Dual-radiator RICH: update

Alessio Del Dotto for the EIC PID/RICH collaboration
October 24, 2016

Study of the background

The aim is to study the different sources of background:

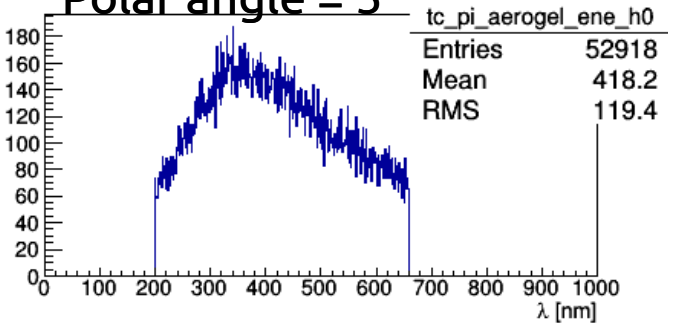
- Optical background: Rayleigh scattering, Forward scattering (is it implemented in GEMC?)
- Delta electrons originated in the Aerogel, low contribution and away from the detector region
- Particles background on the detector coming from different places: a glass layer in front of the PMTs is a source of background (to be tested after the GEMC based pixelization of the photon detector)

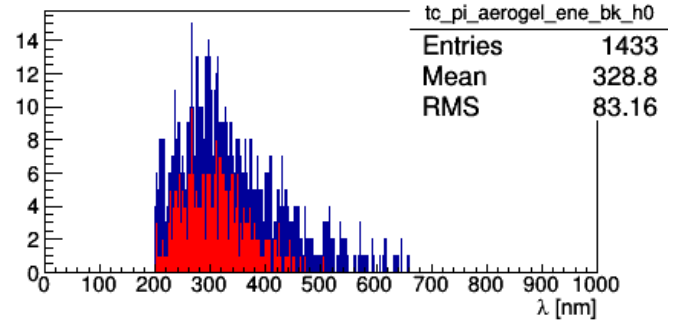
  - this kind of background is difficult to estimate without considering the full EIC detector environment

  - can be simulated using random pixels signals on the detector in order to know the tolerance level of the algorithm

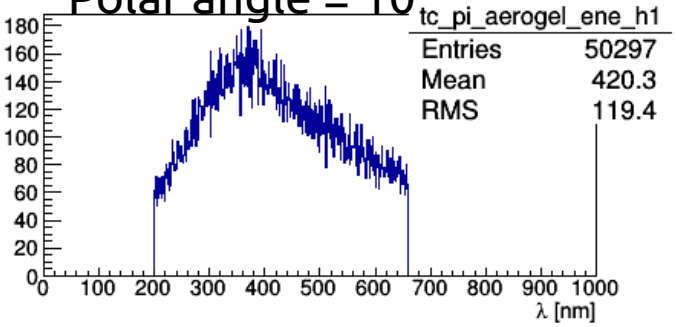
Optical signal/background vs polar angle

