Collimation Upgrade Specification Meeting #35
21st March, 2014

Steady-state cable quench limits of the 11 T dipole

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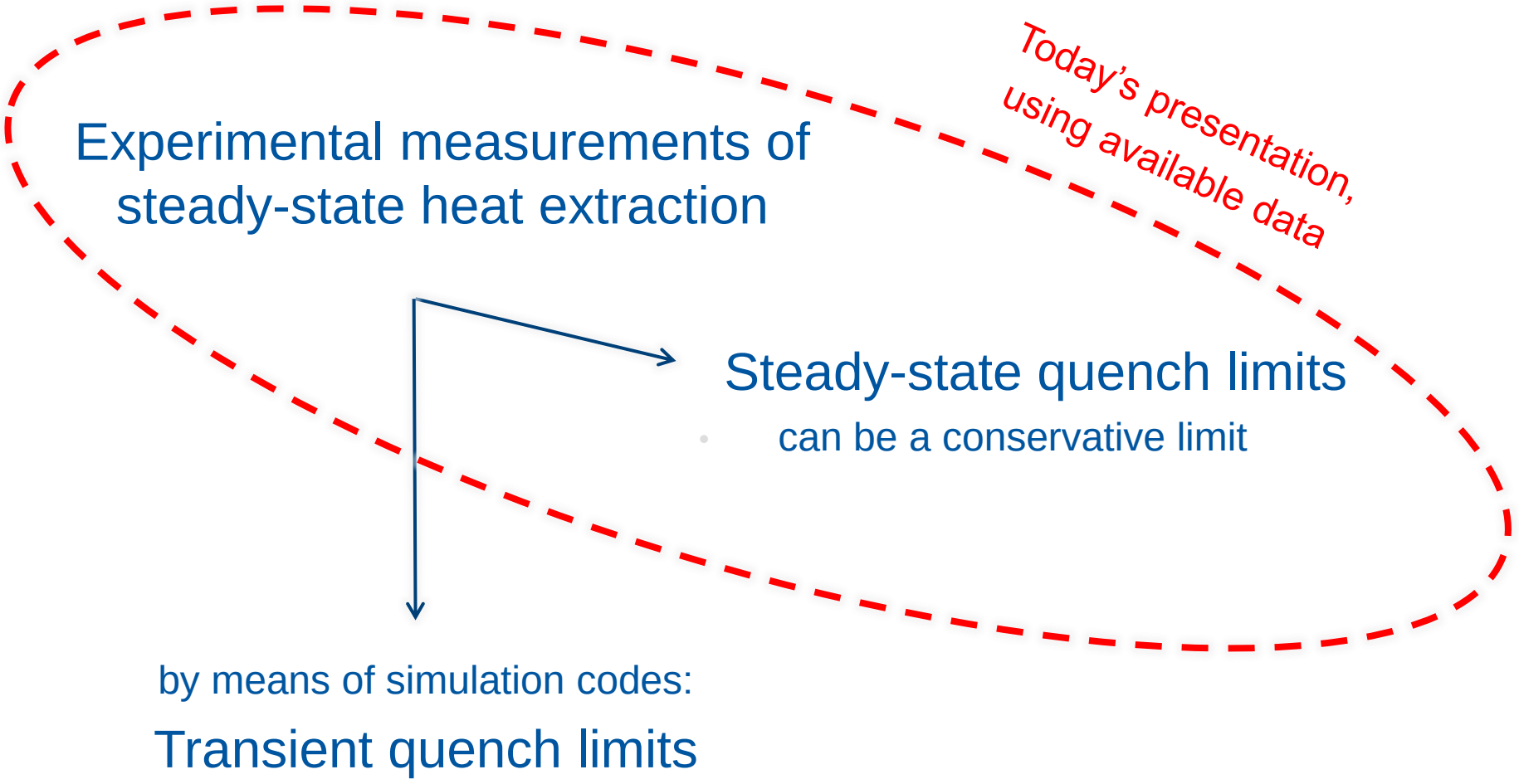
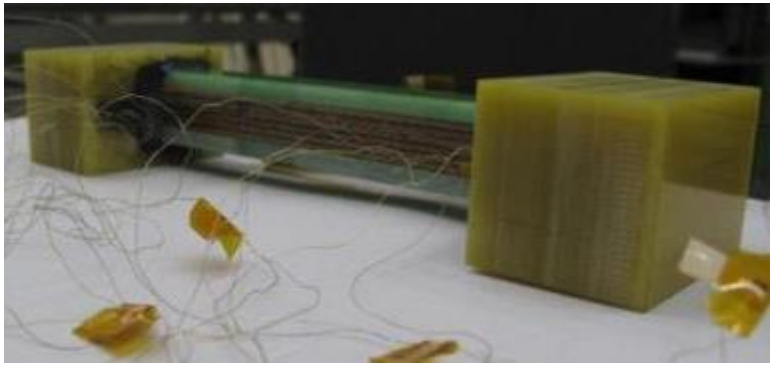
Roadmap


Today's presentation, using available data
Experimental measurements of steady-state heat extraction
Steady-state quench limits
can be a conservative limit
by means of simulation codes:
Transient quench limits

