Notes on Fast Thermometry Test at JLab
August 06 2007

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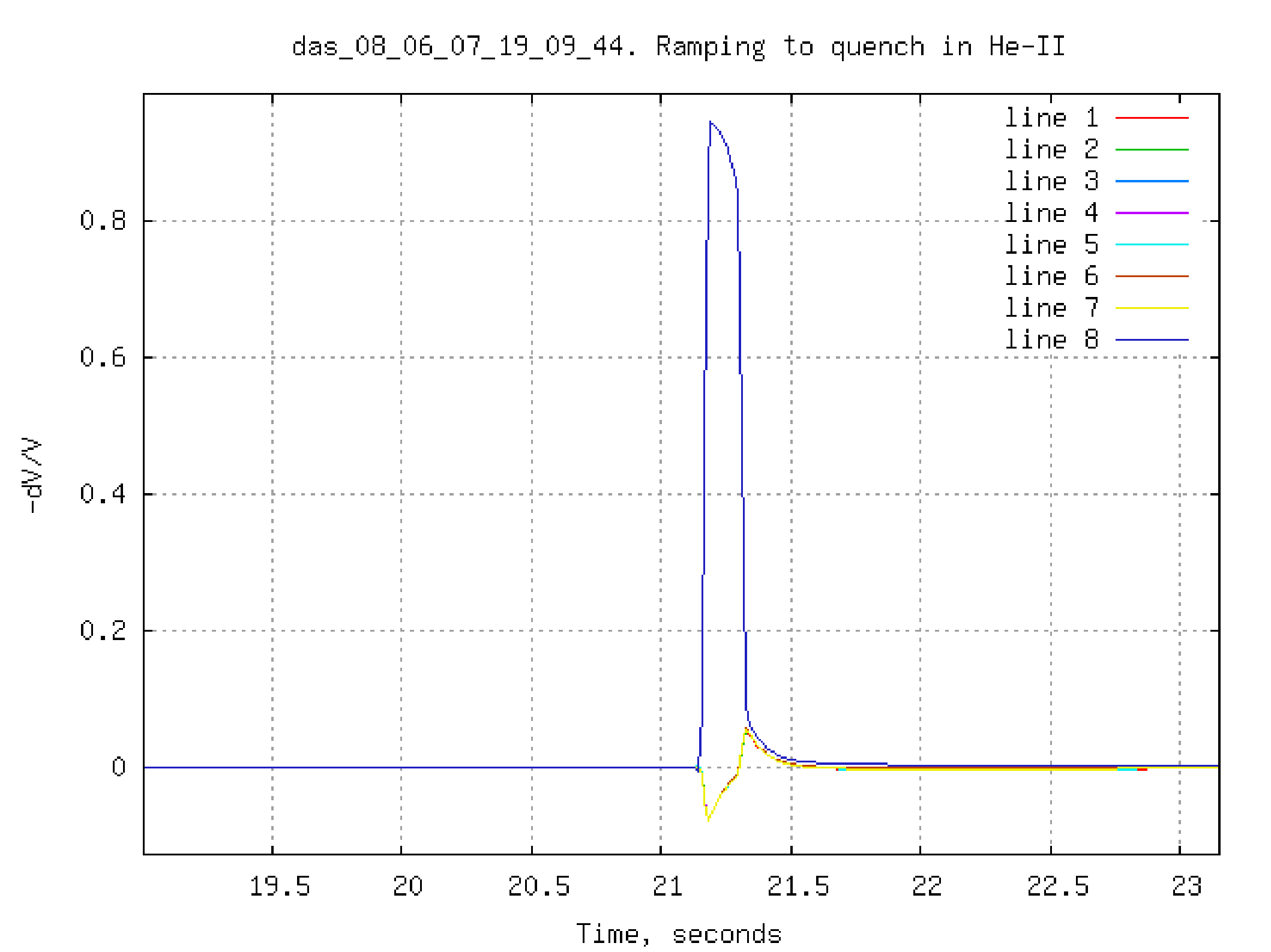
