

Fermilab

J. MacLachlan, AD, retired

Wednesday 3 Sep. 08

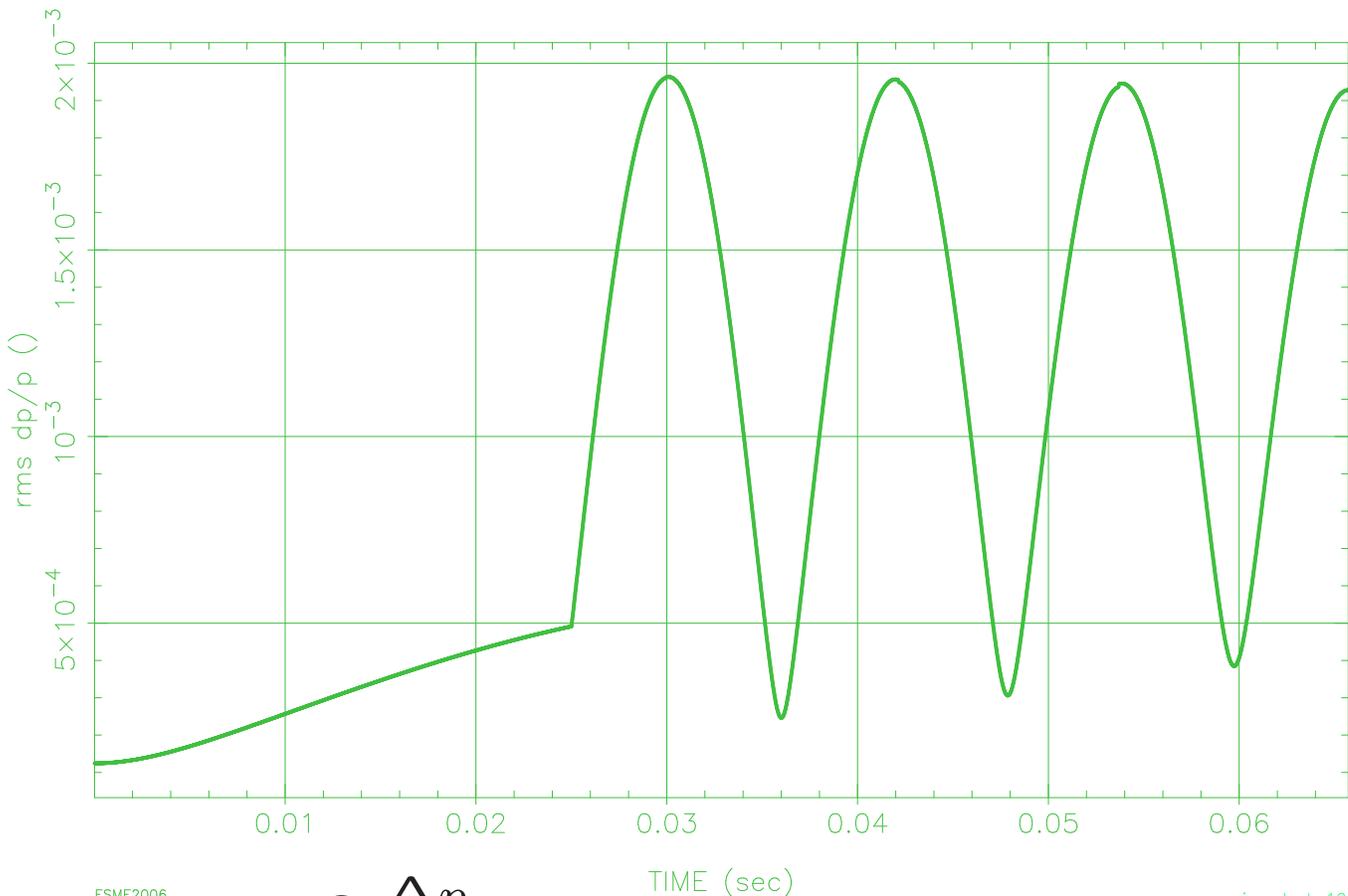
Rebunching Booster Batches in the Recycler for the g-2 Experiment

- Technically feasible concept
- Affordable
- Mostly recycled components
- Flexibility for optimization wrt experimental requirements
- Reasonable extrapolation of current practice

Concept

- Batch segmented into four parts by sawtooth waveform
- Segments rotated to minimum width in 2.5 MHz bucket linearized by second harmonic
- later extractions separated by half periods of synchrotron oscillation (~ 12 ms)

