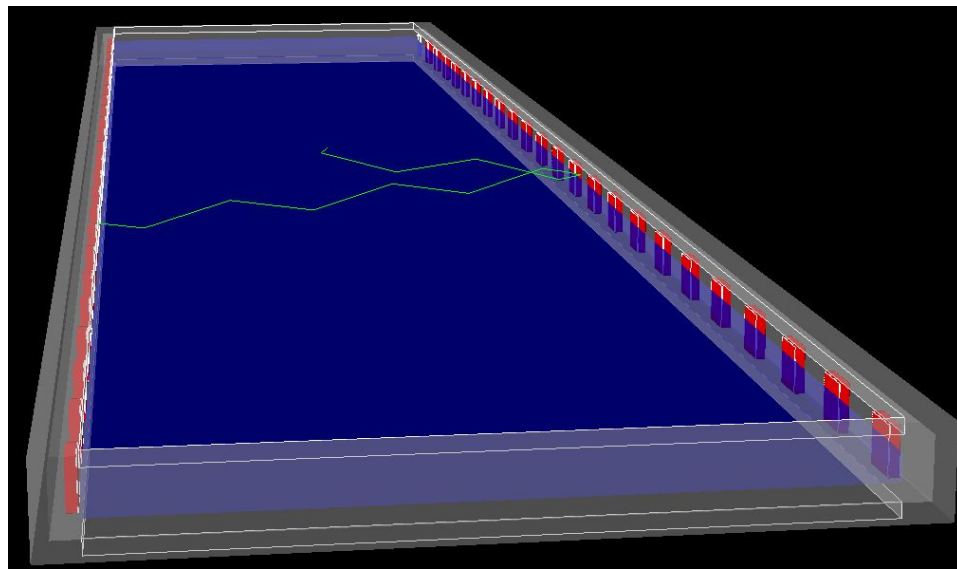


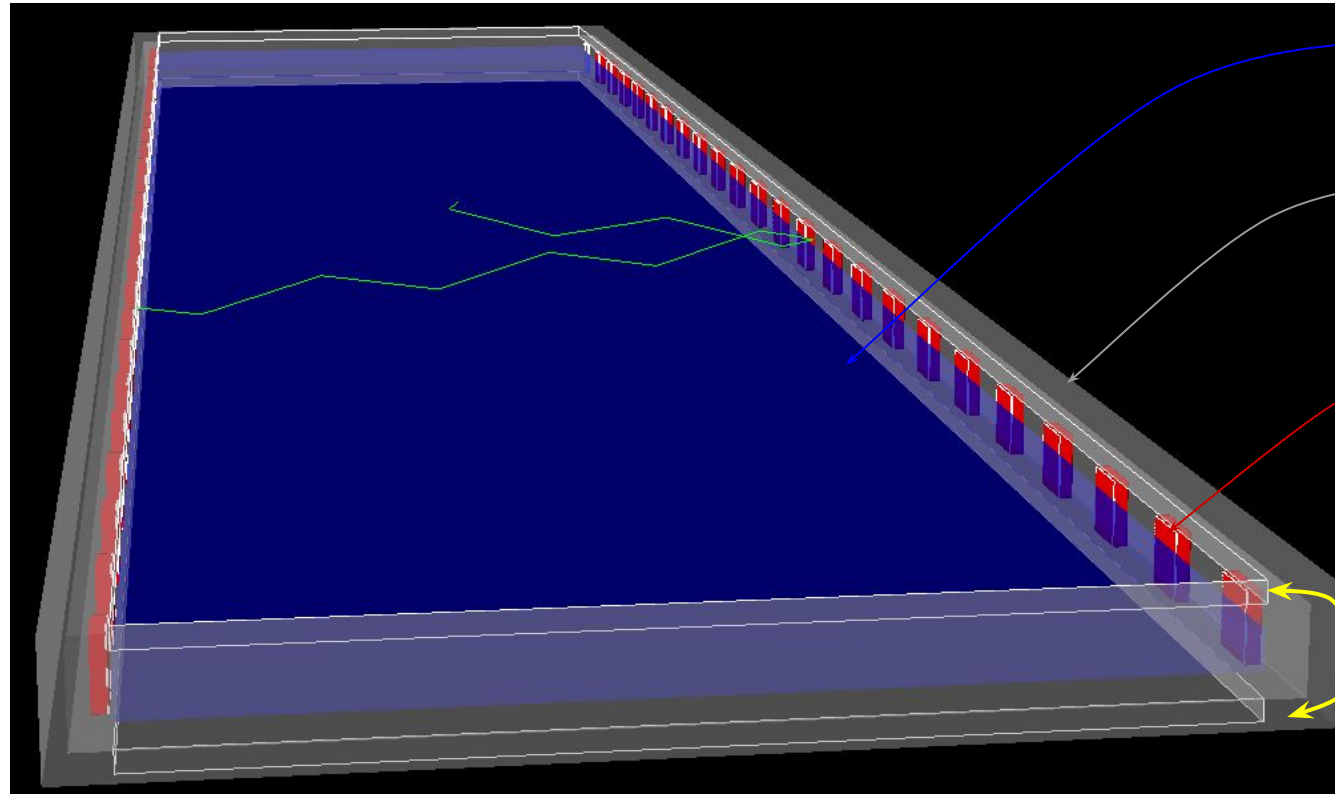
Understanding angular distribution under dichroic filter via G4 simulation

