Study of Single-W process

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—> Current status & progress of my study

Status

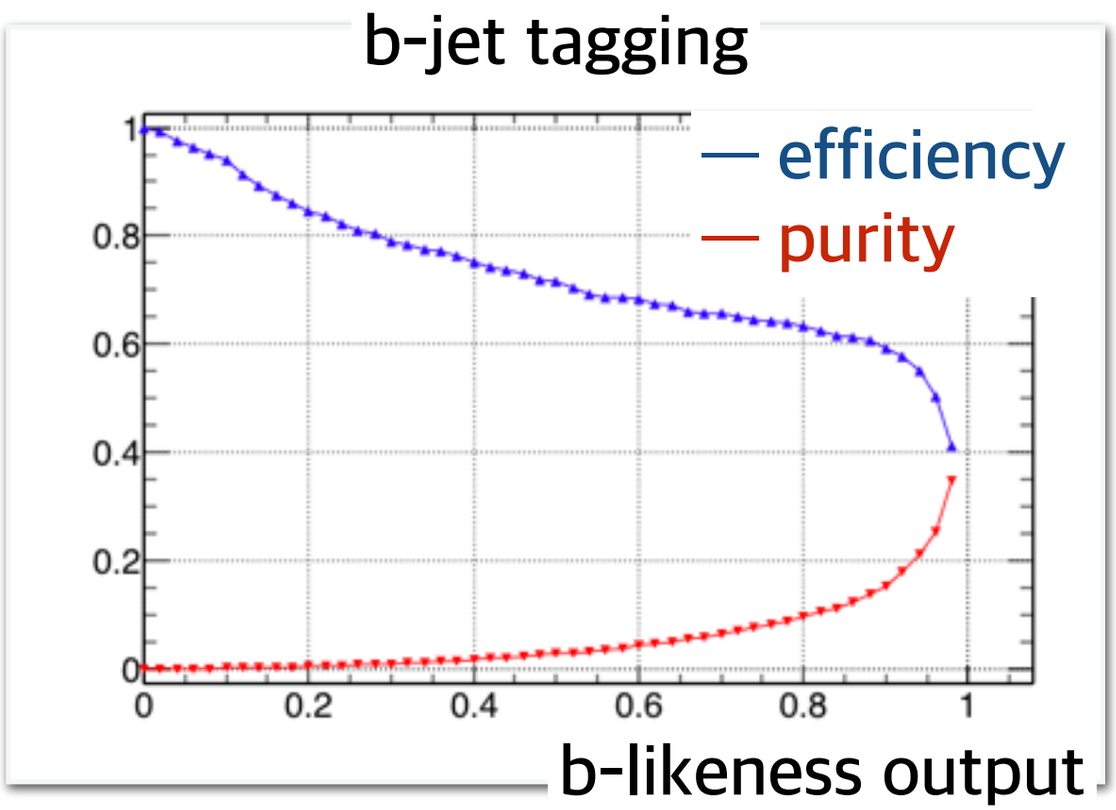
- I tried to tag the events which have some missing energy.
- I considered the cut with flavor of jet and hard lepton p_T with respect to the jet.

