Simulation of Dimuon channel of Drell Yan process at CBM energies

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Outline :

1) What is Drell Yan?

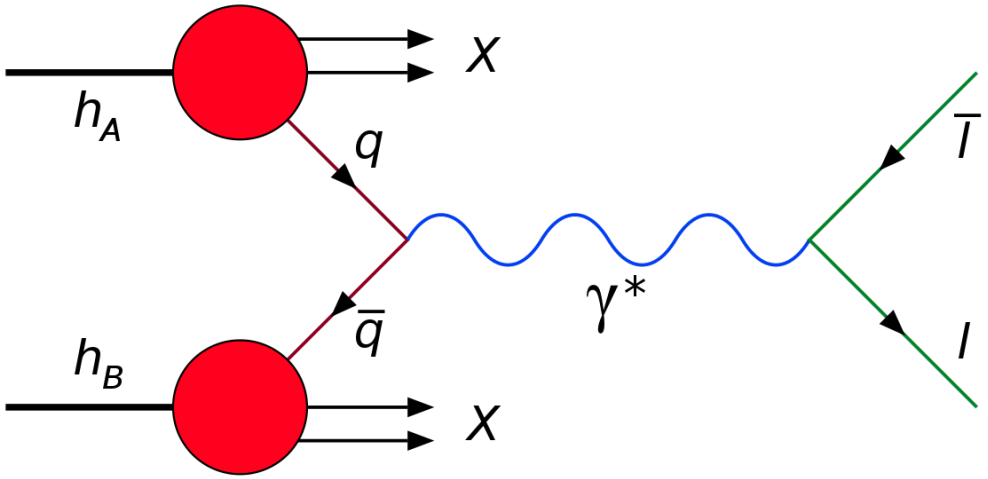
2) Why it is Important?

3) Properties of Di-muons in DY from Pythia (trigger event Simulation)

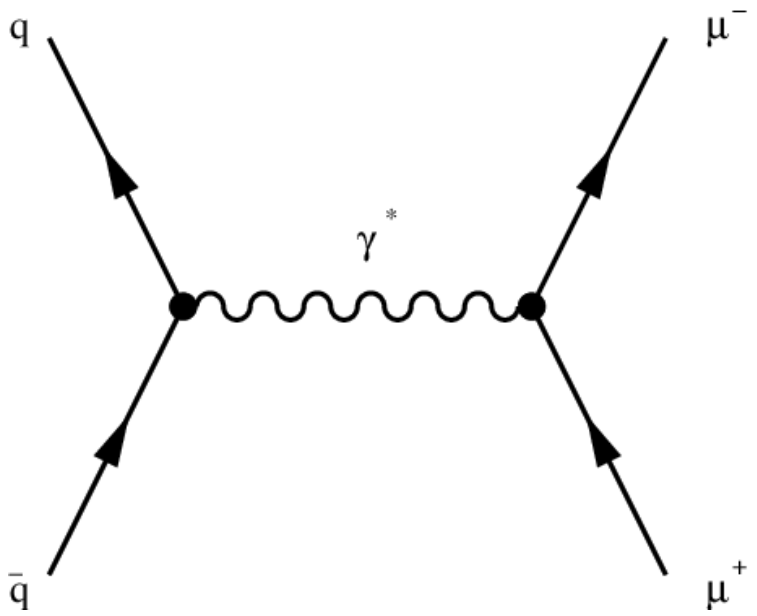
4) Properties of the muon pair (virtual boson)

5) To do list

Drell Yan Interaction



quark from one hadron and anti-quark from another hadron annihiliate



In the di-muon channel

γ* ---------> μ+μ-

Why is DY study important

1) Contribution of DY background to J/Psi reconstruction :
   Preliminary Studies from P. Bhaduri suggested negligible DY in J/Psi Mass region
2) DY background for lower Mass region ?

