

weekly report

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04.25

- Zgam
 - trigger efficiency
 - truth match and different di-jet combination
- VBF diphoton
 - update with h011
 - modify the document for internal review---to do
- High-Mass diphoton
 - categorization

Zgam

- Samples
 - signal:EXOT6 derivation is running, use AOD *ggH750_Zqqgam*
 - bkg:mc15_13TeV*SinglePhotonPtXX_XX*EXOT6*p2459
- Selection(preliminary, not decided)
 - GRL,DQ,PV, trigger:HLT_g120_loose
 - Photon:
 - $p_T > 125 \text{ GeV}$, $|\eta| < 2.37$, remove crack region
 - Author, OQ, Ambiguity, Tight ID
 - Isolation: FixedCutCaloOnly, $\text{topoetcone40} < 0.022 * E_t + 2.45 \text{ GeV}$
 - Jet:
 - $p_T > 25 \text{ GeV}$, $|\eta| < 4.4$, $JVT > 0.64$, jet cleaning
 - Overlap Removal
 - Z sideband: $|m_{\gamma jj-90}| > 15 \text{ GeV}$
 - Overlap removal with boost analysis

Overlap removal

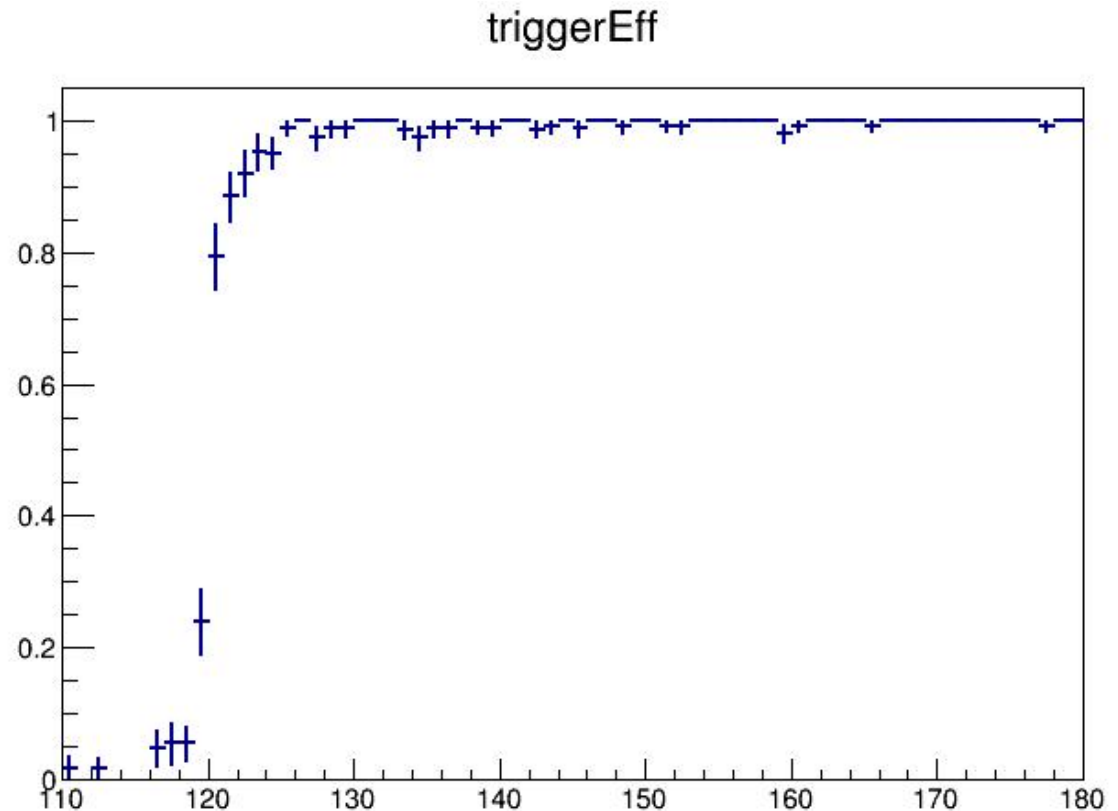
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- https://twiki.cern.ch/twiki/bin/view/AtlasProtected/SusyObjectDefinitions2013TeV#Overlap_Removals
- three steps
 - first jet-electron overlap removal
 - if $dR(\text{jet}, \text{electron}) < 0.2$ remove the jet and keep the electron
 - second jet-electron jet-muon overlap removal
 - if $dR(\text{jet}, \text{electron}) < 0.4$ remove the electron and keep the jet
 - if $dR(\text{jet}, \text{muon}) < 0.4$ remove the muon and keep the jet unless the jet has less than 3 tracks
 - third overlap removal between photon and other objects
 - If $dR(\text{photon}, \text{electron}) < 0.4$: remove the photon, keep the electron.
 - If $dR(\text{photon}, \text{muon}) < 0.4$: remove the photon, keep the muon.
 - If $dR(\text{photon}, \text{jet}) < 0.4$: remove the jet, keep the photon

trigger efficiency

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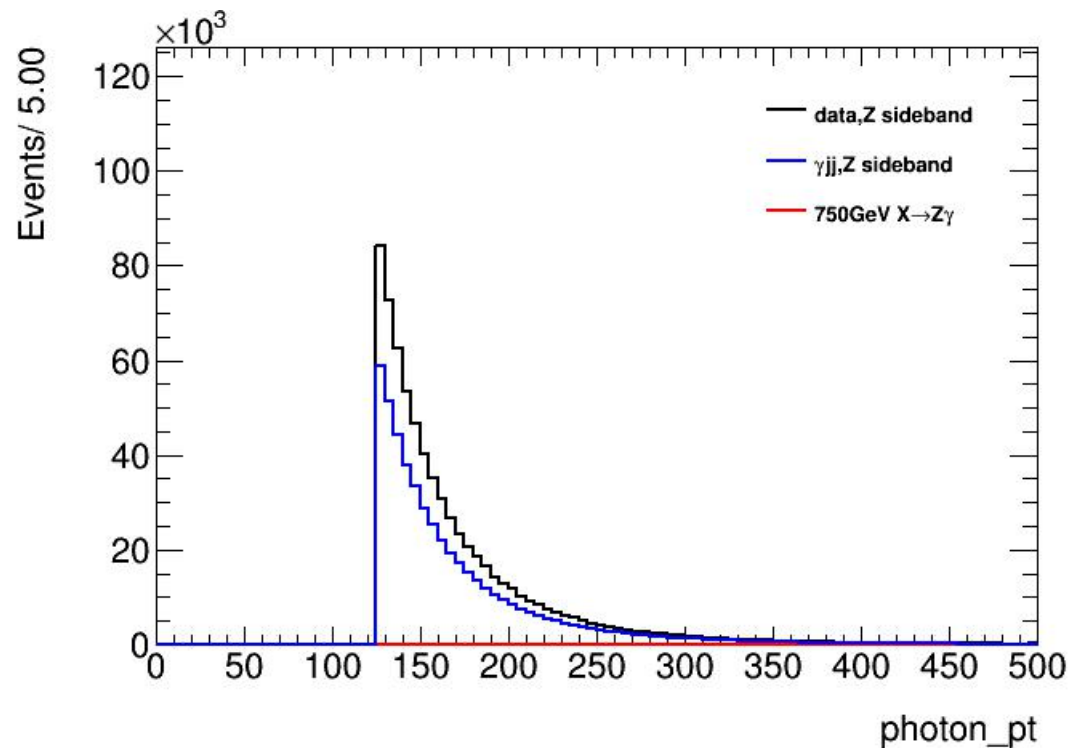
- 750GeV signal sample
- HLT_g120_loose
- trigger efficiency vs leading non-calibrated-loose photon pt
- 125GeV : 95%