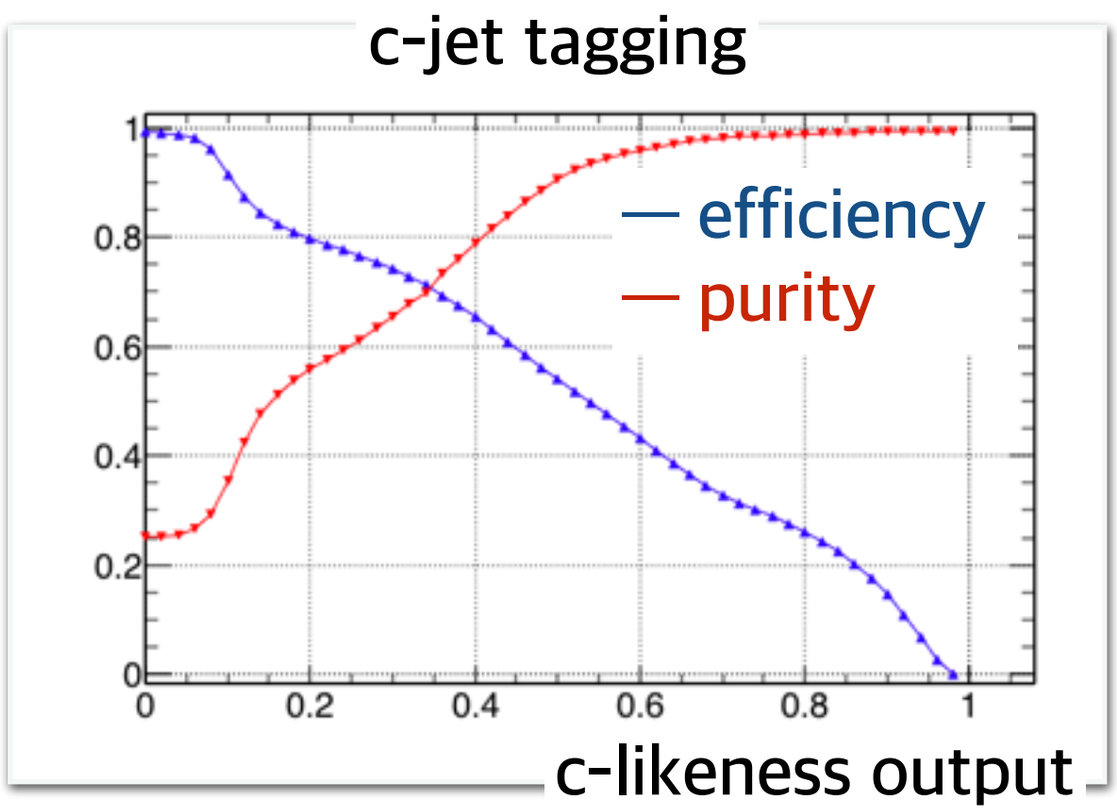
Flavor tagging with LCFIPlus

training sample:
6 jets @ 500GeV

$$tag\ \ purity = \frac{N_{b-jet} \cap N_{tagged}}{N_{tagged}}$$

$$tag\ \ efficiency = \frac{N_{b-jet} \cap N_{tagged}}{N_{b-jet}}$$



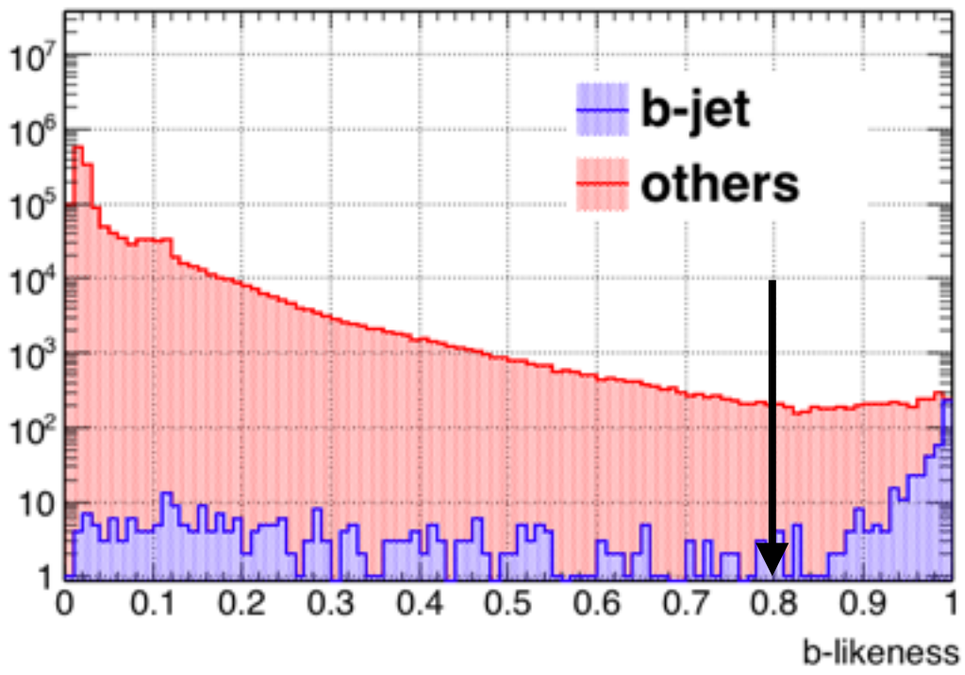


c/b-like jet selection

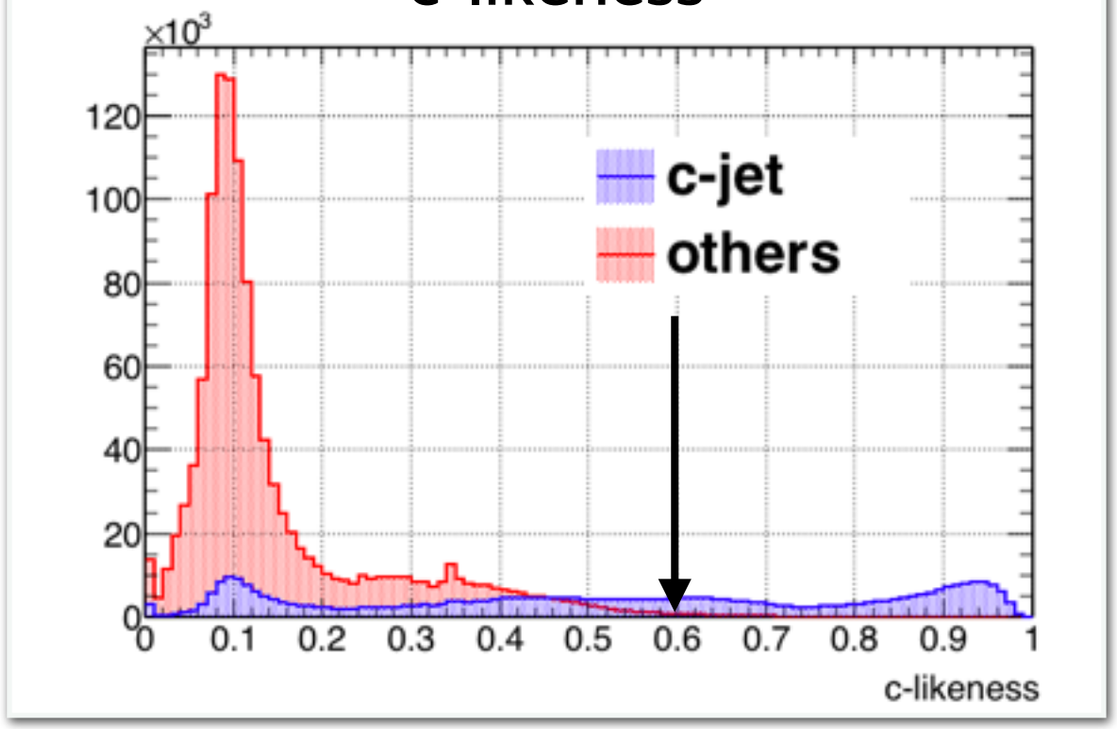
- b-likeness > 0.8
- c-likeness > 0.6
- as the selection criteria

