



Engineering and Testing for EMC and Safety Compliance



Accredited under A2LA Testing Certificate # 2653.01

## FCC Part 25 Certification Report

**Blackbird Technologies, Inc.**  
**13900 Lincoln Park Drive, Suite 400**  
**Herndon, VA 20171**  
**Contact: Bob Nelson**

**MODEL: Blackbird Asset Tracker (BAT)**  
**Revision H**

**FCC ID: X6K-BAT-001**

**March 12, 2010**

Standards Referenced for this Report	
Part 2: 2009	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
Part 25: 2009	Satellite Communications
TIA-EIA-603-C August 2004	Land Mobile FM or PM Communications Equipment – Measurement and Performance Standards
Digital Interface Information:	Digital Interface was found to be compliant

Frequency Range (MHz)	Rated Transmit Power (W) (Conducted)	Frequency Tolerance (ppm)	Emission Designator
1611.25 - 1618.75	0.100	0.7	2M50G1D

**Report Prepared By: Daniel Baltzell**

Document Number: 2010008

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## 1 General Information

### 1.1 Scope

The following certification report is prepared on behalf of **Blackbird Technologies, Inc.** in accordance with the Federal Communications Commission's Rules and Regulations. The Equipment Under Test (EUT) was the **Blackbird Asset Tracker, Revision H; FCC ID: X6K-BAT-001.**

Applicable Standards:

- FCC Rules Part 25: Satellite Communications

### 1.2 Description of EUT

<b>Equipment Under Test</b>	GPS tracking module
<b>Model Name</b>	BAT (Blackbird Asset Tracker) Revision H
<b>Power Supply</b>	Internal 3 VDC (2 AA Lithium batteries)
<b>Modulation Type</b>	BPSK
<b>Frequency Range</b>	1611.25-1618.75 MHz
<b>Antenna Connector Type</b>	Internal MMCX
<b>Antenna Type</b>	Internal Patch 3.5 dBi

### 1.3 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located at 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing (ANSI C63.4-2003).

### 1.4 Related Submittal(s)/Grant(s)

This is an original application for Blackbird Technologies, Inc., FCC ID: X6K-BAT-001, and covers the model Blackbird Asset Tracker (BAT) Revision H.

### 1.5 Modifications

None.

## 2 Test Result Summary

Test	FCC Reference	Result
RF Power Output	2.1046(a), 25.204	Complies
Modulation Characteristics	2.1047(a)(b)	N/A
Occupied Bandwidth/Emission Masks	2.1049(c)(1), 25.202(f)	Complies
Spurious Emissions at Antenna Terminals	2.1051, 25.202(f)	Complies
Field strength of spurious radiation	2.1053(a), 25.202(f)	Complies
Frequency Stability vs. Temperature and Voltage	2.1055, 25.202(d)	Complies
Emissions from Mobile Earth Stations for Protection of Aeronautical Radionavigation-Satellite Service	25.216	Complies

The radio is also subject to FCC verification testing. Verification testing was performed and the data is contained in a separate verification report. All measurements contained in this application were conducted in accordance with the applicable sections of FCC Rules and Regulations CFR 47 Parts 2 and 25. Calibration checks are performed regularly on the instruments, and all accessories including high pass filter, coaxial attenuator, preamplifier and cables.

### 3 Tested System Details

The test sample was received on March 4, 2010. Listed below are the identifiers and descriptions of all equipment, cables, and internal devices used with the EUT for this test, as applicable.

The Equipment Under Test (EUT), the BAT, is a portable battery-operated telemetry device designed to communicate with Globalstar satellites and provide locator or 911 service. The EUT operates at the following 4 transmit frequencies: 1611.25, 1613.75, 1616.25 and 1618.75 MHz. Once service is established with Globalstar, BAT sends information to Globalstar satellites which relay the information to ground stations. The processed information is then available to the user via the internet. The device is delivered complete and ready-to-go with no need for an external antenna and uses two AA 1.5 VDC lithium batteries as a power source.

The device was programmed for continuous mode with normal and CW modulations. For the purpose of this test, the EUT was placed into a max power, constant TX mode of operation and normal modulation.

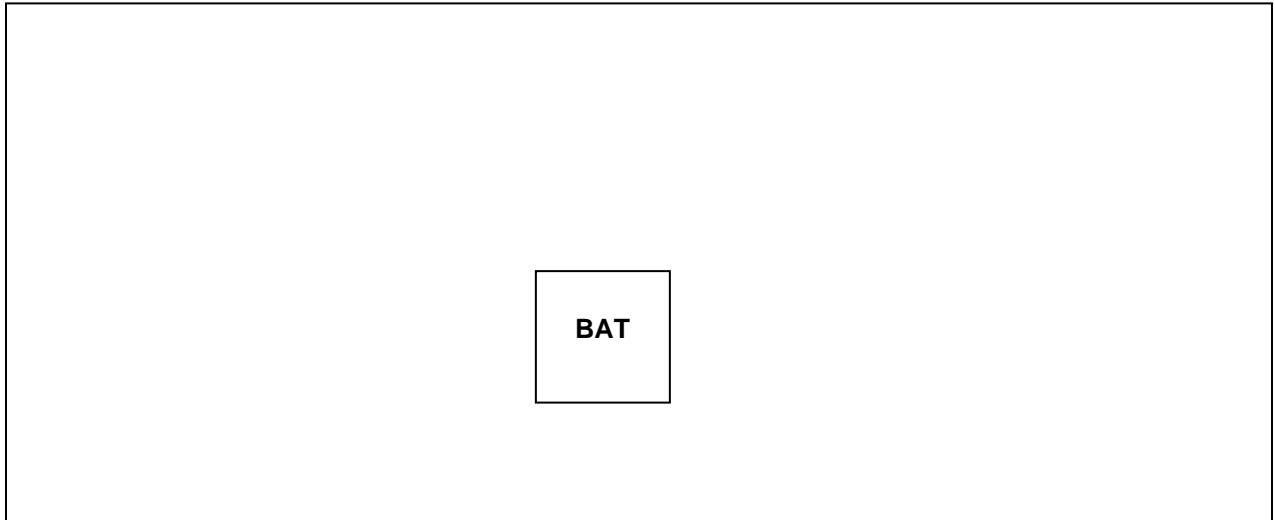
**Table 3-1: Equipment Under Test (EUT)**

Part	Manufacturer	Model	PN/SN	FCC ID	RTL Bar Code
Transceiver	Blackbird Technologies, Inc.	Blackbird Assist Tracker (BAT), Revision H	359648	X6K-BAT-001	19429
Transceiver	Blackbird Technologies, Inc.	Blackbird Assist Tracker (BAT) Revision H	359801	X6K-BAT-001	19430
Transceiver	Blackbird Technologies, Inc.	Blackbird Assist Tracker (BAT) Revision H	359446	X6K-BAT-001	19431

**Table 3-2: Auxiliary Test Equipment**

Part	Manufacturer	Model	PN/SN	FCC ID	RTL Bar Code
Power Supply	Astec	LPS255	26100010410	N/A	19383

**Figure 3-1: Configuration of Tested System**





#### 4 FCC Rules and Regulations §2.1046(a): RF Power Output: Conducted; §25.204: Transmitter Power

##### 4.1 Test Procedure

ANSI/TIA/EIA-603-2004, section 2.2.1

The EUT was connected to a coaxial attenuator having a 50  $\Omega$  load impedance.

EIRP < +40 dBW in any 4 kHz band for  $\theta=0$  degrees

The manufacturer has stated that the EUT has a maximum output power of +20 dBm.

**Rated Power: 0.100 W**

##### 4.2 Test Data

**Table 4-1: RF Conducted Output Power - Measured**

Frequency (MHz)	Power (dBm)	Power (W)
1611.25	19.2	0.083
1613.75	19.2	0.083
1616.25	18.8	0.076
1618.75	18.7	0.074

**Table 4-2: Test Equipment Used For Testing RF Power Output - Conducted**

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901184	Agilent Technologies	E4416A	EPM-P Power Meter, single channel	GB41050573	11/5/10
901356	Agilent Technologies	E9323A	Power Sensor	31764-264	11/5/10
901396	MCE Weinschel	48-40-34	Attenuator, 40 dB, DC-18 GHz, 100 W	93453	12/3/10

##### Test Personnel:

Daniel Baltzell  
EMC Test Engineer



Signature

March 4, 2010  
Date Of Test

## 5 FCC Rules and Regulations §2.1051: Spurious Emissions at Antenna Terminals; §25.202(f) Emission Limitations

### 5.1 Test Procedure

ANSI/TIA/EIA-603-2004, Section 2.2.13

The transmitter is terminated with a 50  $\Omega$  load and interfaced with a spectrum analyzer.

