b, b-bar production study
# for b-jet event generation

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Event Generation

- Event generatror : Aliroot Pythia

- Configuration : kPyMbMSEL1 (= kPyBeautyppMNRwmi)

  ‣ best we have for this purpose

- Events triggered with b-quark : all events generated contain b-quarks

- Events population : generated in four pt Hard bins with the following relative

  ‣ 2.76-4 GeV: 5%

  ‣ 4-6 GeV: 31%

  ‣ 6-8 GeV: 28%

  ‣ >8 GeV: 36%

- Main point of the configuration

  ‣ tuned to get a reasonable agreement between with the NLO calculation by Mangano, Nason, Ridolfi

  ‣ multiple interaction is on (different from PPR setting)

  ‣ initial/final parton shower on, intrinsic kT = 1 GeV

- Acceptance : full theta, phi

- CMS energy : 10TeV, 14TeV

Statistics & b,b-bar selection

- Statistics : 1M events for each 10 TeV and 14 TeV (all contains at least one b or b-bar)

- Way to select b,b-bar quark to look at kinematics

  ‣ Select b,b-bar quark which fragmentized to hadrons containing b-quark (= select hadrons containing b-quark from primary particle list and then check if their mother is b/b-bar quark. If it is, then select this b,b-bar. There are some more details but this is the main concept).
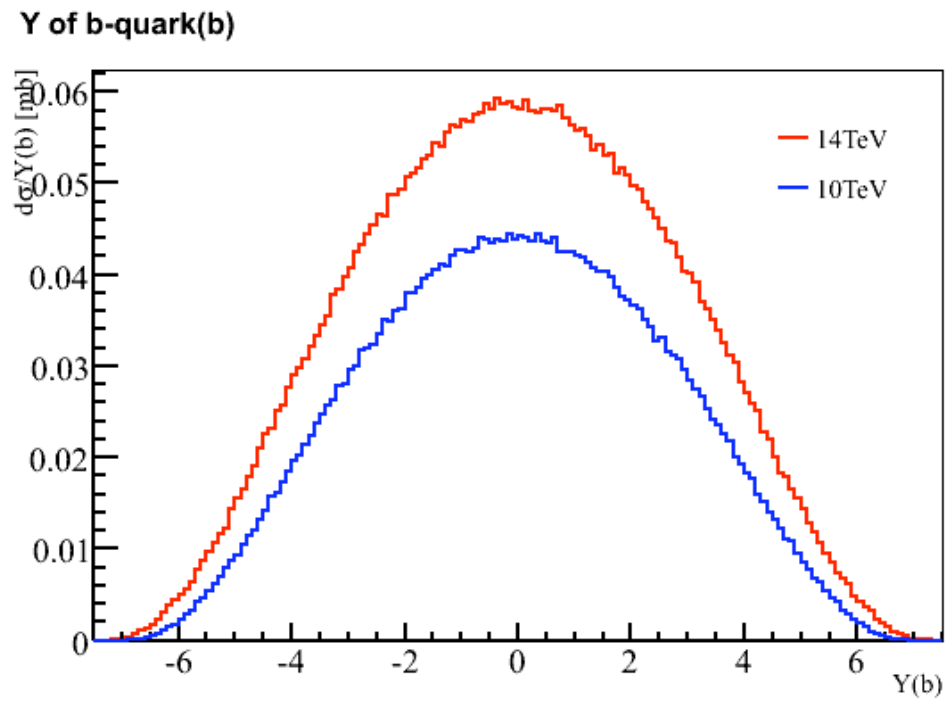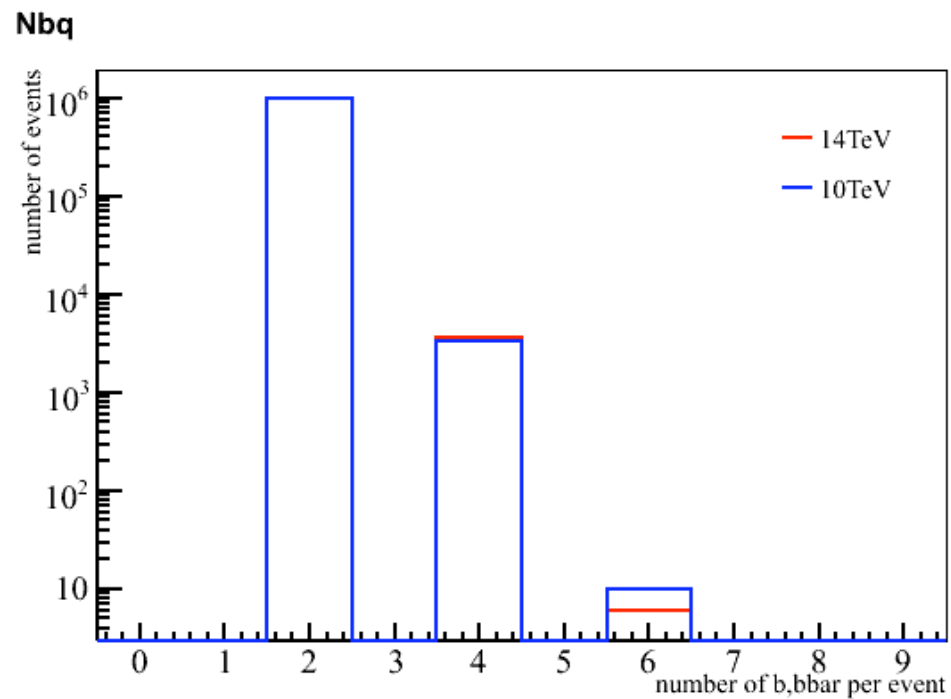
b,b-bar Production Yield