event cut isn't applied only with these selection, but also with the selection criteria from hard lepton p_T as mentioned later

b-likeness

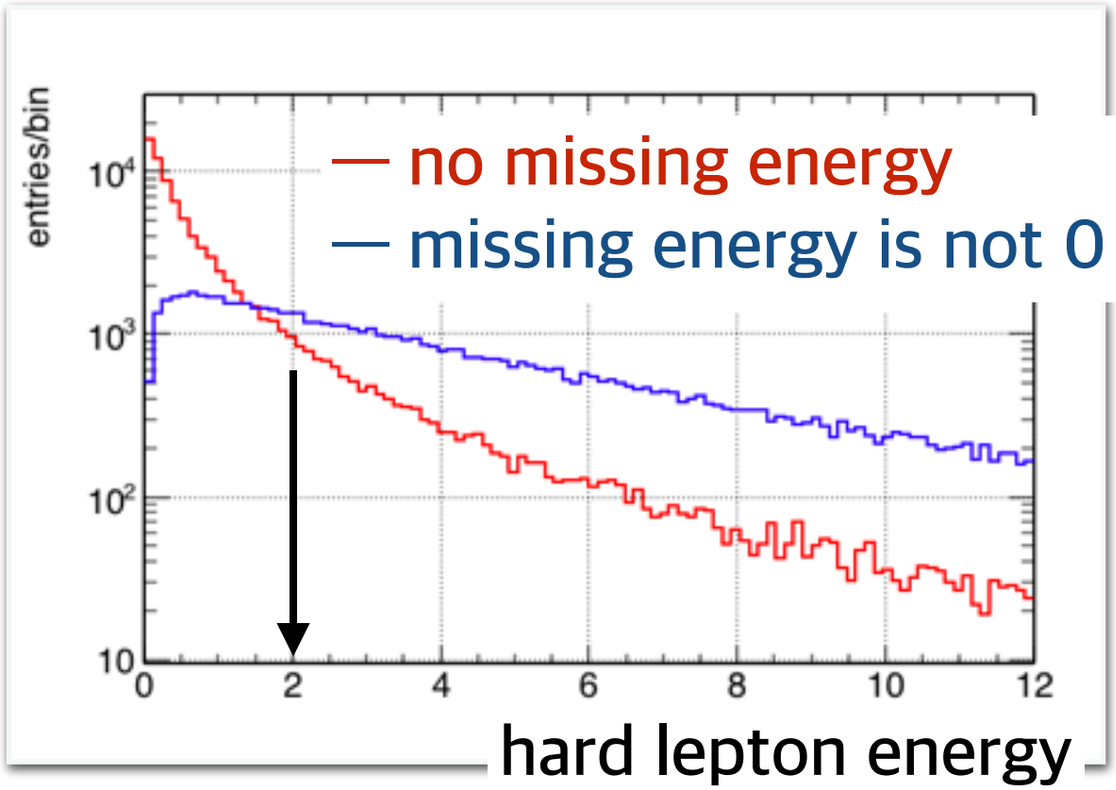


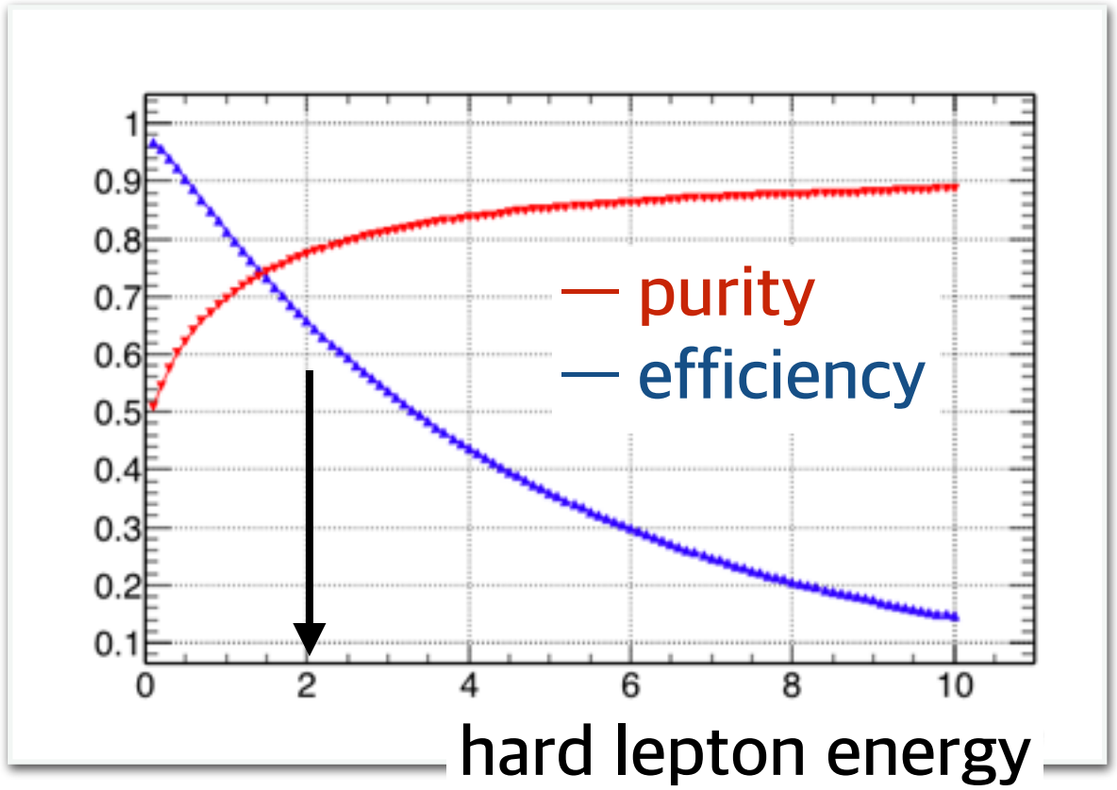
c-likeness



Definition of the hard lepton in a jet

- energetic lepton => large missing energy (if such as c—>slv)
- define “hard lepton” as the largest energy lepton in a jet