Normalization

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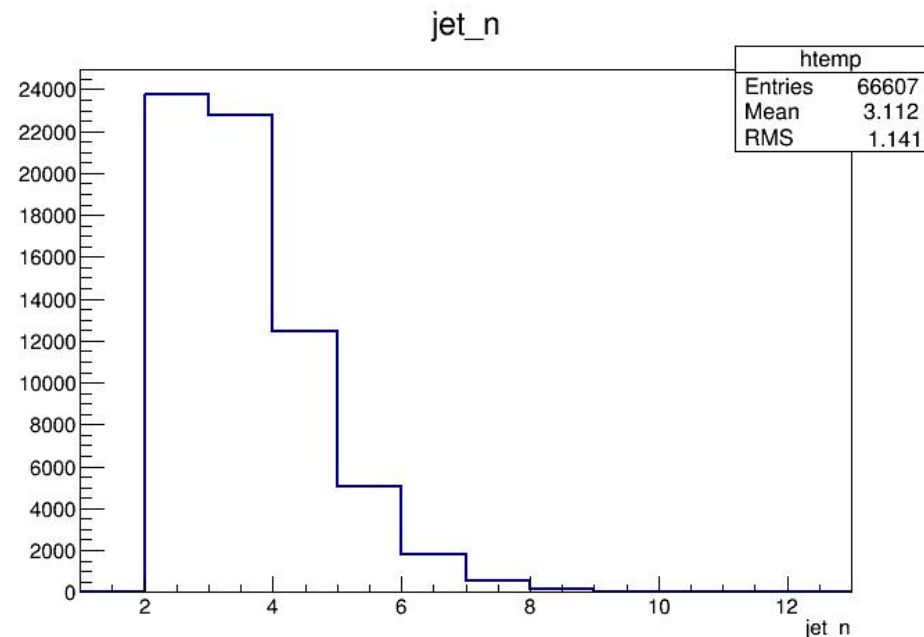
- move to mc15b
- no pile up reweight (due to unmatched config file)
 - runNumber 222525(mc15a) available, but 222526 in mc15b
- scale to $X_{\text{sec}} \cdot \text{FilterEff} \cdot \text{Lumi}$



dijet combination

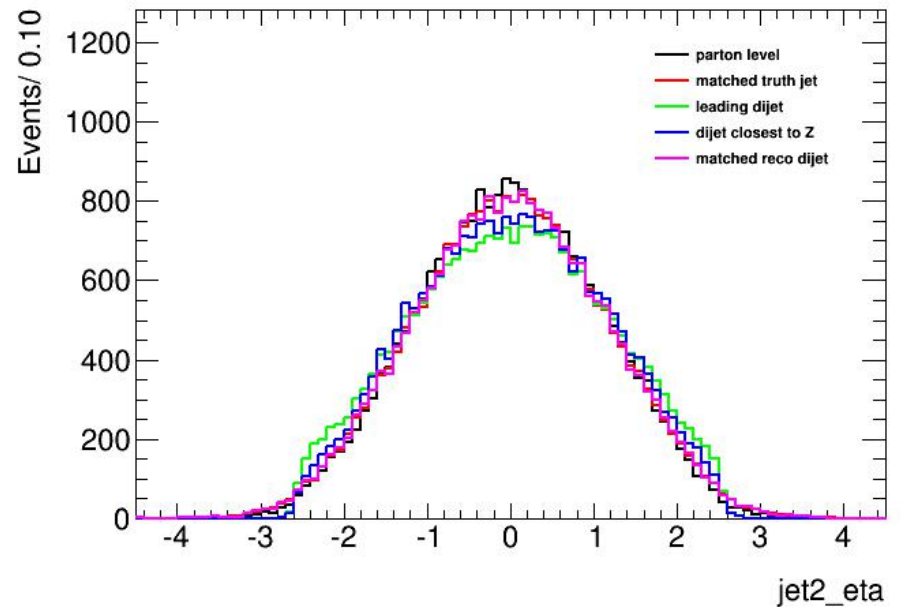
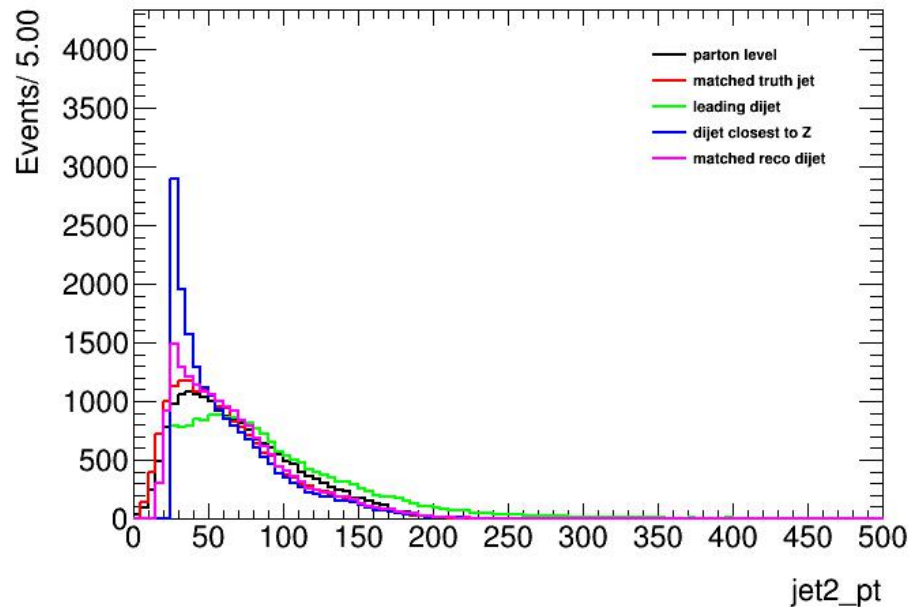
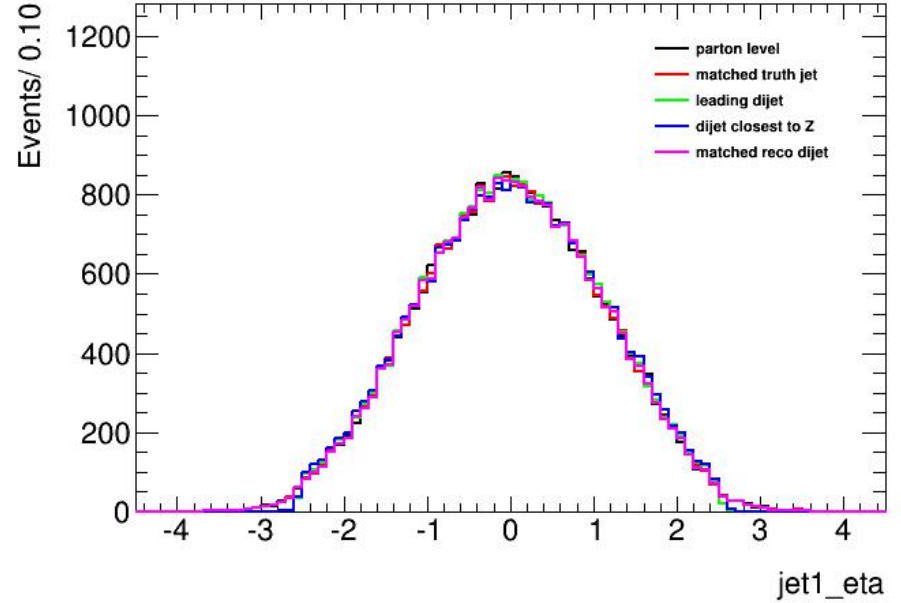
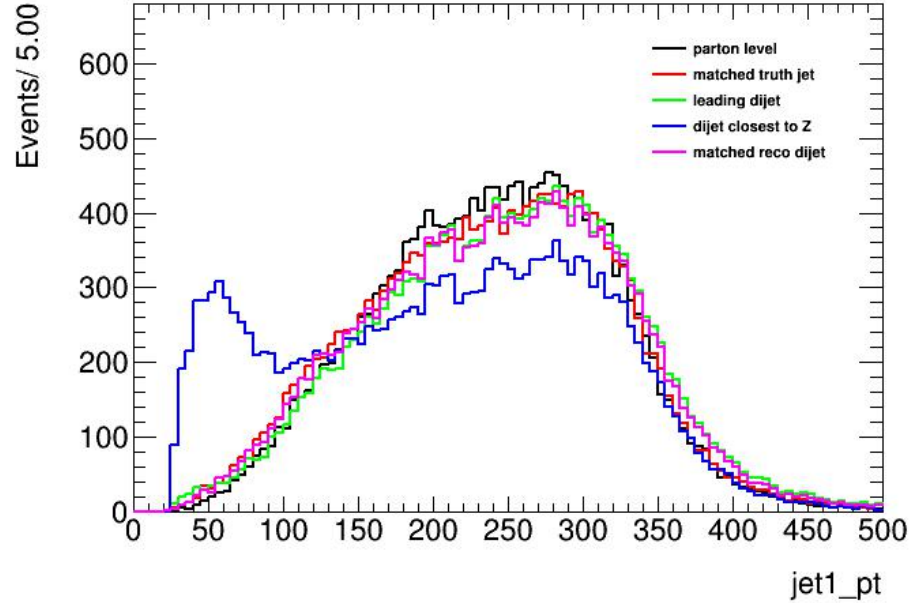
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- do truth match to find the optimal combination
- truth level:
 - truth quark (parton level)
 - matched truth jet
- reco level
 - leading dijet
 - dijet closest to Z mass
 - matched reco dijet



