UNIVERSITEIT TWENTE.

Ongoing activities EUCARD2 - WP10 at Twente

Marc Dhallé, Peng Gao, Bram Hesselink, Simon Otten,
Maikel Hartman, Sander Wessel

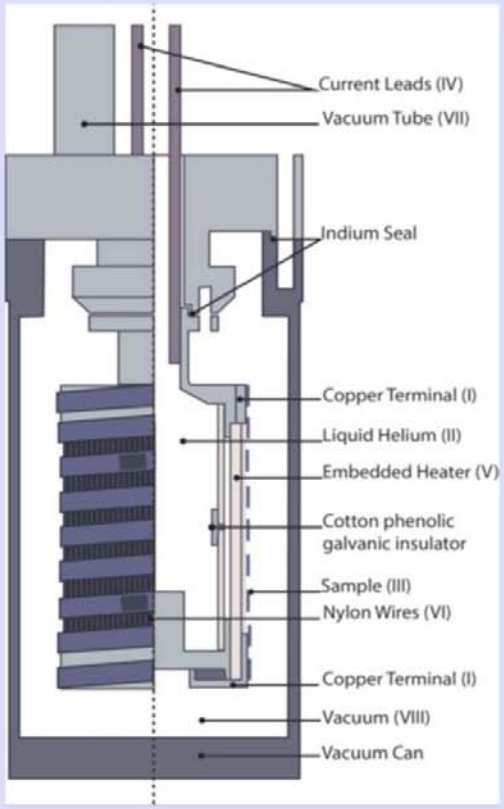
21th May 2014

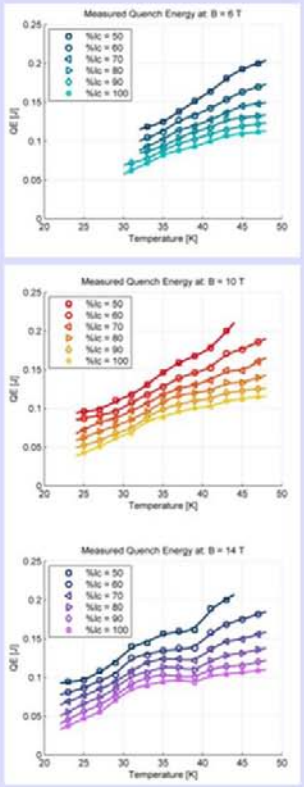
Content

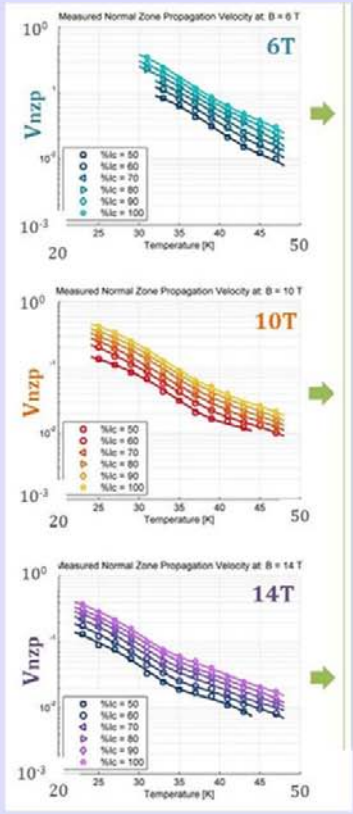
- *Stability & quench propagation*
- *Mechanical behaviour of tapes under axial load*
- *Mechanical behaviour of cables under transverse load*

All work in progress

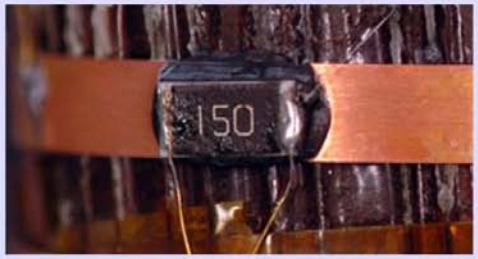
Stability and quench propagation (1)





