Carleton Emerging Jets Analysis Update

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Outline

- Cuts Applied

- Dark/Not Dark Matching Criteria

- Leading-Mass Jets
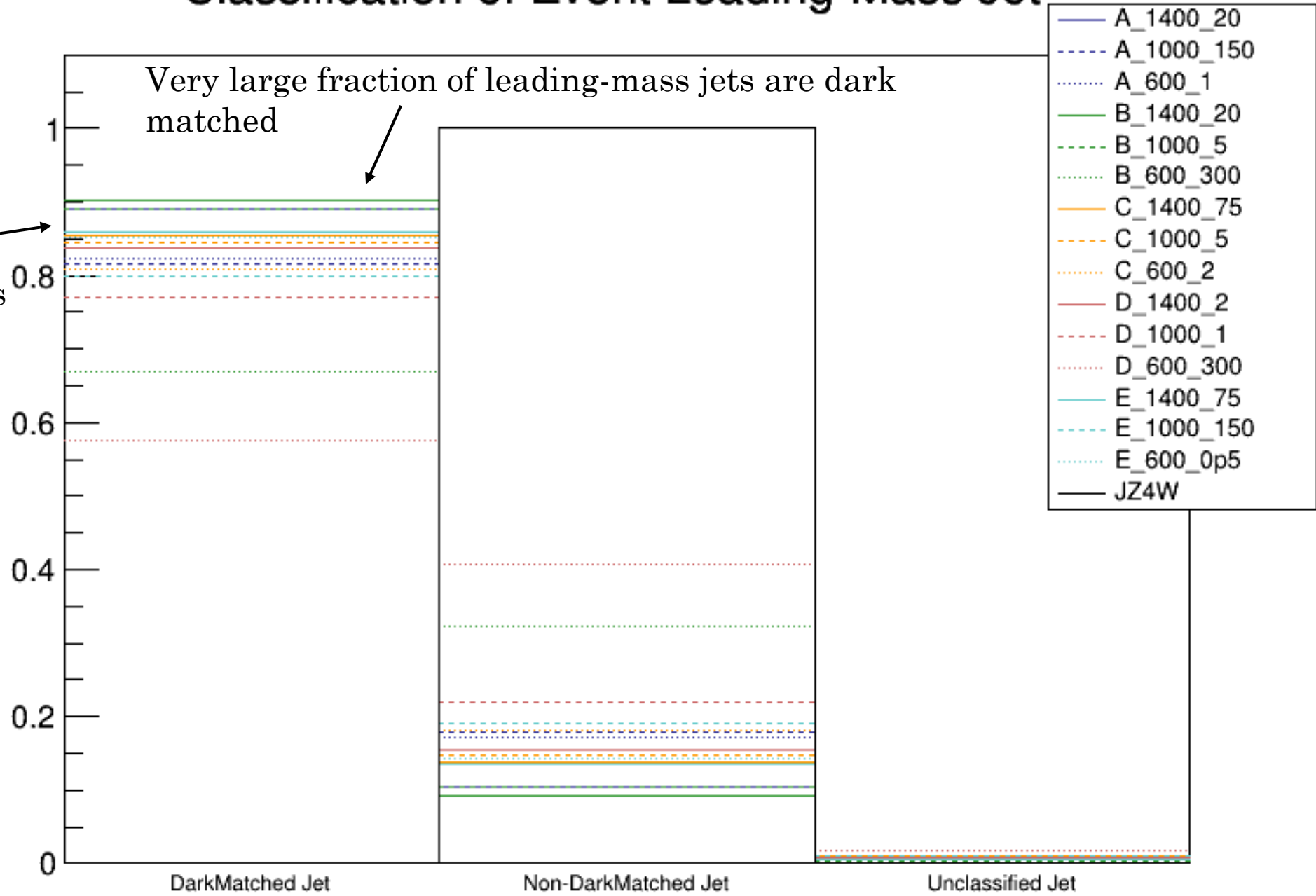
- Two Dimensional Plots

Cuts Applied

- Skip events where isSignal_EMTopo == 0
  - Set in EJsxAODAnalysis
  - Trigger selection is passed
  - Jet multiplicity >= 4
  - 4 Leading jets have pT >= 120 GeV
  - 4 Leading jets have $|\eta|$ <= 2.5
  - 4-Jet HT >= 1000 GeV

- Also require 410 < lead truth jet pT < 790

- Plots Normalized to unity

- Background included for reference in dark-matched jet plots

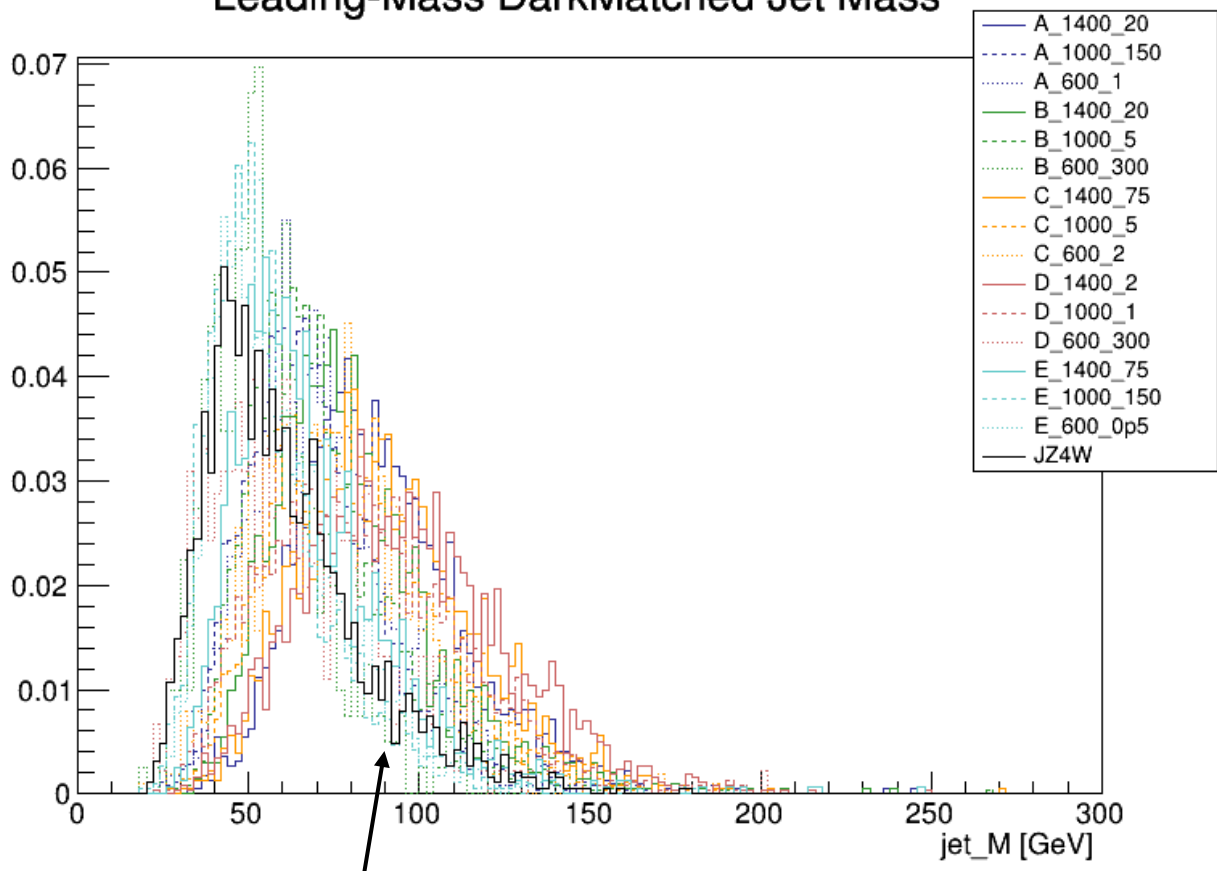- Old nTuples used

Dark/Not Dark Matching Criteria

- DarkMatched Jets:
  - Jet is matched to a truth jet
  - Jet is matched to a dark jet
  - Matched truth jet is matched to a dark jet

- Non-DarkMatched Jets:
  - Jet is matched to a truth jet
  - Jet is Not matched to a truth jet
  - Matched truth jet is Not matched to a dark jet

- Other jets are ignored

Classification of Event Leading-Mass Jet

Very large fraction of leading-mass jets are dark matched

Models with large mediator masses have higher fractions

Legend:
- A_1400_20
- A_1000_150
- A_600_1
- B_1400_20
- B_1000_5
- B_600_300
- C_1400_75
- C_1000_5
- C_600_2
- D_1400_2
- D_1000_1
- D_600_300
- E_1400_75
- E_1000_150
- E_600_0p5
- JZ4W

X-axis: DarkMatched Jet, Non-DarkMatched Jet, Unclassified Jet

Background plotted for reference,
background has no darkmatched jets
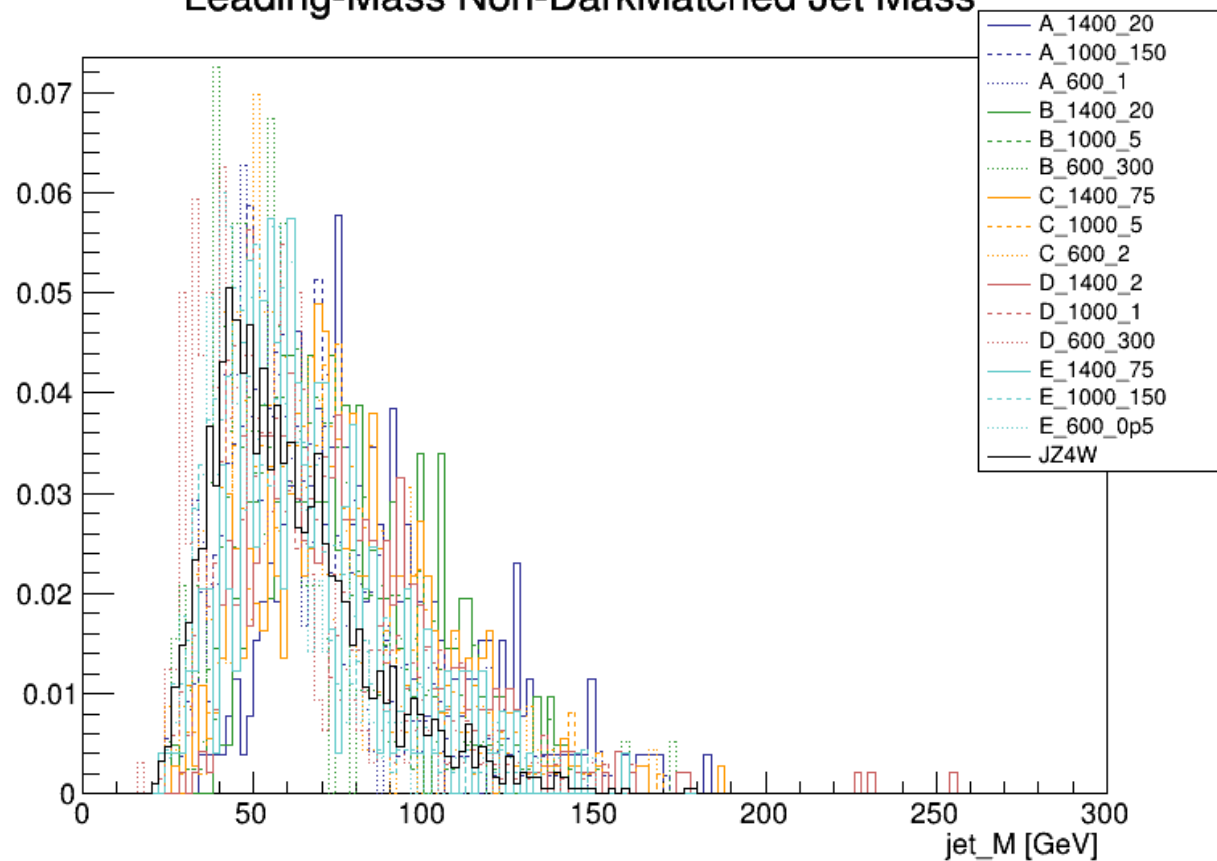
Leading-Mass DarkMatched Jet Energy

