

DRAFT

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ISOLDE AND NEUTRON TIME OF FLIGHT  
EXPERIMENTS COMMITTEE

Minutes of the twentieth Meeting of the INTC  
Held on Monday 24 and Tuesday 25 May 2004

**OPEN SESSION**

Monday 24 May at 14:00 h, Council Chamber

The Chairman of the INTC, Juha Äystö, opened the meeting and announced the agenda.

The ISOLDE Technical Coordinator, Mats Lindroos, reported on recent progress at the facility and the work carried out during the 2003–2004 shutdown. Firstly, he discussed the repair and re-installation of the GPS front-end, now in full operation. He then introduced the priority list for ISOLDE research and development of target and ion sources, which has been set up by the ISOLDE upgrade group (<http://isolde-upgrade.web.cern.ch/isolde-upgrade/>). He also reported on several R&D activities, including the studies of proton induced shock waves on different targets, the standardization of emittance measurements and stable mass-scan analysis for off-line targets and the addition of customary mass-markers to all surface ion-sources. Other ongoing developments include the off-line test of the solid state laser RILIS, the assembly of front-end number 6 and the emittance studies of the standard LaB<sub>6</sub> negative surface ion-source. He also informed the Committee about the newly available RILIS ionisation schemes for Y and Dy and the developments on the ECR source and RFQ cooler.

The upgrade work at REX-ISOLDE was then reviewed, with the commissioning of the 9 gap IH structure for the upgrade to 3.0 MeV/u and tests on SeCO and AlF molecular beams as highlights. The new LINUX/JAVA based control system commissioned for ISOLDE was also presented. The scanners, wire grids and user applications will still be running under Windows on dedicated consoles that will be migrated to Windows XP. He reminded the Committee that the tendering for the extension of the ISOLDE hall is in progress and building will start in July 2004. The Class A laboratory is also under construction and scheduled to be ready after the 2004 – 2005 shutdown.

The ISOLDE Scientific Coordinator, Luis M. Fraile, recounted the first few weeks of operation. Problems at the PS complex have delayed the start-up by one week and have lead to the cancellation of two scheduled runs and further adjustments on the schedule. Discussions are ongoing regarding a possible compensation through a prolonged run in November. He then detailed the scheduled for the remaining 2004 campaign. He specifically reported on the amount of approved Physics shifts for REX-ISOLDE, which sum up to 242, including 180 using MINIBALL and 15 for machine development. A total of 214 REX shifts have been requested, of which it has been possible to allocate 162. The presence of MINIBALL during only a part of the running time is at present one of the main limitations. The delicate situation regarding the use of the ISOLDE RILIS was then emphasized, due to the restricted operation time and manpower limitations. A total 264 shifts have been requested for the present year. A few practical issues where then discussed, in particular the new control system and the reported problems for access to the ISOLDE hall and their possible solution.

The nTOF technical coordinator, P. Cennini, reported on the status of the facility upgrade 2004. The installation of the total absorption calorimeter in the experimental area is underway and expected to be finished on schedule. The second beam collimator has been upgraded and first results do not show a significant flux reduction. The gap in the sweeping magnet has been reduced from 42 to 22 cm without changing the nominal current and a monitor for the neutron flux has been installed in the neutron escape lane. Finally the replacement of the target coolant was addressed. The amount of heavy water required is available at CERN, and four weeks of run at the nominal intensity will produce the maximum permitted activity before the liquid is considered as radioactive waste. The coolant could be replaced at any time, and the activity of tritium will be monitored by SC every week. Seven targets have been delivered from JINR and stored at CERN according to Agreement K1007-AB.

The following proposals were then presented:

1. Beta-decay study of very neutron-rich Cd isotopes with a chemically selective laser ion source, Karl-Ludwig Kratz.
2. Investigation of astrophysically relevant neutron-rich argon nuclei, Leonid Weissman.
3. Laser Spectroscopy study on the neutron rich and neutron-deficient Te isotopes, Brigitte Roussière.
4. Studies of a Target System for a 4-MW, 24-GeV Proton Beam, Harold G. Kirk.
5. IS397 Status Report: Charge Breeding of Radioactive Ions in an Electron Cyclotron Resonance Ion Source (ECRIS) at ISOLDE, Charles Barton.

## **CLOSED SESSION**

Monday 24 and Tuesday 25 May 2004, Room 60-6-002

**Present:** J. Äystö (Chairman), J.J. Blaising (replacing J. Engelen), P. Butler, T. Butz, P. Cennini, E. Chiaveri, H. Doubre, L.M. Fraile (Secretary), M. Hauschild, D. Hilscher, M. Huyse, J. Kluge, M. Lewitowicz, M. Lindroos, T. Otto\*, E. Radermacher, J.-P. Riunaud, D. Schlater, M. Streit-Bianchi (replacing J.A. Rubio), J. Suhonen, D. Warner.

