

NEW RESULTS ON ENERGY-MOMENTUM CONSERVATION IN PARTICLE EMISSION: FIRE STREAKS IN A+A COLLISIONS

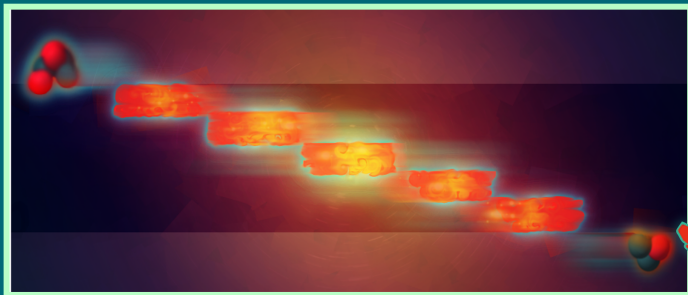
A. RYBICKI, A. SZCZUREK, M. KIĘLBOWICZ,
A. MARCINEK, I. SPUTOWSKA

The Henryk Niewodniczański Institute of Nuclear Physics, Polish Academy of Sciences

Our studies of electromagnetic (EM) effects in A+A collisions at SPS and low RHIC energies brought us information on the longitudinal evolution of the system...

We found that the larger is the pion rapidity, the closer is its **formation zone** to the spectator system.

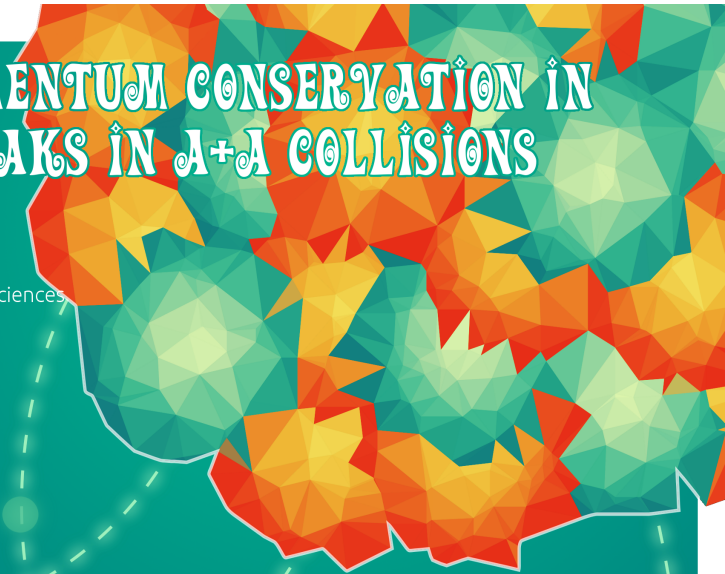
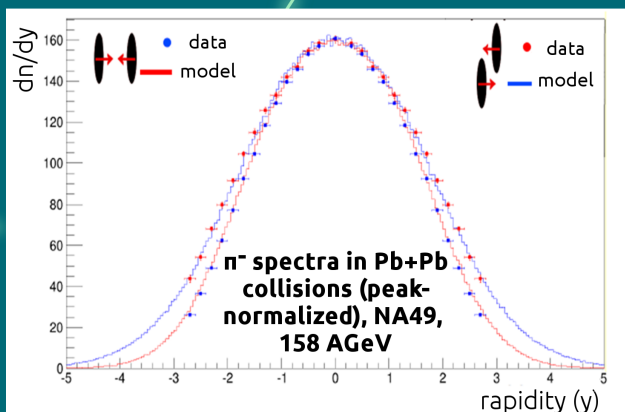
We attempted to use local energy-momentum conservation to elucidate the emerging space-time evolution of the deconfined matter created in the collision.



... deconfined matter appears to behave **differently** in peripheral and in central collisions.

- In a peripheral reaction the various fire streaks will „fly away” with large relative rapidities.

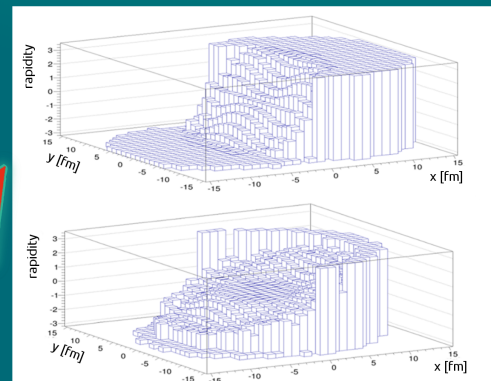
... consequently, we explain both the measured pion multiplicities and the change of shape of pion rapidity spectra as a function of centrality (see below), **as a pure result of local energy-momentum conservation ! ...**



... we applied energy-momentum conservation **locally**, i.e. we divided the nuclear mass into a 2D-set of „bricks” (1 fm x 1 fm each)...

... the bricks collide and form „fire streaks” of deconfined matter. The rapidity of the fire streaks follows directly from energy-momentum conservation...

... each fire streak fragments (or **freezes-out**) independently. We use a uniform, phenomenological fragmentation function which again fulfills energy conservation...



Distribution of rapidity of deconfined matter in the x-y plane for peripheral (up) and central (down) Pb+Pb collisions at $\sqrt{s_{NN}}=17.27$ GeV

WE CONCLUDE

... that nature was kind, this one time. The longitudinal evolution of the deconfined system at SPS energies **seems indeed dominated by energy-momentum conservation**, this is as simple as that.

Thank you (for reading this up, after all not many people read posters in great detail, right? :-)

Papers & Money:

This work: A. Szczurek, M. Kięlbowicz, A. Rybicki, Phys.Rev. C95 (2017) 024908

EM effects: A. Rybicki and A. Szczurek, Phys. Rev. C87 (2013) 054909

NA49 data: T. Anticic et al, NA49 Collab., Phys. Rev. C83 (2011) 014901