

Event Generators : versions/tunes/parameters

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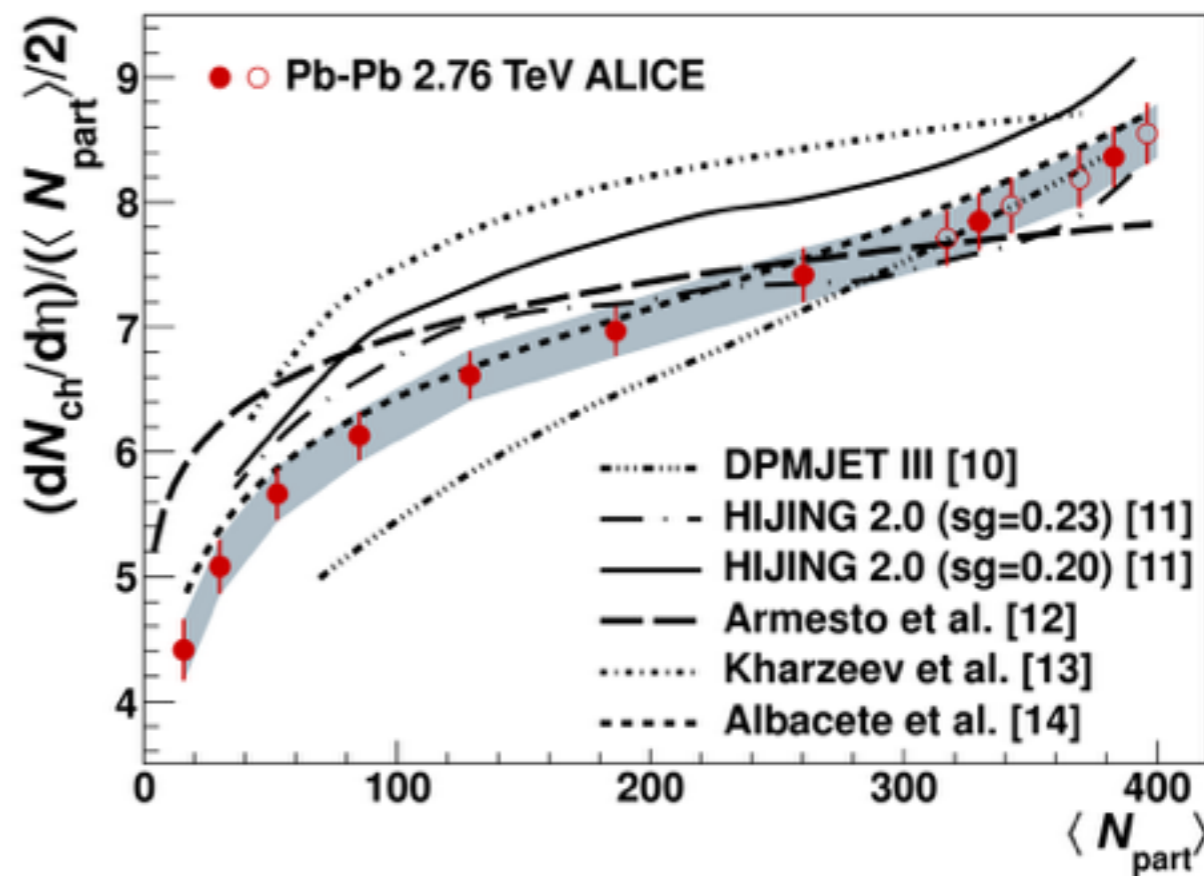
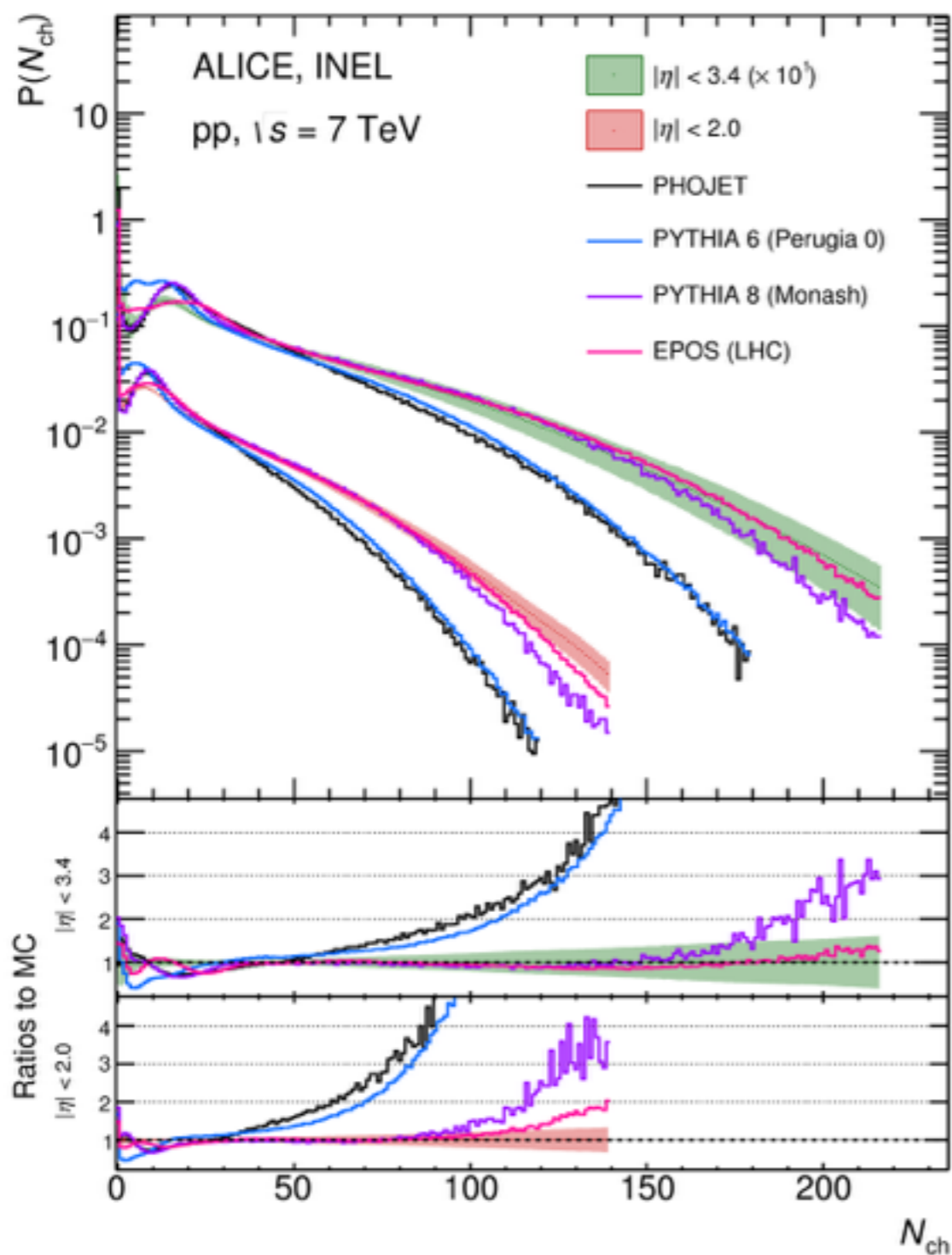
