

# Noise tests in ArgoNeuT during above-ground commissioning

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- Maddalena and I have investigated various sources of noise in ArgoNeuT.
- We started by unplugging all possible sources of noise. We then turned things on one by one, taking a test run each time.
- 10 random triggers were taken per configuration. The following event displays represent the average of the 10 random triggers.

“Everything off” is defined as having the following unplugged and off:

heater15 (bottom of the cryostat), level meter, scale, HV to cathode and cage, wire plane bias voltages, scintillator paddles, cable to vacuum gauge on Pfeifer turbo, purity monitor HV, purity monitor lamp, cryostat thermocouples 12 and 13, NIM crate (trigger logic), NIM crate (purity monitor).

# Not noisy at all

- Level meter
- Cryostat thermocouples (12 & 13)
- Heater 15 w/ control box off
- Pressure gauge on outer cryostat
- Trigger logic NIM crate
- Scale
- Scintillator paddles
- Purity monitor lamp
- Guard vacuum pump

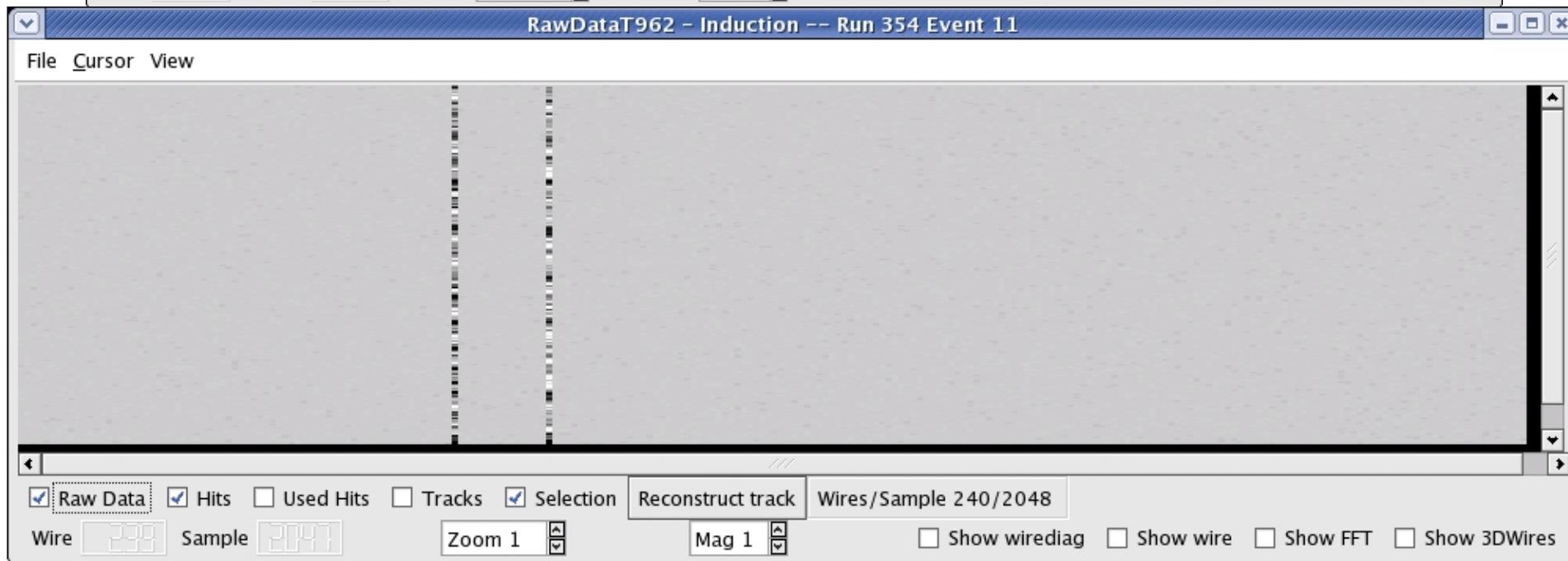
# Barely noisy

- Wire plane bias
  - All wires at 0kV
    - A single wire on the collection plane shows a bit of random-noise
  - shield=-134V, induction=0V, collection=0V
    - The same single wire on the collection plane
  - shield=0V, induction=-82V, collection=0V
    - Two wires on the collection plane including the same single wire on the collection plane.
  - shield=0V, induction=0V, collection=10V
    - The same single wire on the collection plane
- Cathode/field cage HV at 0kV
  - A single wire on the collection plane shows a bit of random-noise

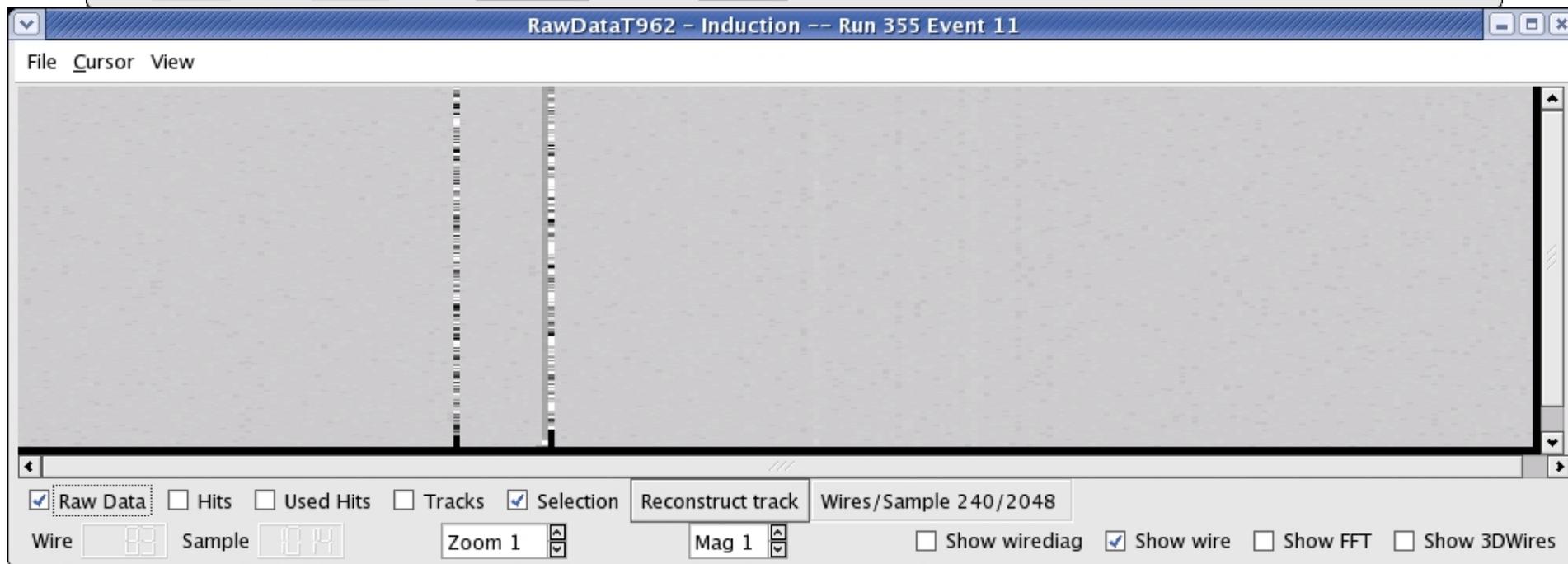
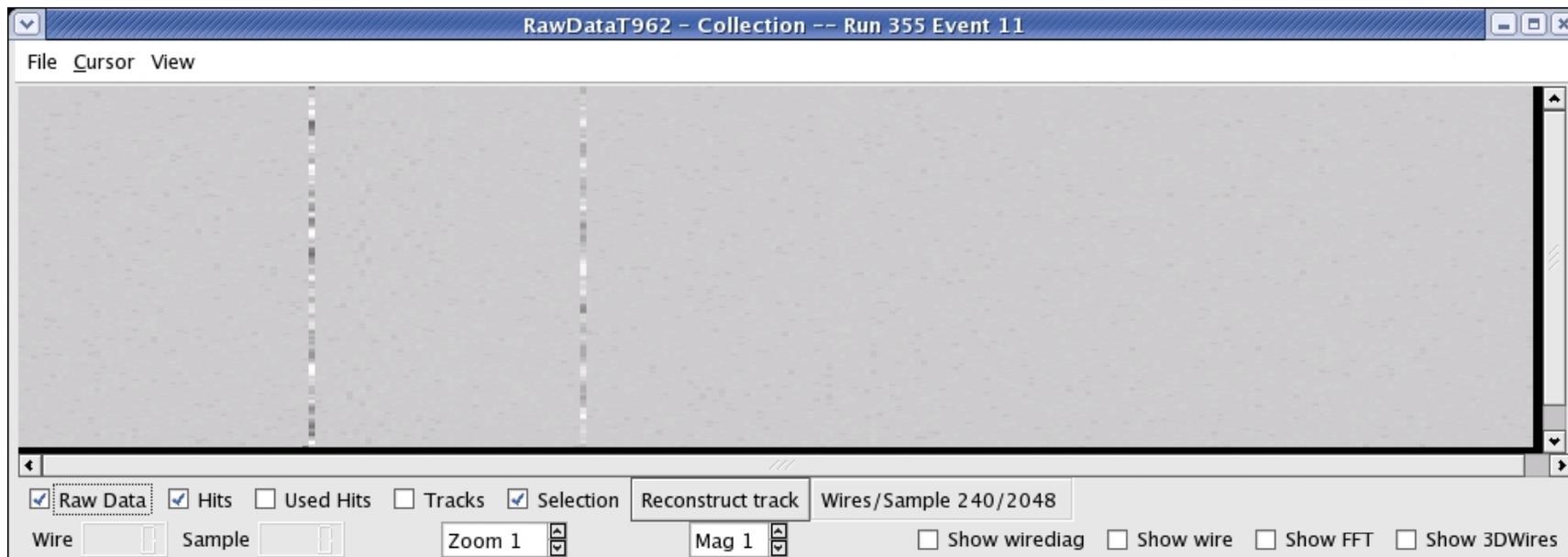
# Noisy (in order from least to most noisy)

- Purity monitor NIM crate (cathode/anode HV are off)
  - Noise is scattered randomly across both induction and collection.
  - Note that (strangely) this type of noise is not visible during the purity monitor run below (w/ HV on). We need to re-examine the 10 event displays one at a time for this run.
- Purity monitor HV (-110V cathode, 1500V anode)
  - Noise is lower frequency, periodic, and on both induction and collection.
- Cathode/field cage HV at -4kV
  - Noise is higher frequency, periodic, and on both induction and collection.
  - Note that the HV current draw is non-Ohmic above -4kV and the preamps get saturated at -10kV.
- Heater 15 w/ control box on mode 5
  - Noise is higher frequency, periodic, and on both induction and collection
- Heater 15 w/ control box on mode 1
  - Noise is higher frequency, periodic, and on both induction and collection
  - Note that “mode” refers to the control box AC waveform. Mode 1 is a chopped AC and mode 5 is a smoother AC waveform.
- The four obviously noisy wires (2 collection, 2 induction)
  - Noise is random.
  - Note that sometimes one of the noisy wires on the induction plane appears to cause an adjacent wire to be noisy. The pedestal seems to uniformly increase for this adjacent wire except at the highest time bins.

