Permanent Final Quadrupole Magnet Test at ATF2

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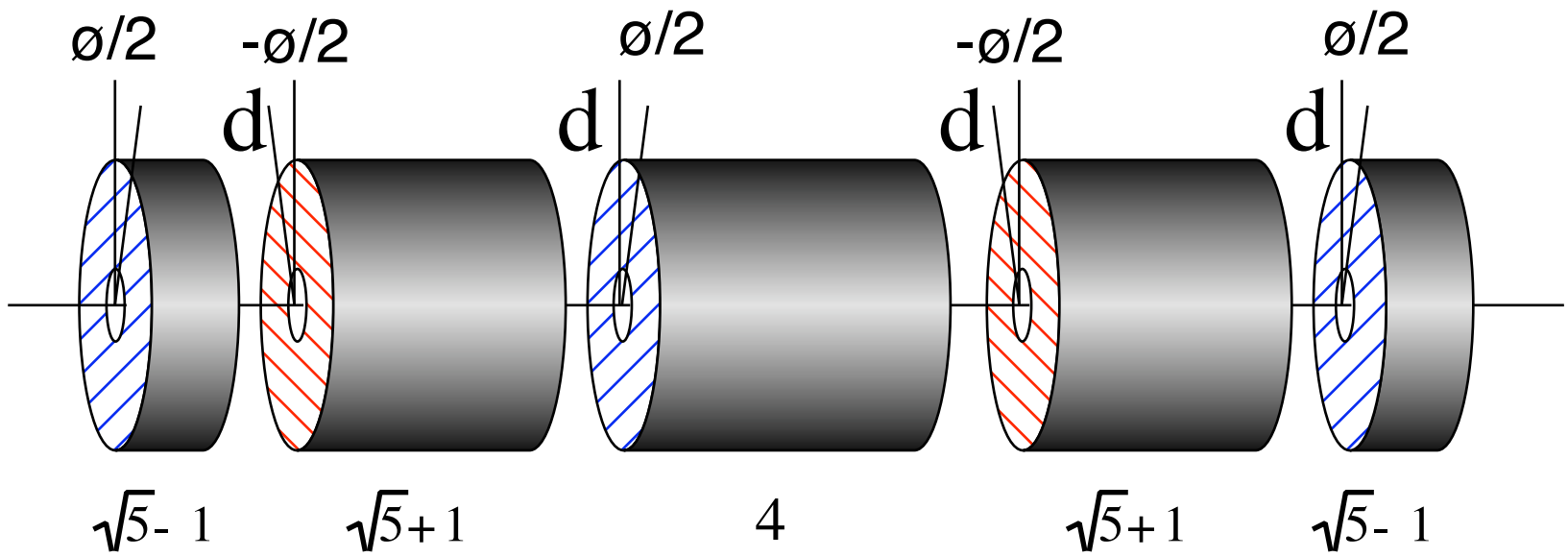
Gluckstern's adjustable PMQ

Gluckstern's skewless variable PMQ



$$M = R \bullet M2 \bullet R^{-2} \bullet M1 \bullet R^{2} \bullet M0 \bullet R^{-2} \bullet M1 \bullet R^{2} \bullet M2 \bullet R^{-1}$$

4x4 matrix: $M=\begin{pmatrix} Mxx & O^5 \\ O^5 & Myy \end{pmatrix}$ when d=0.

R.L. Gluckstern and R.F. Holsinger: Adjustable Strength REC Quadrupoles, IEEE Trans. Nucl. Sci., Vol. NS-30, NO. 4, August 1983, http://epaper.kek.jp/p83/PDF/PAC1983_3326.PDF

