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RHIC Magnetic Design Study

H. Hahn

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Collider Accelerator Department
Brookhaven National Laboratory

U.S. Department of Energy

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RHIC MAGNET DESIGN STUDY

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(BNL, November 23, 1983)

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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

H. Hahn
Nov. 22, 1983

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 $\sigma \sim 6\text{mm}$
"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 x 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
b₀, b₂: if distributed - single layer enough

Skew Quad	}	lumped in insertions
Octupole		
- Q1, Q2 non standard aperture
approximately present size