

**Speaker:** Víctor Delgado, University of Freiburg  
**Title:** Construction of an Attosecond Interferometer for Two-Color Photoionization Experiments  
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**Place:** Seminar room 915

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**Abstract:**

Photoionization experiments study the mechanisms by which electrons are pulled apart from their atoms after absorbing high-energy photons, and they represent ideal tools to investigate light-matter interactions. This thesis has been dedicated to the optimization of an attosecond interferometer which allows for two-color photoionization experiments under a pump-probe configuration. A high-energy laser pulse (the pump) is used to excite a certain gas, while another laser pulse (the probe) monitors the evolution of this process as a function of time. To start with, a one color-field photoionization experiment was performed, where an attosecond pulse train in the extreme-ultraviolet range (XUV) was first created via high harmonic generation (HHG). After describing its spectrum, it was sent to ionize an atomic beam of argon. Photoionization was investigated using a velocity-map imaging (VMI) spectrometer, and the properties of the corresponding photoelectron spectrum were noted. A two color-field experiment followed, where the XUV radiation was recombined with the near-infrared (NIR) femtosecond output of a commercially produced Titanium-doped Sapphire laser system. After the construction and addition of an auxiliary telescope to the original setup, sidebands in the photoelectron spectrum were finally observed as a result of the interaction of photoelectrons with the NIR field. To conclude, the output of an optical parametric amplifier (OPA) was characterized with the purpose of using it as the probe in future two color-field experiments: power, spectrum and pulse duration were analysed at both of its stages, as well as the intensity stability of the amplified output. The properties of the spectrum after amplification by two distinct nonlinear crystals with different thicknesses were also analysed. To measure the CEP fluctuations, an f-to-2f interferometer was built and a Fourier-based algorithm was implemented