



DEPARTMENT OF NUCLEAR REACTIONS

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OVERVIEW:

This year 1999 can be considered as very successful. Not only that we have published 33 papers in journals listed by the Philadelphia Institute of Science but because our hard work allowed us to obtain new and exciting results.

A group of theoretical papers concerned with application of correlation among random matrices elements developed for statistical aspects of nuclear coupling into continuum to study of the collective effects in brain activity and stock market dynamics. These papers arose quite an interest and got several citations.

Studies of the nonpartonic components in the nucleon structure function led to better understanding of the higher-twist effects. It was shown that inclusion of the terms of the order of $1/Q^4$ improves fits to the experimental data. A review paper summarizing results on the role of the leading baryon in high energy reactions appeared in Progress on Nuclear and Particle Physics.

Studies on multistep transfer reactions of light heavy ions in collaboration with the Institute of Nuclear Physics of the Ukrainian Academy of Sciences in Kiev have explained angular distributions of many reactions using the coupled channel theory. We have shown that it is possible to determine energy dependence of the optical model potential for such unstable nuclei like ^8Be .

Further studies of mechanism of near threshold light meson production in collaboration with Jülich and Jagiellonian University were performed. Within COSY 10 and COSY 11 collaborations new data on the isospin symmetry breaking in pionic reactions and strange meson accompanied by hyperons emission were obtained.

Together with colleagues from the Flerov Nuclear Reaction Laboratory we have started experiments with radioactive beams. Using magnetic separator COMBAS velocity distributions of isotopes with $2 \leq Z \leq 11$ in reactions induced by ^{16}O on ^9Be were obtained. At the high resolution radioactive beam channel ACCULINA reactions induced by ^6He and ^8He nuclei were studied.

Muon catalysed dd fusion in solid deuterium at the temperature 3K was studied using $dd\mu$ formation cross-sections previously calculated.

Construction of the Forward Wall detectors for the CHIC collaboration at the CELSIUS Synchrotron is described. First tests of the Phoswich detectors were performed. A new Bragg ionization chamber for studies of spallation reactions induced by cosmic protons was manufactured in collaboration with the Jagiellonian University and tested using light heavy ion beams from the Tandem accelerator in Catania.

Coalescence model analysis was applied to explain spectra of light nuclei emitted in heavy ion induced reactions at 47 AMeV. This work was done in collaboration with Texas A&M University and the Jagiellonian University. We have also joined the Brahms collaboration at RHIC.

Measurements of the transverse polarization of positrons emitted from the decay of polarized muons were performed in collaboration with ETH Zürich and Paul Scherrer Institute. The aim was to study time reversal invariance of weak interaction.



Professor Andrzej Budzanowski