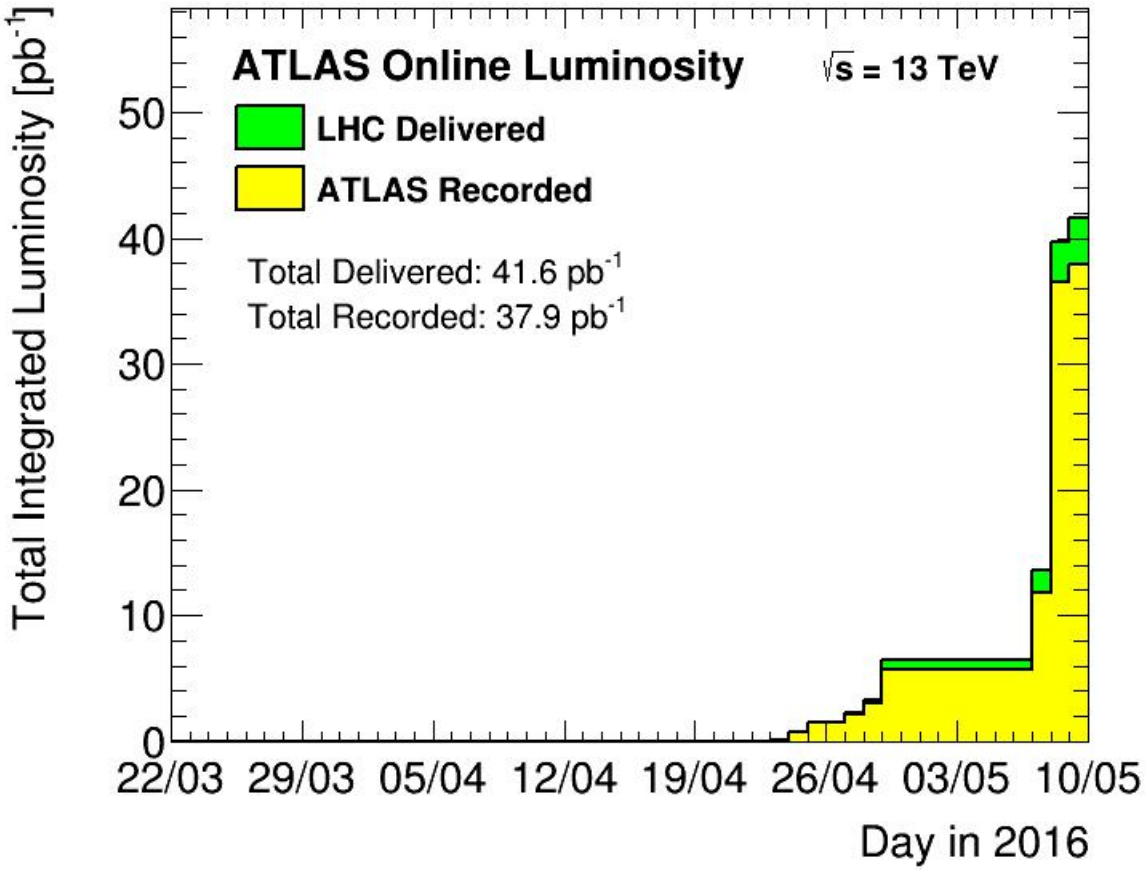
weekly report



Yu Zhang

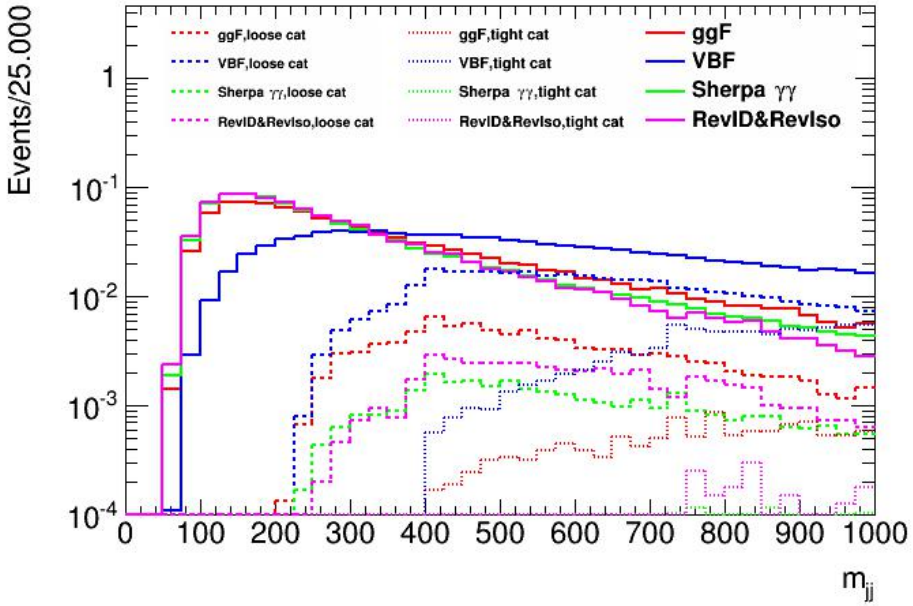
05.09

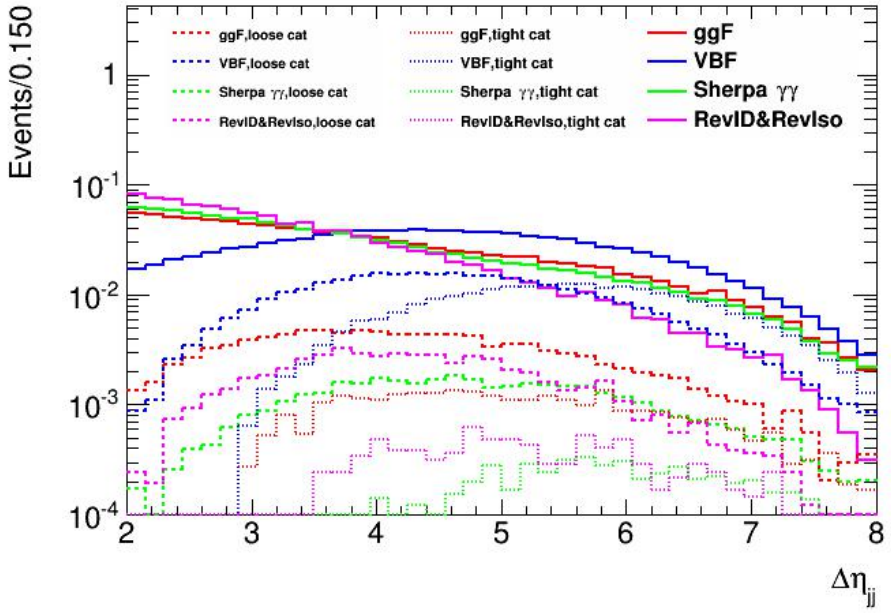
outline

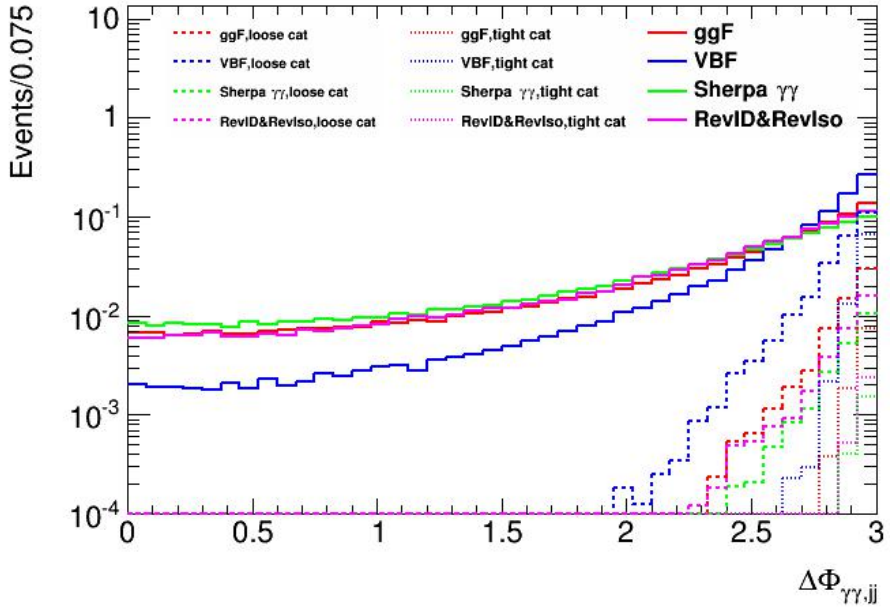
- VBF update
- High-Mass diphoton

VBF update

- begin internal review and plan to touch with EB
- comments from Kerstin:
  - it would also be interesting to add a study that shows which type if events the MVA selects, e.g. add plots of the input variables for signal and background compared before and after the MVA is applied.



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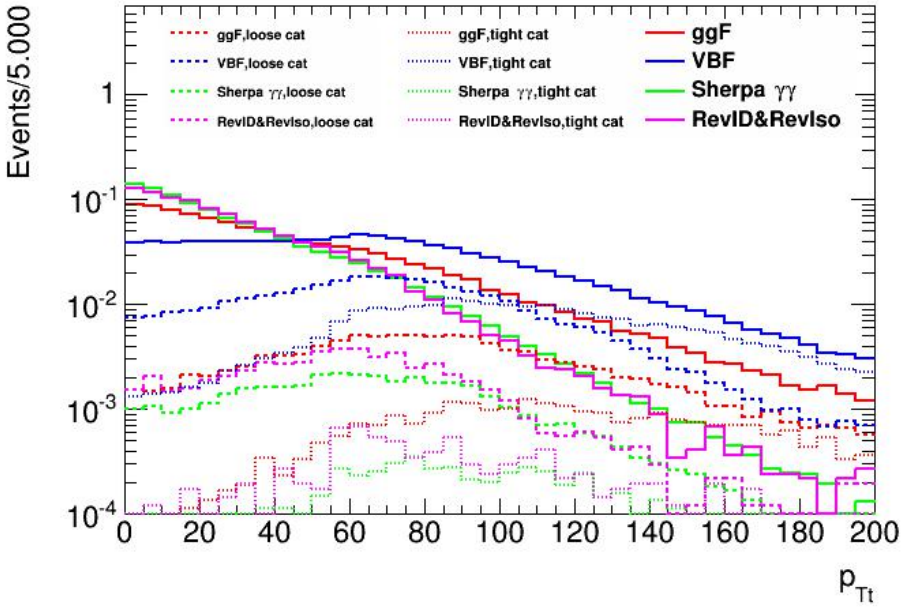
ggF,loose cat
VBF,loose cat
Sherpa γγ,loose cat
RevID&RevIso,loose cat
ggF,tight cat
VBF,tight cat
Sherpa γγ,tight cat
