

# HH vs. WWII

Data comparison for the match  
and for the variables  
 $\Delta R$ , pdgId,  $\eta$  and pT

# Explanation of the variables

- bGenPart = best-GenPart-child for the final state quark
  - bGenJet = closest GenJet for the bGenPart
  - bJet = closest Jet for the bGenJet
- 
- Weak match = ( $\Delta R < 0.4$  match) for  $b\text{GenPart} \rightarrow b\text{GenJet}$
  - Strong match = ( $\Delta R < 0.4$  match) for  $b\text{GenJet} \rightarrow b\text{Jet}$

# HH stats for the weak and strong match

- Weak match success rate: 0.911
- Strong match success rate: 0.836

```
-----  
statistics of 49031 events with deltaRmax = 0.4:  
-----  
# particles/event:  
  
= 2: 1.0  
1: 0.0  
0: 0.0  
  
# all particles  
= 98062  
-----  
in weak match  
= 2: 0.83  
1: 0.161  
0: 0.009  
  
# weak matched particles / # all particles  
= 89299/98062 = 0.911  
-----  
and strong match  
= 2: 0.701  
1: 0.27  
0: 0.029  
  
# strong matched particles / # weak matched particles  
= 82002/89299 = 0.918  
# strong matched particles / # all particles  
= 82002/98062 = 0.836  
-----
```

# HH stats with data filters

- The matching success rates improve a lot with these filters

Statistics of 49031 events with deltaRmax = 0.4:

```
# particles/event with filter: detectable eta  
(|bGenPart_eta| < 5.1 && |bGenJet_eta| < 5.1)  
= 2: 0.885  
1: 0.111  
0: 0.004
```

```
# all filtered particles / # all particles  
= 92222/98062 = 0.94
```

```
in weak match  
= 2: 0.781  
1: 0.204  
0: 0.015
```

```
# weak matched particles / # all (filtered) particles  
= 86620/92222 = 0.939
```

```
and strong match  
= 2: 0.691  
1: 0.278  
0: 0.031
```

```
# strong matched particles / # weak matched particles  
= 81386/86620 = 0.94  
# strong matched particles / # all (filtered) particles  
= 81386/92222 = 0.883
```

Statistics of 49031 events with deltaRmax = 0.4:

```
# particles/event with filter: detectable GenJets  
(bGenPart_pT > 10)  
= 2: 0.721  
1: 0.255  
0: 0.024
```

```
# all filtered particles / # all particles  
= 83196/98062 = 0.848
```

```
in weak match  
= 2: 0.715  
1: 0.259  
0: 0.025
```

```
# weak matched particles / # all (filtered) particles  
= 82864/83196 = 0.996
```

```
and strong match  
= 2: 0.641  
1: 0.317  
0: 0.043
```

```
# strong matched particles / # weak matched particles  
= 78371/82864 = 0.946  
# strong matched particles / # all (filtered) particles  
= 78371/83196 = 0.942
```

Statistics of 49031 events with deltaRmax = 0.4:

```
# particles/event with filter: detectable GenJets and Jets  
(|bGenPart_eta| < 5.1 && |bGenJet_eta| < 5.1  
&& bGenPart_pT > 10 && bGenJet_pT > 15)  
= 2: 0.653  
1: 0.307  
0: 0.04
```

```
# all filtered particles / # all particles  
= 79069/98062 = 0.806
```

```
in weak match  
= 2: 0.65  
1: 0.309  
0: 0.041
```

```
# weak matched particles / # all (filtered) particles  
= 78881/79069 = 0.998
```

```
and strong match  
= 2: 0.62  
1: 0.332  
0: 0.048
```

```
# strong matched particles / # weak matched particles  
= 77059/78881 = 0.977  
# strong matched particles / # all (filtered) particles  
= 77059/79069 = 0.975
```

# WWII stats for the weak and strong match

- Weak match success rate: 0.954
  - (HH: 0.911)
- Strong match success rate: 0.904
  - (HH: 0.836)

```
-----  
Statistics of 51512 events with deltaRmax = 0.4:  
-----  
# particles/event:  
  
= 2: 1.0  
1: 0.0  
0: 0.0  
  
# all particles  
= 103024  
-----  
in weak match  
= 2: 0.91  
1: 0.088  
0: 0.002  
  
# weak matched particles / # all particles  
= 98266/103024 = 0.954  
-----  
and strong match  
= 2: 0.819  
1: 0.17  
0: 0.011  
  
# strong matched particles / # weak matched particles  
= 93119/98266 = 0.948  
# strong matched particles / # all particles  
= 93119/103024 = 0.904  
-----
```

# WWII stats with data filters

- The matching success rates improve a lot with these filters
  - (all are better rates than in HH data)

Statistics of 51512 events with deltaRmax = 0.4:

```
# particles/event with filter: detectable eta  
(|bGenPart_eta| < 5.1 && |bGenJet_eta| < 5.1)  
  
= 2: 0.931  
1: 0.067  
0: 0.002
```

```
# all filtered particles / # all particles  
= 99389/103024 = 0.965
```

```
in weak match  
= 2: 0.871  
1: 0.123  
0: 0.006
```

```
# weak matched particles / # all (filtered) particles  
= 96076/99389 = 0.967
```

```
and strong match  
= 2: 0.81  
1: 0.177  
0: 0.013
```

```
# strong matched particles / # weak matched particles  
= 92554/96076 = 0.963  
# strong matched particles / # all (filtered) particles  
= 92554/99389 = 0.931
```

Statistics of 51512 events with deltaRmax = 0.4:

```
# particles/event with filter: detectable GenJets  
(bGenPart_pT > 10)  
  
= 2: 0.817  
1: 0.173  
0: 0.01
```

```
# all filtered particles / # all particles  
= 93082/103024 = 0.903
```

```
in weak match  
= 2: 0.813  
1: 0.176  
0: 0.011
```

```
# weak matched particles / # all (filtered) particles  
= 92836/93082 = 0.997
```

```
and strong match  
= 2: 0.762  
1: 0.218  
0: 0.02
```

```
# strong matched particles / # weak matched particles  
= 89774/92836 = 0.967  
# strong matched particles / # all (filtered) particles  
= 89774/93082 = 0.964
```

Statistics of 51512 events with deltaRmax = 0.4:

```
# particles/event with filter: detectable GenJets and Jets  
(|bGenPart_eta| < 5.1 && |bGenJet_eta| < 5.1  
&& bGenPart_pT > 10 && bGenJet_pT > 15)  
  
= 2: 0.766  
1: 0.214  
0: 0.02
```

```
# all filtered particles / # all particles  
= 89949/103024 = 0.873
```

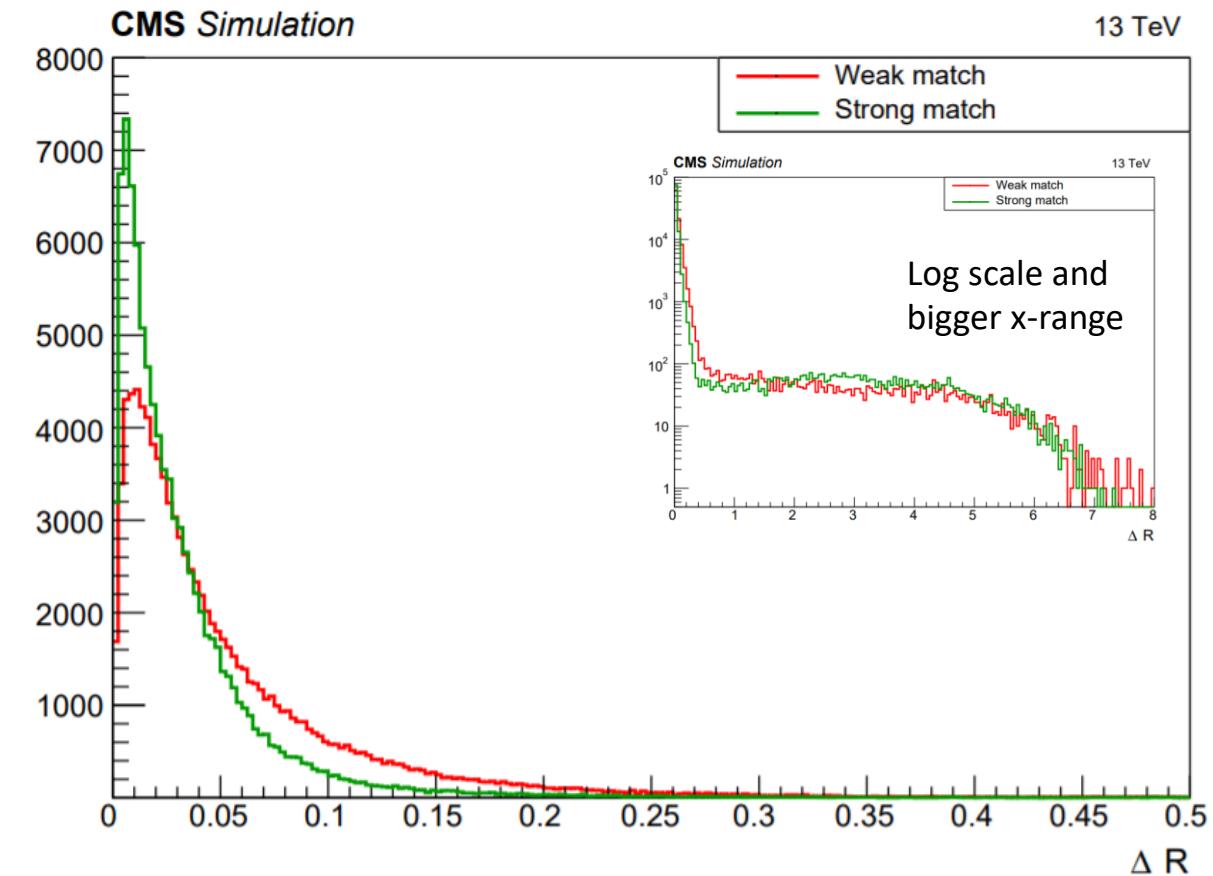
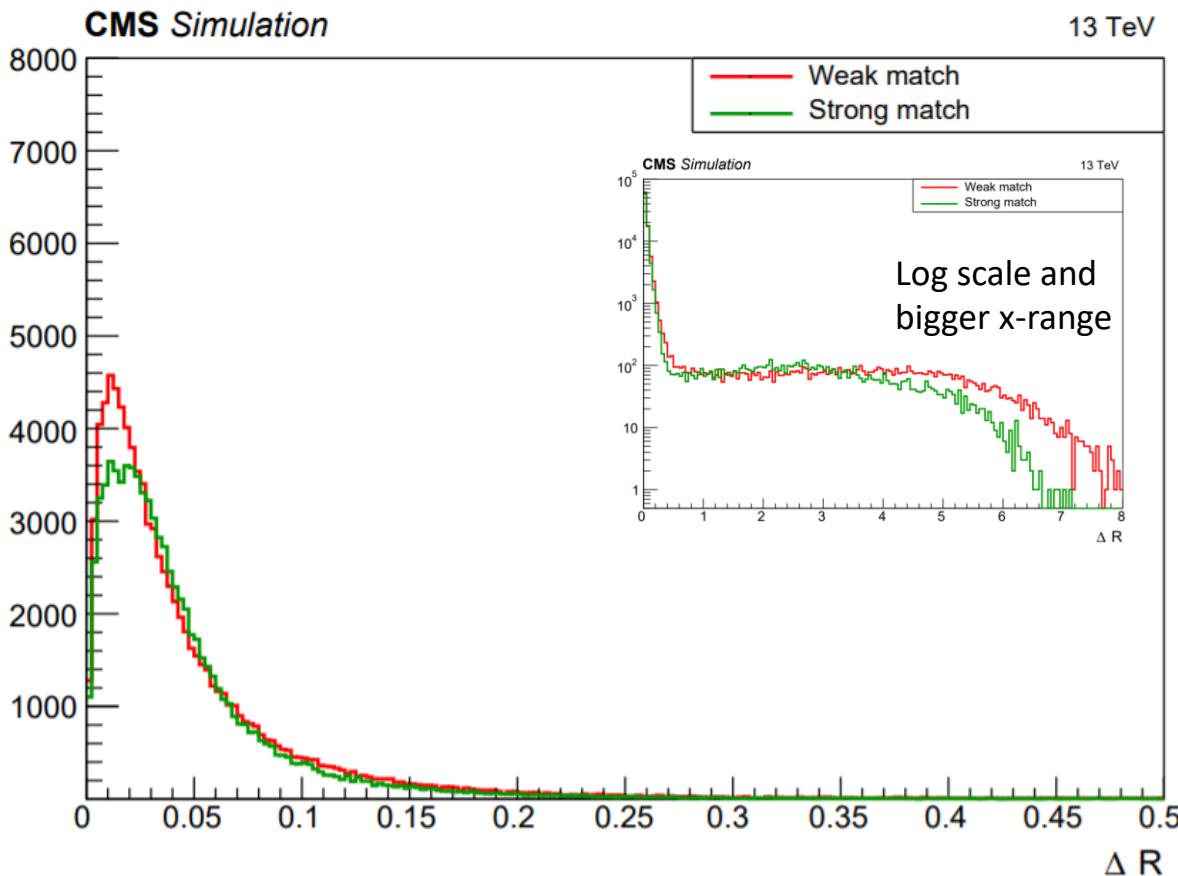
```
in weak match  
= 2: 0.764  
1: 0.216  
0: 0.02
```

```
# weak matched particles / # all (filtered) particles  
= 89819/89949 = 0.999
```

