



Italian National Agency for New Technologies,
Energy and Sustainable Economic Development

Debriefing F09 parasitic 09/04/2019 Briefing F09 16/04/2019

F09: Waves excitation by REs

WIP 15-04-2019

P. Buratti for F09 team



1101 0110 1100
0101 0010 1101
0001 0110 1110
1101 0010 1101
1111 1010 0000



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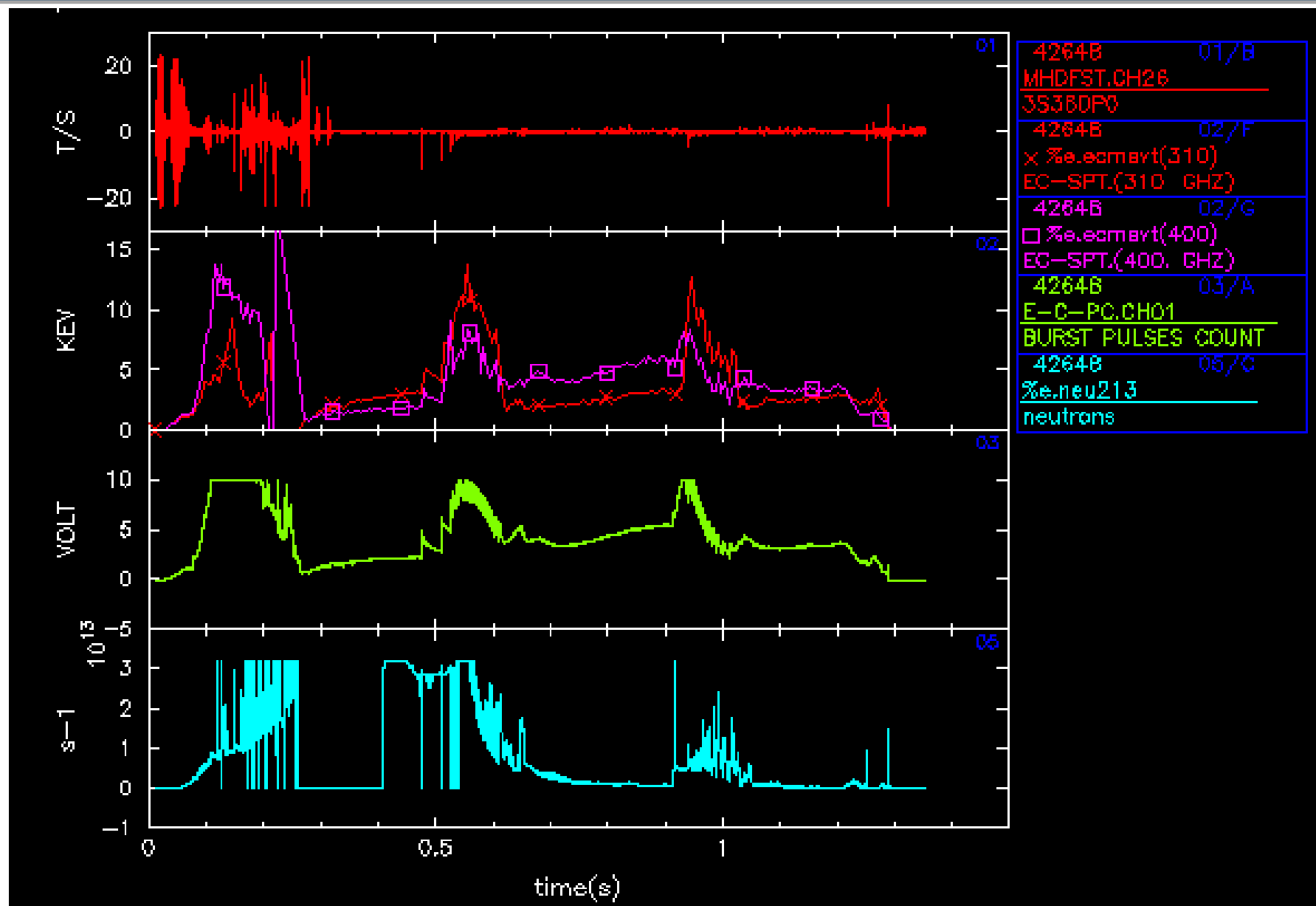
F09: S. Ceccuzzi, L. Gabellieri, F. Bombarda, D. Carnevale, A. Cardinali, F. Napoli, L. Panaccione + W. Bin and B. Baiocchi from CNR/MI

Pulse list (pulses with positive detection only)

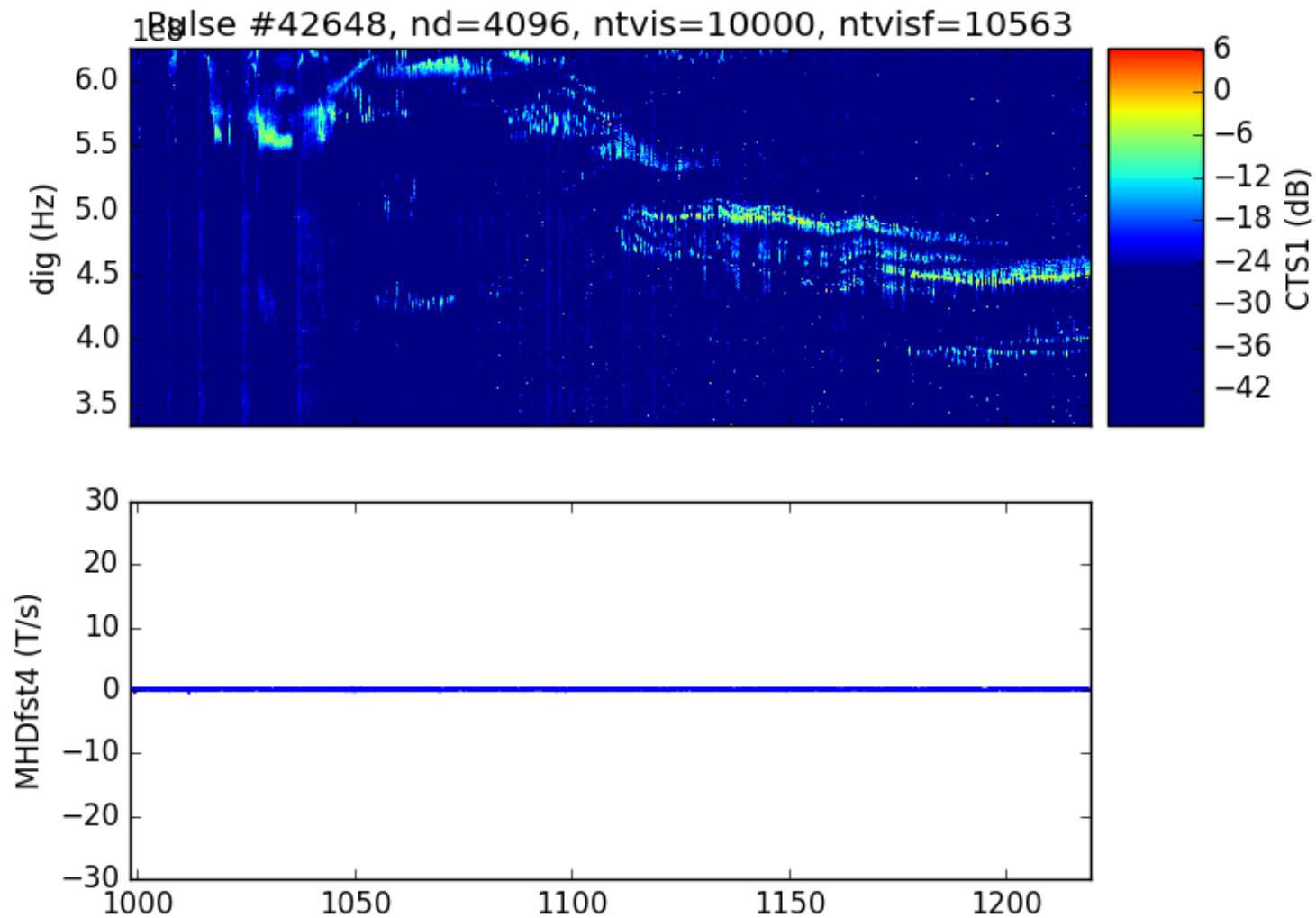
- **42648**
 - Soft stop (+current quench?) and long tail with hot plasma
 - Fe LBO at 0.9 s
 - Radiometer acquisition 0.77 – 1.27 s
- **42658**
 - Soft stop and long tail with hot plasma
 - BT ramp down at 0.916 s
 - Radiometer acquisition 0.85 – 1.35 s
- **42660**
 - Soft stop and long tail with hot plasma
 - Fe LBO at 0.9 s
 - Radiometer acquisition 0.77 – 1.27 s