- then, the jet with hard lepton energy > 2GeV is tagged as “jet with missing energy”

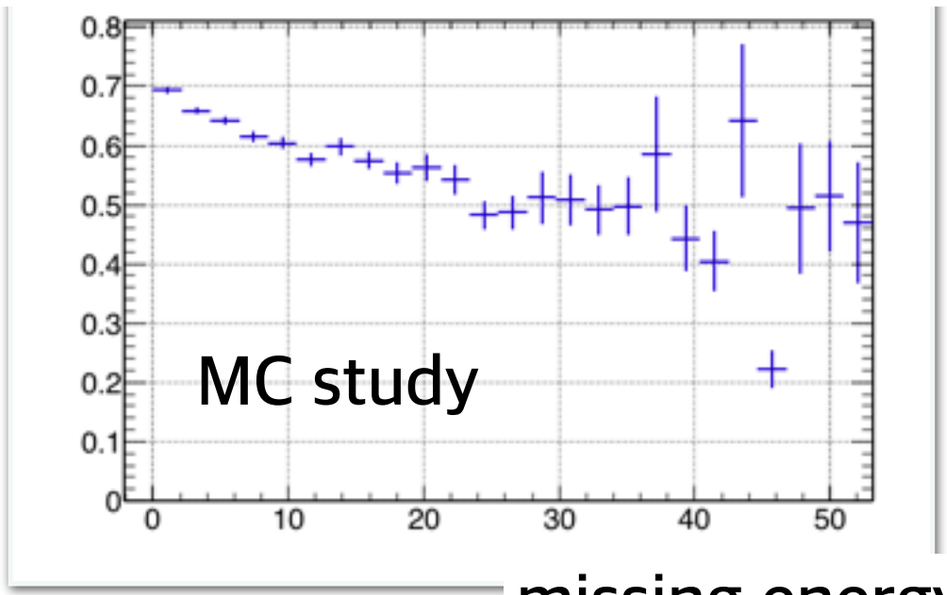




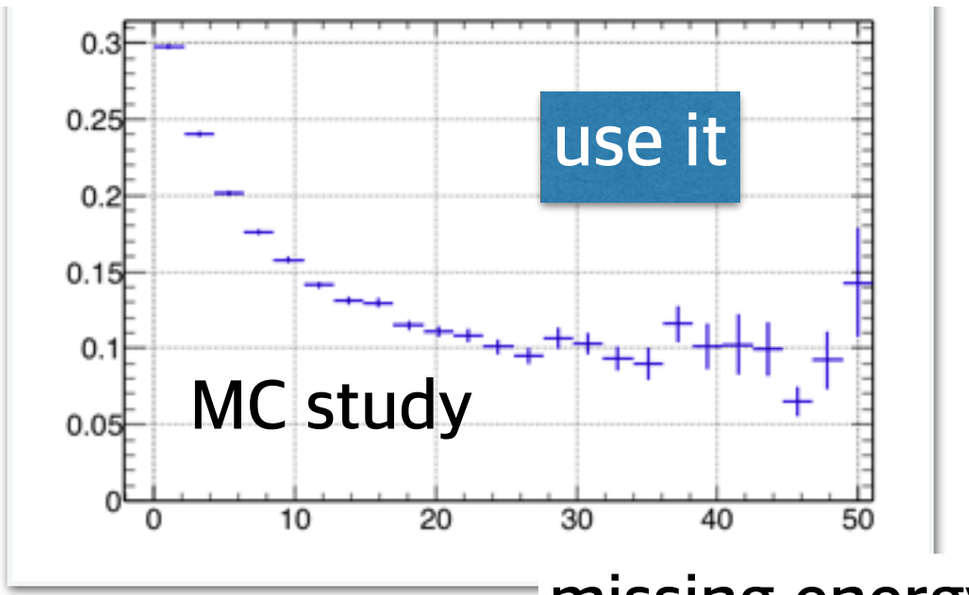
Hard lepton p_T w.r.t. the jet

- we can see the correlation between p_T of hard lepton in the jet and missing energy
    - hard lepton p_T seems to become smaller as larger missing energy
- use p_T/E to tag the events with critical missing energy
    - small p_T/E => large missing energy