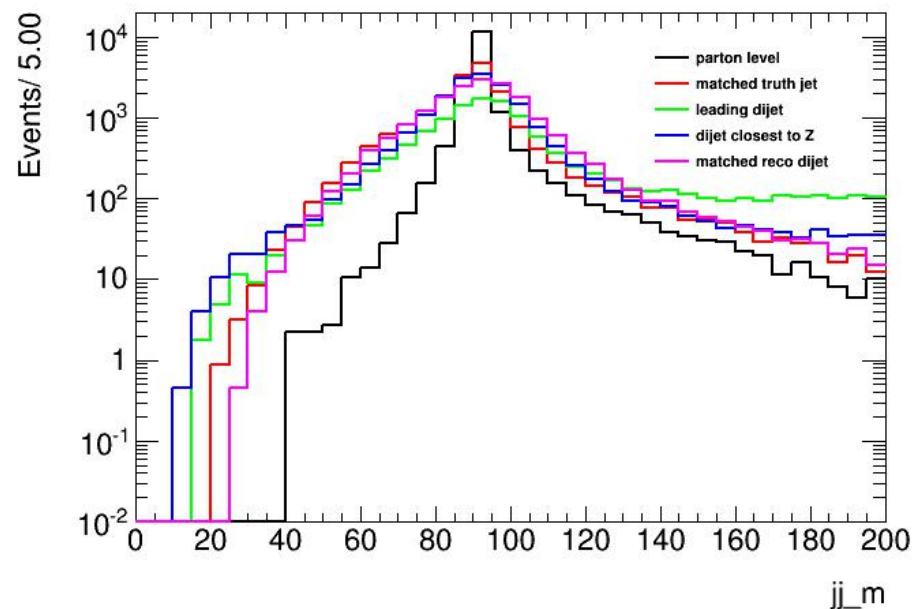
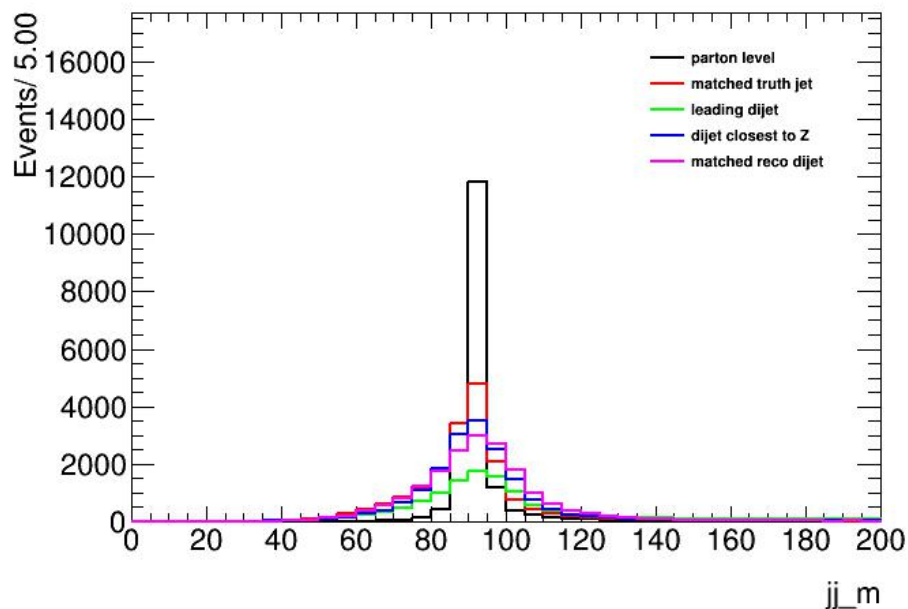
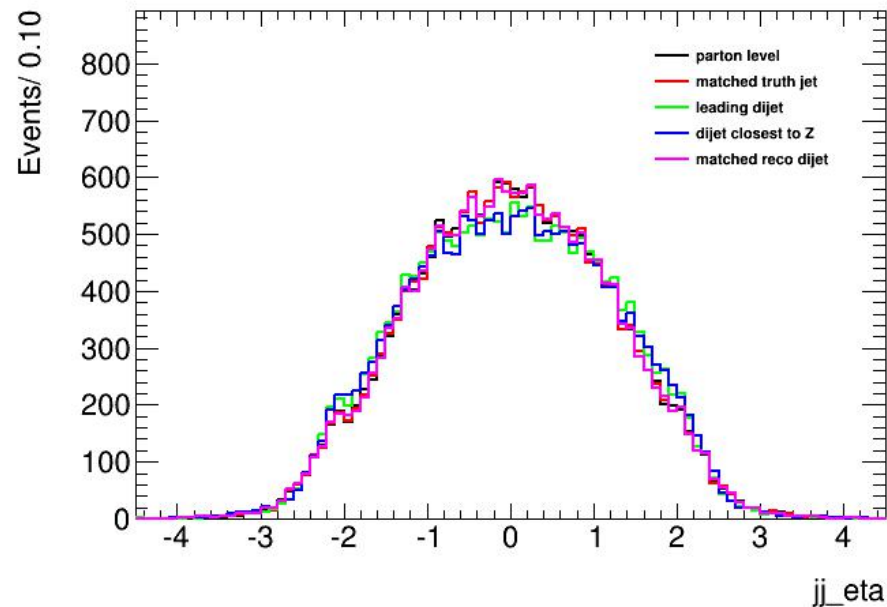
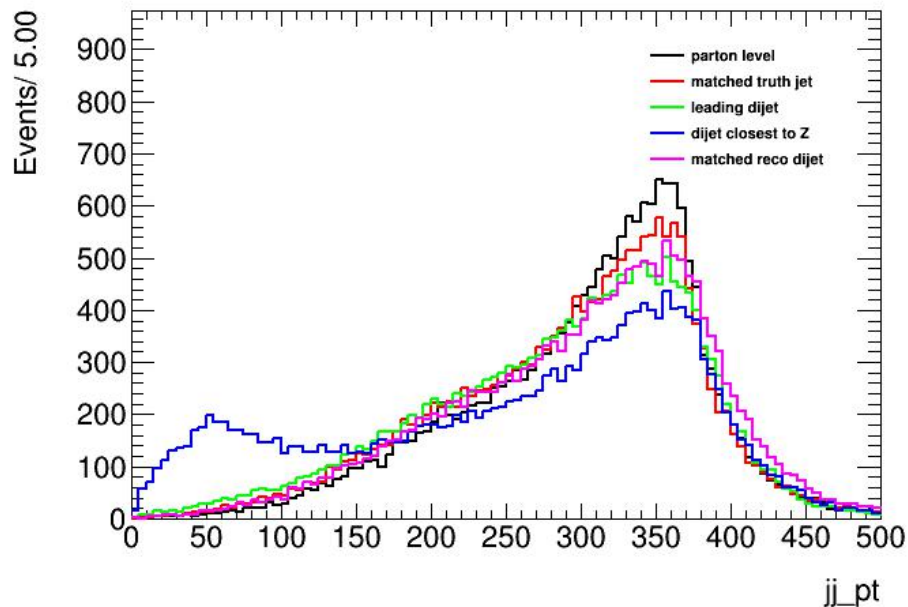
jet kinematic

