Finned Tube to increase target density?

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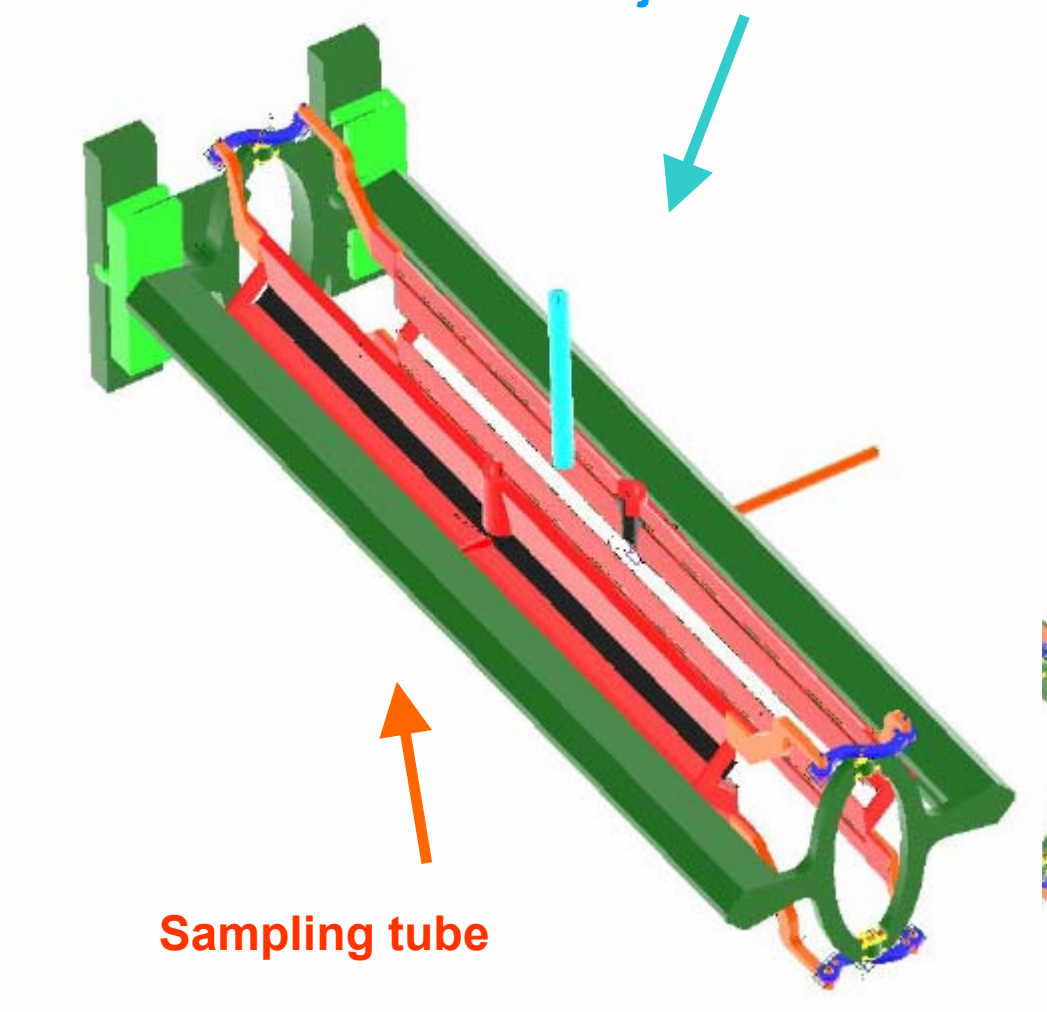
Openable cell for $p_{\uparrow}\bar{p}_{\uparrow}$

Ideas to increase cell thickness

Test on the finned Injection Tube

The openable cell



Openable Cell to inject p_{bar} @ AD

Y = 100, x = 50 mm

- **Closed cell, square 10x10 mm, 5 μm teflon foil.**

Estimation of the target thickness

- **Thickness (t_c) of the cell**

$$t_c = \frac{I}{C_{tot}} \frac{L}{2}$$

- t_c [atom/cm^2]

$$C' = \frac{34.4}{\sqrt{\pi}} \sqrt{\frac{T}{M}} \frac{A^2}{sl} \cdot \left(1 + 5.3 \frac{A}{sl}\right)^{-1} \left[\frac{l}{s}\right]$$

