Brookhaven National Laboratory

U.S. DEPARTMENT OF ENERGY

Tracking Simulation using LDT

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05-13-2024

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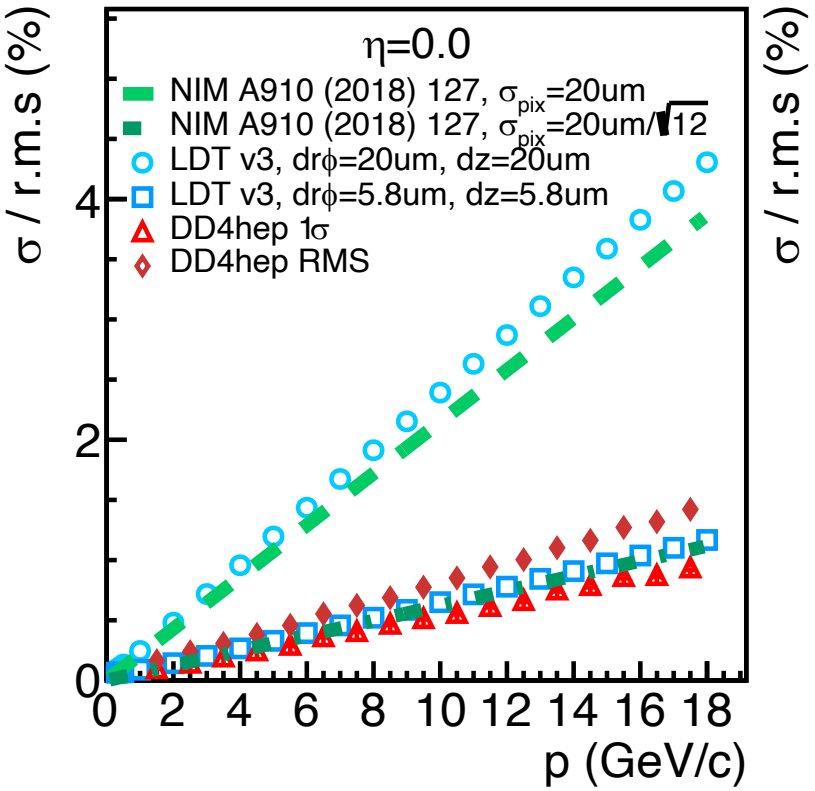
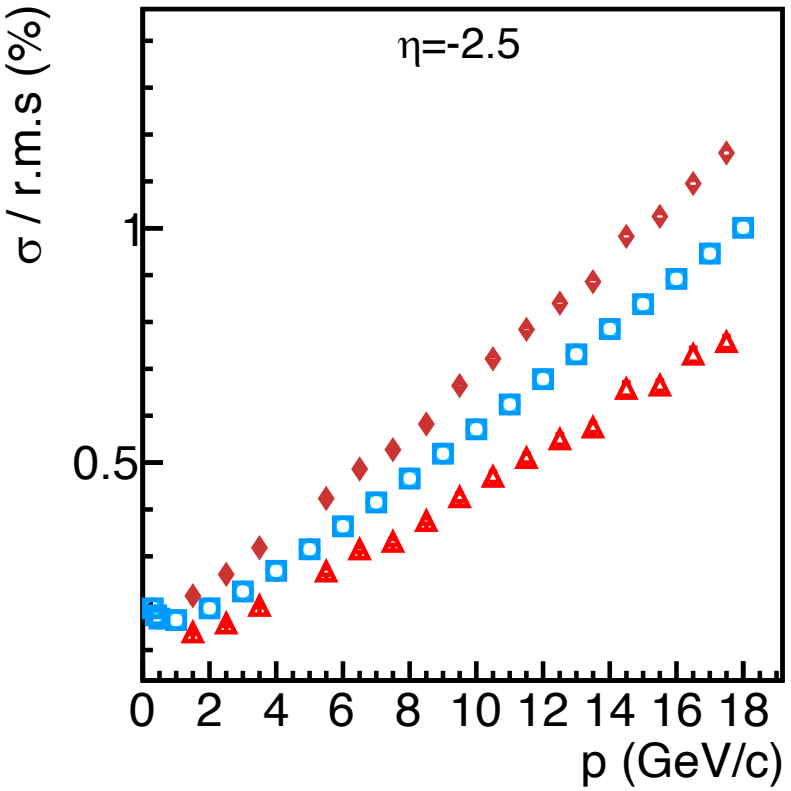
Last Update

