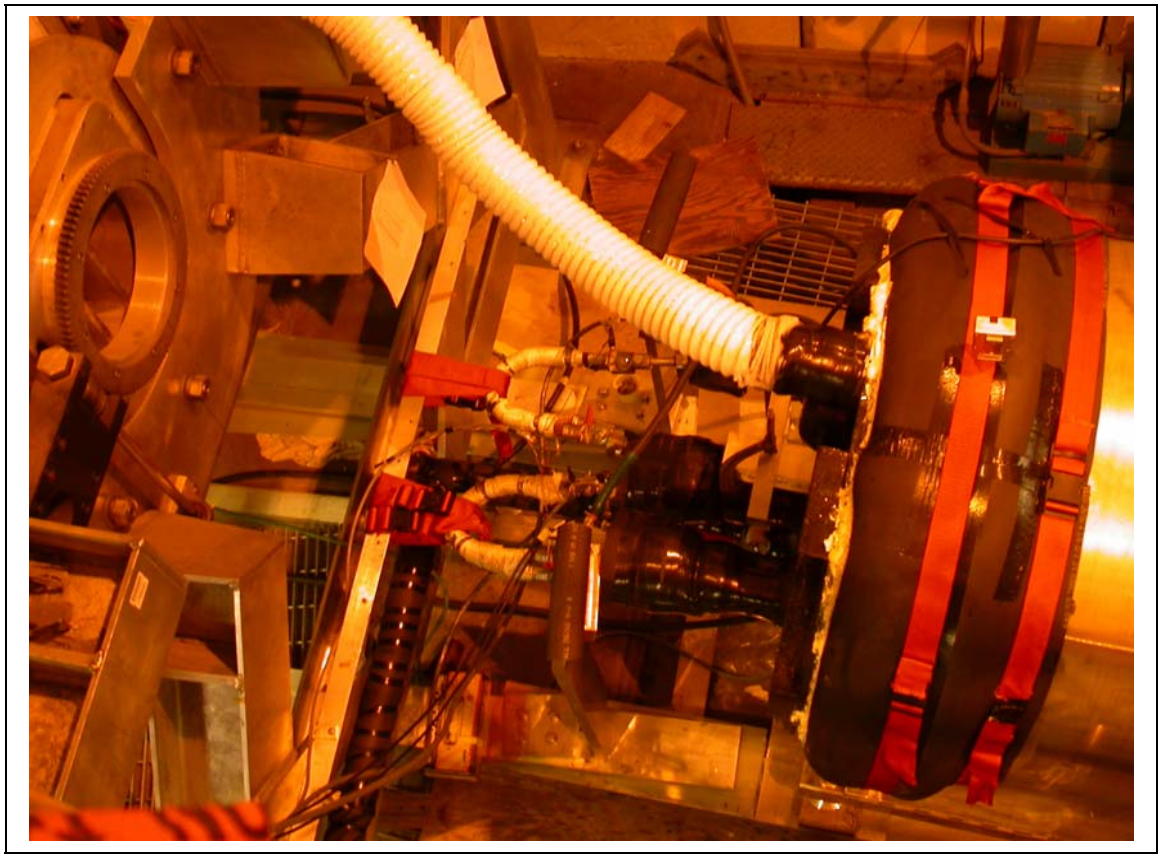
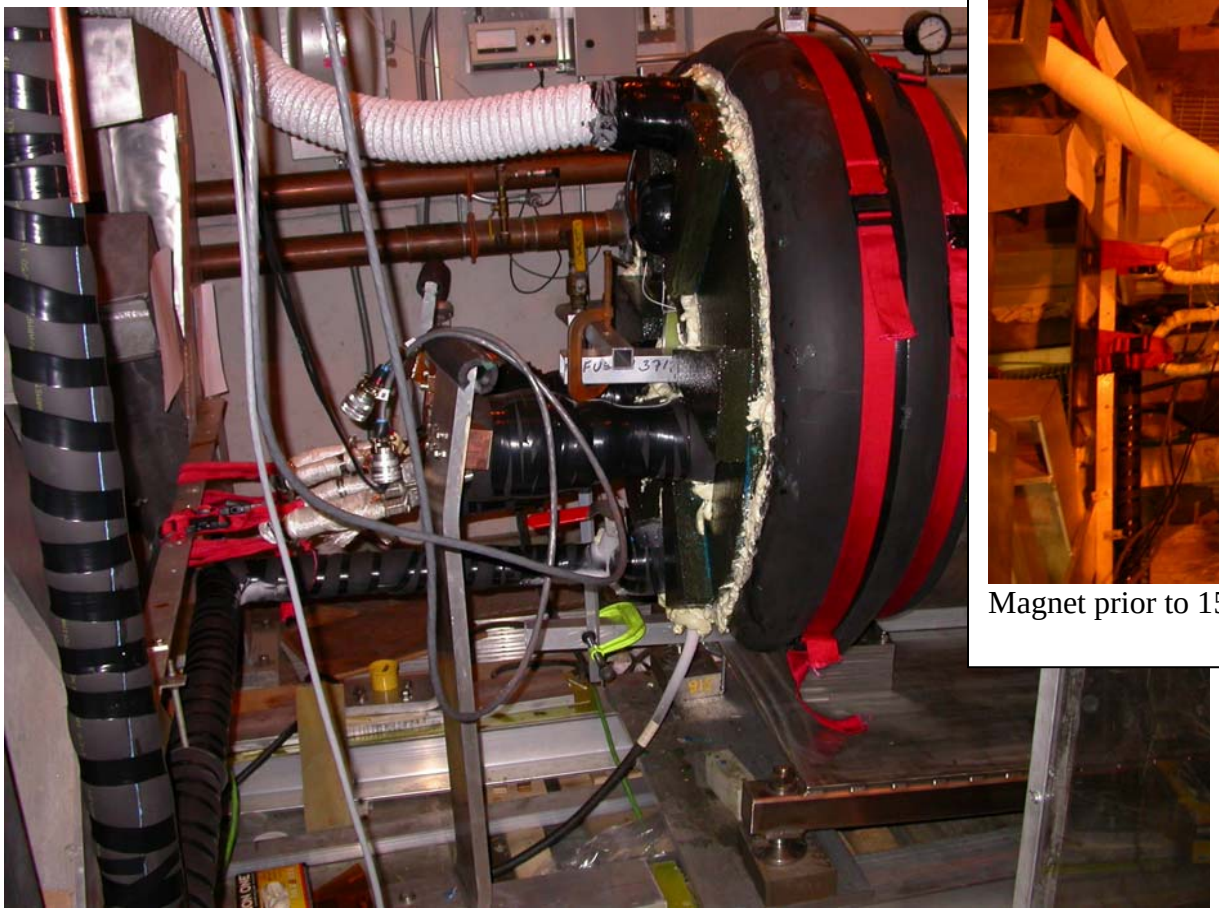


