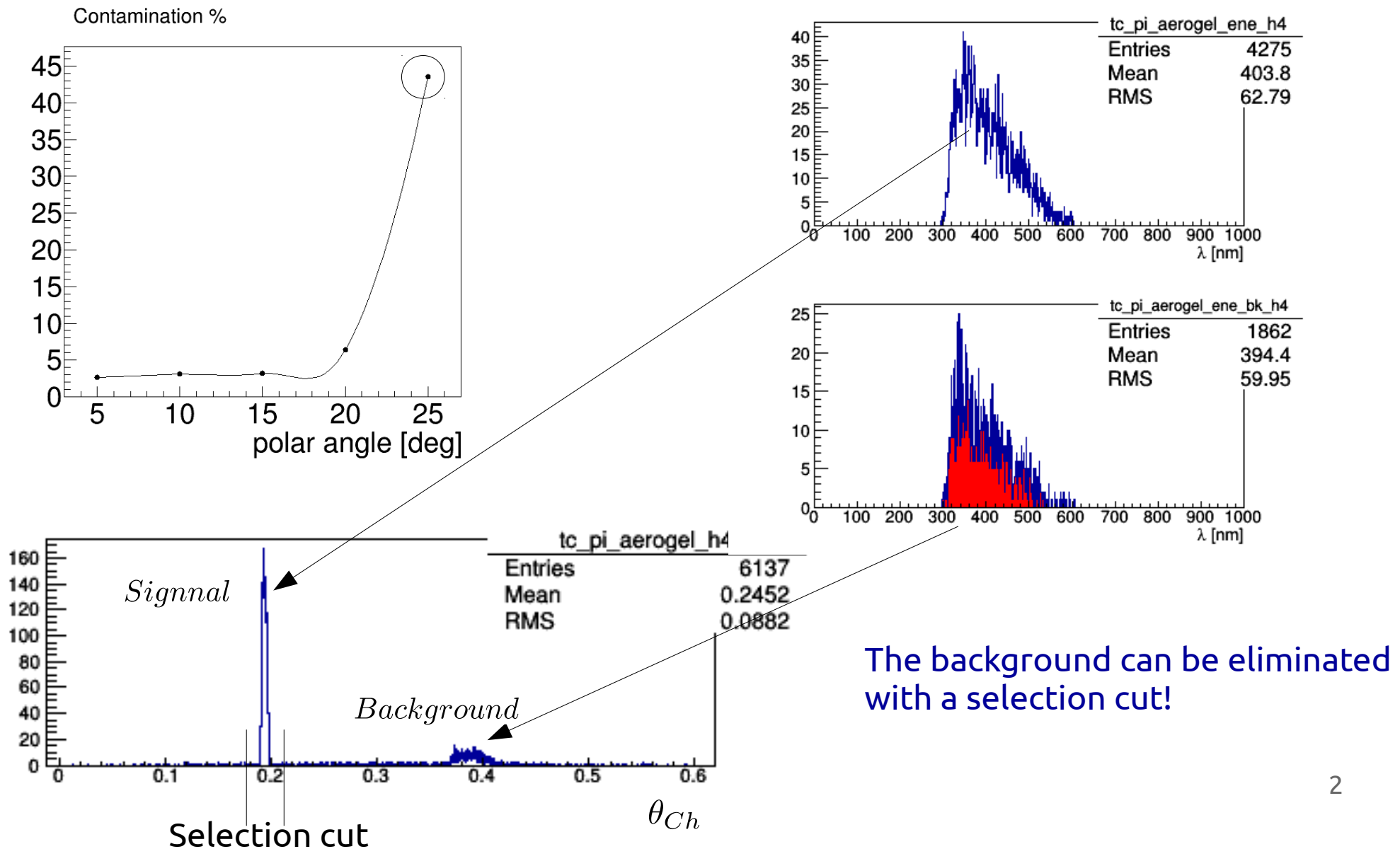# Dual-radiator RICH: update
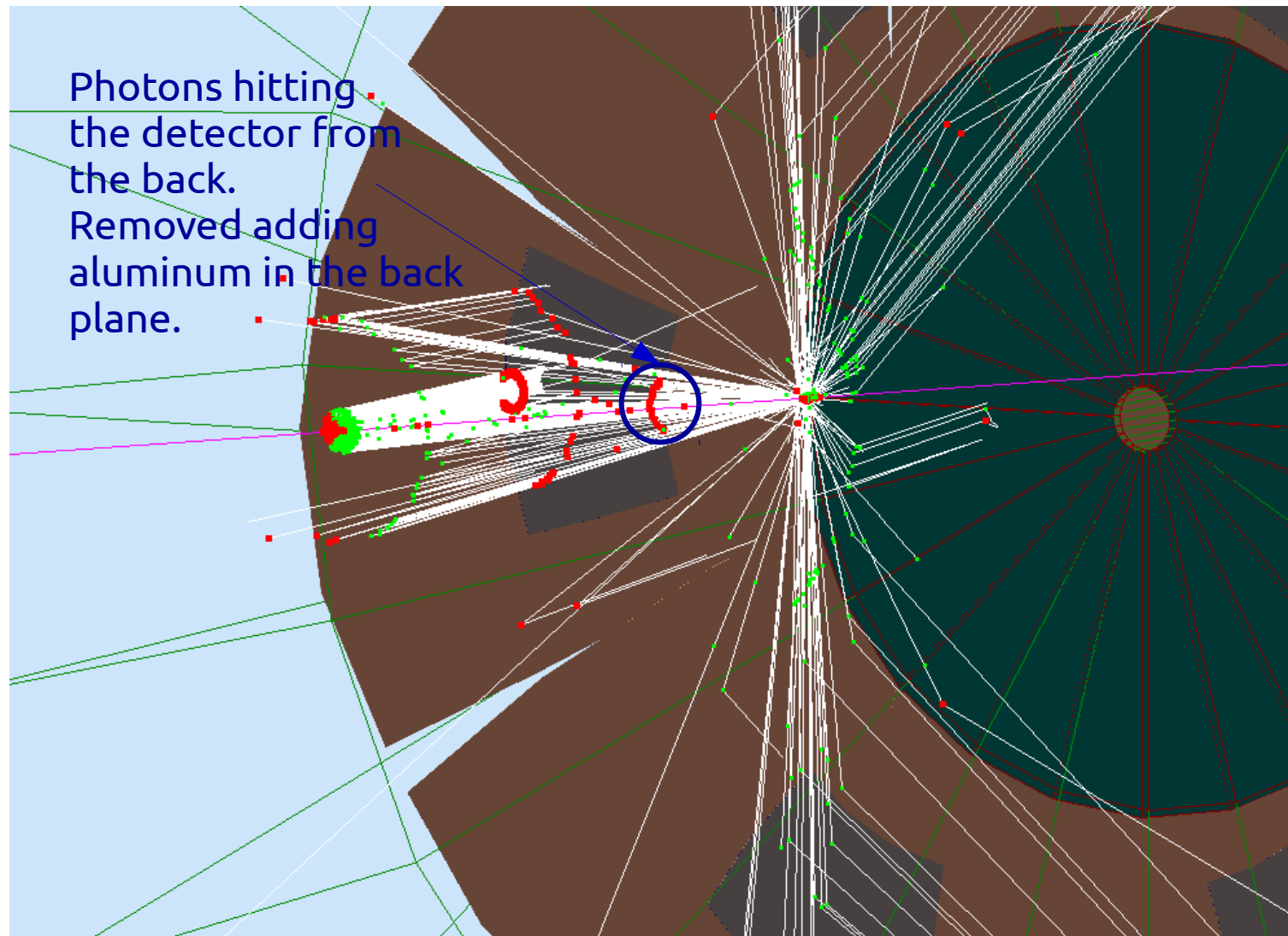
