Higgs BR study status

ILC Physics and software meeting

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Current status of Higgs BR analysis

- 250 GeV qqh anaysis
  - TMVA cut analysis is still on going
- 350 GeV nnh (separate Zh and WW-fusion) re-analyze
  - Current results are inclusive of Zh and WW-fusion →Separate sample with missing mass as first step
  - Binning dependency of template-fitting is well evaluated by Felix. Check his strategy to update the results

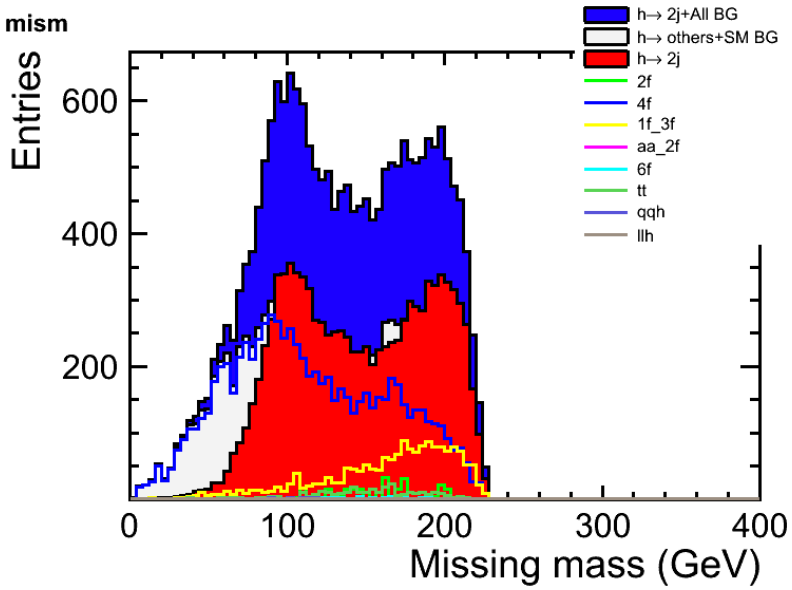
Cut flow for 350 GeV Zh

cuts	h->bb	h->cc	h->gg	h->other	2f	4f	1f_3f	aa_2f	6f	tt	Zh other
No cuts	18,737	864	2,739	10,215	2.4×10^{7}	1.1×10^{7}	5.1×10^{8}	3.4×10^{8}	47,676	273,011	53,747
30<pt<150 GeV	16,024	755	2,392	7,896	507,278	3,598,350	809,292	4,805	20,075	128,889	10,081
|pz|<130 GeV	15,896	747	2,363	7,839	489,993	3,406,920	738,521	4,607	20,060	128,843	10,072
30<NPFOs<100	15,579	716	2,231	4,919	150,909	2,340,950	429,814	0	15,035	93,016	8,297
120<Evis<200 GeV	14,413	679	2,132	4,145	3,325	417,567	195,480	0	1,487	7,658	774
-log(lY34)>2.0	13,980	657	1,956	2,938	3,227	393,059	190,901	0	904	4,844	559
-log(Y23)>1.5	12,499	588	1,601	1,760	2,635	270,214	174,878	0	353	2,005	301
110<Mh<140 GeV	10,234	539	1,525	1,142	558	86,663	8,554	0	116	658	124
LR>0.58	8,513	418	1,322	702	231	8,190	1,805	0	58	297	40
80<MisM<110 GeV	1,774	98	358	247	4	1,889	140	0	9	24	10
B-likeness>0.2	1,700	3	11	13	2	218	1	0	6	21	2

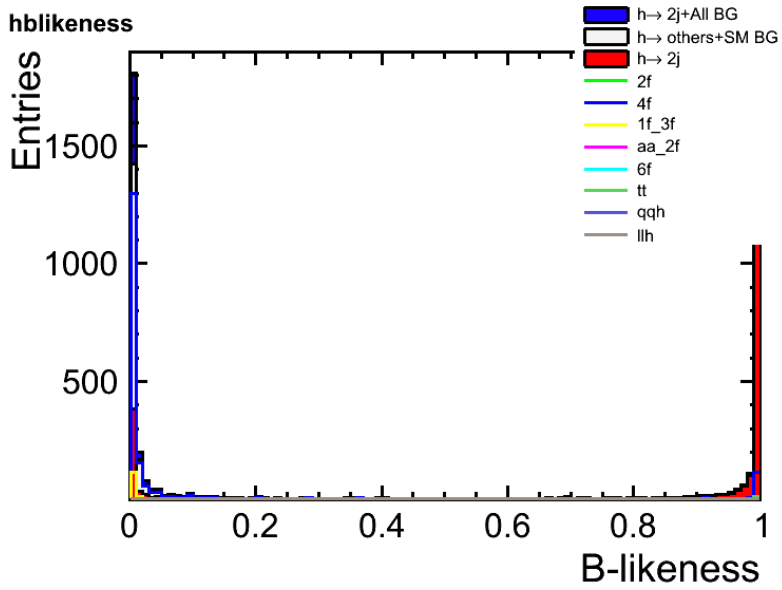
Simple Missing mass and b-likeness cut to evaluate h→bb @ 350 GeV Zh channel

Zh and WW-fusion at 350 GeV

Missing mass after all cuts



B-likeness



Cut on 80 < MissM < 110 GeV for Zh channel

B-likeness > 0.2

Signal significance = 38.2 for Zh, h→bb after B-likeness cut @350 GeV

→ $\Delta\sigma_{Zh}BR/\sigma BR$ (h→bb)=2.6%

Felix tried to separate using templates including Missing mass

vvh @ 350 GeV Zh and WW-fusion

Template fitting result (First trial)
Cut with Missing mass (80<MissM<110 GeV)
Ecm=350 GeV , L=330 fb^{-1}, P(-0.8, +0.3)

Preliminary

vvh	$\Delta\sigma_{Zh}BR/\sigma_{Zh}BR$	$\Delta\sigma_{Inc}BR/\sigma_{Inc}BR$
h→bb	2.5%	1.2%
h→cc	21.4%	10.9%
h→gg	11.2%	6.7%

Zh and WW-fusion separation is not good

→ Use both Missing mass and Thrust
→ New template with missing mass (Felix)