

TEST RESULTS OF DSA329, 50 mm APERTURE MODEL DIPOLE

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April 7, 1992**

Executive Summary of April 7, 1992 MSIM (BNL)
TEST RESULTS OF FERMILAB 50 mm APERTURE, 1.5 m LONG
MODEL DIPOLE

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DSA329 is the sixth, Fermilab built 50 mm aperture short dipole that was cold tested in Lab2 (superconducting magnet test facility at Fermilab). This magnet has gone through two thermal cycles. The magnet showed some training and all the plateau quenches were in the multiple turns with one voltage tap for quench information. As part of the standard procedure, after cooldown, to study the mechanical behavior of the magnet six strain gage runs were made at 4.35 K to different currents. During a strain gage run to high currents the magnet quenched in the upper outer coil at 7672 A. All the quenches with low ramp rates (4,6,16,25 A/s), which preceded flattop at high current had a higher quench current and were in the straight section of the lower inner coil near the lead end (ramp splice side).

DSA329 PLATEAU CURRENTS

# quenches	27Qs	27 Qs
TEMP (K)	TC1	TC2
4.2	7847 A	<u>7842A</u>
4.35	7704 A	7690A .
3.8	----	8364 A

The quench current ramp rate dependence of this magnet is somewhat similar to DSA328 and DSA326. All high ramp rate quenches were in the multipleturn (non pole turn) of the inner coil which is not very well instrumented with voltage taps. The cold harmonics measurement data shows $b_2=1.27$ and $b_4=0.1$ units at 1 cm. The magnet ends were preloaded to ~ 280 lb per bullet. The lead end screws were also torqued to achieve the same preload. AC loss measurements made on this magnet shows that the hysteresis loss is similar to what we have seen on previous short dipoles (81 J).

The magnet was quenched four times at 3.0 K, with the highest quench current of 8926 A. We did not try to plateau the magnet at this current and could not do any strain measurement at this temperature.

TEST RESULTS OF DSA329

50 mm APERTURE, SHORT MODEL

DIPOLE

I. INTRODUCTION

II. MECHANICAL BEHAVIOR

III. QUENCH BEHAVIOR

IV. AC LOSS

DSA329

- > VERTICALLY SPLIT YOKE**
- > ALUMINUM END CAN/G-10 CR11 COLLETS**
- > KAPTON ONLY(NO GLASS TAPE) INSULATION ON THE WEDGES**
- > ROOM TEMPERATURE COLLAR STRESS**

INNER =68 MPa OUTER=38 MPa
(~10 kpsi) (~5.5kpsi)

- > END PRELOAD =~1.1 kN/per Bullet**
- > VOLTAGE TAPS**

SHIMMING

MAGNET	INNER COIL	OUTER COIL
		(mils of Kapton)
DSA321	0.	0 .
DSA323	0.	0 .
DSA324	+5 .	+5.
DSA326	0.	0 .
DSA101	0. (G-10)	-10. +2. (Kapton tape with adhesive)
DSA102	+8. (G-10)	-5. + +2. (Kapton tape with adhesive)
DSA328	+3.8	-5.
DSA329	+4.0	— — (Kapton tape on wedges)

PRESTRESS CHANGE WITH COOLDOWN
1.5 m Long , 50 mm Aperture
SSC Model Dipoles Tested at Fermilab

Magnet	Coil Stress Change (MPa)		End Force Change (kN)
	Inner Coll	Outer Coil	
DSA321	-19	-14	-1
DSA323	-30	-10	0
DSA324	-33	- 8	1
DSA326 _(TC1)	-34	-25	4.8
DSA326 _(TC2)	-37	-23	5
DSA326 _(TC3)	-36	-22	-2.5
DSA101 _(TC1)	-35	-22	---
DSA102 _(TC1)	-49	-18	---
DSA328 _(TC1)	-36	-8.5	6.6
DSA329 _(TC1)	-34	-16	1.4
DSA329 _(TC2)	-35	-17	1.0

DSA329

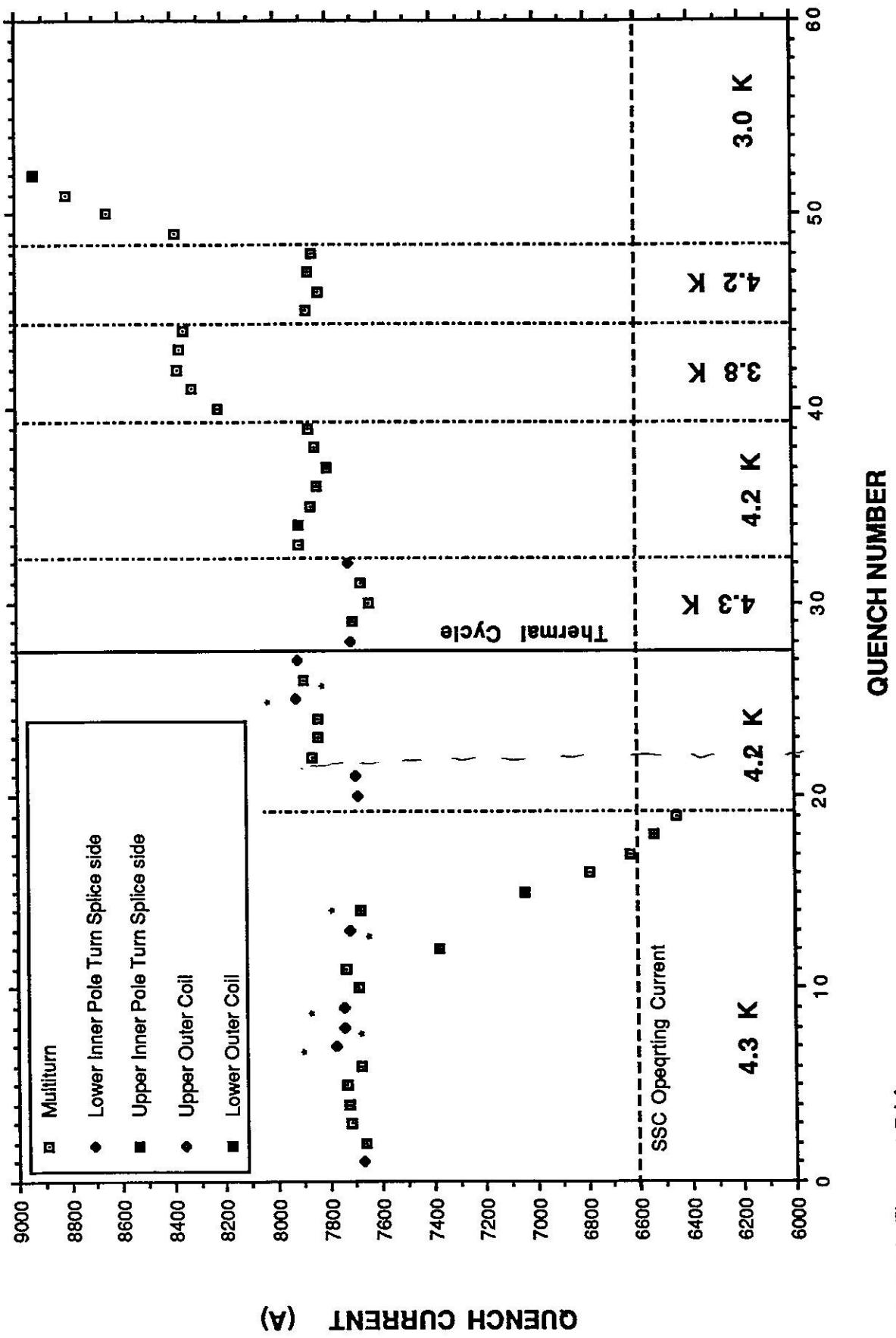
CABLES:	INNER	OUTER
UP	SSC-3-S-00026	SSC-4-I-00040
LO	SSC-3-S-00026	SSC-4-I-00040

PREDICTED Iq at 4.35 K =

PLATEAU CURRENTS:

	$\frac{I_{C2}}{I_{C1}}$	$\frac{I_{C2}}{(27 \text{ quenches})}$
4.3 K =	7704	7674
4.2 K =	7847	7842
3.8 K =	----	8364

