Fermilab

TS-SSC 91-199
J. Strait
10/25/91

DSA326 Quench Summary

Attached are a quench summary table and plots from DSA326. I lifted the quench summary for the first two cooldowns from Tariq Jaffery's area on the Vax and added the summary of the 3rd thermal cycle. I have not attempted to fill in quench locations and Tariq has done only some. (I hope he will finish tabulating the locations and publish a follow up note.) Figure 1 is a quench history plot. The quench plateaus at each temperature are some what erratic for reasons not wholly understood. There are also some indications of modest training at some points, but the "training" is only a little bigger than the spread in the plateau.

Figure 2 is a plot of quench current versus temperature for the first two thermal cycles and $dI/dt \leq 16$ A/s. It is clear that the spread in quench currents cannot be explained by temperature fluctuations. Figure 3 is a plot of quench current versus ramp rate for second thermal cycle quenches at 4.35 K nominal temperature. The wide range of quench currents at 16 A/s is quite evident. There is no evident low ramp rate plateau. This is similar to the BNL short magnet DSA209. That magnet also showed an erratic quench plateau until the ramp rate was reduced to 2 A/s. This was not tried on DSA326.

On the third cooldown the end preload was increased from 500 lbs to 4000 lbs per bullet. There is no evident difference in quench performance due to the end preload change.

Distribution:

R. Bossert
J. Carson
S. Delchamps
A. Devred
W. Koska
T. Jaffery
M. Lamm
G. Pewitt
J. Tompkins (for SSCL)
M. Wake
B. Williams (for G.D. and Westinghouse)

Quench summary for first two cooldowns is taken from Tariq Jaffery, except that I have modified his quench numbers for files 100-108 by subtracting 3 from each. Tariq's comments on the first two cooldowns are attached below.

> This includes all the quenches that we have, so far, from both cooldowns. During second cooldown quench current has been between 7330 - 7465 A. This is definitely not due to temperature flutuations. Zero current prestress for bullet gages in quadrant 2 (ch#40) and 3 (during strain gage run to 7400 A , file dsa326.ca014) changed after the the run.
>
> | | Q2 bullet | Q3 bullet |
> |---|---|---|
> | Zero current prestress before strain run to 7400 A= | 570 lb | 570 lb |
> | Prestress after strain run to 7400 A= | 400 lb | 520 lb |
>
> Bullets in Q4 (ch#45) show a sudden change in slope (could this be due to coil movement or may be bushing screw/bullet are slipping over each other) at ~3100 A during upramp and downramp. Could this be reason for unstable quenches during second cooldown which have been at different currents?
>
> Tariq....

On the first two cooldowns the end load was set to 500 lbs/bullet. On the third cooldown the load was increased to 4000 lbs/bullet.

