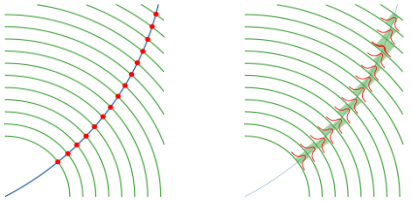
This is work done from 2002 to 2007 and presented at

Santa Cruz, June 2002; Arlington, January 2003; SLAC, January 2004; Paris, April 2004; Victoria, July 2004; Vienna, July 2005; DESY, May 2007

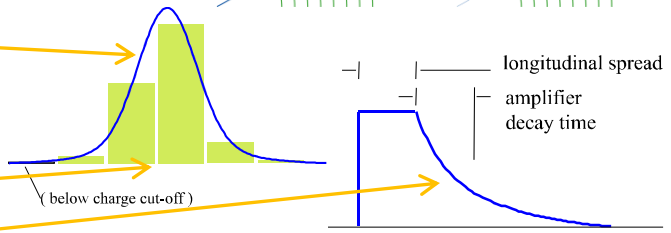
The main results are the **track reconstruction efficiency** as a function of **pad size** and **noise occupancy**.

I started with $e^+e^- \rightarrow HZ$ events in the "Old North American Large Detector".
In this study, TPC O.R.=1.9m, B=3T, BR^2= 10.8; ILD TPC O.R.= 1.8m, B=3.5, BR^2= 11.4



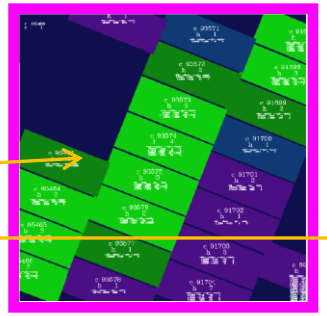
For each track, crossing points are located at 143 radii (ILD has 224 layers).

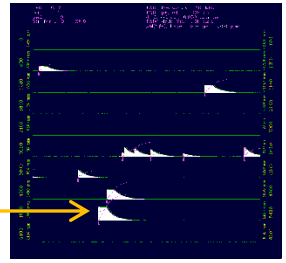
The charge is spread with a gaussian Pad-Response-Function (PRF),
with RMS=0.7 x (pad width)
(by "pad width", I mean center-to-center separation.



Charge is deposited in readout channels
according to the overlap of the PRF with the channel.

The time response takes into account the
longitudinal spread due Z projection, and an amplifier decay time (2 cm).

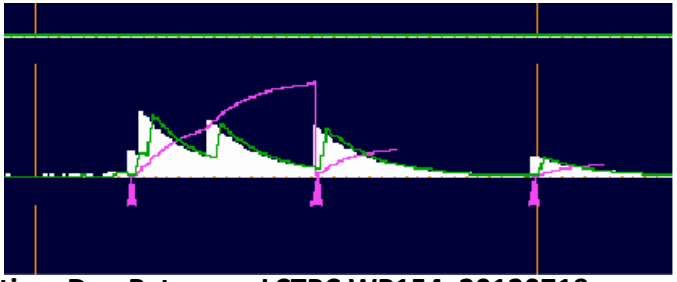




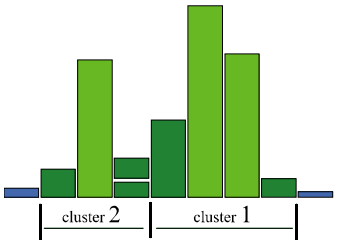
Noise (salt and pepper) is added with a longitudinal spread of 2cm.

Thus, each cell is assigned a list of hits.
And a full FADC digitization is generated for each cell.
(The figure shows the full length of the chamber on 10 lines.)

Pattern recognition is performed in time,
resulting in unambiguous threshold crossings.
Hits can be lost if poorly separated in time.