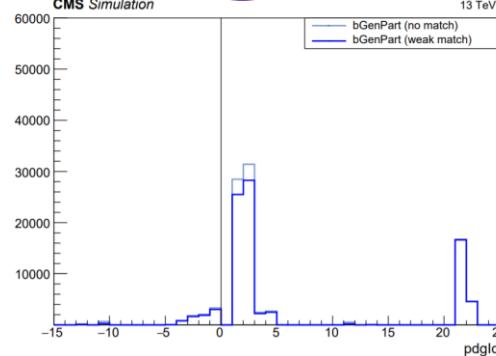
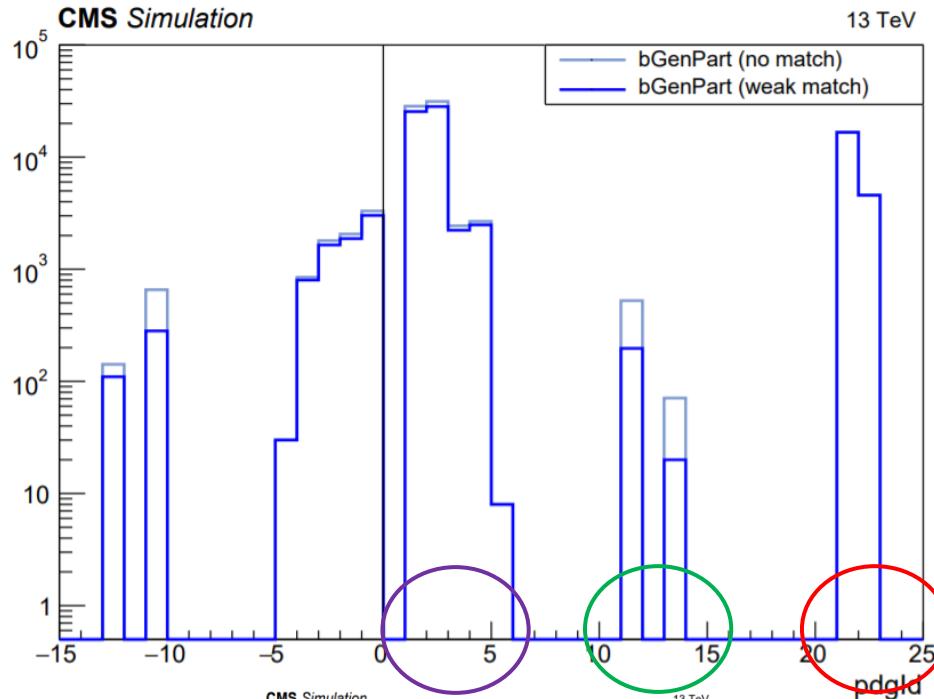
```
and strong match  
= 2: 0.746  
1: 0.231  
0: 0.023
```

```
# strong matched particles / # weak matched particles  
= 88737/89819 = 0.988  
# strong matched particles / # all (filtered) particles  
= 88737/89949 = 0.987
```

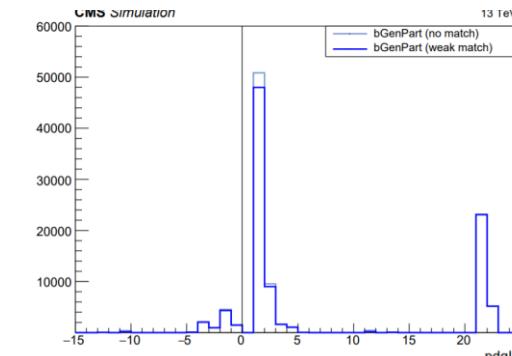
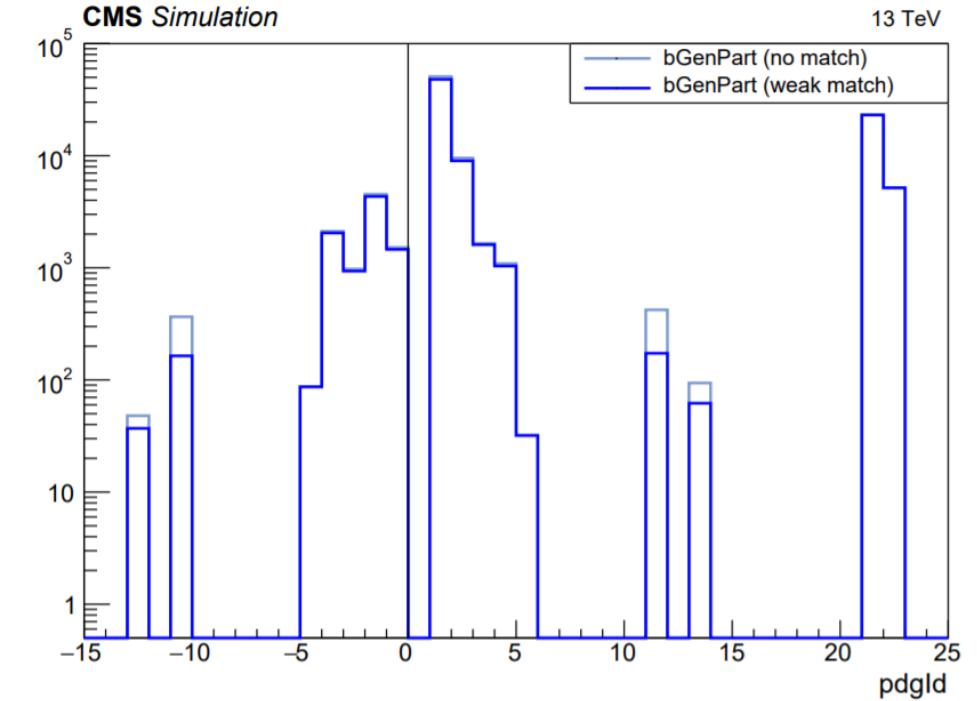
# $\Delta R$ comparison (HH vs. WWII)