All with 'slow' acq, Nyquist around 600 MHz, not sufficient.

42648 (0.77 – 1.265 s)

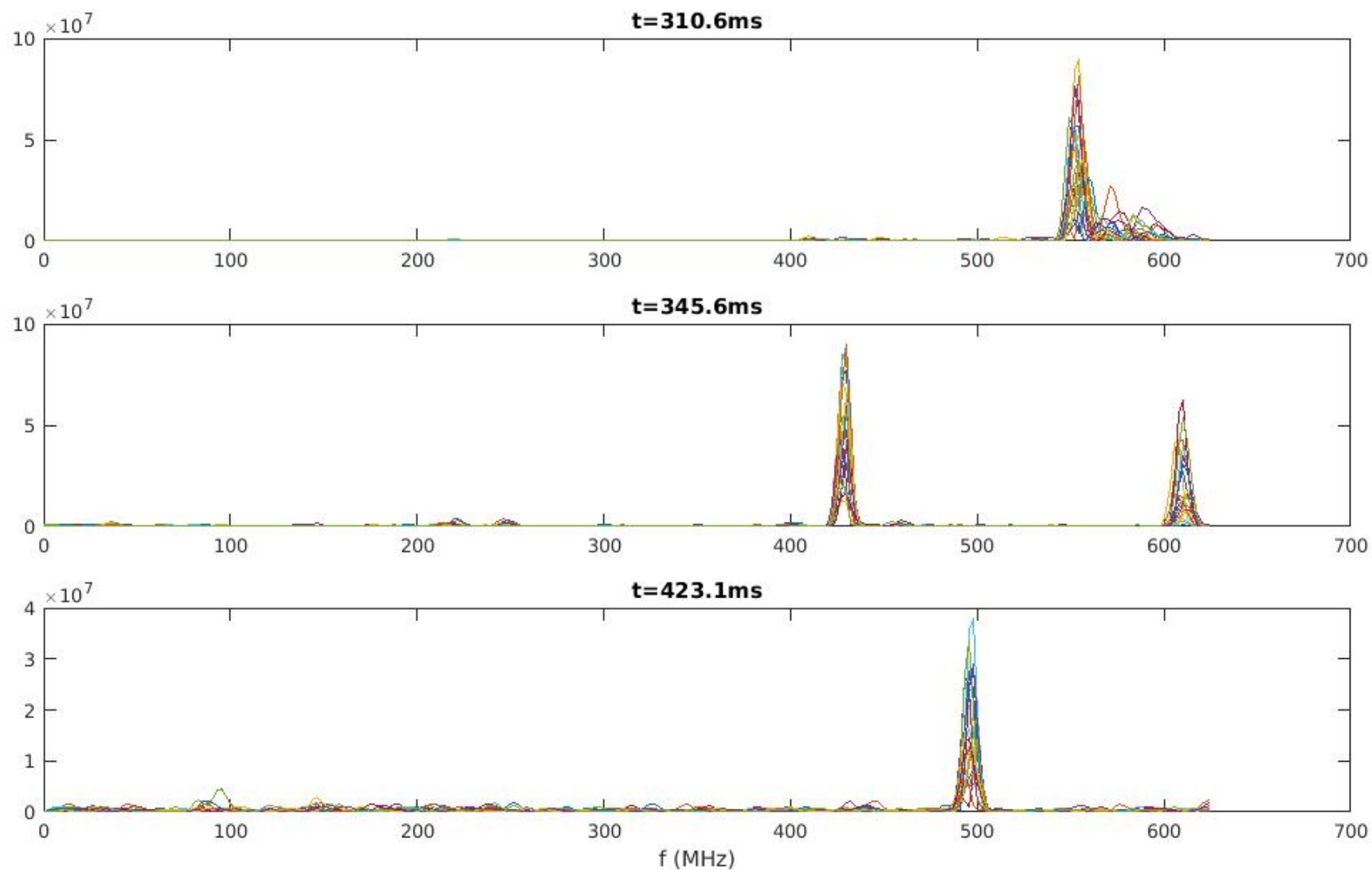


42648 lines 350 – 600 MHz



