Inter-play between TPC, VD, SET and SIT

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Contribution to the ILC workshop, Valencia, November 2006
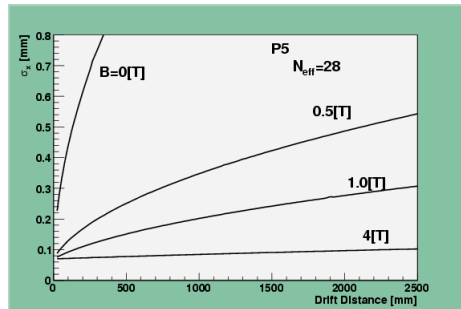
Outline

1. TPC resolution and the Si envelope

2. The interplay of the tracking detectors in the barrel

3. Conclusions

TPC resolution and the Si envelope

Recent studies suggests a better TPC resolution at long drift-distances wrt. the TESLA-TDR.
In fact, the TDR already quoted quite similar numbers, for $Ar-CH_4$ (90/10), but it was claimed that $Ar-CH_4-CO_2$ (93/5/2) was preferable due to it's lower neutron cross-section.
Taking these numbers, how does it influence the amelioration the Si-envelope yields to the tracking ?
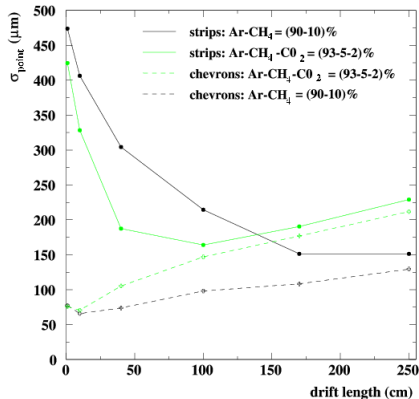
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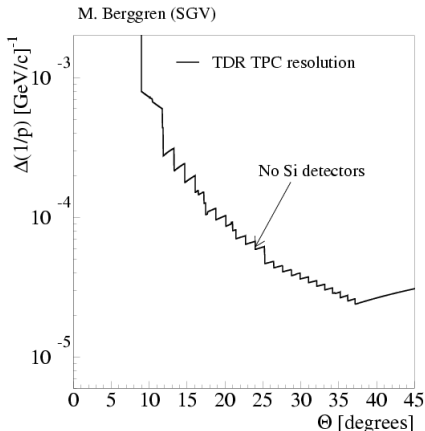Si-envelope yields to the tracking ?

TPC resolution and the Si envelope

- In the forward ...
  - TDR → ameliorated
  - Add SIT-SET and FTD
  - ... and ECT
- In the barrel ...
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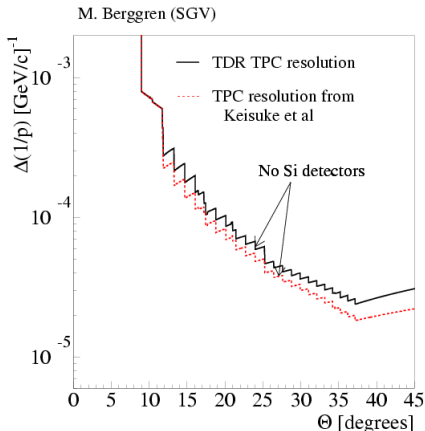# TPC resolution and the Si envelope

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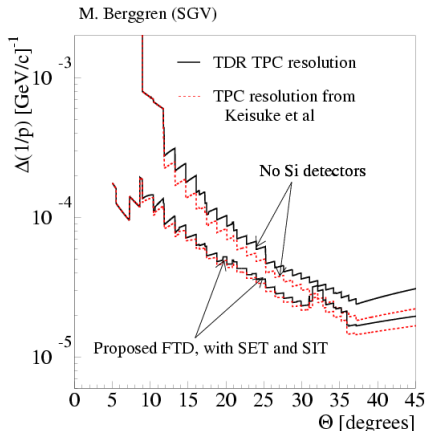
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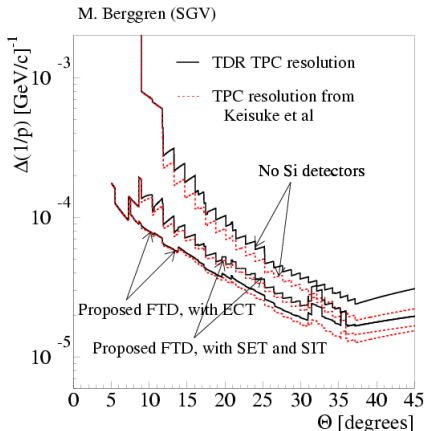# TPC resolution and the Si envelope