Quench File Summary
DSA326
First Cooldown

Q#	File	I-m	Idot	I-t	Idot	QDC	MIITs	t-Q	V-max	Coil	t(H)	V(H)	T(t)	T(m)	T(b)	P	LL	Location
	0	-75.	0.	0.0	0.0	V-dI	0.0	0.000	0.	UO	0.000	0.	0.00	0.00	0.00	0.	0.	manual trip to check s.c.
	1	-85.	0.	0.0	0.0	Vtot	0.0	-.002	7.	UO	0.000	0.	4.23	4.18	4.18	744.	73.	manual trip to check s.c.
	2	-3674.	0.	0.0	0.0	Cu L	0.0	0.000	0.	UO	0.000	0.	4.23	4.18	4.18	743.	73.	manual trip to check s.c.
	3	-3865.	0.	0.0	0.0	Cu L	0.0	0.000	0.	UI	0.000	0.	4.23	4.18	4.18	743.	73.	manual trip to check s.c.
	4	-4114.	0.	0.0	0.0	Cu L	0.0	0.000	0.	UI	0.000	0.	4.23	4.18	4.18	743.	73.	manual trip to check s.c.
	5	1002.	0.	0.0	0.0	V-dI	0.0	0.000	-6.	UI	0.000	0.	4.23	4.18	4.18	743.	72.	manual trip to check s.c.
	6	1991.	0.	0.0	0.0	U-L	0.0	0.000	-11.	UI	0.000	0.	4.35	4.30	4.30	834.	75.	manual trip to check s.c.
	7	1002.	0.	0.0	0.0	V-dI	0.0	0.000	-6.	UI	0.000	0.	4.36	4.32	4.31	845.	72.	manual trip to check s.c.
	8	997.	0.	0.0	0.0	Vtot	0.0	-.003	-8.	UI	0.000	0.	4.40	4.35	4.35	874.	85.	manual trip to check s.c.
										4.3 K QUENCES								
1	9	7343.	16.	0.0	0.0	U-L	0.0	-.017	-25.	UI	0.000	0.	4.39	4.34	4.33	867.	74.	IU19SR 3.5 ms from Ramp Splice
2	10	7362.	16.	0.0	0.0	U-L	0.0	-.014	-23.	UI	0.000	0.	4.35	4.30	4.29	853.	65.	IU19SR 3.5 ms from Ramp Splice
3	11	7397.	16.	0.0	0.0	U-L	0.0	-.011	-25.	UI	0.000	0.	4.40	4.35	4.34	871.	69.	IU19SR 3.5 ms from Ramp Splice
4	12	7392.	16.	0.0	0.0	U-L	0.0	-.015	-25.	UI	0.000	0.	4.38	4.33	4.32	867.	66.	IU19SR 3.5 ms from Ramp Spl
5	13	7416.	16.	0.0	0.0	U-L	0.0	-.010	-25.	UI	0.000	0.	4.35	4.30	4.29	866.	66.	IU19SR 2.5 ms from Ramp Spl
6	14	7406.	16.	0.0	0.0	U-L	0.0	-.009	-24.	UI	0.000	0.	4.37	4.32	4.31	878.	67.	IU19SL 4 ms from LE
										4.2 K QUENCHES								
	15	1007.	0.	0.0	0.0	Vtot	0.0	0.000	-6.	UI	0.000	0.	4.20	4.15	4.15	724.	76.	Manual Trip to check system
7	16	7671.	16.	0.0	0.0	U-L	0.0	-.006	-24.	UI	0.000	0.	4.20	4.15	4.15	724.	76.	IU19SL 4 ms from LE
8	17	7671.	16.	0.0	0.0	U-L	0.0	-.012	-24.	UI	0.000	0.	4.20	4.15	4.15	724.	59.	IU19SR 7 ms from Ramp Spl
9	18	7676.	16.	0.0	0.0	U-L	0.0	-.008	-24.	UI	0.000	0.	4.20	4.15	4.15	724.	59.	IU19SL 4.8 ms from LE
										HEATER STUDIES								
	19	-6.	0.	0.0	0.0	V-dI	0.0	0.000	0.	UO	0.000	0.	4.20	4.15	4.15	724.	84.	
	20	-2.	0.	0.0	0.0	V-dI	0.0	0.000	0.	UO	0.000	0.	4.20	4.15	4.15	724.	84.	
	21	-2.	0.	0.0	0.0	V-dI	0.0	0.000	0.	UO	0.000	0.	4.20	4.15	4.15	723.	75.	
	22	-2.	0.	0.0	0.0	U-L	0.0	0.000	0.	UO	0.000	0.	4.20	4.15	4.15	723.	74.	
	23	1991.	0.	0.0	0.0	V-dI	0.0	-.325	-12.	UI	0.000	0.	4.20	4.15	4.15	723.	74.	
	24	1991.	0.	0.0	0.0	V-dI	0.0	-.341	-12.	UI	0.000	0.	4.20	4.15	4.15	723.	73.	
	25	2025.	0.	0.0	0.0	V-dI	0.0	-.285	-12.	UI	0.000	0.	4.20	4.15	4.15	723.	73.	
	26	1986.	0.	0.0	0.0	V-dI	0.0	-.535	-12.	UI	0.000	0.	4.20	4.15	4.15	723.	73.	
	27	1988.	0.	0.0	0.0	V-dI	0.0	-.492	-12.	UI	0.000	0.	4.20	4.15	4.15	723.	74.	
	28	1986.	0.	0.0	0.0	V-dI	0.0	-.352	-12.	UI	0.000	0.	4.20	4.15	4.15	723.	74.	
	29	1991.	0.	0.0	0.0	V-dI	0.0	-.347	-12.	UI	0.000	0.	4.20	4.15	4.15	723.	74.	
	30	1986.	0.	0.0	0.0	V-dI	0.0	-.346	-12.	UI	0.000	0.	4.20	4.15	4.15	723.	74.	
	31	1991.	0.	0.0	0.0	V-dI	0.0	-.352	-12.	UI	0.000	0.	4.20	4.15	4.15	723.	74.	
	32	4978.	0.	0.0	0.0	V-dI	0.0	-.028	-30.	UI	0.000	0.	4.20	4.15	4.15	723.	74.	
	33	4978.	0.	0.0	0.0	V-dI	0.0	-.012	-30.	UI	0.000	0.	4.20	4.15	4.15	723.	74.	
	34	4978.	0.	0.0	0.0	V-dI	0.0	-.035	-30.	UI	0.000	0.	4.20	4.15	4.15	723.	74.	
	35	4978.	0.	0.0	0.0	V-dI	0.0	-.032	-30.	UI	0.000	0.	4.28	4.22	4.21	771.	48.	
	36	62.	100.	0.0	0.0	Vtot	0.0	-.002	7.	UO	0.000	0.	4.20	4.16	4.15	724.	74.	
	37	1988.	0.	0.0	0.0	V-dI	0.0	-.554	-12.	UI	0.000	0.	4.20	4.16	4.15	724.	74.	
	38	1986.	0.	0.0	0.0	V-dI	0.0	-.554	-12.	UI	0.000	0.	4.20	4.16	4.15	724.	74.	
	39	1986.	0.	0.0	0.0	V-dI	0.0	-.503	-12.	UI	0.000	0.	4.20	4.16	4.15	724.	74.	
	40	1988.	0.	0.0	0.0	V-dI	0.0	-.515	-12.	UI	0.000	0.	4.20	4.16	4.15	724.	74.	
	41	1988.	0.	0.0	0.0	V-dI	0.0	-.518	-12.	UI	0.000	0.	4.20	4.16	4.15	724.	74.	
	42	4973.	0.	0.0	0.0	V-dI	0.0	-.050	-30.	UI	0.000	0.	4.20	4.16	4.15	724.	74.	
	43	4978.	0.	0.0	0.0	V-dI	0.0	-.045	-30.	UI	0.000	0.	4.21	4.17	4.16	730.	75.	
	44	4968.	0.	0.0	0.0	V-dI	0.0	-.051	-30.	UI	0.000	0.	4.21	4.17	4.16	730.	75.	
	45	4978.	0.	0.0	0.0	V-dI	0.0	-.049	-30.	UI	0.000	0.	4.21	4.17	4.16	730.	75.	
	46	4978.	0.	0.0	0.0	V-dI	0.0	-.050	-30.	UI	0.000	0.	4.21	4.17	4.16	730.	75.	
	47	4978.	0.	0.0	0.0	V-dI	0.0	-.049	-30.	UI	0.000	0.	4.21	4.17	4.16	730.	75.	

