INDIAN INSTITUTE OF TECHNOLOGY DELHI
HAUZ KHAS, NEW DELHI-110016

Dated: 14/07/2014

Open Tender Notice No. IITD/CE(SP-46)/2014

PFC (Purchase finalization Committee), Indian Institute of Technology Delhi, Hauz Khas, New Delhi-110016 on behalf of the Director invites online Item Rate Quotation from the specialized agencies for installation work of the following work in two parts (Part-A Technical Bid, Part- B Price/ Financial Bid).

Scope of Work	Purchase of (I) Time-Resolved Stereo Particle Image Velocimetry with additional modules for (II) Volumetric PIV, (III) micro-PIV, (IV) Laser Induced Fluorescence (LIF) and (V) 3D traversing system
Earnest Money Deposit to be submitted	NIL

Tender Documents may be downloaded from Central Public Procurement Portal https://eprocure.gov.in/eprocure/app .Aspiring Bidders who have not enrolled / registered in e-procurement should enroll / register before participating through the website https://eprocure.gov.in/eprocure/app . The portal enrolment is free of cost. Bidders are advised to go through instructions provided at regarding 'Instructions for online Bid Submission '.

Tenderers can access tender documents on the website, fill them with all relevant information and submit the completed tender document online on the website https://eprocure.gov.in/eprocure/app as per the schedule given below:

Schedule

Tender Reference No.	IITD/CE(SP-46)/2014
Name of Organization	Indian Institute of Technology
Tender Type (Open/Limited/EOI/Auction/Single)	OPEN
Tender Category (Services/Goods/works)	Goods
Type/Form of Contract (Work/Supply/ Auction/Service/Buy/Empanelment/ Sell)	Supply
Product Category (Civil Works/Electrical Works/Fleet Management/ Computer Systems)	Measurement system/instrument
Re-bid submission allowed (Yes/No)	YES
Is Offline Submission Allowed (Yes/No)	No
General Technical Evaluation Allowed (Yes/No)	No
Withdrawal Allowed (Yes/No)	Yes
Is Multi Currency Allowed	Yes
Payment Mode (Online/Offline)	Offline
Date of Issue/Publishing	14/07/2014 (14:00 Hrs)
Document Download/Sale Start Date	14/07/2014 (14:00 Hrs)
Document Download/Sale End Date	13/08/2014 (17:00 Hrs)
Clarification Start Date	
Clarification End Date	
Date for Pre-Bid Conference	25/07/2014 (15:00 Hrs)
Venue of Pre-Bid Conference	II-381, Chemical Engineering Library Department of Chemical Engineering IIT Delhi, New Delhi 110016.
Last Date and Time for Uploading of Bids	13/08/2014 (17:00 Hrs)
Date and Time of Opening of Technical Bids	14/08/2014 (11:30 Hrs)
Tender Fee	NIL
No. of Covers (1/2/3/4)	2
Bid Validity days (180/120/90/60/30)	180 days
Address for Communication	Dr. Vivek V. Buwa I-210, Department of Chemical Engineering Indian Institute of Technology Delhi, New Delhi 110016 Tel: 011 2659 1027 email: vvbuwa@iitd.ac.in

Chairman Purchase Committee
(Buyer Member)

Instructions for Online Bid Submission:

As per the directives of Department of Expenditure, this tender document has been published on the Central Public Procurement Portal (URL:https://eprocure.gov.in/eprocure/app) . The bidders are required to submit soft copies of their bids electronically on the CPP Portal, using valid Digital Signature Certificates. The instructions given below are meant to assist the bidders in registering on the CPP Portal, prepare their bids in accordance with the requirements and submitting their bids online on the CPP Portal.

More information useful for submitting online bids on the CPP Portal may be obtained at:

https://eprocure.gov.in/eprocure/app

REGISTRATION

1) Bidders are required to enroll on the e-Procurement module of the Central Public Procurement Portal (URL:https://eprocure.gov.in/eprocure/app) by clicking on the link "Click here to Enroll". Enrolment on the CPP Portal is free of charge.
2) As part of the enrolment process, the bidders will be required to choose a unique username and assign a password for their accounts.
3) Bidders are advised to register their valid email address and mobile numbers as part of the registration process. These would be used for any communication from the CPP Portal.
4) Upon enrolment, the bidders will be required to register their valid Digital Signature Certificate (Class II or Class III Certificates with signing key usage) issued by any Certifying Authority recognized by CCA India (e.g. Sify / TCS / nCode / eMudhra etc.), with their profile.
5) Only one valid DSC should be registered by a bidder. Please note that the bidders are responsible to ensure that they do not lend their DSCs to others which may lead to misuse.
6) Bidder then logs in to the site through the secured log-in by entering their userID / password and the password of the DSC / eToken.

SEARCHING FOR TENDER DOCUMENTS

1) There are various search options built in the CPP Portal, to facilitate bidders to search active tenders by several parameters. These parameters could include Tender ID, organization name, location, date, value, etc. There is also an option of advanced search for tenders, wherein the bidders may combine a number of search parameters such as organization name, form of contract, location, date, other keywords etc. to search for a tender published on the CPP Portal.
2) Once the bidders have selected the tenders they are interested in, they may download the required documents / tender schedules. These tenders can be moved to the respective 'My Tenders' folder. This would enable the CPP Portal to intimate the bidders through SMS / e-mail in case there is any corrigendum issued to the tender document.
3) The bidder should make a note of the unique Tender ID assigned to each tender, in case they want to obtain any clarification / help from the Helpdesk.

PREPARATION OF BIDS

1) Bidder should take into account any corrigendum published on the tender document before submitting their bids.

2) Please go through the tender advertisement and the tender document carefully to understand the documents required to be submitted as part of the bid. Please note the number of covers in which the bid documents have to be submitted, the number of documents - including the names and content of each of the document that need to be submitted. Any deviations from these may lead to rejection of the bid.

3) Bidder, in advance, should get ready the bid documents to be submitted as indicated in the tender document / schedule and generally, they can be in PDF / XLS / RAR / DWF formats. Bid documents may be scanned with 100 dpi with black and white option.

4) To avoid the time and effort required in uploading the same set of standard documents which are required to be submitted as a part of every bid, a provision of uploading such standard documents (e.g. PAN card copy, annual reports, auditor certificates etc.) has been provided to the bidders. Bidders can use "My Space" area available to them to upload such documents. These documents may be directly submitted from the "My Space" area while submitting a bid, and need not be uploaded again and again. This will lead to a reduction in the time required for bid submission process.

SUBMISSION OF BIDS

1) Bidder should log into the site well in advance for bid submission so that he/she upload the bid in time i.e. on or before the bid submission time. Bidder will be responsible for any delay due to other issues.

2) The bidder has to digitally sign and upload the required bid documents one by one as indicated in the tender document.

3) Bidder has to select the payment option as "offline" to pay the tender fee / EMD as applicable and enter details of the instrument.

4) A standard BoQ format has been provided with the tender document to be filled by all the bidders. Bidders are requested to note that they should necessarily submit their financial bids in the format provided and no other format is acceptable. Bidders are required to download the BoQ file, open it and complete the white coloured (unprotected) cells with their respective financial quotes and other details (such as name of the bidder). No other cells should be changed. Once the details have been completed, the bidder should save it and submit it online, without changing the filename. If the BoQ file is found to be modified by the bidder, the bid will be rejected.

5) The server time (which is displayed on the bidders' dashboard) will be considered as the standard time for referencing the deadlines for submission of the bids by the bidders, opening of bids etc. The bidders should follow this time during bid submission.

6) All the documents being submitted by the bidders would be encrypted using PKI encryption techniques to ensure the secrecy of the data. The data entered cannot be viewed by unauthorized persons until the time of bid opening. The confidentiality of the bids is maintained using the secured Socket Layer 128 bit encryption technology. Data storage encryption of sensitive fields is done.

7) The uploaded tender documents become readable only after the tender opening by the authorized bid openers.

8) Upon the successful and timely submission of bids, the portal will give a successful bid submission message & a bid summary will be displayed with the bid no. and the date & time of submission of the bid with all other relevant details.

ASSISTANCE TO BIDDERS

1) Any queries relating to the tender document and the terms and conditions contained therein should be addressed to the Tender Inviting Authority for a tender or the relevant contact person indicated in the tender.
2) Any queries relating to the process of online bid submission or queries relating to CPP Portal in general may be directed to the 24x7 CPP Portal Helpdesk. The contact number for the helpdesk is 1800 3070 2232.

General Instructions to the Bidders

1) The tenders will be received online through portal https://eprocure.gov.in/eprocure/app . In the Technical Bids, the bidders are required to upload all the documents in .pdf format.

2) Possession of a Valid Class II/III Digital Signature Certificate (DSC) in the form of smart card/e-token in the company's name is a prerequisite for registration and participating in the bid submission activities through https://eprocure.gov.in/eprocure/app . Digital Signature Certificates can be obtained from the authorized certifying agencies, details of which are available in the web site https://eprocure.gov.in/eprocure/app under the link “Information about DSC”.

