

**CHARISMA**Cultural Heritage Advanced Research Infrastructures  
Synergy for a Multidisciplinary Approach to Conservation/Restoration

## Transnational Access Service at ATOMKI-HAS in the field of Cultural Heritage

The FP7 project, CHARISMA, of the European Commission is a consortium of 21 partners (universities, museums, research centres and institutions) that are centres of excellence in scientific research devoted to cultural heritage. [www.charismaproject.eu](http://www.charismaproject.eu)

Among other activities, CHARISMA will support users from all institutions of the EU member countries and associates\* for their transnational access to medium and large-scale facilities in Hungary and France (FIXLAB).

The FIXLAB facilities are:

- the **ATOMKI-HAS nuclear microprobe (Debrecen, Hungary)** for high spatial resolution measurements of microsamples with a focussed ion beam;
- **BNC (Budapest, Hungary)** with access to various neutron-based instruments to investigate elemental and structural composition.
- the **AGLAE ion beam accelerator at C2RMF (Paris, France)**, providing elemental analysis with an external beam for whole art objects;
- **IPANEMA**, the platform for ancient material research at synchrotron **SOLEIL** (Gif-sur-Yvette, France) for X-ray, UV-visible and FTIR synchrotron methods;

For more information please visit:

<http://iba.atomki.hu/charisma/index.html> or

<http://www.charismaproject.eu/transnational-access/fixlab/fixlab-welcome-desk.aspx> .

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We are looking forward to receiving your proposals.

\* Please enquire about other eligible countries.

## **Laboratory of Ion Beam Applications (IBA) at the Institute of Nuclear Research of the Hungarian Academy of Sciences (ATOMKI-HAS)**

The Laboratory of Ion Beam Applications of ATOMKI-HAS is based on a home-made 5 MV Van de Graaff electrostatic accelerator. The assortment of ions and their energy range makes it possible to apply most of the non-invasive ion beam analytical techniques used for the study of objects of cultural heritage.

Typical users are scientists, curators, art historians, archaeologists, conservators, restorers who usually carry out materials analysis research with ion beams especially at a micrometer scale. The main fields of study are: a) alterations on samples (origin, products and mechanisms); b) provenance studies; c) characterization of micro-details of altered or unaltered materials to prevent further damage; d) the study of manufacturing techniques as a contribution to art-historical studies; e) characterisation of artwork conservation state or the effectiveness of a conservation treatment.

The IBA infrastructure at ATOMKI-HAS is equipped with four beam lines, two of which are included in the project:

- Particle induced X-ray emission (PIXE) technique done with a collimated ion beam for bulk sample analysis in the Mg-U atomic number range;
- Microbeam analysis of samples with high lateral resolution in the range of 1  $\mu\text{m}$  (PIXE & PIGE techniques completed with several techniques of particle detection [RBS, NRA, ERDA, STIM] for the study of surface topography, 2D tomography, thickness distribution, inhomogeneity etc.)

Main beam characteristics:

<i>Beamline/setup</i>	<i>Particles</i>	<i>E (MeV)</i>	<i>Beam diameter</i>	<i>I (nA)</i>
Micro-PIXE	H <sup>+</sup>	2	1-5 mm	0,1-30
Nuclear Microprobe	H <sup>+</sup> , He <sup>+</sup>	0,7-3,5	1 $\mu\text{m}$	0,01-1

The sample chamber is equipped with a unique detector set-up including an ultra thin windowed and a conventional Be windowed Si(Li) X-ray detectors for the simultaneous detection of elements from boron to uranium with high sensitivity. For elemental depth profiling Rutherford backscattering (RBS) while for the determination of light elements nuclear reaction analysis (NRA) is also available simultaneously with PIXE. Elastic recoil detection analysis (ERDA) technique is

applied for hydrogen detection. In special cases, various gamma ray detectors (HPGe, Clover-Ge-BGO) are available for PIGE analysis and depth profile measurements for light elements.

The spectra are collected with OM\_DAQ and GENIE data acquisition systems and can be stored in ASCII files. Data interpretation is done by the users with the assistance of the scientists of the laboratory. As a complementary infrastructure an evaporator for surface coating, equipment for XRF measurements, Zeiss Axio Imager Optical Microscope (objective lenses 5x, 10x, 20x, 50x, 100x) and a Cole-Parmer Ultrasonic Cleaner & Thermostat (mod. 08895-22, 100W) for surface cleaning are available on-site.

Research guests have access to a computer connected to the internet. The users have also free access to the electronic library. A safe is available to store pieces of art or archaeological samples.

**Please note:** ATOMKI-HAS can provide only in-vacuum measurements with ion beams within this project.

Further information can be found here: [http://iba.atomki.hu/facilities\\_en.html](http://iba.atomki.hu/facilities_en.html)



ATOMKI-HAS Oxford-type Scanning Nuclear microprobe.