

Data Flow: Production Update from the Tracking Detectors

Reminder: Tesla TDR

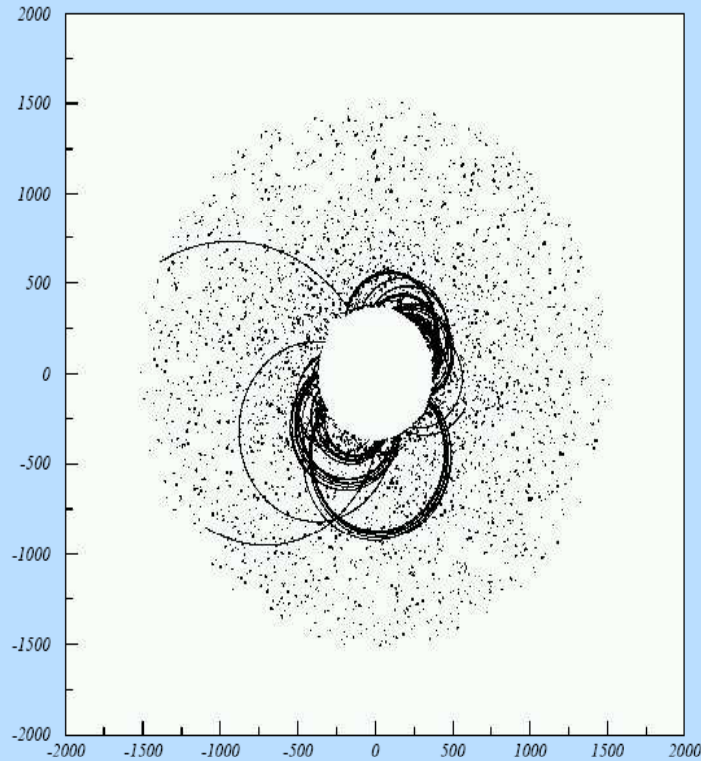
- Data flow dominated by background
 - $O(10^3)$ photons, few 100 neutrons, 5 electrons from pairs, 0.7 hadrons from minijets, 0.3 halo muons per beam crossing
- Huge uncertainties -> mere order of magnitude possible, or needs detailed case studies : photon and neutron shielding, gas choice, algorithms for data reduction. The Tesla case was a TPC
- 1.2 million channels, 110 Mbytes per train (half of the total detector).

What changed (or should change) since then?

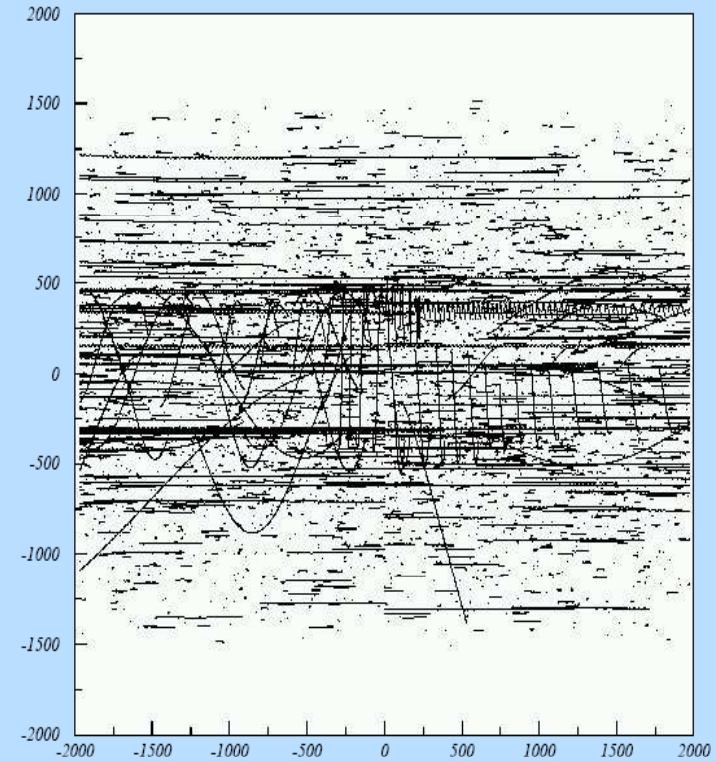
- Machine design (parameters, crossing angle, DID/anti DID)
- At least 3 different technologies for the TPC (GEM with small pads 1x4mm, Micromegas with resistive foil and 2x7mm pads, Digital TPC)
- R&D effort needed to reduce the sensitivity to background (shielding, gas choice). Together with primary ionisation studies starting now.

