TRT Test manual

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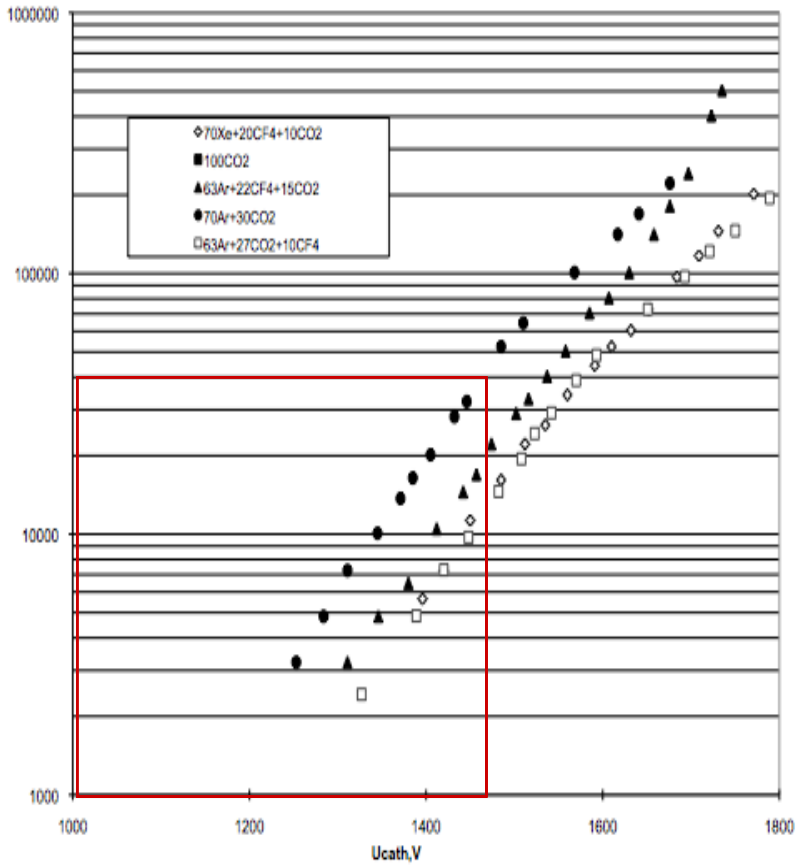
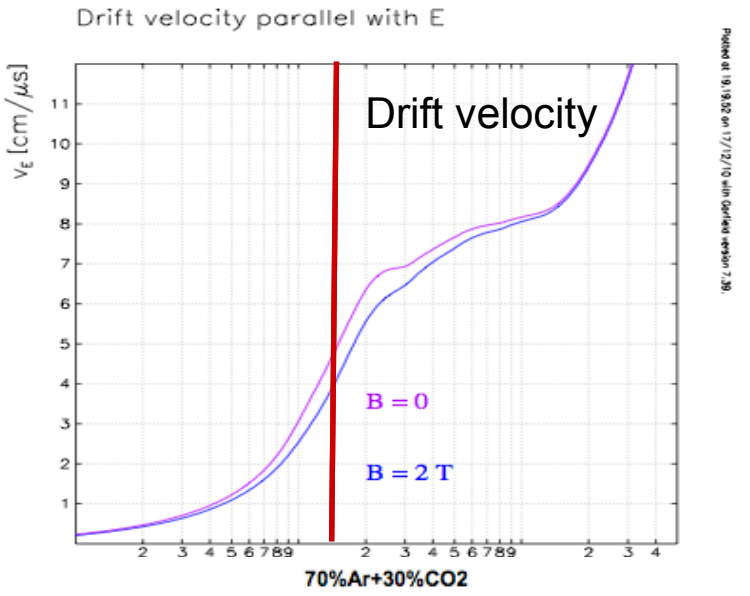
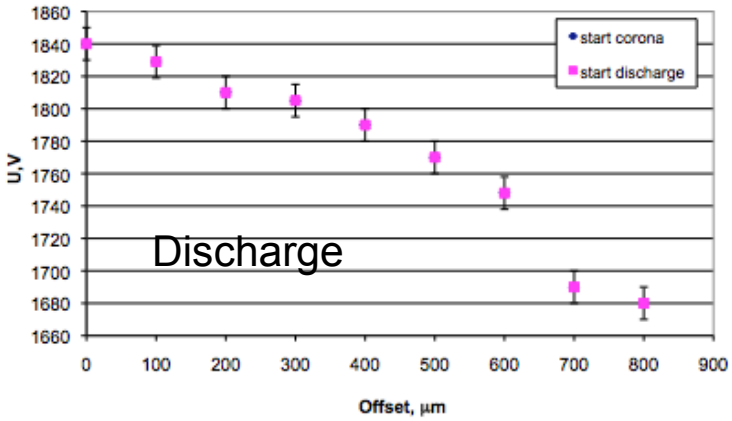
Some important information

- Mixture 70%Ar+30%CO2
- Nominal voltage is 1480 V (gas gain ~$4*10^4$)
- E-filed near the cathode = V/r*ln(R/r) =1480/0.2*ln(2000/15) = 1512 V/cm

