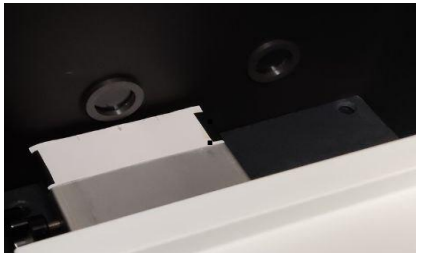
EIC_NET - dRICH meeting

Optical characterization of materials
&
data analysis update

Simone Vallarino



Transmittance

Thickness

$$T = e^{-\frac{t}{\Lambda_{tot}}} = e^{-t\left(\frac{1}{\Lambda_A}+\frac{1}{\Lambda_S}\right)}$$

Hunt formula

$$= Ae^{-\frac{Ct}{\lambda^4}}$$

[Reference: Optical characterization of n=1.03 silica aerogel used as radiator in the RICH of HERMES]

Transflectance

$$A = TF = e^{-\frac{t}{\Lambda_A}}$$

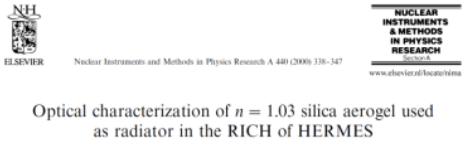
Absorption length

$$\Lambda_A = -\frac{t}{\ln A}$$

Scattering length

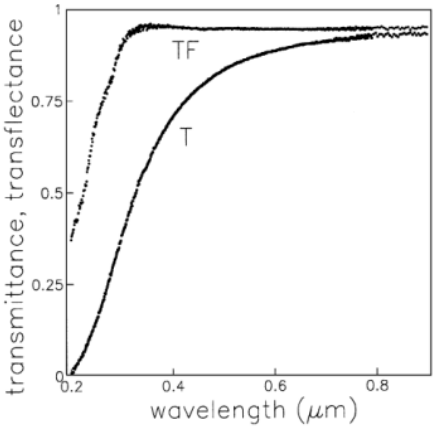
$$\Lambda_S = \frac{\lambda^4}{C}$$

Current status: transmittance measured, transflectance not measured.
(An integrating sphere is needed but ours is under repair).



Transmittance $T = e^{-\frac{t}{\Lambda_{tot}}} = e^{-t\left(\frac{1}{\Lambda_A}+\frac{1}{\Lambda_S}\right)}$ Thickness

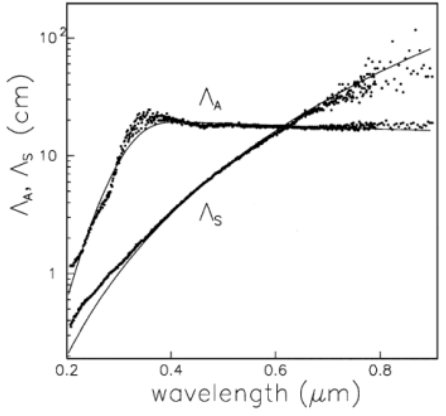
Hunt formula $= Ae^{-\frac{Ct}{\lambda^4}}$