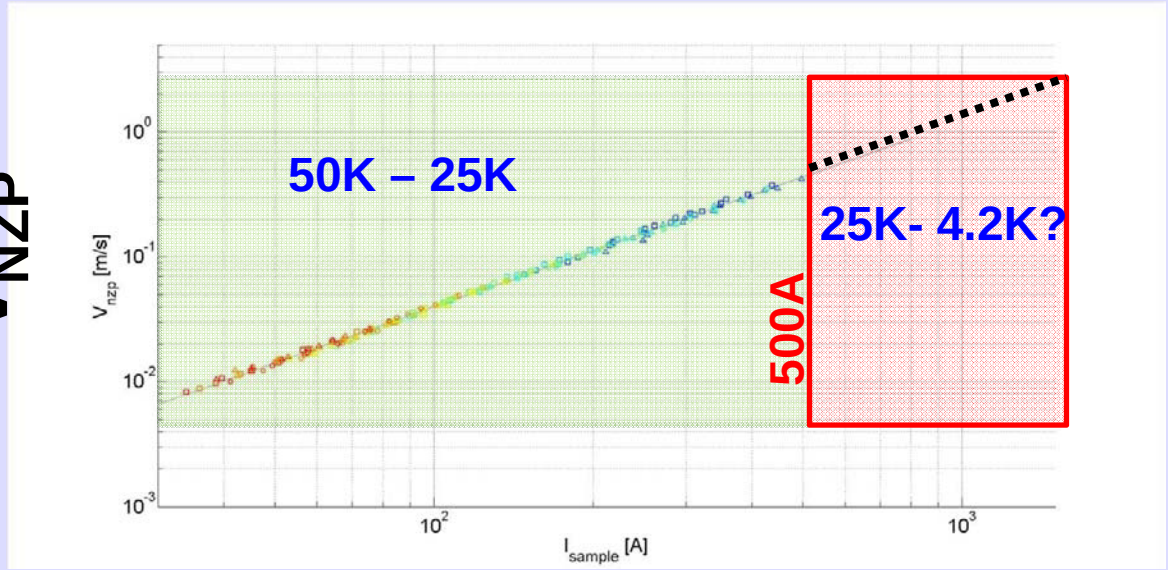


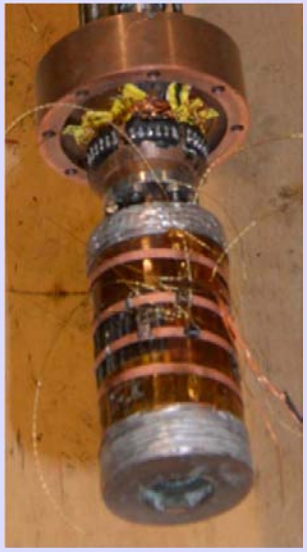
- YBCO sample (SuperPower SCS4050)
- Two copper flanges
- Liquid helium inside
- Nb_3Sn leads at 4.2 K



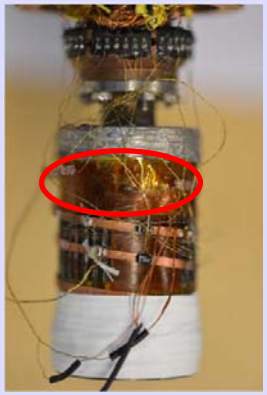
- Quench Heater
- Surface mounted resistor
- Connected to tape with Alumina loaded Epoxy

Stability and quench propagation (2)

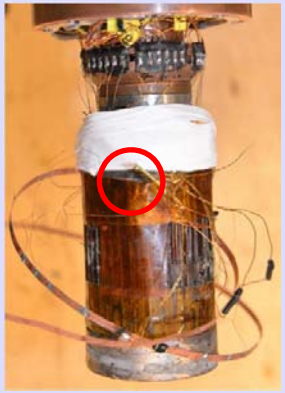




2mm tape
Superpower



burn-out



Mechanical failure

J. Van Nugteren et al. , ICEC-ICMC 2014

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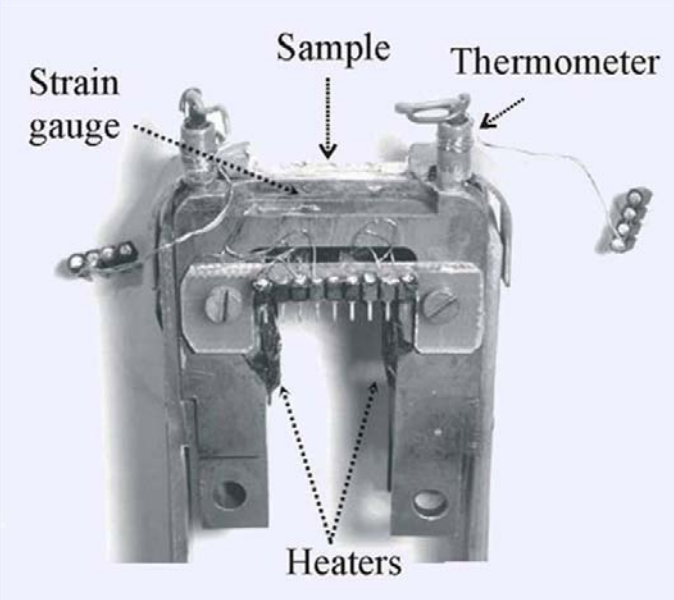
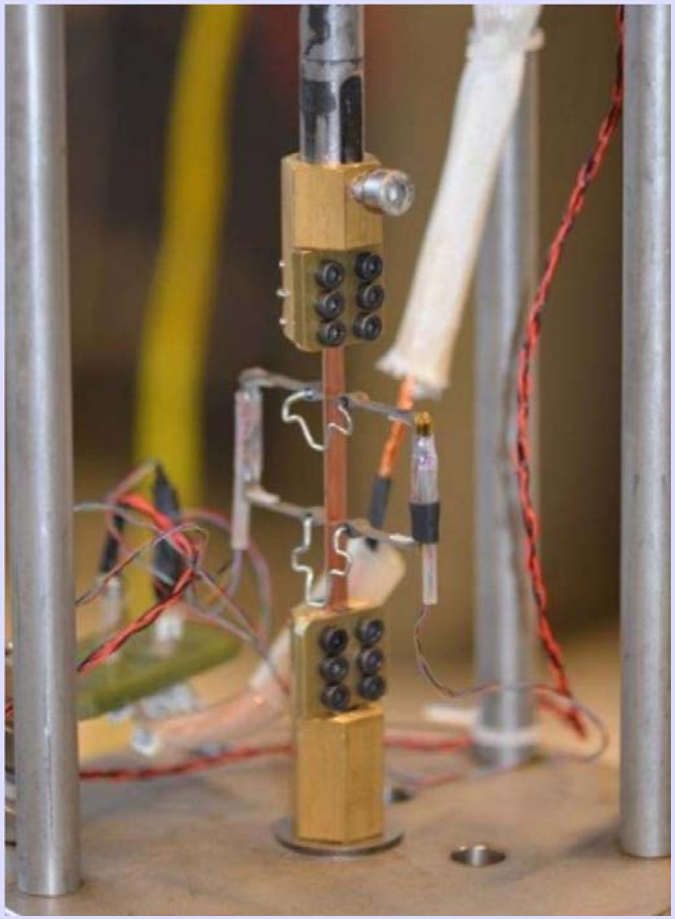
- *Mechanical behaviour of cables under transverse load*