3) Tenderer are advised to follow the instructions provided in the ‘Instructions to the Tenderer for the e-submission of the bids online through the Central Public Procurement Portal for e Procurement at https://eprocure.gov.in/eprocure/app .

Department of Chemical Engineering
Indian Institute of Technology
Hauz Khas, New Delhi-110 016

NOTICE INVITING QUOTATIONS

Dated: **14th July 2014**

Tender No: **IITD/CE(SP-46)/2014**

Subject : **Purchase of (I) Time-Resolved Stereo Particle Image Velocimetry with additional modules for (II) Volumetric PIV, (III) micro-PIV, (IV) Laser Induced Fluorescence (LIF) and (V) 3D traversing system.**

Invitation for Tender Offers

Indian Institute of Technology Delhi invites online Bids (Technical bid and price bid) from eligible and experienced OEM (Original Equipment Manufacturer) OR OEM Authorized Dealer for **supply, installation & integration of I) Time-Resolved Stereo Particle Image Velocimetry with additional modules for (II) Volumetric PIV, (III) micro-PIV, (IV) Laser Induced Fluorescence (LIF) and (V) 3D traversing system** with mandatory three years on site comprehensive warranty from the date of receipt of the material and two years additional warranty as per terms & conditions specified in the tender document, which is available on CPP Portal https://eprocure.gov.in/eprocure/app

TECHNICAL SPECIFICATIONS:

(I) Base system of time-resolved 3D/stereo PIV system with shadowgraphy (40 marks)

Description of applications:

The time-resolved stereo PIV is to be used for time-resolved measurements of velocity flow field (3 components of velocity). While the primary purpose of the system is to perform liquid velocity field measurements, a few applications involve gas phase velocity measurements. However, it is envisioned that most of the applications that the said system will be used for will be multiphase systems, i.e. a continuous phase (for example, liquid) dispersed with gas bubbles or droplets of another immiscible liquid or solid particles.

(a) In experiments to be performed on time-resolved stereo liquid (single phase or two-phase bubbly or droplet flows) velocity measurements, process vessels of approximate size of 1 m x 1 m x 1 m and of different shapes (rectangular, square, circular cross sections) will be used. In the velocity flow field measurements to be performed in these process vessels, the area of interrogation will be ~ 1 m x 1 m. In other applications, the frontal area of interrogation can be as small as 2 cm x 2 cm. Therefore, appropriate accessories for light sheet optics that can be used for generating light sheets for interrogation areas ranging from 2 cm x 2 cm to 1 m x 1 m and corresponding camera lenses to perform the measurements should be quoted.

(b) In case of measurements to be performed on large process vessels, the measurements on planes (~ 1 m x 1 m) at different positions along the depth (z-direction) needs to be performed. Therefore, an appropriate

traversing system (see section (V)) that can help to traverse the laser light guide arm along the depth of the process vessel should be quoted. Also, depending on the optical access available in different applications, the laser sheet needs to be introduced either from side or top or bottom of the process vessel and the traversing system should be capable of traversing the light sheet optics either from side or top or bottom of the process vessel.

(c) In case of measurements to be performed using smaller interrogation areas (e.g. 2 cm x 2 cm or 5 cm x 5 cm), it is desired to traverse the cameras at different locations in a XY plane (e.g. at different locations along the width and height of the process vessel) whereas the laser sheet needs to be traversed along the depth (e.g. along z-direction).

(d) In the measurements to be performed on bubbly/droplet/particulate flows, the time-resolved 2D PIV is to be used to liquid velocity measurements and shadowgraphy measurements are to be performed to get dispersed phase information (e.g. bubble/drop/particle size/shape/velocity distribution). Since the PIV and shadowgraphy measurements are to be performed simultaneously; appropriate traversing mounts/arms to mount the additional camera that sees the same interrogation area as seen by the PIV cameras should be quoted.

The important technical specifications of components of the PIV system and an indicative list of camera lenses/filters, light guide arm, light sheet optics accessories is provided below. <u>Please note that this list is only indicative.</u> It is the responsibility of the bidder to include all the required accessories for complete integration of various system components and their operation.

All the required light sheet optics accessories, mounts for camera and light guide arm and appropriate traversing mounts/arms/rails should be quoted. In addition to the major system components, accessories will be given significant weightage in the evaluation of the technical proposal.

1.	**High-Speed Laser**	**Qty**	**Complied (Yes/ No)**
	1.1 Specifications of the laser unit Double cavity high-speed laser with pulse energy of at least 2 x 30 mJ @ 1 kHz, output wave length of 527 nm	1	
	1.2 Accessories		
	1.2.1 Laser bench to mount the laser and the light guide arm	1 set	
	1.2.2 Long laser guiding arm with accessories to connect it with the laser source unit (approximately 2 m in length) at one end and the light sheet optics at the other end. The light guide should be flexible and the laser arm should allow 360^{o} of light sheet rotation.	1 set	
	1.2.3 Light sheet optics: spherical lenses with variable focal lengths that will allow to focus laser light sheet from 200 mm to 4000 mm, cylindrical lenses with different focal lengths (e.g. -50, -25, -15 mm) to control the light sheet thickness. All required accessories for mounting aforementioned lenses on the laser guiding arm	1 set	
	1.2.4 Mount for laser guide arm, light sheet optics that can be attached to a motorized traversing system to perform the measurements at different locations along the depth of vessel.	1 set	
	1.2.5 Laser safety goggles for 527 nm	4	
	1.2.6 Synchronizer: for computer controlled synchronization of laser pulse, multiple	1	

	high-speed cameras, other flash lights, switches/devices, image acquisition etc., appropriate connectivity for computer control, on-board (front) controls with appropriate number of channels for trigger output and for input trigger, high-speed control (~ 1 ns resolution), fully programmable, integrated with the camera control and data acquisition softwares		
2.	**Back light illumination**		
	2.1 Back light illumination for an area of about 50 cm (width) and 100 cm (height) 2.2 Mounting for back light 2.3 Set of light optics to control illuminated area	1 1 1 set	
3.	**High-speed camera and lenses**		
	3.1 Specifications of high-speed camera High speed camera with a minimum resolution of 1 million pixels and frame acquisition speed of 2 kHz @ full resolution, minimum of 8 GB of memory, Gigabit Ethernet interface, computerized control/data acquisition/synchronization I/O through software Camera with rectangular chip would be preferable. **Given optional prices for monochrome and color cameras** **Quote separately for cameras with 16 GB memory**	3	
	3.2 **Accessories** 3.2.1 Connecting data and power cables/adopters, power adopters 3.2.2 Appropriate camera mounts that can be attached to a motorized traversing system to perform the measurements at different locations along the width and height of the vessel (also see point 6.1 of this table). 3.2.3 High quality lenses with appropriate mount that are compatible with the high-speed cameras 3.2.3.1. 35 mm F/2.8 3.2.3.2. 60 mm F/2.8 3.2.3.3. 85 mm F/2.8 3.2.3.4. 100 mm F/2.8 3.2.3.5. 50 mm F/1.4 3.2.4 Additional high-magnification lens with appropriate extension tube for time-resolved 2D PIV measurements and shadowgraphy measurements of flow through small view fields (e.g. 2 cm x 2 cm, 5 cm x 5 cm). Appropriate connector to connect such high magnification lens to the high speed camera on one end and multiple objective lenses to be used on the other end for different magnifications 3.2.5 Mounting set for aforementioned high-magnification lens	3 sets 3 sets 3 3 3 3 3 3 sets 3	
4.	**Computer**		
	Dual socket INTEL XEON latest generation (at least with 6 cores) processor, additional GPUs for parallel processing of PIVC data, 64 GB DDR 3 RAM, 4 TB storage (with at least two additional HDD bays), NVIDIA graphics card (memory > 1 GB), 64 bit Windows OS (version 7 or higher), DVD +/- RW drive, 2x 22” high resolution flat screen monitors for simultaneous viewing of multiple data sets, wireless ENGLISH keyboard and mouse	1	
5.	**Softwares:**		
	5.1 Software module for high-speed cameras:		