Leading-Mass Non-DarkMatched Jet Energy

A_1400_20	
A_1000_150	
A_600_1	
B_1400_20	
B_1000_5	
B_600_300	
C_1400_75	
C_1000_5	
C_600_2	
D_1400_2	
D_1000_1	
D_600_300	
E_1400_75	
E_1000_150	
E_600_0p5	
JZ4W	
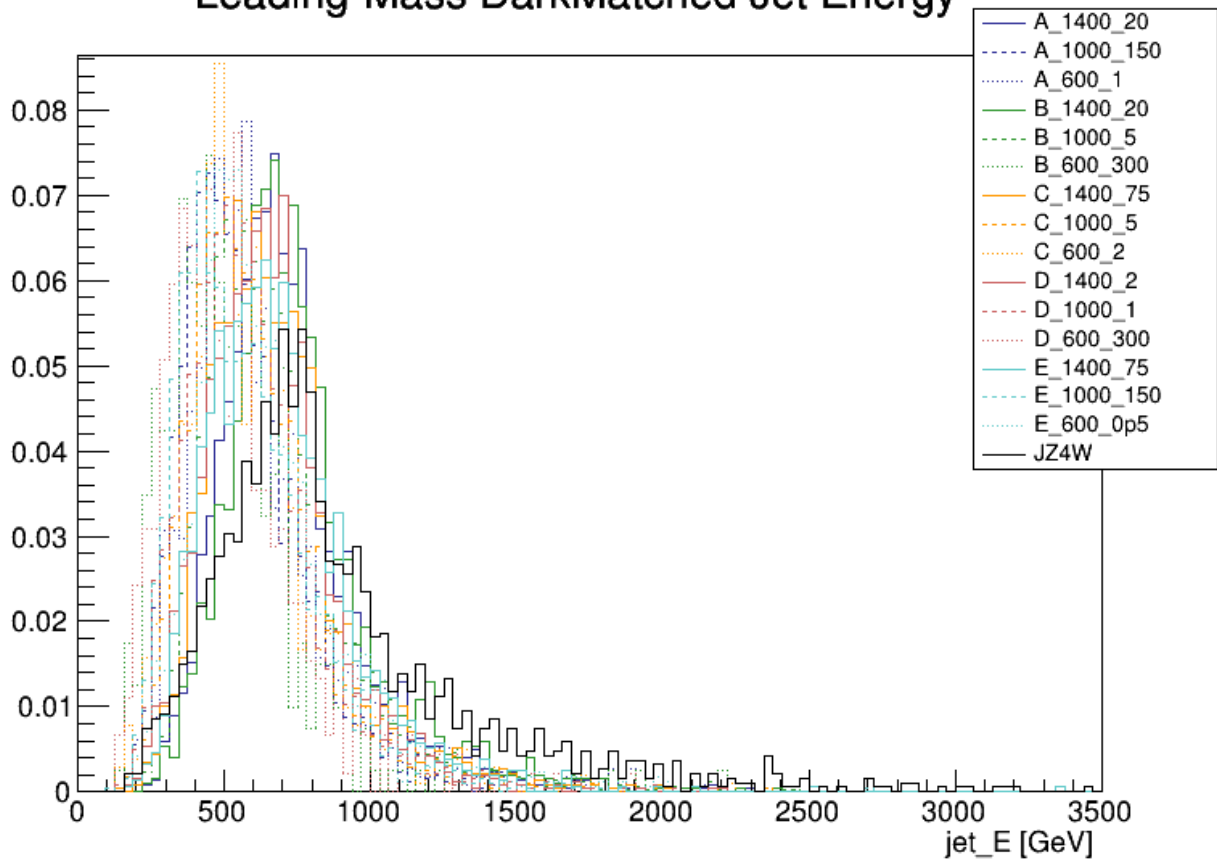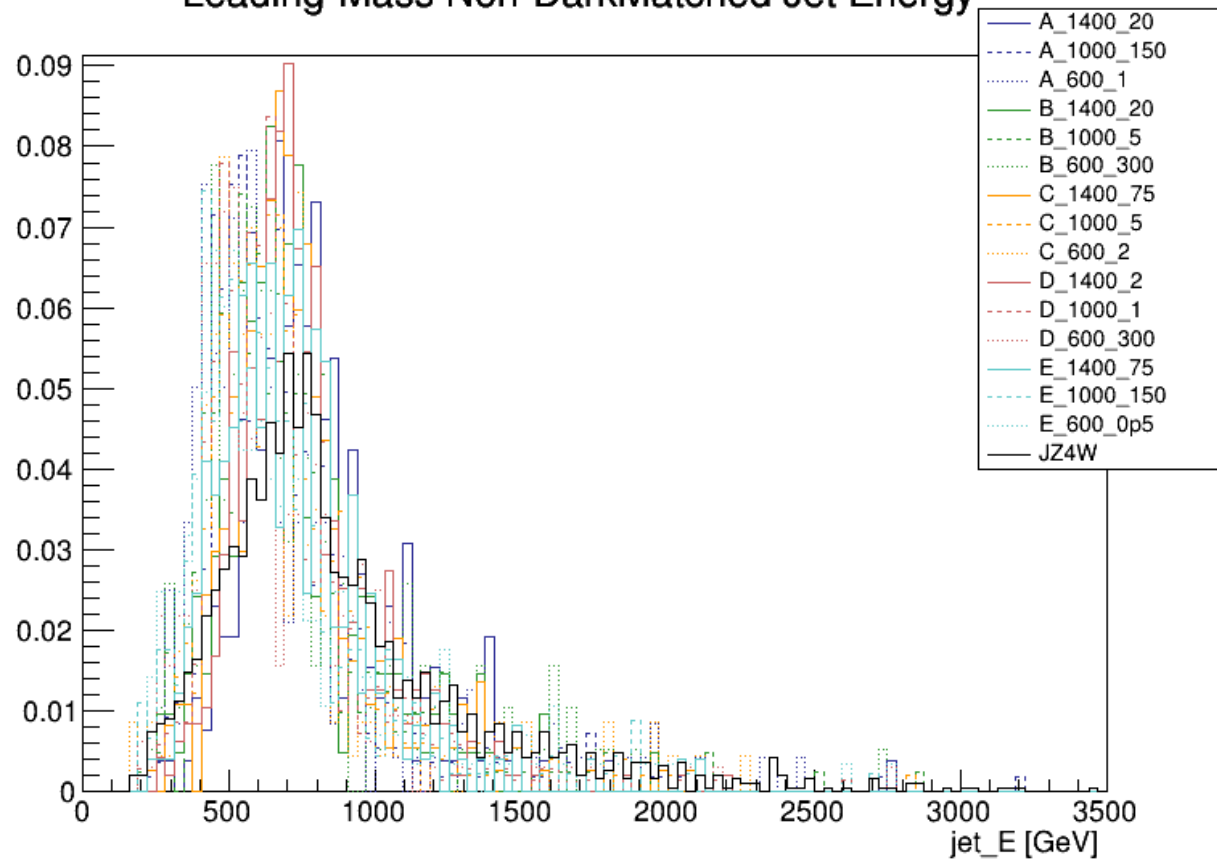
Some models peak earlier

