MPI@LHC 2018 - Personal highlights

CLASH meeting 20-12-2018

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Many good presentatations!

I present only a tight selection – on Indico:

https://indico.cern.ch/event/736470

Also recommended:

J. Gaunt review talk, Sarka Todorva helix strings,

K. Werner microcanonical ensemble in EPOS,

M. Strikman rapidity correlations, K. Gajdsova flow in all systems,

Marco Radici + EiC status, T. Trainor why Pythia is bad, V. Zaccolo the XeXe upswing,A. Velasquez new UE observables, P. Kirchgaesser new Herwig CR, H. Schulz Professor developments, B. Blok collectivity from interference.

CLASH talks: Oleh Fedkevych (Thu), CB (Mon+Mon)

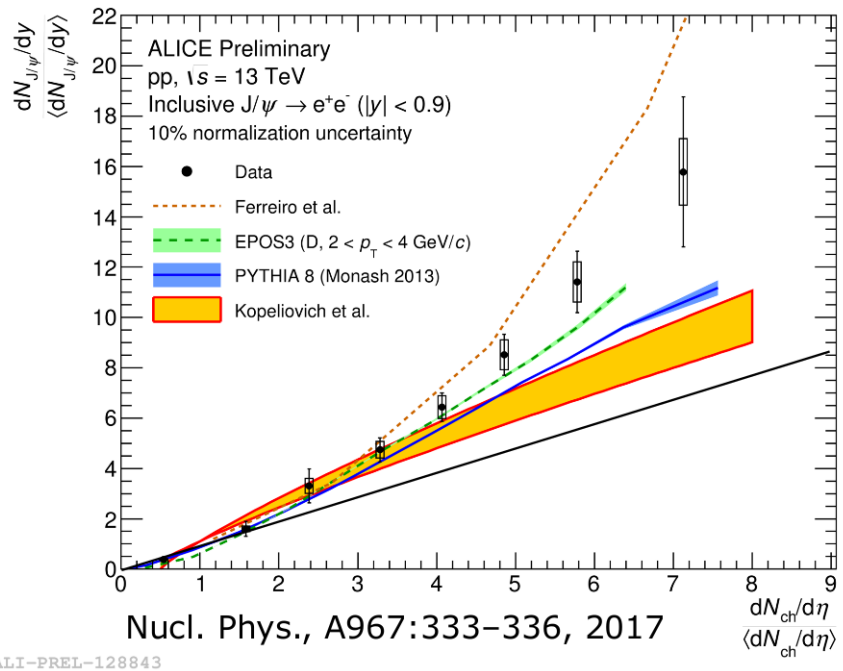
Experimental side: Charming pp

Steffen Weber and Tasnuva Chowdhury (Tue)

Motivation

TECHNISCHE UNIVERSITÄT DARMSTADT

Preliminary ALICE results
- pp @ 13 TeV
- Inclusive J/ψ at |y| < 0.9
- multiplicity at |η| < 1.0



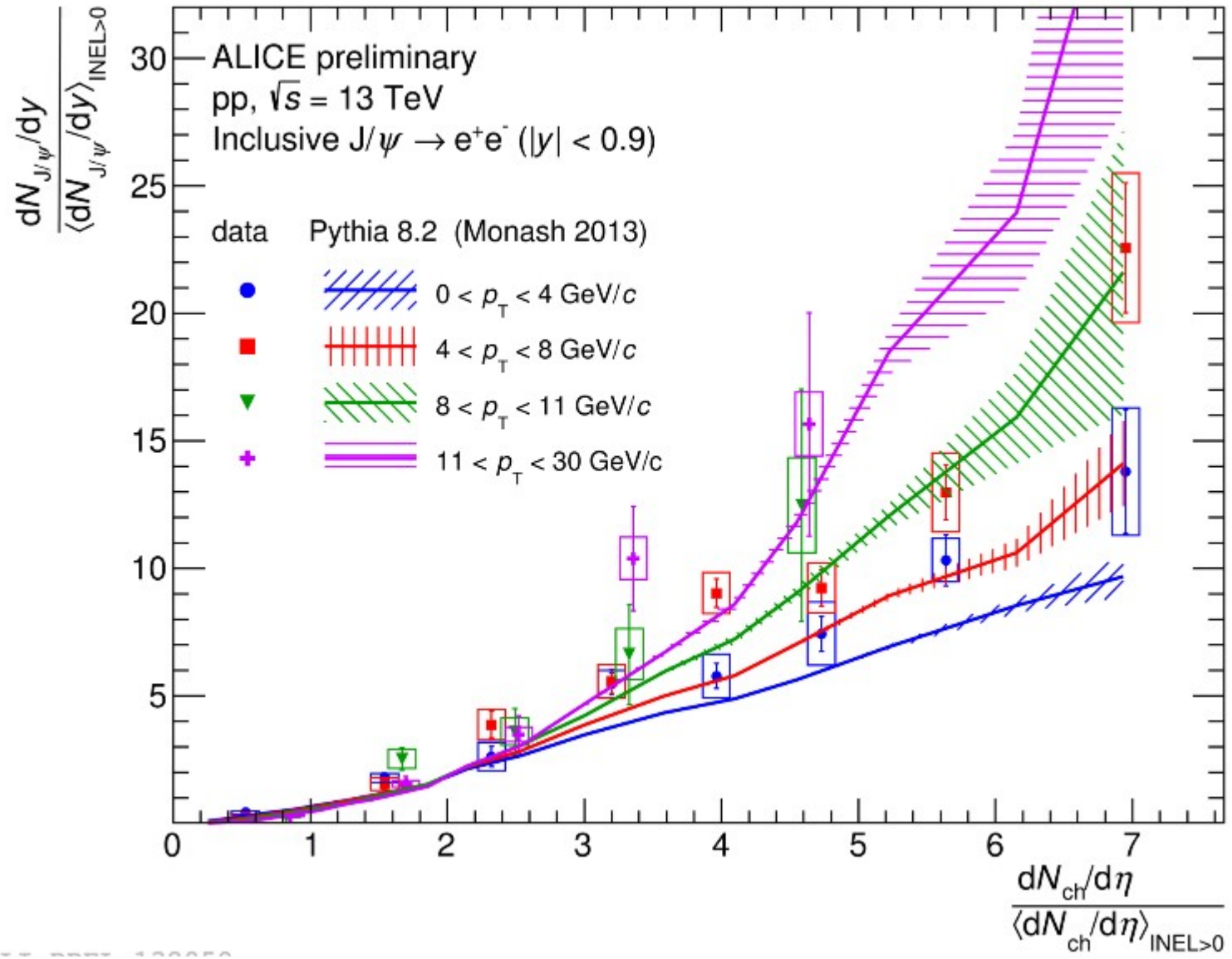
Stronger-than-linear increase

Models assume J/ψ production in MPI and saturation of soft particle production ("compression of x-axis")

