GAS SYSTEM REPORT

AMS
TRD MEETING
Rome 19-20 October 2005

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Engineering Box S Status

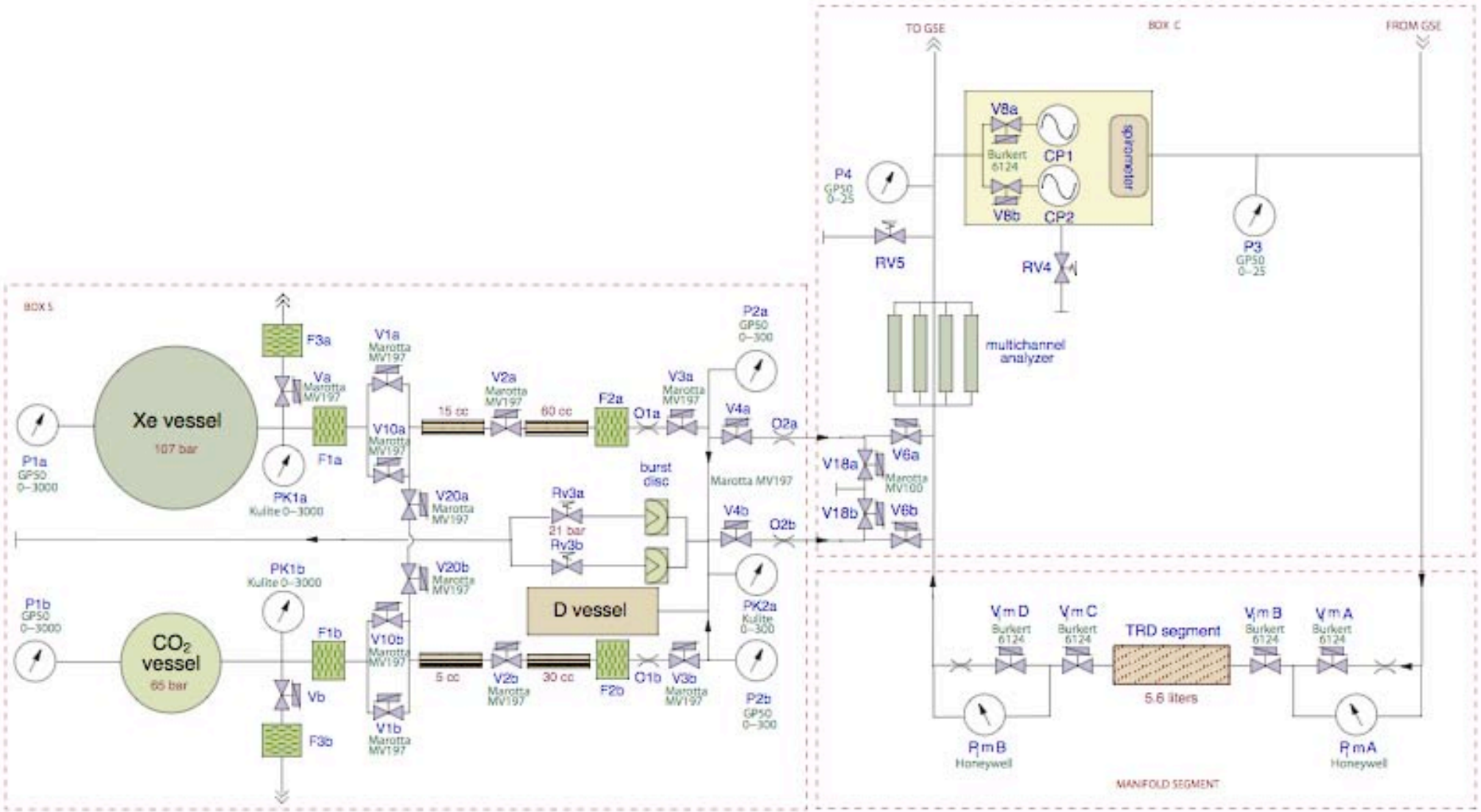
- USCM & can-box from Rome connected
  (no cables for MIT's)
- Dallas sensors: direct connection to USCM
- Gas bottles: Ar used instead of Xe

