

Abstract Submitted
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Opacity of the K Shell as a Function of Atomic Number in Z-Pinch Plasmas¹ J.P. APRUZESE, J.W. THORNHILL, J. DAVIS, R.W. CLARK, Plasma Physics Division, Naval Research Laboratory, C.A. COVERDALE, C. DEENEY, Sandia National Laboratories — Many Z-pinch experiments performed on a variety of generators have succeeded in producing copious yields of K-shell x rays from elements ranging from neon ($Z=10$) to copper ($Z=29$). As the trend toward Z-pinch drivers of higher current and deliverable energy continues, the achievable masses, densities, and therefore opacities of pinches will increase. The effects of opacity on ionization, emissivity, and pinch dynamics, already important issues, are likely to become even more significant. In this work, we examine the variation of K-shell opacity with atomic number. Detailed calculations of photon escape probabilities, and their effects on emitted power and ionization within the pinch are presented. The relationship of single-flight to ultimate escape probability is derived in terms of basic atomic parameters. The range of pinch conditions where opacity is significant is seen to exhibit pronounced changes with atomic number, and is compared with conditions experimentally achieved to date.

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