pT Distribution

Pt of b-quark(b)
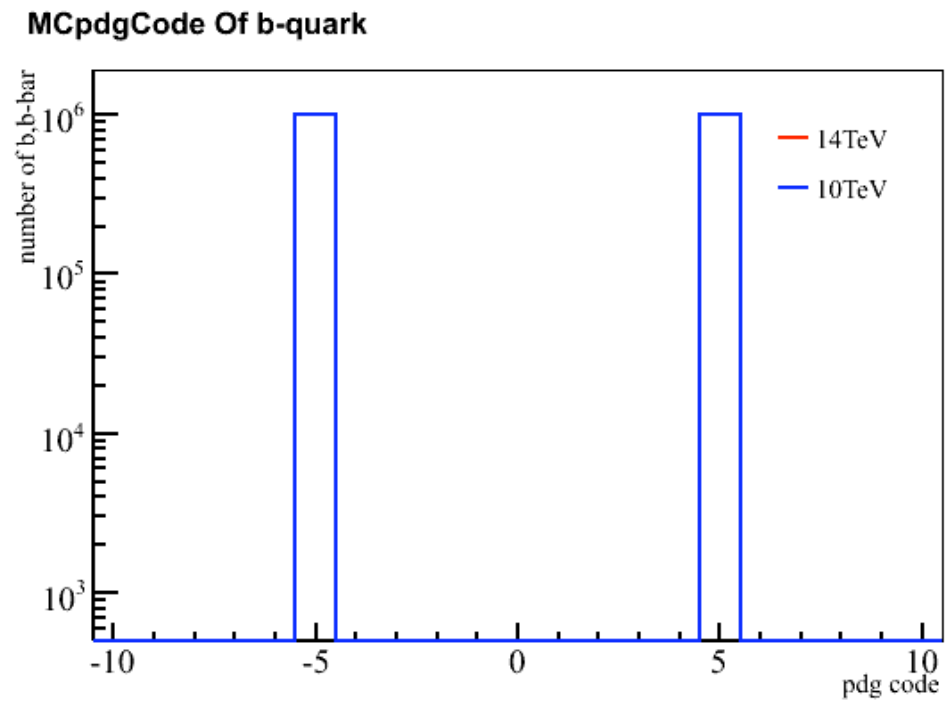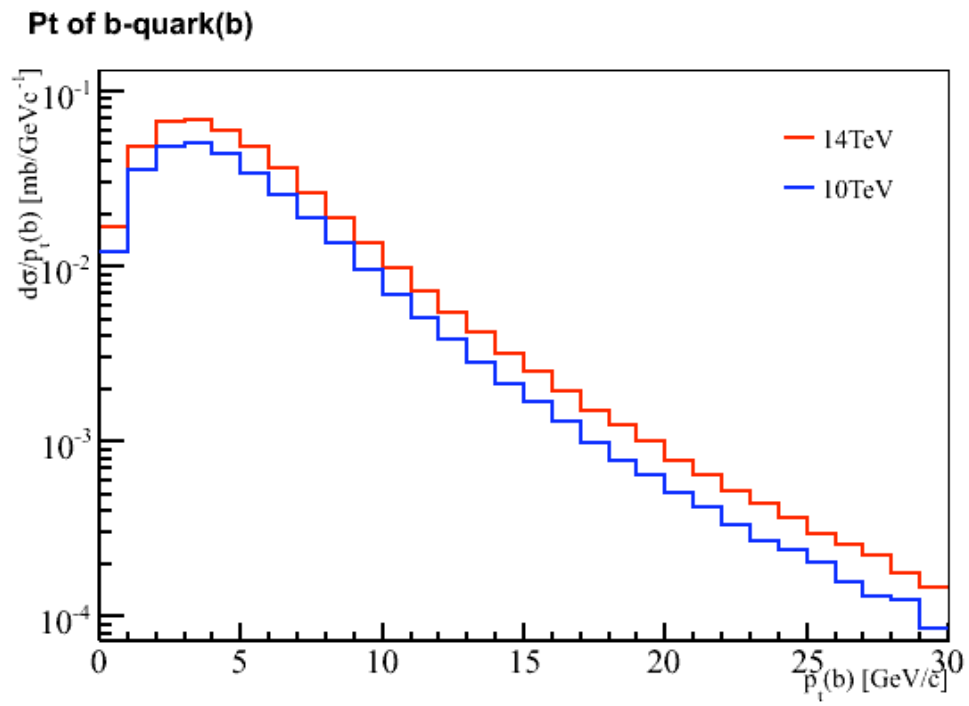
y Distribution

