

ISOLDE AND NEUTRON TIME OF FLIGHT
EXPERIMENTS COMMITTEE

Minutes of the 30th meeting of the INTC
Held on Monday 11 and Tuesday 12 February 2008

OPEN SESSION

Monday 11 February 2008 at 13:30 h, Council Chamber

The Chairman of the INTC, Mark Huyse, opened the meeting and introduced the new members of the INTC, Jonathan Billowes, Paul-Henri Heenen, Rauno Julin, and Christoph Scheidenberger, and also welcomed the new INTC Scientific Secretary Alexander Herlert. He warmly thanked the former members Sven Åberg, Reiner Krücken, Gerda Neyens, and Phil Woods for their work for the Committee. He congratulated everybody involved in the Physics program of ISOLDE for a successful year 2007. The Chairman announced the agenda and informed the Committee that there will be no n_TOF report in the open session.

ISOLDE Technical Report

The AB-ISOLDE representative for the INTC, Mats Lindroos, summarized the technical activities and major installations during the last year and the shutdown period, including the upgrade of the RILIS laser system, the successful commissioning of the off-line LARIS lab, and the outcome of the target research and development program at ISOLDE.

The shutdown work concentrated on the consolidation of the new radiofrequency quadrupole (RFQ) cooler and buncher ISCOOL, which is presently going on and will last until the start of the off-line period and before the start of the Physics program 2008 at ISOLDE. Further work was done on the water cooling system of the target area in order to separate it from the ISOLDE vacuum system and thus ensure a more reliable operation. Regarding the control systems, the REX-ISOLDE control software has been integrated into the CERN standard controls to facilitate operation and maintenance.

During the shutdown work, the REX-ISOLDE facility has undergone maintenance including the investigation of the stable operation of the IH structure above 50kW, the cooling in the RF room, the installation of new steering magnets (for better ion beam transfer into MINIBALL) and several improvements of the low energy part of REX-ISOLDE, including the repair of REXTRAP electrodes, better beam diagnostics, and the investigation of background from residual gas after charge breeding in REX-EBIS.

One of the major problems in the 2007 operation of ISOLDE was caused by an increase of the radiation level of the activated air being released through the stack of ISOLDE hall. After several tests and simulations several scenarios were identified that could increase the delay time

for activated air to be released from the target area. In general, an airflow is needed since the ISOLDE target area was initially not constructed as an air-tight system. After comparison of the different scenarios it was decided to change the airflow in the target area such that activated air is guided to the PS Booster tunnel. In addition, several leaks that have been found during the investigation and which might explain the increase as compared to previous years will be closed in order to improve the overall air flow.

Another major issue for future operation at ISOLDE is radioactive waste management. So far two campaigns of target disposal have been undertaken for 24 and 30 old target units, respectively. It was noticed that the dose present during the process of handling the target units for waste disposal increased in the second campaign due to the higher activity of the targets. The Committee was informed that uranium carbide targets have not been addressed yet and a much higher dose is expected for future campaigns. Nevertheless, the removal of these units is needed to allow storage of new target units which are being built in the next years.

The Committee was further informed that future projects at ISOLDE include the HIE-ISOLDE project, with a cover for the REX-LINAC for shielding and the HIE-LINAC technical design study, a new tape station for the regular yield measurements and target tests, the test of the new frontend FE6 for which an alignment study is being performed in order to minimize the dose during installation, and finally a safe power system for the target heating in order to prevent damage to target units after a power cut by slowly cooling down the units.

The HIE-ISOLDE project continues to take shape not only with the successful implementation of ISCOOL. The envisaged upgrade of the proton beam intensity requires an investigation of the shielding of the target area. It is planned to perform a 3-dimensional scan of the target area in April 2008. Also the layout of the present installations and beamlines at ISOLDE is being studied and a new database for technical drawings has been initiated. A continuous update of all drawings is planned.

The Committee was also informed on the successful start of the LARIS laboratory which aims at the study of new RILIS schemes and at improving the efficiency of already used schemes. The new lab was funded by the Swedish Wallenberg foundation which also provided funding for new solid state lasers, which will replace the existing copper vapor lasers in the present RILIS laboratory at ISOLDE. A parallel operation is planned for 2008.

Finally, the target development was summarized. Concerning liquid metal targets the problem of splashing after the proton pulse impact has been investigated and experimental results have been compared to simulations which now give a good understanding of the behavior. Also the beam energy measurement for a better efficient operation was addressed and new target material for a SiC target has been used to produce a ^{17}F beam for an experiment at REX-ISOLDE and MINIBALL.

