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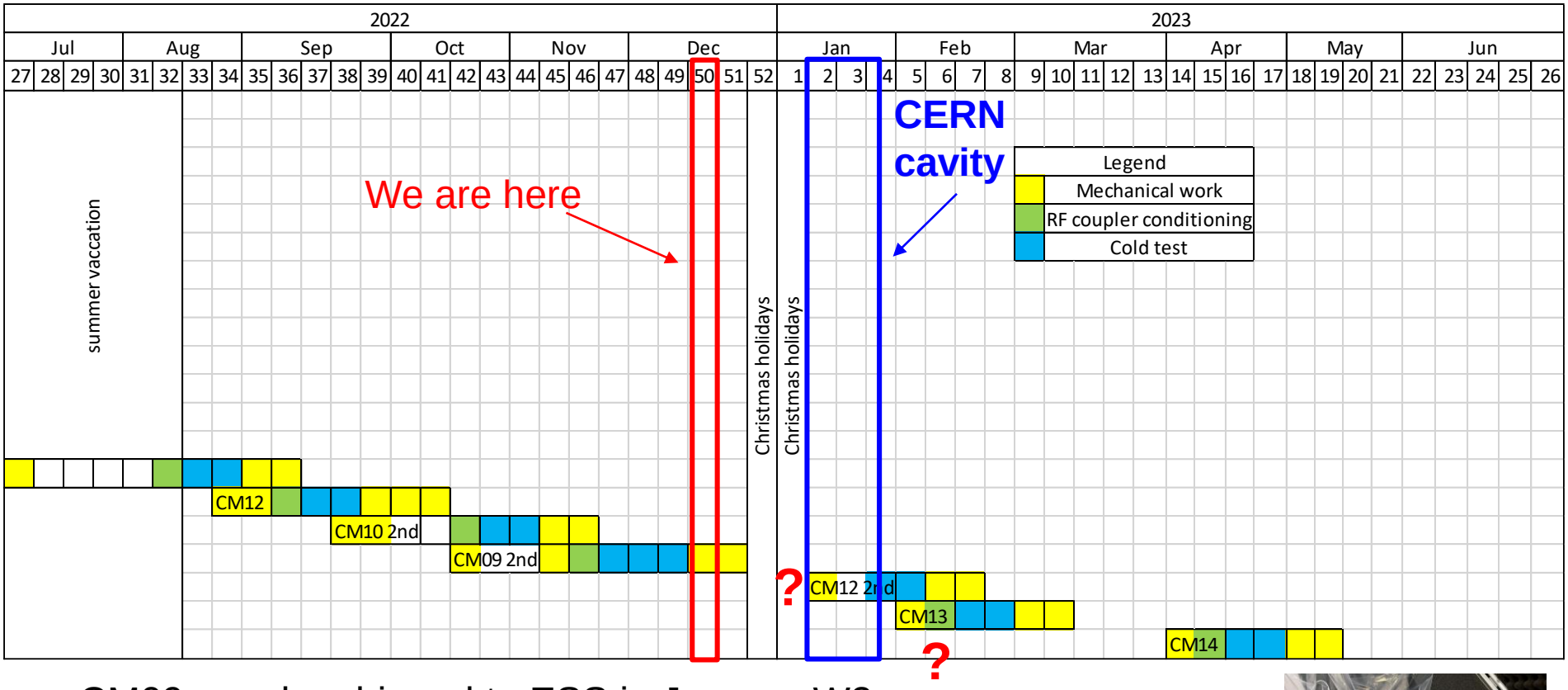
ESS weekly meeting (2022 W50)

