

Low-Mass dimuon measurements in pp collisions with ALICE at the LHC



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Introduction

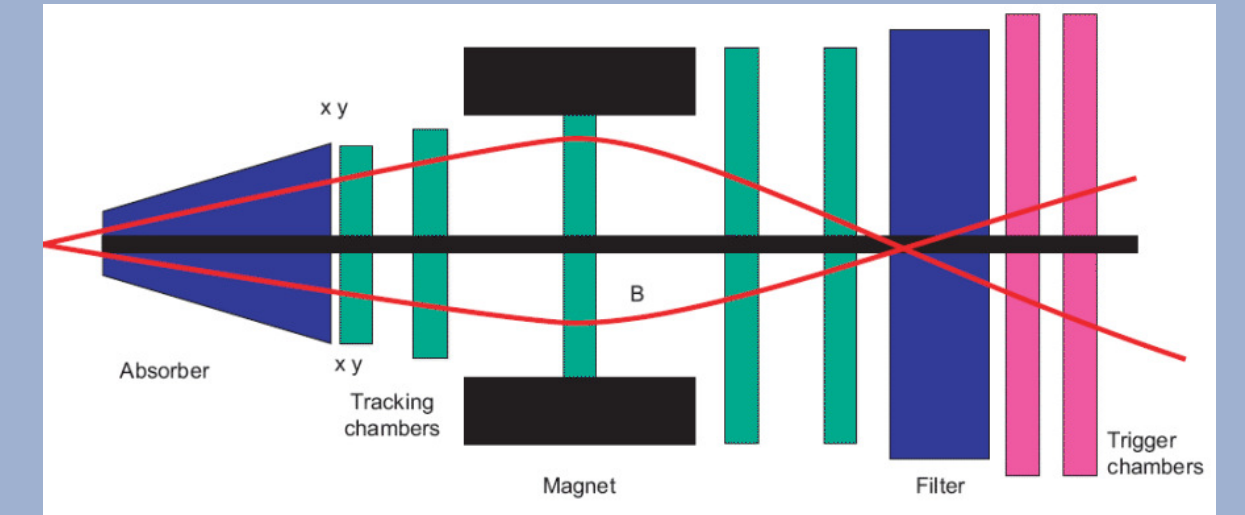
In pp collisions, low-mass dimuon production is studied to measure light neutral mesons (η , ω , and ϕ mesons)

- Input measurements for phenomenological models in the non-perturbative QCD regime
- Search for collective effects in small systems

