

**ISOLDE AND NEUTRON TIME-OF-FLIGHT
EXPERIMENTS COMMITTEE**

Minutes of the thirteenth meeting
on September 23rd 2002

OPEN SESSION

The chairman, Hubert Flocard, opened the session by remarking that this year CERN has started operating under a shortened schedule put in place to cope with the budget problems. Despite this constraining environment, 2002 has witnessed major advances both for nTOF which has entered a phase of scientific production and for ISOLDE with the full start of REX-ISOLDE operation. He then mentioned that a position document on REX-ISOLDE status and operation is presently being prepared by the REX-ISOLDE collaboration with a view to make this unique machine into a facility available to a larger community of physicists.

Mats Lindroos, the ISOLDE Technical coordinator, reported on ISOLDE operation. The more intensive operation of the facility nicknamed “push-pull mode” has generally been successful. On the other hand it puts a major strain on the manpower. This year the number of Engineers-in-charge was just enough for the operation and made no allowance for unforeseen events. Moreover their participation in target tests and other development work has now become very difficult. Then, Mats mentioned the break-down of a turbo pump on the GPS front-end, which has made necessary to operate with the only remaining pump. He also indicated that the level of services to users, especially for the alignment of experiments has been lowered due to retirements. Since no improvement is foreseen in the present conditions, he urged the users to contact the persons in charge well ahead of any requested intervention. He continued by reporting on the consolidation programme and the development of an ECR ion source for ISOLDE.

The ISOLDE Scientific coordinator, Thomas Nilsson, described the status of the ISOLDE programme after 22 out of the 27 available weeks of operation. The push-pull mode operation, made possible by having both the GPS and the HRS operational, has led to an increase of the facility efficiency which has partly compensated the reduction of beam time. As anticipated, the disturbances for the experiments have increased. However, it has to be acknowledged that the user community has generally well accepted them and shown considerable understanding and flexibility. The current number of radioactive beam shifts delivered to approved experiments, tests and developments is 295. He then presented several scientific results with an emphasis on REX-ISOLDE. The first series of experiments with REX-ISOLDE, partly using the MINIBALL Ge-detector array, have globally been successful. Recently, the cooling, charge breeding and acceleration of a stable Cs-ions beam has been achieved. This success paves the way for the planned delivery of post-accelerated beams of medium mass nuclei.

Paolo Cennini, nTOF Technical coordinator, briefly recounted the nTOF running in 2002. The planned measurements of neutron capture reactions have been completed beginning of September. Subsequently, the second collimator with a diameter of 8 cm has been installed to permit fission studies albeit with a two week delay with respect to the initial schedule. Presently, two detectors for fission measurements have been installed in the experimental hall. Finally, Paolo mentioned that the solution of the remaining question regarding the handling of future radioactive targets is being looked for as part of the upgrading and use of the existing infrastructure at ISOLDE.

The nTOF scientific report was presented by P. Pavlopoulos, who showed a large amount of data obtained during the validation and characterization of the facility within nTOF02. The background, after the earlier reported shielding improvements, is now dominated by sample-related background and an in-beam gamma ray contamination. The neutron fluences at the sample position had been determined to be $8 \cdot 10^4$ n/cm² and $1.6 \cdot 10^5$ n/cm² per p-pulse with the 4 cm and 8 cm collimator respectively. The partition of the beam-time in 2002 (using $7.0 \cdot 10^{18}$ protons) among the approved experiments was shown, as well as a preliminary outline for the 2003 running.

The following proposals were then presented:

1. Coulomb excitation of neutron-rich A~140 nuclei; INTC 2002-015/P156; D.Habs.
2. Coulomb excitation of neutron-rich nuclei between the N=40 and N=50 shell gaps using REX-ISOLDE and the Ge Miniball array; INTC 2002-017/P158; P. Mayet.
3. High Precision Mass Measurement of Exotic Nuclei with the triple-trap mass spectrometer ISOLTRAP; INTC 2002-021/P160; K. Blaum.
4. New spectroscopy by two-neutron-pickup of neutron-rich nuclei; INTC 2002-027/P161; D. Habs.

