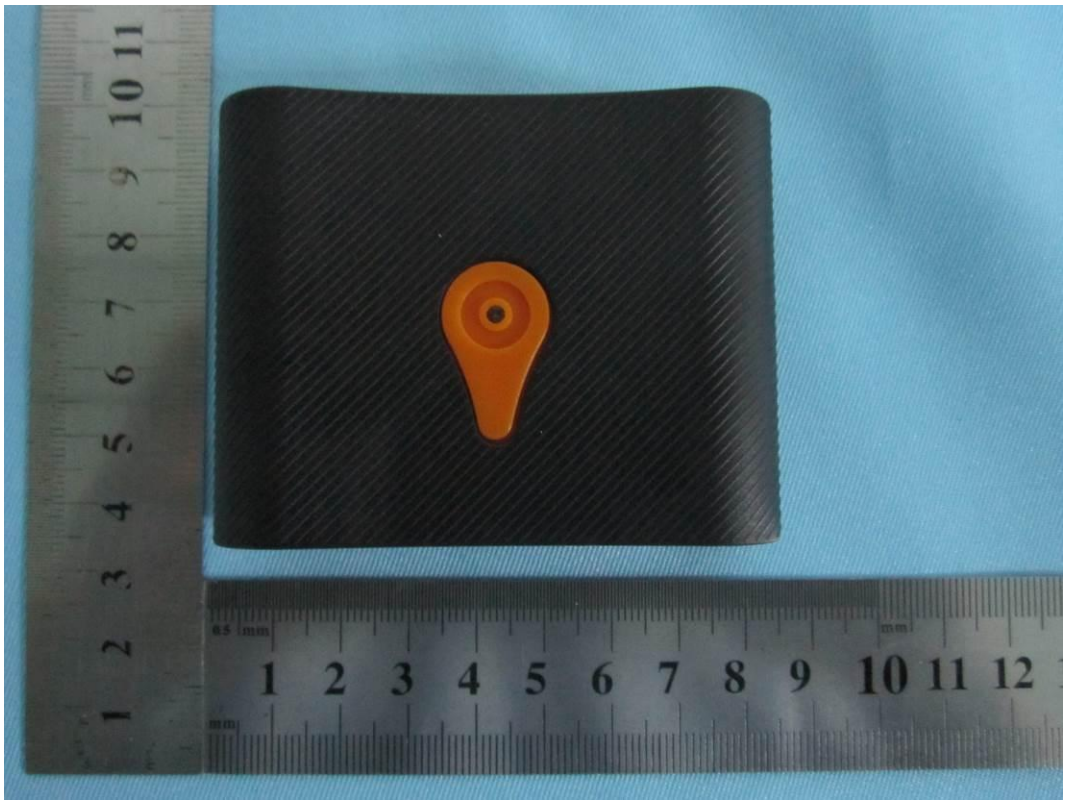
# GlobaTrac LLC

# Trakdot

## Main Model: Luggage Trak V1
## Serial Model: N/A

## 17th June, 2013
**Report No.: 13070068-FCC-R1**
**(This report supersedes NONE)**



**Modifications made to the product : None**

| This Test Report is Issued Under the Authority of: | | |
|---|---|---|
| Back Huang | Alex Liu | |
| **Back Huang**<br>**Compliance Engineer** | **Alex Liu**<br>**Technical Manager** | |

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**Test result presented in this test report is applicable to the representative sample only.**

RF Test Report

To: FCC Part 22(H) & FCC Part 24(E): 2012

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# Laboratory Introduction

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## Accreditations for Conformity Assessment

| Country/Region | Accreditation Body | Scope |
|---|---|---|
| USA | FCC, A2LA | EMC , RF/Wireless , Telecom |
| Canada | IC, A2LA, NIST | EMC, RF/Wireless , Telecom |
| Taiwan | BSMI , NCC , NIST | EMC, RF, Telecom , Safety |
| Hong Kong | OFTA , NIST | RF/Wireless ,Telecom |
| Australia | NATA, NIST | EMC, RF, Telecom , Safety |
| Korea | KCC/RRA, NIST | EMI, EMS, RF , Telecom, Safety |
| Japan | VCCI, JATE, TELEC, RFT | EMI, RF/Wireless, Telecom |
| Mexico | NOM, COFETEL, Caniety | Safety, EMC , RF/Wireless, Telecom |
| Europe | A2LA, NIST | EMC, RF, Telecom , Safety |

## Accreditations for Product Certifications

| Country/Region | Accreditation Body | Scope |
|---|---|---|
| USA | FCC TCB, NIST | EMC , RF , Telecom |
| Canada | IC FCB , NIST | EMC , RF , Telecom |
| Singapore | iDA, NIST | EMC , RF , Telecom |
| EU | NB | EMC & R&TTE Directive |
| Japan | MIC, (RCB 208) | RF , Telecom |
| Hong Kong | OFTA (US002) | RF , Telecom |

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# CONTENTS

# 1. EXECUTIVE SUMMARY & EUT INFORMATION

**The purpose of this test programmed was to demonstrate compliance of the GlobaTrac LLC Trakdot and model: Luggage Trak V1 against the current Stipulated Standards.The Trakdot has demonstrated compliance with the FCC Part 22(H) & FCC Part 24(E): 2012.**

## EUT Information

| | | |
|---|---|---|
| **EUT Description** | : | **Trakdot** |
| **Main Model** | : | **Luggage Trak V1** |
| **Serial Model** | : | **N/A** |
| **Antenna Gain** | : | **GPRS850: 2.0 dBi**<br>**GPRS1900: 2.0 dBi**<br>**BLE: 3.0 dBi** |
| **Input Power** | : | **3 V DC** |
| **Maximum Conducted Peak Power to Antenna** | : | **GPRS850: 31.71 dBm**<br>**GPRS1900: 29.42 dBm** |
| **Maximum Radiated ERP/EIRP** | : | **GPRS850: 29.28 dBm / ERP**<br>**GPRS1900: 25.98 dBm / EIRP** |
| **Classification Per Stipulated Test Standard** | : | **FCC Part 22(H) & FCC Part 24(E): 2012** |

Note: The power supply of the GSM module is 3.7 V, and the details please refer to Declaration letter (see annex E).

# 2. TECHNICAL DETAILS

| | |
|---|---|
| **Purpose** | **Compliance testing of Trakdot with stipulated standard** |
| **Applicant / Client** | **GlobaTrac LLC<br>2930 Westwood Blvd., Suite 250, Los Angeles, CA. 90064 USA** |
| **Manufacturer** | **Linktop Technology Co., Ltd<br>2F Torch Building, No.1 Torch Road, Huli District, Xiamen, Fujian, China** |
| **Laboratory performing the tests** | **SIEMIC Nanjing (China) Laboratories<br>NO.2-1,Longcang Dadao, Yuhua Economic Development Zone, Nanjing, China<br>Tel:+86(25)86730128/86730129<br>Fax:+86(25)86730127<br>Email:info@siemic.com** |
| **Test report reference number** | **13070068-FCC-R1** |
| **Date EUT received** | **17th May, 2013** |
| **Standard applied** | **FCC Part 22(H) & FCC Part 24(E): 2012** |
| **Dates of test** | **20th May, 2013 to 22rd May, 2013** |
| **No of Units** | **#1** |
| **Equipment Category** | **PCE** |
| **Trade Name** | **GlobaTrac** |
| **RF Operating Frequency (ies)** | **GPRS850 TX : 824.2 ~ 848.8 MHz; RX : 869.2 ~ 893.8 MHz<br>GPRS1900 TX : 1850.2 ~ 1909.8 MHz; RX : 1930.2 ~ 1989.8 MHz<br>BLE: 2402-2480MHz** |
| **Number of Channels** | **299CH (GPRS1900) and 124CH (GPRS850)<br>BLE: 40 CH** |
| **Modulation** | **GSM: GMSK<br>Bluetooth: GFSK** |
| **GPRS Multi-slot class** | **8/10** |
| **FCC ID** | **2AADDTRAK** |

# 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:**

**PCE**

**Test Results Summary**

| Test Standard | Description | Product Class | Pass / Fail |
|---|---|---|---|
| § 1.1307, § 2.1091 | RF Exposure | See Above | Pass |
| §2.1046;<br>§ 22.913 (a); § 24.232 (c) | RF Output Power | See Above | Pass |
| § 2.1047 | Modulation Characteristics | See Above | N/A |
| § 2.1049; § 22.905<br>§ 22.917; § 24.238 | 99% & -26 dB Occupied Bandwidth | See Above | Pass |
| § 2.1051,<br>§ 22.917 (a); § 24.238 (a) | Spurious Emissions at Antenna Terminal | See Above | Pass |
| § 2.1053<br>§ 22.917 (a); § 24.238 (a) | Field Strength of Spurious Radiation | See Above | Pass |
| § 22.917 (a); § 24.238 (a) | Out of band emission, Band Edge | See Above | Pass |
| § 2.1055<br>§ 22.355; § 24.235 | Frequency stability vs. temperature<br>Frequency stability vs. voltage | See Above | Pass |

*Note: Testing was performed by configuring EUT to maximum output power status, the declared output power class for different.*

# 5. MEASUREMENTS, EXAMINATION AND DERIVED RESULTS

## 5.1 §1.1307, §2.1091- RF Exposure (SAR)

**Test Result: Pass**

The EUT is not a portable device.
Please refer to SIEMIC RF Exposure Evalution Report: 13070068-FCC-H1

# 5.2 §2.1046 ; §22.913 (a); §24.232 (c)- RF 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 ±1.5dB.
3. Environmental Conditions

| | |
|---|---|
| Temperature | 26°C |
| Relative Humidity | 58% |
| Atmospheric Pressure | 1014mbar |

4. Test date : 20th May, 2013
   Tested By : Back Huang

## Procedures:

**For Conducted Power:**

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.

**For ERP/EIRP:**

1. The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

2. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

3. The frequency range up to tenth harmonic of the fundamental frequency was investigated.

4. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB = 10 lg (TXpwr in Watts/0.001) – the absolute level

Spurious attenuation limit in dB = 43 + 10 $\text{Log}_{10}$ (power out in Watts)

## Test Result: Pass

***Remark:*** Conducted Burst Average power for reporting purposes only

## Conducted Power

| Burst Average Power (dBm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Band** | **GSM850** | | | | **GSM1900** | | | |
| Channel | 128 | 190 | 251 | Tune up Power tolerant | 512 | 661 | 810 | Tune up Power tolerant |
| Frequency (MHz) | 824.2 | 836.6 | 848.8 | / | 1850.2 | 1880 | 1909.8 | / |
| GSM Voice (1 uplink) | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| GPRS Multi-Slot Class 8 (1 uplink) | 31.70 | **31.71** | 31.70 | 32±1 | 28.16 | 28.68 | **29.42** | 29±1 |
| GPRS Multi-Slot Class 10 (2 uplink) | 31.31 | 31.34 | 31.30 | 32±1 | 28.04 | 28.49 | 29.27 | 29±1 |
| GPRS Multi-Slot Class 12 (4 uplink) | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Remark :<br>GPRS, CS1 coding scheme.<br>Multi-Slot Class 8 , Support Max 4 downlink, 1 uplink , 5 working link<br>Multi-Slot Class 10 , Support Max 4 downlink, 2 uplink , 5 working link<br>Multi-Slot Class 12 , Support Max 4 downlink, 4 uplink , 5 working link | | | | | | | | |

### ERP & EIRP (worst case)

# ERP for Cellular Band (Part 22H)

| Frequency (MHz) | Substituted level (dBm) | Antenna Polarization | Antenna Gain correction (dBi) | Cable Loss (dB) | Absolute Level (dBm) | Limit (dBm) |
|---|---|---|---|---|---|---|
| 824.2 | 20.82 | V | 6.8 | 0.5 | 27.12 | 38.45 |
| 824.2 | 22.98 | H | 6.8 | 0.5 | **29.28** | 38.45 |
| 836.6 | 20.74 | V | 6.8 | 0.5 | 27.04 | 38.45 |
| 836.6 | 22.45 | H | 6.8 | 0.5 | 28.75 | 38.45 |
| 848.8 | 20.53 | V | 6.9 | 0.5 | 26.93 | 38.45 |
| 848.8 | 22.52 | H | 6.9 | 0.5 | 28.92 | 38.45 |

# EIRP for PCS Band (Part 24E)

| Frequency (MHz) | Substituted level (dBm) | Antenna Polarization | Antenna Gain correction (dBi) | Cable Loss (dB) | Absolute Level (dBm) | Limit (dBm) |
|---|---|---|---|---|---|---|
| 1850.2 | 15.26 | V | 7.82 | 0.8 | 22.28 | 33 |
| 1850.2 | 18.35 | H | 7.82 | 0.8 | 25.37 | 33 |
| 1880 | 15.65 | V | 7.82 | 0.8 | 22.67 | 33 |
| 1880 | 18.52 | H | 7.82 | 0.8 | 25.54 | 33 |
| 1909.8 | 15.02 | V | 7.82 | 0.8 | 22.04 | 33 |
| 1909.8 | 18.96 | H | 7.82 | 0.8 | **25.98** | 33 |

