

DRAFT

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ISOLDE AND NEUTRON TIME OF FLIGHT
EXPERIMENTS COMMITTEE

Minutes of the nineteenth Meeting of the INTC
Held on Monday 23 and Tuesday 24 February 2004

OPEN SESSION

Monday 23 February at 14:00 h., Council Chamber

1. Introduction by the Chairman; Juha Äystö
2. Report by the ISOLDE Technical Coordinator; Mats Lindroos
3. Report by the ISOLDE Scientific Coordinator; Luis M. Fraile
4. Report from the nTOF Technical Coordinator; Paolo Cennini
5. nTOF experimental plan for 2004; Alberto Mengoni
6. Measurement of Moments and Radii of Light Nuclei by Collinear Fast-Beam Laser Spectroscopy and beta-NMR Spectroscopy; CERN-INTC-2004-007/ P-130-Add.1; IS389; Klaus Blaum
7. Studies of High-TC Superconductors Doped with Radioactive Isotopes; CERN-INTC-2004-006/P-86 Add.2; Guilherme Correia
8. Coulomb excitation of ^{32}Mg CERN-INTC-2004-009/P-159 Add.1; IS410; Heiko Scheit
9. Coulomb excitation of neutron-rich nuclei with MINIBALL at REX-ISOLDE: towards the N = 50 shell closure; CERN-INTC-2004-002/ P-158-Add.1; IS412; Pascale Mayet
10. Study of the Neutron Deficient Lead and Bismuth Isotopes by Simultaneous Atomic and Nuclear Spectroscopy; CERN-INTC-2004-003/P-151; IS407; Serge Franchoo

CLOSED SESSION

Monday 23 and Tuesday 24 February 2004, Room 60-6-002

Present: R. Aymar*, J. Äystö (Chairman), P. Butler, P. Cennini, E. Chiaveri, H. Doubre, J. Engelen, L.M. Fraile (Secretary), M. Hauschild, D. Hilscher, M. Huyse, J. Kluge, M. Lewitowicz*, M. Lindroos, E. Radermacher, H. Ravn, J.-P. Riunaud, M. Streit-Bianchi (replacing J.A. Rubio), D. Warner.

* Part time

Apologies: T. Butz, J.-P. Delahaye, K. Langanke, F. Priolo, D. Schlater, J. Suhonen.

1. INTRODUCTORY REMARKS BY THE CHAIRMAN

J. Äystö opened the session by warmly welcoming J. Engelen as representative of the DG at the INTC. J. Engelen stressed the significance of the INTC and its scientific program, and expressed his interest to take part in this multidisciplinary Committee. He explained that some Executive Boards will be preceded by a Research Board meeting; the Chairperson of the INTC will be called to report on the recommendations to the Research Board as previously. After thanking J. Engelen, the Chairman welcomed L.M. Fraile as Scientific Secretary. He then stressed the importance of year 2004 for discussion on fixed target experiments at CERN, with two highlights, namely the Physics@MegaWatt Proton Source workshop from 25th to 27th May at CERN and the Villars meeting from 22nd to 28th September 2004.

2. MINUTES OF THE LAST MEETING (CERN-INTC-2003-040/INTC-018)

The minutes of the eighteenth INTC meeting from 24th November 2003 were approved without amendments.

3. STATUS OF ISOLDE

The ISOLDE Technical Coordinator, M. Lindroos, showed his confidence on both GPS and HRS running in this campaign, where for the first time there will be also a spare front end. As AB responsible for REX integration he declared the difficulties for groups who could not hire staff, as the working tasks have to be shared.

The ISOLDE Physics Group Leader, P. Butler, set out the status of the ISOLDE finances. The accounting for the extension of building 170 assumes some income from different sources: 300 kCHF was granted in 2003 from the Director General's contingency reserve and a further 250 kCHF is requested from the PH Department in 2004-2005. The ISOLDE Collaboration has agreed to provide 250 kCHF and loan a further 500 kCHF in anticipation of income from the EU via the Integrated Infrastructure Initiative (I3) proposal EURONS. As the EURONS I3 is at present not funded the Collaboration has adjusted the funding profile of several experimental projects.

The Committee requested a status report on target and ion source development at ISOLDE to be delivered yearly to the INTC, and recommended the involvement of groups requesting a certain development by contributing with resources and manpower. The ISOLDE Technical Coordinator stated that the agreement of priorities will take place at the next ISOLDE upgrade group meeting, and stressed that the target and ion source development heavily depends on the time and resources available to build target units, even if approved beam time is assured. The need for establishing preferences and allocation of resources was stressed, and the

requirement for funds for the preparation studies for new beams within EU project was also reminded. The Committee agreed that a report will be presented by M. Lindroos or L.M. Fraile to the INTC after the next ISOLDE upgrade group meeting in November 2004.

