



LEP Energy WG Report



October 13th, 2001

WWMMI

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Overview



Work Continues in several areas

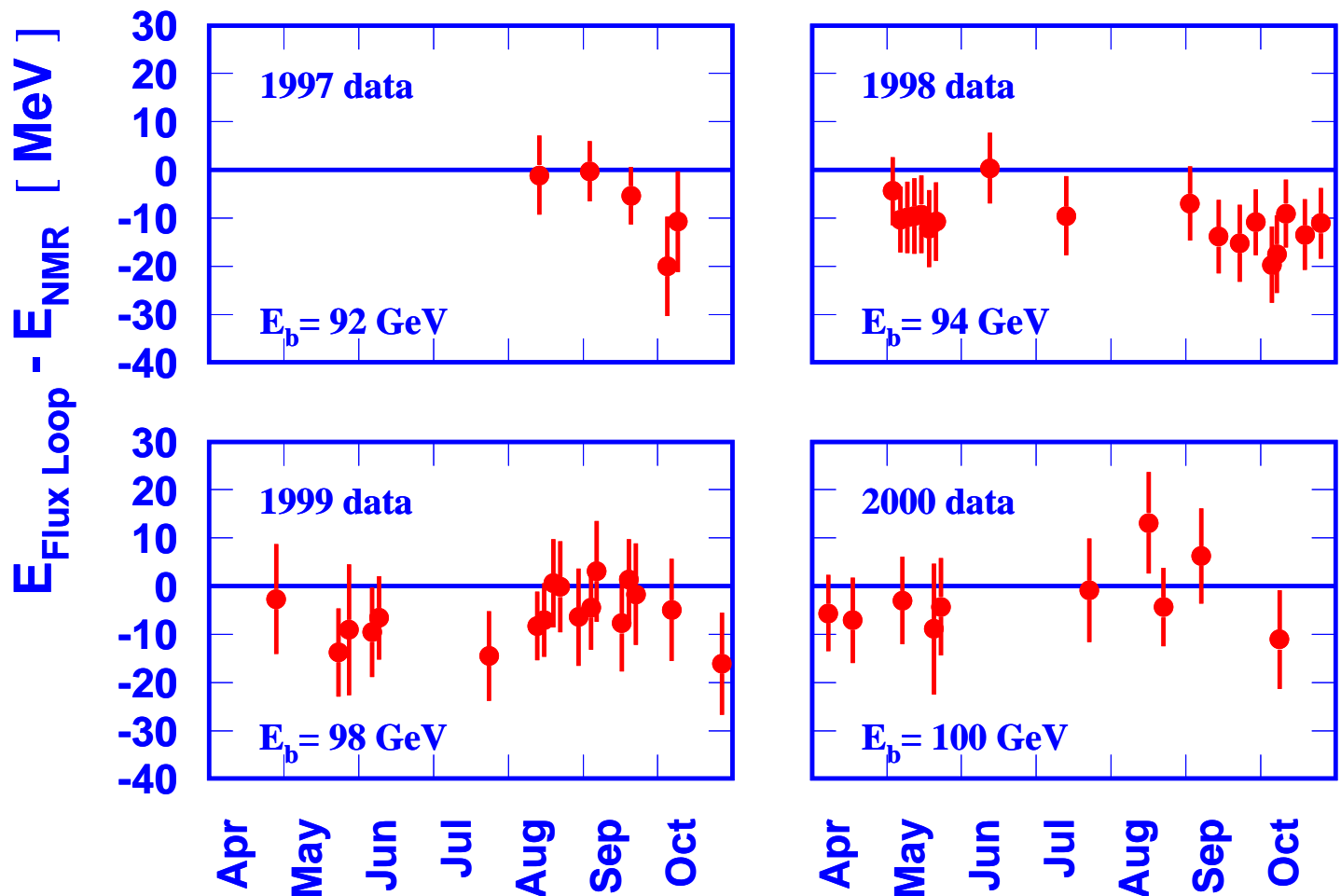
- Flux Loop analysis
- Q_s vs. f_{RF} analysis
- Spectrometer magnet mapping
- Spectrometer BPM analysis

More general overview available here:

http://www.cern.ch/LEPECAL/talks/CERN_01Apr



Flux Loop Studies



Extensive cross-checks

- Analyze all data combined
- Check against octant, NMR, year, etc.
- Documentation underway