Minimized material budget to focus on momentum resolution due to pixel resolutions

Barrel



backward



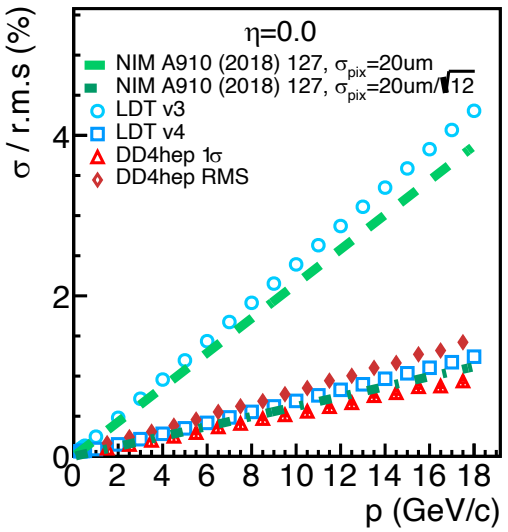
- Barrel: LDT results is close to DD4hep when $\mathrm{d}r\phi = 20/\sqrt{12}$ um and $\mathrm{d}z = 20/\sqrt{12}$ um
- Backward: $\mathrm{d}u = 20$ um and $\mathrm{d}v = 20$ um looks ok

Momentum Resolutions

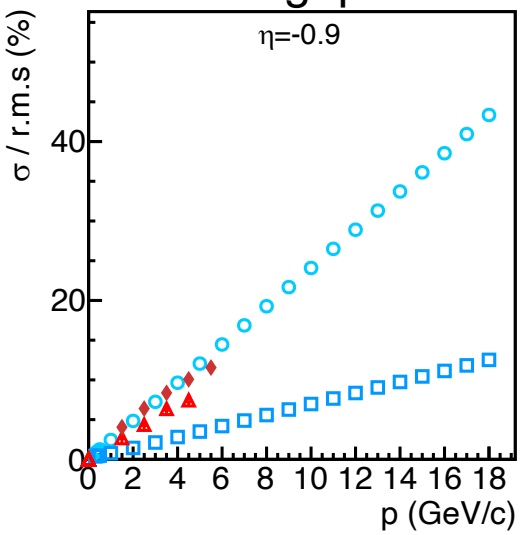
Same as last update, is minimal materials

- V3: $\mathbf{dr\phi = 20\ um}$, $\boldsymbol{dr\phi = 20\ um}$, $\mathrm{d}u = 20$ um, $\mathrm{d}v = 20$ um
- V4: $\mathbf{dr\phi = 20/\sqrt{12}\ um}$, $\boldsymbol{dr\phi = 20/\sqrt{12}\ um}$, $\mathrm{d}u = 20$ um, $\mathrm{d}v = 20$ um

