

Exhibits

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1 Research Project

This authorization to be used for providing communications is essential to a research project. Thus, the following information has been included as an exhibit.

1.1 A description of the nature of the research project being conducted.

KUbeSat-1 is a three-unit cube satellite, which will have two payloads as technology demonstrations for cosmic-ray research. The two payloads on KUbeSat-1 are the HiCalX (High Altitude Calibration Instrument) and the PCRD (Primary Cosmic Ray Detector). The descriptions of the nature of the research projects behind these payloads are as follows. Firstly, using two Vivaldi antennas, the HiCalX will emit radio pulses to mimic Askaryan radiation, generating a calibration signal for the ANITA (Antarctic Impulsive Transient Antenna) missions, which are used for the detection and measurement of cosmic rays, particularly UHECRs (ultra-high-energy cosmic rays). Secondly, the PCRD will detect and measure primary cosmic rays.

1.2 A showing that the communications facilities requested are necessary for the research project involved.

The communications facilities requested for the University of Kansas are necessary for the research projects behind these payloads, as communication between transmitting/receiving equipment on KUbeSat-1 and the transmitting/receiving equipment on the ground station is vital for success. Also, the raw data collected and stored by these payloads must be transmitted to the ground station at the University of Kansas for analysis.

1.3 A showing that existing communications facilities are inadequate.

Currently, the existing communications facilities at the University of Kansas are inadequate, as the University of Kansas does not have a ground station capable communicating with KUbeSat-1 available.

2 Applicant Type

This authorization is to be granted to the University of Kansas, a public research university in Lawrence, Kansas.

3 Station Location: Directional Antenna

The directional antenna will have a beamwidth of 42° at full power. The antenna is not fixed. It is steerable on an elevation-over-azimuth mount. It will be operated over the full azimuth range of 0° to 360° referenced to true north, and over elevation angles in the range of 10° to 90° referenced to the local

horizon. The orientation will change as a function of each pass of the satellite. The antenna will follow the path of the satellite from AOS to LOS.

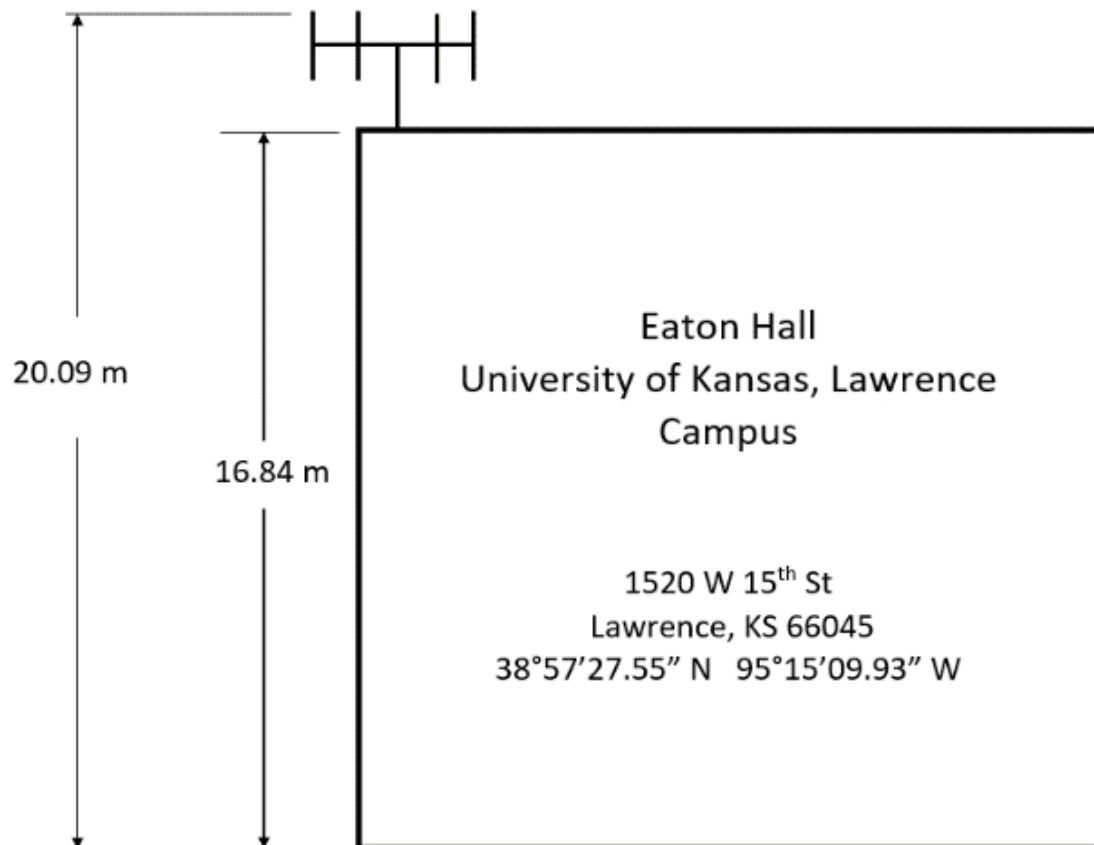
4 Station Location: (Frequency)

