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Field emission and particulate contamination in TRIUMF's superconducting accelerators

Tuesday 23 September 2025 14:30 (3 hours)

Particulate contamination in SRF cavities is known to trigger field emission, a phenomenon where electrons tunnel out from the surface of the cavities due to high electric fields. These rogue electrons limit the achievable accelerating gradient, affecting the final beam energy delivered by the accelerator. The TRIUMF e-Linac and ISAC-II heavy ion accelerators see a progressive onset of field emission in their SRF cavities during operation, despite stringent cleaning and testing procedures prior to installation. One hypothesis is that particulates migrate back into cavities after installation, leading to the renewed onset of field emission. The dynamics of micron scale particulates in vacuum is influenced by their electrostatic charge, and the environment of a particle accelerator is ideal for them to gain such charge. However, fundamental parameters such as composition and charge-to-mass ratio of particulates remain largely unknown. I will present an analysis of particulates collected from TRIUMF accelerators, detailing size, composition and possible sources, and subsequently describe a series of experiments studying the charging and migration mechanisms of particulates in vacuum.

I have read and accept the Privacy Policy Statement

Yes

Footnotes

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Author: MAHON, Aveen (TRIUMF)

Co-author: PLANCHE, Thomas (TRIUMF; University of Victoria)

Presenter: MAHON, Aveen (TRIUMF)

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