Leading-Mass DarkMatched Jet Transverse Momentum
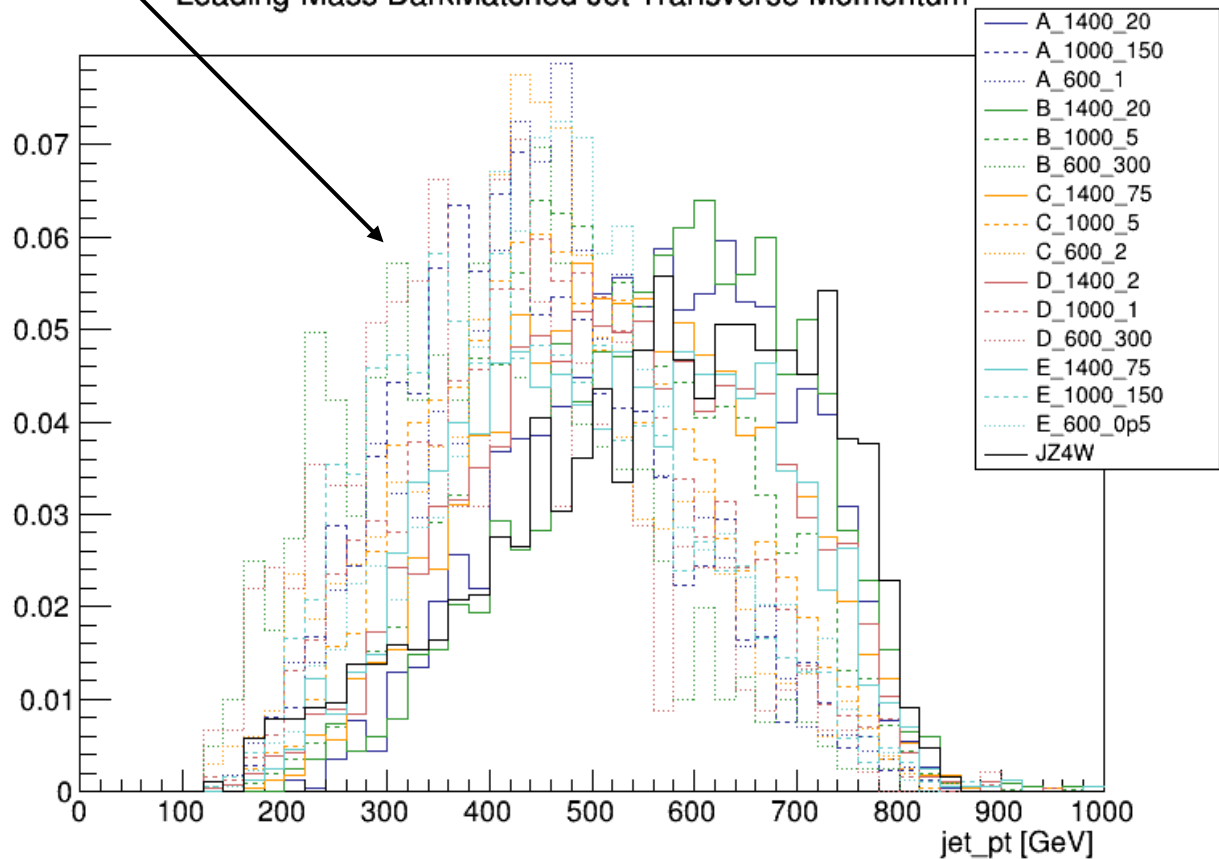
Leading-Mass Non-DarkMatched Jet Transverse Momentum
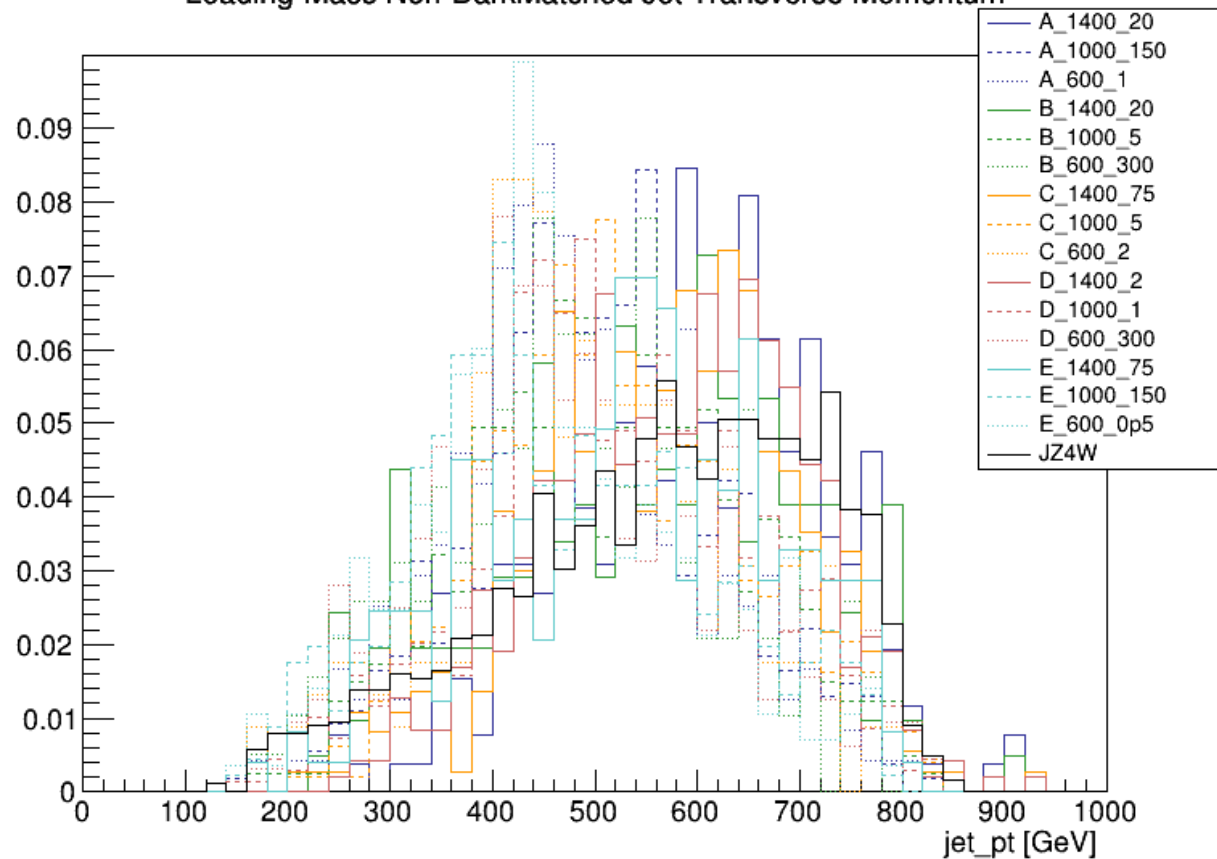
Both "dark" and "standard model" jets peak between eta -1 < eta < 1
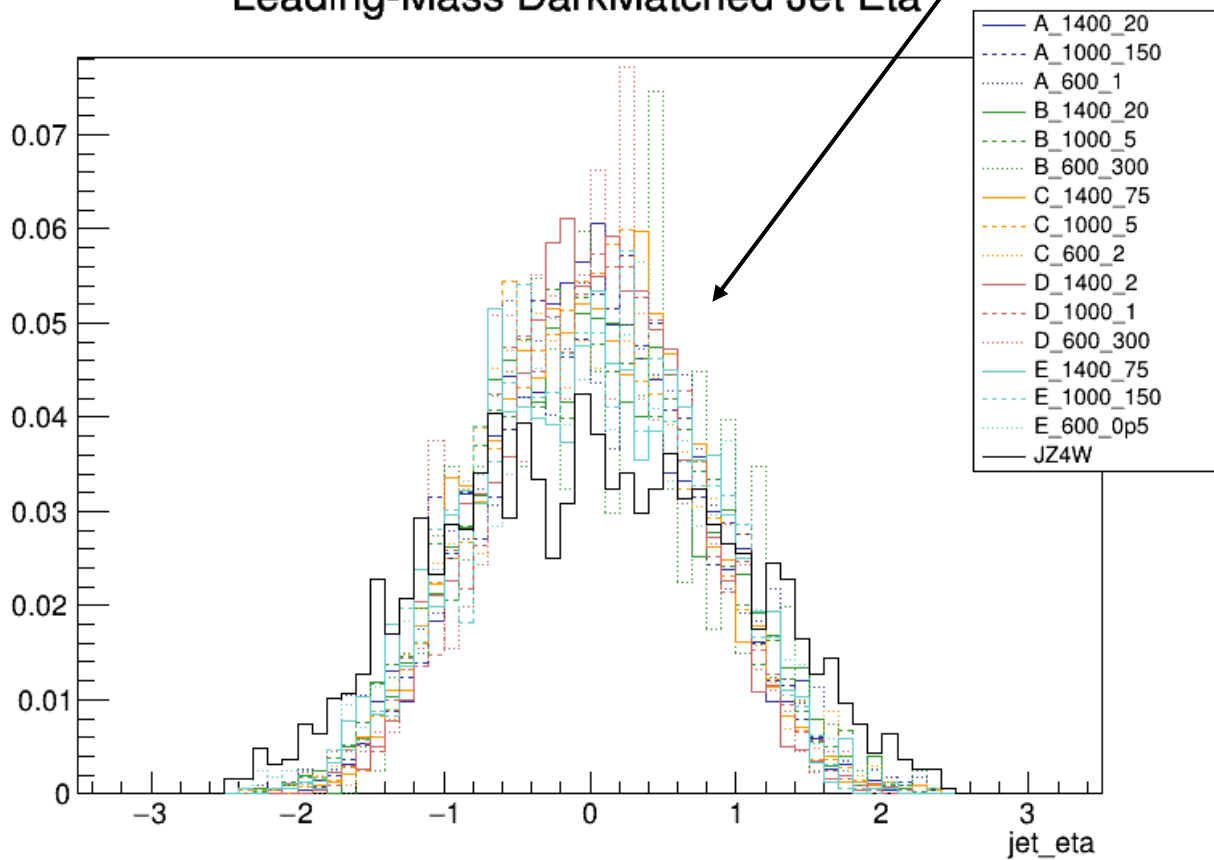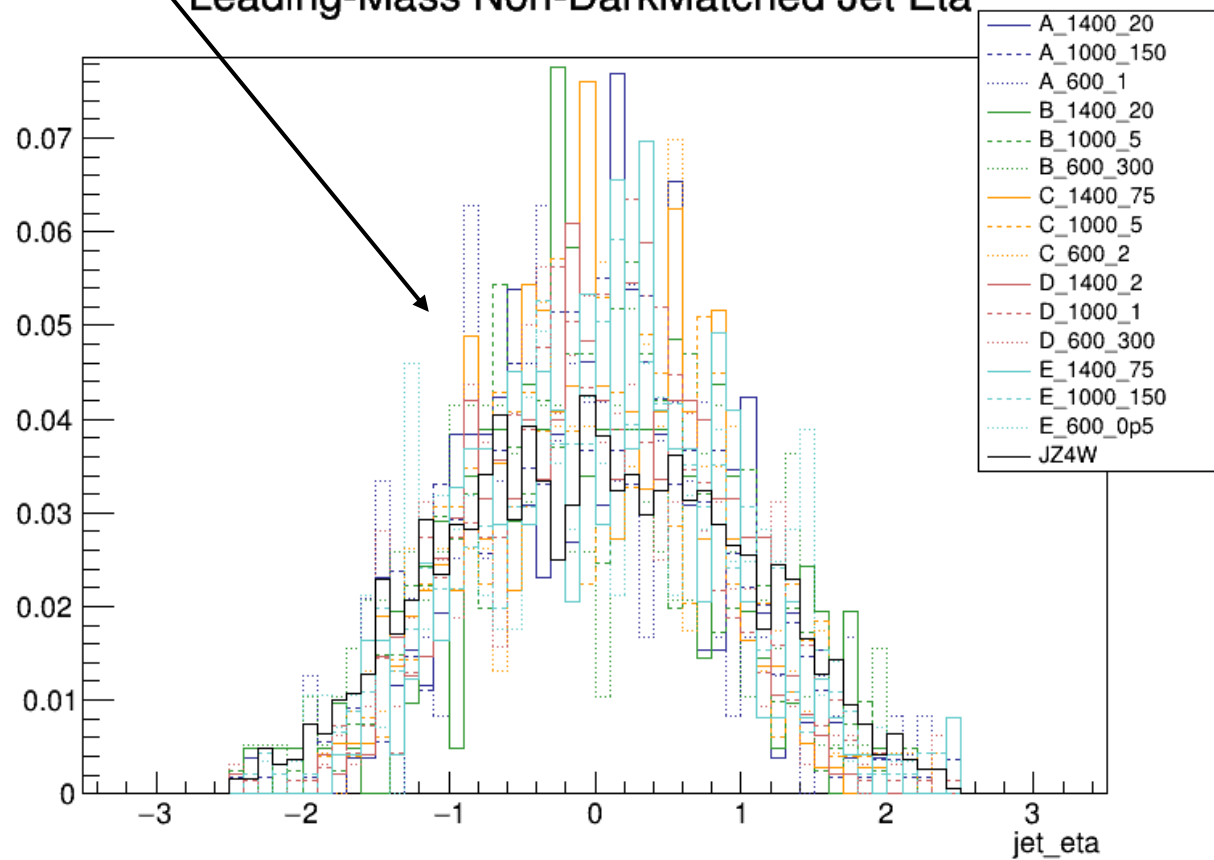
Leading-Mass DarkMatched Jet Width