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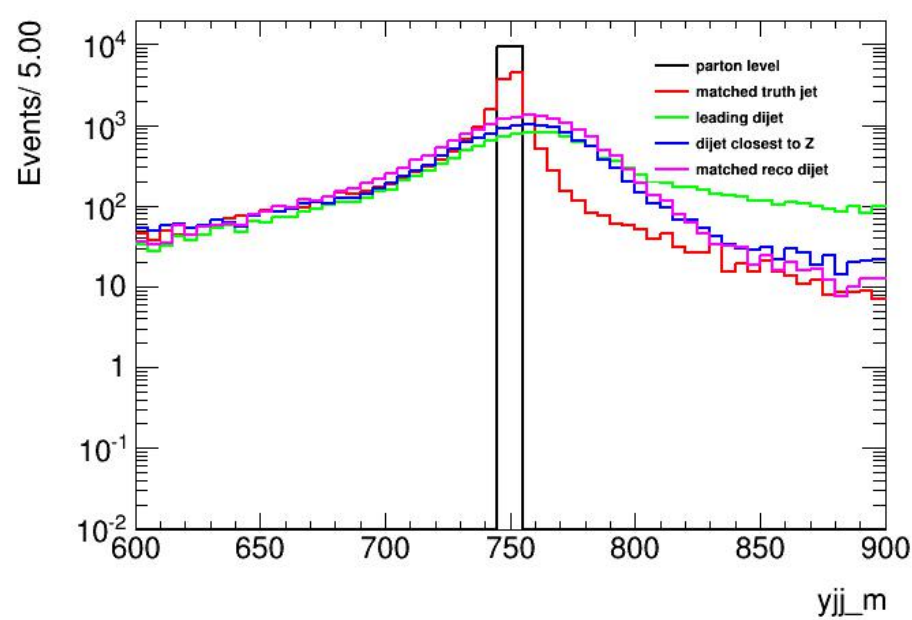
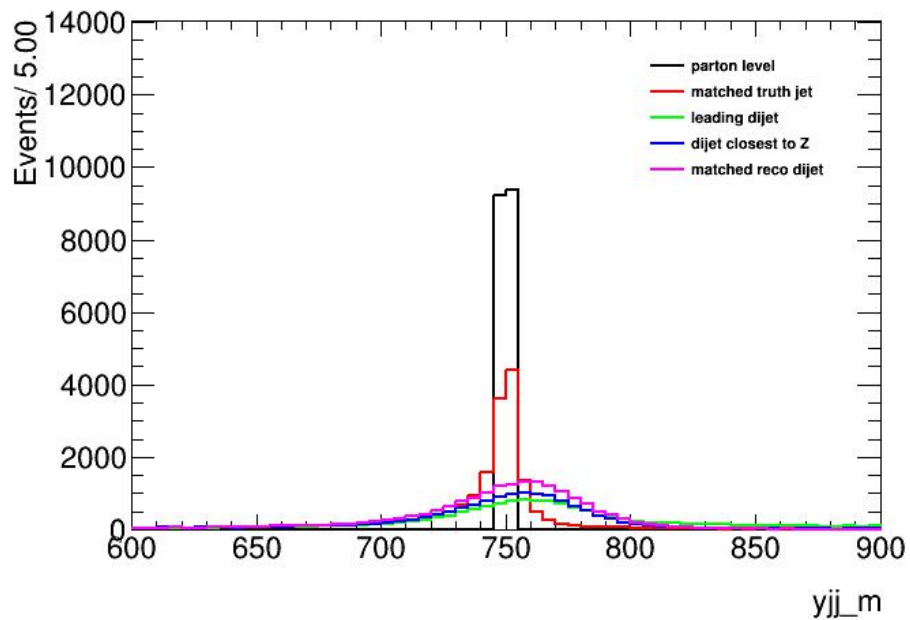
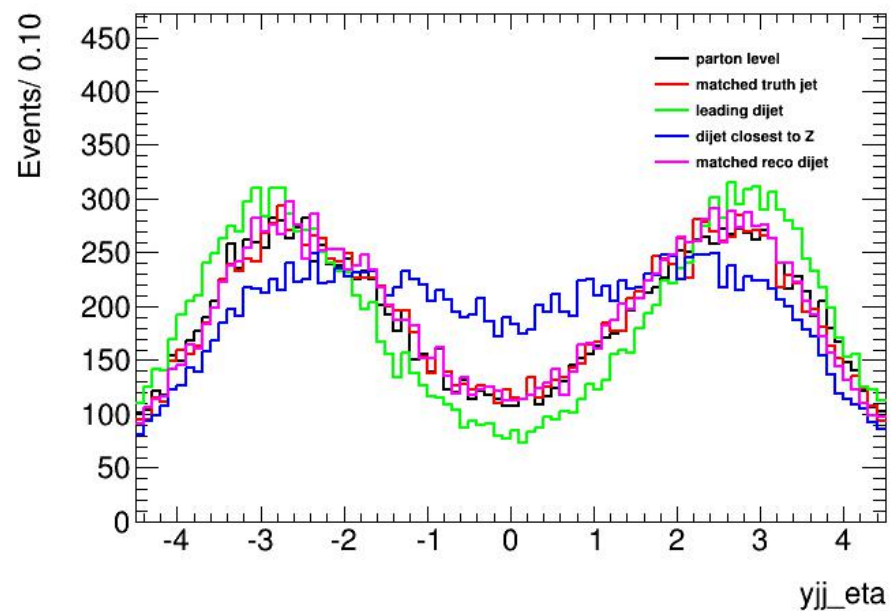
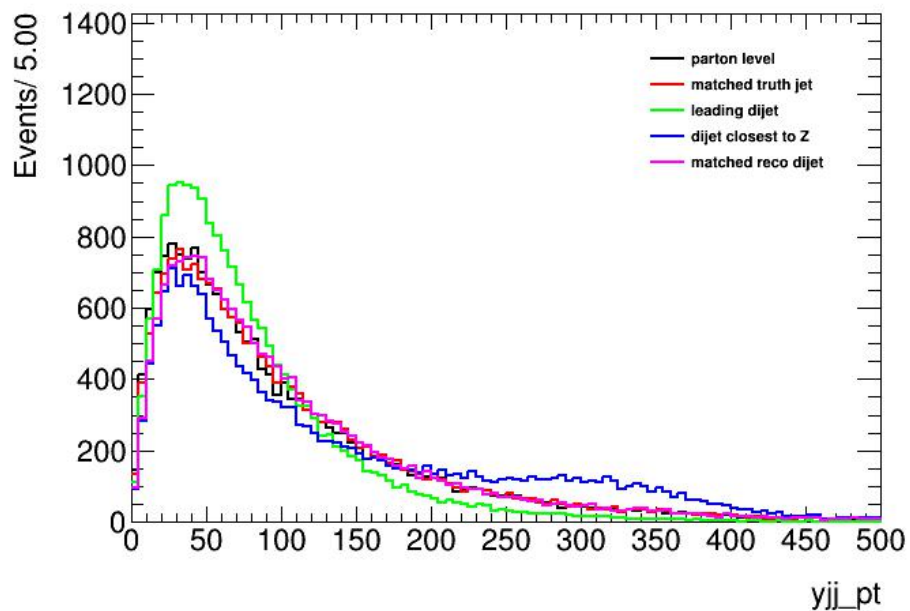
dijet kinematic