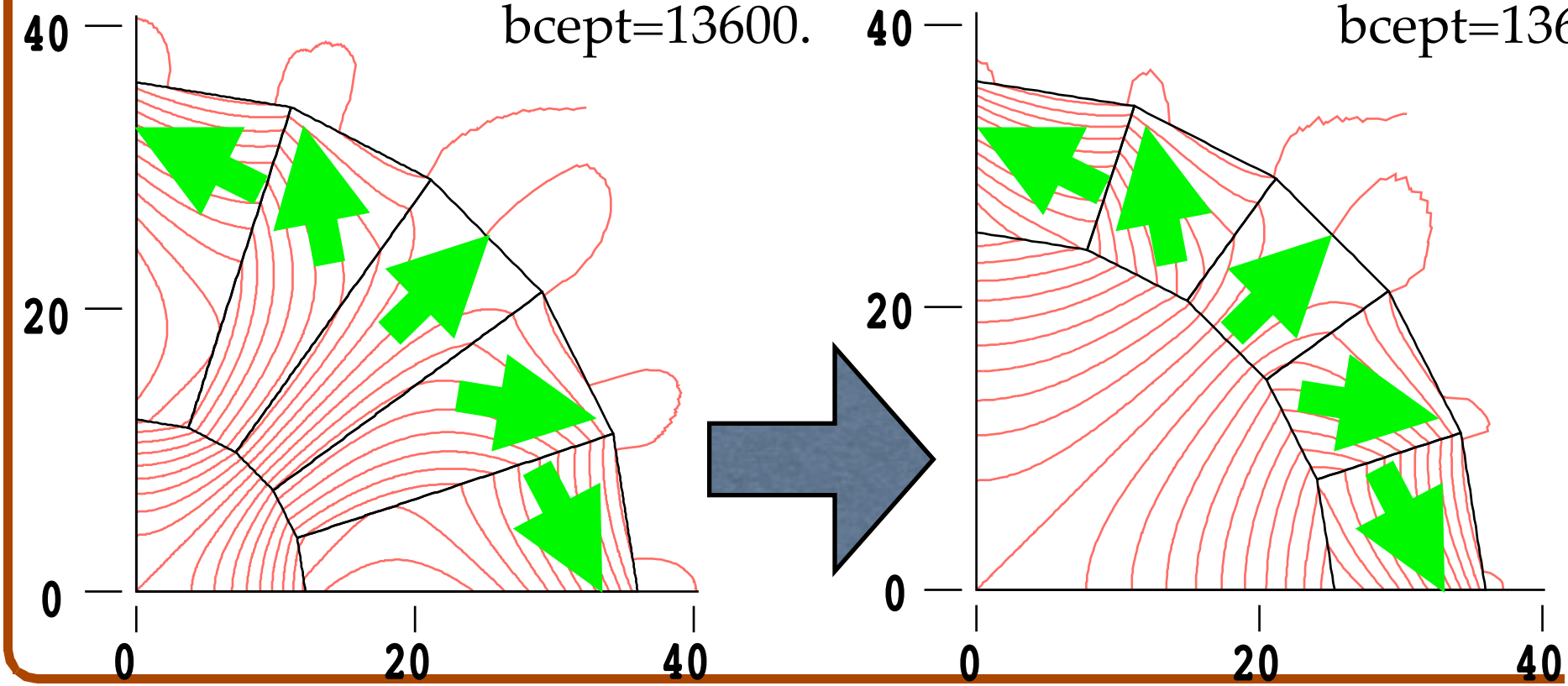
Test at ATF2 – replace QD0

Req'd spec for QD0: L=45cm, ø50mm, G=13T/m

OD: ø72 (=2x(56-20)) GL=5.85 T

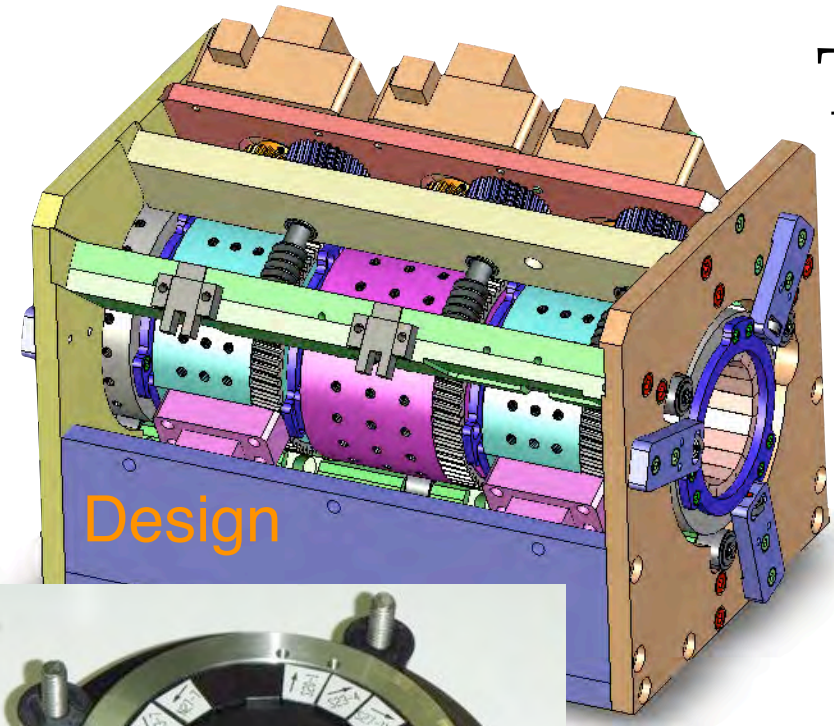
140T/m @ ø24 48H hcept=-12890, bcept=13600.

30T/m @ ø50 48H hcept=-12890, bcept=13600.



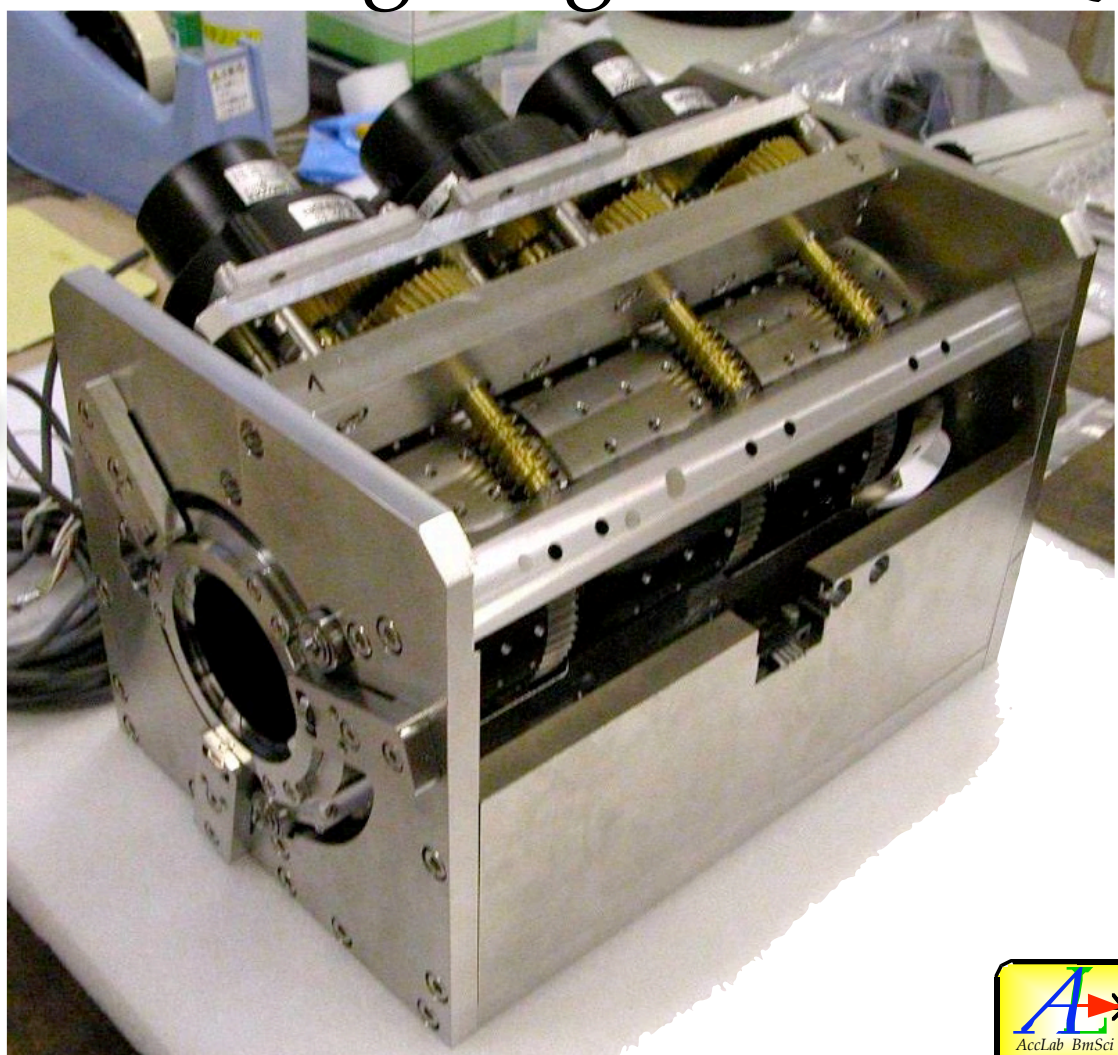
Gluckstern's 5-ring PMQ Singlet(2):

"Continuously Adjustable" PMQ fabricated



Disc(20mm)

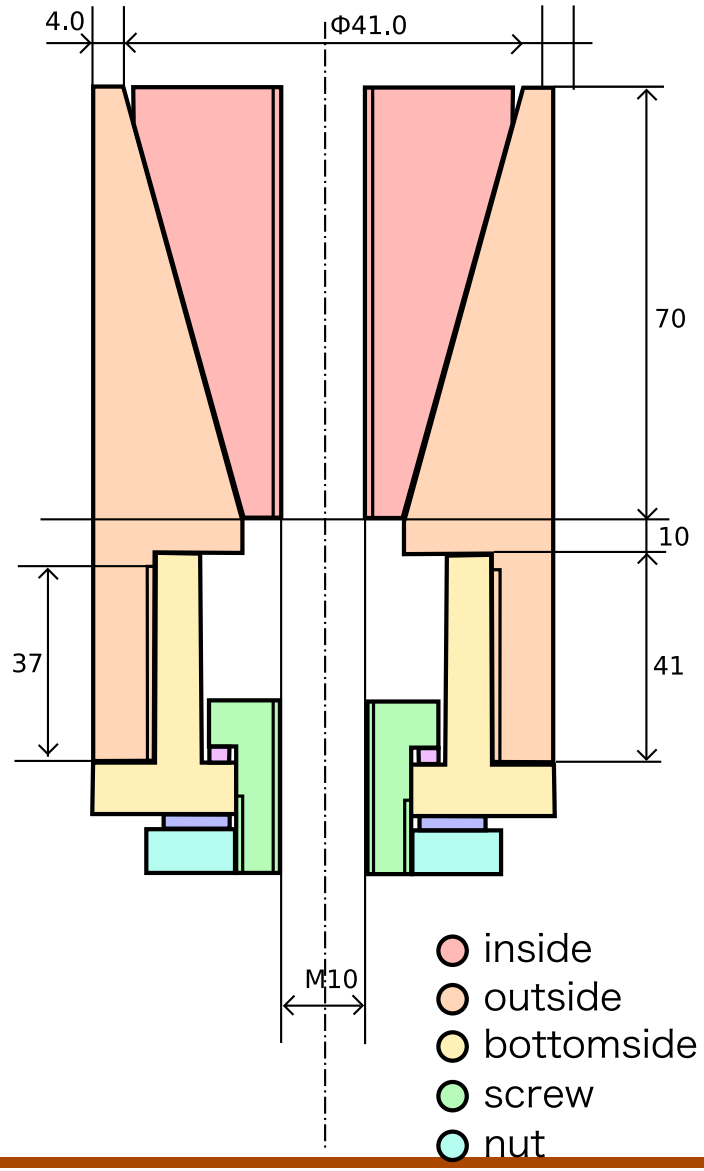
The 5-ring singlet PM-FFQ



Adjustment

Adjustment:

Jig for placing magnet parts



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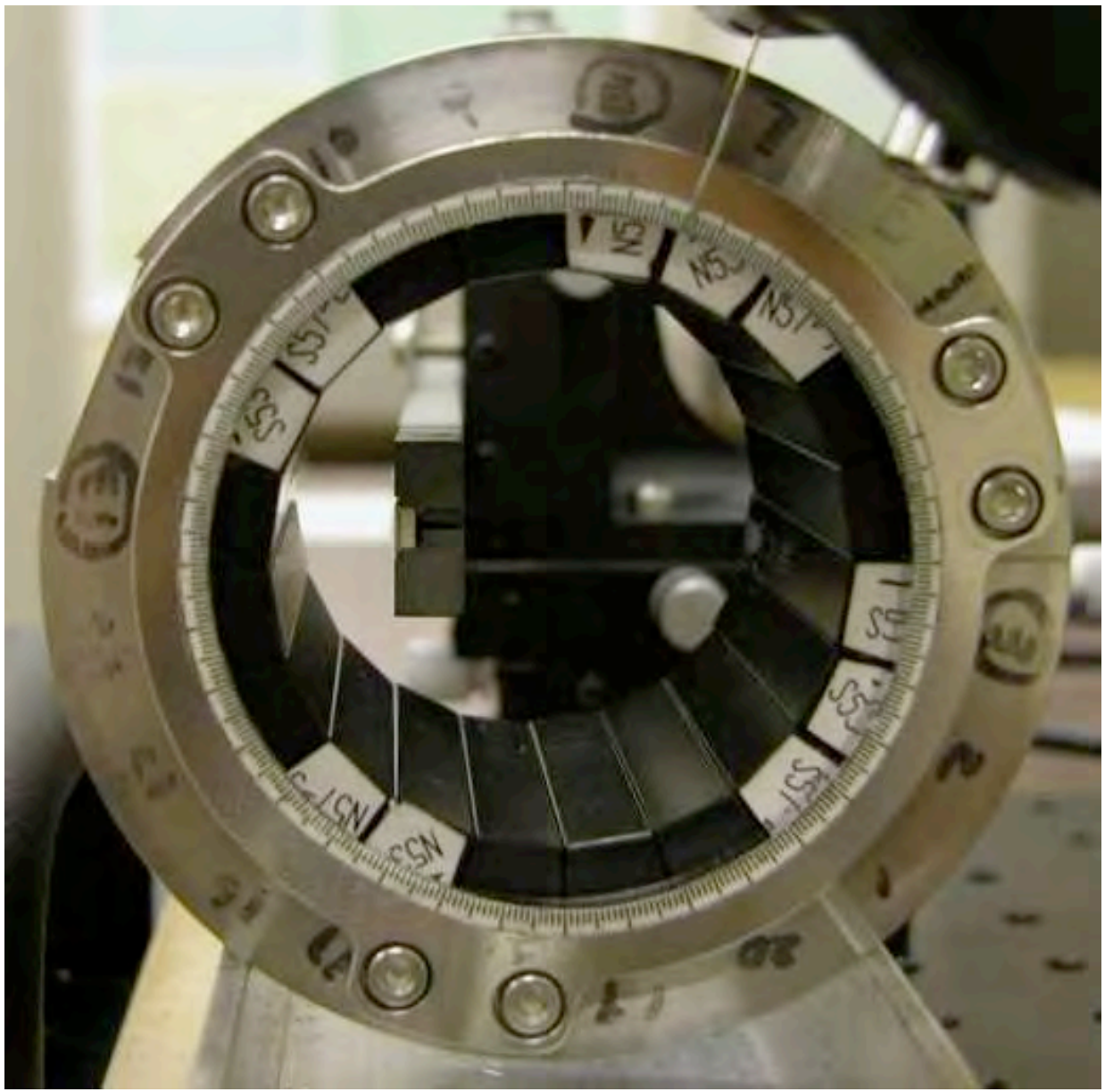
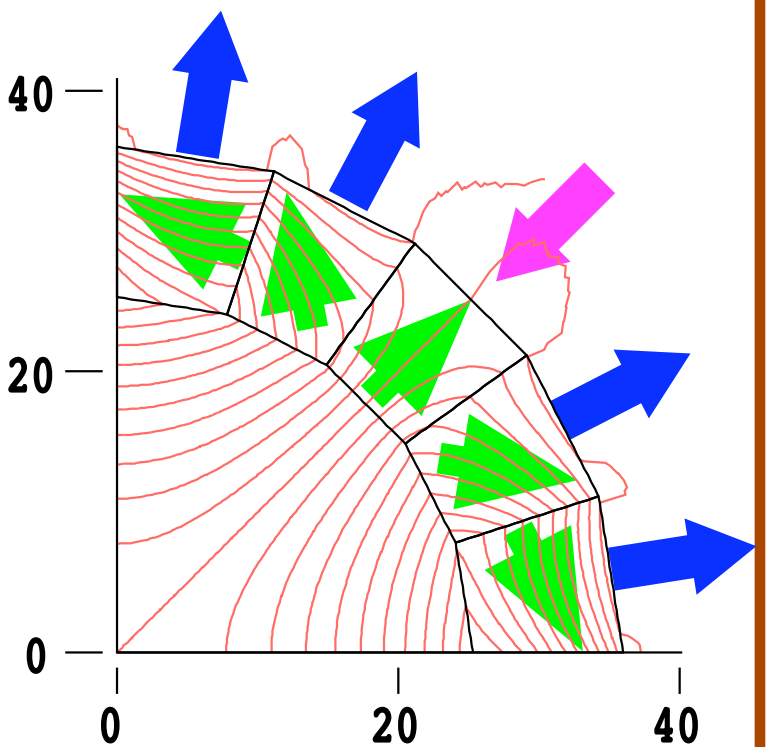
Magnet Bore

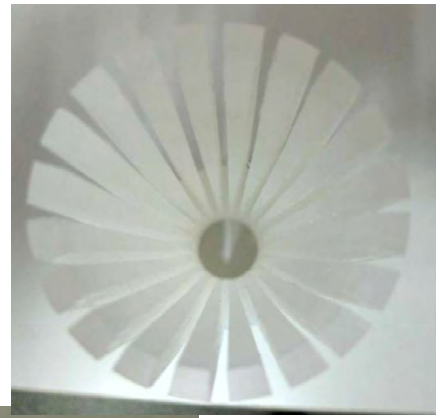


Pole magnets are attracted.