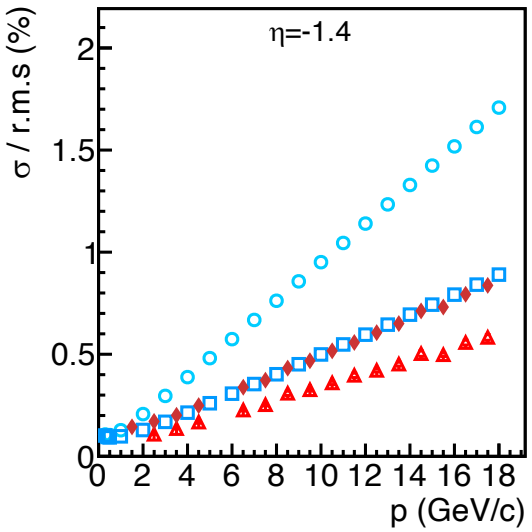
All barrel hits



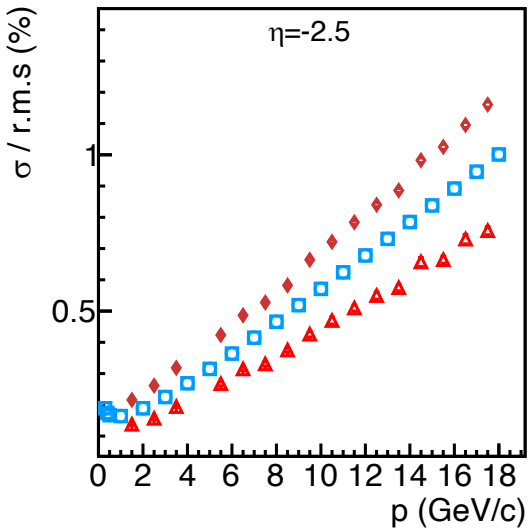
The gap



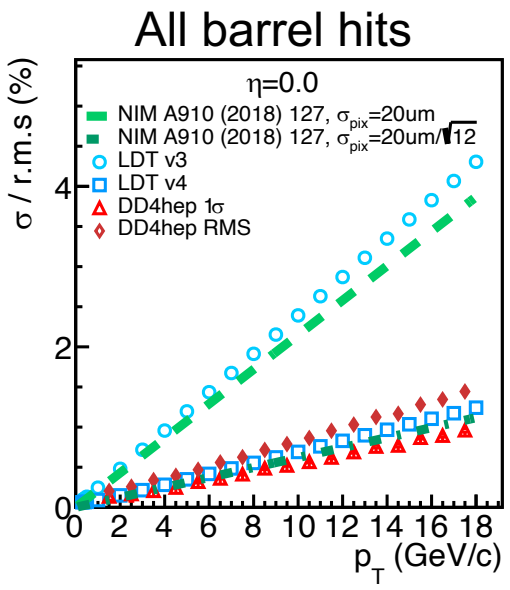
2 barrel + 3 disk hits

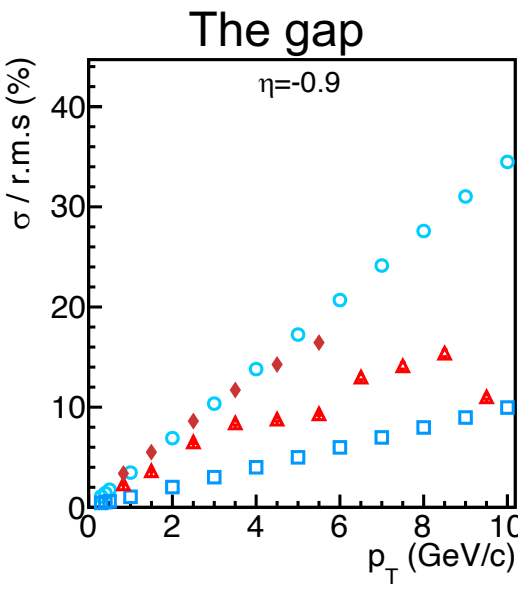


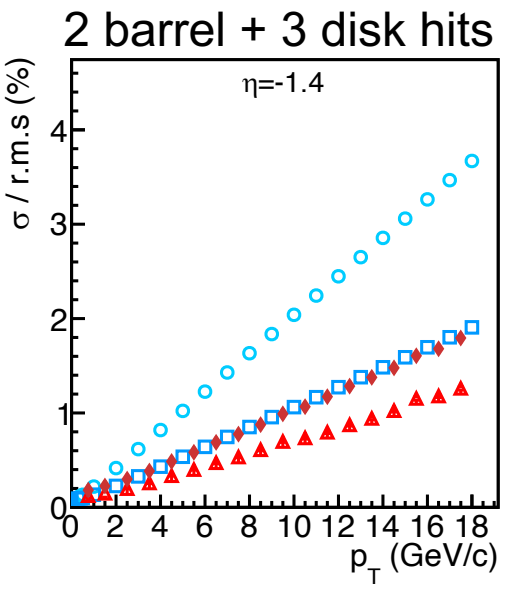
All disk hits

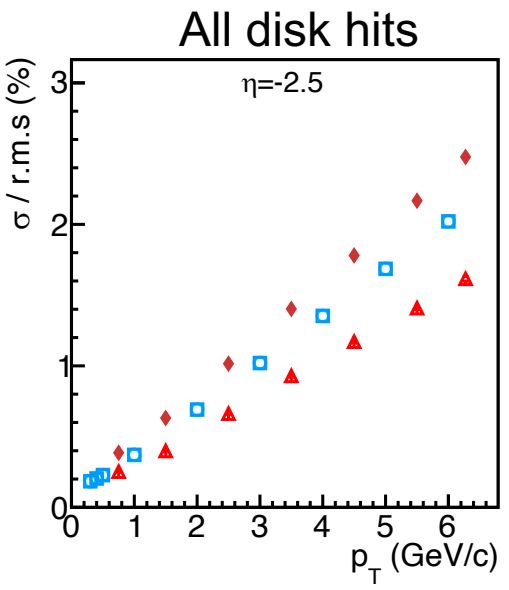


Transverse Momentum Resolutions







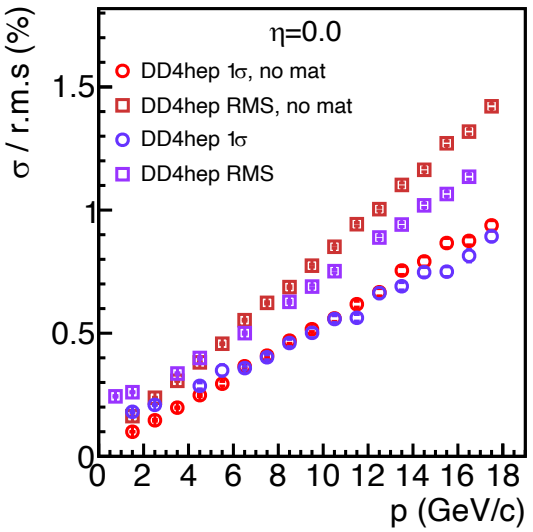


