

## Photon scattering contribution in plasma transmission experiments

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### Abstract

The photon scattering contribution in recent transmission experiments at the Sandia Z-Facility [1] is examined using several approaches. First, spectral lines from single photon absorption are compared to resonant scattering estimates at line centers where photon scattering makes the largest contribution. Second, the full Waller-Kramers-Heisenberg expression [2] is applied to a few initial levels producing spectral lines prominent in the experimental spectrum. Finally, a dispersion-type relation [3] is used to compute the total plasma photon scattering cross-section. This last method accounts for all initial levels included in the photon absorption calculation. The numerical results show that photon scattering by bound electrons fails to resolve the extant discrepancies between transmission measurements of Fe and plasma radiation models.

[1] J.E. Bailey, T. Nagayama, G.P. Loisel, G.A. Rochau et al., Nature 517 (2015) 56-59, doi:10.1038/nature14048. T. Nagayama, J. E. Bailey et al, PRL 122, 235001 (2019), <https://doi.org/10.1103/PhysRevLett.122.235001>

[2] J. J. Sakurai, Advanced Quantum Mechanics, Addison-Wesley: Reading, MA, (1967)

[3] W.D. Barfield, W.F. Huebner, J. Quant. Spectrosc. Radiat. Transfer 16 (1976) 27-34.

*This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under contract DE-AC52-07NA27344. LLNL-ABS-866212*