Alessio Del Dotto for the EIC PID/RICH collaboration
December 5, 2016
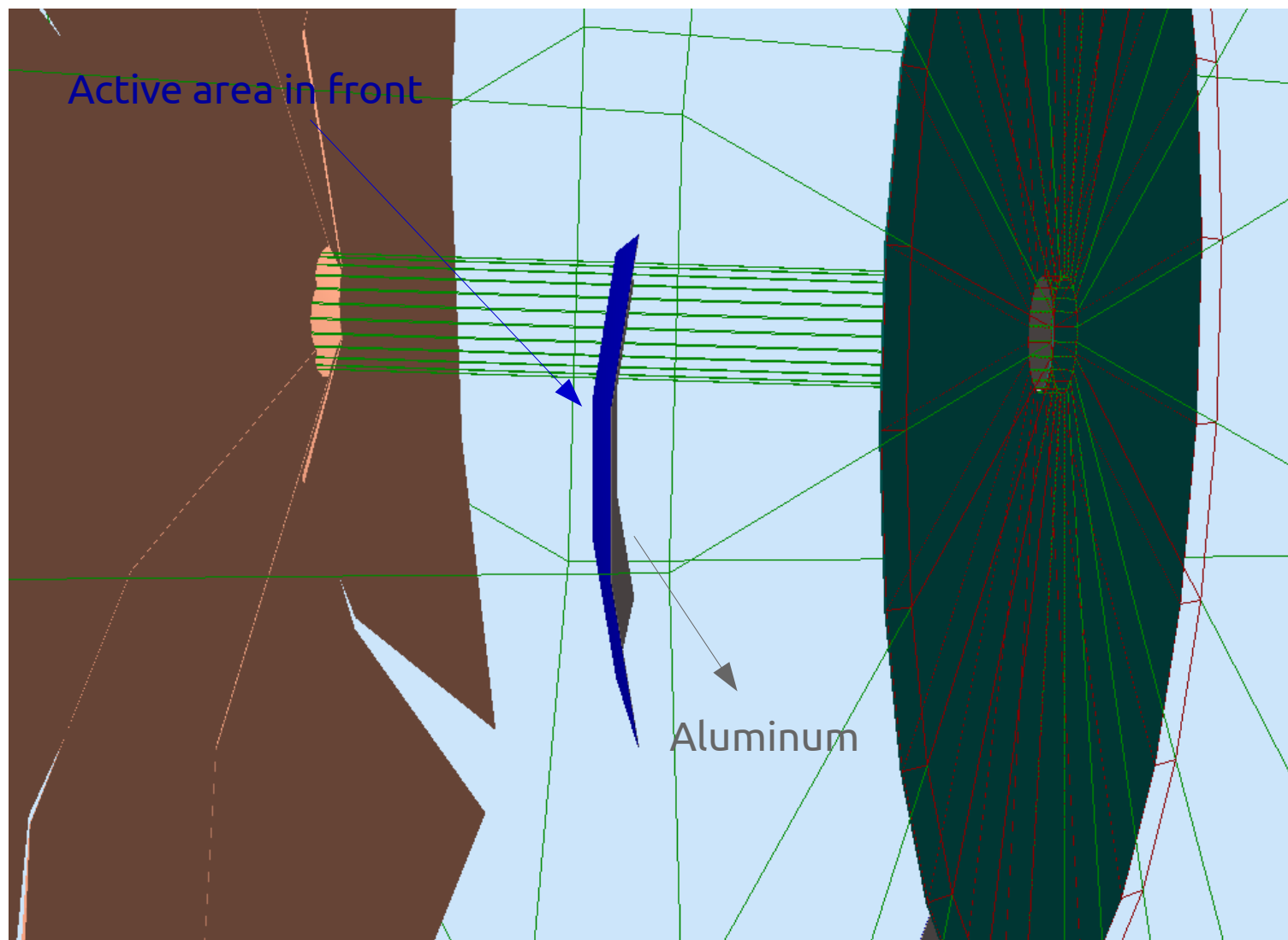
S/B at 25° (polar angle)

