TS-SSC 91-210
11-18-91 Rodger Bossert

SSC 50mm Spot Welded Pair Summary

This note constitutes "Part 2" of a set of data presented on SSC spot welded pairs. Part 1 was released as Technical Support Tech Note #TS-SSC 90-084 and was titled SSC 40mm Spot Welded Pair Summary.

This note has two sections. Section 1 will present spot welded pair registration data for the 50mm collar laminations made for FNAL and BNL. Section 2 will summarize all data, including the 40mm data presented in note TS-SSC 90-084.

Inspection is done by looking across the edges of each pair on an optical comparator. The distance between the flat sheared edge of each lamination is measured. Three places on each pair are measured as shown in Figure 1.

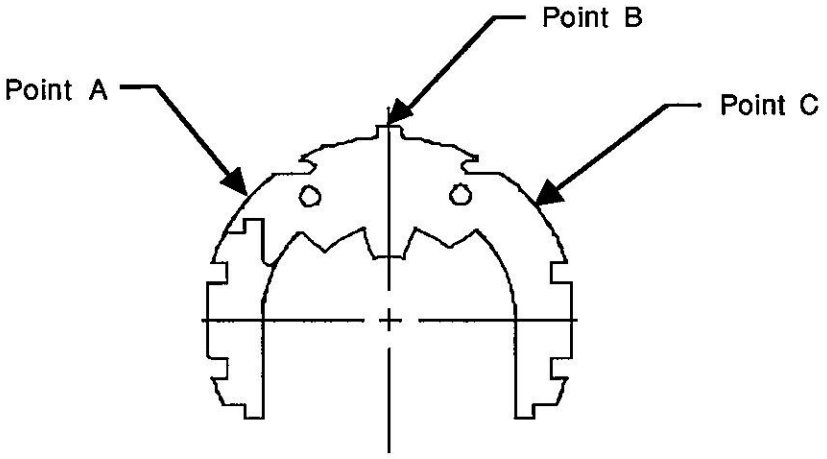

Figure 1

1.) 50mm pair registration

Two types of lamination pairs exist for 50mm SSC magnets. The type shown in Figure 2 were stamped and welded by H & J Tool and Die for BNL 50mm magnets. They were sent to FNAL by BNL to be inspected for purposes of comparison with the FNAL pairs. The registration of these pairs are all below .0025 inches. There appears to be a systematic change at one point indicating that these pairs probably represent two different batches.

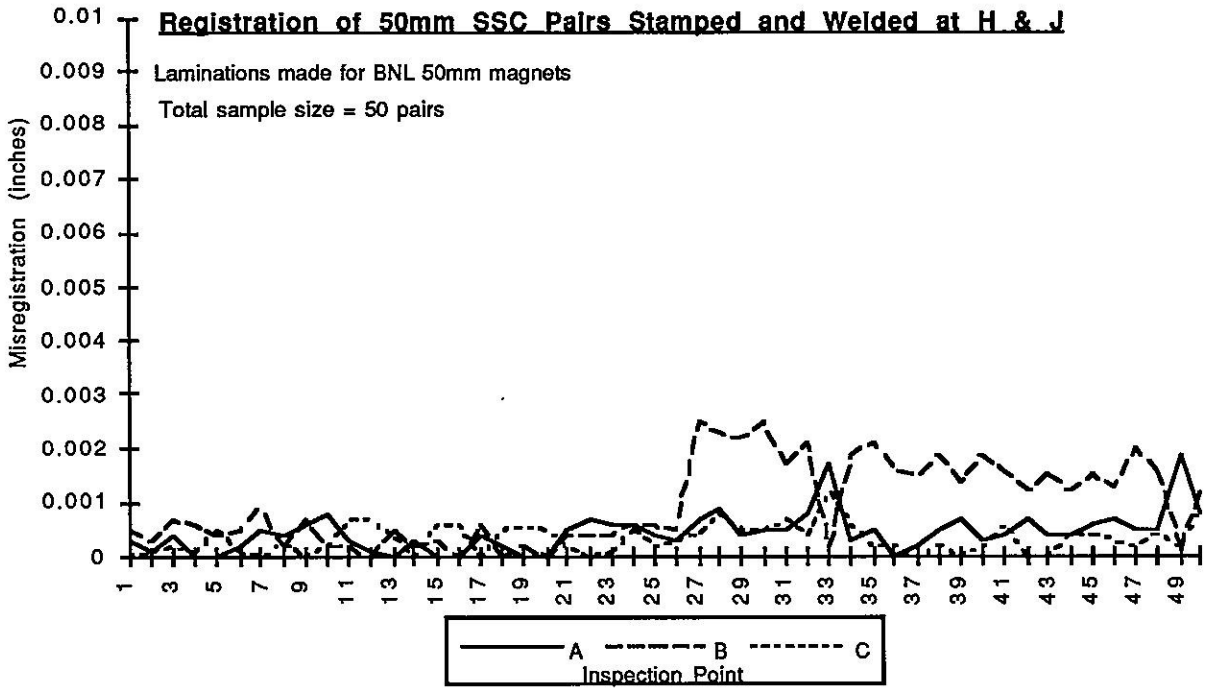

Figure 2.

The type shown in Figure 3 were stamped and welded by Plainfield Tool and die for FNAL 50mm magnets.