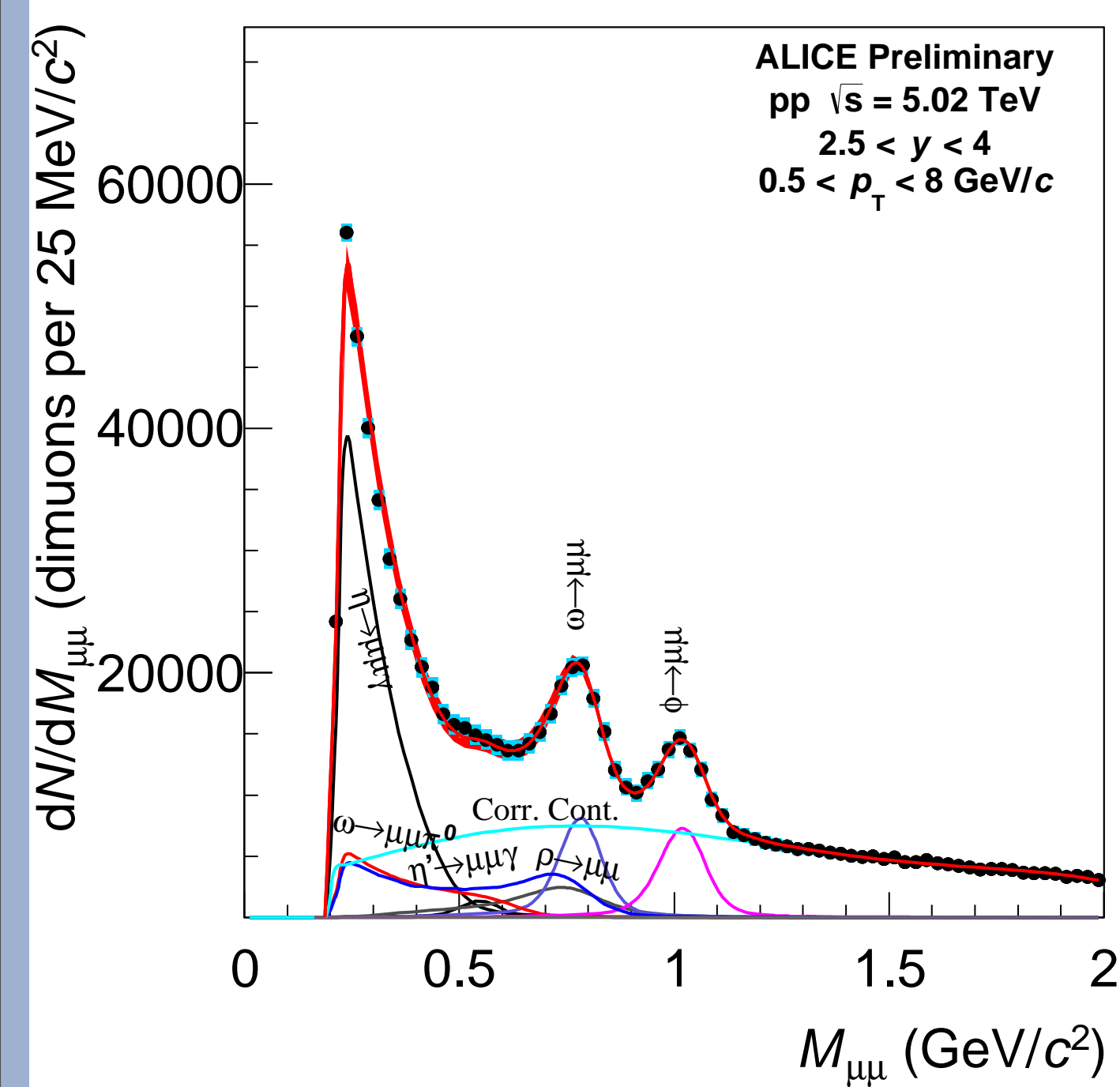
The muon arm

Dimuon measurements are performed at forward rapidity using the muon spectrometer:

