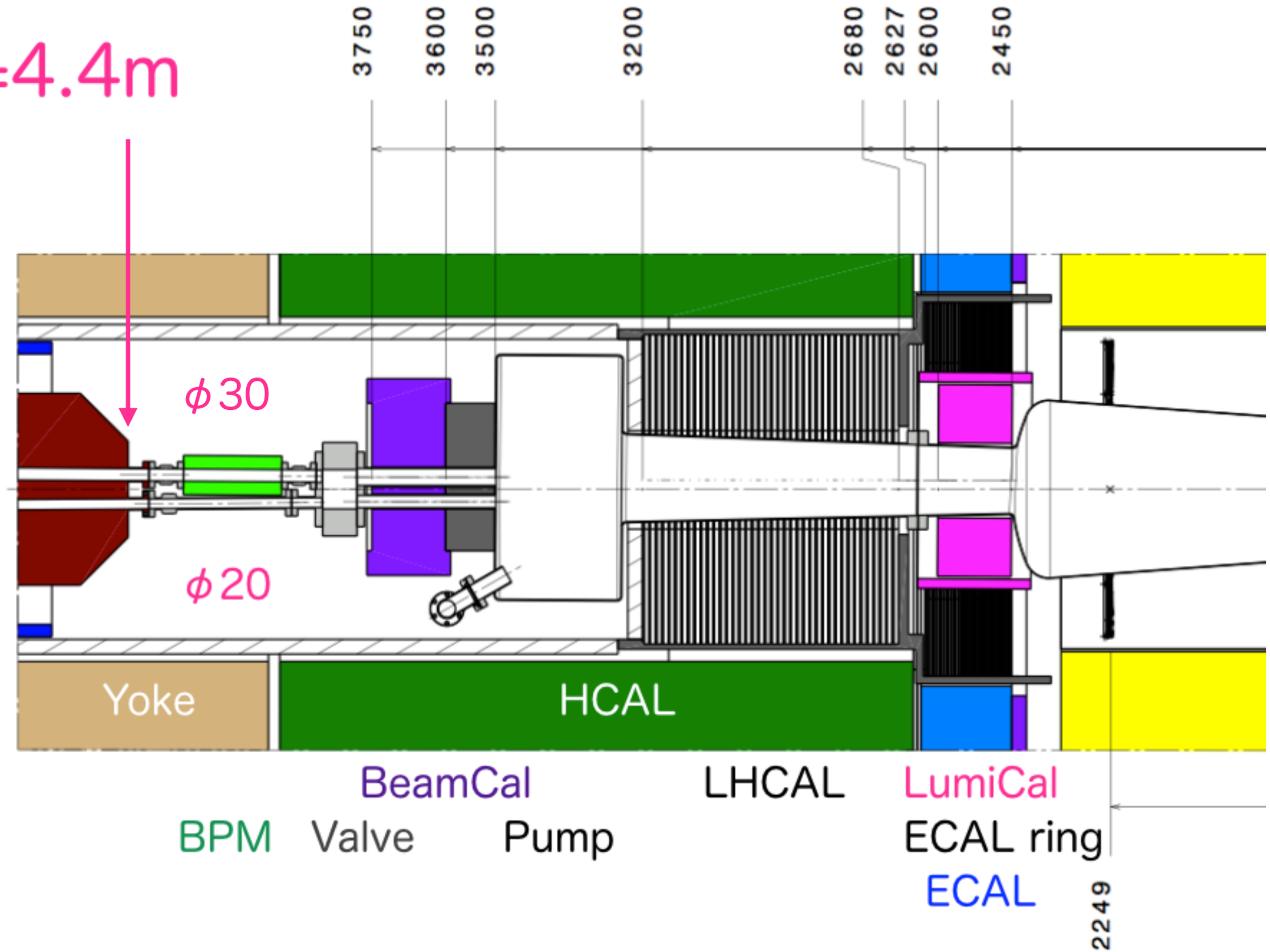
Vacuum pressure in ILD-IR

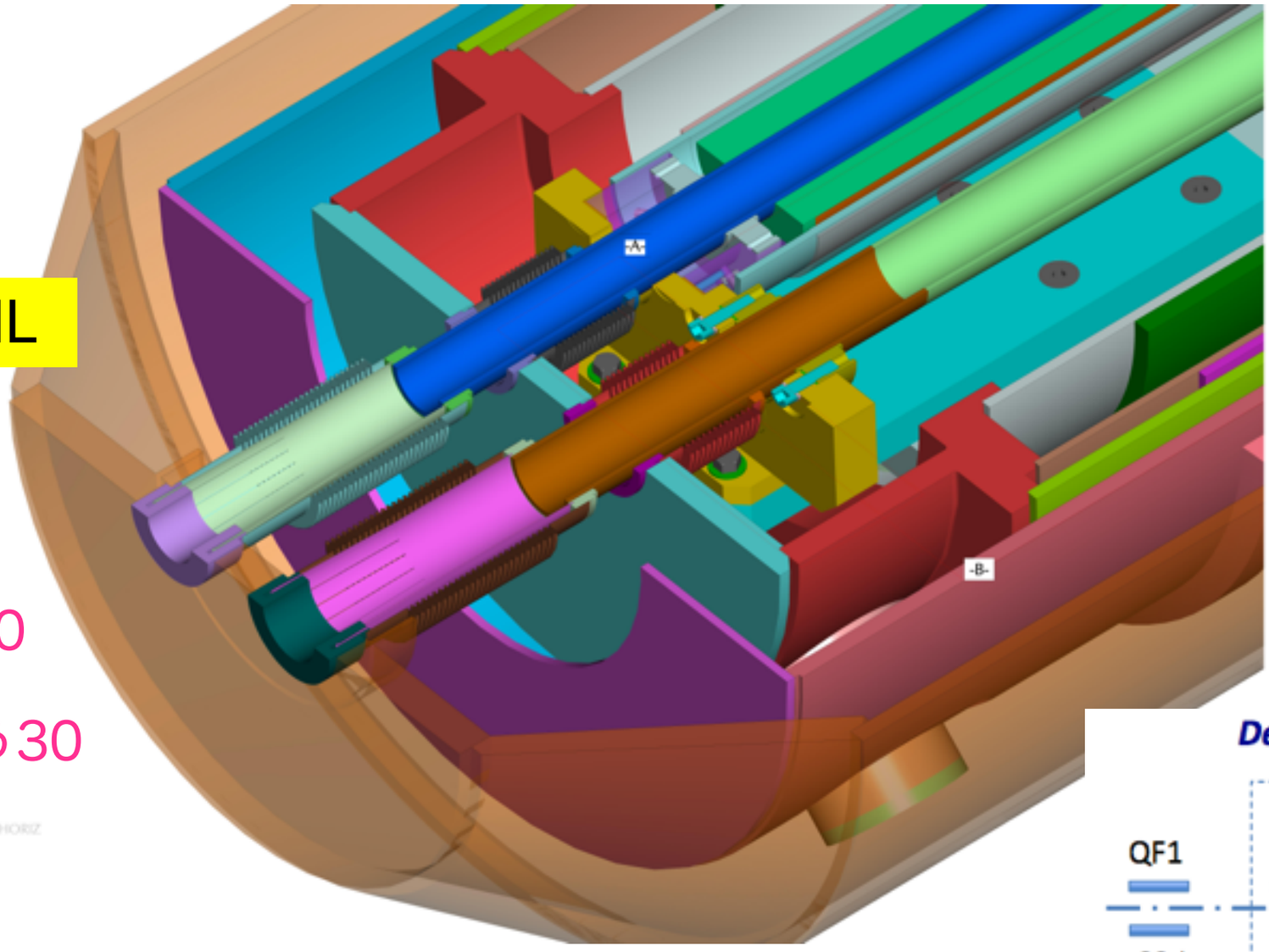
Y. Suetsugu and T. Tauchi, ILD Integration Discussion, 15 December, 2014

