Contribution ID: **51** Type: **Contributed Oral**

Locked in a Dark and Dusty Basement: Field Emission and Particulate Contamination in the TRIUMF e-Linac

Friday, 14 February 2025 21:30 (15 minutes)

The TRIUMF electron linear accelerator (e-Linac) will be the second driver beam for nuclear isotope production at the Advanced Rare IsotopE Laboratory (ARIEL). This particle accelerator will produce radioisotopes in the neutron rich region of the nuclear landscape via photofission, whose yields strongly depend on the incident beam energy. To date, the e-Linac has been commissioned up to 10kW of average beam power at 30 MeV beam energy. In addition to its support of the nuclear isotope program, the e-Linac will operate as a multi-user facility, taking full advantage its scientific potential. One such user is the DarkLight experiment, which will use high energy electron beams to search for a new force carrier, a so-called "dark photon", that would couple the theoretical dark sector to the Standard Model. In the coming years, ARIEL and DarkLight will depend significantly on the reliable operation of the e-Linac. However, this is inhibited by the presence of particulate contamination in its superconducting rf (SRF) cavities. This contamination leads to a phenomenon known as field emission, where electrons tunnel through the surface of the SRF cavities due to the high surface electric fields applied. These rogue electrons limit the accelerating gradient and thus the final beam energy delivered to users. The TRIUMF e-Linac sees a progressive onset in field emission that cannot simply be explained by vacuum accidents. The environment of a particle accelerator provides an ideal opportunity for contaminating particulates to gain electrostatic charge, which is one of the main drivers of their dynamics in vacuum. However, fundamental parameters such as composition and charge to mass ration of these grains remain largely unknown and will be unique to each accelerator environment. After a brief introduction to ARIEL and DarkLight, I will present an analysis of particulates collected from the TRIUMF e-Linac, detailing their size, composition and potential sources.

Your Email

amahon@triumf.ca

Affiliation

TRIUMF | UVic

Supervisor

Thomas Planche

Supervisor Email

tplanche@triumf.ca

Your current academic level

PhD student

Primary author: MAHON, Aveen (TRIUMF | UVic)

Co-author: PLANCHE, Thomas (TRIUMF)

Presenter: MAHON, Aveen (TRIUMF | UVic)

Session Classification: Evening 3 - Dark Matter Searches

Track Classification: Dark Matter Searches