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The Generation of Transient Transparent Aluminum with Intense Femtosecond XUV Light JUSTIN WARK, University of Oxford, PEAK BRIGHTNESS COLLABORATION — Fourth generation light sources have spectral brightnesses ten orders of magnitude brighter than any synchrotron, and when their output is focussed down to small spots, they can create solid density, “crystalline” plasmas on femtosecond timescales, long before the atoms have had time to move. We report specifically on the first experiments performed using the FLASH XUV laser in Hamburg. This laser can produce 15 fsec pulses of XUV radiation containing tens of μJ per pulse. Using a multi-layer-coated off-axis parabola, we have focused 13.5nm radiation to spots of order a few microns in diameter, corresponding to peak intensities in excess of 10^{16}Wcm^{-2} - a region of intensity that had, until recently, been the domain of optical high power lasers. We discuss here some of the interesting absorption physics that takes place at this new frontier, where the intensity is so great that we can eject L-shell electrons from every atom in an aluminum target placed in the focal region of the laser,[1] and how the observed saturable absorption may impact on the creation and diagnosis of warm dense matter.

[1] Bob Nagler et al, Nature Physics, to be published

Justin Wark
University of Oxford

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