

IAF SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
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DEVELOPMENT OF DVB-S2 SMALL SATELLITE TRANSMITTER: AN USE CASE FOR
REAL-TIME VIDEO

Abstract

The ETSI DVB-S2 telecom standard was developed with the views of achieving high power and bandwidth efficiency. It makes use of advanced modulation and coding techniques to deliver performance that approaches the theoretical limit of the radio channel. It is also being recommended by CCSDS as a solution for High Data Rate Telemetry (HDRT) applications, and it offers desirable features like the ability to provide adaptive coding and modulation. Alén developed a DVB-S2 transmitter implementation based on TOTEM, its software defined radio designed for small satellites.

In this communication we analyze a scenario for the use of this transmitter in a small LEO satellite with payloads that demand high data rates. An example of such an application is real-time video forwarding from an on-board camera for Earth observation purposes. Being a mature technology in the satellite broadcasting industry, the use of DVB-S2 receivers developed for the mass market in the Ground Station provide very competitive costs.

Using some low rate return channel, the receiving side can instruct the transmitter to change the modulation and coding on the fly. By combining this with some metric for the quality of the received signal (such as signal-to-noise ratio), we gain the ability to adapt to the channel conditions and maximize the available throughput along the pass. Due to the nature of this adaptive channel, and using some kind of video encoder, the video quality could also match the link capacity at any given time.

The transmitter also provides the ability to aggregate multiple streams into one single RF carrier. In this use case one stream is reserved for the main payload data, and additional streams can be enabled to transfer other traffic like housekeeping telemetry. Other scenarios may deal with joint traffic from different payloads using the same transmitter. These streams can have different priorities or capacity partitioning schemes.