Mechanical behavior of tapes under axial load (1)

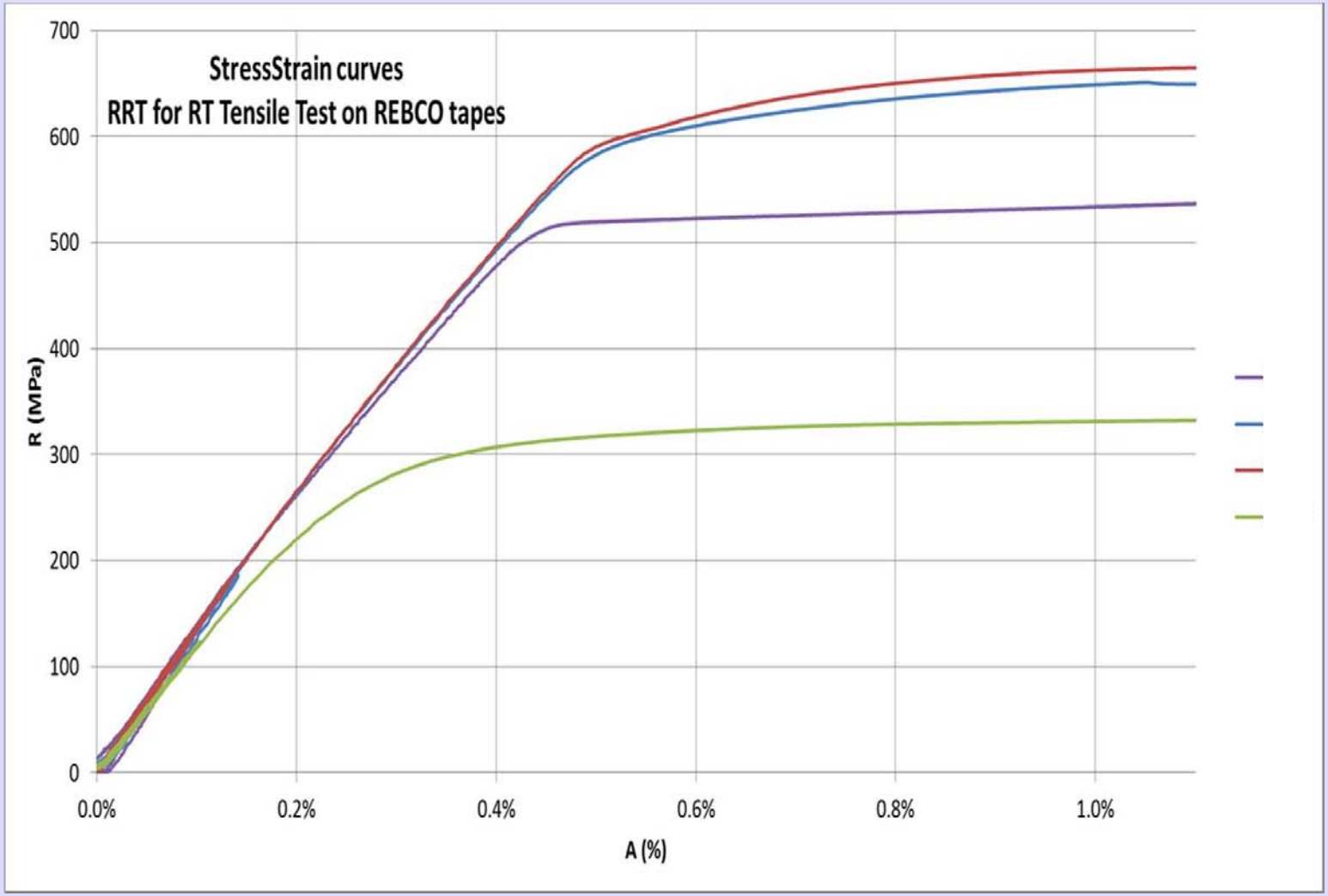


U-spring: $I_c(\varepsilon,B,T)$



