Contribution ID: **69** Type: **Oral**

The Influence of High Energy Proton Irradiation on Fine-Grained Isotropic Graphite Grades: A Summary of Recent RaDIATE Results

Monday, 4 June 2018 16:30 (20 minutes)

Fine-grained isotopic graphite has become a material of choice for neutrino beam targets subjected to high energy, pulsed proton irradiation, such as the NuMI-NOvA beamline with 700 kW of primary beam power. Graphite has been chosen for its stability at high temperature, the physical and mechanical properties that make it particularly resilient to thermal shock conditions, and low atomic mass that helps generate a high yield of secondary particles with the desired energy spectrum for the downstream neutrino experiments. However, the physical and mechanical properties are highly affected by the irradiation conditions, impacting the expected lifetime of the target material, especially considering the higher beam powers of near-future neutrino beamlines, such as the LBNF-DUNE beamline with up to 2.4 MW of primary beam power. Selected results of radiation damage studies on graphite conducted by RaDIATE researchers over the past decade will be presented. Significant changes in physical and mechanical properties (e.g. 60-80% increase in elastic modulus) and lattice swelling are reported and shown to be highly irradiation temperature dependent. The results, especially lattice swelling, are shown to be very similar to those from reactor based irradiations. These results indicate that data from previous reactor low-energy neutron irradiation studies can be correlated to the high-energy proton irradiation regime, as well as quantitatively reinforce the conclusion that correct selection of the operating temperature for a graphite target is critical to maximizing the target lifetime.

Primary author: Mr HURH, Patrick (FNAL)

Co-authors: Dr CASELLA, Andrew (PNNL); Dr SENOR, David (Pacific Northwest National Laboratory); Dr LIU, Dong (Oxford University); Dr AMMIGAN, Kavin (Fermi National Accelerator Laboratory); Dr SIMOS, Nikolaos (BNL)

Presenter: Mr HURH, Patrick (FNAL)

Session Classification: Session 2-Radiation Damage in Target Material and Related Simulations

Track Classification: 2-Radiation Damage in Target Material and Related Simulations