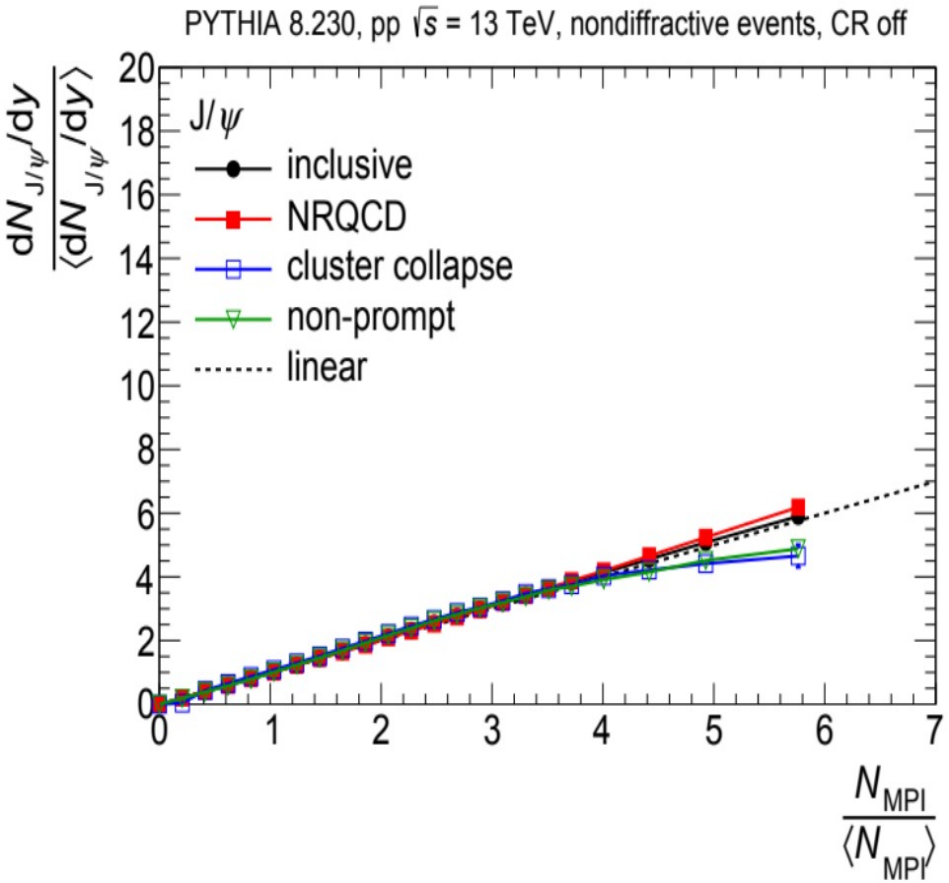
- Ferreiro: Overlapping strings
  Phys.Rev. C86 (2012) 034903
- Kopeliovich: Draw analogy between high multiplicity pp an pA collisions Phys. Rev. D 88, 116002 (2013)
- EPOS3: Hydrodynamic expansion reduces particle multiplicity
  arXiv:1602.03414
- PYTHIA8

