



WESTFÄLISCHE  
WILHELMS-UNIVERSITÄT  
MÜNSTER



FACHBEREICH  
PHYSIK

# ›Allgemeines Physikalisches Kolloquium

›Donnerstag, 10.01.2019 um 16 Uhr c.t.

Dr. Luiz H.G.Tizei

Université Paris Sud



## Quantum optics at the nanoscale with fast electrons

In this seminar, we will discuss the benefits and difficulties of performing optical spectroscopy using fast electrons as the excitation source (either in emission, using cathodoluminescence or absorption, by measuring electron energy loss). Much higher spatial resolution (from tens of nanometers to below a nanometer) is the evident attraction. Indeed, advances in electron optics (aberration correctors, monochromators and spectrometers) and improvements in electron microscope instrumentation (stages with cryogenic temperatures, including light collection systems) have brought electron spectroscopies closer to the energy resolution and detection sensitivity of standard optical spectroscopies.

Beyond optical spectroscopy, it will be shown that light intensity interferometry can also be performed in a cathodoluminescence setup using a Hanbury Brown and Twiss (HBT) interferometer, allowing the detection of single photon source in diamonds and  $h$ -BN.

Finally, recent experiments using electron energy loss spectroscopy in the optical to the infrared energy range will be discussed. The improved resolution available allows us now to probe different excitations down to a few tens of meV. More importantly, the few meV spectral resolution will unveil physical effects which could not be assessed until recently.

