

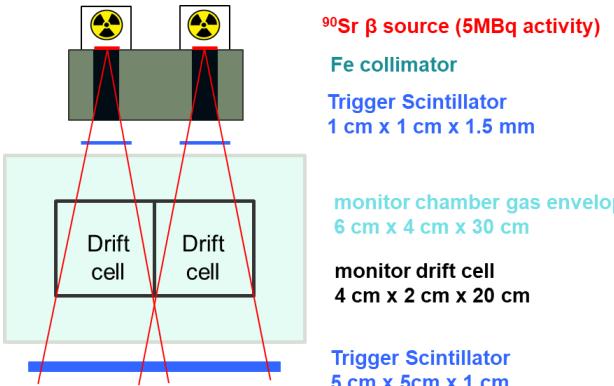
A monitoring chamber for high precision measurements of the drift velocity in gas detectors

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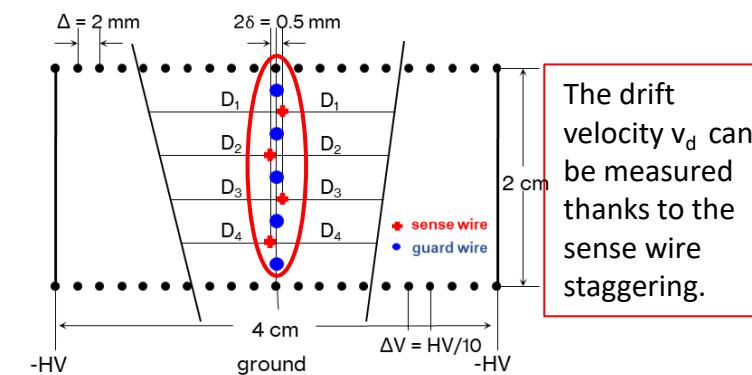
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The tracker detector of MEG II and the one under developments of FCC and CEPC experiments consists of ultralight drift chambers, operated with a mixture of Helium and Isobutane. In order to have a continuous monitoring of the quality of gas, we plan to install a small drift chamber, with a simple geometry that allows to measure very precisely the electron drift velocity in a prompt way.

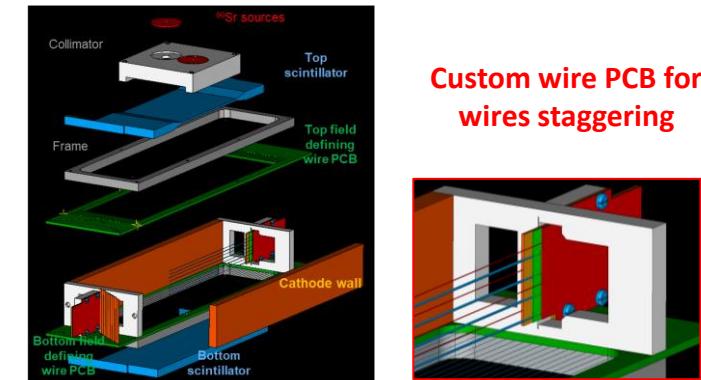
Schematical setup



Drift cells details



Mechanical design



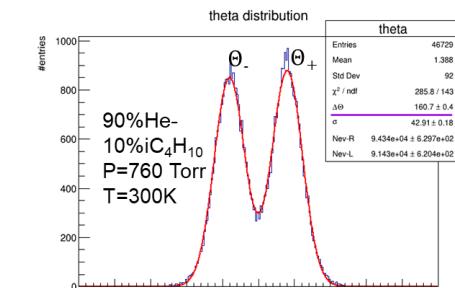
Applied method for drift velocity measurements

Simple geometrical considerations lead to the following relation:

$$\left\{ \begin{array}{l} \theta_+ = +\frac{8\delta}{v_d}, \quad \text{left track} \\ \theta_- = -\frac{8\delta}{v_d}, \quad \text{right track} \end{array} \right. \quad \left\{ \begin{array}{l} v_d = \frac{16\delta}{\Delta\theta} \\ \sigma_{v_d} = \sqrt{\left(\frac{16\delta}{\Delta\theta}\right)^2 \sigma_\delta^2 + \left(-\frac{16\delta}{\Delta\theta^2}\right)^2 \sigma_{\Delta\theta}^2} \end{array} \right.$$

The drift velocity depends on $\Delta\theta = \theta_+ - \theta_-$, which is the distance between the two gaussian peaks distribution of θ .

Simulations



Garfield++ simulations show the double gaussian distribution of the θ variable.

$$v_D = 2.488 \pm 0.006 \text{ cm}/\mu\text{s}$$

Construction of the chamber