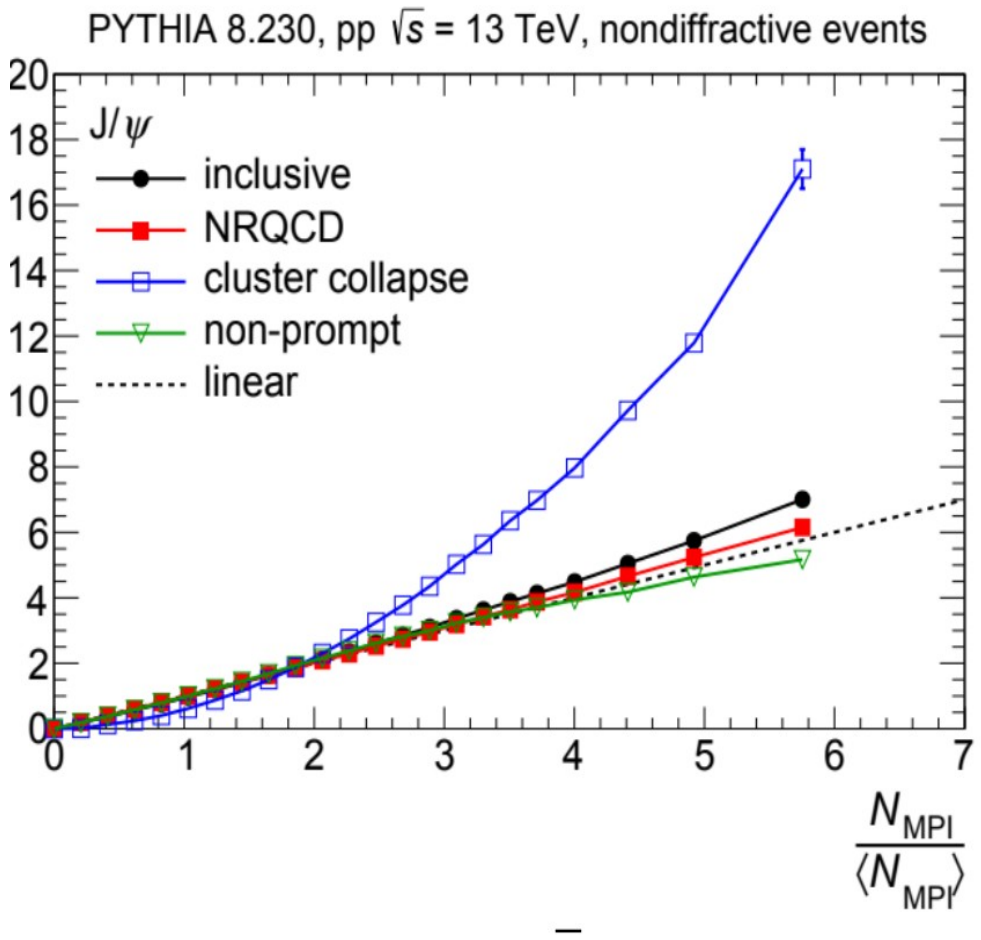
Experimental side: Charming pp

Steffen W

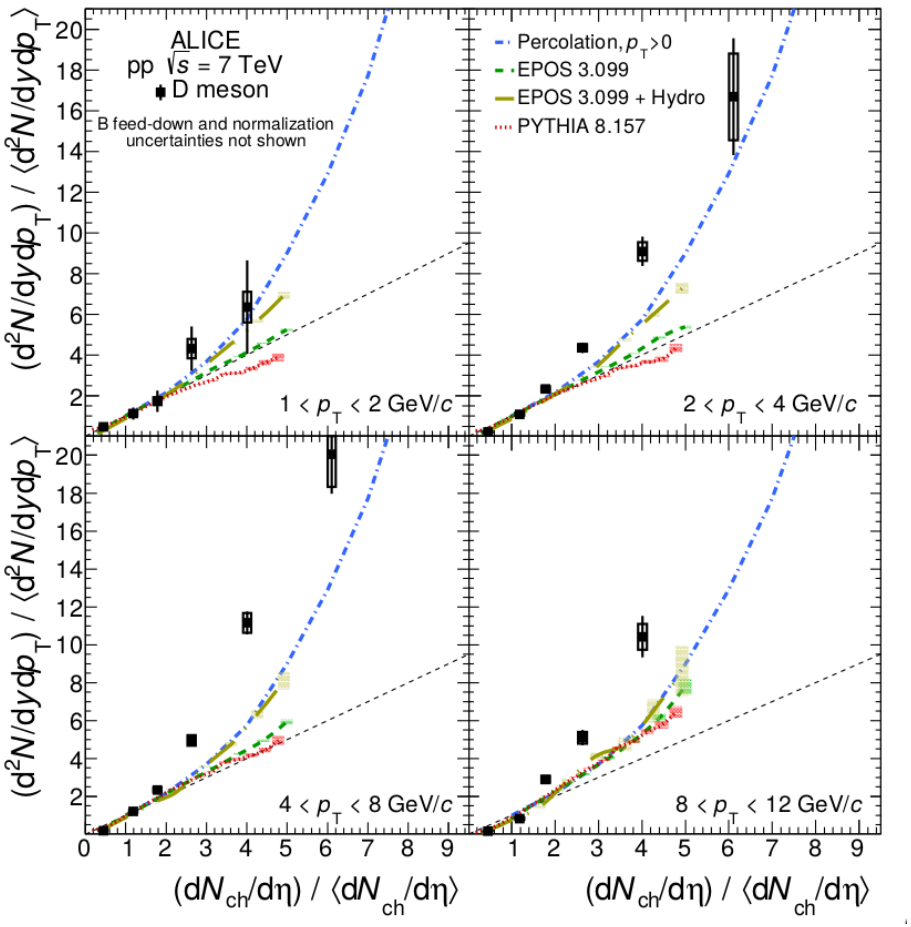


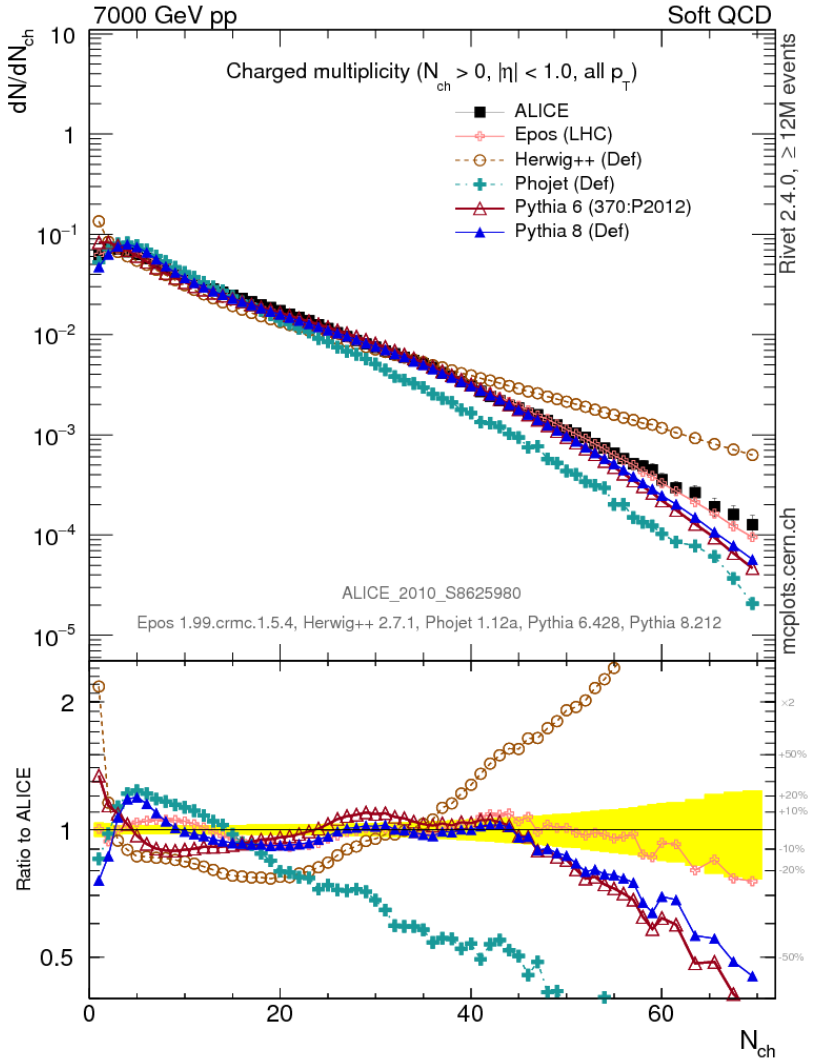
Detailed Pythia study



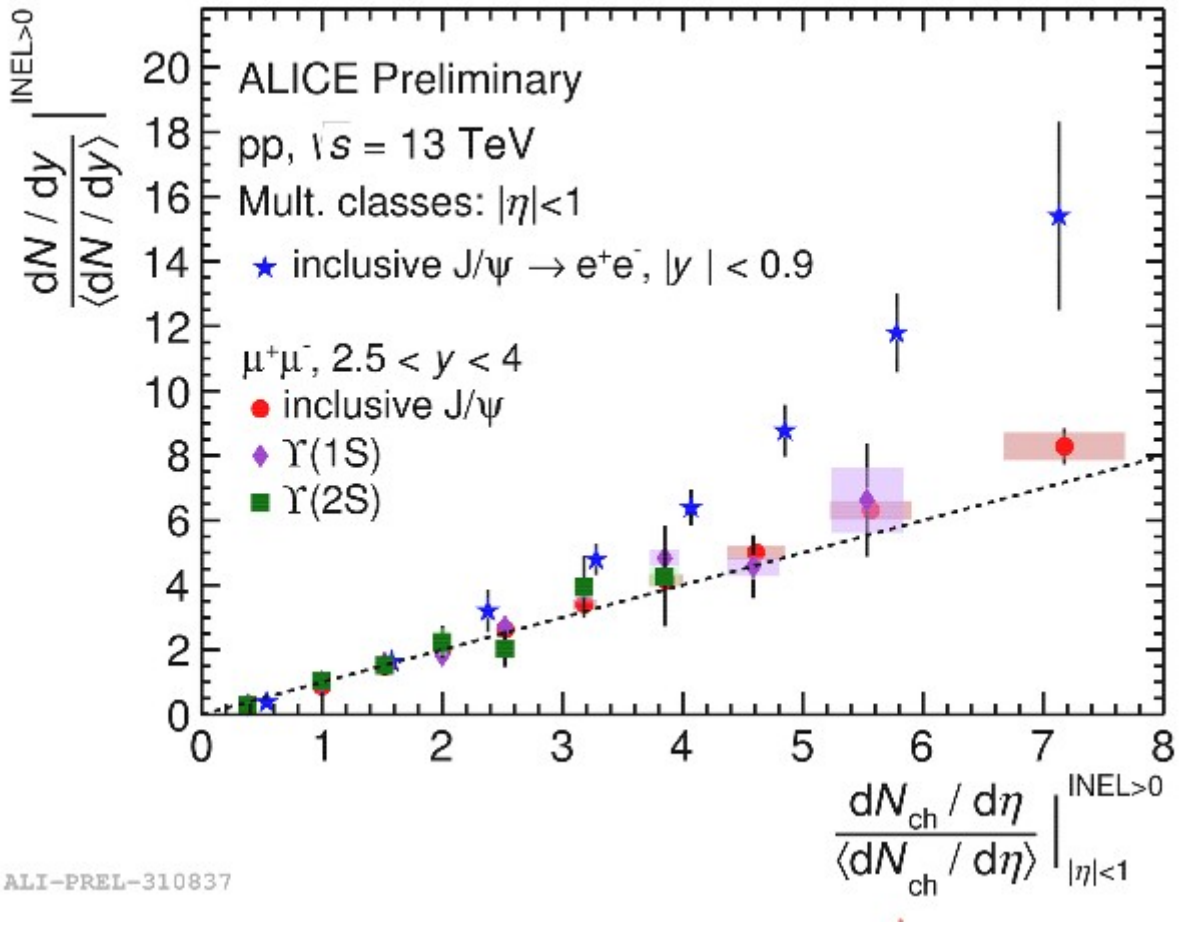


My comments


ALICE
pp $\sqrt{s}$ = 7 TeV
D meson
B feed-down and normalization uncertainties not shown
Percolation, p_T>0
EPOS 3.099
EPOS 3.099 + Hydro
PYTHIA 8.157
1 < p_T < 2 GeV/c
2 < p_T < 4 GeV/c
4 < p_T < 8 GeV/c
8 < p_T < 12 GeV/c
$(d^2N/dydp_T) / \langle d^2N/dydp_T \rangle$
$(dN_{ch}/d\eta) / \langle dN_{ch}/d\eta \rangle$


7000 GeV pp
Soft QCD
Charged multiplicity (N_{ch} > 0, |η| < 1.0, all p_T)
ALICE
Epos (LHC)
Herwig++ (Def)
Phojet (Def)
Pythia 6 (370:P2012)
Pythia 8 (Def)
ALICE_2010_S8625980
Epos 1.99.crmc.1.5.4, Herwig++ 2.7.1, Phojet 1.12a, Pythia 6.428, Pythia 8.212
Rivet 2.4.0, ≥ 12M events
mcplots.cern.ch
dN/dN_{ch}
Ratio to ALICE
N_{ch}

New information from Upsilon?

