Simulation for the ArDM experiment

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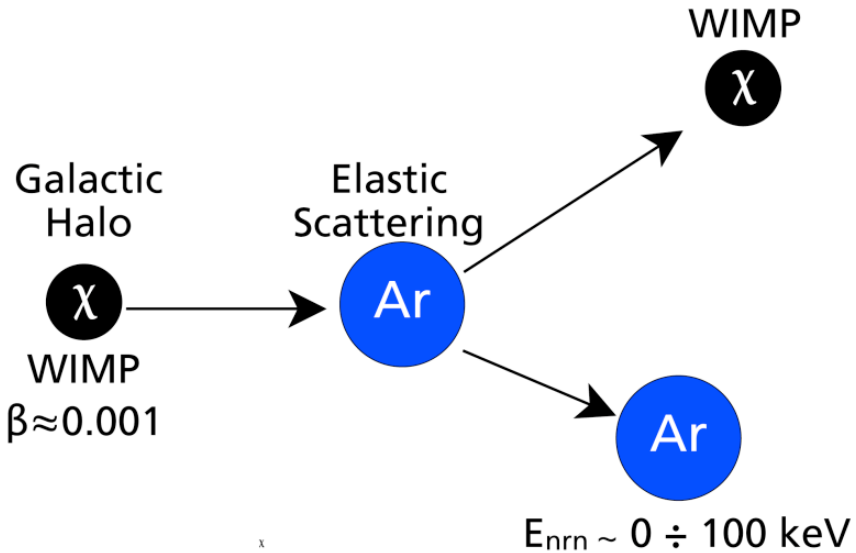
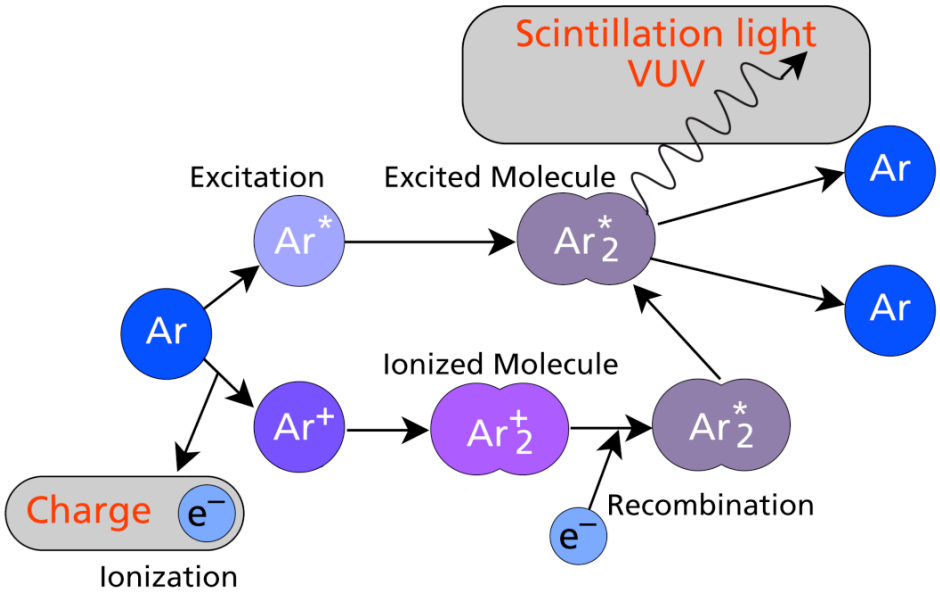
principle

