



Electronic Filing

December 24, 2003

FEDERAL COMMUNICATIONS COMMISSION
Experimental Radio Service
P.O. Box 358320
Pittsburgh, PA 15251-5320

Dear Sir or Madam:

This letter and its attachments are to request an Experimental Authorization to operate transmitters in certain selected bands between 11.7 GHz to 12.2 GHz, and 14.0 to 14.5 at locations in the continental United States as described below. In accordance with 47 CFR chapter 1, (10-1-00 edition), section 5.61, the attached Exhibit A – System Description is being provided to support the application. EMS has filed for an experimental authorization online, FCC Form 442, to allow them to perform test and demonstrations over the next two years.

EMS Technologies has developed a DVB-RCS platform and is using it for satellite 2-way broadband access demonstrations to customers. In order to provide comprehensive service demonstrations EMS would like to provide the service using 1.8 meter VSAT terminals located throughout CONUS. The time frame for this Experimental Authorization request is for, approximately a January 2003 start time running through January 2006. EMS Technologies has filed an STA request concurrent with this Experimental Authorization request. Comsearch, on behalf of EMS Technologies, respectfully requests the FCC to expedite the approval of this Experimental Authorization request. If you have any questions please call.

Also included in this document are Exhibit B – Earth Station Site and Coordination Data, Exhibit C – Radiation Hazard Analysis, and Exhibit D – Equipment Data Sheets.

Sincerely,
COMSEARCH

Kenneth G. Ryan
Director, Spectrum Management Services
(703) 726-5685
kryan@comsearch.com

Exhibit A– System Description

A.1 - Name, address, phone number of the applicant.

EMS Technologies
21025 Trans Canada Highway
Ste-Anne-De-Bellevue, Quebec
Canada, H9X 3R2

Contact:

John Gregus
Manager, Customer Service
EMS Satnet
21025 Trans Canada Highway
Ste. Anne De Bellevue, QC
H9X - 3R2, Canada

Tel: (514) 457 - 2150 Ext.3713
Cell: (514) 770 - 2150
e-mail: gregus.j@ems-t.ca

A.2 - Description of why an Experimental Authorization (EXP) is needed.

EMS Technologies has developed a DVB-RCS platform and is providing demonstrations using a satellite earth station hub Montreal, Canada, into remote terminal sites located at potential customer sites within the continental United States. EMS would like to deploy up to ten identical terminals which would be used, for a limited time, for a satellite 2-way broadband access demonstration to customers.

The reason for the EXP request is to perform outdoor demonstrations between the hub location in Montreal, Canada and selected CONUS terminals. It is anticipated that these demonstrations will required an EXP for at least two (2) years time frame.

A.3 Description of the operation to be conducted and its purpose

EMS will perform real-time satellite link testing of their DVB equipment using a hub earth station located in Montreal, Canada and up to ten US based transmit-receive VSATs, located at various locations in CONUS. EMS will be communicating with Loral Skynet's satellite Telstar T12 at 15 degrees W longitude. It is anticipated that communication with the following satellites may be necessary:

- Loral Skynet Telstar T5 at 97 degrees W longitude
- Loral Skynet Telstar T6 at 93 degrees W longitude
- Loral Skynet Telstar T14 (Estrela Dosul) at 63 degrees W longitude

EMS would like to be able to point to any FSS-GSO satellite within the orbital arc of 15 to 123 degrees west longitude.

The points of contact for each transmitting site are as follows:

John Gregus
Manager Customer Service
EMS Technologies Canada Ltd.
Tel: (514) 457 - 2150 Ext.3713
Cell: (514) 770 - 2150
e-mail: gregus.j@ems-t.ca

A.4 Time and dates of proposed operation.

There will be demonstration sessions, from the remote CONUS locations. It is anticipated that tests will be run during business hours and on weekends during daylight, beginning around January 5, 2003, and extending for a period of approximately 24 months. This EXP request considers a three month window, a Special Temporary Authorization request has been filed simultaneously with this filing, for grant of the Experimental Authorization.

A.5 Class of station

The transmitters, at all CONUS locations, will be identical and will be fixed all of the time.

A.6 Description of the location and, if applicable, geographic coordinates of the proposed operation.

All transmitting signals will originate from Ku-band VSAT terminals located on rooftops or at secure ground locations within the continental United States.

A.7 Equipment to be used, including name of manufacturer, model and number of units.

The VSATs will use a Channel Master 1.8 meter antenna, model # 180 TX, and 4 watt RFT transmitting at 3.6 watts. The 1.8 meter antenna gain is 46.8 dBi at 14.25 GHz, the

maximum EIRP out of any transmitting locations is 52.3 dBW. All remote sites will have the same VSAT configurations.