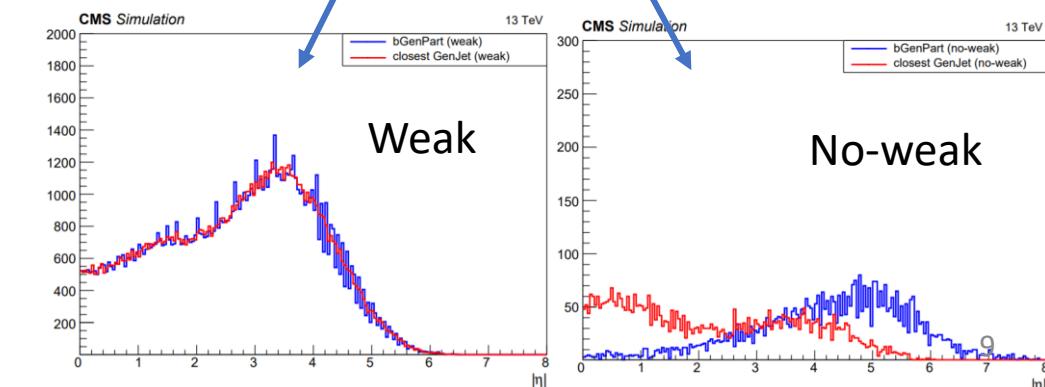
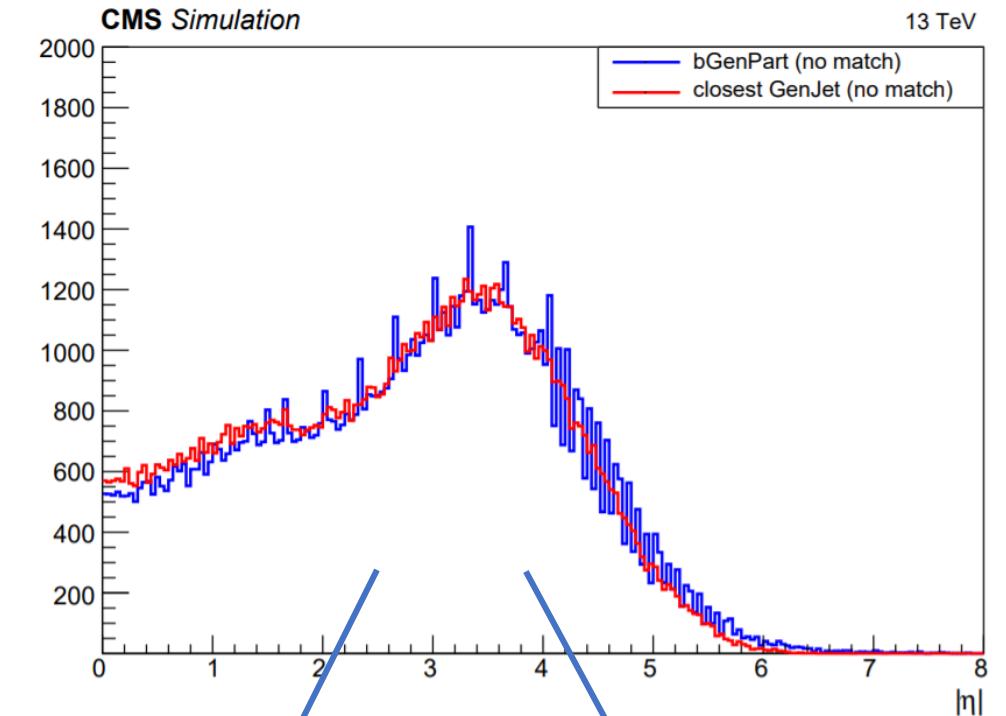
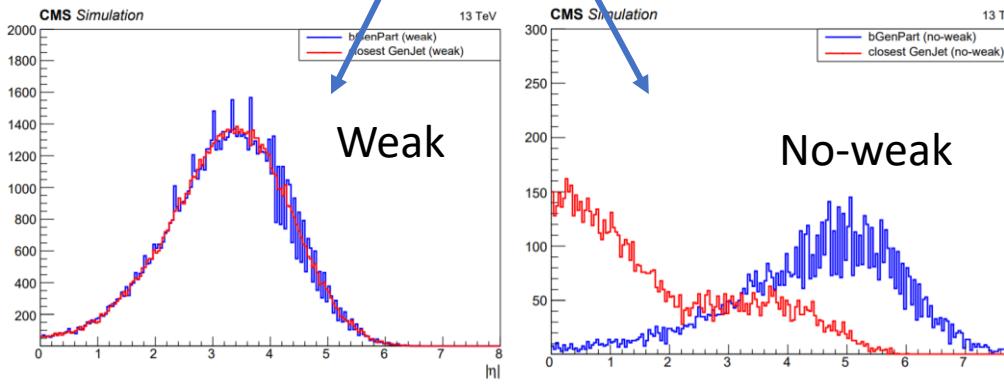
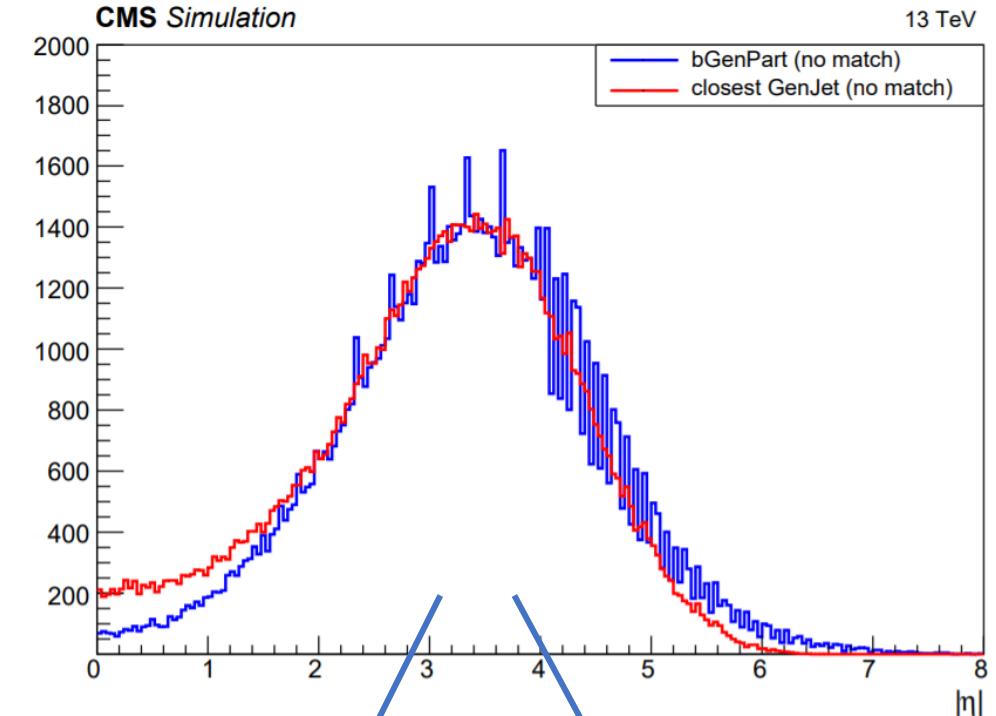
# PdgId comparison (HH vs. WWII)



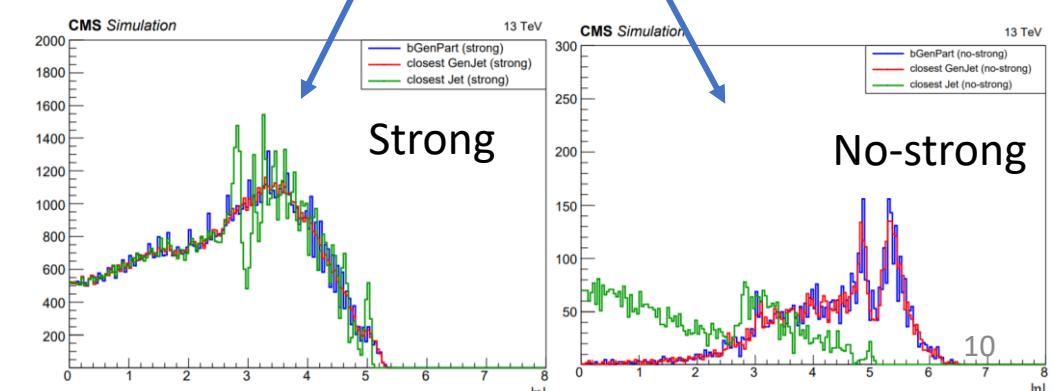
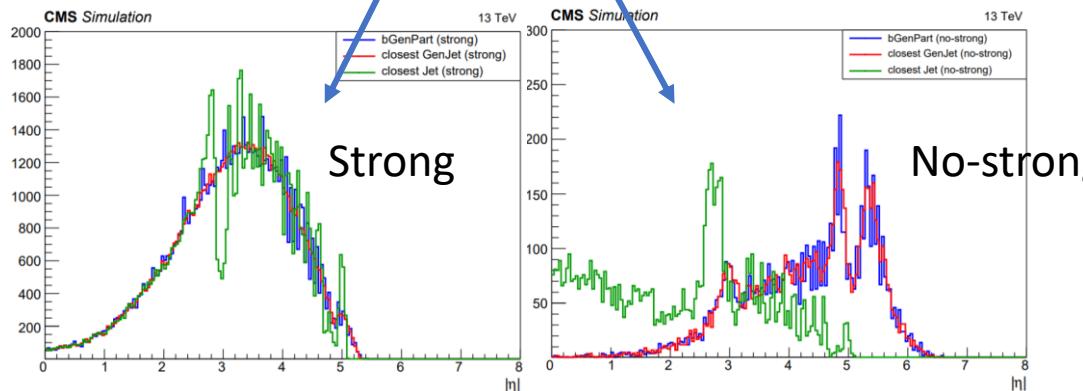
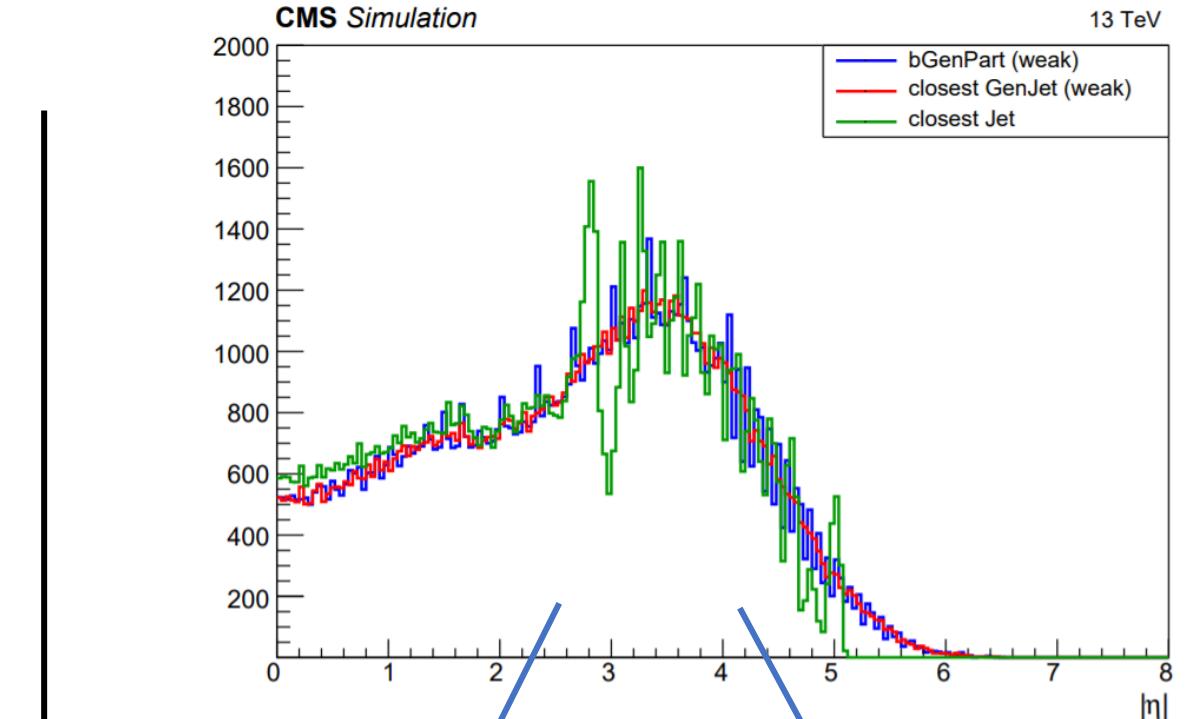
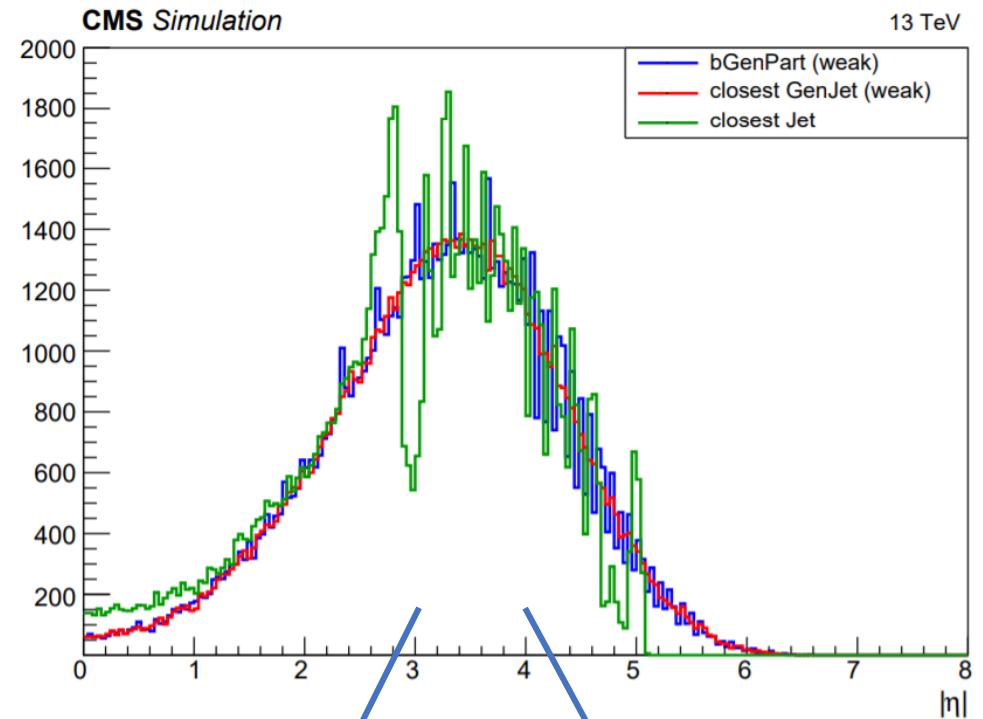
Gluons and photons,  
electrons and muons,  
d, u, s, c, b quarks



