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Improving accuracy of stellar opacity experiments using calibration statistics and Monte-Carlo error propagation TAISUKE NAGAYAMA, J. E. BAILEY, G.P. LOISEL, G. S. DUNHAM, G. A. ROCHAU, Sandia National Laboratories — Opacity quantifies photon absorption in matter and is an important quantity for accurately predicting plasma evolution for astrophysical objects (e.g., stars) and laboratory experiments (e.g., inertial confinement fusion). However, calculated opacities have never been extensively tested. Benchmark opacity measurements at stellar interior temperature are recently available from experiments at Sandia National Laboratories [Bailey Nature (2015), Nagayama PRL (2019)], providing invaluable clues on opacity-model accuracy and suggesting necessary opacity-model refinements. To realize benchmark opacity measurements, the experimental platform must satisfy many challenging criteria, including accurate data analysis and measurement reproducibility. We present recently improved analysis method; this relies on extensive statistics of calibration experiments and formal propagation of multiple sources of uncertainties using Monte-Carlo technique. Opacities inferred from repeated experiments agree within the inferred uncertainties, supporting the validity of the analysis method and reliability of experiments. The idea behind this analysis is general and can be applied to many other experiments. Sandia National Laboratories is a multimission laboratory managed and operated by NTESS LLC, a wholly owned subsidiary of Honeywell International Inc. for the U.S. DOE's NNSA under contract DE- NA0003525.

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