THE HIGH-PERFORMANCE DIRC

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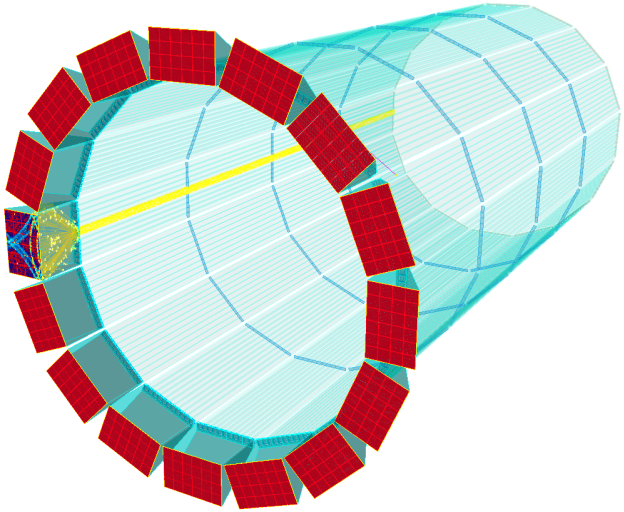
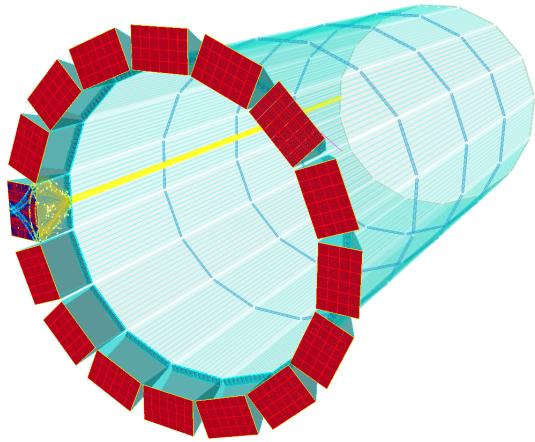


- Resolution components
- Relevant tracking angles
- Performance

HPDIRC RESOLUTION

$$\sigma^2_{\theta_c}(particle) = \sigma^2_{\theta_c}(photon) \Big/ N_\gamma + \sigma^2_{correlated}$$

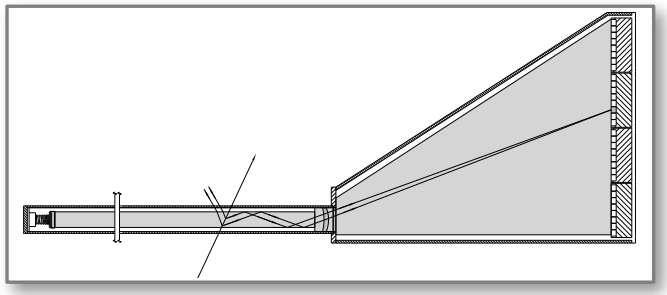


$\sigma_{\theta_c}(particle)$ Cherenkov angle resolution per particle/track

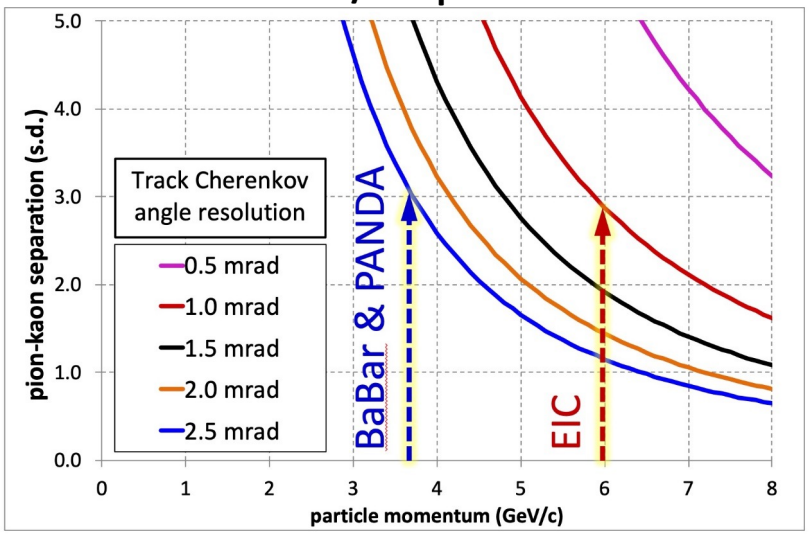
$\sigma_{\theta_c}(photon)$ Cherenkov angle resolution per photon
(bar size, pixel size, chromatic, bar imperfections)

