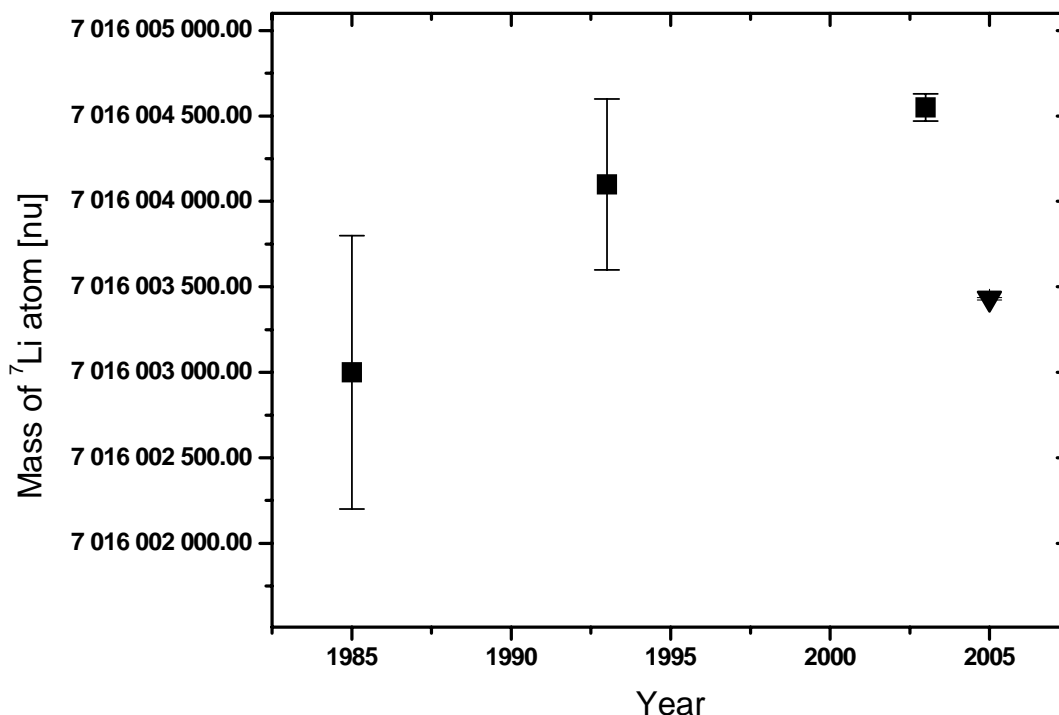




Maj 2005

SMILETRAP is taking data with CRYISIS ions again



The two mass values of ${}^7\text{Li}$ to the left and the upper value (■) are from the mass tables. The 2005 point (▼) with an uncertainty smaller than the triangle represents about 50% of our data.

We have had a couple of very successful weeks with beam after years of various technical troubles. Though we have not finished the data analysis of ${}^3\text{He}^+$, it can already now be concluded that we are likely to have improved our previous Q-value of the tritium β -decay by a factor 3 and that we have shown that there is an unexpectedly large error in the accepted mass of ${}^7\text{Li}$.

Why is an accurate mass value of ${}^7\text{Li}$ of interest?

Since the beginning of 1990 we have had a very fruitful collaboration with the Physics Department of the Johannes Gutenberg University in Mainz. As a matter of fact SMILETRAP was built there by Swedish and German young physicists and attached to CRYISIS in the beginning of 1993. It was to a large extent a copy of ISOLTRAP, located at ISOLDE, CERN dedicated for measurements of masses of radioactive isotopes.

At ISOLTRAP there has since several years been a very active and successful program of studying so called halo nuclei. The mass of ${}^7\text{Li}$ is of special interest since ISOLTRAP pro-

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posed to perform mass measurements on the nearby two- and four-neutron halos ^{11}Li , ^6He and ^8He respectively, where an accurate mass of $^{6,7}\text{Li}$ is needed for calibration purposes. The two-neutron separation energies give information of the halo properties and can be determined in ISOLTRAP by mass measurements to an uncertainty close to 10 ppb.

