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## Search for CP violation in $\Lambda_b \rightarrow p 3\pi$ decays

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CP violation has been established in kaon and B-meson systems, but has yet to be observed in baryonic decays. However, sizeable CP asymmetries of up to 20% are expected in certain beauty baryon decays in the Standard Model. A family of 4-body charmless baryonic decays offer a good theoretical motivation for the observation of CP violation. In this analysis a single decay channel of  $\Lambda_b \rightarrow p 3\pi$  is used. This decay channel is of particular interest, because it propagates through tree and penguin diagrams, proportional to the same order of the Wolfenstein parameter  $\lambda$ , of the CKM matrix, which suggest strong interference between these diagrams. Also this decay has a rich resonance structure that might enhance the CP violation.

Previous analysis of this channel, using a binned Triple Product Asymmetries approach, yielded the first evidence of CP violation in baryon sector with 3.3 sigma significance. An updated analysis is performed on both Run 1 and Run 2 data, collected by the LHCb detector, which corresponds to approximately  $7 \text{ fb}^{-1}$ . This constitutes an approximately sixfold increase in the yield of signal events.

A novel, model independent technique, called the Energy Test is going to be applied alongside the previously used method of Triple Product Asymmetries. This approach allows to test for both, P-even and P-odd contributions to the CP violation and is highly insensitive to detector effects. Together with an optimized binning scheme of the Triple Product Asymmetries method and the increased data sample this analysis has the potential to yield the first observation of CP violation in baryons.

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