Validation of FTF model for strange particle production

A. Galoyan 28.11.2017

The exp. data of NA61/SHINE collaboration

1. Measurements of π±, K± , p and p^- spectra in proton-proton interactions at 20, 31, 40, 80 and 158 GeV/c with the NA61/SHINE spectrometer at the CERN SPS.
NA61/SHINE Collaboration. Eur.Phys.J. C77 (2017) no.10, 671

2. *Production of Λ -hyperons in inelastic p+p interactions at 158 GeV/c.*
NA61/SHINE Collaboration **Eur.Phys.J. C76 (2016) no.4, 198**

3. *Measurements of π±, K± , K0S , Λ and proton production in proton–carbon interactions at 31 GeV/c with the NA61/SHINE spectrometer at the CERN SPS.*
NA61/SHINE Collaboration. Eur.Phys.J. C76 (2016) no.2, 84. arXiv:1510.02703 [hep-ex]

4 Measurements of Hadron Production in Pion-Carbon Interactions with NA61/SHINE at the CERN SPS. **Raul R. Prado for the NA61/SHINE Collaboration. arXiv:1707.07902 [hep-ex]**

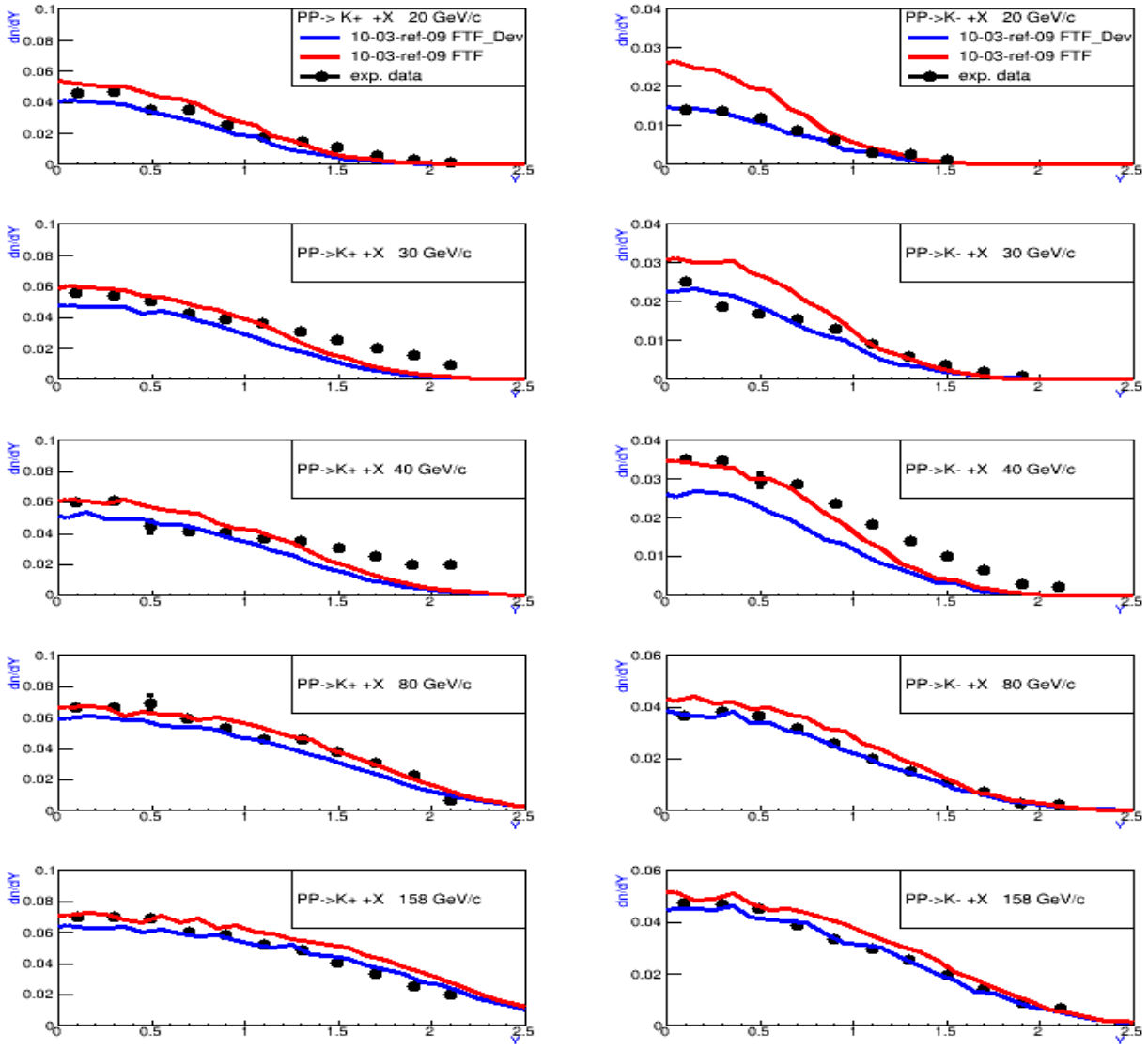
We also used exp. data on Λ, Λbar, K0S, K+, K- production in antiptoton-proton interactions in a wide energy range from 360 MeV/c up to 100 GeV/c.

Subdirectories /test22 /NA61 and test22 /PbarHyperonV are created for corresponding calculations, comparison with exp. data and visualization of results. Comparison of FTF results in G4 -10-03-ref-09 and FTF developed version is presented.

Tuning of FTF model using NA61/SHINE data

Measurements of π±, K± , p and p¯ spectra in proton-proton interactions at 20, 31, 40, 80 and 158 GeV/c with the NA61/SHINE spectrometer at the CERN SPS.

NA61/SHINE Collaboration Eur.Phys.J. C77 (2017) no.10, 671



Probability of strange q-qbar production at final string decay is changed. New probability is chosen:

$$P_{\bar{s}\ s} = 0.108\left[1-\left(\frac{m_{th}}{M_{str}}\right)^4\right]$$

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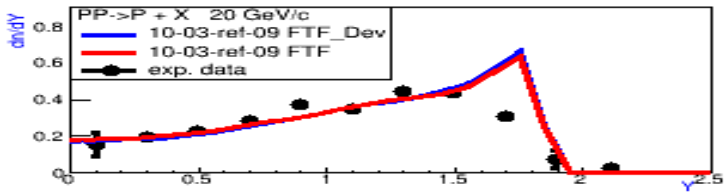
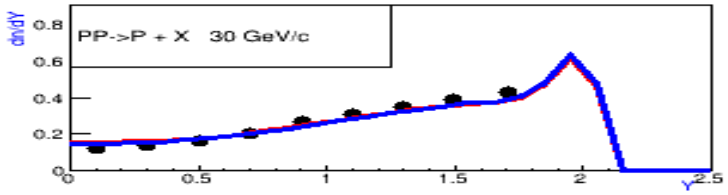
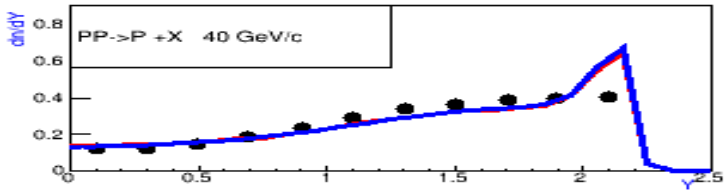
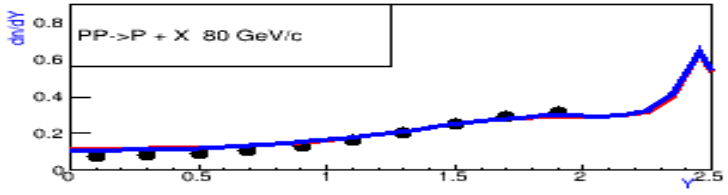
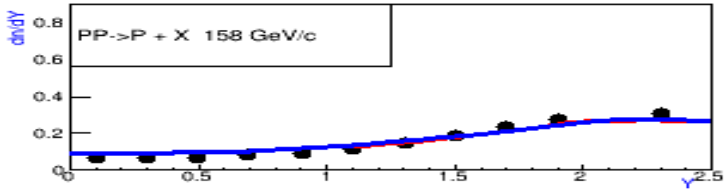
NA61/SHINE Collaboration Eur.Phys.J. C77 (2017) no.10, 671





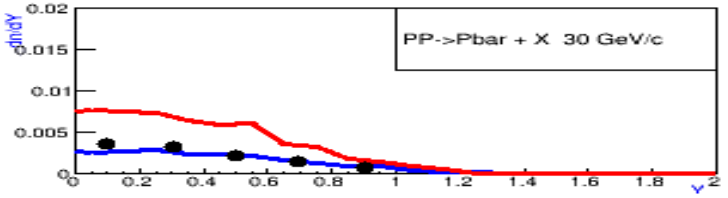


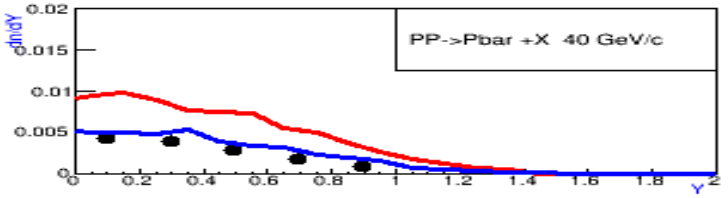


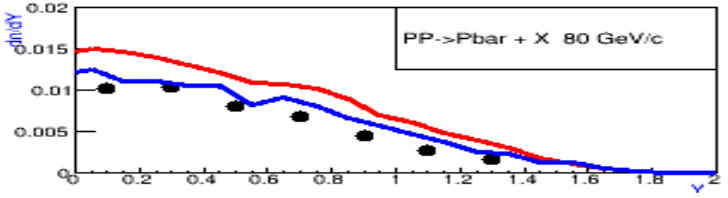


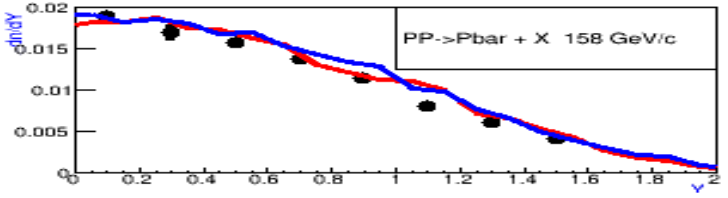
Probability of diquark-antidiquark production at string decay is chosen as:

$$P_{qq-\bar{q}\bar{q}} = 0.15 \left[1 - \left(\frac{1400 * N_b}{M_{str}}\right)^2\right]$$









