



IMPRS UFAST Call for PhD applications 2026/2027



TH1 - Ultrafast pulse generation in chip-integrated microresonators with engineered nonlinear attractor states

Title of PhD Project	Ultrafast pulse generation in chip-integrated microresonators with engineered nonlinear attractor states
Type	Experimental
Supervisor(s)	Tobias Herr
Affiliation(s):	UHH, DESY
Number of positions:	1
Abstract:	Chip-integrated nonlinear microresonators generate femtosecond pulses in the form of dissipative Kerr solitons: self-organized attractor states of a driven nonlinear cavity. Their pulse duration, spectral coverage and timing noise are set by the interplay of dispersion and nonlinearity, both of which can be engineered at the design stage. This project explores how far this control can be pushed to access soliton states that do not exist in conventional resonators. To achieve this, dispersion and effective nonlinearity will be shaped through microresonator geometry and other degrees of freedom provided by advanced nanofabrication. Key goals include ultralow timing jitter, operation at visible and ultraviolet wavelengths, and pulse durations approaching the few-cycle regime. The microresonators will be based on integrated photonic technology, which connects the scientific results directly to scalable and deployable ultrafast technology. The project will cover the full chain from nonlinear simulation and design of photonic chips to ultrafast characterization in our labs. Relevant references: Ulanov et al., Nature Photonics 18, 294 (2024) Ulanov et al., arXiv:2607.06406 (2026).
Contact person for scientific questions about the project:	Tobias Herr: tobias.herr@desy.de
Research Group Website:	https://ump.cfel.de/