



INDIAN INSTITUTE OF TECHNOLOGY MADRAS
Chennai 600 036

Telephone : [044] 2257 8356/8368

FAX : [044] 2257 0545/8366

E-mail: arpp@iitm.ac.in



Ref: ICS/11-12/013/DSTX/TSUN

Date: 23.02.2014

Tender No.: ASE/SRCH/028/2013

Due Date: 17.03.2014, 3:30pm

N.E. Nagaraj
Special Officer (Project Purchase)
IC&SR, I.I.T. Madras

Dear Sirs,

On behalf of the Indian Institute of Technology Madras, offers are invited for the supply of various Scientific Instruments "Two Units of high-speed planar laser induced fluorescence systems to measure temperature with two-line thermometry principle" conforming to the specifications given in Annexure.

I) Instructions to the Bidder

- (i) **Preparation of Bids:-** The tenders should be submitted under two-bid system (i.e.) Technical bid and Financial bid.
- (ii) **Delivery of the tender:-** The tender shall be sent to the below-mentioned addresses either by post or by courier so as to reach our office before the due date and time specified in our Schedule. The offer/bid can also be dropped in the tender box on or before the due date and time specified in the schedule. The tender box is kept in the office of the "Special Officer, Project Purchase" IC & SR Building 2nd floor, I.I.T. Madras, Chennai – 600 036.
- (iii) **Opening of the tender:-** The offer/Bids will be opened by a committee duly constituted for this purpose. The technical bids will be opened first and it will be examined by a technical committee which will decide the suitability of the bid as per our specifications and requirements. The financial offer/bid will be opened only for the offer/bids which technically meet all our requirements as per the specification. The bidders, if interested, may be present on the financial tender opening Day which will be communicated to you.

- (iv) **Prices:-** The price should be quoted in nett per unit (after breakup) and must include all packing and delivery charges to Various Institutions. The offer/bid should be exclusive of taxes and duties, which will be paid by the purchaser as applicable. However the percentage of tax & duties should be clearly indicated.

The price should be quoted without custom duty and excise duty, since I.I.T. Madras is exempt from payment of excise duty, and the custom duty will be paid at concessional rate against duty exemption certificate.

In case of import supply, the price should be quoted on FOB and CIF basis indicating the mode of shipment.

- (v) **Agency Commission:-** Agency commission, if any, will be paid to the Indian agents in Rupees on receipt of the equipment and after satisfactory installation. Agency Commission will not be paid in foreign currency under any circumstances. The details should be explicitly shown in Tender even in the case of 'Nil' commission. The tenderer should indicate the percentage of agency commission to be paid to the Indian agent. The foreign Principal should indicate about the percentage of payment and it should be included in the originally quoted basic price, if any.
- (vi) **Terms of Delivery:-** The item should be supplied to our Various Institutions as per Purchase Order. In case of import supply, the item should be delivered at the cost of the supplier to our Institution. The Installation/Commissioning should be completed as specified in our important conditions.
- (vii) IIT Madras reserves the full right to accept / reject any tender at stage without assigning any reason.

Yours faithfully,



N.E. Nagaraj
Special Officer (Project Purchase)
IC&SR, I.I.T. Madras.

SCHEDULE

I) Important Conditions of the tender

1. The due date for the submission of the tender is **17.03.2014, 3:30pm**.

2. The offers / bids should be submitted in two bids systems (i.e.) Technical bid and Financial bid. The Technical bid should consist of all technical details / specifications only. The Financial bid should indicate item-wise price for each item and it should contain all Commercial Terms and Conditions including Taxes, transportation, packing & forwarding, installation, guarantee, payment terms etc. The Technical bid and Financial bid should be put in separate covers and sealed. Both the sealed covers should be put in a bigger cover. The Limited Tender / Open Tender for supply of “ _____ ” should be written on the left side of the Outer bigger cover.

3. (i) EMD should be at 2% (Two percent) of the tender value quoted by the company. The EMD should be included in the Financial bid which will not be opened for Technical evaluation. **Enclosing the EMD in the Technical bid will automatically disqualify the tenderer.** EMD should be in the form of DD in favour of “The Registrar, Indian Institute of Technology Madras” and payable at Chennai. The tender without EMD would be considered as UNRESPONSIVE and REJECTED. Photo/FAX copies of the Demand Draft/Banker’s pay orders will not be accepted. No interest will be paid for the EMD and the EMD (Bid Security) will be refunded to the Successful bidder on receipt of Performance Security.

(ii) The Successful bidder should submit Performance Security of an amount of 5% of the value of the contract. The Performance Security may be furnished in the form of an Account Payee DD, FD Receipt from the commercial bank, Bank Guarantee from commercial bank will be an acceptable.