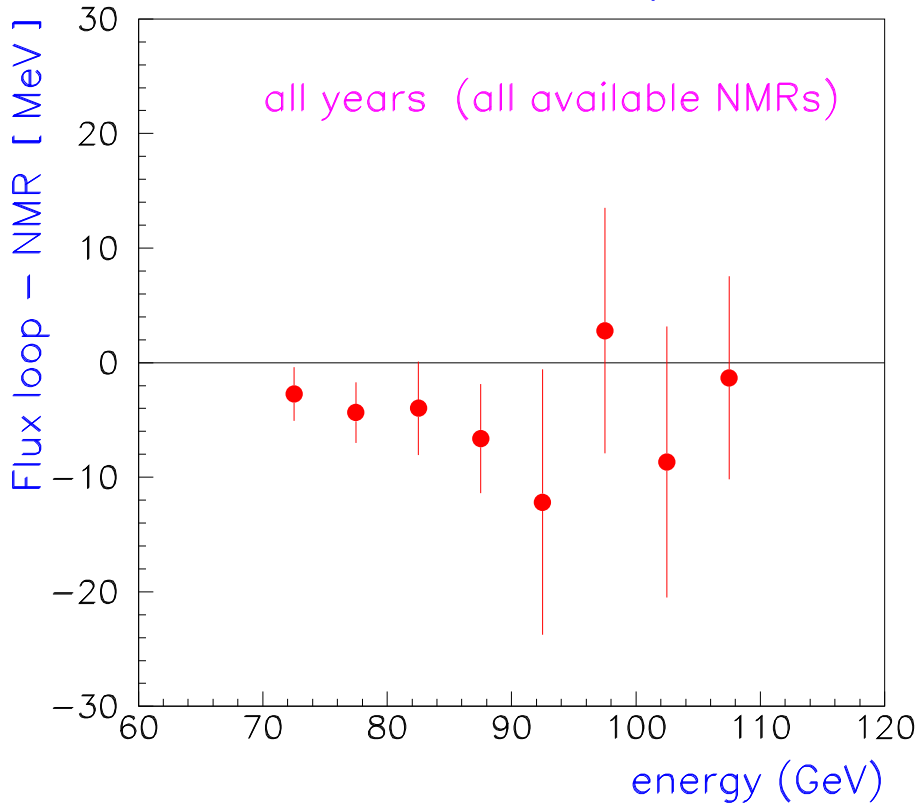
⇒ Stable results for all years



Flux Loop Checks



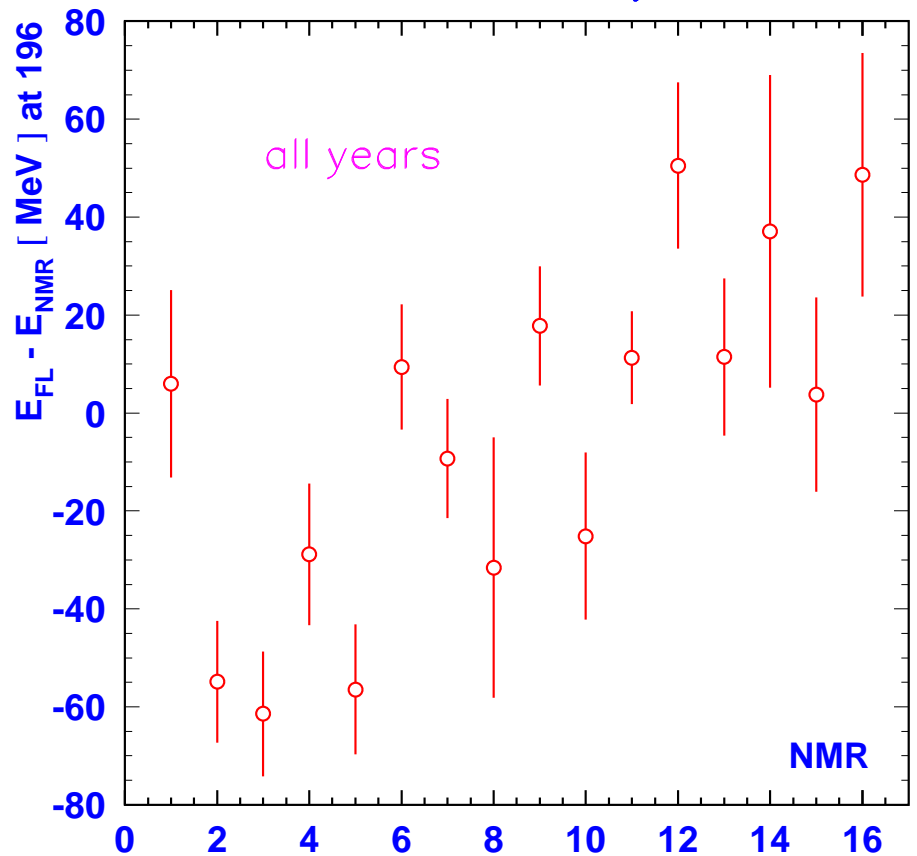
Pete Renton Aug 01



versus
Beam Energy

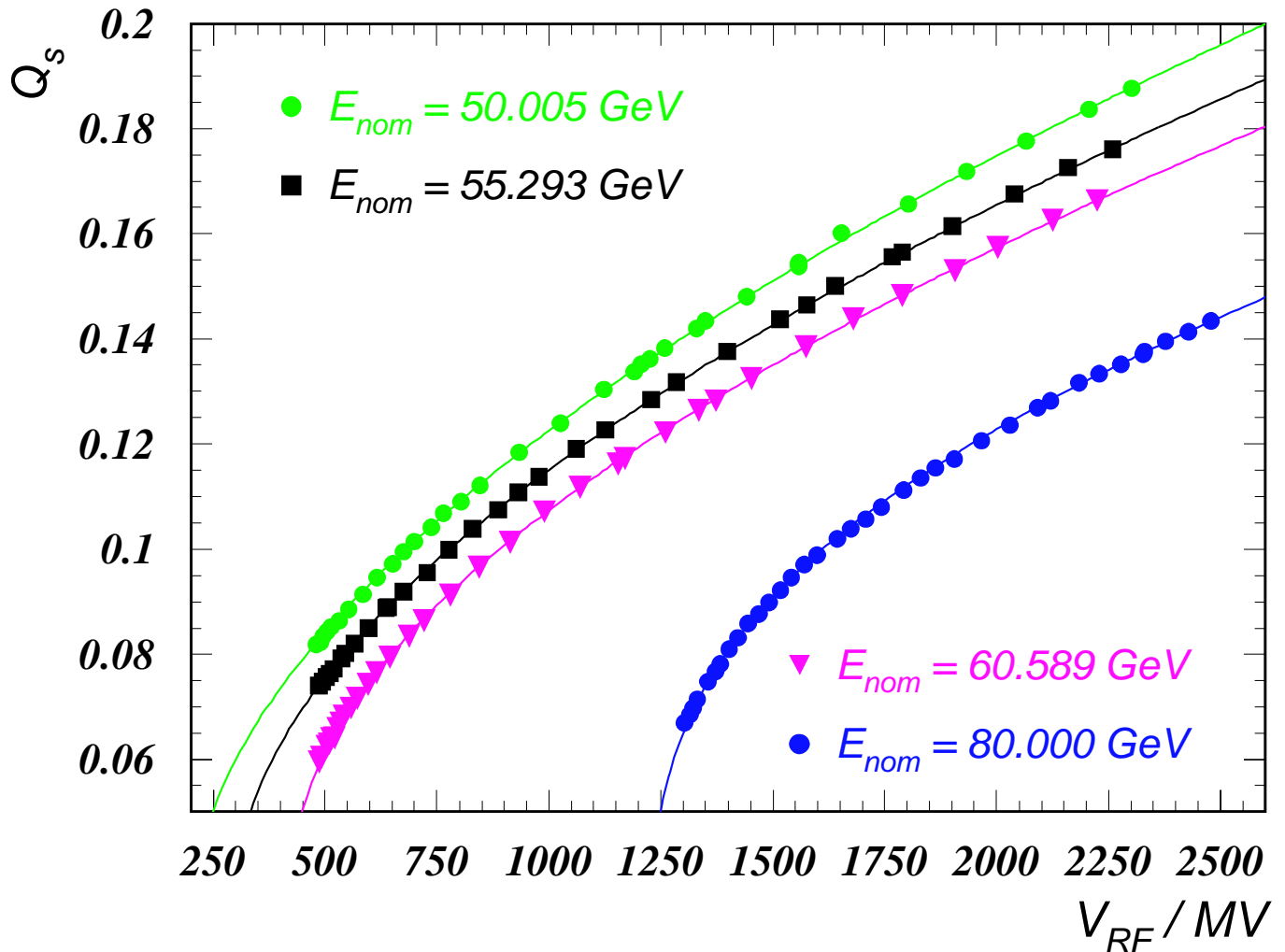
versus
NMR Probe

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Synchrotron Oscillations



$$Q_s^4 = \left(\frac{\alpha_c h}{2\pi} \right)^2 \left\{ \frac{e^2 g^2 V_{RF}^2}{E_c^2} + M g^4 V_{RF}^4 - \frac{1}{E_c^2} \left(\frac{C_\gamma}{\rho} E^4 + K \right)^2 \right\}$$