Q#	File	I-m	Idot	I-t	Idot	QDC	MIITs	t-Q	V-max	Coil	t(H)	V(H)	T(t)	T(m)	T(b)	P	LL	Location
	48	-2.	0.	0.0	0.0	V-dI	0.0	0.000	1.	LO	0.000	0.	0.00	0.00	0.00	0.	0.	
	49	1986.	0.	0.0	0.0	V-dI	0.0	0.000	-12.	UI	0.000	0.	4.21	4.17	4.16	730.	75.	
	50	1986.	0.	0.0	0.0	V-dI	0.0	-.454	-12.	UI	0.000	0.	4.20	4.16	4.15	725.	76.	
	51	1986.	0.	0.0	0.0	V-dI	0.0	0.000	-12.	UI	0.000	0.	4.20	4.16	4.15	725.	76.	
	52	1986.	0.	0.0	0.0	V-dI	0.0	0.000	-12.	UI	0.000	0.	4.20	4.16	4.15	725.	76.	
	53	4973.	0.	0.0	0.0	V-dI	0.0	-.019	-30.	UI	0.000	0.	4.20	4.16	4.15	725.	76.	
	54	4978.	0.	0.0	0.0	V-dI	0.0	-.019	-30.	UI	0.000	0.	4.20	4.16	4.15	725.	76.	
	55	4973.	0.	0.0	0.0	V-dI	0.0	-.004	-30.	UI	0.000	0.	4.20	4.16	4.15	725.	76.	
	56	4973.	0.	0.0	0.0	V-dI	0.0	-.008	-31.	UI	0.000	0.	4.20	4.16	4.15	725.	76.	
	57	4978.	0.	0.0	0.0	V-dI	0.0	-.007	-31.	UI	0.000	0.	4.20	4.16	4.15	725.	76.	
	58	4978.	0.	0.0	0.0	V-dI	0.0	-.002	-30.	UI	0.000	0.	4.23	4.19	4.19	750.	73.	
	59	1991.	0.	0.0	0.0	V-dI	0.0	-.520	-12.	UI	0.000	0.	4.23	4.19	4.19	750.	73.	
	60	1991.	0.	0.0	0.0	V-dI	0.0	-.519	-12.	UI	0.000	0.	4.23	4.19	4.19	750.	73.	
	61	1986.	0.	0.0	0.0	V-dI	0.0	-.521	-12.	UI	0.000	0.	4.23	4.19	4.19	750.	73.	
	62	4973.	0.	0.0	0.0	V-dI	0.0	-.044	-30.	UI	0.000	0.	4.23	4.19	4.19	750.	73.	
	63	4973.	0.	0.0	0.0	V-dI	0.0	-.045	-30.	UI	0.000	0.	4.22	4.18	4.18	741.	75.	
	64	4978.	0.	0.0	0.0	V-dI	0.0	-.046	-30.	UI	0.000	0.	4.22	4.18	4.18	741.	75.	
	65	1986.	0.	0.0	0.0	V-dI	0.0	-.245	-12.	UI	0.000	0.	4.20	4.16	4.15	725.	77.	
	66	1986.	0.	0.0	0.0	V-dI	0.0	-.050	-12.	UI	0.000	0.	4.20	4.16	4.15	725.	77.	
	67	1986.	0.	0.0	0.0	V-dI	0.0	-.023	-12.	UI	0.000	0.	4.20	4.16	4.15	725.	77.	
	68	1991.	0.	0.0	0.0	V-dI	0.0	-.023	-12.	UI	0.000	0.	4.20	4.16	4.15	725.	77.	
	69	1986.	0.	0.0	0.0	V-dI	0.0	-.019	-12.	UI	0.000	0.	4.20	4.16	4.15	725.	77.	
	70	4978.	0.	0.0	0.0	V-dI	0.0	-.007	-31.	UI	0.000	0.	4.20	4.16	4.15	725.	77.	
	71	4973.	0.	0.0	0.0	V-dI	0.0	-.009	-31.	UI	0.000	0.	4.20	4.16	4.15	725.	77.	
	72	4983.	0.	0.0	0.0	V-dI	0.0	-.005	-31.	UI	0.000	0.	4.20	4.16	4.15	725.	77.	
10	73	7646.	16.	0.0	0.0	U-L	0.0	-.008	-24.	UI	0.000	0.	4.20	4.16	4.15	724.	74.	IU19SL 4.5 ms from LE