Note: *Factors= Antenna Gain Correction-Cable Loss*

# 5.3 §2.1047 - Modulation Characteristic

According to FCC §2.1047(d), Part 22H & 24E there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

# 5.4 §2.1049, §22.917, §22.905 & §24.238 - Occupied Bandwidth

1. Conducted Measurement
   EUT was set for low, mid, high channel with modulated mode and highest RF output power.
   The spectrum analyser was connected to the antenna terminal.
2. Environmental Conditions — Temperature 26°C; Relative Humidity 58%; Atmospheric Pressure 1014mbar
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 ±1.5dB.
4. Test date : 20th May, 2013
   Tested By : Back Huang

## 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.

## Test Results: Pass

Cellular Band (Part 22H)

| Channel | Frequency (MHz) | 99% Occupied Bandwidth (kHz) | 26 dB Bandwidth (kHz) |
|---|---|---|---|
| 128 | 824.2 | 237.3049 | 314.275 |
| 190 | 836.6 | 238.9152 | 308.635 |
| 251 | 848.8 | 237.6625 | 311.844 |

PCS Band (Part 24E)

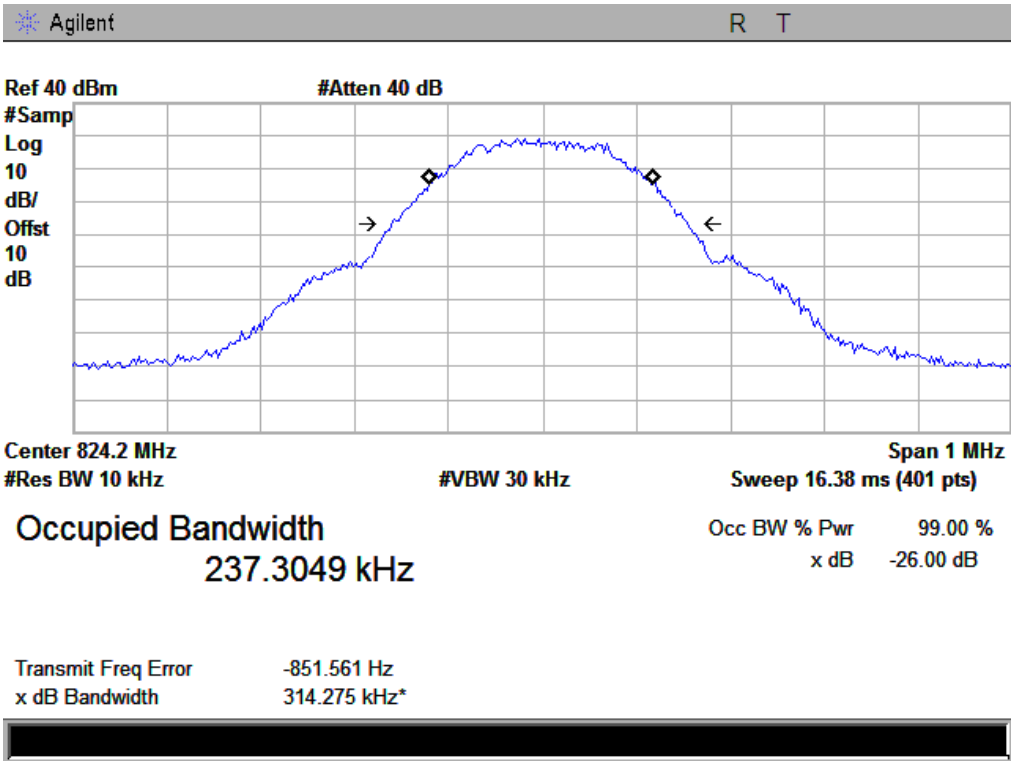
| Channel | Frequency (MHz) | 99% Occupied Bandwidth (kHz) | 26 dB Bandwidth (kHz) |
|---|---|---|---|
| 512 | 1850.2 | 240.4152 | 319.422 |
| 661 | 1880.0 | 242.2233 | 318.195 |
| 810 | 1909.8 | 243.1390 | 322.215 |

Please refer to the following plots.

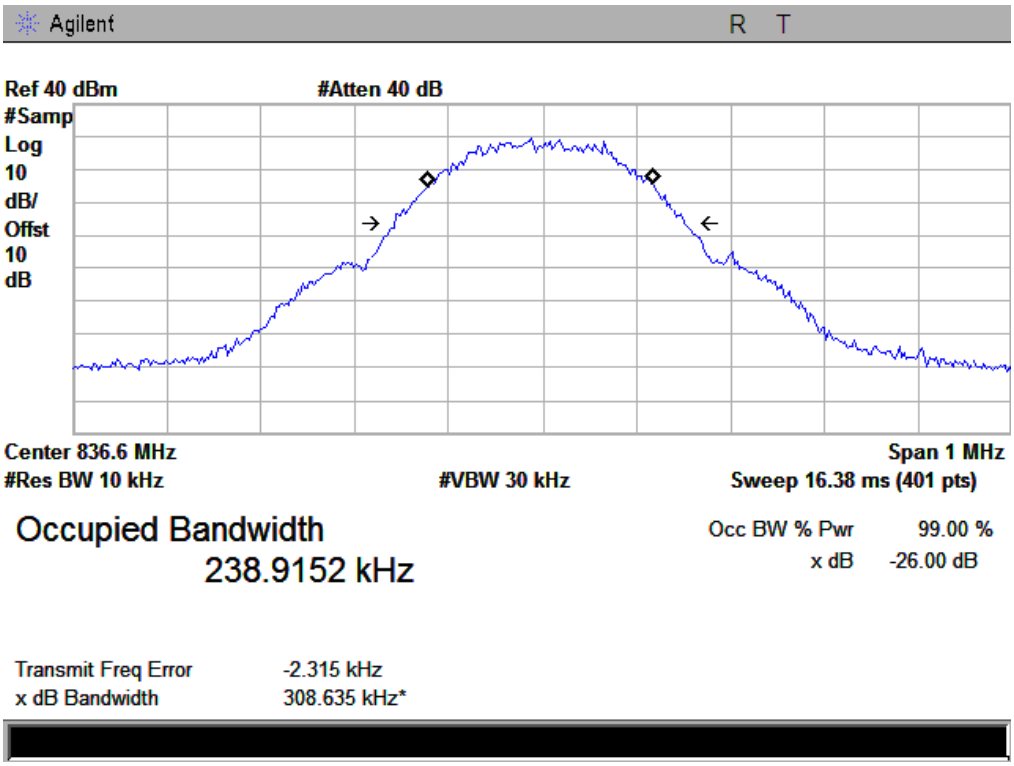
Cellular Band (Part 22H)

**99% Occupied Bandwidth & 26 dB Bandwidth**

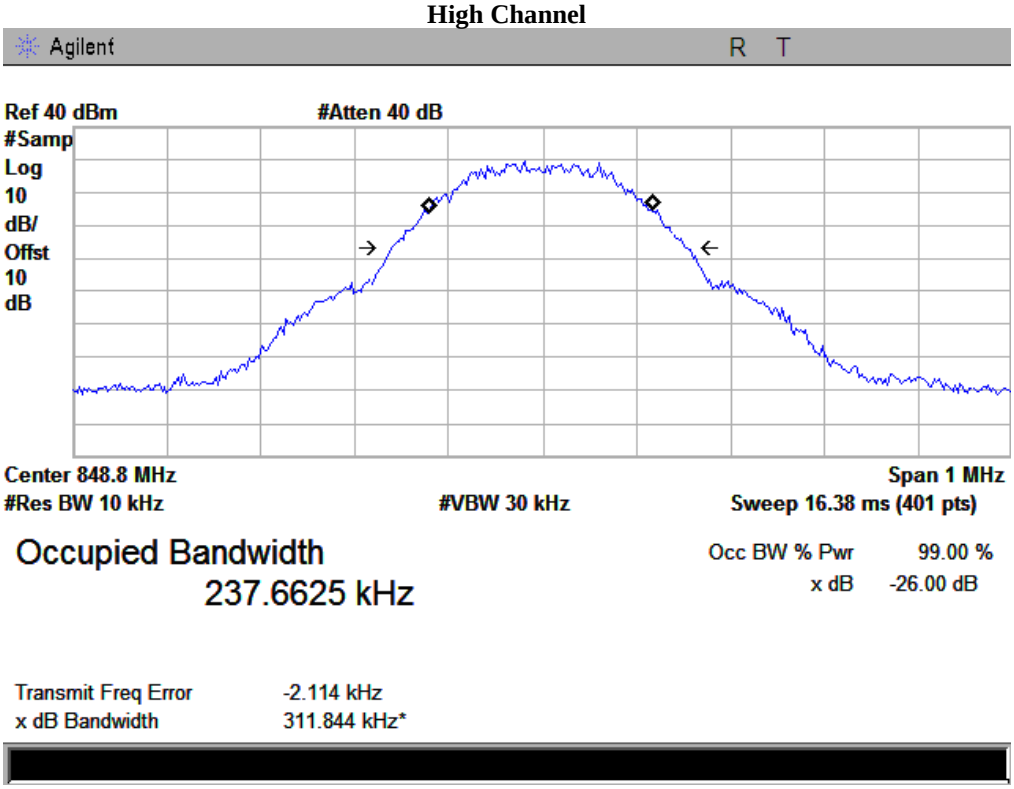
**Low Channel**




**Middle Channel**



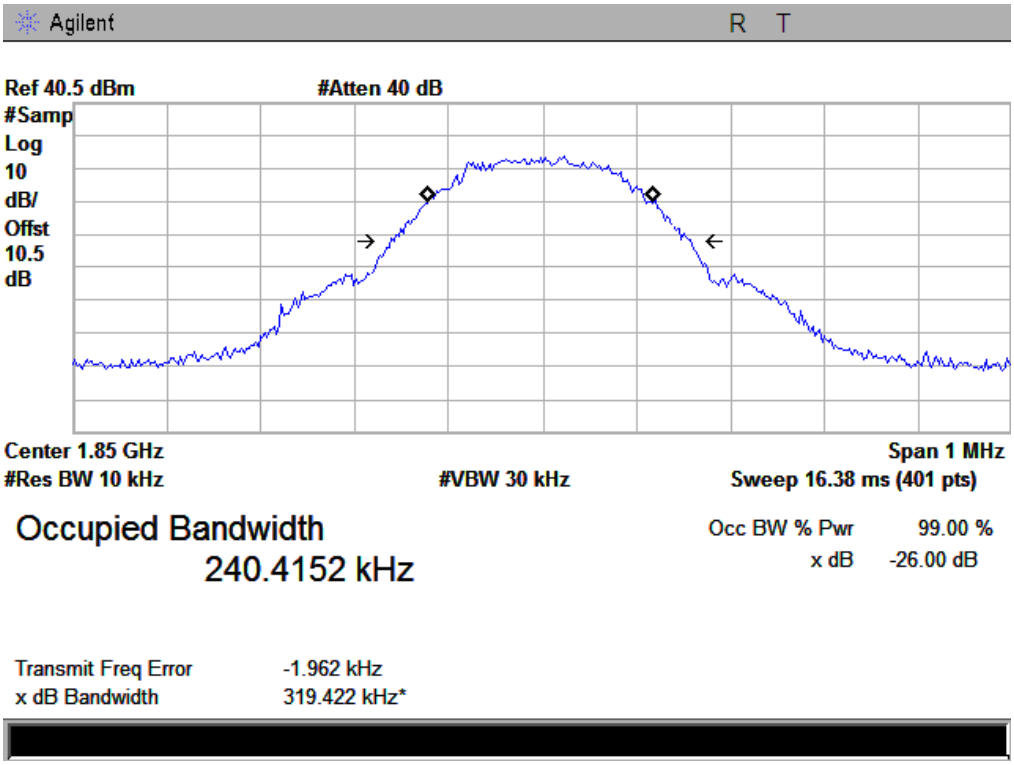
**High Channel**



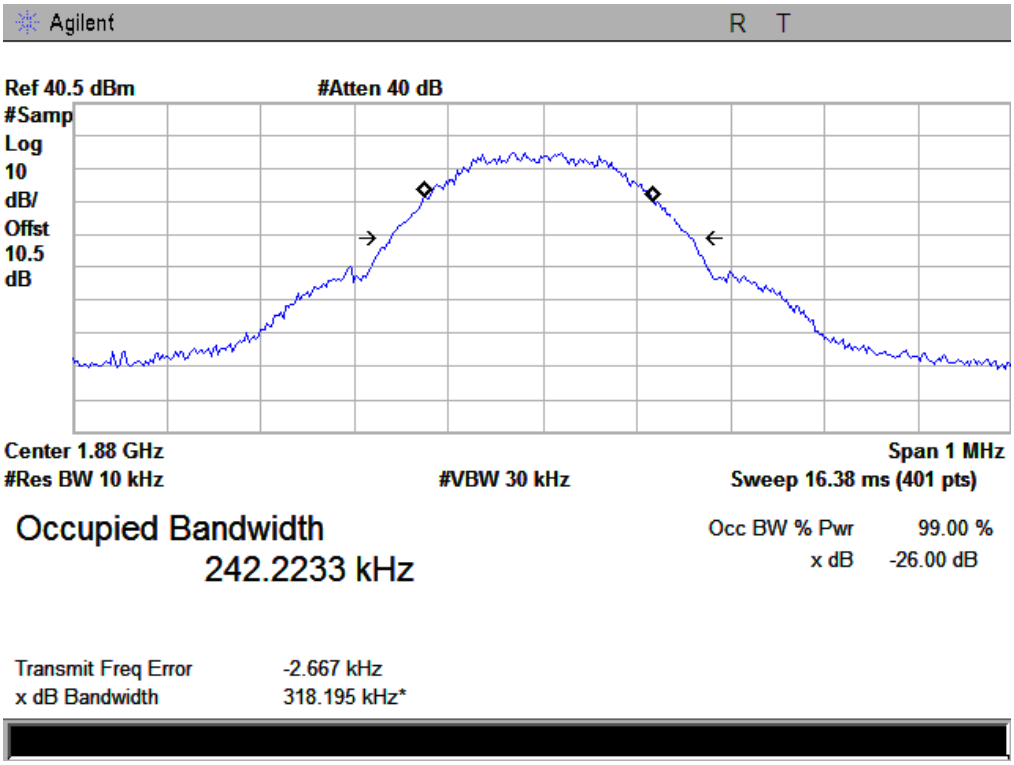

PCS Band (Part 24E)

