

# Progress on Opacity Measurements at Stellar Interior Conditions Using the National Ignition Facility

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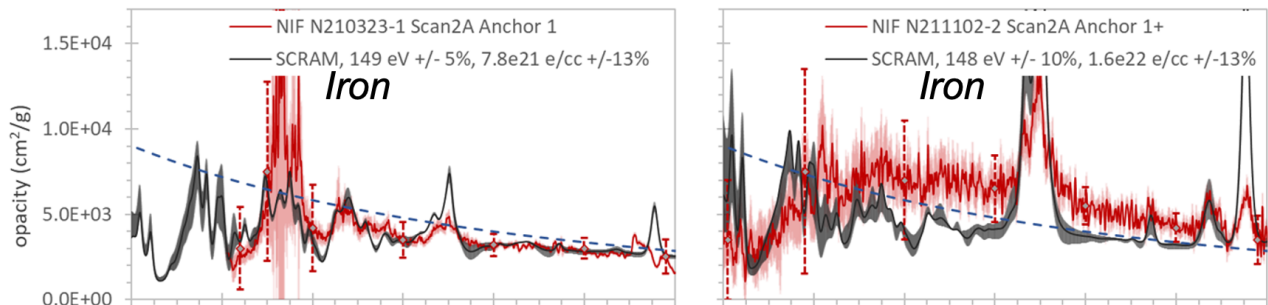
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There is little spectrally resolved experimental opacity data of plasma at temperatures and densities relevant to the physics of the sun, other stars, and laboratory high-energy-density experiments. Prior and ongoing opacity experiments on the Sandia National Laboratories Z machine have shown up to factor-of-2 discrepancies with theory - a challenging puzzle [1]. Since 2015, an additional set of experiments on the National Ignition Facility (NIF) have begun measuring opacities of iron and other materials at temperatures  $\sim 150$  eV and density  $\sim 7 \times 10^{21}$  electrons/cm<sup>3</sup> [2], and since 2021 those measurements have been extended to densities above  $10^{22}$  electrons/cm<sup>3</sup>. Figure 1 shows preliminary analysis of some NIF iron data, with the higher-density data showing higher opacity than expected theoretically [3]. This presentation summarizes the NIF experiments, efforts to constrain hypotheses for systematic errors, and new capabilities [4]. This data may have implications for modeling the structure of the sun and for determining the age of white dwarf stars.



**Figure 1.** Samples of iron opacity measurements at two different densities, from NIF (Livermore, CA, USA).

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## References

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