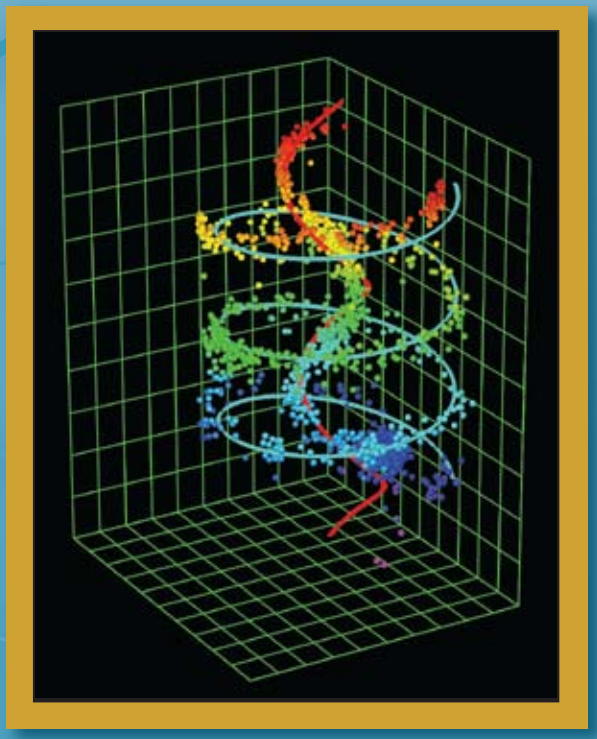
Advanced Instrumentation Seminars

October 29, 2008
1:30 pm, Redwood A&B
ROB

GOSSIP
Tracking Detectors



Guest Speaker –
Harry van der Graaf
NIKHEF

100 years ago Hans Geiger operated the first gaseous detector, which was the basis for 'wire chambers', widely applied as track imaging in particle physics experiments. In wire chambers gas amplification occurs, close to the wire surface, due to the strong (1/R) electric field. This enables the detection of the few single electrons created in the gas by ionisation radiation.
In Micro Pattern Gas Detectors, areas with a strong electric avalanche field are created by two or more conductive perforated planes (grid). The granularity of such a detector is determined by the hole pitch and can be much better in comparison to wire chambers.
In another development, each grid hole is equipped with its own readout channel (preamp, shaper, discriminator) in the form of an active pixel array in a CMOS chip. The combination of an (integrated) grid and the pixel readout enables high spatial resolution, good time resolution (thus precise 3rd (drift) coordinate), fast signal development, low occupancy and low ion feedback. By means of MEMS technology we integrated the Micromegas grid onto pixel chips (InGrid), forming a monolithic readout unit for gaseous detectors.
Essentially, the application of gas as detection material, compared to, for instance, Si, offers several advantages, relevant for future tracking and imaging detector developments.
If newly-to-develop electron emission foils could be made with sufficient efficiency to emit an electron after the passage of a minimum ionizing particle, the gaseous drift layer could be omitted, and the foil, without holes, could replace InGrid. Micro Channel Plates, possibly integrated onto the CMOS pixel chip, would eliminate the gas entirely. This would result in an ultra fast monolithic solid state foil detector for, for instance, CLIC experiments.

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