

# Photonic Phase Noise Analyzer

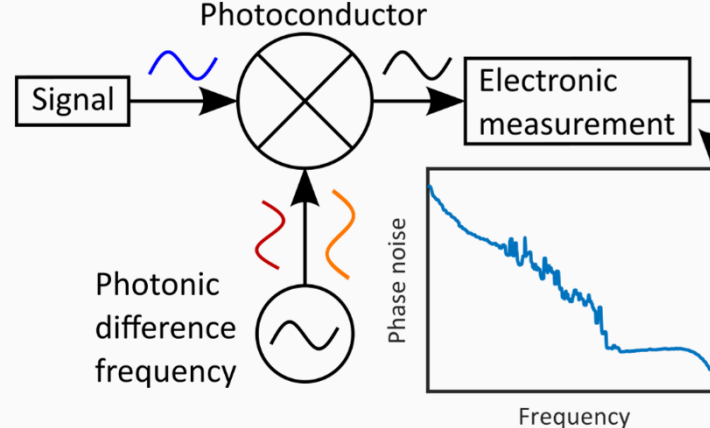
Phase noise characterization in the Terahertz range and beyond

## STATUS QUO

Phase noise characterization of sources of electromagnetic waves are pivotal for their successful development. The current state of the art in the Terahertz (100 GHz-10 THz) domain are microwave units with hollow metal waveguide-based frequency extenders. These have two major disadvantages: 1.) The metal waveguides are limited in tunability to about 50% of the center frequency. 2.) surface roughness and alignment accuracy aggravate accessing frequencies beyond 1.5 THz.

## OUR TECHNOLOGY

The photonic phase noise analyzer combines the tunability of photonic systems with the capabilities of electronic measurement equipment and low-noise photoconductors. The photonic systems provide a difference frequency in the Terahertz domain with tunability of several octaves, e.g. by two lasers or two components of a frequency comb. The photoconductor mixes the difference frequency with the signal to be characterized to an intermediate frequency for subsequent electronic measurement analysis.



## BENEFITS

- ▶ Extreme tunability with a single system
- ▶ Cost-efficient
- ▶ Several variants possible, depending on needed specifications and pricing

## APPLICATION POSSIBILITIES

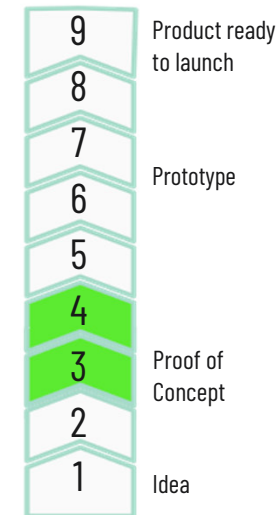
Analysis of the phase noise of sub-mm- Terahertz- and far infrared sources

- from few GHz to 7 THz and approx. 11 THz to the FIR
- Extension to a combined Spectrum analyzer and phase noise characterization unit possible

## COMMERCIALIZATION OPPORTUNITIES

There are various possibilities for cooperation between the industrial partner and TU Darmstadt: from an exchange with the know-how carriers of the technology up to a close cooperation in case of further development needs. The technology is protected by intellectual property rights and can be used by the industry partner after a sale or licensing agreement.

## CURRENT STAGE OF DEVELOPMENT TECHNOLOGY READINESS LEVEL (TRL)



**The technology development is at Level 3-4:**

The low phase noise of an exemplary photonic local oscillator was experimentally confirmed and compared to an electronic one at 40 GHz

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