

Central Exclusive Production at LHCb

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The installation of scintillating pad detectors (Herschel), bracketing the LHCb detector along the beamline, have significantly enhanced LHCb's sensitivity to central exclusive production. Additionally, dedicated triggers during the early measurement period of Run 2 have produced an extended CEP dataset. A summary of results from Run 1 as well as early results from Run 2 will be shown.

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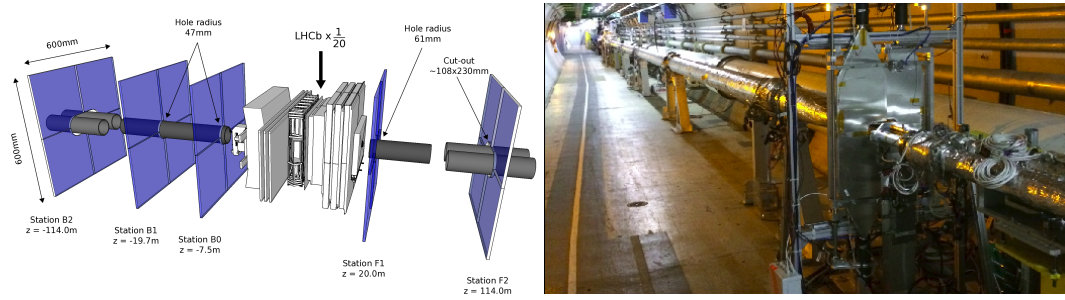


Figure 1: The Herschel detector at the LHCb detector.

Central Exclusive Production (CEP) in pp collisions occurs when colourless propagators are exchanged between the hadrons creating a central system with the colliding protons remaining intact after the interaction. Events are in the form of $pp \rightarrow p + X + p$, where X is reconstructed inside the acceptance of the detector, while $+$ signs indicate a rapidity gap. CEP processes are mediated by different processes (photon-pomeron, pomeron-pomeron and photon-photon) and the LHCb detector provides a clean experimental environment to detect them, with excellent PID and low- P_T capabilities.

1. The Herschel detector [1]

CEP analyses rely on the ability of rejecting diffractive events where the forward fragments of the protons are undetected. In order to increase the pseudorapidity η coverage of the detector, a new sub-detector has been installed for Run-II at the beginning of 2015. The Herschel detector (High Rapidity Shower Counters for LHCb) comprises five planes of 20mm thick scintillators, each divided in four quadrants, increasing the acceptance coverage up to $\eta = 8$ in both forward and backward directions. The Herschel detector is shown in Figure 1.

2. Latest physics results [2]

LHCb has performed measurements of the exclusive differential cross sections in several final states. The poster presents the first measurement of the central exclusive production of J/ψ and $\psi(2S)$ mesons in pp collisions at a centre-of-mass energy of 13 TeV. This analysis is the first published results using the Herschel detector. Backgrounds are significantly reduced compared to previous measurements made at lower energies without the use of the new forward shower counters. Good agreement is observed with theoretical predictions and photoproduction cross-sections are derived and compared to previous experiments.

References

- [1] Akiba, K. and others. The HERSCHEL detector: high-rapidity shower counters for LHCb. [JINST 13 (2018) no.04, P04017].
- [2] Aaij, R. and others. Central exclusive production of J/ψ and $\psi(2S)$ mesons in pp collisions at $\sqrt{s} = 13$ TeV. [JHEP 10 (2018) 167]