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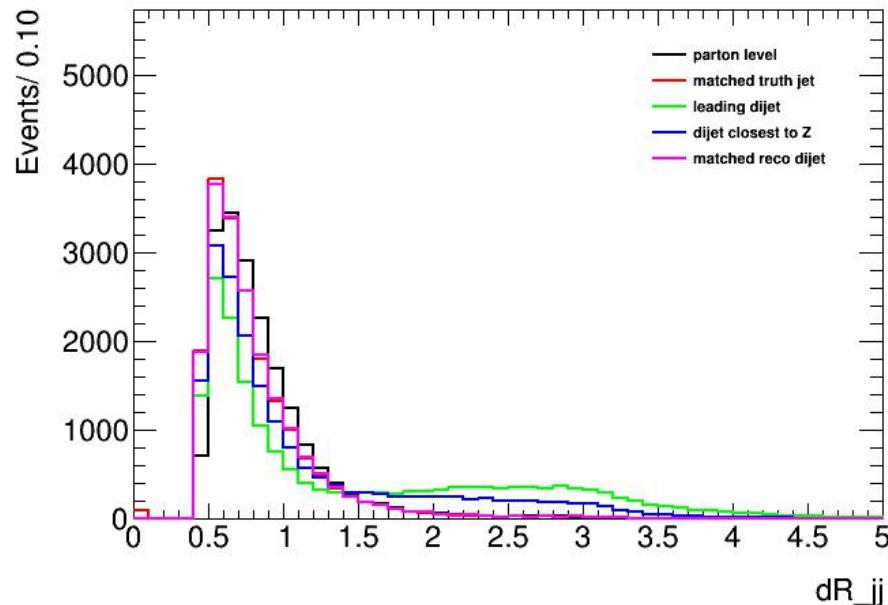
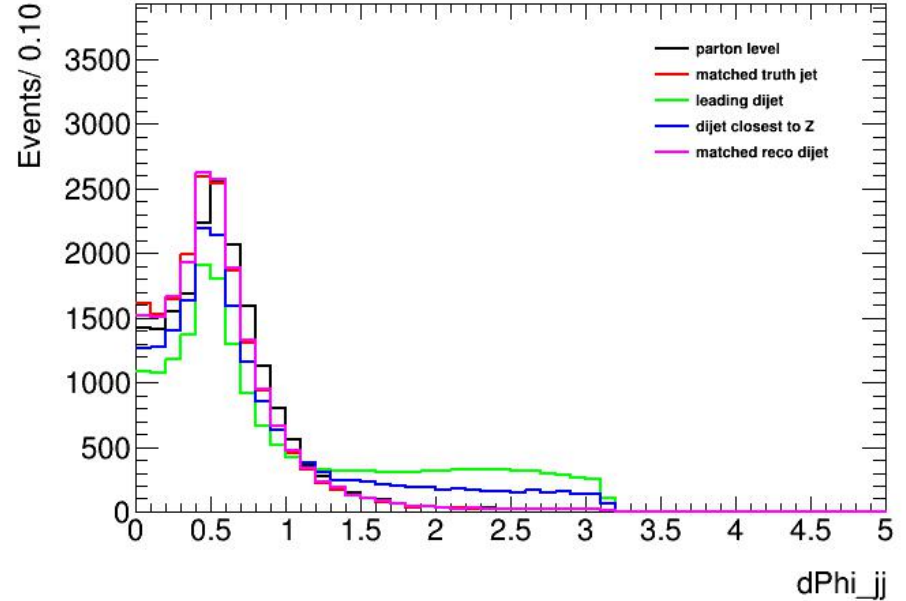
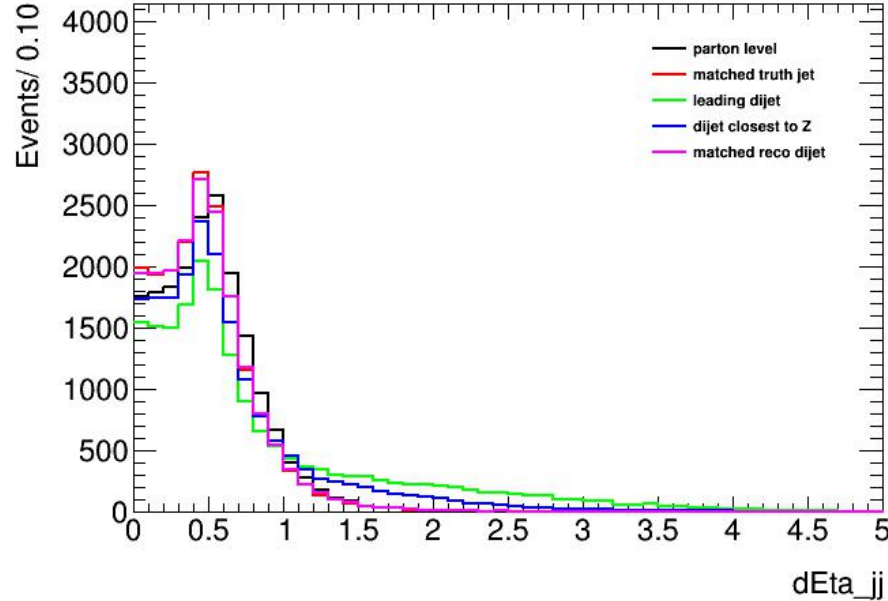
yjj kinematic