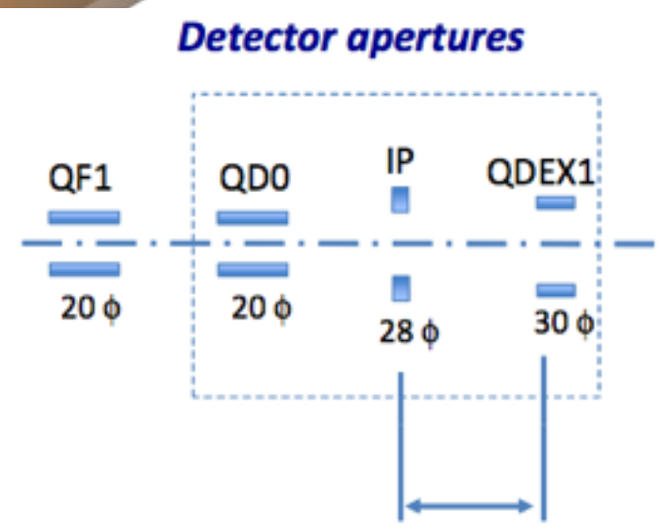
L*=4.4m


3750
3600
3500
3200
2680
2627
2600
2450
ϕ30
ϕ20
Yoke
HCAL
BeamCal
LHCAL
LumiCal
BPM
Valve
Pump
ECAL ring
ECAL
2249

