

Study of A+C Interactions at JINR (4.2 GeV/c/A)

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Geant4 Collab. Meeting

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Comparison with model calculations (DCM, Fritiof, UrQMD+SMM)

Experiment details

2 meter propan bubble chamber.

Beams: p, d, ^4He , ^{12}C with momentum 4.2 GeV/c per nucleon.

Statistics

pC ₃ H ₈	12757	pC	8971
dC ₃ H ₈	9016	dC	5807
$^4\text{HeC}_3\text{H}_8$	22975	αC	13319
CC ₃ H ₈	39544	CC	20594

Good identification of π^+ , π^- - mesons

Proton identification ($0.15 \leq p \leq 0.5$ GeV/c)

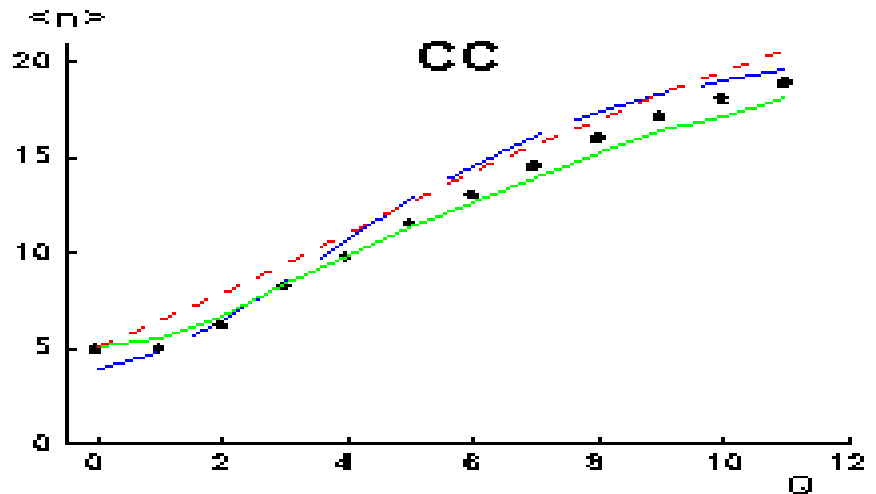
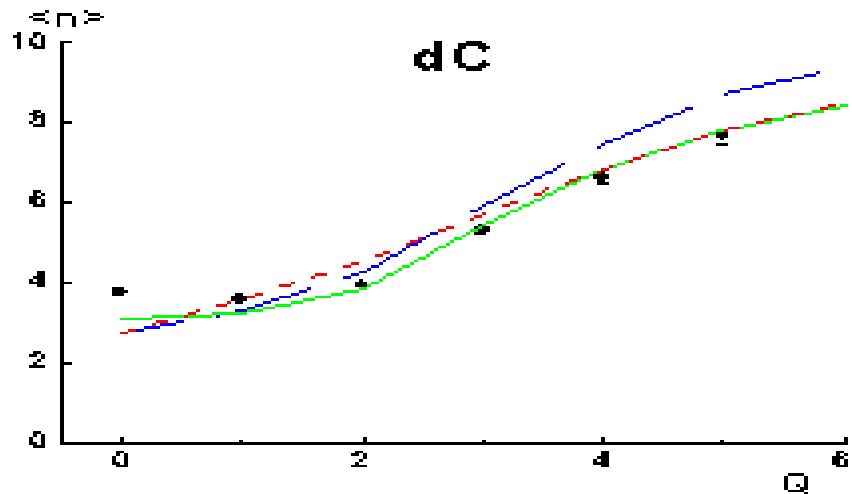
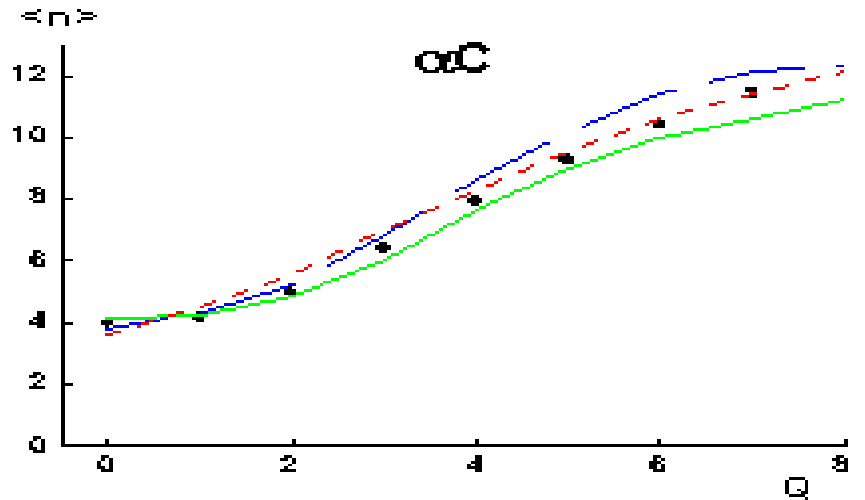
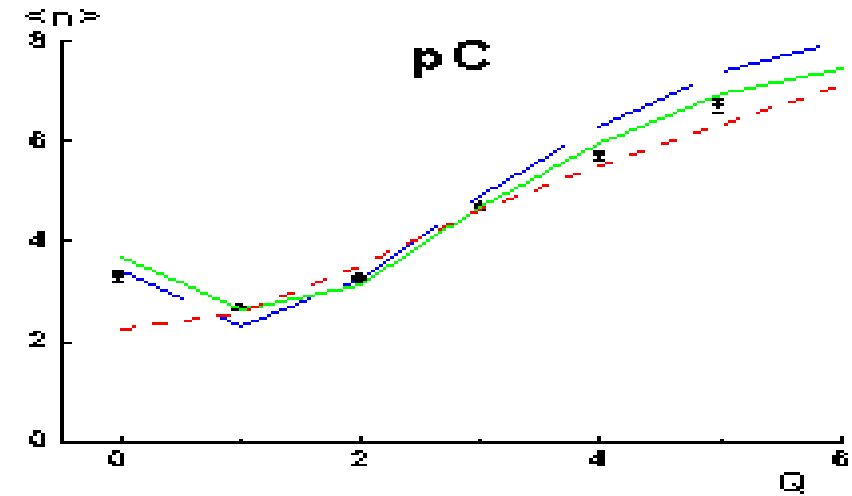
Stripping fragments ($p > 3$ GeV/c and $\theta < 4^\circ$)

Proton participants ($p > 0.3$ GeV/c) without stripping fragments.

Measure of centrality: $Q = n^+ - n^- - n_p^{\text{evap}} - n^{\text{strip}}$

Q is correlated with impact parameter.