Gas gain







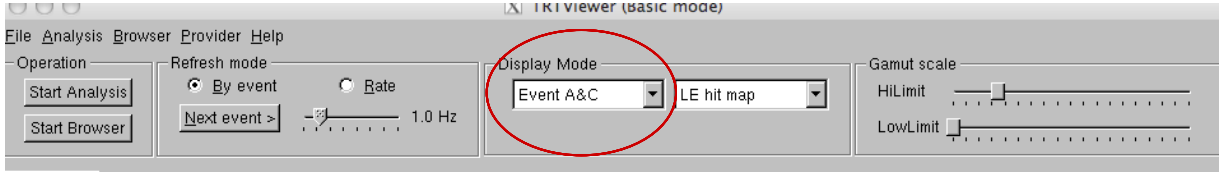
Some important information

- Particle loses ~ 1 keV in Ar-mixture
- One primary ionization cluster ~ 80-100 eV (3-4 el)
- Electronics noise with the detector ~3000 el
- Nominal threshold should be >4 sigma above the noise (now ~14000 el)
- Phys. Threshold = El.Thr* W/(Gas gain * Signal fraction)
- In our case ~14000 el*27/4*10^4*0.12 = 79 eV
- 10 DAC counts =~1400el or 8 eV

Tasks1: Noise characterization

Start DAQ

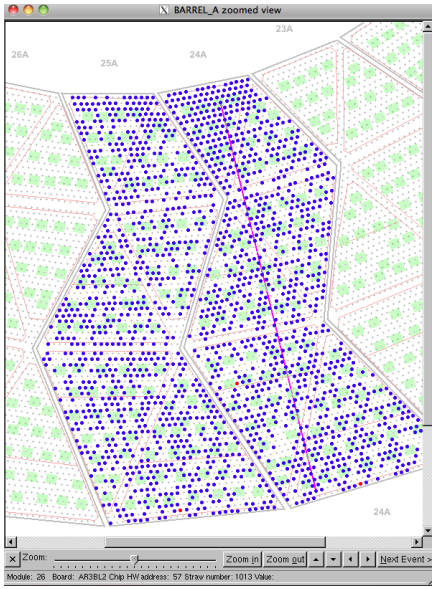
1. Set random trigger
2. Set a LL threshold to 86
3. Start DAQ
4. Start Online mode of the TRTViewer (command trtviewer DAQ)

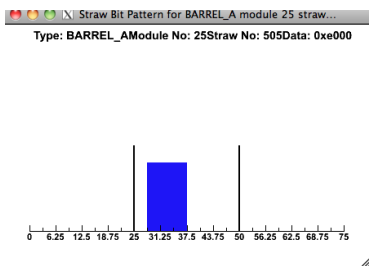


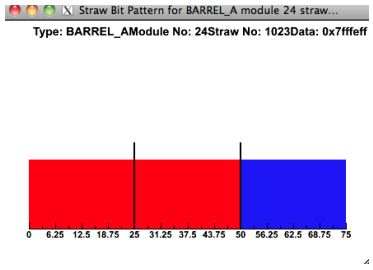
Work with the event display

Double click on general picture gives a zoomed view.
On ZOOM window a double click on each straws gives a bit pattern information

1. What means color coding?
2. What is the main characteristic of the noise signal?
3. Noise uniformity around the detector?

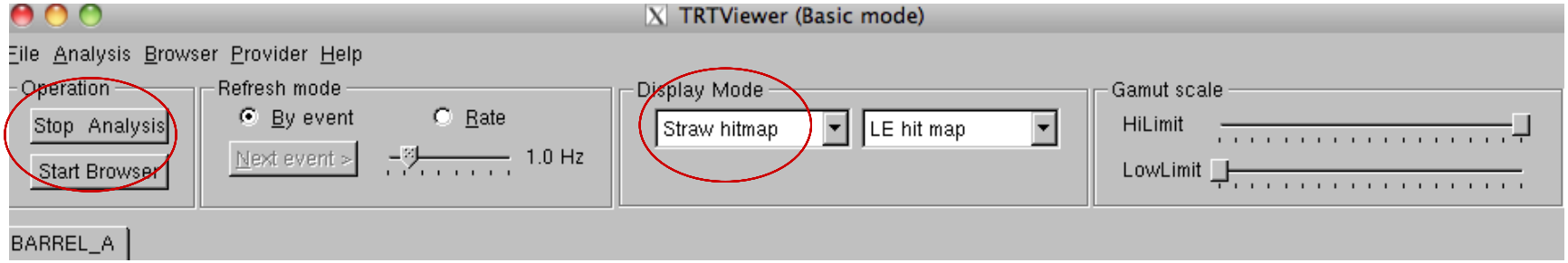






Tasks1: Noise characterization

Start Analysis mode of the TRTVewer



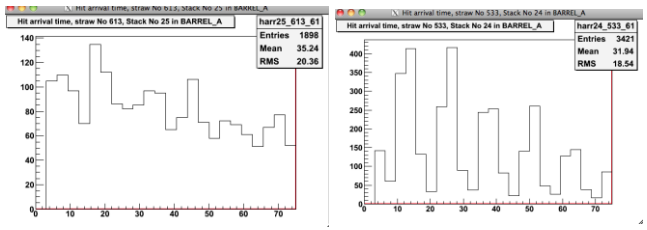
Set a display mode to “Straw map)

