INFO ON 2010 pp PASS4 D-h ANALYSES

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GOAL OF 2010 pp PASS4 D-h ANALYSIS

- Comparison of pass4/pass2 results for D-h correlation analyses
  - Improvement of S/B, with reduced peak widths, in D2H. Could be of great help in reducing the amount of background to be subtracted, and thus our statistical uncertainties

- Need to have the final correlation distributions from pass2 (after ME correction, bkg subtraction and corrected for efficiencies)
  - You can request them to the analyzers, or re-run the task also on run2 (with the proper efficiency maps)

- The easiest way to compare pass4 with pass2 is after all the corrections except purity and FD.
  - These two are performed by an automatized script (see later) which goes up to final results;
  - They should be very similar among pass32 and pass4 (though this is not fully granted)

2010 pp PASS4 D-h ANALYSIS

List of steps to obtain final results

- First look to correlation plots (before all offline corrections)
- Evaluation of trigger efficiency
- Evaluation of tracking efficiency
- Efficiency-corrected correlation distributions
- Secondary track contamination
- Feed-down subtraction
- Fit and extraction of observables
- Systematic uncertainties re-evaluation

FIRST LOOK TO CORRELATION RESULTS

- All the committed tasks allow to run on a data sample, evaluate correlations for SE and ME, in signal region and sidebands
  - Macro to extract correlations, perform ME correction and subtract background correlations are 'private', plan to have them unified/committed in mid-long term furure

- Data sample to be analyzed: 2010 pp, pass4, periods LHC10b,c,d,e. for single-user runs:
  - Runlist already defined in the HFCJ pp lego train (see link below)
  - Remember to add the AddTaskPIDResponse task to the job

- Although the tasks can be run as single users, **it's better to run them on trains**, to keep under control the settings and the runlist, and to maximize the job efficiency:
  - 4 HFCJ trains in https://alimonitor.cern.ch/trains/, for pp/p-Pb, data/MC

- D-meson selection: it's ok to use the standard cuts for 2010 analysis
  - There shall be a setting in the macros to produce the cut objects

FIRST LOOK TO CORRELATION RESULTS

- Associated track selection: use same cuts as those defined for the paper

SetFilterBit(AliAODTrack::kTrkTPCOnly);	**SetMaxChi2PerClusterTPC(4);**
SetRequireITSRefit(kFALSE);	**SetMaxDCAToVertexZ(1);**
SetRequireTPCRefit(kTRUE);	**SetMaxDCAToVertexXY(0.25);**
SetMinNClustersTPC(70);	**No SPD cluster requirements**
SetMinNClustersITS(3);	

- ME pool configuration: use the same as for the paper
  - 3 zVtx pools: -10,-2,5; -2,5,2,5; 2,5,10 cm
  - 3 multiplicity pools: 0-20, 20-35, 35+

- **D^0 meson**: Somnath/Bharati (?)
- **D^+ meson**: Shyam/Jitendra (?)
- **D^* meson**: Fatiha/Sonia (?)

D-MESON EFFICIENCY

- Extract 2D efficiency maps for D-mesons vs pT, event multiplicity, to be used for weighting online the correlation entries
- Use the D2H correction framework (CF) with related AddTaskCFVertexingHF.C macro
  - The task can be run as a single user, but better if run using HFCJ trains
  - If single user: pay attention to AddTask flags (select right pdgcode, cutfile, only prompt D-mesons), and to add the PIDResponse task, with settings: tuneOnData = kTRUE, pass = 4
  - For the Dstar, use the derived CF task, with macro AddTaskCFDStar.C
- Run on LHC15a2a MC sample (c/b enriched, D decay forced, anchored to 2010 pass4)
  - Runlist on HFCJ MC pp lego train
- To build the efficiency maps from the results, extract the output container projections at RecoPID step and LimAcc **(to be verified)** step, versus pT and multiplicity variables
  - Modify the official D2H CF reading macro, i.e. ReadCFHeavyFlavourOutput.C (it makes only 1D projections)
  - Then, build the map dividing RecoPID/LimAcc projections

- **D^0 meson**: TBD, help by Somnath (already run on trains)
- **D^+ meson**: TBD, help by Jitendra (already run on trains)
- **D^* meson**: Fatiha/Sonia (?)

