Field Measurement

- Final field measurement was done in February as scheduled.
- Measurement summary
  - COBRA field
    - $I_{SC}=360A$ $I_{NC}=320A$
    - $|z|<110cm$ $\Delta z=2cm$, $-4cm<R<+29cm$ $\Delta R=2cm$, $0^\circ<\varphi<+330^\circ$ $\Delta \varphi=30^\circ$
    - 22644 points
  - BTS fringe field
    - $I_{BTS}=200A$ (unlike polarity)
    - $-110cm<z<0cm$ $\Delta z=2cm$, $-4cm<R<+29cm$ $\Delta R=2cm$, $0^\circ<\varphi<+330^\circ$ $\Delta \varphi=30^\circ$
    - 11424 points
  - Field stability measurement with NMR
COBRA Field Stability

• Stability of the COBRA field was measured over a week with NMR at the magic point.
• COBRA field is stable within <20ppm.
COBRA Field Map

• We are finishing the analysis.
• Measured data
  • Correction for Hall-sensor readout
    • Absolute calibration
    • Temperature compensation
    • Planar Hall effect
  • Correction with the measured position of measuring machine
  • Interpolation bw/ measuring points by means of bspline surface fitting.
• Calculation
  • Detailed coil modeling
  • Thermal expansion at low temperature (∼-0.4%)
Comparison with calculation to check the validity of the measurement.

- The measured field is in agreement with the calculation within 0.22% (σ) all over the volume.
- Center of field difference distribution ~ 0
- Not a random deviation
- Difficult to judge which is right.

Possible usage:
- Measured data for |z| < 1100mm R < 290mm and calculation for the other regions.
Quench Problem

- There were frequent quenches in the COBRA magnet.
- We found that it is caused by the external noise on the input signal line of the quench detector.
- It seems that they happen mostly at the beg. and the end of the working time.
- Modified shielding and grounding scheme are being tried.
- No quench for the past three weeks, but with zero coil current.
- Looking for the noise source in parallel.
Fringe Field Problem

• A dramatic reduction of beam rate was found in $\pi$M3 beam line last month when the COBRA ON.
  • Reduction: 30% @ GPS, 95% @ LTF
  • Transverse component causes diffraction of the beam.
• There is an effect also at $\pi$E3 beam line, but it’s not serious once the field is stabilized.
• Possible solutions @ $\pi$M3
  • Shielding on beam pipe with high-$\mu$ material
    • Installation of Parmalloy sheet ($\mu = 180000$) was done last week.
    • Shielding factor ~400 is expected.
  • Retune the beam line
  • Add horizontal steering magnet
  • Soft iron wall bw / $\pi$M3 and $\pi$E5
    • The effect is being calculated.
• Shielding with high permeability material (Parmalloy $\mu=180000$) was installed in the $\pi$M3 beam line last week.
• The effect will be measured on Jun. 26th.