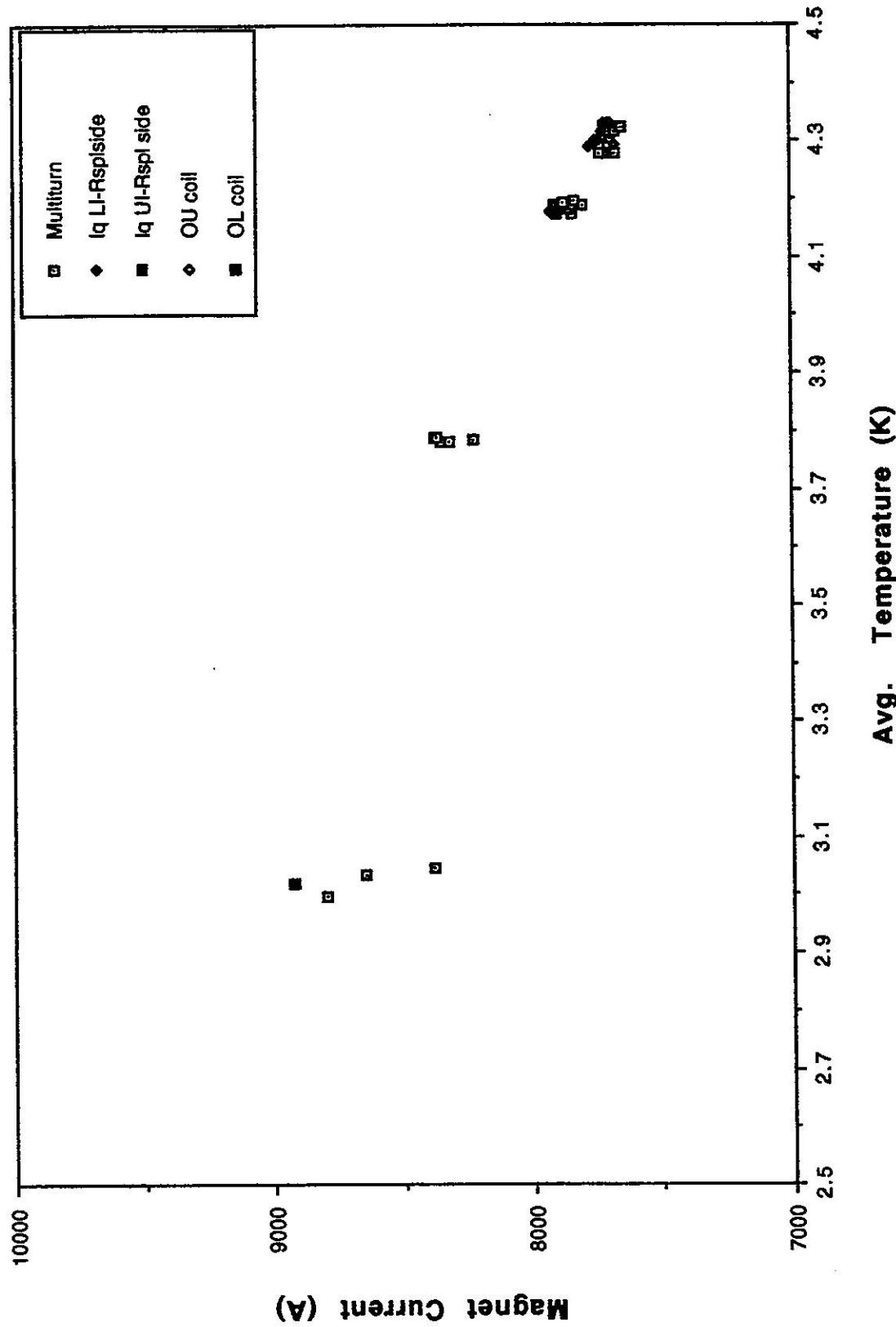
DSA328 QUENCH HISTORY
(Fermilab built 50 mm, 1.5 m long SSC dipole)

