MC VBF+MET QCD Samples Studies

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Today's presentation

Topics

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Introduction

QCD are by far the most frequent processes in collisions at CMS. The elevated cross sections of such processes mean it is normally impossible to generate samples big enough to simulate significant amounts of of equivalent luminosity so they can be used in data analysis.

Methodology

In order to overcome this problem we generated MC QCD samples with MET plus VBF-like jets.

- Real MET (vectorial sum of generator level neutrino p_T)
- VBF-like jets (AK5 generator level jets)

This type of event have a significantly smaller cross section and so to simulate high integrated luminosity samples.

MC Filter Details

MC Filter: Vectorial sum of neutrino E_T

- $\sum E_{\perp}(\vec{\nu}) > 40\ GeV$

MC Filter: Dijet Filter

- Select jets with:
  - $p_{\perp} > 20\ GeV$
  - $|\eta| < 5.0$
- From selected jets at least one pair with:
  - $m_{jj} > 700\ GeV$
  - $\Delta\eta > 3.2$

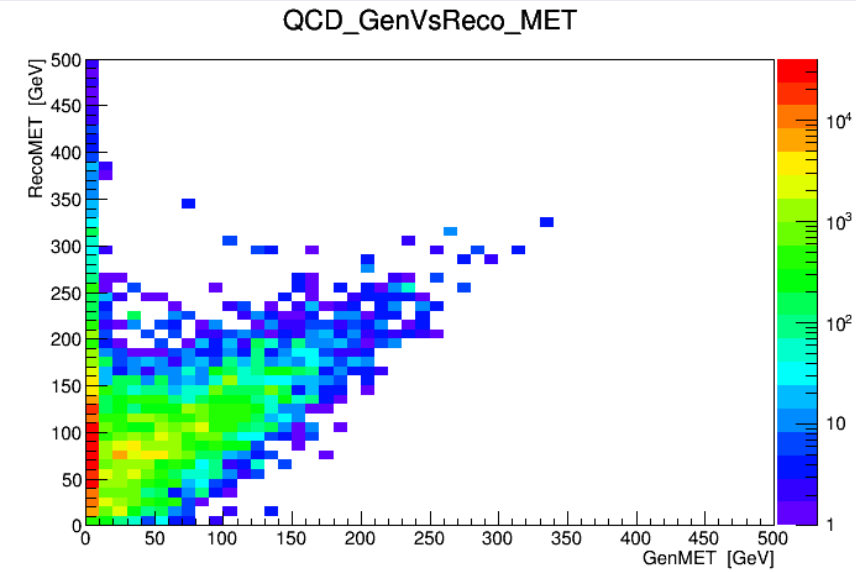
Testing AM-BDT on QCD I

How:

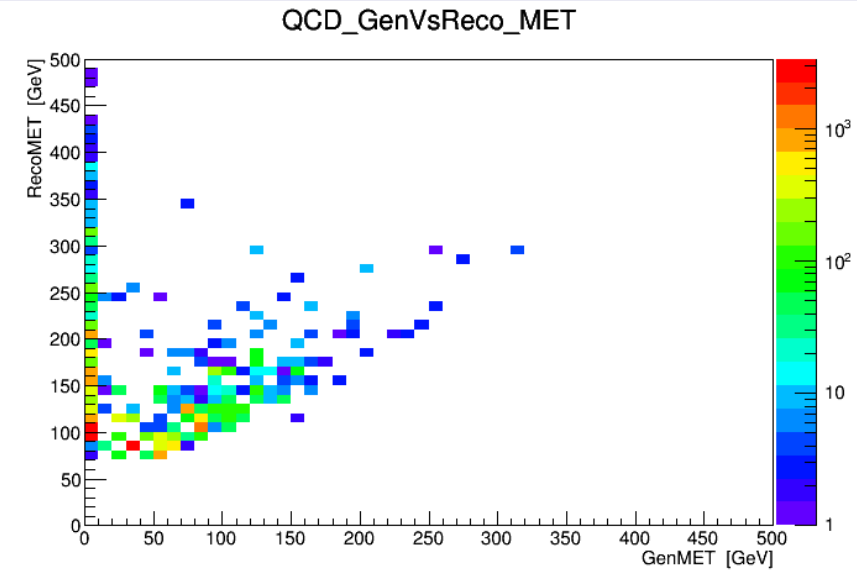
- Some bugs found and fixed and now BDT code is working
- Next plots are produced with the following conditions:
  - Pass VBF trigger (L1+HLT)
  - Same point of the prompt selection where BDT was trained. Implies passing vetos, having 2 reconstructed jets, etc.
  - Pass generator jets cut (same as MC VBF QCD samples)