ISOLDE Physics Report

The ISOLDE Physics Coordinator, Alexander Herlert, reviewed the 2007 campaign including a summary of technical issues that had an impact on the operation of ISOLDE and the Physics program. He also informed the Committee on the priority list of the standing group for the upgrade of ISOLDE (GUI) and the accelerator schedule and planning for 2008.

In total, the running period 2007 has been very successful. Nevertheless, a number of technical problems occurred during the on-line period, hampering a large number of experiments. The two major problems were a faulty new Control System software for the ISOLDE operation and an unexpected increase of the amount of activated air being released through the stack of the

experimental hall. The new Control System software, which was installed to include ISOLDE in the CERN-wide framework of new LINUX controls, led to several problems including malfunctioning of target heating, beam diagnostics, and mass separator magnets. Especially the setting up of new targets was delayed regularly due to problems with the controls. The situation improved during the year. The problem of a threefold increase of the radiation level by a larger amount of activated air from the target areas (especially the GPS target zone) could not be resolved during the on-line running period of ISOLDE and several experiments were hampered due to lower production yields, since ISOLDE was only allowed to get 1 μ A of protons on the GPS target instead of 2 μ A. The HRS was not affected.

In addition to these major issues, several other problems hampered the runs. Three broken targets (including ion-source failures) led to the cancellation of 5 INTC experiment and some target test runs. Also a polluted RILIS window at the HRS separator magnet prevented the normal operation of the RILIS ionization for the production of Cd beams. In several cases the higher level of outgassing of targets prevented the machine supervisors to reach the nominal high voltage of 60kV or 50kV, thus some experiments had to run under non-optimal conditions.

The REX-ISOLDE start was delayed due to the move of the MINIBALL spectrometer. The move was successfully finished on time and the overall operation of REX-ISOLDE was checked in a dedicated run. In total 7 experiments were carried out with REX-ISOLDE and for all those runs accelerated beam was delivered. In some cases the performance of REX-ISOLDE was lower than expected, partly due to a problem with the scaling of the REX-LINAC, partly due to the target performance, especially for molecular BaF beams, where a contamination of the beam with rare-earth ions occurred. For REX-TRAP also a shortcut of the trap electrodes occurred and a cancellation of a Physics run could be avoided by shooting directly into the EBIS.

The installation of the RFQ blocked the HRS for about 5 weeks and no protons could be taken on either front end for one week. The installation and commissioning was successful, but during the installation process several disturbances of the beam-line vacuum around the merging switchyard occurred, which led to several delays for some runs.

In total 480 shifts for INTC experiments were requested and 407 of those were scheduled for 2007. The protons from the PS Booster were delivered to ISOLDE starting April 16 and the Physics program started April 20 and ended November 12. In these 29.5 weeks (207 days) of possible RIB operation 30 experiments were scheduled to take beam from one of the 24 target units planned for 2007. 20 of those targets were new units including 10 new actinide targets. In 2007 377.5 RIB shifts were delivered by ISOLDE, i.e. 1.8 shifts per day. 292 shifts of those were dedicated to INTC experiments (77%), the rest of the shifts were taken for target and ion-source development, yield measurements for LOIs, and debugging of the ISOLDE hardware as well as REX machine development and setup. Out of these 292 shifts about 48% made use of the RILIS ion source (Ag, Mg, Pb, Mn, Cu, Po, and Cd beams).

The 7 experiments at REX-ISOLDE obtained 88.5 RIB shifts and REX-ISOLDE managed to accelerate 7 new isotopes of three new elements for the users. In total there are now 53 RIB of 20 elements available at REX-ISOLDE for experiments. Also a new record for heavy beams was reached: $^{238}\text{U}^{56+}$ was successfully accelerated and $^{184,186,188}\text{Hg}$ ions were accelerated to 2.8MeV/u, thus showing the possibilities for heavy nuclides at REX-ISOLDE. For the operation in 2008 a REX-ISOLDE training was offered to the ISOLDE machine supervisors in the off-line period at the end of 2007.