4. STATUS OF nTOF

The nTOF Technical Coordinator showed his confidence on the successful replacement of the target coolant by heavy water at nTOF once the definition of the procedure to be followed after the measurements was defined, and underlined the need for the sake of the physics. The handling of the 800 litres of the residual tritiated water (55 mCi of tritium) could be carried out by the Grenoble ILL facility, which could reuse it or purify it. There is a LoI in the pipeline and the CERN Safety Commission (SC) has already a contact with Grenoble. There is also the possibility of renting a special transport container from Grenoble for a symbolic price.

5. STATUS OF ACCELERATORS

The SPS/PS Coordinator, M. Hauschild, presented three possible scenarios under realistic conditions for the running. The first one assumes no running of DIRAC detector at the PS east hall, as the case is not yet approved, then 1.596×10^{19} protons can be delivered to nTOF, fulfilling the request by nTOF for 1.6×10^{19} protons from weeks 19 to 44. The second situation would have DIRAC running with one cycle of the PS in parasitic mode, and then 1.542×10^{19} protons can be delivered to nTOF. The last case assumes that no parasitic cycle is feasible for DIRAC, which means 1.477×10^{19} protons to nTOF will be available. In any case, the delivered amount of protons to nTOF will exceed the 1.23×10^{19} from the previous campaign. ISOLDE will take about 50% of the available PS booster cycle, with certain irregularities due to setup beams, MDs, and running of nTOF. M. Hauschild reminded that problems cannot be excluded as in previous years.

6. DISCUSSION ON THE OPEN SESSION

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

P158 (CERN-INTC-2004-002/ P-158-Add.1); IS412: *Coulomb excitation of neutron-rich nuclei with MINIBALL at REX-ISOLDE: towards the $N = 50$ shell closure*

This addendum aims at the continuation of the investigation on Coulomb excitations for $^{74-80}\text{Zn}$ (towards $N=50$) and $^{68-70}\text{Ni}$ (crossing $N=40$) approaching more exotic nuclei, including the puzzling case of ^{68}Ni . The Committee found the physics case for the proposed measurements well presented and convincing. The measurement for the chain of Zn isotopes was perceived well within the experimental possibilities, at least up to ^{78}Zn , but the proposed experiment for the Ni isotopes was believed not capable of reaching the necessary precision (better than 10%) due to the limited intensities of the radioactive beam. Furthermore, it should be proven that the method to normalize and extract the absolute cross-section from the measurement of the Rutherford scattering is reliable despite of the technical difficulties, and the role of the target thickness should be clarified. The high count rate problem both on the data acquisition (deadtime) and on the EBIS (slow extraction) should also be taken care of. With these remarks the Committee decided to **recommend** the 24 shifts requested for the measurement of the $^{74-78}\text{Zn}$ and 3 additional shifts which should allow to increase statistics for ^{78}Zn and to pin down the energy of the first 4^+ state for this isotope.

The Committee showed its **strong support** for further target development to realize radioactive beams of neutron-rich isotopes of nickel.

The session was suspended until Tuesday 24 February 2004 at 9:00 h.

The session was resumed by J. Äystö warmly welcoming R. Aymar, CERN Director General. R. Aymar thanked the Chair and explained his purpose of meeting all the three Scientific Committees at CERN (INTC, SPSC and LHCC). The members of the INTC introduced themselves and the Chairman of the INTC reviewed the members not present. He emphasized the wide scope of the Committee and interdisciplinary way of addressing the scientific issues. The discussions on the addenda presented during the open meeting were then continued.

P130 (CERN-INTC-2004-007/ P-130-Add.1); IS389: *Measurement of Moments and Radii of Light Nuclei by Collinear Fast-Beam Laser Spectroscopy and beta-NMR Spectroscopy*

This experiment intends to measure model independent moments, obtained by combining optical pumping (polarized atom beam) after charge exchange with the radioactive ISOLDE beam and implantation into crystalline solid to obtain the β -asymmetry. The Physics case was judged highly interesting and the request to upgrade the value for the ^{11}Li ground state quadrupole moment (now consistent with the ^9Li one) needed. The accuracy can be improved by a factor of 5, and this will become first-class input to discriminate between theoretical models. It is stressed that the best to-date technology for production of ^{11}Li should be Ta-W target ion source combination. Therefore the Committee **recommended** the allocation of 10 shifts and advised the discussion on the suitable target to be undertaken with the ISOLDE target group and the Physics Coordinator.

P86 (CERN-INTC-2004-006/P-86 Add.2); IS360: *Studies of High- T_c Superconductors Doped with Radioactive Isotopes*

The addendum presents a continuation of the investigations on high- T_c superconductor families Hg1212 and Hg1223 by implantation of $^{197\text{m}}\text{Hg}$ and $^{199\text{m}}\text{Hg}$ and measurement of the quadrupole interaction via perturbed angular correlations. The physics case was judged very attractive and the experimental group experienced and well equipped to achieve good results; the interest of the project under the point of view of technology transfer was also highlighted. The proponents were urged to rapidly publish their results of previous experiments (a publication with the scientific achievements of Add. 1 is now underway). With this remark, the Committee **recommended** the approval of the requested 12 shifts with the provision that the scheduling is made such that an optimized use of the ISOLDE beams is achieved.

