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## $V^0$ Production in Proton-Proton Collisions at 7.0 TeV in the LHCb Experiment

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This research investigates the production of  $V^0$  hadrons ( $\Lambda$ ,  $K^0$ ) in high-energy particle collisions using the LHCb detector. By analyzing their characteristic “V-shaped” decay signatures across proton-proton, proton-nucleus, and nucleus-nucleus collision systems, we gain crucial insights into quantum chromodynamics under extreme conditions. Our measurements of differential cross-sections and nuclear modification factors help disentangle cold nuclear matter effects from potential quark-gluon plasma signatures, advancing our understanding of hadronization processes and partial chiral symmetry restoration in dense nuclear environments. Only  $V^0$  decays occurring within the Vertex Locator (VELO), with both daughter tracks fully reconstructed in the forward spectrometer and having momenta  $p > 2$  GeV/c, are considered. Oppositely charged track pairs are retained as potential  $V^0$  candidates if they form a vertex with a fit quality  $\chi^2_{\text{vtx}} < 9$  (with one degree of freedom for a  $V^0$  vertex).  $\Lambda$  candidates are required to have invariant masses within  $\pm 70$  MeV/c<sup>2</sup>, and  $K_S^0$  candidates within  $\pm 100$  MeV/c<sup>2</sup> of their respective PDG values. The differential production cross-sections of  $V^0$  hadrons are measured using the LHCb forward spectrometer in proton-proton (p-p) collisions at  $\sqrt{s} = 7$  TeV, covering a transverse momentum range of  $0.15 < p_t < 10.0$  GeV/c and a rapidity range of  $1.5 < y < 5.5$ . The current work is completed as part of the analysis aimed at measuring Nuclear Modification Factors of  $V^0$  produced in proton-lead collisions at 8.16 TeV. The Fig 1 presents  $V^0$  single differential cross-sections.

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