RHIC MAGNET DESIGN STUDY

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OBJECTIVES: Reduce Cost

Establish Dependence of cost on aperture, field and unit length
(discontinuities?)
Dipoles and quadrupoles

Decision in March (R&D and construction cost)
- New Magnet 12M$ and 18 months delay (?)
- 2-in-1 CBA 6M$ and 6 months delay (?)

METHOD: Fill tunnel, lower field

Reduce aperture, bunched beams

Use other concepts
- FNAL magnet
- window frame (super ferric),
- SSC
- Conventional magnets
- Different construction (BBC, HERA magnet)
- Single layer CBA quadrupole

FUTURE MEETINGS: R. P. Shutt
TENTATIVE GUIDELINES FOR RHIC MAGNET

- 2-in-1 physical configuration
- Separate magnetic excitation; operate at 2.5:1 ratio
- Horizontal beam crossing; spacing 24 cm
- Magnet Length (CBA) 4.4 m effective
- Field @ 100 GeV 33 kG (higher if lumped trim coils or more quadrupoles for higher transition energy)
- Field range 20:1
- Coil id. in arc 3 in.
- Beam size @ 5 GeV ~ 6 mm
  "7 σ" rule, sagitta, momentum spread
  Intra-beam scattering
- Operating temperature 4.6 K
- Probably cold bore in arc (insertions?)
- Straight magnets (gain in aperture if curved)
- Field quality
  \[ 1 \times 10^{-4} \text{ rms at } 2/3 \text{ aperture and low field} \]
  \[ 10^{-3} \text{ rms at } 1/3 \text{ aperture and high field} \]
- Trim Coils (lumped or distributed?)
  dipole correctors
  quadrupole - separate bus for horizontal and vertical quads
  sextupole
  \( b_0, b_2 \): if distributed - single layer enough

Skew Quad  
\[ \text{lumped in insertions} \]
Octupole  
- Q1, Q2 non standard aperture approximately present size