item We will use as reference the BDT cut of 0.3 (working point recomended by AM)

BDT Score > 0.0

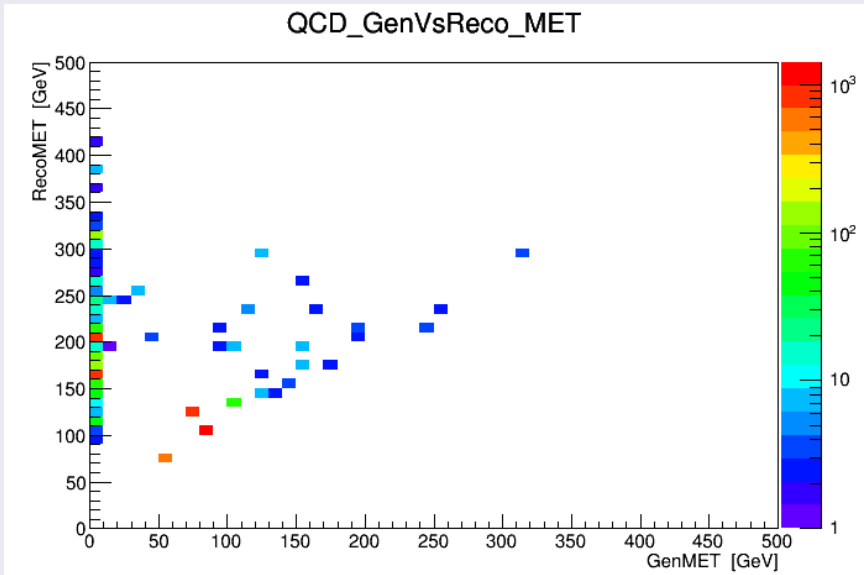


BDT Score > 0.3

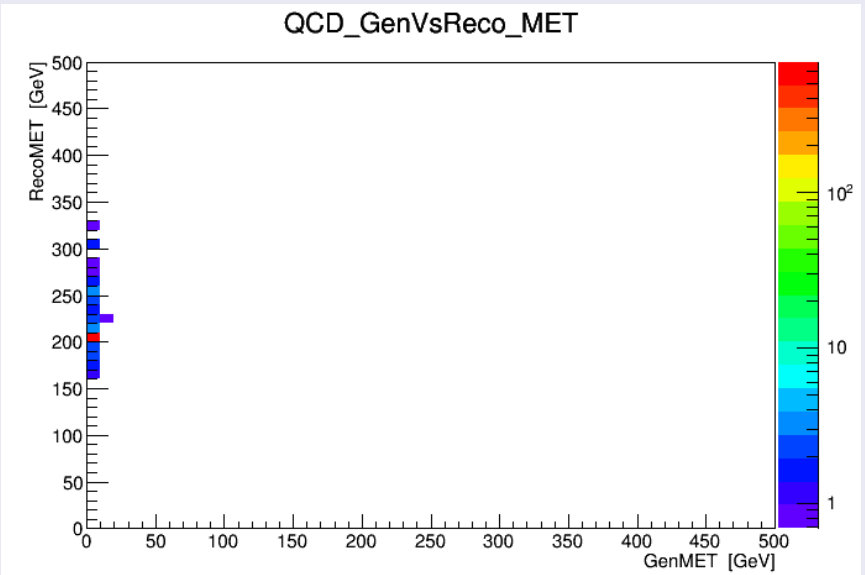


Testing AM-BDT on QCD I

BDT Score > 0.5



BDT Score > 0.75

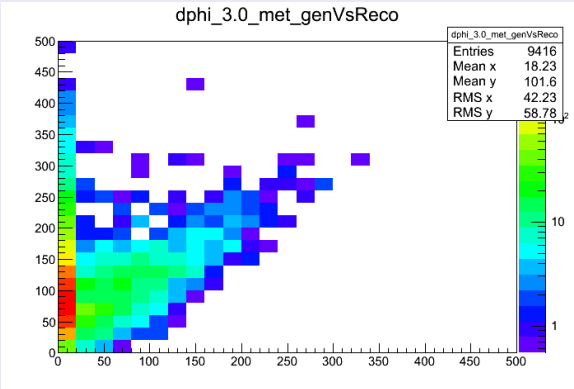


Trying $\Delta\phi$ to kill fake QCD I

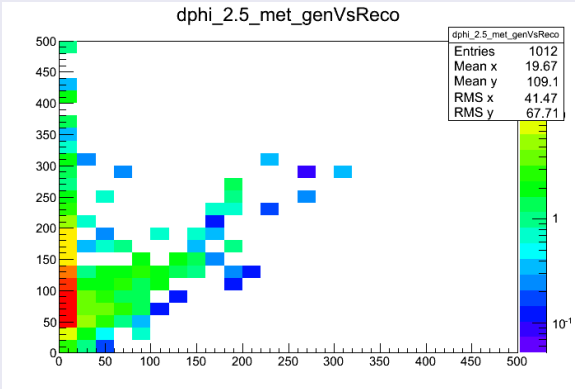
How:

- Next plots are produced with the following conditions:
  - Having 2 reconstructed jets (with jets passing prompt selecton conditions).
  - Pass generator jets cut (same as MC VBF QCD samples)
- Since this was just a quick look just used QCD Pt470-600 GeV

