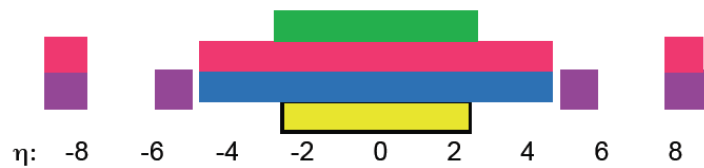


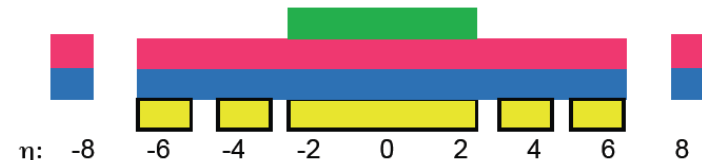
# LHCb strange and identified particle results

Raluca Mureşan

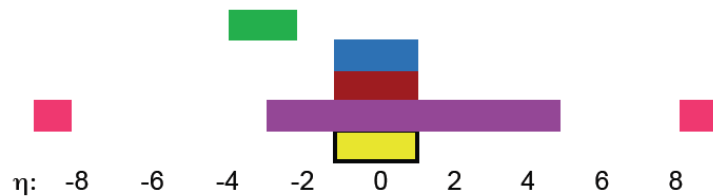
First LHCb public physics results - light hadron production - exploiting the interest for measurements in the forward region where production models were extrapolated not only in energy but also in rapidity.