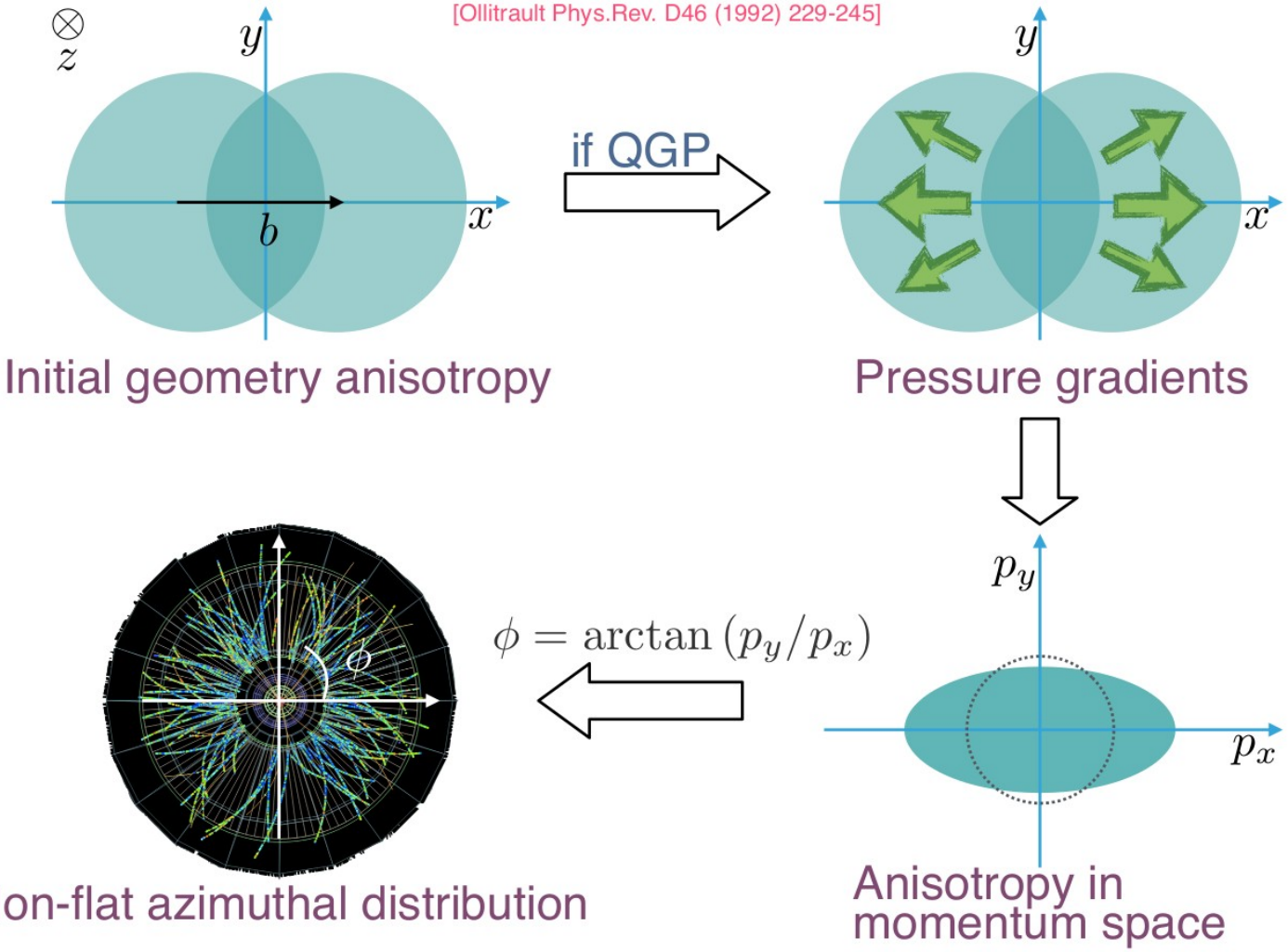


Theory side: Space-time structure

Alba Soto-Ontoso (Mon)

Test case: hydro responsible for v_n's in p+p

[Ollitrault Phys.Rev. D46 (1992) 229-245]



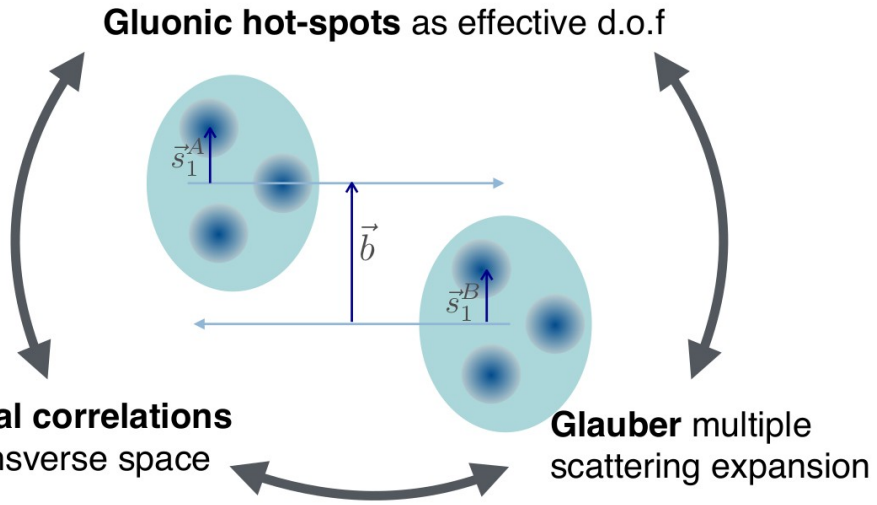
Gluon hotspots + hydro evolution

$$D(\vec{s}_1,\vec{s}_2,\vec{s}_3) = C\prod_{i=1}^{3} e^{-s_i^2/R^2}\,\delta^{(2)}(\vec{s}_1+\vec{s}_2+\vec{s}_3)\times\prod_{\substack{i<j\\ i,j=1}}^{3}\left(1-e^{-\mu|\vec{s}_i-\vec{s}_j|^2/R^2}\right)$$

