

Engineering Solutions & Electromagnetic Compatibility Services

FCC Part 25 Certification Report

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

Model: PANTHER FCC ID: X6K-PAN-001

August 20, 2012

Standards Referenced for this Report			
Part 2: 2011	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations		
Part 25: 2011	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 (kHz)	Emission Designator
1611.25 - 1618.75	0.1	0.8	1M95G1D

Report Prepared By: Daniel Baltzell

Document Number: 2012108

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These tests are accredited and meet the requirements of ISO/IEC 17025 as verified by ANSI-ASQ National Accreditation Board/ACLASS. Refer to certificate and scope of accreditation AT-1445.

Client: Blackbird Technologies, Inc. Model: Panther FCC ID: X6K-PAN-001 Standards: FCC Part 25 Report #: 2012108

Table of Contents

1 General Information	
1.1 Scope	
1.2 Description of EUT	
1.3 Test Facility	
1.4 Related Submittal(s)/Grant(s)	
1.5 Modifications	
2 Test Result Summary	
3 Tested System Details	
4 FCC Rules and Regulations §2.1046(a): RF Power Output: Conducted; §25.204: Transmitter	
4.1 Test Procedure	9
4.2 Test Data	
5 FCC Rules and Regulations §2.1051: Spurious Emissions at Antenna Terminals; §25.202(f) Er	
Limitations	
5.1 Test Procedure	
5.2 Test Data	
6 FCC Rules and Regulations §2.1053(a): Field Strength of Spurious Radiation; §25.202(f) Emis	
6.1 Test Procedure	
6.2 Test Data	
7 FCC Rules and Regulations §2.1049(c)(1): Occupied Bandwidth; §25.202(f) Emission Limitation	
7.1 Test Procedure	
7.2 Test Data	
8 FCC Rules and Regulations §2.1055: Frequency Stability; §25.202(d): Frequency Stability	
8.1 Test Procedure	
8.2 Test Data	
8.2.1 Frequency Stability/Voltage Variation	
9 FCC §2.1047: Modulation Characteristics	
10 FCC Rules and Regulations §25.216 - Emissions from Mobile Earth Stations for Protection of A	
Radionavigation-Satellite Service	
10.1 Test Data	
11 Conclusion	28

Client: Blackbird Technologies, Inc.
Model: Panther
FCC ID: X6K-PAN-001
Standards: FCC Part 25
Report #: 2012108

Table of Figures

Figure 3-1:	Configuration of Tested System	8
	Table of Tables	
Table 3-1: Table 3-2:	Equipment Under Test (EUT)	7 7
Table 4-1: Table 4-2:	RF Conducted Output Power - Measured Test Equipment Used For Testing RF Power Output - Conducted	
Table 5-1: Table 6-1:	Test Equipment Used For Testing Conducted Spurious Emissions	13
Table 6-2: Table 7-1:	Test Equipment Used For Testing Field Strength of Spurious Radiation Test Equipment Used For Testing Conducted Spurious Emissions	15
Table 8-1: Table 8-2:	Temperature Frequency StabilityFrequency Stability/Voltage Variation	21
Table 8-3: Table 10-1:	Test Equipment Used For Testing Frequency Stability Test Equipment Used For Testing Emissions from Mobile Earth Stations	22
	1. h	
	Table of Plots	
Plot 5-1:	Conducted Spurious Emissions - 1611.25 MHz	
Plot 5-2: Plot 5-3:	Conducted Spurious Emissions – 1613.75 MHz Conducted Spurious Emissions – 1616.25 MHz	12
Plot 5-4: Plot 7-1:	Conducted Spurious Emissions – 1618.75 MHz Occupied Bandwidth – 1611.25 MHz	17
Plot 7-2: Plot 7-3:	Occupied Bandwidth – 1613.75 MHz Occupied Bandwidth – 1616.25 MHz	
Plot 7-4: Plot 10-1:	Occupied Bandwidth – 1618.75 MHz	
Plot 10-2: Plot 10-3:	1559 MHz – 1605 MHz; -80 dBW/MHz Limit - FCC §25.216(c) (-54.25 dBm)	24 .75
Plot 10-4:	dBm)	75
Plot 10-5:	dBm) 1559 MHz – 1605 MHz; -80 dBW/MHz Limit - FCC §25.216(i) (Carrier Off) (-54.25 dBm)	

