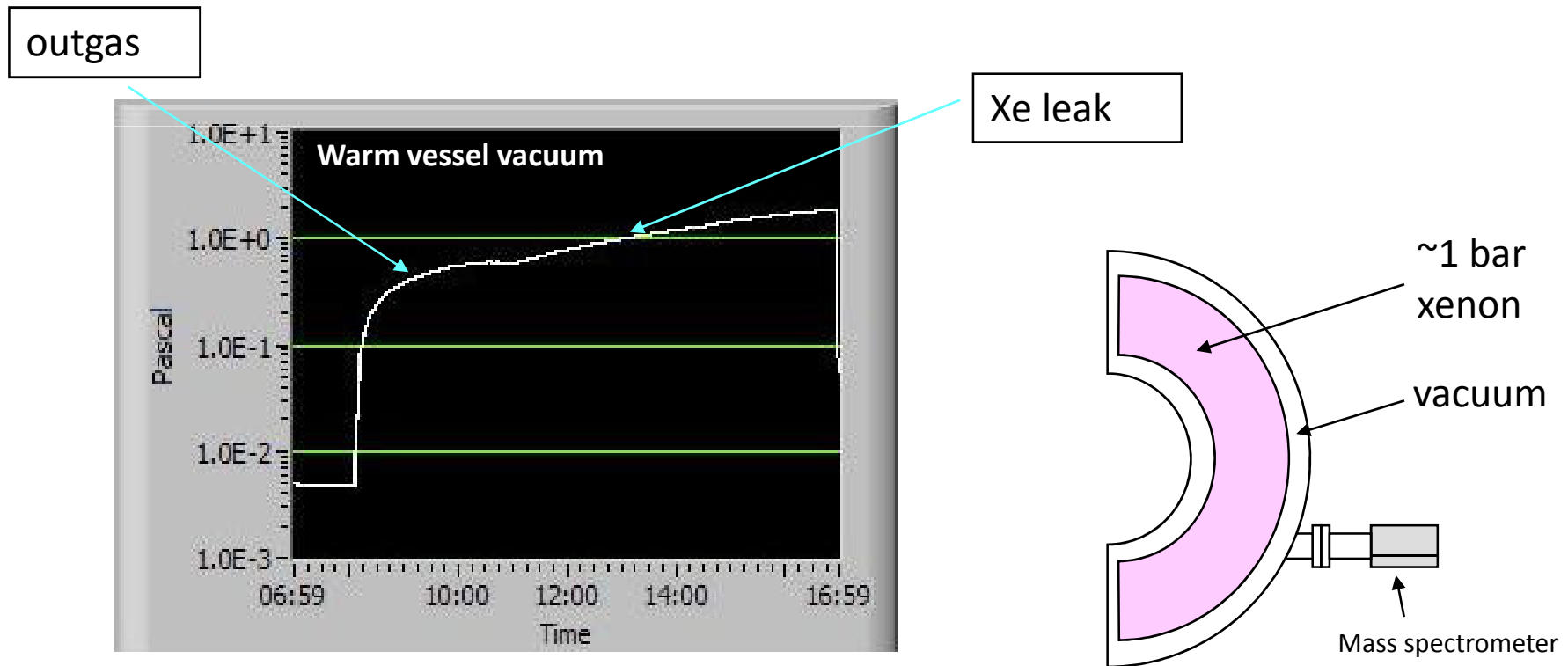# Example of build-up test

- Build-up test of MEG outer vessel
- Taken when testing recycled gaskets

Vacuum build-up test for Liquid-rare gas detectors

- Golden role (I learned this from Prof. Doke)
  - "less than 1Pa overnight"

- Assume remaining gas is oxygen...

  - Impurity $= \left. \dfrac{1.0(Pa) \times 32(g) \times V_{cryo}}{22.4(l) \times 10^5 (Pa)} \middle/ 3.0 \times 10^3 \times V_{xe} \right.$
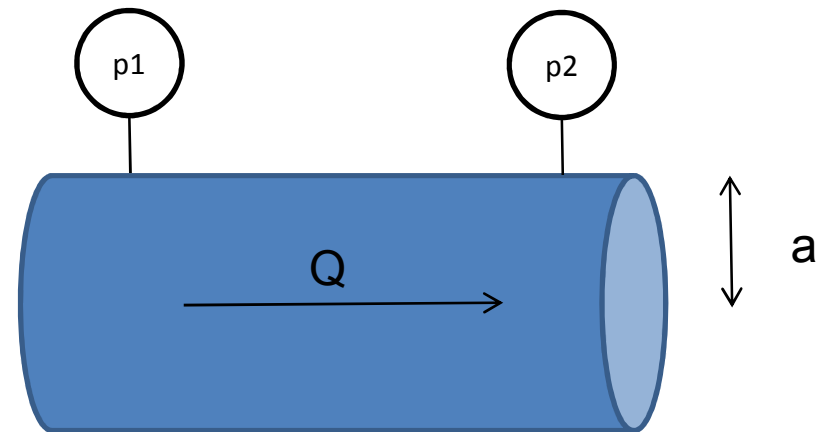
  - V_{cryo} = 10 liter, V_{xe} = 2 liter $\rightarrow$ Impurity = 23 ppb
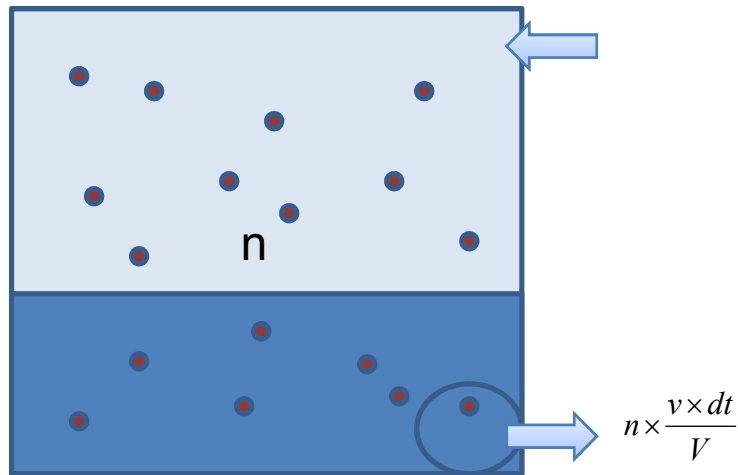
Pumping speed

- Conductance for molecular flow
  - $Q = C\Delta p$, $\Delta p = p1 - p2$
  - $C = a^3/L$

- Ex. 1 a = 12.5mm, L = 1000mm → C = 2.0 liter/sec
- Ex. 2 a = 32mm, L = 200mm → C = 1.6×10^2 liter/sec

Purification speed and growth of observed charge

$$dn = -n \frac{v \times dt}{V}$$

$$n = A \exp\left(-\frac{v}{V} \times t\right) = A \exp\left(-\frac{t}{\tau}\right)$$

$$\lambda = \lambda_0 \exp\left(\frac{t}{\tau}\right)$$

$$Q(\lambda) = Q_0 \frac{\lambda}{d}\left(1 - \exp\left(-\frac{d}{\lambda}\right)\right)$$