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DEVELOPMENT OF MINIATURIZED INTEGRATED AVIONICS PACKAGE FOR SMALL SATELLITES

Abstract

Satellite technology has changed drastically since first satellite was launched around 65 years ago, and the change is the steepest right now. The growing demands in earth and space monitoring, the Internet of Things (IoT), communication, asset monitoring, science, and environmental needs, etc. are driving space technology faster than ever. For a long time, satellite design, manufacturing, and operations were mainly controlled by state-run organizations, but the condition has gradually shifted, and more and more private players are in the business now. The growing demand for satellites has led to a change in the satellite design architecture and smaller satellites are leading the demand for space. The evolution of technology and the emergence of small satellites have meant that start-ups, SMEs, large companies, and emerging countries can affordably reach space and within short periods, be in a position to compete with traditional players in the sector. The paper covers the development of a satellite avionics system that offers a low Size, Weight, and Power consumption (SWaP) system to support small satellites of 50 Kg to 150 Kg. The system may be scaled to support bigger satellites and interplanetary missions. The development is combing the functions of an On-Board Computer (OBC), Baseband Data Handling (BDH), Solid State Recorder (SSR), Telemetry and Tele-Command system (TTC), Satellite Positioning System (SPS), and RF payload Data Transmission System (DTs) in a single system. The RF system is configured to support up to ten chains (4 transmitters and 6 Receivers), with each chain supporting any frequency between 600 MHz to 12 GHz. The development is resulting in a Size and Weight reduction of more than 80% with a considerable reduction in power consumption. Triple Modular Redundancy (TMR) is implemented for critical systems. A radiation Hardened device with space heritage RTX2000 is used for system monitor and scrubbing purposes. The system is highly configurable with the software interfaces. The system interfaces are made expandable by adding additional cards. Off-the shelf-devices with Space Enhanced Plastics (SEP) are used to reduce the turnaround time and cost of the system improving the performance specifically in the RF domain. The system is being developed in synergy with the industry to meet the growing demands and bridge the barrier to entry in the space sector for private players.