	For simultaneous control of multiple high-speed cameras, synchronization of cameras with the laser pulse and other light sources/devices, computer control of common of camera setting such as frame acquisition speed, shutter speed, resolution, aperture control; image/video recordings/editing in different formats, image analysis and processing, compatible with 64 bit Windows 7 or above OS, provision for integration with MATLAB and other third party softwares (e.g. TecPlot)	4 licenses	
	5.2 Software module for time-resolved 2D-PIV: PIV image capture, image processing/enhancement/analysis, background correction, image stitching, construction of 2D velocity fields using state of the art cross-correlation techniques/least squares matching methods, should be capable of online acquisition and analysis/processing of the data , should have parallel processing capabilities, calculation of temporal and spatial distributions of velocity gradients, vorticity, fluctuating velocity components, turbulent kinetic energy etc., state of art tools for time-series analysis e.g. power spectra, different low-pass/band-pass/high-pass filter modules for filtration of the time-series, proper orthogonal decomposition (POD), integration with the image process/signal processing tool boxes of MATLAB, compatibility with third party softwares e.g. TecPlot etc	4 licenses	
	5.3 Software module for time-resolved stereo PIV: Same as that mentioned in section 5.2 but for 3D velocity field measurements, comprehensive calibration tools/routines, parallel processing module for speed up data processing	4 licenses	
	5.4 Software for shadowgraphy Additional module for measurements of size/shape/velocity of individual bubbles/drop, bubble/drop recognition, automated size/velocity measurements for complete 3D trajectory construction, size distribution, etc	4 licenses	
6.	**Other accessories**		
	6.1 Scheimpflug mounts with maximum available scheimflug angles 6.2 Calibration kit with calibration plate, checker board calibration target and other targets required for calibration for 2D-PIV, 3D-PIV, shadowgraphy 6.3 Additional accessories/components that may be required for complete integration of various system components and their operation.	3 1 set	

(II) Add-on module for time-resolved volumetric PIV system (10 marks)

Description of applications:

The time-resolved volumetric PIV is to be used for time-resolved measurements of velocity flow field (3 components of velocity) in a volume located a different x, y and z locations. Therefore, the system components (e.g. the set of 3 camera, volume illumination light optics etc) needs to be traversed at different locations along x, y- and z-directions. **All the required volume illumination accessories, mounts for camera and light guide arm and appropriate traversing mounts/arms/rails should be quoted.** The important technical specifications of components of the volumetric PIV system and **an indicative list of system components/accessories is provided below. It is the responsibility of the bidder to include all the required accessories for complete integration of various system components and their operation. In addition to the major system components, the accessories will be given significant weightage in the evaluation of the technical proposal.**

1.	**High-Speed Laser Light Accessories**	**Qty**	**Complied (Yes/No)**
	1.1 Laser volume illumination optics Additional volume illumination light optics/accessories to be used with the high-speed laser and accessories described in (I) (1) 1.1 & 1.2 above.	1 set	
2.	**Softwares:**		
	2.1 Software module for time-resolved volumetric PIV: Time-resolved measurement of 3D (volumetic) 3 components of velocity, calibration routines, volumetric particle tracking, least squares matching technique, additional modules for parallel data processing through use of GPUs	4 licenses	
3.	**Other accessories**		
	3.1 Additional camera mounts required to perform volumetric PIV measurement 3.2 Calibration kit 3.3 Additional accessories/components that may be required for complete integration of various system components and their operation.	1 set 1 set	

(III) Add-on module for time-resolved micro-PIV (10 marks)

Description of applications:

The time-resolved 2D PIV is to be used for time resolved measurements of velocity flow fields in microchannels/micro-fluidic devices.

(a) In experiments to be performed on time-resolved liquid (single phase or two-phase flows) velocity measurements, transparent (or refractive index matched) microchannels with cross sections approximately of 100 μ x 100 μ to 1000 μ x 1000 μ will be used for experiments and it is desired to resolve length scales of ~ 1 μ. For these measurements, a high-quality inverted microscope will be required. The high-speed camera and high-speed laser from the aforementioned time-resolved PIV system (see Section (I)) is to be used for the micro-PIV measurements. Therefore, appropriate accessories to attach the camera to the microscope, fiber optic light guide to connect the laser light source to the microscope, different sets of objective lenses that will provide magnifications up to ~ 1 μ should be quoted.

(b) In case of measurements to be performed using larger interrogation areas (e.g. 1 mm x 10 mm or 1 mm x 20 mm, etc), additional high-magnification lens with appropriate extension tube for time-resolved 2D measurements of flow through microchannels, appropriate connector to mount such a high magnification lens on the high-speed camera on one end and multiple objective lenses to be used on the other end should be quoted. Appropriate laser light optics/accessories to illuminate such larger measurement volume (e.g. 1 mm x 10 mm or 1 mm x 20 mm, etc) from the backside of the channel, mechanical support to mount such laser light source accessories, high speed camera connected with extension tube (with appropriate lenses, objectives etc) on the traversing system should be quoted.

The key technical specifications of components of the μ-PIV system are provided below. **An indicative list of inverted microscope, camera lenses/filters, optic fiber laser light guide, light optics accessories, objective lenses and other**

accessories is provided below. It is the responsibility of the bidder to include all the required accessories for complete integration of various system components and their operation. In addition to the major system components, the accessories will be given significant weightage in the evaluation of the technical proposal.

1.	**High-Speed Laser Accessories**	**Qty**	**Complied (Yes/No)**
	1.1 Light optics		
	1.1.1 Optic fiber (2 m length) for connecting the high-speed laser to the inverted microscope	1	
	1.1.2 Adapter to connect one end of the optic fiber to the laser	1	
	1.1.3 Adapter to connect the other end of the optic fiber to the inverted microscope	1 1 set	
	1.1.4 Appropriate laser light diffusor and necessary optic filters for uniform laser light illumination	1	
	1.1.5 Appropriate device/optical attenuator for control of laser energy	1	
	1.1.6 Additional optics/accessories for time-resolved 2D PIV measurements of flow through microchannels with larger view areas (e.g. 1 mm x 10 mm) without using inverted microscope		
2.	**Inverted microscope**		
	2.1 Specifications of inverted microscope High-performance inverted microscope with appropriate adaptor to mount high-speed camera and laser light optics described in section 1.1 above, binocular tube for direct observation, provision of halogen lamp illumination for standard observation, appropriate switching mechanism between the halogen light and laser light for focusing and measurements respectively, provision of epi-fluorescence optics for fluorescence techniques, controls for changing laser energy, laser light diffusor for uniform bean profile, advanced safety features such that laser light is not seen through the microscope eyepieces, high-precision controls for focusing and for depth of aperture	1	
	2.2 **Accessories**		
	2.2.1 5X, 10X, 20X, 40X, 60 X objective lenses	1 each	
	2.2.2 1X to 5X relay lenses	1 each	
	2.2.3 Appropriate camera filters for simultaneous measurements of time-resolved velocity field, time-resolved concentration and temperature distributions (also see section IV)	1 each	
3.	**Software**		
	In addition to the software specification for time-resolved 2D and stereo-PIV measurement, the software for time-resolved micro-PIV should have • Provision for online laser light intensity control • Advanced data processing algorithms that will allow the measurement in close vicinity of the walls. • Appropriate modules to identity the measurement plane and to control its location, background correction algorithms to remove unfocussed	4 licenses	

	particles.		
4.	**Other accessories**		
	4.1 Calibration module for μ-PIV measurements 4.2 Additional high-magnification lens with appropriate extension tube for μ-PIV time-resolved 2D measurements of flow through microchannels with larger view areas (e.g. 1 mm x 10 mm or 1 mm x 20 mm). Appropriate connector to connect such a high magnification lens to the high speed camera on one end and multiple objective lenses to be used on the other end for different magnifications 4.3 Mounting set for aforementioned high magnification lens 4.4 Flow models or micro-fluidics PIV starter kit 4.5 Additional accessories/components that may be required for complete integration of various system components and their operation.	1 1 set 1 1	
5.	**Optional component**		
	High-resolution high-speed COLOR camera High-resolution high-speed COLOR camera with a resolution of 4 million pixels and frame acquisition speed of 2 kHz @ full resolution, minimum of 8 GB of memory, Gigabit Ethernet interface, computerized control/data acquisition/synchronization I/O through software. Camera with rectangular chip would be preferable.	1	

(IV) Add-on module for time-resolved Laser Induced Fluorescence (LIF)/Planar Laser Induced Fluorescence (PLIF) Measurements

(10 marks)

Description of application:

The 2D time-resolved PIV system is to be used for simultaneous time-resolved measurements of liquid velocity field, liquid phase concentration and temperature measurements in large process vessels and also in microchannels/micro-fluidic devices described in sections (I) and (III), respectively.

Specifications

S. No.		Quantity	**Complied (Yes/No)**
1.	**Camera filters** 1.1 Appropriate filters for camera for simultaneous measurements of liquid concentration and temperature (to be used with the lenses described for time-resolved PIV measurements (section (I)) and micro-PIV experiments (section (III))	1 set	
2.	**LIF/PLIF software** Image capture, analysis, temperature and concentration calibration modules, calculation and mapping of temperature and concentrations fields using the calibration functions	4 licenses	
3.	**Other accessories** 3.1 Dye calibration cells for concentration and temperature calibration 3.2 Laser safety goggles for laser light emitted at different wavelengths	 1 set 2	

	3.3 Additional accessories/components that may be required for complete integration of various system components and their operation.		

(V) Add-on module for traversing system (10 marks)

Description of application:

(a) The intended use of the time-resolved stereo /volumetric PIV measurements is to measure velocity, concentration and temperature distributions in single phase/multiphase flows (flows with bubbles/drops) in different process vessels. The size of the process vessels can be as large as 1 m (width in X-direction) X 1 m (height in Y-direction) X 1 m (depth in Z-direction). A computer controlled 3D traversing is desired to mount the laser light sheet optics such that it could be traversed along the depth to perform whole field velocity measurements on XY planes at different Z positions.

