# FCC/IC Test Report

**FOR:**

**Manufacturer: 3SI Security Systems**

**Model Name: GT83000VP; GT83000R2; GT83100**

**Product Description: Asset Tracking and Alert Device**

**FCC ID: Q6KGT83000A**
**IC ID: 5043A-GT83000B**

**47 CFR Part 95**
**RSS-210 Issue 8**

**TEST REPORT #: EMC_3SISE-00313001_GT8xxxxFCC95**
**DATE: 2013-10-23**



**FCC:**
**A2LA Accredited**

**IC recognized #**
**3462B-1**

***CETECOM* Inc.**
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## 1 Assessment

**The following device was tested against the applicable criteria specified in FCC rules Parts 95 of Title 47 of the Code of Federal Regulations and Industry Canada Standards RSS 210 Issue 8 and no deviations were ascertained during the course of the tests performed.**

| Company | Description | Model # |
|---|---|---|
| 3SI Security Systems | Asset Tracking and Alert Device | GT83000VP; GT83000R2; GT83100 |

**This report is reviewed by:**

| Date | Section | Name | Signature |
|---|---|---|---|
| 2013-10-23 | Compliance | Tunji Yusuf (Test Lab Manager) |  |

**Responsible for the Report:**

| Date | Section | Name | Signature |
|---|---|---|---|
| 2013-10-23 | Compliance | Danh Le (EMC Engineer) |  |

# 2 Administrative Data

## 2.1 Identification of the Testing Laboratory Issuing the Test Report

| | |
|---|---|
| **Company Name:** | CETECOM Inc. |
| **Department:** | Compliance |
| **Address:** | 411 Dixon Landing Road<br>Milpitas, CA 95035<br>U.S.A. |
| **Telephone:** | +1 (408) 586 6200 |
| **Fax:** | +1 (408) 586 6299 |
| **Test Lab Manager:** | Tunji Yusuf |
| **Responsible Project Leader:** | Danh Le |

## 2.2 Identification of the Client

| | |
|---|---|
| **Applicant's Name:** | 3SI Security Systems, Inc |
| **Street Address:** | 486 Thomas Jones Way |
| **City/Zip Code** | Exton, PA 19341 |
| **Country** | USA |
| **Contact Person:** | Waldemar Sierocinski |
| **Phone No.** | 945-214-5398 |
| **e-mail:** | waldemar_sierocinski@3sisecurity.com |

## 2.3 Identification of the Manufacturer

| | |
|---|---|
| **Manufacturer's Name:** | Same as Client |
| **Manufacturers Address:** | |
| **City/Zip Code:** | |
| **Country:** | |

## 2.4 Environmental conditions during Test:

The following environmental conditions were maintained during the course of testing:
Ambient Temperature: 22 - 24°C
Relative humidity: 32%

## 2.5 Dates of Testing

Sept 5, 2013 - Sept 10, 2013.

# 3 Equipment under Test (EUT)

## 3.1 Specification of the Equipment under Test

| | |
|---|---|
| **Marketing Name:** | Cash Tracker |
| **Model No:** | GT83000VP, GT83000R2, GT83100 |
| **Product Type:** | Asset Tracking and Alert Device |
| **FCC-ID:** | Q6KGT83000A |
| **IC-ID :** | 5043A-GT83000B |
| **Frequency range of test:** | 216.475 MHz |
| **Type(s) of Modulation:** | None (CW),<br>Pulsed carrier signal with no modulation, 20% duty cycle (200ms/s) |
| **Number of channels:** | 1 |
| **Antenna Info:** | Magnetic Loop antenna<br>Gain: -51 dBd ± 3 dB (manufacturer declared value) |
| **Other radios in the device:** | GSM/GPRS 850/900/1800/1900 MHz<br>GPS Receiver: 1575.42 MHz |
| **Rated Operating Voltage Range(DC):** | Internal Battery Operated<br>3.3V (Min) / 3.7V (Nominal) / 4.2V (Max) |
| **Rated Operating Temperature Range:** | **GT83000VP/ GT83000R2/GT83100/:** $0^{o}$C to + $40^{o}$C |
| **Test Sample status:** | Production |

### 3.2 Identification of the Equipment under Test (EUT)

| EUT # | IMEI: | HW Version | SW Version | Model | Notes |
|---|---|---|---|---|---|
| **1** | 352599046090788 | 1.1 | 9.09.07 | GT83000VP | Radiated Sample |
| **2** | 352599044800071 | 1.1 | 11.01.10081 | GT83000R2 | Radiated Sample |
| **3** | 352964051425107 | 1.3 | 9.13.05 | GT83100 | Radiated Sample |

### 3.3 Testing notes

1. There are 4 variants of the EUT. **GT83000**, **GT83000VP**, **GT83000R2** and **GT83100**.
2. The manufacturer's has provided a product equality declaration that model variants **GT83000VP**, **GT83000R2** and **GT83100** incorporate the same VHF portion (Radio, Antenna and associated circuitry) as the base model **GT83000**.
3. Full testing was performed on base model **GT83000** and the data deemed sufficient to compliant the variant models to the applicable requirement. Refer to test report # EMC_3SIE-033-13001_GT83000_FCC95 for full compliance test data on the base model.
4. Additionally, output power and transmission unwanted emission were performed on model variances **GT83000VP**, **GT83000R2** and **GT83100**.
5. All samples have integral antennas. All test cases were performed using radiated test method.

## 4 Subject of Investigation

The objective of the measurements done by CETECOM Inc. was to measure the performance of the EUT as specified by requirements listed in the following test standards: FCC rules Part 95 of Title 47 of the Code of Federal Regulations and Industry Canada Standards RSS 210 Issue 8.

- 47 CFR 2: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communication Commission: Frequency allocations and radio treaty matters; general rules and regulations.
- 47 CFR 95: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communication Commission: Personal Radio Services.
- RSS 210 - Issue 8: Spectrum Management and Telecommunications – Radio Standards Specification; License-exempt Radio Apparatus (All Frequency Bands): Category I Equipment.

This report is to support a request for a Class 2 Permissive Change to add a part 95 frequency to an existing FCC approval under the FCC ID: Q6KGT83000A and to support an application for a new IC approval under IC ID: 5043A-GT83000B including that same frequency; as well as an IC Family approvals of the additional models GT83000VP, GT83000R2 and GT83100.

## 5 Summary of Measurement Results

| Test Specification | Test Case | Temperature and Voltage Conditions | Pass | Fail | NA | NP | Models Tested | Result |
|---|---|---|---|---|---|---|---|---|
| **FCC §95.639 (e) RSS-210 A4.3** | RF Output Power | Nominal | ■ | ☐ | ☐ | ☐ | GT83000VP, GT83000R2, GT83100 | Complies |
| **FCC §95.629 (c) (2) RSS-210 A5.3** | Frequency Tolerance | Nominal & Extreme | ☐ | ☐ | ☐ | ■ | | Note 1 |
| **§95.633(d) (3) RSS Gen Sect. 4.6** | Occupied Bandwidth | Nominal | ☐ | ☐ | ☐ | ■ | | Note 1 |
| **§95.635 (c) (2) (i) RSS210 A4.3 Mask D (a)** | Transmit Spectrum Mask | Nominal | ■ | ☐ | ☐ | ☐ | GT83000VP, GT83000R2, GT83100 | Complies |
| **§95.635 (c) (2) (ii) RSS210 A4.3 Mask D (b)** | Radiated Spurious Emissions | Nominal | ■ | ☐ | ☐ | ☐ | GT83000VP, GT83000R2, GT83100 | Complies |
| **§95.635 (c) (2) RSS210 A4.3 Mask D** | Conducted Spurious Emissions | Nominal | ☐ | ☐ | ■ | ☐ | | Note 2 |

**Note:** NA = Not Applicable; NP = Not Performed

Note 1: See CETECOM Inc test report **EMC_3SISE-033-13001_GT83000_FCC95** dated 2013-09-24 for test data.

