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Talk 1: Investigation of Fundamental Mechanisms of Single Event Effects with Heavy-Ion Microbeam Testing

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Abstract:

Heavy-ion microbeam testing offers unique capabilities for exploring the fundamental mechanisms of single-event effects (SEEs) in electronic devices. This method utilizes a beam focused to a diameter of less than 1 µm to irradiate specific regions on the surface of the device selected by an optical microscope directly installed in the vacuum chamber.
The dimensions of the scanned area, the number of total ions, and the distance among them are adjustable, enabling micron-accurate localization of radiation-sensitive regions. This level of spatial resolution surpasses that of broad-beam testing, providing invaluable insights for a deeper understanding of the basic mechanisms of SEEs.
This presentation introduces commonly used microbeam testing facilities, discussing both the benefits and challenges associated with this methodology [1-3]. Essential considerations for users regarding setup and testing procedures are also compared to those of standard broad-beam testing with heavy ions.
As a case study, the results of microbeam testing on SiC power devices are presented, demonstrating the effectiveness of this methodology in exploring SEEs [4]. Furthermore, the discussion extends to the relevance and applicability of the microbeam testing across various electronic components.

CV:

Corinna Martinella received the MSc degree in Nuclear Engineering at Politecnico di Milano, Italy in 2016. In 2021, she obtained the PhD degree in Applied Physics from the University of Jyväskylä, Finland in the framework of a collaboration with the R2E project at CERN and the Advanced Power Semiconductor (APS) Laboratory at ETH Zurich. Her research was devoted to radiation effects and reliability of commercial SiC power devices for high-energy physics, space and avionic applications. In particular, she focused on the single event effects (SEEs) mechanisms investigating the root cause of the radiation damage. She is currently employed at the APS Laboratory at ETH Zurich as a Senior Scientist and Lecturer of Power Semiconductor. Her technical interests include testing and modeling of radiation effects in power devices (SEE, TID and DD), reliability and failure analysis, investigation of radiation-induced defects in SiC using different spectroscopy analysis, and exploration of doping techniques for the next generation of power devices.

Presenter: MARTINELLA (ETH ZURICH), Corinna (ETH Zurich - APS Laboratory)

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