length unit in cm

$$C_{tot} = 3{,}94 + 3{,}94 + 5{,}83 + 1{,}04$$

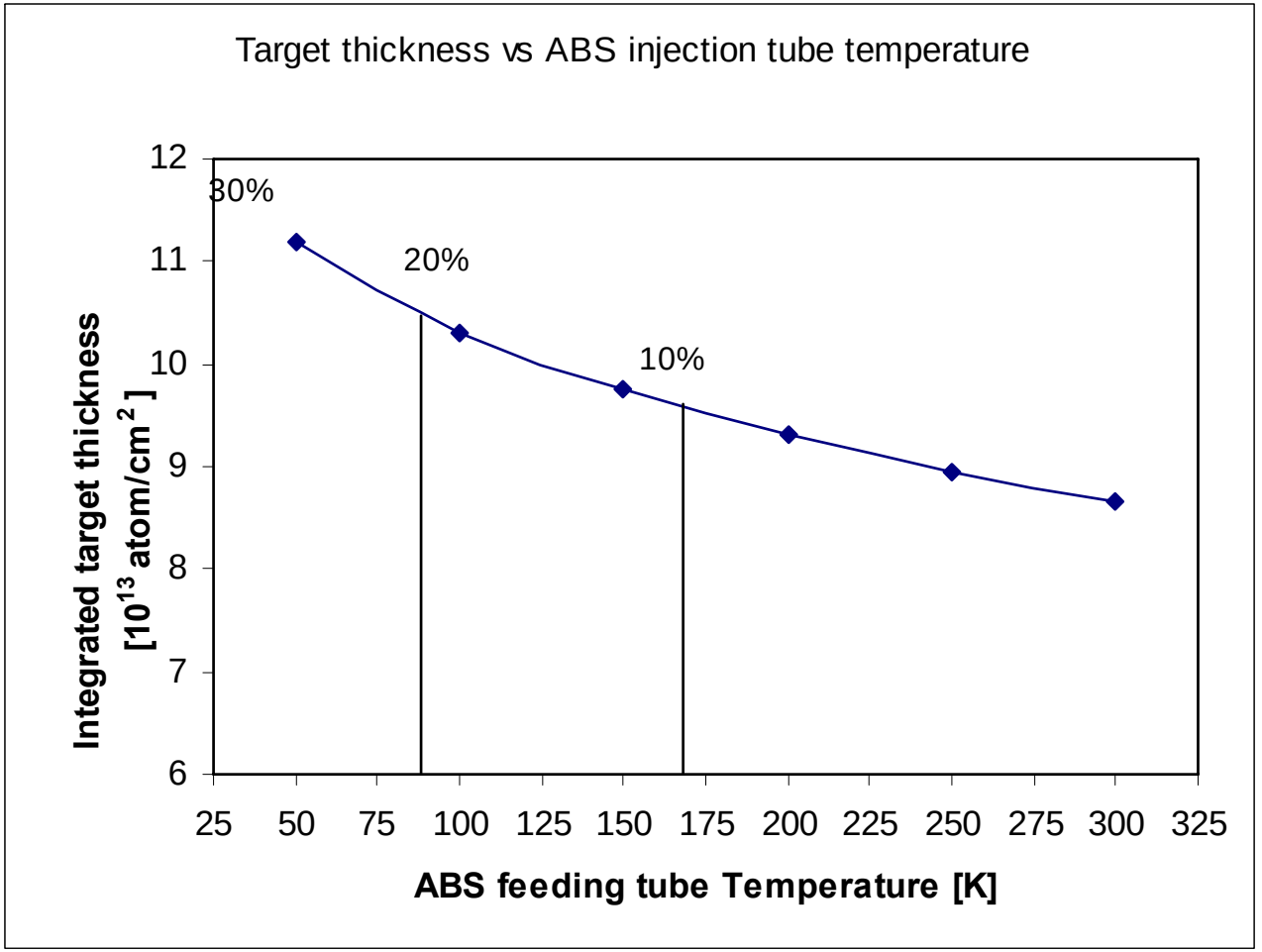
$$\left(\frac{1}{1{,}32} + \frac{1}{4{,}81}\right)^{-1} = 1{,}04$$

- Cell Geometry: square 10x10 mm, length 400 mm
  - **$I_{HERMES\text{-}ABS}$ = 6.5 • 10^{16}at/s then t_c=8.81 • 10^{13}at/cm^2**