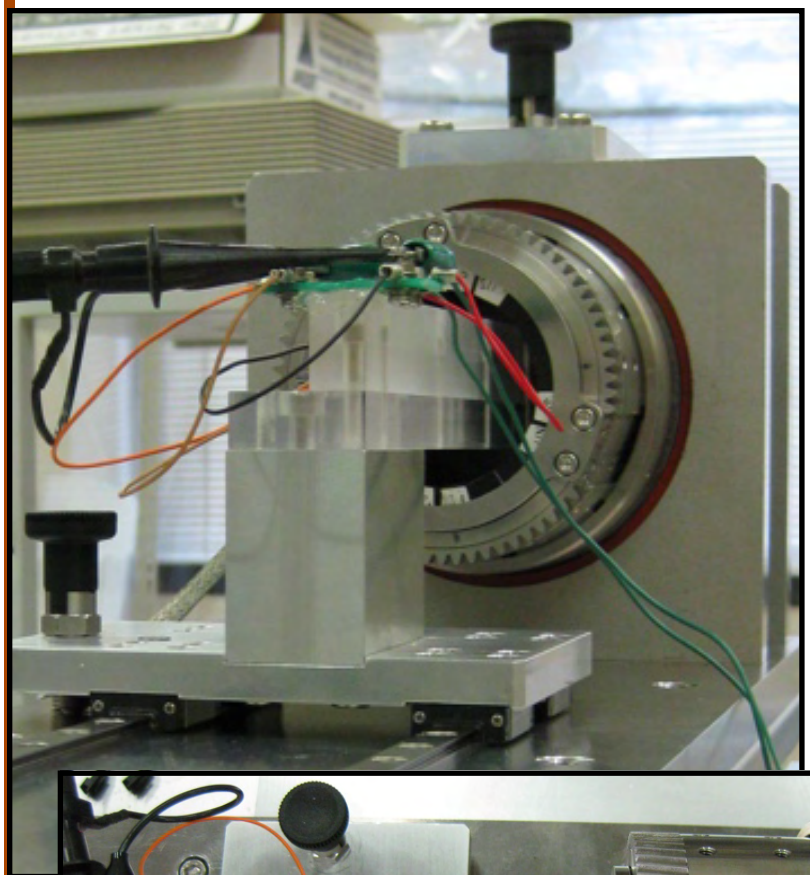
Others are repulsive.

Alignment Jig

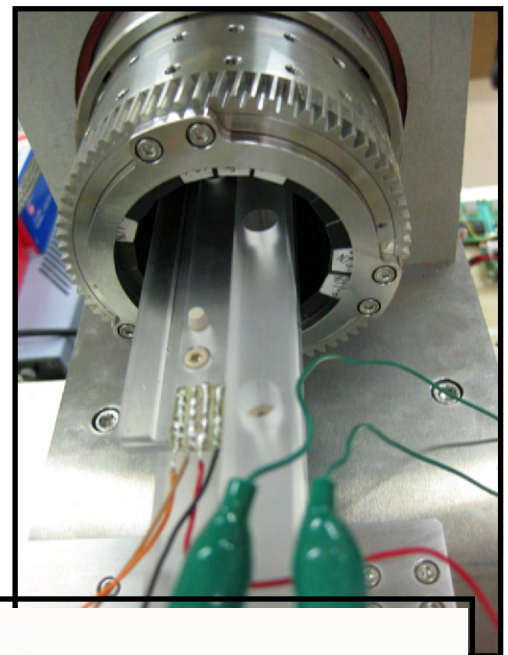


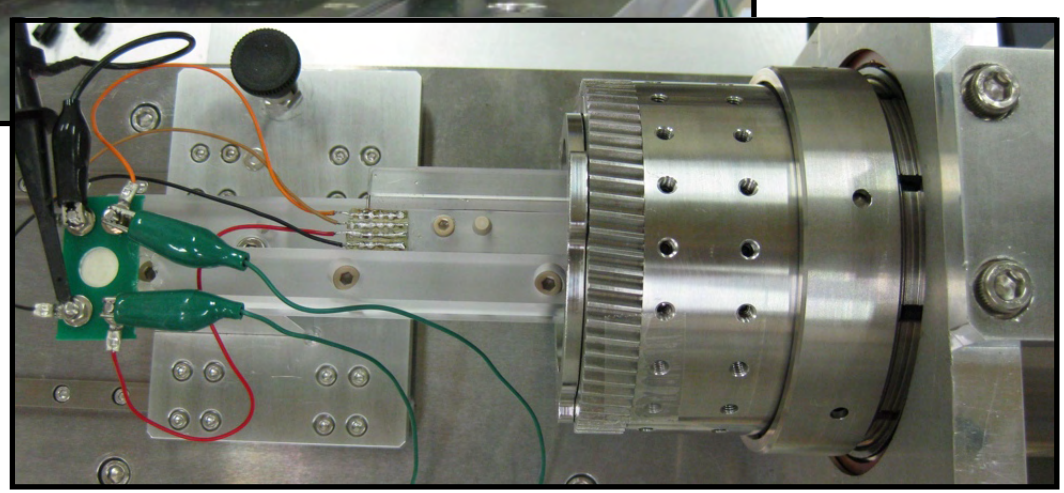
Field Measurement (just status report)

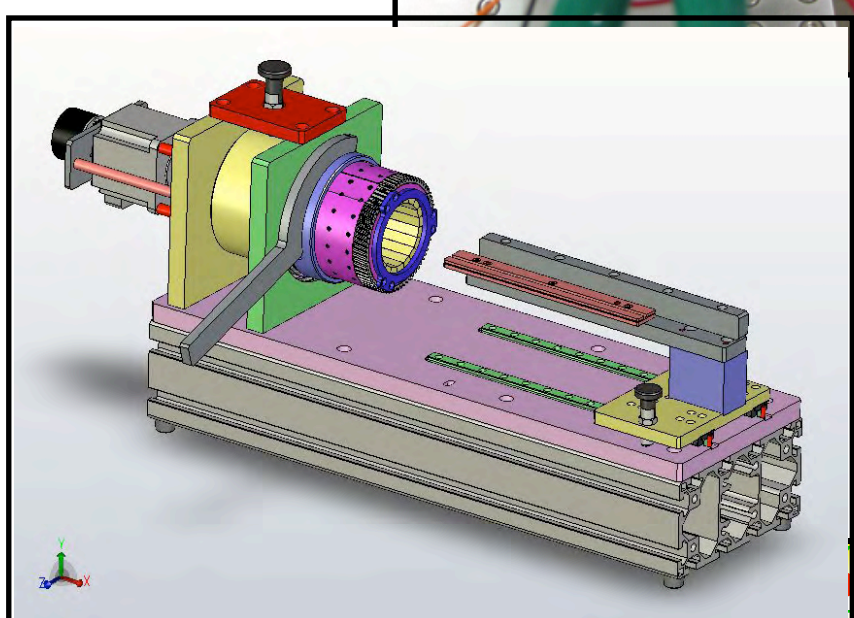
Field Measurement (1):
Rotating magnet instrument



