Fermilab

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To: SSC 50mm File

From: J. Kerby

Subject: Effect of Location and Size of Lifting Fixture Notch in 50mm Collars

Due to the assembly steps associated with a dipole magnet with a vertically split yoke, a lifting fixture notch in the collars at 45° from true center provides for the use of the same lifting fixture independent of the collared coil rotation during assembly. A proposed notch is depicted in Figure 1.

Unfortunately, this location coincides with one of the thinner regions of the collar cross section (17.02mm thick @ 45°). The analysis is to determine the sensitivity of the vertical and horizontal deflections of the collared coil on the collar thickness in the region of the fixture notch. Results are presented for 4 cases, representing collars with no notch, and notches of approximately 1.4, 2.8 and 4.1mm depths. The ANSYS model is based on the SSC 50mm collared coil model of Jon Turner, with 13 ksi preloads applied to both inner and outer coils at the midplane. (Figure 2). Although the lifting notch has not been modeled exactly, the deepest notch removes more collar material than the currently proposed notch. (Figure 3 shows removed elements).

The results are presented below. Node 472 is at the outer radius of the collar at the horizontal plane while N689 is at the outer edge at the vertical symmetry plane. Deflections are in mm, with mils in parentheses below.

			Radial Deflections	
Notch Depth	Area Removed	Collar Thickness	N472	N689
0.0mm	-	17.02mm	-.01249mm	.1136
		(100%)	(-.492)	(4.472)
1.4mm	13.72mm^2	15.62	-.01403	.1146
		(91.8%)	(-.552)	(4.512)
2.8mm	27.21	14.22	-.01687	.1165
		(83.6%)	(-.664)	(4.587)
4.1mm	39.26	12.92	-.02083	.1195
		(75.9%)	(-.820)	(4.705)

The deflections of N689 increase 0.9%, 2.6% and 5.2% from the notchless case for increasing notch depth.

The vertical deflection of the collared coil is a weak function of the notch depth in this region, and the proposed lifting fixture notch should not cause any dramatic change in the 50mm collared coil mechanics. The amount of material removed, however, should be minimized as much as possible.