Julio Ureña

DUNE Collaboration Meeting

19 May 2022



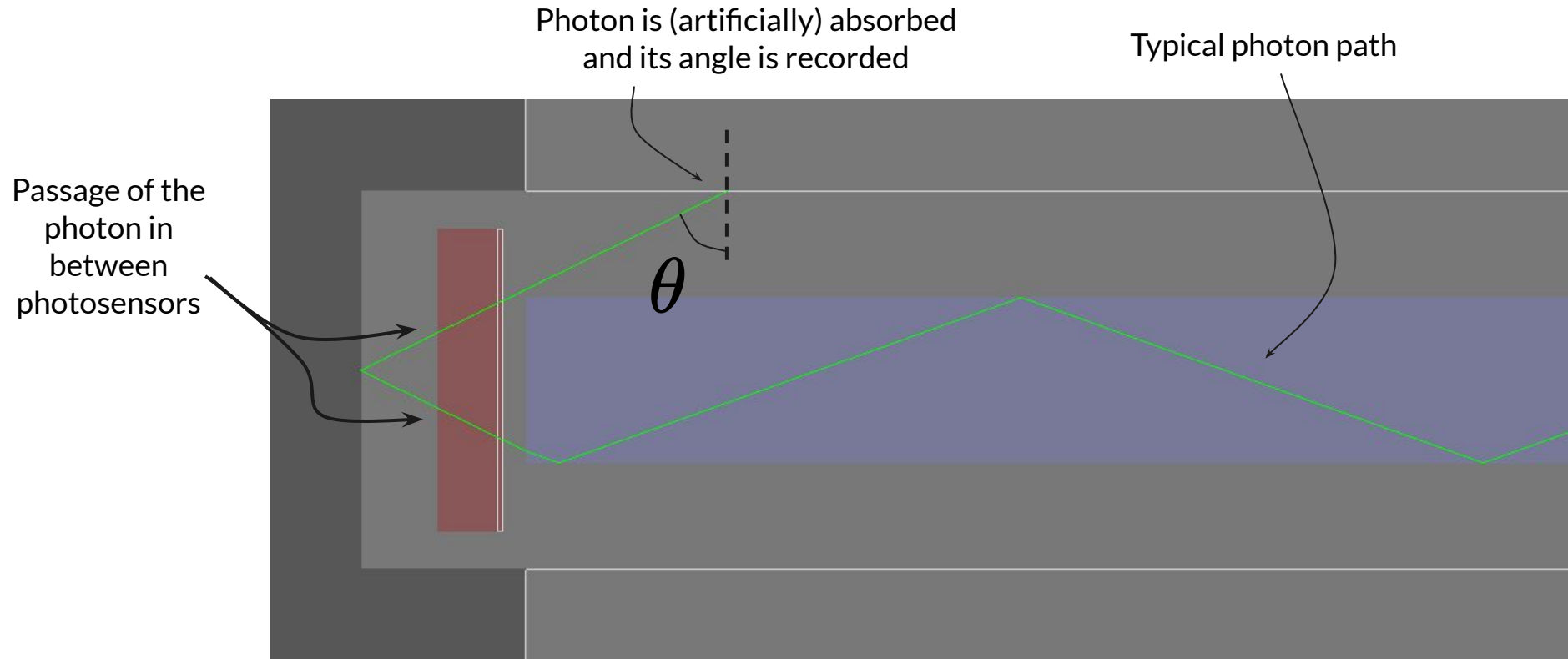


WLS Plate with
EJ286 specs.

Reflective Cage with
VIKUITI reflectivity

