Abstract Submitted
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Analyzing L-Shell Multiplet Dynamics in Moderate Atomic Number Z-pinch Plasmas[1] ARATI DASGUPTA, WARD THORNHILL, JACK DAVIS, Naval Research Laboratory, Washington DC 20375, KENNETH WHITNEY, Berkeley Scholars, Inc., Springfield, VA — To produce significant K-shell emissions from moderate atomic number plasmas such as iron, a plasma must be rapidly ionized through its L-shell ionization stages. In iron, emissions from the Li-like and Be-like ionization stages lie above a kilovolt and are, therefore, relatively easy to measure. They are therefore of potential importance for diagnosing under what experimental conditions and to what extent a Z-pinch plasma has reached temperatures and densities near those required for significant K-shell x-ray production. However, diagnostics based on the spectral shape of L-shell emissions are inherently more difficult than those based on K-shell emissions because of the more complex multiplet structures in the L- as opposed to the K-shell. These structures, in turn, produce line overlaps and a modified ionization dynamics due to a non-LTE distribution of populations in the substates of the multiplets. In this work, we will analyze this behavior in the Li- and Be-like ionization stages of iron using the temperature and density conditions that are predicted in 2-D MHD calculations to be generated in ZR-generator implosions at the Sandia National Laboratories..

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