MERIT Magnet Testing Status
Wednesday April 5 VRVS

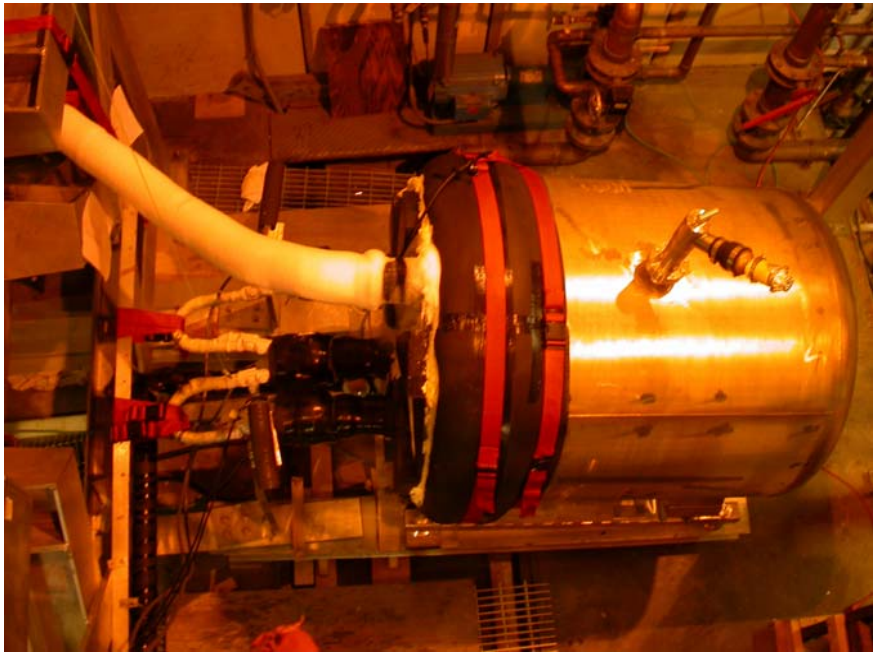
Peter H. Titus, MIT Plasma Science and Fusion Center