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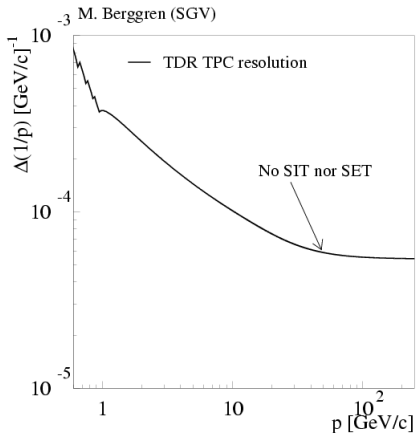 - TDR → ameliorated
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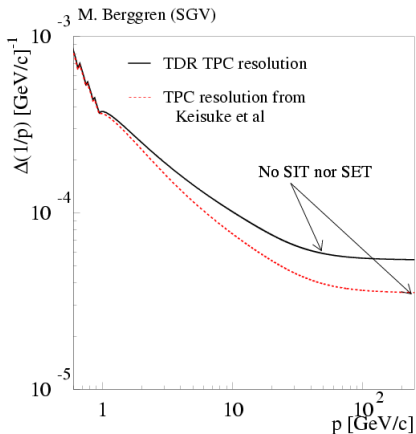 - TDR → ameliorated
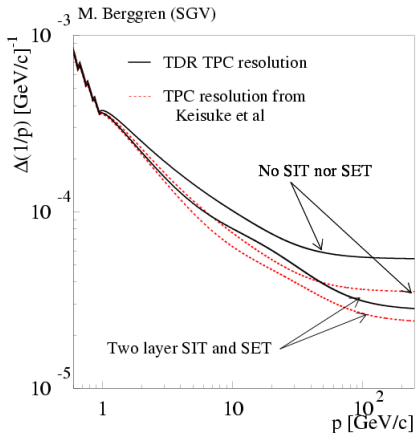 - Add SIT-SET

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The interplay of the tracking detectors in the barrel

Momentum resolution at 90deg

- TPC alone
- TPC and SIT
- TPC and VD. Solid line: The material of the SIT is included. Dashed line: No Sit at all.
- TPC, VD and SIT. Note the region 8 to 25 GeV !
- TPC, VD, SIT and SET.