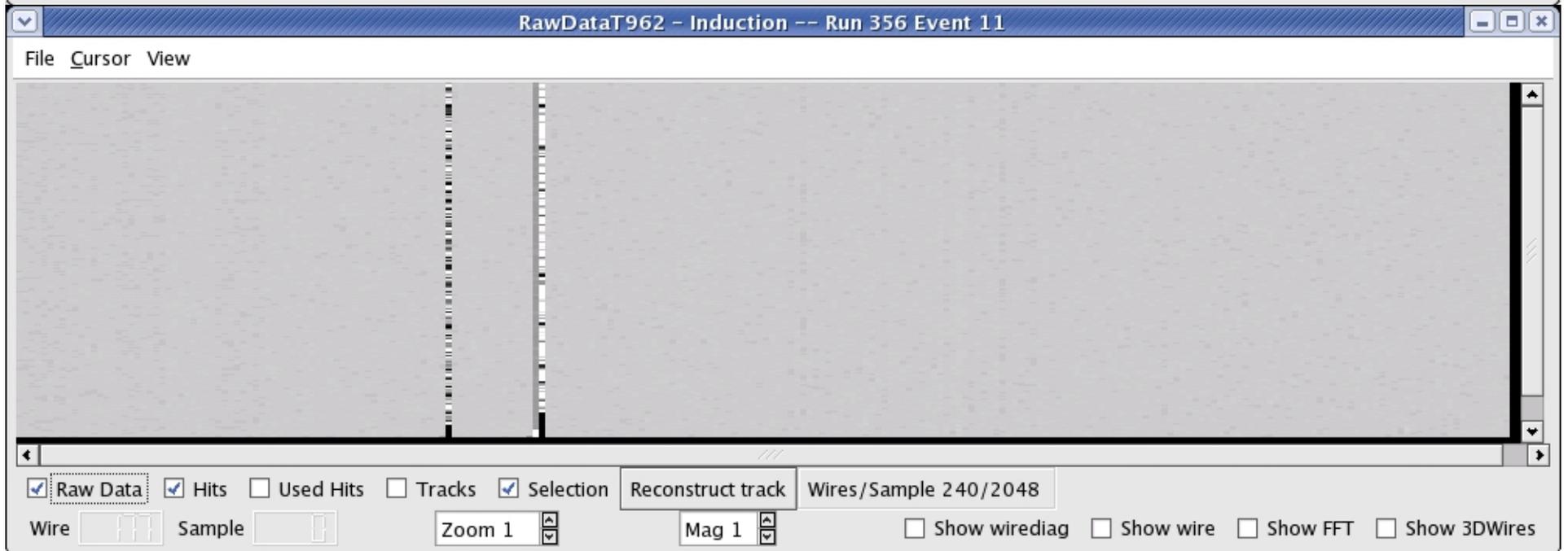
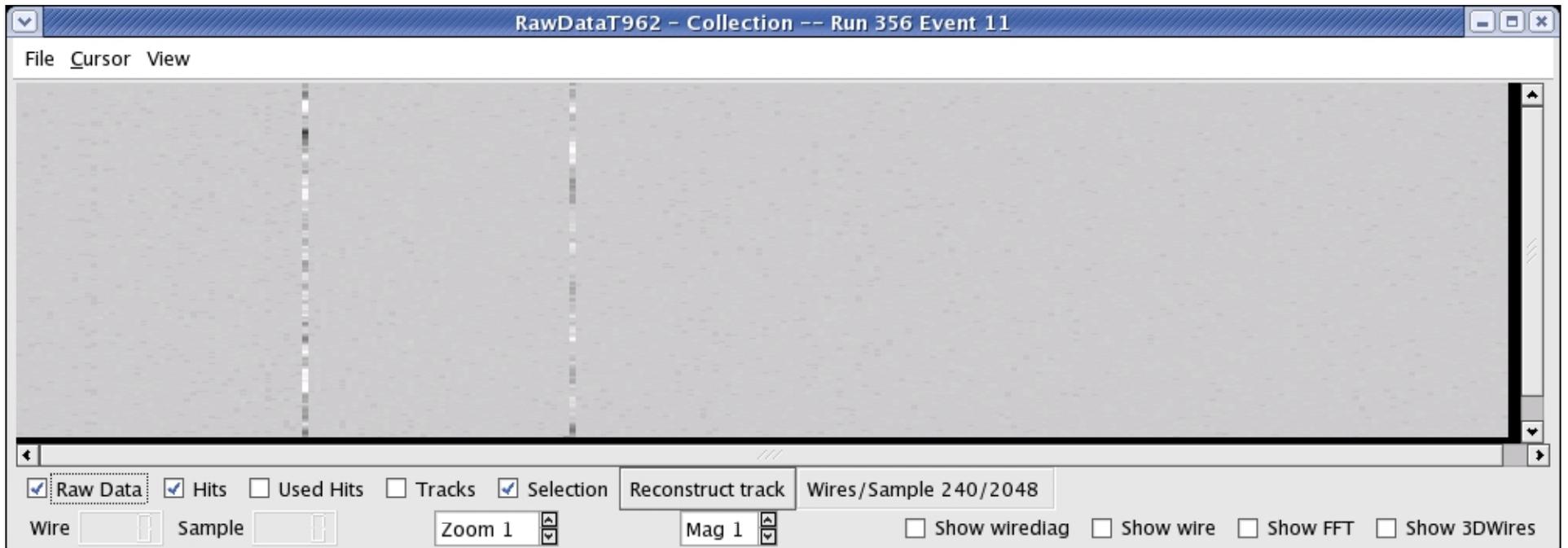
# Everything off



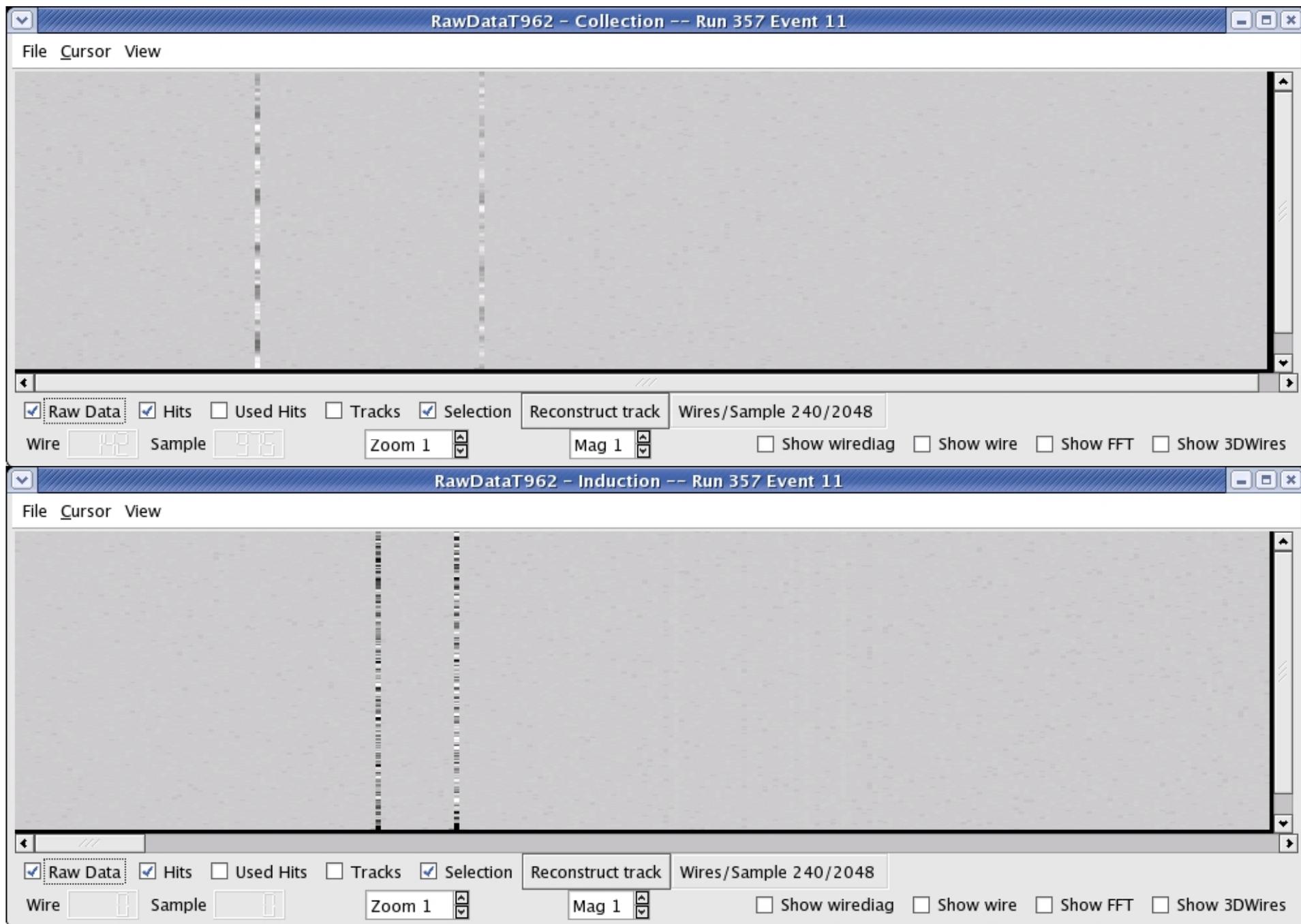
# Everything off except level meter



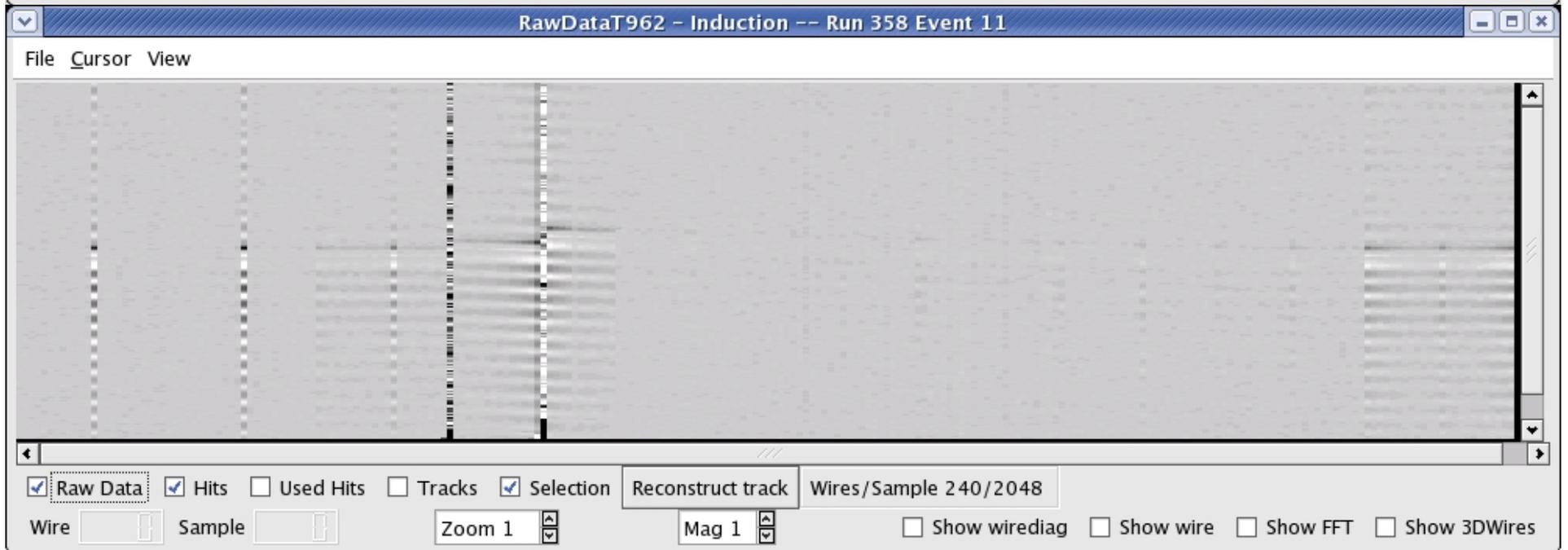
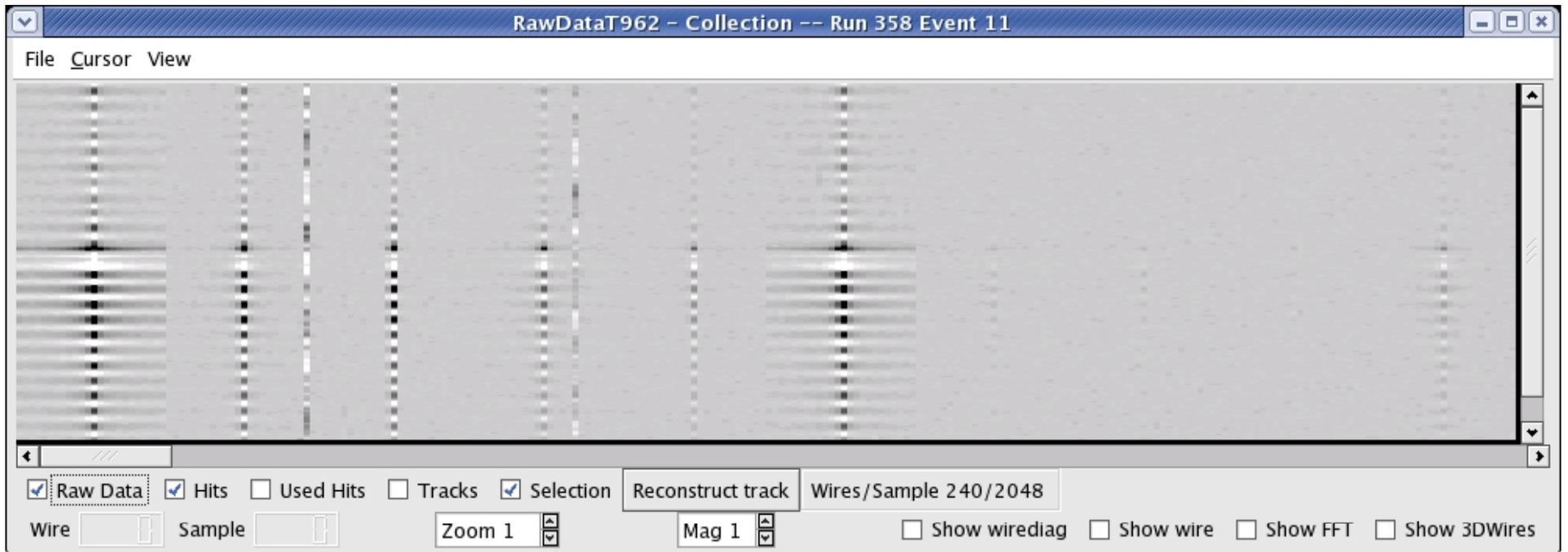
Everything off except cryostat thermocouples are plugged in



