Microprocessor and flash memory are the essential parts of any digital system. Digital systems are important to the technological advancements in space exploration. The space exploration requires a special class of radiation hardened microprocessors and flash memories, which are not functionally disrupted to radiation present outside the earth's atmosphere. The reference design ‘HERMES’ is a radiation-hardened microprocessor with the performance comparable to commercially available designs. The reference design ‘eFlash’ is a prototype of radiation-hardened by design (RHBD) flash memory for configuring Xilinx FPGAs. These designs are manufactured at 90-nm low-power bulk CMOS process from TSMC. This thesis presents the post-silicon validation results of these designs.