**99% Occupied Bandwidth & 26 dB Bandwidth**

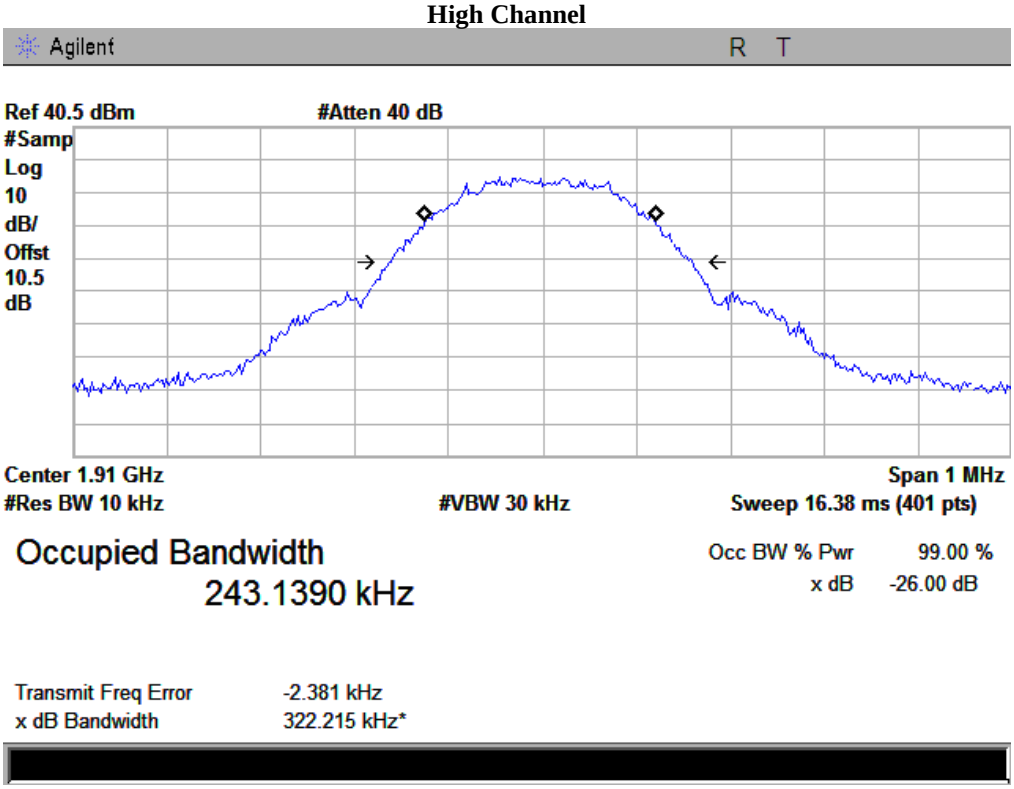
**Low Channel**



**Middle Channel**




**High Channel**



# 5.5 §2.1051, §22.917(a) & §24.238(a) - Spurious Emissions at Antenna Terminals

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 ±1.5dB.
3. Environmental Conditions

| | |
|---|---|
| Temperature | 26°C |
| Relative Humidity | 58% |
| Atmospheric Pressure | 1014mbar |

4. Test date : 20th May, 2013
   Tested By : Back Huang

## Standard Requirement:

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.

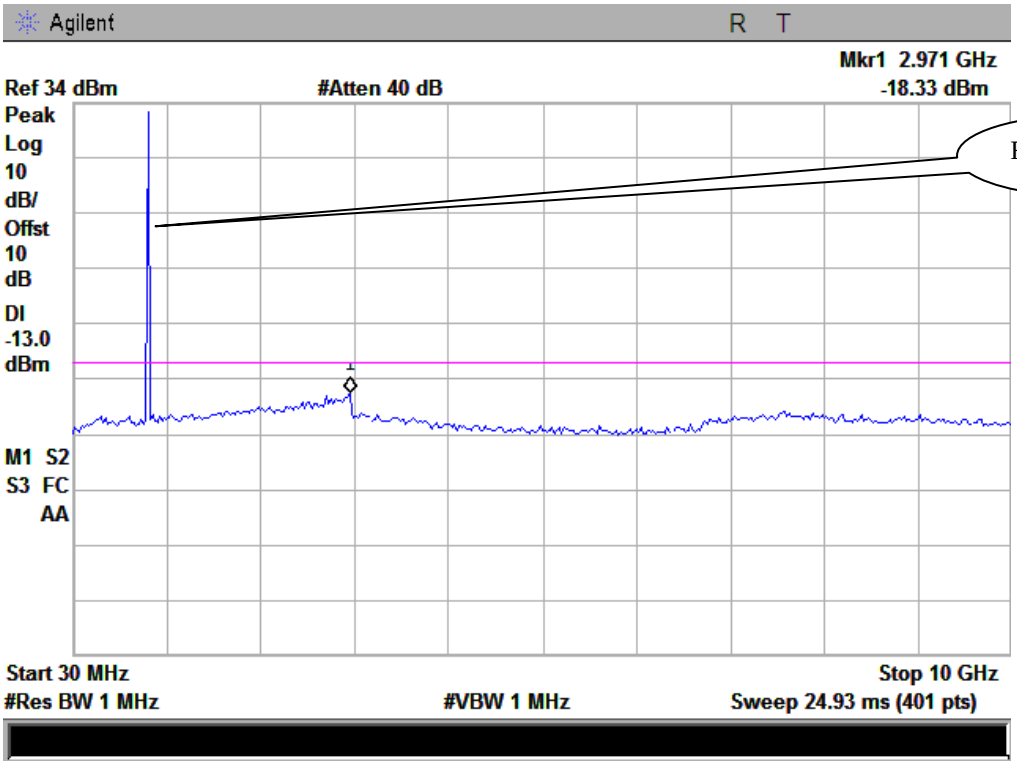
## Test Result: Pass

Refer to the attached plots.

