s393/land02 workshop 2011

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GSI

Book of Abstracts

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CAESAR, Christoph[1]

[1] *GSI*

Corresponding Author(s): c.caesar@gsi.de

did: 1) calibrations - SST-calibrations using Matthias scripts - LAND & TFW calibrations using Domincs scripts - GFI calibration is still in progress ...
2) fragment mass tracking - used Ralfs tracker with little success - used (modified) reference method with little succes but this i did not finish completely - so far best results with empirical mass reconstruction using GFIs
3) prelimenary E__rel for 25-oxygen

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Studies of an improved addback algorithm for the Crystal Ball

Author(s): Mr. RIBEIRO, Guillermo[1]
Co-author(s): Prof. NILSSON, Thomas [2] ; TENGBLAD, Olof [1] ; Dr. JOHANSSON, Håkan [3]

[1] *CSIC-IEM*

[2] *Chalmers Univeristy*

[3] *Chalmers Univerisity*

Corresponding Author(s): g.ribeiro@csic.es

The current algorithms, to perform the addback summation of the gamma interaction depositing energy in several stages and in several adjacent crystals, search for clusters of energy in crystals, using the one found with most energy to make the Doppler correction.
The present work aim is to first study and obtain the gamma distribution within the crystal ball. In continuation an improved algorithm for the addback will be developed, utilizing weights to the Doppler correction depending upon the different energies deposit in each crystal.

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Quasi-Free Scattering with Neutron-Deficient Carbon Isotopes

HOLL, Matthias[1]

[1] *IKP, TU Darmstadt*

Corresponding Author(s): mholl@ikp.tu-darmstadt.de

The current status of the analysis of quasi-free scattering with neutron-deficient carbon isotopes is presented.

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Simulating cosmic muons in the Crystal Ball - energy calibration possibilities

Ms. THIES, Ronja[1]

[1] *Chalmers University of Technology*

Corresponding Author(s): thies@chalmers.se

Cosmic muons offer good possibilities to calibrate various detectors in the LAND-setup. Moreover, using them does neither require time for calibration runs, nor sources, as data can simply be collected off-spill during measurements. With their help the LAND detector timing offset is already calibrated. Using cosmic muons to calibrate the proton branch of the Crystal Ball is possible as shown by Ref. [1] and [2] and the only reliable opportunity. Muons will be more crucial for detector calibration of R3B. Simulations allow to understand the interactions between detectors and muons. But as the muon intensity distribution is nontrivial, depending both on energy and incidence angle, it is necessary to extend the proof of principle simulation [2] to a simulation taking the intensity distribution and the location of the single crystals in the Crystal Ball into account. With the parametrization of the differential muon flux (depending on energy and incidence angle) given by J. Kempa, this simulation is being realized in the framework of GEANT3 / 4. After successful development the simulation can be used for other detectors. Different muon events correspond to different deposited energies. Applying cuts to single out certain events allows to extract different energy deposits. The necessity of a full-scale simulation of the Crystal Ball and the muon (intensity) spectrum will be illustrated and the present progress presented.

[1] Felix Wamers: Quasi-free Knockout Reactions with the Proton-dripline Nucleus 17Ne. PhD thesis, TU Darmstadt, 2011. [2] Rene Reifarth. Re: opposite Simulation. Personal Communication. 12.08.2010.

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Efficiency calibration of the Crystal Ball

Ms. THIES, Ronja[1]

[1] *Chalmers University of Technology*

Corresponding Author(s): thies@chalmers.se

Three different methods for the efficiency calibration of the gamma branch of the Crystal Ball detector have been automated and tested with the s393/s389 calibration data. The three different methods produce differing results. The causes of the different results have been identified. This leaves one method providing reliable efficiency calibration points at 1.18 MeV and 1.33 MeV for the s393/s389 experiment. Another of those three methods turned out to be promising for future usage with both the Crystal Ball and CALIFA. The three different methods will be briefly introduced, their results presented and finally their different problems and merits discussed.

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α-clustering in the ground states of neutron-rich beryllium isotopes

Mr. BARR, Matthew[1]

[1] *University of Birmingham*

Corresponding Author(s): mrb998@bham.ac.uk

α-clustering is well established in light nuclei, both experimentally and in theoretical models such as Anti-Symmetrised Molecular Dynamics. For example 8Be has been well described as two α-particles. These models also predict the possibility of ground state clustering in the neutron-rich beryllium isotopes, however there is a lack of experimental evidence to support this due to the technical challenge of examining clustering in the ground state. α-clustering has generally been examined by measuring cluster breakup from excited states above the cluster decay threshold; this method cannot therefore be used for the ground state.
To investigate the ground state, the XBe(p, pα) reaction was used in quasi-free kinematics. Quasi-free kinematics is an established technique for examining single particle states via nucleon-knockout. In quasi-free kinematics the centre of mass energy is sufficiently high (200-1000 MeV/nucleon)

that the nucleon-nucleon cross-section is minimal, this means that only the knocked out particle participates in the reaction, and the recoil fragment remains un-excited. As a CH2 target was used, the target proton will recoil significantly and can be detected along with the knocked out α particle. Events can then be selected with an azimuthal separation of roughly 180 degrees between the proton and the α particle. By conversation of momentum, this selection ensures that neither particle was excited by the reaction. By this method clustering in the ground state can be examined.
The result of the investigation will be a comparison between the cross-sections and hopefully angular distributions of α particle knockout, compared to single nucleon knockout. Because neutrons become important in stabilising the clustered system, the relationship between clustering and neutron number will also be investigated.
The analysis is currently at the stage of refining the reaction channel. The incoming detectors can be used to isolate the desired isotope of beryllium. The double sided silicon strip detectors are mostly calibrated. These can be used to identify and measure the recoiling proton and α particle. The crystal ball is being investigated as a means of improving identification and measurement of these particles. This is of greater importance, since some of the silicon detectors are not operational.
The analysis is on-going.