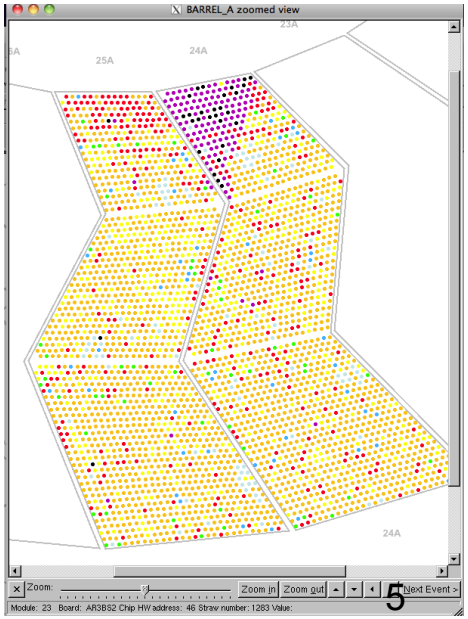
1. Use a different contrast of the noise representation.
2. What noise map tells you?

Work with the hit maps

Double click on general picture gives a zoomed view.
On ZOOM window a double click on each straws gives time distribution of the arriving signals

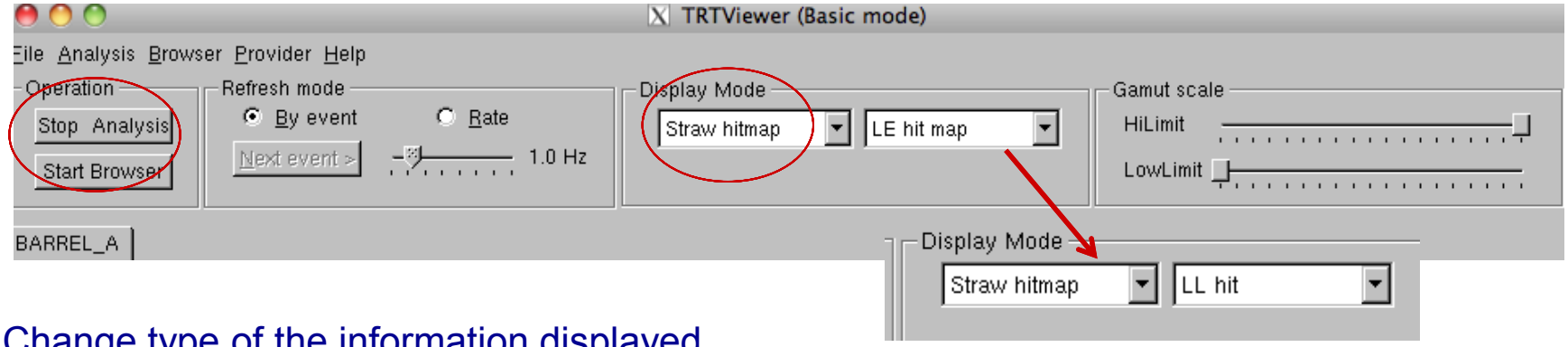
1. How to estimate noise rate?
2. How to distinguish a random noise and a clock noise?
3. Is the noisy area related to the clock activity.





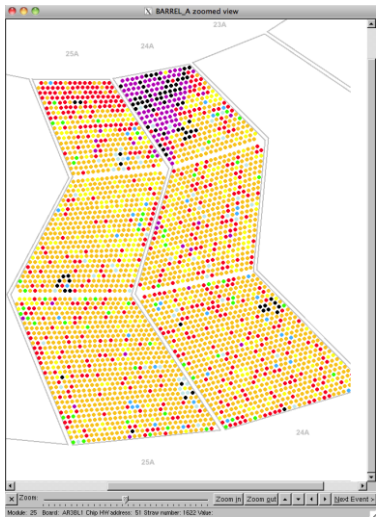
Tasks1: Noise characterization

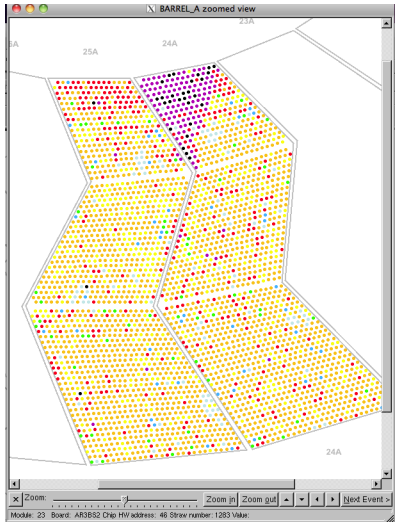
Start Analysis mode of the TRTVewer



Change type of the information displayed

1. What is the difference between two representation?
2. What is the characteristics of the straws which have 100% occupancy?
3. Dead channel definition using the noise map
   A)
   B)