Momentum Compaction RF Voltage Calibration Realistic RF Distribution Dipole Losses Other Losses

2000 Data

- Three energy measurements
- Additional parameter calibrations
- Energy dependence of g

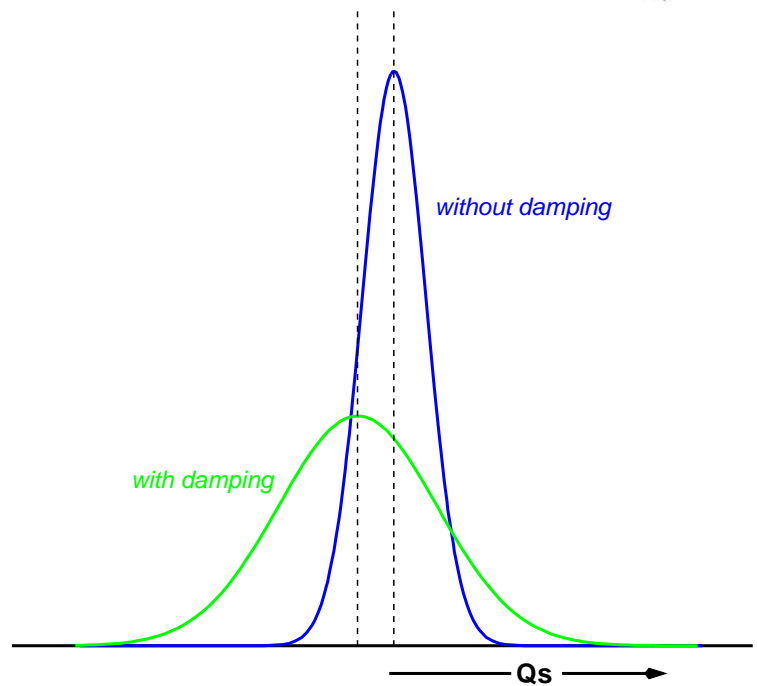


Voltage Calibration

