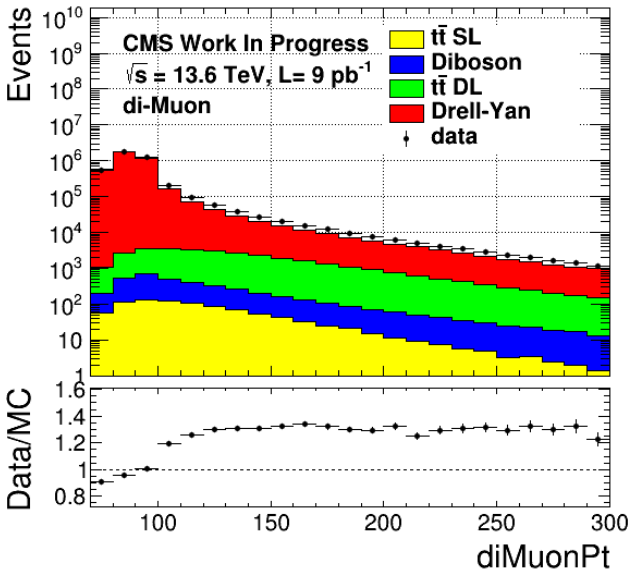
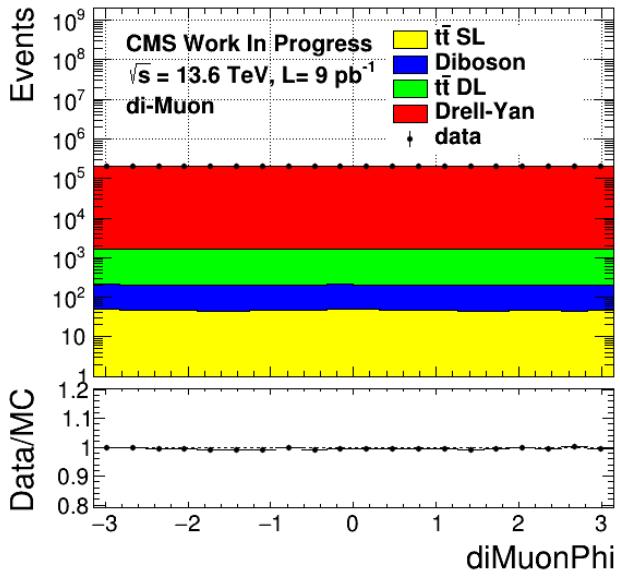
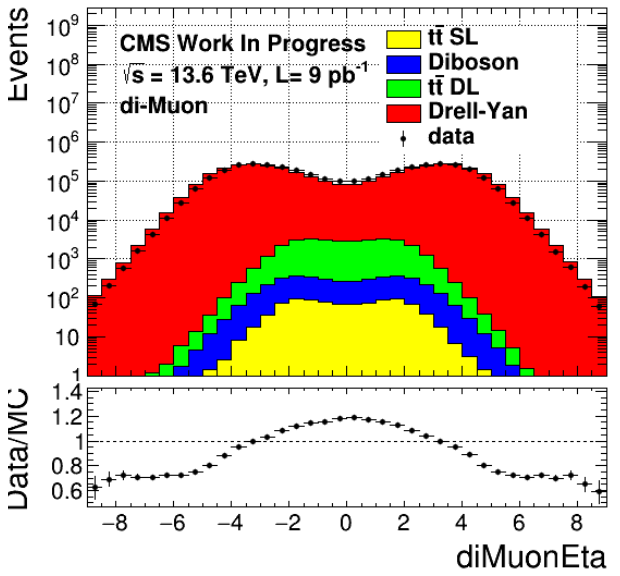
# Further $t\bar{t}HH$ data check and next stage plan

