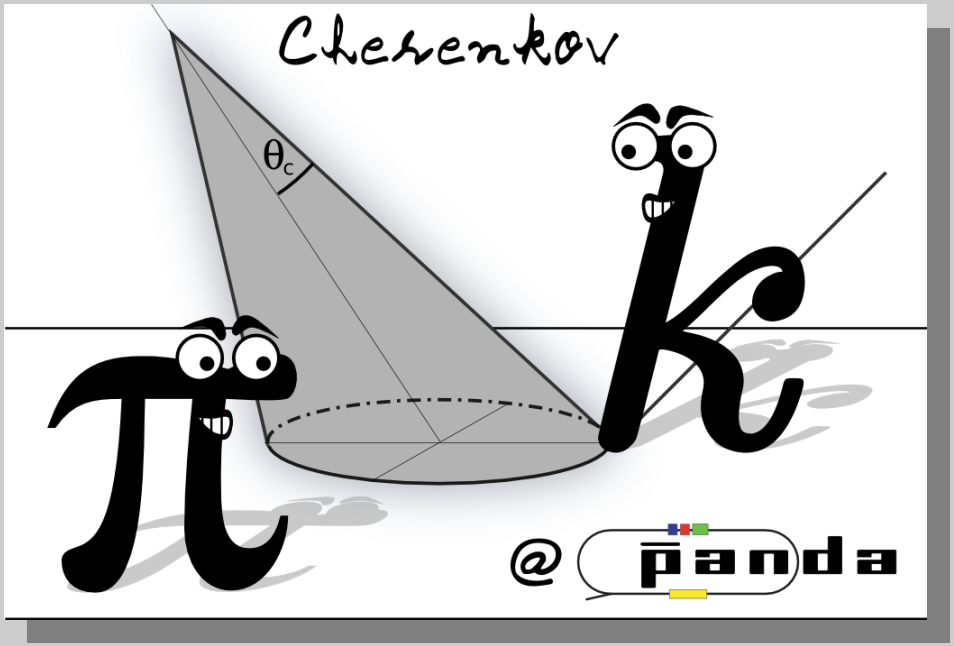
A 3D-Disc DIRC for $\overline{\text{P}}$ANDA

~ Evolution of the ToP-design ~



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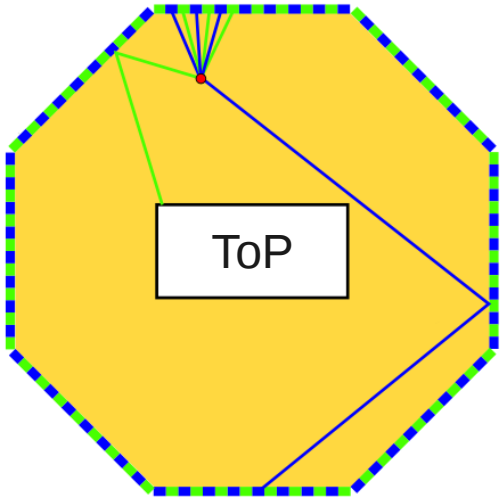
One step further ...

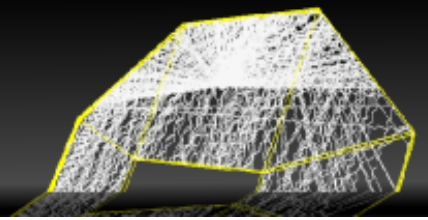


First results (Geant4 + modified reconstruction)

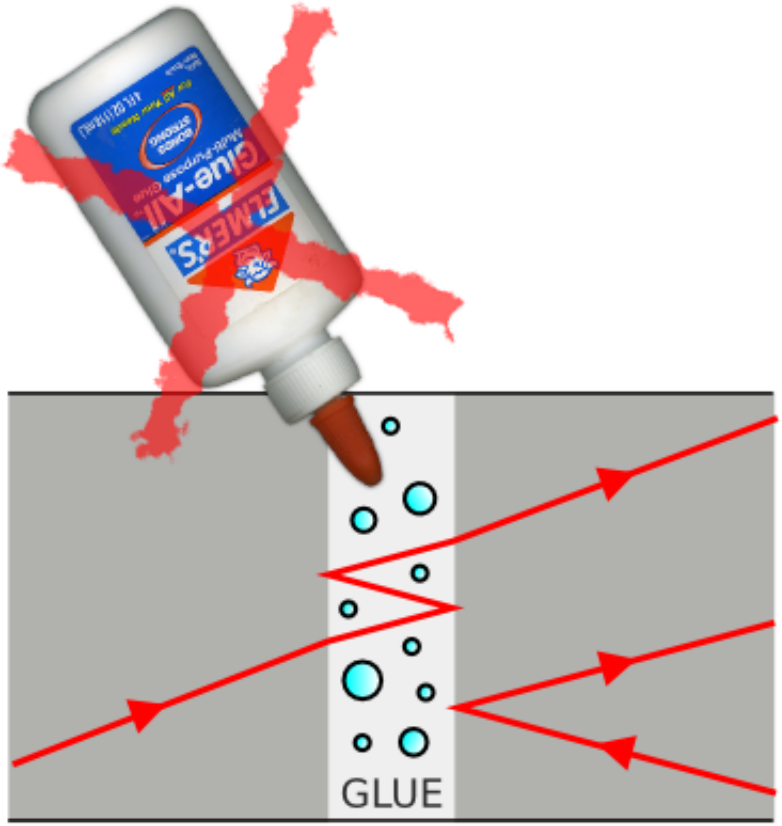
Misidentification [%]	up to p [GeV/c]	ϑ [°]
< 1.0 (*)	3.5	15
<= 2.3	3.0	20

(*) reconstruction including 1 coincident particle

Unique design features



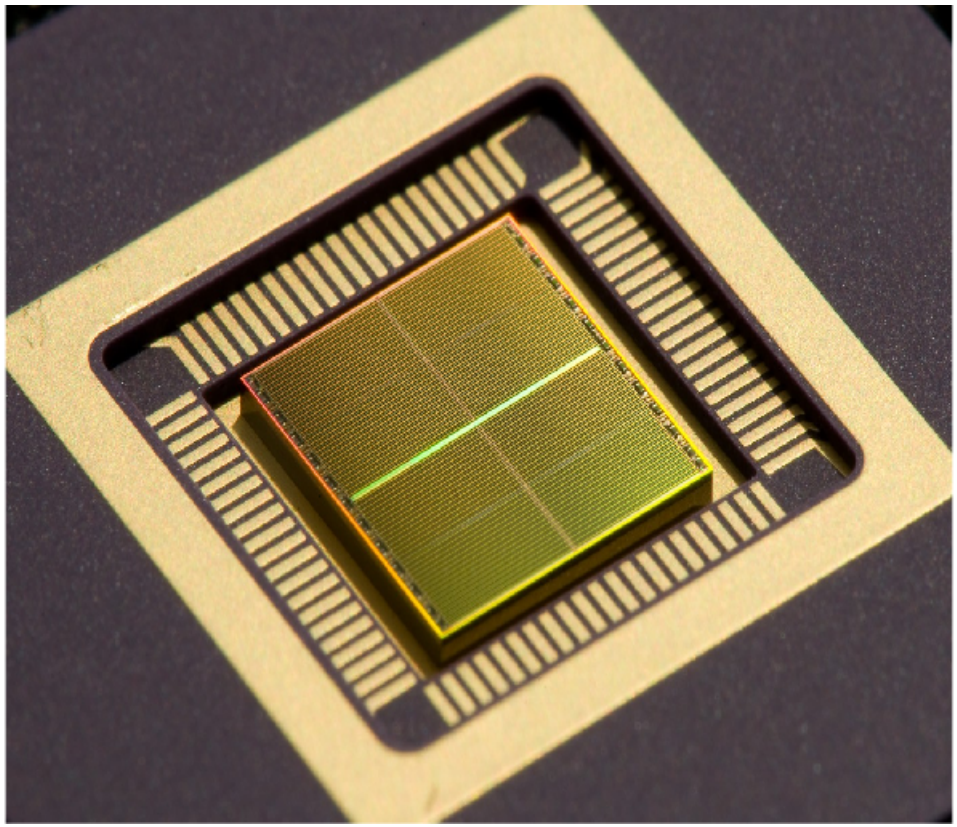
No radiator gluing ...



... the radiator can be manufactured in one single piece.