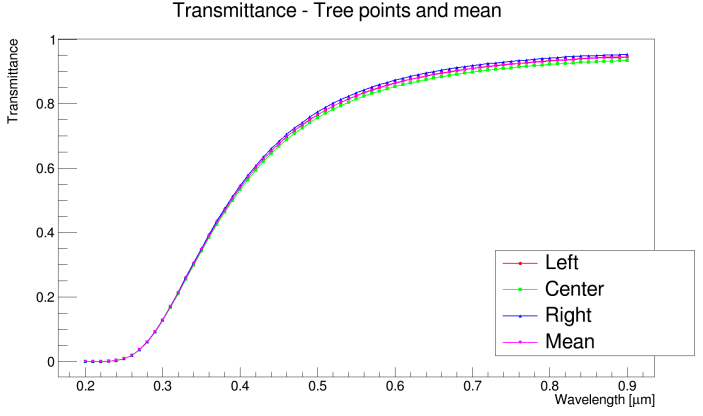


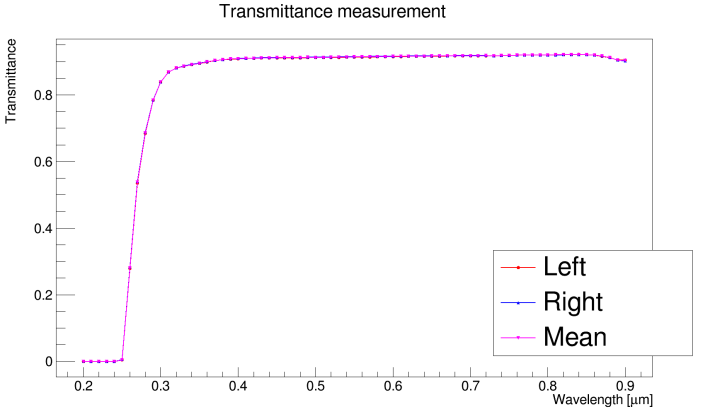
The Hunt formula allows to estimate the Λ_S and Λ_A and to compare different tiles.

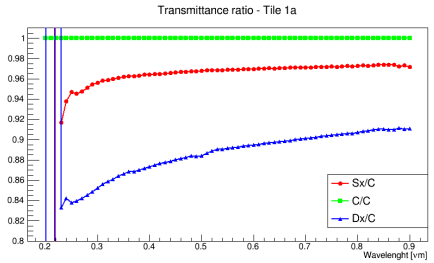
It's not enough to obtain the most realistic simulations, because GEMC asks the curves as function of wavelength.

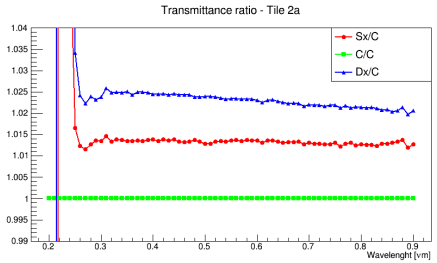
Transmittance was measured in three points for the aerogel and in two points for the lucite.