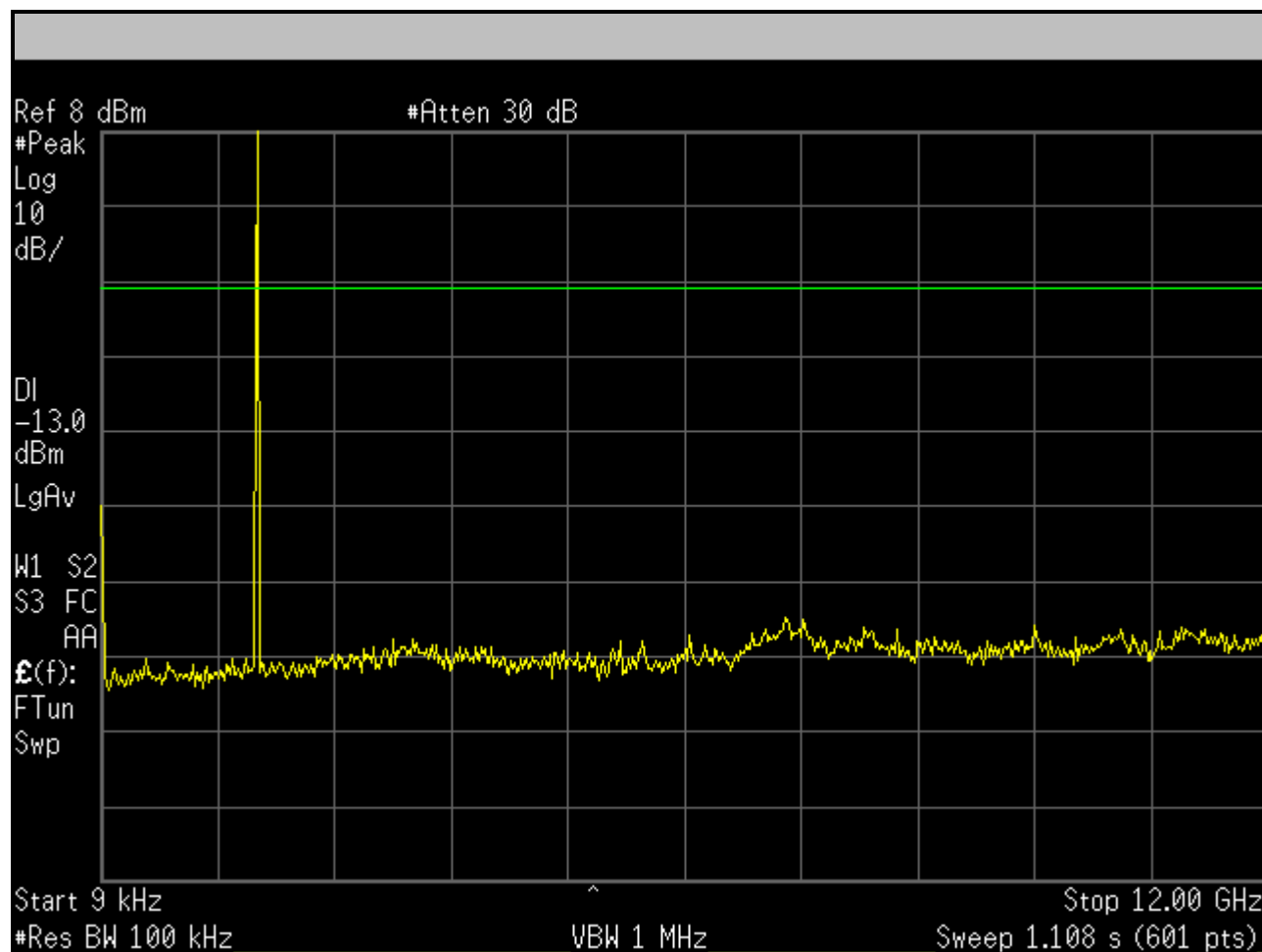
Device with digital modulation: Modulated to its maximum extent using a pseudo-random data sequence.

For out-of-band emissions for frequencies removed from the midpoint of the assigned frequency segment by more than 250% of the authorized bandwidth (2.5 MHz), at least 43 + 10 log (PWatts) attenuation below the mean power of the transmitter.