Contamination %
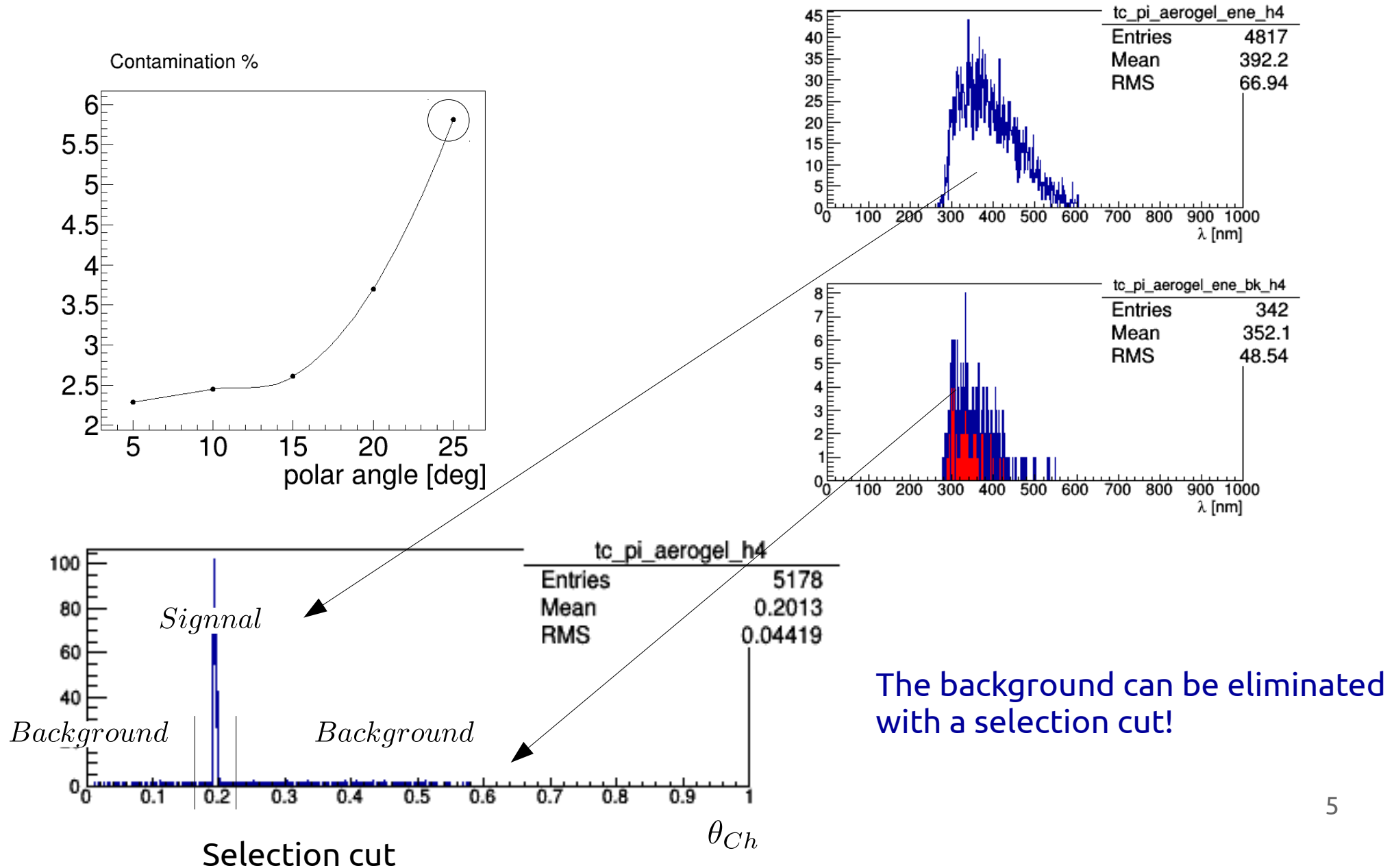
polar angle [deg]

