

BROOKHAVEN NATIONAL LABORATORY



MEMORANDUM

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No: 568-1 (RHIC-MD-269)

Task Force: Coil Geometry

Title: Expected Performance of a Preliminary Design of BNL-Built Hybrid Magnet

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Expected Performance of a Preliminary Design of BNL-built Hybrid Magnet

Ramesh Gupta
October 22, 1997

This note gives an estimated performance of BNL-built hybrid magnet with the following parameters :

Magnet aperture (with HTS) insert : 45 mm
Magnet aperture without HTS insert : 63 mm
Separation between two apertures : 180 mm
Number of layers : 3 (one layer of HTS insert and two layers of normal superconductor)
HTS tape width : 6 mm
Space between HTS tape and normal superconducting cable: 3 mm
Normal Conductor : SSC inner (Nb Ti) cable
 Cu/Sc = 1.5
 insulated width ~ 12.5 mm
 insulated thickness ~ 1.6 mm

Minimum bend radius : 50 mm
Stack height for each coil : 80 mm
Number of turns of SSC cable in each of two stacks : ~50
Yoke outer radius : 311 mm (same as in DX magnet)

A POISSON model of this magnet is shown in Fig 1 and the POISSON input used to create this model is given in Fig 2.

The following is an rough estimate of the expected quench performance of the magnet without an HTS insert:

	At 4.2 Kelvin	At 1.8 Kelvin
Quench Field at the center	6.7 tesla	8.3 tesla
Quench Current	6.7 kA	8.4 kA
Peak Field on conductor	7.9 tesla	9.8 tesla

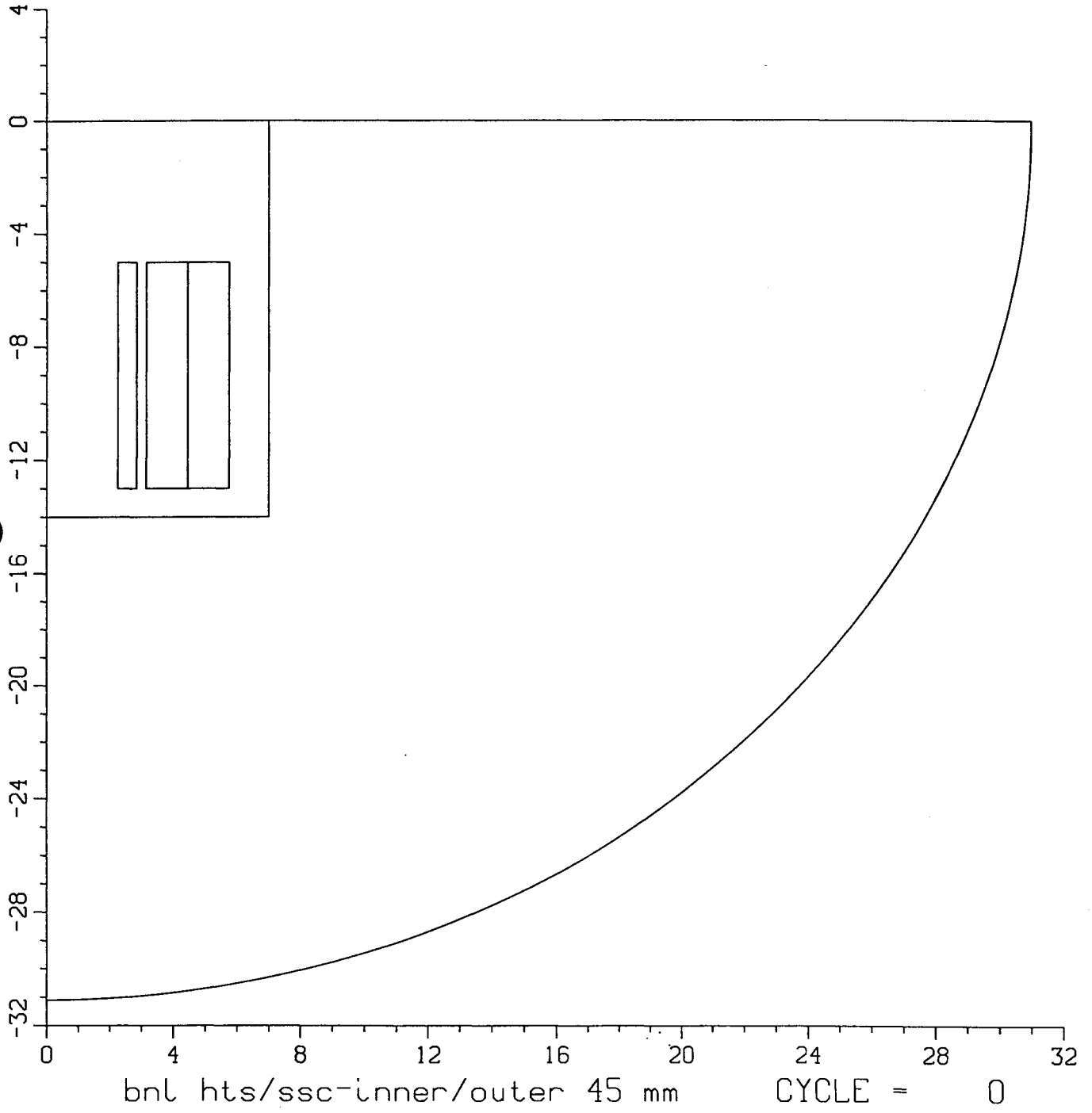


Fig 1 : POISSON Model

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bnl hts/ssc-inner/outer 45 mm
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  Ymin=-60., YMAX=0.0,
  KCAR2=0.0, ycar3=-31.1, ycar6=-14.0,
  LCAR2=120, lcar3=30, lcar6=75,
  IREG=1, MAT=1, NPOINT=5, NREG=6$
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$PO X=70., Y=-60.$
$PO X=70., Y=0.0$
$PO X=0., Y=0.0$
$PO X=0., Y=-60.$
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$PO X0=0., Y0=0.0, X=0., Y=-31.10, NT=2$
$PO X0=0., Y0=0.0, X=0., Y=0.0$
$PO X0=0., Y0=0.0, X=31.1, Y=0.$
$REG IREG=3, MAT=1, NPOINT=5$
$PO X0=0., Y0=0.0, X=0.0, Y=0.0$
$PO X0=0., Y0=0.0, X=7.0, Y=0.0, NT=1$
$PO X0=0., Y0=0.0, X=7.0, Y=-14.0$
$PO X0=0., Y0=0.0, X=0., Y=-14.0$
$PO X0=0., Y0=0.0, X=0.0, Y=0.0$
$REG IREG=4, MAT=1, den=1.0, NPOINT=5$
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$PO X=2.85, Y=-5., NEW=1$
$PO X=2.85, Y=-13., NEW=1$
$PO X=2.25, Y=-13.$
$PO X=2.25, Y=-5.$
$REG IREG=5, MAT=1, den=5200.0, NPOINT=5$
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$PO X=4.45, Y=-5., NEW=1$
$PO X=4.45, Y=-13., NEW=1$
$PO X=3.15, Y=-13.$
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$PO X=4.45, Y=-5.$
$PO X=4.45, Y=-13.$
$PO X=5.75, Y=-13.$
$PO X=5.75, Y=-5.$

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Fig 2 : POISSON Input