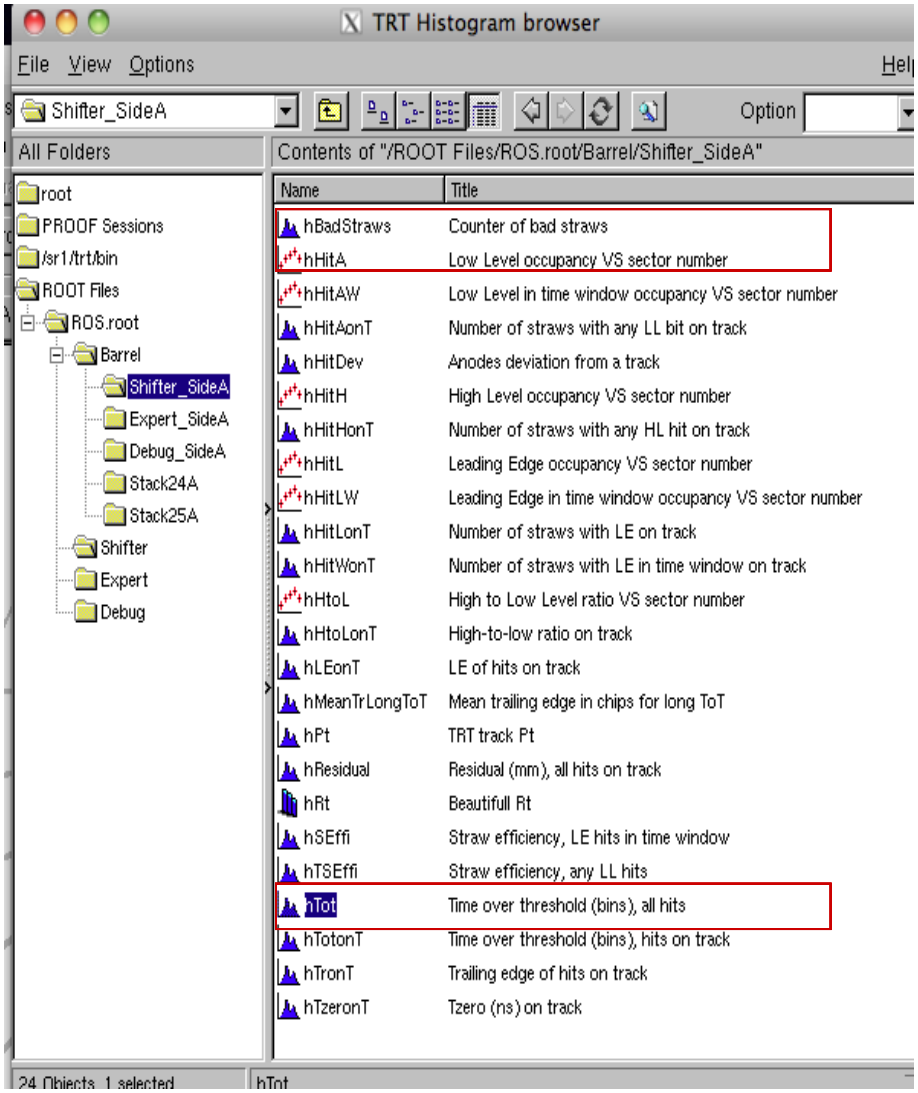
Tasks1: Noise characterization

Start Browser

1. Check selected histograms.
2. What is most probable ToT for the noise signals?
3. What is the average straw occupancy (write number to the table)?
4. Dead straw number?

Repeat the same observations for nominal threshold 116

1. List the observed difference and find explanation if possible.
2. Take noise occupancy scan at 86,96,106, 116 and 126 and make a plot of occupancy and average ToT.
3. Preliminary choice of the operation threshold.



Task 2. Operation with Particles

Start DAQ for particles

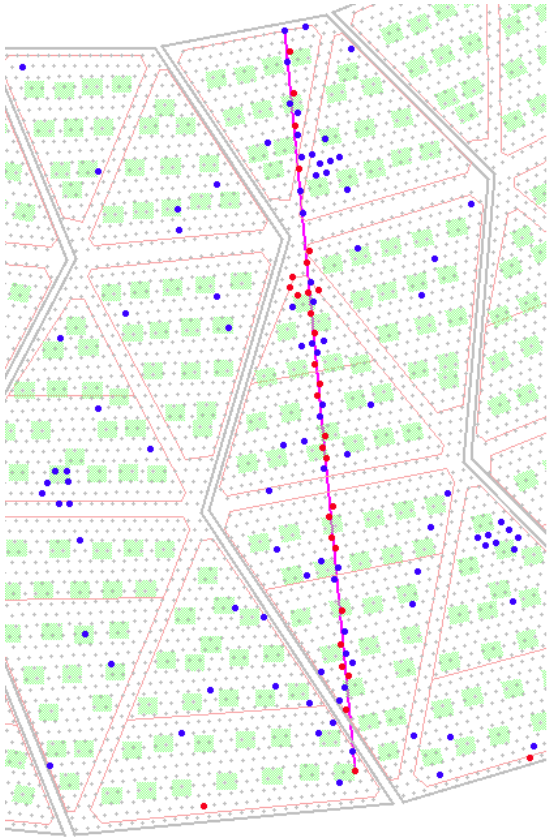
1. Set Fast OR trigger
2. Set a LL threshold to 116
3. Check HV 1480 V
4. Start DAQ
5. Start Online mode of the TRTViewer (command: trtviewer DAQ)