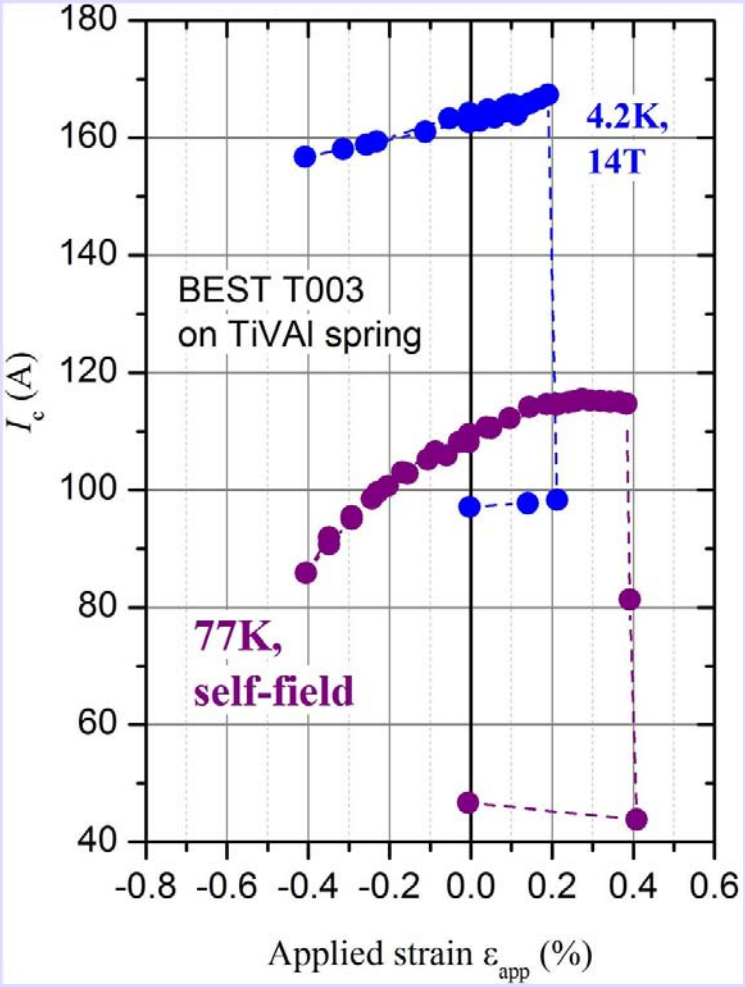
Stress-strain: *300, 77 or 4.2K*

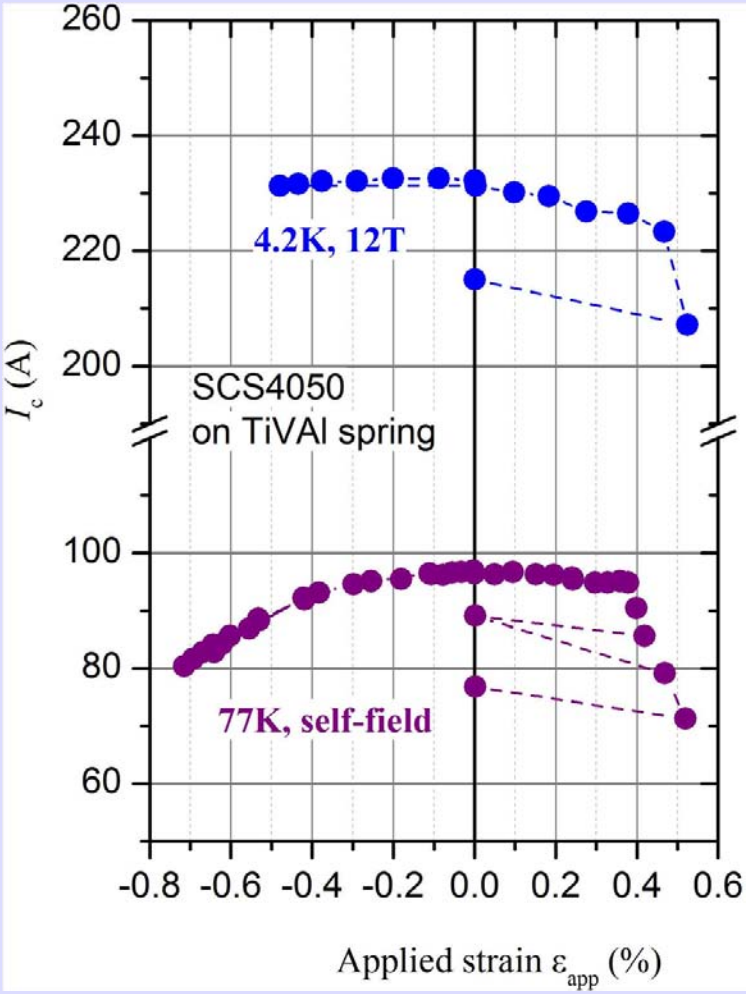
Mechanical behavior of tapes under axial load (2)