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dijet kinematic

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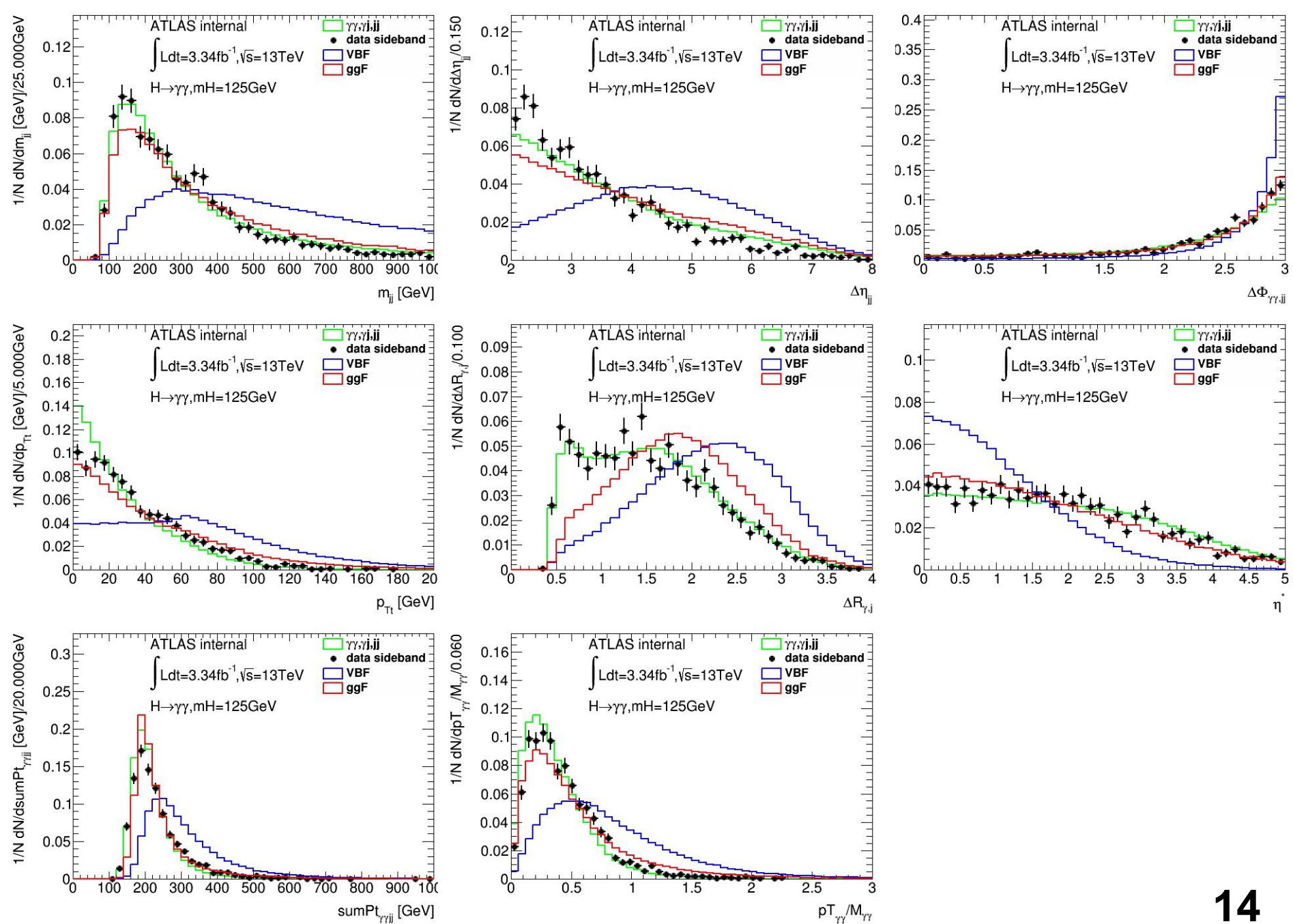


