

Status report on $H \rightarrow b\bar{b}$ analysis on pure hadronic channel

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Intro



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- try to look at SM Higgs in low mass region, by using its $H \rightarrow b\bar{b}$ decay, to use the large branching ratio;
- also interest for neutral SUSY Higgs, with similar decay;
- Use associate production to reject hadronic background
 $pp \rightarrow b\bar{b}H \rightarrow b\bar{b}b\bar{b}$
- Signature:
 - ▶ multiple b – *tag* jets in the event;
 - ▶ reconstruct $b\bar{b}$ invariant mass;
- backgrounds:
 - ▶ mostly QCD, with real or mistagged b-jet;
 - ▶ $t\bar{t}$, Zbb , ZZ , WZ , ...

Which HLT trigger?

- **leptonic trigger**: requires one b semi-leptonic decay;
- Non isolated lepton: current threshold $\mu : p_t > 15 \text{ GeV}$ quite high for a μ from b , but still feasible;
- at higher lumi, not efficient.
- **hadronic+lepton trigger**: such as HT70_Mu5. Lower μ threshold, more efficient (Ugo).

Pure hadronic trigger

Several HLT triggers available:

- **Single Jet**
- **Di-Jet**
- **Quad-Jet**
- **HT**

Check eff with signal



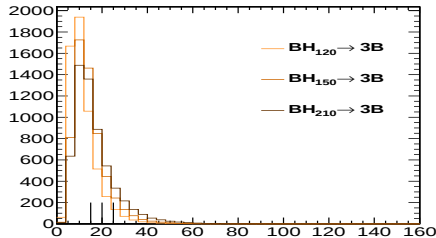
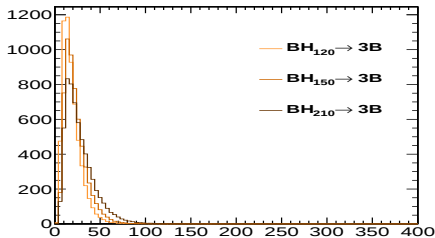
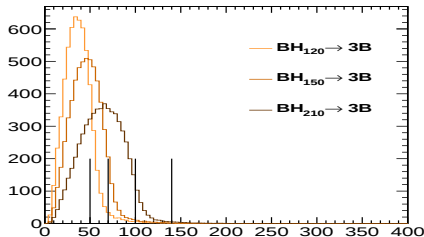
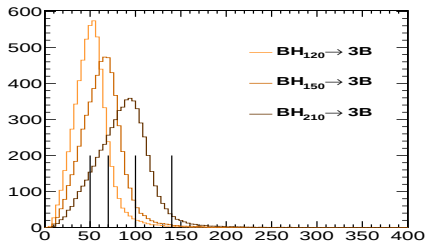
Running trigger table



Run range		$\int \mathcal{L} dt$ pb^{-1}	Single Jet		Di-Jet		Quad-Jet		HT	
first	last		th.	PD	th.	PD	th.	PD	th.	PD
142076	144114	3.17	50	JetMET	50	JetMET	15	JetMET	100	JetMET
144114	146707	0	50	JetMET	50	JetMET	15	JetMET	100	JetMET
146707	147147		70	Jet	70	Jet	20	Jet	100	Jet
147147	147926		100	Jet	100	Jet	20	MultiJet	140	MultiJet
147926	148783		140	Jet	140	Jet	20	MultiJet	140	MultiJet
148783	148801		140	Jet	140	Jet	20	MultiJet	140	MultiJet
148801	-		140	Jet	140	Jet	25	MultiJet	150	MultiJet

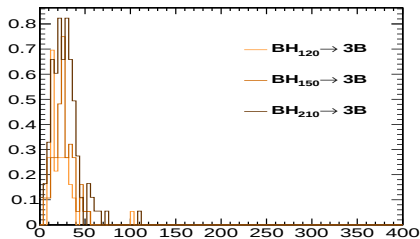
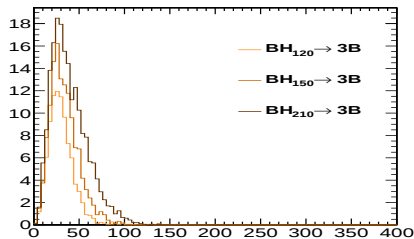
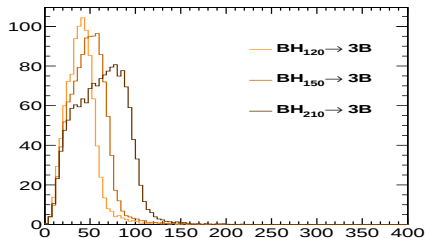
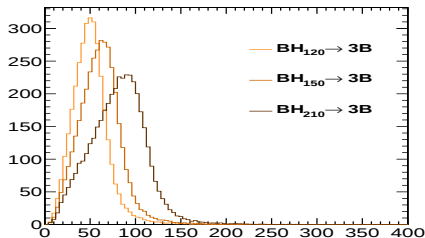


Jet pt 1,2,3,4: SM Higgs



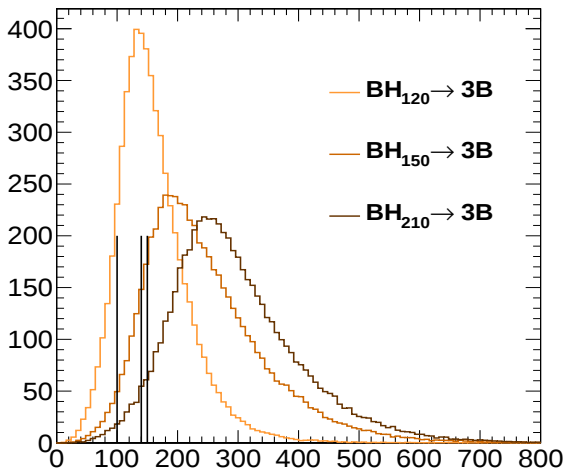


b-Jet pt 1,2,3,4. SM higgs





HT (scalar sum of jet pt)





HLT Trigger eff from MC simulation



Path	$M_H = 120 \text{ GeV}$	$M_H = 150 \text{ GeV}$	$M_H = 210 \text{ GeV}$
Mu11	8%	12%	16%
Jet30	86%	93%	97%
Jet50	45%	69%	88%
Jet70	2%	25%	60%
Jet100	-%	4%	27%
DiJet30	79%	91%	96%
DiJet50	27%	57%	80%
DiJet70	2%	9%	45%
QuadJet20	2%	5%	9%
QuadJet25	1%	2%	4%
HT120	4%	14%	50%
HT140	2%	7%	34%
BTagMu_Jet20	15%	20%	24%

thresholds at end of RunB:

Jet:140 GeV DiJet:140 GeV QuadJet:25 GeV HT:150 GeV



Conclusion



Trigger

- Single Jet HLT threshold is way to hard;
- Di-Jet has apparently the same threshold;
- Quad-Jet looks too high as well;
- HT a bit better, but only (marginally) for high masses ($M \gtrsim 200 \text{ GeV}$);
- BTag trigger can reach 15%, but includes a muon, so it probably overlaps a lot with MuXX_HTTY.
- **Hadronic trigger not suitable for this low mass search**