FCC/IC Test Report

FOR:

Manufacturer: 3SI Security Systems

Model Name: GT86000
Product Description: Asset Tracking and Alert Device

FCC ID: Q6KGT86000A
IC ID: 5043A-GT86000A

47 CFR Part 90
RSS-119 Issue 11

TEST REPORT #: EMC_3SISE-025-13001_VHF
DATE: 2013-04-18

ilac-MRA

A2LA ACCREDITED TESTING LABORATORY Certificate #2135.01

CTIA Authorized Test Lab LAB CODE 20020328-00

FCC: Accredited

IC recognized # 3462B-1

***CETECOM* Inc.**
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CETECOM Inc. is a Delaware Corporation with Corporation number: 2905571

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1 Assessment

The following device was tested against the applicable criteria specified in FCC rules Parts 90 of Title 47 of the Code of Federal Regulations and Industry Canada Standards RSS 119 Issue 11 and no deviations were ascertained during the course of the tests performed.

Company	Description	Model #
3SI Security Systems	Asset Tracking and Alert Device	GT86000

This report is reviewed by:

Date	Section	Name	Signature
2013-04-18	Compliance	Sajay Jose (Test Lab Manager)	

Responsible for the Report:

Date	Section	Name	Signature
2013-04-18	Compliance	Daniel Salinas (EMC Engineer)	Digitally signed by Daniel Salinas DN: cn=Daniel Salinas, c=US, o=Cetecom, Inc., ou=Compliance, email=daniel.salinas@cetecom.com Date: 2013.04.18 16:40:01 -07'00'

The test results of this test report relate exclusively to the test item specified in Section3.
CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM Inc USA.

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 Milpitas, CA 95035 U.S.A.
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Responsible Test Lab Manager:	Sajay, Jose
Responsible Project Leader:	Daniel Salinas

2.2 Identification of the Client

Applicant's Name:	3SI Security Systems
Street Address:	486 Thomas Jones Way
City/Zip Code	Exton, PA 19341
Country	USA
Contact Person:	Latha Ravi
Phone No.	478-718-5791
e-mail:	latha_ravi@3SISecurity.com

2.3 Identification of the Manufacturer

Same as client.

2.4 Environmental conditions during Test:

The following environmental conditions were maintained during the course of testing:
Ambient Temperature: 20-25^{o}C
Relative humidity: 40-60%

2.5 Dates of Testing:

Feb 27, 2013 - Mar 12, 2013.

3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

Marketing Name:	ATM Tracker
Model No:	GT86000
Product Type:	Asset Tracking and Alert Device
FCC-ID:	Q6KGT86000A
IC-ID :	5043A-GT86000A
Frequency range of test:	219.6 MHz
Type(s) of Modulation:	None (CW), Pulsed carrier signal with no modulation, 20% duty cycle (200ms/s)
Number of channels:	1
Antenna Info:	Magnetic Loop antenna Manufacturer stated antenna Gain: 1.2-3.3 dBi
Other radios in the device:	GSM/GPRS 850/900/1800/1900 MHz GPS Receiver: 1575.42 MHz
Rated Operating Voltage Range(DC):	Internal Battery Operated 3.3V (Low) / 3.7V (Nominal) / 9V (Max)
Rated Operating Temperature Range:	0^{o}C to + 60^{o}C
Test Sample status:	Production

3.1 Identification of the Equipment Under Test (EUT)

EUT #	IMEI:	HW Version	SW Version
1	35259904355473703	1.0.0	10.05

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 90 of Title 47 of the Code of Federal Regulations and Industry Canada Standards RSS 119 Issue 11.

- 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 90: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communication Commission Private Land Mobile Radio Services
- RSS 119 – Issue 11: Radio Transmitters and Receivers Operating in the Land Mobile and Fixed Services in the Frequency Range 27.41 – 960 MHz

This report is to support a request for new equipment authorization under the FCC ID: Q6KGT86000A and IC ID: 5043A-GT86000A.

Model GT86000 incorporates the same VHF portion (Radio, Antenna and associated circuitry) as in a variant model- GT83000, from 3SI Security Systems. Based on a related product portion equality declaration from the manufacturer, only power related test cases have been performed and reference is made to the variant test report to prove compliance of this model with all the above listed FCC/IC rule parts.

5 Summary of Measurement Results

Test Specification	Test Case	Temperature and Voltage Conditions	Pass	Fail	NA	NP	Result
§2.1046 §90.205(e) §90.259(a) RSS119 5.4	RF Output Power	Nominal	■	☐	☐	☐	Complies
§2.1055 §90.213(a) RSS119 5.3	Frequency Tolerance	Nominal	☐	☐	☐	■	Complies*
§2.1049 §90.209(b) §90.259(8) RSS119 5.5	Occupied Bandwidth	Nominal	☐	☐	☐	■	Complies*
§90.210(c) RSS119 5.5	Transmit Spectrum Mask	Nominal	☐	☐	☐	■	Complies*
§2.1051 §90.210(c) RSS119 5.8	Conducted Spurious Emissions	Nominal	■	☐	☐	☐	Complies
§2.1053 §90.210(c) RSS119 5.8	Radiated Spurious Emissions	Nominal	■	☐	☐	☐	Complies

