

**Subject:** Charge range on tracking chambers

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Hall D Electronics:

Hi Elke,

Document 747 on the portal shows the charge deposited on the CDC and FDC detectors. These numbers were first estimated for the Electronics Review in July 2003 and were based on geometrical constructs only. You can find a brief summary on slide 22 (a back-up slide) of my presentation for the Hall D Drift Chamber Review of 6-8 March 2007, document 751. Anyway, these numbers have not changed in years....

For the CDC, the dynamic range is shown to be 100 fC - 3 pC - a factor of 30. Because the charge amplifier has a peaking time of about 11 ns, the dynamic range of the preamp would be about 400 fC for point ionization (~13% of total charge). The gain of the preamp would then be ~ 1000 mV (a reasonable maximum amplitude to expect from a preamplifier) divided by 400 fC times a factor to allow for some headroom before saturation, say 80%. The result is 2 mV/fC.

where does 13% come from?

why is gain denominated in millivolts?

does the FDC pre-amp have the same peaking time?

Similarly for the FDC, the dynamic range for the anodes was estimated to be 300 fC - 3 pC, a factor of 10. For the preamp, 400 fC for point ionization and 2 mV/fC for gain.

For the FDC cathodes, the dynamic range was estimated to be 10 fC - 1 pC, a factor of 100. For the preamp, 133 fC for point ionization and 6 mV/fC for gain. Note that here, the estimate presumed a 1/3 of the charge of the anode on the cathode (charge sharing on adjacent strips). Later, it was decided that this number needed to be changed to 1/5 based on published data. For the preamp, the point ionization was then estimated to be 80 fC and 10 mV/fC for gain.

isn't even 1/3 a not-very-conservative number?

There might be a significant number of cases where more charge is seen on the central strip.

According to these estimates, the CDC and the FDC anodes require the same gain (2 mV/fC) and the FDC cathodes require x5 gain or 10 mV/fC.

Obviously, these numbers must be updated to reflect the physics events in the detectors. I hope this helps.

Note: these questions likely just reflect my ignorance.

Regards,  
Fernando

-- Mark