Quench File Summary
DSA326
Second Cooldown

Q#	File	I-m	Idot	I-t	Idot	QDC	MIITs	t-Q	V-max	Coil	t(H)	V(H)	T(t)	T(m)	T(b)	P	LL	Location
	74	997.	0.	0.0	0.0	V-dI	0.0	0.000	-6.	UI	0.000	0.	4.41	4.38	4.38	877.	73.	manual trip to check safet ckt
11	75	7465.	16.	0.0	0.0	U-L	0.0	-.011	-27.	UI	0.000	0.	4.39	4.33	4.33	855.	83.	IU19SR ~3.5 ms from Ramp Splic
12	76	7333.	16.	0.0	0.0	U-L	0.0	-.008	-22.	UI	0.000	0.	4.33	4.27	4.26	859.	87.	IU19SL ~3 ms from LE tap
13	77	7426.	16.	0.0	0.0	U-L	0.0	-.008	-21.	UI	0.000	0.	4.28	4.20	4.20	850.	77.	IU19SL ~3 ms from LE tap
14	78	7406.	16.	0.0	0.0	U-L	0.0	-.012	-26.	UI	0.000	0.	4.36	4.31	4.29	840.	58.	IU19SR ~3.5 ms from Ramp Spl
15	79	7392.	16.	0.0	0.0	U-L	0.0	-.010	-24.	UI	0.000	0.	4.38	4.33	4.32	858.	70.	IU19SR ~4.5 ms from Ramp Spl
16	80	7397.	16.	0.0	0.0	U-L	0.0	-.010	-25.	UI	0.000	0.	4.39	4.32	4.32	857.	76.	IU19SL ~3.5 ms from LE tap
17	81	7460.	16.	0.0	0.0	U-L	0.0	-.011	-26.	UI	0.000	0.	4.41	4.36	4.35	906.	77.	IU19SR ~3 ms from Ramp Spl
18	82	7402.	16.	0.0	0.0	U-L	0.0	-.010	-25.	UI	0.000	0.	4.39	4.33	4.33	855.	68.	IU19SL ~2.5 ms from LE tap
19	83	7441.	16.	0.0	0.0	U-L	0.0	-.011	-26.	UI	0.000	0.	4.40	4.35	4.34	911.	56.	IU19SR ~3 ms from Ramp Spl
20	84	7397.	16.	0.0	0.0	U-L	0.0	-.011	-26.	UI	0.000	0.	4.39	4.34	4.34	860.	74.	IU19SR ~3 ms from Ramp Spl
21	85	7421.	6.	0.0	0.0	U-L	0.0	-.011	-27.	UI	0.000	0.	4.37	4.31	4.30	870.	73.	
22	85	7421.	6.	0.0	0.0	U-L	0.0	-.011	-27.	UI	0.000	0.	4.37	4.31	4.30	870.	73.	
23	86	7421.	16.	0.0	0.0	U-L	0.0	-.011	-25.	UI	0.000	0.	4.38	4.32	4.31	878.	78.	
24	87	7372.	25.	0.0	0.0	U-L	0.0	-.007	19.	UI	0.000	0.	4.40	4.34	4.33	867.	72.	
25	88	7328.	50.	0.0	0.0	U-L	0.0	-.006	21.	UI	0.000	0.	4.36	4.31	4.31	835.	80.	
26	89	7044.	100.	0.0	0.0	U-L	0.0	-.007	-21.	UI	0.000	0.	4.36	4.31	4.30	850.	70.	
27	90	6936.	150.	0.0	0.0	U-L	0.0	-.007	-22.	UI	0.000	0.	4.38	4.33	4.32	867.	80.	
28	91	6770.	200.	0.0	0.0	U-L	0.0	-.007	-23.	UI	0.000	0.	4.37	4.32	4.31	848.	71.	
29	92	6594.	300.	0.0	0.0	U-L	0.0	-.013	-25.	UI	0.000	0.	4.38	4.32	4.31	850.	71.	
30	93	6687.	250.	0.0	0.0	U-L	0.0	-.007	-24.	UI	0.000	0.	4.37	4.31	4.31	851.	72.	
							4.2 K QUENCHES											
31	94	7460.	16.	0.0	0.0	U-L	0.0	-.008	-22.	UI	0.000	0.	4.23	4.19	4.18	781.	75.	
32	95	7519.	16.	0.0	0.0	U-L	0.0	-.011	-23.	UI	0.000	0.	4.27	4.23	4.20	774.	66.	
33	96	7500.	16.	0.0	0.0	U-L	0.0	-.009	-23.	UI	0.000	0.	4.27	4.22	4.21	773.	73.	
34	97	7534.	16.	0.0	0.0	U-L	0.0	-.011	-24.	UI	0.000	0.	4.27	4.22	4.22	770.	69.	
35	98	7661.	16.	0.0	0.0	U-L	0.0	-.007	-23.	UI	0.000	0.	4.20	4.15	4.15	720.	73.	
36	99	7676.	16.	0.0	0.0	U-L	0.0	-.007	-23.	UI	0.000	0.	4.21	4.16	4.15	727.	80.	
37	100	7568.	16.	0.0	0.0	U-L	0.0	-.010	-23.	UI	0.000	0.	4.24	4.19	4.19	750.	84.	
38	101	7671.	16.	0.0	0.0	U-L	0.0	-.011	-24.	UI	0.000	0.	4.20	4.15	4.15	718.	77.	
39	102	7661.	16.	0.0	0.0	U-L	0.0	-.008	-23.	UI	0.000	0.	4.20	4.16	4.15	722.	73.	
40	103	7612.	16.	0.0	0.0	U-L	0.0	-.006	-24.	UI	0.000	0.	4.26	4.21	4.20	766.	77.	
							3.8 K QUENCHES											
41	104	7930.	16.	0.0	0.0	U-L	0.0	-.013	-23.	UI	0.000	0.	3.84	3.80	3.80	497.	92.	
42	105	8121.	16.	0.0	0.0	U-L	0.0	-.005	-22.	UI	0.000	0.	3.83	3.79	3.80	496.	82.	
43	106	8136.	16.	0.0	0.0	U-L	0.0	-.005	-22.	UI	0.000	0.	3.82	3.78	3.78	492.	70.	
44	107	8121.	16.	0.0	0.0	U-L	0.0	-.007	-22.	UI	0.000	0.	3.85	3.81	3.80	505.	70.	
45	108	8126.	16.	0.0	0.0	U-L	0.0	-.005	-23.	UI	0.000	0.	3.79	3.75	3.76	479.	70.	