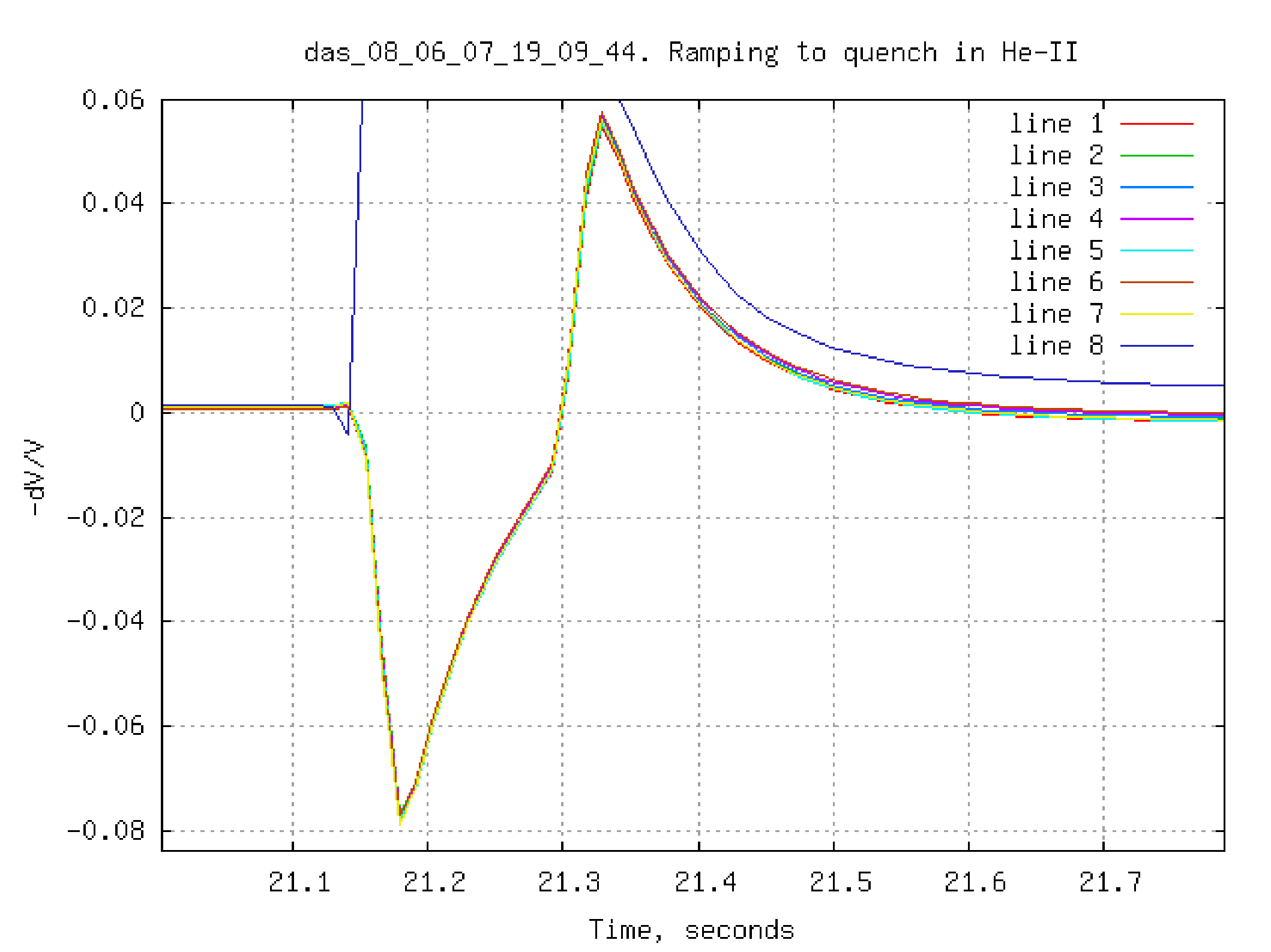
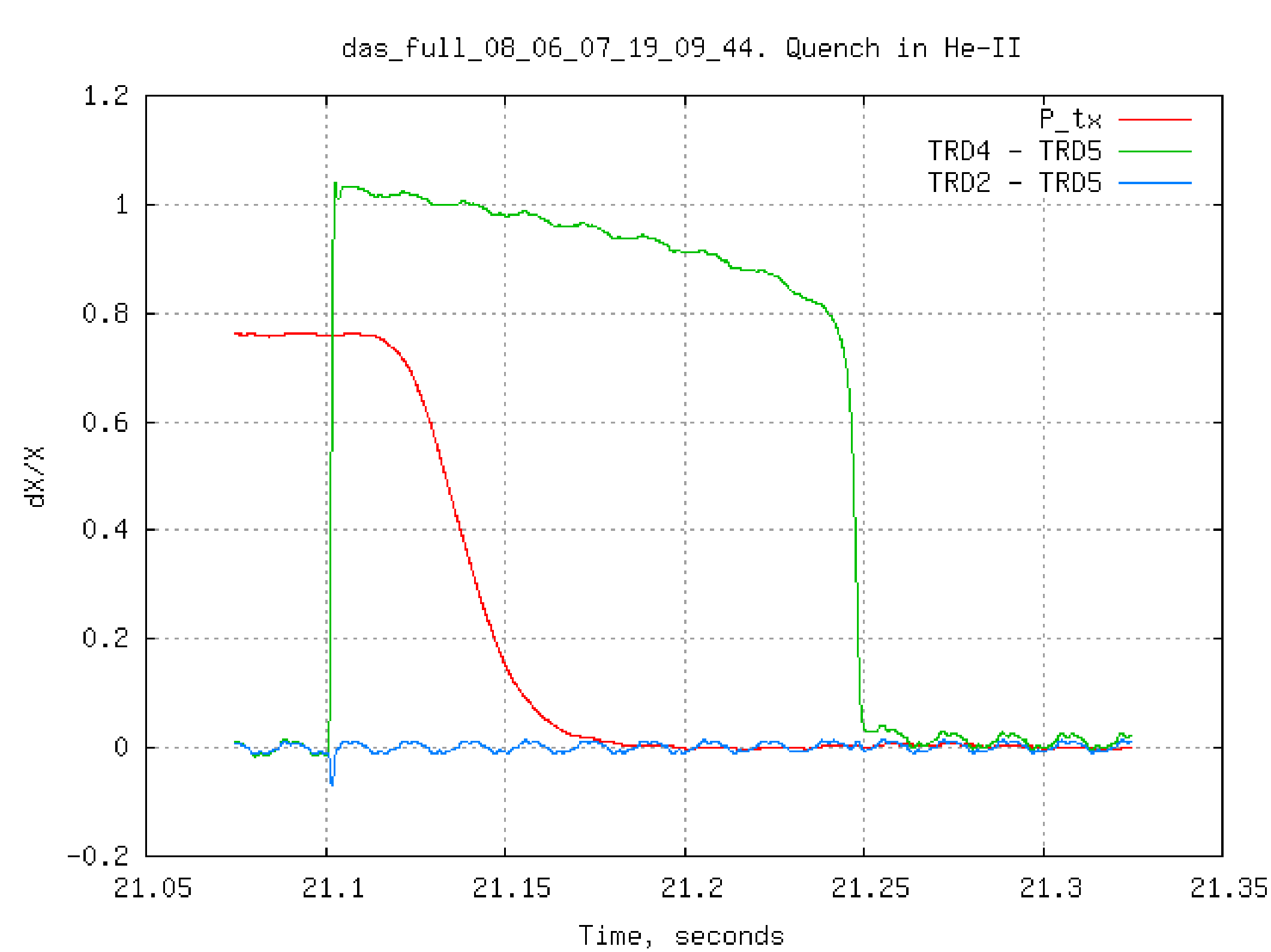
Setup notes

