Contribution ID: **78** Type: **Oral**

High Power Liquid Lead-bismuth Targetry for Intense Fast Neutron Sources Using a Superconducting Electron Linac

Friday, 8 June 2018 09:40 (20 minutes)

Niowave, in a close collaboration with the experts at LANL, is developing a forced-flow liquid metal based high power neutron target that can generate 1014 n/s source neutrons with a 40 MeV 50 kW electron beam. This neutron target not only drives Niowave's subcritical uranium assembly for its medical isotope production facility, it also provides a fast-spectrum neutron environment for material irradiation studies for next generation reactor development.

In this target, a high energy electron from Niowave's superconducting electron linac generates bremsstrahlung in a high Z material then fission-like photoneutrons are produced via photonuclear reactions. Lead bismuth eutectic (LBE, Tmelt = 125 ℃) is chosen to efficiently convert electrons to neutrons and to dissipate heat when operating at high power since majority of beam power is deposited as heat in the target. Small quantities (few grams) of uranium can be added in LBE to increase neutron yield due to fission neutrons from photofission reaction. The system is equipped with an LBE mechanical pump, sealed LBE container, heat exchanger, and converter chamber where electron beam interacts with flowing LBE. Various sensors and instruments are being developed to monitor LBE temperature, flow rate, and oxygen content in this system. In parallel, Niowave designed and built a corrosion test station to investigate the corrosion behavior of various materials in high temperature LBE. Several samples (HT9, MA956, 304L, 316L, Ti, Ti alloy, Nb) were submerged in LBE for up to a month at a constant temperature ranging from 500 to 700 ℃.

In this talk, we will present Niowave's high power liquid metal target development activities including design, thermomechanical analysis, testing, concept validation, and future work. Versatility of the liquid metal target and its relevance to high power targetry development activities for nuclear physics research at FRIB will be discussed.

Primary author: MAMTIMIN, Mayir (Niowave Inc.)

Presenter: MAMTIMIN, Mayir (Niowave Inc.)

Session Classification: Session 8-Multipurpose Use of Targets and Beam Dumps

Track Classification: 8-Multipurpose Use of Targets and Beam Dumps