

Allgemeines Physikalisches Kolloquium

Donnerstag, 13.06.2024 - 16 Uhr c.t.



Prof Dr. David Marpaung

Universität Twente

© D. Marpaung

Brillouin Optomechanics in Photonic Integrated Circuits

Stimulated Brillouin scattering (SBS) is a coherent optomechanical interaction between light and gigahertz acoustic waves that can unlock promising technologies including narrow-linewidth lasers, microwave photonic signal processing, and on-chip nonreciprocal light propagation. Recently, SBS has extensively been studied in integrated waveguides. However, many implementations rely on complicated fabrication schemes, using suspended waveguides, or non-standard materials. The absence of SBS in standard and mature fabrication platforms prevents large-scale circuit integration and severely limits the potential of this technology. In this talk, I will focus on our recent results on enhancement of SBS in scalable integration platform including silicon nitride [1-3] and thin-film lithium niobate [4] and I will discuss the potential applications of this technology.

[1] R. Botter, K. Ye, Y. Klaver, R. Suryadharma, O. Daulay, G. Liu, J. van den Hoogen, L. Kanger, P. van der Slot, E. Klein, M. Hoekman, C. Roeloffzen, Y. Liu, and D. Marpaung, "Guided-acoustic stimulated Brillouin scattering in silicon nitride photonic circuits," *Science Advances*, vol. 8, no. 40, p. 2196, Oct. 2022. [2] R. A. Botter, Y. Klaver, R. te Morsche, B. L. Segat Frare, B. Hashemi, K. Ye, A. Mishra, R. B. G. Braamhaar, J. D. B. Bradley, and D. Marpaung, "Stimulated Brillouin scattering in tellurite-covered silicon nitride waveguides," *arXiv:2307.12814*, Jul. 2023. [3] K. Ye, Y. Klaver, O. A. Jimenez Gordillo, R. Botter, O. Daulay, F. Moriche, A. Melloni, and D. Marpaung, "Brillouin and Kerr nonlinearities of a low-index silicon oxynitride platform," *APL Photonics*, vol. 8, no. 5, p. 51302, May 2023. [4] Ye, Kaixuan, H. Feng, Y. Klaver, A. Keloth, A. Mishra, C. Wang, and D. Marpaung, "Surface acoustic wave Brillouin scattering in thin-film lithium niobate waveguides," *Optica Open*. Preprint. <https://doi.org/10.1364/opticaopen.24441103.v1> (2023).

David Marpaung is a full professor leading the Nonlinear Nanophotonics group at the University of Twente, the Netherlands. He is a fellow of Optica (formerly OSA). He was the recipient of the 2015 Discovery Early Career Research Award (DECRA) from the Australian Research Council, the 2017 Vidi award and the 2019 START UP grant from the Netherlands Organisation for Scientific Research (NWO). In 2022 he was awarded the ERC Consolidator grant on the topic of 3D photonic circuits for Brillouin scattering. His research interests include integrated photonics, nonlinear optics, and microwave photonics.