- 8 thermometers (2 cables x 4)
- 4 and 6 cells suspect
- 12000 (multiple of 60 Hz) samples/sec/channel
- 40 Hz low-pass FIR filter
- Actual sampling rate: 12004.8 (mean)
- Decimated sampling rate: 80.032 Hz (decimation ratio 150)

2007/08/03

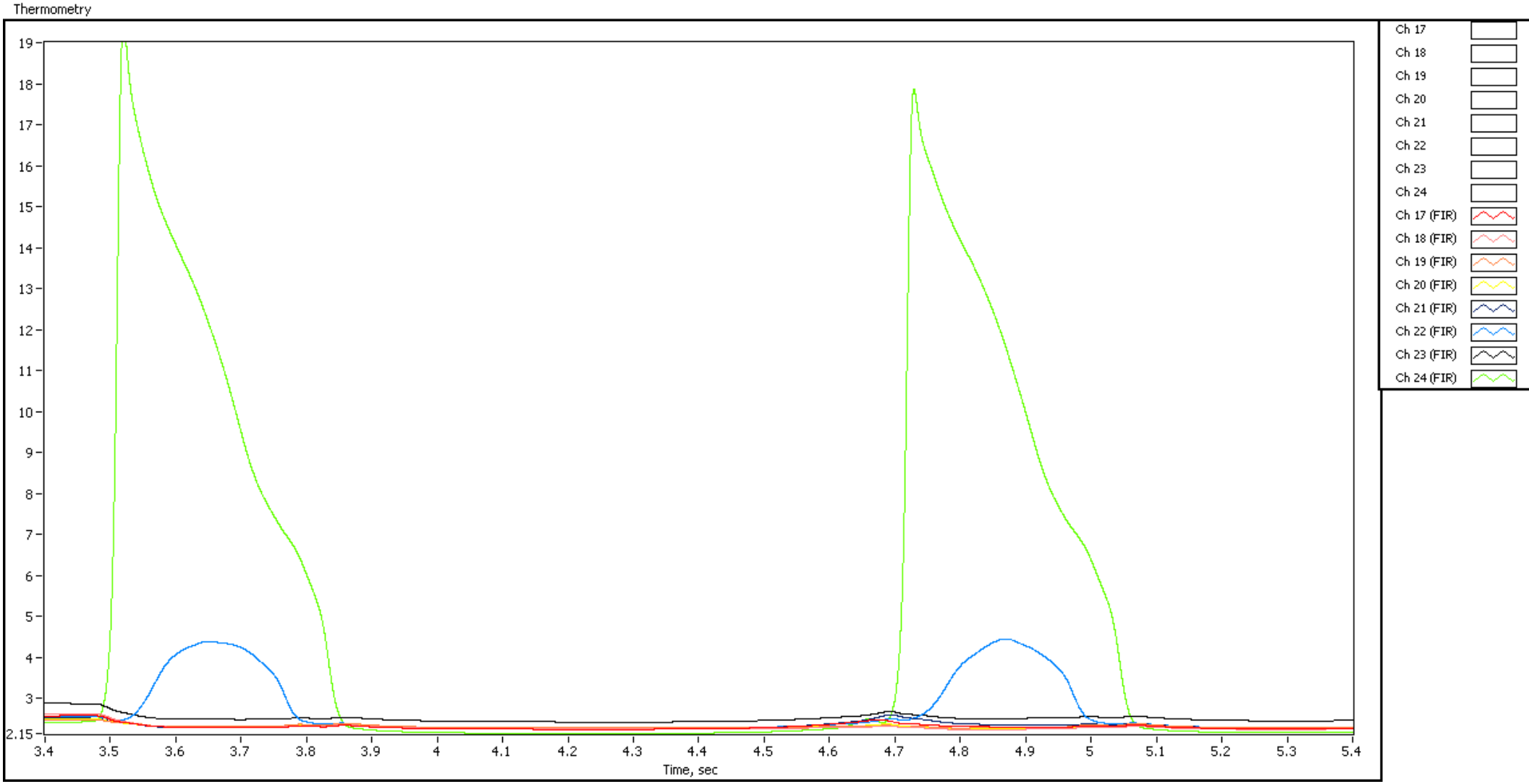

das_08_06_07_19_09_44. Ramping to quench in He-II
line 1
line 2
line 3
line 4
line 5
line 6
line 7
line 8
0.8
0.6
0.4
0.2
0
-dV/V
19.5
20
20.5
21
21.5
22
22.5
23
Time, seconds