(617) 253 1344, titus@psfc.mit.edu, http://www.psfc.mit.edu/people/titus

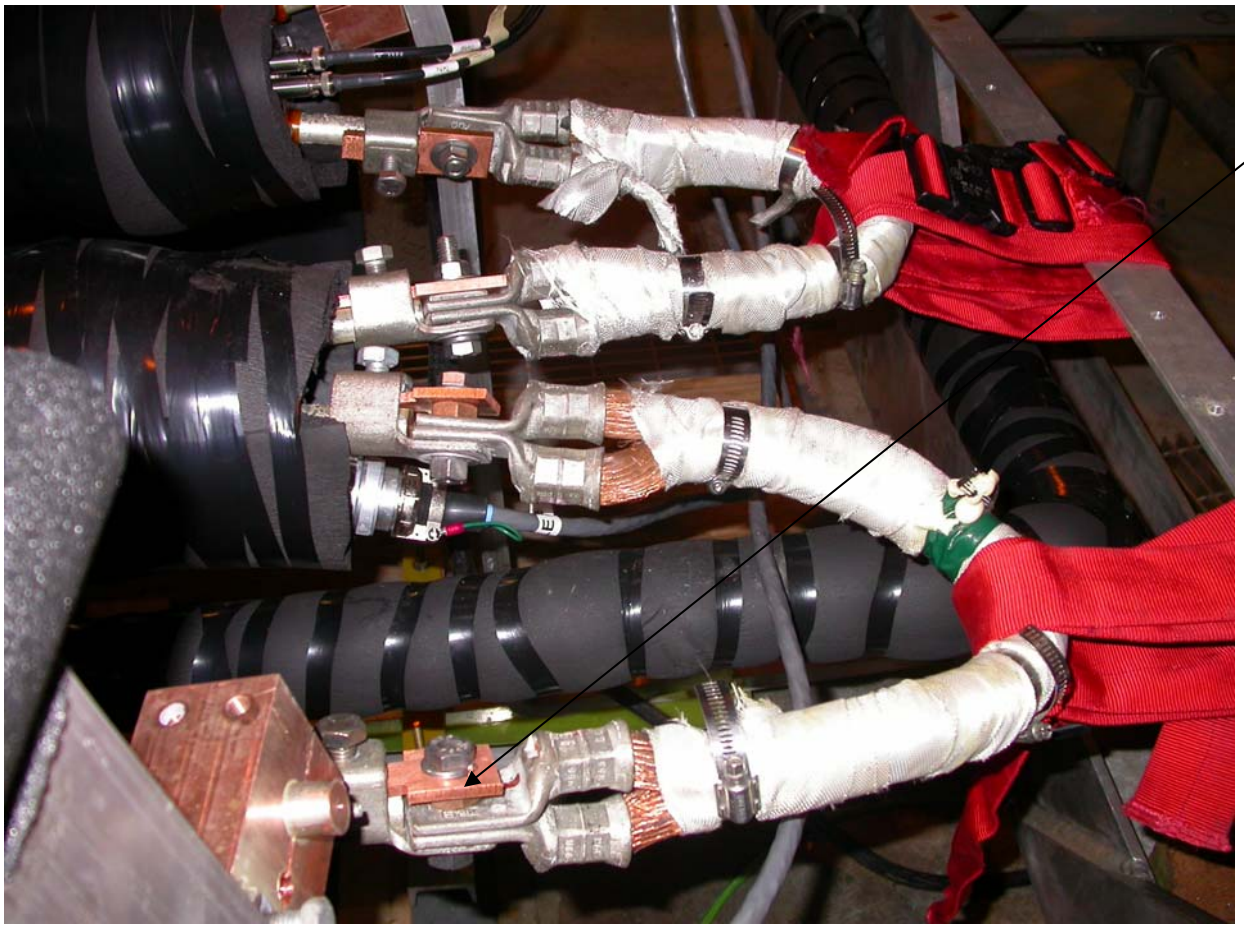
View of Magnet during initial coolown



N2 gas duct is not insulated, and frosts up



Magnet prior to 15T pulse



Jumper Connection Mods

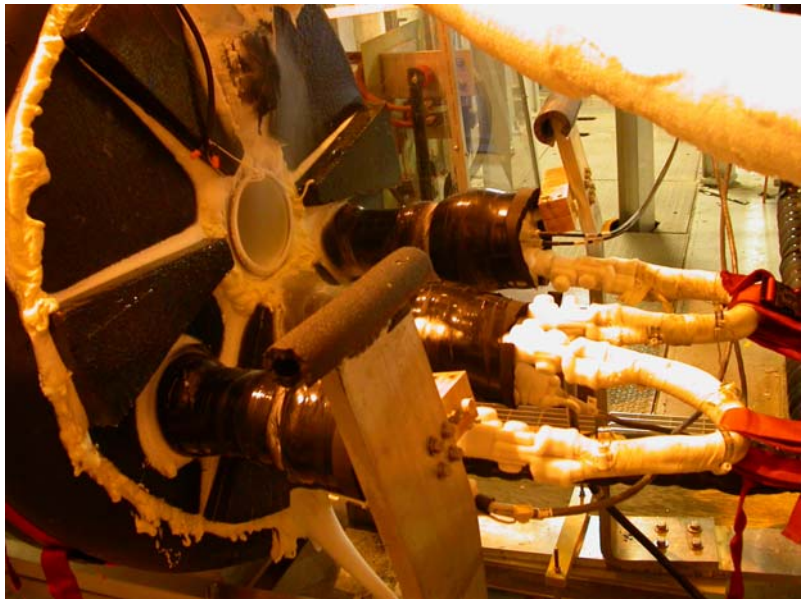
Made before high current shots.

The 15T run with the MERIT magnet, Began Friday March 24

Tuesday we pulsed the magnet with the high voltage taps and at LN2 temperatures. We did .6 and 1.0 T shots

Wednesday we had a 3T and a 7 Tesla shot in the morning and two additional 7T shots in the afternoon.

