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The first data from the Orion laser; measurements of the spectrum of hot, dense aluminum MATTHEW HILL, PETER ALLAN, COLIN BROWN, JAMES HARRIS, DAVID HOARTY, LAUREN HOBBS, STEVEN JAMES, JOHN MORTON, Radiation Physics Department, AWE, RG7 4PR, UK, ED MARLEY, RONNIE SHEPHERD, JIM DUNN, JIM EMIG, STEVE FULKERSON, HUI CHEN, PETER BEIERSDORFER, Physics Division, Lawrence Livermore National Laboratory, CA 94550, USA — The newly commissioned Orion laser system has been used to study dense plasmas created by combined short pulse laser heating and laser driven shock compression, using the ns and sub-ps laser beams available at the facility. The plasma density was systematically varied between 1 g/cc and 10 g/cc by using aluminum samples buried in plastic or diamond sheets. The aluminum was heated to electron temperatures between 500 eV and 700 eV allowing the plasma conditions to be diagnosed by K-shell emission spectroscopy. These were inferred from comparison with a variety of codes, including FLY and FLYCHK and from radiation-hydrodynamic simulations. Time-resolved X-ray emission was recorded using a spectrometer coupled to an X-ray streak camera, with additional time-integrated spectrometers recording onto image plate. The K-shell spectra show evidence of the lowering of the ionization potential, where the data are in reasonable agreement with FLY and FLYCHK when using the standard treatment proposed by Stewart and Pyatt. The data have also been compared to more sophisticated models and the results are presented.

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