Average multiplicities of charged particles

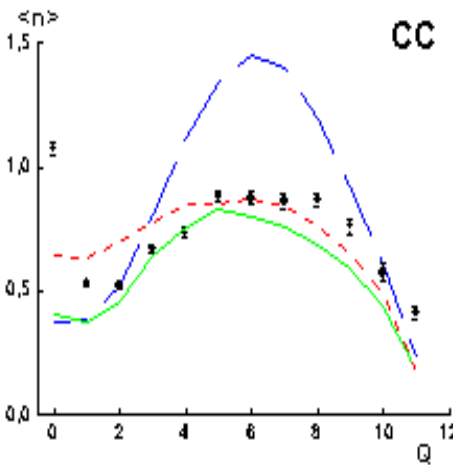
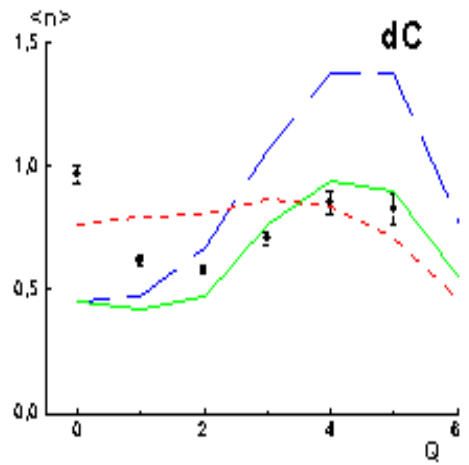
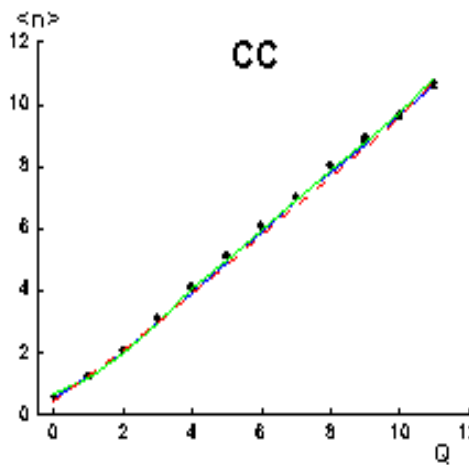
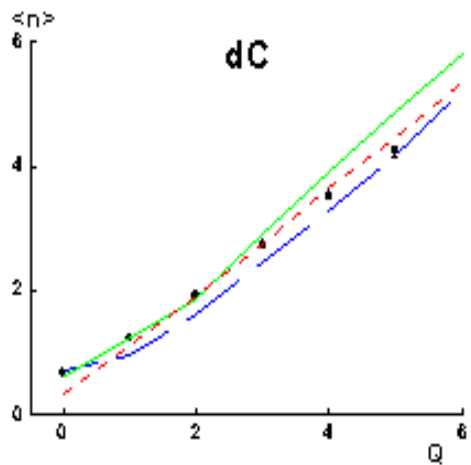
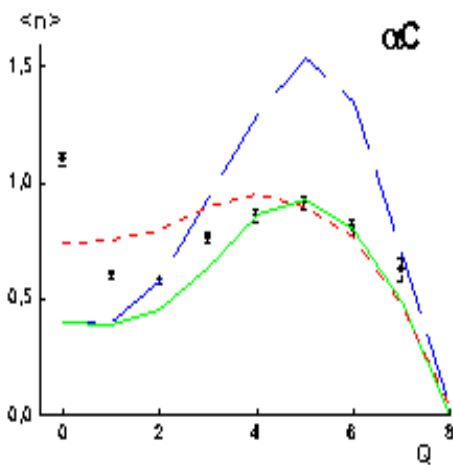
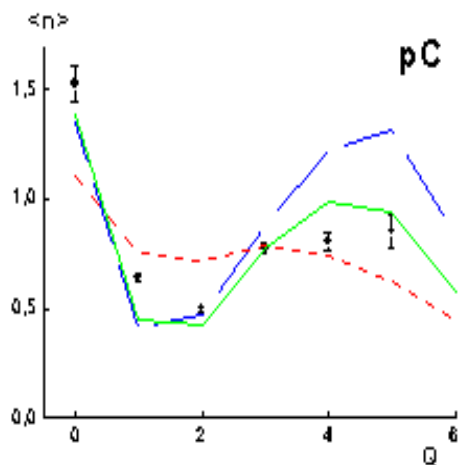
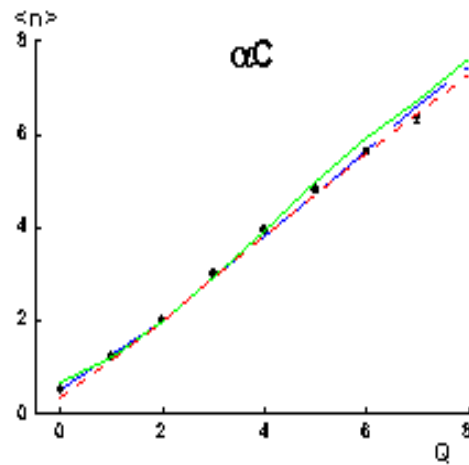
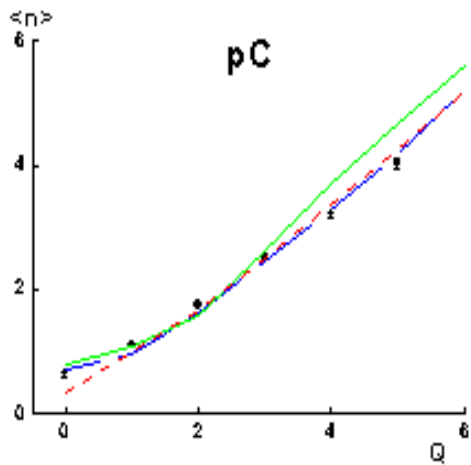


Points – exp. Data, Lines – model calculations: **green -- FRITIOF**, **red – UrQMD+SMM**, **blue – DCM**. All models reproduce the data.

Average multiplicities of protons

Proton-participants

Evaporated protons

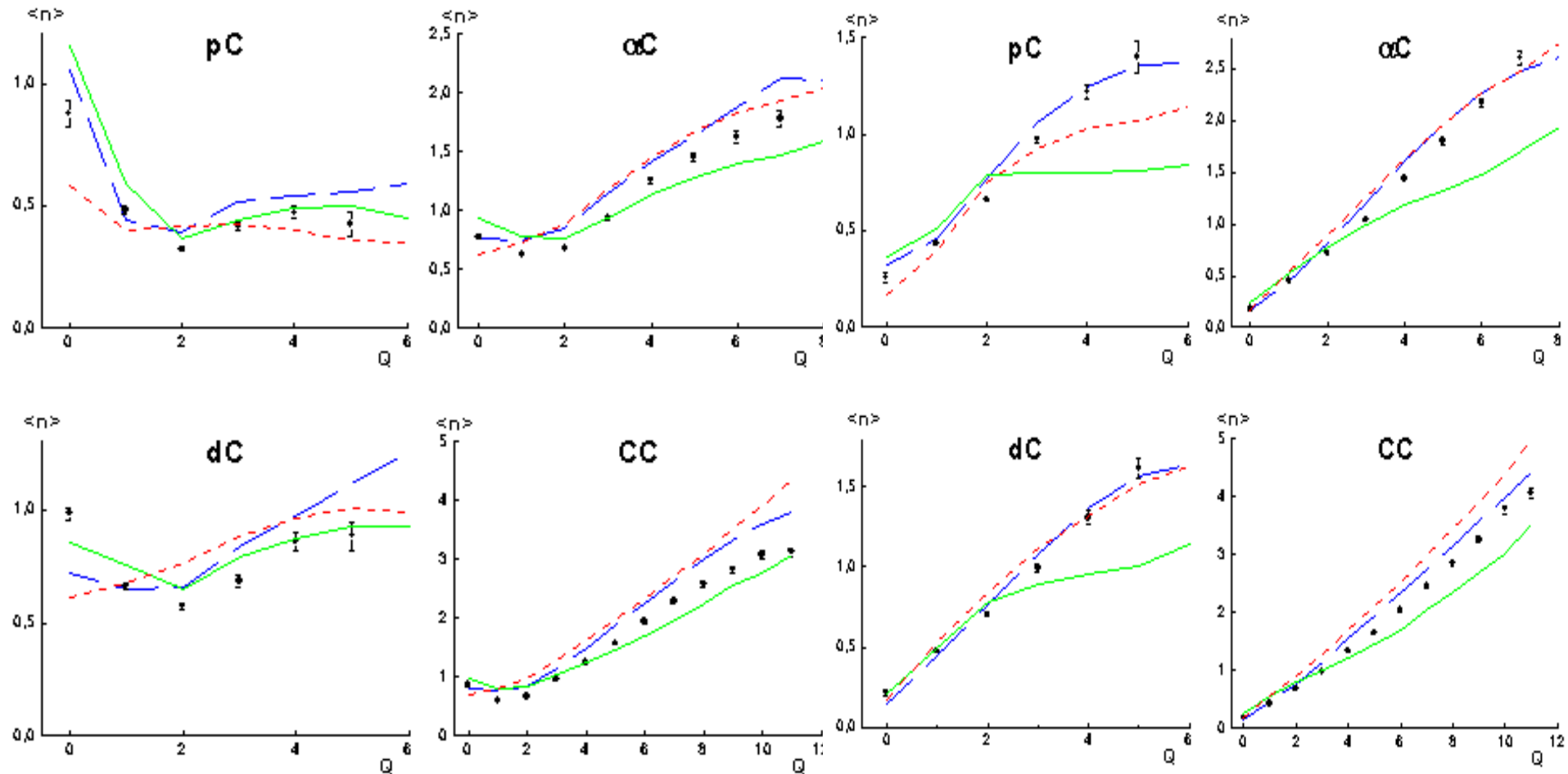


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Average multiplicities of mesons as functions of Q

