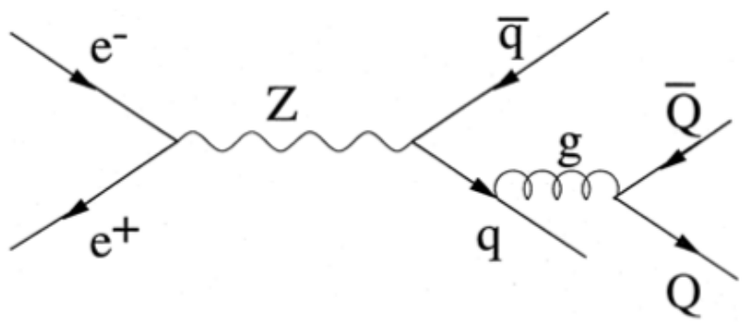
Jets' Heavy Flavor SubStructure at CEPC

Yu Bai(白羽)

2020-07-25

Review of g->QQ Measurement

Quark initiated (radiation)

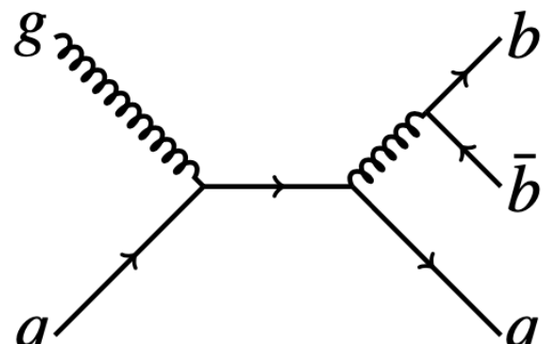


- Lepton colliders: LEP, SLD
- Three jets events/4 jets(4 b-jets) in Z hadronic decay

Observables:

$$\bar{n}_{g \to Q\bar{Q}} = \frac{N(Z \to q\bar{q}g, g \to Q\bar{Q})}{N(Z \to \text{hadrons})}$$

Gluon initiated

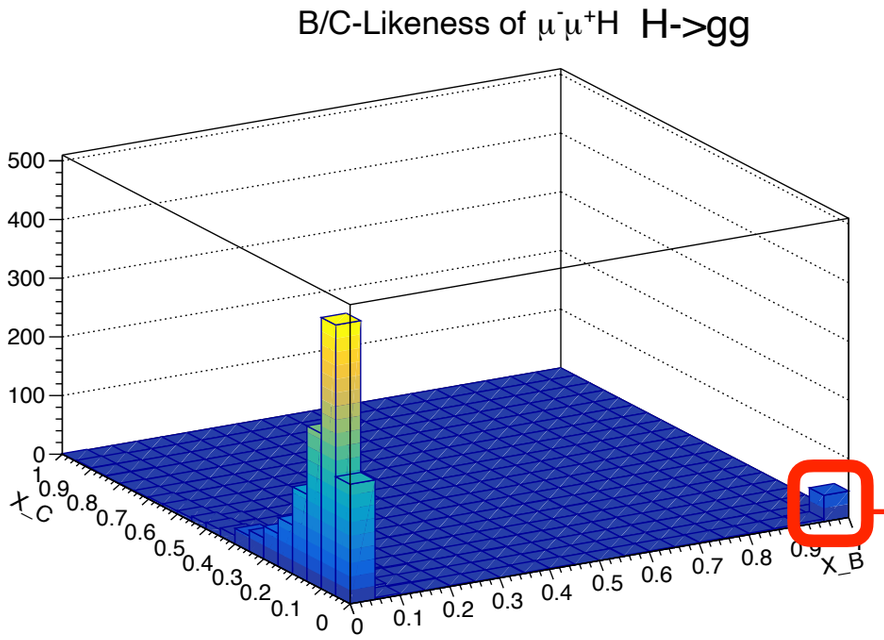


- Hadron Collider: LHC, Tevatron
- Large/Small radius jets

Observables:

- Momentum sharing of b-jets
- Angler seperation of b-jets

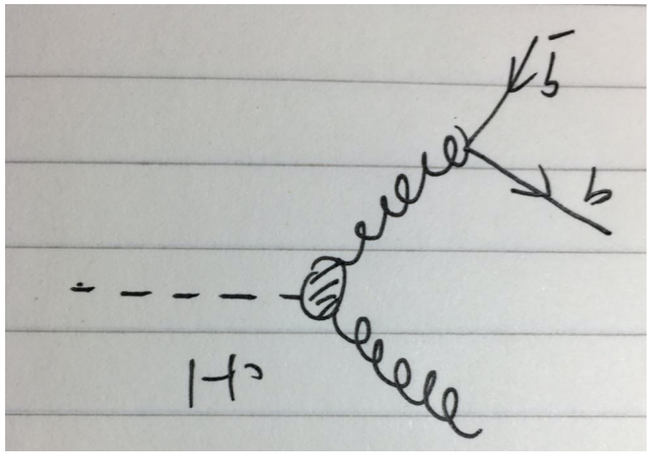
Motivation



$$X_B = L_{b1}L_{b2}/[L_{b1}L_{b2} + (1 - L_{b1})(1 - L_{b2})]$$

- A concentration of bb like events
- It should be caused by gluon->bb.
- Fraction: about 3% in H->gg events
- Can we measure it?

A direct measurement of g->bb process from gluons with tens of GeV momentum



Advantages:

- Can measure the ratio n(g->QQ)/n(gluon)
- Clean Higgs Signal, H->gg can be well measured
- Can also achieve differential x-section information with constantly high momentum gluons

Outlook of the Analysis

- Signal identification:
  - Standard Higgs selection(recoil mass in llH channel)
  - Need to tag two heavy flavor jets, typically close to each other
- Background:
  - H->bb events, with high momentum gluon radiation, a better understanding on this process is needed
  - Higher order QCD process (like H->gluon+ (gluon+bb)).
  - ZZ*/Zγ*->qq+bb, with small bb system invariant mass(typically highly boosted).

Ongoing works

- Typically one b-quark contributes one b-hadron in the detectable final state
- Get heavy flavor candidate in object level(high IP tracks, vertices)
- The multiplicity and distribution of such objects should provide the informations interested
- The differential information needs more inputs than the heavy flavor hadrons