

## Antennas at the Colorado Space Grant Ground Station

The antennas used for the UHF/VHF station are circularly polarized Yagi antennas. These antennas provide a directional beam and high gain to meet to satisfy satellite link budgets while retaining a small cross section to protect from high winds. The two antennas are positioned on opposite sides of the rotator in order to balance the rotator cross beam.

The circular polarization of the antennas allows for better signal propagation as there may be atmospheric conditions that would attenuate certain linear polarizations. By keeping the polarization circular, these types of interference would only affect the signal for a small portion of the time. While there is a polarization mismatch between circular and linear polarization, the loss is relatively low, around -3 dB. A polarization mismatch between horizontal and vertical linear polarizations has theoretically infinite loss. Due to imperfections in the polarization, some signal gets through and the real life value for this loss is approximately -30 dB or greater. Due to the various attitudes that a satellite can take with respect to the ground station, the easiest way to guarantee that the satellite's linear signal is not cross polarized with the ground station is to use circular polarization on the ground station.



Figure 1: 2-meter (left) and 70-cm (right) Antennas

## **70-cm Antenna**

The 70-cm antenna is an M2 Antenna Systems 436CP42 U/G. This antenna is tuned for frequencies between 430 and 438 MHz and, provides a gain of 19 dBi with a -3 dB beamwidth of 21 degrees. The antenna is currently set up for right-hand circular polarization (RHCP), however, if the ability to switch between RHCP and LHCP then a switching box can be installed.

## **2-meter Antenna**

The 2-meter antenna is an M2 Antenna Systems 2MCP22. This antenna operates from 144 to 148 MHz, and has a gain of 14.45 dBi. The -3 dB beamwidth is 37 degrees. This antenna is currently set for RHCP but, the ability to switch can be installed later.

## **Antenna Tower**

The COSGC antenna tower is approximately 30 feet tall and attached to the roof of the DLC. The tower supports an azimuth-elevation rotator which allows the 2-meter (VHF) and 70-cm (UHF) antennas to track satellites. The tower can be lowered to a horizontal position for maintenance of the antennas and rotator.



**Figure 2: UHF/VHF Radio Tower**

# Antenna Proximity to nearest airport

Proximity to nearest Airport

