

High average power femtosecond laser driver for plasma accelerators by compression of spectrally broadened high energy Yb:YAG laser pulses

J.J. Rocca^{1,3}, B.E. Schmidt², H. Wang¹, Y. Wang^{1,3}, H. Chi¹, T. Tarkil¹, C.S. Menoni^{1,3}

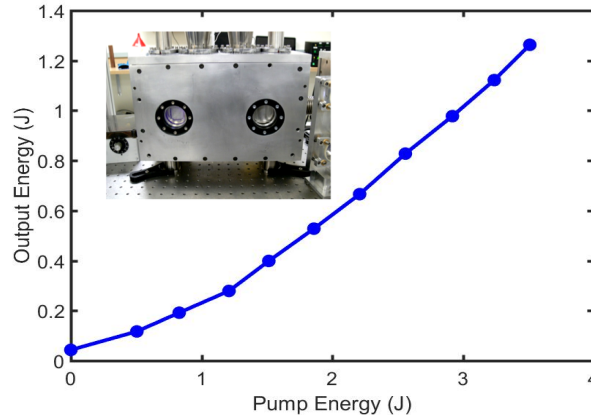
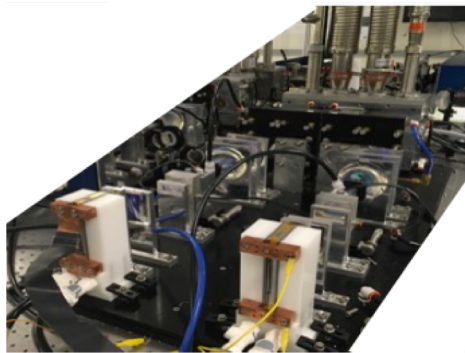
¹. Colorado State University, Fort Collins, CO

