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Latest single top cross section measurements in the tW channel at CMS

*November Large Hadron Collider Conference (**LHCC**) – Geneva (Switzerland) – November 2021*

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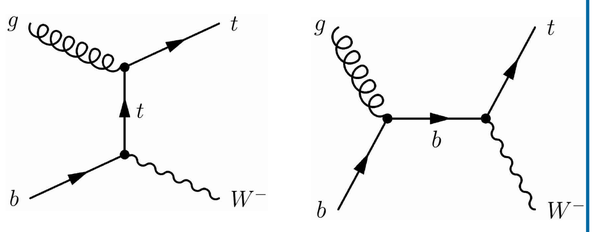
CMS-PAS-TOP-19-003

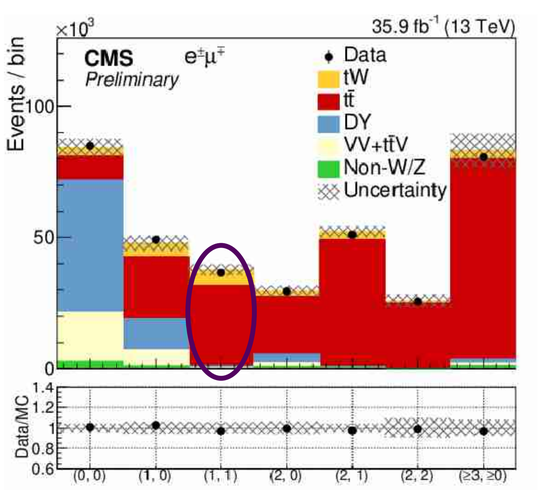
Introduction

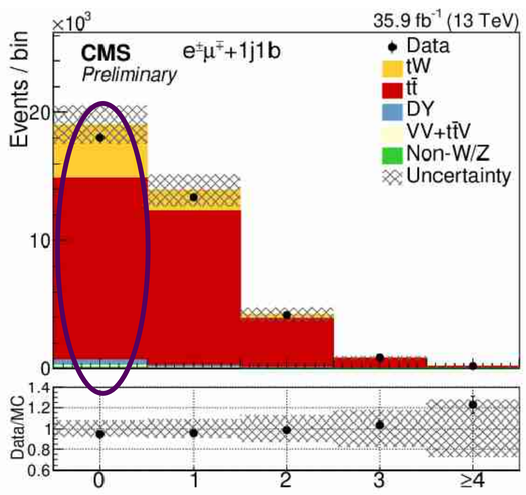
The tW process is one of the main channels for single top quark production.



- At NLO shows **quantum interference** due to shared final states with the pair production diagrams of top quarks.
- Allows to **probe the V_{tb} element** of the CKM matrix.
- Is sensitive to **beyond Standard Model** physics.

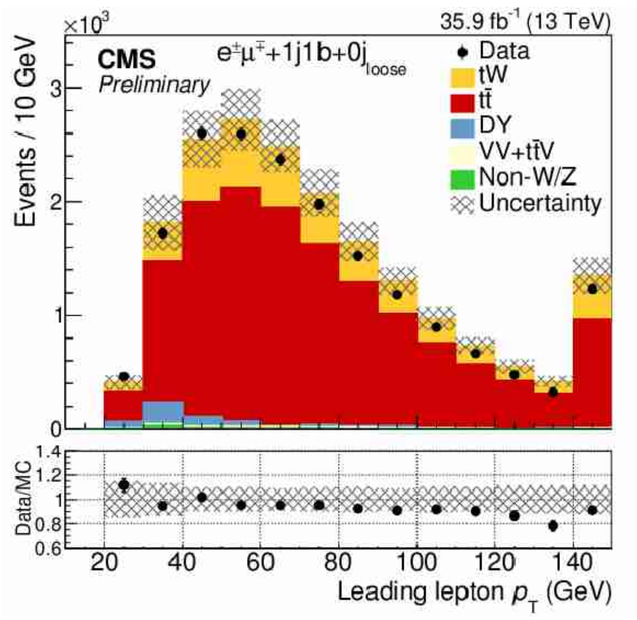
The latest analysis from the CMS Collaboration in this process measures differential cross sections as a function of the leading lepton p_T, jet p_T, $\Delta\varphi(e^{\pm},\mu^{\mp})$, $p_Z(e^{\pm},\mu^{\mp}, j)$, $m(e^{\pm},\mu^{\mp}, j)$ and $m_T(e^{\pm},\mu^{\mp}, j, p_T^{miss})$.





