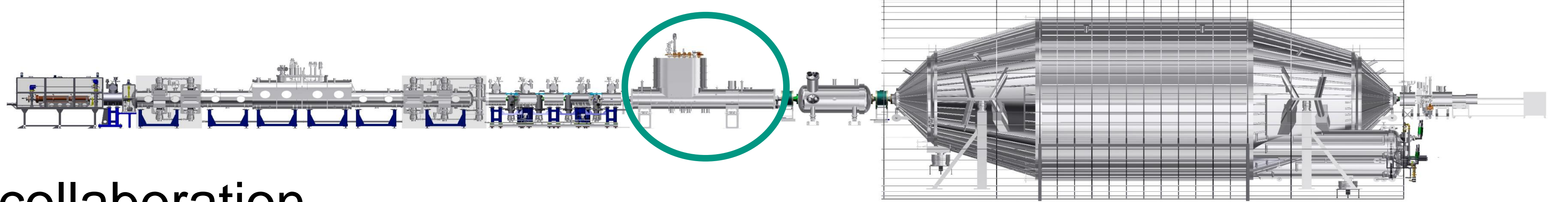
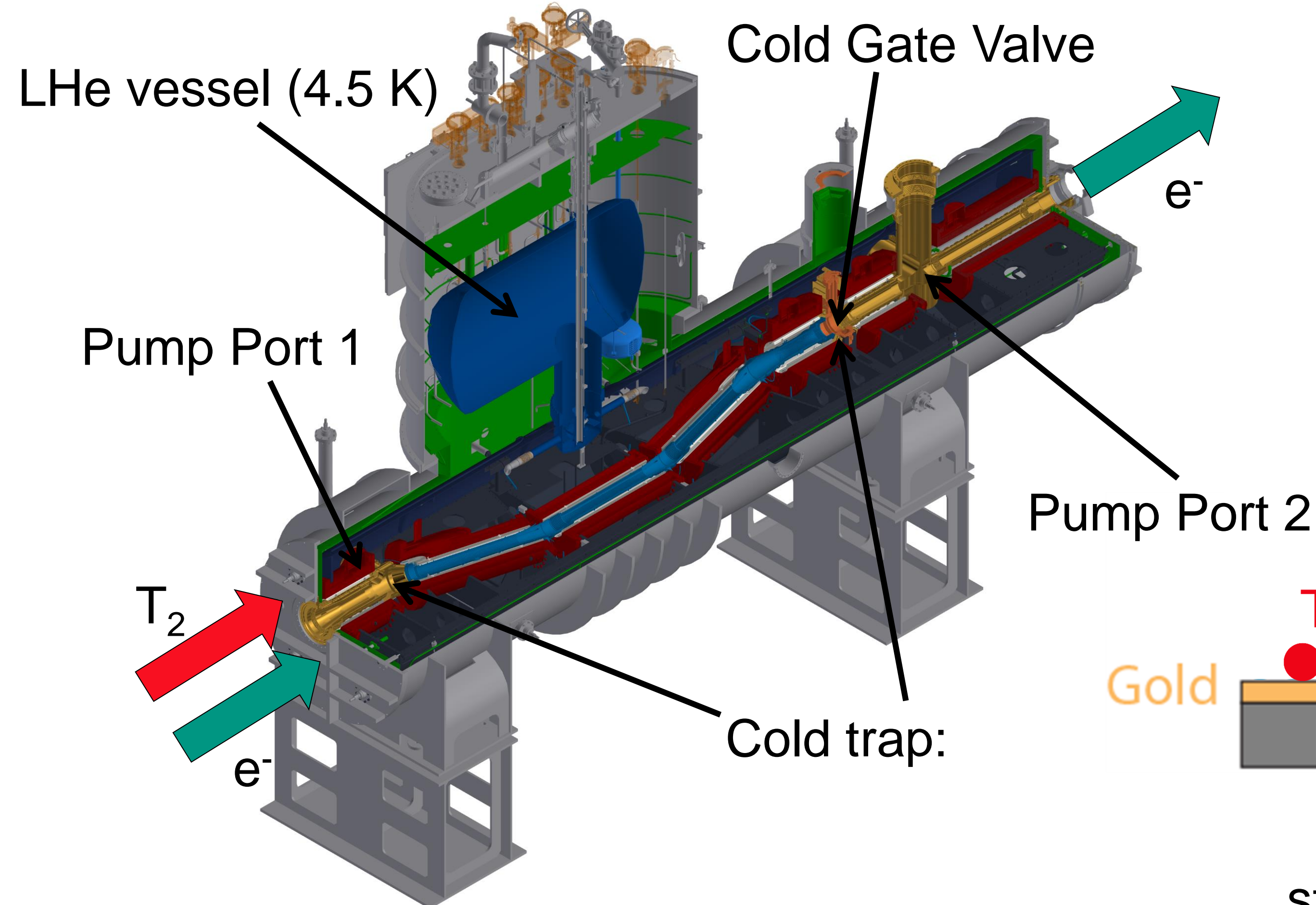