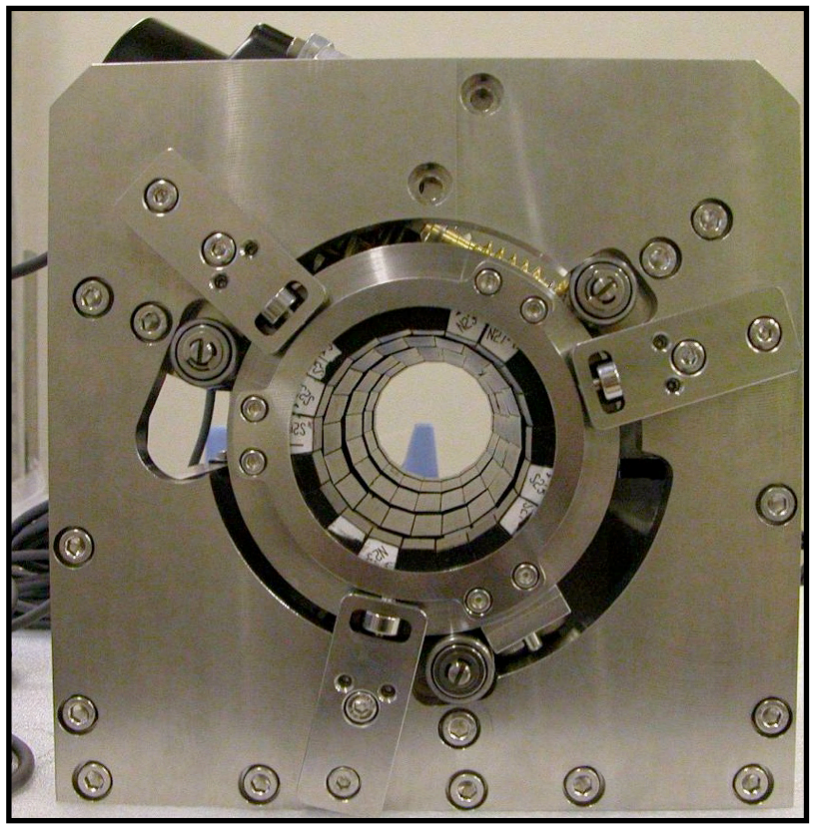
Magnets are rotated to find their magnetic center against the outer shell.