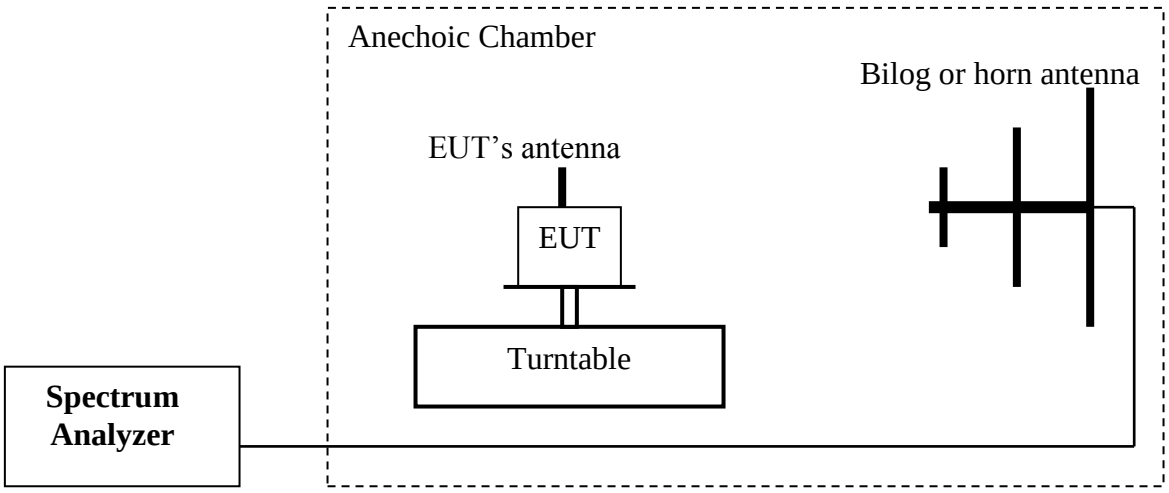
Note: NA = Not Applicable; NP = Not Performed

*Compliance data referenced from variant test report #EMC_3SISE-020-12001_VHF issued by CETECOM Inc. on 4/4/2013.

6 Measurements

6.1 Radiated Measurement Procedure

Ref: TIA-603C 2004 -2.2.17.2 Effective Radiated Power (ERP) or Effective Isotropic Radiated Power (EIRP)



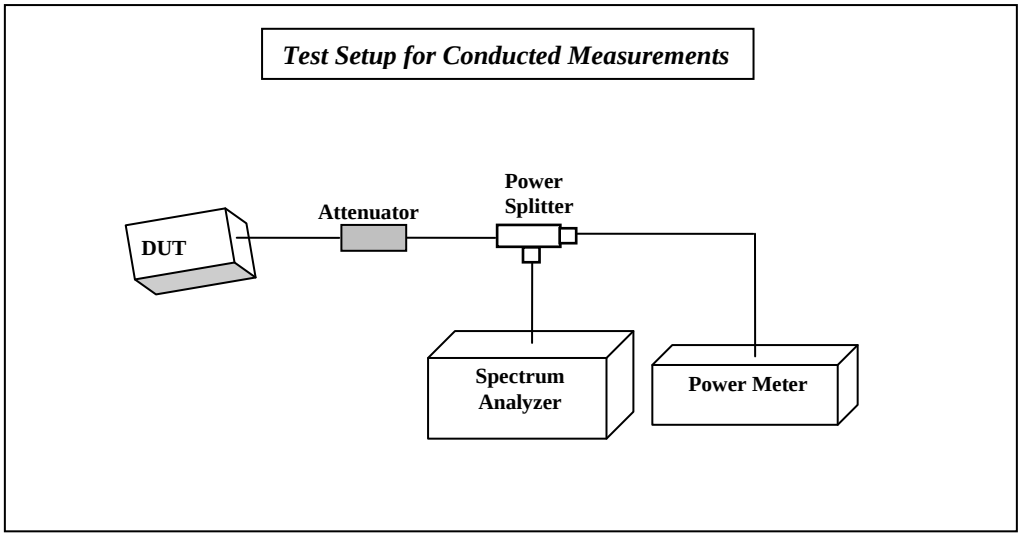
1. Connect the equipment as shown in the above diagram with the EUT's antenna in a vertical orientation.
2. Set the EUT to its maximum power at the required channel.
3. Set the spectrum analyzer to the channel frequency. Set the analyzer to measure peak hold with the required settings.
4. Rotate the EUT 360°. Record the peak level in dBm (**LVL**).
5. Replace the EUT with a vertically polarized half wave dipole or known gain antenna. The center of the antenna should be at the same location as the center of the EUT's antenna.
6. Connect the antenna to a signal generator with known output power and record the path loss in dB (**LOSS)**. **LOSS** = Generator Output Power (dBm) – Analyzer reading (dBm).
7. Determine the ERP using the following equation:
   ERP (dBm) = **LVL** (dBm) + **LOSS** (dB)
8. **EIRP** (dBm) = **ERP** (dBm) + **2.15** (dB)
9. Measurements are performed with the EUT set at the operating channel.

6.1.1 Measurement Uncertainty

+/- 3 dB

6.2 Conducted Output Power Measurement procedure

Ref: TIA-603C 2004 2.2.1 Conducted Carrier Output Power Rating



1. Connect the equipment as shown in the above diagram.
2. Enable the EUT to its maximum power at the required channel.
3. Record the output power level measured Spectrum Analyzer.
4. Correct the measured level for all losses in the RF path.
5. Measurements are to be performed with the EUT set at the operating channel.

6.2.1 Measurement Settings:

RBW=VBW=100kHz; Span=200kHz; Detector: Peak- Max Hold;
Sweep time: Auto.

