Simplified Boosted categorization

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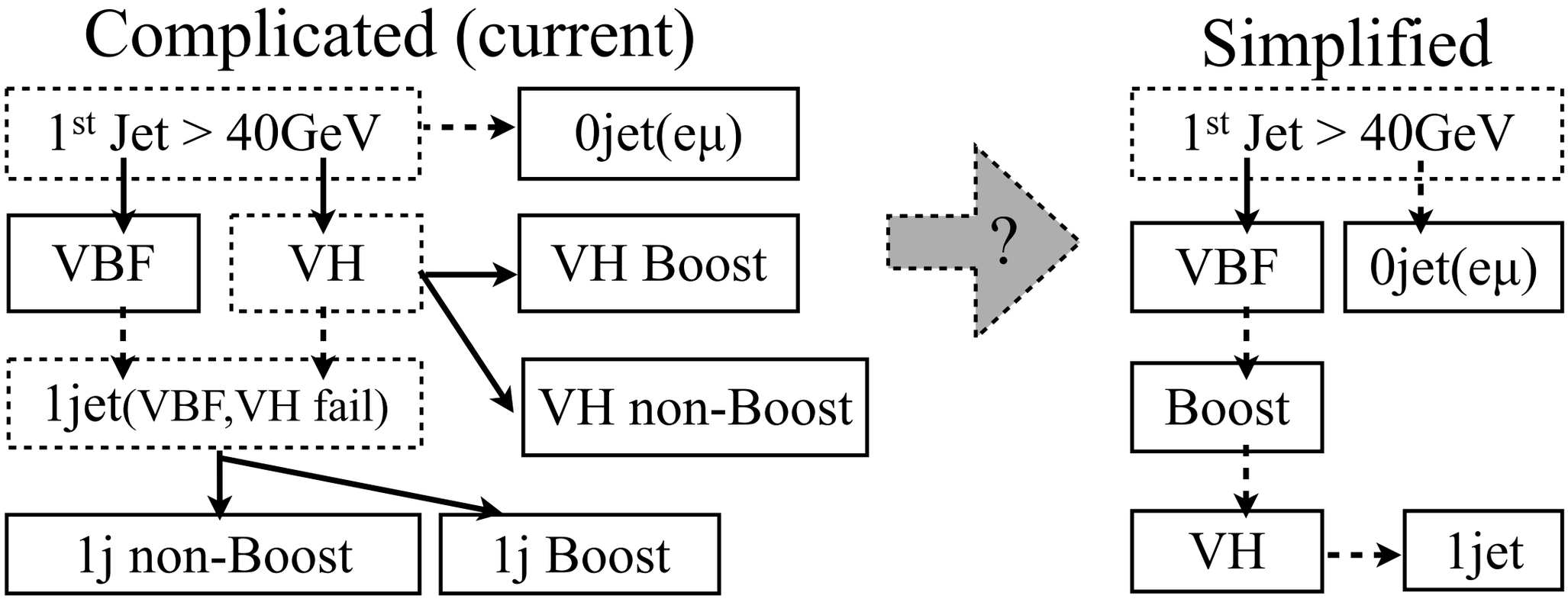
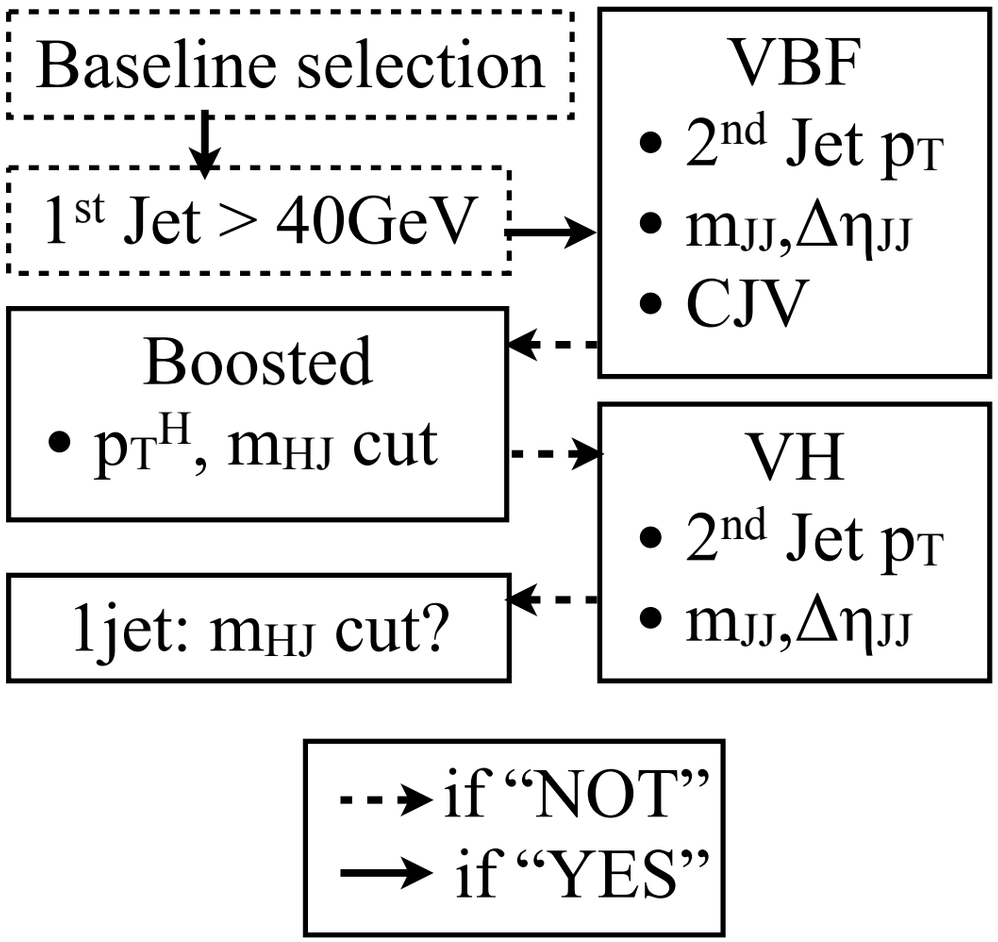
Motivation

