Graphene based optical modulators and photodetectors for chip-integrated communication systems

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High frequency opto-electronic devices like photodetectors and electro-optical modulators are the core of modern information and communication systems. Those devices have been recognized from the very beginning as one of the most promising fields of applications for graphene having the potential to significant outperform their counterparts based on Silicon and III/V semiconductors in terms of speed. This expectation has mainly been fuelled by graphene's tunable, broadband optical interaction, the outstanding charge carrier mobility, and the possibility to integrate graphene on nearly any platform.

The on-chip integration of different optical components is the major route for further increasing the bandwidth and reducing cost. While silicon is a perfect material for guiding and routing infrared light, the low light-interaction of silicon requires hetero-integration of other materials for realizing compact modulators and photodetectors. This offers an excellent opportunity for graphene to enter silicon technology by adding missing functionalities. In this talk I will discuss our latest results on graphene based photodetectors and modulators integrated on silicon waveguides [1,2]. Key parameters 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)