Leading-Mass Non-DarkMatched Jet Width
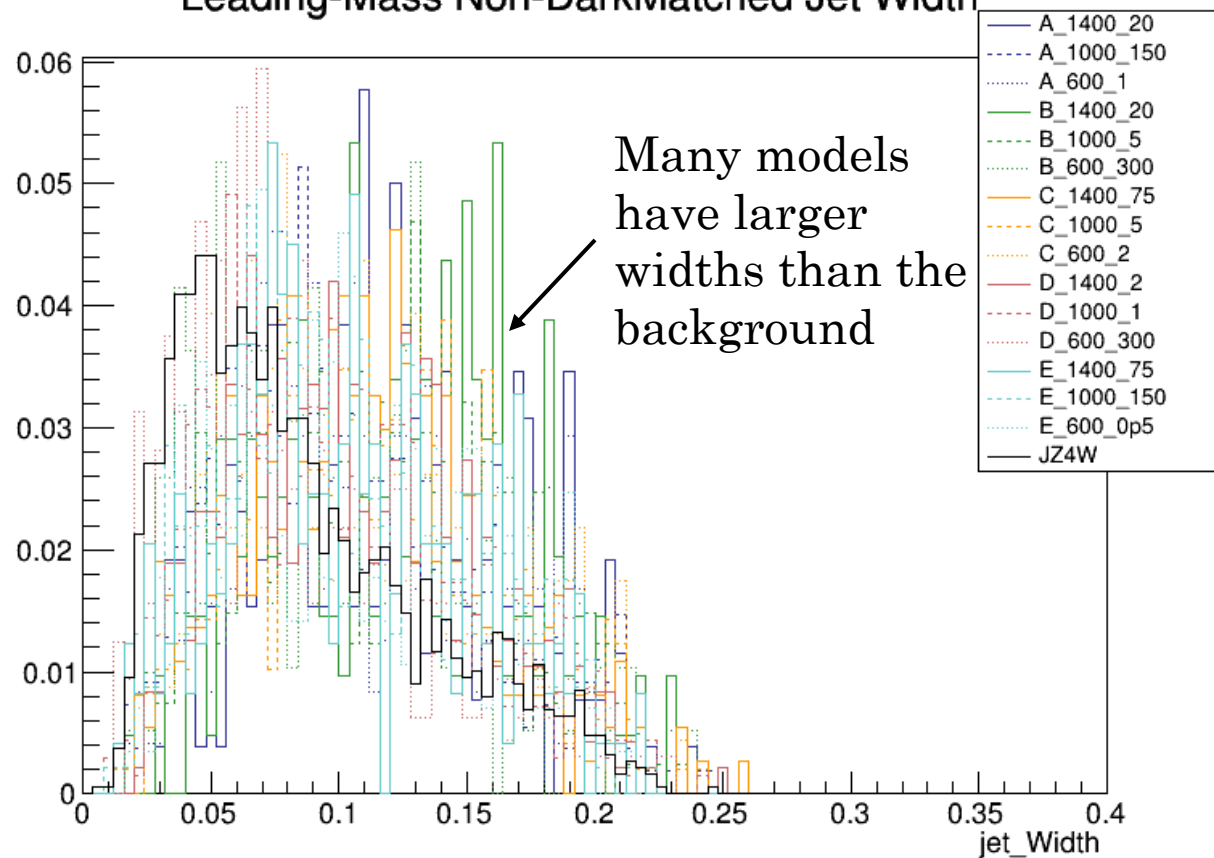
Many models have larger widths than the background

Dark matched jets for all models have some degree of separation from background
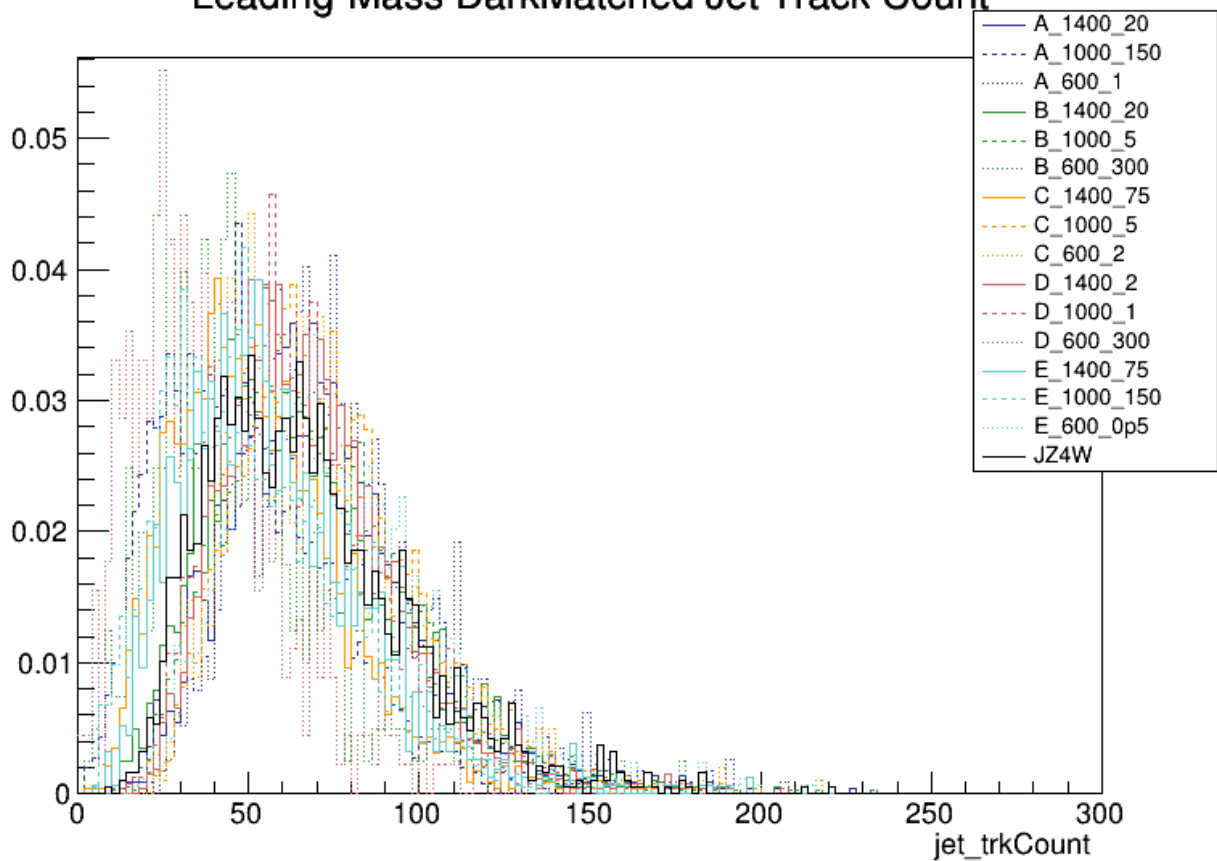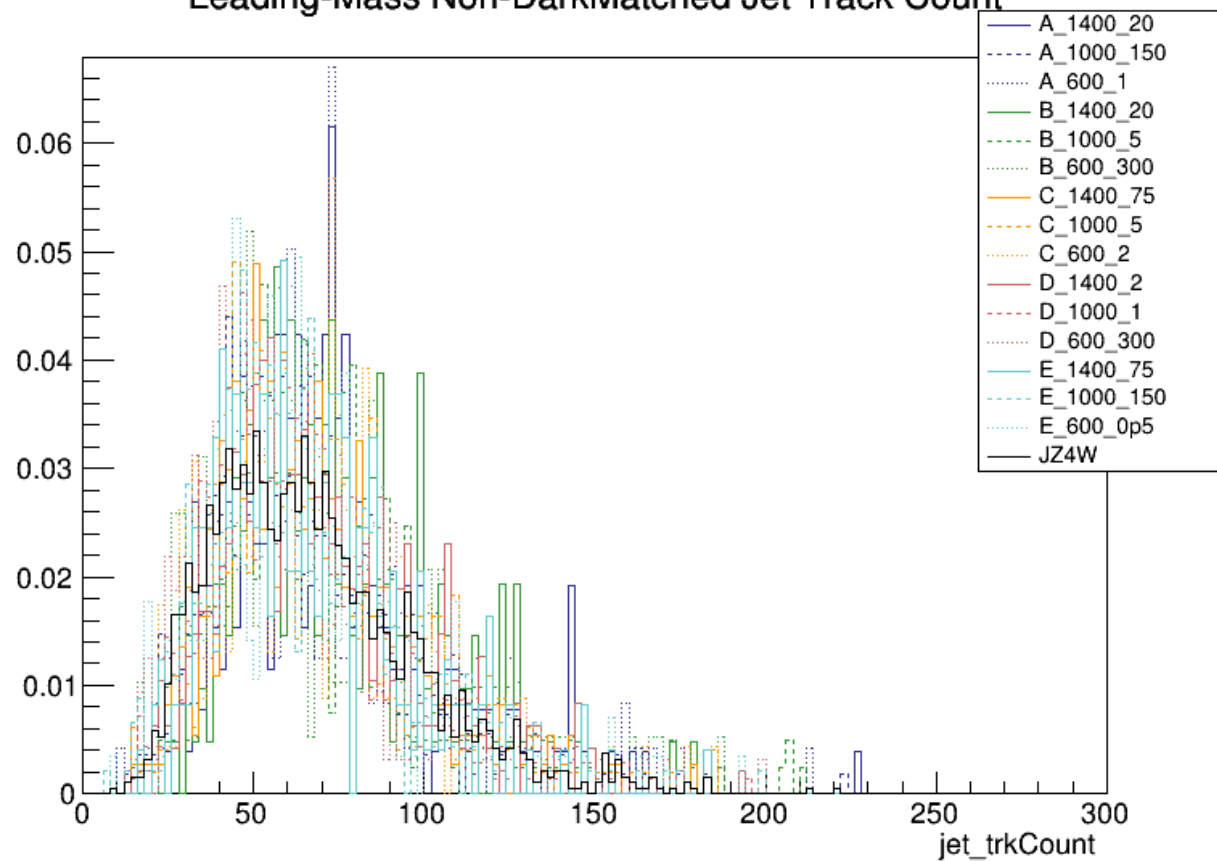
Leading-Mass DarkMatched Jet Track Count

Leading-Mass Non-DarkMatched Jet Track Count

A_1400_20	A_1400_20
A_1000_150	A_1000_150
A_600_1	A_600_1
B_1400_20	B_1400_20
B_1000_5	B_1000_5
B_600_300	B_600_300
C_1400_75	C_1400_75
C_1000_5	C_1000_5
C_600_2	C_600_2
D_1400_2	D_1400_2
D_1000_1	D_1000_1
D_600_300	D_600_300
E_1400_75	E_1400_75
E_1000_150	E_1000_150
E_600_0p5	E_600_0p5
JZ4W	JZ4W

