

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

Minutes of the twenty-fourth meeting of the INTC
Held on Monday 31 October and Tuesday 1 November 2005

OPEN SESSION

Monday 31 October 2005 at 13:30 h, Council Chamber

The Chairman of the INTC, Juha Äystö, opened the meeting and announced the agenda. He underlined that the meeting would focus on the discussions at the Nuclear Physics and Astrophysics at CERN (NuPAC) workshop, held at CERN from 10 to 12 October 2005 and on the preparation of a report with the summary and conclusions.

The ISOLDE Technical Coordinator, Mats Lindroos, reported on the ISOLDE 2005 campaign. Many target and ion source developments have been accomplished during the year, for example the successful on-line tests of a negative ion LaB₆ source, the construction of a new target prototype fitted with a quartz transfer line for alkaline suppression, and several development efforts related to the 100 kW direct target task of the EURISOL design study.

With respect to the ISOLDE RFQ cooler and buncher project (ISCOOL), the mechanical assembly is finished and the last support pieces are being constructed. Tests are planned from the beginning of 2006 in parallel with the study for the installation in the ISOLDE hall, foreseen for the 2006-2007 shutdown.

The Resonant Ionization Laser Ion Source (RILIS) has accumulated 1920 hours of operation in 2005. A reinforcement of the operation for 2006 will be necessary due to the limited manpower available to work on the RILIS laser upgrade and on the set-up of the new offline spectroscopy laboratory. The latter will be used to investigate new ionization schemes with new solid state lasers without jeopardizing the on-line operation of RILIS.

The REX-ISOLDE facility has been operating very reliably during 2005, with faster setting up compared to past campaigns and higher average efficiencies. For the first time the 200 MHz amplifier has been running at full power (100 kW), with a 10% duty cycle. Nevertheless both the 100 MHz and 200 MHz radiofrequency amplifiers are not completely reliable yet. Concerning the control system, the front-end optics applications are ready and the beam diagnostics applications are in progress, but the console control applications are still missing. During the shutdown the remaining vacuum valves after the bender magnet will be included in the vacuum control system.

The ISOLDE Class A target laboratory is in operation for manufacturing and testing of UC_x targets, handling of used targets and examination after irradiation. There is still equipment needed for the off-line checks of UC_x targets, the test of front-ends and waste conditioning.

There will be a re-organization of the ISOLDE experimental area to conform to the rest of CERN experimental areas. This will hopefully lead to improved support, a defined set of procedures for new installations in the ISOLDE hall, and proper staffing for shutdown work.

The ISOLDE Scientific Coordinator, Luis M Fraile, summarized the ISOLDE 2005 operational period and presented the running statistics. A total of 385.5 shifts of radioactive beam have been used for approved experiments, target tests and beam development runs. The breakdown of the beam time in the different subfields is shown in Table 1. Thirty-five percent of the shifts devoted to Nuclear Physics, Atomic Physics, Solid State Physics, Astrophysics and Life Sciences were delivered to experiments at the REX-ISOLDE facility. Forty-five percent of the shifts delivered to experiments in the above-quoted categories made use of the RILIS.

He then presented a selection of the Physics highlights from the scientific programme. These included the first experiments making use of post-accelerated isomeric Cu beams from REX-ISOLDE (IS435), the Coulomb excitation measurement of ^{70}Se (IS405) and the first radioactive beam experiment with ^{11}Be at REX-ISOLDE (IS430). Some examples of mass measurements were also shown, in particular the new determination of Zn masses with ISOLTRAP (IS413) and the test run on Be mass measurements at MISTRAL (IS436). Other highlighted experiments were fast-timing measurements around $N=20$ making use of new scintillation crystals (IS414), Pb charge radii measurements with in-source RILIS spectroscopy (IS407) and measurement of parity non-conservation in the gamma decay of $^{180\text{m}}\text{Hf}$ (IS429). Examples of Mössbauer measurements of Fe impurities tracked in $\text{Si}_{1-x}\text{Ge}_x$ via the ^{57}Mn decay (IS426) and channelling analysis of As dopants in ZnO (IS368) were also presented.

The proposed accelerator schedule for 2006, approved by the CERN Research Board on 1 September 2005, was shown next. Protons will be delivered to ISOLDE from 18 April 2006 and the Physics experiments will start on 24 April 2006. The on-line operation for ISOLDE will end 28 weeks later, on 6 November 2006.

Table 1: Breakdown of radioactive beam shifts delivered to ISOLDE experiments in 2005

Category	Number of shifts	Percentage of total (%)
Nuclear Physics and Weak Interaction	143.5	37%
Atomic Physics	69.5	18%
Solid State Physics	51.5	13%
Particle and Astrophysics	30.0	8%
Research and Development	15.0	4%
Biology and Medicine	0.0	0%
Target and ion source development and REX-ISOLDE machine development	53.5	14%
Coordinator's reserve	22.5	6%
TOTAL	385.5	100 %

The following proposal was then presented:

1. *Nuclear moments, spins and charge radii of copper isotopes from $N=28$ to $N=50$ by collinear fast-beam laser spectroscopy (INTC-2005-031/P-200)*, K Flanagan

CLOSED SESSION

Monday 31 October 2005 and Tuesday 1 November 2005

Present: S. Åberg, J. Äystö (Chairman), H. Börner, T. Butz, J.-P. Delahaye, H. Doubre, J. Engelen, L.M. Fraile (Secretary), R. Krücken, M. Lewitowicz, M. Lindroos, L. Linssen, G. Neyens, F. Priolo, E. Radermacher^{*)}, C. Rembser, K. Riisager, M. Streit-Bianchi, V. Vlachoudis and P. Woods.