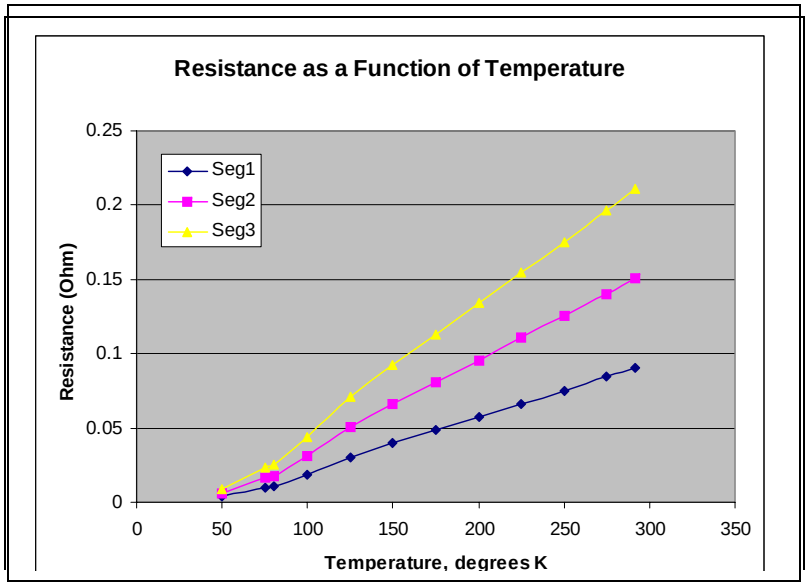
Thursday March 30 we had a number of shots used to diagnose a mal-distribution of current in the converters. We had one 10T shot that tripped on a control fault, Then a 15 T shot, and we finished the day with a 7T shot. Stray field measurements were made for the 10 and 15T shots and benchmarked well with the calculations of the stray field in the test procedure. The 10 and 15T shots began at around 80 to 85K.



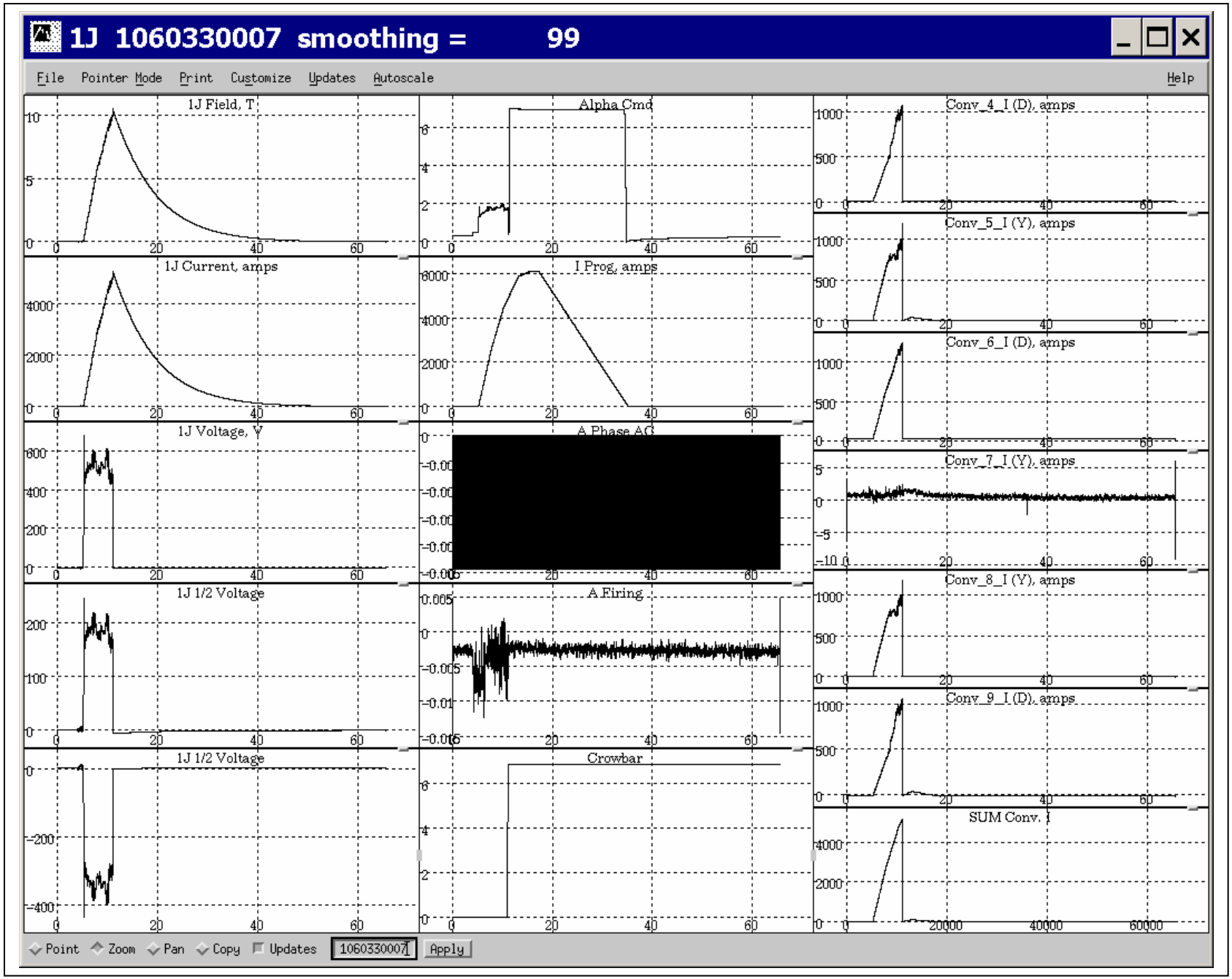
Thursday The cold end of the magnet. We had the bore heater off, Jumpers were not insulated.