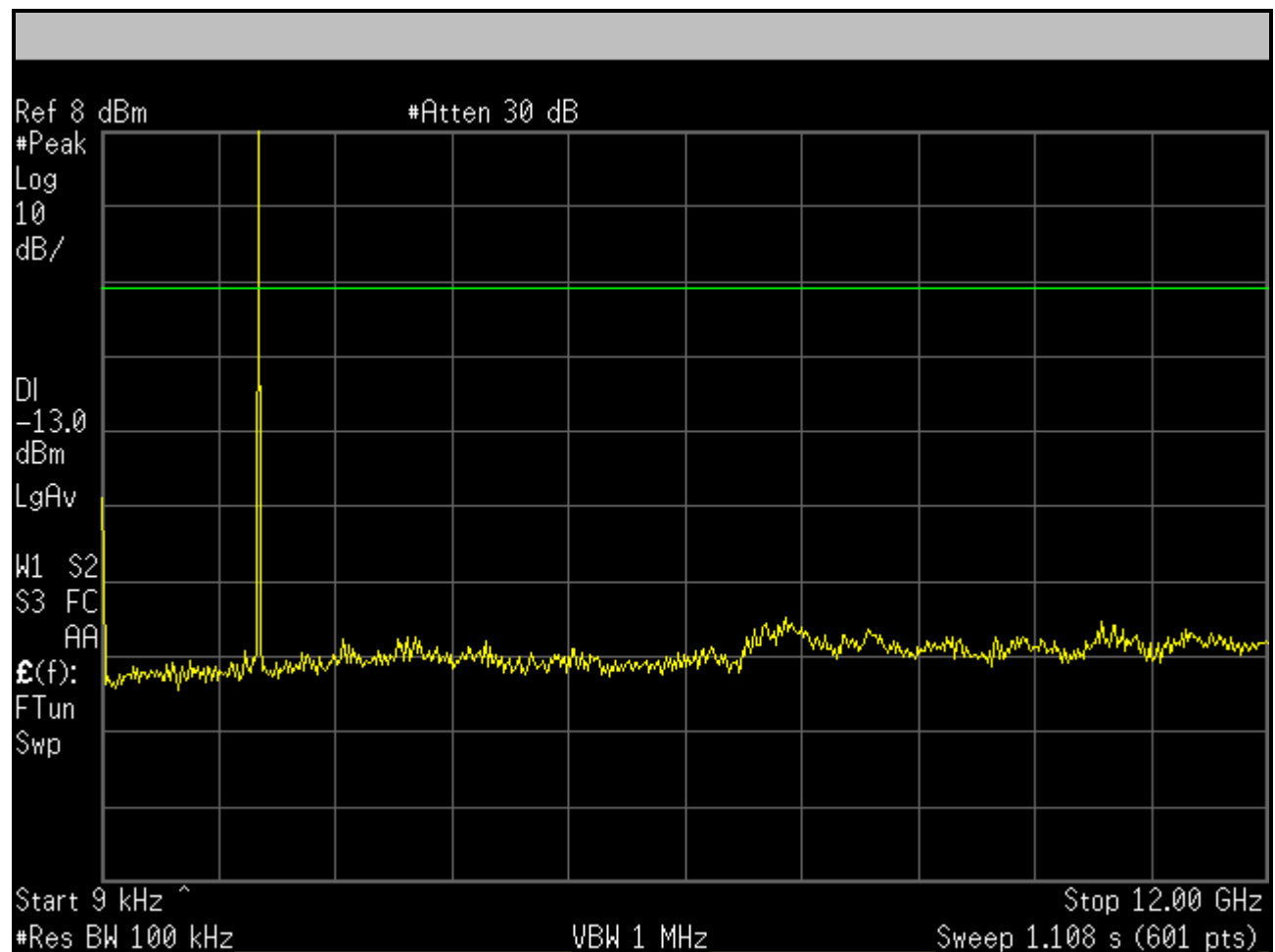
### 5.2 Test Data

Frequency range of measurement per Part 2.1057: 9 kHz to 10 x Fc

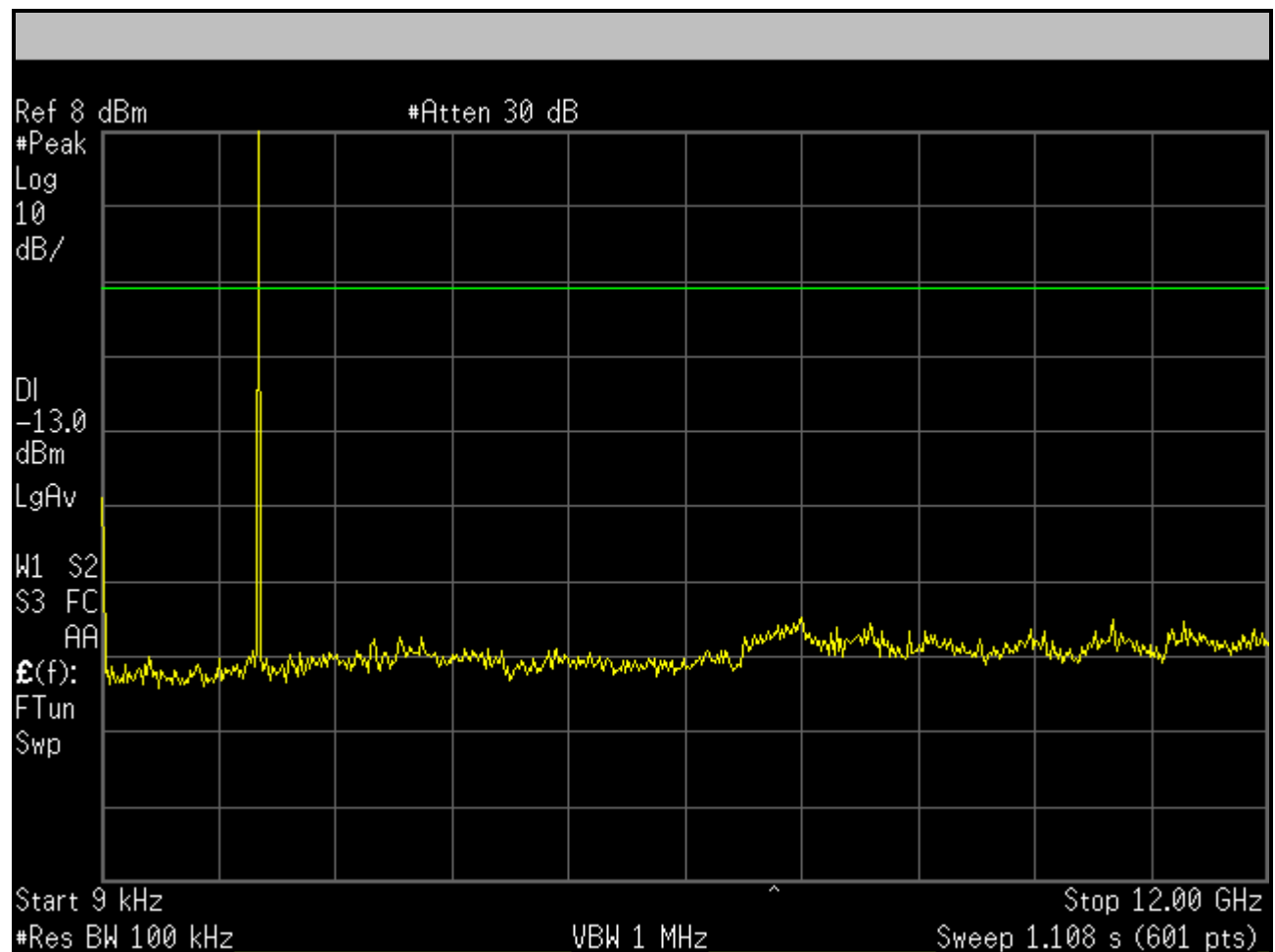
**Plot 5-1: Conducted Spurious Emissions - 1611.25 MHz**



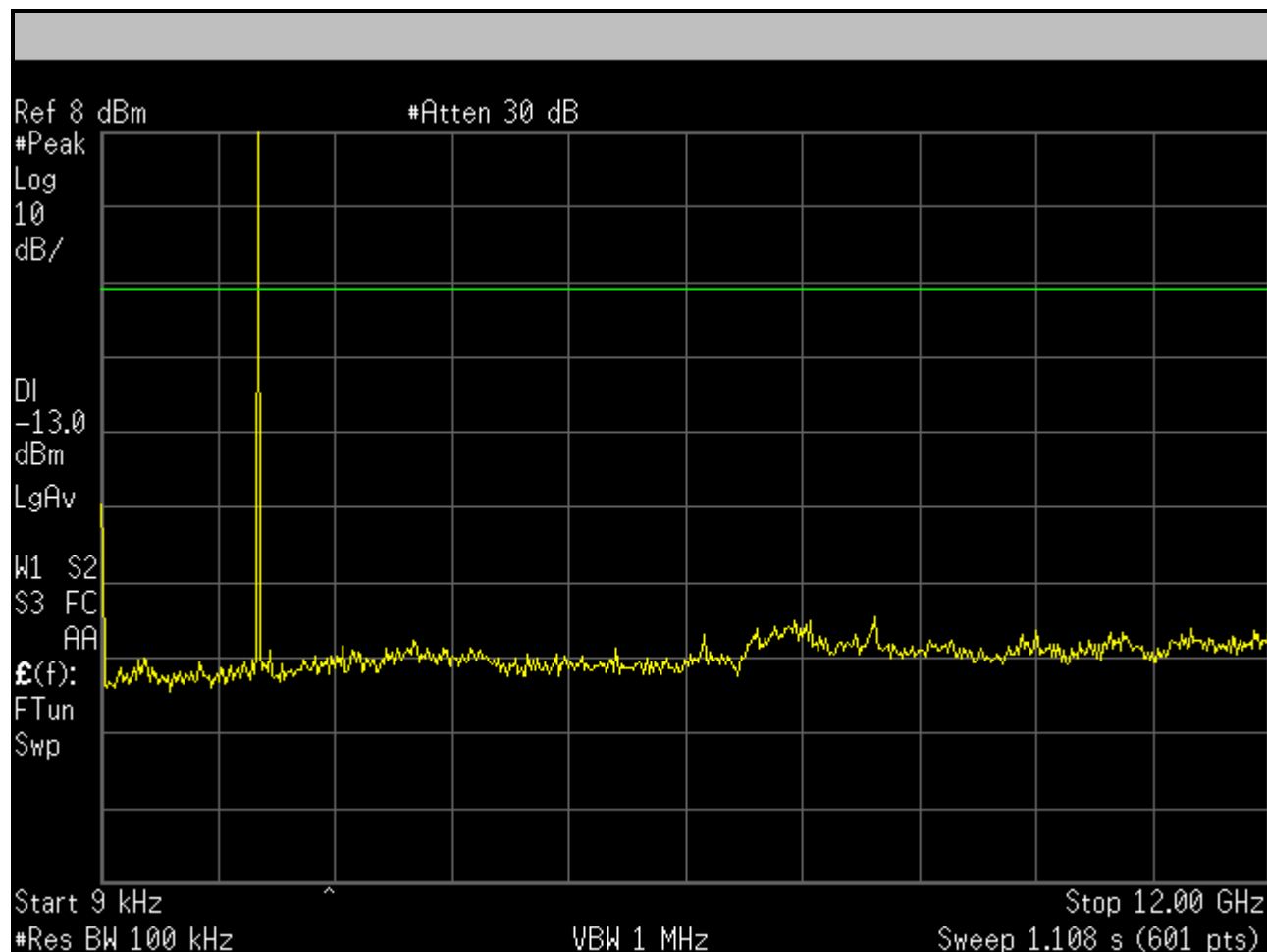
**Plot 5-2: Conducted Spurious Emissions – 1613.75 MHz**



**Plot 5-3: Conducted Spurious Emissions – 1616.25 MHz**



**Plot 5-4: Conducted Spurious Emissions – 1618.75 MHz**



**Table 5-1: Test Equipment Used For Testing Conducted Spurious Emissions**

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	11/10/10

**Test Personnel:**

Daniel Baltzell EMC Test Engineer	 Signature	March 4, 2010 Date Of Test
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## 6 FCC Rules and Regulations §2.1053(a): Field Strength of Spurious Radiation; §25.202(f) Emission Limitations

### 6.1 Test Procedure

ANSI/TIA/EIA-603-2004, section 2.2.12

Device with digital modulation: Modulated to its maximum extent using a pseudo-random data sequence.

The spurious emissions levels were measured, and the device under test was replaced by a substitution antenna connected to a signal generator. This signal generator level was then corrected by subtracting the cable loss from the substitution antenna to the signal generator, and the gain of the antenna (dBi) was added to achieve the ERP level and compared to the limit.

