Integrated photonics and electro-optic devices

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Abstract

Thin-film lithium niobate on insulator (TFLN) is a promising platform for integrated classical and quantum photonics due to its intrinsically large electro-optic effect, wide transparency window, and wafer-scale availability. The direct connection between driving electric fields and refractive index in this platform has enabled new levels of interactions between optical and electric fields. This presentation will primarily focus on work from my postdoctoral work using this platform to create integrated photonic devices to new and unparalleled functionality. First, I will describe a few device examples in this platform that leverage the strong electro-optic modulation capabilities, including femtosecond pulse generation, high-power and narrow-linewidth lasers, and microwave-optical quantum transducers. Next, I will highlight some work we are undertaking at Northwestern to understand the materials origins of drift and stability issues at low frequencies that this material system is plagued by. Finally, we will present some future work to develop new integrated photonic materials and devices that overcome the limitations of Lithium Niobate on Insulator. Together, this work develops better structure-processing-performance metrics for devices in Lithium Niobate, while motivating new materials development for integrated photonics to push the limits of performance and efficiency.

Short Biography

David Barton is a tenure-track Assistant Professor in the Materials Science and Engineering department at Northwestern University. David's group specializes in integrated optical materials and devices, with a focus on integrated electro-optics and nonlinear optical devices. The group grows new optical materials, characterizes their electronic, optical, and photonic properties, and develops nanofabrication strategies to enable a new generation of energy-efficient photonic devices. David received his PhD in Materials Science and Engineering from Stanford University in 2021 and received a Materials Research Society Graduate Student Award (Silver) in 2019. Following this, David was awarded an Intelligence Community Postdoctoral Fellowship to work at Harvard University, working on scalable integrated nanophotonics.