



REPORT

For

Norsat International Inc.

110-4020 Viking Way
Richmond, B.C.
V5C 2N2, Canada

Date: Dec. 18, 2008
Report No.: 9021-3E
Revision No.: 0
Project No.: 9021
Equipment: Portable SNG System
Model No.: 5200-40W-STD



ONE STOP GLOBAL CERTIFICATION SOLUTIONS



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Title 47 of the CFR: 2007, Part 25		
Report reference No.....:	9021-3E	
Report Revision History:	➤ 0 – Dec. 18, 2008	
Tested by (printed name and signature)	Jeremy LEE	
Approved by (printed name and signature)	Kavinder Dhillon, Eng.L.	
Date of issue	Dec. 18, 2008	
<p>Note: By signing this report, both the Testing Technician and the Reviewer hereby declare to abide by the applicable LabTest policies:</p> <p>1.) Statement of Independence # 3014 (LabTest Employees), 2.) Independence, Impartiality, and Integrity #1039, clause 11 (Engineering Service Subcontractors), or 3.) Independence, Impartiality, and Integrity #1019, clause 3.5 (Testing Subcontractors).</p>		
FCC Site Registration No.:	552549	
IC Site Registration No.:	5970A	
Testing Laboratory Name	LabTest Certification Inc.	
Address	3133 – 20800 Westminster Hwy, Richmond, B.C. V6V-2W3	
OATS Test Location Name	LabTest Certification Inc. (FCC Registration No.: 552549)	
Address	5340 – 164 Street, Surrey, BC, Canada	
Applicant's Name	Norsat International Inc.	
Address	110-4020 Viking Way, Richmond, B.C. V5C 2N2, Canada	
Manufacturer's Name	Same as Applicant	
Address	Same as Applicant	
Test specification		
Standards	Title 47 of the CFR: 2007, Part 25	
Date Test sample received	Apr. 30, 2008	
Date of Testing	May 03 to Dec. 17, 2008	
Test item description		
Manufacturer	Norsat International Inc.	
Model and/or type reference	5200-40W-STD	
Serial numbers	90025	
Frequency Range:	TX:13.75 to 14.50GHz, RX:10.95-11.7,11.7-12.2,12.25-12.75GHz	
Power (W):	40W	
Rating(s).....	93.5 to 126.5VAC, 60Hz, < 6A, Single Phase	

Device Under Test Description

Type of Equipment:	Portable Satellite News Gathering(SNG) system
RF/Antenna Band	Ku-band
Transmit Frequency Range:	14.00 to 14.50GHz
Receive Frequency Range:	10.95 to 11.70GHz, 11.70 to 12.20GHz, 12.25 to 12.75GHz
RF Power(SSPA Output)	40W
EIRP	56.5dBW
Antenna	1m carbon fiber, segmented(6)
Antenna Tx Gain at 14.25GHz	41.9dBi
Antenna Rx Gain at 10.95GHz	39.5dBi
Antenna Platform	Motorized El over Az mounted on support frame
Modulation	QPSK
Data Rates	1500 kbps – 10Mbps
Operating Temperature Range:	-30 °C to 50 °C
Supply Voltage:	93.5 to 126.5VAC, 60Hz, < 6A, Single Phase
General Product Information:	<p>The EUT is a portable satellite news gathering(SNG) system. It is fully automated with both non-technical and 'power-users' in mind, and is the industry's only comprehensive SNG system. The system includes a segmented carbon fiber antenna; motorized feed assembly; LNB; 40W SSPA with on integrated BUC; motorized azimuth/elevation superstructure; motorized polarization; built-in inclinometer; compass; GPS; baseband unit with a single-board computer, up-converter, spectrum analyzer, DVB-S receiver, Ethernet switch, DC-DC converter, and shock controller including a wired display with software and a graphical user interface(GUI). Sleekly packaged in three rugged, self-contained and wheelable cases.</p>

Parts List of System

Parts Name
Antenna – segmented carbon fiber, 1meter diameter
40W SSPA with an integrated BUC
LNB, 3 bands
Lower Boom Arm
Upper Boom Arm and Feed Assembly, including motorized polarization
Compass
Motorized Azimuth/Elevation Assembly
Baseband Unit with a single-board computer, up-converter, spectrum analyzer, DVB-S receiver, Ethernet switch, DC-DC converter, and shock-protected chassis
AC-DC Power Supply
System controller including a wired display, with software and a GUI
Audio/Data Kit with MPEG-2 encoder, modulator, modem

List of ancillary and/or support equipment provided by the applicant

Model:	Description:	Manufacturer
75-630HPA-30-6-6	Waveguide Attenuator, WR-75, 30 dB	Advanced Technical Materials Inc.
RBC75-20-1A-1A-1A-A	Waveguide Coupler, WR-75, 20dB coupling	Cobham Defense Electronic Systems
TRM-100150-02	Tx termination, 60W	SDP
PE9817	Adapter, WR-45 to N(f)	Pasternack Enterprises
M1290	Band attenuator	mitec
11989	Waveguide Adapter	Apollo
12249	Waveguide Adapter	Apollo
TWT-28-S19R0	Waveguide Adapter	Millitech
TWT-22-R15R0	Waveguide Adapter	Millitech

Markings

Blank

You should refer to the clause of FCC Part 2 Section 2.295 and FCC Part 15 Section 15.19 for information to be contained on the label as well as information about the label. Any other statements or labelling requirements may appear on a separate label at the option of the applicant/grantee.

According to FCC Section 2.925(a),

"(a) Each equipment covered in an application for equipment authorization shall bear a nameplate or label listing the following:

(1) FCC Identifier consisting of the two elements in the exact order specified in §2.926. The FCC Identifier shall be preceded by the term *FCC ID* in capital letters on a single line, and shall be a type size large enough to be legible without the aid of magnification.

Example: FCC ID XXX123. XXX-Grantee Code 123-Equipment Product Code"

According to FCC Section 15.19(a)(3), the following statement must be included on the identification label: This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Test Summary

Test	FCC CFR 47	Result
RF Power Output	25.203(c), 25.204(a) & 2.1046	PASS
Modulation Limiting	25.202(f) & 2.1047(b)	PASS
Emission Limitation & Field Strength of Spurious Emissions	25.202(f) & 2.1049	PASS
Emission Limitation – Spurious Emissions at Antenna Terminal	25.202(f), 2.1051 & 2.1057	PASS
Frequency Tolerance	25.202(d) & 2.1055	PASS
RF Exposure Requirements	1.1307, 1.1310, 2.1091 & 2.1093	PASS
Unintentional Radiated Emissions	15.109:2007, Class A	PASS
Unintentional Conducted Emissions	15.107:2007, Class A	PASS

RF Power Output

Basic Standard	FCC25.203(c), 25.204(a) & 2.1046
Temperature	14.7 °C
Relative Humidity	34.8 %
Barometric Pressure:	100.31 kPa
Test Date	Dec 17, 2008
Calibrated Test Equipment (ID)	228, C1
Reference Equipment (ID) (Calibration not required)	059, 227-3
Electrical Rating	110VAC, 60Hz, Single Phase
Tested By	Jeremy LEE

Use the barometric pressure reported at: <http://www.theweathernetwork.com/weather/CABC0308>

Test Limits

FCC 25.203(c)(ix): Maximum equivalent isotropically radiated power (e.i.r.p.) density in the main beam in any 4 kHz band, (dBW/4 kHz) for frequency bands below 15 GHz or in any 1 MHz band (dBW/MHz) for frequency band above 15 GHz,

FCC 25.204(a): In bands shared coequally with terrestrial radio communication services, the equivalent isotropically radiated power transmitted in any direction towards the horizon by an earth station, other than an ESV, operating in frequency bands between 1 and 15GHz, shall not exceed the following limits except as provided for in paragraph (c) of this section:

+40 dBW in any 4 kHz band for $\theta \leq 0^\circ$

+40 + 3 θ dBW in any 4 kHz band for $0^\circ < \theta \leq 5^\circ$

where θ is the angle of elevation of the horizon viewed from the center of radiation of the antenna of the earth station and measured in degrees as positive above the horizontal plane and negative below it.

Test Setup

: CONDUCTED POWER MEASUREMENTS

The test was performed in accordance with **FCC 25.203 and 2.1046**.

Test procedure was as follows:

- The EUT was connected from the Antenna terminal directly to the Spectrum Analyzer, using 30dB attenuator, adapter and cable.
- The EUT was set to transmit at peak power level as well as using 3000kS/s of Data rates. The average output power of the transmitter was determined.
- This measurement was performed at the Transmitters lowest, middle and highest frequencies.
- RBW was used 10 kHz, it was the nearest RBW value of 4 kHz RBW.
- 33.9dB of referenced offset was used for compensation of an attenuator and cable losses.

Calculation of Average EIRP:

- The observed value shall be recorded as "A" (in dBm);
- The e.i.r.p. shall be calculated from the above measured power output "A", the observed duty cycle x, and the applicable antenna assembly gain "G" in dBi, according to the formula:
- **EIRP = A + G + 10log(1/x)**

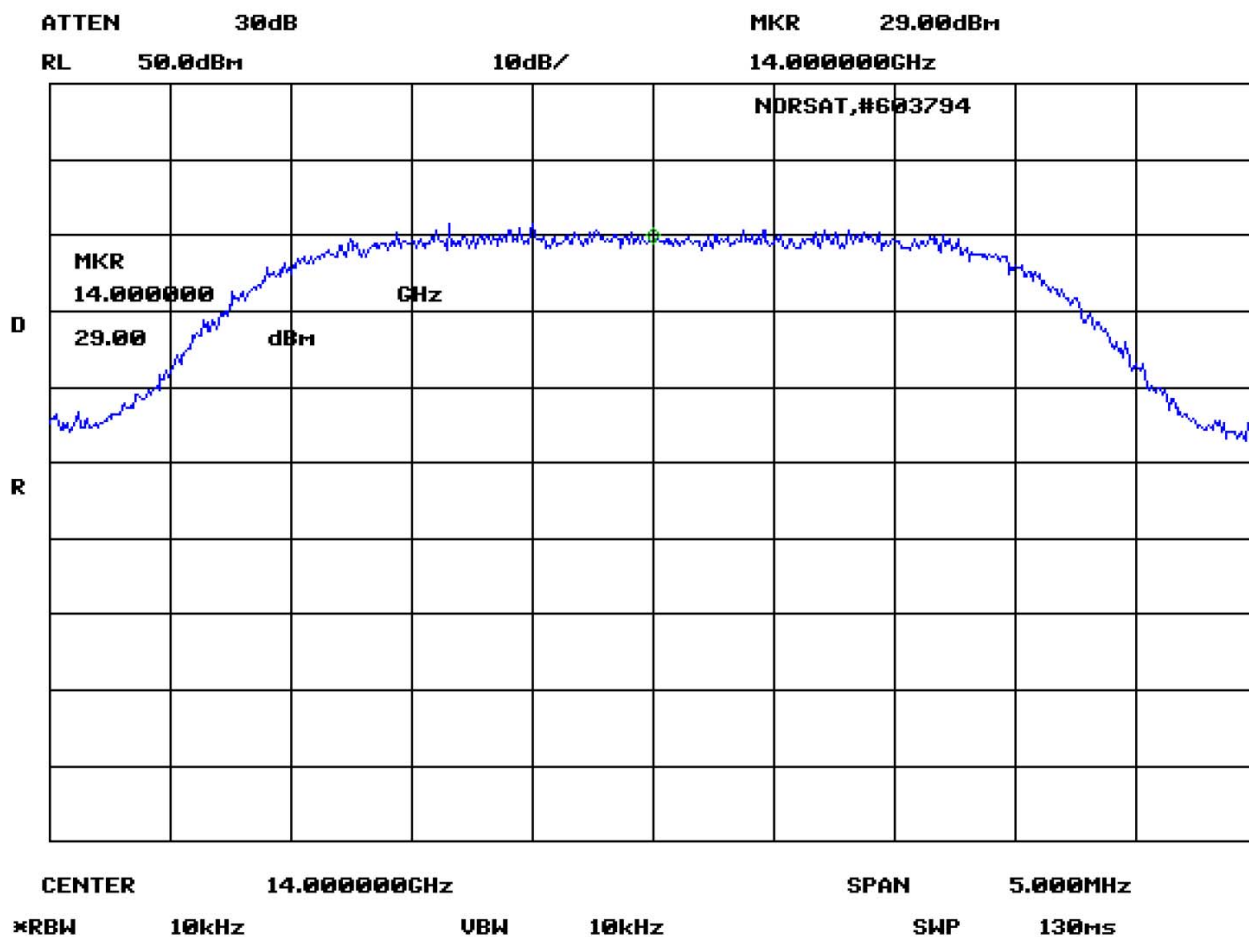
- { $X = 1$ for continuous transmission $\Rightarrow 10\log(1/x) = 0$ dB }

Test Results:

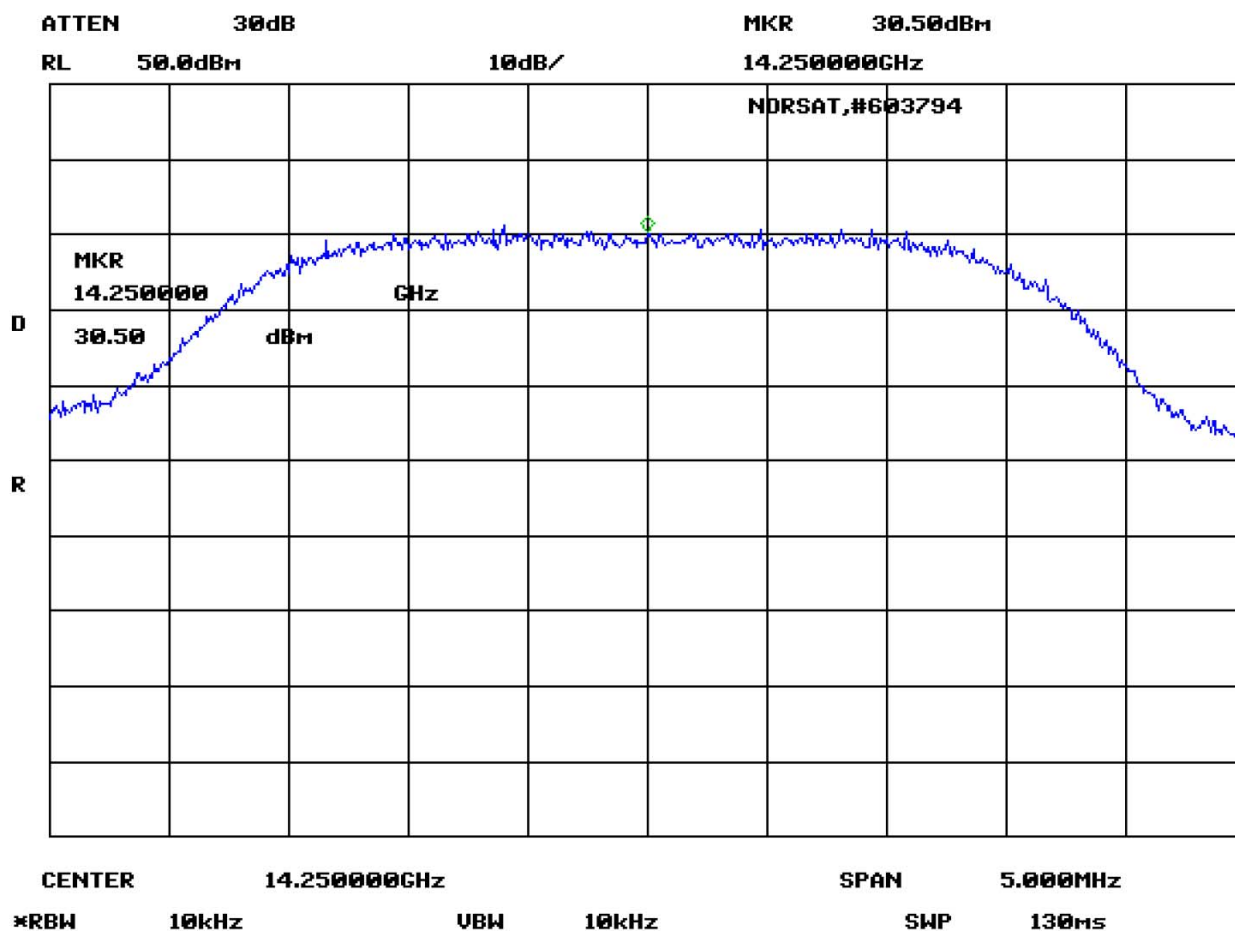
Power Density at Antenna Port in 4kHz BW

Carrier Frequency	Measured Power at 10kHz BW	Measured Power at 4kHz BW	Antenna Gain	EIRPD in 4KHz BW	EIRPD Limit in 4KHz BW
(GHz)	(dBm)	(dBW)	(dB)	(dBW)	(dBW)
14	29.00	-4.98	41.40	36.42	+ 40
14.25	30.50	-3.48	41.57	38.09	+ 40
14.5	28.17	-5.81	41.70	35.89	+ 40

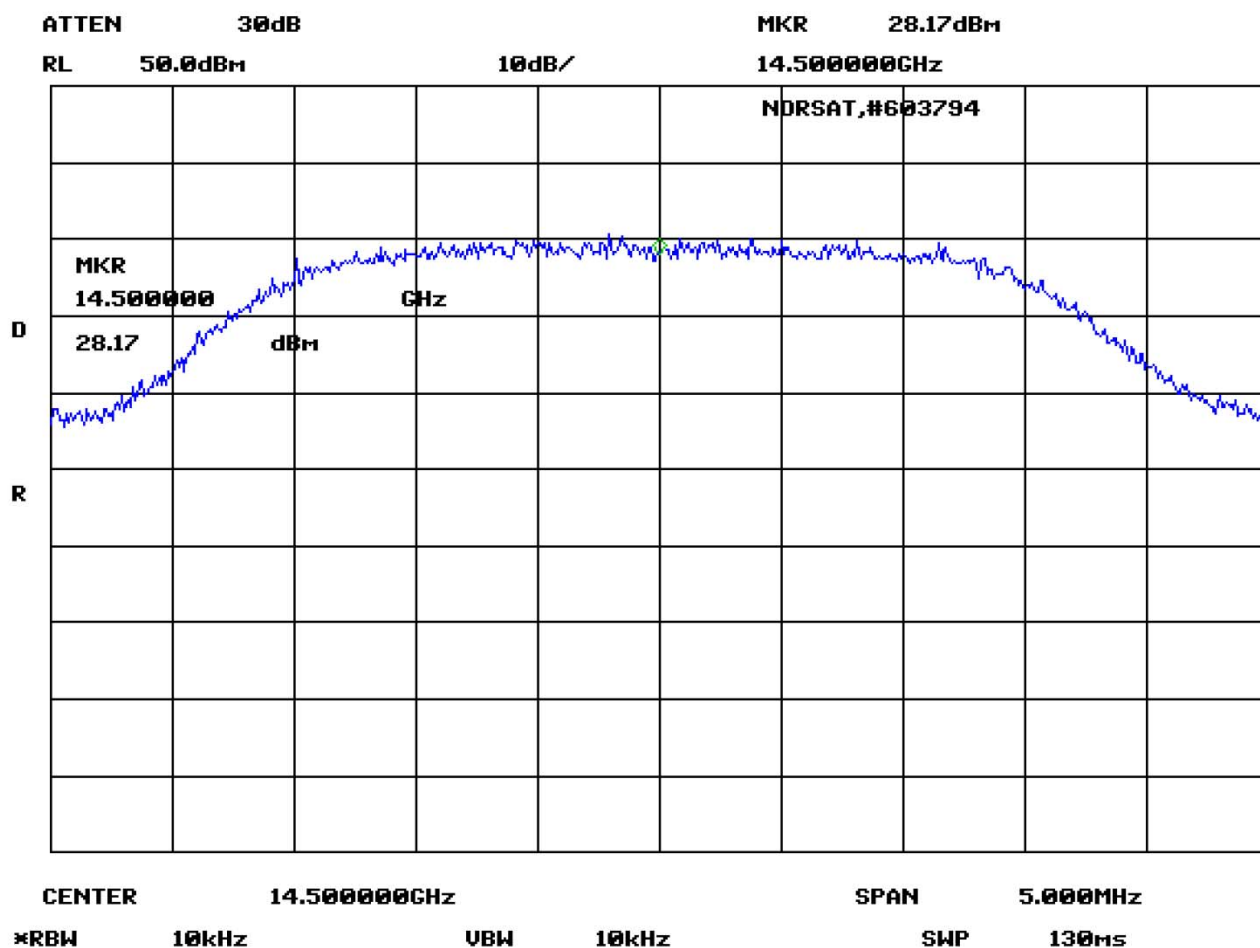
- Output Power; TX center frequency is 14.00GHz



- Output Power; TX center frequency is 14.25GHz



- Output Power; TX center frequency is 14.50GHz



Modulation Limiting

Basic Standard	FCC25.202(f) & 2.1049
Temperature	14.7 °C
Relative Humidity	34.8 %
Barometric Pressure:	100.31 kPa
Test Date	Dec 17, 2008
Calibrated Test Equipment (ID)	228, C1
Reference Equipment (ID) (Calibration not required)	059, 227-3
Electrical Rating	110VAC, 60Hz, Single Phase
Tested By	Jeremy LEE

Use the barometric pressure reported at: <http://www.theweathernetwork.com/weather/CABC0308>

Test Limits

FCC 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;
- (4) In any event, when an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in paragraphs (f) (1), (2) and (3) of this section.