A. Miyazaki et al

Global planning



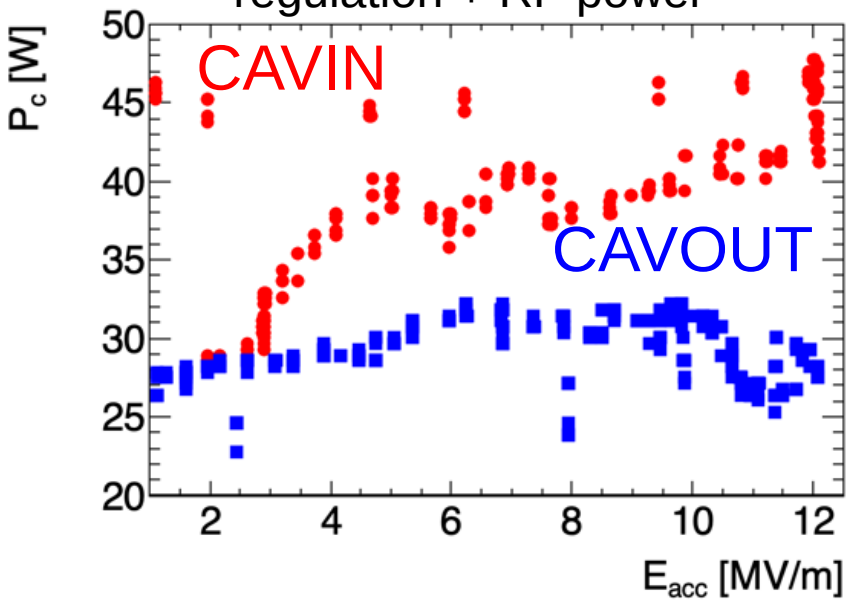
- CM09 may be shipped to ESS in January W3
- FREIA will measure CERN HL-LHC crab cavity in W2, W3, and probably W4 in our vertical cryostat
- Do we need cold leak test of CM12? (→ see this presentation)
- CM13?
  - Preparation work and coupler conditioning can be done in parallel to the cryogenic operation in the vertical cryostats

CM09_2: heat loads & field emission

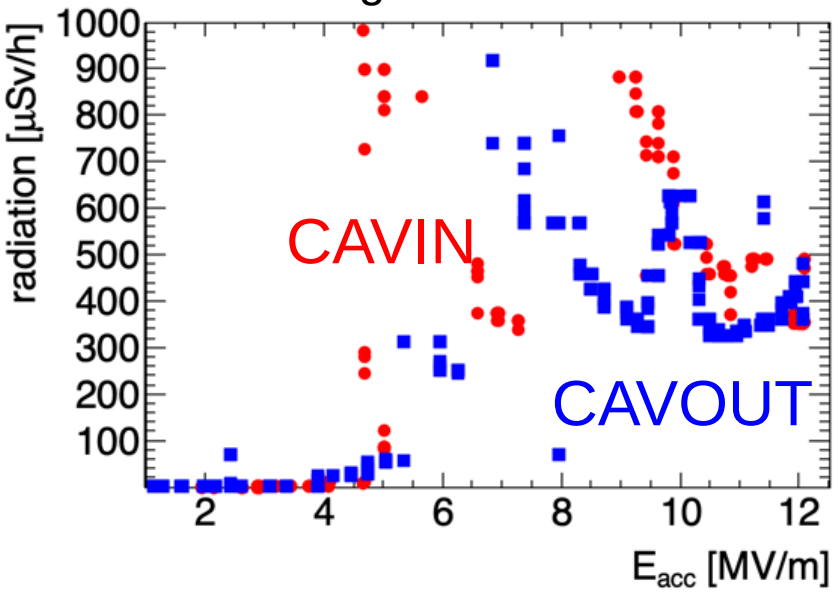
Cav IN [MV/m]	0	0	9	9	9	12	0	0	9	0
Cav Out [MV/m]	0	0	9	0	0	0	9	12	9	0
FT551 [m3/h]	18,23	18,98	17,87	18,09	18,24	17,71	17,64	17,79	18,41	17,62
HL [W]	19,32	20,32	19,12	19,36	19,52	18,95	18,86	19,03	19,7	18,86
std [W]	0,8	0,43	0,67	1,8	0,94	0,43	0,5	0,56	0,94	1,21
CTS	No	yes	yes	yes	yes	yes	yes	yes	yes	yes

