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 a spectrum survey payload developed by Aurora Insight ("Aurora"). The payload is a novel, proprietary design and is experimental in nature. The primary objective of the mission it to qualify Aurora's payload, consisting of a proprietary spectrometer and components, and demonstrate the generation of relevant measurements of the spectral environment. The results of the experiment will inform future development of advanced instrumentation by Aurora and component development by SpaceQuest.

The requested UHF frequency assignment will be used for satellite telemetry, tracking and command (TT&C), while the S-Band assignment will be used to download selected spectrum data from the payload. SpaceQuest will also test the effectiveness of a new VHF "backdoor" receiver that the company designed and built to receive executive commands and/or to reboot the satellite flight computer in the event of a system failure. SpaceQuest will test whether the receiver, with its low-cost design and reduced weight and power, has the ability to function in very small satellites. The technical challenge is to demonstrate in space that a small, low-power radio device can be used to command a spacecraft independent of its traditional TT&C radio equipment. The benefit to the small satellite community is to establish the ability to rescue a spacecraft in the event of a non-recoverable anomaly within an acceptable size, mass, budget and cost.

Specifically, SpaceQuest requests FCC experimental authority to construct, launch and operate a low-Earth orbit CubeSat, "THEA", on an unprotected, non-interference basis. The space-to-Earth downlink frequency band of 400.50-400.65 MHz and the Earth-to-space uplink frequency band of 399.90-400.05 MHz for TT&C communications will communicate with SpaceQuest's Earth stations in Fairfax, Virginia, Naalehu, Hawaii, North Pole, Alaska, and Limestone, Maine. The SpaceQuest TT&C Earth stations will also have the capability to uplink executive commands to the backdoor receiver at 145.92 MHz.

A one MHz allocation in the space-to-Earth frequency band of 2200-2290 MHz will be used to downlink experimental test data to Earth Stations in Inuvik, Canada and Esrange, Sweden. A one MHz allocation in the Earth-to-space uplink frequency band of 2025-2110 MHz will be used to acknowledge the downlinks and to upload new firmware to the Aurora payload infrequently. There will be no transmissions in these bands to any S-Band stations in the United States.

SpaceQuest is manufacturing the THEA satellite to test experimental payloads from SpaceQuest and Aurora. SpaceQuest has extensive experience in the design and manufacture of microsatellite components, ground system hardware and software, spacecraft buses, and with space operations. The 3U CubeSat is scheduled to be launched by Spaceflight on a SpaceX Falcon 9 rocket from Vandenberg Air Force Base in October 2018.

SpaceQuest's 24-hour contact for any interference issues that may arise is provided to the FCC in Exhibit 2, Technical Information, Section 15.

B. The Specific Objectives Sought To Be Accomplished

- Validate the performance and survivability of the SpaceQuest and Aurora hosted payloads in a space environment.
- Validate the functionality of the Aurora and SpaceQuest firmware
- Flight-qualify and evaluate the performance of a novel, broadband, cavity-backed spiral antenna.
- Demonstrate the ability of the Aurora payload to capture, digitize, store, and then download spectrum power, noise, and interference measurements in different bands.
- Measure the performance, functionality and survivability of SpaceQuest's "backdoor" executive command receiver.
- Demonstrate the ability to upload and execute new payload firmware
- Document lessons learned to incorporate in future payload development
- Evaluate and space-qualify a miniature low-power receiver that can provide satellite executive commands independent of the primary TT&C system.

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.

Aurora's instrument comprises a novel design for a passive spectrometer and employs custom cloud-based software to execute complex data management and post-processing functions. The technology and data produced by Aurora are not widely available and will make as valuable contributions to efficient use of the radio frequency environment. Proactive understanding of spectrum usage will have a direct impact on the development, extension, expansion, and utilization of the radio art by enabling interested parties with a validated need to obtain spectrum data to replace current assumptions. As the industry seeks to deploy more and increasingly complex radio spectrum technologies, verified information can be incorporated into link budgets and models, minimizing uncertainty, streamlining planning, and improving performance.

Operational experience in space has confirmed a requirement to have a small, low-power, highly-sensitive backup receiver operating at a fixed frequency for a satellite to accept executive commands to repair or restore its functionality in the event of a software or system failure. As a manufacturer of advanced satellite components, SpaceQuest expects that qualifying and testing the effectiveness of a new "backdoor" receiver in a CubeSat environment will result in a significant advancement in satellite radio equipment technology for reliability and recovery.

D. About SpaceQuest, Ltd.

Since its formation in 1994, SpaceQuest has specialized in the design, development, integration and testing of advanced space and ground components for low-Earth orbit satellites. Over the years, the company has also built, launched and operated over 12 satellites to support experimental and amateur payloads – including AMSAT, EduSat, SaudiComSat, National Science Foundation, Stanford University, Colorado University, University of Arizona, 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 its 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 its experimental program is 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 expedited consideration of this Application will be given in order to ensure favorable authorization in advance of the scheduled October 2018 launch of the THEA satellite.

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

Requested grant date: Not later than August 15, 2018

Critical go/no go date relevant to the license: September 1, 2018