
Integrated lithium niobate photonics: from communications to metrology

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Lithium niobate features low absorption, high refractive index, large electro-optic coefficient, and high chemical and thermal stability from 0.4 μm to 5 μm , leading to the broad applications in the electro-optic modulators of fiber-optic communications. Recently, the fabrication technique of thin film lithium niobate on insulator (TFLNOI) wafer and its nanofabrication techniques achieved significant development. This development enables integrated electro-optic modulators with voltage-length product of as low as $\sim 1\text{V}\cdot\text{cm}$ as well as 3dB bandwidth of over 100GHz, electro-optic frequency combs with tunable repetition rate. By fully leveraging the tunable repetition rate of electro-optic frequency combs, we achieved ambiguity-free absolute distance measurement system with a precision of $\sim 100\ \mu\text{m}$ and an acquisition rate of $\sim 10\ \text{kHz}$. Based on the integrated lithium niobate phase modulators, we achieved 16-channel optical phased array, featuring beam steering of 24° and 8° , respectively, in two dimensions. To achieve the mass production of integrated TFLN devices with high fidelity and low cost, we developed wet etching-based fabrication process for TFLNOI, resulting in microring with intrinsic quality factor of over 10 million.



Short Bio:

Yang Li received B.S. degree in telecommunication engineering (2006) and M.S. degree in electromagnetic field and microwave technology (2008) from Huazhong University of Science and Technology, China, and Ph.D. degree in Electrical Engineering (2012) from Iowa State University. He was a Postdoctoral Fellow at Harvard University from 2013 to 2018. In 2018, he joined the Department of Precision Instrument at Tsinghua University as an Associate Professor. His current research interests include integrated lithium-niobate photonics and integrated zero-index metamaterials. He published several papers on high-impact journals including Nature Photonics,

Advanced Materials, eLight, Light: Science and Applications, Nano Letters. Four of his journal papers were featured as cover stories. Two of his papers has been cited for over 200 times on Web of Science. He received the first-class award of excellent faculty advisor of Tsinghua University, the IEEE Antennas and Propagation Society Doctoral Research Award and was nominated for the R.W.P. King Award. He is the PI of several grants of National Nature Science Foundation, Beijing Natural Science Foundation, National Key Research and Development Program of China as well as co-PI of grants of National Science Foundation and Samsung.