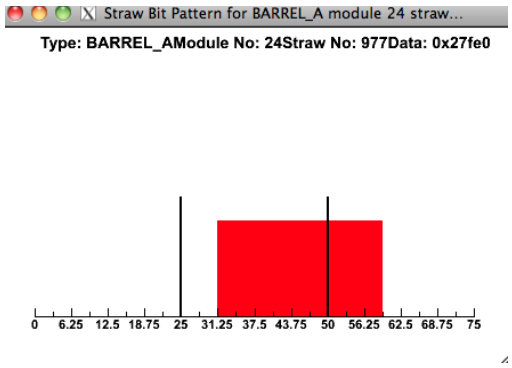
Work with the event display

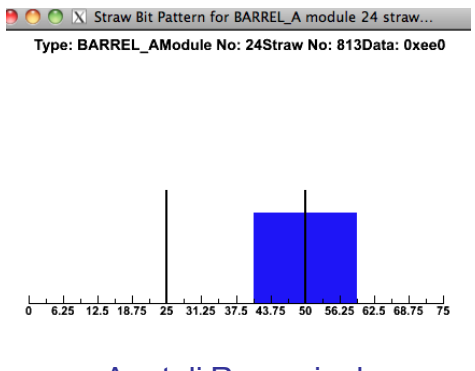
Double click on general picture gives a zoomed view.

On ZOOM window a double click on each straws gives a bit pattern information

1. What means color coding?
2. What is the signal difference between hits from particles and noise?
3. Noise suppression possibility?



