

OPTICAL DIAGNOSTIC RESULTS FROM THE MERIT HIGH-POWER TARGET EXPERIMENT

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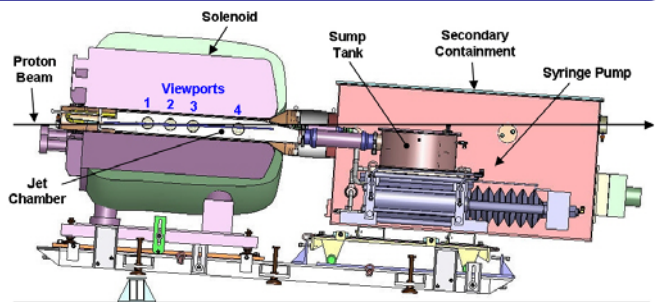
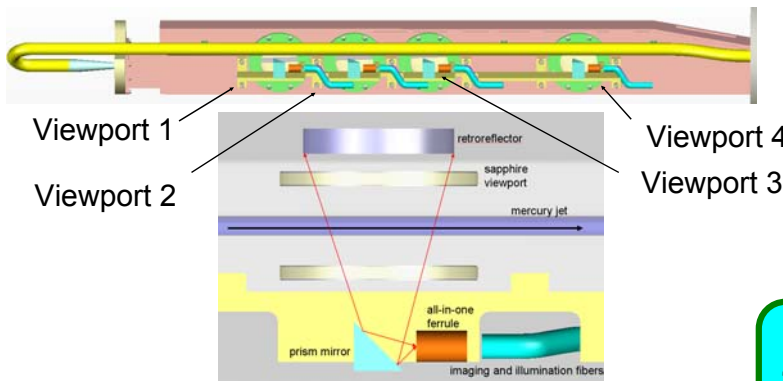
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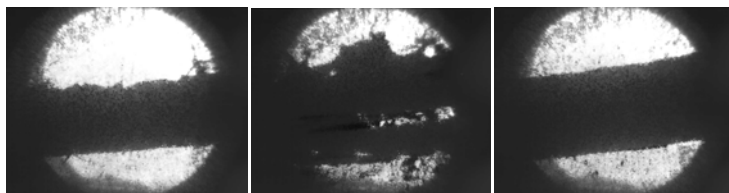
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The **MERIT experiment**, which ran at CERN in 2007, was a proof-of-principle test for a target system that converts a 4-MW proton beam into a high-intensity muon beam for either a Neutrino Factory complex or a Muon Collider. The target system is based on a free mercury jet that intercepts an intense proton beam inside a 15-T solenoid magnet.

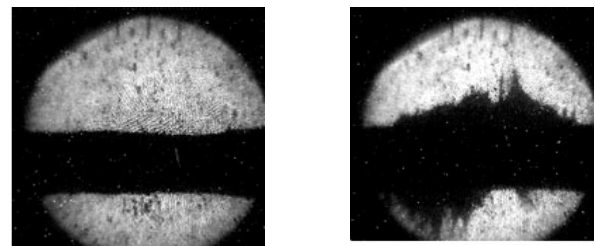


Cutaway view of the MERIT experiment. The solenoid/Hg jet system was tilted by 67mrad with respect to the beam/floor. The 15-T magnet was cooled by LN₂ and can be pulsed every 30 min. The hydraulic injection system was capable of delivering an Hg jet of 1-cm in diameter with a velocity up to 20 m/s.

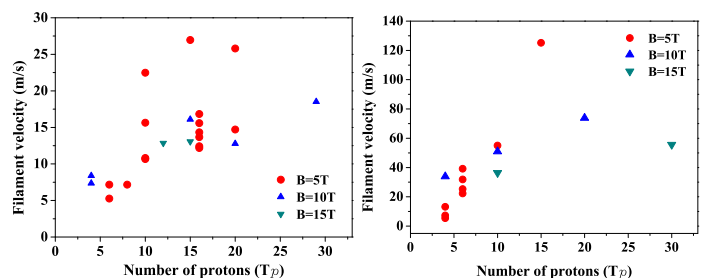
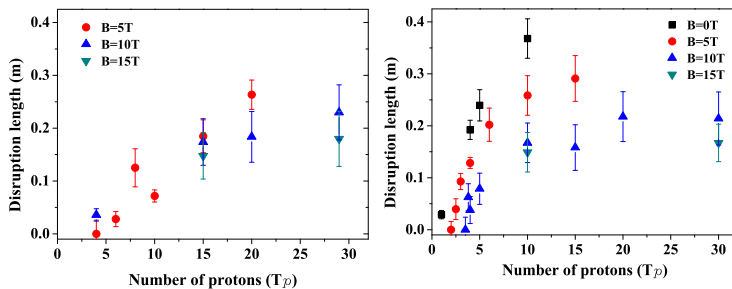
Details of the primary containment with the optical diagnostic system. The Hg jet was viewed as it streamed by viewports 1, 2, 3, and 4. The jet and beam axis overlapped at viewport 2, while the aftermath of the interaction was viewed at viewports 3 and 4.



A proton beam/jet interaction as viewed in viewport 3: Left image is before interaction, middle image is of the interaction aftermath; the right image is the reformed jet stream.



A proton beam/jet interaction as viewed in viewport 2: Left image: before interaction; Right image: 500 μs after proton beam arrival.



Extent of the proton-beam-induced disruptions: Left: the jet disruptions resulting from a 14-GeV proton beam; Right: jet disruptions with a 24-GeV proton beam. In both cases, the proton beam intensity and solenoid magnetic field were varied.

Measured filament velocities: Left: 14-GeV proton beam with various solenoid field strengths; Right: 24-GeV protons on the mercury target.