Contribution ID: **127** Type: **Oral contribution**

Search for CP violation in baryon decays at LHCb

Friday, April 21, 2017 11:30 AM (15 minutes)

The phenomenon of CP violation has been observed in the K- and B-meson systems, but not yet in the decay of any baryonic particle. Decays of beauty baryons to final states consisting of hadrons with no charm quarks are predicted to have non-negligible CP asymmetries in the SM, as large as 20% for certain three-body decay modes. The LHCb experiment is collecting unprecedented statistics of beauty baryons allowing for the first time to study CP violation in these decays. A systematic study of CP violation in beauty baryon decays can test the validity of the CKM mechanism in the baryon sector, for example by comparing asymmetries with B meson decays with identical underlying quark transitions. We report on searches for CP violation in baryon decays at LHCb using Run I data. We find evidence for CP violation in $\Lambda b \to p \pi^- \pi^+ \pi^-$ decays with a statistical significance corresponding to 3.3 standard deviations, including systematic uncertainties, which might bring to the discovery of CP violation in the baryon sector with additional statistics. An overview of recent LHCb searches for CP violation in baryon decays will be presented, and also prospects for the future.

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Session Classification: Sessione Frontiera Intensita'

Track Classification: Sessione Frontiera Intensità