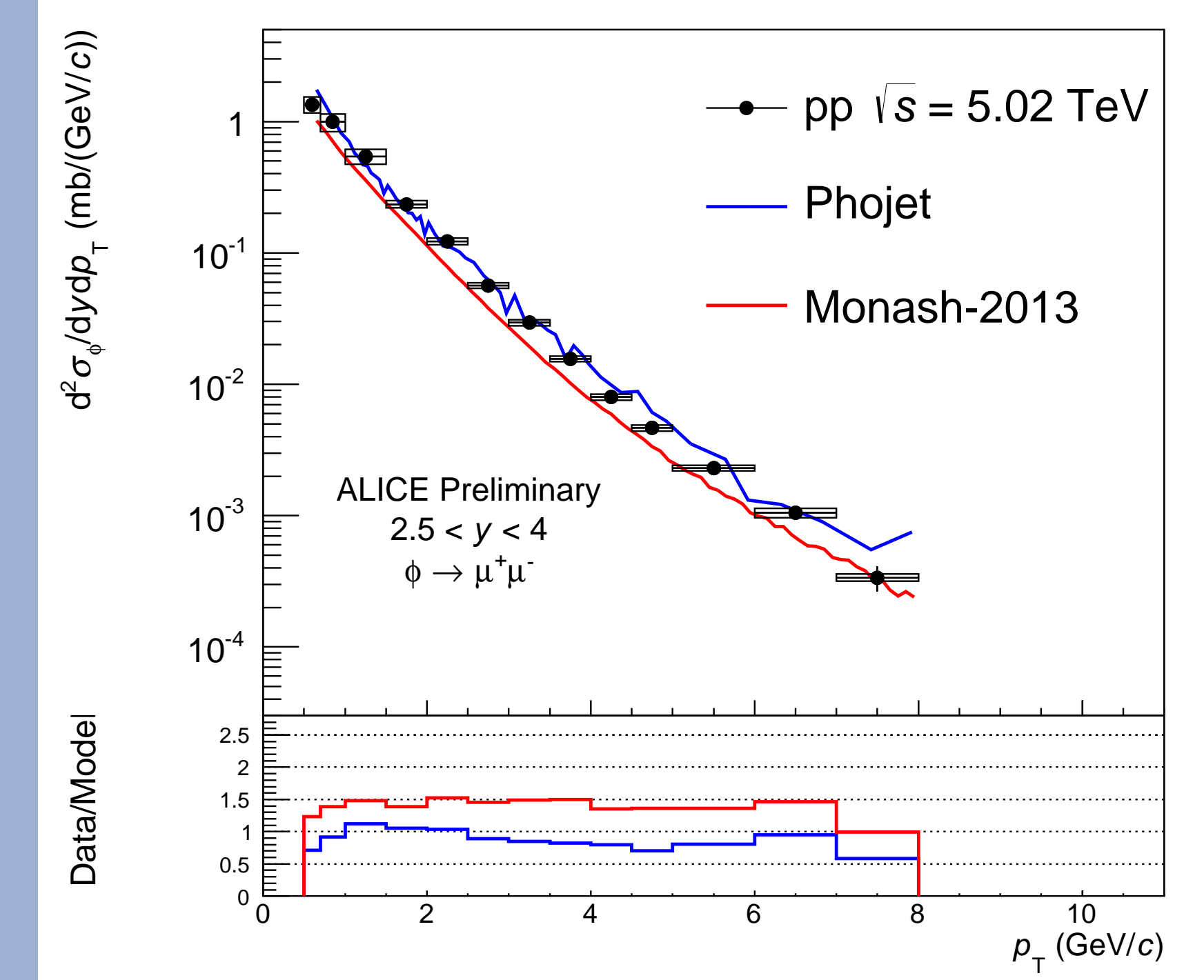
- $-4 < \eta < -2.5$,
- hadronic absorber, 5 tracking stations, 3Tm dipole magnet, an iron wall, and 2 trigger stations