Validation of FTF model for strange particle production

Production of Λ -hyperons in inelastic p+p interactions at 158 GeV/c

NA61/SHINE Collaboration **Eur. Phys. J. C76 (2016) no.4, 198**

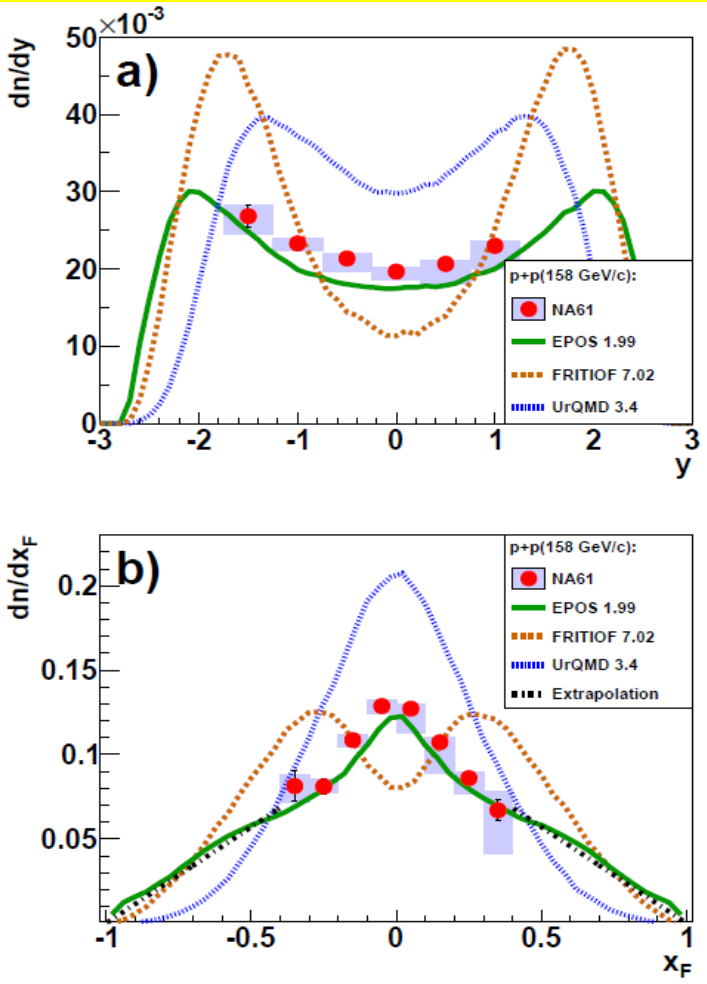
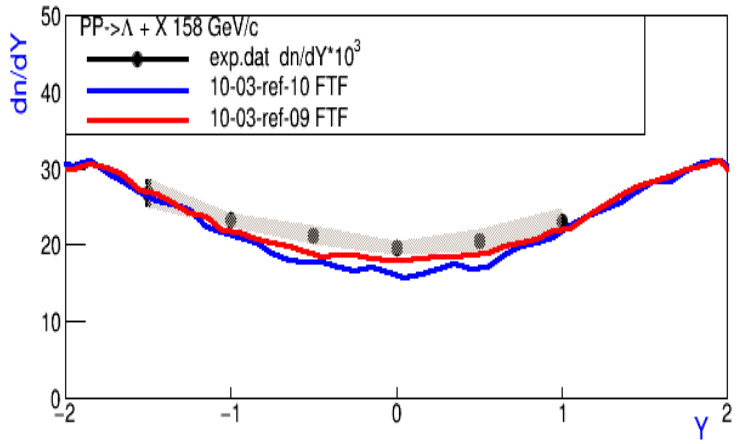
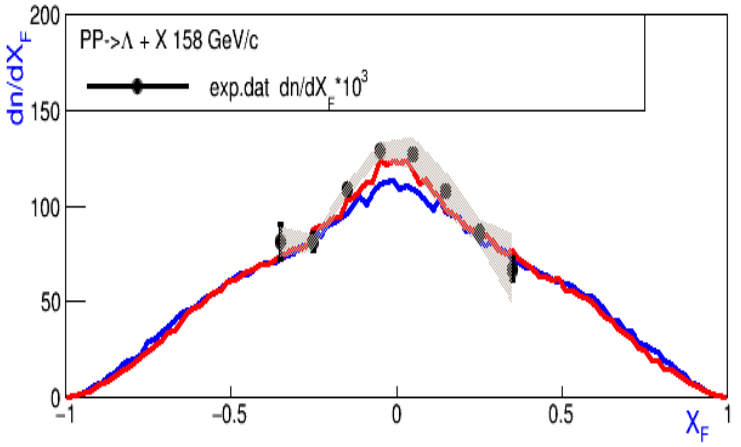


Fig. 20 Comparison of $\frac{dn}{dy}$ (a), and $\frac{dn}{dx_F}$ (b) distributions with calculations of the EPOS [19], URQMD [34, 35] and FRITIOF [36] models. The chain line was used to extrapolate the NA61/SHINE measurements to full phase space. For details see text.





FTF works as well as EPOS 1.99 model.

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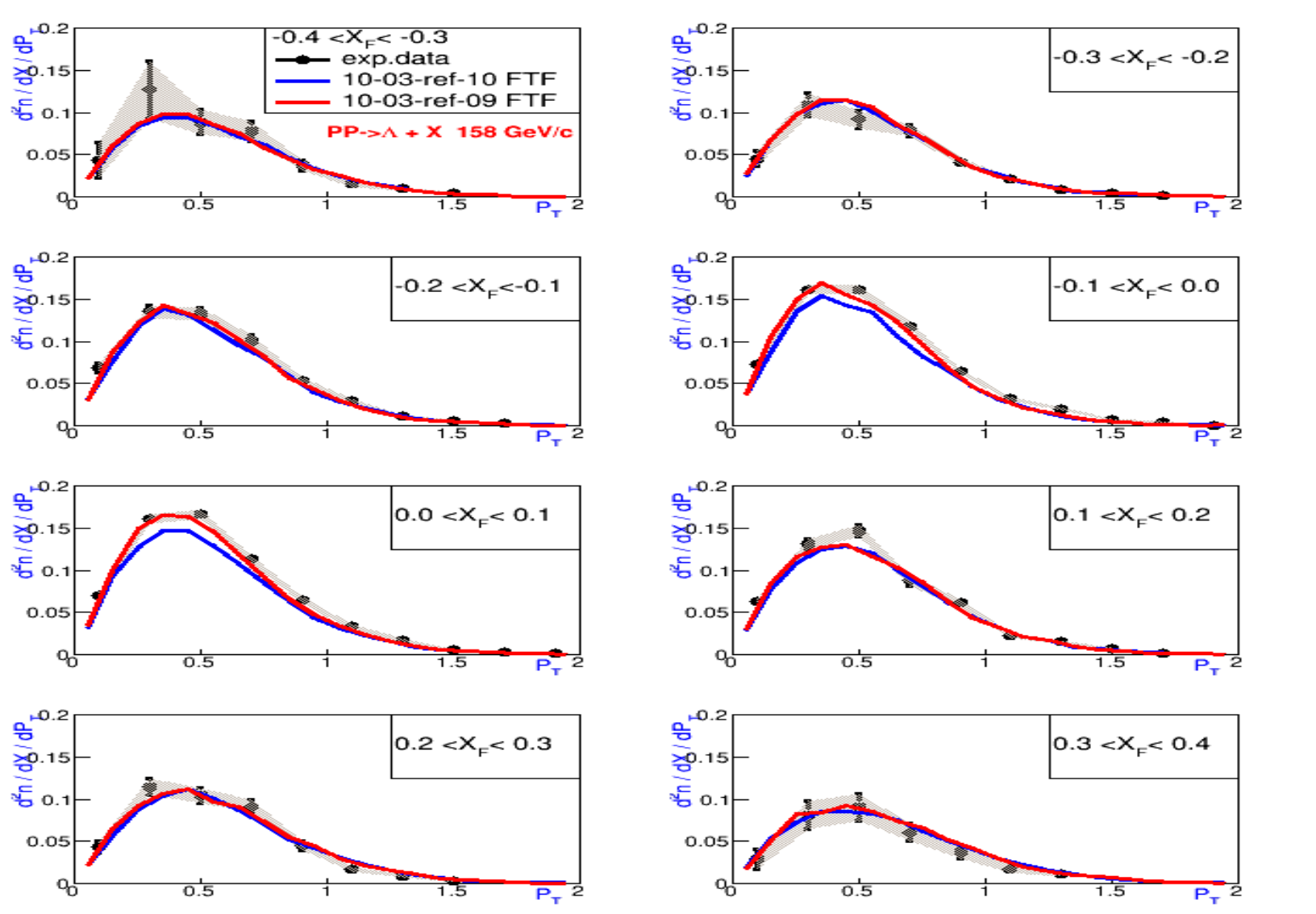

