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The enabling role of Graphene in integrated optics

The hetero-integration of different photonic components is the major route to further increase the performance and functionality of silicon based microelectronic devices. For guiding and routing infrared light silicon is already a perfect material because of its low light interaction and high refractive index. However, because of this low light interaction the hetero-integration of different materials is needed to realize competitive key active components like modulators and photodetectors. Graphene offers high carrier mobility, broadband and electrically tunable light interaction in combination with the possibility to integrate graphene onto nearly any substrate. By adding major photonic functionalities to the silicon platform graphene emerged as a key enabling material for integrated photonic devices.

In this talk our latest results on graphene based photodetectors and modulators integrated on silicon waveguides will be presented and future challenges discussed. The key parameters of these devices will be assessed and compared with competing technologies.

References

[1] D. Schall, et al. 50 GBit/s photodetectors based on wafer-scale graphene for integrated silicon photonic communication systems ACS Photonics 1, 781 (2014).

[2] M. Mohsin, D. Schall, M. Otto, A. Noculak, D. Neumaier, and H. Kurz, Graphene based low insertion loss electro-absorption modulator on SOI waveguide Optics Express. 22, 15292 (2014)

Figures

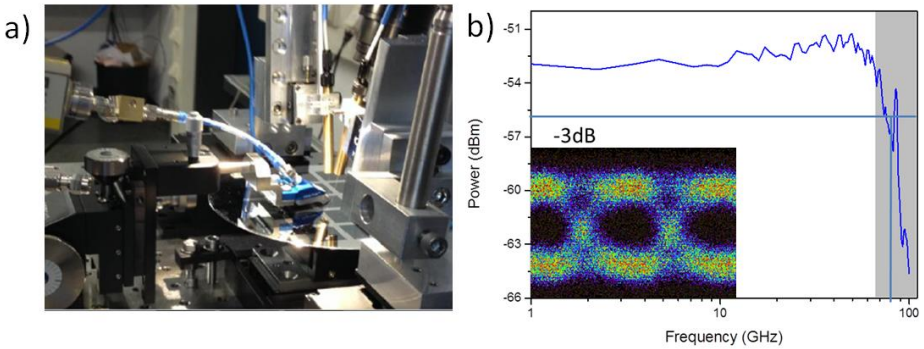

Figure 1: a) On-wafer high-freuqency electro-optical characterisation of graphene photodetectors. b) The as measured frequency response of a graphene photodetector, demonstrating a -3 dB bandwidth of 80 GHz. The inset shows an open eye-diagram recorded at a data rate of 12.5 GBit/s.