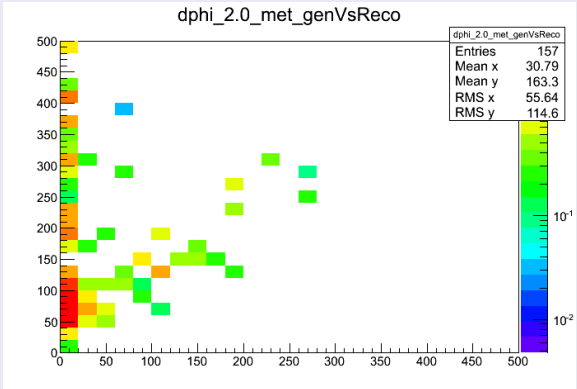
$\Delta\phi < 3.0$



$\Delta\phi < 2.5$

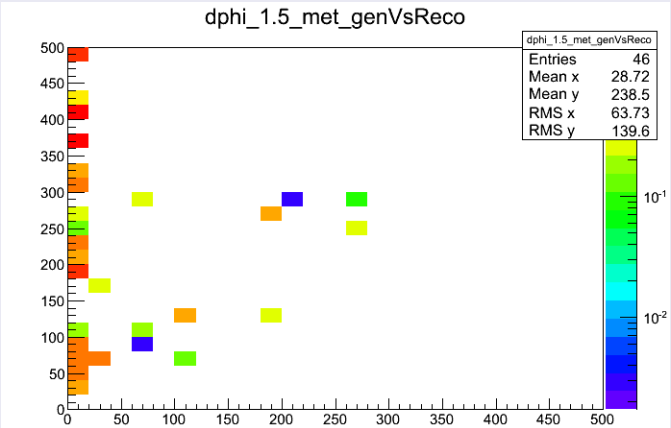


$\Delta\phi < 2.0$

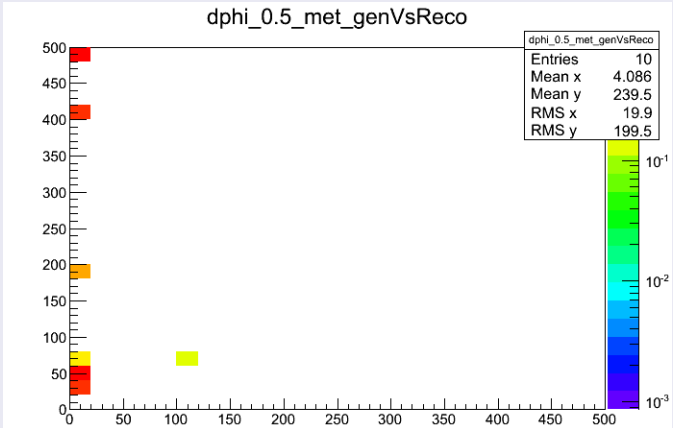


Trying $\Delta\phi$ to kill fake QCD II

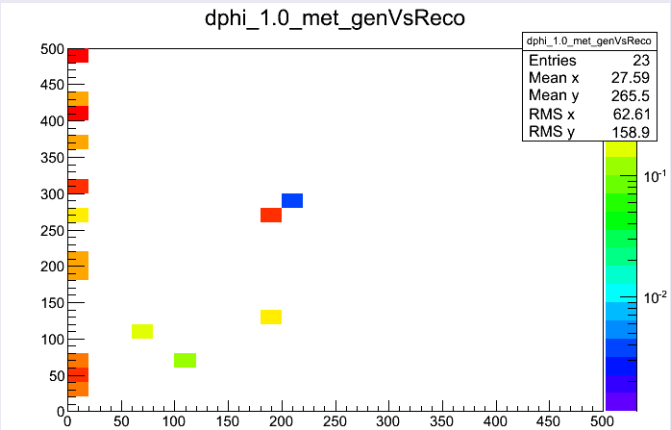