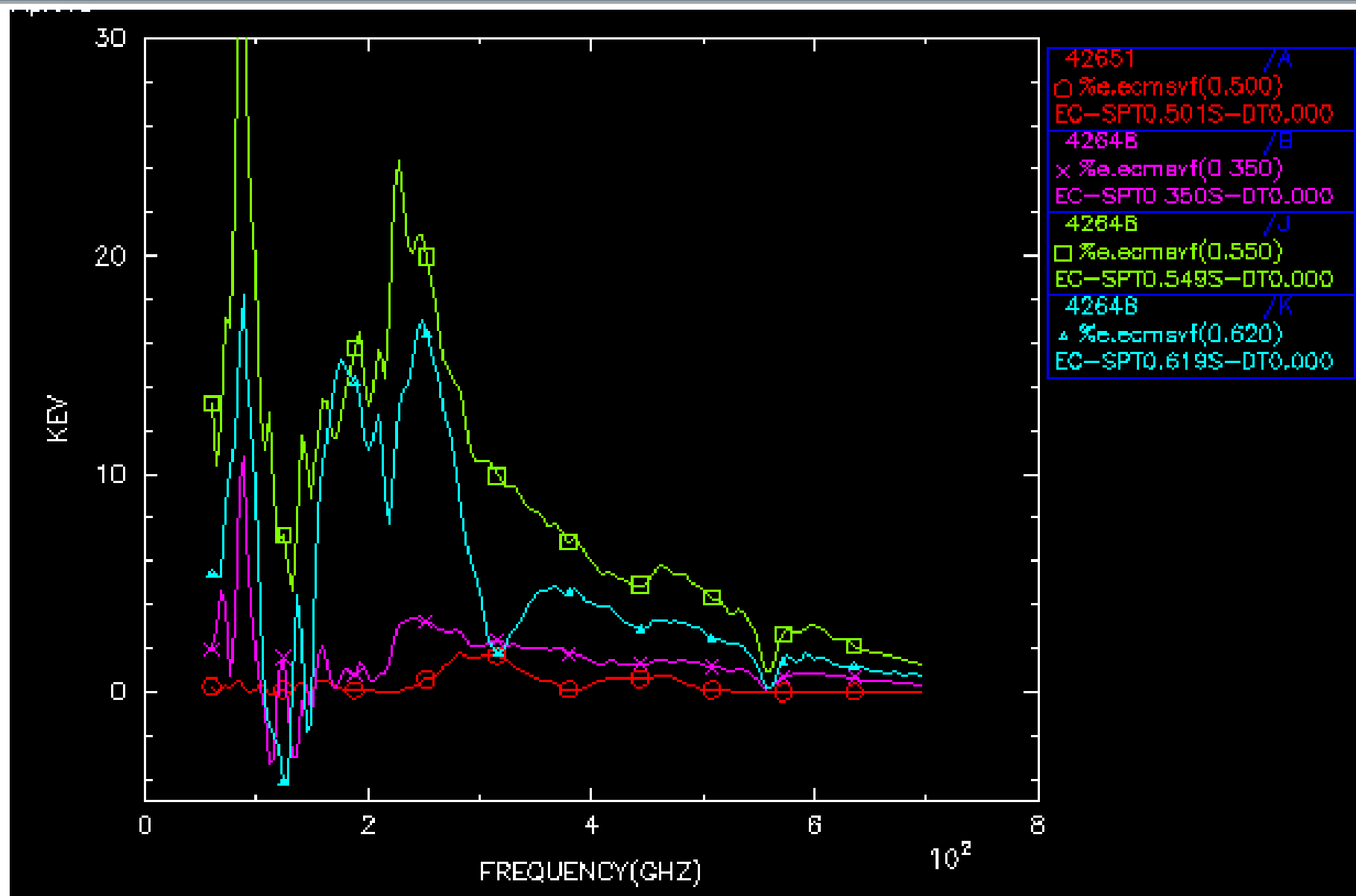
W. Bin

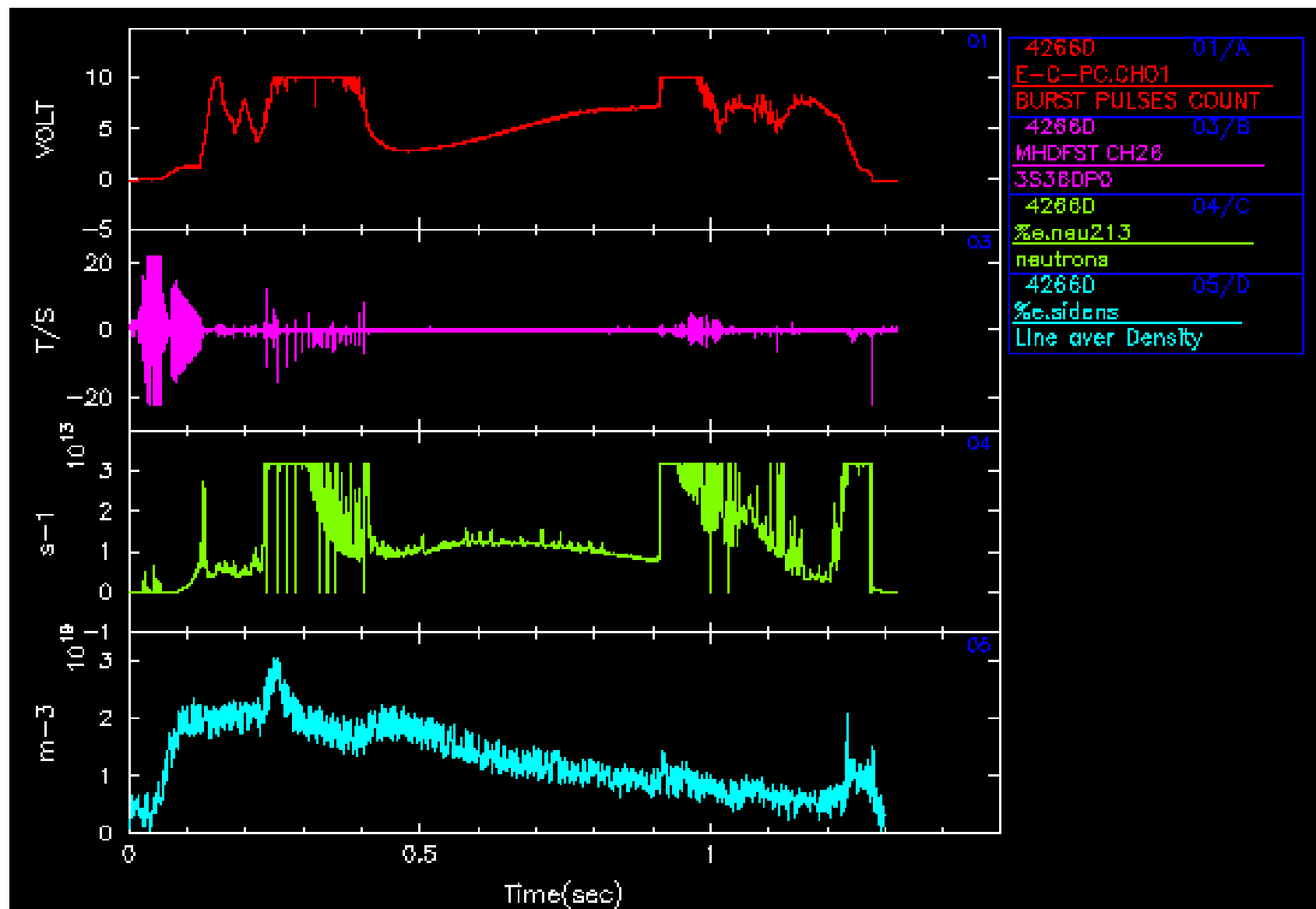
42648 time slices (time after trigger)

