Higgs BR study

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Current status

- ATLAS and CMS report the latest results of the Higgs boson seach at Dec. 13. 2011
  115.5 < Mh < 131 GeV in ATLAS
  115 < Mh < 127 GeV in CMS
  - Mh~125 GeV peak in H→$\gamma\gamma$?
  - Mh=124~126 GeV in H→ZZ→4l several events
- Consider to analyze Mh=120, 125, 130 GeV to follow up the LHC results.
  - Mh = 125 GeV full simulation sample exists?

H→WW* analysis

H→WW*→4j reconstruction, Ecm=250 GeV, L=250 fb^{-1}

P(e+,e-)=(-30%, +80%) electron right handed pol.

Forced four-jet clustering, then select best jets pair with minimum χ^2

Require M_{j12} is on-shell W and M_{4j} is Higgs

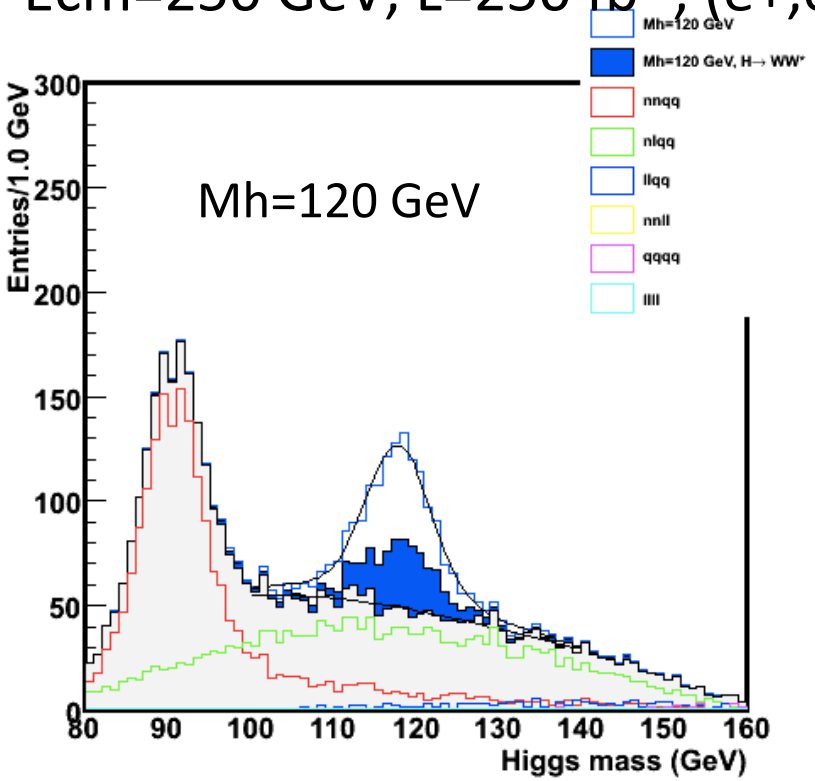
$$\chi^2 = \left(\frac{M_W^{\text{Rec}} - M_W}{\sigma_W} \right)^2 + \left(\frac{M_H^{\text{Rec}} - M_H}{\sigma_H} \right)^2$$

