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ISRO Satellite Centre (ISAC), India, kesava@isac.gov.inLINK LOSS RECOVERY STRATEGY USING SUN SENSOR AND BEACON SIGNAL IN MARS
ORBITER MISSION**Abstract**

Mars Orbiter Mission is India's first Interplanetary Mission launched in November ,2013 and aimed to reach MARS in September ,2014. Mars Orbiter Mission carries two antennas Medium Gain Antenna(MGA) with field of View of 40o and one High Gain Antenna(HGA) with field of view of 2o . The nominal attitude of spacecraft ensures Earth Pointing and continuous link with the ground station. During any anomaly with respect to Link-loss , spacecraft enters SAFE mode and the recovery is executed by onboard computer in an autonomous way . There are two paths of recovery . The first path uses Star sensors , gyros and onboard loaded reference attitude(Earth pointing attitude) to re-establish the link with HGA. But in case of unavailability of Star Trackers updates , the alternative path uses Sun Sensor and the Beacon Signal from Ground to re-establish the attitude pointing and henceforth the communication with larger FOV antenna i.e. MGA. This paper discusses about the methodology involved in Using Sun Sensor and limited FOV antenna to re-establish the communication link. Sun and Earth Geometry During Cruise Phase During the Cruise Phase i.e. heliocentric orbit phase of Mars Orbiter Mission , Sun and Earth Angle at spacecraft varies with the minimum of 14 0 to the maximum of 110 degrees. Methodology to Re-establish Communication Link Once the spacecraft enters SAFE Mode , the acquisition process starts with Sun-Acquisition Using Sun-Sensors , wherein the Sun is aligned along a selected axis-direction depending upon the relative separation of Earth and Sun at that instant . The direction about which Sun should be aligned is stored in EEPROM memory area. After the completion of Sun-Acquisition , the spacecraft is made to rotate about the Sun-Line (Earth Search Mode) in order to bring Earth Pointing Vector within the FOV of MGA). MGA is mounted in positive roll and positive yaw quadrant at an angle of 35 degrees from roll towards yaw. During the link-loss , ground station doesn't receive any telemetry and it starts sending the Beacon Signal towards the spacecraft direction. Once the onboard receives the signal from ground , the search rate is brought to zero and the attitude is held at the current orientation which enables continuous communication with the spacecraft and hence acquires the spacecraft to its nominal attitude