Measurements in pp collisions at $\sqrt{s} = 5.02$ TeV

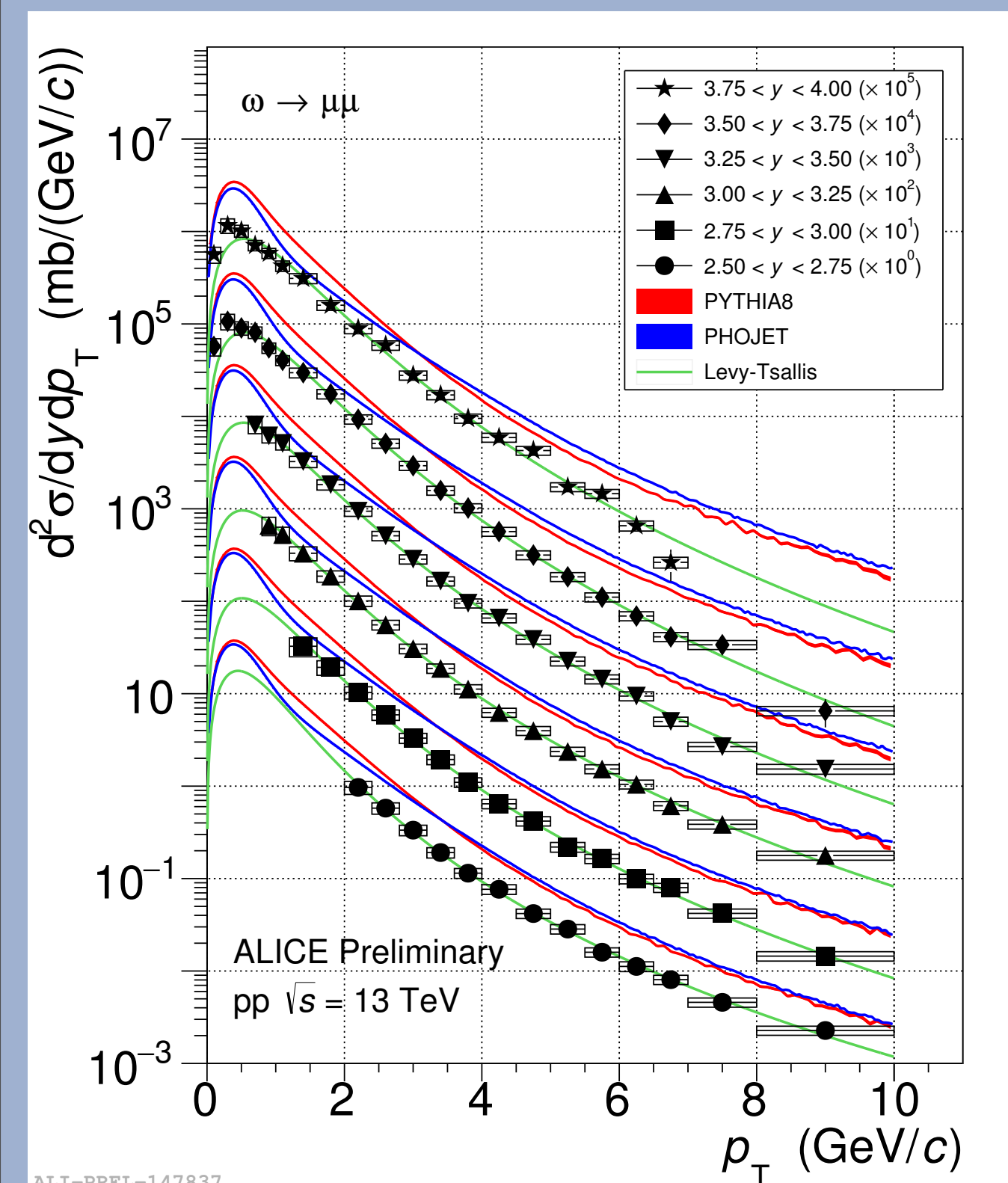


- ϕ -meson: p_T spectrum extracted from the 5.02 TeV sample with $L_{int}=1.2 \text{ pb}^{-1}$, could be extended to a p_T -rapidity double-differential analysis and allow the extraction of η and ω mesons
- New approach for the **description of the correlated continuum** (regularisation of the correlated background on top of heavy flavours) adopted to effectively describe the full low-mass dimuon spectrum, across the whole accessible rapidity range
- p_T spectrum at $\sqrt{s} = 5.02$ TeV: fair description of the shape by both Pythia8 (Monash-2013 tuned) and Phojet. Pythia8 systematically underestimates the production cross section



