Norsat International Inc.

GlobeTrekker 5200KuAA-ID

Report of Measurements
per
FCC CFR47 Part 15/B; Part 25

Revision 1.0

August 08, 2006

Approved by		
Checked by	Robert Stirling, P.Eng.	Aug 8, 2006 Date

Protocol Datasystems Inc.,Labs, Abbotsford BC, Canada
FCC Registration Number 96437
Industry Canada Registration Number IC3384

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Section I: Information for Test Report of Measurements

Testing Details

TESTED BY: David Johanson

TEST CONDITIONS: Temperature and Humidity: 5.5°C, 68%

TEST VOLTAGE: 120Vac 60Hz and 24VDC Battery pack

Test Facilities

Protocol Datasystems Inc., Labs
28945 McTavish Rd.
Abbotsford BC, Canada, V4X 2E7

FCC Registration Number 96437
Industry Canada Registration Number IC3384

Test Equipment List

EMISSION:

Manufacturer	Model	Equipment Description	Serial No.	Last Cal	Next Cal
HP	85650A	CDN Quasi-Peak Adapter	2043A00240	22/03/05	22/03/06
HP	85662A	Spectrum Analyzer Display	2318A05184	22/03/05	22/03/06
HP	8566B	Spectrum Analyzer RF Section	2241A02102	22/03/05	22/03/06
HP	85685A	RF-Preselector	3107A01222	22/03/05	22/03/06
A.H. Systems	SAS-200/510	Antenna Log Periodic	761	04/03/05	04/03/06
EMCO	3105	Antenna DRG Horn (Med)	2024	25/02/05	25/02/06
LaPlace Instruments	AC1000	Low Distortion Power Source	138041	12/12/05	12/12/06
Thurlby Thandar	HA1600	Power and Harmonics Analyzer	140108	13/12/05	13/12/06
EMCO	3825 2	LISN(25A 50ohm 50/250uH 10k-100M)	9509-2470	20/07/05	20/07/06
EMCO	3110B	Antenna Biconical (Type 3)	9401-1850	01/03/05	01/03/06
Rhientech	Custom	Antenna Mast	N/A	N/A	N/A
Protocol EMC	Custom	Turntable	N/A	N/A	N/A

Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	±1 x 10^{-5}
Total RF power, conducted	±1,5 dB
RF power density, conducted	±3 dB
Spurious emissions, conducted	±3 dB
All emissions, radiated	±6 dB
Temperature	±1°C
Humidity	±5 %
DC and low frequency voltages	±3 %

Company Under Test

NAME: Norsat International Inc.

ADDRESS: 300 – 4401 Still Creek Drive
Burnaby, BC V5C 6G9

CONTACT PERSON: Mr. Micheal Schefter

EMAIL: mschefter@norsat.com

PHONE NUMBER: 604-292-9000

Equipment Under Test

THE TEST SYSTEM:

EUT 1: GlobeTrekker 5200KuAA-ID – 15W System
Manufacturer: Norsat International Inc
Part Number: 099-40010-00
Serial Number: FDR-05

EUT 2: Globetrekker Baseband Unit
Manufacturer: Norsat International Inc
Part Number: 5200-BB-ID / 099-40011-01
Serial Number: FDR-05

EUT 3: Globetrekker Antenna/RF Unit
Manufacturer: Norsat International Inc
Part Number: 5200-ANT-15W / 099-40012-01
Serial Number: FDR-05

AUX EQUIP 1: Globetrekker AC-DC Power Supply Unit
Manufacturer: Norsat International Inc
Part Number: 5200-PS / 027869
Serial Number: FDR-05

AUX EQUIP 2: Globetrekker User Interface Unit
Manufacturer: Panasonic
Part Number: 5200-PANA-18 / 190-20903-30
Serial Number: CF-18KDHZXVM – 5KKSA42618

Cabling

Ref	Cable	Pins	Connector	Termination	Shielded	Ferrites
1	LNB Rx cable assmebly	Coaxial	F-Type	75Ω	Yes	No
2	Polarization motor/Feedback cable assy	6	Amphenol 10-6	No	Yes	No
3	Compass & GPS combined cable assy	4 & Coaxial	Amphenol 8-4 & TNC	No & 50Ω	Yes&Yes	No & No
4	SSPA DC/MAC cable assembly	12	Amphenol 14-12	No	Yes	No
5	Elevation motor cable assembly	6	Amphenol 10-6	No	Yes	No
6	Inclinomotor cable assembly	3	Amphenol 8-3	No	Yes	No
7	BUC Tx cable assembly #1	Coaxial	TNC	50Ω	Yes	No
8	BUC Tx cable assembly #2	Coaxial	TNC	50Ω	Yes	No
9	DC-DC cable assembly	4	Amphenol 12-4	No	Yes	Yes Steward P/NBO0686-200 or equiv.
10	AC Cable assembly	3	Amphenol 12-3	No	Yes	Yes Steward P/NBO0686-200 or equiv.
11	Ethernet cable assembly	8	RJ45	No	Yes	No

TEST SETUP: The EUT was setup in its normal operating mode. For tests requiring that the unit be placed in transmission mode, the Antenna port was connected to a 50Ohm load or connected to an uplink/downlink converter test set. Refer to Appendix A for photo's about Cables and setup.

MODIFICATIONS: This unit requires no modifications for it to pass.

CONCLUSION: The Globetrekker 5200KuAA complies with the requirements of FCC CFR47 part 15/B and Part 25 subpart C. These test results are representive of the provided sample given to us for testing as documented above in the EUT section

Section II: Report of Measurements to FCC 47CFR Ch. I

General

Tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 15 – Subpart B – Unintentional Radiators Class B and; Part 25 – Satellite Communications.

The specific sections used for Part 25 compliance is contained in Subpart C – Technical Standards - for Satellite Communications operating in the frequency bands 14-14.5GHz Ku Band (Earth to Space).

Requirements for Intentional Radiators

According to 47CFR Ch. I FCC Part 25 Section 25.102(a), "*No person shall use or operate apparatus for the transmission of energy or communications or signals by space or earth stations except under, and in accordance with, an appropriate authorization granted by the Federal Communications Commission.*

There is a requirement for this product to be submitted for certification under the rules and regulations of FCC Part 25 Subpart C and FCC Part 2 Subpart J. An FCC ID must be applied for and added to the labels in accordance with FCC CFR47 Part 2 subpart J.

Labeling and Markings

You should refer to to the clauses of FCC part 2 Section 2.925 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 labeling requirements may appear on a separate label at the option of the applicant/grantee.

According to FCC Part 2 Section 2.925(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 of a type size large enough to be legible without the aid of magnification. Example: FCC ID XXX123. XXX—Grantee Code and 123—Equipment Product Code "

According to FCC Section 15.19(a)(3), the following statement must be included on the identification label:

> "This equipment complies with FCC Rules, Part 15 for a Class A Digital Device. Operation is subject to the following two conditions: 1) This device may not cause harmful interference, and 2) This device must accept any interference that may cause any undesired operation"

According to FCC Section 15.19(b) the FCC logo is not required for this product since it does not fall under the rules for a Product subject to authorization under a Declaration of Conformity.

User Manual Statements

According to FCC Section 15.105, the following statement must be included in a prominent location in your User's Manual:

> "NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense."

According to FCC Section 15.21, a caution statement is to be included. It can similar to:

> "Caution: Changes or modifications to this equipment, not expressly approved by the manufacturer could void the user's authority to operate the equipment. "

Test Results - Summary

Test	Standard	Description	Result
Unintentional Radiated Emissions - Idle Mode	FCC PART 15 Subpart B Class A Limits	The radiated emissions are measured in the 30-1000Mhz range	Complies
Unintentional AC Mians Conducted Emissions - Idle Mode	FCC PART 15 Subpart B Class A Limits	The Conducted Emissions are measured on the phase and Neutral Power lines in the 0.15 - 30.0 MHz range.	Complies
Intentional Radiated Emissions - Transmit Mode	FCC Part 25.203(c) and 2.1046	RF Power Output	Complies
Intentional Radiated Emissions - Transmit Mode	FCC Part 25.202(d) and 2.1055	Frequency Tolerance	Complies
Intentional Radiated Emissions - Transmit Mode	FCC Part 1.1310 and 2.1091	RF Exposure Requirements	Complies
Intentional Radiated Emissions - Transmit Mode	FCC Part 25.202(f) and 2.1047(b)	Modulation Limiting	Complies
Intentional Radiated Emissions - Transmit Mode	FCC Part 25.202(f) and 2.1049	Emission Limitation	Complies
Intentional Radiated Emissions - Transmit Mode	FCC Part 25.202(f) and 2.1057 and 2.1051	Emission limits – Spurious Emissions at Antenna Terminal	Complies
Intentional Radiated Emissions - Transmit Mode	FCC Part 25.202(f) and 2.1057 and 2.1053	Emission limits – Field Strength of Spurious Emissions	Complies

Part 1 - Unintentional Radiated Emission Testing

DATE: February 13, 2006

TEST STANDARD: FCC 47CFR, Part 15, Subpart B – Class A

TEST VOLTAGE: 120Vac, 60Hz

TEST SETUP: Although this test calls for measurements to be performed at 10-meters, this EUT radiates so few frequencies and at such low levels that the equipment was set up in a 3-meter open field test site. Emissions in both horizontal and vertical polarizations were measured while rotating the EUT on a turntable to maximize the emissions signal strength and compensated to indicate the equivalent level if the signals were measured at 10-meters.

The EUT was tested with the power "ON" and in Receive Mode with all motors in continuous operation.

MINIMUM STANDARD: Class A Limits:

Frequency	Field Strength at 10m		Equivalent Field Strength at 3m	
MHz	µV/m at 10m	dBµV/m at 10m	µV/m at 3m	dBµV/m at 3m
30 - 88	90	39.0	300	49.5
88 - 216	150	43.5	500	54.0
216 - 960	210	46.4	700	56.9
960 - above	300	49.5	1000	60.0

METHOD OF MEASUREMENT: The equipment was set up in a 10-meter open field test site; Tests were performed at 3 meters. Limit lines were modified to compensate as per procedures for short range, as below, using the manufacturer's specified normal cabling configuration, with all cables over 1 meter in length bundled at 1 meter and retained from the floor. A typical application was tested.

Emissions in both horizontal and vertical polarization's were measured while rotating the EUT on a turntable to maximize the emissions signal strength.

Per ANSI C63.4-2003 5.1.2 in cases where the presence of high ambient noise makes it difficult to measure an emission at the required distance, the measurement is performed at a closer distance and the limit is adjusted in accordance with the formula as outlined in CISPR 22.

For limits specified in **dBmV/m** - 20 Log (D1/D2)
Where D1 = New Distance D2 = Required Distance The result is added to the required emission level to ensure compliance at the new distance.

DEVICE DESCRIPTIONS: As described in the Equipment Under Test Section, above.

CABLE DESCRIPTIONS: cables as specified in **Section 1 - Cabling**

MEASUREMENT DATA: See Appendix C for corresponding frequencies, tables and plots

PERFORMANCE: Complies.

