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JYFL Accelerator News

– Accelerator Laboratory, Department of Physics University of Jyväskylä, Finland –

JYFL-ACCLAB committed to Open Science

JYFL-ACCLAB is committed to following the national and international principles and requirements of openness in science and research. In practice, the University requires that all research publications are self-archived in the university repository JYX (https://jyx.jyu.fi) and encourages publishing in open publication series where esteemed publication series exist. For self-archiving, sometimes the published article pdf can be directly archived but often the author's final draft version is required. The experiment spokespersons, together with the local liason person, should take care that the publications resulting from work done in JYFL-ACCLAB will be self-archived at JYX. The result is that more than 95% of the research published in 2019 by the Department of Physics is openly accessible. It is also important to remember to advertise the openly available publications to make them reachable to as broad an audience as possible.

In addition to open-access publications, more and more attention has been paid to Open Data. The University of Jyväskylä requires that the research data is deposited and, whenever possible, published on an open access basis so that they will be freely searchable and usable. In Finland, a declaration for Open Science and Research also stresses the need for open access to research publications, research data and methods. To meet this criterion, more attention will be paid to Open Data in JYFL-ACCLAB and the first data sets will be opened in the Spring using tools available at the national computing centre CSC. Each experiment should have a designated person responsible for storing the data together with the required metadata. The data will be made openly available after a specified embargo period.

NEWS

A winter photo of the Ylistö campus on January 16, 2020. It has been the warmest winter for ages.

International Advisory Board and Users Meeting 25th + 26th March, 2020

In order to maintain a channel for external review and to obtain critical feedback on the operations of JYFL-ACCLAB, it was decided to form an International Advisory Board (IAB), similar to that which previously operated as part of the Centre of Excellence (status held until 2018). The laboratory has invited Piet Van Duppen from KU Leuven and Christof Vockenhuber from ETH Zürich to act as board members. The first IAB meeting will be held in March in conjunction with a Users Meeting on the Physics Opportunities with MARA. Details can be found at the website: https://www.jyu.fi/accelerator/iab2020

Next Call for Proposals Deadline: March 15, 2020

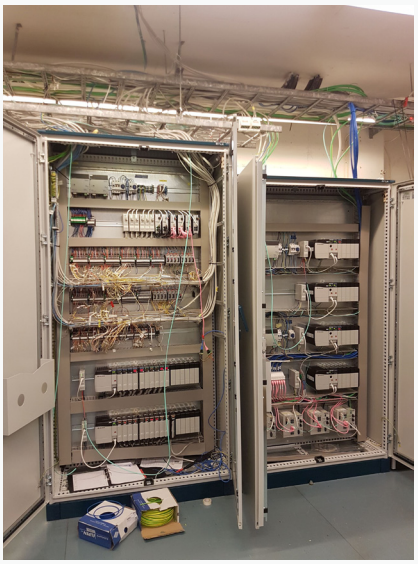
READ MORE

Major upgrades carried out during maintenance shutdown

For the first time in close to thirty years of running the K130 cyclotron, an extended three-month shutdown period was required starting 2nd December 2019. The shutdown was needed in order to complete the overhaul of the JYFL-ACCLAB operational control system, a project started in 2016 when Academy of Finland Research Infrastructure (FIRI) funding was granted. The former ALCONT system served the laboratory fantastically well over its lifetime, but unfortunately was no longer supported and spare parts were becoming difficult to come by. The system has been replaced with a completely new system which was provided by Rockwell through an open tendering procedure. The demanding work has been led by Operations Manager Arto Lassila and his excellent hard-working team: Markus Liimatainen, Kalle Salminen and Olli Leiviskä, backed up by the staff of the electronic and mechanical workshop and our cyclotron operators.

In addition to the control system upgrade, the opportunity was taken to perform other maintenance tasks, including checking and re-alignment of the beam-lines, cleaning and maintenance of the inner parts and RF of the cyclotron, installation of parts to aid modification of the cyclotron central region and repair of the inflector changing mechanism.

The Control Group Team: (From the left) Olli Leiviskä, Arto Lassila, Markus Liimatainen and Kalle Salminen.



