Measuring the Higgs Self-coupling Using the Muon Collider

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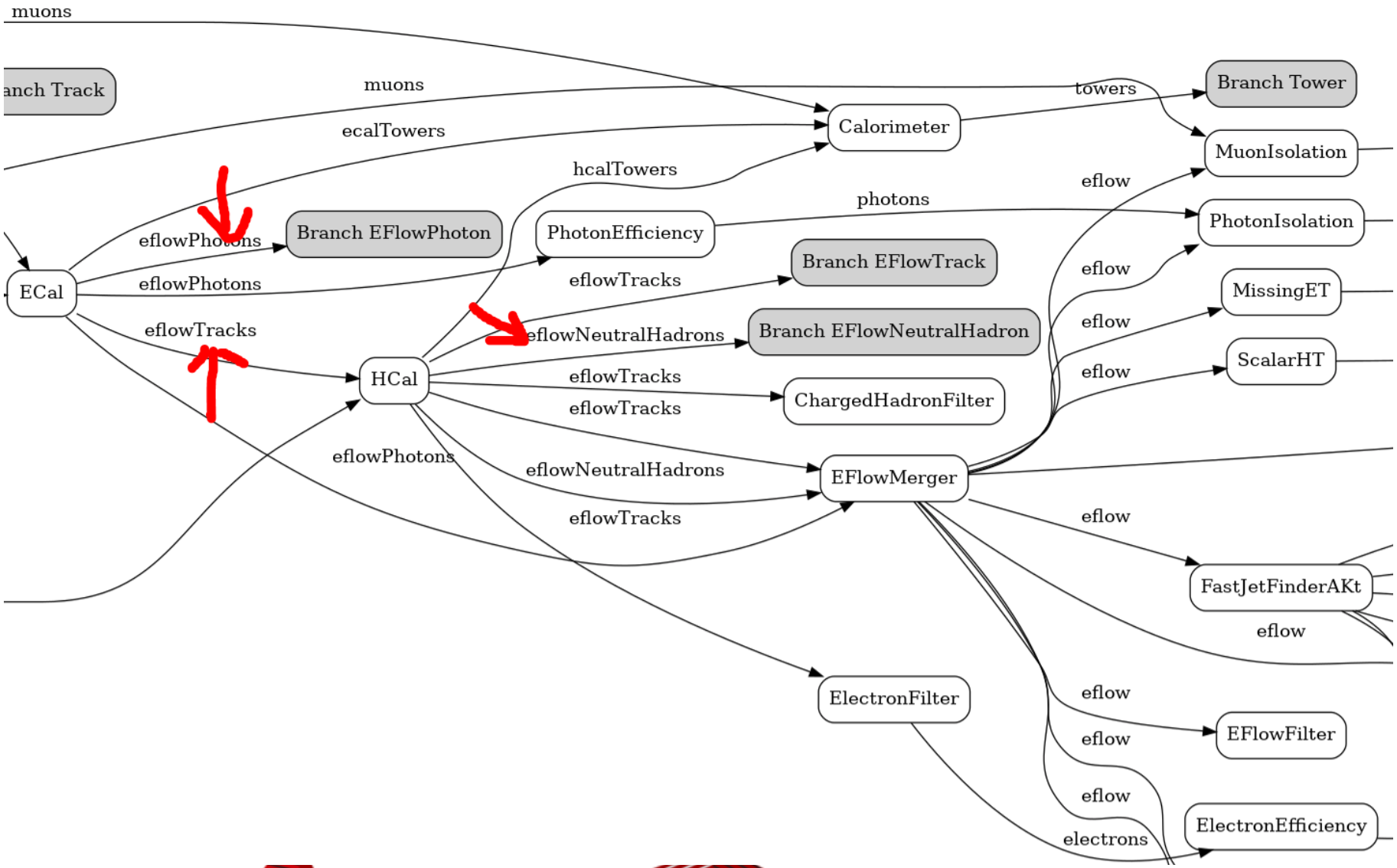
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ElectronFilter
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EFlowFilter
eflow
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ElectronEfficiency
electrons

```
module BIBECal BIBECal {
    set PhotonInputArray ECal/eflowPhotons
    set TtackInputArray ECal/eflowTracks

    set PhotonOutputArray eflowPhotons
    set TrackOutputArray eflowTracks


    set NumParticles 9000000
        #37759050

    set FileName /nfs_scratch/hjia38/MG5_aMC_v3_3_2/Delphes/cards/MuonCollider/histograms_MCPar_muComb_files1To8_Allevts.root
    set xHistName x
    set PositionHistName z_r
    #set PhiHistName phi
    #set ThetaHistName theta
    set MomentumHistName px_py_pz
    set PdgEnergyHistName pdgid_energy
    set PhotonsDeltaR 0.5
    set TracksDeltaR 0.5

}
```

```
//check if BIB generated in proximity of original eflowPhotons
if (EMFlag) {
    while((original = static_cast<Candidate *>(originalPhotons -> Next()))) {
        original = static_cast<Candidate *>(original -> Clone());
        TLorentzVector *originalMomentum = original -> Momentum;
        if (originalMomentum.DeltaR(bibMomentum) < fPhotonsDeltaR) proximity = true;
    }
    if (proximity) fPhotonsOutputArray -> Add(bib);
}

if (HadFlag) {
    while((original = static_cast<Candidate *>(originalTracks -> Next()))) {
        original = static_cast<Candidate *>(original -> Clone());
        TLorentzVector *originalMomentum = original -> Momentum;
        if (originalMomentum.DeltaR(bibMomentum) < fTracksDeltaR) proximity = true;
    }
    if (proximity) fTracksOutputArray -> Add(bib);
}
```

- Currently, I am just adding BIB particles into eflowTracks, eflowPhotons. But we could not know the kinematics of these eflows with only kinematic info of BIB particles on generator level. How could we know the distribution of tracks?

- Maybe we could write our own ECal and HCal adding BIBs to it and let the Delphes SimpleCalorimeter module finish the classification and calorimeter work? Maybe a simple particle propagation charged particle and calorimeter in just one module to save memory use?

```
#############
#   ECAL
#############

module SimpleCalorimeter ECal {
    set ParticleInputArray ParticlePropagator/stableParticles
    set TrackInputArray TrackMerger/tracks

    set TowerOutputArray ecalTowers
    set EFlowTrackOutputArray eflowTracks
    set EFlowTowerOutputArray eflowPhotons
```

```
#############
#   HCAL
#############

module SimpleCalorimeter HCal {
    set ParticleInputArray ParticlePropagator/stableParticles
    set TrackInputArray ECal/eflowTracks

    set TowerOutputArray hcalTowers
    set EFlowTrackOutputArray eflowTracks
    set EFlowTowerOutputArray eflowNeutralHadrons
```