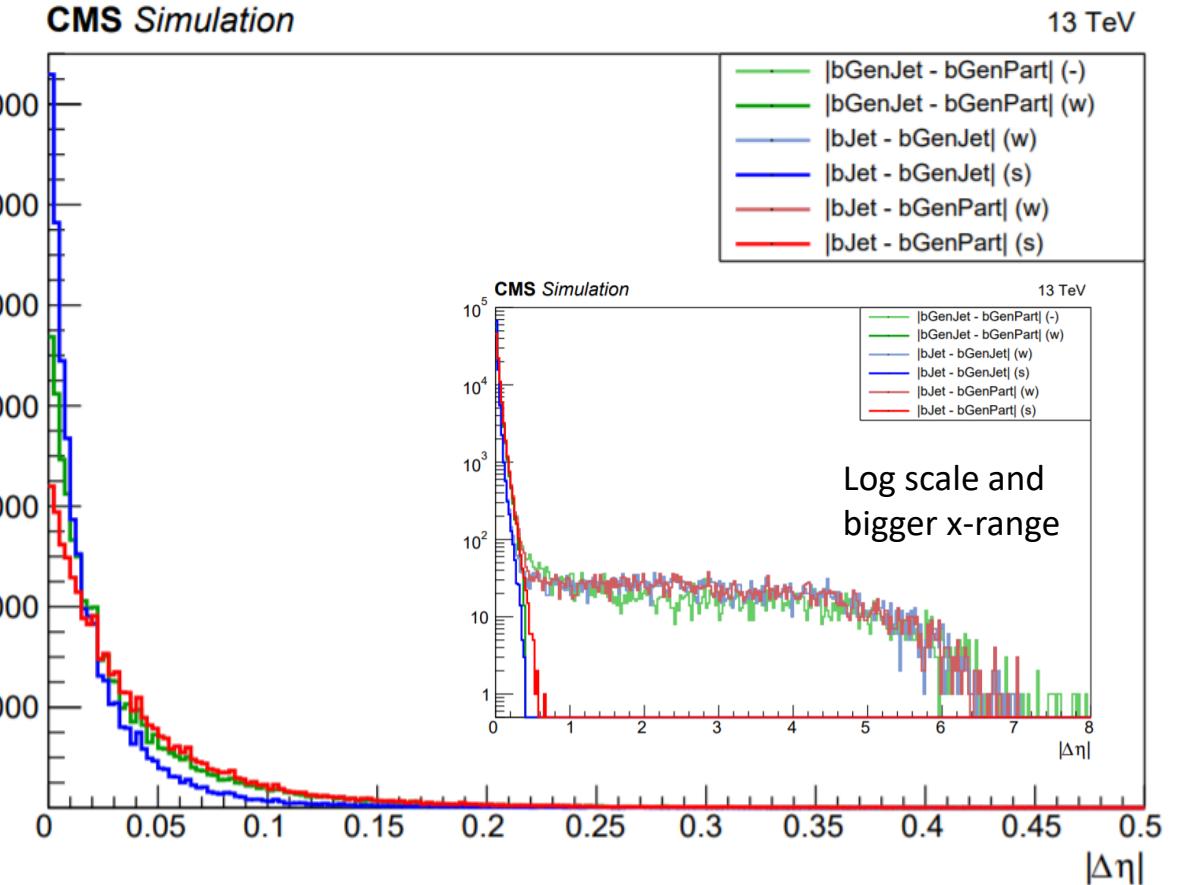
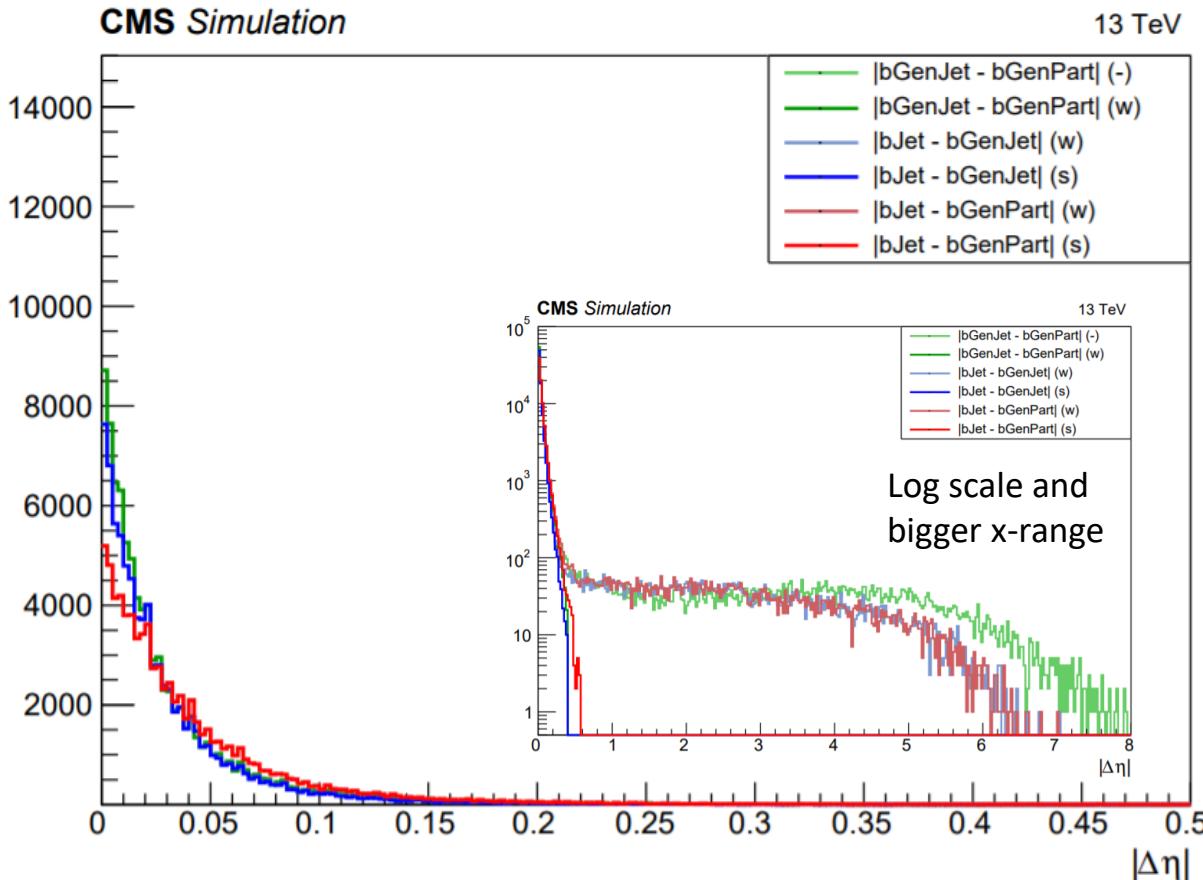
# $\eta$ comparison WEAK MATCH (HH vs. WWII)