PT2: J/ψ

- μ ID employing ANN algorithms (Sumit Kundu)
- $\mu^+\mu^-$ & e^+e^- produce and analyse Au+Au E_{beam}=11A GeV and p+Au E_{beam}=30 GeV (together with PWG-COM)
- move to PYTHIA event generator for J/ψ production (particular pA)
- trigger concept! also for IMR dileptons

PT3: Direct photons

- *analysis update*

PT4:Freeze-out meson reconstruction (i.e. π, η, ω, ϕ) and Drell-Yan

- $\mu^+\mu^-$ Ajit Kumar, Anna Senger finalize multi-differential analysis
- e^+e^- Pavish Subramani (update results from photon conversion method with up-to-date detector setup)
- $\mu^+\mu^-$ & e^+e^- extract fully efficiency and acceptance corrected (in p_T-y), extrapolated to the full phase space multiplicities and compare to world data
- include Drell-Yan to the simulations, event generator?

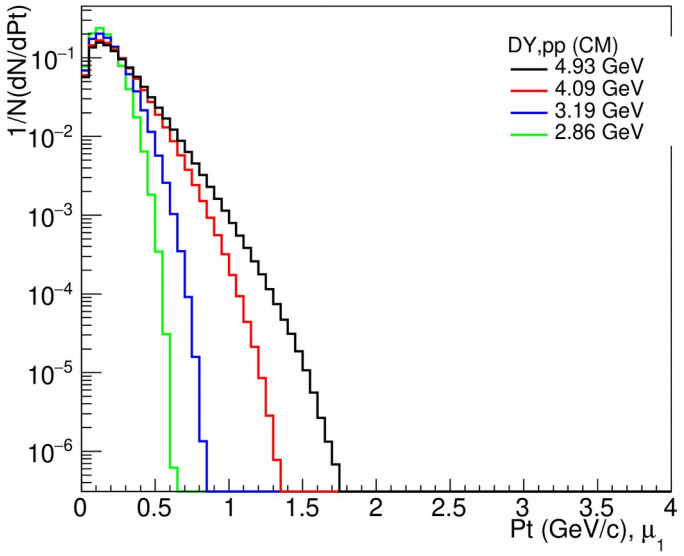
To-do list discussed in the collaboration meeting

Problem worked.

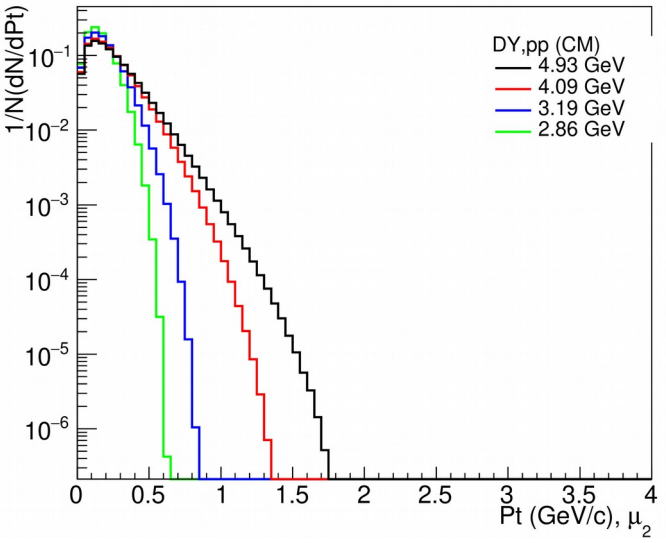
Properties of the muon particles produced (Pt and Rapidity)

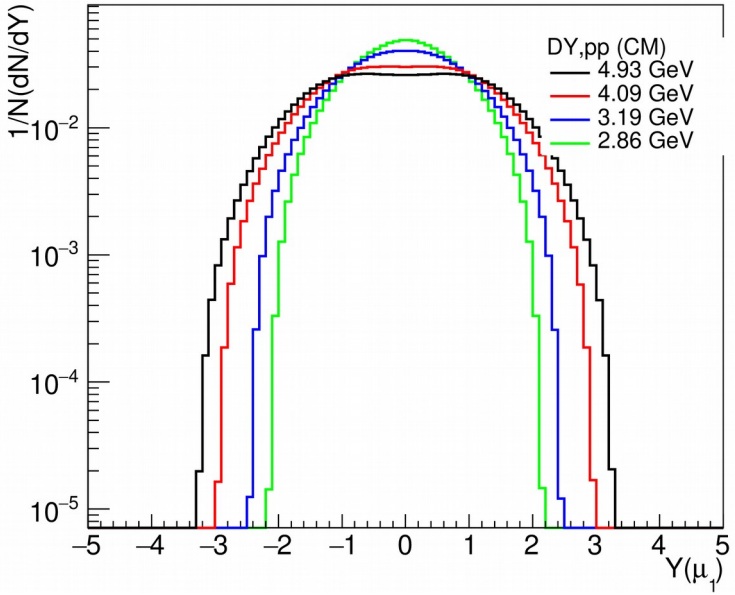
Collision in CM frame at given CBM energies

