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FAULT-TOLERANT MODULAR SENSOR ELECTRONICS TO PERFORM LONG-TERM MEASUREMENTS WITH SMALL SATELLITE REMOTE SENSING INSTRUMENTS

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Single event effects generated by ionizing radiation cause a variety of problems inside satellites up to mission failures. In case of COTS-based nanosatellites, much effort has to be invested in mitigation measures and redundancy concepts. Increasingly, longer mission durations are targeted for imaging instruments used as remote sensing devices, e.g., to observe long-term climate processes. Highly integrated System-on-Module (SoM) architectures enable high processing performance for imaging applications with low resource requirements in terms of power and mass. The major advantages of these architectures are flexibility, (re)programmability, modularity and module reuse. In order to achieve a fault tolerant design we modeled the radiation environment, estimating the hazards at module level with the objective to reduce the risks to an acceptable level by applying appropriate mitigation techniques. This approach results in an electronics design that combines hardware and software redundancies paired with reconfiguration strategies to assure system availability and reliability for mission lifetime longer than 3 years in Low-Earth-Orbits (LEO). In this contribution, we will present a dual-imager electronics that uses an SRAM-based Xilinx Zynq-7000 architecture, which can accommodate a wide variety of imaging sensors in visible and near infrared spectral range and is part of a

limb sounding spatial heterodyne interferometer to measure temperatures in the atmosphere. This instrument is scheduled for the Atmospheric Coupling and Dynamics Explorer (ARCADE) mission inside the International Satellite Program in Research and Education (INSPIRE) series of satellites.