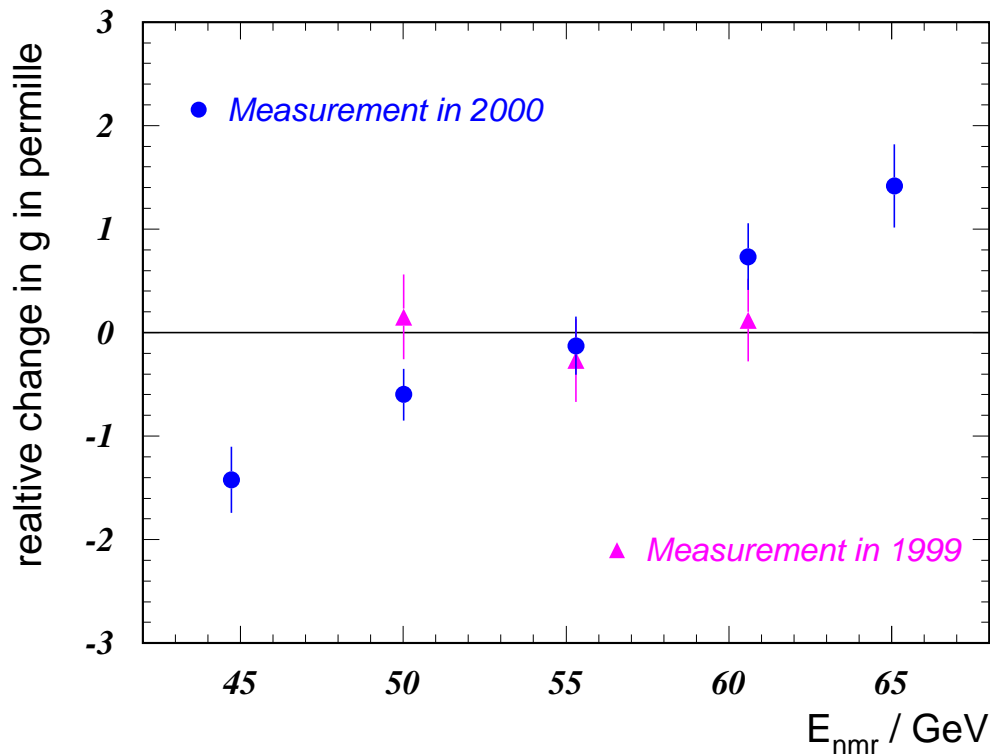


2000 Data

- Enhanced damping
- Need to excite Q_s
- Frequency shifts



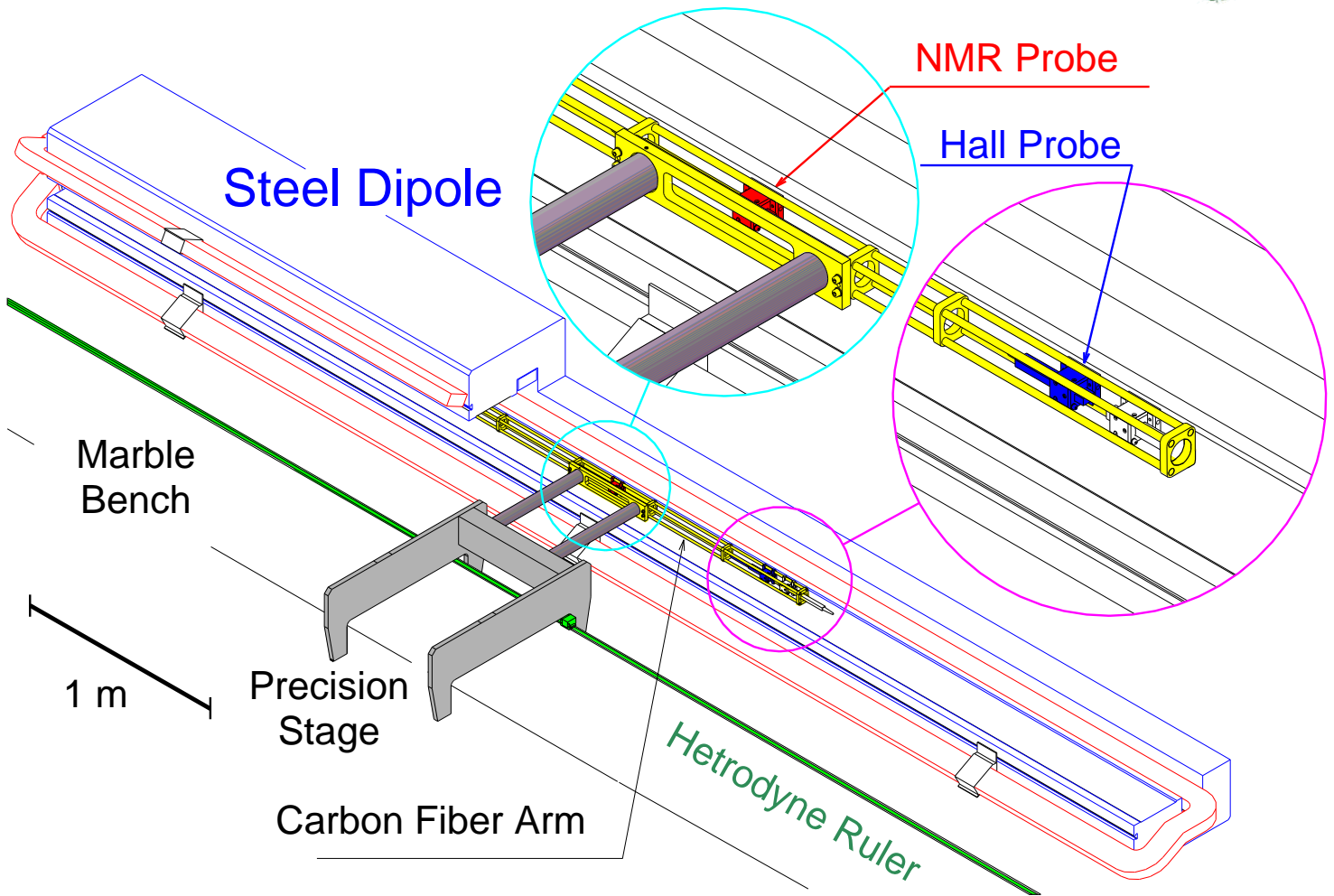
Additional Calibration



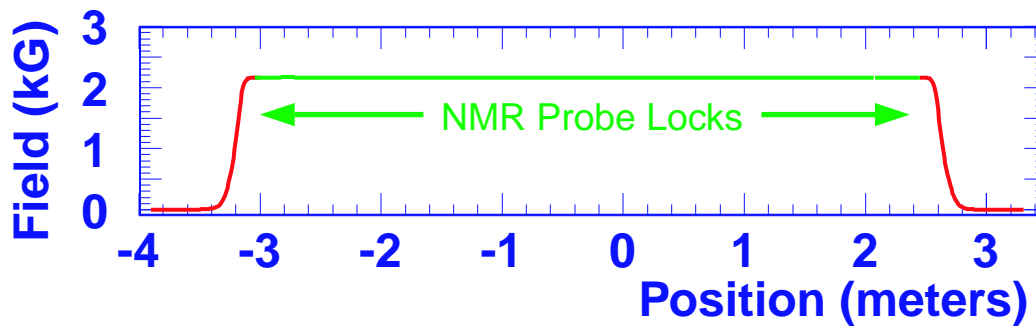
⇒ Does not effect 1999, precision possibly reduced



