GALILEO TELECOM LINK AND ITS APPLICATION TO FUTURE MISSIONS

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Abstract

Driven by the needs of the Galileo mission, JPL has developed a telecommunications link design and the corresponding ground equipment that offer multiple techniques (arraying, *error-correcting coding, dafa compression, etc) to maximize the data return,* while applying *automation to minimize the complexity and cost of operations. The design* and *the equipment are especially suitable for the era of Discovery and Millennium missions where there is severe pressure to reduce both the spacecraft cost (e.g. antenna size* and transmitter *power) and operations cost.*

After the Galileo High Gain Antenna (HGA) failed to *deploy in April 1991, JPL has completely redesigned the telemetry downlink to provide* a *viable mission, based on Galileo's S-band, Low-Gain Antenna. The redesign required extensive changes in the DSN facilities in Goldstone (USA), Tidbinbilla (Australia) and Robledo (Spain) and at the Parkes Observatory in Australia, as well as new uploads* of Galileo's on-board *software. The DSN/Parkes upgrades include increasing the* antenna sensitivity, adding wide-area *arraying bet ween the Goldstone 70 m antenna, the Tidbinbilla 70 m and 34 m antennas and the Parkes 64 m antenna, installing new error-correcting coding, and providing the infrastructure to ensure gap-free, guaranteed delivery, telemetry processing. At the same time, Galileo has developed extensive on-board data editing and compression capabilities. Together, The DSN/Parkes and* Galileo *upgrades* increase *the* raw *down/ink volume by a factor of 10, and its value by another factor of 10, resulting in Galileo meeting 70% of the original science goals, The DSN/Parkes* equipment, denoted *DSCC Galileo Telemetry Subsystem or DGT, was validated at JPL and installed at the DSN/Parkes facilities. /t already has provided some "firsts", such as the first full-spectrum arraying of telemetry data, intercontinental/ arraying.*

Two key DGT features that would benefit the Discovery and Millennium missions are the recovery of pre-acquisition data and the availability of digitally-recorded full-spectrum replicas of the signal for later processing. The former is especially important to short missions (balloons, penetrators) - it eliminates the telemetry loss during the acquisition/locking of the receiving equipment. The latter enables a '{second chance" at recovering the data, if any equipment failures prevent the first attempt. Finally, the DGT operates from an IF input and is compatible *with missions at S-, X- or Ka-bands.*

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