Abstract Submitted
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The solar elemental abundances problem: Large enhancements in photoionization and bound-free opacity A. PRADHAN[1], S. NAHAR, Ohio State Univ - Columbus — Aimed at solving the outstanding problem of solar opacity and radiation transport, we report substantial photoabsorption in the high-energy regime due to atomic core photo-excitations not heretofore considered. In an extensive R-Matrix calculations of unprecedented complexity for an important iron ion Fe XVII, with a wave function expansion of 99 Fe XVIII core states from $n \leq 4$ complexes (equivalent to 218 fine structure levels), we find: i) up to orders of magnitude enhancement in background photoionization cross sections, in addition to strongly peaked photo-excitation-of-core resonances not considered in current opacity models, and ii) demonstrate convergence with respect to successive core excitations. These findings may explain the "higher-than-predicted" monochromatic iron opacity measured recently at the Sandia Z-pinch fusion device at solar interior conditions [1]. The findings will also impact the total atomic photoabsorption and radiation transport in laboratory and astrophysical plasmas, such as UV emission from host stars of extra-solar planets.

1. J. Bailey, et al., Nature, 517, 56 (2015).

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[1]power point presentation

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