TS-SSC 91-237

Fermilab

FNAL/SSC Magnet Project
P.O. Box 500
Batavia, IL 60510

MEMORANDUM

To: **E. G. Pewitt, Project Manager**

From: **D. Tinsley, Project QA/QC Manager**
A. Koca, QA Engineer

Date: **November 18, 1991**

Subject: **Trend Analysis - 50MM Magnet Project**

Attached for your information is the third Discrepancy Report Trend Analysis dated 10-28-91.

cc:

R. Coombes	J. Carson	M. Packer, (GD)
C. Allen	J. Strait	T. Bush
D. Warner	G. Kobliska	
P. Mantsch	T. Nicol	
R. Williams	P. Mazur	

FNAL/SSC 50 MM MAGNET PROJECT

TREND ANALYSIS
10-28-91

The total amount of Discrepancy Reports at this point for Magnets DCA 310 through 321 cover those FNAL activities from Incoming Cable Inspection to Final Assembly. The range of time was 31 weeks from March 21 to October 28, 1991.
Magnets DCA 310 through 314 have completed Collared Coil End Clamp installation and can be compared at this point for possible trends.

I. Status:

Total DR Population up to 10-28-91 is 252. **(Open (53) 21. %, Closed (199) 79 %)**

This population is shown on the chart titled "Distribution of 252 Discrepancy Reports from 3-21-91 to 10-28-91" which places each Discrepancy Report into one of the five problem area groups below.

II. Chart Definitions:

Material	(related to Magnet components, parts, their design and acceptance for use)
Manpower	(related to human error or actions)
Method	(related to the fabrication and assembly process and those actions which complete each step)
Machine	(related to the acceptability and design of tooling, parts and equipment used in the fabrication and assembly of a Magnet)
Measurement	(acceptability of electrical, dimensional and mechanical checks taken during fabrication and assembly of a Magnet)

III. Summary of Problem Areas:

The Magnet with the largest amount (20%) of the Discrepancy Reports written is the Practice Magnet DCA 310 with associated Tooling and Traveler problems. The diagram "Distribution of Discrepancy Reports per Magnet as of 10-28-91" shows the population of DRs to date.

Magnets DCA 310 through 315 have completed the Collared Coil End Clamp installation stage and DCA 312 appears to have the least amount of problems, but the G.D. Magnet DCA 313 had an increase in DRs. The next Magnet, DCA 314 dropped in total DRs, but DCA 315 has shown an increase. This is shown in the diagram "142 DR's For Magnets completed up to Collared Coil End Clamp Installation (10-28-91)".

The area of Materials is the major problem area and appears to be consistent on the later Magnets. The area of Measurement is behind Methods, but is on the increase due to the amount of testing done as Magnets progress. This can be expected and seen on diagram "Distribution of 252 Discrepancy Reports from 3-21-91 to 10-28-91".

The following is a brief summation of **major** problems that have occured for those Magnets with fifteen or more DRs written up to 10-28-91.

DCA 310
1. Repaired or removed Collapsed Cable.
2. Replaced Pultrusions that failed the Hi-Pot Test.
3. Skin Strain Gages not installed.
4. Repair Coil to Beam Tube Short.
5. Re-clean Collar Packs with Weld Splatter and contamination.
6. Repaired torn B-Stage.
7. Scribe line on Wedges not in center.
8. Beam Tube Ball inspection failure.

DCA 311
1. Replaced Pultrusions that failed Hi-Pot Test.
2. Skin Strain Gages not installed.
3. Repaired turn to turn short after R.E. Clamp installation.
4. Repaired cut Voltage Taps.
5. Repair of chips and coil damage.
6. Beam Tube Ball inspection failure.
9. Post with 20K MLI not to Rev. 9.5" changed to 12".
10. Repaired Turn to Turn short.
11. Inner/Outer Coil orientation off.

?

DCA 312
1. Replacement of Pultrusion Bus that failed electrical test.
2. Re-cleaning of Collar Packs with weld flash material present.
3. Re-cleaning of Strain Gage Packs from corrosion.
4. Surface chip that affected electrical check was found and corrected.
5. Repair of torn B-Stage.
6. Repair of Cable that uncoiled during the insulation process.
7. Beam Tube Ball inspection failure.

DCA 313
1. Torque change in R.E. Bushing Screws.
2. Two Open Voltage Taps.
3. Heater Strip shorting to R.E. Cap.
4. Cleaning of Metal chips from Collar Packs.
5. Repair or torn or scraped B-Stage or Kapton.
6. Repair of exposed strands in cable and wire sprung out of matrix.
7. Metal chip problems.
8. Beam Tube Ball inspection failure.

DCA 314

1. Problem with post weld electrical resistance checks due to temperature.
2. Replacement of Pultrusion that failed electrical check.
3. G-10 End Piece repairs.
4. Replacement of Beam Tube due to Kapton not applied correctly.
5. Repair Cable Strand that was out of place during Winding.
6. Repair of torn insulation on cable after Curing.
7. Beam Tube Ball inspection failure.