A.8 Frequencies Desired

The tests will be performed in the US domestic FSS Ku-band. Transmissions will be between 14,000 and 14,500 MHz and reception will be between 11,700 and 12,200 MHz.

A.9 Maximum effective radiated power (ERP) or equivalent isotropically radiated power (EIRP)

The transmit earth stations are Channel Master 1.8 meter earth stations (Model 180 TX), with a gain of 46.8 dBi (at 14.25 GHz). The high powered amplifier is rated for 4 watts maximum. The maximum total EIRP at the feed flange of the earth stations will be 52.3 dBW, or a total RF power of 3.6 Watts. The uplink RF power density is within Part 25.212 requirement of -14 dBW/4kHz. The antenna complies with the FCC 2-degree satellite spacing antenna performance requirement of Part 25.209.

A.10 Emission designator and description of emission (bandwidth, modulation, etc.)

The VSAT return link transmission is digital data at various data rates as specified in the table below. The received emission is a digital DVB signal at 7373 kbps in an allocated bandwidth of 11 MHz.

VSAT Return Link Transmission Data Rates and Bandwidths

240 ksps	in an allocated bandwidth of 360kHz
624 ksps	in an allocated bandwidth of 936kHz
1632 ksps	in an allocated bandwidth of 2448kHz
3264 ksps	in an allocated bandwidth of 4896kHz
250 ksps	in an allocated bandwidth of 375kHz
500 ksps	in an allocated bandwidth of 750kHz
1000ksps	in an allocated bandwidth of 1500kHz
2000ksps	in an allocated bandwidth of 3000kHz

A.11 Overall height of antenna structure above the ground

It is anticipated that some of the transmitters will be roof mounted no higher than 6' above roof top level.

EXHIBIT B

SATELLITE EARTH STATION FREQUENCY COORDINATION DATA 12/24/2003

Company	EMS TECHNOLOGIES		
Earth Station Name, State	CONUS, VA		
Latitude (DMS) (NAD83)	N/A		
Longitude (DMS) (NAD83)	N/A		
Ground Elevation AMSL (Ft/m)	/		
Antenna Centerline AGL (Ft/m)	6.00	/	1.83
Receive Antenna Type:	Channel Master 180 TX		
	32-25LOG(THETA)		
12.0 GHz Gain (dBi) / Diameter (m)	45.3	/	1.8
3 dB / 15 dB Half Beamwidth	0.50	/	1.00
Transmit Antenna Type:	Channel Master 180 TX		
	32-25LOG(THETA)		
14.0 GHz Gain (dBi) / Diameter (m)	46.8	/	1.8
3 dB / 15 dB Half Beamwidth	0.40	/	0.85
Operating Mode	TRANSMIT AND RECEIVE		
Modulation	DIGITAL		
Emission / Receive Band (MHz)	11M0G7D / 11700.0000 - 12200.0000		
Emission / Transmit Band (MHz)	360KG7D, 936KG7D / 14000.0000 - 14500.0000		
	2M44G7D, 4M90G7D, 375KG7D,		
	750KG7D, 1M50G7D, 3M00G7D		
Max. Available RF Power (dBW)/4 kHz)	-14.00		
(dBW)/MHz)	10.00		
Max. EIRP (dBW)/4 kHz)	32.80		
(dBW)/MHz)	56.30		
(dBW)	52.30		
Max permissible Interference Power			
12.0 GHz, 20% (dBW/1 MHz)	-156.0		
12.0 GHz, 0.0100% (dBW/1 MHz)	-146.0		
14.0 GHz, 20% (dBW/4 kHz)	-151.0		
14.0 GHz, 0.0025% (dBW/4 kHz)	-128.0		
Range of Satellite Arc (Geostationary)			
Degrees Longitude	15.0 W / 123.0 W		
Azimuth Range (Min/Max)	N/A		
Corresponding Elevation Angles	N/A (5 deg. Min)		

Exhibit C – Radiation Hazard Study

Analysis of Non-Ionizing Radiation for a 1.8-Meter Earth Station System

This report analyzes the non-ionizing radiation levels for a 1.8-meter earth station system. The analysis and calculations performed in this report comply with the methods described in the FCC Office of Engineering and Technology Bulletin, No. 65 first published in 1985 and revised in 1997 in Edition 97-01. The radiation safety limits used in the analysis are in conformance with the FCC R&O 96-326. Bulletin No. 65 and the FCC R&O specifies that there are two separate tiers of exposure limits that are dependant on the situation in which the exposure takes place and/or the status of the individuals who are subject to the exposure. The Maximum Permissible Exposure (MPE) limits for persons in a General Population/Uncontrolled environment are shown in Table 1. The General Population/Uncontrolled MPE is a function of transmit frequency and is for an exposure period of thirty minutes or less. The MPE limits for persons in an Occupational/Controlled environment are shown in Table 2. The Occupational MPE is a function of transmit frequency and is for an exposure period of six minutes or less. The purpose of the analysis described in this report is to determine the power flux density levels of the earth station in the far-field, near-field, transition region, between the subreflector or feed and main reflector surface, at the main reflector surface, and between the antenna edge and the ground and to compare these levels to the specified MPEs.