Retention measurements of the KATRIN Cryogenic Pumping Section

Carsten Röttele for the KATRIN collaboration

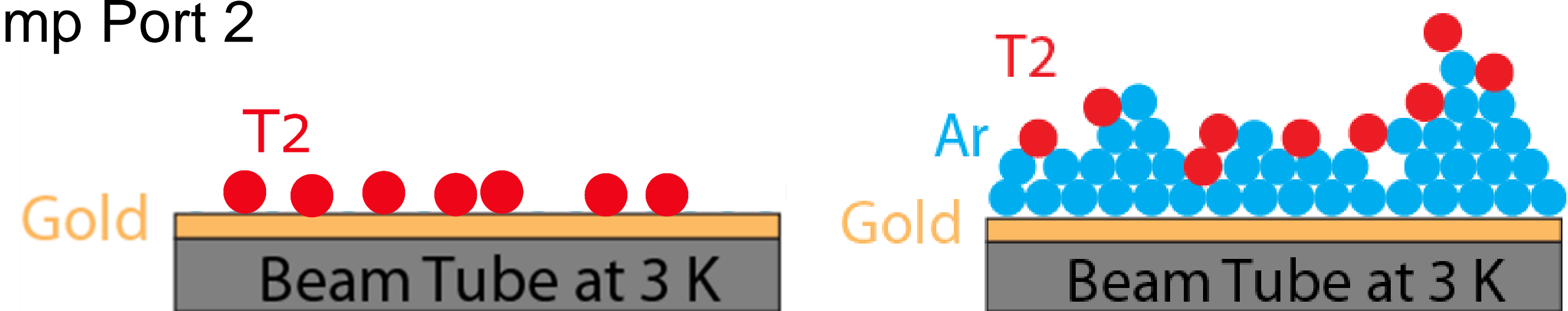


Cryogenic Pumping Section (CPS)



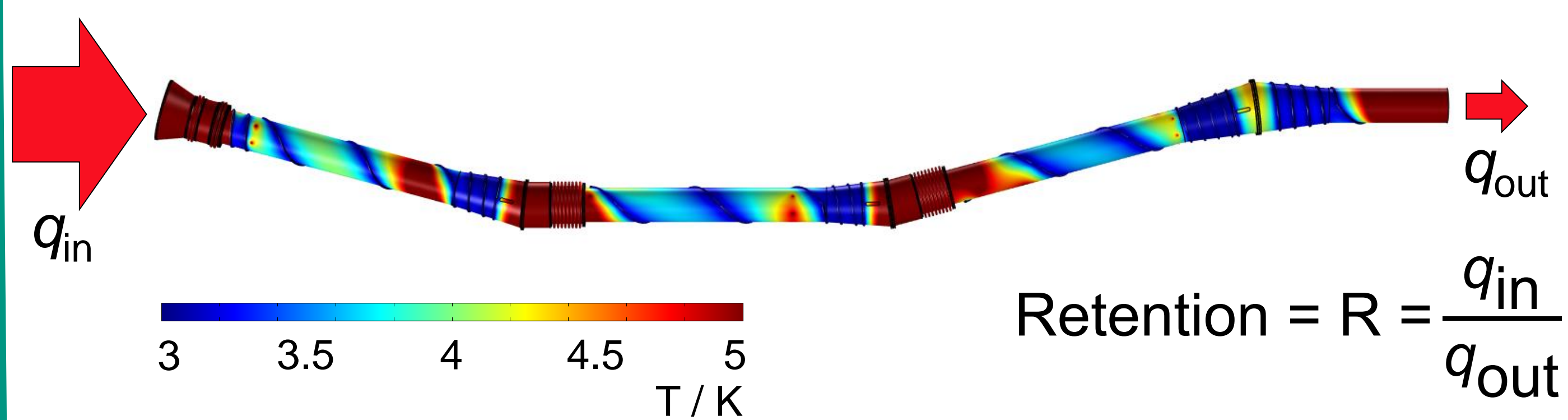
- Required retention factor of molecular tritium flow $> 10^7$ (overall: 10^{14})
- Safety limit of capacity: 1 Ci
- Retention R directly correlated to mean sojourn time τ_{des} :