The accelerator schedule of 2008 was approved by the Research Board on November 28, 2007. Due to the planned LHC operation in 2008 and the required tests of the LHC injectors, the start of ISOLDE is delayed to May 5, 2008. The physics program is expected to start on May 7, 2008

and to stop on November 12, 2008. During these 27 weeks of operation there will be several blocks of machine development with no proton beam to ISOLDE, adding up to additional two weeks without protons. Due to the large number of users of the proton pulses delivered by the PS Booster, it is expected that there are frequent changes of the supercycle as well as long supercycles.

The following proposals, addenda and status reports were then presented:

1. **CERN-INTC-2007-027 and INTC-P-234**, *Evolution of nuclear shape in the light radon isotopes*, Andrew Robinson
2. **CERN-INTC-2008-001 and INTC-P-235**, *Identification and systematical studies of the electron-capture delayed fission (ECDF) in the lead region - Part I: ECDF of $^{178,180}\text{Tl}$ and $^{200,202}\text{Fr}$ isotopes*, Andrei Andreyev.
3. **CERN-INTC-2008-005 and INTC-P-236**, *Beta-decay studies of neutron rich $^{61-70}\text{Mn}$ isotopes with the new LISOL beta-decay setup*, Jarno van de Walle
4. **CERN-INTC-2008-006 and INTC-P-237**, *Investigation of beam purity after in-trap decay and Coulomb excitation of ^{62}Mn - ^{62}Fe* , Jarno van de Walle
5. **CERN-INTC-2008-007 and INTC-P-238**, *One Nucleon Transfer Reactions Around ^{68}Ni at REX-ISOLDE*, Nikolaos Patronis
6. **CERN-INTC-2008-008 and INTC-P-239**, *Shape coexistence in the "island of inversion": Search for the 0_2^+ state in ^{32}Mg applying a two-neutron transfer reaction*, Thorsten Kröll
7. **CERN-INTC-2008-010 and INTC-P-240**, *Collinear resonant ionization laser spectroscopy of rare francium isotopes*, Kieran Flanagan
8. **CERN-INTC-2008-011 and INTC-P-241**, *High Resolution optical spectroscopy in isotopically-pure Si using radioactive isotopes: towards a re-evaluation of deep centres*, Karl Johnston
9. **CERN-INTC-2008-012 and INTC-P-242**, *Search for new candidates for the neutrino-oriented mass determination by electron-capture*, Sergey Eliseev
10. **CERN-INTC-2008-002 and INTC-SR-008**, *Experiment IS413: High-precision mass measurements of exotic nuclei with the triple-trap mass spectrometer ISOLTRAP*, Magdalena Kowalska
11. **CERN-INTC-2008-004 and INTC-P-111-ADD-2**, *Experiment IS433: Search for new physics in beta-neutrino correlations using trapped ions and a retardation spectrometer*, Nathal Severijns
12. **CERN-INTC-2008-013 and INTC-P-214-ADD-1**, *Experiment IS449: Measurement of the isotope shift of $^{7,9,10,11}\text{Be}$ at COLLAPS*, Wilfried Nörtershäuser
13. **CERN-INTC-2007-009 and INTC-P-217-ADD-1**, *Experiment IS452: Measurements of shape co-existence in $^{182,184}\text{Hg}$ using Coulomb excitation*, Piet van Duppen

CLOSED SESSION

Tuesday 12 February 2008

Present: J. Billowes, Y. Blumenfeld, Ph. Chomaz, M. Doser, J. Engelen, M. Fanciulli, P.-H. Heenen, A. Herlert (Secretary), M. Huyse (Chairman), R. Julin, M. Lindroos, E. Perez, K. Riisager, V. Vlachoudis, U. Wahl

Apologies: H. Leeb, Ch. Scheidenberger

1. INTRODUCTORY REMARKS

The Chairman opened the meeting by welcoming the new members. Then he introduced the general procedures for refereeing and for recommendations to the CERN Research Board.

2. MINUTES OF THE LAST INTC MEETING

The minutes of the 29th INTC meeting held on 21 and 22 May 2007 were approved without amendments.

3. REPORT ON COMPLETED AND INACTIVE EXPERIMENTS

In previous meetings the Committee decided to review experiments inactive for more than three years. The Committee had requested Status Reports for the following projects:

- IS325 (INTC-P-035, *Combined electrical, optical and nuclear investigations of impurities and defects in II-VI semiconductors*),
- IS391 (INTC-P-133, *Radiotracer spectroscopy on group II acceptors in GaN*),
- IS416 (INTC-P-167, *Production of rare earth isotope beams for radiotracer-DLTS on SiC*), and
- IS406 (INTC-P-150, *Precision study of the β -decay of ^{62}Ga*).