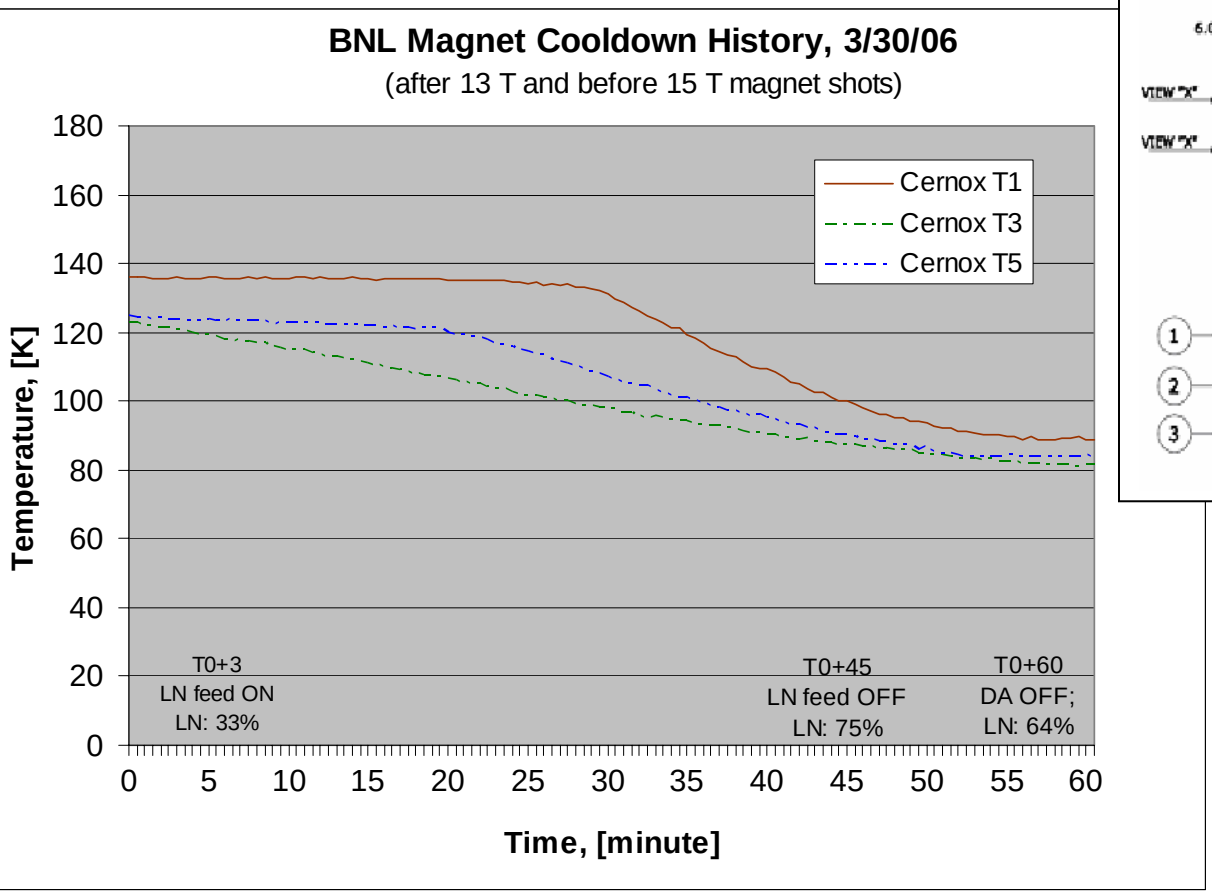
Monday March 27

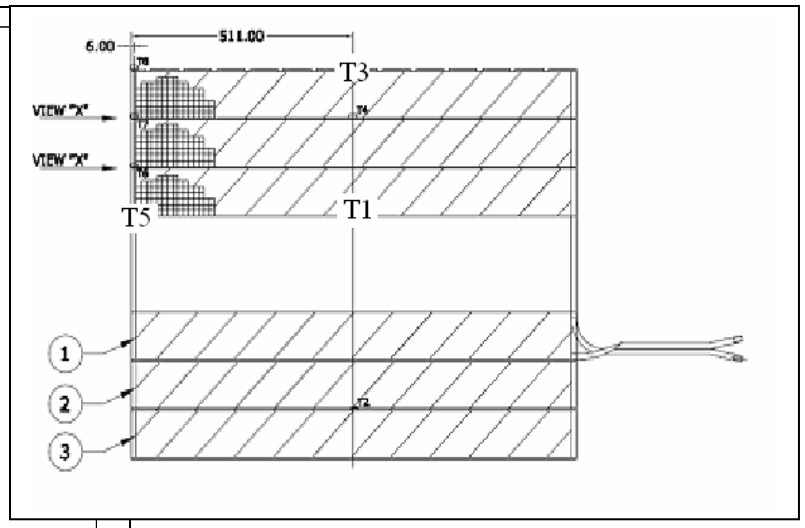
Seg 1 volt Ohm degK	Seg 2 volt Ohm degK	Seg 3 volt Ohm degK	Total Voltage Across Magnet	Magnet Current (Amps) PS Meter	Ave Mag Temp (K)
1.94 .051 175	3.25 .0592 125	4.55 .1197 175	9.74	38	170
2.38 .0793 280	3.71 .1236 255	3.49 .1633 225	9.59	30	210
3.25 .0625 200	3.87 .0744 170	2.46 .0473 100	9.57	52	135
1.94	3.19	4.49	9.63	37	175