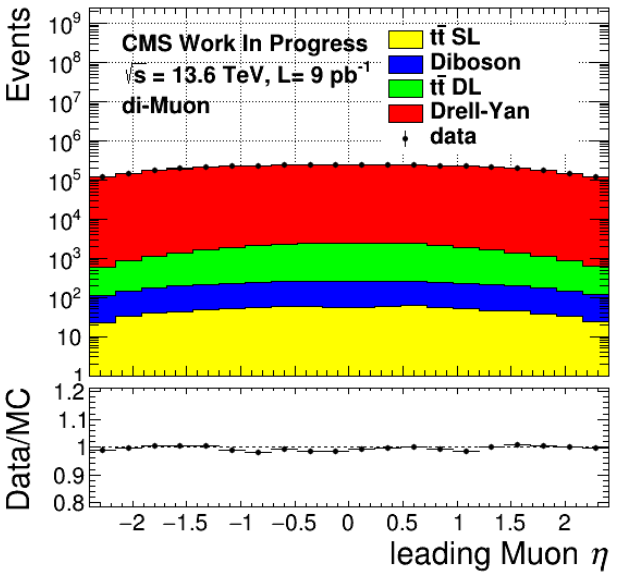
Yang Tianyi

# di-Muon properties



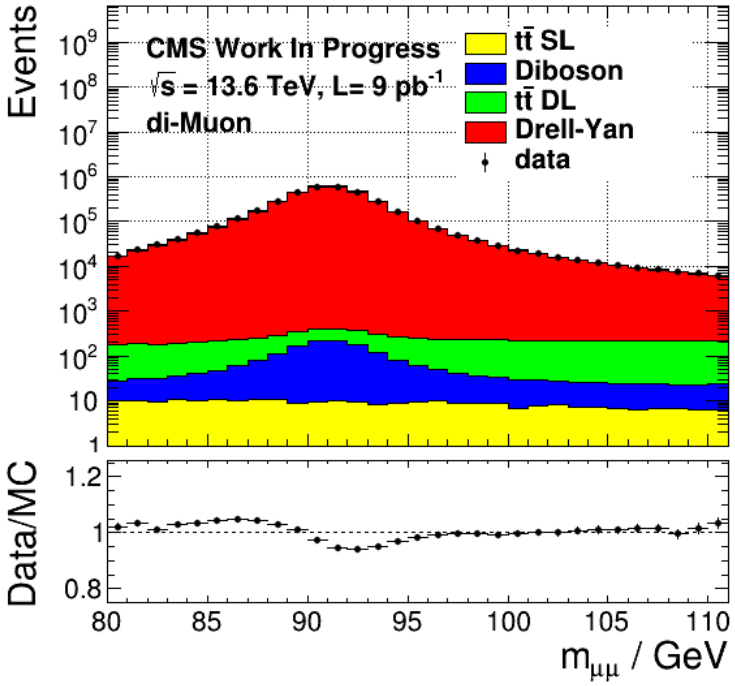



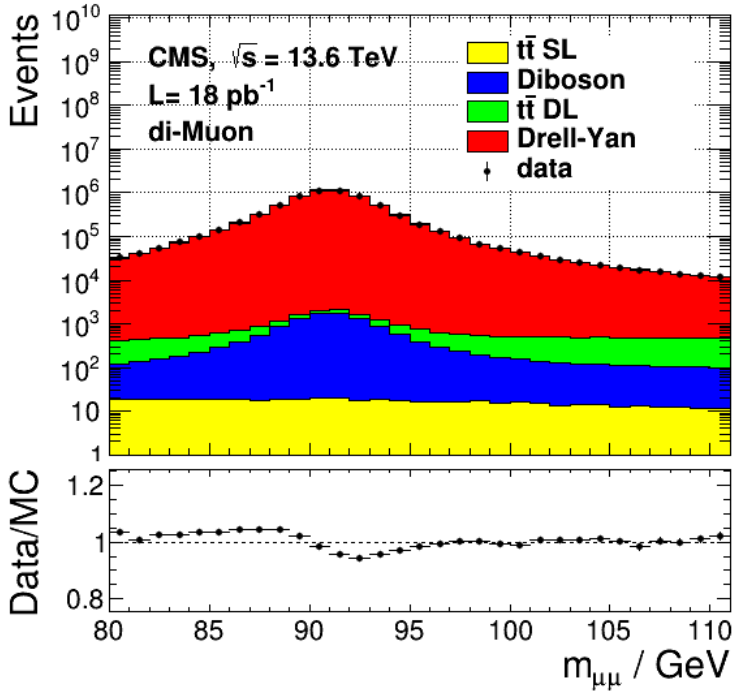

- di-Muon $p_T$ shows the same shift effect as seen in the single Muon.
- $\phi$ distribution is uniform.
- The shift of $p_T$ cause larger also $\eta$ distribution more centralized in data, which is not for the single Muon. This would because the two muons has different $p_T$ shift, but why they become more concentrated would need further check.