$\Delta\phi < 1.5$



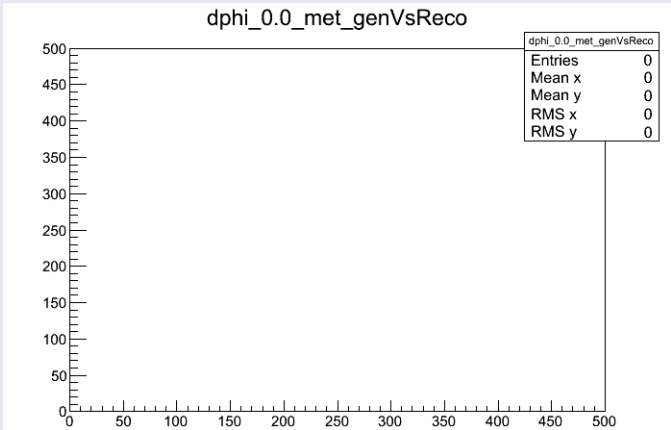
$\Delta\phi < 0.5$



$\Delta\phi < 1.0$



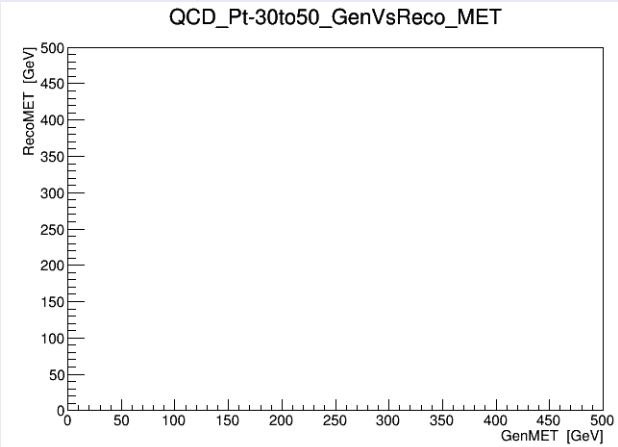
$\Delta\phi < 0.0$



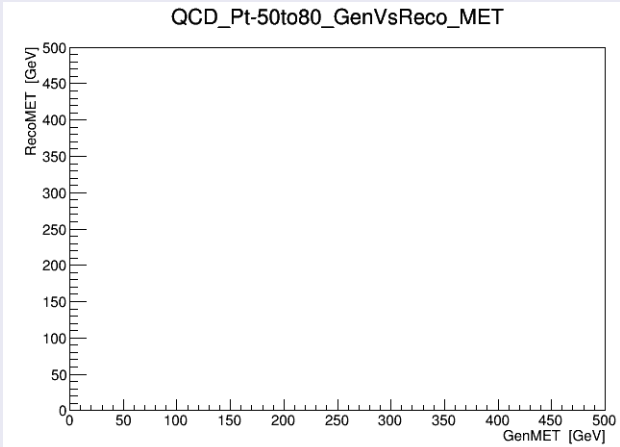
Backup Slides

$BDT > 0.3$ - Plots by Sample I

