

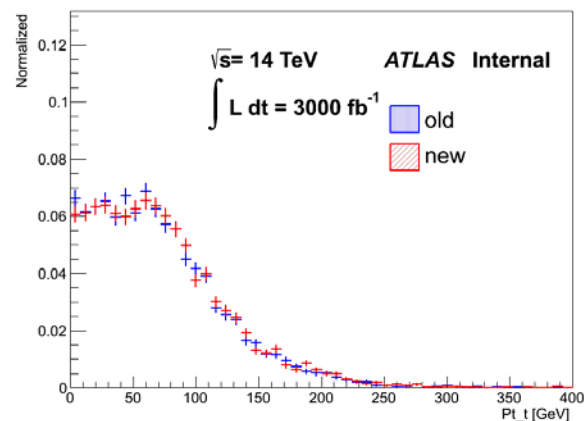
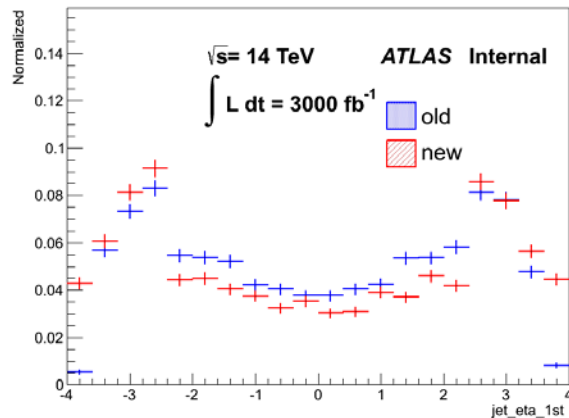
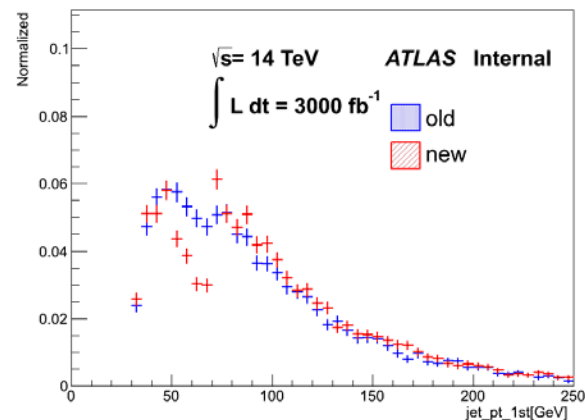
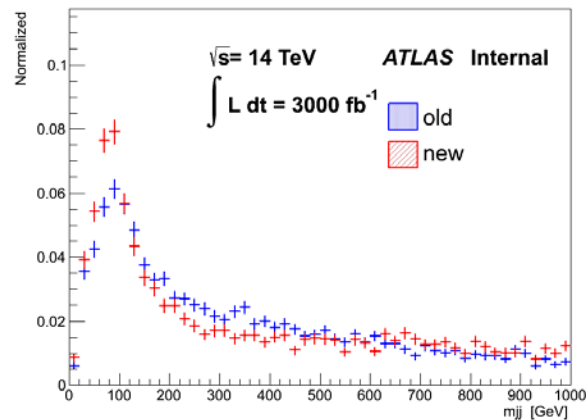
VBF Projection in HL-LHC

All under bronze scenario

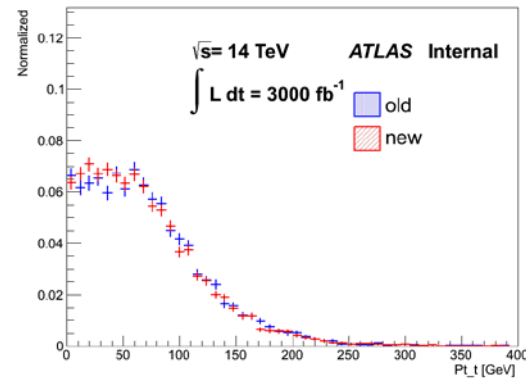
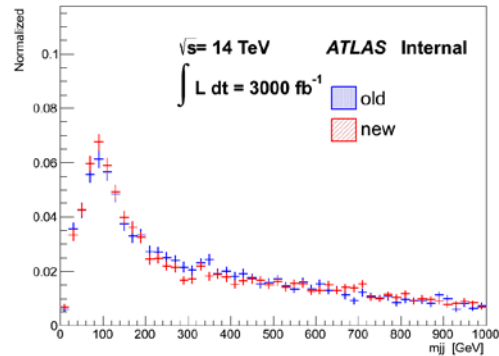
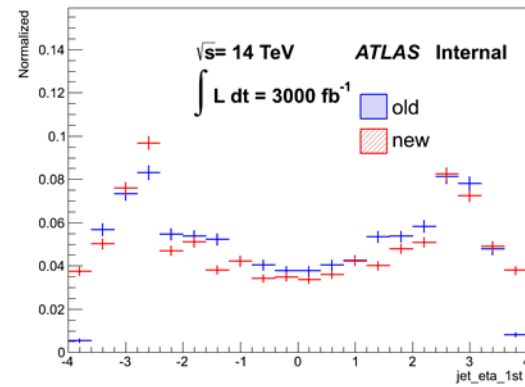
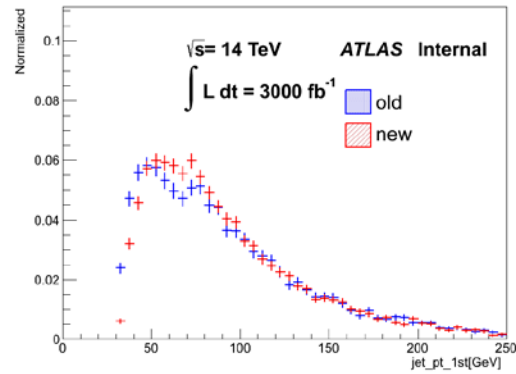
Validation plots for new Framework

