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RHIC Magnetic Design Study

H. Hahn

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Collider Accelerator Department
Brookhaven National Laboratory

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USDOE Office of Science (SC)

DISCLAIMER

RHIC MAGNET DESIGN STUDY

H. HAHN

(BNL, November 23, 1983)

H. Hahn
Nov. 22, 1983

RHIC MAGNET DESIGN STUDY

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

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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 $\sigma\sim$ 6mm
  "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
  1×10^{-4} rms at 2/3 aperture and low field
  10^{-3} rms at 1/3 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, Octupole } lumped in insertions

- Q1, Q2 non standard aperture
  approximately present size