Note 2: EUT contains an integral antenna.

# 6 Radiated Peak Output Power

## 6.1 References

FCC: 2.1046, 95.639(e)
RSS 210: A4.3

## 6.2 Limits

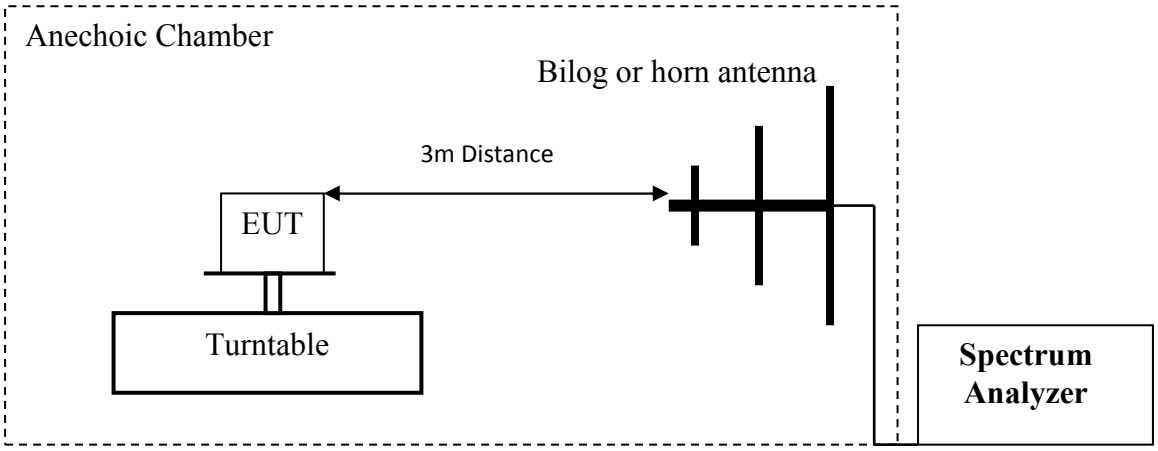
FCC: The maximum transmitter output power authorized for LPRS stations is 100 mW (20dBm).
RSS 210: The peak output power shall not exceed 100 mW (20 dBm) or 160 mW (22 dBm) EIRP.

## 6.3 Test Conditions

Tnom: 24°C
Vnom: 3.7 V dc

## 6.4 Radiated Measurement Procedure

**Ref: ANSI/TIA-603-C-2004 & RSS-Gen Section 4.8.**
**Effective Radiated Power (ERP) or Effective Isotropic Radiated Power (EIRP)**




1. Connect the equipment as shown in the above diagram with the EUT's antenna in a vertical orientation.
2. Set the EUT in continuous transmission mode with its maximum power @ 98% - 100% duty cycle.
3. Set the spectrum analyzer to the channel frequency of interest.
4. Maximize the emission amplitude by rotating the turntable 0 - 360°, adjusting the measuring antenna height from 1 – 4 m & changing antenna polarity.
5. Repeat steps 4 with all antennas different polarity and determine the maximized polarity for measurement. Measure and record the peak level of field strength (**LVL**) in dBuV.
6. Adjust correction factors to the measured field strength (**LVL**) and using the field strength approach calculation to convert FS from dBuV to transmitter output power (EIRP) in Watts using the following equations:
7. Correction factors (**CF**) in dB = Antenna factor (dB) + Cable loss (dB).
   **LVLc** (dBuV) = **LVL**(dBdBuV) + **Correction Factors** (dB)
   **EIRP** (W) = (**LVLc** (V/m) x D)² / (30 x G)
8. Convert Watt to dBm (logarithmic), using the following formula:
   EIRP (dBm) = 10 log (W x 1000)
9. Manually peak search, record readings and save data.
   N**ote:** Steps 7 above are performed prior to testing and **CF** was entered in the test software. Steps 3, 4, 5, 6 and 8 above are performed and controlled by test software.)

## 6.5 Measurement Settings

RBW ≥ OBW; VBW ≥ RBW or 3 x RBW
Span= 2 x RBW or wide enough to capture bandwidth of emission being measured
Detector = Peak; Trace = Max Hold
Sweep time: Auto.

## 6.6 Measurement Uncertainty

+/- 3 dB

## 6.7 Sample Calculations for Radiated Measurements

When the EUT power is measured by using radiated test method, the EIRP can be directly determined using the field strength (linear) approach calculation by applying the following equations:

(1) FS (dBuV/m) = Measured FS (dBuV/m) + CF (dB)

Where

- CF = Ant. Factor + Cable Loss – Ext. Amp Gain (if required)
- FS = electric field strength in dBuV/m

Then convert from dBuV to V/m by using the equation (2):

(2) FS (V/m) $= 10^{(\frac{dBuV}{m}-120)/20}$

The EIRP (dBm) is calculated by using equation (3):

(3) EIRP (dBm) $= 10\,Log\,(\frac{(FS \times D)^2}{30} x\,1000)$

- FS = electric filed strength in V/m
- D = measurement distance in meters (m)
- 30 = basic free space propagation path loss

| **Frequency (MHz)** | **Measured Field Strength** (FS) (dBµV/m) | **Correction Factors** (CF) (dB) | **Calculated FS** FS +CF (dBuV/m) | **Calculated FS** @ 3m (V/M) | **Calculated EIRP** (dBm) |
|---|---|---|---|---|---|
| 1000 | 40 | 12 | 52 | 0.0004 | -43.23 |

## 6.8 Test Results

| **Model: GT83000VP** | | | | | |
|---|---|---|---|---|---|
| **Frequency (MHz)** | **Antenna Polarity (H/V)** | **Antenna Height (m)** | **Angle ( $^{o}$ )** | **ERP (dBm)** | **Conducted Output Power ERP - Ant.G (dBd) (dBm)** |
| **216.475** | H | 1.25 | 188 | -39.82 | 11.18 |
| **Model: GT83000R2** | | | | | |
| **Frequency (MHz)** | **Antenna Polarity (H/V)** | **Antenna Height (m)** | **Angle ( $^{o}$ )** | **ERP (dBm)** | **Conducted Output Power ERP - Ant.G (dBd) (dBm)** |
| **216.475** | H | 1.3 | 28.6 | - 39.23 | 11.77 |
| **Model: GT83100** | | | | | |
| **Frequency (MHz)** | **Antenna Polarity (H/V)** | **Antenna Height (m)** | **Angle ( $^{o}$ )** | **ERP (dBm)** | **Conducted Output Power ERP - Ant.G (dBd) (dBm)** |
| **216.475** | H | 1.45 | 28.8 | - 37.97 | 13.03 |

