

## 6. DEPARTMENT OF HIGH ENERGY PHYSICS

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### Overview

The main activities of the Department can be grouped into four parts:

#### I. An ongoing analysis of data from large accelerator facilities

At CERN SPS:

The Compass experiment, 'a flagship of the CERN fixed target program', studies the structure of the nucleon. Gluon polarization analysis was the main subject this year. Compass is an active experiment, and there is an ongoing effort in data taking and detector development.

Two heavy ion experiments, WA98 and NA49, have finished data taking, but continue analysis. In 2008, important results on transverse momentum spectra were published.

At COSY:

The WASA experiment works with low energy (up to 3.7 GeV) beams of protons and deuterons, studying rare decays of eta mesons. New limits on branching ratios for such decays have been determined. This information is important for the theory of C and CP symmetry, and chiral perturbation theory.

#### II. Preparations for soon-to-be-operating experiments at the LHC

Three teams work on LHC experiments: CMS, LHCb and ALICE.

The CMS experiment is ready for data taking. The muon trigger system, based on resistive plate chambers RPC, has been installed and tested using cosmic ray muons.

Simulations of physical processes predicted by some extensions of the Standard Model were performed.

The LHCb experiment team has worked on the system of the Inner Detector positioning station Rasnik, and the beam phase and intensity monitor (together with a P-III team). Simulations of the B decays into vector mesons, for the High Level Trigger, were performed.

The ALICE team has worked on the installation of the photon detector PHOS and tests with cosmic muons. Simulations of neutral pion reconstruction were performed.

Preparation of the computing base for future large experiments – work within the Worldwide LHC Computing Grid was actively pursued by a dedicated team.

In 2008, many activities were directed at information and popularization of LHC physics. Our department members actively participated in the special Open Symposium on Elementary Interactions in the LHC Era (April 2008), several high school lectures and an exhibition, accompanied with lectures, organized at the Warsaw Technical University.

#### III. Preparations for neutrino physics experiments

The neutrino team works on preparations for the T2K experiment, which will study neutrino oscillations. Local work concentrates on the Side Muon Range Detector, part of the near detector ND280. This involves calculations of the trigger rates, simulations for the multi pixel photon counters and participation in electronics tests. Participation in the CERN SPS NA61 experiment, already active, will serve for the determination of cross sections for hadron-nucleus processes, important for neutrino physics.

#### IV. There is an opening into future diffraction physics experiment at RHIC, starting with participation in test runs of polarized proton beams.

A future oriented project is an involvement in the studies of the MAPS vertex detector, for the ILC collider.

Twelve PhD students work under the supervision of our department members. One degree was granted in 2008.

*Helena Białkowska*