**Description of the infrastructure**

Name of the infrastructure (and its installations, if applicable): ALTO

Location (town, country) of the infrastructure:IJCLab, Orsay, France

Web site address: https://www.ijclab.in2p3.fr/en/platforms/alto/

Annual operating costs (excl. investment costs) of the infrastructure (€): 1.55M€

Description of the infrastructure:

*Give a brief general description of the infrastructure to which access is offered. Illustrate, in particular, its state-of-the-art equipment and services offered to users that make it rare or unique in Europe. Outline the areas of research normally supported by the infrastructure, as well as new areas opening to users, if any. If the infrastructure is composed of several installations, describe these including their specific features. If parts of the infrastructure are still under construction, specify the starting date of construction and indicate the date when access can realistically be made available.*

The ALTO facility consists of two accelerators, Tandem accelerator for stable beams (ions and cluster beams for interdisciplinary physics) and a linear electron accelerator for the production of radioactive beams.

The Orsay Tandem Van de Graaff accelerator (15 MV) is usually operated up to 14.6 MV. Stable ion beams ranging from protons to gold can be delivered. “Cluster-beams” and micro-droplets can also be delivered (C60 and gold droplets), but at lower voltage (10 MV). The ion sources were recently improved to deliver 5-time higher intensity. Rare ion beams (3He, 14C, 48Ca, ...) are also available.

The ALTO electron accelerator (50 MeV, 10 μA) is used as a driver to induce fission (photofission) in a thick heated uranium carbide target (up to 1011 fissions/s). Very exotic pure neutron-rich nuclei are obtained and used for studies of nuclear structure, decay heat in reactors and of solid-state physic. Research and development on target and ion sources for all the future second-generation radioactive ion beam projects (SPIRAL2, EURISOL…) is at the heart of the activity at ALTO. A new area is also open to particle physics users with the use of electron beam for tests of small units of particle physics detectors (vertex detectors, several layers of calorimeters w/o absorber etc.) before going to the large facilities such as DESY and CERN.

The associated research instrumentation with ALTO: six beam lines are available for experiments for stable beams, one is devoted to industrial irradiation and two others to cluster physics. Light, non-permanent experimental devices are used in any of three experimental areas.

There are 4 Radioactive Ion Beam (RIB) lines dedicated to the study of very neutron-rich nuclei from photofission. Fast tape transport systems are available for studying short-lived nuclei. Several target ion source ensembles are developed at the facility: surface ionisation, laser ion source, FEBIAD ion source. On the four lines, fixed experimental setup can be found:

* BEDO a high efficiency gamma spectroscopy setup to the study of decay properties of neutron rich nuclei.
* TETRA: it is an 3He neutron detector used to measure neutron emission from neutron rich nuclei.
* LINO: for collinear laser spectroscopy and laser-induced nuclear orientation
* POLAREX: is an instrument based on the On-Line Nuclear Orientation method to observe the decay of a spin-oriented ensemble of nuclei.
* Split Pole is a magnetic spectrometer used for the study of “two body” reactions with high resolution. This spectrometer is now used intensively for nuclear astrophysical studies.
* GAMMA SPECTROSCOPY beamline. Since 2005, ALTO has hosted gamma-ray spectroscopy setups such as ORGAM, 20 co-axial HPGe with BGO shields and MINORCA based on the Miniball array. From 2018 onwards the nu-ball spectrometer, which consists of a hybrid LaBr3/HPGe array, was installed and run at ALTO.
* LICORNE is a neutron converter providing intense (up to 108 neutrons/s/str), kinematically focused, quasi-mono-energetic neutron beams with energies between 0.5 and 4 MeV.
* AGAT is a new developed detector for Cluster Physics used for atomic astrophysical studies.
* SIHL is an offline separator to test and develop target ion sources used at PARRNe.

Services currently offered by the infrastructure ALTO:

*Describe the services offered by the infrastructure and its research environment, and demonstrate how they will enable scientists to carry out high-quality research, giving examples of relevant scientific achievements it enabled. Demonstrate that there is a widespread interest from users in other countries to conduct research at the infrastructure (or make otherwise use of its services), e.g. by indicating the number of international users currently using the facility per year.*

The Detector Laboratory is among the most advanced in Europe for testing and repairing HPGe detectors and is used by several European Laboratories (http://ipnweb.in2p3.fr/GePool/ ); the Target Laboratory produces thin films for targets; Experimental Hall services provide the technical assistance for new installation and maintenance. Computer centres (CC IN2P3/Lyon) and Data-Acquisition services provide help with hardware and data-acquisition software. A Laser laboratory is available to test new ionisation schemes for the production of radioactive ion beams. ALTO has a long tradition to work with different research communities: nuclear, atomic, solid-state, and acceleration physics, nanotechnology and biology. Nearly 400 researchers (250 from abroad) from 41 institutions (31 from abroad) come to the ALTO for experiments due to the available beams and devices.

