Additional Publications

Adams, James. H., Zachary D. Robinson, Joseph H. Nonnast, Jonathon H. Fisher, Hope, D. M., **Zachary B. Lane,** et al. (2020). The SIRE2 toolkit. *Space Weather*, 18, doi:10.1029/2019SW002364.

Abstract
The Space Ionizing Radiation Environment and Effects (SIRE2) toolkit has been developed to update and extend the tools used by the space and radiation effects community. It includes new environment models, the capability to examine how the environment changes along satellite and other trajectories and batch processing capabilities for both environments and radiation effects on electronics. An overview of the capabilities in the SIRE2 Toolkit is provided, and examples of applying SIRE2 to satellite orbits and arbitrary trajectories are given.

Robinson, Zachary D., James H. Adams, Jonathon H, Fisher, Joseph H. Nonnast, & David C. Terry, (2020). Mission Specific Solar Radiation Environment Model (MSSREM): Peak Flux Model. *Space Weather*, 18, doi:10.1029/2019SW002361.

Abstract
Coronal mass ejections and solar flares can accelerate high fluxes of energetic particles. Depending on where this solar activity occurs on the sun, these outward moving particles can reach the Earth and enter the Earth's magnetosphere. They can also strike manmade objects in space. If the electronics in space are not protected from these energetic particles, they can cause the spacecraft to reboot, go into “safe mode,” have other anomalies, or cause catastrophic damage and loss of the mission. To protect the mission, the user can employ one or more mitigation strategies. The user may choose to add shielding, choose parts less prone to radiation effects, and/or mitigate by design. Implementing any of these strategies adds cost to the mission, so it is important to frame the design for the purpose of survival in a reference environment, which is severe enough to provide the desired confidence of mission success, but not more. For this reason, models have been developed that construct a design reference environment tailored to a specific mission. In this paper, the Mission Specific Solar Radiation Environment Model (MSSREM) peak flux model will be discussed. MSSREM uses probabilistic modeling techniques to build a design reference environment that can be tailored to a user specified mission start date, mission duration, and confidence level. The model can be run for any space mission outside the Earth's magnetic field and 1 AU from the sun during the years 1953–2055.

Tostanoski, M.J., T. F. Deaton, R. E. Strayer, **Rudolf Goldflam** and T. Z. Fullem, "Neutron Induced Single Event Upset (SEU) Testing of Static Random Access Memory (SRAM) Devices," *2014 IEEE Radiation Effects Data Workshop (REDW)*, Paris, France, 2014, pp. 1-8, doi:10.1109/REDW.2014.7004579.

Abstract
Results of neutron induced single event upset (SEU) testing of two Synchronous Burst Static Random Access Memory (SRAM) devices, the Galvantech GVT71128G36 128K x 36 and the

GSI GS816273CC 256K x 72, and the internal RAM (iRAM) in the Texas Instruments SM32C6713BGDPA20EP Digital Signal Processor (DSP) are described. Four samples of each device type were irradiated with a 14-MeV neutron source, with and without a polyethylene moderator. The units were irradiated using a continual read/write correct loop using several bit patterns. All units-under-test were operated during irradiation using the respective operating datasheet supply potential. It is noted that one of these devices exhibited a large low energy (<; 1MeV) neutron cross section.

Fisher, Jonathan H., David C. Newlander, Richard D. Horton, et al. (2012). Radiochromic film measurement of spatial uniformity for a laser generated x-ray environment. *Review of Scientific Instruments*, 83(10):10E137. doi: 10.1063/1.4746811.

Abstract

An existing x-ray source application (XRSA) test cassette was modified to hold multiple x-ray filter materials followed by two radiochromic film types (FWT-60 and HD-810 Gafchromic® film) to qualitatively characterize the spectral-spatial uniformity over the XRSA sample field of view. Multiple sets of film were examined, and nominal set was determined. These initial, qualitative measurements suggest a low-energy regime (E < 3 keV) spatial anisotropy and spatial isotropy at higher energies (E > 3 keV).

Doughty, Kathryn & **Rudolf Goldflam**. (2008). Testing of Transient Radiation Noise Subtraction Using a Commercially Available 3-Color Visible Detector. 37.

Abstract

Description of testing of commercial Foveon 3-color device for total dose radiation hardness as well as the technology's suitability for use of Self-Referential Transient Suppression (SRTS) radiation mitigation techniques. The detector was shown to be hard to 100KRads total ionizing dose. The results of tests as a radiation mitigation device showed excellent agreement with predictions and indicate that modification of the structure to optimize mitigation parameters will lead to a device that can perform in high radiation flux and fluence environments.

Miller, K.B. & **Kathryn L. Doughty** (2004). Advanced charge injection devices for space instruments. *Proc. SPIE 5167, Focal Plane Arrays for Space Telescopes*. doi:10.1117/12.508491

Abstract

Charge Injection Devices (CIDs) have historically played a niche role in visible imager technologies, mainly for applications requiring high radiation tolerance. They have not exhibited the radiometric performance of competing visible- imaging technologies such as CCDs, and so have not been widely applied to space instrument systems. Recent advances in CIDs have demonstrated much higher radiometric performance as well as lower noise operation, without compromising the radiation tolerance of the devices, making the devices suitable for a wide range of space instruments. We present radiometric, noise, and radiation response data for

several of the newest CID designs that are candidate technologies for visible space telescope systems.

Nonnast, J.H., Tostanoski, M.J., & **Rudolf Goldflam** (2002). TDAT: a test data analysis tool for near-real-time and batch processing of infrared focal plane data. *Photonics for Space Environments VIII.* doi:10.1117/12.453518

Abstract

The number of defensive and reconnaissance systems requiring infrared focal plane arrays (IRFPAs) has steadily increased over the last few years. These missions require operation of the IRFPAs through nuclear environments both manmade and natural. The Mission Research Corporation Longmire Laboratory was formed to support electro-optic testing of these IRFPAs and other devices such as visible CCDs and FPAs, and IR and visible optical components. Early on, it was found that it would be desirable to possess a real-time analysis capability for all test data collected in the laboratory. Without a real-time, or near real-time analysis capability, a significant number of resources can be lost collecting large quantities of erroneous data. A real-time capability has yet to be achieved, but a near real-time capability, TDAT (Test Data Analysis Tool) has been developed and has been in use at Longmire Laboratory for the past year. TDAT has been developed entirely in-house in the Borland Delphi programming language. This allows for rapid modifications to the code's capabilities when needed by laboratory users.