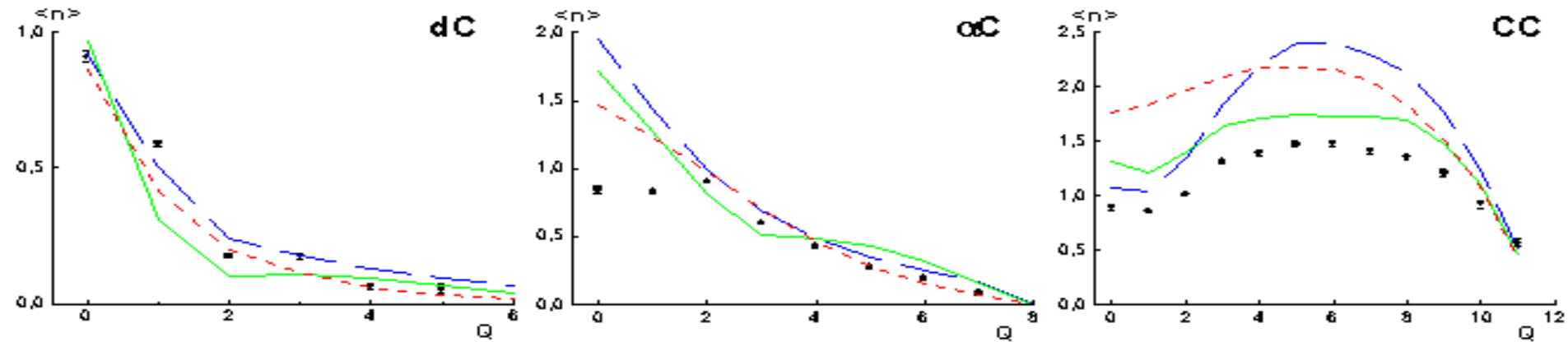
π^- -mesons

π^+ -mesons

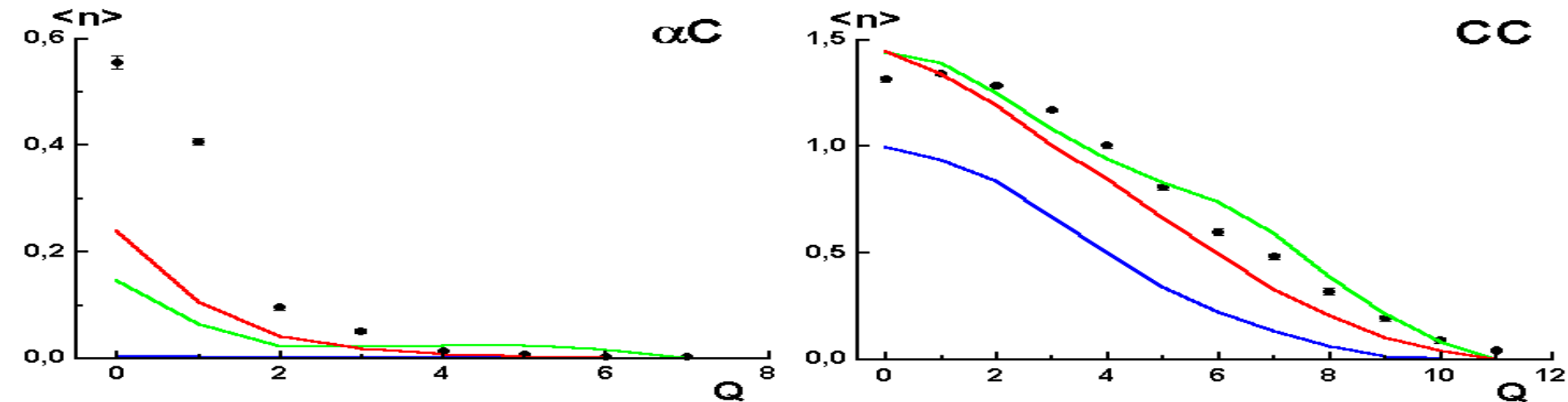


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Average multiplicities of stripping protons



Average multiplicities of multi-charged fragments

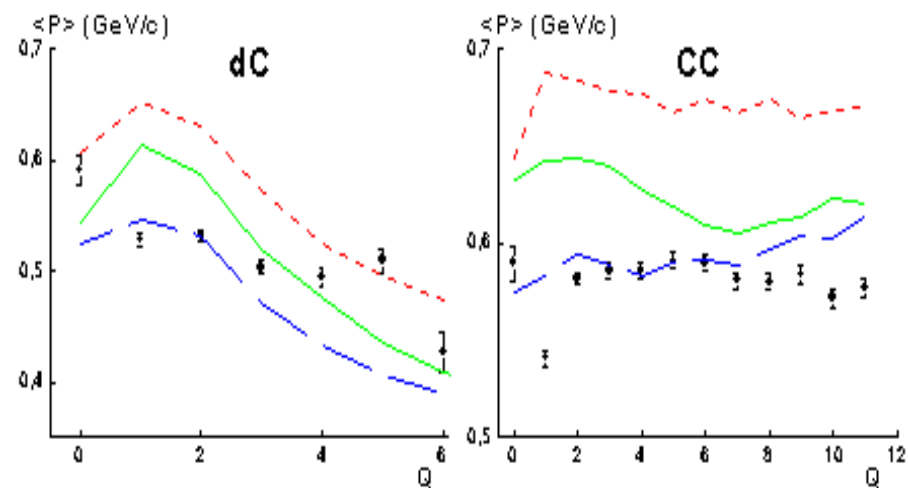
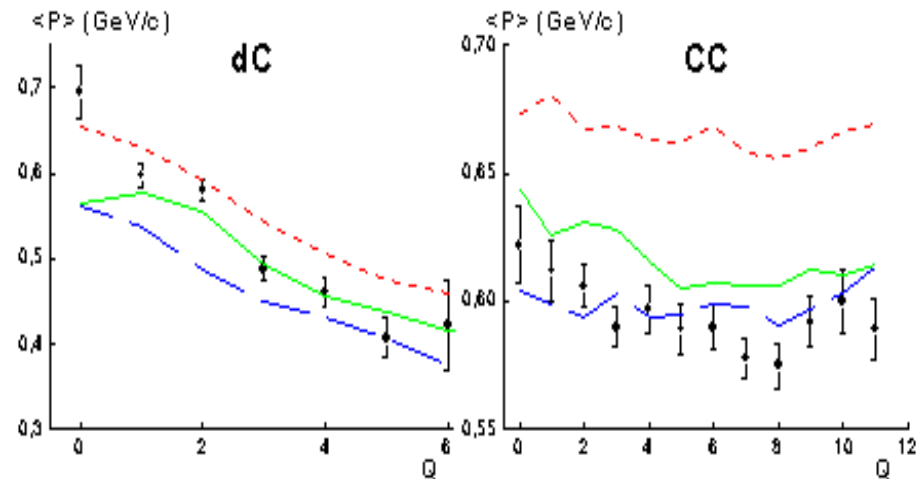
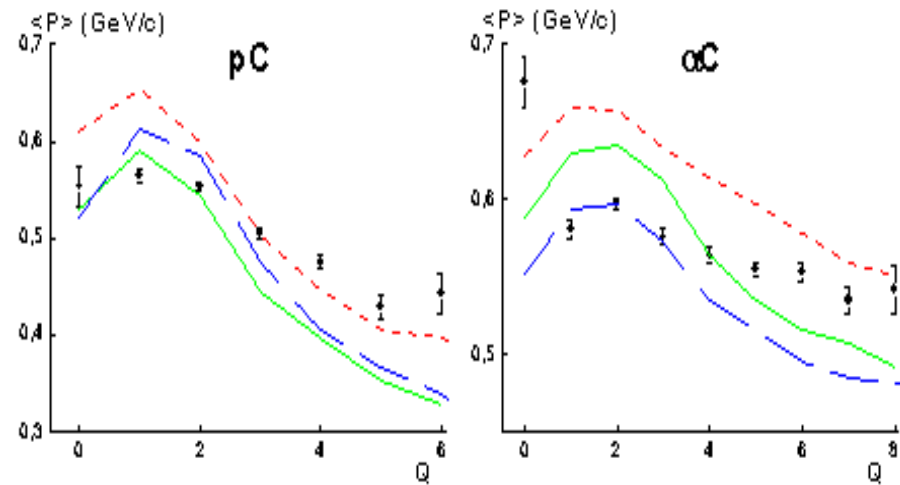
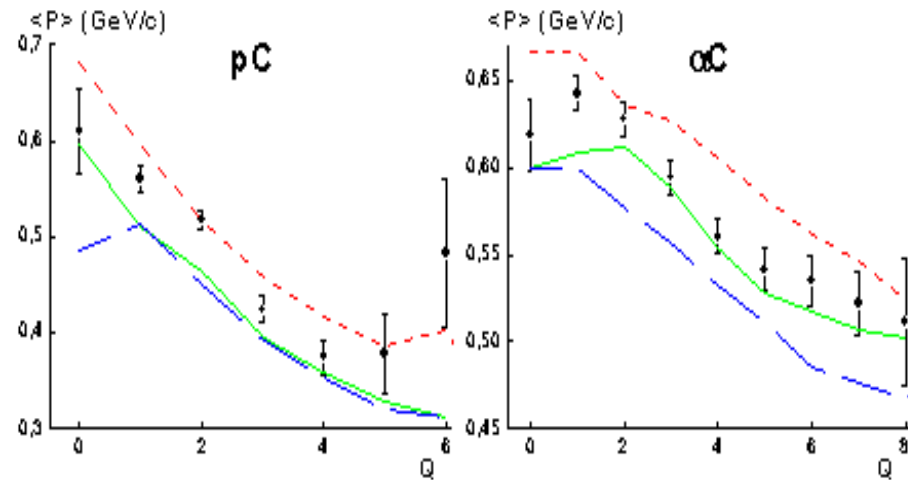


