

Toward the production of the first 1-m long Canted-Cosine-Theta (CCT) model magnet at PSI

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ABSTRACT

The Canted-Cosine-Theta (CCT) PSI magnet program aims at demonstrating that the CCT technology has the potential for the development of 16 T dipole magnets, required for high performance particle colliders. The first step in this direction is the implementation of a Nb₃Sn 1-m-long, 2-layer CCT single-aperture dipole model, referred to as Canted Dipole One (CD1) which is designed to achieve a peak field in a 63 mm bore of ~11 T. The in-house production/assembly of CD1 requires to setup at PSI a number of fabrication steps. In this poster, the authors review the status of advancement of the production process of Nb₃Sn CCT model magnets at PSI.

PSI CCT Program

Canted Dipole 1 (CD1)

- 1-m-long
- 63-mm-bore
- 2-layers CCT single-aperture
- Bladder and keys mechanical structure

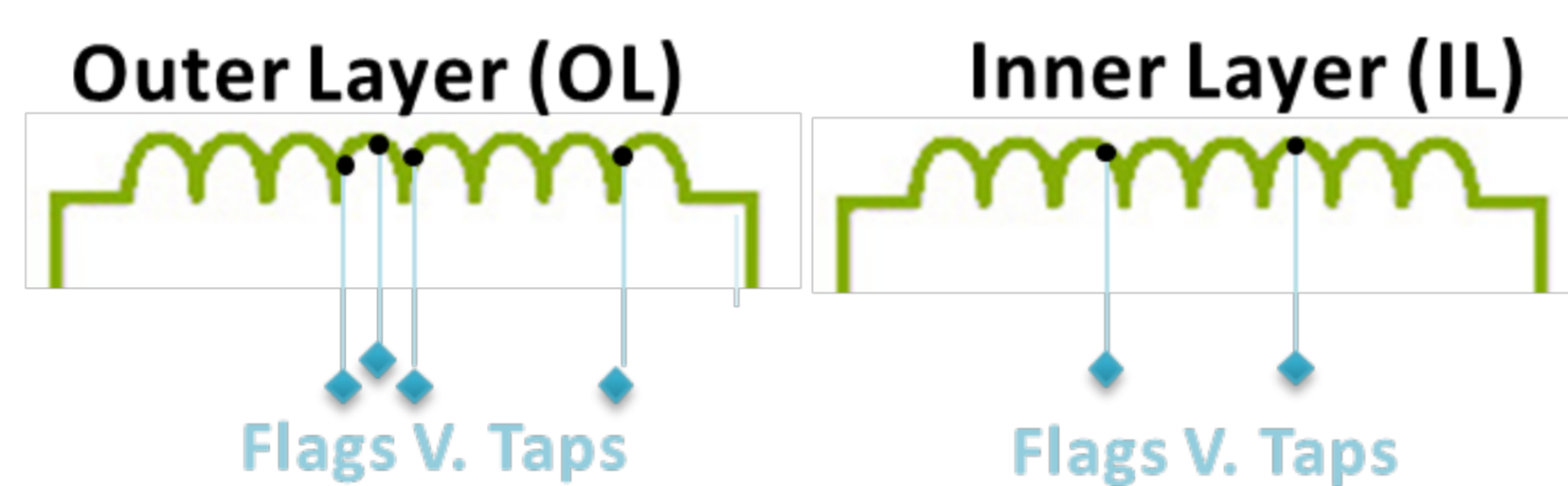
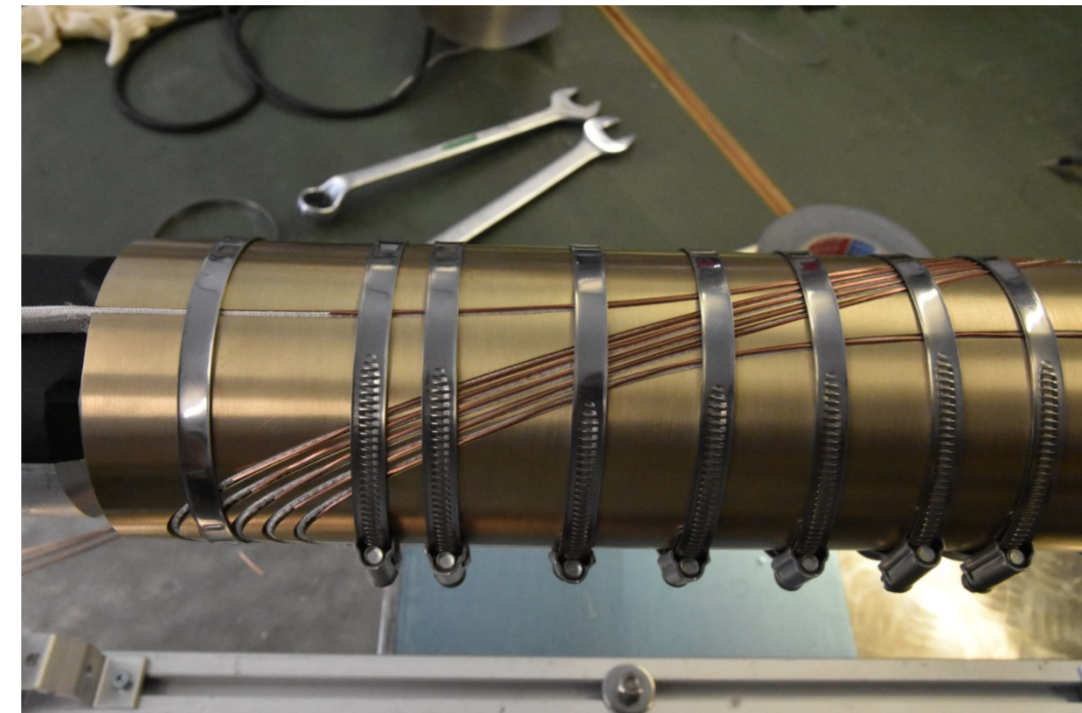
Al-Bronze Former (50 turns)

