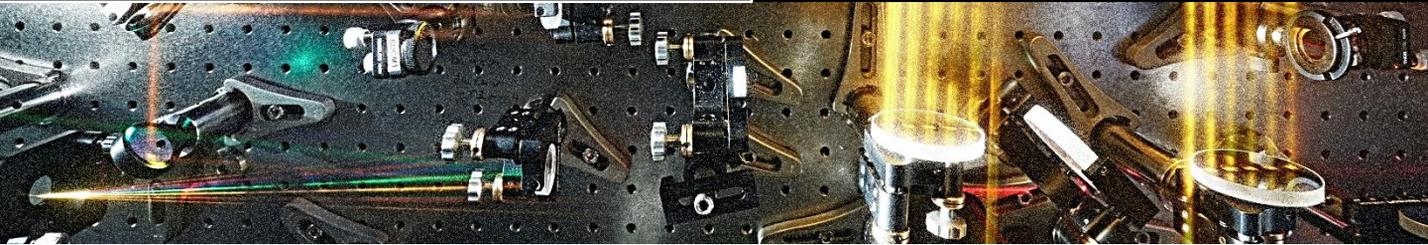


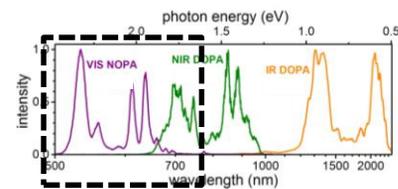
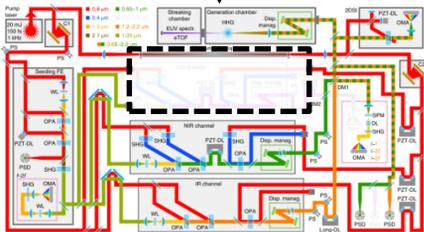
# BACHELOR/MASTER THESIS

Generation of multi-octave,  
infrared sub-cycle pulses



The ultrafast optics and X-rays division led by Prof. Franz X. Kärtner at CFEL/DESY investigates on the advancement of ultrafast laser technologies and their application to ultrafast sciences. Laser sources delivering sub-cycle pulses in the visible and infrared spectral range are developed to explore attosecond and femtosecond phenomena during light-matter interaction.

## Your work!



We are seeking motivated students, interested in **ultrafast laser source development**. The synthesis of ultrashort light pulses with durations shorter than their oscillation period (**sub-cycle pulses**) and with mJ energies, enables the **direct generation** of tunable **isolated attosecond pulses** in the **extreme ultraviolet** and **soft X-ray regime** via **high-harmonic generation (HHG)**, as well as the investigation of currently unexplored **strong field phenomena**. You will build and integrate a **visible channel (~0.5 – 0.7 μm)** onto an existing two-channel **sub-cycle waveform synthesizer**, which currently combines an infrared (IR) and a near-infrared (NIR) spectral channels. You will learn how to **design, build** and **characterize optical parametric amplifiers (OPAs)** in the visible spectral regime as well as to **temporally-compress** the generated ultrabroadband pulses. At the end of the project, you will coherently combine the visible channel with the NIR- and IR channels and **measure** their **relative phase stability**.

**Prof. Franz X. Kärtner**  
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Besides a basic knowledge in linear, nonlinear and strong field optics, a good practice in English for daily communication would be helpful. Interested? Please contact

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- (1) Rossi, G.M., Mainz, R.E., Yang, Y. *et al.*, Nat. Photonics **14**, 629–635 (2020)
- (2) O. D. Mücke et al., IEEE J. Sel. Top. Quantum Electron. **21**, 8700712 (2015)

Other topics in ultrafast laser science and attosecond science are available as well.