Comparison various manufacturers

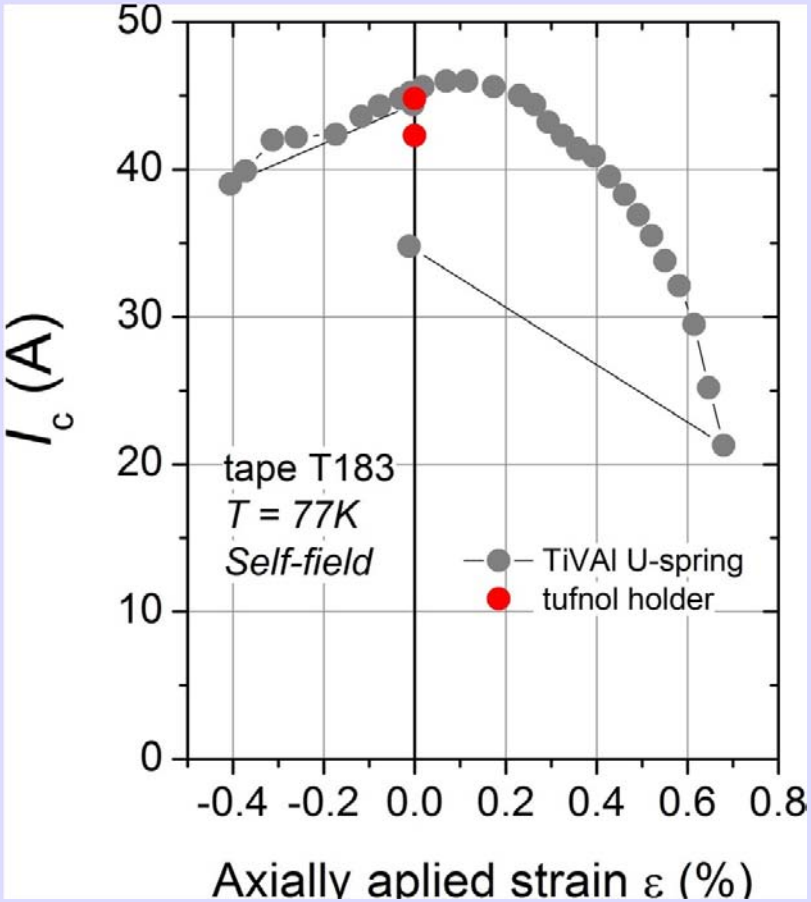
Mechanical behavior of tapes under axial load (3)

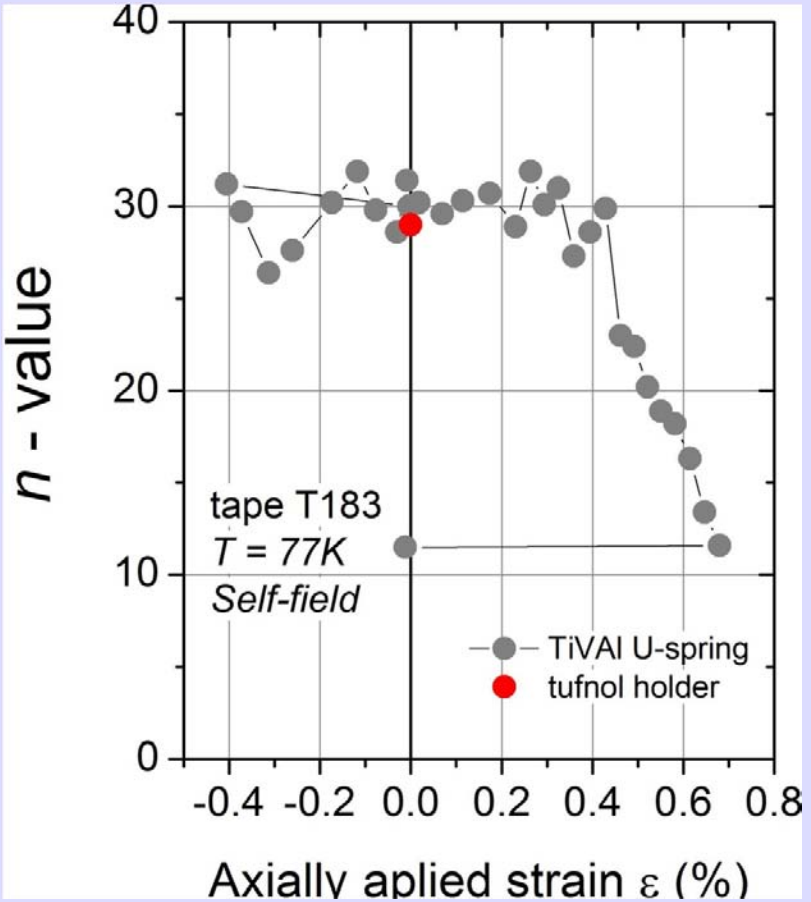




Meeting December: BEST tape T03

Mechanical behavior of tapes under axial load (4)





