

**PREBID CLARIFICATION**

**I-HUB QUANTUM TECHNOLOGY FOUNDATION, IISER, PUNE**

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Refer I-HUB QTF's GeM tender no. GEM/2023/B/3733022 dated 05/08/2023 with file reference no. I-HUBQTF/PUR/23-24/007 for the procurement of Atomic Force Microscope. The Pre-Bid meeting was held on 16/08/2023.

At the outset, the Technical Committee welcomed all the Members and the Representatives of Prospective Bidders and briefed in general the scope of the tender and thereafter briefed the bidders on the salient features of the tender.

The representatives present were satisfied with the replies given and it was informed that the corrections / additions / clarifications given, as discussed during the Pre-Bid Conference would be hosted on the website of I-HUB QTF, IISER Pune and all the Prospective Bidders are required to take cognizance of the proceedings of the Pre-Bid Conference before submitting their bids as stipulated in the Bidding Documents. Attached are the detailed technical and commercial queries with their clarifications (Annexure I).

The other terms & conditions of the notice issued on GeM and on I-HUB QTF's website ([quantech.org.in](http://quantech.org.in)) will remain unchanged. No more correspondence in this regard will be entertained. The meeting ended with a vote of thanks.

Sd/-

**Project Director / Chief Executive Officer**

**TECHNICAL AND COMMERCIAL QUERIES AND CLARIFICATION – ANNEXURE I**

Tendered Sr. No.	Query / Clarification Sought	Clarification / Amendment
-	<p>In the <b><u>“Instrument Geometry”</u></b> section, it is requested to amend the specifications as below:</p> <ul style="list-style-type: none"> <li>• Latest modern piezo tube scanners are small in size, low mass and offer fast scan and very high resolution. They are also not prone to failures like decoupled flexure scanners. Hence request you to remove this spec.</li> <li>• Please amend as “the instrument must accommodate samples sizes up to 100mm (dia) and 15mm thick or better.</li> </ul>	Tendered specification prevails.
-	<p>In the <b><u>“Operating Modes”</u></b> section, it is requested to amend the specifications as below:</p> <ul style="list-style-type: none"> <li>• Please remove “each of which requires at minimum that the signals noted in the corresponding parentheses be recordable simultaneously. Each of these signals must be recorded in both trace and retrace scan directions”, as these words are brand specific”.</li> <li>• Request to remove wordings which are brand specific and allow similar technology/ methods.</li> <li>• Instead, we sincerely request IISER Pune to share their samples for measurements, as a technical qualification criteria.</li> <li>• Systems should support, Contact resonance PFM and side band frequency to get high spatial resolution. In Vertical PFM (out-of-plane polarization), Lateral PFM (in-plane polarization)</li> <li>• Systems should also have switching spectroscopy mode.</li> <li>• A dedicated high voltage (specify voltage) module for tip or sample bias is also required to enable measurements on materials with weak piezoelectric response.</li> </ul>	<p>Tendered specification prevails.</p> <p>Modified the wordings without compromising users’ requirement in various places.</p> <p>As it will be used by various users, so optimization on a particular type of samples will not be possible. Rather we have to look into the general specifications.</p> <p>From the tender specification, in the <b><u>operating modes</u></b> the following parts have been <b><u>removed</u></b>:</p> <p>“The instrument must exhibit extremely low crosstalk between the tip-drive voltage and the measured deflection. The measure of crosstalk is defined as follows:</p> <ul style="list-style-type: none"> <li>•Position of the tip &gt;1cm from the sample surface.</li> <li>•Apply the bias voltage to the tip.</li> </ul>