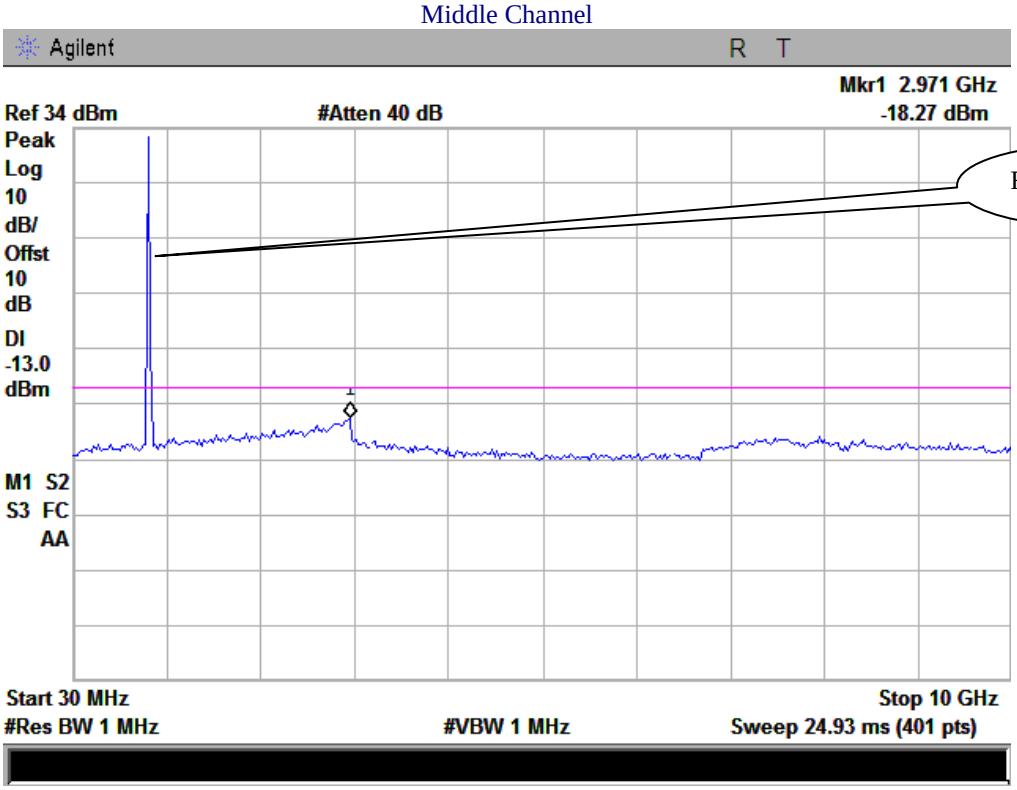
**Cellular Band (Part 22H)**

30MHz-10G – GPRS850

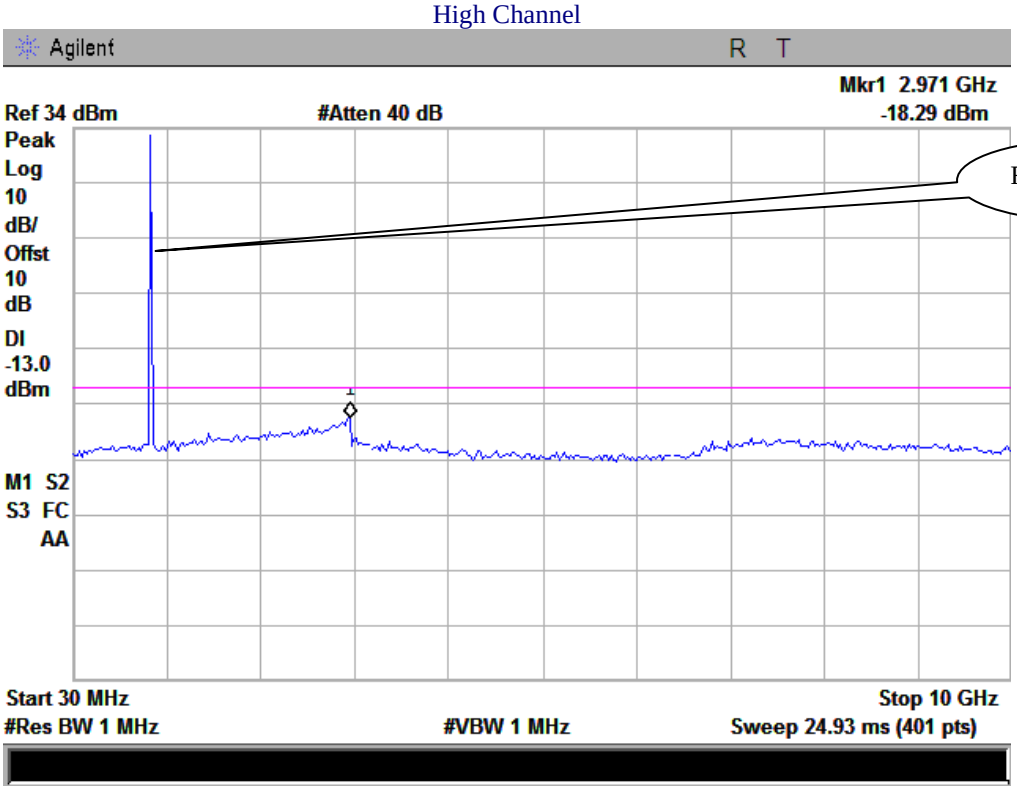
Low Channel




Middle Channel



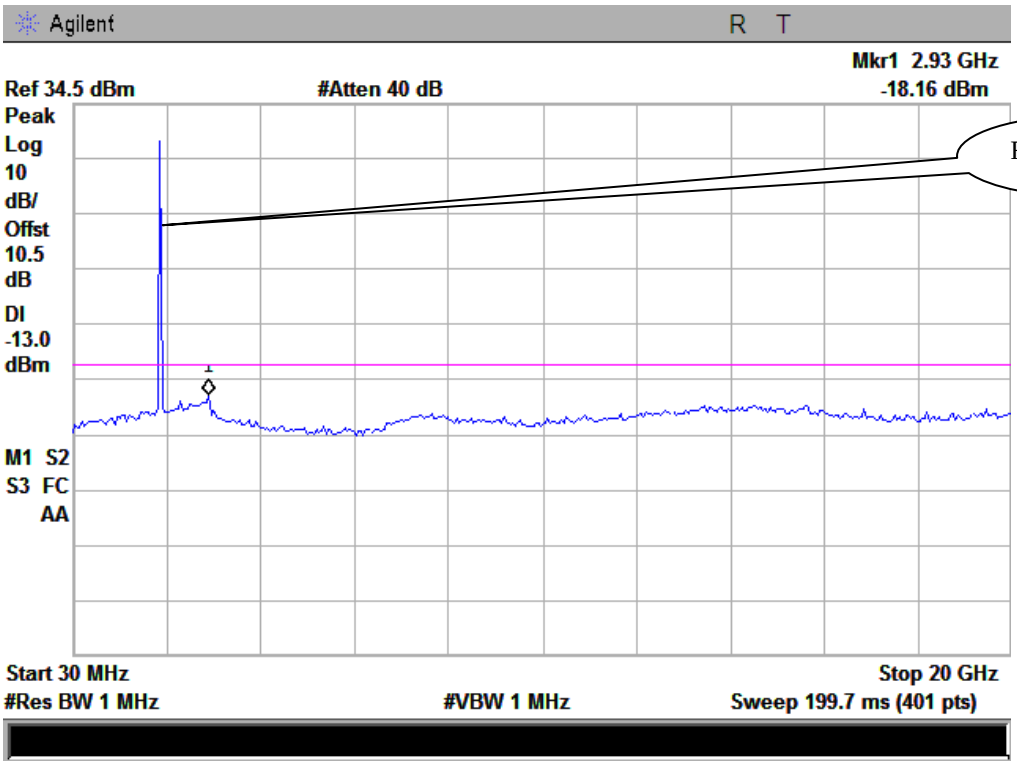
High Channel



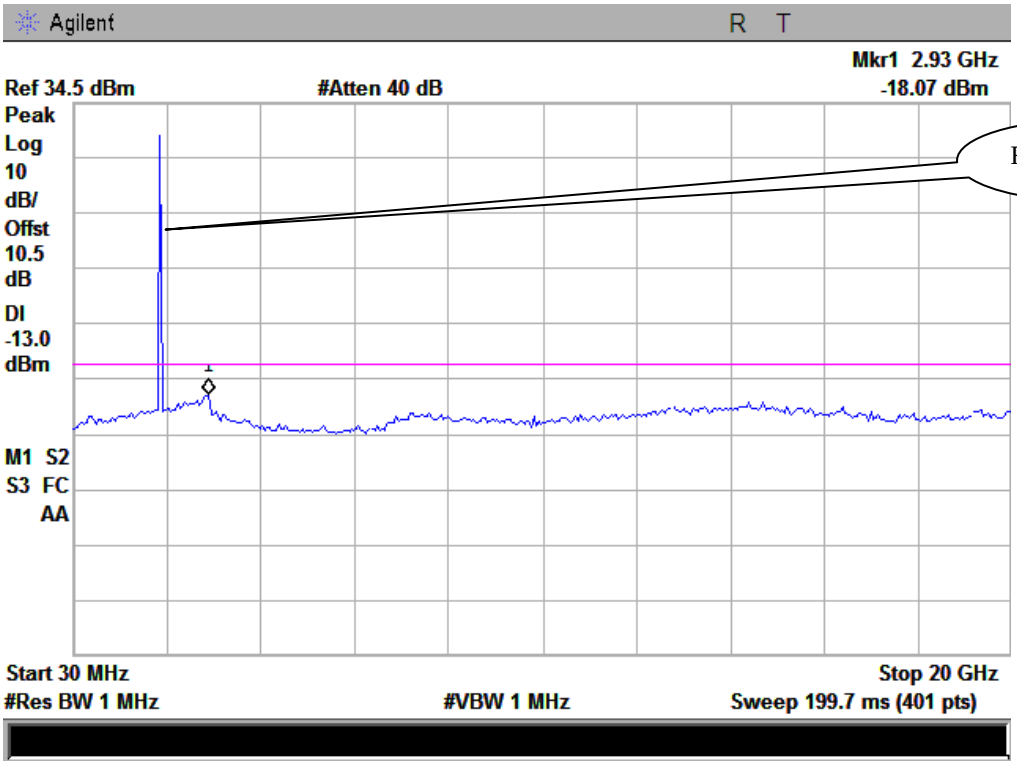

**PCS Band (Part24E)**

30MHz-20G – GPRS1900

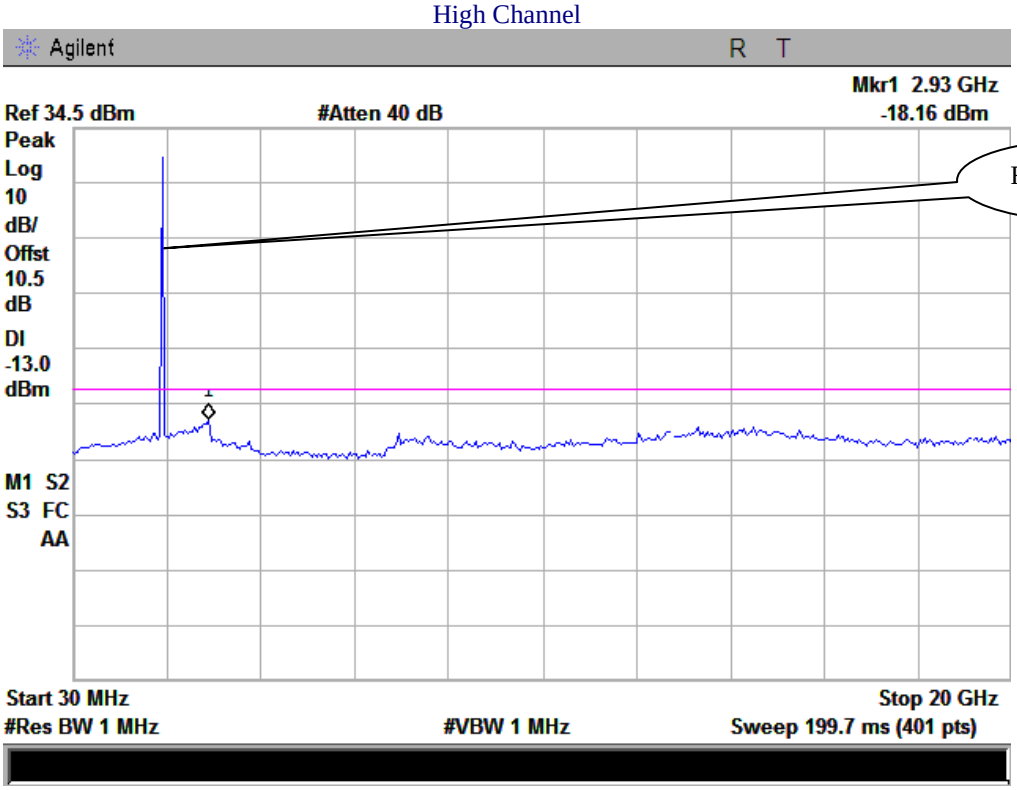
Low Channel



Middle Channel




High Channel



# 5.6 §2.1053, §22.917 & §24.238 - Spurious Radiated Emissions

1. 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.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. 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 – 40GH is ±6.0dB (for EUTs < 0.5m X 0.5m X 0.5m).
4. Environmental Conditions

| | |
|---|---|
| Temperature | 25°C |
| Relative Humidity | 58% |
| Atmospheric Pressure | 1015mbar |

5. Test date : 22rd May, 2013
   Tested By : Back Huang

## Standard Requirement:

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 10th 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

# Cellular Band (Part 22H)

## Low channel

| Frequency (MHz) | Substituted level (dBm) | Direction (degree) | Height (cm) | Polarity (H/V) | Antenna Gain Correction (dB) | Cable Loss (dB) | Amplifier (dB) | Corrected Reading (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1648.4 | -47.49 | 243 | 100 | V | 7.95 | 0.78 | 0 | -40.32 | -13 | -27.32 |
| 1648.4 | -44.54 | 78 | 120 | H | 7.95 | 0.78 | 0 | -37.37 | -13 | -24.37 |
| 247.8 | -43.87 | 302 | 120 | H | 6.7 | 0.32 | 0 | -37.49 | -13 | -24.49 |
| 254.8 | -43.41 | 305 | 110 | H | 6.8 | 0.32 | 0 | -36.93 | -13 | -23.93 |

## Middle channel

| Frequency (MHz) | Substituted level (dBm) | Direction (degree) | Height (cm) | Polarity (H/V) | Antenna Gain Correction (dB) | Cable Loss (dB) | Amplifier (dB) | Corrected Reading (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1673.2 | -48.54 | 245 | 100 | V | 7.95 | 0.78 | 0 | -41.37 | -13 | -28.37 |
| 1673.2 | -44.98 | 85 | 110 | H | 7.95 | 0.78 | 0 | -37.81 | -13 | -24.81 |
| 248.6 | -43.52 | 108 | 110 | H | 6.7 | 0.32 | 0 | -37.14 | -13 | -24.14 |
| 251.2 | -44.15 | 310 | 110 | H | 6.8 | 0.32 | 0 | -37.67 | -13 | -24.67 |

## High channel

| Frequency (MHz) | Substituted level (dBm) | Direction (degree) | Height (cm) | Polarity (H/V) | Antenna Gain Correction (dB) | Cable Loss (dB) | Amplifier (dB) | Corrected Reading (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1697.6 | -49.13 | 248 | 110 | V | 7.95 | 0.78 | 0 | -41.96 | -13 | -28.96 |
| 1697.6 | -45.24 | 72 | 120 | H | 7.95 | 0.78 | 0 | -38.07 | -13 | -25.07 |
| 250.2 | -43.52 | 112 | 110 | H | 6.8 | 0.32 | 0 | -37.04 | -13 | -24.04 |
| 251.6 | -44.15 | 306 | 110 | H | 6.8 | 0.32 | 0 | -37.67 | -13 | -24.67 |

## PCS Band (Part 24E)

### Low channel

| Frequency (MHz) | Substituted level (dBm) | Direction (degree) | Height (cm) | Polarity (H/V) | Antenna Gain Correction (dB) | Cable Loss (dB) | Amplifier (dB) | Corrected Reading (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| 3700.4 | -53.83 | 108 | 100 | V | 10.25 | 2.73 | 0 | -46.31 | -13 | -33.31 |
| 3700.4 | -50.67 | 34 | 110 | H | 10.25 | 2.73 | 0 | -43.15 | -13 | -30.15 |
| 245.2 | -43.54 | 108 | 110 | H | 6.6 | 0.32 | 0 | -37.26 | -13 | -24.26 |
| 248.6 | -43.96 | 302 | 110 | H | 6.7 | 0.32 | 0 | -37.58 | -13 | -24.58 |

### Middle channel

| Frequency (MHz) | Substituted level (dBm) | Direction (degree) | Height (cm) | Polarity (H/V) | Antenna Gain Correction (dB) | Cable Loss (dB) | Amplifier (dB) | Corrected Reading (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| 3760 | -54.17 | 113 | 110 | V | 10.25 | 2.73 | 0 | -46.65 | -13 | -33.65 |
| 3760 | -50.03 | 39 | 110 | H | 10.25 | 2.73 | 0 | -42.51 | -13 | -29.51 |
| 245.6 | -44.02 | 106 | 110 | H | 6.6 | 0.32 | 0 | -37.74 | -13 | -24.74 |
| 248.3 | -43.84 | 310 | 100 | H | 6.7 | 0.32 | 0 | -37.46 | -13 | -24.46 |

### High channel

| Frequency (MHz) | Substituted level (dBm) | Direction (degree) | Height (cm) | Polarity (H/V) | Antenna Gain Correction (dB) | Cable Loss (dB) | Amplifier (dB) | Corrected Reading (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| 3819.6 | -54.31 | 108 | 110 | V | 10.36 | 2.73 | 0 | -46.68 | -13 | -33.68 |
| 3819.6 | -51.28 | 89 | 110 | H | 10.36 | 2.73 | 0 | -43.65 | -13 | -30.65 |
| 247.4 | -43.71 | 106 | 110 | H | 6.7 | 0.32 | 0 | -37.33 | -13 | -24.33 |
| 251.6 | -44.24 | 310 | 100 | H | 6.8 | 0.32 | 0 | -37.76 | -13 | -24.76 |

# 5.7 §22.917(a) & §24.238(a) - Band Edge

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 ±1.5dB.
3. Environmental Conditions

| | |
|---|---|
| Temperature | 26°C |
| Relative Humidity | 58% |
| Atmospheric Pressure | 1014mbar |

4. Test date : 20th May, 2013
   Tested By : Back Huang

## Standard Requirement:

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.