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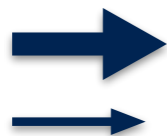
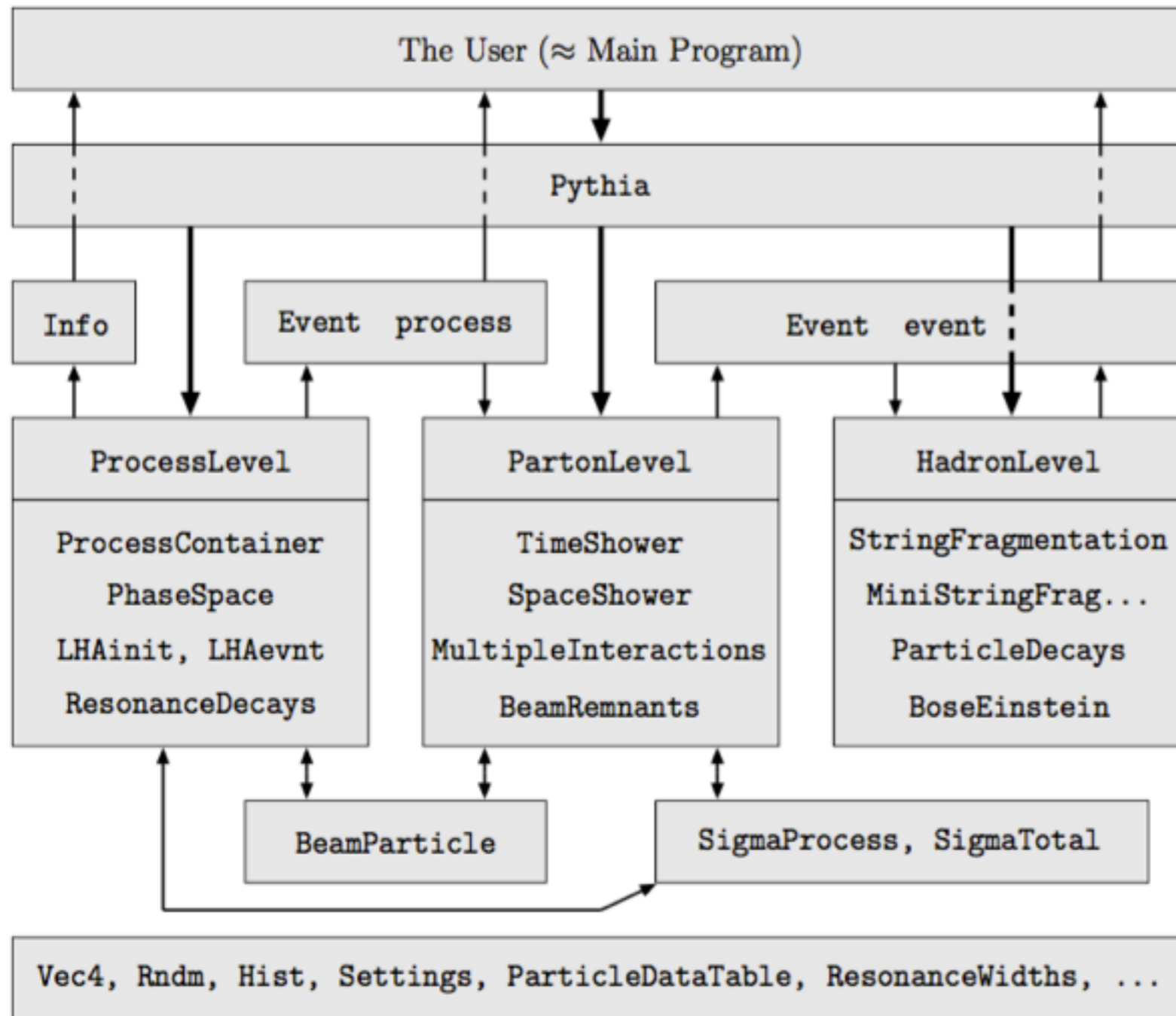
विज्ञान एवं प्रौद्योगिकी विभाग
DEPARTMENT OF
SCIENCE & TECHNOLOGY