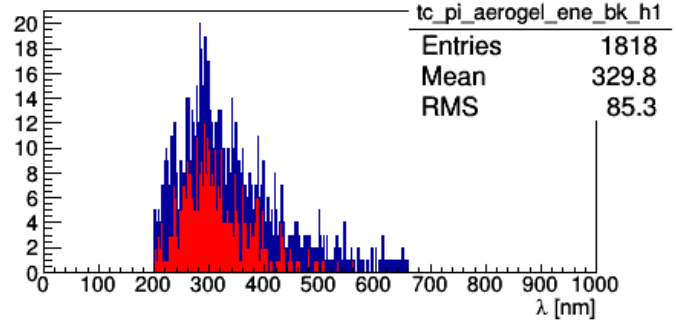
Polar angle = 5°



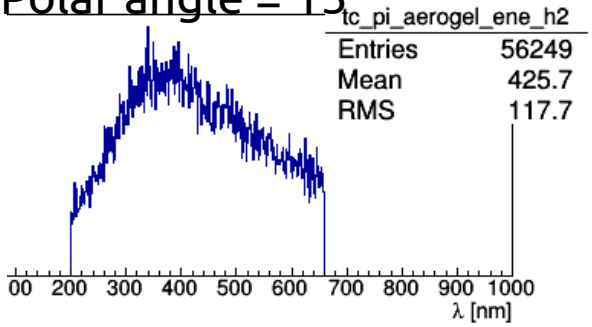


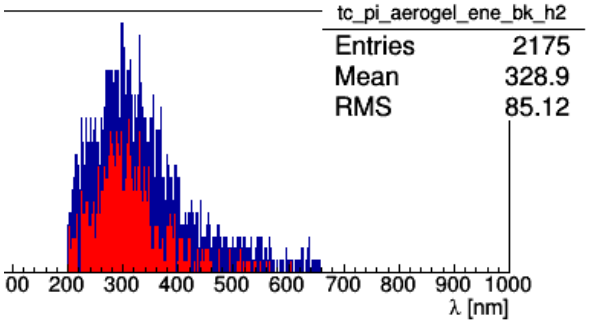
Polar angle = 10°



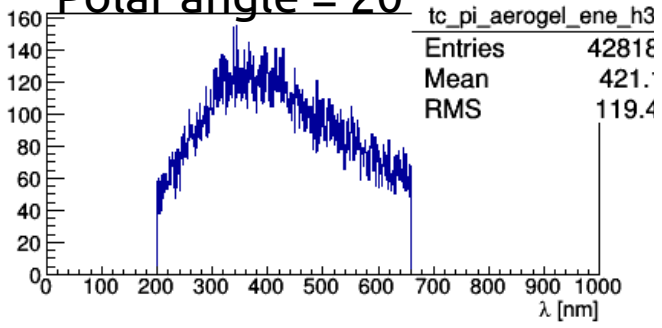


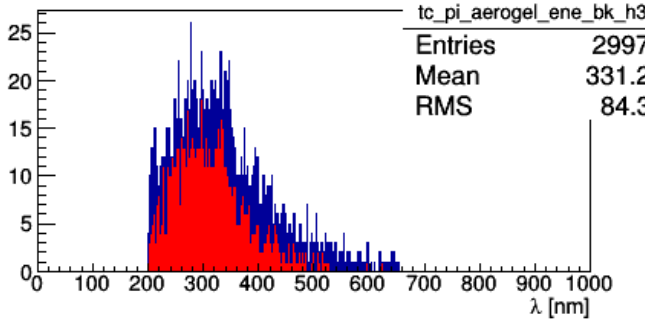
Polar angle = 15°



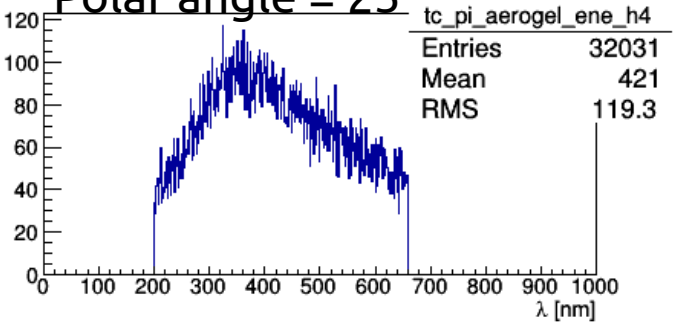


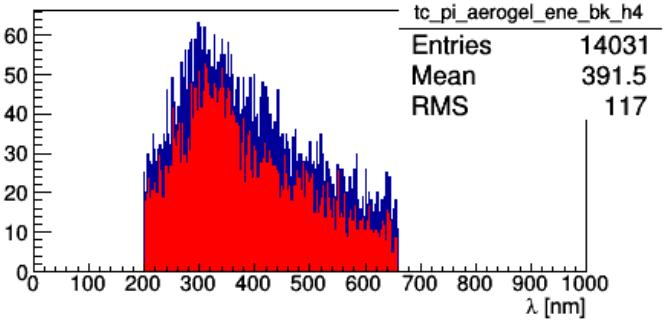
Polar angle = 20°





Polar angle = 25°



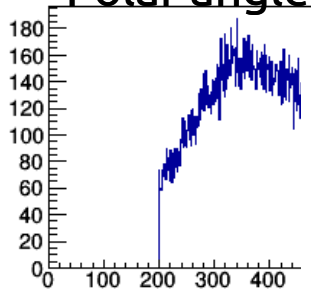


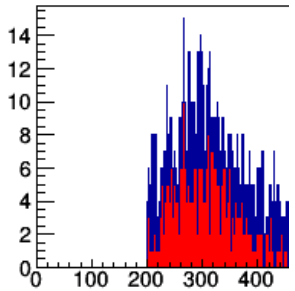
Background = detected (and reconstructed) photons outside the fiducial angular region of the IRT alghoritm