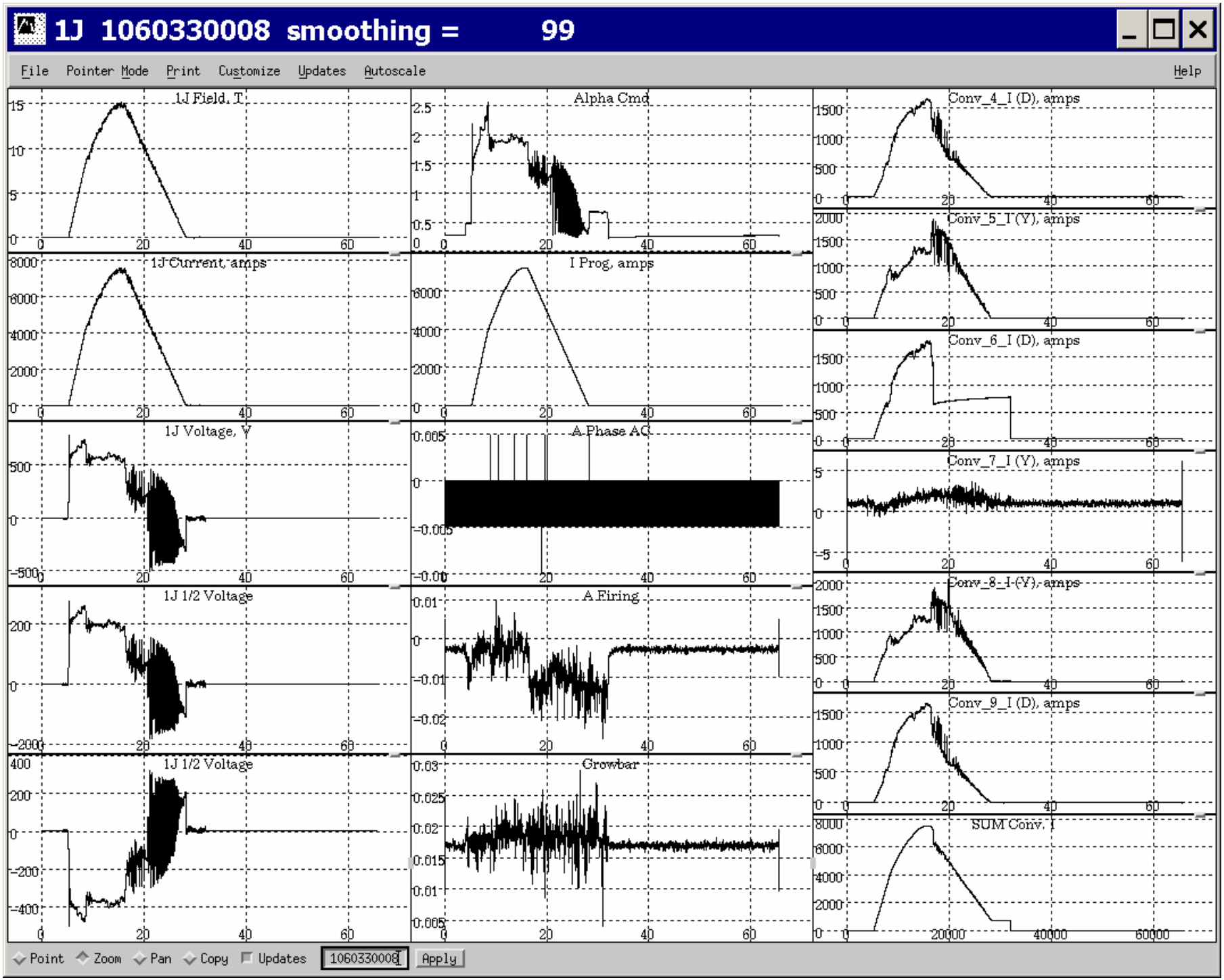
Intended as a 13T shot. It ended on a control fault at 10.5T – Interesting because of the L/R decay







