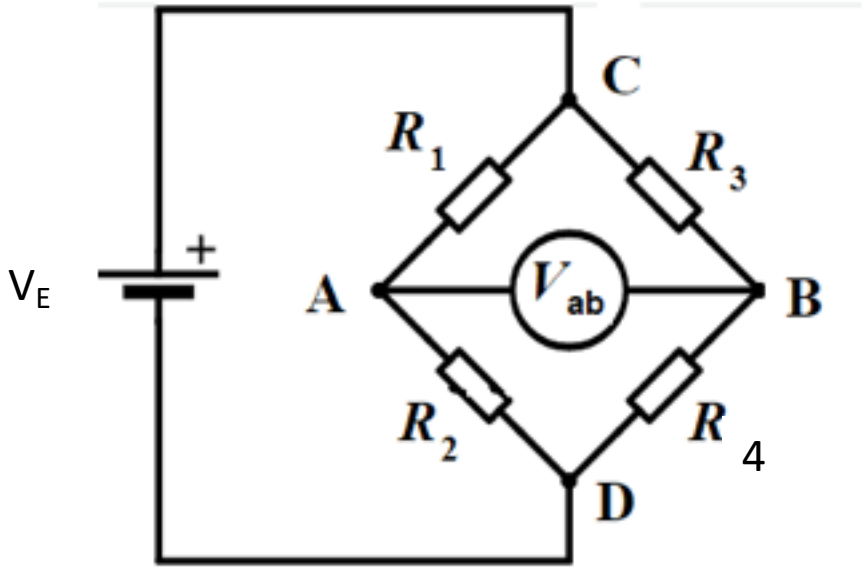
Strain Gage preparation

M. Beretta, B. Lenci, M. Testa

Strain Gage configuration



- R_1 attached on HS inside Climate Chamber (CC)
- R_2 nearby R1, not attaced on HS, inside CC
- R_3 and R_4 outside CC
- R_i = 350 Ohm

- $\Delta R_i / R_i = K \varepsilon_i$
- $\varepsilon_i = \Delta L_i / L_i$
- K ~ 2 is the gage factor
- L_i ~ 7mm is the gage length

if $\Delta R_i << R_i$

$V_{ab} / V_E = K/4 (\varepsilon_1 - \varepsilon_2 + \varepsilon_3 - \varepsilon_4)$

During Thermal cycle:

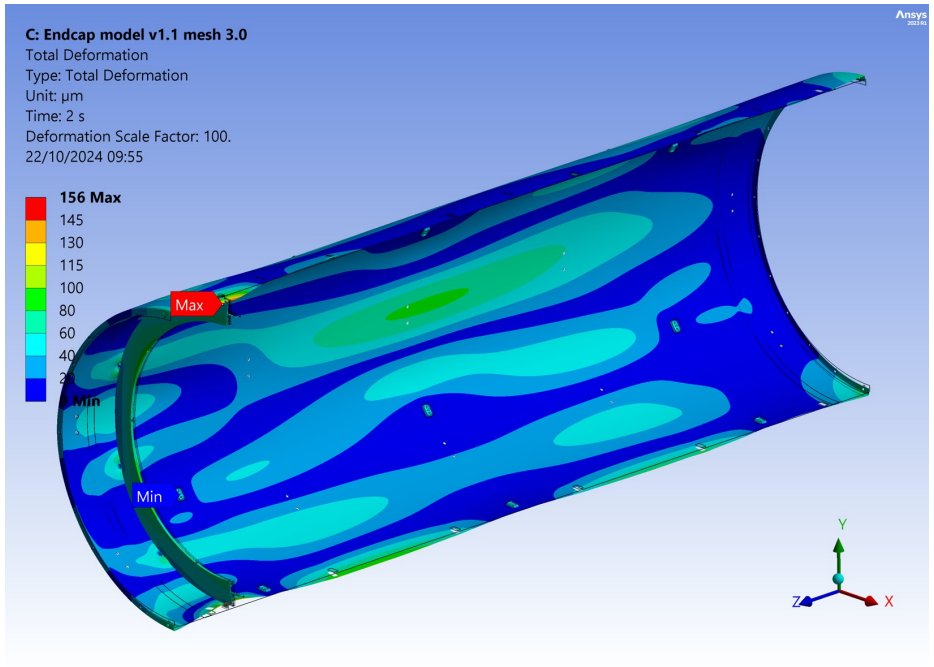
- $\Delta R_1 / R_1 = K (\varepsilon_{Mech} + \varepsilon_{Therm})$
- $\Delta R_2 / R_2 = K (\varepsilon_{Therm})$
- $\Delta R_3 / R_3 = \Delta R_4 / R_4 = 0$