The first three **experiments IS325, IS391, and IS416 were closed in September 2007** by the spokespersons. The spokespersons of the experiment IS406 were reminded by the Committee to present a Status Report at the next INTC meeting. In addition, the Committee requested Status Reports for the following projects:

- IS399 (INTC-P-134, *Exploring the dipole polarizability of ^{11}Li at REX-ISOLDE*),
- IS421 (INTC-P-175, *Study of neutron-rich $^{124,126,128}\text{Cd}$ isotopes; excursion from symmetries to shell-model picture*), and
- IS436 (INTC-P-133, *High Accuracy Mass Measurement Of The Halo Nuclides $^{12,14}\text{Be}$*).

4. STATUS OF ISOLDE

The Committee expressed the importance of the HIE-ISOLDE project and was informed that all effort is undertaken to secure the budget for HIE-ISOLDE and to reach the state to activate HIE-ISOLDE as an official CERN program. The highest priority is put on the 5.5MeV/u upgrade of the REX-ISOLDE LINAC. A research and development project for the prototyping of a cryogenic module has already been financed by external funds (e.g. Belgium) with further involvement of INFN Legnaro and the Cockcroft Institute Daresbury as collaborators. The envisaged 2-year activity will result in a technical design report and it is planned to install the new LINAC modules 2010 and to allow physics in 2011. Higher intensity is foreseen together with the upgrade to LINAC4 at CERN. However, more funds are needed for the required change

of the ISOLDE target area. An upcoming joint meeting (EU-RIB'08, Giens, France, June 8-13, 2008) will be taken as an opportunity to further line up the activities.

The Committee was also informed on the OECD report, which is in the final stage of being completed and approved. This report recognizes the internationalization of nuclear physics with a balance between national and local laboratories. Projects like HIE-ISOLDE and SPIRAL2 are seen as important for the future, aiming for example at EURISOL as a global project for nuclear physics. CERN management showed confidence that HIE-ISOLDE will receive the required funds as an outcome of the OECD report, showing the structural place of it within the framework and a cost-efficient way of doing nuclear physics.

The Committee was informed about the recently published HIE-ISOLDE physics report (CERN-2007-008) which shows the new opportunities for experiments at ISOLDE due to higher beam intensities, a higher beam energy after post-acceleration, and better beam purity. It was pointed out that some projects already aim at new physics possibilities at HIE-ISOLDE. The Committee brought forward the idea to ask for letters of intent for new physics projects at HIE-ISOLDE, and a call for LOIs can be implemented in the program of the next ISOLDE workshop.

The Committee showed concern on the report about the waste disposal of old target units and the possible limitation for the future operation of ISOLDE especially with respect to uranium carbide target units. The careful analysis of the Safety Commission of CERN and the Radioprotection group showed an existing and well established procedure for the waste management of non-actinide targets. However, a solution has to be found for the 120-130 actinide target units being presently stored at CERN. It was pointed out that the costs for an external company doing the waste disposal might be much higher than establishing a long-term solution at CERN. Also the disposal of actinide targets is a common problem for all other facilities and it should be acknowledged that CERN/ISOLDE is attacking the problem rather than delaying or postponing it.

The Committee acknowledged the successful and remarkable advance in RILIS development, especially with the opportunities to study new and to increase efficiencies of existing laser schemes at the LARIS laboratory. The Committee encourages external people to join the activities of the LARIS lab. New developments should be discussed at the standing group for the upgrade of ISOLDE (GUI).

Finally, the Committee was informed that Norway and Romania joined the ISOLDE Collaboration as new members and several other countries, e.g. Portugal, are interested to become members as well.

5. STATUS OF N_TOF

Vasilis Vlachoudis, section leader of AB-ATB-EET, presented a technical report on the status of the n_TOF facility. The Committee was informed that in the past years, after the last operation in 2004, several simulations and investigations of the present target unit have been undertaken, in order to understand the failure of the target (due to an increase of the dose rate above the allowed limit after an intervention) and to deduce information for a new target design.

The target was removed on September 27, 2007 followed by a visual inspection which revealed a hole at the proton beam impact point. FLUKA simulations and detailed dose rate measurements performed after the target inspection showed a "pitting corrosion" at the proton impact location (3.5 cm hole in the surface). Enhanced surface oxidation occurred due to insufficient cooling, since hot water changed the oxidation state of the lead at the target surface.

