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QHAPAQ ÑAN PROJECT: DEVELOPMENT OF THE ENGINEERING MODEL OF A PAYLOAD FOR THE MEASUREMENT OF THE EARTH'S MAGNETIC FIELD BY APRS COMMUNICATION IN A CUBESAT.

Abstract

In South America, space phenomena like the South Atlantic Magnetic Anomaly affect satellite communications, highlighting the importance of monitoring the Earth's magnetic field, especially with the expected increase in solar activity. For this monitoring, the Qhapaq Ñan (QÑ) project is proposed, which is an engineering model of a payload for a CubeSat that aims to monitor the Earth's magnetic field with a magnetometer, storing the collected data to be later transmitted through the Automatic Packet Reporting System (APRS) protocol. This paper describes the development of the QÑ payload, product of more than one year of development. The payload integrates low-cost components, divided in three subsystems developed in a modular way: Microcontroller Unit (MCU) & Terminal Node Control (TNC); the Communication System composed by a Very High Frequency (VHF) band transceiver working at a frequency of 145.825 MHz and using the AX.25 protocol; and the Scientific Payload that incorporates a 3-axis magneto-inductive magnetometer. The payload operates in two main modes: Digipeating and Store Forward. The first phase of the QÑ payload was based on the requirements of the Interface Control Document (ICD) of the BIRDS-X APRS Payload Competition of the Kyushu Institute of Technology (Kyutech), achieving the outstanding position of global finalist. In the second phase of the project, the QÑ payload underwent vacuum chamber, thermal cycling and vibration tests, successfully passing them. Throughout its development, QÑ was supported in manufacturing, test facilities and ground station development by research institutions and the amateur radio community in Peru. Finally, the project generated a positive impact by promoting the development of portable APRS stations for radio amateurs in Peru,

strengthening the APRS community.