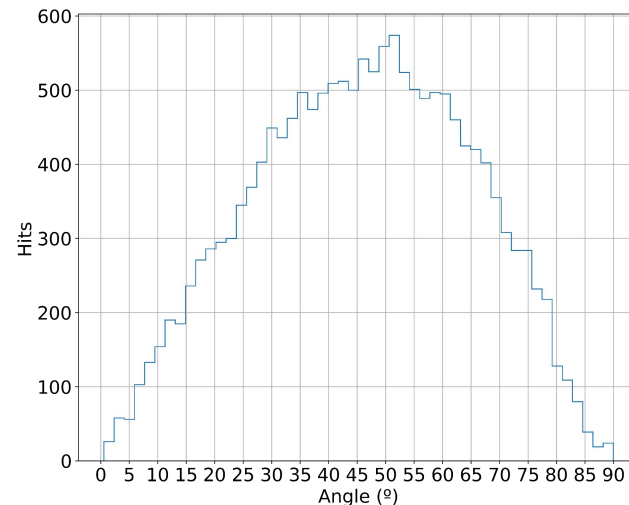
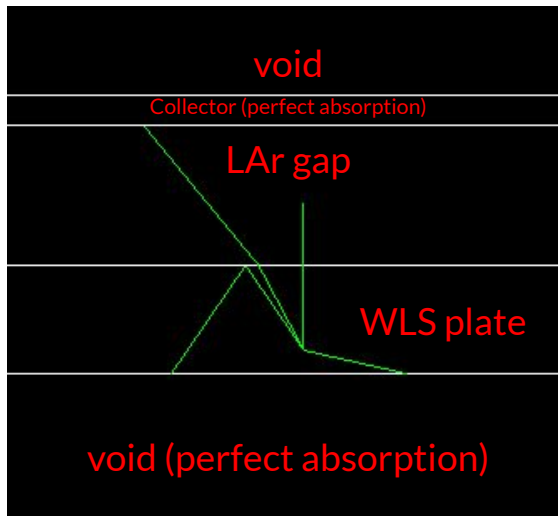
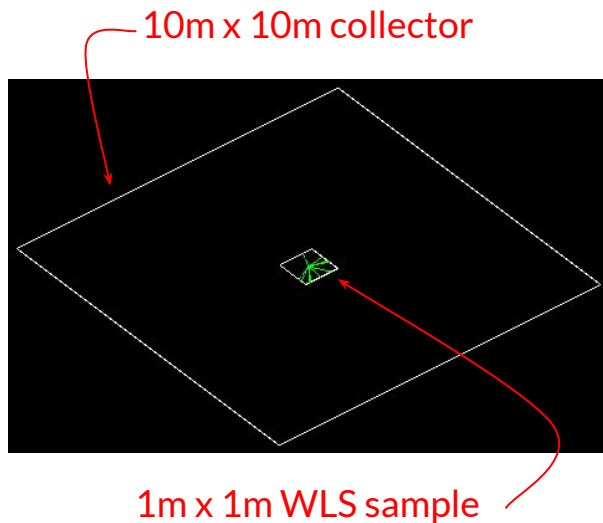
Photosensors with
Hamamatsu S13360
typical PDE