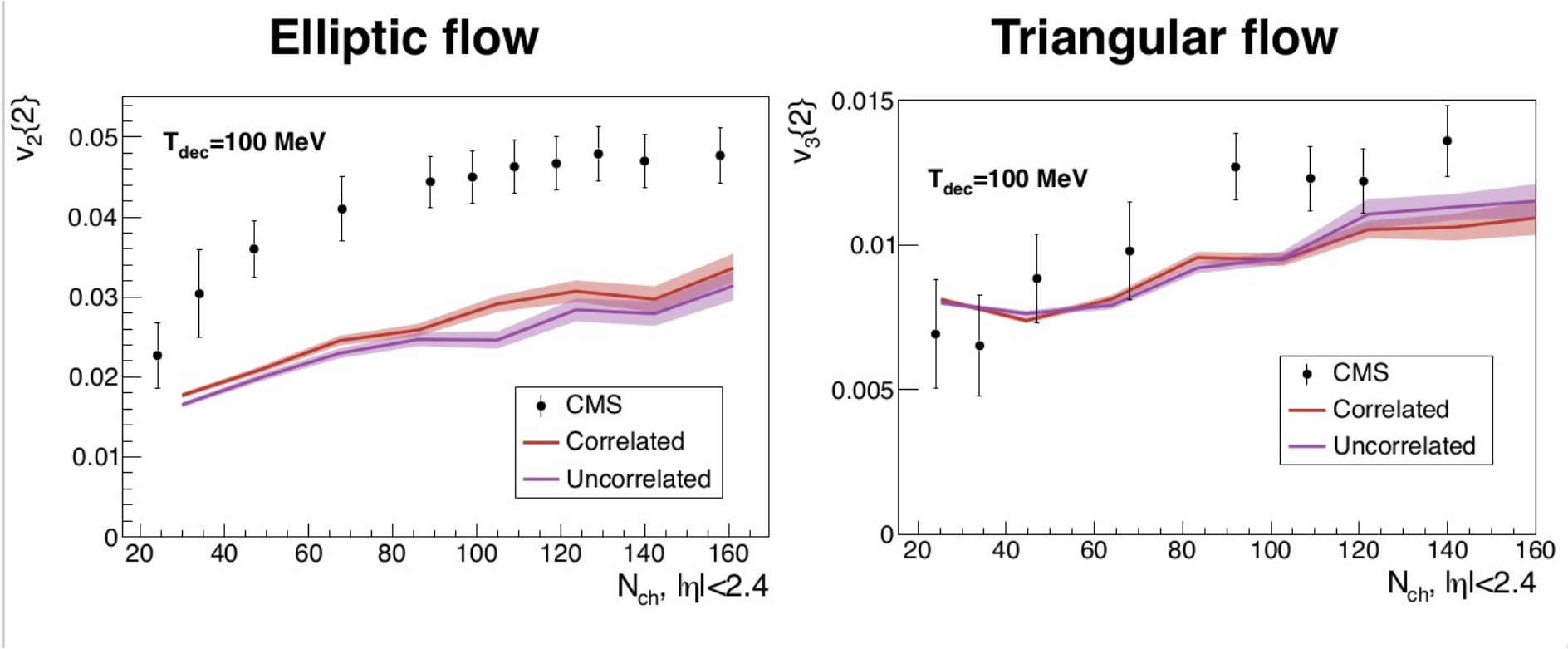
uncorrelated probability distribution characterized by R (not the proton radius)

fixes the C.o.M of the hot spots system

short range repulsive correlations controlled by $r_c^2 \equiv R^2/\mu$



Results



See also: Miroslav Myska (Mon), ST model in Herwig – not yet so advanced, little effect on observables.

