Fermilab

TS-SSC 92-048
4/6/92
J. Strait

Location of First Quench in DCA317

The first quench in DCA317 is very similar to the first quenches[1] of DCA313 and DCA314, both in current (5630 A) and location. As in those magnets the quench originates in the pole turn at the lead end on the side opposite the splice. Because of the low current and consequent slow quench propagation, the quench begins before the earliest voltage data recorded. Therefore the precise quench location must be determined from the point where the quench appears in the next turn. Figure 1 shows the voltage traces for the relevent cable segments. The segment in which the quench began, 18C-18B (tap 18A is broken), shows a non-zero and rising voltage when data collection begins. The quench first appears in the 2nd turn from the pole in the lead end segment, 17A-17B, and then propagates into the straight section 17B-18D 3.5+-0.5 msec later. The quench velocity is gotten from the known length[2] of the lead end segment and the sum of the quench propagation times to the two ends, assuming a constant velocity. An uncertainty of +-20% is arbitrarily assigned to this estimate. The deduced quench velocity is 10.4+-2.1 mm/msec. This locates the quench origin in the pole turn 36+-9 mm from the position of tap 17B towards the lead end, or 11+-14 mm from the collar - end clamp boundary. The error on the last quantity has been increase by 5 mm to account for mechanical tolerances and no error has been assigned for the use of the adjacent turn for quench location.

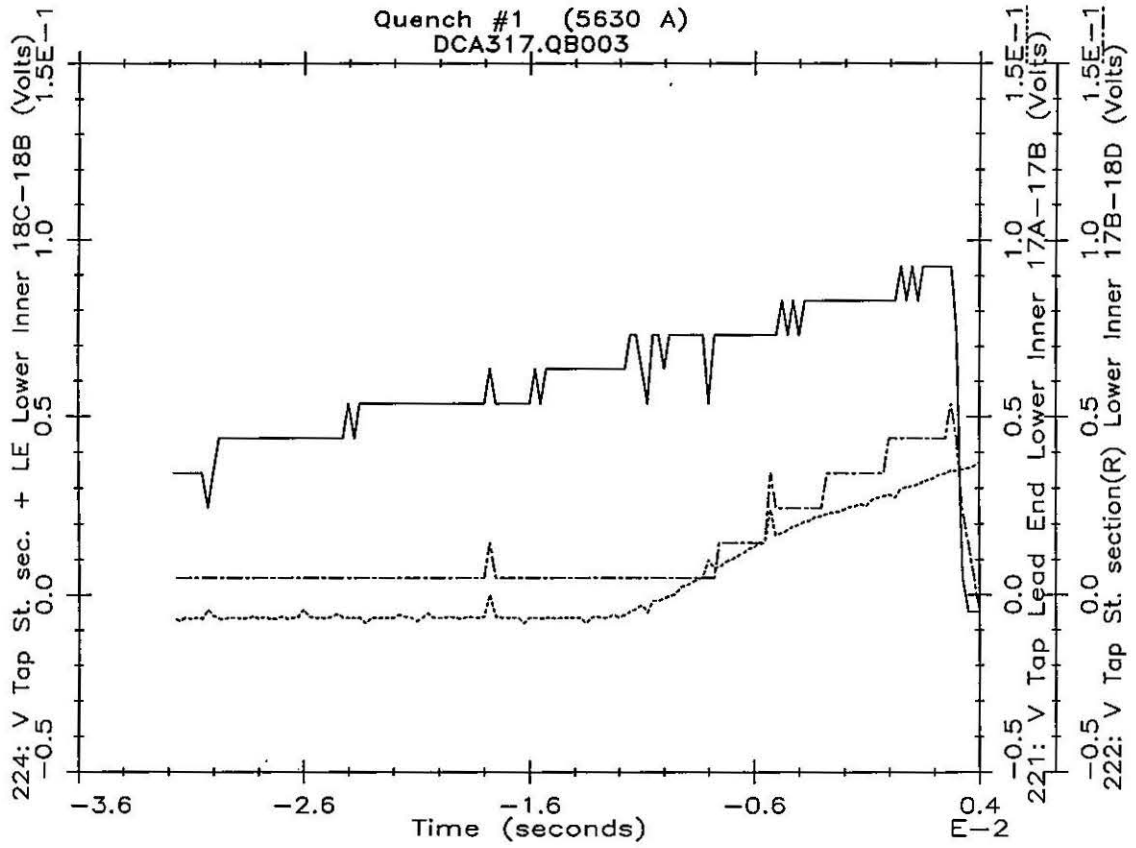
Three of 8 magnets tested so far have had one initial low current training quench in this location. A candidate cause of the problem may be mis-seating of the key extension. The last nominally 12.7 mm of the key is recessed to allow for the extension of the ground insulation into the end clamp region, and this piece of the key is made as a separate piece. This is done at both ends of the inner and outer coils. After all four coils have been assembled but before the collar packs are installed, key extensions of the proper length are inserted to bring the distance from the end of saddle to the end of the key plus extension to the correct value and to match all 4 coils. The key extensions are cemented to the appropriate key with just enough cement to hold them during assembly. The intent is that the glue joint will break if necessary during end clamp assembly and the key extension will seat itself to its natural and correct position. Perhaps these low current quenches indicate that the lead end inner key extensions sometimes remain slightly out of place until the first high current excitation. It may be that the presence of the splice lead at the lead end makes the key extension more likely to be mis-placed there than at the return end. The fact that the outer coil key extension is larger, is more accessible, and is supported by the inner coil may make it more likely to be properly seated during assembly.