- The motivation of this study is to compare complicated categorization and simplified ones.
- We can change an event categorization into more simplified ones.
- I put the point of view to check mass resolution for simplified categorization.

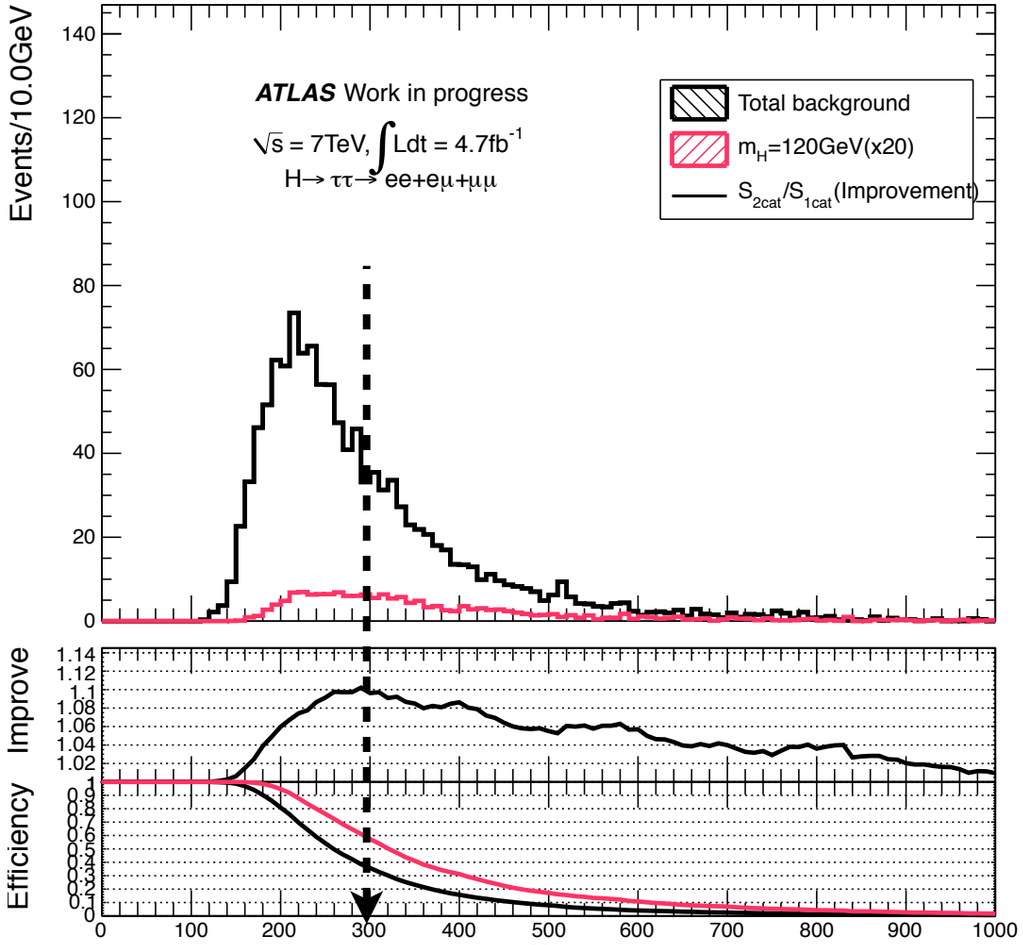


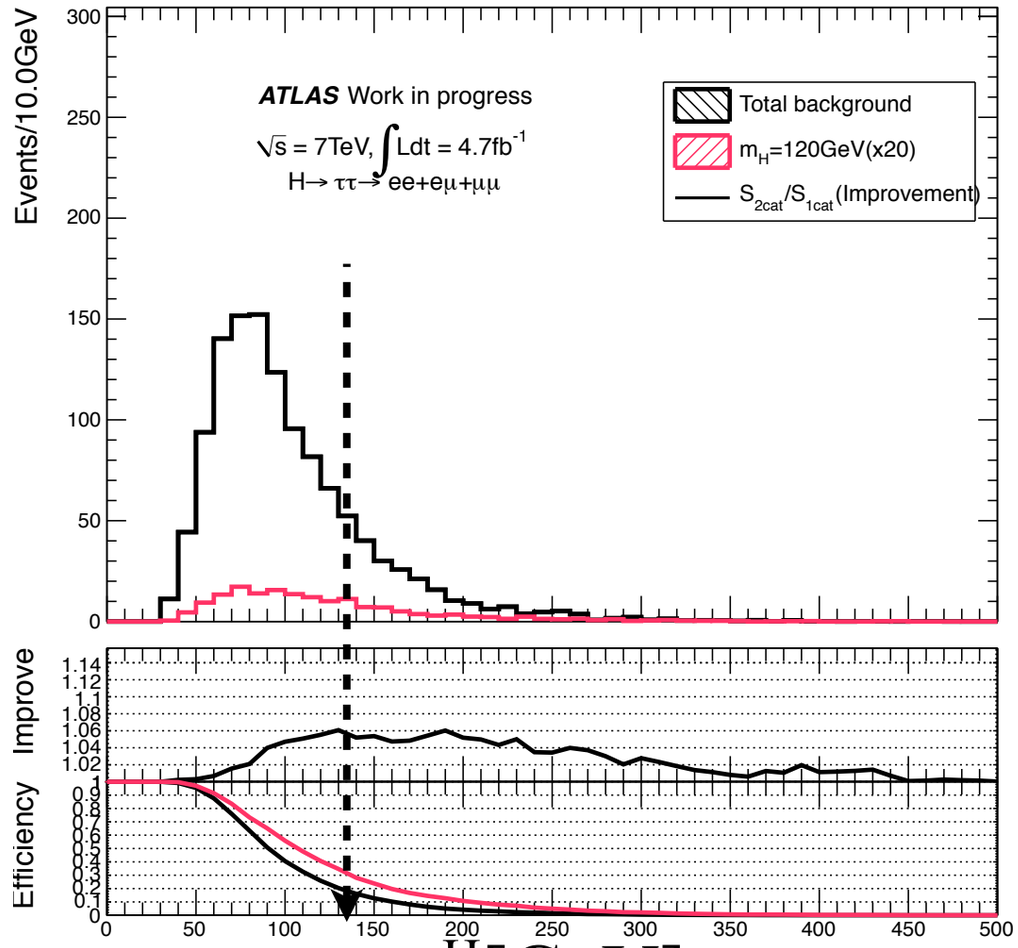
Simplified categorization



- The simplified categorization is represented by below chart.
- If events fail VBF selection, move to boosted selection.
- Boosted fail → VH selection
- VH fail → 1jet selection
- Final 1jet failed events is rejected.

