ANALYSIS METHODS
A. PROTON ANALYSIS
To analyze the proton data, the SEE are grouped by type, frequency and severity. The errors are counted and inputted into a program called PROTEST [3]. PROTEST derives the equivalent 10 year MTBF for the hardware. This software integrates the test data with the LEO radiation environment defined above. It typically assumes worst-case environmental conditions, with 0.1 inch shielding around the device to give a conservative result. The output of PROTEST is the calculated Mean-Time-Between-Failure (MTBF), rate expected for operating the hardware in LEO orbit (expressed in terms of days between failures). An MTBF is calculated for each beam position, as well as for an entire test. These results estimate the hardware is operating continuously-on-orbit and does not take into account the actual mission timeline in which it will be used. For those devices that show no SEE failures in a typical 1E+10 exposure, we estimate end of life. These calculations end the part’s lot-date code, the host board circuit design, DUT setup, and test software used. The duty cycle, input/output signals, and DUT resource utilization are directly related to the device’s SEE performance. As NASA continues to develop plans for returning to deep space, new radiation-related challenges exist. Mission durations will be longer and the radiation environments are harder and the electronics used will therefore need to be more reliable, fault-tolerant, and autonomous. The JSC Radiation Effects Team has implemented changes to our current test philosophy and analysis methods in order to meet this challenge.

CONCLUSIONS
Presented in this body of work is a small summary of the ongoing testing the NASA-JSC Radiation Effects Group has tested over the past years. We frequently test many commercial microelectronic devices, boards and assemblies for short-term use in LEO applications. Actual on-orbit radiation performance obtained has also been very consistent with our proton-based predictions. Caution must be used in interpreting these results as the data we measured is very dependent on the part’s lot-date code, the host board circuit design, DUT setup, and test software used. The duty cycle, input/output signals, and DUT resource utilization are directly related to the device’s SEE performance. As NASA continues to develop plans for returning to deep space, new radiation-related challenges exist. Mission durations will be longer and the radiation environments are harder and the electronics used will therefore need to be more reliable, fault-tolerant, and autonomous. The JSC Radiation Effects Team has implemented changes to our current test philosophy and analysis methods in order to meet this challenge.