PCMAG Status

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DESY

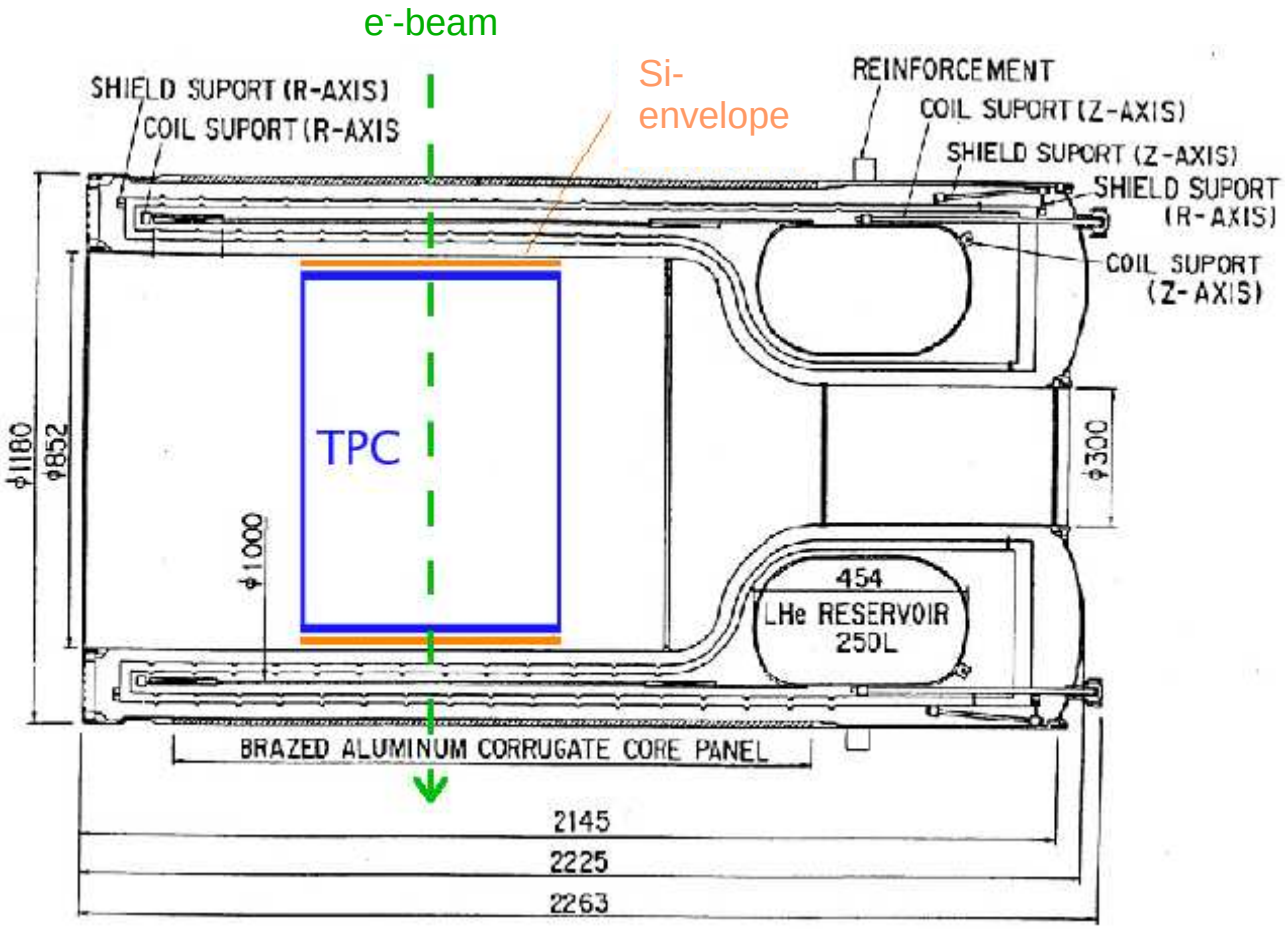
EUDET Extended SC Meeting JRA1

01-Sep-2008

PCMAG

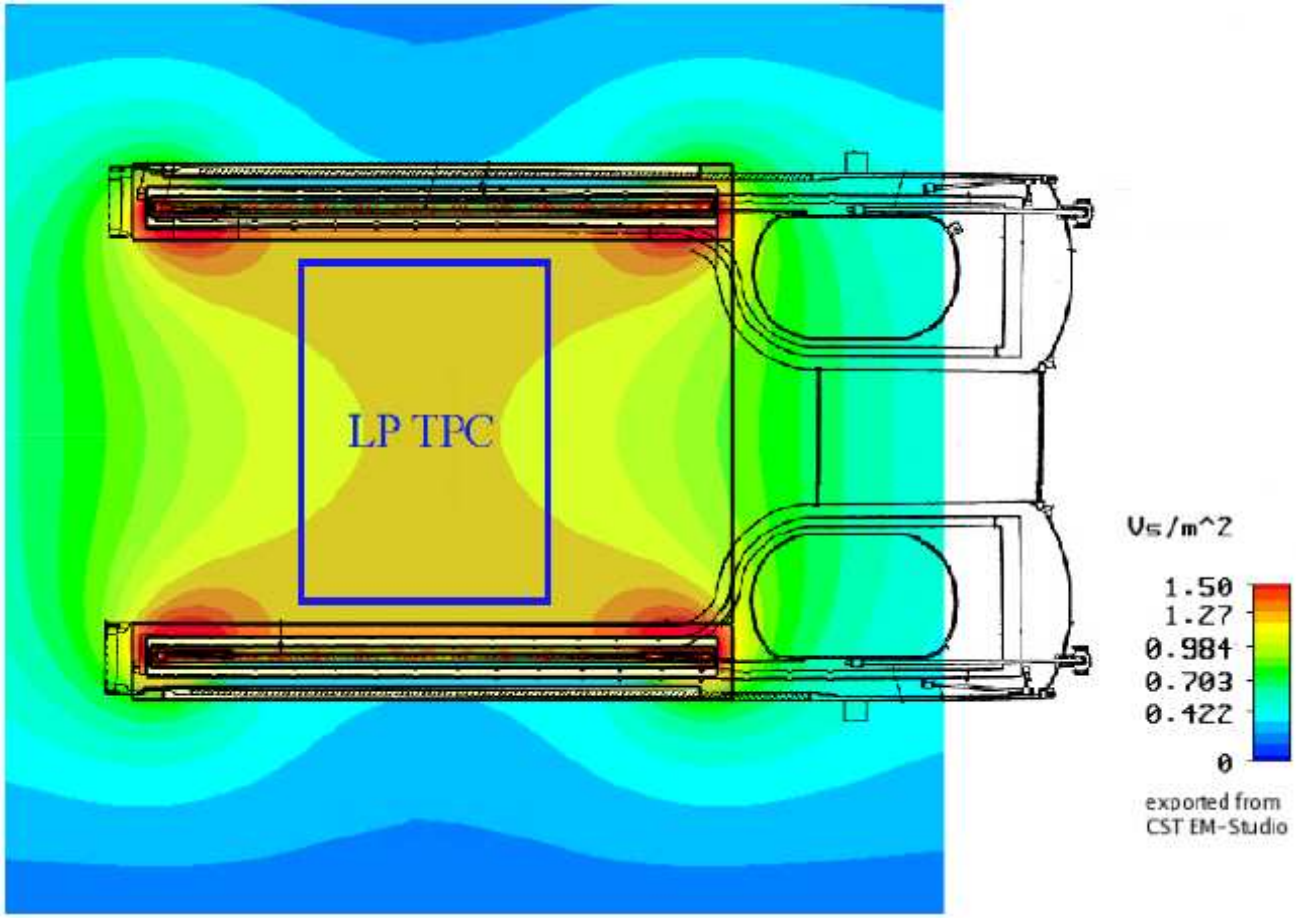
- Permanent Current Magnet
- Superconducting coil
- B_{max} (520 A) = 1.25 T, $B_{nominal}$ (430 A) = 1.0 T
- PCMAG at DESY-II test beam: T24/1
- Initially installed in December 2006

