

microTPC simulation

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for the Belle2 Collaboration

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Table of contents

- 1 BASF2
- 2 Figure-Of-Merit
- 3 TDR plots

BASF2

Thanks to the help of Belle2 and PIC technical support BASF2 is now running at PNNL PC farm

Nakayma-San gives precise and clear instructions to run the beam-induced background simulation.

Current status:

- installation finished
- copying event generator files (SAD)
- production of 5th campaign which will include secondary particles with kinetic energy below 1 MeV will start in the coming days

Figure-Of-Merit

Figure-Of-Merit is derived from what I did in arXiv:1110.3444, in neutron case can be expressed by as function of pressure as:

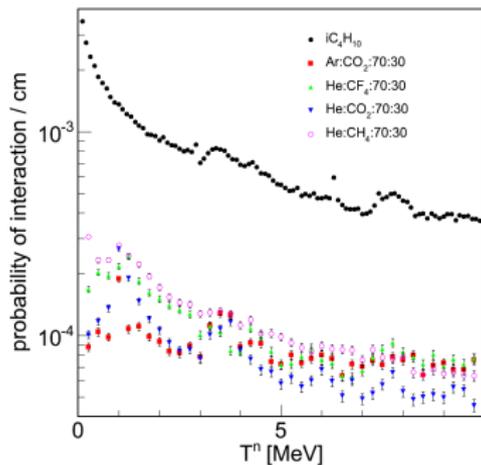
$$\frac{dFOM}{dT_R}(P) = \rho(P) \cdot V \frac{d}{dT_R} \frac{\int_0^{z_{max}} L_{L>L_0(P)}(T_R, P, \epsilon) dz}{L(T_R, P, \epsilon)} \quad (1)$$

as function of drift distance

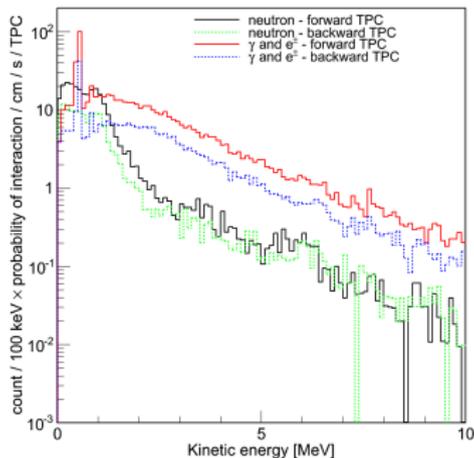
$$\frac{dFOM}{dT_R}(z_{drift}) = \frac{dFOM}{dT_R}(z_1) + \dots + \frac{dFOM}{dT_R}(z_{max}) \quad (2)$$

(3)

● probability of interaction



● expected rate of interacting particles in a single TPC



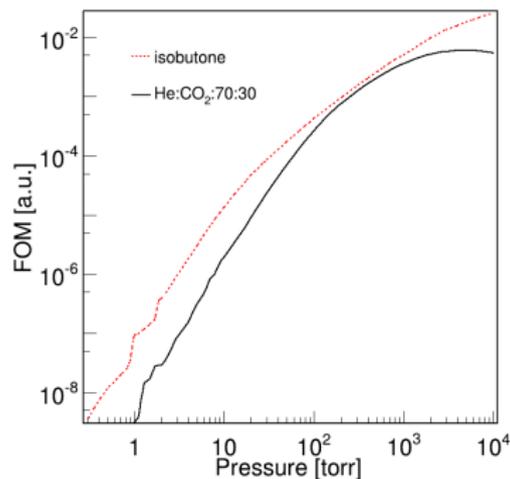
FOM construction

- $L > 6 \times \sigma$ and $L^{max} = 3 \text{ cm}$

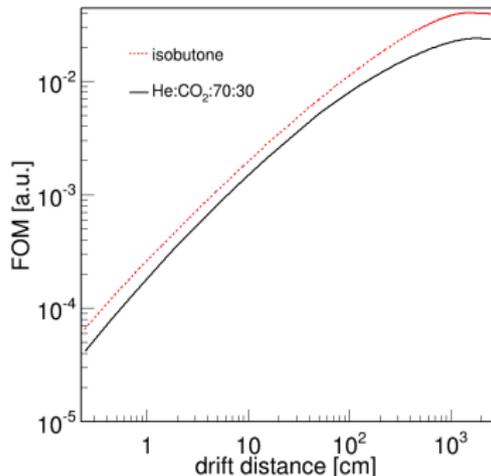
- no maximum because:

- ▶ only take into account elastic scattering which is in any case dominant between few 100 keV and 20 MeV
- ▶ \Rightarrow enough energy transferred or no hard cut off in the recoil energy spectrum

- ▶ FOM v. pressure



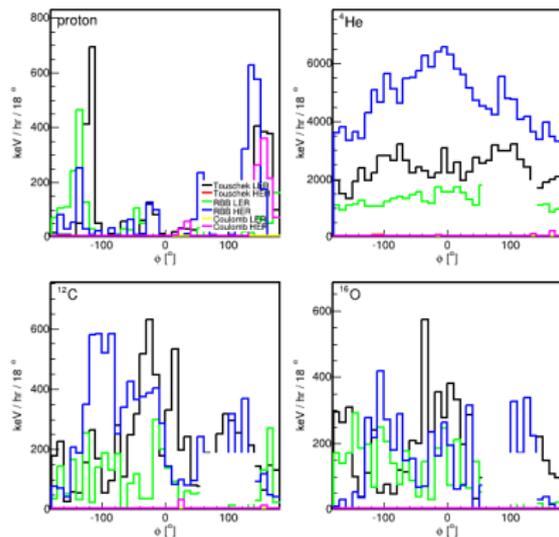
- ▶ FOM v. drift distance



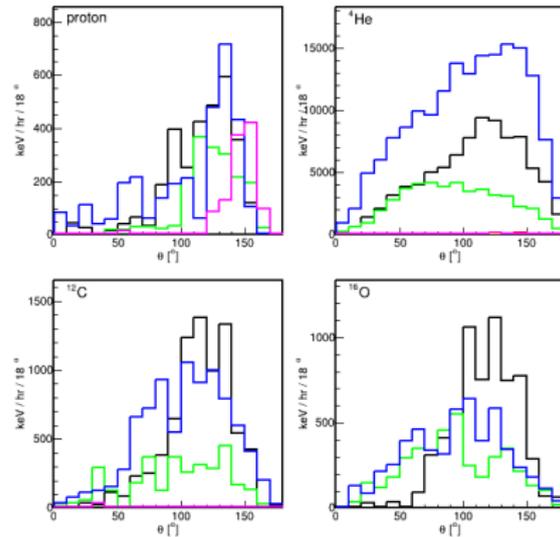
Recoil angular distributions

- He:CO₂:70:30 at 1 atm
- for $5 \times 5 \text{ cm}^2$ re-scale by 0.53 for 4 chips
- 100 % HT, 1 degree angular resolution and $L > 6\sigma$ diffusions

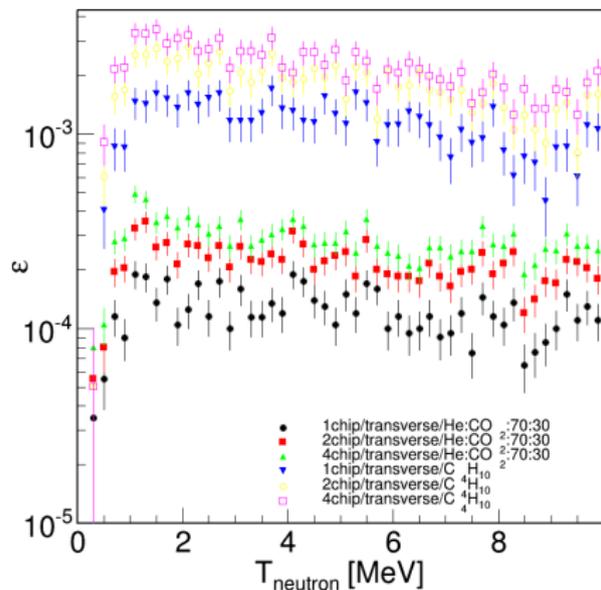
▶ FOM v. pressure



▶ FOM v. drift distance



Neutron detection efficiency



2 chips = 4 chips
4 chips = 8 chips

Rate