Filling status

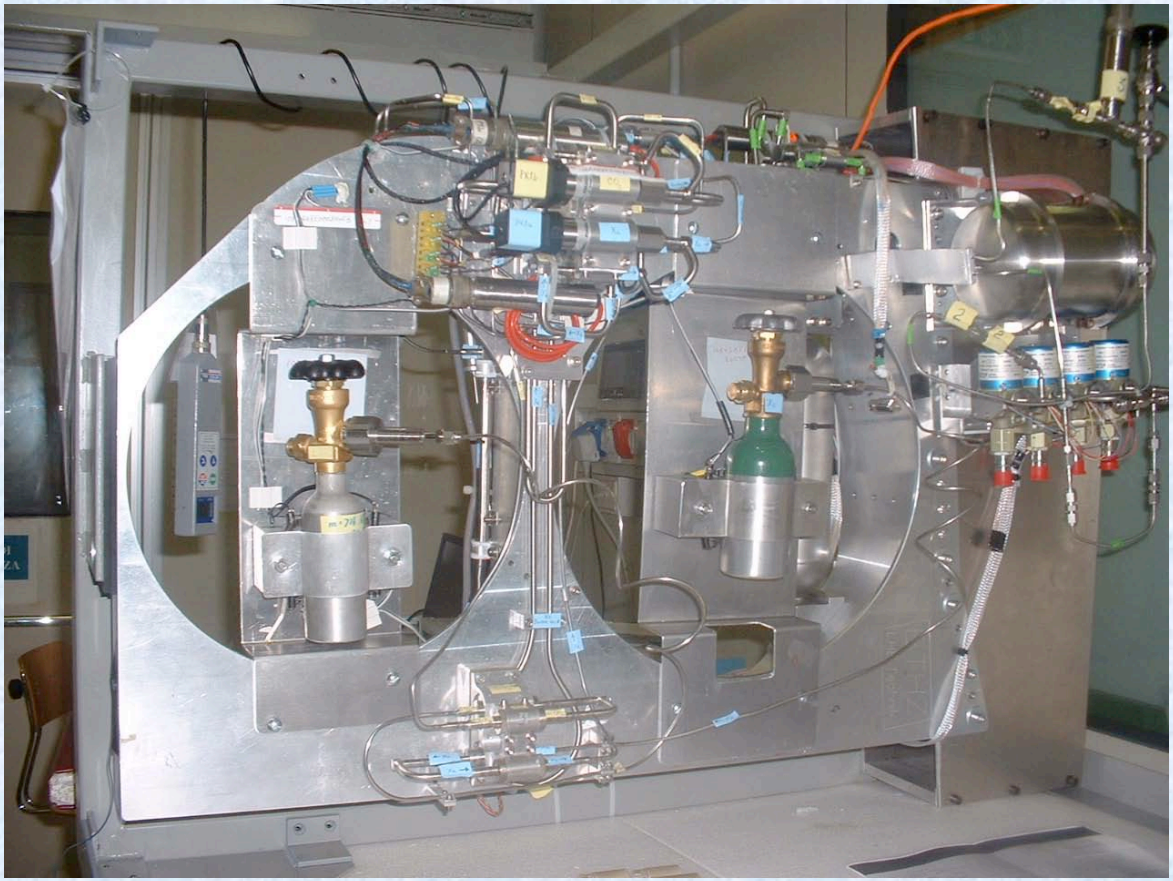
Ar 105 bar @ 21 °C V = 300ml □ = 4,3mol/l

CO_2 57 bar @ 21 °C V = 150,5ml □ = 9,7mol/l

Gas system circuit



- 9 MV197 connected (V1a, V1b, V2a, V2b, V3a, V3b, V4a, V20a, V20b)
- Heaters instead of V10a & V10b in the bottles' supports
- GP:50 P2b not connected
- 9 Dallas connected



Test performed

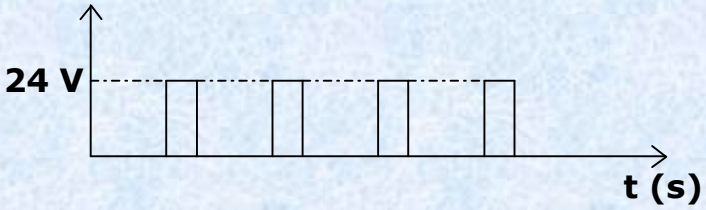
- Operating valves both manually (control box) & via electronics
- Heating Ar & CO_2 bottles
- Dallas sensors readings
- Pressure sensors readings