Unique design features

Digitization at detection & no MCP-like lifetime issues



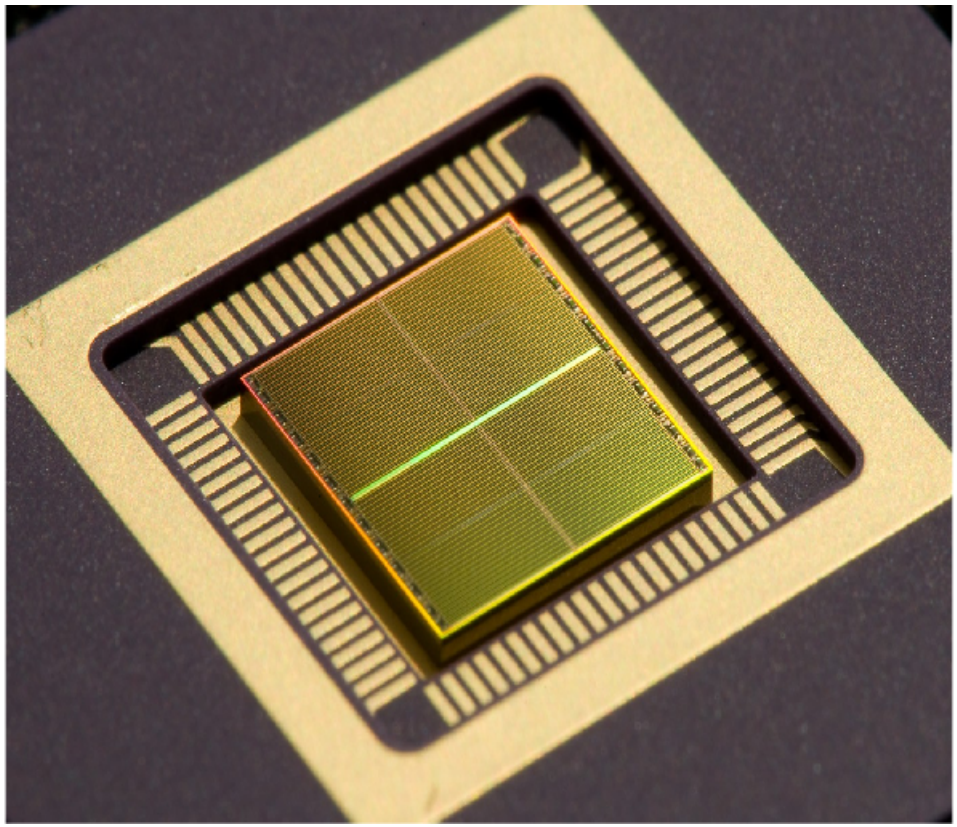
Source: Presentation by Thomas Frach @ 2009 IEEE Nuclear Science Symposium

- Digital Silicon Photomultiplier
- Chip-size: ~ 7 x 8 mm²
- On-chip TDC
- Time res.: 60 ps rms, 10 ps LSB
- Spacial res.: 2x2 pixel
  >2000 APD micro-cells per pixel
- Disc-DIRC readout modification:
  50 lines instead of 4 large pixel.

... due to newest Philips SiPM technology.

Unique design features

Digitization at detection & no MCP-like lifetime issues



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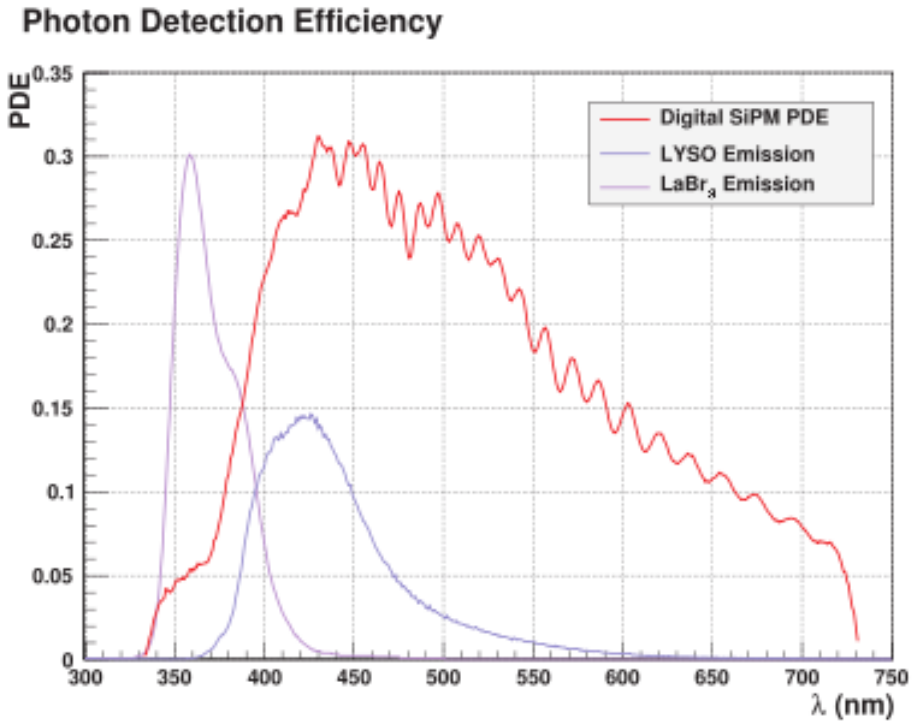
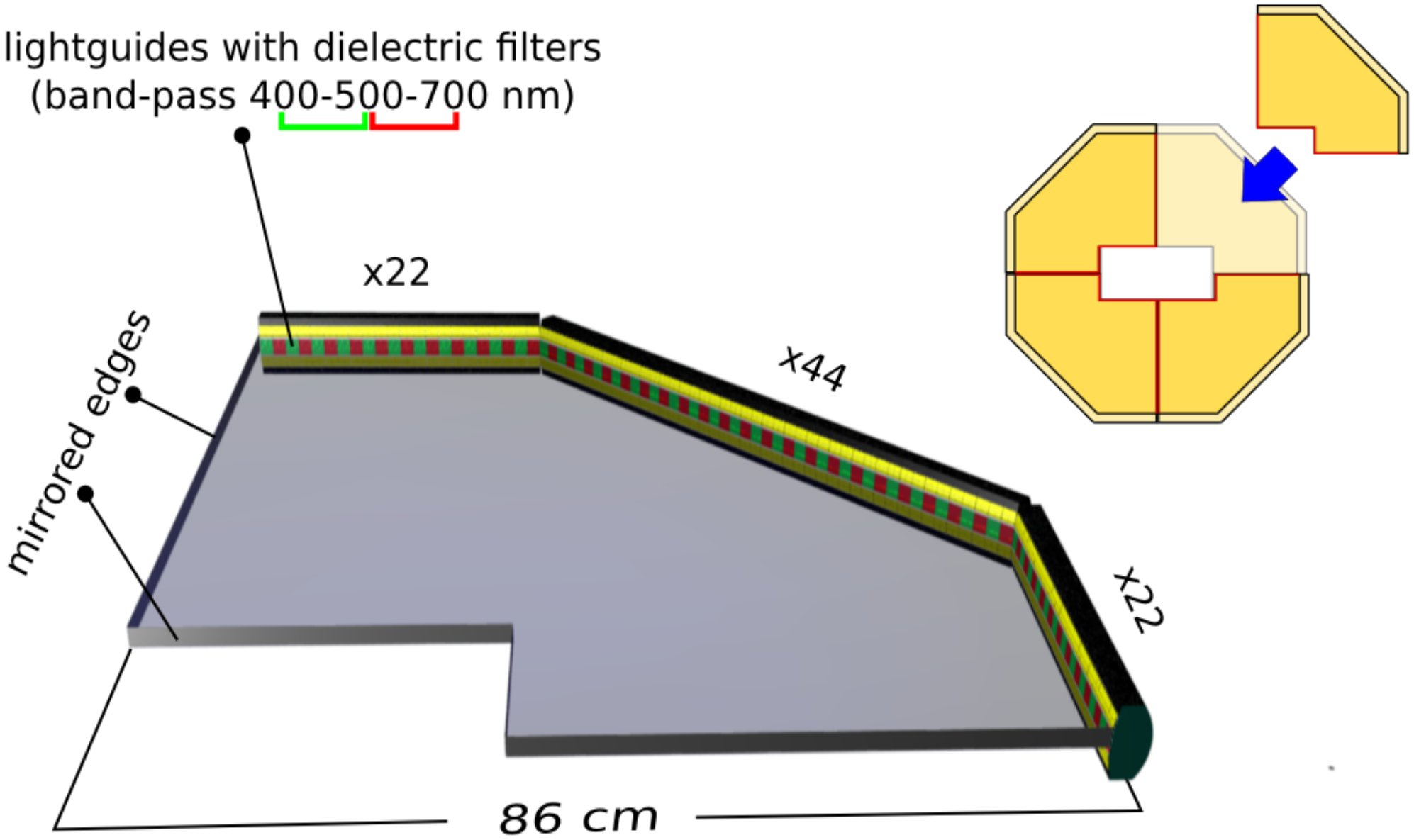
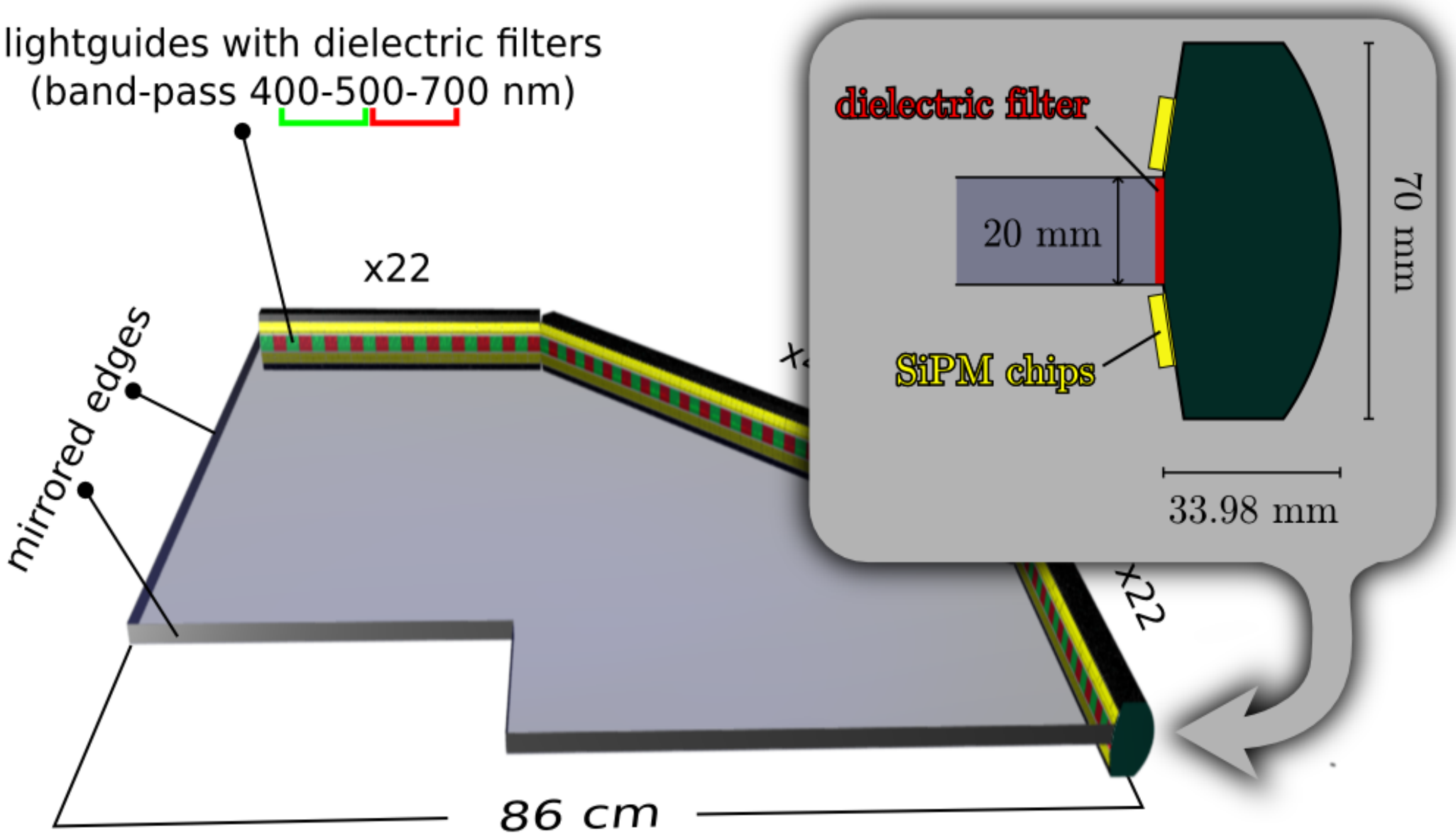