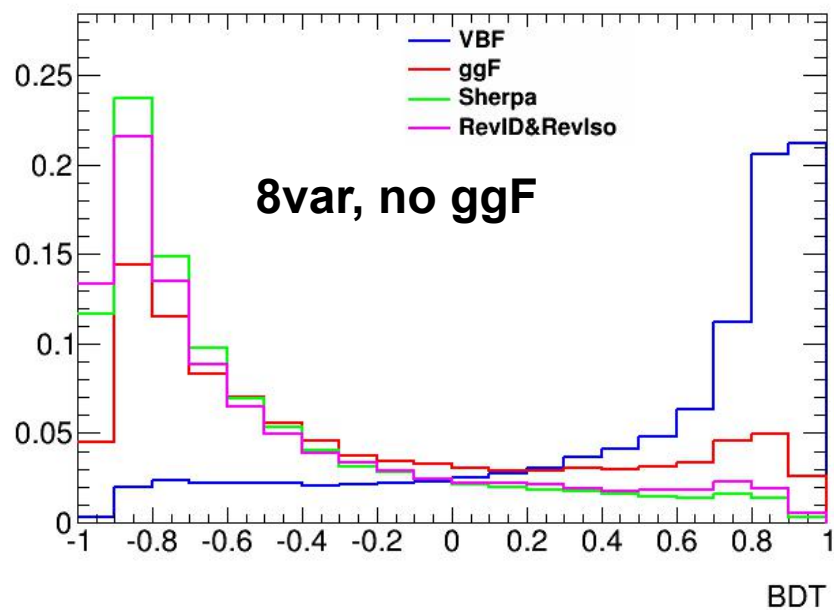
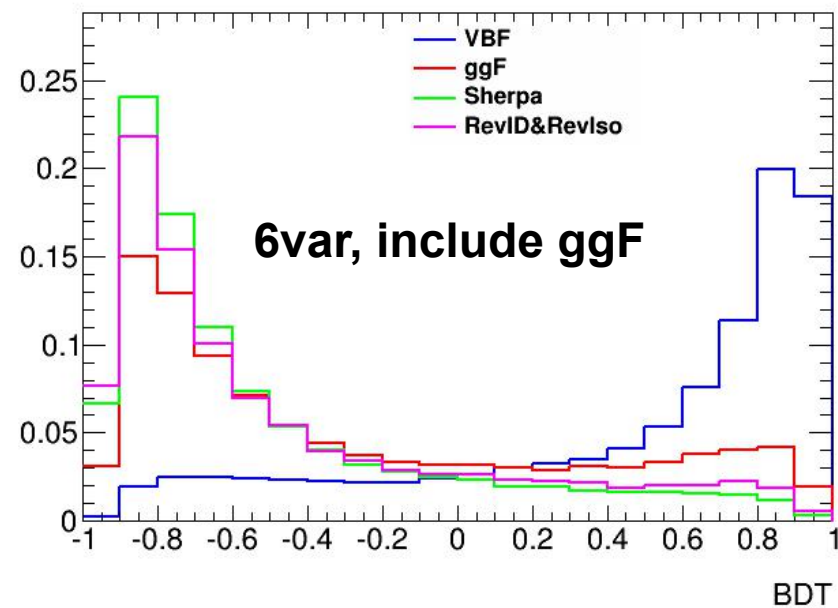
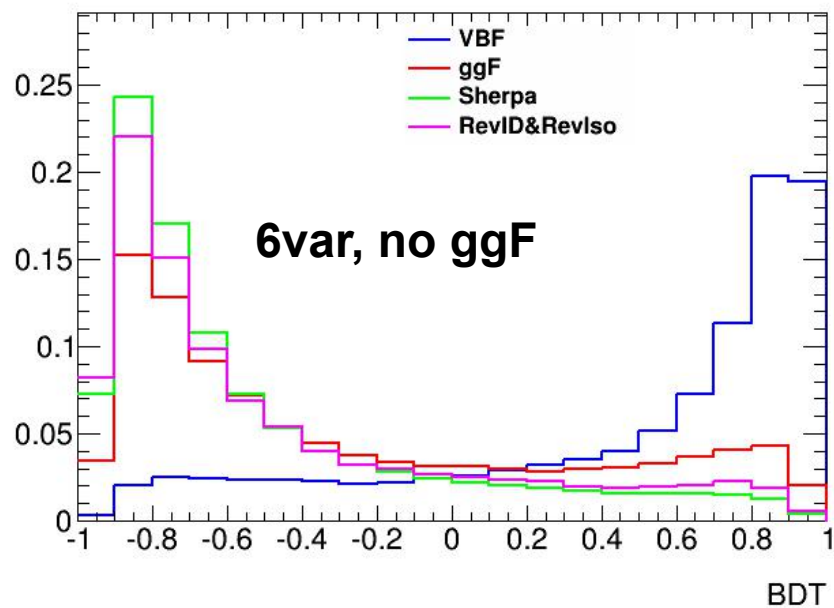
- summary
 - leading dijet: bad resolution
 - dijet closest to Z: kinematic doesn't match
- plan:
 - first, select a leading jet
 - another jet closest to the leading

VBF diphoton

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- motivation to update with h011
 - h008 is a quite old tag
 - new cp recommendation
 - weight caculated by myself ---not 100% reliable





- h008 result

6 variables	not include ggF		include ggF	
	MVA tight	MVA loose	MVA tight	MVA loose
VBF	1.85	2.47	1.81	2.40
ggF	0.73	2.47	0.70	2.32
background	3.06	26.21	2.90	24.01
VBF purity	0.72	0.50	0.72	0.51
significance	0.88	0.45	0.89	0.46
combined significance	0.99		1.00	

not include ggF	6 variables		8 variables	
	MVA tight	MVA loose	MVA tight	MVA loose
VBF	1.85	2.47	1.84	2.21
ggF	0.73	2.47	0.82	2.12
background	3.06	26.21	2.21	16.74
VBF purity	0.72	0.50	0.69	0.51
significance	0.88	0.45	0.97	0.50
combined significance	0.99		1.09	

