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COMMUNICATION NETWORK IN LEO: IN-ORBIT VERIFICATION OF INTERSATELLITE LINK
BY NANOSATELLITE CLUSTER S-NET

Abstract

As one of the first nanosatellite missions ever, S-Net could successfully demonstrate multihop inter-satellite communication in orbit in S-Band frequency. The S-Band Network for Co-operating Satellites (S-Net) is a cluster of four nanosats developed by the Technische Universität Berlin (TUB) and successfully launched in 2018 from Vostochny cosmodrome. S-Net is designed to verify an S-band transceiver developed by the company IQ wireless and TUB and furthermore test the communications architecture for distributed nanosats developed by the TUB. Networked swarms of small satellites provide new opportunities for a large range of missions including data collection with distributed sensors, disaster monitoring or machine-to-machine communication. This paper describes the in-orbit results of the communication network architecture of the mission S Net. Three different approaches for the organization of a reliable inter-satellite networking are discussed. The first one is based on token passing through the small cluster and comes without a central spacecraft collecting the data from other nodes and distributing them. The second one is the approach with a central node and the third in a de-centralized architecture with a random access. All three architectures are based on the same physical layer with 0.5 W RF power, adaptive modulation and coding (AMC) and the same data layer protocol stack, both implemented as a digital radio in a compact single unit with a weight of approximately 0.5 kg. Furthermore, the problems of routing and antenna pointing for the mission are addressed. Finally, future work based on S-Net is discussed.