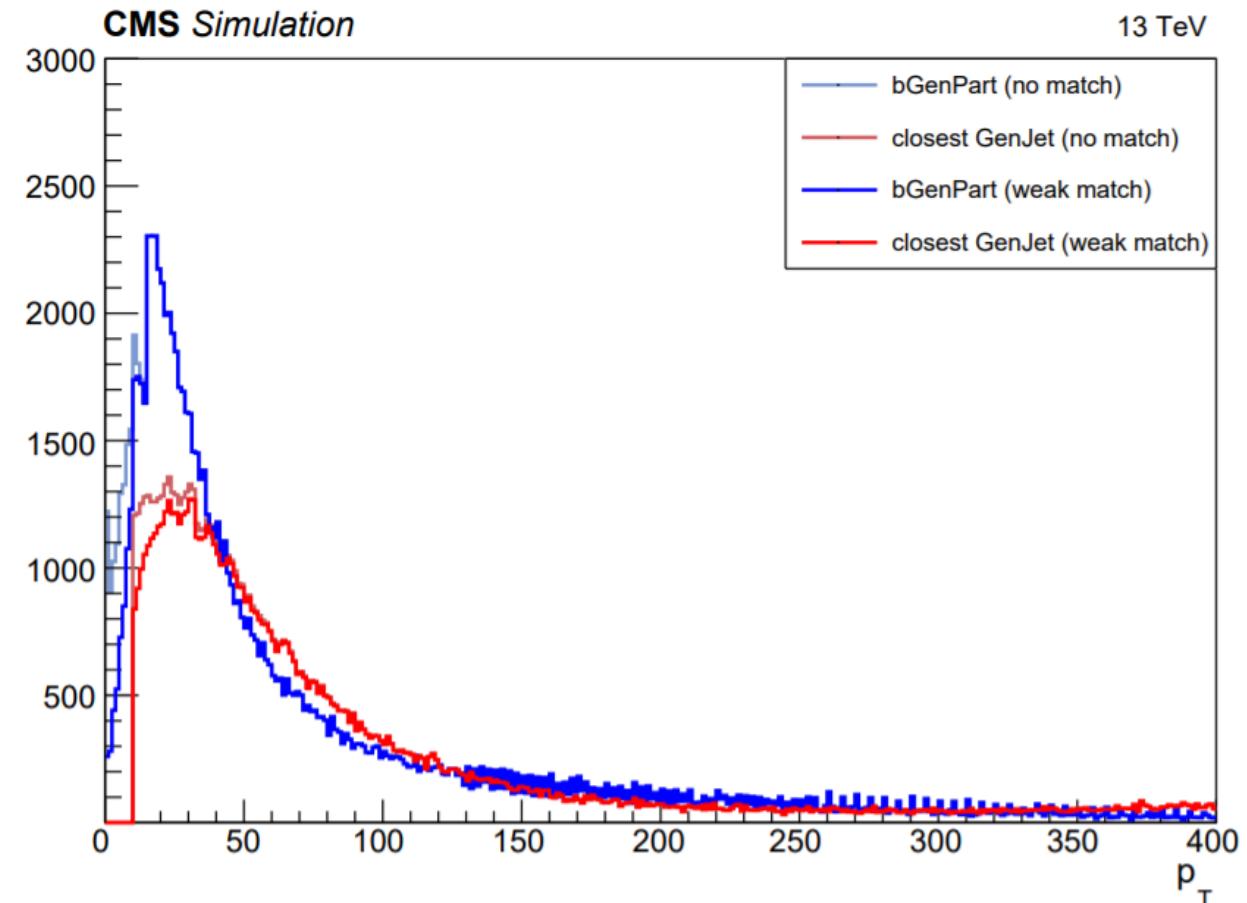
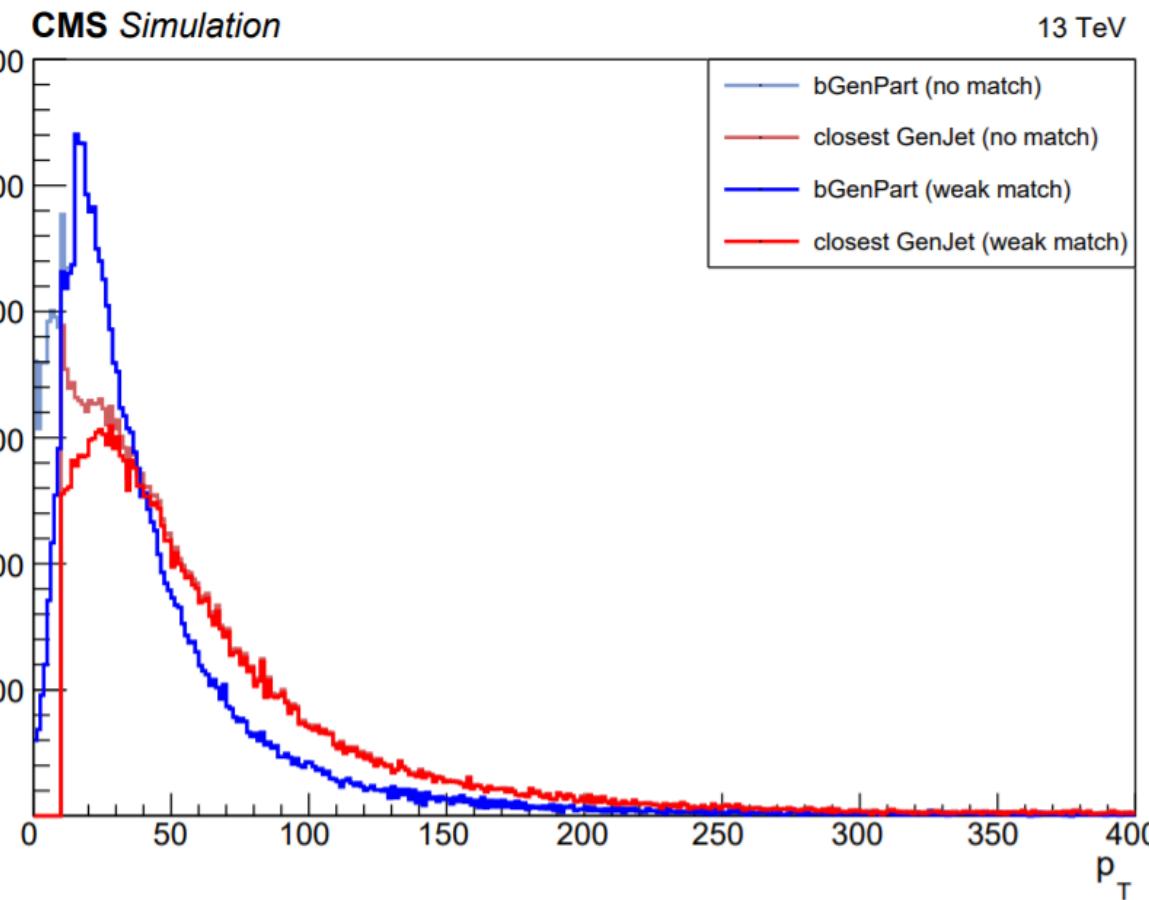
# $\eta$ comparison STRONG MATCH (HH vs. WWII)



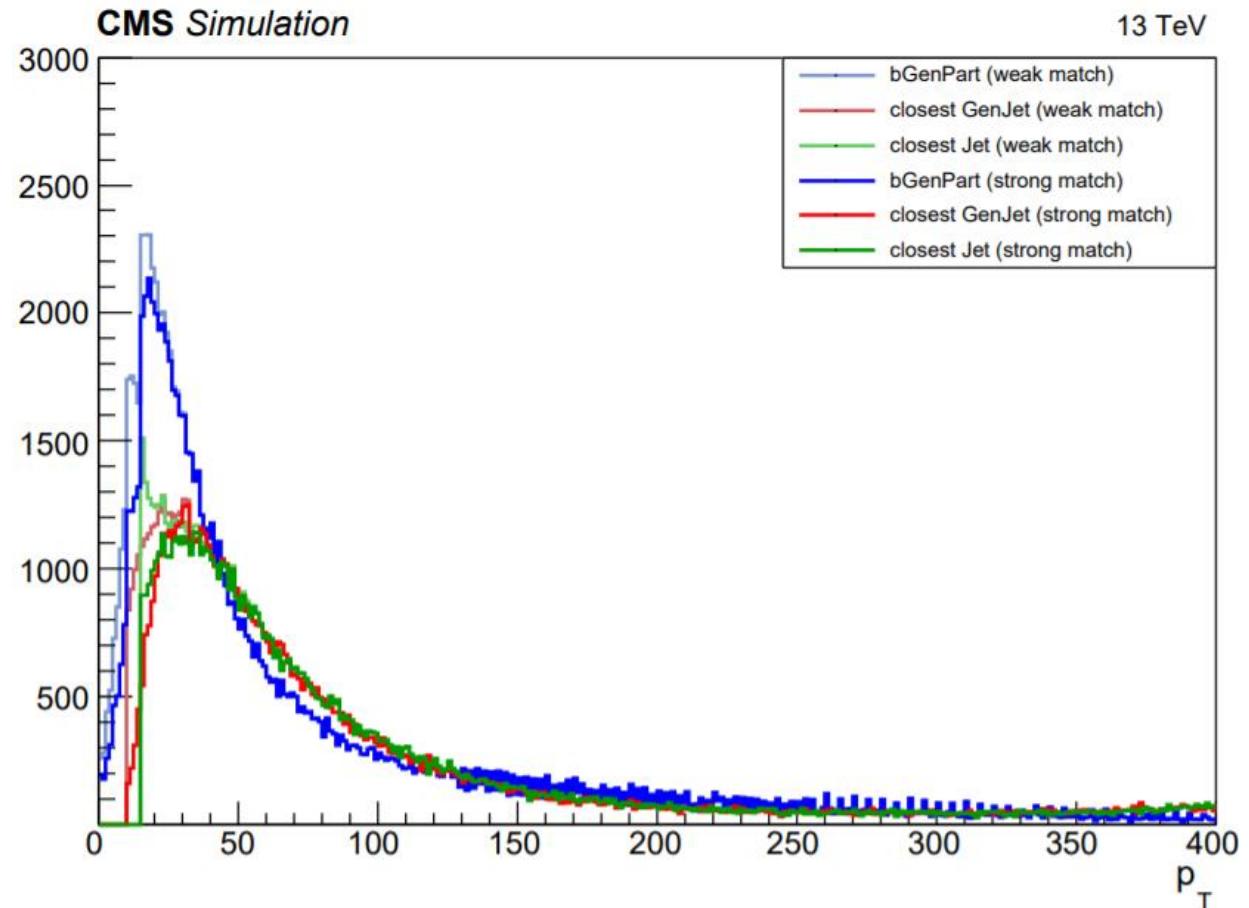
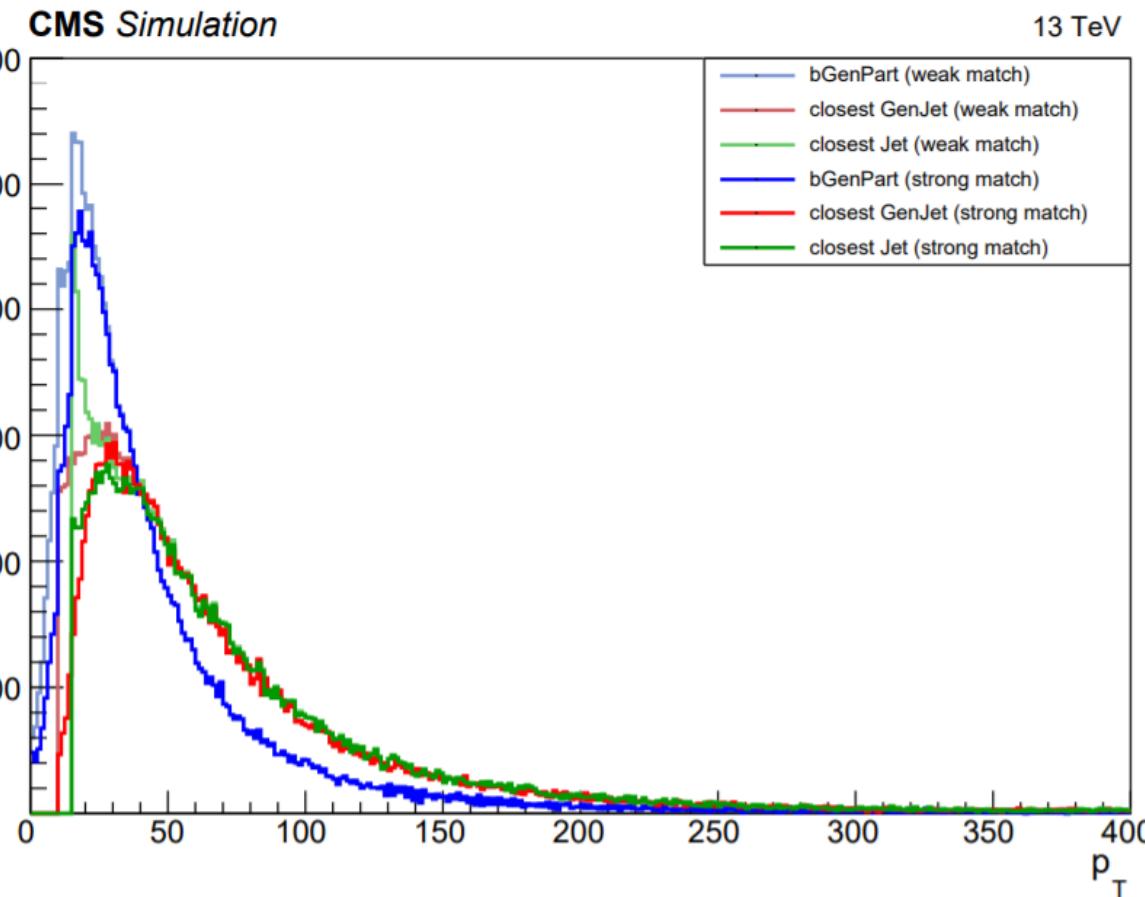
# $|\Delta\eta|$ comparison (HH vs. WWII)



