

MAGNET DIVISION NOTE

Author: R. Gupta
Date: August 5, 1985
No.: 153-1(SSC-MD-116)
Task Force: Coil Geometry Analysis
Title: Effect of the Steel Collar on the Magnetic Properties of
SSC Dipole

M. Anerella	E. Kelly
G. Bagley	H. Kirk
A. Bertsche	R. Louttit
D. Brown	R. LeRoy
J. Cottingham	G. Morgan
J. Cullen	S. Plate
P. Dahl	A. Prodell
Y. Elisman	K. Robins
R. Fernow	E. Rogers
G. Ganetis	W. Sampson
M. Garber	W. Schneider
A. Ghosh	M. Shapiro
C. Goodzeit	R. Shutt
A. Greene	J. Skaritka
H. Hahn	C. Sylvester
W. Harrison	P. Thompson
J. Herrera	P. Wanderer
R. Hogue	T. Wild
S. Kahn	E. Willen

RG:vm (This paper consists of 4 pages excluding cover sheet.)

Effect of the steel collar on the magnetic properties of SSC dipole

Ramesh C. Gupta.

The effect of steel collar has been studied on the magnetic properties of SSC dipole (with C-5 coil) using the code MDP. The model has been described by G. H. Morgan in the SSC Technical Note No. 23, "The 1-in-1 SSC Dipole with C-5 coil".

The effect is examined at the field near injection energy (current = 320 Amps) and the μ value of the steel has been considered constant. The collar used in this analysis is made up from either of the following :

- (1) Steel type Nitronic 40 with $\mu = 1.0025$,
- (2) Steel type 304 N with $\mu = 1.008$.

These data have been provided by R. LeRoy. The magnet is shown in Fig. 1. It has 15 mm steel collar. The mesh has been created by the program QMESH <1> and is shown in Fig 2. The space between the coil and the collar is 0.5 mm (21 mils).

The results are summarized in Table 1. The most serious effect of the collar may be the change in the transfer function. As compared to the case of the magnet without collar, the transfer function increases by 0.08 % with collar 1 and 0.25 % with collar 2. The sextupole changes by about half prime unit in case of collar 1 and by one and a quarter prime unit in case of collar 2. The changes in the other harmonics may be seen in the same table.

<1> R. E. Jones, SLAC-74-0239, "Users Manual for QMESH, a self Organizing MESH Generating Program".

