11 T Task Force Meeting
Insulation, Coil Size and Rigidity

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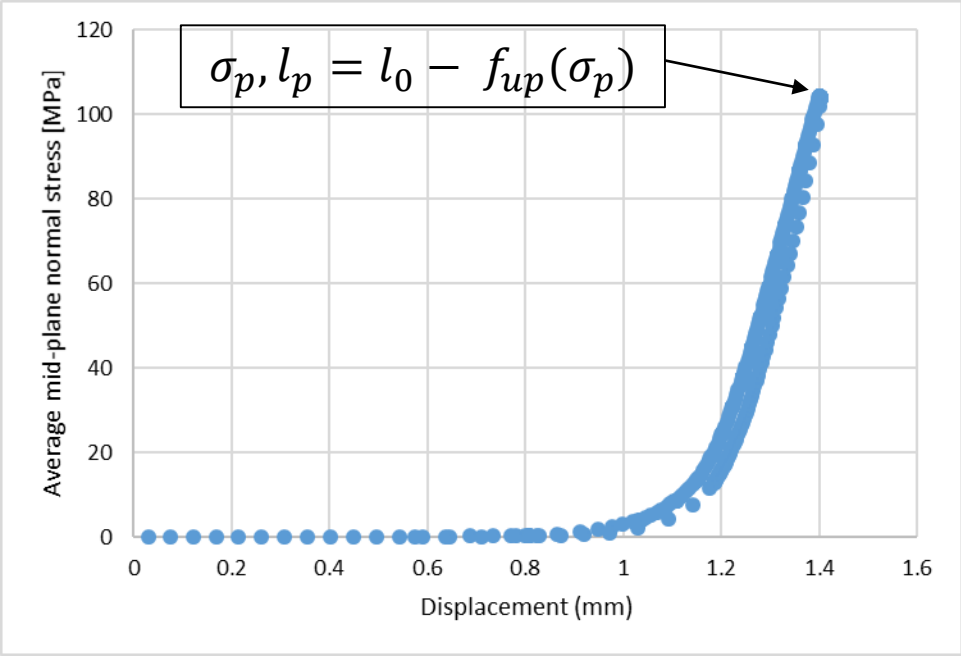
General overview

- Insulation thickness measured for cable in coil 120
  - Target is 100 µm → OK

Sample	Insulation thk. At 5MPa [µm]
S1	104
S2	104
S3	106

- The source of the discrepancy between FARO Arm and CMM segments on coils 105 and 107 have been found (non consistent alignment of the CMM measurements. Agreement now is better than 10 µm
- 4 ten stacks for E-modulus measurements(2 old insulation layout, 2 new insulation layout, RRP 108/127 strand) under preparation
  - They will be reacted together with coil 120.
- Coil E-modulus measurements
  - Three coils (or coil segments) have been measured up to the date
    - Coil 105, 106, 108 and Coil 113
  - We plan to measures also coil 111, and re-measure coils 106 and 108 before the end of January to have statistics on the spread in terms of rigidity among coils
  - CR03 (our first chance to measure a virgin coil!) to be fully characterized first half of February.
  - Post-processing on-going to further understand how to use the data for the collaring mock-up