Artificial photon
collectors
replacing dichoric
filters



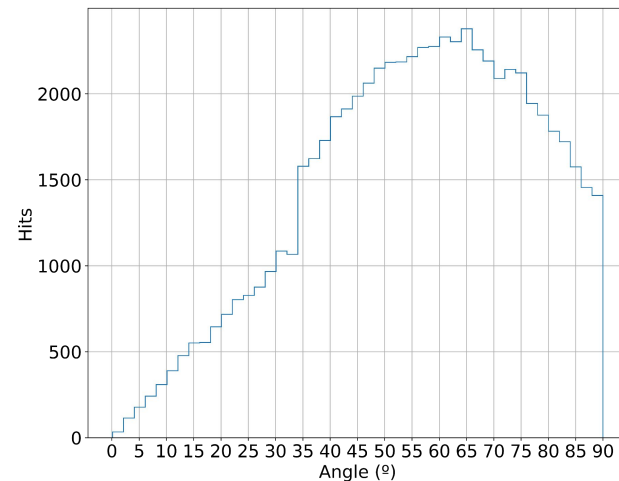
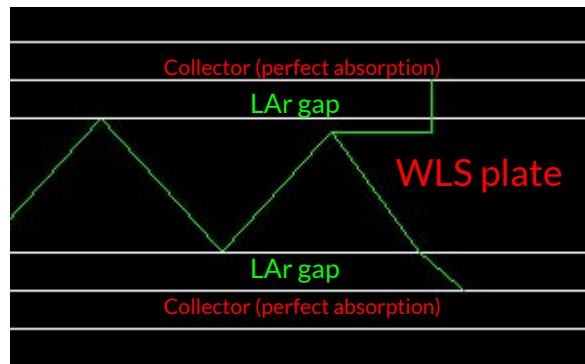
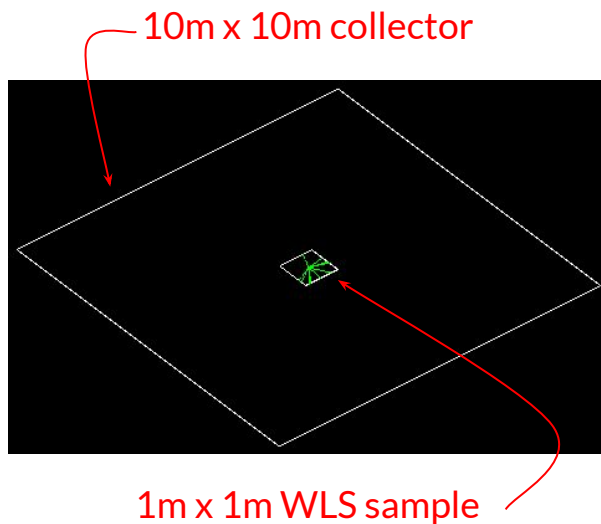
1) Bottom tight square WLS plate

In this configuration, only photons that are WLS shifted and emitted backwards are potentially collected