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- Release 01-05 with old result , with new lib: PULibrary-Tag-02-01.root



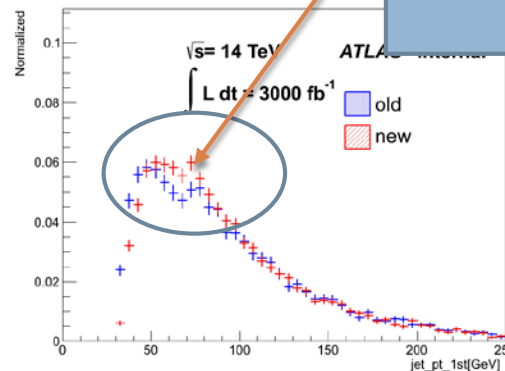
● Release 02-03-02 $M_u = 200$ compare to old frame



Efficiency of pre-selection

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VBF	initial	≥ 2 photon	≥ 2 jets	
Old	50000	11031	7974	
01-05	50000	11666	7878	
02-03-02	50000	11626	10254	



May due to pile-up
jets here

MVA result

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- For 01-05 The MVA result is extremely high
- Need more investigation

DATA Results:

Loose cut: 0.7
Tight cut: 0.93

low category is [0.7,0.93], vbf significance is 4.62802
in 5GeV window the total signal is 1772.46, ggF is 1026.29, VBF is 746.242, ttH is 0, WH is 0, ZH is 0
in 5GeV window fraction of ggF is 0.579021, of VBF is 0.42102, ttH is 0, WH is 0, ZH is 0
in 5GeV window fitted background in 5GeV mass window is 24728.1
in [105,160] the total signal is 2258.5, ggF is 1329.36, VBF is 929.231, ttH is 0, WH is 0, ZH is 0
in [105,160] fraction of ggF is 0.588604, of VBF is 0.411437
in [105,160]total fitted background is 267148
in [105,160] number of data is 251122

high category is [0.93,1], vbf significance is 7.11552
in 5GeV window the total signal is 338.834, ggF is 82.6545, VBF is 256.177, ttH is 0, WH is 0, ZH is 0
in 5GeV window fraction of ggF is 0.243939, of VBF is 0.756055, ttH is 0, WH is 0, ZH is 0
in 5GeV window fitted background in 5GeV mass window is 1130.88
in [105,160] the total signal is 396.615, ggF is 89.5424, VBF is 307.07, ttH is 0, WH is 0, ZH is 0
in [105,160] fraction of ggF is 0.225766, of VBF is 0.774227
in [105,160]total fitted background is 12439.6
in [105,160] number of data is 11082.1

Categorization is [0.7, 0.93, 1] with combined significance 8.48818

MVA result

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- For release 02-03
- Under $\mu = 200$, the result is similar to the nominal one in the old frame

DATA Results:

Loose cut: 0.3
Tight cut: 0.82

low category is [0.3,0.82], vbf significance is 1.91082

in 5GeV window the total signal is 5719.08, ggF is 4787.08, VBF is 932.09, ttH is 0, WH is 0, ZH is 0

in 5GeV window fraction of ggF is 0.837037, of VBF is 0.162979, ttH is 0, WH is 0, ZH is 0

in 5GeV window fitted background in 5GeV mass window is 233095

in [105,160] the total signal is 8721.99, ggF is 7190.89, VBF is 1530.75, ttH is 0, WH is 0, ZH is 0

in [105,160] fraction of ggF is 0.824455, of VBF is 0.175505

in [105,160]total fitted background is 2.39367e+06

in [105,160] number of data is 2.33415e+06

high category is [0.82,1], vbf significance is 5.09811

in 5GeV window the total signal is 2214.37, ggF is 1301.81, VBF is 912.647, ttH is 0, WH is 0, ZH is 0

in 5GeV window fraction of ggF is 0.587893, of VBF is 0.412148, ttH is 0, WH is 0, ZH is 0

in 5GeV window fitted background in 5GeV mass window is 30436.2

in [105,160] the total signal is 3217.16, ggF is 1866.62, VBF is 1350.64, ttH is 0, WH is 0, ZH is 0

in [105,160] fraction of ggF is 0.580208, of VBF is 0.419824

in [105,160]total fitted background is 334799

in [105,160] number of data is 317202

Categorization is [0.3, 0.82, 1] with combined significance 5.44444

Fake vbf study

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- Using mc12_14TeV.181782.MadGraphPythia8_AU2CTEQ6L1_GammaGammaJetJet.merge to mimic $P P \rightarrow \gamma \gamma$ process
- The xsection is calculated with MadGraph5, using same cuts as this sample

run_02	p p 7000 x 7000 GeV	tag 1	6.947 ± 0.027	10000	parton	LHE	remove run launch pythia
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Conclusion

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- ① The Updated
 - ① The distribution validation is OK
 - ① New frame has higher efficiency
- ① Next
 - ① Run all the scenario after fixing everything
 - ① Using fake vbf to get more accurate estimation of $\gamma\gamma$ background