		<ul style="list-style-type: none"> <li>•With a tip bias voltage drive amplitude of 100V, sweep the drive frequency from 50kHz to 2MHz or better.</li> <li>•The Sum signal should be at least 7 volts and the deflection zeroed to provide the highest measurement sensitivity.</li> <li>•The measured amplitude at all frequencies should be less than 300 microvolts.”</li> </ul> <p>“Phase locked loops (PLL) do not offer sufficient stability to satisfy this specification. System should use in-built lock-in amplifiers and same AFM software for resonance tracking PFM mode. Use of external lock-in amplifiers &amp; third-party software for tracking resonance is not acceptable.”</p>
	<ul style="list-style-type: none"> <li>• Variable temperature stages covering a range from ambient to 300 / 250 deg C should also be offered.</li> </ul>	<p>Tendered specification is amended from:</p> <p>“Variable temperature stages covering a range from ambient to 300 deg C should also be offered”</p> <p>to:</p> <p>“Variable temperature stages covering a range from ambient to 250 deg C or more should also be offered”.</p>
-	<p>In the “<b>System Scanner</b>” section, it is requested to amend the specifications as below:</p> <ul style="list-style-type: none"> <li>• Usually all renowned AFM systems use either tip-scanning or sample-scanning technique. Hence request to remove the concerned point.</li> <li>• Request to remove “flexure stage.</li> </ul>	<p>Tendered specification prevails.</p>

<ul style="list-style-type: none"> <li>Request to amend as <i>“System must include a closed-loop XY scanner with a minimum range of 100 μm or more (closed loop).”</i></li> </ul>	<p>Tendered specification is amended from:</p> <p><i>“At both 120-micron and 10-nm scan sizes, the corresponding bit resolution must be sub-Angstrom (&lt;0.1nm).”</i></p> <p>to:</p> <p><i>“At both 100-micron and 10-nm scan sizes, the corresponding bit resolution must be sub-Angstrom (&lt;0.1nm).”</i></p>
<ul style="list-style-type: none"> <li>Noise values are usually reported in RMS and are better representation than ADev values. Hence request to amend as: <i>“X and Y sensor noise must be &lt; 300pm RMS in a 0.1Hz to 1 kHz BW, with sensor nonlinearity &lt;0.15% at full scan”</i></li> </ul>	<p>Tendered specification prevails.</p>
<ul style="list-style-type: none"> <li>Request to amend as: <i>“System must include a Z scanner with a minimum range of 10μm or more”.</i></li> </ul>	<p>Tendered specification is amended from:</p> <p><i>“System must include a Z scanner with a minimum range of 15μm that is capable of both open-loop and closed-loop operation.”</i></p> <p>to:</p> <p><i>“System must include a Z scanner with a minimum range of 10 μm or more that is capable of both open-loop and closed-loop operation.”</i></p>
<ul style="list-style-type: none"> <li>Noise values are usually reported in RMS and are better representation than ADev values. Hence request to amend as: <i>“Z sensor noise must be &lt;60pm RMS”</i></li> <li>Request to amend as: <i>“Noise floor &lt;15pm RMS”</i></li> </ul>	<p>Tendered specification prevails.</p>

<ul style="list-style-type: none"> <li>Motorized X-Y-Z Stage should with minimum of 20x20 mm stage movement in XY and 20 mm in Z or more.</li> </ul>	<p>Manual or motorize both are acceptable</p>
<p>Should have Integrated LVDT / piezo based position sensors in all three axes provide seamless closed loop operation.</p>	<p>Tendered specification is amended from:</p> <p>“Should have Integrated LVDT position sensors in all three axes provide seamless closed loop operation.”</p> <p>to:</p> <p>“Should have Integrated LVDT / piezo based position sensors in all three axes provide seamless closed loop operation.”</p>
<p>System must include a closed-loop XY scanner with a minimum range of <del>120 μm</del> 100 micron (closed loop).</p>	<p>Tendered specification is amended from:</p> <p>“System must include a closed-loop XY scanner with a minimum range of 120 μm (closed loop).”</p> <p>to:</p> <p>“System must include a closed-loop XY scanner with a minimum range of 100 μm (closed loop).”</p>
<p>In the “<b>System Optics</b>” section, it is requested to amend the specifications as below:</p> <ul style="list-style-type: none"> <li>The in-built video microscope optics with hi-res 5MP camera provides high resolution AFM imaging. As such separate 10x objective is not needed. Hence request to remove 10x objective.</li> <li>Also request to amend “Field of View 400 – 1000 microns or better”</li> </ul>	<p>Tendered specification is amended from:</p> <p>“Suitable camera system for tip / sample viewing should be included. Following should be the minimal specifications - The Top View illumination and built-in CCD camera for viewing the cantilever and sample from above through the 10X objective located in the head. Field of view switchable between at least 700 and 250 microns.”</p> <p>to:</p> <p>“Suitable camera system for tip / sample viewing should be included.”</p>

