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Capabilities of the PULSAR ultrafast laser system for attosecond research[1] K.J. BETSCH, Z. WANG, NORA G. KLING, JRML, M. KÜBEL, Max-Planck-Institut für Quantenoptik, D-85748 Garching, Germany, B. LANGDON, D. RAYMONDSON, M. KIRCHNER, KMLabs, Inc., Boulder, Colorado 80301, USA, C.W. FEHRENBACH, K.D. CARNES, V. KUMARAPPAN, C. TRALLERO-HERRERO, M.F. KLING, I. BEN-ITZHAK, J. R. Macdonald Laboratory (JRML), Physics Department, Kansas State University, Manhattan, KS 66506, USA — We describe the new PULSAR ultrafast laser system at the J. R. Macdonald Laboratory. In its conventional mode of operation, the Red Dragon^{TM} Ti:Sapphire laser amplifier from KMLabs provides 21 fs Fourier-transform-limited (FTL), 2 mJ pulses centered around 800 nm at a repetition rate of 10 kHz. Slight modifications also support sub-40 fs pulses at an increased repetition rate (0.8 mJ, 20 kHz) or 50 fs FTL pulses (2 mJ, 10 kHz). The amplifier can be carrier-envelope-phase (CEP) stabilized with RMS noise below 300 mrad over 3 hours. Spectral broadening in a gas-filled hollow core fiber and pulse compression with chirp compensation mirrors generates 4 fs pulses. We also employ a single-shot phase meter to measure and tag the CEP of every laser shot for either free-running or CEP-stabilized laser pulses. Phase tagging and CEP-stabilization can be combined to provide increased precision in measurements using CEP-stabilized pulses.

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