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Average momentum of mesons as functions of Q

π^- -mesons

π^+ -mesons

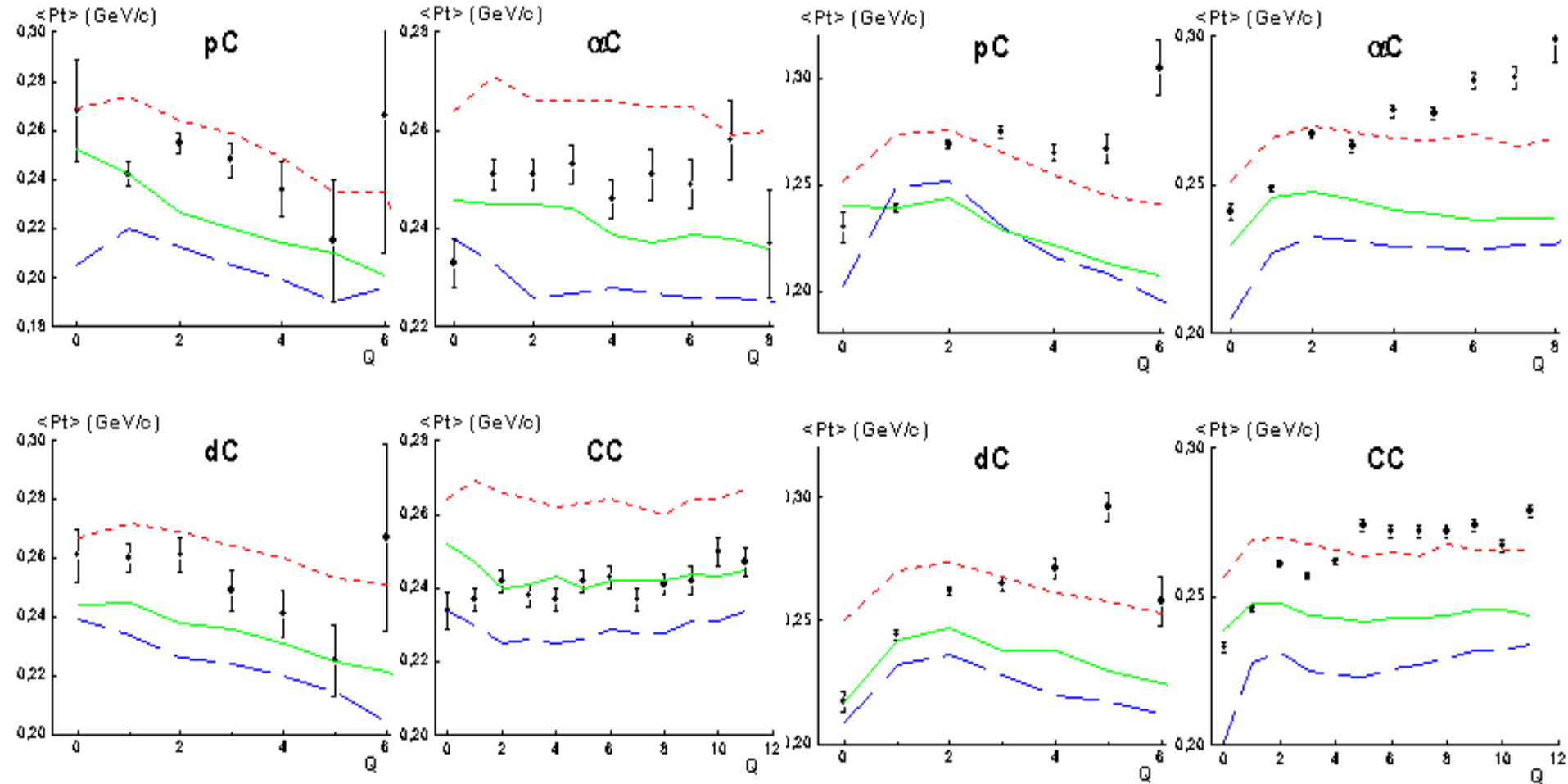


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Average transverse momentum of mesons as functions of Q

π^- -mesons

π^+ -mesons

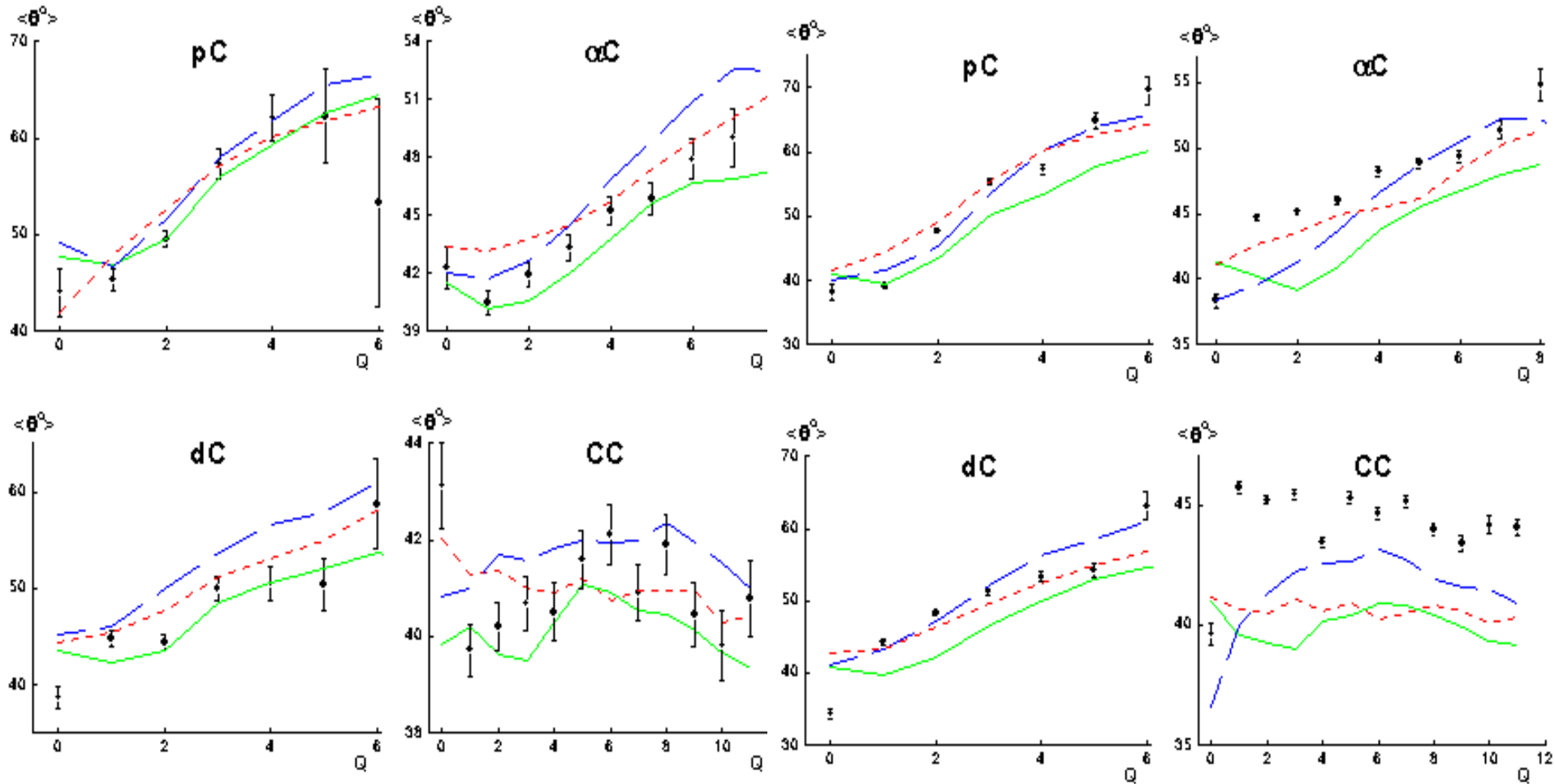


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Average polar emission angles of mesons as functions of Q