It was also pointed out that the content of cobalt in the steel used for the target support led to an increase of the dose rate.

The new target design takes into account the results of the target inspection. The target cooling system will be changed and an un-cladded lead target is favored for the new design. Stainless steel with a low Co fraction in the material is favored as well. The new target will be of cylindrical shape and smaller in size in order to fit in the existing pool of the target area while the cooling water will be supplied from the top. An intensive study has been done to reduce the dose rate during the installation campaign. The target design will be discussed for approval in an upcoming meeting. The target unit might be ready in October 2008. Despite the new design study, the Committee expressed some concern on the life-time of the new target unit, which is expected to last for about 10 years.

The Committee was informed that the n-TOF collaboration is still active and the CERN management is waiting for a review meeting (to be held right after this INTC meeting) before the MoU can be signed and funds can be provided to pursue all required technical changes to the setup. The Committee **requested a Status Report of the physics outcome** of previous runs as well as an **outlook of future activities at n_TOF** to be presented at the next INTC meeting.

6. DISCUSSION ON THE OPEN SESSION AND ON LETTERS OF INTENT

The presentations of the proposals and status reports made during the open session were then discussed.

CERN-INTC-2007-027/P-234, *Evolution of nuclear shape in the light radon isotopes*

The experiment proposes the study of nuclear shape coexistence by use of Coulomb excitation with post-accelerated beams of $^{200,202}\text{Rn}$. The aim is to find intruder states as in the case of the similar successful experiments on Hg beams and to extract $B(E2)$ values. Although there is a risk that a clear identification of the states of interest will be impossible, the Committee found the proposed experiment challenging and important in order to obtain information from a mass region where not much is presently known. The Committee decided to **recommend** to the Research Board the approval of **21 shifts** for this project. The ISOLDE Physics Coordinator was asked to consult the target group before scheduling to check any safety constraints due to contamination with long-lived nuclides.

CERN-INTC-2008-001/P-235, *Identification and systematical studies of the electron-capture delayed fission (ECDF) in the lead region - Part I: ECDF of $^{178,180}\text{Tl}$ and $^{200,202}\text{Fr}$ isotopes*

The proposal aims at the investigation of electron capture delayed fission (ECDF) in the case of neutron-deficient nuclides $^{178,180}\text{Tl}$ and $^{200,202}\text{Fr}$, following the successful observation of ECDF for ^{194}At at the velocity filter SHIP at GSI. It is planned to initiate with this proposal a systematic study of this phenomenon in the neutron-deficient lead region. So far only 10 cases are known in the trans-uranium region, close to beta stability. For one additional nuclide, the not yet confirmed case of ^{180}Tl , the results do not follow the same trend as for the heavy nuclides. Also the observation of "doubly magic" fission of ^{178}Tl into ^{100}Sn and ^{78}Ni is envisaged. The Committee questioned the motivation of the proposal with the astrophysical interest for the r-process, since neutron-rich nuclei are not addressed and the question remains if neutron-rich and neutron-deficient nuclei are comparable in the case of ECDF. However, the Committee regarded the case of ^{180}Tl as a good test case for the feasibility of the experiment and also ^{178}Tl was seen as a straight forward candidate, although the ion yield is expected to be quite low. The Committee decided to **recommend** to the Research Board **the approval of 18 shifts** for the investigation of $^{178,180}\text{Tl}$. For the neutron-deficient Fr nuclides of interest further yield checks

should be performed and the Committee suggests that a new proposal is submitted for these cases once the experiments on the Tl isotopes have been completed. For the development of At ionization the Committee sees no high priority.

CERN-INTC-2008-005/P-236, *Beta-decay studies of neutron rich $^{61-70}\text{Mn}$ isotopes with the new LISOL beta-decay setup*

The proposal is directed towards the investigation of nuclear structure around $N=40$ nuclides below ^{68}Ni using beta decay studies on $^{61-70}\text{Mn}$ isotopes. It is planned to use two MINIBALL detectors in a face-to-face geometry and a tape station forming a new setup called "LISOL beta-decay setup". The Committee underlined the importance of the spectroscopic investigation of the Mn isotopes and their daughters, which should deliver data that is needed to study the relevance of the tensor force. It was pointed out that ISOLDE is a unique source for neutron-rich Mn isotopes. The Committee decided to **recommend** for approval by the Research Board **24 shifts** to investigate the beta-decay of $^{61-70}\text{Mn}$. The Committee also showed concern about backscattering due to the close geometry of the two Ge detectors and asks for tests of the setup to be done prior to the scheduling of the experiment.

