Brief report (updated) January 2014

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Introduction



- Focus on the bias of the signal strength in the fit to the expectaion after combination since the last talk
- Find out the bug (renaming is not automatically implemented for embedded datasets [reported to statistics mailing list]) and solve it in combining workspace
- The new self-made models are based on the inputs from the analyses
 - Next, I will show the simplified model for the two analyses, since their workspace are not yet fully ready

H->hh->bbbb

- Extract the signal and background templates from a preliminary workspace provided by bbbb group
 - signal: lumi, jer
 - qcd (data-driven): qcd_shape
 - ttbar (data-driven): ttbar_norm
- Use a template on invariant mass of the resonance



Jets b-tagged and with p_T > 40 GeV

H->hh->bbyy

- No preliminary workspaces are available from bbyy
 - signal: lumi, jer
 - bkg: lumi, jer
- Only 1 bin is used for now, event counting

Next, I will show you the expected results after fitting to the self-made templates

Standalone fit results (expectation)

Fit to bbbb standalone 1 +0.324196 -0.293413 Fit to bbyy standalone 1 +0.895964 -0.604801



Combined fit results (expectation)



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A recent review on Pythia8

- Motivated by the newly release MG5_aMC@NLO, one may start to validate the new implementations in MG5 with the comparison of Pythia8
- Last studies on Pythia8:
 - Compared MG5 vs PY8, and found up to mH=500GeV, MG5 heft works well
 - The only problem is that PY8 cannot produce the width properly
 - The corresponding solution is NWA (narrow width approximation), which should work thearetically, well, never works in the real world for process gg->H->hh (after many struggles)
- Next, I will show you
 - NWA gg->H (we are only interested in this production)
 - NWA all->H
 - No NWA all->H

• Turn on NWA and turn on gg->H->hh

*	PYTHIA	Event	and C	ross	Section	Statistics								*
1														I.
Subproce	Subprocess				Code	1	Nu	umber of eve	ents	1	sigma +	- delta		
1							1	Tried	Selected	Accepted	Ι.	(estimate	ed) (mb)	I.
1							1				Ι.			I.
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1							1				1			I.
I							1				1			I.
sum							1	0	0	0	1	0.000e+00	0.000e+00	I.
1														I.
*	End PYT	HIA Ev	ent a	and Cr	oss Sect	tion Statist:	ics							*

• So the pure gg->H is always vanishing

Turn on NWA and turn on all->H->hh



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Turn on NWA and turn on all->H->hh



• Turn off NWA and turn on all->H->hh

Subprocess	Code	Nt	umber of eve	ents	sigma +- delta		
	1	Tried	Selected	Accepted	(estimat	ed) (mb)	
$f_{\text{fbar}} \rightarrow H0(H2)$	1021	12	1	1	6.874e-18	6.874e-18	
g g -> H0(H2)	1022	5731	531	528	1.795e-15	5.183e-17	
f fbar -> H0(H2) Z0	1024	105	6	4	8.096e-18	3.611e-18	
f fbar -> H0(H2) W+-	1025	202	4	3	1.477e-17	6.153e-18	
f f' -> H0(H2) f f' (Z0 Z0 fusion)	1026	7890	142	140	4.216e-16	1.621e-17	
f_1 f_2 -> H0(H2) f_3 f_4 (W+ W- fusion)	1027	18910	325	321	1.115e-15	2.809e-17	
g g -> H0(H2) t tbar	1028	475	4	3	5.272e-18	2.113e-18	
q qbar -> H0(H2) t tbar	1029	354	1	0	0.000e+00	0.000e+00	
sum		33679	1014	1000	3.368e-15	6.198e-17	

- One can see that the pdocution rate is large mH set to 800GeV
 for gg->H
- Well, in this case, the width is totally out of control



Particle.M {Particle.PID==35}

Conclusion on Pythia8

- Whenever NWA is turned on
 - gg->H vanishes
 - other processes (except qqbar->H) do not, instead, increase
- Solutions?
 - Instead of setting a narrow width, introduce **a mass window**



Conclusion

- The combination machinary is fully in place and debugged, giving reasonable and proper combination results now
- Started to contact bbbb/bbyy people to unify the systematic sources as well as the mass points we need to scan
- Next, I will implement the ATLAS-suggested statistical interpretation on the combined model
 - Low-count regime: not using asymptotic distributions, still run the toys
- MG5 validation
 - Try to make a mass window in pytha8 and compare with MG5 to see what's gonna happen
 - Contact Nikos for some new validation if possible?