Part 2 - Unintentional AC Mains Conducted Emission Testing

DATE: January 31, 2006

TEST STANDARD: FCC 47CFR, Part 15, Subpart B – Class A

TEST VOLTAGE: 120Vac, 60Hz

TEST SETUP: The EUT was connected to the conducted emissions LISN apparatus. The equipment was operated and tested at 120Vac 60Hz. The EUT was tested with the power "ON" and in Receive Mode with all motors in continuous operation.

MINIMUM STANDARD: Class A Limit:

Frequency (MHz)	Conducted Limit (dBμV)	
	Quasi-Peak	Average
0.15 - 0.50	79	66
0.50 - 5	73	60
5 - 30	73	60

METHOD OF MEASUREMENT: Measurements were made using a spectrum analyzer with 10kHz RBW, Peak detector. Any emissions that are close to the limit are measured using a test receiver with 10kHz bandwidth, CISPR Quasi-Peak detector as well as an average detector meter.

DEVICE DESCRIPTIONS: As described in the Equipment Under Test Section, above.

CABLE DESCRIPTIONS: cables as specified in **Section 1 - Cabling**

MEASUREMENT DATA: See Appendix C for corresponding frequencies, tables and plots

PERFORMANCE: Complies.

Part 3 - Intentional Radiator RF Power Output – 25.203(c), 25.204(a) and 2.1046

DATE: January 31, 2006

TEST VOLTAGE: 120Vac, 60Hz

TEST SETUP: The EUT was connected from the Antenna Terminal directly to the Spectrum Analyzer, using appropriate adapters, cables and attenuators, and the signal frequency and the Average level was measured. The EUT was set to transmit at peak power level as well as using a Low and High levels of Data rates. This measurement was performed at the Transmitters lowest, middle and highest frequencies.

TEST STANDARD: FCC 47CFR, Part 25.203(c)(IX) & (X); part 25.204(a)

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 15GHz,
(x) Maximum available RF transmit power density in any 1 MHz band and in any 4 kHz band at the input terminals of the antenna(s),

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

+40 dBW in any 4 KHz band for È : 0°.
+40+3 q dBW in any 4 KHz band for È < 0°≤05°.

where q 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.

METHOD OF MEASUREMENT: Measurements were made using a spectrum analyzer with 1MHz RBW and 10kHz RBW. Measurements were made using Carrier Wave (C.W.) as well as a modulated signal simulating 128Kbaud and 1Mbaud communication system. Since the 4kHz Power Density can not be measured directly, the Power Density was measured in 10kHz and then converted to 4kHz using the formula: PD(4kHz) = PD(10kHz) + 10Log(4kHz/10kHz).

DEVICE DESCRIPTIONS: As described in **Section 1 - Equipment Under Test**

CABLE DESCRIPTIONS: cables as specified in **Section 1 - Cabling**

MODIFICATIONS: No modifications have been made to the EUT.

MEASUREMENT DATA:

Power Density at Antenna Port in 4KHz BW

Frequency	Modulation Data Rate	Raw measurement	Corrections	Power Density at Antenna Port at 10kHz BW	Power Density at Antenna Port at 4kHz BW	EIRPD in 4kHz BW (PD + G)	EIRPD Limit in 4kHz BW
(GHz)		(dBm)	(dB)	(dBm)	(dBm)	(dBm)	(dBm)
14.00	128kBaud	-14.2	43.6	29.4	25.4	67.5	70
14.00	1MBaud	-30.1	43.6	13.5	9.5	51.6	70
14.25	128kBaud	-14.8	43.1	28.3	24.3	66.4	70
14.25	1MBaud	-31.3	43.1	11.8	7.8	49.9	70
14.5	128kBaud	-14.0	43.2	29.2	25.2	67.3	70
14.5	1MBaud	-30.8	43.2	12.4	8.4	50.5	70

Notes:

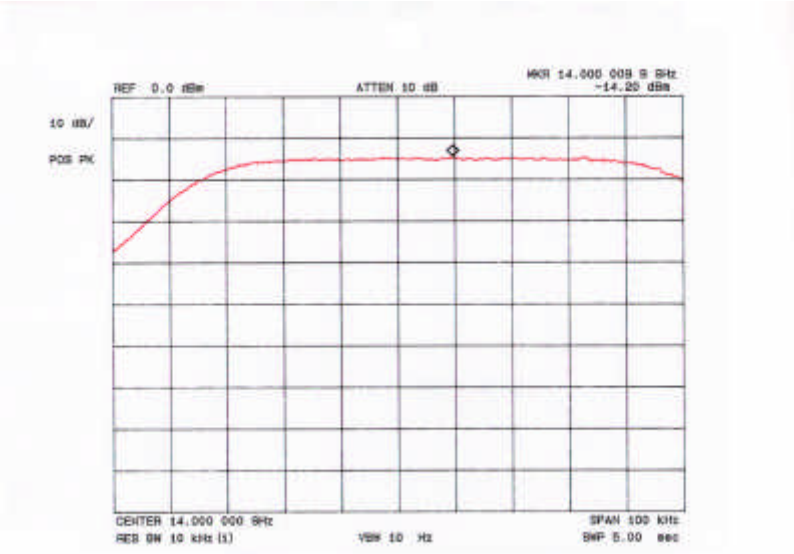
1) PD(4kHz) = PD(10kHz) + 10Log(4kHz/10kHz)
2) G (Antenna Gain): 42.1dBi (Maximum gain measured at 14.5GHz)
3) FCC EIRP Density Limit = 40dBW = 70dBm in 4kHz RBW

Power Density at Antenna Port in 1MHz RBW; 10Hz VBW

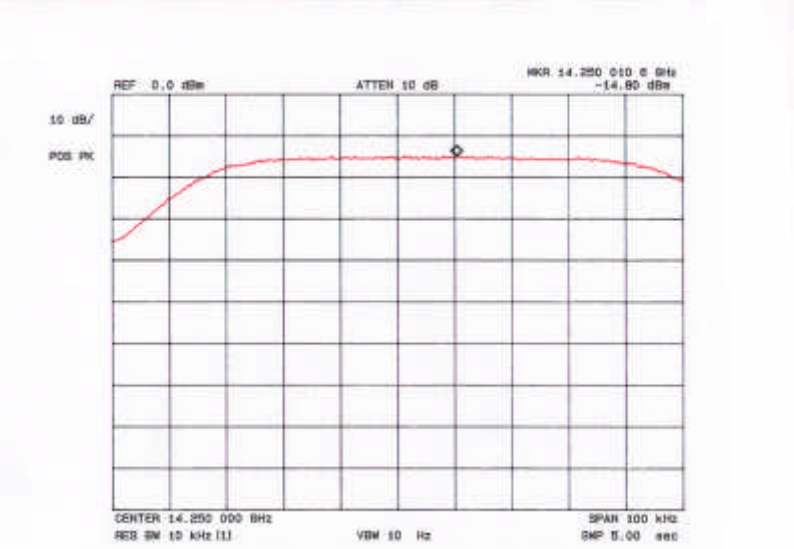
Frequency	Modulation	Raw Measurement	Corrections	Power Density at Antenna Port at 1 MHz BW
(GHz)		(dBm)	(dB)	(dBm)
14.00	128kBand	-4.2	43.6	39.4
14.00	6Mband	-12.2	43.6	31.4
14.25	128kBand	-4.6	43.1	38.5
14.25	6Mband	-12.9	43.1	30.2
14.5	128kBand	-3.8	43.2	39.4
14.5	6Mband	-12.8	43.2	30.4

Frequency	Modulation	Raw Measurement	Corrections	Total Peak Power
(GHz)		(dBm	(dB)	(dBm)
14.00	C.W.	-3.1	43.6	40.5
14.25	C.W.	-3.5	43.1	39.6
14.5	C.W.	-3.3	43.2	39.9

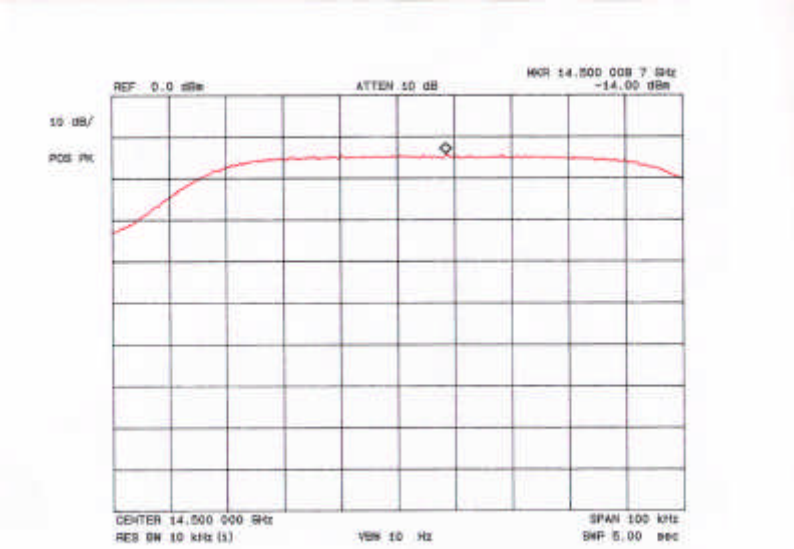
Part 3: Plots



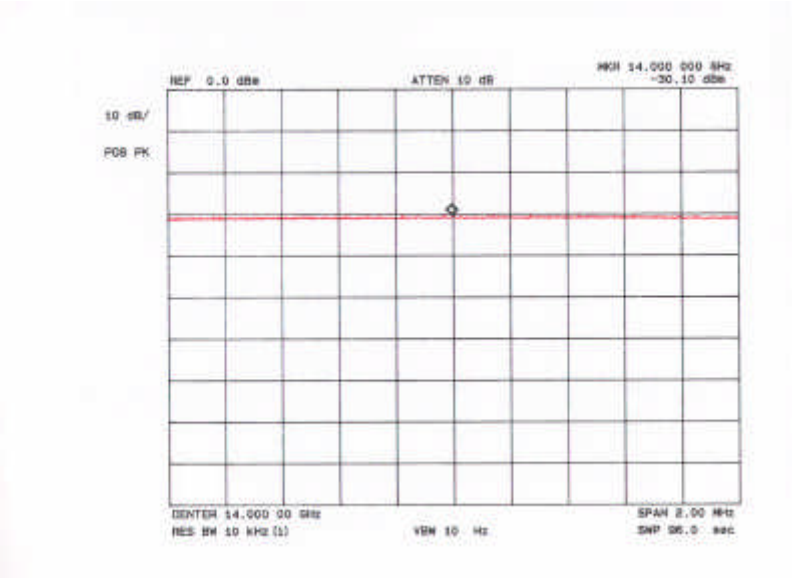
Low Channel – 14.0GHz - Power Density in 4kHz at 128kBaud modulation