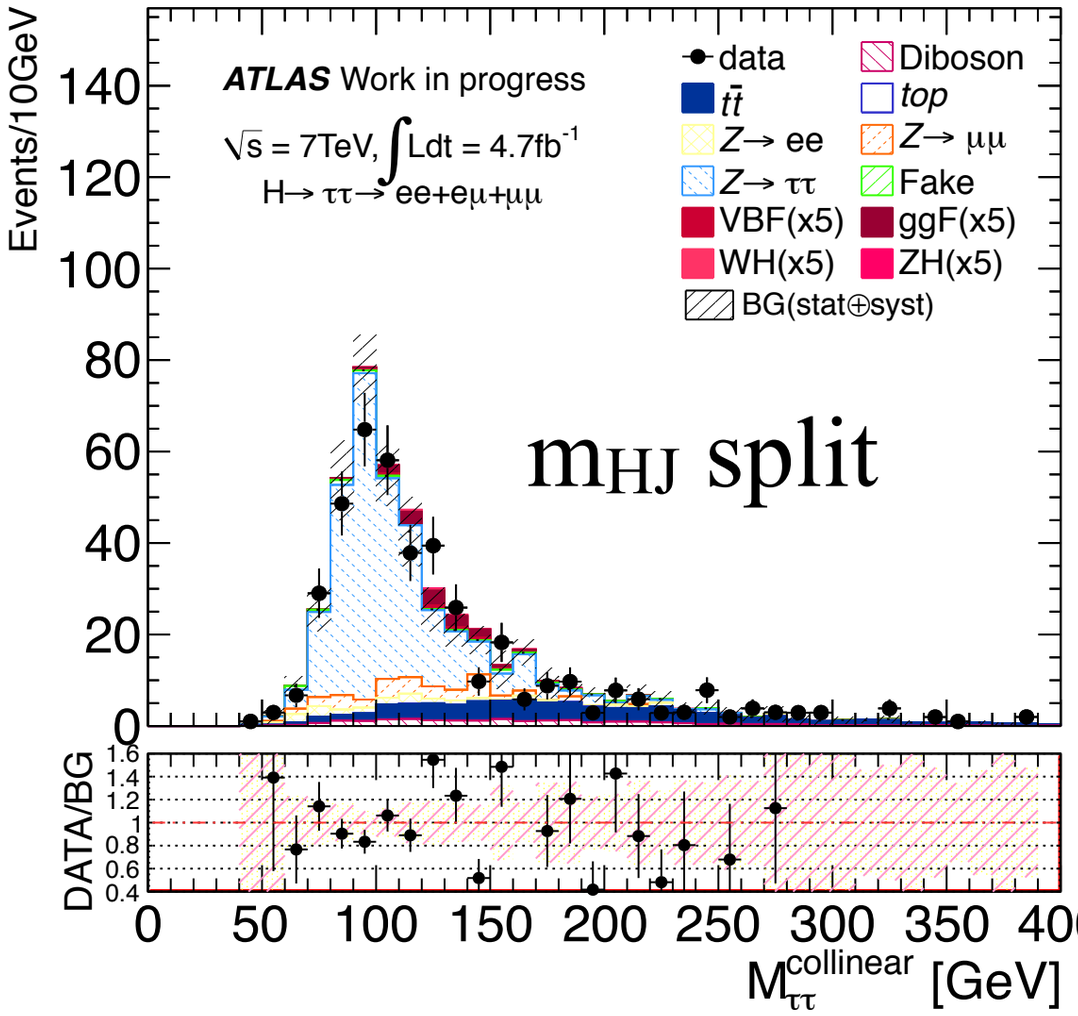
Boosted optimize

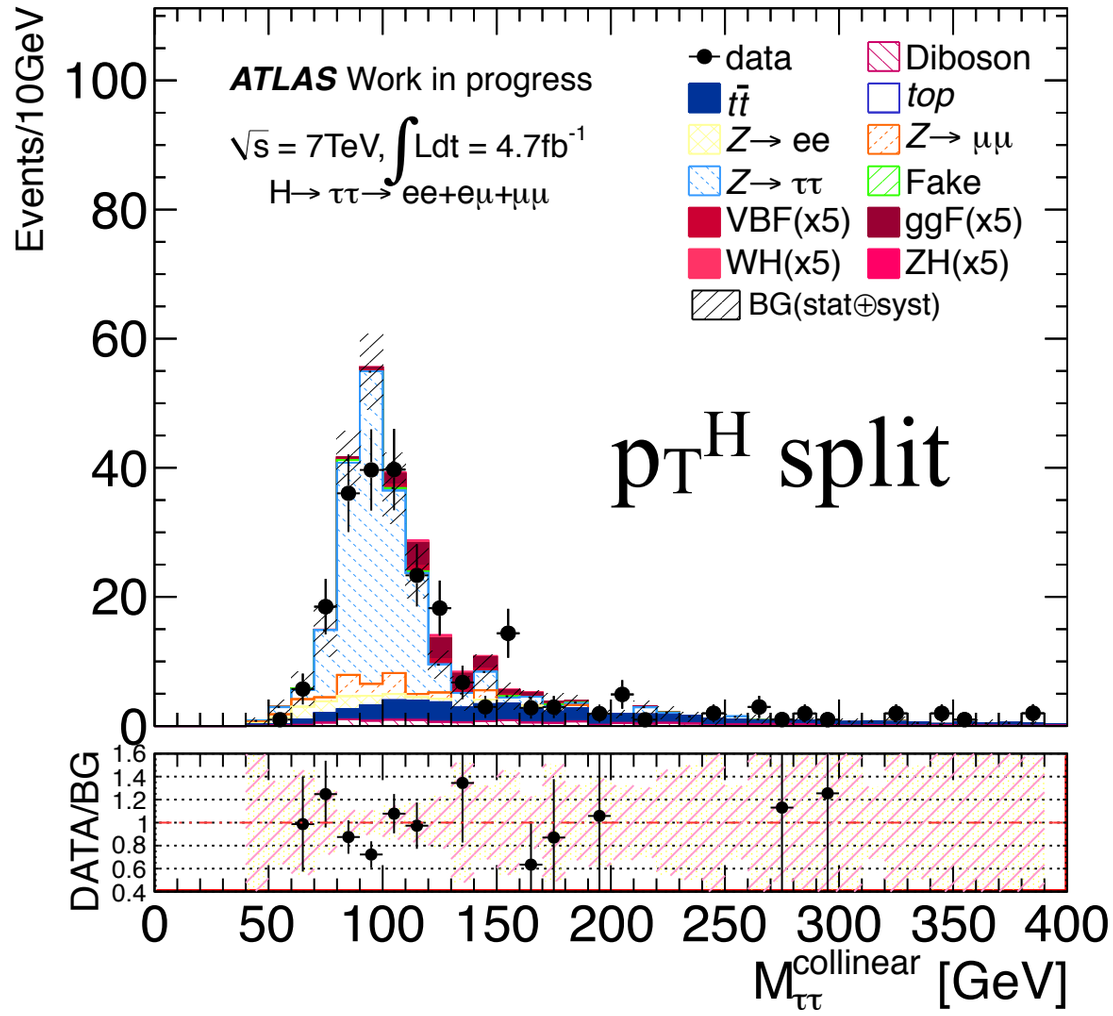




- I have scan High/Low p_T region by using Poisson significance.
  - This scan is only Boosted and other categories(VH,1jet merged).
- $m_{HJ}(p_T^H)$'s optimal point is 300GeV(130GeV).
  - $m_{HJ}(p_T^H)$ splitting has 11%(6%) improvement.