hard lepton p_T w.r.t. the jet as a function of missing energy

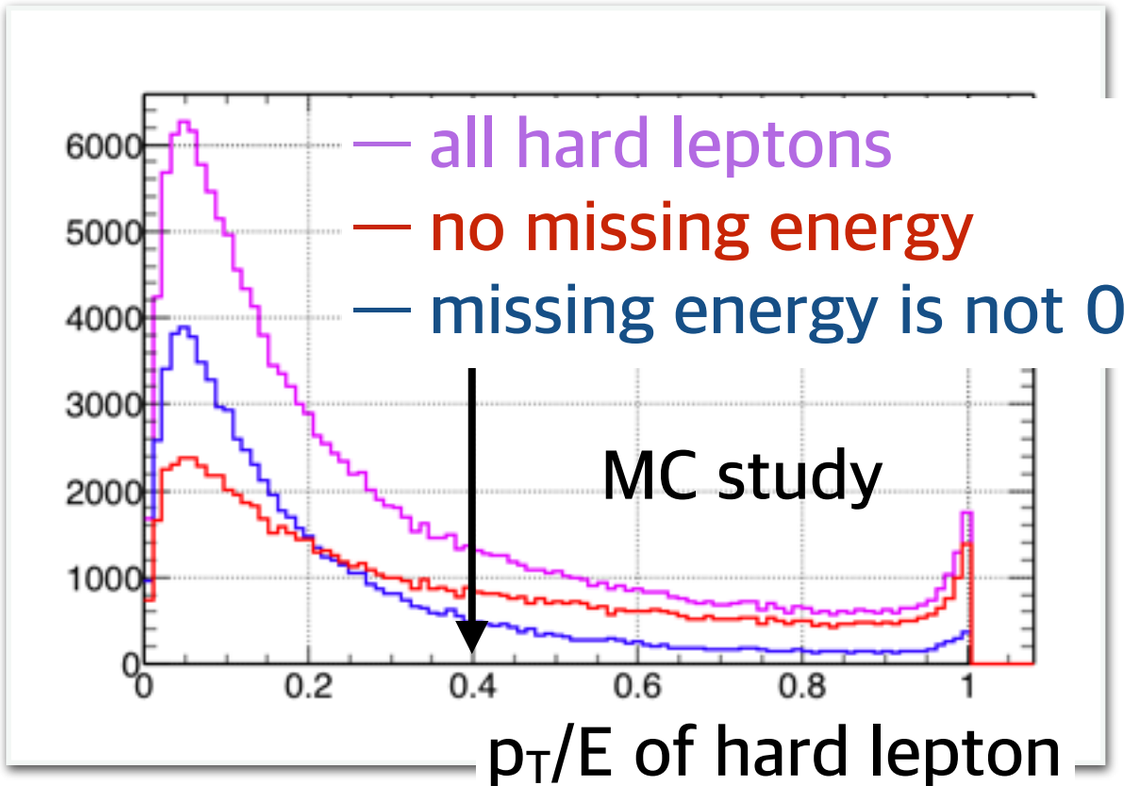


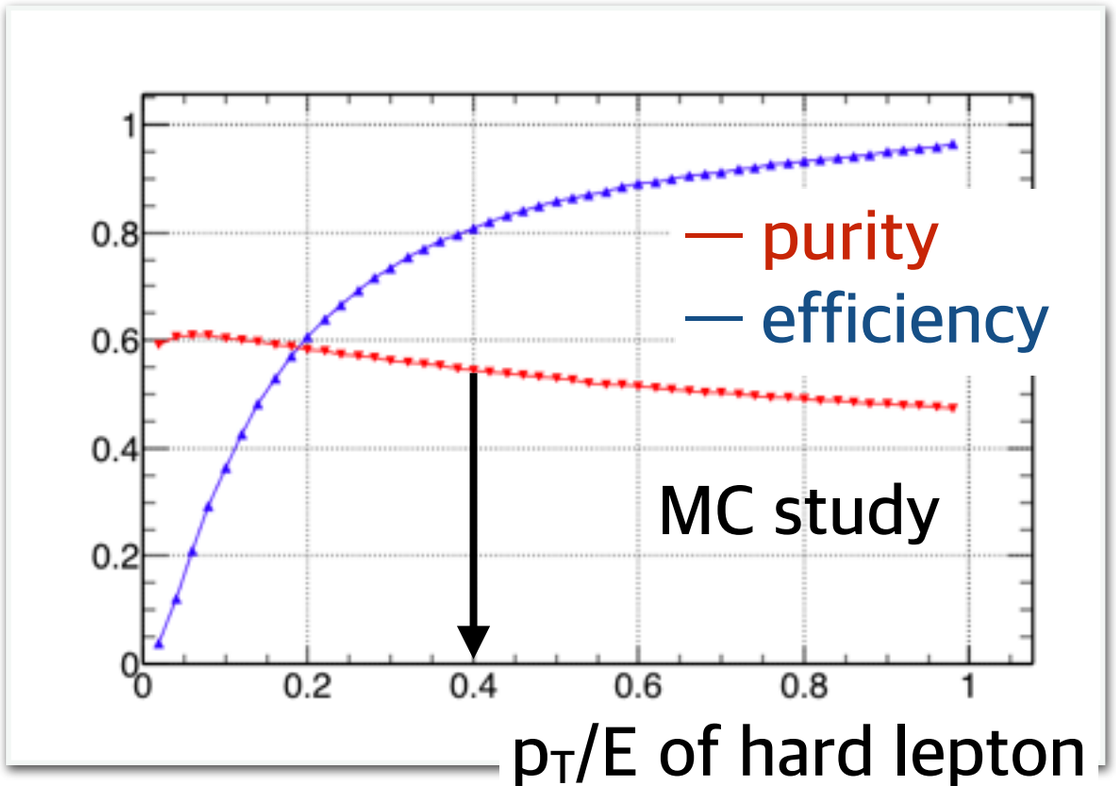
hard lepton p_T divided by its energy as a function of missing energy



Missing energy tagging with p_T/E

- thinking p_T/E of hard lepton in a jet
  - small p_T/E => missing energy
  - $p_T/E < 0.4$ as the selection criterion

