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Mechanical and Thermal R&D for the backward Electromagnetic Calorimeter (EEEMCal) of the upcoming Electron Ion Collider

The Electron Endcap Electromagnetic Calorimeter (EEEMCal), designed for integration into the Electron-Proton/Ion Collider (ePIC) experiment at Brookhaven National Laboratory (BNL), represents an important component for the detection and analysis of particles
The preferred material for the EEEMCal calorimeter is lead tungstate (PWO), an extremely fast, compact, and radiation-hard scintillator providing sufficient luminescence yield (15–25 photoelectrons/MeV) to achieve good energy resolution.
To ensure the physics requirements, the crystals must be thermally stabilized within ±0.1 ℃ (standard deviation), a condition essential for long-term operation.
This poster presents recent R&D activities focusing on two complementary approaches:
(i) the design and fabrication of the external cooling plates using Friction Stir Welding (FSW) technology, offering robust construction, with good water tightness, and efficient thermal management;
(ii) the development of an internal structure integrating mechanically crimped copper tubes for localized and reliable heat extraction.
In addition, we highlight the critical role of thermal insulation to decouple the calorimeter from ambient temperature fluctuations in the experimental hall (±1.5 ℃), ensuring the required crystals stability of 0.1 ℃.
These combined strategies provide a mechanically feasible, thermally stable, and scalable solution for the EIC electromagnetic calorimeter, paving the way for future prototypes and integration studies.

Title

Topic

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