Test Setup

The test was performed in accordance with **FCC 25.202 and 2.1049**.

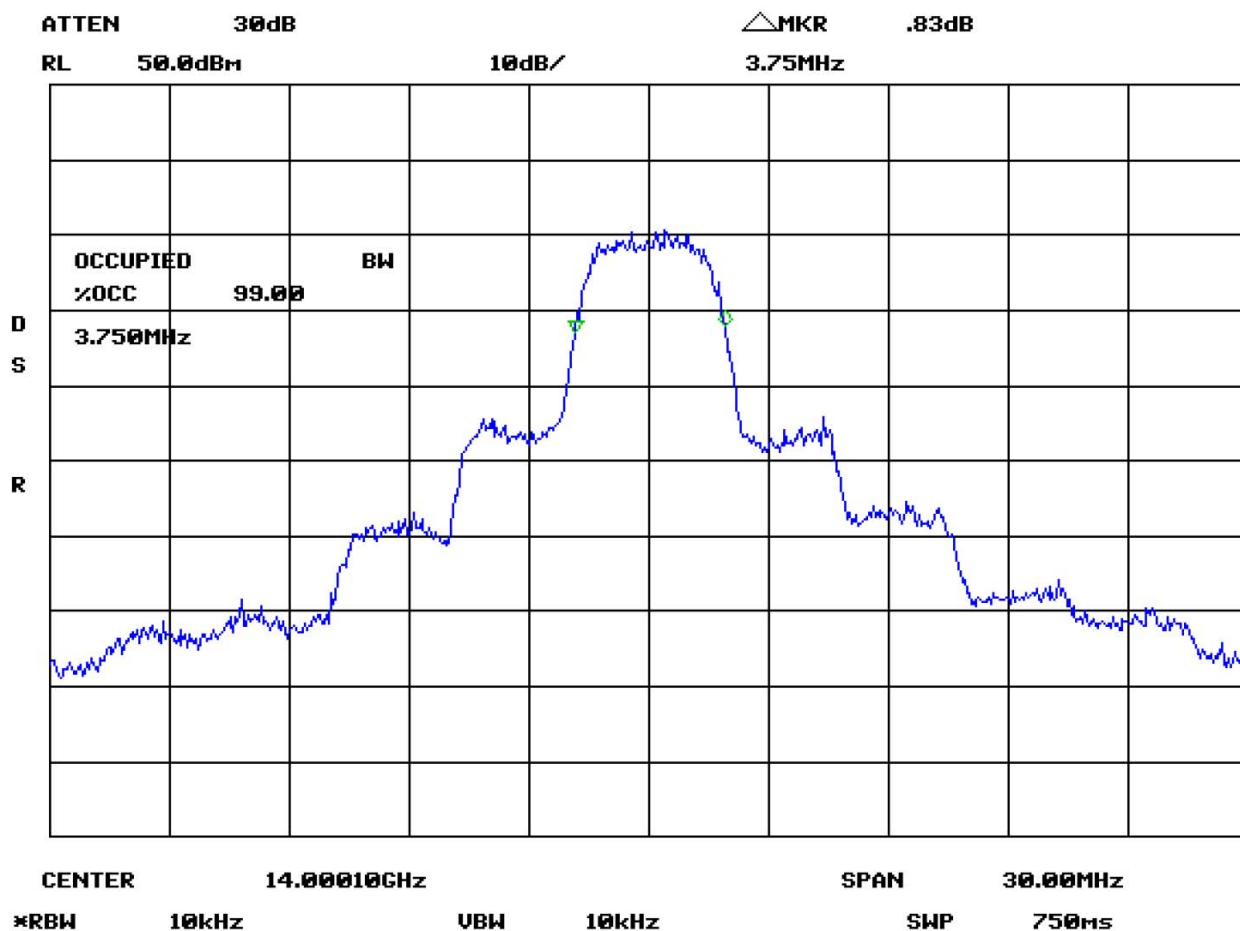
Test procedure was as follows:

- The EUT was connected from the Antenna terminal directly to the Spectrum Analyzer, using 30dB attenuator, adapter and cable.
- The EUT was set to transmit at peak power level as well as using 3000kS/s of Data rates.
- This measurement was performed at the Transmitters lowest, middle and highest frequencies.
- RBW was used 10 kHz, it was the nearest RBW value of 4 kHz RBW.
- BW was measured by using the 99% Method.

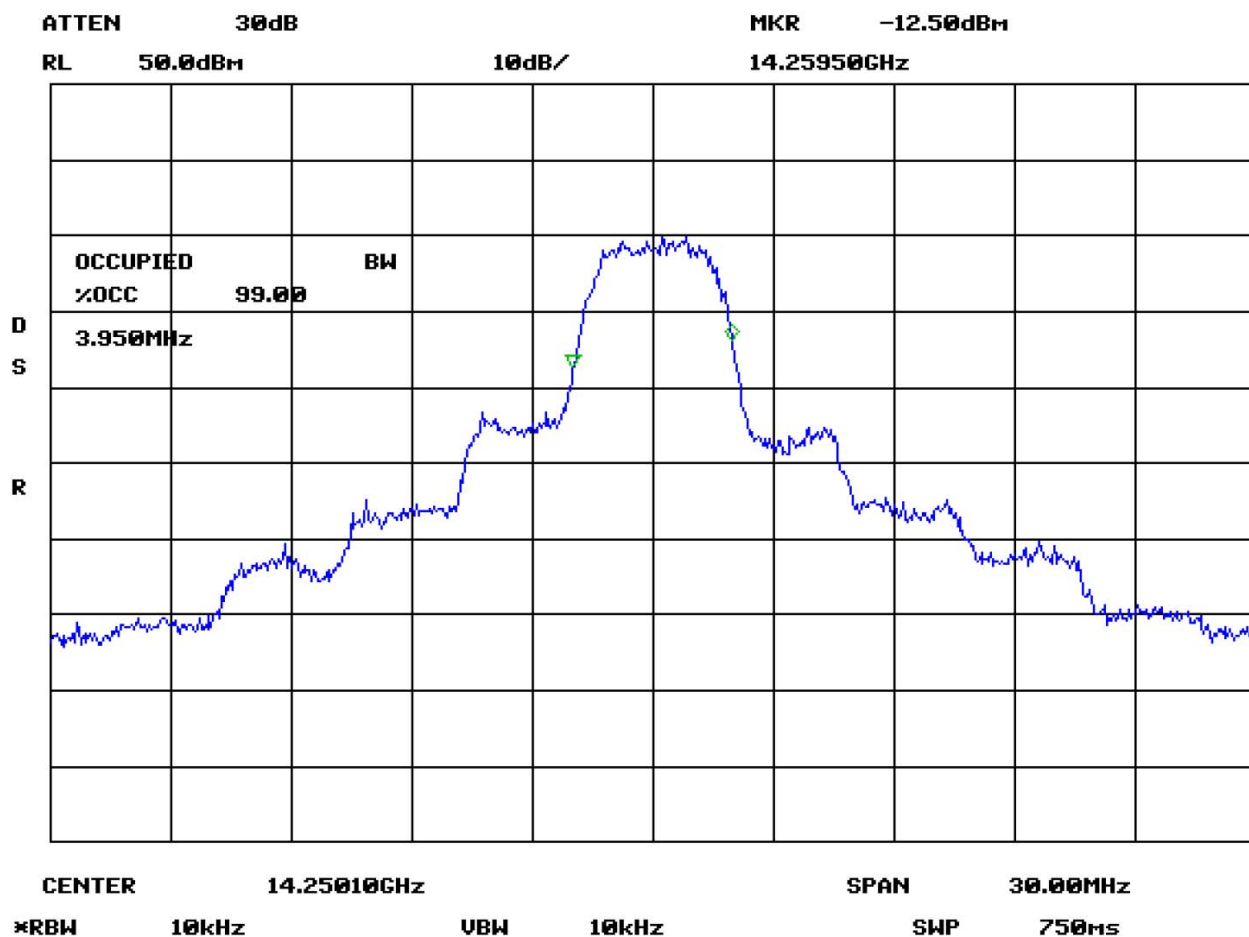
Test Results:

Centre Frequency(GHz)	14.00	14.25	14.50
Bandwidth(MHz)	3.75	3.95	4.60

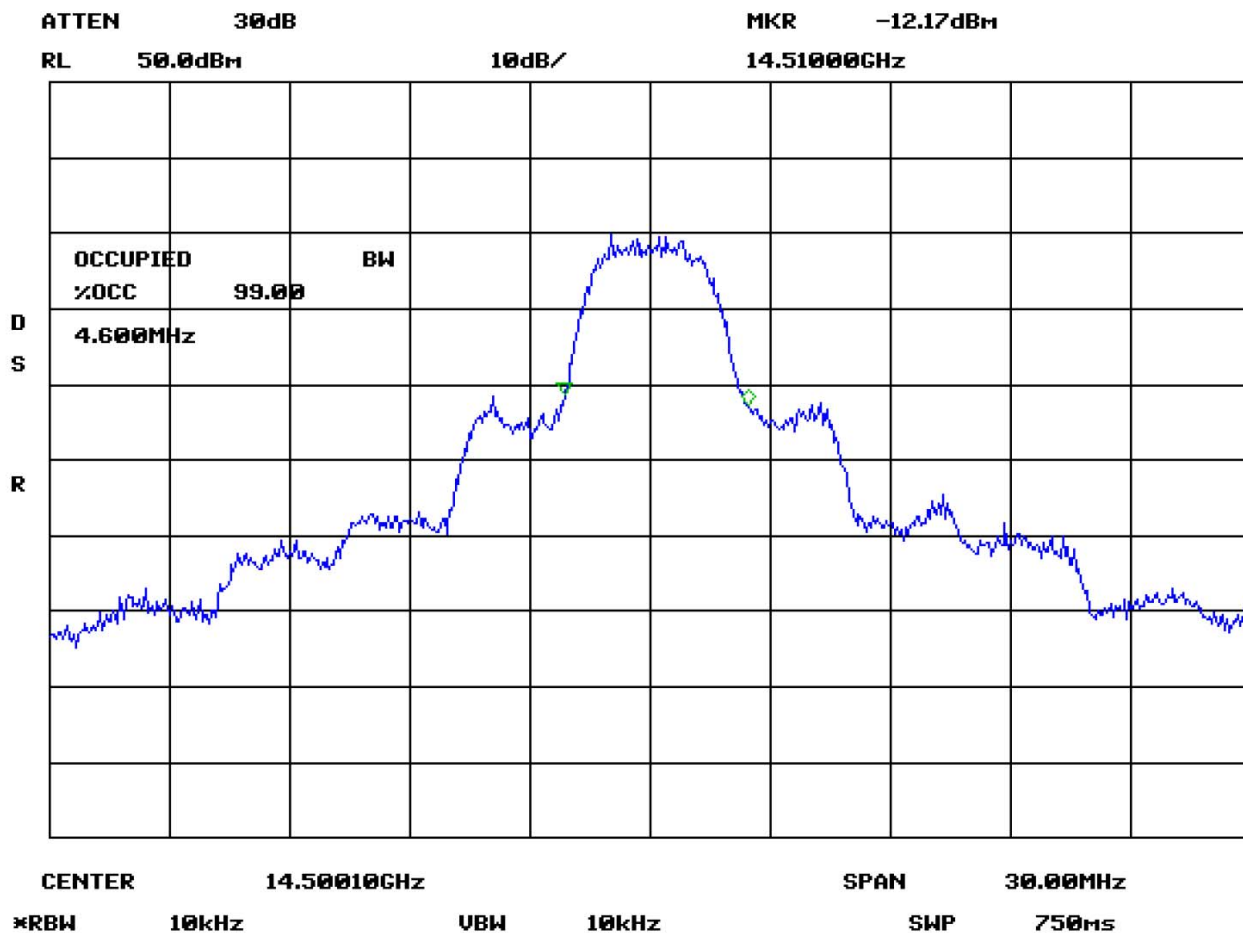
- Bandwidth; TX Centre Frequency is 14.00GHz



- Bandwidth; TX Centre Frequency is 14.25GHz



- Bandwidth; TX Centre Frequency was 14.50GHz



Emission Limitation & Field Strength of Spurious Emissions

Basic Standard	FCC25.202(f)
Temperature	14.7 °C
Relative Humidity	34.8 %
Barometric Pressure:	100.31 kPa
Test Date	Dec 17, 2008
Calibrated Test Equipment (ID)	228, C1
Reference Equipment (ID) (Calibration not required)	059, 227-3
Electrical Rating	110VAC, 60Hz, Single Phase
Tested By	Jeremy LEE

Use the barometric pressure reported at: <http://www.theweathernetwork.com/weather/CABC0308>

Test Limits

FCC 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;
- (4) In any event, when an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in paragraphs (f) (1), (2) and (3) of this section.

Test Setup

The test was performed in accordance with **FCC 25.202**.

Test procedure was as follows:

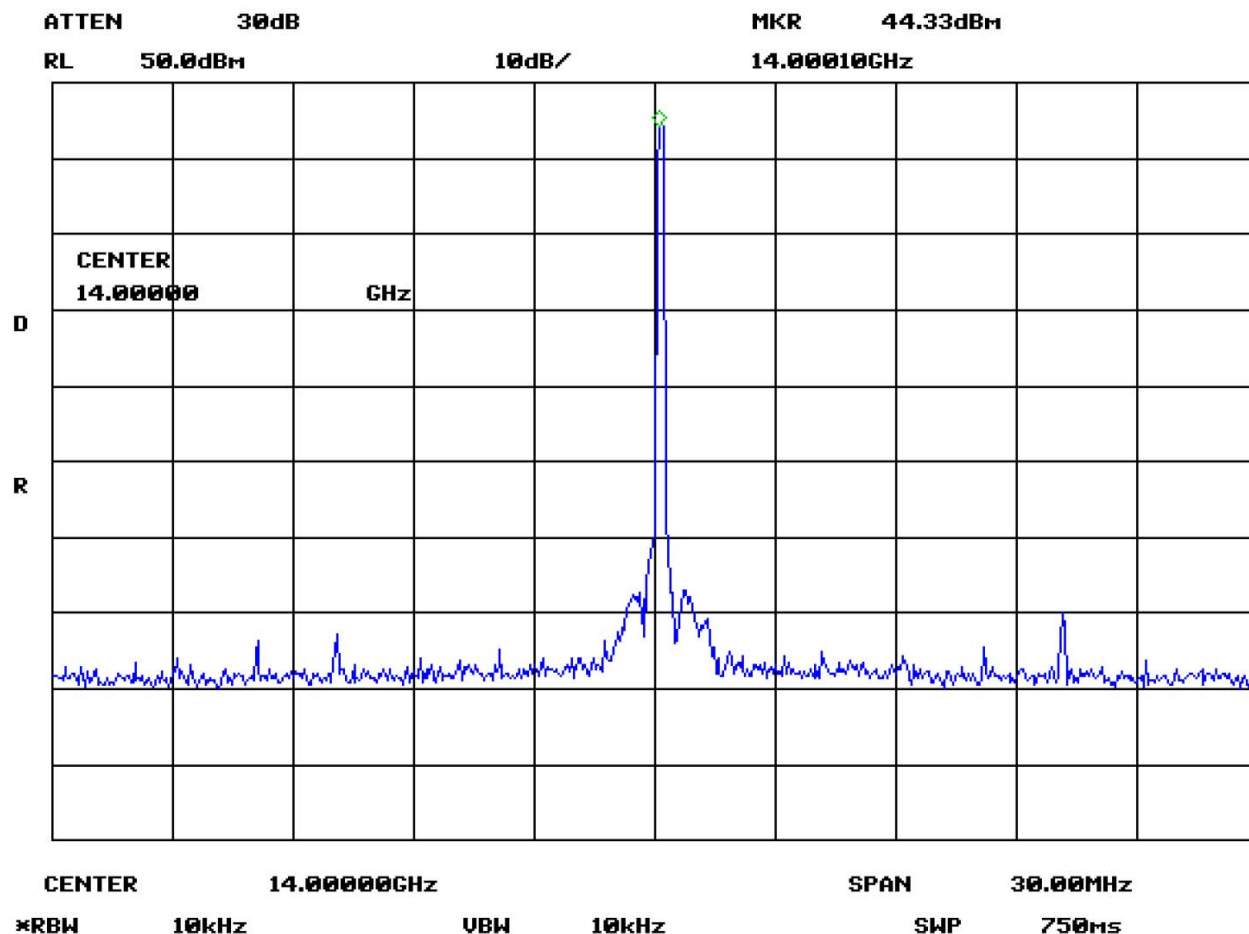
- The EUT was connected from the Antenna terminal directly to the Spectrum Analyzer, using 30dB attenuator, adapter and cable.
- The EUT was set to transmit at peak power level as well as using 3000kS/s of Data rates.
- This measurement was performed at the Transmitters lowest, middle and highest frequencies.
- RBW was used 10 kHz, it was the nearest RBW value of 4 kHz RBW.
- BW was measured by using the 99% Method.