- **Some ideas "appear" in order to increase t_c?!**

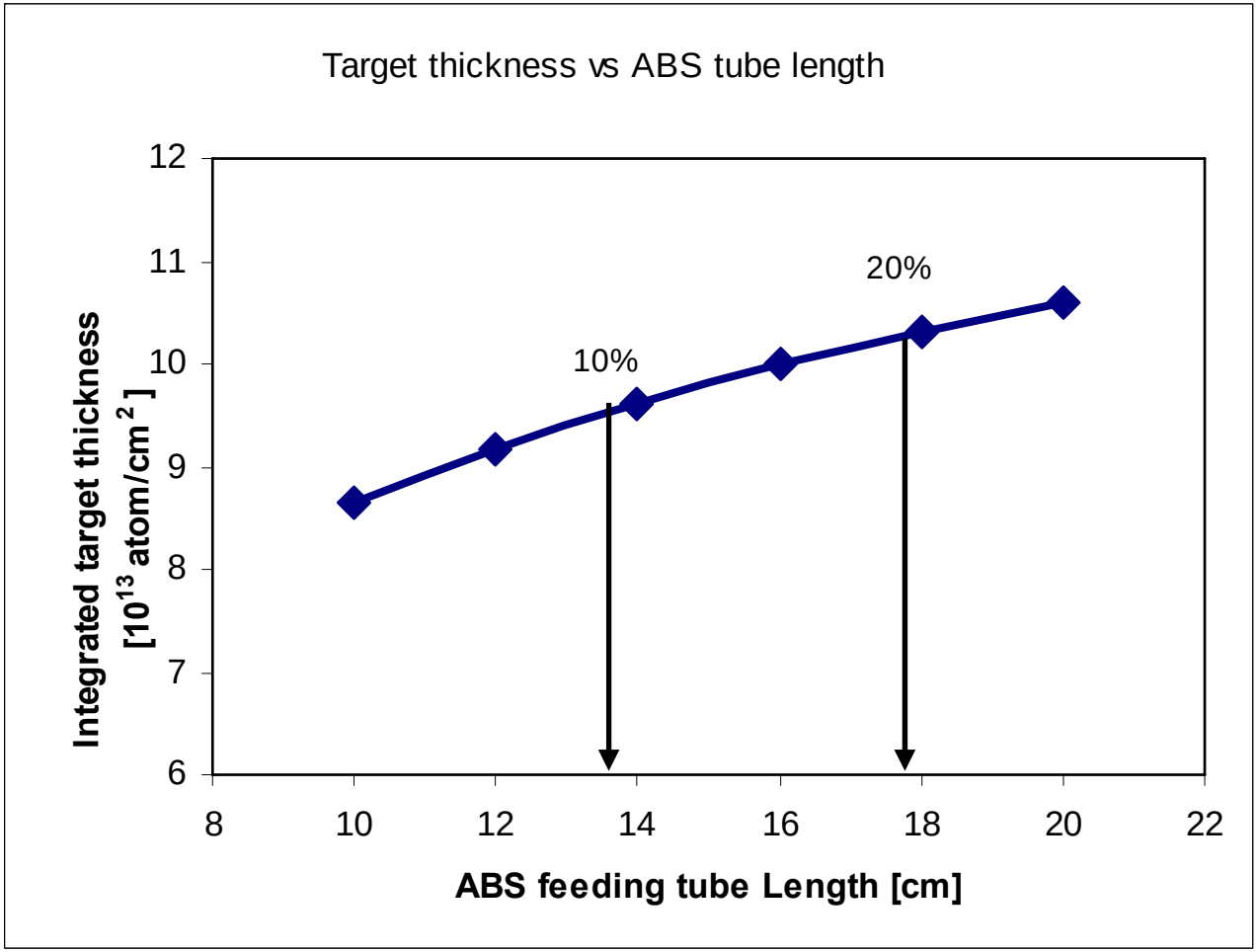
Lower conductance thicker Target

- **Lowering the ABS injection Tube Temperature**



Lower conductance thicker Target

- **Longer ABS injection Tube**

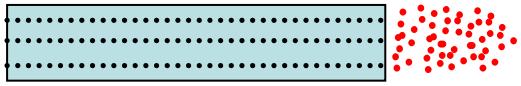


Lower conductance thicker Target

