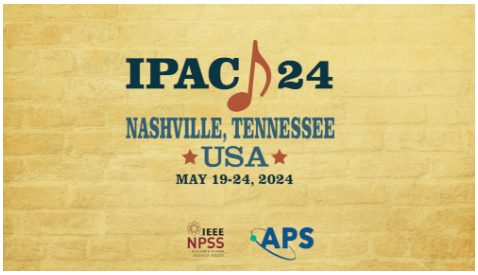

Contribution ID: **846** Contribution code: **TUPS44** Type: **Poster Presentation**

Multiphysics simulations of thermal shock testing of nanofibrous high power targets

Tuesday, 21 May 2024 16:00 (2 hours)

Increase of primary beam power for neutrino beam-lines leads to a reduced lifespan for production targets. The field of High Power Targetry (HPT) is generating new concepts to meet the need for robust targets. One idea being investigated by the HPT Research and Development Group at Fermilab is an electrospun nanofiber target. As part of their evaluation, samples with different densities were sent to the HiRadMat facility at CERN for thermal shock tests. The samples with the higher density, irradiated under a high intensity beam pulse, exhibit major damages at the impact site whereas those with the lower density show no apparent damages. The exact cause of this failure was unclear at the time. In this paper, we present the results of multiphysics simulations of the thermal shock experienced by the nanofiber targets that suggest the failure originates from the reduced permeability of the high density sample to airflow. The air present in the porous target expands due to heating from the beam, but is unable to flow freely in the high density sample, resulting in a larger back pressure that blows apart the mat. We close with a discussion on how to further validate this hypothesis.

Footnotes

Funding Agency

This work was produced by Fermi Research Alliance, LLC under Contract No. DE-AC02-07CH11359 with the U.S. Department of Energy, Office of Science, Office of High Energy Physics.

Paper preparation format

LaTeX

Region represented

North America

Primary author: ASZTALOS, William (Illinois Institute of Technology)

Co-authors: PELLEMOINE, Frederique (Fermi National Accelerator Laboratory); RATH, Prasenjit (Indian Institute of Technology Bhubaneswar); BIDHAR, Sujit (Fermi National Accelerator Laboratory); TORUN, Yagmur (Illinois Institute of Technology)

Presenter: ASZTALOS, William (Illinois Institute of Technology)

Session Classification: Tuesday Poster Session

Track Classification: MC4: Hadron Accelerators: MC4.T20 Targetry and Dumps