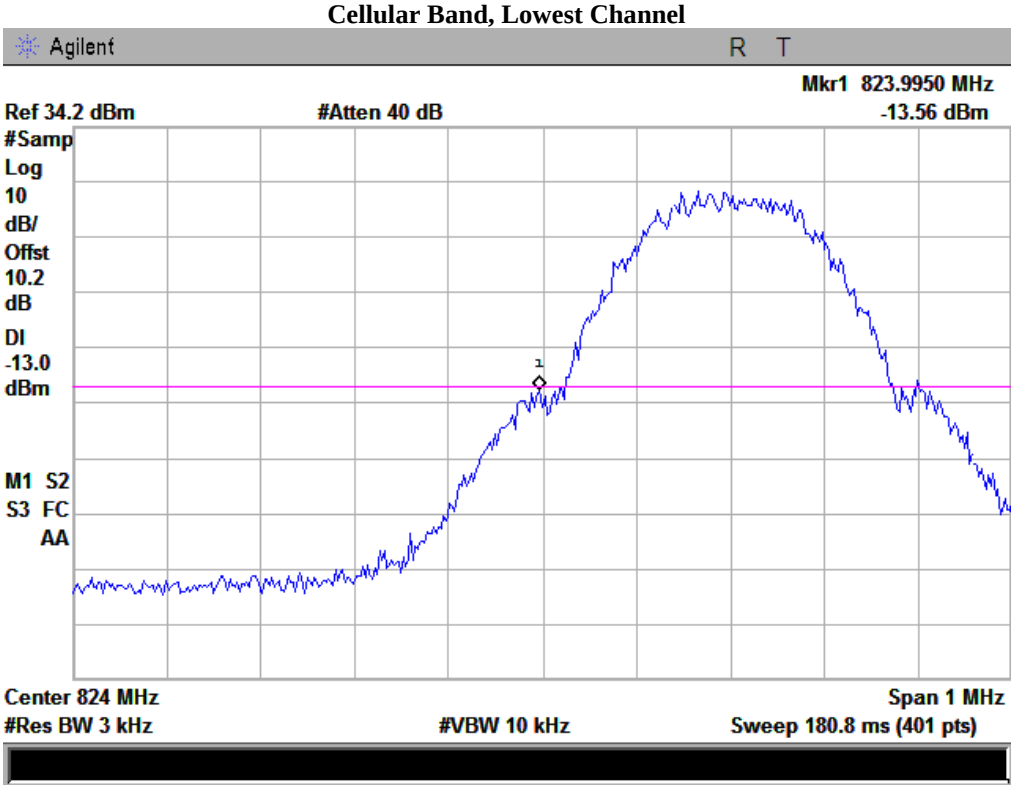
**Cellular Band (Part 22H)**

| Frequency (MHz) | Emission (dBm) | Limit (dBm) |
|---|---|---|
| 823.9950 | -13.56 | -13 |
| 849.0200 | -14.12 | -13 |

**PCS Band (Part 24E)**

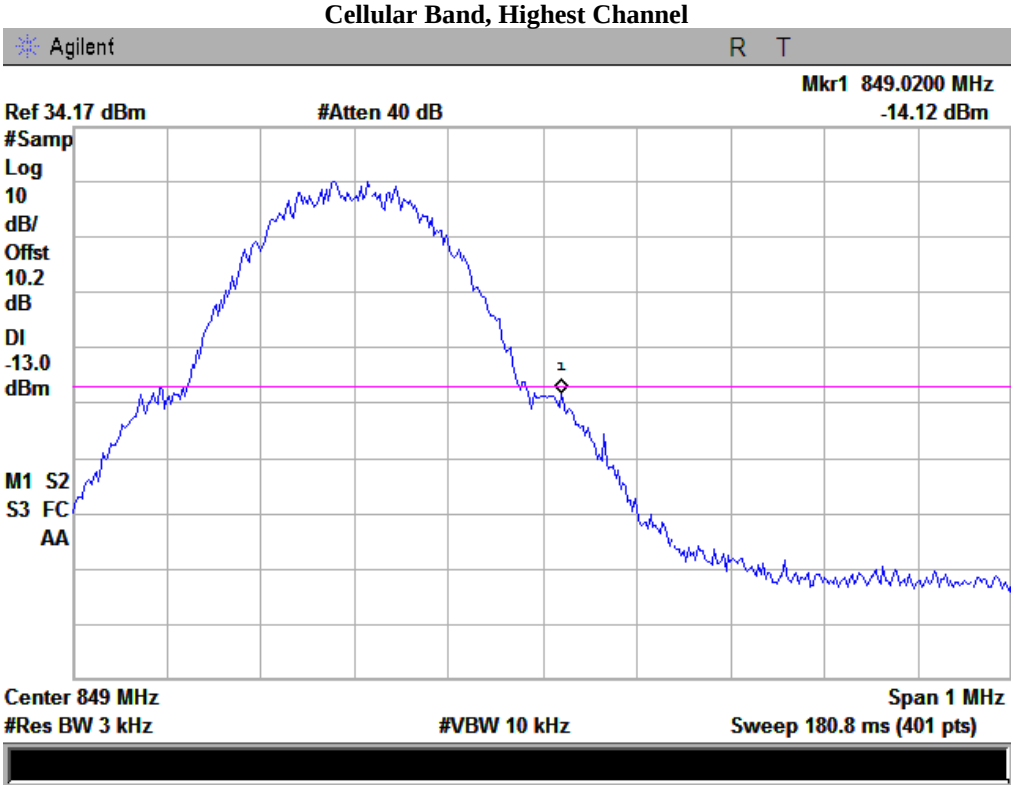
| Frequency (MHz) | Emission (dBm) | Limit (dBm) |
|---|---|---|
| 1849.9775 | -17.23 | -13 |
| 1910.0025 | -15.10 | -13 |

**Cellular Band, Lowest Channel**



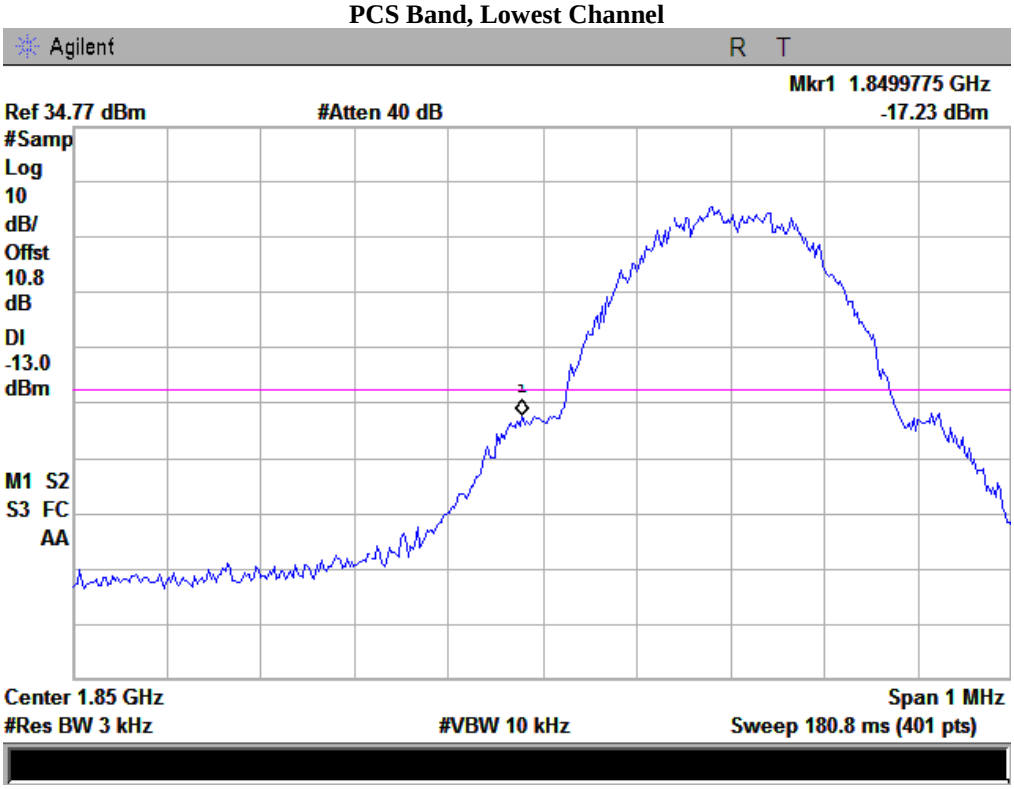

Note: Offset=Cable loss (4.0)+ Attenuation Factor(6.0) + 10log (3.14/3)=4.0+6.0+0.2=10.2 dB

**Cellular Band, Highest Channel**



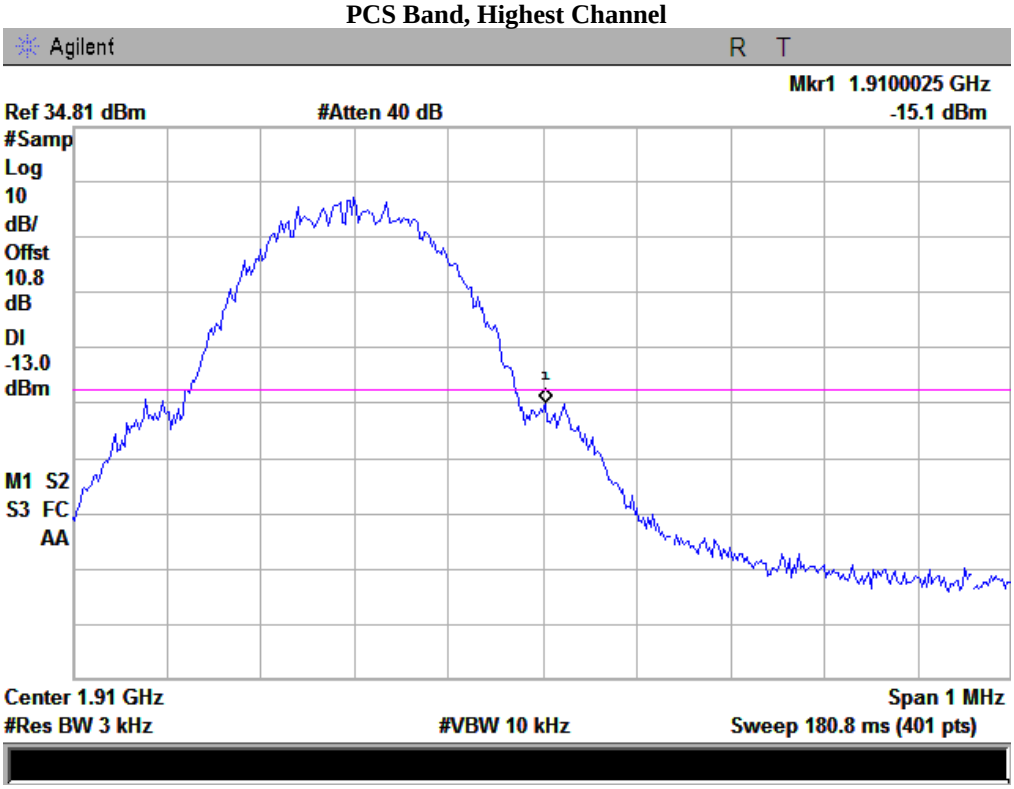

Note: Offset=Cable loss (4.0)+ Attenuation Factor(6.0) + 10log (3.12/3)=4.0+6.0+0.17=10.17 dB

**PCS Band, Lowest Channel**




Note: Offset=Cable loss (4.5)+ Attenuation Factor(6.0) + 10log (3.19/3)=4.5+6.0+0.27=10.77 dB

**PCS Band, Highest Channel**




Note: Offset=Cable loss (4.5)+ Attenuation Factor(6.0) + 10log (3.22/3)=4.5+6.0+0.31=10.81 dB

# 5.8 §2.1055, §22.355 & §24.235 - Frequency Stability

| | | | |
|---|---|---|---|
| 1. | Environmental Conditions | Temperature | 25°C |
| | | Relative Humidity | 56% |
| | | Atmospheric Pressure | 1018mbar |
| 2. | Test date : 21st May, 2013 | | |
| | Tested By : Back Huang | | |

## Standard Requirement:

According to §22.355, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table below:

Frequency Tolerance for Transmitters in the Public Mobile Services

| Frequency Range (MHz) | Base, fixed (ppm) | Mobile ≤ 3 watts (ppm) | Mobile ≤ 3 watts (ppm) |
|---|---|---|---|
| 25 to 50 | 20.0 | 20.0 | 50.0 |
| 50 to 450 | 5.0 | 5.0 | 50.0 |
| 450 to 512 | 2.5 | 5.0 | 5.0 |
| 821 to 896 | 1.5 | 2.5 | 2.5 |
| 928 to 929. | 5.0 | N/A | N/A |
| 929 to 960. | 1.5 | N/A | N/A |
| 2110 to 2220 | 10.0 | N/A | N/A |

According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized frequency block.

