

# **Single-event and total-dose effects in geo-stationary transfer orbit during solar-activity maximum period measured by the Tsubasa satellite**

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The Tsubasa satellite developed by the Japan Aerospace Exploration Agency was launched in Feb. 2002 into Geo-stationary Transfer Orbit (GTO, Perigee:500km, Apogee:36000km), and had been operated well until Sep. 2003. The objective of this satellite was to verify the function of commercial parts and new technologies of bus-system components in space. Thus, the on-board experiments were conducted in the more severe radiation environment of GTO rather than in Geo-stationary Earth Orbit (GEO) or Low Earth Orbit (LEO). The Space Environment Data Acquisition equipment (SEDA) on board the Tsubasa satellite had the Single-event Upset Monitor (SUM) and the DOSimeter (DOS) to evaluate influences on electronic devices caused by radiation environment, that was also measured by the particle detectors of the SEDA; the Standard DOse Monitor (SDOM) for measurements of light particles, and the Heavy Ion Telescope (HIT) for measurements of heavy ions. The SUM monitored single-event upsets and single-event latch-ups occurred in the test sample of two 64-Mbit DRAMs. The DOS measured accumulated radiation dose at fifty-six locations in the body of the Tsubasa satellite. Using the data obtained by these instruments, single-event and total-dose effects in GTO during solar-activity maximum period, especially their rapid changes due to solar flares and CMEs, in the region from L=1.1 through L=11 is discussed in this paper.