# Run2023C and Run2023D

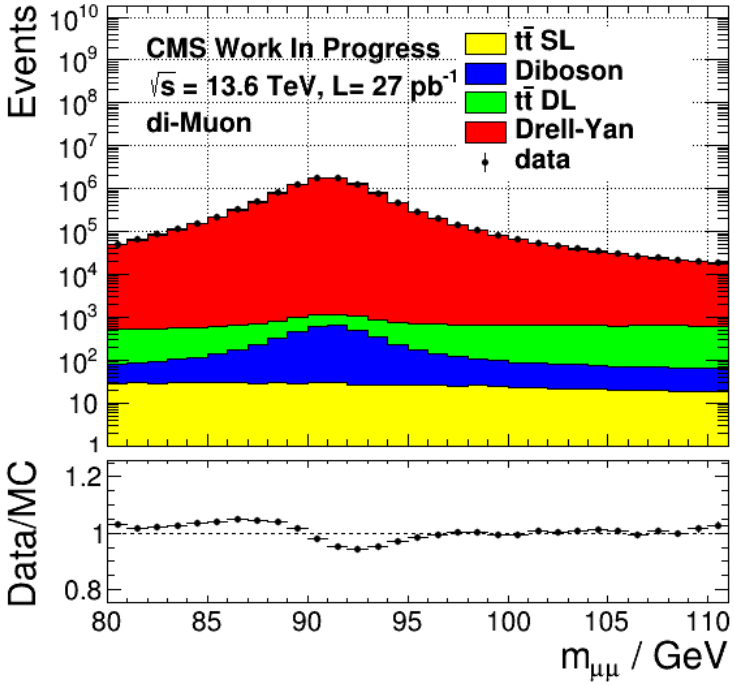
**Run2023D**




**Run2023C**



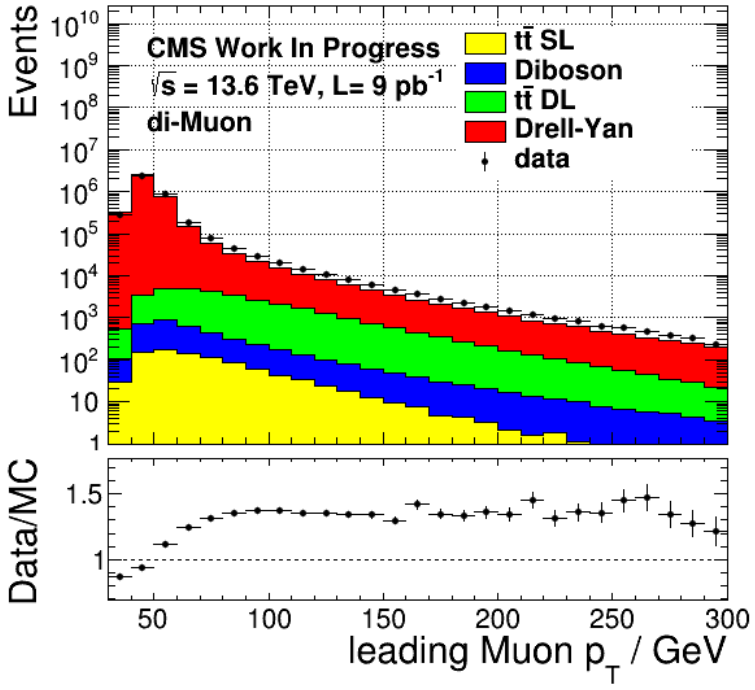

**Run2023C+D**



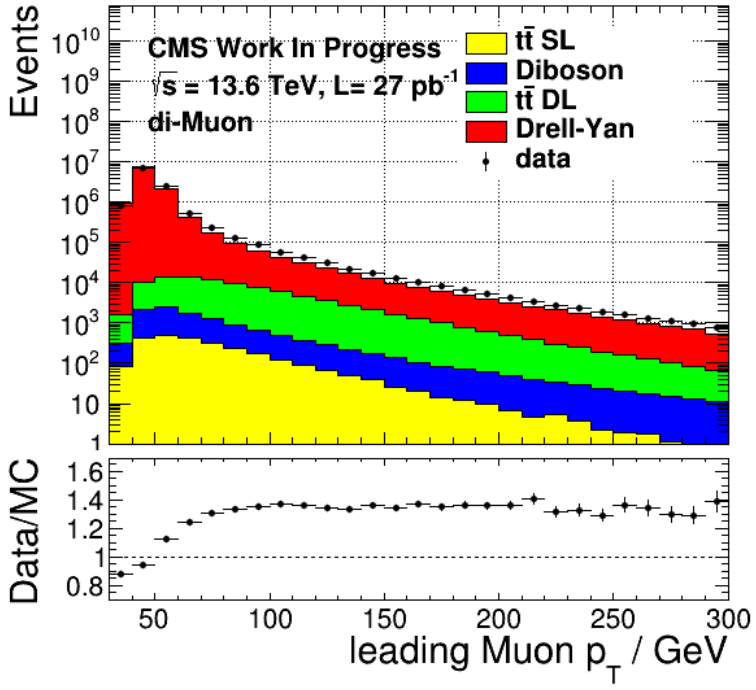

- The Run2023C era has the same issue of invariant mass shift.
- The $t\bar{t}$ contribution seems to be different.