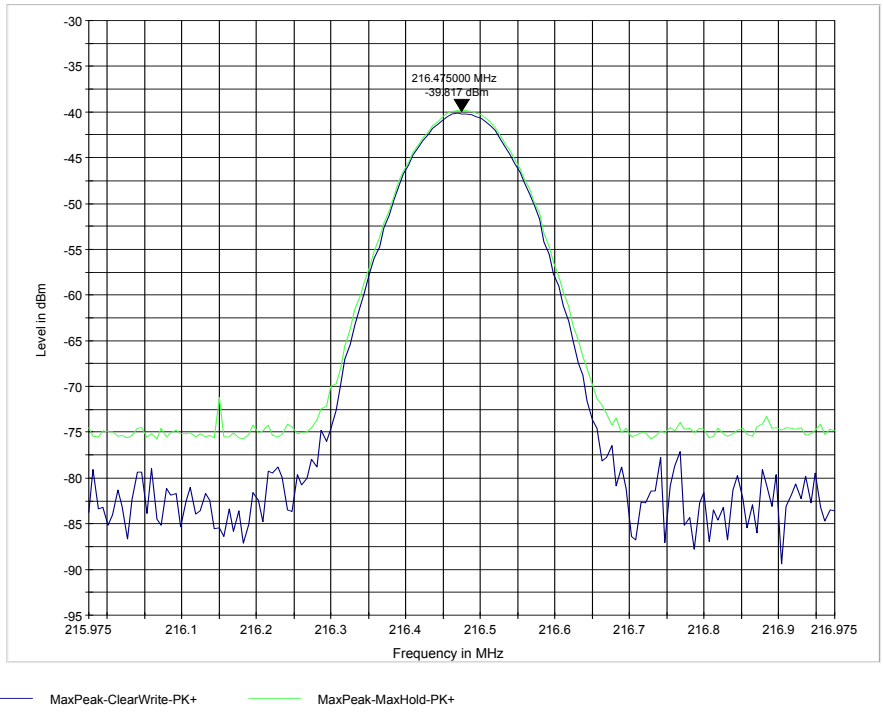
**Note**: The worst case emissions show in the horizontal antenna polarization.

## 6.9 Measurement Verdict

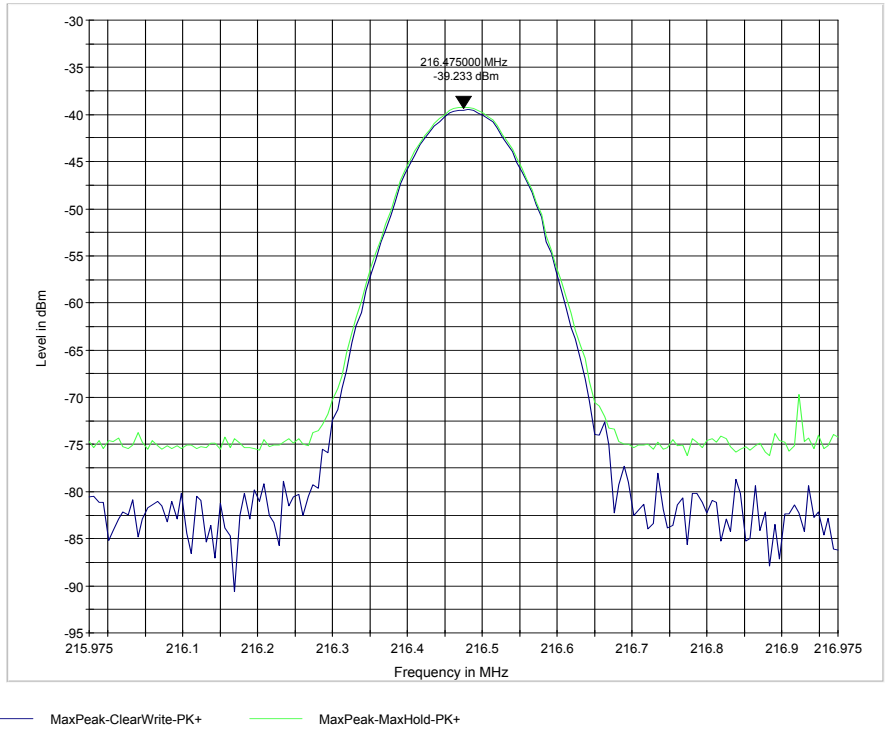
Pass.

## 6.10 Measurement Plots

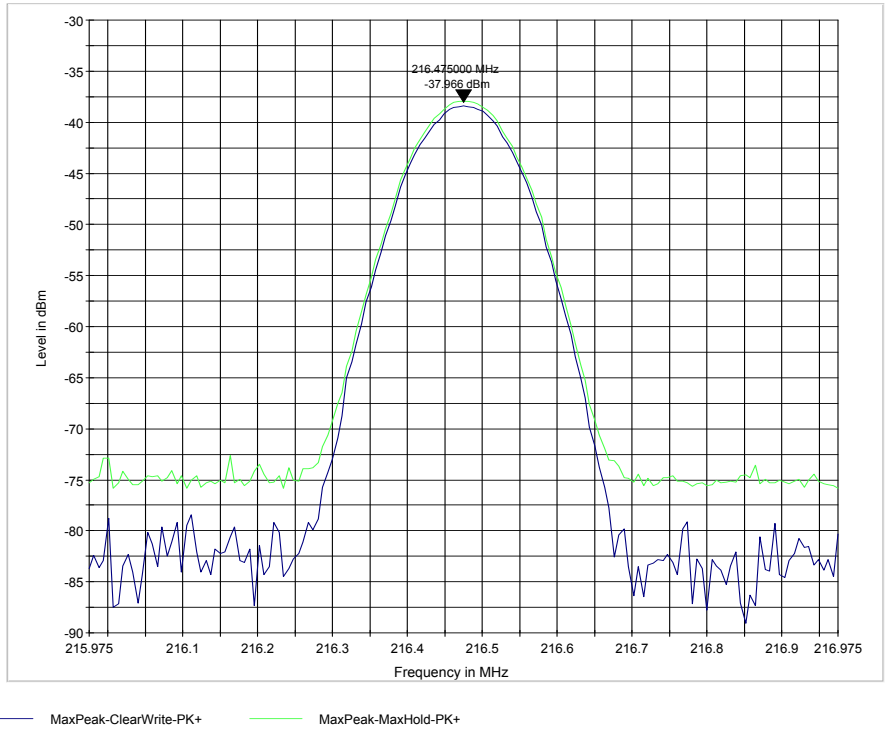
### Radiated Peak Power – GT83000VP




### Radiated Peak Power – GT83000R2



## Radiated Peak Power – GT83100



## 7 Modulation Characteristics

The transmitter emits a pulsed carrier signal without modulation.