(b) Depending on the optical access to measurement plane, the light sheet optics needs to be mounted on side or top or bottom of the measurement vessel. The traversing system should allow traversing of system components along the sides, bottom or top of the vessel.

(c) In addition, the measurements also need to be performed with smaller view fields (e.g. 2 cm x 2 cm or 5 cm x 5 cm) at different locations in the XY plane. This would require traversing of the cameras and light sheet optics in all three directions.

(d) In case of time-resolved volumetric PIV measurements, measurements will be carried on volumes located at different locations along X-, Y- & Z-directions and the proposed traversing system is expected traverse all the 3 camera and light/illumination (sheet or volume) at different locations.

The key requirements are given below. The bid should include all components/accessories to provide a complete comprehensive solution.

Specifications

S. No		**Quantity**	**Complied (Yes/No)**
1	A 3D motorized and computer controlled traversing system for automated movement of camera and light speed optics in all the three directions with traversing range of 1 m x 1 m x 1 m.	1 unit	
2	Appropriate mounts for 3 high-speed cameras, light sheet optics and light illumination for volumetric PIV	6	
3.	Additional accessories/components that may be required for complete integration of various system components and their operation.		

(VI) Supply of seeding/fluorescent particles/dyes (5 marks)

Owing to shelf time of the seeding particles, a periodic supply (e.g. after every six months) of the seeding/fluorescent particles/fluorescent dyes for a period of 5 years is required.

S. No		Quantity	**Complied (Yes/No)**
1	**Liquid phase PIV experiments**		

	1.1 Polyamide seeding particles 5 micron size 1.2 Polyamide seeding particles 20 micron size 1.3 Polyamide seeding particles 50 micron size 1.4 Hollow glass (HSG) particles 10 micron size 1.5 Silver coated HSG particle 10 micron size	250 gm 250 gm 250 gm 1 lit bottle 100 ml bottle	
2	**Gas phase PIV experiments**		
	Aerosol generator for seeding particle generator	1 unit	
3	**Micro-PIV experiments**		
	3.1 Fluorescent particles 0.9 (or smaller) micron size 3.2 Fluorescent particles 10 micron size 3.3 Fluorescent particles 30 micron size	15 ml bottle 15 ml bottle 15 ml bottle	
4.	**Laser Induced Fluorescence measurements**		
	4.1 Dye for concentration measurements 4.2 Dye for temperature measurements	1 gm 1 gm	

Notes:

- Technical bid should contain detailed specifications of particles (size, absorption and emission wavelengths in case of fluorescent particles, shelf life, concentrations of particles to be used in stereo PIV measurements (e.g. gm/lit of measurement of volume) and in micro-PIV measurements (e.g. mg/mm^3 of measurement of volume)
- Price bid should contain prices of individual particle type. A regular supply particles for a period of 5 years is required.

(VII) Warranty and Software upgrades (5 marks)

1. A comprehensive warranty for THREE years is mandatory on ALL SYSTEM COMPONENTS and ACCESSORIES e.g. high-speed laser, high-speed cameras, inverted micro-scope, light sheet optics and other illumination optics, camera accessories/lenses, traversing systems. The warranty should include on-sight repair costs, free replacement of components/spare parts. If some components cannot be repaired onsite, the principals and their Indian representative shall bear all costs related to shipping of the components/units from IIT Delhi and return, insurance costs and the repair charges. **The warranty should also include at least three visit per year for periodic maintenance and support in application customization.**
2. **A comprehensive warranty, with its scope as described above, for TWO additional years must be quoted separately.**
3. In case of all THIRDY PARTY PRODUCTS, principals and their Indian representative shall be responsible for executing aforementioned warranty agreements for THREE + TWO YEARS, as appropriate, with respective Original Equipment Manufacturers (OEMs) and submit copies of such extended warranty agreements as appendages to the technical proposal.
4. All upgrades of the softwares provided with the system that will be released in FIVE YEARS should be provided FREE OF COST. In addition, if any new softwares are released for the systems mentioned in the present NIQ in FIVE YEARS, such new softwares, even if they are completely new, should be provided FREE OF COST.

(VIII) Prior Experience (10 marks)

1. The principals through their current Indian Representatives must have supplied and successfully installed at least one of stereo or time-resolved system or micro-PIV or volumetric PIV system in India in last 3 years.
2. Further it is stated that in the evaluation process, demonstrated success in prior installations elsewhere in India would be given weightage. The technical bid should contain copies of purchase orders for any of the 2D PIV, stereo PIV, time-resolved 2D and/or 3D PIV, μ-PIV, LIF systems supplied by the Principal to Indian academic institutes/universities/research organizations in last 3 years. Letters/testimonials from end users (with their contact details) should be enclosed. IIT Delhi reserves all rights to contact these academic or research institutions or corporates to seek feedback regarding their experience on supply and installation of the PIV systems.

(IX) Installation and Training

1. The principals, directly or through their Indian distributors, will be responsible complete installation and integration of various components of the system and to demonstrate the technical performance of the system as quoted in the technical bid. The principals and Indian representative are collectively responsible to ensure that all components/accessories are included in the quotation. It is the responsibility of the Principals and Indian representative to ensure that all the components/accessories are included in the technical/ price bids and if components/accessories are missing or any additional part(s) are required for complete installation and integration of system, the principals and Indian representative shall be collectively responsible for providing them without additional costs.
2. The principals should provide a detailed training to the potential users at IIT Delhi explaining all the details of the systems components and their usage, demonstrate the systems performance with actual measurements and complete analysis, typically for a period of 3-4 days. At least one technically competent person from the principals and Indian representatives should be present for the installation and training. Such person must have installed these systems mentioned in the NIQ (see Sections (I) to (IV)). **The details of such persons with educational background and prior experience in installation/usage of such systems should be enclosed with the technical bid.**
3. No separate charges will be paid for the installation and training. The engineers/personnel responsible for installation/training should make their own arrangements of travel to and stay in New Delhi.

(X) Evaluation of the proposal

1. **Cost evaluation under Combined Quality Cum Cost Based System (CQCCBS) will used for evaluation of the proposals. Under CQCCBS, the technical proposal will be allotted weightage of 70% while the financial proposal will be allotted weightage of 30%.**
2. The technical committee will do the evaluation of all technical proposals and will award marks out of 100 to all technically satisfactory proposals. Unsatisfactory technical proposals will be rejected and the price bids of such proposals will not be evaluated. **The minimum qualifying marks in the technical evaluation will be 70 out of 100.**
3. The price bids of technically satisfactory proposals will be opened. Proposal with the lowest cost will be given a financial score of 100 and financial score of all other proposals will be given scores that are inversely proportional to their prices i.e. the financial score of all other proposals will be calculated using the formula (LEC / EC)x100, where LEC stands for lowest evaluated cost and EC stands for evaluated cost. For example, if

there are three bids (which are technically satisfactory and have secured marks ≥ 70/100 in the technical evaluation) that have quoted prices as:
Bidder 1: Rs. 200
Bidder 2: Rs. 120
Bidder 3: Rs. 145
The lowest evaluated cost (LEC) among all above bidders is 120 and the financial score (out of 100) that will be awarded to each of the above bidders will be calculated using the formulae (LEC/EC)x100 as:
Bidder 1: (120/200)x100 = 60 points
Bidder 2: (120/120)x100 = 100 points
Bidder 3: (120/145)x100 = 82.76 points

4. The total score shall be obtained by weighing the quality and cost scores and adding them up. On the basis of the combined weighted score for quality and cost, the proposals will be ranked in terms of the total score obtained. For example, if the technical and financial scores (obtained out of 100) considered in above example are as given in the following table, the combined score will be calculated by giving 70% weightage to the technical score and 30% evaluation to the financial score (see the 4th column of the table). Using the combined technical and financial evaluation, the proposals will ranked as shown in the 5th column. The H1 bidder will be called for further negotiations.

(1) Bidder	(2) Technical Score (out of 100)	(3) Financial Score (out of 100)	(4) Combined Score (out of 100)	(5) Rank
Bidder 1	90	60	90x0.7+60x0.3=81	H2
Bidder 2	80	100	80x0.7+100x0.3=86	H1
Bidder 3	75	82.76	75x0.7+82.76x0.3=77.33	H3

5. In addition to the major system components, the accessories will be given weightage in the evaluation of the technical proposal.

(XI) Additional information required in technical & price bids

In addition to the terms and conditions given below, following information must be provided in the technical and price bids.

