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Pionic Hydrogen: Precision Spectroscopy

W.H. Breunlich[1], M. Cargnelli[1], B. Gartner[1], M. Giersch[1], A. Gruber[1], R. King[1], B. Lauss[2], J. Marton[1], M. Stifter[1], R. Ursin[1], J. Zmeskal[1], et al.[3]

[1]IMEP, ÖAW, Vienna; [2]IMEP, on leave at LNFrascati; [3]Aarhus Univ.; Inst. of Nucl. Research, Hung. Acad. of Sci.; Univ. Joannina; FA Jülich; Univ. Leicester; Univ. Neuchatel; EISI-St.Imier; Univ. P. et M. Curie; PSI; ETH Zurich; Univ. Zurich.

An experimental program to measure the width and shift of the K-alpha x-ray line of pionic hydrogen is being conducted at PSI. Due to the unprecedented precision of the measurement a new level of sensitivity will be reached for tests of chiral perturbation theory calculations of the pion nucleon scattering length. A cyclotron trap, a cryogenic target and a bent crystal spectrometer with CCD detector system will be used. Major components of the experimental setup are under development at IMEP/Vienna, in particular a new light weight gas target which is presented.

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Simulation of Antiproton Transport in the ATRAP Beam Detector and Moderator

W.H. Breunlich[1], M. Cargnelli[1], H. Fuhrmann[1], A. Gruber[1], R. King[1], R. Ursin[1], J. Zmeskal[1], et al.[2]

[1]IMEP, ÖAW, Vienna; [2]Univ. Bonn; Harvard Univ.; MPI Quantenoptik; IKP/KFA Julich.

For the formation of antihydrogen atoms, antiprotons extracted from the AD/CERN are moderated to very low energies before being captured in a trap. In this energy range the Barkas effect contributes significantly. This effect is accounted for by introducing a Z to the third power term into the Bethe-Bloch formula for the stopping power. In our present work we introduce such a correction term in a simulation of antiproton transport. A precise simulation is essential to select moderator properties for optimal slow antiproton yield.

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Hard photons: Production mechanisms and nuclear dynamics in intermediate energy heavy ion collision

C. Agodi

Istituto Nazionale di Fisica Nucleare, Roma, Italy

The occurrence in the photon spectra of a component between 30 and 50 MeV with inverse slope parameter smaller than the one expected in the first chance neutron - proton bremsstrahlung hypothesis is investigated in heavy ion collisions at intermediate energy.

The experiment has been performed at Laboratori Nazionali del Sud using the coupled MEDEA[1] and MULTICS[2] multidetectors arrays. The simultaneous detection of gamma-rays , light charged particles, IMF's and PLF's with high
efficiency and granularity allows a good characterization of the reaction events. $^{58}Ni+^{27}Al$ at 30A MeV and
$^{58}Ni+^{197}Au$ at 30A and 45A MeV reactions have been studied. The experimental photon spectra can actually be described as the superposition of two exponential components with significantly different slopes. From the comparison
between the three reactions the mass and incident energy dependence of this phenomenon has been deduced.
Several observables have been studied to point out a possible different origin of high energy photons in selected energy bins. The interplay between photon production and particle emission has also been investigated.
[1] - E.Migneco et al. , Nucl.Instrum.Methods A314(1992)31.
[2] - I.Iori et al., Nucl.Instrum.Methods A325 (1993)458.

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The CMS First-Level Trigger

M. Brugger, J. Eroe, M. Fierro, P. Porth, H. Rohringer, L. Rurua, H. Sakulin, A. Taurok, H. Woehri, C.-E. Wulz

Institut für Hochenergiephysik der Österreichischen Akademie der Wissenschaften, Nikolsdorfergasse 18, A-1050 Wien

The trigger is one of the crucial components of experiments at the CERN Large Hadron Collider. CMS will receive proton-proton collisions with a rate of 40 MHz. Only about 100 events per second will be written to mass storage. This reduction is achieved in several steps. The initial step is a custom designed electronics system, the First-Level Trigger, which has to decrease the rate to 100 kHz. The Higher Level Triggers are performed by a commercial processor farm. The complete First-Level Trigger system is presented. Austria's Institute for High Energy Physics is responsible for the construction of the Global Trigger Processor and the Muon Trigger Track Finder in the central region. Special emphasis will be given to these two items.