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Design of a Telemetry, Tracking, and Command Radio-Frequency Receiver for Small Satellites Based on Commercial Off-The-Shelf Components

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Abstract : From several years till now the aerospace industry is developing more and more small satellites for Low-Earth Orbit (LEO) missions. Such satellites have a low cost of making and launching since they have a size and weight smaller than other types of satellites. However, because of size limitations, small satellites need integrated electronic equipment based on digital logic. Moreover, the LEOs require telecommunication modules with high throughput to transmit to earth a big amount of data in a short time. In order to meet such requirements, in this paper we propose a Telemetry, Tracking & Command module optimized through the use of the Commercial Off-The-Shelf components. The proposed approach exploits the major flexibility offered by these components in reducing costs and optimizing the performance. The method has been applied in detail for the design of the front-end receiver, which has a low noise figure (1.5 dB) and DC power consumption (smaller than 2 W). Such a performance is particularly attractive since it allows fulfilling the energy budget stringent constraints that are typical for LEO small platforms.

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