- Static heat load seems higher than usual
- RF heat load is not visible

- Static heat load + JT valve regulation + RF power



- We did not observe any strong field emission



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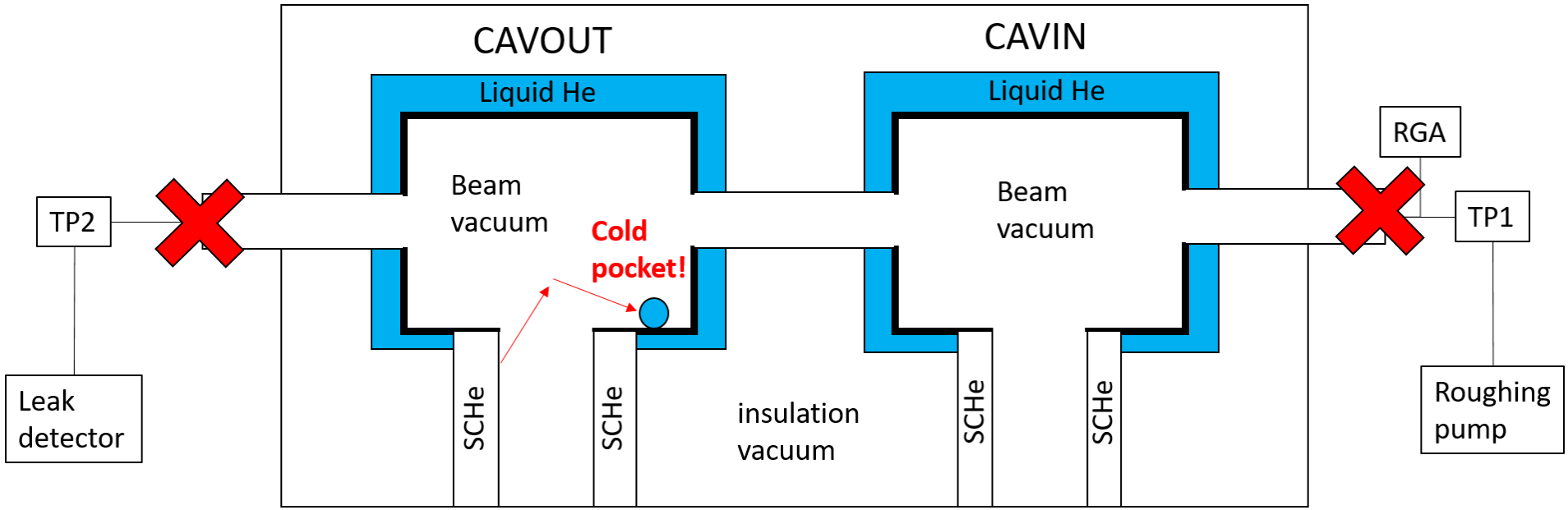
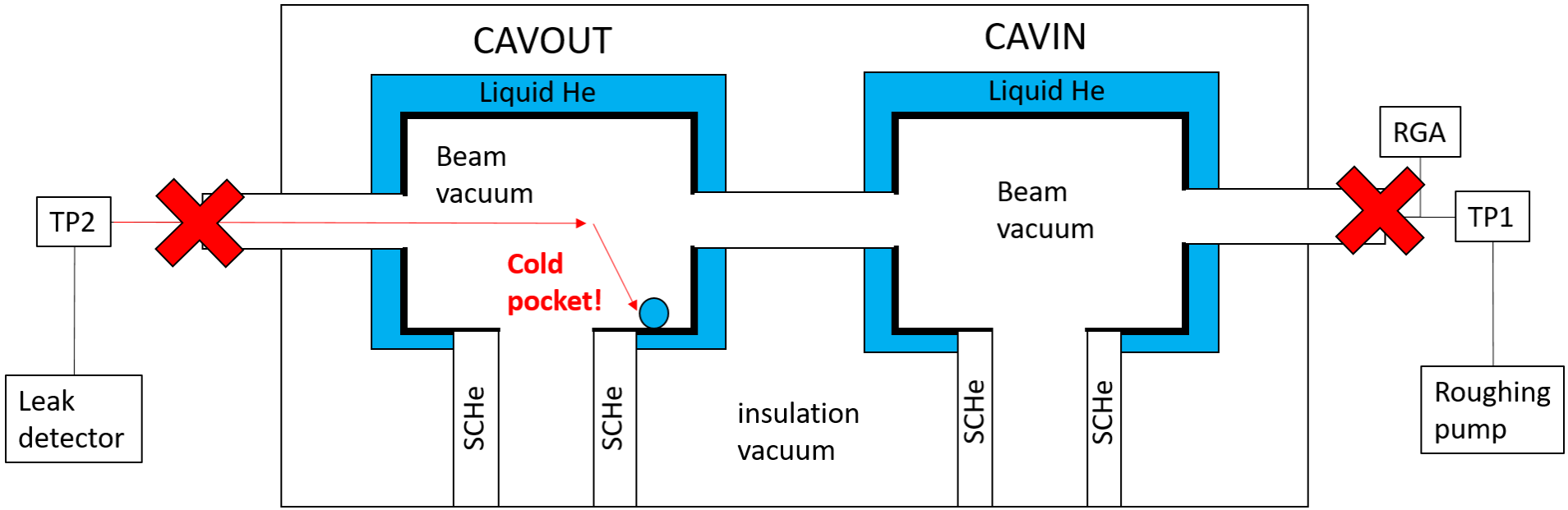
Leak test at cold via helium desorption