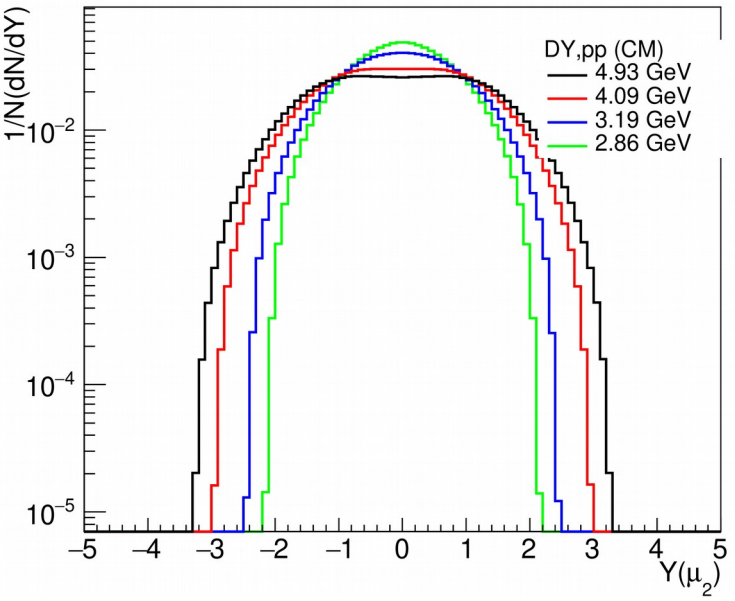
μ_1



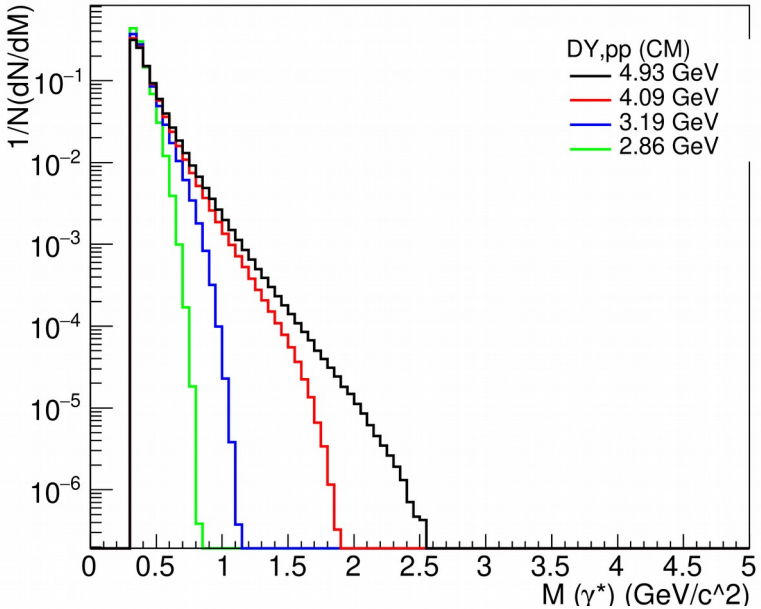
μ_2

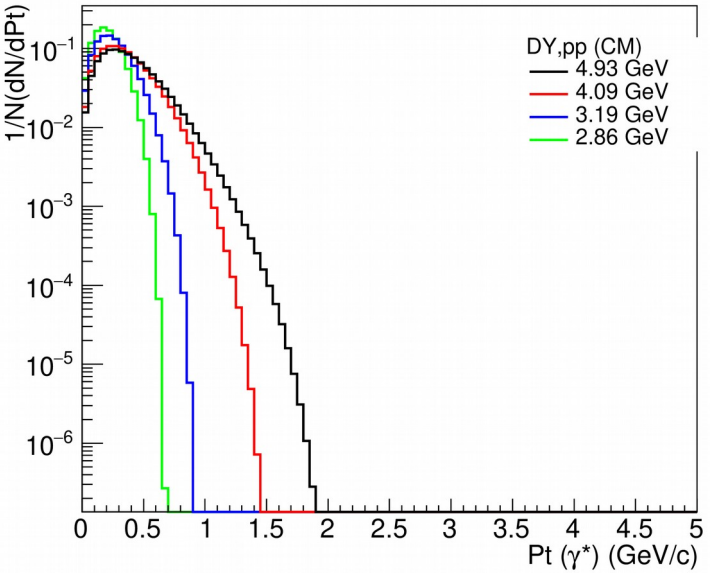


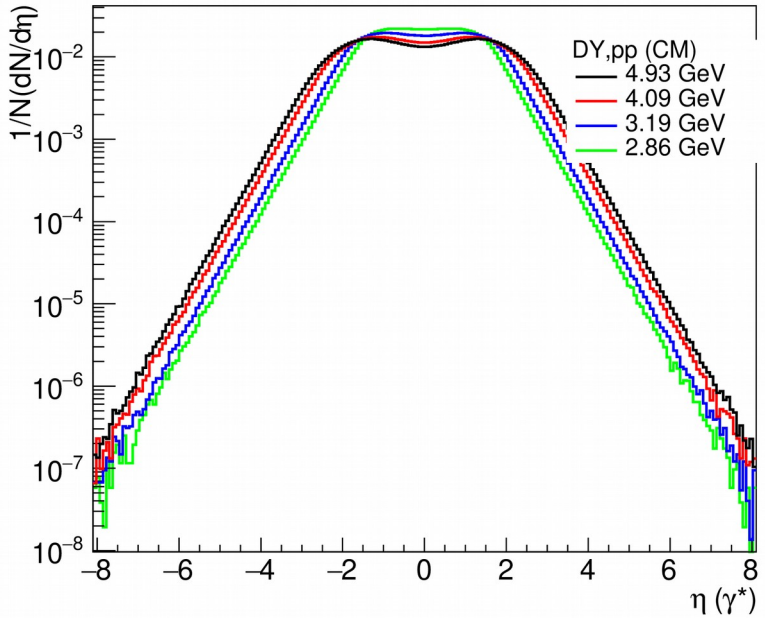


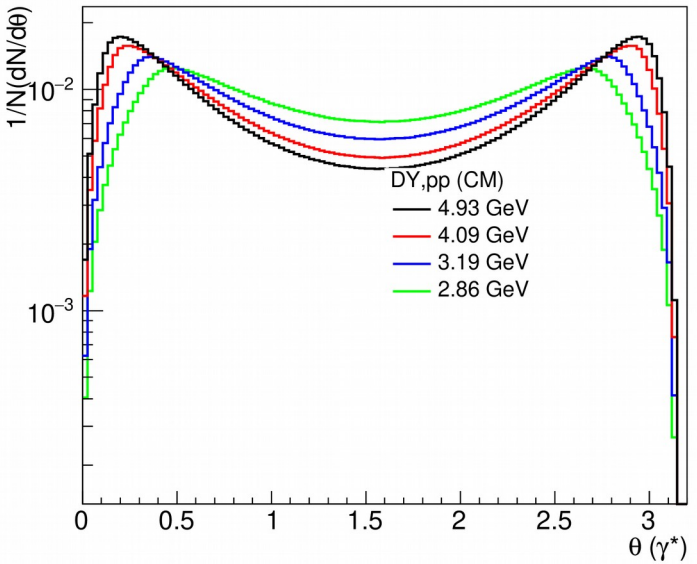


Properties of Drell Yan y* at CBM Energies









Collision in CM frame at given CBM energies

Event generation Statistics from pythia 8306

Process generated : f fbar -> gamma*/Zo -> μ +μ- pair

Table for No. of events in different mass regions