Different event generators, different results



Feature consistent in both elementary and nuclear collisions.

Pythia: a bit more inside



Commands to carry out different physics tasks
 Flow of information between different task blocks

Pythia: a bit more inside

arxiv:1005.3457

Different tunes are obtained by refining physics processes from data obtained by different experiments:

- Perugia:

- A. Perugia HARD : More ISR, more FSR, less MPI, less Hadronic

- B. Perugia SOFT: Less ISR, less FSR, more MPI, more hadronic

- C. Perugia AMBT: ATLAS MB tune (7 TeV pp)

- Monash:

- A. FSR parameters : Minimum p_T for QCD radiation = 0.5 (against 0.4)

- B. HAD parameters: Strangeness to ud ratio = 0.217 (against 0.19)

- C. MPI parameters : Primordial k_T for soft processes = 0.9 (against 0.5)

UrQMD

Microscopic model, valid for energies starting from Bevalac upto RHIC. Includes

- Creation of dense hadronic matter at high temperatures
- Properties of nuclear matter, Delta & Resonance matter
- Creation of mesonic matter and of anti-matter
- Creation and transport of rare particles in hadronic matter.
- Creation, modification and destruction of strangeness in matter
- Emission of electromagnetic probes

Input controls:

- projectile, target, energy, impact parameter, EoS, events, time of calculation

Output:

- standard output: contained all particles at a certain time stamp
- collision history file: information of all collisions, decays
- decay file: information of all decayed particles and stable particles
- OSC file : output in OSCAR format