jet_trkCount
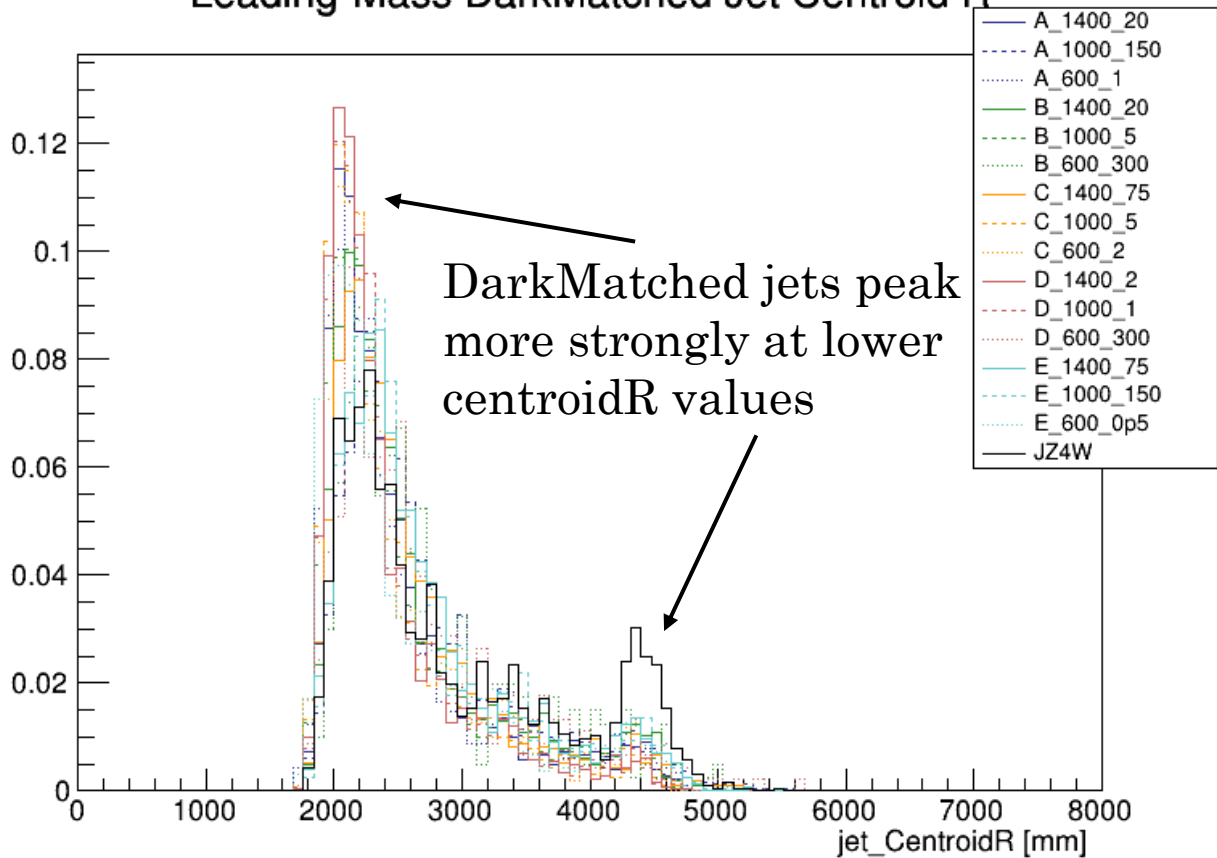
Leading-Mass DarkMatched Jet Centroid R

Leading-Mass Non-DarkMatched Jet Centroid R

DarkMatched jets peak more strongly at lower centroidR values
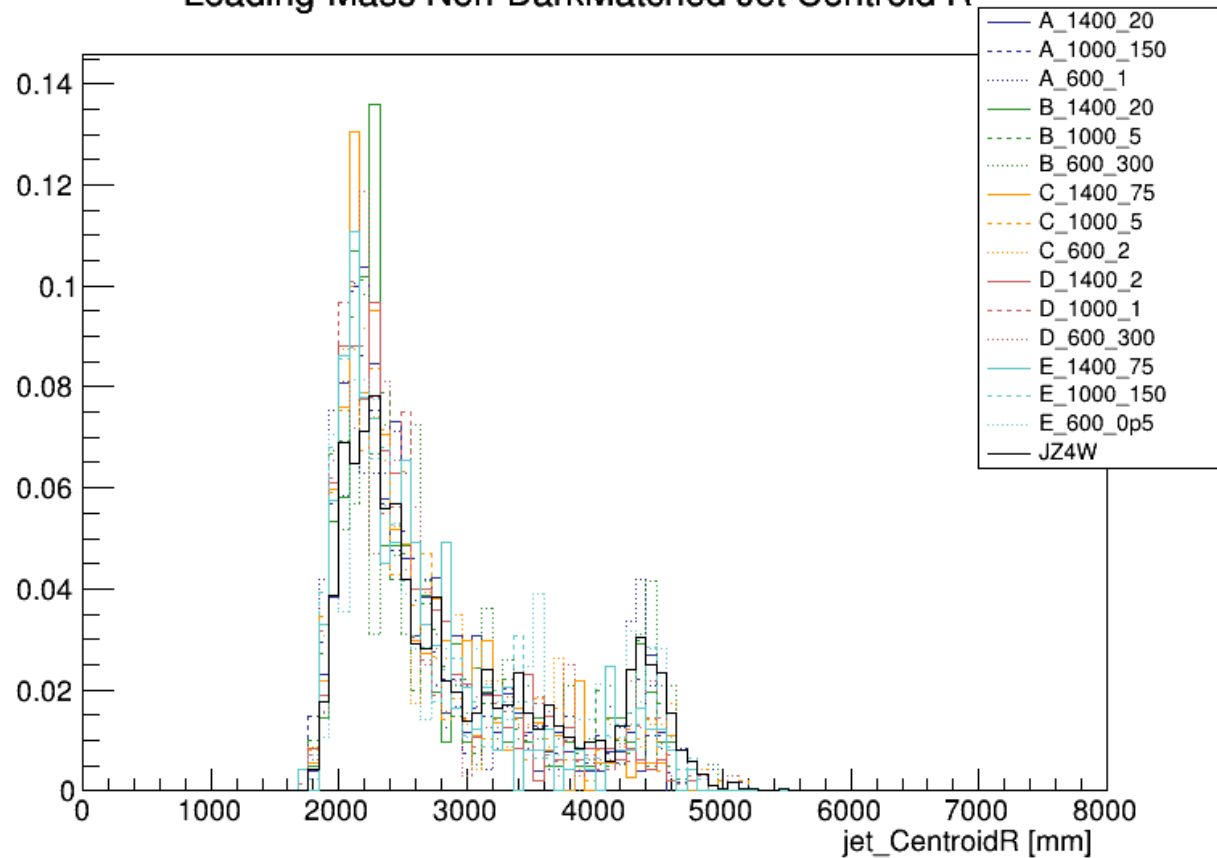
Leading-Mass DarkMatched Jet EM Fraction

Leading-Mass Non-DarkMatched Jet EM Fraction

Legend
A_1400_20
A_1000_150
A_600_1
B_1400_20
B_1000_5
B_600_300
C_1400_75
C_1000_5
C_600_2
D_1400_2
D_1000_1
D_600_300
E_1400_75
E_1000_150
E_600_0p5
JZ4W
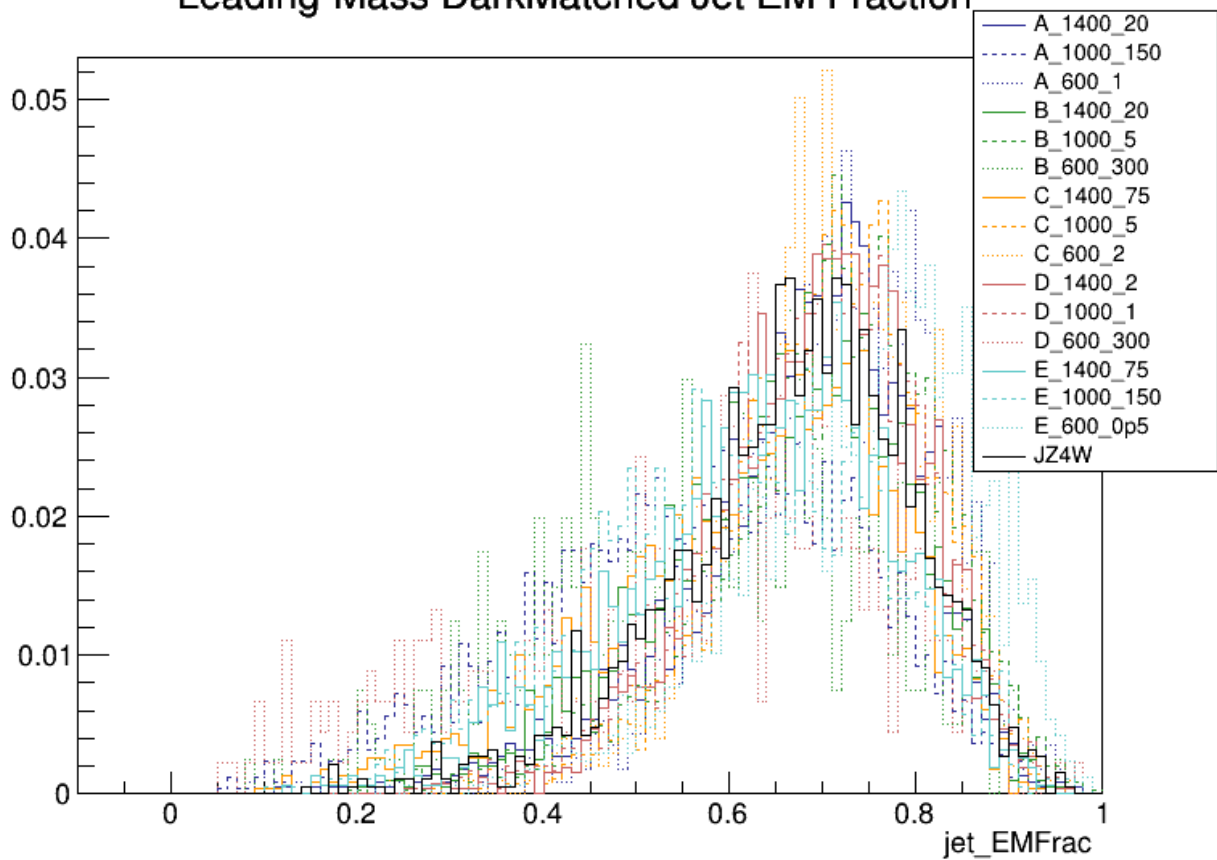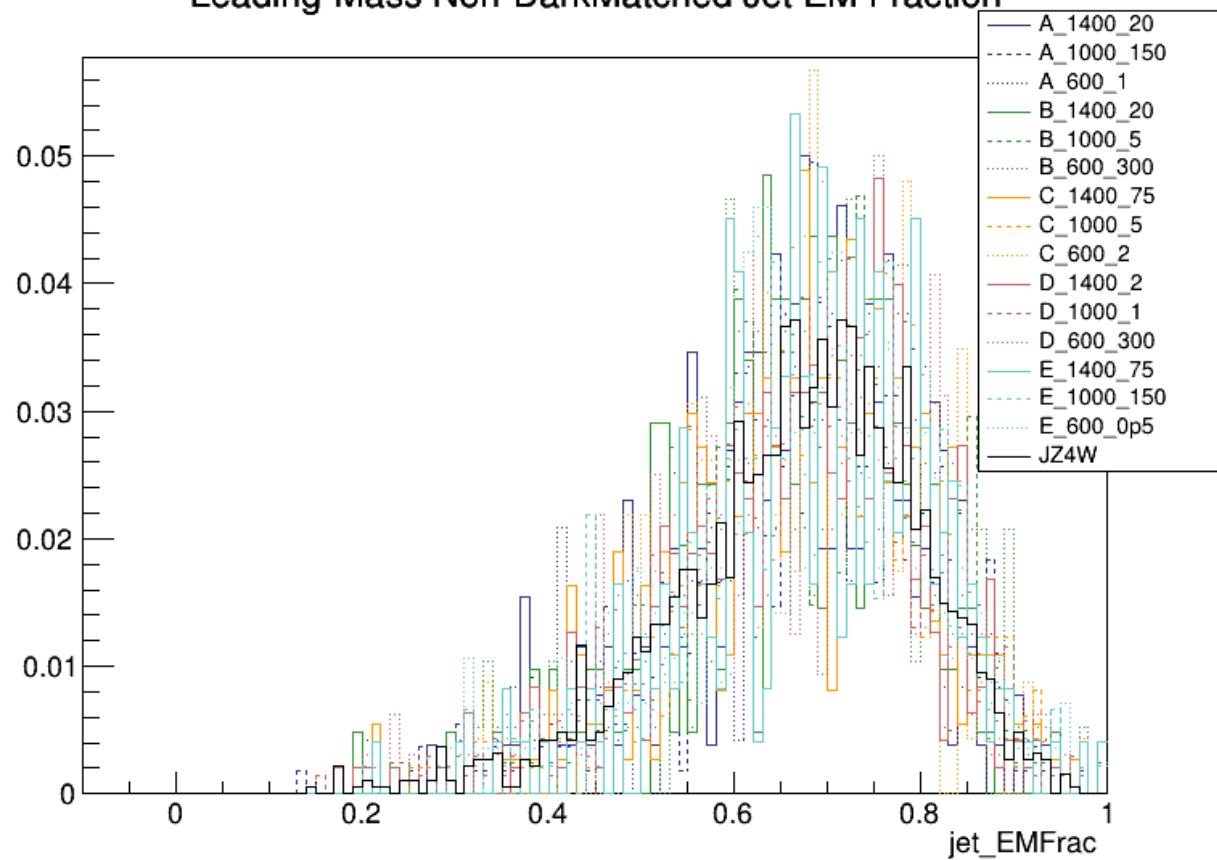
2D Histograms