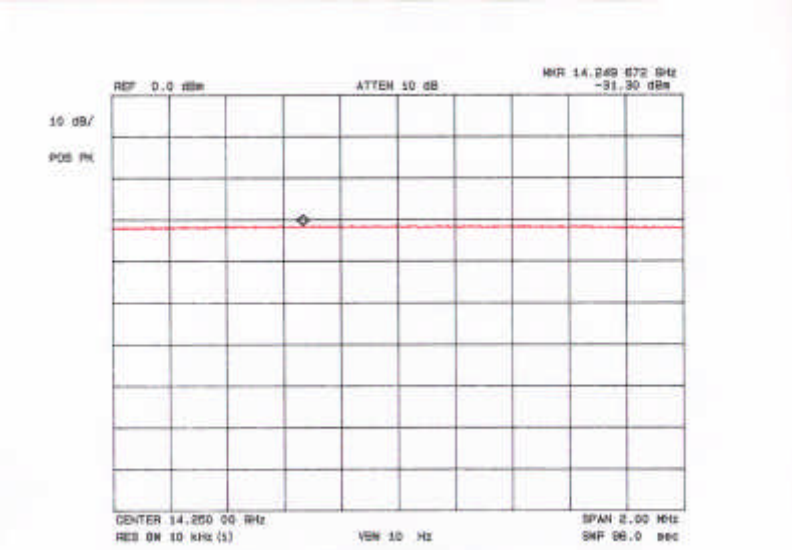
Middle Channel – 14.25GHz - Power Density in 4kHz at 128kBaud modulation



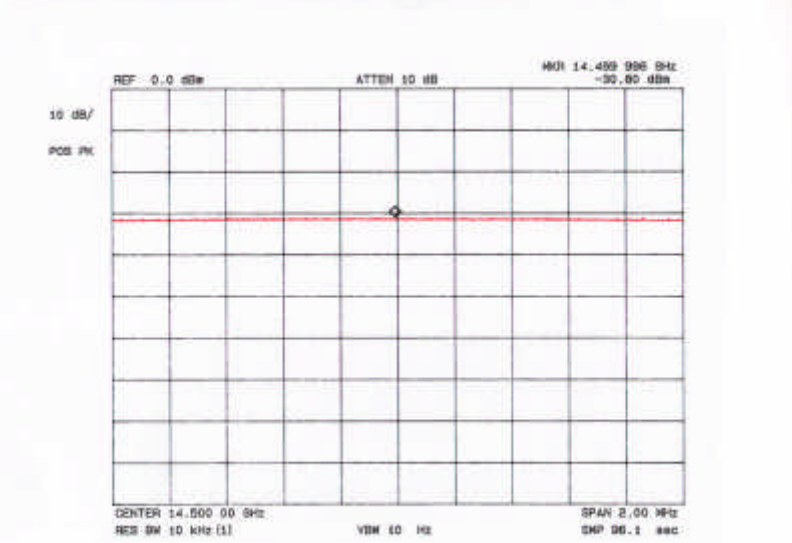
High Channel – 14.5GHz - Power Density in 4kHz at 128kBaud modulation



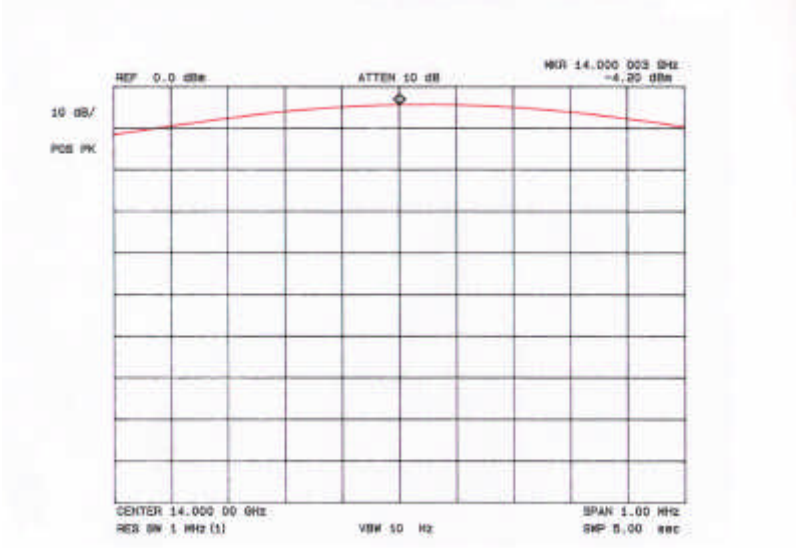
Low Channel – 14.0GHz - Power Density in 4kHz at 6MBaud modulation



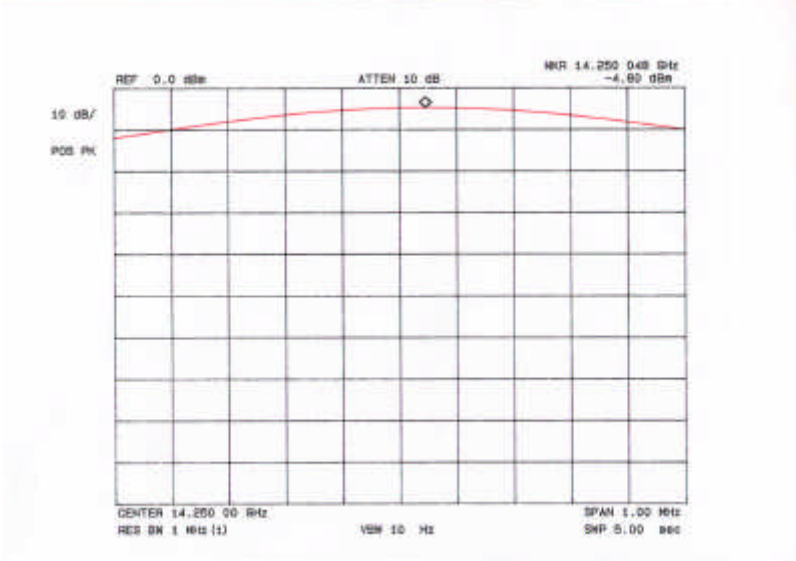
Middle Channel – 14.25GHz – Power Density in 4kHz at 6MBaud modulation



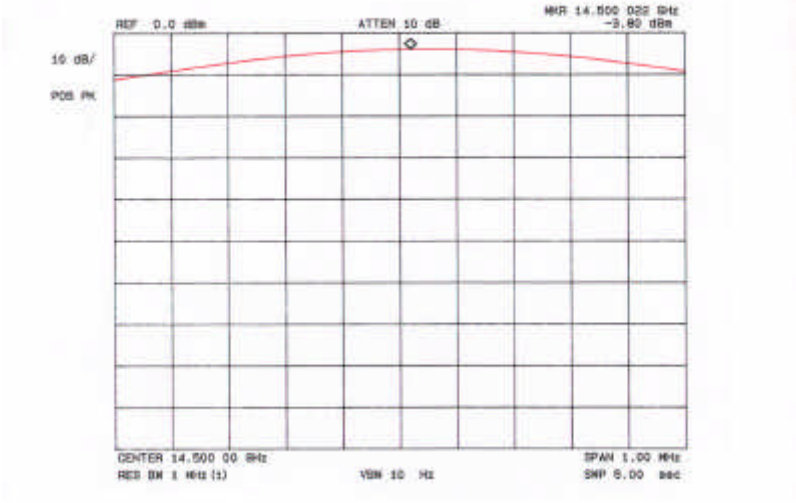
High Channel – 14.50GHz – Power Density in 4kHz at 6MBaud modulation



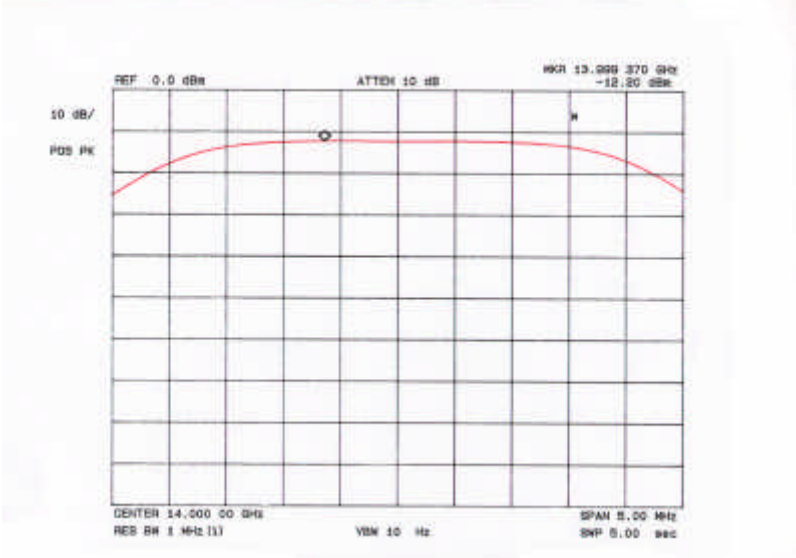
Low Channel – 14.0GHz – Power Density in 1MHz at 128kBaud modulation



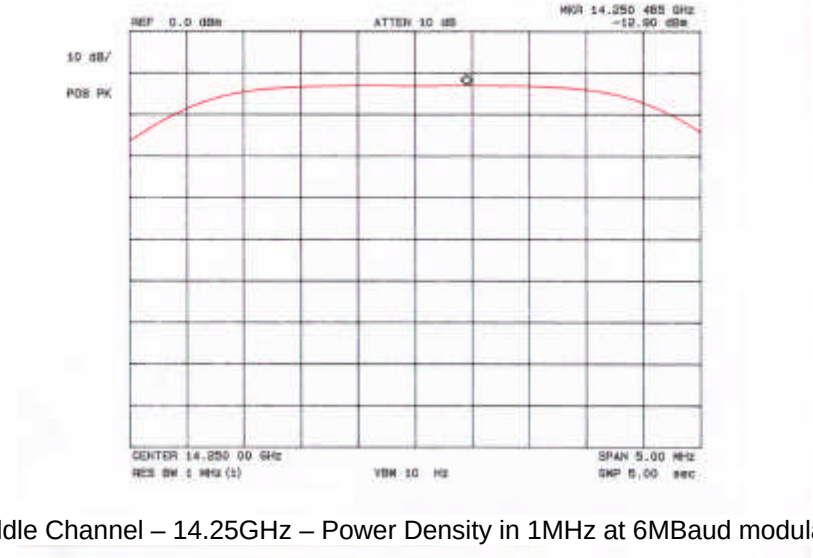
Middle Channel – 14.25GHz – Power Density in 1MHz at 128kBaud modulation



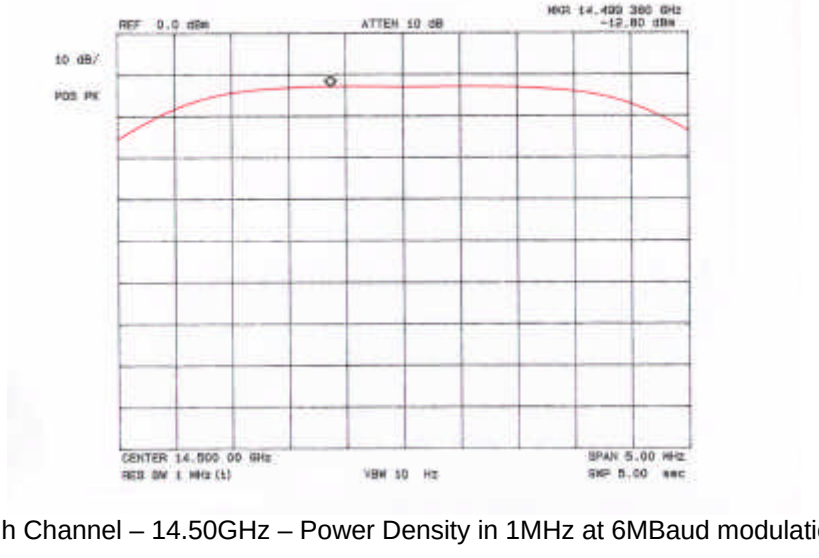
High Channel – 14.5GHz – Power Density in 1MHz at 128kMbaud modulation