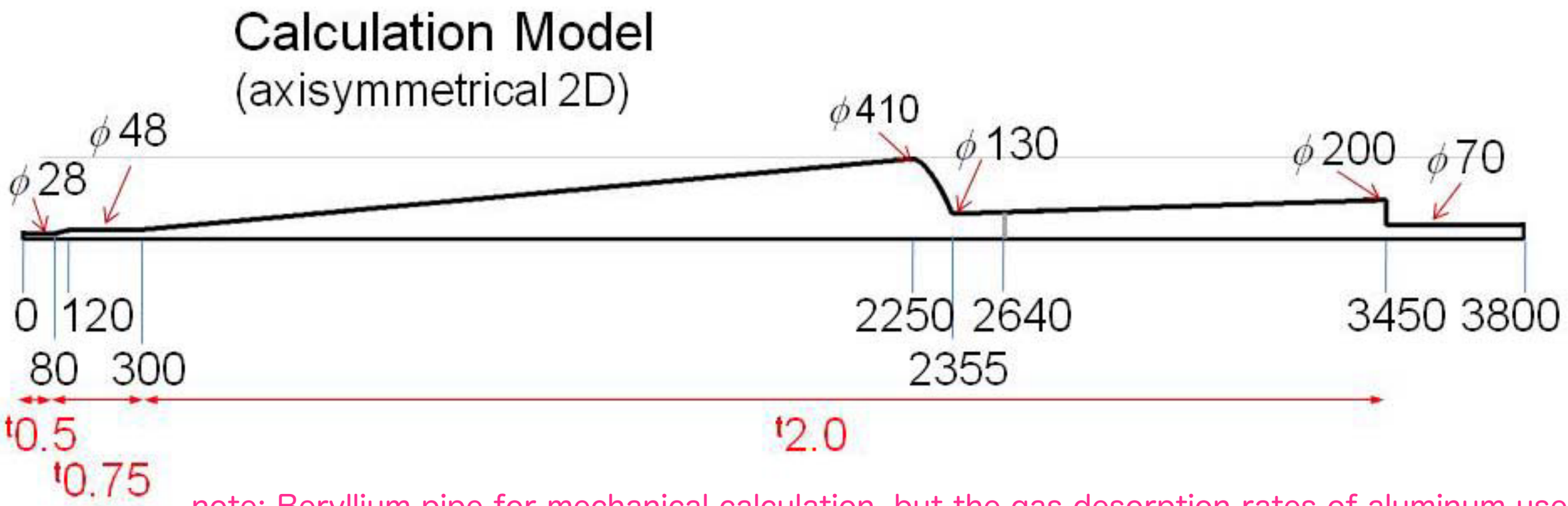
QD0 Cutaway

Andy Marone/BNL

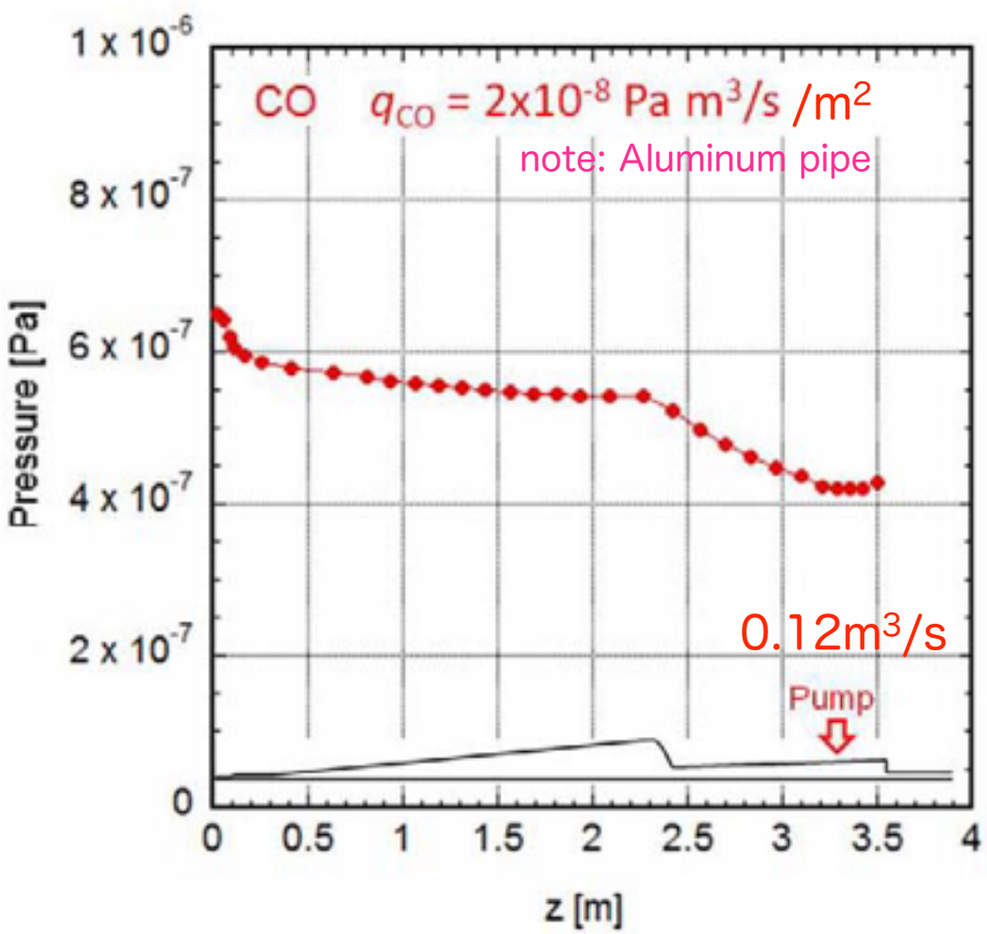


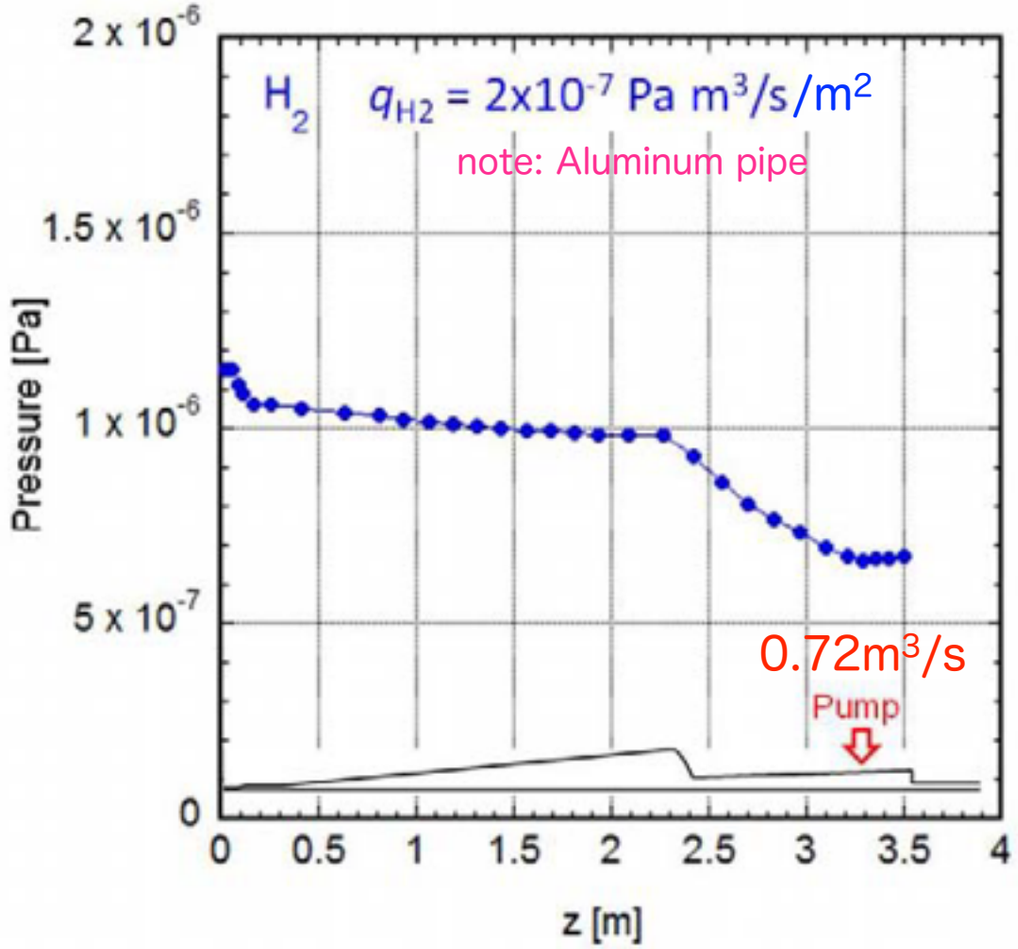