- Use same cuts and jet matching criteria

- Only show plots from model A

- Plots are Rough Copies

Dark-Matched Jet Eta vs Energy
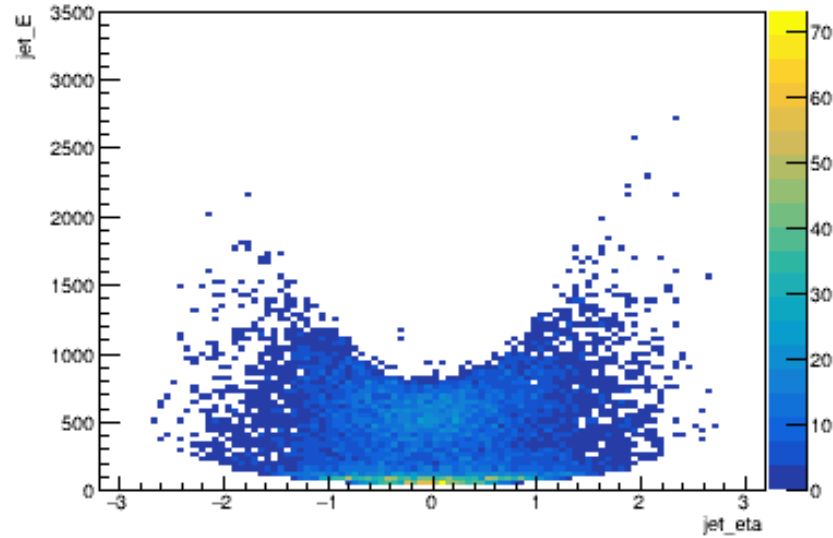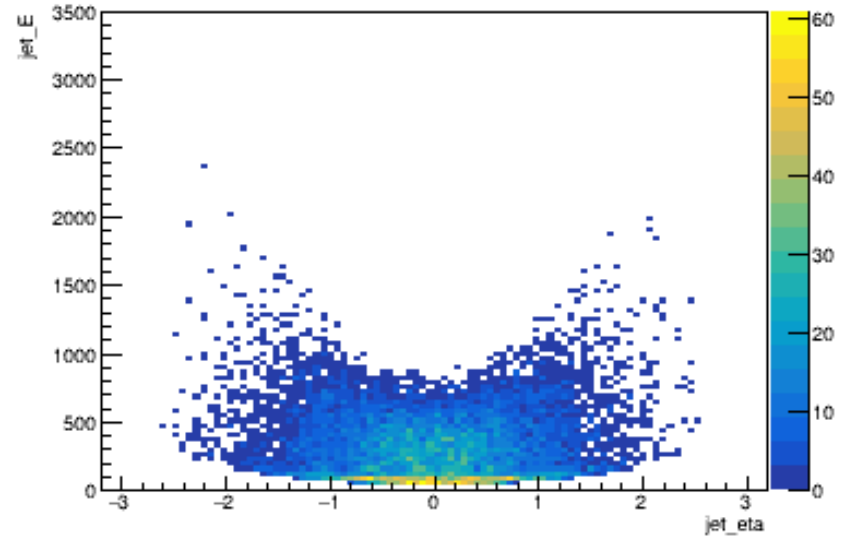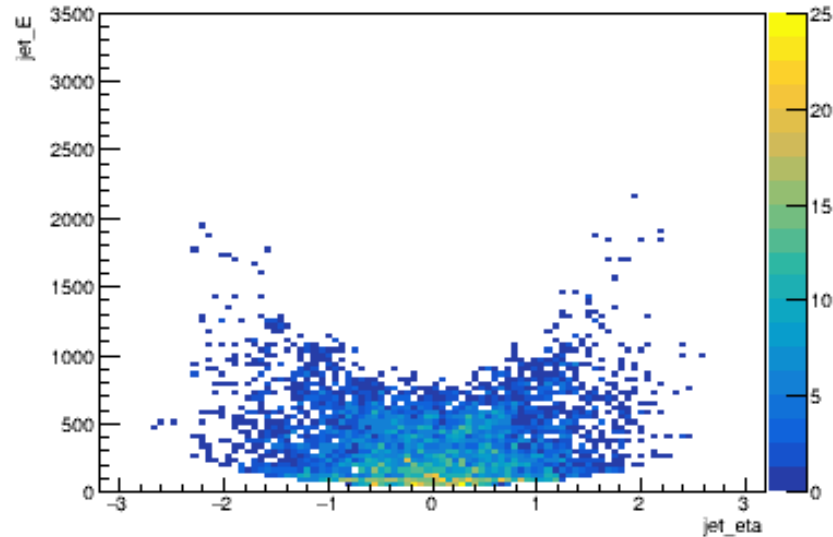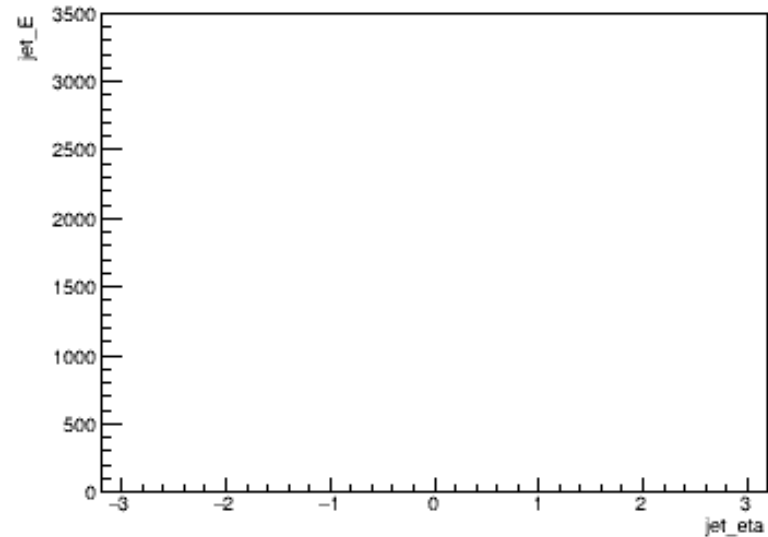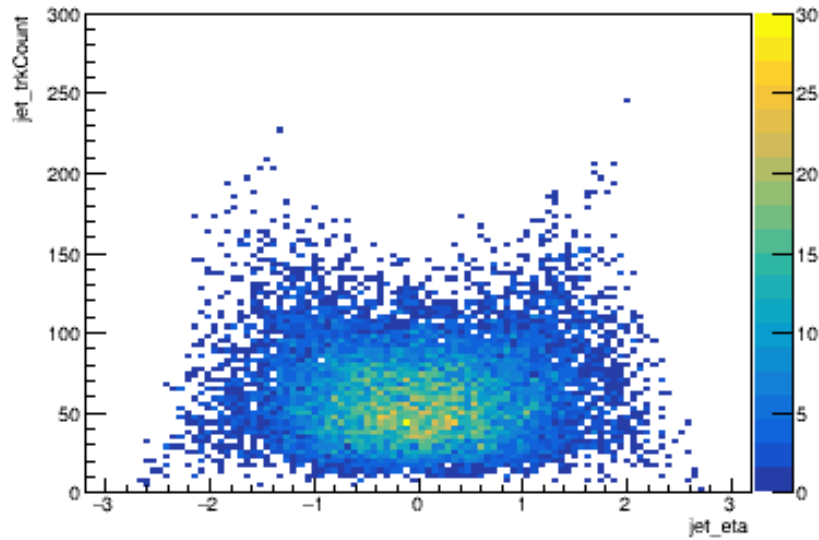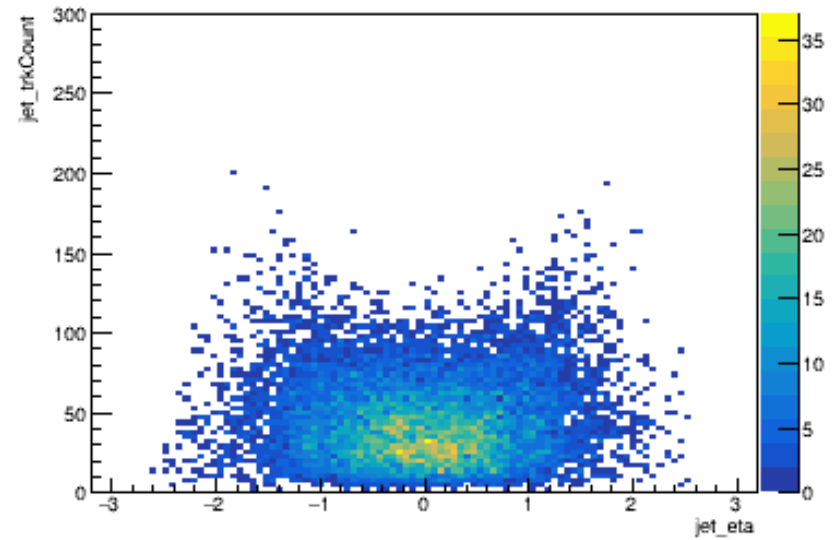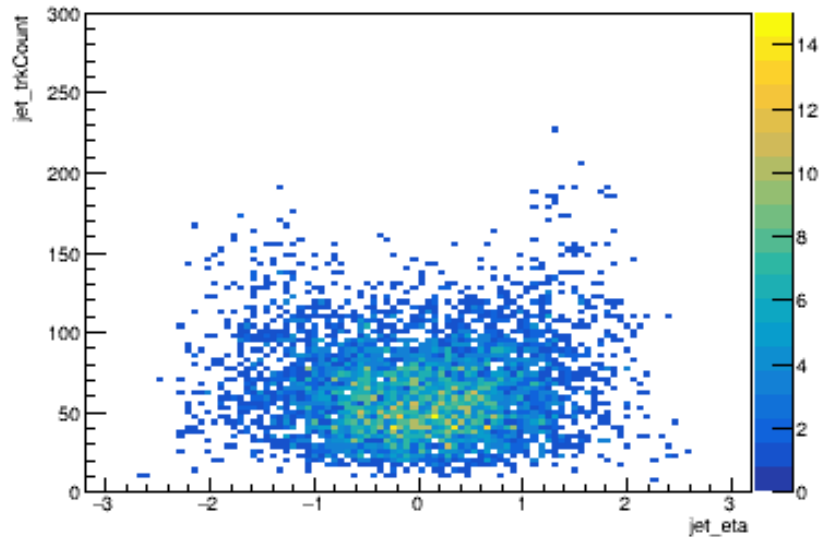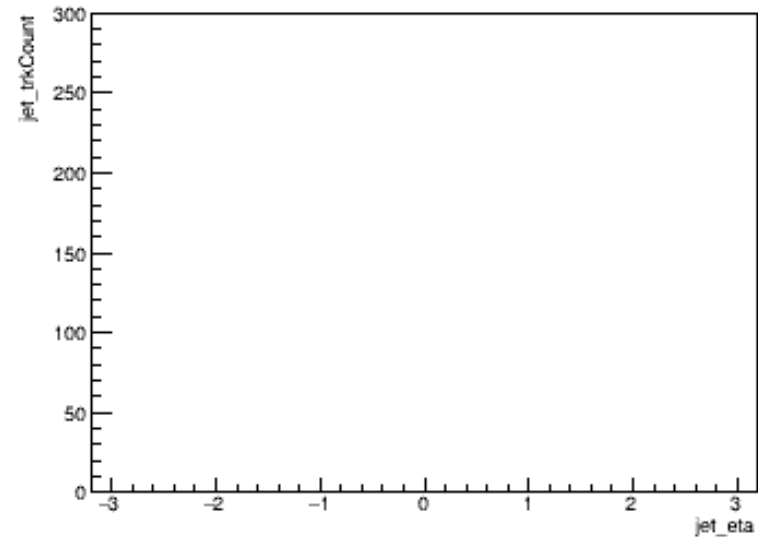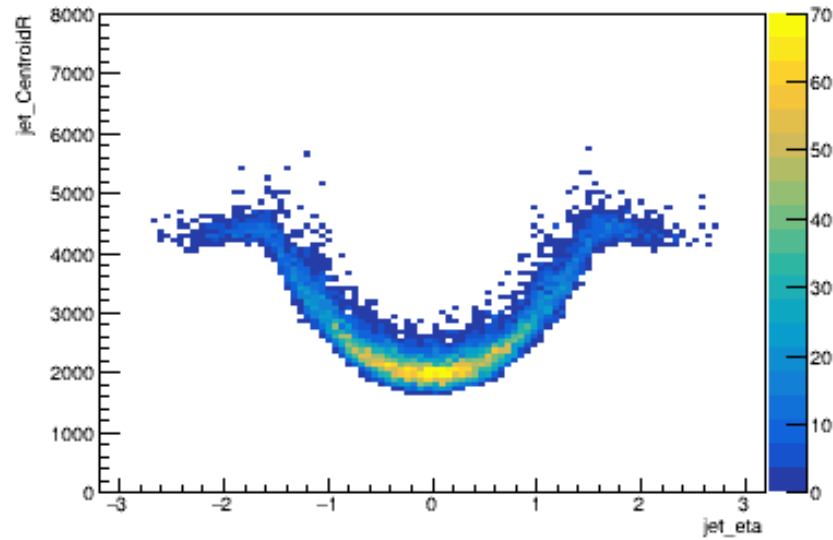
Dark-Matched Jet Eta vs Track Count