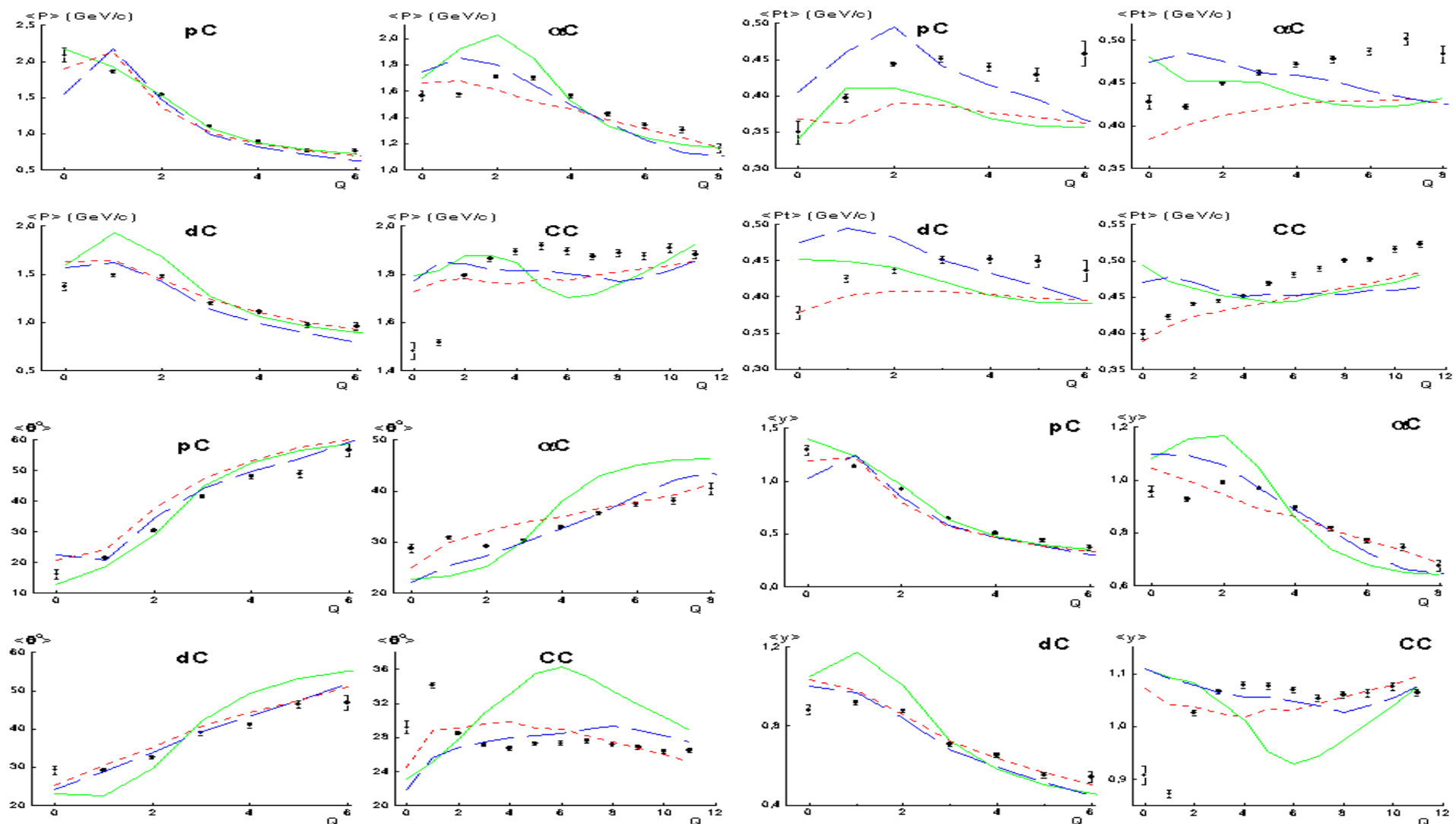
π^- -mesons

π^+ -mesons



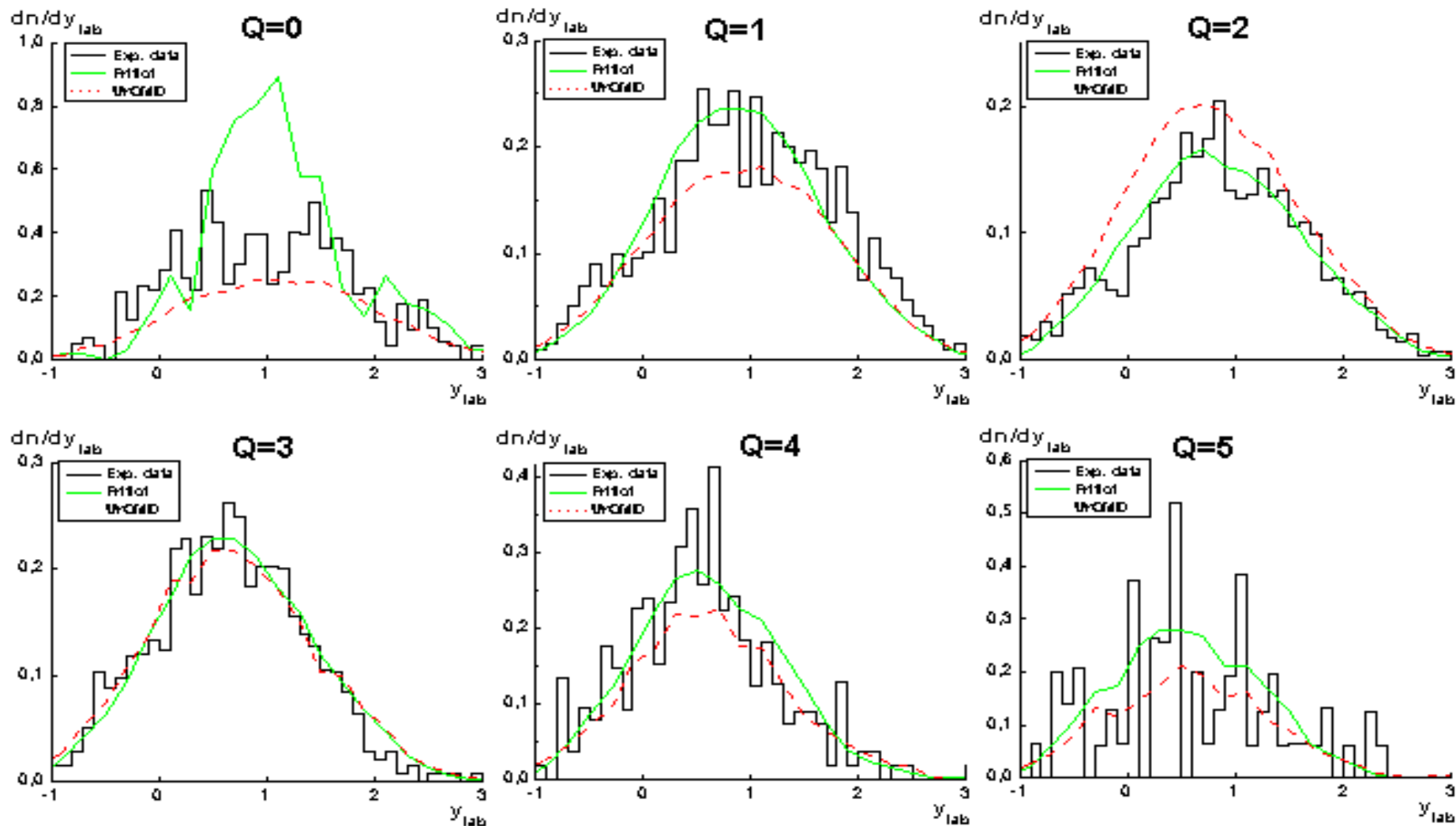
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Average properties of proton participants as functions of Q



