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RHIC Magnetic Design Study

H. Hahn

November 1983

Collider Accelerator Department Brookhaven National Laboratory

U.S. Department of Energy

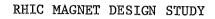
USDOE Office of Science (SC)

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RHIC-PG-9



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H. HAHN

(BNL, November 23, 1983)

RHIC MAGNET DESIGN STUDY

Reduce Cost **OBJECTIVES:** 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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H. Hahn
                                                               Nov. 22, 1983
                 TENTATIVE GUIDELINES FOR RHIC MAGNET
- 2-in-1 physical configuration
- Separate magnetic excitation; operate at 2.5:1 ratio
                                                              24
- Horizontal beam crossing; spacing
                                                                   cm
                                                               4.4 m effective
- Magnet Length (CBA)
- Field @ 100 GeV
                                                              33 kG
      (higher if lumped trim coils or
       more quadrupoles for higher transition energy)
                                                              20:1
- Field range
- Coil id. in arc
                                                               3
                                                                   in.
      Beam size @ 5 GeV on 6mm
      "7 \sigma" rule, sagitta, momentum spread
      Intra-beam scattering
                                                               4.6 K
- Operating temperature
- Probably cold bore in arc (insertions?)
- Straight magnets
      (gain in aperture if curved)
- Field quality
      1 \times 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<sub>0</sub>, b<sub>2</sub>: if distributed - single layer enough
      Skew Quad
                     lumped in insertions
      Octupole
- Q1, Q2 non standard aperture
         approximately present size
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