

18th International School on the Effects of Radiation on Embedded Systems for Space Applications (SERESSA)

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Single-Event Effect Criticality Analysis

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In July 2021, the NASA Engineering and Safety Center released Avionics Radiation Hardness Assurance (RHA) Guidelines, which included an update for a methodology called Single-Event Effects Criticality Analysis (SEECA)¹. SEECA was originally developed by NASA in the mid-1990s and offers a methodology to identify the impact of single-event effects (SEE) on mission, system, and subsystem reliability². It provides guidelines for the assessment of SEE-induced failure modes or impacts throughout a mission's concept of operations. Techniques like SEECA are increasingly important for successful use of complex embedded devices in space systems.

This presentation will guide when and how to use SEECA for verification of availability, performance, schedule, and cost risk associated with SEE for a chosen environment throughout the design process. SEECA may be used in determining the severity of faults caused by SEEs, accounting for criticality of functions performed, and identifying when to design for SEE tolerance. A completed SEECA is a tool for radiation tolerant design, requirements generation for SEEs, design verification, and requirements validation. This presentation will describe SEE hazards and suggest how to use a SEECA to categorize these threats from a systems perspective for active design trades.

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