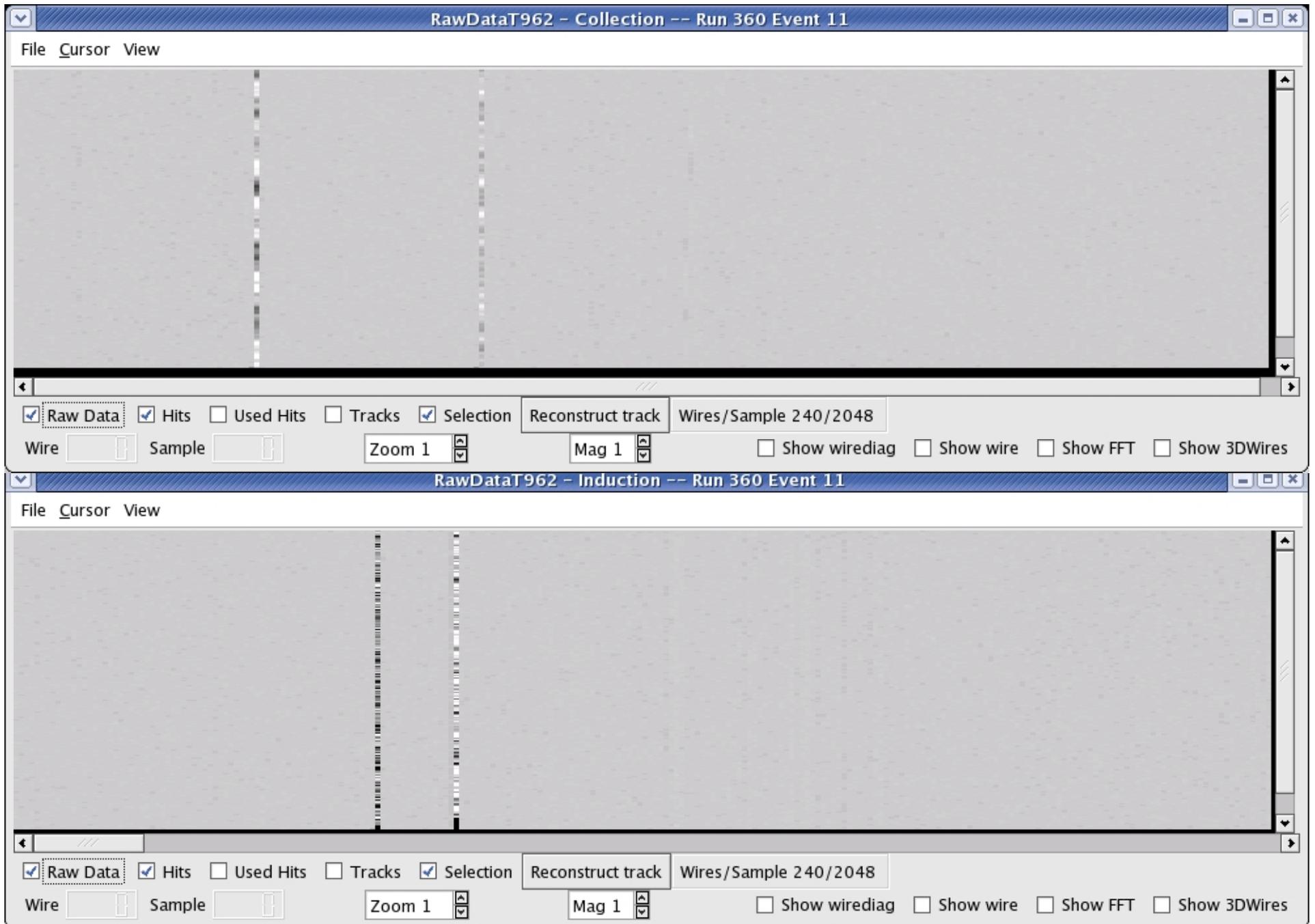
Everything off except heater15 plugged in (control box is off)



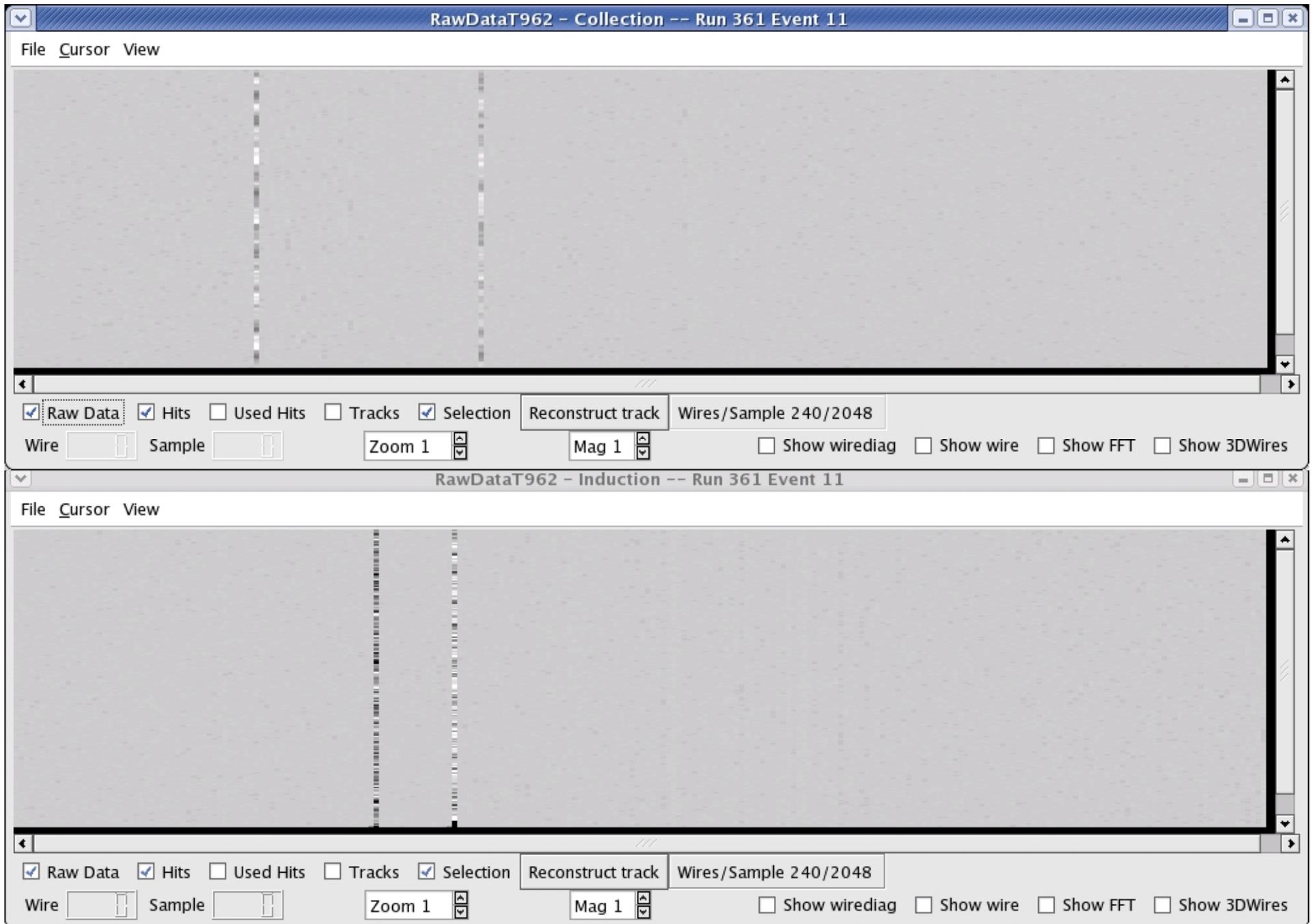
Everything off except heater15 plugged in (control box is on mode 1, heater off)