## 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 ±0.00025% (±2.5ppm) of the center frequency.

## Test Results: Pass

**Frequency Stability versus Temperature:** The Frequency tolerance of the carrier signal shall be maintained within 2.5ppm of the operating frequency over a temperature variation of -10℃ to +55℃ at normal supply voltage.

## Cellular Band (Part 22H)

| Middle Channel, $f_o$ = 836.6 MHz | | | | |
|---|---|---|---|---|
| **Temperature (℃)** | **Power Supplied ($V_{DC}$)** | **Frequency Error (Hz)** | **Frequency Error (ppm)** | **Limit (ppm)** |
| -10 | 3.7 | 30 | 0.0359 | 2.5 |
| 0 | | 3 | 0.0036 | 2.5 |
| 10 | | 24 | 0.0287 | 2.5 |
| 20 | | 31 | 0.0371 | 2.5 |
| 30 | | -18 | -0.0215 | 2.5 |
| 40 | | 7 | 0.0084 | 2.5 |
| 50 | | 27 | 0.0323 | 2.5 |
| 55 | | 16 | 0.0191 | 2.5 |
| 25 | 4.2 | -21 | -0.0251 | 2.5 |
| | 3.5 | 6 | 0.0072 | 2.5 |

## PCS Band (Part 24E)

| Middle Channel, $f_o$ = 1880 MHz | | | | |
|---|---|---|---|---|
| **Temperature (℃)** | **Power Supplied ($V_{DC}$)** | **Frequency Error (Hz)** | **Frequency Error (ppm)** | **Limit (ppm)** |
| -10 | 3.7 | 25 | 0.0133 | 2.5 |
| 0 | | 24 | 0.0128 | 2.5 |
| 10 | | -15 | -0.0080 | 2.5 |
| 20 | | -13 | -0.0069 | 2.5 |
| 30 | | 20 | 0.0106 | 2.5 |
| 40 | | 4 | 0.0021 | 2.5 |
| 50 | | 22 | 0.0117 | 2.5 |
| 55 | | 9 | 0.0048 | 2.5 |
| 25 | 4.2 | -23 | -0.0122 | 2.5 |
| | 3.5 | 19 | 0.0101 | 2.5 |

# Annex A. TEST INSTRUMENT & METHOD

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

| Instrument | Model | Serial # | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| **RF conducted test** | | | | |
| Agilent ESA-E SERIES SPECTRUM ANALYZER | E4407B | CFG038 | 10/25/2012 | 10/24/2013 |
| Power Splitter | 1# | 1# | 02/02/2013 | 02/01/2014 |
| Universal Radio Communication Tester | CMU200 | 121393 | 02/21/2013 | 02/20/2014 |
| Temperature/Humidity Chamber | 1007H | N/A | 01/07/2013 | 01/06/2014 |
| DC Power Supply | E3640A | MY40004013 | 03/22/2013 | 03/21/2014 |
| **Radiated Emissions** | | | | |
| EMI test receiver | ESL6 | 100262 | 11/19/2012 | 11/19/2013 |
| Positioning Controller | UC3000 | MF780208282 | 11/19/2012 | 11/19/2013 |
| OPT 010 AMPLIFIER(0.1-1300MHz) | 8447E | 2727A02430 | 11/19/2012 | 11/19/2013 |
| Microwave Preamplifier(0.5～18GHz) | PAM-118 | 443008 | 11/08/2012 | 11/07/2013 |
| Bilog Antenna (30MHz~6GHz) | JB6 | A110712 | 1/27/2013 | 1/26/2014 |
| Bilog Antenna (30MHz~2GHz) | JB1 | A112107 | 2/9/2013 | 2/9/2014 |
| Double Ridge Horn Antenna (1 ~18GHz) | AH-118 | 071259 | 11/20/2012 | 11/19/2013 |
| Double Ridge Horn Antenna (1 ~18GHz) | AH-118 | 071283 | 11/20/2012 | 11/19/2013 |
| SYNTHESIZED SIGNAL GENERATOR | 8665B | 3744A01293 | 04/22/2013 | 04/22/2014 |
| Tunable Notch Filter | 3NF-800/1000-S | AA4 | 12/14/2012 | 12/13/2013 |
| Tunable Notch Filter | 3NF-1000/2000-S | AM 4 | 03/01/2013 | 02/28/2014 |
| Universal Radio Communication Tester | CMU200 | 121393 | 02/21/2013 | 02/20/2014 |

# Annex A. ii. RADIATED EMISSIONS TEST DESCRIPTION

## EUT Characterisation

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

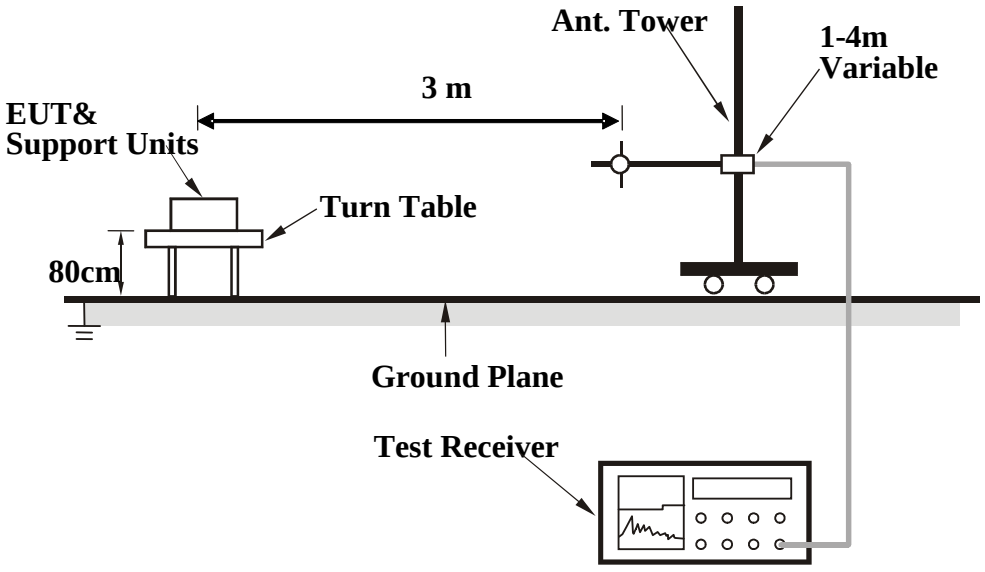
The EUT was placed in the chamber, at a height of about 0.8m on a turntable. Its radiated emissions frequency profile was observed, using a spectrum analyzer /receiver with the appropriate broadband antenna placed 3m or 10m away from the EUT. Radiated emissions from the EUT were maximised by rotating 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 3m 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:

Peak = Reading + Corrected Factor

where

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

And the average value is

Average = Peak Value + Duty Factor or

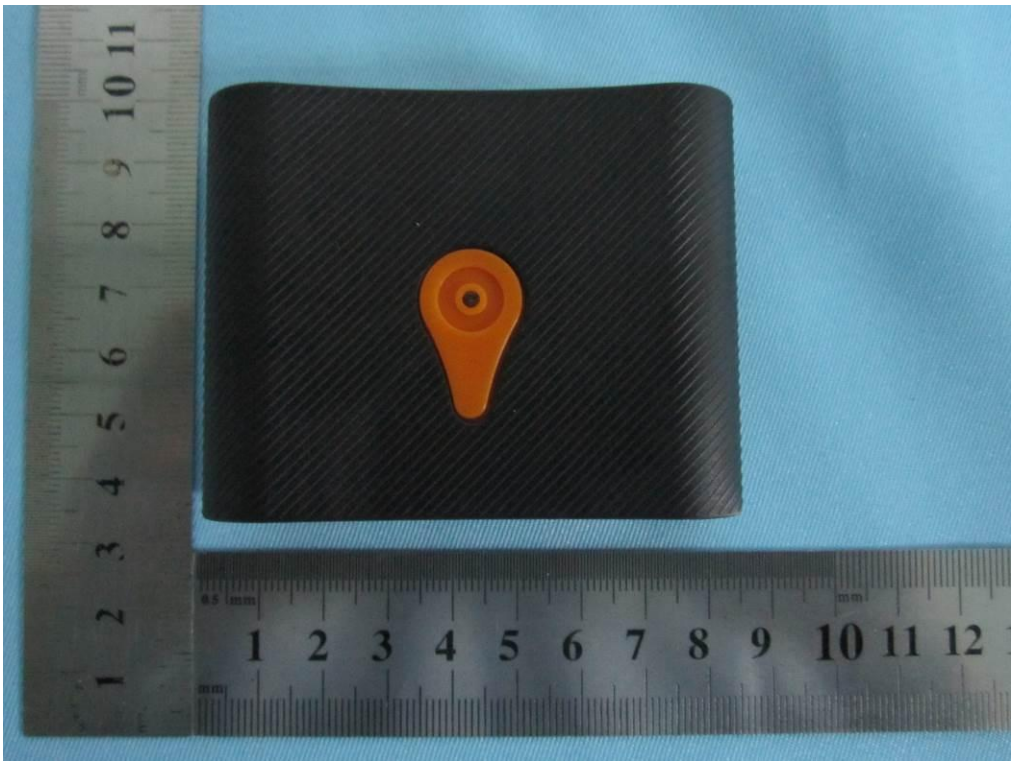
Set RBW = 1MHz, VBW = 10Hz.

Note:

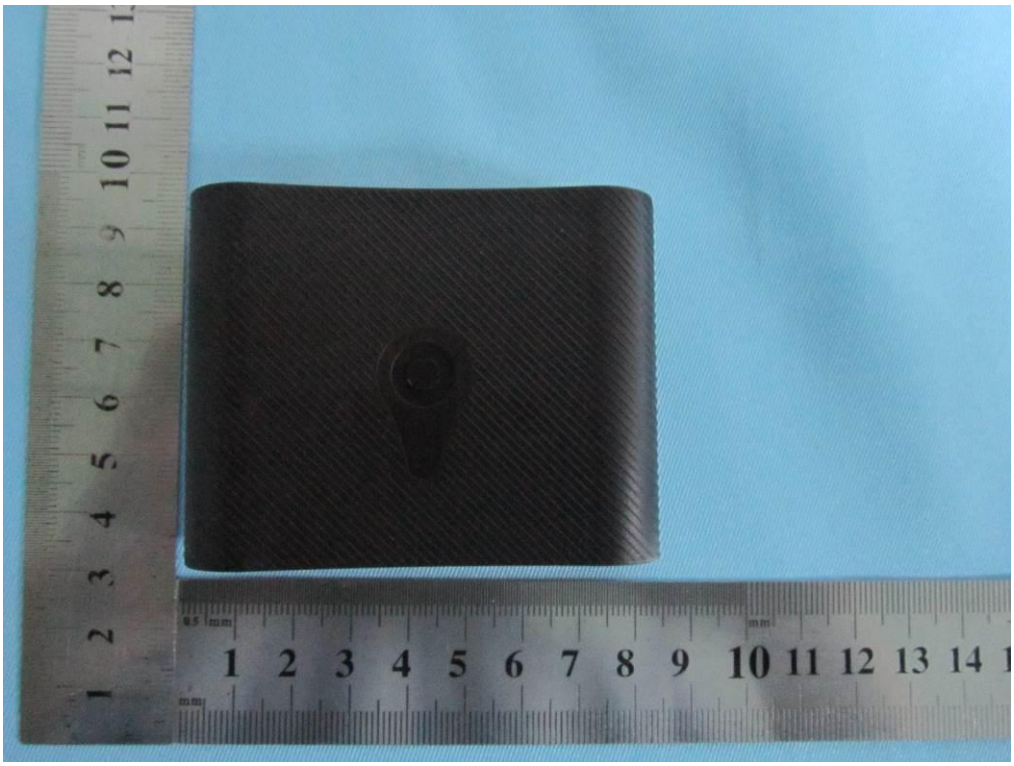
If the measured frequencies are fall in the restricted frequency band, the limit employed must be quasi peak value when frequencies are below or equal to 1 GHz. And the measuring instrument is set to quasi peak detector function.