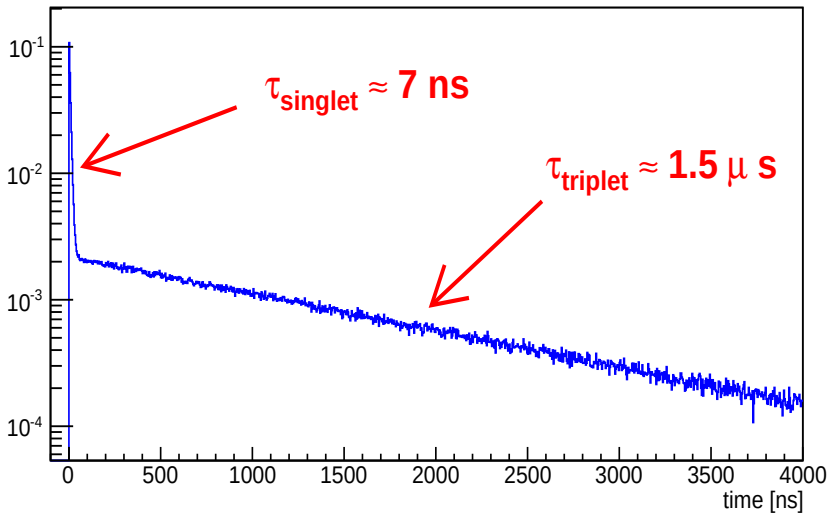




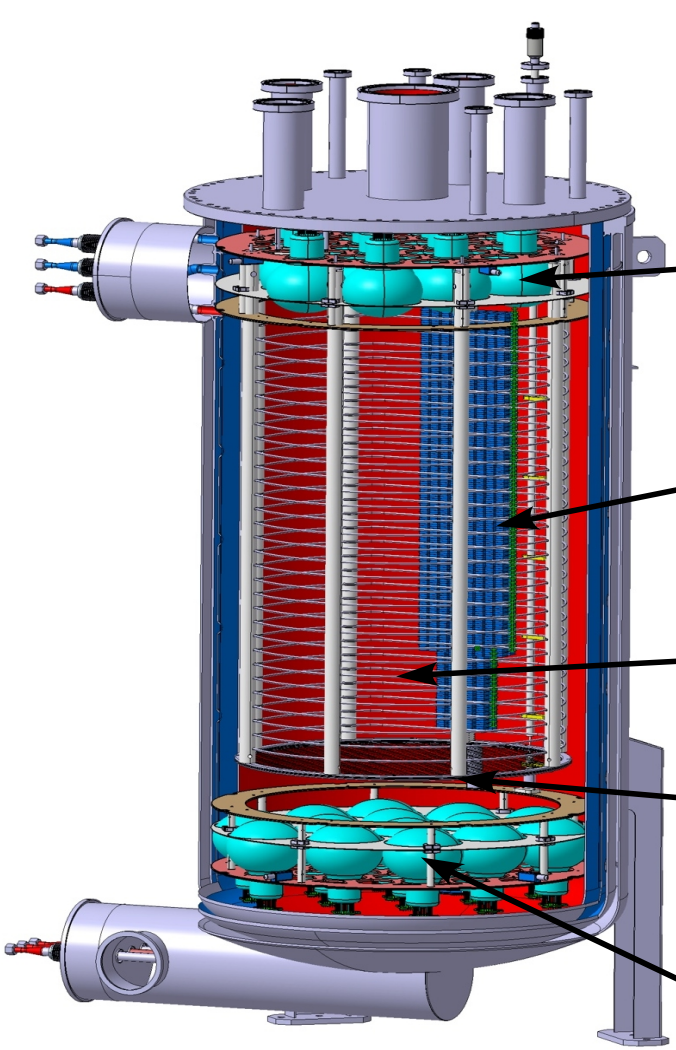
ArDM aims at direct search for WIMP .

detection :