². few-cycle Inc., Montreal

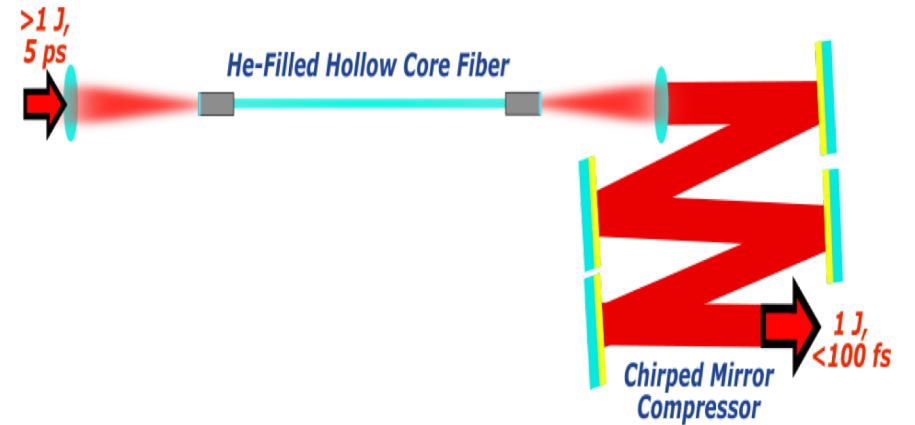
³. XUV Lasers Inc., Fort Collins, CO

1. Efficient generation of ps pulses of Joule energy at kW average power in cryogenically cooled Yb:YAG amplifiers

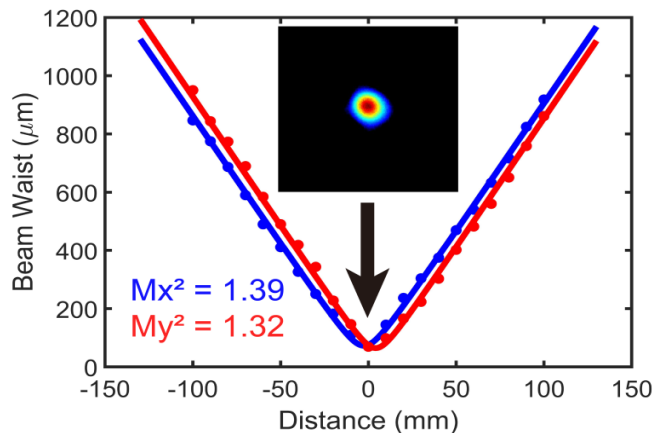
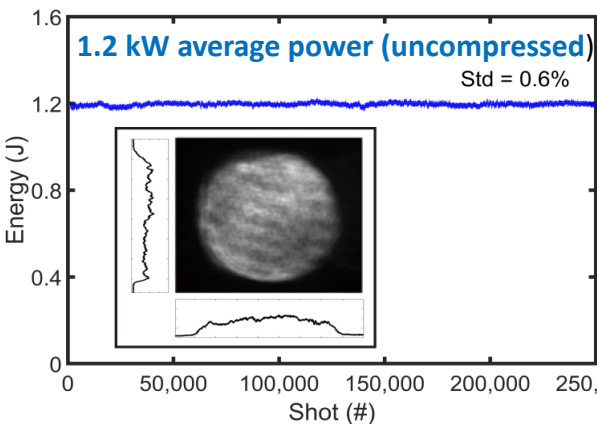
1.1 J, 4.5 ps pulses at 1 kHz (1.1 kW) demonstrated



2. Spectral broadening and compression in large large ID hollow-core fibers provides a path forward for the direct generation of sub-100 fs high energy laser pulses at high average powers