1. **Technical bids:**
   - **1.1 A carefully prepared detailed technical proposal providing detailed write ups on usage/application for each and every component/accessory of the system and their detailed technical specifications is mandatory.** In addition, technical specification sheets of all the components/accessories/softwares should be provided as appendages. **Please note that the technical proposals that are mere a compilation of specification sheets will not be acceptable and may lead to complete disqualification of technical grounds or reduction in marks.** In addition, technical bid should contain following documents.
   - **1.2** Letter/Certificate from foreign principals authorizing Indian representative. This letter should clearly mention the period of such authorization.

1.3 Agreement/undertaking from the foreign principals confirming that the foreign principals shall be liable to provide warranty (see section VII) through the Indian Representative that they have appointed. If in case, the agreement between the foreign principals and their Indian representative expires or terminates because of any reason, the foreign principals shall be responsible for providing the warranty (see sections VII) directly or through newly appointed Indian Representative without any additional costs. It will be the responsibility of the foreign principals to inform IIT Delhi if their contract with Indian Representative is renewed or terminated and appointment of new Indian Representative.

1.4 The warranty certificates/agreements from all the THIRD PARTY OEMs of all systems components for the warranty period and terms and conditions mentioned in section VII should be enclosed with the technical bid.

2. Price bid

2.1 Price bid must provide cost of all system components, accessories separately and total amounts should be provided separately.

2.2 IIT Delhi is a premier education and research institute of international repute. All the price discounts eligible for educational institute/university, should be offered and mentioned clearly in the price bid.

(XII) Additional Terms & Conditions:

In addition to Terms & Conditions given below

- **Depending on availability of funds, IIT Delhi reserves the right to buy a few (and not all) of the add-on modules, accessories mentioned therein, seeding particle quantities and additional warranty cover.**

A complete set of tender documents* may be Download by prospective bidder free of cost from the website http://eprocure.gov.in/eprocure/app.

1.	Price of Tender Document	NIL
2.	EMD Amount	NIL
3.	Issue of Tender Document .	**14.07.2014**
4.	Last date for receipt of queries	**12.08.2014**
5.	Date of pre bid meeting	**25 .07.2014**
7	Last Date and Time for receipts of Bids	Upto **17:00** Hrs. on **13.08.2014**
8	Opening of Technical Bid	**1130** Hrs. on – **14.08.2014**
9	Place of Opening of Bids	**Central Stores & Purchase Section** Indian Institute of Technology, Hauz Khas, New Delhi - 110016
10.	Address of Communication	**Dr. Vivek V. Buwa** **I-210, Department of Chemical Engineering** Indian Institute of Technology, Hauz Khas, New Delhi - 110016
11.	Contact Phone Numbers	(+91)-11- **2659 1027**
12.	Fax Number	(+91)-11- **2658 1120**
13.	E-mail Address	vvbuwa@iitd.ac.in

*Tender document can be downloaded (from **14.07.2014** to **13.08.2014** from https://eprocure.gov.in/eprocure/app

Terms & Conditions

Sl.No.	Specification
1.	**Due date**: The tender has to be submitted before the due date. The offers received after the due date and time will not be considered.
2.	**Preparation of Bids**: The offer/bid should be submitted in two bid systems (i.e.) Technical bid and financial bid. The technical bid should consist of all technical details along with commercial terms and conditions. Financial bid should indicate item wise price for the items mentioned in the technical bid. The Technical bid and the financial bid should be submitted Online in 2 Envelope.
3.	**Opening of the tender**: The online bid will be opened by a committee duly constituted for this purpose. Online bids (complete in all respect will be opened as mentioned at "Annexure: Schedule" in presence of bidders representative if available, Only one representative will be allowed to participate in the tender opening. The technical bid will be opened online first and it will be examined by a technical committee which will decide the suitability as per our specification and requirement. The financial offer/bid will be opened only for the offer/bid which technically meets all our requirements as per the specification, and will be opened in the presence of the vendor's representatives subsequently for further evaluation. The bidders if interested may participate on the tender opening Date and Time. The bidder should produce authorization letter from their company to participate in the tender opening.
4.	**Acceptance/ Rejection of bids:** The Committee reserves the right to reject any or all offers without assigning any reason.
5.	**Pre-qualification criteria:** (i) Bidders should be the manufacturer / authorized dealer. Letter of Authorization from original equipment manufacturer (OEM) on the same and specific to the tender should be enclosed. (ii) An undertaking from the OEM is required stating that they would facilitate the bidder on a regular basis with technology/product updates and extend support for the warranty as well. (iii) OEM should be internationally reputed Branded Company. (iv) Non-compliance of tender terms, non-submission of required documents, lack of clarity of the specifications, contradiction between bidder specification and supporting documents etc. may lead to rejection of the bid.
6.	**Performance Security**: **The supplier shall require to submit the performance security in the form of irrevocable bank guarantee issued by any Indian Nationalized Bank for an amount which is equal to the 10% of FOB value within 21 days from the date of receipt of the purchase order and should be kept valid for a period of 60 days beyond the date of completion of warranty period.**
7.	**Force Majeure:** The Supplier shall not be liable for forfeiture of its performance security, liquidated damages or termination for default, if and to the extent that, it's delay in performance or other failure to perform its obligations under the Contract is the result of an event of Force Majeure. • For purposes of this Clause, "Force Majeure" means an event beyond the control of the Supplier and not involving the Supplier's fault or negligence and not foreseeable. Such events may include, but are not limited to, acts of the Purchaser either in its sovereign or contractual capacity, wars or revolutions, fires, floods, epidemics, quarantine restrictions and freight embargoes. • If a Force Majeure situation arises, the Supplier shall promptly notify the Purchaser in writing of such conditions and the cause thereof. Unless otherwise directed by the Purchaser in writing, the Supplier shall continue to perform its obligations under the Contract as far as is reasonably practical, and shall seek all reasonable alternative means for performance not prevented by the Force Majeure event.
8.	**Risk Purchase Clause**: In 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 the other source on the total risk of the supplier under risk purchase clause.
9.	**Packing Instructions**: Each package will be marked on three sides with proper paint/indelible ink, the following: i. Item Nomenclature ii. Order/Contract No. iii. Country of Origin of Goods iv. Supplier's Name and Address v. Consignee details vi. Packing list reference number
10.	**Delivery and Documents:** Delivery of the goods should be made within a maximum of 08 to 16 weeks from the date of placement of purchase order and the opening of LC. Within 24 hours of shipment, the supplier shall notify the purchaser and the insurance company by cable/telex/fax/e mail the full details of the shipment including contract number, railway receipt number/ AAP etc. and date, description of goods, quantity, name of the consignee, invoice etc. The supplier shall mail the following documents to the purchaser with a copy to the insurance company: 1. 4 Copies of the Supplier invoice showing contract number, goods' description, quantity 2. unit price, total amount; 3. Acknowledgment of receipt of goods from the consignee(s) by the transporter; 4. Insurance Certificate if applicable; 5. Manufacturer's/Supplier's warranty certificate; 6. Inspection Certificate issued by the nominated inspection agency, if any 7. Supplier's factory inspection report; and 8. Certificate of Origin (if possible by the beneficiary); 9. Two copies of the packing list identifying the contents of each package. 10. The above documents should be received by the Purchaser before arrival of the Goods (except where the Goods have been delivered directly to the Consignee with all documents) and, if not received, the Supplier will be responsible for any consequent expenses.
11.	**Delayed delivery:** If the delivery is not made within the due date for any reason, the Committee will have the right to impose penalty 1% per week and the maximum deduction is 10% of the contract value / price.
12.	**Prices**: Bidder should quote the prices in the given format as .PDF. The price should be quoted in net per unit (after breakup) and must include all packing and delivery charges. The offer/bid should be exclusive of taxes and duties, which will be paid by the purchaser as applicable. However the percentage of taxes & duties shall be clearly indicated. The price should be quoted without custom duty and excise duty, since IIT Delhi is exempted from payment of Excise Duty and is eligible for concessional rate of custom duty. Necessary certificate will be issued on demand. **In case of import supply the price should be quoted on FOB Basis only.** Under special circumstances (eg. perishable chemicals), when the item is imported on CIF, please indicate CIF charges separately upto IIT Delhi indicating the mode of shipment. IIT Delhi will make necessary arrangements for the clearance of imported goods at the Airport/Seaport. Hence the price should not include the above charges.
13.	**Notices:** For the purpose of all notices, the following shall be the address of the Purchaser and Supplier. **Purchaser: Dr. Vivek V. Buwa** I-210, Department of Chemical Engineering Indian Institute of Technology