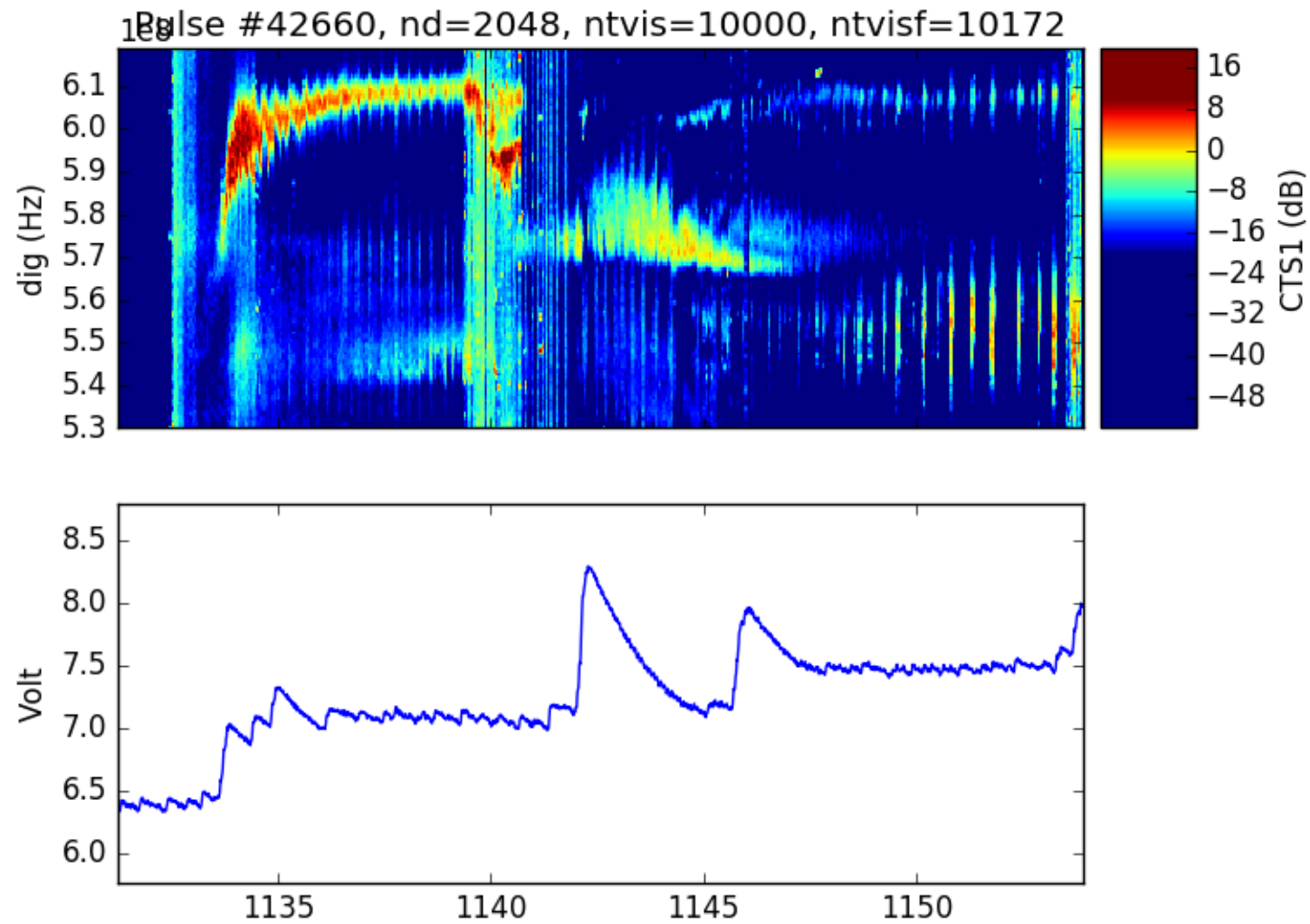


F. Napoli

42648 signs of thermal plasma reappear at 0.62 s







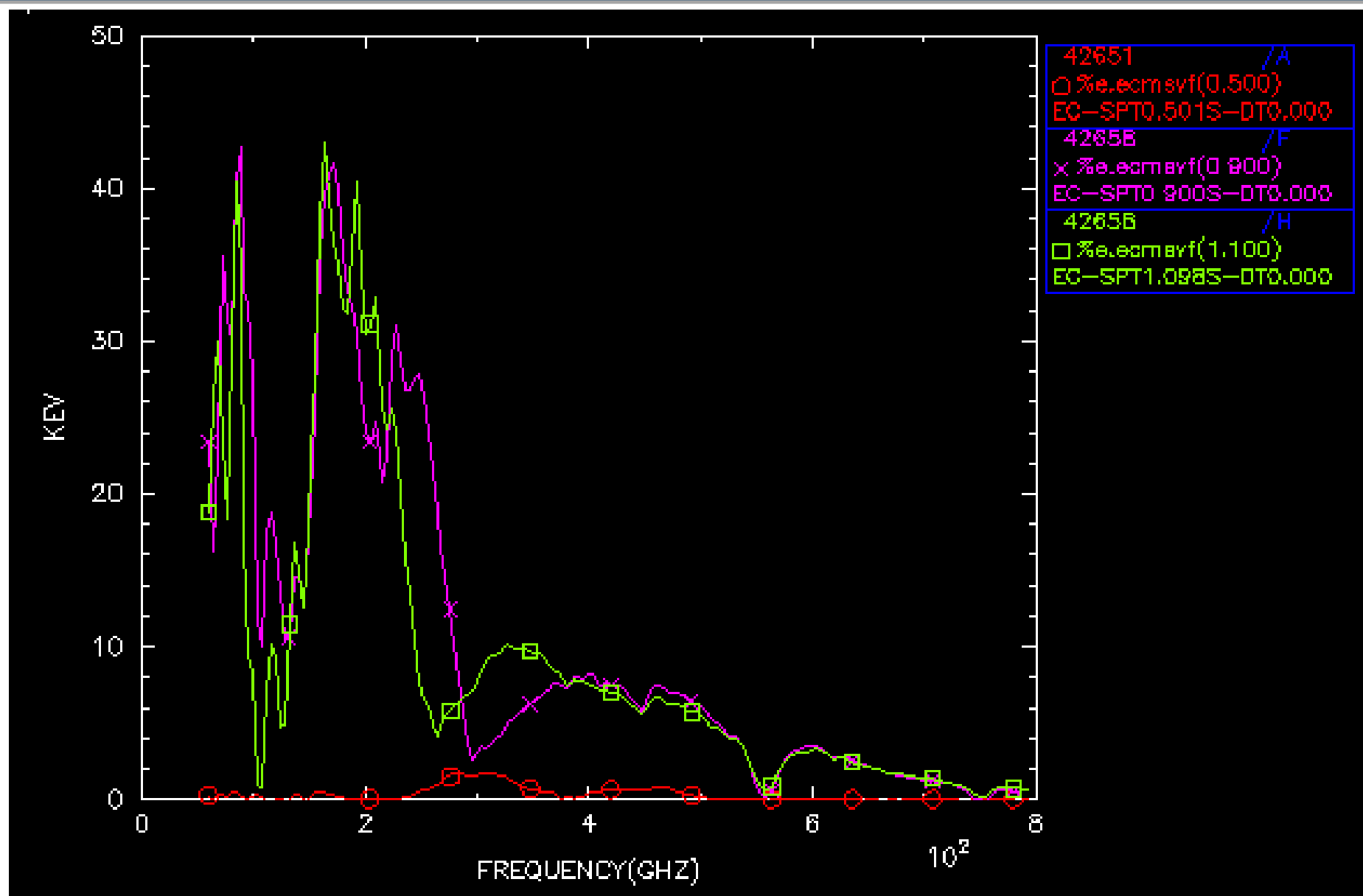
Pulse plan for 16/04 morning

- Reference 42660 5.3T/360kA with shortened duration (depending on IC1 limit and RE control request)
- Fast acquisition 0.2 - 0.45 s
- Repeat with acq 0.4 – 0.65 s
- Repeat with acq 0.6 – 0.85 s and Fe LBO at 0.7 s
- Zero for BT ramp-down
- BT ramp-down from $t = 0.5$ s (or adjust to interval with good signal)
- 5.3T/lower current for lower density
- Repeat with gas puff for density dependence
- Continue in parasitic