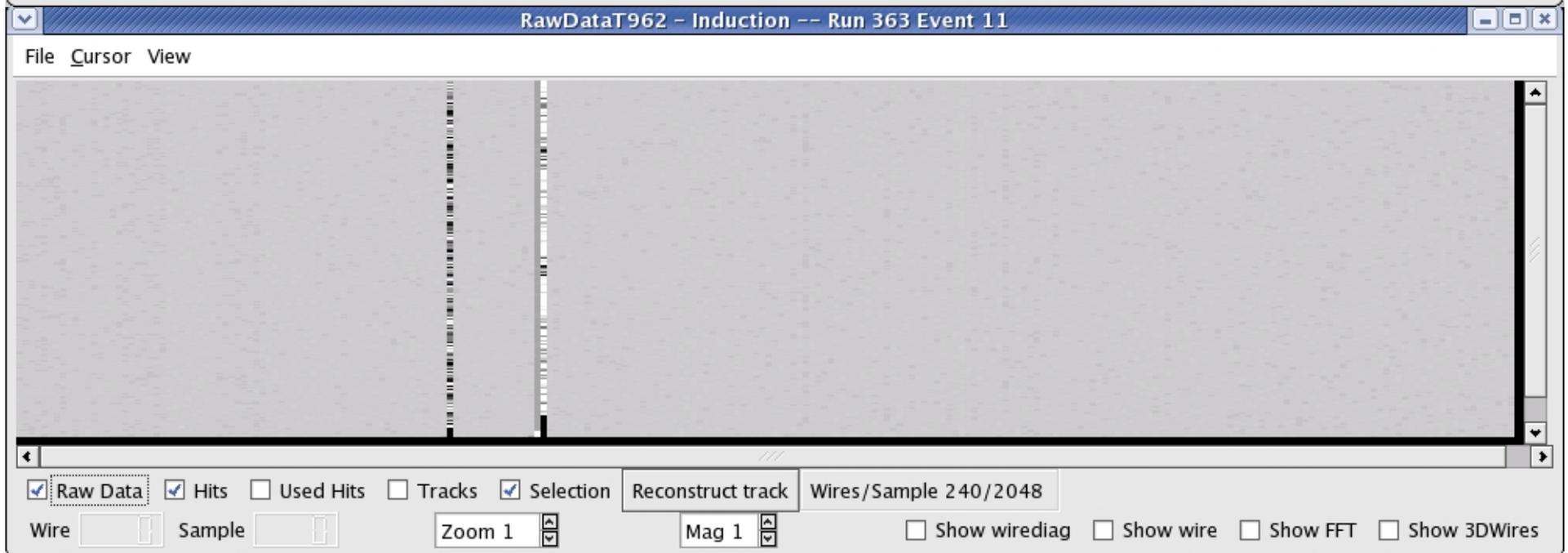
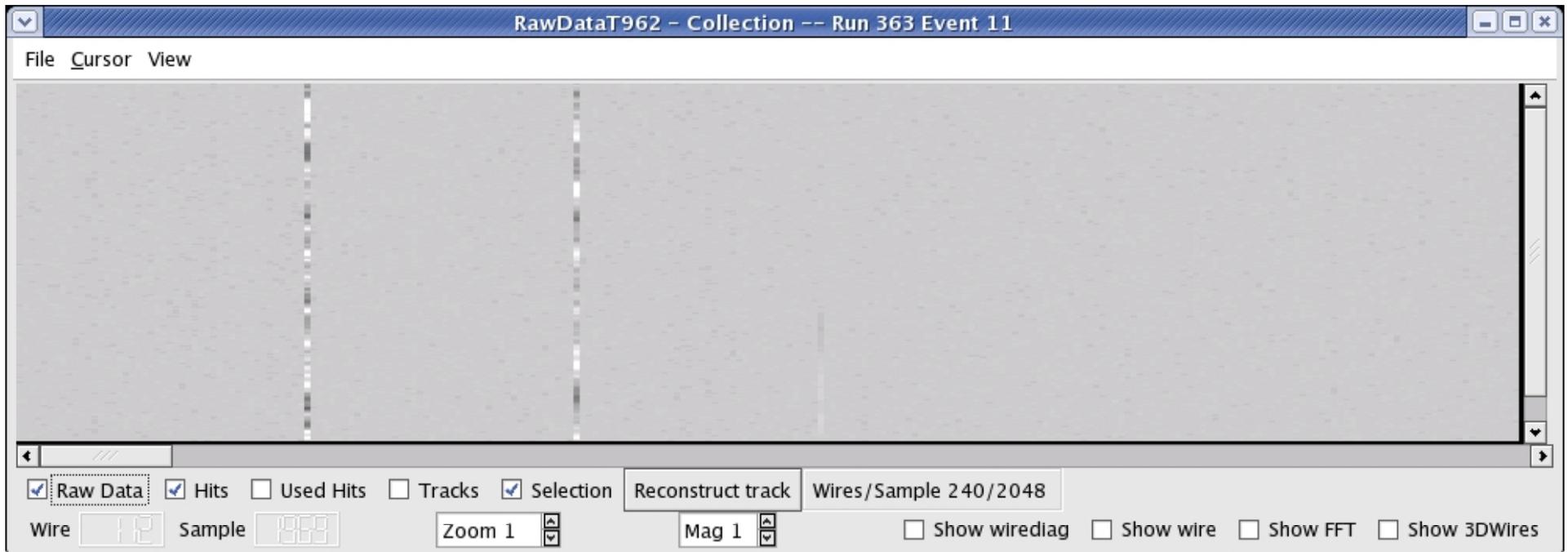
Everything off except NIM crate (trigger logic) is on



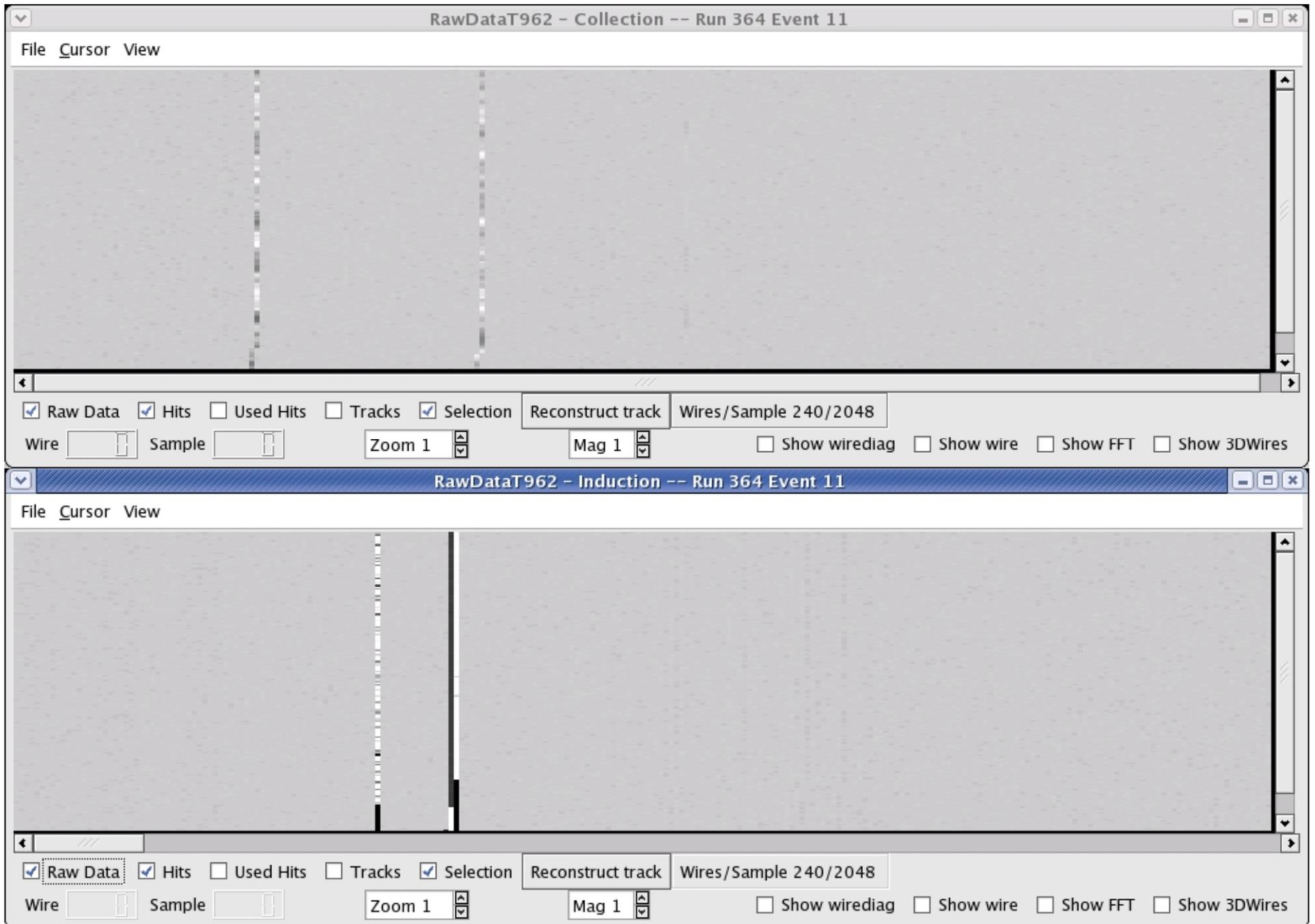
Everything off except scale is plugged in and on



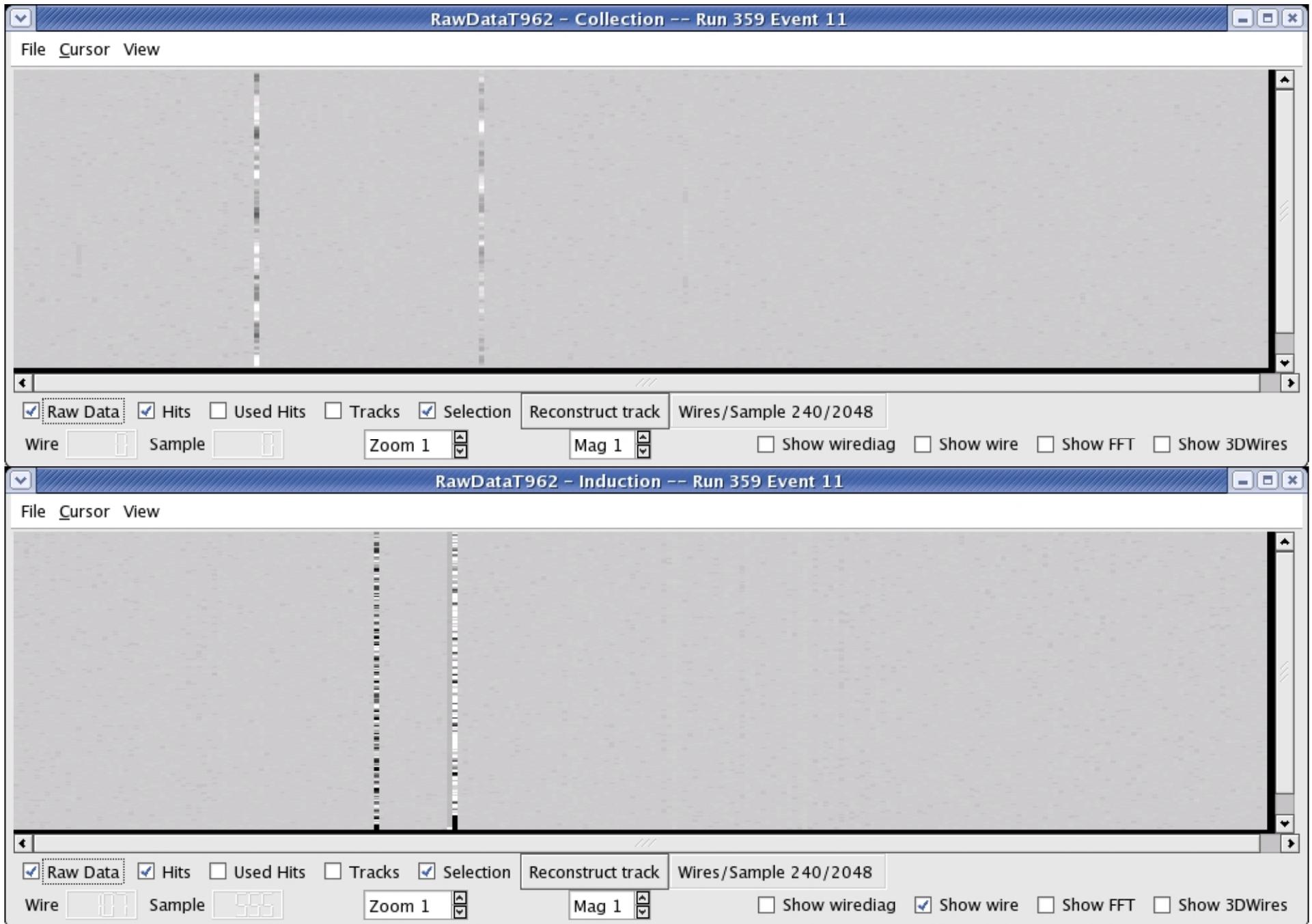
# Everything off except cathode/field cage HV=0kV