6.2.2 Measurement Uncertainty

+/- 0.5 dB

6.3 Maximum Peak Output Power

6.3.1 References:
FCC: Part 90.205(e); 90.259(a)
RSS 119: 5.4

6.3.2 Limits
FCC CFR 90.259(a): 2W, Class C
RSS 119: Less than 5 Watts.

6.3.3 Test Conditions:
Tnom: 22.7^{o}C; Vnom

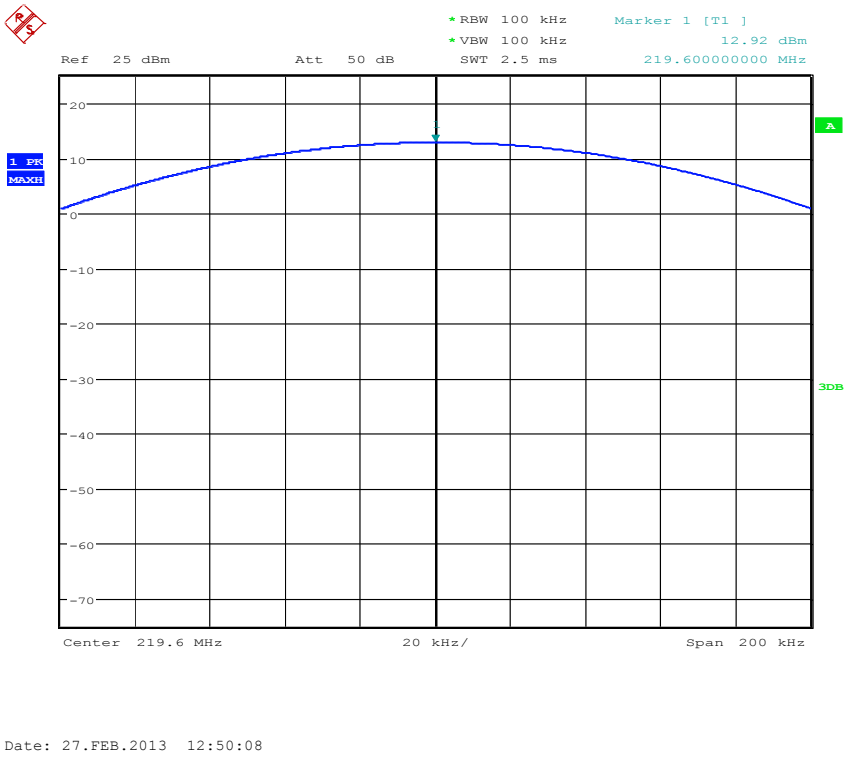
6.3.4 Test Results:

Model: GT86000		
Frequency (MHz)	**Max Peak Output Power- Conducted (dBm)**	**Radiated ERP (dBm)**
219.6 MHz	12.92	-31.58

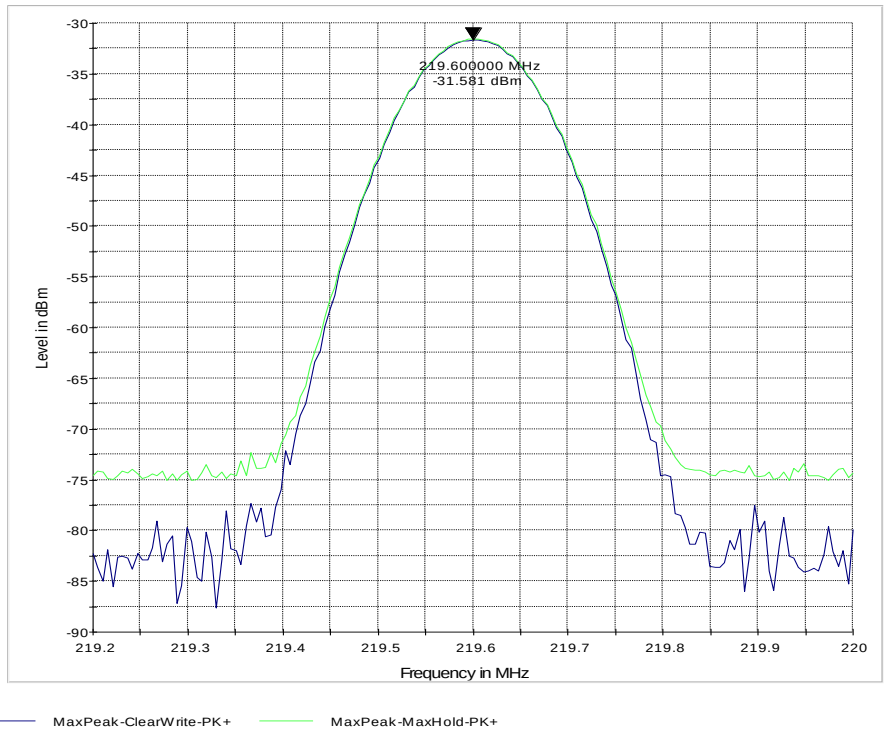
6.3.5 Measurement Verdict:
Pass.