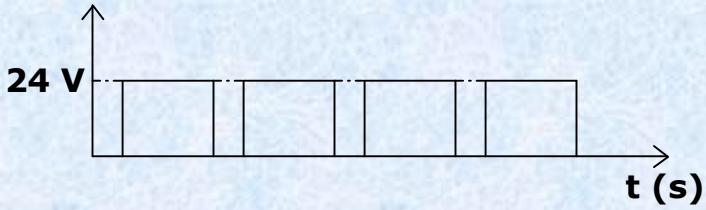
Valves

- Operated manually & via software succesfully
- Checked working status by clicks listening & leds lighting up
- V20a not working (no valve, no led): 2 pins missing on the connector
- Replaced leds on the line of V1a, V20b
- Checked the lines of disconnected stuff (V10 a&b: heaters now) by leds lighting up

Heaters & Dallas

- Operated Ar & CO_2 heaters via software
- Heated Ar bottle to 24 °C changing duty from 30% to 80% (full scale 6W)





- Read out Ar Dallas to show temperature increase
- Read out all dallas succesfully with increased accuracy (1/16 °C)

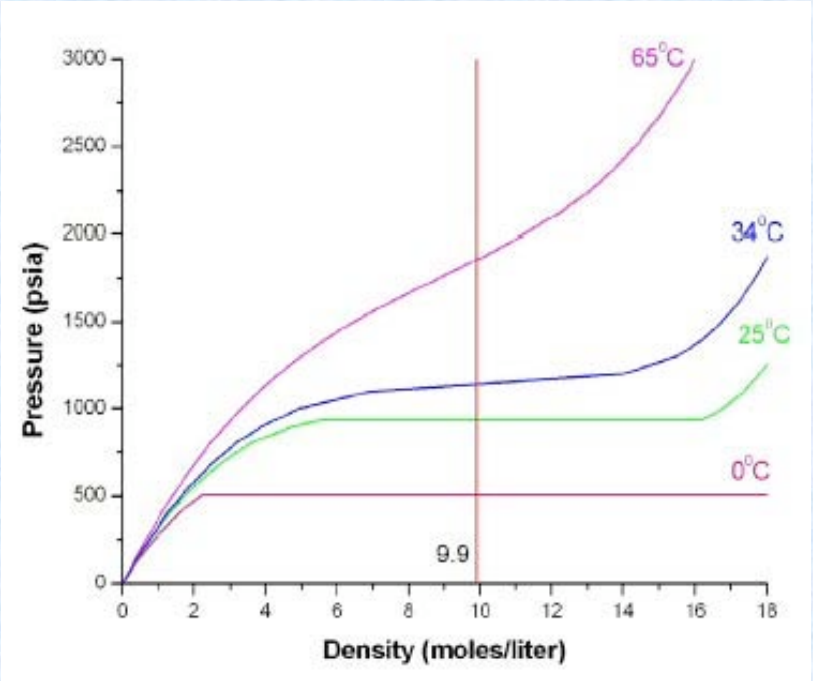
Pressure sensors

- Connected 24V & checked current
- First measurement predicted temperature

DVM: P1b ~ 1144mV = 750,17 psia

T ~ 16 °C

(NIST CO_2 isothermal properties)

