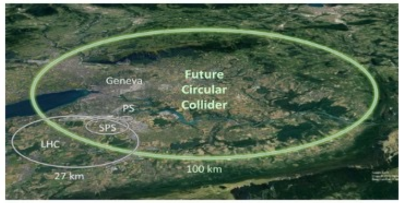
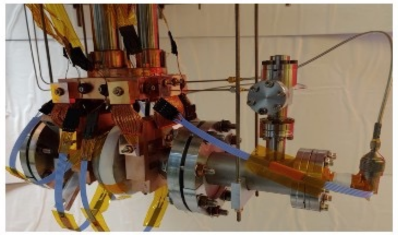
BEAM ACCELERATION Roadmap 2022

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.

FY 22 | FY 23 | FY 24 | FY 25 | FY 26

Objectives	Deliverables	Legacy
Advanced SRF materials growth: Develop improved growth methods; understand impact of realistic (non-ideal) surfaces on performance	Methods of growth and their refinement leading to annually enhanced performance for Nb_3Sn on Nb and Cu substrates	 FCC-ee running energy efficient on Nb_3Sn cavities
	Methods of growth and their refinement leading to annually enhanced performance for Nb-Zr alloys	
	Determination whether other materials have potential for higher efficiency and/or higher fields above Nb_3Sn and Nb-Zr limits	
Multi-layers and inhomogeneous layers: Increasing RF performance via surfaces by design	Determination whether inhomogeneous surface layers offer significantly increased RF performance over homogeneous materials	 Multi-TeV e^+e^- collider enabled by CBB surfaces
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 with cooling power <4W/(active meter)/(MV/m)^2, (10x reduction)	 Compact SRF with conduction cooling for turn-key operation
	Non-Nb, high-efficiency surfaces capable of sustaining accelerating fields of 25 MV/m	
	Non-Nb surfaces supporting accelerating fields exceeding 50 MV/m	
	Documented best practices for specifying SRF materials growth processes, critical material parameters, and material validation	