**mm-Wave Wireless Communications based on Silicon Photonics Integrated Circuits.**

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Silicon Photonic Integrated Circuits

Why Silicon Photonic Integrated Circuits?

Silicon-on-insulator (SOI) photonic integrated circuits (PICs) are a prime candidate for photonic integration, due to a number of factors:

- Compatible to CMOS technology and fabrication infrastructure
  - Highly accurate, high-yield and mature technology
  - Hybrid photonic and electronic integration
- Operation in the 1.3μm and 1.55μm telecommunications windows
- Large selection of photonic components available
  - Filters
  - Modulators
  - (De-)Multiplexers
  - Mach-Zehnder Interferometers
  - Splitters
  - Photodetectors
- Active components with heterogeneous integration (III/V, InP etc)

Integration of mm-Wave Transmitter

Silicon photonic integrated circuits allow integration of the mm-wave generation setup, including generation of a wavelength comb or two appropriately spaced spectral lines and the modulation for data transmission or sensing.

Photonic-Wireless mm-Wave Systems

Applications

The large bandwidth made available by the use of mm-waves and the flexibility of hybrid photonic-wireless systems benefits not only data communications but also a large range of applications in radar and sensing:

- Photonic-Wireless mm-Wave Systems

System Architectures

Optical generation and delivery of the RF signal to the antenna site allows easy realisation of system setups for both communications and sensing.

mm-Wave Wireless Transmission

Wireless transmission in the W-band based on discrete optical components is demonstrated in the lab at distances up to 70m.

Project Goals

The project will demonstrate that mm-wave transmissions based on silicon photonic integrated circuits may enable the ubiquitous high-speed wireless networks of the future. To this end the steps and goals of the project are:

- Design and test of a PIC for mm-wave signal generation
- Photodiode design and test for mm-wave OE-conversion
- Demonstration of a high speed mm-wave wireless link supporting 100Gbit/s or more