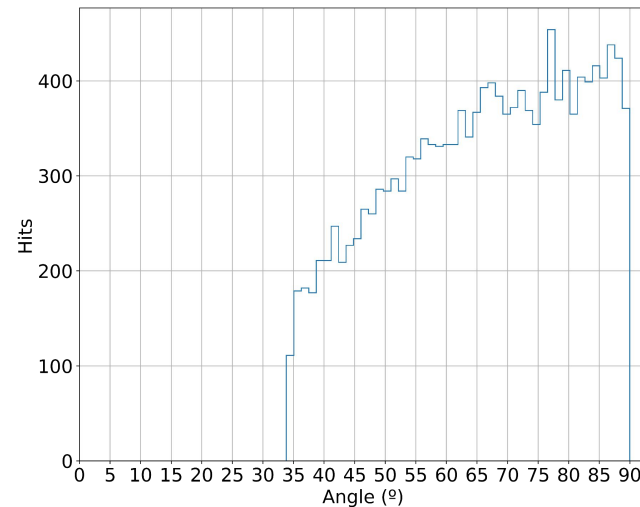
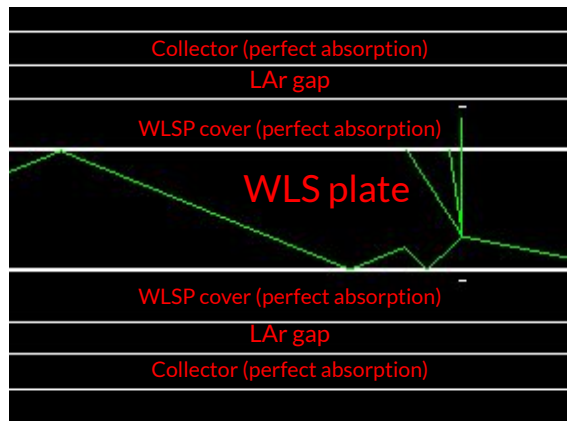
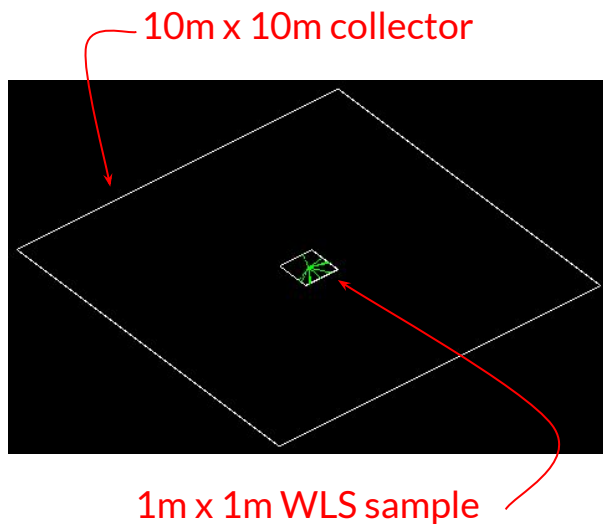
2) Loose square WLS plate

In this configuration, photons can consecutively bounce within WLS plate and end up scaping it via its side faces.



