



## European XFEL Science Seminar

**Tuesday, 3<sup>rd</sup> September 2019, 13:00**

Campus Schenefeld, XHQ, room E1.173 (coffee & biscuits will be served from 12:30)

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## High-order interferometry at XFEL sources

The invention of optical lasers led to a revolution in the field of optics as well as to the birth of quantum optics. The reasons were the unique statistical and coherence properties of lasers. Short wavelength free-electron lasers (FELs) are sources of bright, coherent extremeultraviolet and X-ray radiation with pulse duration on the order of tens of femtoseconds and are presently considered to be laser sources at these energies. Hanbury Brown and Twiss (HBT) interferometry that is based on intensity correlations allows fast and comprehensive analysis of the FEL statistical properties. In my talk it will be demonstrated that self-amplified spontaneous emission (SASE) FELs are highly spatially coherent to the first-order, but despite their name, statistically behave as chaotic sources. HBT measurements performed at an externally seeded FEL FERMI showed that it behaves as a real laser-like source according to a Glauber definition. These new concepts lead to new imaging opportunities based on correlation techniques: quantum imaging and ghost imaging. In my talk I will discuss both approaches and will focus on possible extensions to hard x-rays. Short femtosecond pulses of XFEL's open opportunities of performing pump-probe experiments with optical lasers. In the end of my talk I will describe one of such experiments aimed to understand dynamics in thin Pt films induced by IR laser and probed by hard x-rays from PAL XFEL facility.

**Host:** Johan Bielecki