

Specifications for an all solid state femtosecond laser system

1.0 Requirement

1.1 The Naval Research Laboratory has a requirement for one solid state femtosecond laser system. The full laser system shall include a high-peak-power, appropriately seeded, amplified Titanium:Sapphire primary laser source and an independently tunable optical parametric amplifier. The successful offeror shall provide installation and acceptance test to demonstrate that the system meets the government's minimum requirements.

1.2 Options: The Contractor shall propose as optional items, one (1) additional independently tunable optical parametric amplifier and two (2) suitable nonlinear-optical wavelength conversion stages.

2.0 Specifications

2.1 Specifications for the complete system (option specifications are marked with asterisks):

a) Repetition rate: Adjustable from 10 Hertz to at least 1000 Hertz

b) Independently wavelength tunable beams based on single sets of optics that access the following wavelength regions with the indicated output energies at all repetition rates:

Wavelength range	Energy/pulse
450-500 nanometers	>3 microJoules
500-700 nanometers,	>5 microJoules
700-1600 nanometers	>2 microJoules
*240-245 nanometers	>1 microJoules
*345-355 nanometers	>1 microJoules

c) Temporal profile:
Smooth pulses with FWHM < 60 femtoseconds

d) Spatial quality:
 M^2 value of 2 or better

e) Line width:
Near transform limited

f) Energy stability:
99% of the pulses shall be within 5 % of the average over a period of 5 minutes

g) Beam pointing stability:

The total beam motion shall not exceed 100 microradians.

h) Polarization:

Linearly polarized with a polarization ration of 100:1 or better.

2.2 Specifications for the primary amplified Titanium/Sapphire laser source are:

a) Repetition rate: Adjustable from 10 Hertz to at least 1000 Hertz.

b) Wavelength: Fixed central wavelength between 765 and 810 nm with greater than 750 microJoules/pulse at all repetition rates.

c) Temporal profile:

Smooth pulses with FWHM < 150 femtoseconds

d) Spatial quality:

M^2 value of 1.2 or better

e) Line width:

Near transform limited

f) Energy stability:

99% of the pulses shall be within 1% of the average over a period of 5 minutes

g) Beam pointing stability:

The total beam motion shall not exceed 100 microradians.

h) Polarization:

Linearly polarized with a polarization ration of 100:1 or better.

2.3 Specifications for the optical parametric amplifiers:

a) Repetition rate: Adjustable from 10 Hertz to at least 1000 Hertz

b) Two independently wavelength tunable beams based on single sets of optics that access the following wavelength regions with the indicated output energies at all repetition rates:

Wavelength range	Energy/pulse
450-500 nanometers	>3 microJoules
500-700 nanometers,	>5 microJoules
700-1600 nanometers	>2 microJoules

c) Wavelength tuning/scanning:

Motorized mounts which can be computer-controlled to tune the output automatically to arbitrary, fixed wavelengths.

Motorized mounts which can be computer-controlled to scan the output wavelength ± 50 nanometers about a central wavelength, at variable scanning speeds, without degradation of the output pulse characteristics.

d) Temporal profile:

Smooth pulses with FWHM < 60 femtoseconds

e) Spatial quality:

M^2 value of 2 or better

f) Line width:

Near transform limited

g) Energy stability:

99% of the pulses shall be within 5 % of the average over a period of 5 minutes

h) Beam pointing stability:

The total beam motion shall not exceed 100 microradians.

i) Polarization:

Linearly polarized with a polarization ration of 100:1 or better.

2.4 *Nonlinear Conversion Stages

Two nonlinear conversion stages designed for second harmonic generation of light pulses from the optical parametric amplifiers (OPAs). Each stage shall convert the output from one OPA to greater than 1 microJoule of energy per pulse in at least the following two wavelength ranges: 240-250 nanometers, and 345-355 nanometers. This shall be accomplished with a single set of optics and crystals, requiring only minor alignment between the two wavelength ranges. The spatial and temporal characteristics of the converted pulses shall be of the same quality as the OPA pulses.

3.0 Minimum one-year warranty

4.0 Installation/Acceptance Testing

The Contractor shall provide installation and acceptance testing at the Naval Research Laboratory, Building A50, RM 181, 4555 Overlook Ave SW, Washington, D.C. 20375-5320. The test shall demonstrate that the system meets the governments requirements listed in section 2.0 above, which shall include completion of degenerate four-wave mixing measurements with user-supplied samples and experimental configuration.

5.0 Deliverables:

- 1) Laser system.
- 2) Hard copy operation and maintenance manuals.

6.0 Delivery

The desired and required delivery times are 90 days and 90 days respectively. The time required for inspection and acceptance is upon completion of installation and acceptance testing.

Delivery of optional items shall be 90 days from exercise of option. Installation required for the optional items.