Results of Aug. 23-27 Laser Tests (ongoing)

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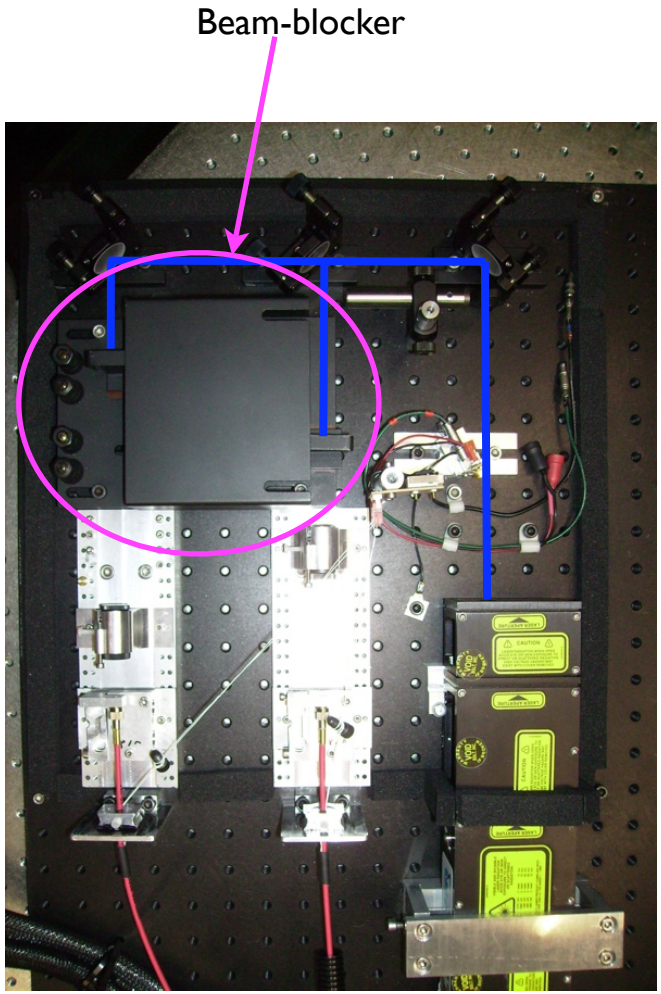
Thanks to P. Colas, M. Dixit, D. Attie, M. Riallot, S. Turnbull, and D. Karlen

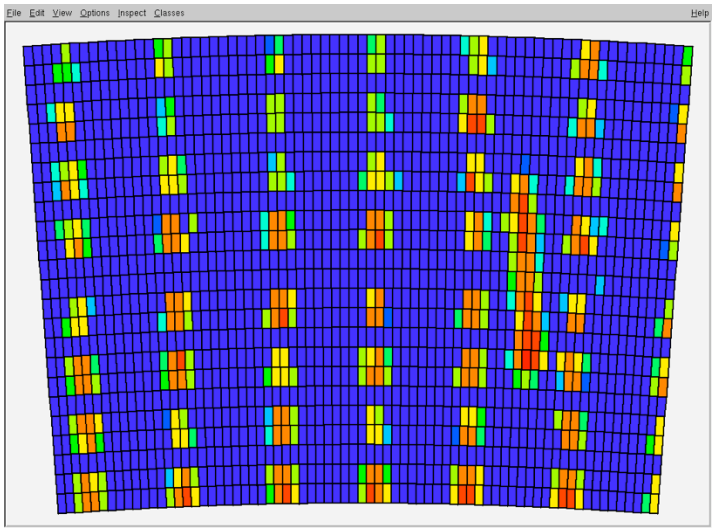
Tests of individual fibres

- Laser's power supply gave less power (lower electron counts) in a high field.
- Longer (~18m) fibres were prepared so the laser could be moved out of the field
- Fibres are manually polished, so transmission cannot be guaranteed to be exactly even
- Beam-blocker system allows us to test the energy transmitted by one fibre at a time