For out-of-band emissions for frequencies removed from the midpoint of the assigned frequency segment by more than 250% of the authorized bandwidth (2.5 MHz), at least 43 + 10 log (PWatts) attenuation below the mean power of the transmitter.

All frequencies were found to be greater than 20 dB below the limit with the worst case channel at 1611.25 MHz, for which data is presented.

### 6.2 Test Data

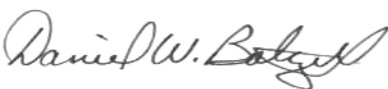
Table 6-1: Field Strength of Spurious Radiation – 1611.25 MHz

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Limit (dBc)	Margin (dB)
3222.50	53.0	-41.0	16.6	7.0	69.8	32.2	-37.6
4833.75	54.0	-37.6	16.6	8.8	64.6	32.2	-32.4
6445.00	49.4	-42.6	17.4	9.7	69.4	32.2	-37.2
8056.25	53.9	-37.8	17.9	9.2	65.7	32.2	-33.5
9667.50	44.7	-44.4	18.4	9.7	72.3	32.2	-40.1
11278.75	46.0	-41.8	19.0	10.3	69.6	32.2	-37.4
12890.00	36.2	-41.6	20.2	11.1	69.9	32.2	-37.7
14501.25	31.0	-53.3	22.3	9.7	85.1	32.2	-52.9
16112.50	32.6	-54.4	24.3	14.5	83.4	32.2	-51.2

**Table 6-2: Test Equipment Used For Testing Field Strength of Spurious Radiation**

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900932	Hewlett Packard	8449B OPT H02	Preamplifier (1 - 26.5 GHz)	3008A00505	2/22/11
900878	Rhein Tech Laboratories	AM3-1197-0005	3 meter antenna mast, polarizing	OATS1	N/A
901516	Insulated Wire Inc.	KPS-1503-2400-KPS	RF cable, 20'	NA	10/19/10
901517	Insulated Wire Inc.	KPS-1503-360-KPS	RF cable 36"	NA	10/19/10
901242	Rhein Tech Laboratories	WRT-000-0003	Wood rotating table	N/A	N/A
901215	Hewlett Packard	8596EM	Spectrum Analyzer (9 kHz - 12.8 GHz)	3826A00144	10/23/10
900791	Chase	CBL6111B	Bilog Antenna (30 MHz – 2000 MHz)	N/A	12/12/10
900321	EMCO	3161-03	Horn Antennas (4 – 8 GHz)	9508-1020	6/14/10
900323	EMCO	3160-07	Horn Antennas (8.2 – 12 GHz)	9605-1054	6/14/10
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	6/14/10
901426	Insulated Wire Inc.	KPS-1503-3600-KPS	RF cable, 30'	NA	10/19/10
900928	Hewlett Packard	83752A	Synthesized Sweeper, 0.01 to 20 GHz	3610A00866	2/17/11
900930	Hewlett Packard	85662A	Spectrum Analyzer Display Section	3144A20839	8/26/10
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	8/26/10
901262	ETS	3160-9	Double ridged Guide Antenna (1-18 GHz)	6748	5/1/11

**Test Personnel:**

Daniel Baltzell Test Engineer	 Signature	March 5, 2010 Date Of Tests
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## 7 FCC Rules and Regulations §2.1049(c)(1): Occupied Bandwidth; §25.202(f) Emission Limitations

### 7.1 Test Procedure

ANSI/TIA/EIA-603-2004, section 2.2.11 and TIA/EIA-102.CAAA-2002 section 2.2.5

Device with digital modulation: Modulated to its maximum extent using a pseudo-random data sequence.

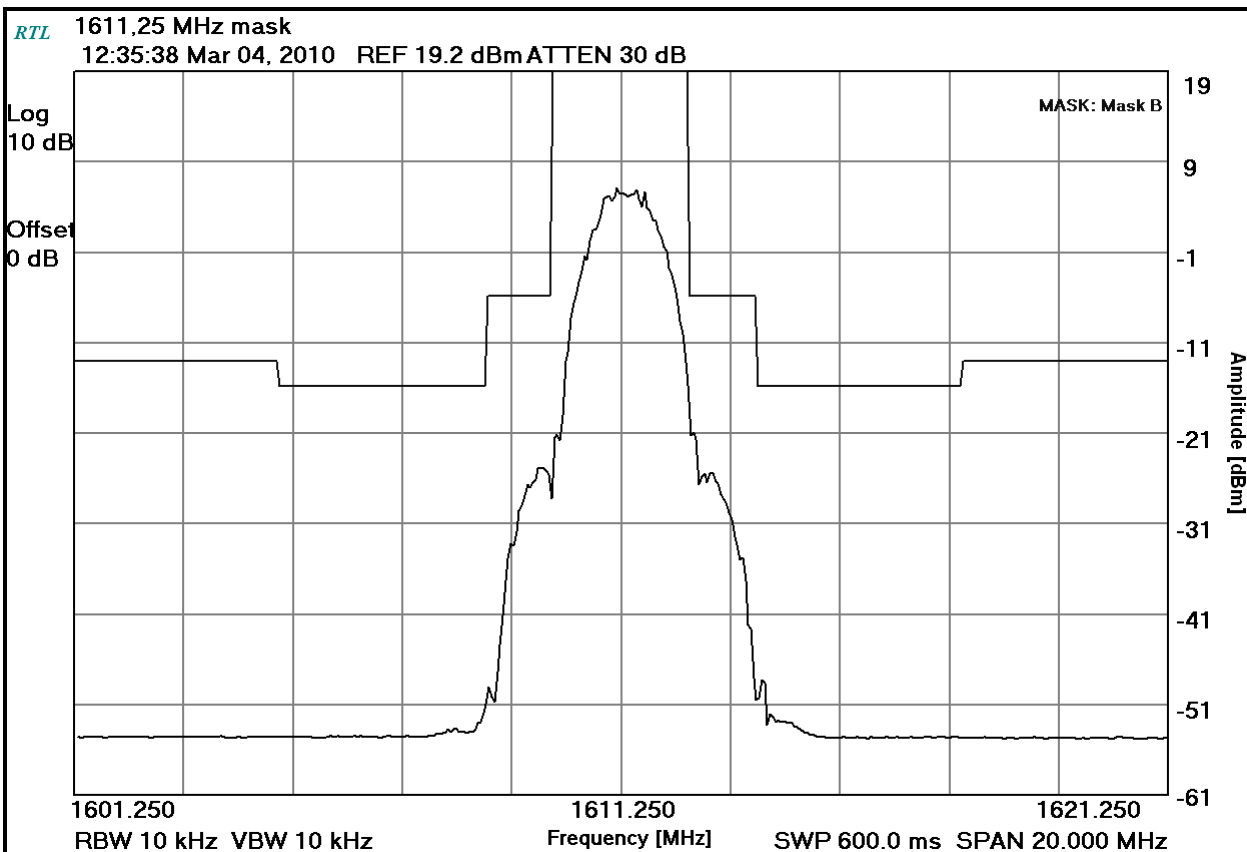
25.202(f) Emission limitations. The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

- (1) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: 25 dB;
- (2) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: 35 dB;
- (3) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 250 percent of the authorized bandwidth: an amount equal to 43 dB plus 10 times the logarithm (to the base 10) of the transmitter power in watts;

Note: A 10 kHz RBW was used to measure the 4 kHz band requirements.