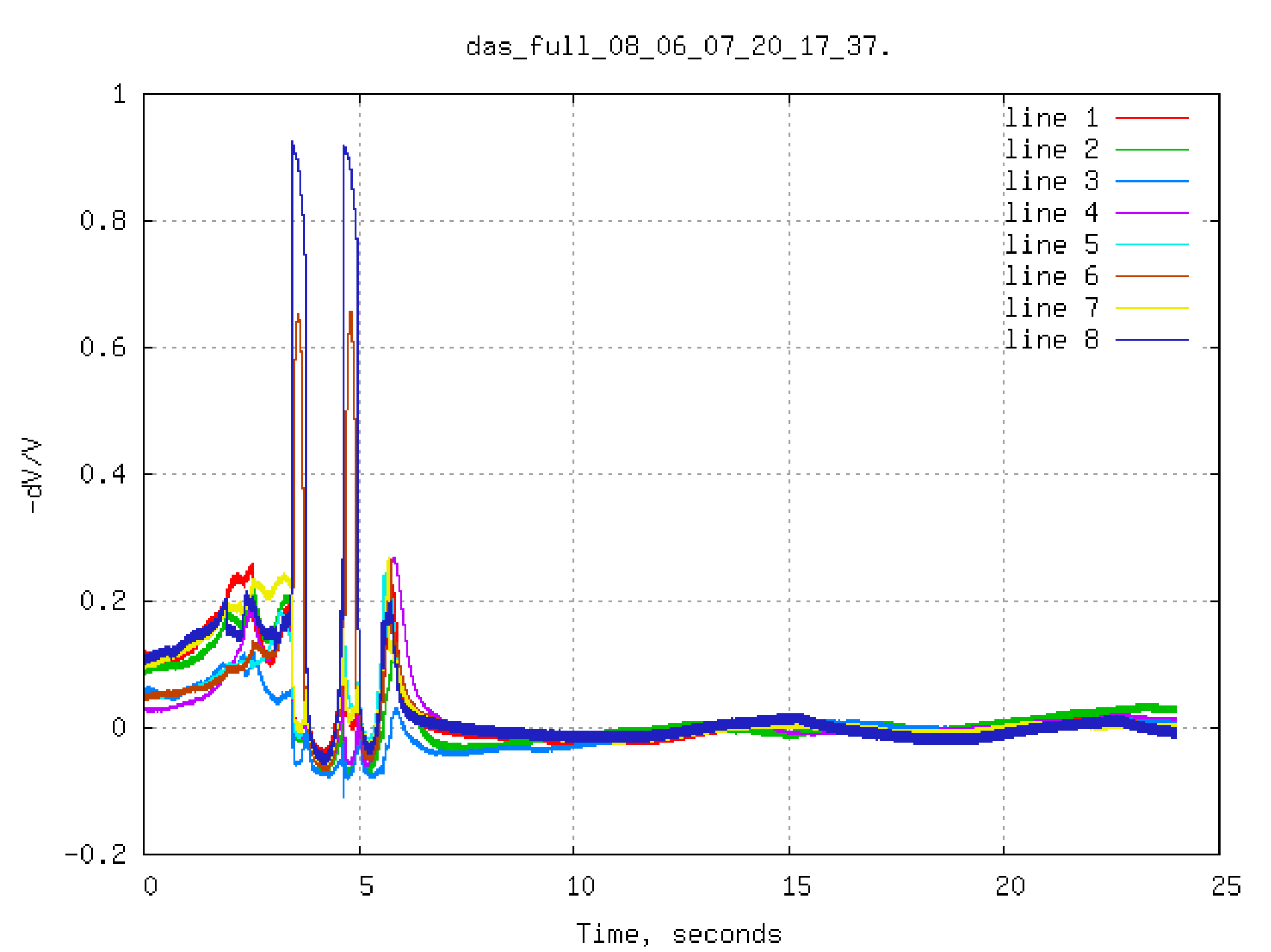

das_08_06_07_19_09_44. Ramping to quench in He-II
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
-dW/W
21.1
21.2
21.3
21.4
21.5
21.6
21.7
Time, seconds
line 1
line 2
line 3
line 4
line 5
line 6
line 7
line 8