Test Results:

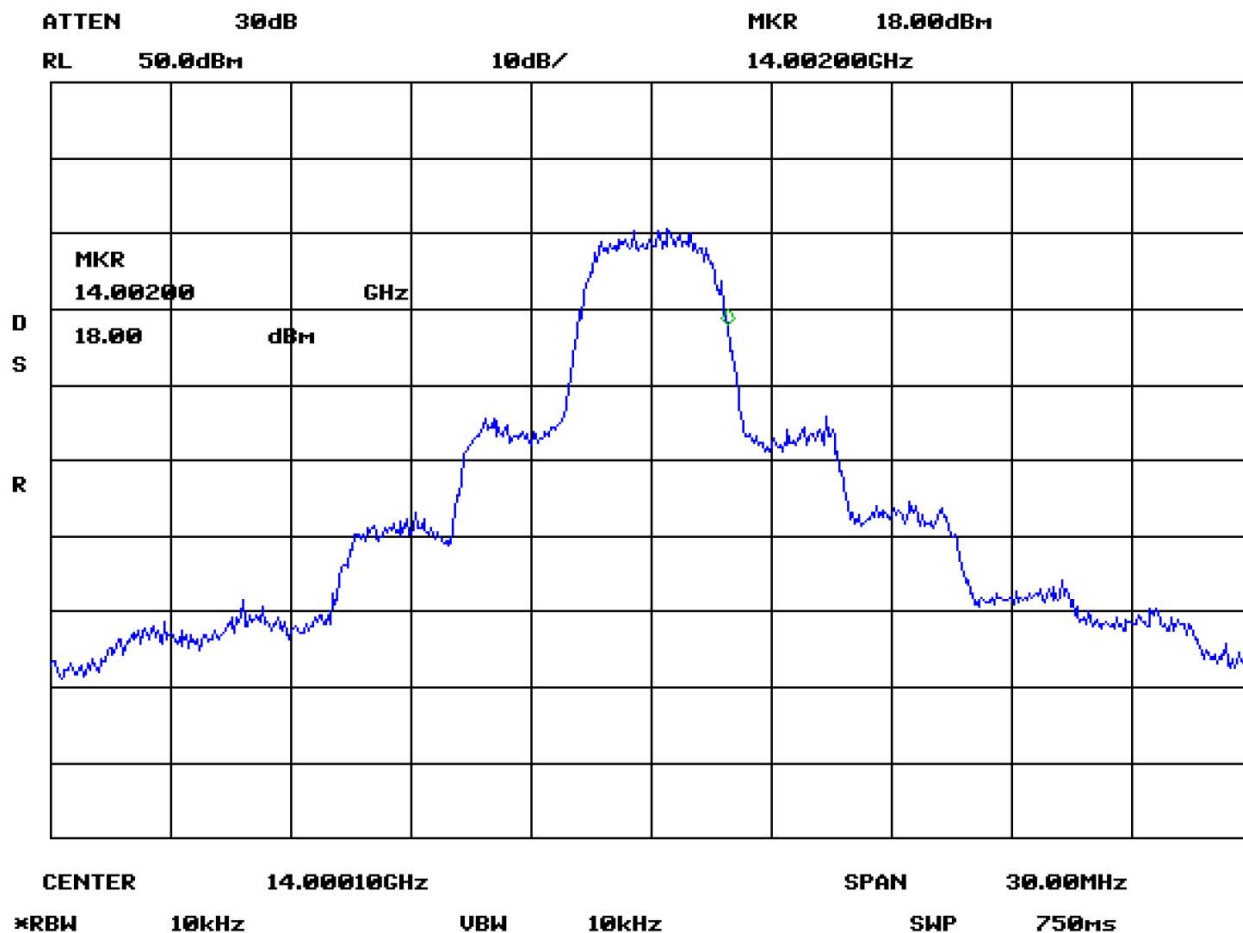
- Emission; TX Centre Frequency is 14.00GHz

Frequency Offset		Measured in 10kHz BW	Corrected in 4kHz BW	Emission	Limit in 4kHz BW	Margin
%	MHz	dBm	dBm	dBc	dBc	dB
50 to 100	1.875 to 3.75	18.00	14.02	30.31	25	5.31
100 to 250	3.75 to 9.375	4.00	0.02	44.31	35	9.31
> 250	> 9.375	-17.67	-21.65	65.98	59	6.98

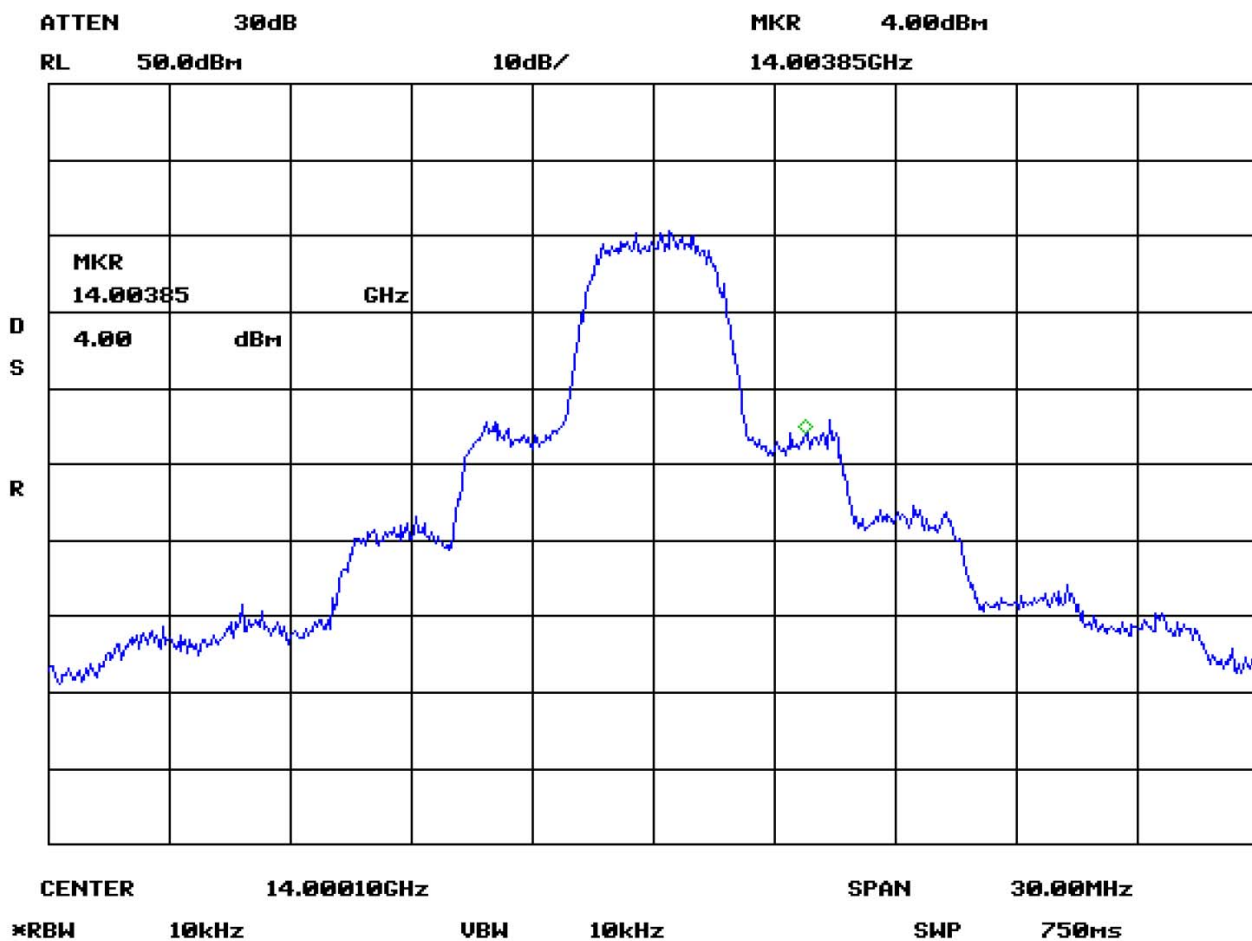
- Measured CW Power



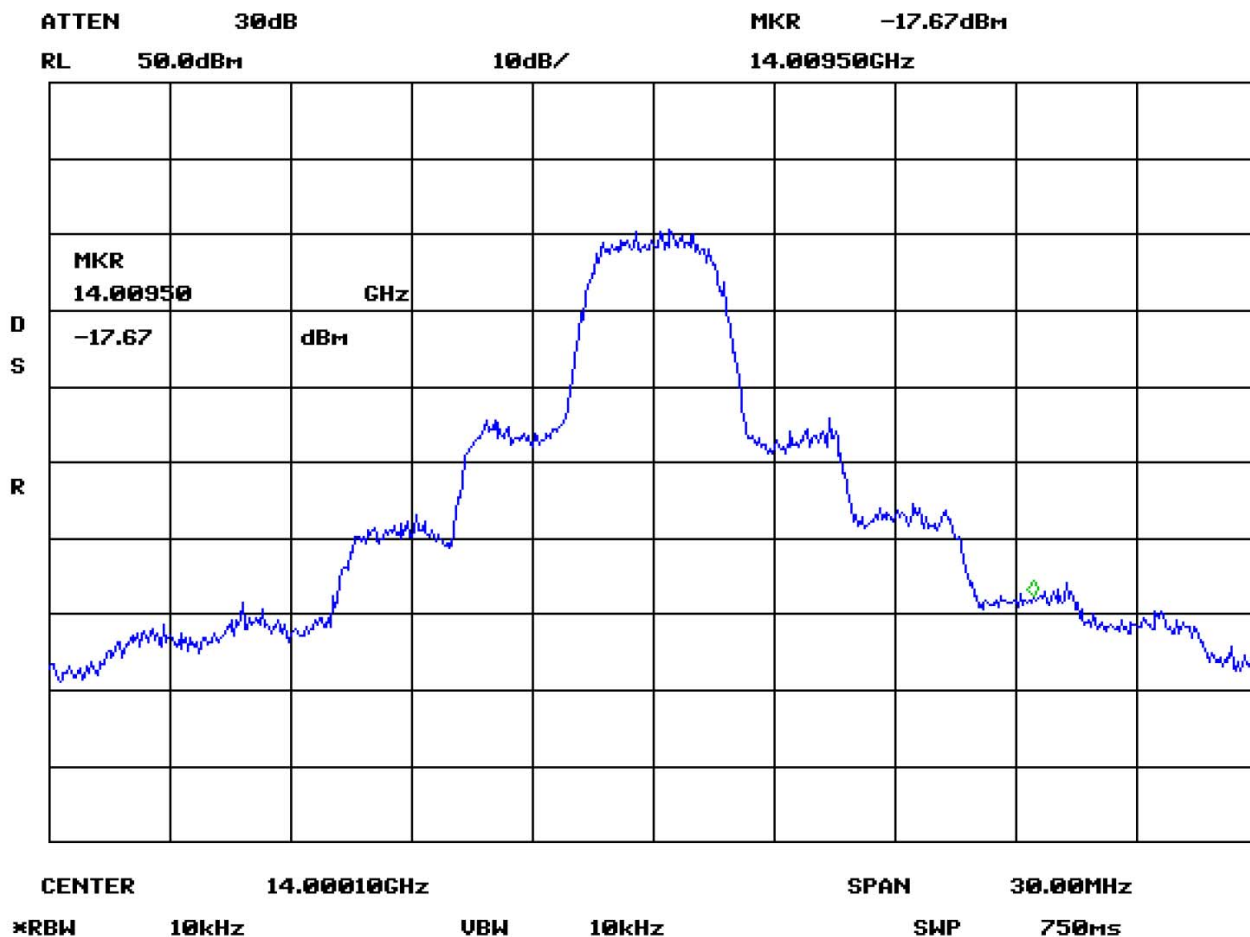
- Measured emission at 50% offset



- Measured emission at 100% offset



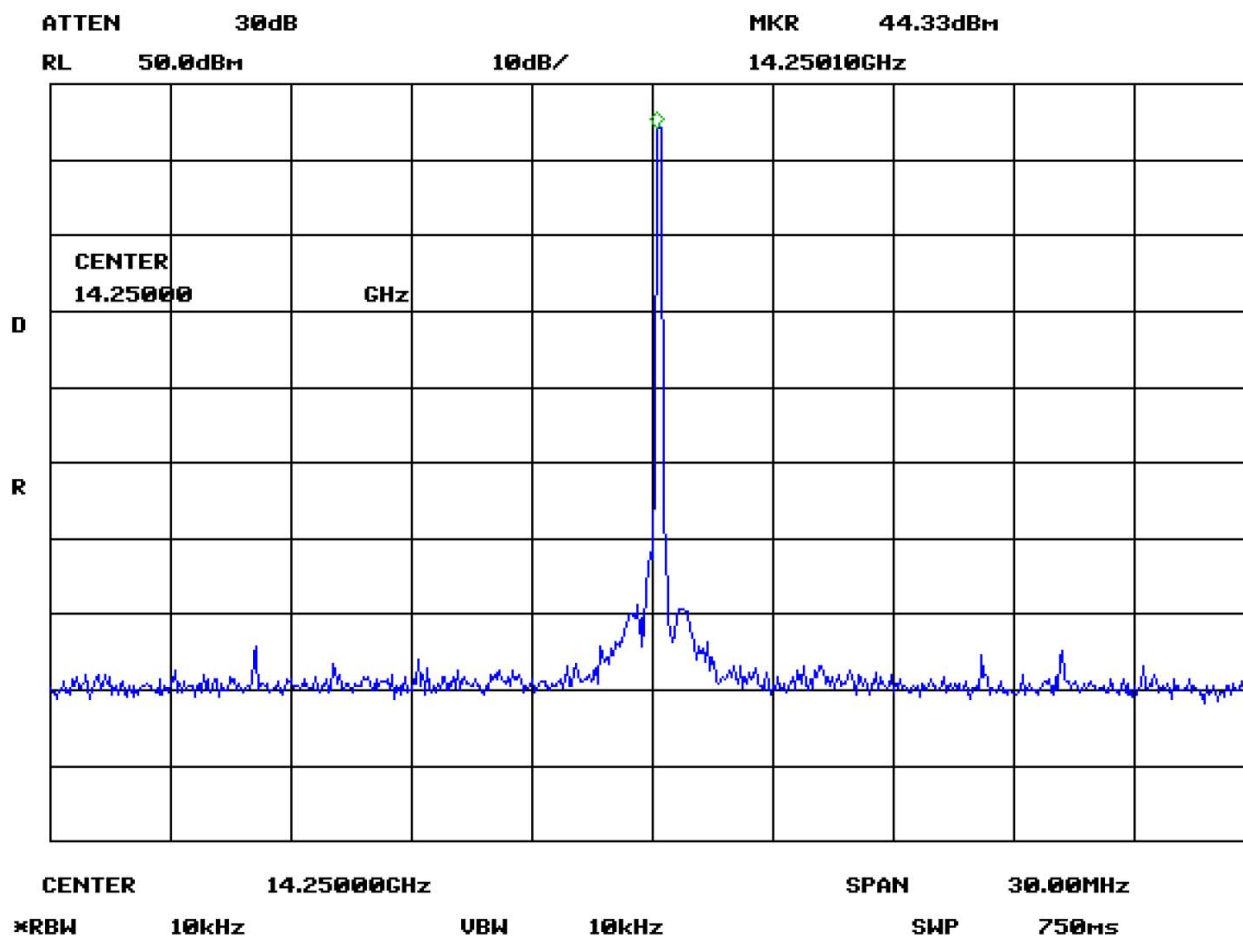
- Measured emission at 250% offset



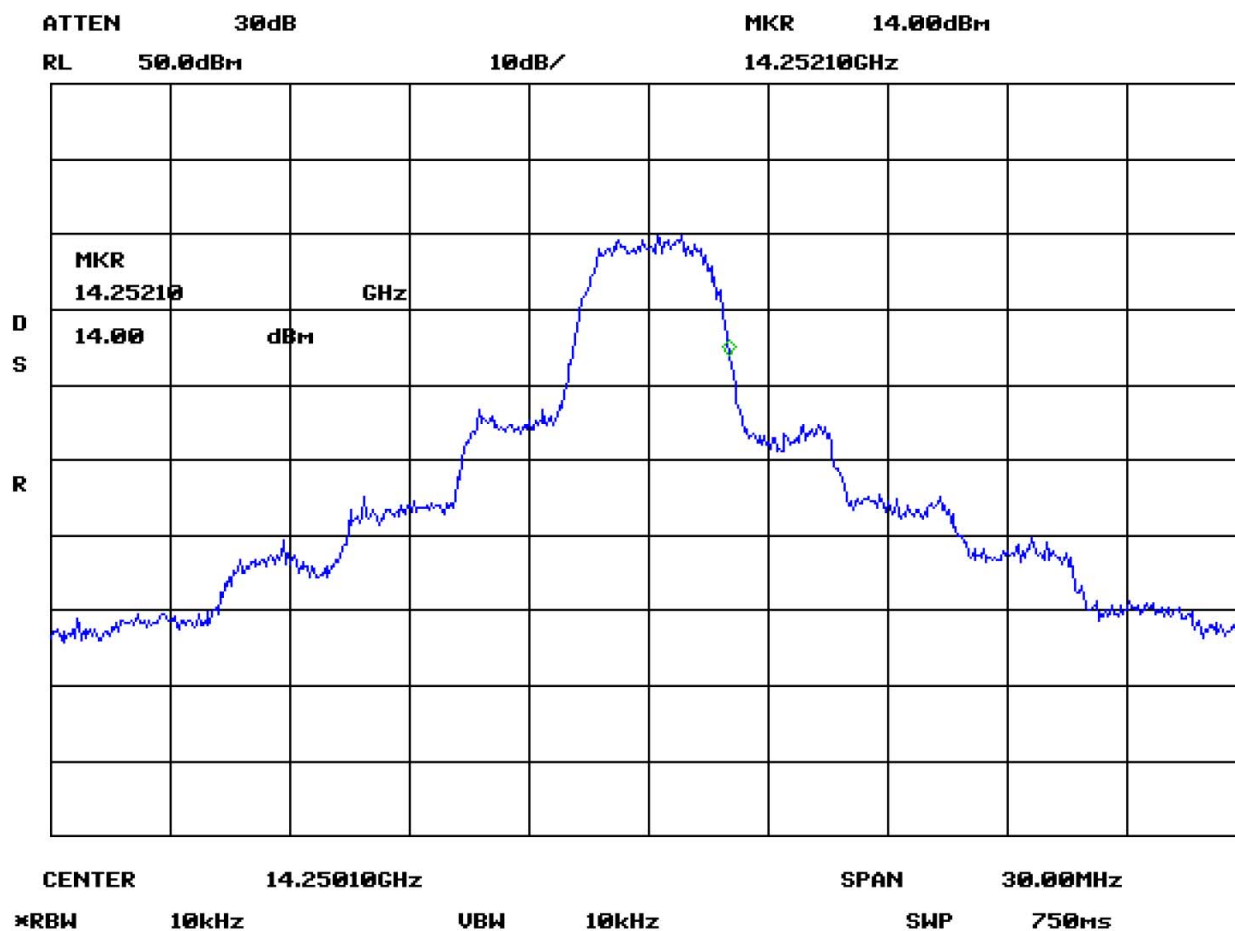
- Emission; TX Centre Frequency is 14.25GHz

Frequency Offset		Measured in 10kHz BW	Corrected in 4kHz BW	Emission	Limit in 4kHz BW	Margin
%	MHz	dBm	dBm	dBc	dBc	dB
50 to 100	1.975 to 3.95	14.00	10.02	34.31	25	9.31
100 to 250	3.95 to 9.875	3.33	-0.65	44.98	35	9.98
> 250	> 9.875	-13.33	-17.31	61.64	59	2.64

