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INTER-SATELLITE COMMUNICATION LINK FOR A SPACE BASED INTERFEROMETER

Abstract

Nanosats are more and more used for experiments in space due to their low costs and relative low complexity. The TwenteSat project is a student nanosat project at the University of Twente. The concept of Twentesat is to launch two tethered nanosats as one unit. Once in Low Earth Orbit (LEO) it is deployed in two separate units. The purpose of this project is to create an interferometer based on these two nanosat units to do radio astronomy observations at low frequencies (up to 50 MHz). A radio telescope has to be built in space because of the strong man-made interference present on earth. Each of the two units consists of a receiver for the astronomical signals. The interferometric operation is performed in one of the nanosats and the output data is send to Earth.

Because the system is based on two units, data has to be exchanged between the two nanosats. The exchanged data consists of measurement data from the radio astronomical receiver, as well as possible settings and control signals for the nanosats. Because we are dealing with a tethered system the communication system does not have to be wireless, wired options along the tether might also be a possibility for this inter-satellite communication system. The tether is already in place when the satellite is deployed and can be used as a transmission line. Another option is a wireless communication link.

Since this is an experimental setup, the length of the tether will be about 100 meters. The data rate needed by the system is around 250 kbits/s. Furthermore, the system has to be as low power as possible because the satellite has a limited power budget. The system should easily fit in a nanosat unit, which measures 10x10x10 centimeters. Finally the system should be low cost, and created with off the shelve parts available at large component distributors. The link has to be easily accessed by the processing unit of the satellite. In this paper, different possibilities for inter-satellite communication systems are examined. The examined systems include a wireless system, but also wired systems using the tether. Finally a low cost, low power and reliable inter-satellite communication design for the TwenteSat project is presented.