XM Radio Inc.
Form 442
Exhibit 1
Response to Questions #4 and #13

Experiment Objectives and Operations

XM Radio Inc. ("XM Radio") intends to utilize a System Validation Single Frequency Network (SV-SFN) of four fixed locations to test the deployment of its terrestrial repeater system. The terrestrial network will retransmit the satellite Digital Audio Radio Service (DARS) system signal. Satellite signals at S-Band do not fully provide coverage to urban areas due to the severe blockage from buildings. Consequently, a terrestrial network will retransmit the satellite service signal to provide coverage in those urban areas where the satellite signal is blocked. To optimize the network planning, XM Radio plans to continue a series of tests it began in February 2000 in Ft. Lauderdale, FL pursuant to an STA granted by the Commission. *See* File No. 0199-EX-ST-2000.

Testing of the SV-SFN transmitter system will be for the purpose of channel characterization, including signal power and multi-path characteristics, to assist in establishing and validating propagation and channel models for a single frequency network. Consequently, on any given field testing day, one transmitter may be operating or several repeaters could be transmitting simultaneously. These measurements will help verify techniques and equipment. The test team will have access to all the transmitter locations so they can monitor and control the equipment.

Transmitter Locations and Transmitter Technical Parameters

The System Validation Single Frequency Network (SV-SFN) proposed herein will consist of four fixed transmitters located around Ft. Lauderdale, FL. The specific geographic and site parameters of the repeaters are provided below. The technical characteristics for the repeaters are provided in Exhibit 3. The antennas for the standard transmitters will be located on controlled access rooftops, top floor equipment rooms, or towers. The antennas will not extend more than 6 meters above the building height. The antennas will be mounted less than 4 meters above the building height.

The high-power antenna will be located on a tower that is shared among a number of different transmitting systems. The site is owned by the Dade County school board and the tower is owned by WRLN. There is controlled access to the area around the tower so that a person from the general public could not casually walk into the area.

Fixed Transmitter Site Parameters

Transmitter Site	Latitude (North)	Longitude (West)	Building Height Above Ground (Note 1)	Ground Elevation	Transmitter Type
SV-SFN Tx 1	26° 12' 19"	80° 08' 20"	48 m	4.0 m	Standard
SV-SFN Tx 2	26° 07' 17"	80° 08' 23"	122 m	3.1 m	Standard
SV-SFN Tx 3	26° 13' 50"	80° 05' 27"	92 m	2.0 m	Standard
SV-SFN Tx 4	25° 58' 58"	80° 11' 46"	153 m	3.1 m	High-power

The standard antennas will be mounted less than 4 meters above the building height; they will not extend more than 6 meters.