CERN-INTC-2008-006/P-237, *Investigation of beam purity after in-trap decay and Coulomb excitation of ^{62}Mn - ^{62}Fe*

The aim of the proposed experiment is to investigate the beam purity after in-trap decay in REX-TRAP and REX-EBIS and to perform Coulomb excitation with the daughter nuclides at the MINIBALL setup. The proof-of-principle experiment is planned with the nuclide ^{62}Mn and its daughter nuclide ^{62}Fe . Main questions addressed are the loss of the decay products, the length of the possible storage period, and if the beam mixture can be measured and identified. The Committee found the idea of using in-trap decay and subsequent post-acceleration and experimental investigation of high interest and **recommended** for approval by the Research Board **9 shifts** for the study of in-trap decay losses and daughter production and for performing Coulomb excitation measurements on the daughter nuclide ^{62}Fe .

CERN-INTC-2008-007-P-238, *One Nucleon Transfer Reactions Around ^{68}Ni at REX-ISOLDE*

The proposal intends to study the single particle properties of neutron-rich Ni isotopes around ^{68}Ni . It is planned to perform the one nucleon transfer reaction $^2\text{H}(^{66}\text{Ni},\text{p})^{67}\text{Ni}$ at the MINIBALL experiment which incorporates a new setup for beam diagnostics as successfully used in the IS454 experiment. This study will be a test case for other isotopes. The Committee stressed the importance of measurements to be performed in this mass region and that a lot of information can be deduced; but it was also pointed out that it is a challenging task especially due to the $\text{p-}\gamma$ correlation. Because of its prototype character, the Committee decided to **recommend** for approval by the Research Board **25 shifts**. The Committee also reminded to consider radiation safety issues for scheduling the experiment due to the comparable long half life of ^{67}Ni .

CERN-INTC-2008-008/P-239, *Shape coexistence in the "island of inversion": Search for the 0_2^+ state in ^{32}Mg applying a two-neutron transfer reaction*

The aim of the proposed experiment is to determine the shape coexistence in the "island of inversion" by looking for the 0_2^+ state in ^{32}Mg . It is planned to perform a two neutron transfer reaction with a ^{30}Mg beam from REX-ISOLDE at 2 MeV/u and a tritium target at MINIBALL. The tritium target is a titanium foil loaded with tritium having an activity of 10 GBq. The target parameters and the conditions for operation of the target conform with CERN radioprotection rules. The Committee confirmed the high interest of this mass region and acknowledged the

various experimental and theoretical investigations done so far. The proposal could give further valuable information, although it is not granted that the excited state will be populated. Also the application of a tritium target was regarded by the Committee as a pioneering step for two neutron transfer reaction measurements. The Committee **recommended** for approval by the Research Board **30 shifts**. The Committee also asks for a Status Report after the experiment to see if the assumptions made for the proposal and the location of the excited states could be confirmed by the experimental results.

CERN-INTC-2008-010/P-240, *Collinear resonant ionization laser spectroscopy of rare francium isotopes*

The proposal is dedicated to a new collinear laser spectroscopy experiment (CRIS), aiming at such a good sensitivity to allow very low production yields down to 1 atom per second. The experiment will make use of the new ISCOOL radiofrequency quadrupole cooler and buncher. It is planned to do a first test with laser spectroscopy on francium isotopes in order to investigate the neutron dependence of the nuclear states. The Committee regarded with highest interest the physics case of short lived Fr isotopes and stressed the impressive sensitivity which was already reached at IGISOL in Jyväskylä. The Committee pointed out that already the study of the ground states will give valuable results and addressing the isomers is even more interesting. The Committee also suggested to check the possibility of doing decay spectroscopy with pure beams at the new setup, especially with regard to the world-wide effort to perform trap-assisted spectroscopy on pure beams. The proposal is regarded as a long term program and the Committee **recommended** for approval by the Research Board **12 shifts** on-line beam to address the cases $^{203-206}\text{Fr}$ and 1 week of off-line shifts for testing the new setup prior to the on-line run. The physics case for the other francium nuclides is **endorsed**, but the Committee requests a status report after the first on-line run before further shifts can be recommended. Especially the performance of the ISCOOL buncher and the CRIS setup for very short-lived isotopes should be investigated. The Physics Group Leader and the Physics Coordinator are asked to provide suitable laboratory space in the ISOLDE hall for the new setup.