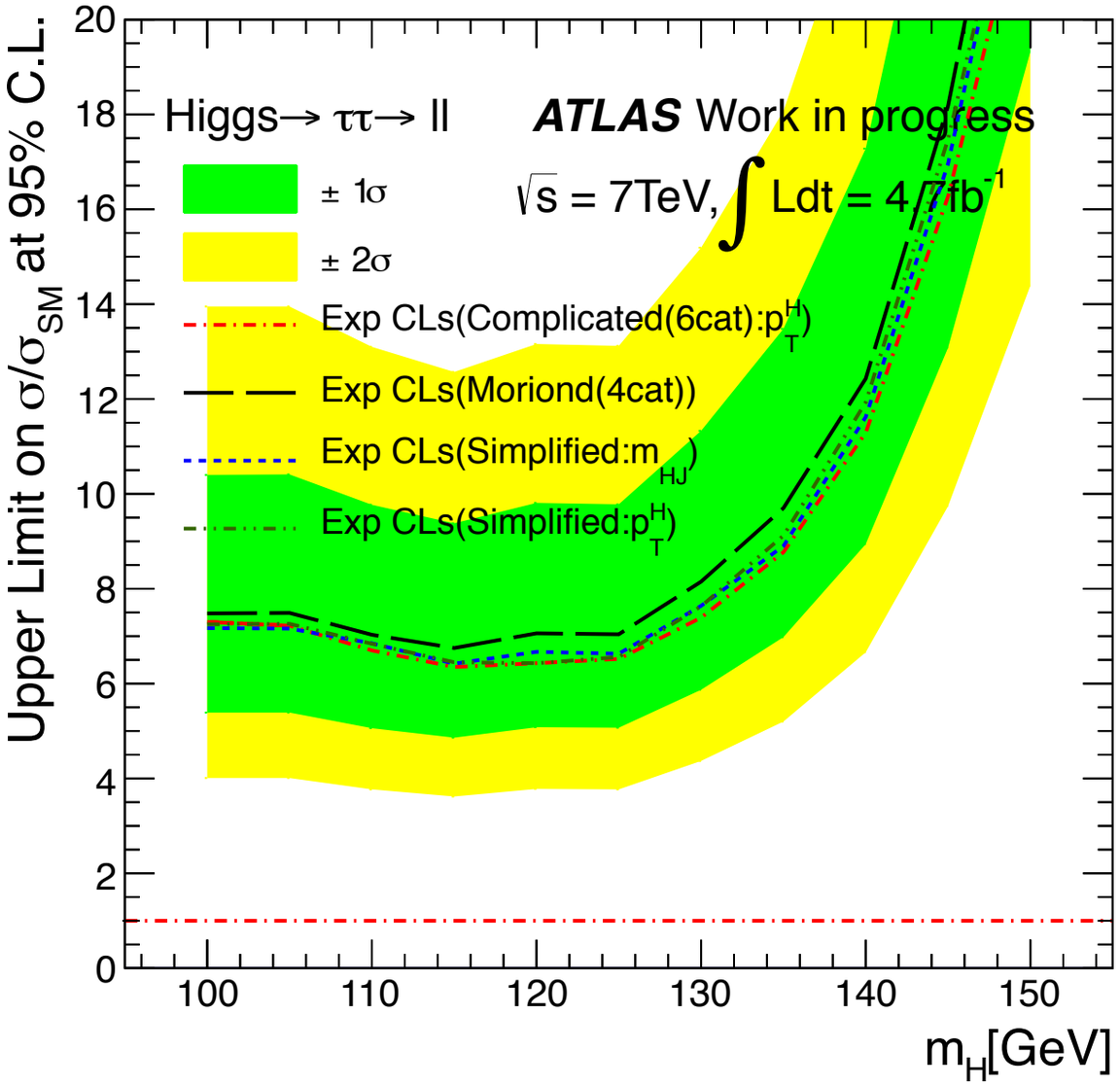
Boosted category





- The mass resolution of Z to tautau is clearly better if we use p_T^H cut.
  - S/N is 3.49/800(m_{HJ} split), 2.68/237(p_T^H split).
- We can improve a mass resolution by suing p_T^H splitting.

Combined Limit



- I changed a jet uncertainty tool version into 00-05-09.