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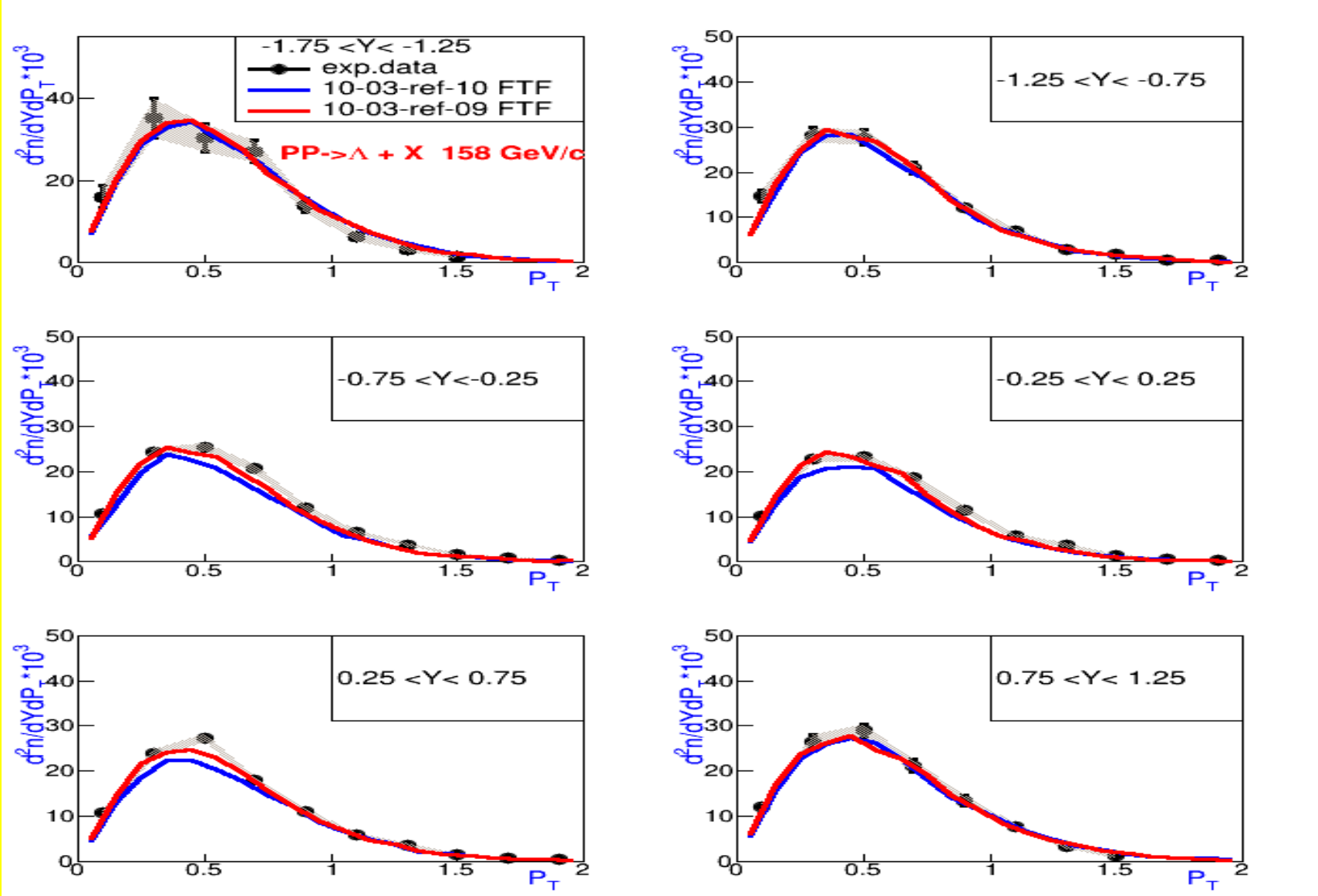
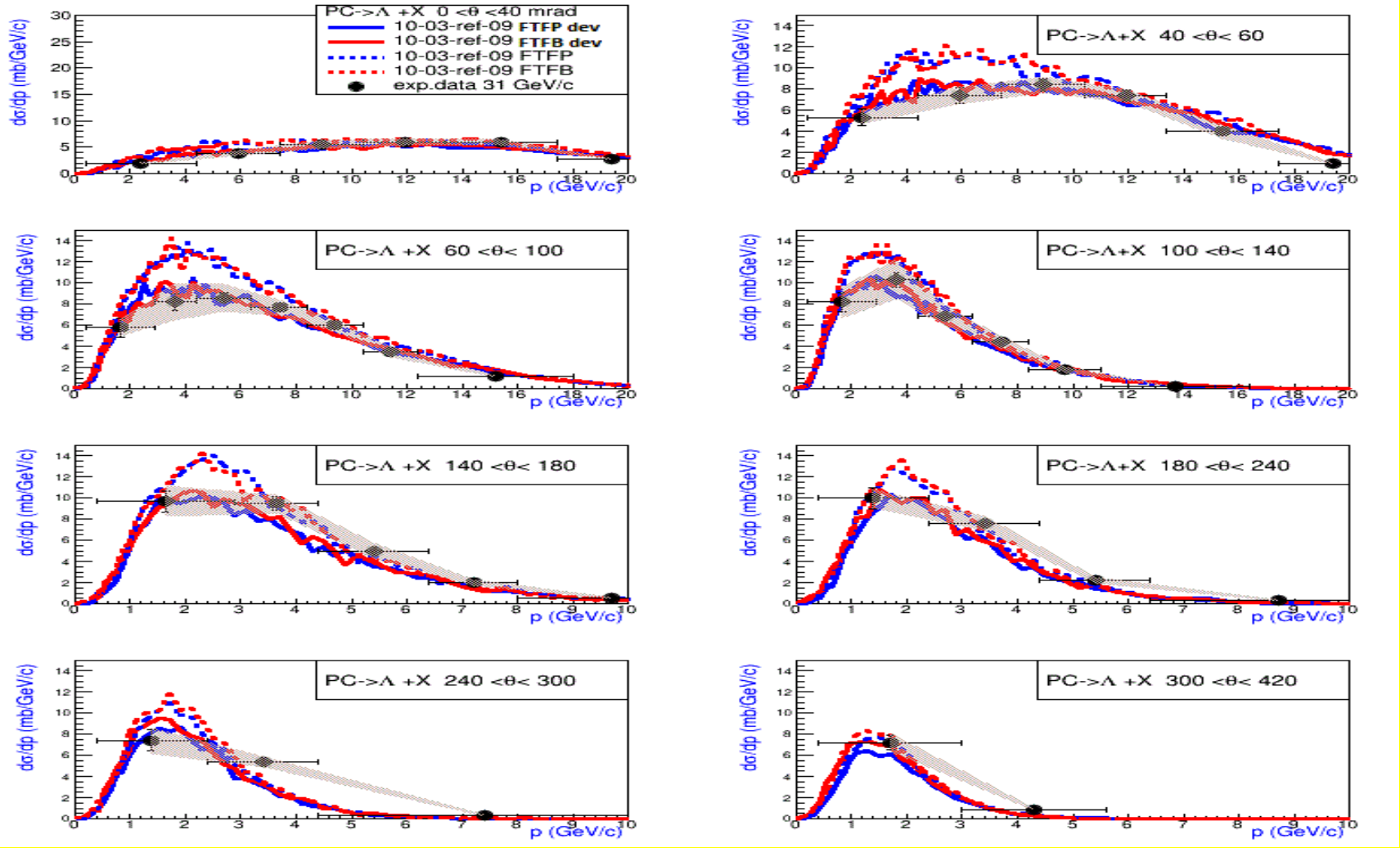
NA61/SHINE Collaboration **Eur.Phys.J. C76 (2016) no.4, 198**



Validation of FTF model for strange particle production

Measurements of π±, K± , K0S , Λ and proton production in proton–carbon interactions at 31 GeV/c with the NA61/SHINE spectrometer at the CERN SPS
Eur.Phys.J. C76 (2016) no. 2, 84



(Comparison with VENUS, GiBUU, FTFB in G4-10 is done in the paper.)

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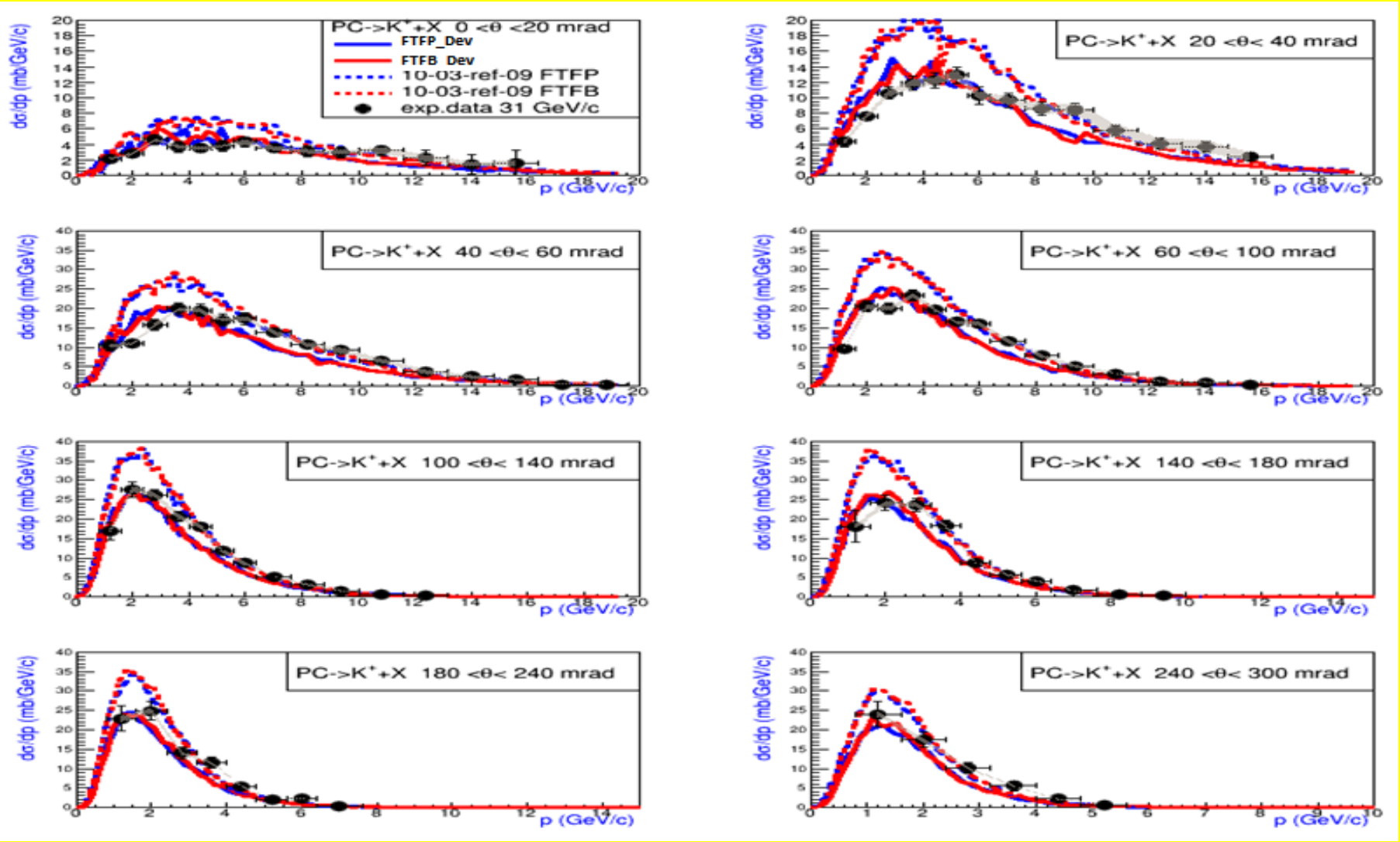
Eur.Phys.J. C76 (2016) no.2, 84



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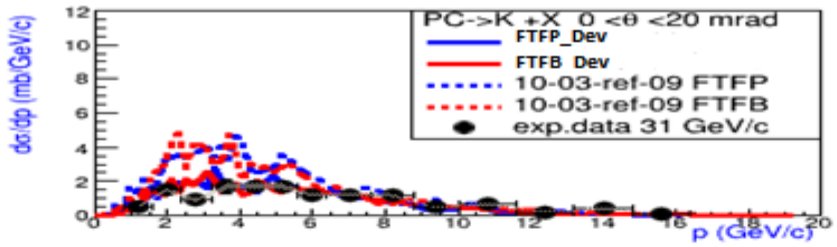