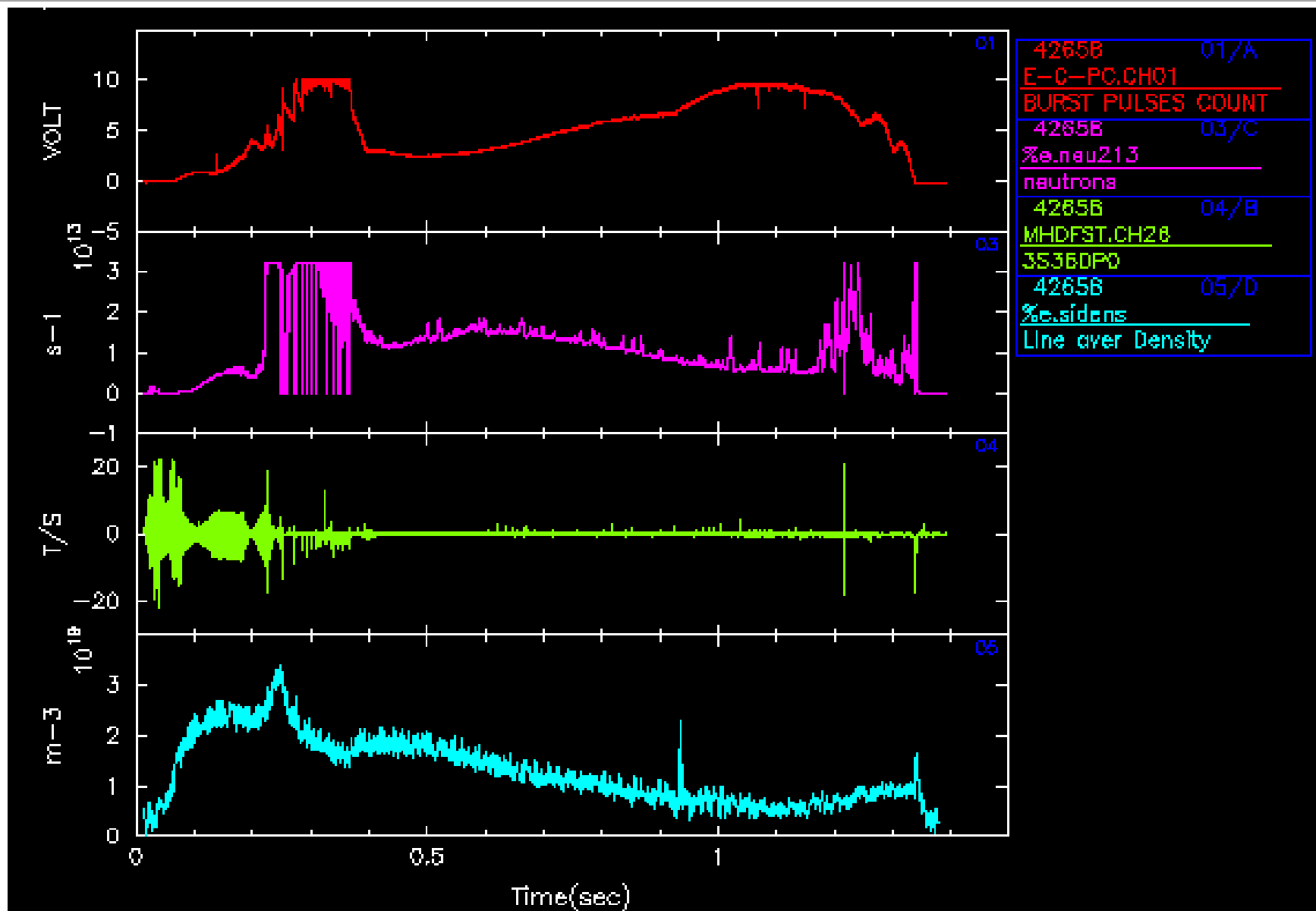
42648 (0.77 – 1.27 s)

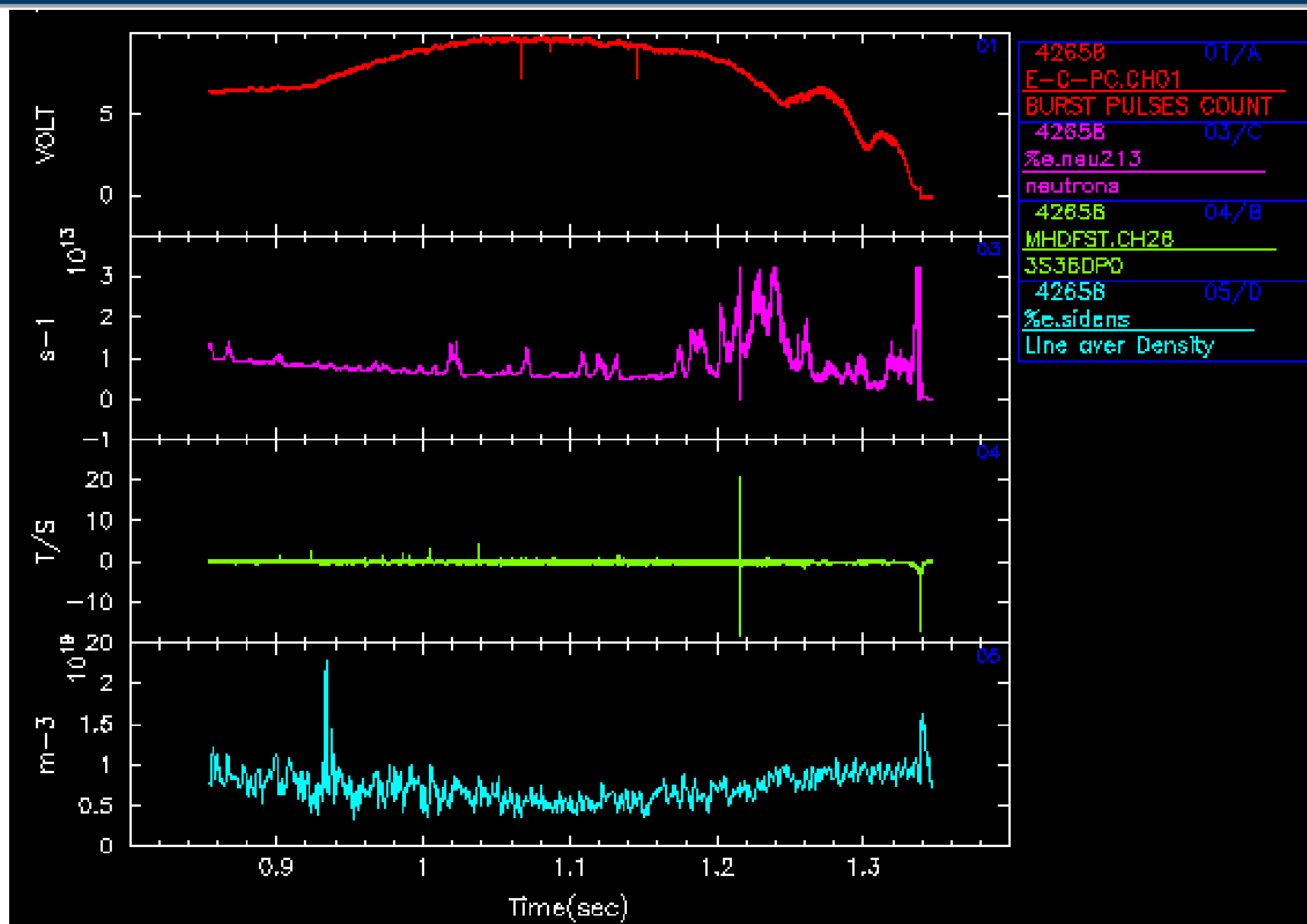
- **42648** Current quench at $t = 0.26$ s, $n < 4.E19$; end 1.3 s
0-0.26: Michelson 7V, NEU213 $2.5E13$ both with spikes; ADI
0.26-0.47: Michelson 1.2V fully non thermal, NEU213 sat, no ADI
0.47-0.61: Mich. 5V, N213 going to $1.E13$, ADI series
0.61-0.91: Mich. going up; N213 going to 0; no ADI
0.91: sudden increase of all markers
Fe LBO at 0.9
0.91-1.02: ECE up; N213 up again; ADI series
1.02-1.3: Mich 2V; N213 some spikes
- ECE spectra:
before quench: very intense with deep reabsorption (e.g. 0.14)
0.35 fully non thermal with cutoff at 220 GHz
resolved ADI .475-.485 (change of shape) and .51-.515
0.55 fully non-thermal
0.62 sign of reabsorption by thermal plasma different shape
reabsorption when $S(310) < S(400)$

