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Appendix-3

Technical Compliance Sheet

1A) Imaging Spectrograph				
Sr No	Item	ITER-India Specifications	Description	Vendor Specifications
1	Type Mount	Visible imaging spectrograph Preferably Czerny-Turner Usable wavelength range 300 – 1000 nm	Any modified Czerny Turner complying with ITER-India technical specifications can also be quoted as an option.	
2	F#(F-number)	5 to 7	Vendor may choose to quote the appropriate focal length of the instrument which yields the desired F# in the specified range.	
3	Image distortion# at the exit focal plane	Less than 22% image distortion across the focal plane.	<i># Image distortion means the size of the image at the focal plane after correcting all the aberrations such as spherical aberrations, astigmatism etc.</i>	
4	Required no of gratings	Three		

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	Grating groove density Grating no .1 Grating no .2 Grating no. 3 Grating configuration/mount :	1800 l/mm Plane reflecting holographic 1200 l/mm Plane reflecting holographic 600 l/mm (Ruled) Turret		
5	Linear dispersion(nm/mm)	1.0 to 0.8 nm/mm for Grating no.1 1.5 to 1.3 nm/mm for Grating no .2 3.5 to 2.8 nm/mm for Grating no.3		
6	Wavelength resolution with CCD detector	$\leq 0.06\text{nm}$ across the focal plane for Grating no.1 $\leq 0.08\text{nm}$ across the focal plane for Grating no.2 $\leq 0.15\text{ nm}$ across the focal plane for Grating no.3	This is to be achieved, when the input slit width is nearly equal to the pixel size of the CCD detector.	
7	Wavelength coverage with CCD detector	13-10 nm for Grating no.1 20-17 nm for Grating no.2 45-35nm for Grating no.3		
I.B) Entrance and exit ports with slit assembly				
1	No of entrance ports	One motorized slit assembly One manual bilateral slit	Externally controlled motorized micrometers to vary the slit width.	

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2	No of exit ports	One for mounting CCD detector One manual bilateral slit assembly	The additional exit port should be similar to the manual slit assembly used at the entrance port.	
3	Diverter mirrors	One at Entrance One at Exit	To select entrance and exit ports.	

I.C) External shutter

1	Shutter	Shutter for entire CCD exposure	Shutter to be mounted at the entrance port of the spectrograph.	
2	Shutter Open time	$\leq 20\text{ms}$		
3	Delay in close and opening	$\leq 20\text{ms}$		

II) Technical specifications of Imaging fiber adapter and fiber array


Sr No	Item	ITER-India Specifications	Description	Vendor Specifications
1	Optical fiber array terminated with a common ferrule.	A vertical array of 16 to 18 optical fibers. At one end, the array has to be terminated with a common ferrule. At the other end, each fiber has to be separately terminated with a SMA	<i>Vendor can also suggest the maximum no of fibers in the fiber array based on the quoted height of CCD. This should be clearly mentioned in the</i>	

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2	Optical fiber	connector. Type : Multimode Single core Silica Core diameter : 400 micron Length: 2 meters with standard SMA terminations.	<i>quotation.</i> A Compatible ferrule with the quoted imaging fiber adapter. (A schematic for fiber alignment drawing is given in Appendix-1).	
3	Imaging fiber adapter	To couple light to the input of the spectrograph Should have provisions for transverse and longitudinal adjustments.	Vendor can suggest alternative coupling mechanisms, if any, for coupling the fiber array to the input of the spectrograph and quote for the same.	

III) Technical specifications of CCD detector


Sr No	Item	ITER-India Specifications	Description	Vendor Specifications
1	Grade	Scientific grade ,Grade 1		
2	Type	Back Illuminated		

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3	Dimension	>12 mmX12mm	The chip vertical dimensions has to accommodate the image of fiber array as mentioned in item. II, Sr.no.1.	
4	Sealing	Hermetically sealed /All metallic vacuum sealing	Permanent vacuum and Maintenance free	
5	Head Cooling	TE cooled up to -50 C or better		
6	Read out rate	≥ 1MHz		
IV) System Integration, Control and Data Acquisition				
Sr No	Item	ITER-India Specifications	Description	Vendor Specifications
1	CCD integration with Spectrograph	CCD coupling flange to spectrograph		
2	Wavelength calibration	To be provided in instrument's operation software.		
3	Data acquisition and Control	Windows based software to operate and control the integrated system including shutter. The integrated system should be operable in synchronization with an external trigger.		

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4	Interface	USB port option apart from other options is provided if any		
5	Data export option	file export option to ascii / csv/ excel etc.		
Additional requirements:				
Sr No	Item	ITER-India Specifications	Description	Vendor Specifications
1	All the cables, tools and power supplies (~220 V and 50Hz) have to be provided by vendor.			
2	All the technical manuals and along with the operation manual for hard ware and software have to be provided by the vendor during commissioning at ITER-India.			
V. Acceptance criteria				
Sr No	Item	ITER-India Specifications	Description	Vendor Specifications
1	<p>The final acceptance of the integrated systems will be given after the following two tests:</p> <ol style="list-style-type: none"> 1. Pre-dispatch test at factory site by the vendor. (ITER-India reserves the right to carryout Pre-dispatch Inspection (PDI) of the ordered item/s. by ITER-India personnel at factory site) 2. Final acceptance test at ITER-India by the vendor <p>Part I: Pre-dispatch test at factory site by the vendor:</p> <p>Vendor will carry out detailed test and evaluation of the instruments as per mutually agreeable procedures. In Appendix - 2, details of the relevant acceptance test procedures are described. If further modifications are necessary, vendor can suggest the same to ITER-India. The test criteria will be mutually agreed between both the parties with in 1 month of placing the purchase order. The vendor will send a detailed test report to ITER-India before the dispatch of the equipment. The test report will be evaluated by ITER-India and if found satisfactory, ITER-India will send the dispatch clearance</p>			

