



**2<sup>nd</sup> May, 2017 – 11:00 am**  
CFEL-bldg. 99, seminar room I (EG.076)

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## Opportunities and challenges of terahertz emitting organic crystals: The terahertz $\lambda^3$ bullet source at the SwissFEL

Terahertz pump X-ray probe is an emerging spectroscopic technique with big potential for ultrafast physics and chemistry. As a terahertz emitter, organic crystals recently rose to prominence as an efficient energy converter. However, the generated high terahertz energies have always been challenged by focusing hurdles leading to low brightness. My talk will focus on the recent THz source development at the SwissFEL.

First, I will describe an experimental scheme for spatio-temporal confinement of low-frequency terahertz radiation to its physical limits to the least possible three-dimensional light bullet volume of wavelength-cubic. This approach relies on finding the optimum settings of pump wavefront curvature and post generation beam divergence. This leads to a regime of extremely bright PW m<sup>-2</sup> level THz radiation with peak fields up to 83 MV/cm and 27.7 T. Second, I will discuss the parallel development of organic crystal technology at the SwissFEL to reach reliable, high quality terahertz emitters. Finally, I will present general directions for upscaling the terahertz generation technology from organic crystals.

1. <https://www.psi.ch/swissfel/>

2. Shalaby & Hauri, Nat. Commun. 6, 5976 (2015).

3. Shalaby, Vicario & Hauri, Nat. Commun. 6, 8439 (2015).