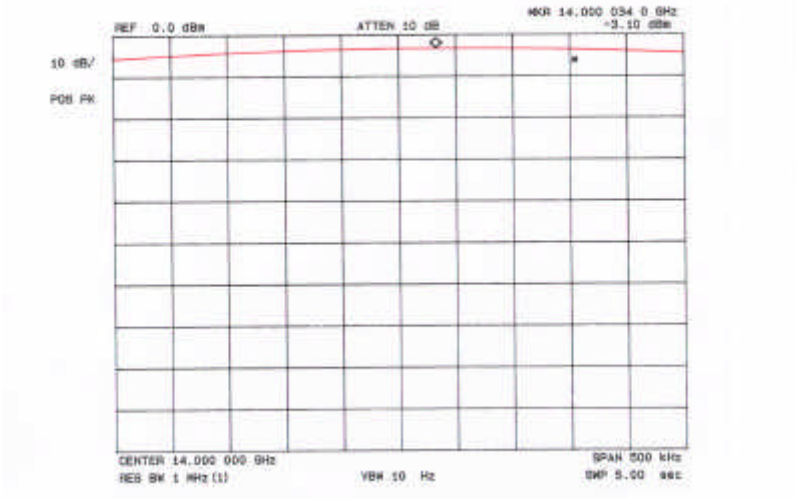
Low Channel – 14.0GHz – Power Density in 1MHz at 6MBaud modulation



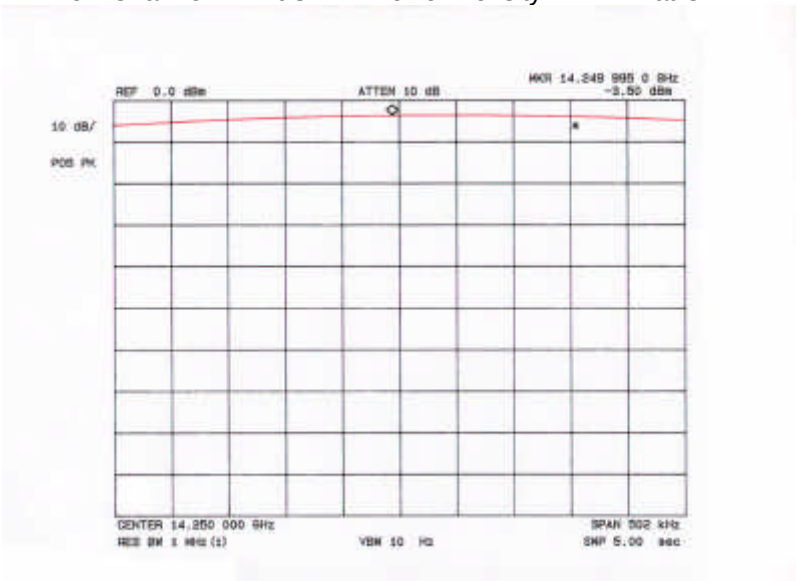
Middle Channel – 14.25GHz – Power Density in 1MHz at 6MBaud modulation



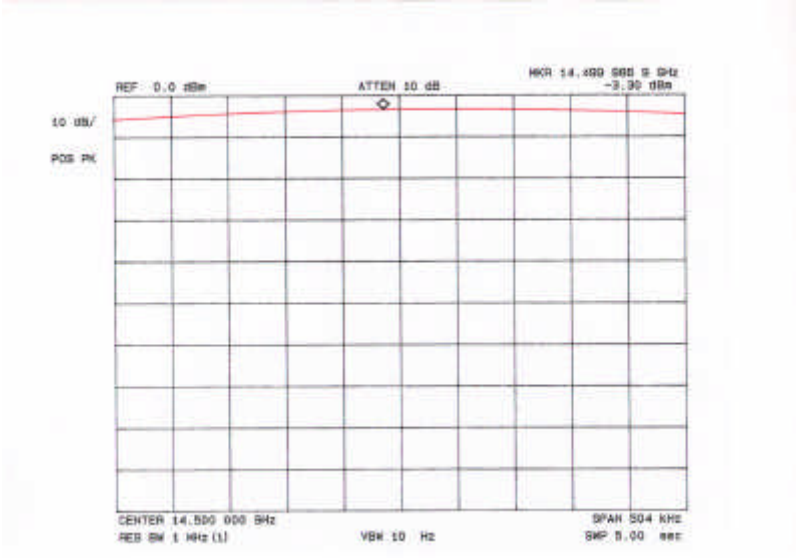
High Channel – 14.50GHz – Power Density in 1MHz at 6MBaud modulation



Low Channel – 14.0GHz – Power Density in 1MHz at C.W.



Middle Channel – 14.250GHz – Power Density in 1MHz at C.W.



High Channel – 14.50GHz – Power Density in 1MHz at C.W.

Part 4 - RF Exposure Requirements – 1.1310 & 2.1091

DATE: January 31, 2006

TEST STANDARD: FCC 47CFR, Part 1.1310; part 2.1091

1.1310 Radiofrequency radiation exposure limits. The criteria listed in table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in § 1.1307(b),

Limits for Maximum Permissisible Exposure (MPE)

Frequency Range	Electric Field Strength	Magnetic Field Strength	Power Density	Average Time
(MHz)	(V/m)	(A/M)	(mW/cm^2)	(Minutes)
(A) Limits for Occupational/Controlled Exposures				
1500 –100,000	…	….	5	6
(B) Limits for General Population/Uncontrolled Exposure				
1500-100,000	…	…	1.0	30

f = frequency in MHz

NOTE 1 TO TABLE: 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: General population/uncontrolled exposures apply in situations in which the general public may be ex-posed, 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.

METHOD OF MEASUREMENT:

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

(1) calculations that estimate the minimum separation distance (20 cm or more) between an antenna and persons required to satisfy power density limits (defined for free-space)
(2) antenna installation and device operating instructions for installers (professional and/or unskilled users), and the parties responsible for ensuring compliance with the RF exposure requirements,
(3) any caution statements and/or warning labels that are necessary in order for a device to comply with the exposure limits
(4) any other RF exposure related issues that may affect MPE compliance.

Calculation Method of RF Safety Distance:

OET Bulletin 65 Page 29 Equation 18:

$S = PG/4ÐR^2$ Which is equivalent to: $R = (PG/4ÐS)$

Where:
P = Power input to the Antenna in mW
S = Power Density in mW/cm^2
G = numeric gain of antenna relative to isotropic radiator
R = distance to center of radiation in cm

DEVICE DESCRIPTIONS: As described in **Section 1 - Equipment Under Test**
Aperature Antenna size: 1meter

CABLE DESCRIPTIONS: cables as specified in **Section 1 - Cabling**

MODIFICATIONS: No modifications have been made to the EUT.

MEASUREMENT DATA:

Frequency	Measured Peak Conducted Transmit Power at Antenna Teminal (C.W 1MHz BW)	Peak Power (P) $10^{4.05}$	Maximim Antenna Gain	Gain (G) $10^{4.21}$	Recommended Minimum Safe Distance in Beam path Uncontrolled S=1.0mW/cm^2	Recommended Minimum Safe Distance in Beam Path Controlled S=5.0mW/cm^2
(GHz)	(dBm)	(mW)	(dBi)	(Gi)	(meters)	(meters)
14.00-14.50	40.5	11220	42.1	16218	38.05	17.02

Notes:
1) RF Exposure Distance Limits

R = (PG/4ÐS)

Referring to the notes in the OET Bulletin 65 section for Aperature Antennas, the above Safe Distance is only applicable to Human Exposure in the Beam Path. For the Off-Axis calculations, refer to the notes on Page 30, paragraph 2. The Aperature Antenna used for this product has a diameter of 1meter.

At 3m – Beam Power S = (PG/4ÐR^2)
P = 11220
G = 16218
R = 300
S = 160.89 mW/cm^2 = 22.1dBm/cm^2

At 3m – Off-Axis Power S = (PG/4ÐR^2) – 20dB
S = 2.1dBm/cm^2 = 1.049mW/cm^2

At 2m – Beam Power S = (PG/4ÐR^2)
P = 11220
G = 16218
R = 170
S = 501.05 mW/cm^2 = 27.0dBm/cm^2

At 2m – Off-Axis Power S = (PG/4ÐR^2) – 20dB
S = 7.0dBm/cm^2 = 5.0mW/cm^2

Recommended Minimum Safe Distance Off-axis Uncontrolled S=1.0mW/cm^2	Recommended Minimum Safe Distance Off-axis Controlled S=5.0mW/cm^2
(meters)	(meters)
3.0	1.7

Part 5 - Field Strength of Spurious Radiation Measurements – 2.1053 and 25.202(f)

DATE:	March 13, 2006
TEST STANDARD:	FCC 2.1053, 25.202(f)
TEST VOLTAGE:	120Vac, 60Hz
TEST SETUP:	As required by §2.1053, field strength of spurious radiation measurements were made in accordance with the general procedures of TIA/EIA-603-A using the Substitution Method. The final measurements were made on a 3meter open area test site for Frequencies up to 1GHz. The remaining measurements above 1GHz were made at 1meter using Microwave Mixers and the appropriate antennas. Any measurement made at 1meter would then be converted to it's equivalent at 3meters. For this measurement, the EUT was set to broadcast in C.W., 126kBaud and 6MBaud modes of operation to ensure compliance.
MINIMUM STANDARD:	25.202(f)(3) *Emission limitations.* The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule: (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) (43 + 10log(P)) of the transmitter power in watts
MODIFICATIONS:	No modifications were required for the device to pass the test.
EMISSIONS DATA:	Nothing was detectable when the unit was tested in all 3 frequencies, in all modes of operation in both Vertical and Horizontal modes.
PERFORMANCE:	Complies with standard.

Part 6 - Occupied Bandwidth and Emission Limitation – 2.1049 and 25.202(f)

DATE: February 14, 2006

TEST STANDARD: FCC 47CFR, Part 2.1049 and 25.202(f)

TEST VOLTAGE: 120Vac, 60Hz

TEST SETUP: The EUT was connected from the Antenna Terminal directly to the Spectrum Analyzer, using appropriate adapters, cables and attenuators, and the signal frequency and the Average level was measured. The EUT was set to transmit at peak power level as well as using a Low and High levels of Data rates. This measurement was performed at the Transmitters lowest, middle and highest frequencies.