\* Invited part-time

**Apologies:** K. Langanke, F. Priolo, H. Ravn.

### **1. INTRODUCTORY REMARKS BY THE CHAIRMAN**

J. Äystö opened the session by explaining that he will report to the Research Board the outcome of the INTC discussions concerning 10 experimental proposals from the meetings held in November 2003 and February 2004. He pointed out that, though not excessive, certain backlog for ISOLDE is required for an effective use of the beam time.

### **2. MINUTES OF THE LAST MEETING**

The minutes of the nineteenth INTC meeting from 23-24<sup>h</sup> February 2004 were approved with minor corrections.

### **3. STATUS OF ISOLDE**

The shutdown period was judged fruitful for ISOLDE with the highlights being the start of the construction work for the class A laboratory and the decision on the extension of the ISOLDE experimental hall. The availability in the near future of a spare front end for the separators was also stressed; it could serve as a spare for both separators but the replacement would be slower for the HRS.

With the aim of having five engineers in charge for the running of the facility a new technical position has been advertised. Further assistance is envisaged from the ATB group of the CERN AB department in the form of support for the experimental areas.

A crucial issue for the facility, namely the research and development of targets and ion sources, was then addressed. The priority for R&D defined by the ISOLDE upgrade group was explained as consisting of 1) development of beams for approved experiments, 2) developments for supported letters of intent and 3) general requests to improve the actual operation. The feedback from the ISOLDE upgrade group to INTC has to be fully developed, either as an agenda issue or a report by the coordinators. It was requested that beam development be addressed when a proposal is presented, and be explicitly mentioned in the request.

The Committee urged the completion of the RFQ project for ISOLDE as it will be a great help for, among others, collinear spectroscopy experiments. The persistent difficulties for getting resources were highlighted, and in particular the funds for the RF generator and vacuum system. If these problems are solved it is feasible to foresee the installation during the next shutdown.

The Committee acknowledged the scheduling of more than 350 shifts for the present ISOLDE campaign, and expressed the need to deal with the present limitations, namely the RILIS and REX operation. The INTC strongly requested having MINIBALL at ISOLDE for the whole running campaign.

Afterwards, operation in future years was discussed. The 2005 campaign will have ISOLDE as the only user for the PSB, with a time span of about 6 months. In comparison, different scenarios are being considered for the 2006 campaign, when the LHC tunnel should be closed at the end of the year. The first one assumes a normal operation; the second, a limited operation of about 3 months from July onwards; and the last one, a full year without running, with two possible derivations, no accelerator running at CERN or running of the PSB only. The scenario will be defined before the next INTC meeting. The INTC showed its extreme concern about the situation and especially about the last scenario, as a long interruption would severely hamper Physics at ISOLDE and nTOF. Furthermore, many groups rely on the yearly experimental plans and PhD projects would be blocked due to a full year interruption.

#### **4. STATUS OF nTOF**

The problems with the replacement of the target coolant by heavy water at nTOF were reported. As soon as the total absorption calorimeter is in place the decision to replace the water by heavy water will be taken, and then a continuous monitoring will be undertaken. There is enough heavy water at CERN to fill the coolant tank twice. The procedure is still under discussion.

Problems with the handling of the nTOF targets were mentioned. Although the conditions were agreed in November 2003, it was later found that the dose to population will be above the allowed limit in case of accident or security incident. After the estimation of risks made by SC RP the decision is to discard the  $^{241}\text{Am}$  target, which cannot be stored at CERN. An alternative storage or shipment is being sought, as the return to the supplier (JINR) of a single target requires a new agreement between CERN and JINR, and thus additional costs.

The EU contract for nTOF will soon finish but some institutes are likely to envisage continuing research at CERN, as expensive equipment already exists here. A proposal may be ready for 2006. Close collaboration with the SC section is now ongoing in order to establish precise safety conditions for the target and experimental area.

The program for this year may have to be revised as the requirement of  $1.6 \times 10^{19}$  protons seems difficult to achieve due to the initial delays and stops. The request will be revised at the Collaboration meeting on 15 June 2004.

## 5. DISCUSSION ON THE OPEN SESSION

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

### **P135 (INTC-2004-014/P135 Add.1)** *Beta-decay study of very neutron-rich Cd isotopes with a chemically selective laser ion source*

This proposal was seen as ambitious, but some difficulties have to be addressed, in particular the theoretical support for the experiment, where the inclusion of the low-lying negative parity states was considered essential. Doubts were cast on the possibility of unambiguous spin parity assignment from the  $\beta$ -decay and  $\beta$ -n. It was also judged that some development work is still needed for the realization of the quartz transfer line and tests would be required. It was decided to request a report from the proponents to the INTC, including three main points: *a)* a full theoretical prediction *b)* an explanation based on the prediction showing that the proposed setup is able to identify levels and properly assign spin and parities and *c)* a plan for the implementation of a quartz transfer line in the target in coordination with ATB IF group, considering resources and manpower. The decision on the proposal was **delayed** until the report is provided.