RevID&RevIso,tight cat
ggF
VBF
Sherpa γγ
RevID&RevIso
ΔΦγγ,jj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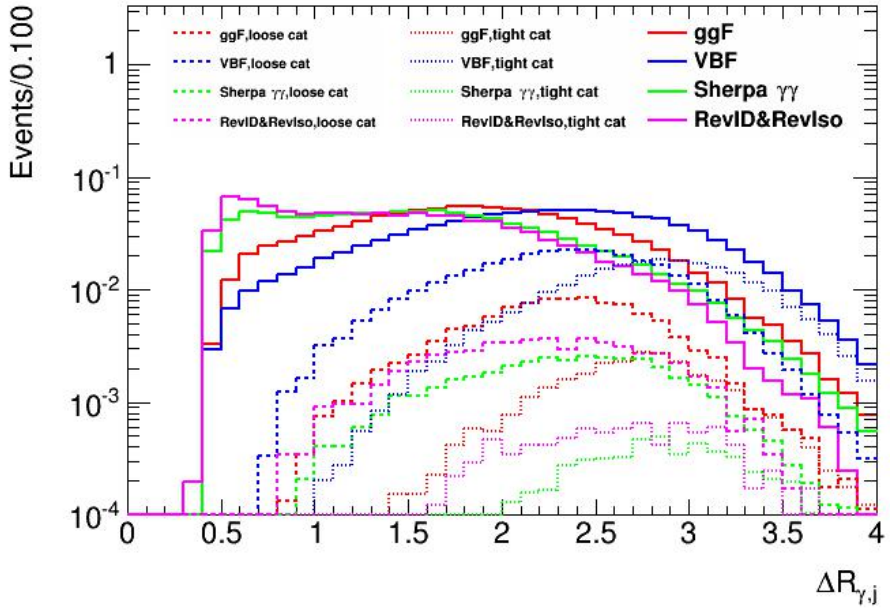
VBF,loose cat
Sherpa γγ,loose cat
RevID&RevIso,loose cat
ggF,tight cat
VBF,tight cat
Sherpa γγ,tight cat
RevID&RevIso,tight cat
ggF
VBF
Sherpa γγ
RevID&RevIso
pTt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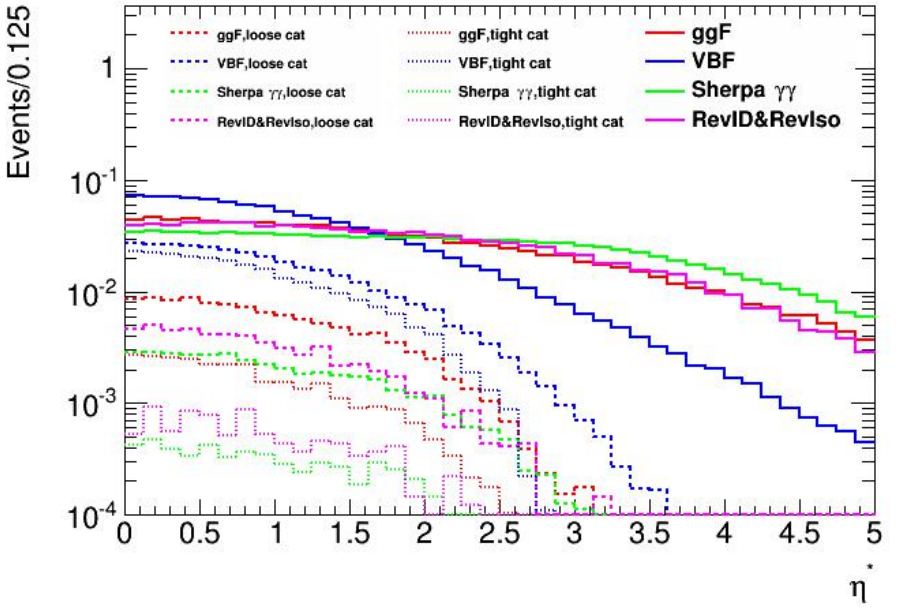
Sherpa γγ,loose cat
RevID&RevIso,loose cat
ggF,tight cat
VBF,tight cat
Sherpa γγ,tight cat
RevID&RevIso,tight cat
ggF
VBF
Sherpa γγ
RevID&RevIso
ΔRγ,j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Sherpa γγ,loose cat
RevID&RevIso,loose cat
ggF,tight cat
VBF,tight cat
Sherpa γγ,tight cat
RevID&RevIso,tight cat
ggF
VBF
Sherpa γγ
RevID&RevIso
η*