Put in the Materials

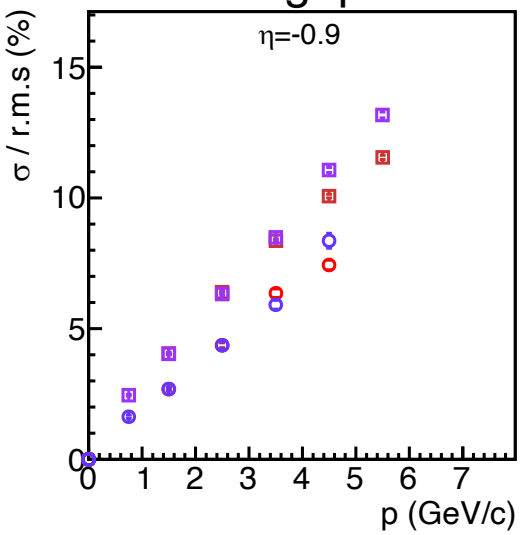
Momentum Resolutions from DD4hep

- V4: $\mathrm{d}r\phi = 20/\sqrt{12}$ um, $dr\phi = 20/\sqrt{12}$ um, $\mathrm{d}u = 20$ um, $\mathrm{d}v = 20$ um, **minimal materials**
- V5: $\mathrm{d}r\phi = 20/\sqrt{12}$ um, $dr\phi = 20/\sqrt{12}$ um, $\mathrm{d}u = 20$ um, $\mathrm{d}v = 20$ um, **proper materials**

