



Weekly Update

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Outline

- I've mainly been working on my final report

Outline of this presentation:

- From last time: I made momentum-angle distributions for the *default* eta distributions at different beam energies with **better binning** (next slide)
- Quick summary of what I've done
- A few things I need to do before I leave
- The future of this project

What do the default distributions for pi0 and eta look like?

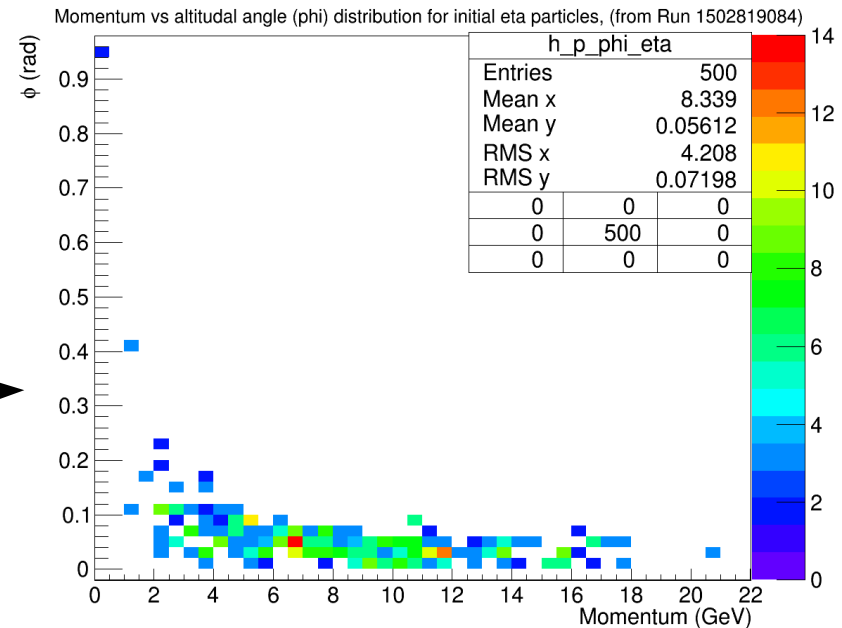
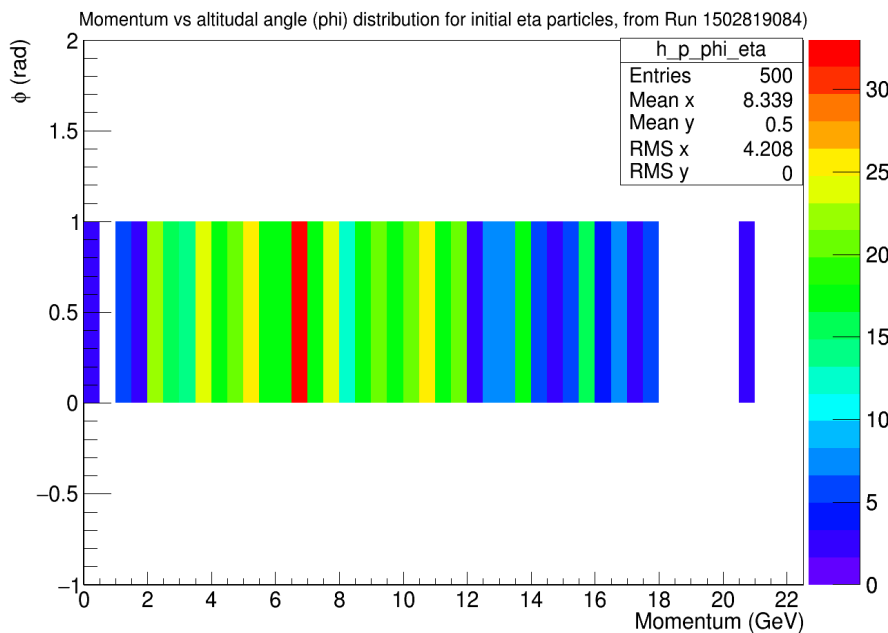
Ran bdnmc at 30 GeV beam energy for pi0 and eta production channels with default and bmpt production distributions:

