RQME DATA
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Nov 20,2000

As part of the MI-30 upgrade 8 20 inch quads (RQME001 through 8) were removed from the tunnel and tuned to a different strength. The first step in this process was to mount the magnets on the MTF test stand B and use Morgan coil 860207 to measure the field. This is the same coil that was used in MP-9 to measure the magnets in production. Each magnet was measured with the same checklist and analyzed with the same programs as used in tuning at MP-9. Tests on other magnets indicate that both test stands agree to within $\pm 1 \times 10^{-4}$ or ± 1 unit. There was also very good agreement with the 32 RQRA quads that were built in the fall of 1998 and put into storage until August of 2000.

The RQRA magnets were all built in September of 1998 and a final tuning was done in February of 1999. The magnets were stored in TPL until August when they were brought MTF for re-work. The relative gradient (grel) is defined to be:

$$\text{Grel} = (\text{measured} - \text{ideal})/\ \text{ideal} * 10{,}000$$

The measured difference in grel from August 2000 – February 1999 is 0.4 ± 1.8 units. Figure 1 is a histogram of those data

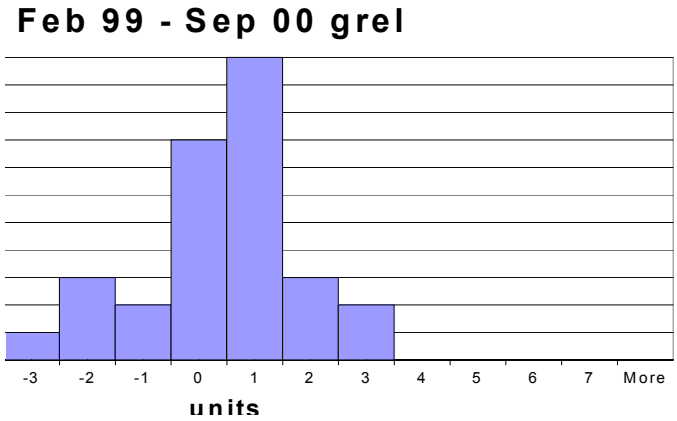

Figure 1

These magnets were stable in time since they were built and let to stabilize for six months before a final tuning.

The bricks for the RQME magnets were all magnetized between June 10, 1998 and July 6, 1998. The magnets were then assembled in late June and early July and tuned up in early to mid July. The measured difference in grel November 2000 minus July 1998 is -25 ± 5 units. Using the parameterization for time decay of magnets taken from RGF005-1 data

$$M_2/M_1 = -9 \times 10^{-4} * \log(t_2/t_1)$$

The expected decay in grel is –26 units. Figure 2 is a histogram for the grel difference

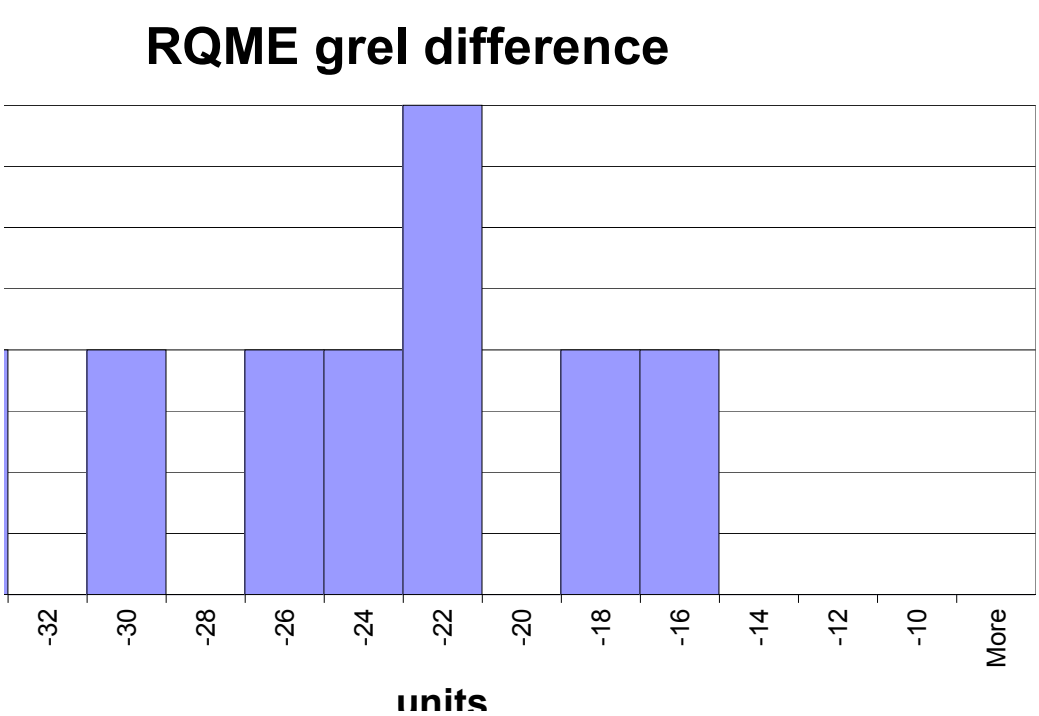

Figure 2

It is to be expected that all the re-cycler magnets have decreased in strength by a similar amount. There appears to be no degradation due to radiation effects. The exact exposure is yet to be determined based on continue activity in beam pipe removed from one of the quads.

The sextupole and skew sextupole did not statistically vary from 0 but there were changes of ±2 units in some magnets for both sextupole and skew sextupole. It should be noted that these values are normalized to the grel.

I leave it to the machine designers to determine if an overall decrease in field of 0.25% has a major effect on performance. In the future permanent magnets should be allowed to age for 6 months before final tune up to reduce aging effects.