HK 51 Kern- und Teilchen-Astrophysik

Zeit: Donnerstag 17:00–18:30 Raum: E

HK 51.1 Do 17:00 E

Neutron studies on hafnium: s abundances and r residuals — •Franz Käppeler[1], Saed Dababneh[1], Iris Dillmann[1], Michael Heil[1], Friedrich Voss[1], Nicolas Winckler[1], Klaus Wisshak[1], Christoph Vockenhuber[2], Walter Kutschera[3], Anton Wallner[3], Max Bichler[4], Leonid Kazakov[5], Frantisek Bečvář[6], Milan Krtička[6], Roberto Gallino[7], and Marco Pignatari[7] — [1]Forschungszentrum Karlsruhe, D-76021 Karlsruhe, Germany — [2]TRIUMF, 4004 Wesbrook Mall, Vancouver, Canada — [3]Universität Wien, A-1090 Wien, Austria — [4]Atominstitut der Österreichischen Universitäten, A-1020 Wien, Austria — [5]IPPE Obninsk, Kaluga-Region, Russia — [6]Charles University, CZ-180 00 Prague, Czech Republic — [7]Università di Torino and Sezione INFN di Torino, I-10125 Torino, Italy

The stellar (n,γ) cross sections of the stable Hf isotopes have been determined by comprehensive time-of-flight measurements with the Karlsruhe 4π Barium Fluoride Detector. These results were obtained with uncertainties between 0.9% and 2.6%, five times smaller than in previous experiments. Partial cross sections to ground and isomeric states could be experimentally identified for neutron capture on ^{176,177,178,179}Hf, indicating a strong population of yet unknown isomeric states in ^{177}Hf and ^{180}Hf. Additional measurements were carried out via activation on ^{174}Hf and on the unstable isotope ^{182}Hf in a quasi-stellar neutron spectrum for $kT = 25$ keV. Based on these results the implications arising from the improved separation of the solar s- and r-process components are discussed.

HK 51.2 Do 17:15 E

Asymmetric neutrino emission in quark matter and pulsar kicks — •Irina Sagert and Jürgen Schaffner-Bielich — Institut für Theoretische Physik, Johann Wolfgang Goethe-Universität, Max-von-Laue-Straße 1, 60438 Frankfurt am Main, Germany

The direct Urca process in quark matter is tested for asymmetric neutrino emission due to a strong magnetic field. The results are applied to neutron stars with quark cores. To create a possible propulsion mechanism for the neutron stars due to the asymmetric neutrino emission we give constaints on the neutron star's temperature, magnetic field strength and electron chemical potential by considering fully spin-polarized electrons and neutrino mean free paths.

HK 51.3 Do 17:30 E

The ^{15}N(p,α)^{12}C reaction reexamined at astrophysical energies — •Daniel Bemmerer[1,2], Peter Heide[1], Rolf Hellhammer[1], and Falk Reinhardt[1] — [1]Institut für Atomare Physik und Fachdidaktik, Technische Universität Berlin, Germany — [2]Istituto Nazionale di Fisica Nucleare, Sezione di Padova, Italy

The branching between the ^{15}N(p,γ)^{16}O and the ^{15}N(p,α)^{12}C reactions determines the relative rate of the hydrogen burning CNO cycles I and II, respectively. As a first step for a new measurement of the ^{15}N(p,α_0)^{12}C cross section at astrophysical energies, angular distributions have been measured for $E = 60$–140 keV. The prospectives for a future direct, absolute measurement of this cross section at energies of stable hydrogen burning in stars will be discussed.

HK 51.4 Do 17:45 E

Absence of local diquark-gluon interactions in color superconductivity — •Jorge Noronha[1], Hai-cang Ren[2,3], Ioannis Giannakis[2], Defu Hou[3], and Dirk Rischke[1,4] — [1]Frankfurt Institute for Advanced Studies, J.W. Goethe-Universität, D-60438, Frankfurt am Main, Germany — [2]Physics Department, The Rockefeller University, 1230 York Avenue, New York, NY 10021-6399, USA — [3]Institute of Particle Physics, Huazhong Normal University, 430079 Wuhan, China — [4]Institut für Theoretische Physik,J.W. Goethe-Universität, D-60438, Frankfurt am Main, Germany

We have consistently calculated the effects of gauge field fluctuations on the free energy of a homogeneous CFL color superconductor in the Hartree-Fock approximation. We numerically evaluated the temperature of the fluctuation induced first-order phase transition and the discontinuity of the diquark condensate at the critical point. The superheated (supercooled) temperature and the latent heat associated with the first-order phase transition were also obtained. We found that the absence of the London limit of magnetic interactions in color superconductivity is a striking new physical consequence of the long-range interaction mediated by magnetic gluons. The crossover from non-local to local interactions near the critical temperature in superconducting metals has been recently measured. Our results rule out the possibility of observing such a crossover in color superconductors.

HK 51.5 Do 18:00 E

Electromagnetic design calculations for the KATRIN experiment — •Ferenc Glück for the KATRIN collaboration — Universität Karlsruhe (TH), Institut für Experimentelle Kernphysik, 76131 Karlsruhe

The purpose of the KATRIN experiment is to determine the absolute neutrino mass with 0.2 eV sensitivity, by measuring the integral electron energy spectrum near the endpoint of tritium beta decay. Electric retardation with magnetic adiabatic collimation is used for the spectrum measurement, thus one can obtain optimal conditions for statistics, energy resolution and background (for detailed description see: KATRIN Design Report 2004, http://www-ik.fzk.de/~katrin.index.html). We summarize in our talk the methods and results of various electromagnetic calculations needed for the optimal design of the experiment: electric field calculations (with wire electrodes); magnetic field calculations of superconducting and air coils, and of magnetic materials (f.e. steel in the building); trajectory calculations of electrons in static electromagnetic field, with high accuracy and small computer time.

HK 51.6 Do 18:15 E

Ergebnisse des KATRIN Vorspektrometers — •Joachim Wolf für die KATRIN-Kollaboration — Universität Karlsruhe (TH), Institut für experimentelle Kernphysik

Die Skala der absoluten Neutrinomassen ist von fundamentaler Bedeutung für die Kosmologie und die Astroteilchenphysik. Die Bestimmung dieser Skala stellt daher eine vordringliche Aufgabe für die experimentelle Neutrinophysik der kommenden Jahre dar. Das KArlsruhe TRItium Neutrinomassenexperiment ist ein Tritiumzerfallsexperiment der nächsten Generation, das es erlaubt, die Sensitivität bei der Suche nach der Neutrinomasse um eine Größenordnung zu verbessern. KATRIN basiert auf der Kombination einer fensterlosen molekularen Tritiumquelle hoher Luminosität und einem hochauflösenden System von zwei elektrostatischer Retardierungsspektrometern (MAC-E-Filtern). Das KATRIN Experiment erreicht nach 3 Jahren Meßzeit eine Sensitivität von $m_\nu < 0,2$ eV/c^2 (90%CL).

Der Vortrag gibt einen Überblick über Messungen mit dem Vorspektrometer, das als Prototyp für das im Bau befindliche Hauptspektrometers dient, das mit einem Volumen von $1400m^3$ und einem angestrebten Druck von $10^{-11}mbar$ zu den größten Ultrahochvakuumtanks der Welt zählt. Teilweise gefördert vom BMBF unter den Förderkennzeichen 05CK1VK1/7, 05CK1UM1/5 und 05CK2PD1/5