Table 1. Limits for General Population/Uncontrolled Exposure (MPE)

Frequency Range (MHz)	Power Density (mW/cm ²)
30-300	0.2
300-1500	Frequency (MHz)*(0.8/1200)
1500-100,000	1.0

Table 2. Limits for Occupational/Controlled Exposure (MPE)

Frequency Range (MHz)	Power Density (mW/cm ²)
30-300	1.0
300-1500	Frequency (MHz)*(4.0/1200)
1500-100,000	5.0

Table 3. Formulas and Parameters Used for Determining Power Flux Densities

Parameter	Symbol	Formula	Value	Units
Antenna Diameter	D	Input	1.8	m
Antenna Surface Area	A _{surface}	$\pi D^2 / 4$	2.54	m ²
Feed Flange Diameter	D _{fa}	Input	10.0	cm
Area of Feed Flange	A _{fa}	$\pi D_{fa}^2 / 4$	78.54	cm ²
Frequency	F	Input	14250	MHz
Wavelength	λ	$300 / F$	0.021053	m
Transmit Power	P	Input	3.60	W
Antenna Gain (dBi)	G _{es}	Input	46.8	dBi
Antenna Gain (factor)	G	$10^{G_{es}/10}$	47863.0	n/a
Pi	π	Constant	3.1415927	n/a
Antenna Efficiency	η	$G\lambda^2 / (\pi^2 D^2)$	0.66	n/a

Far Field Distance Calculation

The distance to the beginning of the far field can be determined from the following equation:

$$\begin{aligned} \text{Distance to the Far Field Region} \quad R_{ff} &= 0.60 D^2 / \lambda \\ &= 92.3 \text{ m} \end{aligned} \quad (1)$$

The maximum main beam power density in the far field can be determined from the following equation:

$$\begin{aligned} \text{On-Axis Power Density in the Far Field} \quad S_{ff} &= G P / (4 \pi R_{ff}^2) \\ &= 1.608 \text{ W/m}^2 \\ &= 0.161 \text{ mW/cm}^2 \end{aligned} \quad (2)$$

Near Field Calculation

Power flux density is considered to be at a maximum value throughout the entire length of the defined Near Field region. The region is contained within a cylindrical volume having the same diameter as the antenna. Past the boundary of the Near Field region, the power density from the antenna decreases linearly with respect to increasing distance.

The distance to the end of the Near Field can be determined from the following equation:

$$\begin{aligned} \text{Extent of the Near Field} \quad R_{nf} &= D^2 / (4 \lambda) \\ &= 38.5 \text{ m} \end{aligned} \quad (3)$$

The maximum power density in the Near Field can be determined from the following equation:

$$\begin{aligned} \text{Near Field Power Density} \quad S_{nf} &= 16.0 \eta P / (\pi D^2) \\ &= 3.754 \text{ W/m}^2 \\ &= 0.375 \text{ mW/cm}^2 \end{aligned} \quad (4)$$

Transition Region Calculation

The Transition region is located between the Near and Far Field regions. The power density begins to decrease linearly with increasing distance in the Transition region. While the power density decreases inversely with distance in the Transition region, the power density decreases inversely with the square of the distance in the Far Field region. The maximum power density in the Transition region will not exceed that calculated for the Near Field region. The power density calculated in Section 1 is the highest power density the antenna can produce in any of the regions away from the antenna. The power density at a distance R_t can be determined from the following equation:

$$\begin{aligned} \text{Transition Region Power Density} \quad S_t &= S_{nf} R_{nf} / R_t \\ &= 0.375 \text{ mW/cm}^2 \end{aligned} \quad (5)$$

Region between the Feed Assembly and the Antenna Reflector

Transmissions from the feed assembly are directed toward the antenna reflector surface, and are confined within a conical shape defined by the type of feed assembly. The most common feed assemblies are waveguide flanges, horns or subreflectors. The energy between the feed assembly and reflector surface can be calculated by determining the power density at the feed assembly surface. This can be determined from the following equation:

$$\begin{aligned} \text{Power Density at the Feed Flange} \quad S_{fa} &= 4000 P / A_{fa} \\ &= 183.346 \text{ mW/cm}^2 \end{aligned} \quad (6)$$