Client: Blackbird Technologies, Inc.
Model: Panther
FCC ID: X6K-PAN-001
Standards: FCC Part 25
Report #: 2012108

Table of Appendixes

Appendix A:	ECC \$1 1207 \$1 1210 \$2 1001 \$2 1002; DE Expenses	20
Appendix A:	FCC §1.1307, §1.1310, §2.1091, §2.1093: RF Exposure	
Appendix C:	Agency Authorization Letter FCC Confidentiality Request Letter	
Appendix C. Appendix D:	Attestation Letter – No Simultaneous Transmission	ا ک دد
Appendix E:	ID Label and Location	
Appendix F:	Technical Operational Description	
Appendix G:	Schematics	
Appendix H:	Block Diagram	
Appendix I:	Parts List	
Appendix J:	Tune Up/Alignment	38
Appendix K:	User Manual	
Appendix L:	External Photographs	40
Appendix M:	Internal Photographs	41
Appendix N:	Test Configuration Photographs	
	Table of Photographs	
Photograph 1	: Radiated Emissions – Front View	42
	: Radiated Emissions – Back View	

Client: Blackbird Technologies, Inc. Model: Panther FCC ID: X6K-PAN-001 Standards: FCC Part 25 Report #: 2012108

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 Model **PANTHER**, **FCC ID**: **X6K-PAN-001**.

Applicable Standards:

FCC Rules Part 25: Satellite Communications

1.2 Description of EUT

Equipment Under Test	GPS tracking module	
Model Name	PANTHER	
Power Supply	9 VDC-AC Adapter	
Modulation Type	Type BPSK	
Frequency Range 1611.25-1618.75 MHz		
Antenna Connector Type External MCX Jack		
Antenna Type	Internal 4.25 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 certification report for Blackbird Technologies, Inc. for the model: PANTHER, FCC ID: X6K-PAN-001.

1.5 Modifications

None.

Client: Blackbird Technologies, Inc. Model: Panther FCC ID: X6K-PAN-001 Standards: FCC Part 25 Report #: 2012108

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 report 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.

Client: Blackbird Technologies, Inc. Model: Panther FCC ID: X6K-PAN-001 Standards: FCC Part 25 Report #: 2012108

3 Tested System Details

The test sample was received on June 22, 2012. Listed below are the identifiers and descriptions of all equipment, cables, and internal devices used with the EUT for this test, as applicable.

The EUT, the PANTHER, is a portable, battery-operated telemetry device designed to communicate with Globalstar satellites and provide locator service. The EUT operates at the frequencies 1611.25 and 1616.25 MHz. The PANTHER is additionally capable of transmitting at 1613.75 and 1618.75 MHz, but is limited from doing so by firmware; these frequencies were also tested. In typical operation, the PANTHER 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 an external receive and transmit antenna; it uses an external 9VDC AC adapter as a power source.

The device was programmed for continuous mode with normal modulation and CW modes.

Table 3-1: Equipment Under Test (EUT)

Part	Manufacturer	Model	PN/SN	FCC ID	RTL Bar Code
Transceiver	Blackbird Technologies, Inc.	PANTHER	P1068	X6K-PAN-001	20744

Table 3-2: Auxiliary Test Equipment

Part	Manufacturer	Model	PN/SN	FCC ID	RTL Bar Code
9VDC-AC Adapter	Cincon Electronics Co., Ltd	TR30R090	TR30R090- 62E03	N/A	20746
Laptop	Sony	VPCEB23FM	N/A	N/A	N/A
Transceiver Base	Blackbird Technologies, Inc.	PANTHER	N/A	N/A	20745

Figure 3-1: Configuration of Tested System

Panther

Client: Blackbird Technologies, Inc. Model: Panther FCC ID: X6K-PAN-001 Standards: FCC Part 25 Report #: 2012108

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 Ω load impedance.

