

From: FNAL::JBS 16-JUL-1990 14:54:11.22
To: BOSSERT, CARSON, KOSKA, MANTSCH, PEWITT
CC: MYSELF
Subj: Improved harmonics for 50 mm dipole

As you know, after the cross section was "fixed" and a considerable amount of tooling and parts had been ordered, particularly at BNL, the final dimensions of the cable were set at values slightly different from those assumed in the magnetic design. In particular, the inner cable width increased by 9 mils from the original design and by 6 mils from the first samples and the outer cable thickness was decreased by 0.4 mils. [1] The increased inner cable width was handled by keeping the inner coil outer radius and pole angles fixed and reducing the inner radius by 9 mils. We have decided to handle the decreased outer cable thickness by, to first order, ignoring it. That is, we leave the mold dimensions the same and count on the epoxy to fill the extra 0.4 mils between cables. This should result in no change in the harmonics generated by the outer coil. BNL has apparently decided to mold the coil to a smaller size to maintain the same amount of turn-to-turn epoxy. Ramesh Gupta has calculated the expected harmonics in these two cases (see attached e-mail) and finds that our solution gives $b_2 = -1$ unit and BNL's gives $b_2 = +1.3$ units. If we decrease the mold and collar sizes by 4 mils azimuthally, then $b_2 = 0$. This reduces the amount of "extra" turn-to-turn epoxy from 0.4 to 0.25 mils. Is there any reason we should not make "one final revision" to the collar drawing to accomplish this?

- [1] In my notes from the task force meeting of 5/3/90 when these cable dimension changes were discussed and "approved" I have the thickness decrease as 0.3 mils and the resultant mid-thickness as 45.6 mils. The latest cable drawing from SSCL, reproduced in the "Yellow Book" has the mid-thickness as 1.156 mm or 45.5 mils.

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Subj: Field harmonics for wider inner and thinner outer cables

Jim,
As discussed before regarding the change in the thickness of outer cable, initial thinking at BNL is using 10 mil shim (for minimum change in mechanical properties) and at FNAL is using extra epoxy (for minimum change in magnetic properties) to fill up the extra space created by 4 mil thinner cable. However, from b2 consideration alone, there is an intermediate solution where half the space is filled by 5 mil shim and half by epoxy. I am listing these three cases below:

Case/Details	b2	b4	b6	b8	b10
1. BNL :: 10mil Shim 3.45+3.45 mil Insulation (top+bottom)	1.29	0.08	-0.024	0.043	0.015
2. FNAL :: No Shim 3.65+3.65 mil Insulation	-0.96	0.06	-0.017	0.043	0.015
3. Alternate, 5 mil Shim 3.55 + 3.55 mil Insulation	0.16	0.07	-0.021	0.043	0.015

---Ramesh Gupta.