... due to newest Philips SiPM technology.

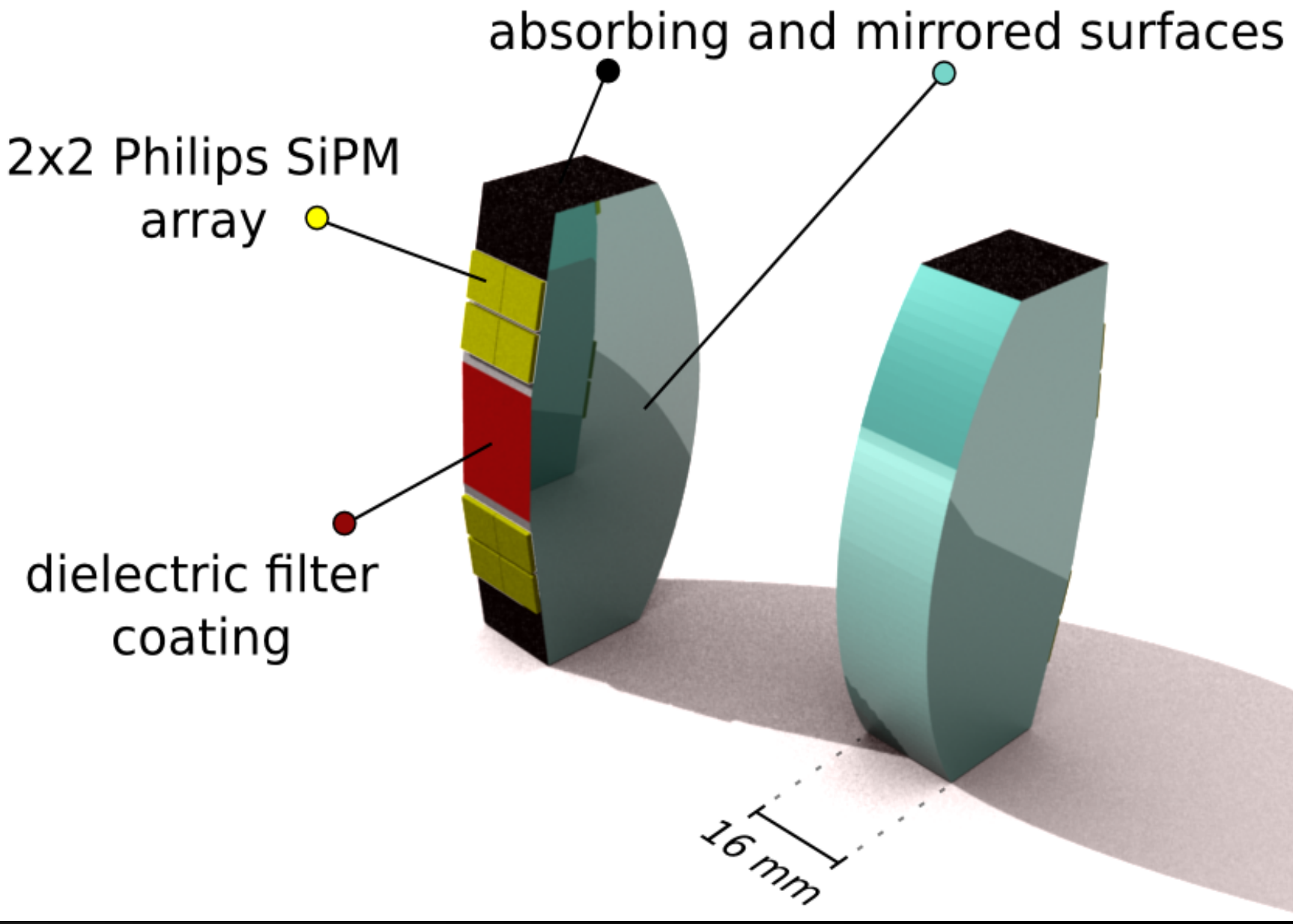
Detector design



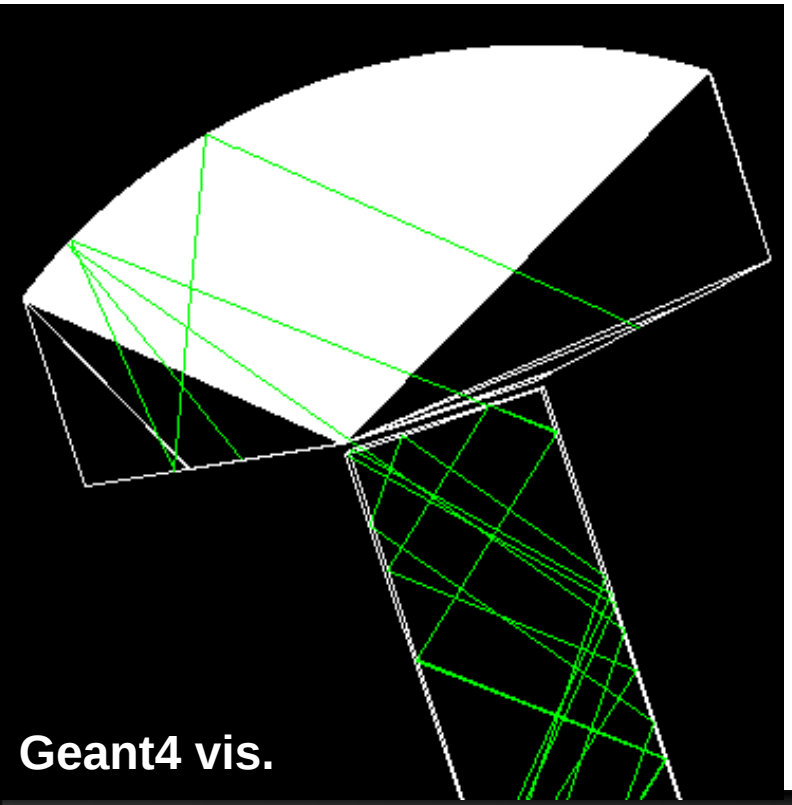
Detector design

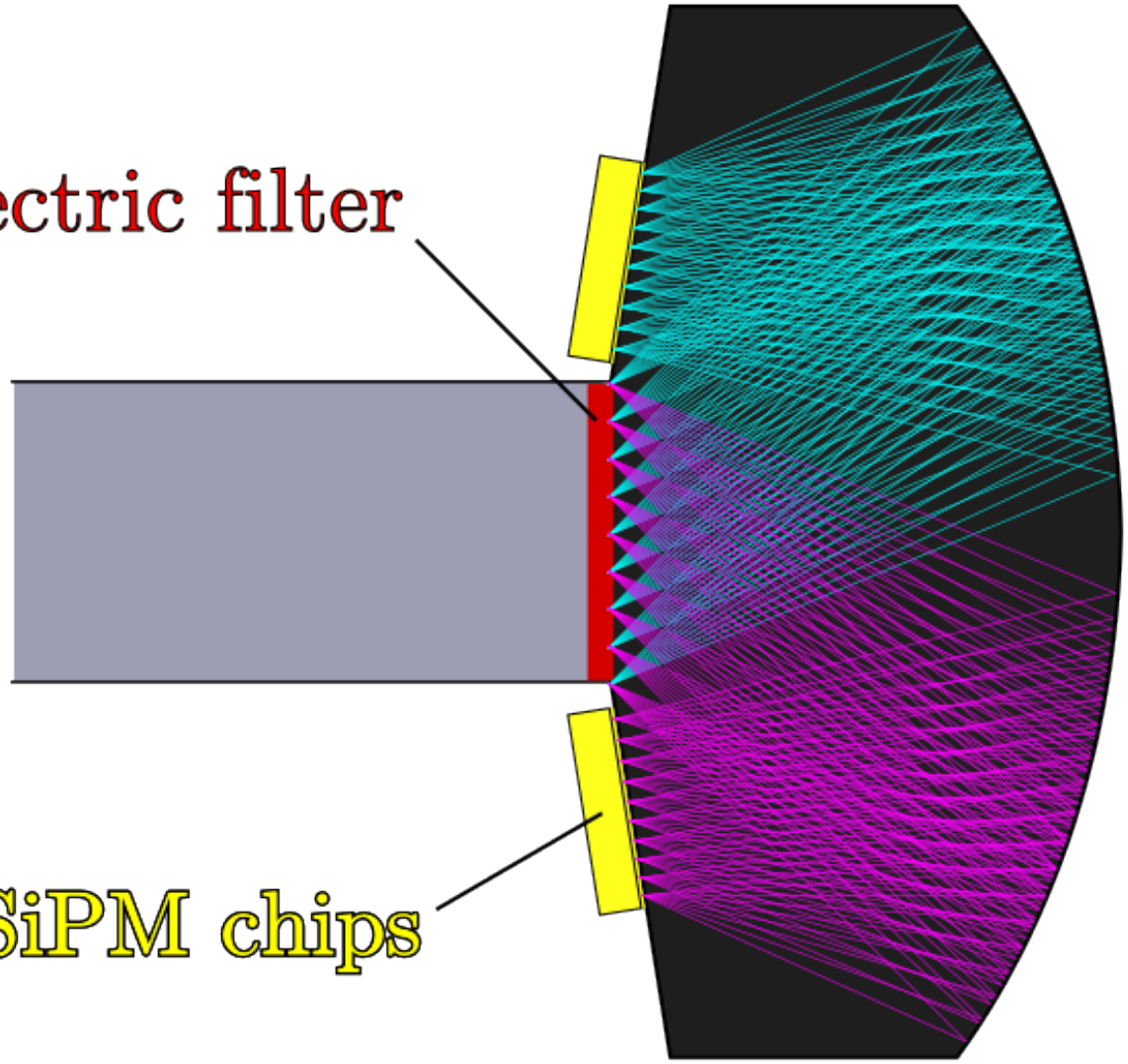


Detector design

