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OPOSSUM - An Open-Source Tool for Holistic Modeling of High-Energy, High-Intensity Laser Systems

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The THRILL (Technology for High-Repetition-rate Intense Laser Laboratories) project develops technologies for future laser facilities at European Analytical Research Infrastructures (ARIs)[1]. Its main research areas are increasing the repetition rate of high-energy amplifiers, optimizing beam transport and stabilization of large-aperture/high-energy beams, developing large-area optical coatings, and providing designs for new laser facilities such as Eu-XFEL and FAIR.

With the increasing size and complexity of modern laser architectures, final designs require a holistic approach, as couplings between subsystems are significant and nonlinear. To address this, OPOSSUM –the Open-Source Optics Simulation System and Unified Modeler –has been developed within THRILL to support, guide, and evaluate different design approaches. Its objective is to provide a common software platform for the holistic simulation of large-scale optical systems, enabling co-development of the facility alongside its “digital twin.”

With OPOSSUM we aim to facilitate optical system setup through a node-based construction approach, mimicking laboratory assembly. Once defined, a system can be analyzed using various modeling methods without redefining it across multiple tools. To leverage existing expertise, an essential building block of OPOSSUM is the integration of already established modeling codes.

In this contribution, we present the current status of the OPOSSUM project, its modeling capabilities, and future development plans.

Speed talk:

I am unwilling/unable to present a speed talk

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