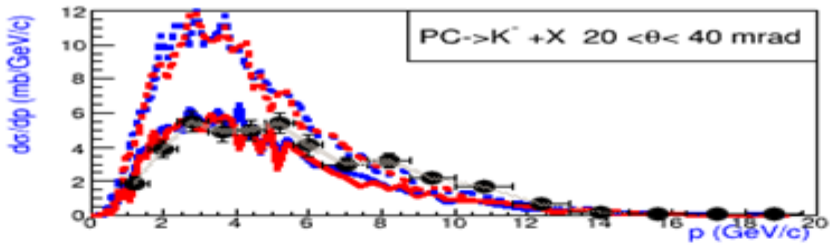

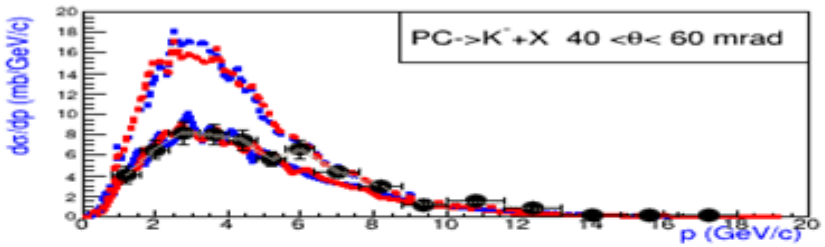

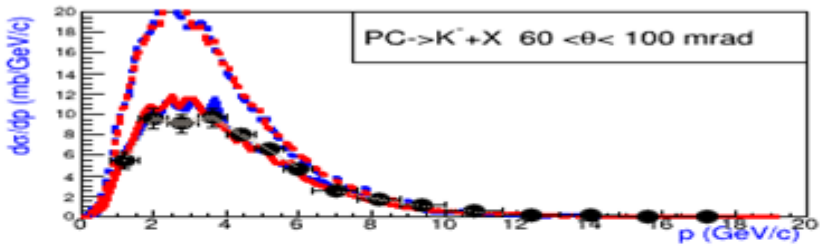

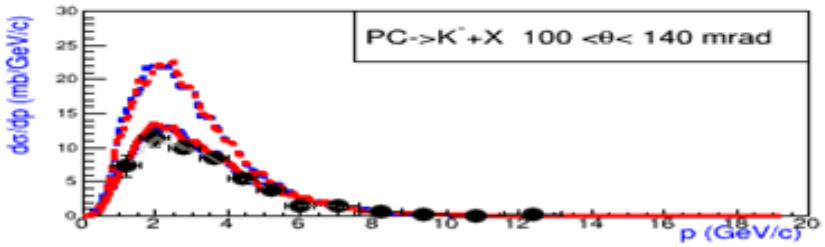

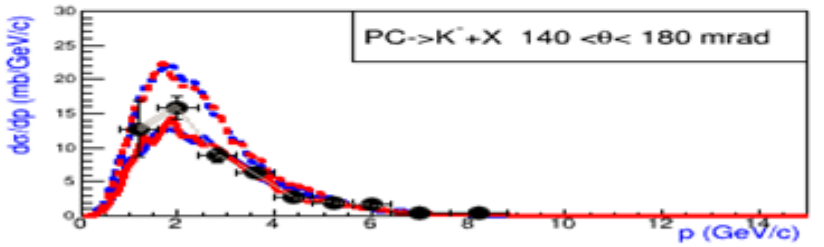

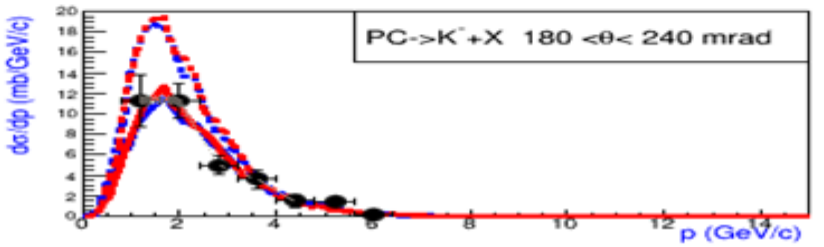

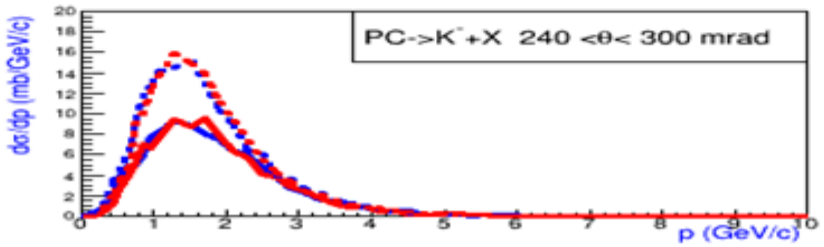

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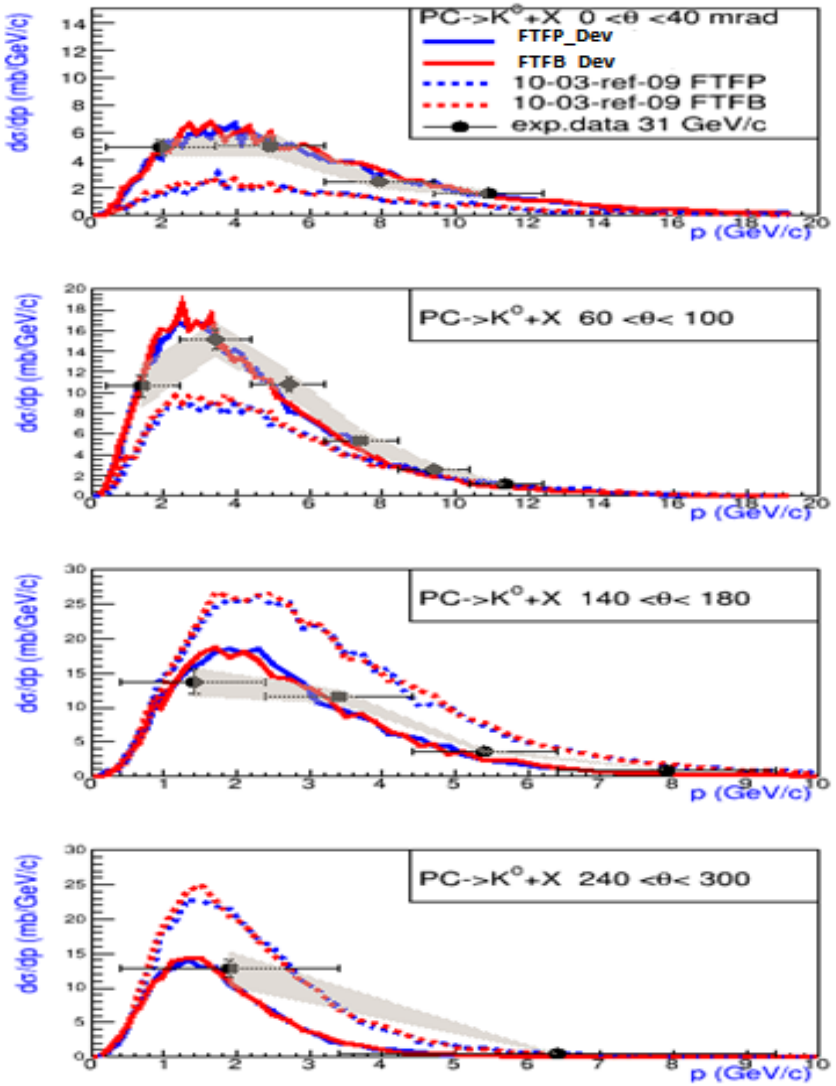
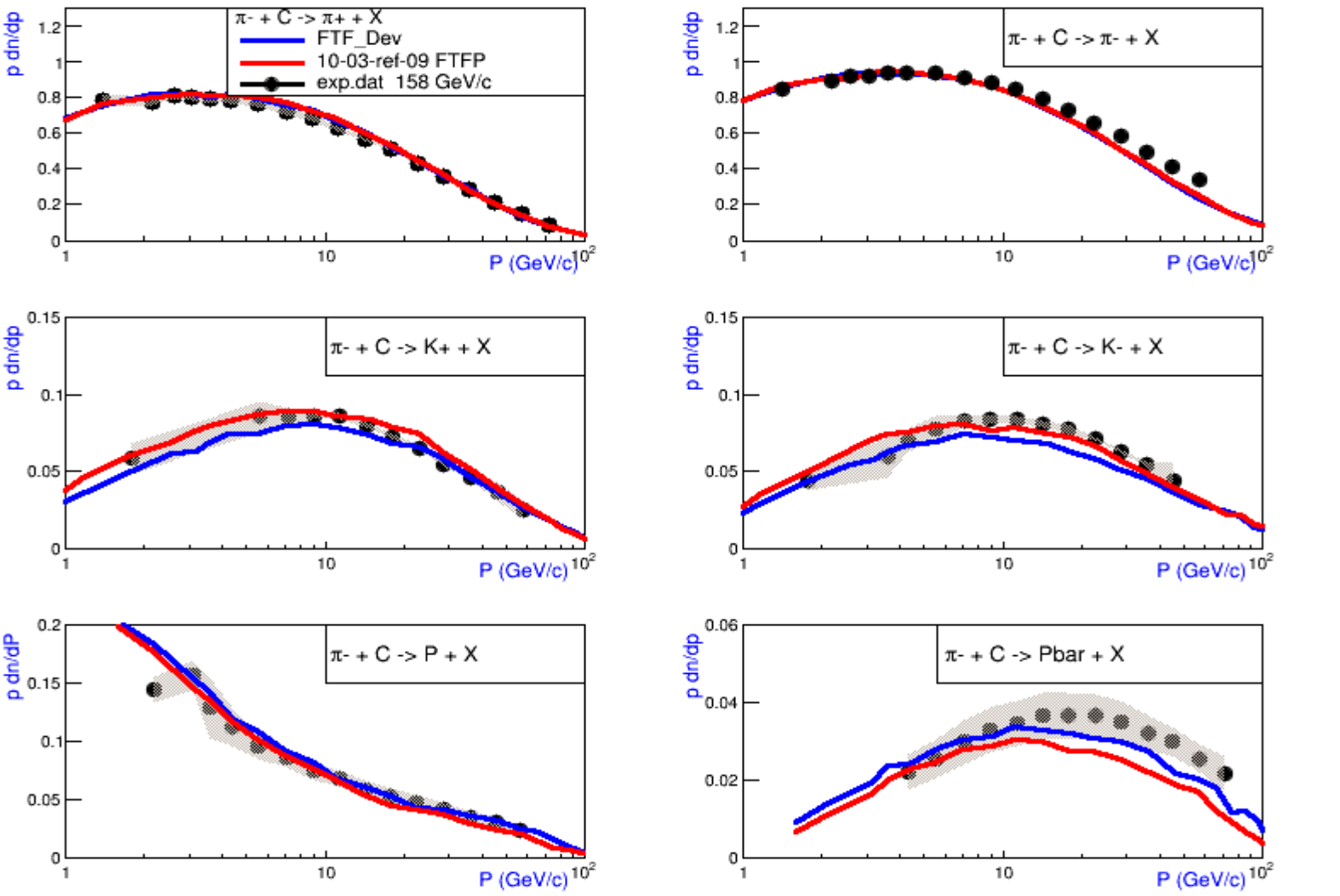


(Comparison with EPOS, FTFB in G4-09-05 is done in the paper.)