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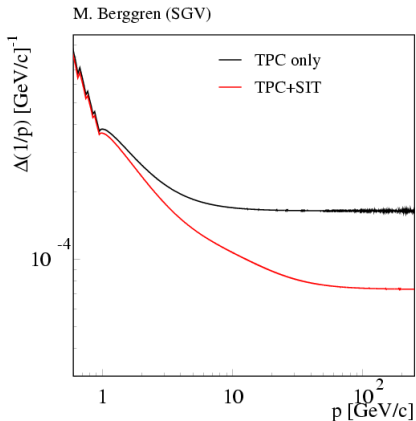
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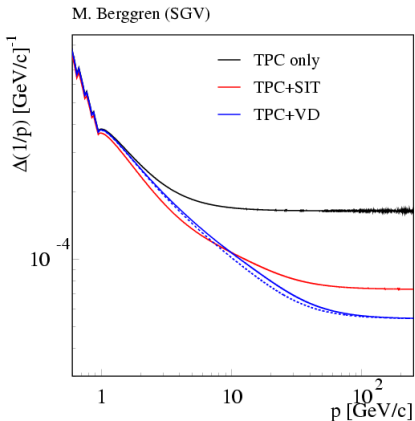
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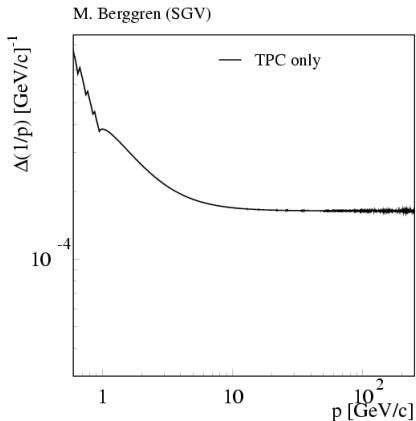
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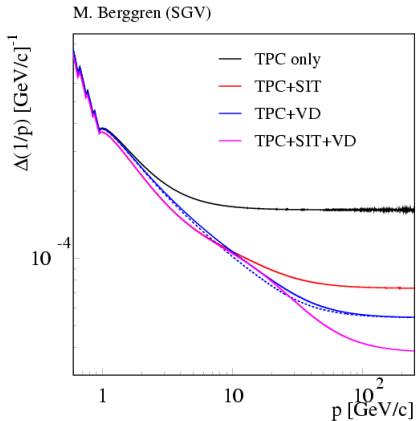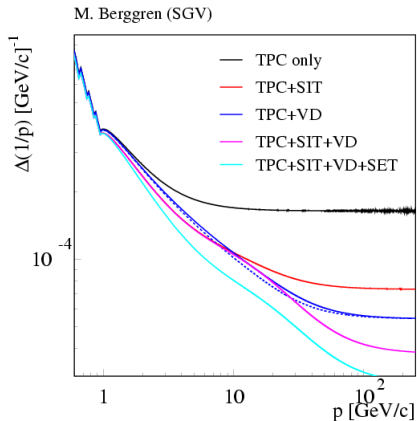- TPC, VD, SIT and SET.

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What happens between 8 to 25 GeV ?

- Low momentum: The SIT gives a better first point. The VD has too much material, and is to far to help.

- At 8 GeV: The extrapolation from the VD to the outer SIT layer is better tan the SIT point.

- At 15 GeV: The MS in the inner field-cage of the TPC is defeated, and VD+SIT contributes both with position and angle.

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TPC+SIT
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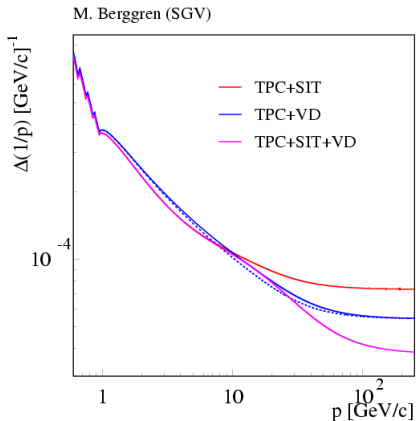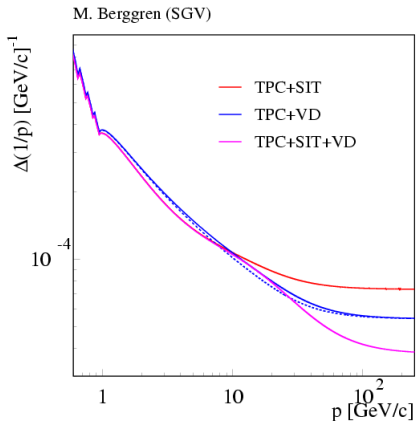
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Conclusions

- Whatever the diffusion in the TPC is, the Si-envelope will help, in particular in the forward region.

- The SIT is needed for lowish momenta, where the VD can't contribute.

- But with the material introduced by the SIT, the resolution gets worse than without it at intermediate momenta.

- At high momentum, the SIT and the VD works in concert to give better resolution than either gives alone.

- The intermediate momentum problem is rectified by the SE.,

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