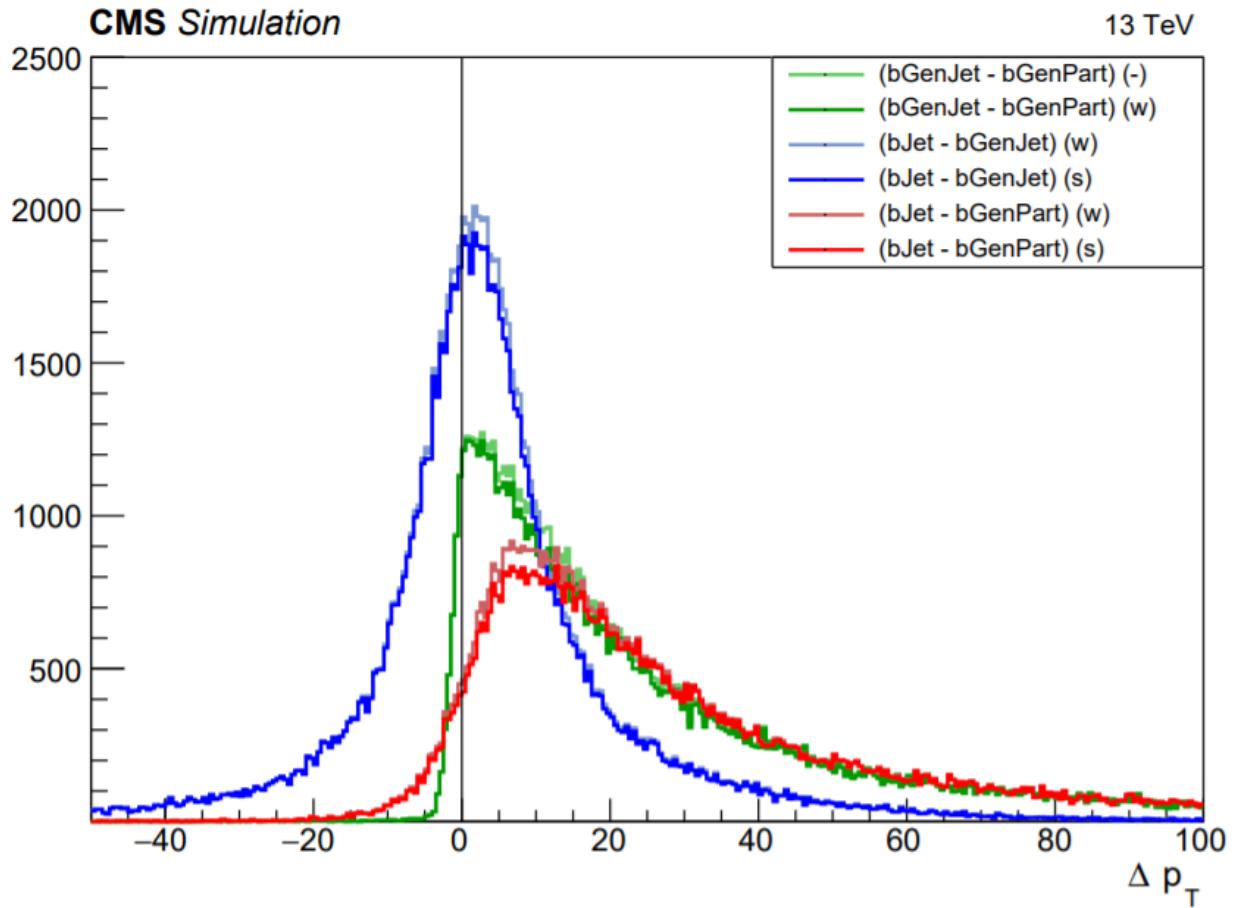
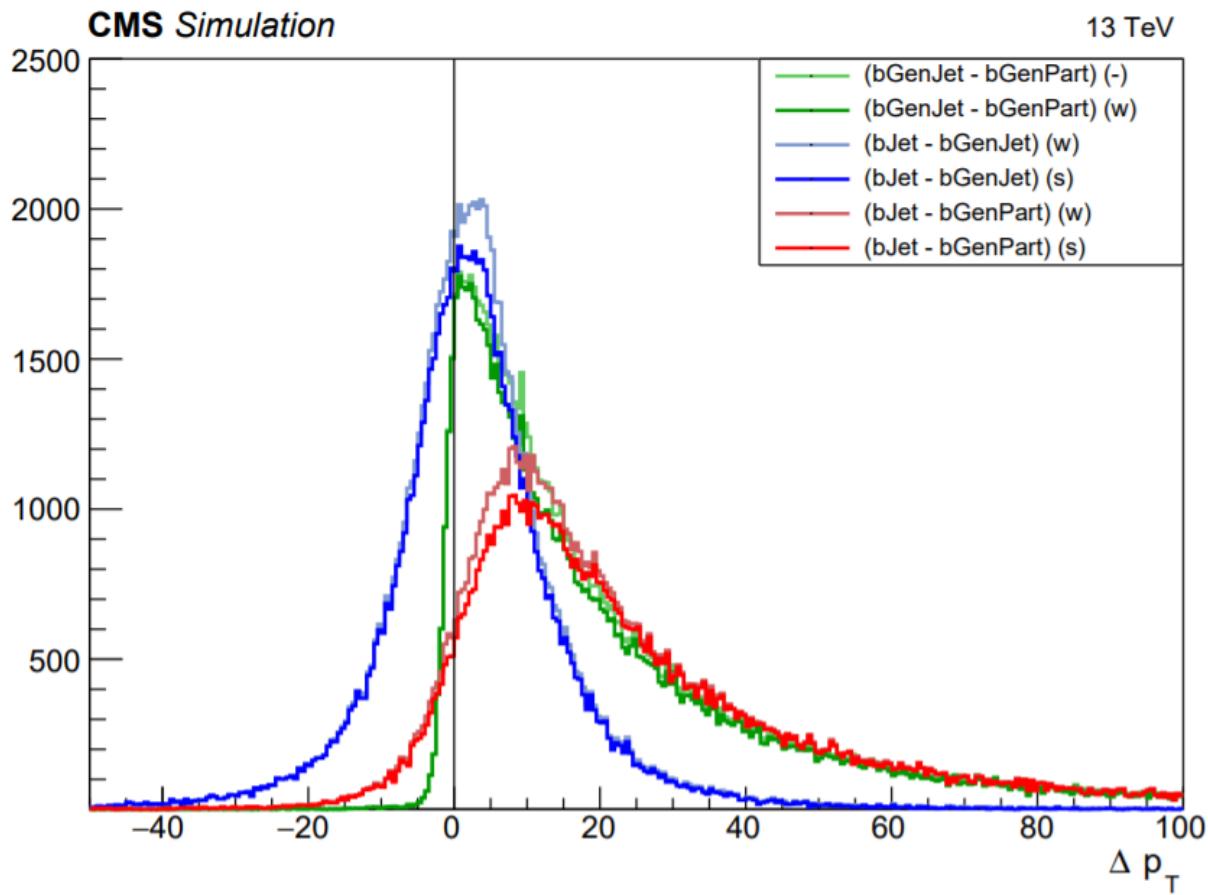
# Small pT comp. WEAK MATCH (HH vs. WWII)



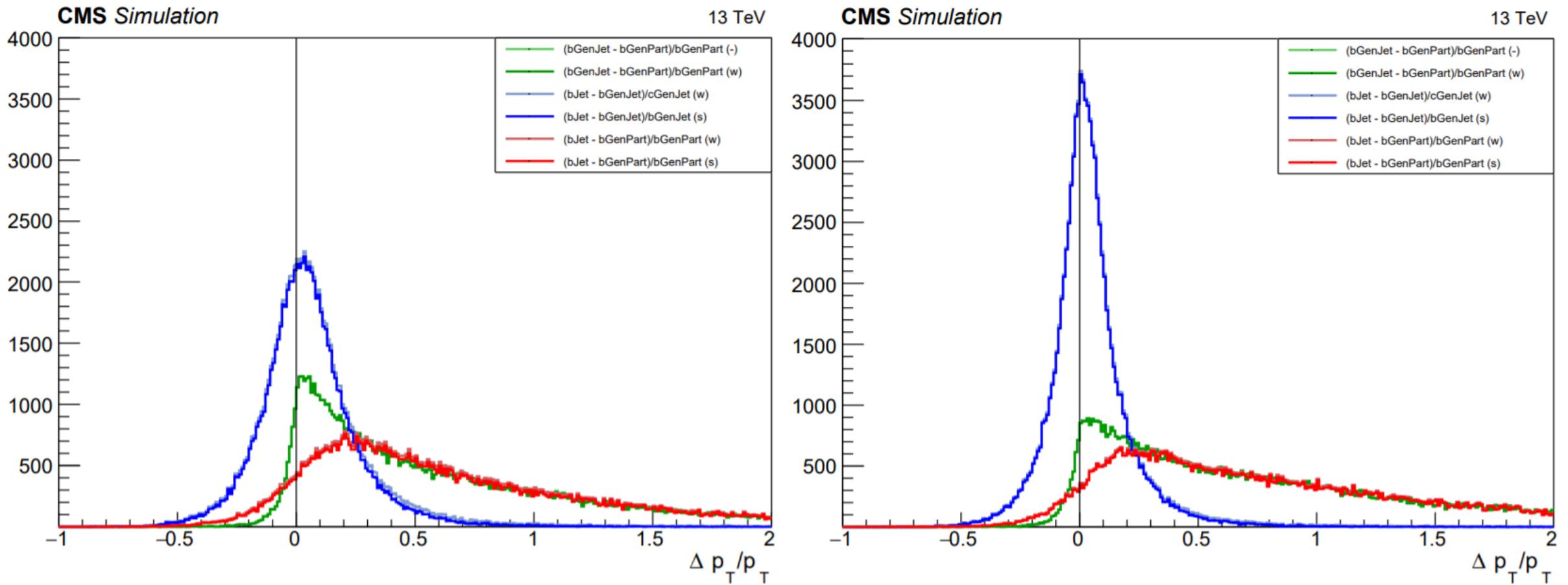
# Small pT comp. STRONG MATCH (HH vs. WWII)