Closed the angle valves



If the accumulated helium is from inside the cryomodule i.e. leak somewhere, the helium signal at 13 K will be enhanced

Another scenario: back stream from TP

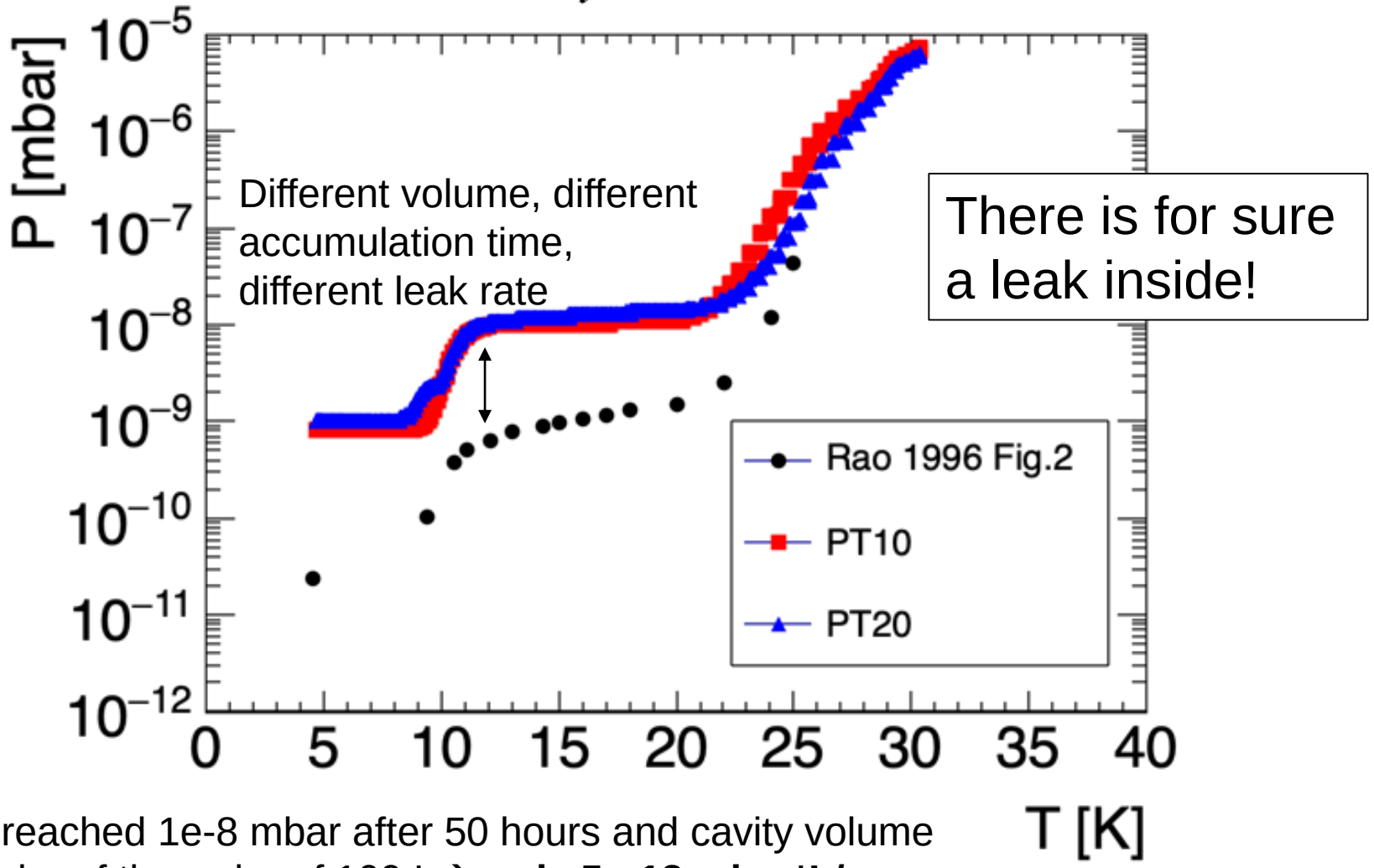


If the accumulated helium is from the back stream of TPs, we should not see the helium signal when cavities are warmed up to 13 K

