the DMM to read voltage. The operator places the heated tip of the soldering iron onto the metal tab with a small amount of solder to ensure a complete connection. The voltage is read and recorded. The operator switches the DMM to read resistance. The operator places the heated tip of the soldering iron onto the metal tab with a small amount of solder to ensure a complete connection. The resistance is recorded. If the recorded voltage and resistance are below a number stated in ESDA ESD STM 13.1-2000, the test is considered to pass.

The device includes all the necessary wiring internal to its body so the operator does not need to do any independent wiring, except for grounding. It uses a stack of high-thermal-resistance washers to minimize the heat transfer from the soldering iron to the wiring used to measure the resistance and voltages. This minimizes thermal error.

The device allows very rapid execution of a test that is performed frequently.

This work was done by José Sancho and Robert Esser of Goddard Space Flight Center. Further information is contained in a TSP (see page 1). GSC-16611-1

FPGA-Based X-Ray Detection and Measurement for an X-Ray Polarimeter

Goddard Space Flight Center, Greenbelt, Maryland

This technology enables detection and measurement of x-rays in an x-ray polarimeter using a field-programmable gate array (FPGA). The technology was developed for the Gravitational and Extreme Magnetism Small Explorer (GEMS) mission. It performs precision energy and timing measurements, as well as rejection of non-x-ray events. It enables the GEMS polarimeter to detect precisely when an event has taken place so that additional measurements can be made. The technology also enables this function to be performed in an FPGA using limited resources so that mass and power can be minimized while reliability for a space application is maximized and precise real-time operation is achieved.

This design requires a low-noise, charge-sensitive preamplifier; a high-speed analog to digital converter (ADC); and an x-ray detector with a cathode terminal. It functions by computing a sum of differences for time-samples whose difference exceeds a programmable threshold. A state machine advances through states as a programmable number of consecutive samples exceeds or fails to exceed this threshold. The pulse height is recorded as the accumulated sum. The track length is also measured based on the time from the start to the end of accumulation. For track lengths longer than a certain length, the algorithm estimates the barycenter of charge deposit by comparing the accumulator value at the midpoint to the final accumulator value. The design also employs a number of techniques for rejecting background events.

This innovation enables the function to be performed in space where it can operate autonomously with a rapid response time. This implementation combines advantages of computing system-based approaches with those of pure analog approaches. The result is an implementation that is highly reliable, performs in real-time, rejects background events, and consumes minimal power.

This work was done by Kyle Gregory, Joanne Hill, and Kevin Black of Goddard Space Flight Center, and Wayne Baumgartner of the University of Maryland. For further information, contact the Goddard Innovative Partnerships Office at (301) 286-5810. GSC-16367-1

Sequential Probability Ratio Test for Spacecraft Collision Avoidance Maneuver Decisions

Goddard Space Flight Center, Greenbelt, Maryland

A document discusses sequential probability ratio tests that explicitly allow decision-makers to incorporate false alarm and missed detection risks, and are potentially less sensitive to modeling errors than a procedure that relies solely on a probability of collision threshold. Recent work on constrained Kalman filtering has suggested an approach to formulating such a test for collision avoidance maneuver decisions: a filter bank with two norm-inequality-constrained epoch-state extended Kalman filters. One filter models the null hypotheses that the miss distance is inside the combined hard body radius at the predicted time of closest approach, and one filter models the alternative hypothesis. The epoch-state filter developed for this method explicitly accounts for any process noise present in the system. The method appears to work well using a realistic example based on an upcoming, highly elliptical orbit formation flying mission.

This work was done by J. Russell Carpenter and F. Landis Markley of Goddard Space Flight Center. For further information, contact the Goddard Innovative Partnerships Office at (301) 286-5810. GSC-16333-1.