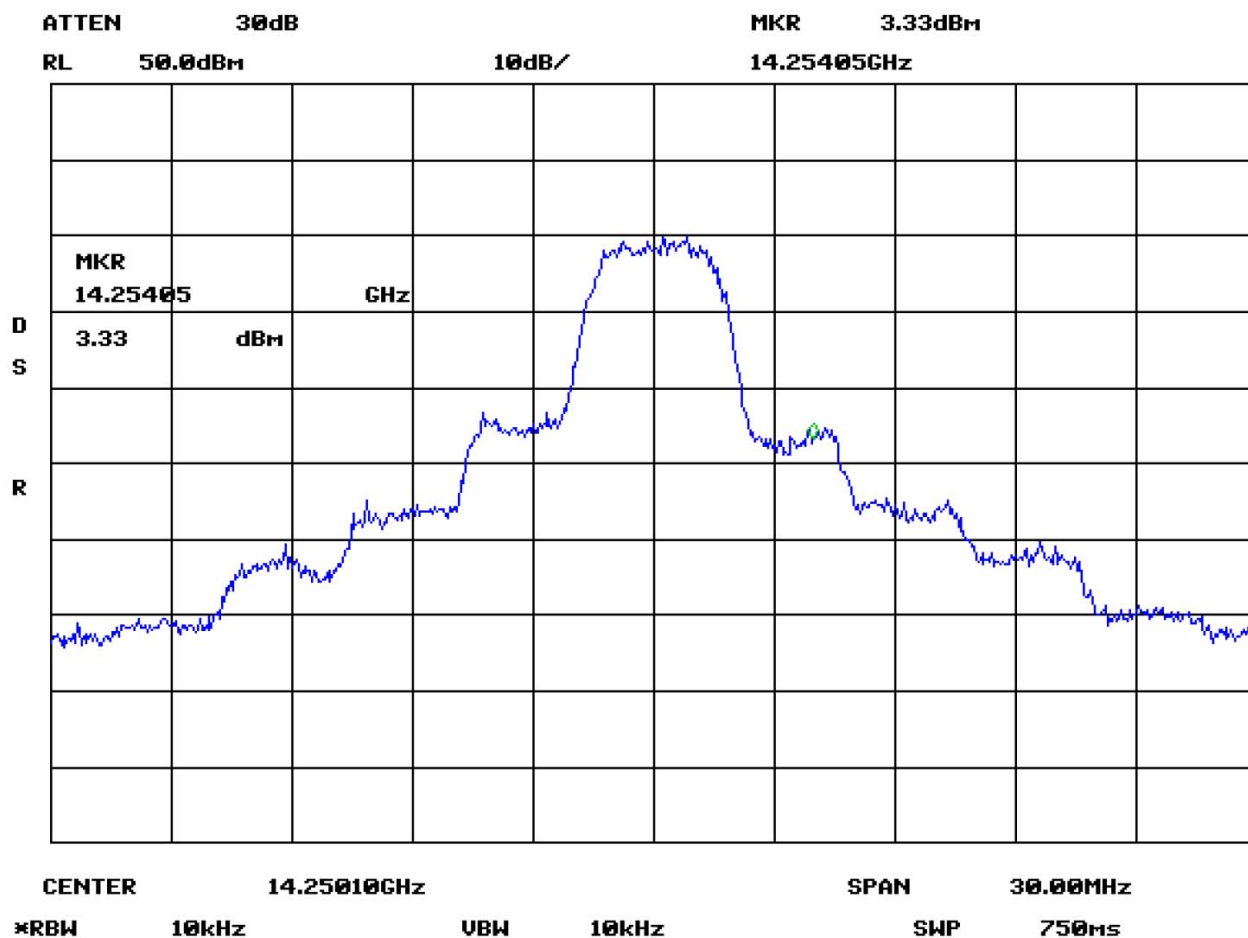
- Measured CW Power



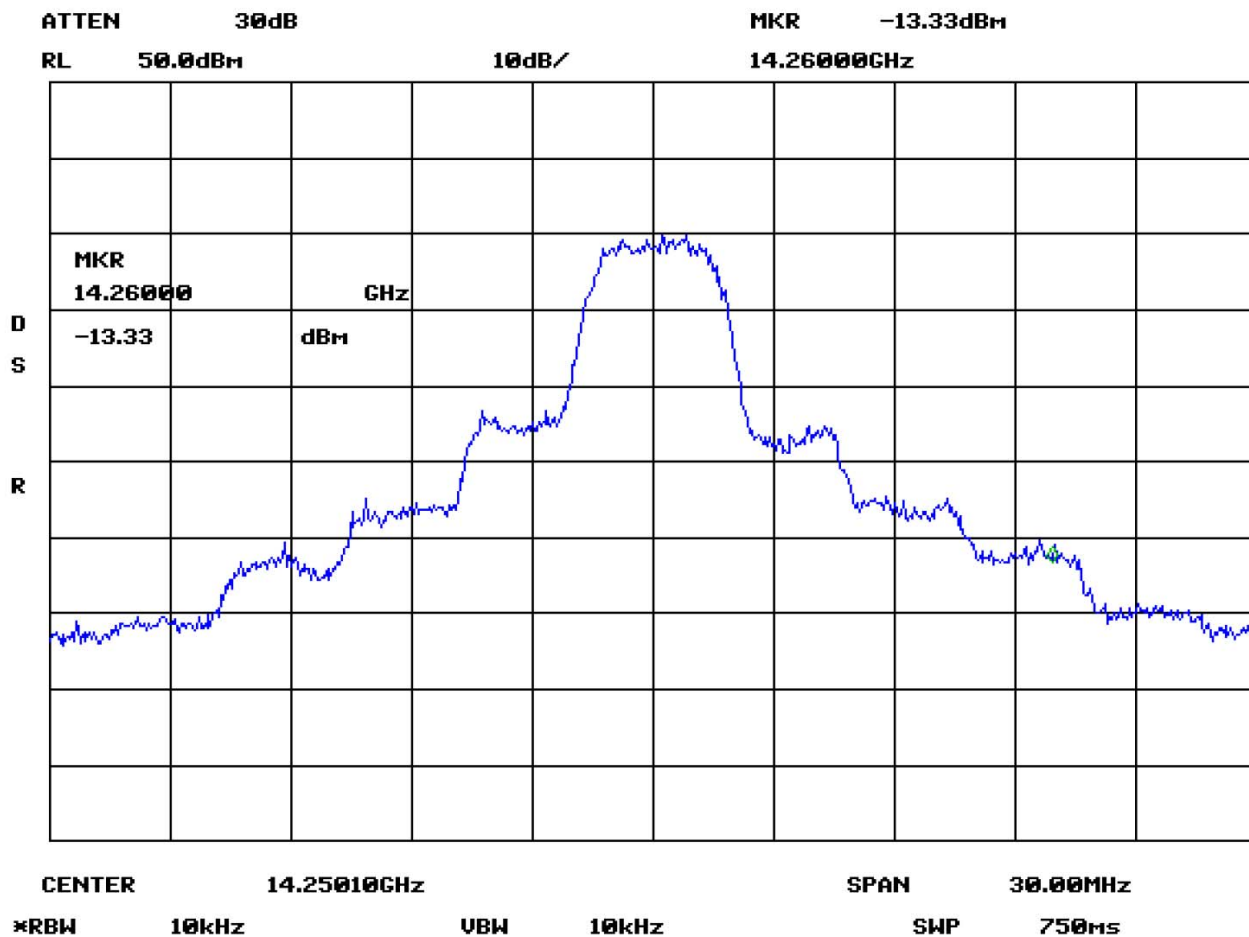
- Measured emission at 50% offset



- Measured emission at 100% offset



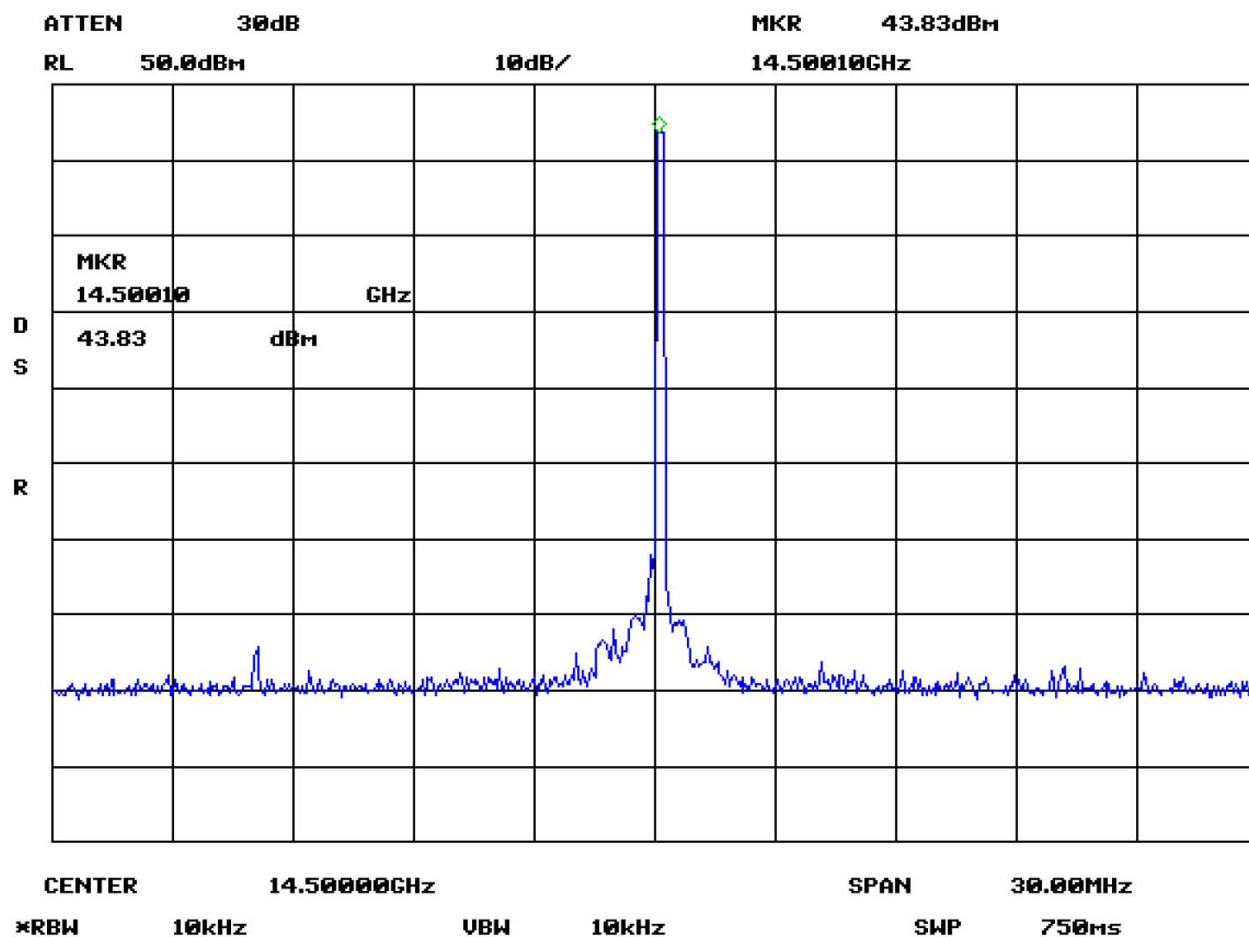
- Measured emission at 250% offset



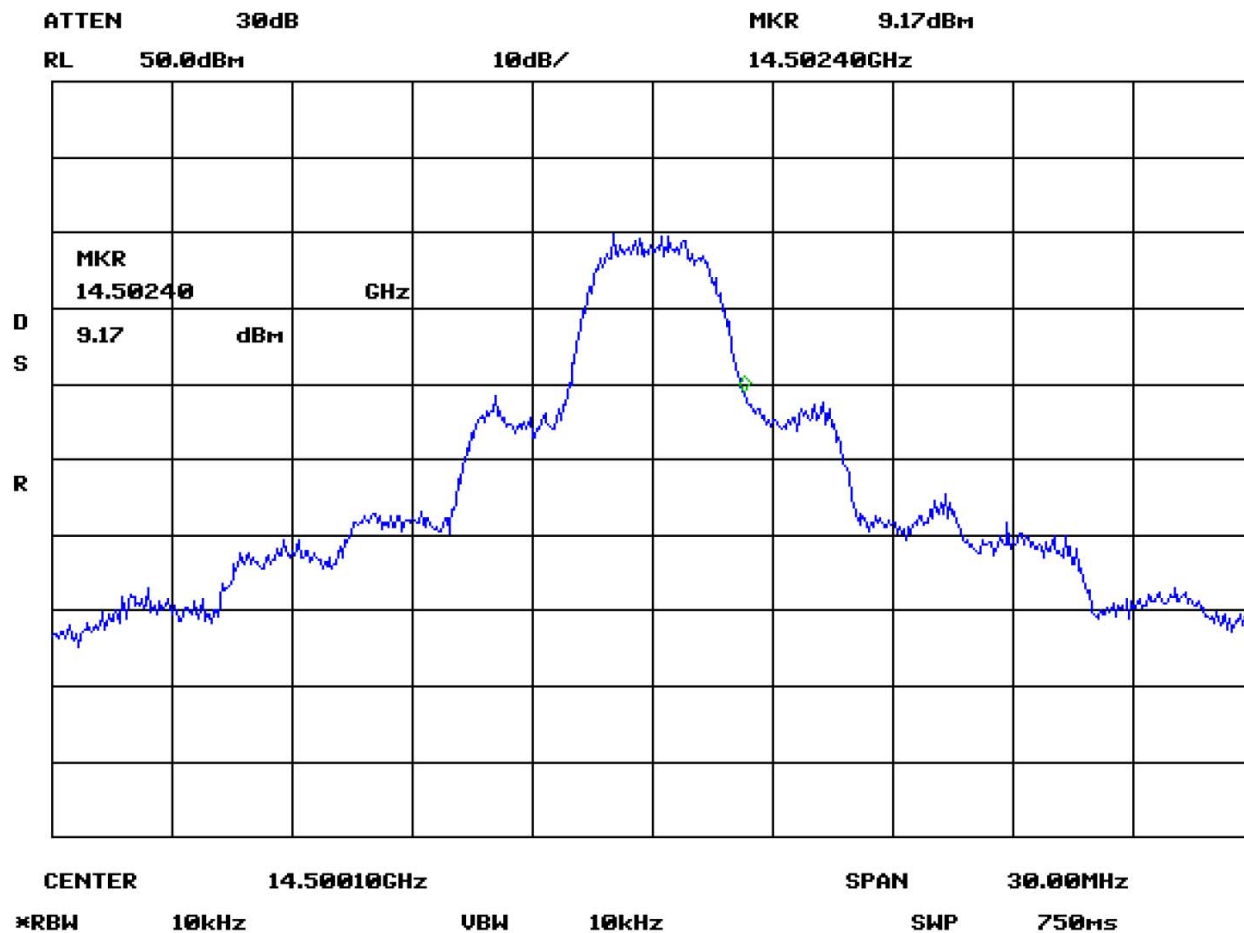
- Emission; TX Centre Frequency is 14.50GHz

Frequency Offset		Measured in 10kHz BW	Corrected in 4kHz BW	Emission	Limit in 4kHz BW	Margin
%	MHz	dBm	dBm	dBc	dBc	dB
50 to 100	2.3 to 4.6	9.17	5.19	38.64	25	13.64
100 to 250	4.6 to 11.5	2.50	-1.48	45.31	35	10.31
> 250	> 11.5	-19.00	-22.98	66.81	59	7.81

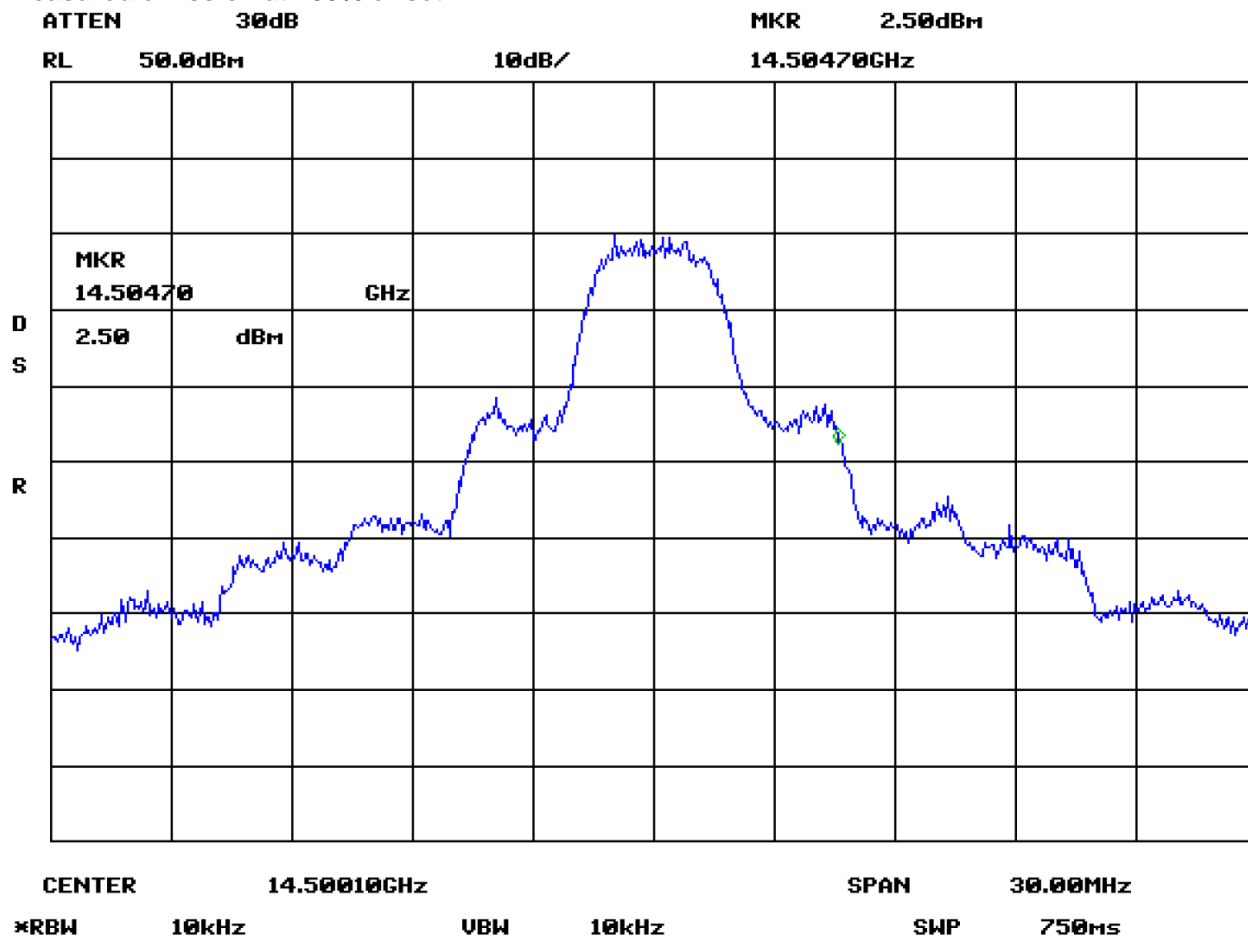
- Measured CW Power



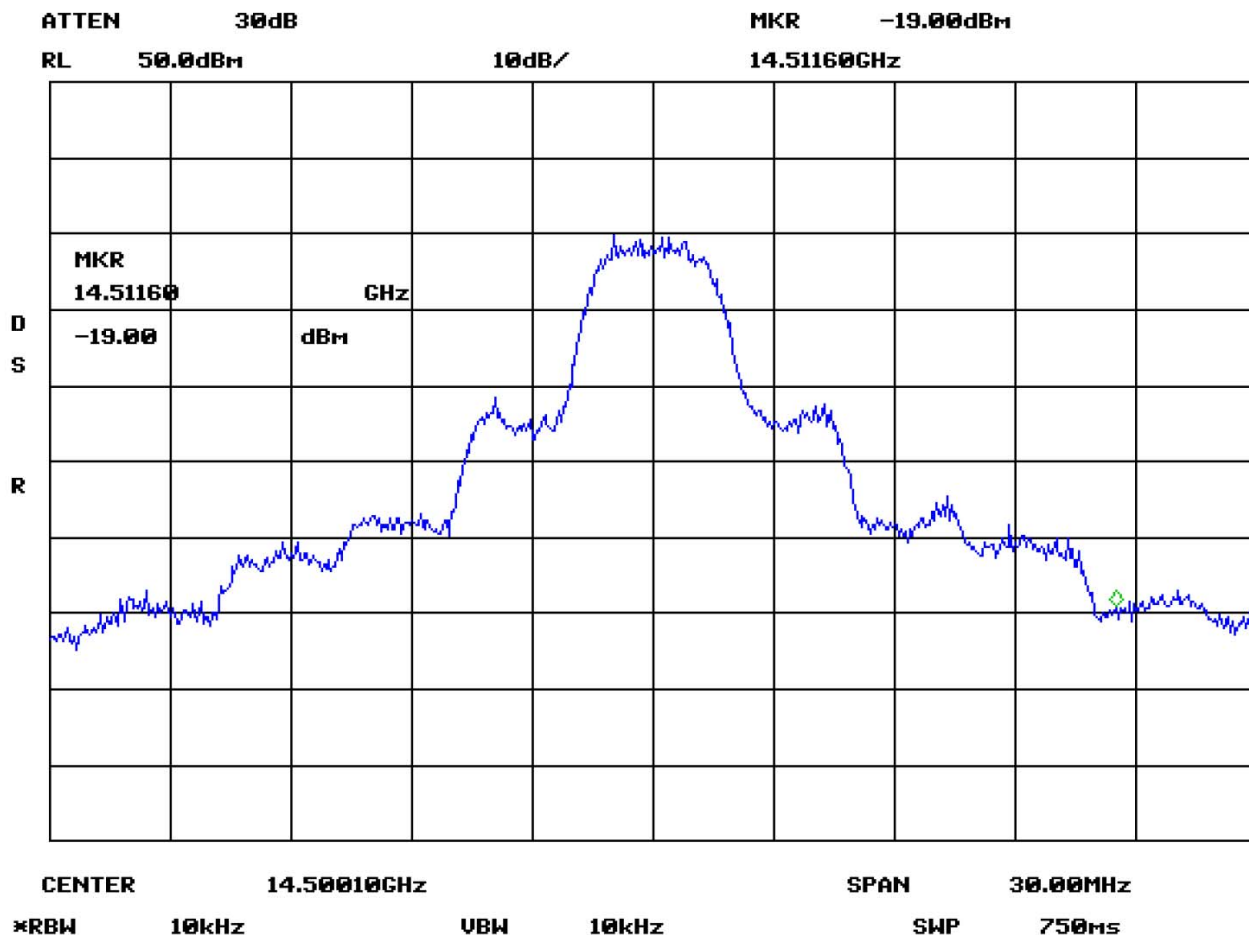
- Measured emission at 50% offset



- Measured emission at 100% offset



- Measured emission at 250% offset



Emission Limitation – Spurious Emissions at Antenna Terminal

Basic Standard	FCC25.202(f), 2.1051 & 2.1057
Temperature	14.7 °C
Relative Humidity	34.8 %
Barometric Pressure:	100.31 kPa
Test Date	Dec 17, 2008
Calibrated Test Equipment (ID)	228, 243, 244, C1
Reference Equipment (ID) (Calibration not required)	059, 227-3
Electrical Rating	110VAC, 60Hz, Single Phase
Tested By	Jeremy LEE

Use the barometric pressure reported at: <http://www.theweathernetwork.com/weather/CABC0308>

Test Limits

FCC 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;
- (4) In any event, when an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in paragraphs (f) (1), (2) and (3) of this section.