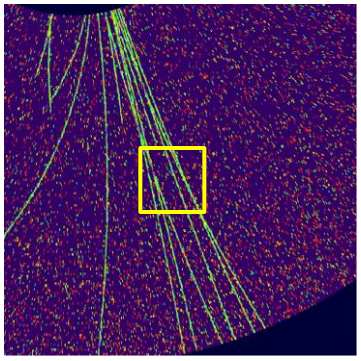


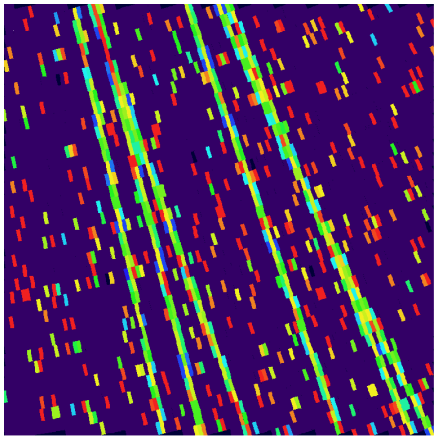
Pattern recognition is performed in φ .
Charge can be incorrectly clustered.



Pattern recognition uses the CLEO program,
adapted to the TPC by separating the chamber into time slices.

Note regarding the time evolution of the resistive spreading:
this is not an issue. Clustering can take into account the known time variation with respect to distance from the charge center.





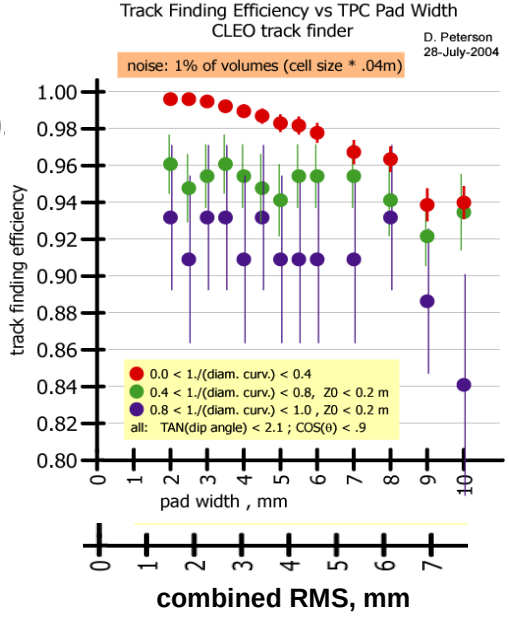
The first result was
efficiency as a function of "pad width" (PW)

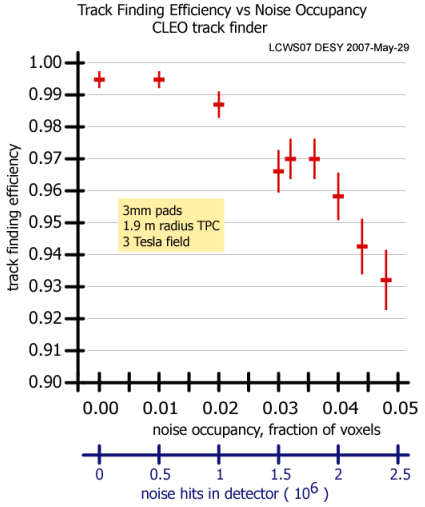
Recall, this is for a PRF with RMS=0.7 x PW.

But, the effect on the efficiency is really
due to a combination of pad width and PRF.

In the present case,
the RMS due to the pad width is 0.289 x PW
and the RMS due to the PRF is 0.70 x PW.
Simply, the combined RMS is 0.76 x PW.

When attempting to interpret this plot to predict
the efficiency for a resistive spread Micromegas,
I would use the combined RMS due to the pad and PRF
as shown in the added horizontal axis.





The second result was the **efficiency as a function of voxel occupancy**. Noise was pushed to 4.8%, or 2.5 x10^6 hits in the detector. This was publish in the LOI, figure 4.3-4.