PWG3 Analysis: status, experience, requests

Andrea Dainese

on behalf of PWG3

Outline

- Analysis groups in PWG3:
  - D2H: vertexing
  - HFE: single electrons
  - JPSI2E: dielectrons
  - MUON: muons and dimuons
- Analysis modes and issues
- Requirements
  - data sets
  - MC productions

Analyses in progress

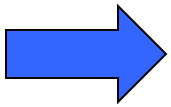
- D2H (vertexing): ~12 ongoing analyses
  - 5 channels: D0→Kpi, D0→K3pi, D+, Ds, Lc
  - pt spectra in pp and PbPb (→ RAA, RCP)
  - azimuthal analysis in PbPb
  - correlations with jets
- Electrons: ~10 ongoing analyses
  - single electrons with cocktail method and displaced from primary vertex
  - Jpsi→ee and displaced Jpsi
  - low-mass dielectrons
  - pt spectra in pp and PbPb (→ RAA, RCP)
  - Jpsi polarization
- Muons: ~10 ongoing analyses
  - single muons in pp and PbPb (→ RAA,RCP)
  - Jpsi in pp and PbPb (→RAA,RCP)
  - Jpsi and single muon pt spectra in pp vs. multiplicity
  - Jpsi polarization in pp
  - low-mass dimuons in pp and PbPb
  - starting with Y in pp (first signal seen)

Code

- Most of the “core” code development is done
  - effort on optimization / standardization
- New wave of development for PbPb
  - centrality, flow, “QA”, code speedup
- Coverity now under control (a handful of defects left)
  - thanks to all developers, to “committers” (Silvia, Anton, Ginés, AD), and to Ivana

Analysis Input

- D2H (vertexing): entirely based on AOD
- Electrons: mostly based on ESD; tests with AOD ongoing
  - main point to stay with ESD for a while: electron ID is crucial for these analyses
    - still being understood/optmized
    - many detectors (TPC, TOF, TRD, EMCAL)
- MUON: mostly based on AOD, but can use also ESD (convenient for “first analysis”)
  - new development: write to muon-AOD only relevant branches
    - 1% of size of standard AOD



>20 analyses on AODs + ~10 on ESDs

Analysis Input - Considerations

- AOD based analysis:
  - necessary/useful for analysis of large datasets
    - all our analyses look for rare signals; e.g. pp analyses on min. bias pp need LHC10bcde (some will even need 2010+2011)
  - profits from “pre-analysis” done centrally (ESDfilter)
    - candidates construction, data reduction, tenders, phys. selection, …
  - however, the ESD→AOD step takes still quite some time (because it is quite complicated and highly non-standard, period-by-period settings, …)
    - complication increases the risk that something goes wrong
  - new developments come later to AODs (data and methods have to be “ported” from ESD, sometimes AOD sets need to be redone)
    - typical example: PID, for electrons in particular
  - 2 AOD “categories”:
    - AOD = “miniESD”, no tenders, immediately after reco; needed for all runs (MUON can be OK when barrel is not!)
    - AOD = “recalibrated/fixed” ESD, with tenders, “ultimate” input for analysis

Analysis Input - Considerations

- ESD based analysis:
  - ideal for analyses that depend on new developments in many detectors
  - more difficult to have frequent cycles with large stat on the Grid
    - e.g. electron PID analyses run locally at GSI during development phase
- Tenders:
  - needed to include latest calibration (crucial for PID) and sometimes also to patch problem during reconstruction (e.g. wrong geometry)
  - list of tenders:
    - V0, TPC, TRD, TOF (T0)
  - procedure looks more under control when applied to central trains (ESD→AOD)
    - tenders configured by experts and not by end users
  - what to do for ESD analysis? (automatic tender configuration?)

PID and OADB

- Parameters used for PID selection depend on reconstruction conditions and collision type (pp/PbPb)
- Typically, dE/dx parametrizations
- At the moment, different parametrizations “hardcoded” in analysis classes (e.g. AliAODPidHF)
- TPC parametrizations being moved to OADB
  - this will remove the need for a tender after pass2

PbPb analysis issues

- Analyses will large combinatorics (3 prong decays) are very slow, due to large number of candidates in central events
  - effort on reconstruction cuts tuning
  - speed up the code (no speed optimization was done for pp)
  - however, cannot split with more than ~10 files/subjob
- Global events properties “from the framework”:
  - Centrality: OK, we can use it without problems
  - Event Plane: needed soon by several analyses
    - Central development to provide event plane from tracks: needs still ~2 weeks to be ready, looks a bit behind…
    - Temporary solution: event plane from VZERO included in D2H code and almost ready
    - In parallel: ongoing studies to adapt the PWG2flow code for Λ and K0s to D mesons

User feedback

- Analysis (on AODs) on the Grid mainly as single user jobs
  - few cases of 2-3 users who cluster and try to submit together
- Two different “modes”:
  - pp analysis: strategy and cuts established; run when new sets are available; few iterations
    - could go to a central train
  - PbPb analysis: still experimenting/exploring (tune cuts and PID strategies); chaotic analysis; continuous changes in the tasks code; frequent iterations
    - cannot go to a central train
- User problems:
  - merging: sometimes very painful (better with merging via jdl)
  - quota: limited #subjobs (problematic in PbPb, where long CPU times require finer splitting)
  - grid traffic (e.g. very difficult two weeks ago, when T1s were taken for LHC10e pass2)

PWG3 Central Train(s)

- Central train macro kindly prepared and tested by Mihaela
  - committed to PWG3/centraltrain
- Can be configured for AOD or ESD, pp or PbPb
- Contains ~10-15 taks that run on AODs + 2 tasks on ESDs
- We are getting organized to start running it
- Natural splitting in 3 trains:
  1. ESD (electrons)
  2. AOD min. bias (vertexing)
  3. AOD muon (much smaller set of interesting events in muon-AOD, different runs,…)
     - however, it can run also on standard-AOD, but needs a mechanism for “task-by-task” good runs list
- Need to identify and train a team of conductors
- Looks tough to do before QM…

Requests: Data sets

- pp:
  - LHC10e pass2 went incredibly fast! it is needed for three papers
  - AOD productions (in the pipeline): LHC10bcde, with proper tenders
- PbPb:
  - AOD production for LHC10h: ongoing, but very very slow…

MC requests: pp 7 TeV

- pp 7 TeV: mainly for low-stat channels (D0→4, Ds, Lc)
  - ~10 M pp events, anchor runs of LHC10bcde (reduction factor 1/50)
  - can start with next tag (one port pending)
  - can be used also for ITS upgrade studies
- Same Pythia settings as for LHC10f7a (CharmppMNRwmi, BeautyppMNRwmi)
  - + use AliGetPythia::fTriggerParticle to require a particle with given probability (eg. 40% D0, 20% D+, 20% Ds, 20% Lc) in |eta|<0.9

MC requests: Pb-Pb

- PbPb: join central production
- 3M min. bias Hijing + various signals
- For PWG3: same signals as LHC11a3 + Jpsi→mm / event
- PWG3 barrel signals: N full PYTHIA events on top of Hijing event
- N depends on PbPb impact parameter b:

  N = 20. * (b < 5.) + 80./3. * (1. - b/20.) * (b > 5.)
- 20 signal events for b < 5 fm, then linear drop form 5 to 20 fm, minimum is 1
- We should get:
  - 600k evts in 0-20% with ~20 PYTHIA/event (15 x LHC11a3)
  - 1.2M evts in 40-80% with ~9 PYTHIA/event (7 x LHC11a3)
- + reduce the y cut on quark from 1.5 to 1.0