A. Vogel, TPC jamboree, Aachen 2/2007 and this conference

Mokka hits in the TPC (overlay of 100 BX)



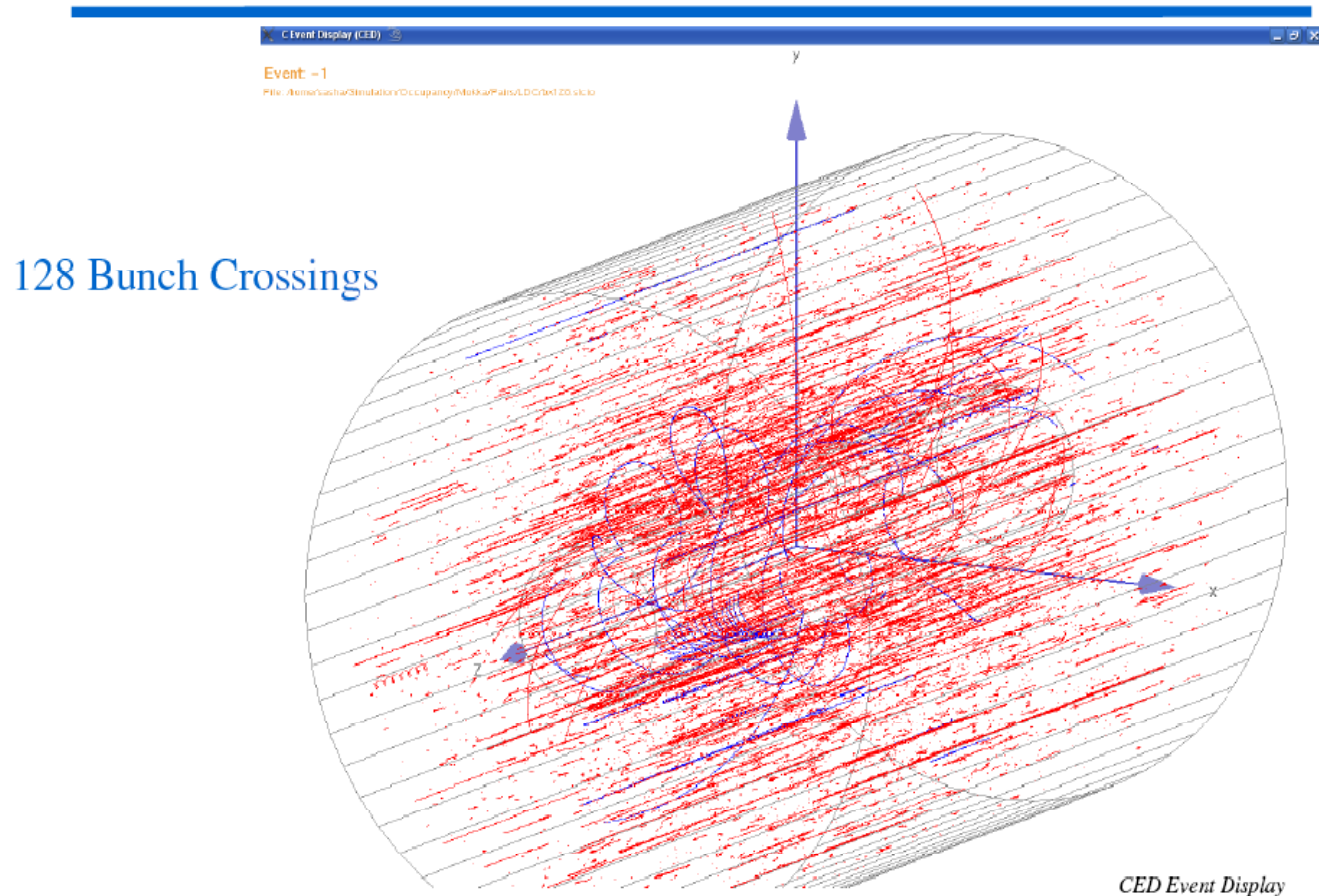
Front view



Side view

A. Khauker, this conference

Pair background simulation: GUINEA-PIG/Mokka



Necessary upper limit

- Before all these studies converge, we can get a “necessary upper limit” from other studies, which say that a 0.2 % pad occupation is to be expected, and that a 1% (see D. Peterson’s tracking talk – note that this is for standard pads) is the maximum with no significant damage to the reconstruction.
- In a bunch train, a 1ms time interval is sliced in 50 ns ‘pancakes’ of $1.5 \cdot 10^6$ pads $\rightarrow 3 \cdot 10^8$ charge (10 bits) and pad number (21 bits) information, that is 4 bytes : 1200 Mbytes.
- Early zero suppression is mandatory

Conclusion

- Between the TDR estimate (110 Mbytes) and the maximum admissible (1200 Mbytes) there is an order of magnitude margin.
- The BG hits can be suppressed at an early stage (remove isolated hits – they carry little information and are likely to be noise), but this has to be studied.
- A refinement of the BG estimate is necessary not to oversize the DAQ system