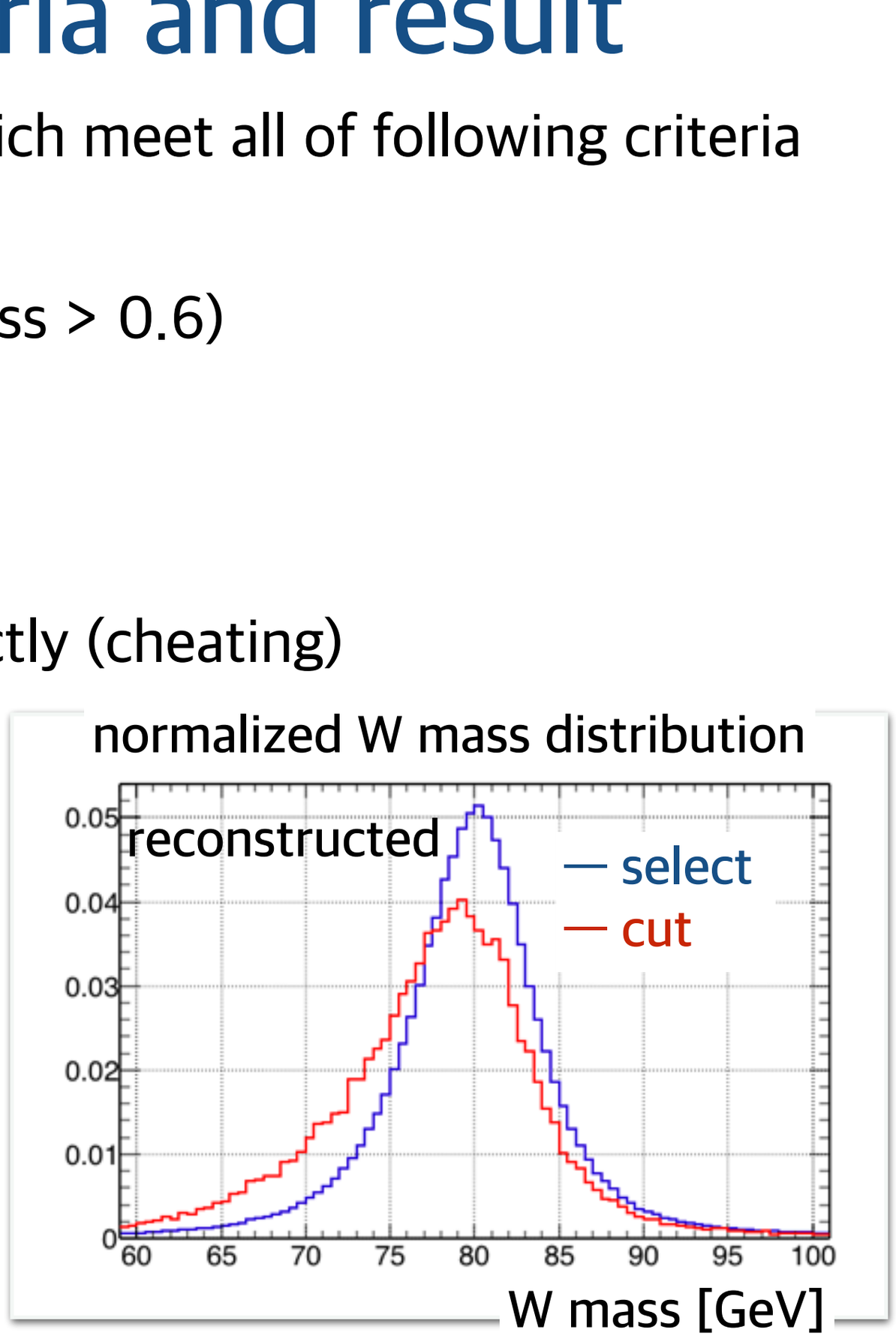




Event cut criteria and result

- the events which have the jets which meet all of following criteria are cut
  - (b-likeness > 0.8) || (c-likeness > 0.6)
  - $E_{\text{hard lepton}} > 2\text{GeV}$
  - $\{p_T/E\}_{\text{hard lepton}} < 0.4$
- lepton tagging is performed perfectly (cheating)
- cut efficiency = 0.314
- cut purity = 0.538
- loss of statistics : 5.85%