42658 Large ECE but with reabsorption

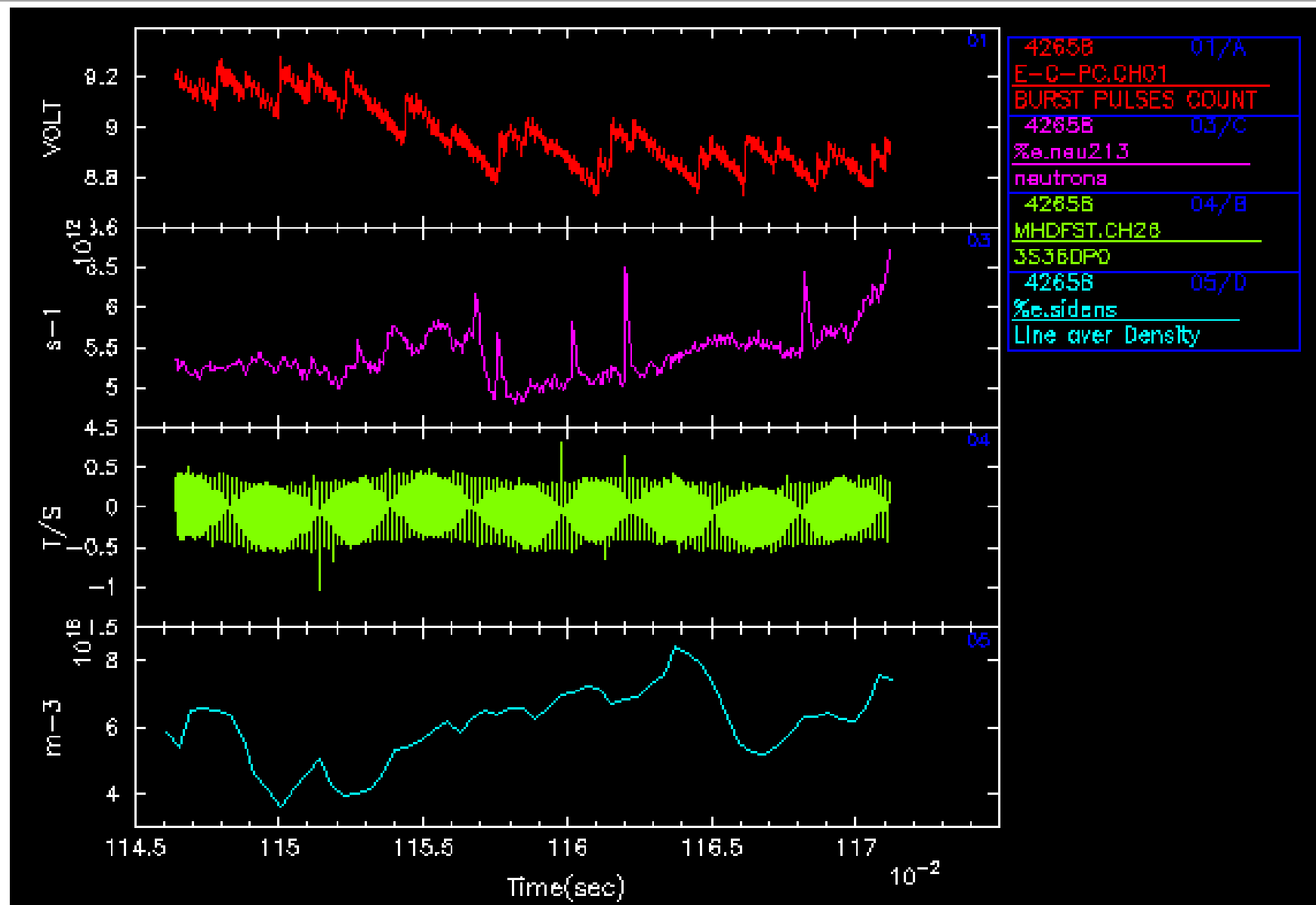


42658 (0.845 – 1.25 s)





