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SC cavities I

Friday, 23 June 2023 12:00 (1 hour)

The lectures covers design, engineering, fabrication, testing and operation of superconducting systems for particle accelerator.
The main focus of this lecture is to cover the technological aspects of SRF Superconductivity.
Part I starts with explaining the benefits offered by RF superconductivity, and the conditions required for the operation in this regime, introducing the temperature choice and the thermodynamics aspect. The rest of this part introduces the design process of an accelerating cavity, in terms of RF, mechanical and cryogenic aspects. Limiting factors of SRF cavities are described, together with the processes needed to guarantee the needed performances. Cavity fabrication and preparation processes are reviewed, highlighting the need to avoid RF surface contamination to the maximum extent. Finally, the ancillaries needed for operation (couplers & tuners) are briefly introduced.
Part II concentrates of the environment needed for the SRF cavity operation, i.e. the accelerator cryomodule. Basic thermodynamics concepts and refrigeration processes are reviewed and the cryomodule design process illustrated, focusing on heat loss management practices.
Part III is finally dedicated to the performance characterization and operational aspects of superconducting RF cryomodules.

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