Results (50 hours below 10 K)

observable

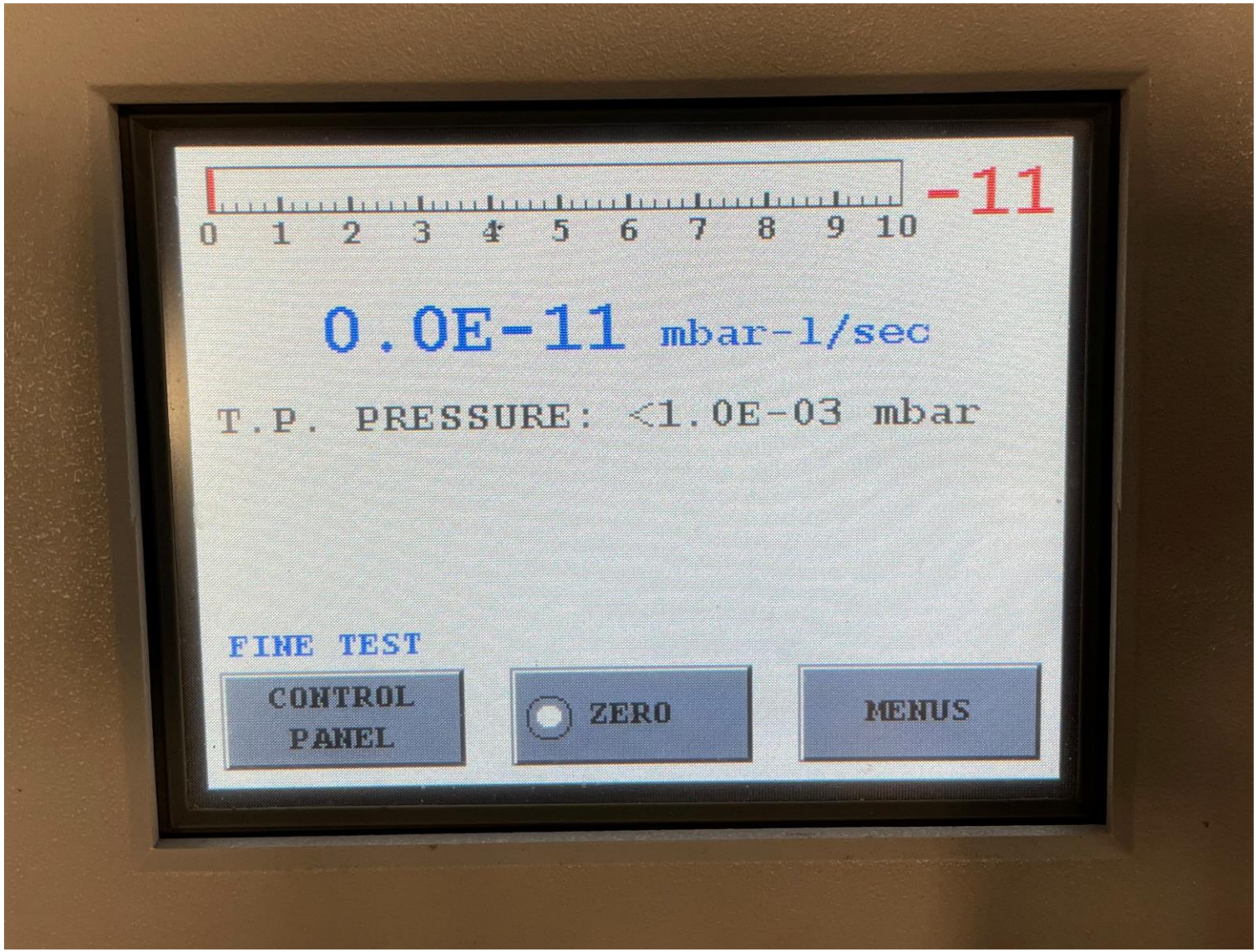
$$\text{Leak rate} = \frac{P}{t}\left[V_{RT} + (T_{RT}/T_C)^{1/2} V_C\right],$$



There is for sure a leak inside!