tc_pi_aerogel_ene_h4

Entries	4275
Mean	403.8
RMS	62.79

λ [nm]

tc_pi_aerogel_ene_bk_h4

Entries	1862
Mean	394.4
RMS	59.95

λ [nm]

tc_pi_aerogel_h4

Entries	6137
Mean	0.2452
RMS	0.0882

Signnal

Background

θ_{Ch}

Selection cut

The background can be eliminated with a selection cut!

2

Origin of the second peak

Photons hitting the detector from the back. Removed adding aluminum in the back plane.

This is a temporary solution before the detector plane GEMC based pixelization

Active area in front

Aluminum

S/B at 25° (polar angle)

Contamination %

	tc_pi_aerogel_ene_h4	
Entries		4817
Mean		392.2
RMS		66.94

	tc_pi_aerogel_ene_bk_h4	
Entries		342
Mean		352.1
RMS		48.54

Signal

Background   *Background*

	tc_pi_aerogel_h4	
Entries		5178
Mean		0.2013
RMS		0.04419

The background can be eliminated with a selection cut!

Selection cut

θ_{Ch}
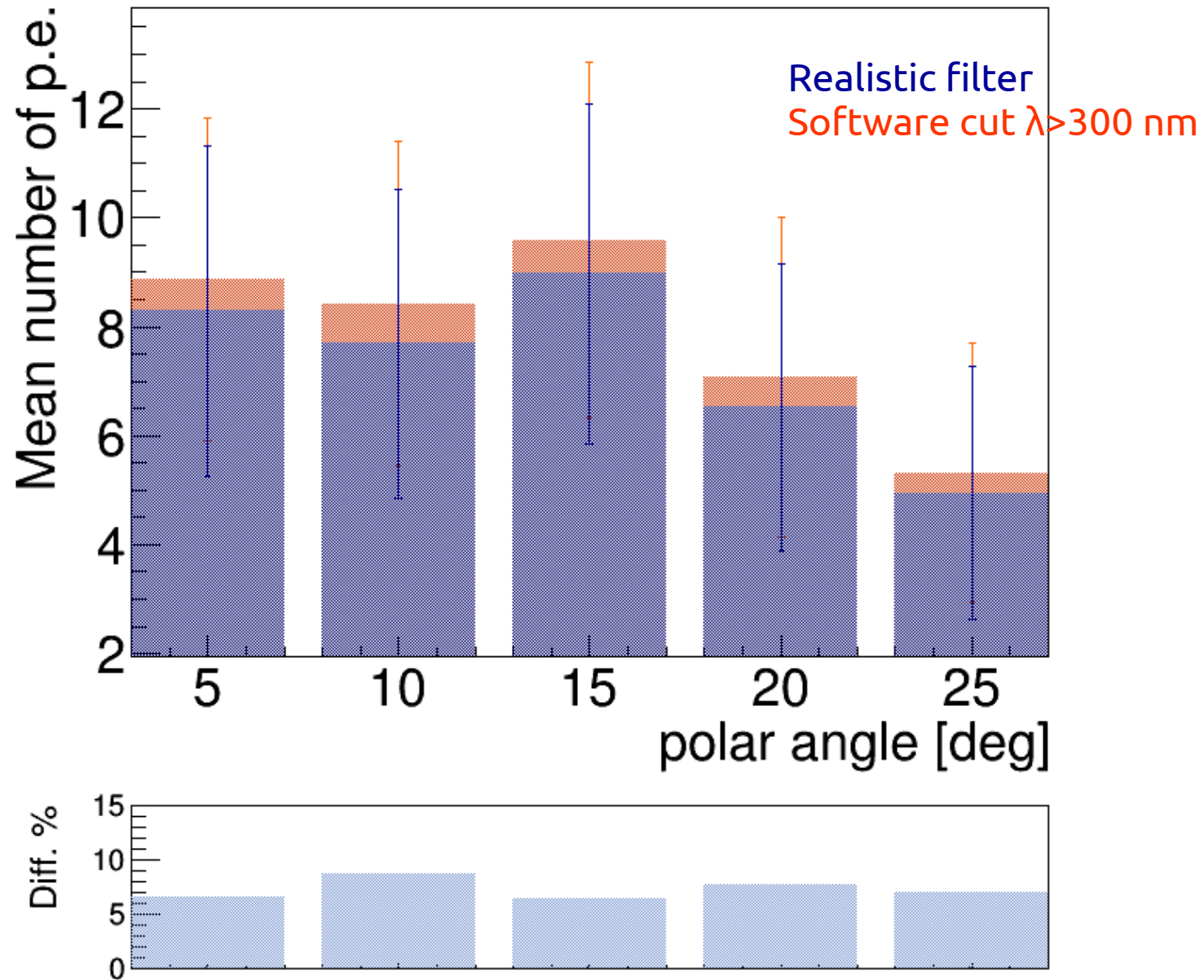
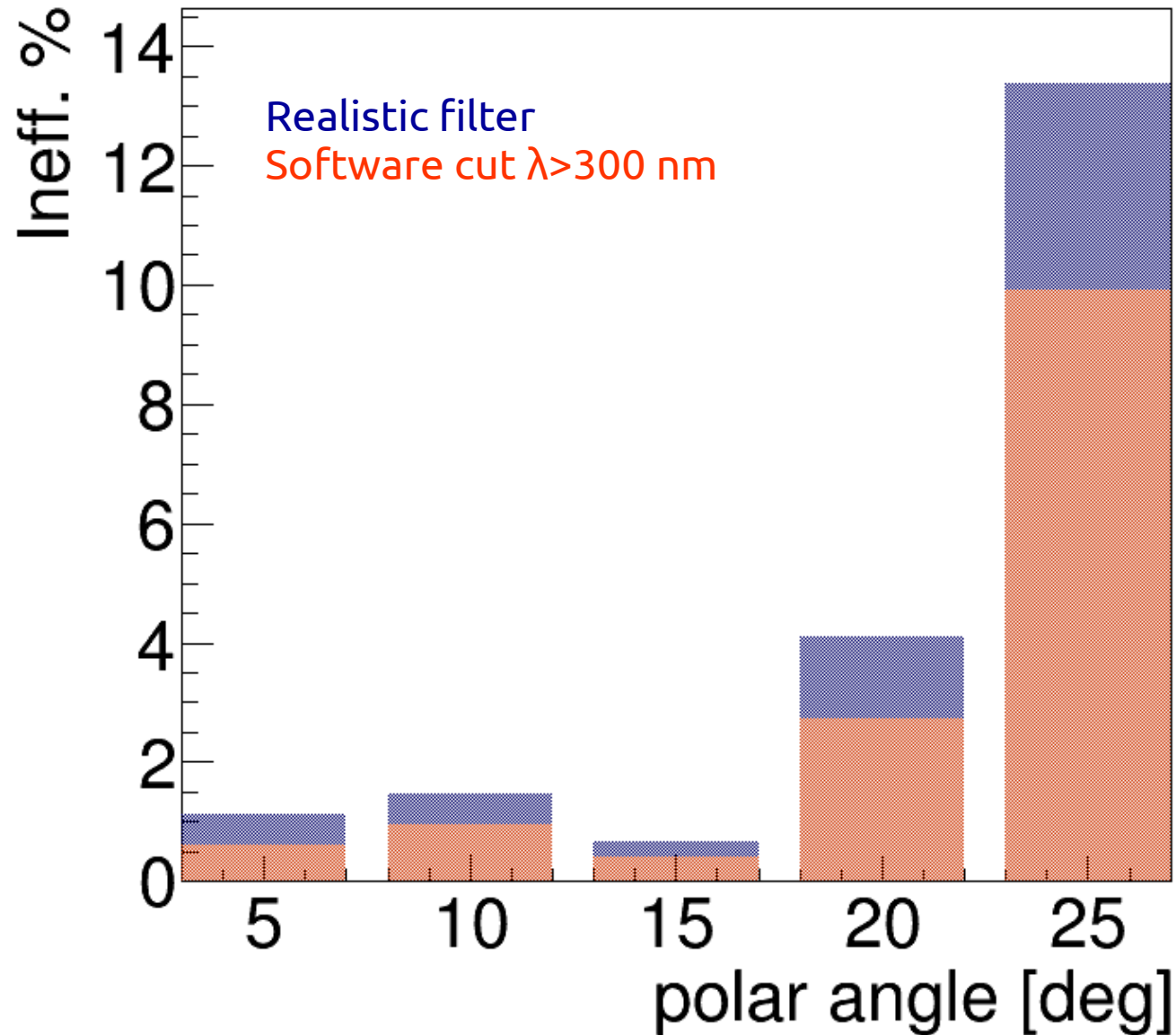# N~pe~ vs polar angle