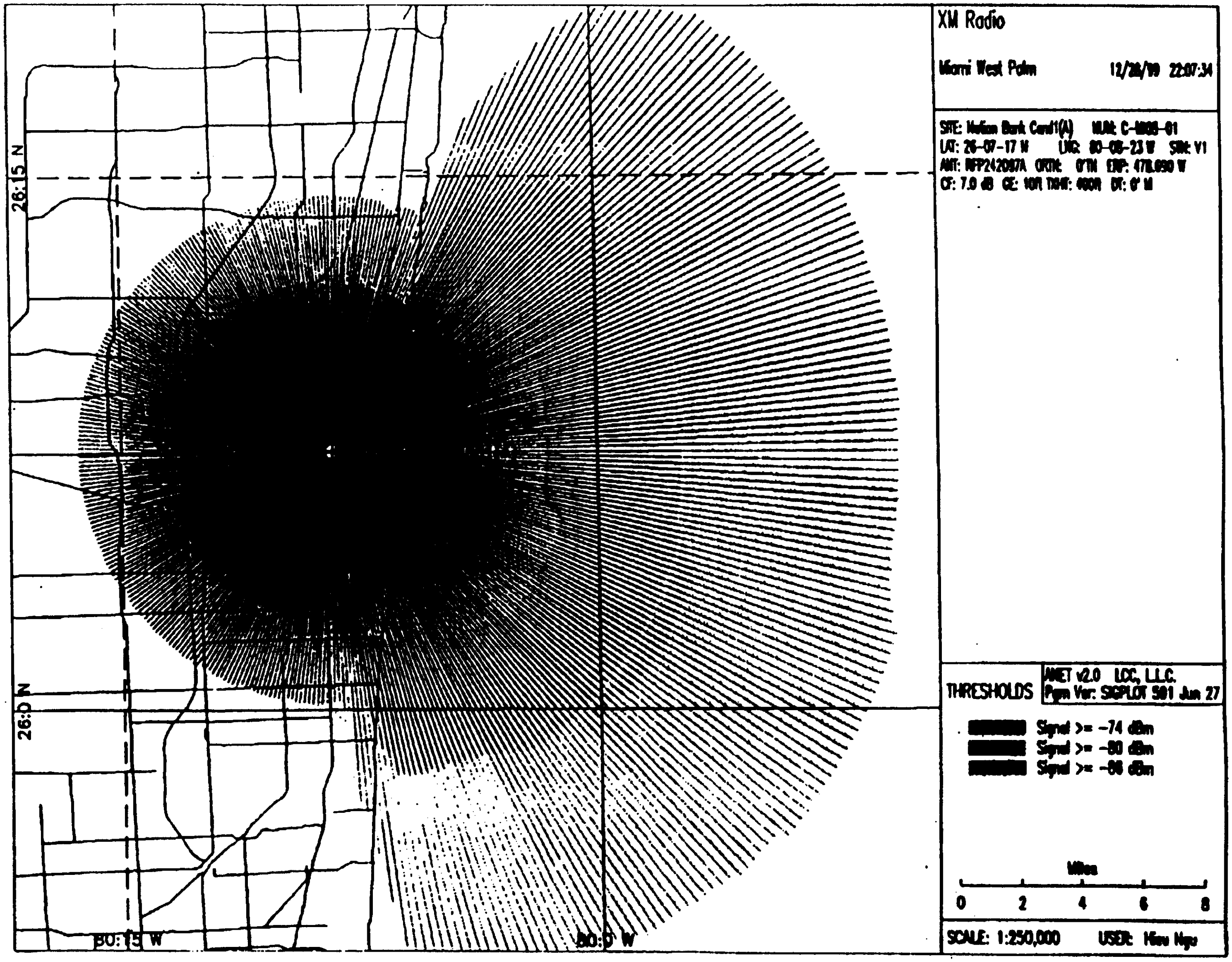

Figure B-1 Nation Bank Location

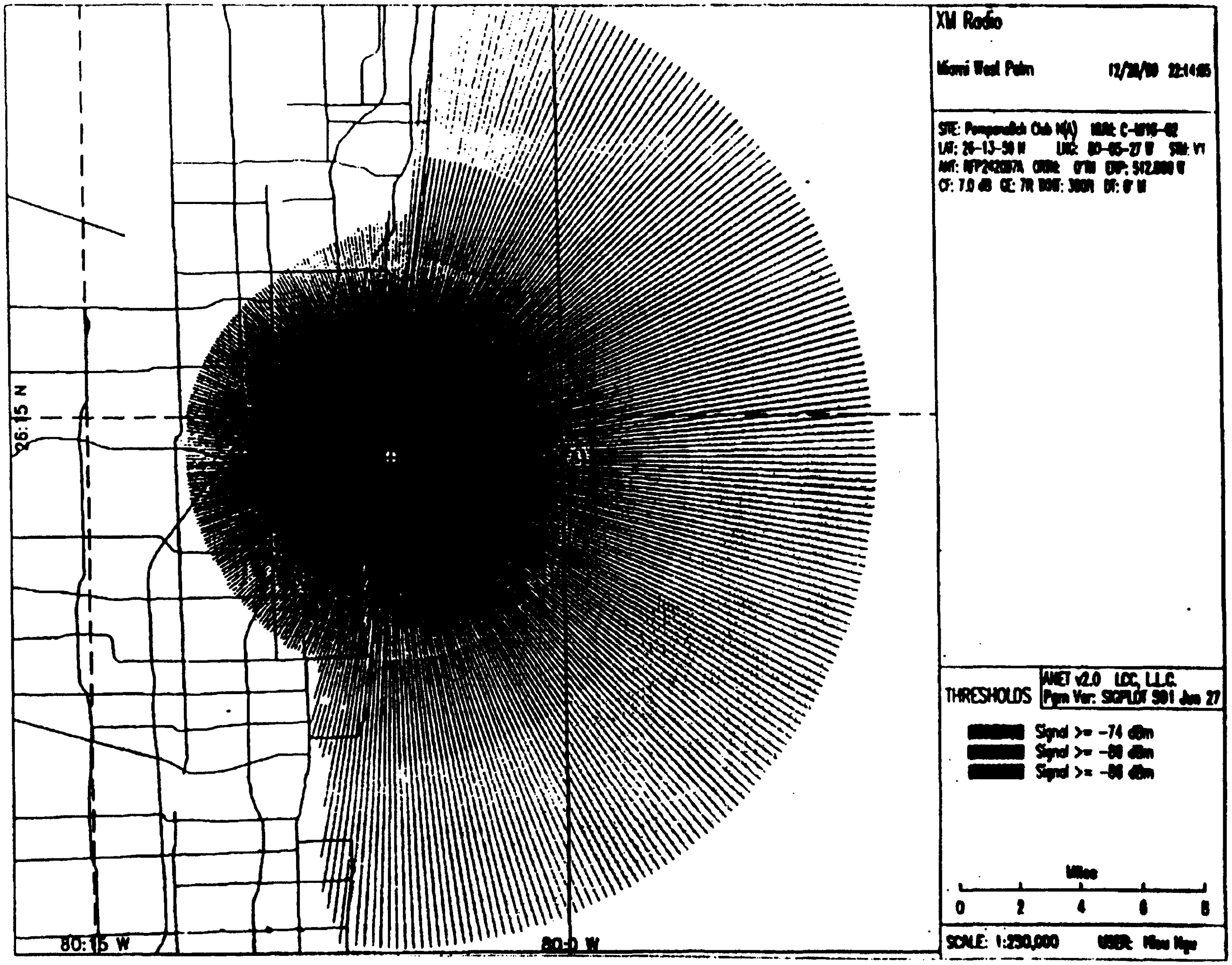

Figure B-2 Pompano Beach Location

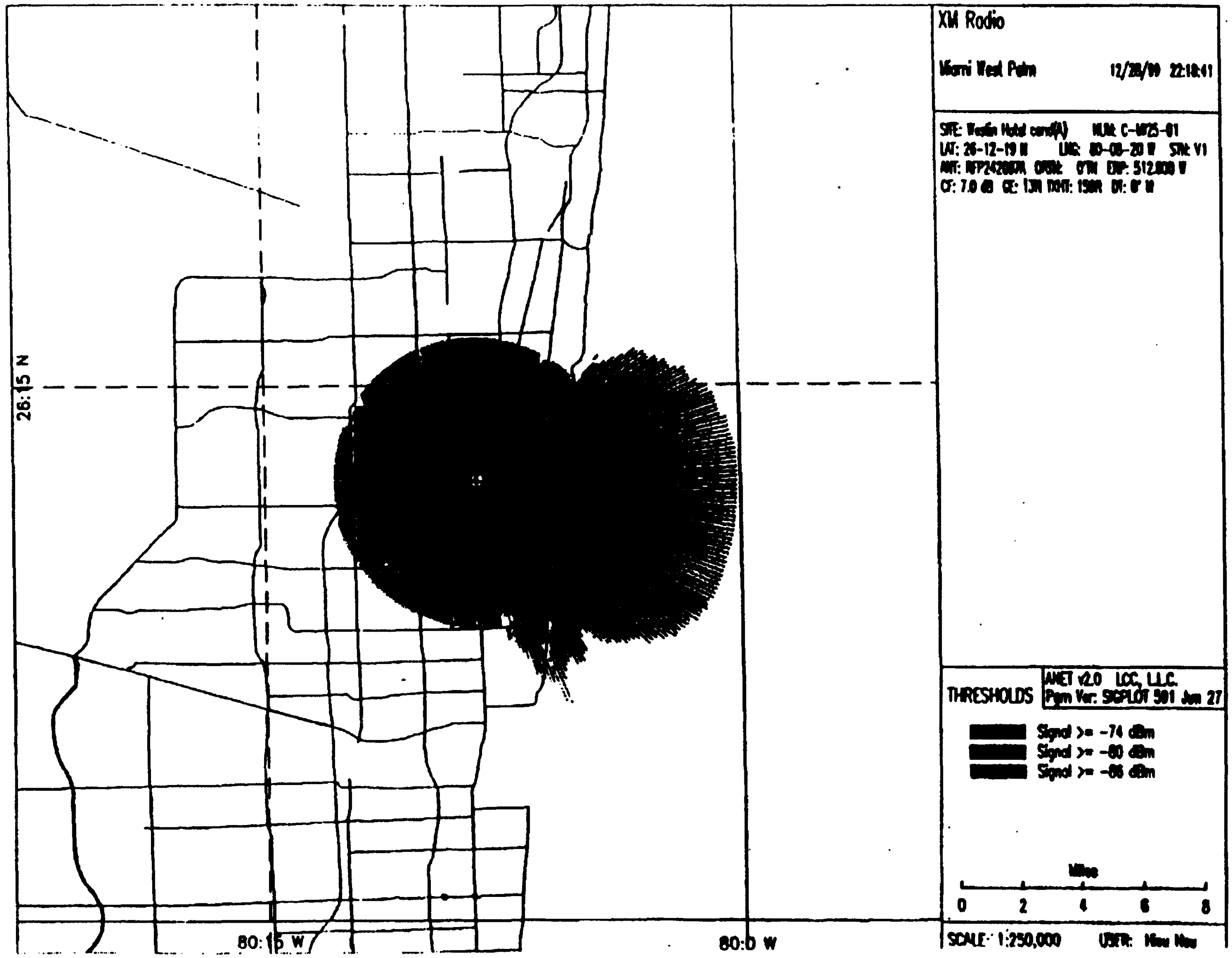

Figure B-3 Nation Bank Location

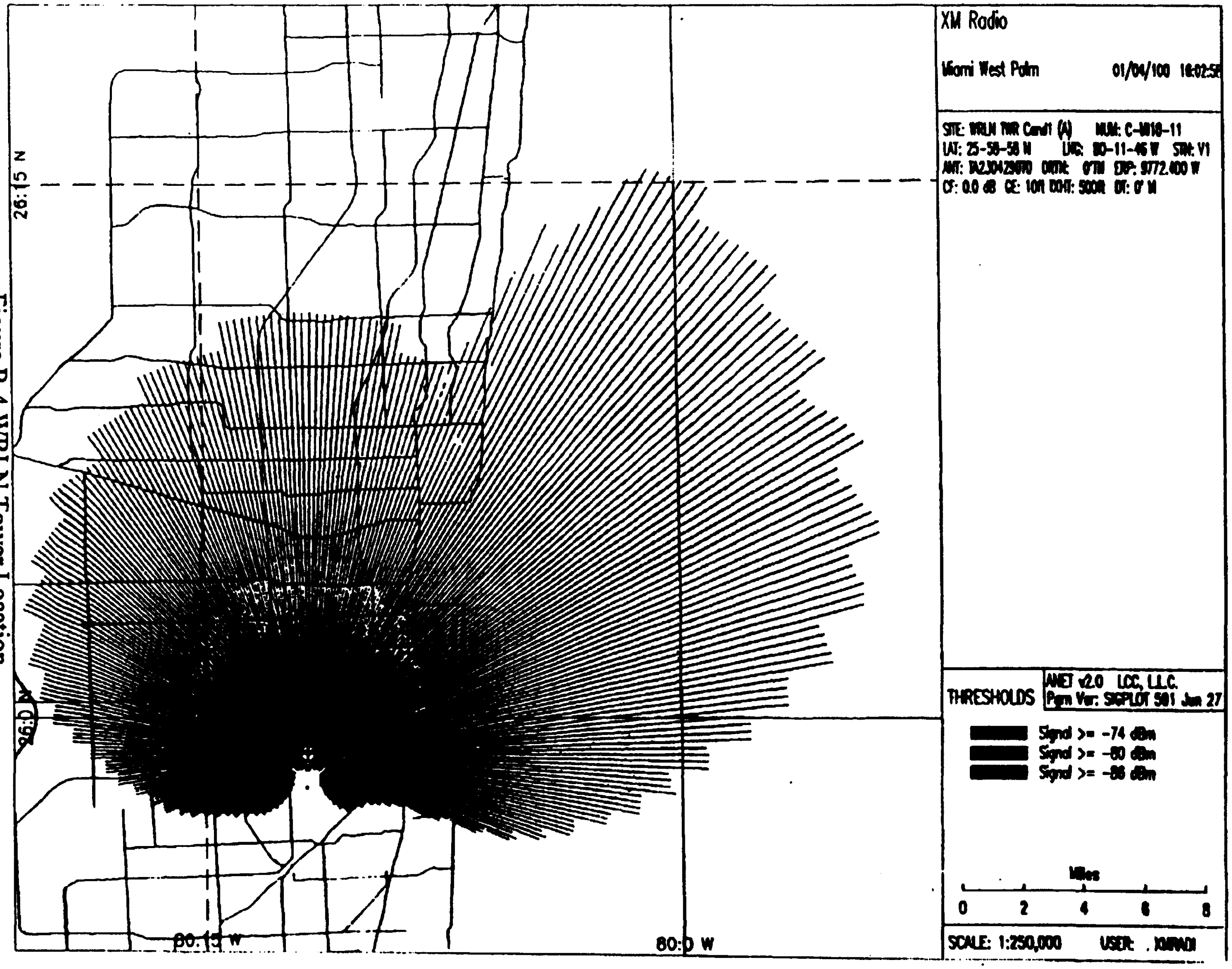

Figure B-4 WRLN Tower Location

Transmitter Technical Parameters

There will be two types of transmitters used in the SV-SFN. Three of the transmitters will be identical. These are called the standard transmitters. One transmitter will have approximately 10 dB higher EIRP and will be called the high-power transmitter. Table 3-1 summarizes the technical parameters of the fixed transmitters. Tables 3-2 and 3-3 provide technical information about the transmitter equipment.