# 8 Transmitter Unwanted Emissions – Radiated

## 8.1 References

FCC: 95.635 (c) (2)
RSS 210 A4.3 Mask D

## 8.2 Limits

According to FCC CFR 47 section 95.635 (c) (2)
Emissions for LPRS transmitters operating on extra band channels (50 kHz) shall be attenuated below the un-modulated carrier in accordance with the followings:

1) Emissions more than 25 kHz to 35 kHz from the channel center frequency: at least 30dB; and
2) Emissions more than 35 kHz away from the channel center frequency: at least 43 + 10 log (carrier power in watts) dB.
   **FCC:** -13 dBm

According to RSS 210 A4.3
The following unwanted emissions mask shall be measured with the measurement meter in peak mode and a bandwidth of at least 300 Hz. Unwanted emissions shall be attenuated below the peak transmitter output power (P, watts) in accordance with the following mask:
Mask **D**

i) At least 30dB for emissions 25 kHz to 35 kHz removed from the channel center frequency: and
ii) At least 55 + 10 log (carrier power in watts) dB or to the general field strength limits list in RSS-Gen, whichever is less stringent, for emissions more than 35 kHz removed from the channel center frequency.
   **IC:** -25 dBm

## 8.3 Measurement Settings

For emissions measurement 25 kHz to 35 kHz from center frequency:

RBW=500 Hz for measurements
VBW=RBW or 3x RBW
Span= 100 kHz or sufficient to capture the entire frequency range to be investigated

For emissions measurement more than 35 kHz away from the channel center frequency:

RBW=100 kHz for measurements < 1GHz
RBW=1MHz for measurements > 1GHz
VBW=RBW or 3x RBW
Span= Entire range of measuring antenna or in segment
Detector: Peak- Max Hold
Peak- Max Hold
Sweep time: Auto.

## 8.4 Test Conditions

**Tnom**: 22°C
**Vnom**: 3.7 V dc

## 8.5 Radiated test procedure for transmitter unwanted emissions
**Ref: ANSI C63.4:2009**

**Refer to section 10 for test setup diagrams.**

1. Connect the equipment as shown in the above diagram with the EUT's antenna in a horizontal orientation.
2. The EUT was set to continuous transmission mode with its maximum power @ 100% duty cycle.
3. Set the spectrum analyzer to measure peak hold with the required settings.
4. Rotate the EUT 360°. Raise the measurement antenna up to 4 meters in 0.5 meters increments and rotate the EUT 360° at each height to maximize all emissions. Measure and record all spurious emissions (**LVL**) up to the tenth harmonic of the carrier frequency.
5. Repeat steps 4, 5 and 6 with all antennas vertically polarized and determine the maximized polarity for measurement.
6. Select 6 closest readings or more to the limits for measurements.
7. Determine the level of spurious emissions using the following equation:
   **LVLc** (dBuV) = Measured **LVL** (dBuV) + **CF**
8. Correction factors in dB **(CF)** = Antenna factor (dB) + Cable loss (dB).
9. Convert the adjusted **LVLc** from dBuV/m to dBm using the following formula:

   **LVLc** (dBm) = $10\,Log\ (\frac{(FS \times D)^2}{30} \times 1000)$

10. Manually peak search, record reading in dBm and save data.

(N**ote:** Steps 8 above are performed prior to testing and **CF** is entered in test software. Steps 3, 4, 5, 6, 7 and 9 above are performed with test software.)

**Measurement Surve**y:
The site is constructed in accordance with ANSI C63.4 requirements and is recognized by the FCC to be in compliance for a 3m site. The spectrum is scanned from 30MHz to the 10$^{th}$ harmonic of the highest frequency generated by the EUT. Measurements are to be performed from 30 MHz to the 6 GHz with the EUT set to the main operating frequency.

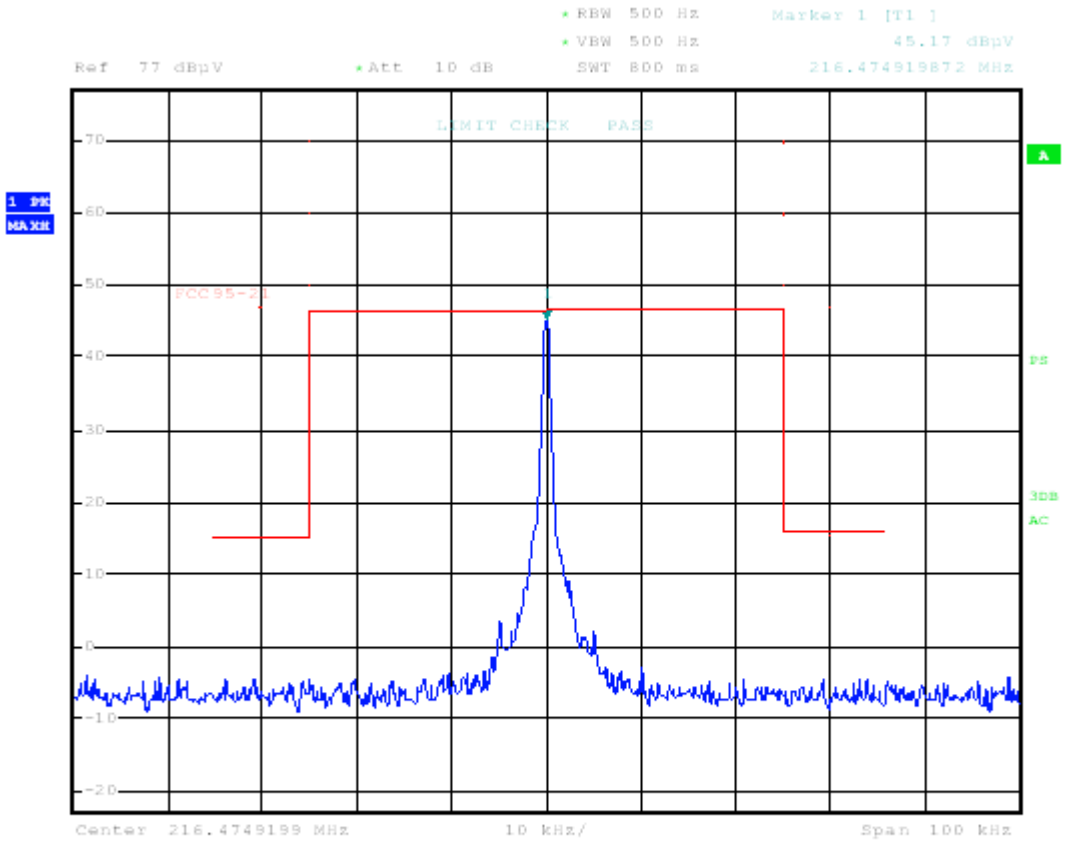
For radiated measurements, all data in this report shows the worst case emissions data between H/V antenna polarizations and for all 3 orthogonal orientations of the EUT.

