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High-resolution absorption spectroscopy of photoionized silicon plasma, a step toward measuring the efficiency of Resonant Auger Destruction[1] GUILLAUME LOISEL, JAMES BAILEY, STEPHANIE HANSEN, TAISUKE NAGAYAMA, GREGORY ROCHAU, Sandia National Laboratories, DUANE LIEDHAL, Lawrence Livermore National Laboratory, ROBERTO MANCINI, University of Nevada, Reno — A remarkable opportunity to observe matter in a regime where the effects of General Relativity are significant has arisen through measurements of strongly red-shifted iron x-ray lines emitted from black hole accretion disks. A major uncertainty in the spectral formation models is the efficiency of Resonant Auger Destruction (RAD), in which fluorescent Kα photons are resonantly absorbed by neighbor ions. The absorbing ion preferentially decays by Auger ionization, thus reducing the emerging Kα intensity. If Kα lines from L-shell ions are not observed in iron spectral emission, why are such lines observed from silicon plasma surrounding other accretion powered objects? To help answer this question, we are investigating photoionized silicon plasmas produced using intense x-rays from the Z facility. The incident spectral irradiance is determined with time-resolved absolute power measurements, multiple monochromatic gated images, and a 3-D view factor model. The charge state distribution, electron temperature, and electron density are determined using space-resolved backlit absorption spectroscopy. The measurements constrain photoionized plasma models and set the stage for future emission spectroscopy directly investigating the RAD process.

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