1. Pythia can be used for hard scatterings for CM energy ≤ 10 GeV (CTO44).
2. Hydrodynamics can be incorporated (CTO45)

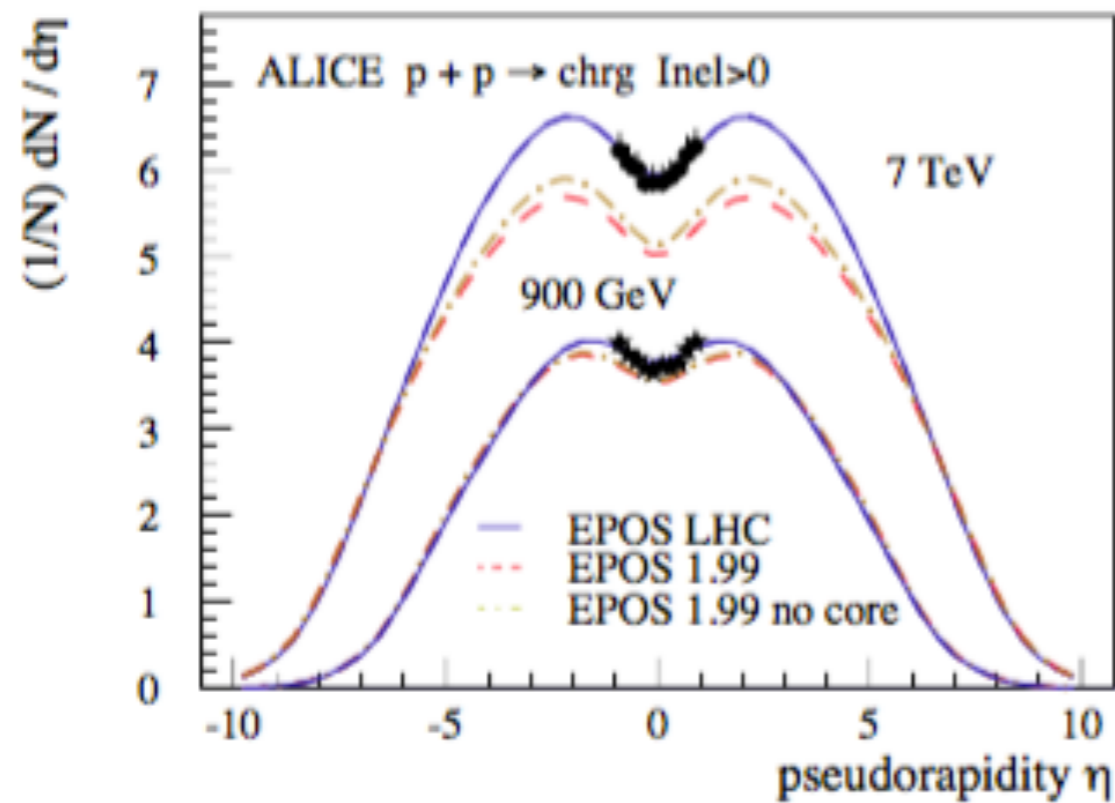
Not recommended for LHC (can do it at own risk)

EPOS

Used both for pp and HI collision.

Modification for LHC:

- Radial flow in case of very dense system in a small volume



Code is not public, you need to communicate with the authors

HIJING

SUBROUTINE HIJSET (EFRM, FRAME, PROJ, TARG, IAP, IZP, IAT, IZT)

EFRM: Colliding energy (GeV) per nucleon

FRAME: Frame of the collision “CMS” or LAB”

PROJ, TARG: Projectile and target particles such as “p”, “PBAR”, “N”, “NBAR”, “PI+”, “PI-”, “A”

IAP, IAT: Mass number of projectile and target (1 for hadrons)

IZP, IZT: Charge number of projectile and target

SUBROUTINE HIJING (FRAME, BMIN, BMAX)

FRAME: Frame of the collision as given in the HIJSET

BMIN, BMAX: Min. (0) and Max. (2R) impact parameters (in fm); 0,0 for hadron-hadron collisions

Open Standard Codes And Routines (OSCAR)



So many event generators

Need for

- accessibility of source and documentation
- common interfaces
- systematic version control
- standardized tests

<https://karman.physics.purdue.edu/OSCAR-old/models/list.html>

However, not maintained anymore ... 😞

Thank you