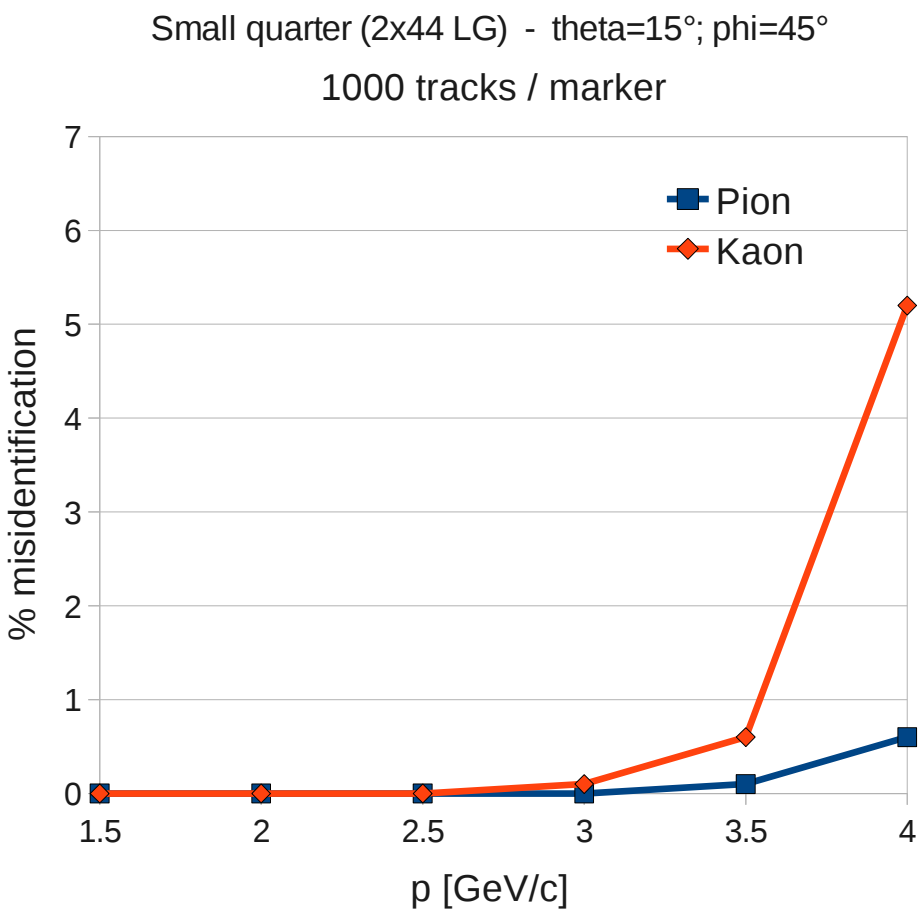


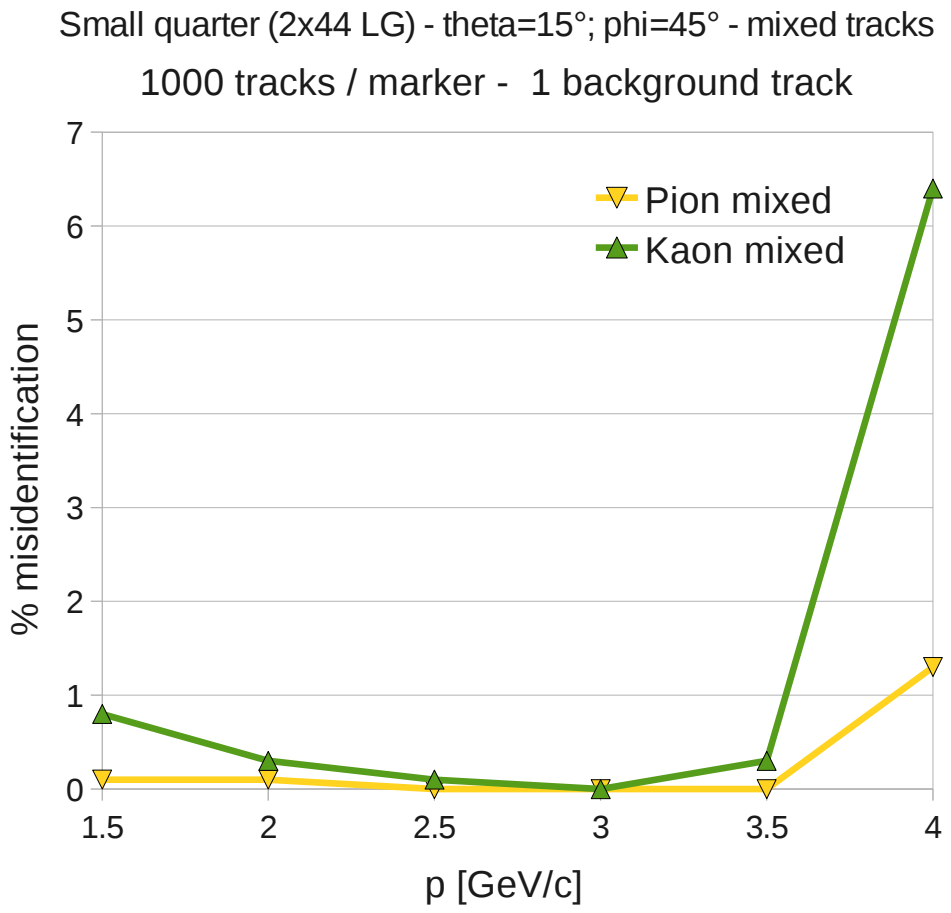
Lightguide imaging



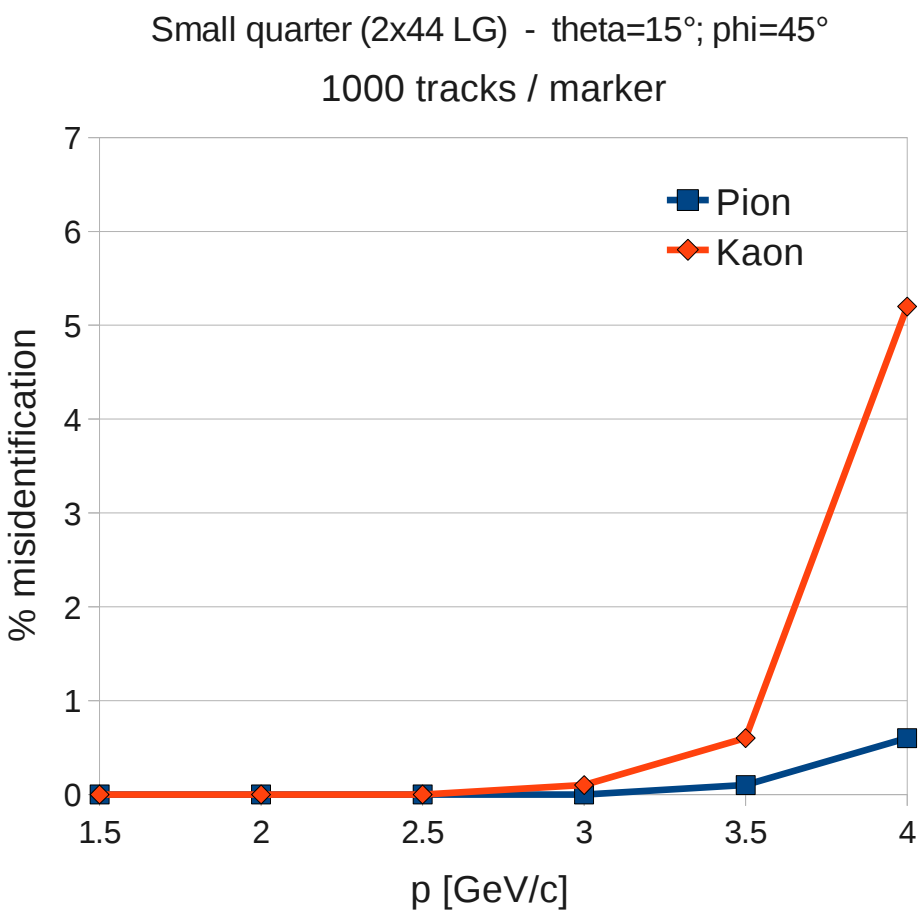


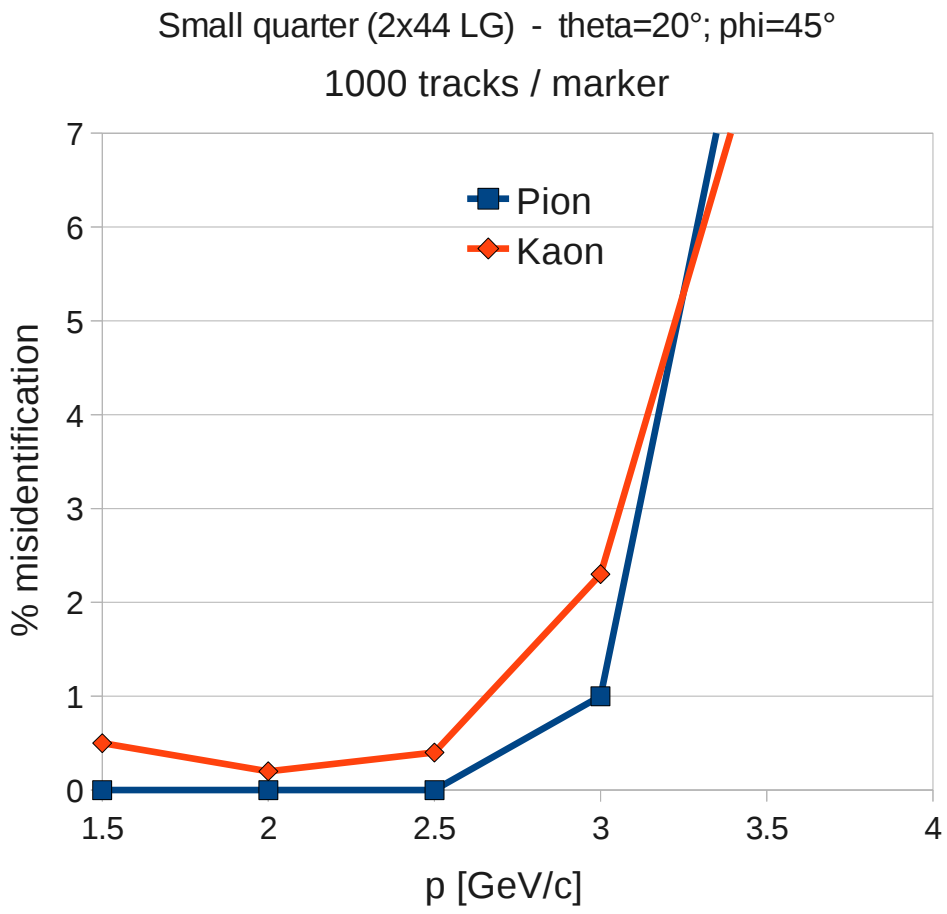
First preliminary results