Signal = detected (and reconstructed) photons in the fiducial angular region of the IRT alghoritm

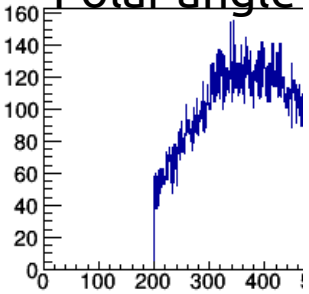
Optical signal/background vs polar angle

Polar angle = 5°



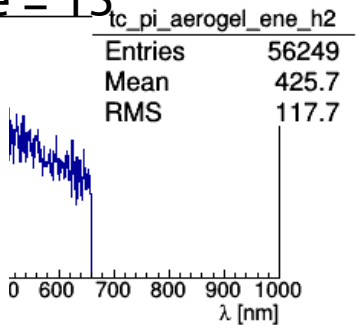


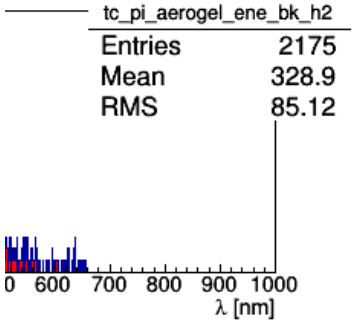
Polar angle

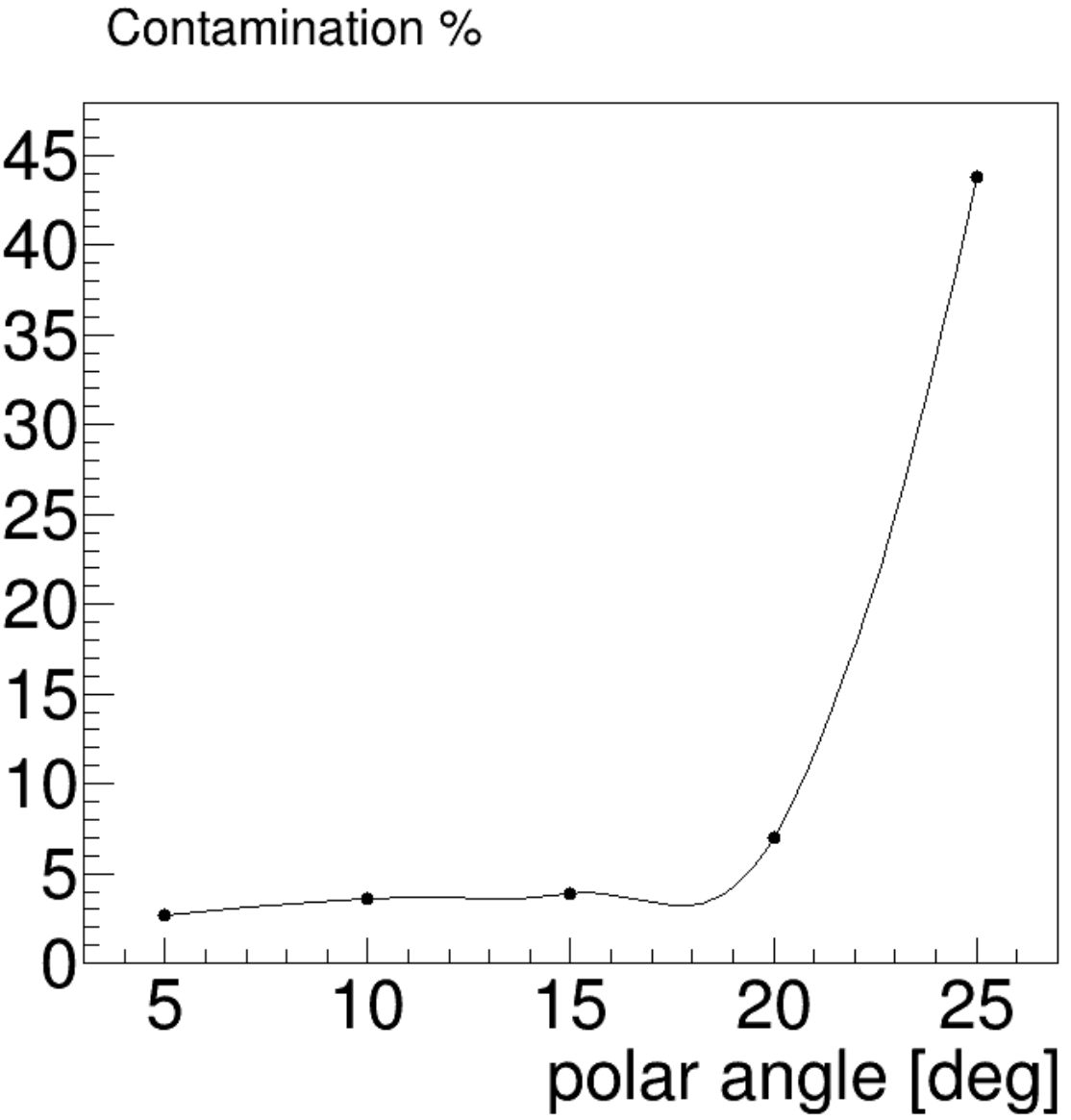


Polar angle = 10°

Polar angle = 15°