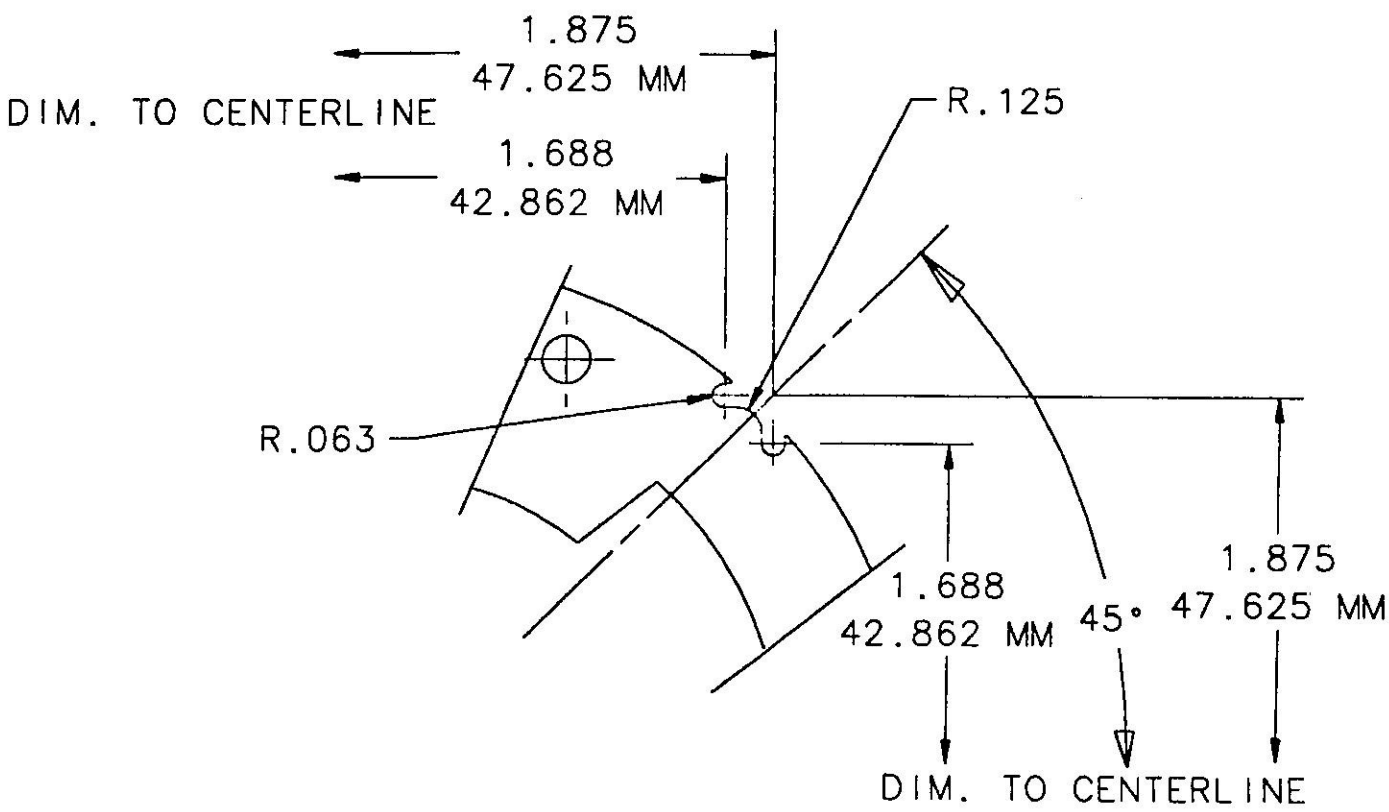
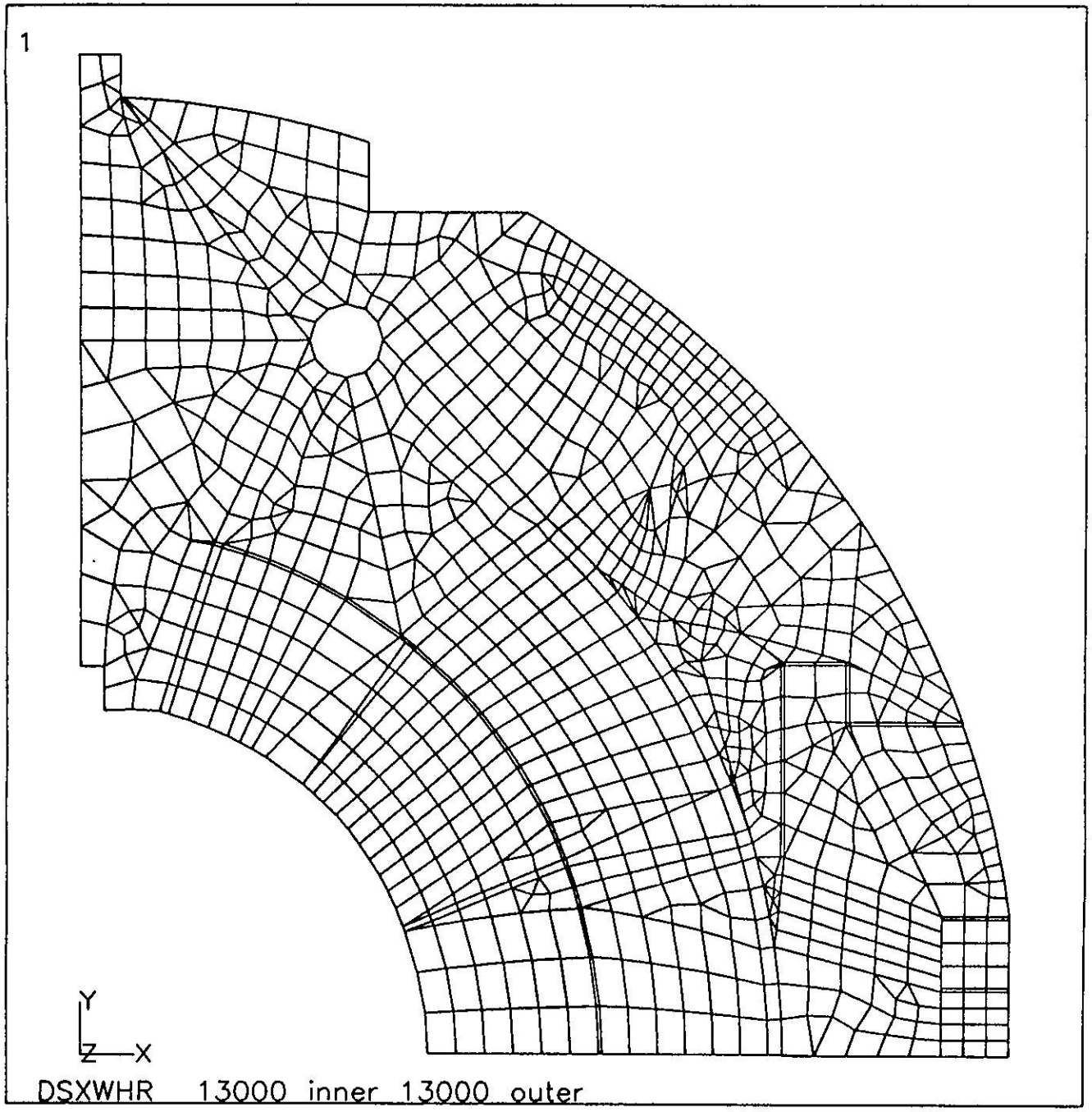