Coil stress-strain curve



Coil 108 with trace

$l_0 = coil\ arc\ at\ rest$

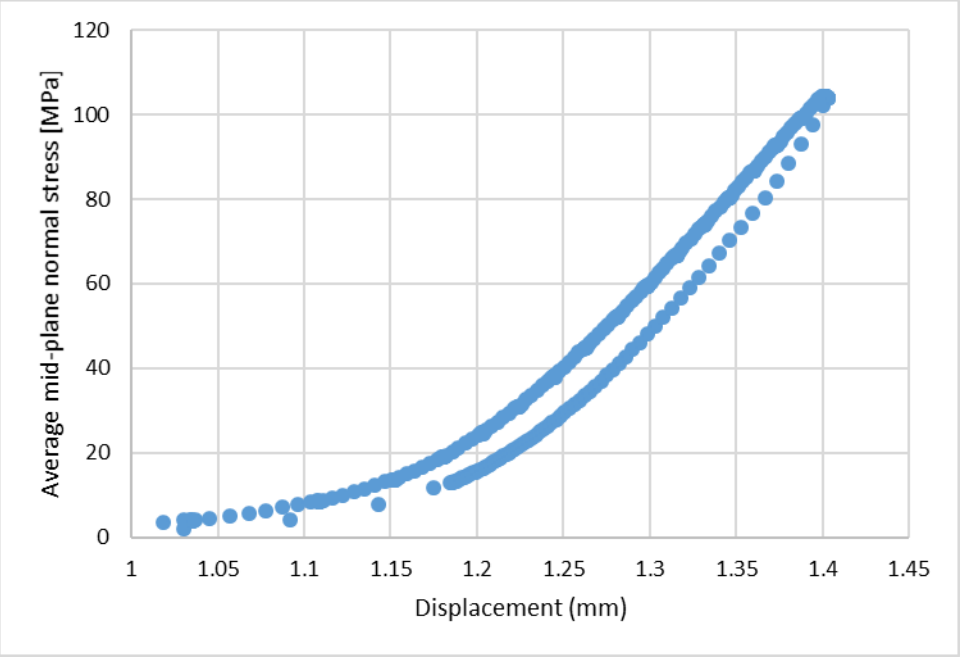
$l_{up} = l_0 - f_{up}(\sigma)$

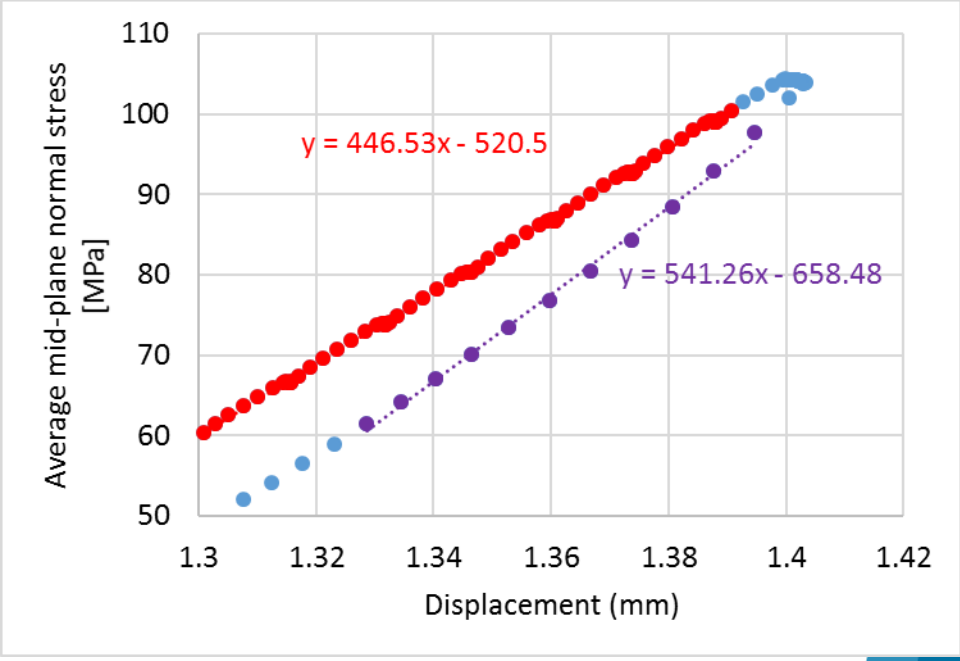
$l_{down} = l_0 - f_{down}(\sigma, \sigma_p, l_p)$

