



# Joint LLC Seminar

Thursday November 9, 15:15  
The Rydberg Lecture Hall, Dep. of Physics

**Cord Arnold**

Div. of Atomic Physics, Lund University

## **Towards high repetition rate attosecond science**

Ultrafast science is the science of the generation, control, and characterization of ultrashort light pulses as well as their application in time-resolved measurements. With the first demonstration of attosecond pulses in 2001, it suddenly became possible to optically probe the quantum nature of matter by capturing the fundamental electronic response underlying virtually all light-matter interactions on their natural attosecond time scale. Attosecond sources are compact laser-driven secondary light sources with their characteristics being determined by the properties of the driving laser.

In my presentation, I will highlight how we push the possibilities of attosecond science by advanced laser development and pulse characterization techniques. During the last five years, we have developed a near-infrared optical parametric chirped pulse amplifier (OPCPA), delivering intense few-cycle laser pulses at 200 times faster repetition rate than the current Titanium:Sapphire workhorse laser technology in the field. By identifying universal scaling laws of gas nonlinear optics we have realized an efficient high repetition rate attosecond source, allowing for unprecedented signal-to-noise ratio and suddenly enabling experiments with high demands on statistics, out of reach until now because of inconveniently long acquisition times. A further upgrade of the laser is being undertaken right now, also including a mid-infrared output with the possibility for attosecond pulses in the soft-X-ray spectral range, opening up for probing the inner electronic shells of atomic, molecular, and surface systems.

**The Rydberg Lecture Hall is located at the Department of Physics,  
Professorsgatan 1**

**Coffee and refreshments will be served  
before the seminar, from 15:00**

