<u>Special seminar – Tuesday 23rd of May</u>

<u>Homodyne Measurement – Why is it so important</u> and how we can make it better.

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Homodyne measurement is a corner-stone of quantum optics. It measures the fundamental variables of quantum electrodynamics - the quadratures of light, which represent the cosine-wave and sine-wave components of an optical field and constitute the quantum optical analog of position and momentum. Yet, standard homodyne, which is used to measure the quadrature information, suffers from a severe bandwidth limitation: While the bandwidth of optical states can easily span many THz, standard homodyne detection is inherently limited to the electrically accessible, MHz to GHz range, leaving a dramatic gap between the relevant optical phenomena and the measurement capability. We demonstrate a fully parallel optical homodyne measurement across an arbitrary optical bandwidth, effectively lifting this bandwidth limitation completely. Using optical parametric amplification, which amplifies one quadrature while attenuating the other, we measure two-mode quadrature squeezing of 1.5dB below the vacuum level simultaneously across a bandwidth of 55THz, using just one local-oscillator - the pump. This broadband parametric homodyne measurement opens a wide window for parallel processing of quantum information.

Date: Tuesday 23rd of May

Location: Nanotechnology institute building (#51) room 15

Time: 10:00

Refreshments will be served.