Test Setup

The test was performed in accordance with **FCC 25.202, 2.1051 and 2.1057.**

Test procedure was as follows:

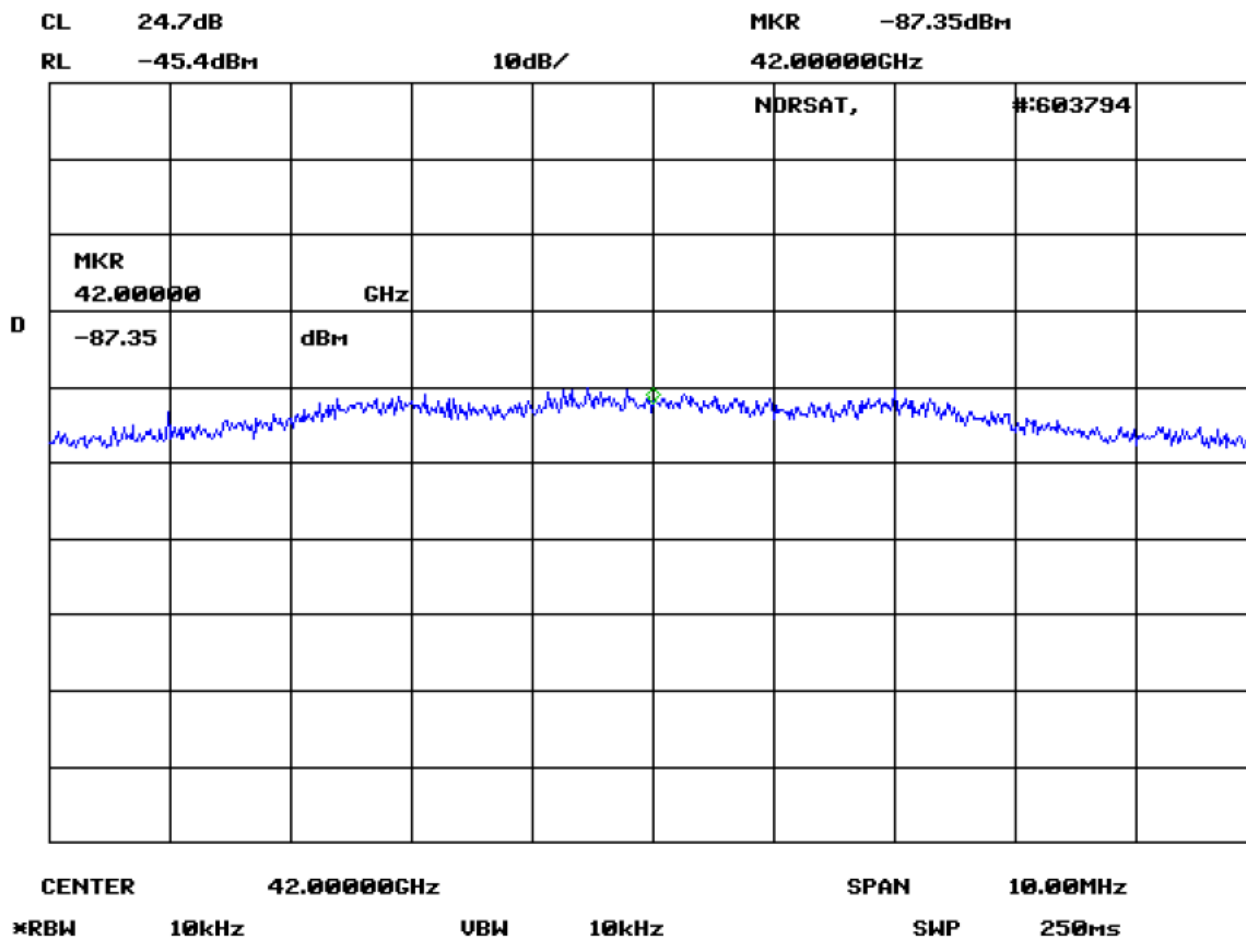
- The EUT was connected from the Antenna terminal directly to the Spectrum Analyzer, using external mixers and cable.
- The EUT was set to transmit at peak power level as well as using 3000kS/s of Data rates.
- This measurement was performed at the Transmitters lowest, middle and highest frequencies.
- RBW was used 10 kHz, it was the nearest RBW value of 4 kHz RBW.

Test Results:

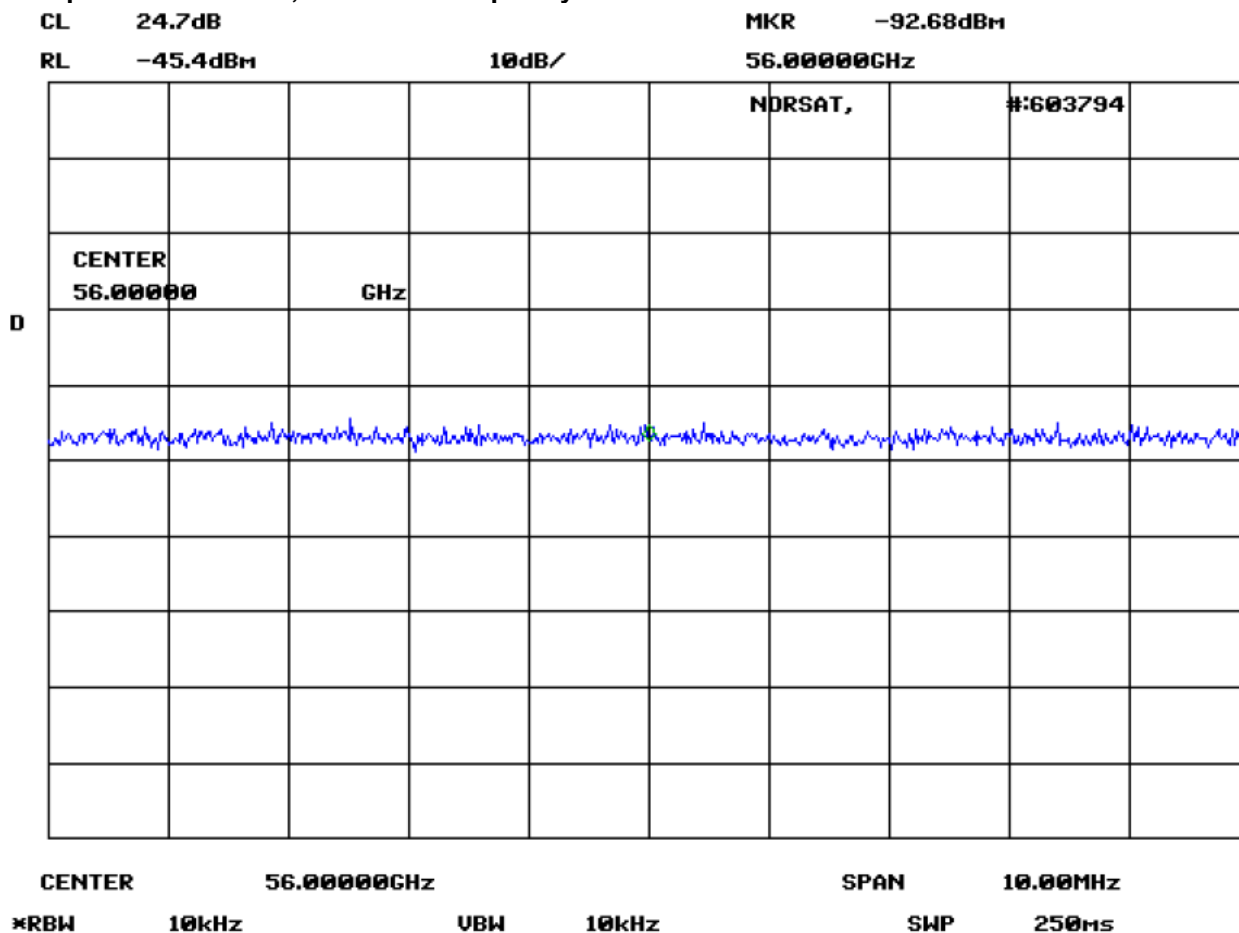
Carrier Frequency (GHz)	Limit in 4kHz BW (dBc)	2 nd Harmonic(dBc)	3 rd Harmonic(dBc)	4 th Harmonic(dBc)	5 th Harmonic(dBc)
14.00	59	114.48	135.66	140.99	129.61
14.25		108.98	141.49	140.99	131.11
14.50		121.64	139.16	138.66	129.78

ATTEN 10dB MKR -66.17dBm
RL -25.0dBm 10dB/ 28.000000GHz
NDRSAT, #:603794
RL 5.0 OFFSET 5.0dB
D
R
CENTER 28.000000GHz SPAN 10.00MHz
*RBW 10kHz VBW 10kHz SWP 250ms

- 3rd Spurious Emission; TX Centre Frequency is 14.00GHz



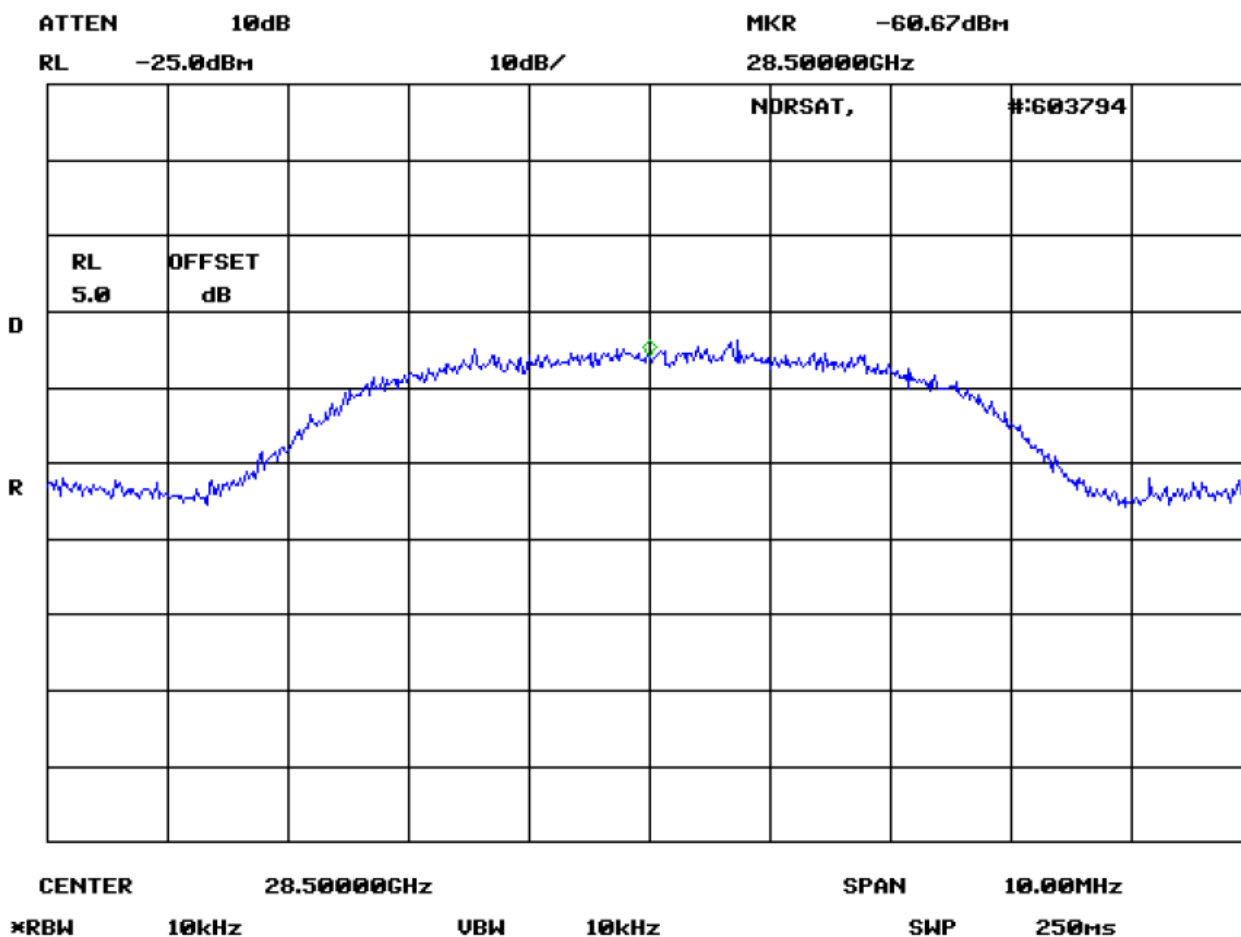
- 4th Spurious Emission; TX Centre Frequency is 14.00GHz



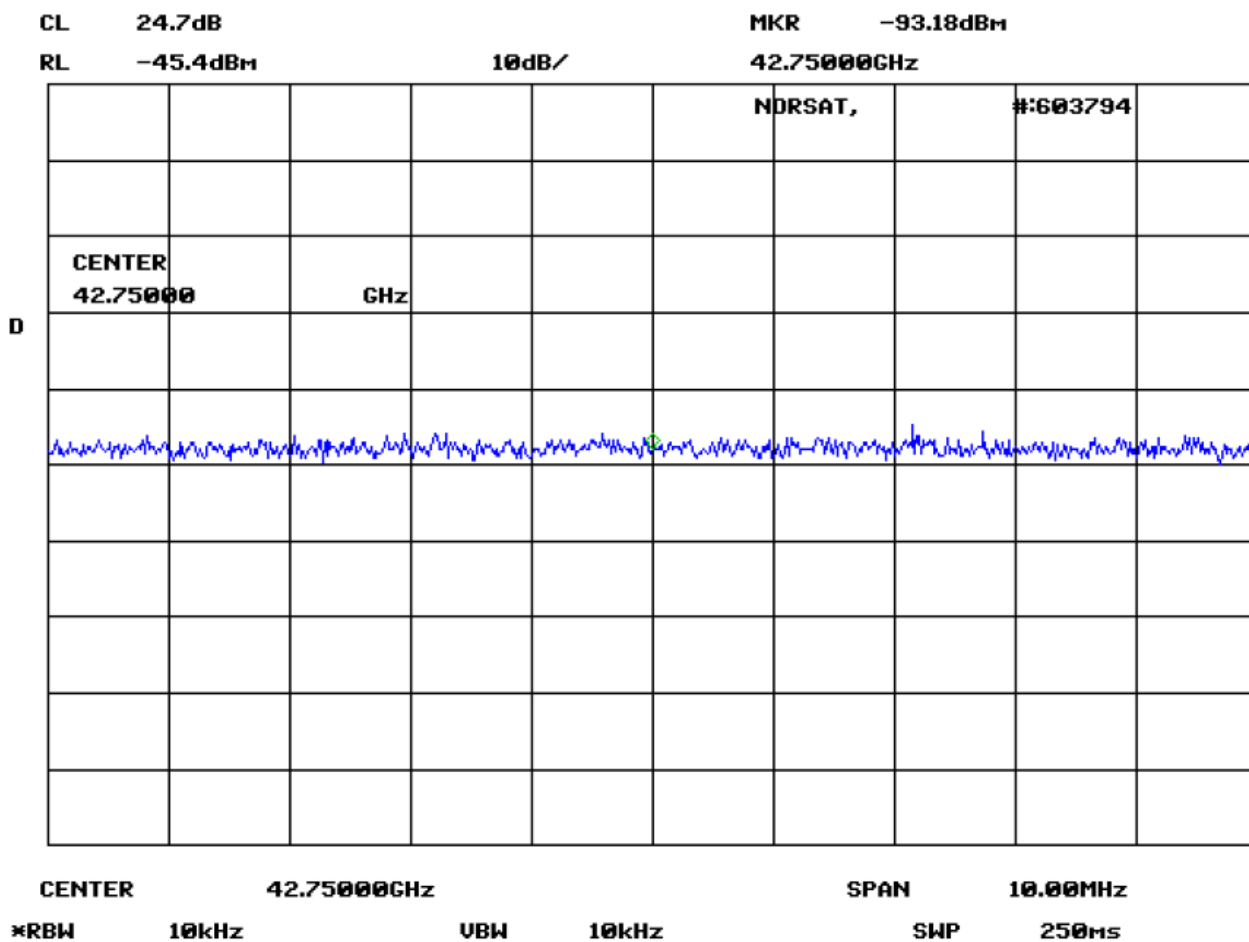
Client:Norsat International Inc.
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CL	34.7dB	MKR	-81.30dBm
RL	-35.3dBm	10dB/	70.000000GHz
		NDRSAT,	#603794
MKR	70.000000	GHz	
-81.30		dBm	
CENTER	70.000000GHz	SPAN	10.00MHz
*RBW	10kHz	VBW	10kHz
		SWP	250ms

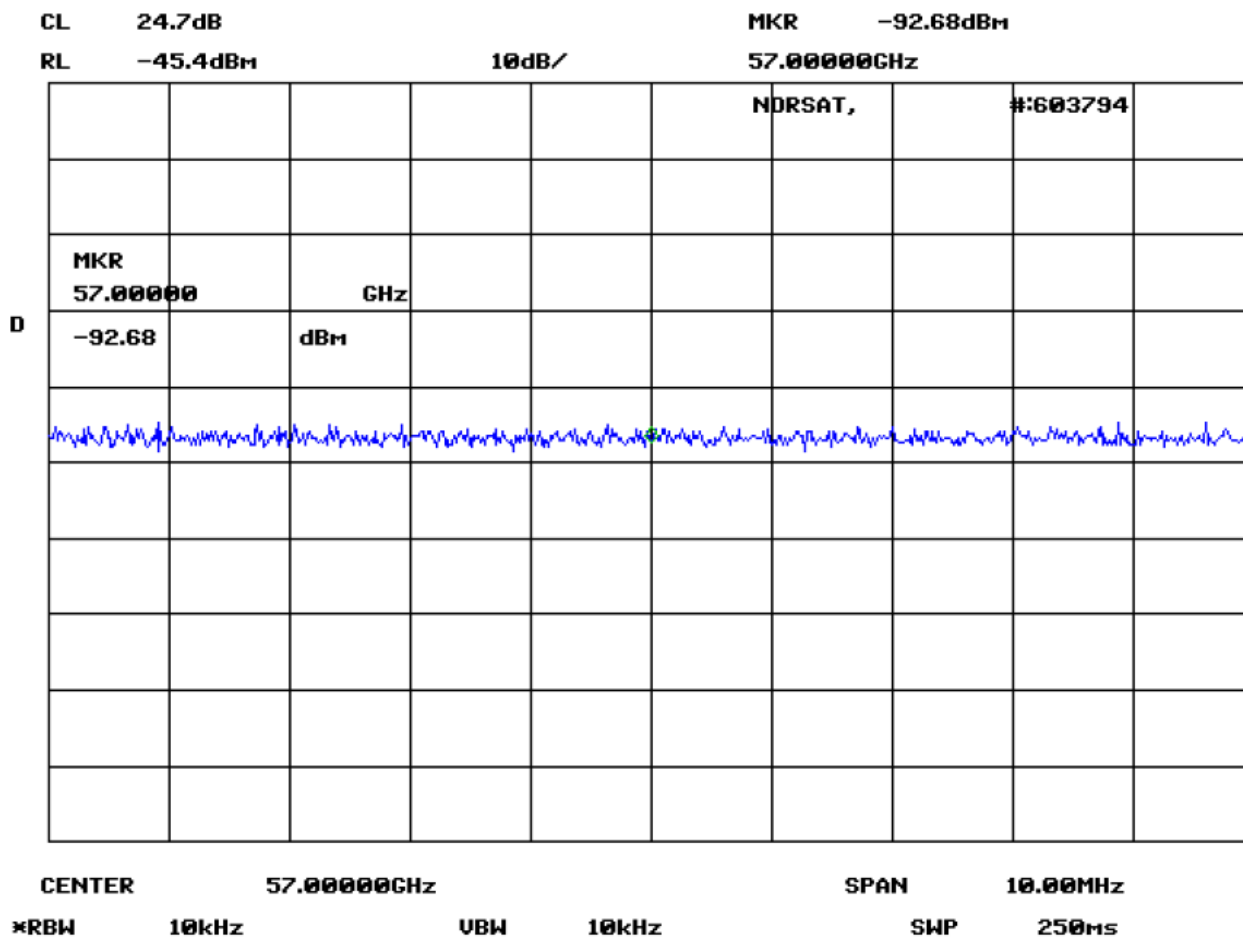
- 2nd Spurious Emission; TX Centre Frequency is 14.25GHz