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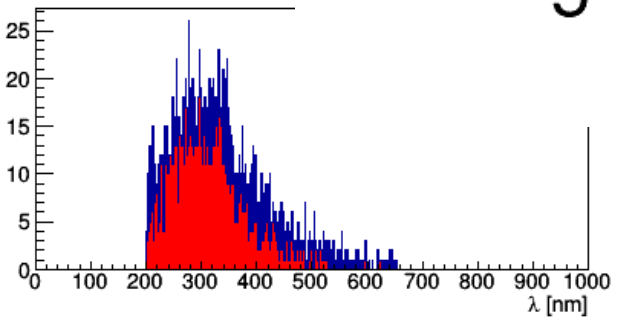
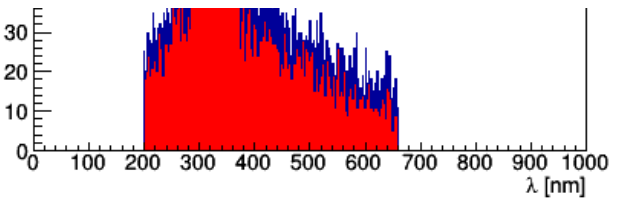
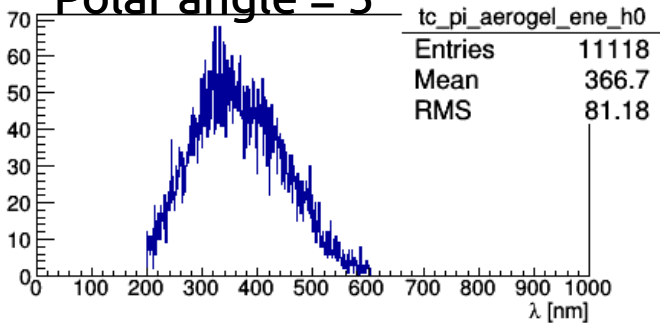


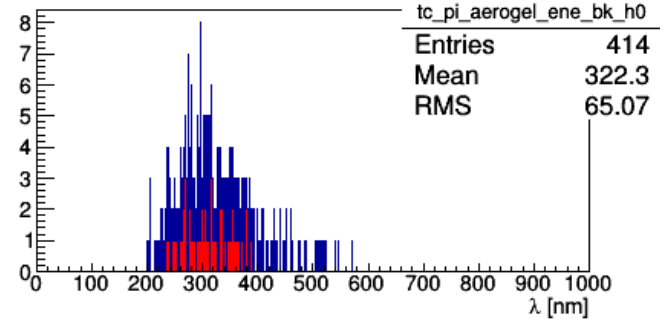


photons in the fiducial
angular region
of the IRT alghoritm

Optical signal/background vs polar angle using QE

Polar angle = 5°





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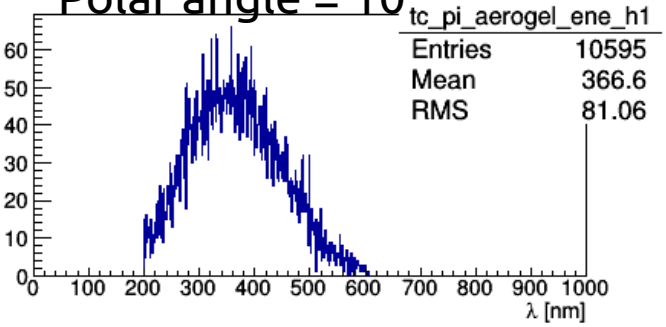