Coil stress-strain curve

$$f_{up}(\sigma) \cong c + \frac{\sigma w_{coil}}{k_{up}}$$

$$f_{down}(\sigma, \sigma_p, l_p) \cong f_{up}(\sigma_p) - \frac{(\sigma - \sigma_p) w_{coil}}{k_{down}}$$



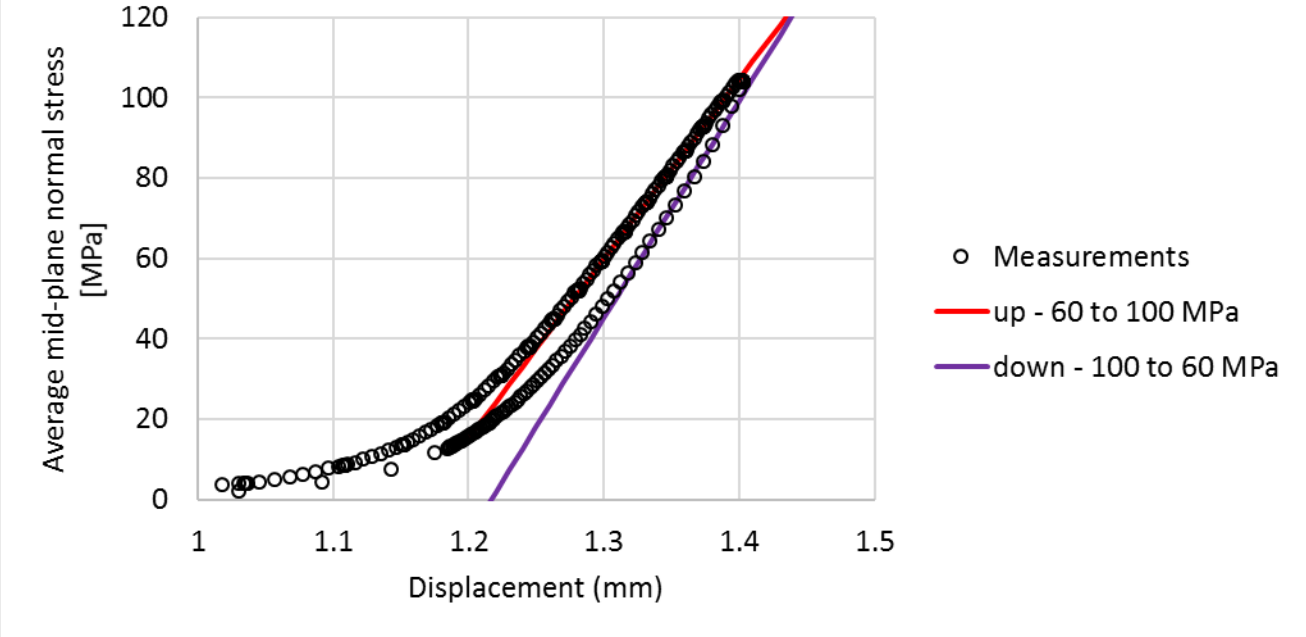


Coil 108 with trace

Set of parameters to minimize error

Fitting data form 60 to 100 MPa

		sigma_p	130
		k_down	16562.556
lo [mm]	0	lo [mm]	0
w_coil [mm]	30.6	w_coil [mm]	30.6
k_up [MN/(m*m)]	13663.818	k_up [MN/(m*m)]	13663.818
c [mm]	1.165655163	c [mm]	1.165655163