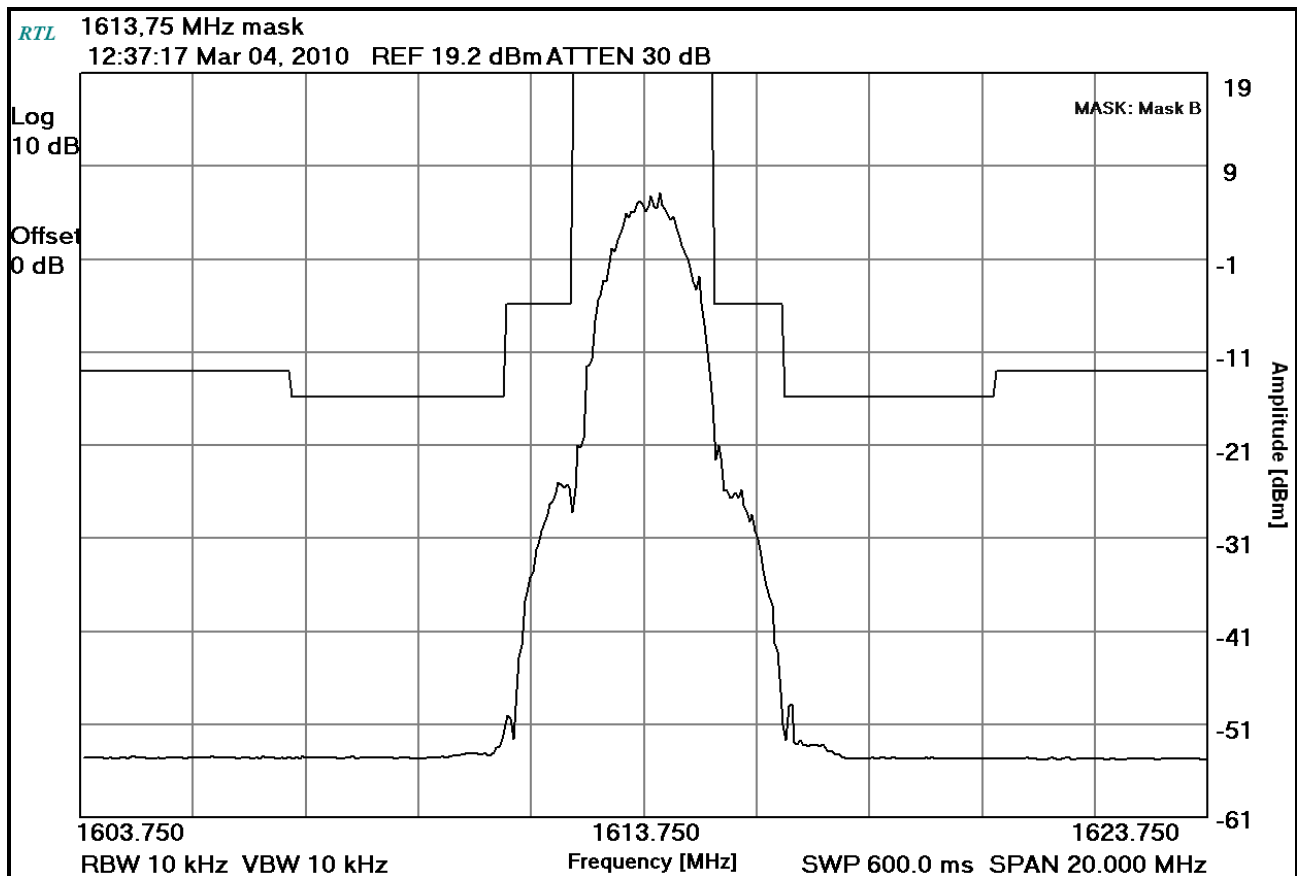
### 7.2 Test Data

Plot 7-1: Occupied Bandwidth – 1611.25 MHz

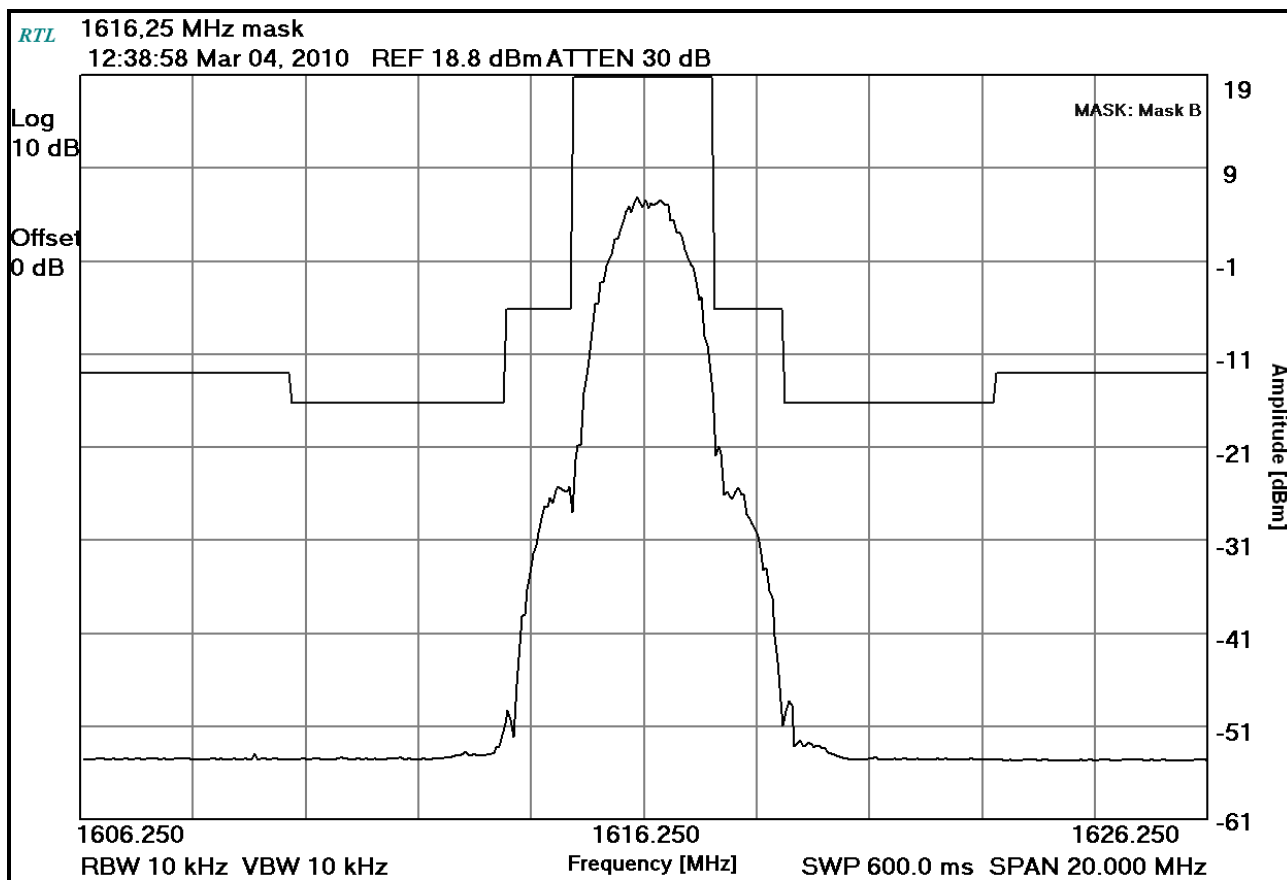




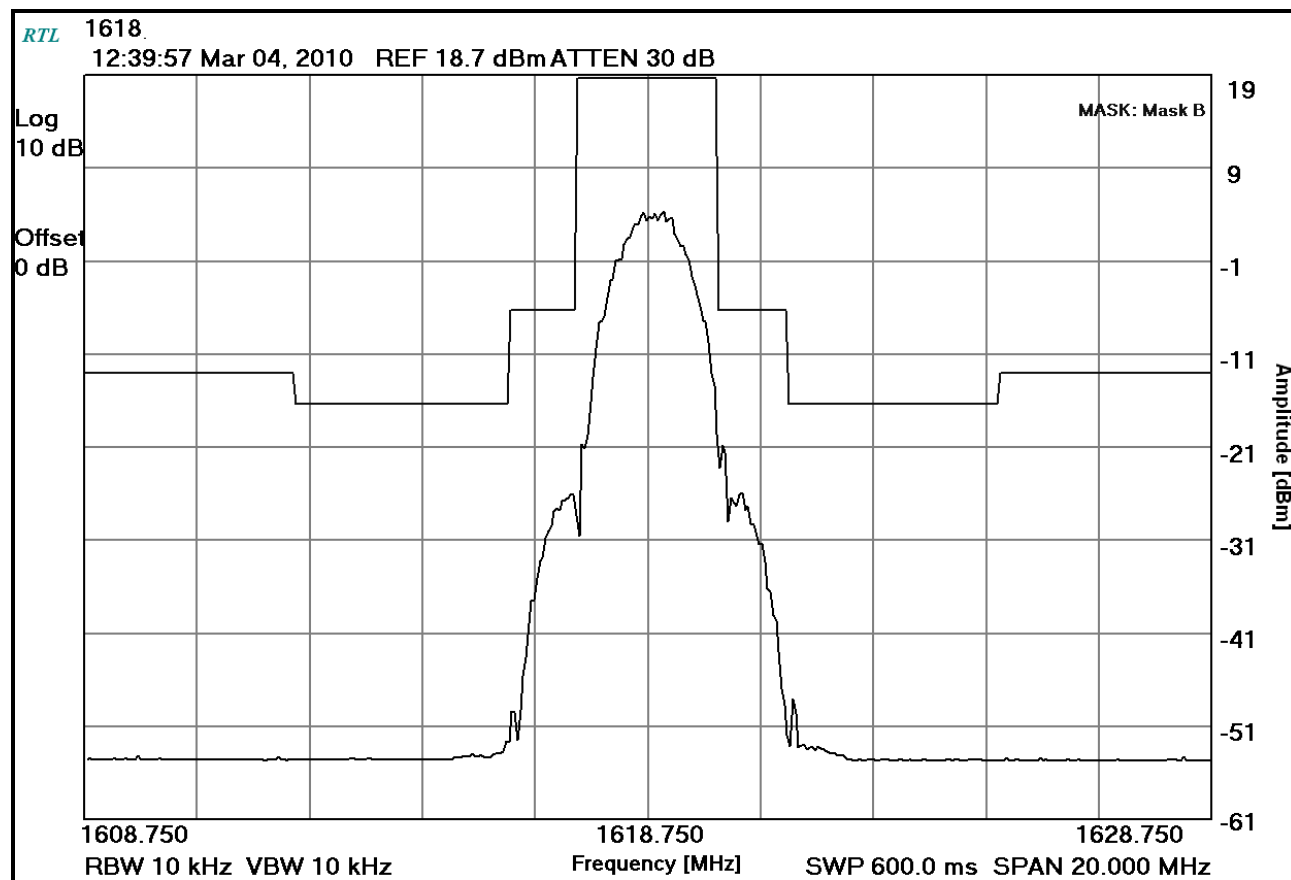
**Plot 7-2: Occupied Bandwidth – 1613.75 MHz**