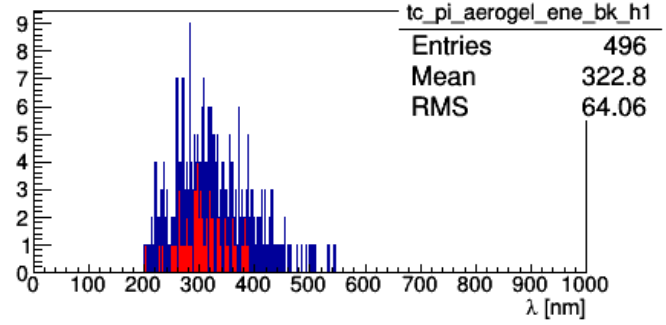

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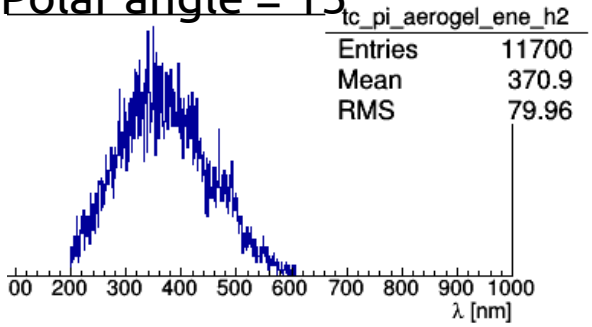

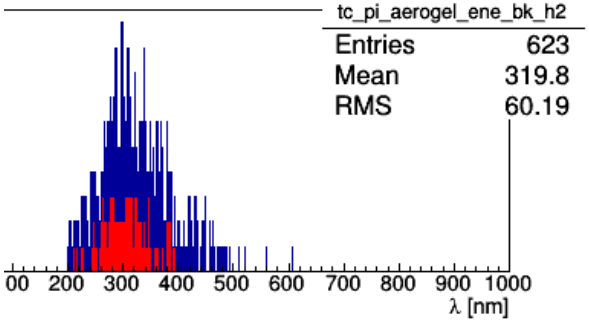

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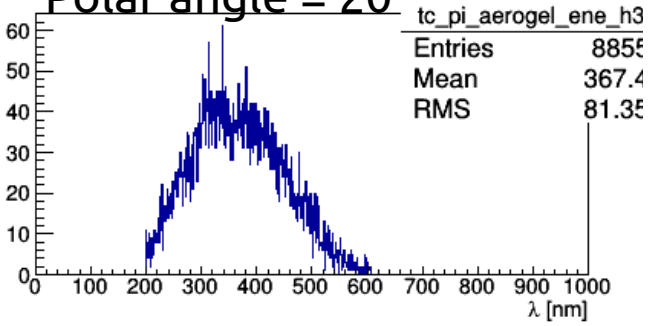

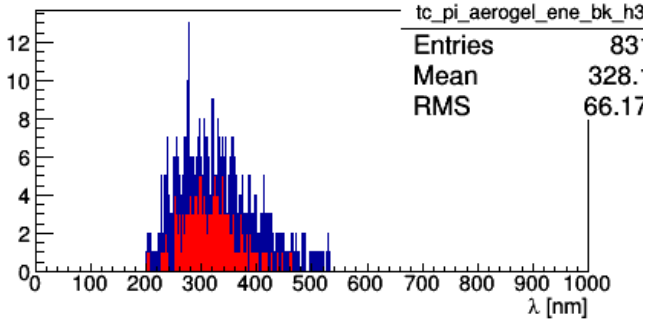

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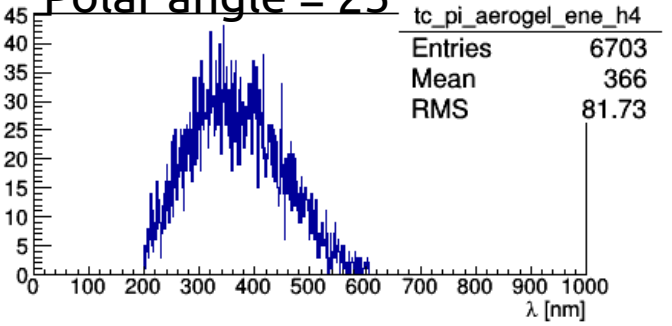

