

Monday Evening, November 4, 2024

Plenary Lecture

Room Ballroom B - Session PL-MoE

Plenary Lecture

Moderator: Mark Engelhard, Pacific Northwest National Laboratory

5:30pm **PL-MoE-1 Advancing Measurement Science for Microelectronics: CHIPS R&D Metrology Program, Marla Dowell**, NIST CHIPS Metrology Program **INVITED**

Metrology plays a key role in semiconductor manufacturing. As devices become more complex, smaller, and multi-layered, the ability to measure, monitor, predict, and ensure quality in manufacturing becomes much more difficult and uncertain. For example, modern chips may contain over 100 billion complex nanodevices that are less than 50 atoms across—all must work nearly identically for the chip to function. Today, the semiconductor industry faces some of these metrology challenges with workarounds and inadequate tools, limiting production yields, impacting quality, and increasing costs. As greater demands are put on semiconductor device performance and material requirements, these challenges will continue to intensify.

The 2022 NIST Report *Strategic Opportunities for U.S. Semiconductor Manufacturing* identified seven grand challenges that if overcome will support increased production, innovation, and competitiveness in the domestic semiconductor industry. The CHIPS Metrology Program has aligned its R&D portfolio with these grand challenges, emphasizing measurements that are accurate, precise, and fit-for-purpose to produce microelectronic materials, devices, circuits, and systems.

This work leverages NIST's proven measurement science expertise, foundational communications and computing research capabilities, standards development contributions, and stakeholder engagement practices to address the highest priority metrology challenges identified across industry, academia, and government agencies. This talk will highlight research activities that support measurements for materials, processing and interfaces of interest to the semiconductor research and manufacturing communities.

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