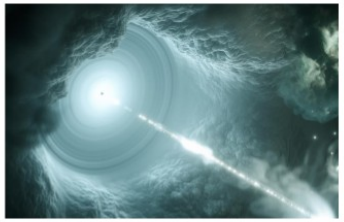
Wildcard I – Cosmic showers

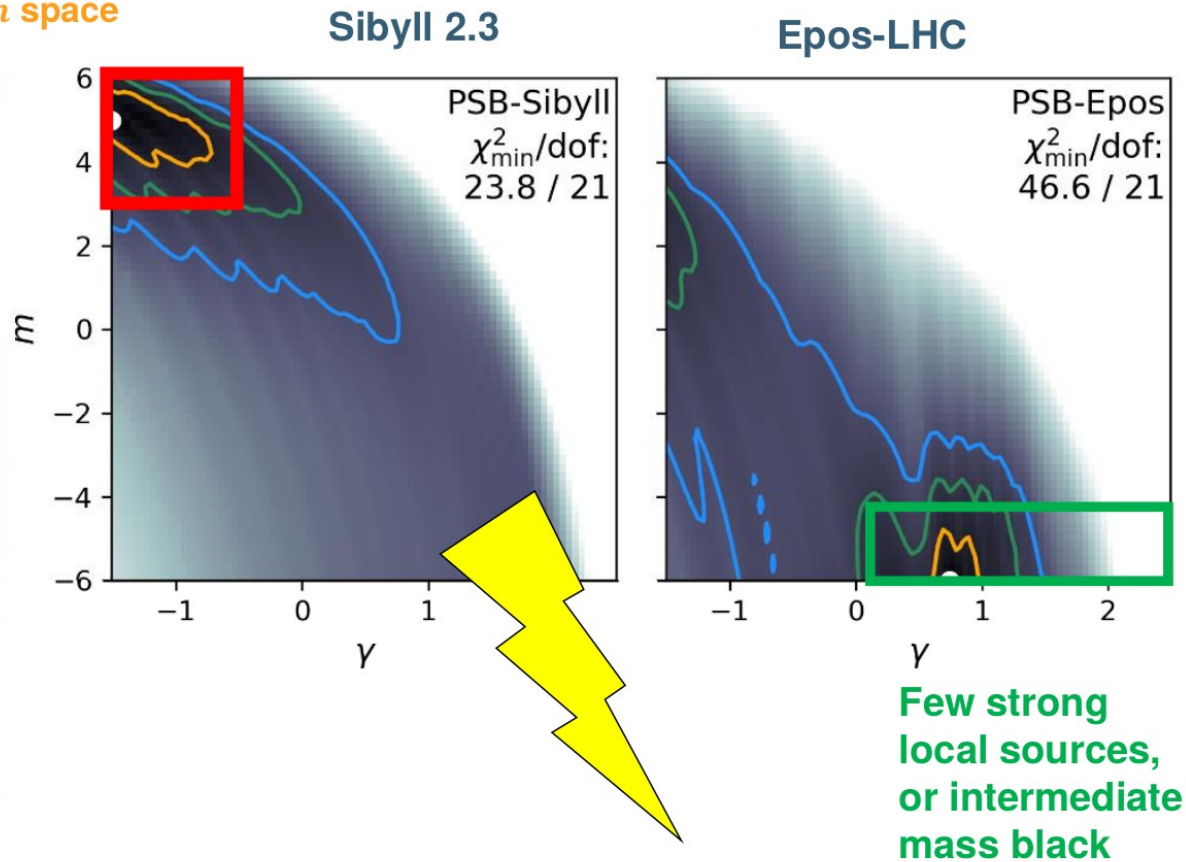
Anatoly Fedynitch

Model dependence of the interpretation

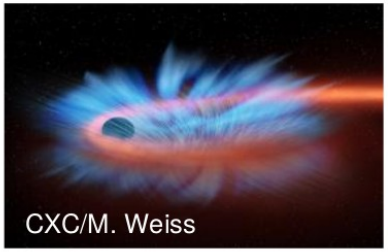
Compared in $\gamma - m$ space

Density evolves like: Stars, Galaxies, Supernovae, AGN





Few strong local sources, or intermediate mass black holes



See also: Auger Collaboration JCAP02(2013)026
Auger Collaboration JCAP04(2017)038

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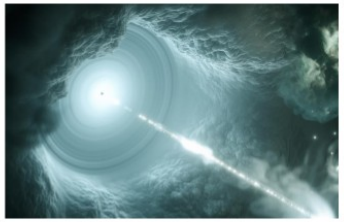
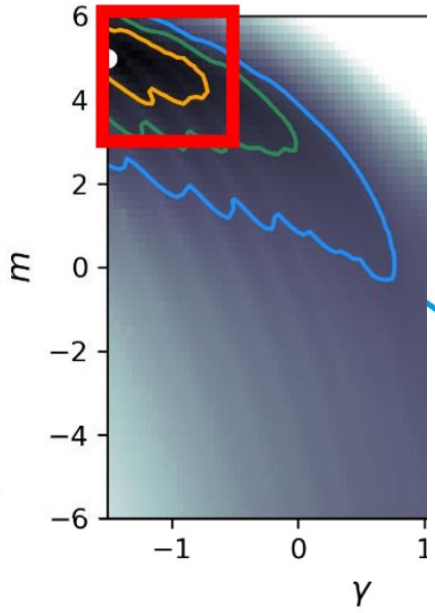
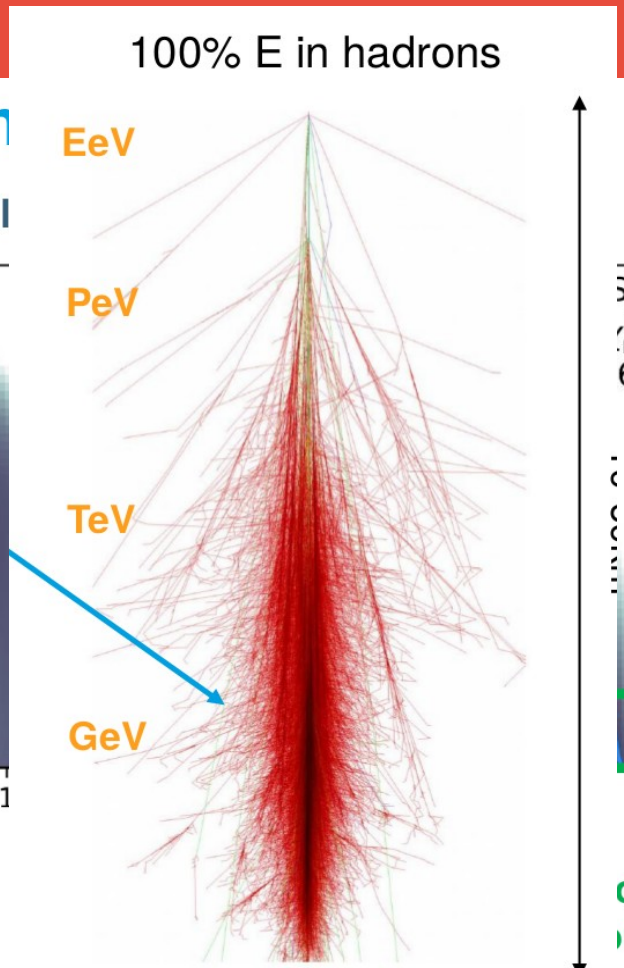
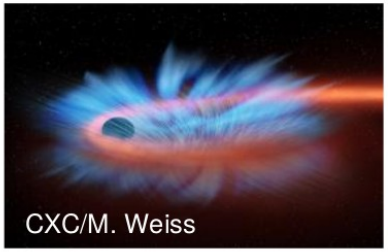






ong urces, mediate lack



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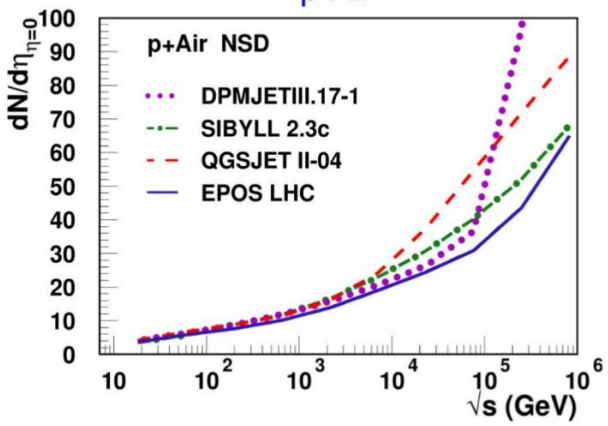
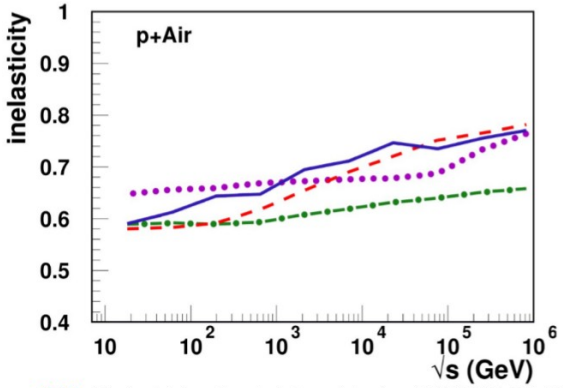
Key observables