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Calibration status s393

Ms. PALOMA, Diaz[1]

[1] *University of Santiago de Compostela*

Corresponding Author(s): paloma.diaz.fdz@gmail.com

Results of the calibration of the incoming and outgoing heavy ion branch detectors for the experiment s393 will be presented. Open questions that are still remaining for the case of the incoming beam will be shown for discussion. Results for the heavy ions will be displayed focusing in the TFW to crosscheck results. The efficiency evaluation and calibration of Crystal Ball has been started as well. Preliminary results will be shown.

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Crystal Ball gamma energy calibration for s393

Mrs. MOSTAZO CARO, Magdalena[1]

[1] *PhD Student, University Santiago de Compostela, Spain*

Corresponding Author(s): magdalena.mostazo@rai.usc.es

Within the s393 experiment, a 4pi gamma detector (known as Crystal Ball), consisting of an array of 162 NaI crystals surrounding the reaction target, is used for measuring the gamma rays emitted by the de-exciting fragment after quasifree reactions. During the gamma energy calibration stage of this detector, we performed some changes in the already known scripts used for this matter, due to the fact that we discovered gain-dependent jumps in the peaks delivered by some crystals. Besides, we found out that the calibration parameters varied along the experiment. To minimize the effect of this latter, we used the LT_RANGE function implemented in land02 for enhancing the choice of parameters for Crystal Ball measurements. The study of the background peaks in data runs acquired between calibration runs allows us to decide which set of calibration parameters to use for a specific run. Comparison with the usual technique of choosing the average value of the calibration parameters will also be shown.

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Calibration of drift chambers

Mr. NAJAFI, Mohammad Ali[1]

[1] *KVI, University of Groningen*

Corresponding Author(s): m.najafi@rug.nl

In the s393 experiment, the momentum distribution of the knocked-out protons is of crucial importance. Determination of this distribution in the current setup depends on the trajectory of the protons after the ALADIN magnet. For this reason, two drift chambers are used to measure the position of the knocked-out protons. In this presentation, I will report on the calibration of the drift chambers as well as the proton track reconstruction.

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Fun with gammas

Mr. JOHANSSON, Håkan[1]

[1] *Fundamental Physics, Chalmers*

Corresponding Author(s): h.johansson@gsi.de

The workflow of the calibration-reconstruction loop with land02 will be illustrated by the gamma1 and gamma2 programs. The determination of the activity of a calibration gamma source by using random coincidences will be used as particular example.

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Incoming detectors and SSTs Calibration Status, S393 experiment

HENRIQUES, Ana[1]

[1] *Centro de Física Nuclear da Universidade de Lisboa*

Corresponding Author(s): anah@cii.fc.ul.pt

I aim at presenting the status of the calibration of the incoming detectors and the Silicon strip tracker systems for the s393 experiment.

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TFW and GFI calibration status

Mr. VELHO, Paulo[1]

[1] *CFNUL - University of Lisbon*

Corresponding Author(s): pvelho@cii.fc.ul.pt

I aim at presenting the current status of the calibration of the detection systems TFW and GFI for experiment s393.

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Particle Identification with Incoming Beam using S8 and POS Detectors

ATAR, leyla[1]

[1] *gsi*

Corresponding Author(s): l.atar@gsi.de

This work presents the analyzing of the run file 480 with a secondary beam 24O at the energy 490 AMeV using the time of flight between S8 and POS detectors. In order to explain the strange structure in the plot charge vs. mass (which appears as column in the middle and at the end of the plot) a script for the charge identification has been written. By switching off one of the photomultiplier of S8 the fragments are reconstructed and compared with the results of Land02.

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Distance Measurement and Incoming ToF Analysis

HEINE, Marcel[1]

[1] *TU Darmstadt*

Corresponding Author(s): m.heine@gsi.de

Results of a photogrametric distance measurement performed with V.Volkov will be presented. This includes detector positions and resolutions obtained, but also a sketch of the measuring method. Furthermore the study of the double-hump structure of the incoming-ToF of nuclei in several A/Z-settings will be discussed as well as the conclusions drawn.

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The land02 framework

Corresponding Author(s): d.rossi@gsi.de

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SST calibration

Corresponding Author(s): mholl@ikp.tu-darmstadt.de

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Corresponding Author(s): r.plag@gsi.de

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Incoming tracking

Corresponding Author(s): m.heine@gsi.de

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Tracking of heavy fragments and protons

Corresponding Author(s): r.plag@gsi.de

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Tracker demonstration

Corresponding Author(s): r.plag@gsi.de

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R3BROOT simulation for Crystal Ball

Corresponding Author(s): paloma.diaz.fdz@gmail.com