3) Only side photons

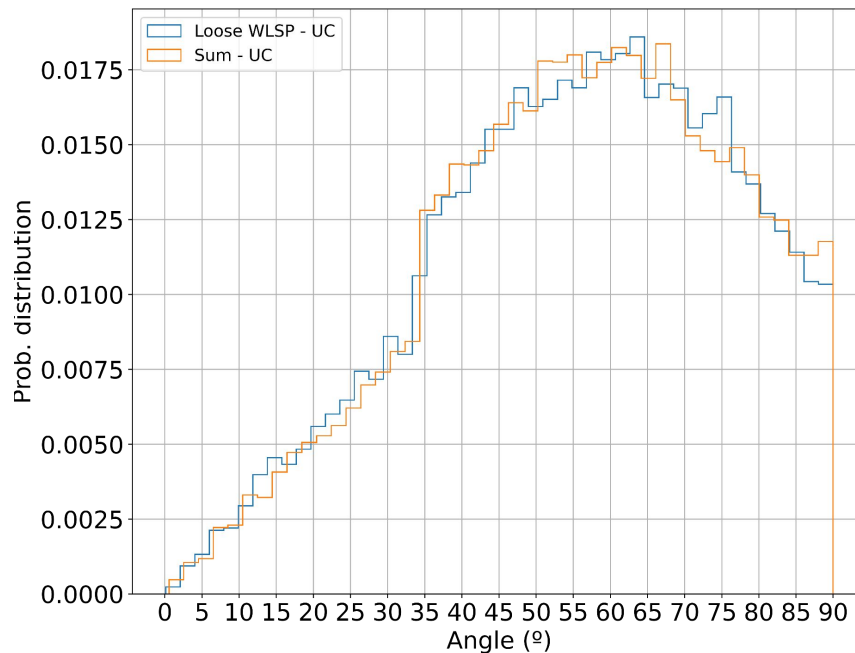
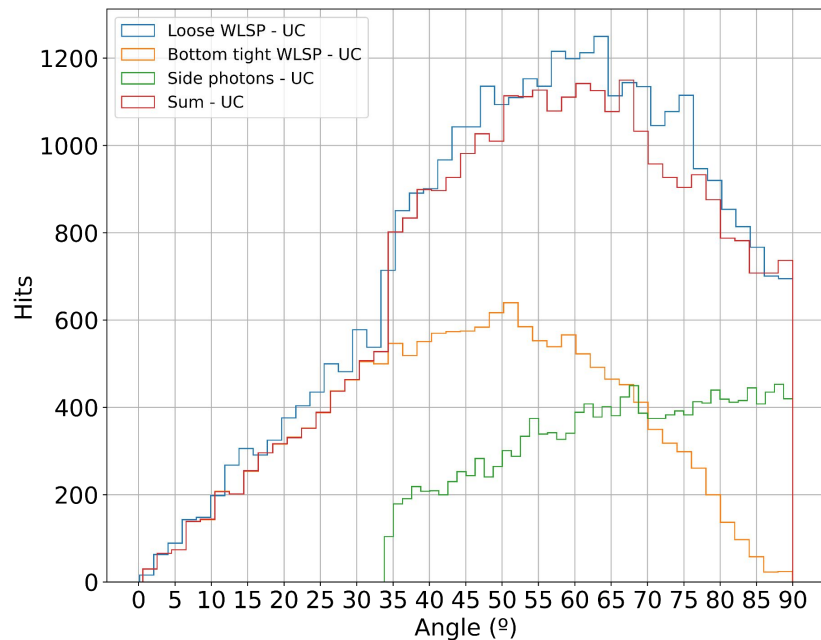
In this configuration, photons can consecutively bounce within WLS plate and end up scaping it via its side faces.



Step back to elementary geometry



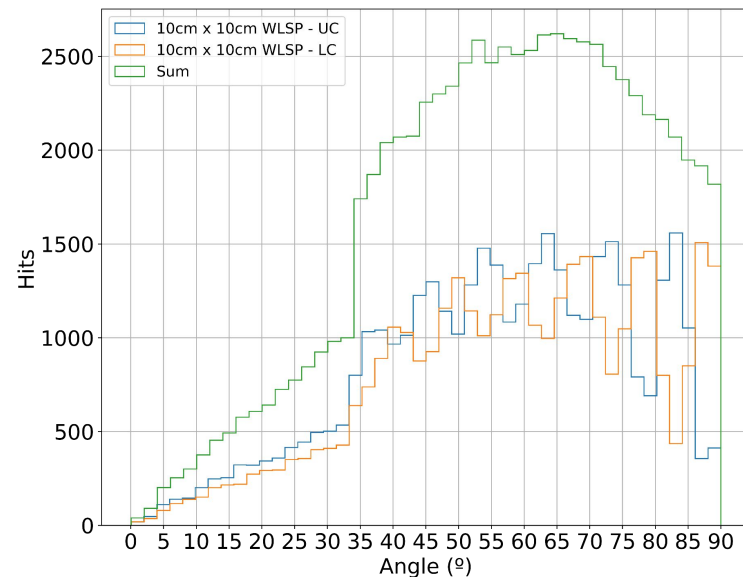
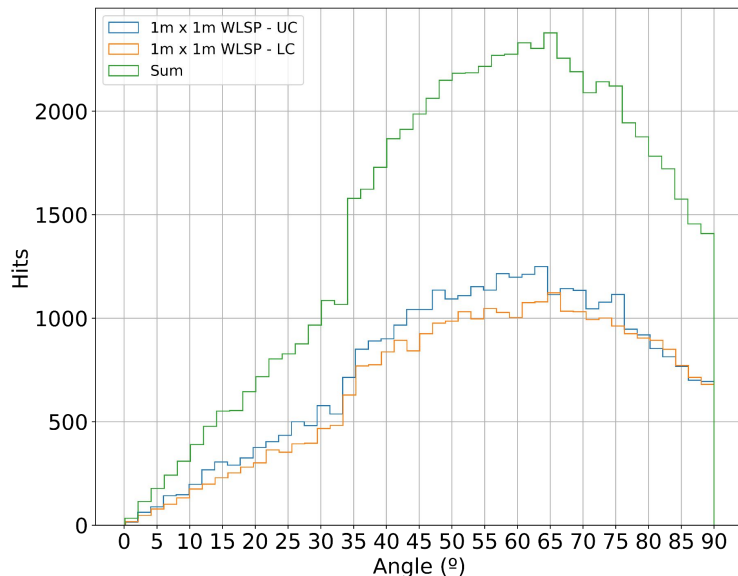
Both separate contributions add up to the simulated angle distribution with an step at $\simeq 35^\circ$



