

Charge determination for GMP

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GMP meeting, February 25, 2013

Want best charge determination possible

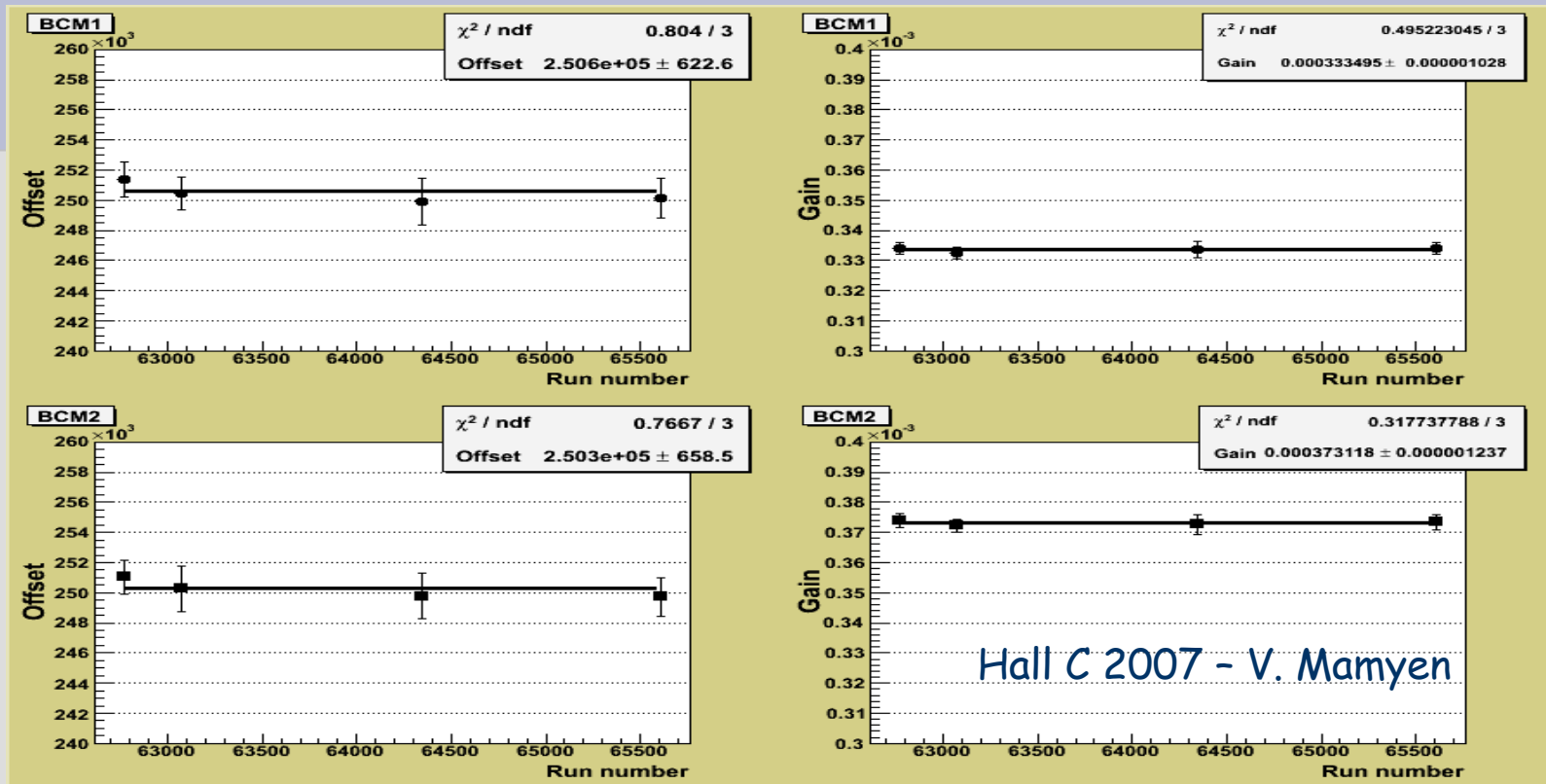
→ Want small uncertainties in both **absolute** and **time dependence** ($\Rightarrow Q^2$ dependence of *GMP*).

→ To my mind, the latter is more critical to *GMP*, since we can cross normalize to existing data at lowest Q^2 with dedicated runs.