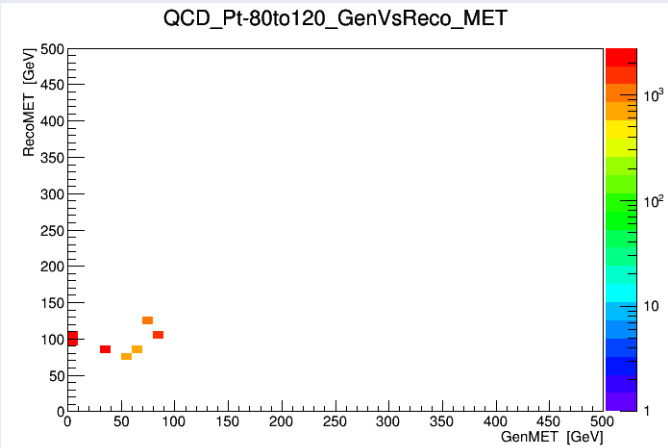
QCD_Pt-30to50



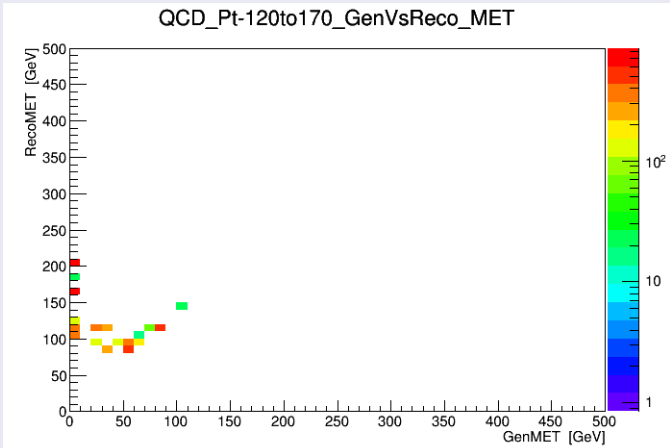
QCD_Pt-50to80



QCD_Pt-80to120

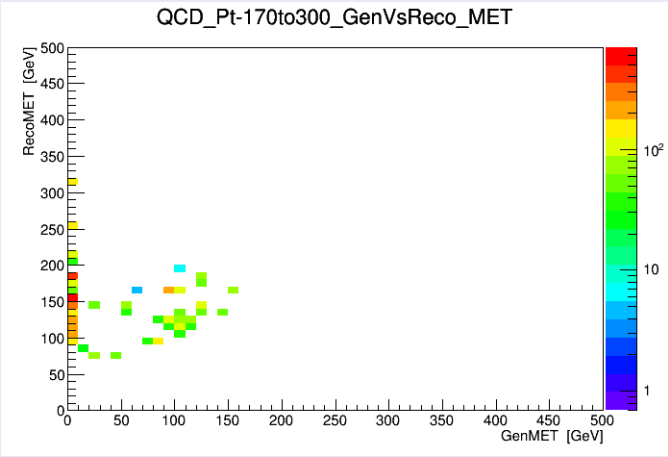


QCD_Pt-120to170

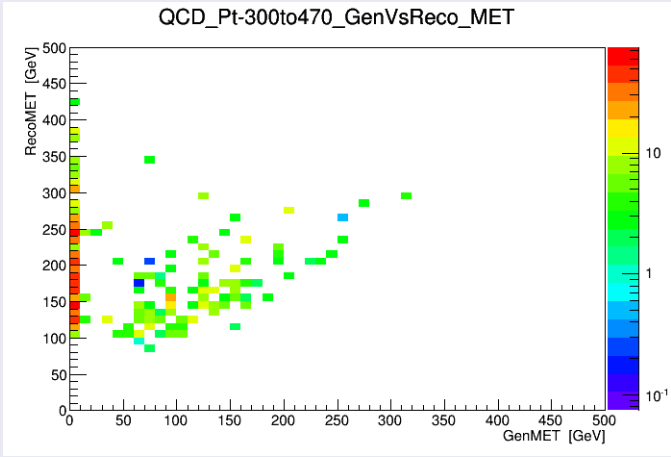


$BDT > 0.3$ - Plots by Sample II