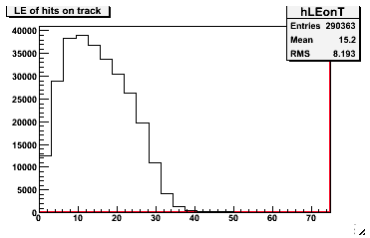


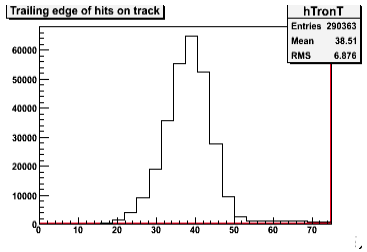


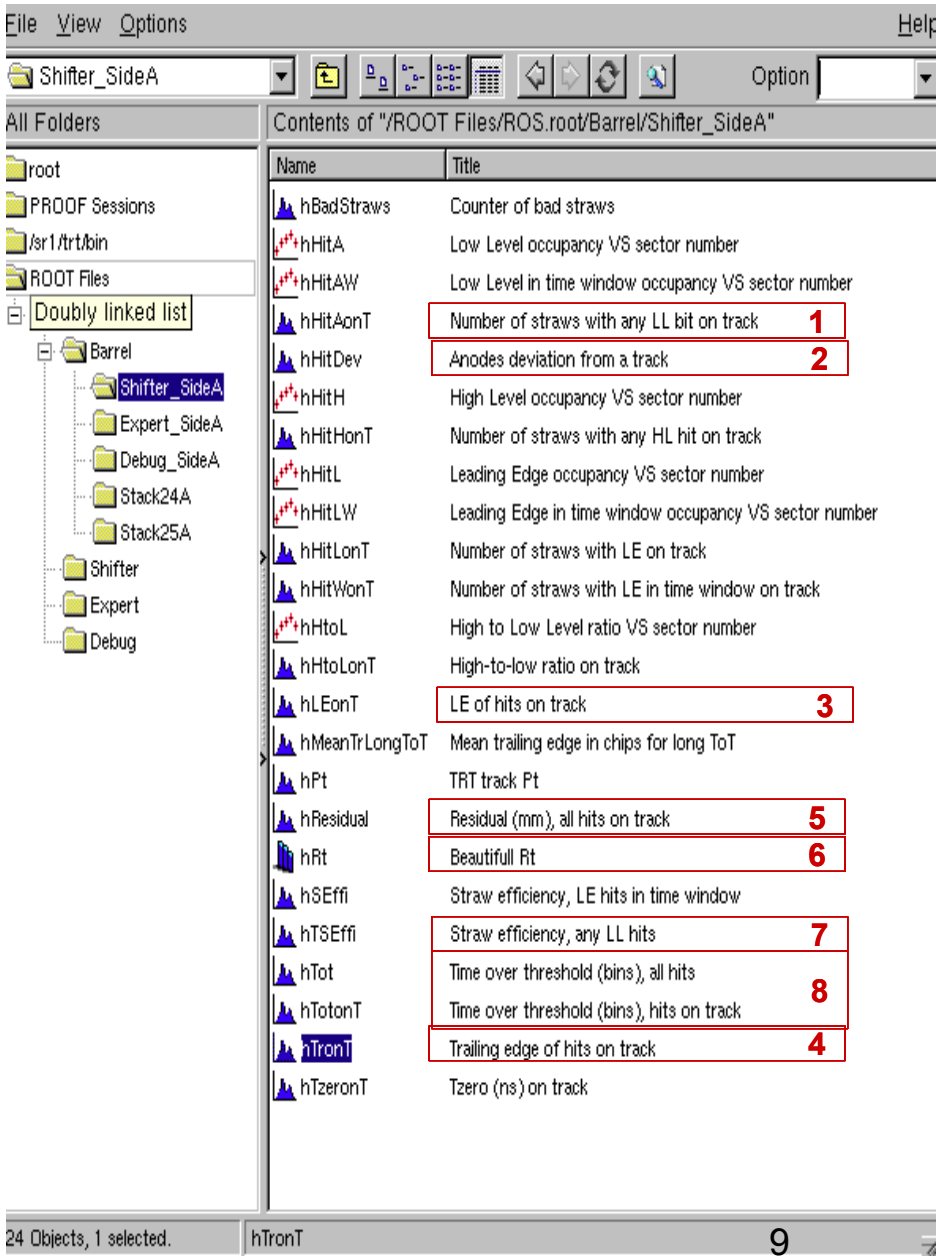
Task 2. Operation with Particles

Start Browser and check selected histograms

1. Number on straws crossed by particle.
2. Straw profile.
3. Leading edge distribution on track.
4. Trailing edge distribution on track.
   - Discuss the physics reason why they look as on the pictures.
5. Hit residual distribution.
6. R-T distribution.
7. Straw efficiency.
8. Time Over Threshold distribution
   - Discuss the shape and conclusion how to minimize the noise effect