- 3-mm-thick spars
- 10.6-mm-deep channels
- Minimum rib thickness 0.35 mm

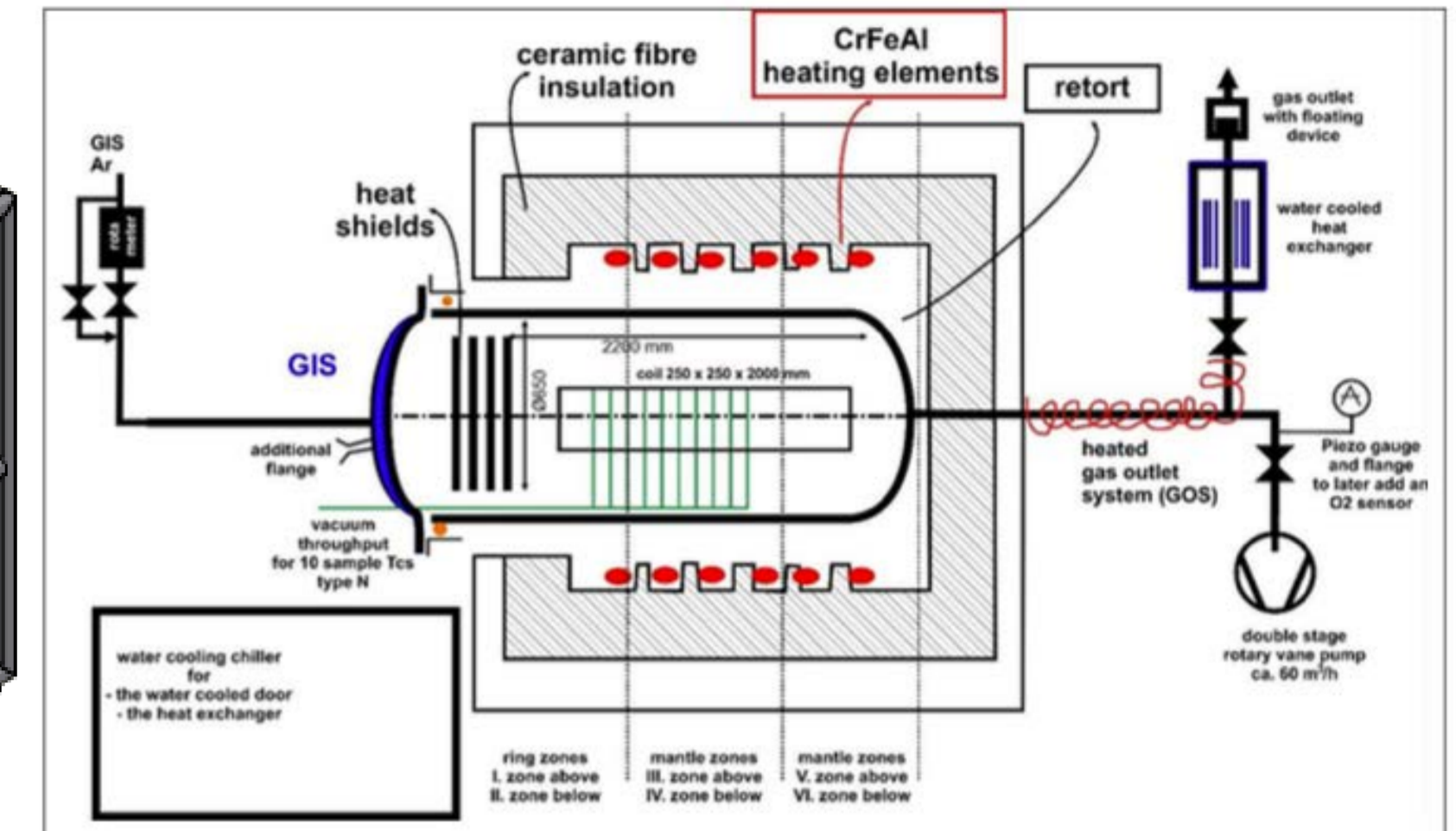
