

SPECIFICATION FOR THE ULTRASHORT PULSED LASER SYSTEM

For a successful award the contractor must demonstrate they meet all the following minimum requirements:

A 20-fs pulsed laser system consisting of the following components:

- 1) Mode-locked seed laser capable of 20-fs output
 - 2) Pulse shaper to shape the pulses from the seed laser in #1
 - 3) A regenerative amplifier at 250-kHz with 6-uJ, 35-fs pulse output
 - 4) An optical parametric amplifier capable of >10-nJ pulses from 480-2300nm
 - 5) Pulse diagnostic testing to resolve optical pulse's electric field (amplitude and phase).
1. The mode-locked laser must have the following characteristics:
 - (a) >300-mW average power, 20-fs pulse, ~80-MHz repetition rate, 800-nm center wavelength.
 - (b) An adjustable bandwidth from <30 nm to >100 nm with a spec of > 100 nm max.
 - (c) The ability to tune the center wavelength across 110nm of tuning range at 30 nm of bandwidth.
 - (d) Integrated pump laser capable of pumping both this laser and the regenerative amplifier (#3), with noise <0.03% rms from 10Hz to 1GHz.
 - (e) Active alignment for short and long-term optical power and pulse stability.
 2. The pulse shaper must have the following characteristics:
 - (a) A closed-loop optical device that is software controlled
 - (b) Capability of manipulating the optical phase and amplitude of the pulse.
 - (c) Wavelength coverage 700-900nm
 - (d) An internal measurement capability of laser's amplitude and phase.
 - (e) Software control of optical phase and amplitude modulation with built-in functions for pulse shaping of Gaussian, Sech, ramp functions and their inverse.
 - (f) Capability of operating on each pulse at in an 80-MHz pulse train.
 3. The regenerative amplifier must have the following characteristics:
 - (a) CW-pump
 - (b) Cavity-dumped regenerative amplifier
 - (c) Ability to run single-shot up to 300 kHz (with up to 6uJ, <35fs pulses)
 4. The optical parametric amplifier must have the following characteristics:
 - (a) Ability to run up to 300 kHz.
 - (b) Tunable output from 480 to 2300nm with <225-fs pulses of >10-nJ energy at 250 kHz.
 - (c) Time-correlated separate output ports from 480-700 nm, 933-2300 nm and 400 nm and <300-1000 nm.

5. Pulse diagnostics must have
 - (a) Ability to characterize from 20-fs to 1-ps optical pulses with >1-kHz repetition rates
 - (b) Sensitivity of $<1\text{W}^2$
 - (c) Wavelength range of 480nm to 2000nm