.75                                              | -20                 | <2.5                              | Pass      |
| 5.0                                               | -5                  | <2.5                              | Pass      |
| 4.25                                              | 15                  | <2.5                              | Pass      |

**Frequency Stability versus Temperature:** The Frequency tolerance of the carrier signal shall be maintained within  $\pm 0.00025\%$  of the operating frequency over a temperature variation of  $-10^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  at normal supply voltage.

**Test Result for PCS1900, Channel 661 (mid channel)**

| Temperature<br>( $^{\circ}\text{C}$ ) | Freq. Drift<br>(Hz) | Freq. Deviation<br>(Limit: ppm) | Pass/Fail |
|---------------------------------------|---------------------|---------------------------------|-----------|
| 50                                    | 67                  | <2.5                            | Pass      |
| 40                                    | 53                  | <2.5                            | Pass      |
| 30                                    | 14                  | <2.5                            | Pass      |
| 20                                    | 8                   | <2.5                            | Pass      |
| 10                                    | 13                  | <2.5                            | Pass      |
| 0                                     | 2                   | <2.5                            | Pass      |
| -10                                   | 16                  | <2.5                            | Pass      |
| -20                                   | 37                  | <2.5                            | Pass      |
| -25                                   | 70                  | <2.5                            | Pass      |

Note : Manufacturer declares that operating temperature range of EUT is  $-25 \sim +50^{\circ}\text{C}$ .

**Frequency Stability versus Input Voltage:** The Frequency tolerance of the carrier signal shall be maintained within  $\pm 0.00025\%$  of the operating frequency, the frequency of the transmitter was measured at 85% and at 115% of the rated power supply voltage at  $20^{\circ}\text{C}$  environmental temperature.

| Measured Voltage<br>$\pm 15\%$ of nominal<br>(DC) | Freq. Drift<br>(Hz) | Freq. Deviation<br>(Limit: 0.01%) | Pass/Fail |
|---------------------------------------------------|---------------------|-----------------------------------|-----------|
| 5.75                                              | 11                  | <2.5                              | Pass      |
| 5.0                                               | 5                   | <2.5                              | Pass      |
| 4.25                                              | 27                  | <2.5                              | Pass      |

## 5.8 Receiver Spurious Emissions

- Conducted Measurement  
EUT was set for low , mid, high channel with modulated mode and highest RF output power.  
The spectrum analyzer was connected to the antenna terminal.
- Conducted Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is  $\pm 1.5\text{dB}$ .
- Environmental Conditions

|                      |          |
|----------------------|----------|
| Temperature          | 23°C     |
| Relative Humidity    | 50%      |
| Atmospheric Pressure | 1019mbar |
- Test Date : June 22, 2011  
Tested By :Peter Cai

Standard Requirement: N/A

Procedures: The conducted spurious emissions were measured conducted using a spectrum analyzer at mid channels. the search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is the higher, to at least 3 times the highest tuneable or local oscillator frequency, whichever is the higher, without exceeding 40 GHz. Receiver spurious emissions at any discrete frequency shall not exceed 2 nanowatts in the band 30-1000 MHz, or 5 nanowatts above 1 GHz..

Test Result: Pass

Note: All test modes were verified, there's no outstanding emission was detected.