T. Markiewicz/SLAC

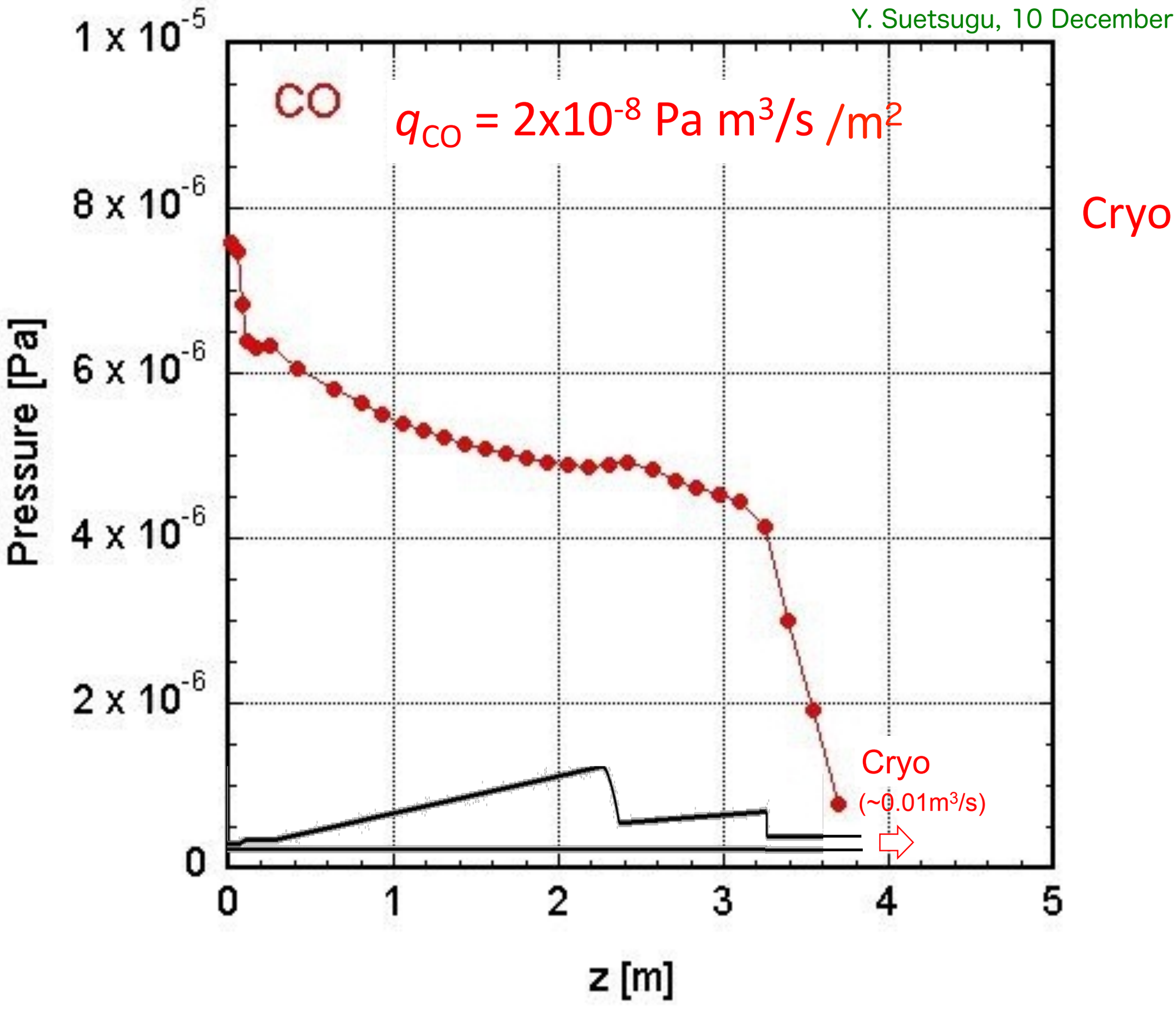


note: Beryllium pipe for mechanical calculation, but the gas desorption rates of aluminum used