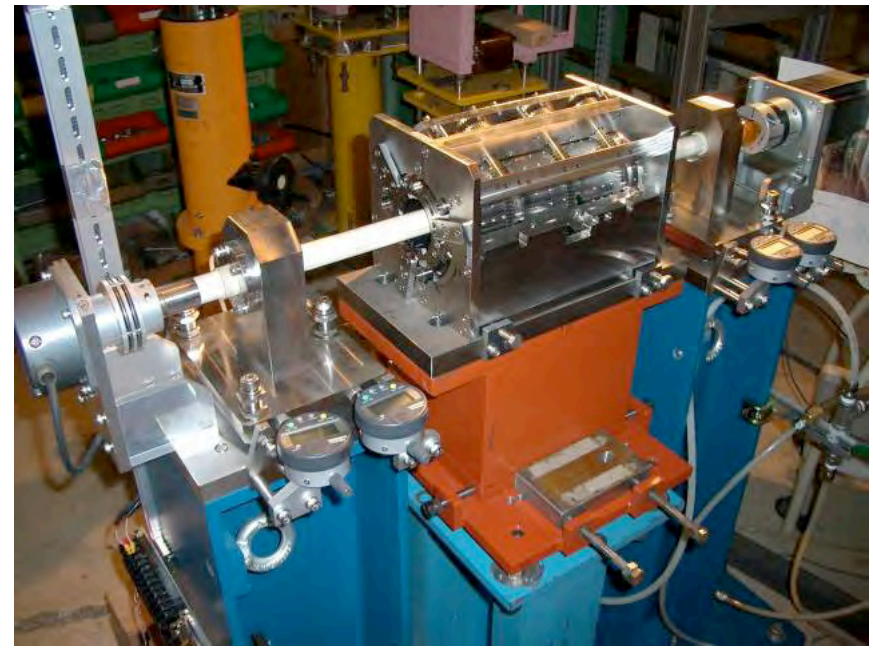


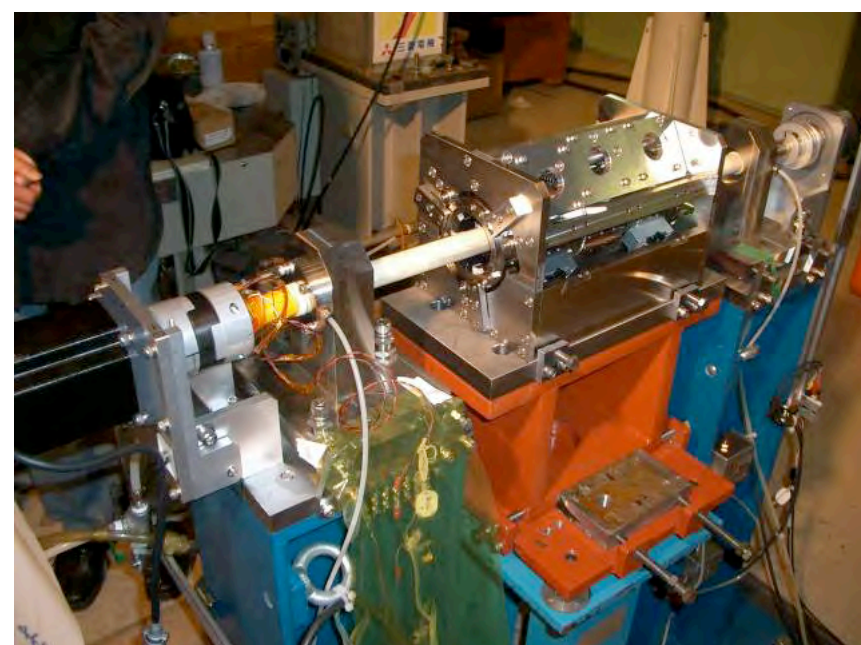


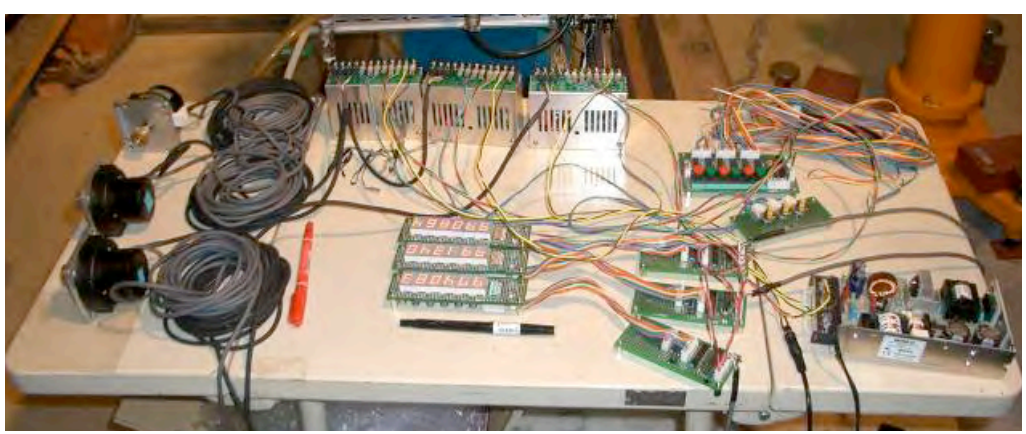


By Rotation Coil









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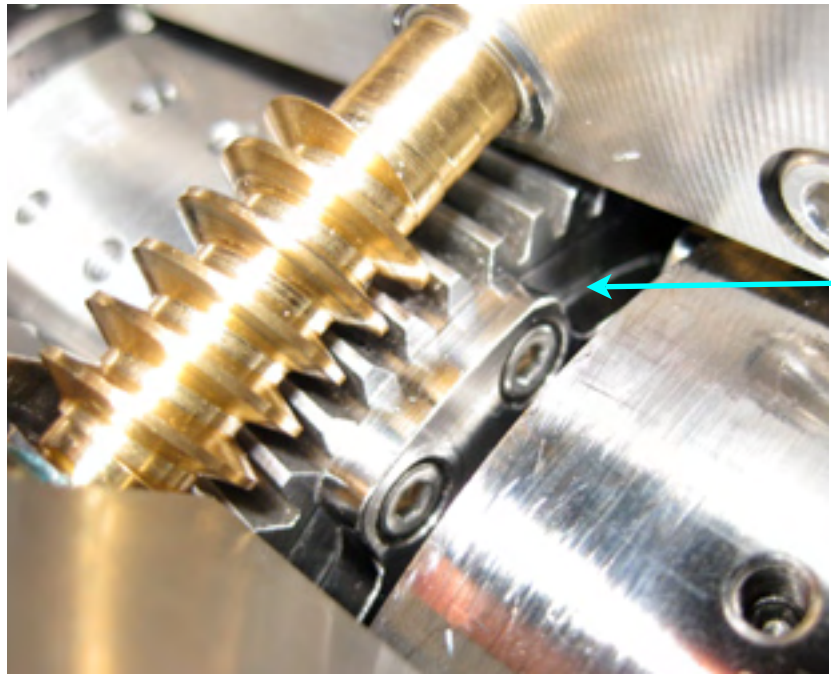

