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(I) Superconducting Radiofrequency Science and Technology in Canada

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Superconducting radiofrequency (SRF) cavities have been used for more than 50 years to increase the energy of charged particles. In Canada there are two accelerator centres which use SRF technology, i.e TRIUMF and the Canadian Light Source (CLS). The CLS was the first light source to use an SRF cavity in a storage ring from the beginning of operations in 2004. TRIUMF began developing SRF technology in 2000 which led in 2006 to the commissioning of the ISAC-II heavy ion superconducting linac for the post-acceleration of radioactive beams. More recently, the ARIEL SRF electron accelerator was installed at TRIUMF as a second driver for radioactive isotope production. In this talk, I will first give an overview of Canada's SRF infrastructure and the underlying concepts. Then, I will briefly present how performance has globally evolved since the early days. Nowadays, state of the art niobium cavities reach fundamental limitations in terms of accelerating gradient (energy gain per unit length) and power dissipation. Increasing performance requires specialized chemical and surface treatments which must be tailored to specific cavity types and exploring materials beyond bulk niobium. I will highlight recent research highlights from TRIUMF and UVic including results from testing new surface treatments on unique multimode coaxial resonators and material science investigations using beta detected nuclear magnetic resonance (beta-NMR) and muon spin rotation and relaxation (muSR).

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