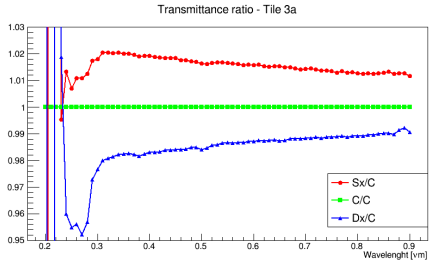


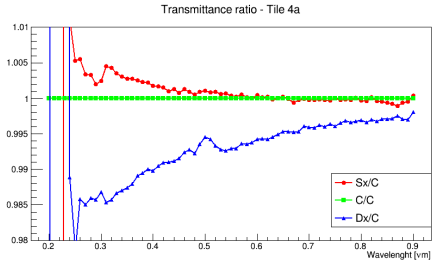




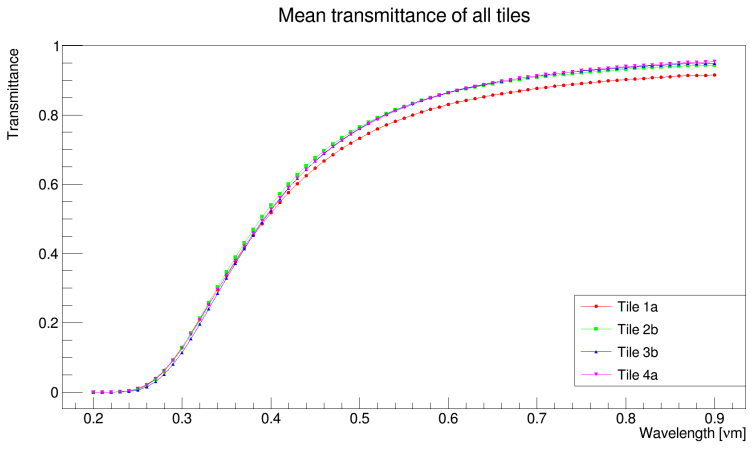


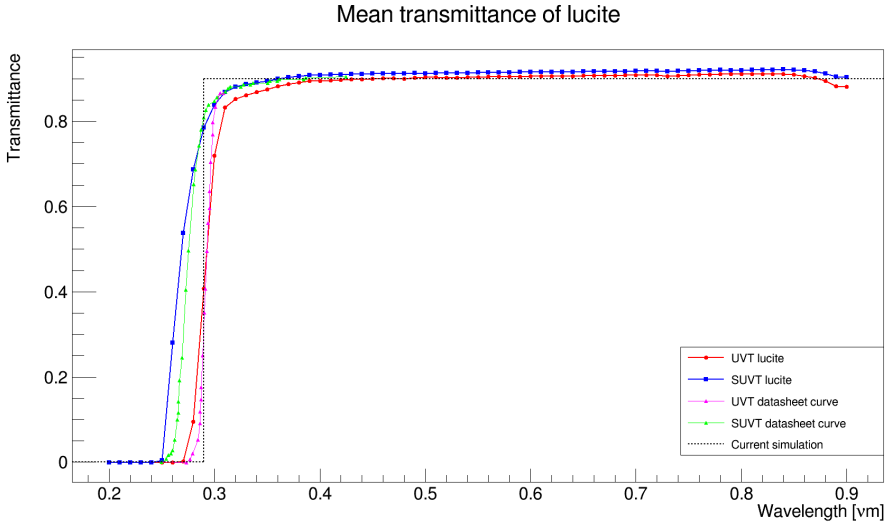






Top left: ratio between one transmittance measurement and the measurement at center for all tiles (to notice, the scale it is not the same for all plots).
Bottom left: mean transmittance of all tiles.
Right: Lucite transmittance, comparison between measurement, datasheet and values currently used in the simulations.





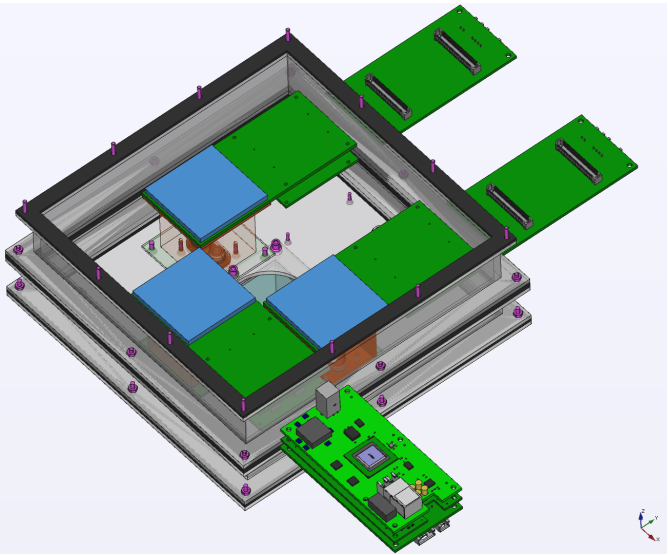
From characterization to simulations

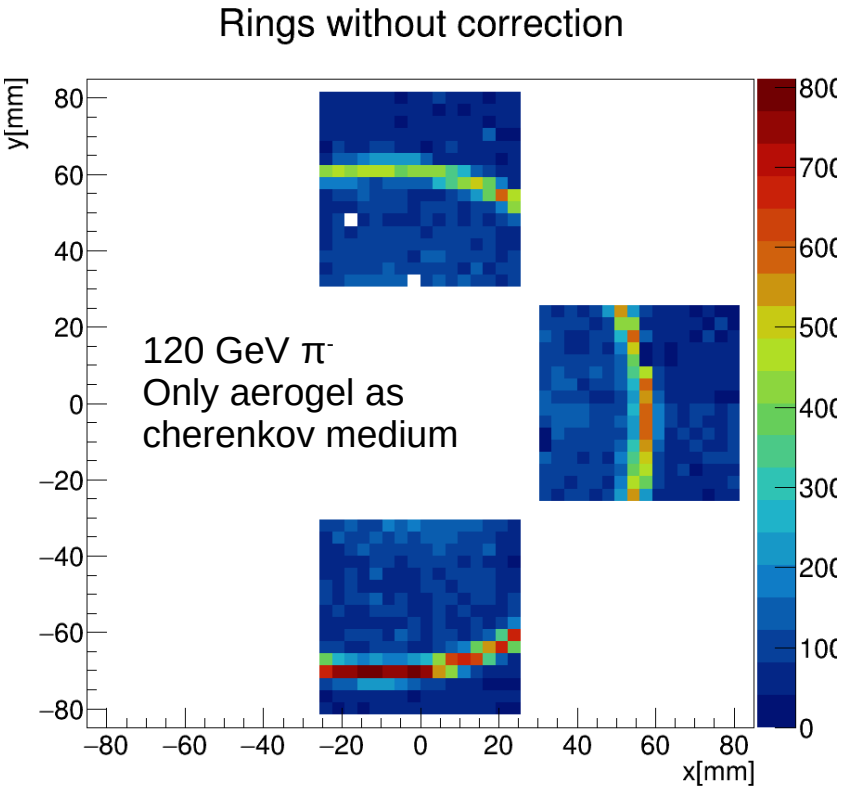
Next step:

- To insert the lucite window in the GEMC simulations, using the measured values of transmittance.
- To measure the aerogel reflectance, to obtain the scattering and absorption length as function of wavelength.
- To insert the absorption and scattering length in GEMC simulations.