→ Several tools available in Hall A: Unser, Faraday cup (@ injector), silver calorimeter (1% @ 1uA), BCMs.

➡ BCMs are non-invasive, measure the current in the Hall, and typically have good stability over time.

BCM calibrations have good stability



- BCM stability good to few tenths of percent over weeks to months.
- Calibration against Unser takes ~2hrs. Should perform once per week.
- Want to check absolute offsets with other tools available.

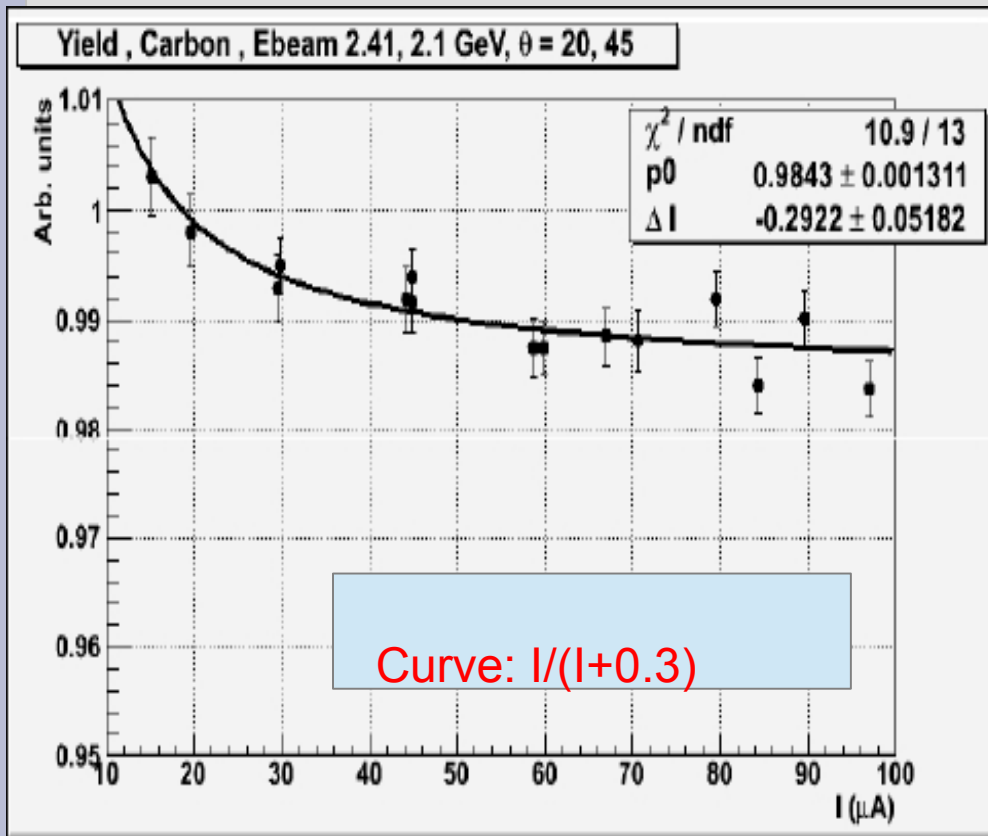
Use all tools available

- Calibrate BCMs against Unser
- Cross check Unser at low currents against:
 1. calibrate against Faraday cup
(sensitive to beam loss from injector to Hall)
 2. Silver calorimeter in Hall (1% at 1 μA) ****If manpower available**
- Check for offsets with solid target luminosity scans
 - Hall C studies indicate we can do this to $\sim 0.1 \mu\text{A}$.
 - Should perform twice with 2 different targets (eg C, Al).

Redundant Unser Calibrations

- Calibrate against Faraday cup, and
- Against know current in wire insert (Hall C method)

