

ABSTRACT

This research is motivated by the need to develop a communication system that can support disaster mitigation, especially in areas that often experience communication infrastructure disruptions due to natural disasters. Satellite communication is a much-needed alternative in emergency conditions, where telecommunication towers are damaged or ground infrastructure is not functioning. One solution proposed is the use of a satellite-based communication system with LoRa technology, which has low power consumption and wide transmission range.

The use of this technology can ensure smooth emergency communications, speed up disaster response, and improve coordination between authorities and the community. The implementation of this system refers to a design involving the design of a LoRa-based *Telemetry, Tracking, and Command* (TTC) communication system for PocketCube satellites.

The tools used in this system are the LoRa RFM95 communication module and the Arduino Mini Pro 3.3V microcontroller, which are optimized for low-power operation and long-range communication capabilities. This system has been tested to consume only 0.25 watts of power, making it highly efficient for miniature satellites. The device design and testing were conducted to validate the communication system under various environmental conditions, including extreme temperatures, vibrations, and atmospheric disturbances.

The test results show that satellite communication using LoRa at a frequency of 923 MHz can be achieved at a maximum distance of 600 km with a *link margin* of 4.70 dB. Satellite communication can be ensured to run well if the *link margin* is greater than 4 dB, which indicates that the system can still operate. The best parameters for maintaining communication stability are SF: 12, BW: 250 kHz, and CR: 6. Further testing at a distance of 11 km also proved that the *link margin* calculation was valid, with stable and reliable communication.

Keywords: *LoRa, PocketCube, Telemetry Tracking Command, Low Orbit, Satellite Communication.*