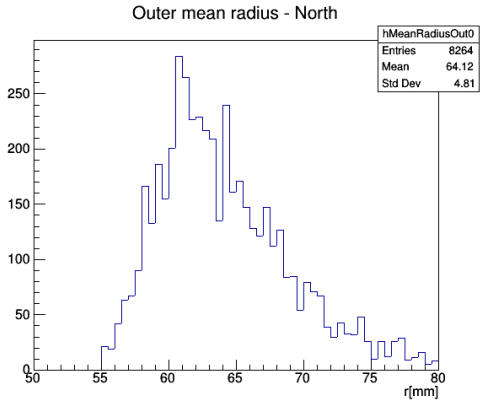
Data analysis update

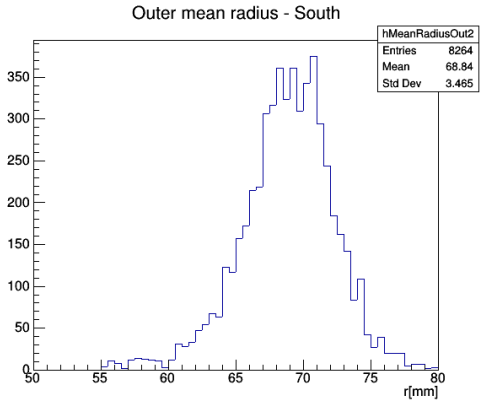
Data acquired on parasitic run at SPS (14-17 october 2021) are being analyzed.
Three Hamamatsu Multi-Pixel Photon Counter (MPPC) with MAROC readout was used.
The tracking based on GEMs was available and running

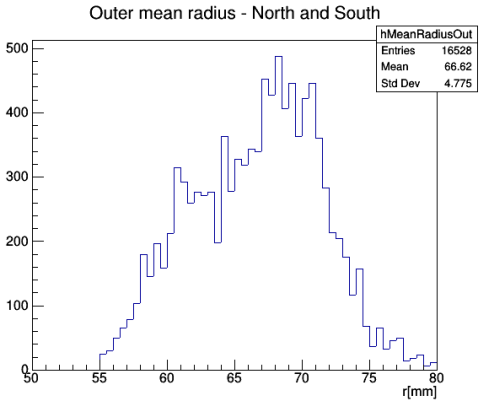


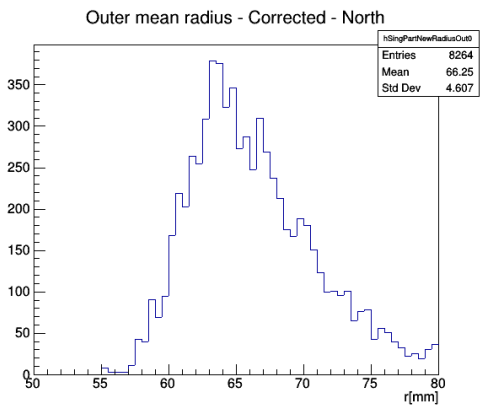


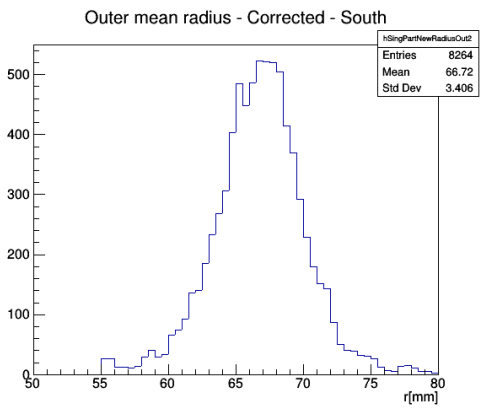
Applying the correction developed for PS data