- 3rd Spurious Emission; TX Centre Frequency is 14.25GHz



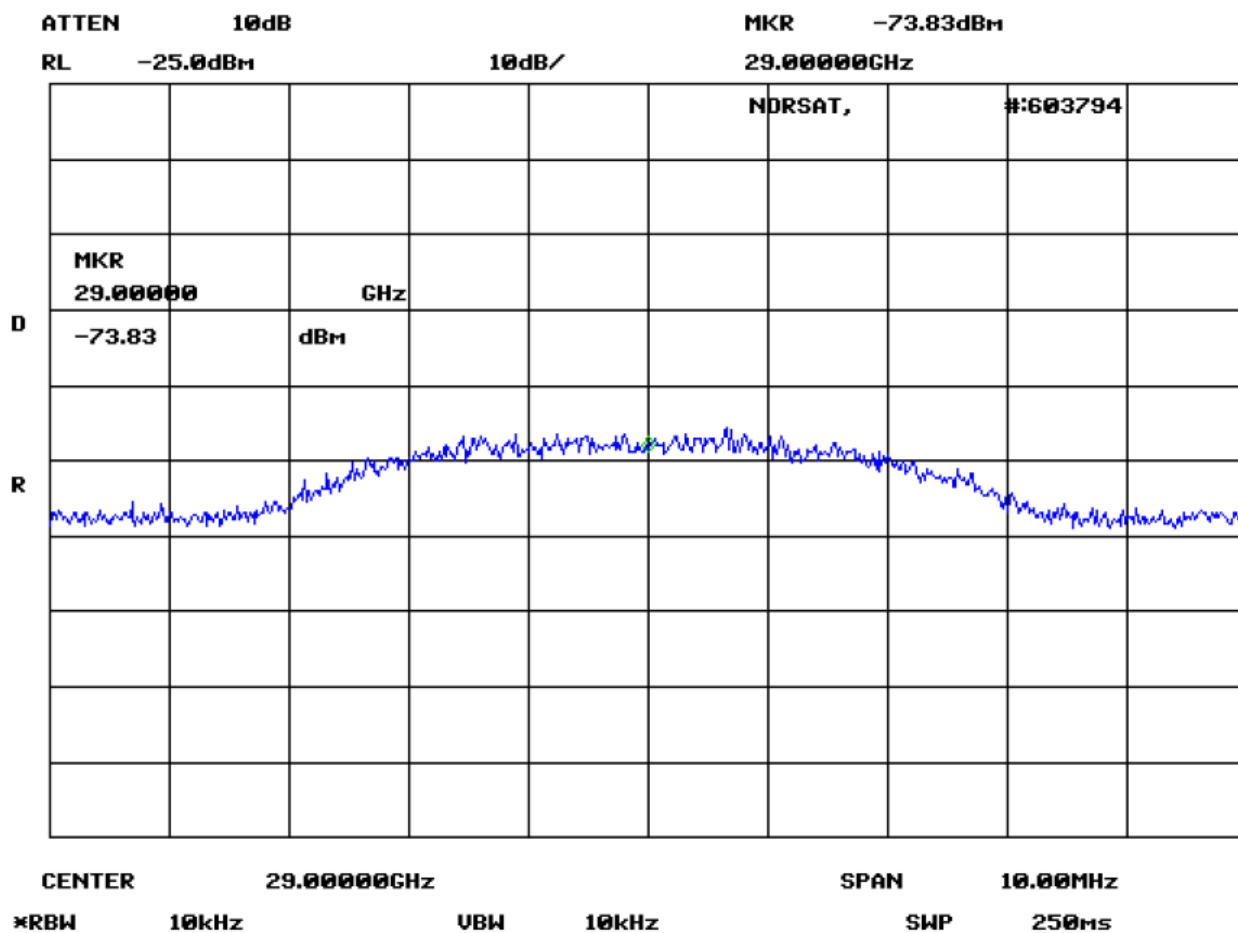
- 4th Spurious Emission; TX Centre Frequency is 14.25GHz



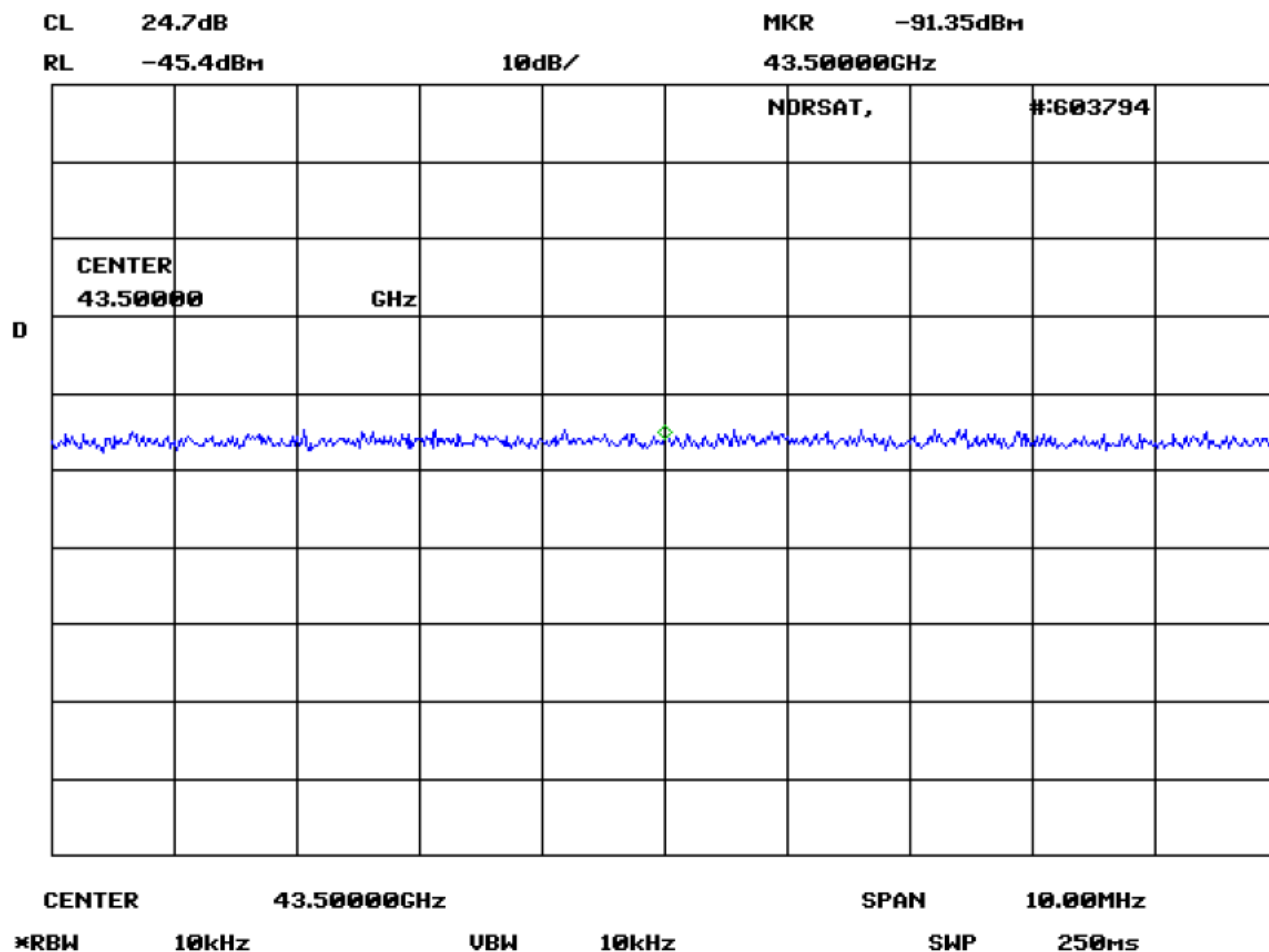
Client:Norsat International Inc.
Report No.:9021-3E
Revision No.:0

CL	34.7dB	MKR	-82.80dBm
RL	-35.3dBm	10dB/	71.25000GHz
		NDRSAT,	#603794
MKR	71.25000	GHz	
-82.80		dBm	
CENTER	71.25000GHz	SPAN	10.00MHz
*RBW	10kHz	VBW	10kHz
		SWP	250ms

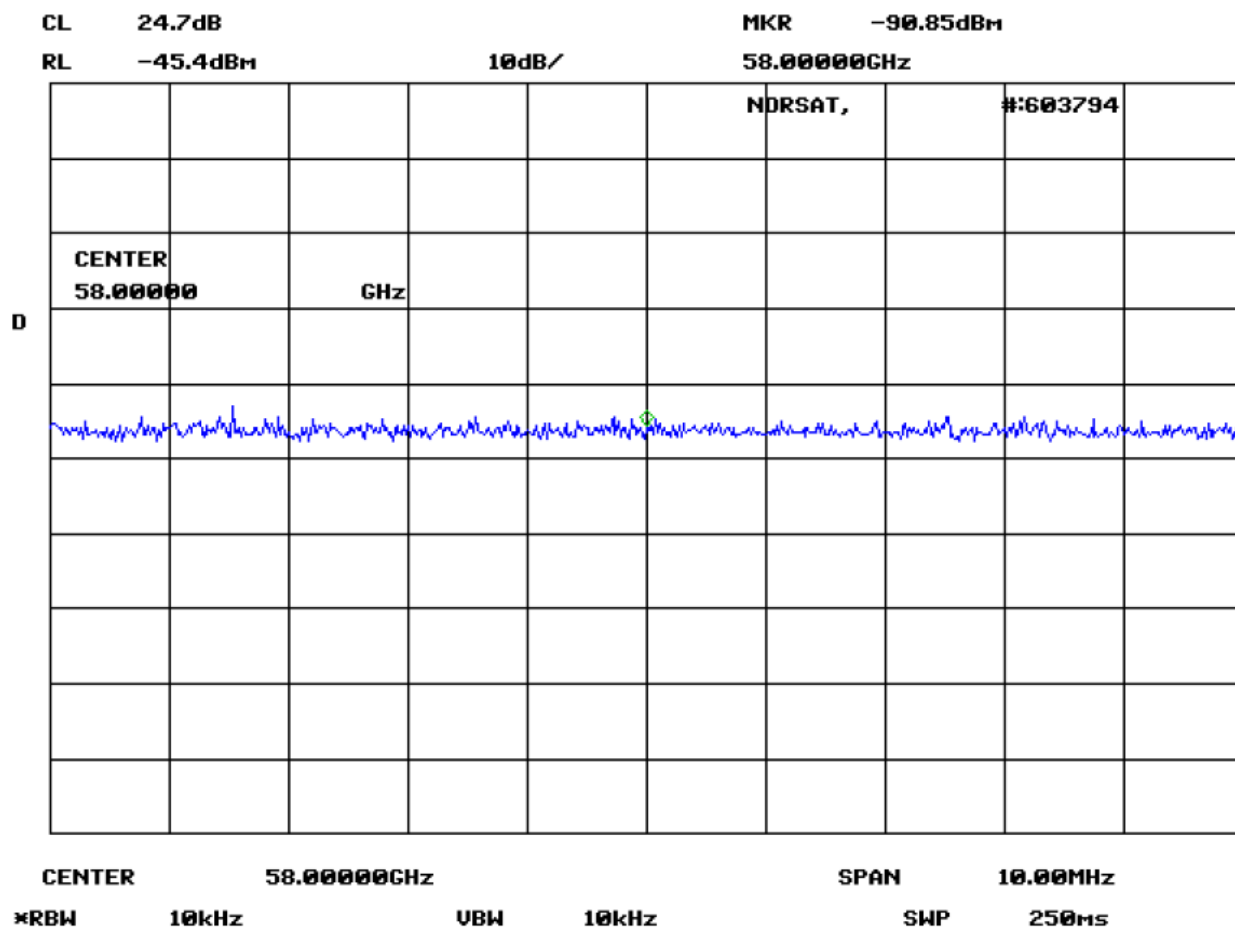
- 2nd Spurious Emission; TX Centre Frequency is 14.50GHz



- 3rd Spurious Emission; TX Centre Frequency is 14.50GHz



- 4th Spurious Emission; TX Centre Frequency is 14.50GHz



CL	34.7dB	MKR	-81.97dBm
RL	-35.3dBm	10dB/	72.50000GHz
		NDRSAT,	#:603794
MKR	72.50000	GHz	
-81.97		dBm	
CENTER	72.50000GHz	SPAN	10.00MHz
×RBW	10kHz	VBW	10kHz
		SWP	250ms

Frequency Tolerance

Basic Standard	FCC25.202(d) & 2.1055
Barometric Pressure:	102.14 kPa
Test Date	Jun. 13, 2008
Calibrated Test Equipment (ID)	058, 152
Reference Equipment (ID) (Calibration not required)	023, 059
Electrical Rating-Nominal	110VAC, 60Hz, Single Phase
Tested By	Jeremy LEE

Use the barometric pressure reported at: <http://www.theweathernetwork.com/weather/CABC0308>

Test Limits

FCC25.202(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.

Test Setup

The test was performed in accordance with **FCC 25.202 and 2.1055.**

Test procedure was as follows:

- The EUT was connected from the Antenna terminal directly to the Spectrum Analyzer, using 20dB coupler, adapter and cable.
- The EUT was set to transmit at peak power level as well as CW signal.
- This measurement was performed at the Transmitters lowest, middle and highest frequencies.
- RBW was used 10 Hz.
- For the Temperature Stability part of the test, the measurements were taken over the temperature range of -30°C to +50°C in 10 degree increments for each of the frequencies under test. The measurements were taken after the frequency and unit had stabilized for each frequency and temperature over a period of 10 minutes from power on.
- The Voltage Stability part of the test, the measurements were taken over the voltage range of 93.5VAC to 126.5VAC which is the 85% to 115% of the rated operating voltage of 110VAC.

Test Results:

- Temperature Stability (< 0.001%)

Temperature(°C)	Low-end Frequency Fc=14.00GHz 13.99986 to 14.00014	Middle Frequency Fc=14.25GHz 14.2498575 to 14.2501425	High-end Frequency Fc=14.50GHz 14.499855 to 14.500145
+ 50	13.999987915	14.249987936	14.499988107
+ 40	13.999987875	14.249987881	14.499987880
+ 30	13.999988007	14.249987956	14.499987925
+ 20	13.999988109	14.249988189	14.499988217
+ 10	13.999988453	14.249988394	14.499988381
0	13.999988667	14.249988759	14.499988777
- 10	13.999989221	14.249989248	14.499989243
- 20	13.999989229	14.249989260	14.499989279
- 30	13.999989541	14.249989557	14.499989558

- Voltage stability

Voltage(VAC)	Low-end Frequency Fc=14.00GHz 13.99986 to 14.00014	Middle Frequency Fc=14.25GHz 14.2498575 to 14.2501425	High-end Frequency Fc=14.50GHz 14.499855 to 14.500145
126.5	13.999987950	14.249988194	14.499988215
110	13.999988109	14.249988189	14.499988217
93.5	13.999988117	14.249988184	14.499988222

RF Exposure (SAR)

Basic Standard	1.1307, 1.1310, 2.1091 & 2.1093
Sample Number	603794
Calculated By	Jeremy LEE

Use the barometric pressure reported at: <http://www.theweathernetwork.com/weather/CABC0308>

Test Limits

FCC1.1310:

The criteria listed in table 1 shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in § 1.1307(b),

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f ²)	6
30–300	61.4	0.163	1.0	6
300–1500 .....	.....	.....	f/300	6
1500–100,000 .....	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f ²)	30
30–300	27.5	0.073	0.2	30
300–1500 .....	.....	.....	f/1500	30
1500–100,000 .....	.....	.....	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

Test Setup

FCC Part 1.1310, 2.1091 and OET Bulletin 65 Edition 97-01 MPE Calculations for a Mobile Unit that is using an Aperture Antenna. In order to demonstrate compliance with MPE requirements, the following information is typically needed:

- Estimate the minimum separation distance between an antenna and persons required to satisfy power density limits.
- Antenna installation and device operating instructions for installers, and the parties responsible for ensuring compliance with the RF exposure requirements

Calculation Method of RF Safety Distance:

OET Bulletin 65 Page 29 Equation 18:

$$S_{ff} = \frac{PG}{4\pi R^2} \quad (18)$$

where: S_{ff} = power density (on axis)

P = power fed to the antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the point of interest

Test Results:

Calculations

- In Beam path

Frequency(GHz)	Measured Peak Conducted Output Power at Antenna Terminal (mW)	Gain of Antenna(G)	Recommended Minimum Safe Distance in Beam path Uncontrolled S=1.0mW/ cm ² (m)	Recommended Minimum safe distance in Beam Path controlled S=5.0mW/ cm ² (m)
14.00	27101.92	13803.84	54.56	24.40
14.25	27101.92	14354.89	55.64	24.88
14.50	24154.61	14791.08	53.32	23.84

- Off-Axis

Frequency(GHz)	Measured Peak Conducted Output Power at Antenna Terminal (mW)	Gain of Antenna at 4 degree (G)	Recommended Minimum Safe Distance off-axis Uncontrolled S=1.0mW/ cm ² (m)	Recommended Minimum safe distance off-axis controlled S=5.0mW/ cm ² (m)
14.00	27101.92	28.64	2.49	1.11
14.25	27101.92	33.57	2.69	1.20
14.50	24154.61	37.93	2.70	1.21

Conclusion

In the EUT's User Manual, the FCC Radio Frequency Exposure information will be inserted.

Unintentional Radiated Emissions

Basic Standard	FCC15.109:2007, Class A
Highest Unintentional Radiating Frequency	900MHz
Detecting Method	Quasi Peak Detector: 30 to 1,000MHz Average Detector: 1 to 9Ghz
IF Bandwidth	120kHz: 30 to 1,000MHz, 1MHz: 1 to 9GHz
Temperature	14.1 to 18.8 °C
Relative Humidity	65 to 72 %
Barometric Pressure:	100.55 to 102.15 kPa
Test Date	May 03 to 26, 2008
Sample Number	603794
Calibrated Test Equipment (ID)	058, 106, 112, 124, 141, 225, 227-1, 227-2
Reference Equipment (ID) (Calibration not required)	059, 233, 235
Electrical Rating	110VAC, 60Hz, Single Phase
Tested By	Jeremy LEE

Use the barometric pressure reported at: <http://www.theweathernetwork.com/weather/CABC0308>

Test Limits

FCC 15.109:

(b) The field strength of radiated emissions from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the following:

Frequency of Emission (MHz) Field Strength (microvolts/meter)

30 – 88	90
88 – 216	150
216 – 960	210
Above 960	300

Test Setup for Pre-scan

The test was performed in accordance with **FCC 15.31, 15.33, 15.35, 15.109:2007 and ANSI C63.4:2003.**

The setup for pre-scan the radiated emissions in a GTEM cell is shown in Figure - 1. The EUT is placed inside the GTEM and its radiation is measured with a receiver - spectrum analyzer. The receiver was software controlled.

Test procedure was as follows:

- The EUT was set to transmit at peak power level as well as using high levels of Data rates. The average output power of the transmitter was determined.
- This measurement was performed at the Transmitters lowest, middle and highest frequencies.