- pi0 bmpt: Run 1502818965
- Pi0 default: Run 1502829091
- Eta bmpt: Run 1502819084
- Eta default: Run 1502819130

Also ran it for the eta production channel with the default production distribution at different beam energies:

- At 9 GeV beam energy, eta default: Run1502830499
- At 80 GeV beam energy, eta default: Run1502830538

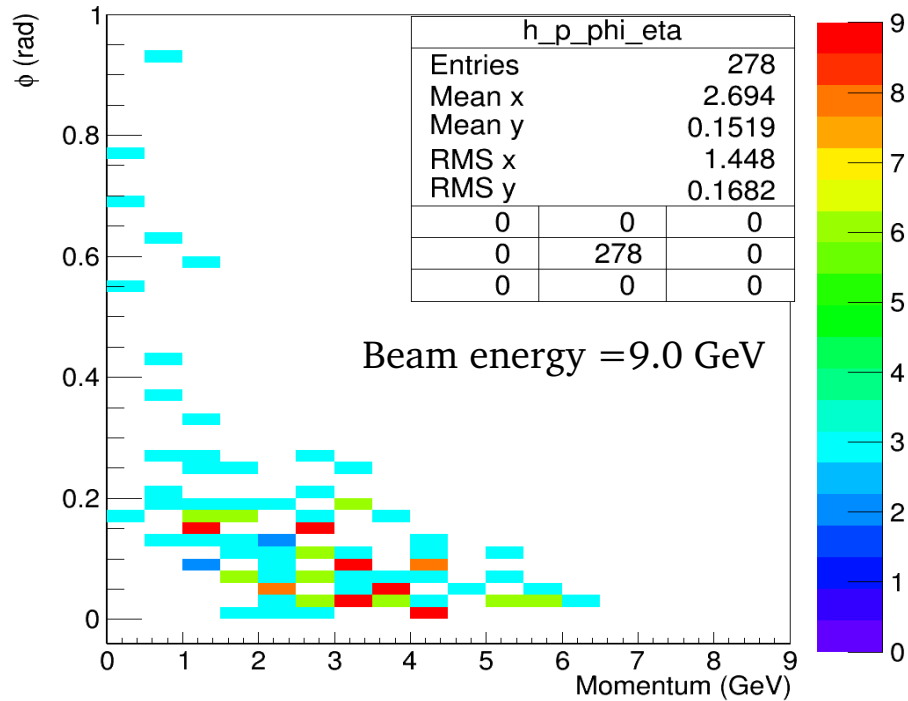
- ♦ I showed these distributions last time, but I changed the binning → more info now



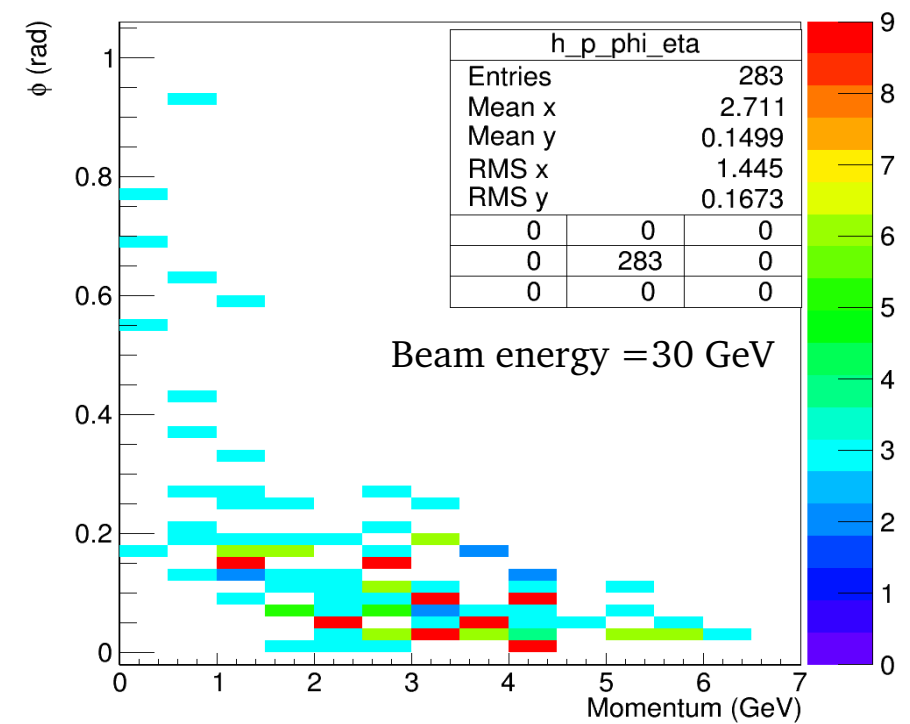
Updated distributions are shown on the next few slides

