OPTICA SPIE. Student Chapters @ Columbia University | OPTICA Advancing Optics and Photonics Worldwide | Columbia University Student Chapter | COLUMBIA ENGINEERING The Fu Foundation School of Engineering and Applied Science

Topic: Resonator-Enhanced Electro-Optic Frequency Combs

Brandon Buscaino

Research Scientist, Ciena Corporation

Location: Online via Zoom

Date: April 20th (Wednesday), 2022

Time: 3pm – 4pm, EST

Sign Up Here

Abstract:

Optical frequency combs (OFCs) are ubiquitous in spectroscopy, metrology, and precision time-keeping. While OFCs are commonly generated from mode-locked lasers or Kerr nonlinear resonators, it is possible to generate OFCs through other phenomena, such as the electro-optic (EO) effect. EO OFCs are useful due to their flexible frequency spacing, predictable spectrum, and broad input wavelength operation. However, these combs typically lack optical bandwidth and have high power consumption. In order to alleviate these problems, researchers have proposed resonator-enhanced electro-optic (RE-EO) comb generators that utilize a resonant cavity to efficiently generate many comb lines. While many of these designs require bulky components with an active gain medium, recent developments in low-loss thin-film lithium niobate (TFLN) platforms have enabled broadband, chip-scale, RE-EO comb generation.

In this talk, I will give an overview of OFCs, focusing on single-resonator electro-optic (SR-EO) comb generators. I will discuss analytical and numerical tools to predict the output comb spectrum away from their typical resonant operation mode, i.e. when the input optical source and the input electrical driver are non-resonant with the cavity free spectral range. Then, I will extend these models to RE-EO comb generators and simulate power-efficient, broadband comb formation. Finally, experimental results from a joint Stanford-Harvard collaboration demonstrating a broadband (over 80 nm) SR-EO OFC generated in a TFLN platform will be presented. Early experimental results demonstrating a RE-EO comb generator with 30% conversion efficiency and 132 nm bandwidth will also be presented.

Speaker Bio:

Brandon Buscaino received a Ph.D. in Electrical Engineering from Prof. Joseph Kahn's Optical Communications Group at Stanford University in 2020, where he developed novel techniques for electro-optic frequency comb generation and designed optical links for co-packaged data center communications. As president of the Stanford Optical Society, the student Optica/SPIE chapter, he organized community conferences, led outreach presentations at FiO+LS, and served on the Optica Student Leadership Conference planning committee. Since then, he has continued professional involvement in optics by participating in various Optica technical groups and committees as well as several Congressional Visits Days, advocating for optics and photonics funding in Congress. Currently, Brandon is a Research Scientist at Ciena Corporation, focusing on coherent optical communications technologies and applications. In 2021, Brandon was awarded the Kaminow Outstanding Early Career Professional Prize from Optica.

Sign Up Here

For more information, check https://www.ee.columbia.edu/osa/