ANNEXURE – I

Technical Specifications of High-resolution X-ray diffractometer for thin film and powder analysis

1.0 Bidder Eligibility Criteria-I

Sl. No	Bidder Eligibility Criteria-I	Complied / Not Complied	Reference Page No.	Remarks, If any
1	The bidder/OEM should have supplied at least 3 items to IITs, NITs, IISERs, CSIR Labs or other Govt. R&D organizations in the last 5 years, PO copies or installation certificates along with contact details of end user need to be submitted as the proof of supply. IIT Madras reserves its right to verify the claims submitted by the bidder and the feedback from the previous customers will be part of technical evaluation.			
2	The bidder/OEM should have local service Center in India.			

2.0 Technical Specifications II

SI No.	Specifications	Complied / Not Complied	Reference Page No.
	High Resolution X-ray diffractometer capable of performing high resolution structural characterization on bulk, powder and thin films with the following specification		
1	**X-ray Generator:**		
	a) Output Power $\geq$ 3 kW		
	b) Maximum voltage $\geq$ 60 kV		
	Voltage increment $\leq$ 1 kV		
	c) Maximum current $\geq$ 60 mA		
	d) Current increment $\leq$ 1 mA		
	e) Stability: should be less than 0.01% for $\pm$ 10% voltage fluctuation		
	f) Mode of operation: Automatic and software controlled		
	g) Safety : Overload limit setting, Automatic ageing of X-ray		
	h) X-ray tube protection against under voltage, over load, over voltage, over current and/or failure of water supply. Should have door interlock safety mechanism which allows the generation of x-rays only when the door is closed. Water Cooled Chiller of reputed make for the above.		
2	X-ray Target: Cu Latest Generation Ceramic Type Sealed Tube operating At 1.8 kW or more with appropriate filter and Parabolic Multigraded mirror in the incident beam for making the beam parallel.		

3	**Goniometer:**		
	The goniometer should be Vertically or Horizontally mounted. It should have the capability of carrying out the complete analysis of bulk, powder and thin films(4 circle geometry or similar) samples. All accessories required for reciprocal space mapping with appropriate software should be quoted. The system should allow residual stress and pole figure analysis of the samples. Should have automatic alignment alignment free change over / when the mode of operation is changed using optical encoders.		
	i) Type: Theta – Theta (θ- θ) or Theta- 2 Theta (θ-2θ)		
	ii) 2θ range – 0 to 160 degrees (deg.) or better		
	iii) Minimum step size: 0.0001 deg. or smaller		
	iv) Angle reproducibility: 0.0001 deg. or smaller		
	v) Resolution: <0.04 deg. or better		
	vi) 4-axis attachment for analysis of thin/textured films		
	vii) Sample height alignment unit with sample up/down mechanism		
4	**In-plane arrangement for RSM/GID**		
	i) Scanning axis (driving method): Horizontal/vertical		
	ii) Scanning speed: 0.01 ~ 20 deg./min or more		
	Iii) Step width: 0.002 deg. or less		
	vi) Scanning range: 0 – 100 deg.-or more		
5	**Thin film attachment:**		
	i) Should allow XRD of multilayer thin films. Should work in both reflection and transmission mode.		
	ii) Phi (□) axis- Operating range -360 to +360 deg. with minimum 0.01 deg. step or better		
	iii) Kai (χ) Axis-Operating range -5 to 92 deg. with minimum 0.01 deg. step or better		
	Iv) Z Axis- Operational Range -6 to +1 mm range with minimum 0.001 mm step or better		
	v) Thin Film Slit		
	Vii) Should allow high resolution and high intensity X-ray reflectivity, in-plane GID,2D GISAXS and 2D WAXS measurements. Ultrafast RSM &Rocking curve measurements.		
	Viii) In Plane analysis Necessary accessory to be included		
6	**Detector:**		
	One Dimensional (1D) Linear Detector: Additionally, a multistrip solid state1D detector which can work in both 0D and 1D model. The pixel size here should be equal to or less than 75 microns. The detector should have Fluorescence suppression mode built-in. Detector should allow ultrafast RSM without any additional monochromator. In case monochromator is Necessary it should mentioned in the quote		
7	**Slits:**		

	i)Slits: Should include necessary divergence, scattering,receiving and height slits and Slit Exchanger system The arrangement should facilitate small angle (~ 0.5 degree) measurements.		
	ii)All the relevant slits including slits for high resolution focusing method (all slits used in incident beam optics and diffracted beam optics includingIncident and receiving Soller slits) should be mentioned		
	iii)Two bounce monochromators both at primary and secondary beam sides. For parallel beam optics: A parallel beam mirror and Ge (220) two bounce crystal for Cu Kα in the incident path with the Divergence of the exit beam should be below 0.01 degree.		
8	**Accessories:**		
	i)Automatic Attenuators: Automatic attenuators should be available to protect the detector from direct beam		
	ii)Sample holders: Flat sample stage for solid, powder and polycrystallinc thin film sample with 20 numbers of rectangular sample holders, Zero Background sample holder (at least 2 in number). Sample holders for gels, liquids,suspensions, nanocomposites and any other kind of sample that can bemeasured.		
	iii)Standard samples: standard samples for all Measurements possible with the diffractometer should be provided for calibration purposes.		
	iv) Any other essential spares and accessories as required		
9	**Future Upgradeability:**		
	System in its present form should be upgradable in future to include other modulesand optional attachments from time to time. The basic design should not becomeobsolete for at least 10 years of operation. Spare parts and service should be made available for at least 10 years of operation.		
10	**Standard measurement, data processing and analysis software and database:**		
	The software should be able to perform		
	i) X-Ray Generator Operation.		
	ii) Manual Measurement.		
	iii) Auto setting (with counting loss correction Function).		
	iv) Standard measurement.		
	v) Automatic Alignment.		
	vi) System conditioning setting (Change configurations).		
	vii)Data processing software: Academic License should be clearly specified inthe tender document		

	viii)Data processing software: Academic License should be clearly specified in the tender document		
	ix)Analysis Software: Should allow both qualitative and comprehensive Analysis, should include (but not limited to) lattice constants,Crystallinity, Indexing. The details of the softwarefunctionalities should beclearly specified in the tender document.		
11	**Computer**		
	Computer with following specification or better should be quoted: Intel core i7 processor, DVD-RW drive, 16GB or better RAM, 2TB HDD,23 inch LED monitor, Windows 10 Software.		
12	**Water Chiller and UPS**		
	i) Quote for appropriate reputed brand compact chiller with adequate capacity for the XRD system.		
	ii) A suitable UPS of reputed brand capable of providing minimum 30 minutes back-up along with isolation transformer of reputed make.		
	iii)Standard samples: standard samples for all measurementspossible with the diffractometer should be provided for calibration purposes.		
	iv)Any other essential spares as required		
13	**Future Upgradeability:**		
	System in its present form should be upgradable in future to include other modules and optional attachments from time to time. The basic design should not become obsolete for at least 10 years of operation. Spare parts, accessories, and service should be made available for at least 10 years of operation.		
14	**Optional requirements**		
	Solid state X-ray generator for Cu k-a source of power > 6 **kW**		
	Goniometer with in-plane XRD measurement capability.		
Other Term and Conditions:			
1	Neccesary Training and installation should be provided at IIT Madras.		
2	**Warranty period:** 2 years Minimum Warranty + 1 year Extended Warranty from the day of installation to be provided		

(Note: It is mandatory for the bidders to provide the compliance statement in tabular column format along with catalogue page number (comply/not comply) for the Above points with document proof as required. Failing which bidders will be technically disqualified)