Above: Some of the new Rockwell cabinets. Below: Some of the old Alcont cabinets.

Taneli Kalvas installing the central region of the K130 cyclotron.

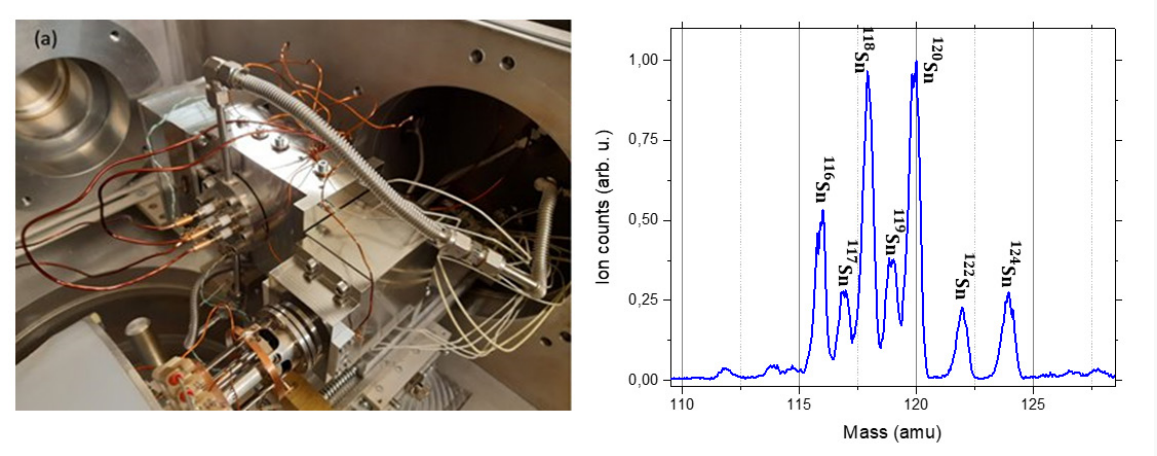
Beta-decay experiment at IGISOL sheds light on the fate of intermediate-mass stars

The magnetic electron transporter "Veikon kone" and a part of the research team of the experiment. From left: Oliver Kirsebom, Marjut Hukkanen, Anu Kankainen, Cobus Swartz and Wladek Trzaska.

The rare beta transition between the ground states of ^{20}F and ^{20}Ne has been recently studied at the IGISOL facility in the Accelerator Laboratory. The experiment employed a refurbished magnetic electron transporter also known as "Veikon kone" (see figure) and a segmented plastic scintillator for detecting the electrons coming from the beta decay of ^{20}F. The studied transition, which is a second forbidden, non-unique beta transition between 2^+ and 0^+ states, turned out to be one of the strongest of its type with a log ft value of 10.89(11). Such a strong transition increases the electron-capture rate on the ground state of ^{20}Ne by several orders of magnitude in the ONeMg cores of intermediate-mass stars. This has a profound impact on the fate of intermediate-mass stars, increasing the likelihood that the star is (partially) disrupted by a thermonuclear explosion rather than collapsing to form a neutron star. The research, led by Oliver Kirsebom from Aarhus University, has been published in Physical Review Letters and experimental details in Physical Review C. It was highlighted as Editor's Suggestion accompanied with a separate Physics Viewpoint article "A Forbidden Transition Allowed for Stars".