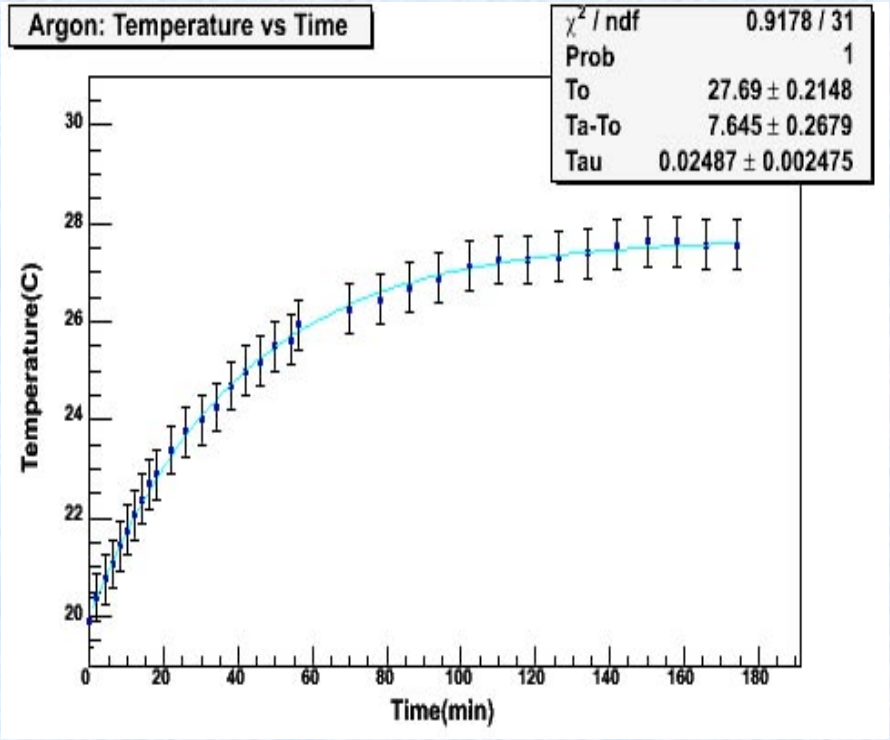


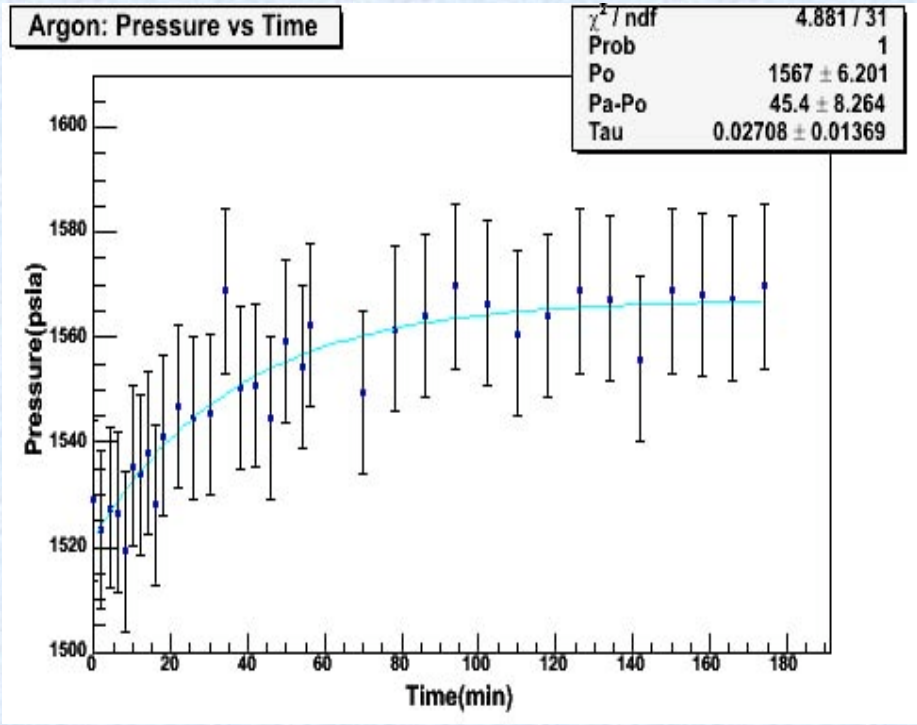
Discrepancy with other measurements:

