FCC Form 442

Exhibit 1

Leo One USA Experimental Application

Introduction

Leo One USA, through the filing of this request for experimental authority, seeks to test and confirm the functional capabilities of various aspects of its proposed Non-Voice, Non-Geostationary Mobile Satellite Service ("NVNG MSS") low-Earth orbit ("LEO") satellite communication system. The Leo One USA experiment is designed to validate the technical characteristics and performance of an important new communications service, and as such will contribute to the expansion of the radio art.

Leo One USA is requesting experimental licensing for the construction, launch and operation, for a period of two years, of two LEO satellites. These satellites will be placed in circular Earth orbits, of 1,100 km altitude and 80° inclination, with a resulting orbit period of 1 hour 47 minutes. Each satellite will be capable of receiving transmissions from hand-held mobile terminals and from a Network Operations Control Center (NOCC) to be colocated with the system's primary gateway and TT&C earth station, storing those messages in its 16 MByte of memory, and retransmitting them to other mobile or the NOCC terminals. The messages carried by the system, which will comply with the FCC's proposed NVNG MSS rules, will be relatively short, with a low duty cycle. As an integral part of this experiment, Leo One USA is also requesting experimental licensing for the construction and operation of a single gateway earth station and NOCC, to be located in the United States, and one thousand mobile terminals, all of which will be operated within the United States.

Objectives of the Experimental Program

There are several distinct objectives for the Leo One USA experimental program. Firstly, the use of low-cost, commercial grade LEO satellites is novel, and the verification of this technology is an important aspect of the proposed experiment. Secondly, other services use the frequency bands of operation (particularly the 148.0 to 149.9 MHz uplink band), and the special techniques Leo One USA proposes to use to avoid interference with these other services will be tested. Thirdly, there is currently only limited propagation data available for mobile satellite communications links using these frequencies. The understanding of this propagation path, as a function of the elevation angle to the satellite and the environment in which the mobile terminal is operating, is a key factor in determining the service offering and assessing the potential market. Fourthly, the specific coding and modulation schemes to be employed in the Leo One USA system, which have been designed with the objective of maximizing the spectral efficiency of the system, need to be validated with low-cost mobile terminals. By working with the mobile terminal manufacturers in this way during the experimental period, fully developed and validated terminals, in the appropriate quantities and at the right prices, will be available at the time the Leo One USA system begins full commercial operation. Finally, the Leo One USA experiment is designed to stimulate the market for NVNG MSS services through early validation of the potential market for NVNG MSS services.

Experimental Equipment Description

The two proposed experimental satellites will be identical in their functionality to the satellites to be deployed in the fully operational Leo One USA system. These satellites are described in Appendix A of the Leo One USA Satellite System Application, which is being filed concurrently with this application for experimental authorization. Similarly, the experimental TT&C and NOCC facilities, as well as the mobile terminals, are as described in Appendices C and B respectively of the Satellite System Application. There will, however, be only a single TT&C and NOCC Facility which will be located in the United States and only one thousand mobile terminals.

Theory of Operation

A description of how the elements of the Leo One USA system operate and interact with one another to form the complete communication system can be found in Appendices A, B and C of the Leo One USA Satellite System Application. This description is equally applicable to the experimental phase.

Experiment Activities and Phases

The Leo One USA experimental activities, after the two Leo One USA satellites are launched, will be divided as follows:

1. Verification of the spacecraft related operations, involving full exercise of all appropriate TT&C functions. This will ensure that the spacecraft are operating correctly and supporting the Leo One USA communications payload.

2. Verification of the functioning of the Leo One USA communications payloads on both satellites, involving tests carried out from the NOCC. This will ensure that all communications related functions are operating correctly.

3. Testing of communications links to mobile terminals. This will involve the testing of the adaptive channel allocation scheme to avoid interference with other services in the frequency bands, and the testing of the communications link protocols.

4. Collection of propagation data for mobile terminals in a wide range of operating situations and environments.

5. Mobile terminal development phase. Mobile terminal equipment manufacturers will employ actual satellite links in their development of the low-cost mobile terminals required for the eventual fully operational Leo One USA system.

6. Mobile terminals will be allocated to potential end-users and service providers for their evaluation of the performance of the NVNG MSS service. The feedback from these trials will be used in the development of the marketing plan for the eventual fully operational Leo One USA system.

Activities 4, 5 and 6 described above will take place concurrently, after completion of activities 1, 2 and 3 sequentially.

Potential for Success

Leo One USA is committed to the successful deployment of an exciting new communications service. The experimental verification of this service is an integral part of the business plan and Leo One USA is confident that it will be achieved with results that will not only contribute to the radio art in general, but also will ensure that the best quality and range of services are available in the most timely manner to the public.

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Exhibit 2

Waiver Request for Station Identification

Leo One USA respectfully requests a waiver of Section 5.152 of the Commission's Rules, 47 C.F.R. § 5.152, which requires an experimental station to transmit its assigned call sign at the end of each complete transmission. The inclusion of this feature would not be feasible, taking into account the nature of the NVNG MSS service, which is a sporadic, low duty cycle, short message transmission service. Inherent in the Leo One USA system design is the ability of the NOCC to identify each mobile terminal by means of the address header, which is an intrinsic part of the message protocol. This will permit identification of any and all mobile terminal transmissions by the NOCC, and allow them to be terminated immediately. Similarly, any transmissions from the satellites or the NOCC can be identified and terminated if necessary.

