

DATASAT – ADA Ground Station Network. Automatic Directional Antenna for Space Communications on LEO Spacecrafts

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Abstract: This paper describes a Ground Station Network (DATSAT) designed and developed in Brazil for automatically tracking, telemetry acquisition and command of a Low Earth Orbit (LEO) spacecraft. Each ground station of the network is named ADA (Automatic Directional Antenna). For each ADA we have an external module that contains the pointing and tracking mechanisms and the antennas as well an internal module where the controller and receiver are located. A desktop computer is responsible for run the TT&C software, the signal processing and the data dissemination tasks. The data is processed and it is available through a Data Mission Center (<http://datasat.space>) available for public or private missions. The Data Mission Center can also establish a direct channel with the Mission Flight Center to send Telecommands and Visualize Telemetrys in Real Time. The technologies for DATASAT Ground Stations Network was developed using proprietary and open source software and hardware. The ADA can be acquired free of charge for any eligible Educational Institution that will use it for educational purposes. The success of DATASAT/ADA can be exploited in terms of its own operational procedures that include, low cost, automatic tracking and command, encryption and data reduction, data log and high reliability including in weather hazard environment.

The Ground Station ADA can operate in VHF, UHF, S and X Bands. Tests were already performed in real scenarios for VHF and UHF Bands while S and X Bands has already designed and is in simulation and manufacture phase. The downlink and uplink are made by Software Defined Radio (SDR) technology that allows flexibility and reconfiguration of the Ground Station transceiver. The unit responsible to control, process and storage the data is the ADASERVER, that was designed to provide a reduction of human efforts during and after operation and more reliable data in order to avoid human failures. The modularity of hardware and software in terms of interoperability and capabilities including procedures of operations and costs that makes ADA an innovative product for Educational and Corporate purposes.

Studies have been conducting in order to tracking and telemetry acquisition for satellites on, MEO (Medium Earth Orbit) and GEO (Geosynchronous Orbit) as a proof of concept and scientific educational purposes.

Keywords: ground-station, antenna, network, TT&C, SDR.