- elastic scattering off nuclei
  → charge, light (singlet + triplet)
  → singlet, triplet well separated
- charge, light : independent collection
- $N\gamma \propto E_{dep}$



detector geometry



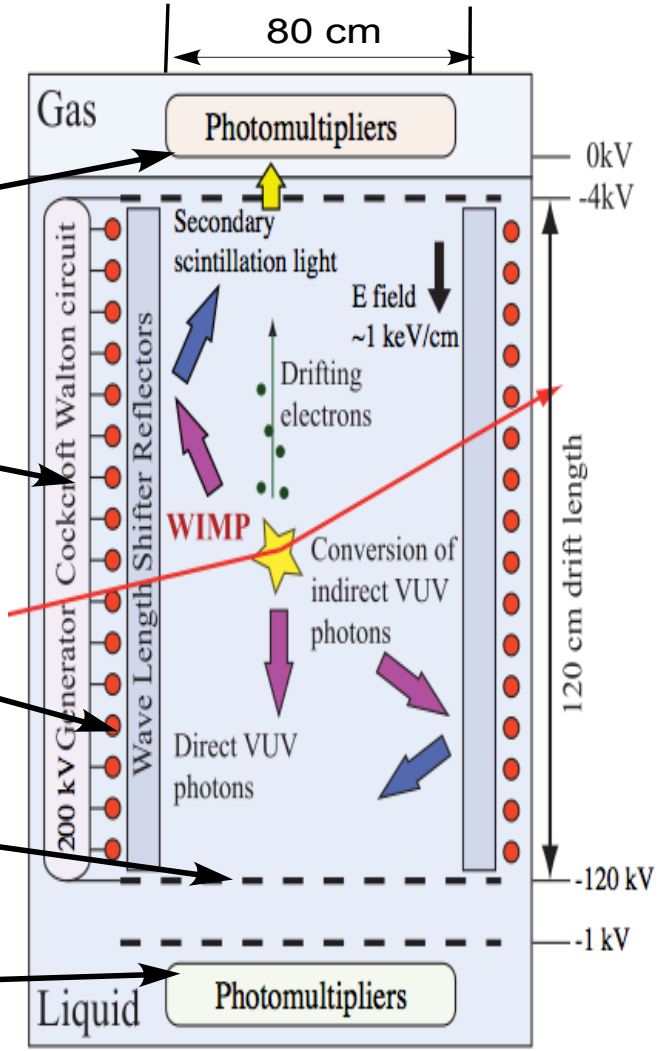
Low bkg PMTs

HV generator

Field shaper

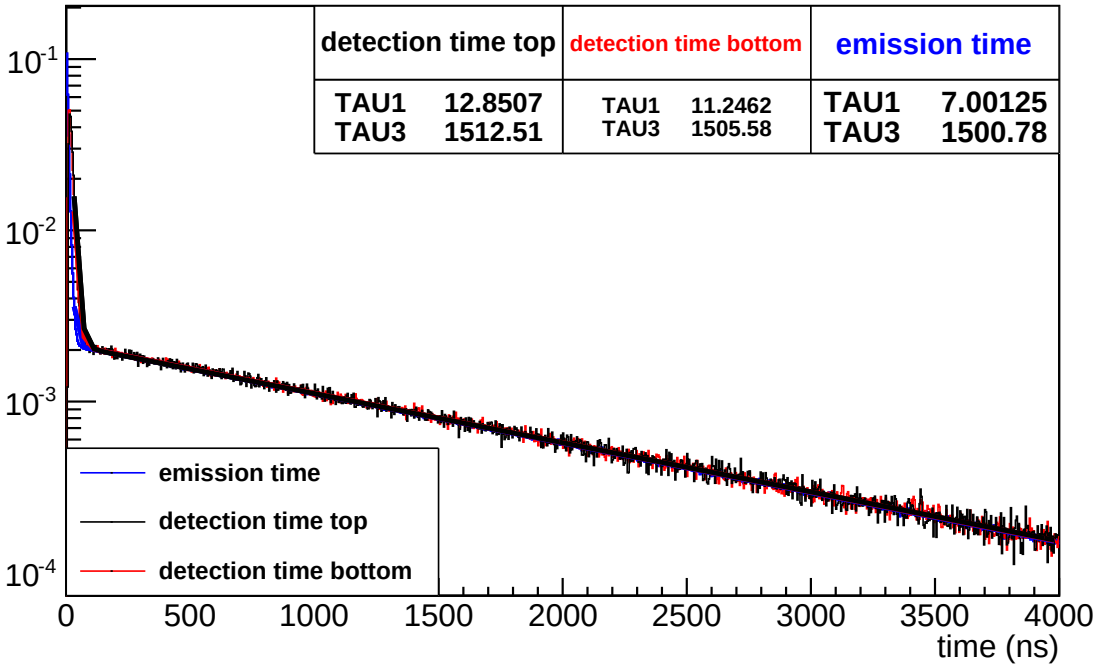
