Table of Contents

EmbeddingTools event preselection

This page describes the event preselection in the "!HepEvt" (first) step of the EmbeddingTools procedure. The job options that run this are in `share/RunHepEvt_jobOptions.py`, but the actual code is in `share/make_evts.py` (note: it is in `share` despite being a PyAlgorithm!).

Event quality cuts

Muon-level cuts

- `MuonPt` (default: 0): Cut on `Muon::pt()`.
  - ♦ Controlled by `EmbeddingFlags.HepEvtMuonPt` (default: 5000)
- `MuonMaxEta` (default: 1e99): Cut on `Muon::eta()`.
  - ♦ Controlled by `EmbeddingFlags.HepEvtMuonMaxEta` (default: 1e99)
- `MuonAuthors` (default: `[6]`): "Staco" throughout code actually refers to this.
  - ♦ Controlled by `EmbeddingFlags.HepEvtMuonAuthors` (default: `[6]`)
- `MuonCaloRelIsolation` (default: 1e99): Cut on `Muon::parameter(1)/Muon::pt()`.
  - ♦ Controlled by `EmbeddingFlags.HepEvtMuonCaloRelIsolation` (default: 1e99)
- `MuonCaloAbsIsolation` (default: 1e99): Cut on `Muon::parameter(1)`.
  - ♦ Controlled by `EmbeddingFlags.HepEvtMuonCaloAbsIsolation` (default: 1e99)
- `MuonTrackAbsIsolation` (default: 1e99): Cut on `Muon::parameter(17)/Muon::pt()`.
  - ♦ Controlled by `EmbeddingFlags.HepEvtMuonTrackAbsIsolation` (default: 1e99)
- `MuonTrackRelIsolation` (default: 1e99): Cut on `Muon::parameter(17)`.
  - ♦ Controlled by `EmbeddingFlags.HepEvtMuonTrackRelIsolation` (default: 1e99)
- `MuonRequireVtx` (default: True): Cut on `Muon::track()::reconstructedVertex()==True`.
  - ♦ Controlled by `EmbeddingFlags.HepEvtMuonRequireVertex` (default: True)

Jet-level cuts

- `JetsMinNum` (default: 0): ie, one can ask for Z+jets events.
  - ♦ Controlled by `EmbeddingFlags.HepEvtJetsMinNum` (default: 0)
- `JetsMinPt` (default: 0): Cut on `Jets[JetMinNum-1].pt()`, ie assumes jets are pt-ordered.
  - ♦ Controlled by `EmbeddingFlags.HepEvtJetsMinPt` (default: 0)

Event-level cuts

- `MaxEtmiss` (default: 1e99): Obvious.
  - ♦ Controlled by `EmbeddingFlags.HepEvtMaxEtmiss` (default: 1e99)

The following cuts are only applied if `NumMuonsToReplace` is equal to 2. If `NumMuonsToReplace` equals 2 and more than two pairs pass all cuts, the pair with the highest pt is taken. If it equals 1, the **undefined** method `rndChooseOneMuon` is called if there is more than one muon found passing the muon cuts.

- Hard-coded cut on `q1*q2 < 0`.
- `MuonRequireSameVtx` (default: True): Cut on x,y,z match for `Muon::track()::reconstructedVertex()::recVertex()::position()` (surely a pointer check would be better?). Set to False if `MuonRequireVtx` is False or `NumMuonsToReplace` is not 2.
  - ♦ Controlled by `EmbeddingFlags.HepEvtMuonRequireSameVtx` (default: True)
- `MuonMinInvMass` (default: 0): Obvious.
  - ♦ Controlled by `EmbeddingFlags.HepEvtMuonMinInvMass` (default: 0)
- `MuonMaxInvMass` (default: 1e99): Obvious.

- ♦ Controlled by `EmbeddingFlags.HepEvtMuonMaxInvMass` (default: 1e99)

The following cuts are applied if `JetsMinNum` is greater than 0.

- `JetsMinInvMass` (default: 0): Cut on invariant mass of first two jets.
  - ♦ Controlled by `EmbeddingFlags.HepEvtJetsMinInvMass` (default: 0)
- `JetsMinDEta` (default: 0): Cut on `abs(Jets[0].eta()-Jets[1].eta())`, if there are at least 2 jets.
  - ♦ Controlled by `EmbeddingFlags.HepEvtMinDEta` (default: 0)

Flags controlling the cuts

- `useTruthMuons`: Replaces muons after selection with their truth-matched counterparts (matched using `Rec::TrackParticleTruth`, there is also a pdg ID check).
  - ♦ Controlled by `EmbeddingFlags.HepEvtUseTruthMuons` (default: False)
- `applyTruthCuts`, `doTruth`, `doFDR`, `inputStoreGateString`: Do nothing!
  - ♦ Not controlled by any `EmbeddingFlags` flag.
- `EventInfoContainerName`, `StacoContainerName`, `JetContainerName`, `METContainerName`, `trackParticleTruthCon`: Obvious.
  - ♦ Controlled by `EmbeddingFlags.EventInfoContainerName` (default: "McEventInfo"), `EmbeddingFlags.StacoContainerName` (default: "StacoESDMuonCollection"), `EmbeddingFlags.JetContainerName` (default: "Cone4H1TopoJets"), `EmbeddingFlags.MissingETContainerName` (default: "MET_RefFinal"), and nothing! (default: "TrackParticleTruthCollection").
- `ConvertMuonsToTaus` (default: False): If True, puts taus into LHEF file instead of muons, including momentum rescaling.
  - ♦ Controlled by `EmbeddingFlags.HepEvtConvertMuonsToTaus` (default: True)
- `NumMuonsToReplace` (default: 2): Reset to 2 if `ZEvents` is True. Exactly this many muons must pass cuts if `ZEvents` is True, else it is a minimum.
  - ♦ Controlled by `EmbeddingFlags.HepEvtNumMuonsToReplace` (default: 2)
- `ZEvents` (default: True): Dumps Z boson header to LHEF file, and puts restrictions on event selection.
  - ♦ Controlled by `EmbeddingFlags.ZEvents` (default: True)

The following flags can **not** be set using `EmbeddingFlags`: `trackParticleTruthCon`.