Inefficiency vs polar angle

$$P(N_{ph} < 3) = \exp(-\langle N_{ph} \rangle)(1 + \langle N_{ph} \rangle + \langle N_{ph} \rangle^2 / 2)$$


Realistic filter
Software cut λ>300 nm

To do next

- Data for producing plots of number of sigma vs momentum under simulation (**with realiistic shield**). Ready in one or two days.

- Next steps:

- **Draft of the report**

- **Study of the feasibility of the dRICH to fit the BNL version of EIC detector**

Part of a slide of

Goal:

- Implement in the same compact design:
  - homogeneous ~3T field in the TPC
  - hadron-track-aligned field in the RICH
- Keep it simple (no dual solenoid configuration; no reversed current coils; no flux return through HCal; no warm coils between EmCal and HCal)
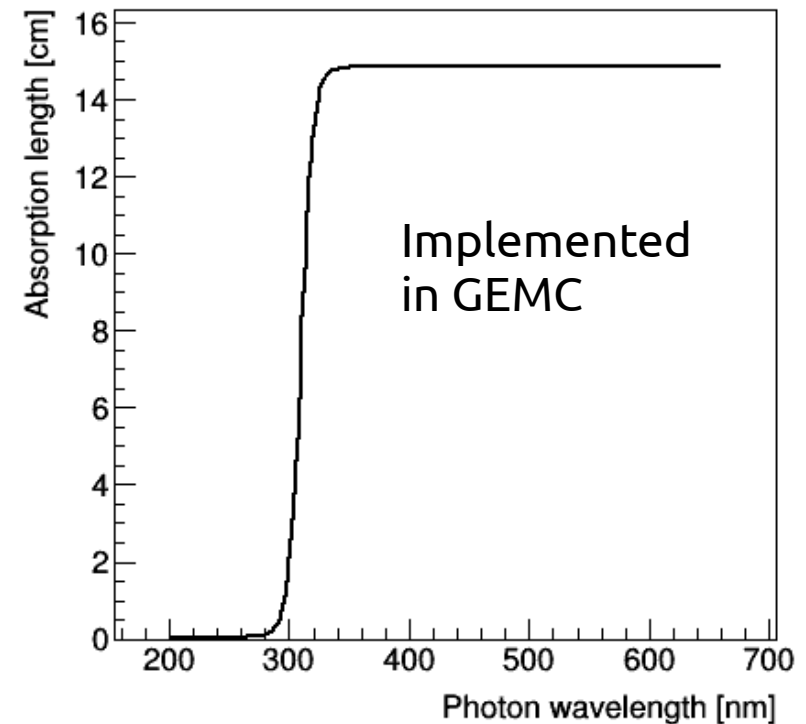
$\eta = 1.0$

