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WP4 Meeting, ALBA
Cryogenic SEY measurements

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EuroCirCol
A key to New Physics

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Outline

- We need to measure the SEY of materials at Cryogenic temperatures
- To do this we will need to cool the samples to these temperatures
- We will also need to desorb gas onto the samples

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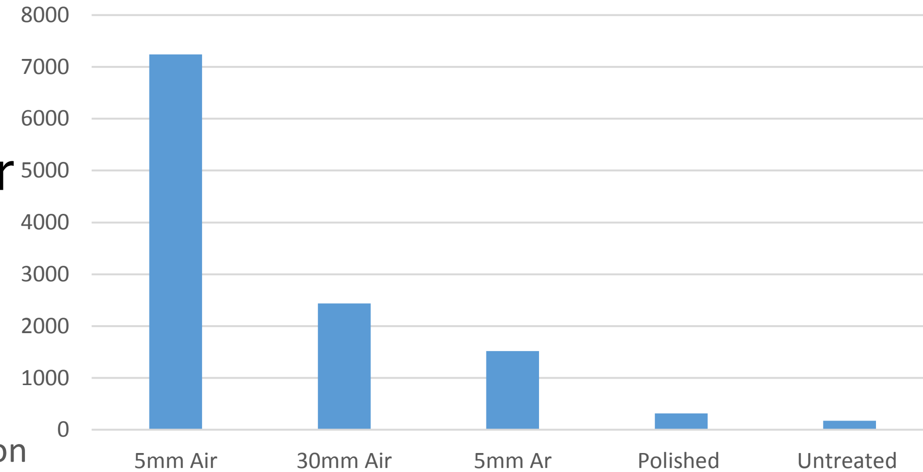
Particle Counts

- Measurements taken with 0.5 bar of filtered N2 onto sample 50 mm away from the sample
- The measurements were taken for 1 minute and the counts were averaged over 3 measurements