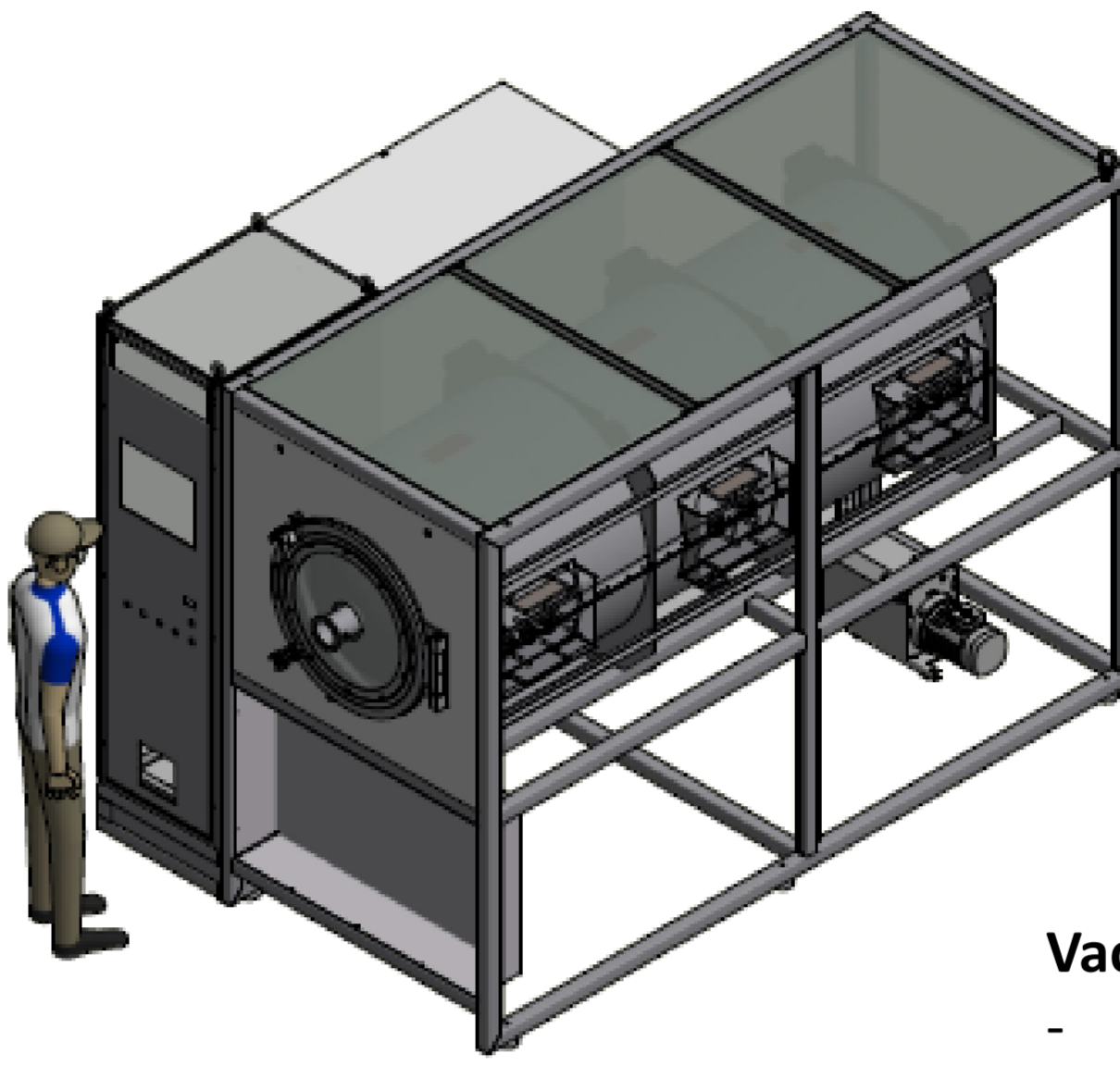
Nb₃Sn Cable

- 21 x 0.85 mm ϕ strands (RRP 108/127)