ATLAS



CMS&TOTEM



ALICE

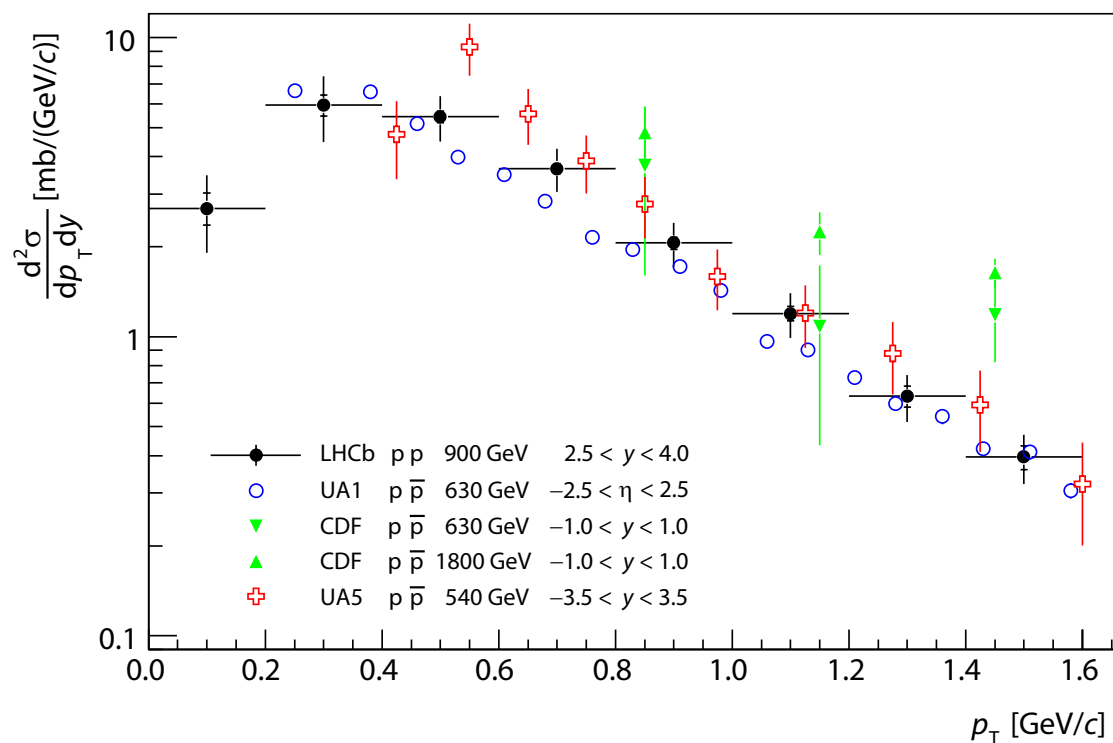


LHCb

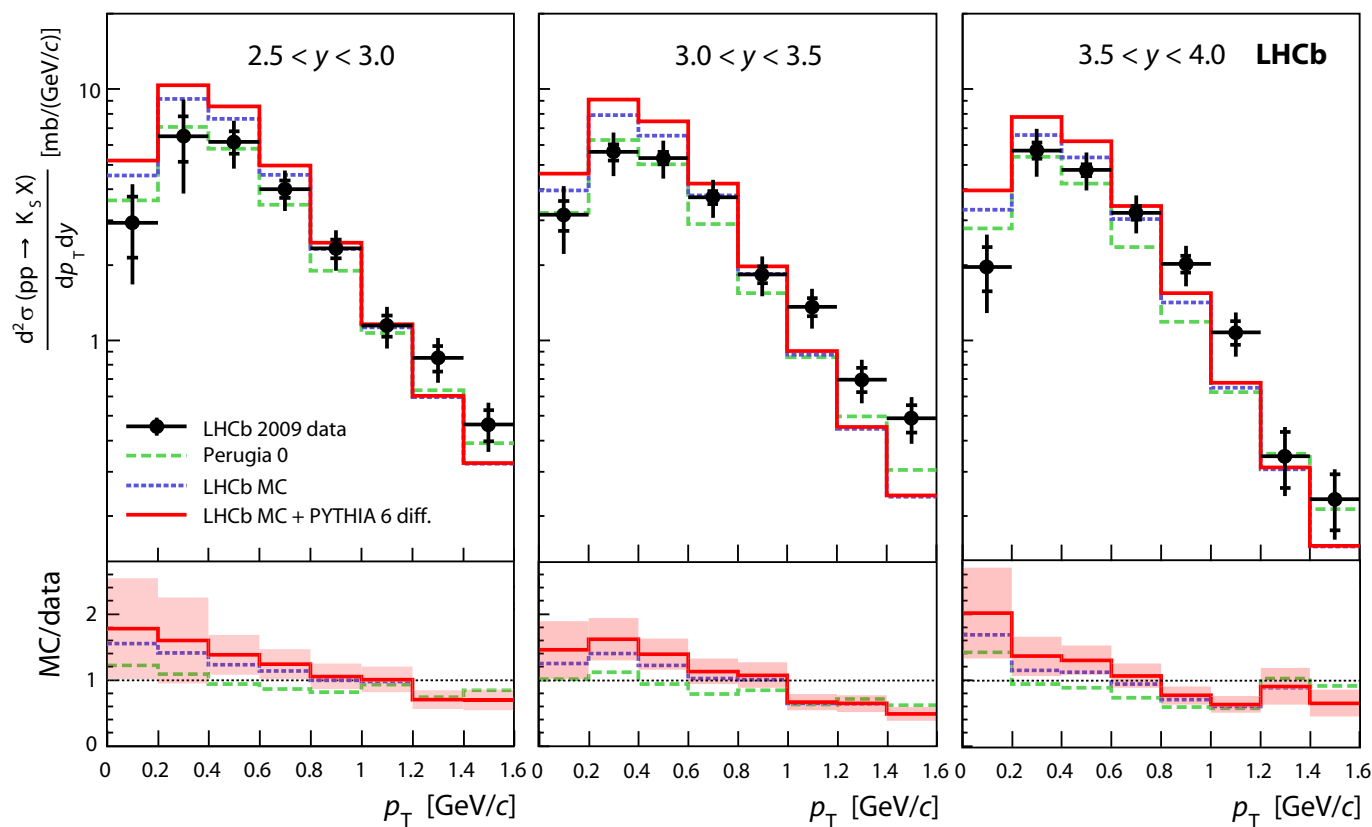
LHCb fully instrumented in the forward region: tracking, ECAL, HCAL, counters lumi, muon, hadron PID