**Spokesperson: Jonathan Wilson**

**Description of work**

Modality of access under this proposal:

: *Outline how a user, or user group, will be given access to the infrastructure or to its services (e.g.* ***trans-national/virtual****, type of equipment/service used, expected output/deliverables, etc.).*

*For* ***trans-national access*** *indicate the typical execution and duration of work (if access is provided ‘in person’, thus not remotely, indicated the estimated number of days spent at the infrastructure), and, where relevant, how the users will be integrated into the scheduling of the infrastructure and the degree of independence they will experience with respect to the normal research activity of the infrastructure.* *Define clearly, for each installation, the* ***unit of access*** *used to measure the access offered and indicate what is covered and included (e.g. preparatory work, specific training courses) in one unit. This is essential for monitoring the access provided under this project, but also to justify the corresponding costs. Indicate for each installation which modality will be used to declare access costs (on the basis of* ***unit cost****, as* ***actual cost****, or as a* ***combination*** *of the two) and justify your choice.*

*For* ***virtual access****, define clearly, for each installation, the* ***unit of access*** *used to measure the access offered and indicate what is covered and included in one unit. This is essential for monitoring the access provided under the project, but also to justify the corresponding costs. Indicate for each installation which modality will be used to declare access costs (on the basis of* ***unit cost****, as* ***actual cost****, or as a* ***combination*** *of the two) and justify your choice.*

Modality of access under this proposal to ALTO: the laboratory fully meets the requirements for open access to international users. Access has to be asked by submitting a written proposal. An additional application form has to be submitted by the users interested in the EC support. Preliminary contacts with the responsible of the facility of interest must be established in advance in order to ascertain the feasibility of the experiment and to comply with the scientific scheduling and safety rules. Local research groups are in charge of the above-mentioned experimental facilities and the users are independent in all the activities allowed by safety rules. The duration of a user’s stay can range between a few days for the short solid-state physics experiments to several weeks for long nuclear physics experiments or campaigns of experiments. The unit of access for ALTO is the beam hour and it will be declared on the basis of unit cost, as already used for previous European projects (ENSAR, ENSAR2, CHANDA). The beam hour covers the experimental time when particle beam is delivered to the detector hall. It includes the preparatory work for the experiment.

Support offered under this proposal: *Describe the scientific, technical and, for trans-national access, logistic support that would be offered to the users. Where relevant, emphasise the quality of the scientific environment in which the users will be working and explain how this might stimulate their research. Explain to what extent such support is already routinely provided to external users.*

A number of main services are offered to users, including: 1) engineering project service and mechanical machine shops, 2) vacuum laboratories; 3) cryogenics and superconductivity laboratory; 4) target laboratory 5) detector laboratory 6) accelerator division.

Important logistics support includes: 1) Canteen and cafeteria service for IJCLab employees and

ALTO users; 2) Guest house with 7 rooms for ALTO users. Communal kitchen and rest areas. 4) Library and documentation service.

Outreach to new users: *State what measures are taken to attract new potential users (e.g. web page, call for proposals, etc.), including specific user groups such as users coming from SMEs or representing new areas of research, if appropriate. Indicate why and to which extent the EU funding of this trans-national and/or virtual access activity will provide European research teams with new opportunities of access to the infrastructure. Indicate whether the number of trans-national and/or virtual users is expected to increase as a result of this proposal, and how you will monitor such an increase. If trans-national access to the infrastructure is being opened to users other than those from the host country of the infrastructure for the first time, what evidence is there that there will be sufficient demand for the access offered under this proposal?*

Information on ALTO facilities and on internal meetings relevant to users is available online: https://www.ijclab.in2p3.fr/en/platforms/alto/ and widely announced via extended mailing lists.

* All workshops and conferences organized by ALTO are also widely advertised by email distribution, and information posted on the websites. In addition, surveys are made when decisions have to be taken involving the scheduling of beam time or developing of new beams.
* For industrial applications, outreach is achieved via an active participation in the RADECS association that gathers companies and beam providers, and also through participation in related conferences.
* All ALTO users are registered and this allows for an easy monitoring of their number on a year-by-year basis.

Review procedure under this proposal: *For trans-national access activities, describe the peer review procedure that will be used to select users under this proposal. Outline the composition of the User Selection Panel. Demonstrate that the selection of users will follow the principles of transparency, fairness and impartiality. As the selection will be based on the evaluation of scientific merit of the applications, but with priority to new users and users coming from countries where such infrastructure is not available, indicate any additional selection rule that you would like to add.*

*For virtual access activities, describe how and when the periodical assessment of the services offered to the scientific community will be carried out (e.g. by an international review panel). The corresponding assessment reports must be defined as deliverables to the EC.*

Proposal to conduct an experiments at ALTO are submitted, they are evaluated and ranked by the Programme Advisory Committee (PAC), with members mainly from international institutions. During the public sessions, proposals for new experiments and continuations are presented by their spokespersons. The evaluation process from PAC is based entirely on the criteria of scientific excellence. The selection of international users benefitting from the EC support is also based solely on scientific merit and is communicated to the spokespersons. Up to now, all experiments fulfilling EC criteria could benefit from the EC funds, with a special attention to new users and users from countries where such infrastructure is not available, and to young scientists, PhD students and postdoctoral fellows.