The ground station and satellite will be capable of transmission at any frequency in the 435 – 438 MHz range. If the requested frequency range is not available, the University of Kansas would be willing to modify the frequency range.

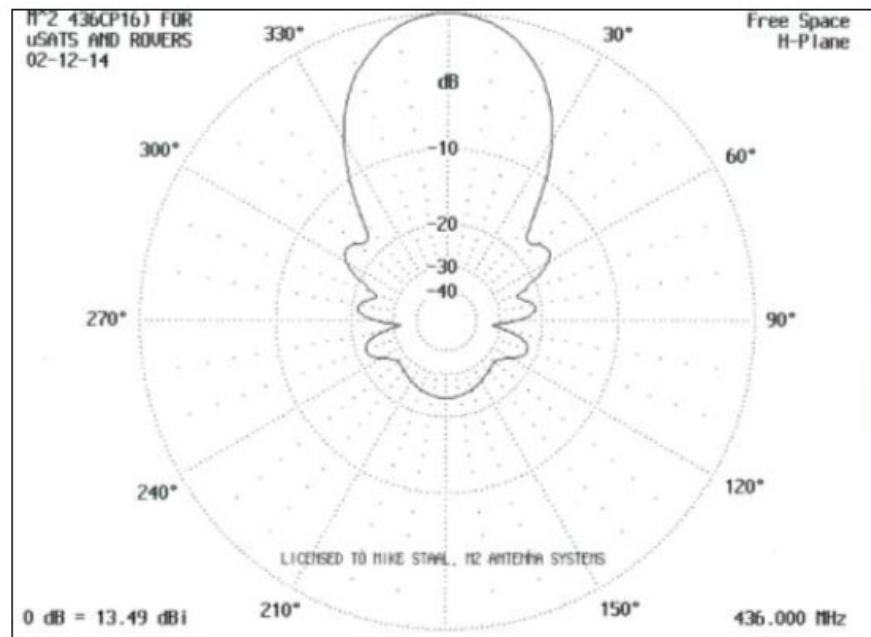
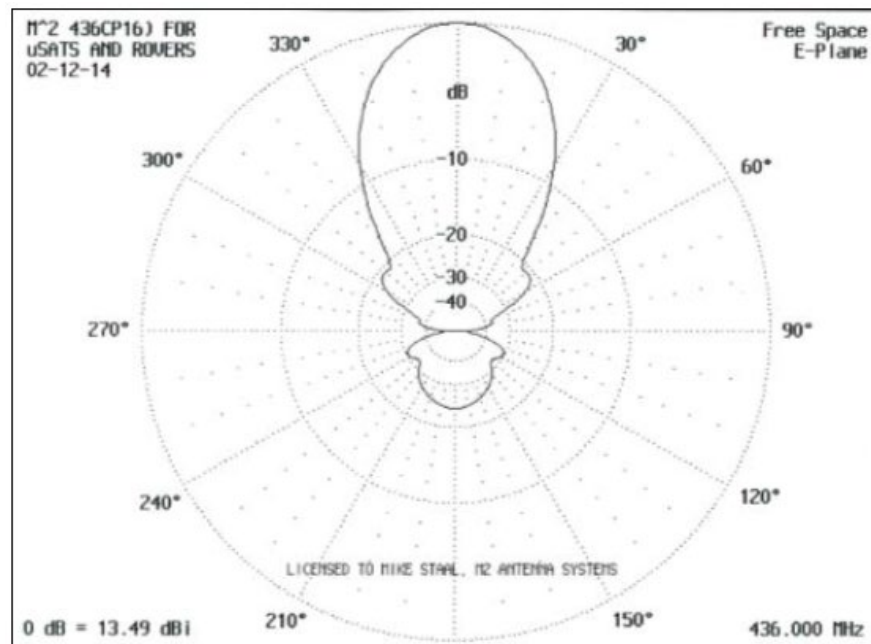
5 Additional Exhibits

