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Measurements of W boson properties at $\sqrt{s} = 5$ and 13 TeV with the ATLAS detector at the LHC.

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After the discovery of the W and Z bosons at the Super Proton Synchrotron (SPS) at CERN, particles responsible for weak interactions, the efforts have been geared towards measuring their properties. A precise measurement of the W boson properties remains a major test for the validation of the standard model.

In this presentation, the measurement of the W boson transverse momentum p_W^T and the differential cross sections are described. Using low pile-up data set, collected with low number of interactions per bunch crossing, by the ATLAS detector in 2017 and 2018.

- **Measurement of the transverse momentum distribution:** One of the most important theoretical sources of uncertainties in the measurement of the W-boson mass, is the extrapolation of the p^T distribution from Z boson to W-boson (≈ 6 MeV), a direct measurement of p_W^T would avoid such an extrapolation and the corresponding theoretical modelling uncertainty.
- **Measurement of the differential cross sections:** The measurement of the differential cross sections for the W boson provides stringent tests of the QCD theory, and is crucial for a deep understanding and modelling of QCD interactions. Also, the rapidity dependence of the W boson production in the Drell-Yan process provides constraints on the parton distribution functions (PDFs), which are currently the dominant uncertainty source in the W mass measurement (9.2 MeV).

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