clean room thermometer	~ 20 °C
Dallas sensors	~ 20 °C
DVM probe	~ 17 °C

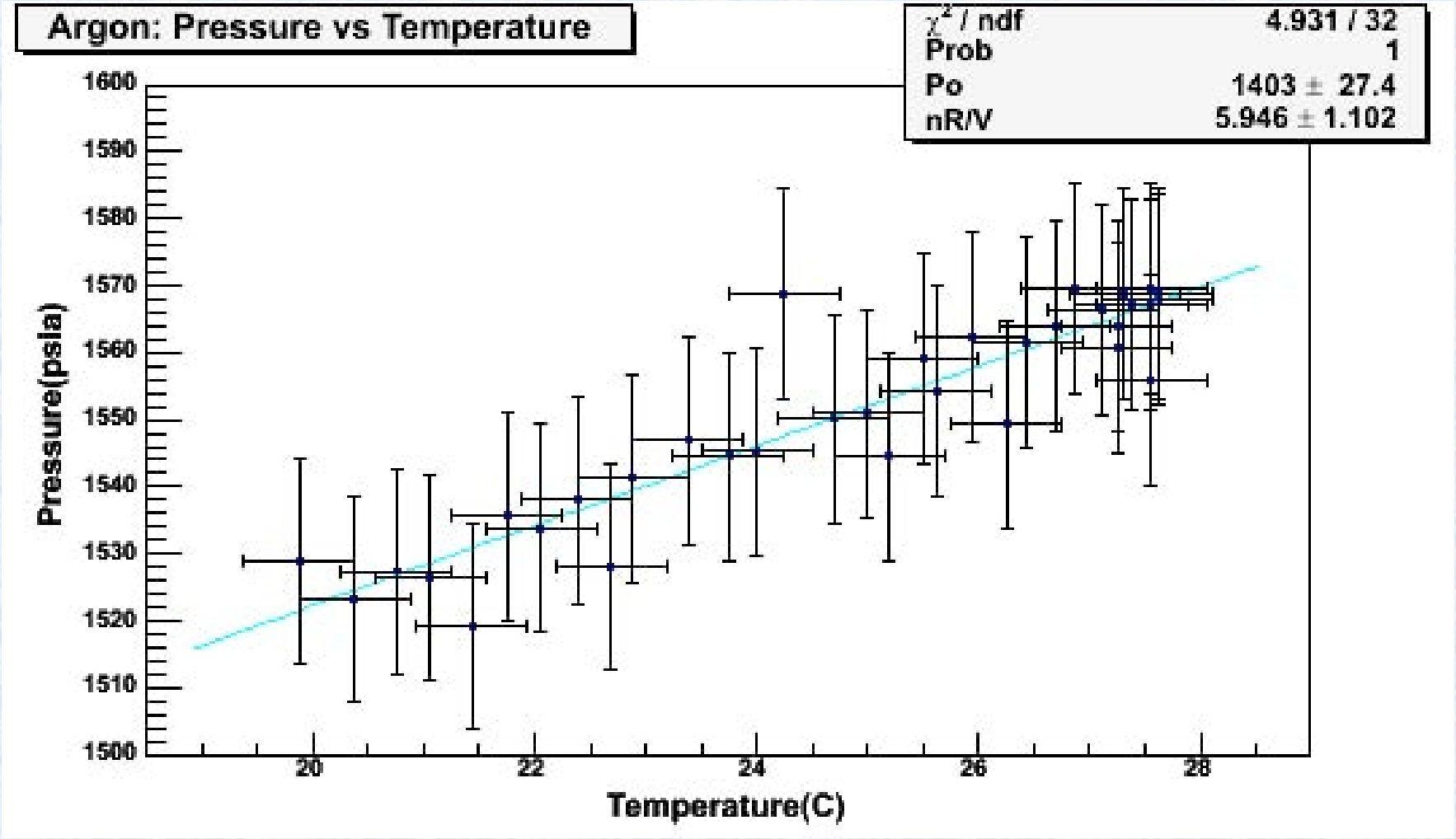
- Better in future (Pt thermometer)

