Advanced Optical Simulation Techniques

EDRMedeso, a leader in simulation technology deployment in Northern Europe and the UK, delivers cutting-edge simulation technologies through knowledge transfer. The company is the exclusive Apex Channel Partner for Ansys in the Nordics and the UK and has a robust reputation for delivering comprehensive Ansys solutions in addition to complementary simulation services which allow customers to extend the value of their investment.

In its latest strategic move, EDRMedeso has expanded its offerings to include Ansys Optics and Ansys Photonics. These advanced software solutions optimize optical and photonic systems, reducing costs and improving design reliability.

The products developed by Ansys include Ansys Lumerical, Ansys Zemax OpticStudio, and Ansys Speos. Ansys Lumerical specializes in wave optics for photonic simulations and can model structures with dimensions comparable to the wavelength of light. Ansys Zemax OpticStudio is used for optical design at the component level, focusing on systems like lenses, mirrors, and prisms.

Ansys Speos facilitates system-level design, allowing optical engineers to design new features under various environmental conditions, optimize material selections and other characteristics, measure results, test product safety, and comply with strict industry regulations. Ansys Speos also offers robust rendering capabilities.

Ansys' tools exhibit interoperability with each other and with other multiphysics tools, enabling automated workflows that seamlessly integrate nanoscopic and macroscopic aspects of designs while accounting for all relevant physical phenomena. This interoperability significantly enhances efficiency in modelling and accelerates the design process.

Originally used as a finite-difference time-domain (FDTD) solver, Ansys Lumerical was designed to solve Maxwell's equations to simulate light propagation in wave optics. Over time, it has expanded significantly and now comprises approximately 14 distinct tools, including Rigorous Coupled-Wave Analysis (RCWA) and STACK.

"Today, Ansys Lumerical has evolved into the industry's foremost solution for photonic simulation, widely favoured by research centres and universities alike for its comprehensive capabilities and robust performance," says Sophia Fox, Optics and Photonics expert at EDRMedeso.

Ansys Lumerical is used extensively in telecommunications, sensing, and imaging technologies and has become indispensable for the design of next-generation photonic integrated circuits. Numerous success stories highlight collaborations between Ansys, Lumerical, and various companies, including startups and industry giants.

For instance, Hewlett Packard Labs utilizes Ansys Lumerical to enhance their electronic-photonic workflow for photonic integrated circuit designs. Meanwhile, Xanadu, a startup focusing on quantum scaling with low-loss photonics, also leverages Ansys Lumerical in its innovative endeavours. These examples illustrate Ansys Lumerical's significance in advancing technological capabilities across diverse fields.

A key factor in adopting the software often hinges on the need for automated workflows. This is particularly crucial in fields involving complex multi-physics processes, which often require extensive post-processing and error correction during setup. Ansys Lumerical addresses these challenges with its multiphysics tools specifically designed to model optoelectronic

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and semiconductor components. These tools enable the modelling of optical, electrical, and thermal effects, catering to a broad spectrum of customer needs.

In addition, to address speed requirements, Ansys Lumerical supports parallel computation and cloud-based operations to meet these demands effectively. For customers needing faster computation times, Ansys Lumerical offers a GPU-accelerated version.

Ansys Lumerical is faster and more stable. Its parallel and HPC capabilities allow for large-scale simulations, ensuring the design works as intended, which is crucial for meeting aggressive timelines. This feature is invaluable for all companies faced with the pressure to be the first to get to market with innovative technology, but maybe more so for startups under pressure.

A compelling success story of Ansys Lumerical's impact involves a client specializing in head-up displays. The client previously relied on a labour-intensive in-house process, using scripts to calculate efficiencies of nanostructured diffraction gratings, followed by cumbersome post-processing to integrate the data into Ansys Zemax OpticStudio for ray propagation. Leveraging Ansys Lumerical's interoperability with Ansys Zemax OpticStudio, the client can simulate diffraction gratings in Ansys Lumerical and seamlessly transfer the results to Ansys Zemax OpticStudio for immediate ray tracing and analysis. This integration accelerates the workflow and reduces the errors commonly associated with manual data transfer, thereby enhancing speed and optimization capabilities.

Beyond speed, Ansys Lumerical excels in design optimization. Ansys Lumerical offers advanced optimization capabilities, including photonic inverse design, enabling automatic tuning of each component to achieve desired performance targets. Many users rely on in-house software with limited functionalities developed by a transient workforce, whereas Ansys Lumerical provides extensive features and capabilities for modelling various material properties and nonlinear effects. It offers an intuitive interface for ease of use.

EDRMedeso's approach goes beyond selling Ansys software; it is committed to empowering customers to utilize these tools and digital solutions throughout their entire design process—from concept through system-level design to production. It enables customers to innovate, mitigate risks, and expedite time to market for superior product development. This commitment sets EDRMedeso apart in the industry, reflecting its dedication to customer satisfaction and excellence. SR

Sophia Fox,
Optics & Photonics Expert