Quench File Summary
DSA326
Third Cooldown

Q#	File	I-m	Idot	I-t	Idot	QDC	MIITs	t-Q	V-max	Coil	t(H)	V(H)	T(t)	T(m)	T(b)	P	LL	Location
	109	1002.	0.	0.0	0.0	V-dI	0.0	0.000	-6.	UI	0.000	0.	4.39	4.34	4.34	858.	76.	
	110	1002.	0.	0.0	0.0	V-dI	0.0	0.000	-6.	UI	0.000	0.	4.37	4.32	4.32	844.	74.	
45	111	7441.	0.	0.0	0.0	U-L	0.0	-.012	-32.	UI	0.000	0.	4.42	4.36	4.36	878.	74.	
46	112	7387.	16.	0.0	0.0	U-L	0.0	-.010	-27.	UI	0.000	0.	4.41	4.36	4.36	877.	68.	
47	113	7421.	16.	0.0	0.0	U-L	0.0	-.010	-25.	UI	0.000	0.	4.40	4.34	4.34	861.	76.	
48	114	7392.	16.	0.0	0.0	U-L	0.0	-.012	-26.	UI	0.000	0.	4.40	4.35	4.34	871.	79.	
49	115	7397.	16.	0.0	0.0	U-L	0.0	-.010	-27.	UI	0.000	0.	4.37	4.32	4.31	847.	67.	
50	116	7387.	16.	0.0	0.0	U-L	0.0	-.011	-27.	UI	0.000	0.	4.39	4.33	4.32	855.	70.	
51	DATA_LOST																	
52	117	7656.	16.	0.0	0.0	U-L	0.0	-.010	-24.	UI	0.000	0.	4.21	4.16	4.16	726.	73.	
53	118	8092.	16.	0.0	0.0	U-L	0.0	-.005	-22.	UI	0.000	0.	3.84	3.80	3.80	499.	87.	
54	119	8121.	16.	0.0	0.0	U-L	0.0	-.006	-22.	UI	0.000	0.	3.85	3.81	3.81	505.	88.	
55	120	8102.	16.	0.0	0.0	U-L	0.0	-.005	-22.	UI	0.000	0.	3.84	3.81	3.80	503.	81.	
	121	5355.	0.	0.0	0.0	Cu L	0.0	-.001	0.	LI	0.000	0.	3.84	3.80	3.79	503.	94.	

