Int J Sens Netw Data Commun 2018, Volume 7
DOI: 10.4172/2090-4886-C1-012

LiNSAT: Nano-satellite for lightning detection, discrimination and geo-location

Ghulam Jaffer
University of the Punjab, Pakistan

This paper describes a project for the detection of sferics in very high frequency (VHF) range by a lightning nano-satellite mission (LiNSAT) in low-earth-orbit around 1000 km. The impulsive electromagnetic signals generated by electrical discharges in terrestrial thunderstorms (lightning) having a global terrestrial lightning rate of 100 lightning flashes per second with an average energy per flash of about 109 Joule. The nano-satellite emphasizes on the investigation of the global distribution and temporal variation of lightning phenomena using radio-frequency signals. We present architecture of the LiNSAT lightning detector and results of two terrestrial measurement campaigns to geo-locate and discriminate lightning types in presence of noise sources. We mainly investigate the transient electromagnetic waves in the frequency range of 20–100 MHz. The onboard RF lightning triggering system along with pre-selectors is a special capability of the LiNSAT to avoid false signals detection (false alarm) onboard. Adaptive filtering techniques have been implemented to differentiate terrestrial electromagnetic impulsive signals from ionospheric or magnetospheric signals. The data of past missions and two terrestrial lightning campaigns have been used to test the hard- and software of the lightning experiment before integration into the spacecraft. Moreover, we have verified its lighting geo-location capability by simulating its constellation of four satellites. After successful detection of lightning transients, data is dumped into available memory for future download. The post-processing on ground characterizes the data through whitening, de-chirping and classifying the signals in time and frequency domains.

gjaffer.spsc@pu.edu.pk