Default distributions for eta particles

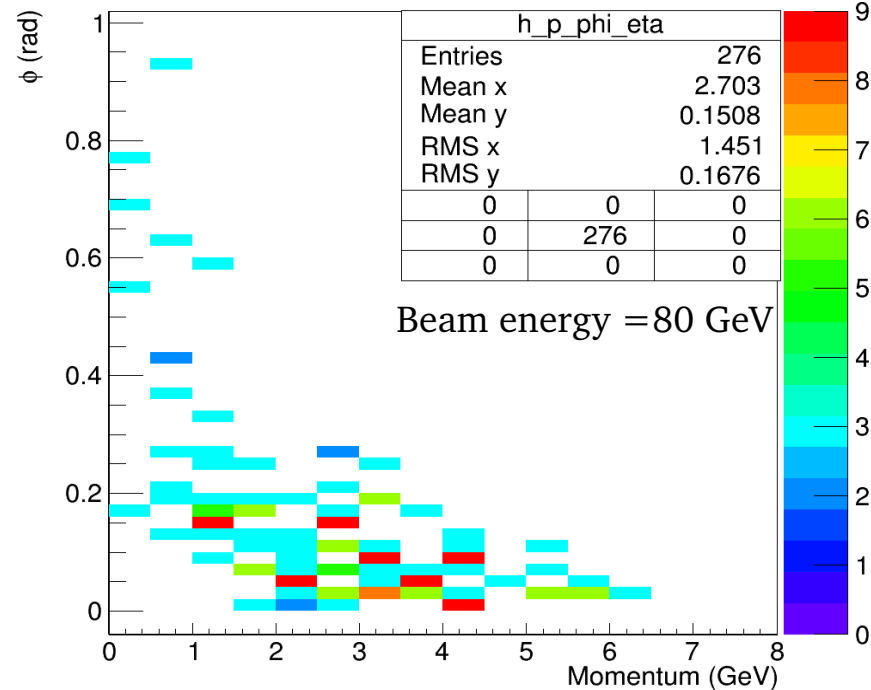
Momentum vs altitudal angle (phi) distribution for initial eta particles, (from Run 1502830499)



Momentum vs altitudal angle (phi) distribution for initial eta particles, (from Run 1502819130)



Momentum vs altitudal angle (phi) distribution for initial eta particles, (from Run 1502830538)



→ Default distribution still looks independent of beam energy

→ don't use default distribution for SK studies

- | |
|---|
| At 30 GeV beam energy |
| • pi0 bmpt: Run 1502818965 |
| • Pi0 default: Run 1502829091 |
| • Eta bmpt: Run 1502819084 |
| • Eta default: Run 1502819130 |
| At 9 GeV beam energy, eta default: Run1502830499 |
| At 80 GeV beam energy, eta default: Run1502830538 |

Quick summary of this project

- Initially we wanted to make sure everything works as expected:
 - I Ran BdNMC with the MiniBooNE experiment parameters to reproduce some MiniBooNE plots in the paper
 - Got the same results as paper and Patrick
- Along the way, I made code to input the BdNMC run output data file (events.dat) and make some histograms (next slide)

All the histograms made by my code:

These histograms are also made for

- DM particles
- scattered particles (protons +neutrons)
 - there are also position/time histograms for scattered particles

Separate histograms made for each production channel

(eg V coming from pi0 decay, eta decay, proton Bremsstrahlung)

- in the image, proton Bremsstrahlung was the only production channel

h_px_V_all;1
h_py_V_all;1
h_px_py_V_all;1
h_pz_V_all;1
h_px_py_pz_V_all;1
h_p_V_all;1
h_E_V_all;1
h_theta_V_all;1
h_phi_V_all;1
h_theta_phi_V_all;1
h_phi_p_V_all;1

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h_z_scattered_n_pBrem;1
h_time_scattered_n_pBrem;1

Quick summary cont.

What I've done:

- I Ran BdNMC with SK parameters
- I need to look at the particle distributions (momenta, energy, position, time, angle) for the SK run

-Note I ran BdNMC for SK by increasing the detector volume by a factor of 1000 (computational power limitations: I just run bdnmc from the terminal)

- The interesting thing would be to run BdNMC with the proper SK volume, look at the particle distributions (future work)

The future of this project:

- Run BdNMC with the proper detector size
 - I use the bmpt distribution for pi0 and eta particles, next step it to use T2K software to get distributions of initial pions and eta particles at T2K
 - I use 1.0 for pi0_per_pot (Patrick uses 1.0 for sk), next step is to use a more accurate value
- my code puts all the info of the particles involved in BdNMC scattering events (initial particle, DM, V, scattering particle) into a TTree
 - TTree stores the pdg convention particle integer for protons and neutrons
 - (separate) code also makes the distributions for the scattered protons/neutrons
- next step is to put the scattered particles into the SK detector simulation software (Corina)

Some things I need to do before I leave:

- make Q^2 distributions for the events in the BdNMC runs
- make normalized histograms for the angular distributions + figure out why there were sinusoidal patterns in the azimuthal angle distributions for the miniboone-like example
- finish my report