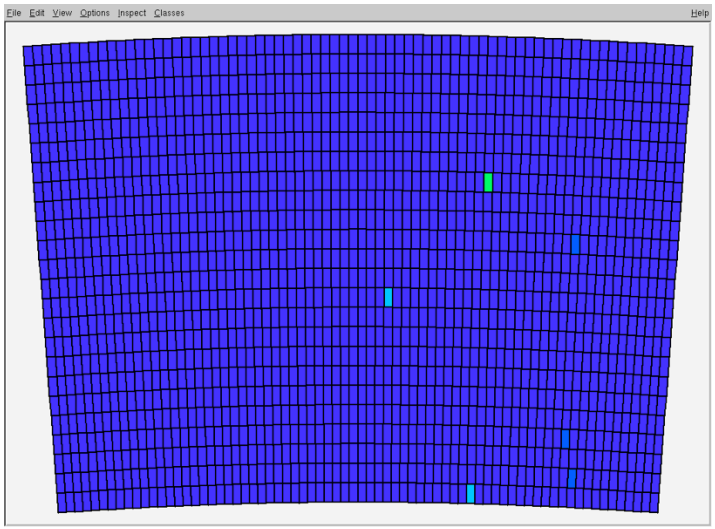


Tests of individual fibres

Fibre 'M'



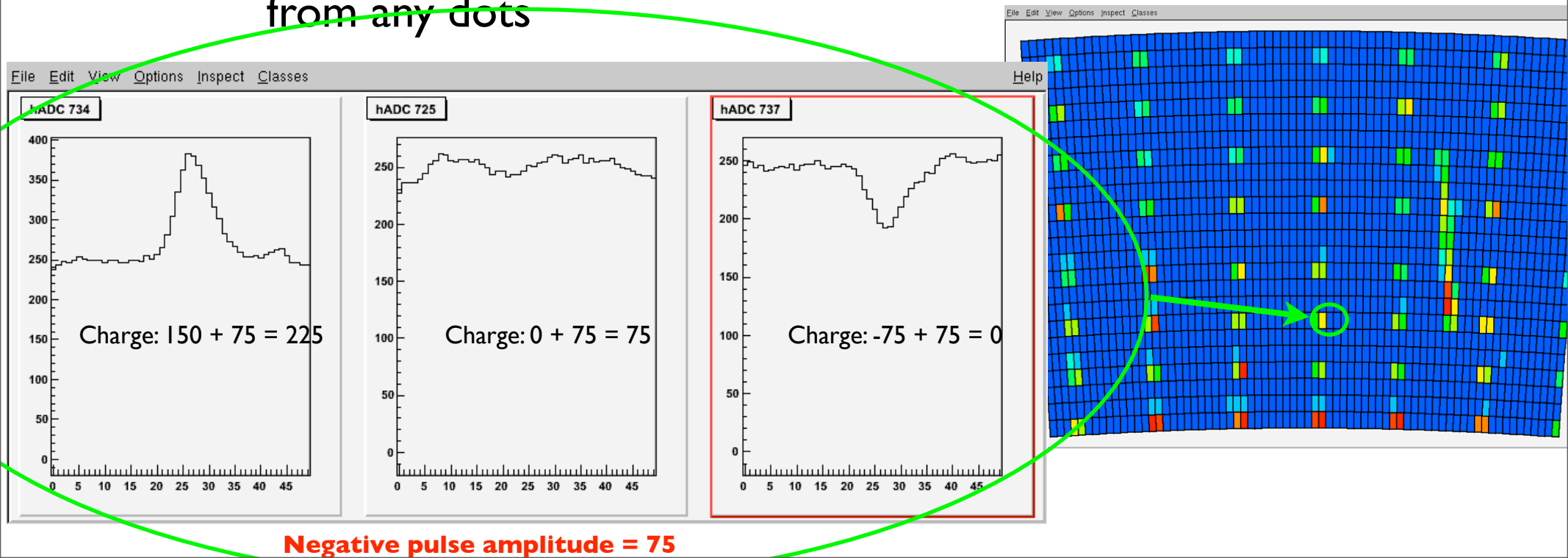
Fibre 'N'