EIRP < +40 dBW in any 4 kHz band for θ =0 degrees

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	18.8	0.076
1613.75	19.0	0.079
1616.25	19.1	0.081
1618.75	19.2	0.083

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

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901583	Agilent Technologies	N9010A	EXA Signal Analyzer (10 Hz-26.5 GHz)	MY51250846	3/13/13
901337	Narda Microline	766-10	Attenuator DC-4GHz, 10 dB, 20W	6242	7/15/13

Test Personnel:

Daniel Baltzell

EMC Test Engineer

Signature

August 13, 2012

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 Ω 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.

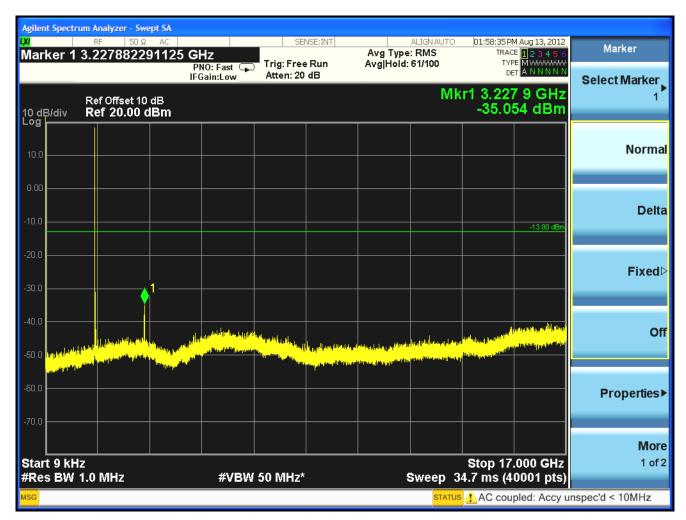
5.2 Test Data

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

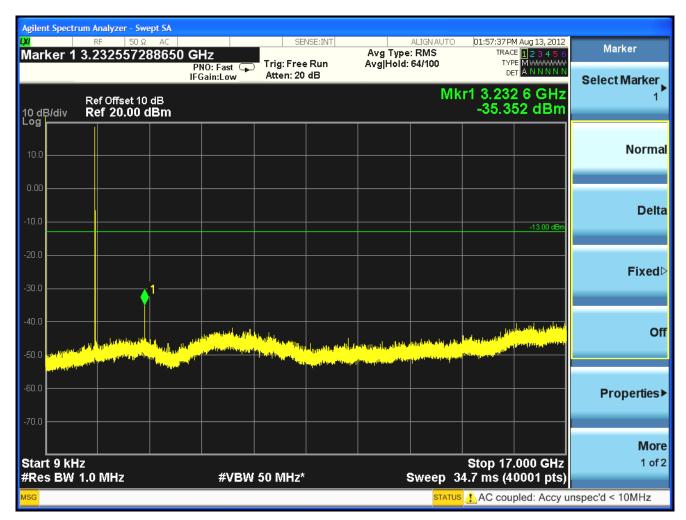
Plot 5-1: Conducted Spurious Emissions - 1611.25 MHz



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
901583	Agilent Technologies	N9010A	EXA Signal Analyzer (10 Hz-26.5 GHz)	MY51250846	3/13/13
901337	Narda Microline	766-10	Attenuator DC-4GHz, 10 dB, 20W	6242	7/15/13

Test Personnel:

Daniel Baltzell
EMC Test Engineer

Signature

Daniel W. Bolgel

August 13, 2012

Date of Test

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	27.2	-85.3	1.5	9.4	96.2	31.8	-64.4
4833.75	27.7	-75.8	1.8	10.8	85.6	31.8	-53.8
6445.00	36.6	-65.6	2.1	11.7	74.8	31.8	-43.0
8056.25	18.2	-83.4	2.3	11.3	93.2	31.8	-61.4
9667.50	31.9	-66.5	2.4	12.1	75.6	31.8	-43.8
11278.75	17.2	-78.7	2.5	12.6	87.4	31.8	-55.6
12890.00	19.7	-71.5	2.6	13.1	79.8	31.8	-48.0
14501.25	12.8	-74.5	2.7	11.3	84.7	31.8	-52.9
16112.50	10.0	-80.3	2.7	16.1	85.7	31.8	-53.9