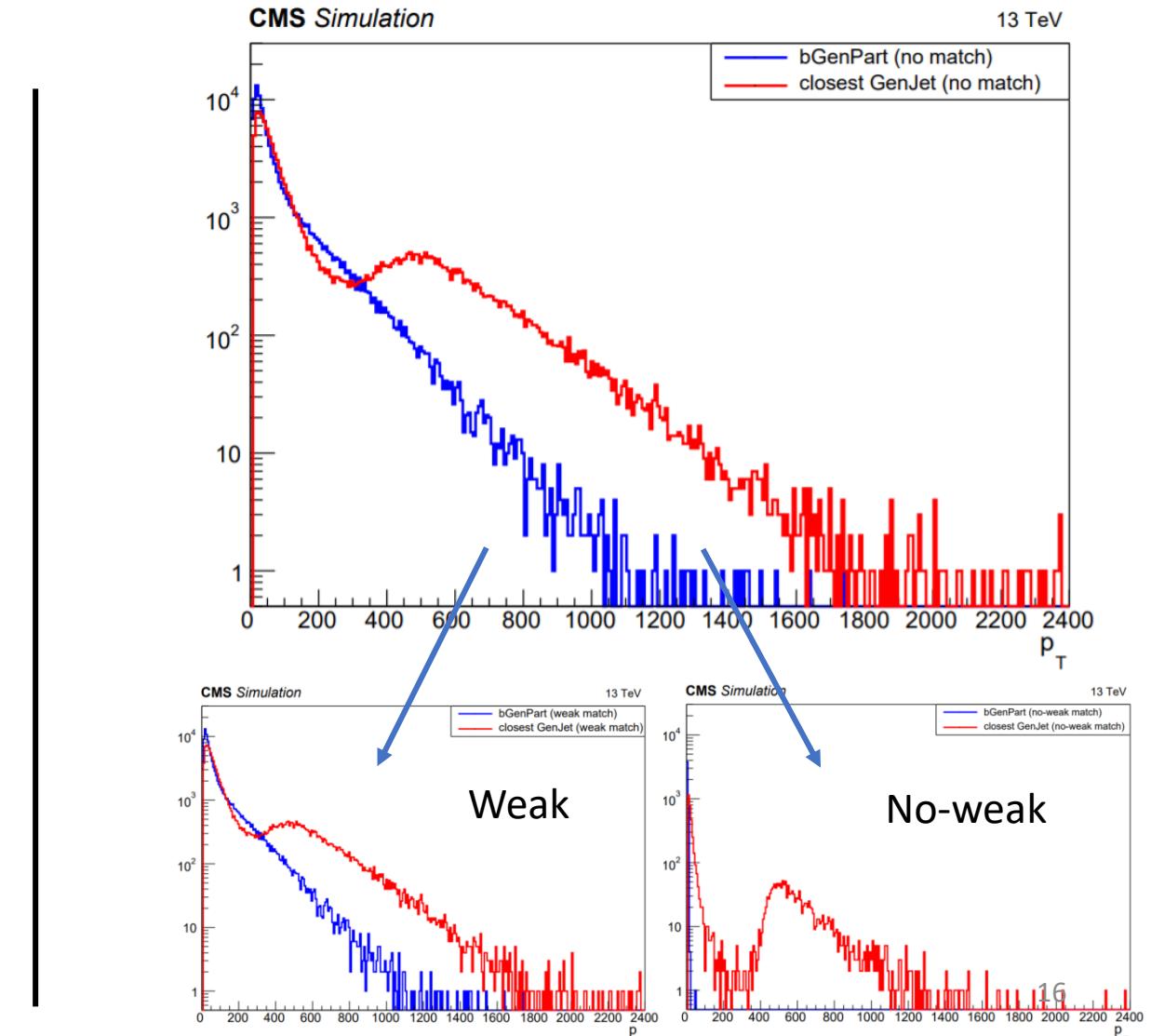
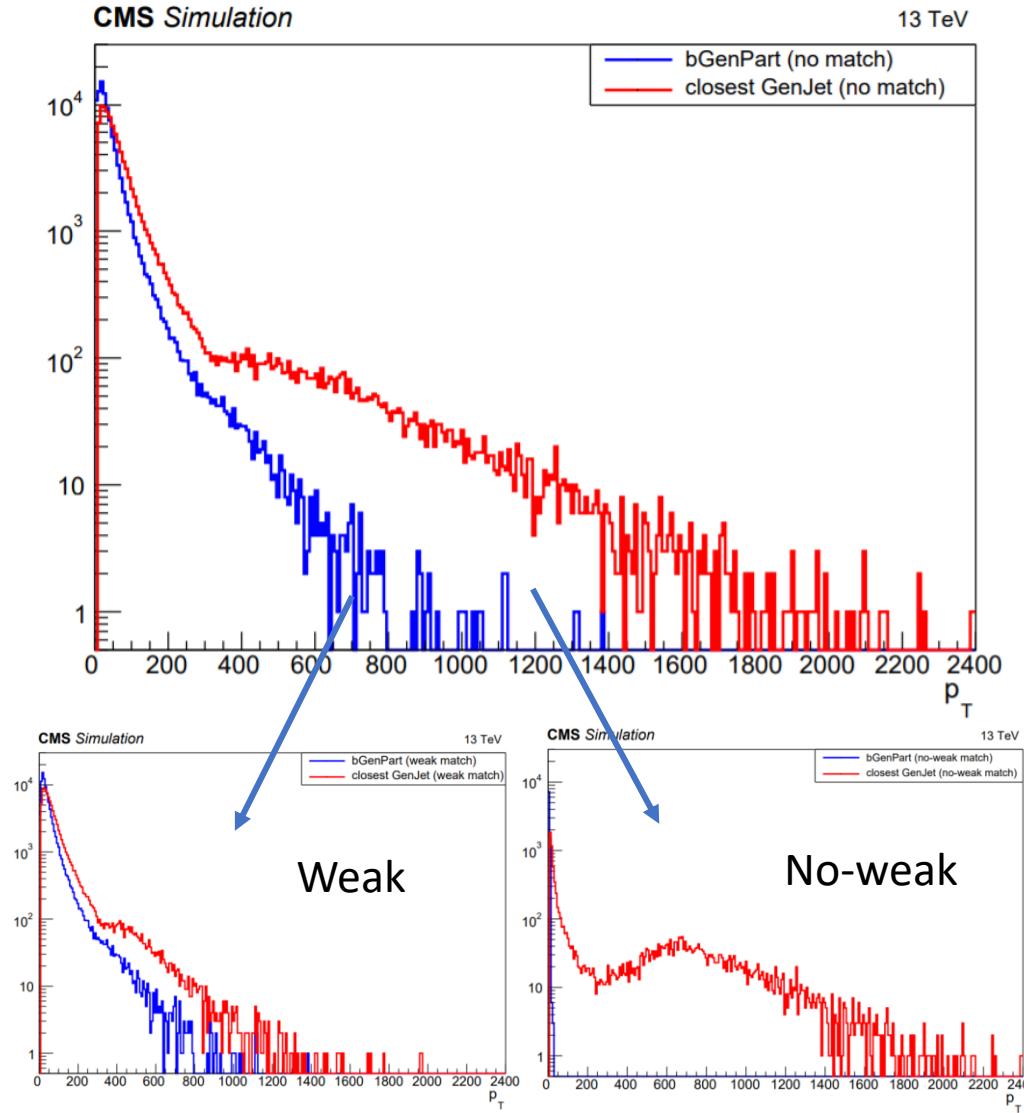
# Small $\Delta p_T$ comp. STRONG MATCH (HH vs. WWII)



