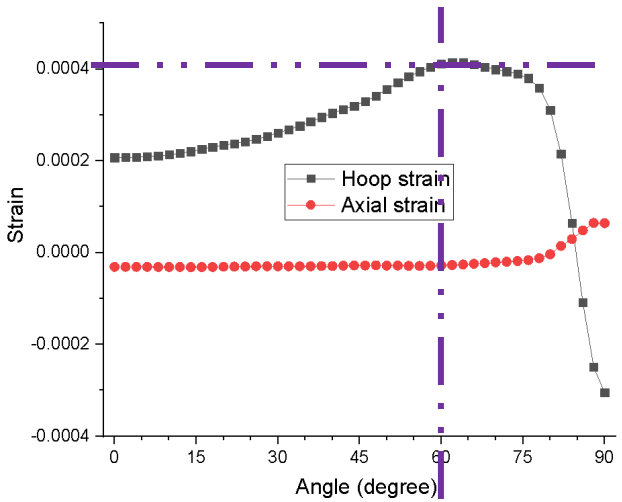
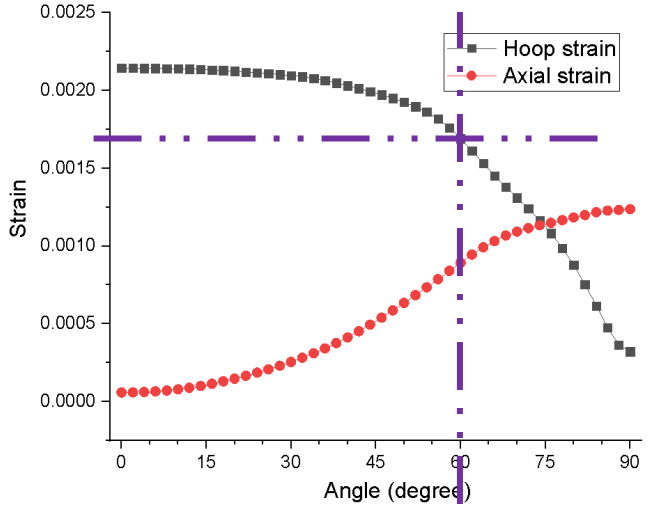
Coil Pre-Loading and Cool-Down Followed FEM Predictions

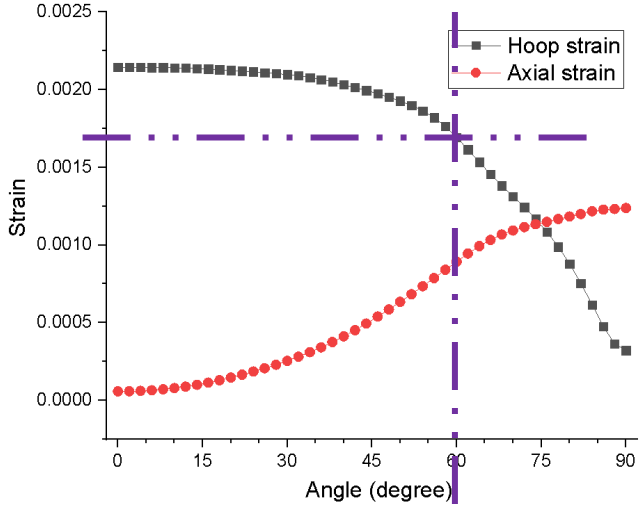
Assembly



Cool-down



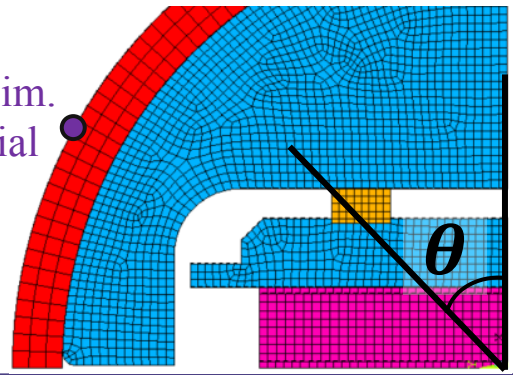
Excitation



Measured (RT)
SG3 – Azim. $\varepsilon = 0.000422$
SG4 – Axial $\Delta\varepsilon = 0.000017$

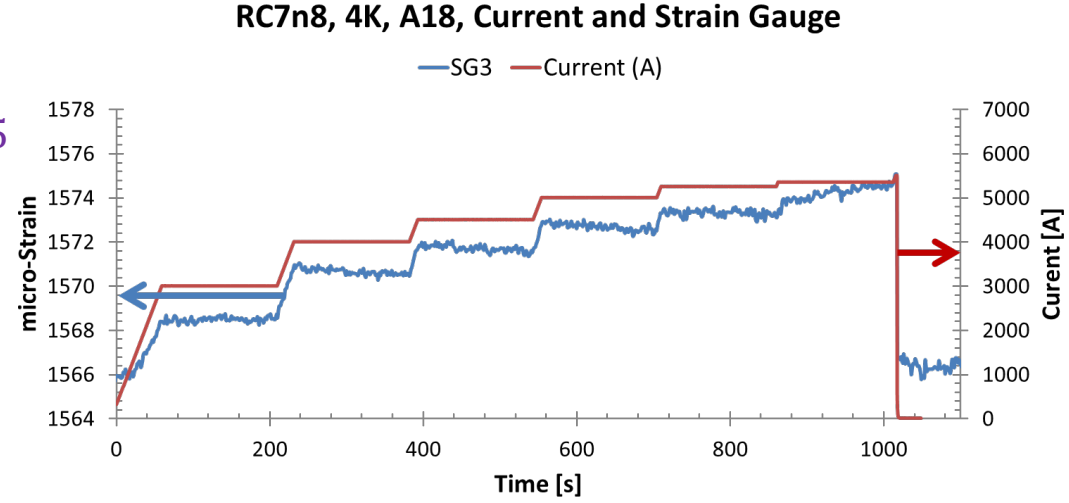
Measured (77K)
SG3 – Azim. $\varepsilon = 0.001457$
SG4 – Axial $\Delta\varepsilon = 0.000055$