## 5.9 AC Power Line Conducted Emission

### Note:

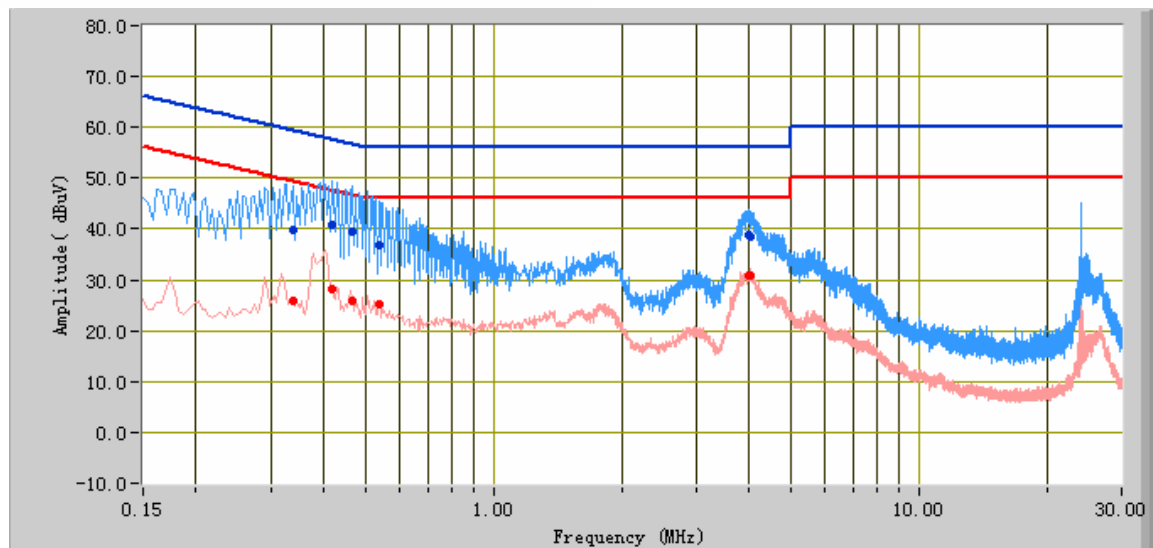
1. All possible modes of operation were investigated. Only the several worst case emissions measured, using the correct CISPR and Average detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Conducted Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 9kHz – 30MHz (Average & Quasi-peak) is  $\pm 3.86\text{dB}$ .
4. Environmental Conditions

|                      |         |
|----------------------|---------|
| Temperature          | 20°C    |
| Relative Humidity    | 65%     |
| Atmospheric Pressure | 995mbar |
5. Test Date : June 22, 2011  
Tested By : Peter Cai

Test Result: Pass  
See next page

|                   |                    |
|-------------------|--------------------|
| <b>Test Mode:</b> | <b>Power- Line</b> |
|-------------------|--------------------|

**Peak Detector**       **Quasi Peak Limit**        
**Average Detector**       **Average Limit**      



**Phase Line Plot at 120Vac, 60Hz**

| Frequency (MHz) | Quasi Peak (dBuV) | Limit (dBuV) | Margin (dB) | Average (dBuV) | Limit (dBuV) | Margin (dB) | Factors (dB) |
|-----------------|-------------------|--------------|-------------|----------------|--------------|-------------|--------------|
| 0.42            | 40.86             | 57.51        | -16.65      | 28.11          | 47.51        | -19.41      | 10.17        |
| 0.47            | 39.41             | 56.59        | -17.18      | 25.72          | 46.59        | -20.87      | 10.17        |
| 0.54            | 36.80             | 56.00        | -19.20      | 25.18          | 46.00        | -20.82      | 10.16        |
| 0.34            | 39.96             | 59.31        | -19.35      | 25.81          | 49.31        | -23.50      | 10.18        |
| 3.97            | 38.71             | 56.00        | -17.29      | 30.88          | 46.00        | -15.12      | 10.50        |
| 4.02            | 38.59             | 56.00        | -17.41      | 30.91          | 46.00        | -15.09      | 10.51        |

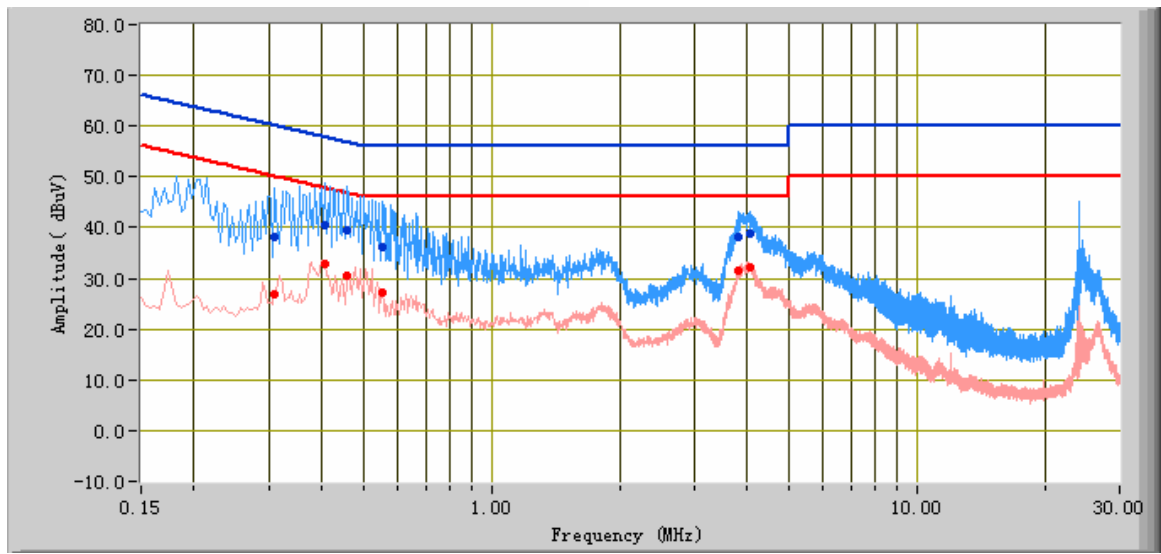
|                   |                        |
|-------------------|------------------------|
| <b>Test Mode:</b> | <b>Power-- Neutral</b> |
|-------------------|------------------------|