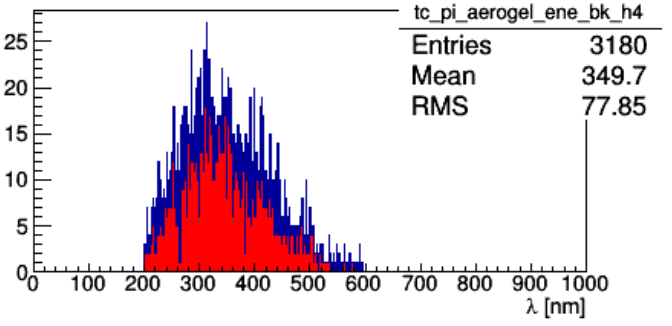

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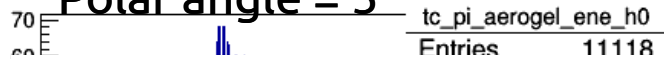
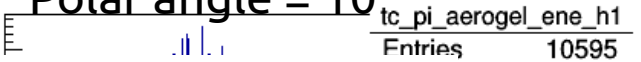
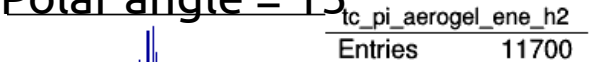
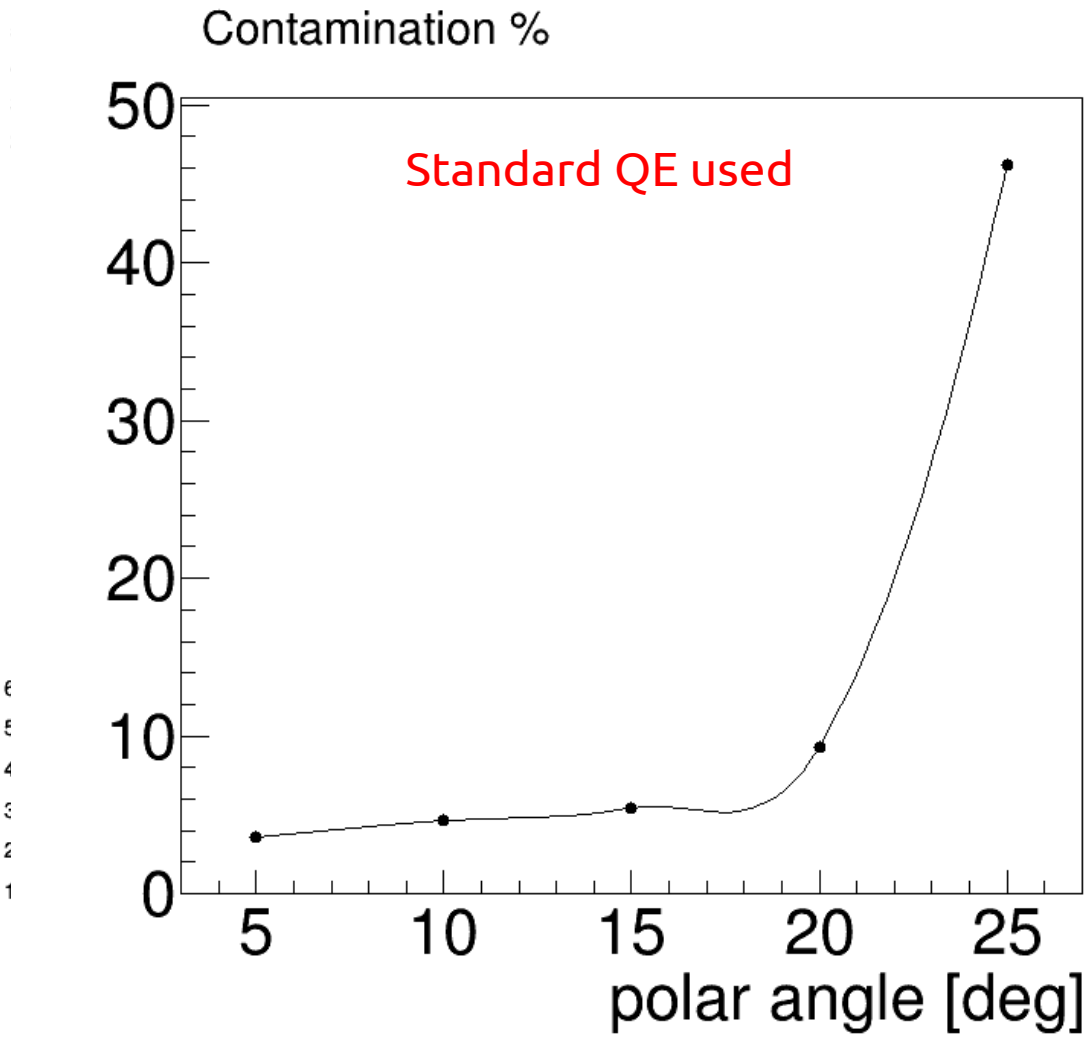


