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M3Or1B-01 [Invited]: Recent Progress on Flexible Superconducting Integration Technology: Cables and Connectors

Wednesday, July 24, 2019 9:30 AM (30 minutes)

Superconducting electronics (SCE) has experienced a recent surge in popularity due to a growing expectation of their use in future high-performance computing systems. This talk will cover two main topics that are important for integration of SCE systems: (1) superconducting flexible cables and (2) cable-to-cable connectors for superconducting flexible cables. Over the past several years, we have been developing thin-film, flexible superconducting microwave transmission line cables that enable high-performance interconnections within densely-integrated cryogenic electronics systems. Rigid or hand-formable co-axial cables, which are used in present systems, are expensive, bulky and often limit the integration of a large density of input/output signals into cryogenic environments due to system constraints including volume and thermal load. I will discuss the status of our research and development efforts to construct multi-conductor superconducting flexible cables, in microstrip and stripline configurations, along with superconducting cable-to-cable connectors. These structures are fabricated using thin-film, wafer-level processing techniques and typically use Nb (or stacks of Nb with other conductors) as the superconductor and various polyimide materials as the flexible cable substrate and interlayer dielectrics. I will also discuss efforts directed at materials (superconductor and dielectric) characterization using superconducting flexible resonators in microstrip and stripline configurations, as well as challenges we have faced with characterizing superconducting transmission lines with extremely low insertion loss at multiple GHz.

Primary author: Dr HAMILTON, Michael (Auburn University)

Presenter: Dr HAMILTON, Michael (Auburn University)

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