m_H[GeV]	115	120	125	130
Moriond	6.75	7.06	7.04	8.15
Complicated	6.35	6.43	6.52	7.39
Simplified(m_{HJ})	6.42	6.67	6.63	7.64
Simplified(p_H^H)	6.45	6.43	6.56	7.63

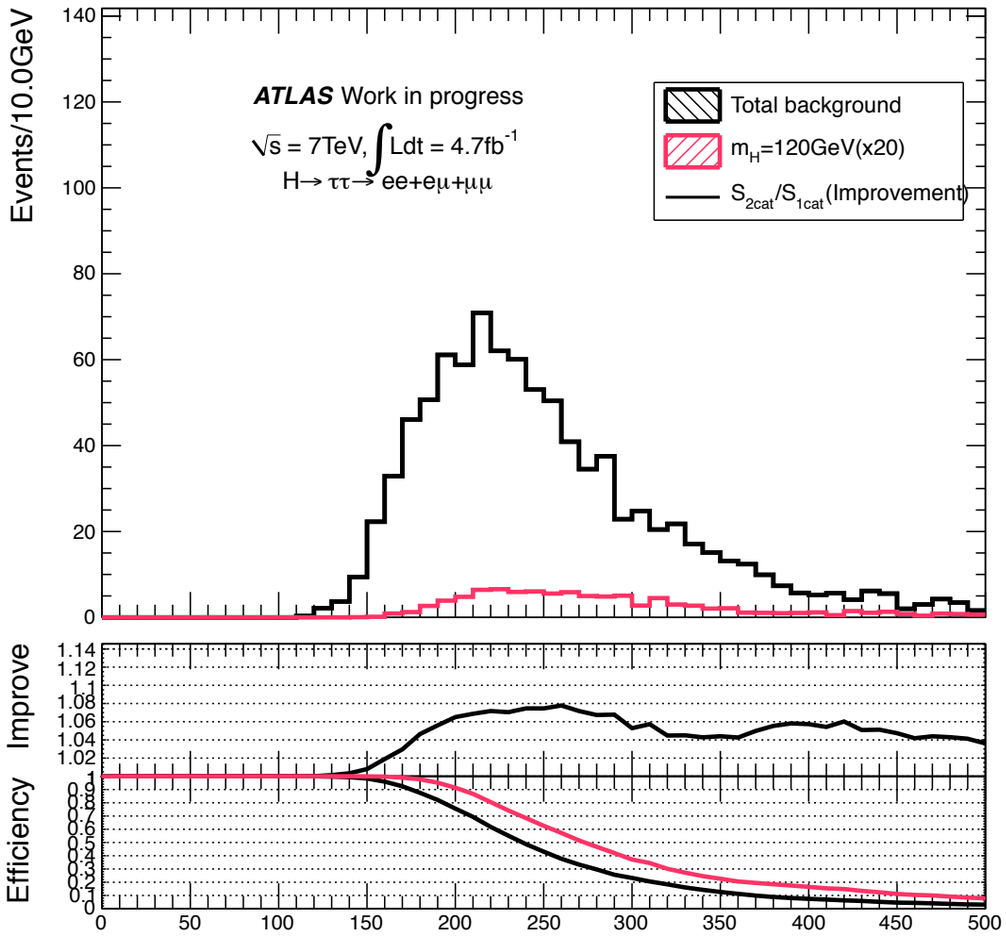
- Under 130GeV, simplified categorization has the same performance as complicated ones.
- m_{HJ} splitting did not less improve than p_T^H splitting.