### **P138 (INTC-2004-005/P138 add.2)** *Investigation of astrophysically relevant neutron-rich argon nuclei*

The Physics case had already been positively evaluated and was still considered highly interesting. It has already been a notable effort to overcome the selectivity problems and in this context the use of the ECRIS was judged very interesting. Nevertheless, the injection and breeding of radioactive ions into the source has to be proven prior to the experiment. The allocation of the 16 requested shifts was **conditionally recommended** pending a successful outcome of the tests with the ECR source.

### **P186 (INTC-2004-016/P186)** *Studies of a Target System for a 4-MW, 24-GeV Proton Beam*

The proposal was judged very significant in the framework of a multi MW target station, where there are still many unknown factors such as, for example, the magneto-hydrodynamics parameters. The combination of the pulsed proton structure, the Hg jet and the magnetic field together has never been investigated before. The requested beam time has been reduced from previous discussions to 40 pulses with  $20 \times 10^{12}$  intensity (three times the intensity of the nTOF pulses) but there are still safety problems to be addressed. It was noticed that, in spite of being difficult, the discussions between SC and the proponents were not mentioned during the oral presentation. T. Otto made it clear that there are no large problems with safety, but certain issues need to be solved before

approval can be given. Due to the special situation at CERN, no radioprotection authority is consulted for each particular situation. However, CERN has agreed to apply the safety regulations from France and Switzerland. They request that the experimental apparatus is mechanically and thermally qualified by an independent body according to the technical requirements of International Standard ISO 2919 for sealed Radioactive Sources. The existing experience with nTOF shows that the test can be done at CERN; the knowledge on Hg targets exists also at other facilities. The proposal was given full scientific support but the way of implementing it at CERN in terms of engineering, safety, storage, transport, funding and timing should be addressed. With this **condition** the proposal was **recommended** for approval.

**P153 (INTC-2004-017/P-153-Add.1)** *Laser Spectroscopy study on the neutron rich and neutron-deficient Te isotopes*

The proposal aims at the measurement of nuclear moments and charge radii in the Te region, close to the N=82 shell closure. The addendum was the response to the request by the INTC for clarification of the suitability of the experiment and the efficiency of the setup. It was considered that the experimental problems had been addressed by the proponents but that the possibility of normalizing the beam intensity still has to be studied. The large fluctuations of the desorbed material have also to be tackled. The experiment was **recommended** for 17 shifts with the UC<sub>2</sub> target to study the neutron rich Te isotopes and 6 shifts for the target test and pilot experiment with CeO<sub>2</sub> HP to obtain yields and show the procedure to measure n-deficient Te isotopes. The proponents should provide a status report to the INTC after these measurements.

**IS397 Status Report (INTC-2001-023/P-143):** *Charge Breeding of Radioactive Ions in an Electron Cyclotron Resonance Ion Source (ECRIS) at ISOLDE*

The ECR is assembled and tested as a standalone source. The next step is the injection of 1+ and charge breeding to n+. After the successful tests, information should again be provided to the INTC.

## **6. LETTERS OF INTENT:**

**Post-acceleration of light proton-rich beams close to the N=Z line for studies of reactions with applications in nuclear astrophysics and nuclear structure (INTC-2004-011/I-051)**

This letter of intent was seen as part of the ongoing developments required for experiments with REX-ISOLDE. The Physics case is judged compelling but problems with the beam should be addressed before submitting a full proposal, in particular the beam purity. The Letter of Intent was **supported** but more experimental details should also be added, the detector scenario should be worked out and the need for a recoil separator should also be discussed.

**Letter of Intent: Production of generator source of alpha-emitters for radiotherapy (INTC-2004-012-I-052)**

The generator production based on recoils was judged interesting but the radiotherapy details are not clearly identified. The type of tumour, the way of introducing the generator and the diffusion into the tissues are not mentioned. The experience with the  $^{228}\text{Th}$  source should also be specified, together with the details of the decay chains. Although the production advantage is clear (as the beam at ISOLDE is implanted), the advantage of this decay chain is not really explained. The safety issues have to be addressed and the radiotoxicity is to be discussed. The proponents are requested to provide these details and to explain how the collaboration for this experiment is set up. The discussion was **postponed** until all this information is received.

**High-precision mass measurements of highly-charged exotic ions with the mass spectrometer ISOLTRAP (INTC-2004-015/I-053)**

The upgrade to mass measurements with highly-charged ions was thought really worthwhile in order to keep the facility in the forefront of this kind of Physics. A new beam line and technical support is required, and the resources are to be discussed in the framework of the AB support to experimental areas. A technical report will be ready by the end of 2004 on the beam line. The Letter of Intent was strongly **endorsed** and the 2006 shutdown seen as a very good occasion for the installation.

The next INTC meeting will take place on **Monday 15 and Tuesday 16 November 2004**. The deadline for submission of proposals is **Friday 15 October 2004**.

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