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Author: Mr. Adam Crifasi
Johns Hopkins University Applied Physics Laboratory, United States, adam.crifasi@jhuapl.edu

ADAPTIVE DATA RATE FEATURE ON JHU APPLIED PHYSICS LABORATORY FRONTIER RADIO LITE

Abstract

The Frontier Radio Lite Software Defined Radio is derived from the Frontier Radios flown on Van Allen Probes (VAP), Parker Solar Probe (PSP), and Emirates Mars Mission (EMM), with streamlining applied to the hardware platform to reduce it to a single card form factor while retaining the same flight qualified modem design and parts selection. Waveforms for both near-Earth and deep space applications have been flight qualified and successfully used on the VAP, PSP, and EMM missions in both S-band and X/Ka-band variants. DAVINCI will leverage the near-Earth, S-band waveform variant, with enhancements specific to the relay application; prior usage scenarios were constrained to direct-to-Earth communications. The Frontier Radio Lite on DAVINCI will perform as a relay link between two deep space assets, the orbiting spacecraft and descent sphere, to study the atmosphere of Venus. To support the DAVINCI mission, an adaptive data rate (ADR) algorithm has been incorporated to maximize science return link potential through the relay. The ADR method is employed to maximize data return, increase link reliability, and simplify the descent sphere autonomous functionality (i.e. complexity). ADR allows for more data return on a "good day" by increasing symbol rate, as well as increasing link reliability on a "bad day" by decreasing symbol rate. This text will describe the purpose, platform, design, and test results of the ADR feature on the APL Frontier Radio.