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Two-photon processes and their minor contribution to the Sandia Z-pinch iron opacity experiments

Michael Kruse[1], **Carlos Iglesias**[1]

[1] *Lawrence Livermore National Laboratory, USA*

The discrepancies between theoretically calculated and experimentally measured Iron opacities at the Sandia National Laboratory Z-pinch machine are hitherto still unexplained even after nearly a decade of effort. Theoretical opacities have neglected higher-order processes such as two-photon processes, i.e., two-photon ionization or Raleigh and Raman scattering and thus could be a potential additional source of opacity that may lessen the disagreement with experimental measurements. We will present a summary of our two-photon ionization calculations in which we conclude that two-photon absorption cannot explain the bound-free discrepancy between experiment and theory, and then move on to show previously unreported calculations for the elastic (Raleigh) and inelastic (Raman) scattering contributions for the measured 2-4 Ne-like Iron lines.

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Presenting Author Email Address: *kruse9@llnl.gov*