CERN-INTC-2008-011/P-241, *High Resolution optical spectroscopy in isotopically-pure Si using radioactive isotopes: towards a re-evaluation of deep centres*

The aim of the proposal is to use isotopically pure ^{28}Si crystals to enhance the resolution of Photoluminescence (PL) spectra measured after implantation of metallic impurities like Fe, Ag, Cu, or Au. It has been observed, that Cu and Ag impurities form a cluster of four atoms in these crystals. The measurement method makes use of the different stable isotopes and the only case missing is gold since it has only one stable isotope. It is planned to implant long lived ^{195}Au into a pure and single-isotope Si crystal and to compare these PL measurements with results taken for ^{197}Au impurities. The Committee regarded the proposal as an exciting spectroscopic experiment with a well founded physics case. It is also a challenging experiment, especially due to the long half-life of ^{195}Au and the possible influence that ion implantation and annealing may have on the resolution achieved in the PL experiments. The Committee **recommended** for approval by the Research Board **6 shifts**.

CERN-INTC-2008-012/P-242, *Search for new candidates for the neutrino-oriented mass determination by electron-capture*

It is proposed to search for new candidate nuclides - in addition to ^{163}Ho - that exhibit electron capture and may serve as probes to determine an upper limit of the mass of the electron neutrino with an uncertainty of the order of 1 eV. To this end, the Q-values of ^{194}Hg and ^{202}Pb , as well as

their daughters ^{194}Au and ^{202}Tl have to be determined accurately with less than 2 keV uncertainty. It is planned to use the ISOLTRAP mass spectrometer to perform the precise mass measurements. The Committee regarded the proposal as a first step towards the precise determination of the upper limit of the electron neutrino mass. Although it is not clear that the proposed new candidates will be better systems than ^{163}Ho , a search has to be pursued and the Committee **recommended** for the approval by the Research Board **8 shifts**. In addition, the Physics coordinator is asked to allow for further 3 shifts of mass measurements during the target cooling period (without protons from the PS Booster) if the schedule permits.

CERN-INTC-2008-002/SR-008, *Experiment IS413: High-precision mass measurements of exotic nuclei with the triple-trap mass spectrometer ISOLTRAP*

The Status Report summarized the results obtained by the ISOLTRAP collaboration in 2007 aiming at the physics case of the P160 proposal (recently extended by an addendum). Several nuclide masses from the original proposal had not been addressed so far and it was tried to complete the measurement program for some of the missing cases. However, due to target failures, too low production yields, and too large contamination of the delivered beam, only one beam time dedicated to neutron deficient Cd isotopes was successful. The Committee confirmed the importance of the still not measured nuclide masses and suggested to continue the measurement program. The halo nuclides $^{6,8}\text{He}$ and $^{11,12}\text{Be}$ are of high interest, but partly they have already been measured at the new Penning trap mass spectrometer TITAN at TRIUMF, Canada. Nevertheless, results from the established ISOLTRAP system should be compared to the first results of TITAN in order to rule out any systematic effects. The Committee **recommended** for the approval by the Research Board **22 shifts** to measure the masses of $^{6,8}\text{He}$, $^{11,12}\text{Be}$, ^{14}O , $^{125-131}\text{Cd}$ and $^{115,122-124}\text{Ag}$. The Committee pointed out that the mass measurements for the heavy Pb and Tl isotopes should be postponed until further yield and contamination checks have been performed. Due to the low production yield compared to other facilities, the case of ^{11}Li is not considered for recommendation.

CERN-INTC-2008-004/P-111-ADD-2, *Experiment IS433: Search for new physics in beta-neutrino correlations using trapped ions and a retardation spectrometer*

The second addendum of the original proposal P111 summarized the present status of the WITCH experiment, which aims at the precise measurement of the recoil-ion energy spectrum after beta decay in order to search for scalar and tensor contributions to the weak interaction. The past years saw an increase of the overall efficiency of the spectrometer and in November 2006 a first recoil-ion energy spectrum could be recorded for ^{124}In . In 2007 a dedicated run for ^{35}Ar failed due to a large contamination with ^{35}Cl and charge exchange in REX-TRAP and the WITCH Penning traps. The Committee regarded WITCH as a very competitive experiment and acknowledged the efforts made by the users to improve the experimental setup. However, the maintenance list is quite long and so the Committee **recommended** for the approval by the Research Board **27 shifts** which are on hold for scheduling by the Physics Coordinator until the target performance for ^{35}Ar as well as the WITCH setup are in a reasonably good state to continue the on-line experiments. The Committee also reminded to address any new physics case and/or new application of the WITCH setup in a separate proposal.