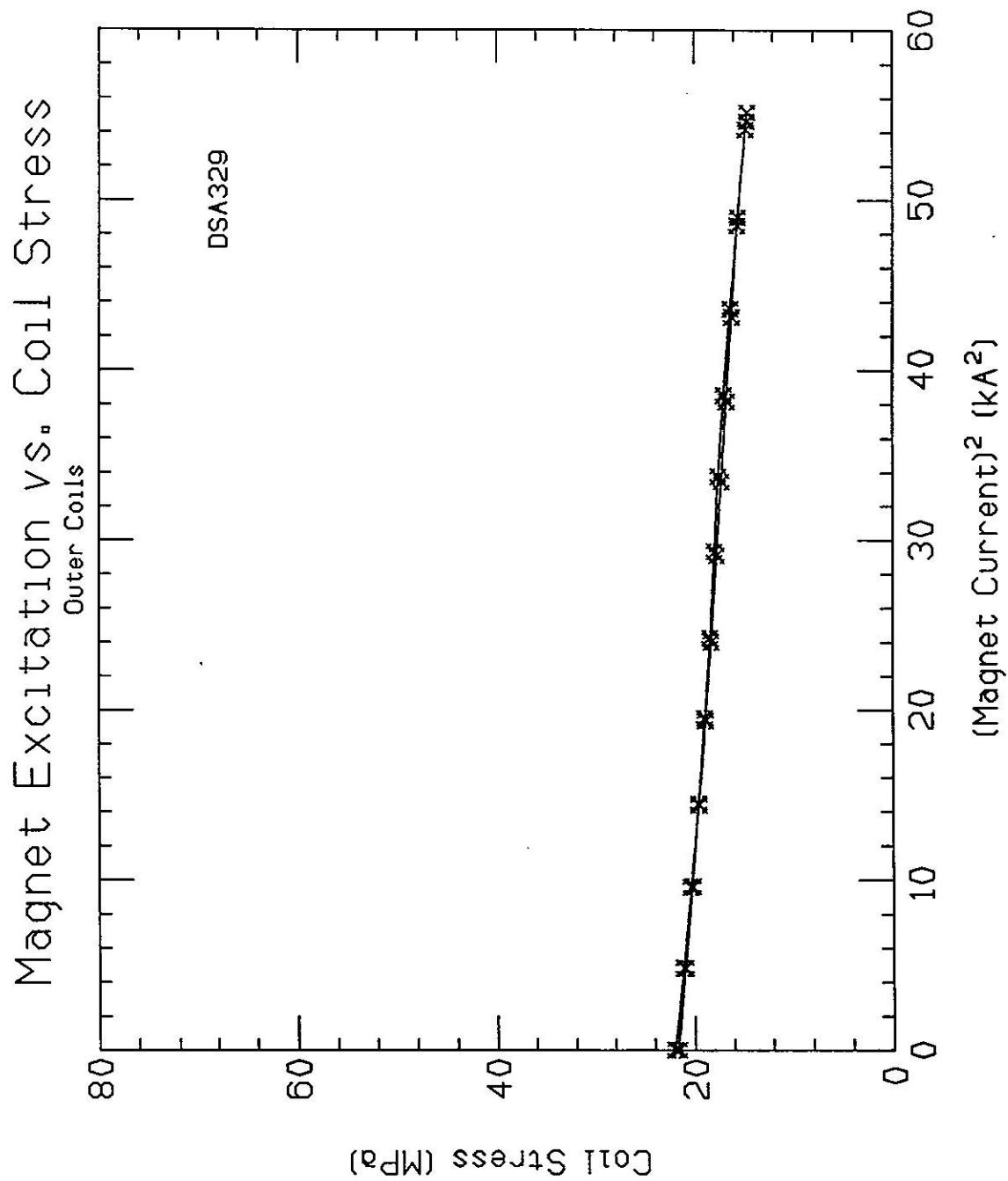


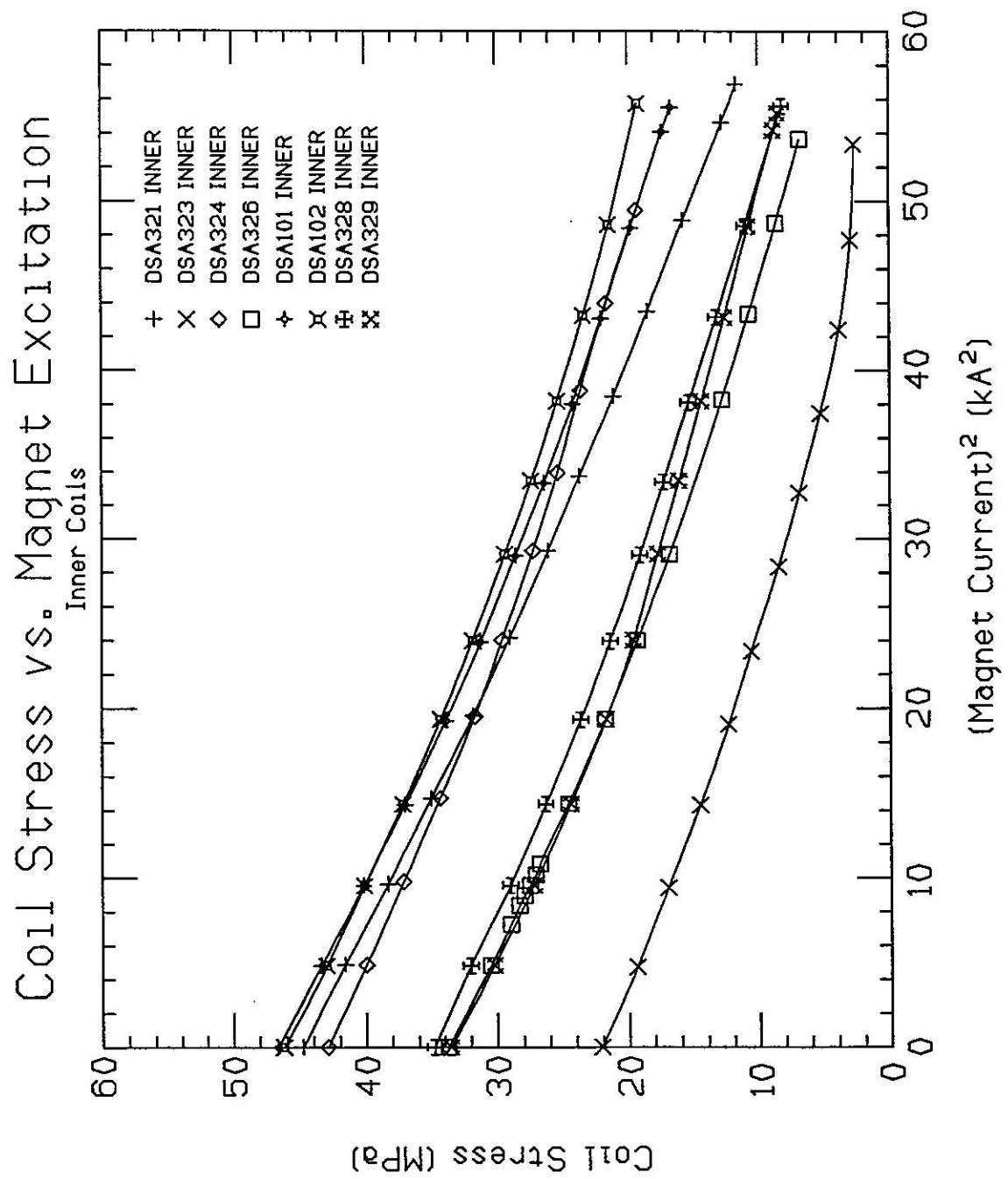
* 10 min Flattop at 7 kA

Temperature Fluctuation ~30 - 50 mK