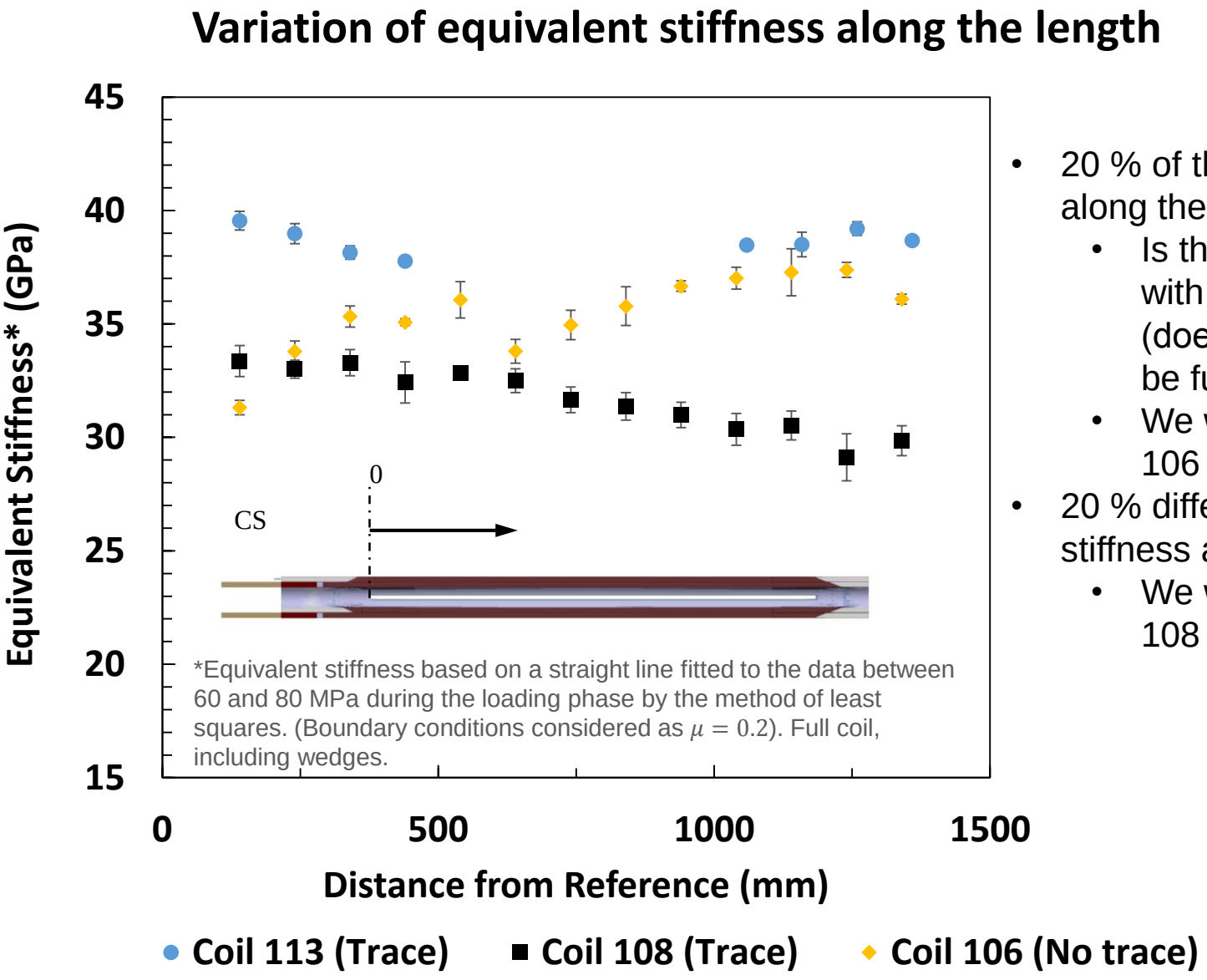


E-modulus:

$$E_{up} = k_{up}\frac{l_{COIL}^{n}}{w_{coil}} = 27\ GPa \qquad E_{down} = k_{down}\frac{l_{COIL}^{n}}{w_{coil}} = 33\ GPa$$