Table 3-1. Transmitter Characteristics

Component/Parameter	Value	Notes
Transmit Frequency	2332.5 – 2345 MHz	Adjustable center frequency within range
EIRP of Standard Transmitter Maximum Nominal	 1.2 kW 800 W	Measured at antenna boresight Referenced to isotropic antenna Power will be adjustable (nominal EIRP = 800 W +/- 200 W)
EIRP of High-power Transmitter Maximum Nominal	 50 kW	Measured at antenna boresight Referenced to isotropic antenna Power will be adjustable
CW Tone Emission Designator	 NON	This signal will be used for propagation measurements

Table 3-2. Transmitter Equipment for Standard Repeater

Component/Parameter	Value	Notes
RF S-Band HPA Rated Output Power Spectral Shoulder Regrowth Back-off	 100 W 30 dBc >6 dB	Manufacturer: Unique Systems Measured from 1 dB compression point
Antenna Model number Gain at Boresight Polarization Electronic Downtilt	 TA-2350 10 dBi Vertical 0°	Manufacturer: TIL-TEK

Table 3-2. Transmitter Equipment for High-Power Transmitter

Component/Parameter	Value	Notes
RF S-Band HPA Rated Output Power Spectral Shoulder Regrowth Back-off	 1400 W 24 dBc >6 dB	Manufacturer: Unique Systems Measured from 1 dB compression point
Antenna Model number Gain at Boresight Polarization Electronic Downtilt	 TA-2304-2 15.5 dBi Vertical 0°	Manufacturer: TIL-TEK For 90° Sector Coverage

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Form 442
Exhibit 4

Radio Frequency Exposure Compliance

The standard transmitter antennas will be located on controlled access building roof tops, so the exposure to humans will be limited. The standard transmitters can be turned off whenever there are activities close to the antennas by maintenance or other workers. In addition, the antennas will be situated such that the distance to near-by buildings will be greater than that indicated by the calculations listed below. Consequently, the FCC radio-frequency field exposure limits will not be exceeded.