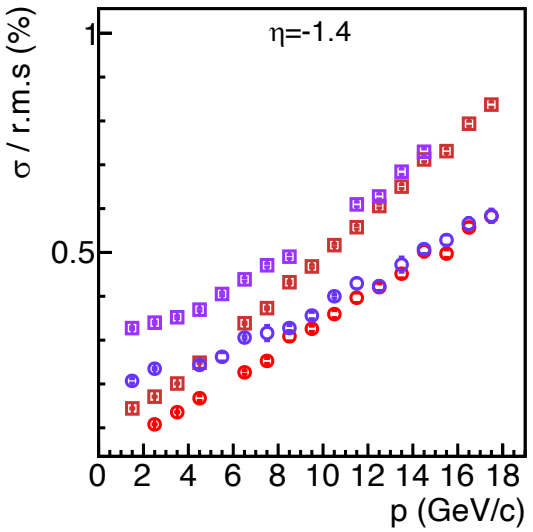
All barrel hits



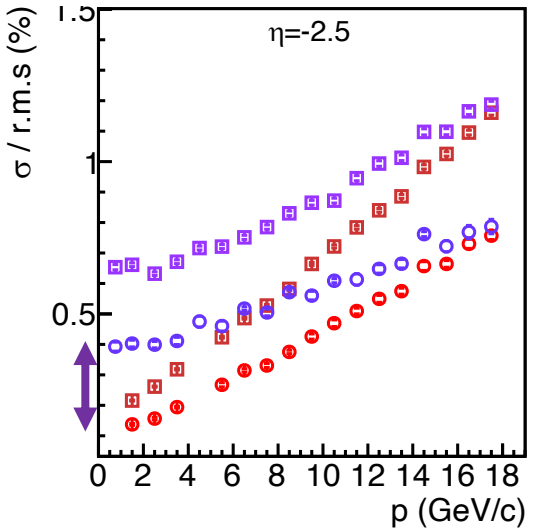
The gap



2 barrel + 3 disk hits



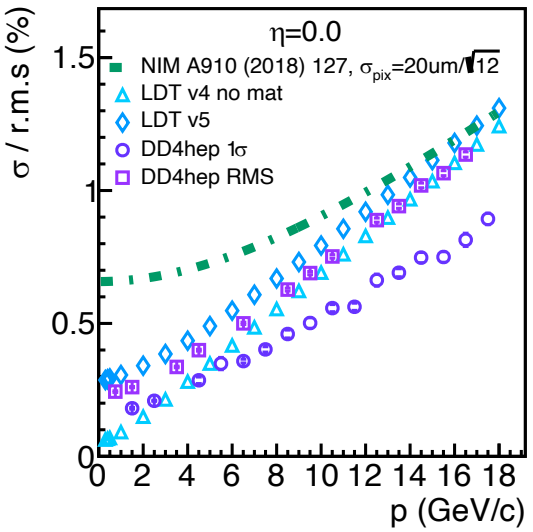
All disk hits



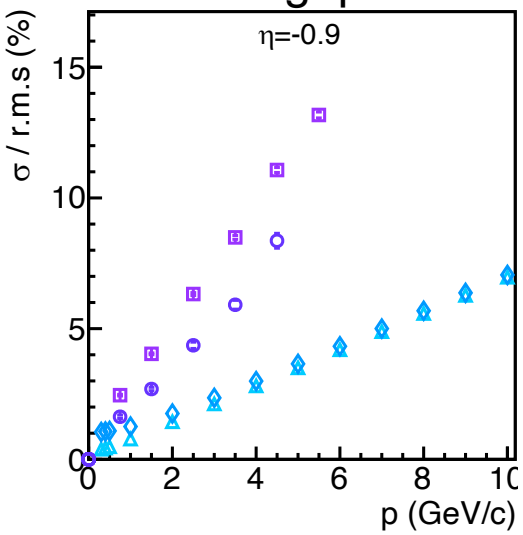
Backward region is more sensitive to material budget at low momentum

