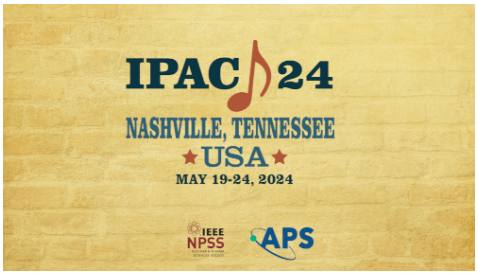

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Niobium-tin as a transformative technology for low-beta linacs

Wednesday, 22 May 2024 16:00 (2 hours)

Niobium-tin has been identified as the most promising next-generation superconducting material for accelerator cavities. This is due to the higher critical temperature (Tc = 18 K) of Nb3Sn compared to niobium (TC = 9.2 K), which leads to greatly reduced RF losses in the cavity during 4.5 K operation. This allows two important changes during cavity and cryomodule design. First, the higher Tc leads to negligible BCS losses when operated at 4.5 K, which allows for a higher frequency to be used, translating to significantly smaller cavities and cryomodules. Second, the reduced dissipated power lowers the required cryogenic cooling capacity, meaning that cavities can feasibly be operated on 5-10 W cryocoolers instead of a centralized helium refrigeration plant. These plants and distribution systems are costly and complex, requiring skilled technicians for operation and maintenance. These fundamental changes present an opportunity for a paradigm shift in how low-beta linacs are designed and operated. Fabrication challenges and first coated cavity test results are discussed.

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