Validation of FTF model for strange particle production

Measurements of Hadron Production in Pion-Carbon Interactions with NA61/SHINE at the CERN SPS. **NA61/SHINE Collaboration (Raul R. Prado (Sao Paulo U., Sao Carlos) for the collaboration).Jul 25, 2017. Conference: C17-07-12 Proceedings. arXiv:1707.07902 [hep-ex]**



Validation of FTF model for strange particle production

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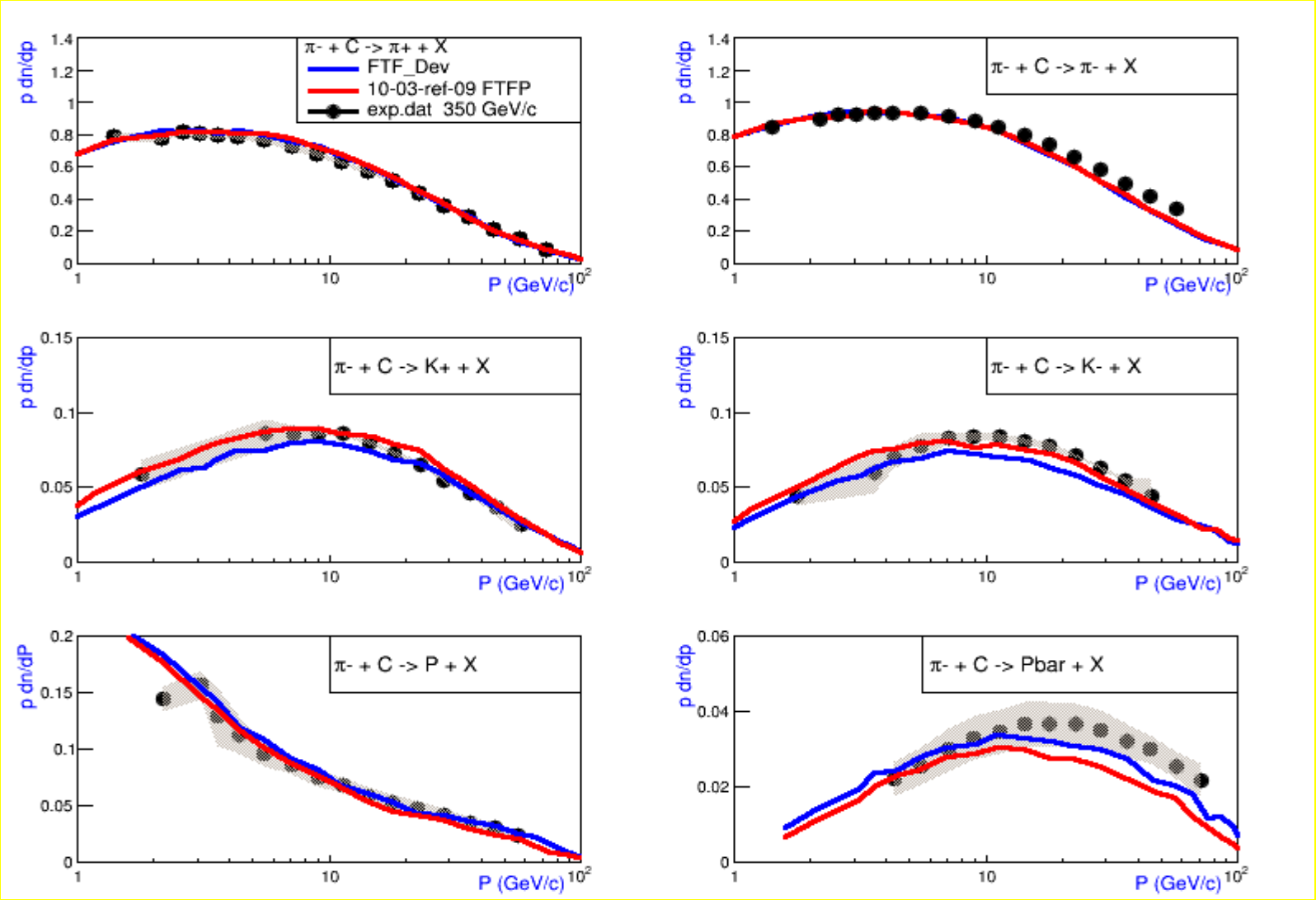
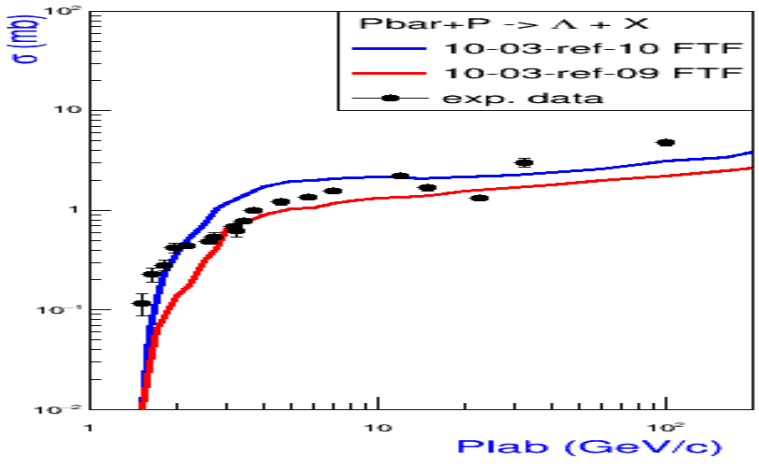
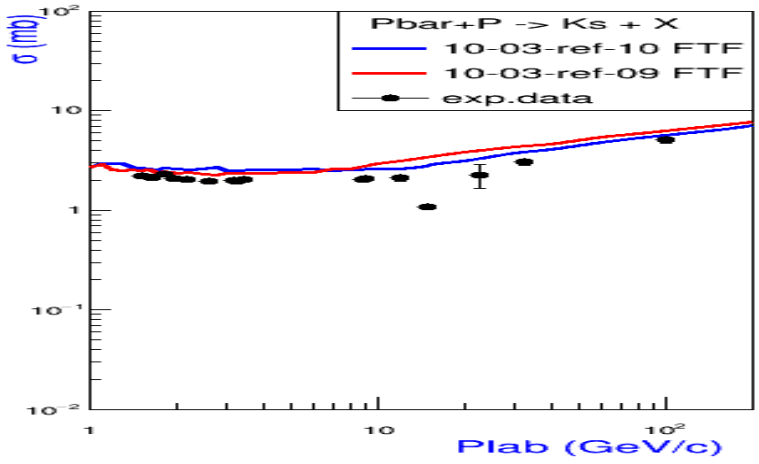


Validation of FTF model for strange particle production

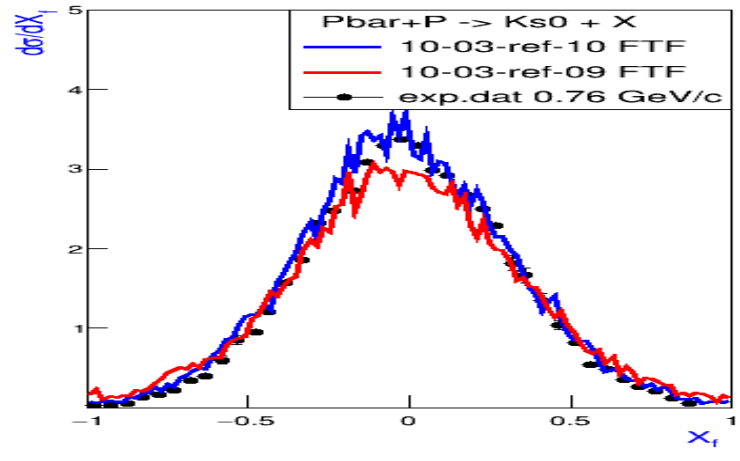
Inclusive Cross Sections of PbarP->Λ+X and PbarP->Ks^0+X processes

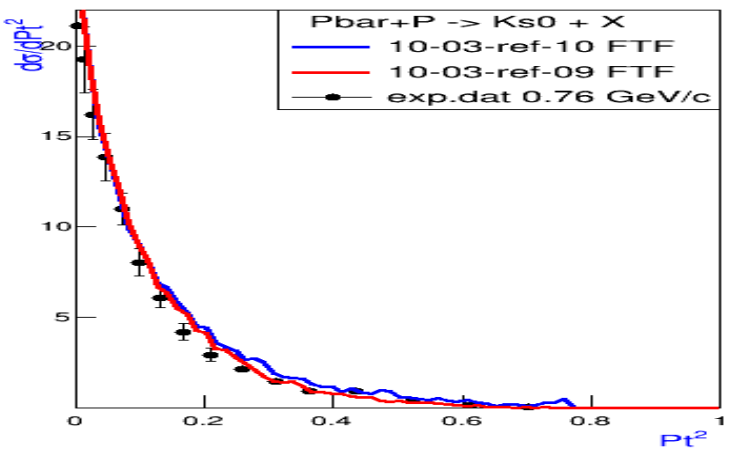
Exp.data: S. Banerjee et al., TIFR-BC-78-8