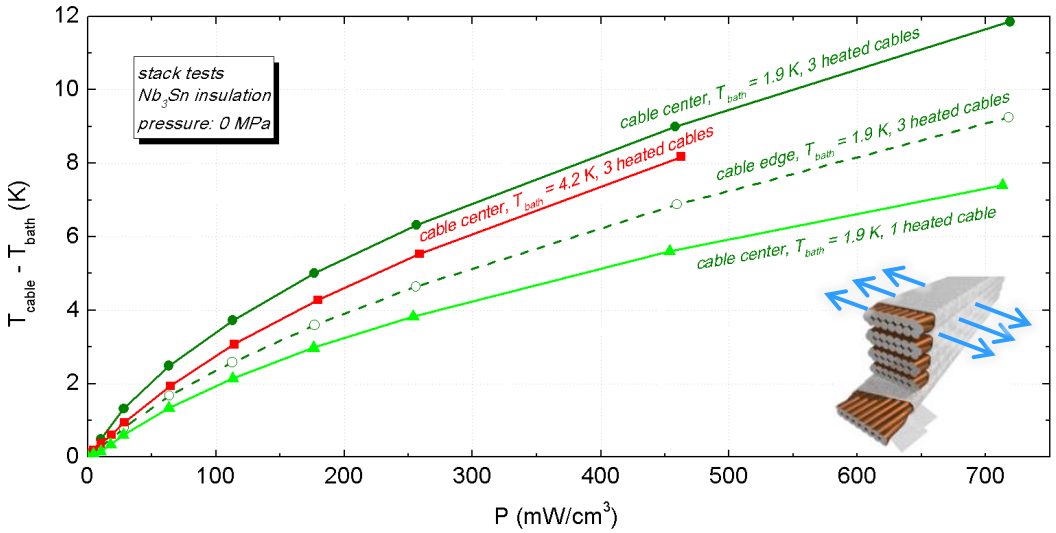
Steady-state heat extraction

Measurements performed in 2012, for the **Nb_3Sn MQXF magnet**

- **different** electrical insulation, w/o mica glass
- unreacted cable (effects on fiberglass thermal conductivity ?)



Different position in the cable, T_{bath}, heating configuration :

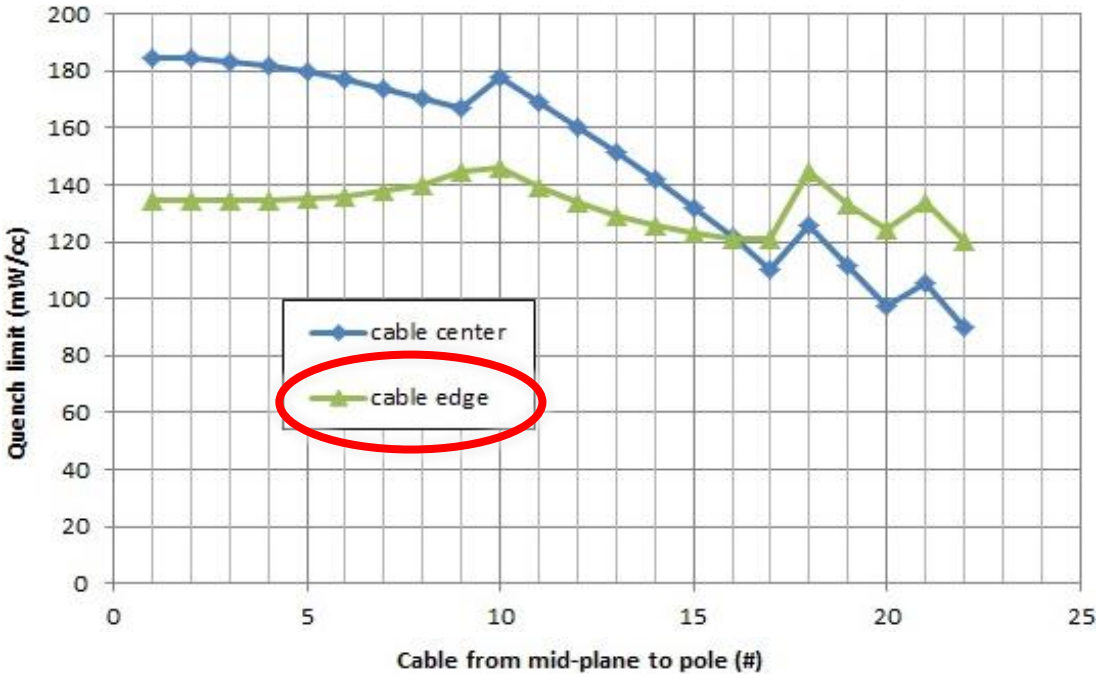


N.B. Heat transfer mechanisms in Nb_3Sn coils are much simpler than in the current LHC Nb-Ti coils

Steady-state cable quench limits

Calculated assuming the following hypotheses:

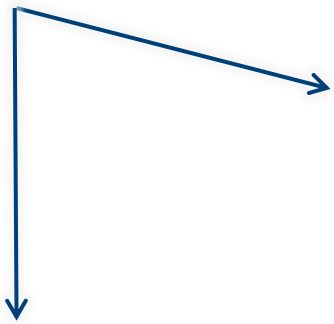
- nominal operating conditions
- available heat transfer data (MQXF, see previous slide)
- field map of the 11 T 1-in-1 demonstrator (around 10% optimistic)



Follow-up

Experimental measurements of steady-state heat extraction

To be performed using the 11 T (reacted) cable-type → next days



Steady-state quench limits

- can be a conservative limit

by means of simulation codes:

Transient quench limits

Conclusion

- Steady-state heat extraction determined for a **Nb_3Sn cable**, **similar but not equal to the 11 T** one

- With this assumption, cable quench limit around **110 mW/cm³**
  - steady-state (conservative, 20% ?)
  - uniform heat deposit over cable cross-section

- **Measurement** of the **actual 11 T cable soon available**

→ update of the quench limit calculation