$\eta = 1.5$
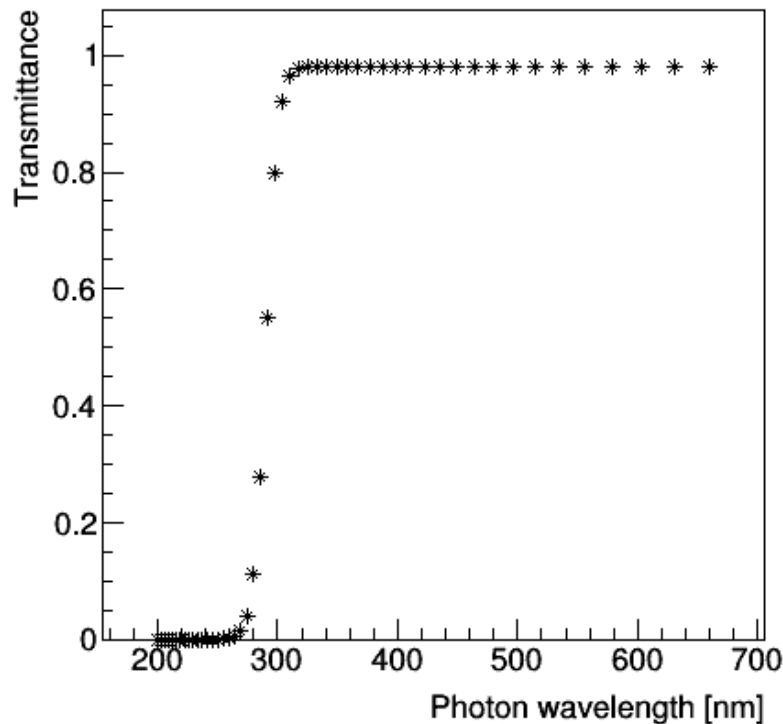
$\eta = 3.5$

RICH location

TPC volume
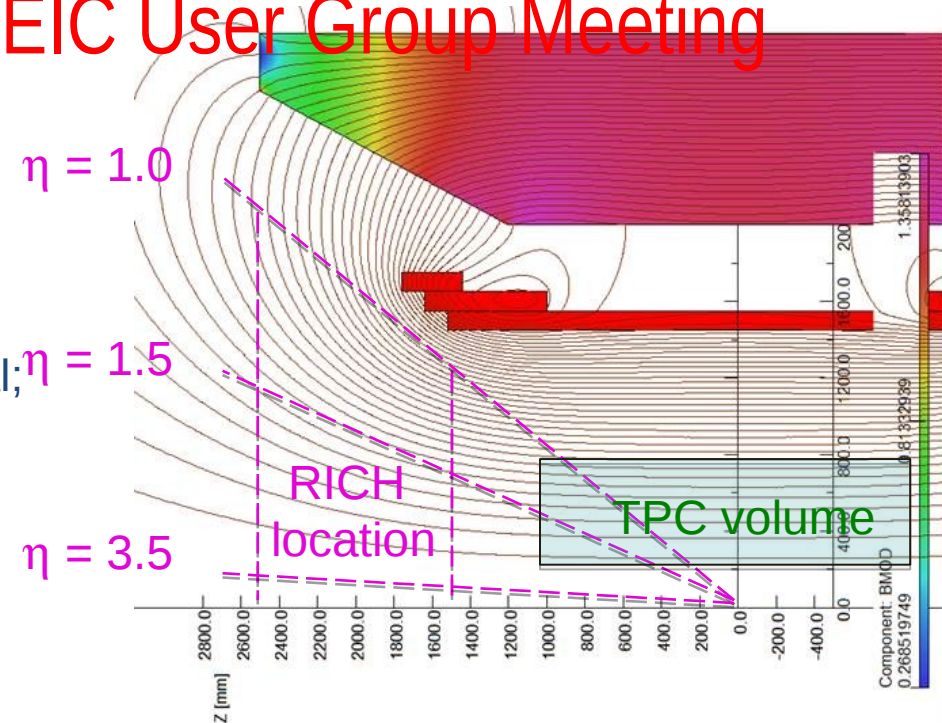
The space for the RICH is small, smaller than the one that we have in JLab EIC ...

