



# Measuring the Higgs Self-coupling Using the Muon Collider

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# Proximity?

```
module BIBECal BIBECal {  
  set PhotonsInputArray ECal/eflowPhotons  
  set TracksInputArray ECal/eflowTracks  
  
  set PhotonsOutputArray eflowPhotons  
  set TracksOutputArray eflowTracks  
  
  set NumParticles 10000000  
  
  set FileName /Delphes/cards/MuonCollider/histograms_MCPar_muComb_files1To8_Allevts_new.root  
  set xHistName x  
  set PositionHistName z_r  
  set MomentumHistName px_py_pz  
  set PdgEnergyHistName pdgid_energy  
  set PhotonsDeltaR 0.1  
  set TracksDeltaR 0.2  
}
```



```
module BIBNeutralHadrons BIBNeutralHadrons {  
  set InputArray BIBHCal/eflowNeutralHadrons  
  
  set OutputArray eflowNeutralHadrons  
  
  set NumParticles 10000000  
  
  set FileName /Delphes/cards/MuonCollider/histograms_MCPar_muComb_files1To8_Allevts_new.root  
  set xHistName x  
  set PositionHistName z_r  
  #set PhiHistName phi  
  #set ThetaHistName theta  
  set MomentumHistName px_py_pz  
  set PdgEnergyHistName pdgid_energy  
  set DeltaR 0.2  
}
```



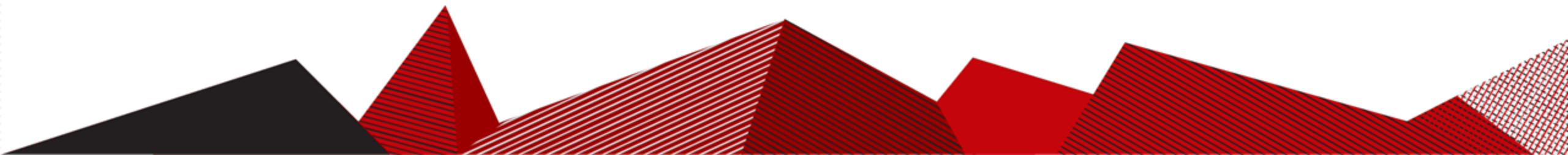
# Add in bib momentum

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

if (HadFlag) {
    TLorentzVector originalMomentum;
    while((original = static_cast<Candidate *>(fItTracksOutputArray -> Next())) {
        originalMomentum = original -> Momentum;
        if (originalMomentum.DeltaR(bibMomentum) < fTracksDeltaR) {
            originalMomentum = originalMomentum + bibMomentum;
            original -> Momentum = originalMomentum;
        }
    }
}
```

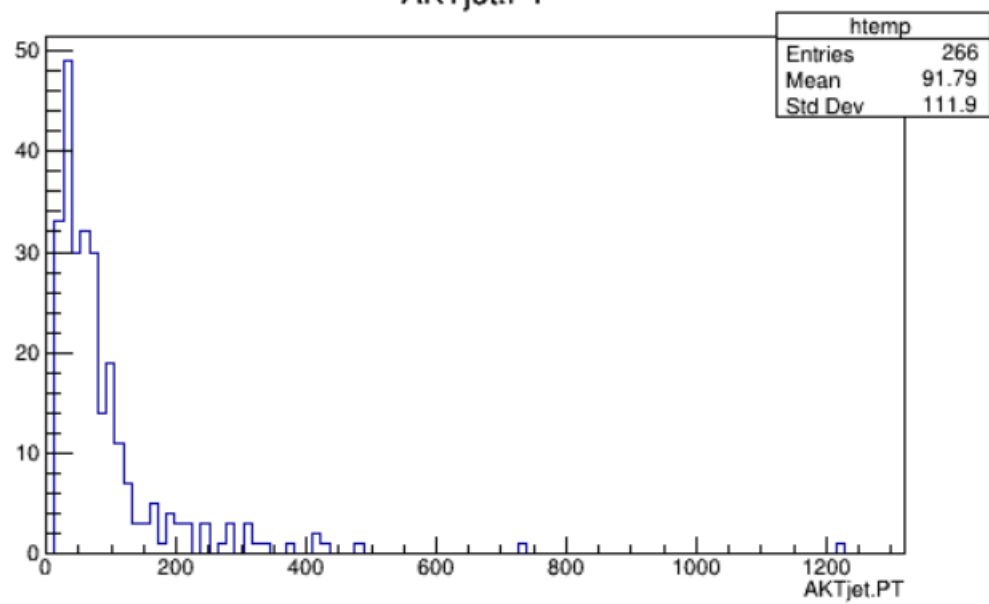


- <30min run time for  $10^7$  particles and much less memory usage  
~1GB
- usagePropagation under magnetic field for charge particles
- Strong dependence of jet pt on proximity of hadrons





AKTjet.PT



BIBAKTjet.PT

