

LASER ABSORPTIVITY MEASURING DEVICE

for Characterizing Laser-Based Processes

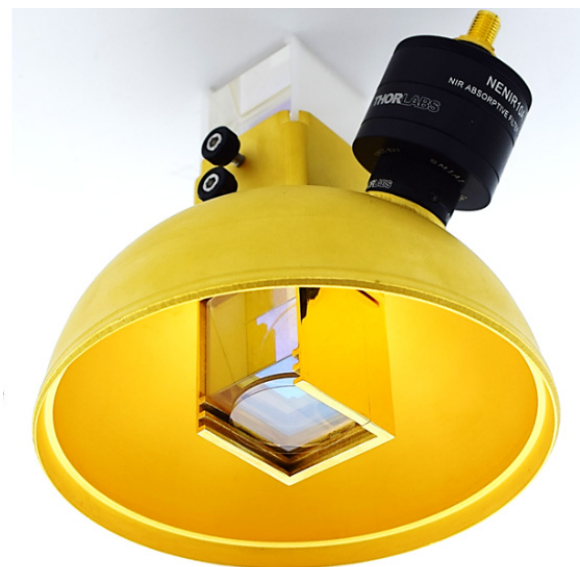
A compact high-throughput diagnostic tool for characterizing laser-based processes

Patent Pending

Technology Readiness Level 7

Characterizing the laser absorptivity and efficiency compensation of laser-based processes can provide useful avenues for defect characterization and mitigation; however, laser-metal interactions during welding and metal additive manufacturing are notoriously complex. Existing techniques for measuring laser absorption efficiency rely on reflective rather than direct measurements, require the use of simulative samples that add assumptions, and/or involve large processing setups that behave differently than the genuine process.

Researchers at Sandia National Laboratories have invented a compact diagnostic tool for directly measuring the laser absorptivity of laser-based processes such as laser powder bed fusion additive manufacturing and laser welding. The device's small integrating hemisphere with a reflective baseplate can be placed on top of any processing substrate directly inside the equipment and can measure reflections of a moving heat source. An optical diode ensures capture of all back-reflected light. By correlating transience with defect formation, this device can lead to enhanced performance, properties, and defect mitigation through improved process monitoring and control.



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Commercialization Status

This system has been used to collect absorptivity data in a variety of environments, including inside of additive manufacturing equipment, laser welding equipment, and small-scale optomechanics environments.

Industries & Applications

- Additive manufacturing
- Laser welding, brazing, and soldering
- Laser cutting/drilling, micromachining, and selective material removal
- Laser engraving
- Laser cleaning

Next Steps

Sandia is seeking partners to commercialize and bring the Laser Absorptivity Measuring Device to market. To learn more, contact Sandia National Laboratories' Licensing and Technology Transfer.

Technical Benefits

- Compact battery-powered unit with simple setup
- Provides high-resolution laser measurement and calibration data in real-time
- Capable of performing over a wide range of incident laser powers (mW to kW)
- Contributes to enhanced performance via process monitoring and control
- Provides critical data for computational modeling

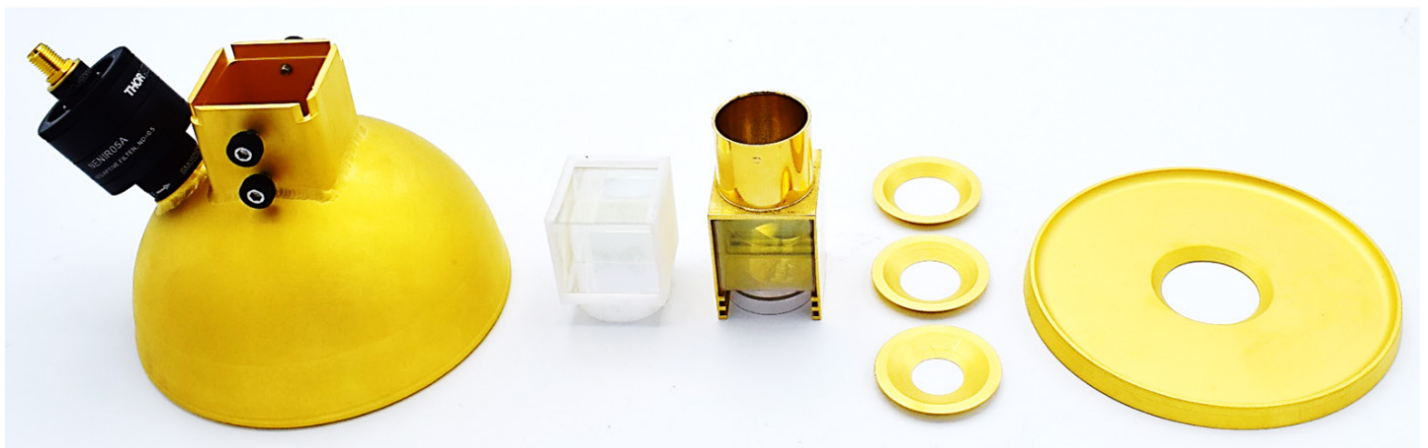
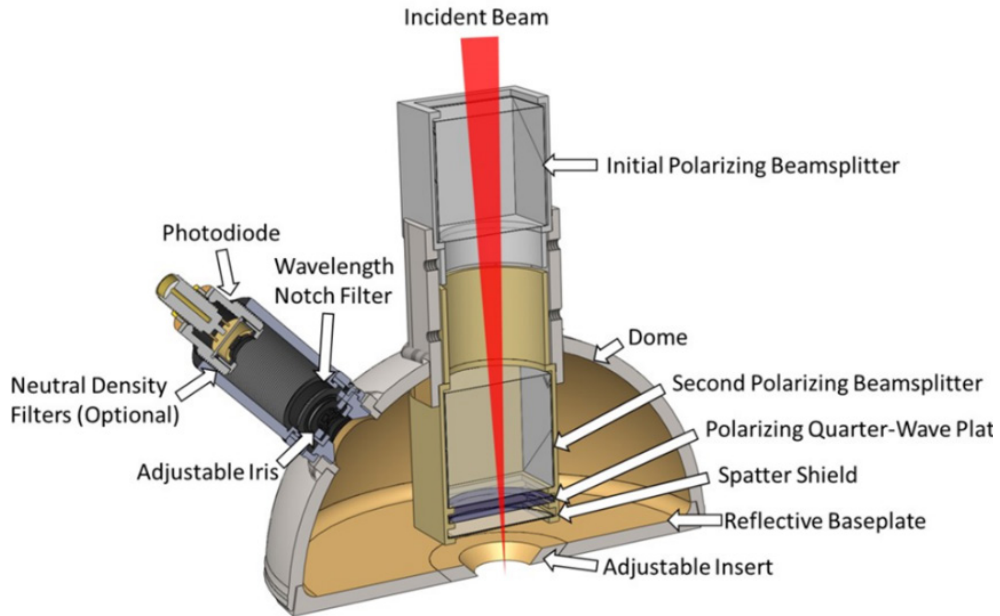
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Additional Figures



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