**Peak Detector**

**Average Detector**

**Quasi Peak Limit**

**Average Limit**



**Phase Neutral Plot at 120Vac, 60Hz**

| Frequency (MHz) | Quasi Peak (dBuV) | Limit (dBuV) | Margin (dB) | Average (dBuV) | Limit (dBuV) | Margin (dB) | Factors (dB) |
|-----------------|-------------------|--------------|-------------|----------------|--------------|-------------|--------------|
| 0.46            | 39.36             | 56.74        | -17.37      | 30.55          | 46.74        | -16.19      | 10.17        |
| 0.41            | 40.54             | 57.76        | -17.22      | 32.84          | 47.76        | -14.92      | 10.17        |
| 0.55            | 36.12             | 56.00        | -19.88      | 27.14          | 46.00        | -18.86      | 10.16        |
| 0.31            | 38.24             | 60.04        | -21.80      | 26.70          | 50.04        | -23.34      | 10.19        |
| 4.06            | 38.70             | 56.00        | -17.30      | 32.13          | 46.00        | -13.87      | 10.50        |
| 3.82            | 38.11             | 56.00        | -17.89      | 31.38          | 46.00        | -14.62      | 10.46        |

## Annex A. TEST INSTRUMENT & METHOD

### Annex A.i. TEST INSTRUMENTATION & GENERAL PROCEDURES

| Instrument                           | Model                  | Calibration Due  |
|--------------------------------------|------------------------|------------------|
| <b>AC Conducted Emissions</b>        |                        |                  |
| R&S EMI Test Receiver                | ESPI3                  | 05/25/2012       |
| R&S LISN                             | LI-115                 | 05/25/2012       |
| R&S LISN                             | LI-115                 | 05/25/2012       |
| Universal Radio Communication Tester | CMU200                 | 02/22/2012       |
| <b>Radiated Emissions</b>            |                        |                  |
| Spectrum Analyzer                    | 8563E                  | 01/10/2012       |
| EMI Receiver                         | ESPI3                  | 05/18/2012       |
| Antenna(1 ~18GHz)                    | 3115                   | 6/2/2012         |
| Antenna (30MHz~2GHz)                 | JB1                    | 05/25/2012       |
| Chamber                              | 3m                     | 4/13/2012        |
| Pre-Amplifier(1 ~ 18GHz)             | AMF-7D-00101800-30-10P | 5/25/2012        |
| Horn Antenna (18~40GHz)              | AH-840                 | 7/23/2013        |
| Microwave Pre-Amp (18~40GHz)         | PA-840                 | Every 2000 Hours |
| Universal Radio Communication Tester | CMU200                 | 02/22/2012       |
| Signal Analyzer                      | 8665B                  | 1/21/2012        |
| Temperature/Humidity Chamber         | 1007H                  | 06/08/2012       |