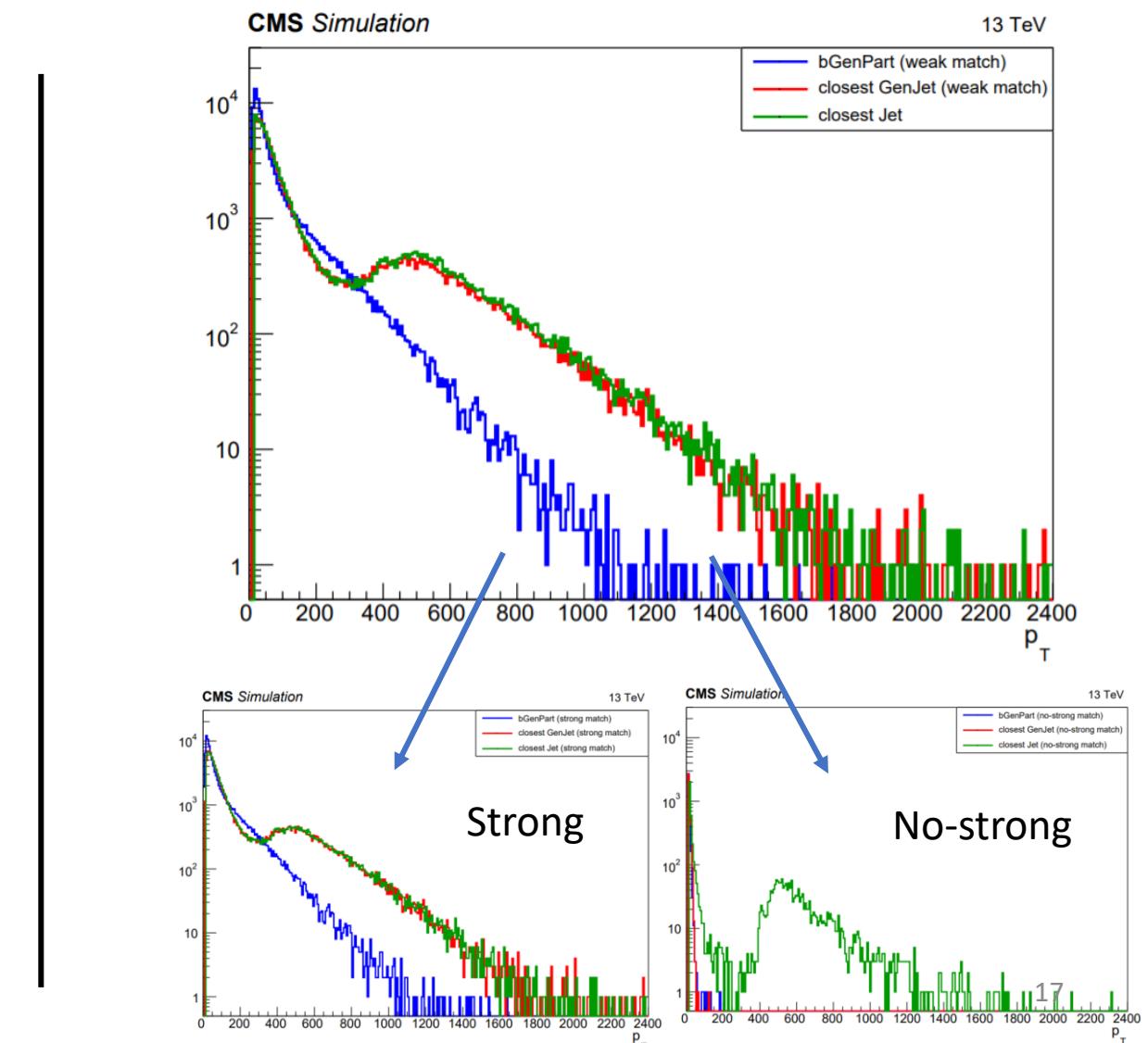
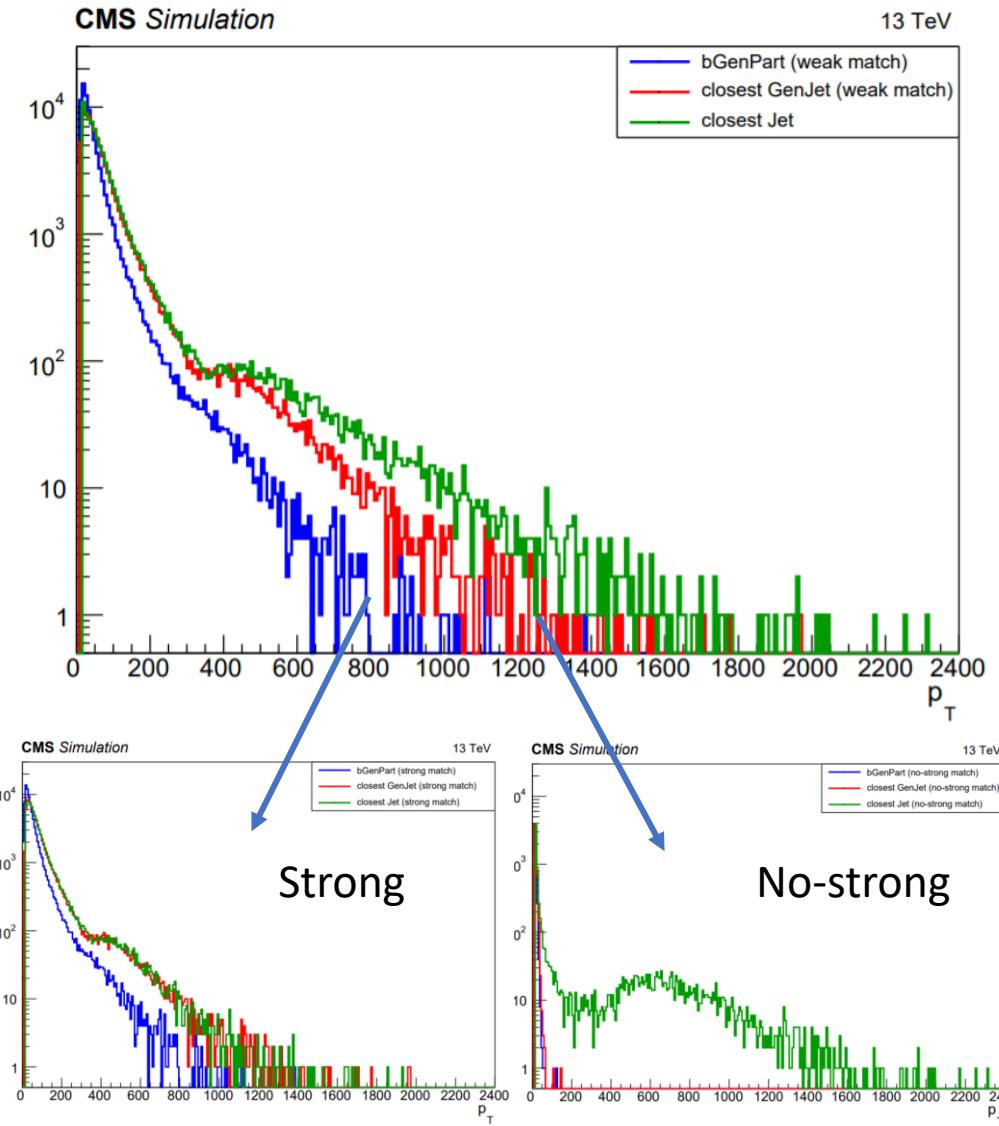
# Small $\Delta p_T/p_T$ comp. STRONG MATCH (HH vs. WWII)



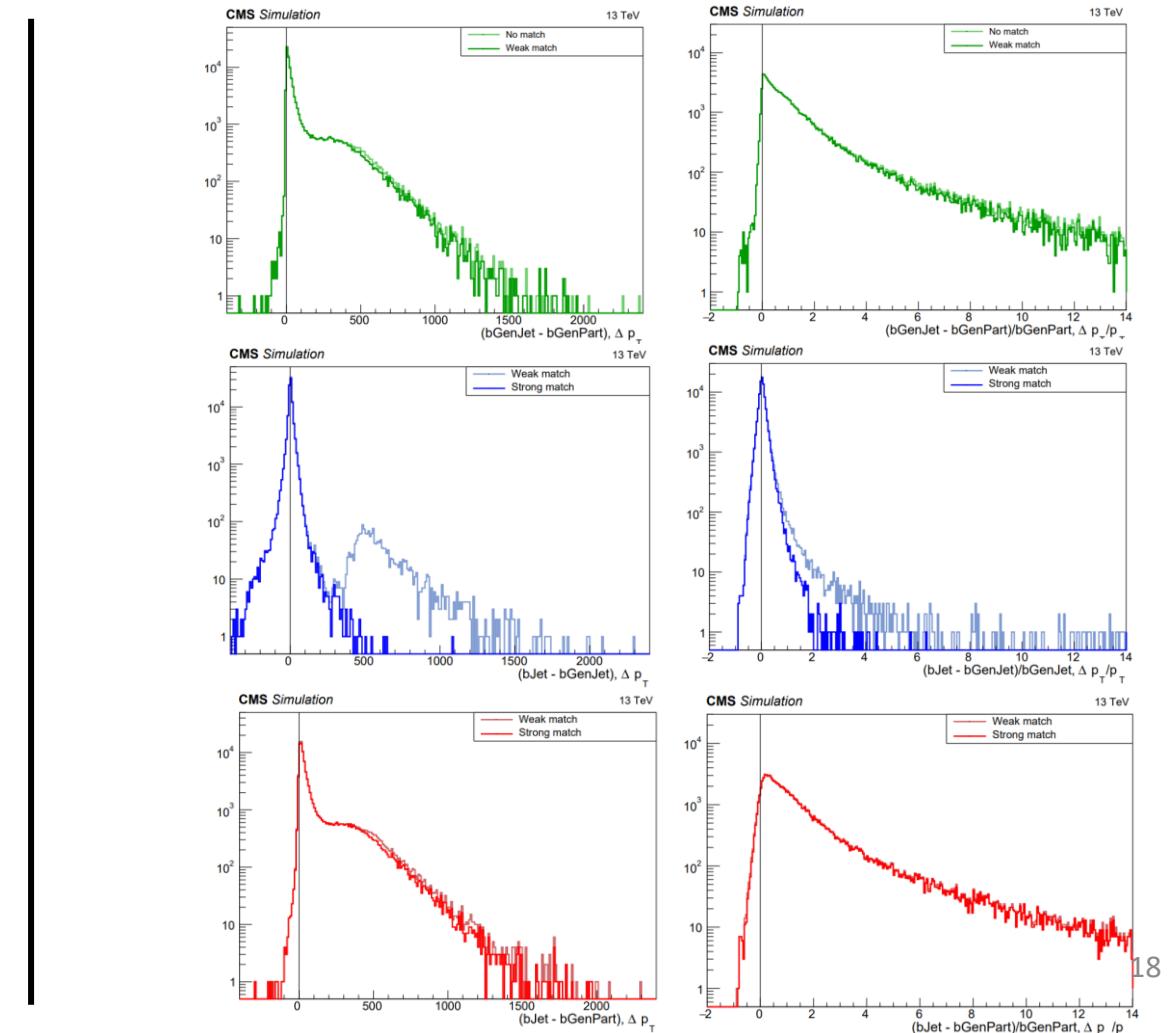
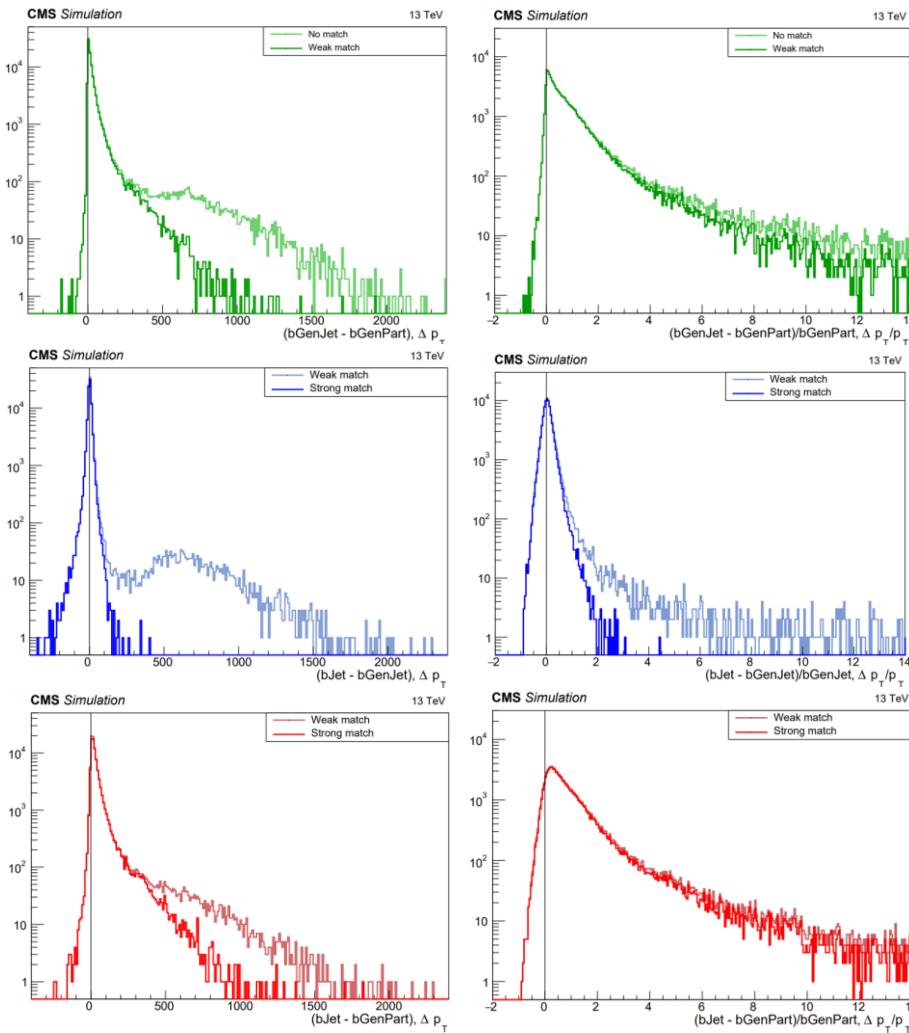
# Big pT comp. WEAK MATCH (HH vs. WWII)



# Big pT comp. STRONG MATCH (HH vs. WWII)



# Big $\Delta p_T$ and $\Delta p_T/p_T$ comp. (HH vs. WWII)



# Q1 vs Q2 comp. variables (HH vs. WWII)