Cooldown from 125 to ~85 is about ½ hour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Alpha Cmd
Conv_4_I (D), amps
1J Current, amps
I Prog, amps
Conv_5_I (Y), amps
1J Voltage, V
A Phase AC
Conv_6_I (D), amps
Conv_7_I (Y), amps
1J 1/2 Voltage
A Firing
Conv_8_I-(Y), amps
1J 1/2 Voltage
Crowbar
Conv_9_I (D), amps
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Updates
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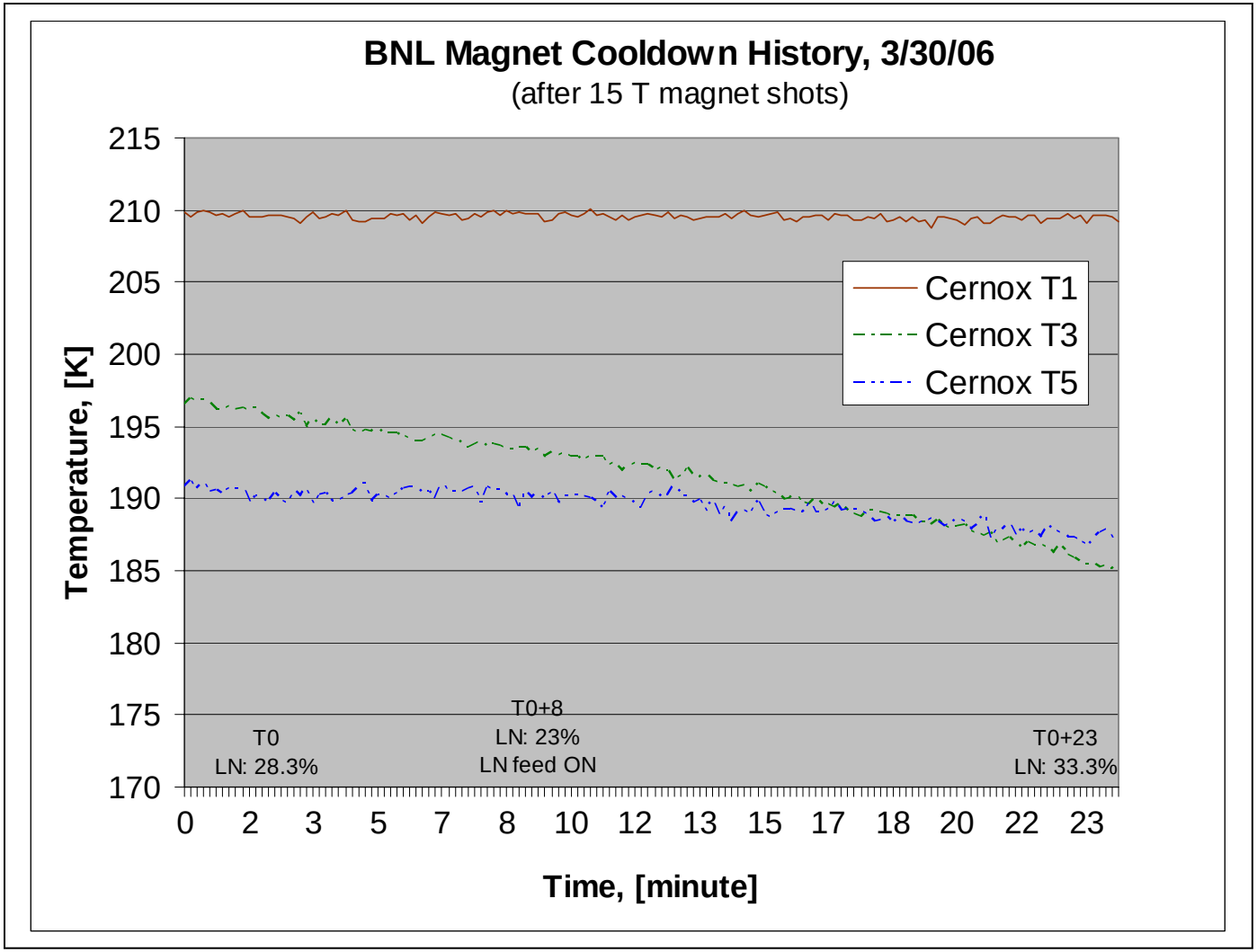
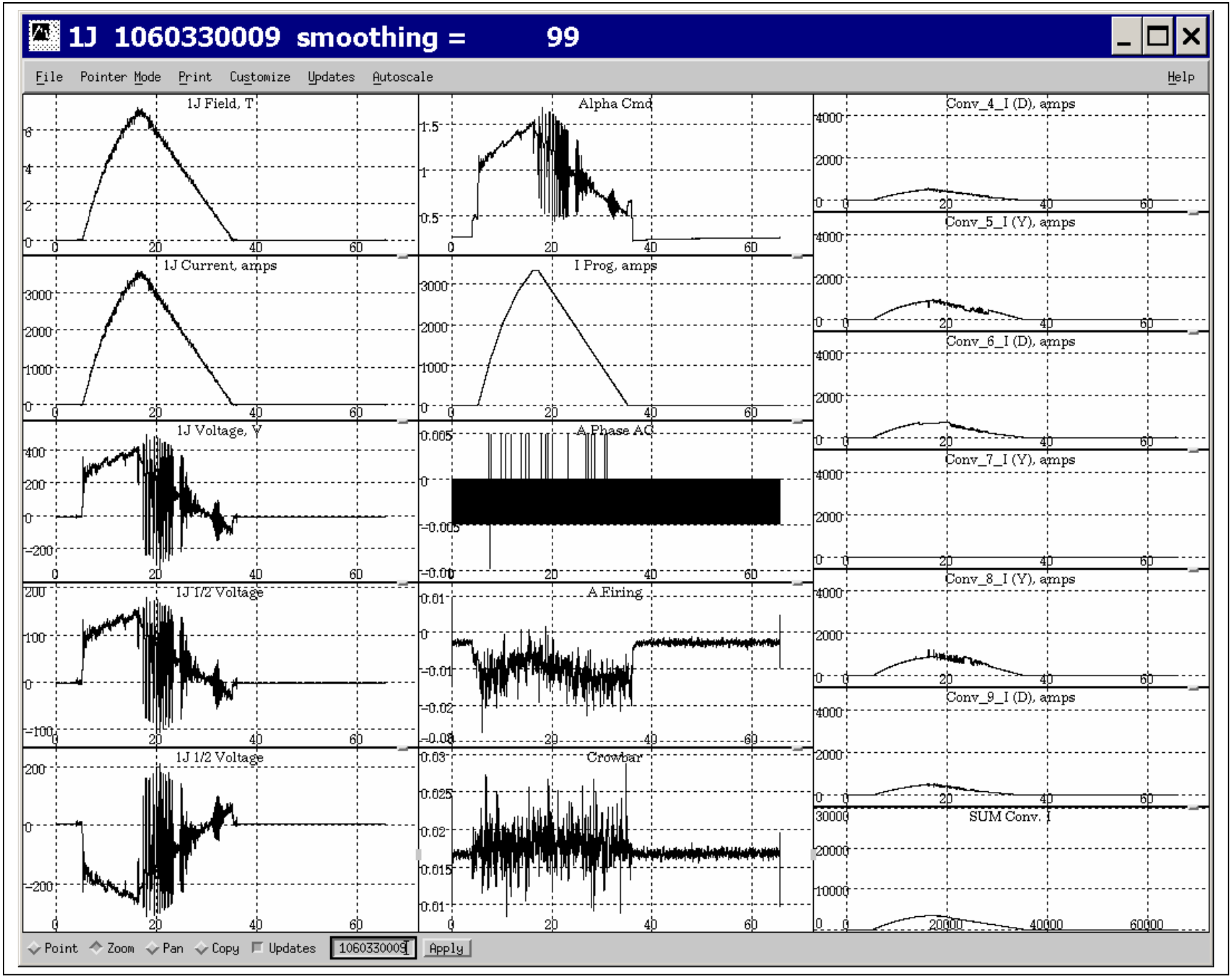