PCMAG



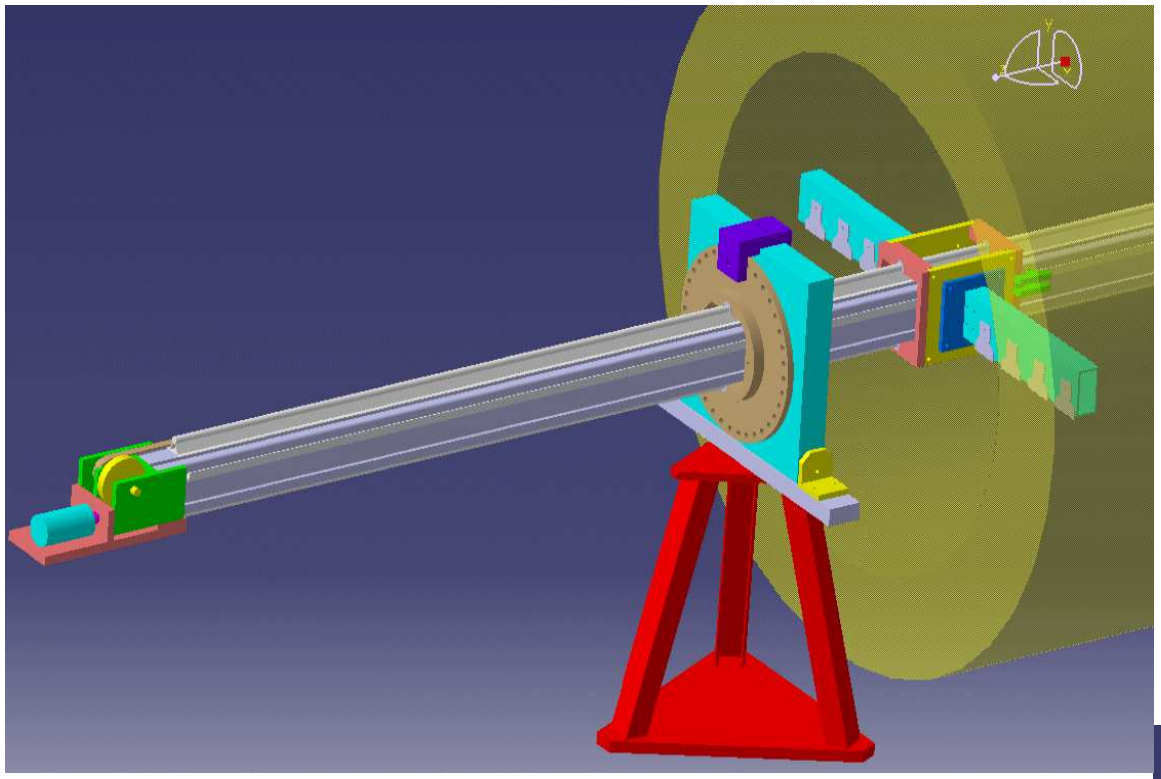
B_{max} ~ 1.25 T

PCMAG

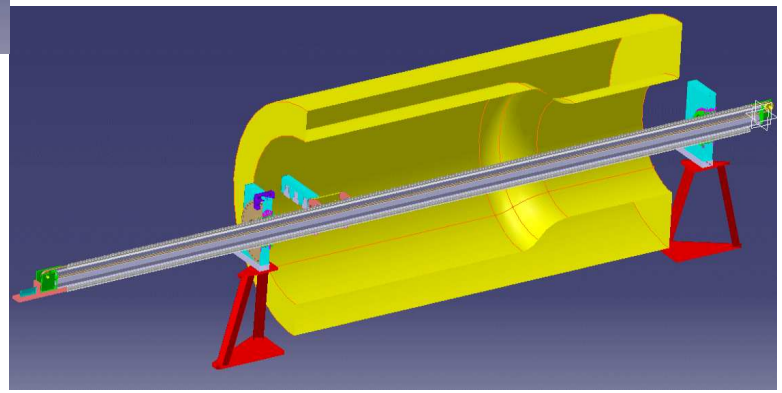


$B_{max} \sim 1.25$ T

Field Mapping



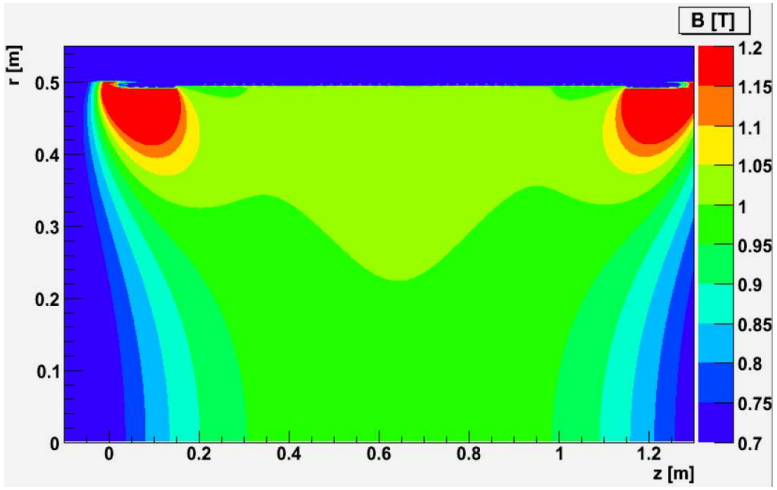
Field measurements performed in July 2007



P. A. Giudici / C. Bault

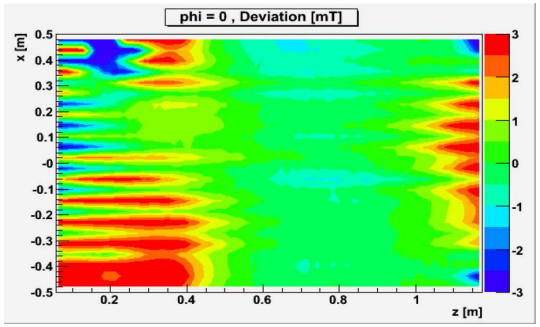
Field Mapping

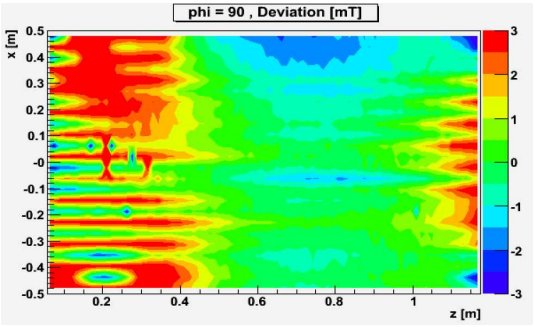
Biot-Savard yields:

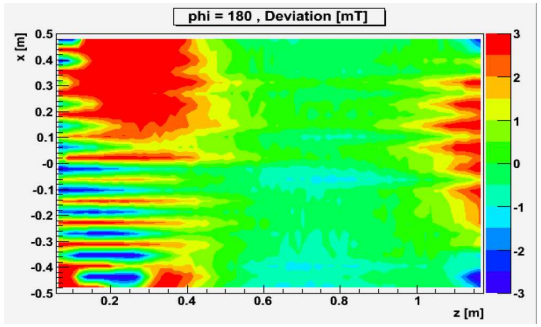


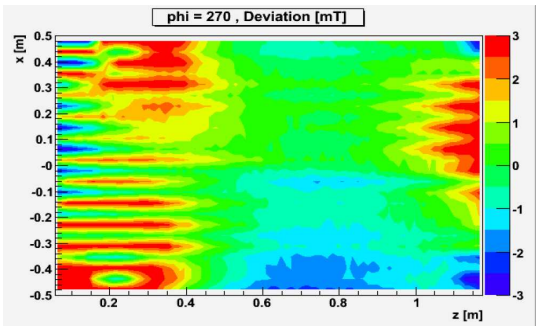
C. Grefe, Univ. of Hamburg

Comparison Model – Field measurements









C. Grefe, Univ. of Hamburg

Field Mapping

- Field map has been created
- Model based on data from field mapping campaign
- Accuracy in field map between 5 to 10 Gauss, slightly worse than expected
- Most important component: $\Delta B_z = 5.7$ Gauss
- Design of Hall sensor cards was not optimal

Field Mapping

- Two Hall sensors are permanently installed in PCMAG
  - One in the “bottleneck”
  - One at the front side of the magnet

- Together with the reading of the current of the PCMAG power supply, the permanent probes will give a redundant check of the overall magnet's field strength

Field Mapping

- Perfect adjustment after performing calibration at three B fields
- Unexpected calibration degradation in the long term, in particular at high fields
- Tests going on to understand the cause of the effect
  - Temperature characterization
  - Reference voltage slow variations
- Improved sensor cards are being developed by NIKHEF and CERN

Field Mapping

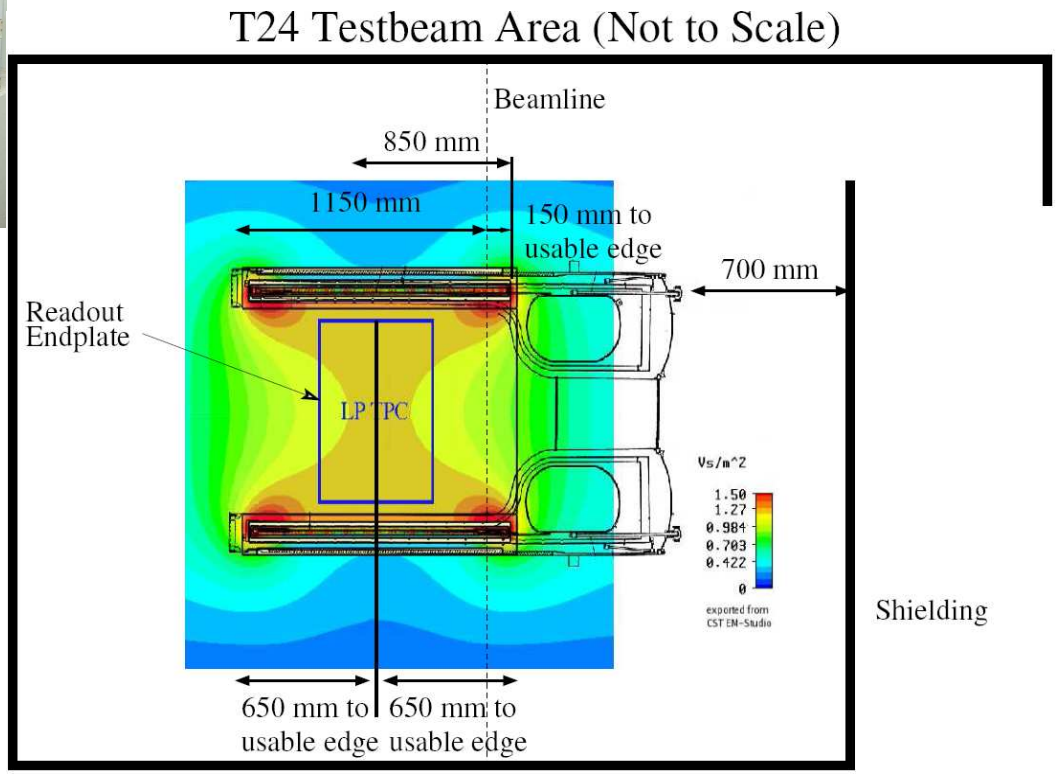
- Scheduling of intervention:
  - Replacement of the 2 permanent sensor cards
  - Positioning of an NMR probe in the PCMAG's center
  - Excitation of PCMAG (2-3 current values)
  - Measurement of NMR and the two sensors to obtain new reference values
- To be coordinated with the “handover” visit of the KEK colleagues