$$\tau_{\text{des}} = \tau_0 \exp\left(\frac{E_B}{RT}\right)$$

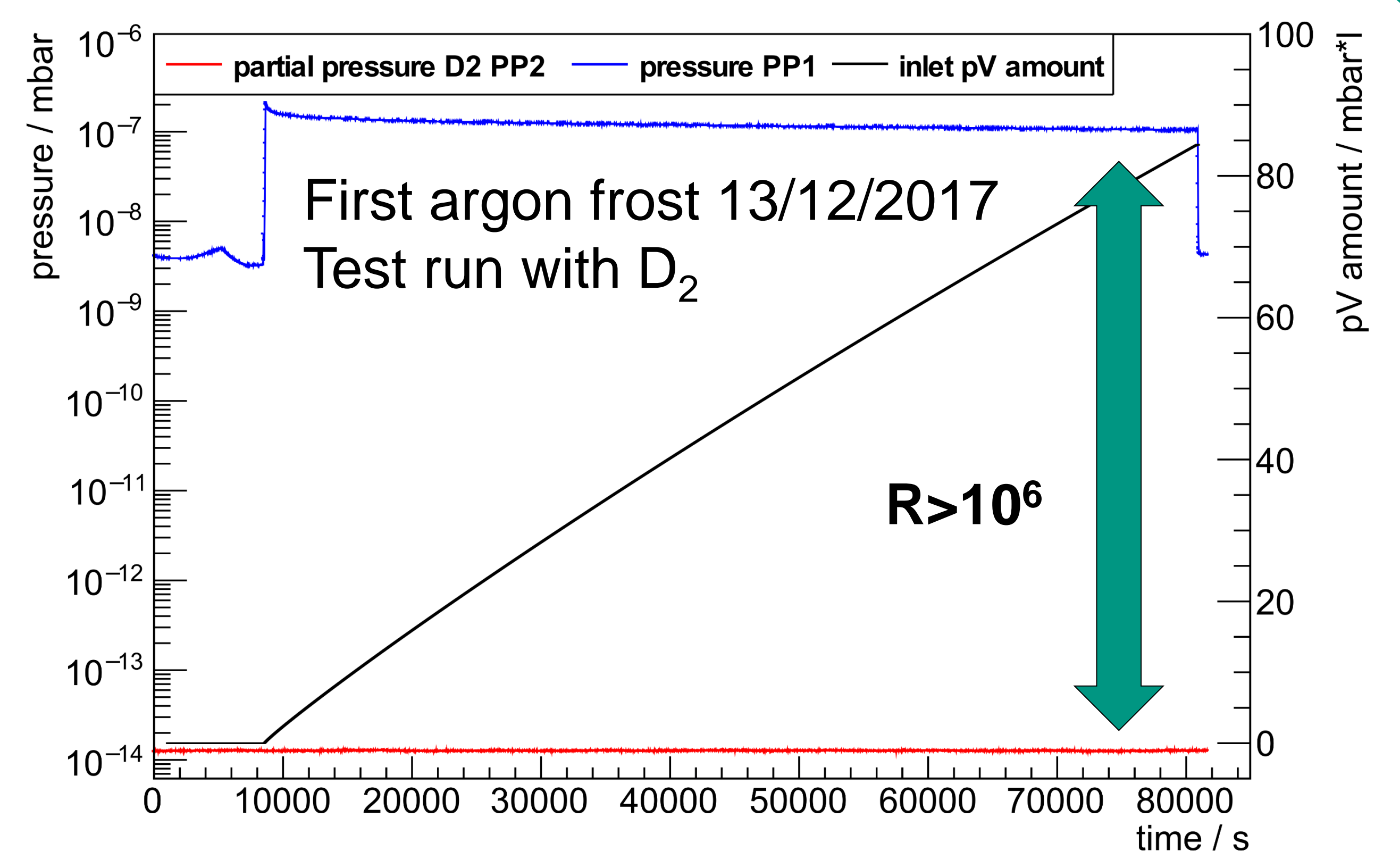


stronger binding energy E_B & much larger surface

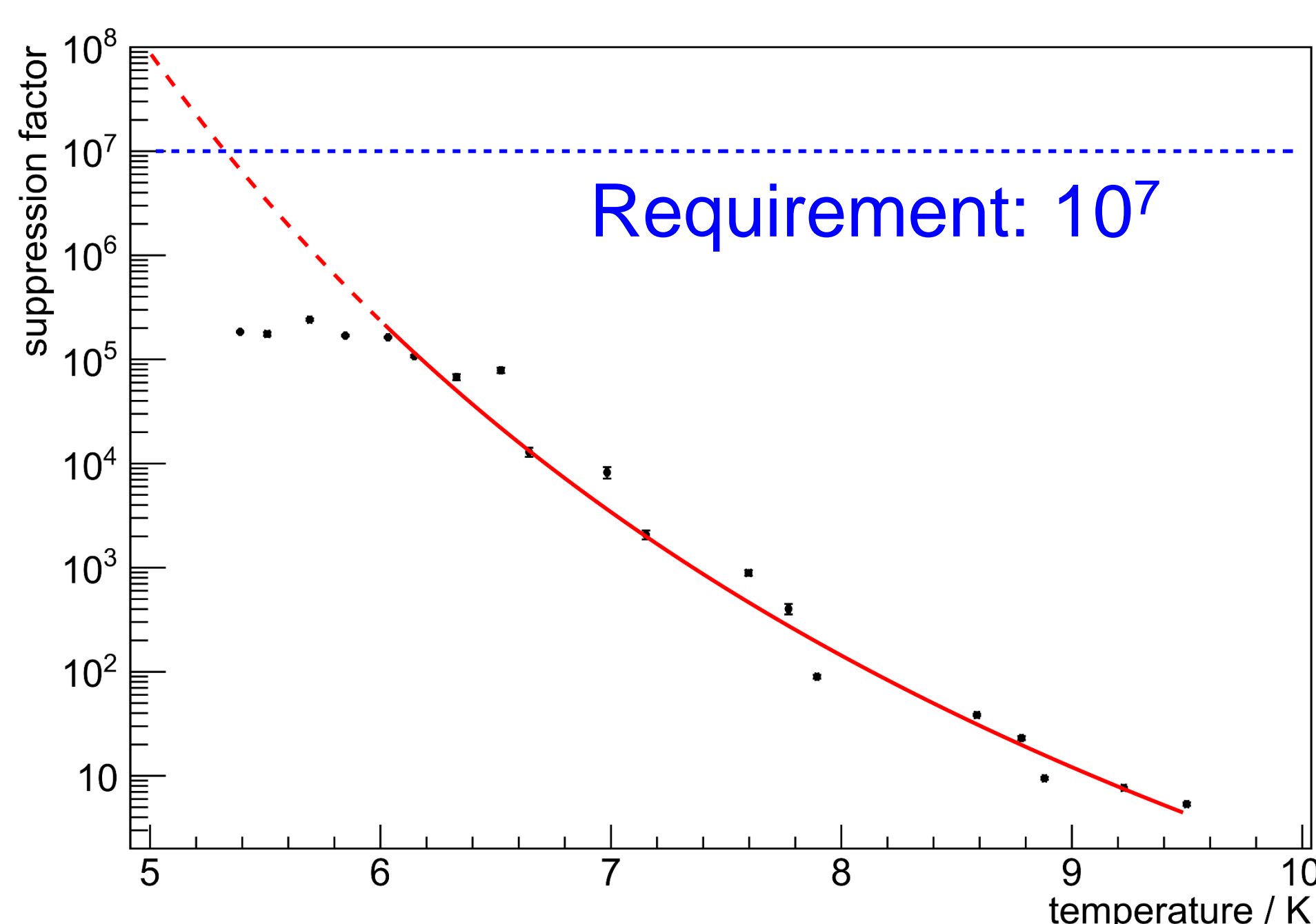
Performance of argon frost layer



- Injected deuterium pV amount equivalent to 5 KATRIN lifecycles
- Successful demonstration of CPS design performance
→ higher sensitivity with tritium operation



Temperature dependence investigation



- Retention directly correlated to the temperature:
→ retention factor $\propto \exp\left(\frac{E_B}{RT}\right)$
- Pressure gauge behind PP2 sensitive only above 6 K
- Expected temperature dependency confirmed
- Extrapolated retention factor when operated in standard 3 K mode:
 $R \approx 10^{15}$
→ limited by β -induced desorption

CPS exceeds specifications by 8 orders of magnitude