# Annex B. EUT AND TEST SETUP PHOTOGRAPHS

## Annex B.i. Photograph 1: EUT External Photo



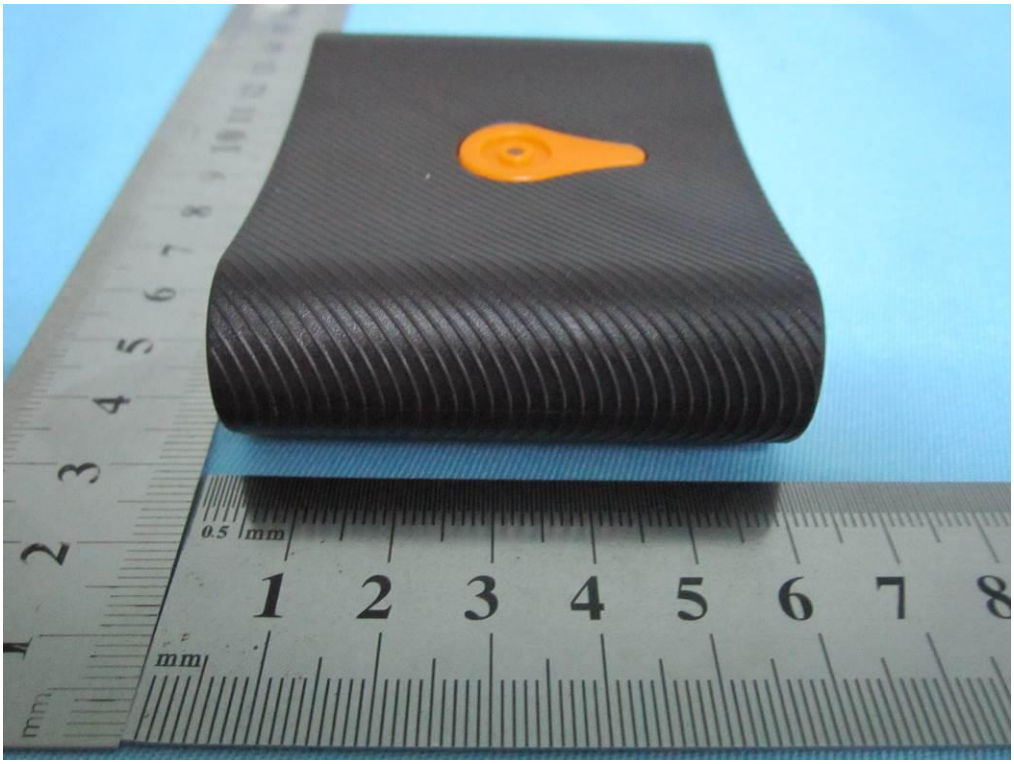
EUT - Front View



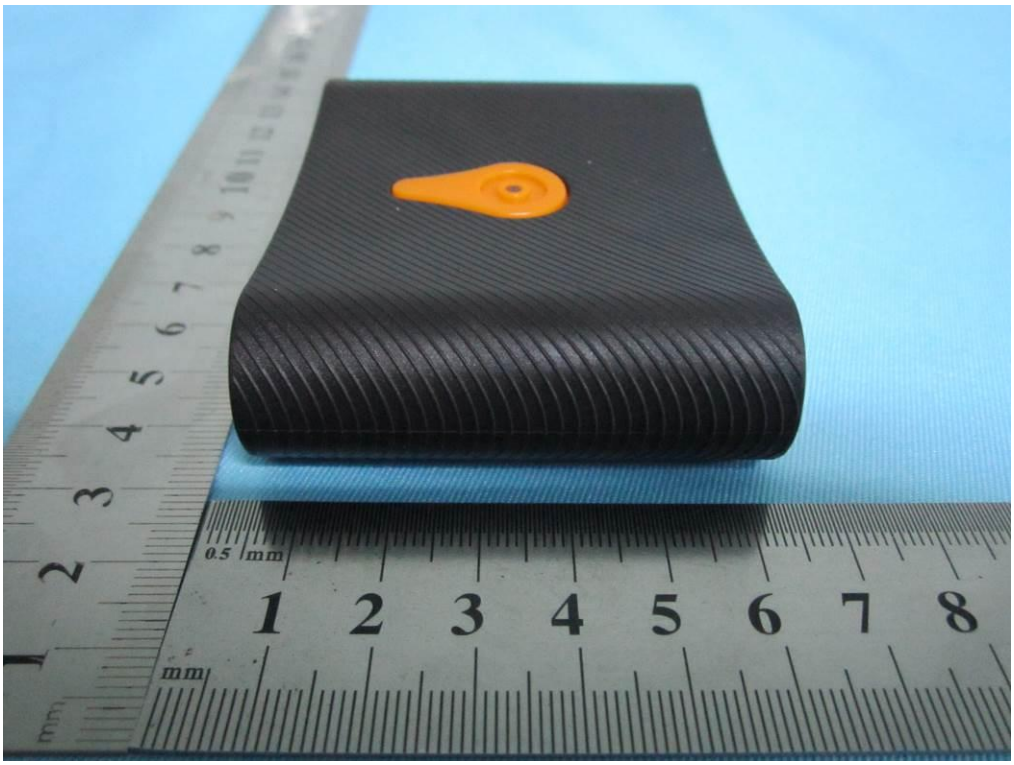
EUT - Rear View


EUT - Top View


EUT - Bottom View



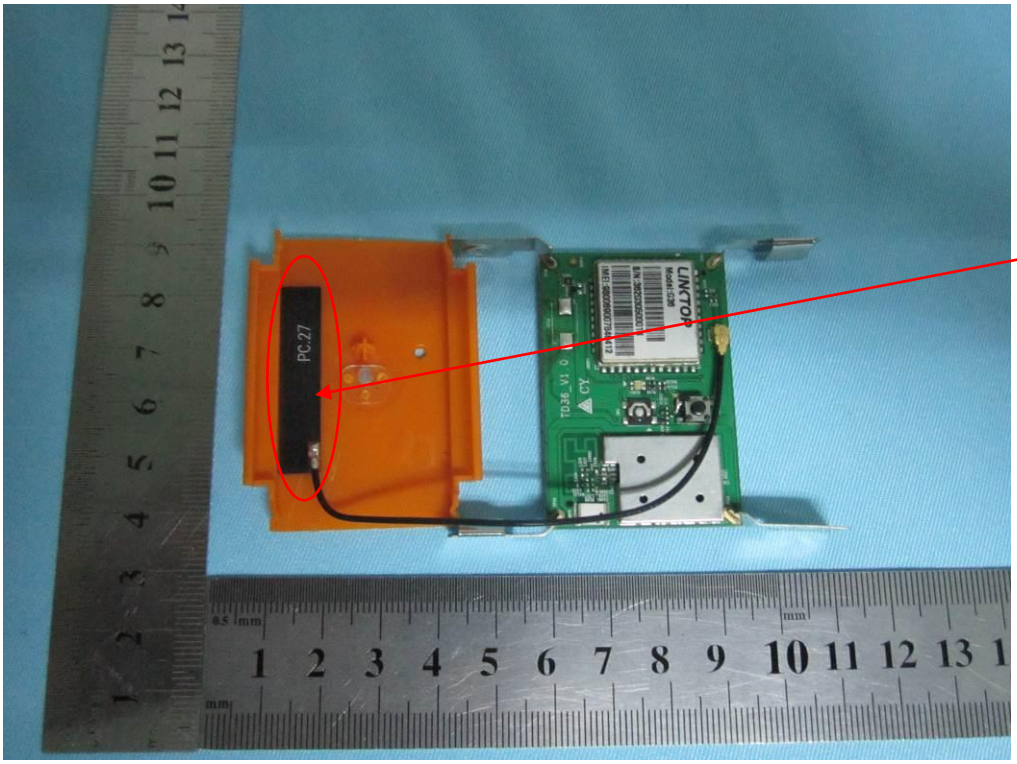

EUT - Left View



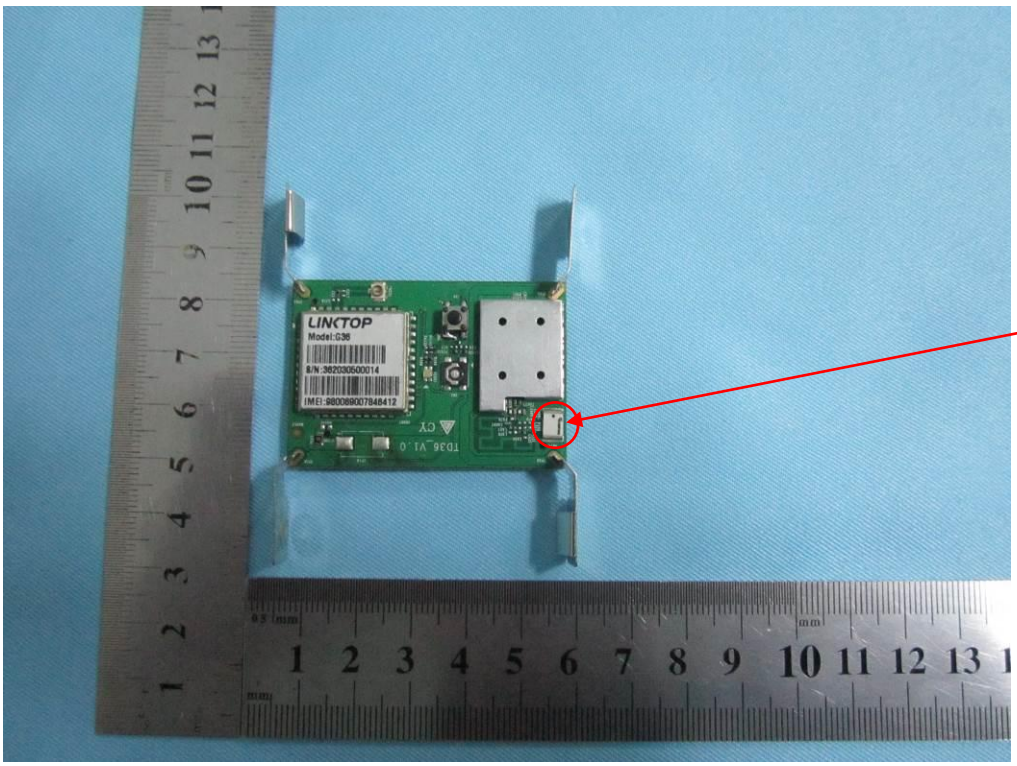

EUT - Right View

## Annex B.ii. Photograph 2: EUT Internal Photo

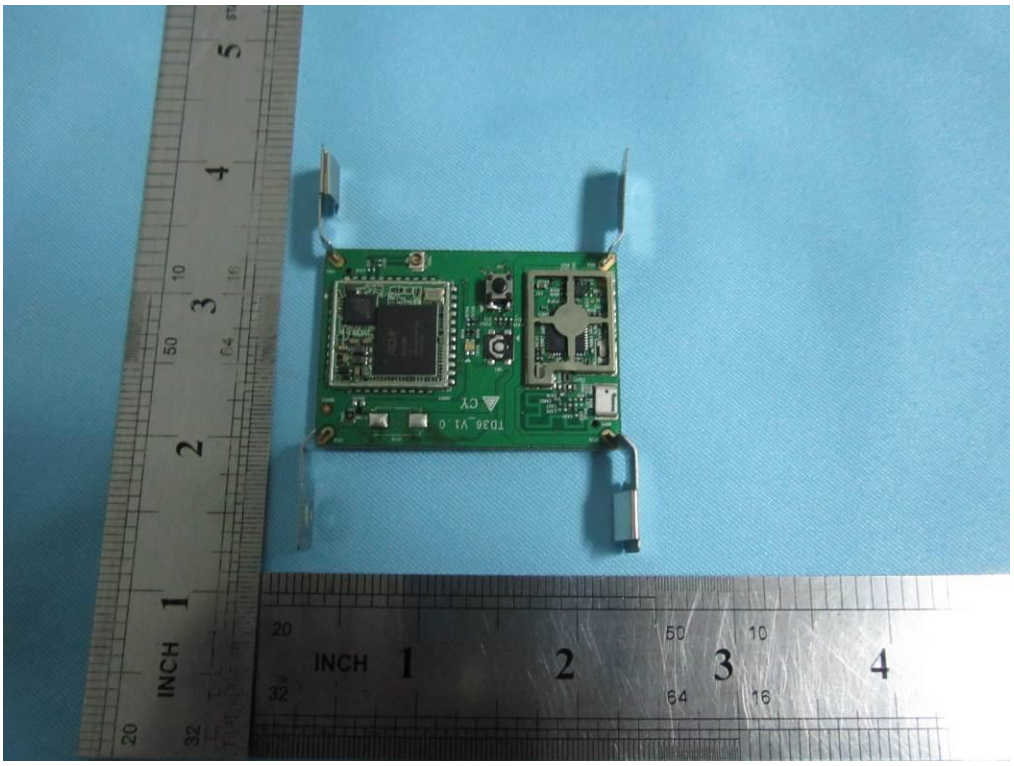
Cover Off - Top View



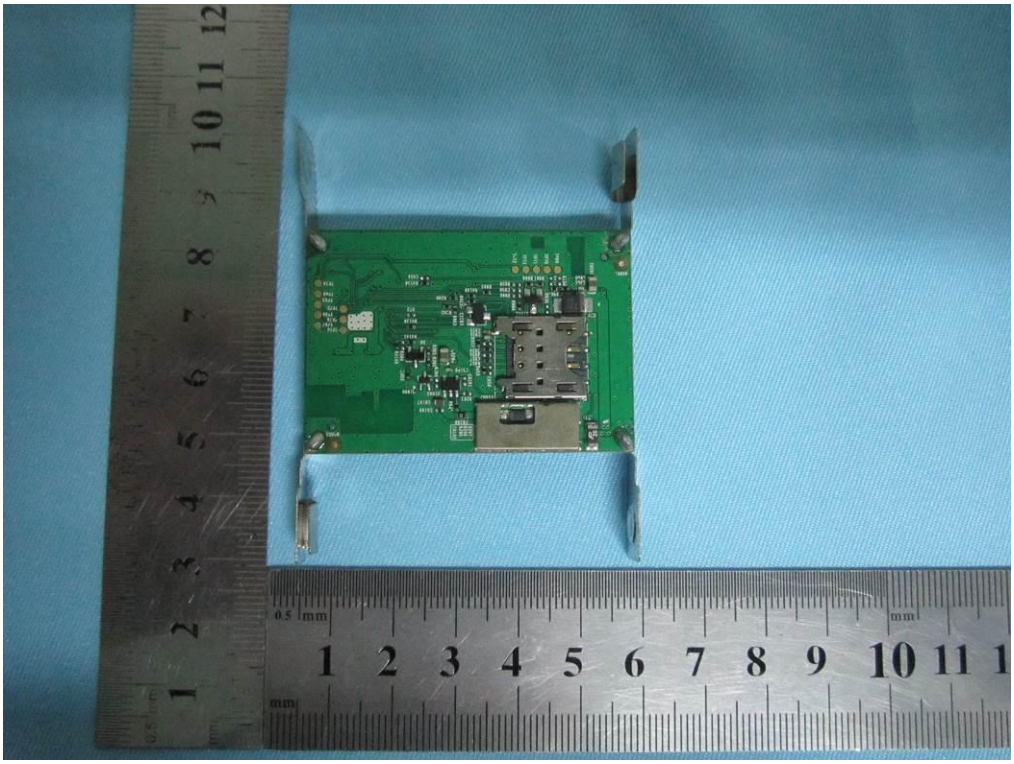

Cover Off – Main Borad View




Main Borad - Top View

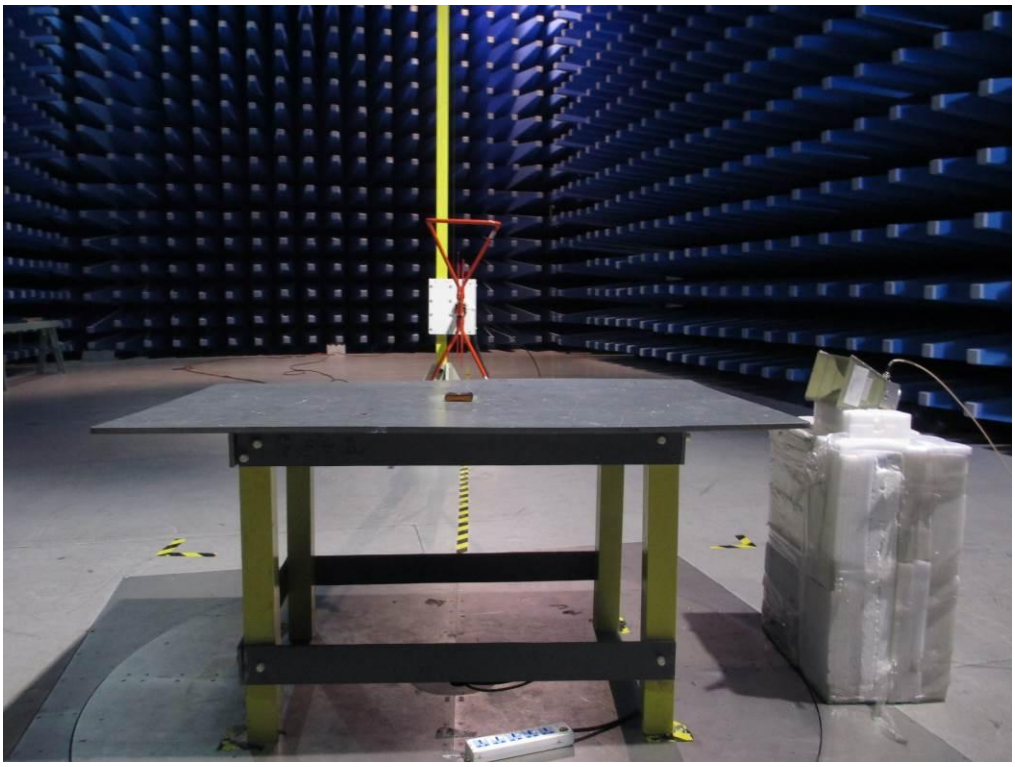


Main Borad Without Shielding - Top View

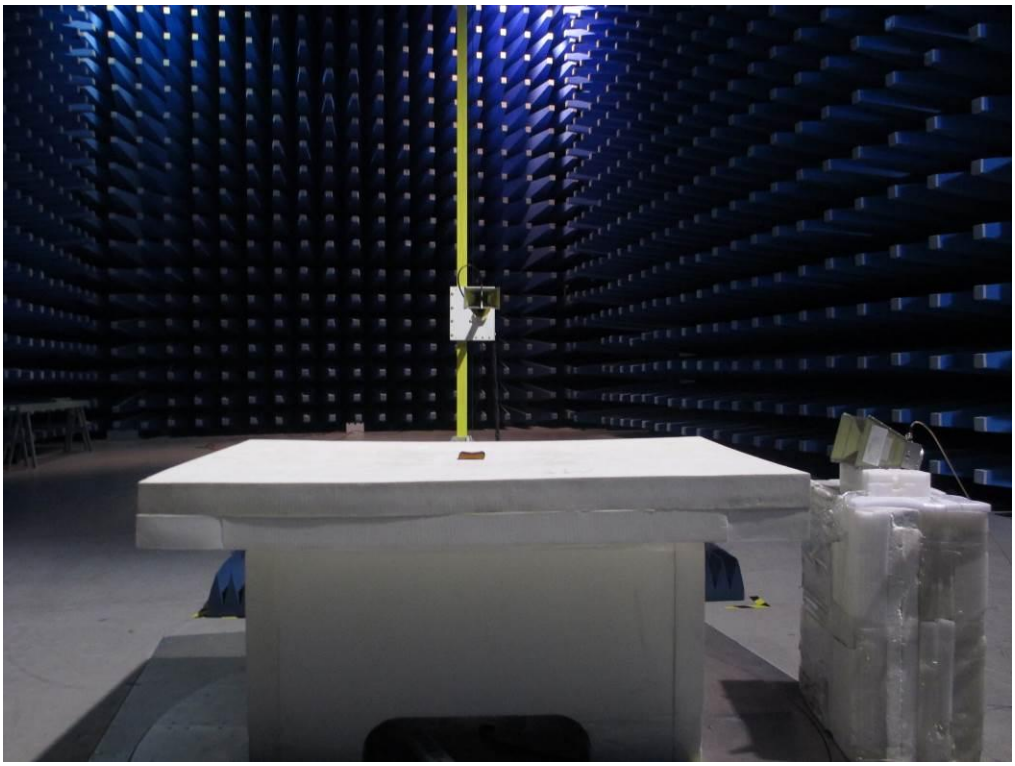


Main Borad - Bottom View

## Annex B.iii. Photograph 3: Test Setup Photo



Radiated Spurious Emissions Test Setup Below 1GHz - Front View