- Ar: heated bottle at 80% duty & measured temperature and preassure



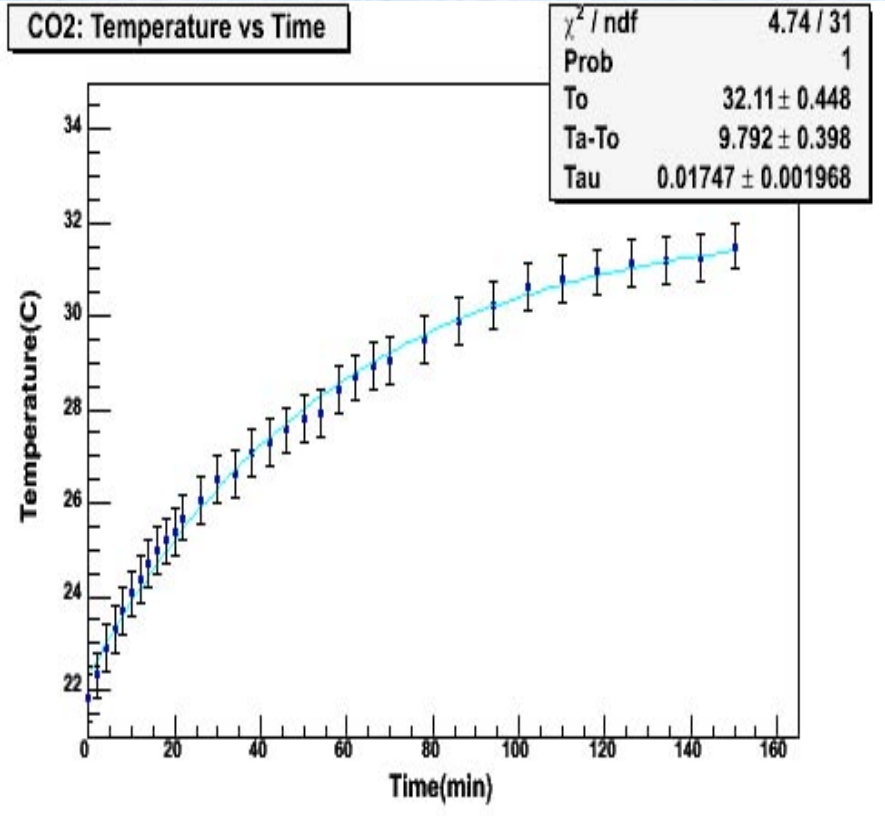


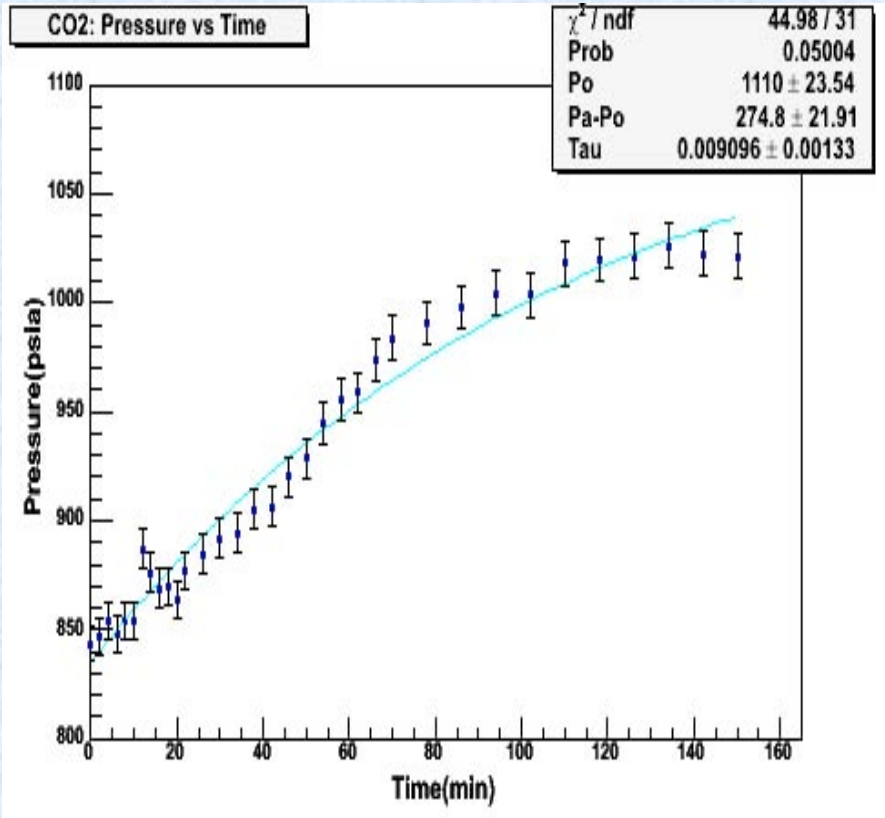
Stabilized for heat loss


Argon: Pressure vs Temperature
χ² / ndf 4.931 / 32
Prob 1
Po 1403 ± 27.4
nR/V 5.946 ± 1.102
Pressure(psia)
1600
1590
1580
1570
1560
1550
1540
1530
1520
1510
1500
20
22
24
26
28
Temperature(C)

