

ARCTIC SPM Lab

Redefining Low-Temperature SPM: The First Commercial Closed-Cycle System with High Magnetic Field & Optics

Experience next-generation low-temperature scanning probe microscopy with precision, efficiency, and adaptability. The ARCTIC SPM Lab offers continuous operation, a compact footprint, and modular expansion to support evolving research needs. Its closed-cycle cooling technology ensures a sustainable and cost-effective approach, eliminating helium dependency. While providing virtually unlimited measurement time the SPM maintains exceptional mechanical stability.

The current and future SPM experiments on quantum phenomena at a single molecule level increasingly involve low temperature environments that provide only small thermal motion and excitation, keeping the object under investigation close to its ground state. Minimizing thermal broadening is crucial for accurate determination of the energy levels of quantum systems.

The ARCTIC SPM integrates a high magnetic field, radio frequency (RF) signaling, and optical elements, making it a versatile tool for engineering and surface-based quantum characterization.

The system features modern, sophisticated cooling technology that efficiently converts electrical energy into cooling power. Its dedicated vibration and acoustic isolation allow the closed-cycle SPM to match the performance of 'wet' SPM without its drawbacks.

The SPM operation at low temperature delivers ultimate STM/STS performance and stability as well as the best commercially available QPlus® AFM solution as shown in a multitude of highly ranked publications.



The ARCTIC SPM Lab

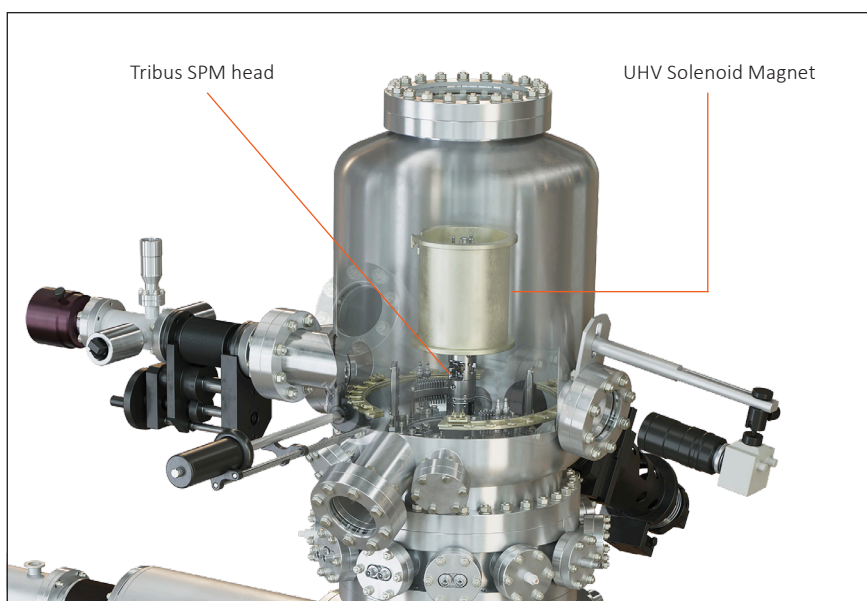
The ARCTIC SPM Lab supports a diverse range of applications, including

- Scanning Tunneling Microscopy (STM) & Spectroscopy (STS)
- QPlus® Non-Contact Atomic Force Microscopy (NC-AFM)
- Tip functionalization, Bond-resolved STM and AFM
- I(V), dI/dV, dI/dz, IETS, ESR
- Atom/molecule/nanoparticle manipulation
- $\Delta f(z)$, $\Delta f(U)$, Spin-Polarized STM (SP-STM)
- THz applications, Time-resolved SPM, TERS, Luminescence, Radio Frequency experiments (ESR, ...) (additional external equipment needed)

The system houses a superconducting dry magnet, aligned perpendicular to the sample surface within an ultra-high vacuum (UHV) solenoid, ensuring a highly homogeneous magnetic field. The renowned TRIBUS SPM head, fully non-magnetic and optimized for stability regardless of the applied field, is utilized across POLAR, INFINITY SPM, and custom-built systems. The ARCTIC SPM Lab fits in any lab environment with its small footprint. As already known from the Scienta Omicron INFINITY SPM the acoustic noise of the system is barely audible due to a dedicated noise cancelling system.

Following the current trend of radio frequency (RF) experiments, the ARCTIC SPM can be equipped with dedicated RF cabling. For optical experiments static or motorized dual optical lens systems or dual parabolic mirrors can be added for combined experiments with optics and magnetic field.

More than just a regular SPM, the ARCTIC SPM LAB is designed for growth and flexibility. It features a modular architecture, allowing for effortless expansion with RF capabilities, optical integration, and future experimental enhancements. Whether for fundamental quantum research or advanced nanoscale engineering, the ARCTIC SPM can be upgraded to support your evolving research needs—ensuring your investment remains future-proof.



SPM chamber showing the Tribus SPM head and magnet

Why choose the ARCTIC SPM LAB

- Exceptional Performance – Closed-cycle cooling delivers ‘wet’ SPM performance without cryogenic liquids, ensuring high-resolution STM/STS and best QPlus™ AFM sensitivity.
- Well-confined & homogeneous Magnetic Field – Superconducting dry magnet in UHV solenoid design ensures uniform fields not interacting with the lab surroundings.
- Compact & Quiet – Small footprint with a dedicated noise-canceling system for ultra-quiet operation.
- Low Maintenance & Cost-Efficient – No helium refills, reducing operating costs while ensuring long-term system stability.
- Modular & Upgradeable – RF capabilities, optical elements, and other components can be integrated anytime with minimal downtime.

Specifications

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| Base pressure: | 3E-10 mbar |
| Magnet: | Superconducting and dry |
| Magnetic field orientation: | Perpendicular to sample surface |
| Optical access: | 9 ports |
| Evaporation ports: | 4 |
| SPM Head: | Tribus Ultra |
| Options: | <ul style="list-style-type: none"> • QPlus® AFM operation • 4 or 10 additional sample contacts • STM tip preparation tool • Customized preparation chamber • RF cabling for tip and sample • RF antenna (e.g. for ESR experiments) • Optics: dual-lens or dual parabolic mirror (on request) |

Get in touch with us at www.scientaomicron.com/arctic