

**Mississippi State University  
Notice of Proposed Sole Source Purchase**

**256-111**

Mississippi State University anticipates purchasing the item(s) listed below as a sole source purchase. Anyone objecting to this purchase shall follow the procedures outlined below.

1. Commodity or commodities to be purchased (make, model, description):

**ThermoFisher Scientific Helios 5 Hydra CX DualBeam System:** Extreme High Resolution (XHR) Field Emission Scanning Electron Microscope (FE-SEM) equipped with a switchable multiple-ion-species (Xe, Ar, O, N) inductively coupled plasma focused ion beam (ICP-PFIB). It includes an Elstar electron column with UC+ technology, an oil-free vacuum system, advanced auto-processing application software (AutoTEM 5, Auto Slice & View 5), and an integrated MultiChem Gas Delivery System. It also has EDS and EBSD attachments from EDAX that provide needed analysis capability for microstructural characterization. Preferred Service Agreements providing 2 additional years beyond 1 year warranty of 48-hour targeted onsite labor response, unlimited labor hours, and all necessary spare parts.

**ThermoFisher Scientific Spectra 200 S/TEM:** Field Emission Scanning Transmission Electron Microscope operating across a 30–200 kV high-tension range. It is equipped with an Ultra-High Brightness Cold Field Emission Gun (X-CFEG), a probe aberration corrector (Cs S-CORR), a proprietary Super-X EDS detector integrated into the objective lens, a 16-megapixel Ceta-S CMOS camera, and an EMPAD 2 (Electron Microscope Pixelated Array Detector) for advanced 4D-STEM applications. Preferred Service Agreements providing 2 additional years beyond 1 year warranty of 48-hour targeted onsite labor response, unlimited labor hours, and all necessary spare parts.

2. Explanation of the need to be fulfilled by this item(s), how is it unique from all other options, and why it is the only one that can meet the specific needs of the department:

**Need:**

Mississippi State University's Institute for Imaging and Analytical Technologies was named in the Consolidated Appropriations Act, 2026 (Appropriations Act) as the recipient of a Community Project Funding/Congressionally Directed Spending grant,

referenced as Congressionally Funded Community Project (CFCP) grant. In accordance with the grant, MSU will acquire two advanced microscopy systems, a plasma-focused ion beam scanning electron microscope (PFIB-SEM) and a 200 kV aberration-corrected transmission electron microscope (AC-TEM) to support advanced materials characterization in the Golden Triangle region. These two advanced microscopes will be used to support local manufacturers by giving researchers powerful tools to prepare, examine, and measure materials at the atomic level, with unique features that improve accuracy, reduce damage, and provide detailed data not possible with other equipment.

**Key unique capabilities include:**

*ThermoFisher Scientific Helios 5 Hydra CX DualBeam System:*

- **Multi-Ion Species Plasma FIB:** The Helios 5 Hydra features a unique ICP-PFIB column that can seamlessly switch between four ion species (Xenon, Argon, Oxygen, and Nitrogen). This unique ability to select the ion source enables preparation and analysis of large, high-quality samples with minimal damage to the material. The Hydra platform provides multiple ion species and flexible milling conditions that are important for complex material systems. This capability allows researchers to study defects, grain boundaries, cracks, precipitates, and three-dimensional microstructures with higher accuracy and reliability. The integrated workflow also improves sample preparation for high-resolution TEM and atom probe studies, which are essential for the proposed characterization program. The Hydra system offers a level of versatility that allows researchers to avoid damaging samples or creating unwanted chemical changes. **No other manufacturer offers the four ion species capability.**
- **Extreme High-Resolution Optics:** The electron gun utilizes proprietary UC+ technology to reduce the beam energy spread below 0.2 eV, enabling sub-nanometer resolution (0.6 nm to 1.1 nm) and high surface sensitivity at ultra-low landing energies (down to 20 V). **This capability is unique to this manufacturer.**

*ThermoFisher Scientific Spectra 200 S/TEM:*

- **EMPAD-2 Detector:** The Spectra 200 features the proprietary EMPAD 2 detector, which captures full diffraction patterns at every individual pixel at a 10 kHz readout rate with an expansive dynamic range ( $>10^7$ ). This allows direct phase contrast imaging, ptychography, and precise strain analysis on a single platform. This capability is critical for strain mapping, defect characterization, precipitate analysis, and diffraction-based metrology in complex alloy systems. **The EMPAD-2 is exclusive to this instrument and provides the measurement accuracy, signal range, and integrated workflow needed for the proposed characterization program.**