Number of b,bar per Event

- Check how many b,b-bar we have per event

  ‣ All events has b,b-bar as pairs (no single b quarks).

  ‣ There are events which have more than one pair due to mainly the initial/final parton shower on.

b,b-bar Production Process

- Process Type and matching Process ID

  ‣ 0 : Pair Creation(qqbar->QQbar), 1 : Pair Creation(gg->QQbar)

  ‣ 2 : Flavor Excitation(qg->qg), 3 : Gluon Splitting(g->QQbar)

  ‣ 4 : Both b,b-bar's has same mother, and the mother is incoming parton before initial radiation

  ‣ 5 : Similar case of flavor excitation but the one b quark's mother is incoming light quark(instead of gluon) before initial radiation)
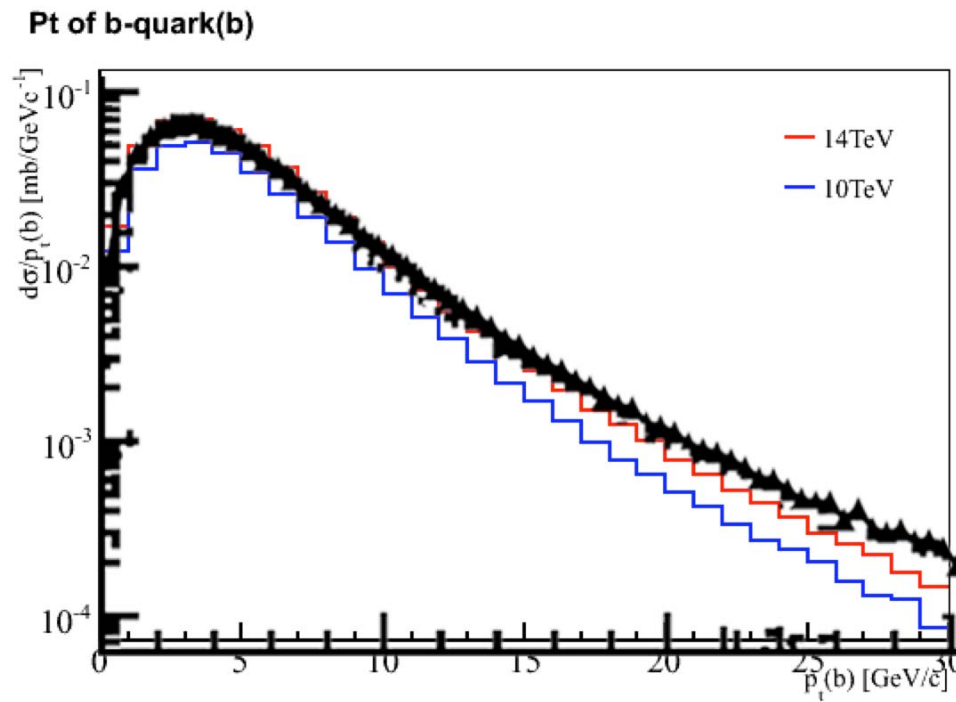

