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Integration and Commissioning of the ARIEL e-Linac Cryogenic System

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The Advanced Rare Isotope Laboratory (ARIEL) is a major expansion of the Isotope Separation and Acceleration (ISAC) facility at TRIUMF. The key part of the ARIEL project is a superconducting radiofrequency (SRF) electron linear accelerator (E linac). E-linac helium cryogenic system was designed to meet the ARIEL specifications. The HELIAL LL helium liquefier by Air Liquide Advanced Technologies supplies 4 K liquid helium (LHe) to cryomodules via LHe distribution system. The cryomodules have a top-loaded design. The 4 K – 2 K temperature conversion is achieved by a counter flow heat exchanger and a JT-valve installed onboard of each cryomodule. The temperature in 2K volume of cryomodules is controlled by the pressure control in sub-atmospheric line. Sub-atmospheric helium is warmed up in a custom-designed heat exchanger and after passing sub-atmospheric pumps goes to the helium compressor suction line. LN₂ system supplies liquid nitrogen to the liquefier, 80K shielding of the cryomodules and LHe distribution system, as well as to freeze-out helium purifier.

The installation of the E-linac cryogenic system components started in February 2013 while the corresponding subsystems tests started in November 2013. This paper describes the E linac cryogenic system components integration and presents the results of the acceptance tests and commissioning activities performed at TRIUMF since November 2013.

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