CLOSED SESSION

Present: P. Butler, P. Cennini*, E. Chiaveri*, C. Détraz, J. -P. Duraud, H. Flocard (Chairman), M. Hauschild, H. -J. Kluge, K. -H. Langanke, M. Lewitowicz, K. -P. Lieb, M. Lindroos, T. Nilsson (Secretary), E. Radermacher, H. Ravn, J. -P. Riinaud, B. Rubio, W. Scobel, J. Suhonen, D. Warner

Apologies: E. Migneco, D. Schinzel, J.A. Rubio

* Part-time

1. INTRODUCTION

The Chairman opened the session by welcoming Peter Butler, the new ISOLDE Physics Group leader. Due to an incomplete distribution of the minutes of the twelfth meeting to the members, their approval was deferred to the following meeting.

E. Chiaveri presented an overview of the mandate and of the organizational structure of the future AB/ATB group responsible for nTOF technical matters and physics effort as well as ISOLDE front-end and RILIS matters. In the following discussion, the following responsibilities within the nTOF collaboration were confirmed:

- E. Chiaveri, chairman of the nTOF Collaboration Board
- P. Pavlopoulos, nTOF Collaboration spokesperson
- A. Mengoni, Coordinator n_TOF-ND-ADS Project
- P. Cennini, Technical coordinator (and GLIMOS from 2003)

2. A DISCUSSION ON THE REPORTS AND PROPOSALS RELATED TO nTOF FOLLOWED:

ISOLDE Technical and Scientific reports

The committee noted with pleasure that so far the intensive push-pull mode operation had been successful and that it was not unreasonable to expect the same number of shifts for physics this year as in 2001 in spite of the shorter running period. It **congratulated** the whole operation team for this demonstration of performance. However, INTC noted that the strain on the operation team left almost no margin warranting the continuity of such an operation should any member of the team become temporarily unavailable. Thus, it **recommended** that, within CERN, measures be looked for to guarantee the same level of efficiency that has been achieved in 2002. It also encouraged the experimental groups to continue help the team accomplish the operation as hitherto done. Answering to a question whether target production was sufficient or not, M. Lindroos indicated that the limited resources have necessitated an operation in which already used target units are called back for a more extensive reuse. C. Detraz commented on this procedure as an example of good management in a period of restriction. However, it was pointed out that in many cases, reusing old targets was liable to cause a loss of yield for the experiments compared to operation with unused units. Moreover, it appears that the more intense operation of ISOLDE which can be anticipated in 2005 will require more target units than in the years before. A discussion of the REX-ISOLDE programme and in particular of its impact on ISOLDE was then started. The number of shifts already approved for both ISOLDE and REX-ISOLDE is presently within control with respect to conditions required for an effective operation of the facility in 2003. On the other hand, now that REX-ISOLDE has become operational, one can anticipate an increasing pressure, all the more so because experiments with the low intensity beams delivered by REX-ISOLDE will on the average request larger number of shifts. For this reason, INTC expressed its desire to be informed of the main lines of the strategy of the collaboration as well as of expectations for the number of shifts deliverable by REX-ISOLDE. As a matter of fact, since constant evolution on both these points is to be expected, INTC feels that in order to accomplish its task efficiently, regular updating of this information will be necessary. As a conclusion of this discussion, INTC **expressed its strong appreciation** of the progress of REX-ISOLDE and MINIBALL and congratulated the collaborations.

nTOF Technical report

The committee **noted with pleasure** that the facility is now operational. It also took note of the modification of the collimator allowing a wider beam diameter and that it was now possible to modify the diameter of the collimator aperture with only a few hours downtime.

nTOF Scientific report

The committee **was satisfied** with the preliminary information given on the facility performances and on the present status of the approved programme. It congratulated all persons whose action has made this successful operation possible. Although first indications of performance seem to be in line with expectations, a detailed comparison with the expected performances as described in previous nTOF documents is necessary. Thus, the importance of a presentation document given precise information on the facility and its performance was reiterated independently of the final TDR which is expected for next year. It is the opinion of the INTC that the already obtained results are sufficient for the preparation of a presentation document. Thus, the committee **demand**s that this document be made available by the first week of November in order to be able to analyze it and discuss its content at the next INTC meeting. It was stated that such a document is necessary for the committee to be able to evaluate future proposals.

3. DISCUSSION ON THE OPEN SESSION

The presentations of the new proposals made during the open meeting were then discussed.