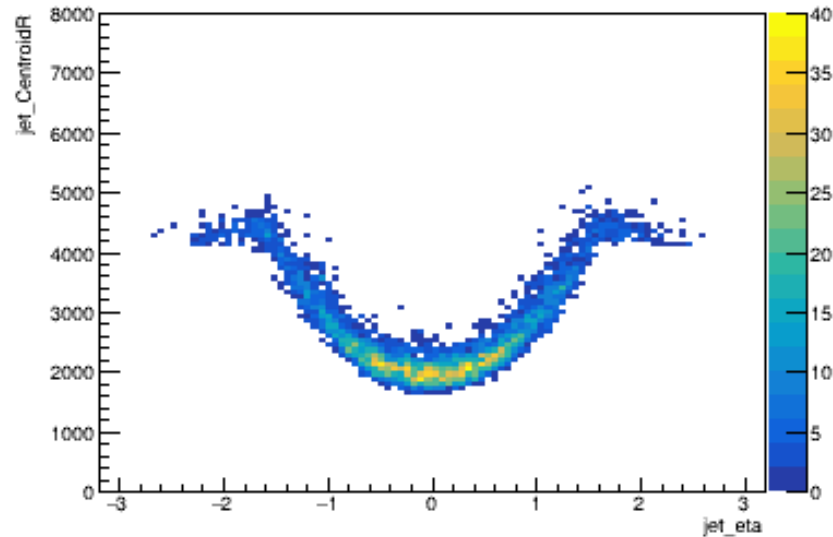
Dark-Matched Jet Eta vs CentroidR
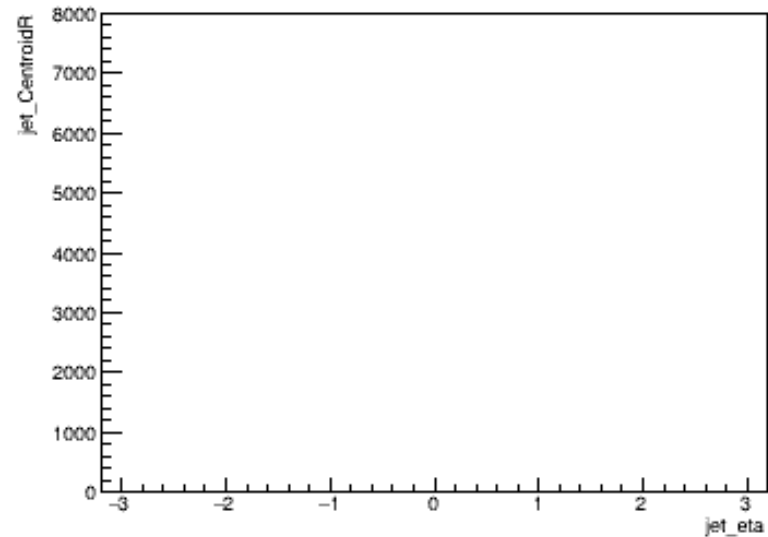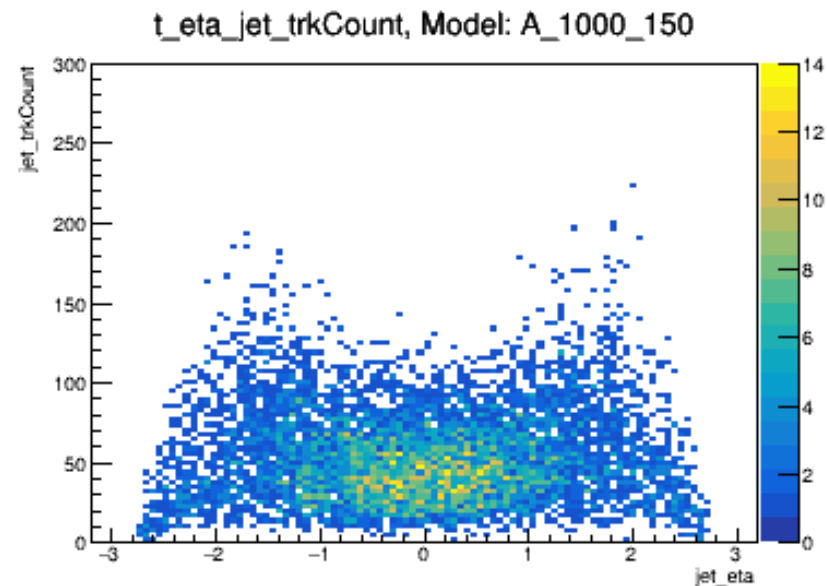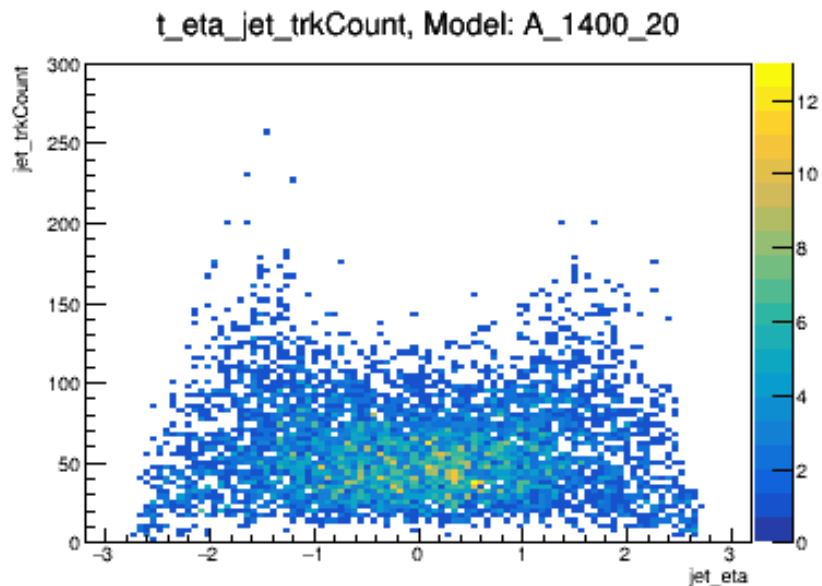
Non Dark-Matched Jet Eta vs Energy
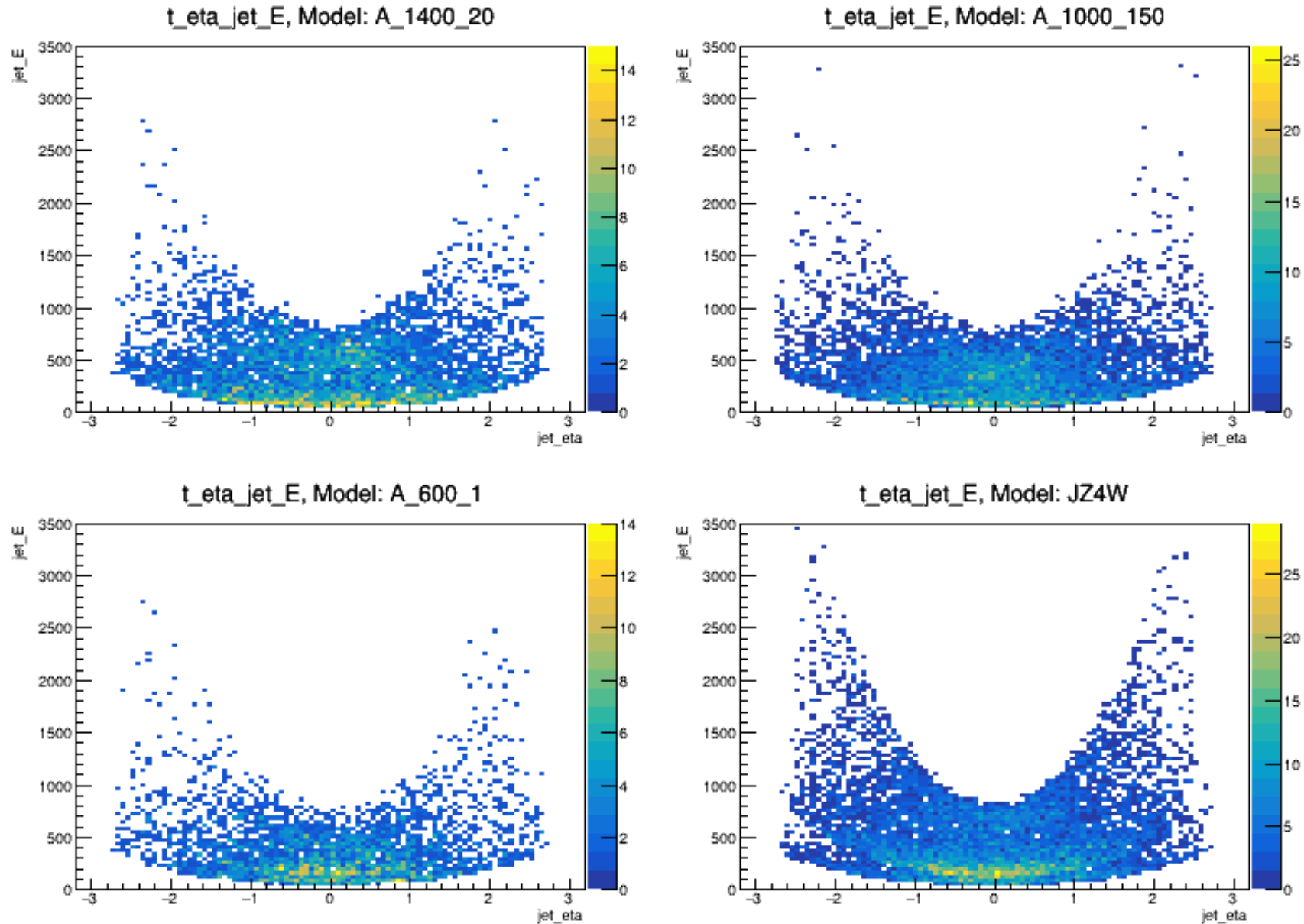
Non Dark-Matched Jet Eta vs Track Count
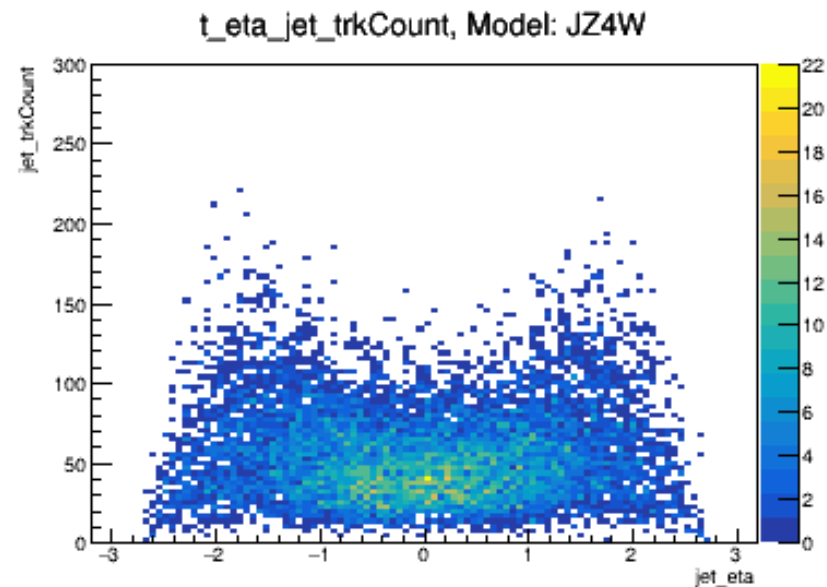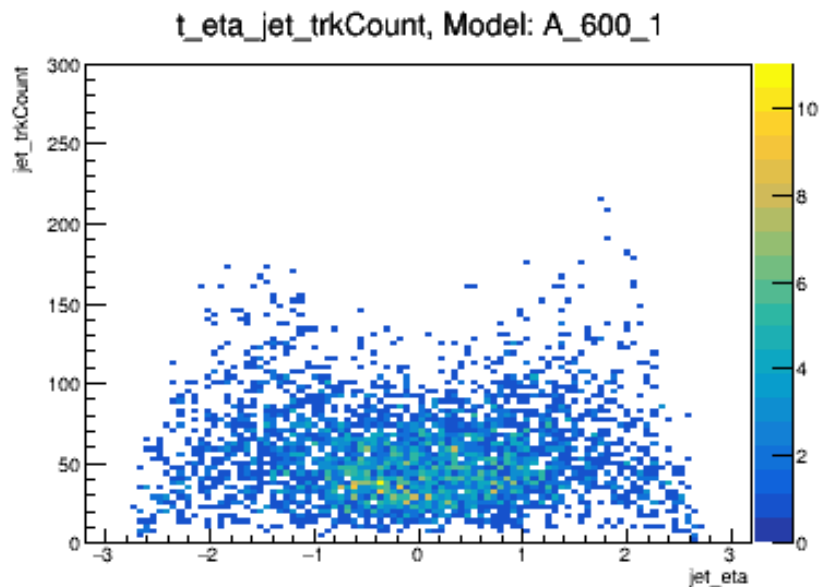
Non Dark-Matched Jet Eta vs CentroidR
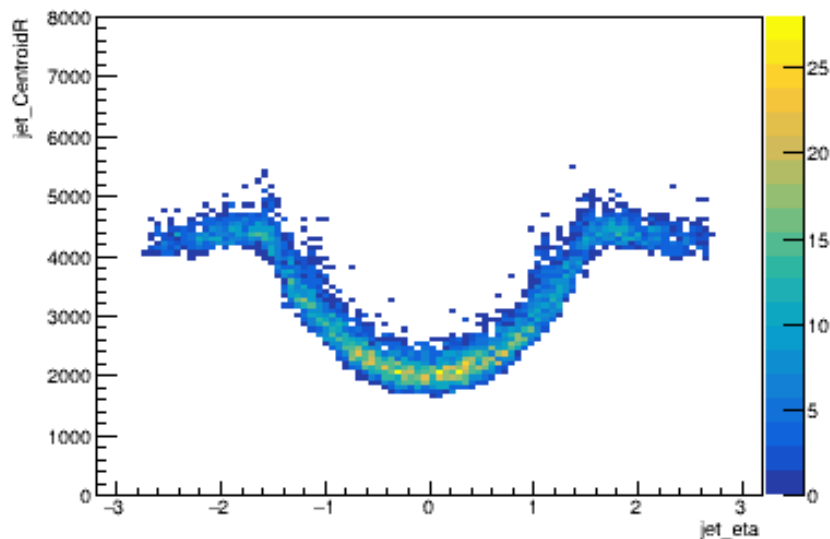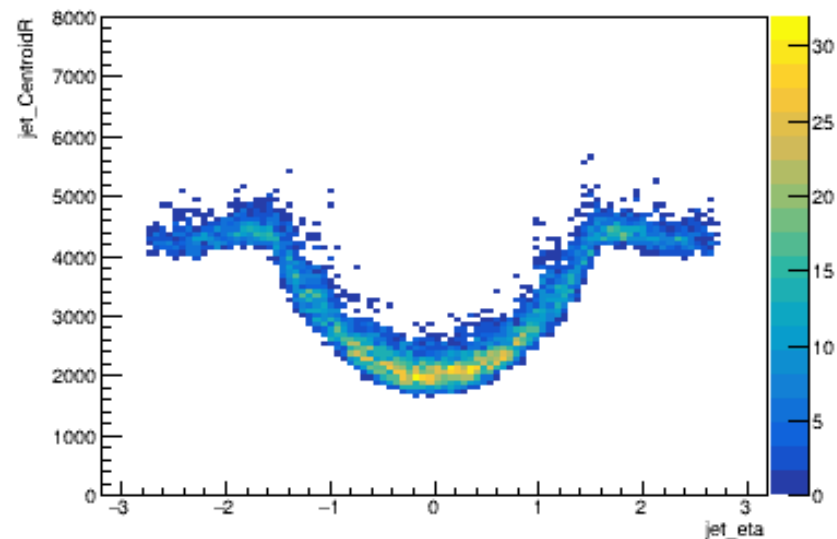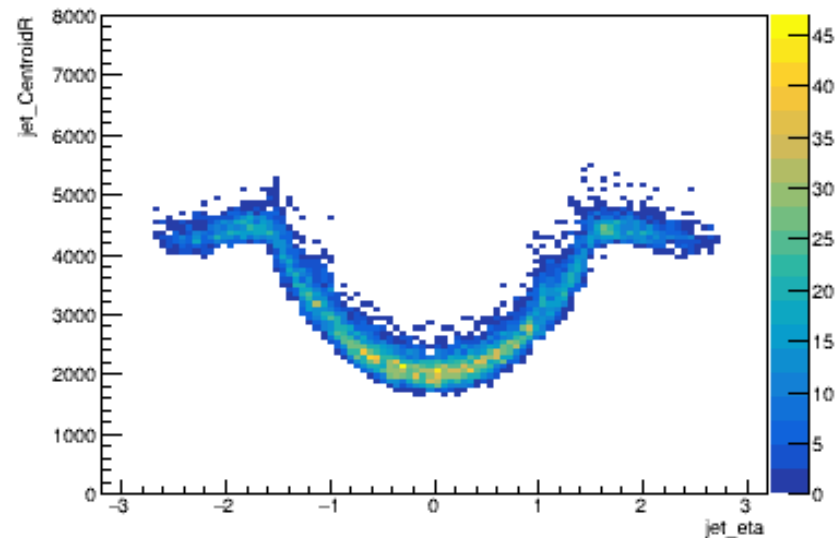
Next Steps