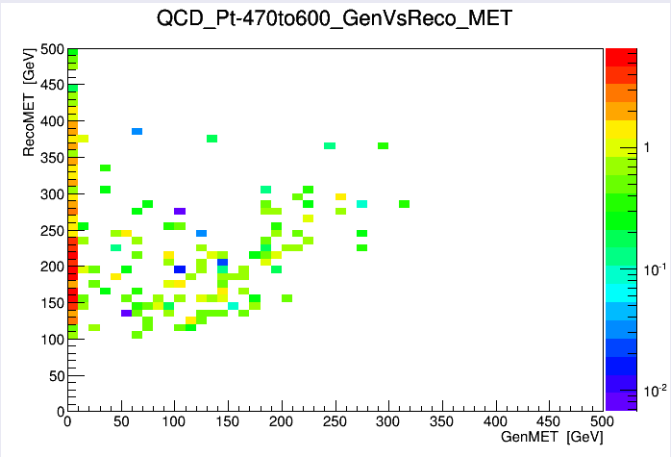
QCD_Pt-170to300



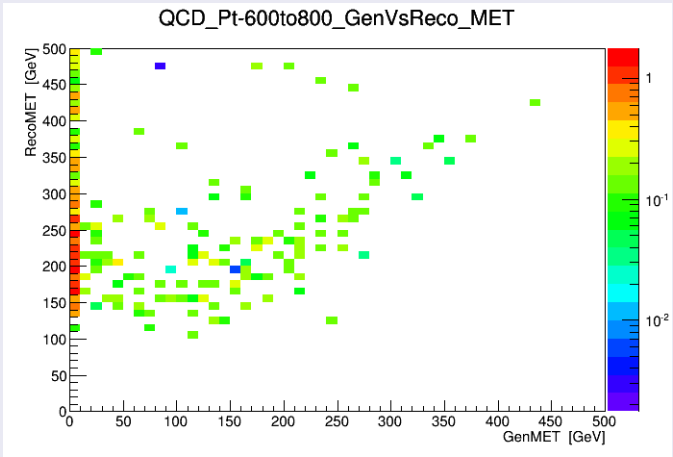
QCD_Pt-300to470



QCD_Pt-470to600

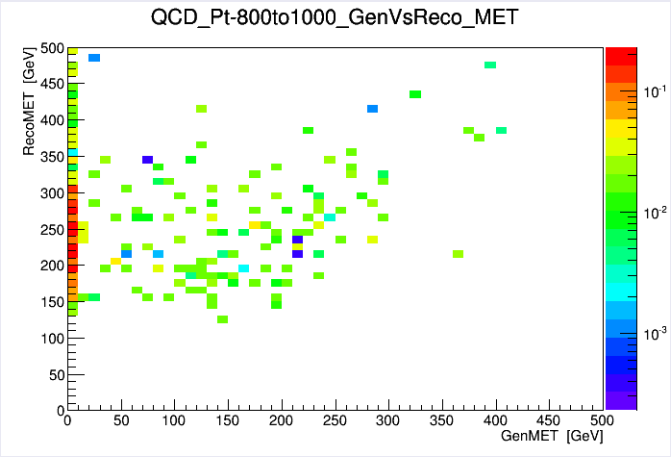


QCD_Pt-600to800

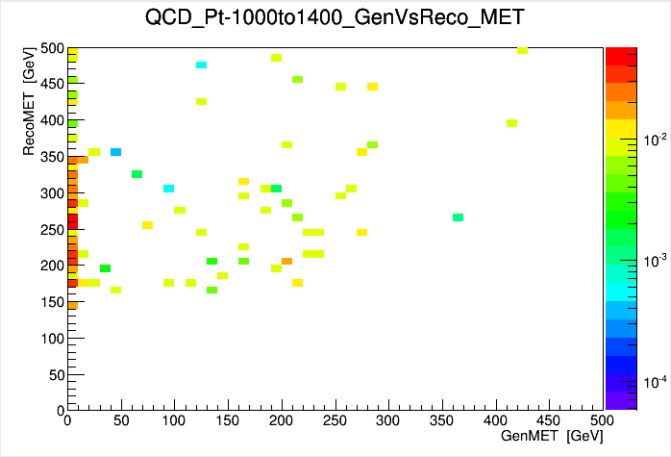


$BDT > 0.3$ - Plots by Sample III