Plot 7-3: Occupied Bandwidth – 1616.25 MHz



**Plot 7-4: Occupied Bandwidth – 1618.75 MHz**



**Table 7-1: Test Equipment Used For Testing Occupied Bandwidth**

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901215	Hewlett Packard	8596EM	Spectrum Analyzer (9kHz-12.8GHz)	3826A00144	11/23/10

**Test Personnel:**

Daniel Baltzell EMC Test Engineer	 Signature	March 4, 2010 Date Of Test
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## 8 FCC Rules and Regulation §2.1055: Frequency Stability; §25.202(d): Frequency Stability

### 8.1 Test Procedure

ANSI/TIA/EIA-603-2004, section 2.2.2

The carrier frequency stability is the ability of the transmitter to maintain an assigned carrier frequency.

The EUT was evaluated over the temperature range -30°C to +60°C.

The temperature was initially set to -30°C and a 1-hour period was observed for stabilization of the EUT. The frequency stability was measured within one minute after application of primary power to the transmitter. The temperature was raised at intervals of 10 degrees centigrade through the range. A ½-hour period was observed to stabilize the EUT at each measurement step and the frequency stability was measured within one minute after application of primary power to the transmitter. Additionally, the power supply voltage of the EUT was varied +/-15% nominal input voltage.

Part 25.202(d) Frequency tolerance, Earth stations. The carrier frequency of each earth station transmitter authorized in these services shall be maintained within 0.001 percent of the reference frequency.

Limit = 1611.249 (20° C ref) X 0.00001= 16.112 kHz

### 8.2 Test Data

**Table 8-1: Temperature Frequency Stability**

Temperature (°C)	Measured Frequency (MHz)	Deviation from 20°C Reference (kHz)
-30	1611.249072	-0.138
-20	1611.249896	0.686
-10	1611.249333	0.123
0	1611.249521	0.311
10	1611.249406	0.196
20	1611.249210	0.000
30	1611.249033	-0.177
40	1611.249053	-0.157
50	1611.248817	-0.393

Result: The EUT is compliant, worst case is 686 Hz.

## 8.2.1 Frequency Stability/Voltage Variation

**Table 8-2: Frequency Stability/Voltage Variation**

Voltage (VDC)	Measured Frequency (Hz)	Deviation from 20°C Reference (kHz)
2.55	1611.248976	-0.097
3.00	1611.249073	0.000
3.45	1611.249123	0.050

**Table 8-3: Test Equipment Used For Testing Frequency Stability**

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900946	Tenney Engineering, Inc.	TH65	Temperature Chamber with Humidity	11380	7/23/10
901300	Agilent Technologies	53131A (225 MHz)	Universal Frequency Counter	MY40001345	6/18/10

### Test Personnel:

Daniel Baltzell		March 4, 2010
EMC Test Engineer	Signature	Date Of Test

## 9 FCC Part 2.1047: Modulation Characteristics

The EUT is digitally modulated, therefore no modulation requirements apply.

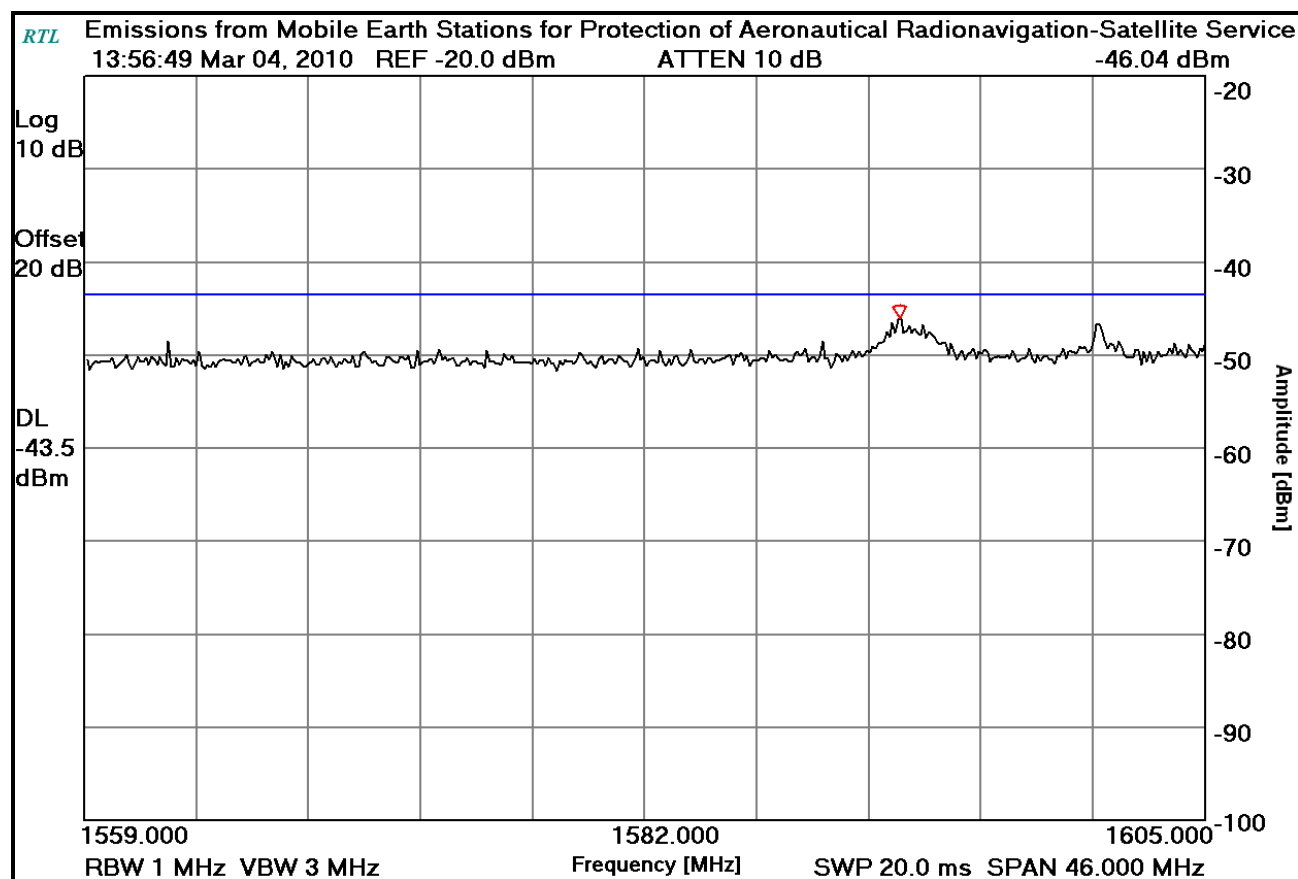
## 10 FCC Rules and Regulation §25.216 - Emissions from Mobile Earth Stations for Protection of Aeronautical Radionavigation-Satellite Service

- 25.216(c) from 1559 MHz – 1605 MHz, limit of -70 dBW/MHz, averaged over 20 milliseconds and the limit of -80 dBW/MHz, averaged over 20 milliseconds for discrete emissions less than 700 Hz.
- 25.216(g) from 1605 MHz – 1610 MHz, limits ranging from -70 dBW/MHz at 1605 MHz to -10 dBW/MHz at 1610 MHz, averaged over 2 milliseconds and ranging from -80 dBW/MHz at 1605 MHz to -20 dBW/MHz at 1610 MHz, averaged over 2 milliseconds for discrete emissions less than 700 Hz.
- 25.216(i) from 1559 MHz – 1605 MHz, limit of -80 dBW/MHz over any 2 millisecond active transmission interval. (carrier off).