1. Coil Winding (Instrumentation 1)



2. Heat Treatment

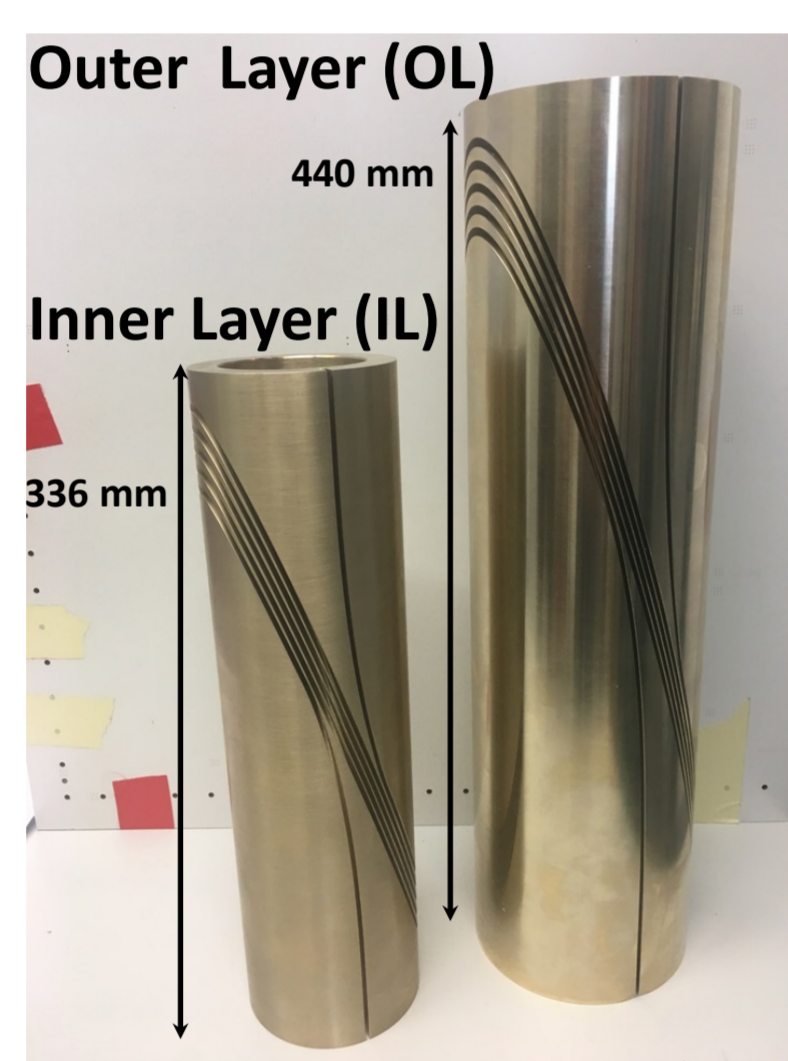


- Vacuum Reaction furnace for superconducting coils and cables
- Available heating volume 250 mm x 250 mm x 2000 mm
 - 6 heating zones
 - Heat treatment for Nb₃Sn of 180 h at up to 660 °C in inert atmosphere (Ar)