- Fibre 'N' transmits visible light (from a laser pointer) but very little UV light - it is being returned to Victoria for repairs.
- Data this week is being taken with only fibre 'M' shining into the bottom TPC feedthrough
- Light-tight box and TPC feedthroughs for fibre 'N' have been sealed for safety

Negative-polarity pulses

- The 7ns laser pulse deposits lots of charge on the mesh at once - has been seen to cause a global drop in potential coincident with the laser flash
- Correct charge deposited on a pad is (amplitude of signal) + (amplitude of negative pulse)
- Amplitude of negative pulse can be measured from pads far from any dots

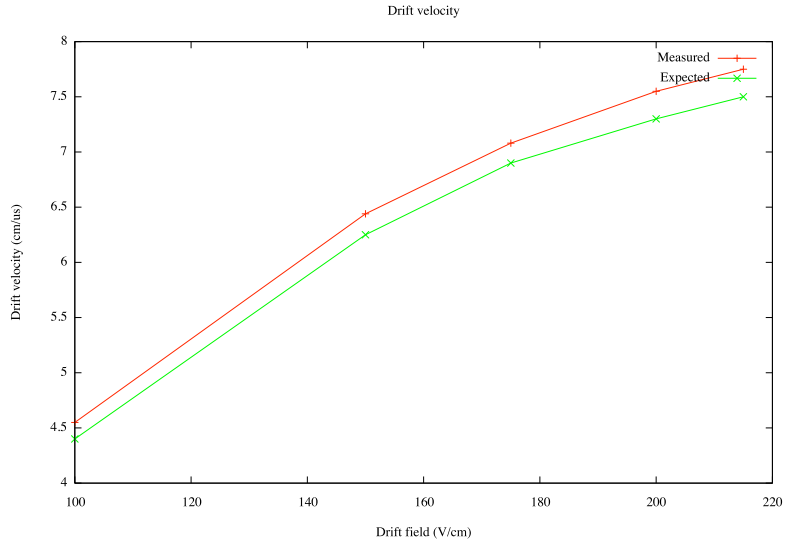


Negative-polarity pulses

- Information about total deposited charge is contained in the amplitude of the negative pulse
  - zero-suppression loses this negative charge
  - Any low-amplitude pulses are eliminated with pedestals because of the absence of the negative pulse to use as correction
- We are taking data without pedestal subtraction and zero-suppression. Analysis will find the negative pulse and correct the charge on other pads to give an accurate picture of a laser event

Drift velocity measurements

- Cohesive laser pulse gives us precise information about drift velocity after few events
- Measurements of drift velocity in several fields show good agreement with expectations