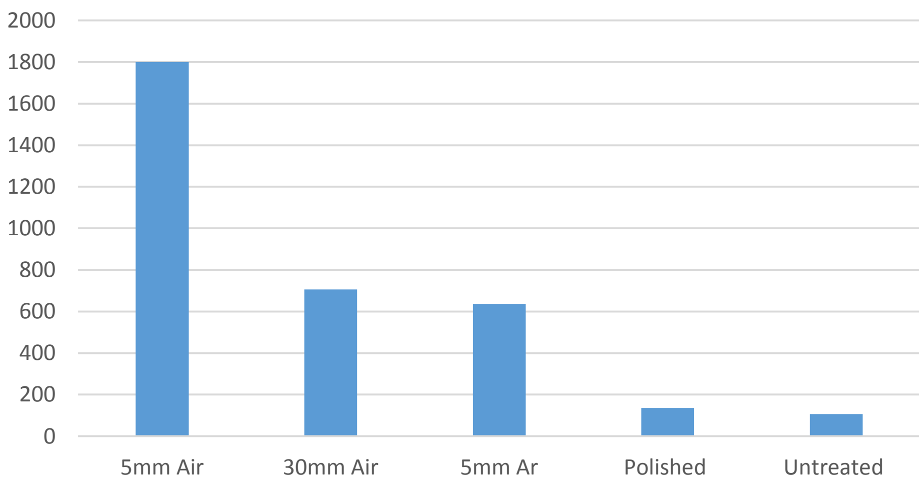
Particle Counts

Particle counts between 0.3 and 0.5 microns



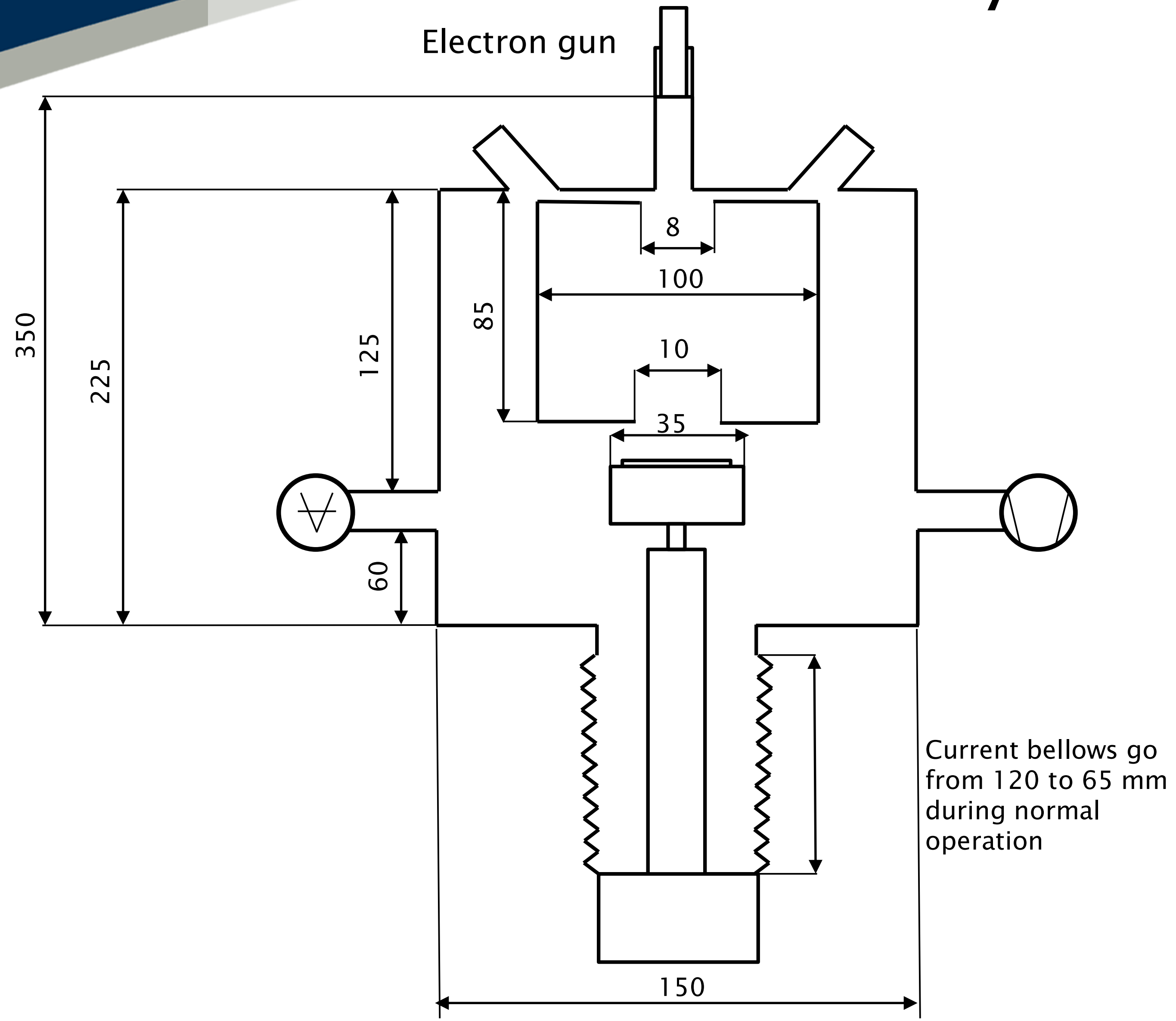
- Largest particle size measured was 1 micron
- The sample prepared in Ar had the lowest counts

Particle counts between 0.5 and 1 micron



- Polished and untreated samples were used as reference
- The detector could measure particles up to 25 microns