Figure 1. Proposed Lifting Notch



ANSYS 4.4
MAY 7 1990
15:42:55
PLOT NO. 1
PREP7 ELEMENTS
TYPE NUM

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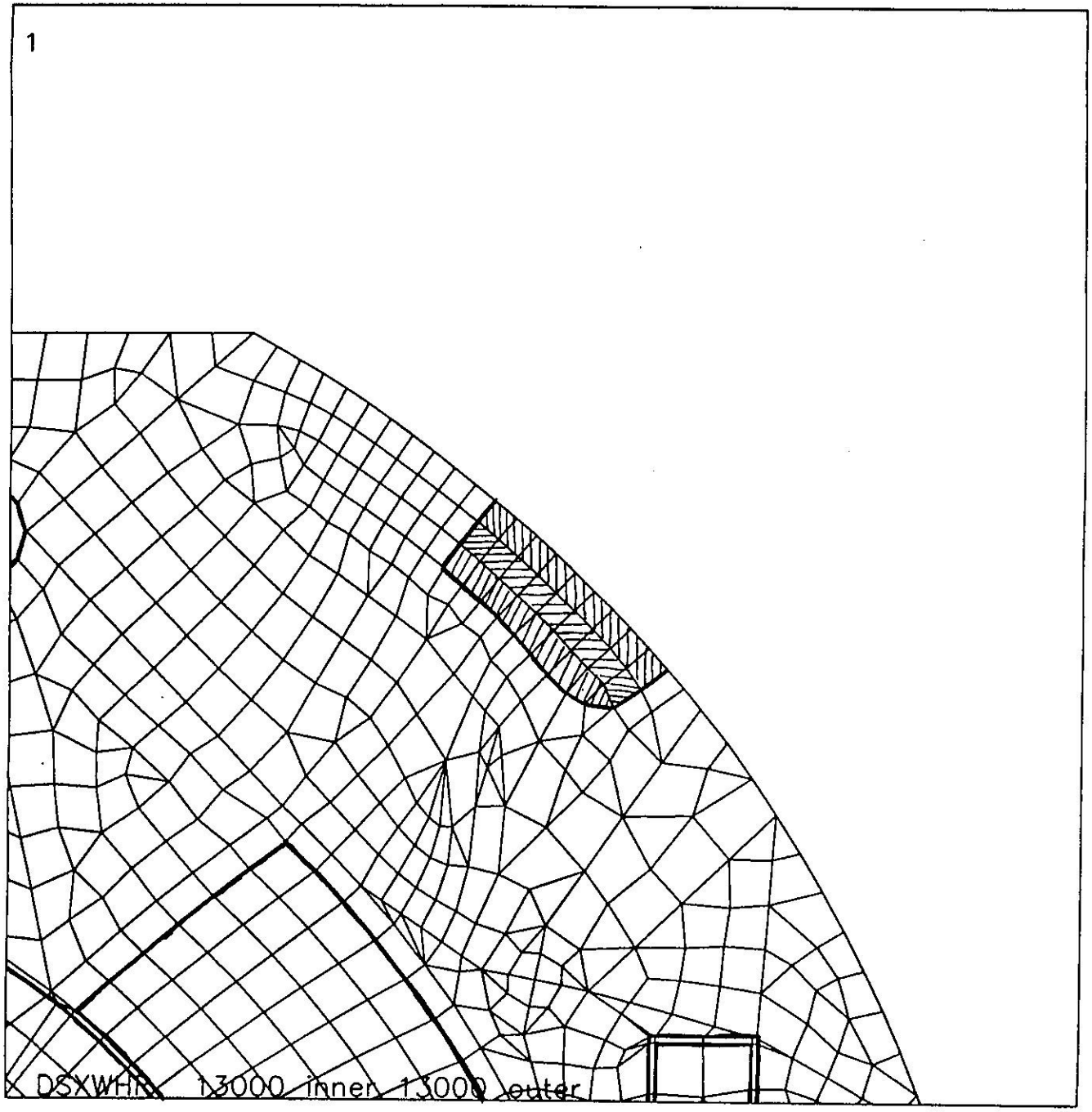
DIST=38.874
XF =33.515
YF =35.34

Figure 2. 50mm Collared Coil Model



ANSYS 4.4
MAY 7 1990
15:44:17
PLOT NO. 2
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TYPE NUM

ZV =1
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*XF =45.565
*YF =49.742

Figure 3. Elements Removed from Collar for Notch Depth Calculations