Strahlasymmetrie Σ sind wichtig zur Extraktion der Resonanzparameter aus den Daten mittels einer Partialwellenanalyse.
Im Vortrag werden neue Ergebnisse zur Messung der Strahlasymmetrie Σ für die Reaktion $\vec{\gamma}p \rightarrow p\pi^0\eta$ bis zu einer Photonenergie von 1600 MeV vorgestellt.

Gefördert durch die Deutsche Forschungsgemeinschaft (SFB/TR16)

HK 36: Kern- und Teilchen-Astrophysik

Zeit: Donnerstag 16:30–19:00 Raum: 2B

Gruppenbericht HK 36.1 Do 16:30 2B

Status and perspectives of the LUNA experiment at Gran Sasso/Italy — •Daniel Bemmerer[1], Ralf Kunz[2], Michele Marta[1], Claus Rolfs[2], Frank Strieder[2], and Hanns-Peter Trautvetter[2] for the LUNA-Collaboration — [1]Forschungszentrum Dresden-Rossendorf, 01328 Dresden, Germany — [2]Institut für Experimentalphysik III, Ruhr-Universität Bochum, Bochum, Germany

The Laboratory Underground for Nuclear Astrophysics (LUNA) in the Gran Sasso underground facility, Italy, has been designed to measure low cross sections for astrophysical purposes. The ^{3}He(α,γ)^{7}Be study at LUNA has now been completed, and the final data will be shown here. During the year 2007, two measurement campaigns have been performed: First, a precision study of ground state capture in the ^{14}N(p,γ)^{15}O reaction with an impact on solar ^{13}N and ^{15}O neutrinos (contribution by M. Marta). Second, a study of the ^{25}Mg(p,γ)^{26}Al reaction producing radioactive ^{26}Al, a tracer of live nucleosynthesis in our galaxy (contribution by F. Strieder).

The scientific program for the next years at the current LUNA 400 kV accelerator includes the study of the ^{2}H(α,γ)^{6}Li reaction for big-bang nucleosynthesis and the study of the ^{15}N(p,γ)^{16}O reaction and several other reactions of the CNO cycles. Feasibility studies on selected cases will be presented.

The scientific program for the proposed new LUNA 3 MV accelerator will be discussed.

Gruppenbericht HK 36.2 Do 17:00 2B

Progress in determining keV neutron cross sections with AMS — •Iris Dillmann[1,2], Anton Wallner[3], Georg Rugel[2], Laurent Coquard[4], Stephan Walter[1], Franz Käppeler[1], Oliver Forstner[3], Robin Golser[3], Alfred Priller[3], Peter Steier[3], Thomas Faestermann[2], Klaus Knie[5], Gunther Korschinek[2], and Michael Poutivsev[2] — [1]Institut für Kernphysik, Forschungszentrum Karlsruhe, Postfach 3640, D-76021 Karlsruhe — [2]Physik Department, Technische Universität München, D-85747 Garching — [3]Vienna Environmental Research Accelerator, Institut für Isotopenforschung und Kernphysik, Universität Wien, A-1090 Wien — [4]Technische Universität Darmstadt, Institut für Kernphysik, D-64289 Darmstadt — [5]Gesellschaft für Schwerionenforschung, D-64291 Darmstadt

This status report deals with the progress in the measurements of keV-neutron cross sections with a combination of the activation technique and accelerator mass spectrometry. The neutron activations were done at the Karlsruhe 3.7 MV Van de Graaff accelerator using the ^{7}Li$(p,n)^7$Be neutron source, and the subsequent AMS measurements performed at the VERA facility in Vienna and the Maier-Leibnitz laboratory in Munich. The (n,γ) cross sections of ^{9}Be, ^{13}C, ^{235}U, and the ^{14}N(n,p) reaction were activated with a quasi-stellar neutron distribution of kT=25 keV and with monoenergetic neutron beams of 140, 220, and 500 keV. Further (n,γ) measurements on ^{35}Cl, ^{40}Ca, ^{54}Fe, ^{58,62}Ni, and ^{78}Se were performed at kT=25 keV and will be compared to previous TOF measurements.