High-Mass diphoton---eta category

- Kirill's result

Significance in categories 6%, GeV			
η-cut	Inclusive	3 categories: BB, BE,EE	2 Categories (BB, at least one not B)
0.6	3.93 σ	4.36 σ (+11%)	4.23 → **4.30** σ (+10%)
0.7		-	4.30 σ (+10%)
0.8		4.19 σ (+7%)	4.17 → 4.17 σ (+6%)

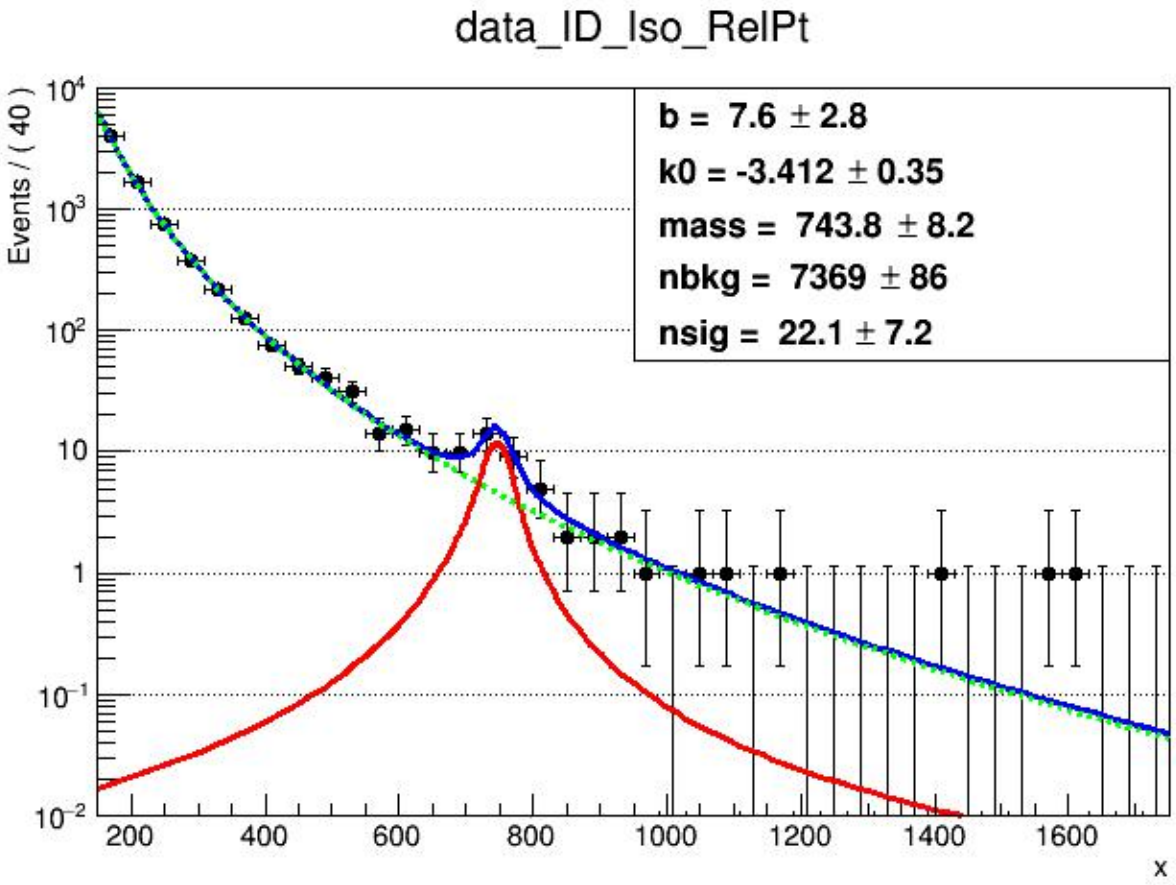
Spin-0 analysis	Scalar Γ_X=6%m_X		Scalar NWA	
	Z_{exp} (σ)	w.r.t inclusive case	Z_{exp} (σ)	w.r.t inclusive case
Inclusive	3.92	—	4.78	—
$\|\eta_{s2}\|$=0.5	4.15	6%	5.01	5%
$\|\eta_{s2}\|$=0.6	4.40	12%	5.14	8%
$\|\eta_{s2}\|$=0.7	4.45	14%	5.19	9%
$\|\eta_{s2}\|$=0.75 (Run 1 mass)	**4.56**	**16%**	**5.34**	**12%**
$\|\eta_{s2}\|$=0.8	4.56	16%	5.31	11%
$\|\eta_{s2}\|$=1.0	4.46	14%	5.22	9%
$\|\eta_{s2}\|$=1.2	4.35	11%	5.13	7%
$\|\eta_{s2}\|$=1.37 (Barrel-endcap)	4.18	7%	5.11	7%

- Hongtao's result
- asimov data should not have big difference with data`

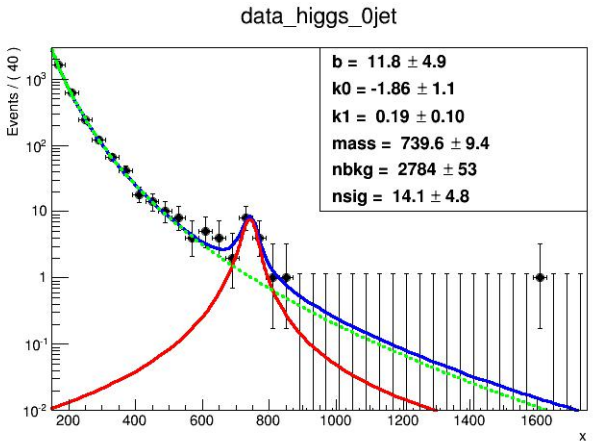
preparation for jet category

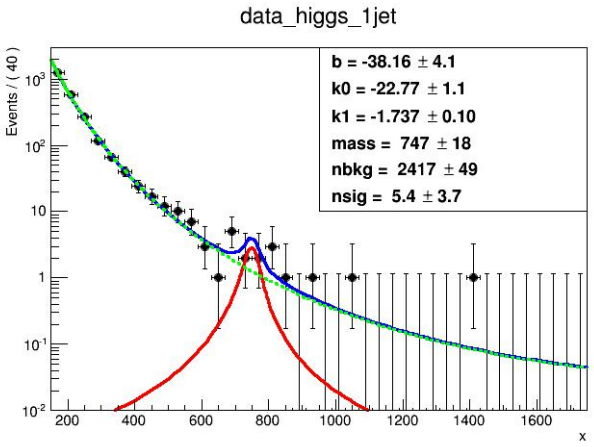
- three options
  - BB(both |eta|<0.75) ,nBB (at least one |eta|>0.75)
  - 0jet, 1jet, >=2jet
  - BB 0jet, BB >=1jet, nBB 0jet, nBB >=1jet
- selection: Higgs selection
- samples
  - data
  - S+B mc: signal and bkg are scaled to fitted signal and bkg
- signal and bkg modeling --- no systematics
  - 6% width signal pdf
  - $(1-x)^{b}x^{k0+k1*\log(x)}$
- significance calculation
  - [700,800]GeV mass window and poisson fomula