First preliminary results





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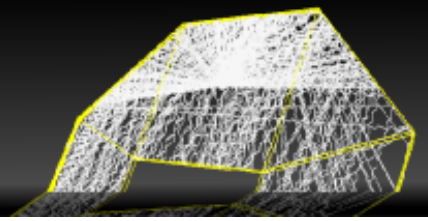
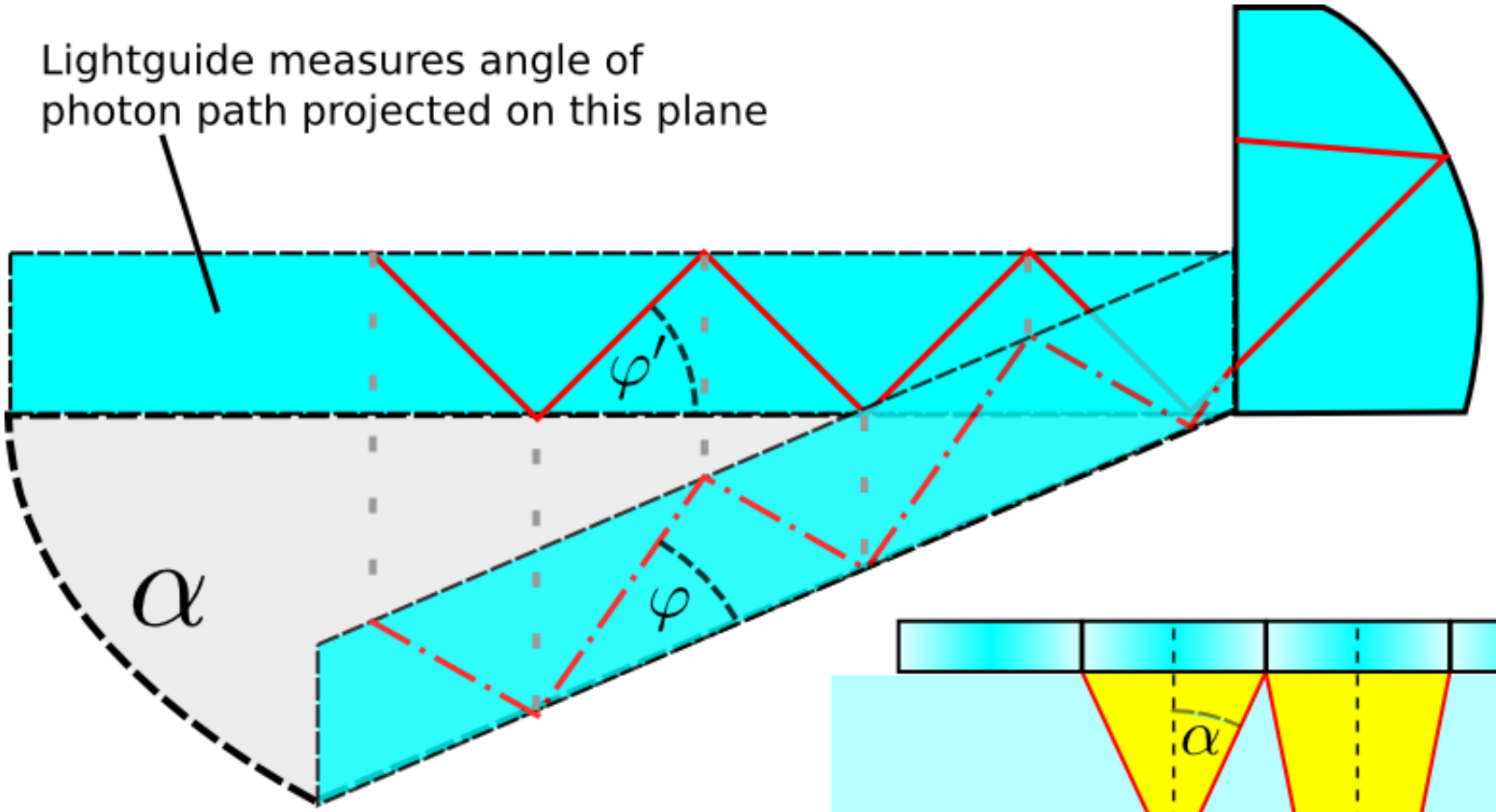
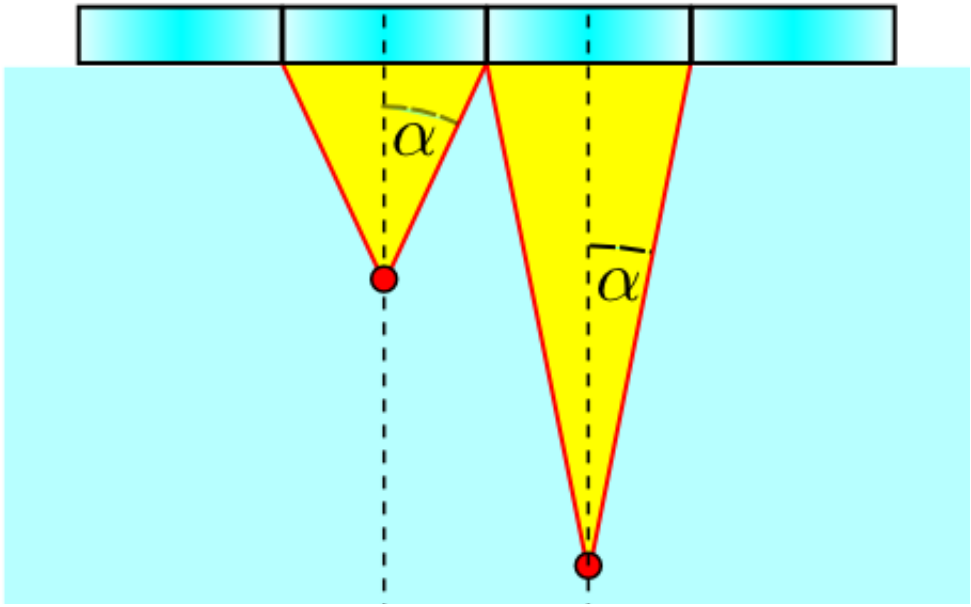