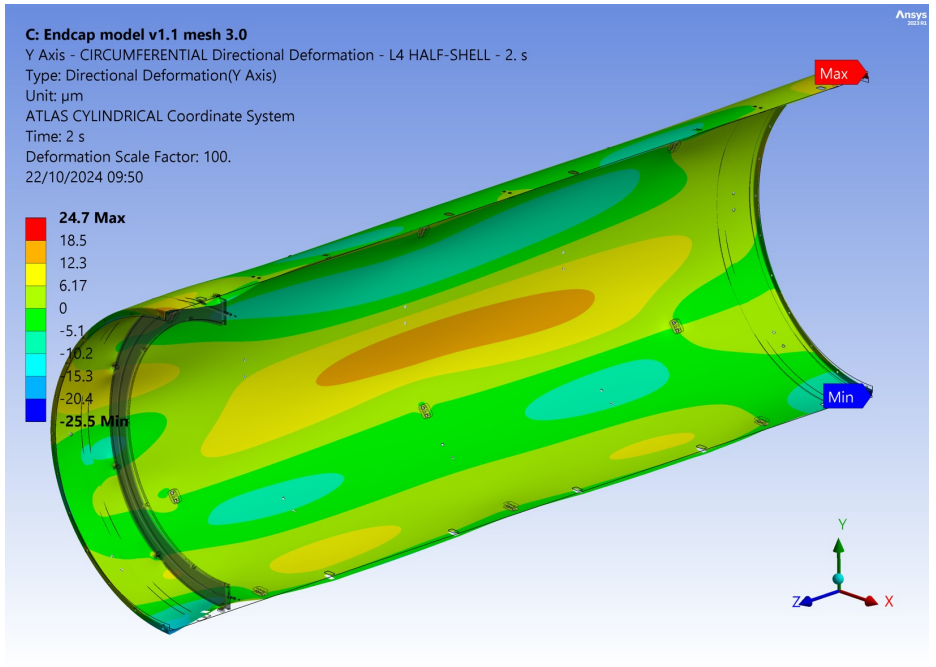
$V_{ab} / V_E = K/4 (\varepsilon_{Mech} + \varepsilon_{Therm} - \varepsilon_{Therm}) = K/4 \varepsilon_{Mech}$

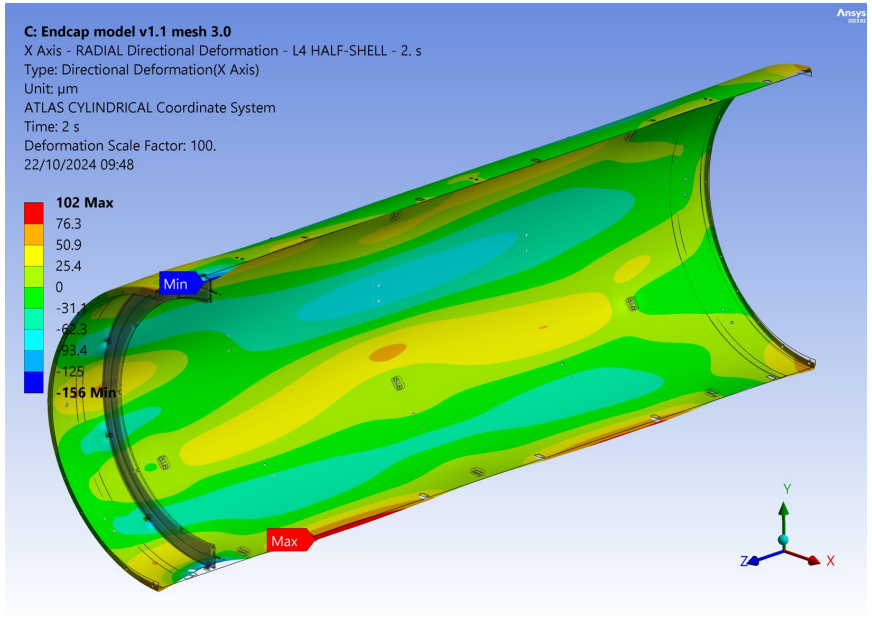
Strain Gage: Expected signal

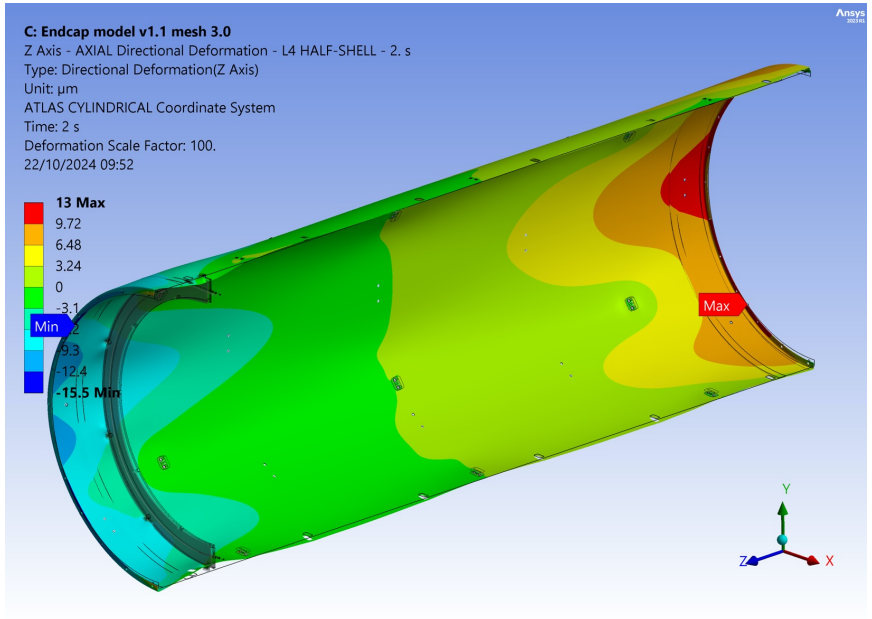
- ΔL_1 ~ 10-100 μm from Mauro's Ansys simulation (next slide)
- For 100 μm:
  - $\varepsilon_{Mech} = \Delta L_1 / L_1 = 100\ \mu m / 7\ mm \sim 1.4 \times 10^{-2}$
  - $V_{ab} / V_E = K/4 \times \varepsilon_{Mech} = 2/4 \times 1.4 \times 10^{-2} \sim 0.7 \times 10^{-2}$
  - $V_E \sim 15\ V$

→ Vab ~ 100 mV (x Amplification from electronics if needed)









T_{start} = +20C

T_{end} = -55 C