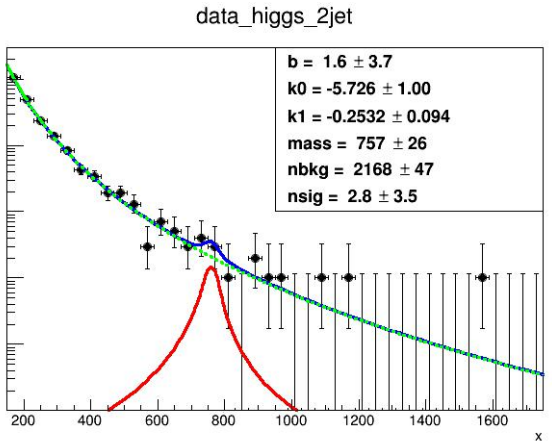
myy spectrum after Higgs selection



0jet, 1jet, >=2jet



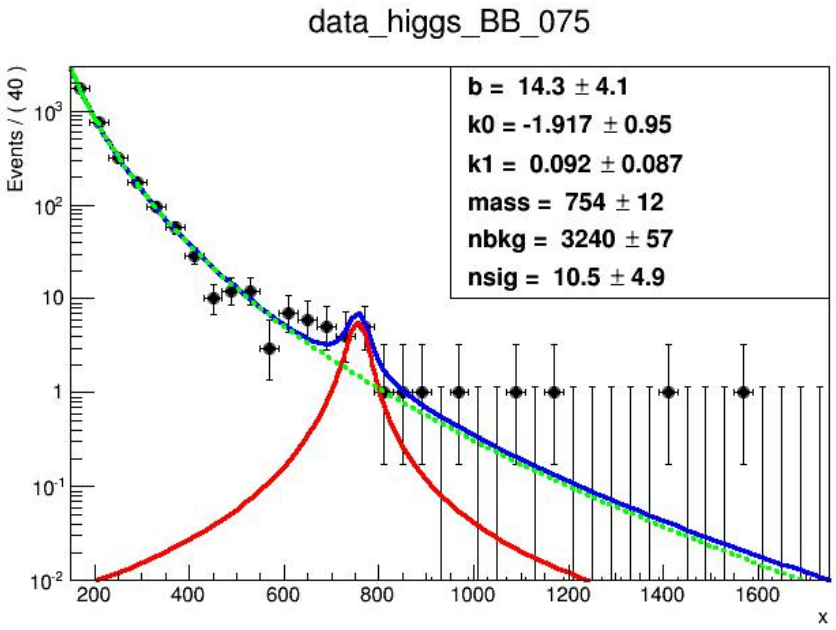


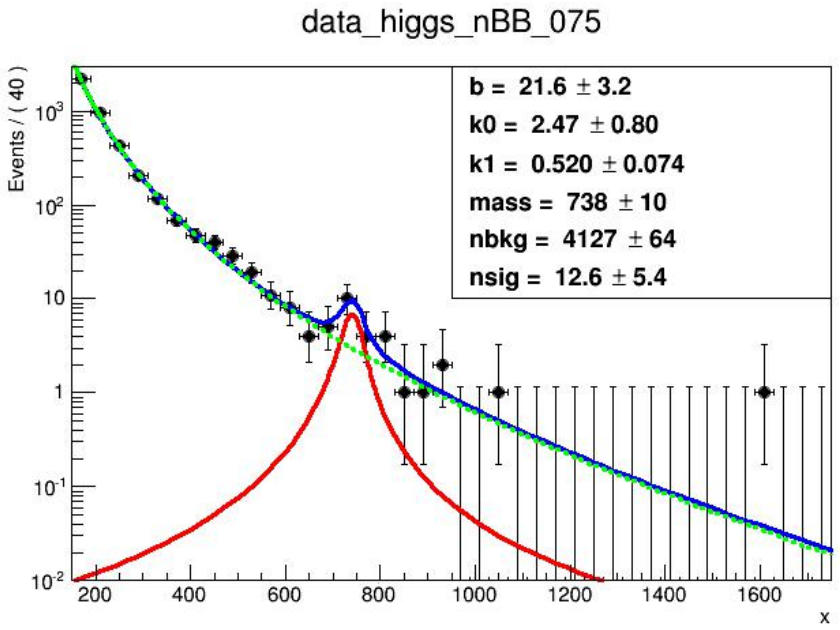


- data

	0jet	1jet	>=2jet	inclusive
signal	10.32	3.95	2.04	16.27
bkg	2.53	3.24	5.65	11.52
significance	4.59	1.89	0.82	4.05
combined		5.03		improve:24%