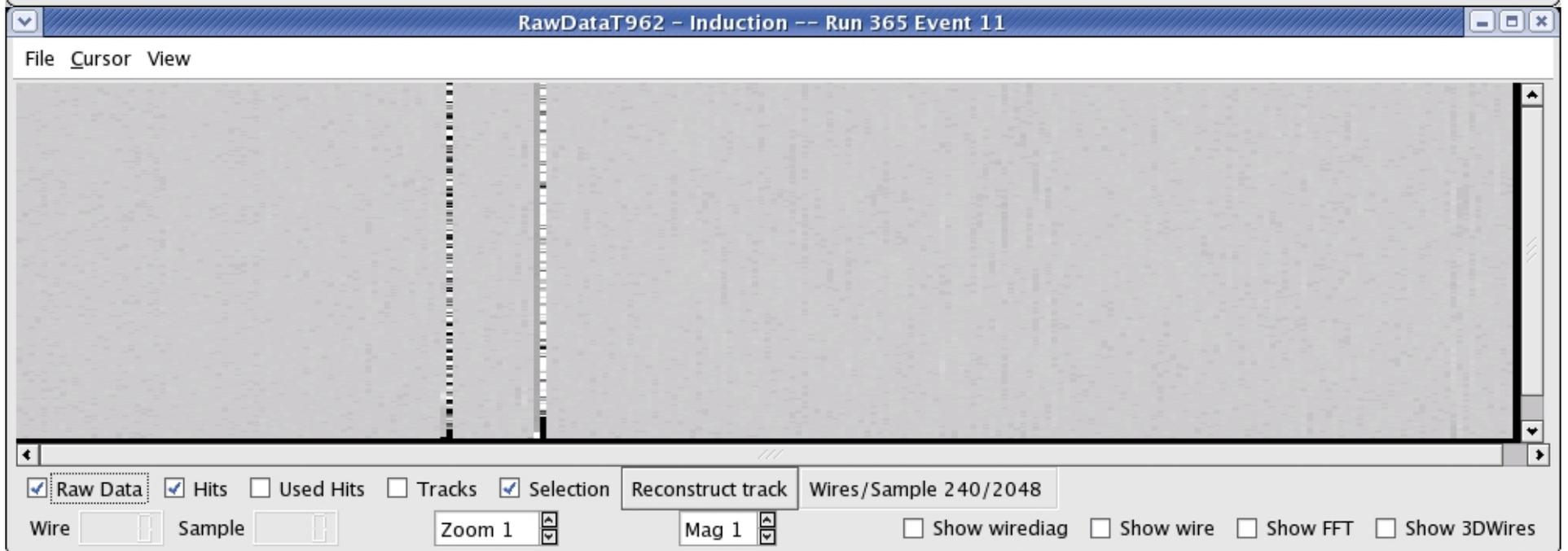
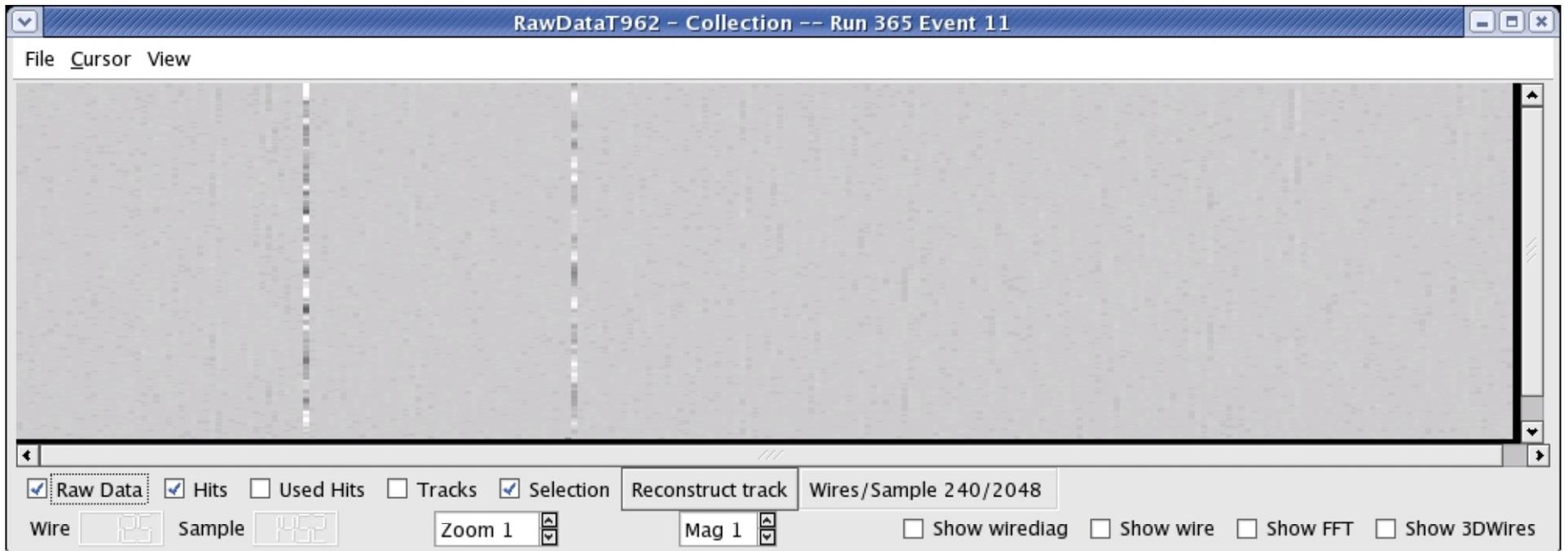
Everything off except scintillator paddles are on



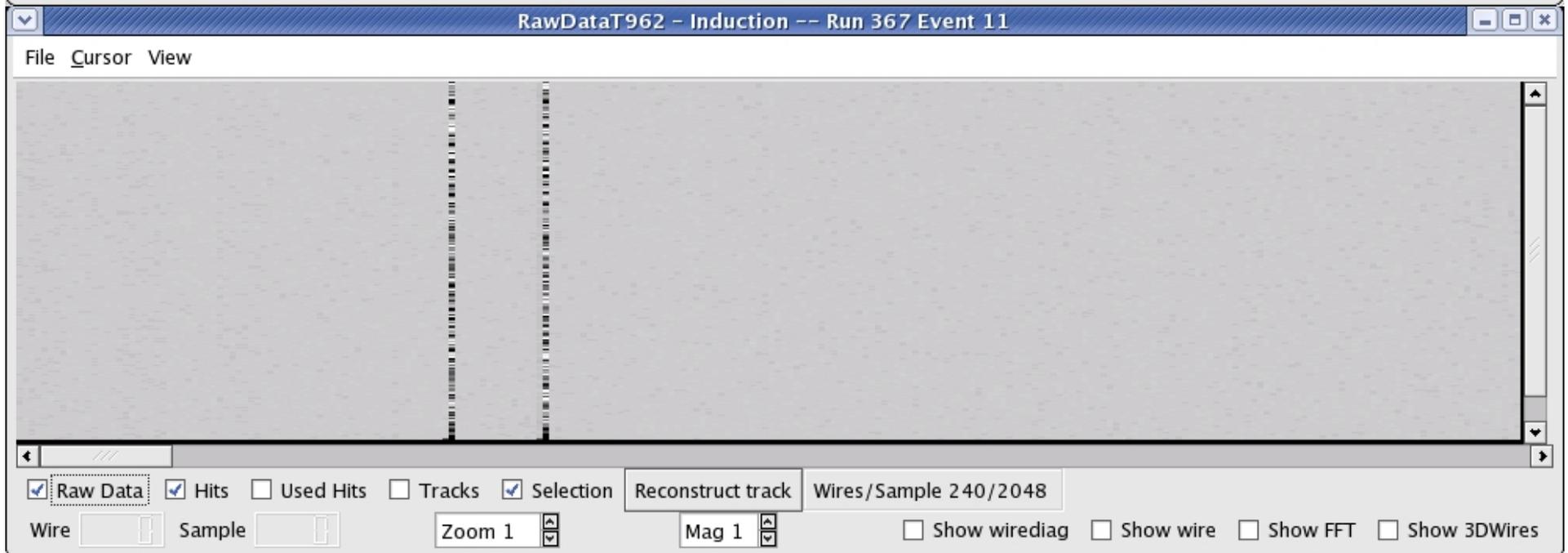
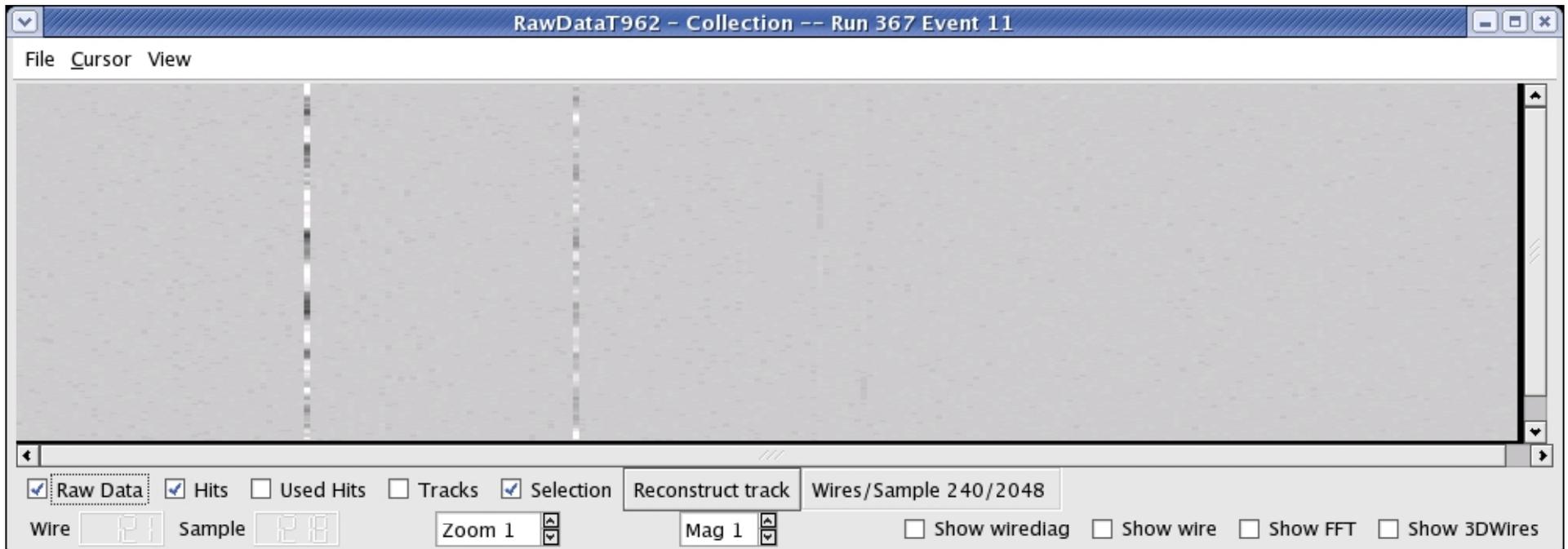
Everything off except pressure gauge on outer cryostat plugged in and on