ProcessID
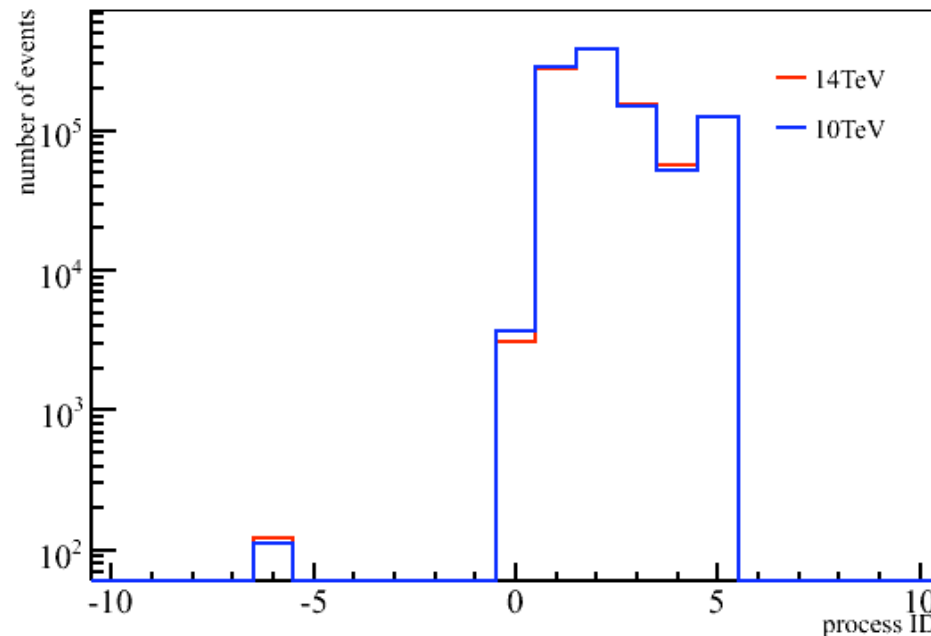
* negative ID : in case process identification fails (there are still some process which I couldn't put above described categories)
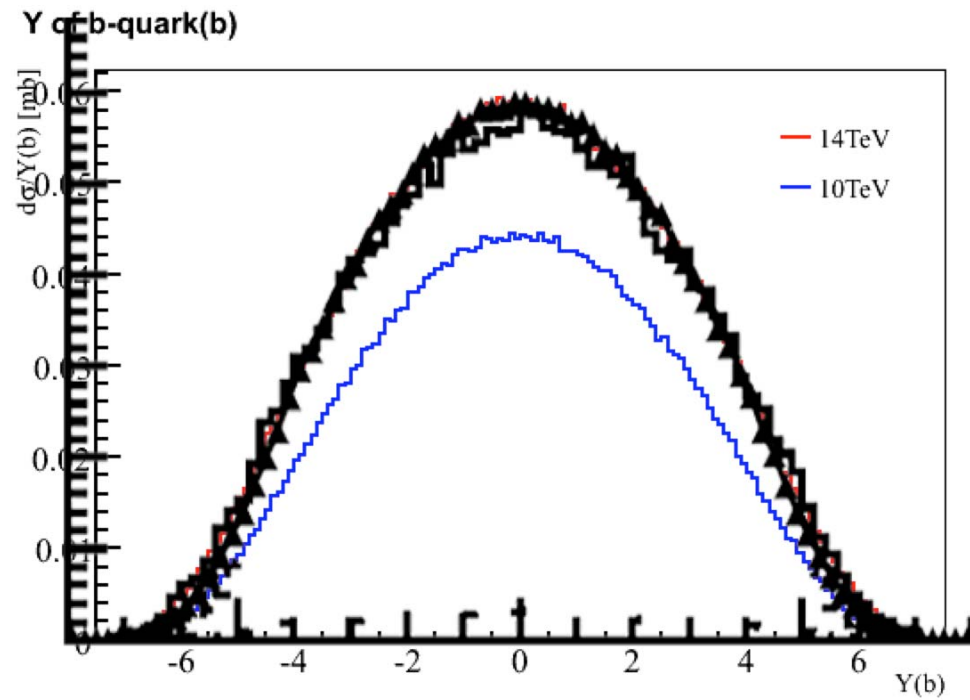
- One can try to put the case of 4 and 5 to 2 or 3 but.,I don't think it is necessary to put since it is the way that Pythia try to reproduce NLO prediction using parton shower.

Compare with NLO prediction(Fig. 6.275 in PPR) for 14TeV

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Conclusion

- Configuration kPyMbMSEL1 (= kPyBeautyppMNRwmi) with right relative event population reproduces reasonably well the NLO prediction shown in PPR (at least for pT and eta distribution)

- Not sure if it is OK to be used for the correlation analysis but enough for study related to single b.