Since the spectrum analyzer has no capacity of measurement in 4kHz RBW, 100kHz RBW was employed for measurement as the worst case. If the signal emissions were found to exceed the FCC limit in 4kHz, a calculated RBW correction would be applied:

$$PD(4kHz) = PD(100kHz) + 10Log\ (4kHz/100kHz)$$

MINIMUM STANDARD: 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:

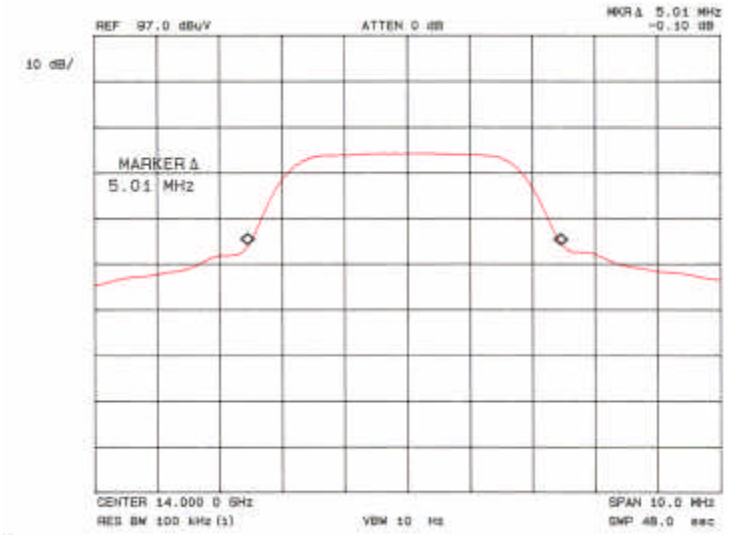
(1) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: 25 dB
(2) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 100 percent up 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) (43 + 10log(P)) 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.

CABLING DETAILS: The EUT was set up using the manufacturer's specified normal cabling configuration.

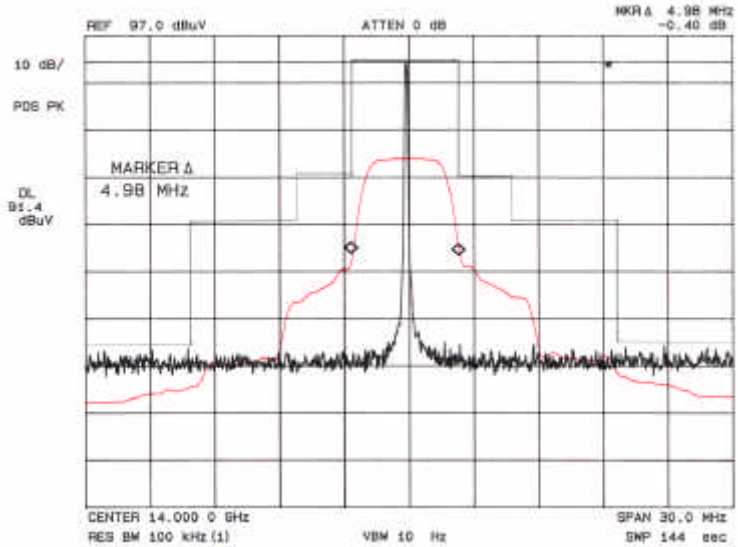
MODIFICATIONS: No modifications were required for the device to pass the test.

EMISSIONS DATA: See the following pages for the Plots.

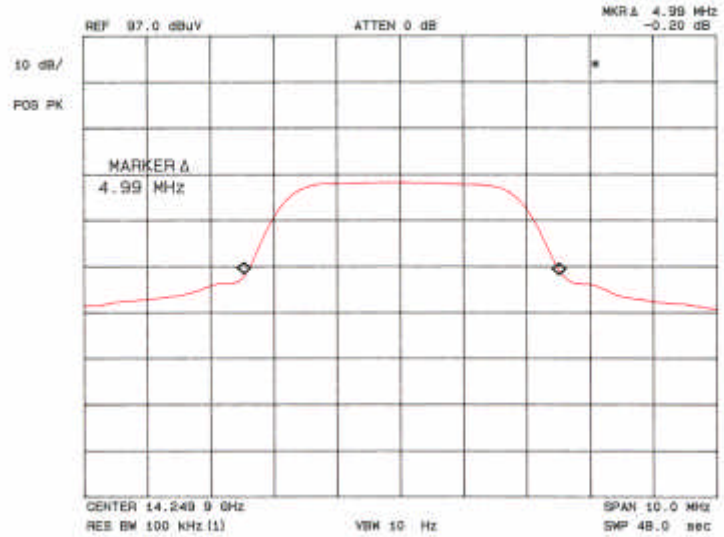
PERFORMANCE: Complies with standard.



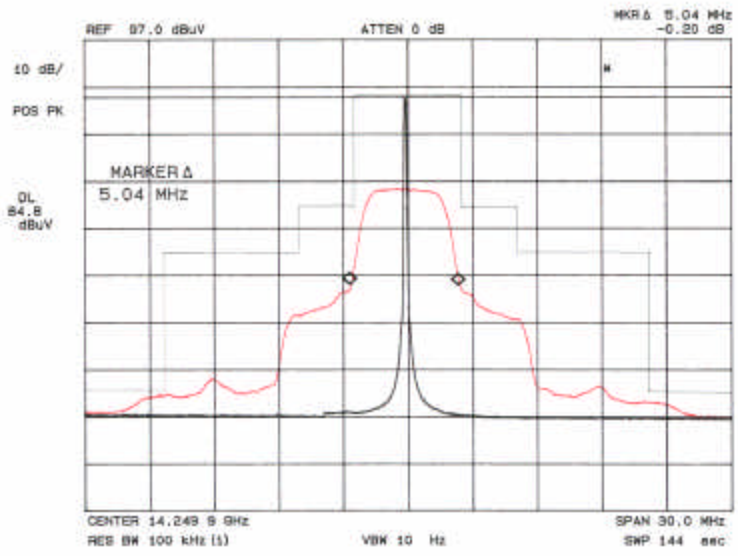
Occupied Bandwidth - Lowest Channel 6Mbaud



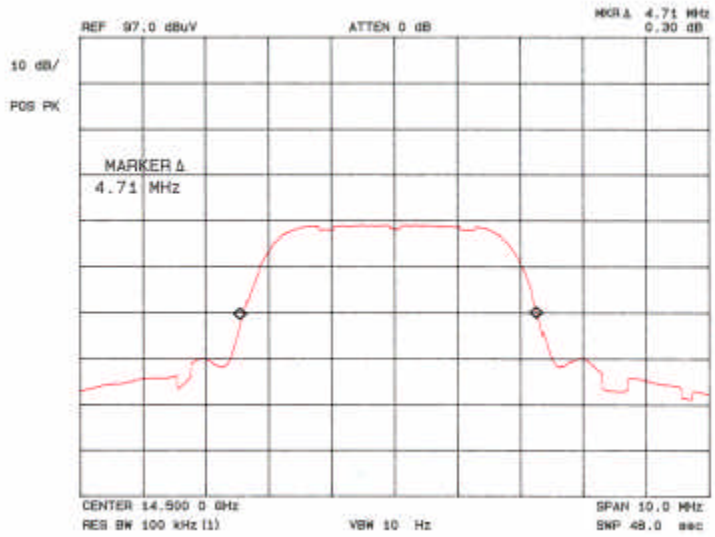
Emission Mask - Lowest Channel 6MBaud



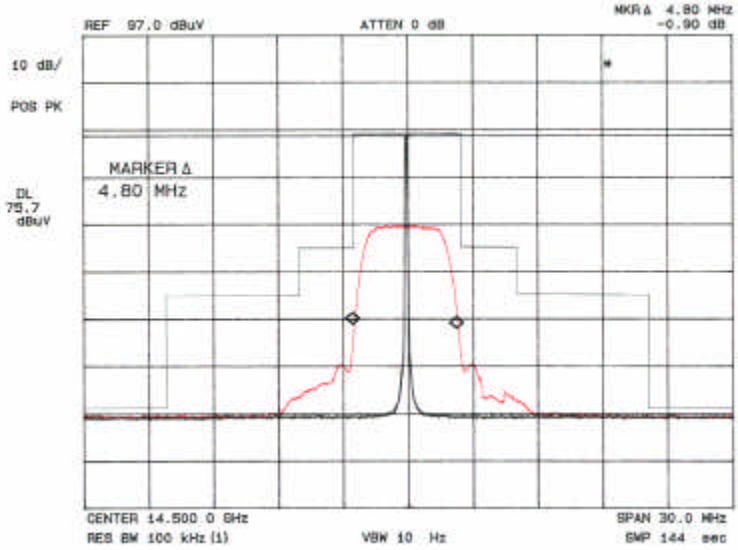
Occupied Bandwidth - Middle Channel 6Mbaud



Emission Mask - Middle Channel 6MBaud



Occupied Bandwidth - Highest Channel 6MBaud



Emission Mask - Highest Channel 6MBaud

Part 7 - Spurious Emissions at Antenna Terminals – 2.1051 and 25.202(f)

DATE:	March 14, 2006
TEST STANDARD:	FCC CFR47, Part 2.1051; 25.202(f)
TEST VOLTAGE:	120Vac, 60Hz
TEST SETUP:	The EUT was connected from the Antenna Terminal directly to the Spectrum Analyzer, using appropriate adapters, cables and attenuators, and the signal frequency and the Average level was measured. The EUT was set to transmit at peak power level as well as using a Low and High levels of Data rates. This measurement was performed at the Transmitters lowest, middle and highest frequencies. Since the spectrum analyzer has no capacity of measurement in 4kHz RBW, 100kHz RBW was employed for measurement as the worst case. If the signal emissions were found to exceed the FCC limit in 4kHz, a calculated RBW correction would be applied: PD(4kHz) = PD(100kHz) + 10Log (4kHz/100kHz)
MINIMUM STANDARD:	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: (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) (43 + 10log(P)) of the transmitter power in watts
CABLING DETAILS:	The EUT was set up using the manufacturer's specified normal cabling configuration.
MODIFICATIONS:	No modifications were required for the device to pass the test.
EMISSIONS DATA:	Nothing was detectable when the unit was tested in all 3 frequencies, in 128kBaud and 6Mbaud modes of operation 0 to 75GHz.
PERFORMANCE:	Complies with standard.

Part 8 - Frequency Tolerance for Earth Stations – Part 2.1055 and 25.202(d)

DATE:	March 18, 2006
TEST STANDARD:	FCC 47CFR, Part 2.1055; 25.202(d)
TEST VOLTAGE:	120Vac, 60Hz
STANDARD:	§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.
TEST SETUP:	As required by §2.1055 of CFR 47, stability measurements were made at the antenna output terminal using a 50 Ohm attenuator and spectrum analyzer set for a 10Hz resolution bandwidth. This test was performed uing a CW signal and measured using a RBW=10Hz For the Temperature Stability part of the test, the measurements were taken over the temperature range of –30 to +50 deg. Celsius, in 10 deg. 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 EUT has a built-in heater and software that prevents the Transmitter from starting until the electronics have been warmed up to 0 degrees Celcius. This is normally a period of about 3.5 minutes. 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.
CABLING DETAILS:	The EUT was set up using the manufacturer's specified normal cabling configuration.
MODIFICATIONS:	No modifications were required for the device to pass the test.
EMISSIONS DATA:	See the following pages for the data.
PERFORMANCE:	Complies with standard.

