

## MS 9 Präzisions-MS kurzlebiger Nuklide 2

Zeit: Montag 16:15–17:30

Raum: HU Senatssaal

MS 9.1 Mo 16:15 HU Senatssaal

**The mass of  $^{22}\text{Mg}$**  — ●MANAS MUKHERJEE<sup>1</sup>, D. BECK<sup>1</sup>, K. BLAUM<sup>1,2</sup>, G. BOLLEN<sup>3</sup>, F. CARREL<sup>4</sup>, P. DELAHAYE<sup>4</sup>, J. DILLING<sup>5</sup>, S. GEORGE<sup>2</sup>, C. GUÉNAUT<sup>6</sup>, F. HERFURTH<sup>1</sup>, A. HERLERT<sup>4,7</sup>, A. KELLERBAUER<sup>4</sup>, H.-J. KLUGE<sup>1</sup>, U. KÖSTER<sup>4</sup>, D. LUNNEY<sup>6</sup>, S. SCHWARZ<sup>3</sup>, L. SCHWEIKHARD<sup>7</sup>, and C. YAZIDJIAN<sup>4</sup> — <sup>1</sup>GSI, 64291 Darmstadt, Germany — <sup>2</sup>Johannes Gutenberg-Universität, 55099 Mainz, Germany — <sup>3</sup>NSCL, Michigan State University, East Lansing, MI 48824-1321, USA — <sup>4</sup>CERN, 1211 Geneva 23, Switzerland — <sup>5</sup>TRIUMF, Vancouver, V6T 2A3, Canada — <sup>6</sup>CSNSM-IN2P3-CNRS, 91405 Orsay-Campus, France — <sup>7</sup>Ernst-Moritz-Arndt-Universität, 17487 Greifswald, Germany

Direct high-precise mass measurements around mass number  $A = 22$  are of utmost importance. First, the masses of the superallowed  $\beta$ -emitter  $^{22}\text{Mg}$  and its daughter  $^{22}\text{Na}$  are needed to test the CVC hypothesis and the CKM-matrix unitarity, both being predictions of the Standard Model. Second, to calculate the reaction rate of  $^{21}\text{Na}(p, \gamma)^{22}\text{Mg}$  the involved masses are required. This rate is needed in order to extract an upper limit on the amount of a characteristic  $\gamma$ -radiation emitted from classical nova bursts which has been searched for but not yet detected. At the triple trap mass spectrometer ISOLTRAP, the masses of  $^{21}\text{Na}$ ,  $^{22}\text{Na}$ , and  $^{22}\text{Mg}$  have been measured with relative uncertainties of better than  $1.5 \times 10^{-8}$ . This solved a conflict between two available mass values for  $^{22}\text{Mg}$ . The mass measurements as well as their impact will be presented.

MS 9.2 Mo 16:30 HU Senatssaal

**Investigations of the magnetic field stability at SHIPTRAP** — ●C. RAUTH for the SHIPTRAP collaboration — GSI, Planckstrasse 1, D-64291 Darmstadt, Germany

The ion trap facility SHIPTRAP at GSI Darmstadt was set up to study different properties of the heavy elements produced in fusion evaporation reactions at SHIP. First investigations focus on precision mass measurements with a Penning trap mass spectrometer. With these results the nuclear binding energy can be determined to test different nuclear models or to look at shell structure effects. The mass of an ion inside a Penning trap can be determined by measuring the cyclotron frequency  $\omega_c$  which is given by  $\omega_c = eB/m$ . In order to calibrate the magnetic field strength inside the trap, the cyclotron frequency of a reference ion with a well known mass is measured. The mass of the ion is calculated from the cyclotron frequency ratios and the mass of the reference ion. Systematic errors can occur if the magnetic field strength changes significantly between the two frequency measurements. To investigate the temporal stability of the magnetic field, the cyclotron frequency of different reference ions was measured over many days and the changes due to the variation of the magnetic field determined. As reference ions  $^{133}\text{Cs}$  and  $^{85}\text{Rb}$  from a surface ion source as well as noble gases like  $^{40}\text{Ar}$  from a cross beam ion source were used. Cross correlations between these measurements also allow to determine other systematic errors.

MS 9.3 Mo 16:45 HU Senatssaal

**Magnetic field stabilization in superconducting magnets for high-precision Penning trap experiments** — ●SLOBODAN DJEKIC<sup>1</sup>, KLAUS BLAUM<sup>1,2</sup>, MAXIME BRODEUR<sup>3</sup>, PIERRE DELAHAYE<sup>4</sup>, JENS DILLING<sup>3</sup>, SEBASTIAN GEORGE<sup>1</sup>, FRANK HERFURTH<sup>2</sup>, ALEX HERLERT<sup>4,5</sup>, HANS-JÜRGEN KLUGE<sup>2</sup>, WOLFGANG QUINT<sup>2</sup>, LUTZ SCHWEIKHARD<sup>5</sup>, STEFAN STAHL<sup>1</sup>, JOSÉ VERDU<sup>1</sup>, MANUEL VOGEL<sup>1</sup>, GÜNTHER WERTH<sup>1</sup>, and CHABOUH YAZIDJIAN<sup>2,4</sup> — <sup>1</sup>Institut für Physik, Universität Mainz, 55099 Mainz — <sup>2</sup>GSI, 64291 Darmstadt — <sup>3</sup>TRIUMF, Vancouver, British Columbia V6T 2A3, Canada — <sup>4</sup>Department of Physics, CERN, 1211 Geneva 23, Switzerland — <sup>5</sup>Institut für Physik, Ernst-Moritz-Arndt-Universität, 17487 Greifswald