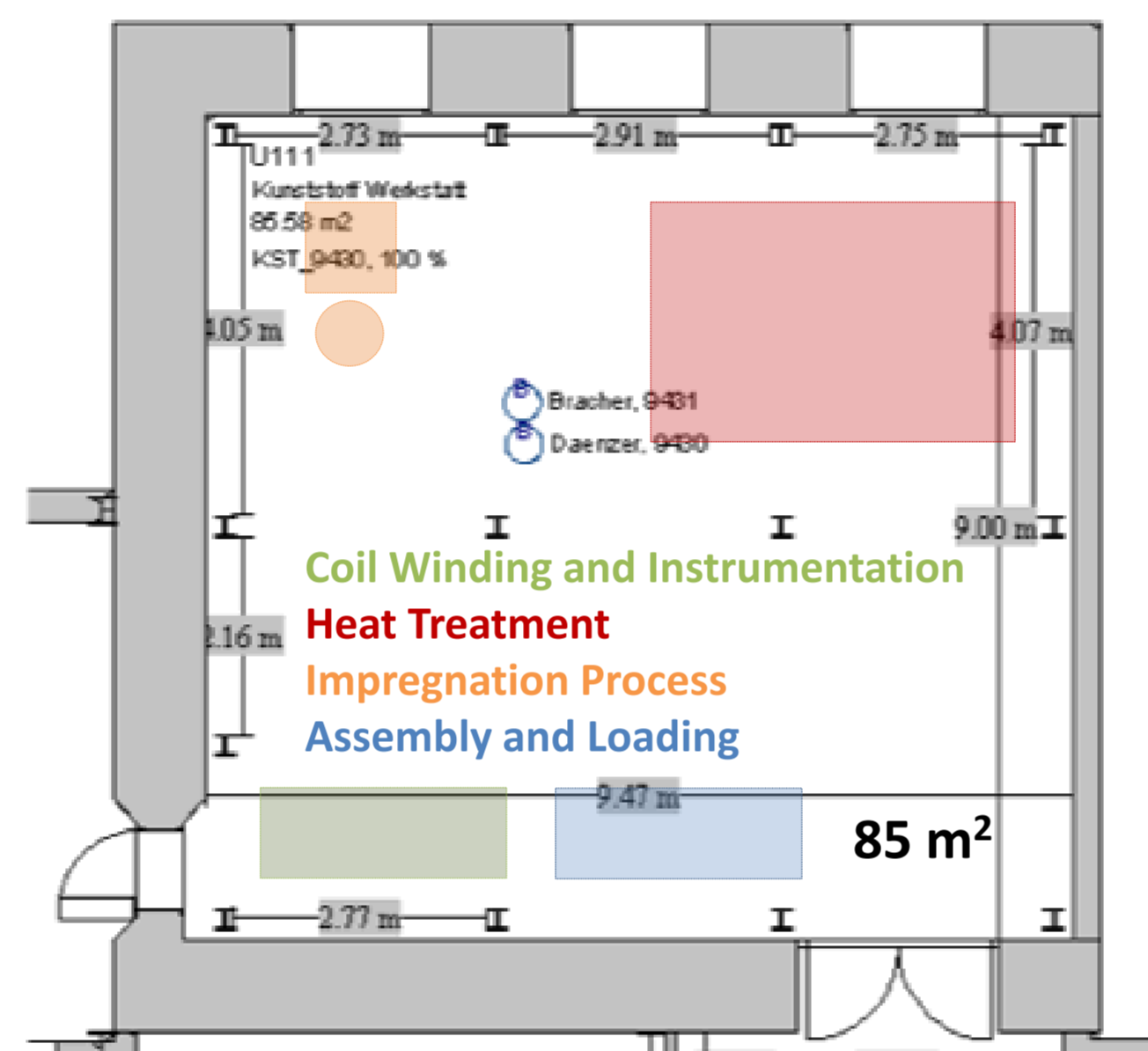
Cable



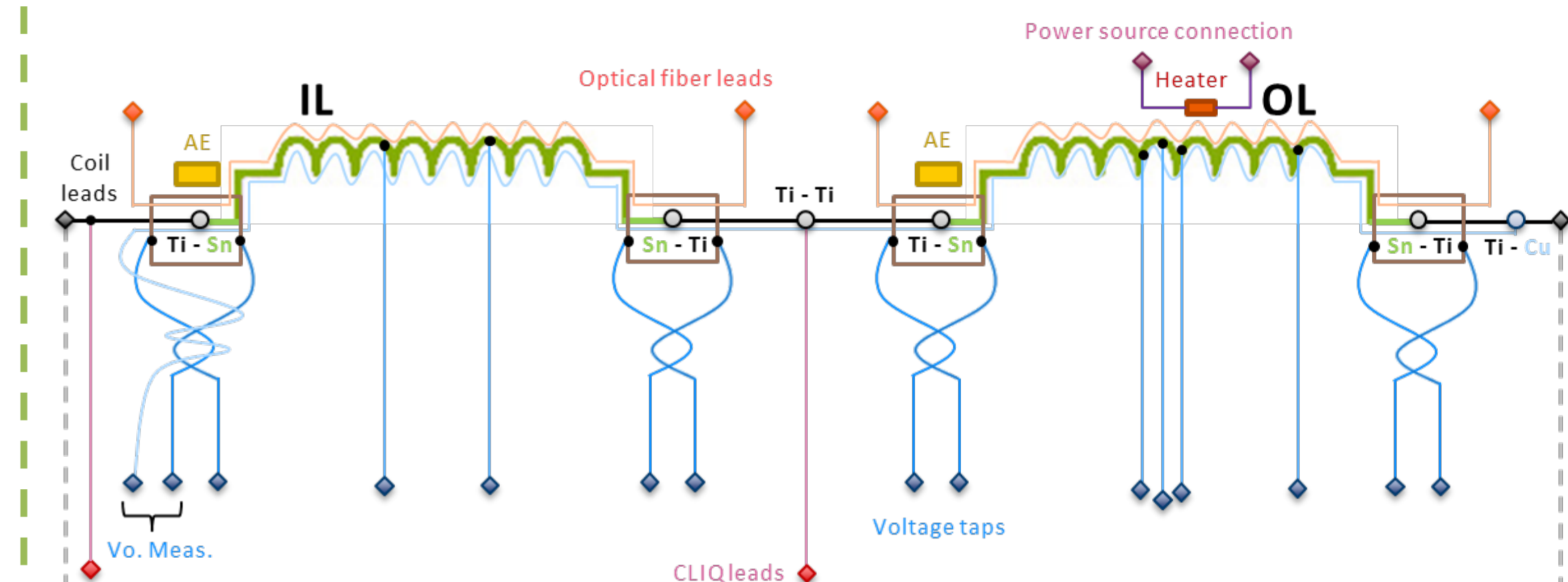
Formers (short model)