PCMAG Operation Issues

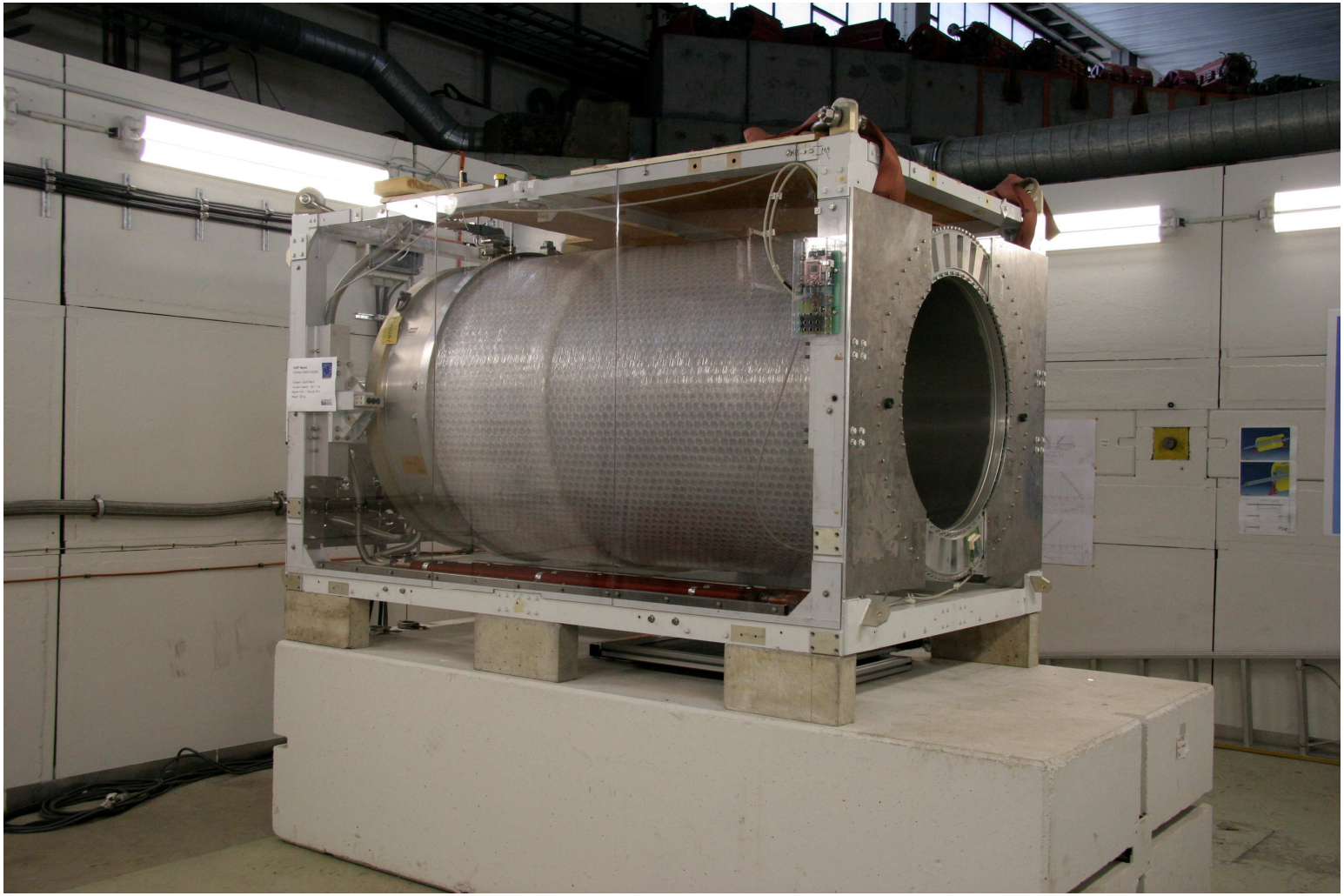
- Double He exhaust line
- 2nd safety valve installed
- Touch protections installed
- PCMAG newly-arranged
- New LHe transfer line