Spectrometer Mapping



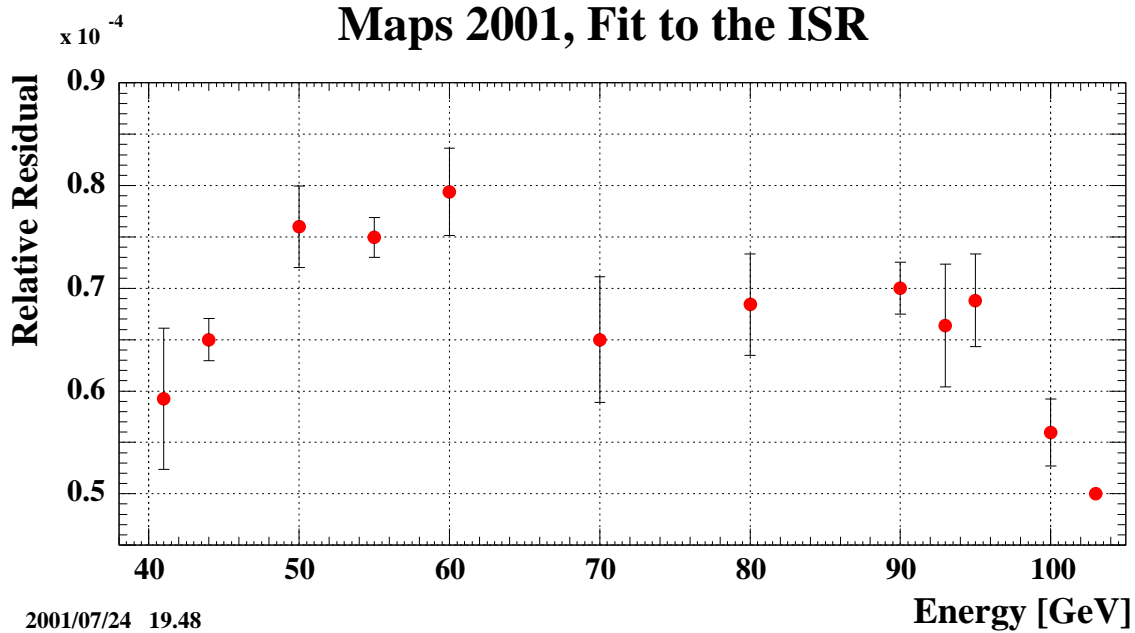
Need $\oint B dl$ as $f(B_{Ref})$



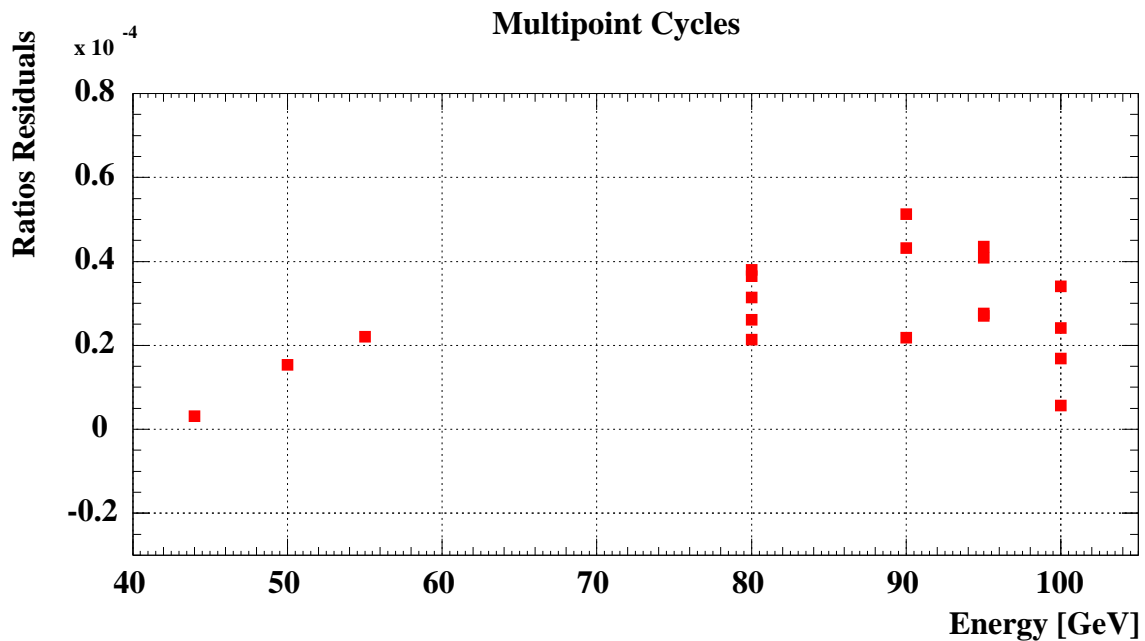
Magnet remapping essentially finished!



