HMS Luminosity Scan

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Runs used are 2073 - 2095 taken in the beginning of April 2018

Scaler Cuts

After discussions with Mark Jones learned that:

- hcana "synchronizes" bcm scaler cuts between scaler reads and the events.
- this is done in gscalers.param to set threshold, and hstackana_decode_cuts.def to enable
- data is never thrown out, simply given a flag H.bcm.CurrentFlag for events, or filled into a .scalerCut variable in the scaler tree
- thus do not have to traverse scaler tree manually as hcana does the work. For this analysis, the scaler tree was analyzed event by event just to ensure answers are correct.

Computer Deadtime

Calculated according to

$$\text{Computer Live-Time} = \frac{N_{\text{Trigger}}}{N_{\text{Pretrigger}}}$$

where accepted triggers are stored in scaler leaf H.hL1ACCP.scaler and pretriggers are stored in H.hTRIG#.scaler (where # = {1, 2, 3, 4, 5, 6}).
Note that runs 1415 - 1423 do not store any information in this leaf, may be functionality added after January.

Electronic Deadtime

Calculated according to

$$\text{Electronic D.T.} \approx \frac{6}{5} \left(\frac{N_{\text{PRE100}} - N_{\text{PRE150}}}{N_{\text{PRE100}}} \right)$$

and is stored in scaler leaves H.hPRE#.scaler where $\# = \{40, 100, 150, 200\}$.

Tracking Efficiency

Just as before, is read out from the REPORT_FILE. Specifically

$$E \text{ SING FID TRACK EFFIC}$$

is the tracking efficiency used.

Sample Efficiencies – LH2

Current	Charge	Computer L.T.	Electronic L.T.	Tracking Efficiency
10 mA	16467 uC	99.3% ± 0.5%	99.99% ± 0.03%	98.53% ± 0.08%
20 mA	23179 uC	98.8% ± 0.4%	100% ± 0.00%	98.23% ± 0.08%
35 mA	23864 uC	98.1% ± 0.6%	100% ± 0.00%	97.98% ± 0.09%
43 mA	23967 uC	97.5% ± 0.5%	99.99% ± 0.03%	97.82% ± 0.09%
53 mA	26770 uC	97.1% ± 0.4%	100% ± 0.00%	97.48% ± 0.09%
66 mA	53186 uC	96.4% ± 0.3%	99.99% ± 0.03%	97.32% ± 0.07%
73 mA	39007 uC	96.0% ± 0.3%	99.99% ± 0.03%	97.08% ± 0.08%

Good Event Selection

Similar to previous procedure, I applied cuts for:

- $|\beta - 1.0| < 0.2$
- $\chi^2/N < 25.0$
- $E_{\text{Cal,Norm}} > 0.6$
- $|\delta| < 8.0$
- $|\theta| < 0.080$
- $|\phi| < 0.035$
- BCM4a Current Flag $== 1$

where the only changes were to $E_{\text{Cal,Norm}}$ because of a new calibration, and the BCM Current Flag.
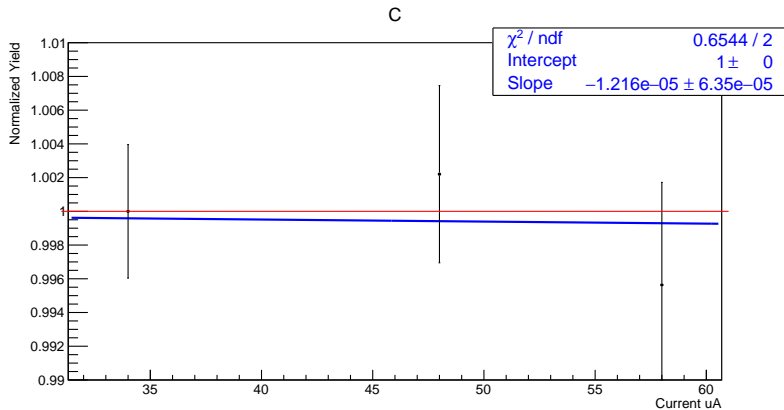
Results - Carbon

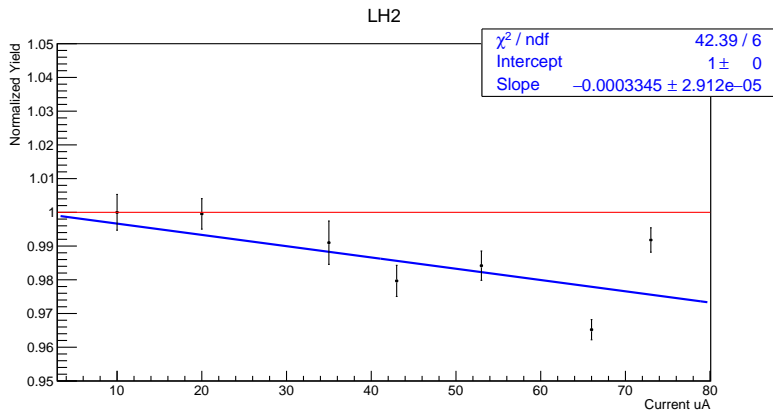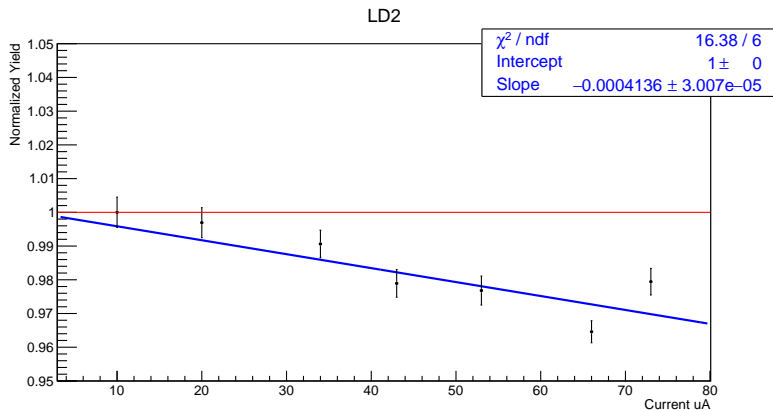Figure 1 : Scan of Carbon runs.

Results - LH2

Figure 2 : Scan of LH2 runs.

Results - LD2

Figure 3 : Scan of LD2 runs.