	<p>In the “<b>Controller and Electronics</b>” section, it is requested to amend the specifications as below:</p> <ul style="list-style-type: none"> <li>• <i>Due to special design of tip driving/excitation system in our AFM, this is not required. So request to amend as “Digital Q control or similar technology”.</i></li> </ul>	<p>Tendered specification prevails.</p>
	<ul style="list-style-type: none"> <li>• <i>The auto configuration should be possible.</i></li> </ul>	<p>Tendered specification is amended from:</p> <p><i>“The instrument must include auto configuration of external hardware and accessories. Device parameters must be stored in non-volatile RAM on the device itself and read into the software when the device is plugged in. This eliminates the need for parameter files.”</i></p> <p>to:</p> <p><i>“The instrument must include auto configuration of external hardware and accessories.”</i></p> <p>Also, the line <i>“There must also be an audio-out for ear phone”</i> has been removed.</p>
	<ul style="list-style-type: none"> <li>• <i>System must use at least 24-bit digital-to-analog converters (DACs) and Analog to digital converter in order to generate the XY and Z piezo scan signals. At both 120-micron 100 micron and 10-nm scan sizes, the corresponding bit resolution must be sub-Angstrom (&lt;0.1nm).</i></li> </ul>	<p>Tendered specification is amended from:</p> <p><i>“At both 120-micron and 10-nm scan sizes, the corresponding bit resolution must be sub-Angstrom (&lt;0.1nm).”</i></p> <p>to:</p> <p><i>“At both 100-micron and 10-nm scan sizes, the corresponding bit resolution must be sub-Angstrom (&lt;0.1nm).”</i></p>
	<ul style="list-style-type: none"> <li>• <i>The system must provide thermal tunes of the cantilever up to at least 5 MHz.</i></li> </ul>	<p>Tendered specification prevails.</p>
	<p>In the “<b>Optical Lever Arm</b>” section, it is requested to amend the specifications as below:</p> <ul style="list-style-type: none"> <li>• <i>Beam reflection should be avoided.</i></li> </ul>	<p>Tendered specification is amended from:</p> <p><i>“Beam used for deflection detection must approach the probe at an angle that is significantly (&gt;20 degrees) off vertical relative to the sample, such that reflections from the sample surface do not reflect back into the light source or into the detector.”</i></p>

		<p>to:</p> <p><i>“Beam used for deflection detection must approach the probe at an angle that is significantly off vertical relative to the sample, such that reflections from the sample surface do not reflect back into the light source or into the detector.”</i></p>
-	<p>In the <b>“Software”</b> section, it is requested to amend the specifications as below:</p> <ul style="list-style-type: none"> <li>• <i>The data acquisition system must be capable of recording individual image sizes of 4000x4000 pixels or greater on all 16 imaging channels.</i></li> </ul>	<p>Tendered specification is amended from:</p> <p><i>“The data acquisition system must be capable of recording individual image sizes of 8000x8000 pixels or greater.”</i></p> <p>to:</p> <p><i>“The data acquisition system must be capable of recording individual image sizes of 4000x4000 pixels or greater.”</i></p>
-	<p>In the <b>“Optional Accessories / Modules for future upgradation”</b> section, it is requested to amend the specifications as below:</p> <ul style="list-style-type: none"> <li>• <i>ORCA is a term used by one specific vendor. Hence, is requested to be removed and modified.</i></li> </ul>	<p>Tendered specification is amended from:</p> <p><i>“Optional Accessories / Modules for future upgradation</i></p> <ul style="list-style-type: none"> <li>• <i>Quantitative Nano Scale Maps - System configuration must include an imaging mode that is capable of generating quantitative nanoscale maps of storage and loss modulus, and loss tangent (loss modulus divided by storage modulus), at high pixel resolution (at least 1024x1024 pixels). Data capture must occur during normal AC mode imaging of topography at normal scan rates (&lt;20 minutes per scan). Proposals for techniques that map storage modulus only are insufficient and will be rejected.</i></li> <li>• <i>Conductive AFM - The system allows conductive measurements while scanning as well as at user specified locations (I-V curves). A sample bias of -10V to 10V is possible. The software allows user-specified wave forms for I/V spectroscopy (square, sine, triangle, pulse, or user defined). The current sensing range is 1pA to 20nA.</i></li> </ul> <p>OR</p> <p><i>Optional Dual Gain ORCA simultaneously monitors current in two separate gains stages of 1μA/V and 1nA/V sensitivities. With a range of ±10V, it can monitor current from the noise floor of a few picoamps, up to 10 μA. Since the two channels are acquired simultaneously, there is no need to withdraw and switch the</i></p>

