Integrated lithium niobate photonics: from communications to metrology

(onsite and online)

Seminar jointly organized by the Department of Mechanical Engineering and the HK Institute of Quantum Science and Technology

Date: 6 December, 2023 (Wednesday)
Time: 11:00 a.m. (Hong Kong Time)
Venue: CPD-3.15, Centennial Campus
HKU

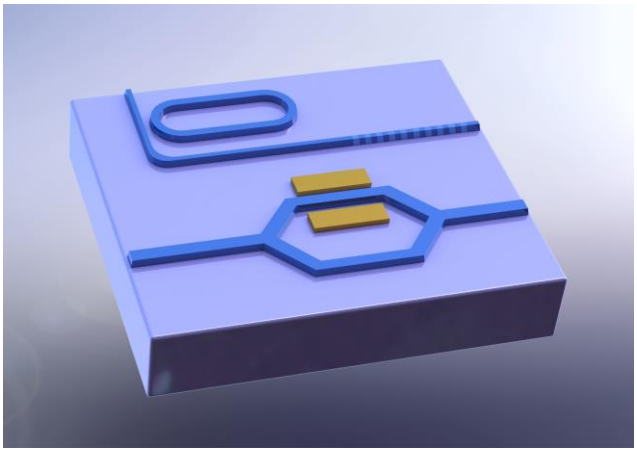
Speaker: Professor Yang Li
Department of Precision Instrument
Tsinghua University

Zoom Online Lecture:

Meeting ID: 923 6189 8401
Password: 508873

Abstract:

Lithium niobate features low absorption, high refractive index, large electro-optic coefficient, and high chemical and thermal stability from 0.4μm to 5μm, 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 ~1V•cm as well as 3dB bandwidth of over 110GHz, electro-optic frequency combs with tunable repetition rate. Leveraging the tunable repetition rate of electro-optic frequency combs, we achieved ambiguity-free absolute distance measurement system with a precision of ~100 μm and an acquisition rate up to 25 MHz. Based on the integrated lithium niobate phase modulators, we achieved 16-channel optical phased array, featuring beam steering of 24^{o} and 8^{o}, 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.



References:

[1] Zhuang, R., He, J., Qi, Y. & Li, Y. High-Q thin-film lithium niobate microrings fabricated with wet etching. Adv. Mater. 35, 2370015 (2023).

[2] Yue, G. & Li, Y. Integrated lithium niobate optical phased array for two-dimensional beam steering. Opt. Lett. 48, 3633-3636 (2023).

[3] Qi, Y., Yue, G., Hao, T. & Li, Y. 110-GHz bandwidth integrated lithium niobate modulator without direct lithium niobate etching. arXiv:2308.03073 (2023).

Biography:

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, Light: Science and Applications, Nano Letters. Four of his journal papers were featured as cover stories. One of his papers has been cited for over 250 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.

ALL INTERESTED ARE WELCOME

For further information, please contact Prof. Nicholas Fang at 3917 2639.