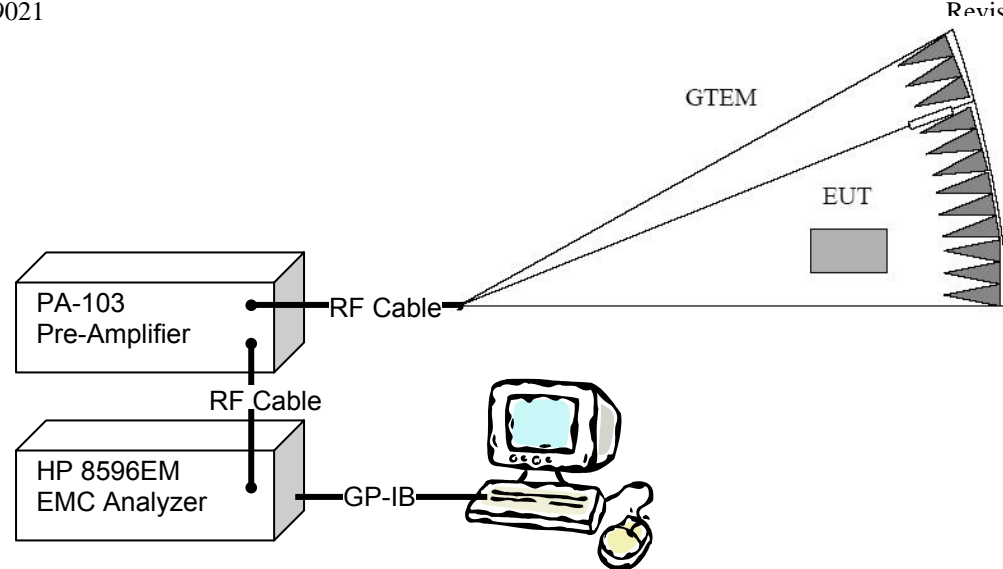


Figure 1 – The setup for Radiated emission test in GTEM

Test Setup for Open Area Test Site(OATS)

The setup for Radiated emission measurements at OATS is shown in Figure - 2.

- The EUT was placed on a wooden table, and it was put on the turning ground plate.
- The EUT was set 1 or 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna supporter.
- It is measured with a receiver - spectrum analyzer, was software controlled.
- Test frequencies under 1GHz were detected by the results of pre-scan.
- Test frequencies over 1GHz were selected up to 10th harmonics of the highest frequency, 900MHz.

Test procedure was as follows:

- The EUT was set to transmit at peak power level as well as using high levels of Data rates. The average output power of the transmitter was determined.
- This measurement was performed at the Transmitters lowest, middle and highest frequencies.

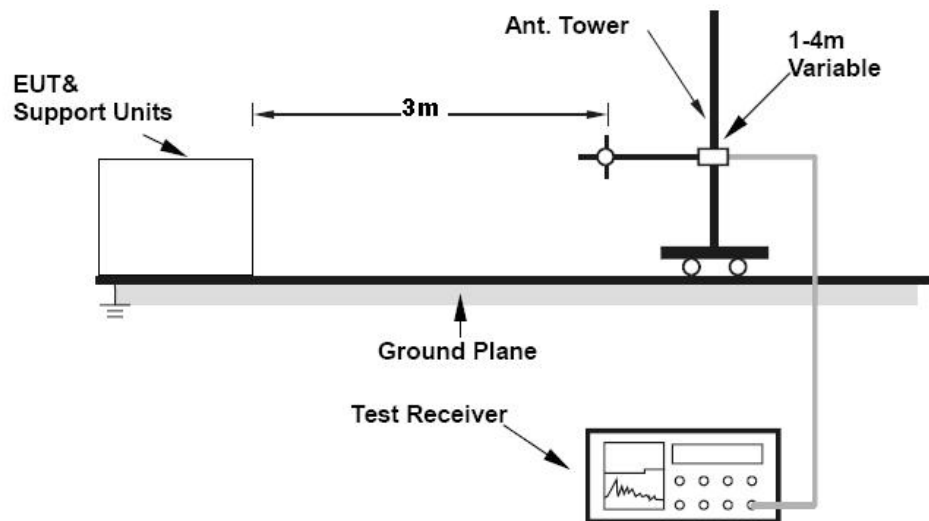


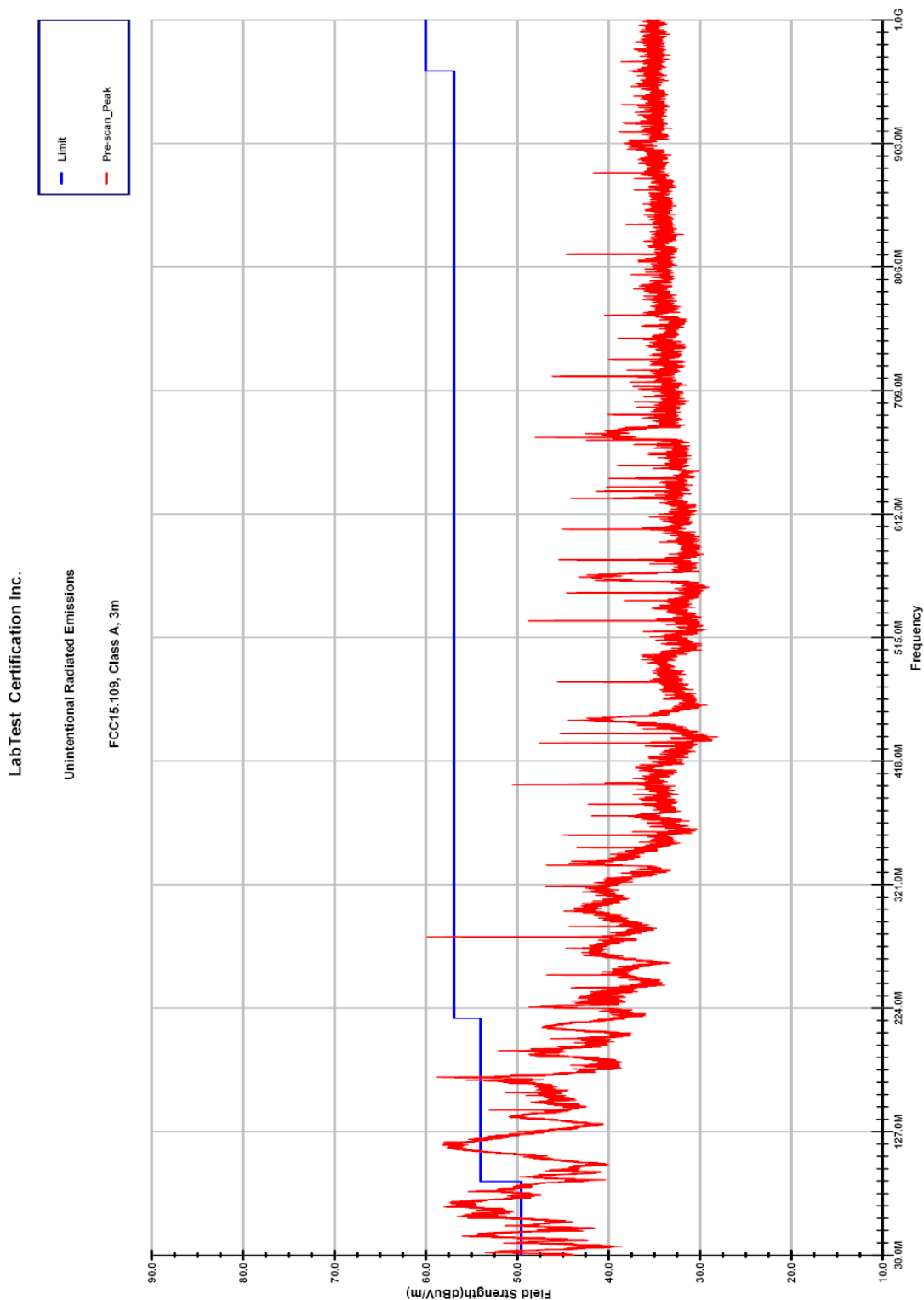
Figure – 2 Test setup for radiated emission at OATS

Test Results:

Emission level (dBuV/m) = Quasi-Peak detected level (dBuV) + Cable Loss (dB)
+ Antenna Factor (dB/m) - Pre-amplifier's Gain (dB)

There was no signal over limit.

- Pre-scan test results of Radiated Emission



Prepared by: LabTest Certification Inc.
 Date Issued: Dec. 18, 2008
 Project No.: 9021

Client: Norsat International Inc.
 Report No.: 9021-3E
 Revision No.: 0

- Table of Radiated Emission-Horizontal: 30-300MHz, Quasi-peak detecting, Antenna was used 3110B

LabTest Certification Inc. Unintentional Radiated Emissions FCC15.109, Class A, 1 meter						
Operator: Jeremy Lee			Proj #: 9021			
01:40:14 PM, Thursday, July 03, 2008			Contact: Pieter Bezuidenhout Company: Norsat International Inc.			
Frequency MHz	LIMIT	QP_RESULTS	MARGIN	TOWER	T/T	POL
30.000 MHz	59.08					
31.905 MHz	59.08	33.69	25.39	1.50	216.20	H
39.440 MHz	59.08	30.15	28.93	1.50	130.50	H
44.918 MHz	59.08	32.28	26.80	1.50	303.60	H
67.950 MHz	59.08	36.22	22.86	1.50	172.50	H
88.000 MHz	59.08					
88.000 MHz	63.52					
116.445 MHz	63.52	35.42	28.10	1.50	288.40	H
144.024 MHz	63.52	36.66	26.86	1.50	64.30	H
167.309 MHz	63.52	32.43	31.09	1.50	55.90	H
169.663 MHz	63.52	30.52	33.00	1.50	300.60	H
190.457 MHz	63.52	34.48	29.04	1.50	147.70	H
216.000 MHz	63.52					
216.000 MHz	66.44					
279.836 MHz	66.44	32.13	34.31	1.50	315.60	H
960.000 MHz	66.44					
960.000 MHz	69.54					
26.500 GHz	69.54					
Sample #: 603794						
Temp.: 18.2 C, Hum.: 71 %						
Barometer Pres.: 102.15 kPa						

- Table of Radiated Emission-Vertical: 30-300MHz, Quasi-peak detecting, Antenna was used 3110B.

LabTest Certification Inc. Unintentional Radiated Emissions FCC15.109, Class A, 1 meter						
Operator: Jeremy Lee			Proj #: 9021			
01:40:14 PM, Thursday, July 03, 2008			Contact: Pieter Bezuidenhout Company: Norsat International Inc.			
Frequency MHz	LIMIT	QP_RESULTS	MARGIN	TOWER	T/T	POL
30.000 MHz	59.08					
31.906 MHz	59.08	33.65	25.43	1.50	348.30	V
39.541 MHz	59.08	28.65	30.43	1.50	150.30	V
44.928 MHz	59.08	31.28	27.80	1.50	123.10	V
67.965 MHz	59.08	36.02	23.06	1.50	145.60	V
88.000 MHz	59.08					
88.000 MHz	63.52					
116.389 MHz	63.52	32.97	30.55	1.50	27.80	V
144.024 MHz	63.52	35.54	27.98	1.50	58.10	V
167.308 MHz	63.52	36.64	26.88	1.50	204.10	V
169.660 MHz	63.52	30.02	33.50	1.50	65.60	V
190.461 MHz	63.52	35.40	28.12	1.50	305.90	V
216.000 MHz	63.52					
216.000 MHz	66.44					
279.794 MHz	66.44	35.18	31.26	1.50	41.10	V
960.000 MHz	66.44					
960.000 MHz	69.54					
26.500 GHz	69.54					
Sample #: 603794						
Temp.: 18.2 C, Hum.: 71 %						
Barometer Pres.: 102.15 kPa						

Prepared by: LabTest Certification Inc.
Date Issued: Dec. 18, 2008
Project No.: 9021

Client: Norsat International Inc.
Report No.: 9021-3E
Revision No.: 0

- Table of Radiated Emission-Horizontal: 300-1000MHz, Quasi-peak detecting, Antenna was used SAS-510-2.

LabTest Certification Inc.
Unintentional Radiated Emissions
FCC15.109, Class A, 3 meters

Operator: Jeremy Lee

Proj #: 9021

01:49:09 PM, Thursday, July 03, 2008

Contact: Pieter Bezuidenhout

Company: Norsat International Inc.

Frequency MHz	LIMIT	QP_RESULTS	MARGIN	TOWER	T/T	POL	
30.000 MHz	59.08						
88.000 MHz	59.08						
88.000 MHz	63.52						
216.000 MHz	63.52						
216.000 MHz	66.44						
319.759 MHz	66.44	25.19	41.25	1.50	16.10	H	
336.028 MHz	66.44	28.29	38.15	1.50	283.60	H	
399.663 MHz	66.44	29.36	37.08	1.50	344.80	H	
432.101 MHz	66.44	29.98	36.46	1.50	155.50	H	
439.933 MHz	66.44	24.63	41.81	1.50	151.10	H	
480.258 MHz	66.44	26.76	39.68	1.50	280.30	H	
528.220 MHz	66.44	36.61	29.83	1.50	287.90	H	
576.216 MHz	66.44	45.69	20.75	1.50	16.00	H	
672.273 MHz	66.44	27.73	38.71	1.50	182.20	H	
720.225 MHz	66.44	53.33	13.11	1.50	245.90	H	
960.000 MHz	66.44						
960.000 MHz	69.54						
26.500 GHz	69.54						
Sample #: 603794							
Temp.: 18.8 C, Hum.: 65 %							
Barometer Pres.: 101.83 kPa							

- Table of Radiated Emission-Vertical: 300-1000MHz, Quasi-peak detecting, Antenna was used SAS-510-2.

LabTest Certification Inc.
Unintentional Radiated Emissions
FCC15.109, Class A, 3 meters

Operator: Jeremy Lee

Proj #: 9021

01:49:09 PM, Thursday, July 03, 2008

Contact: Pieter Bezuidenhout

Company: Norsat International Inc.

Frequency MHz	LIMIT	QP_RESULTS	MARGIN	TOWER	T/T	POL	
30.000 MHz	59.08						
88.000 MHz	59.08						
88.000 MHz	63.52						
216.000 MHz	63.52						
216.000 MHz	66.44						
319.768 MHz	66.44	21.41	45.03	1.50	107.80	V	
336.015 MHz	66.44	27.60	38.84	1.50	264.40	V	
399.725 MHz	66.44	31.47	34.97	1.50	346.10	V	
432.101 MHz	66.44	27.10	39.34	1.50	291.30	V	
439.930 MHz	66.44	26.70	39.74	1.50	12.10	V	
480.168 MHz	66.44	26.27	40.17	1.50	71.10	V	
528.184 MHz	66.44	33.46	32.98	1.50	77.60	V	
576.229 MHz	66.44	47.25	19.19	1.50	60.60	V	
672.351 MHz	66.44	27.35	39.09	1.50	266.10	V	
720.244 MHz	66.44	53.35	13.09	1.50	38.90	V	
960.000 MHz	66.44						
960.000 MHz	69.54						
26.500 GHz	69.54						
Sample #: 603794							
Temp.: 18.8 C, Hum.: 65 %							
Barometer Pres.: 101.83 kPa							

Prepared by: LabTest Certification Inc.
 Date Issued: Dec. 18, 2008
 Project No.: 9021

Client: Norsat International Inc.
 Report No.: 9021-3E
 Revision No.: 0

- Table of Radiated Emission-Horizontal: 1 to 9GHz, Average Detecting, Antenna was used SAS-571.

LabTest Certification Inc.
 Unintentional Radiated Emissions
 FCC15.109, Class A, 3 meters

Operator: Jeremy Lee

Proj #: 9021

01:58:44 PM, Thursday, July 03, 2008

Contact: Pieter Bezuidenhout

Company: Norsat International Inc.

Frequency MHz	LIMIT	AVG_Result	MARGIN	POL	
30.000 MHz	59.08				
88.000 MHz	59.08				
88.000 MHz	63.52				
216.000 MHz	63.52				
216.000 MHz	66.44				
960.000 MHz	66.44				
960.000 MHz	69.54				
1.025 GHz	69.54	30.22	39.32	H	
1.025 GHz	69.54	30.17	39.37	H	
1.299 GHz	69.54	31.57	37.97	H	
5.895 GHz	69.54	51.41	18.13	H	
26.500 GHz	69.54				
Sample #: 603794					
Temp.: 14.1 C, Hum.: 72 %					
Barometer Pres.: 100.55 kPa					

- Table of Radiated Emission-Vertical: 1 to 9GHz, Average Detecting, Antenna was used SAS-571.

LabTest Certification Inc.
 Unintentional Radiated Emissions
 FCC15.109, Class A, 3 meters

Operator: Jeremy Lee

Proj #: 9021

01:58:44 PM, Thursday, July 03, 2008

Contact: Pieter Bezuidenhout

Company: Norsat International Inc.

Frequency MHz	LIMIT	AVG_Result	MARGIN	POL	
30.000 MHz	59.08				
88.000 MHz	59.08				
88.000 MHz	63.52				
216.000 MHz	63.52				
216.000 MHz	66.44				
960.000 MHz	66.44				
960.000 MHz	69.54				
1.025 GHz	69.54	30.22	39.32	V	
1.201 GHz	69.54	32.06	37.48	V	
1.299 GHz	69.54	31.57	37.97	V	
5.894 GHz	69.54	51.38	18.16	V	
26.500 GHz	69.54				
Sample #: 603794					
Temp.: 14.1 C, Hum.: 72 %					
Barometer Pres.: 100.55 kPa					

Unintentional Conducted Emissions

Basic Standard	FCC15.107:2007, Class A
Detecting Method	Quasi Peak and Average Detector
IF Bandwidth	9 kHz
Temperature	21.5 °C
Relative Humidity	45.6 %
Barometric Pressure:	101.14 kPa
Test Date	June 05, 2008
Sample Number	603794
Calibrated Test Equipment (ID)	058, 106, 127, 128
Reference Equipment (ID) (Calibration not required)	059
Electrical Rating-Nominal	110VAC, 60Hz, Single Phase
Tested By	Jeremy LEE

Use the barometric pressure reported at: <http://www.theweathernetwork.com/weather/CABC0308>

Test Limits

FCC 15.107:

(b) For a Class A digital device that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms LISN. Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	79	66
0.5-30	73	60

Test Setup

The test was performed in accordance with **FCC 15.31, 15.33, 15.35, 15.107:2007 and ANSI C63.4:2003.**

The EUT was placed on the floor shown in Figure- 3, and 0.4 meters from the conducting wall with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

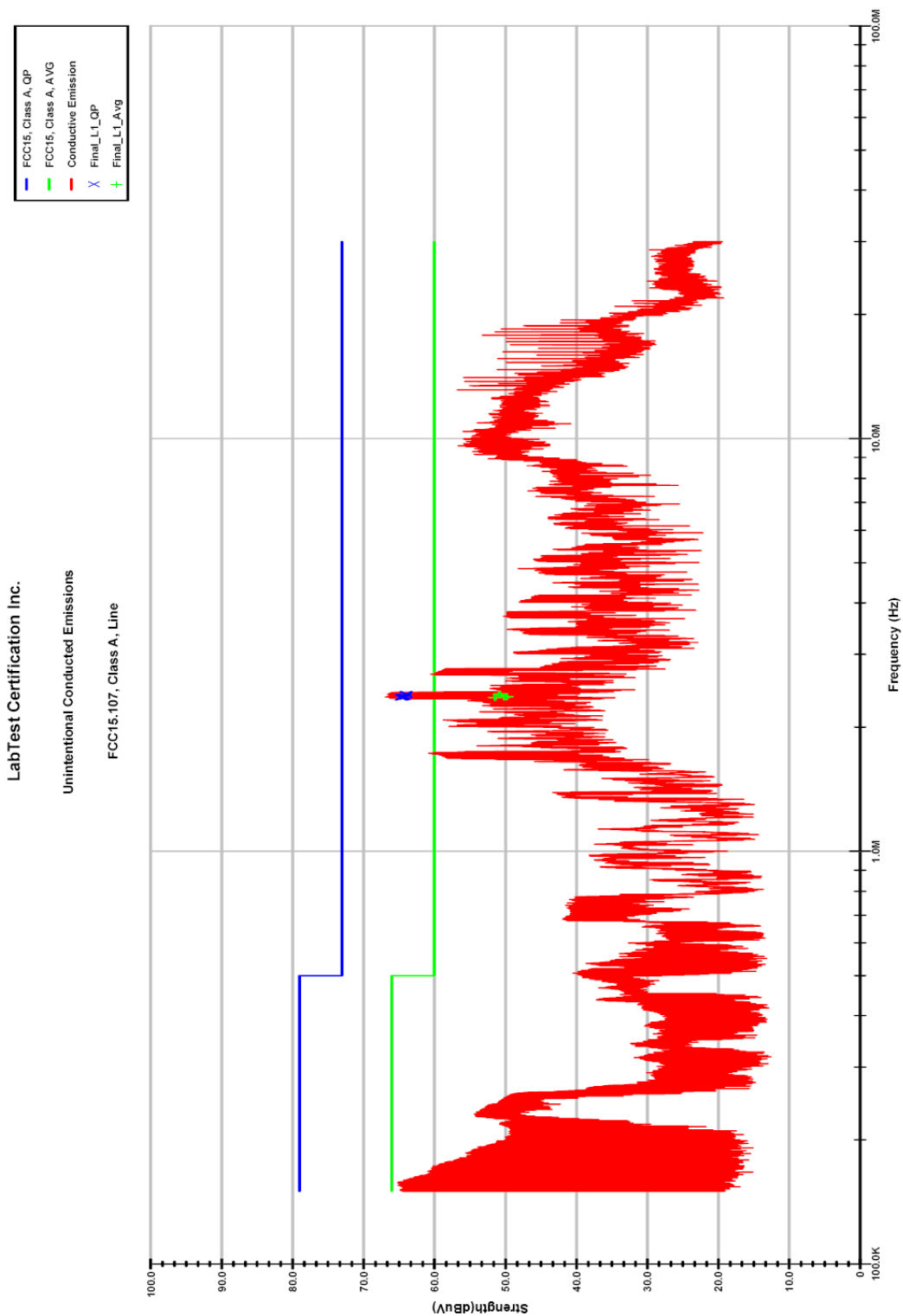
Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

Initially a scan was made with a Spectrum Analyzer from 150 kHz to 30 MHz on each phase with the receiver in the peak mode. The receiver IF bandwidth was 9 kHz and scan step was about 9 kHz. Measurements were then made using CISPR quasi peak and average detectors when the peak readings were within 10dB of the lower average limit line.


$$\text{Emission level (dBuV)} = \text{Detected level (dBuV)} + \text{Cable Loss (dB)} + \text{Insertion Loss of LISN (dB)}$$

DCN: 1034, Rev 2

- Graph of Conducted Emission: Line



LabTest Certification Inc.