Many high-precision experiments with Penning traps are presently limited by magnetic field fluctuations in the superconducting magnet. The magnetic field instabilities originate from external and/or internal sources, e.g. temperature and pressure fluctuations in the helium and nitrogen reservoirs of the superconducting magnets. They cause changes in the properties of the materials surrounding the Penning trap and thus in the magnetic field strength and homogeneity. The effect of temperature and pressure fluctuations was evaluated and a stabilization system for both was implemented resulting in a reduction of the systematic un-

certainties. The technical realization and experimental results from the Penning trap mass spectrometer ISOLTRAP at ISOLDE/CERN and the g-factor Penning trap at the University of Mainz will be presented.

MS 9.4 Mo 17:00 HU Senatssaal

**Einsatz der Ramsey-Technik bei Präzisionsmassenmessungen mit ISOLTRAP** — ●S. GEORGE<sup>1,2</sup>, K. BLAUM<sup>2,3</sup>, P. DELAHAYE<sup>4</sup>, ALEXANDER HERLERT<sup>4,5</sup>, H.-J. KLUGE<sup>3</sup>, M. KRETZSCHMAR<sup>2</sup>, L. SCHWEIKHARD<sup>5</sup> und C. YAZIDJIAN<sup>3,4</sup> für die ISOLTRAP-Kollaboration — <sup>1</sup>Institut für Kernphysik, Universität Münster, Wilhelm-Klemm-Str. 9, 48149 Münster — <sup>2</sup>Institut für Physik, Universität Mainz, Staudingerweg 7, 55128 Mainz — <sup>3</sup>GSI, Planckstr. 1, 64291 Darmstadt — <sup>4</sup>Physics Department CERN, 1211 Geneva 23, Switzerland — <sup>5</sup>Institut für Physik, Universität Greifswald, 17487 Greifswald

Das ISOLTRAP-Massenspektrometer am on-line Isotopenseparator ISOLDE/CERN benutzt eine Penningfalle zur Bestimmung der Massen kurzlebiger Radionuklide. Dazu wird die Zyklotronfrequenz der gespeicherten Ionen in einem homogenen Magnetfeld bestimmt, wobei ein Flugzeitresonanznachweis eingesetzt wird. Um die Genauigkeit bei der Bestimmung der Resonanzfrequenz zu erhöhen, wurde das Schema zur Anregung der Ionenbewegung verändert. Anstelle der kontinuierlichen Anregung wird sie mittels der Ramsey-Technik durchgeführt, d.h. durch zeitlich voneinander getrennter oszillierender Felder. Der Vorteil dieser sogenannten "Ramsey-Fringes" liegt in der kürzeren Anregungsdauer. Eine Linienverbreiterung aufgrund von Feldinhomogenitäten kann dadurch verringert und die Zyklotronfrequenzbestimmung eventuell verbessert werden. Die Methode und erste Ergebnisse werden präsentiert.

MS 9.5 Mo 17:15 HU Senatssaal

**A new detection technique for mass spectrometry on radionuclides** — ●R. FERRER<sup>1</sup>, K. BLAUM<sup>1,2</sup>, M. BLOCK<sup>2</sup>, F. HERFURTH<sup>2</sup>, H.-J. KLUGE<sup>2</sup>, C. KOZHUKHAROV<sup>2</sup>, G. MARX<sup>3</sup>, M. MUKHERJEE<sup>2</sup>, W. QUINT<sup>2</sup>, S. RAHAMAN<sup>2</sup>, S. STAHL<sup>1</sup>, C. WEBER<sup>1,2</sup>, and AND THE SHIPTRAP COLLABORATION.<sup>2</sup> — <sup>1</sup>Institute of Physics, Johannes Gutenberg-University, D-55099 Mainz — <sup>2</sup>GSI, D-64291 Darmstadt — <sup>3</sup>Institute of Physics, Ernst-Moritz-Arndt-University, D-17487 Greifswald

One of the main scientific goals of the SHIPTRAP experiment at GSI is mass spectrometry on heavy transuranium nuclides produced at the velocity filter SHIP. Nowadays the destructive time-of-flight-ICR (Ion Cyclotron Resonance) method is exclusively used for the mass determination of radionuclides in a Penning trap. Since the production rate for the nuclides of interest at SHIP is extremely low, the non-destructive and highly-sensitive Fourier Transform FT-ICR technique will be employed. It enables measurements even on single ions. First experimental tests and specification measurements with the cryogenic trap system will be performed off-line using stable cesium ions. For the future commissioning of the setup and the comparison of both detection schemes a detector tandem consisting of a microchannel plate and a channeltron will be used. In this contribution the detection techniques, the experimental goals as well as first results will be presented