A. The Proposed Program of Research and Experimentation

SpaceQuest, Ltd. ("SpaceQuest"), a U.S. corporation headquartered in Fairfax, Virginia, requests FCC experimental authorization to test and evaluate an advanced RF Transceiver developed by Myriota, a spin-off company from the University of South Australia. Myriota has designed a novel communications protocol that uses a Software Defined Radio (SDR) and advanced signal processing that allows very large numbers of low power signals from user terminals to be received on the same frequency channel. Myriota desires to evaluate the ability of this advanced radio to function in a space environment. If successful, this would bring a cost-effective data communication technology to a new class of users – those with operations that require direct-to-orbit access for small amounts of data from numerous low-power devices.

The primary objective of the mission is to investigate, identify and resolve potential technical and implementation issues with its advanced satellite SDR radio design. Another important objective is to demonstrate the ability to upload and run new firmware that can introduce new features to the SDR Radio after it is on orbit. The results of this three-phase experiment will: (1) demonstrate and validate the ability to uplink large numbers of messages to a satellite using a single channel, (2) demonstrate the ability to downlink messages to different ground devices on a single channel, and (3) implement Myriota's advanced signal processing algorithms on board a satellite to provide highly spectrally efficient bidirectional communications.

The requested UHF frequency assignment will be used for satellite telemetry, tracking and command (TT&C) and bidirectional communication with Myriota's ground based terminals. The S-Band assignment will be used to download selected mission data from the payload.

Specifically, SpaceQuest requests FCC experimental authority to construct, launch and operate a low-Earth orbit 3U CubeSat, "BRIO", on an unprotected, non-interference basis using the space-to-Earth UHF downlink frequency band of 400.50-400.65 MHz and the UHF Earth-to-space uplink frequency band of 399.90-400.05 MHz for TT&C communications as well as for two-way data communication with multiple small low-power radio devices on the ground.

The allocation in the space-to-Earth frequency band of 2200-2202 MHz will be used to downlink experimental test data to Earth Stations in Limestone, Maine and Esrange, Sweden. The allocation in the Earth-to-space uplink frequency band of 2045-2046 MHz will be used to acknowledge the downlinks and to upload new firmware to the SDR payload infrequently.

SpaceQuest is manufacturing the BRIO satellite to evaluate the Myriota communications waveforms and firmware on board the experimental payload. SpaceQuest has extensive experience in the design and manufacture of microsatellite components, ground system hardware and software, spacecraft buses, and space operations. The 3U CubeSat is scheduled to be launched by Spaceflight on a SpaceX Falcon 9 rocket from Vandenberg Air Force Base in November 2018.

SpaceQuest has provided a 24-hour contact to the FCC for any interference issues that may arise (see Exhibit 2, Technical Information, Section 15).

B. The Specific Objectives Sought To Be Accomplished

- Validate all hardware elements of an SDR payload in low-Earth orbit
- Verify functionality of on-orbit firmware upgrade capability
- Characterize and de-risk SDR firmware implementation of an advanced signal processor
- Verify the performance of a highly spectrally efficient uplink multiuser receiver and associated system capacity benefits
- Validate the operation of an advanced satellite UHF communications system
- Confirm link budgets, and tune the operational parameters for the signal processing algorithms while operating on-orbit
- Confirm power and data rate design to close the link to a small remote receiver

C. How the program of experimentation has a reasonable promise of contribution to the development, extension, expansion, or utilization of the radio art, or is along line not already investigated.

Through this experimental program, SpaceQuest will be able to test and evaluate the effectiveness of Myriota's advanced satellite communications system. Myriota's goal is to develop a satellite-based data delivery system that can provide dramatically lower cost, improved battery life and increased access to large populations of devices via low-Earth orbiting satellites. Users that require data from remote areas beyond the reach of cellular networks will benefit from the flexibility and convenience of a simple system that works anywhere. Users will be able to access data via a Cloud-based data management system. Results of this program of experimentation will spur development of new applications and solutions for various asset classes including industrial, utility, agricultural and environmental project applications and will facilitate critical information exchange, providing new levels of executive control, personnel efficiency and customer service.

D. About SpaceQuest, Ltd.

SpaceQuest specializes in the design, development, integration and testing of advanced space and ground components for low-Earth orbit satellites. Over the years, the company has developed satellite components and microsats to support experimental and amateur payloads – including AMSAT, EduSat, SaudiSat, USAF Academy, NASA Marshall, Stanford University, Colorado University, among others. SpaceQuest constructed the first mobile satellite communications terminal to be carried to the North Pole by an Arctic expedition team. The terminal was used successfully to transmit two-way messages and digital photographs to SpaceQuest's satellite ground station in Fairfax, Virginia.

Among SpaceQuest's successful experimental efforts, were its work for Bigelow Aerospace, developing the designs and manufacturing the hardware for the Genesis Pathfinder

experimental space habitat, and developing, integrating and launching the Team Encounter Flight One mission that demonstrated Solar Sail Technology.

Over the years, the company has provided payloads for experimental missions and tested cutting-edge wireless communication components that have resulted in the development of cost-effective, timely and reliable hardware and software products for the space industry.

E. Estimated Experiment Duration

Pursuant to Part 5 of the Commission's Rules (§ 5.71 License period), SpaceQuest respectfully requests approval for a 5-year license for this experimental program. Due to the long lead times required for spacecraft construction, consideration of SpaceQuest's requested frequencies is of paramount importance in the near term. However, due to the SpaceX launch schedule, the earliest date that SpaceQuest can begin this experimental program is in the fourth quarter of 2018. Thereafter, SpaceQuest will continue to operate the satellite through its expected lifetime of 5 years.

In summary, SpaceQuest respectfully requests the Commission to grant its application for launch and experimental operation authority as detailed herein. To the extent possible, SpaceQuest requests that expedited consideration of this Application will be given in order to ensure favorable authorization in advance of the scheduled September 12, 2018 integration of the BRIO with the Spaceflight payload stack.

Pursuant to the document *FCC-Guidance-DA-13-445A1*, SpaceQuest provides the following:

Requested grant date: Not later than September 7, 2018

Critical go/no go date relevant to the license: September 12, 2018