BEST tape T183 *(april 2014)*

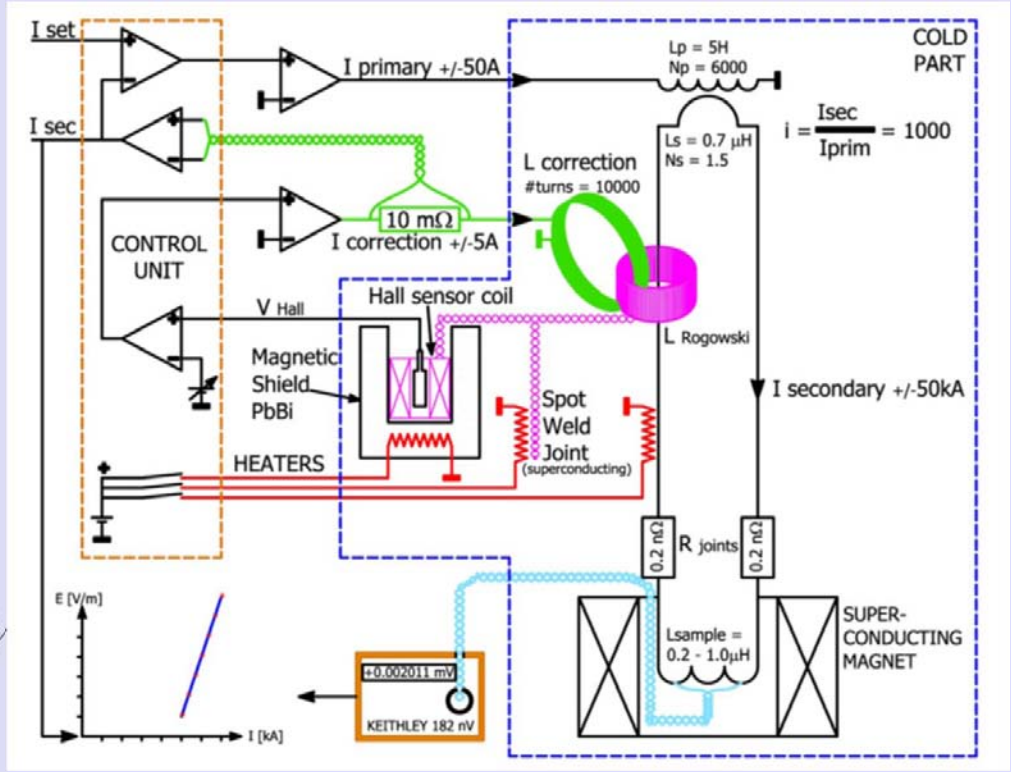
Content

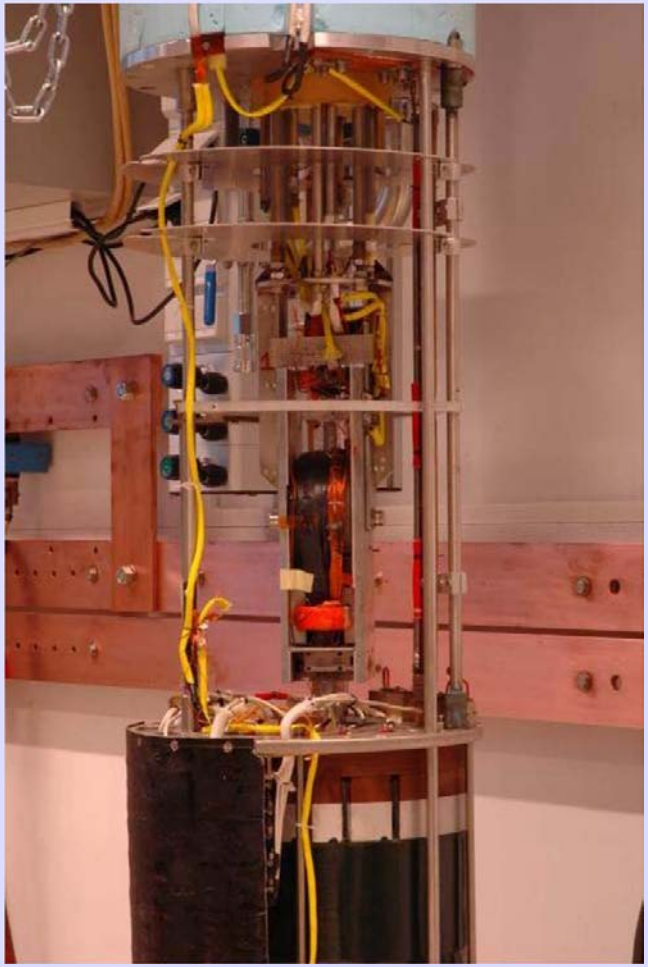
- *Stability & quench propagation*
- *Mechanical behaviour of tapes under axial load*
- *Mechanical behaviour of cables under transverse load*

Mechanical behavior of cables under transverse load (1)

