

SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)  
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A TT&C SCHEME AND IN-ORBIT VERIFICATION OF HIGH ORBIT SATELLITE WITH DOUBLE  
CHANNEL OF DIFFERENT ROTATION AND DIFFERENT FREQUENCY ANTENNA ARRAY

**Abstract**

For TT&C system of high orbit satellite, full space coverage of TT&C antenna and almost 1Mbps high speed telemetry data transmission are not taken into account simultaneously. For the problem, a simple and reliable TT&C scheme with double channel of different rotation and different frequency antenna array is presented. It has two channels, each channel is independent, the master antenna transceiver of each channel is designed. There is no shared equipment between two channels, and the reliability of system is increased. One channel used the left-hand circularly polarized antenna towards the earth, and the right-hand circularly polarized antenna towards the space. The other channel used the right-hand circularly polarized antenna towards the earth, and the left-hand circularly polarized antenna towards the space. The two antennas of each channel is not interference with each other. The synthesis antenna gain map of two antennas of each channel is full space coverage. With the uplink budget and downlink budget and the attitude in-orbit of satellite, high-speed telemetry data and low speed telemetry data is switched, and TT&C function is realized. The main performance indicators of TT&C system is analyzed, including cross polarization isolation of satellite TT&C antennas, transceiver isolation of each channel, G/T, EIRP. The synthesis antenna gain map of two antennas of each channel is analyzed. The TT&C system scheme is verified in an IGSO satellite. The full space beam coverage of antennas and the switch of high-speed telemetry data and low speed telemetry data of the satellite are verified on the transfer orbit and on operation orbit. The results show that the scheme is feasible, the function in-orbit is good. It can be referenced for intimate engineering applications.