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	8/10/13
900878	Rhein Tech Laboratories	AM3-1197-0005	3 meter antenna mast, polarizing	OATS1	N/A
301592	IW Microwave Products	KPS-1503-2400- KPR	20' 2.92mm Cable	N/A	8/15/12
901236	IW Microwave Products	KPS-1503-360-KPS	High Frequency RF Cables	36"	8/10/13
301594	IW Microwave Products	KPS-1503-360-KPR	3' 2.92mm Cable	N/A	8/15/12
901242	Rhein Tech Laboratories	WRT-000-0003	Wood rotating table	N/A	N/A
901581	Rohde & Schwarz	1166.1660.50	Spectrum Analyzer	2001006	6/3/13
900791	Chase	CBL6111B	Bilog Antenna (30 MHz–2000 MHz)	N/A	1/31/13
900321	EMCO	3161-03	Horn Antennas (4–8 GHz)	9508-1020	4/19/14
900323	EMCO	3160-07	Horn Antennas (8.2–12 GHz)	9605-1054	4/19/14
900772	EMCO	3161-02	Horn Antenna (2-4 GHz)	9804-1044	4/19/14
900356	EMCO	3160-08	Horn Antenna (12.4-18 GHz)	9607-1044	4/19/14
901582	Rohde & Schwarz	1167.0000.02	Signal Generator	101903	4/23/13
900814	Electro-Metrics	EM-6961 (RGA-60)	Double Ridged Guide Antenna (1-18 GHz)	2310	10/27/12

Test Personnel:

Daniel Baltzell
Test Engineer
Signature
Daniel Baltzell
August 15, 2012
Date of Test

Client: Blackbird Technologies, Inc. Model: Panther FCC ID: X6K-PAN-001 Standards: FCC Part 25 Report #: 2012108

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:

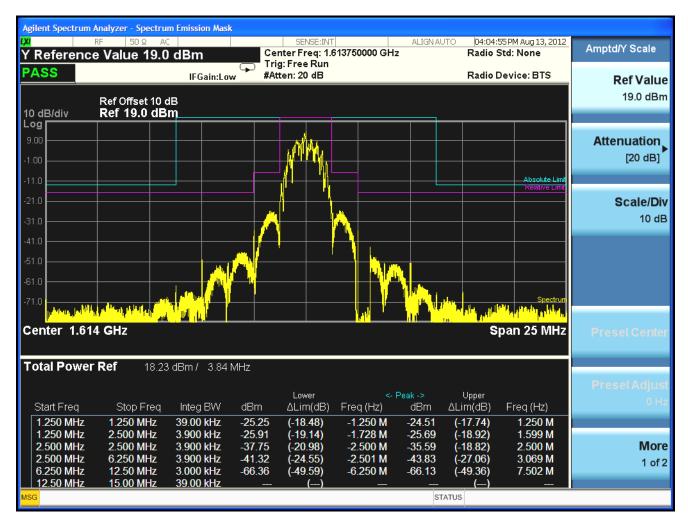
- (1) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: 25 dB;
- (2) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 100 percent 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;

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 Conducted Spurious Emissions

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901583	Agilent Technologies	N9010A	EXA Signal Analyzer (10 Hz-26.5 GHz)	MY51250846	3/13/13
901337	Narda Microline	766-10	Attenuator DC-4GHz, 10 dB, 20W	6242	7/15/13

Test Personnel:

Daniel Baltzell

EMC Test Engineer

Daniel W. Bolgel
Signature

August 13, 2012

Date of Test

8 FCC Rules and Regulations §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 $\frac{1}{2}$ -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 = 1618.75 (20° C ref) X 0.00001 = 16.1875 kHz

8.2 Test Data

Table 8-1: Temperature Frequency Stability

Temperature (°C)	Measured Frequency (MHz)	Deviation from 20°C Reference (kHz)
-30	1611.250354	0.35
-20	1611.250147	0.15
-10	1611.250383	0.38
0	1611.250163	0.16
10	1611.249586	-0.41
20	1611.250000	0.00
30	1611.250046	0.05
40	1611.249982	-0.02
50	1611.249936	-0.06

Result: The EUT is compliant; worst case is 0.8 kHz.