REFERENCES

[1] J. Strait, Location of Low Current Quenches in DCA313 and DCA314, TS-SSC 92-016, 1/30/92

[2] J. Strait, Location of turn-to-turn short in DCA318, TS-SSC 91-234, 12/4/91.

DISTRIBUTION: R.Bossert, J.Carson, S.Delchamps, A.Devred, J.Dimarco, W.Koska, J.Kuzminski, M.J.Lamm, P.O.Mazur, D.Orris, E.G. Pewitt, M.Wake


Quench #1 (5630 A)
DCA317.QB003
224: V Tap St. sec. + LE Lower Inner 18C−18B (Volts)
221: V Tap Lead End Lower Inner 17A−17B (Volts)
222: V Tap St. section(R) Lower Inner 17B−18D (Volts)
1.5E−1
1.0
0.5
0.0
−0.5
−3.6
−2.6
−1.6
−0.6
0.4
E−2
Time (seconds)

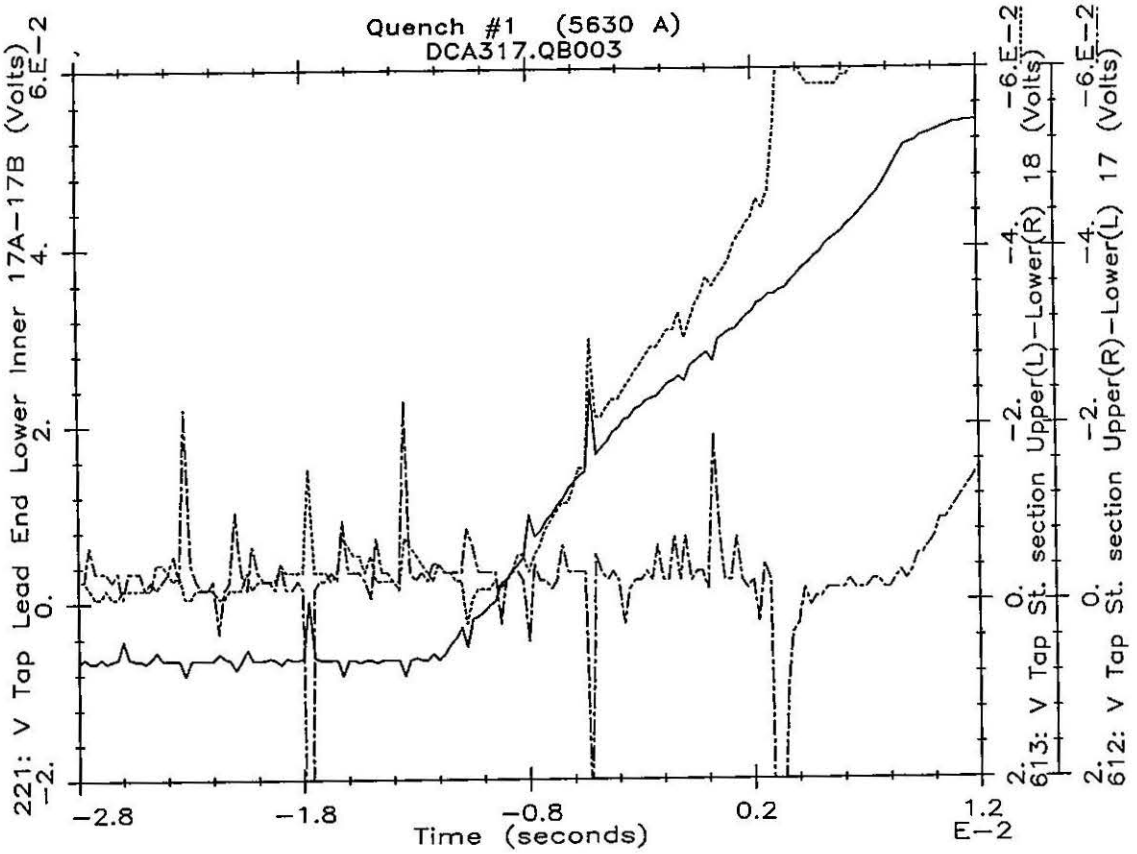
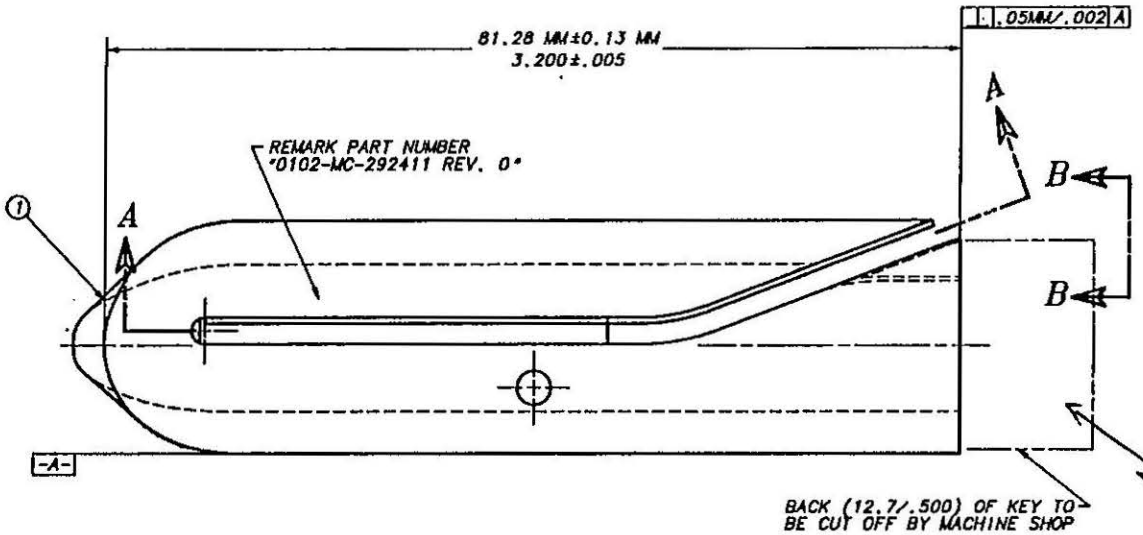
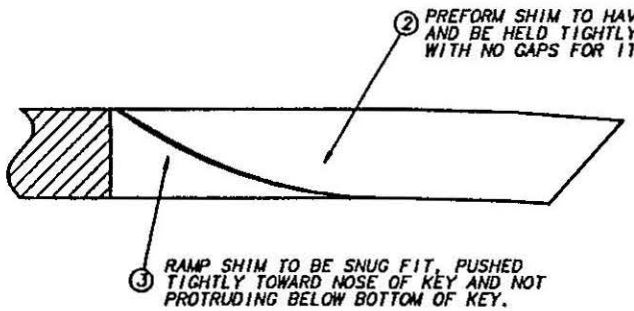

