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## **Multi-GeV Electron Beams from Self-Waveguided Laser Wakefield Acceleration in ELBA at ELI Beamlines**

*Wednesday, 24 September 2025 19:00 (1h 30m)*

We present recent high-power guiding and laser wakefield acceleration results from the ELBA at ELI Beamlines, utilizing the L3 laser system delivering 13 J, 30 fs pulses at 0.2 Hz. In these experiments, self-waveguiding was employed to generate 20 cm plasma channels in helium above an ELBA-developed supersonic gas jet. The channel forming beam was split from the drive beam post-compression and focused with an off-axis reflective axicon—used for the first time in self-waveguiding experiments—to generate the plasma/neutral prepared index structure for the ~2-3 ns delayed, 11.4 J self-waveguiding LWFA drive pulse. This all-reflective optical setup allowed efficient guiding and stable acceleration of electron beams to energies approaching 5 GeV and is suitable for 3.3 Hz repetition rate. This new implementation of self-waveguided LWFA demonstrates a robust and compact approach compatible with single-laser, single-compressor platforms. ELBA is a fully operational user beamline capable of delivering multi-GeV-class electron beams, including 5 GeV-level outputs, for a range of experiments in advanced laser-plasma acceleration and secondary source development.

**Primary author:** ŠIŠMA, Jiří (ELI Beamlines)

**Co-authors:** NEVRKLA, Michal (ELI Beamlines); VITHA, Filip (ELI Beamlines); LORENZ, Sebastian (ELI Beamlines); ZYMAK, Illia (ELI Beamlines); ŠPÁDOVÁ, Alžběta (ELI Beamlines); GRITTANI, Gabriele Maria (ELI Beamlines); JECH, Matěj (ELI Beamlines); LAZZARINI, Carlo Maria (ELI Beamlines); SHROCK, Jaron (University of Maryland); ROCKAFELLOW, Ela (University of Maryland); MIAO, Bo (University of Maryland); SLOSS, Ari (University of Maryland); MILCHBERG, Howard (University of Maryland); BULANOV, Sergei V. (ELI Beamlines)

**Presenter:** ŠIŠMA, Jiří (ELI Beamlines)

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