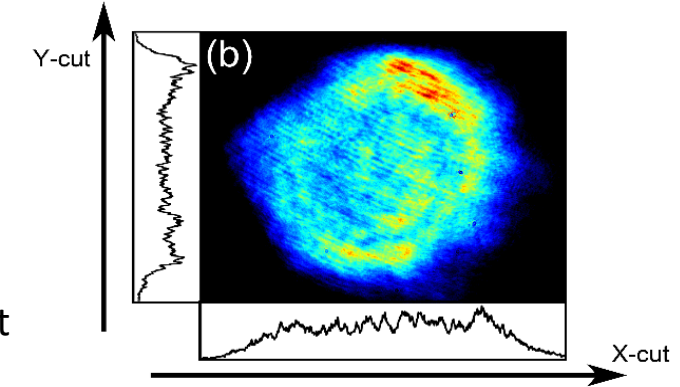
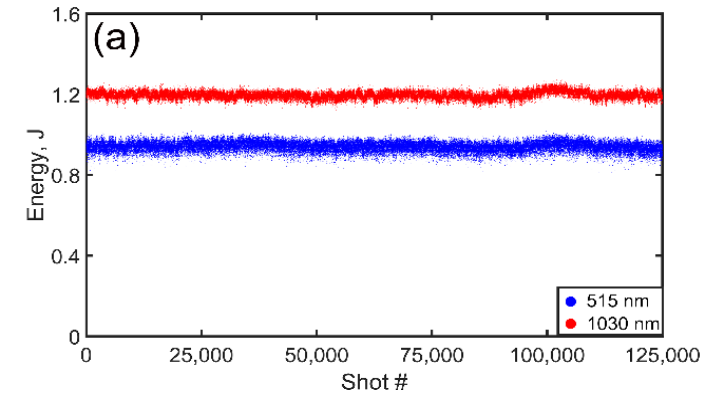
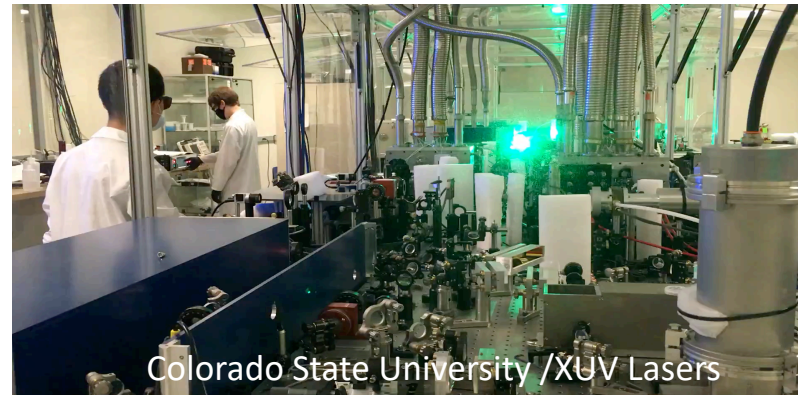
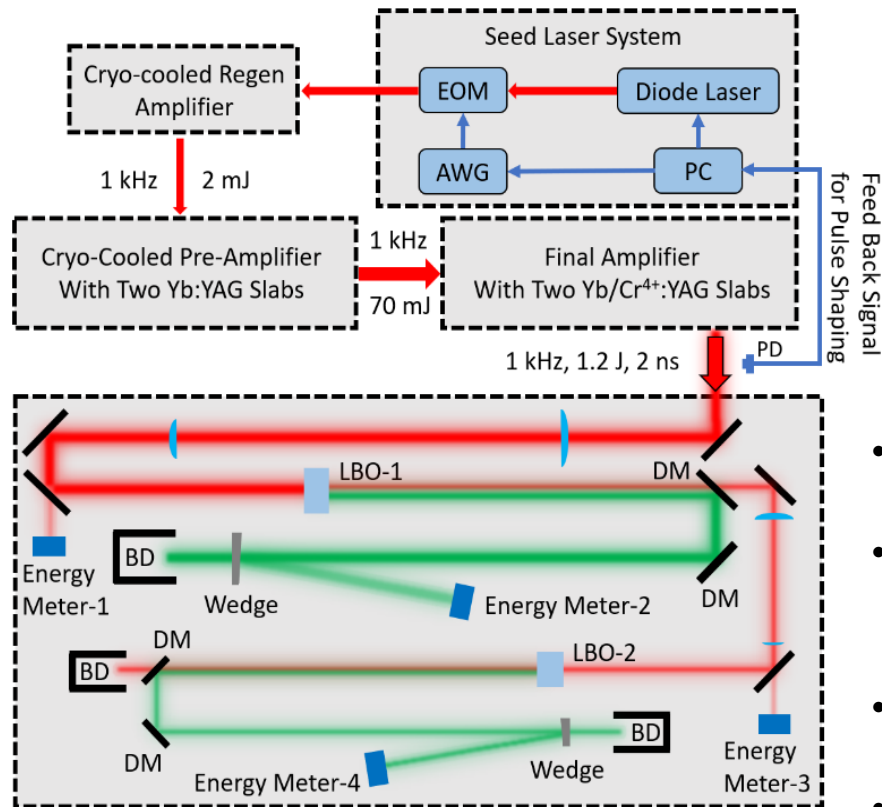


- Compression factor of 33 were achieved in a single compression stage
- Average power scaling has been tested at the half kW average power level
- 0.7 J, 7 ps pulses have been compressed to 240 fs at 10 Hz repetition rate



kW average power green amplifiers to pump high energy femtosecond lasers at kHz repetition rates for plasma accelerators

J.J. Rocca^{1,2}, H. Chi¹, Y. Wang^{1,2}, V. Chvykov¹, A. Davenport¹, C.S. Menoni^{1,2}
¹Colorado State University, Fort Collins, Colorado
²XUV Lasers Inc., Fort Collins, Colorado



- Ti:Sa is mature technology that makes possible Pw lasers
- Scaling to kHz repetition rate requires multi- J green pump pulse generation at kW average power
- 1.2 J, 1030 nm ns pulses have been generated at 1 kHz (1.2 kW average power)
- ~ 80% doubling efficiency in LBO demonstrated