- **ABS injection Tube with fins**

Incoming atoms

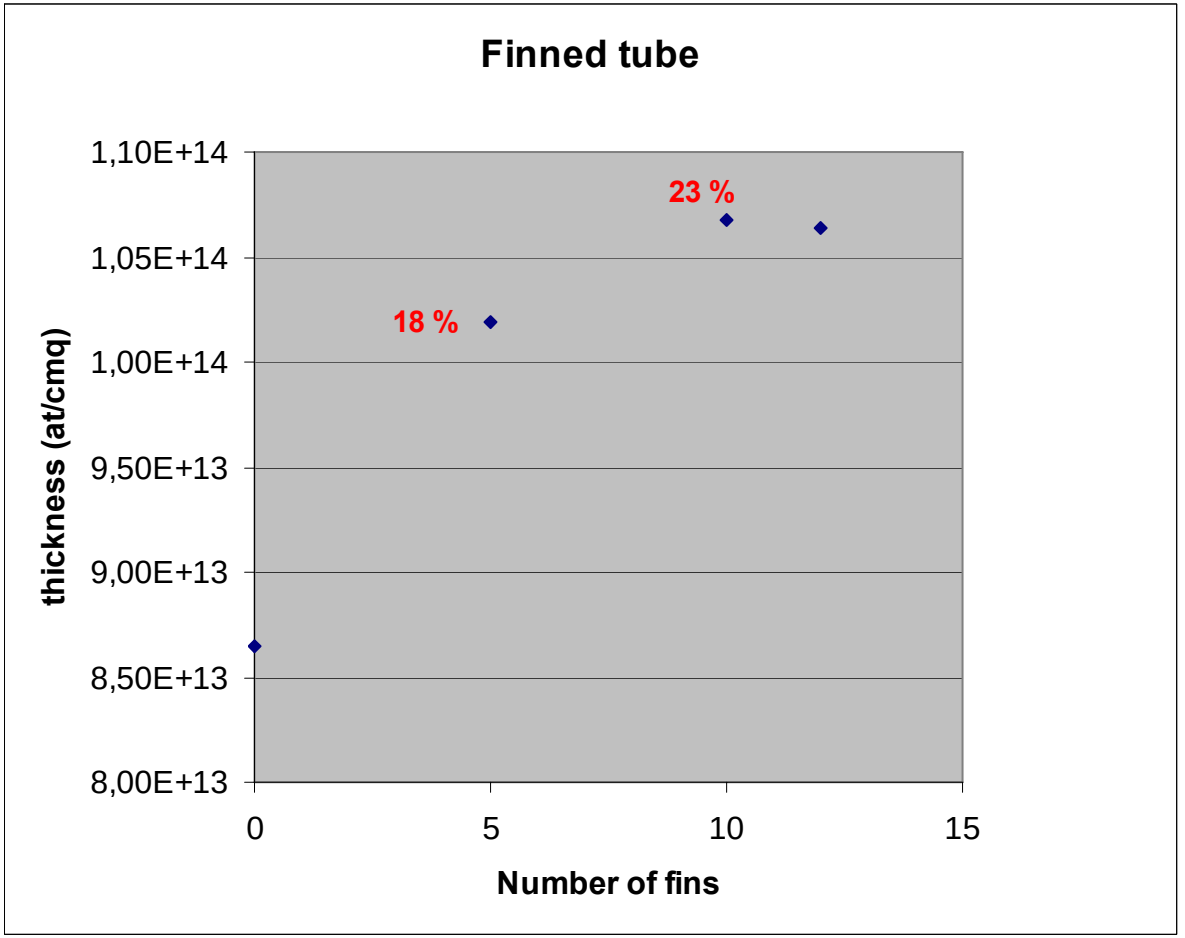
$$I' \propto A$$



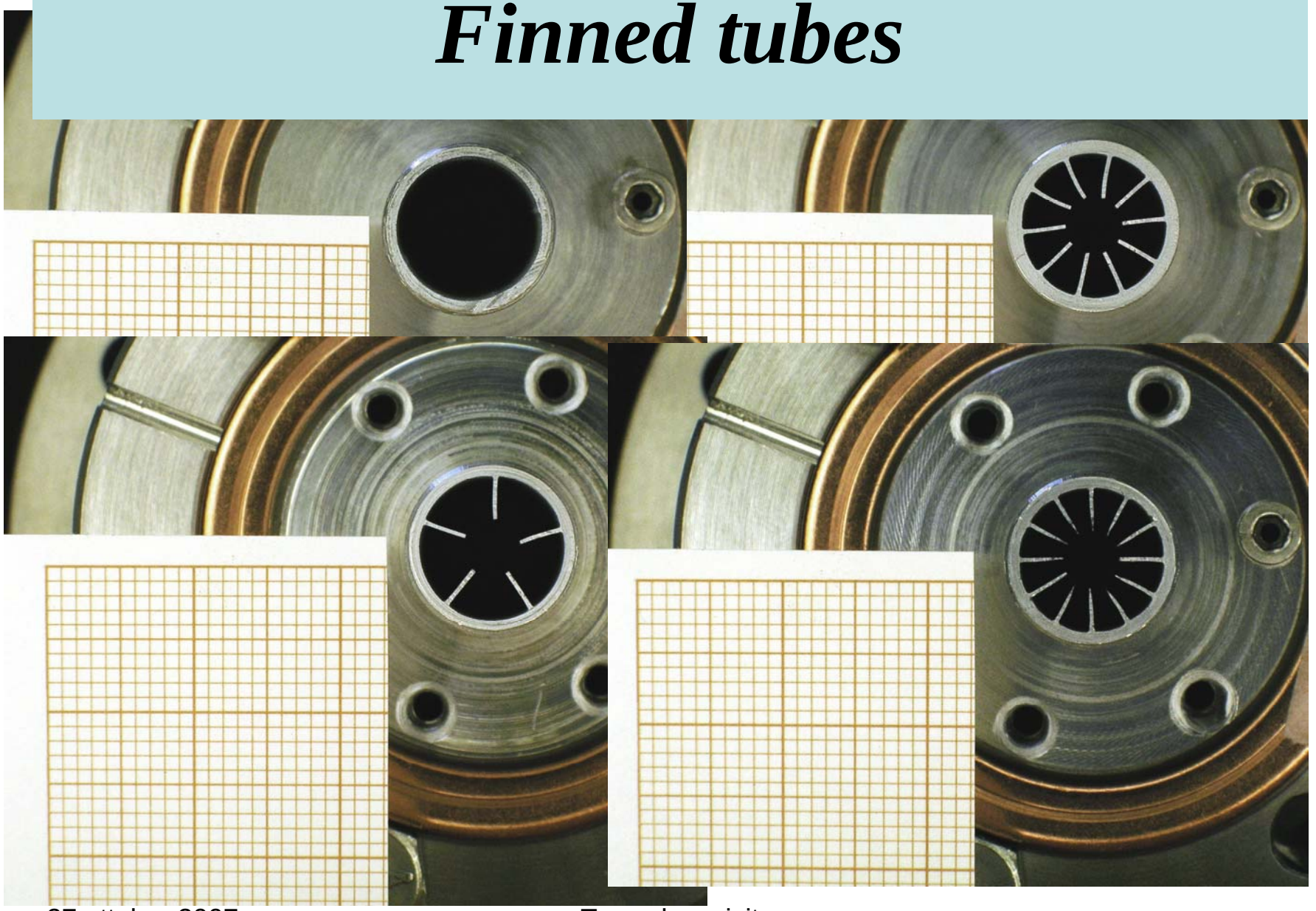
Outcoming atoms

$$C' = \frac{34.4}{\sqrt{\pi}} \sqrt{\frac{T}{M}} \frac{A^2}{\text{sl}} \cdot \left(1 + 5.3 \frac{A}{sl}\right)^{-1} \left[\frac{l}{s}\right]$$

