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SDR BASED RF OBSERVATION FROM NANO-SATELLITES

Abstract

CubeSat based nano-satellites are ideal for rapid and inexpensive in-orbit testing of new technology. Many vendors supply standardized modules to quickly build a satellite bus, allowing developers to focus their efforts on the payload. With standardized SDR platforms for CubeSats, the payload development time can be significantly reduced as well. For many RF observation missions, the pre-analysis for estimating what the signal to be observed will look typically takes up a significant portion of the mission analysis; even in this case different phenomena may not be sufficiently accounted for. The paradigm changes with a standardized SDR platform and a frequency specific front-end module. Now only a rough idea of the RF environment is needed at the mission analysis stage. After the satellite is launched, raw spectrum samples may be downlinked to ground, allowing analysis algorithms to be developed based on in-situ data. These can then be uplinked to the satellite as need be. These rapid development and adaption methods have been explored through the GOMX series of satellites, of which GOMX-3 is the latest. On GOMX-3 two different SDR platforms are flown and tested: a dedicated ADS-B signal reception payload, and a flexible L-band signal observation payload. For upcoming GOMX satellites, a wide-band SDR payload will be flown as well, which will be testing if further characteristics of the signals can be extracted in order to estimate the origin of the signal. In this paper we present: the main structure of the SDR platform along with its attached front end modules, how the SDR platform was utilized on the GOMX-3 satellite along with its in-flight obtained results, and how the payload is designed to be used on future GOMX satellites.