An Experiment to Study $\mathcal{CP}$ Violation in the B System Using an Internal Target at the HERA Proton Ring

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Abstract

The **HERA** – B experiment is designed for studying $\mathcal{CP}$ violation phenomena in B system. The physical program of **HERA** – B detector includes the measurements of $\mathcal{CP}$ asymmetries in $\mathrm{B_d} \rightarrow \mathrm{J}/\psi \mathrm{K_S^0}$ and $\mathrm{B_d} \rightarrow \pi^+\pi^-$ decay channels, the measurement of $\mathrm{B_s^0} - \bar{\mathrm{B}}_\mathrm{s}^0$ oscillation strength, search for direct $\mathcal{CP}$ violation phenomena and many other items.

B hadrons are produced in interactions of 820 GeV/c protons with an internal target. The performed measurements have shown that the required target efficiency of about 60% is obtained with two sets of thin (50 μm) target wires introduced into the beam halo.

The **HERA** – B detector is a large acceptance forward spectrometer which combines a good momentum and vertex resolution, electron identification in electromagnetic calorimeter and transition radiation detector, muon identification and hadron identification in RICH detector.

The small $\mathrm{b\bar{b}}$ production cross section, the high rate of background processes and the necessity to operate with several superimposed interactions per HERA bunch crossing result in events with large charge and neutral multiplicities, hard radiation conditions for detector operation and challenge for triggering. A sophisticated multilevel trigger scheme includes the fast selection and estimation of kinematical properties of pairs of leptons and hadrons with high transverse momenta already at first level.

The full commissioning of the **HERA** – B detector is expected in 1999. An overview of physical perspectives of **HERA** – B experiment, detector and trigger technologies, the current status of the detector and the experience gained during the test runs will be reported.