DCA 315

1. Beam Tube Ball inspection failure.
2. Replacement of wrinkled Heater Strip.
3. Repair of B-Stage or Kapton.
4. Crack in G-10 Lead End Key.

DCA 316

1. Repair Kapton that moved out of its position.
2. Repair Voltage Tap that tested as open.
3. Metal chips found and repairs made.
4. Repaired Torn Kapton & B-Stage.
5. Coil 2015 Repair damaged Preform Shim that raised out of slot.

DCA 317

1. Disassemble for turn to turn short in coil 1007.
2. Kapton with indentions, spots, hole or torn.
3. Lead End Saddle cut too short.
4. Beam Tube with scratch in Kapton.

IV. Conclusion:

The major problems still lie in the areas of Materials, Methods and Measurement used in the fabrication and assembly of the 50MM Dipole Magnets as shown in the diagram "Distribution of 252 Discrepancy Reports from 3-21-91 to 10-28-91".

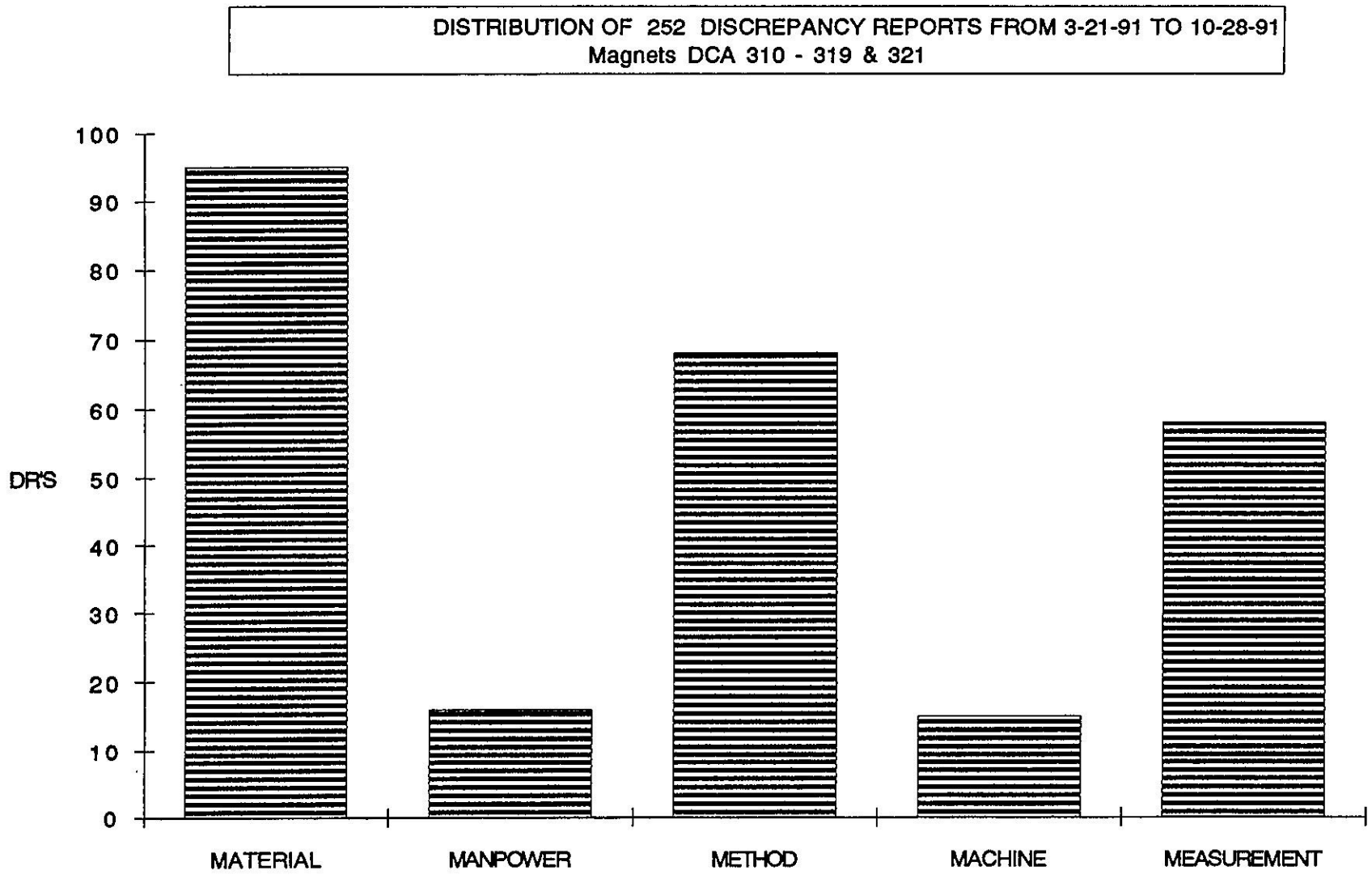
Magnet DCA 312 appears to have the least amount of problems and shows the least amount of Material problems reported. See diagram "Total DRs Per Magnet 10-28-91.