BB and nBB

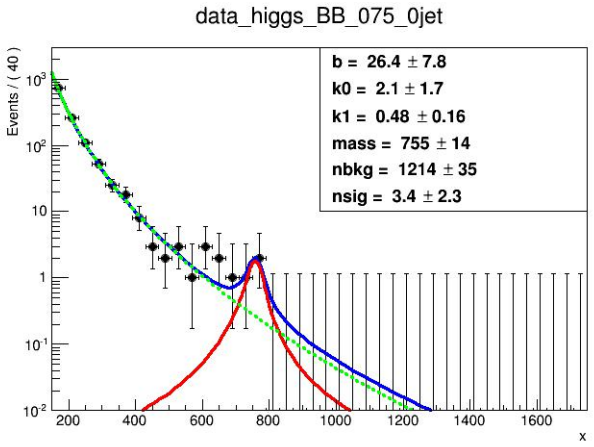


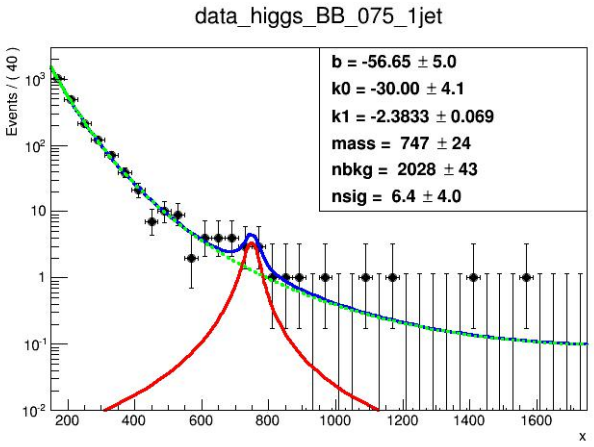


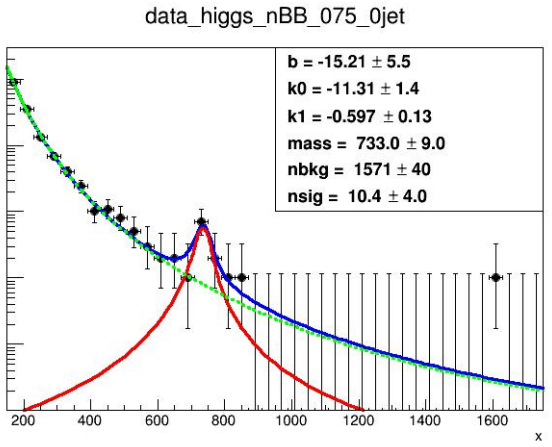
- data

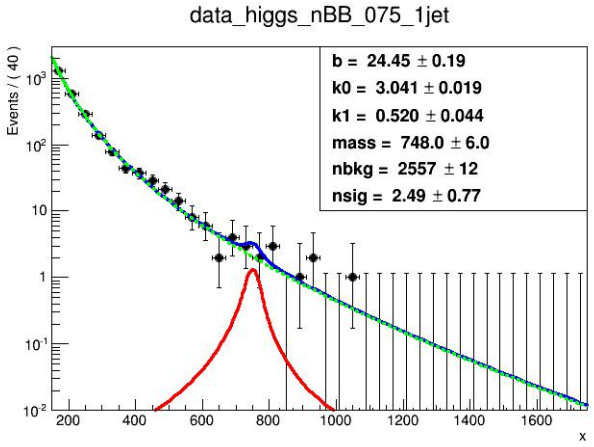
	BB	nBB	inclusive
signal	7.76	9.19	16.27
bkg	4.06	7.19	11.52
significance	3.12	2.93	4.05
combined	4.28		improve:5.6%

BB(0,>=1jet),nBB(0,>=1jet)





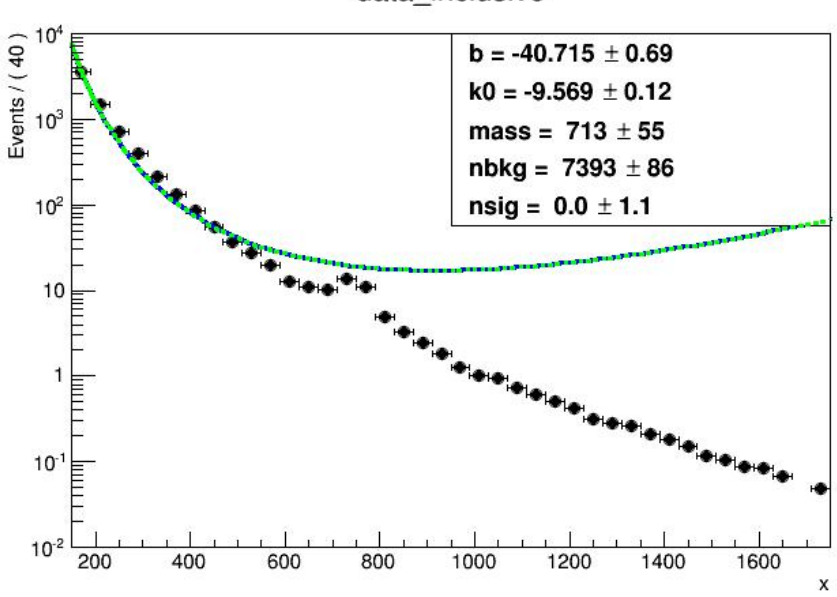


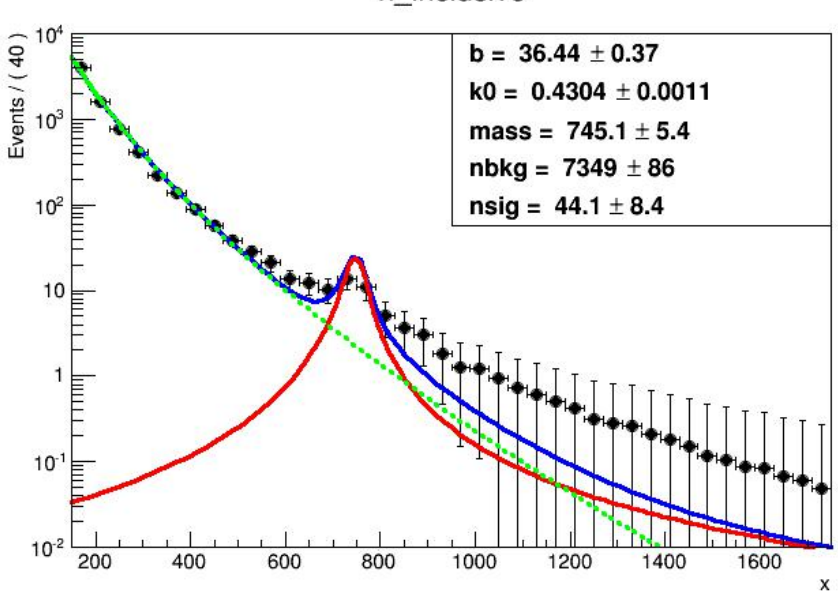


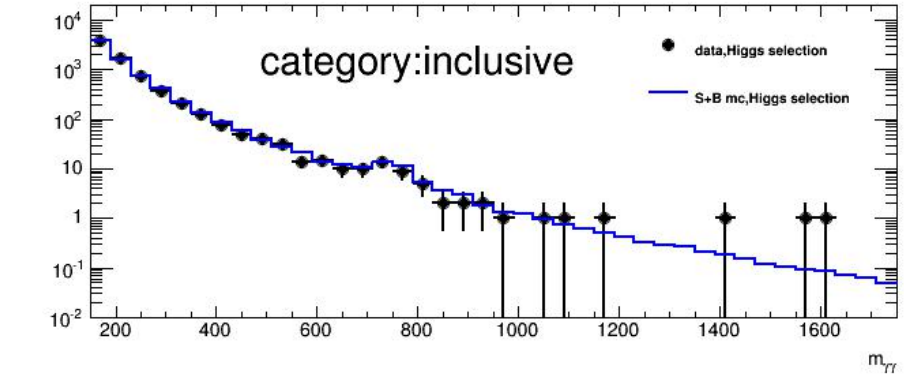
- data

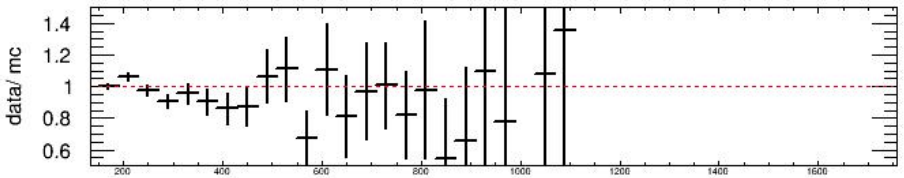
	BB0jet	BB>=1jet	nBB0jet	nBB>=1jet	inclusive
signal	2.53	4.72	7.43	1.84	16.27
bkg	0.73	3.32	1.86	5.29	11.52
significance	2.16	2.19	3.88	0.76	4.05
combined			5.01		improve:24%

