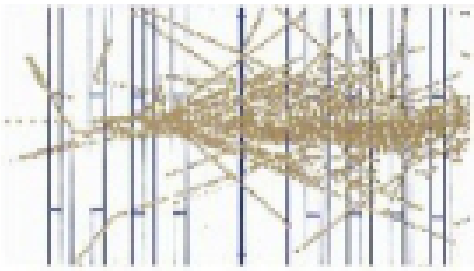

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Estimate of neutrons event-by-event in the DREAM module

Summary

Dual readout calorimetry has so far focussed on the large fluctuations in the electromagnetic content of hadronic showers (\fem) which degrade the performance in several respects: poor energy resolution, a non-Gaussian response function, and a non-linear response with increasing hadron energy. The next largest fluctuation is the binding energy loss that is proportional to the MeV neutrons liberated in nuclear break-up.

These liberated neutrons have velocities about $v \sim 0.05c$ and fill the volume of the module like a gas. We expect to find the neutron signal in the long-time tails of the plastic scintillating fibers which record the recoil protons in $np \rightarrow np$ elastic scatters, through which the neutrons rapidly lose kinetic energy as $\Delta E_n/E_n \approx 1/2$ per elastic scatter. The \dream collaboration is seeking a means to attain the 'ultimate' calorimeter energy resolution, and a measurement of the neutron content shower-by-shower is one component of that goal.

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