Client: Blackbird Technologies, Inc. Model: Panther FCC ID: X6K-PAN-001 Standards: FCC Part 25 Report #: 2012108

8.2.1 Frequency Stability/Voltage Variation

Table 8-2: Frequency Stability/Voltage Variation

Voltage (VDC)	Measured Frequency (MHz)	Deviation from 20°C Reference (kHz)	
7.65	1611.247123	-2.88	
9.00	1611.249375	-0.62	
10.35	1611.250441	0.44	

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	1/13/13
901300	Agilent Technologies	53131A (225 MHz)	Universal Frequency Counter	MY40001345	7/18/13

Test Personnel:

Daniel Baltzell August 15, 2012

EMC Test Engineer Signature Date of Test

9 FCC §2.1047: Modulation Characteristics

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

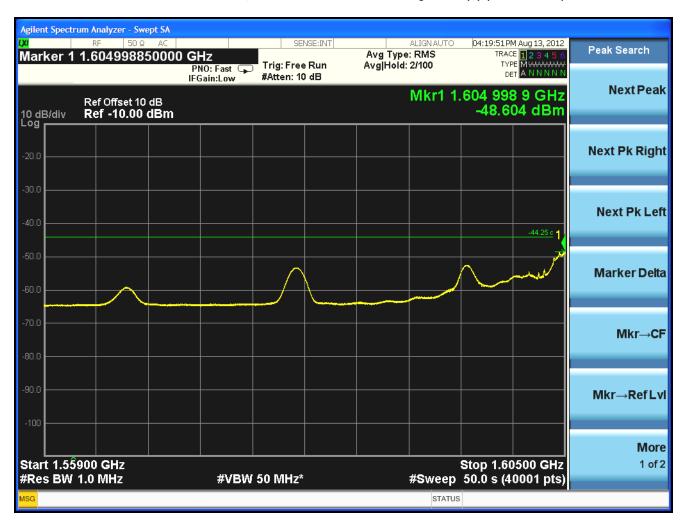
10 FCC Rules and Regulations §25.216 - Emissions from Mobile Earth Stations for Protection of Aeronautical Radionavigation-Satellite Service

- §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).

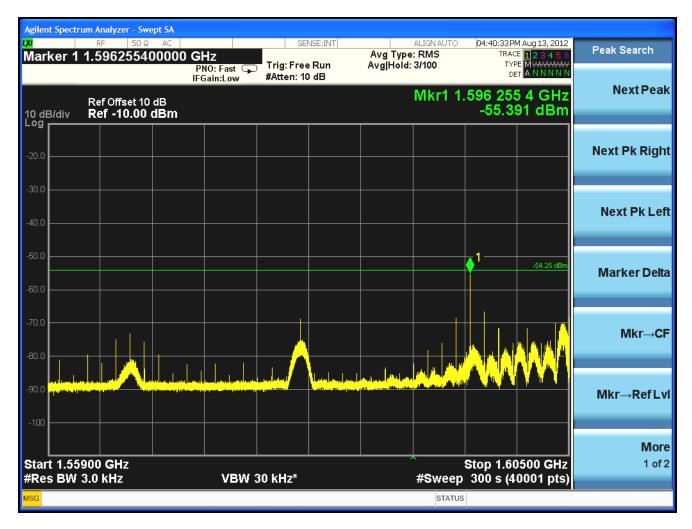
Emissions were measured with a spectrum analyzer by connecting the spectrum analyzer to the antenna output terminal with RBW set to 1 MHz and VBW 10 MHz. The test results follow. Limits are offset amount of antenna gain (4.25 dBic).