(iii) The Performance Security should remain valid for a period of sixty days beyond the date of completion of all contractual obligations of the supplier including the warranty obligations

4. If an Indian agent is involved, the following documents must be enclosed:
 - i) Foreign principal's proforma invoice indicating the commission payable to the Indian Agent and nature of after-sales service to be rendered by the Indian Agent.
 - ii) Copy of the agency agreement with the foreign principal and the precise relationship between them and their mutual interest in the business.
 - iii) The enlistment of the Indian agent with Director General of Supplies & Disposals under the Compulsory Registration Scheme of Ministry of Finance.

5. The offer/bids should be sent only for a machine that is available in the market and supplied to a number of customers. A list of customers in India and abroad with details must accompany the quotations. Quotations for a prototype machine will not be accepted.

6. Original catalogue (not any photocopy) of the quoted model duly signed by the principals must accompany the quotation in the Technical bid. No prices should ever be included in the Technical bid.

7. Documentary proof for the claimed position and repetition accuracies must be obtained from the principals and submitted along with the relevant pages of the standards.

8. Compliance or Confirmation report with reference to the specifications and other terms & conditions should also be obtained from the principal.

9. **Validity:** Validity of Quotation not less than 90 days.

10. **Delivery Schedule:-** The tenderer should indicate clearly the time required for delivery of the item. In case there is any deviation in the delivery schedule, liquidated damages clause will be enforced or penalty for the delayed supply period will be levied.

11. **Risk Purchase Clause:-** In the event of failure of supply of the item/equipment within the stipulated delivery schedule, the purchaser has all the right to purchase the item/equipment from other sources on the total risk of the supplier under risk purchase clause.
12. **Payment:-** No Advance payment will be made for Indigenous purchase. However 90% Payment against Delivery and 10% after installation is agreed to wherever the installation is involved. In case of import supplies the payment will be made only through Letter of Credit and 90% payment will be released against delivery and 10% after installation wherever the installation is being done.
13. **On-site Installation:-** The equipment or machinery has to be installed or commissioned by the successful bidder within 15 to 20 days from the date of receipt of the item at Institution of IIT Madras.
14. **Warranty/Guarantee:-** The offer should clearly specify the warranty or guarantee period for the machinery/equipment. Any extended warranty offered for the same has to be mentioned separately.
15. **Late offer:-** The offers received after the due date and time will not be considered. The Institute shall not be responsible for the late receipt of Tender on account of Postal or any other delay.
16. **Acceptance and Rejection:-** I.I.T. Madras has the right to accept the whole or any part of the Tender or portion of the quantity offered or reject it in full without assigning any reason.
17. **Disputes and Jurisdiction:-** Any legal disputes arising out of any breach of contract pertaining to this tender shall be settled in the court of competent jurisdiction located within the city of Chennai in Tamil Nadu.
18. **Acknowledgement:-** It is hereby acknowledged that the tenderer has gone through all the conditions mentioned above and agrees to abide by them.

**SIGNATURE OF TENDERER
ALONG WITH SEAL OF THE
COMPANY WITH DATE.**

Specifications for two units of high-speed planar laser induced fluorescence systems to measure temperature with two-line thermometry principle

Description:

Two units of high-speed planar laser induced fluorescence (PLIF) systems are required to measure the flame temperature based on two-line thermometry principle. Generally OH radical (283 nm) is targeted to perform this measurement. However, measurements with other species such as CH, NO, Indium are also desired. The OH-PLIF system is essential, whereas other species are optional. Provide option for operating two PLIF systems independent of each other.

Key Specifications and requirements:

1. Repetition rate : 10 kHz
2. Minimum energy @ 10 kHz (μJ) : 225 @ 283 nm
3. High speed camera with two-stage intensifier to image the fluorescence signal @ 10 kHz rate

I. Pumping Nd:YAG Lasers (2 Nos.)

1. Repetition rate range : 10 Hz to 10 kHz
2. Average power (W) : ≥ 90 @ 532 nm
3. Energy at 532 nm(mJ) : ≥ 9 @ 10 kHz
4. Energy at 355 nm (mJ) : ≥ 4 @ 10 kHz
4. Pulse duration (ns) : 5 to 10
5. Beam diameter or size (mm) : 3 to 8mm
6. Divergence (mrad) : < 0.5 @ 1064 nm
7. Polarization ratio (%) : > 90 @ 532 nm
8. Beam profile : Gaussian/Top-hat
9. Energy stability (%) : $< 4\%$ rms
10. Capable to switch from 532 / 355 nm

II. High-speed Tunable Dye Lasers (2 Nos.)

1. Repetition rate (kHz) : 0 to 10
2. Grating (1/mm) : 2400
3. Linewidth (cm^{-1}) : 0.06 @ 570 nm
4. Tuning range (nm) : 220 – 750
5. Pump wavelength (nm) : 532 or 355
6. Beam pointing stability (μrad) : < 50
7. Polarization (%) : $\geq 98\%$ vertical
8. Absolute wavelength error (pm) : ≤ 30
9. Repeatability (pm) : ≤ 5
10. Thermal Stability ($\text{pm}/^\circ\text{C}$) : ≤ 2
11. ASE at edge of dye band (%) : < 0.5
12. Minimum energy at 10 kHz (μJ) : 225 to 250 @ 283 nm
13. Doubling/mixing crystals : Optical extension inbuilt with the dye laser with high efficiency doubling or mixing crystals to achieve above wavelengths. Internal doubling unit with Autotracking and BBO from 220 nm - 300 nm.