## 8.6 Measurement Uncertainty
+/- 3 dB

## 8.7 Measurement Verdict
Pass.

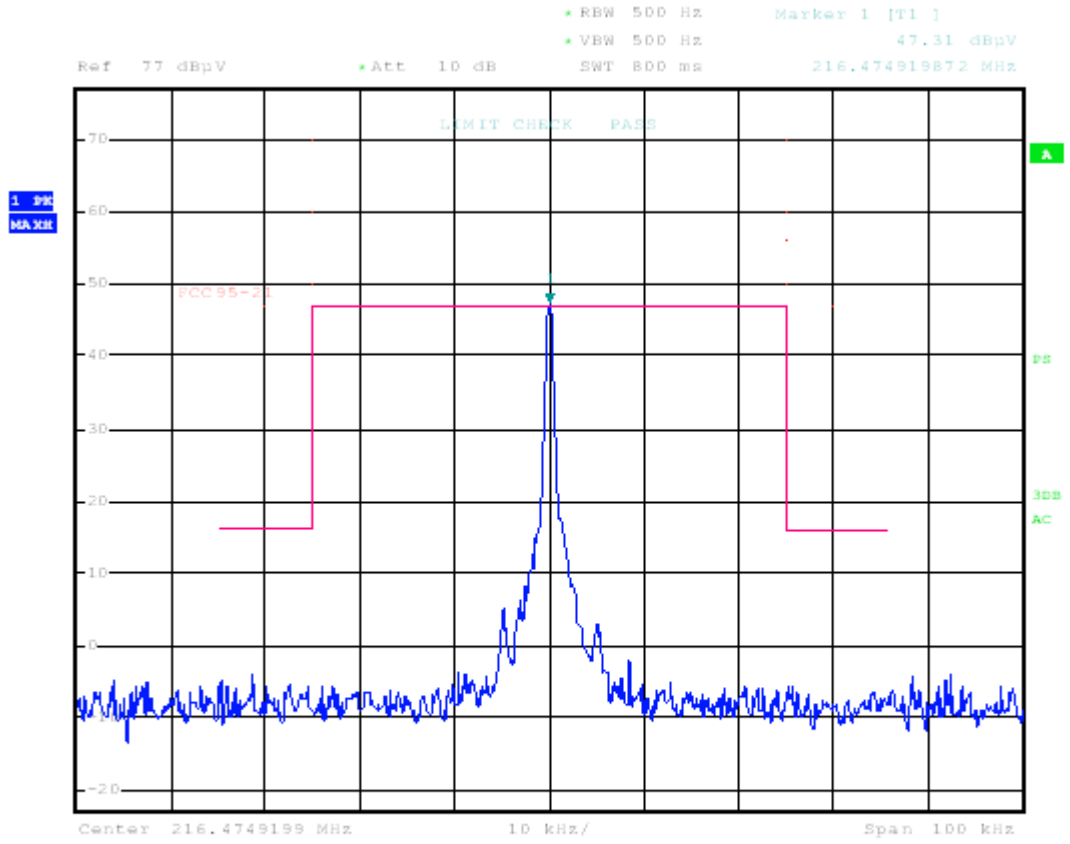
## 8.8 Measurement Plots

### 30 dB down Emission Mask – GT83000VP




Date: 10.SEP.2013 04:46:25

**30 dB down Emission Mask – GT83000R2**

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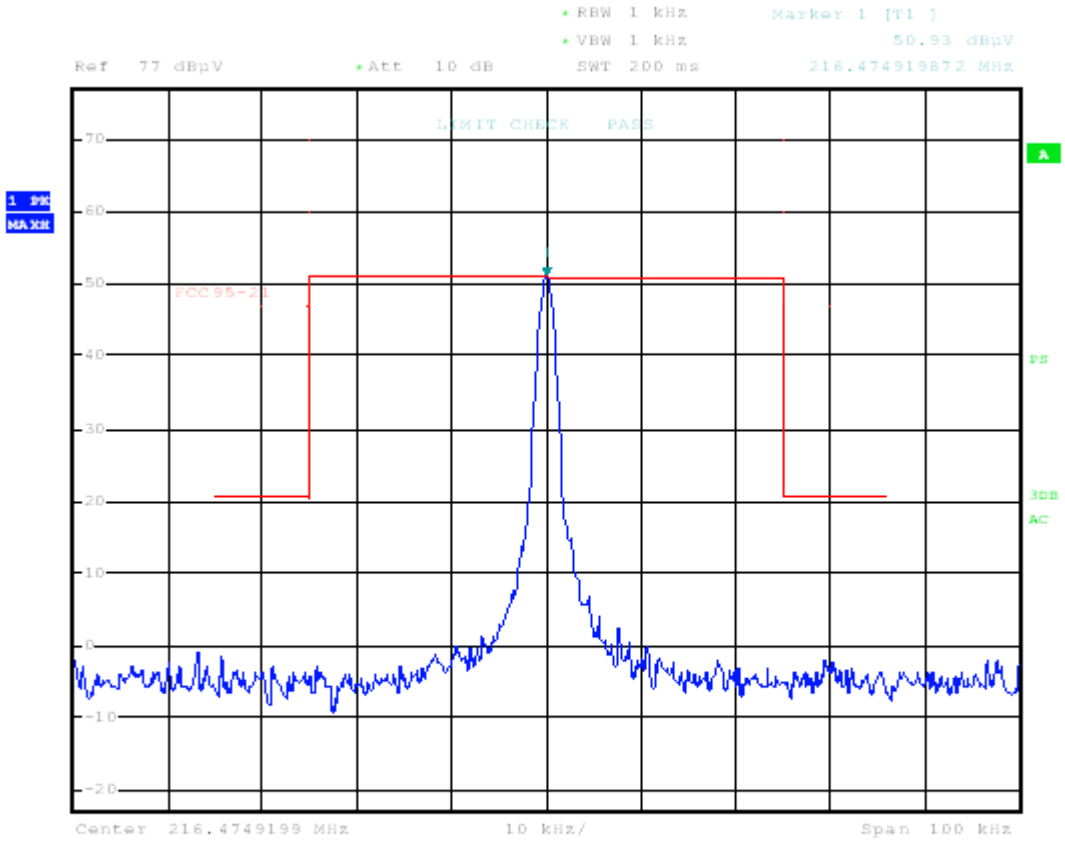
**30 dB down Emission Mask – GT83100**