- **Mechanical & Thermal Stability:** The Spectra 200 features a 300 mm diameter column integrated inside a specialized acoustic enclosure that dampens environmental fluctuations, enabling highly reproducible atomic-scale spatial resolution. Its **ConstantPower** lens design minimizes thermal stabilization time when switching modes, providing maximum stability regardless of lens settings. **This capability is unique to this manufacturer.**
- **Integrated EDS System:** The Super-X EDS detector integrates an array of four silicon drift EDS detectors directly into the objective lens, achieving a high collection efficiency solid angle of 0.7 sr with extremely low shadowing. This vendor offers a completely native EDS hardware and software ecosystem delivering live drift-corrected elemental quantification at the exact speed of the microscope scan. **This capability is unique to this manufacturer.**

3. Name of company/individual selling the item and why that source is the only possible source that can provide the required item(s):

**Selling Entity:** FEI Company (An affiliate/part of Thermo Fisher Scientific).

**Address:** 5350 NE Dawson Creek Drive, Hillsboro, Oregon 97124.

**Primary Contact / Account Manager:** Lane Wooten, Senior Account Manager (Phone: +1 470-277-9553 | Email: [lane.wooten@thermofisher.com](mailto:lane.wooten@thermofisher.com)).

FEI Company/Thermo Fisher Scientific is the original equipment manufacturer (OEM), developer, and sole direct distributor of the integrated platform comprising the **Helios 5 Hydra CX DualBeam System** and the **Spectra 200 S/TEM**. The core sub-systems, highly specialized components, and unified operation software are proprietary intellectual property exclusive to this company. Major underlying technologies embedded natively within these systems cannot be procured anywhere else. No third-party distributors or alternative instrumentation vendors are authorized or legally capable of supplying these specific configurations.

4. Estimated cost of item(s) and an explanation why the amount to be expended is considered reasonable:

**Estimated Grand Total Cost: \$5,186,011.**

**Total Value of Equipment (List Price): \$11,745,479**

**Total Negotiated Discount Applied: \$6,559,468**

Through institutional negotiations with FEI Company (Thermo Fisher Scientific), the department secured a **55.85% price reduction** across the bundled package.

The standalone retail price for the Helios 5 Hydra CX system configuration sits at **\$5,845,665**

The standalone retail price for the Spectra 200 S/TEM system configuration sits at **\$5,899,814**

By capitalizing on a coordinated "Two Tool Bundle" procurement protocol, the university is successfully acquiring **\$11,745,479 worth of state-of-the-art instrumentation for \$5,186,011** saving the university over \$6.5 million in capital equipment outlays.

This bundle includes advanced application software packages including AutoTEM 5, Autoscript, Auto Slice and View 5, Maps3 and Avizo that traditionally command steep individual licensing fees.

Additionally, the quote includes **Uninterruptible Power Supply (UPS) for both instruments to protect the instrument against power surges and outages.**

The cost includes **Preferred Service Agreements** for both standalone platforms extending for **2 full years** past the baseline 1 year factory warranty. This tier provides 4-hour targeted phone triage, a strict **48-hour targeted on-site engineering labor arrival**, comprehensive coverage of all factory-certified spare parts, annual preventative maintenance interventions, and free functional software updates.

5. Explanation of the efforts taken by the department to determine whether this is the only source and the efforts used to obtain the best possible price:

The Institute for Imaging and Analytical Technologies (I2AT) is a university-wide research institute and core facility which meets MSU's missions in research, teaching, and service. I2AT houses major research instrumentation that is available to the entire university, industry partners, and other universities across the state.

The department conducted a thorough, multi-phase technical evaluation of the electron microscopy market to identify platforms capable of supporting our advanced material characterization needs. This involved evaluating technical specifications, product portfolios, and demos from major global manufacturers of high-end electron microscopes (specifically JEOL, TESCAN, and Hitachi).