Cathode

Low bkg PMTs



target mass $\approx$ 850 kg

simulation – light propagation



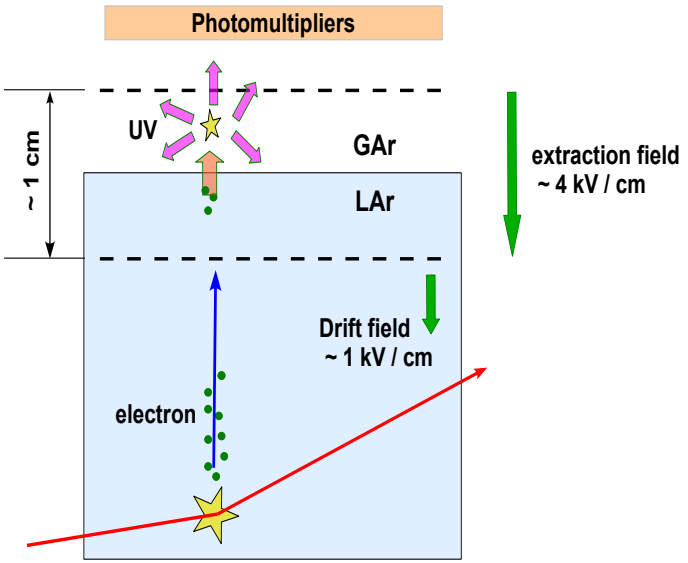
legend:

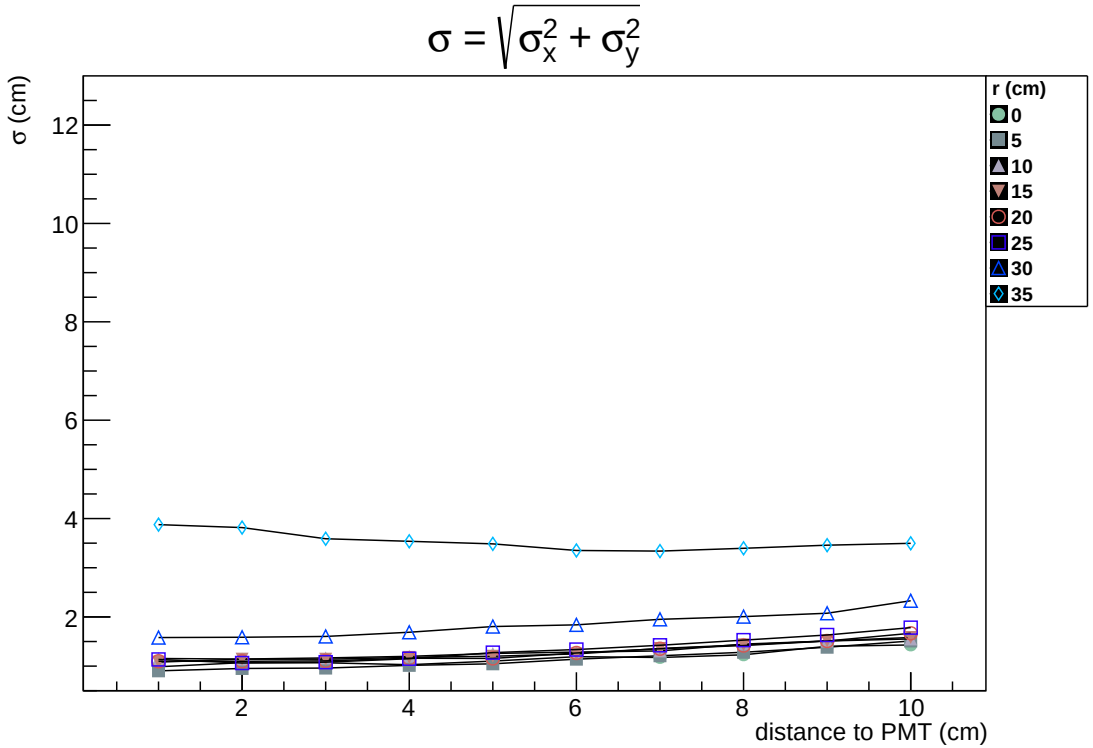
- RS : Rayleigh scattering
- BP : boundary process (reflection, refraction, total reflection)
- WLS : wavelength shifting