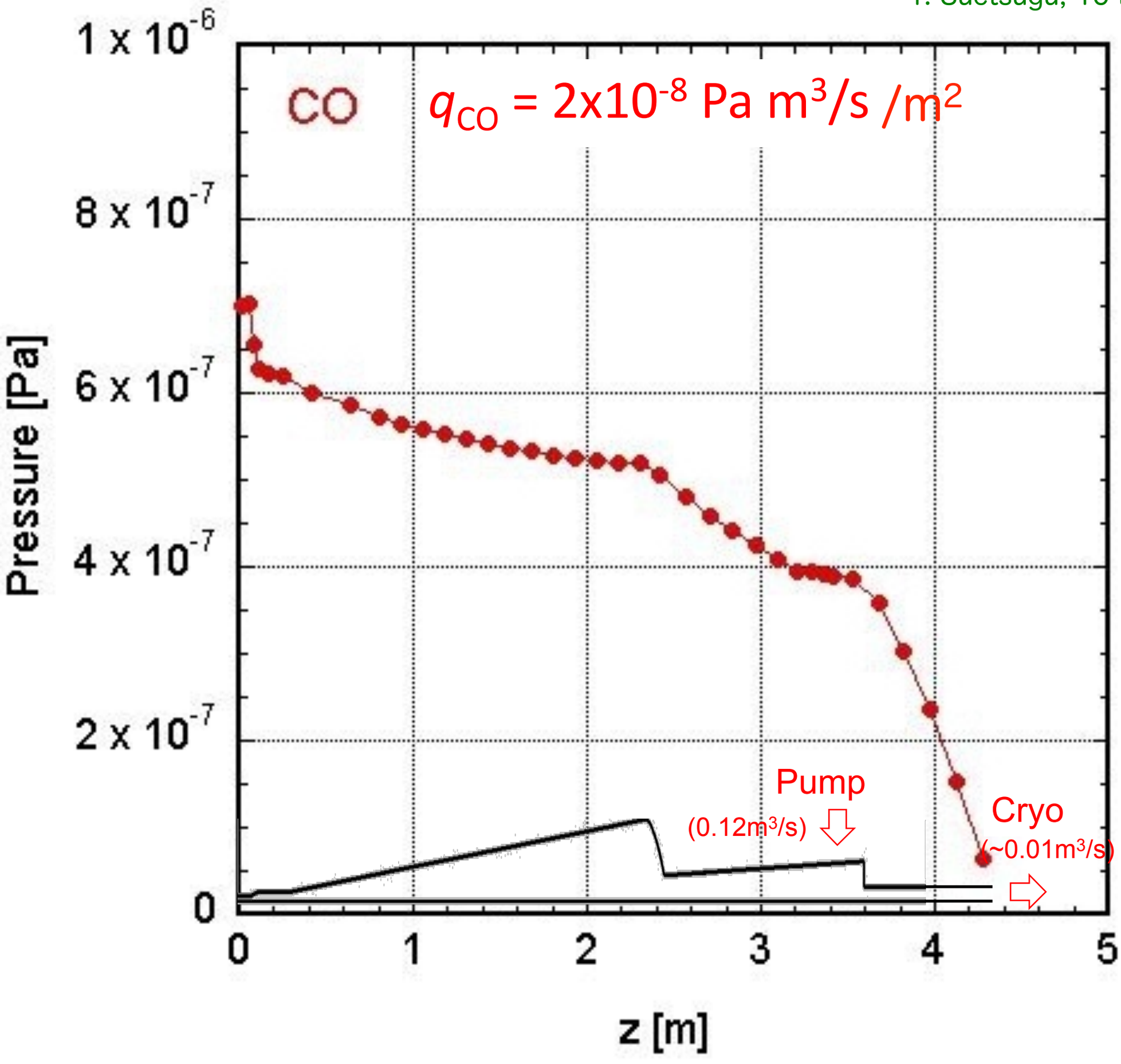




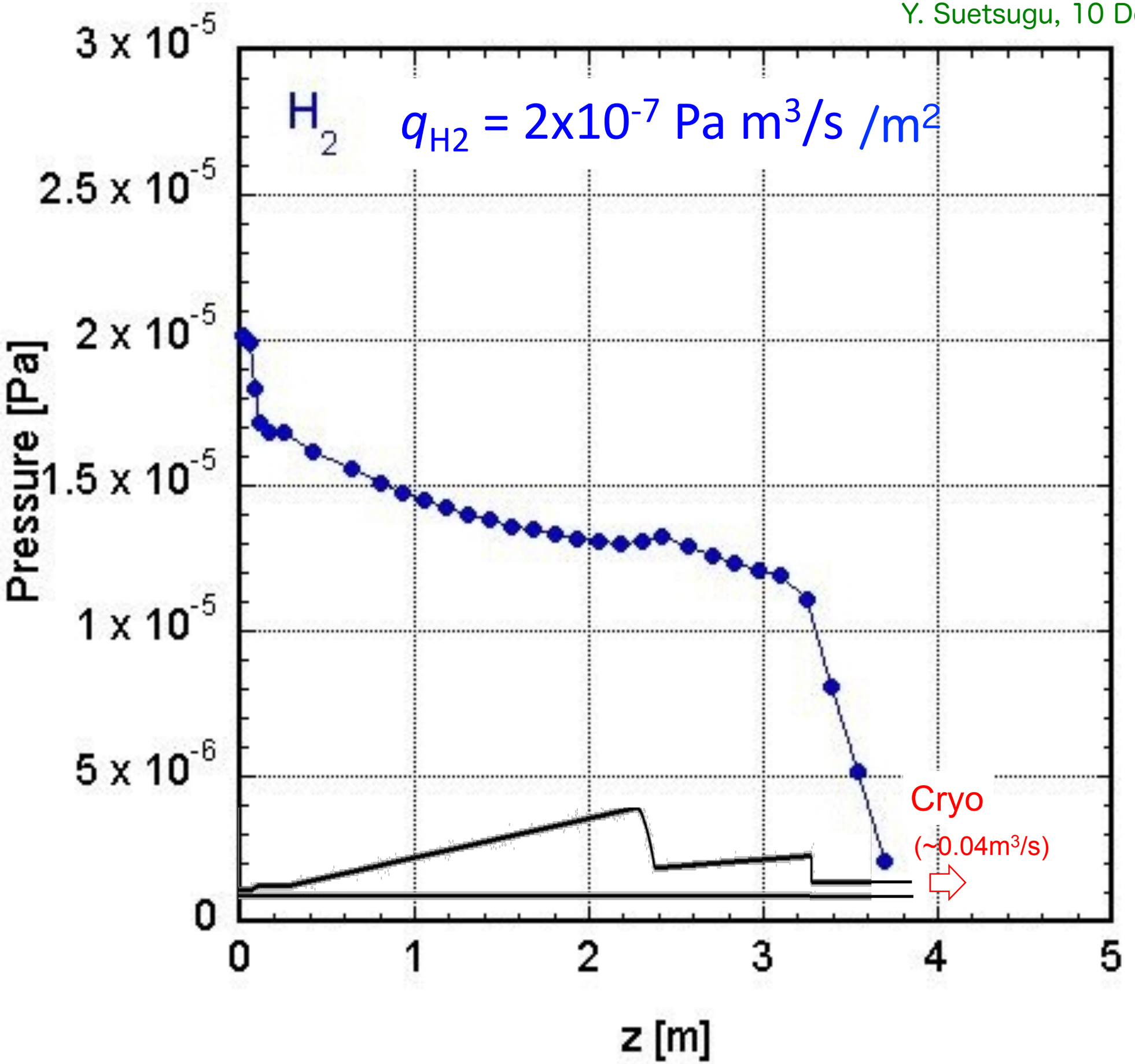
Y. Suetsugu, 10 December 2014



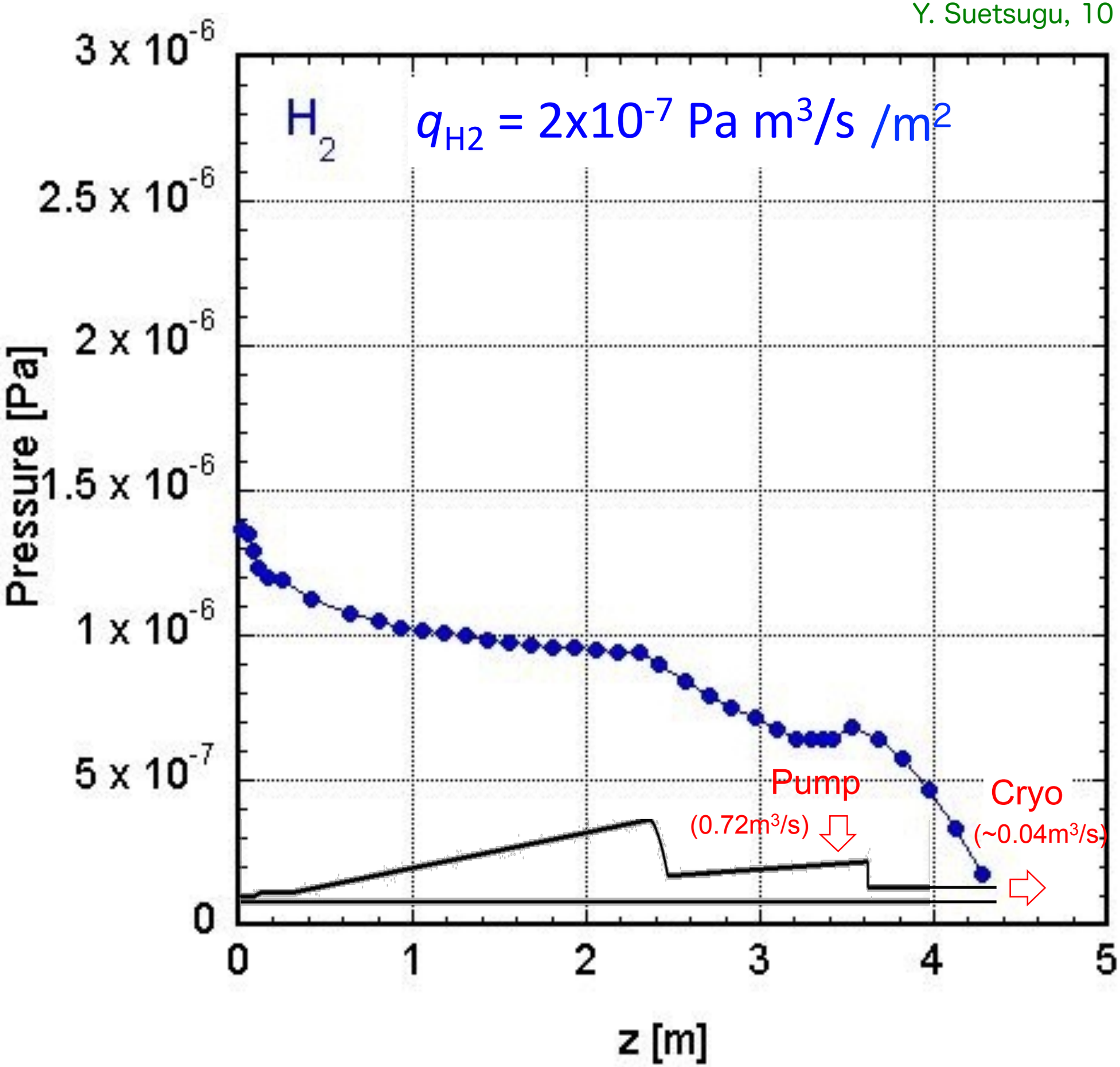
Y. Suetsugu, 10 December 2014



Y. Suetsugu, 10 December 2014



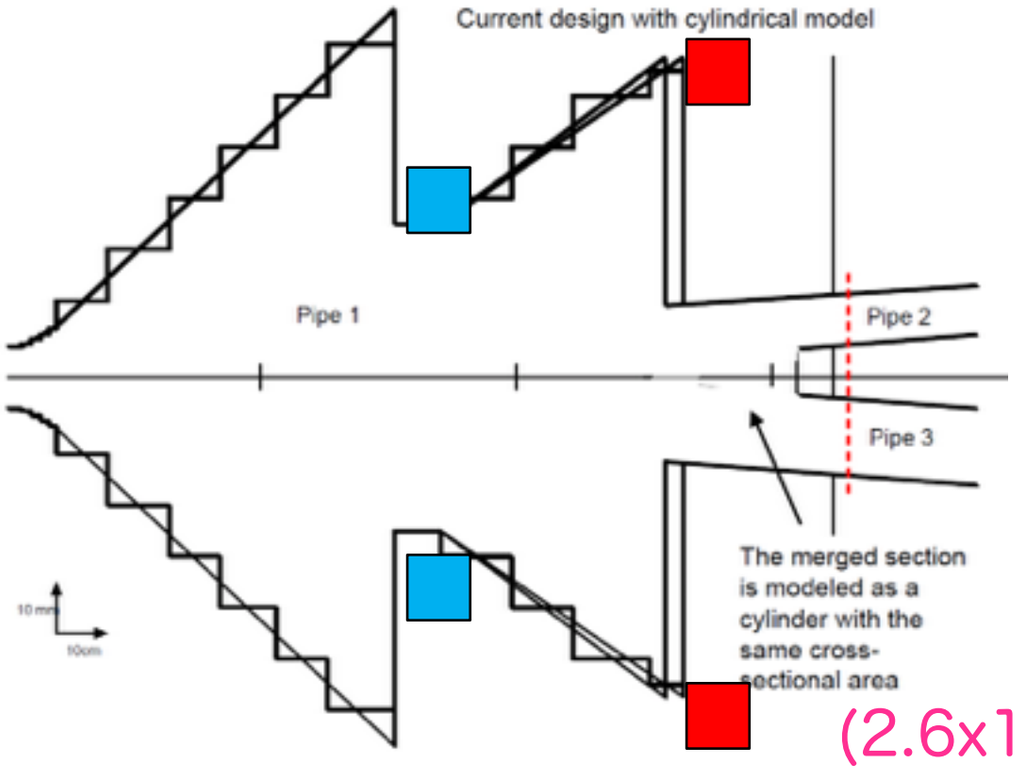
Y. Suetsugu, 10 December 2014