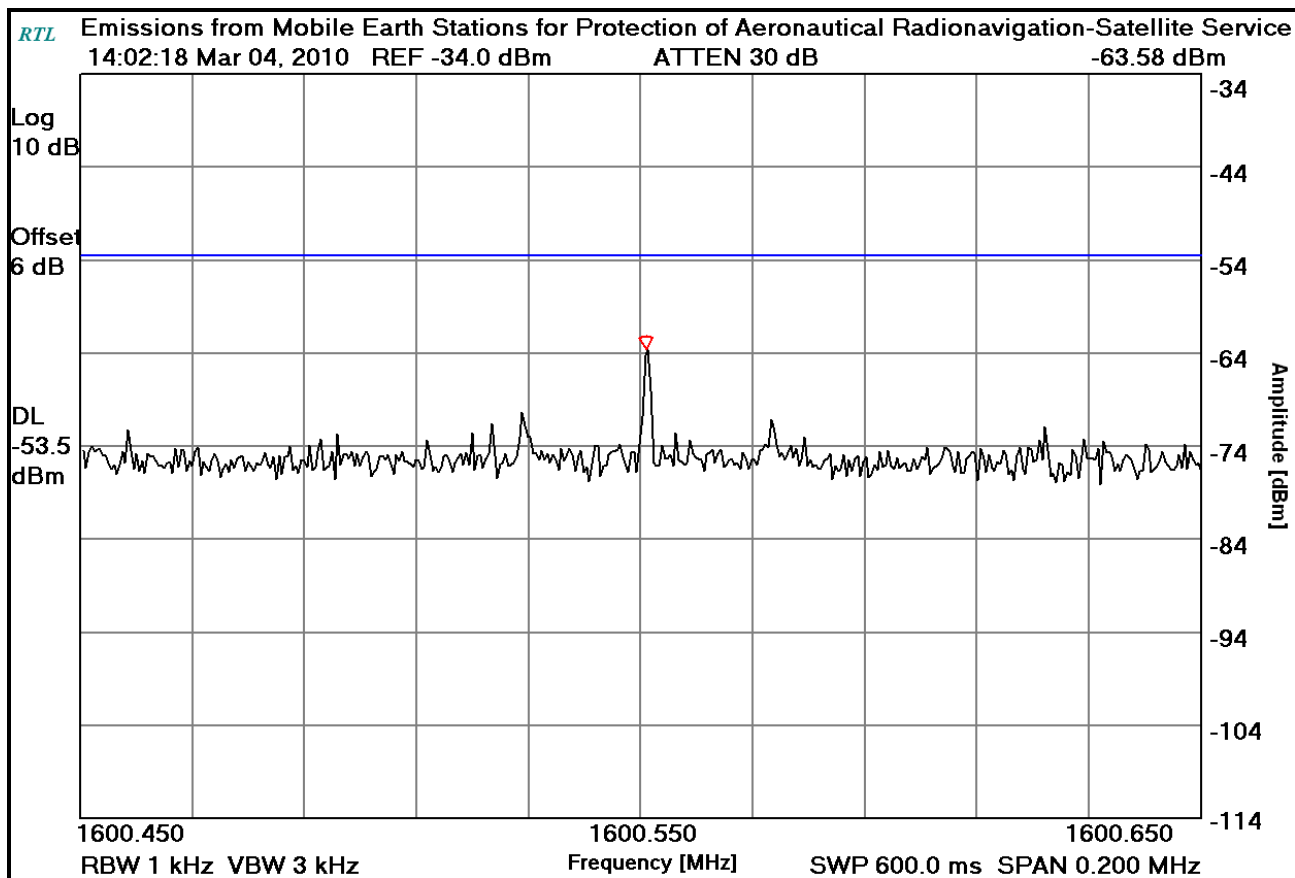
Emissions were measured with a spectrum analyzer by connecting the spectrum analyzer directly via a 6 dB attenuator to the antenna output terminal with RBW set to 1 MHz and VBW 3 MHz. Results are as follows.

### 10.1 Test Data

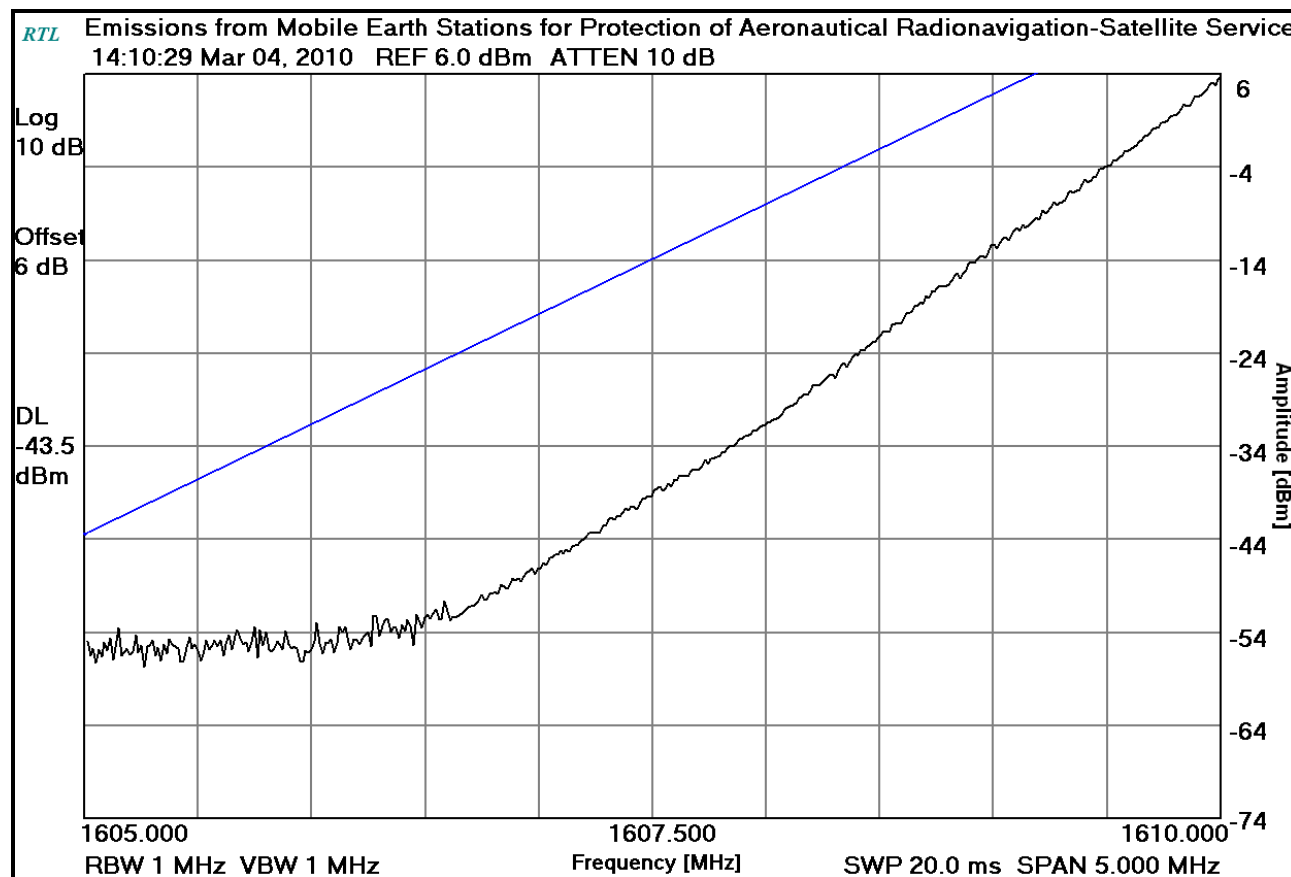
Plot 10-1: 1559 MHz – 1605 MHz -70 dBW/MHz limit FCC Part 25.216 (c)



Plot 10-2: 1559 MHz – 1605 MHz -80 dBW/MHz limit FCC Part 25.216 (c)