N_γ Number of detected photons per particle
(bar size, bar imperfections, Photon Detection Efficiency)

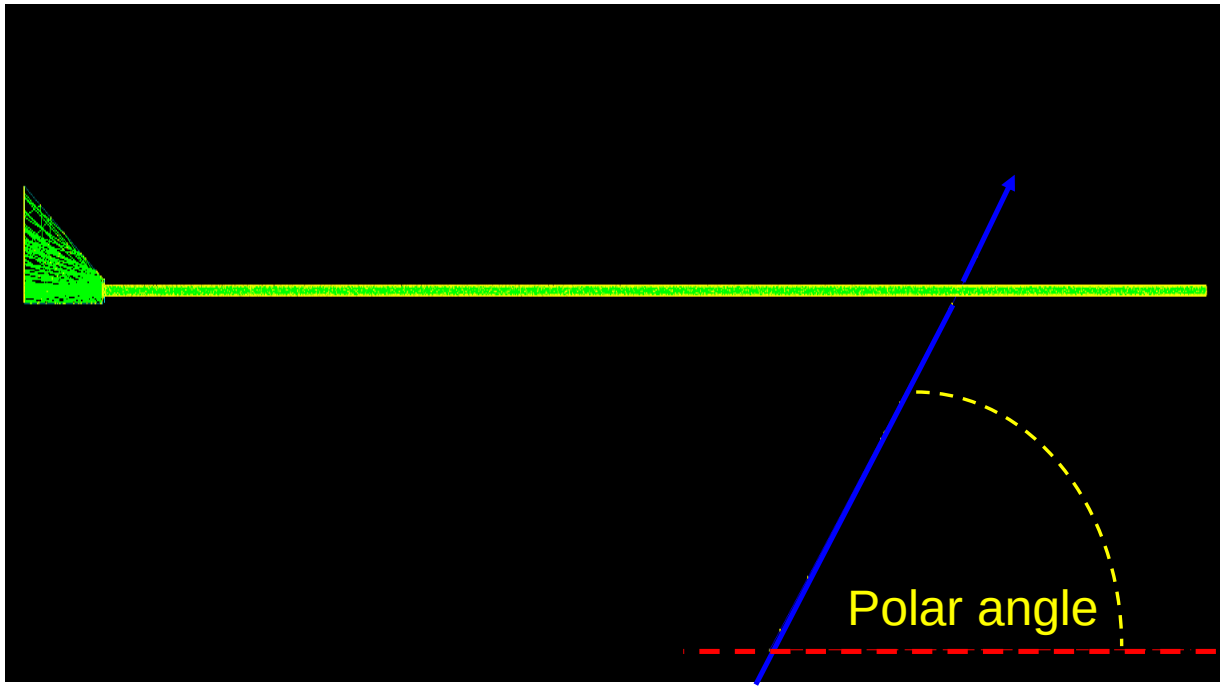
$\sigma_{correlated}$ Contribution from external sources
(tracking, multiple scattering, etc.)

