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Something is Askew

(An explanation of my remarks last week)

1. Remember the Summer of '72! First attempts at slow extraction from the Main Ring hit an impasse due to horizontal-vertical coupling. Successful extraction followed rotation of a dozen equispaced quadrupoles through one-half degree. Each such skew element had a focal length of 2 km. See EXP-27, November 8, 1972.
2. We won't make that mistake again! Because it would not be easy to rotate quadrupoles in the Tevatron, we installed lots of skew quad adjustors. The main circuit has 48 elements uniformly spaced around the ring. Each element at full excitation would represent a lens of focal length 0.4 km. Looked strong enough.
3. Something has deteriorated! When we turned the Tevatron on in mid-1983, only 4% excitation of the main skew circuit was required. Now that has increased to 60%. There are 48 quads each of which has a focal length of 0.7 km. An order of magnitude increase over the correction required in 1972: $(48/12) \times (2/0.7) = 11$.
4. Look for the source! Last week, the alignment results presented by Stefanski and the analysis shown by Syphers accounted for the high steering strengths. Quadrupole roll values did not account for the skew circuit excitation. Cold mass rotation in the quadrupole cryostats is a candidate. This specter could be put to rest by orbit difference measurements at injection.