Ideal first measurement for LHCb - high-purity selection without requiring particle identification

## 2009 Data



- Using the  $6.8 \mu\text{b}^{-1}$  recorded in the pilot run;
- $K_S^0$  cross-section not measured before at 0.9 TeV;
- $y$  and  $p_T$  range were extended;
- Main systematic contributions:  
luminosity  $\sim 12\%$ ,  
tracking efficiency  $\sim 10\%$



Important input for hadronization models, measured in bins of  $y$  and  $p_T$  and compared to LHCb MC and Perugia 0 (arXiv:1005.3457).

Physics Letters B 693 (2010) pp. 69-80.

High-purity, prompt  $K_s^0$  and  $\Lambda$  samples selection based on a combination of impact parameters (IP):

$$\nu = \ln IP^+ + \ln IP^- - \ln IP^{V^0}$$

PV requirement ensures that only the  $V^0$  coming from non-diffractive events are kept ( model based definition PYTHIA 6 & PYTHIA 8).

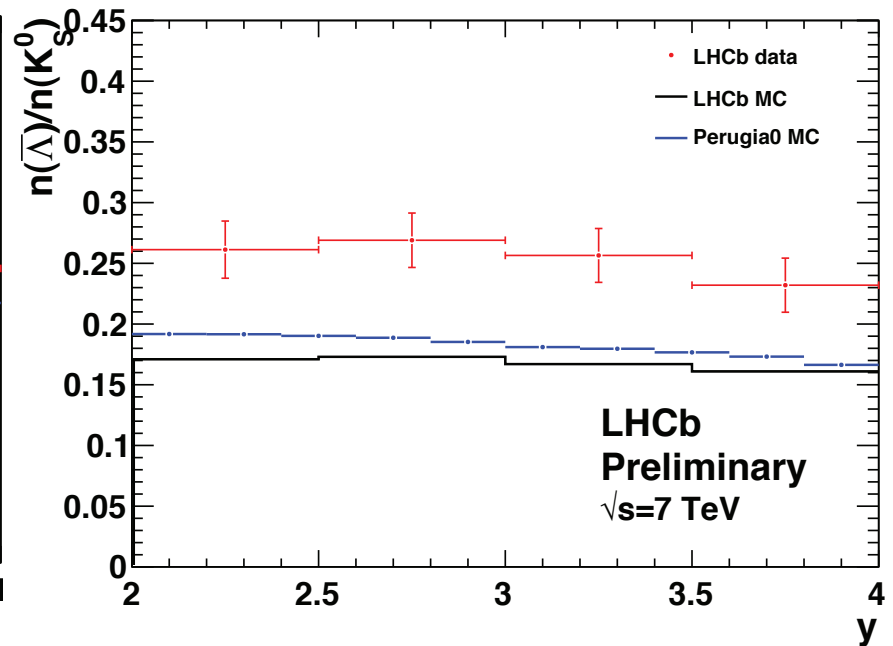
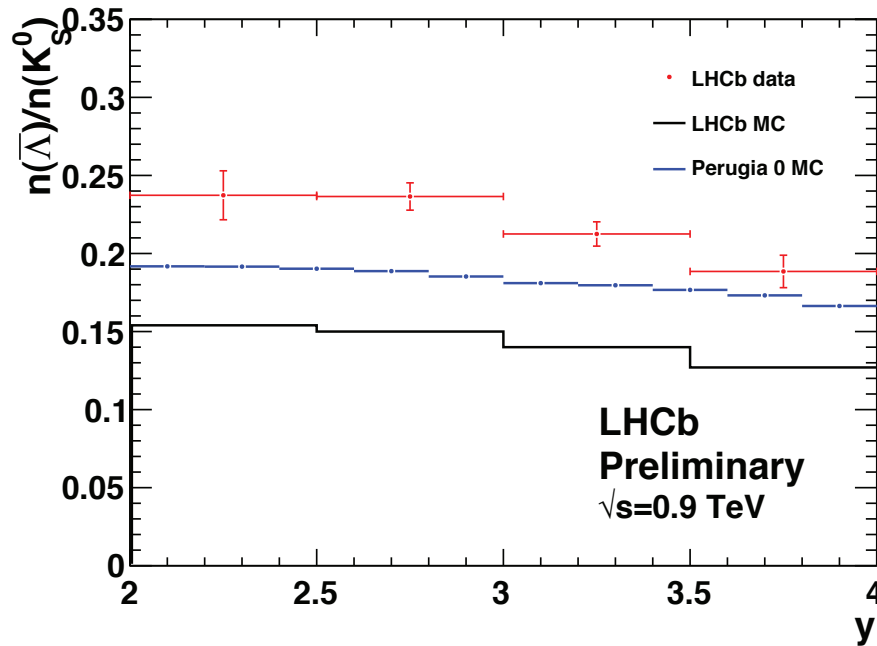
Efficiency from LHCb-MC ( PYTHIA & EvtGen) and GEANT simulation for prompt, non-diffractive events.