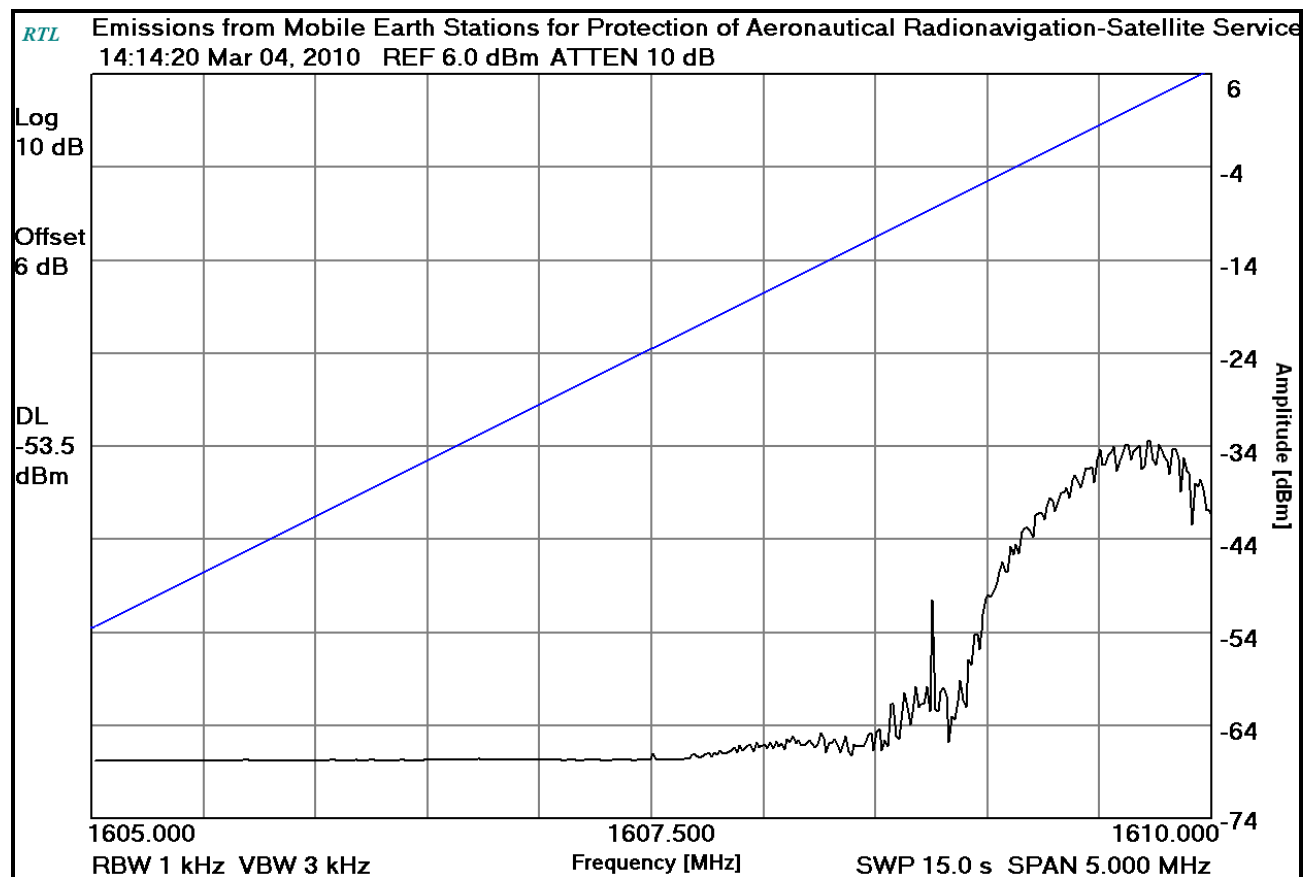


**Plot 10-3: 1605 MHz – 1610 MHz -70 dBW/MHz to -10 dBW/MHz limit FCC Part 25.216 (g)**

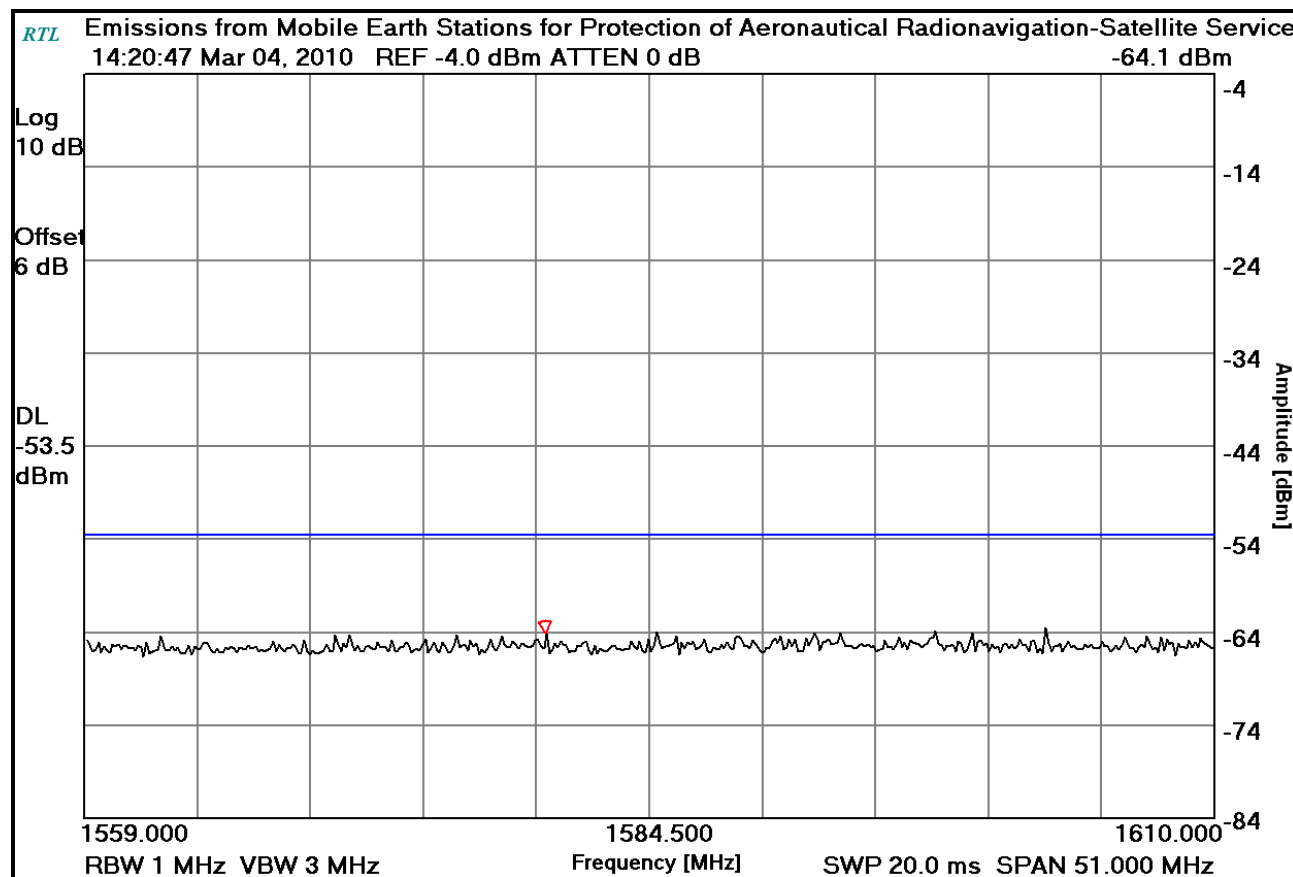




**Plot 10-4: 1605 MHz – 1610 MHz -80 dBW/MHz to -20 dBW/MHz limit FCC Part 25.216 (g)**



**Plot 10-5: 1559 MHz – 1605 MHz -80 dBW/MHz limit FCC Part 25.216 (i) (Carrier Off)**



**Table 10-1: Test Equipment Used For Testing Emissions from Mobile Earth Stations**

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901215	Hewlett Packard	8596EM	Spectrum Analyzer (9kHz-12.8GHz)	3826A00144	11/23/10
900906	Weinschel Corp	1B	10 dB Attenuator; 5 W	AL7407	2/17/11

**Test Personnel:**

<p>Daniel Baltzell</p> <p>EMC Test Engineer</p>	 <p>Signature</p>	<p>March 4, 2010</p> <p>Date Of Test</p>
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Client: Blackbird Technologies, Inc.  
Model: Blackbird Asset Tracker  
FCC ID: X6K-BAT-001  
Standards: FCC Part 25  
Report #: 2010008

## 11 Conclusion

The data in this measurement report shows that the **Blackbird Technologies, Inc. Model Blackbird Asset Tracker(BAT), Revision H, FCC ID: X6K-BAT-001**, complies with all the applicable requirements of Parts 2 and 25 of the FCC Rules and Regulations.