

BELLA iP2: The Short Focal Length Beamline for High Energy Density Research at High Repetition Rates at the BELLA PW

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The high-intensity iP2 beamline at the BELLA PW laser enables frontier capabilities in High Energy Density Science, including accessing new regimes of ion acceleration. This system provides a focal spot of $\sim 3\text{ }\mu\text{m}$ diameter, resulting in peak intensities of $>5 \times 10^{21}\text{ W/cm}^2$. The 1 Hz pulse repetition rate, if paired with replenishable target systems, can increase the particle flux for applications and allows for the collection of large data sets. During commissioning, proton beams were accelerated up to 40 MeV with TNSA at 17 J laser pulse energy. We have implemented a double plasma mirror to improve the temporal contrast of the laser pulse before target interaction. These capabilities enable a series of experiments to study advanced ion acceleration mechanisms and fundamental plasma processes relevant for Inertial Fusion Energy, and to develop innovative plasma-based technologies for ion beam applications. Those include improvements for radiation therapy, or studies of radiation effects in materials and (quantum) electronic devices. The iP2 beamline is accessible to users through LaserNetUS. In this contribution we present the iP2 facility and recent ion acceleration results.

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