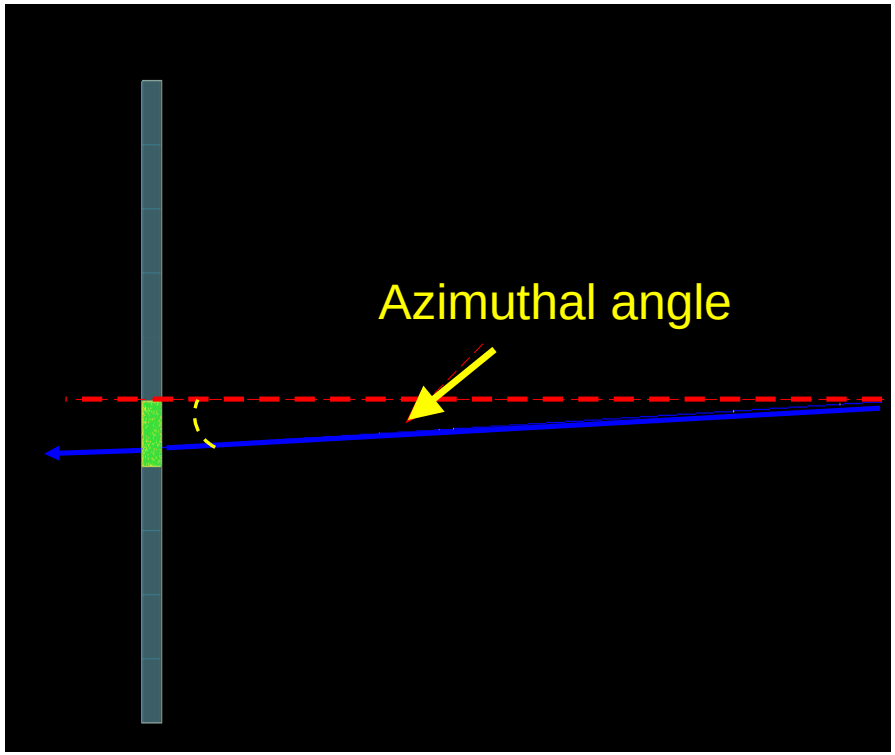


π/K separation



HPDIRC TRACK ANGLES





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