P159 (CERN-INTC-2004-009/P-159 Add.1); IS410: *Coulomb excitation of ^{32}Mg*

This proposal intends the measurement of the collectivity via the B(E2) values obtained from Coulomb excitation of ^{30}Mg - ^{32}Mg . The Physics case had been already judged a strong one and well suited to the REX-ISOLDE facility. It was pointed out that this kind of low-energy experiments are the cleanest way to excite first 2^+ states, as experiments with heavy ions produced at fragmentation energy suffer from population of many more excited states, and thus additional gamma decay branches. The previous results compared to those from relativistic heavy ion facilities show large discrepancies, and there is also a wealth of

conflicting theoretical results. This situation strongly advises a validation of the ^{30}Mg value and the measurement of the new $B(E2)$ value for ^{32}Mg , provided that the issue of the isobaric contamination is tackled with the inclusion of a ΔE detector in the setup. Doubts were cast on the feasibility of DSAM measurements for a 2.6 ps lifetime as ion identification is required. Therefore the Committee **recommends** the allocation of the requested 33 shifts, on condition that the ΔE detector is implemented before the measurement. The development for a ^{34}Mg beam for future experiments was also given strong support.

P151 (CERN-INTC-2004-003/P-151); IS407: *Study of the Neutron Deficient Lead and Bismuth Isotopes by Simultaneous Atomic and Nuclear Spectroscopy*

The proposed measurements are a follow-up of the studies of n-deficient Pb isotopes, using the ISOLDE RILIS to measure the hyperfine structure. The Committee reaffirmed the quality of this physics case and the interesting combination of laser spectroscopy in the RILIS with nuclear spectroscopy. It noted the validity of the technique for this region of nuclei when using Cu vapour lasers, and found worth pushing both ^{181}Pb and ^{182}Pb to the experimental limit. There were some concerns about the presence of a kink on the systematics of $\delta(\langle r \rangle^2)$ vs. N , which should be clarified by the experiment. The request by the proponents for a dedicated short target was also considered an important test for a diffusion-effusion code, which requires verification. It was pointed out that ^{182}Pb has not been produced at ISOLDE so far. With these remarks, the proposal will be **recommended** to the Research Board for approval of 8 shifts.

7. LETTER OF INTENT: Laser Ion Source Development applying an All Solid State Titanium Sapphire Laser System (CERN-INTC-2004-004/I-050)

The letter of intent aims at combining a titanium sapphire laser system with the existing RILIS in order to achieve an enhanced and more reliable performance. At a second stage, it also proposes an investigation to increase the selectivity of RILIS by neutralization of the beam and subsequent use of the titanium sapphire laser. No influence on the running period is foreseen. The Committee took note of the RILIS not being presently up to date and on the strong need for a solid state laser system, with increased reliability and less need of manpower for operation, which has been already tested at other research facilities. The ISOLDE technical coordinator expressed the intention to continue the ongoing improvements in the RILIS by first determining the nature of a future upgrade, since there are still open questions on the achievable flux. It was pointed out that certain complementarity in the laser wavelengths would be highly advisable and that improvements with the existing laser system and targets will help experiments in progress without exhausting many resources. Existing parallel developments were also underlined, namely the collaboration by A. Petit (CEA) with ISOLDE, the work of Mainz-GSI collaboration on the addition of a linear quadrupole trap to the laser system, and a potential application by Nordic countries for funds to purchase a high power laser. In conclusion, the Committee dearly welcomed the project and **strongly supported** the Letter of Intent.

8. A.O.B.

Information on the workshop on Physics with a multi MW proton source was presented by P. Butler, co-chair of the workshop. The meeting intends to address the scientific opportunities for particle and nuclear physics offered by a multi-MW beam with a few GeV from a proton

linear accelerator or a rapid cycling synchrotron. It will present the scientific case for the SPL at CERN, with the multiple synergies between nuclear physics and astrophysics with radioactive beams, neutrino physics, and muon/kaon physics. The edition of the workshop proceedings is planned.

9. CONCLUDING REMARKS

The Chairman thanked the attendees and mentioned that the following INTC meeting will take place in May when ISOLDE and nTOF are already fully operational. He wishes good luck for the 1.6×10^{19} protons to nTOF and 350 shifts to ISOLDE. Without further comments the meeting was concluded at 10:45.

The next INTC meeting will take place on **Monday 23 and Tuesday 24 May 2004**. The deadline for submission of proposals is **Friday 23 April 2004**.

The remaining INTC meeting in 2004 will take place on 15 and 16 November 2004.

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