----- QSUMARY V03.13 -----

FORMAT:

Q#	File	I-m	Idot	I-t	Idot	QDC	MIITs	t-Q	V-max	Coil	t(H)	V(H)	T(t)	T(m)	T(b)	P	LL	Location
A5,	I5,	F8.0,	F5.0,	F5.1,	F5.1,	A5,	F5.1,	F6.3,	F6.0,	A4,	F8.3,	F5.0,	F5.2,	F5.2,	F5.2,	F5.0,	F5.0,	2X,A30

NOTATION KEY

Q#	Quench number or Spot heater number (e.g. s4 is spot heater 4)
File	Quench file number
I-m	Main coil current at quench
Idot	Main coil dI/dt at quench
I-t	Trim coil current at quench
Idot	Trim coil dI/dt at quench
QDC	Name of quench detection circuit which tripped: 1) U-L Upper - Lower Coil 2) V-dI Magnet - Idot 3) SC L SC Pwr Leads - Idot 4) Vtot Magnet 5) Trim Trim Coil 6) Cu L Cu Pwr Leads - IR 7) GndI Ground Fault Monitor 8) Thru Through Bus - Idot
MIITs	Integral of (I**2)dt from t-Q to "infinity"
t-Q	Time first voltage appears in V(Upper) - V(Lower) (relative to quench detection time)
V-max	Maximum voltage across any quarter coil
Coil	Coil corresponding to V-max
t(H)	Protection heater firing time (relative to quench detection time); -.999 if heater did not fire
V(H)	Protection heater firing voltage; -999. if heater did not fire
T(t)	Temperature at top of magnet
T(m)	Temperature at middle of magnet
T(b)	Temperature at bottom of magnet
P	Dewar pressure (Torr)
LL	Liquid level (%)
Location	Quench or spot heater location

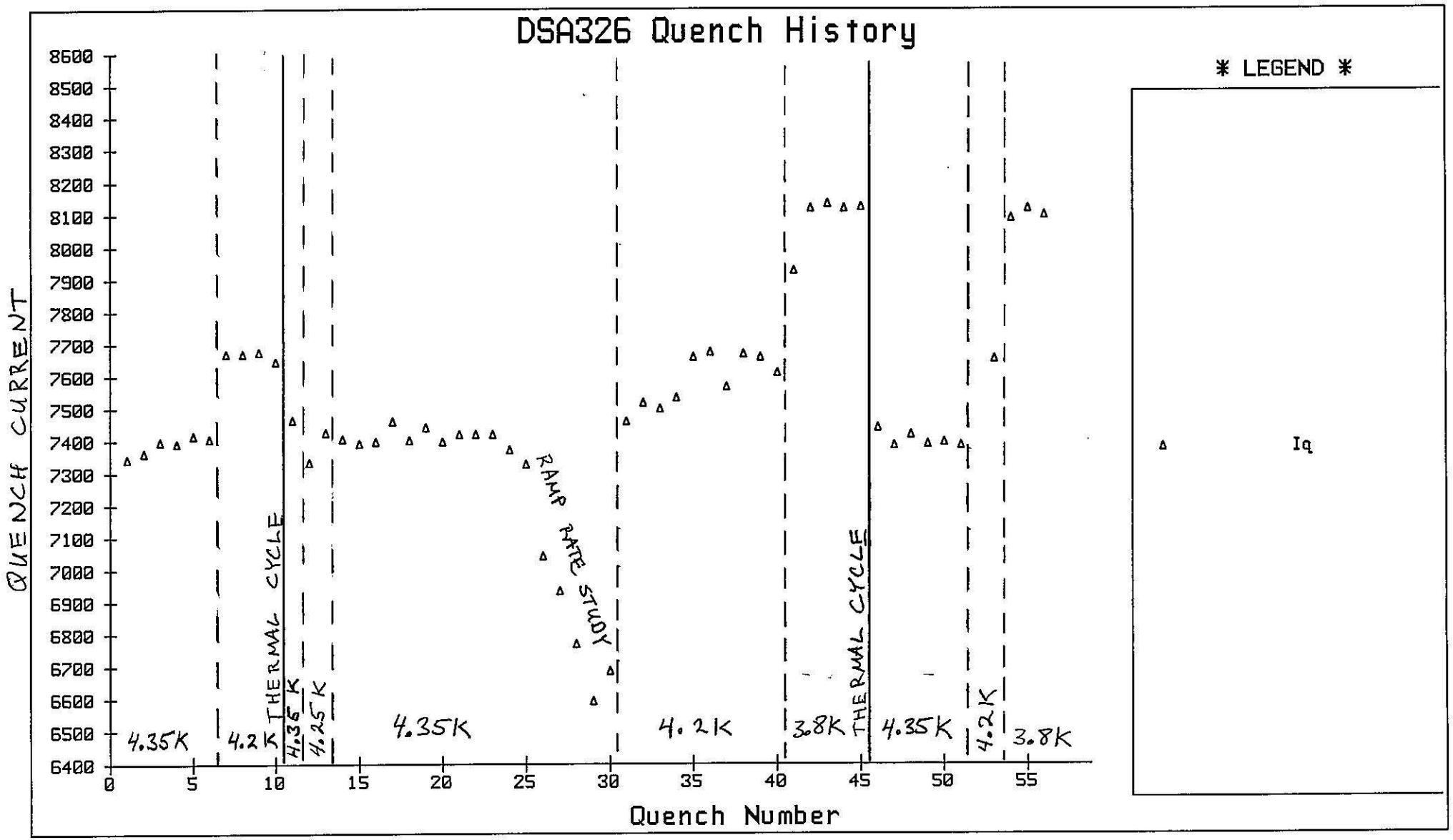
DSA326 Quench History
QUENCH CURRENT
Quench Number
8600
8500
8400
8300
8200
8100
8000
7900
7800
7700
7600
7500
7400
7300
7200
7100
7000
6900
6800
6700
6600
6500
6400
0
5
10
15
20
25
30
35
40
45
50
55
4.35K
4.2K
THERMAL CYCLE
4.35K
4.25K
4.35K
RAMP RATE STUDY
4.2K
3.8K
THERMAL CYCLE
4.35K
4.2K
3.8K
* LEGEND *
Iq