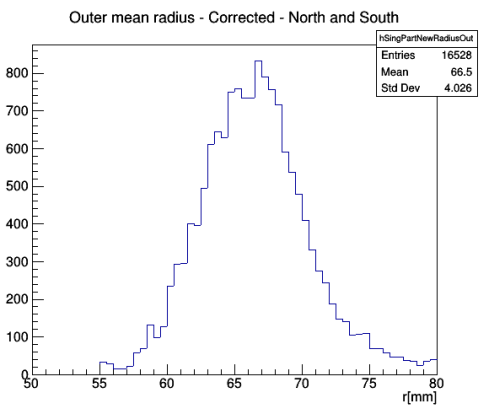






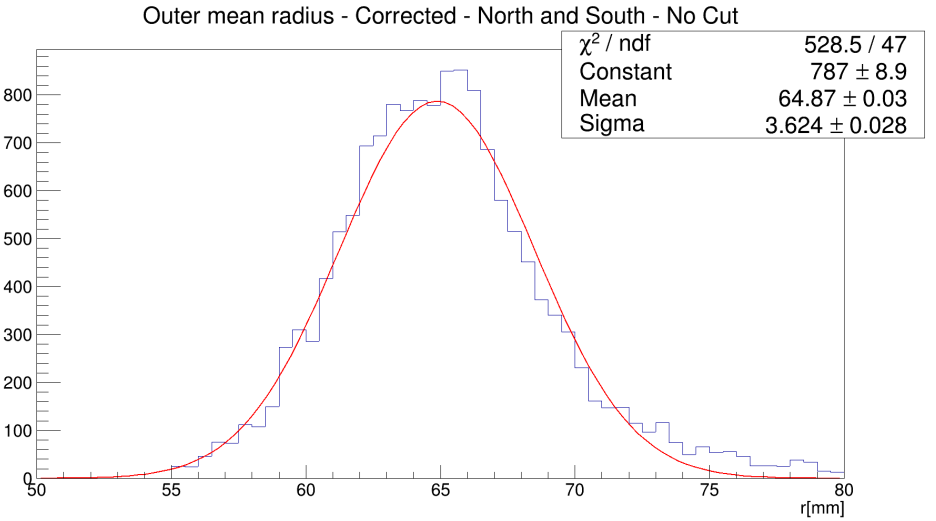


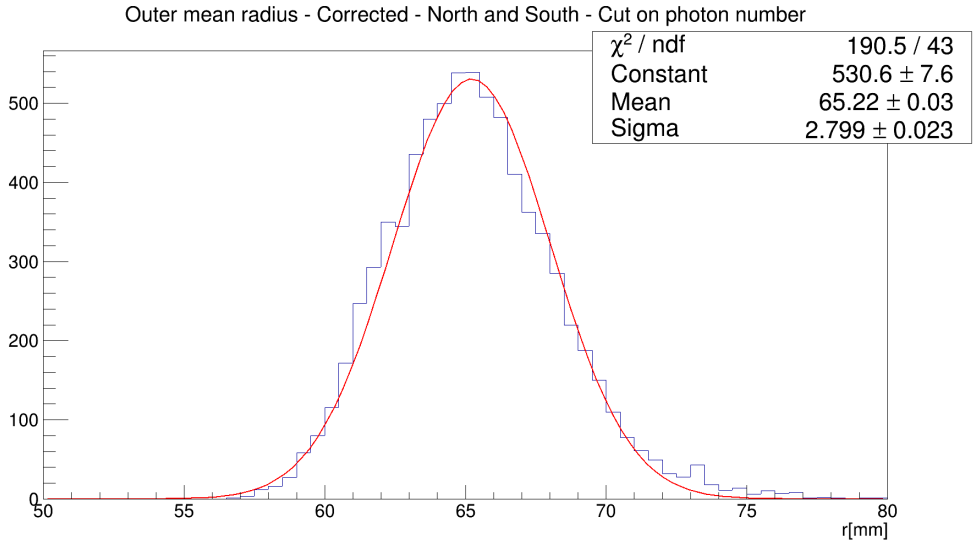




The center correction is available for the Y axis.
It is under study if some correction for the X axis is available.

Currently, I analyzing a specific run of data for which the GEMs data are processed. It is useful to check the corrections, but the mirrors is not in the right position to obtain the best resolution.





Top: single particle radius for north and south detector, applying the center correction, without any cut.
Bottom: single particle radius for north and south detector, applying the center correction, requiring at least two photons for MPPCs.

Data analysis next step

- To study the X axis correction for MPPC data.
- To develop the channel-to-channel time calibration, to shrink the extension of coincidence window.
- To apply the time calibration to improve the analysis of MPPCs and MAPMTs data.