Arrangement PCMAG

Magnet needed to be rotated by 180º



Arrangement PCMAG

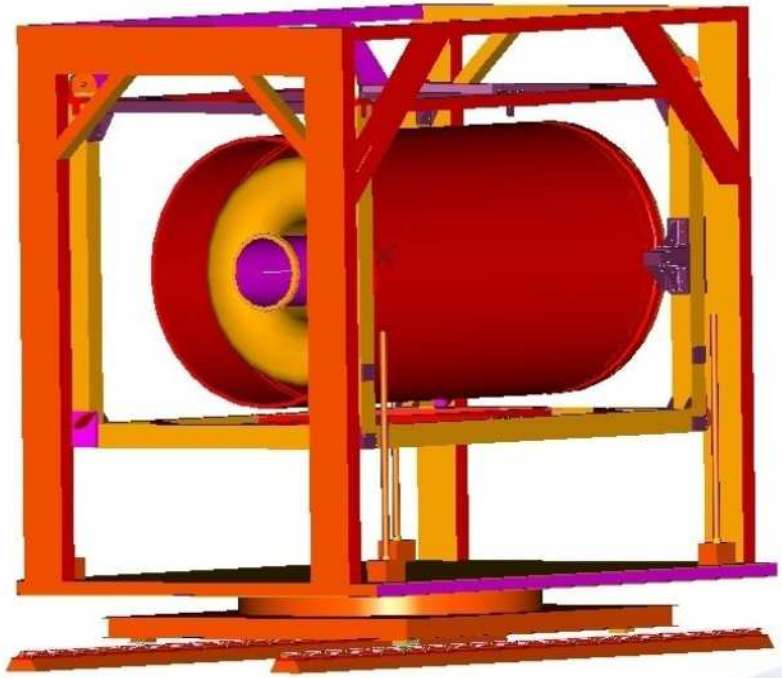


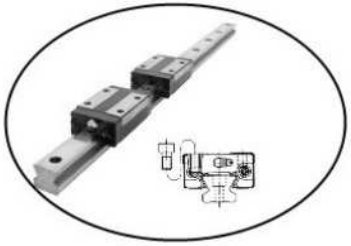
LHe Transfer Line

PCMAG Stage

Design Study of the Magnetmovementtable

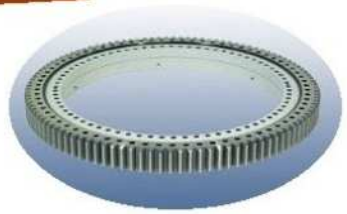
Power Jack



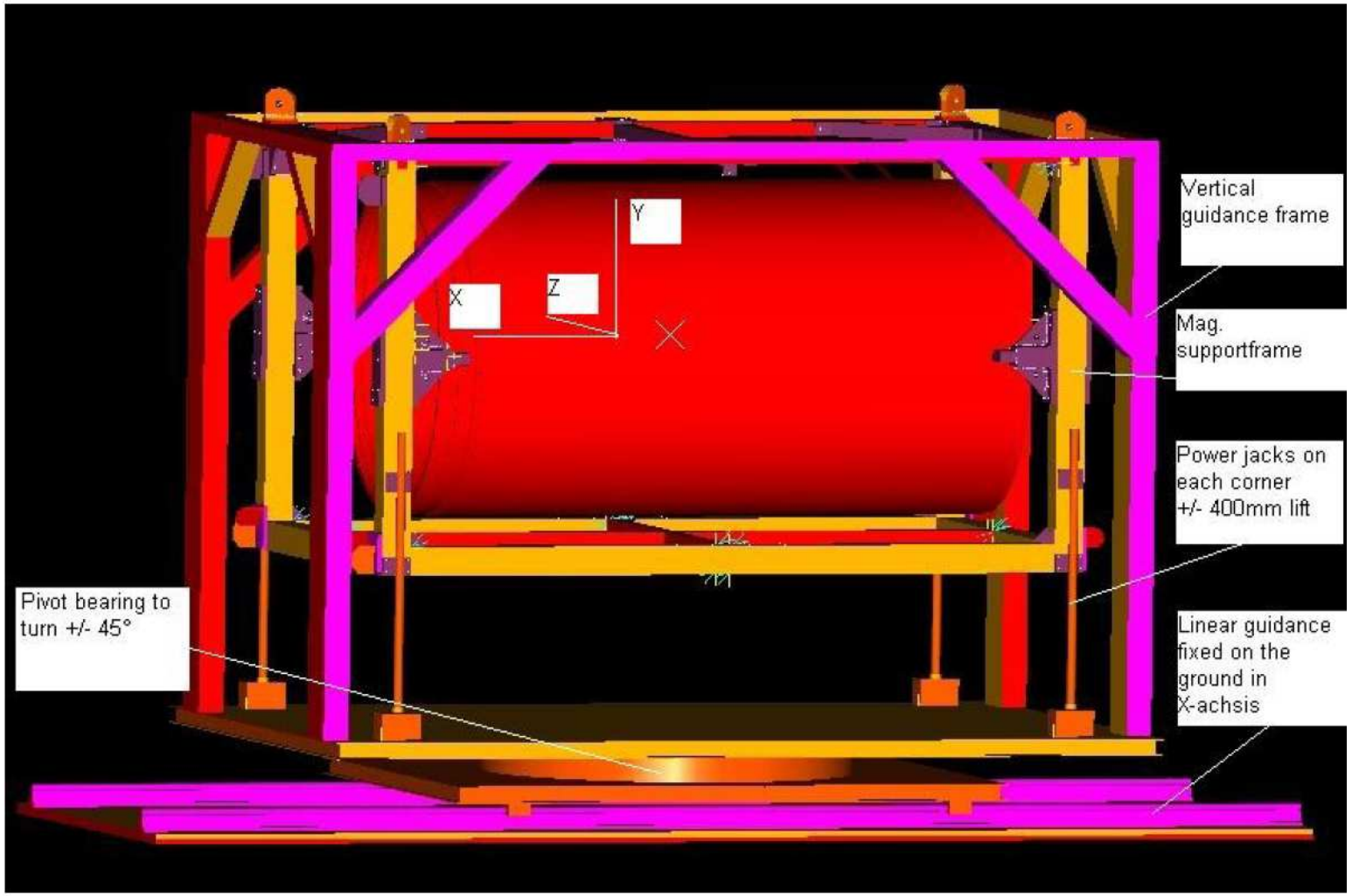


Linear guiding

Bearing



PCMAG Stage


Y
X
Z
Vertical guidance frame
Mag. supportframe
Power jacks on each corner +/- 400mm lift
Pivot bearing to turn +/- 45°
Linear guidance fixed on the ground in X-achsis

