AUDACY ZERO EXPERIMENTAL MISSION
FORM 442 QUESTION 7: EXPERIMENTATION DESCRIPTION
REVISION 2.0

7 Purpose of Experiment

a. Description

Audacy is a satellite communications company which is designing and developing a CubeSat-scale K-band Communications System ("client terminal"), to help standardize and simplify satellite communications. A first-generation prototype terminal and antennas will be flown on a 3U CubeSat demonstration mission ("Audacy Zero"), to a sun-synchronous orbit (575 km altitude at 97.7° inclination) in Q1 2018. The terminal will follow the CubeSat standard and will interface directly with Audacy's K-band antennas. Audacy will also deploy and operate a high-gain, highly efficient K-band tracking antenna in the San Francisco Bay Area as a fixed earth station for telemetry, command, and data transmission.

i. Description of Equipment

Audacy's experimental client terminal will include two S-band software defined radios ("SDR") each with a K-band converter board. The GomSpace NanoCom SR2000 SDR is included along with an experimental SDR developed by Audacy. The terminal will use the DVB-S2 data standard, and the K-band transmitter will operate with an emission bandwidth of 20 MHz. Downlink will be in the 20.18-20.20 GHz FSS frequency band. The terminal will interface with both high gain and low gain antennas. The high gain antennas have a 3 dB beamwidth of 21.5° and a gain of 18 dBi, while the low gain antennas are omnidirectional in the horizontal axis and have a beamwidth of 29.8° and gain of 6 dBi in the vertical axis.

The ground station will utilize a 7 m diameter, mechanically steered dish to track Audacy Zero during each communications pass. The 3 dB beamwidths of this antenna are 0.10° and 0.15° at uplink and downlink frequencies respectively. Uplink will be in the 29.50-29.52 GHz FSS frequency band.

ii. Theory of Operation

Audacy will be employing communications links between its ground station and Audacy Zero on an experimental basis. The on-board antennas will be pointed within 10° of Audacy's ground station during each pass. Audacy Zero may also periodically transmit telemetry as a fail-safe to obtain spacecraft status. The ground station dish will be pointed as closely at the expected location of Audacy Zero as possible based on orbit propagation and location estimates based on GPS data.

b. Specific Objectives

Audacy has three primary objectives for the Audacy Zero CubeSat demonstration mission:

- Design and implement first generation hardware and software for Audacy's client terminal.
- Demonstrate on-orbit end-to-end testing of the client terminal with Audacy's ground station.
- Understand the existing communications and regulatory challenges faced by satellite designers and operators.

c. Promise of Contribution

Audacy's mission will improve upon the existing satellite communications infrastructure and the utilization of the radio art in a few ways:

- This demonstration represents a first step toward developing a standardized and interoperable K-band radio for small satellites.
- Development of a reliable CubeSat-scale K-band SDR with modular and simple interfaces may help reduce the communications design risks and challenges faced by small satellite operators.
- Future generations of this user terminal will be able to obtain continuous Inter-Satellite communications access through Audacy's multiple-access relay satellites.
- One of Audacy's goals is to assist in reducing regulatory burdens, both at the satellite operator side and for the FCC and ITU, by optimizing the use of spectrum across a wide range of user spacecraft.