Ratios benefit from reduced systematic uncertainties since absolute luminosity not required.

0. 31  $\text{nb}^{-1}$  @ 0.9 TeV and 0.2  $\text{nb}^{-1}$  @ 7 TeV as  $V^0$ s abound in minimum bias data: 5  $K_s^0$  & 1  $\Lambda$  selected per 100 triggers in data at  $\sqrt{s} = 7$  TeV.

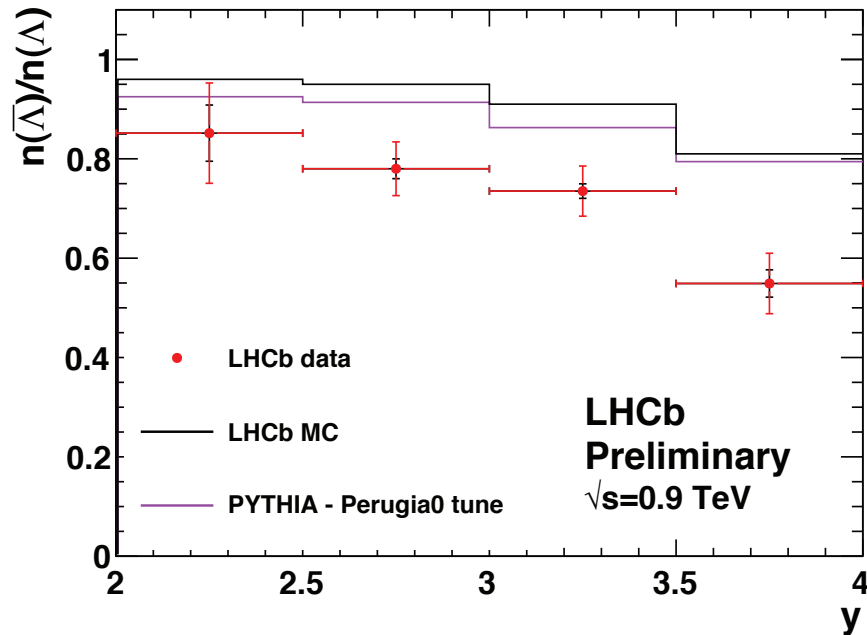
0.9 TeV

7 TeV

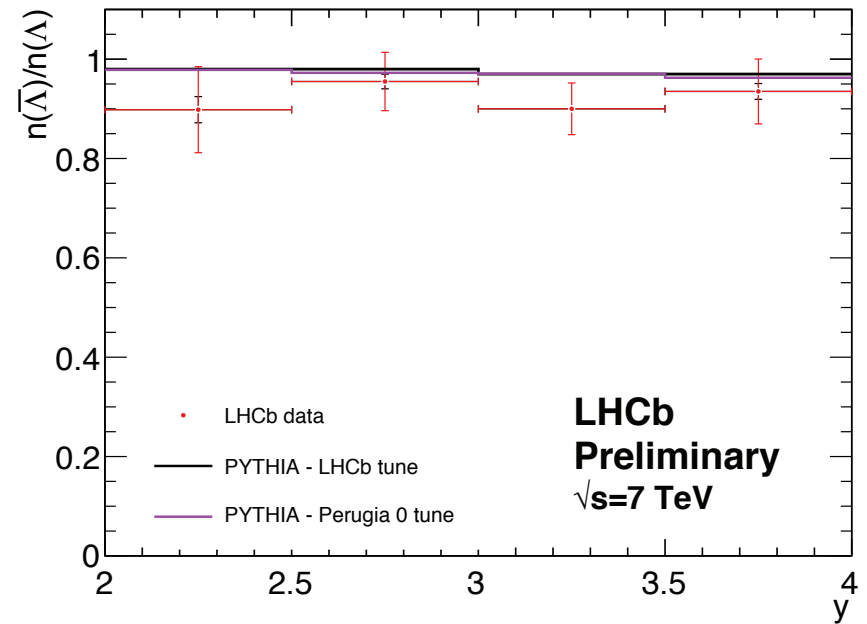


Ratio of  $\bar{\Lambda}/K_S^0$  higher than expectation at both energies.