Interference from the Leo One USA experimental stations is unlikely for several reasons. Firstly, before any mobile terminal is permitted to transmit it will be notified of a clear uplink channel frequency based on information collected by the band-scanning receivers on board the Leo One USA satellites. This minimizes the chance of the narrow-band mobile transmission taking place on a channel that is in use by another service in the geographical vicinity. Secondly, the mobile transmission is of very short burst, low cycle (burst duration 450 milliseconds, burst spacing 15 seconds, duty cycle 9 seconds every 15 minutes), and narrow bandwidth (15 kHz). The transmissions from the NOCC are via a high gain antenna (12.25° half-cone half-power beamwidth), which will not be operated at elevation angles below 15°. Care will be taken in the location of this NOCC to minimize the risk of

interference with any other services. The NOCC transmissions are also of relatively low bandwidth (50 kHz). Regarding transmissions from the satellite, these consist of one 50 kHz channel and one 115 kHz channel. The former is of very low power, as it is intended to be received by the high gain NOCC antenna. The 115 kHz satellite downlink channel will be selected within the band to minimize the risk of interference with other services.

Therefore, Leo One USA believes that a waiver of Section 5.152 is appropriate in this instance.

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Exhibit 3

Orbit Characteristics of Leo One USA Satellites

Orbit altitude and type:	1,100 km circular
Orbit inclination:	80 degrees
Orbit period:	1 hour, 47 minutes
Phasing of 2 satellites:	180 degrees apart

LEO 1 USA (FROM APPLICATION)

Table A-1. Summary of Space Segment Parameters

Mass:	154 kilograms (on-orbit)
Satellite Footprint Diameter	4,326 km
Minimum Elevation Angle:	15°
Orbital Constellation	
Satellites per Plane:	3
Number of Planes:	4
Orbit Altitude:	1,100 km Circular
Inclination:	80°
Right Ascension of the Ascending Node:	0°, 45°, 90°, 135°
Argument of Perigee:	N/A -- Satellite in Circular-orbit
Active Service Arcs:	All Satellites may be active at all times
Satellite Lifetime:	5 years (7 years of consumables)
Launch Vehicle Candidates for Leo One USA:	
For Groups of Satellites on Carriage:	Delta, Lockheed LLV-1, Pegasus, Long March, Tsyklon, and Kosmos
For Individual Satellites:	Minuteman II SLV, Pac Astro, and START
Deployment Schedule:	
Experimental Satellites:	Late 1994
First Launch of Constellation:	Mid 1995
Full Constellation Deployed	Late 1995

Table A-7. RF Plan - Gateway-Satellite Links

	GSU	GSD
Frequency Band	148 - 149.9 MHz	137.175 - 137.825 MHz
Channel Bandwidth	50 KHz	50 KHz
Number of Channels	1	1
Modulation Format	OQPSK	OQPSK
Emission Designator	50K0G7D	50K0G7D
Transmit Power	1.8 W	2.5 W
Maximum EIRP	18.6 dBW	9.4 dBW
Transmit Polarization	LHC	LHC
Peak Flux Density in 4 kHz	-121.8 dBW/m^2	-138.4 dBW/m^2
Receiving System Polarization	LHC	LHC
Receiving System Noise Temp	732 K	1197 K
G/T	-30.6 dB	-17.8 dB
Source Data Rate	50 kbps	50 kbps
Modulation/Coding Rate	1.75 bit/symbol	1.75 bit/symbol
Symbol Rate	28.5 ksps	28.5 ksps
Bandlimiting	1.5 Hz/symbol	1.5 Hz/symbol

The peak power flux density produced at the Earth's surface by the Leo One USA satellites in the 137-138 MHz band will be -125.2 dB(W/m^2/4 kHz) in any 4 kHz bandwidth. This will be below the -125 dB(W/m^2/4 kHz) limit of international footnote 599A. (See 47 C.F.R. § 2106). Thus, coordination with terrestrial services is not required.

The required Leo One USA channel bandwidths are a function of the data rate, the spectral efficiency of the modulation and coding, the transceiver (or gateway) and satellite frequency stability, the uncompensated Doppler shift and the channel filtering. The required channel bandwidths are shown in Table A-5 .

Table A-5. Channel Bandwidth Requirements

	Transceiver Uplink	Transceiver Downlink	Gateway Uplink	Gateway Downlink
Signal Bandwidth	8.2 kHz	82.1 kHz	42.8 kHz	42.8 kHz
+/- Frequency Stability	0.6	0.3	0.3	0.3
+/- Doppler	4. 4	4.0	4.4	4.0
Total	13.2	86.4	47.5	47.1
Channel Bandwidth	15 kHz	115 kHz	50 kHz	50 KHz

The RF plan for the transceiver-satellite links is summarized in Table A-6 and the RF plan for the gateway-satellite links is summarized in Table A-7. For each link, the operating frequency bands are specified. Leo One USA is flexible as to the specific channel frequency assignments within the bands. Leo One USA does not require that the TSU channel assignments all be contiguous. All of the Leo One USA satellites will use the same frequencies providing full frequency reuse.