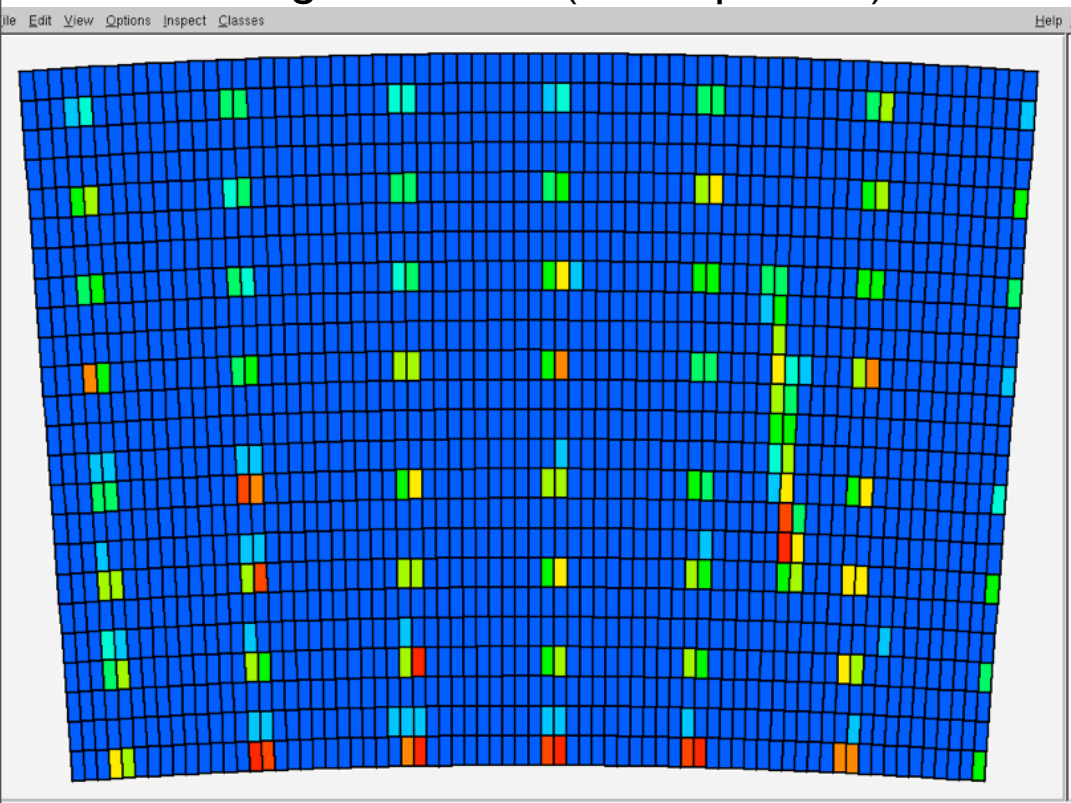


- Velocity measured at these drift fields at different magnetic fields and in inhomogeneous magnetic and electric fields (not analysed).

