

**Portugal-Braga: Transmission electron microscope**

OJ S 176/2014 13/09/2014

Contract notice

Supplies

Directive 2004/18/EC

**Section I: Contracting authority**

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**I.1. Name and addresses**

Official name: INL, International Iberian Nanotechnology Laboratory

Postal address: Avenida Mestre José Veiga

Town: Braga

Postal code: 4715 330

Country: Portugal

Contact person: [http://inl.int/contractors\\_projects?section=contract-opportunities](http://inl.int/contractors_projects?section=contract-opportunities)

For the attention of: Adrian Watson

E-mail: [adrian.watson@inl.int](mailto:adrian.watson@inl.int)

Telephone: +351 253140112

Fax: +351 253140119

**Internet address(es):**General address of the contracting authority: [www.inl.int](http://www.inl.int)Address of the buyer profile: <http://inl.int/contractors/info>Electronic access to information: [http://inl.int/contractors\\_projects?section=contract-opportunities](http://inl.int/contractors_projects?section=contract-opportunities)**Additional information can be obtained from:**

the abovementioned address

**Specifications and additional documents (including documents for competitive dialogue and a dynamic purchasing system) can be obtained from:**

the abovementioned address

**Tenders or requests to participate must be submitted:** the abovementioned address**I.2. Type of the contracting authority**

European institution/agency or international organisation

**I.3. Main activity**

Other: Nanotechnology Research Laboratory

**I.4. Contract award on behalf of other contracting authorities**

The contracting authority is purchasing on behalf of other contracting authorities: no

**Section II: Object of the contract**

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**II.1. Description****II.1.1. Title attributed to the contract by the contracting authority**

Contract for the Supply and Installation of an Aberration-Corrected Transmission Electron Microscope (AC-HRTEM) to the International Iberian Nanotechnology Laboratory.

**II.1.2. Type of contract and place of performance or delivery**

Supplies

Main site or place of performance: Avenida Mestre José Veiga,  
Braga,  
Portugal.  
NUTS code PT112 Cávado

### **II.1.3. Information about a framework agreement or a dynamic purchasing system**

The notice involves a public contract

### **II.1.4. Information about framework agreement**

### **II.1.5. Short description of the contract or purchase(s)**

This single lot tender is for an Aberration-Corrected Transmission Electron Microscope (AC-HRTEM). It will be devoted to atomic resolution imaging both in conventional high-resolution TEM (HRTEM) and in scanning high-resolution TEM (HRTEM), and present a suitable setup to perform in-situ experiments and collect multiple signals, i.e. imaging and spectroscopy, with high spatial resolution and high frame rate.

It is expected to be a very stable instrument with internal parameters accurately determined, therefore allowing complex imaging experiments, such as atomic resolution HRTEM focal series acquisition, and the posterior data treatment and simulation. This system is expected to be remotely-controlled in real time and equipped hardware and software that can support huge datasets to be stored and transferred for post-processing.

Technical Specifications:

Electron beam generation

- High-brightness and stable field-emission gun (FEG). Effective beam current must present fluctuations lower than 0,75 nA/day (long term) or lower than 0,07 nA 6short term/ noise).
- Accurate control for the current density, allowing both analytical microscopy with high current and low-dose imaging of beam sensitive materials.
- Wien-type monochromator system, allowing combination of high currents and ultra-high energy resolution illumination of the sample.

Acceleration, condensing systems

- 300kV, 200kV, 80kV and 60kV operation modes fully aligned at delivery.
- 3-condenser lenses (excluding mini-condenser lens) system that allows full-control for the electron beam size and convergence.
- Highly stable aberration-corrector hardware for the condensing system. An accurate measurement of the aberrations from the condenser lens (upper objective lens) system by the use of Zemlin Tableau method should be supported.

— Highly stable scanning system that allows flawless atomic resolution HRSTEM imaging  
Goniometer and sample holder

- Stable goniometer system with movement ranges of at least:
  - +/- 1.0 mm on X-Y plane
  - +/-0.3 mm on Z direction
  - Maximum attainable alpha tilt angle: +/-35°
- Ultra-stable piezoelectric stage for fine sample positioning. Stability better than 0,5 nm/min.
- Low-background single tilt holder and double tilt sample holder with attainable beta tilt of at least 30°.
- MEMS type sample holder for in situ heating (up to 1000 °C) and electrical biasing experiments

Objective lens

- Highly stable aberration-corrector hardware for the objective system (lower objective lens). An accurate measurement of the aberrations from the objective lens system by the use of Zemlin Tableau method should be supported.

— Pole piece gap of at least 5 mm allowing in situ and tomography experiments.

— Lorentz lens.

#### Detection and spectroscopy

— Fluorescent screen with a real-time (at least 24 fps) monitoring system for remote operation

— STEM detectors:

— High Angle Annular Dark Field (HAADF).

— Bright Field (BF) STEM detector

— Annular Bright Field (ABF).

— Segmented Annular detector for STEM imaging, allowing Annular Dark Field (ADF) and Differential Phase contrast (DPC) imaging modes with a controllable annular range.

— Fast read-out low-noise 16 Megapixel (4k x 4k) CMOS camera, with a frame rate of at least 24 frames per second at 512x512 pixels

— Low-background X-ray Energy Dispersive Spectroscopy (XEDS) windowless detector with detection solid angle of, at least, 0.7 srad.

— High-energy resolution Electrons Energy Loss Spectroscopy (EELS) spectrometer with a fast shutter, coupled with a low-noise, CCD camera with a dynamic range and fast frame rate.