Strain Gauges
SG3 – Azim.
SG4 - Axial

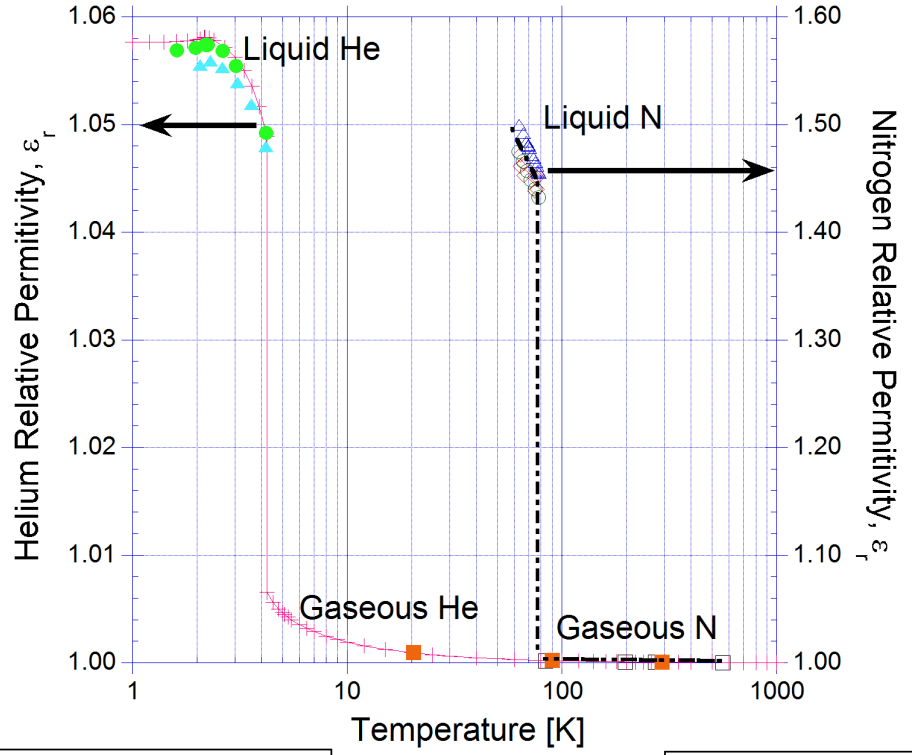


Iron yoke

Interference key
Pressure pad
Coil



Phase Change of Permittivity for Stray Capacitance



Clausius-Mossotti, Arp et al. (1998)
Maryott and Smith (1951)
Grebenkemper and Hagen (1950)
Van Itterbeek and Spaepen (1943)

Ebert and Keesom (1926)
McLennan et al. (1930)
Guillien (1938)
Zahn (1926)

Stray capacitance can be measured between any metallic component electrically insulated from the others

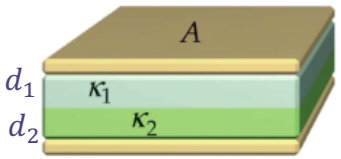
$C = \varepsilon_0 \varepsilon_r A/d$

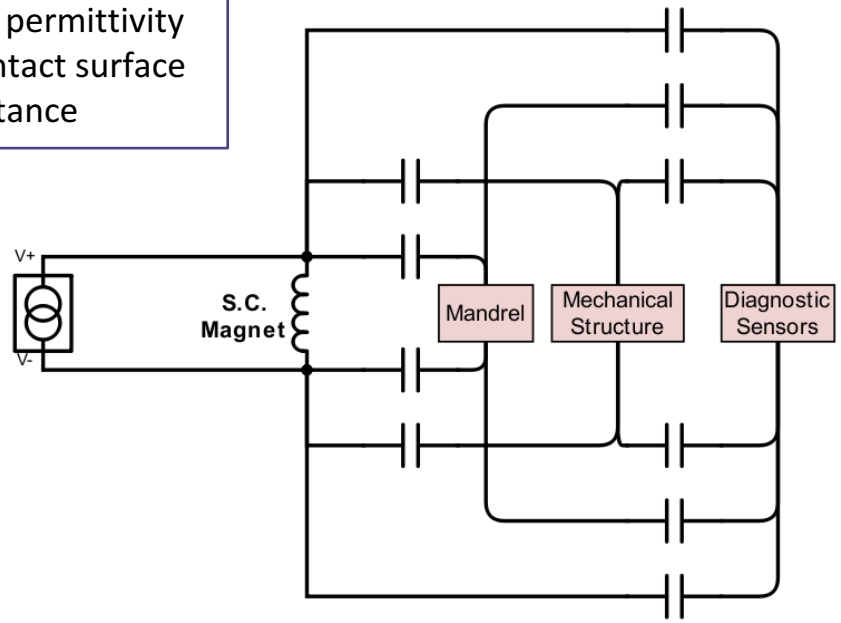
ε_0=8.854 10^{-12} Fm^{-1}

ε_r rel permittivity

A contact surface

d distance





Local Heating → Cryogenic Fluid Boil-off → Permittivity Change → Capacitance Change → Quench Detection

Horseshoe-Yoke works as a stray capacitance sensor