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X-ray scattering measurements of magnesium at the transition from the condensed matter to the warm dense matter regime LUKE FLETCHER, SLAC National Accelerator Laboratory, ART PAK, TAMMY MA, TILO DOPPNER, BENJAMIN BACHMANN, SEBASTIEN LEPAPE, ULF ZASTRAU, BOB NAGLER, HAEJA LEE, ERIC GALETIER, MAXENCE GAUTHIER, ELISEO GAMBOA, MICHAEL MACDONALD, MINGSHENG WEI, ZHIJIANG CHEN, MIANZHEN MO, BENJAMIN BARBREL, DOMINIK KRAUS, ROGER FALCONE, JERRY HASTINGS, SIEGFRIED GLENZER, HED science collaboration — Direct measurements of the strength in the ionic structure factor at various scattering angles is important for accurate first-principle calculations of material properties in the high pressure and temperature phase. In this study, spectrally resolved XRTS measurements in combination with proof-of-principle, single shot 2D angularly resolved x-ray scattering measurements of changes in the solid-state structure and the ion-ion correlation peak for both single and double (counter-propagating) shocks have been observed in Mg foils. The 527 nm, 2 GW laser system available at the MEC station of the LCLS facility has been used to compress magnesium foils using laser-driven shocks. In our study, 25 _m and 50 _m thick Mg targets were compressed 2x and 3x the solid density respectively using 3 ns pulses with a total laser energy of 6 J per beam. A drive intensity of 4x10^{14} W/cm^2 on each irradiated surface was used to generate high pressure shock waves into the sample while 8 keV x-rays from the LCLS were used to probe the compressed targets for both single and double shocked geometries.

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