0.9 TeV

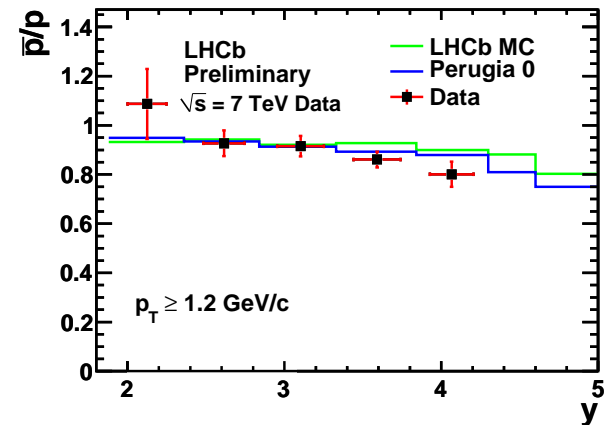
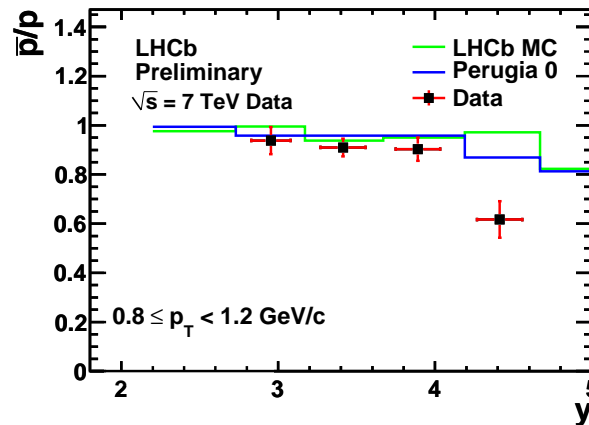
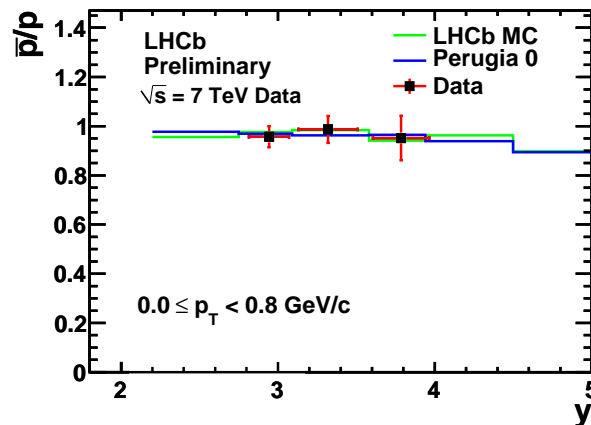
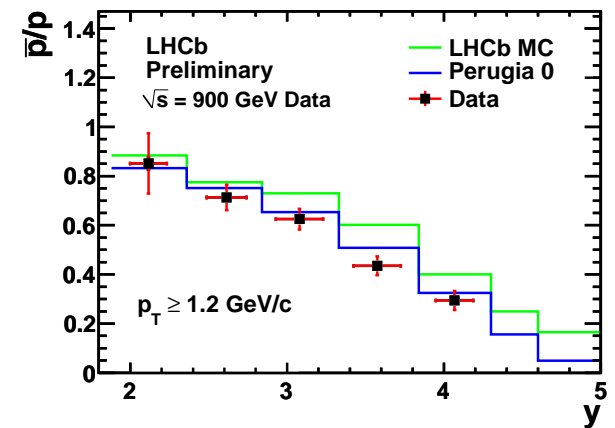
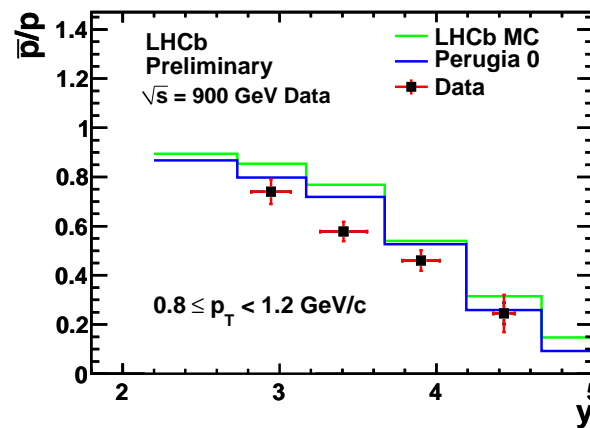
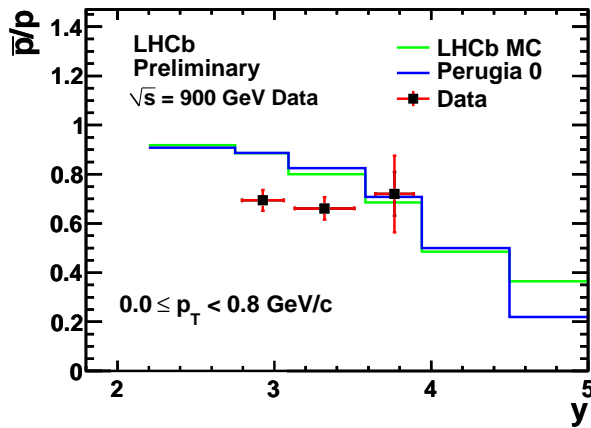


7 TeV



Measurements lie significantly under MC predictions at 0.9 TeV;

Reasonable agreement farther from the beam (in y), at 7 TeV, where the ratio must be very close to the unity.



Big deviation in ratio from unity at low energy. Much less so at 7 TeV. Reasonable agreement observed with Perugia 0.