Figure 1

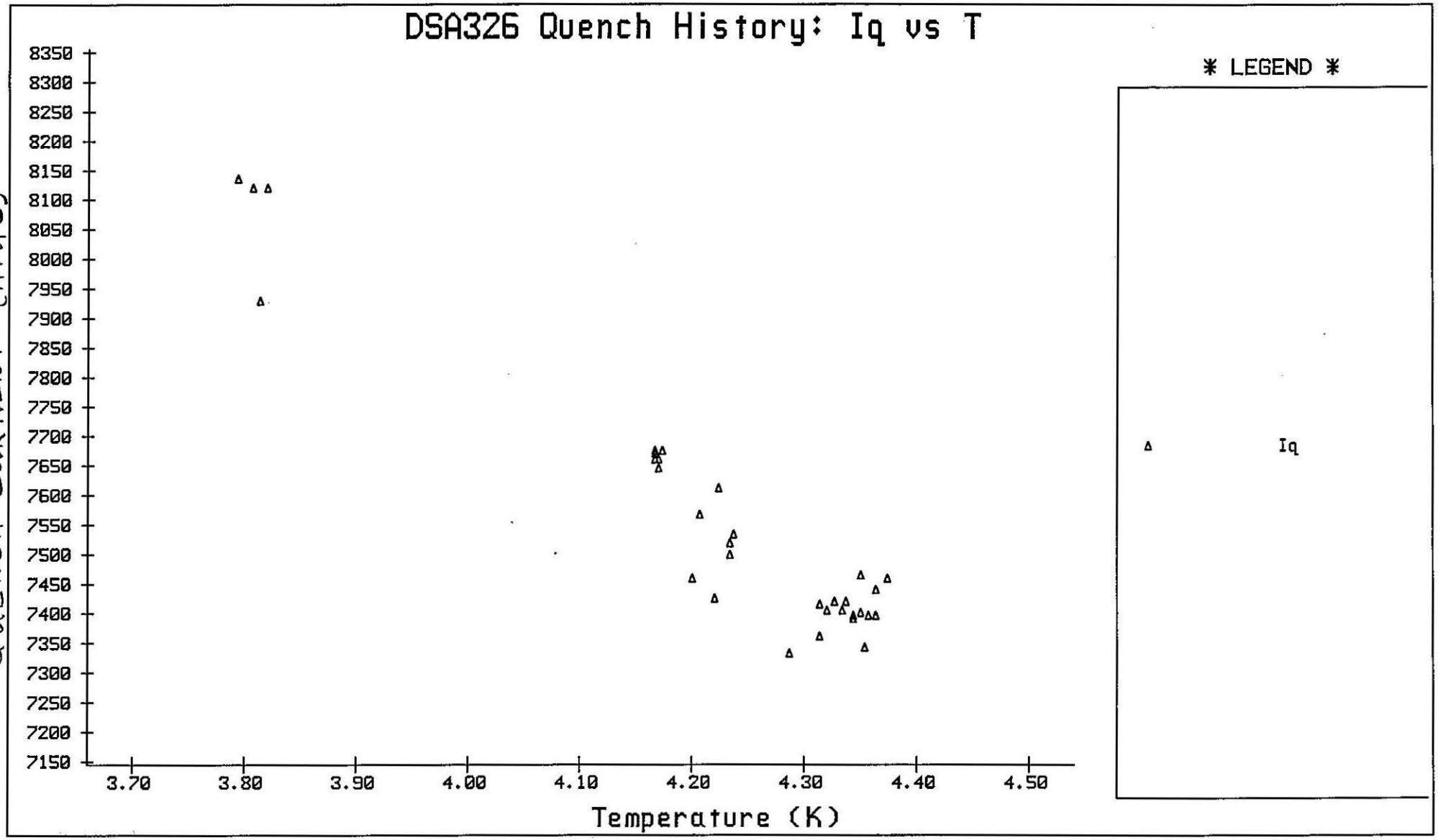
DSA326 Quench History: Iq vs T
QUENCH CURRENT (AMPS)
8350
8300
8250
8200
8150
8100
8050
8000
7950
7900
7850
7800
7750
7700
7650
7600
7550
7500
7450
7400
7350
7300
7250
7200
7150
3.70
3.80
3.90
4.00
4.10
4.20
4.30
4.40
4.50
Temperature (K)
* LEGEND *
Iq