Superconducting transformer …

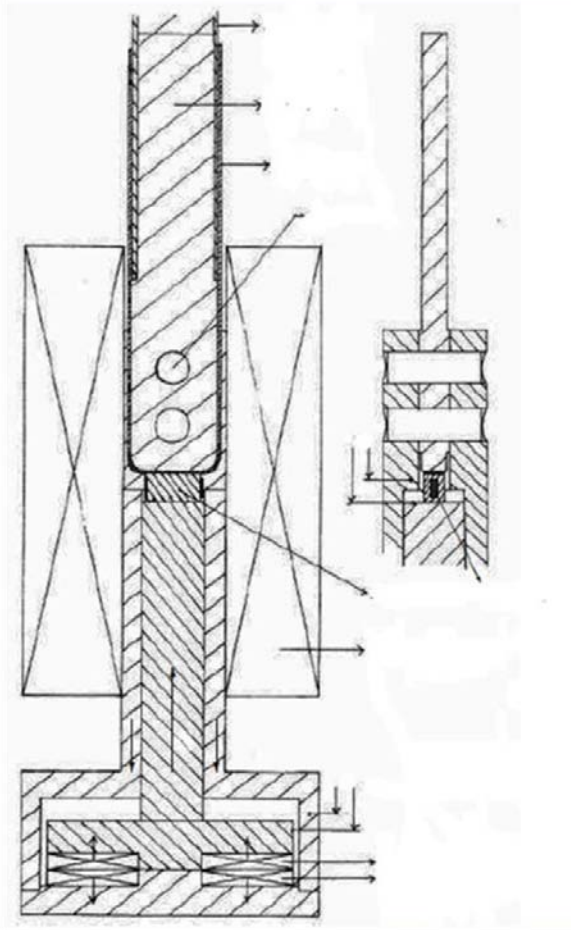
I_{max} <= 50 kA ; $B_{appl.}$ <= 11T

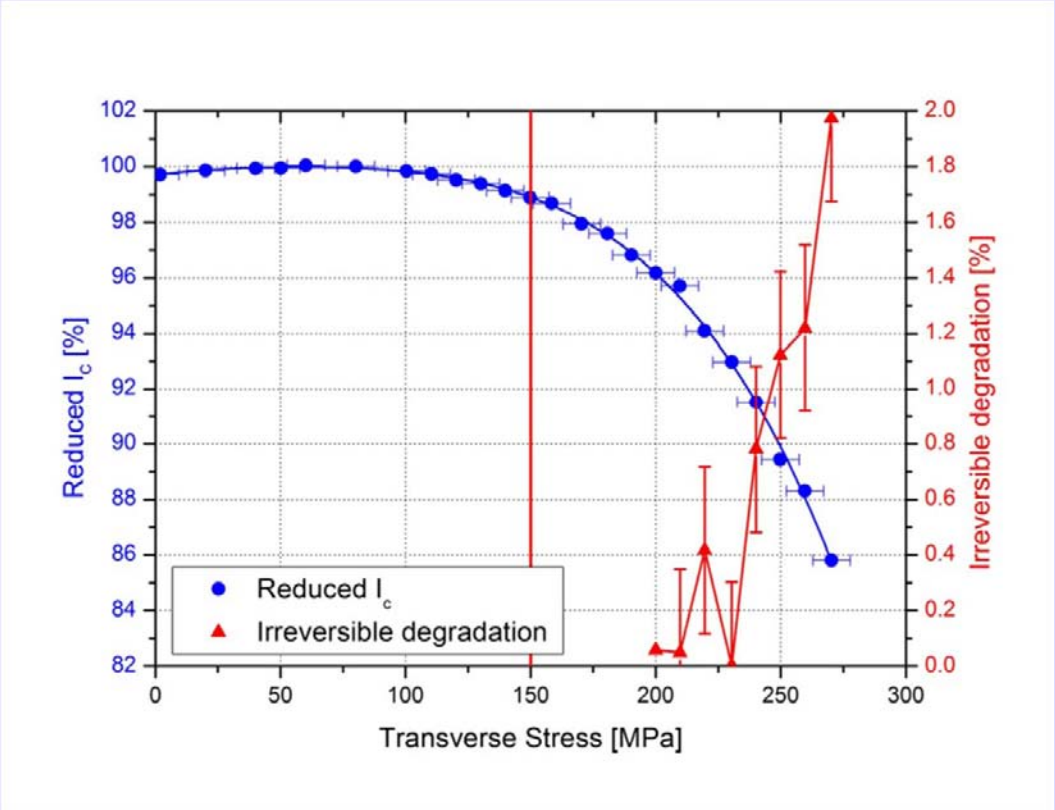




Mechanical behavior of cables under transverse load (2)

... + E.M. press (σ <= ~ 300 MPa)



