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Ionizing radiation test results for an automotive microcontroller on board the Schiaparelli Mars lander

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The Finnish Meteorological Institute (FMI) has delivered a pressure and a humidity instrument for the ESA ExoMars 2016 Schiaparelli lander mission. Schiaparelli is scheduled to launch towards Mars with the Trace Gas Orbiter on 14th of March 2016. The DREAMS-P (pressure) and DREAMS-H (Humidity) instruments are operated utilizing a novel FMI instrument controller design based on a commercial automotive microcontroller (MCU). A custom qualification program was implemented to qualify the MCU for the relevant launch, cruise and surface operations environment of a Mars lander. Resilience to ionizing radiation is one of the most critical requirements for a digital component operated in space or at planetary bodies. Thus, the expected Total Ionizing Dose accumulated by the MCU was determined and a sample of these components was exposed to a Co-60 gamma radiation source. Part of the samples was powered during the radiation exposure to include the effect of electrical biasing. All of the samples were verified to withstand the expected total ionizing dose with margin. The irradiated test samples were then radiated until failure to determine their ultimate TID.