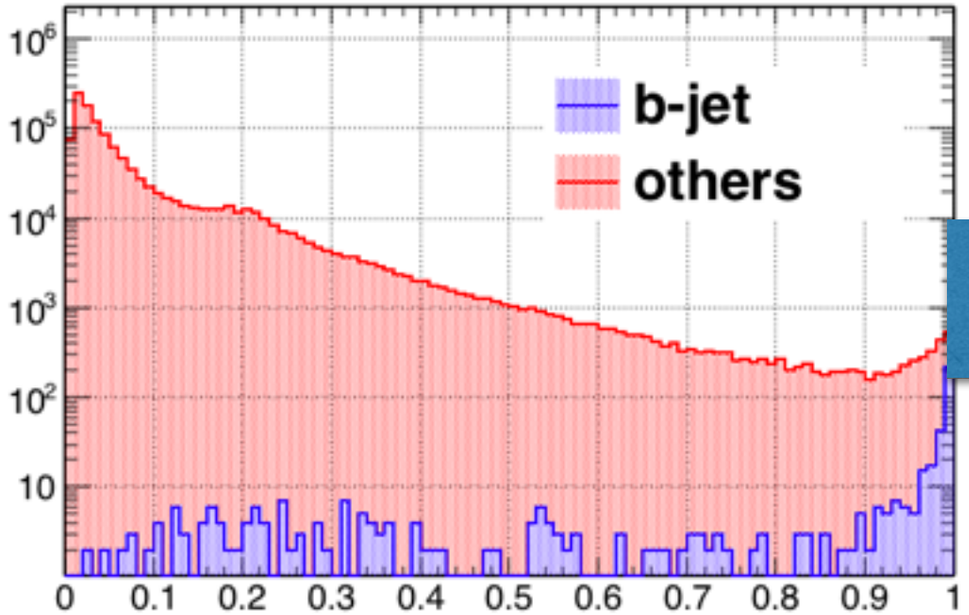
result will be worth when realistic lepton tagging will be performed..