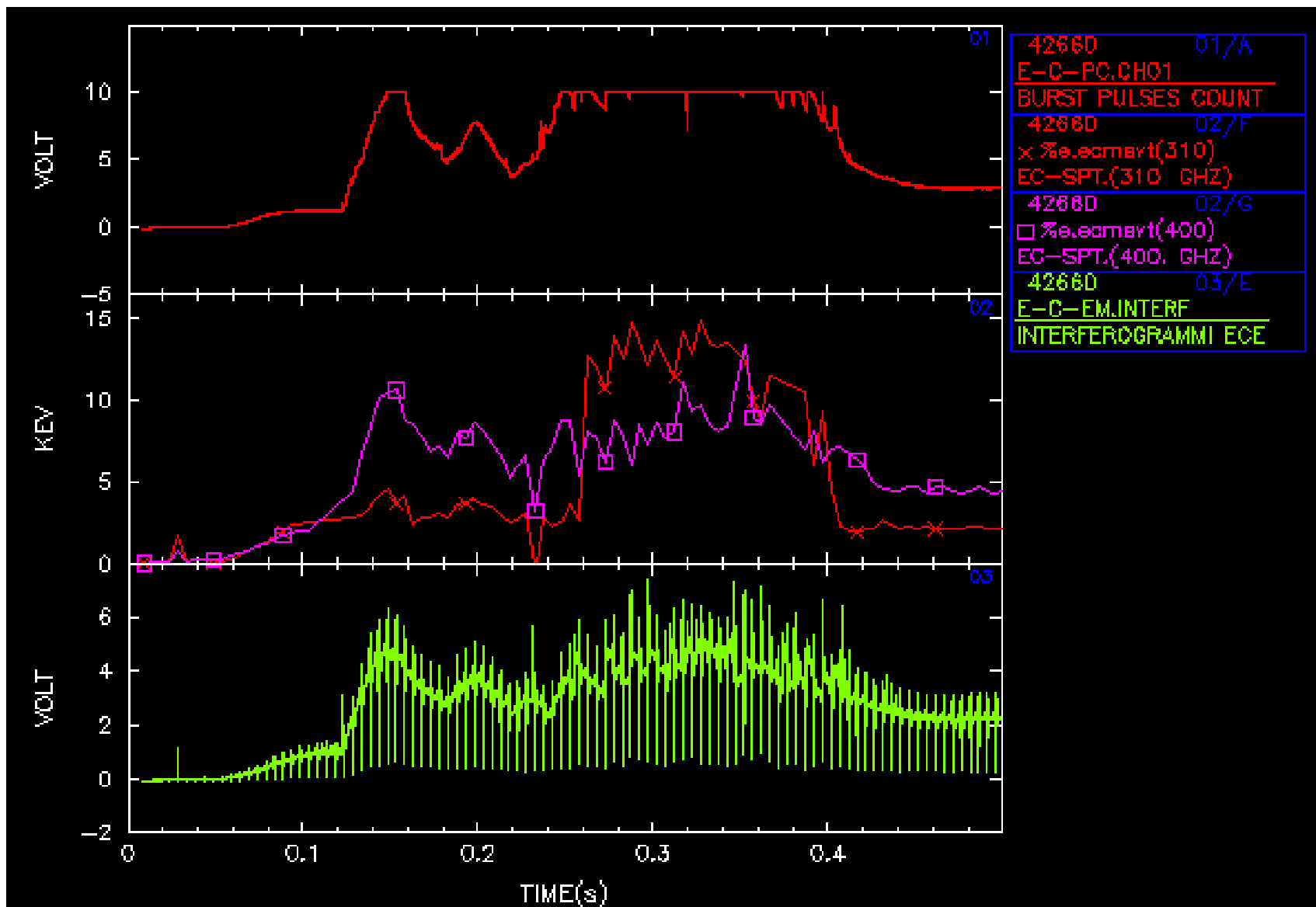
42658 very little ADI



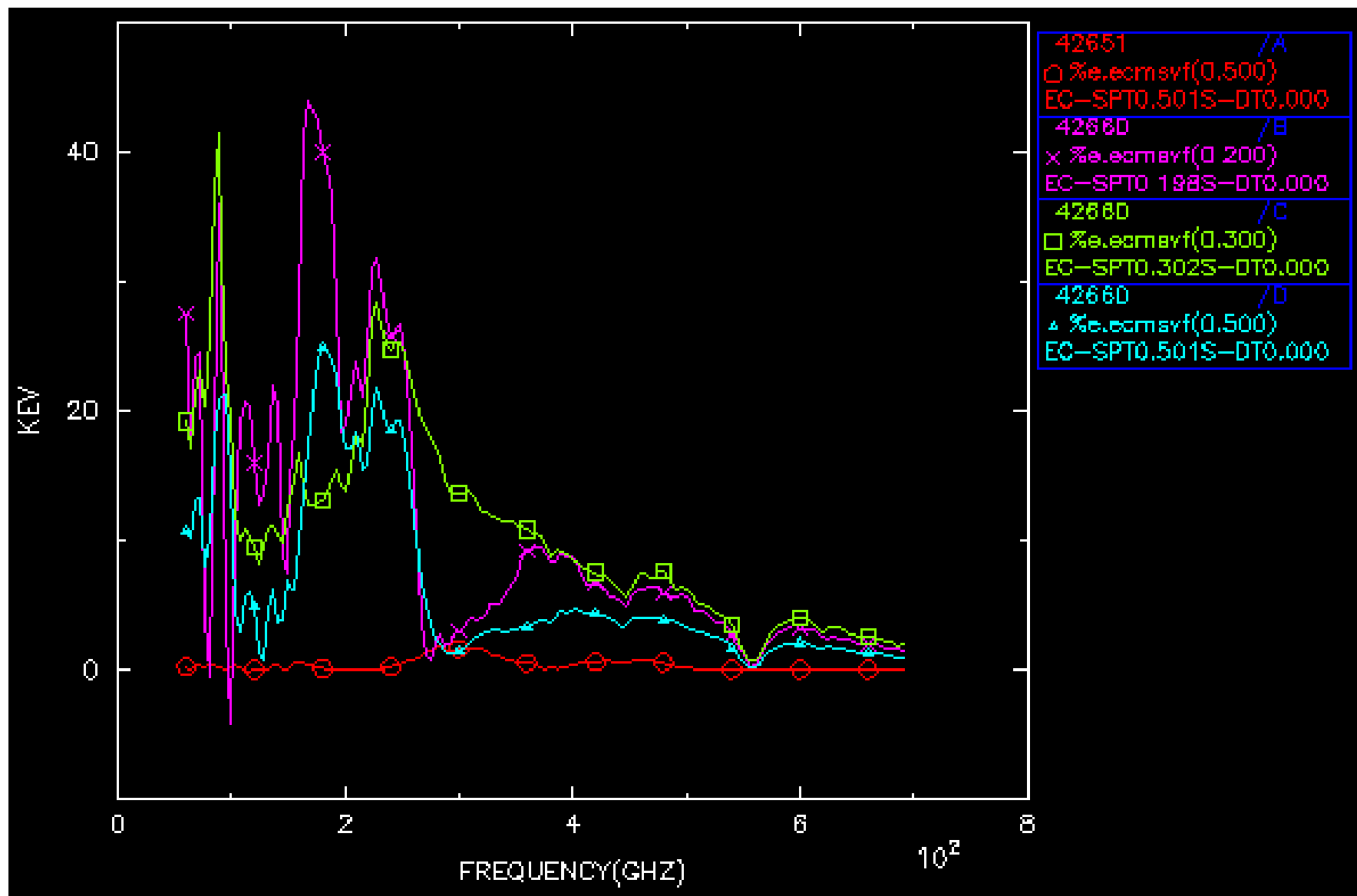
42660 (1 – 1.25 s)

- **42660** SOFT STOP $n < 3.E19$
increase of RE signals at 0.91
- Big ADI 0.24 – 0.4 s
- ECE spectra:
large radiation temperature from $t = 0.15$ s
clear thermal reabsorption at $t = 0.2$ s
fully non-thermal at 0.3 s (likely from 0.24 s)
again thermal reabsorption at 0.5 s

42660 (0.18 – 0.4 s)



42660 (0.18 – 0.4 s)