test MC









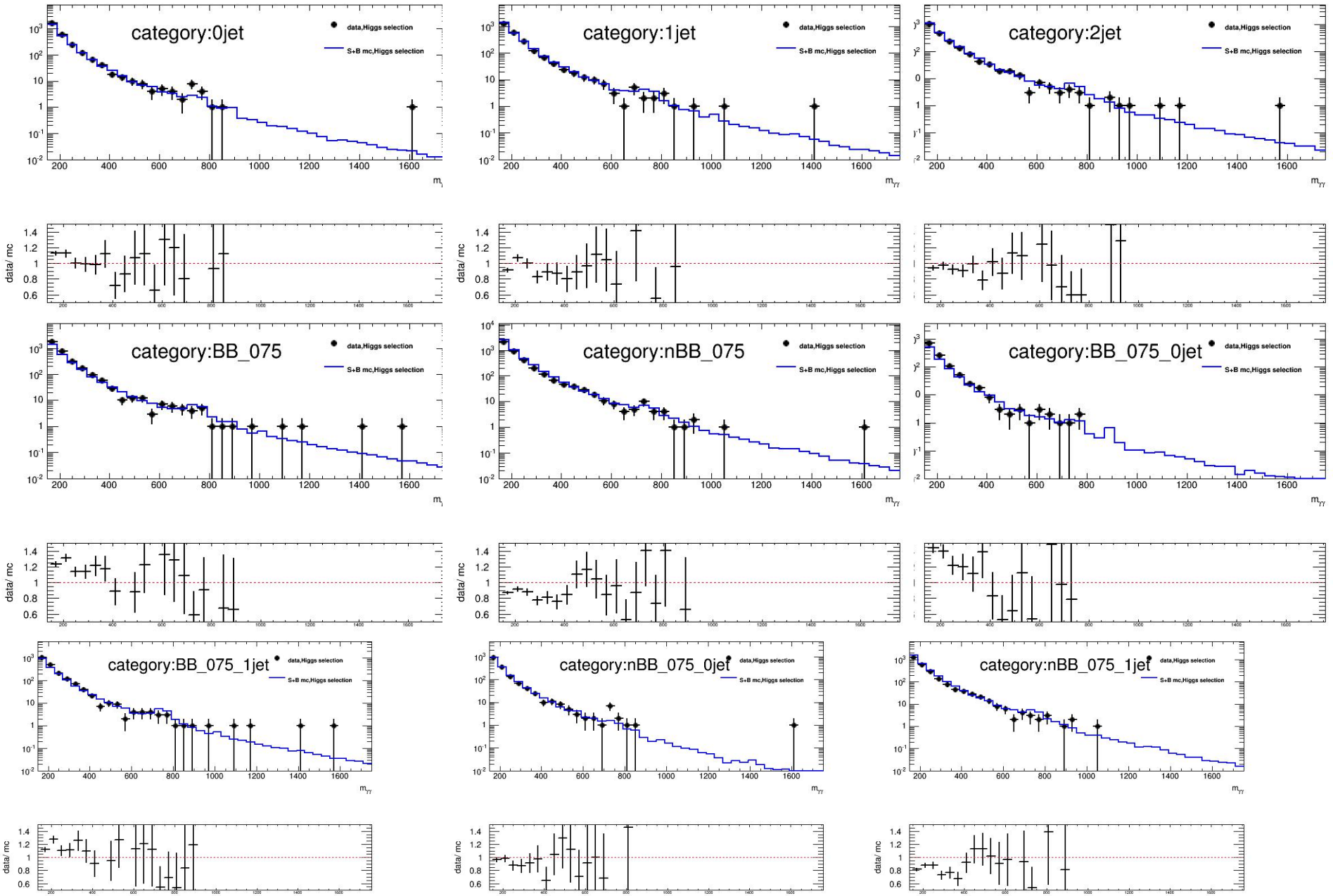
- top left : unbinned fit
- top right : binned
- exactly same function used on data, but strange result
- ratio on the bottom left

test MC

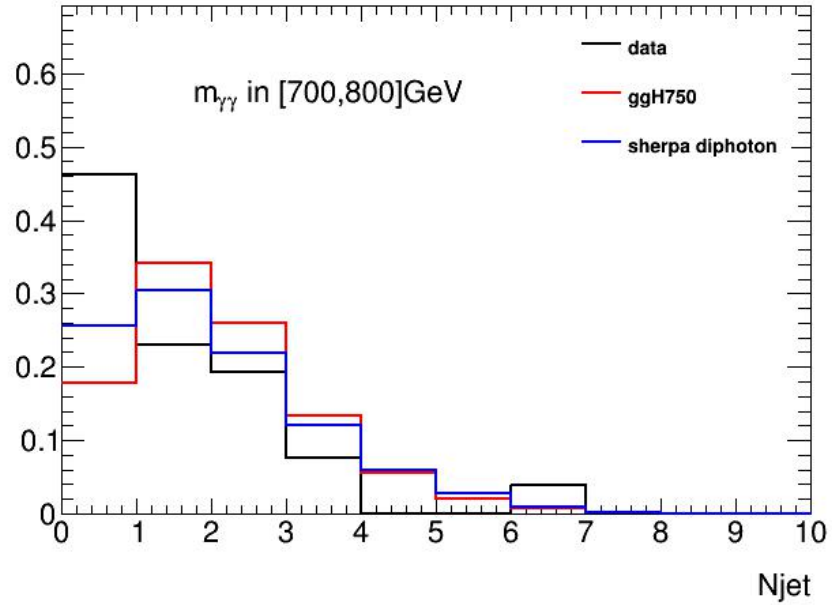
- obtain the parameter value by fitting data and fix it when fit MC? a compromise but not exact way

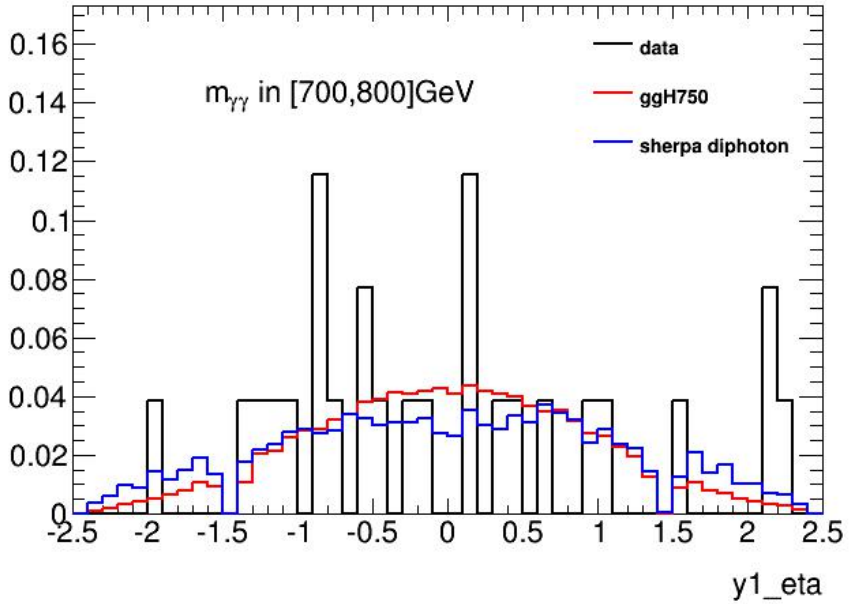
	BB	nBB	0jet	1jet	>1jet	BB0j	BB>0j	nBB0j	nBB>0j	inc
signal										
bkg										
signifi	**5.00**	**2.07**	**2.47**	**2.74**	**2.63**	**2.99**	**4.00**	**0.84**	**1.80**	**4.05**
comb	**5.41**			**4.53**			**4.46**			**4.05**