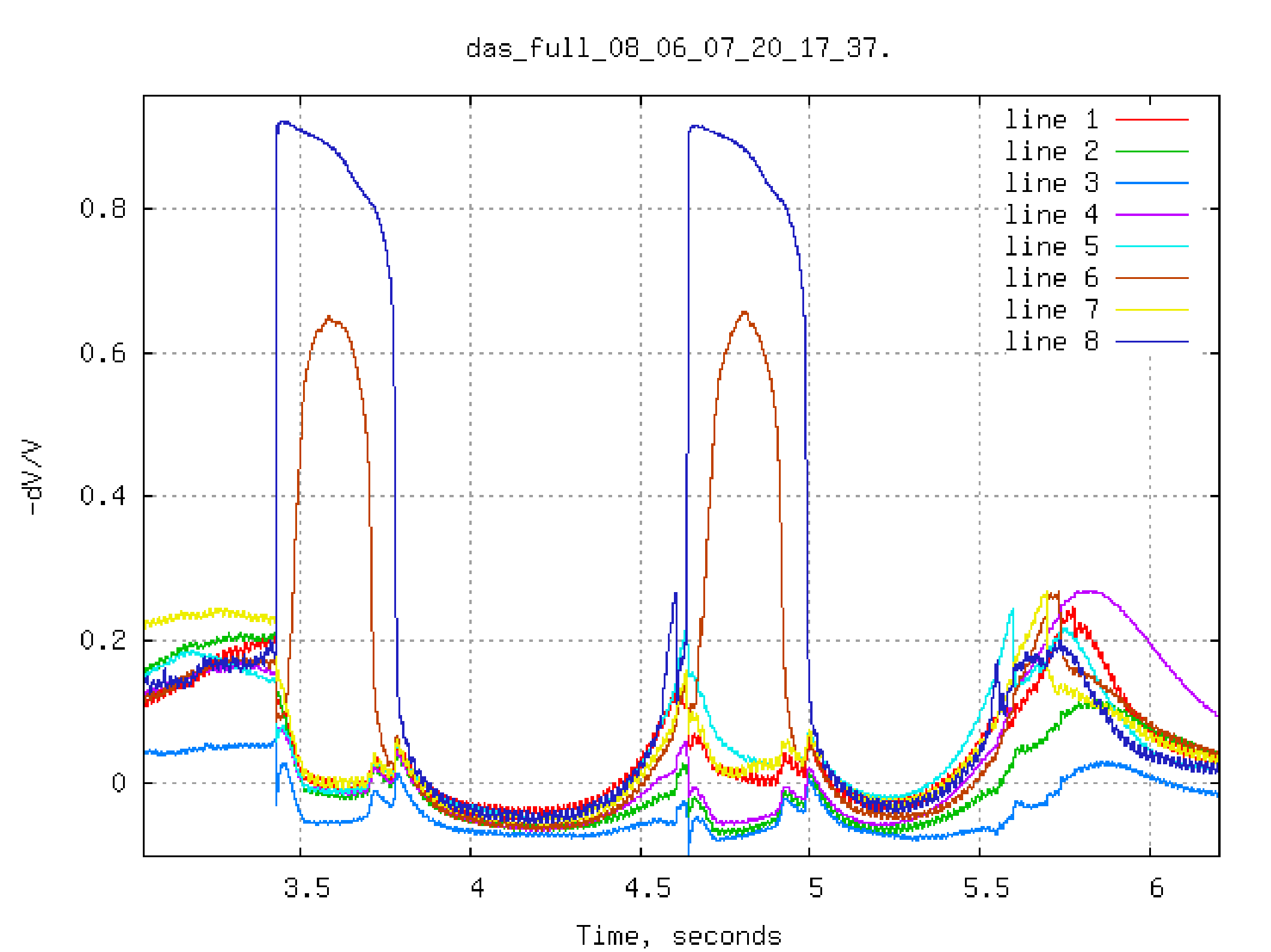

das_full_08_06_07_19_09_44. Quench in He-II
P_tx
TRD4 - TRD5
TRD2 - TRD5
dX/X
Time, seconds
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
21.05
21.1
21.15
21.2
21.25
21.3
21.35