E_{CM} (pp, GeV)	Total Events	$M_{\mu\mu} < 1.$	$1.< M_{\mu\mu} < 2.$	$2.<M_{\mu\mu} <2.9$	$2.9 <M_{\mu\mu} < 4.2$
4.93	96372196 ($\sim 10^8$)	95571137 ~99.16%	797051 ~0.8%	4008	0
4.09	91646627	91197790	448837	0	0
3.19	74257926	74255911	2015	0	0
2.86	51836242	51836242	0	0	0

Conclusions :

1) ~10^8 triggered dimuon DY events generated using pythia8306.

2) In the mass range 2.9 – 4.2 GeV Zero dimuon DY events were found

3) Negligible DY events in di muon channel for the invariant mass range corresponding to J/Psi signal mass

4) For the lower dimuon pair invariant mass, these DY events can be used as a background in addition to the combinatorial background

To do list :

1) Simulation in the lab frame

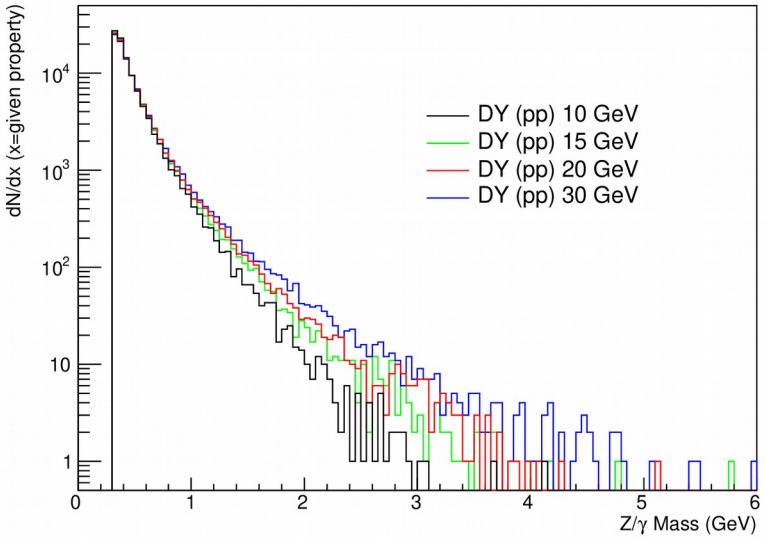
2) Generation of root file input for CBM software
   (four momentum of muons)

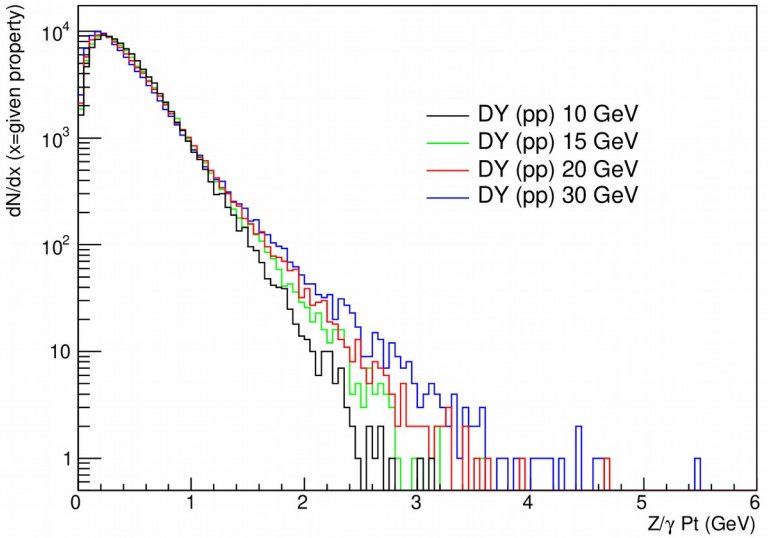
Thank you!