The following information has been included as additional exhibits.

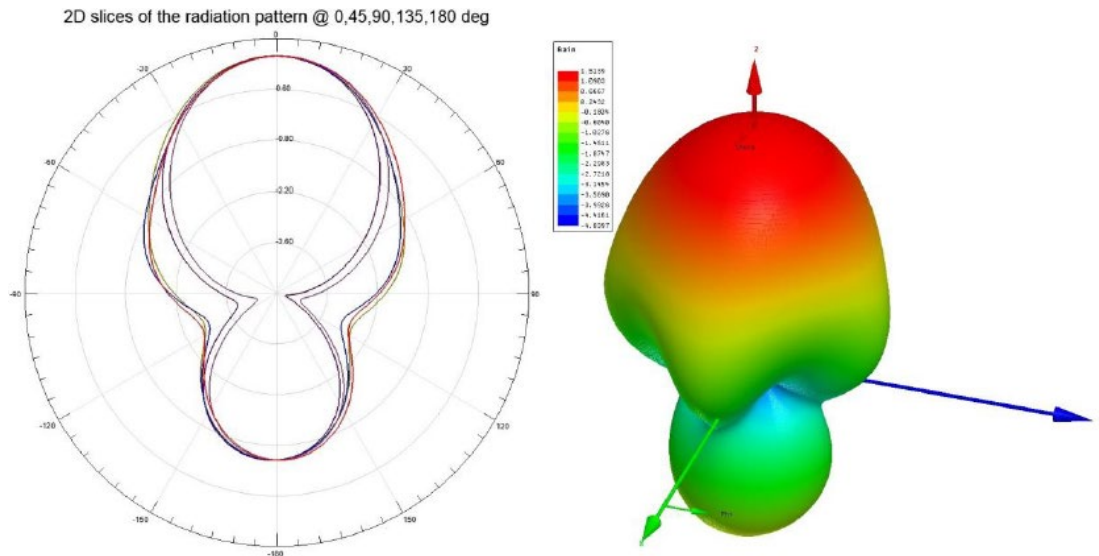
5.1 Vertical Antenna Profile Sketch



5.2 Ground Station Antenna Radiation Pattern



5.3 Satellite Antenna Radiation Pattern



5.4 Other Orbit and Radio Information

- Type of Satellite: Non-Geostationary
- Inclination Angle: Between 85° and 98°
- Apogee: 400 Kilometers
- Perigee: 400 Kilometers
- Orbital Period: 1.55 Hours
- Number of Satellites in System: 1
- Satellite Transmitter Antenna Gain: > 0 dBi
- Satellite Transmitter Beamwidth: > 0°
- Satellite Transmitter Antenna Azimuth: Narrow Beam (NB)
- Earth Station Receiver Antenna Gain: 13.3 dBi
- Earth Station Receiver Beamwidth: 42°

- Earth Station Receiver Azimuthal Range: 0° to 360°
- Earth Station Receiver Site Elevation Above Mean Sea Level: 284.09 Meters
- Earth Station Receiver Antenna Height Above Terrain: 20.09 Meters
- Earth Station Receiver Antenna Azimuth: 0° to 360°
- Earth Station Minimum Angle of Elevation: V10
- Satellite Transmitter Antenna Orientation: XAP01 J
- Satellite Receiver Antenna Orientation: RAP01 J
- Ground Station Transmitter Antenna Orientation: XAPO1 R
- Ground Station Receiver Antenna Orientation: RAP01 R