DSA329 Quench Current vs Temperature

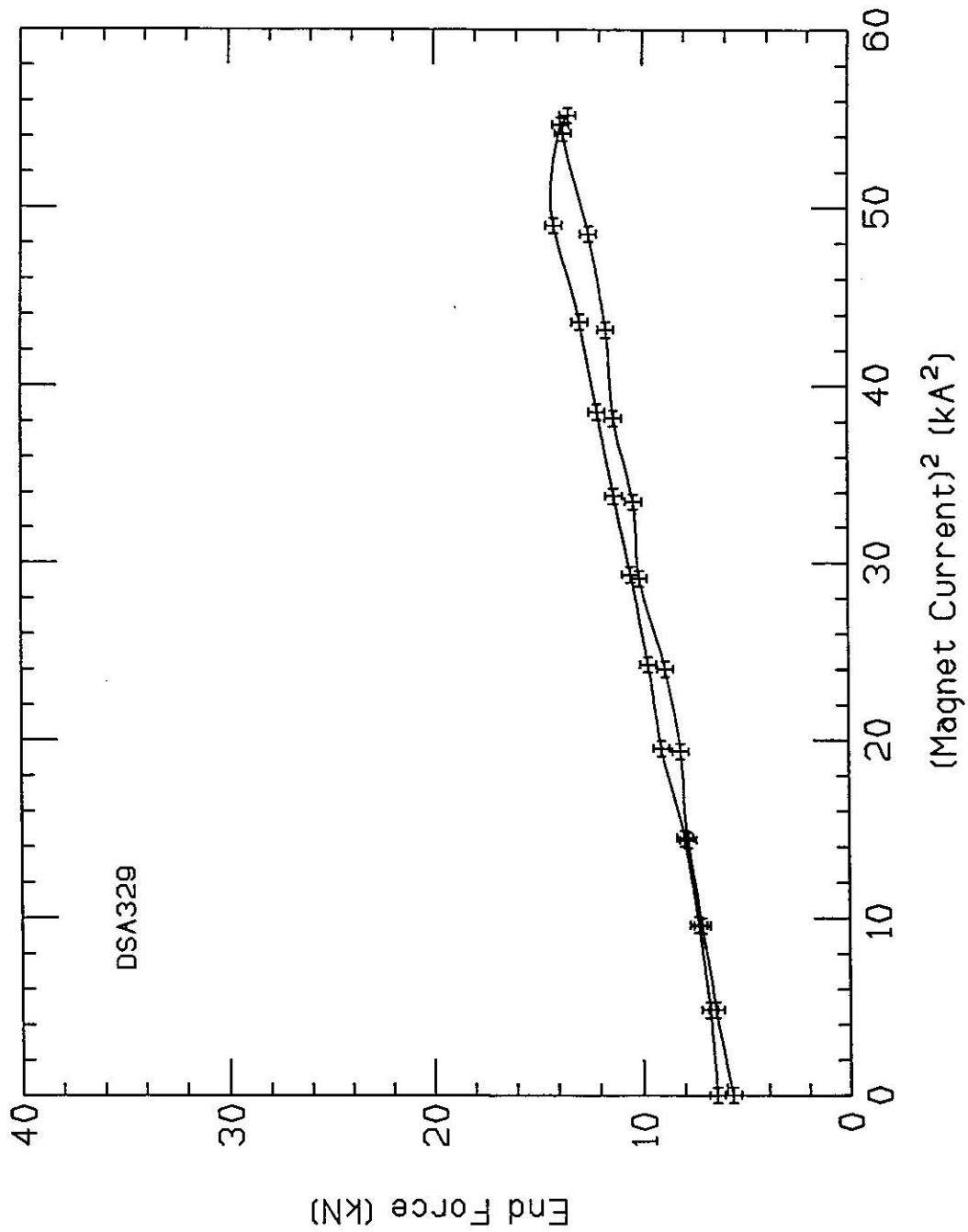




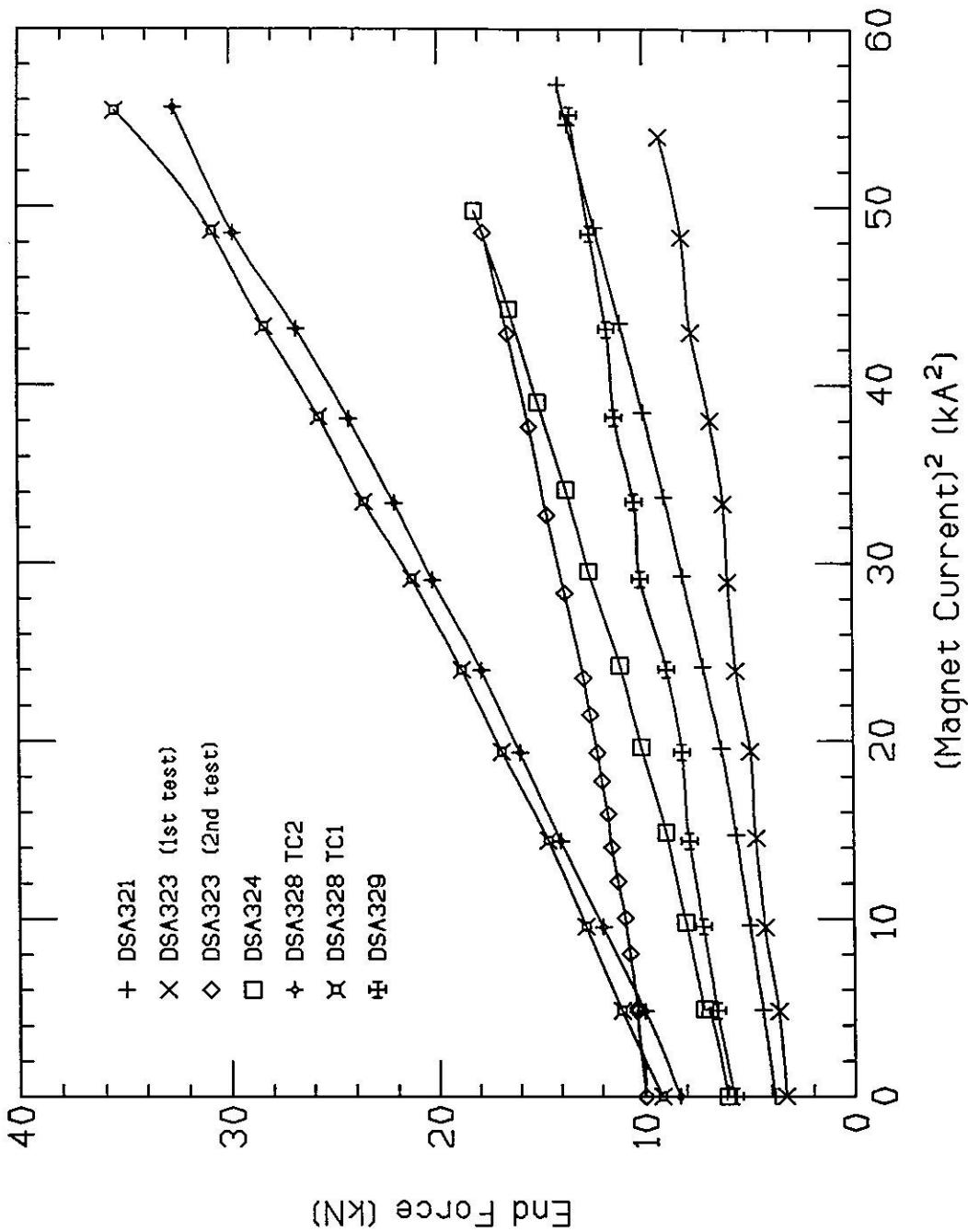


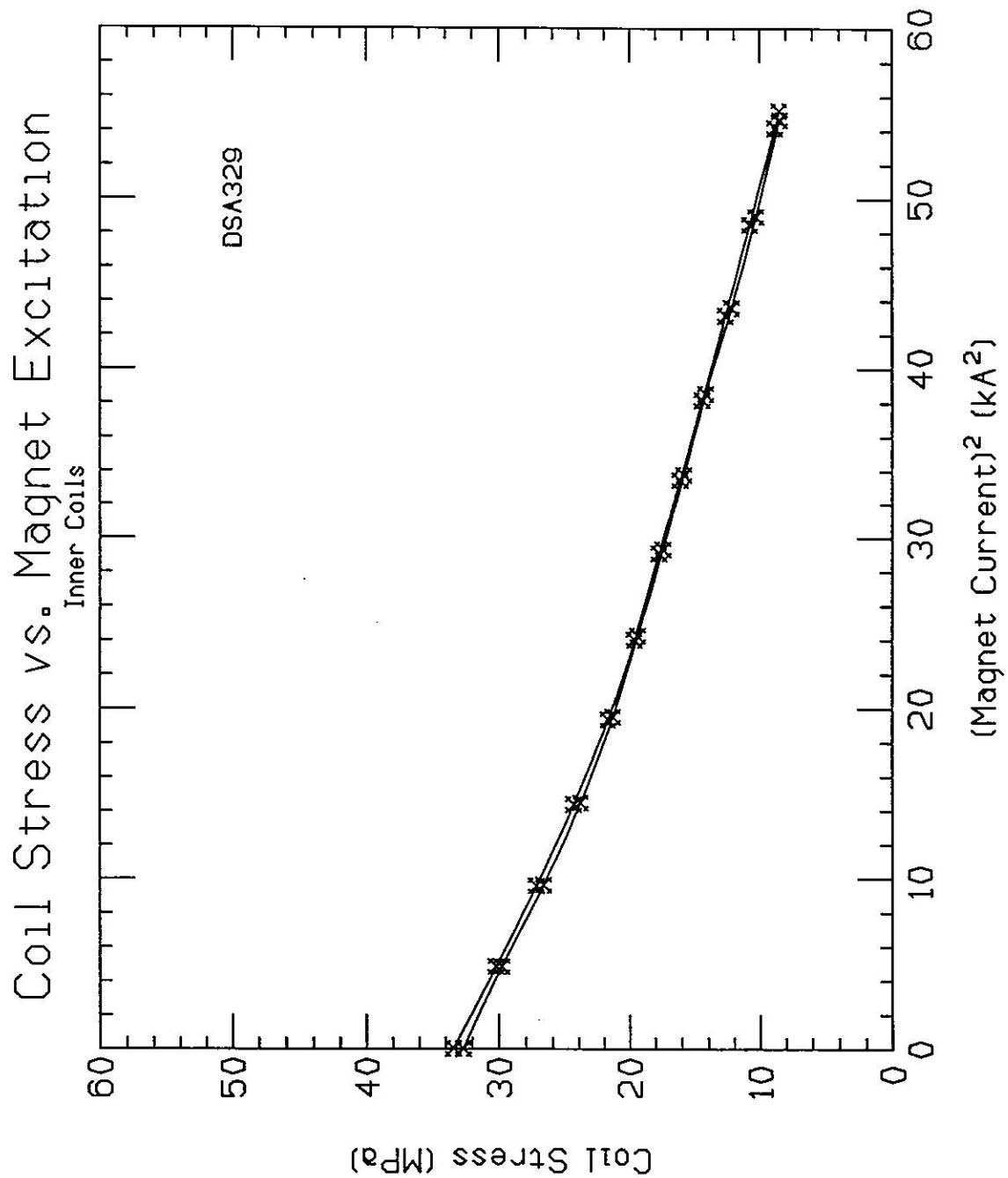