10.1 Test Data

Plot 10-1: 1559 MHz – 1605 MHz; -70 dBW/MHz Limit - FCC §25.216(c) (-44.25 dBm)



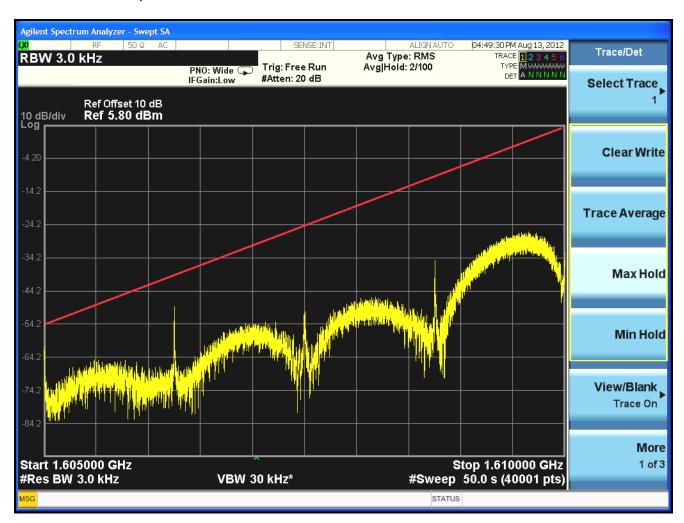
Plot 10-2: 1559 MHz - 1605 MHz; -80 dBW/MHz Limit - FCC §25.216(c) (-54.25 dBm)



Plot 10-3: 1605 MHz – 1610 MHz; -70 dBW/MHz to -10 dBW/MHz Limit - FCC §25.216(g) (-44.25 to 15.75 dBm)



Plot 10-4: 1605 MHz – 1610 MHz; -80 dBW/MHz to -20 dBW/MHz Limit - FCC §25.216(g) (-54.25 to 5.75 dBm)



Plot 10-5: 1559 MHz - 1605 MHz; -80 dBW/MHz Limit - FCC §25.216(i) (Carrier Off) (-54.25 dBm)

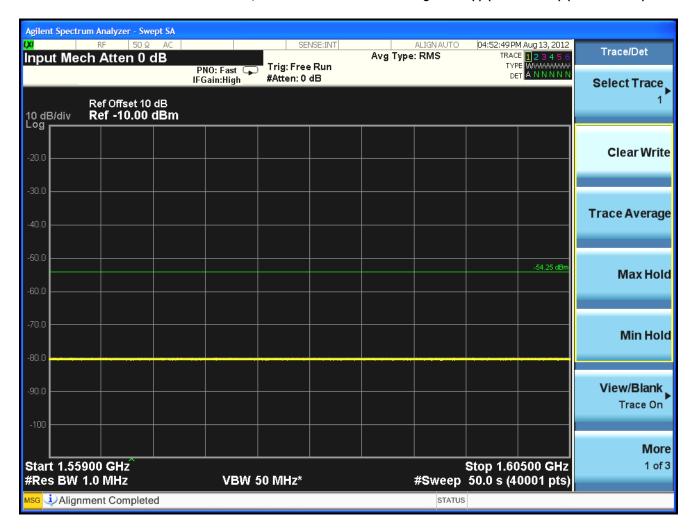


Table 10-1: Test Equipment Used For Testing Emissions from Mobile Earth Stations

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901583	Agilent Technologies	N9010A	EXA Signal Analyzer (10 Hz-26.5 GHz)	MY51250846	3/13/13
901337	Narda Microline	766-10	Attenuator DC-4GHz, 10 dB, 20W	6242	7/15/13

Test Personnel:

Daniel Baltzell
Test Engineer

Daniel W. Bolgson

August 13, 2012
Date of Test

Client: Blackbird Technologies, Inc. Model: Panther FCC ID: X6K-PAN-001 Standards: FCC Part 25 Report #: 2012108

11 Conclusion

The data in this measurement report shows that the Blackbird Technologies, Inc. Model PANTHER, FCC ID: X6K-PAN-001, complies with all the applicable requirements of Parts 2 and 25 of the FCC Rules and Regulations.