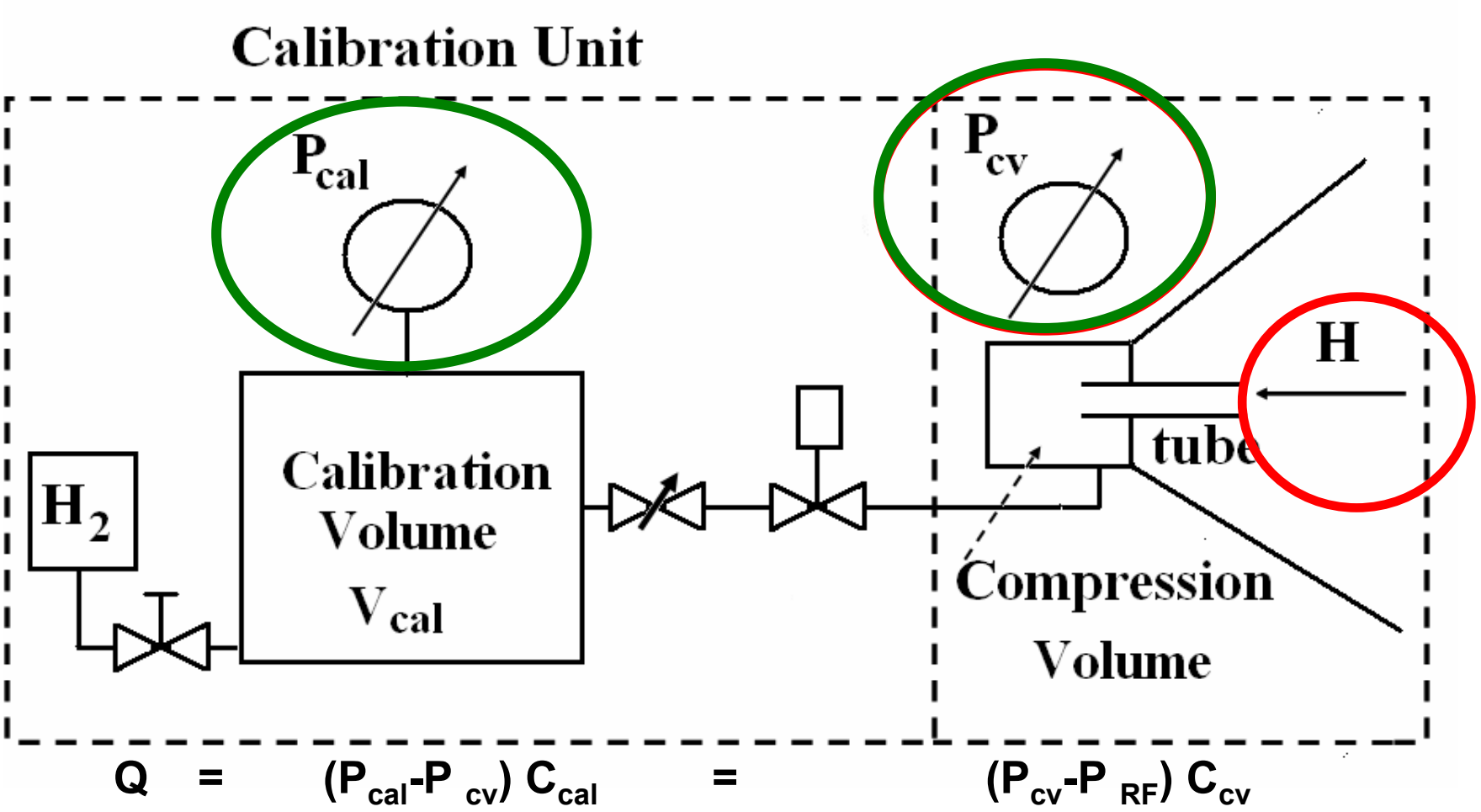
length unit in cm



Finned tubes

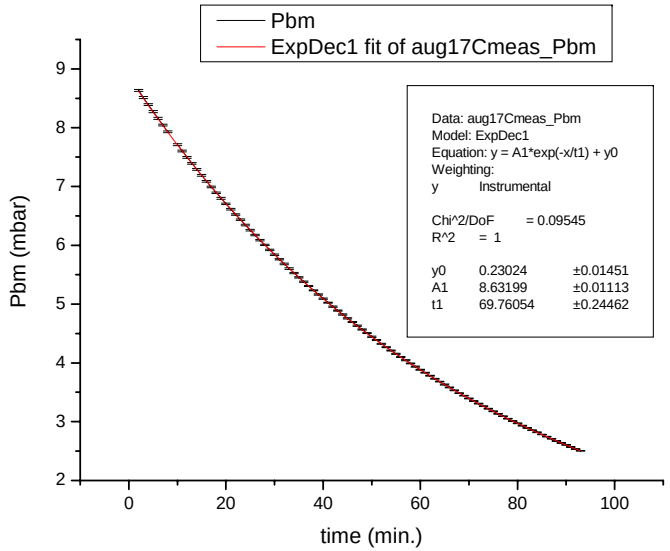


Test on the finned tubes



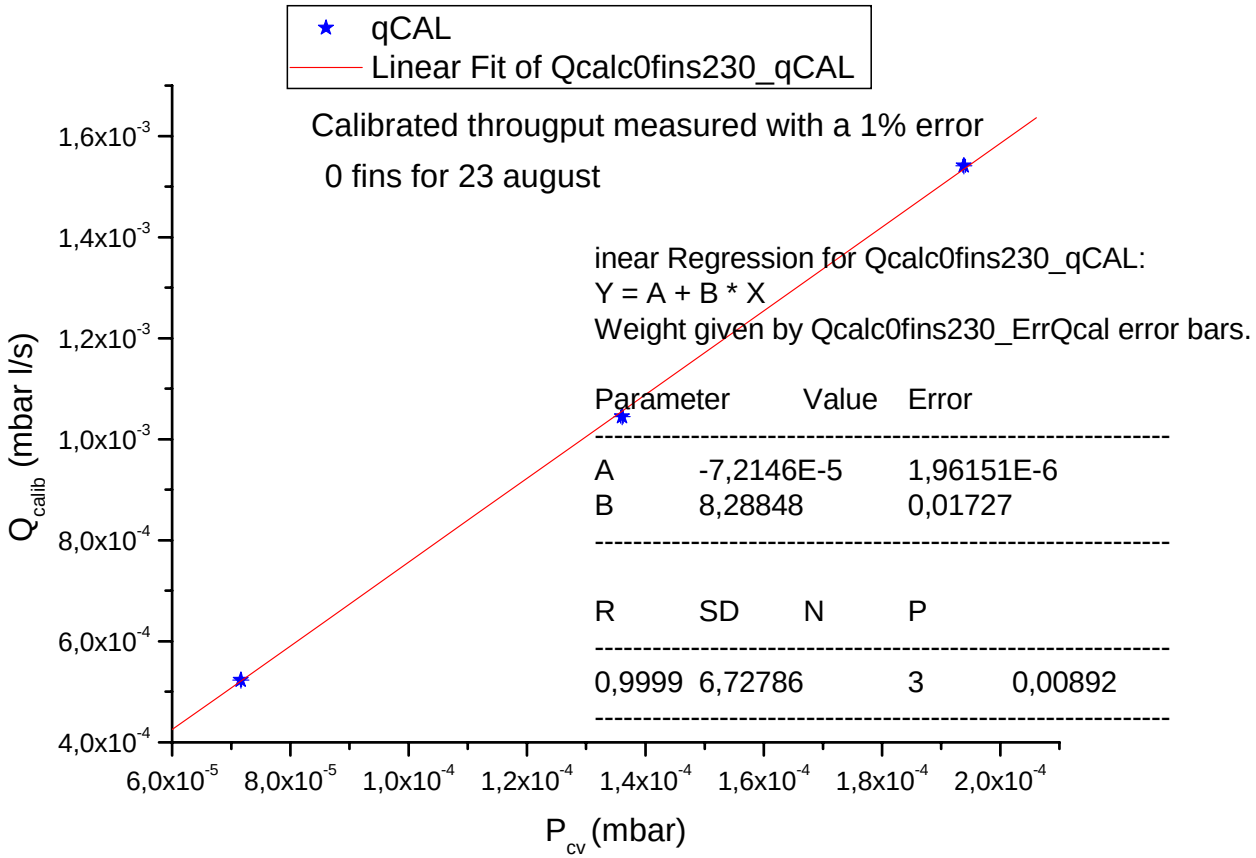
Measure of C_{cal}

- **Misura di C_{cal}**
  - Evacuazione di V_{cal} da C_{cal}



$$C_{cal} = \frac{V_{cal}}{\tau}; \text{inoltre } \frac{\delta C_{cal}}{C_{cal}} = \frac{\delta V_{cal}}{V_{cal}} + \frac{\delta \tau}{\tau}.$$