6.3.6 Test Data:

Conducted Peak Power – GT86000



Radiated Peak Power – GT86000



6.4 Transmitter Spurious Emissions- Conducted

6.4.1 References:

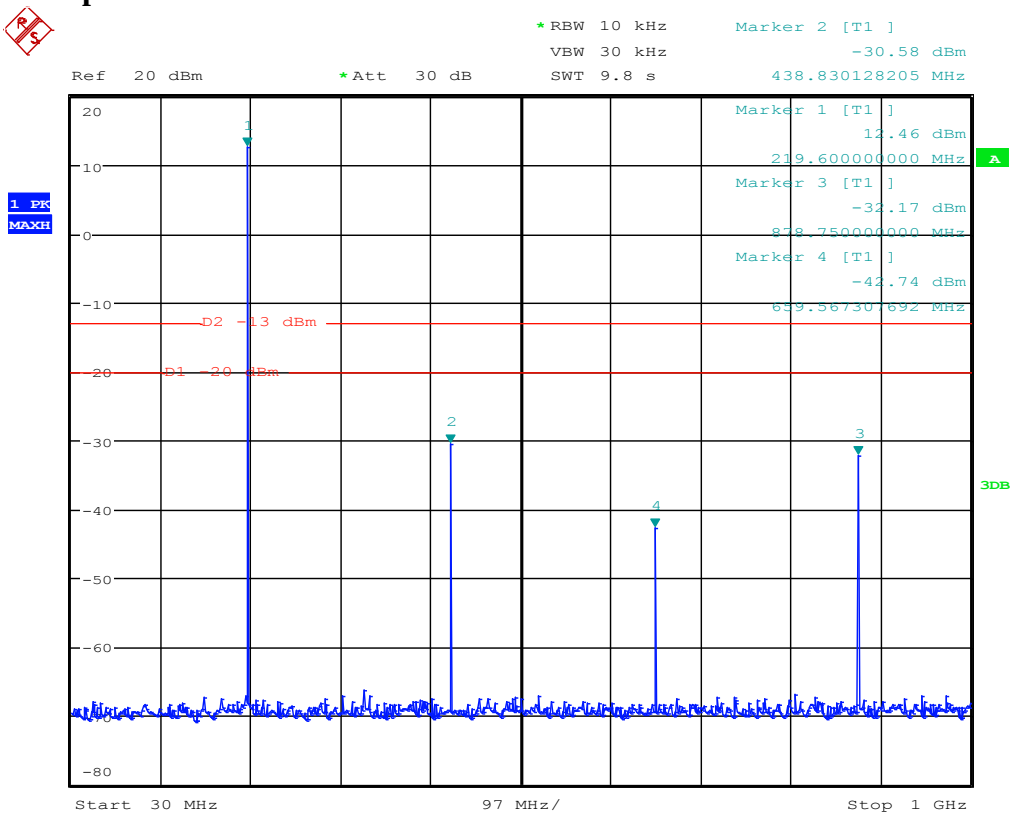
FCC: 2.1051, 90.210(c)
RSS 119: 5.8

6.4.2 Limits

FCC: -13 dBm
IC: -20 dBm

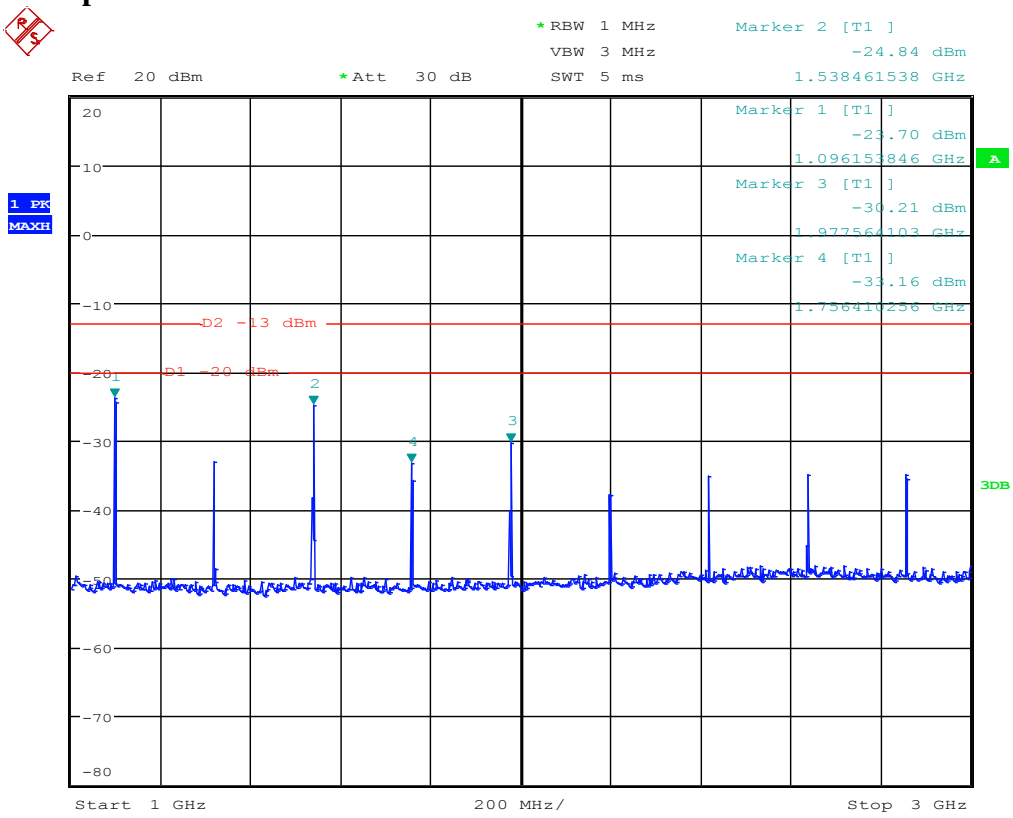
6.4.3 Test data/ plots:

Conducted Spurious Emissions 30 – 1000 MHz – GT86000



Date: 18.MAR.2013 13:12:32

Conducted Spurious Emissions 1 – 3GHz – GT86000



Date: 18.MAR.2013 13:13:32

6.5 Transmitter Spurious Emissions- Radiated

6.5.1 References

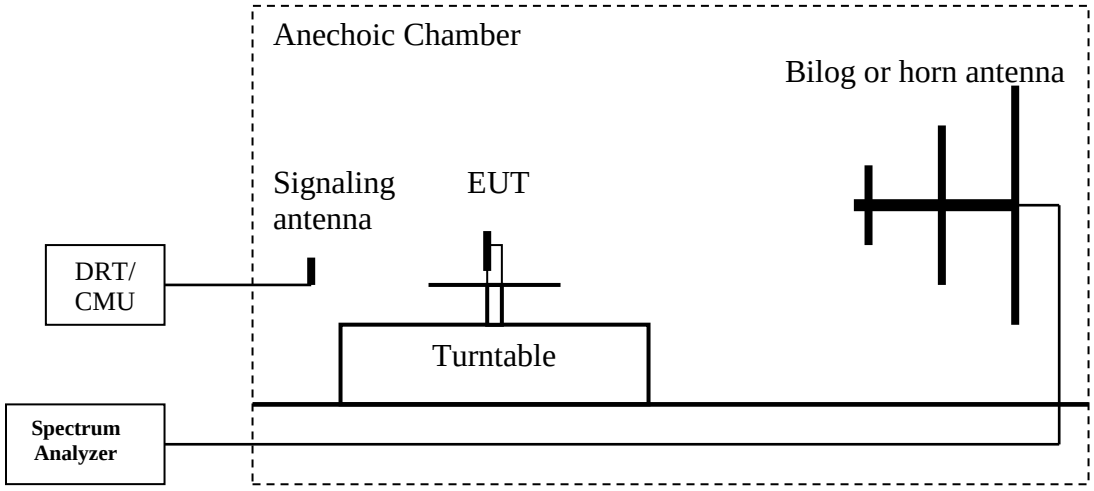
FCC: CFR Part 2.1053, 90.210 (c)
RSS 119: 5.8

6.5.2 Limits

FCC: -13 dBm
IC: -20 dBm

6.5.3 Radiated out of band measurement procedure:

Ref: TIA-603C 2004- 2.2.12 Unwanted emissions: Radiated Spurious



1. Connect the equipment as shown in the above diagram with the EUT's antenna in a horizontal orientation.
2. Adjust the settings of the Digital RadioCommunication Tester (DRT) to set the EUT to its maximum power at the required channel.
3. Set the spectrum analyzer to measure peak hold with the required settings.
4. Place the measurement antenna in a horizontal orientation. 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. Replace the EUT with a horizontally polarized half wave dipole or known gain antenna. The center of the antenna should be at the same location as the center of the EUT's antenna.
6. Connect the antenna to a signal generator with known output power and record the path loss in dB (**LOSS)**. **LOSS** = Generator Output Power (dBm) – Analyzer reading (dBm).
7. Determine the level of spurious emissions using the following equation:
   Spurious (dBm) = **LVL** (dBm) + **LOSS** (dB)
8. Repeat steps 4, 5 and 6 with all antennas vertically polarized.

9. Determine the level of spurious emissions using the following equation:
   Spurious (dBm) = **LVL** (dBm) + **LOSS** (dB)
10. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.
    (N**ote:** Steps 5 and 6 above are performed prior to testing and **LOSS** is recorded by test software. Steps 3, 4 and 7 above are performed with test software.)

6.5.4 Sample Calculations for Radiated Measurements

6.5.4.1 Power Measurements using Substitution Procedure:

The measurement on the Spectrum Analyzer is used as a basis for the Substitution procedure. The EUT is replaced with a Signal Generator and an antenna. The setting on the Signal Generator is varied until the Spectrum Analyzer displays the original reading. EIRP is calculated as-

EIRP (dBm)= Signal Generator setting (dBm)- Cable Loss (dB)+ Antenna Gain (dBi)
Eg:

Frequency (MHz)	Measured SA (dBµV)	Signal Generator setting (dBm)	Antenna Gain (dBi)	Dipole Gain (dBd)	Cable Loss (dB)	EIRP (dBm)
1000	95.5	24.5	6.5	0	3.5	27.5

Measurement Survey:
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 10th harmonic of the highest frequency generated by the EUT.

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.

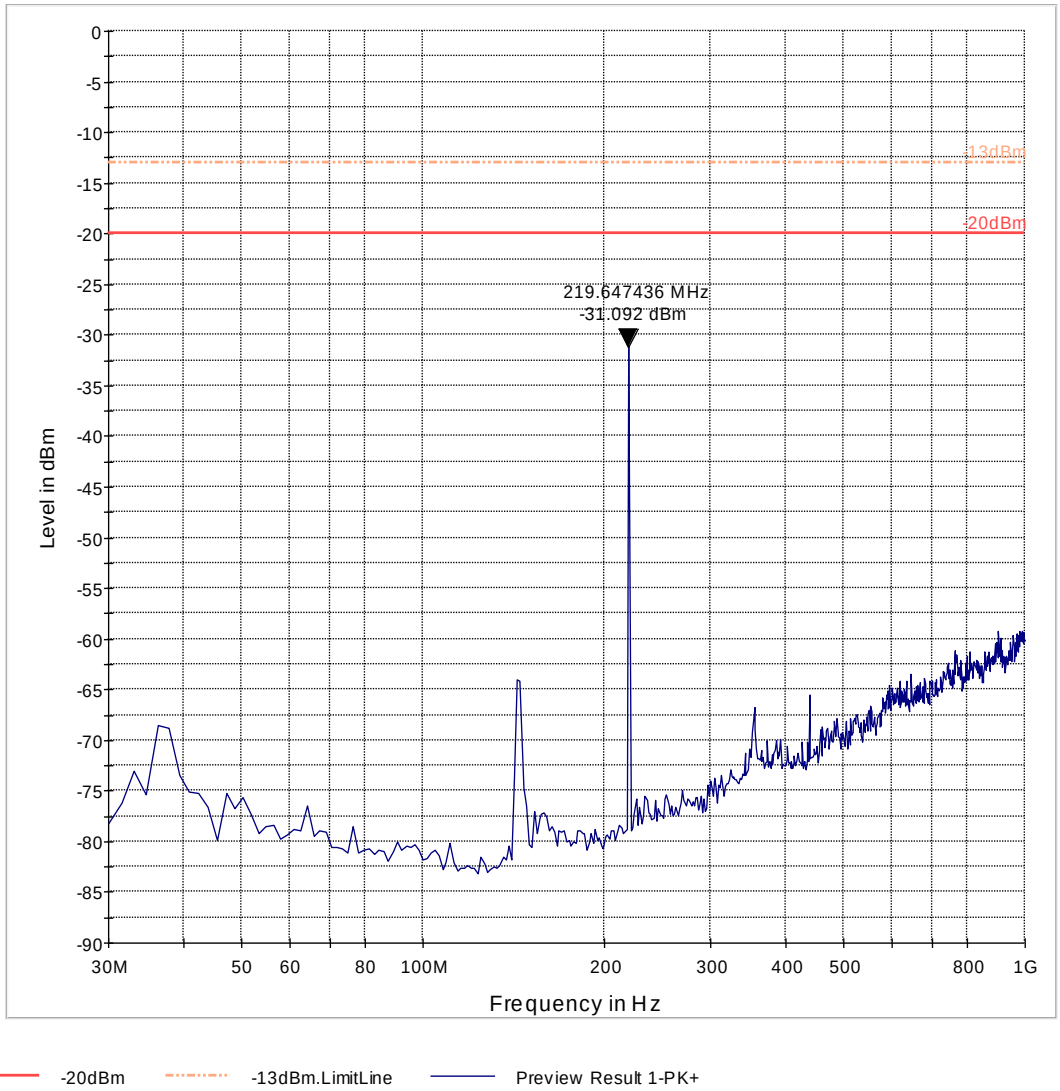
Measurement Uncertainty= +/- 3.0 dB.