After the long break we wanted to start with a simple measurement and therefore decided to check the accepted mass of ^7Li (natural abundance 92.41%), a very suitable calibration isotope for ISOLTRAP.

The CHORDIS ion source used LiBr for the production of mass separated singly charged ions, which were fed into CRYISIS for charge breeding to 3+ ions. After a few hours of data collection we made a preliminary evaluation and were shocked by finding a deviation from the accepted value by as much as 160 ppb (see the figure). Because of having had so many technical problems among them the quench of the superconductive magnet hosting the precision trap, our first reaction was that something was wrong with SMILETRAP. We therefore compared the cyclotron frequencies of $^4\text{He}^{2+}$ and H_2^+ ions, a q/A doublet, and found no problem, the agreement was about 0.5 ppb.

The accepted mass of ^7Li is obtained from a Penning trap measurement of ^6Li . The mass difference between the two Li isotopes was measured in a (n, γ)-reaction, where an accuracy of 13 ppm was claimed. It is evident that either one of these two measurements is entirely wrong. Having a lot of experience in trap measurements we conclude that the mass of ^6Li cannot be that wrong and it therefore seems likely that the small uncertainty in the gamma ray energy (about 7.2 MeV) is too optimistic. In order to definitely confirm this conclusion we decided to measure also the mass of ^6Li before summer.

The SMILETRAP collaboration

Experimentverksamheten

RING

Vecka 18: Förberedelser för v 19

Vecka 19: R Thomas, D_5O_2^+ , LiH_2^+ , O_3^+

Vecka 20: R Schuch, C^+

Vecka 22: S Mannervik, Ba^+

CRYISIS

Vecka 19: SMILE, Ca^{17-19+}

Vecka 21: SMILE, K^{16-18+}

ECR

Vecka 18-19: M B Sahana, Ne^{7+}

Vecka 20: R Schuch, C^+

Gäster på MSL

Vecka 19:

E Bahati, M Bannister och M Fogle från Oak Ridge, USA

Vecka 19 - 21:

Günther Werth från Johannes Gutenberg-Universität i Mainz, Tyskland

Vecka 20:

A Filevich från CNEA, Argentina

Vecka 22:

Emile Biémont och Danijela Rostohar från universitetet i Liège, Belgien

Sammanträden

Samrådsgruppen: 17 maj kl 14.30



MSL award seminar

Wednesday, 18 May 2005 at 15:00

Dr Alberto Filevich

CONICET
Comisión Nacional de Energía Atómica, CNEA
Argentina

Awarded by MSL with a medal in memory of Manne Siegbahn

The search for Cosmic Rays of the Highest Energies ...or How to build a Monster Observatory

Abstract:

The Ultra High Energy Cosmic Radiation constitutes one of the remaining mysteries in our knowledge of Nature. A large number of detector arrays have been built in different countries during the second half of the past century, in attempts to detect and characterize the highest energy portion of the cosmic radiation spectrum falling on the Earth. However, the scarcity of the data collected, due mainly to the limited aperture of those installations is the main reason of our present ignorance about the nature and origin of this radiation. A new and important effort to improve this situation is being made by a 16-countries collaboration, the Pierre Auger Project. In order to be able to survey the whole sky, and to collect a reliable and statistically significant amount of data, "within a physicist's lifetime", two very large observatories, one in each hemisphere, are being developed. The southern component, presently under construction in Malargüe, Mendoza, Argentina, is already collecting data, and constitutes the largest installation in the world. It is expected to be completed within next year.

In this seminar, after a brief introduction, facts and circumstances of the first stages of the southern P. Auger observatory will be presented, together with a status update and some preliminary samples of the data being collected.

Dr. A Filevich and the background to the award were presented in *Månadsbladet* April 2005

MSL seminars

Wednesday, 11 May 2005 at 15:00

Dr Tomas Fritioff

Atomic Physics Department
Stockholm University

Some highlights from CERN

Charge breeding of radioactive ions using
an ECRIS

Wednesday, 25 May 2005 at 15:00

Dr Oscar Tjernberg

Department of Microelectronics and Information
(IMIT) IT University, Kista

Free electron lasers: Current developments and future applications

Coffee is served before the seminars at 14:30