End Force vs. Magnet Excitation

DSA329

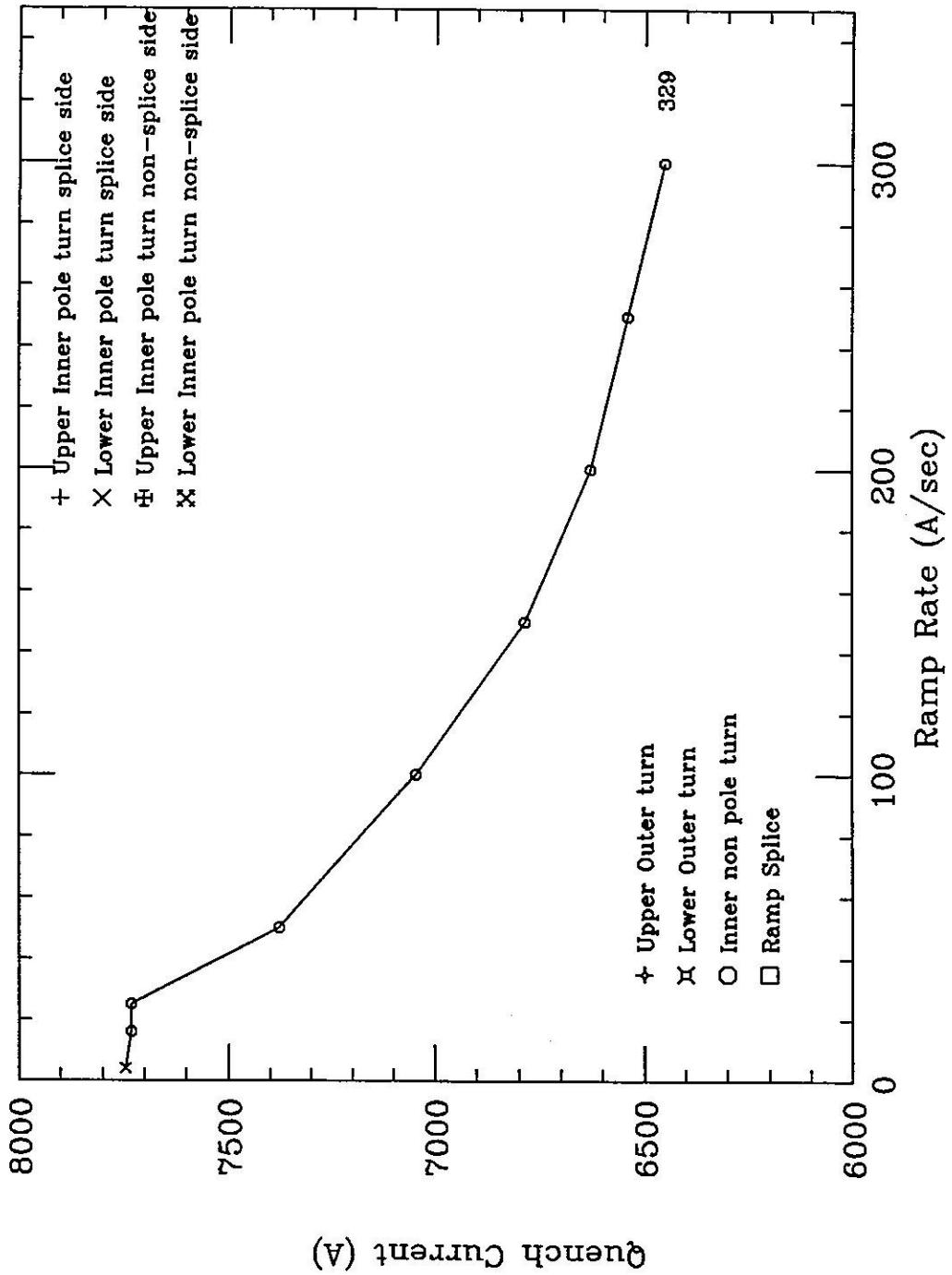


End Force vs. Magnet Excitation

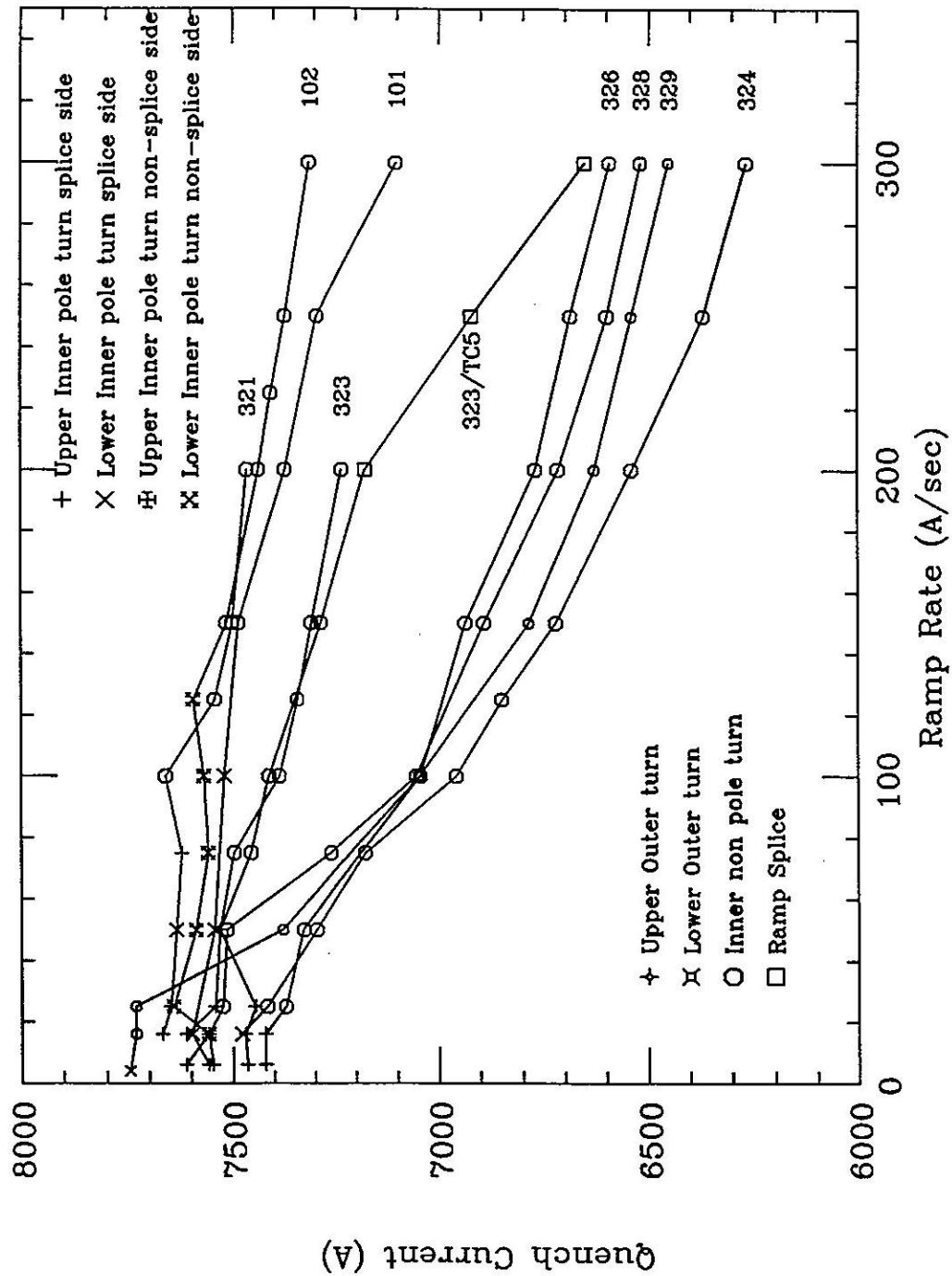