2001 Mapping Results



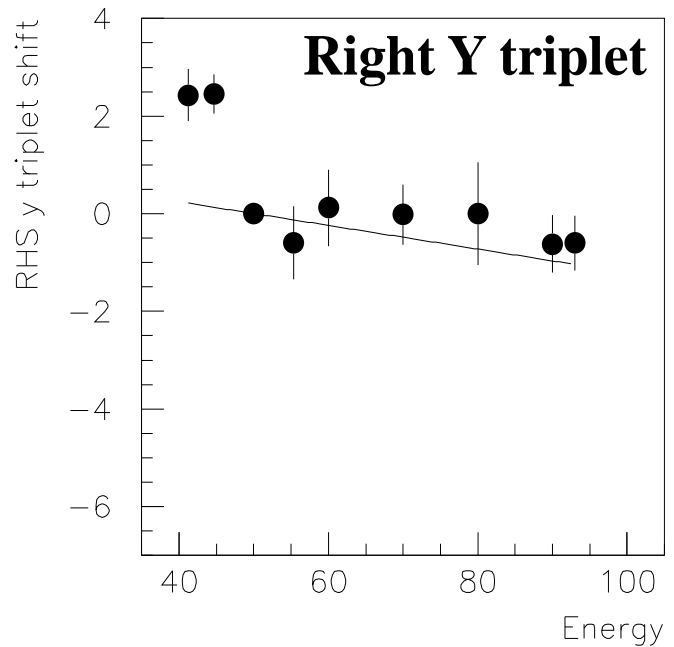
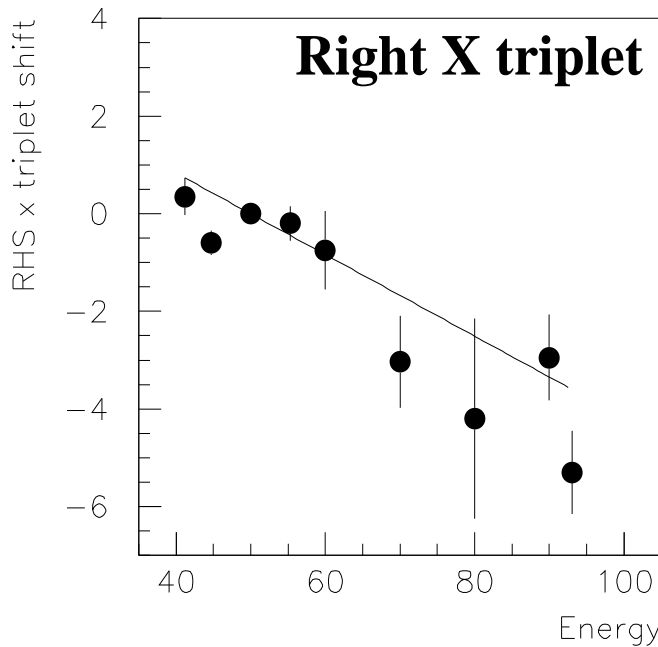
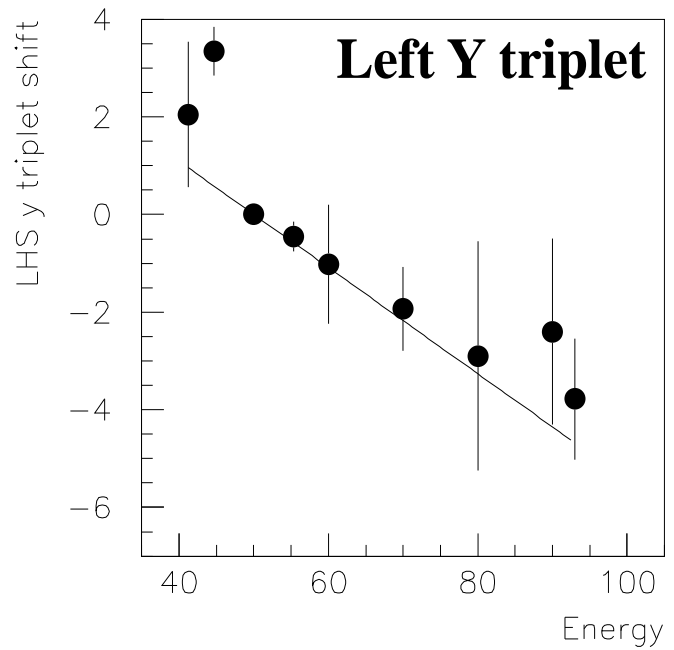
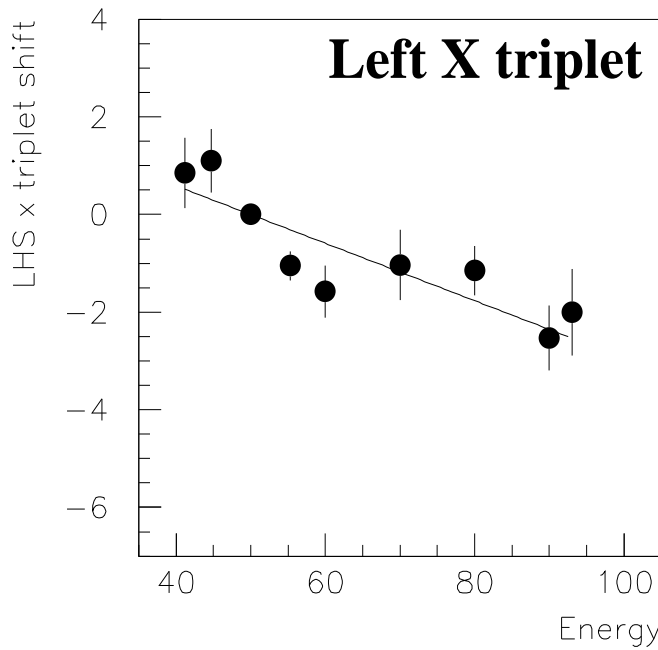
7×10^{-5} offset from 1999!