6.5.5 Test Conditions:

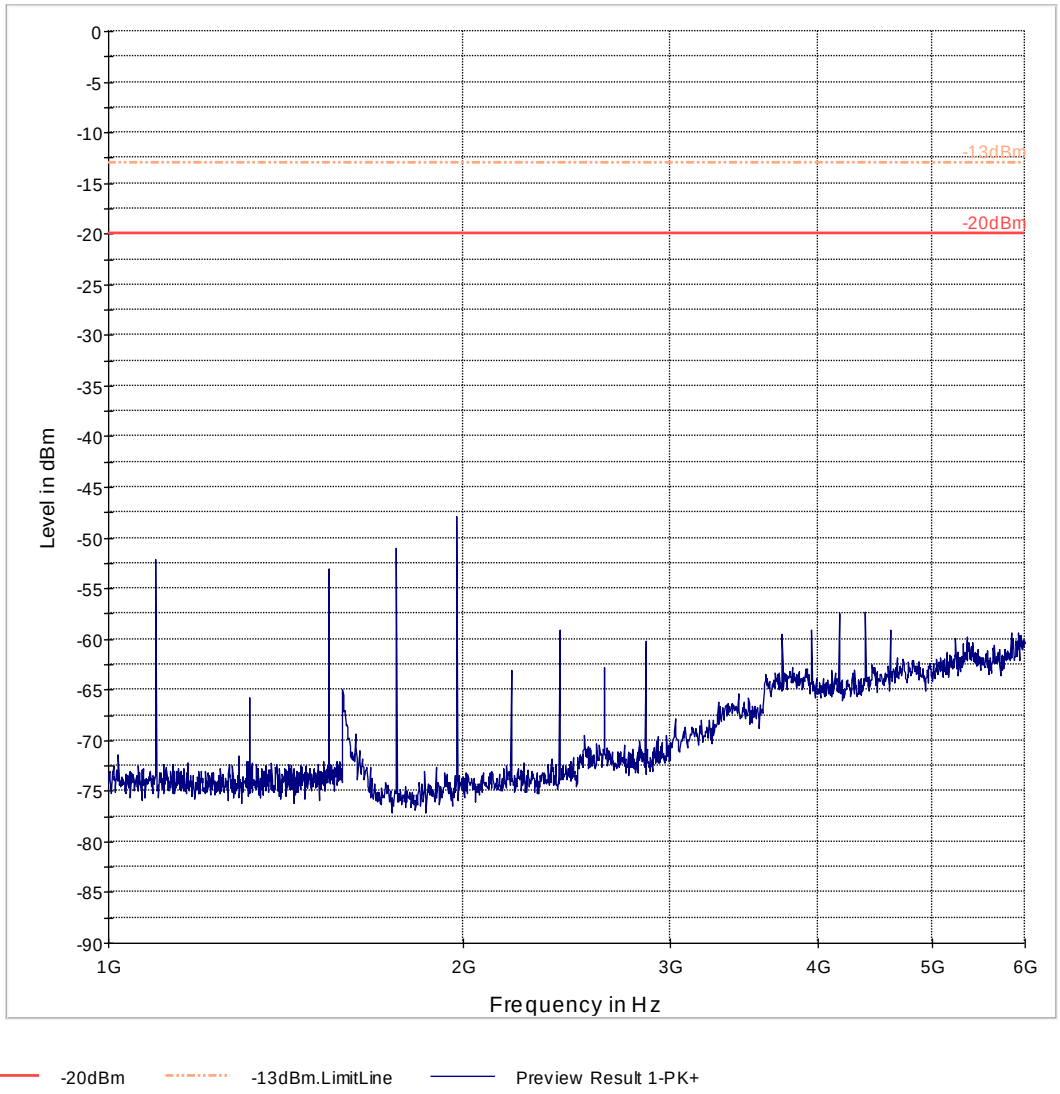
Tnom: 20^{o}C; Vnom: 3.7 V

6.5.6 Test Result:

Spurious Emissions: 30MHz – 1000MHz – GT86000



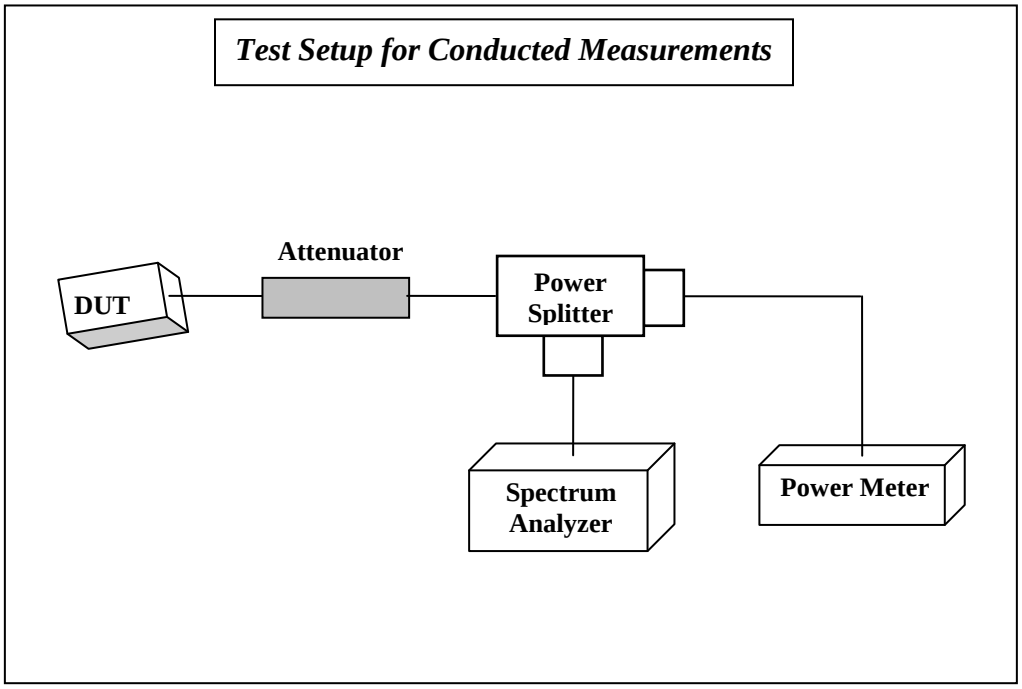
Spurious Emissions 1GHz – 6GHz – GT86000

