



LMU | CALA Ultra-Intense Seminar on
FRIDAY, October 9 at 15:00 CEST

Prof. Stefan Karsch

Injection and beam-loading of high-charge electron bunches

After a short introduction about the status of Garching's CALA facility and the current ATLAS laser performance, we report on the content of three recent publications in the context of high-charge electron bunch generation, propagation and application. First, we will focus on injection control with combined shock/colliding pulse methods to produce two independent electron bunches in one wakefield period. Thus, if the first bunch contains high and the second low charge, the second („witness“) bunch can serve as a probe of beamloading induced by the first („drive“) bunch. We will then discuss the effects of beam loading on high-charge bunch injection and its energy spectrum, which has been studied in great detail over a broad parameter range and on several different lasers. Second, we will report on the transition from a beam-loaded to a beam-dominated regime, where the high-charge beam dominates the wakefield generation, as can be observed by a few-cycle shadowgraphs probe. Finally, we will report on a hybrid acceleration scheme, where the second bunch is accelerated in this beam-driven wakefield, thus transferring energy from the driver to the witness.

References

- J. Wenz et al. *Nature Photonics* **13**, 263-269 (2019)
- M. F. Gilljohann et al. *Physical Review X* **9**, 011046 (2019)
- J. Götzfried et al. *Physical Review X* (accepted)