Flags to be added for W selection

- `WEvents` (default: False): Dump W boson header to LHEF file, put restrictions on event selection. To do this, a neutrino solution needs to be chosen - how? `ZEvents` takes precedence if both are set.
  - ♦ Controlled by `EmbeddingFlags.WEvents` (default: False)
- `MinEtmiss` (default: 0): Obvious.
  - ♦ Controlled by `EmbeddingFlags.HepEvtMinEtMiss` (default: 0)
- `VertexContainerName` (default:): Obvious.
  - ♦ Controlled by `EmbeddingFlags.VertexContainerName` (default: "VxPrimaryCandidate")
- `MuonMinMT` (default: 0), `MuonMaxMT` (default: 1e99): Minimum/maximum transverse mass, only used if `WEvents` is True.
  - ♦ Controlled by `EmbeddingFlags.HepEvtMuonMinMT` (default: 0) and `EmbeddingFlags.HepEvtMuonMaxMT` (default: 1e99)
- `EventVertexMinNTracks` (default: 0): Event must have a vertex with at least that many tracks. If 0, no vertex selection is made at the event level.
  - ♦ Controlled by `EmbeddingFlags.HepEvtVertexMinNTracks` (default: 3)
- `EventVertexMaxZzero` (default: 1e99): Cut on |z| of primary vertex, in addition to the n tracks cut above.

    - ♦ Controlled by `EmbeddingFlags.HepEvtVertexMaxZzero` (default: 1e99)
- `MuonCaloIsoCone`, `MuonTrackIsoCone` (defaults: both 20): 100*!DeltaR cone used for isolation cuts
    - ♦ Controlled by `EmbeddingFlags.HepEvtMuonCaloIsoCone` and `EmbeddingFlags.HepEvtMuonTrackIsoCone` (defaults: both 20)
- `EmbeddingFlags.HepEvtTrigger` (default: ""), `EmbeddingFlags.HepEvtGRL` (default: `[]`): Passed into LumiCalc tools, to apply GRL and/or trigger selections.
    - ♦ `EmbeddingFlags.HepEvtGRLName` (default: "MyLBCollection"): Auxiliary information needed to process the GRL.

- `HepEvtApplySMAnalysis` (default: False): Controls whether the MuonSelectorTool and special MET calculation are used or not. The remaining flags in this list only apply if this flag is True. It also controls whether or not the jet quality criteria are applied or not.
    - ♦ Controlled by `EmbeddingFlags.HepEvtApplySMAnalysis` (default: False)
- `MuonMSPt` (default: 0): Minimum pT in the Muon Spectrometer.
    - ♦ Controlled by `EmbeddingFlags.HepEvtMuonMSPt` (default: 0)
- `MuonDeltaPt` (default: 1e99): Maximum value of abs(MS pt - ID pt + 2.9 GeV).
    - ♦ Controlled by `EmbeddingFlags.HepEvtMuonDeltaPt` (default: 1e99)
- `JetsMaxEta` (default: 1e99): Maximum eta for jet selection.
    - ♦ Controlled by `EmbeddingFlags.HepEvtJetsMaxEta` (default: 1e99)
- `PseudoJetsMinNum` (default: 0): Minimum number of jets+muons passing pseudo-jet selection.
    - ♦ Controlled by `EmbeddingFlags.HepEvtPseudoJetsMinNum` (default: 0)
- `PseudoJetsMinPt` (default: 0): Minimum pseudo-jet pT.
    - ♦ Controlled by `EmbeddingFlags.HepEvtPseudoJetsMinPt` (default: 0)

W/Z muon selection

See the MuonCombinedSelectorTools twiki for details. In 15.6.11.4, you need to check out these packages:

```
cmt co -r MuonCombinedToolInterfaces-00-01-02 Reconstruction/MuonIdentification/MuonCombinedToolI
cmt co -r MuonCombinedEvaluationTools-00-00-07 Reconstruction/MuonIdentification/MuonCombinedEval
cmt co -r MuonCombinedSelectorTools-00-00-02 Reconstruction/MuonIdentification/MuonCombinedSelect
```

`MuonRecToolInterfaces` is not necessary, as the release already has the correct version. **Important:** the `MuonCombinedToolInterfaces` package needs python bindings to be added for the `IMuonCombinedSelectorTool` class, as described in ReflexMiniTutorial.

Jet cleaning

See the JetCaloQuality for the details of packages and functions, and WZObservationWithMuons for the cuts. Release 15.6.11.4 already has `Reconstruction/Jet/JetUtils-01-01-27`, so this should not need to be checked out.

-- MichaelFlowerdew - 15-Jul-2010

This topic: Sandbox > EmbeddingPreselection
Topic revision: r13 - 2010-11-17 - MichaelFlowerdew