Step back to elementary geometry

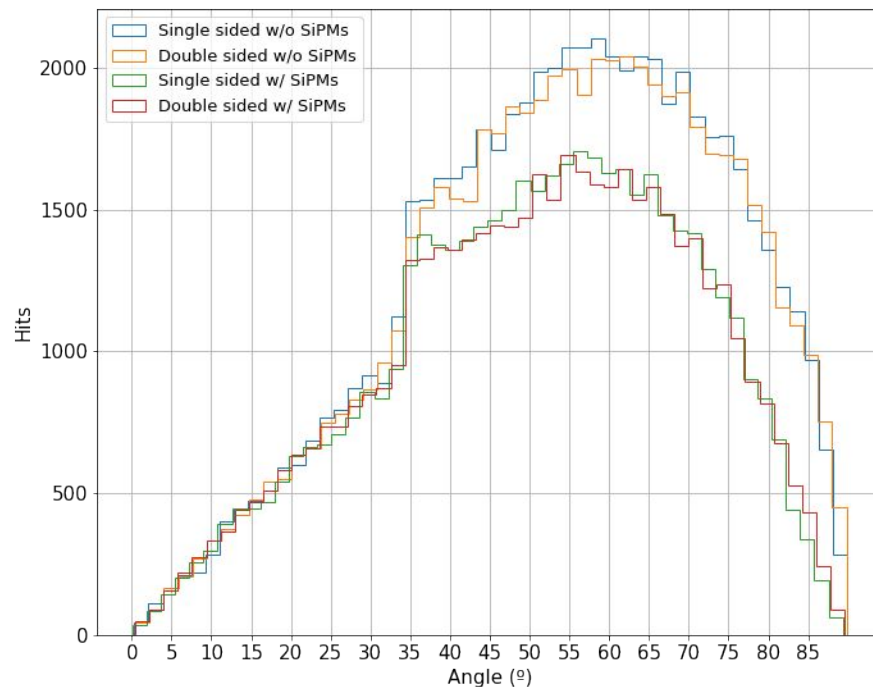
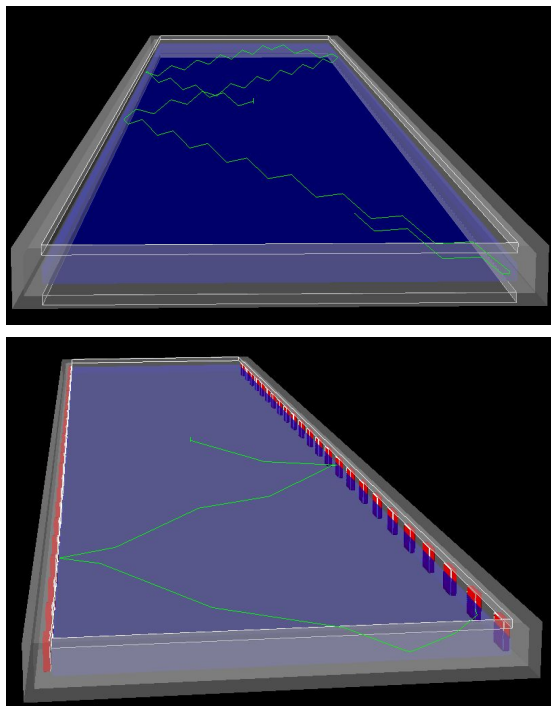