Frequency Stability over Temperature Range (Minimum/Maximum over a 10minute period)

Temperature (°C)	Low Frequency 14000 MHz	Middle Frequency 14250 MHz	High Frequency 14500 MHz
+50	14000.005679/14000.006233	14250.006600/14250.006958	14500.006331/14500.006921
+40	14000.005225/14000.005683	14250.005448/14250.006056	14500.006192/14500.006479
+30	14000.005107/14000.005478	14250.006003/14250.006198	14500.006375/14500.006478
+20	14000.005006/14000.005448	14250.006280/14250.006390	14500.006257/14500.006365
+10	14000.005172/14000.005340	14250.006116/14250.006291	14500.006382/14500.006553
0	14000.005227/14000.005468	14250.005851/14250.006037	14500.006314/14500.006491
-10	14000.005601/14000.006103	14250.005900/14250.006215	14500.006159/14500.006417
-20	14000.007526/14000.007834	14250.007310/14250.007766	14500.007622/14500.008095
-30	14000.006172/14000.006516	14250.006952/14250.007461	14500.007364/14500.007844
Limit (0.001%)	13999.860 – 14000.140	14249.8575 – 14250.1425	14499.855 – 14500.145

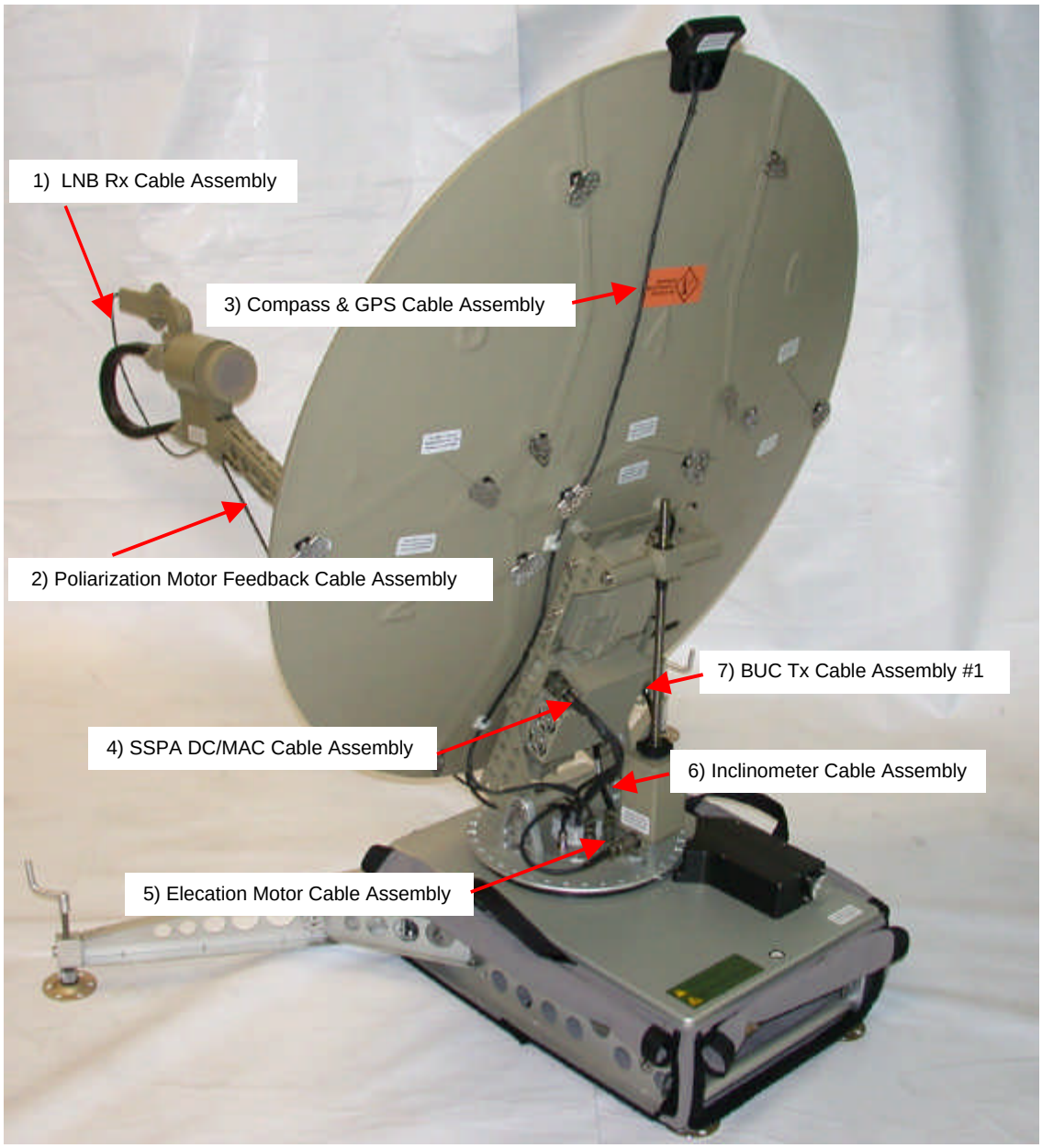
Nominal Voltage: 110.0Vac 60Hz

Frequency Stability over Voltage Range.

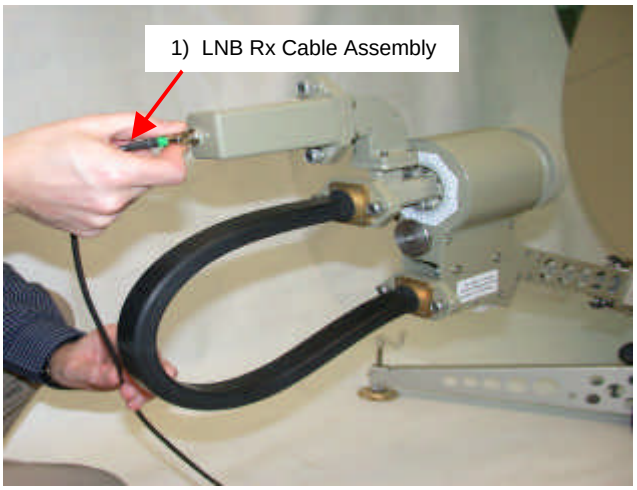
Voltage (Vac)	Low Frequency 14000 MHz	Middle Frequency 14250 MHz	High Frequency 14500 MHz
126.5	14000.005614	14250.005982	14500.006195
115.5	14000.005648	14250.005997	14500.006200
110.0	14000.005628	14250.005937	14500.006221
104.5	14000.005703	14250.005902	14500.006210
93.5	14000.005765	14250.005892	14500.006175
Limit (0.001%)	13999.860 – 14000.140	14249.8575 – 14250.1425	14499.855 – 14500.145