Figure 2

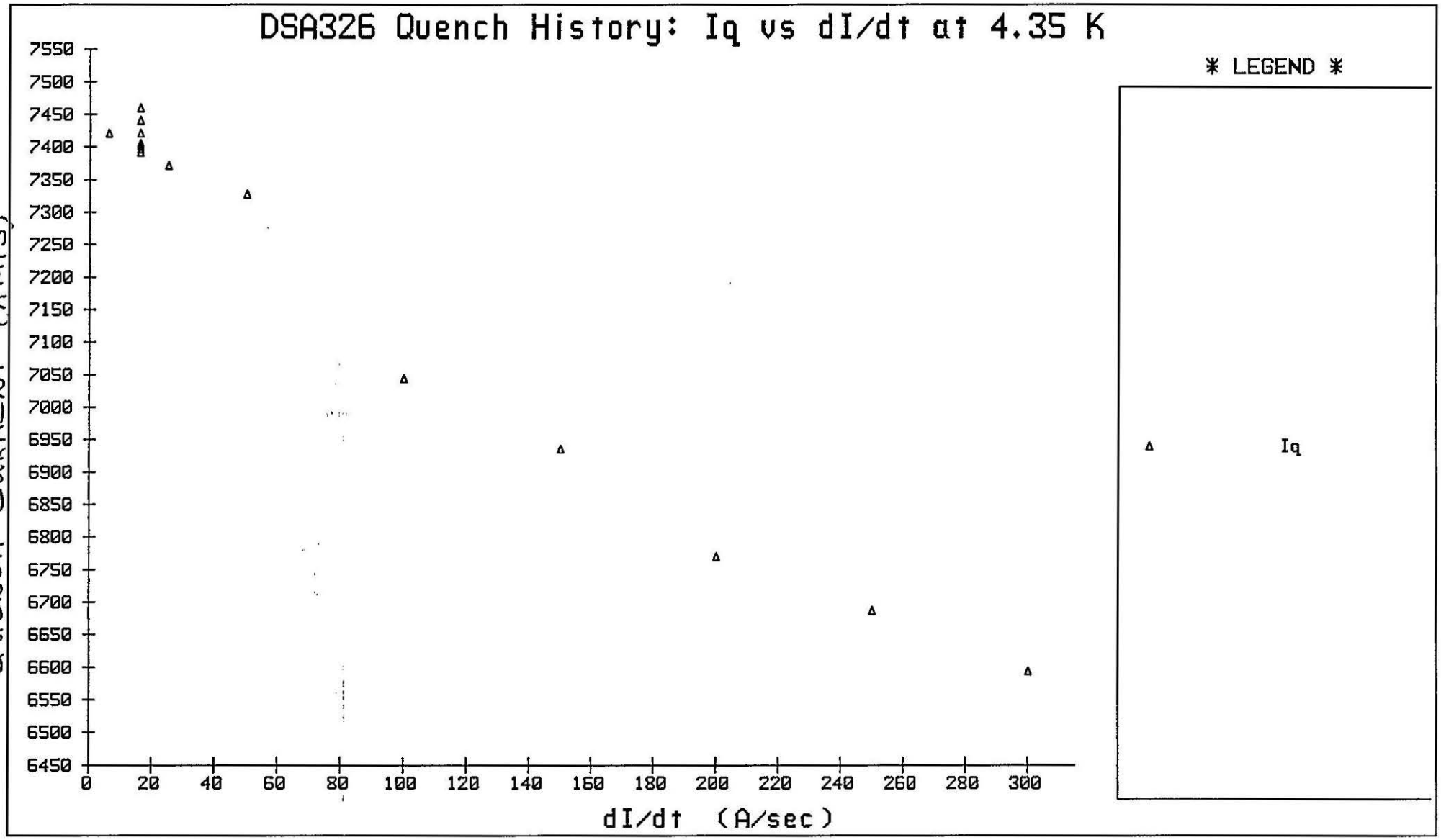
DSA326 Quench History: Iq vs dI/dt at 4.35 K
QUENCH CURRENT (AMPS)
7550
7500
7450
7400
7350
7300
7250
7200
7150
7100
7050
7000
6950
6900
6850
6800
6750
6700
6650
6600
6550
6500
6450
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
dI/dt (A/sec)
* LEGEND *
Iq

Figure 3