	Hauz Khas, New Delhi - 110016. **Supplier:** (To be filled in by the supplier) _____ _____ _____
	Progress of Supply: Wherever applicable, supplier shall regularly intimate progress of supply, in writing, to the Purchaser as under: 1. Quantity offered for inspection and date; 2. Quantity accepted/rejected by inspecting agency and date; 3. Quantity dispatched/delivered to consignees and date; 4. Quantity where incidental services have been satisfactorily completed with date; 5. Quantity where rectification/repair/replacement effected/completed on receipt of any communication from consignee/Purchaser with date; 6. Date of completion of entire Contract including incidental services, if any; and **7.** Date of receipt of entire payments under the Contract (In case of stage-wise inspection, details required may also be specified).
14.	**Inspection and Tests:** Inspection and tests prior to shipment of Goods and at final acceptance are as follows: • After the goods are manufactured and assembled, inspection and testing of the goods shall be carried out at the supplier's plant by the supplier, prior to shipment to check whether the goods are in conformity with the technical specifications attached to the purchase order. Manufacturer's test certificate with data sheet shall be issued to this effect and submitted along with the delivery documents. The purchaser shall be present at the supplier's premises during such inspection and testing if need is felt. The location where the inspection is required to be conducted should be clearly indicated. The supplier shall inform the purchaser about the site preparation, if any, needed for installation of the goods at the purchaser's site at the time of submission of order acceptance. • The acceptance test will be conducted by the Purchaser, their consultant or other such person nominated by the Purchaser at its option after the equipment is installed at purchaser's site in the presence of supplier's representatives. The acceptance will involve trouble free operation and ascertaining conformity with the ordered specifications and quality. There shall not be any additional charges for carrying out acceptance test. No malfunction, partial or complete failure of any part of the equipment is expected to occur. The Supplier shall maintain necessary log in respect of the result of the test to establish to the entire satisfaction of the Purchaser, the successful completion of the test specified. • In the event of the ordered item failing to pass the acceptance test, a period not exceeding one weeks will be given to rectify the defects and clear the acceptance test, failing which the Purchaser reserve the right to get the equipment replaced by the Supplier at no extra cost to the Purchaser. • Successful conduct and conclusion of the acceptance test for the installed goods and equipment shall also be the responsibility and at the cost of the Supplier.
15.	**Resolution of Disputes**: The dispute resolution mechanism to be applied pursuant shall be as follows: • In case of Dispute or difference arising between the Purchaser and a domestic supplier relating to any matter arising out of or connected with this agreement, such disputes or difference shall be settled in accordance with the Indian Arbitration & Conciliation Act, 1996, the rules there under and any statutory modifications or re-enactments thereof shall apply to the arbitration proceedings. The dispute shall be referred to the Director, Indian Institute of Technology (IIT) Delhi and if he is unable or unwilling to act, to the sole arbitration of some other person appointed by him willing to act as such Arbitrator. The award of the arbitrator so appointed shall be final, conclusive and binding on all

	parties to this order. • In the case of a dispute between the purchaser and a Foreign Supplier, the dispute shall be settled by arbitration in accordance with provision of sub-clause (a) above. But if this is not acceptable to the supplier then the dispute shall be settled in accordance with provisions of UNCITRAL (United Nations Commission on International Trade Law) Arbitration Rules. • The venue of the arbitration shall be the place from where the order is issued.
16.	**Applicable Law:** The place of jurisdiction would be New Delhi (Delhi) INDIA.
17.	**Right to Use Defective Goods** If after delivery, acceptance and installation and within the guarantee and warranty period, the operation or use of the goods proves to be unsatisfactory, the Purchaser shall have the right to continue to operate or use such goods until rectifications of defects, errors or omissions by repair or by partial or complete replacement is made without interfering with the Purchaser's operation.
18.	**Supplier Integrity** The Supplier is responsible for and obliged to conduct all contracted activities in accordance with the Contract using state of the art methods and economic principles and exercising all means available to achieve the performance specified in the contract.
19.	**Training** The Supplier is required to provide training on training to the designated Purchaser's technical and end user personnel to enable them to effectively operate the total equipment.
20.	**Installation & Demonstration** The supplier is required to done the installation and demonstration of the equipment within one month of the arrival of materials at the IITD site of installation, otherwise the penalty clause will be the same as per the supply of materials.
21.	**Insurance:** For delivery of goods at the purchaser's premises, the insurance shall be obtained by the Supplier in an amount equal to 110% of the value of the goods from "warehouse to warehouse" (final destinations) on "All Risks" basis including War Risks and Strikes. The insurance shall be valid for a period of not less than 3 months after installation and commissioning. **In case of orders placed on FOB/FCA basis, the purchaser shall arrange Insurance. If orders placed on CIF/CIP basis, the insurance should be up to IIT Delhi.**
22.	**Incidental services:** The incidental services also include: • Furnishing of 01 set of detailed operations & maintenance manual. • Arranging the shifting/moving of the item to their location of final installation within IITD premises at the cost of Supplier through their Indian representatives.
23.	**Warranty**: 1. See section (VII) given above. 2. The Purchaser shall promptly notify the Supplier in writing of any claims arising under this warranty. Upon receipt of such notice, the Supplier shall immediately within in 02 days arrange to repair or replace the defective goods or parts thereof free of cost at the ultimate destination. The Supplier shall take over the replaced parts/goods at the time of their replacement. No claim whatsoever shall lie on the Purchaser for the replaced parts/goods thereafter. The period for correction of defects in the warranty period is 02 days. If the supplier having been notified fails to remedy the defects within 02 days, the purchaser may proceed to take such remedial action as may be necessary, at the supplier's risk and expenses and without prejudice to any other rights, which the purchaser may have against the supplier under the contract.
24.	**Governing Language** The contract shall be written in English language. English language version of the Contract shall govern its interpretation. All correspondence and other documents pertaining to the Contract, which are exchanged by the parties, shall be written in the same language.

25.	**Applicable Law** The Contract shall be interpreted in accordance with the laws of the Union of India and all disputes shall be subject to place of jurisdiction.
26.	**Notices** • Any notice given by one party to the other pursuant to this contract/order shall be sent to the other party in writing or by cable, telex, FAX or e mail and confirmed in writing to the other party's address. • A notice shall be effective when delivered or on the notice's effective date, whichever is later.
27.	**Taxes and Duties** Suppliers shall be entirely responsible for all taxes, duties, license fees, octroi, road permits, etc., incurred until delivery of the contracted Goods to the Purchaser. However, VAT in respect of the transaction between the Purchaser and the Supplier shall be payable extra, if so stipulated in the order.
28.	**Agency Commission**: Agency commission if any will be paid to the Indian agent 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 case of Nil commission. The tenderer should indicate the percentage of agency commission to be paid to the Indian agent.
29.	**Payment**: Payment will be made through irrevocable Letter of Credit (LC). Letter of Credit (LC) will be established in the favour of foreign Supplier after the submission of performance security. The letter of credit (LC) will be established on the exchange rates as applicable on the date of establishment. • For Indigenous supplies, 100% payment shall be made by the Purchaser against delivery, inspection, successful installation, commissioning and acceptance of the equipment at IITD in good condition and to the entire satisfaction of the Purchaser and on production of unconditional performance bank guarantee as specified in Clause 9 of tender terms and conditions. • For Imports, LC will be opened for 100% FOB/CIF value. 80% of the LC amount shall be released on presentation of complete and clear shipping documents and 20% of the LC amount shall be released after the installation and demonstration of the equipment at the INST site of installation in faultless working condition for period of 60 days from the date of the satisfactory installation and subject to the production of unconditional performance bank guarantee as specified in Clause 9 of tender terms and conditions. • Indian Agency commission (IAC), if any shall be paid after satisfactory installation & commissioning of the goods at the destination at the exchange rate prevailing on the date of negotiation of LC documents, subject to DGS&D registration for restricted items. • All the bank charges within India will be borne by the Institute and outside India will be borne by the Supplier.
30.	**User list:** Brochure detailing technical specifications and performance, list of industrial and educational establishments where the items enquired have been supplied must be provided.
31.	**Manuals and Drawings** • Before the goods and equipment are taken over by the Purchaser, the Supplier shall supply operation and maintenance manuals. These shall be in such details as will enable the Purchaser to operate, maintain, adjust and repair all parts of the works as stated in the specifications. • The Manuals shall be in the ruling language (English) in such form and numbers as stated in the contract. • Unless and otherwise agreed, the goods equipment shall not be considered to be completed for the purposes of taking over until such manuals and drawing have been supplied to the Purchaser.
32.	**Application Specialist**: The Tenderer should mention in the Techno-Commercial bid the availability

