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BEAUTY, CHARM and STRANGENESS of LHCb. (View in Ukraine from the 70 years tower of CERN)

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Some results are presented on the activities of scientists of the Institute for Nuclear Research NAS Ukraine (KINR) within the framework of international collaborations LHCb, MEDIPIX and ENLIGHT (CERN, Geneva), The LHCb Collaboration functions for almost 30 years with the main goal to study the CP violation, in heavy flavor hadrons (beauty, charm) as one of the possible reasons for asymmetric composition of the Universe.. Ukrainian scientists have contributed into building the Silicon tracker as well as Beam & Background monitoring systems developed and built at KINR. Data obtained in the experiment (colliding as well as fixed target mode), on the decay of heavy hadrons allowed to measure their mass, lifetime, oscillation frequencies, ratio of branches of decay, etc. with the most accurate precision or to observe/dicover a phenomenon for the first time in the world (penta quarks, rare decay modes, CPV etc.). Detailed analysis is ongoing for the properties of neutral strange hadrons (V0) produced in p-p and p-Pb collisions at 5.02 and 8.16 TeV. In particular, nuclear modification factors demonstrate interesting dependence on the multiplicity of the final states. By far non-trivial results were obtained in the data analysis of ultra-peripheral production of charmonium in Pb-Pb collisions at the energy of 5 TeV. Looking forward to the running LHCb experiment at the era of HL-LHC with instantaneous luminosity increased by two orders of magnitude compared to the initial one in RUN1. KINR scientists contribute into the LHCb UPGRADE II activity, developing a monitoring system for the on-line observation of the luminosity region.
In terms of technology transfer,an application of micropixel detectors was fulfilled in frames of activity within the MEDIPIX and ENLIGHT Collaborations (CERN), International Associated Laboratory LIA IDEATE (France —Ukraine). Micro-detector systems, including one micrometer thick metal microstrip detectors developed at KINR, have been successfully tested at the Heidelberg Ion Therapeutic Center (HIT, Heidelberg, Germany). “Electronic focal planes”based on micro-pixel (Timepix) detectors have essentially improved performance of the laser mass-spectrometer (IAP NASU, Sumy) as well as Roentgen diffractometer (IPM NASU, Kyiv). For the first time in experiments on low energy nuclear physics micropixel detectors (Timepix) were implemented in correlative studies of the aneutronic fusion reaction, presumably prospective source of the clean production of the energy. The technique of high energy physics experiments poses a challenge to the most modern technologies and encourages the scientific and technological progress of mankind. This area of activity requires the involvement of new intellectual forces, including ones from Ukraine and CERN.
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