The market screening proved that alternative platforms fail to meet the department's operational needs for the following reasons:

FIB Limitations: Alternative vendors (such as TESCAN and JEOL) only offer single-species plasma focused ion beams (typically Xenon-only). Thermo Fisher Scientific Helios 5 Hydra CX stands uniquely alone with its patented Inductively Coupled Plasma (ICP) column that switches between four distinct gases (**Xenon, Argon, Oxygen, and Nitrogen**) via software control in under 10 minutes. The multi-ion species provides researchers with the ability to optimize milling rates and minimize damage across complex multilayer materials. While alternative market configurations may attempt to supplement a baseline Xenon system with a separate, auxiliary Argon ion gun attachment, such workarounds fail to meet our technical requirements. A secondary hardware attachment lacks the nanometer-scale focus, spatial resolution, and optical alignment of a primary column, making it incapable of site-specific, automated TEM lamella preparation required for our sensitive multi-material workflows. Without this feature, structural artifacts, phase transformations, and severe curtaining or amorphization may occur at the delicate material interfaces of sensitive polymers, light alloys, biological and energy storage materials. Such degradation is unacceptable for data-integrity reasons, as it obscures the true atomic scale boundaries of the samples, compromising the subsequent S/TEM strain-mapping and ptychography data, ultimately impairing active federally funded research deliverables.

S/TEM Limitations: To conduct atomic-scale strain mapping and ptychography, the department requires a high-dynamic-range pixelated direct electron detector that natively bridges the microscope's automation scripts. Competing TEM manufacturers must source third-party aftermarket detectors (such as Gatan or Quantum Detectors) that run on disconnected software and suffer from severe pixel saturation under standard analytical beam currents. The proprietary **EMPAD 2** detector included on the Spectra 200 platform operates continuously at a true 10 kHz frame rate with a large dynamic range ( $>10^7$ ) that handles intense unscattered beams safely, natively embedded within the core Velox control software.

Additionally, in a multi-user core facility, competing systems suffer from substantial thermal drift and 30–60 minutes of stabilization downtime whenever users switch settings (High Tension and probe current) for atomic-resolution imaging. The Spectra 200 eliminates this bottleneck via a factory-integrated acoustic enclosure and proprietary **ConstantPower™** lenses that maintain a perfectly flat thermal profile. This eliminates user-to-user stabilization delays, maximizing facility throughput with immediate, highly reproducible atomic-scale resolution.

To ensure the best possible value to the University, the department conducted a comprehensive evaluation of available PFIB and S/TEM systems from the major manufacturers capable of serving this application. The evaluation included a review of

each vendor's published technical specifications, system capabilities, and pricing to determine the extent to which each instrument could satisfy the performance requirements.

Because common workflows include the use of both PFIB and S/TEM systems to support related research activity, manufacturers were afforded the opportunity to demonstrate not only the capabilities of individual instruments, but also the advantages of providing an integrated solution across both platforms. This approach allowed the department to evaluate technical compatibility, software and hardware interoperability, workflow efficiency, training and support considerations, and any pricing advantages associated with a multi-instrument acquisition.

Through this process, the department determined that FEI/Thermo Fisher is the only manufacturer capable of providing both instruments with the required technical specifications. No other vendors were able to provide paired systems that could meet the technical requirements of the program needed to support the common workflows used by the PFIB and S/TEM. This allowed the department to take advantage of bundled pricing advantages from FEI/Thermo Fisher that substantially reduced the list price of both instruments from their standalone prices.

Any person or entity that objects and proposes that the commodity listed is not sole source and can be provided by another person or entity shall submit a written notice to:

Jennifer Mayfield, CPPO

Director of Procurement Services, Chief Procurement Officer

[jmayfield@procurement.msstate.edu](mailto:jmayfield@procurement.msstate.edu)

Subject Line must read "Sole Source Objection"

The notice shall contain a detailed explanation of why the commodity is not a sole source procurement. Appropriate documentation shall also be submitted if applicable.

If after a review of the submitted notice and documents, MSU determines that the commodity in the proposed sole source request can be provided by another person or entity, then MSU will withdraw the sole source request publication from the procurement portal website and submit the procurement of the commodity to an advertised competitive bid or selection process.

If MSU determines after review that there is only one (1) source for the required commodity, then MSU will appeal to the Public Procurement Review Board. MSU will have the burden of proving that the commodity is only provided by one (1) source.