P156 (CERN/INTC 2002-015): Coulomb excitation of neutron-rich $A \sim 140$ nuclei

The scientific motivation of this proposal is the exploration of the weakening of neutron pairing strength in neutron-rich nuclei. It was considered timely and interesting. The connected issues are presently actively debated by theorists and a further analysis of this mass region will provide useful information on level densities of nuclei involved in the r-process. However, the large number of different beams requested was noted. The committee was concerned that spreading the activity over so many beams may delay or not allow an in-depth investigation of the phenomenon. Taking into account the situation of the competition, it was recommended that the collaboration focuses its measurements on Cd-isotopes beams which are only available at REX-ISOLDE. An allocation of **21 shifts will be recommended** to the Research Board.

P158 (CERN/INTC 2002-017): Coulomb excitation of neutron-rich nuclei between the $N=40$ and $N=50$ shell gaps using REX-ISOLDE and the Ge Miniball array

The proponents envisage to probe the structure of neutron-rich nuclei between the $N=40$ and $N=50$ shell gaps by Coulomb excitation, using REX-ISOLDE and MINIBALL. The project begins with Zn beams, with which part of the goals can be reached with the existing REX-ISOLDE beams of 2.2 MeV/u although the planned 3.1 MeV/u would be more favourable. Later, an extension to Ni beams requiring the 3.1 MeV energy is outlined. The committee supported the physics case and the exploration of Coulomb excitation in a new region but recommended that all efforts be made to perform the experiment with the optimal, higher energy. **21 shifts will be recommended** for approval to the Research Board.

P160 (CERN/INTC 2002-021): High Precision Mass Measurement of Exotic Nuclei with the triple-trap mass spectrometer ISOLTRAP

This proposal contains a broad programme of mass measurements, motivated by nuclear structure issues, CVC tests and halo nuclei, to be performed over the coming four years. The committee recognized the world unique potential of ISOLTRAP and considered that the programme would indeed allow an exploitation of this potential. It also noted that the flexibility of ISOLTRAP operation would help optimise ISOLDE beam scheduling. On the other hand, INTC felt that it could not approve a program over such a long period and requested that a no longer than two-year programme be resubmitted. Moreover, INTC opinion is that clear priorities within the list of measurements should be set by the collaboration. For these reasons, the committee deferred a full evaluation of the proposal and expects the collaboration to react on its requests.

P161 (CERN/INTC 2002-027): New spectroscopy by two-neutron-pickup of neutron-rich nuclei

Two-neutron transfer reactions on ^{10}Be -targets were acknowledged by INTC as a very powerful method to populate states in very neutron-rich nuclei while preserving the shape of the projectile nucleus. As a first application, the proposed measurements the spherical excited 0^+ state in ^{32}Mg was considered appropriate. However, the committee felt that the presented status of cross-section calculations was not accurate enough to take a decision on number of shifts. INTC thus recommend that they be pursued to the point when they can provide an accurate estimate of the needed beam time. This could take the form of a letter to the committee. Pending the reception of this letter the decision was deferred.

I-044 (CERN/INTC 2002-028): Study of the decrease of neutron pairing with neutron number by measuring the transfer of paired neutrons

This Letter-of-intent had a similar physics scope as that of P156 but involved the use of two-neutron transfer reactions which might deliver further, conclusive information on weakening of neutron pairing in neutron-rich nuclei. The committee found the project interesting and awaits a full proposal.

4. OTHER BUSINESS

The SPS/PS Coordinator, Michael Hauschild, reported on the proton beam availability for nTOF and ISOLDE. September 17, the status was that nTOF had received $5.91 \cdot 10^{18}$ protons and the estimated total amount by the end of the running period was $7.5 \cdot 10^{18}$, thus in slight excess over the number initially planned. For 2003, the envisaged amount of protons for nTOF could reach 12-14 $\cdot 10^{18}$. This increase is correlated with the cessation of data taking by the DIRAC experiment. Protons for ISOLDE Physics are planned for 181 days in 2003 compared to 192 in 2002.

The chairman informed the committee that Juha Äystö, Jyväskylä, will take over the chairmanship from the start of 2003.

The next meeting is on **Monday November 25**, and the deadline for submission of proposals is **Friday, October 18, 2002**.

The dates of the INTC meetings in 2003 are:

24-25 February
19-20 May
22-23 September
24-25 November

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