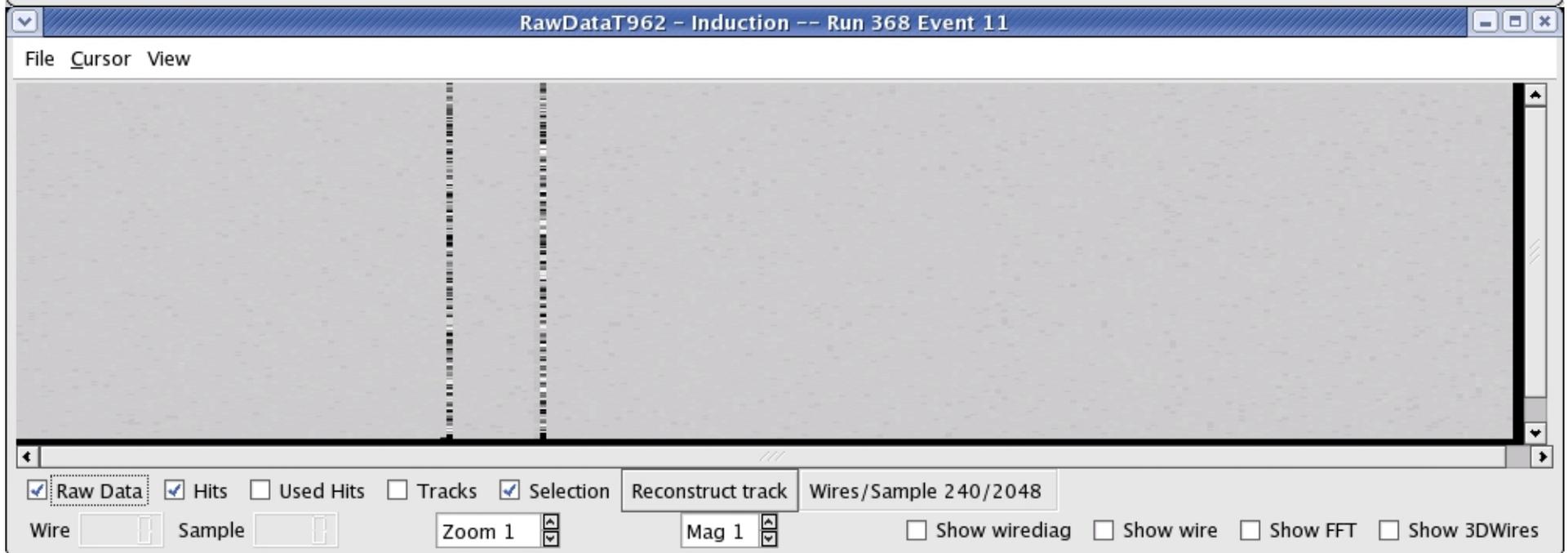
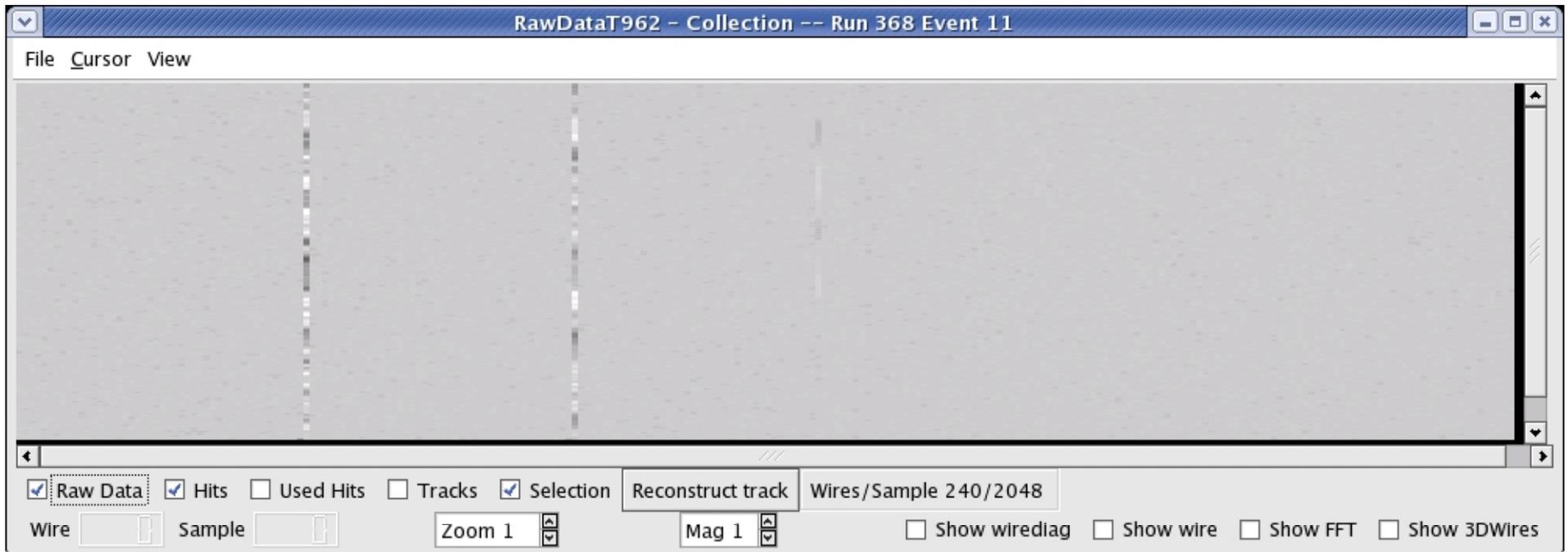
Everything off except NIM crate (purity monitor) is on



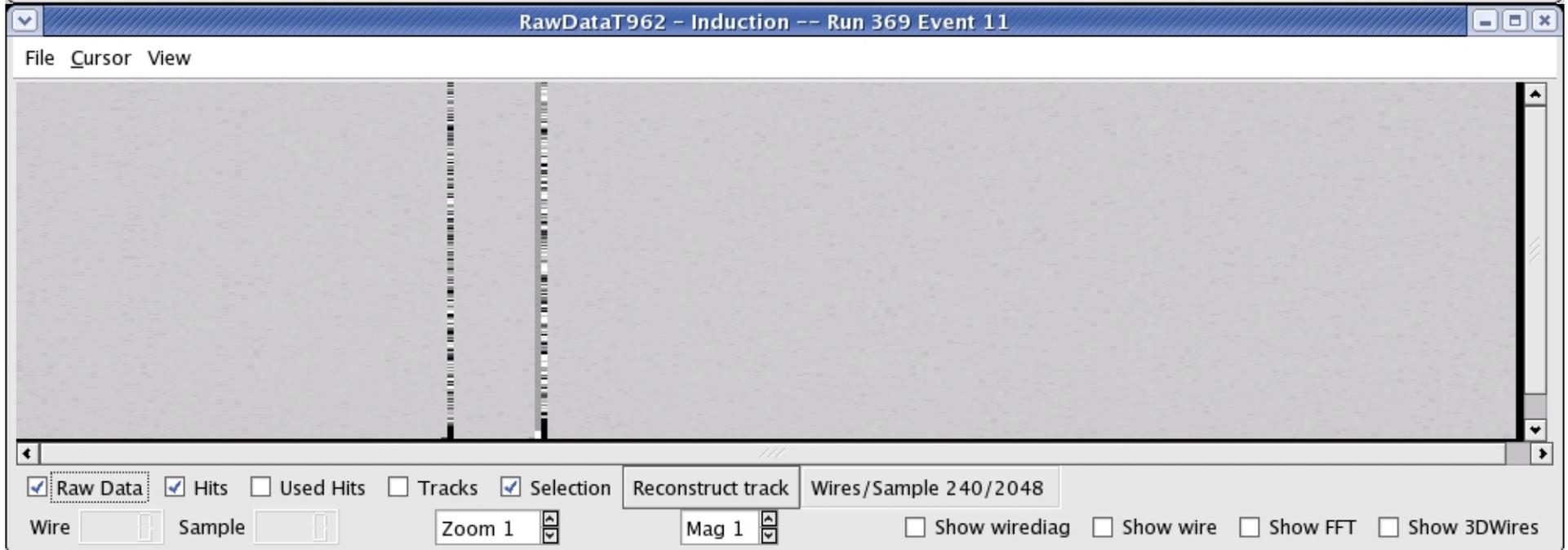
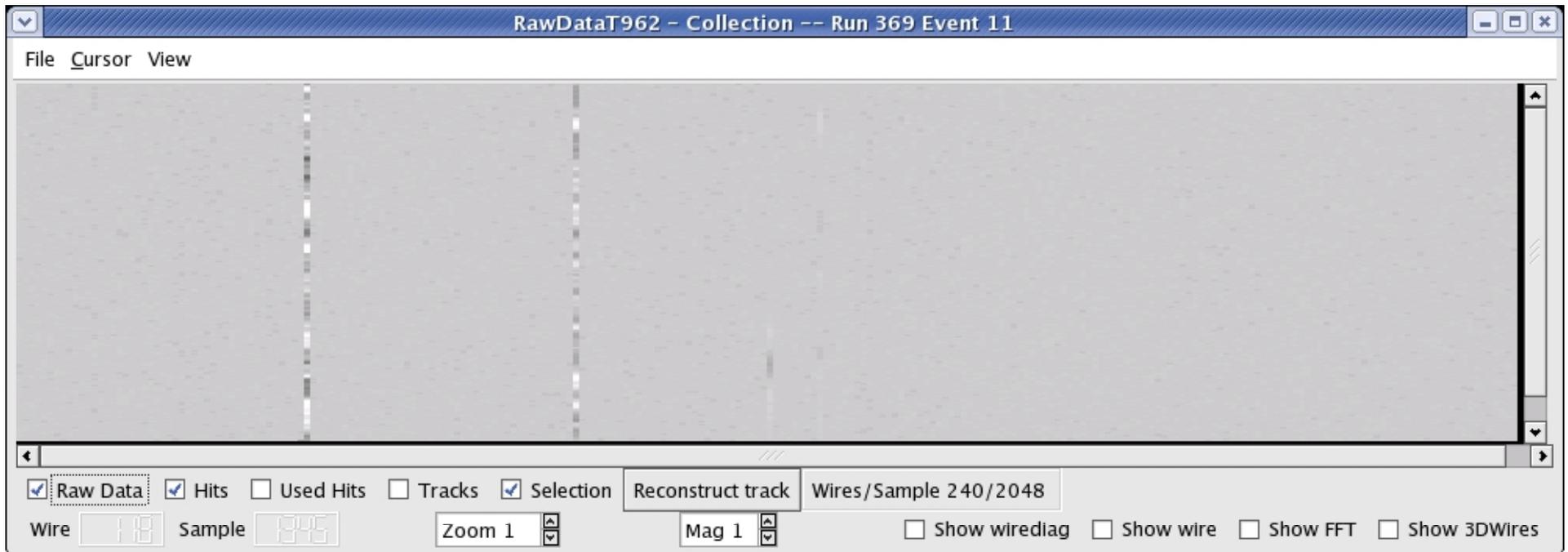
Everything off except wire bias power supply is on (all wires at 0kV)



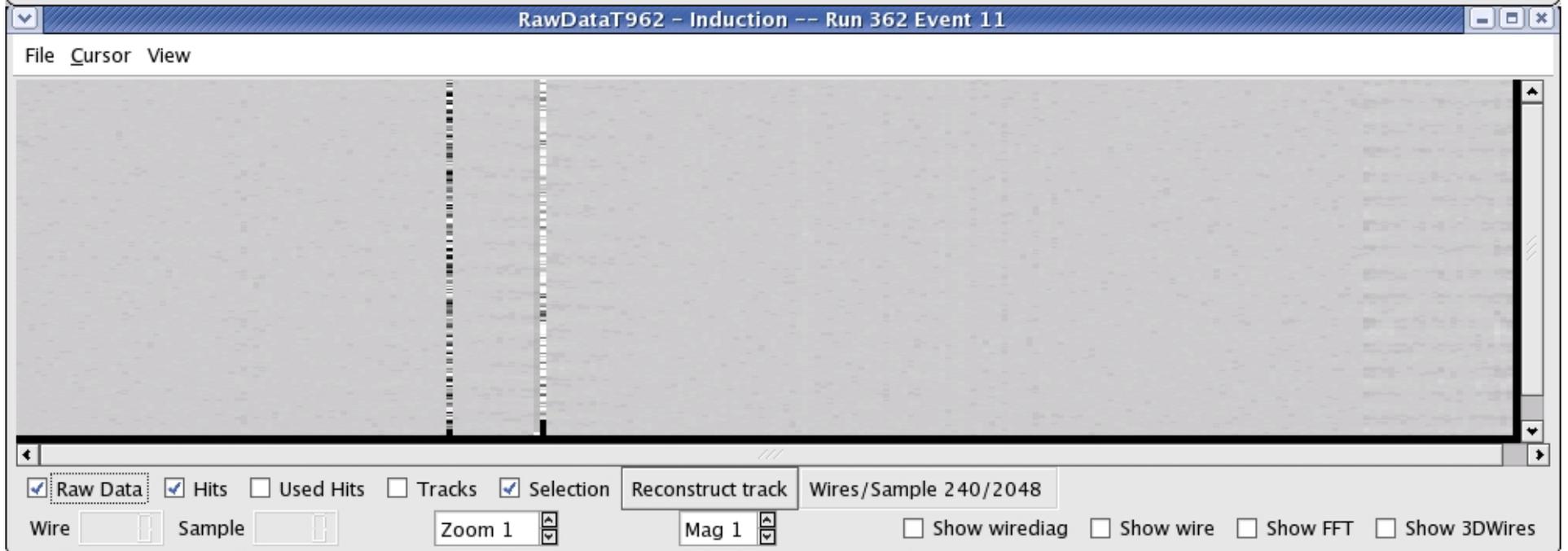
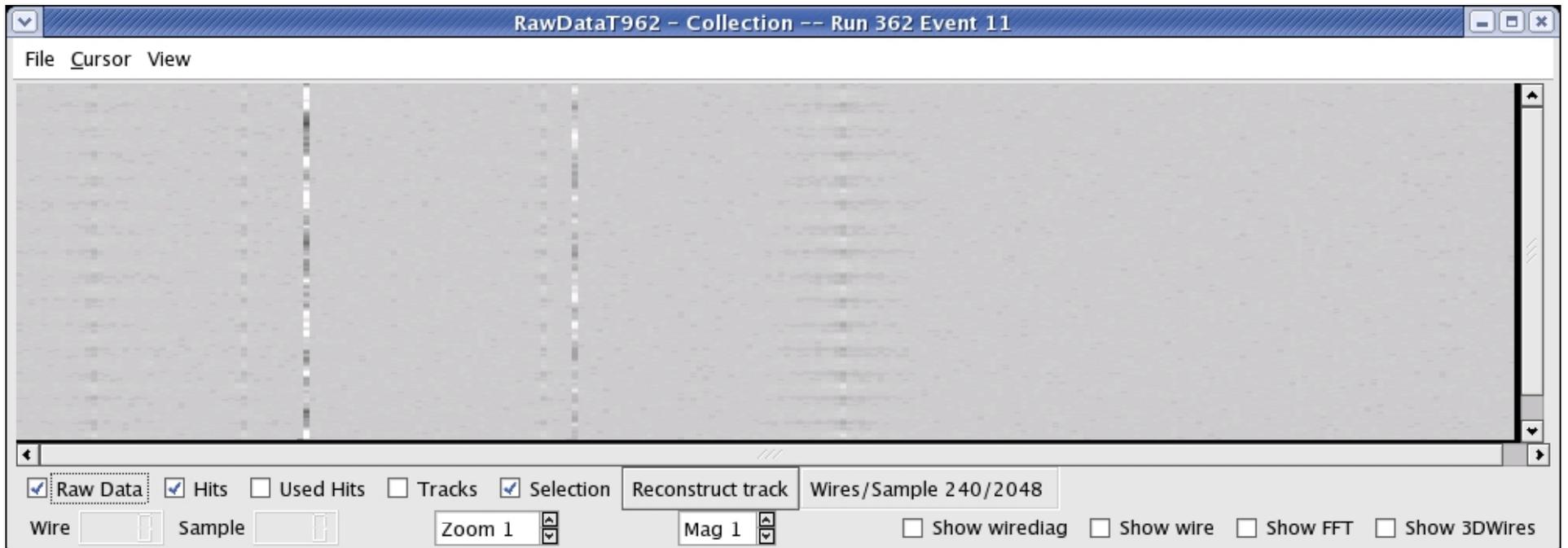
Everything off except wire bias power supply is on (shield=-134V, induction=0V, collection=0V)