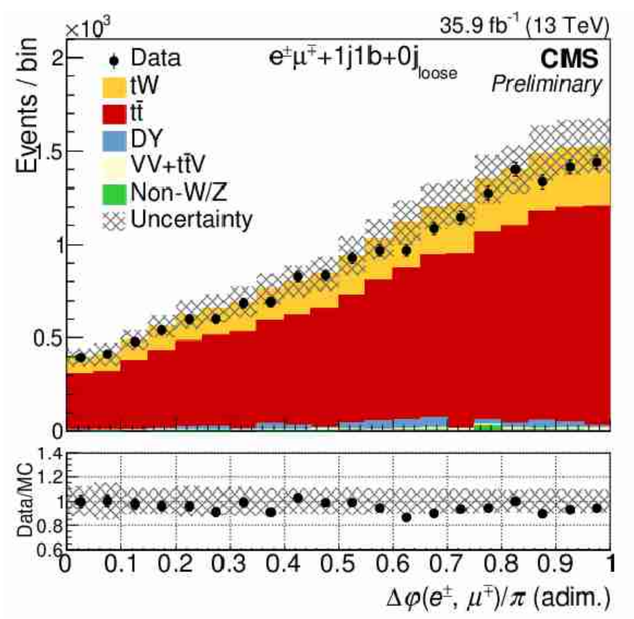
Methodology

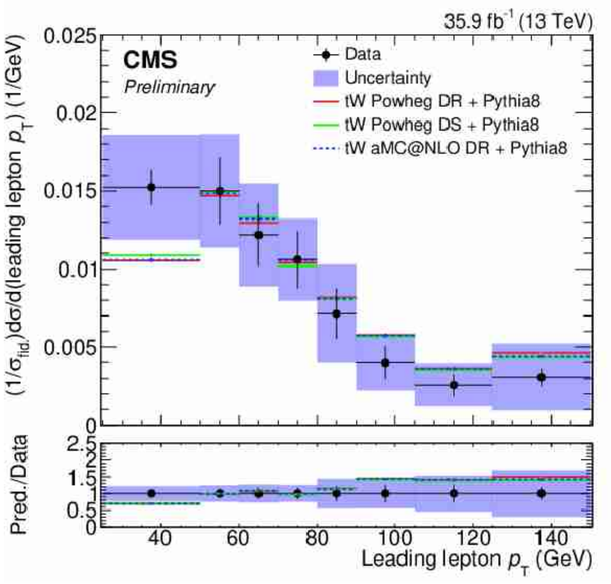
- Event **selection**:
  - Dileptonic channel ($e^{\pm}\mu^{\mp}$, with p_T > 25, 20 GeV).
  - $m(e^{\pm}\mu^{\mp})$ > 20 GeV.
  - Exactly one jet (p_T > 30 GeV) that is b-tagged.
  - Zero loose jets (jets with 20 GeV < p_T < 30 GeV).
- **Dominated by the overwhelming top quark pair production**.
- **Signal is extracted** by subtracting the background to the data.
- **Unfolding** [2] is performed to take into account detector effects in the reconstruction.
  - Systematic uncertainties are considered by repeating the entire process for each variation, and then taking the difference with the result.
  - No regularisation was deemed necessary, as all response matrices are mostly diagonal.