As a side effect for this generator, photons that scape the WLS plate via one of its lateral faces hit one collector or another with certain privileged angles. This angle bias is attenuated with the ratio length/thickness of the WLS plate.

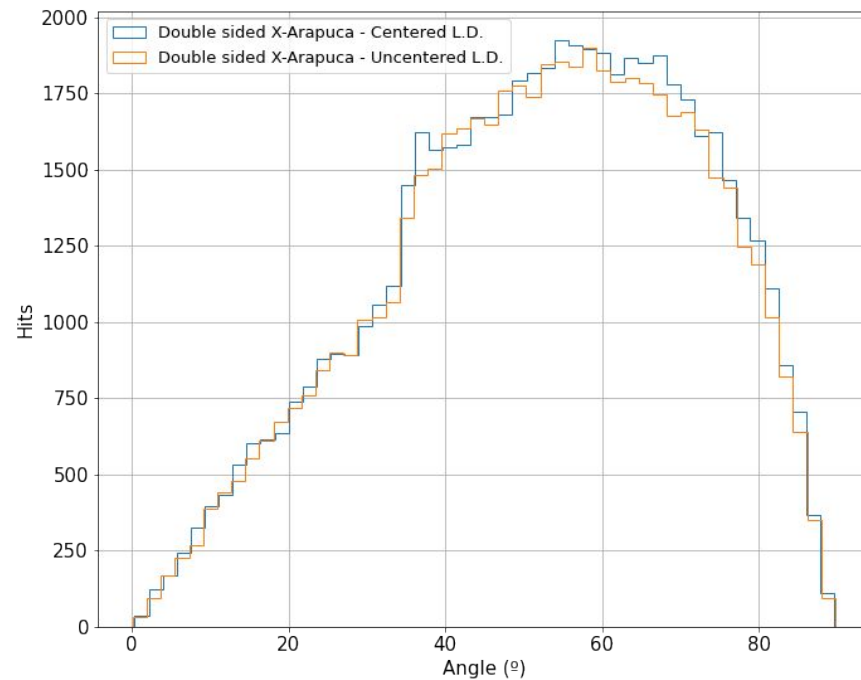
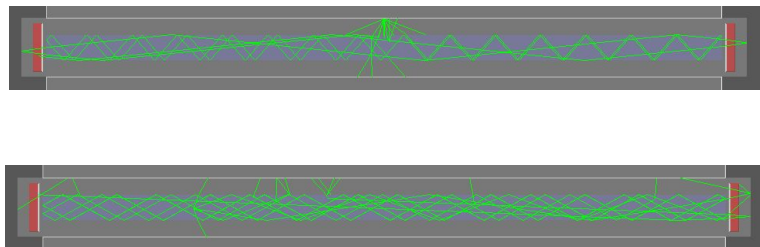


$2n < \frac{l}{d} \tan \theta < 2n + 1$ <- Photons emitted with this angles after WLS are prone to be captured by the UC

Single sided & double sided reflective box w/ WLSP, w/ and w/o photosensors and standard generator



Double sided reflective box w/ WLSP, w/ photosensors and lambertian generator



in process...

2) Loose square WLS plate

Such photon will eventually encounter a situation like this one

Extra contribution to $[34, 90]^\circ$

$$\theta \in [50, 90]^\circ \rightarrow \alpha = \sin^{-1} \left(\frac{n_{\text{WLS}}}{n_{\text{LAr}}} \cdot \sin\left(\frac{\pi}{2} - \theta\right) \right) \rightarrow \alpha \in [0, 56]^\circ \dots$$