Summary & Outlook

- Field mapping produced and implemented in Analysis Software
- Operational and safety issues have been solved
- PCMAG has been repositioned due to space issues
  - New permanent Hall-sensor cards to be implemented
  - Final handover by KEK colleagues (September ?)
  - TPC support structure to be installed mid September
  - PCMAG stage studies are under way

Field Mapping

- Perfect adjustment after performing calibration at three B fields
- Unexpected calibration degradation in the long term, in particular at high fields
- Tests going on to understand the cause of the effect
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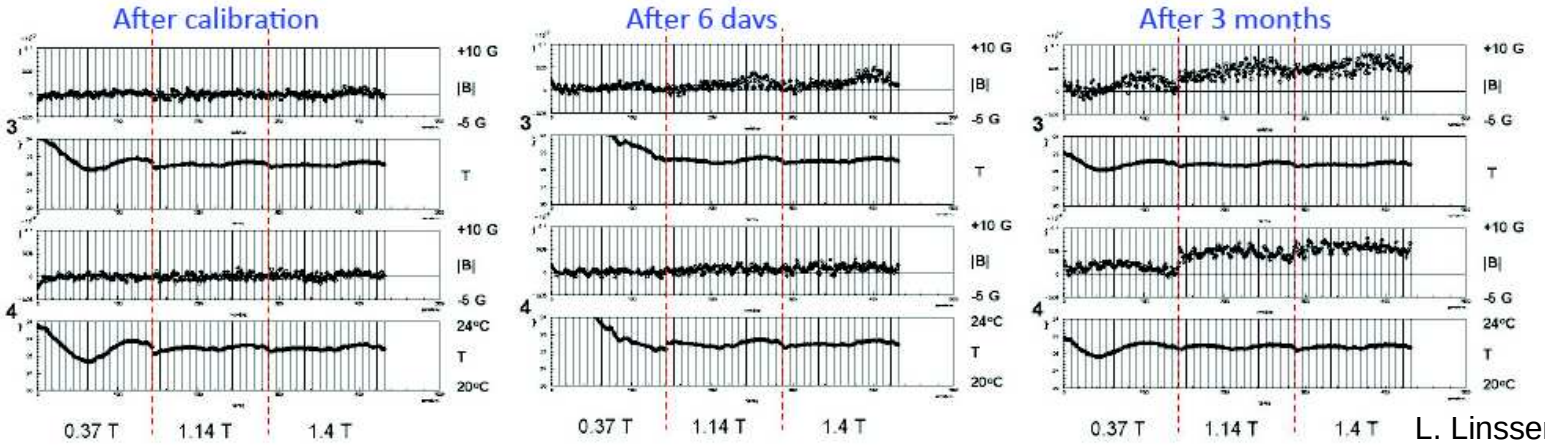
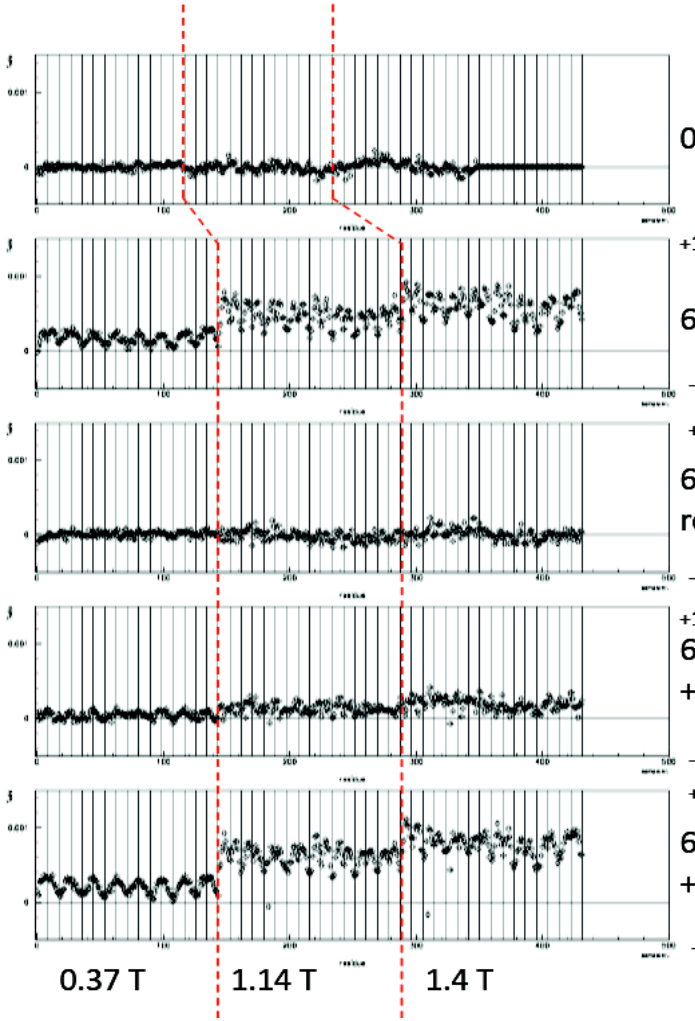
  - Reference voltage slow variations



