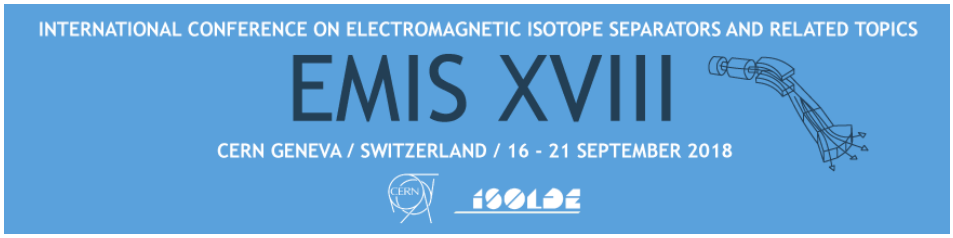

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Beam Thermalization at the National Superconducting Cyclotron Laboratory

Thursday, 20 September 2018 12:10 (15 minutes)

Thermalization of projectile fragment beams provides access to a wide range of low-energy rare isotope beams at projectile fragmentation facilities. The thermalization process includes slowing down the fast exotic beams in solid degraders combined with momentum compression and removal of the remaining kinetic energy by collision with helium buffer gas. The second-generation National Superconducting Cyclotron Laboratory (NSCL) beam thermalization facility includes a momentum compression beam line with degraders, a large radio-frequency gas catcher constructed by Argonne National Laboratory and a low energy transport system. A number of experiments have been carried out to characterize the behaviour of the gas catcher for capturing and extracting a variety of fast beams.The stopping and extraction efficiency as a function of incoming particle rates, the effect of range focusing on extracted beam rates, the drift time in gas catcher and the chemical forms of extracted ions have been studied for a variety of chemical elements. The combined stopping and extraction efficiencies were found to vary from 0.05% to 40% for fragments ranging from O-14 to Ga-76. Careful selection of degraders and dispersion matching of the fast beam to the wedge angle increases the extracted beam rate significantly. Since different rare ion beams require different angle wedges, a variable wedge angle device has been constructed. The properties of the gas catcher, techniques used to thermalize radioactive beams and the performance of the whole system will be presented.

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Primary authors: Dr SUMITHRARACHCHI, Chandana (National Superconducting Cyclotron Laboratory); MORRISSEY, David (Michigan State University); SAVARD, Guy (Argonne National Laboratory); SCHWARZ, Stefan (NSCL/MSU); VILLARI, Antonio (Michigan State University); LUND, Kasey (NSCL/MSU)

Presenter: Dr SUMITHRARACHCHI, Chandana (National Superconducting Cyclotron Laboratory)

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