HK 36.3 Do 17:30 2B

Messung der niederenergetischen Resonanzen der Reaktion ^{25}Mg(p,γ)^{26}Al — •Frank Strieder[1], Ralf Kunz[1], Hanns-Peter Trautvetter[1], Claus Rolfs[1], Daniel Bemmerer[2] und Michele Marta[2] für die LUNA-Kollaboration — [1]Institut für Physik mit Ionenstrahlen, Ruhr-Universität Bochum, Germany — [2]Forschungszentrum Dresden-Rossendorf, 01328 Dresden, Germany

Die Kernreaktion ^{25}Mg(p,γ)^{26}Al ist die langsamste Reaktion des Mg-Al-Zyklus und verantwortlich für die Produktion des radioaktiven Isotops ^{26}Al. Der Grundzustand von ^{26}Al zerfällt über einen β^+-Zerfall oder Elektroneneinfang in den ersten angeregten Zustand von ^{26}Mg, der wiederum über die Emission eines 1.809 MeV γ-Quants in den Grundzustand übergeht. Diese γ-Strahlung kann mit Satelliten-Teleskopen beobachtet werden, wodurch man Informationen über die Art der galaktischen Produktionsstätten des ^{26}Al erhält und somit auch Hinweise auf die astrophysikalischen Szenarien.

Im Rahmen der LUNA Kollaboration wurden die astrophysikalisch relevanten Resonanzen der Reaktion ^{25}Mg(p,γ)^{26}Al bis zur Energien unterhalb von 100 keV über Gammaspektroskopie mit verschiedenen Detektoren im Gran Sasso Untergrundlabor gemessen und die Resonanzstärken bestimmt. Dabei wurde die niederenergetische Resonanz bei E_{cm} = 93 keV zum erstenmal direkt beobachtet. Die Ergebnisse des Experimentes und die astrophysikalischen Auswirkungen werden in diesem Vortrag diskutiert.

Diese Projekt wird unterstützt von der Deutschen Forschungsgemeinschaft (DFG-Ro429/41)

HK 36.4 Do 17:45 2B

Microscopic calculation of phase shifts and astrophysical S-factors using fermionic molecular dymamics — •Robert Cussons — Gesellschaft für Schwerionenforschung, Planckstr. 1, 64291 Darmstadt, Germany

Scattering states have been calculated in a microscopic and unified way using Fermionic Molecular Dynamics. The realistic Argonne-V18 interaction was transformed into a phase shift equivalent effective interaction, V_{UCOM}, by using the Unitary Correlation Operator Method to include short range correlations. Both ground states of the nuclei in the incoming and outgoing channels and the phase shifts were calculated microscopically for the elastic scattering reactions: $^4He(n,n)^4He$ and $^3He(\alpha,\alpha)^3He$. The S-factor for the reaction $^3He(\alpha,\gamma)^7Be$, which is of astrophysical interest in the ppII chain, is compared to data.

HK 36.5 Do 18:00 2B

Precision study of the ^{14}N(p,γ)^{15}O reaction at LUNA — •Michele Marta[1], Daniel Bemmerer[1], Ralf Kunz[2], Claus Rolfs[2], Frank Strieder[2], and Hanns-Peter Trautvetter[2] for the LUNA-Collaboration — [1]Forschungszentrum Dresden-Rossendorf, 01328 Dresden, Germany — [2]Institut für Experimentalphysik III, Ruhr-Universität Bochum, Bochum, Germany

The rate of the hydrogen-burning CNO cycle is controlled by the slowest reaction, ^{14}N(p,γ)^{15}O. 15-30% of the total cross section are contributed by radiative capture to the ground state in ^{15}O. Previous extrapolated S-factors for this ground state contribution disagree by a factor 2. The precision of those previous studies had been limited by a sizable true coincidence summing correction. In a new experiment using a segmented Clover detector deep underground at LUNA, the summing correction has been reduced by a factor 30, so existing R-matrix fits can now be precisely tested. The present data enable a direct measurement of the metallicity at the center of the Sun by detecting solar CNO neutrinos, for example at Borexino.

HK 36.6 Do 18:15 2B

The Study of ^{3}He(α,γ)^{7}Be with a Recoil Separator — •Antonino DiLeva[1,2], Ralf Kunz[1], Claus Rolfs[1], Frank Strieder[1], and Lucio Gialanella[2] — [1]Institut für Physik mit Ionenstrahlen, Ruhr-Universität Bochum, Germany — [2]INFN Napoli, Italy

The ^{3}He(α,γ)^{7}Be reaction plays an important role in the interpretation of the solar neutrino experiments, since the estimate of the total neutrino flux relies on the solar neutrino spectrum, calculated by solar models. The high energy component in this spectrum is mainly produced by the decay of ^{7}Be and ^{8}B. Moreover, the uncertainty in the ^{3}He(α,γ)^{7}Be cross section is one of the largest uncertainty in the predicted primordial ^{7}Li abundance in Big Bang Nucleosynthesis calculations.

Previous measurements of the ^{3}He(α,γ)^{7}Be cross section have been performed detecting the capture γ-rays or, alternatively, measuring the activity of the synthesized ^{7}Be. An alternative approach uses the ERNA recoil separator at the 4MV tandem accelerator at the Ruhr-Universität Bochum to detect directly the ^{7}Be reaction products and, additionally, the coincident detection of the capture γ-rays. The results