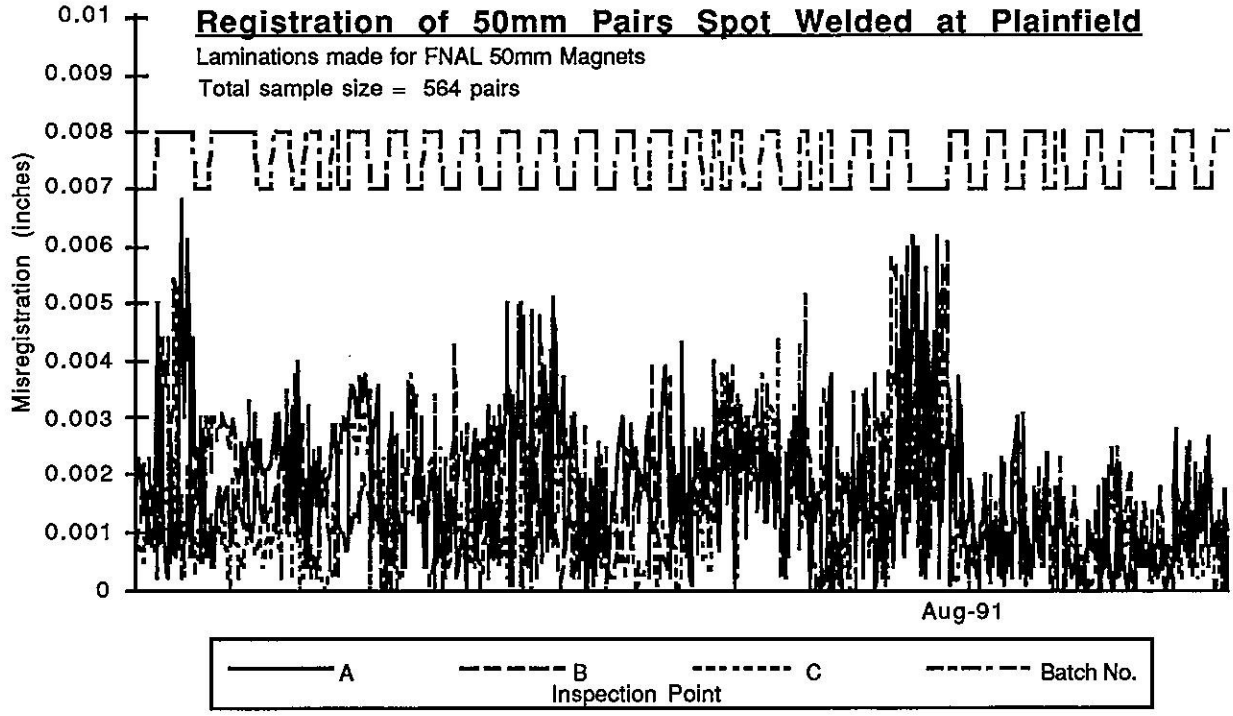

Figure 3.

The pairs shown in Figure 3 were produced between October 1990 and October 1991. They are graphed in approximately chronological order. The misregistration of these pairs varies from zero to .007 inches.

The later portion of the graph, in which all registration is below .003 inches, corresponds to dates after August 1991. A problem at Plainfield was corrected at this point. After a recent series of very poorly registered pairs (which were rejected), the production setup was internally inspected by Plainfield. Several problems were found. Pins which align the pairs through holes in the laminations were found to be excessively worn. Points in the contactor of the spot weldor were found to be burned. The lamination stamping die insert which stamps the hole in the lamination was found to be out of tolerance. These problems were corrected at that time. A solid state controller of heat and time was also added. These problems are now being periodically monitored. Registration results have clearly improved.

2.) Figure 4 shows a summary of six groups of spot welded pairs made for the 40mm and 50mm SSC dipoles. Group 4 is a subset of group 3. It represents the pairs made by Plainfeld Tool since August 1991. These pairs have been more consistently accurate than the earlier Plainfield pairs. It seems that both vendors can now spot weld pairs with a high level of accuracy, although H & J is still slightly superior.

SSC Spot Welded Pair Registration Summary

	Description	Stamped By	Welded By	Sample Size		Position A	Position B	Position C		
1	FNAL 40mm Laminations	Plainfield	Weldfab	350	Mean Std. Dev.	.0014 .0010	.0016 .0011	.0015 .0011	Overall Mean Overall SD	.0015 .0011
2	FNAL 40mm Laminations	Plainfield	H & J	134	Mean Std. Dev.	.0024 .0019	.0022 .0015	.0013 .0013	Overall Mean Overall SD	.0019 .0016
3	FNAL 50mm Laminations	Plainfield	Plainfield	564	Mean Std. Dev.	.0017 .0012	.0017 .0013	.0014 .0011	Overall Mean Overall SD	.0016 .0012
4	FNAL 50mm Laminations	Plainfield	Plainfield Aft. Aug 91	65	Mean Std. Dev.	.0009 .0007	.0009 .0007	.0008 .0006	Overall Mean Overall SD	.0009 .0007
5	BNL 40mm Laminations	H & J	H & J	41	Mean Std. Dev.	.0009 .0006	.0007 .0005	.0006 .0004	Overall Mean Overall SD	.0007 .0005
6	BNL 50mm Laminations	H & J	H & J	50	Mean Std. Dev.	.0005 .0004	.0010 .0008	.0003 .0003	Overall Mean Overall SD	.0006 .0006

Figure 4.

References:

1.) SSC 40mm Spot Welded Pair Summary, R. Bossert, Fermilab, Technical Support Technical Memo # TS-SSC-90-084.

2.) Mike Anarella, Brookhaven National Laboratory, private communication.