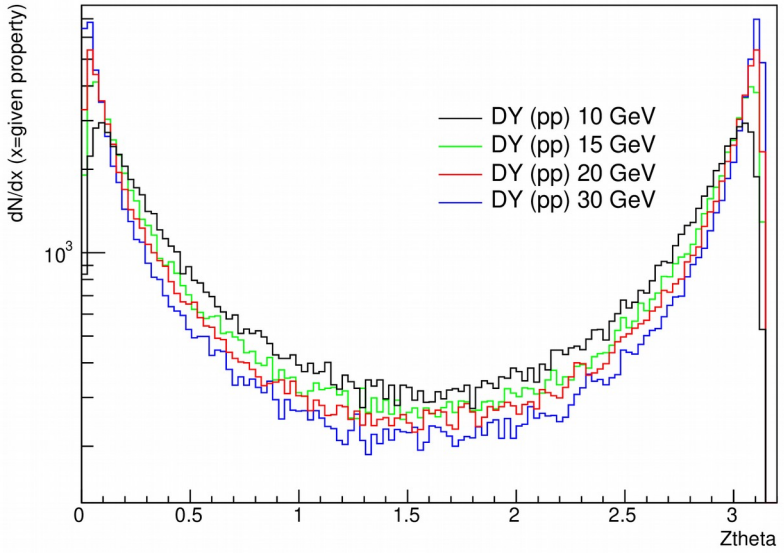
Back up

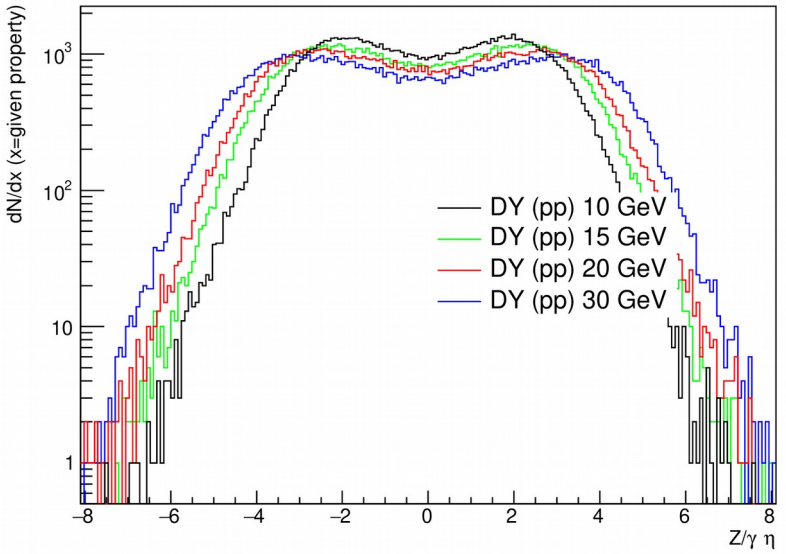
DY Plots at higher CM energies for comparison