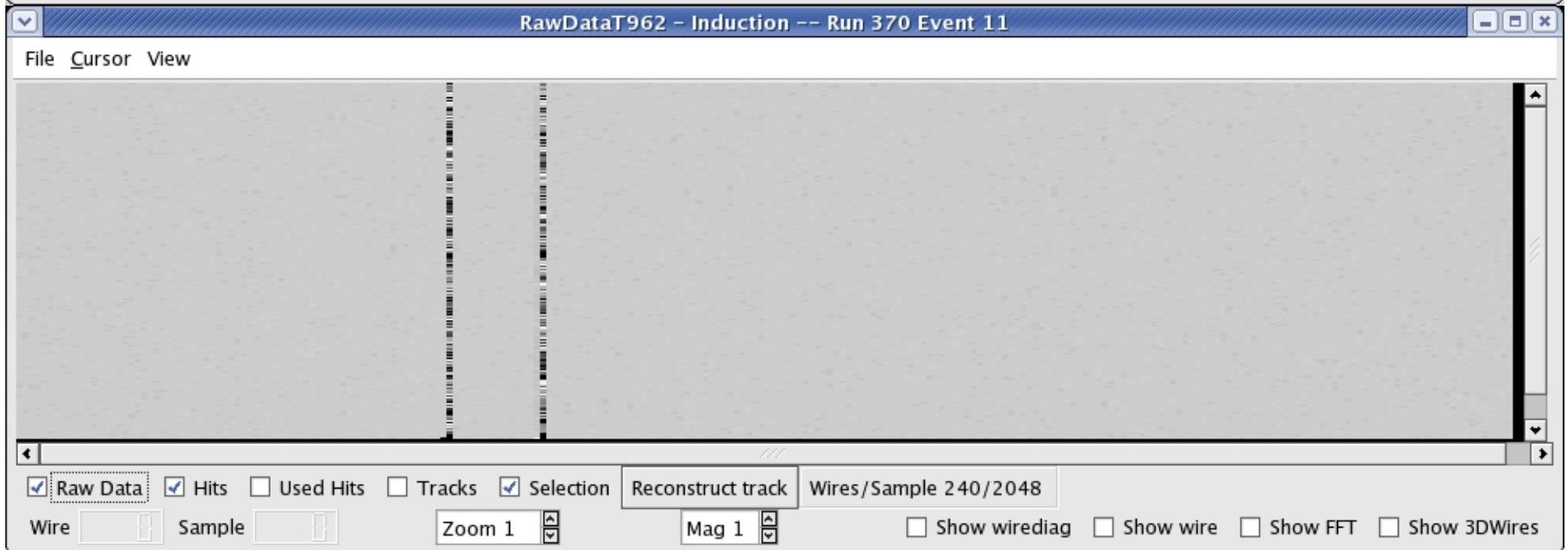
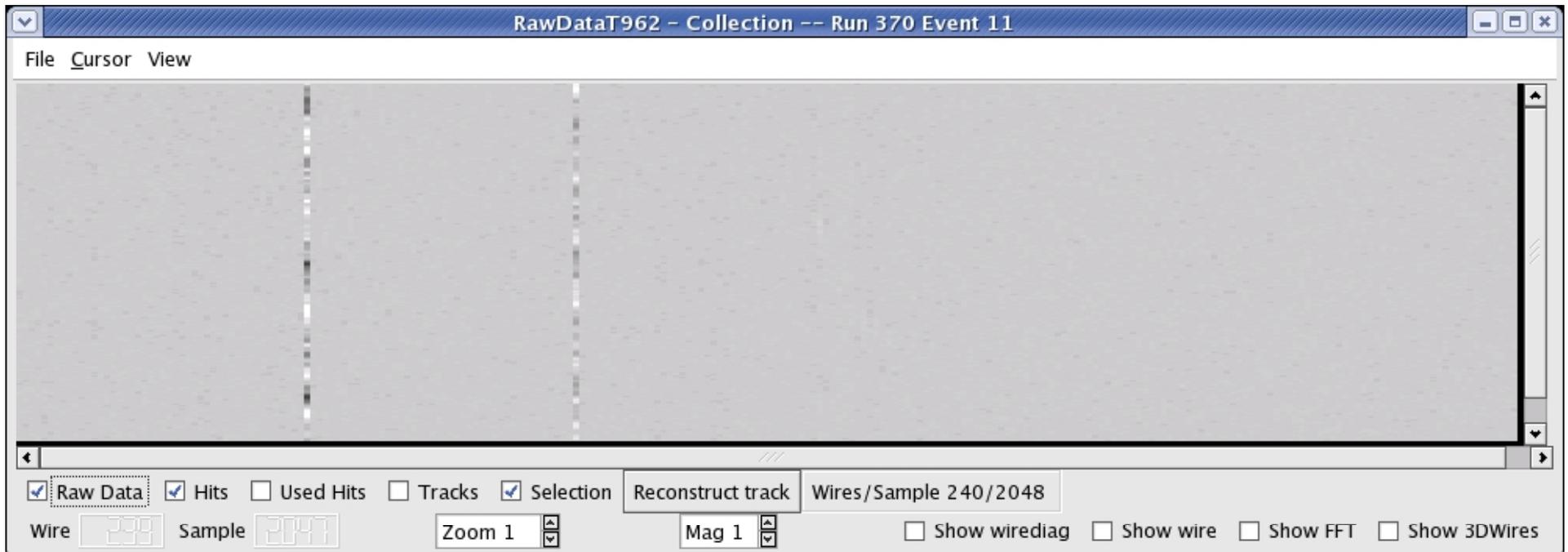
Everything off except wire bias power supply is on (shield=0V, induction=-82V, collection=0V)



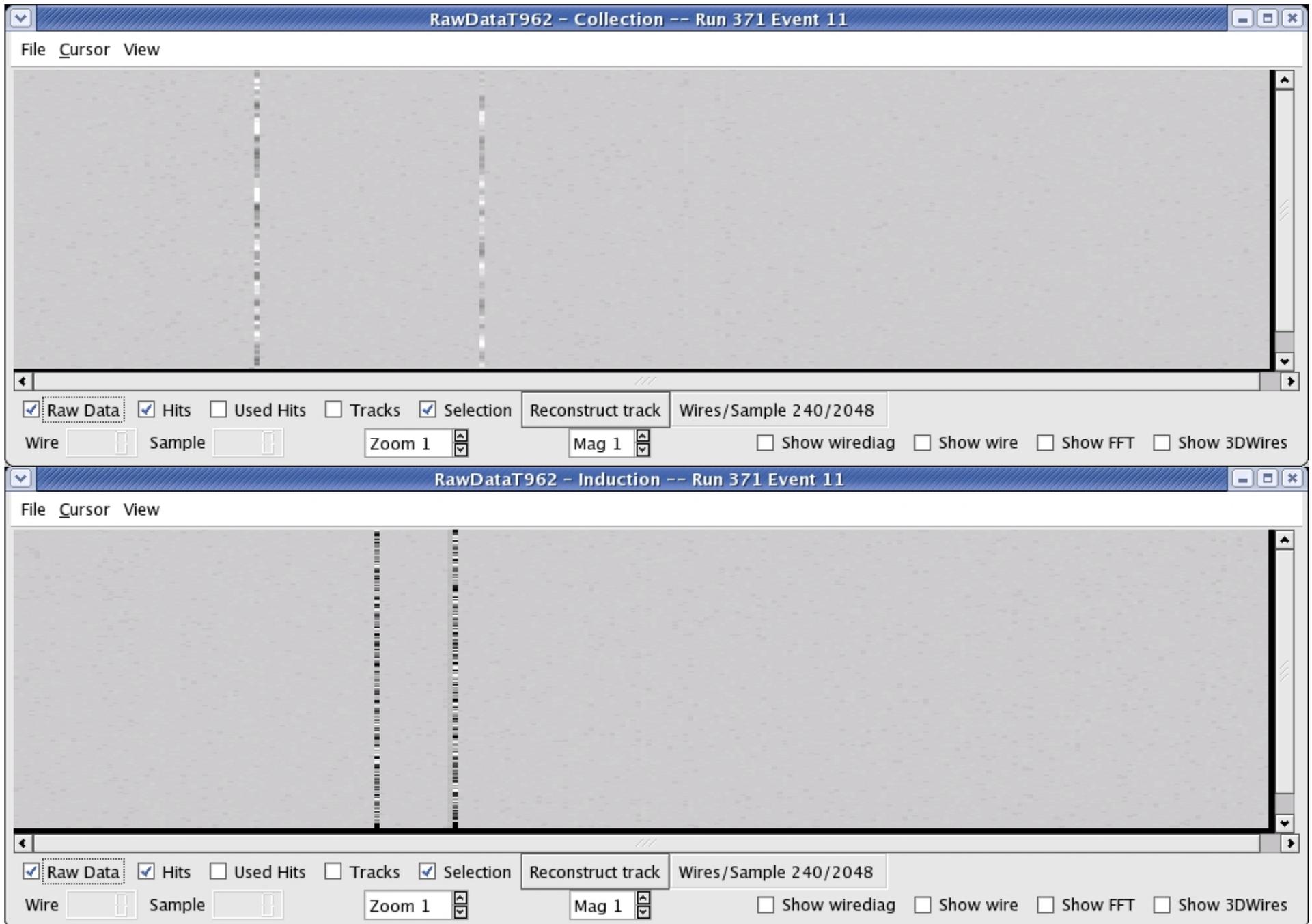
# Everything off except cathode/field cage HV=-4kV