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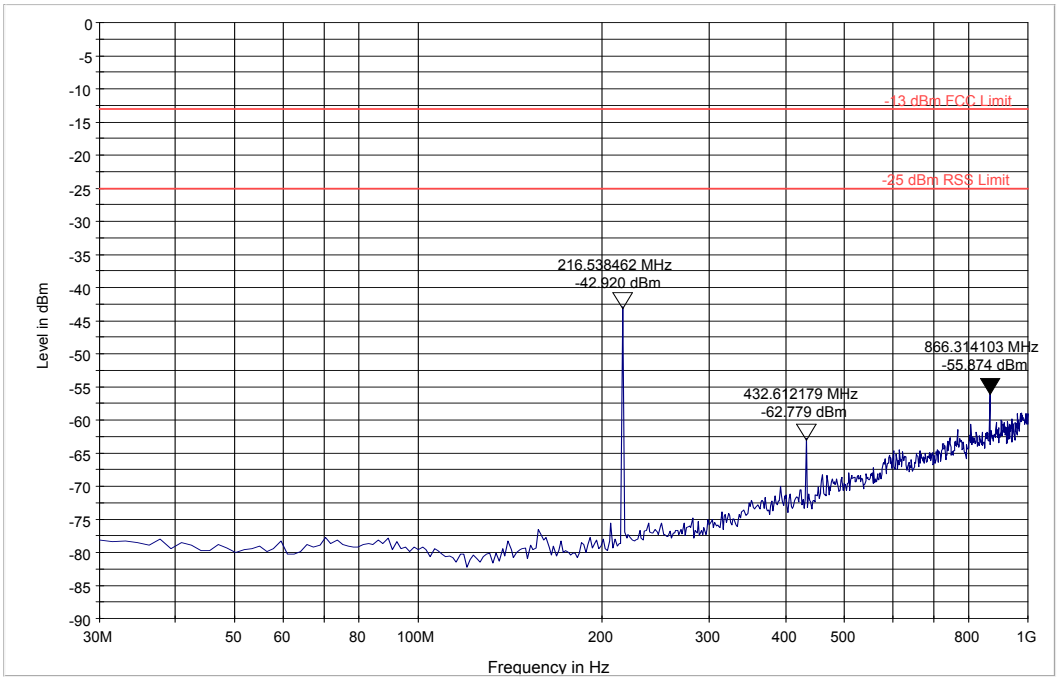
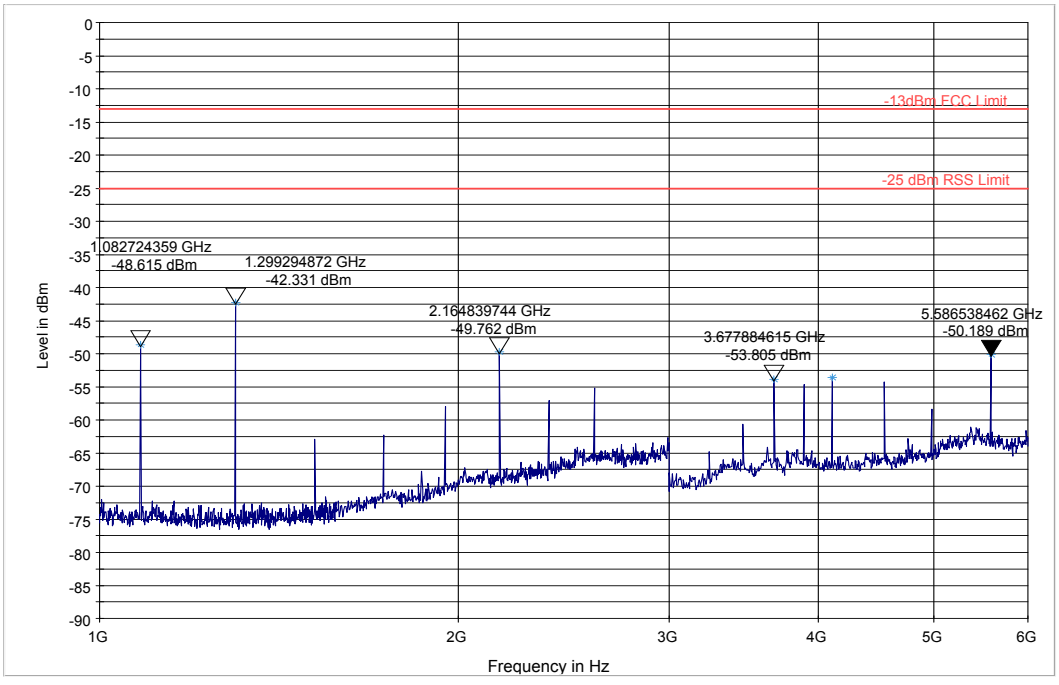
## 8.9 Measurement Plots

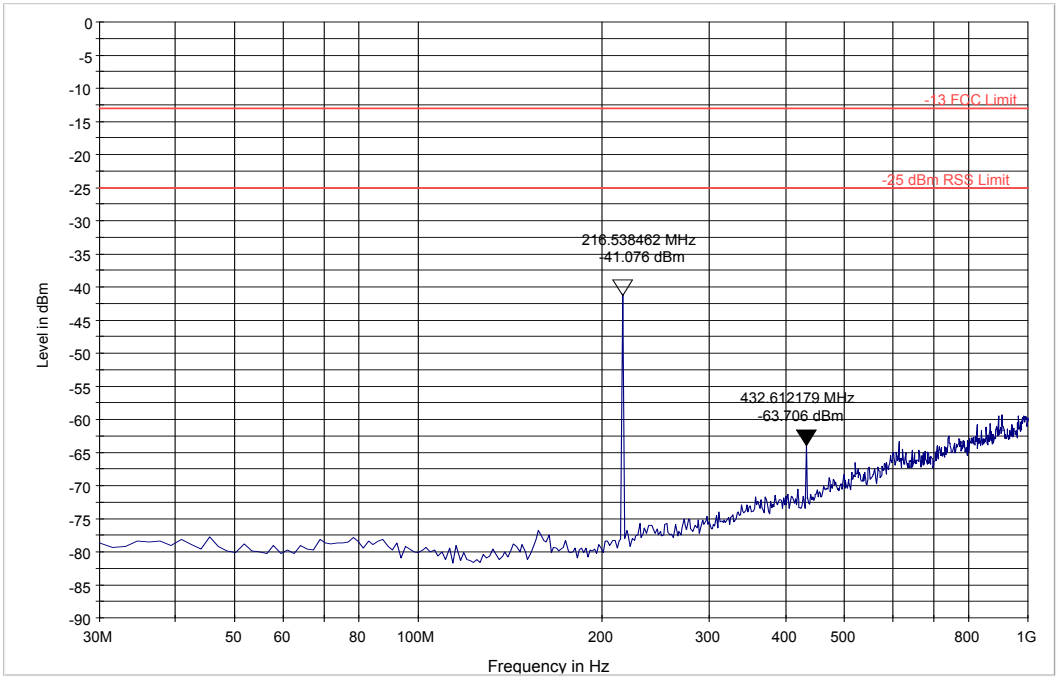
### Spurious Emission: 30MHz – 1GHz – GT83000VP