CERN-INTC-2008-013/P-214-ADD-1, *Experiment IS449: Measurement of the isotope shift of $^{7,9,10,11}\text{Be}$ at COLLAPS*

The addendum of the proposal P214 asks for additional on-line shifts to measure the charge radius of neutron-rich Be isotopes with the COLLAPS setup. This will be a precursor

experiment of the original proposal, where the charge radii will be measured with a new setup which is called BeTINA and which makes use of a new ion trap setup. The results from the COLLAPS measurements can be used for the future experiments. It is also planned to use for the first time a frequency comb for the laser spectroscopy at COLLAPS, which will also be a test for the future BeTINA experiment. The Committee confirmed the relevance of results from this standard experiment and **recommended** for the approval by the Research Board **16 shifts**. The Committee also asked the Physics Coordinator to schedule 8 off-line shifts for testing the laser setup prior to the experiment. In addition, the Committee requested a Status Report to be submitted after the COLLAPS experiment in order to be informed on the status of the BeTINA setup and the first charge radii results.

CERN-INTC-2007-009/P-217-ADD-1, *Experiment IS452: Measurements of shape co-existence in $^{182,184}\text{Hg}$ using Coulomb excitation*

The addendum of the proposal P217 aims at the continuation of the successful run on Coulomb excitation of Hg isotopes (IS452). The Committee found the cases of ^{182}Hg and ^{180}Hg of interest, where for both nuclides the deformation can be determined and in the case of ^{182}Hg also the sign of the quadrupole deformation. The Committee **recommended** for the approval by the Research Board **13 additional shifts** to the remaining 11 shifts and suggested to perform yield measurements for ^{180}Hg prior to the experiment.

CERN-INTC-2007-028/I-073, *Study the effect of shell stabilization of the collective isovector valence-shell excitations along the $N=80$ isotonic chain*

The letter of intent requests the development of beams of ^{140}Nd and ^{142}Sm with respect to the RILIS ionization schemes. It is planned to study proton-neutron mixed-symmetry states using the MINIBALL setup. The Committee found the physics case not well argued and the letter of intent lacked a more general theoretical approach. However, the Committee considered this letter of intent as a further opportunity to support technical development for new RILIS schemes of rare-earth elements. The Committee looks forward to receiving a proposal with a more detailed physics case.

CERN-INTC-2007-029/I-074, *Measurements of competing structures in neutrondeficient Pb isotopes by employing Coulomb excitation*

The presented letter of intent aims at Coulomb excitation measurements at MINIBALL for neutron-deficient Pb isotopes. The physics case is the same or similar to the ones presented for Hg and Rn nuclei. The Committee **endorsed** the letter of intent and supported the development of pure $^{186-192}\text{Pb}$ beams. Especially the contamination with Tl and Fr isobars needs to be investigated. With the present energy of REX-ISOLDE the Committee estimates that most probably the information will be limited to the first 2^+ level, yielding two important quantities of possible deformation: the B(E2) and the sign of the quadrupole moment. Only with the higher energy of HIE-ISOLDE a full study will be obtained.

CERN-INTC-2008-015/I-075, *UCx prototype target tests for EURISOL*

The letter of intent requests the construction of a target unit for the investigation of new uranium carbide material of higher density (up to 12 g/cm^3) than used in standard UC targets. The present results from tests at Gatchina are controversial and ISOLDE would be an ideal location to test the new target material and to compare the yields to standard uranium carbide units. The Committee regarded the test of the new material as important, also in the direction towards tests

for EURISOL. However, there was some concern on the release properties of the more dense material and doubt on a significant increase of the production yields. The Committee **endorsed** the letter of intent for the intention to build one additional target unit. It was also pointed out, that the target construction and the target tests should not significantly interfere with the rest of the Physics program at ISOLDE. If possible, the test target unit should be included in the running period.

Out of the **297** radioactive beam shifts requested to the INTC a total of **231** have been recommended for approval by the Research Board.

7. DATES OF NEXT MEETING

The next INTC meeting will take place on **Monday 19 and Tuesday 20 May 2008**. The deadline for submission of proposals is **Monday 21 April 2008**.

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