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Optimization of filamentation compression of CPA laser pulses using machine-learning techniques

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Compression of amplified laser pulses beyond the limits of a compressor grating-setup has been a fruitful topic of research for decades. Filamentation compression offers a solution which benefits from a higher energy capacity and being easier to couple light into than the the hollow-core fiber compression scheme. Here, 40 fs CPA laser pulses with 40 nm FWHM bandwidth are spectrally-broadened and compressed. Additionally, a genetic algorithm is implemented in the execution of these experiments using a deformable mirror and a Dazzler acoustic-optic programmable dispersive filter with myriad feedback parameters and figures of merit. This allows optimization of the parameters of the experiment including energy throughput and output pulse duration. An experimental analysis of the post-filamented beam's spatial profile, spectrum, and pulse length is presented along with optimization characterizations utilizing the genetic algorithm.

Working group

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