Contribution ID: **50** Type: **Student Poster**

# X-ray source development for high energy density science via self-modulated laser wakefield acceleration

*Tuesday, 8 November 2022 17:00 (2h 30m)*

We are demonstrating an X-ray source driven by a self-modulated laser wakefield accelerator (SM-LWFA) platform to generate bright, (10^10 photon/keV/sr), high energy (10 keV - 1 MeV) X-rays for use in high energy density science (HEDS) experiments. Over the years, this X-ray platform has been developed on Titan, Omega EP, and ARC lasers. An intense picosecond laser pulse propagates into a gas jet where it can excite both a multiple plasma periods plasma wave by the transverse self-modulation instability and produces a partially evacuated channel via relativistic self-focusing. We have shown that this regime can produce an extremely high charge (10s - 100s nC) relativistic electron beam via both the longitudinal electric field of the wake and the tightly focused laser pulse as well as the transverse electric field of the laser by the direct laser acceleration mechanism. We are now exploring if either the maximum electron energy or the peak electron current can be increased by employing plasma down/up ramps. We have used these high charge and energy electron beams to generate betatron-, inverse Compton scattering-, and bremsstrahlung radiation with photon energies up to several hundred keV range. Current work aims to improve the X-ray fluence particularly in the MeV energy range and use this platform for radiography of passive and active (HED) targets.

## Acknowledgments

This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344. We acknowledge support from the DOE Office of Sciences Early Career Research Program (Fusion Energy Sciences) SCW-1575-1. Work performed by UCLA was supported by DOE grant DE-SC0010064, NNSA grant DE-NA0003873, & NSF Grant No. 2003354. Computational support was provided by NSERC under the m1157 account.

**Primary author:** SINCLAIR, Mitchell

**Co-authors:** MILLER, Kyle (University of Rochester Laboratory for Laser Energetics); PAGANO, Isabella (UT Austin); AGHEDO, Adeola; ARROWSMITH, Charlie; LEMOS, Nuno; Dr SHAW, Jessica (University of Rochester, Laboratory of Laser Energetics); ALBERT, Félicie; JOSHI, Chan

**Presenter:** SINCLAIR, Mitchell

**Session Classification:** Poster Session and Reception

**Track Classification:** Poster Session: WG7 Poster: Radiation Generation and Advanced Concepts