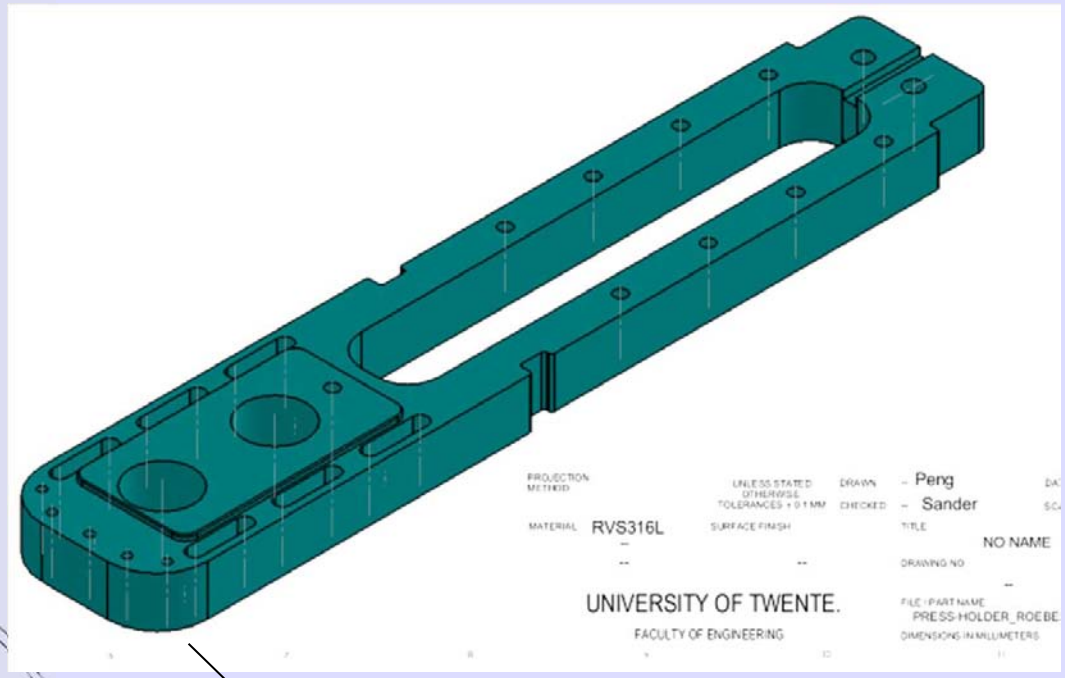


Nb_3Sn cable: $I_c(\sigma)$: 1% reversible reduction at 150 MPa
irreversible damage only at σ > 210 MPa

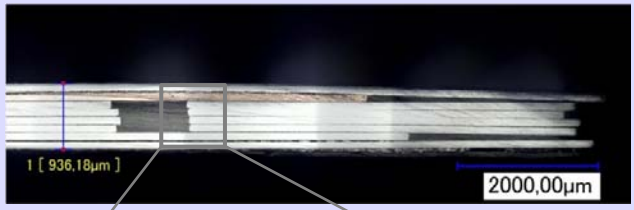
P. Gao et al. , ICEC-ICMC 2014

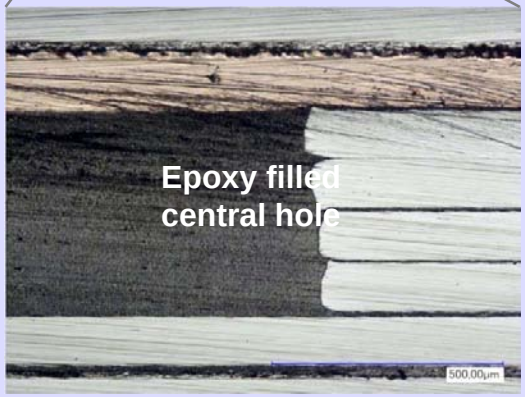
Mechanical behavior of cables under transverse load (3)

Collaboration with KIT *(see also presentation A. Kario)*



R = 20mm

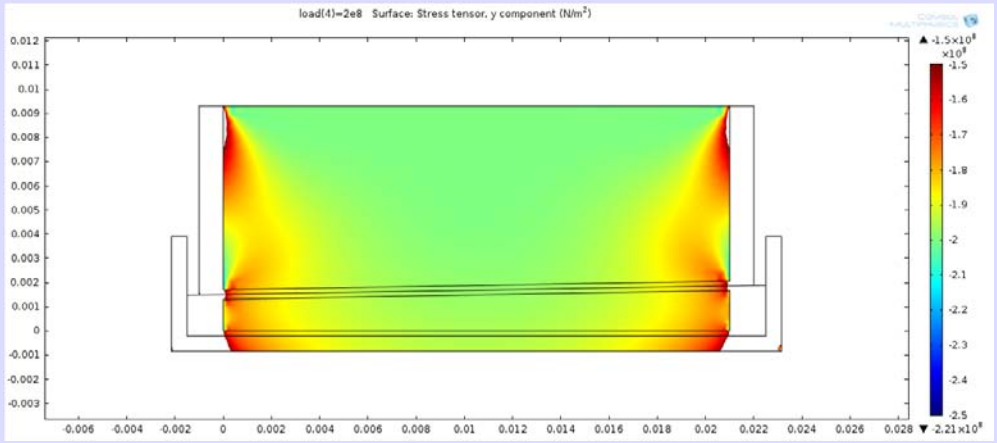


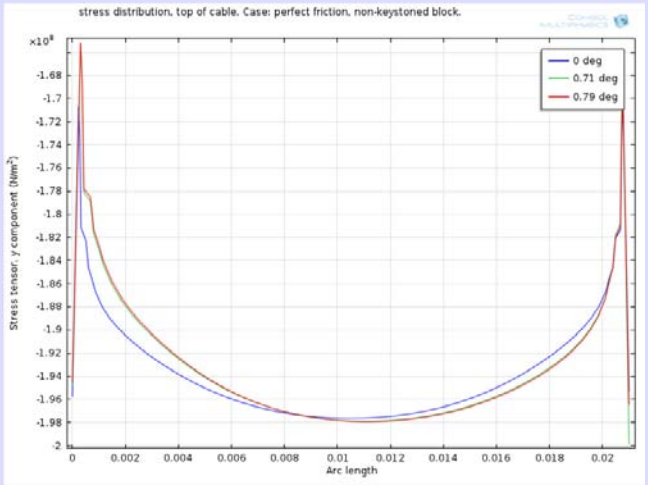


Mechanical behavior of cables under transverse load (4)

Modelling of stress distribution

(parallelism!)





Transverse stress

lateral position

10%

Conclusions

- *MQE & V_{NZP} data (and model!)*
  soon extended all the way to 4.2K
- *Preliminary data show improved mechanical performance T183 compared to T03*
- *HTS transverse pressure dependence of properly impregnated cables underway*