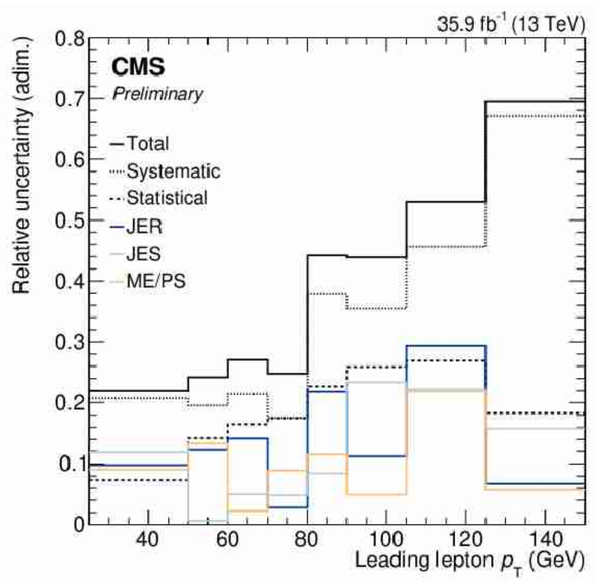


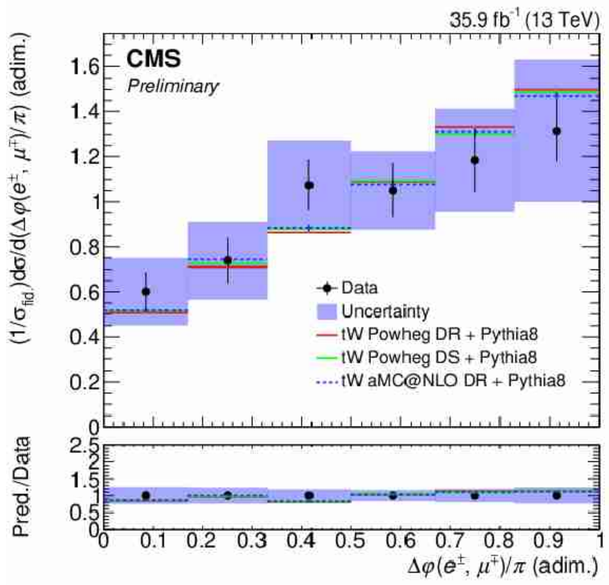
Results

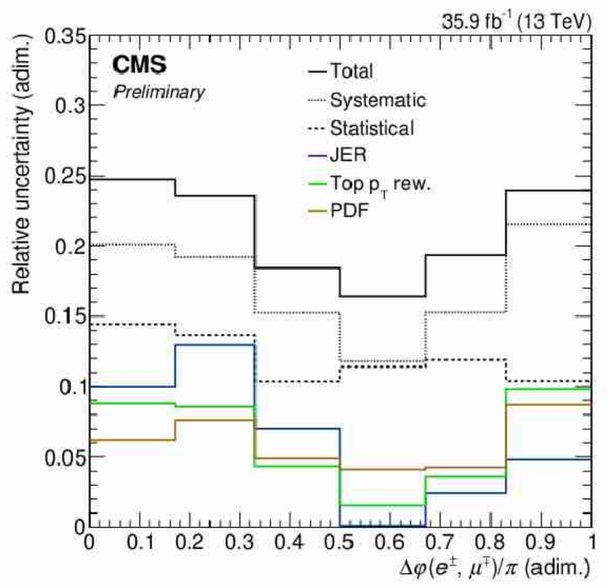
- Distributions are unfolded to **particle level** and **normalised** to the fiducial cross section.
- The **main sources of uncertainty**, both in the jet reconstruction and the theoretical modelling, are driven by the overwhelming top quark pair production background.
- The results obtained are, in general, **consistent with the expectations from** the two generators used for the modelling of the signal, **POWHEG** and **MADGRAPH5_aMC@NLO**.











[1] ***CMS Collaboration,*** "Measurement of differential cross sections for single top quark production in association with a W boson at √s = 13 TeV", CMS-PAS-TOP-19-003.

[2] ***S. Schmitt,*** "TUnfold: an algorithm for correcting migration effects in high energy physics", *JINST* ***7*** *(2012) T10003,* ***doi:10,1088/1748-0221/7/10/T10003****,* ***arXiv:1205.6201****.*

Partially publicly funded by Ministerio de Ciencia e Innovación (Gobierno de España), *through the* "Ayudas para contratos predoctorales para la formación de doctores 2019" *program*