Momentum Resolutions

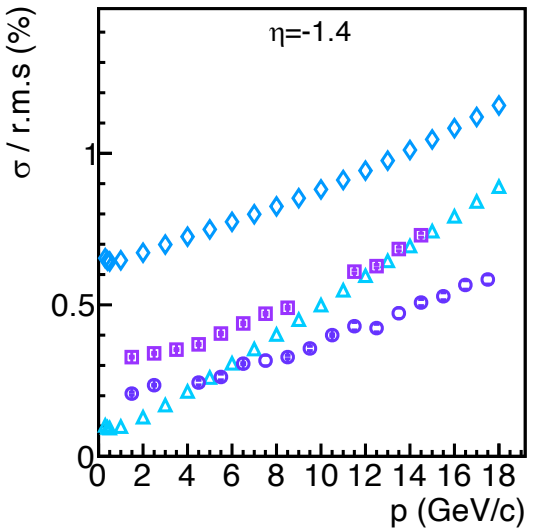
All barrel hits



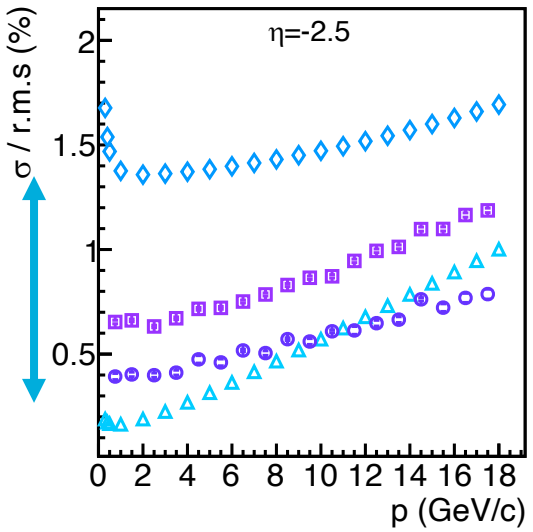
The gap



2 barrel + 3 disk hits



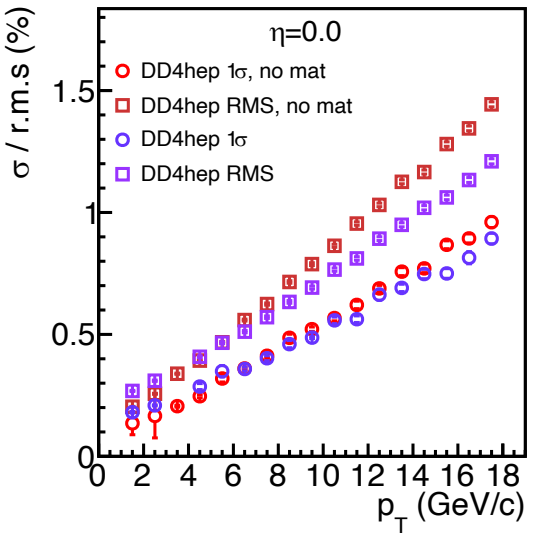
All disk hits



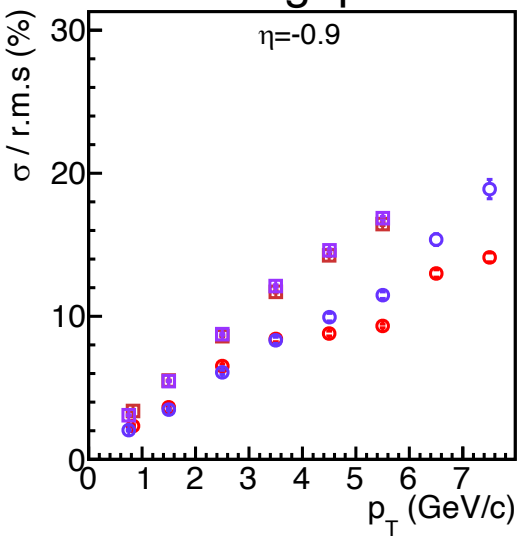
Multiple scattering has a larger impact on momentum resolutions in LDT