Properties of Drell Yan Z/Photon



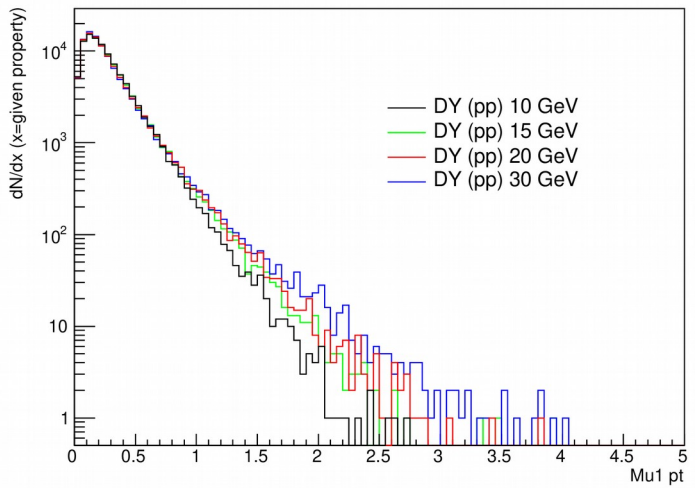


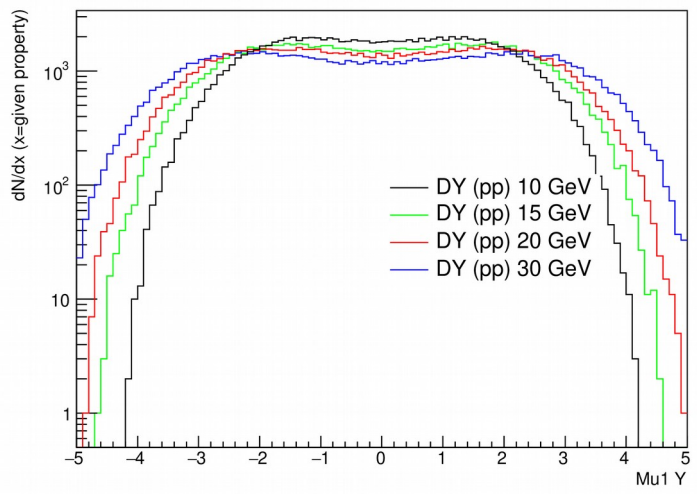




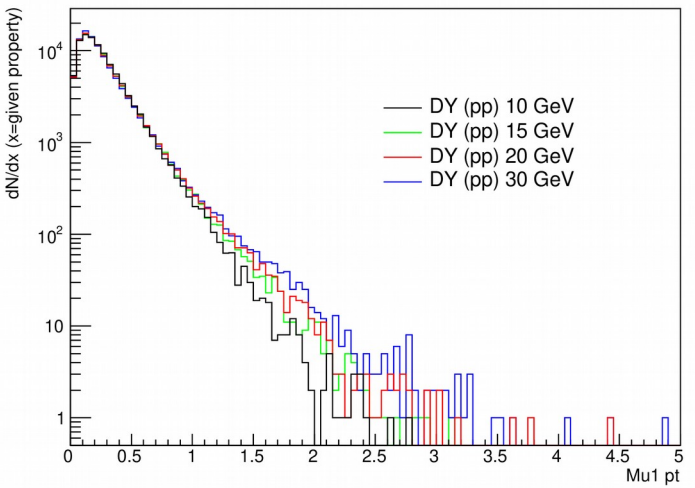
Properties of the muon particles produced (Pt and Rapidity)

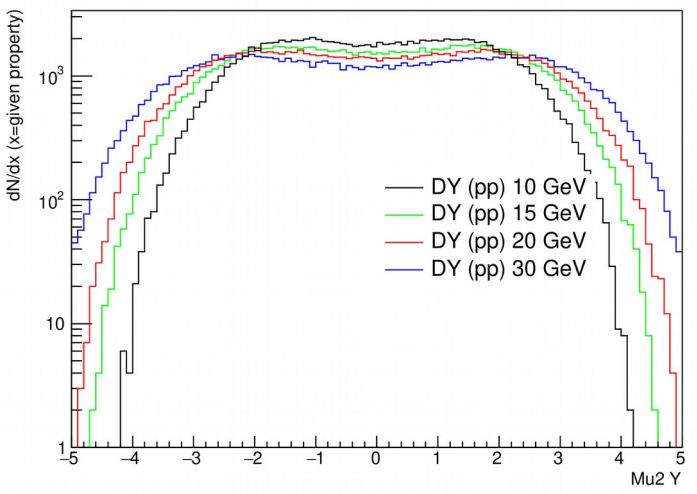
Mu1





Mu2





```
pythia.readString("PartonLevel:ISR = off");// !  initial-state radiation
pythia.readString("PartonLevel:FSR = off");// !  final-state radiation
pythia.readString("PartonLevel:MPI = off");// !  MPI

pythia.readString("PhaseSpace:mHatMin = 0.22");
//  pythia.readString("PhaseSpace:mHatMax = 10");
pythia.readString("23:mMin = 0.22");

// primordial kt
pythia.readString("BeamRemnants:primordialKTsoft = 0.9");
pythia.readString("BeamRemnants:primordialKThard = 1.8");
pythia.readString("BeamRemnants:halfScaleForKT   = 1.5");
```