Quench #1 (5630 A)
DCA317.QB003
221: V Tap Lead End Lower Inner 17A−17B (Volts)
613: V Tap St. section Upper(L)−Lower(R) 18 (Volts)
612: V Tap St. section Upper(R)−Lower(L) 17 (Volts)
6.E−2
4.
2.
0.
−2.
−6.E−2
−4.
−2.
0.
2.
−2.8
−1.8
−0.8
0.2
1.2
E−2
Time (seconds)

Figure 1

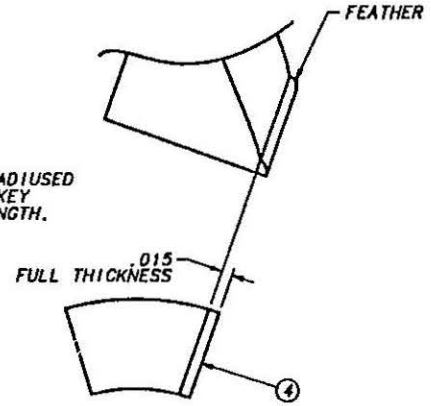
REV.	DESCRIPTION	DRAWN / APPD.	DATE / DATE



NOTE:
G-10 SHIMS #2, #3 AND #4 TO BE GLUED TO CUT-OFF KEY #1 WITH CYANOACRYLATE OR TWO-PART EPOXY. SHIMS MUST BE TIGHTLY PUSHED AGAINST KEY WHILE GLUE SETS TO PREVENT GAPS OR EXCESSIVE GLUE BOND THICKNESS.



VIEW A-A
SCALE 2:1



VIEW B-B
SCALE 2:1

ITEM	PART NUMBER	DESCRIPTION	QTY
4	0102-MB-292408	SHIM- TRIANGULAR	1
3	0102-MB-292374	SHIM- RAMP	1
2	0102-MB-292372	SHIM- PREFORM	1
1	0102-MC-292026	KEY- INNER COIL LEAD END	1

UNLESS OTHERWISE SPECIFIED:
1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. TOLERANCES: SEE NOTE 3
3. DIMENSIONS BASED UPON ANSI Y14.5M-1982.
4. INCH DIMENSIONS ARE FOR REFERENCE ONLY.
6. BREAK ALL SHARP EDGES.
8. DO NOT SCALE DRAWING.
7. MAX. ALL MACH. SURFACES 125
8. DIMENSION IDENTIFICATION: MILLIMETER / INCH (MILLIMETER/INCH)

ORIGINATOR	J. BRANDT	
DRAWN	NWBARTLETT	6/28/91
CHECKED	J. BRANDT	7-9-91
APPROVED	Patty Brandt	7-9-91
USED ON	0102-MA-292020	
MATERIAL		

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY
SSC

SSC 50mm DIPOLE COLD MASS INNER COIL ASSEMBLY MODIFIED LEAD END KEY- G-10

SCALE	DRAWING NUMBER	SHEET	REV.
3:1	0102-MC-292411	1 of 1	

CREATED WITH I-DEAS 5.0 | USER NAME: NancyB

Figure 2