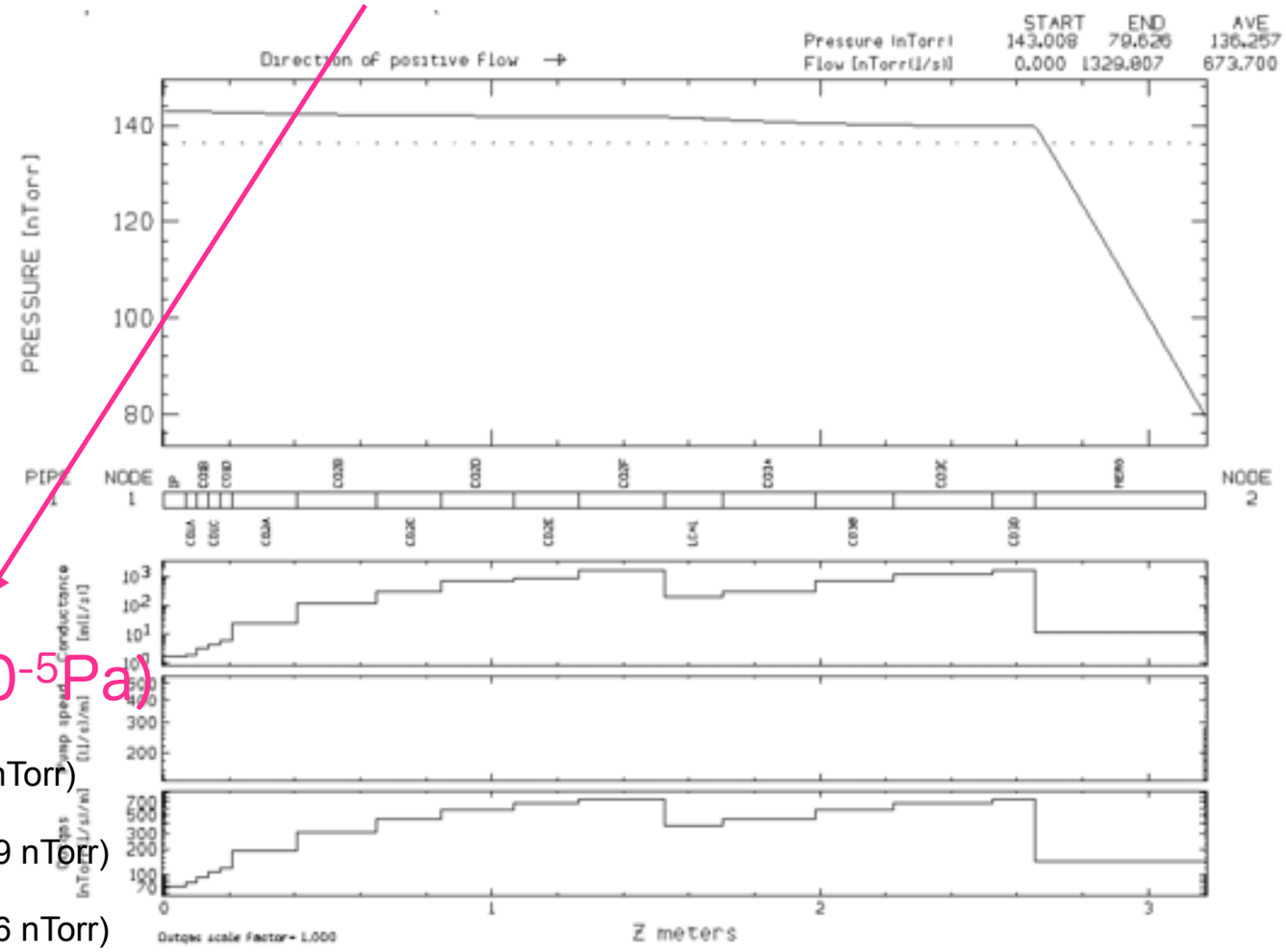
SiD : IP Vacuum

M. Sullivan/SLAC

- VACCALC: " A Method for Calculating Pressure Profiles in Vacuum Pipes", SLAC-PEP-II-APNOTE-6-94
  - The outgassing rate is taken to be 7.6×10^{-7} Pa m^3/s (0.1 nTorr•l/s/cm^2).



(3.8 times larger than Suetsugu)



(2.6x10^{-5}Pa)

If cryo-pump only 1×10^{-4} Pa (136 nTorr)

- If add 10 l/s pump 5.2×10^{-5} Pa (69 nTorr)
- If add 20 l/s pump 3.5×10^{-5} Pa (46 nTorr)

Summary

The IP vacuum pressure was estimated to be 7.5x10^{-6}Pa of CO and 2x10^{-6}Pa of H_2 with only Cryo-pump (QD0 and QDEX1), which are about one oder of magnitude higher than those with the pump, assuming the gas desorption rates of Aluminum instead of Beryllium.

Since the effective pumping speed was strongly limited by the conductance of small pipes, the gas desorption rate must be reduced by baking, special surface treatment etc. in order to decrease the vacuum pressure.