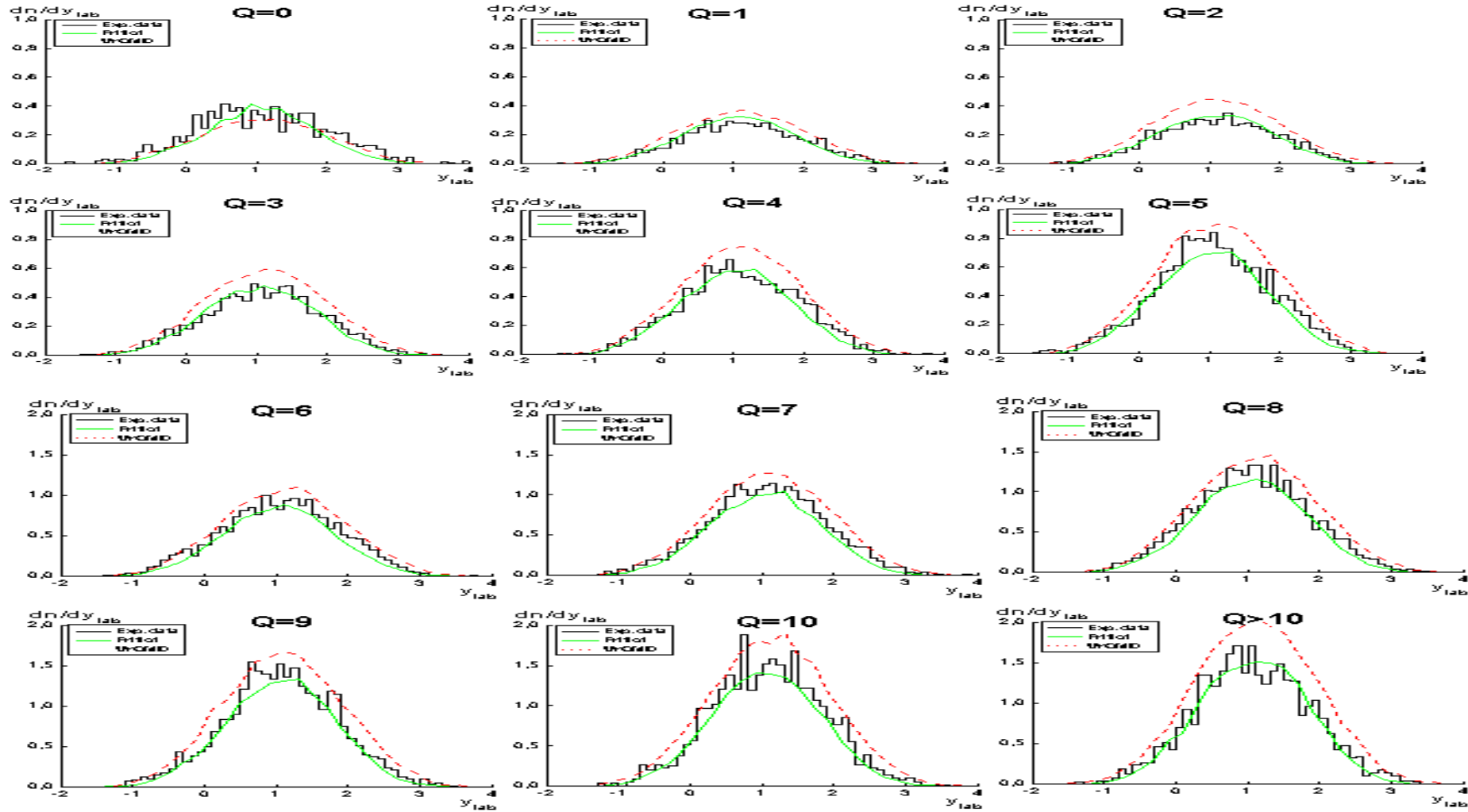
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Rapidity distributions of π^- -mesons in pC interactions



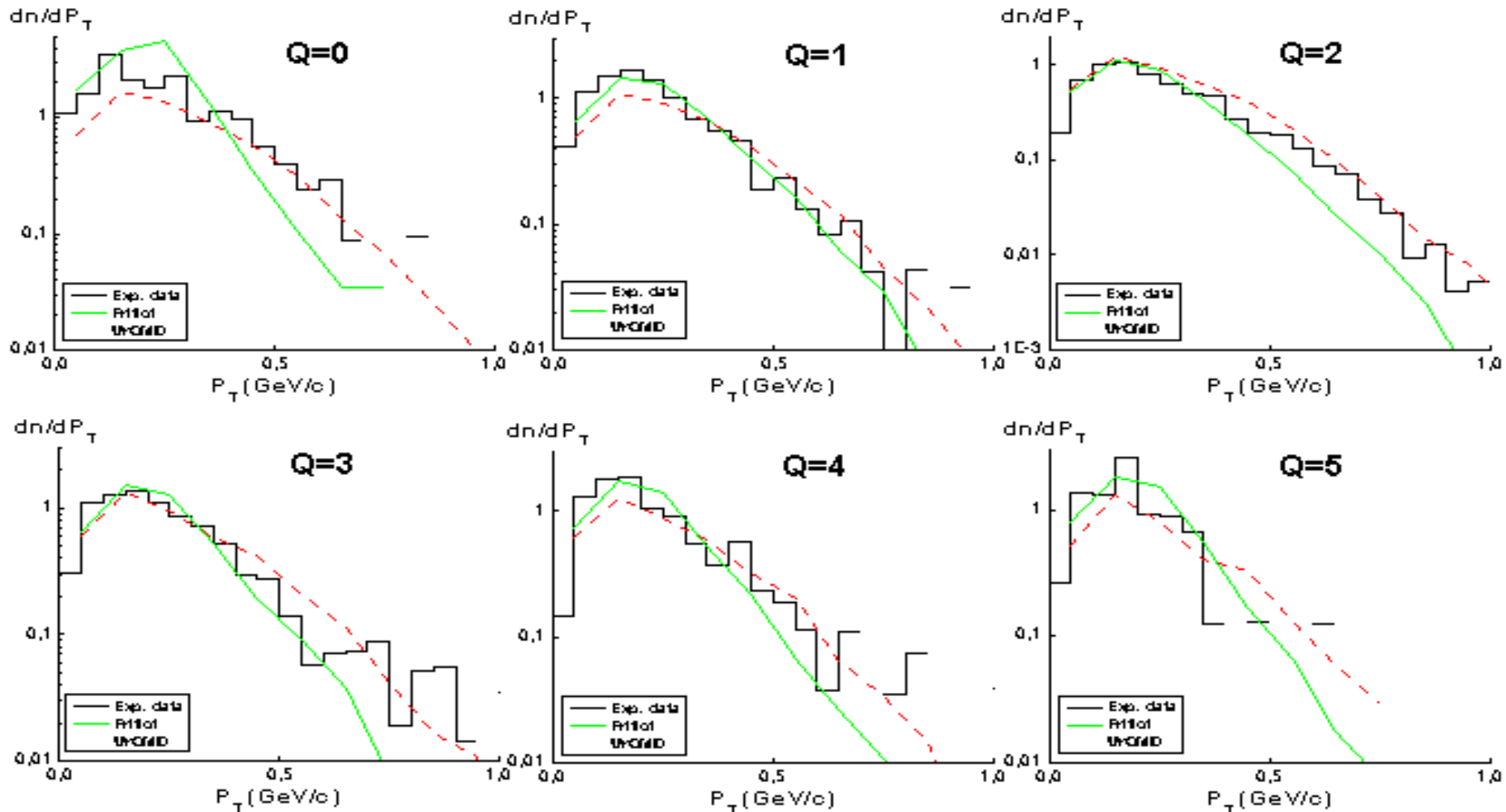
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Rapidity distributions of π^- -mesons in CC interactions



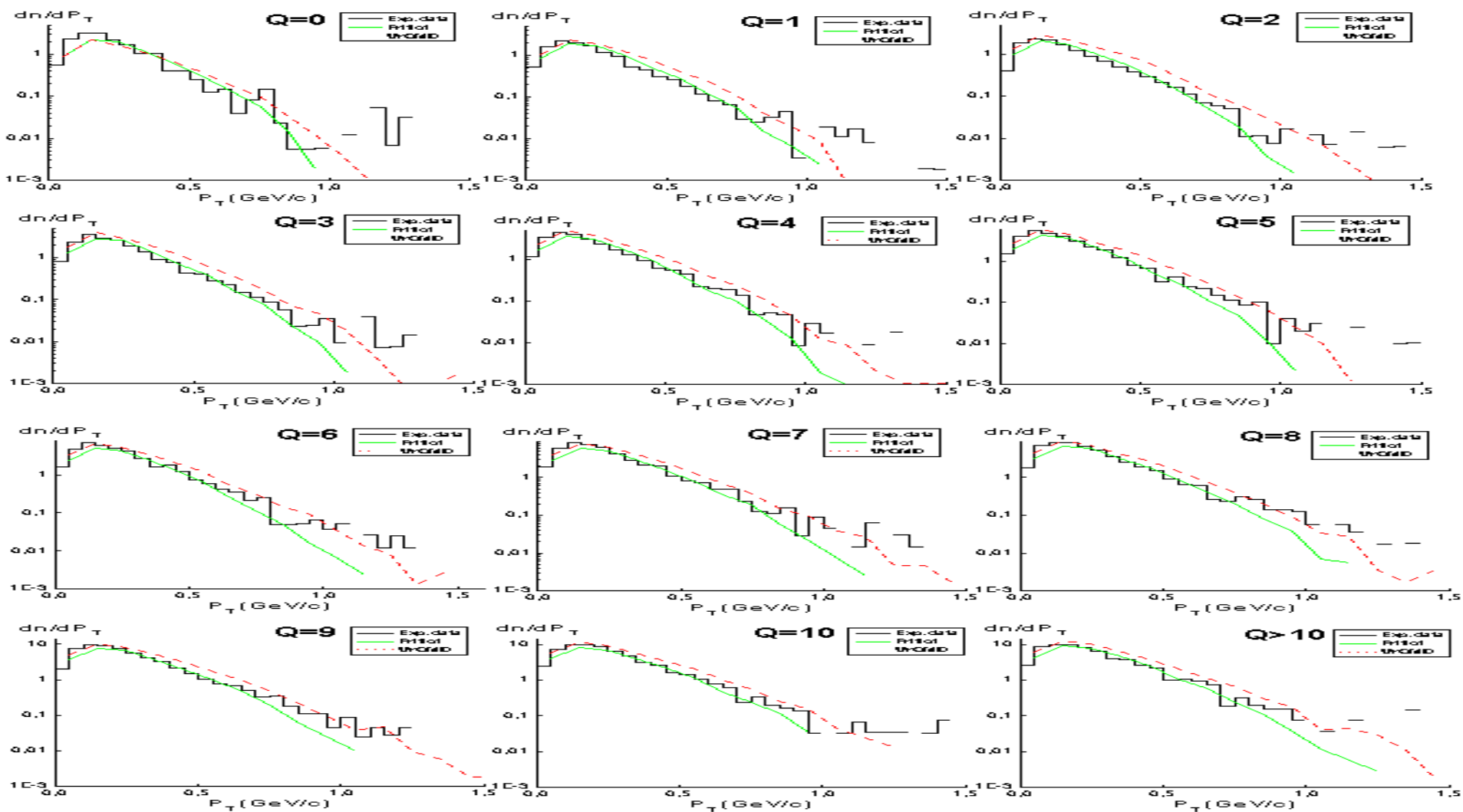
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Pt distributions of π^- -mesons in pC interactions