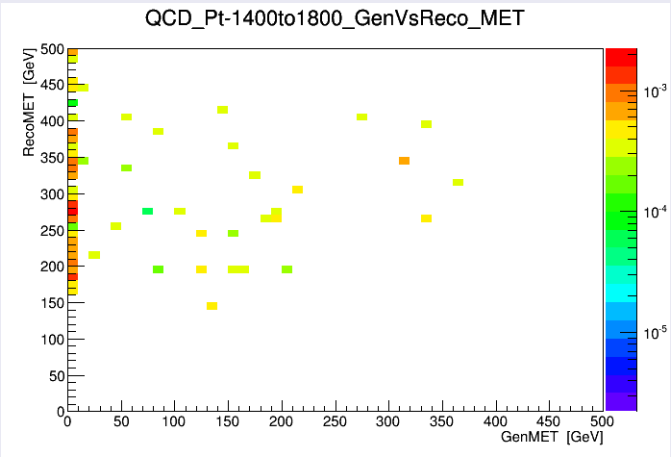
QCD_Pt-800to1000



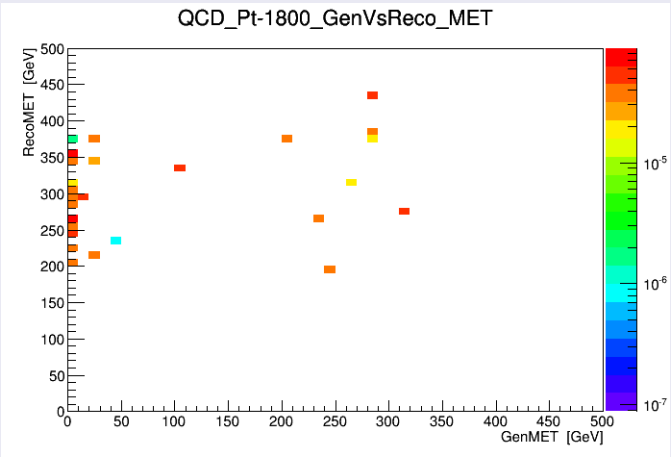
QCD_Pt-1000to1400



QCD_Pt-1400to1800

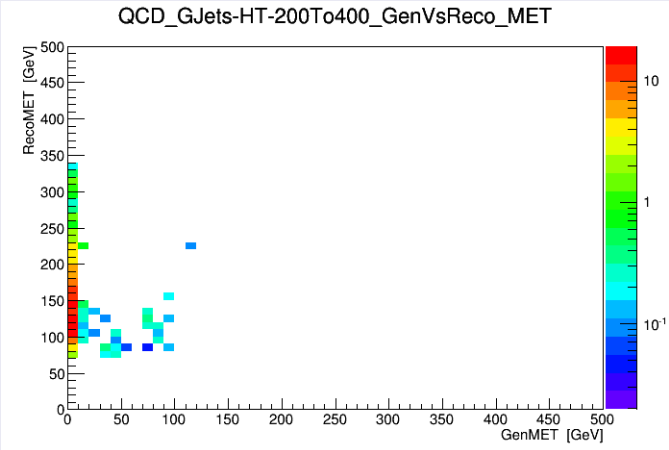


QCD_Pt-1800



$BDT > 0.3$ - Plots by Sample III

GJets-HT-200To400



GJets-HT-400ToInf