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2.51 Design and Raytrace Simulations of a Multilayer-Coated Wolter X-Ray Optic for SNL's Z Machine

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Recent breakthroughs in the fabrication of small-radii Wolter optics allow NNSA facilities to consider such optics as x-ray diagnostics at 15-50 keV. Recently, LLNL, SNL, the Harvard-Smithsonian Center for Astrophysics and NASA MSFC jointly developed and fabricated the first custom Wolter microscope for implementation in SNL's Z machine with optimized sensitivity at 17.4 keV. To achieve spatial resolution of order 100-200 microns over 5x5x5 mm³ with high throughput and narrow energy bandpass, the geometry of the optic and its multilayer (ML) required careful design and optimization. While the geometry mainly influences resolution and field of view, the mirror coating determines spectral response and throughput. Here we outline the details of the design process for the first Z Wolter including the optimization of its WSi ML and present results of raytrace simulations completed to predict and verify the performance of the optic. This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344. Sandia National Laboratories is a multimission laboratory managed and operated by NTES,LLC., a wholly owned subsidiary of Honeywell International,Inc., for the U.S. DOE's NNSA under contract DE-NA-0003525.

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