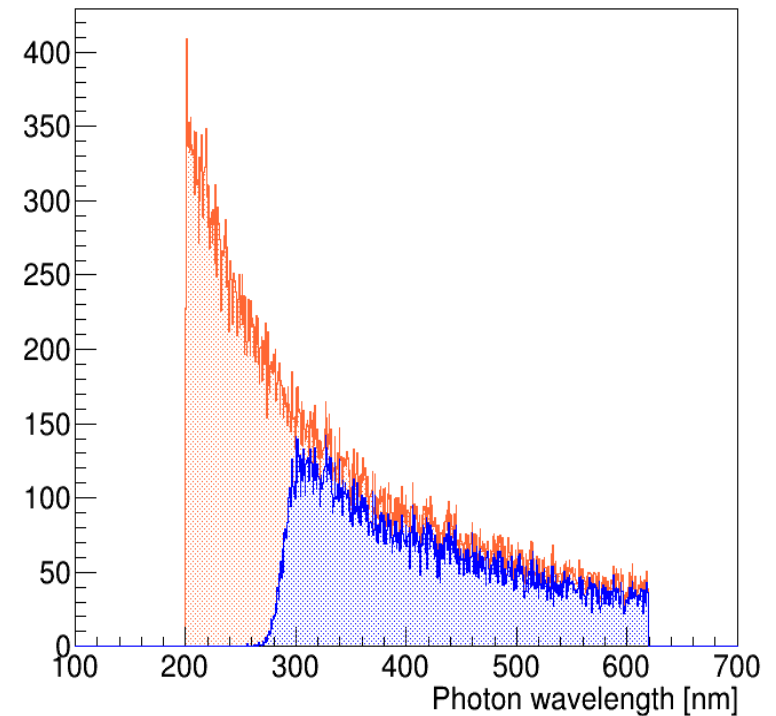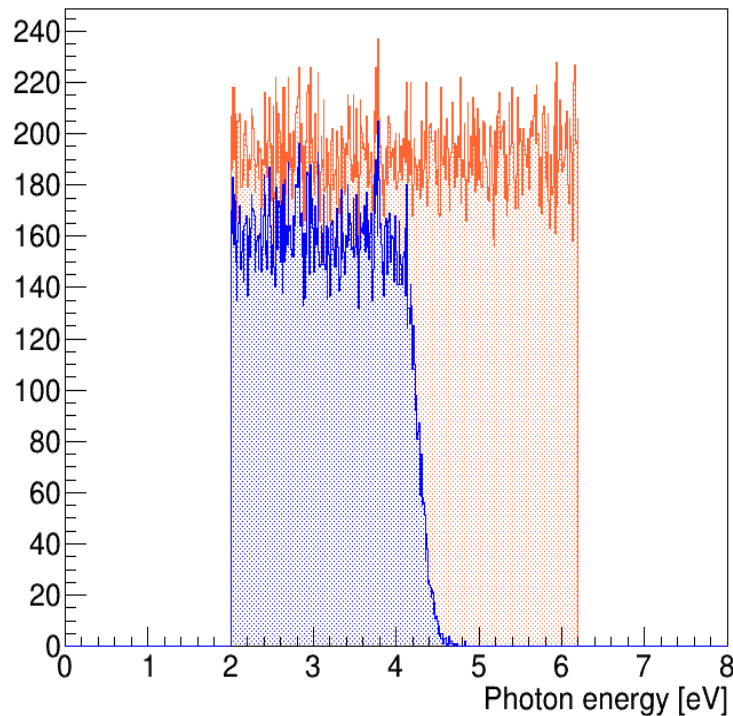- First step: try to adapt the current design to the BeAST design (difficult!)

Transmittance and Absorption length

Transmittance is defined by a sigmoid function, and the Absorbtion length is $A = d/\ln T$ with d = 0.3 cm

Implemented in GEMC

Filtered spectrum

This is the effect of the shield on a beam of photons of
E = [2,6.2] eV

With the shield there is an additional absorption of photons, even in the good range!
A trade off is needed!