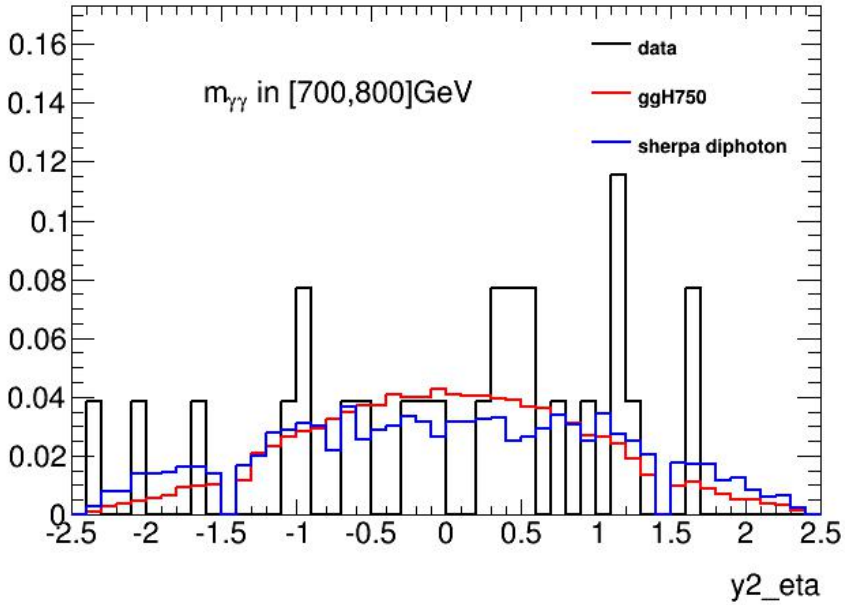
data/mc comparison in each cat



data/mc comparison



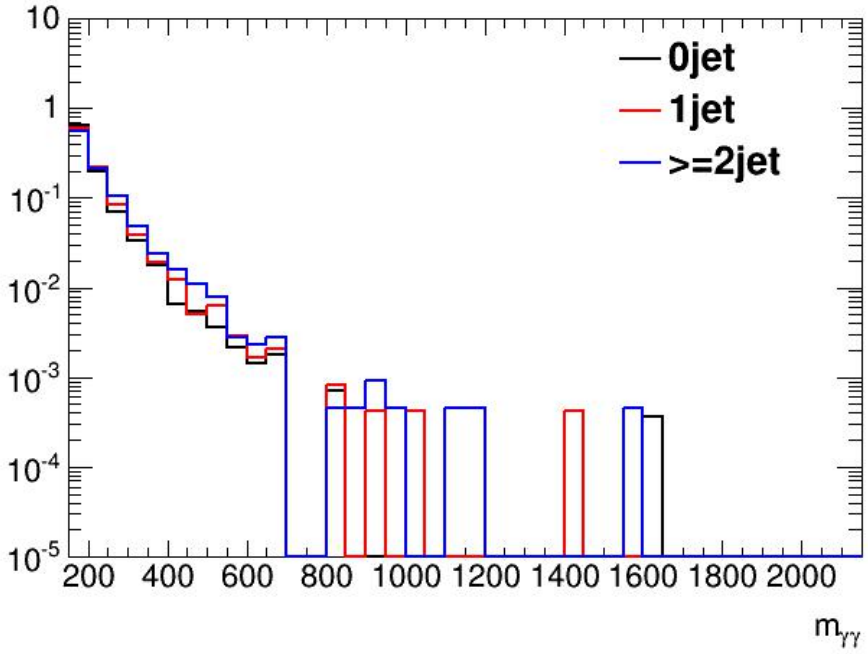


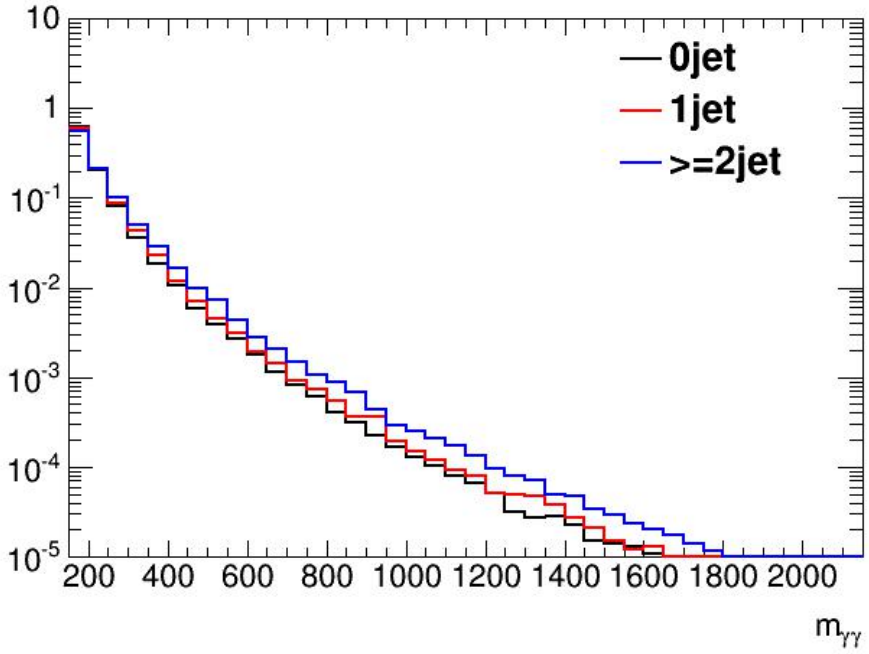


- Njet in data is not consistent with MC
- jet multiplicity could be model dependent
- jet multiplicity could be used to understand production mechanism

bkg shape in jet category

- exclude [700,800]GeV
- left is data, right is Sherpa diphoton mc
- bkg in 0jet category goes down more quickly as myy increases





photon-photon fusion?

- talk from someone else
- but where the photons come from? VBF-like?

Feynman diagrams

- import model HEFT
- generate a a > h, h > a a

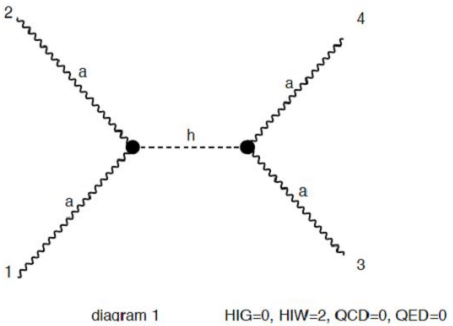


diagram 1 HIG=0, HIW=2, QCD=0, QED=0

- Import model heft
- Generate p a > h j, h > a a

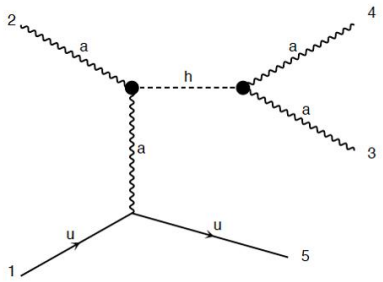


diagram 1 HIG=0, HIW=2, QCD=0, QED=1

- Import model HEFT
- Define qa = a u u~ c c~ d d~ s s~ b b~
- generate qa qa > h j j HIW=1 HIG=0 QED=2 QCD<=1, h > a a