Transverse Momentum Resolutions from DD4hep

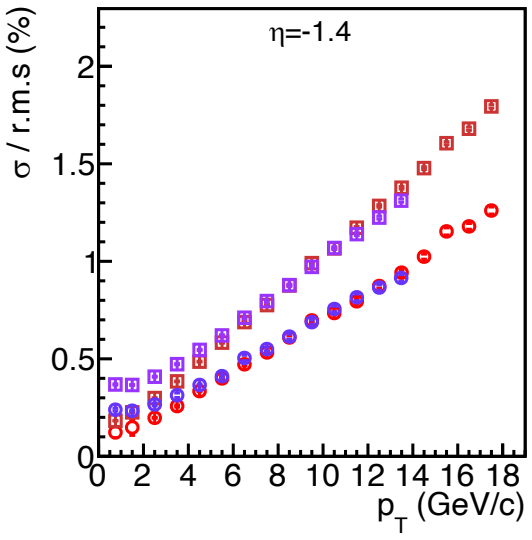
All barrel hits



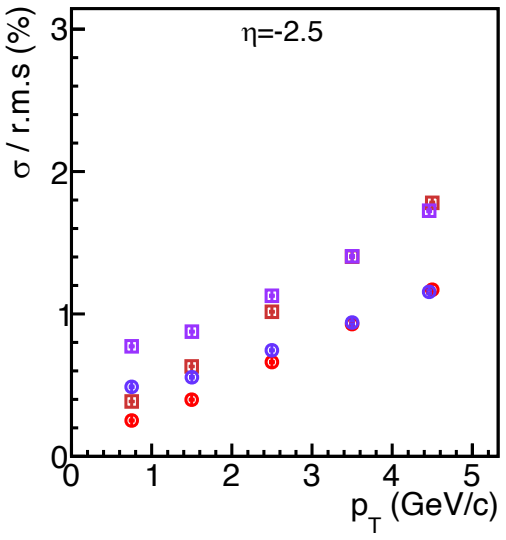
The gap



2 barrel + 3 disk hits

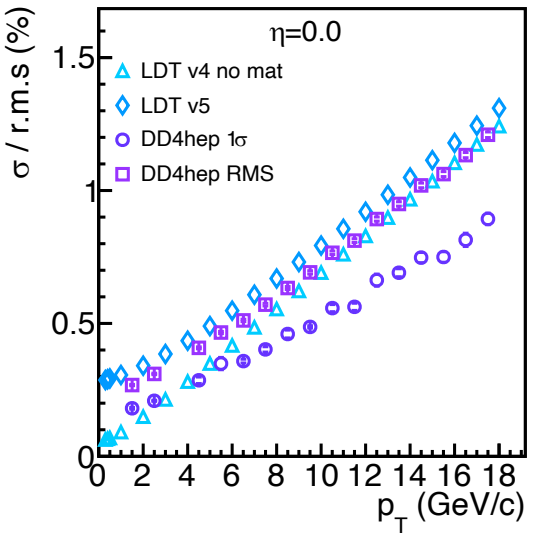


All disk hits

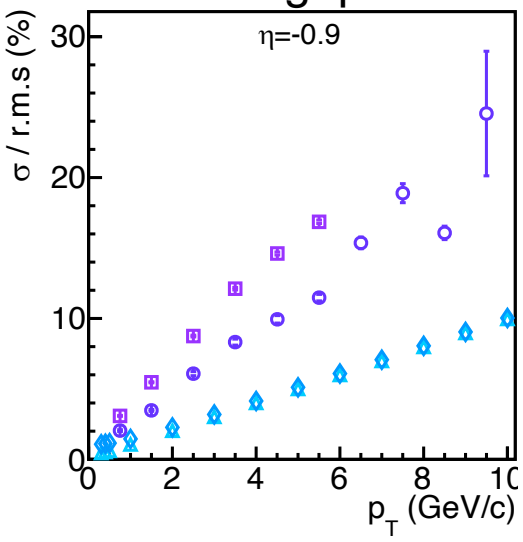


Transverse Momentum Resolutions

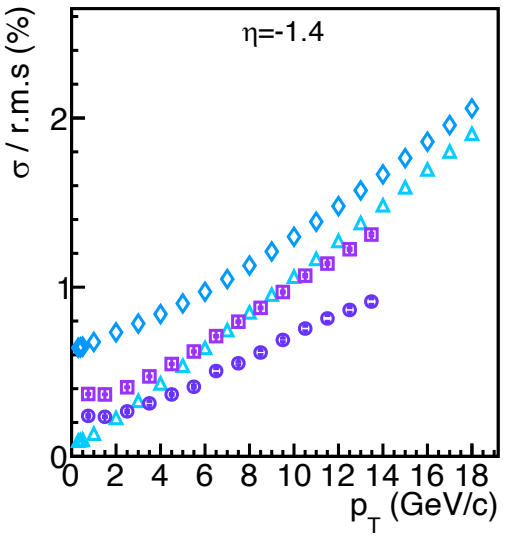
All barrel hits



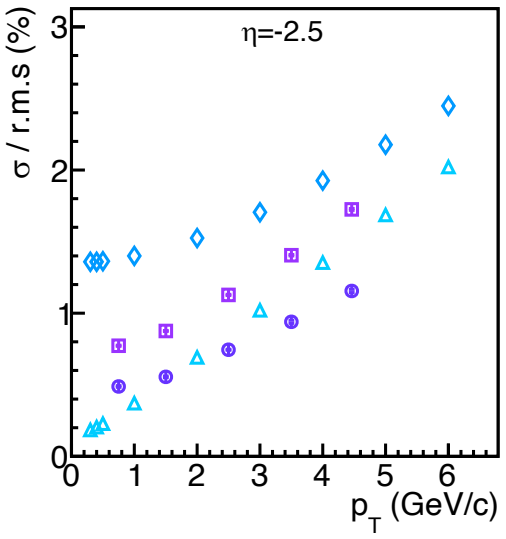
The gap



2 barrel + 3 disk hits



All disk hits



Summary

- Settle on the pixel resolutions/errors
  - $\mathrm{d}r\phi = 20/\sqrt{12}$ um
  - $\mathrm{d}z = 20/\sqrt{12}$ um
  - $\mathrm{d}u = 20$ um
  - $\mathrm{d}v = 20$ um
- Put in proper materials in detector setup
  - Multiple scattering has a larger impact on momentum resolutions in LDT than in DD4hep