Main Reflector Region

The power density in the main reflector is determined in the same manner as the power density at the feed assembly. The area is now the area of the reflector aperture and can be determined from the following equation:

$$\begin{aligned} \text{Power Density at the Reflector Surface} \quad S_{\text{surface}} &= 4 P / A_{\text{surface}} \\ &= 5.659 \text{ W/m}^2 \\ &= 0.566 \text{ mW/cm}^2 \end{aligned} \quad (7)$$

Region between the Reflector and the Ground

Assuming uniform illumination of the reflector surface, the power density between the antenna and the ground can be determined from the following equation:

$$\begin{aligned} \text{Power Density between Reflector and Ground} \quad S_g &= P / A_{\text{surface}} \\ &= 1.415 \text{ W/m}^2 \\ &= 0.141 \text{ mW/cm}^2 \end{aligned} \quad (8)$$

Summary of Calculations

Table 4. Summary of Expected Radiation levels for Uncontrolled Environment

Region	Calculated Maximum Radiation Power Density Level (mW/cm²)		Hazard Assessment
1. Far Field ($R_{ff} = 92.3$ m)	S_{ff}	0.161	Satisfies FCC MPE
2. Near Field ($R_{nf} = 38.5$ m)	S_{nf}	0.375	Satisfies FCC MPE
3. Transition Region ($R_{nf} < R_t < R_{ff}$)	S_t	0.375	Satisfies FCC MPE
4. Between Feed Assembly and Antenna Reflector	S_{fa}	183.346	Potential Hazard
5. Main Reflector	$S_{surface}$	0.566	Satisfies FCC MPE
6. Between Reflector and Ground	S_g	0.141	Satisfies FCC MPE

Table 5. Summary of Expected Radiation levels for Controlled Environment

Region	Calculated Maximum Radiation Power Density Level (mW/cm²)		Hazard Assessment
1. Far Field ($R_{ff} = 92.3$ m)	S_{ff}	0.161	Satisfies FCC MPE
2. Near Field ($R_{nf} = 38.5$ m)	S_{nf}	0.375	Satisfies FCC MPE
3. Transition Region ($R_{nf} < R_t < R_{ff}$)	S_t	0.375	Satisfies FCC MPE
4. Between Feed Assembly and Antenna Reflector	S_{fa}	183.346	Potential Hazard
5. Main Reflector	$S_{surface}$	0.566	Satisfies FCC MPE
6. Between Reflector and Ground	S_g	0.141	Satisfies FCC MPE

It is the applicant's responsibility to ensure that the public and operational personnel are not exposed to harmful levels of radiation.

Conclusions

Based on the above analysis it is concluded that harmful levels of radiation will not exist in regions normally occupied by the public or the earth station's operating personnel. The transmitter will be turned off during antenna maintenance so that the FCC MPE of 5.0 mW/cm² will be complied with for those regions with close proximity to the reflector that exceed acceptable levels.

Exhibit D - Equipment Data Sheets

PRELIMINARY SPECIFICATION 4-watt BLOCK UP CONVERTER

1.0 Scope

This document describes the specifications of a phase locked Ku Band
Four Watt Block Up Converter

2.0 Electrical Specifications

2.1 Input Frequency	950 to 1450	MHz
2.2 Input Connector	Type "N"	Female
2.3 Input Return Loss	-10	dB Maximum
2.4 Reference Frequency	10	MHz Via Input Connector
2.5 Reference Level	0 +/- 10	dBm
2.6 L.O. Phase Noise	-60	dBc @ 100 Hz offset
@ 13.05 GHz	-70	dBc @ 1 KHz offset
	-80	dBc @ 10 KHz offset
	-90	dBc @ 100 KHz offset
2.7 Noise Figure	10	dB Maximum
2.8 Gain	51	dB Nominal
2.9 Gain Stability over Temperature	+/-2.0	dB Maximum
2.10 1 dB Compression Point	+36	dBm Minimum over Temp. and Freq.
2.11 Two Tone Intermod Products		
with two +30 dBm signals at the output	-22	dBc Maximum
2.12 Output Frequency	14.0 to 14.5	GHz
2.13 Undesired Sideband 11.6 to 12.1 GHz	-70	dBc Maximum
2.14 Spurious	-50	dBc Maximum
2.15 Harmonics	-25	dBc Maximum
2.16 Broadband Noise (10.95 to 12.75 GHz)	-150	dBm/Hz Maximum
2.17 Output Connector	WR-75	Internally Sealed
2.18 Output Return Loss	-10	dB Maximum
2.19 Output VSWR Protection		Protected into 3:1 Loads at all Phase Angles
2.20 Power Requirement	+24	VDC @ 50 W Typical Via Input Connector

3.0 Other Specifications

3.1 Size	4.5 Diameter X 9.5 Long	Inches Approximately
3.2 Weight	3.6	Pounds Approximately
3.2 Temperature Range	-40 to +50	Degrees C.