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Abstract: Under extreme temperature and pressure conditions, matter behaves unusually. Material in this unique state is referred to as warm dense matter (WDM), which is too hot to be described by solid matter physics and too dense to be accurately described by plasma physics. WDM is found naturally in the cores of Earth and Earth-like rocky planets. Understanding the thermal conductivity of warm-dense composites in Earth's core is vital to furthering our understanding of planetary evolution. In particular, thermal conductivity plays a crucial role in the structure and dynamics of the core-mantle boundary, heat transfer from the core to the mantle, and the generation of a planet's magnetic field. Magnesium oxide (MgO) is the second most abundant material in Earth's lower mantle, making it an ideal candidate for such research. However, existing computational research seeking to analyze MgO's thermal conductivity shows drastic variations in results, necessitating further experimental data to benchmark these simulations. My research group has previously designed an experimental platform that was successfully used to analyze thermal conductivity of other warm dense materials. Using a high-performance computing code, I conducted simulations to investigate the feasibility of using our previously designed platform for an experiment that would analyze the thermal conductivity of warm-dense MgO, and help anticipate what we might see in an experiment.