$$\varphi' > \varphi$$



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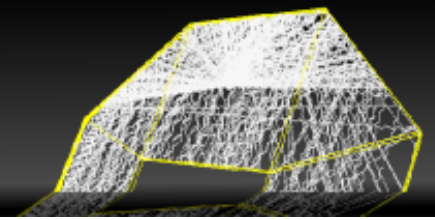
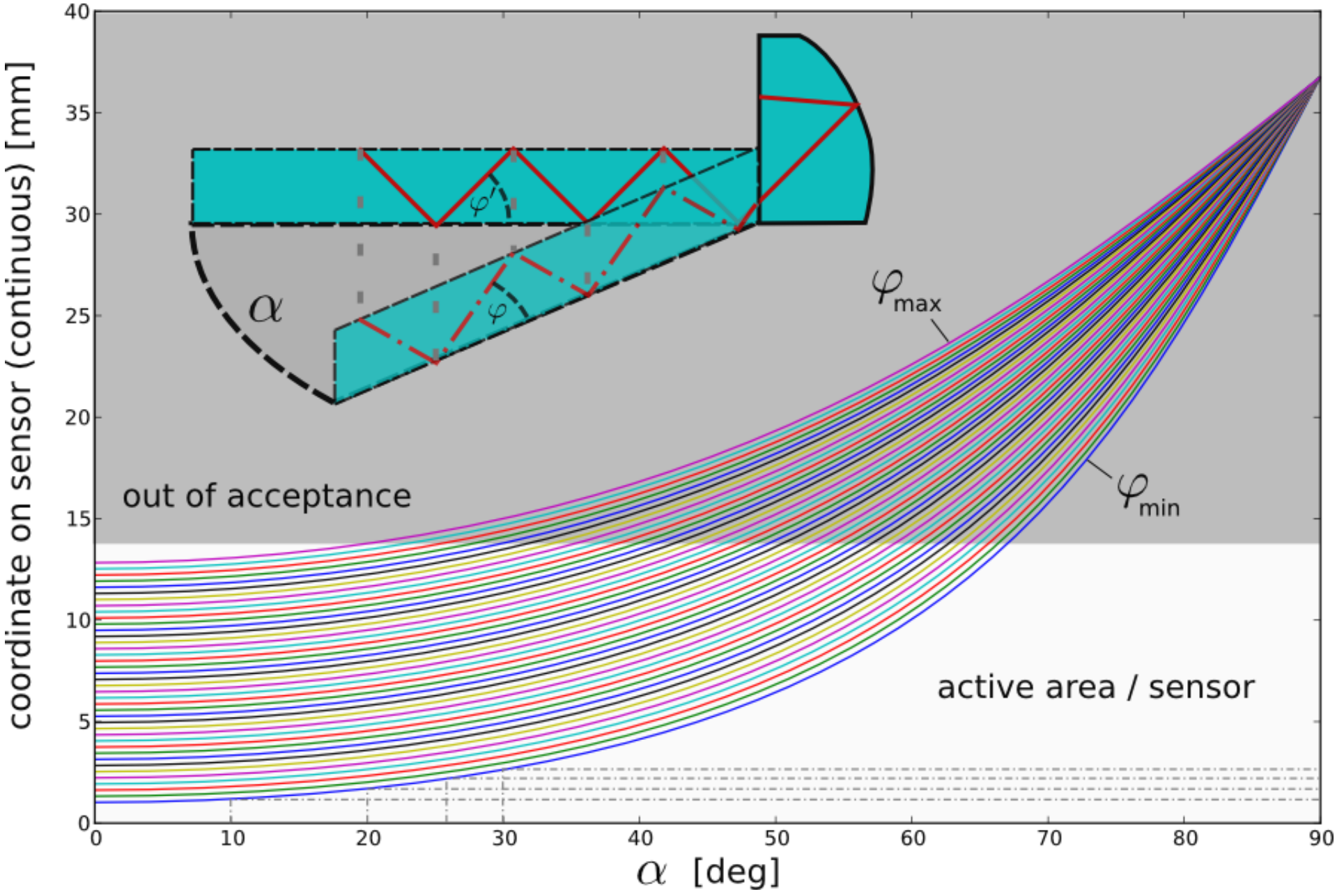
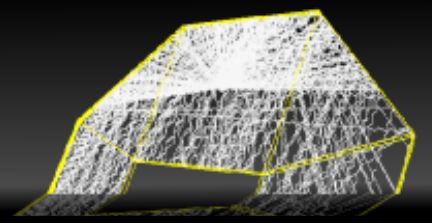
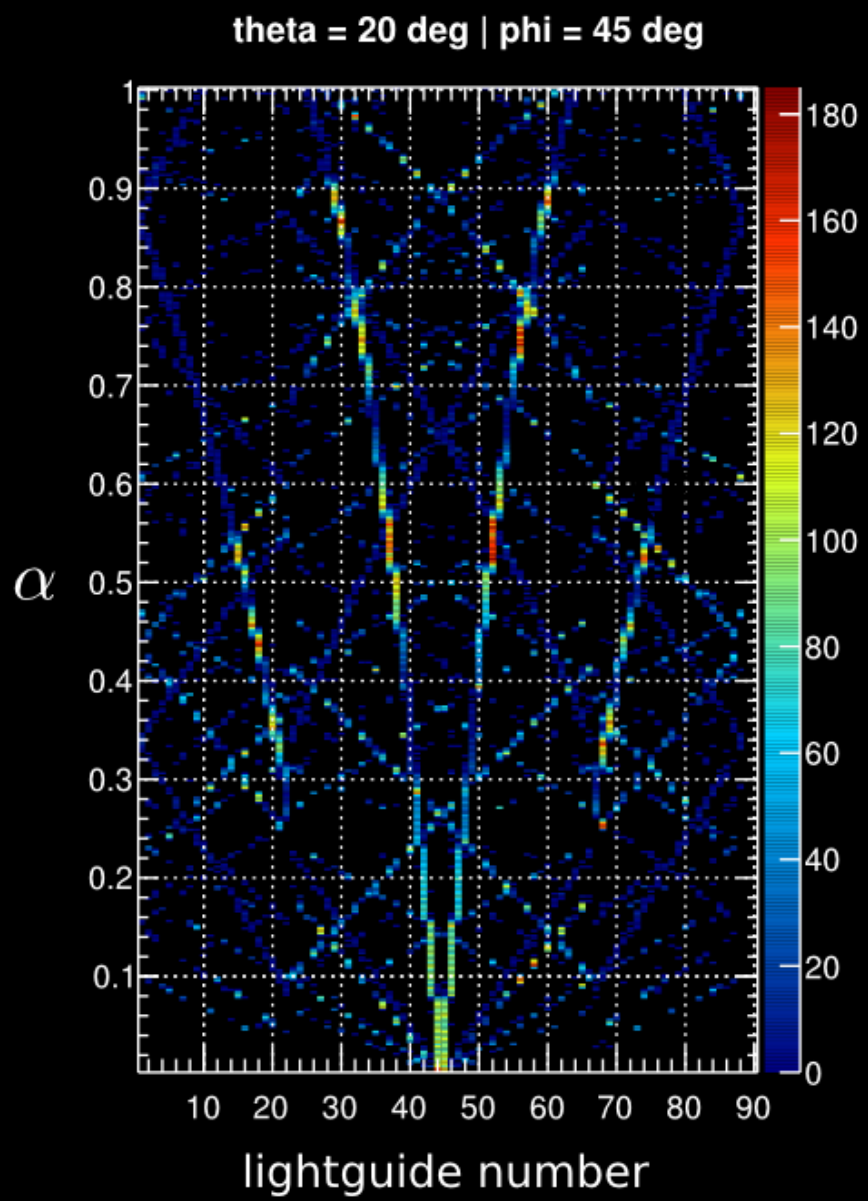
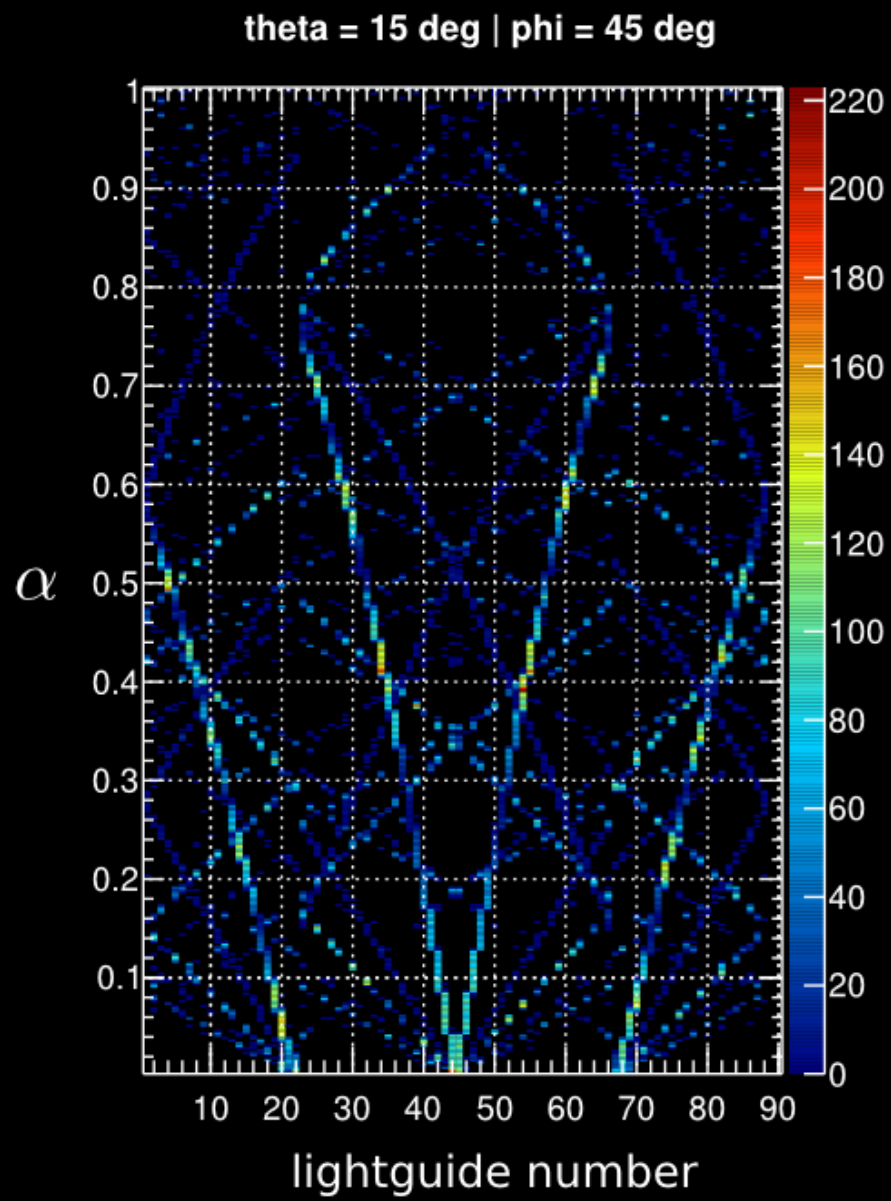