Performed at: +20°C
Nominal Voltage: 110.0Vac 60Hz

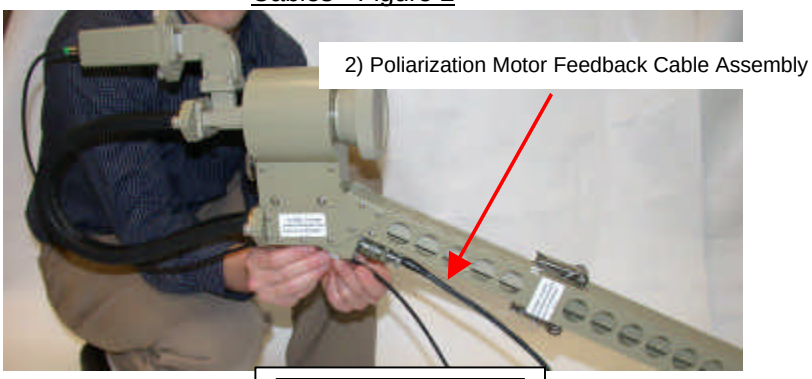
Appendix A: EUT Photos



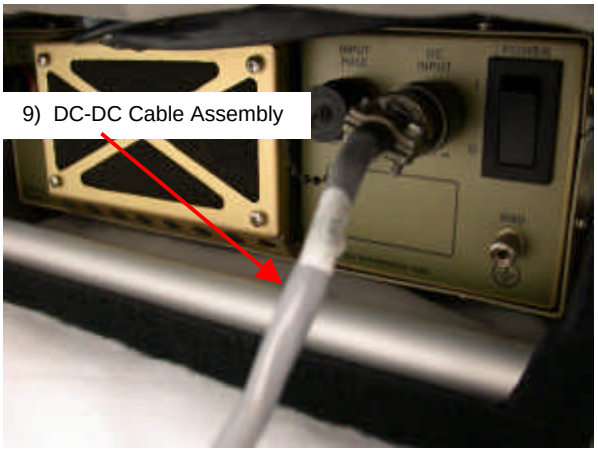
Cables - Figure 1



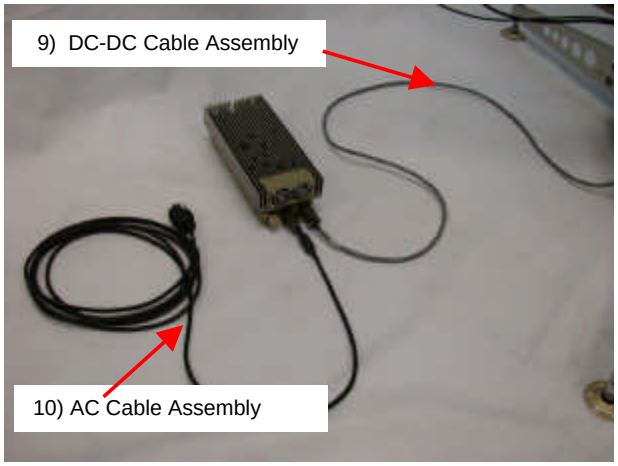
Cables - Figure 2



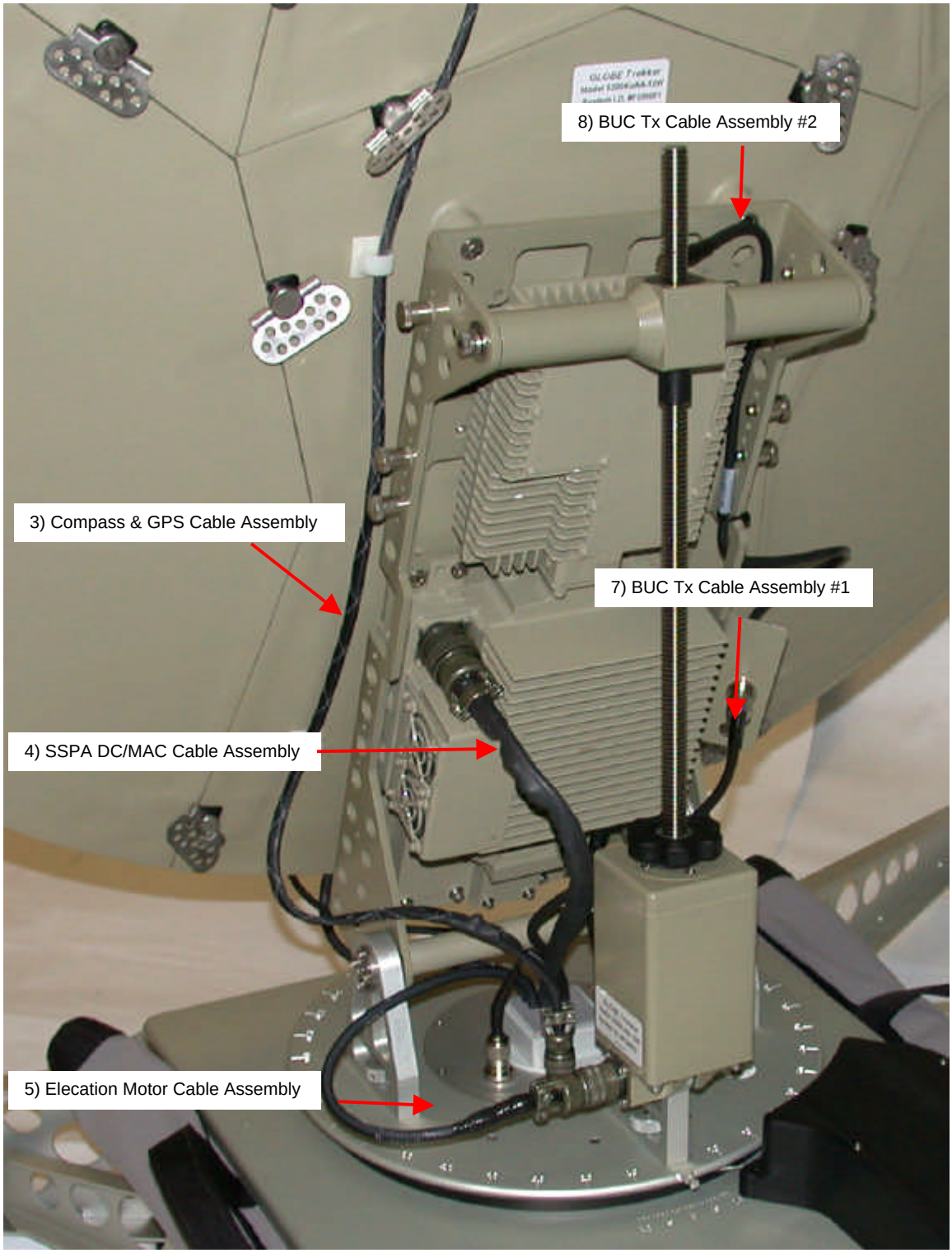
Cables – Figure 3



Cables – Figure 4



Cables – Figure 5



Cables - Figure 6

Appendix B: Measurement Data & Conducted Emission Plots

Criteria: FCC/CE Class B - Radiated Emission Test Performed at 3-m.

Transmission Mode,

Table 1: Line 1- Peaks 120Vac, 60Hz

Frequency (MHz)	Peak (dBµV)	DelLim-Pk (dB)
9.977	53.0	3.0
10.190	53.0	3.0
10.080	52.6	2.6
9.872	52.3	2.3
9.665	52.1	2.1
10.460	52.1	2.1
Average		
0.1864	49.7	-4.4
10.190	43.4	-6.6
9.716	43.0	-7.0
10.35	42.1	-7.9
9.412	41.7	-8.3

Table 2: Line 2- Peaks 120Vac, 60Hz

Frequency (MHz)	Peakt (dBµV)	DelLim-Pk (dB)
10.35	54.9	4.9
10.14	54.4	4.4
10.24	54.4	4.4
9.977	54.3	4.3
11.15	54.1	4.1
9.462	52.1	2.1
Average		
0.1864	50.1	-4.0
10.08	45.9	-4.1
10.35	45.9	-4.1
11.09	44.9	-5.1
9.614	44.6	-5.4

Receive Mode,

Table 3: Line 1- Peaks 120Vac, 60Hz

Frequency (MHz)	Peak (dBµV)	DelLim-Pk (dB)
9.924	51.2	1.2
10.24	51.2	1.2
9.513	50.4	0.4
9.412	49.6	-0.4
9.313	48.9	-1.1
9.215	48.6	-1.4
Average		
10.24	44.0	-6.0
9.924	43.9	-6.1
10.03	43.8	-6.2
10.41	43.5	-6.5
9.768	43.2	-6.8

Table 4: Line 2- Peaks 120Vac, 60Hz

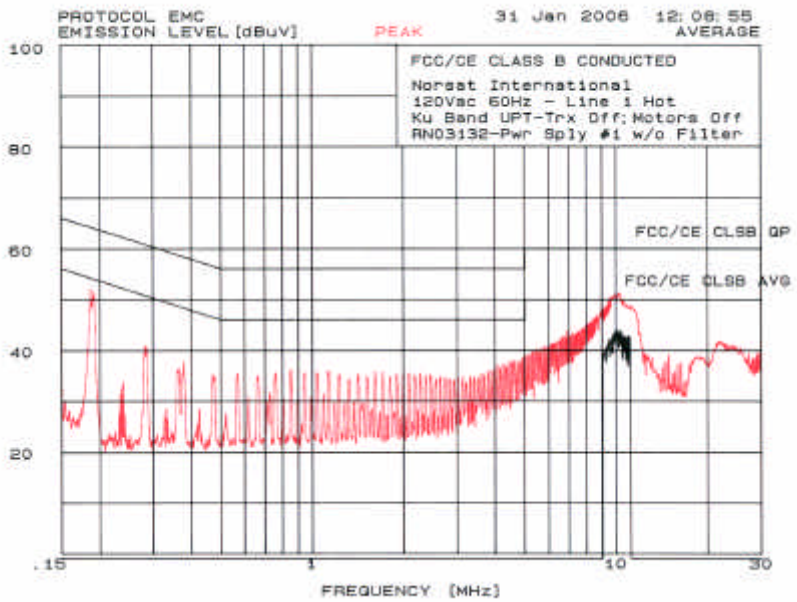
Frequency (MHz)	Peakt (dBµV)	DelLim-Pk (dB)
10.19	53.0	3.0
10.3	52.6	2.6
10.46	52.3	2.3
10.92	52.1	2.1
11.03	52.0	2.0
9.264	50.2	0.2
Average		
11.15	45.8	-4.2
10.19	45.6	-4.4
10.92	45.6	-4.4
10.63	45.4	-4.6
10.35	45.3	-4.7

Radiated Emissions – Receive Mode

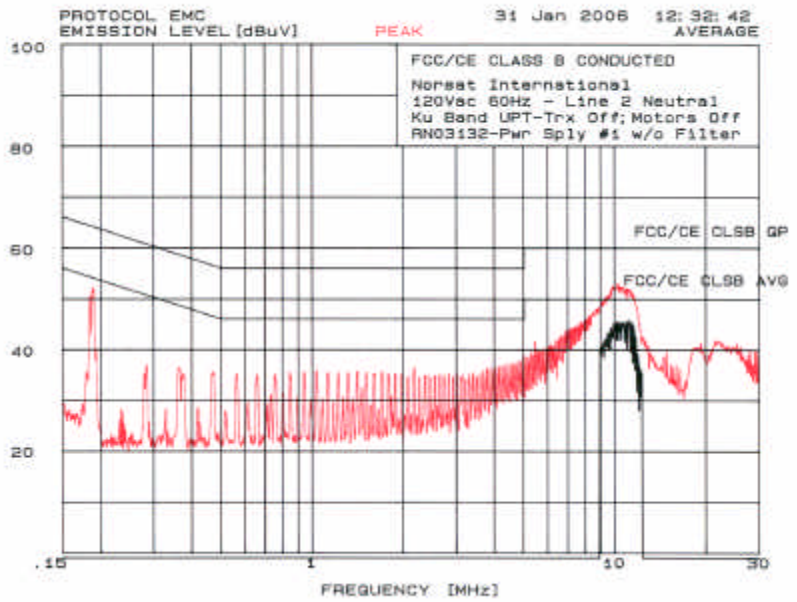
Table 5: FCC Emissions Class A 3-m

Frequency	Pol	Hgt	Angle	Uncor-Pk	Tot Corr	Peak	QP Lmt	DelLim-Pk	QP	DelLim-QP
(MHz)		(m)	(deg)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(dBµV/m)	(dB)
58.98056	Vert	1.0	90.00	26.90	10.75	37.65	49.53	-11.88	37.14	-12.39
65.04310	Vert	1.0	90.00	28.60	10.72	39.32	49.53	-10.21	37.34	-12.19
80.82443	Vert	1.0	180.00	31.50	11.20	42.70	49.53	-6.83	36.27	-13.26
101.33896	Vert	1.0	180.00	25.60	12.47	38.07	54.00	-15.93	35.91	-18.09
114.25356	Vert	1.0	360.00	22.70	13.14	35.84	54.00	-18.16	31.55	-22.45
224.81102	Vert	1.0	120.00	15.20	19.11	34.31	56.90	-22.59		
336.03638	Vert	1.0	360.00	21.50	17.02	38.52	56.90	-18.38		
624.00193	Vert	1.0	90.00	18.70	22.16	40.86	56.90	-16.04		

