The next-generation PXTD for simultaneous time-resolved measurements of nuclear-burn and x-ray emission histories in support of basic-science and high-yield DT-implosion experiments at OMEGA

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The next-generation Particle X-ray Temporal Diagnostic (PXTD) is being implemented for simultaneous measurements of multiple nuclear-burn and x-ray emission histories from a wide range of Inertial Confinement Fusion (ICF) and High Energy Density Plasma (HEDP) experiments with unprecedented timing precision and accuracy. Results from the first set of measurements using the first-stage implementation of the system were very encouraging. The fully-implemented PXTD system will provide unique information on a wide range of ICF implosion parameters such as the evolution of ion and electron temperatures; evolution of kinetic effects such as species separation and ion-thermal decoupling; and evolution of flow of impurities in the core of an ICF implosion. Experimental campaigns that use the Proton Radiography platform to backlight various types of plasmas will also substantially benefit from using the new PXTD to get an accurate time stamp on the generated radiographs. Experiments involving a gas jet colliding with a plasma, which generates x-rays and nuclear-fusion reactions, are another set of experiments that will benefit greatly from using the new PXTD capability. As the PXTD is being implemented behind the OMEGA target-bay shield wall, where it is protected from background, it can also be used on high DT-yield implosion experiments at OMEGA, and thus be used to help guide that program toward higher-performing implosions.

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