Ar: ideal gas

- CO_2: heated bottle at 80% duty & measured temperature and preassure





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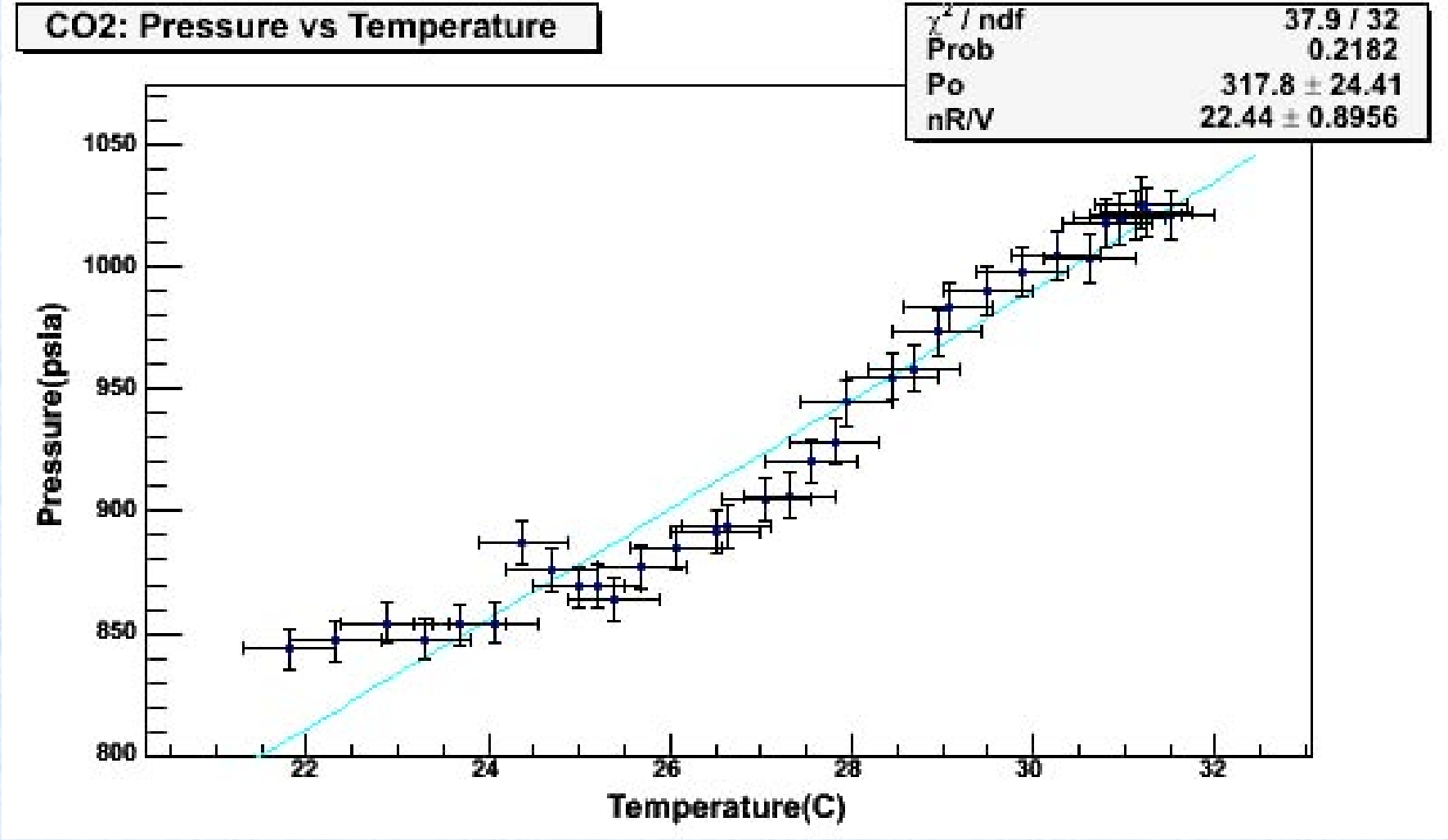


CO_2: non ideal

To do…

- Dallas calibration (using Pt thermometers)
- Controlling mixing procedure via software
- n shots of Ar, m shots of CO_2 to reach 80:20 mixture (partial preassures method)
- Operate pumps in box C
- Circulate gas through the circuit (TRD simulated by a 5l vessel)
- Spirometer reading of gases' %

Notes

- Most important: simulation of 1% life cycle under computer control only 10 days per cycle due to same mol/l but 1% volume
- No possibility to reach 80:20 mix exactly

  reason: bigger loss of CO_2 ⟶ never ideal mix.
  Adjusted mixture with the accuracy limits needed
- Calculating residual gas quantity in primary bottles