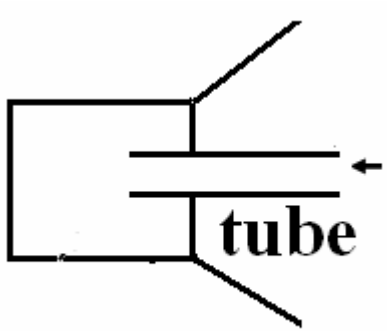
Measured of Q calibrated



Q calibration curve derived for all finned tubes

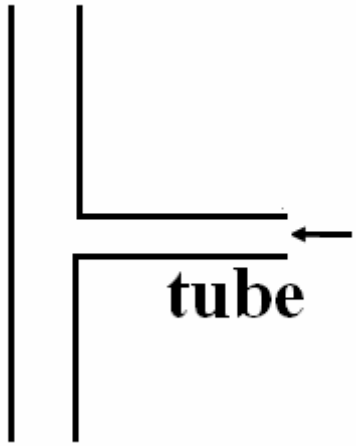
Fixing in mind problems

- **We can measure**
  - The $Q_{incoming}$ is well calibrated measurement
  - Then derive the t_c

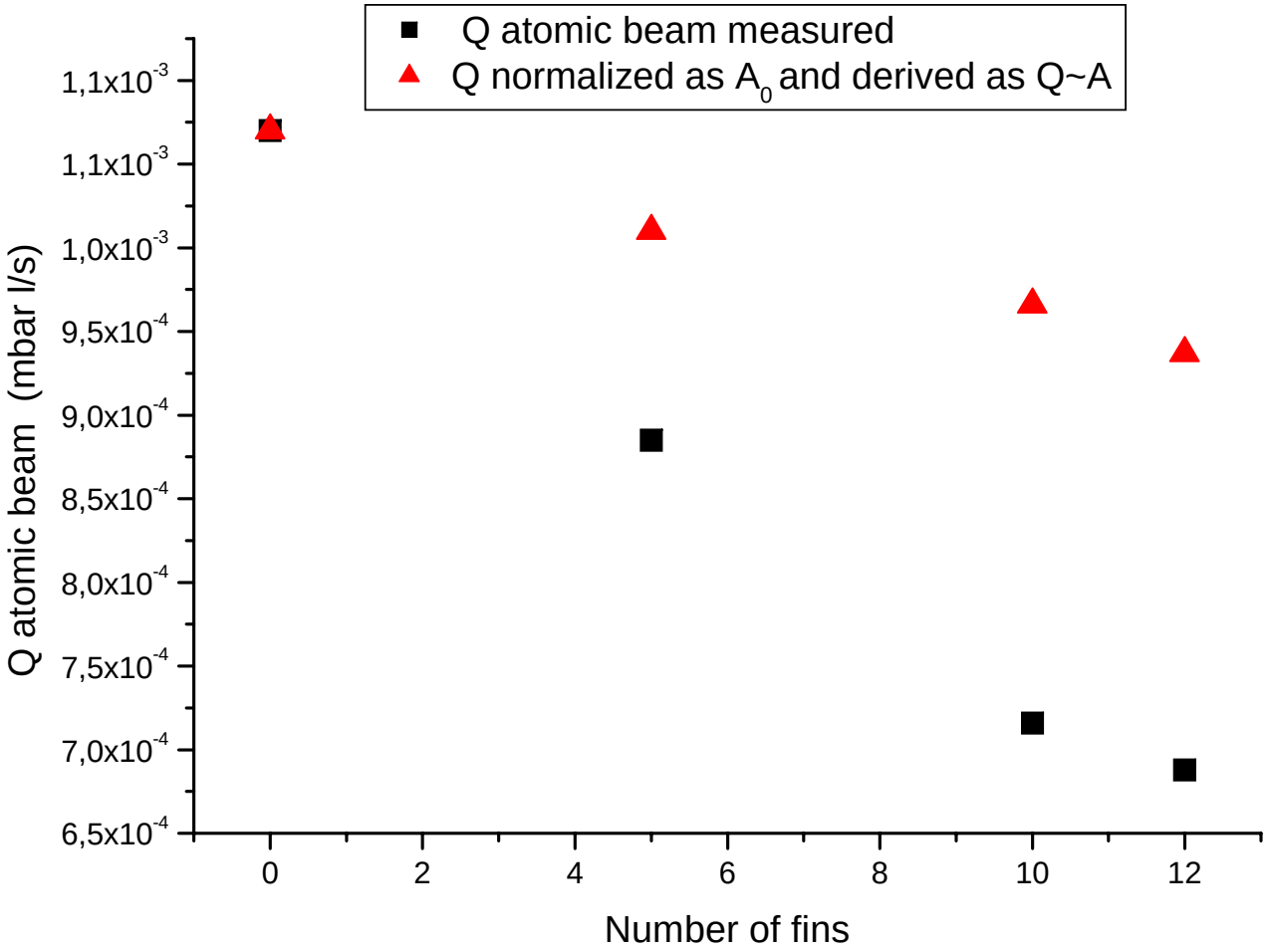


- To derive the t_c, from data
  - » We need $Q_{incaming}$ (2%)

