Bound states in the continuum for photonic integration and InP membranes for heralded single photon generation

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Bound-state In Continuum for Photonic Integration and InP membranes for Heralded Single Photon generation

H.K. Tsang¹, Y. Wang¹, R.R. Kumar¹, Z. Yu¹, X. Sun¹, M. Raevskaia², V. Pogoretskii², Y. Jiao²

¹ Department of Electronic Engineering, The Chinese University of Hong Kong, Shatin, Hong Kong SAR, P.R. China

² Institute for Photonic Integration (IPI), Eindhoven University of Technology, Eindhoven, The Netherlands

Abstract

We present our recent results on the use of two quite different approaches for photonic integration. First we shall explain how the concept of bound states in the continuum (BiC) may be used to make channel guided devices without the need for any dry etching. We illustrate this generic technique with a specific experimental application in the hybrid integration of graphene on lithium niobate for making high speed channel-guided photodetectors and electroabsorption modulators on lithium niobate [1]. The BiC concept facilitates the hybrid integration of 2D materials on different substrates and may also be used to increase the effective optical nonlinearity of the underlying substrate by hybrid integration of the appropriate 2D material [2]. Second we shall discuss the InP membrane waveguide platform for nonlinear applications. InP has a third order nonlinearity that is over an order of magnitude larger than silicon, and is therefore of potential interest for spontaneous four wave mixing to produce entangled photons [3]. The use of InP membranes can potentially facilitate the integration of active III-V lasers, and Geiger mode avalanche photodiodes for single photon detection and nonlinear devices on large scale silicon wafers which can integrate the large delay interferometers and filters needed for quantum information processing. We discuss the advantages and disadvantages of InP for SFWM and present recent results on the use of InP membranes for generating heralded single photons [4].

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