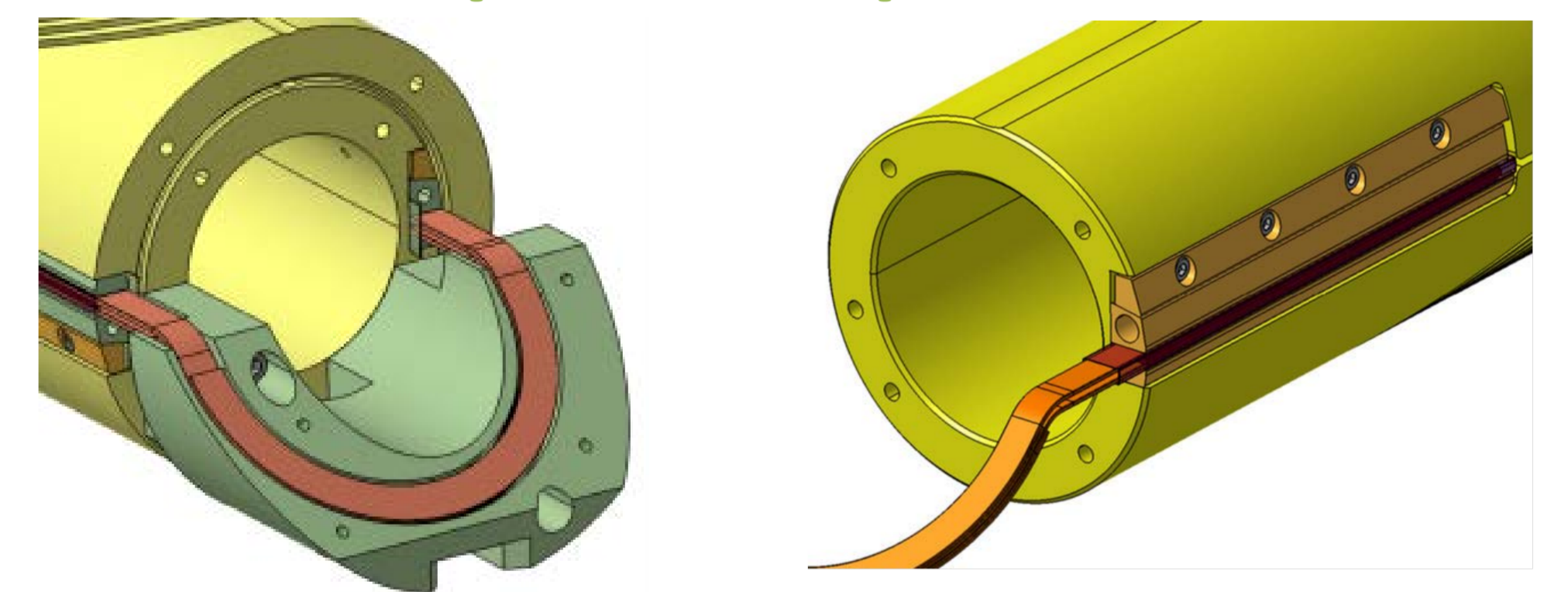
SC Lab @ PSI (May 2018)



