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Opacity Measurements on Fully Characterized 1.3 MK Titanium Plasmas ROBERT HEETER, SCOTT ANDERSON, GREG BROWN, JOHN CASTOR, JIM EMIG, KEVIN FOURNIER, CARLOS IGLESIAS, STEPHAN MACLAREN, ROSS MARRS, MARILYN SCHNEIDER, CHARLES SORCE, BRIAN WILSON, PETER BEIERSDORFER, Lawrence Livermore National Laboratory — X-ray transmission spectra from fully characterized, high temperature plasmas provide validation benchmarks for high-energy-density physics models of interest to stellar astrophysics. This work presents new data from experiments at the Omega laser. 24 beams (at $\approx$ 500J/beam) heat the outer chambers of a 3-part (shine-shielded), 1.6 mm diameter hohlraum. The outer chambers radiatively heat a CH-tamped Ti foil in the center. Other beams drive 2 backlighters: a rear wall burnthrough halfraum, and a Kr-filled CH capsule implosion. Looking through the sample to these backlighters, 2 spectrometers measure the sample transmission from 250-1600 eV and 3000-5500 eV, respectively. The lower energy band encompasses the Rosseland mean opacity, governing radiation flow in stellar interiors. Plasma density of 0.05 g/cc, measured by expansion radiography, agrees with pre-shot calculations. Plasma temperature of 110-125 eV (1.3 MK), inferred from n=1 to n=2 titanium absorption lines, is 10-30% below predictions. Use of similar techniques on the National Ignition Facility could validate stellar models in stellar core conditions.

Robert Heeter
Lawrence Livermore National Laboratory

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