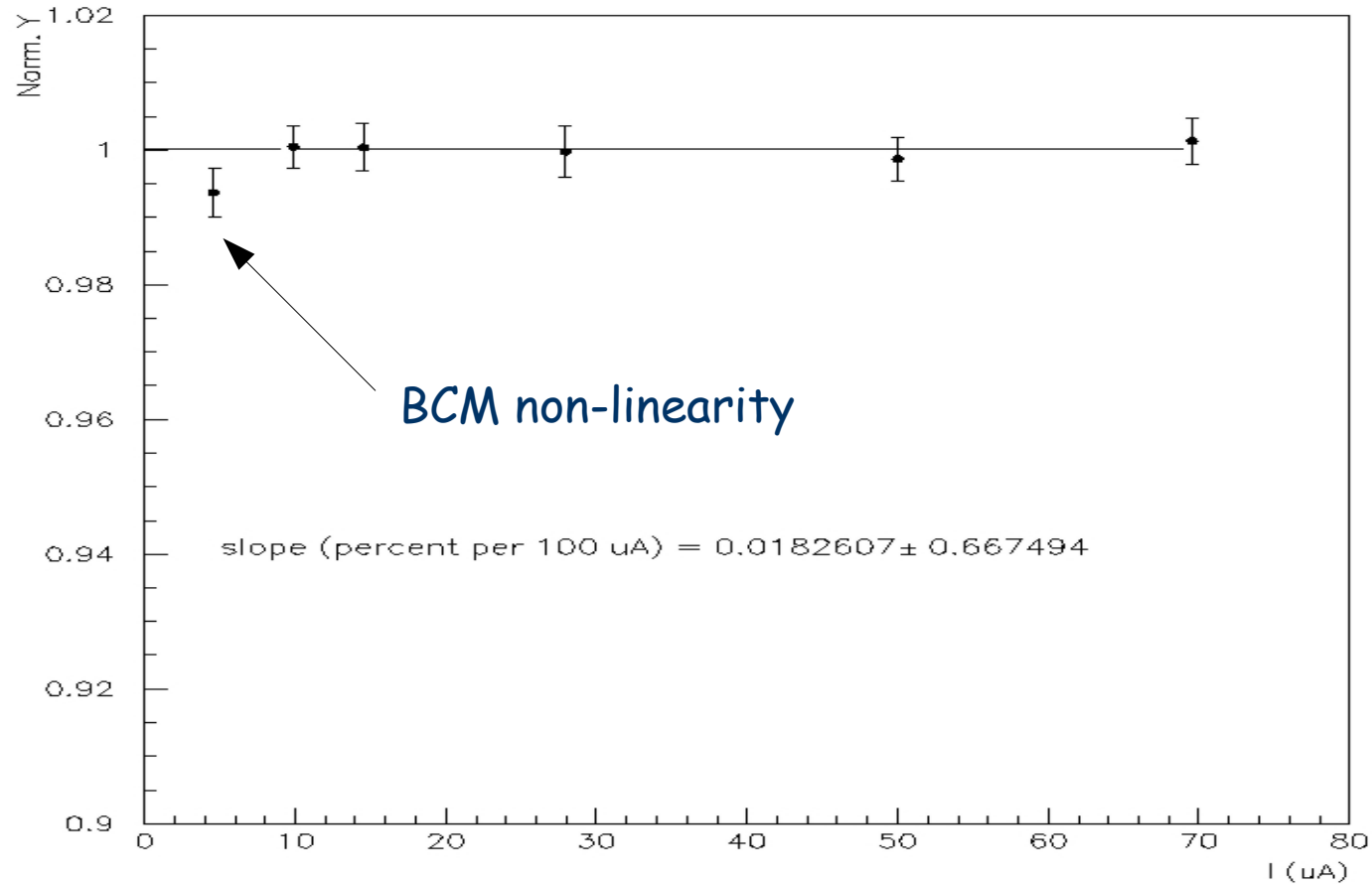
Determining absolute current offset (Unser zero).



- Luminosity scans on solid Targets provide current offset offset.
- Generally this is small in Hall C ($< 0.2 \mu\text{A}$)
- Think we can determine to better than an determine to better than $0.1 \mu\text{A}$.

Current offset from Unser zero typically small in Hall C

Low rate luminosity scan carbon target from 2005 data



In Hall A we can check non-linearities using Faraday cup

Final Notes

- I think we have enough tools to determine the charge to 0.1-0.2 μA .
- This will require multiple calibrations and cross checks (once per week?)
- Doug H. sent me the BCM/Unser calibration documents, but I am still going through these to better understand the Hall A procedures.
- Doug H. says the Silver calorimeter is *Not* turnkey and might require some significant collaboration resources before and during experiment.
- Limiting current range during running will minimize Q^2 dependence.
=> Should think about dedicated low Q^2 runs for normalization