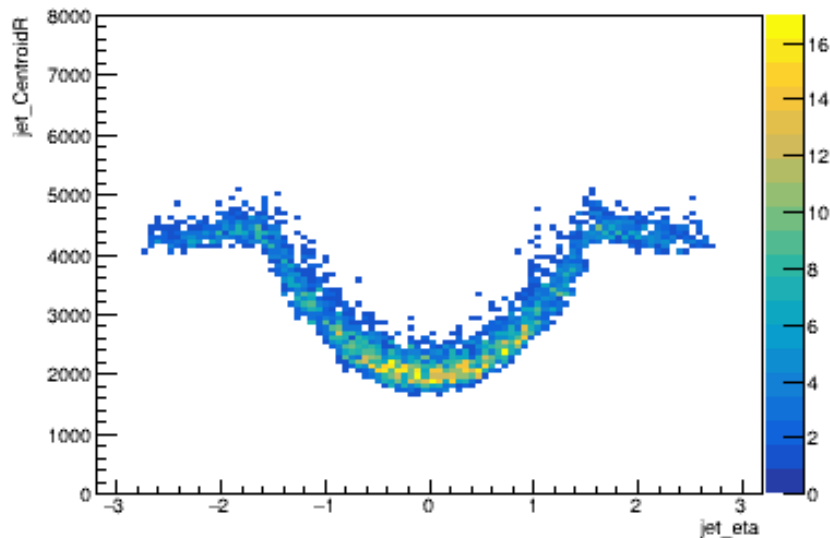- Start using new nTuples

- Look at second leading-mass jets

- Look at leading/second leading energy jets

- Look at more 2D distributions

- Compare dark/not dark matched jet 2D plots

- Make 2D plots with only leading-mass jets