Discussion on Multiple Parton Interactions

Cyrille Marquet Peter Steinberg



We are well-accustomed to multiple interactions in collisions of nuclei (and consequences on final state, i.e. hydrodynamization)

HI and HEP communities are more and more interested in consequences of >1 partonic interactions even in pp collisions

How important are (fluctuating) spatial distributions for understanding properties of pp collisions



Figure T. Sjöstrand

"standard" MPI (is there 2D evolution?)



DIPSY evolution in transverse space



Initialization of hydro

How do we disentangle the (possibly simultaneous) role of these different scenarios?

Questions (instead of summary)

(continuing Andreas' discussion!)

- How to move from MC tuning to extraction of physical parameters for the transverse structure of hadrons (including errors) ?
- Can one constrain generalised *pdf* (g(x,b)) and multiparton *pdf s*
- How does re-scattering modify (de-correlate) low-p_T jetlike correlations ?
- Can "elementary" string interactions explain collective bahavior in small systems ?

how to distinguish Hydro and Pythia H. BELLO, G. BENCEDI, E. CUAUTLE, R. Diaz, S. IGA, A. ORTIZ, G. PAIĆ

Multiplicity and MPI in Pythia



high

color reconnection till high pt

The prediction of pythia spectra for the case of no CR with the predicitons for two CR modes for z= Nch/<Nch> = 0.5 and >5 and for the min bias case. The result suggest that with multiplicity the color reconnection increases (ref.3.)

The very low multiplicity events z <0.5 could be used as the No CR case in data analysis



Color reconnection tuning on the mean pt at 7 TeV



Comparison with Hydro inspired EPOS3



conclusions

- The differentiation between hydro and Pythia occurs after 2-3 GeV/c. Should be easy to investigate with experiments
- Interesting behavior at low multiplicity



8th International Workshop

on Multiple Partonic Interactions at the LHC

http://www.nucleares.unam.mx/MPI2016/ San Cristóbal de las Casas, Chiapas, Mexico November 28 - December 2, 2016

ORGANIZERS

Gabriel Ascencio (CIMSUR), Pacio Bartalini (OCNU) Elvisor Cueuro (JIIAM), Anturo Pernández (BUAP) Antonio Onta (JIIAM), Guy Paci (JIIAM) Lizardo Valencia (JIIACH), Amulto Zapeda (MCTP)

TOPICS

- PHENOMENOLOGY OF MPI PROCESSES AND MULTIPARTON DISTRIBUTIONS
- CONSIDERATIONS FOR THE DESCRIPTION OF MPLIN QCD
- MEASURING MULTIPLE PARTONIC INTERACTIONS
- EXPERIMENTAL RESULTS ON INELASTIC HADRONIC COLLISIONS: UNDERLYING EVENT, MINIMUM BIAS, FORWARD ENERGY FLOW
- MONTE CARLO DEVELOPMENT AND TUNING
- CONNECTIONS WITH LOW X, DIFFRACTION, HEAVY ION PHYSICS AND COSMIC RAYS
- STUDY OF THE HIGH-PT DOUBLE PARTON SCATTERING

INTERNATIONAL ADVISORY BOARD Paulo Bargeton (China Central Normal Drawenity) **Assochian Butterworth S.K. London)** Marika Dervi DROTO Lario Tand-Strintensity of Perugle, INFN) Bichard Field (University of Forlida) Hatnes Jung (DES), University of Anteenpl Juden Katoy (DESY) Frank Rosen (MPP Darham) RECorded Robals (N) PARK Contribut Michelampelo Mangano (CDR) Actour Walson: Cantro Brasileiro de Petrainas Philad Andrea Munch (C186) Antiante Onto (UNAM) Guy that S.M.AM Gapta Pancheir (NPN: Prescati Nat Lab.) Michael Schwalling (MPK: Heidelberg) **Rotation Salethand Lund Internity** Peter Scands (Monash University) Mark Striktion (Permahania State University) Antoni Sectoreli (15 PAN Koskiba) Dartonia Trainanti University of Trauta, Bellin, Parry-can Machalan (University of Anteenpl) Nick van Remortel (University of Anteenpl



WORKING GROUPS and CONVENERS:

Interview bias and Underlying Event Deepok Kar (WIS University) & Kantondeep Hamar (Pargab University) Monte Carlo Development and Taning: Pulip James Illers (MIT) & Hans Werver Endoatech Double Parton Scattering: Jonathan Gaute H000ED, Packa Gamelini (DDSY) Small x and Diffractions: Martin Heatschineki (UMAM COL) & Christophe Rayon (Neventity of Kansa) High Maltiplicities and Interactions with Nocki: Antonio Onto UNAM COL & Christophe Rayon (Neventity of Kansa)

hard MPIs = double parton scattering (DPS)

for instance: 4-jet production coming from a double hard scattering of two partons in each incoming hadron

there is a kinematical domain in which this is as important as the leading-twist process of 4-jet production in one hard scattering



QCD factorization not proven (probably does not apply) yet used in all phenomenological studies

parameters (like σ_{eff}) need to be tuned to unphysical values

soft MPI = underlying event



the most popular approach in p+p: event generators like PYTHIA

in A+A or high-multiplicity p+p CGC = first-principle approach if Qs is large enough

Hard MPI-Soft MPI interplay ?

when triggering on a hard event, does one bias the distribution of the soft particles by selecting only rare wavefunction configurations of the colliding particles

if so, how to calculate this effect in QCD ?



Important for p+A: can we correct for this effect when measuring R_{pPb} ?

ALICE: hybrid method measures correction factors in ZDC-selected bins, under assumptions that different regions in eta are proportional to N_{part} or N_{coll} scaling.

ATLAS: calculates "centrality bias" corrections, restores N_{coll} scaling to Z, W



ATLAS observed centrality-dependent splitting of nuclear modification factor in p+Pb



Several modification on the market but modified spatial configuration of nucleon remnant in presence of large-x jet is able to explain this effect





Energy conservation in presence of hard process can influence soft processes, bias centrality measure