Note: Functional Verification

## Annex A.ii. CONDUCTED EMISSIONS TEST DESCRIPTION

### Limit

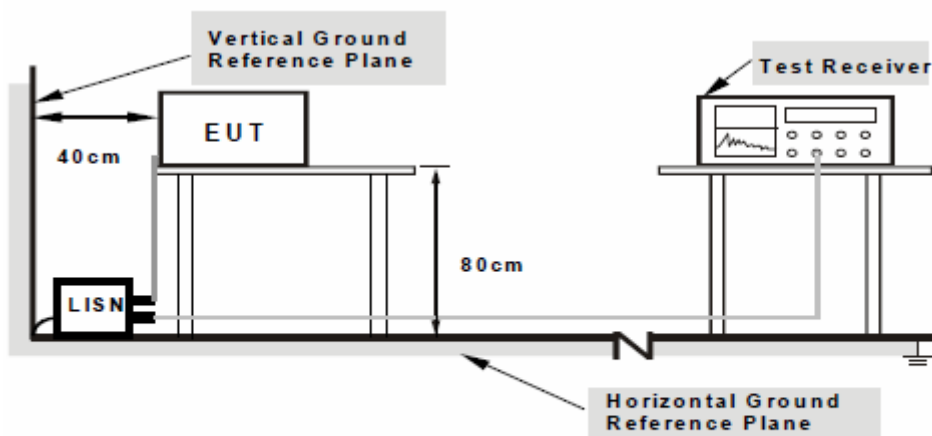
For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

| Frequency Range (MHz) | Limits (dB $\mu$ V) |          |
|-----------------------|---------------------|----------|
|                       | Quasi-peak          | Average  |
| 0.15 to 0.50          | 66 to 56            | 56 to 46 |
| 0.50 to 5             | 56                  | 46       |
| 5 to 30               | 60                  | 50       |

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

### Test Set-up

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table, as shown in Photographs of the Test Configuration1.
2. The power supply for the EUT was fed through a 50 $\Omega$ /50 $\mu$ H EUT LISN, connected to filtered mains.
3. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.
4. All other supporting equipments were powered separately from another main supply.



**Note: 1.** Support units were connected to second LISN.  
**2.** Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration1.

### Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. A scan was made on the NEUTRAL line (for AC mains) or Earth line (for DC power) over the required frequency range using an EMI test receiver.
3. High peaks, relative to the limit line, were then selected.
4. The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10 KHz. For FCC tests, only Quasi-peak measurements were made; while for CISPR/EN tests, both Quasi-peak and Average measurements were made.
5. Steps 2 to 4 were then repeated for the LIVE line (for AC mains) or DC line (for DC power).

### **Description of Conducted Emission Program**

This EMC Measurement software run LabView automation software and offers a common user interface for electromagnetic interference (EMI) measurements. This software is a modern and powerful tool for controlling and monitoring EMI test receivers and EMC test systems. It guarantees reliable collection, evaluation, and documentation of measurement results. Basically, this program will run a pre-scan measurement before it proceeds with the final measurement. The pre-scan routine will run the common scan range from 150 kHz to 30 MHz; the program will first start a peak and average scan on selectable measurement time and step size. After the program complete the pre-scan, this program will perform the Quasi Peak and Average measurement, based on the pre-scan peak data reduction result.

### **Sample Calculation Example**

|                                                                                                      |                                        |
|------------------------------------------------------------------------------------------------------|----------------------------------------|
| At 20 MHz                                                                                            | limit = 250 $\mu$ V = 47.96 dB $\mu$ V |
| Transducer factor of LISN, pulse limiter & cable loss at 20 MHz = 11.20 dB                           |                                        |
| Q-P reading obtained directly from EMI Receiver = 40.00 dB $\mu$ V<br>(Calibrated for system losses) |                                        |
| Therefore, Q-P margin = 47.96 – 40.00 = 7.96                                                         | i.e. 7.96 dB below limit               |