Hadronic interactions and air-shower observables

p-Air

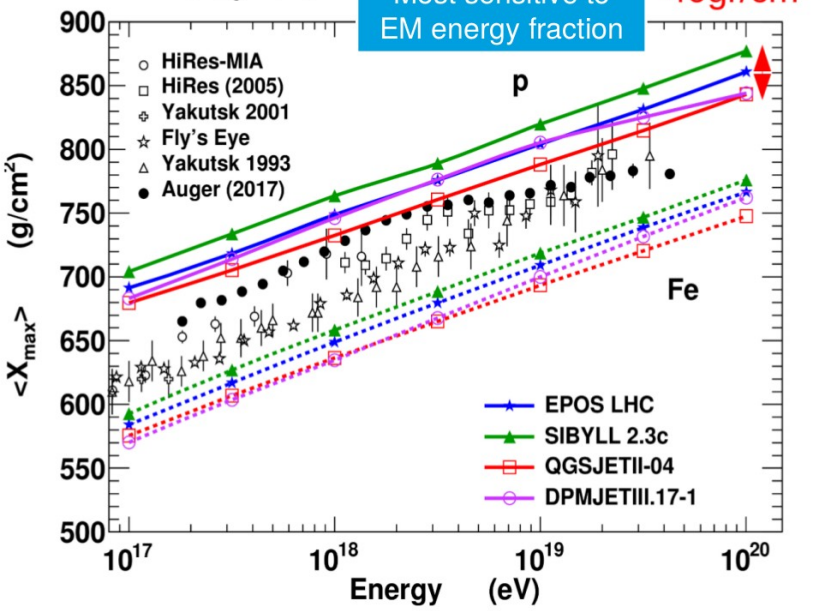




T. Pierog 2018

Most sensitive to EM energy fraction

40gr/cm²



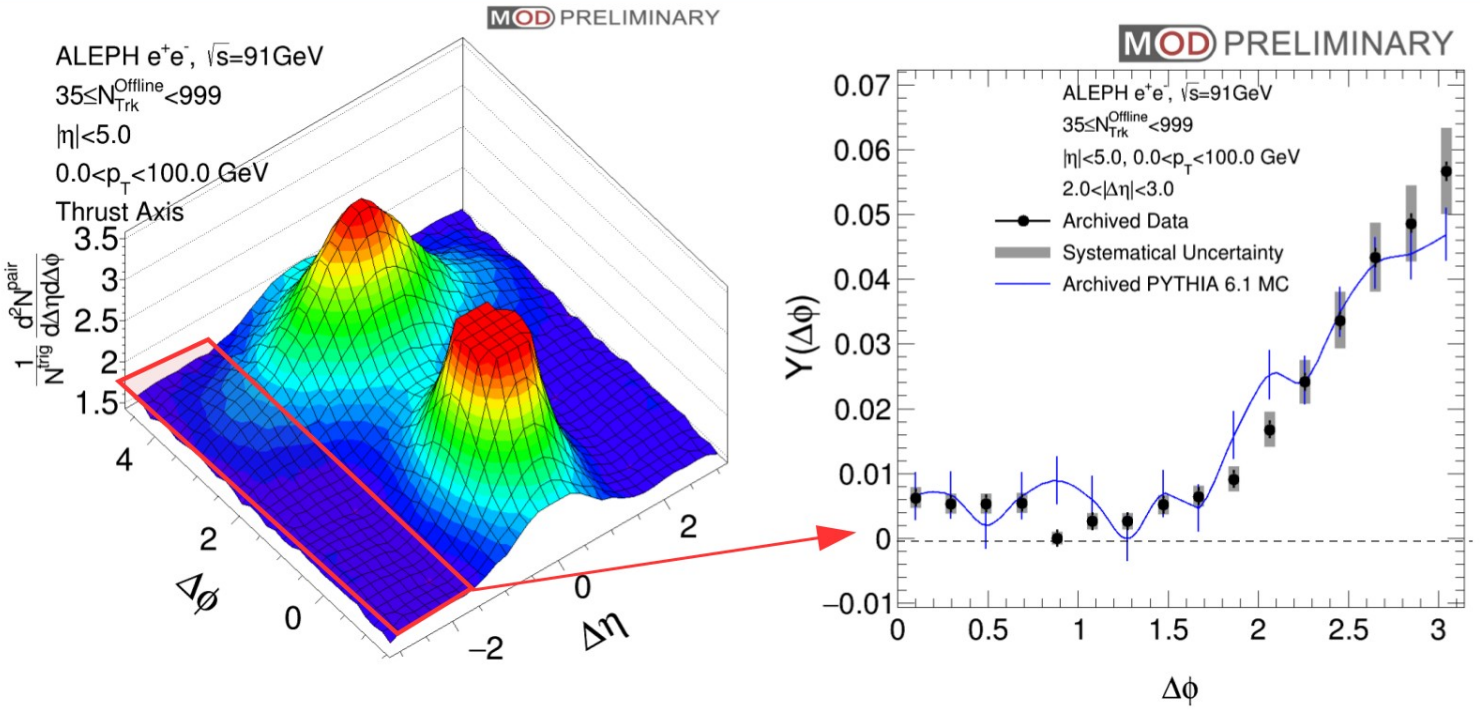
$$\langle X^{p}_{\max} \rangle \approx \lambda_p + X_0 \ln\left(\frac{\kappa_{\mathrm{ela}} E}{2N\varepsilon_{\mathrm{c}}^{\mathrm{em}}}\right)$$

Angantyr is not half bad…

Wildcard II – Collectivity from ALEPH

Austin Alan Baty (Tue)

Thrust axis projection N_{trk}>35



Short answer: No!