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OPEN-SOURCE GROUND SEGMENT AND SATELLITE COMMUNICATION EMPLOYING
GNURADIO, LORA AND SDR TECHNOLOGIES**Abstract**

Regarding telemetry and telecommand systems for small satellites, the use of LoRa modules has become increasingly common. This module has a proprietary protocol, popularly used in devices in the Internet of Things (IoT) category, which allows communication over long distances with low energy consumption. Due to the proprietary nature of the LoRa, the receivers at ground segments rely on radio modules that use non-open architecture to implement this protocol, not allowing the use of Software Defined Radio (SDR) or other types of hardware for this application.

This article aims to demonstrate the use of SDR for transmitting and receiving messages employing LoRa technique through the GnuRadio software, which provides greater flexibility and compatibility with standard infrastructure already used for other technologies. This way, it is possible to use these methods to communicate with various nanosatellites that employ the LoRa technique.

As this project is based on open-source code, it will be presented in this article the methodology of the development of this segment, including the process of studying the library, its use for this application, construction and testing of an experimental setup, and also the results obtained at each stage of the project. It will also discuss the next steps for the use of the project in a real mission of a PocketQube 1P picosatellite that will be launched in 2024, using the LoRa technique in the UHF range, specifically in the 70-centimeter band (433 MHz).