		<p>stages when the current saturates in the higher gain stage.</p> <ul style="list-style-type: none"> <li>An extended 40<math>\mu</math>m Z scanner range for samples with taller features or for longer range force pulling applications. Z Sensor noise &lt;0.3nm ADev and head should still capable of atomic resolution imaging. This should be an upgrade / extension to the standard scan head detailed above.</li> </ul> <p>to:</p> <p>“Optional Accessories / Modules for future upgradation</p> <ul style="list-style-type: none"> <li>Quantitative Nano Scale Maps - System configuration must include an imaging mode that is capable of generating quantitative nanoscale maps of storage and loss modulus, and loss tangent (loss modulus divided by storage modulus), at high pixel resolution (at least 1024x1024 pixels). Data capture must occur during normal AC mode imaging of topography at normal scan rates (&lt;20 minutes per scan). Proposals for techniques that map storage modulus only are insufficient and will be rejected.</li> <li>Conductive AFM - The system allows conductive measurements while scanning as well as at user specified locations (I-V curves). A sample bias of -10V to 10V is possible. The software allows user-specified wave forms for I/V spectroscopy (square, sine, triangle, pulse, or user defined). The current sensing range is 1pA to 20nA.</li> </ul> <p>OR</p> <p>Optional Dual Gain for simultaneously monitors current in two separate gains stages of 1<math>\mu</math>A/V and 1nA/V sensitivities. With a range of <math>\pm</math>10V, it can monitor current from the noise floor of a few picoamps, up to 10 <math>\mu</math>A. Since the two channels are acquired simultaneously, there is no need to withdraw and switch the stages when the current saturates in the higher gain stage.</p> <ul style="list-style-type: none"> <li>An extended 25<math>\mu</math>m Z scanner range for samples with taller features or for longer range force pulling applications. Z Sensor noise should be low enough to produce atomic resolution imaging. This should be an upgrade / extension to the standard scan head detailed above..”</li> </ul>
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	<ul style="list-style-type: none"> <li>An extended 40<math>\mu</math>m / 25<math>\mu</math>m Z scanner range for samples with taller features or for longer range force pulling applications. Z Sensor noise &lt;0.3nm ADev and head should still capable of atomic resolution imaging.</li> </ul>	<p>Tendered specification is amended from:</p> <p><i>“An extended 40<math>\mu</math>m Z scanner range for samples with taller features or for longer range force pulling applications. Z Sensor noise &lt;0.3nm ADev and head should still capable of atomic resolution imaging.”</i></p> <p>to:</p> <p><i>“An extended 25<math>\mu</math>m Z scanner range for samples with taller features or for longer range force pulling applications. Z Sensor noise should be low enough to produce atomic resolution imaging.”</i></p>
-	<p>Being a completely imported tool with a huge configuration, it is requested to amend the “<i>Delivery Period</i>” to “<i>180 days</i>”.</p>	<p>Delivery Period is amended from: “<i>90 days.</i>” to: “<i>180 days.</i>”</p>
-	<p>It is requested to clarify on the “<i>payment terms</i>”. Being a very high valued equipment, can IISER Pune open inland Letter of Credit in INR?</p>	<p style="text-align: center;"><b><u>Payment Terms</u></b></p> <p><i>“Inland Letter of Credit will be established for 100% order value. 90% payment shall be made against the presentation of original shipping documents. Balance 10% will be released after completion of satisfactory installation, commissioning, demonstration of the whole system, imparting training and upon receipt of Bank Guarantee for 10% of total order value. Performance security to be valid till warranty period from the date of installation.”</i></p>