We may have lost T1
The start temp for 15T shot may have been locally higher than 85K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Conv_5_I (Y), amps
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1J Voltage, V
A Phase AC
Conv_7_I (Y), amps
Conv_8_I (Y), amps
1J 1/2 Voltage
A Firing
Conv_9_I (D), amps
1J 1/2 Voltage
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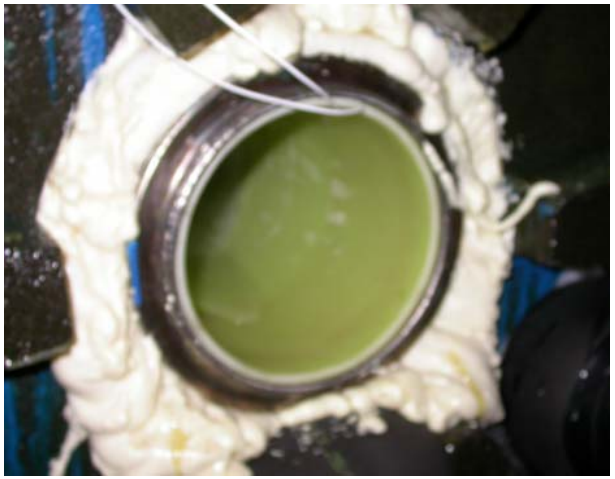
use a small 150 W heater that I have running at about 40% power at the terminal end of the bore. It covers around 75% of the circumference, and warms about 25% of the length of the bore. It actually covers only about 4 inches of the length that it is heating. It is a silicon type heater. Another in the middle and another at the dished head end should solve the problem. With three separate ones, you can control the temperature distribution.

At 08:00 AM 3/31/2006 -0500, you wrote:
>Dave: when you get a chance, could you check the vacuum level in the
>BNL magnet.

Pete
The pressure is 50 mtorr .
Dave

Condition of the Bore April 4 2006



Hi Peter,

This morning I had a brief chat with Bill Cochran and Gary Dekow regarding the data traces obtained during yesterday afternoon's 15T MERIT magnet pulse.

The traces appear reasonable for the first experimental run of the system, but are inadequate for operation of the magnet on a production basis. As I read it, the proposed schedule of the tests with mercury jet calls for roughly 12 magnet pulses at each of three field levels, 5T, 10T and 15T. A total of at least 36 magnet pulses in all.

The voltage ripple from the power supplies during the down ramp from 15T, exceeds +/- 400V peak to peak. This is highly undesirable for both the supplies and the magnet as a standard operating condition. Additional tuning of the power supply feedback regulators is clearly called for. In addition to Gary's linear system's model, Bill Cochran recommends a full simulation of the west cell power system coupled to the MERIT magnet including modeling of the power convertors' thrysistor bridges. This is fairly standard now that the necessary tools are available in commercial software products.

The MERIT magnet has significantly longer time constant than any magnet previously tested with the six coupled convertors. For most of the down ramp the magnet's stored energy is transferring back to the power grid, which is a significantly different situation that we normally confront during operation of these convertors.

The observed distortion to individual power convertor output current traces for the 15T shot is also disturbing. Power sharing between the convertors has never been all that great, even so, the individual current traces in you short report are even worse than usual. Bill suspects some minor instrumentation issues may be responsible for at least a portion of the observed distortions.

Bill and Gary conservatively estimate that to properly tune up the magnet power system for repetitive operation of the MERIT magnet will likely require about 1 man-week each of their time (a total of at least two man-weeks for your in process phase II budget estimate). To proceed we would need to reach some sort of agreement with Jim Irby about an appropriate schedule for Bill and Gary's time. We may also need some minor work from Bill Parkin's group to implement a few of Bill's proposed instrumentation modifications.

Please let me know if you have questions about these recommendations.

- Phil