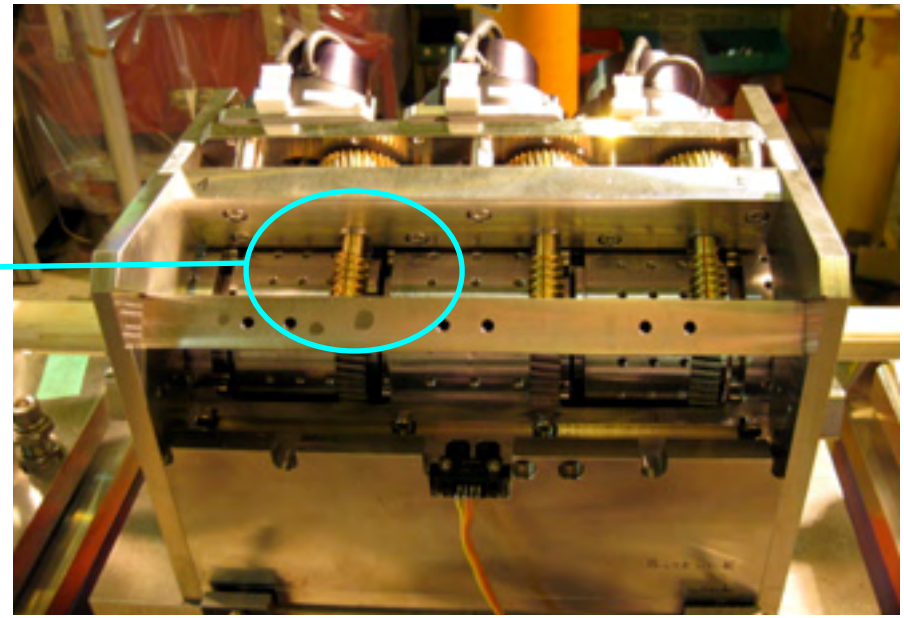

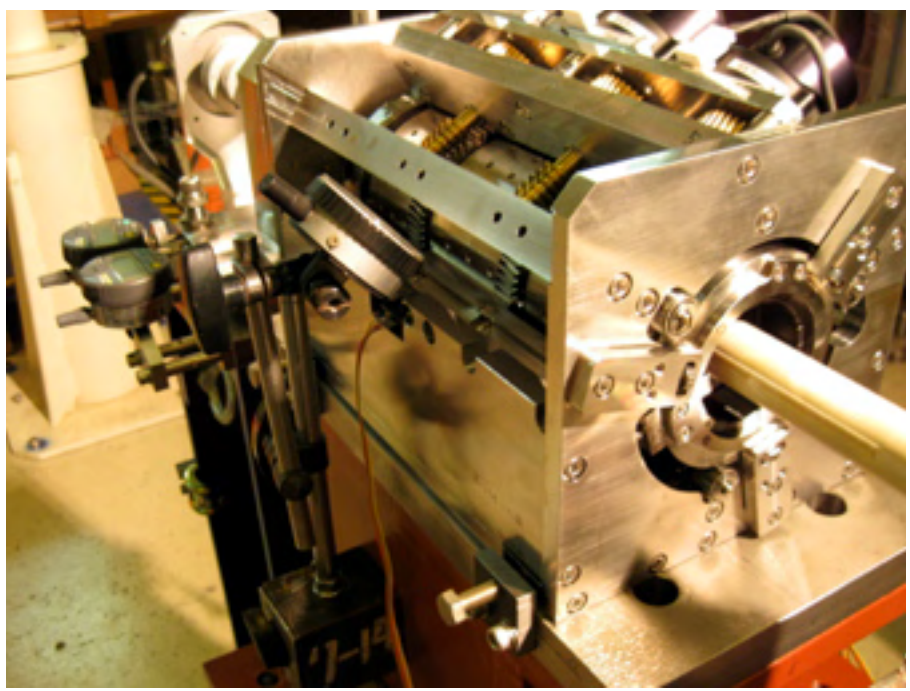

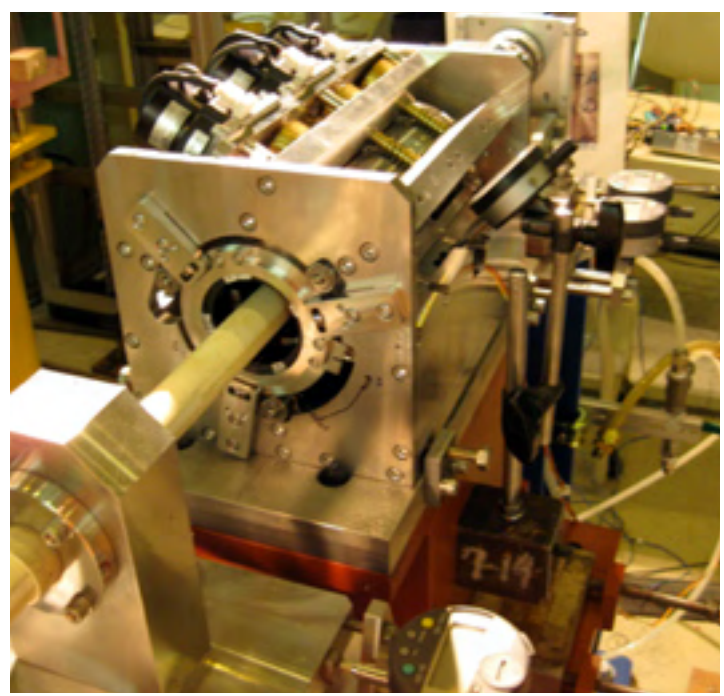

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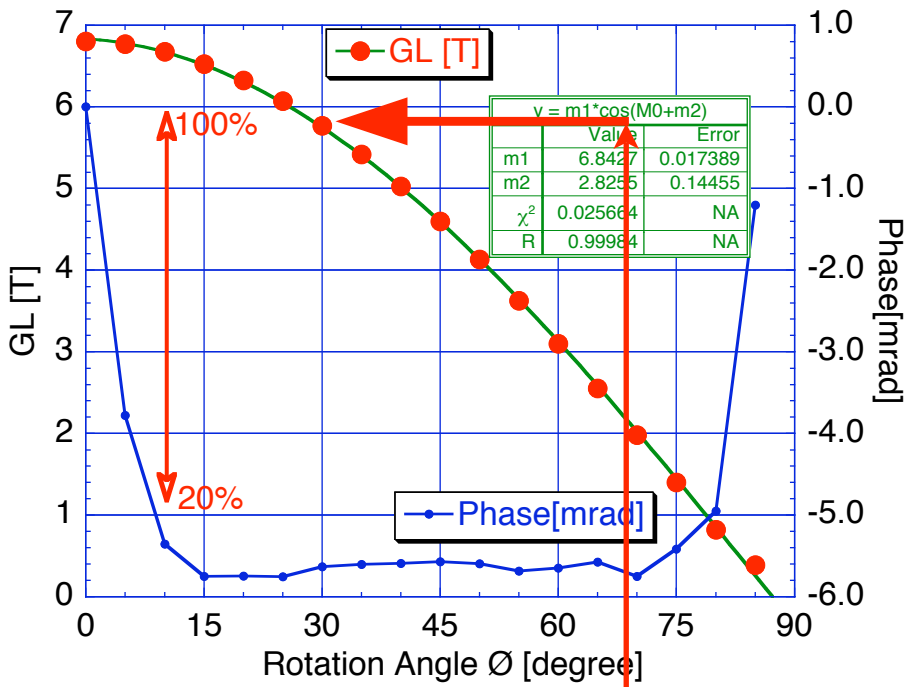
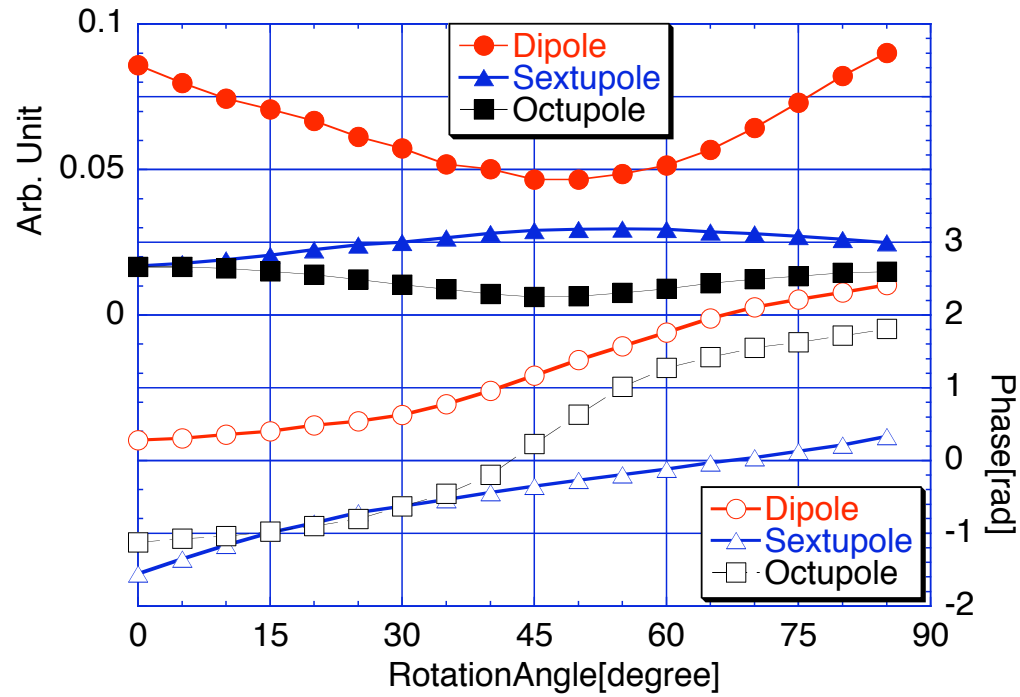
Very preliminary Data





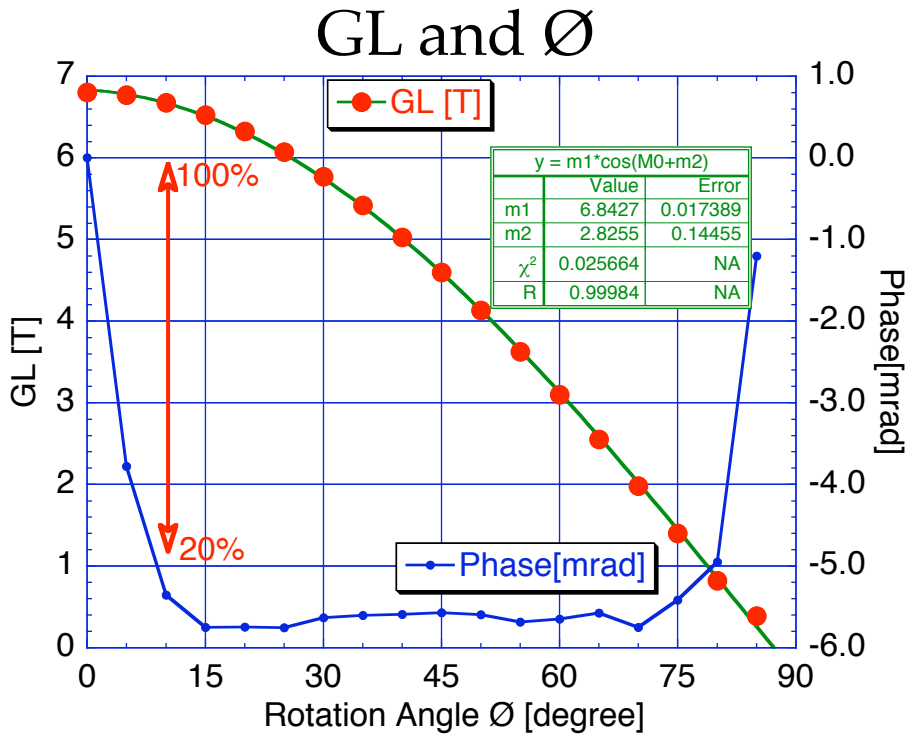
Quad

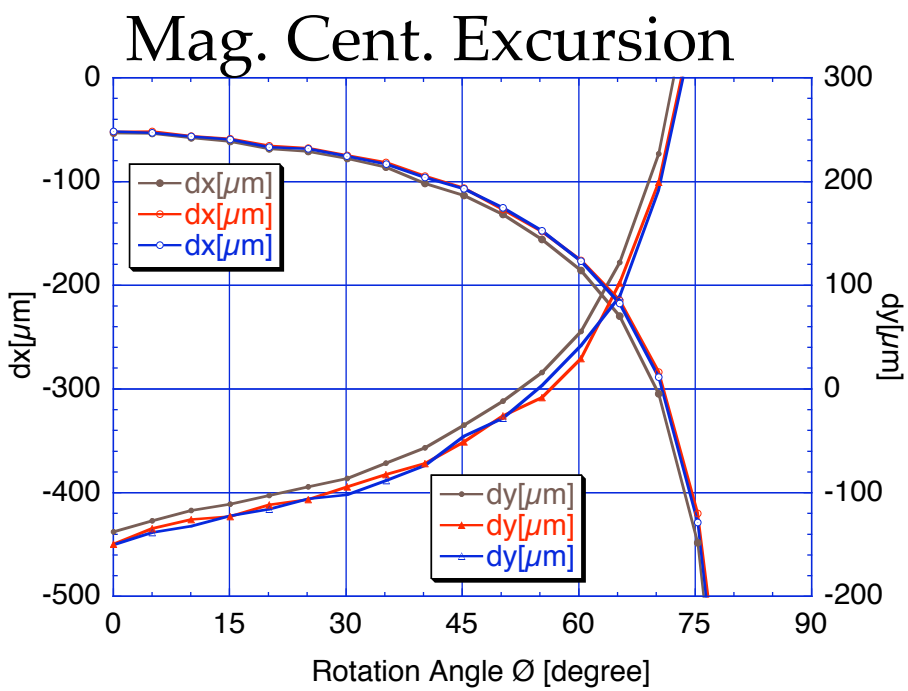
Period/2:
Quad. at 45°
Sext. at 30°
Oct. at 22.5°

D, Sx, Oct

GL for ATF2: 5.85T

Measured at r=11mm





Observations

- GL (100~20%) can be covered.
- Angle adjustment needed.
- Reproducible magnet center excursion.
- But the value is big – needs adjustment.
- Minor mechanical modification will improve the excursion.

