

Dust contamination in the TRIUMF electron linear accelerator: charging, detachment and migration of micrometer sized particulates

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Dust particulates are always present to some degree inside the vacuum space of particle accelerators, causing a variety of issues. At the LHC, beam loss events have been linked to the interaction of charged dust with the proton beams. In superconducting rf cavities, dust contamination leads to field emission, limiting the accelerating gradient and causing damage to external beamline components. Facilities such as the SLAC LCLS-II and TRIUMF electron linear accelerator see progressive onsets in field emission that cannot simply be explained by vacuum events. The environment of a particle accelerator provides an ideal opportunity for dust to gain charge, which is one of the main drivers of dust grain dynamics in vacuum. However, fundamental parameters such as the dust composition and charge to mass ratio of these grains are unique to each accelerator environment and remain largely unknown. We will present an analysis of dust samples taken from TRIUMF linear accelerators, detailing their size, composition and potential sources. Preliminary results from experimental studies on the charging, detachment and migration mechanisms acting on micron sized particulates will also be presented.

Footnotes

Funding Agency

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