Xf and Pt^2 distributions of Ks^0 in PbarP->Ks^0 +X at Plab=0.76 GeV/c

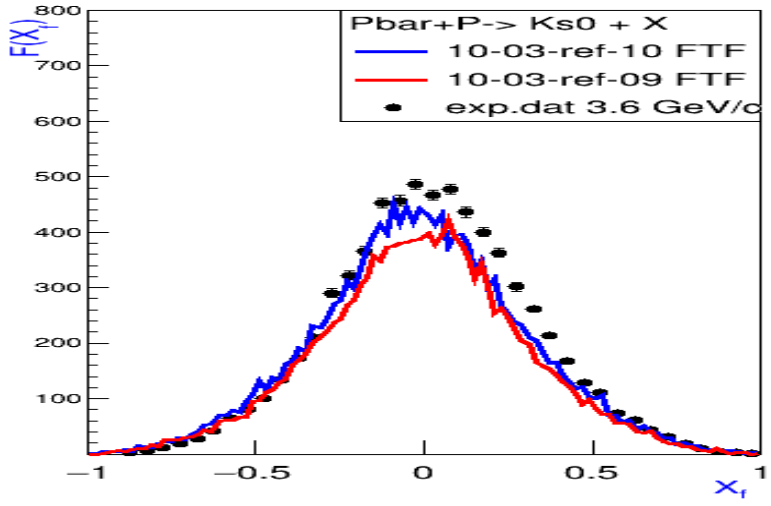


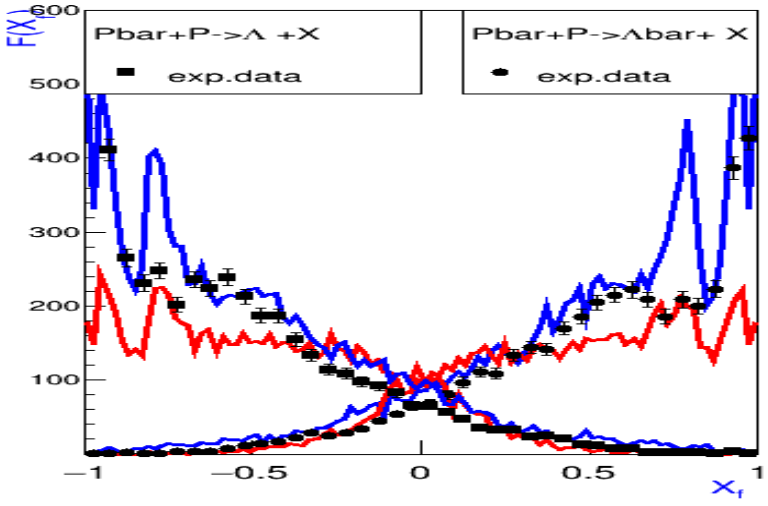


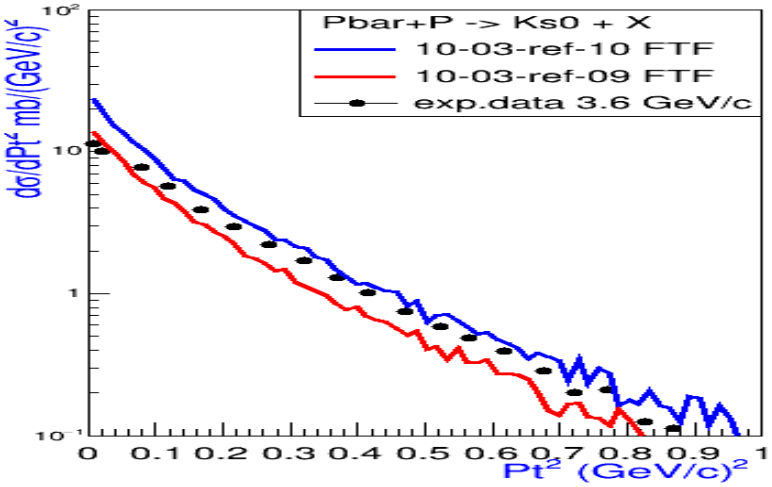
Exp.data: A.M. Cooper et al., Nucl.Phys.B 136, 1978, P.365

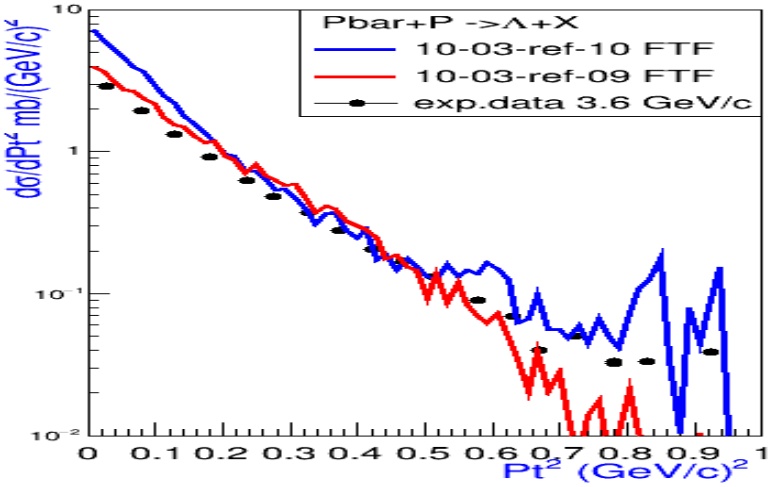
Validation of FTF model for strange particle production

Kinematic distributions of Λ, Λbar, Ks^0 produced in PbarP interactions at 3.6 GeV/c





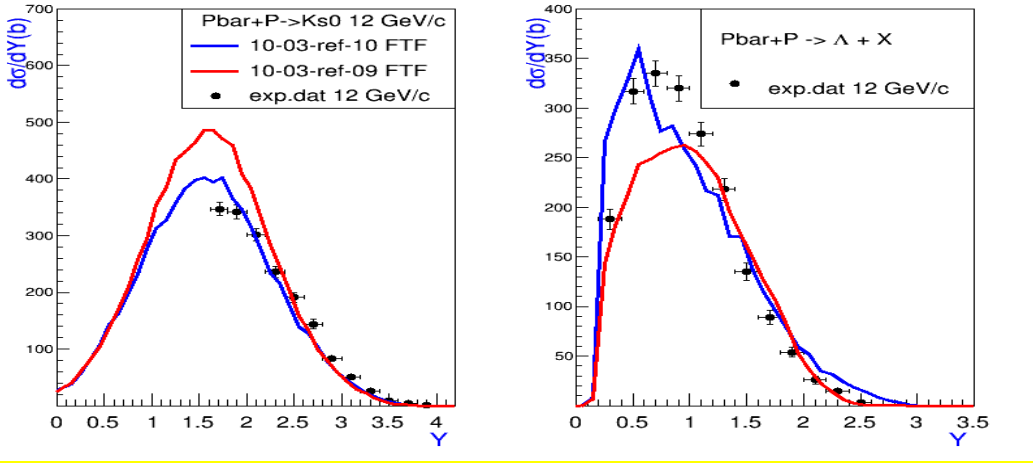


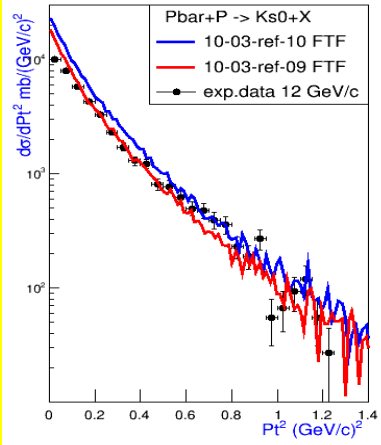


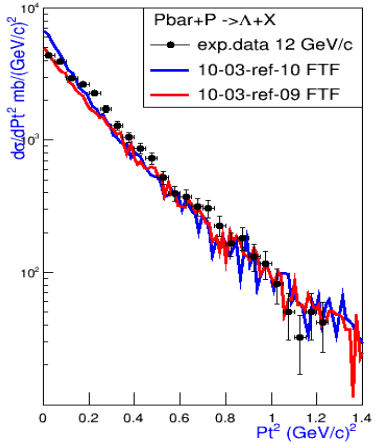
exp data: S.Banerjee et al.,TIFR-BC-78-8

Validation of FTF model for strange particle production

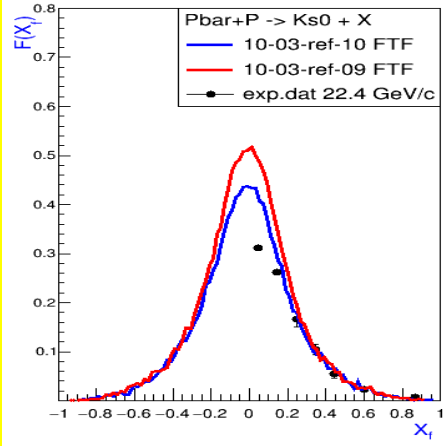
Kinematic distributions of Λ and Ks^0 produced in PbarP interactions at Plab=12 GeV/c and 22.4 GeV/c

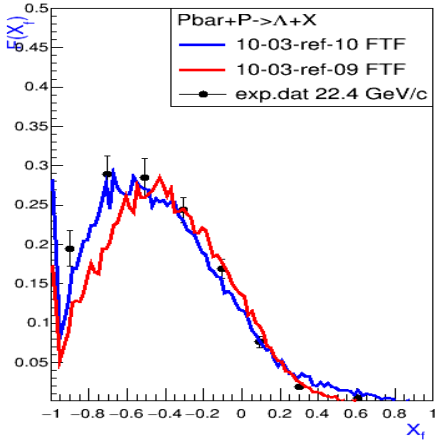


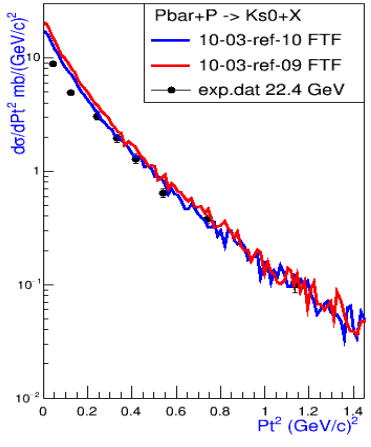


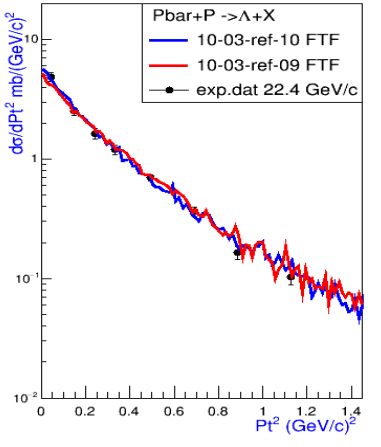


Exp data: D. Bertrand et al., Nucl. Phys. B 128 365 (1977)