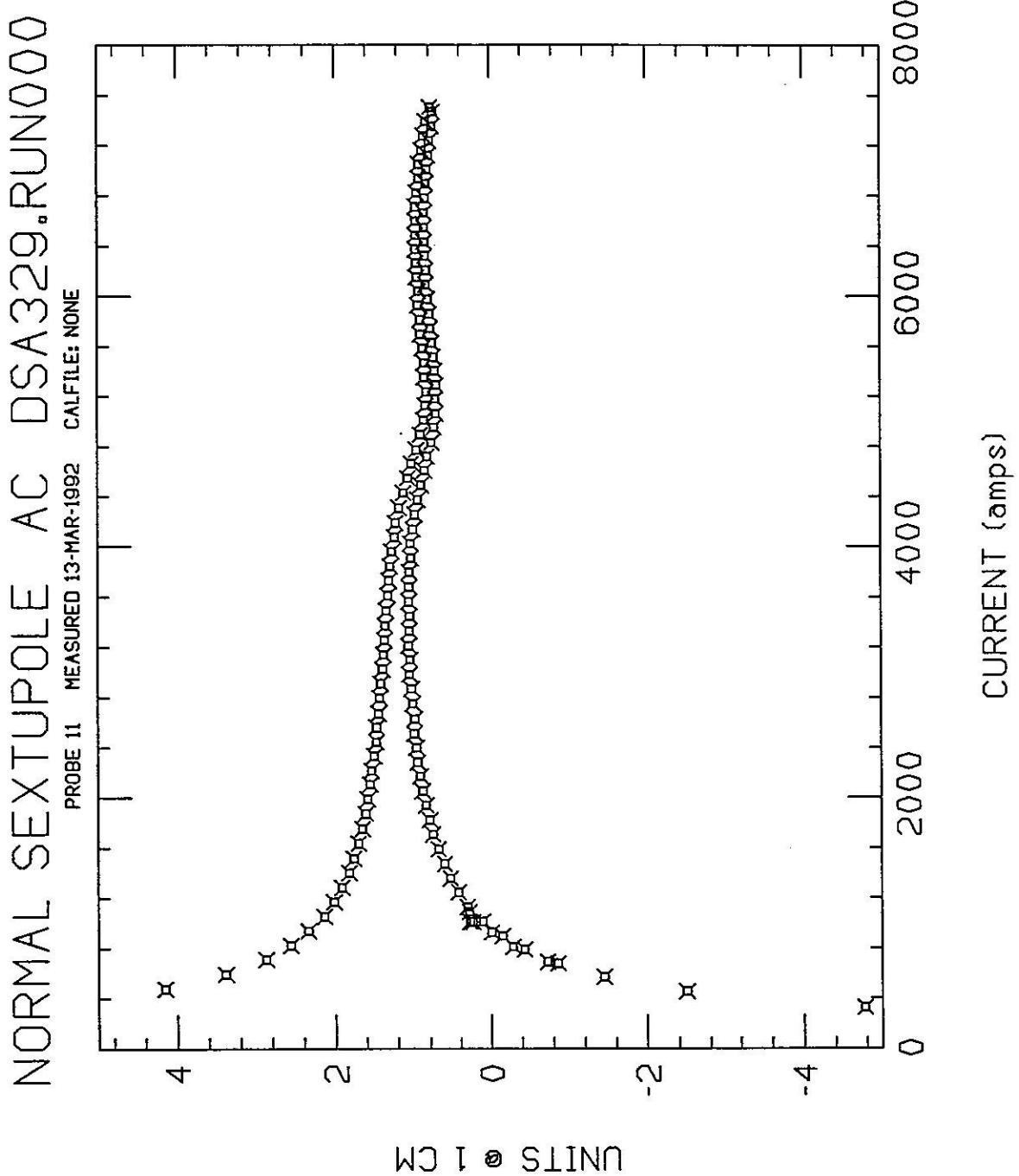


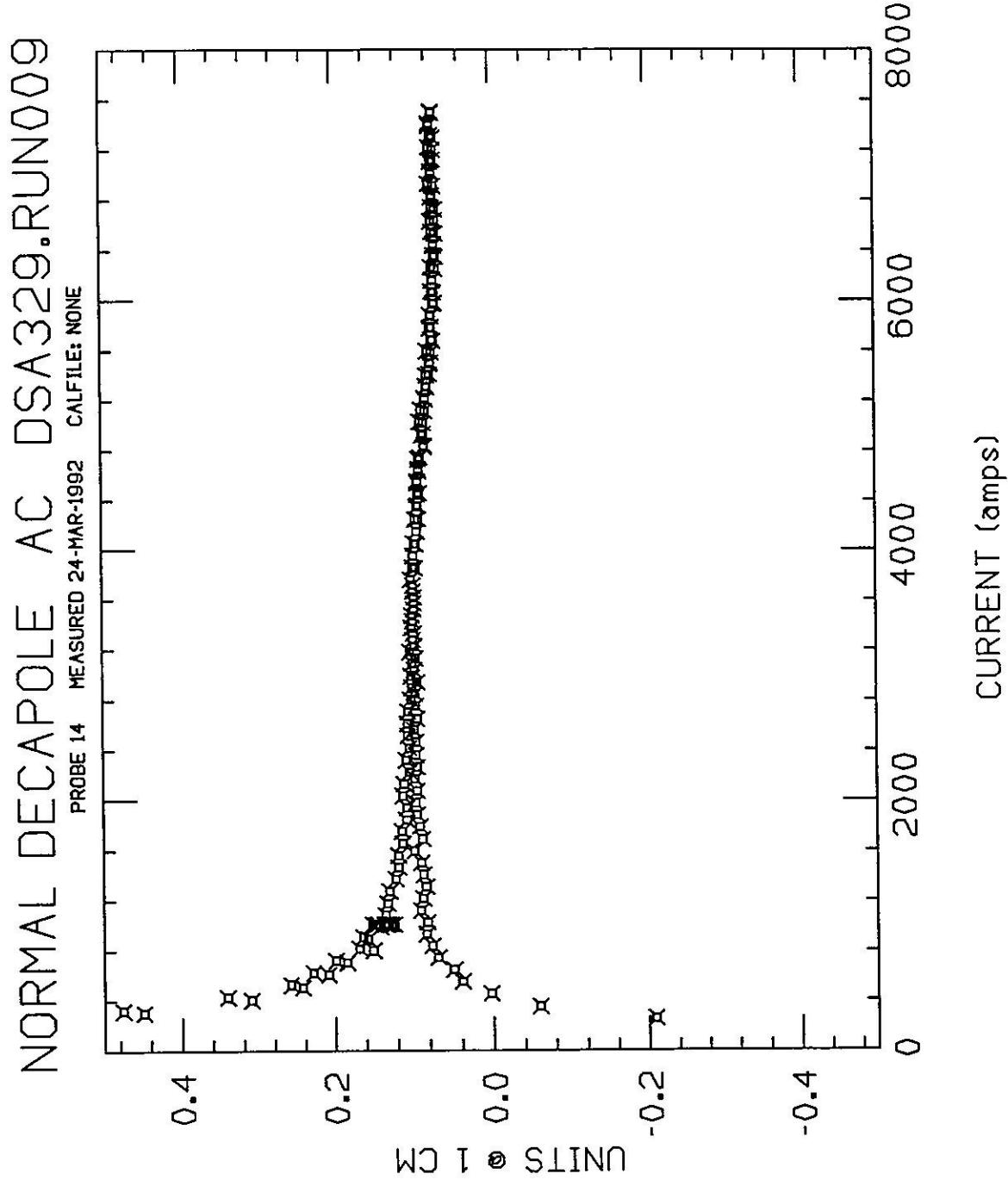
DSA329 RAMP RATE DEPENDENCE



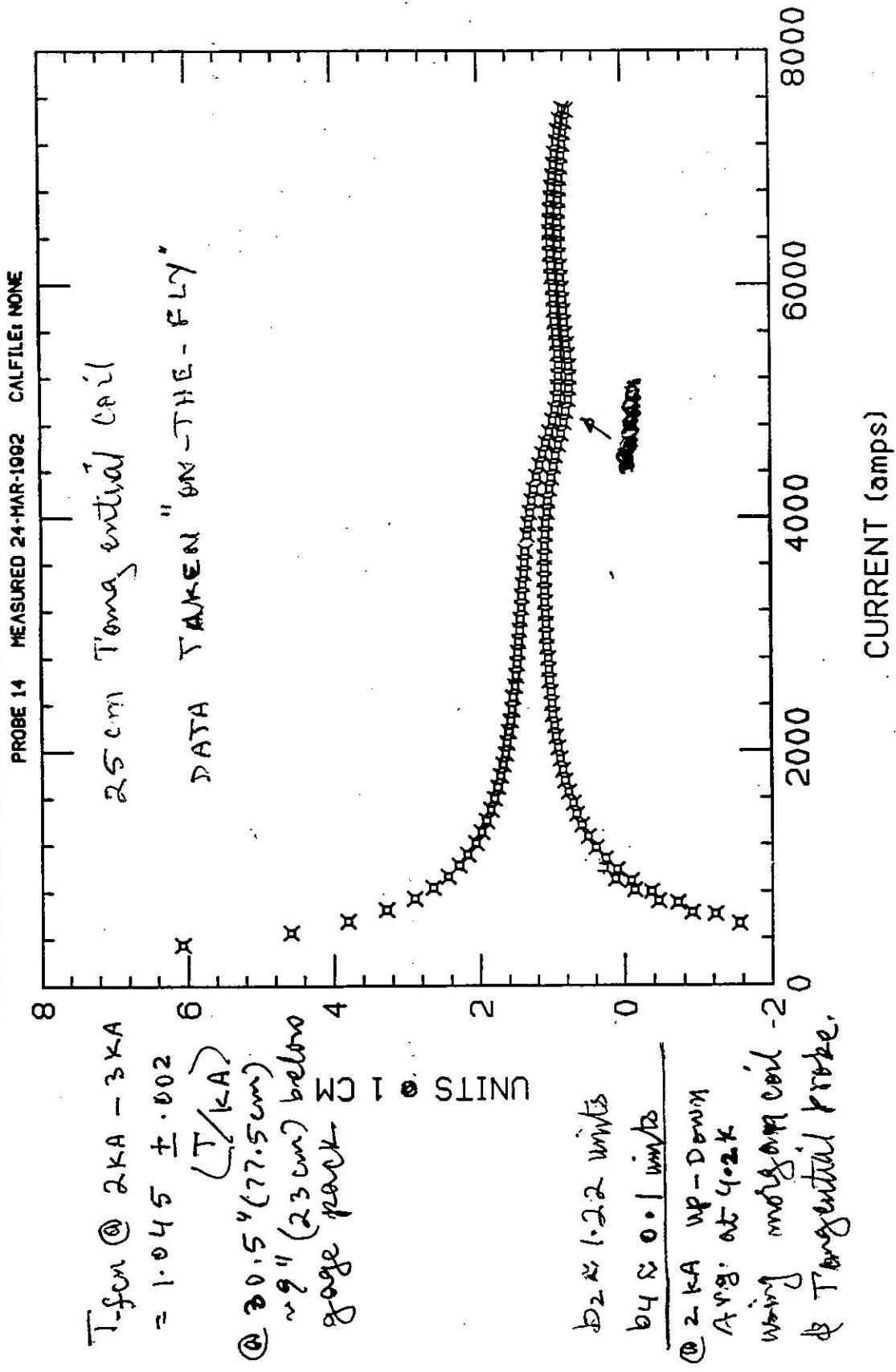
