

7 DEPARTMENT OF COSMIC RAY PHYSICS



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Overview

The Department of Cosmic Ray Physics in Łódź is involved in basic research in the area of high-energy physics and cosmic ray physics related to:

- Experimental and phenomenological studies of Extensive Air Showers induced by cosmic ray particles.
- Studies of ultra-high energy (above 10^{19} eV) cosmic rays: determination of energy spectrum and mass composition of primary particles
- Studies of asymptotic properties of hadronic interactions based on the analysis of cosmic ray propagation through the atmosphere.
- Studies of mass composition of cosmic rays in the energy range 10^{15} - 10^{17} eV.
- Registration of cosmic ray intensity variation correlated with solar activity.

Theoretical and experimental studies of Extensive Air Shower properties are performed mostly based on the results obtained by the Łódź Extensive Air Shower Array. We have noticed unexplainable delayed signals registered about 500-900 microseconds after the main EAS pulse. We prepared hardware for further experimental study of this effect.

Continuous registrations of 5 GeV muon flux with the underground muon telescope have been carried on during 2001. We detected several changes of muon intensity correlated with Forbush decreases registered at lower energies. We have also started registration of the muon counting rate in on-surface scintillation detectors. These measurements will be included to the analysis of the disturbed energy spectrum of primary cosmic rays and its dependence on interplanetary disturbances related to solar activity.

In construction and data interpretation of cosmic ray experiments the Łódź group collaborates with many foreign institutes and laboratories: Forschungszentrum in Karlsruhe (Germany), College de France, Institute for Nuclear Studies of the Russian Academy of Sciences, Uppsala University (Sweden) and DESY (Germany).

We have prepared a project of large air shower array for studies of cosmic rays up to 10^{20} eV. Detectors would be placed on the roofs of high schools in Łódź. Using the urban infrastructure (INTERNET, electricity etc.) we can significantly lower the cost of the experiment. The educational effects of the project are very important. The response to the project from the local authorities, school teachers and students was very good.

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