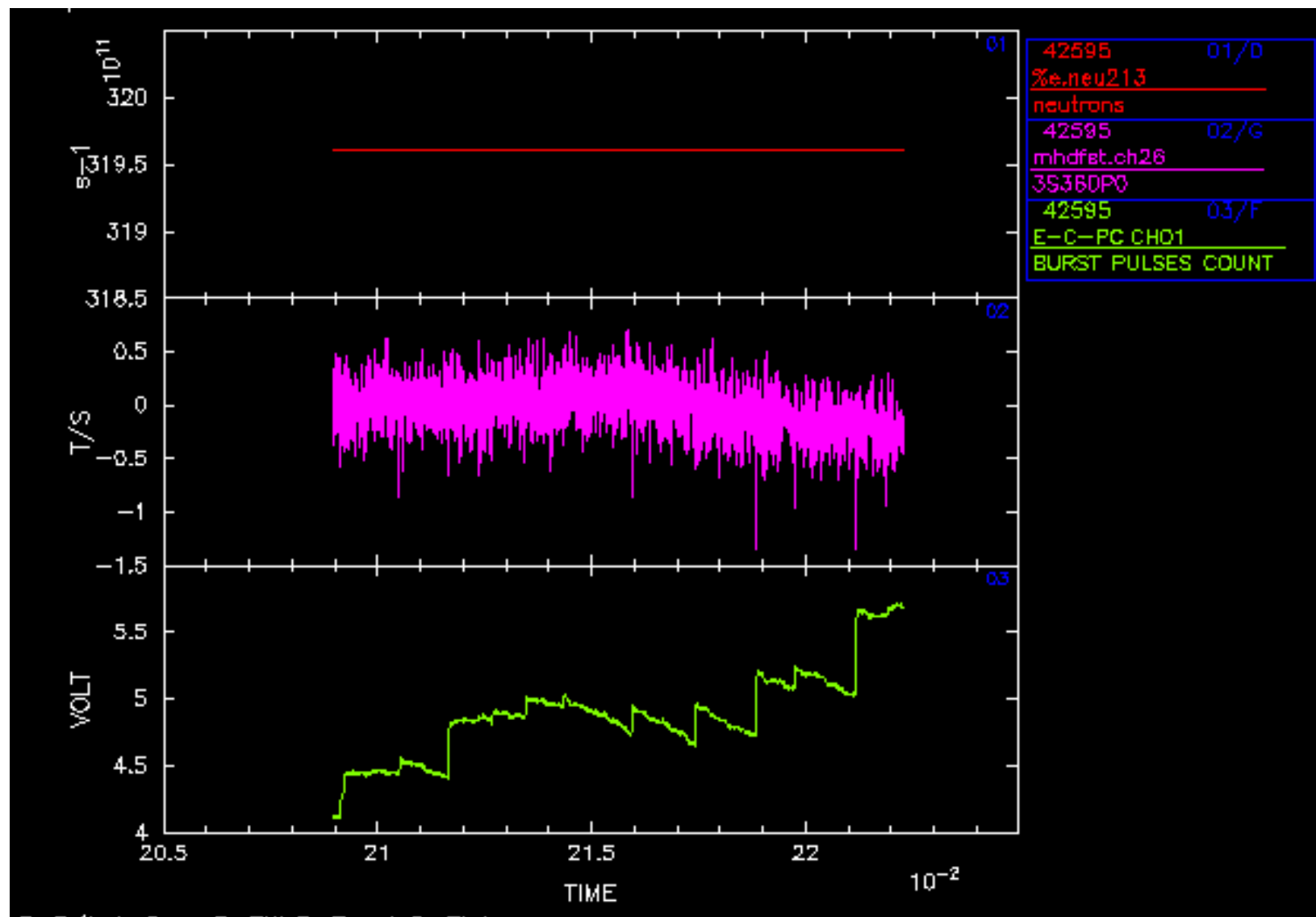


Previous slides

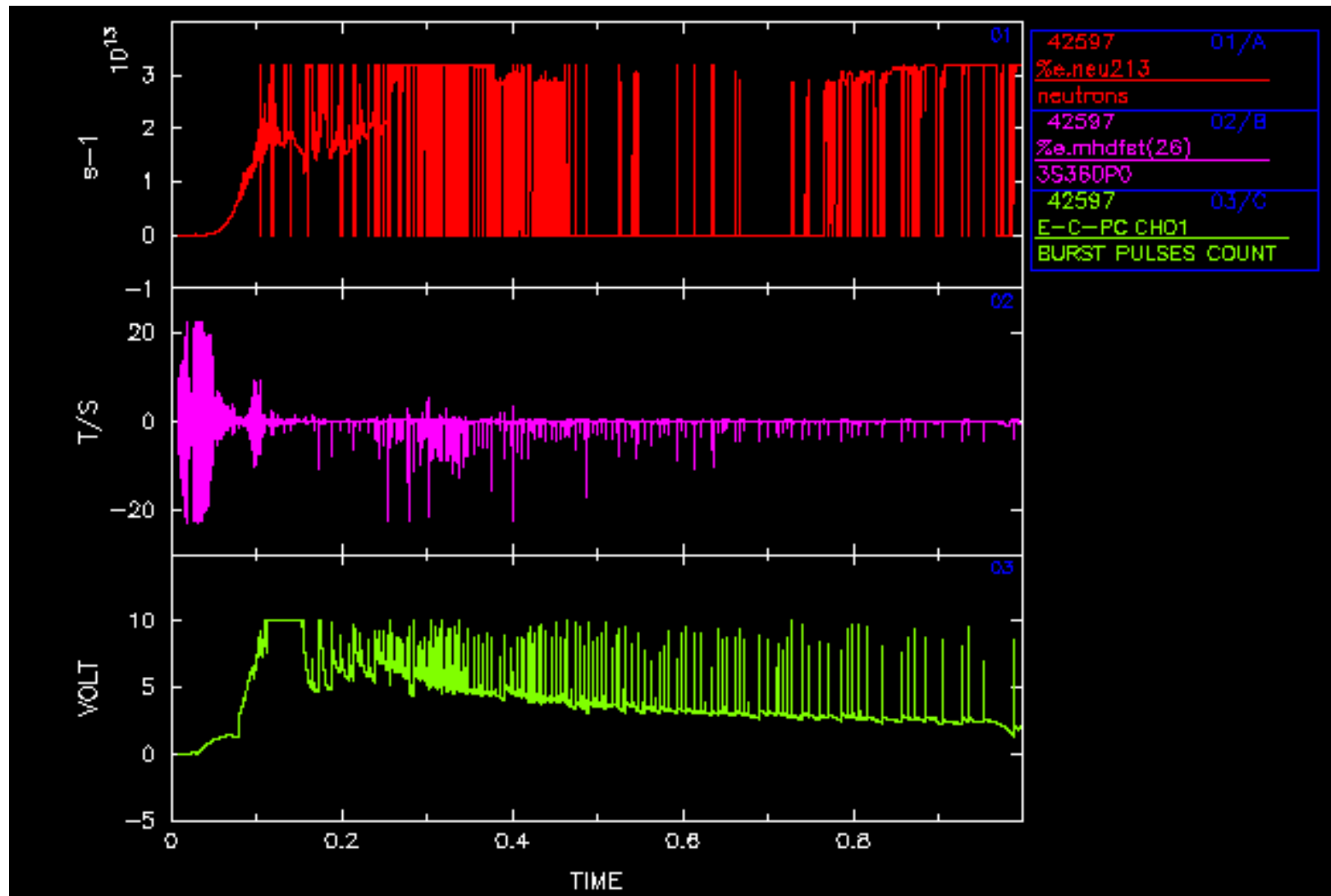
Pulse list (all 5.3 T 500 kA)

- **42588** interesting RE dynamics with locked mode
- **42589** NEU213 to 5E12; thermal ECE
- **42590** Repetitive instabilities with hard-x bursts and decreasing ECE
- **42591** NEU213 to 2.5E13 suprathermal ECE, no ADI
- **42594** NEU213 > 3.3E13 (sat.). Little ADI evidence (ECE jumps at $t = 0.27$ and 0.6 s, no magnetic spikes). Different synchrotron spot.
- **42595** slightly stronger ADI with magnetic counterpart.
- **42596** some gas. NEU213 near sat. Little ADI.
- ----- F18 pulse:
- **42597** big ADI, record spikes on ECE

Previous slides



42597 big ADI, record spikes on ECE



Results and actions

- No detection of low-frequency waves, including the pulse with extreme instabilities.
- Frequency ranges scan
 - 400-600 MHz #42595
 - 600-760 MHz #42596
 - 760-940 MHz #42594

Actions (parasitic 09/04)

- Decrease bandwidth
- Use low-attenuation cable
- Use CTS acquisition
- Try Langmuir probes as antennas (after 09/04).