## Annex A. iii RADIATED EMISSIONS TEST DESCRIPTION

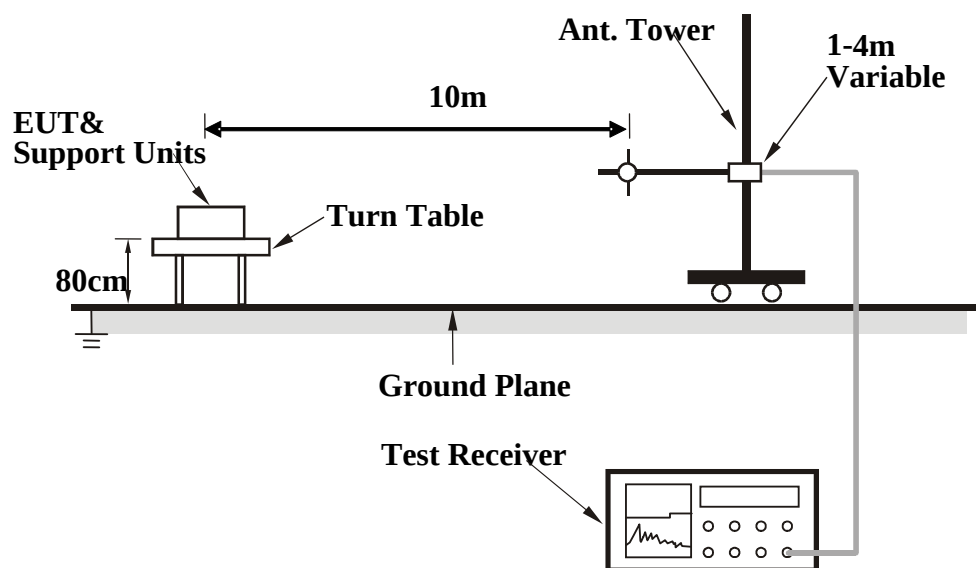
### EUT Characterisation

EUT characterisation, over the frequency range from 30MHz to 1GHz (for FCC tests, until the 10<sup>th</sup> harmonic for operating frequencies  $\geq$  108MHz), was done in order to minimise radiated emissions testing time while still maintaining high confidence in the test results.

The EUT was placed in the chamber, at a height of about 0.8m on a turntable. Its radiated emissions frequency profile was observed, using a spectrum analyzer /receiver with the appropriate broadband antenna placed 3m or 10m away from the EUT. Radiated emissions from the EUT were maximised by rotating the turntable manually, changing the antenna polarisation and manipulating the EUT cables while observing the frequency profile on the spectrum analyzer / receiver. Frequency points at which maximum emissions occurred, clock frequencies and operating frequencies were then noted for the formal radiated emissions test at the Open Area Test Site (OATS) or EMC 10m chamber.

### Test Set-up

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m X 1.0m X 0.8m high, non-metallic table.
2. The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable.
3. The relevant broadband antenna was set at the required test distance away from the EUT and supporting equipment boundary.



## Test Method

The following procedure was performed to determine the maximum emission axis of EUT:

1. With the receiving antenna is H polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
2. With the receiving antenna is V polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
3. Compare the results derived from above two steps. So, the axis of maximum emission from EUT was determined and the configuration was used to perform the final measurement.

### Final Radiated Emission Measurement

1. Setup the configuration according to figure 1. Turn on EUT and make sure that it is in normal function.
2. For emission frequencies measured below 1 GHz, a pre-scan is performed in a shielded chamber to determine the accurate frequencies of higher emissions will be checked on a open test site or EMC 10m chamber. As the same purpose, for emission frequencies measured above 1 GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.
3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 100 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.
4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0 ° to 360 ° with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading.
5. Repeat step 4 until all frequencies need to be measured were complete.
6. Repeat step 5 with search antenna in vertical polarized orientations.

During the radiated emission test, the Spectrum Analyzer was set with the following configurations:

| Frequency Band (MHz) | Function | Resolution bandwidth | Video Bandwidth |
|----------------------|----------|----------------------|-----------------|
| 30 to 1000           | Peak     | 100 kHz              | 100 kHz         |
| Above 1000           | Peak     | 1 MHz                | 1 MHz           |
|                      | Average  | 1 MHz                | 10 Hz           |

## Description of Radiated Emission Program

This EMC Measurement software run LabView automation software and offers a common user interface for electromagnetic interference (EMI) measurements. This software is a modern and powerful tool for controlling and monitoring EMI test receivers and EMC test systems. It guarantees reliable collection, evaluation, and documentation of measurement results. Basically, this program will run a pre-scan measurement before it proceeds with the final measurement. The pre-scan routine will run the scan on four different antenna heights, 2 antenna polarity, and 360 degrees table rotation. For example, the program was set to run 30 MHz to 1 GHz scan; the program will first start from a meter antenna height and divide the 30 MHz to 1 GHz into 10 separate parts of maximum hold sweeps. Each parts of maximum hold sweep, the program will collect the data from 0 degree to 360 degrees table rotation. After the program complete the 1m scan, the antenna continues to rise to 2m and continue the scan. The step will repeated for all specified antenna height and polarity. This program will perform the Quasi Peak measurement after the signal maximization process and pre-scan routine. The final measurement will be base on the pre-scan data reduction result.