- h011

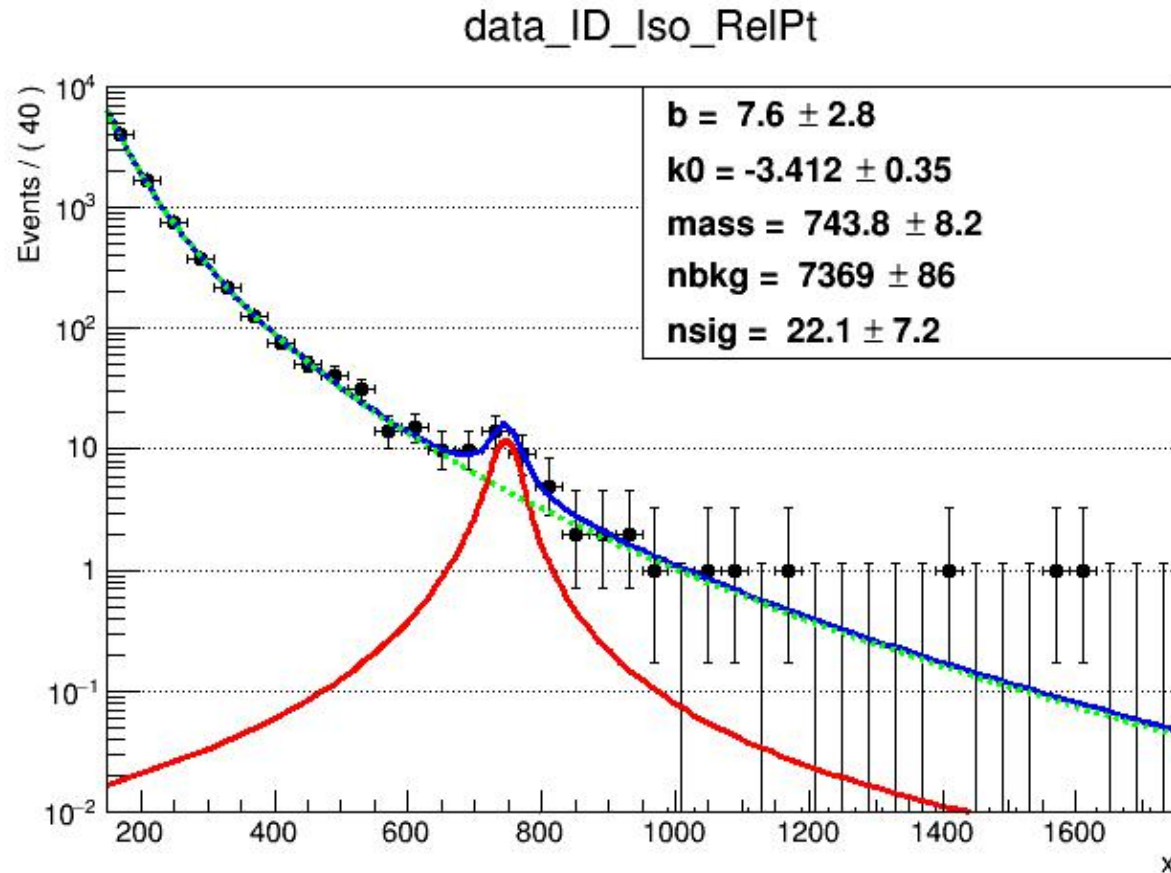
	6vars, no ggF		6var, include ggF		8var, no ggF	
	MVA tight	MVA loose	MVA tight	MVA loose	MVA tight	MVA loose
VBF	1.64	2.17	1.71	2.18	1.25	2.54
ggF	0.51	1.90	0.56	2.00	0.38	2.08
bkg	2.42	17.71	2.70	19.04	1.11	16.56
VBF purity	0.76	0.53	0.75	0.52	0.76	0.55
significance	0.88	0.47	0.88	0.47	0.91	0.58
combined	1.00		1.00		1.06	

High-Mass diphoton

categorization

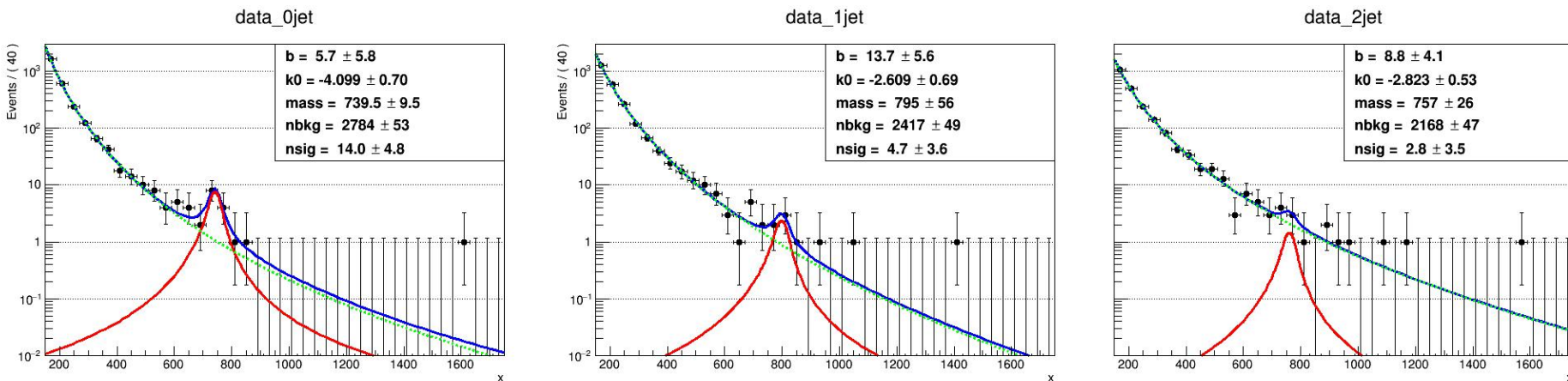
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- review the inclusive Higgs result



categorization---#jet

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- more ideas
 - to be discussed

[650,850]	0jet	1jet	>=2jet	inclusive
signal	10.20	2.28	2.03	16.27
bkg	2.59	3.23	5.69	11.52
significance	4.52	1.15	0.81	4.05
combined	4.73			4.05

- Elisabeth's talk :
https://indico.cern.ch/event/522115/contributions/2138556/attachments/1259929/1861504/Petit_HighMassGG_SelectionCuts_Apr19.pdf



η categories? (2)

- ◆ Expecting significances from section 11.4 of the 13 TeV supporting note
- ◆ Scalar model:

	rel. ET cuts	ET > 55 GeV	
inclusive	3.9 σ	2.8 σ	← 749 GeV
barrel-barrel	5.0 σ	3.3 σ	
barrel-endcap	0.6 σ	1.1 σ	
endcap-endcap	0.2 σ	0.2 σ	
quadratic sum	5.0 σ	3.5 σ	
	↑ 749 GeV	↑ 761 GeV	

- ◆ Graviton model:
 - loose isolation (?)

	ET > 55 GeV
inclusive	4.1 σ
barrel-barrel	4.1 σ
barrel-endcap	2.5 σ
endcap-endcap	0.3 σ
quadratic sum	4.8 σ

- Fuquan's talk :
https://indico.cern.ch/event/522115/contributions/2140772/attachments/1259980/1861588/20160418_PreliminaryCategories.pdf

Expected Z_0	Inclusive analysis	Barrel-endcap categorization	Unconv.-conv. categorization
$k/M_{PI}=0.2$	2.9σ	3.3σ	2.9σ
$k/M_{PI}=0.01$	2.3σ	2.6σ	2.3σ