Current SEY system



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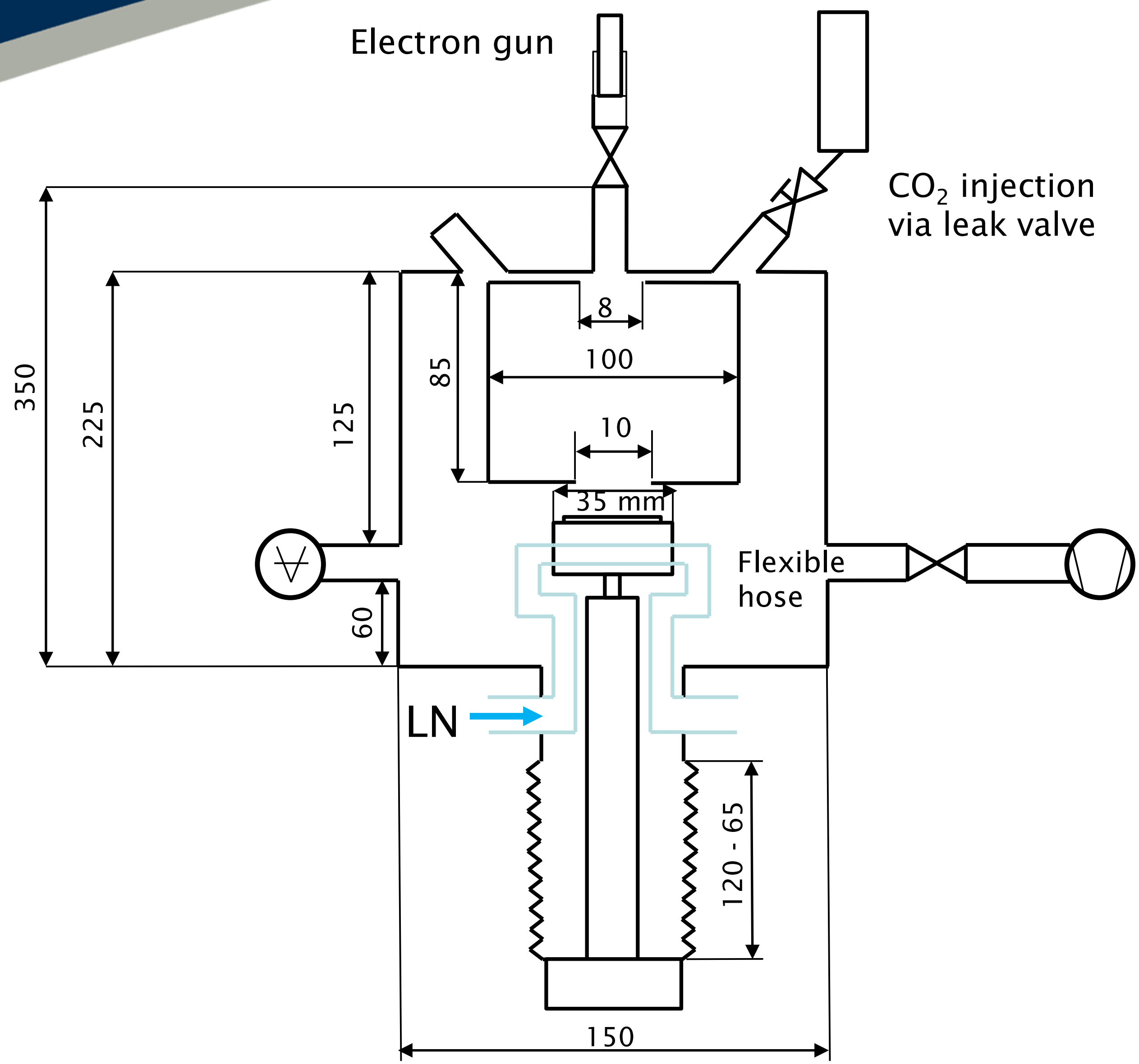
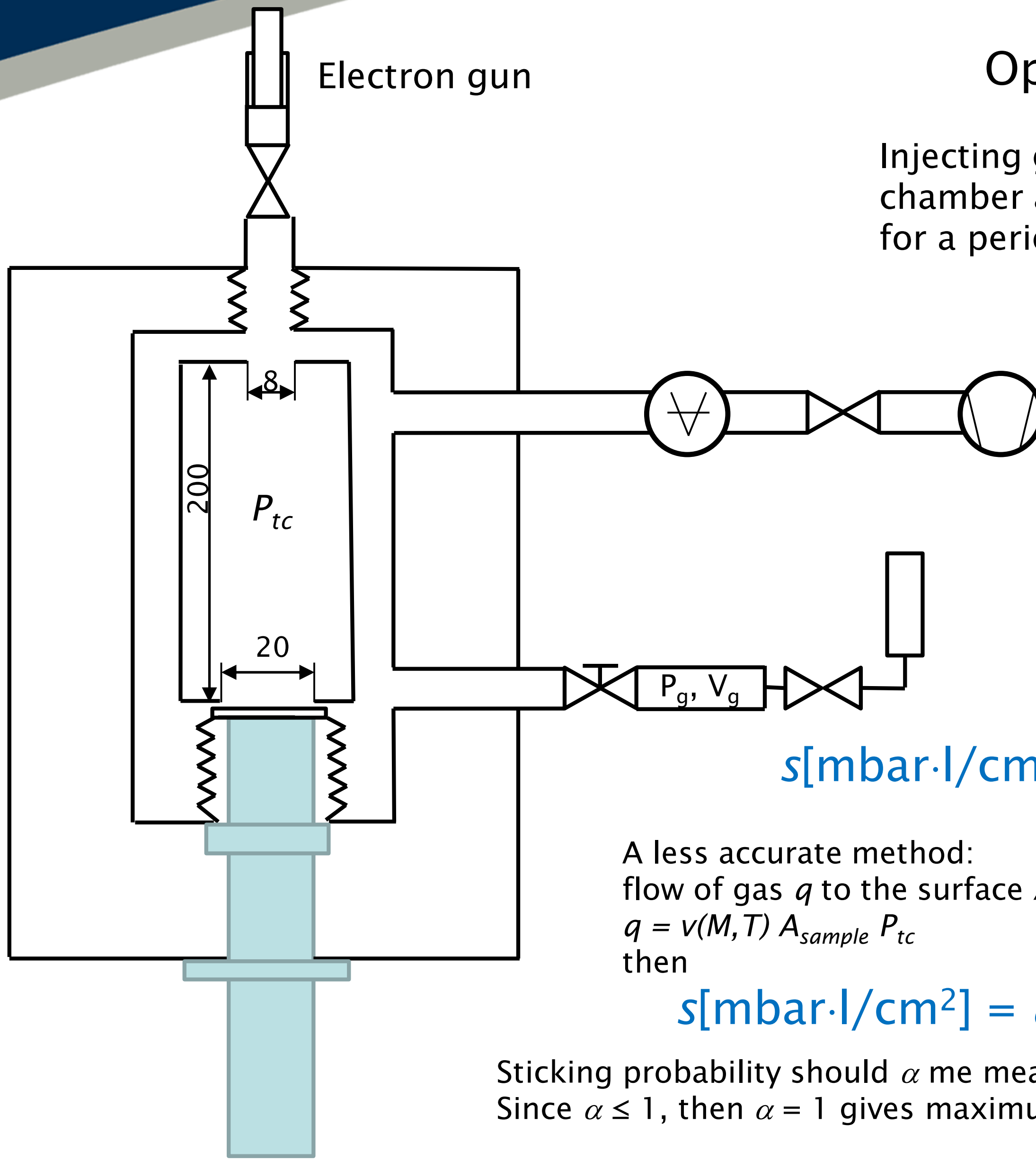
Un upgrade to current system for cooling sample to 77 K