# Run2023C and Run2023D

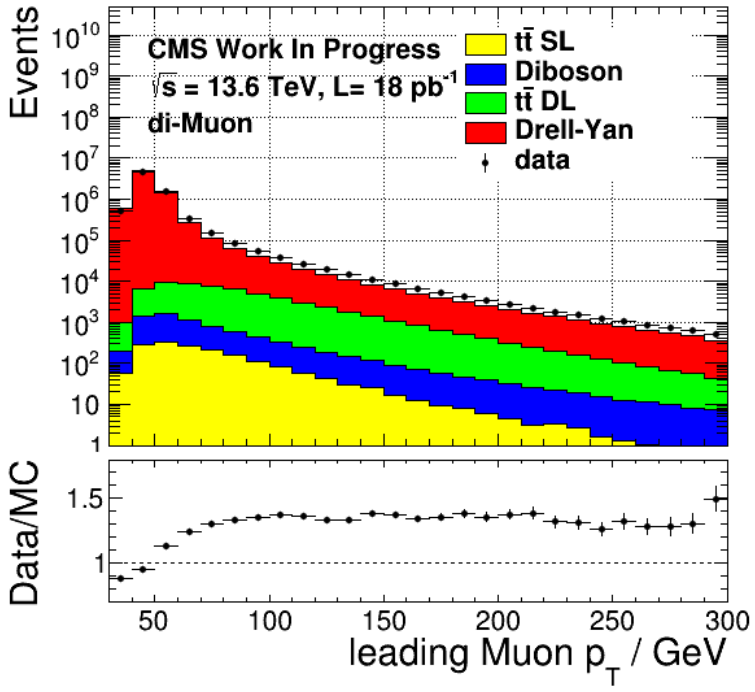
**Run2023D**




**Run2023C**

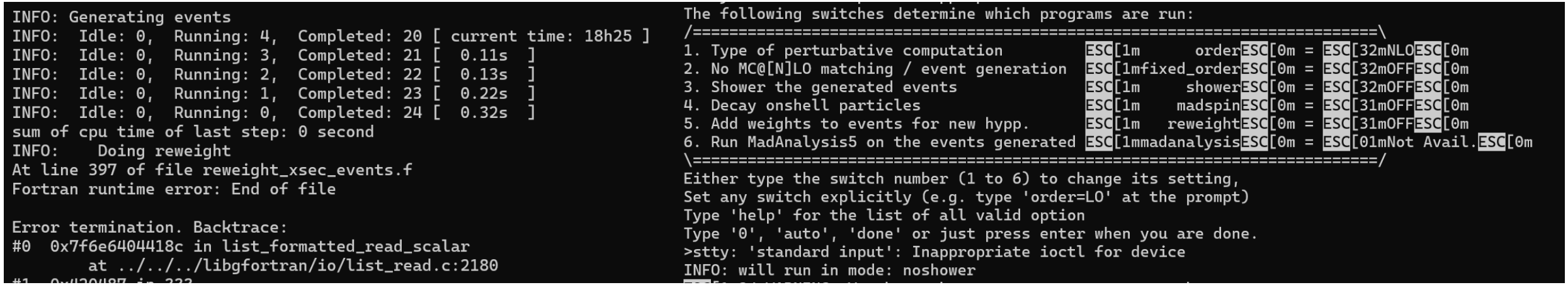



**Run2023C+D**




- The Run2023C has the same $p_T$ shift.

# Trying on gridpack




- I am trying the master branch generator pack https://github.com/cms-sw/genproductions.
- Not need CMSREL environment. Trying the running on lxplus EOS filesystem.
- Testing the central production card 13p6TeV/ggh012j_5f_NLO_FXFX_60. Meet some issue in the production step, need further check. Then we can have our private ttHH production for Run3.

- Also, I found the gridpack generation turning off the Pythia showering. In the 2020 MC tutorial, the Parton shower need to be done after Nano production? Would need to check the procedure.

# Discussion with French group

- The French group comes back to contact, and we would have a further discussion on this **Thursday 4pm** CERN time.
- Proposed discussion with the French group:
  - MC samples production: including the Run3 signal processes, ttbb and tt4b backgrounds. We would need ttHH sample with **inclusive decay** mode.
  - Normalization and scaling: for the common sample shared in our study, we may have NNLO XS values, reducible background scaling values, lepton ID scaling values shared.

# GEM EPR

- Task: uploading to GEM database the QC info.
- I have finished External frame, Internal frame, Foil, Chips QC records XML preparation. Stefano and Luigi seems to be satisfied with the style. (Sorry our communication is using skype, that no emails c.c. to everyone in the group).
- This is a short and simple task guiding me to the GEM. Later on we may have chance joining more interesting study.
- This **Wednesday 2 pm** CERN time, I will have a presentation on the work done. Later today when I send the email to Stefano and Luigi, I will c.c. to people in our group.