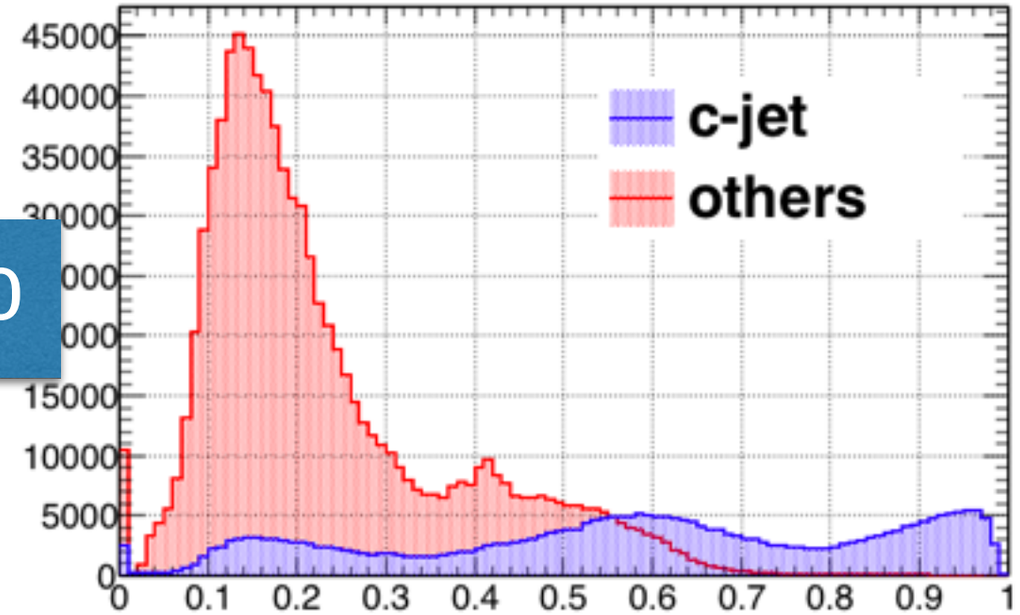
Summary & Next

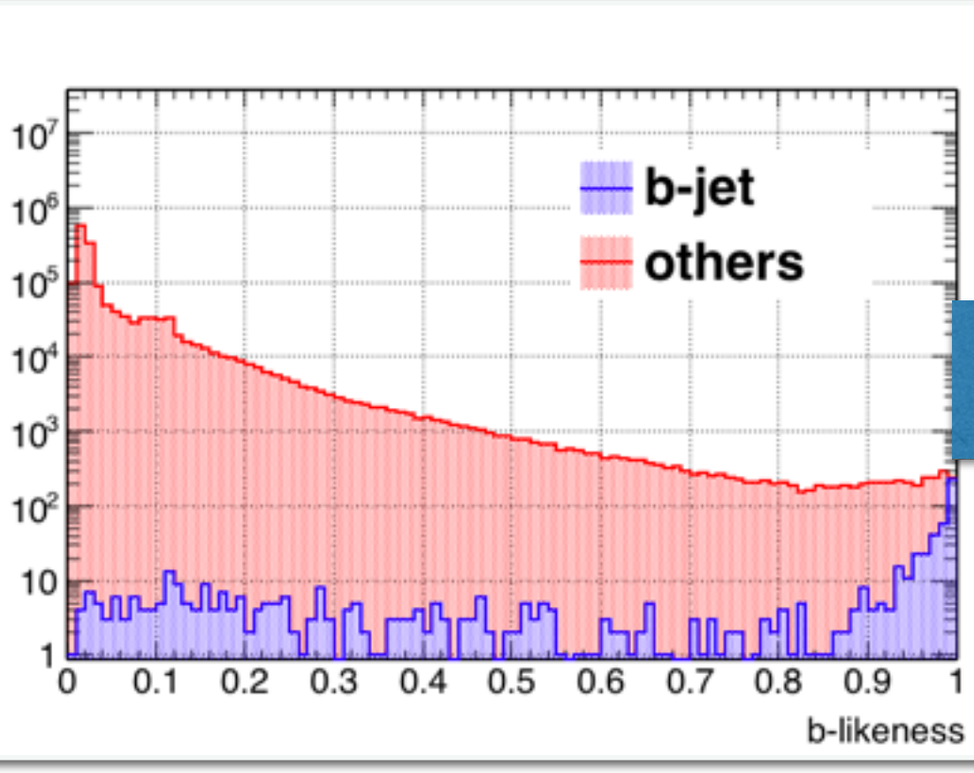
- I tried to tag the events with missing energy, and cut them
  - cut criteria from jet flavor tagging and hard lepton p_T
  - event tagging is performed, but the tag efficiency is low (efficiency~0.3, purity~0.5)
  - loss of statistics is ~6%
    - result will become worth if realistic lepton tagging is performed . . .
    - How can I get better efficiency ?
- For the next,
  - try to make the cut criteria looser
  - perform realistic lepton tagging
  - to do jet energy scale calibration

Back up

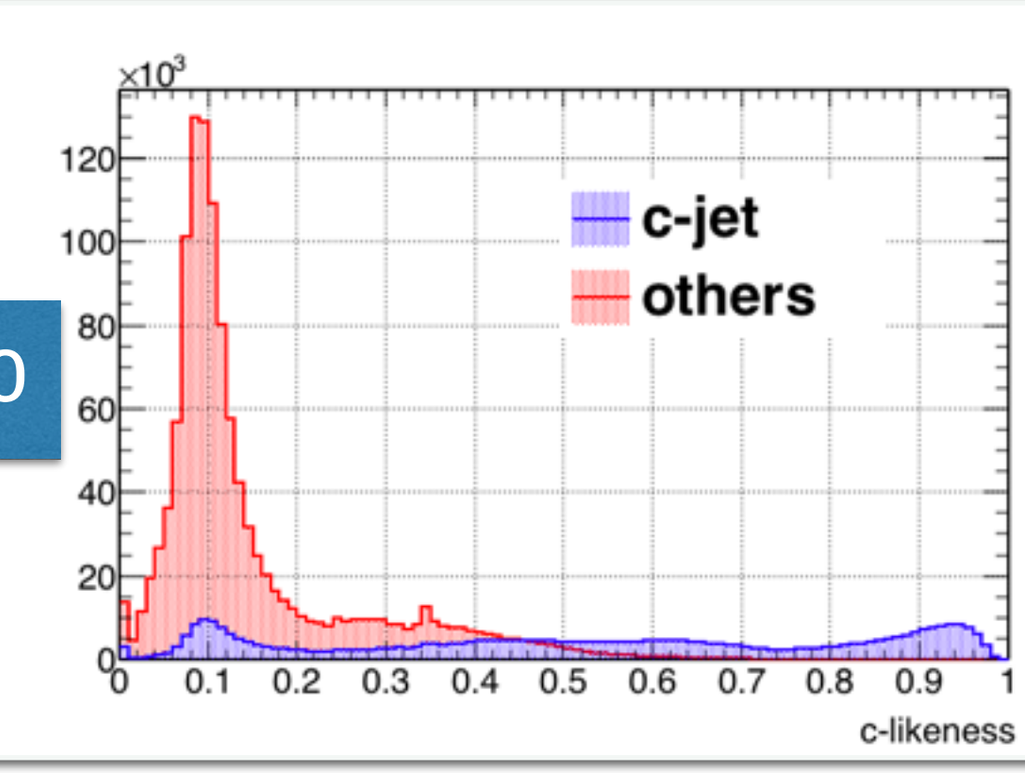

b-jet
others
b-likeness

qq250


c-jet
others
c-likeness


b-jet
others
b-likeness

6q500


c-jet
others
c-likeness