Radiated Spurious Emissions Test Setup Above 1GHz –Front View

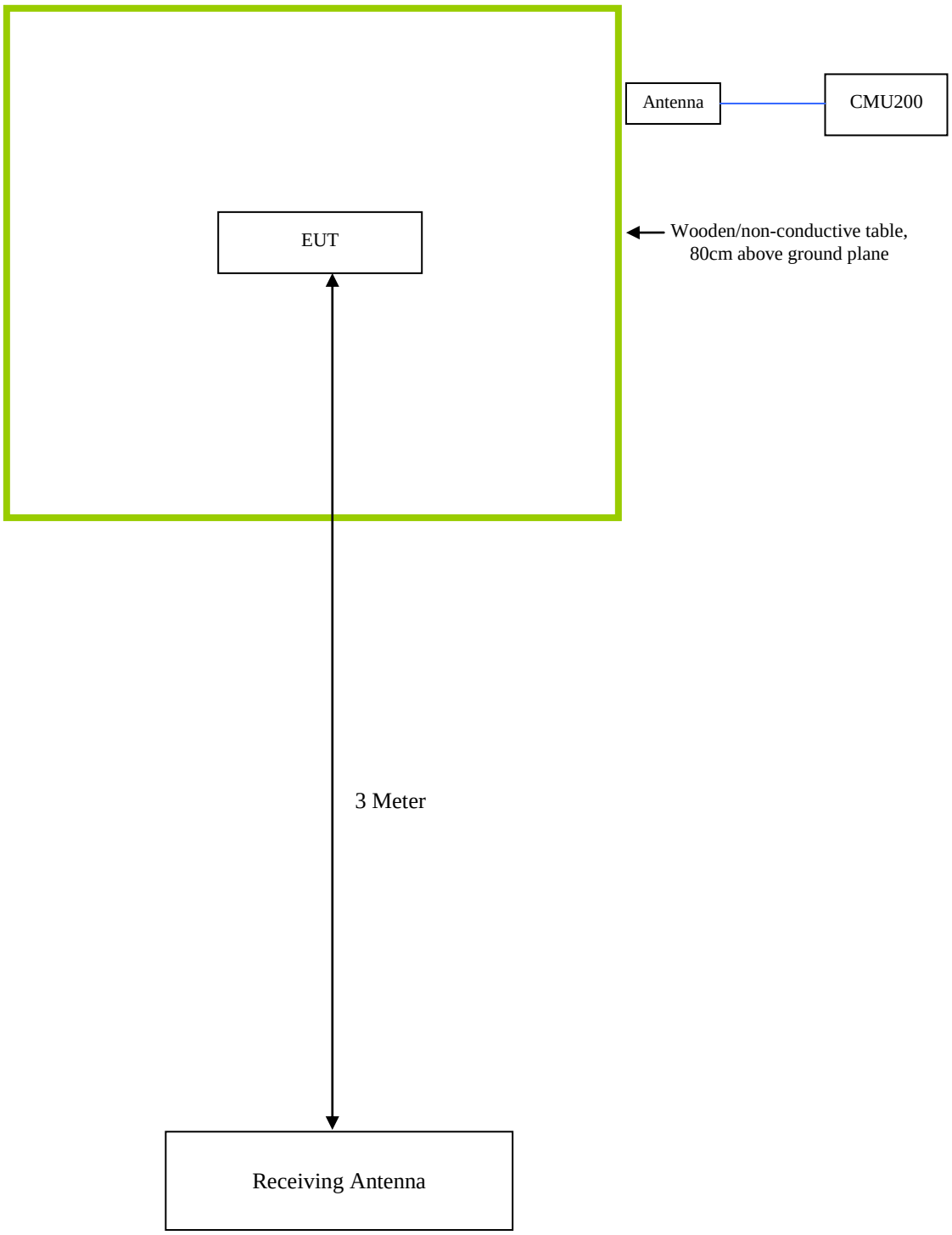
# Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

## 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.

## Block Configuration Diagram for Radiated Emissions



## 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 / SCHEMATICS / PART LIST

**Please see attachment**

# Annex E. DECLARATION OF SIMILARITY

Globatrac

To: SIEMIC , 775 Montague Expressway. Milpitas, CA 95035, USA

## Declaration Letter

Dear Sir,

We declare that the power supply of product is provided by 2 AA batteries, so the normal working voltage is 3.0V. There is a step-up DC-DC circuit in the PCBA, so the power supply of the GSM module is 3.7V.

Thank you!

Printed name/title: Harry Steck / Manager
Tel: 310-362-7200
Fax: 310-362-7255
Address: 2930 Westwood Blvd., Suite 250, Los Angeles, CA. 90064 USA