A new system with sample temperature between 3.5 and 80 K



Option 1:

Injecting gas to the test chamber at a pressure P_{tc} for a period of time t_{inj}

A flow of injected gas q:
q [mbar·l/s] = $V_g \, dP_g/dt$

Pumping speed:
S [l/s] = Q / P_{tc}

then concentration of cryosorbed gas s on the sample surface:

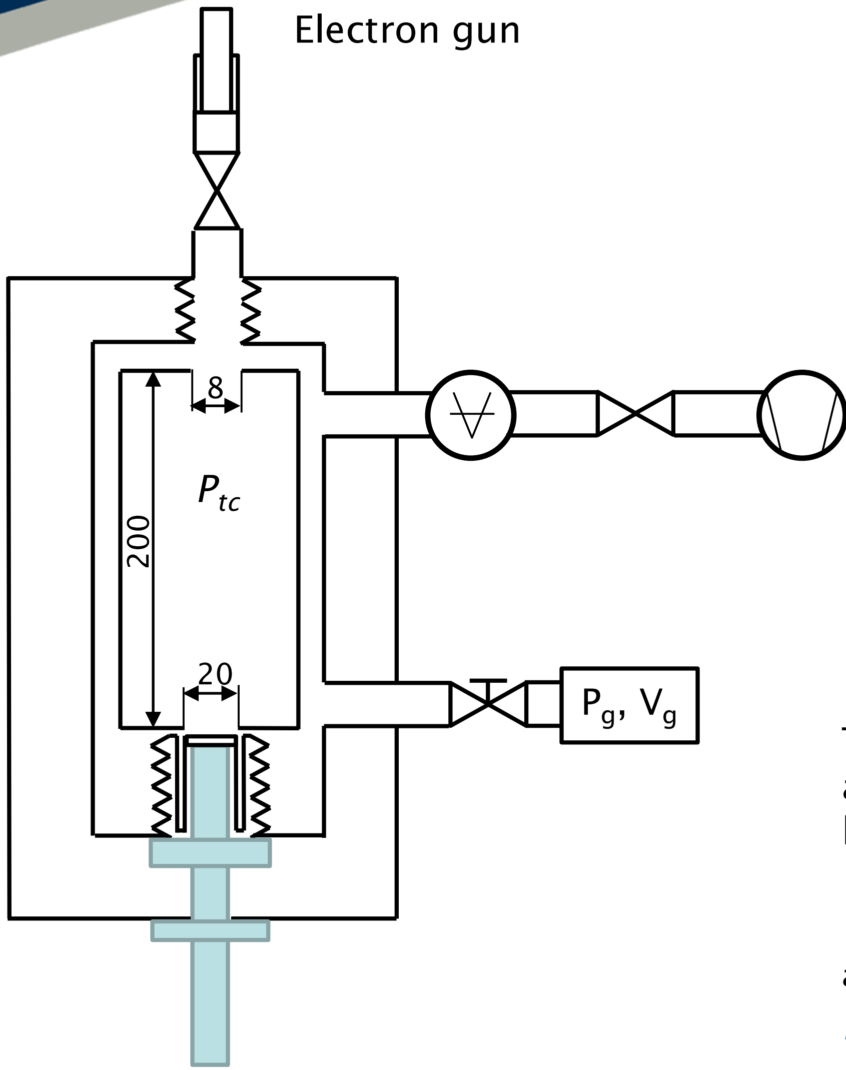
$$s\,[\mathrm{mbar \cdot l/cm^2}] = P_{tc}\, S\, t_{inj} / A_{sample} \quad (1)$$