processes	τ_1^{top} (ns)	τ_1^{bottom} (ns)	τ_1^{emiss} (ns)	τ_3^{top} (ns)	τ_3^{bottom} (ns)	τ_3^{emiss} (ns)
RS 0 – BP 0 – WLS 1	7.09	7.16	7.05	1480	1495	1500
RS 1 – BP 0 – WLS 1	8.00	7.72	7.03	1478	1482	1498
RS 0 – BP 1 – WLS 1	11.63	10.66	7.03	1507	1505	1499
RS 1 – BP 1 – WLS 1	12.85	11.25	7.00	1512	1505	1500

(in this example : the light source is on the z-axis, at d = 50 cm above the bottom PMTs)

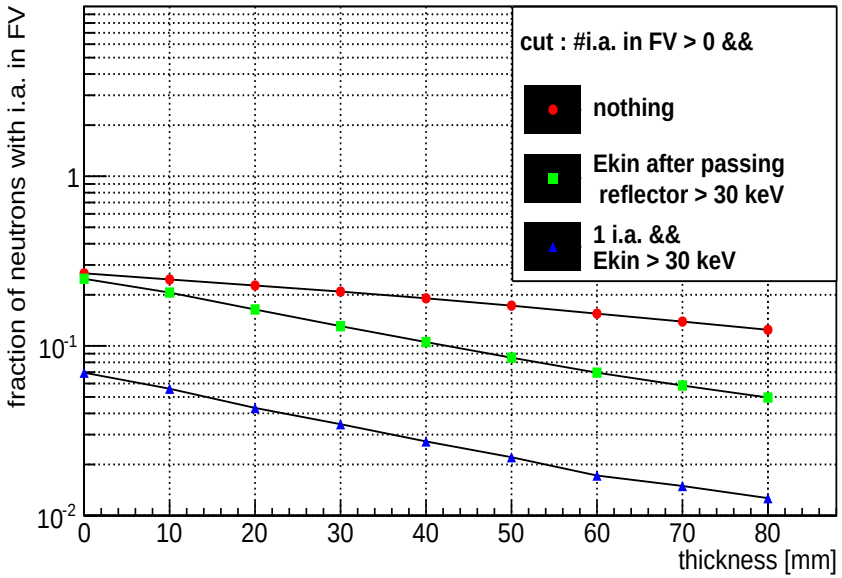
position reconstruction (toyMC)





- $r < 35\ cm : \sigma < 4\ cm$
- no strong dependence on distance d to PMT (for $d < 10\ cm$)
  $\rightarrow$ LAr level is not relevant for σ

neutron shield (preliminary)



- simulation run for neutrons emitted from tank's material
- shield moderates neutron's energy
- thickness = 80 mm :
  - thickness = 80 mm : suppress 80% neutrons compared to w/o shield
  - $<$ 2% neutrons have WIMP signature