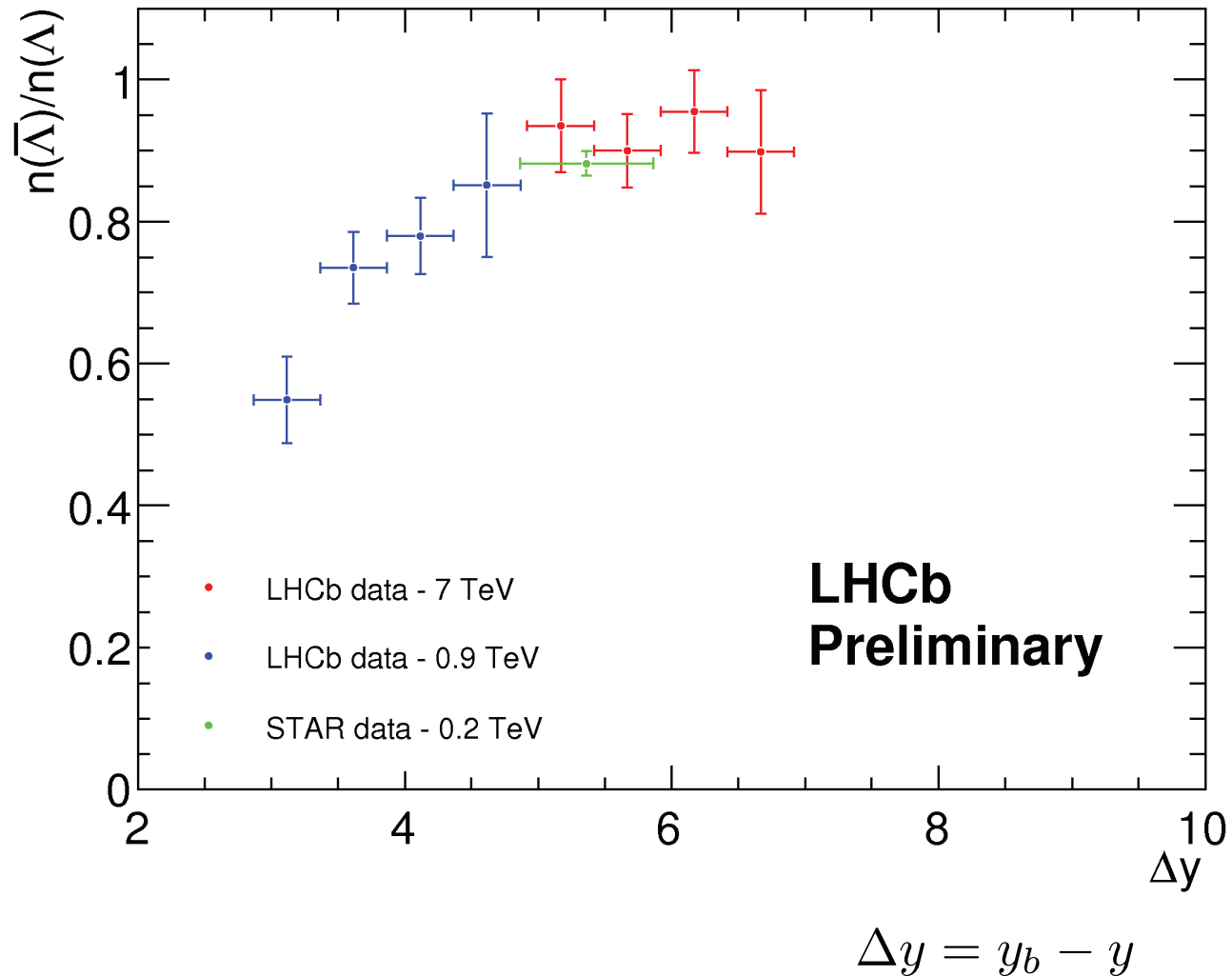


Comparing rapidity bins equally away from the beam

$$y_1 = y_2 + \ln \left( \frac{E_{b1}}{E_{b2}} \right)$$

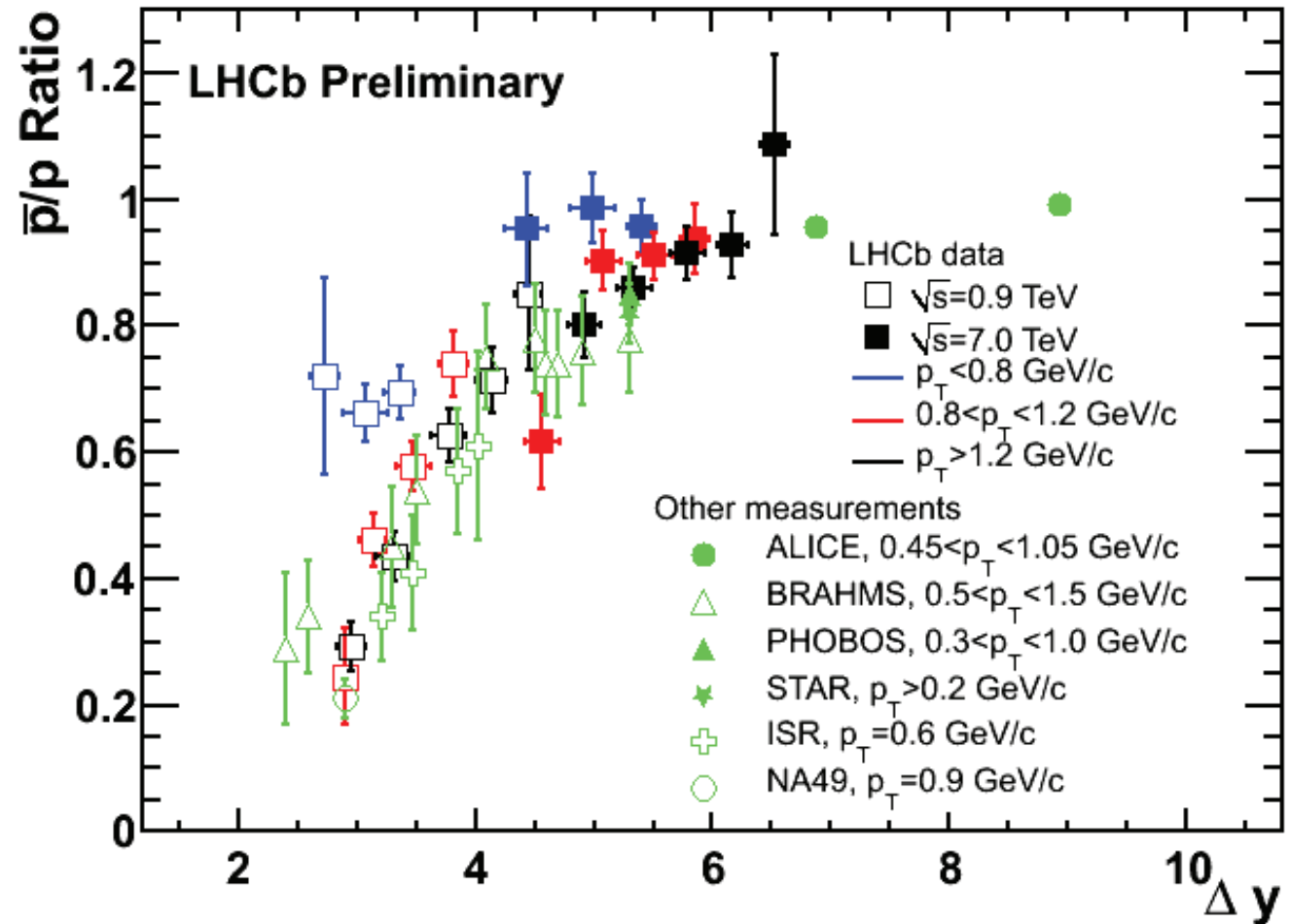
probes scaling violations.

Consistency between the two energy measurements and previous result.



Reasonable consistency with previous measurements.

Good agreement if the same  $p_t$  range is covered (high  $p_t$ ).



$$\Delta y = y_b - y$$

- LHCb produced very interesting minimum bias physics results exploiting the unique rapidity and transverse momentum acceptance of the experiment;
- Preliminary results for ratios of  $V^0$  and protons suggest lower baryon suppression and higher baryon transport in data than in the MC models investigated.
- Reasonable consistency with previous measurements.
- $\phi$  cross-section preliminary results will be made public soon.