SHORT DIPOLE RAMP RATE DEPENDENCE

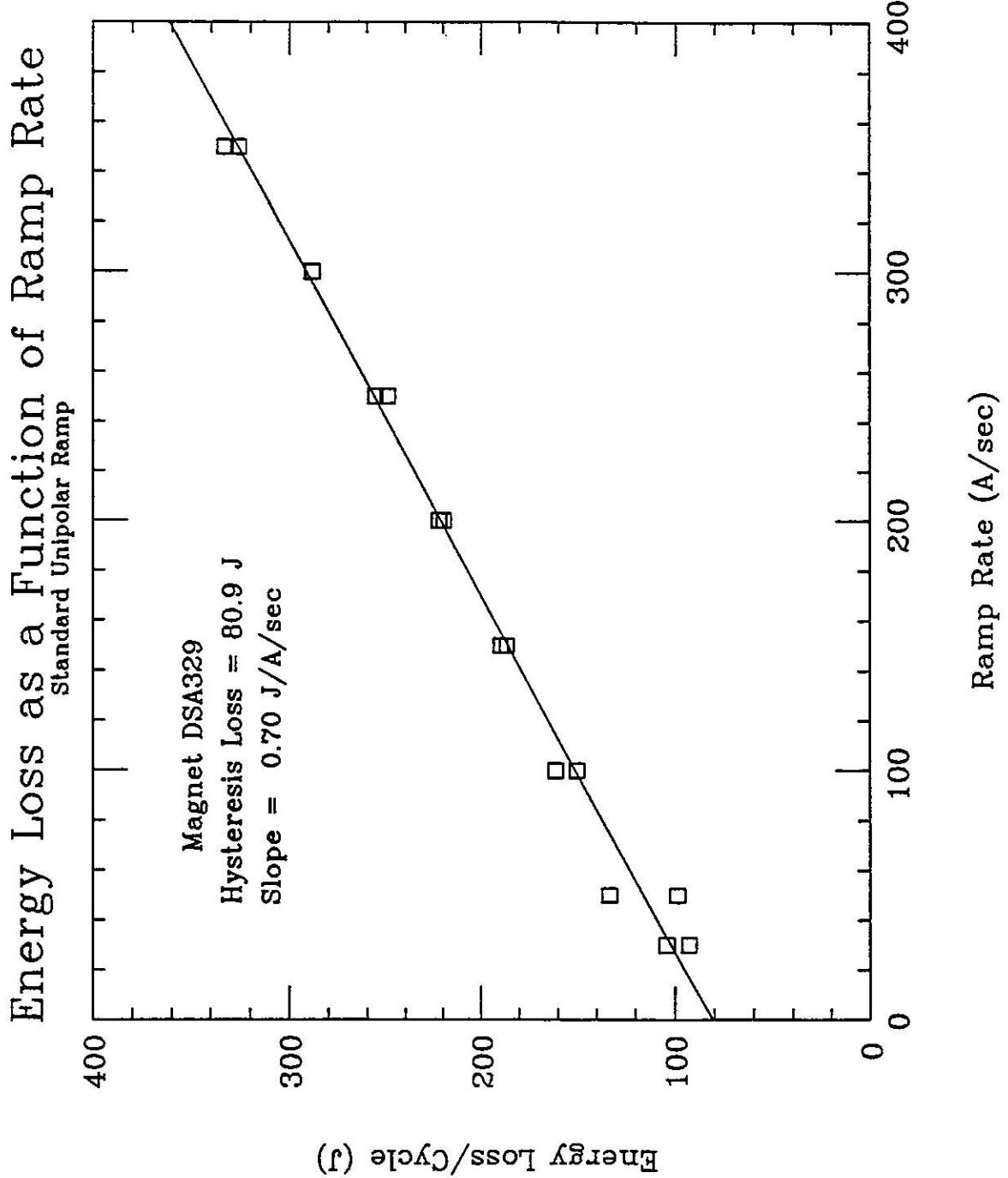


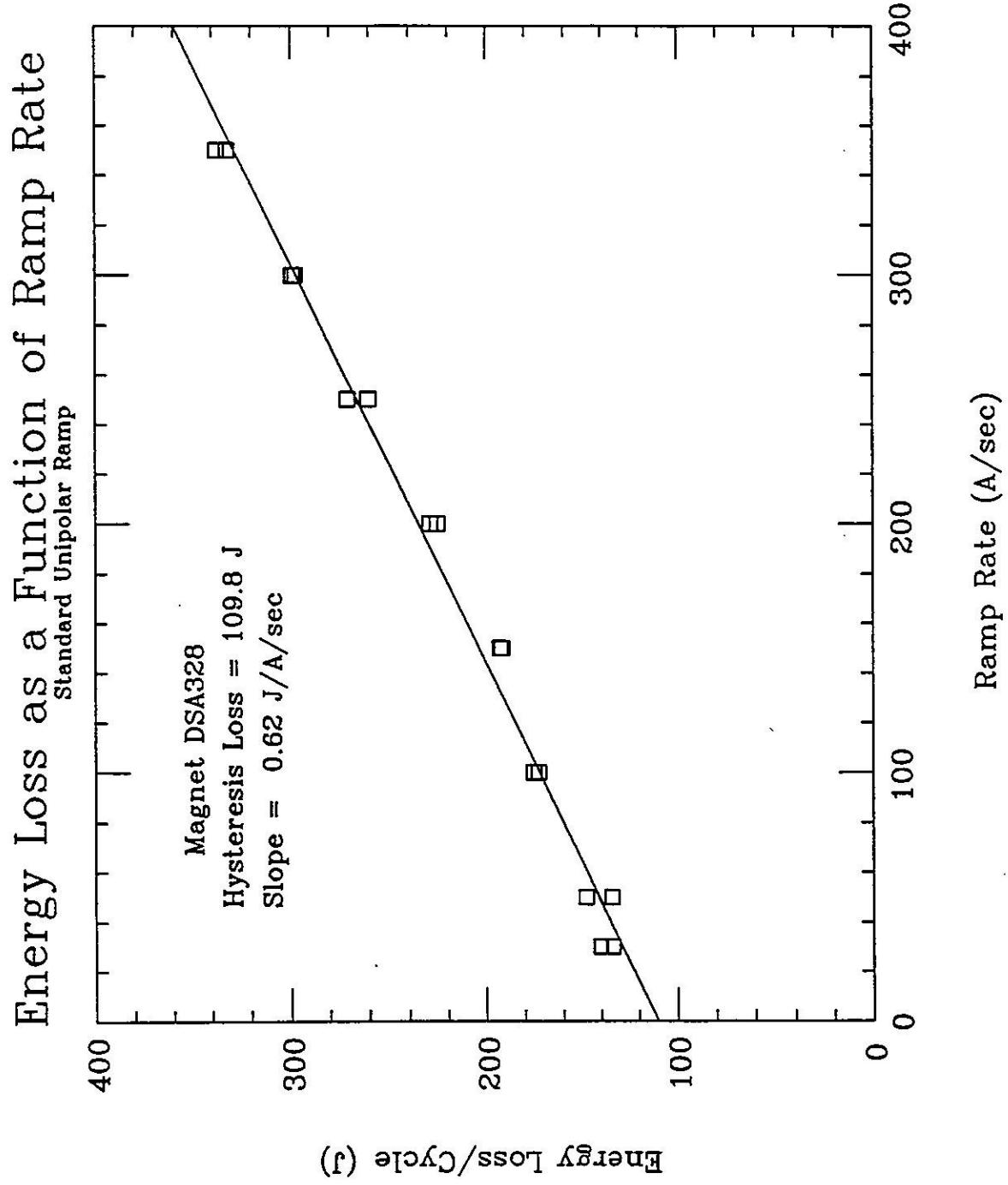


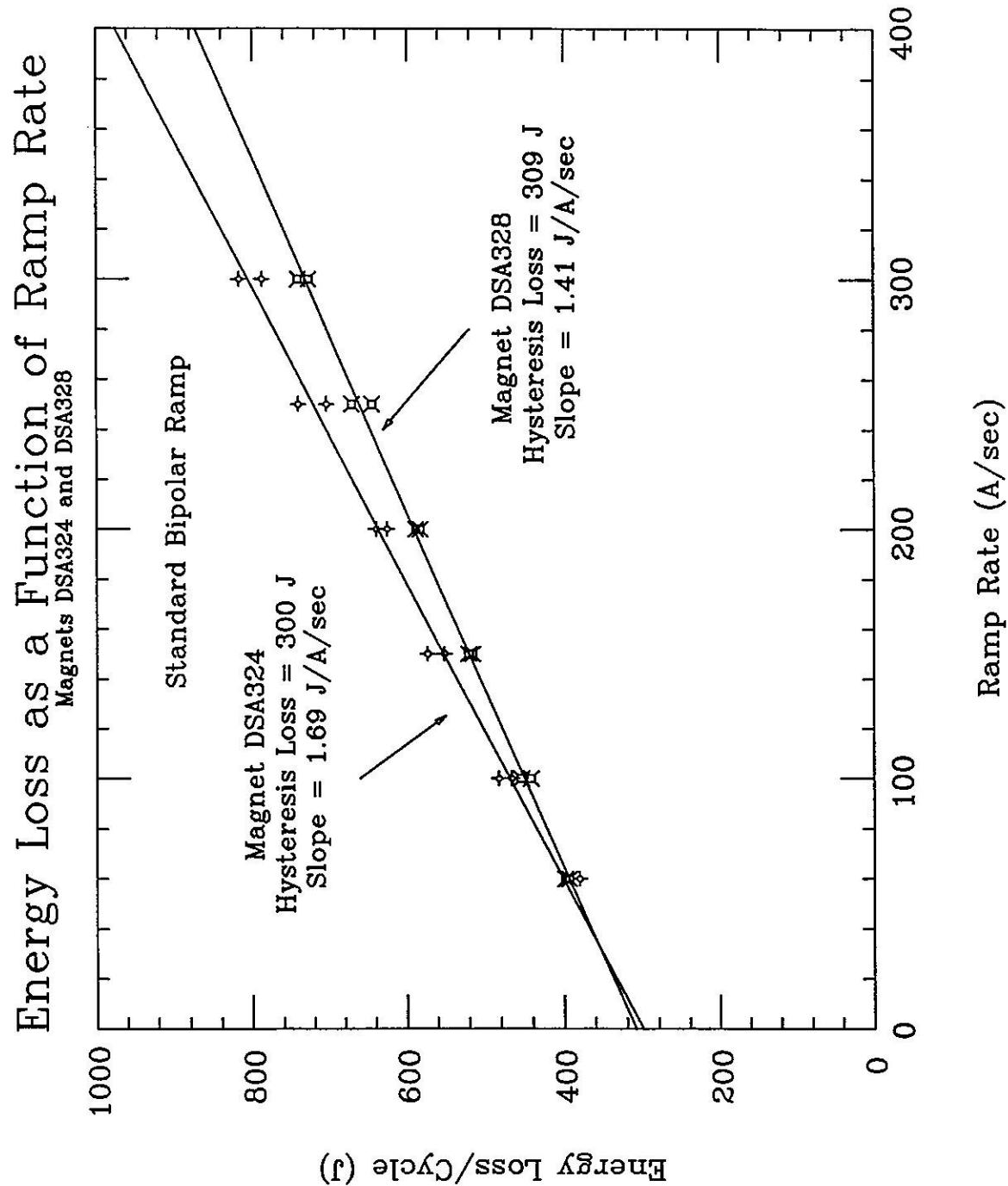


