JOB POSTING: Postdoctoral Position in Plasma CVD of Materials

Fraunhofer USA CMW and Michigan State University (MSU), in East Lansing, MI, is looking for a postdoctoral research candidate with a Ph.D. in Electrical Engineering, Materials Science and Engineering, or a related discipline, for a project related to radiation-hardened microelectronic chips for space communciations.

In particular, we seek a candidate with experience in microwave plasma assisted chemical vapor deposition (MPACVD) of thin film materials such as polycrystalline diamond (PCD) for thermal management layers in GaN-based transistor devices. Cleanroom experience is a plus.

Interested candidates should send a CV to Dr. Matthias Muehle at Fraunhofer USA CMW (mmuehle@fraunhofer.org). A brief summary of the overall project is included below. Information about Fraunhofer USA CMW can be found here.

Radiation-Hardened Phased Array Technology For 6G Non-Terrestrial Networks

The use of higher performance phased arrays to support future 5G and 6G mobile network technology standards is a growing trend in the space-based communications market. This shift involves replacing vacuum tube amplifiers with microelectronic chip amplifiers that outperform the current systems, but adapting them for the harsh environment of space presents challenges. This project addresses two significant barriers: thermal management and radiation tolerance.

“Despite the coldness of space, phased arrays with over a thousand amplifiers generate heat that is difficult to dissipate without adding the extra weight of complex heatsinks, which is not practical for spacecraft,” said **Dr. Matthew Hodek**, Assistant Professor, Electrical and Computer Engineering (ECE), College of Engineering.

A buildup of heat can affect the transistors’ tolerance to high-energy particles from the sun and other cosmic bodies, making them more susceptible to single event effects (SEE) that disrupt space communications or even end multi-billion-dollar space missions. However, incorporating a diamond layer beneath a transistor body could help dissipate heat and effectively trap radiation-induced charges, protecting the sensitive transistors.

“While the thermal and electrical properties of large single crystal diamonds (SCD) are attractive, they’re difficult to process and integrate with electronics,” Hodek explains. “Polycrystalline diamond (PCD) membranes combine the material benefits of diamond with manufacturing scalability, making them ideal for space applications.”

The project aims to refine the processing and polishing of PCD membranes to create suitable surfaces for interfacing with thinned gallium nitride (GaN) transistors, develop amplifier circuits by integrating these transistors with other electrical components to efficiently amplify radio frequency (RF) signals, and assess the radiation performance of the devices by testing their sensitivity to radiation exposure. It leverages recent advances in PCD membranes by MSU and Fraunhofer USA, as well as the new SEE space electronics testing facility being built on campus. These advances will position the University as a leader in advanced space communication technologies.