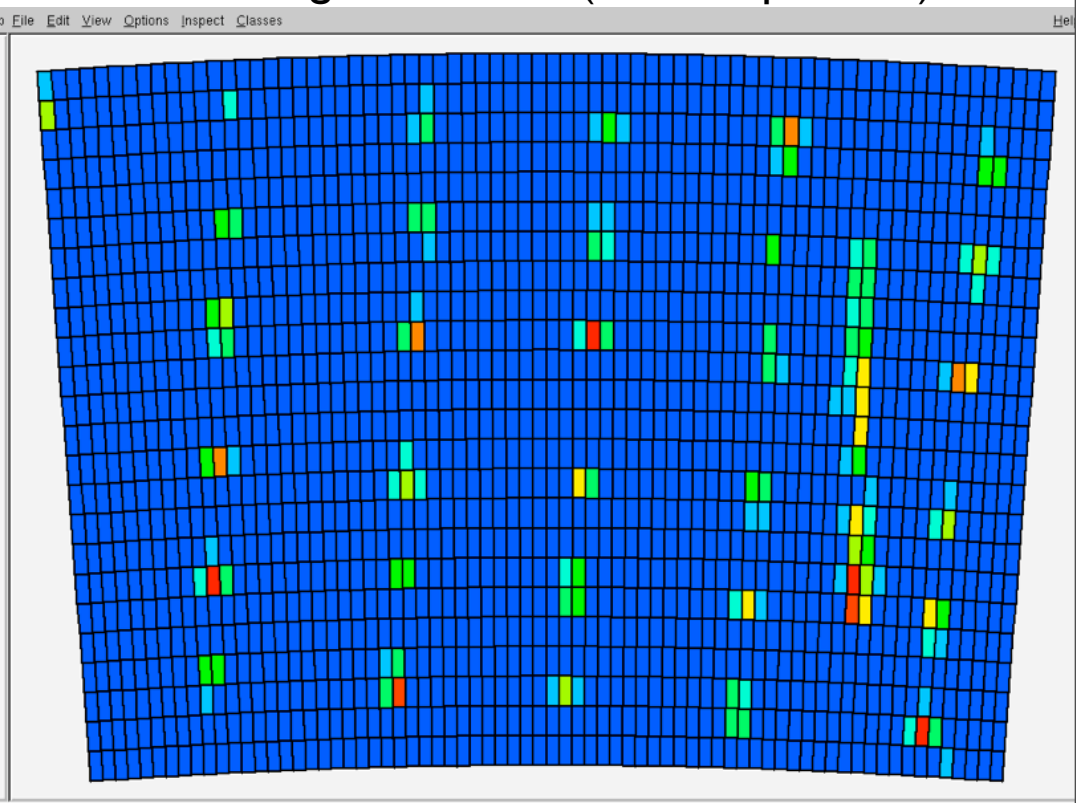
Inhomogeneous magnetic field

- Distortions have been measured with the TPC moved to inhomogeneous areas of the magnet
- Repetition of measurements from May, with better statistics because laser is not near the TPC

Homogeneous field (B-Max position)



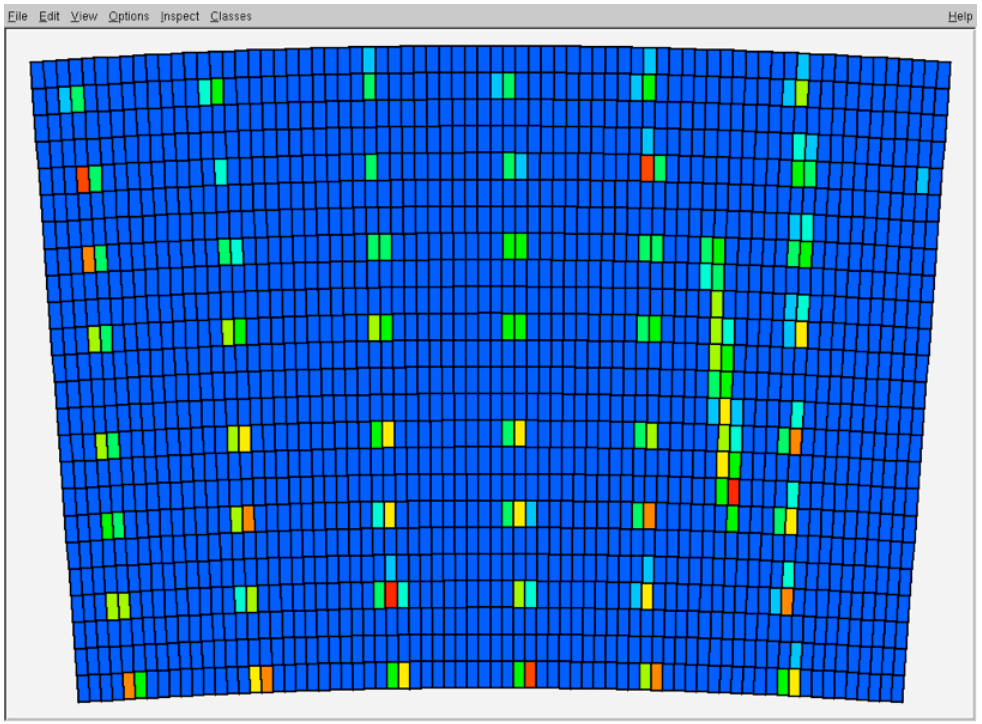
Inhomogeneous field (z=50cm position)



Inhomogeneous electric field

- Measurements have been taken with one dummy module removed from HV and grounded, and with all dummy modules grounded.
- Similar measurements were taken in May without magnetic field, and without grounding. In all but one case distortions were undetectable.

- All dummy modules have been grounded (B=1T)
- The top has been shifted slightly left relative to the bottom



Further tests

- Runs with a high-intensity beam: space charges might introduce distortions
- Runs with the fibre in each feedthrough on the TPC: the change in intensity across a dot may introduce measurable distortions.
- Runs at reduced field (eg. 0.5T)