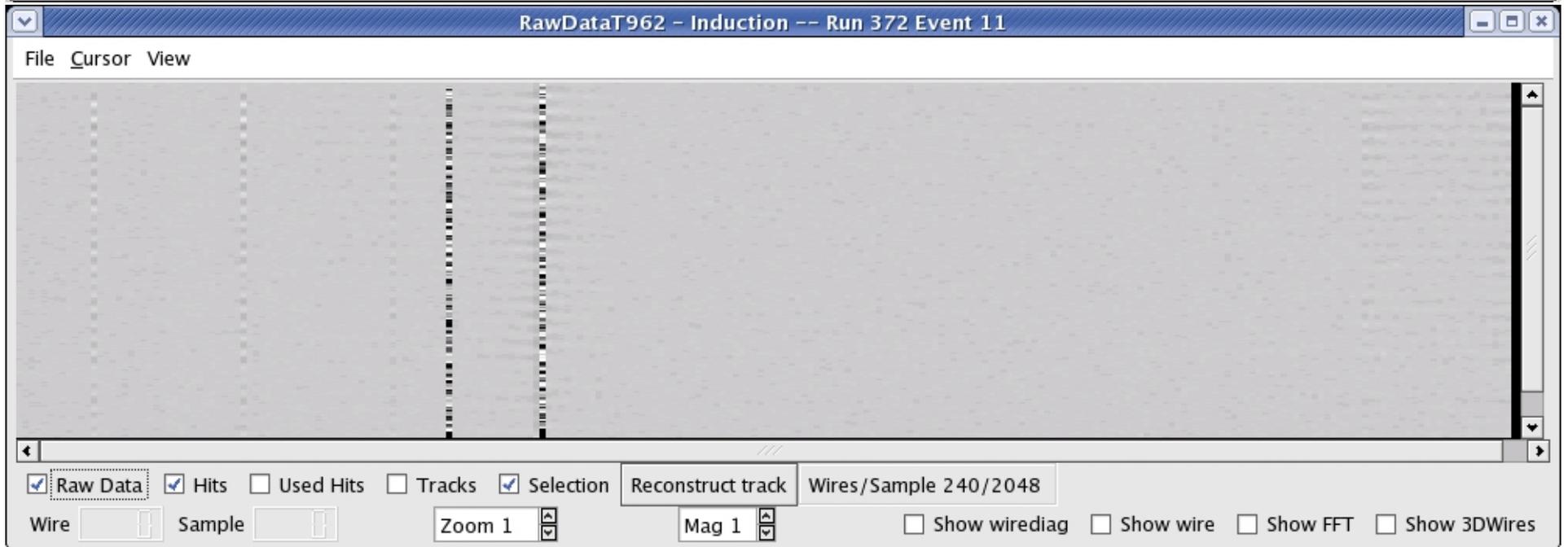
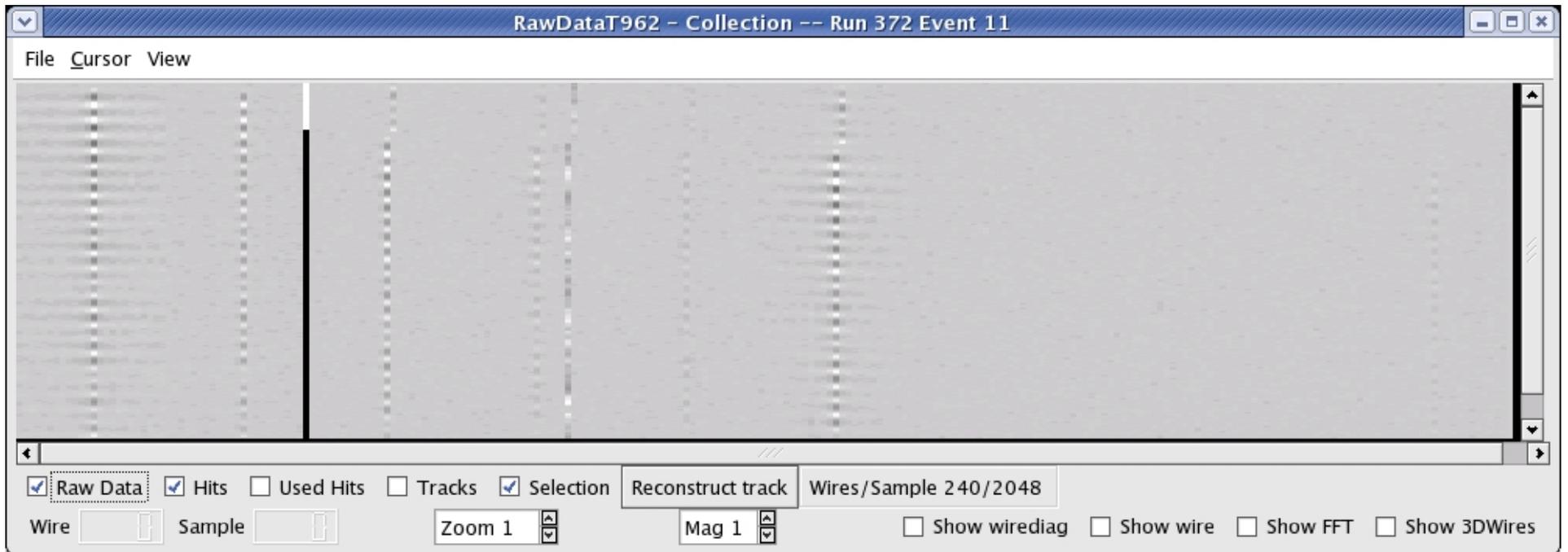
Everything off except wire bias power supply is on (shield=0V, induction=0V, collection=10V)



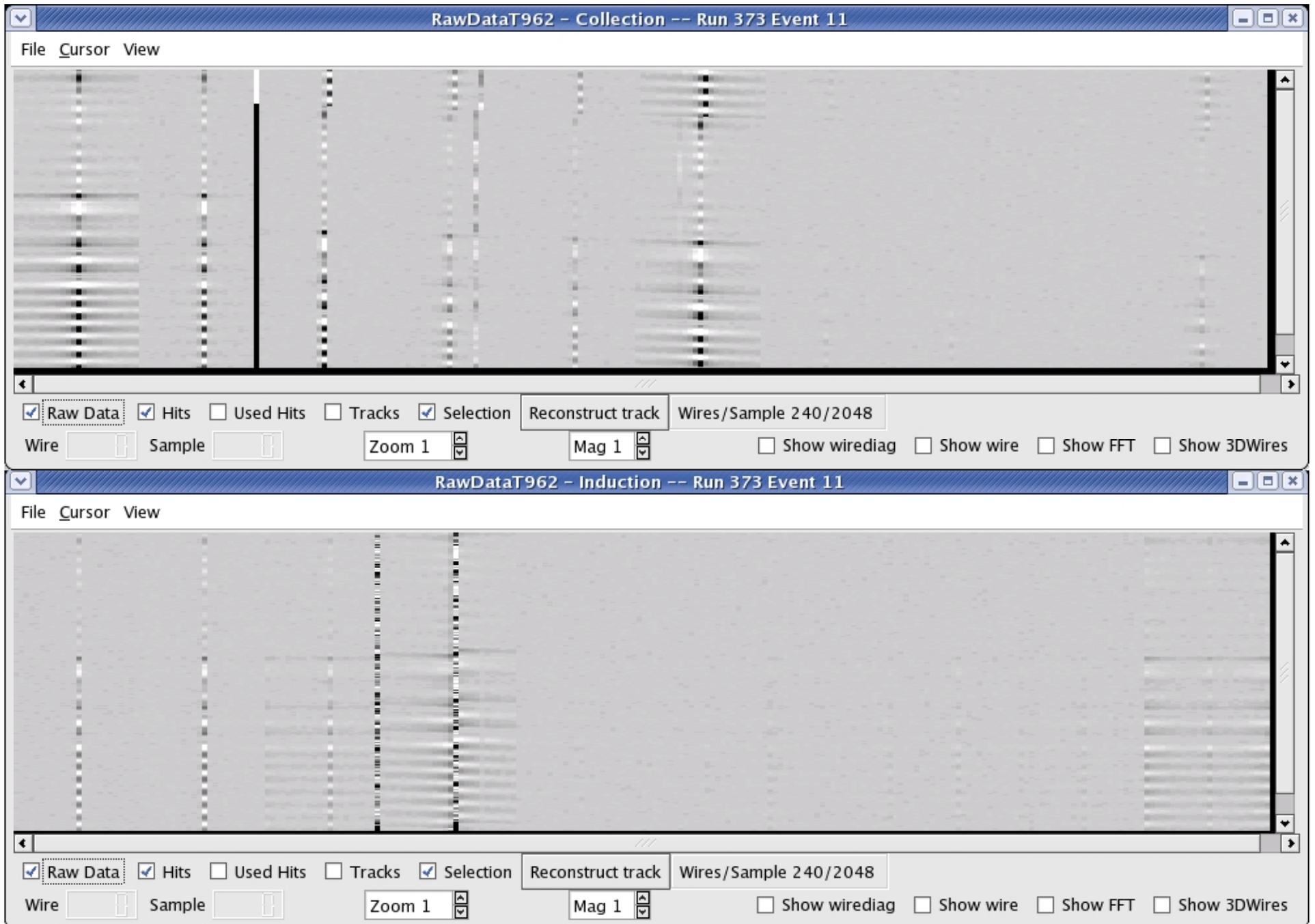
Everything off. The guard vacuum pump was also shut off for this run.



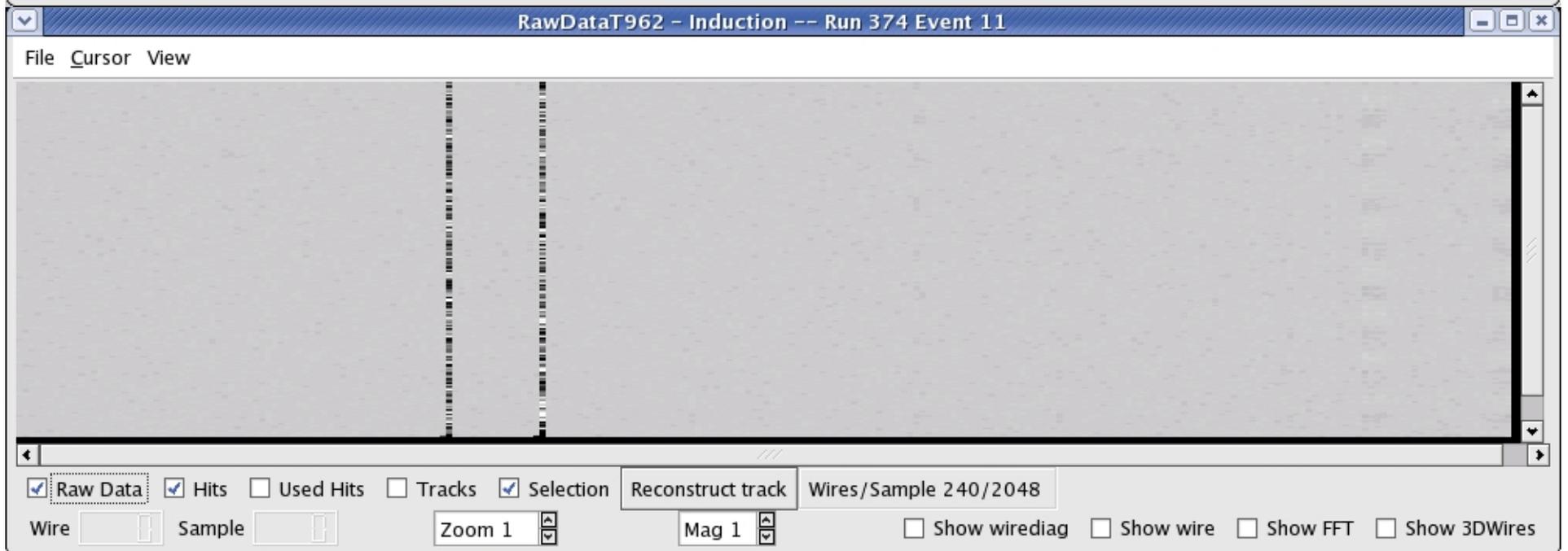
Everything off except heater15 (mode 5) and thermocouples plugged in



Everything off except heater15 (mode 1) and thermocouples plugged in



Everything off except purity monitor HV (-110V cathode, 1500V anode)



# Everything off except purity monitor lamp (1Hz, 3J)