II. Light sheet optics (2 Nos.)

1. Wavelengths range from 220 to 800 nm
2. Adjustable light sheet height between 35 to 50 mm
3. Adjustable focus from 0.5 to 2 m
4. Beam waist adjuster
5. Beam steering arm / optics coated for high transmission for OH-PLIF

III. Detection units (2 Nos.)

A) CMOS Camera

1. Chip area (pixel) : 1280 x 800
2. Frame rate (fps) : 6200 @ 1280 x 800 pixel resolution
3. Repetition rate : 10 Hz to 10 kHz (10 kHz at reduced resolution)
4. Digital resolution (bit) : 12
5. Internal memory (GB) : 16

B) Two stage image intensifier module

1. Repetition rate range : 10 Hz to 10 kHz
2. Minimum gating (ns) : 50 ns
3. Spectral range (nm) : 225 to 800
4. Input diameter (mm) : 25
5. Typical resolution on output: ≥ 33 lp/mm without magnification
6. Optics to couple intensifier with high speed camera

C) UV lens

1. Aperture : F/2.8
2. Focal length (mm) : 100 mm
3. Image projection diameter : ≥ 18 mm
4. Transmittivity (%) : $\geq 90\%$ @ 250 to 410 nm
5. Lens mount adapters : F mount / C mount adapters as the case may be

D) Filters

1. Filter to image OH LIF signal with high 80% transmission at 310 nm

IV. Control unit

A) Workstation (2 nos.)

1. 16 GB RAM
2. 2 TB internal hard drive
3. Windows 7 64 bit OS
4. 21" flat screen monitor, mouse and keyboard

B) Synchronizer (2 nos.)

1. Synchronizer to sequence lasers and cameras for two-line PLIF thermometry
2. 8 channels
3. Time resolution of 10 ns
4. Provide low noise BNC cables

V. Software (2 License)

1. Software compatible with windows 7-64 bit for data acquisition, pre-processing and post-processing
2. All above hardware should be able to control from the software

VI. Mounting table (2 Nos.)

Single optical table to mount each of the Pump-Dye lasers together laser units.

VII. Power and energy meter (1 No.)

1. Power up to 100W
2. Wavelength sensitivity 225 to 1064 nm

Optional requirements:

A) Wavelengths and optical filters for following species

1. 225 nm for NO PLIF
2. 390 nm for CH PLIF
3. 410 nm and 450 nm for Indium PLIF

State the minimum energy at above wavelength @10 kHz for combination of offered Nd:YAG-Dye laser.

B) Features of hardware/software

1. Software to acquire and synchronize two PLIF systems
2. Online automated correction for variation in the light sheet intensity resulted from non-uniform beam profile and absorption of species
3. Online automated correction for shot-to-shot laser energy variation
4. Autoscan for the dye laser, so that the energy is optimized and beam position is unaltered during wavelength tuning
5. Online automatic fine tuning of the wavelength to excite the right absorption line based on feedback from the PLIF signal Data processing algorithm to deduce temperature from the ratio of PLIF signals from two excitation lines
6. Recording of excitation and emission LIF spectra
7. Online energy monitor up to 10 kHz repetition rate
8. Capability to alternate two wavelengths at each other shot at 10 kHz (e.g. switch every other shot between 282.4 nm and 283 nm). These two different wavelengths must come from the same laser system

C) Accessories

1. Laser safety goggles to protect at above wavelengths
2. Filtered air blow unit to protect lasers from the dust
3. Third and fourth harmonic generators to be fitted with Nd:YAG laser
4. Necessary dyes to generate above wavelengths 3 gm each.
5. Provision for accessing second, third and fourth harmonic wavelengths without altering the dye laser attachment.

D) Chiller unit (2 Nos.) suitable for quoted pump lasers to control the temperature of flashlamps

VII: Notes:

1. The complete system dye laser, Nd:YAG laser and camera with intensifier should be supplied together, and the integrated PLIF system should be tested to confirm above specifications before delivery.
2. Test report should include energy, wavelength and bandwidth at above-mentioned wavelengths.
3. Installation and user training should be provided by manufacturer.
4. Provide the list of customers with their contact details where similar system has been installed.

IX: Maintenance and Service agreement:

Three years service and maintenance after warranty period (mention the service charges if any) that should contain:

1. Annual visit on system by engineer from manufacturer
2. Annual training on system for new student or researcher
3. Providing free consumable items such as distilled water for laser, de-ioniser cartridge, etc
4. Visit in 5 working days by local train engineer from the date of complain