*) Part-time

1. MINUTES OF THE LAST MEETING

The minutes of the twenty-third INTC meeting from 23 May 2005 were approved.

2. STATUS OF ISOLDE

The Committee judged the 2005 ISOLDE campaign as extremely successful and congratulated the ISOLDE teams for the reliable operation and outstanding physics output. Emphasis was made on the technical development programme, which has a direct and important impact on the physics outcome. The high efficiency and the reliability of the facility, and in particular of REX-ISOLDE, were underlined.

3. DISCUSSION ON PROPOSALS AND LETTERS OF INTENT

P200 (INTC-2005-031/P-200) *Nuclear moments, spins and charge radii of copper isotopes from N=28 to N=50 by collinear fast-beam laser spectroscopy*

This proposal aims at the measurement of quadrupole and magnetic moments along the isotopic chain of Cu nuclei and at the determination of model independent spins of ground and isomeric states in neutron rich Cu isotopes. The proposed technique is collinear laser spectroscopy performed at the COLLAPS setup at ISOLDE. The experiment can explore the weakening of the shell closure at N=28 for light Cu isotopes and the inversion of shell configurations around A=75, and furthermore seek clarification of the ⁷²Cu case, where conflicting experimental data exist.

The Committee judged the proposal to have potential to solve several outstanding physics issues, and noted that the implications of the measurements of ⁵⁷Cu for the astrophysical r-p process had not been mentioned in the text. The Committee considered that some of the proposed measurements can only be achieved when the RFQ cooler and buncher is installed at ISOLDE, and that some of the measurements which are already feasible could be significantly improved with such a technical development. The Committee decided to **recommend to the Research Board the approval of a total of 19 shifts** of radioactive beam, 10 shifts to study n-rich Cu nuclei and 9 shifts to investigate n-deficient Cu isotopes. The collaboration is asked to deliver a status report after the first year of data-taking.

P192 (CERN-INTC-2005-033/CLL-001) *Elastic scattering and fusion studies in the reactions ^{10,11}Be+⁶⁴Zn (Report on a test for P192)*

The P192 proposal intends the measurement of the elastic scattering and the fusion excitation functions for the reactions ¹⁰Be+⁶⁴Zn and ¹¹Be+⁶⁴Zn, in order to investigate the effects of the structure of halo nuclei in the mechanism of reactions below the Coulomb barrier. The physics

case had already been judged as very compelling by the Committee, but an assessment of the contaminants in the ^{11}Be and ^{10}Be beams from REX-ISOLDE was requested. The present clarification letter comes as a response to this request. The test performed shows that clean and intense ^{10}Be and ^{11}Be beams, suitable for the proposed experiment, can be post-accelerated with REX-ISOLDE. The Committee judged the report as satisfactory and therefore decided to **recommend a total of 21 shifts** for approval by the Research Board.

P170 (INTC-2005-026/P-170 Add.1) *Coulomb excitation of neutron deficient Sn-isotopes using REX-ISOLDE*

This addendum intends to continue the experiment IS418, which investigates reduced transition probabilities in neutron deficient Sn isotopes by Coulomb excitation at REX-ISOLDE. The Committee was concerned by the lack of results from the previous runs supporting quantitatively the need for another measurement of ^{108}Sn , but nevertheless considered the continuation of the Coulomb excitation measurements in neutron deficient Sn isotopes to be of interest. Therefore the Committee decided to **recommend to the Research Board the approval a total of 19 shifts** to be used in a single beam time, including 2 shifts for measurements with stable ^{112}Sn and 2 shifts for the set up of REX-ISOLDE.

I62 (CERN-INTC-2005-030/I62) *Experiments with Accelerated Beams of Ne at REX-ISOLDE*

This letter of intent requests the test of trapping and extraction of Ne isotopes in REX-TRAP for the development of post-accelerated Ne beams at REX-ISOLDE. The Physics case was judged too weak by the Committee and the suitability of ISOLDE for this type of studies was questioned, given the existence of intense Ne beams in other facilities in Europe. Therefore the letter of intent **was not endorsed**. However the Committee considered that the development of Ne beams will benefit the physics programme and that one of the required steps to be pursued is the test of trapping of Ne.

4. INTC MEETING ON NUCLEAR PHYSICS AND ASTROPHYSICS AT CERN (NUPAC)

A discussion followed on the Nuclear Physics and Astrophysics at CERN (NuPAC) meeting, held at CERN from 10 to 12 October 2005. A report summarizing the evaluation of the ISOLDE and n_TOF Programmes, and drawing recommendations for the future of both facilities has been produced [**CERN-INTC-2005-035**].

5. A.O.B.

The next INTC meeting will take place on **Monday 20 and Tuesday 21 February 2006**. The deadline for submission of proposals is **Friday 20 January 2006**.

The dates of the other two INTC meetings in 2006 are fixed at 22 and 23 May 2006, and 30 and 31 October 2006.

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