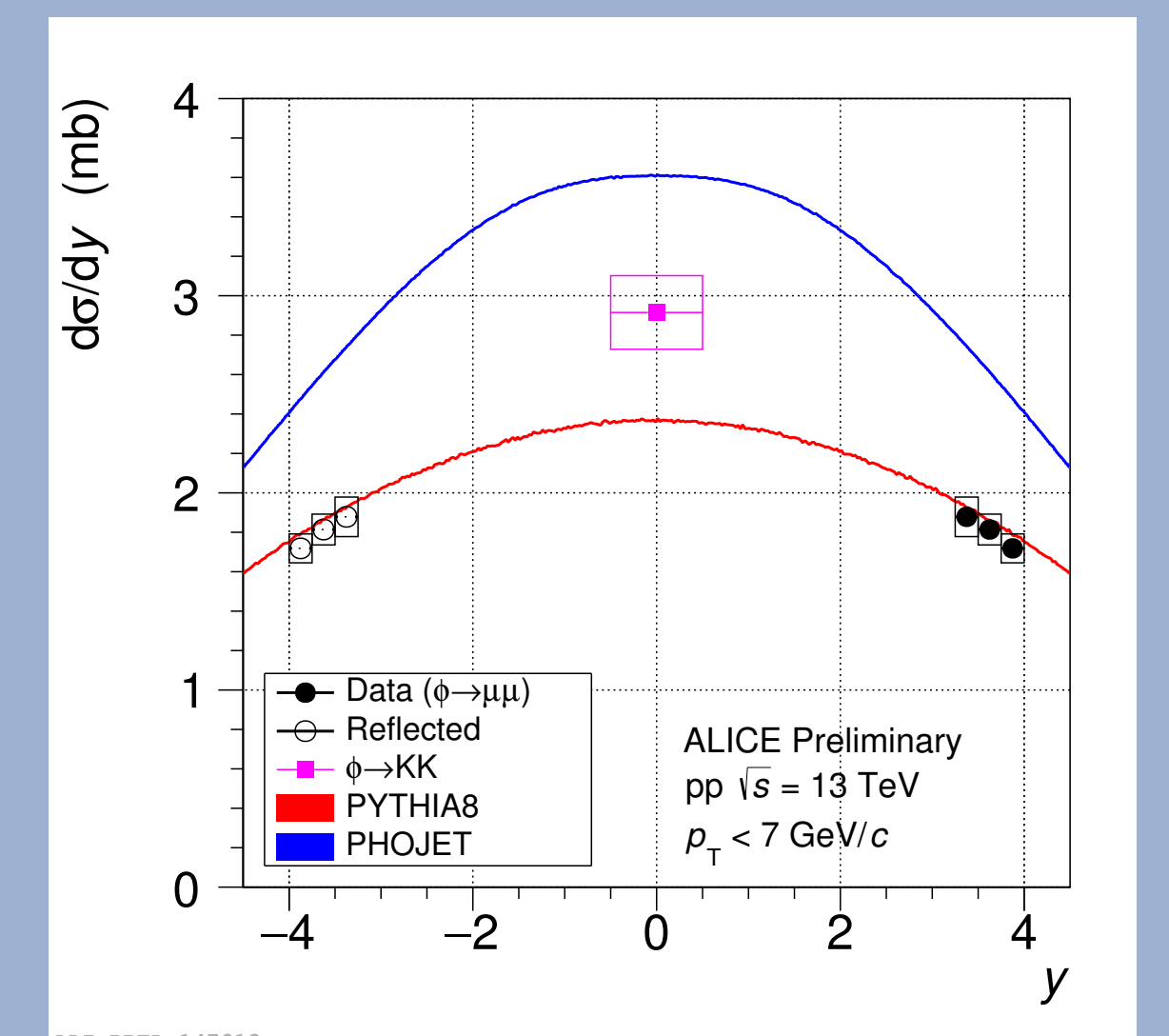
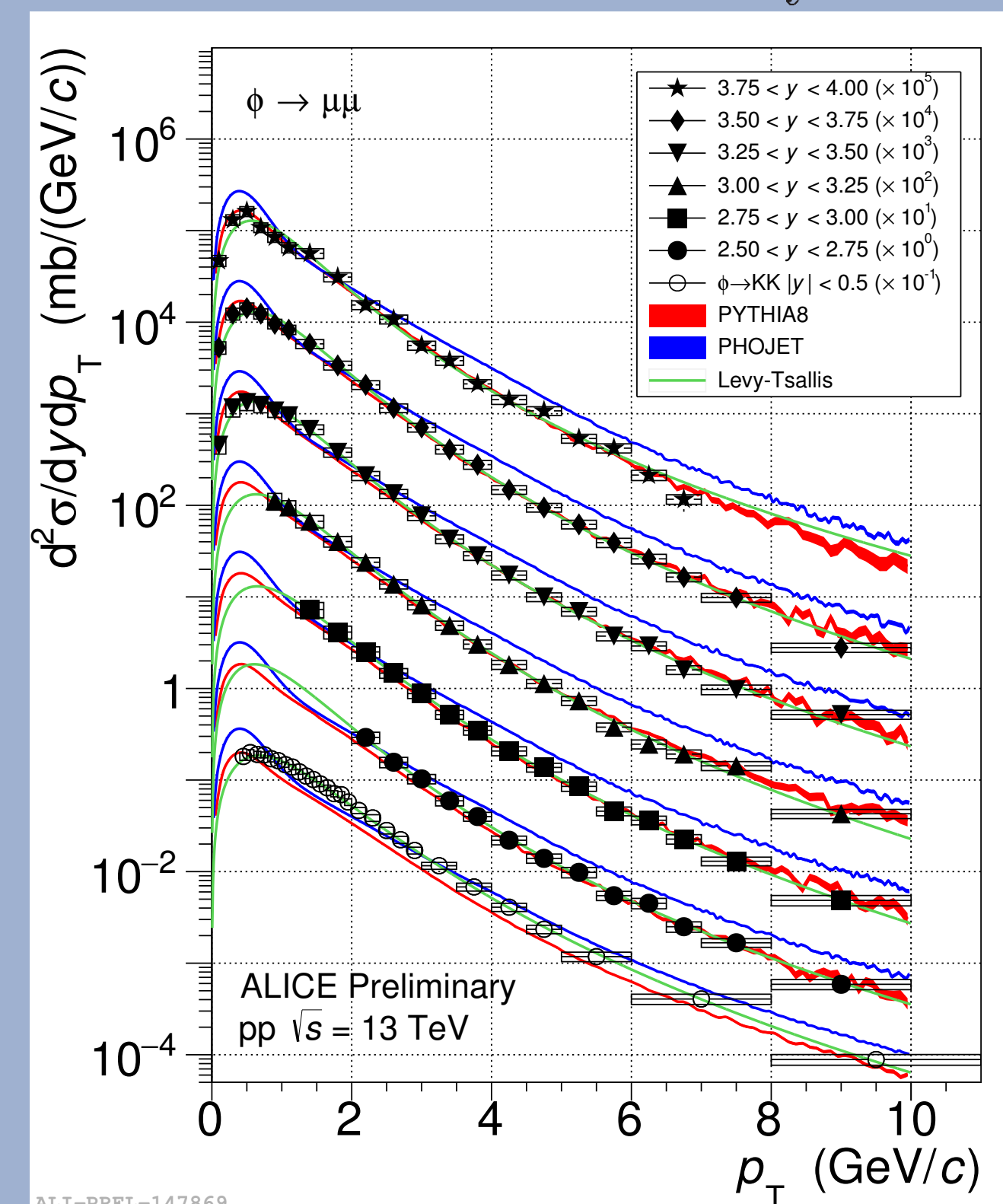
Measurements in pp collisions at $\sqrt{s} = 13$ TeV

