ICFO

Funded by the European Union

European Research Council
Established by the European Commission

SPECIFICATION SHEET

SUPPLY, INSTALLATION AND COMMISSIONING OF A "ULTRA-LOW-TEMPERATURE SCANNING TUNNELING MICROSCOPE" FOR THE LABORATORY OF THE INSTITUT DE CIÈNCIES PHOTONIQUES, THROUGH AN OPEN PROCEDURE SUBJECT TO HARMONIZED REGULATION

FILE NUMBER: 2025.EX.004

Contents

CLAUSE 1. Object of the contract

The purpose of this contract is the supply, installation and commissioning of a "Supply, installation and commissioning of a low-temperature scanning tunnelling microscope" for the ICFO laboratory.

CLAUSE 2. Needs to satisfy

Scanning Tunneling Microscopy (STM) is an important microscopy technique for physics, chemistry and general materials science. In an STM, a tunnelling current is measured between an atomically sharp tip and a sample. Through the scanning of the surface, information about the topography and the local density of states is obtained with atomic resolution. It enables understanding of the electronic properties of a material with atomic resolution.

The objective of this proposal is to install an ultra-low temperature scanning tunnelling microscope (LT-STM). The state-of-the-art LT-STM will advance the research of several directly interested ICFO groups.

We are looking to purchase a LT-STM to operate at millikelvin temperatures and under ultra-high-vacuum conditions to conduct research on two-dimensional materials. For this purpose, it is necessary that the LT-STM operates under 50 mK, ultra-high-vacuum conditions, has a vector magnet. A position readout with capacitive sensors for the sample is necessary in order to locate the position of the 2D material due to their small sizes (on the order of 20 um). The system should include:

1. Anti-vibration table with air damping
2. Load lock, exchange and STM chambers with tip and sample storage
3. Vector magnet
4. STM high resolution piezo scanner
5. Coarse motion with position readout

CLAUSE 3. Technical requirements

- Operate in ultra-high-vacuum
- Operate at ultra-low-temperature (<50 mK)
- High resolution piezo scanner
- Low z-noise 2 pm/√Hz
- Position readout with capacitive sensors for each axis with reproducibility <1 um
- Individual bake-out heaters and thermostats for every chamber
- STM stage with multiple sample contacts
- Acquisition must be performed through Nanonis software

CLAUSE 4. Power distributions and safety

The system should be configured for EU (Spain) power grid (voltage, sockets, etc.) and be CE marked.

The system will be fully protected against unexpected power cuts and, in that case, will be fully safe for the operators. A quick and easy turning on of the system has to be possible after a power cut.

CLAUSE 5. System layout and services

The proposal will include a complete set of pictures, drawings and layouts of the system, including dimensions, location and details of the different components.

The proposal will include full installation and start-up requirements (power, water, compressed air, process gases, etc), clearly specifying connection type, tubing materials, pressures, flows, etc, for the specific configuration of the offered system.

CLAUSE 6. Transportation, installation, start-up and training

The supplier shall be responsible for transport, customs clearance, insurance, and final delivery of the system to ICFO under DAP incoterms. Installation shall be performed at the final laboratory location specified by ICFO, and all logistics, including any necessary lifting or disassembly operations, shall be handled by the supplier.

The supplier must perform full installation, calibration, and system start-up, followed by user training. The training must be conducted on-site and cover system operation, imaging and spectroscopy techniques, maintenance routines, and troubleshooting. Instruction must be provided in English and include both theoretical and hands-on sessions.

CLAUSE 7. Acceptance test

Test Parameter specifications:

Temperature reading of STM head temperature and of mixing chamber: T < 40mK
Achieve atomic resolution
Achieve noise level of 2 pm/√Hz
Determination of electronic temperature of 150 mK through superconducting gap measurement
Base pressure below $3 \cdot 10^{-10}$ mbar
Working magnet
Woking STM while running the magnet
Calibration of the magnetic field
Function test of heating stage, sputtering gun and sample stage contacts

CLAUSE 8. Warranty and Follow-on Support

The supplier shall provide a minimum full warranty of one (1) year, starting from the date of successful installation and acceptance of the equipment at ICFO. This warranty shall include all parts and components of the system, irrespective of whether they are manufactured by the supplier or sourced from third parties.

The warranty shall cover all costs related to the repair or replacement of any defective part, including labor, travel expenses, transport, and insurance. The supplier must provide on-site service whenever possible, or offer a suitable temporary replacement or solution to minimize system downtime.

The supplier guarantees a response time of no more than five (5) working days from the receipt of a service request and a repair or resolution time of no more than fifteen (15) working days, unless otherwise agreed upon in writing with ICFO.

Availability of spare parts must be guaranteed for a minimum period of five (5) years following delivery. Software and firmware updates that address security, functionality, or performance issues must be provided free of charge during the warranty period.

The warranty shall not exclude liability for failures due to manufacturing or design defects and must remain valid even if minor hardware adjustments or maintenance are performed by ICFO personnel, following supplier instructions.

CLAUSE 9. Delivery and Installation Time

The system must be delivered and installed at ICFO within a maximum period of 18 months

Delivery time is defined as the time elapsed since the signature of the contract until the system delivery at ICFO facilities. It includes the manufacture of the system, the transportation, the installation and the acceptance test at ICFO's premises.

CLAUSE 10. Target price

The target price for the system is 1.550.000€ (VAT excluded).

Payment terms:

- 30% upon drawing signing,
- 30% once 80% of major materials are available and system assembly commences,
- 30% upon delivery,
- 10% after installation training and acceptance.

Castelldefels, on the date of its digital signature

Prof. Dr. Carmen Rubio Verdú
GL STM on 2D Quantum Materials