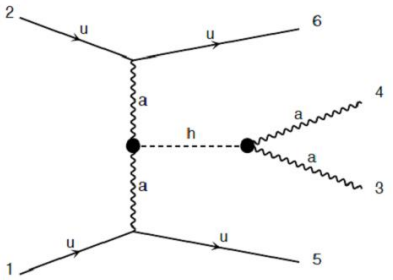
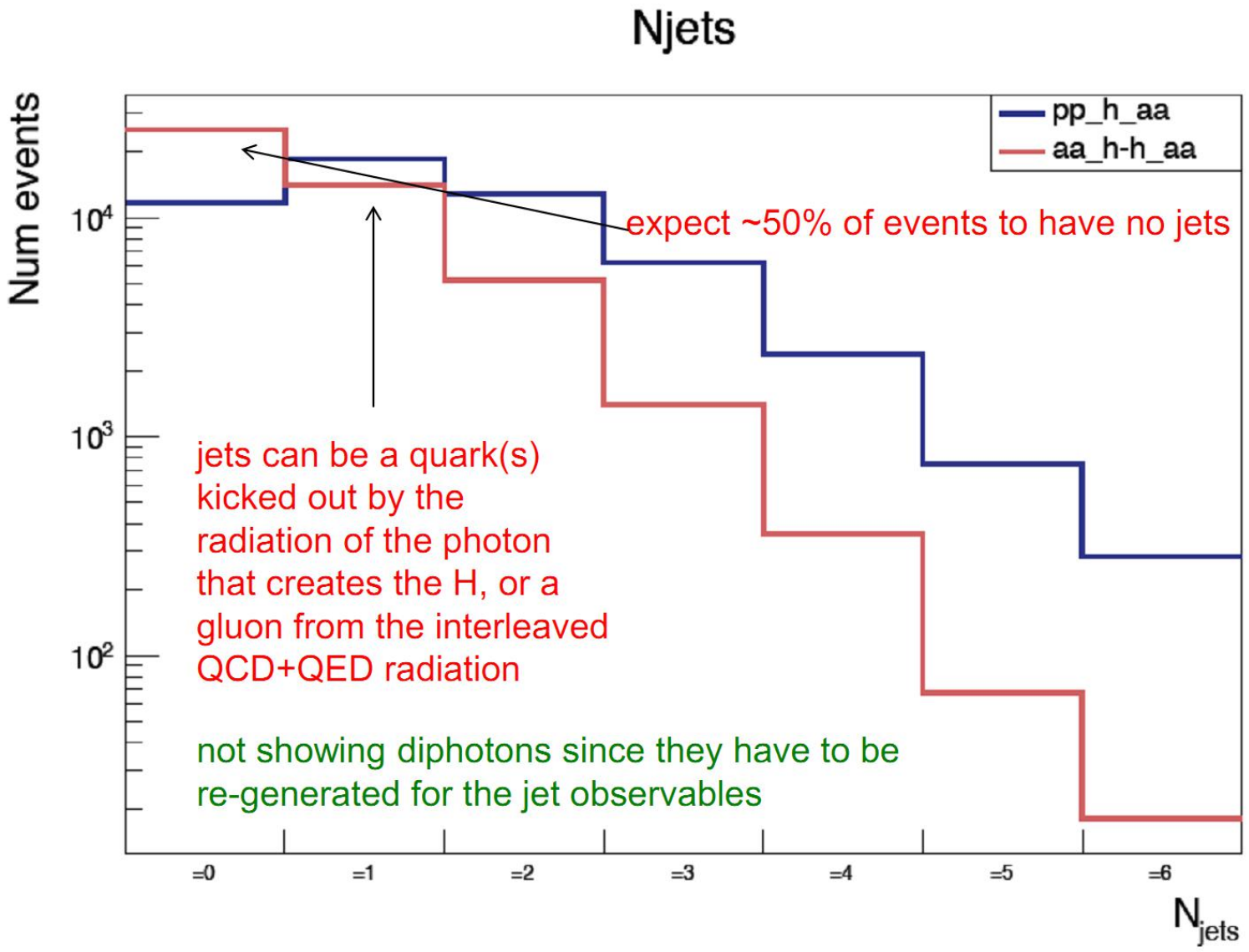


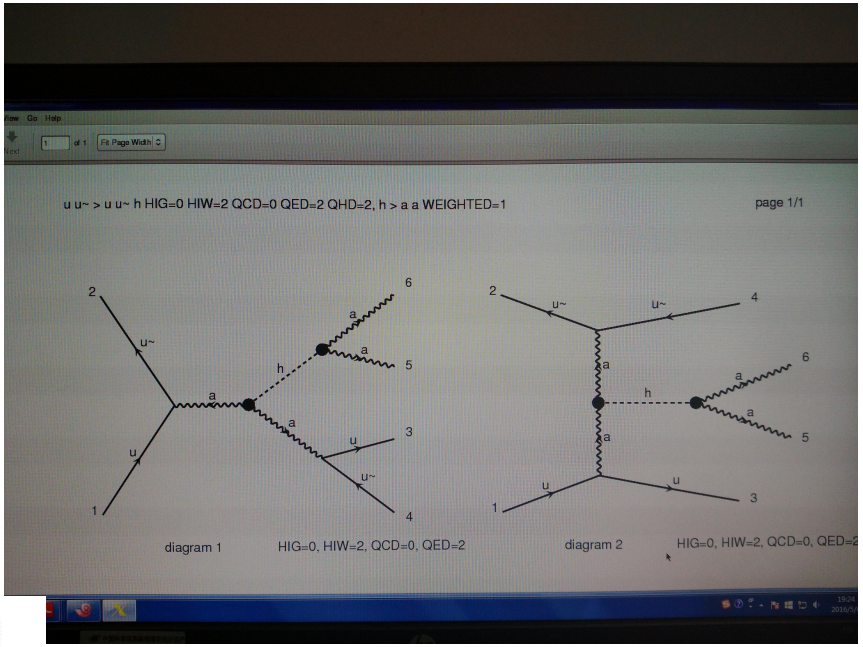
diagram 1 HIG=0, HIW=2, QCD=0, QED=2

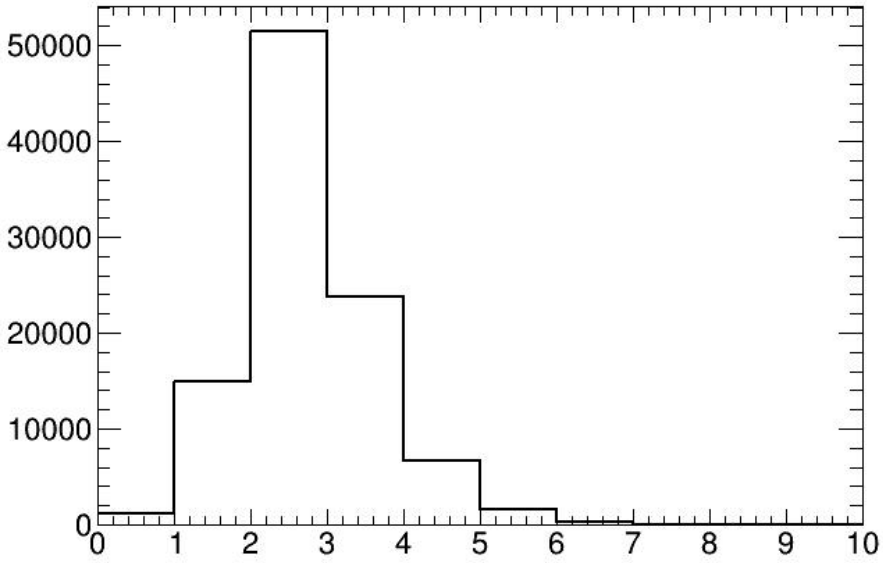
photon photon fusion



Maosen's Ntuple

- check the jet multiplicity
  - pT>25GeV,|eta|<4.4
  - VBF sample
- a a >h, h > a a ?





Summary