- Large data sample:** collected during Run 2 data taking, the presented results are based on $L_{int}=8.4 \text{ pb}^{-1}$, corresponding to one third of the available data at this energy



- $\omega - p_T$ spectra: both Pythia8 and Phojet overestimate the production cross section, while the Levy-Tsallis fit works fine above $p_T \approx 0.5 \text{ GeV}/c$, where:
$$\frac{dN}{dp_T} \propto \frac{dp_T}{[1+(dp_T/dp_0)^2]^n}$$
- $\phi - p_T$ spectra: Pythia8 provides a fair description of the p_T -distributions while Phojet only manages to describe data for $1 < p_T < 2 \text{ GeV}/c$

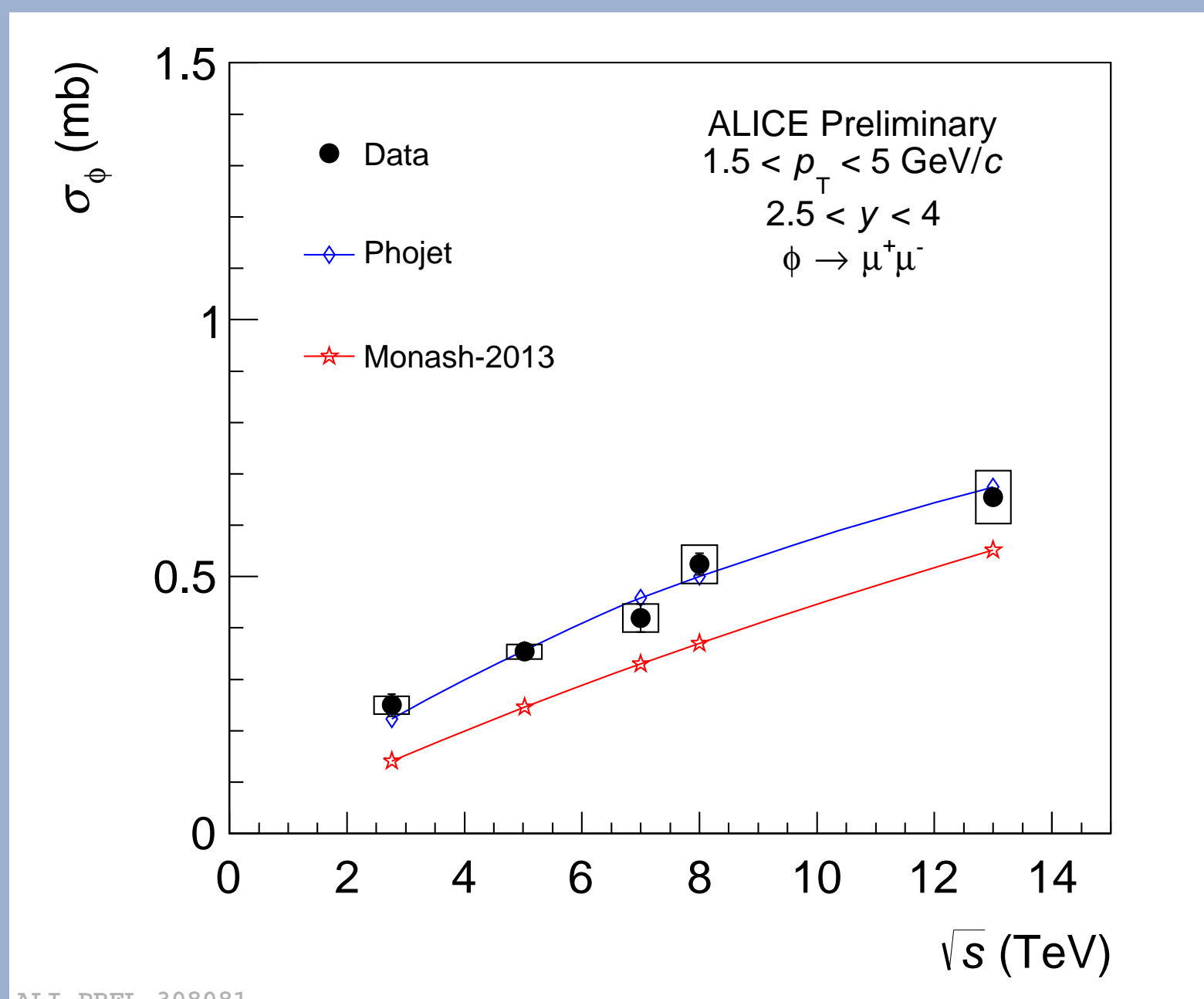
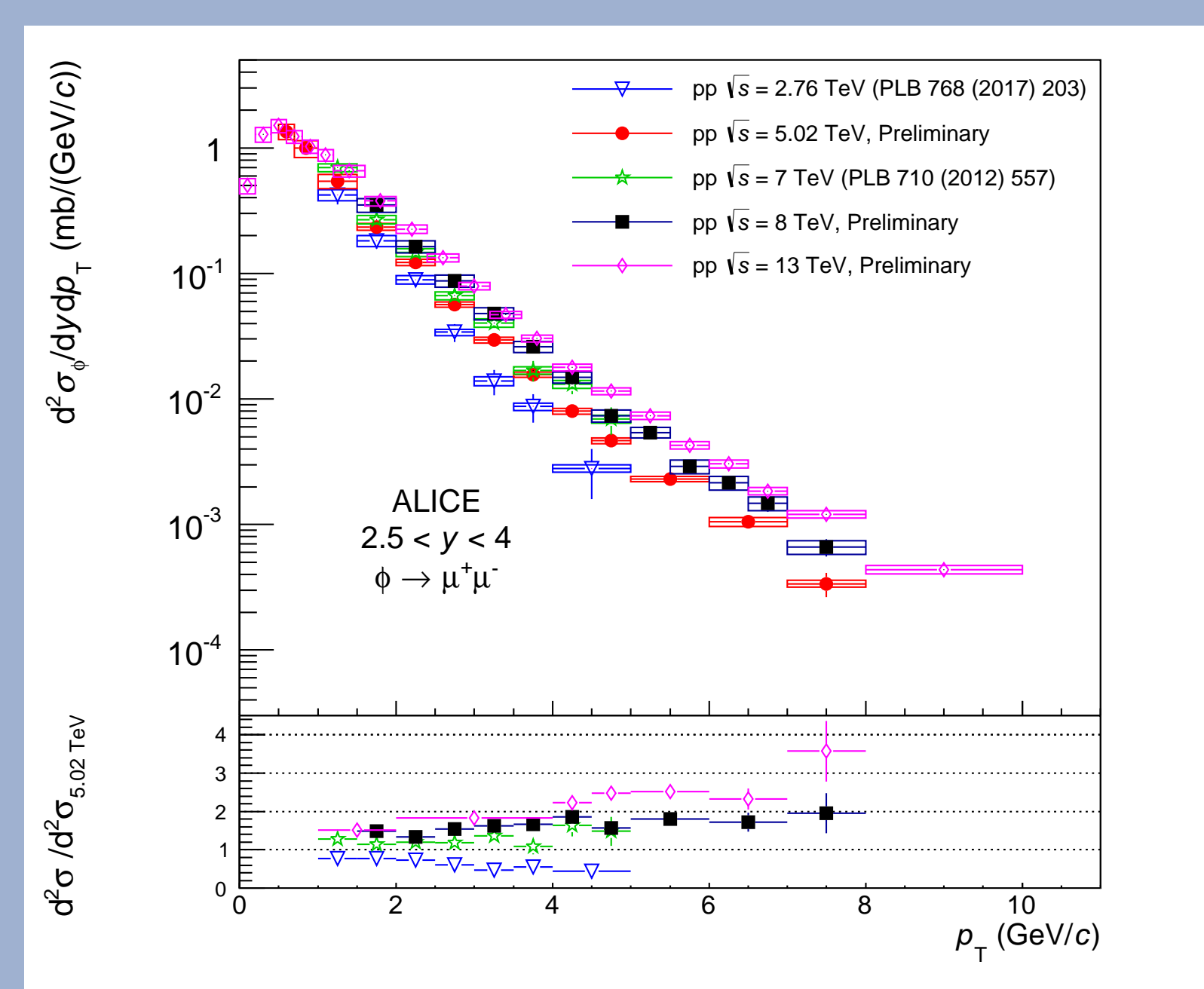
- ϕ and ω -meson: p_T and p_T -rapidity double-differential spectra extracted from the 13 TeV sample, could be extended to a p_T -rapidity double-differential analysis



- $\phi - y$ spectrum: Pythia8 succeeds to describe the p_T -integrated distribution at forward rapidity, but neither of the two models compared manage to describe the full rapidity dependence

Multi-Energy measurements

- The comparison of the ϕ -meson production cross section as function of p_T at the various available energies, shows a hardening of the p_T spectra with increasing energy



- The energy dependence of the ϕ -meson cross section indicates an increase of the production with the energy
- This increase is fairly well described by Phojet while Pythia8 shows an overall underestimation in the specific phase space covered

Perspectives

- Extend the analysis at 5.02 TeV to the double-differential cross section
- Access the η and ω cross sections
- Analyse the full data sample at 13 TeV
- Multi-energy analysis about to be published



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