Synchronisation
for CP H in tau decays analysis

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Introduction

- Steps of synchronisation procedure
  - "Sync ntuple" to synchronize
    - variables defining selection, e.g. tau, jet momenta, IDs, jet multiplicities, etc.
    - variables to build final observables, e.g. [SVFit]mass, IPs, SV, PV, charged/neutral momenta, etc.
    - "event weights" like normalisations, corrections / scale factors, etc.

    Performed with a specific (signal) sample
    - could be repeated with other samples, e.g. to understand discrepancies seen in further steps

    Today, we will focus on this step
  - "Data-card" level to synchronise distributions used for combine fit
    - all samples and event categories
    - nominal distributions and shifted by systematic uncertainties
  - "Limit" level to synchronise final result
    - requires definition of parameter-of-interest (POI) (phase of phi*?)
    - look only at differences between results to stay blind

Variables for sync ntuple

- Few sets of variables
  - Standard ones, i.e. common with other HTT analyses as stage-1 STXS
    - Still need to define some variables, e.g. MET, tauID, isolation, mTT, etc. and correction/weight sources

    => probably more or less known, but it should be strictly specified

    => definition of sync ntuple requires also definition of baseline selection with its era-depended variations (thresholds)
  - CPH in tau decays specific variables:
    - e.g. IPs, MVA-DMs, charged/neutral momenta, PV, SV, tauSpinner weights, etc.

    => need define list and variables themselves
  - Additional, new variables for further studies
    - e.g. deepTauID, fastMTT, deep-b-tagging

    => not mandatory but it could be useful to have them already now (?)

Samples for sync ntuple

- Propose to use SM VBF HTT samples:
  - Fall17 MiniAODv2 to start with:
    /VBFHToTauTau_M125_13TeV_powheg_pythia8/RunIIFall17MiniAODv2-PU2017_12Apr2018_new_pmx_94X_mc2017_realistic_v14-v1/MINIAODSIM
  - Autumn18 MiniAOD:
    /VBFHToTauTau_M125_13TeV_powheg_pythia8/RunIIAutumn18MiniAOD-102X_upgrade2018_realistic_v15_ext1-v1/MINIAODSIM
  - Summer16 MiniAODv3 (aka 2016 94X-legacy)
    /VBFHToTauTau_M125_13TeV_powheg_pythia8/RunIISummer16MiniAODv3-PUMoriond17_94X_mcRun2_asymptotic_v3-v2/MINIAODSIM
- Samples as coherent at MiniAOD level as possible:
  - e.g. track information in packedCandidates, tau reco&Id, electron ID, etc.
  - All samples can and should be analysed with CMSSW >=10_2_16
    - Most tools easly portable from 94X, some e.g. deepTau v2p1, available only with 102X
- NanoAOD (v5) is not a real option for CP H in tau decays analysis due to missing individual particles and tracks
  - Mandatory for (re)fit of PV, SV, to build IPs, obtain charged/neutral momenta, etc.

Documentation

- TWiki meant to describe sync procedure created: https://twiki.cern.ch/twiki/bin/view/CMS/HiggsCPinTauDecaysSync (available from the main HiggsCPinTauDecays TWiki)
- Currently only “Sync ntuple” step in the TWiki
  - Still needs to be tuned
- Next steps will be added successively following progress of the analysis