Only 3×10^{-5} in $\oint B dl_{E2} / \oint B dl_{E1}$ residual



Spectrometer BPMs



- 1 micron ~ 10 MeV
- Systematic shifts, not random
- Possible to correct?



Bunch Length?

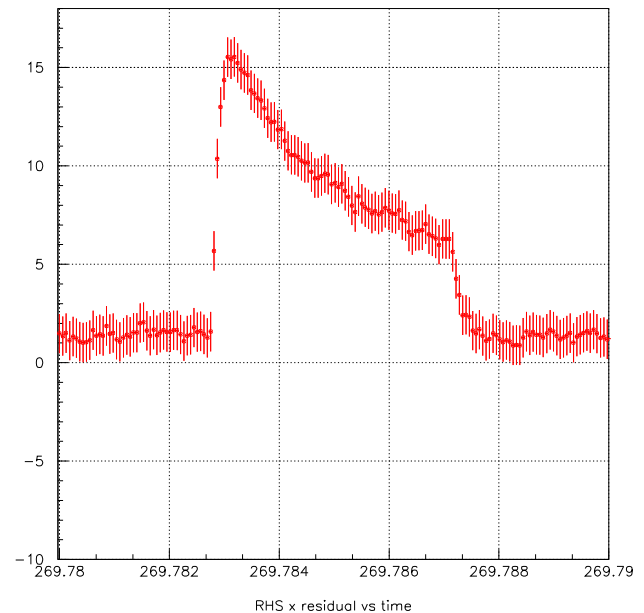


Example Wiggler Experiments

| Wigglers | σ_z | LHS x | LHS y | RHS x | RHS y |
|------------|------------|-------|-------|-------|-------|
| on (7667) | 8.4 mm | 0 | 0 | 0 | 0 |
| off (7667) | 4.7 mm | -4.8 | -1.2 | +2.3 | +0.5 |
| on (7676) | 8.4 mm | 0 | 0 | 0 | 0 |
| off (7676) | 4.7 mm | -4.4 | -0.1 | +1.0 | +2.2 |

Q_s Experiments

$$\sigma_z = 4.4 \rightarrow 3.7 \rightarrow 4.4 \text{ mm}$$



Bench BPM Test

- Recreate in lab
- Results in spring



Timeline



Flux Loop

- Nearly final
- Documentation started

Q_s vs. f_{RF}

- Additional damping seen in 2000
- Analysis finished by end of year

Spectrometer mapping

- Differences found
- Nothing serious for spectrometer

BPM analysis

- Clear systematic trend
- Correction possible, but explanation?
- Lab test to verify beam measurements

Start writing this Winter

Final document(s) by Summer?