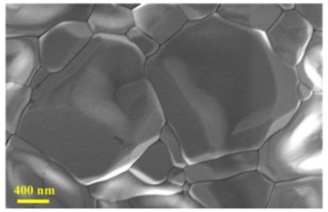
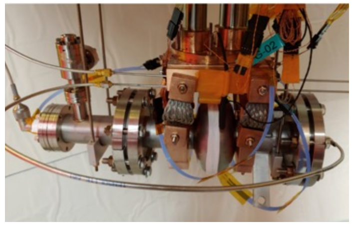
BEAM ACCELERATION Roadmap

The advanced methods and surfaces needed for next-generation SRF cavities that enable game-changing reduction of cooling power, higher temperature operation, and higher accelerating fields for lower cryogenic system costs, energy sustainability, and simpler refrigeration.

TARGET DATES: FY 22 | FY 23 | FY 24 | FY 25 | FY 26

OBJECTIVES	DELIVERABLES	APPLICATIONS
Advanced SRF materials growth: Develop improved growth methods and understand the impact of realistic (non-ideal) surfaces on performance	New and improved growth methods and alternative materials for increased cavity efficiency and operating temperature	 SEM image of a high-quality Nb_3Sn film, showing individual grains.
Multi-layers and inhomogeneous layers: Increasing RF performance via surfaces by design	Optimized inhomogeneous surface layers for increased cavity efficiency and increased accelerating fields	 Multilayer surface with 100nm ALD NbTIN layer on niobium substrate.
Higher efficiency and higher fields: Demonstrate higher RF performance in proof-of-principle SRF cavities and study RF superconductivity under extreme conditions	Surfaces from non-Nb at 20 MV/m with cooling power <1.5 kW/(active meter), corresponding to a 10× reduction Surfaces capable of sustaining higher accelerating field with ultra-high efficiencies, and surfaces approaching 400 mT.	 Compact Nb_3Sn coated SRF cavity with conduction cooling for stand-alone operation.