An acquisition rate on the order of 1000 spectra/s and the possibility of simultaneous measurement of the Zero-loss peak (ZLP) and Core Loss (CL) EELS spectrum is required

Structure, Interface, Peripheral hardware, software

— Insulating microscope enclosure to reduce thermal instabilities and vibration induced by the ambient

— 64-bits software interface for the complete control of the microscope, including the electron gun, optical elements, vacuum system, stage, spectrometers. The software solution must provide real-time remote operation possibility

— User interface to control the microscope with the possibility to automatically recall all optimized operating conditions including lens settings, gun parameters, optical elements alignments for all the different techniques such as TEM imaging, STEM imaging and Spectroscopies setups for different acceleration voltages.

— Highly stable water cooling unit

— Uninterruptible power supply (UPS) system covering the microscope vital parts.

— Fully interlocked oil free vacuum system, with suitable vacuum levels attained on the gun and on the column by individual Ion Getter Pumps (IGP)

— Cooling device with cold trap and liquid nitrogen dewar in the objective lens block to maintain the cleanliness of the vacuum.

— Suitable hardware to monitor and control the heating sample holder

— Suitable software and hardware that allows the local and remote real-time operation of the microscope, including two required connections and monitors.

— Suitable 64-bits software and/or packages to acquire and process microscopy data

— TEM images and focal series

— STEM images and DPC results

— XEDS and EELS spectroscopies

#### Other requisites

— The company offering the system should make a proposal for:

— Assessment of the aberration temporal stability for both correctors and optimization of the existing resolution specs (TEM and STEM)

— Low-dose optimization

#### Technical requisites:

a) Information limit (pm)

Mode 300kV 200kV 80kV 60kV

HRTEM 63 70 90 100

HAADF - HRSTEM 63 80 110 120

The detection systems mentioned above must be adequate to operate for the mentioned acceleration voltages. The HRTEM spatial resolution benchmark should be carried out using Young Fringes experiment. The HRSTEM spatial resolution benchmark should be carried by showing on Si (110) in the Fourier transformed image.

Final energy resolution (eV) monochromator on:

Mode 300kV 200kV 80kV 60kV

Energy Resolution 0.30 0.25 0.20 0.19

To be measured as FWHM of the zero-loss peak after the monochromator tuning.

**II.1.6. CPV code(s)**

38511200 Transmission electron microscope

**II.1.7. Information about the Government Procurement Agreement (GPA)**

The procurement is covered by the Government Procurement Agreement: no

**II.1.8. Lots**

This contract is divided into lots: no

**II.1.9. Information about variants**

Variants will be accepted: no

**II.2. Scope of the procurement**

**II.2.1. Total quantity or scope**

1

Estimated value excluding VAT: 2 700 000 EUR

**II.2.2. Information about options**

Options: no

**II.2.3. Information about renewals**

This contract is subject to renewal: no

**II.3. Duration of the contract or time limit for completion**

**Section III: Legal, economic, financial and technical information**

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**III.1. Conditions related to the contract**

**III.1.1. Deposits and guarantees required**

The INL will make an advanced payment on the signing of the contract amounting to 30 %. A bank guarantee will be required for the amount of this payment.

Additionally, a 10 % bank guarantee is required by the INL for the duration of the warranty period.

**III.1.2. Main financing conditions and payment arrangements and/or reference to the relevant provisions governing them**

**III.1.3. Legal form to be taken by the group of economic operators to whom the contract is to be awarded**

**III.1.4. Contract performance conditions**

The performance of the contract is subject to particular conditions: no

## **III.2. Conditions for participation**

**III.2.1. Suitability to pursue the professional activity, including requirements relating to enrolment on professional or trade registers**

**III.2.2. Economic and financial ability**

**III.2.3. Technical and professional ability**

**III.2.4. Information about reserved contracts**

## **III.3. Conditions specific to services contracts**

**III.3.1. Information about a particular profession**

**III.3.2. Information about staff responsible for the performance of the contract**

## **Section IV: Procedure**

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### **IV.1. Type of procedure**

**IV.1.1. Type of procedure**

Open

**IV.1.2. Information about the limits on the number of candidates to be invited**

**IV.1.3. Information about reduction of the number of solutions or tenders during negotiation or dialogue**

### **IV.2. Award criteria**

**IV.2.1. Award criteria**

The most economically advantageous tender in terms of Price is not the only award criterion and all criteria are stated only in the procurement documents

**IV.2.2. Information about electronic auction**

An electronic auction will be used: no

### **IV.3. Administrative information**

**IV.3.1. File reference number attributed by the contracting authority**

AW/PF

**IV.3.2. Previous publication concerning this procedure**

no

**IV.3.3. Conditions for obtaining specifications and additional documents or descriptive document**

**IV.3.4. Time limit for receipt of tenders or requests to participate**

3.11.2014 - 17:00

**IV.3.5. Estimated date of dispatch of invitations to tender or to participate to selected candidates**

**IV.3.6. Languages in which tenders or requests to participate may be submitted**

English.

**IV.3.7. Minimum time frame during which the tenderer must maintain the tender**

**IV.3.8. Conditions for opening of tenders**

**Section VI: Complementary information**

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**VI.1. Information about recurrence**

This is a recurrent procurement: no

**VI.2. Information about European Union funds**

The procurement is related to a project and/or programme financed by European Union funds:  
yes

Identification of the project: This project will be co-financed by the European Regional Development Fund (ERDF), namely through the Programa Operacional Regional Do Norte on. 2 (Portugal).

**VI.3. Additional information**

**VI.4. Procedures for review**

**VI.4.1. Review body**

**VI.4.2. Review procedure**

**VI.4.3. Service from which information about the review procedure may be obtained**

**VI.5. Date of dispatch of this notice**

10.9.2014