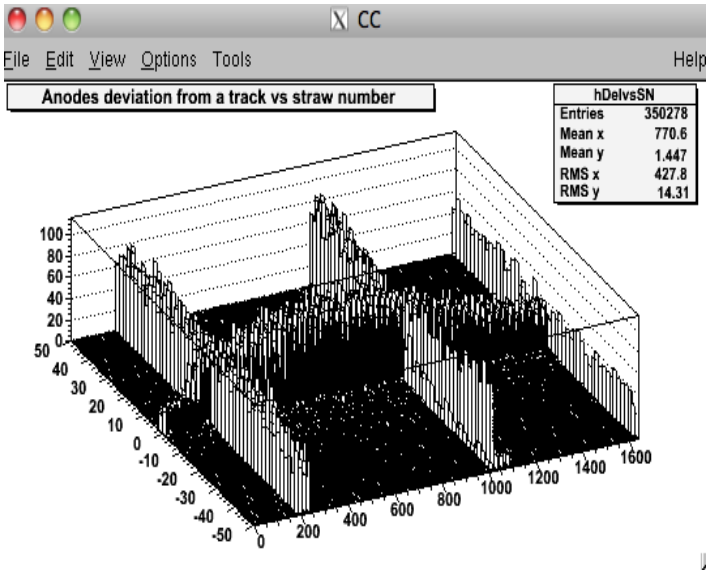


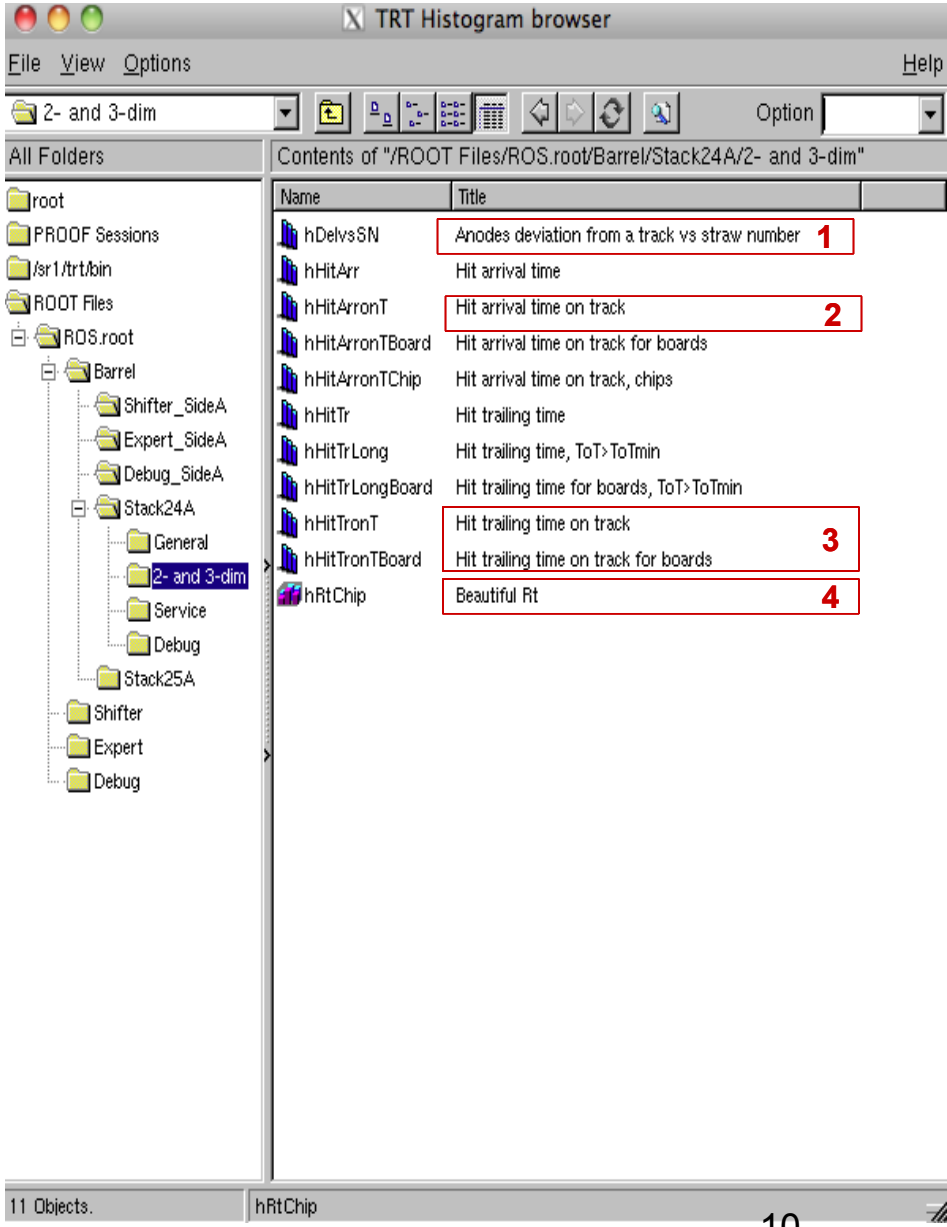


Task 2. Operation with Particles

Check selected 2D histograms and discuss the results

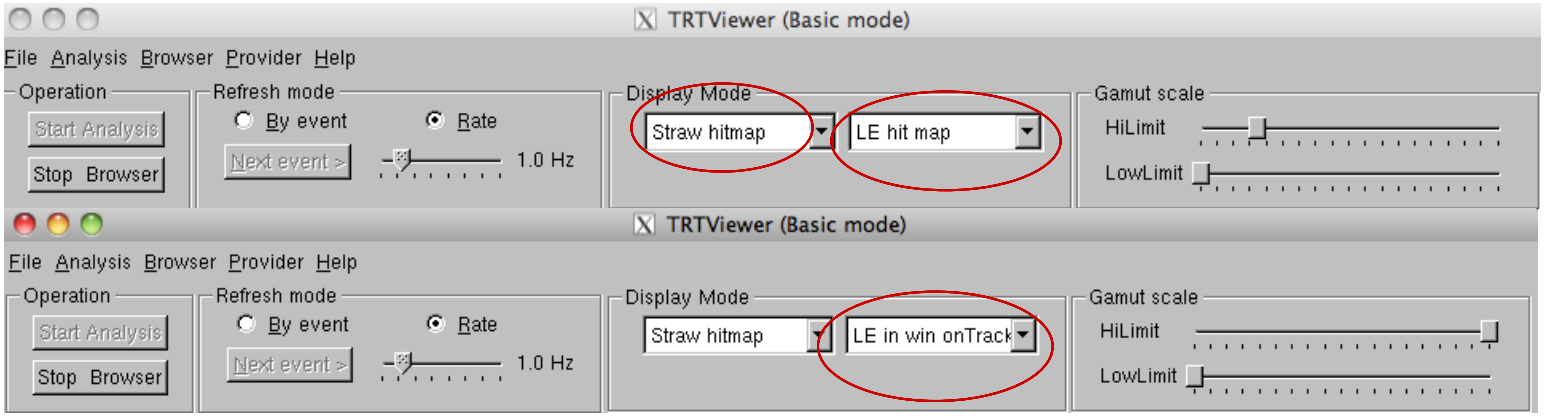
1. Anode deviation from a track.
2. Hit arrival time.
3. Trailing edge distribution.
4. Recommendations for the detector tuning.
5. R-T dependence.



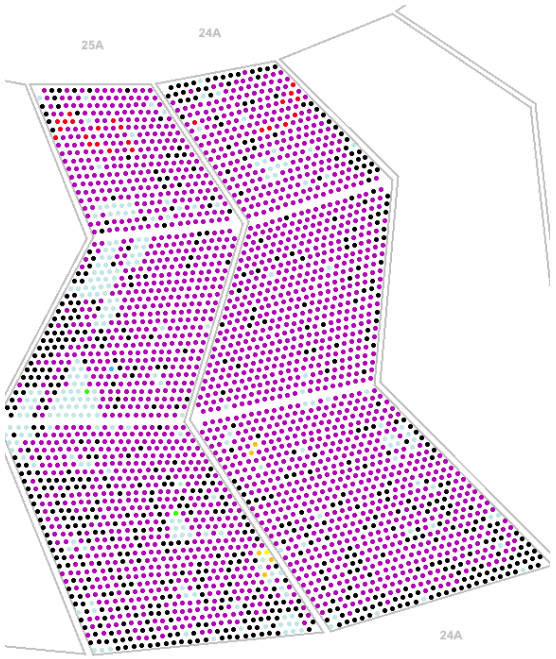


Task 2. Operation with Particles

Work with the straw maps



1. Compare LE hit map and LE on track
2. Straw efficiency level and uniformity
3. Possible reasons for dead areas:
   - Dead chips?
   - Too high threshold?
   - HV problems?
4. Leading edge distribution for individual straws.