NEWS

First characterization tests of the MARA-LEB gas cell

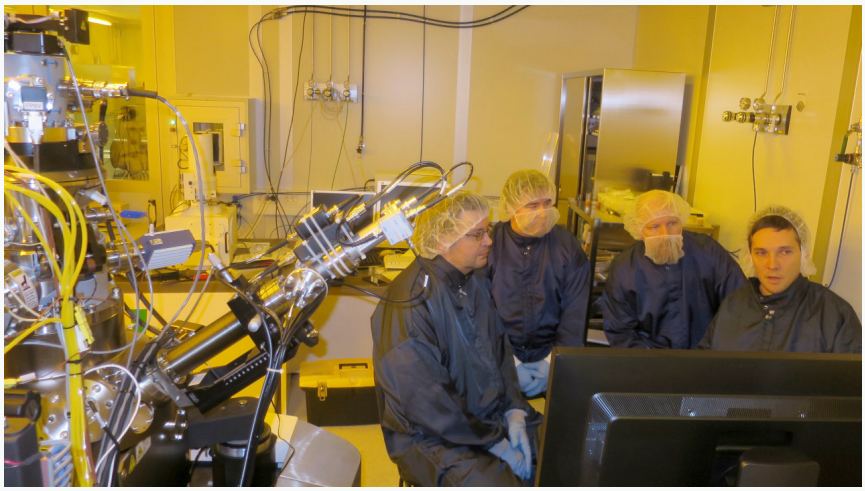


The gas cell designed for MARA-LEB undergoing offline testing at IGISOL (left). A mass scan showing stable isotopes of tin following in-gas-cell resonance laser ionization (right).

Work towards realization of MARA-LEB is ongoing with simulations of the ion-optical elements, designs of the radiofrequency (RF) ion guides and a large number of technical drawings being prepared. In the Fall of 2019, the first offline tests of the gas cell for MARA-LEB were performed following adaptation to the IGISOL target chamber as shown in the figure. A radioactive ^{223}Ra α-recoil source ($T_{1/2}$= 11.4 d) was installed at different locations within the cell. Survival efficiency and evacuation time of ions transported by subsonic helium gas flow were studied. Cleanliness of the gas cell was monitored via ionization of impurities caused by the recoiling ions. A maximum ion survival efficiency of 12% and shortest evacuation time of about 100ms were measured using an exit orifice of 1.3mm in diameter. The results are currently being compared with numerical simulations using COMSOL Multiphysics software.

This month, the tests continue. A bronze filament has been installed and resistively heated to produce an atomic vapor. Two-step laser resonance ionization has been used to selectively ionize stable isotopes of tin inside the gas cell. The right panel in the figure shows a mass scan of the isotopes with their expected isotopic abundances. Pressure broadening and shift of the atomic transitions are being probed in both helium and argon buffer gases. Evacuation time profiles will be compared with gas flow simulations. The ion collector electrodes, used to collect non-neutralized species entering the gas cell from the MARA separator, are being tested. This work is an important step towards an implementation of in-gas-jet laser ionization and spectroscopy for neutron-deficient isotopes of tin at MARA-LEB in the future.

Mass spectrometer for helium ion microscope



The analysis capabilities of the University of Jyväskylä's helium ion microscope (HIM) have been greatly improved by installing a time-of-flight secondary ion mass spectrometer (TOF-SIMS) to the instrument located in the NanoScience Center cleanroom. The detector was manufactured by HZDR Innovation GmbH and it was funded with the FIRI funding scheme.

The operation of the new detector is based on pulsing the incident neon beam and extracting the sputtered sample ions (positive or negative) with a time-of-flight detector. With this tool the HIM users have now access to elemental information with better than 10 nm resolution in addition to imaging with 0.5 nm resolution. This instrument has an open access via, for example, RADIATE transnational access (https://www.ionbeamcenters.eu/radiate/radiate-transnational-access/)

NEWS

Next Call for Proposals – Deadline: March 15, 2020

The next deadline for submission of proposals and letters of intent is March 15, 2020. **Proposals should include an abstract/summary**. A justification of the beam time requested, based on cross-sections, detector efficiencies, etc. should be given. If a proposal is the continuation of an existing experimental program at the JYFL Accelerator Laboratory, a summary of the status of the project should be included. Proposals and letters of intent should be sent (preferably as a postscript or pdf file) to the Program Advisory Committee secretary Mikael Sandzelius (address: see below) and include the Proposal Summary Sheet which is available from the JYFL WWW-pages (https://www.jyu.fi/science/en/physics/research/infrastructures/accelerator-laboratory/access/apply-for-beamtime). You are encouraged to contact anyone in the Contact List at the end of this Newsletter for more information.

From 1st March 2016, the JYFL Accelerator Laboratory acted as one of the HORIZON2020 ENSAR2-Infrastructures offering a certain amount of supported access to the users from the EU and associated countries. All publications resulting from work done at the Accelerator Laboratory and supported by ENSAR2 should also contain the following acknowledgement:

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