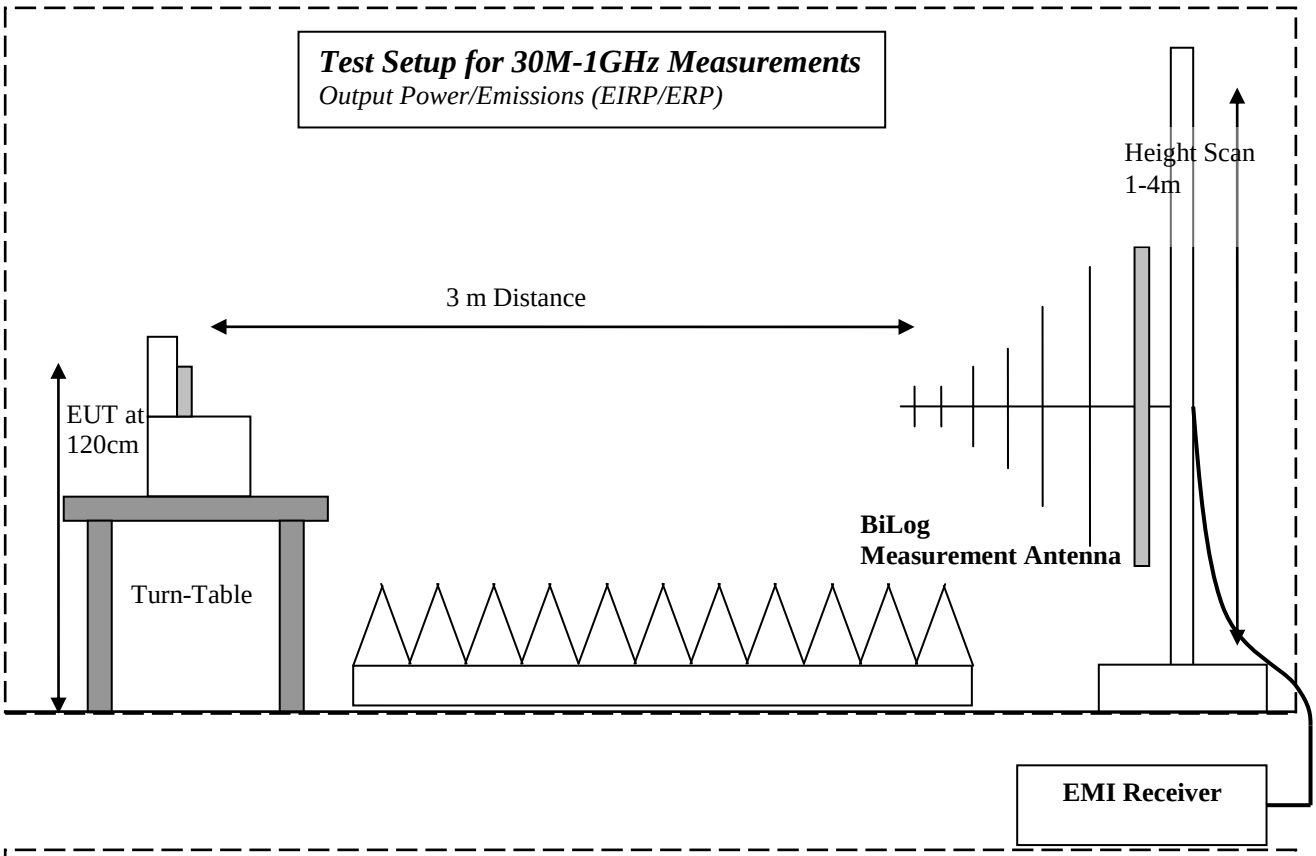


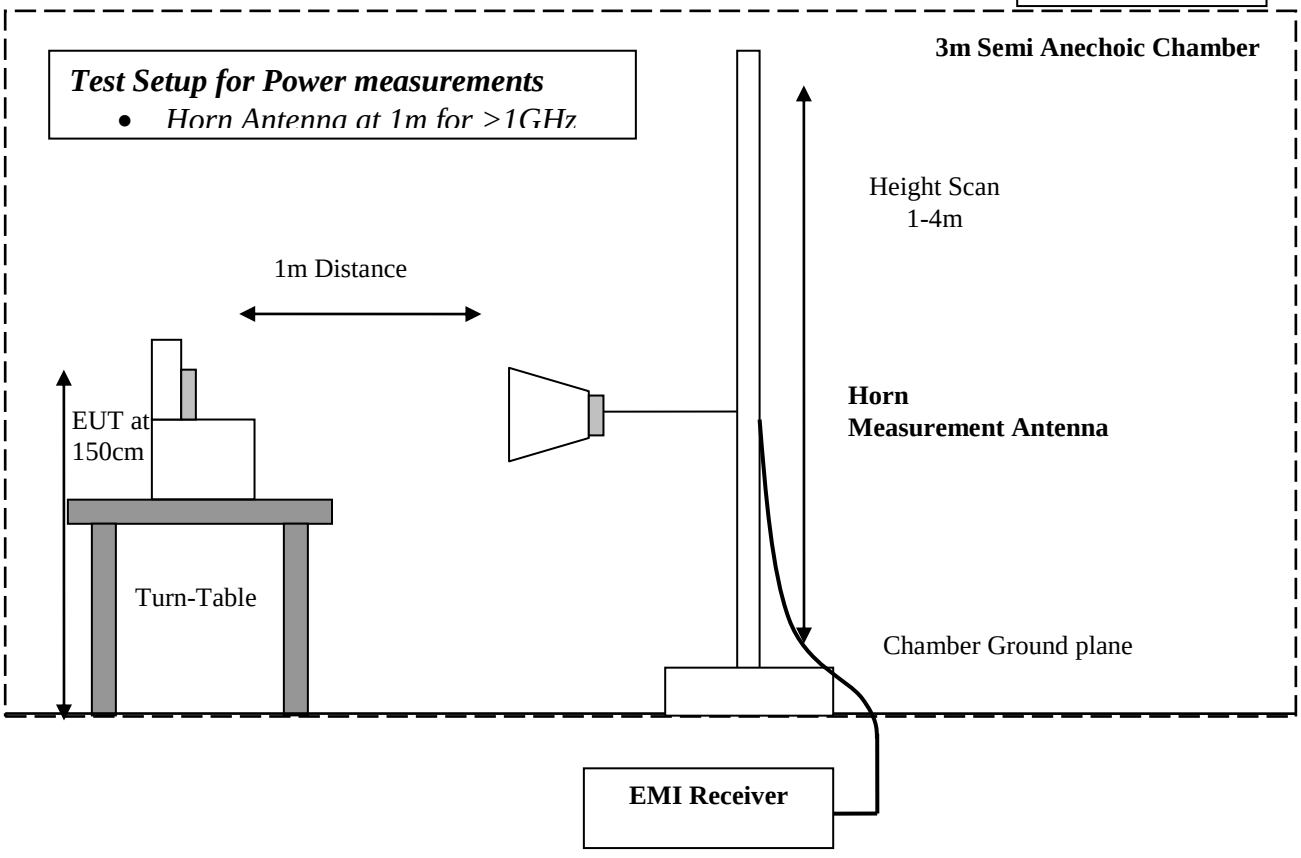
7 Test Equipment and Ancillaries used for tests

Instrument/Ancillary	Model	Manufacturer	Serial No.	Cal Date	Cal Interval
Radio Communication Tester	CMU 200	Rohde & Schwarz	101821	May 2011	2 Years
Radio Communication Tester	CMU 200	Rohde & Schwarz	109879	May 2011	2 Years
Radio Communication Tester	CMU 200	Rohde & Schwarz	110759	May 2011	2 Years
EMI Receiver/Analyzer	ESU 40	Rohde & Schwarz	100251	Aug 2012	2 Years
Spectrum Analyzer	FSU	Rohde & Schwarz	200302	May 2011	2 Years
Loop Antenna	6512	EMCO	00049838	Apr 2012	3 years
Biconilog Antenna	3141	EMCO	0005-1186	Mar 2012	3 years
Horn Antenna (1-18GHz)	3115	ETS	00035111	Mar 2012	3 years
Horn Antenna (1-18GHz)	3115	ETS	00035114	Apr 2012	3 years
Horn Antenna (18-40GHz)	3116	ETS	00070497	Aug 2011	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	
LISN	50-25-2-08	FCC	08014	Jan 2012	1 year
Power Smart Sensor	R&S	NRP-Z81	100161	May 2011	2 Years
DC Power Supply	6655A	Hewlett Packard	3403A-00487	n/a	n/a
Multimeter	MM200	Klein	N/A	Apr 2011	2 Years
Temp Hum Logger	TM320	Dickson	03280063	Feb 2012	1 Year
Temp Hum Logger	TM325	Dickson	5285354	Feb 2012	1 Year

8 Test Setup Diagrams




Test Setup for 30M-1GHz Measurements
Output Power/Emissions (EIRP/ERP)
Height Scan
1-4m
3 m Distance
EUT at
120cm
BiLog
Measurement Antenna
Turn-Table
EMI Receiver


3m Semi Anechoic Chamber
Test Setup for Power measurements
Horn Antenna at 1m for >1GHz
Height Scan
1-4m
1m Distance
EUT at
150cm
Horn
Measurement Antenna
Turn-Table
Chamber Ground plane
EMI Receiver

9 Revision History

Date	Report Name	Changes to report	Report prepared by
2013-04-18	EMC_3SISE-025-13001 _VHF	First Version	Daniel Salinas