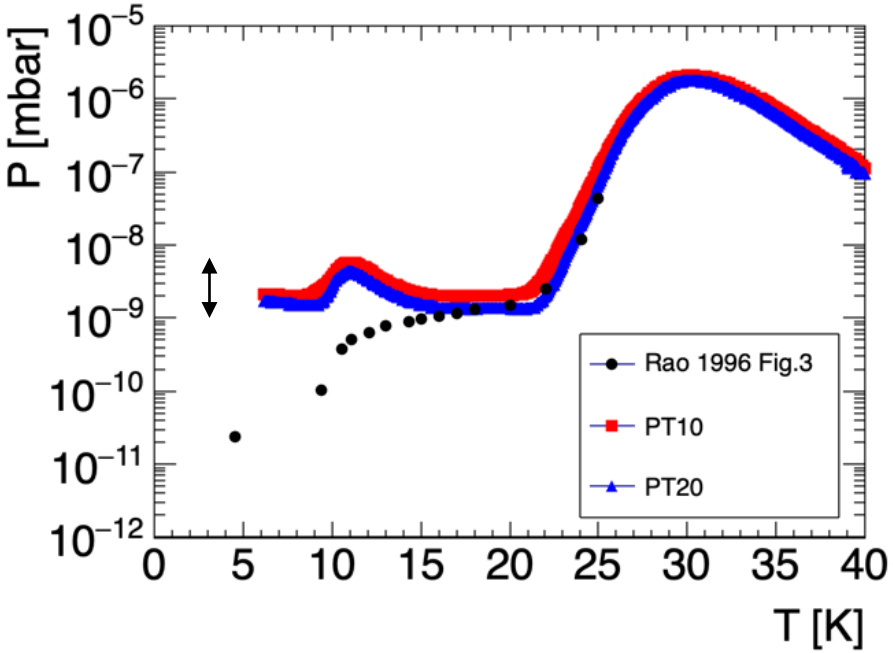
We reached 1e-8 mbar after 50 hours and cavity volume may be of the order of 100 L→ **only 5e-12 mbar*L/s**