A less accurate method:
flow of gas q to the surface A_{sample} is
$q = v(M,T)\, A_{sample}\, P_{tc}$
then

$$s\,[\mathrm{mbar \cdot l/cm^2}] = \alpha\, P_{tc}\, v(M,T)\, A_{sample}\, t_{inj} \quad (2)$$

Sticking probability should α me measured or use literature data.
Since $\alpha \le 1$, then $\alpha = 1$ gives maximum possible s.

A new system with sample temperature between 3.5 and 80 K



Option 2:

Fill with a set amount of gas from a defined volume V_g at known pressure P_g.

Majority of gas should cryosorb to the sample as it is the only part of that is cold besides the gap which has low conductance.

$$s[\mathrm{mbar{\cdot}l/cm^2}] = P_g V_g / A_{sample}$$

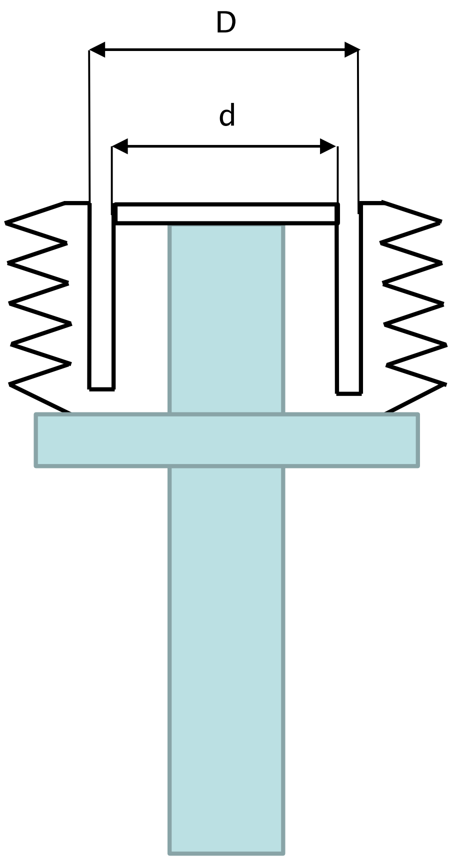
This method is more precise, the total amount of cryosorbed gas Q can be checked by heating the sample and measuring P_{tc}

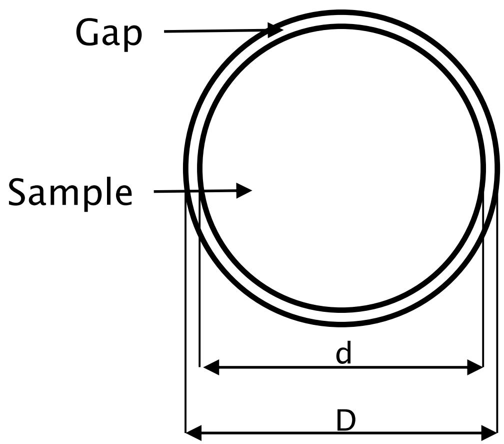
$$Q\ [\mathrm{mbar{\cdot}l}] = P_{tc} V_{tc}$$

and

$$s[\mathrm{mbar{\cdot}l/cm^2}] = P_{tc} V_{tc} / A_{sample}$$

A new system with sample temperature between 3.5 and 80 K
Option 2: accuracy





For d = 20 mm and D = 21 mm Area ratio is 10 thus maximum uncertainty in the total amount of cryosorbed gas Q is 10%

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Thanks
Questions?