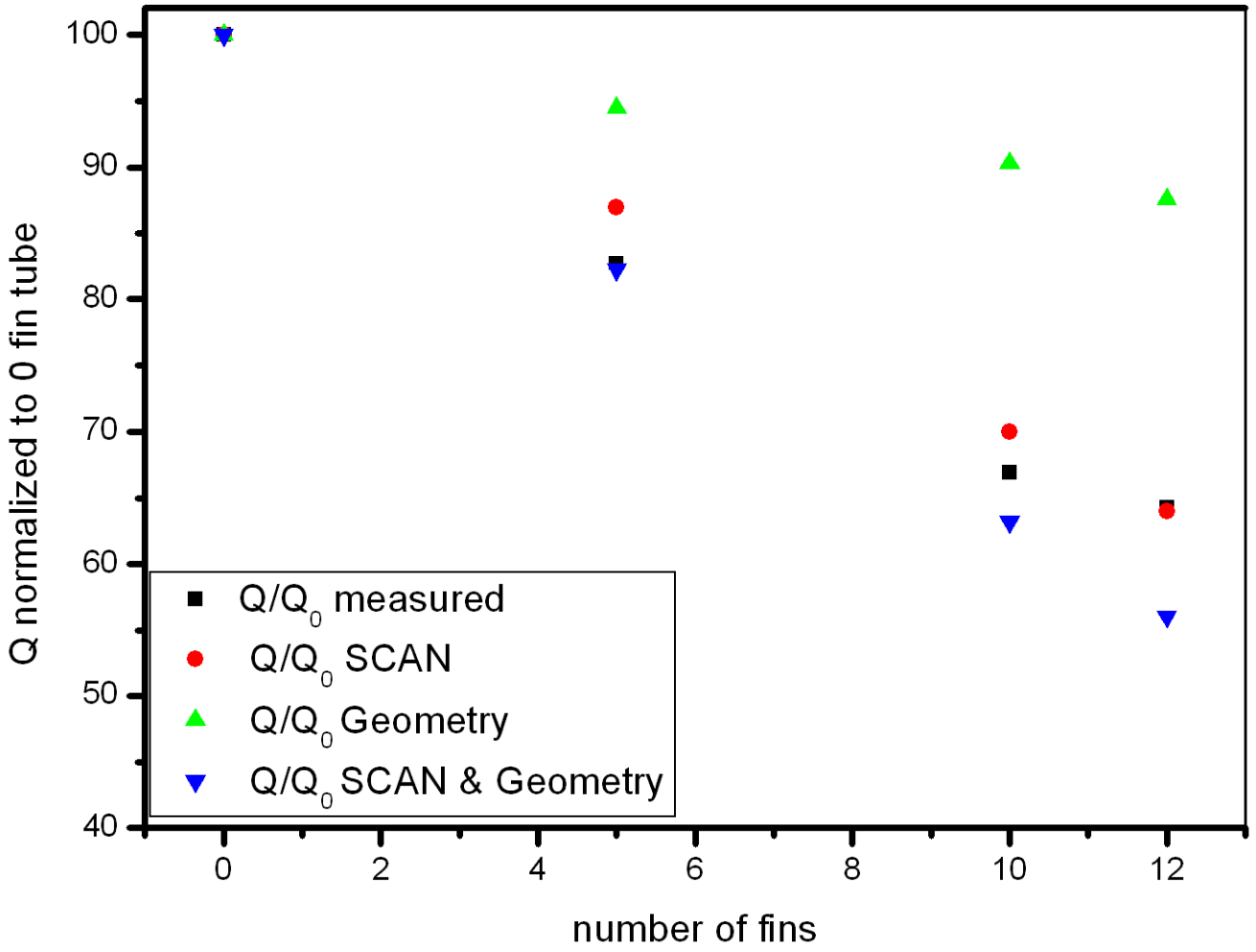
    And
  - » $C_{outcoming}$ (30%)