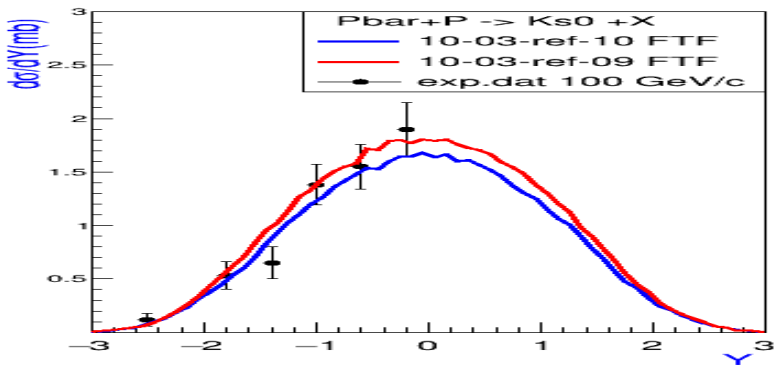


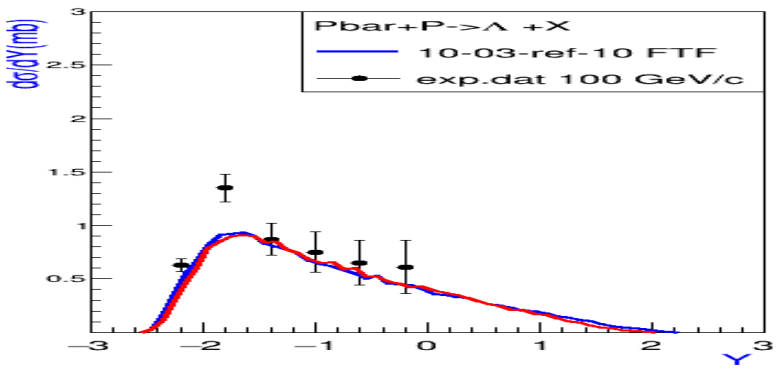


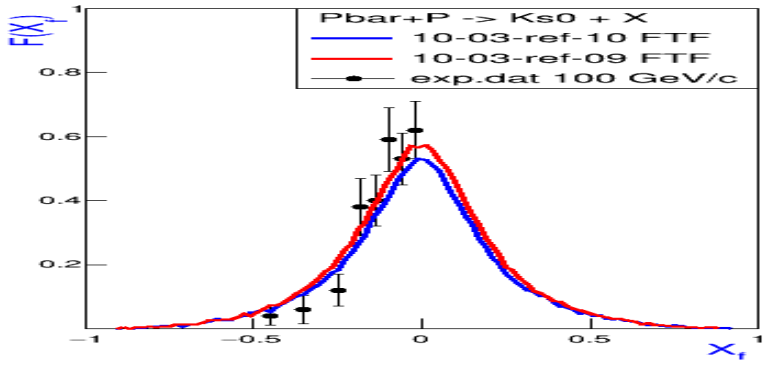


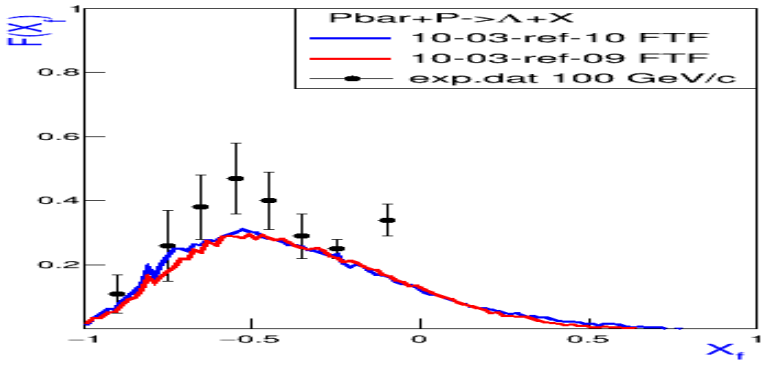
Exp data: B.V. Batyunya et al., Z. Phys.C 25 213 (1984)

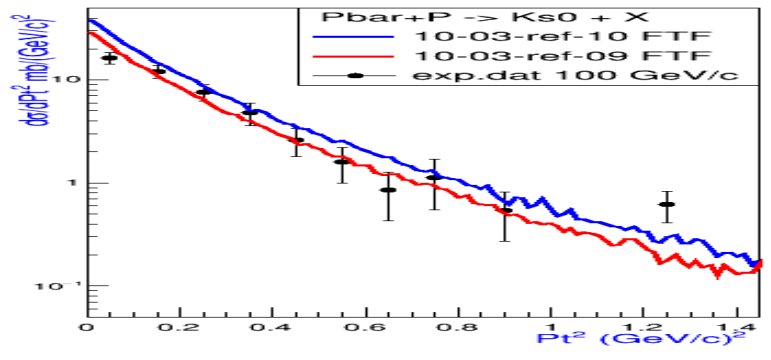
Kinematic distributions of Λ and Ks^0 produced in PbarP interactions at Plab=100 GeV/c

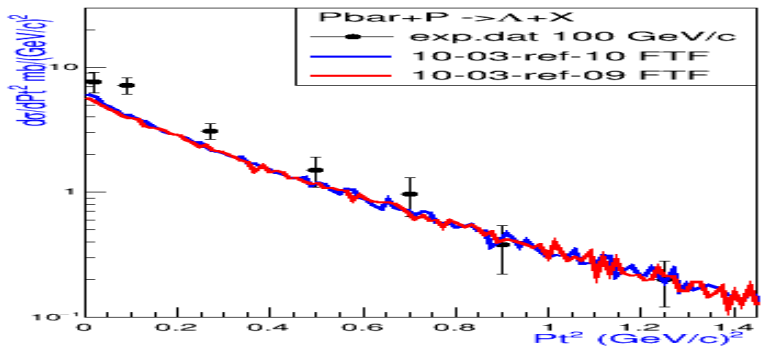






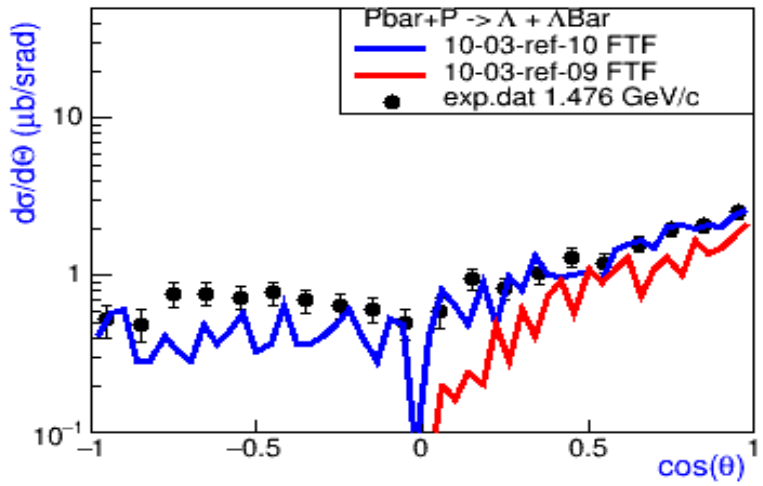


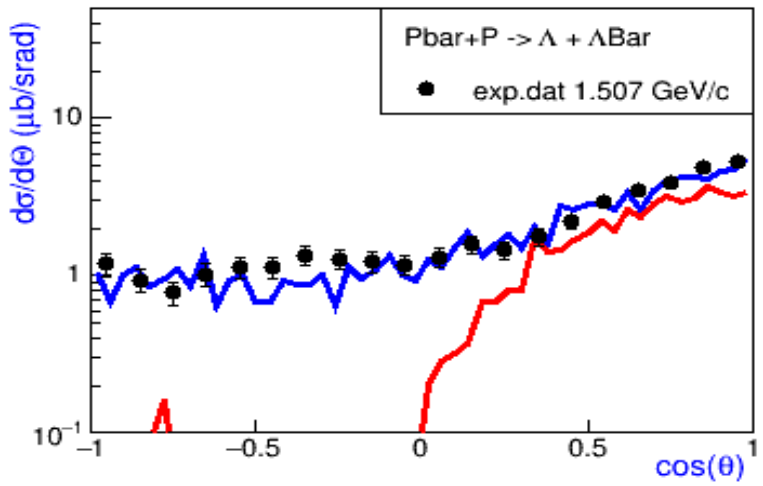


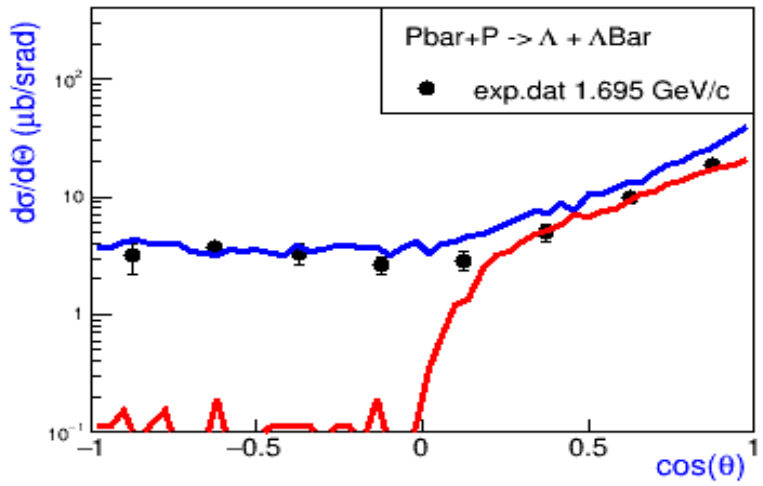


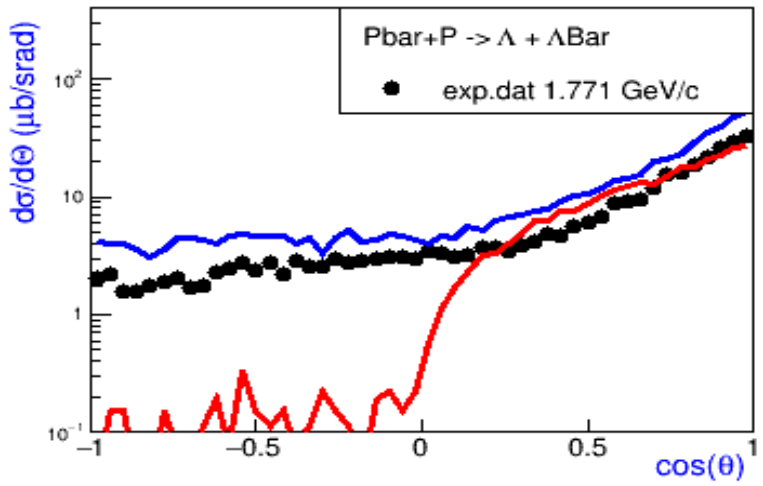
Exp data: D.R. Ward et al., Phys. Lett. 62B 237 (1976)

Differential Cross Sections of PbarP->ΛΛbar at threshold momenta (cms angle distributions) FTF with rotating strings





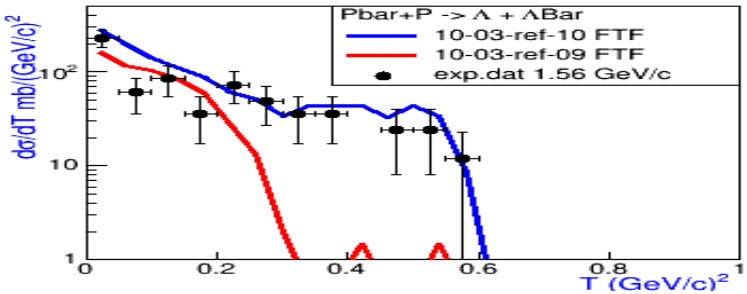


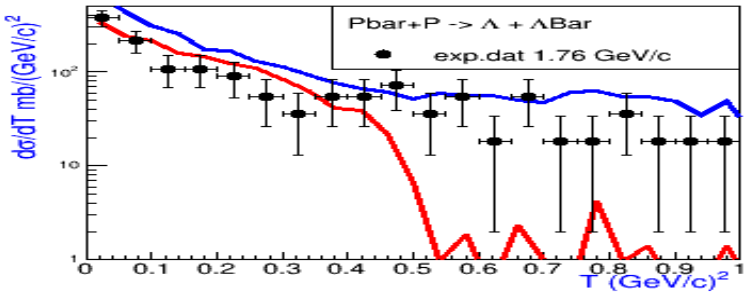


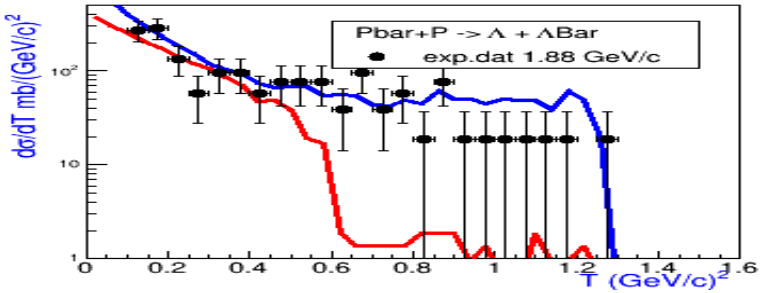
Exp. data: P.D. Barnes et al., Phys. Rev.C, V54. N6 (exp. PS185 at LEAR)

