→ Cross-section for capture and ionisation of $^{206}Pb^{81+}$ ①
with H_2 gas jet target (from GLOBAL):

Settings :

- $^{206}Pb^{81+}$ @ 400 MeV/u
- H_2 target density = 10^{14} particles/cm^3

  $\simeq 0,0000004$ mg/cm^2

- From Global Calculations,

  1) Ionisation cross-section (ie. formation of $^{206}Pb^{82+}$)

  $\sigma_{K\text{-shell, ionisation}} = 7.89$ barn

  $= 7.89 \times 10^{-24}$ cm^2

Now, let the number of $^{206}Pb^{81+}$ in ESR $\approx 10^6$ particles
and Revolution frequency ~ 2 MHz
and Gas jet density $\sim 10^{14}$ particles/cm^3
then,

Ionisation Rate $\approx 7.89 \times 10^{-24} \times 10^6 \times 2 \times 10^6 \times 10^{14}$

$\sim 8 \times 10^{-24} \times 10^{26}$

$\sim 8 \times 10^2$

~ 800 Hz (for 10^6 particles)

→ The DAQ rate for CsISiPHOS (loss detector) is < 5 kHz and thus, 800 Hz rate is acceptable.

2) Capture Rate :

2.a) K- shell capture only :

$$\sigma_{K,C} \sim 2.87 \times 10 \text{ barn}$$

$$= 2.87 \times 10 \times 10^{-24} \text{ cm}^2$$

$$\sim 3 \times 10^{-23} \text{ cm}^2$$

$$\frac{\sigma_{K,C}}{\sigma_I} = \frac{3 \times 10^{-23}}{7.89 \times 10^{-24}} \sim \frac{30}{8}$$

$$\frac{\sigma_{K,C}}{\sigma_I} = 3.63$$

Thus, for 10^6 particles in ESR and for 10^{14} particles/cm^3 H_2 gas jet density,

K-shell capture rate on MWPC $\sim 3.63 \times 800$ Hz

~ 2.904 kHz

If we consider the DAQ rate < 3 kHz, then we should down~~scale~~ scale the MWPC rate.

2.b) All captures (K-, L-, M-shell)

$$\sigma_C = (28.7 + 5.18 + 1.53) \text{ barn} = 35.41 \times 10^{-24} \text{ cm}^2$$

$$\frac{\sigma_C}{\sigma_I} = \frac{35.41}{7.89} = 4.487$$

Thus, for 10^6 particles in ESR, for 10^4 particles/cm^3 H_2 gas jet,
Kapture rate on MWPC $\sim 4.487 \times 800$ Hz $= 3.589$ kHz
If we consider DAQ rate < 3 kHz, then, we must down scale the MWPC rate