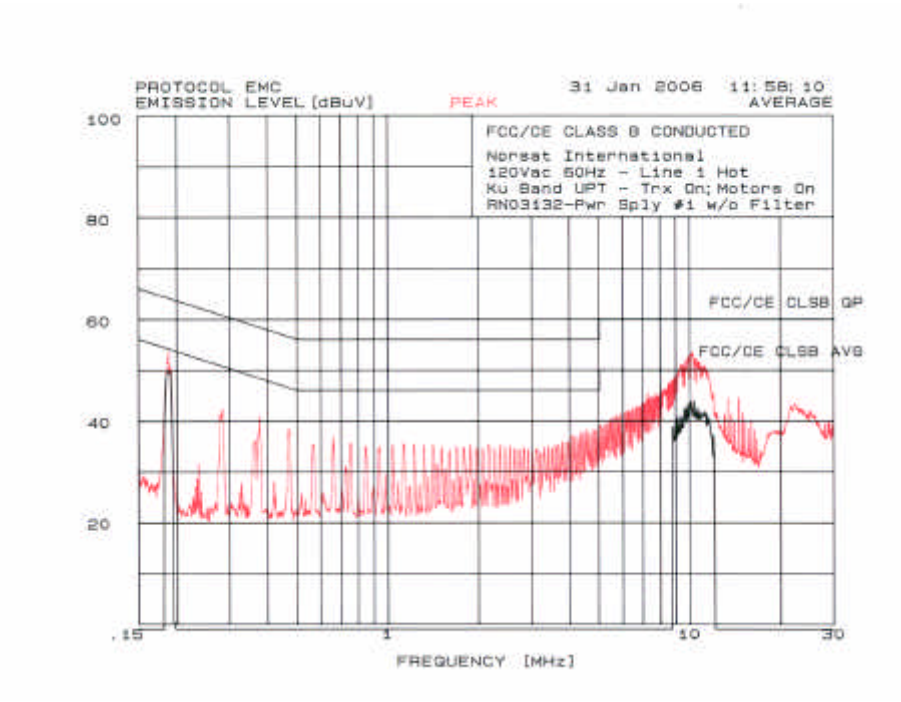
Conducted Emissions Plots



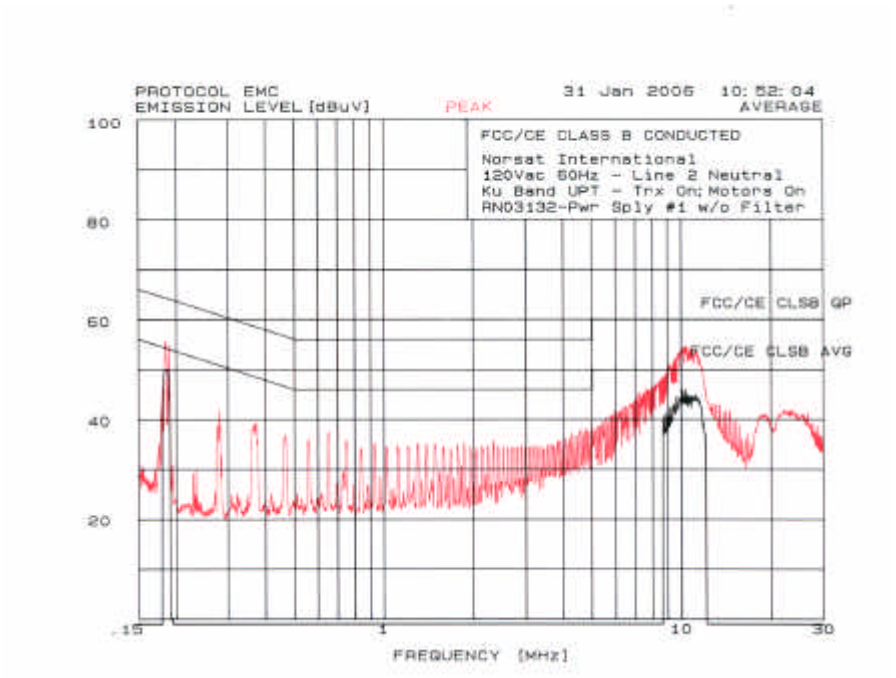
Line 1 – 120Vac, 60Hz Hot Motors Off



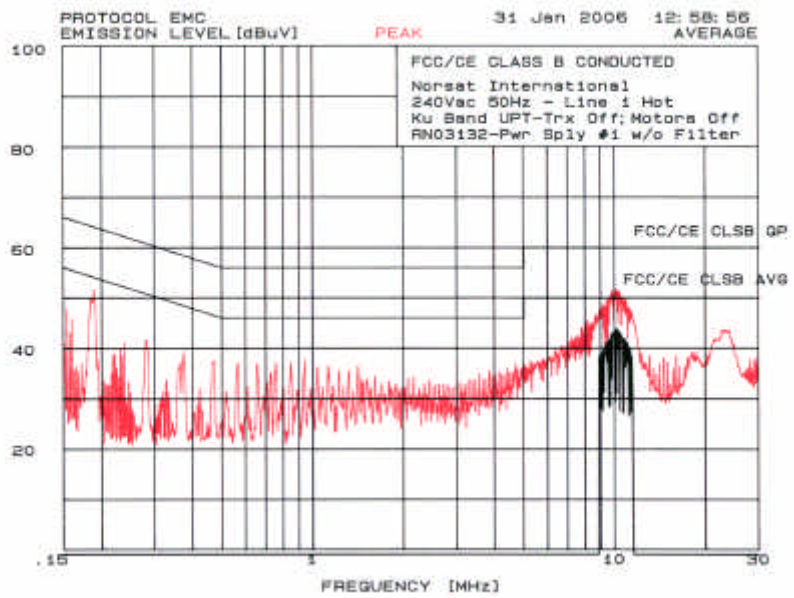
Line 2 – 120Vac, 60Hz Neutral Motors Off



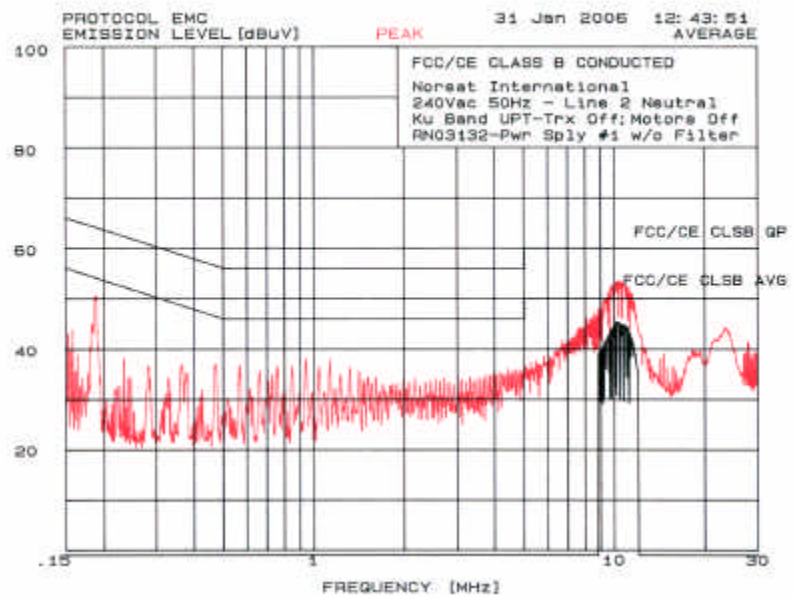
Line 1 – 120Vac, 60Hz Hot Motors On



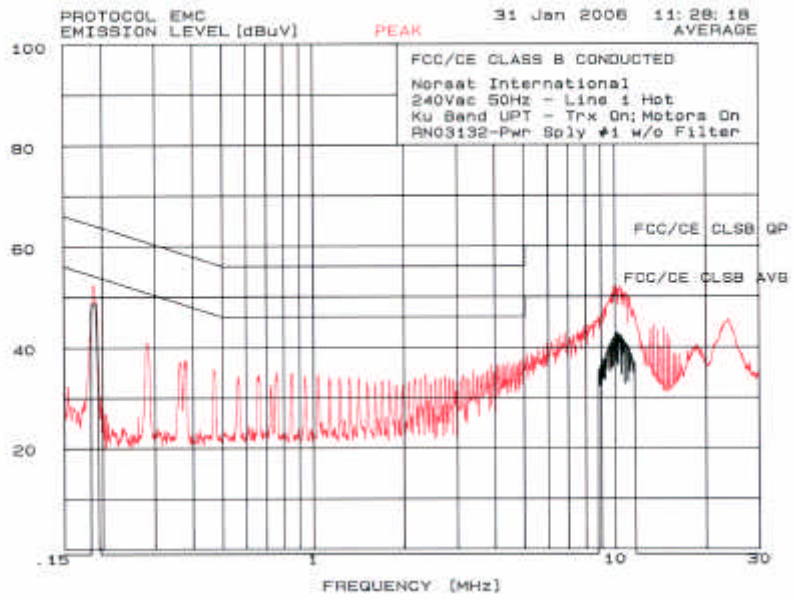
Line 2 – 120Vac, 60Hz Neutral Motors On



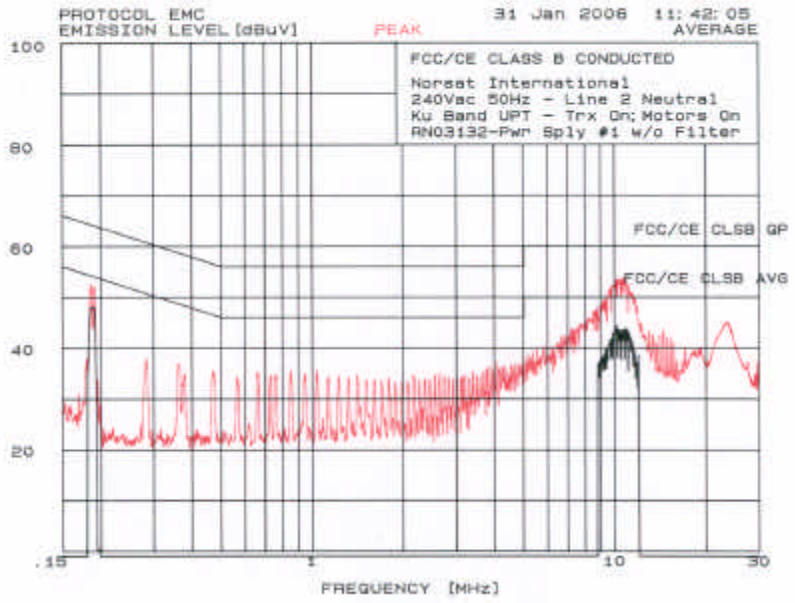
Line 1 – 240Vac, 50Hz Hot Motors Off



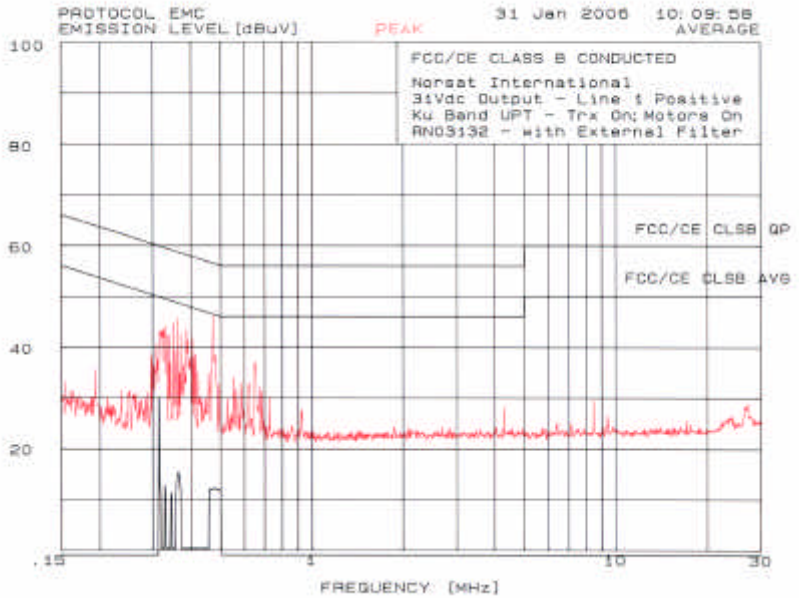
Line 2 – 240Vac, 50Hz Neutral Motors Off



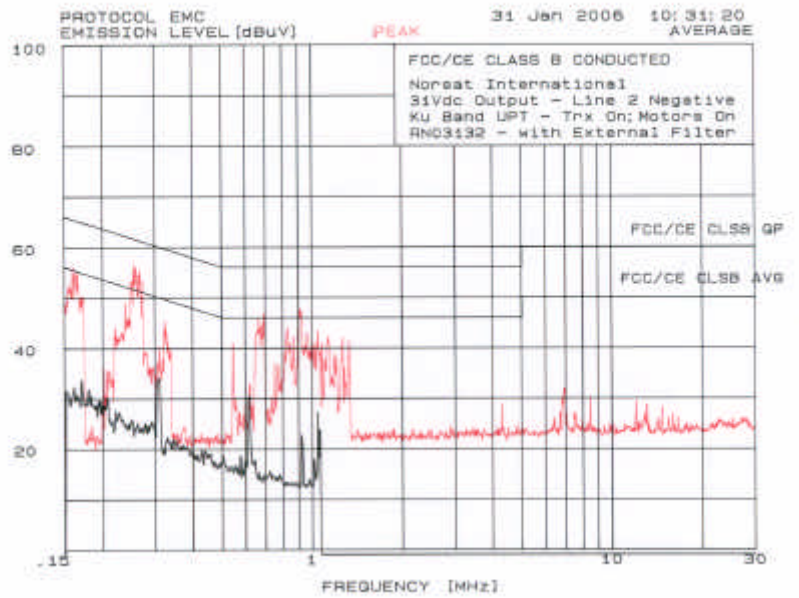
Line 1- 240Vac, 50Hz Hot Motors On



Line 2 – 240 Vac, 50Hz Neutral Motors On



Line 1 - 31Vdc Positve Motors On



Line 2 - 31Vdc, Negative Motors On