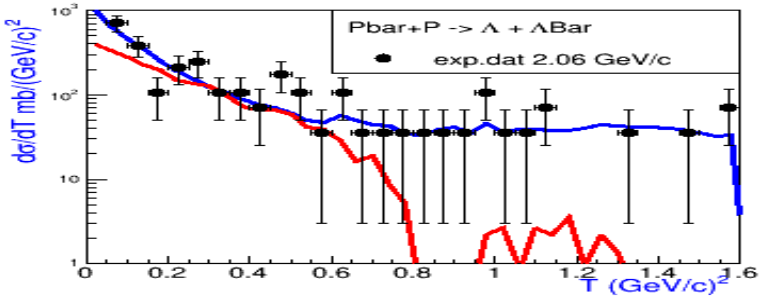
Differential Cross Sections of PbarP->ΛΛbar at various initial energies (transfered momentum distributions) FTF with rotating strings

Exp. data: B. Jayet et al., Nuov. Cim. A45, 371 (1978)

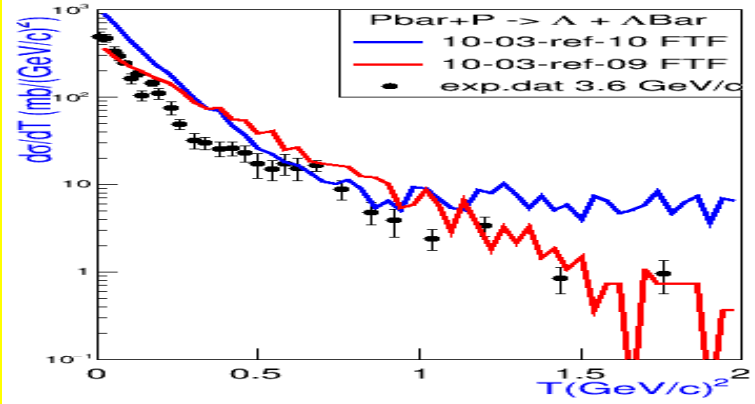


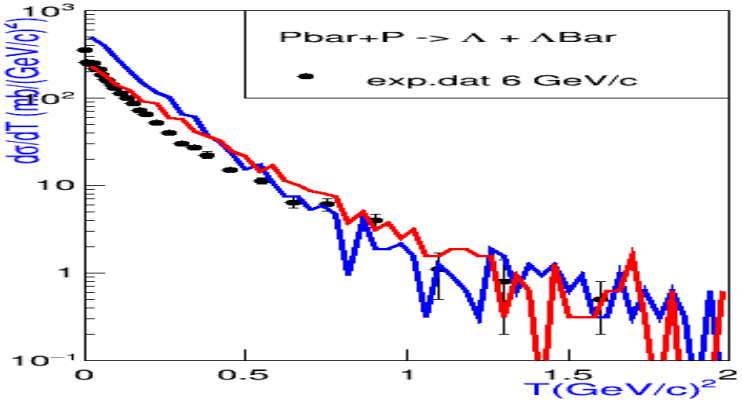






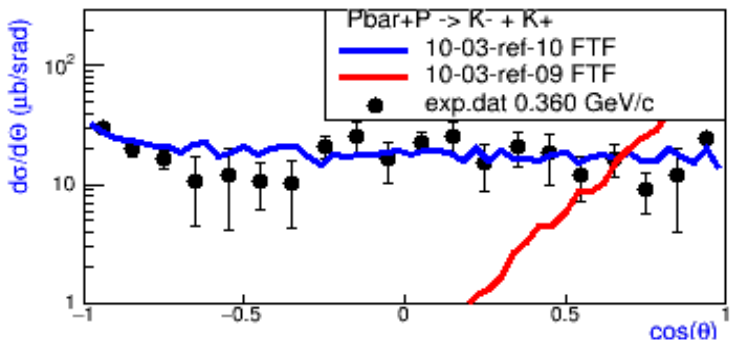
Differential Cross Sections of PbarP->ΛΛbar at Plab= 3.6 and 6 GeV/c

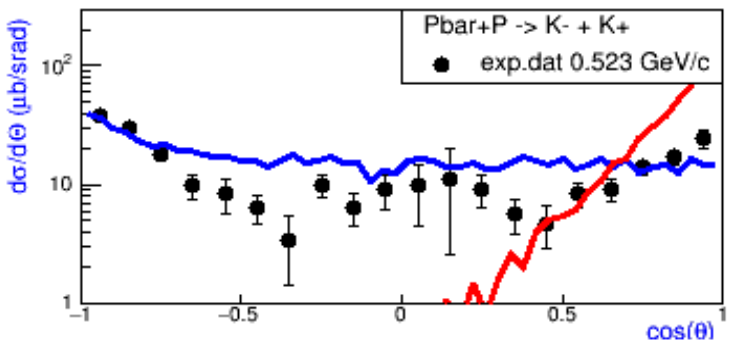


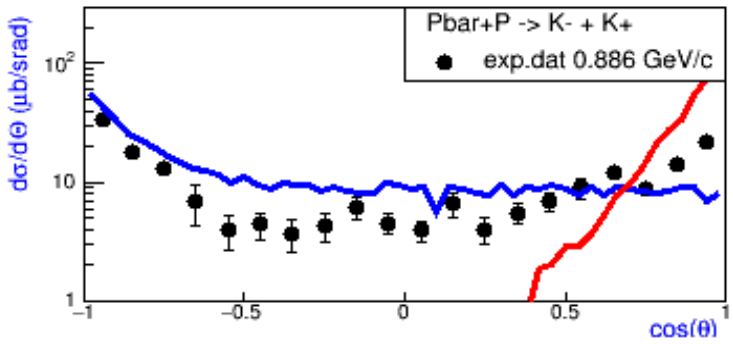


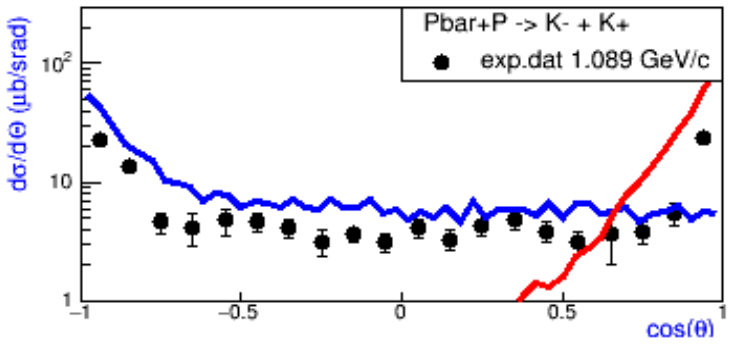
Exp. data: H. Becker et al., Nucl. Phys. B141 48 (1978)

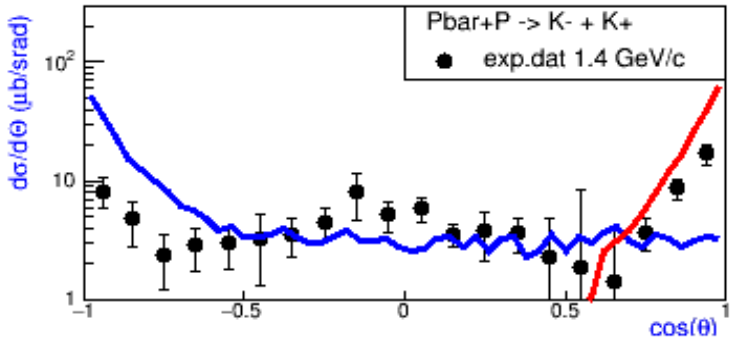
Differential Cross Sections of PbarP->K+ K- at various initial energies (cms angle distributions) FTF with rotating strings

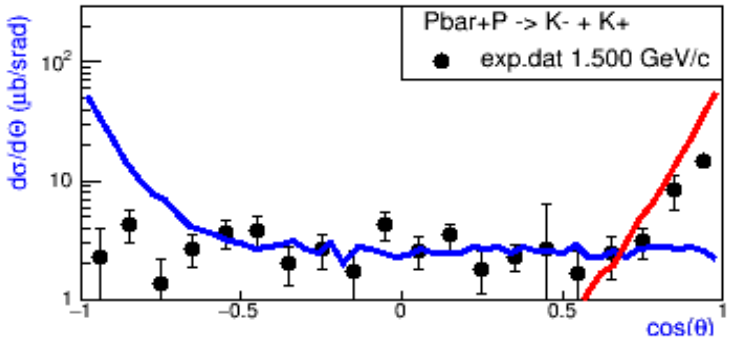












Conclusion

1. FTF model validation for *K±, K0S, Λ* production in proton-proton, proton-Carbon and π-meson – Carbon interactions is checked. Corresponding files are created for model calculations, visualization and comparison with exp. data of NA61/SHINE collaboration and ready to commit in folder test22/NA61.

2. A new formula for *Probability* of strange q-qbar production at final string decay is proposed and implemented in the FTF model. New *Probability* essentially improved description of strange particle production in FTF.

3. A new formula for *Probability* of diquark-antidiquark production at string decay is proposed and implemented in the FTF model. New *Probability* essentially improved description of antiproton and *Λ* production in FTF model.

4. Good agreement of model calculations and exp. data on *K±, K0S, Λ* production in proton-proton, proton-Carbon and π-meson – Carbon collisions in wide energy range is reached in improved FTF.

5. Kinematical properties of Λ hyperons and Ks^0 mesons produced in Pbar-P reactions are calculated in FTF model with rotating strings and compared with exp. data at different initial momenta. Reasonable description of exp. data is obtained in FTF.

6. Differential cross sections of ΛΛbar and K+K- produced in Pbar-P interactions are calculated in FTF model with rotating strings. New FTF describes the cross sections well.

Tuning of FTF model using NA61/SHINE data

Measurements of π±, K± , K0S , Λ and proton production in proton–carbon interactions at 31 GeV/c with the NA61/SHINE spectrometer at the CERN SPS

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