Unintentional Conducted Emissions

FCC15.107, Class A, Line

Project # 9021

Contact: Pieter Bezuidenhout

Company: Norsat International Inc.

Sample #: 603794

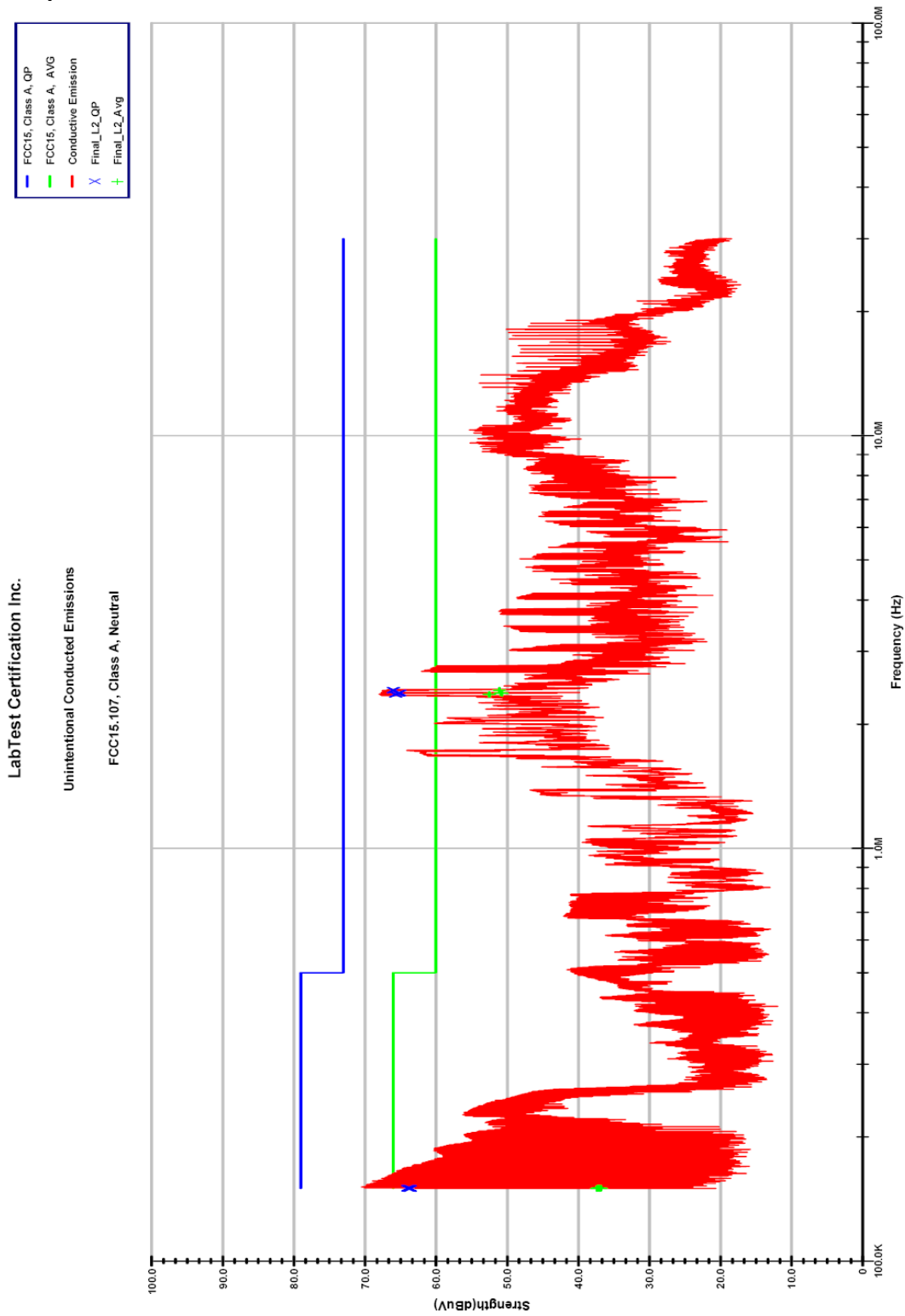
Temp.: 21.5 C, Hum.: 45.6 %

Barometer Pres.: 101.14 kPa

Operator: Jeremy LEE

10:51:29 AM, Thursday, June 05, 2008

- Graph of Conducted Emission: Neutral



Project #: 9021
 Contact: Pieter Bezuidenhout
 Company: Norsat International Inc.

Sample #: 603794
 Temp.: 21.5 C, Hum.: 45.6 %
 Barometer Pres.: 101.14 kPa

Operator: Jeremy LEE
 11:09:57 AM, Thursday, June 05, 2008

Prepared by: LabTest Certification Inc.
 Date Issued: Dec. 18, 2008
 Project No.: 9021

Client: Norsat International Inc.
 Report No.: 9021-3E
 Revision No.: 0

- Table of Conducted Emission: Line

LabTest Certification Inc.
 Unintentional Conducted Emissions
 FCC15.107, Class A, Line

Operator: Jeremy LEE

02:19:04 PM, Thursday, July 03, 2008

Project #: 9021

Contact: Pieter Bezuidenhout

Company: Norsat International Inc.

Frequency MHz	Limit_QP	Measured_QP	Margin_QP	Limit_AVG	Measured_AVG	Margin_AVG
150.000 KHz	79.00			66.00		
500.000 KHz	79.00			66.00		
500.001 KHz	73.00			60.00		
2.360 MHz	73.00	64.66	8.34	60.00	51.44	8.56
2.364 MHz	73.00	64.47	8.53	60.00	50.12	9.88
2.369 MHz	73.00	64.17	8.83	60.00	49.89	10.11
2.369 MHz	73.00	64.13	8.87	60.00	49.83	10.17
2.399 MHz	73.00	63.97	9.03	60.00	50.82	9.18
2.401 MHz	73.00	63.97	9.03	60.00	50.78	9.22
30.000 MHz	73.00			60.00		
Sample #: 603794						
Temp.: 21.5 C, Hum.: 45.6 %						
Barometer Pres.: 101.14 kPa						

- Table of Conducted Emission: Neutral

LabTest Certification Inc.
 Unintentional Conducted Emissions
 FCC15.107, Class A, Neutral

Operator: Jeremy LEE

02:19:04 PM, Thursday, July 03, 2008

Project #: 9021

Contact: Pieter Bezuidenhout

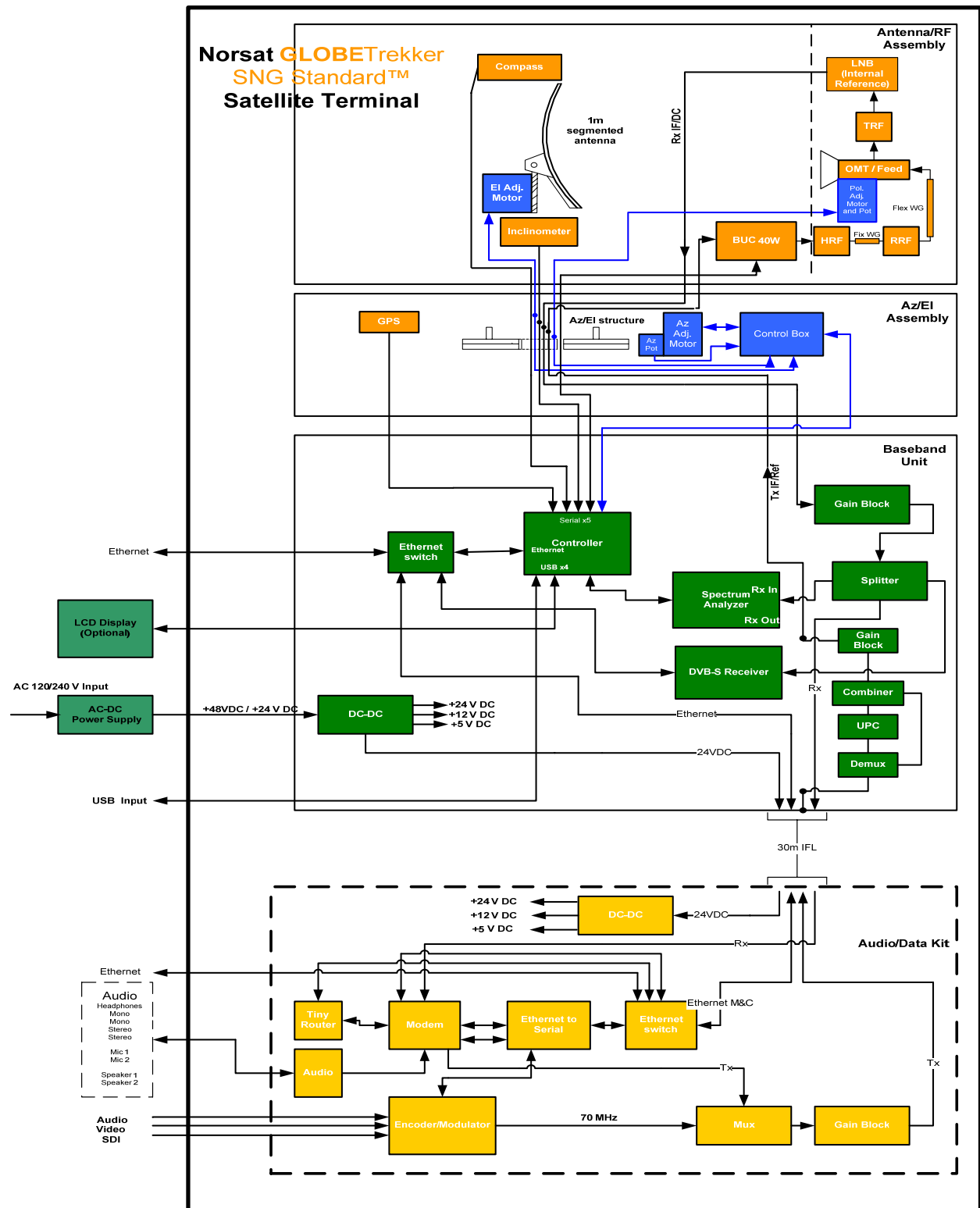
Company: Norsat International Inc.

Frequency MHz	Limit_QP	Measured_QP	Margin_QP	Limit_AVG	Measured_AVG	Margin_AVG
150.000 KHz	79.00			66.00		
150.007 KHz	79.00	63.65	15.35	66.00	37.35	28.65
150.060 KHz	79.00	63.86	15.14	66.00	37.05	28.95
150.164 KHz	79.00	63.61	15.39	66.00	36.97	29.03
150.168 KHz	79.00	63.61	15.39	66.00	36.80	29.20
150.274 KHz	79.00	63.93	15.07	66.00	37.21	28.79
150.504 KHz	79.00	63.81	15.19	66.00	37.15	28.85
500.000 KHz	79.00			66.00		
500.001 KHz	73.00			60.00		
2.361 MHz	73.00	65.66	7.34	60.00	52.49	7.51
2.376 MHz	73.00	65.26	7.74	60.00	50.72	9.28
2.380 MHz	73.00	65.10	7.90	60.00	50.87	9.13
2.417 MHz	73.00	65.98	7.02	60.00	51.07	8.93
30.000 MHz	73.00			60.00		
Sample #: 603794						
Temp.: 21.5 C, Hum.: 45.6 %						
Barometer Pres.: 101.14 kPa						

Appendix A: Test Equipment Used

ID No.	Description	Manufacturer	Model	Serial No.	Calibration Date	Calibration Due Date	Calibration Certificate No:	Calibration Laboratory
023	Temperature Test Chamber	Thermotron	S-8	17633	N/A	N/A	N/A	N/A
058	Humidity/ Temperature Logger	Veriteq	SP-2000	04032164	13-Sep-2007	13-Sep-2008	0125372	Veriteq
059	AC Power Source	California Instrument	5000i	HK51870	N/A	N/A	N/A	N/A
106	Spectrum analyzer	HP	8596EM	3536A00113	15-Sep-2007	13-Sep-2008	CX19712	CMC
112	GTEM EMC Chamber	Emco	5317	N/A	04-Oct-2005	04-Oct-2010	1000082343	Wescan
124	Pre-Amplifier	Com-Power	PA-103	161118	29-Nov-2007	29-Nov-2008	269525	Wescan
127	LISN (I)	Com-Power	LI-200	12054	31-Aug-2007	29-Aug-2008	CX19714	CMC
128	LISN (II)	Com-Power	LI-200	12216	31-Aug-2007	29-Aug-2008	CX19713	CMC
141	Pre-Amplifier	RF Bay	LPA-10-10	N/A	28-Feb-2008	28-Feb-2009	272296	Wescan
152	Spectrum analyzer	Adventest	R3271	15050455	11-Oct-2007	11-Oct-2008	268170	Wescan
225	Biconical Antenna	EMCO	3110B	9211-1595	28-Apr-2008	28-Apr-2009	S000013015	ETS-Lindgren
227-1	Log Periodic Antenna	A.H. Systems	SAS-510-2	1262	30-Apr-2008	30-Apr-2009	66817	ETS-Lindgren
227-2	Horn Antenna	A.H. Systems	SAS-571	936	30-Apr-2008	30-Apr-2009	66892	ETS-Lindgren
227-3	RF Cable	A.H. Systems	SAC-26G-3	205	N/A	N/A	N/A	N/A
228	Humidity/ Temperature Logger	Veriteq	SP-2000-20R	07072157	16-Sep-2008	16-Sep-2009	0133270	Veriteq
233	RF Cable	N/A	LCI-001	N/A	N/A	N/A	N/A	N/A
235	Turn table System	Sunol Sciences Co.	SC104V	031407-1	N/A	N/A	N/A	N/A
243	External Mixer	Agilent	11970U	2332A00471	29-Aug-2008	29-Aug-2009	418167518	Agilent
244	External Mixer	Agilent	11970V	2521A01640	29-Aug-2008	29-Aug-2009	1418168089	Agilent
C1	Spectrum analyzer	HP	8564E	3751A01079	05-Jul-2008	05-Jul-2009	10137	National Test Equipment

Appendix B: Block Diagram

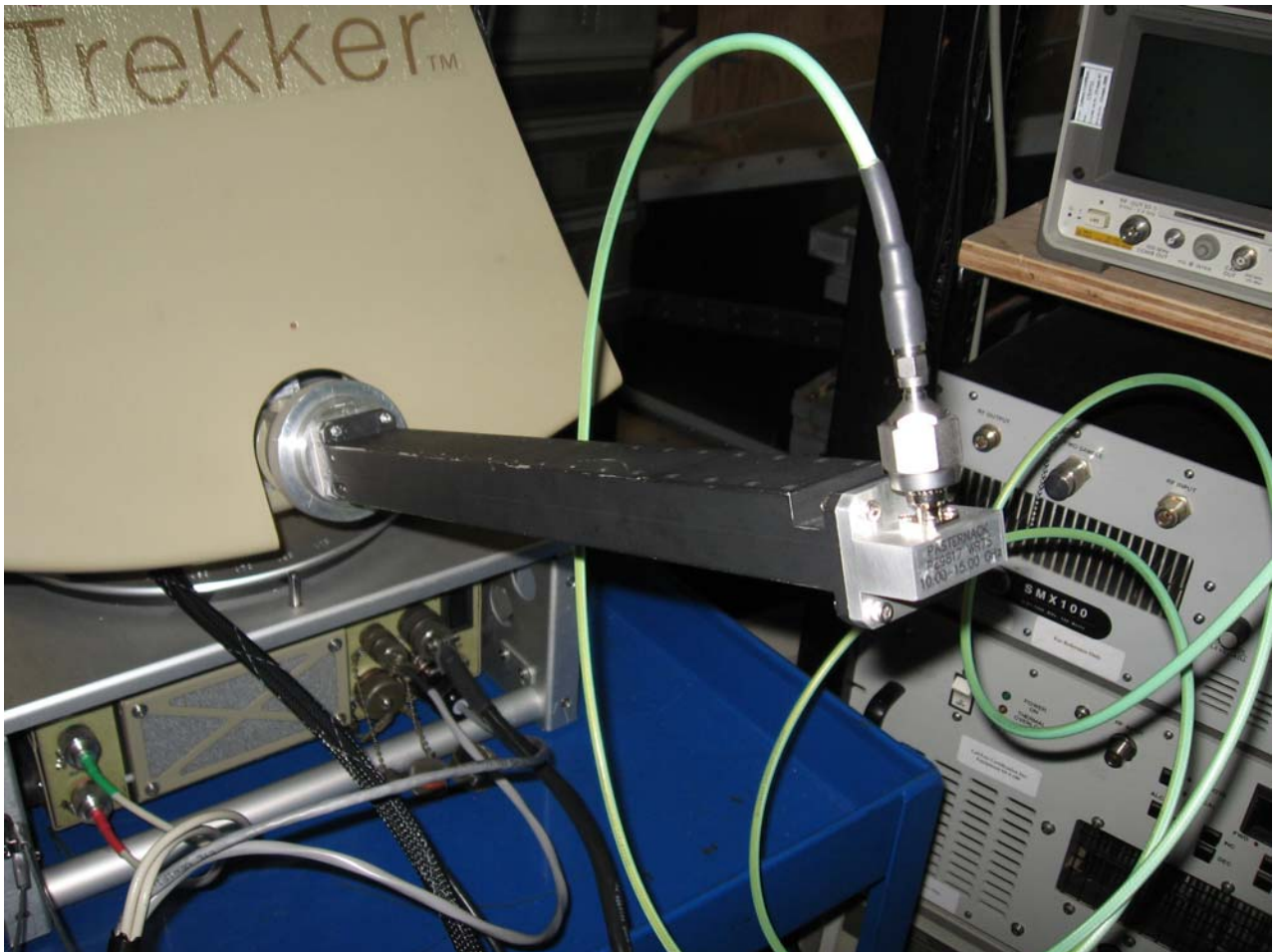


Appendix C: Photographs

- EUT : System



- Test configuration for Conducted Measurements



- Test configuration for Conducted Measurements for Spurious Emissions



- Test configuration at Temperature test chamber



- Test configuration for Unintentional Radiated Emissions at OATS



- Test configuration for Conducted Emissions



END OF REPORT