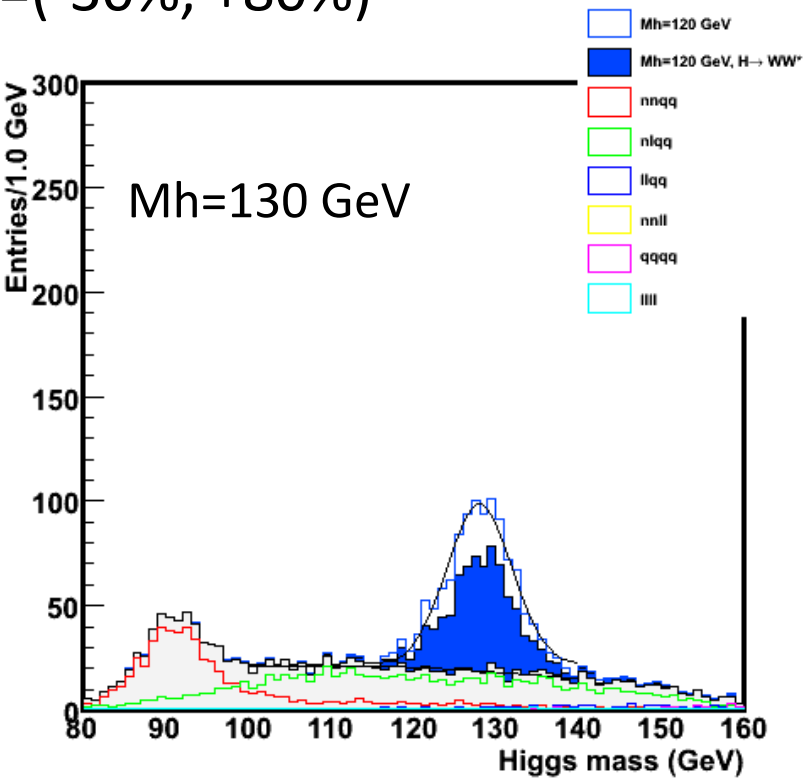
1. 110<Mh<130, 120<Mh<140 GeV
2. 70 < Miss mass < 140 GeV
3. W11 Y minus > 0.0005
4. $|\cos\theta_h|<0.95$
5. Max E_{trk} < 30 GeV
6. W1/W2 b-likeness < 0.2 (No b-jets)
7. b-likenss (2j) < 0.2 (Reject H→bb)
8. likelihood > 0.7

1. Missing mass
2. $\cos\theta_h$
3. W11 Y34
4. W1 b-likeness
5. # of charged tracks

Different mass analysis in H→WW*

Ecm=250 GeV, L=250 fb^{-1}, (e+,e-)=(-30%, +80%)





ΔBR/BR(H→WW→4j)=13%

ΔBR/BR(H→WW→4j)=7%

Preliminary results

Well suppressed by LR cut, check more detail

Including 2.5 % σ_{ZH} uncertainty

BG reduction summary (Mh=120 GeV)

	Gen	Rec	Mh	MissM	Y-	cos	w-blike	b-like(2j)	Etrk	LR
vvww4j	678	678	611	604	603	579	564	548	536	367
vvww	1486	1408	638	632	629	604	589	573	561	372
vvbb	7101	7101	4628	4585	4001	3816	662	300	293	128
ZH all	10634	10396	6255	6194	5463	5219	1988	1592	1553	915
nlqq	298103	298103	34186	16975	14132	12410	11986	11746	11114	1060
nnqq	63649	63649	2382	2334	1890	1712	1400	1354	1290	230
llqq	335756	335753	5502	2611	2278	913	612	571	535	68
nnll	108074	58504	6249	5553	90	80	80	80	70	0
qqqq	378726	378726	529	172	170	18	11	9	9	2
llll	753964	752157	16913	6836	2159	471	447	432	363	0
SM all	1938270	1886890	65761	34481	20719	15603	14535	14191	13380	1361
Sig.	0.49	0.49	2.28	3.00	3.73	4.01	4.39	4.36	4.39	7.70

Signal significance: 7.70 for H→WW*→4j

BG reduction summary (Mh=130 GeV)

	Gen	Rec	Mh	MissM	Y-	cos	w-blike	b-like(2j)	Etrk	LR
vvww4j	1345	1345	1219	1203	1202	1146	1124	1109	1085	535
vvww	2918	2767	1245	1230	1228	1171	1149	1134	1109	537
vvbb	4774	4774	3056	3020	2597	2474	522	267	259	47
ZH all	9413	9129	5175	5111	4576	4360	2319	2037	1985	807
nlqq	298103	298103	36683	15929	13014	11550	11171	10932	10272	283
nnqq	63649	63649	1530	1509	1199	1102	908	872	826	49
llqq	335756	335753	6457	2874	2473	1104	740	688	645	28
nnll	108074	58504	5723	4772	76	69	68	68	59	0
qqqq	378726	378726	665	197	194	26	14	13	12	3
llll	753964	752157	20317	7935	2538	624	590	577	476	3
SM all	1938270	1886890	71376	33216	19494	14475	13491	13150	12291	366
Sig.	0.96	0.98	4.40	6.15	7.75	8.35	8.94	9.00	9.08	15.62

Signal significance: 15.6 for H→WW*→4j