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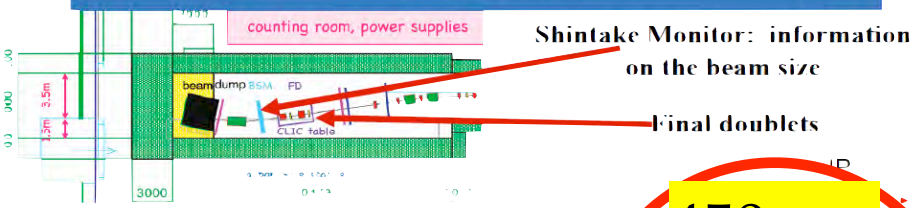
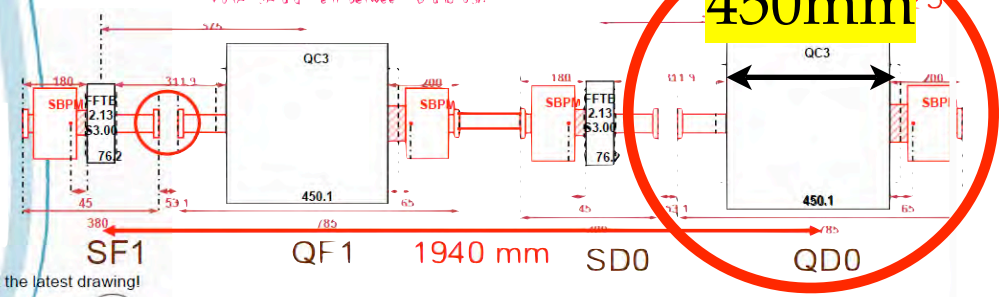
Installation to ATF2?

FD layout



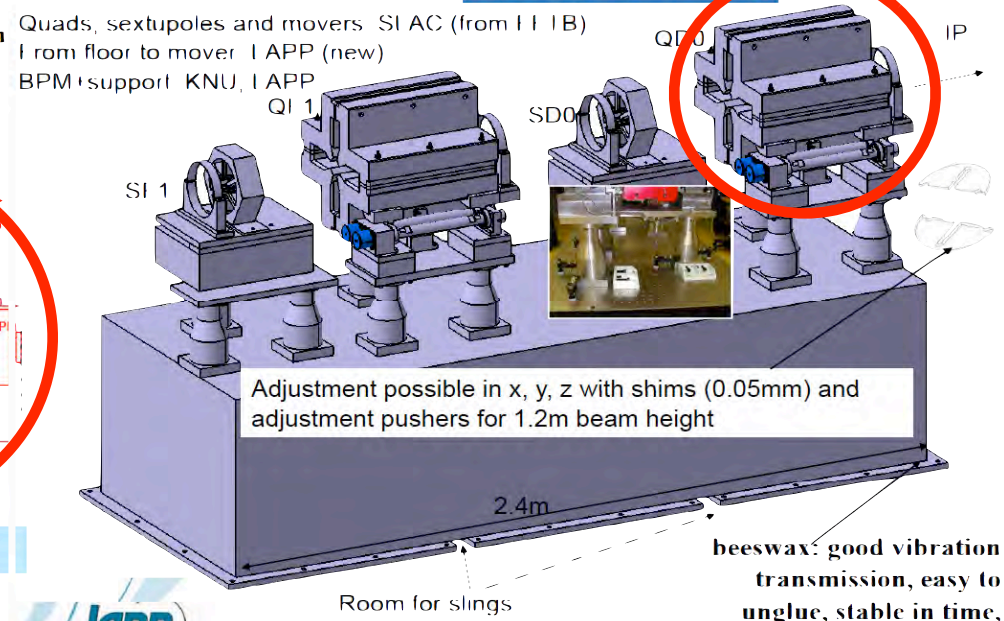


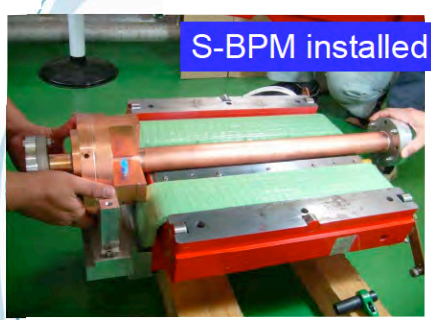
Not the latest drawing!

What is needed to support all these components?

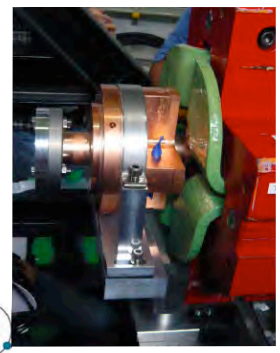
Final assembly

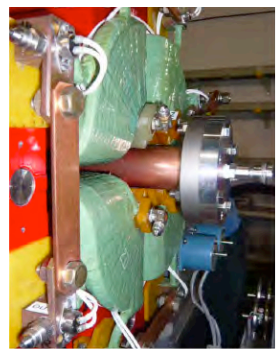
Replace?





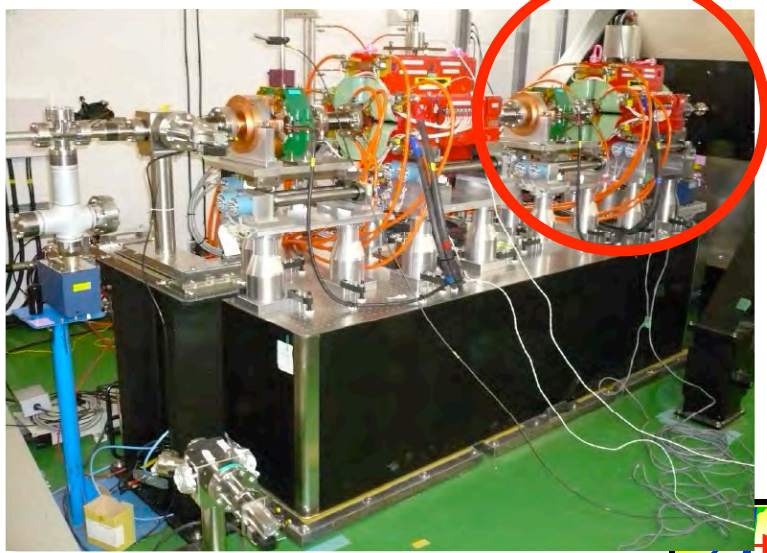
S-BPM installed October 15, 2008





new BPM Needed!

FD mid-november 2008



Summary

- Five-Ring-Single PM-FFQ:
  magnet: 2+5+7+5+2=21cm (25cm incl. 4 gaps)
- Strength (GLmax=6.8T) enough for ATF2.
- Mag. center movements, plane tilt and multipoles are under analysis.
- Adjustment aiming at a test in ATF2 beam line.
- Movers have to be installed.
- BPM unit should fit in the bore:
  – Vacuum flange has to be fitted lastly.

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