Task 2. Operation with Particles

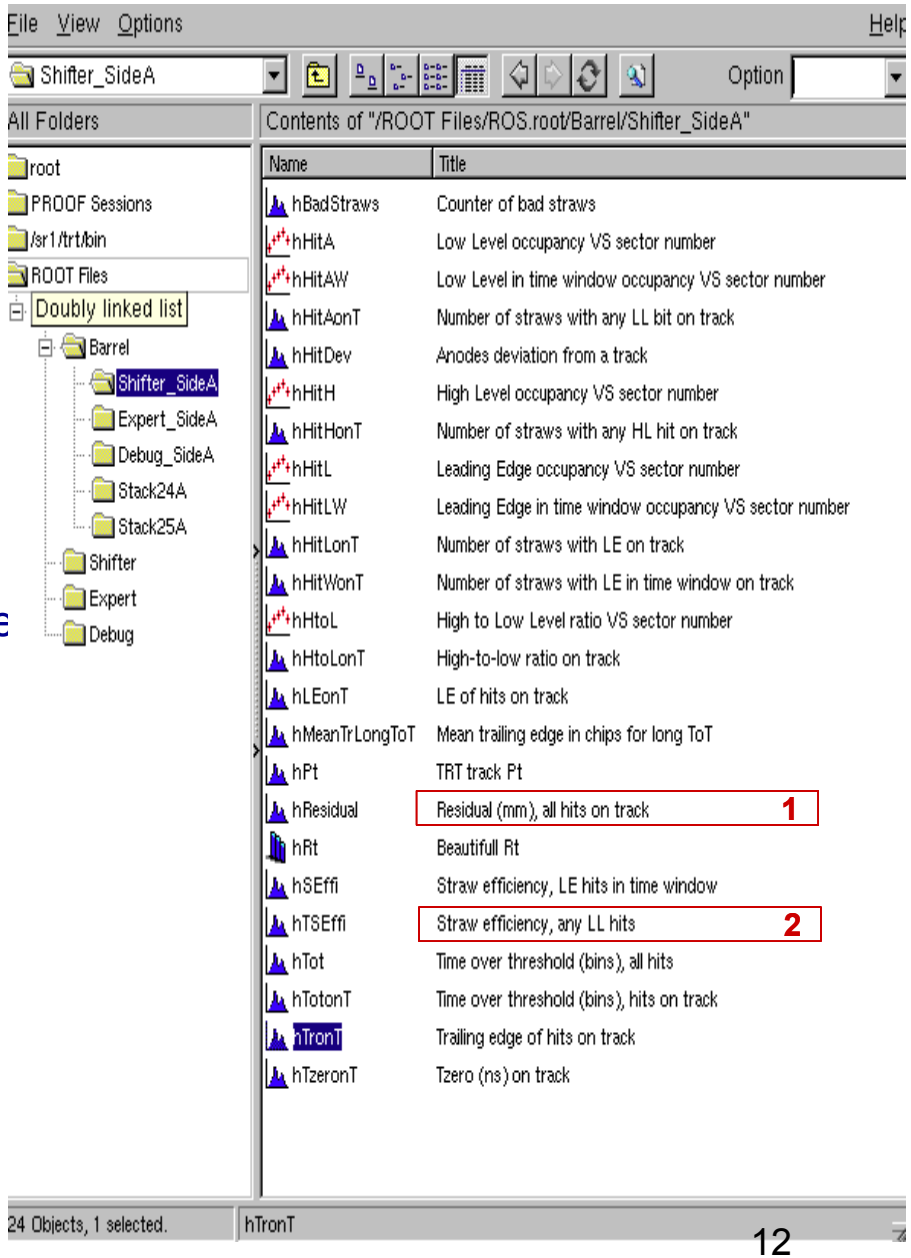
Define dependence straw efficiency and drift- time accuracy on threshold and HV

Start DAQ

1. Set Fast OR trigger
2. Take runs at different LL thresholds settings with a step of 15 DAC counts form 108 to 140 at 1480V
3. Take also runs with HV settings 1430 at the same LL thresholds.

Analysis

1. Start Online mode of the TRTViewer (command trtviewer DAQ)
2. Start browser and check corresponding histograms
3. Present the results as a plot
4. Try to explain observed behavior.



Task 3:Conclisions about the problems found and make recommendations what should be fixed.

1. Noise issues

2. Dead straws
   - Electronics
   - HV

3. Misbehaving channels

4. Threshold and HV to be used

Your comments/questions.

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