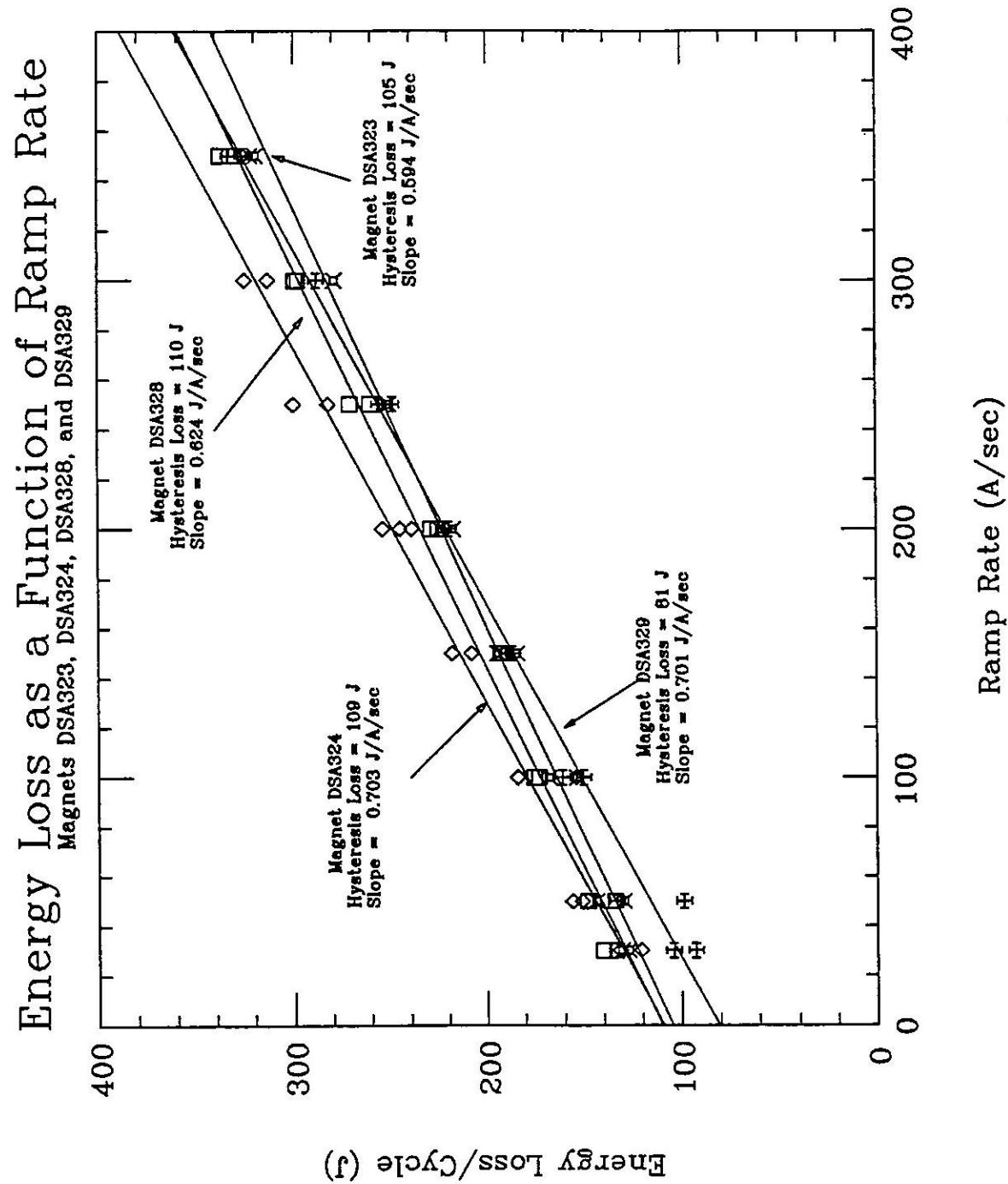
NORMAL SEXTUPOLE AC DSA329.RUN009











Relationship Between Eddy Current Heating and I_q