	and names of Application Specialist and Service Engineers in the nearest regional office.
33.	**Site Preparation**: The supplier shall inform to the Institute about the site preparation, if any, needed for the installation of equipment, immediately after the receipt of the purchase order. The supplier must provide complete details regarding space and all the other infrastructural requirements needed for the equipment, which the Institute should arrange before the arrival of the equipment to ensure its timely installation and smooth operation thereafter. The supplier shall visit the Institute and see the site where the equipment is to be installed and may offer his advice and render assistance to the Institute in the preparation of the site and other pre-installation requirements.
34.	**Installation**: The equipment or machinery has to be installed or commissioned by the successful bidder within 30 days from the date of receipt of the item at IITD. In case of any mishappening/damage to equipment and supplies during the carriage of supplies from the origin of equipment to the installation site, the supplier has to replace it with new equipment/supplies immediately at his own risk. Supplier will settle his claim with the insurance company as per his convenience. IITD will not be liable to any type of losses in any form.
35.	**Spare Parts** The Supplier may be required to provide any or all of the following materials, notifications, and information pertaining to spare parts manufactured or distributed by the Supplier: i. Such spare parts as the Purchaser may elect to purchase from the Supplier, providing that this election shall not relieve the Supplier of any warranty obligations under the Contract; and ii. In the event of termination of production of the spare parts: iii. Advance notification to the Purchaser of the pending termination, in sufficient time to permit the Purchaser to procure needed requirements; and iv. Following such termination, furnishing at no cost to the Purchaser, the blueprints, drawings and specifications of the spare parts, if requested. Supplier shall carry sufficient inventories to assure ex-stock supply of consumable spares for the Goods, such as gaskets, plugs, washers, belts etc. Other spare parts and components shall be supplied as promptly as possible but in any case within six months of placement of order.
36.	**Defective Equipment**: If any of the equipment supplied by the Tenderer is found to be substandard, refurbished, un-merchantable or not in accordance with the description/specification or otherwise faulty, the committee will have the right to reject the equipment or its part. The prices of such equipment shall be refunded by the Tenderer with 18% interest if such payments for such equipment have already been made. All damaged or unapproved goods shall be returned at suppliers cost and risk and the incidental expenses incurred thereon shall be recovered from the supplier. Defective part in equipment, if found before installation and/or during warranty period, shall be replaced within 45 days on receipt of the intimation from this office at the cost and risk of supplier including all other charges. In case supplier fails to replace above item as per above terms & conditions, IIT Delhi may consider "Banning" the supplier.
37.	**Termination for Default** The Purchaser may, without prejudice to any other remedy for breach of contract, by written notice of default sent to the Supplier, terminate the Contract in whole or part: i. If the Supplier fails to deliver any or all of the Goods within the period(s) specified in the order, or within any extension thereof granted by the Purchaser; or ii If the Supplier fails to perform any other obligation(s) under the Contract. iii If the Supplier, in the judgment of the Purchaser has engaged in corrupt or fraudulent practices in competing for or in executing the Contract. • For the purpose of this Clause: i. "**Corrupt practice**" means the offering, giving, receiving or soliciting of anything of value to

	influence the action of a public official in the procurement process or in contract execution. ii. "**Fraudulent practice**" means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Borrower, and includes collusive practice among Bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the Borrower of the benefits of free and open competition;'" • In the event the Purchaser terminates the Contract in whole or in part, the Purchaser may procure, upon such terms and in such manner, as it deems appropriate, Goods or Services similar to those undelivered, and the Supplier shall be liable to the Purchaser for any excess costs for such similar Goods or Services. However, the Supplier shall continue the performance of the Contract to the extent not terminated.
38.	**Shifting**: After 3-4 years once our new building is ready, the supplier has to shift and reinstall the instrument free of cost.
39.	**Warranty/Guarantee**: see Section (VII) give above.
40.	**Downtime:** During the warranty period not more than 5% downtime will be permissible. For every day exceeding permissible downtime, penalty of 1/365 of the 5% FOB value will be imposed. Downtime will be counted from the date and time of the filing of complaint with in the business hours.
41.	**Training of Personnel:** The supplier shall be required to undertake to provide the technical training to the personnel involved in the use of the equipment at the Institute premises, immediately after completing the installation of the equipment for a minimum period of one week at the supplier's cost.
42.	**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 New Delhi.
43.	**Compliancy certificate**: This certificate must be provided indicating conformity to the technical specifications.
44.	**Acknowledgement**: It is hereby acknowledged that we have gone through all the conditions mentioned above and we agree to abide by them.

Annexure- Financial Bid

(I) Base system of time-resolved 3D/stereo PIV system with shadowgraphy

1.	High-Speed Laser	Qty	Rates
	1.3 Specifications of the laser unit Double cavity high-speed laser with pulse energy of at least 2 x 30 mJ @ 1 kHz, output wave length of 527 nm	1	
	1.4 Accessories 1.4.1 Laser bench to mount the laser and the light guide arm 1.4.2 Long laser guiding arm with accessories to connect it with the laser source unit (approximately 2 m in length) at one end and the light sheet optics at the other end. The light guide should be flexible and the laser arm should allow 360^{o} of light sheet rotation.	 1 set 1 set	

	1.4.3 Light sheet optics: spherical lenses with variable focal lengths that will allow to focus laser light sheet from 200 mm to 4000 mm, cylindrical lenses with different focal lengths (e.g. -50, -25, -15 mm) to control the light sheet thickness. All required accessories for mounting aforementioned lenses on the laser guiding arm	1 set	
	1.4.4 Mount for laser guide arm, light sheet optics that can be attached to a motorized traversing system to perform the measurements at different locations along the depth of vessel.	1 set	
	1.4.5 Laser safety goggles for 527 nm	4	
	1.4.6 Synchronizer: for computer controlled synchronization of laser pulse, multiple high-speed cameras, other flash lights, switches/devices, image acquisition etc., appropriate connectivity for computer control, on-board (front) controls with appropriate number of channels for trigger output and for input trigger, high-speed control (~ 1 ns resolution), fully programmable, integrated with the camera control and data acquisition softwares	1	
2.	**Back light illumination**		
	2.1 Back light illumination for an area of about 50 cm (width) and 100 cm (height)	1	
	2.2 Mounting for back light	1	
	2.3 Set of light optics to control illuminated area	1 set	
3.	**High-speed camera and lenses**		
	3.3 Specifications of high-speed camera High speed camera with a minimum resolution of 1 million pixels and frame acquisition speed of 2 kHz @ full resolution, minimum of 8 GB of memory, Gigabit Ethernet interface, computerized control/data acquisition/synchronization I/O through software Camera with rectangular chip would be preferable. **Given optional prices for monochrome and color cameras** **Quote separately for cameras with 16 GB memory**	3	
	3.4 **Accessories**		
	3.4.1 Connecting data and power cables/adopters, power adopters	3 sets	
	3.4.2 Appropriate camera mounts that can be attached to a motorized traversing system to perform the measurements at different locations along the width and height of the vessel (also see point 6.1 of this table).	3 sets	
	3.4.3 High quality lenses with appropriate mount that are compatible with the high-speed cameras		
	3.2.3.1. 35 mm F/2.8	3	
	3.2.3.2. 60 mm F/2.8	3	
	3.2.3.3. 85 mm F/2.8	3	
	3.2.3.4. 100 mm F/2.8	3	
	3.2.3.5. 50 mm F/1.4	3	
	3.4.4 Additional high-magnification lens with appropriate extension tube for time-resolved 2D PIV measurements and shadowgraphy measurements of flow through small view fields (e.g. 2 cm x 2 cm, 5 cm x 5 cm). Appropriate connector to connect such high magnification lens to the high speed camera on one end and multiple objective lenses to be used on the other end for different magnifications	3 sets	
	3.4.5 Mounting set for aforementioned high-magnification lens	3	

4.	**Computer**		
	Dual socket INTEL XEON latest generation (at least with 6 cores) processor, additional GPUs for parallel processing of PIVC data, 64 GB DDR 3 RAM, 4 TB storage (with at least two additional HDD bays), NVIDIA graphics card (memory > 1 GB), 64 bit Windows OS (version 7 or higher), DVD +/- RW drive, 2x 22" high resolution flat screen monitors for simultaneous viewing of multiple data sets, wireless ENGLISH keyboard and mouse	1	
5.	**Softwares:**		
	5.1 Software module for high-speed cameras: For simultaneous control of multiple high-speed cameras, synchronization of cameras with the laser pulse and other light sources/devices, computer control of common of camera setting such as frame acquisition speed, shutter speed, resolution, aperture control; image/video recordings/editing in different formats, image analysis and processing, compatible with 64 bit Windows 7 or above OS, provision for integration with MATLAB and other third party softwares (e.g. TecPlot)	4 licenses	
	5.2 Software module for time-resolved 2D-PIV: PIV image capture, image processing/enhancement/analysis, background correction, image stitching, construction of 2D velocity fields using state of the art cross-correlation techniques/least squares matching methods, should be capable of online acquisition and analysis/processing of the data , should have parallel processing capabilities, calculation of temporal and spatial distributions of velocity gradients, vorticity, fluctuating velocity components, turbulent kinetic energy etc., state of art tools for time-series analysis e.g. power spectra, different low-pass/band-pass/high-pass filter modules for filtration of the time-series, proper orthogonal decomposition (POD), integration with the image process/signal processing tool boxes of MATLAB, compatibility with third party softwares e.g. TecPlot etc	4 licenses	
	5.3 Software module for time-resolved stereo PIV: Same as that mentioned in section 5.2 but for 3D velocity field measurements, comprehensive calibration tools/routines, parallel processing module for speed up data processing	4 licenses	
	5.4 Software for shadowgraphy Additional module for measurements of size/shape/velocity of individual bubbles/drop, bubble/drop recognition, automated size/velocity measurements for complete 3D trajectory construction, size distribution, etc	4 licenses	
6.	**Other accessories**		
	6.1 Scheimpflug mounts with maximum available scheimflug angles 6.2 Calibration kit with calibration plate, checker board calibration target and other targets required for calibration for 2D-PIV, 3D-PIV, shadowgraphy 6.3 Additional accessories/components that may be required for complete integration of various system components and their operation.	3 1 set	