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	<p>certificate.</p> <p>Part II: Acceptance Test at ITER-India:</p> <p>At ITER-India, installation, testing and demonstration of the instruments and its performance should be carried out either by the principal or by their Indian representative. After successful commissioning at ITER-India, acceptance will be given only when it complies with all the technical specifications and reproduces the same results that were obtained during the pre-dispatch test by the vendor at their factory site.</p> <p>Note: Vendor should arrange the items required for testing @ their own cost during Factory Acceptance Test(FAT). During Site Acceptance Test (SAT) arrangement of items required for testing would be finalized based on mutual agreement.</p>	
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Appendix-2

PERFORMANCE CRITERIA FOR THE ACCEPTANCE OF THE SPECTROGRAPH WITH CCD DETECTOR


All the acceptance tests are to be demonstrated using 1800l/mm (Grating#1), 1200l/mm (Grating# 2) and 600 l/mm(Grating# 3).

1) Test for the imaging performance

Items	ITER-India Specifications	Vendor specifications
At the entrance of the spectrograph	Fiber array coupled and aligned using imaging fiber adapter.	
Light sources	<ol style="list-style-type: none"> 1) Integrating sphere and a Quartz Tungsten lamp 2) Low pressure spectral calibration lamp 	
Spectrograph Settings	Configuration 1: Slit width : As same as pixel size of CCD	


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Test procedure	<p>Slit height : As same as height of CCD</p> <p>Configuration 1 :</p> <ul style="list-style-type: none"> a) Scan few spectra in the range 500-800nm using light source.1 b) Record few standard lines using light source.2. 	
Configuration	Required test result	
Configuration 1	<ul style="list-style-type: none"> a) A dispersed spectrum consisting of distinct, spatially well resolved and uniformly illuminated tracks with the track to track separation remaining nearly same across the focal plane of the CCD. b) Image distortion across the focal plane should be less than 22%. c) When only one track is illuminated, the intensity reading in the other track should show counts corresponding to the background counts of CCD. The test has to be repeated by illuminating all the tracks one by one to check consistency across the image plane. 	

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2) Test for average wavelength coverage and average wavelength dispersion


Items	ITER-India Specifications	Vendor specifications
At the entrance of the spectrograph	Fiber array coupled and aligned using imaging fiber adapter.	
Light source	Low pressure Mercury lamp/Argon lamp/Neon lamp	
Spectrograph Settings	Slit width : Same as pixel size of CCD Slit height : As same as height of CCD	
Test procedure	Scan nearby wavelengths: λ_1 and λ_2 Dispersion = $(\lambda_2 - \lambda_1) / W$ Where, W= No of pixels covered* pixel width (mm)	
	Required test result	

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Wavelength dispersion	1.0 to 0.8 nm/mm for Grating no.1 1.5 to 1.3 nm/mm for Grating no .2 3.5 to 2.8 nm/mm for Grating no.3	
Wavelength coverage	13-10 nm for Grating no.1 20-17 nm for Grating no.2 45-35nm for Grating no.3	

3) Test for wavelength resolution

Items	ITER-India Specifications	Vendor specifications
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At the entrance of the spectrograph	Fiber array coupled and aligned using imaging fiber adapter.	
Light source	Low pressure Mercury lamp/Argon lamp/Neon lamp	
Spectrograph Settings	Slit width : As same as pixel size of CCD Slit height : As same as height of CCD	
Test procedure		
Spectral lines	Few standard emissions lines in 300-800 nm for 1800 l/mm and lines in 300-1000 nm range for 1200 l/mm and 600 l/mm.	
	Required test result	

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Wavelength Resolution	<p>For all the recordings <i>i.e. center, right and left edges of CCD</i></p> <p>≤ 0.06nm across the focal plane for Grating no.1</p> <p>≤ 0.08nm across the focal plane for Grating no.2</p> <p>≤ 0.15 nm across the focal plane for Grating no.3</p>	
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Eligibility criteria

Sl No	ITER-India Specification	Documents required to be submitted by the vendor	Vendor specifications
1	Bidder should be an Original Equipment Manufacturer (OEM) / Authorized Dealer / Distributor of OEM.	The vendor should upload company profile of OEM in details. If the bidder is authorized dealer /distributor of OEM, they should submit the latest and valid authorization certificate issued by manufacturer or agency agreement along with the company profile of the OEM.	
2	Bidder should have	The vendor should upload the copy/copies of	

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	successfully executed at least 1 purchase orders of spectrometer in visible range with a Scientific CCD (Charged Coupled Device) Camera.	purchase orders (unpriced) along with the installation/ Completion/Acceptance certificate.	
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