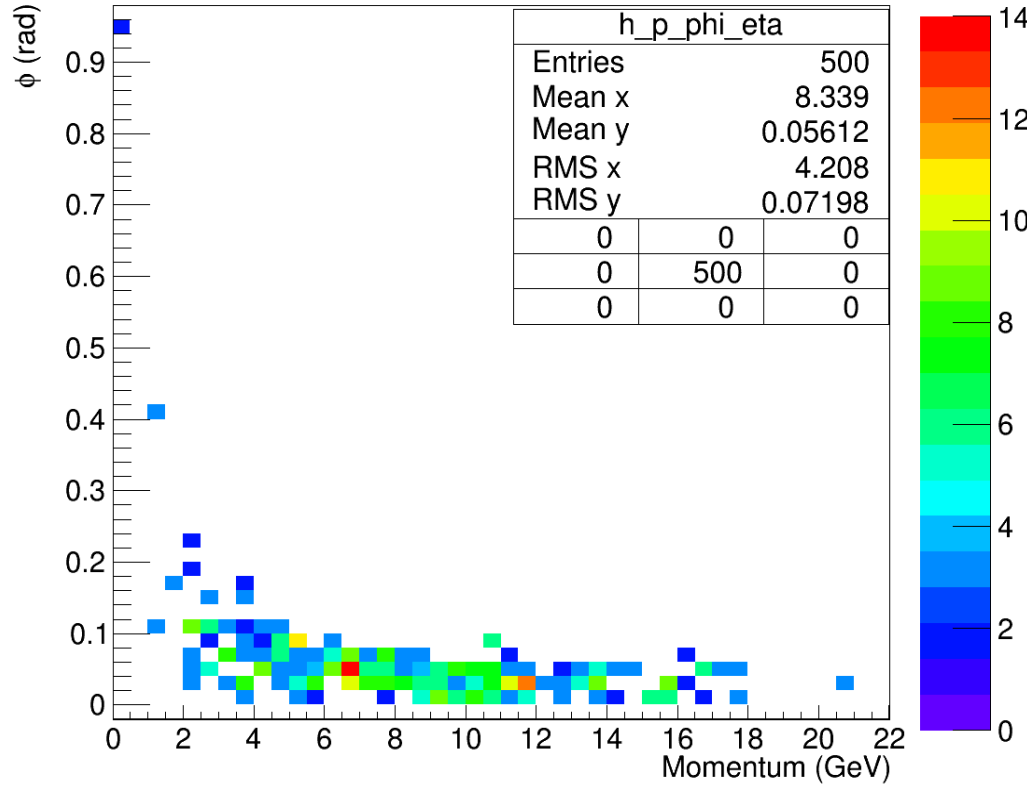
Back up

**Some momentum angle
distributions fr default vs bmpt
distributions with better binning**

Default distributions

Eta bfmt: Run 1502819084, beam energy = 30 GeV

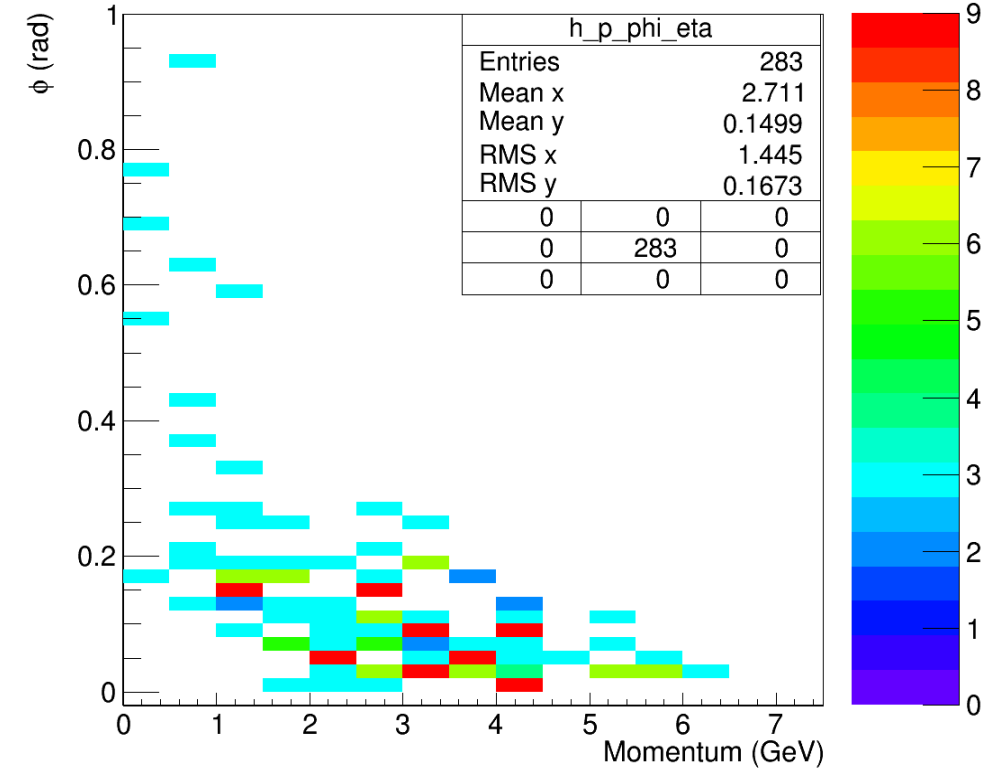
Momentum vs altitudal angle (phi) distribution for initial eta particles, (from Run 1502819084)



P: ½ GeV per bin
Phi: 0.04 rad per bin

Eta default: Run 1502819130, beam energy = 30 GeV

Momentum vs altitudal angle (phi) distribution for initial eta particles, (from Run 1502819130)



P: ½ GeV per bin
Phi: ~ 0.02 rad per bin

At 30 GeV beam energy

- pi0 bfmt: Run 1502818965
- Pi0 default: Run 1502829091
- Eta bfmt: Run 1502819084
- Eta default: Run 1502819130

At 9 GeV beam energy, eta default: Run1502830499

At 80 GeV beam energy, eta default: Run1502830538