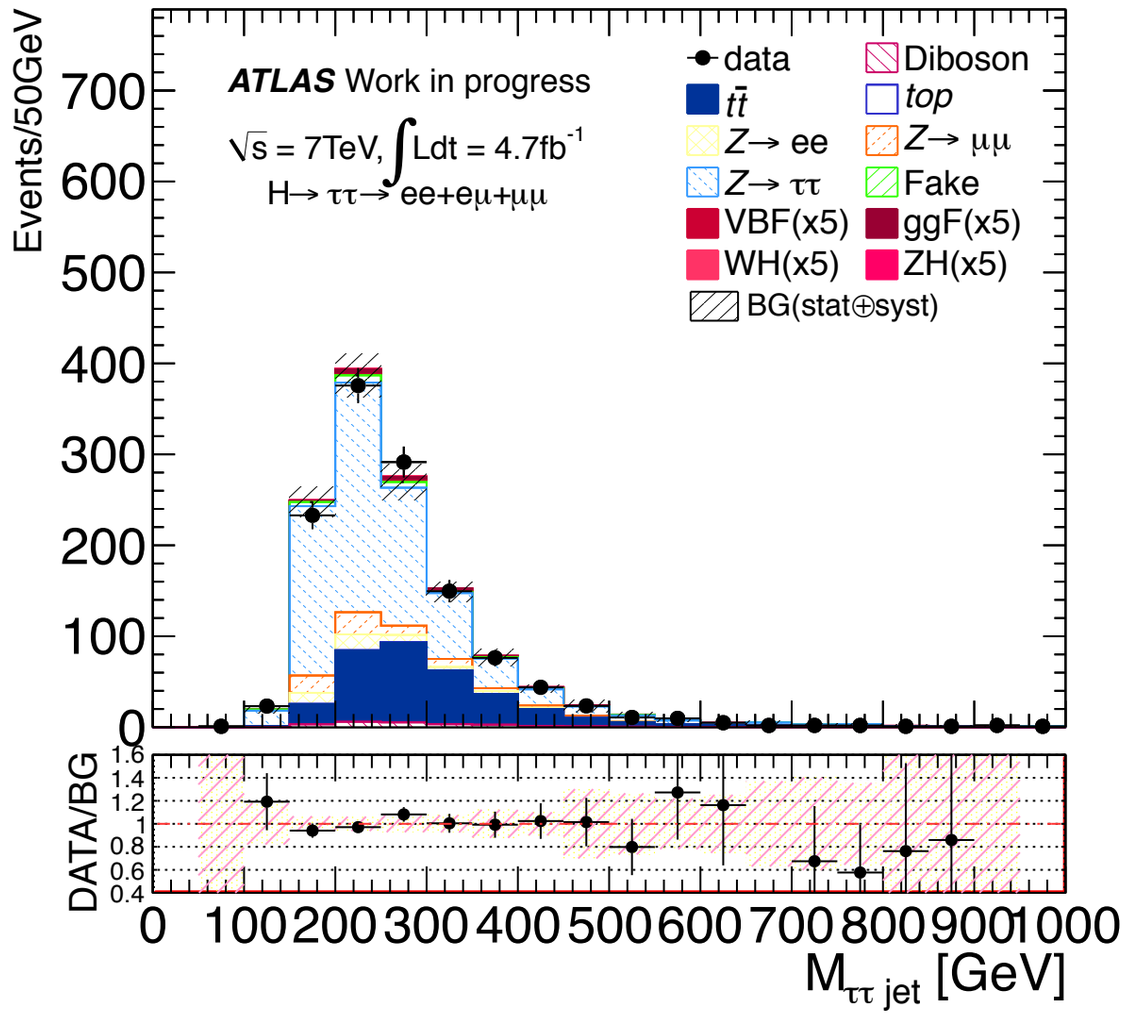
Conclusion

- We can change current categorization into simplified ones.
  - proposal: p_T^H cut value is over 130GeV for Boosted category.
- If we use complicated categorization, we should use blow values.
  - proposal: 1jet $p_T^H > 125$GeV(1jBoost)
  - proposal: VH $p_T^H > 175$GeV(VHBoost)
- We can add other kinematics cut.
- In any case, the key of boosted category is improvement of mass resolution.

Back Up!

