

To: FCC

From: PolySat

Date: April 9, 2015

Subject: Modifications to ExoCube experimental license 0052-EX-ML-2015

Background

ExoCube is a 3U (30 x 10 x 10 cm) CubeSat designed and built by PolySat, a research group at California Polytechnic State University, in collaboration with NASA Goddard Space Flight Center, Scientific Solutions, the University of Wisconsin, and the University of Illinois. ExoCube's mission is to measure in-situ densities of various ions and neutrals in the upper ionosphere and lower exosphere using a dual ion neutral spectrometer.

Original Plan and Licensing

Cal Poly's ground station was to be used as the central point of communications with the satellite. ExoCube has a monopole antenna that operates at 437.270 MHz with an ERP of less than 1 Watt. Using Cal Poly's dual-yagi antenna, the link budget would have had around a 10 dB link margin.

Current Issue

Unfortunately, ExoCube's antenna did not deploy. The RF amp is still functional and transmitting, however, the signal strength is very weak. Testing has shown that ExoCube is probably experiencing between 20-40 dB of additional loss depending on the orientation of the antenna relative to the ground. Cal Poly's ground station antenna is no longer capable of decoding the packets from ExoCube, because the signal strength is too weak.

Addition of high-gain antenna

Cal Poly would like to add a large, high-gain dish, in coordination with one of our partner organizations, to the license in order to close the link with ExoCube. The setup would be nearly identical to how Cal Poly controls its ground stations, aside from low-gain yagi being replaced with a high-gain dish. Cal Poly would control all transmissions and the dish station would act as a bent pipe, sending the commands to ExoCube and sending the received packets back to Cal Poly. Transmission is necessary for our mission success, because the communication architecture relies on a back forth dialogue between the satellite and the ground station.