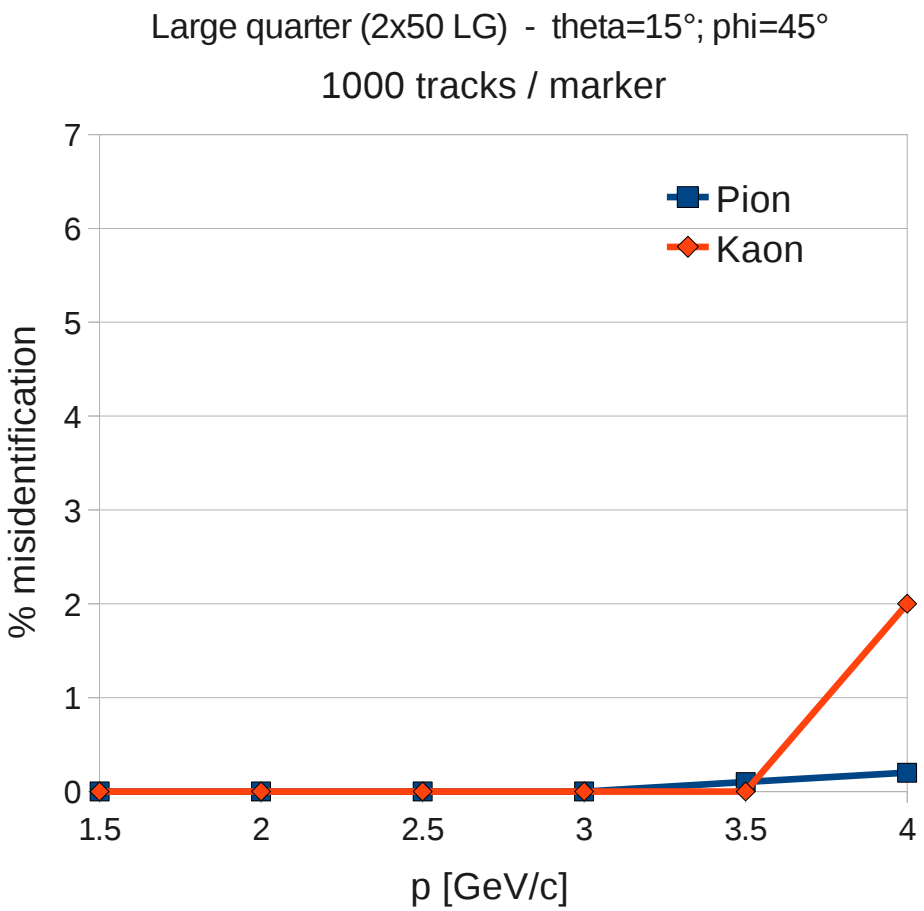
Lightguide imaging

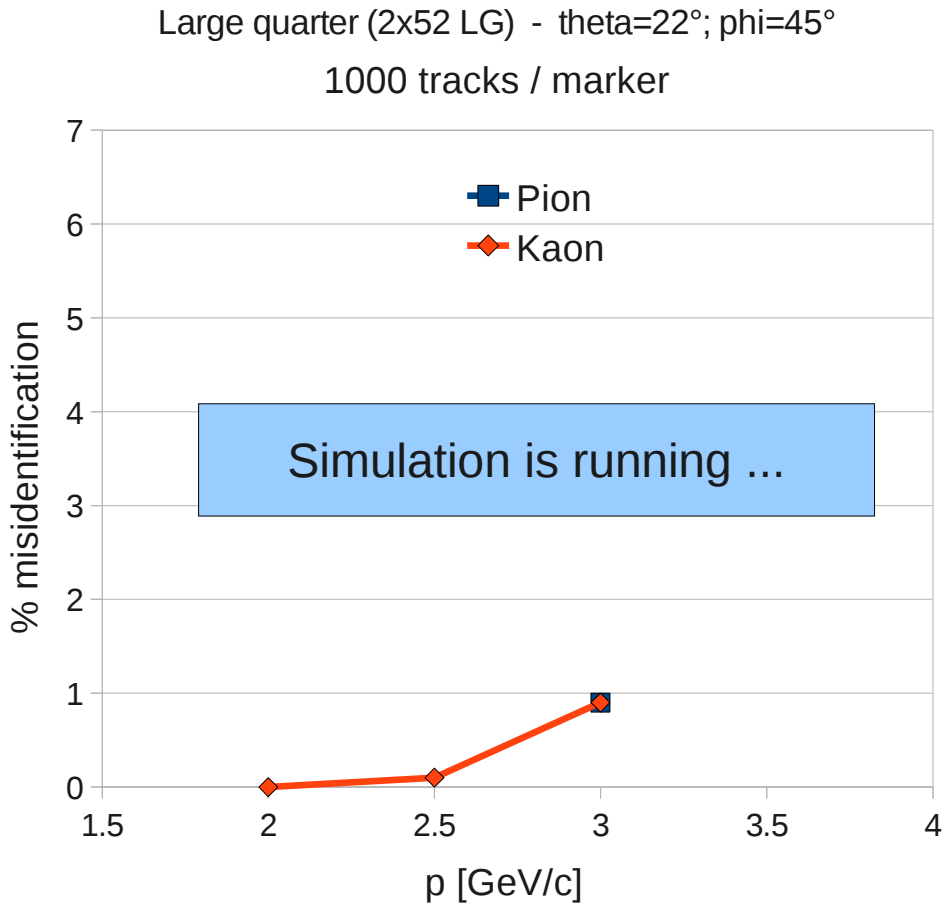






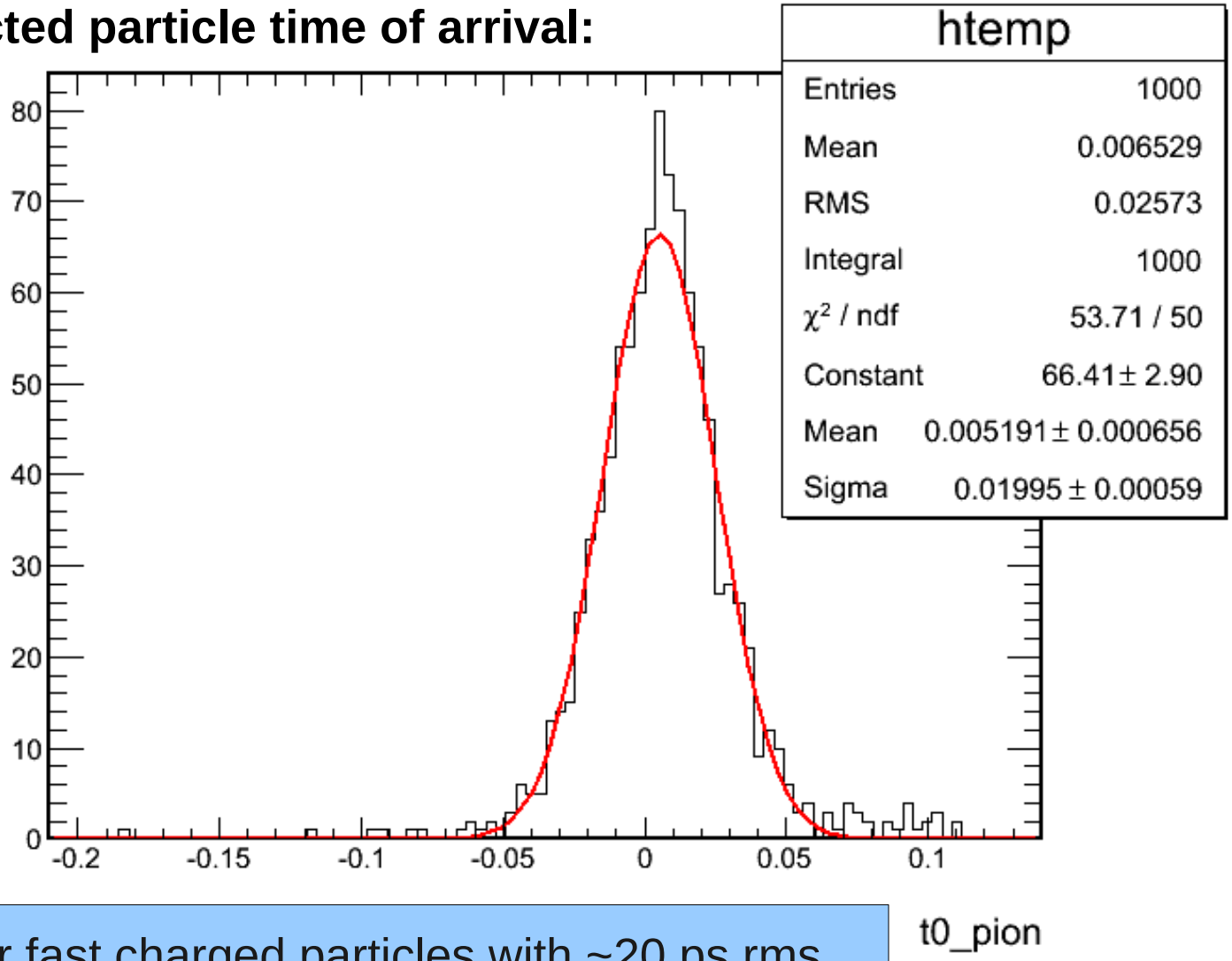
First preliminary results





First preliminary results

Reconstructed particle time of arrival:



ToF stop for fast charged particles with ~20 ps rms

Software stack

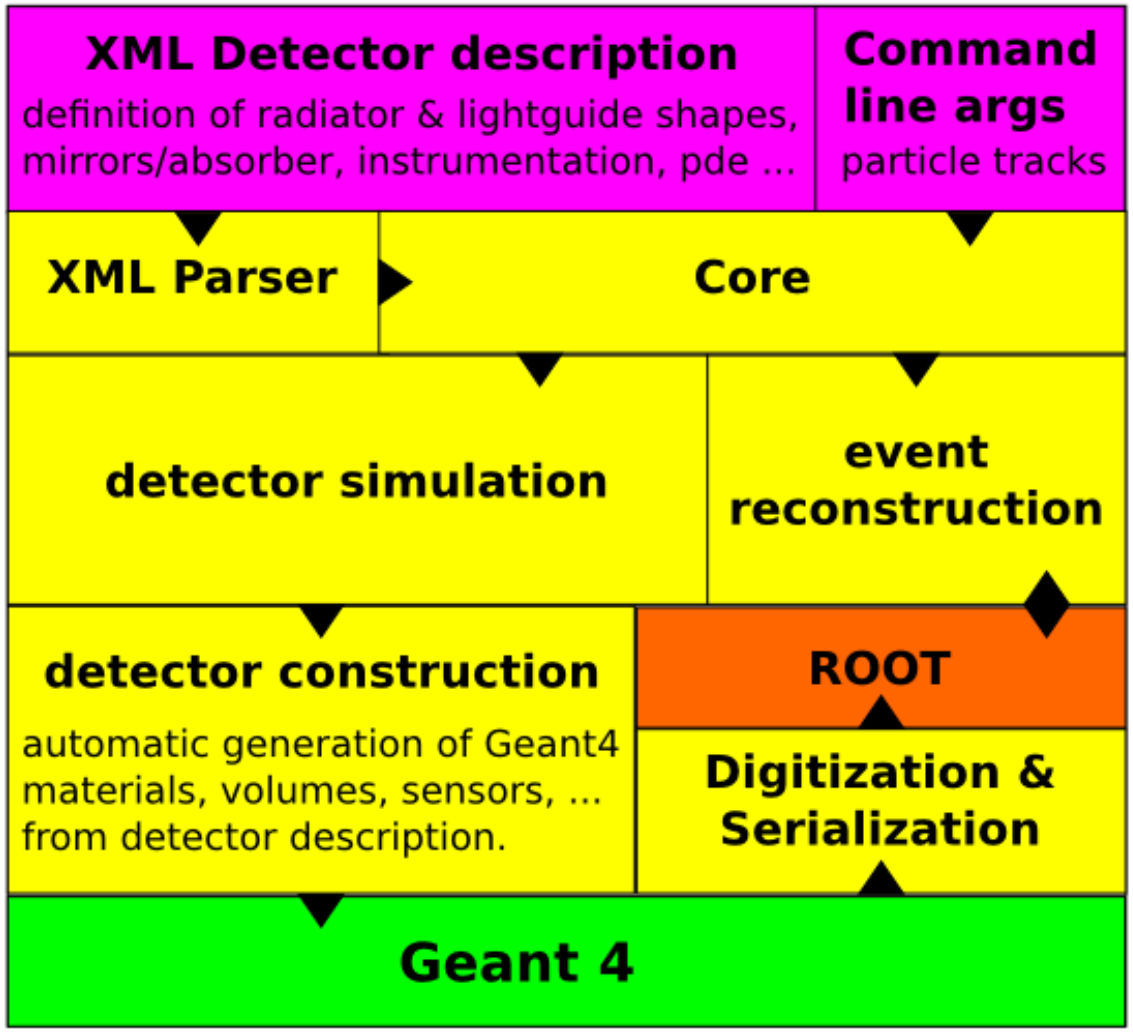
DiscDIRC toolkit

(c) Oliver Merle 2010