## Sample Calculation Example

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. For the limit is employed average value, therefore the peak value can be transferred to average value by subtracting the duty factor. The basic equation with a sample calculation is as follows:

$$\text{Peak} = \text{Reading} + \text{Corrected Factor}$$

where

Corr. Factor = Antenna Factor + Cable Factor - Amplifier Gain (if any)

And the average value is

$$\text{Average} = \text{Peak Value} + \text{Duty Factor or}$$

$$\text{Set RBW} = 1\text{MHz}, \text{VBW} = 10\text{Hz}.$$

Note :

If the measured frequencies are fall in the restricted frequency band, the limit employed must be quasi peak value when frequencies are below or equal to 1 GHz. And the measuring instrument is set to quasi peak detector function.

## Annex B EUT AND TEST SETUP PHOTOGRAPHS

Please see the attachment

## Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

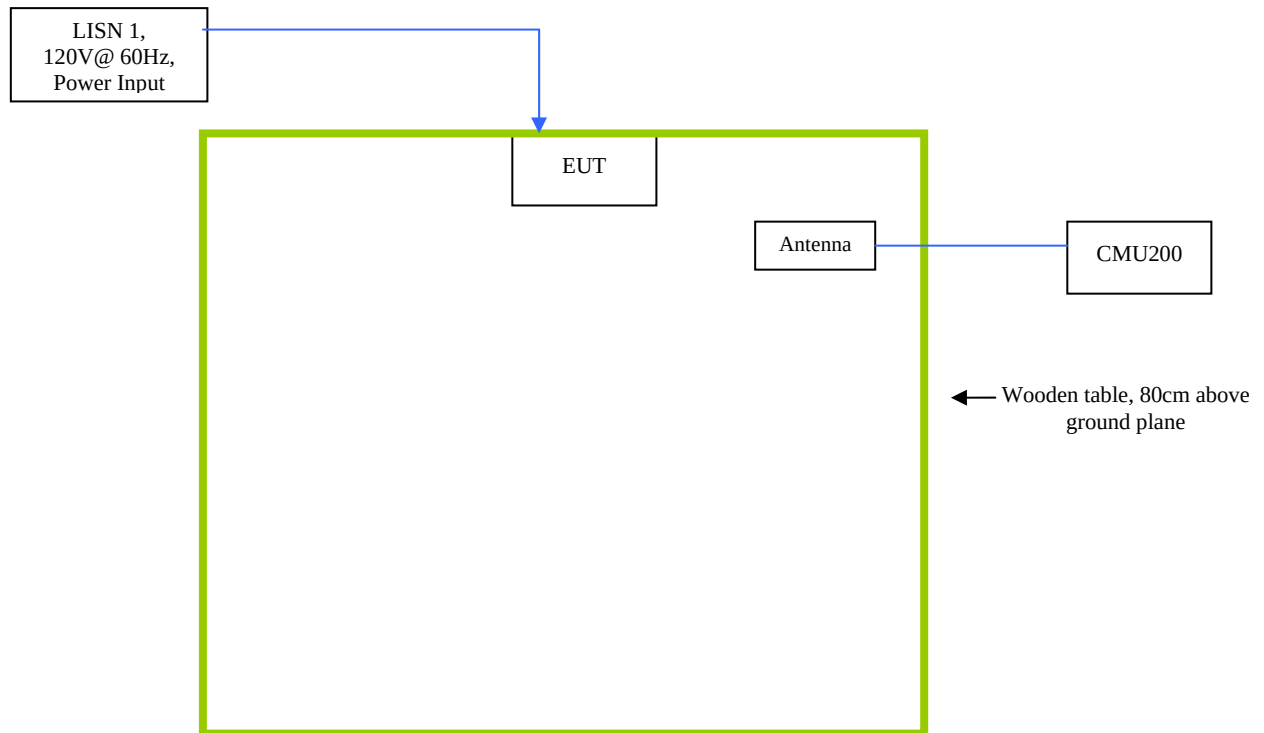
### EUT TEST CONDITIONS

#### Annex C. i. SUPPORTING EQUIPMENT DESCRIPTION

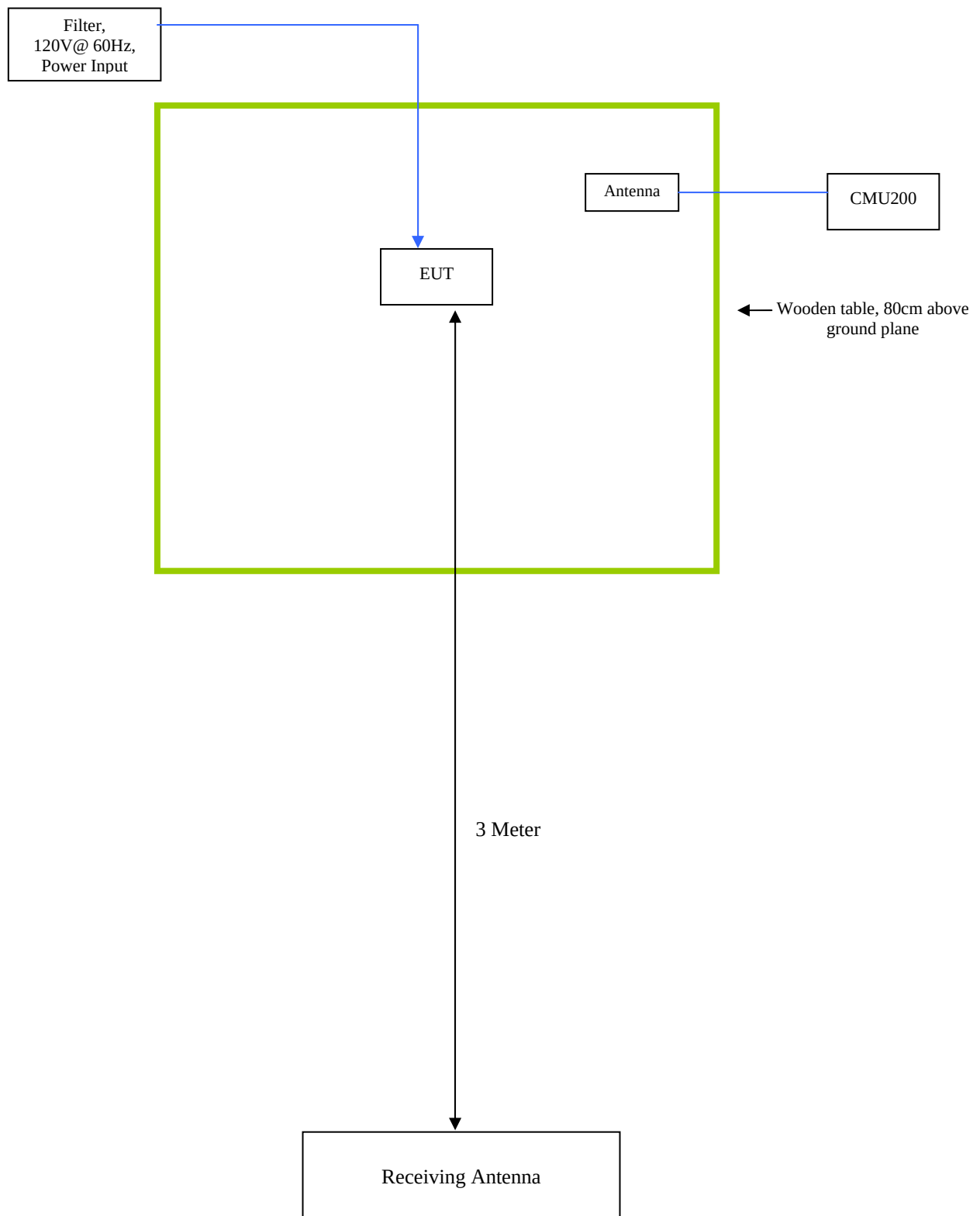
The following is a description of supporting equipment and details of cables used with the EUT.

| Equipment Description<br>(Including Brand Name) | Model & Serial<br>Number | Cable Description<br>(List Length, Type & Purpose) |
|-------------------------------------------------|--------------------------|----------------------------------------------------|
| N/A                                             | N/A                      | N/A                                                |

## Block Configuration Diagram for Conducted Emission



## Block Configuration Diagram for Radiated Emission



## Annex C.ii. EUT OPERATING CONDITIONS

The following is the description of how the EUT is exercised during testing.