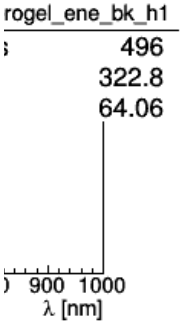
Polar angle = 10°

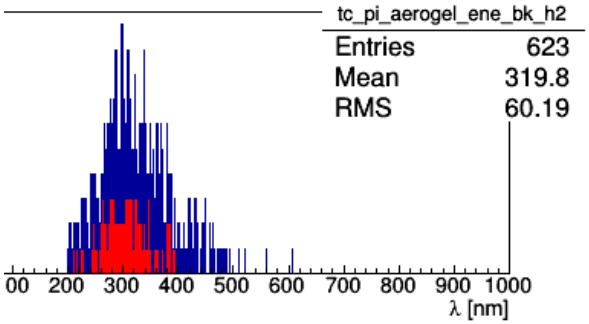


Polar angle = 15°









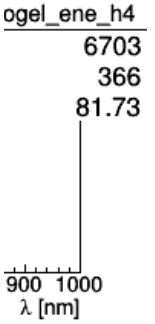
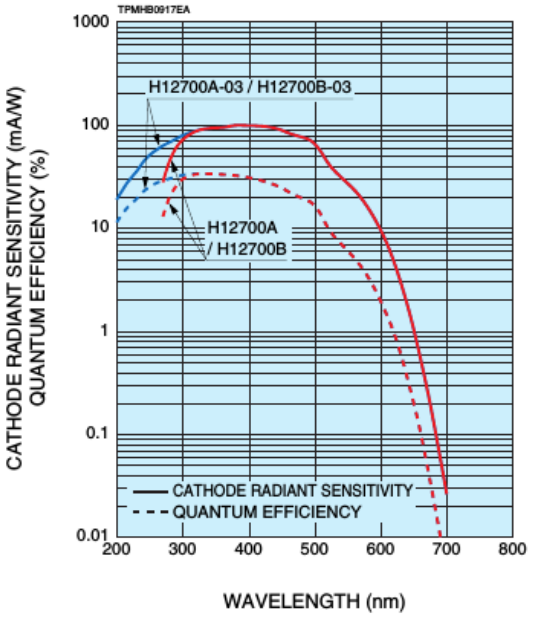
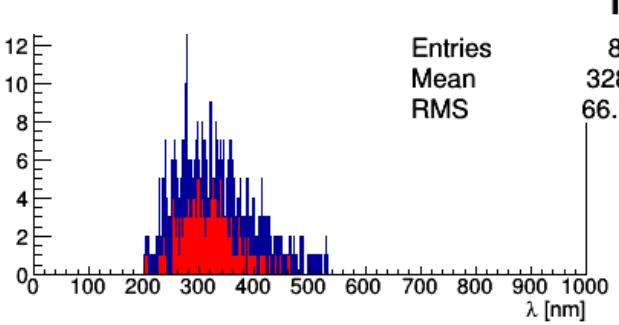
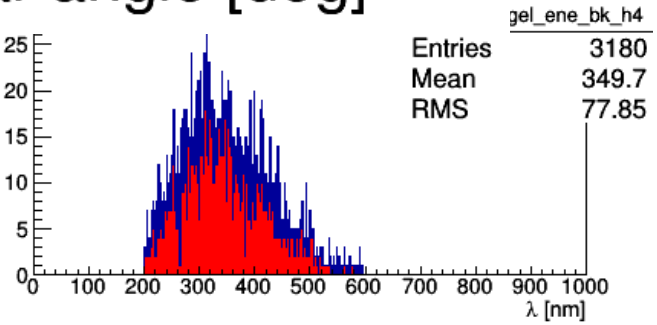


