Paper ID: 34288
student

45th STUDENT CONFERENCE (E2)
Student Team Competition (3-GTS.4)

Author: Mr. Zouhair Briqech
Concordia University, Canada, zouhair.briqech@spaceconcordia.ca

Mr. Kenton Neustaeter
Concordia University, Canada, neustaeterk@gmail.com
Ms. Mariya Krasteva
Concordia University, Canada, mariya.krasteva@spaceconcordia.ca
Mr. Emmanuel Papanagiotou
Concordia University, Canada, emmanuel.papanagiotou@spaceconcordia.ca
Mr. Jan Clarence Dee
Concordia University, Canada, jan.clarence.dee@spaceconcordia.ca
Mr. Rami Kandela
Concordia University, Canada, rami.kandela@spaceconcordia.ca

DOUBLE-LOOP DUAL-BAND VHF/UHF MONOPOLE ANTENNA FOR ALEKSANDR NANOSATELLITES

Abstract

Aleksandr is a 10 x 10 x 30 cm 3U CubeSat nanosatellite designed and built by the Space Concordia team during its second and third entry to the Canadian Satellite Design Challenge (CSDC). This mission's purpose is to study the long-term performance of a new self-healing material in a microgravity environment. This material is developed at Concordia's Centre for Composites (CONCOM). Aleksandr's uplink and downlink communication system depends on a single antenna, and separation of the transmitted and received signal is achieved using a diplexer. The novel antenna design was implemented and fabricated at Concordia's Antenna and Microwave Research Center Laboratories. The antenna is made of spring-steel, the attachment of the arches is made of flexible-steel wire for easy folding around the nanosatellite followed by straightening in the deployment stage. The antenna consists of a /4 monopole attached to two separate parabolas generating two different resonant modes at 146 MHz (/4) and 438 MHz (3/4), and implements a diplexer efficiently designed for both the VHF and UHF bands. The resonant modes optimization is easily achieved with two parabolas - the first controls the lower band, and the second controls the upper band, which greatly enhances the impedance bandwidth. The dual-frequency antenna operates with - 10 dB impedance bandwidths for bands from 136 to 160.4 MHz and 416 to 466 MHz. In addition, the proposed antenna maintains good omnidirectional radiation patterns over the operating bands, and achieves simulation gains of 2 dB at 146 MHz and 3.85 dB at 438 MHz. This new design model is preferable as it reduces the return loss and increases the half power beam width (HPBW). The antenna characteristics and diplexer design make it a good candidate for nanosatellite LEO range communications.