(II) Add-on module for time-resolved volumetric PIV system

1.	High-Speed Laser Light Accessories	Qty	Rates
	1.2 Laser volume illumination optics Additional volume illumination light optics/accessories to be used with the high-speed	1 set	

	laser and accessories described in (I) (1) 1.1 & 1.2 above.		
2.	**Softwares:**		
	2.1 Software module for time-resolved volumetric PIV: Time-resolved measurement of 3D (volumetic) 3 components of velocity, calibration routines, volumetric particle tracking, least squares matching technique, additional modules for parallel data processing through use of GPUs	4 licenses	
3.	**Other accessories**		
	3.1 Additional camera mounts required to perform volumetric PIV measurement 3.2 Calibration kit 3.3 Additional accessories/components that may be required for complete integration of various system components and their operation.	1 set 1 set	

(III) Add-on module for time-resolved micro-PIV

1.	**High-Speed Laser Accessories**	**Qty**	**Rates**
	1.2 Light optics		
	1.2.1 Optic fiber (2 m length) for connecting the high-speed laser to the inverted microscope	1	
	1.2.2 Adapter to connect one end of the optic fiber to the laser	1	
	1.2.3 Adapter to connect the other end of the optic fiber to the inverted microscope	1	
	1.2.4 Appropriate laser light diffusor and necessary optic filters for uniform laser light illumination	1 set	
	1.2.5 Appropriate device/optical attenuator for control of laser energy	1	
	1.2.6 Additional optics/accessories for time-resolved 2D PIV measurements of flow through microchannels with larger view areas (e.g. 1 mm x 10 mm) without using inverted microscope	1	
2.	**Inverted microscope**		
	2.1 Specifications of inverted microscope High-performance inverted microscope with appropriate adaptor to mount high-speed camera and laser light optics described in section 1.1 above, binocular tube for direct observation, provision of halogen lamp illumination for standard observation, appropriate switching mechanism between the halogen light and laser light for focusing and measurements respectively, provision of epi-fluorescence optics for fluorescence techniques, controls for changing laser energy, laser light diffusor for uniform bean profile, advanced safety features such that laser light is not seen through the microscope eyepieces, high-precision controls for focusing and for depth of aperture	1	
	2.3 **Accessories**		
	2.3.1 5X, 10X, 20X, 40X, 60 X objective lenses	1 each	
	2.3.2 1X to 5X relay lenses	1 each	
	2.3.3 Appropriate camera filters for simultaneous measurements of time-resolved velocity field, time-resolved concentration and temperature distributions (also see section IV)	1 each	
3.	**Software**		

	In addition to the software specification for time-resolved 2D and stereo-PIV measurement, the software for time-resolved micro-PIV should have • Provision for online laser light intensity control • Advanced data processing algorithms that will allow the measurement in close vicinity of the walls. • Appropriate modules to identity the measurement plane and to control its location, background correction algorithms to remove unfocussed particles.	4 licenses	
4.	**Other accessories**		
	4.1 Calibration module for μ-PIV measurements 4.2 Additional high-magnification lens with appropriate extension tube for μ-PIV time-resolved 2D measurements of flow through microchannels with larger view areas (e.g. 1 mm x 10 mm or 1 mm x 20 mm). Appropriate connector to connect such a high magnification lens to the high speed camera on one end and multiple objective lenses to be used on the other end for different magnifications 4.3 Mounting set for aforementioned high magnification lens 4.4 Flow models or micro-fluidics PIV starter kit 4.5 Additional accessories/components that may be required for complete integration of various system components and their operation.	1 1 set 1 1	
5.	**Optional component**		
	High-resolution high-speed COLOR camera High-resolution high-speed COLOR camera with a resolution of 4 million pixels and frame acquisition speed of 2 kHz @ full resolution, minimum of 8 GB of memory, Gigabit Ethernet interface, computerized control/data acquisition/synchronization I/O through software. Camera with rectangular chip would be preferable.	1	

IV) Add-on module for time-resolved Laser Induced Fluorescence (LIF)/Planar Laser Induced Fluorescence (PLIF) Measurements

S. No.		Quantity	**Rates**
1.	**Camera filters** 1.2 Appropriate filters for camera for simultaneous measurements of liquid concentration and temperature (to be used with the lenses described for time-resolved PIV measurements (section (I)) and micro-PIV experiments (section (III))	1 set	
2.	**LIF/PLIF software** Image capture, analysis, temperature and concentration calibration modules, calculation and mapping of temperature and concentrations fields using the calibration functions	4 licenses	
3.	**Other accessories** 3.4 Dye calibration cells for concentration and temperature calibration 3.5 Laser safety goggles for laser light emitted at different wavelengths 3.6 Additional accessories/components that may be required for complete	 1 set 2	

	integration of various system components and their operation.		

(V) Add-on module for traversing system

S. No		Quantity	Rates
1	A 3D motorized and computer controlled traversing system for automated movement of camera and light speed optics in all the three directions with traversing range of 1 m x 1 m x 1 m.	1 unit	
2	Appropriate mounts for 3 high-speed cameras, light sheet optics and light illumination for volumetric PIV	6	
3.	Additional accessories/components that may be required for complete integration of various system components and their operation.		

(VI) Supply of seeding/fluorescent particles/dyes

S. No		Quantity	**Rates**
1	**Liquid phase PIV experiments**		
	1.1 Polyamide seeding particles 5 micron size 1.2 Polyamide seeding particles 20 micron size 1.3 Polyamide seeding particles 50 micron size 1.4 Hollow glass (HSG) particles 10 micron size 1.5 Silver coated HSG particle 10 micron size	250 gm 250 gm 250 gm 1 lit bottle 100 ml bottle	
2	**Gas phase PIV experiments**		
	Aerosol generator for seeding particle generator	1 unit	
3	**Micro-PIV experiments**		
	3.1 Fluorescent particles 0.9 (or smaller) micron size 3.2 Fluorescent particles 10 micron size 3.3 Fluorescent particles 30 micron size	15 ml bottle 15 ml bottle 15 ml bottle	
4.	**Laser Induced Fluorescence measurements**		
	4.1 Dye for concentration measurements 4.2 Dye for temperature measurements	1 gm 1 gm	

(VII) Warranty and Software upgrades

S. No	**Description**	**Rates**
1.	A comprehensive warranty for THREE years is mandatory on ALL SYSTEM COMPONENTS and ACCESSORIES e.g. high-speed laser, high-speed cameras, inverted micro-scope, light sheet optics and other illumination optics, camera accessories/lenses, traversing systems. The warranty should include on-sight repair costs, free replacement of components/spare parts	

Bid Submission

i. Online Bid Submission :

The Online bids (complete in all respect) must be uploaded online in **Two** Envelops as explained below :-

Envelope – 1 (Following documents to be provided as single PDF file)			
Sl. No.	**Documents**	**Content**	**File Types**
1.	Technical Bid	Scanned copy of A carefully prepared detailed technical proposal providing detailed write ups on usage/application for each and every component/accessory of the system and their detailed technical specifications	.PDF
2.	Technical Bid	Scanned copy of Detailed technical specification sheets of all the components/accessories/softwares should be provided as appendages.	.PDF
3	Technical Bid	Scanned copy of Letter/Certificate from foreign principals authorizing Indian representative. This letter should clearly mention the period of such authorization.	.PDF
4	Technical Bid	Scanned copy of Agreement/undertaking from the foreign principals confirming that the foreign principals shall be liable to provide warranty (see section VII) through the Indian Representative that they have appointed	.PDF
5	Technical Bid	Scanned copy of The warranty certificates/agreements from all the THIRD PARTY OEMs of all systems components for the warranty period and terms and conditions mentioned in section VII.	.PDF
6	Technical Bid	Scanned copy of Copies of purchase orders for any of the 2D PIV, stereo PIV, time-resolved 2D and/or 3D PIV, μ-PIV, LIF systems supplied by the Principal to Indian academic institutes/universities/research organizations in last 3 years. Letters/testimonials from end users (with their contact details) should be enclosed.	.PDF
7	Technical Bid	Scanned copy of Details of person(s) who will be responsible for installation & commissioning and post-installation technical support (with their educational background and prior experience in installation/usage of such systems)	.PDF
8	Technical Bid	Scanned copy of All other TECHINCAL INFORMATION mentioned in the NIQ	.PDF
9	Technical Bid	Scanned copy of Any other TECHNICAL INFORMATION, if any	.PDF
Envelope – 2			
Sl. No.	TYPES	Content	
1.	Financial Bid	Price Bid To Be Uploaded .PDF Format as per Annexure- Financial Bid	.PDF