

# Prospects for Hybrid Integration of Si and SiN Waveguides with Graphene and Other 2D-Materials

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**Abstract:** In this presentation, I will review recent state-of-the-art in graphene optical intensity modulators, including our work on multi-channel WDM-modulators, and the prospects of using alternative 2D-materials.

## Introduction

In this presentation, I will review recent state-of-the-art in graphene optical intensity modulators, including our work on multi-channel WDM-modulators [1] and improved modelling of the effect of doping-type in the silicon waveguide on the operation of single-layer graphene modulators [2]. Next, I will discuss the prospects of using alternative 2D-materials for realizing integrated phase and intensity modulators. Finally, I'll discuss coupling of TMDC-based 2D-emitters to SiN-waveguides [3].

## 3. References

- [1] C. Alessandri *et al.*, “ $5 \times 25$  Gbit/s WDM transmitters based on passivated graphene–silicon electro-absorption modulators,” *Appl. Opt.*, *AO*, vol. 59, no. 4, pp. 1156–1162, Feb. 2020, doi: 10.1364/AO.383462.
- [2] C. Alessandri *et al.*, “High speed graphene-silicon electro-absorption modulators for the O-band and C-band,” *Japanese Journal of Applied Physics*, accepted for publication, 2020. <https://doi.org/10.35848/1347-4065/ab8920>
- [3] F. Peyskens, C. Chakraborty, M. Muneeb, D. V. Thourhout, and D. Englund, “Integration of single photon emitters in 2D layered materials with a silicon nitride photonic chip,” *Nat Commun*, vol. 10, no. 1, pp. 1–7, Sep. 2019, doi: 10.1038/s41467-019-12421-0.