### Spurious Emissions: 1 GHz – 6GHz – GT83000VP

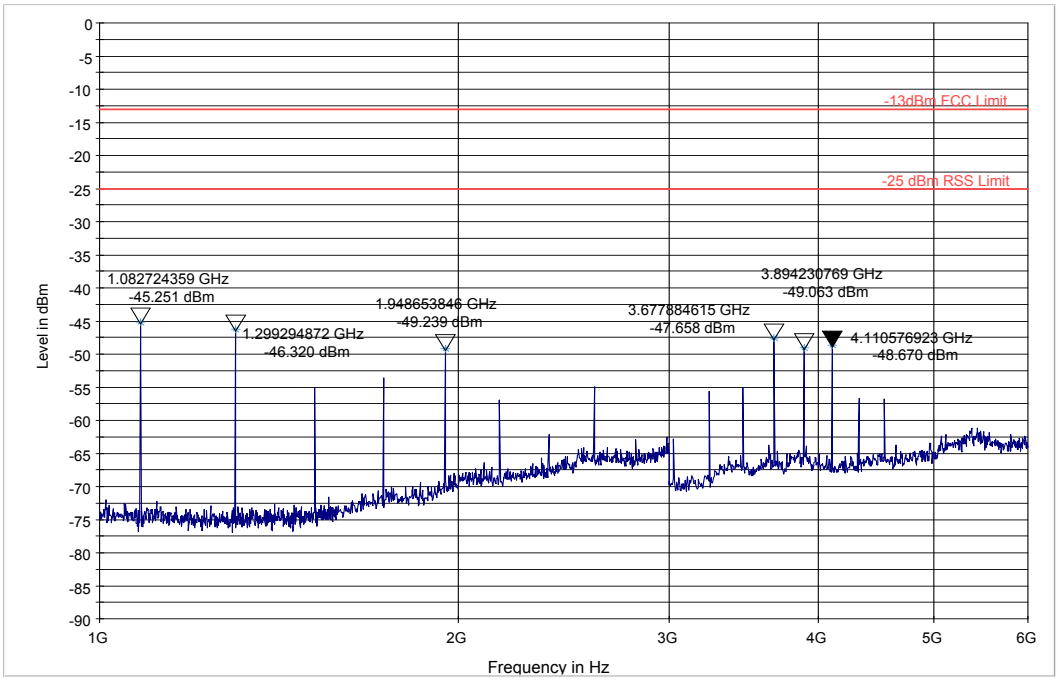


## Spurious Emissions: 30MHz – 1GHz – GT83000R2



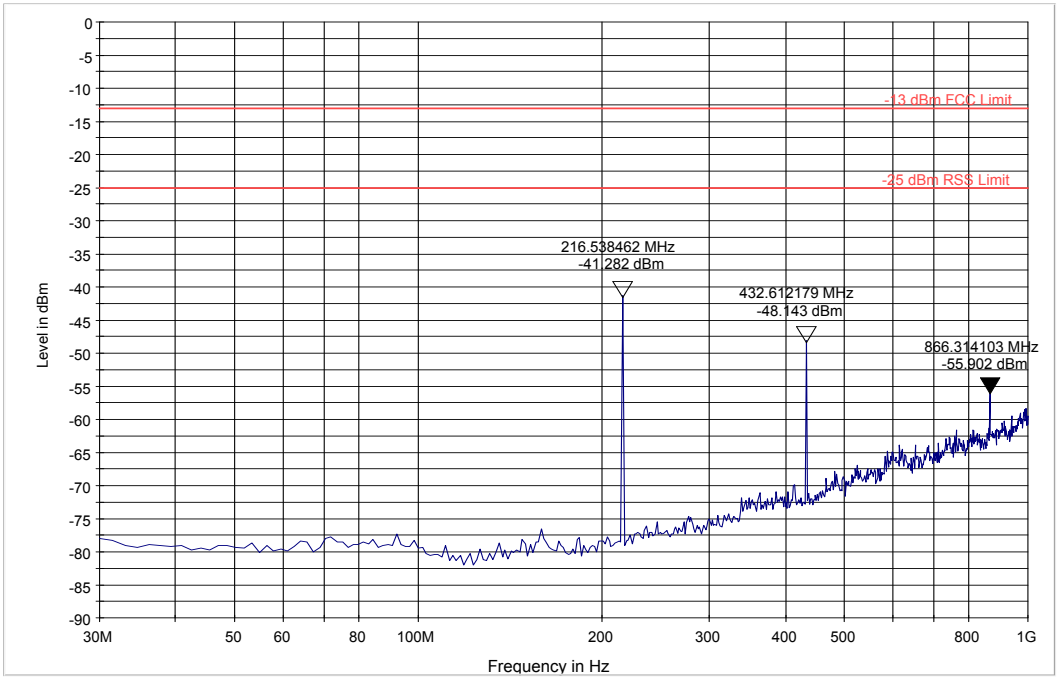

-13 FCC Limit  Preview Result 1-PK+  -25 dBm RSS Limit

## Spurious Emissions: 1GHz – 6GHz – GT83000R2

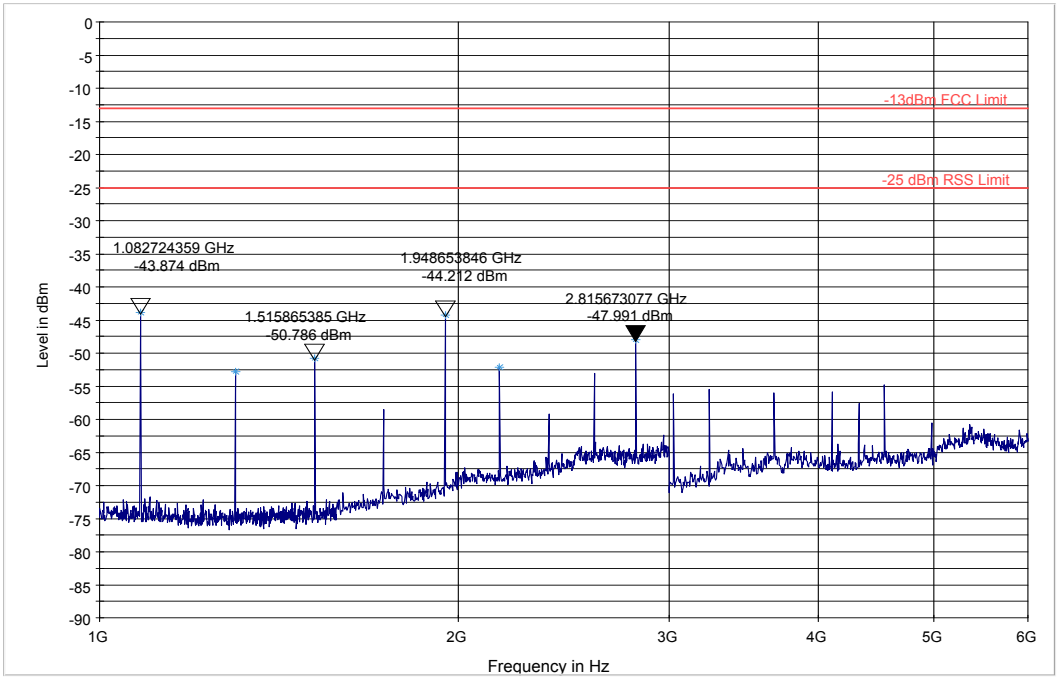



-13dBm  Preview Result 1-PK+  Data Reduction Result 1 [3]-PK+  -25 dBm RSS Limit

## Spurious Emissions: 30MHz – 1GHz – GT83100




## Spurious Emissions: 1GHz - 6GHz – GT83100



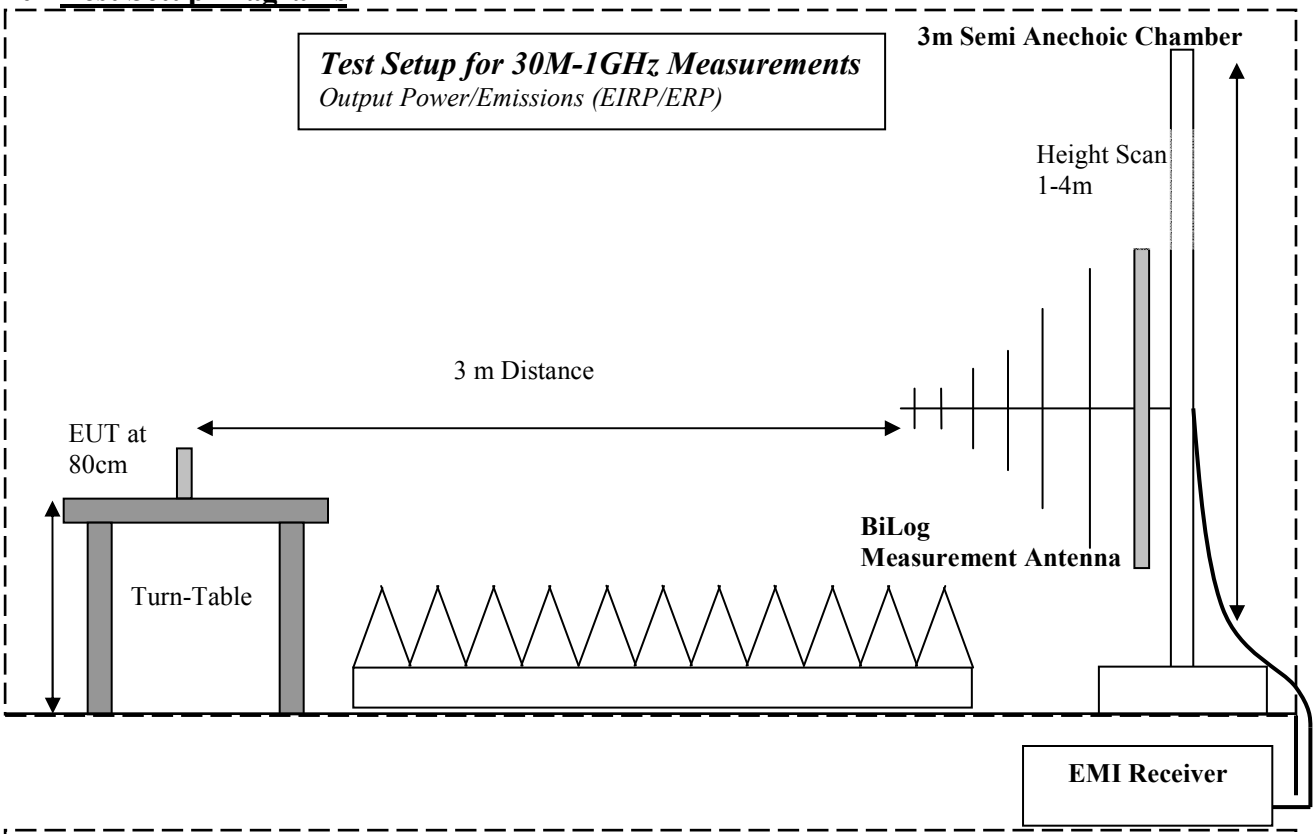

## 8.10 Measurement Verdict

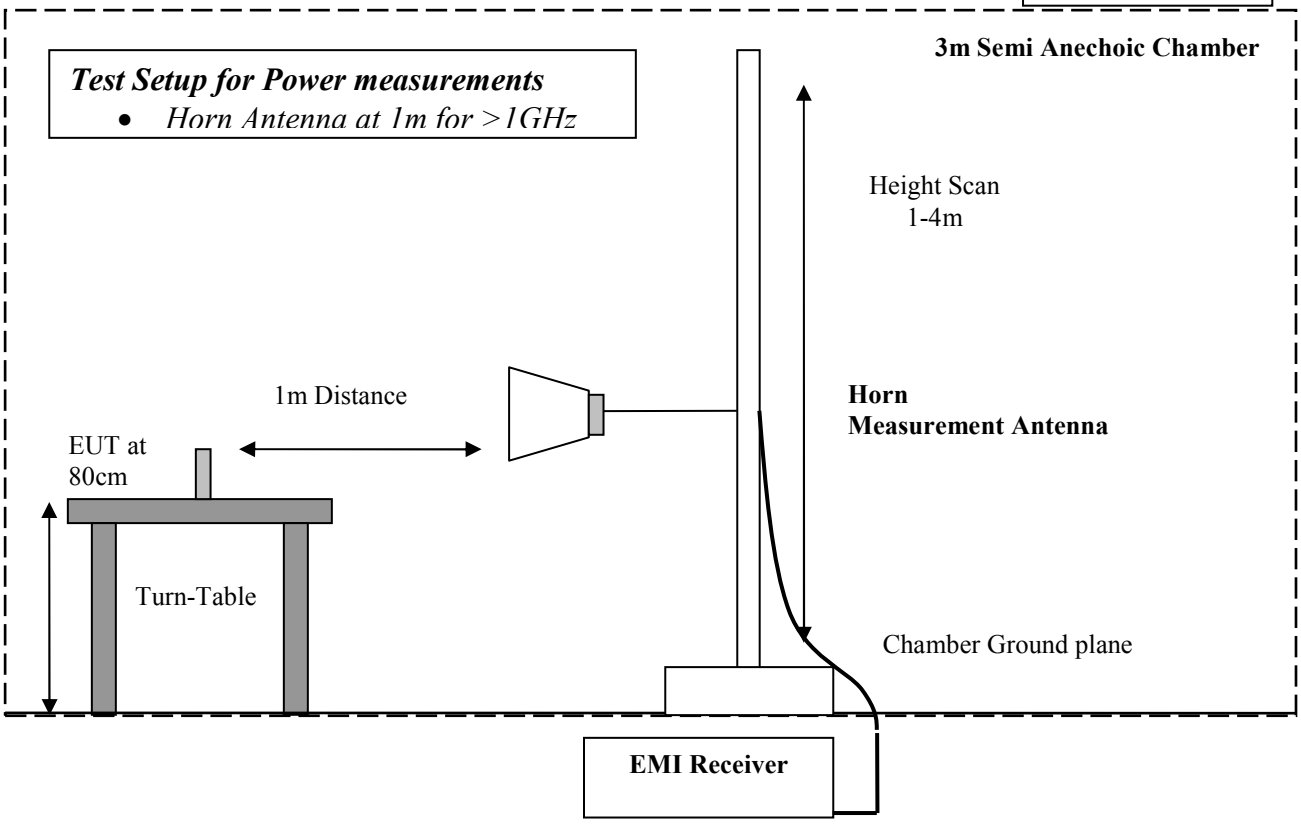
Pass.

## 9 Test Equipment

| Instrument/Ancillary | Model | Manufacturer | Serial No. | Cal Date | Cal Interval |
|---|---|---|---|---|---|
| EMI Receiver/Analyzer | ESU 40 | Rohde & Schwarz | 100251 | Aug 2012 | 2 Years |
| Biconilog Antenna | 3141 | EMCO | 0005-1186 | Mar 2012 | 3 years |
| Horn Antenna (1-18GHz) | 3115 | ETS | 00035111 | Mar 2012 | 3 years |
| Communication Antenna | IBP5-900/1940 | Kathrein | n/a | n/a | n/a |
| High Pass Filter | 5HC2700 | Trilithic Inc. | 9926013 | Part of system calibration | |
| High Pass Filter | 4HC1600 | Trilithic Inc. | 9922307 | Part of system calibration | |
| 6GHz High Pass Filter | HPM50106 | Microtronics | 001 | Part of system calibration | |
| Pre-Amplifier | JS4-00102600 | Miteq | 00616 | Part of system calibration | |

## 10 Test Setup Diagrams



## 11 Revision History

| Date | Report Name | Changes to report | Report prepared by |
|---|---|---|---|
| 2013-10-23 | EMC_3SISE-003-13001_GT8xxxx_FCC95 | First Version | Danh Le |