0.1 Simulations

The correction factor is better estimated through a Montecarlo simulation. If we denote as E the total energy of the three photons, we randomly divided the segment $[0, E]$ into three parts E_1, E_2, E_3.

Discarding triplets that don't allow momentum conservation, we obtain a uniform distribution on all the possible energy triplets.* Simulating also the three detectors (we assume 100% efficiency) and triggering on the triple coincidences, the ratio of observed events results:

$$c_{3\gamma} := \frac{\text{detected events}}{\text{total events}} \sim 5 \cdot 10^{-4}$$

With a similar calculation the ratio of observed events for the two-photons decay can be obtained:

$$c_{2\gamma} \sim 3.7 \cdot 10^{-2}$$

Therefore the correction factor results:

$$c_f = \frac{c_{2\gamma}}{c_{3\gamma}} = 71 \pm 7 \tag{1}$$

where the errors are estimated thanks to the simulations, remembering the uncertainty on d and r. This lead to a ratio of about:

$$R = 150 \pm 15 \tag{2}$$

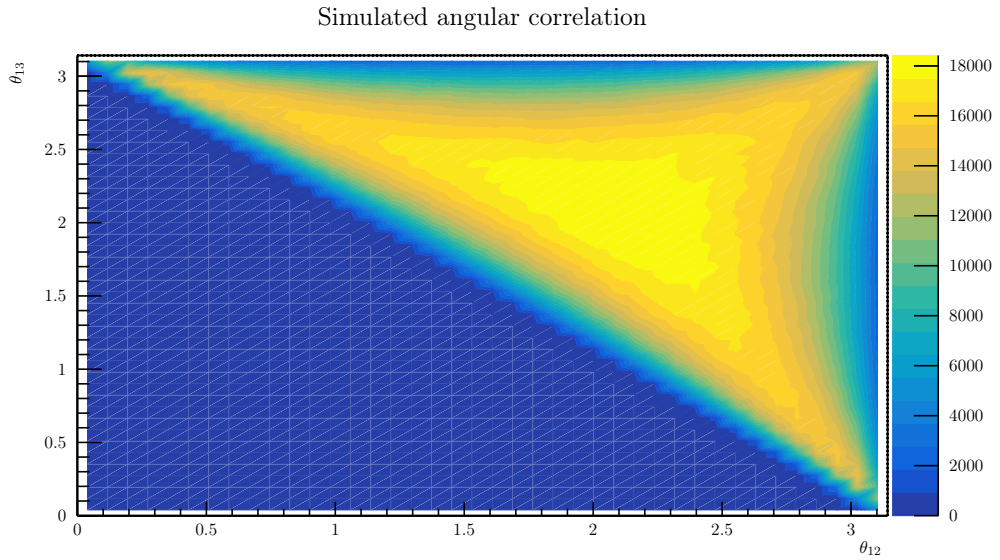

Figure 1: Correlation of the angles between first and second (x axis) and first and third (y axis) simulated photon.

*This method produces results compatible with the ones in *D. Kaminska et al., A feasibility study of ortho-positronium decays measurement with the J-PET scanner based on plastic scintillators, Eur. Phys. J. 22 Aug 2016*