CM09_2: leak test after warming up

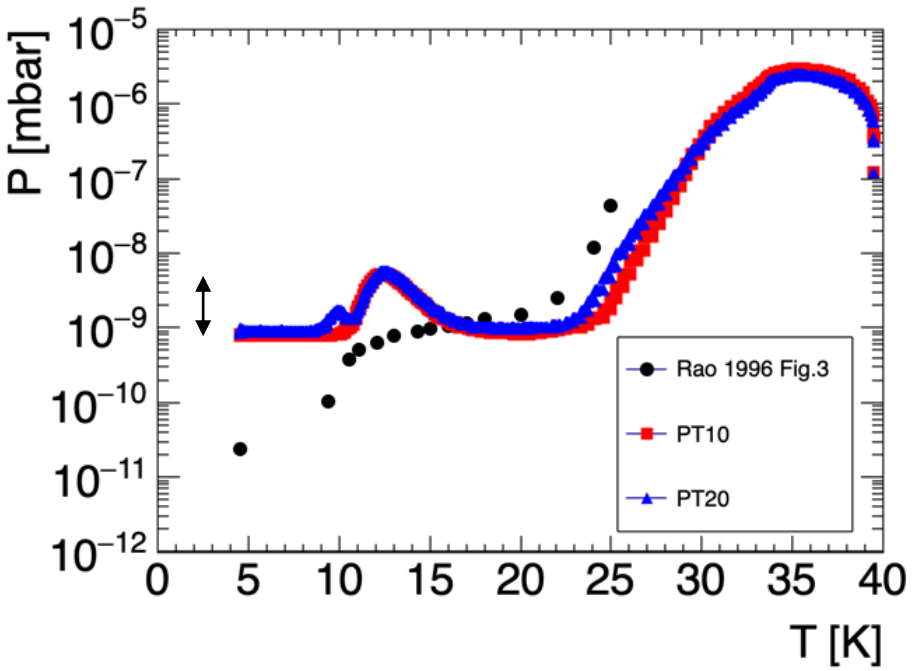


Comparison: CM12 and CM09_2

CM12: after 10 days below 10 K



CM09_2: after 2.5 days below 10 K

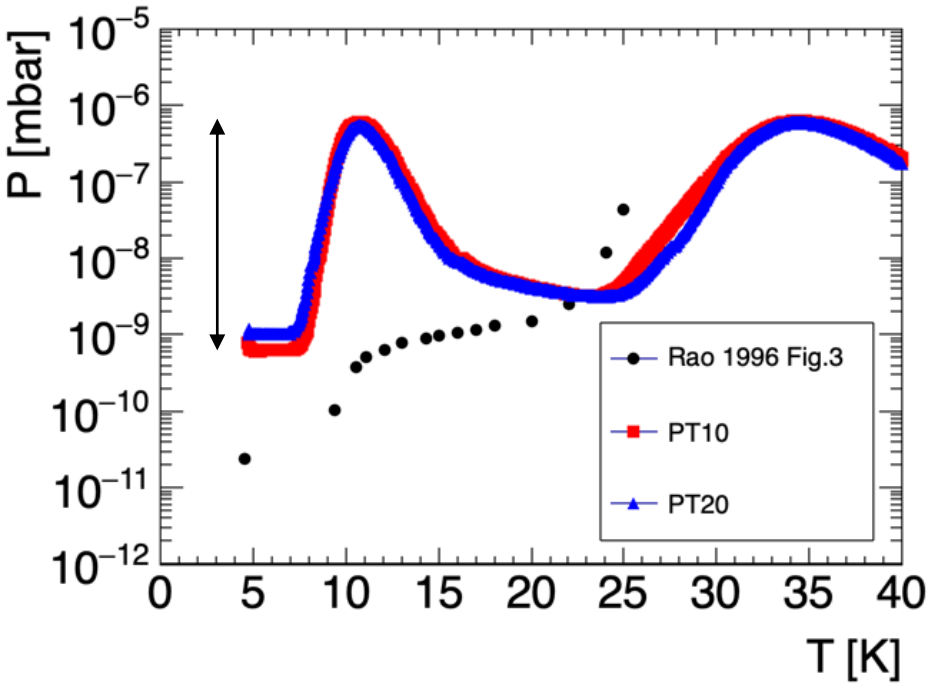


- Angle valve open in both cases (no closed data in CM12…)
- The order of magnitude of the helium signal is the same
  - The signal is smaller with longer accumulation in CM12

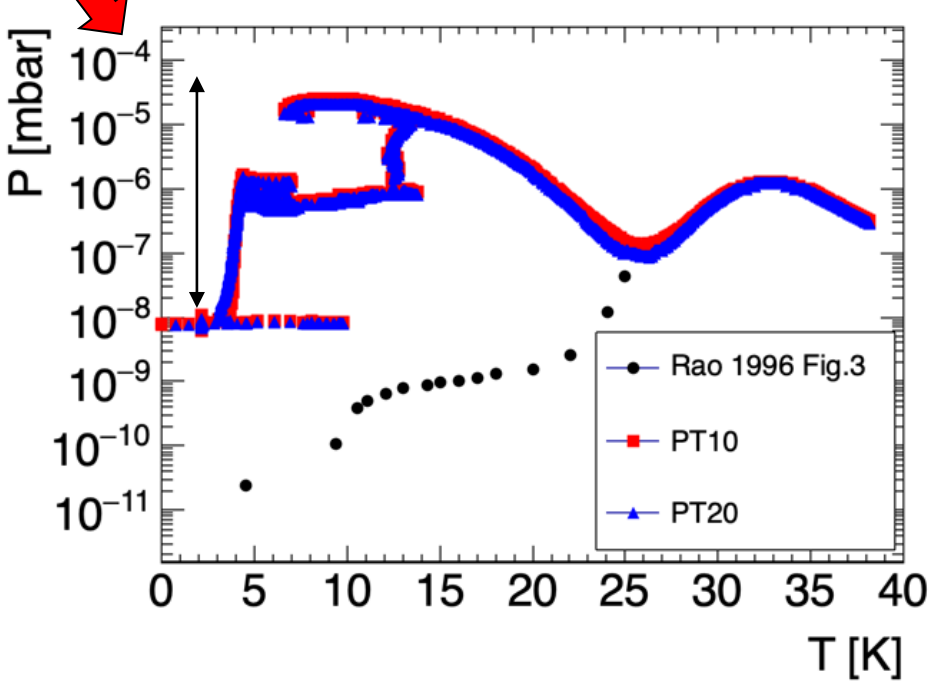
  → Maybe the leak is even smaller
- We may not need to redo CM12 cold test

Cf. CM09 (1st test) and CM04 (1st test)

CM09: after 9 days below 10 K



CM04: after 7 days below 10 K



- CM09 1st test → The leak was confirmed at warm
- CM04 1st test → Penning gauge observed gradual increase in beam vacuum over 1-2 weeks