L. Linssen, CERN

Field Mapping



Eudet cards used at DESY
card 5

Calibration drift up to ~10 Gauss (1 per mille) after 6 months

12 cards tested, look similar

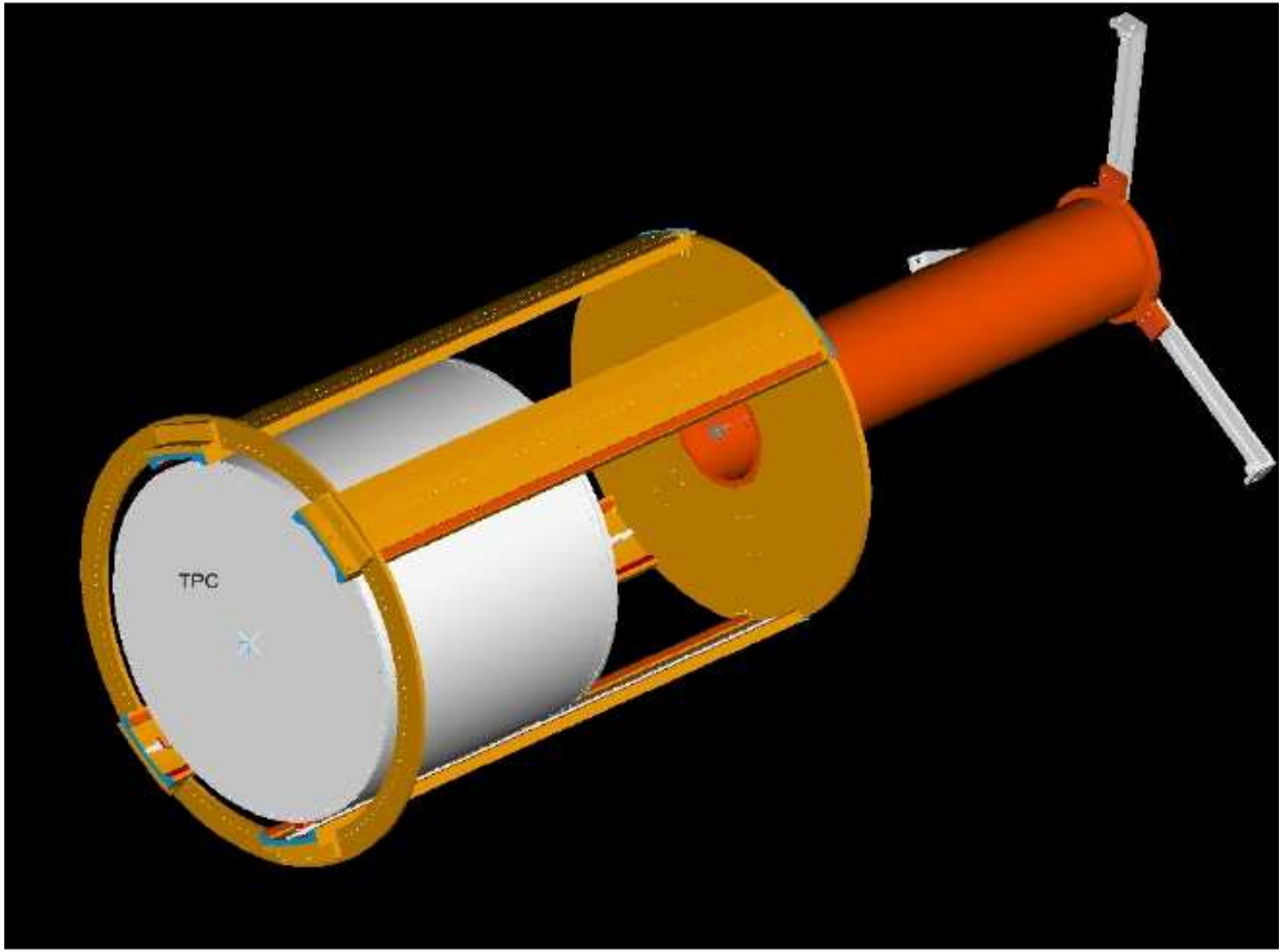
Measurements at 22 ^{0}C
Calibration done at 20, 24 ^{0}C

L. Linssen, CERN

Field Mapping

- Improved sensor cards are being developed by NIKHEF and CERN
- First production batch of cards will be arriving at mid September
- Four of them can be made available for PCMAG
  - Two cards to replace the installed probes
  - Two cards to be attached to the TPC

TPC Support Structure



TPC Support Structure