

II. REPORTS ON RESEARCH



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1 DEPARTMENT OF NUCLEAR REACTIONS

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Overview

It is surprising how so few under-paid scientists could do so much. During 2004 the number of papers published or being in press exceeded fifty, making almost three papers per person employed in our department. Furthermore, among these papers one was published in *Nature*, the World's highest-ranked scientific journal. This is a result that will be difficult to beat. It is my pleasure to mention that one of our PhD students, Mr Sergiy Mezhevych, won a prestigious Heavy Ion Laboratory Prize founded by Prof. Inamura, for his experimental work using a beam from the Warsaw Cyclotron.

Thanks to the effort of our colleagues the Hermes Collaboration Meeting organized by IPJ in Kazimierz Dolny (June 25 – July 1) turned out a success.

The following short reports cover the three major domains of our scientific activities: nuclear, materials and atomic physics.

- Nuclear physics

The structure of light nuclei, including exotic radioactive isotopes, was investigated both experimentally and theoretically. Some experimental studies were performed at the Heavy Ion Laboratory of Warsaw University in collaboration with scientists from the Institute of Nuclear Research in Kiev, Ukraine. The two reports present interesting results for the rare carbon isotope, ^{14}C .

In the framework of Feshbach, Kerman and Koonin theory the multistep emission of one particle as well as more complicated direct processes were studied. It was found that these more complex processes play an important role in proton induced reactions.

Experimental data from projectile-multifragmentation experiments with stable and radioactive beams were analysed. Some preliminary results are presented.

Using a proton beam provided by the C-30 compact cyclotron at Świerk, detectors consisting of a PWO scintillator coupled to avalanche photodiodes were tested. The aim of these tests was to find the best detectors for the large electromagnetic calorimeter which will be used in future PANDA Collaboration experiments.

In the series of four short contributions, recent experimental results from the HERMES Collaboration are presented. Particularly important are the results on the quark transverse spin polarisation in the nucleon. The Hermes experiments have found evidence of nonvanishing quark transverse polarisation and have provided an indication for a nonzero orbital angular momentum of quarks in the nucleon.

- Atomic physics

The L-shell ionisation cross sections for atoms of some heavy elements were measured. The results are presented and compared to different model calculations.

- Materials research

Our group of scientists performed many experimental studies using low-energy p -, d - and α - beams from the van de Graaff accelerator of the Department which were commissioned by other institutions. In this Annual Report the results of experiments devoted to studying damage buildup and recovery of compound semiconductors are presented. The experiments were performed at the Friedrich Schiller University of Jena, in collaboration with local scientists.

Our involvement in education and science popularization has become a tradition. Students of Warsaw High Schools and of Warsaw University attended in 2004 many lectures given by Dr. Andrzej Korman & Dr. Lech Nowicki on nuclear physics, accelerators, detectors and nuclear methods in solid state physics.

Our contribution to the 8th Scientific Picnic and the 11th Science Festival is also worth mentioning.