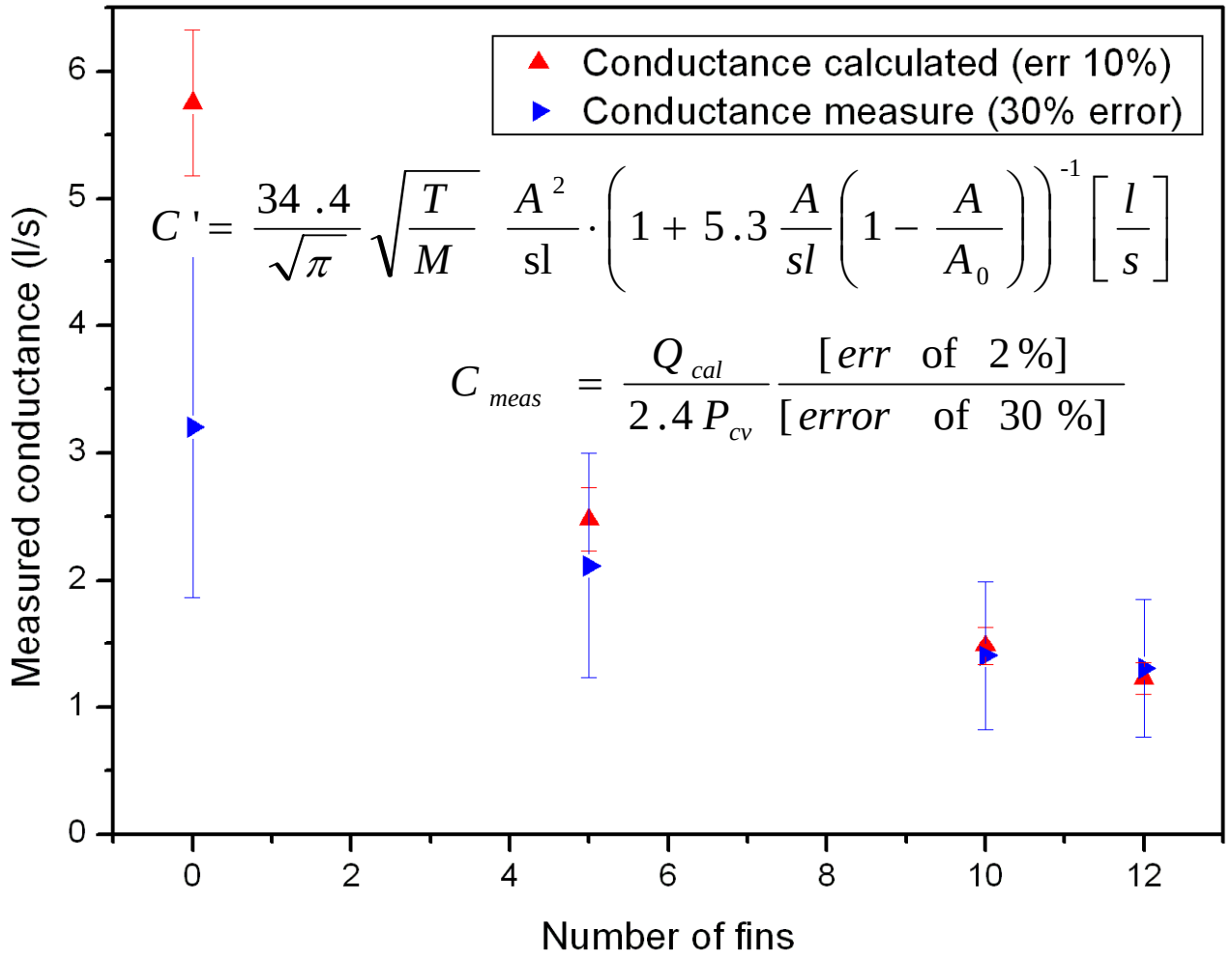
I measured and see MC simulation



Surviving atomic beam

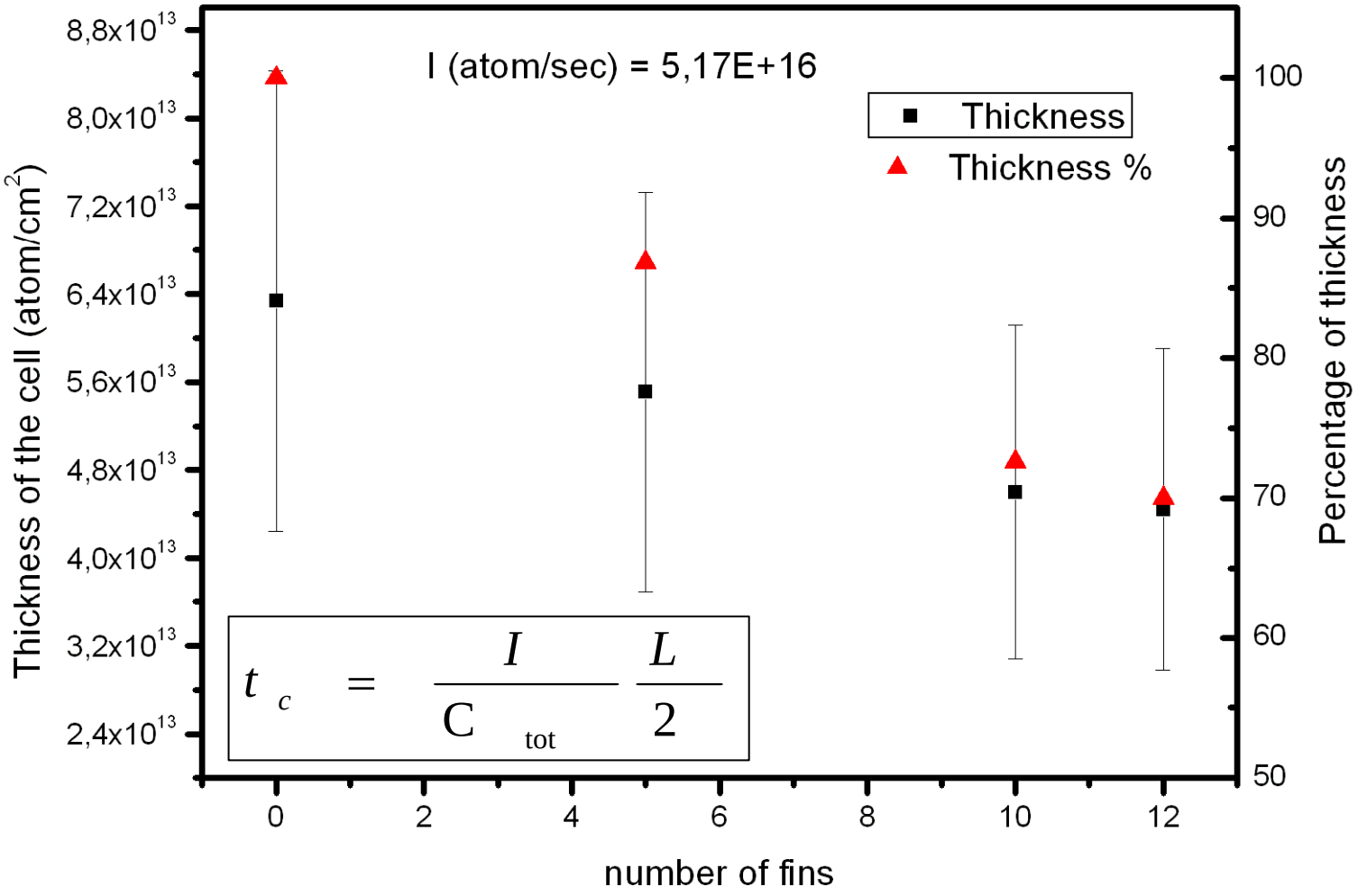


C_{cv} measured and calculated



Next step: use the baratron to measure P_{CV} ?!

Thickenss of the cell



Conclusions

- **To increase the target density**
  - Lower temperature of ABS injection tube
    - Mechanical complication and vibrations.
  - Longer tube
    - Test on the recombination and transport required?
  - Finned tube
    - Due to the azimuthal motion of the focused atomic beam
      - » Reduced target thickness.