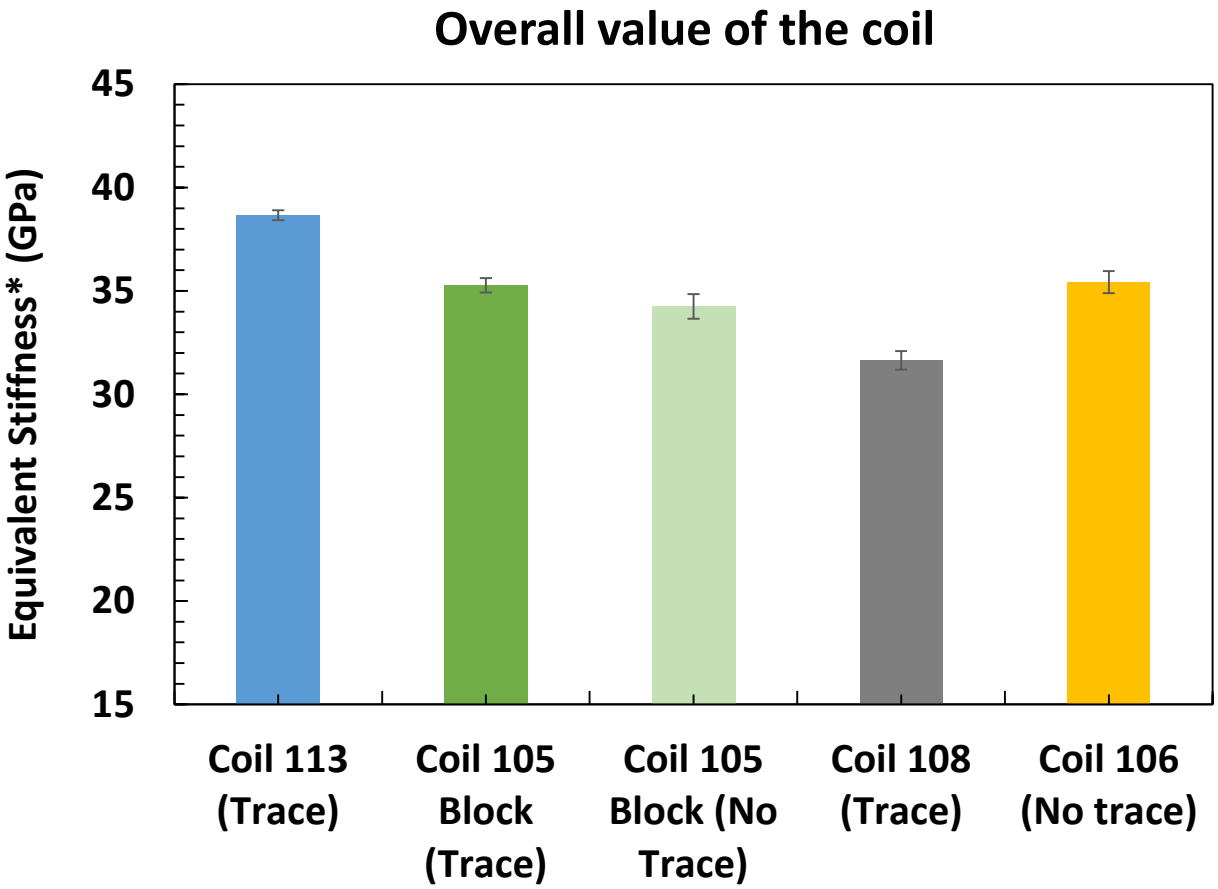
Coil 108 with trace

Coil stiffness



- 20 % of the coil stiffness along the length for coil 106!
  - Is there a correlation with the coil size? (doesn't look like, but to be further studied)
  - We will re-measure coil 106 to confirm the data
- 20 % difference on coil stiffness among coils
  - We will re-measure coil 108 to confirm the data

Coil stiffness



- Coil 108 and 106 will be re- measured.
- Coil 111 will be also measured, to have more statistics.

*Equivalent stiffness based on a straight line fitted to the data between 60 and 80 MPa during the loading phase by the method of least squares. (Boundary conditions considered as $\mu = 0.2$).
Full coil, including wedges.

Additional slides

Compliance Correction