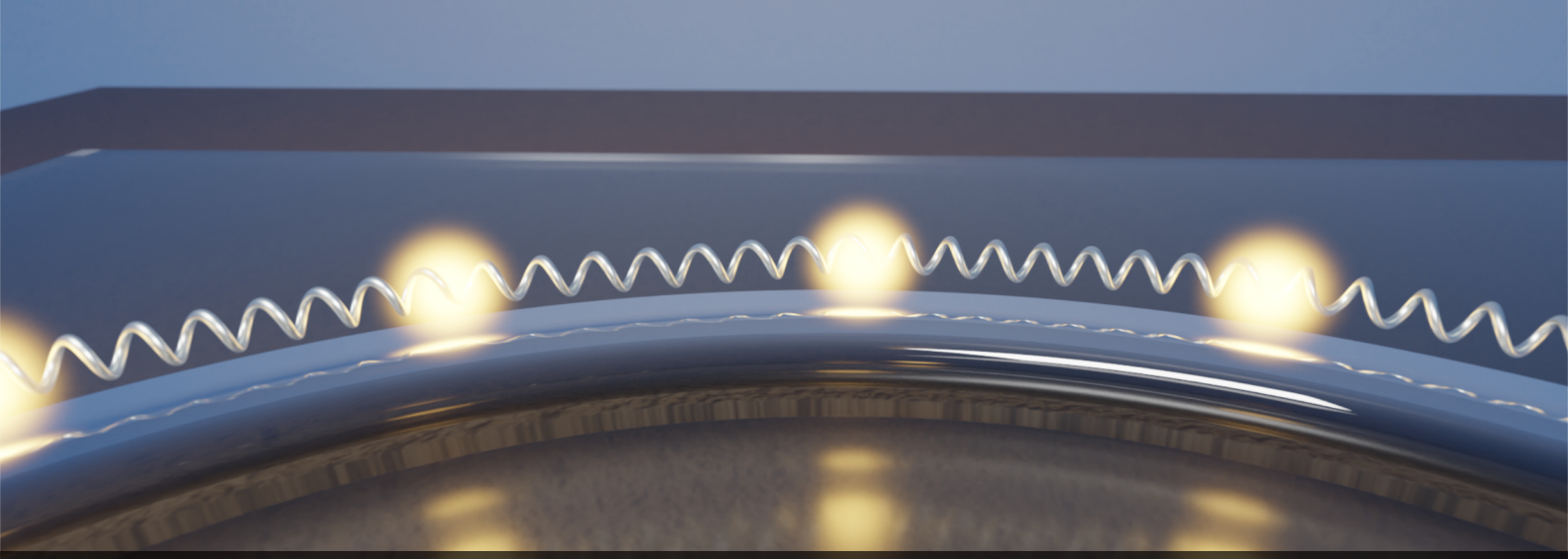
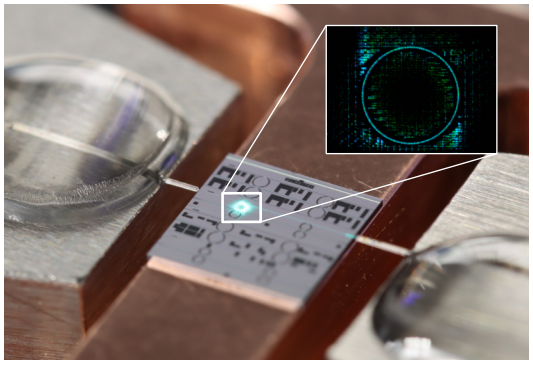


PhD/MSc Thesis

"Materials" made of light



Are you interested or would you like more information? Please don't hesitate to get in touch.

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CFEL SCIENCE
Ultrafast Nonlinear Microphotonics

About the project

Through nonlinear optical self-organization stable femtosecond laser pulses can form inside a ring-like microresonator[1],[2],[3]. When multiple pulses are created, they can interact like atoms and form "molecules"[4] or "crystals"[5].

In this project, we will explore the fundamental classical and quantum properties of these novel light-based "materials". For their synthesis, we will leverage techniques equivalent to those in cold atom physics, such as lattice-trapping and laser cooling. The generated insights can immediately impact emerging applications in ultrafast optical sensing, photonic computing, and mobile navigation[6].

The **PhD thesis** will combine experimental, numerical, and analytical techniques at the forefront of integrated photonic technology, ultrafast lasers and nonlinear optics. It includes the design of integrated photonic circuits and advanced microphotonic laser systems as well as experiments in our state-of-the-art laboratory (https://ump.cfel.de/). The **MSc thesis** will focus on one of these aspects.

If you like working collaboratively with a highly motivated team in a fast-paced research field at the interface of fundamental science and applied photonic technology, please don't hesitate to get in touch. Curiosity and general understanding of physics are more important than field-specific prior knowledge.

This project will be carried out in a close collaboration with researchers from Caltech/NASA JPL.

References:

[1] Vahala, *Nature* 424, 839-846 (2003)
[2] Herr et al., *Nature Photonics* 8, 145 (2014)
[3] Brasch et al., *Science* 351, 6271 (2016)
[4] Weng et al., *Nature Communications* 11, 2402 (2020)
[5] Cole et al., *Nature Photonics* 11, 671 (2017)
[6] Kippenberg et al., *Science* 361, 6402 (2018)

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