

## **Three-dimensional THz bullet source at the SwissFEL**

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Terahertz pump X-ray probe is an emerging spectroscopic technique with big potential for ultrafast research in physics and chemistry. The SwissFEL is an X-ray free electron laser being constructed at the Paul Scherrer Institute near Zurich. While THz pulses are capable of selectively exciting ultrafast dynamics, X-ray pulses can capture the delayed dynamics on the femtosecond and atomic temporal and spatial resolutions.

In my talk, I will describe an intense THz source constructed at the SwissFEL with record high intensity of 83 MV/cm based on organic crystals. The source depends on a novel approach that combines optical wavefront control and optimized focusing scheme to reach the physical limits of THz energy confinement in space and time. The capabilities of this source extend from THz-induced demagnetization and material damage to direct visualization of low frequency THz radiation on normal silicon CCD detectors.

1. <https://www.psi.ch/swissfel/>
2. Shalaby & Hauri, Nat. Commun. 6, 5976 (2015).
3. Shalaby, Vicario & Hauri, Nat. Commun. 6, 8439 (2015).