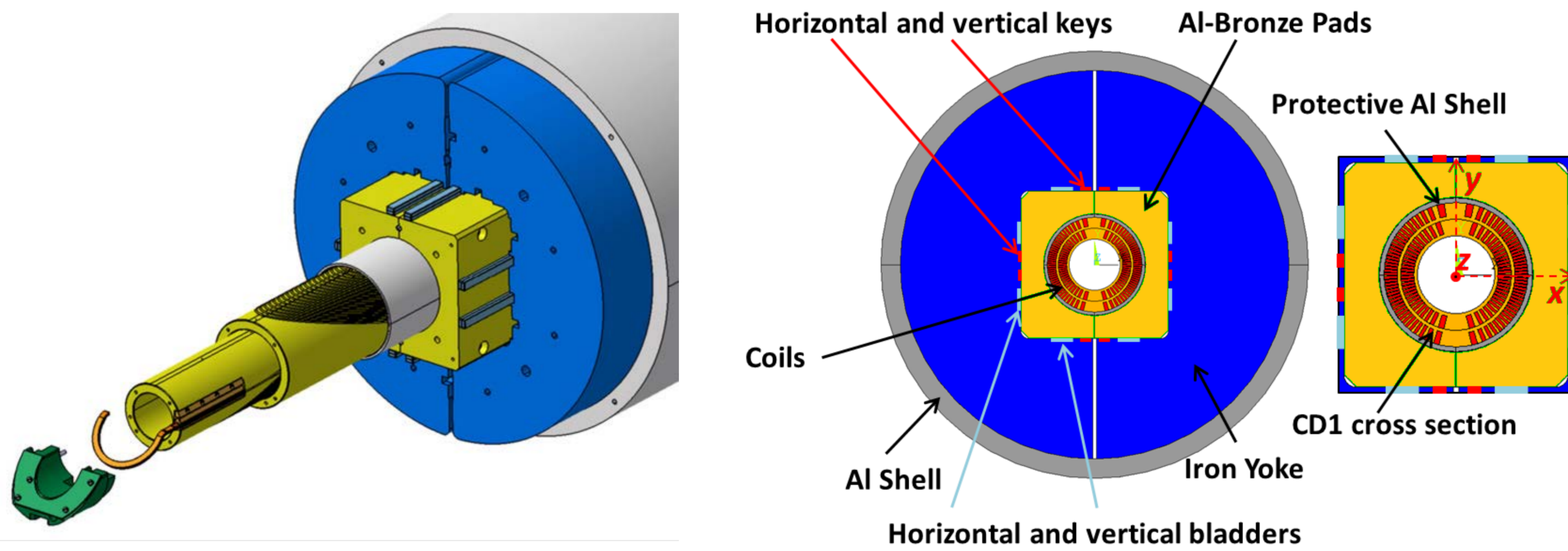
3. Instrumentation 2



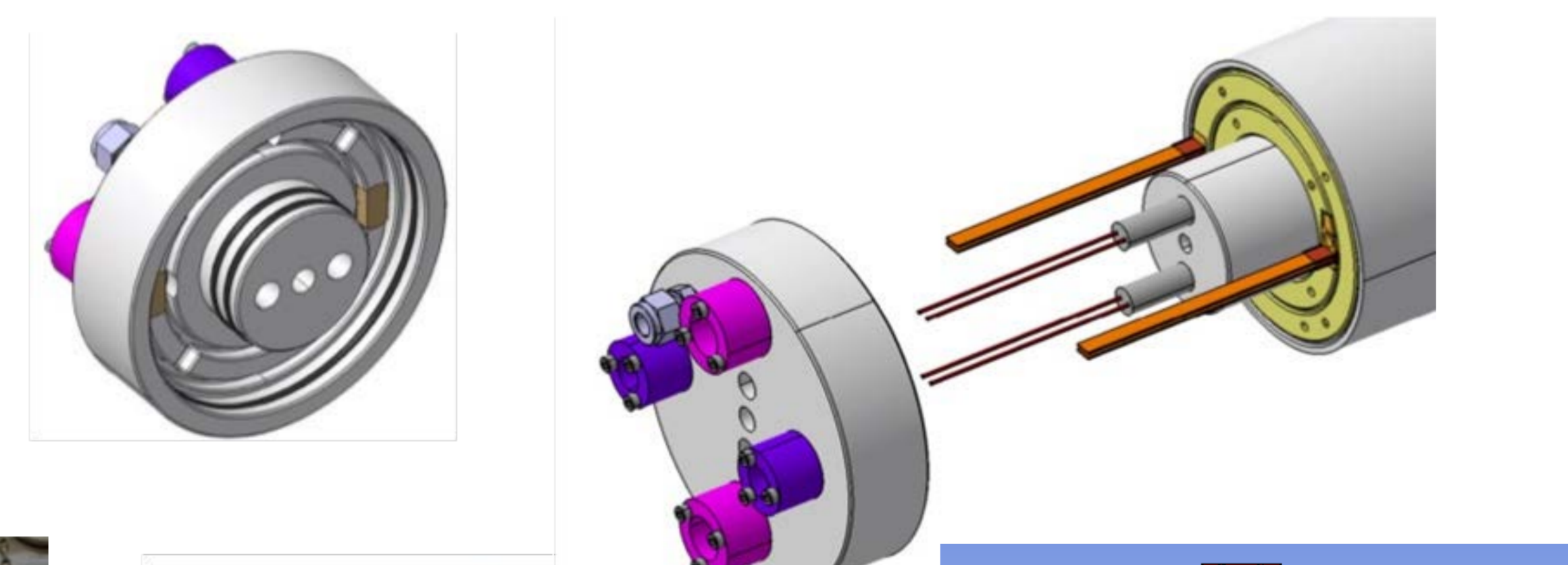
4. Splices Preparation



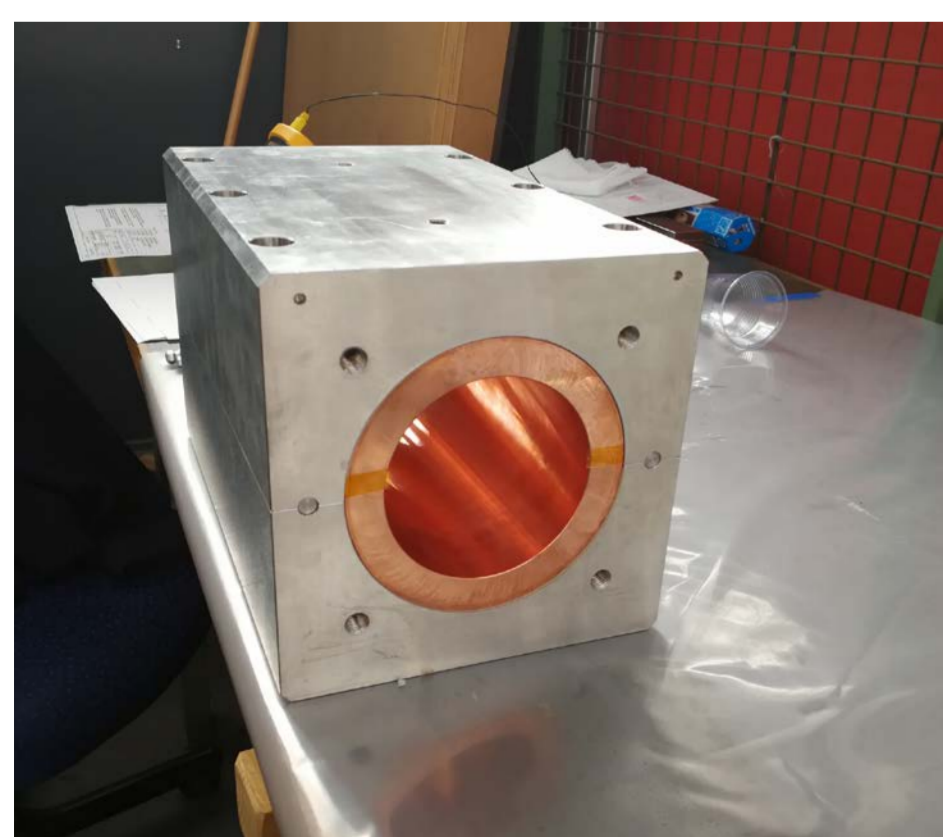
7. Assembly and Loading



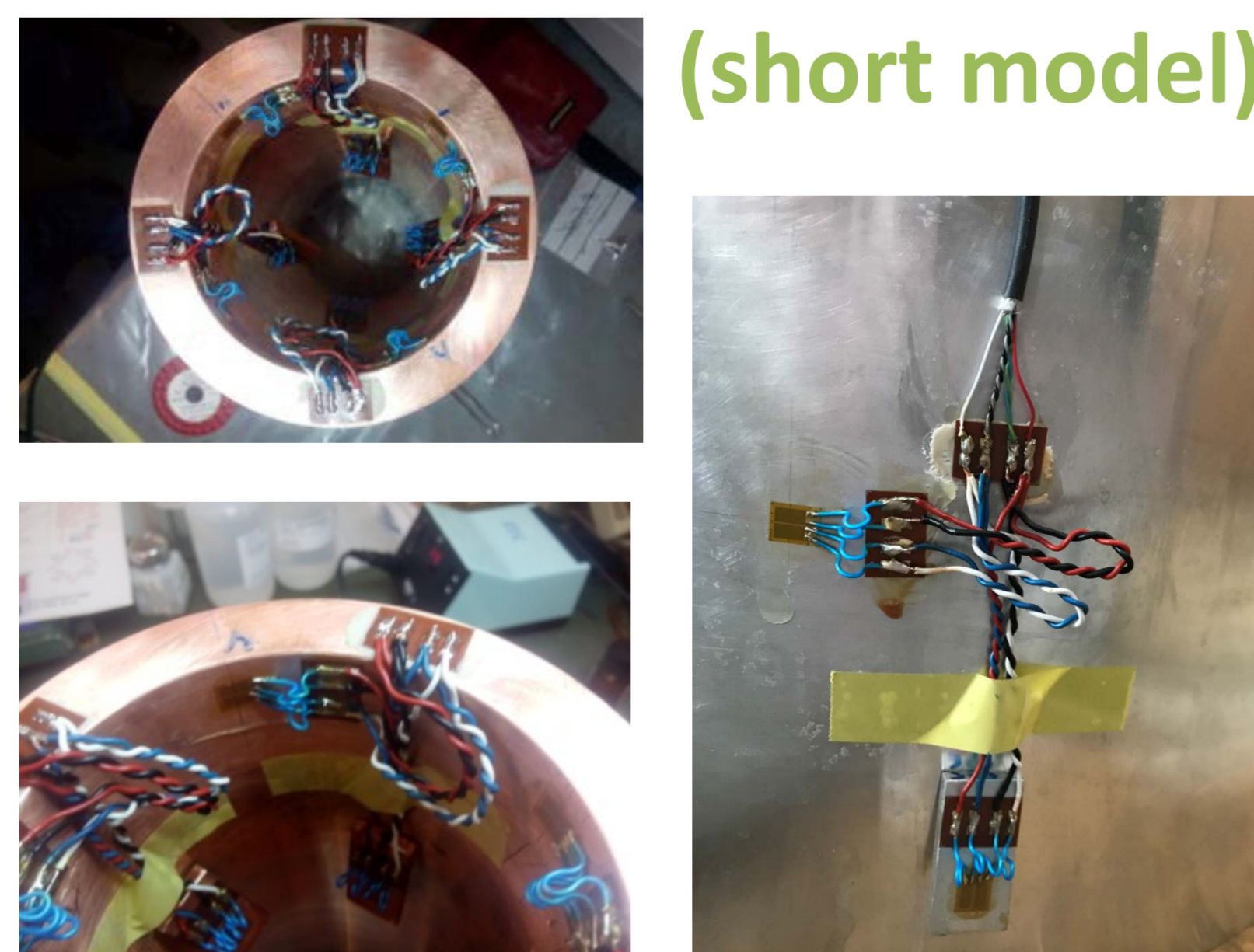
5. Vacuum Impregnation Process



Mechanical Structure (short model)



6. Instrumentation 3 (short model)



Conclusions

- At PSI, the infrastructure for the production of the CD1 model magnet is currently under preparation
- Major progress on the production steps has been done
- The first model magnet will be ready by the end of 2018

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