

LWFA-driven X-rays and Applications

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Abstract

We present data on a various X-ray production schemes from laser-wakefield-driven electron beams. This includes detailed electron beam characterization measurements [1] from various gas target sources, comparing beam properties from different targets. Since stable beams can now be routinely achieved over a wide range of parameters, we show their use for X-ray production by undulator radiation, betatron emission [2] and Thomson scattering [3].

A quantitative phase-contrast tomogram of an insect has been recorded with a 5-keV betatron source with few-micron source size. We show that our method permits accurate reconstruction of electron densities in the insect by comparing our reconstructed images with electron-microscopy images.

For Thomson scattering, we demonstrate the onset of the nonlinear scattering regime by the spectral downshift of the emitted radiation due to the transverse excursion of the electron bunch in a colliding pulse with $a_0=0.9$, and the presence of second and third order harmonic emission.

We will also show the latest status of the ongoing facility upgrade at Garching and first results with the upgraded 300 TW laser.

References

[1] M. Heigoldt et al, arXiv 1406.6653

[2] J. Wenz et al., Nature Communications **6** 7568 (2015)

[3] K. Khrennikov et al., Phys. Rev. Lett. **114** 195003 (2015)