TRACKING EFFICIENCY

- Extract 3D tracking efficiency maps, vs pT, eta and vertex z, to be used for weighting online the correlation entries
- Use the single-track efficiency correction framework (AliCFSingleTrackEfficiencyTask.) with related AddSingleTrackEfficiencyTask.C macro (in PWGPP)
  - The task can be run as a single user or using HFCJ trains (preferred option)
  - Important to check that the pT(assoc) thresholds are taken as pT bin edges!
- Run on LHC15a2c MC sample (c/b enriched, D decay not forced, anchored to 2010 pass4)
- To build the efficiency maps from the results, use the related macro, ReadCFSingleTrackEfficiencyTask.C (by Jitendra)

❑ **D^0,D^+,D^* meson**: Jitendra

✓ The track efficiency map doesn't depend on the D meson, so it can be evaluated once and used for all the cases

After obtaining, run again on data, loading both efficiency maps, to obtain the corrected results!

PURITY CORRECTION

- This will came at a later stage, anyway here are basic information on how this can be done
- Modify the correlation task, when running on MC:
  - Disable the rejection of tracks which do not satisfy DCA selection
  - Disable the rejection of tracks with IsPhysicalPrimary()==0 (if done, on MC)
  - Build the azimuthal correlation distributions for 'true' primary tracks which pass/don't pass the DCA cut, and for 'true' secondary tracks which pass/don't pass the DCA cut
    - 'true' = check by looking at IsPhysicalPrimary() output
- Run on LHC15a2c MC sample (c/b enriched, D decay not forced, anchored to 2010 pass4)
- Evaluate the ratio of correlation distributions for true secondaries which pass the DCA cut over primaries+ secondaries which pass the DCA cut
  - Check its flatness and, if so, fit with a constant to obtain the secondary contamination
  - Check the dependence on pT(D) and pT(assoc)
  - From the other plots, also the rejection of 'false positives'
- The purity value (1 – contamination) must be then passed to the script which extracts the final results → see next slide)

FEED-DOWN, FIT, FINAL OBSERVABLES

- From the purity correction onwards, all the analysis steps are automatized, and executed buy the ProducePlotChain.sh script (and all the related scripts/macros). This performs
  - Purity and feed-down corrections
  - Evaluate FD uncertainty
  - Apply the other systematic uncertainties defined in the related systematic class
  - Fitting and extraction of observables
  - Final plotting
  - Comparison with p-Pb /models

- Ingredients needed:
  - Efficiency-corrected correlation distributions after ME correction and bkg subtraction
  - Purity value (currently the pass2 values are there, for pp)
  - f_{prompt} value *(slides will be updated with some instruction to obtain it)*
  - Templates for feed-down D-hadron correlation distributions (already available on the Twiki page)

- The latest version of the code will be committed in these days. It also contains some instructions about its usage.

SYSTEMATIC UNCERTAINTIES

- Some systematic uncertainties will need to be re-evaluated, in particular, those related to:
  - Extraction of S and B from the invariant mass plots:
    - ✓ Use integrals of the fit functions to extract both S and B
    - ✓ Obtain S, instead of B, via bin-counting (i.e. bin counts – integral of bkg funct.)
    - ✓ Extend/reduce the range of the fit function
    - ✓ Change the function used to model the background (pol2/exponential)
  - Shape of background correlation distribution:
    - ✓ Reduce/enlarge the size of the sidebands
    - ✓ Split the sideband in two and use only inner/outer bands, and compare the bkg subtracted results
  - Stability of D meson selection, aka D-meson efficiency (but not sure it's really needed)

- Additional points:
  - Different tuning of the D-meson selection (lower priority)
  - For the D+, use the new variable by Andrea (residual impact parameter significance)

FURTHER CONSIDERATIONS

- Timeline – we propose to launch trains in the following dates, please attach your wagons with the correct configuration by the day before:
  - Train on data for first look at the results: this Friday
  - Train on MC to evaluate D-meson and single track efficiencies: this Friday
  - Train on data, with new efficiency maps loaded, for efficiency-corrected results: next Thursday (after checking the results from the above trains at next week's HFJC)
  - The values of purity correction and the final results (running the script is very quick) can be hopeflly obtained before the Christmas stop

- Some general suggestions, for both new and 'old' analyzers (and for **all** analyses):
  - As soon as you have something new to show, please present it to HFCJ! It's an excellent way to keep people informed of the analysis progresses, and to spot potential issues that you are not aware of.
  - Also, showing results at the meeting it's better than just circulating them via email, since it can trigger fruitful discussions with a wider audience.
  - When sending emails about analysis issues/technicalities, it's better to use the mailing list for D-h analyses (alice-pag-hf-hfcj-Dh@cern.ch). This allows also other involved people to be aware of updates/issues/solutions, and we avoid multiple email on the same topic.