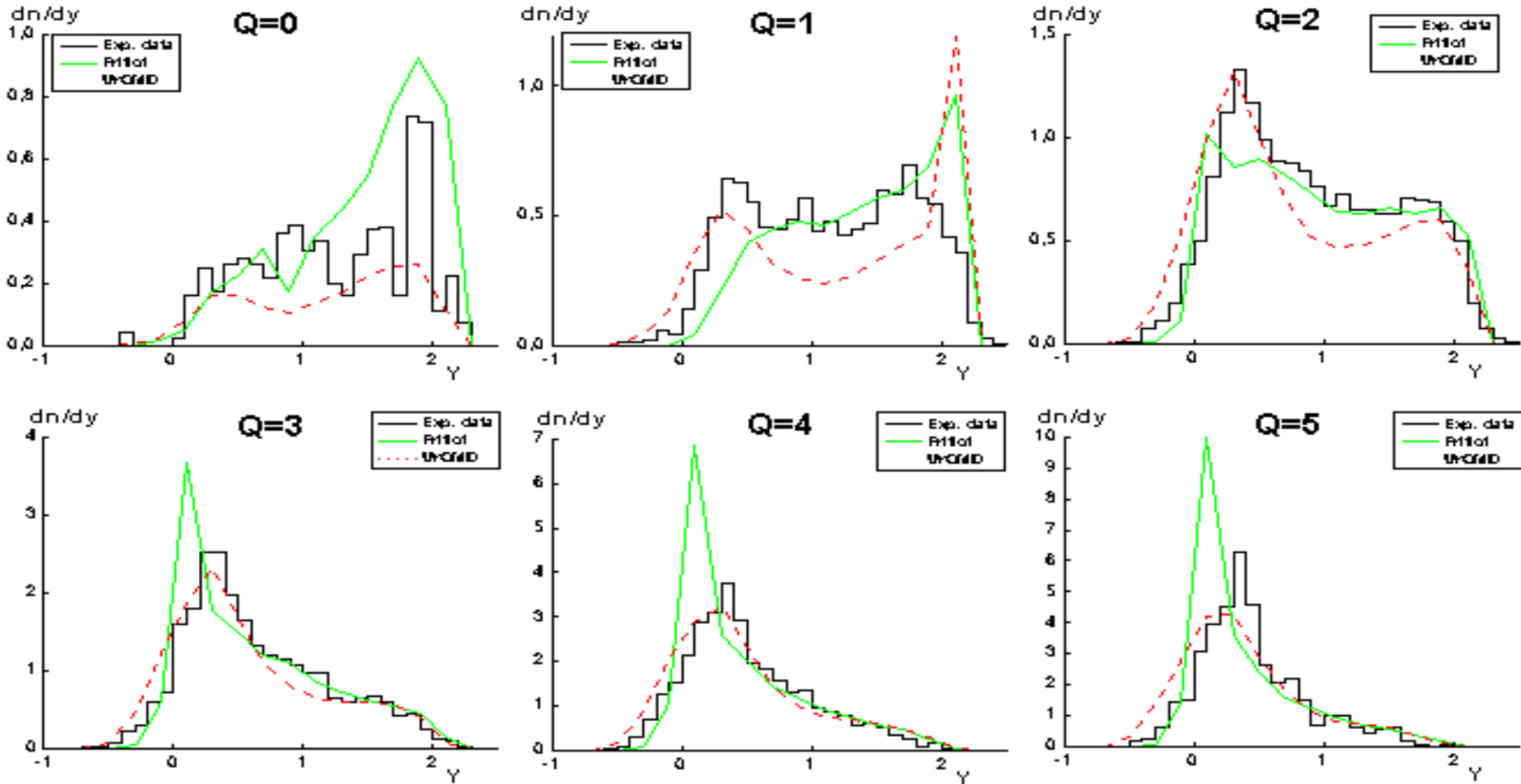
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Pt distributions of π^- -mesons in CC interactions



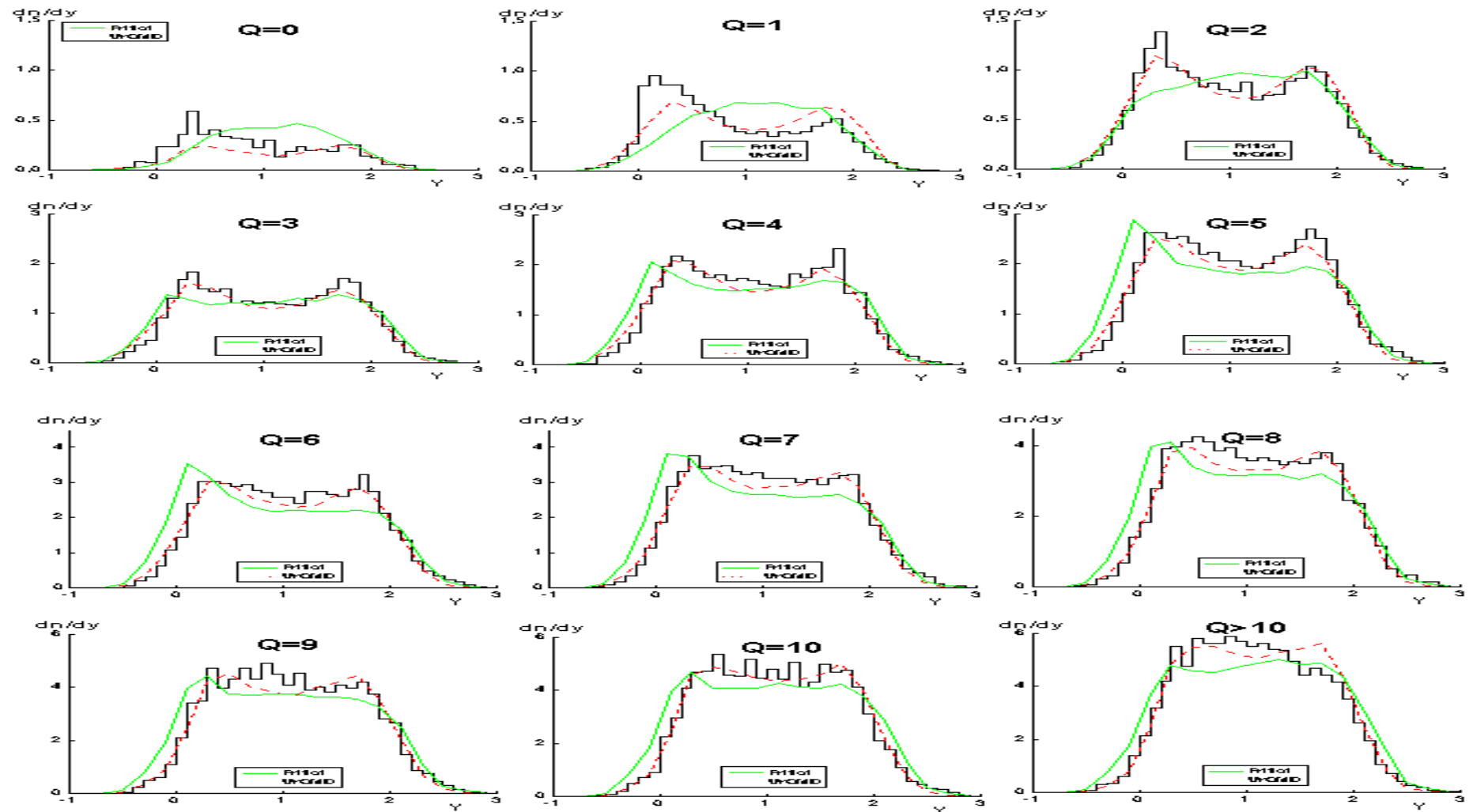
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Y distributions of **proton-participant** in pC interactions



