

JOINT LASER PROJECT EXECUTIVE COMMITTEE

Note by Secretary

Attached are the final versions of the specifications for the glass laser systems.

A. CON/ENQ/IC/148 for a Laser System

Sent to (1) GEC, U.S.A.

(2) Compagine Industrielle des Lasers, France.

(3) Quantel Lasers at Electro-Optique, France.

Due for return on 15th April, 1975

B. CON/ENQ/IC/154 for Laser Systems on Laser Amplifier

Sent to (1) GEC, U.S.A.

(2) Compagnie Industrielle des Lasers, France.

Due for return on 15th April, 1975.

20 March 1975

PREAMBLE

The attached specification relates to a laser system to be used in a variety of laser matter interactions in a multi-user facility. Standards of engineering and construction should be such as to ensure high operating reliability.

The laser light will be focussed on to small delicate targets. It is an experimental requirement that negligible energy falls on the target before the main pulse.

Prospective suppliers should indicate how much energy is emitted in the beam, defined in the specification, between the initiation of firing and the occurrence of the main laser pulse. Supplementary equipment may be proposed to reduce this pre-cursor energy to less than 5×10^{-5} of the energy in the main pulse.

Some experiments will demand stable and reproducible switching times; timing jitter should be stated. Beam coherence length and bandwidth for the oscillators should be given together with an estimate of subsequent degradation in the amplifying sections.

SPECIFICATION IA Medium Power Neodymium Glass Laser System

Neodymium glass laser system to deliver an energy of about 10 joules in an approximately Gaussian pulse with a full width of 100 picoseconds at the half maximum intensity level (fwhm), and 20 joules in an approximately Gaussian pulse with a fwhm of 300 picoseconds.

The laser will be used to produce a high intensity focal spot on a reflecting target and must be protected by suitable isolators against retro-reflection of 30% of the incident energy.

Beam quality is of utmost importance and the intensity x length integral must be minimised to ensure that not less than 90% of the radiated energy in a collimated beam is contained in a 0.5 milli-radian full angle cone. The beam quality will be measured by focussing the output of the final laser stage, using a lens of 10m focal length, onto an aperture 5mm in diameter. 90% of the radiated energy will be required to enter the aperture.

The repetition rate must not be less than one pulse per 10 minutes, the capacitor bank charging time must not be greater than 1 minute. For electrical tests the capacitor and pulse forming networks must be capable of sustaining a firing rate of once per minute. The laser must be provided with a single mode TEM₀₀ oscillator capable of providing pulses with adjustment in the range fwhm 30 picoseconds to 5 nanoseconds. The stability of the oscillator shall ensure that in 100 consecutive pulses the energy in any single pulse shall not deviate by more than 15% from the mean value under the standard operating conditions.

The equipment supplied should include all necessary benches, supports, cooling and control systems needed to operate the laser system.

Delivery, installation and commissioning costs should be quoted separately. The cost of an itemised list of recommended spares should be quoted separately.

PREAMBLE

The attached specifications relate to a laser system, of 500 Joules total energy, to be used in a variety of laser matter interactions in a multi-user facility. Standards of engineering and construction should be such as to ensure high operating reliability.

Specification 1 refers to the total system for which you are invited to tender on the basis that your company will be responsible for supply, installation and testing at site or alternatively for supply and delivery only. Specification 2 is for the supply of the laser amplifier only and would apply if the Authority decided to purchase the amplifier and a laser of the specification sent you under reference CON/ENQ/1C/148 separately and themselves assume responsibility for the installation and commissioning of the system.

The laser light will be focussed on to small delicate targets. It is an experimental requirement that negligible energy falls on the target before the main pulse.

Prospective suppliers should indicate how much energy is emitted in the beam, defined in the specification, between the initiation of firing and the occurrence of the main laser pulse. Supplementary equipment may be proposed to reduce this pre-cursor energy to less than 5×10^{-5} of the energy in the main pulse.

Some experiments will demand stable and reproducible switching times; timing jitter should be stated. Beam coherence length and bandwidth for the oscillators should be given together with an estimate of subsequent degradation in the amplifying sections.

SPECIFICATION NO. 1A high power medium energy laser system.

Neodymium glass laser system to deliver an energy of about 500 joules in two beams in an approximately Gaussian pulse with a full width of 300 picoseconds at the half maximum intensity level (fwhm).

The laser will be used to produce a high intensity focal spot on a reflecting target and must be protected by suitable isolators against retro-reflection of 30% of the incident energy.

Beam quality is of utmost importance and the intensity x length integral must be minimised to ensure that not less than 70% of the radiated energy in a collimated beam is contained in a 0.5 milli-radian full angle cone. The beam quality will be measured using a plane beam splitter to deflect a small fraction (e.g. about 5%) of the output of the final laser state and by focussing this fraction with a 10m focal length lens onto a circular aperture 5mm in diameter. 70% of the energy of this deflected beam will be required to enter this aperture.

The repetition rate must not be less than one pulse per 20 minutes, the capacitor bank charging time must not be greater than 3 minutes. For electrical tests the capacitor and pulse forming networks must be capable of sustaining a firing rate of once per 3 minutes. The laser must be provided with a single mode TEM₀₀ oscillator capable of providing pulses with adjustment in the range fwhm 30 picoseconds to 5 nanoseconds. The stability of the oscillator shall ensure that for 100 consecutive pulses the energy in any single pulse shall not deviate more than 15% from the mean value under the standard operating conditions.

The equipment supplied should include all necessary cooling and control systems needed to operate the laser system.

The cost of laser support tables is to be quoted separately.

Delivery, installation and commissioning costs should be quoted separately.

The cost of an itemised list of recommended spares should be quoted separately.

SPECIFICATION NO. 2A high power laser amplifier

Neodymium glass laser system consisting of only that part of the system described in Spec. 2 after the last Neodymium rod amplifier. The output is to be as specified in Spec. 2, the input to be specified by the supplier but capable of being delivered by a laser conforming to the specification in Spec. 1 with an appropriate setting of the oscillator pulse width. The electrical and optical interface at the input of this amplifier to be the responsibility of the purchaser.

The cost of laser support tables is to be quoted separately.

Delivery, installation and commissioning costs should be quoted separately.

The cost of an itemised list of recommended spares should be quoted separately.