Figure 1: Typical Spectral Response

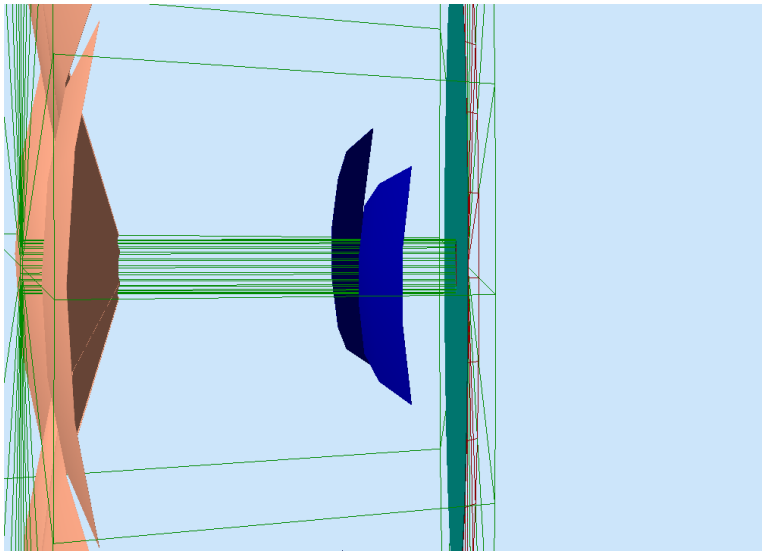


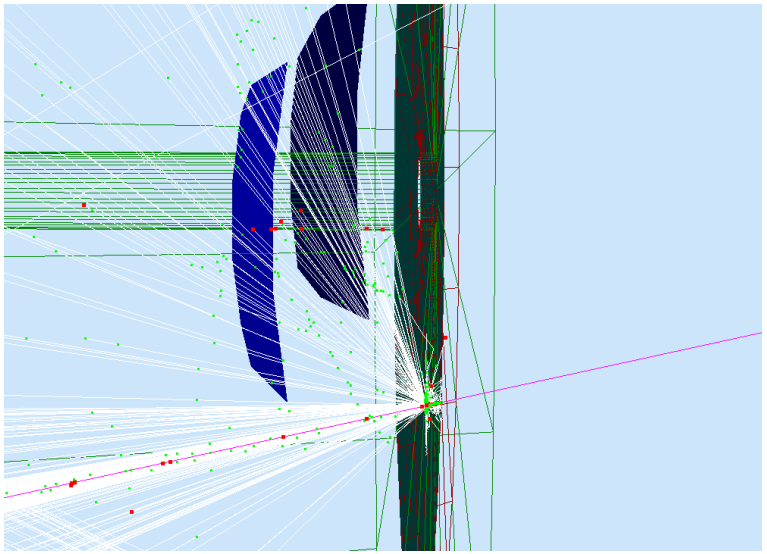




Background with the acrylic shield

Under study and simulation:





- 3 mm thick acrylic shield
- Seems to be too high taking into account the information on similar shielding in literature
- Signal/background order 1
- Under study, better understanding!

Comments and to do next

- The signal/background grow up at high polar angles, because the track is closer to the detector region.
- The optical background can be (at some extent) disentangled from the good signal by the reconstruction algorithm

Next steps:

- The deadline for the proceedings (RICH 2016) is November 1, 2016. I will provide the text within tomorrow.
- The signal/background with shield under study.

$Aerogel(n = 1.02)$ | $e_{th}(GeV/c) = 0.0025$ | $\pi_{th}(GeV/c) = 0.67$ | $K_{th}(GeV/c) = 2.46$ | $p_{th}(GeV/c) = 4.89$

$C_2F_6(n = 1.00082)$ | $e_{th}(GeV/c) = 0.0123$ | $\pi_{th}(GeV/c) = 3.48$ | $K_{th}(GeV/c) = 12.3$ | $p_{th}(GeV/c) = 23.4$