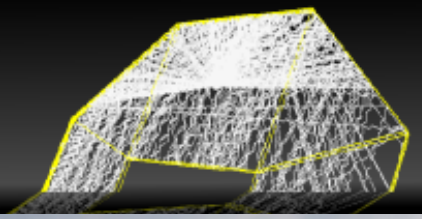
Will be continuously extended and improved while working on the Disc DIRC design.

Source will be released under the DiscDIRC license, similar to the Geant4 software license.

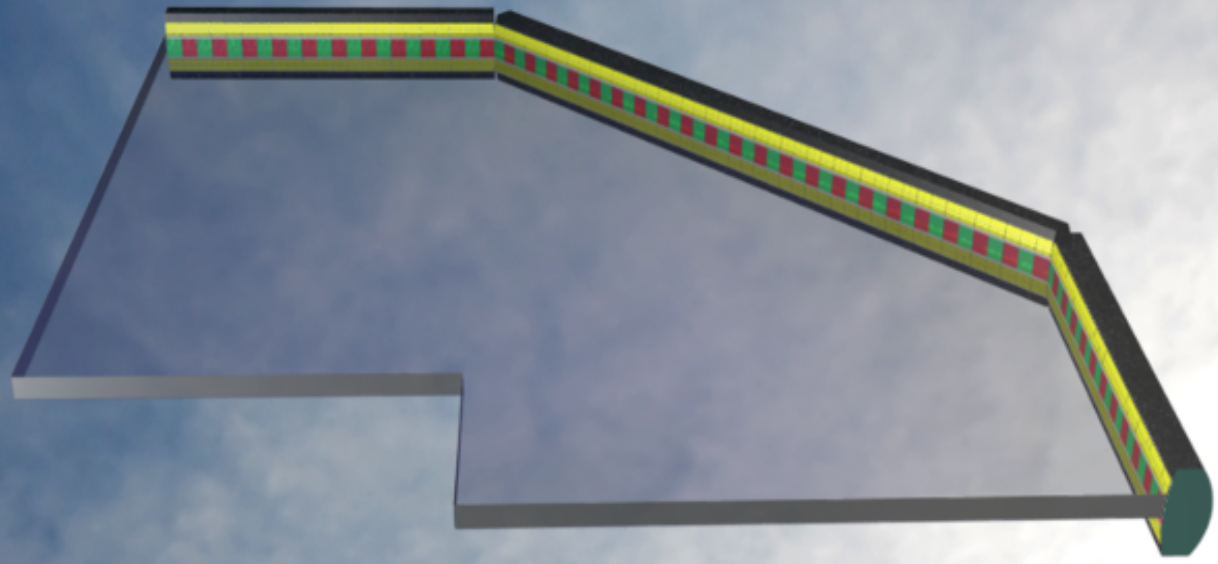
- **user provided input**
- **Disc DIRC toolkit**
- **simulation backend**
- **serialization**



Here we are.



Finally, in reach



Detector integration