



Contribution ID: 639

Type: **Contributed Oral Presentation**

C3Or1B-02: FRIB Helium Refrigeration System Commissioning and Performance Test Results

Wednesday 24 July 2019 11:15 (15 minutes)

At its maximum capacity condition, the 4.5 K refrigerator system for the FRIB accelerator supports a 180 g/s 30 K 1.16 bar cold compressor return flow, a 14 g/s 4.5 K liquefaction load, a 4 kW 4.5 K refrigeration load, and a 20 kW 35-55 K shield load. Five additional design conditions, ranging from liquefaction to refrigeration and a stand-by/reduced load state, were specified for the sizing and selection of its components. The cold box system is comprised of a 300-60 K vertical cold box that incorporates a liquid nitrogen pre-cooler and a 60-4.5 K horizontal cold box housing seven turbines that are configured in four expansion stages including one Joule-Thompson expander. This cold box system, operates using the Ganni-Floating pressure process, automatically adjusting to the Linac load with the cold box supply (and compressor discharge) pressure varying from 6 to 21 bar, without introducing additional (artificial) loads or throttling turbine inlet valves (or other exergy loss mechanisms), and with minimal liquid nitrogen usage. This paper will briefly review the salient 4.5 K system design features and discuss the recent commissioning results.

Primary authors: Dr KNUDSEN, Peter (Facility for Rare Isotope Beams - Michigan State University); Dr GANNI, Venkatarao (Facility for Rare Isotope Beams - Michigan State University); Dr HASAN, Nusair (Facility for Rare Isotope Beams - Michigan State University); Mr WRIGHT, Mathew (Facility for Rare Isotope Beams - Michigan State University); Dr CASAGRANDE, Fabio (Facility for Rare Isotope Beams - Michigan State University); Mr VARGAS, Gerardo (Jacobs Technology-JSC); Mr JOSEPH, Nathan (Facility for Rare Isotope Beams Michigan State University)

Presenter: Dr HASAN, Nusair (Facility for Rare Isotope Beams - Michigan State University)

Session Classification: C3Or1B - Large Scale Refrigeration and Liquefaction - FRIB