



Contribution ID: 24

Type: **not specified**

Control of spatio-temporal correlations for experiments with synchronized laser pulses

Friday, 1 November 2024 10:20 (25 minutes)

This work explores the stabilization of key parameters in dual-arm femtosecond laser systems, focusing on improving spatio-temporal control and synchronization to achieve peak powers above 10 PW. In the High-Power Laser System (HPLS) at ELI-NP, pulse energy, spectrum, and temporal “jitter” were analyzed to identify sources of instability and improve overall performance. The ongoing upgrade of the Avesta laser system, with a second arm with parallel amplification and compression, provides a controlled setup for studying and addressing instabilities. This research demonstrates the potential for coherent pulse combination and the scalability of these systems to higher peak powers.

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Session Classification: Oral contributions IX