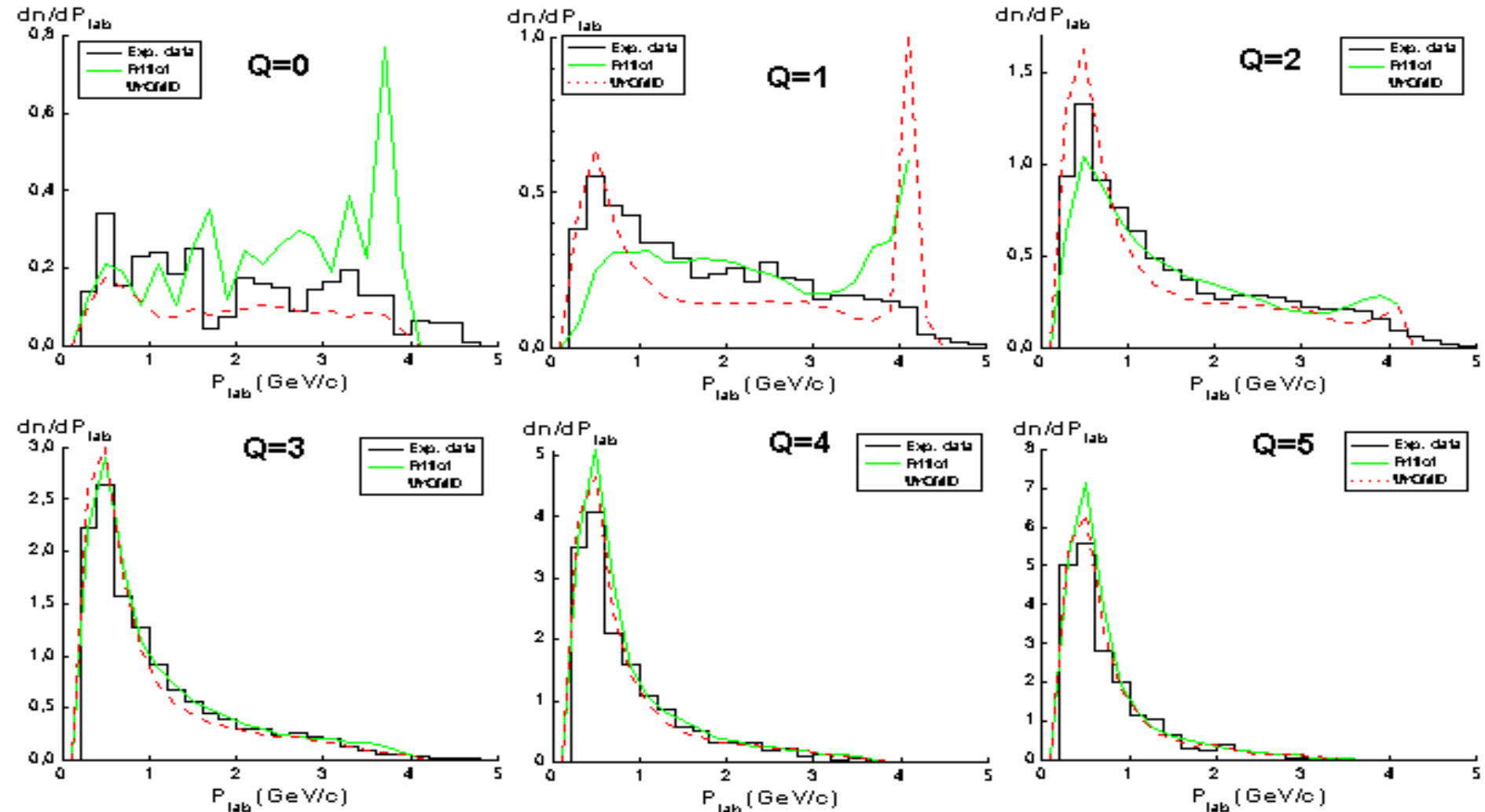
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Y distributions of **proton-participant** in CC interactions



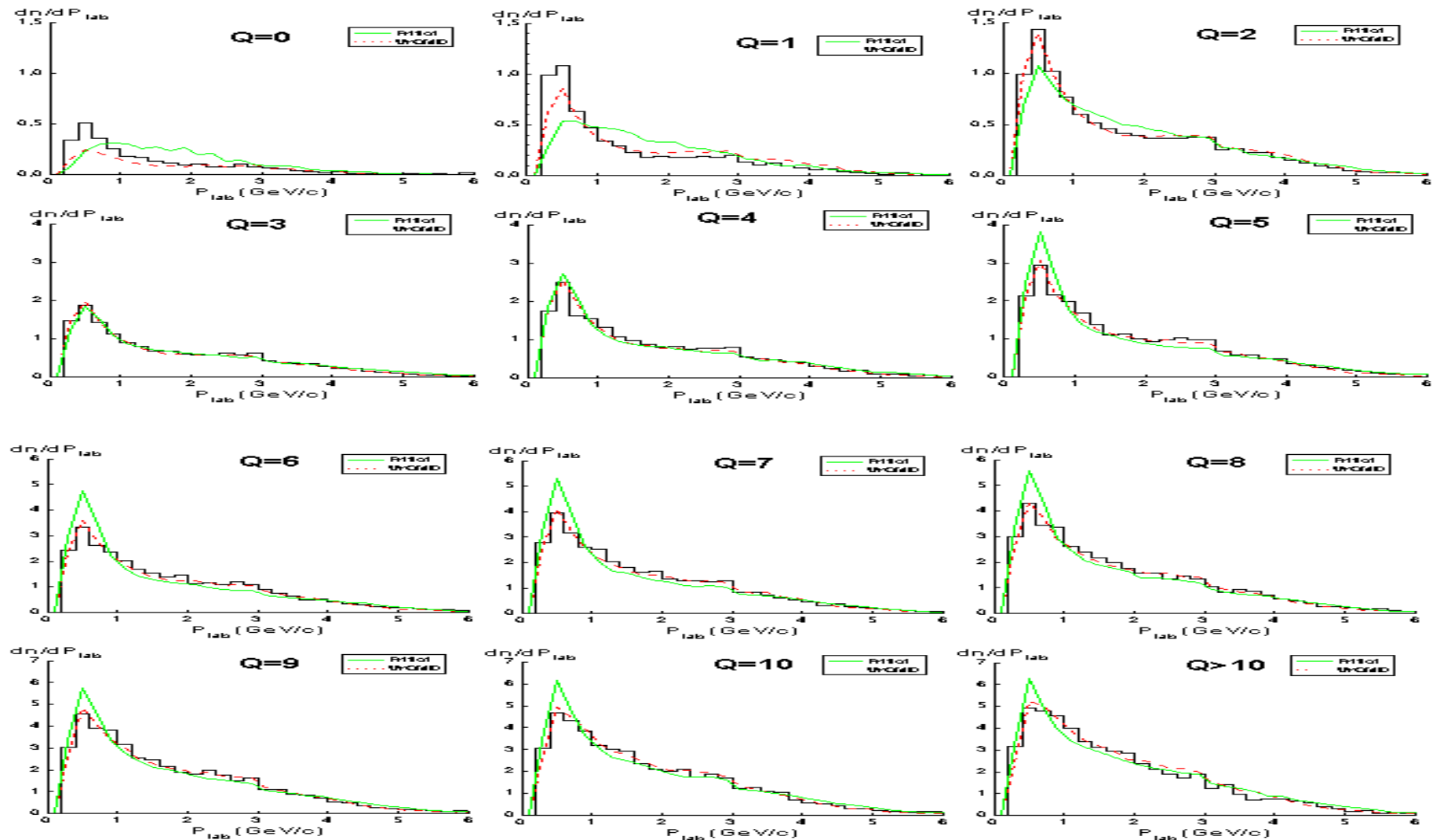
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Plab distributions of proton-participant in pC interactions



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Plab distributions of proton-participant in CC interactions



Points – exp. Data, Lines – model calculations: **green -- FRITIOF**, **red – UrQMD+SMM**, **blue – DCM**. All models reproduce the data.

Conclusion

1. A lot of data had been collected. They can be used for a code development.
2. All the models reproduce the multiplicities of the proton-participants.
3. UrQMD+SMM and DCM overestimate pion multiplicities.
4. UrQMD+SMM and DCM have problems with evaporated protons and nuclear fragments.
5. Tuned Fritiof model works well.

**There is no problem with meson production at high energies.
Evaporated particles and nuclear fragments are badly described!**