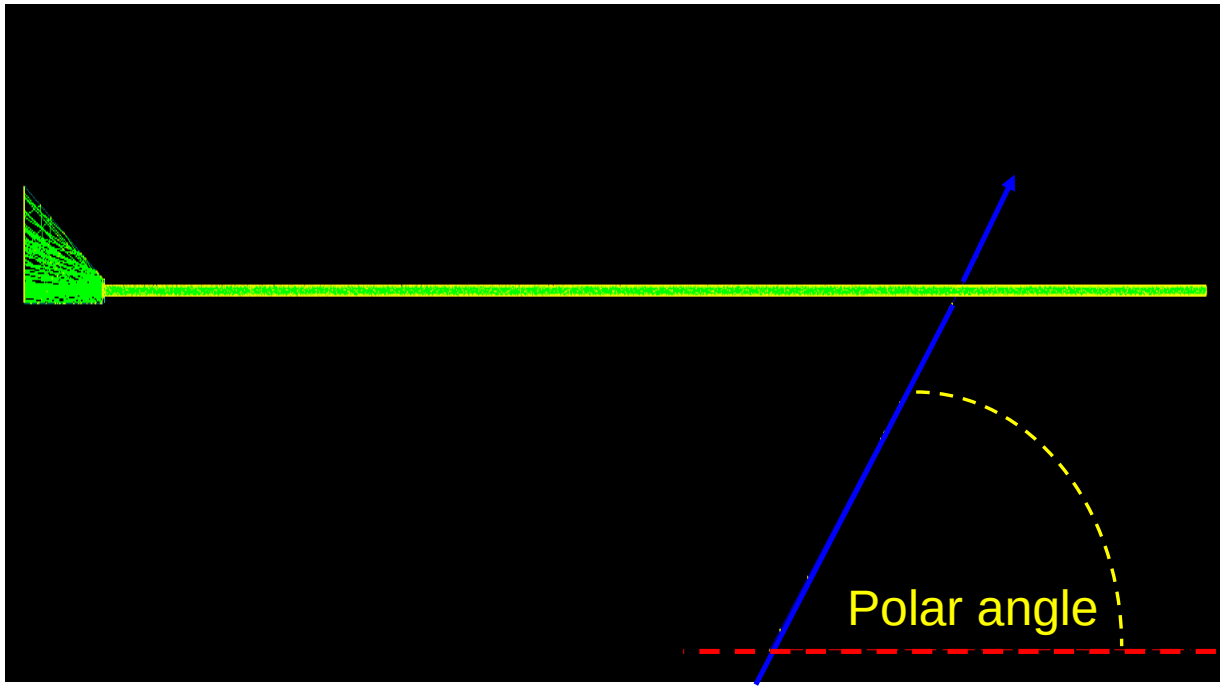
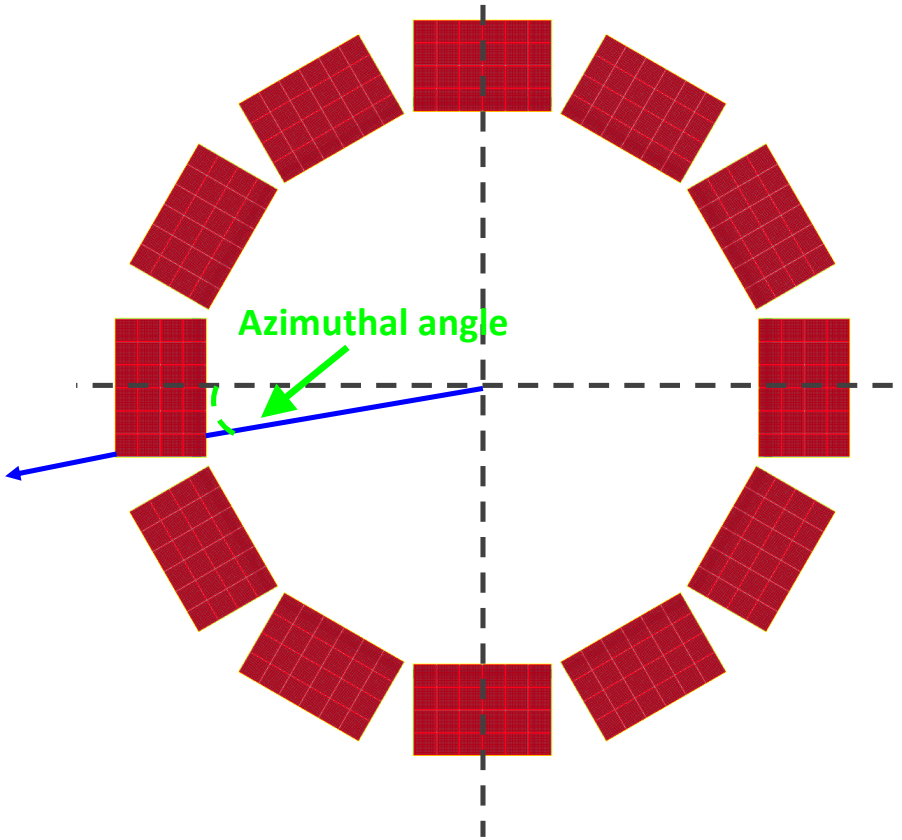
HPDIRC TRACK ANGLES





