

Design and Implementation of the Full Spectrum Recorder and Full Spectrum Combiner

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The Full Spectrum Recorder (FSR) and Full Spectrum Combiner (FSC) are key components of the Deep Space Communication Complex Galileo Telemetry system (DGT). The DGT will array antennas from both the Goldstone, California and Canberra, Australia Deep Space Network sites to enhance the data return from the Galileo spacecraft in the **face of the failed high** gain antenna. Each FSR will record data on disk and tape from one antenna in the array for subsequent processing. The FSR digitizes the incoming analog signal at 256 megasamples per second with 8-bit resolution and applies a delay to compensate for differences in arrival times at the antennas. Up to 16 frequency windows up to 10 kilohertz wide can be selected for recording. In the DGT, nine windows will be used to record the carrier and four subharmonics of the telemetry from Galileo. The recording loss is expected to be no more than 0.4 dB.

The FSC will receive streams of data from up to seven FSRs. The FSC determines the differential frequency and phase as well as residual delay of each stream relative to a reference stream. It applies the appropriate corrections to each stream and coherently **adds** them to **produce** one combined output stream. The loss due to combining is expected to be no more than 0.1 dB.

This talk will describe the design and implementation of the FSR and FSC. A demonstration will show spectra taken by the FSR in trial runs with the Galileo spacecraft as well as the corresponding spectra after combining in the FSC.