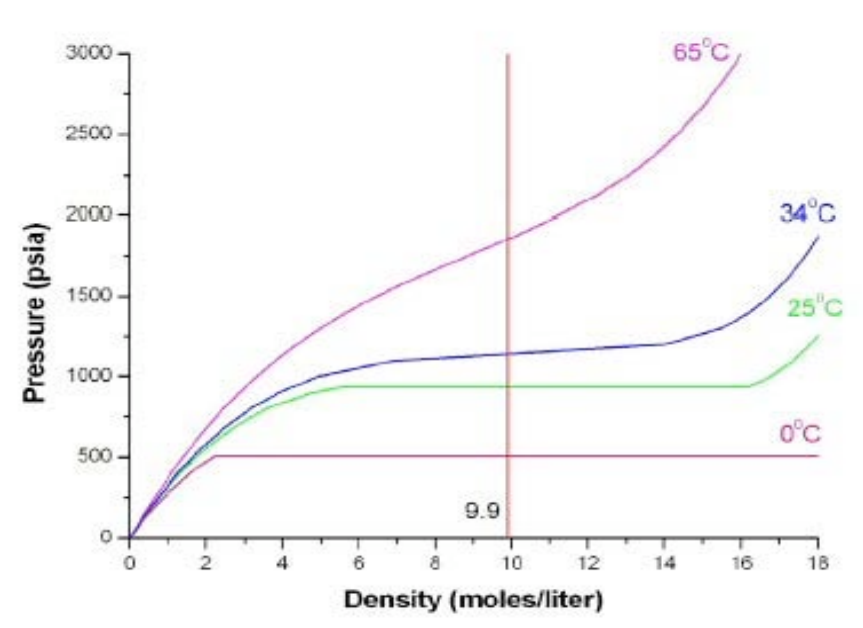
  small pressure's variation corresponding to large density variation (NIST isothermal properties) ⇨ heating needed

- Need to take Xe over 22°C & CO_2 over 34°C
- Careful temperature's readings needed

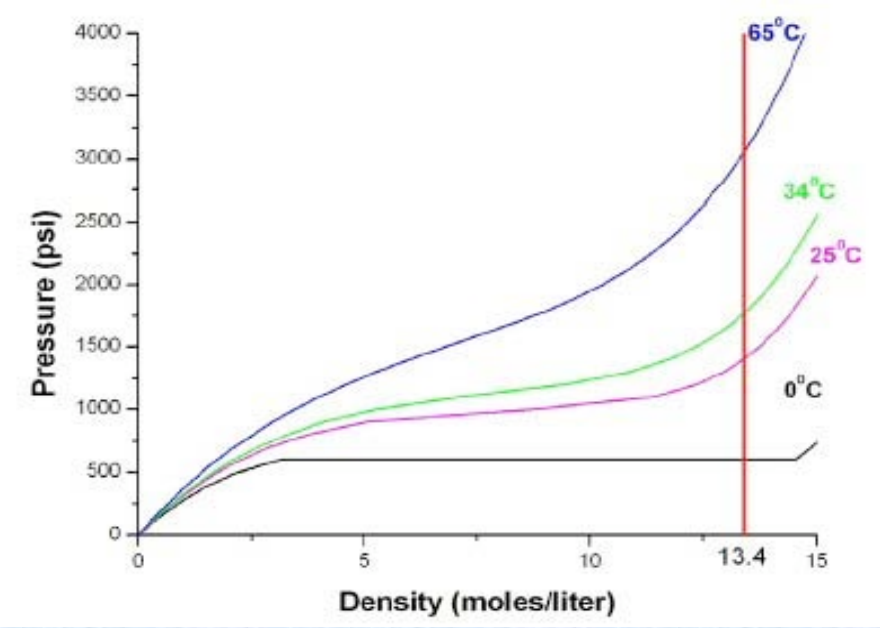
  reason: pressure increases fastly with

  temperature ⇨ risk of explosion

CO2 isothermal properties (NIST)



Xe isothermal properties (NIST)



Summary

- We can operate valves, T & P sensors via software
- First measurements are reasonable
- Working on box C now: pumps got running yesterday (Mariusz Sapinski & Carlo Bosio)
- Next: do 1% life cycle tests