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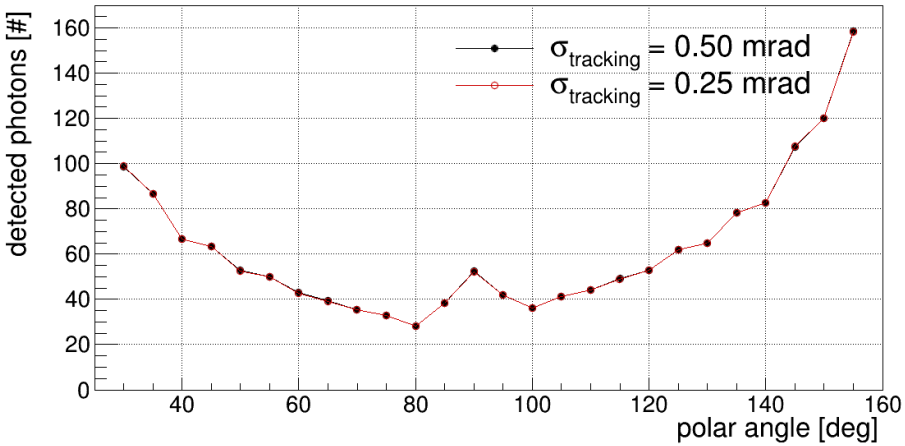
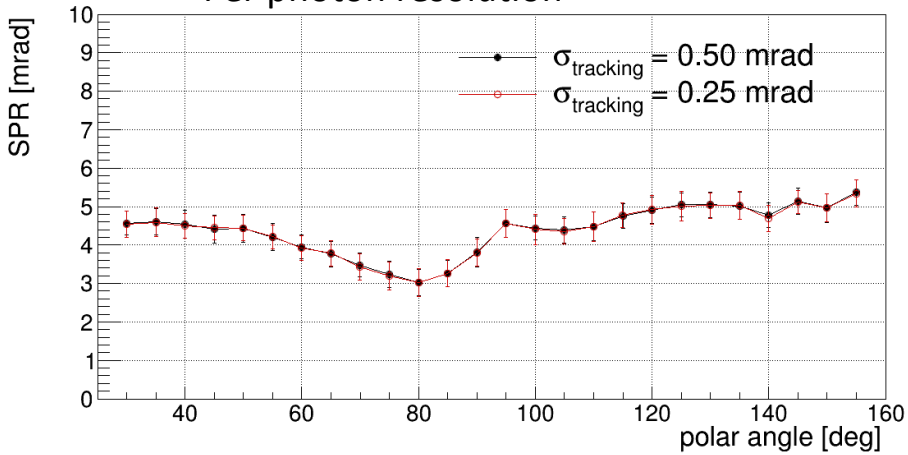
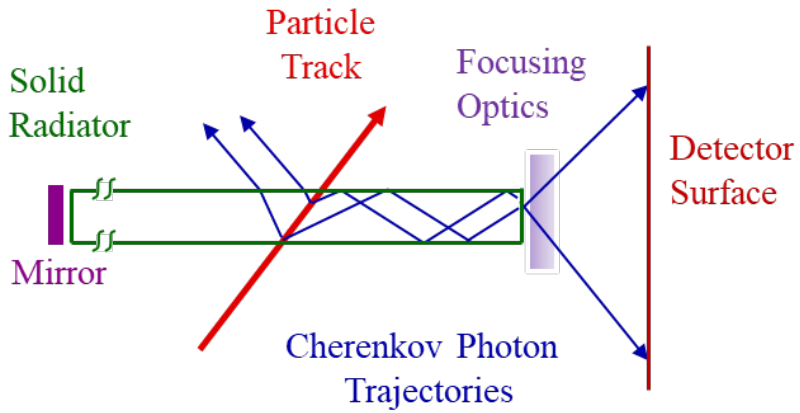
HPDIRC PERFORMANCE