| Test              | Description Of Operation                                                             |
|-------------------|--------------------------------------------------------------------------------------|
| Emissions Testing | The EUT was communicating with base station and set to work at maximum output power. |
| Others Testing    | The EUT was communicating with base station and set to work at maximum output power. |

## Annex D User Manual, Block Diagram, Circuit Diagram

Please see attachment

## Annex E SIEMIC ACCREDITATION

SIEMIC ACREDITATION DETAILS: FCC Test Site Registration No. **986914**

### FEDERAL COMMUNICATIONS COMMISSION

Laboratory Division  
7435 Oakland Mills Road  
Columbia, MD 21046

April 19, 2011

Registration Number: 986914

SIEMIC Nanjing (China) Laboratories  
2-1 Longcang Avenue,  
Yuhua Economic and Technology Development Park,  
Nanjing, 210039  
China

Attention: Leslie Bai,

Re: Measurement facility located at 2-1 Longcang Avenue, Nanjing, China  
Anechoic chamber (3 meters) and 3&10 meter OATS  
Date of Renewal: April 19, 2011

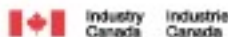
Dear Sir or Madam:

Your request for renewal of the registration of the subject measurement facility has been received. The information submitted has been placed in your file and the registration has been renewed. The name of your organization will remain on the list of facilities whose measurement data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Please note that the file must be updated for any changes made to the facility and the registration must be renewed at least every three years.

Measurement facilities that have indicated that they are available to the public to perform measurement services on a fee basis may be found on the FCC website [www.fcc.gov](http://www.fcc.gov) under E-Filing, OET Equipment Authorization Electronic Filing, Test Firms.

Sincerely,

Phyllis Parrish  
Industry Analyst

**SIEMIC ACREDITATION DETAILS: Industry of Canada Test Site Registration No. 4842B**

January 25, 2011

OUR FILE: 46405-4842  
Submission No: 145222

**Siemic Nanjing (China) Laboratories**  
2-1 Longcang Avenue  
Yuhua Economic & Technology Dev. Park, Nanjing  
China

*Attention:* Leslie Bai

Dear Sir/Madame:

The Bureau has received your application for the registration of a 3/10m OATS. Be advised that the information received was satisfactory to Industry Canada. The following number(s) is now associated to the site(s) for which registration / renewal was sought ( **Site# 4842B-2** ). Please reference the appropriate site number in the body of test reports containing measurements performed on the site. In addition, please keep for your records the following information:

- The company address code associated to the site(s) located at the above address is: **4842B**

Furthermore, to obtain or renew a unique site number, the applicant shall demonstrate that the site has been accredited to ANSI C63.4-2003 or later. A scope of accreditation indicating the accreditation by a recognized accreditation body to ANSI C63.4-2003 or later shall be accepted. Please indicate in a letter the previous assigned site number if applicable and the type of site (example: 3 metre OATS or 3 metre chamber). If the test facility is not accredited to ANSI C63.4-2003 or later, the test facility shall submit test data demonstrating full compliance with the ANSI standard. The Bureau will evaluate the filing to determine if recognition shall be granted.

The frequency for re-validation of the test site and the information that is required to be filed or retained by the testing party shall comply with the requirements established by the accrediting organization. However, in all cases, test site re-validation shall occur on an interval not to exceed three years. There is no fee or form associated with an OATS filing. OATS submissions are encouraged to be submitted electronically to the Bureau using the following URL:  
[http://strategis.ic.gc.ca/epic/internet/inceb-bhst.nsf/en/h\\_tt00032e.html](http://strategis.ic.gc.ca/epic/internet/inceb-bhst.nsf/en/h_tt00032e.html).

If you have any questions, you may contact the Bureau by e-mail at [certification.bureau@ic.gc.ca](mailto:certification.bureau@ic.gc.ca). Please reference our file and submission number above for all correspondence.

Yours sincerely,

Dalwinder Gill  
For: Wireless Laboratory Manager  
Certification and Engineering Bureau  
3701 Carling Ave., Building 94  
P.O. Box 11490, Station "H"  
Ottawa, Ontario K2H 8S2  
Email: [dalwinder.gill@ic.gc.ca](mailto:dalwinder.gill@ic.gc.ca)  
Tel. No. (613) 998-8363  
Fax. No. (613) 998-4752