

## **Hungarian Ion-beam Physics Platform (HIPP)**

HIPP is an open consortium of two research institutes of the Hungarian Academy of Sciences (HAS) established for operating and developing the ion beam physics resources of the stakeholders as a unified distributed facility of common strategy and coordinated user access. Stakeholders of the consortium are the Institute of Nuclear Research (ATOMKI) of HAS, Debrecen, Northern Great Plain Region and the KFKI Research Institute for Particle Nuclear Physics (RMKI) of HAS, Budapest, Central Hungary Region. Both ATOMKI and RMKI are legal entities belonging to the network of research institutions of HAS.

Part of the experimental facilities of HIPP is located at ATOMKI. These facilities are mainly based on a homemade 5-MV Van de Graaff (VdG) electrostatic accelerator for ions lighter than O and include, besides conventional beamline for PIXE/PIGE and DIGE analysis of larger sized samples, a PIXE beamline devoted to aerosol analysis in the Mg–U range, a microbeam for PIGE, RBS, NRA, ERDA and PIXE analysis in the C–U range as well as micro-machining of minute samples with high lateral resolution. Further facilities of ATOMKI partly belonging to HIPP are a 20-MV cyclotron, a 1-MV VdG accelerator and an Electron Cyclotron Resonance ion source.

Another part of the experimental facilities of HIPP is located at RMKI. The accelerator complex consists of the homemade 5-MV single-ended VdG accelerator and a 450-kV heavy-ion cascade implanter connected to each other via a joint scattering chamber. Three beam lines (RBS/channelling, proton microprobe and PIXE the latter allowing for performing external analysis) are devoted to ion-beam analysis.

HIPP carries out research and provides research services related to ion-beam physics in the field of materials science, ion-solid interactions, nuclear solid-state physics, cultural heritage research, environmental research, earth sciences, biomedicine, etc.

HIPP is in possession of special sample preparation and characterisation facilities (MBE and magnetron sputtering equipments, SIMS/SNMS mass spectrometers, SEM and STEM electron microscopes, etc.). Moreover, it has excellent access to preparation and characterisation instruments of the four university campuses in Debrecen (as ATOMKI is an associated member of the University of Debrecen) and the KFKI Campus hosting RMKI as well as other four physics research institutes of HAS in Budapest.

The HIPP accelerators and experimental stations at ATOMKI and RMKI are mutually complementary to each other. The strategy elaborated by the HIPP Steering Committee ensures a long-term development policy to achieve synergy of the facilities at both sites. Sample preparation and characterisation facilities of ATOMKI and RMKI are freely used within HIPP. New users are mutually directed to appropriate HIPP facilities.

HAS and its institutions have to consider, by law, not only national but also regional research interests in shaping their research profiles. Further influence of the regions to decision-making and financial engineering of HIPP stakeholders appears in the form of the three Operational Programmes (OP) of the New Hungary Development Plan, viz. the Economic Development OP, the North Great Plain OP and the Central Hungary OP.

Influence of Europe in decision-making and financial engineering of the stakeholders appears in the form of the proposals to the Research Framework Programmes of the European Commission. Subjects of proposals are food, agriculture and fisheries, biotechnology, nanosciences, nanotechnologies, materials & new production technologies, energy, environment, and cultural heritage research. ATOMKI is a member of the consortium CHARISMA, a successful proposer of Call FP7-Infrastructures-2008-1 while RMKI is part of the Budapest Neutron Center, another member of CHARISMA. Both institutes participate in this Integrated Infrastructure Initiative

aiming at the conservation of cultural heritage with their HIPP accelerators the transnational access to which is, accordingly, financially supported by the European Commission.

About 92 % of the 538 thousand €/year HIPP operation costs is covered by HAS while 8 % comes from other sources like support by domestic, EU and international funding agencies and R&D contracts. The HIPP beamtime is shared between HIPP (36 %), regional (24 %), other EU (16 %) and non-EU (19 %) scientists while 3 % is used by SMEs and 2 % is devoted to testing the accelerators. The full personnel effort devoted to HIPP operation is 21.5 FTE.

Most of the regional HIPP users come from departments and research institutes of universities and museums in Hungary, from the Hungarian Meteorological Service, as well as from several research institutes of HAS. HIPP services extend to whole Hungary; furthermore they are exploited by users from neighbouring countries like Croatia, Romania and Slovenia.

As a rule, access to HIPP by European users is realised in frames of various scientific cooperations. Examples are international projects organised and funded by the International Atomic Energy Agency, Research Framework Programmes of the European Commission, bilateral agreements of institutions funded by governments, etc. A complete list of international HIPP users would contain over 50 names of scientists from more than 20 different EU and non-EU research institutions located in Belarus, Belgium, Bulgaria, Germany, France, Greece, Italy, Japan, Poland, Portugal, Russia, Singapore, Spain, United Kingdom, etc.

HIPP is tightly linked with the University of Debrecen, the College of Nyíregyháza, the University of Szeged, the University of Pannonia, Veszprém, the Eötvös Loránd University, Budapest and the Budapest University of Technology and Economics through their joint researches in a broad range of research fields; participation in education of undergraduate and graduate students, tuition of BSc, MSc and PhD students. HIPP is an active partner of the Sapiientia Hungarian University of Transylvania (Cluj-Napoca, Romania) by conducting joint research in environmental science and in organising meetings for young scientists.

HIPP cooperates with several high-tech SMEs (LAsERSkill, Szeged; Microvacuum Kft. Budapest; Technoorg-Linda Kft. Budapest; Kálmán System Kft. Budapest; Videoton Holding Rt. Székesfehérvár; TEVA Pharmaceutical Works Private Ltd. Co., Debrecen; BudaSolar Technologies Co. Ltd., Budapest; Apagyi Trade Impex Co. Ltd., Budapest).

HIPP creates opportunities for sharing knowledge, skills and information around innovative and cutting-edge research areas and ensures effective dissemination of experience and learning. It organises national and international conferences, workshops and symposiums on different topics with the aim of strengthening collaborative approaches that bring diverse institutions and stakeholders together to discuss regional and pan-European issues and needs.

HIPP and its scientists are worldwide renowned for their achievements in development of ion-beam analytical methods and for their outstanding experimental results in the field of basic and applied research of ion-solid interactions.