Number of measured photons

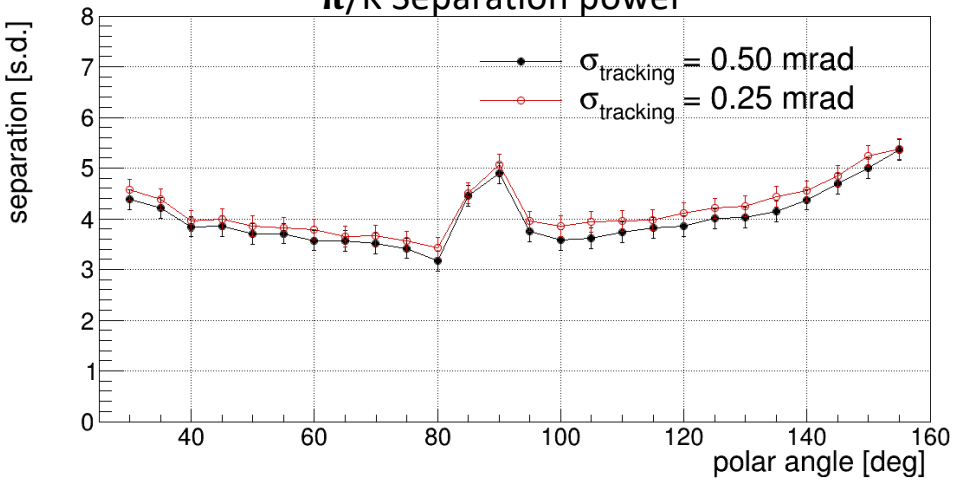


Per photon resolution



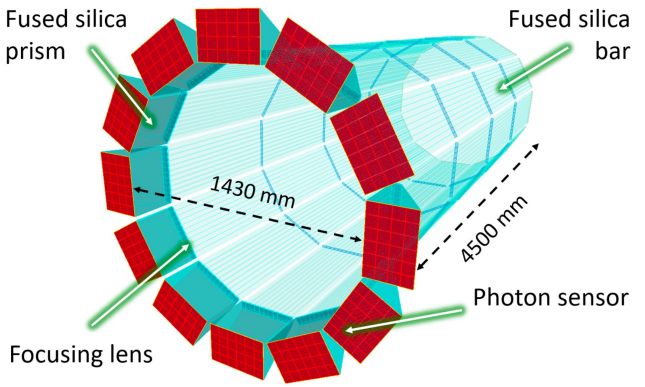


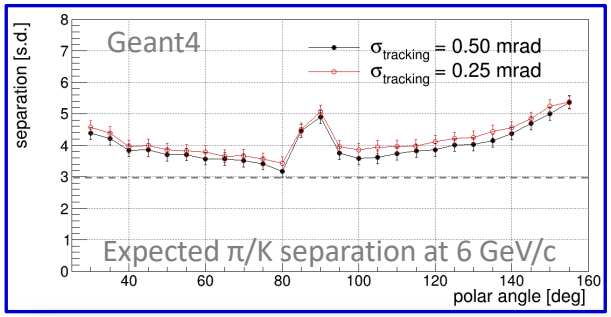
π/K Separation power

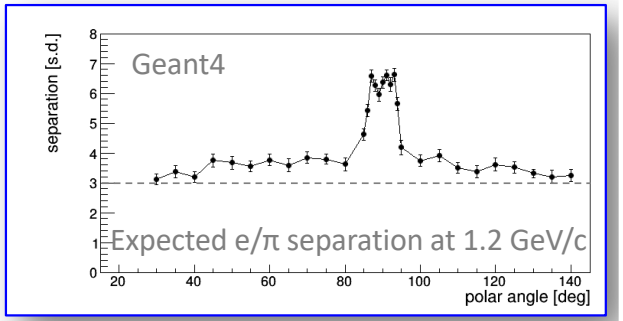


HPDIRC TRACING

- **Performance established with particle gun over wide angular range:**
  - ≥ 3 s.d. π/K up to 6 GeV/c, ≥ 3 s.d. e/π up to ~1.2 GeV/c
  - Low momentum π/K identification in “veto mode” down to 0.2-0.3 GeV/c
- So far all studies done without tracking layer behind DIRC -> Particle angle defined at the entrance of the bar.
- With extra tracing behind DIRC track angle would move to middle of the bar.
- 0.5 mrad resolution for both polar and azimuthal track angle resolution allows to reach desired resolution.
- Improving further tracing doesn’t help much. Studies with tracing smearing of 1 mrad showed significant performance deterioration.







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