

## **Laser-shaping of x-ray free-electron laser pulses at the Linac Coherent Light Source**

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The x-ray free-electron laser is the brightest source of x-rays, with a peak brightness ten orders of magnitude higher than conventional synchrotron radiation sources. Much like conventional lasers, xFELs are extremely flexible machines and the properties of the x-rays can be controlled by accurately manipulating the lasing medium, i.e. the electron beam.

In my talk I will discuss our ongoing efforts to shape the temporal properties of the x-rays using optical and infrared lasers at the Linac Coherent Light Source (LCLS).

First I will discuss the optical spoiler method, which relies on the shaping of the laser-heater temporal profile to manipulate the properties of the x-rays at the few-femtosecond time-scale. This technique was recently demonstrated at LCLS and holds great promise to arbitrarily shape the temporal profile of the LCLS-II FEL, overcoming the limitations of the existing methods based on an emittance spoiler.

Finally, I will discuss our plans for the generation sub-fs soft x-ray pulses at LCLS and LCLS-II by means of a laser-slicing scheme. This method will allow the generation of soft x-ray pulses as short as 500 as and coherent bandwidth up to 5 eV, thus enabling groundbreaking applications, such as stimulated x-ray Raman scattering, at fourth generation light sources.