(3) Attachments:

1. Distribution of 252 Discrepancy reports from 3-21-91 to 10-28-91
2. Distribution of Discrepancy Reports per Magnet as of 10-28-91
3. 142 DRs for Magnets completed up to Collared Coil End Clamp Installation (8-17-91)

Compiled By:
A. Koca, QA Engineer

FNAL/SSC 50 MM MAGNET PROJECT

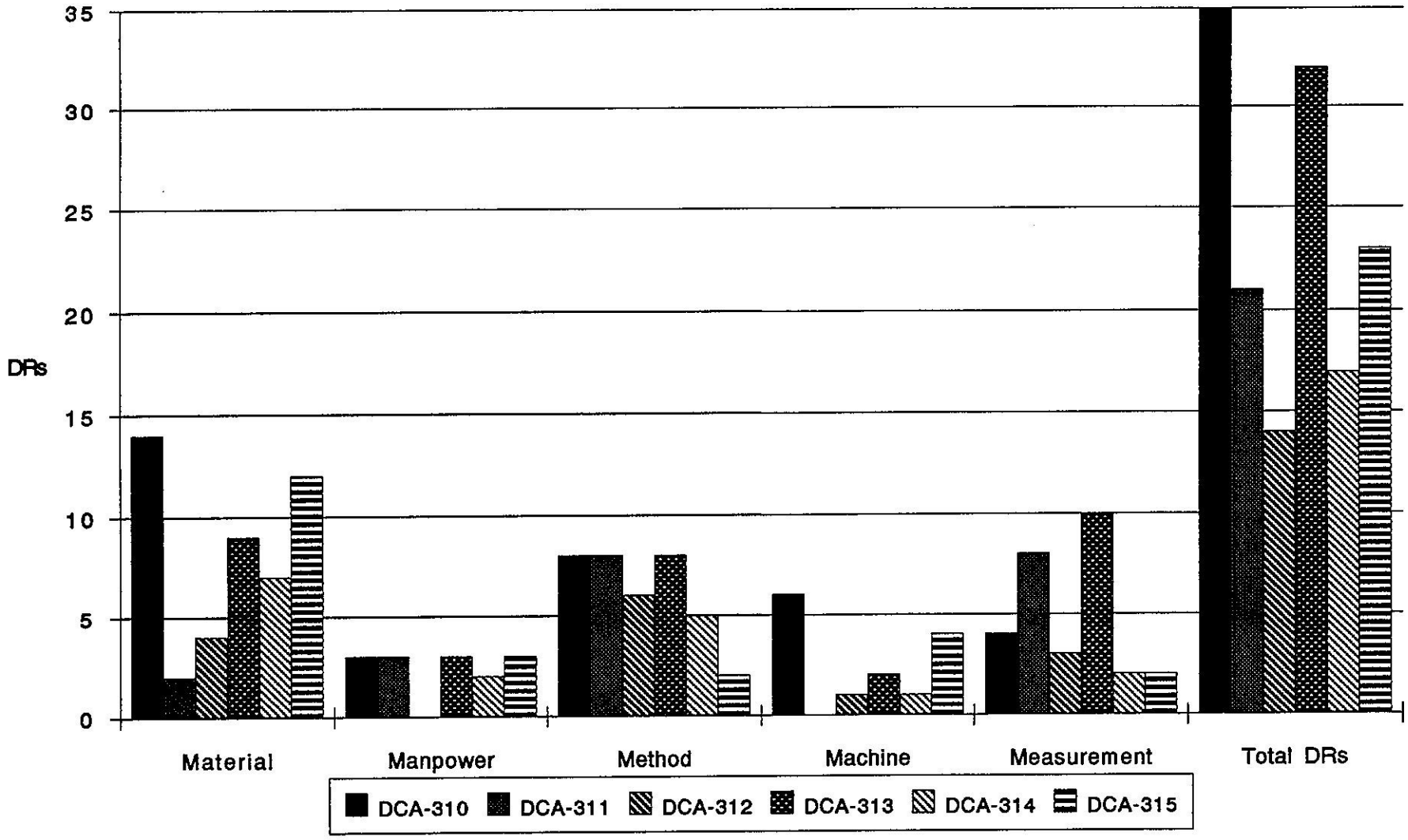


FNAL/SSC 50 MM MAGNET PROJECT

Distribution of Discrepancy Reports per Magnet as of 10-28-91

Magnet	Material	Manpower	Method	Machine	Measurement	Total
DCA 310	17	3	10	6	14	50
DCA 311	8	3	12	0	15	38
DCA 312	6	0	11	1	5	23
DCA 313	12	3	11	2	10	38
DCA 314	8	1	9	1	3	22
DCA 315	12	4	2	4	2	24
DCA 316	11	0	6	0	2	19
DCA 317	9	2	3	0	5	19
DCA 318	2	0	3	0	0	5
DCA 319	6	0	0	1	1	8
DCA 320	1	0	0	0	0	1
DCA 321	1	0	0	0	0	1
DCA XXX	1	0	1	0	1	3
Totals	94	16	68	15	58	251

Cable =1 DR

FNAL/SSC 50 MM MAGNET PROJECT

142 DRs FOR MAGNETS COMPLETED UP TO COLLARED COIL END CLAMP INSTALLATION
(10-28-91)