**ANNEX NO. 4 OF DOCUMENTATION OF THE PROCUREMENT PROCEDURE**

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**SPECIFICATION OF THE PUBLIC CONTRACT SUBJECT**

The subject of the public contract shall meet the following requirements for technical parameters and equipment:

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| **Technical specification – Low-temperature STM with magnetic field** | | |
| **Designation of the delivery (min. brand and type)** | |  |
| **Individual technical parameters of the performance** | | **Data about the offered performance** |
| 1 | The device is compatible with conditions of ultrahigh vacuum |  |
| 2 | All materials are nonmagnetic and bakeable to at least 95 °C |  |
| 3 | The system is leak-tight, with a maximum total permissible leak rate below 2\*10-8 sccm/s (standard atmospheric cubic centimetre per second) | ***and fills out the actual value*** |
| 4 | The microscope is free of any contamination incompatible with ultrahigh vacuum, such as fluorine or zinc |  |
| 5 | The temperature achievable on the head is below 1.5 Kelvin (K) | ***and fills out the actual value*** |
| 6 | The cooling system is based on a bath cryostat with additional 1-K stage (not a closed cycle cooling) |  |
| 7 | The hold time of the cryostat is above 100 hours of continuous operation at <1.5 K |  |
| 8 | The helium consumption is below 2 litres/day |  |
| 9 | The heat radiation can be suppressed by a liquid nitrogen bath cryostat with a hold time of at least 75 hours. |  |
| 10 | The transfer line for filling the helium cryostat is a part of the delivery   * The cryostat must include a sensor for measuring the level of liquid helium. |  |
| 11 | The system must contain a superconducting magnetic coil, capable of achieving a magnetic field of 5 Tesla (T) at the sample in continuous operation. The requested field direction is perpendicular to the sample surface. |  |
| 12 | All electronics for controlling the coil are provided as a part of the delivery. |  |
| 13 | The STM operation is possible in combination with optical access. |  |
| 14 | When operated with optical access, magnetic field of 2 T on the sample must be achievable. |  |
| 15 | The microscope must be compatible with a standard flag-style sample holder (see figure 1). |  |
| 16 | The STM tip is exchangeable, while keeping the ultrahigh vacuum conditions and cryogenic temperature at the STM head |  |
| 17 | The tip receptor stage is equipped with 4 electrical contacts (for a possible future extension to AFM operation)   * The contacts must be low resistance, each below 2 Ohm | ***and fills out the actual value*** |
| **Geometry of the instrument**  The microscope must be compatible with a standard geometry of vacuum systems used in our laboratory: | | |
| 18 | The sample is facing down, the tip is facing up. |  |
| 19 | The microscope is mounted on a vacuum chamber via a flange 711-0028 (compatible with DN 300CF ISO/TS 3669-2) |  |
| 20 | Optical access from at least two directions is requested, and possible access ports are listed in attachment 1. The vacuum chamber available for installing the instrument has 8 ports for optical access to the sample and one port suitable for tip exchange, situated in a fixed position. |  |
| **Detailed technical specifications (vibrations, scan range, coarse approach)** | | |
| 21 | The mechanical vibrations in the z-direction must be below 2 pm peak-to-peak measured as an average over one STM image. x-y vibrations must be below 15 pm peak-to-peak and will be verified on a step edge. | ***and fills out the actual value*** |
| 22 | Mechanical noise in the x-y direction must be below 15 pm p.p. | ***and fills out the actual value*** |
| 23 | The scan range at 5K must be at least 1.8x1.8x0.35 µm. (x-y-z) | ***and fills out the actual value*** |
| 24 | Possibility of coarse movement of the sample within 4x4 mm. The coarse motion must be on the sample stage, while the tip remains stationary in the x-y plane. The z coarse approach of the tip must be at least 8 mm long (for samples of various heights). The smallest reliable of the coarse motion must be below 100 nm (such as the slip-stick motion). | ***and fills out the actual value*** |
| 25 | Possibility of measuring at variable temperature: The head must contain a heating element for working above the base temperature |  |
| 26 | Radiofrequency cabling: Two cables for high-frequency transmission are required: The connection to the tip, and an antenna leading close to the tunnel junction. The expected frequency range is 20 GHz with attenuation of approximately 90% at this frequency, in terms of amplitude (corresponding to 99% attenuation in power). |  |
| 27 | Electrical connection to the sample: A coaxial cable, plus 10 additional electrical contacts. |  |

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| 28 | The instrument will be delivered without control electronics, but with cabling. All cable connection must be according to widely accepted industrial standards (such as BNC connectors). Compatibility of the instrument with commercial SPM controllers is requested: Controlling by low-noise piezovoltages in the range of hundreds of Volts. |  |
| 29 | Replacement materials requested: Additional spare cabling and connectors must be provided with the instruments, for making minor repairs and modifications: 1 meter of coax cable, 5m PhB wires 0.1mm, 20x female and 20x male connectors, all compatible with the materials and standards used in the microscope. |  |

Instructions for the participants:

*The participant fills in the data in the “Data about the offered performance” column, indicating for each item whether the performance offered by him meets the relevant request of the contracting authority (“****YES****”) or does not (“****NO****”).*

**Obsah obrázku diagram, skica, řada/pruh, kresba

Obsah vygenerovaný umělou inteligencí může být nesprávný.**

Figure 1: Drawing of the sample holder.