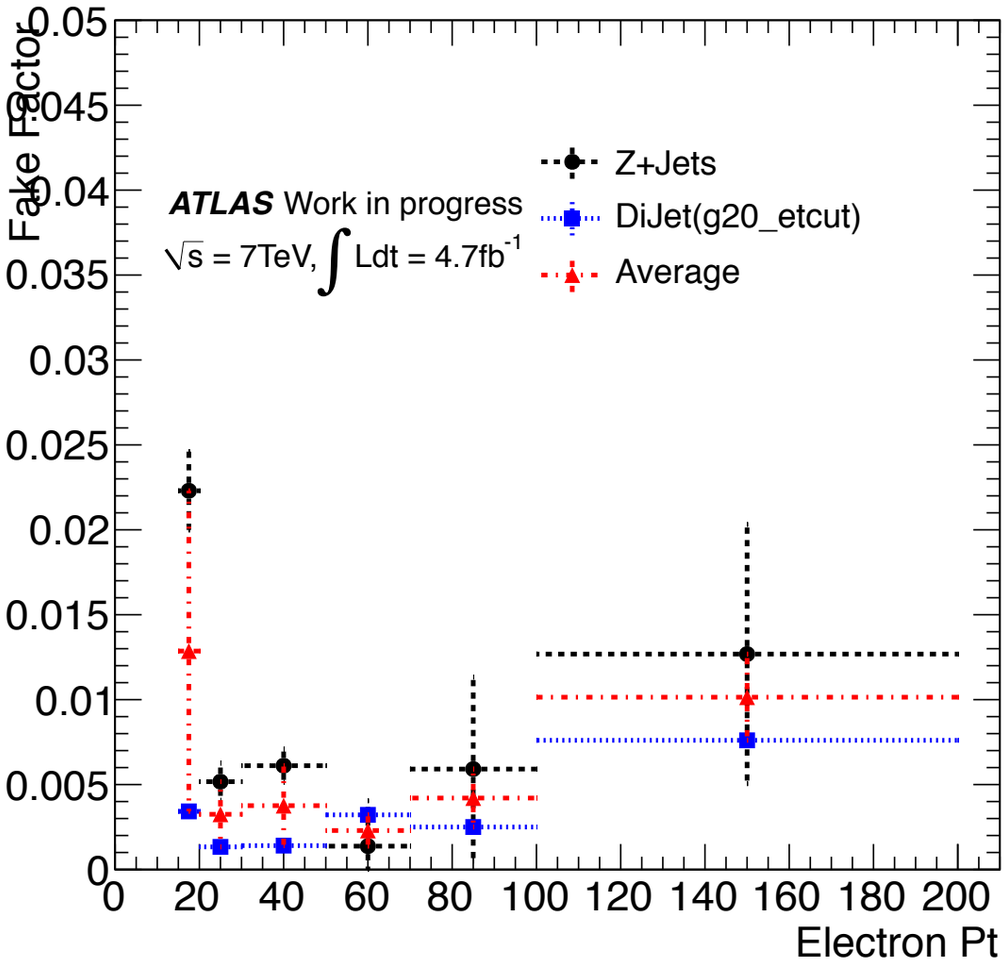
Additional Cut

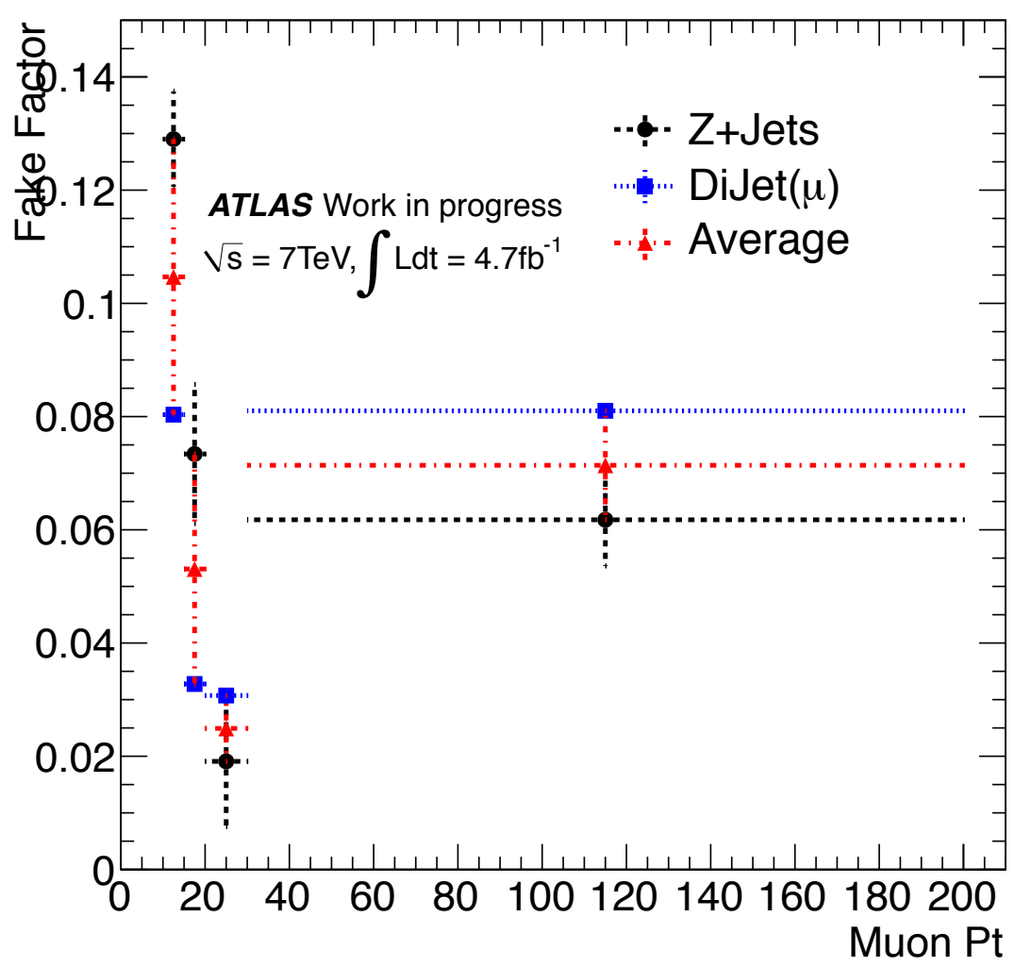




- m_{HJ} is powerful additional cut.
- Most improvement point is around 250GeV.

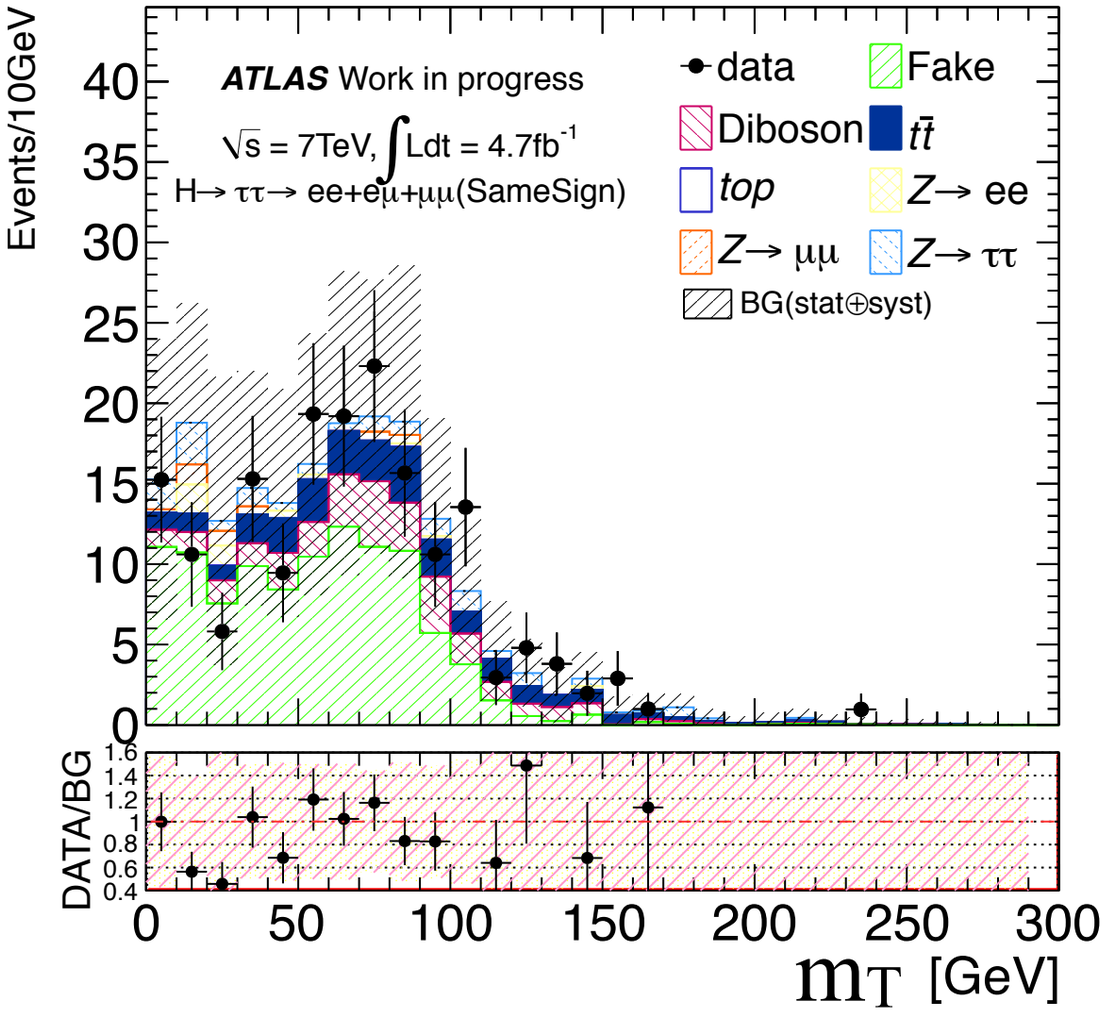
Fake Factor





- I changed how to choose tag-Z boson and overlap removal between LNT leptons.
- Basically the fake factor uncertainty have been smaller than previous talk.

Fake Events



- Left plot is 1st lepton transverse mass distribution in same sign CR.
- Cut level is after missing E_T cut.

Fake events Result		
	Official(Template)	Fake Factor
VBF	$1.3 \pm 0.8 \pm 0.6$	$2.00 \pm 0.26 \pm 0.83$
VH	$13 \pm 2 \pm 5$	$15 \pm 0.7 \pm 7$
1jet	$30 \pm 4 \pm 12$	$30 \pm 0.9 \pm 15$
0jet	$1183 \pm 12 \pm 473$	$3713 \pm 9 \pm 2858$

- A result of the fake estimation by the fake factor method is shown above table.
  - The fake factor method has ~60% systematics uncertainty.
  - Need to check 0jet events...