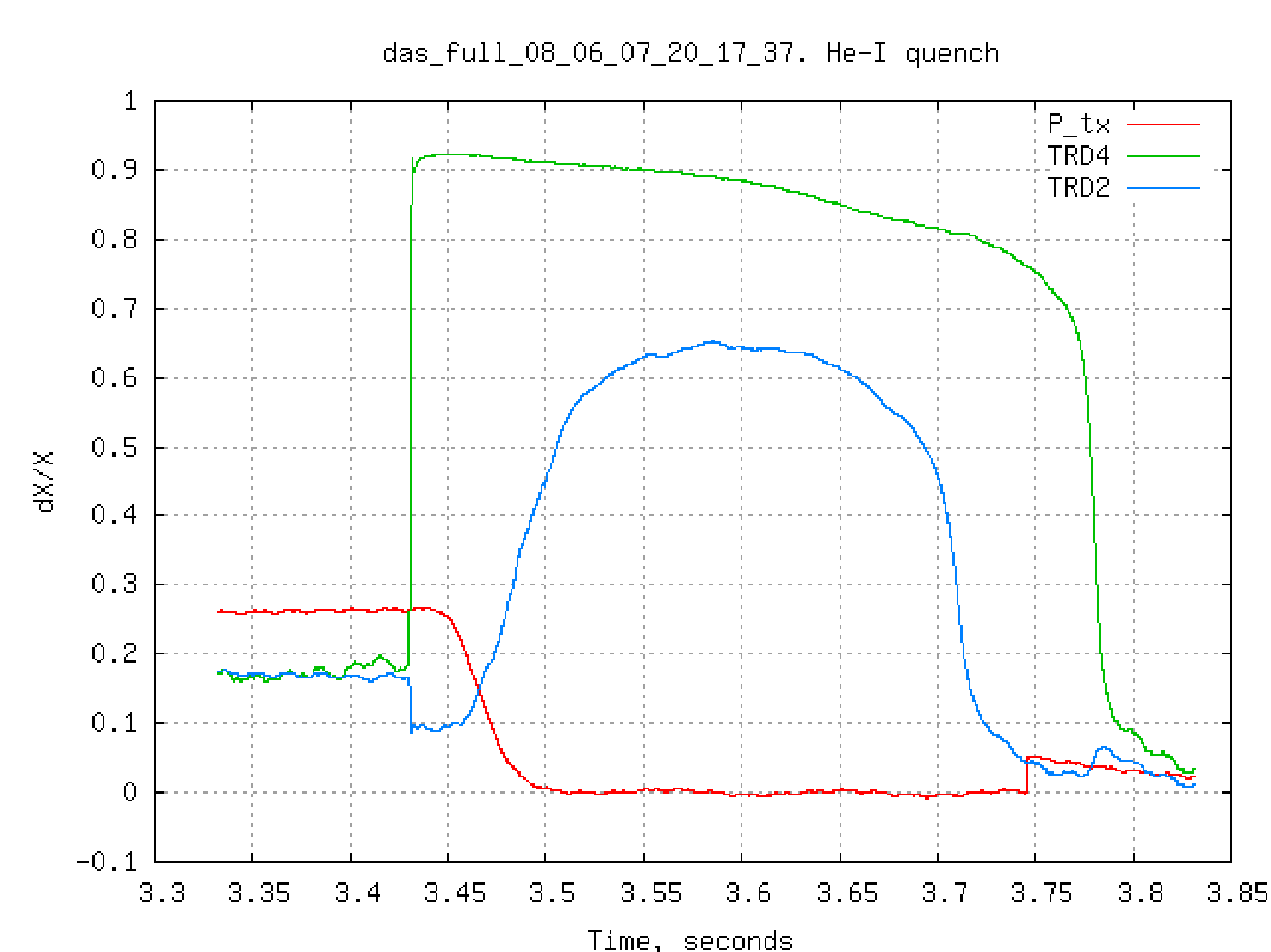
Quench in He-I

In superfluid helium (He-II, T<T_lambda=2.1768K) thermoconductivity of He >> than that of Nb, in normal helium (He-I, T > T_lambda) it is the other way around. This means a completely different heat flow pattern. Thermal convection complicates the picture. Density maximum is T_lambda +6.28mK. Near the maximum convective effects are minimized.


Thermometry
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2.15
3.4
3.5
3.6
3.7
3.8
3.9
4
4.1
4.2
4.3
4.4
4.5
4.6
4.7
4.8
4.9
5
5.1
5.2
5.3
5.4
Time, sec
Ch 17
Ch 18
Ch 19
Ch 20
Ch 21
Ch 22
Ch 23
Ch 24
Ch 17 (FIR)
Ch 18 (FIR)
Ch 19 (FIR)
Ch 20 (FIR)
Ch 21 (FIR)
Ch 22 (FIR)
Ch 23 (FIR)
Ch 24 (FIR)


das_full_08_06_07_20_17_37.
line 1
line 2
line 3
line 4
line 5
line 6
line 7
line 8
-dV/V
Time, seconds
1
0.8
0.6
0.4
0.2
0
-0.2
0
5
10
15
20
25


das_full_08_06_07_20_17_37.
line 1
line 2
line 3
line 4
line 5
line 6
line 7
line 8
0.8
0.6
0.4
0.2
0
-dV/V
3.5
4
4.5
5
5.5
6
Time, seconds


das_full_08_06_07_20_17_37. He-I quench
P_tx
TRD4
TRD2
dX/X
Time, seconds
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
3.3
3.35
3.4
3.45
3.5
3.55
3.6
3.65
3.7
3.75
3.8
3.85

Conclusions

- Test in He-I – different look, new info
- Timing info is important
- Record P_tx and other parameters (X-rays?)
- ~ 1K effects warrant to look at it with ~0.1mK precision
- Going beyond T-mapping – verify thermal property of a cavity; e.g. Nb thermal diffusivity and Kapitza resistance
- Need accurate thermal (FEM) model of cavity