Based on the FCC limits outlined in OET Bulletin 65[1] for maximum permissible exposure (MPE) for a frequency of 2340 MHz, the maximum allowable power density is calculated to be:

General Population Exposure =	1.0 mW/ sq cm
Occupational Exposure =	5.0 mW/ sq cm

As a worst case prediction, 100% reflection of the incoming radiation is assumed. This is representative of a roof top environment. This results in a four-fold increase in the power density using the equation:

$$S = \frac{EIRP}{\Pi R^2}$$

where:
S= Power Density (mW/ sq cm)
EIRP = Transmit Power (mW) x Antenna Gain (relative it isotropic radiator)
R = distance to the center of radiation of the antenna (m)

Using this equation, the minimum separation distance required to receive this power density is calculated as a function of the antenna discrimination for the standard transmitter is shown in Table 4-1.

[1] *Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields*, FCC OET Bulletin 65, Ed. 97-01, August 1997.

Table 4-1. RF Exposure Limit Ranges

Angle Below Main Beam (Deg)	Antenna Gain (dBi)	Occupational (m)	General Pop (m)
0	10	2.52	5.64
5	6	1.59	3.56
10	-6	0.40	0.89
15	-2	0.63	1.42
20	-5	0.40	0.89
25	-3	0.56	1.26
30	-8	0.32	0.71
35	-5	0.45	1.00
40	-9	0.28	0.63
45	-5	0.45	1.00
50	-14	0.16	0.36
55	-8	0.32	0.71
60	-9	0.28	0.63
65	-18	0.10	0.22
70	-9	0.28	0.63
75	-8	0.32	0.71
80	-9	0.28	0.63
85	-10	0.25	0.56
90	-13	0.18	0.40

The high-power transmitter will be located on a tower that is shared among a number of different transmitting systems. The site is owned by the Dade County school board and the tower is owned by WLRN. The area beneath the tower has controlled access so that a person from the general public could not casually walk into an area. The nearest building that could be within the coverage of the antenna's 90° sector is approximately 1000 meters away, which is outside the RF exposure range limit for the high-power transmitter computed in Table 4-2. The RF exposure range limit as a function of the antenna discrimination is listed in Table 4-2.

Table 4-2. RF Exposure Limit Ranges for High-Power Transmitter

Angle Below Main Beam (Deg)	Antenna Gain (dBi)	Occupational (m)	General Pop (m)
0	15	16.79	37.54
5	9	8.45	18.90
10	1	3.23	7.22
15	-5	1.64	3.66
20	-2	2.36	5.28
25	-11	0.81	1.80
30	-4	1.91	4.26
35	-15	0.51	1.14
40	-4	1.94	4.34
45	-10	0.94	2.09
50	-11	0.85	1.89
55	-9	1.09	2.45
60	-14	0.59	1.33
65	-17	0.43	0.95
70	-18	0.37	0.82
75	-23	0.21	0.46
80	-27	0.14	0.31
85	-24	0.18	0.41
90	-23	0.21	0.46

Emission Isolation to Existing Systems

XM Radio recognizes that the experimental transmitters are not allowed to cause harmful interference to nearby stations including systems operating in adjacent bands. In addition, XM Radio understands that space communications (Deep Space Network (DSN) in the 2290-2300 MHz band) and Radioastronomy (ARECIBO in the 2370-2380 MHz band) as well as aeronautical telemetry systems (>2360 MHz) operate in nearby bands. As noted in the Wireless Communications Service Report and Order (FCC 97-112), some existing multipoint distribution service and instructional television fixed service systems (MDS/ITFS) have a poor front-end design with limited frequency selectivity and are thus susceptible to out-of-band emissions.

Because the experimental transmitters will be located on roof tops or on towers, they may be situated near base stations for systems such as MDS/ITFS. Preliminary measurements of the high power amplifier indicate that harmonics will be - 55 dBc and spurious emissions less than -60dBc. This combined with other reductions to out-of band emissions (e.g., filtering at input to HPA, coupling loss to antenna) will dramatically reduce any emission outside the 2320 - 2345 MHz band.