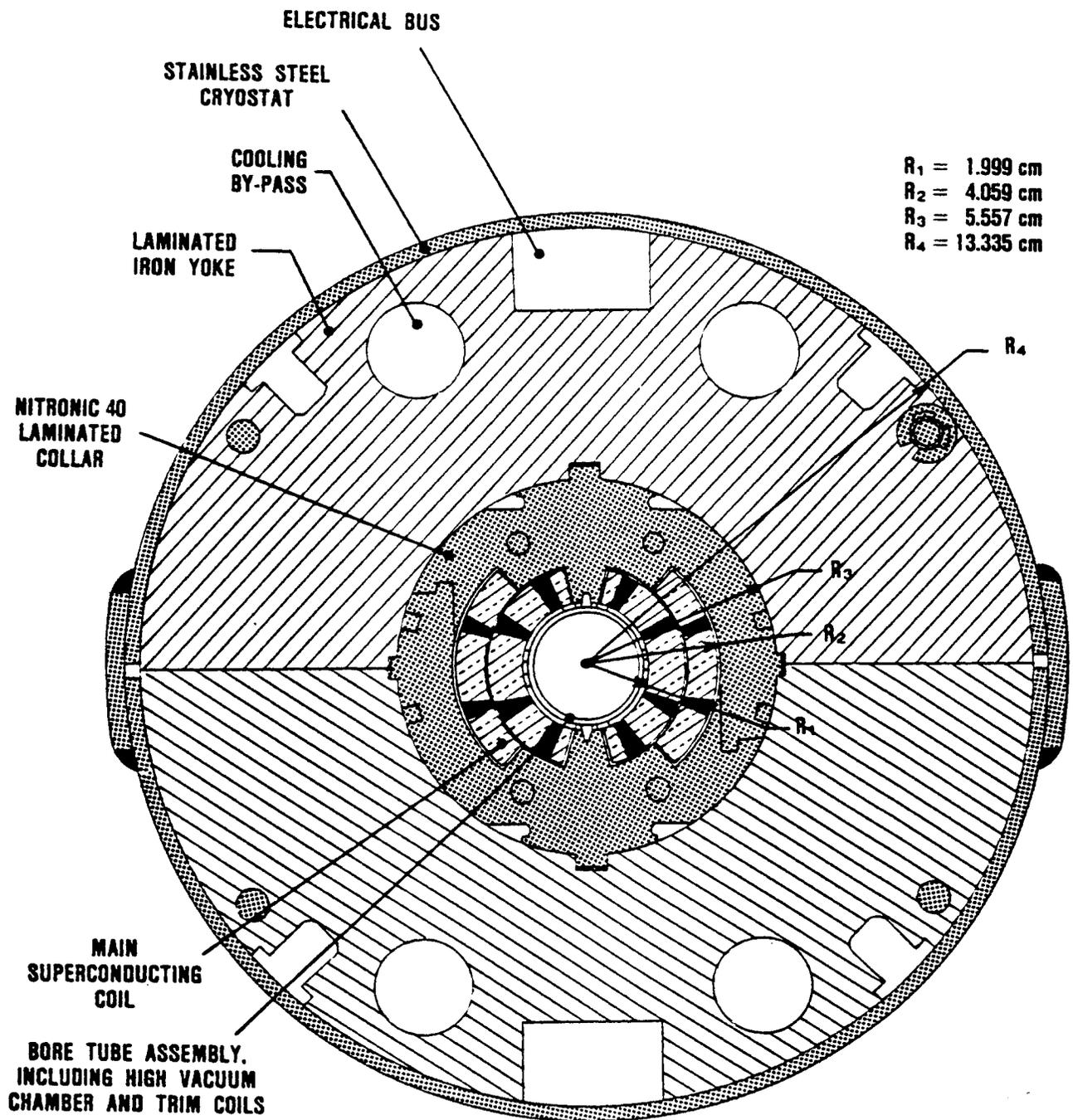
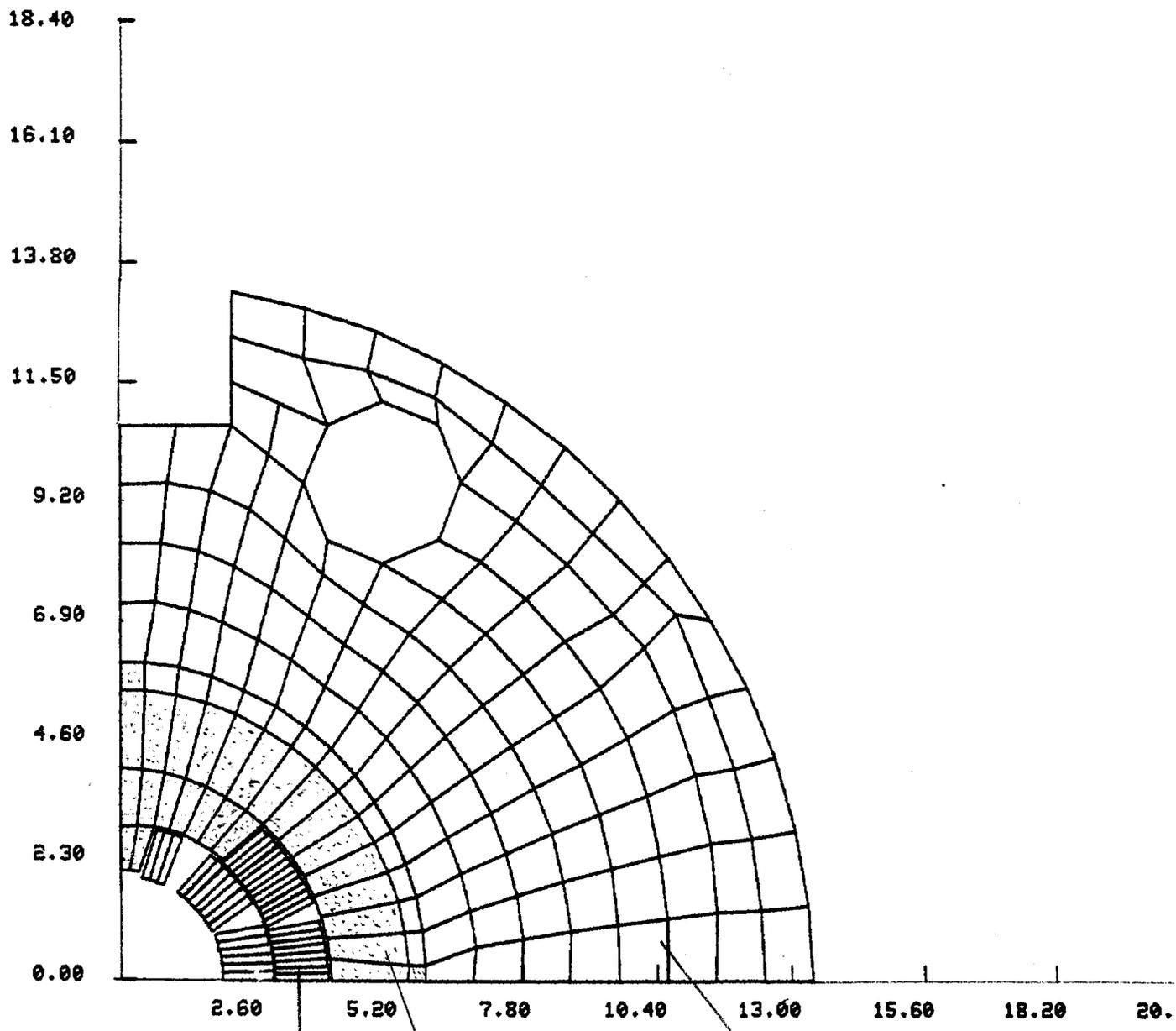


FIG 1. THE MAGNET.



...3187

C 5 coil

Steel collar

Iron

FIG 2. THE MESH.

Table 1.

*)

Harmonic computations with and without the steel collar

Harmonic	without collar	with collar 1	with collar 2
Dipole	0.329336 T	0.3296 T	0.330178 T
Sextupole	1.70	1.02	0.45
Decuploe	-0.07	0.04	0.27
14th pole	0.16	0.14	0.09
18th pole	0.85	0.85	0.86
22nd pole	-0.03	-0.03	-0.03
Transfer function	1.0292 T/KA	1.03 T/KA	1.0318 T/KA

*) Field harmonics for 1 cm normalization radius at 320 Amps.

Collar 1 (Nitronic 40) : $\mu = 1.0025$

Collar 2 (304 N) : $\mu = 1.008$