Simulation of 2D Material Optoelectronic Devices Using Ansys Lumerical

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This presentation showcases the capabilities of **Ansys Lumerical** for modeling optoelectronic devices based on two-dimensional (2D) materials. Atomically thin materials such as graphene can be accurately represented using surface conductivity models in **Lumerical FDTD** and **Lumerical MODE**, eliminating the need for sub-nanometer volumetric meshing while maintaining physical accuracy.

Using a graphene-based electro-absorption modulator integrated on a silicon waveguide as a case study, we demonstrate a complete simulation workflow. This includes optical mode analysis, modeling of light–material interaction, bias-dependent tuning, and extraction of key performance metrics.

The presentation emphasizes practical aspects such as solver configuration, material modeling strategies, and computational efficiency, providing a streamlined approach for designing next-generation 2D material optoelectronic devices.