Beam for g-2 expt
rms dp/p VS TIME



ESME2006

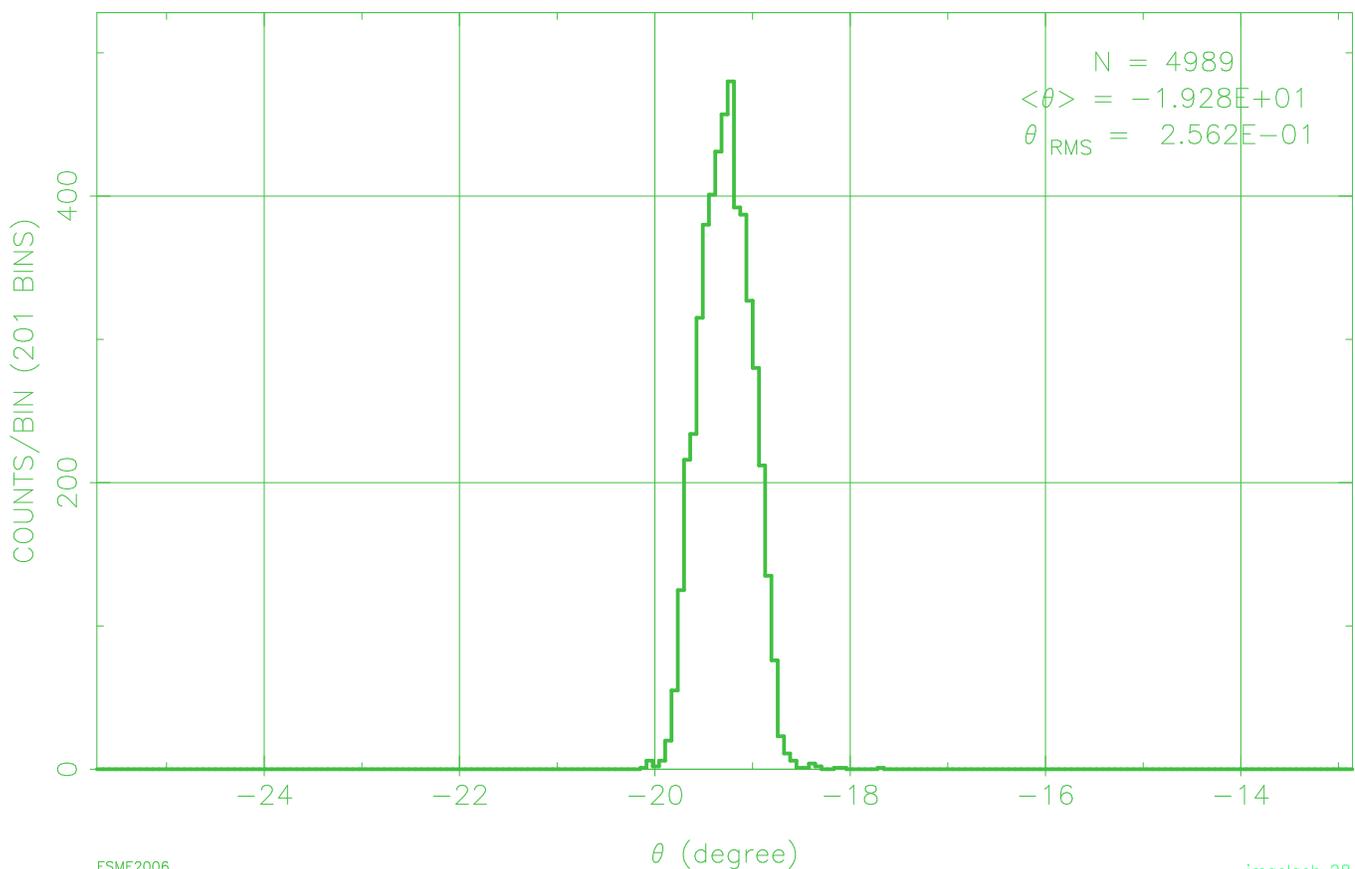
RMS $\frac{\Delta p}{p}$ in the Recycler vs. time [s]

jmaclach 19-Aug-2008 13:52

The four maxima are at the times the bunch widths are minimum. The interval is one half of a synchrotron oscillation period, ~ 12 ms. The $\Delta p/p$ is about 0.8 % full width. Therefore, if the *effective* ε_ℓ in the Booster is much larger than the 0.07 eVs assumed, the momentum aperture of the Recycler could become a concern, but there is nearly 50 % headroom with the parameters used.

Beam for g-2 expt

Iter 2696
3.003E-02 SEC

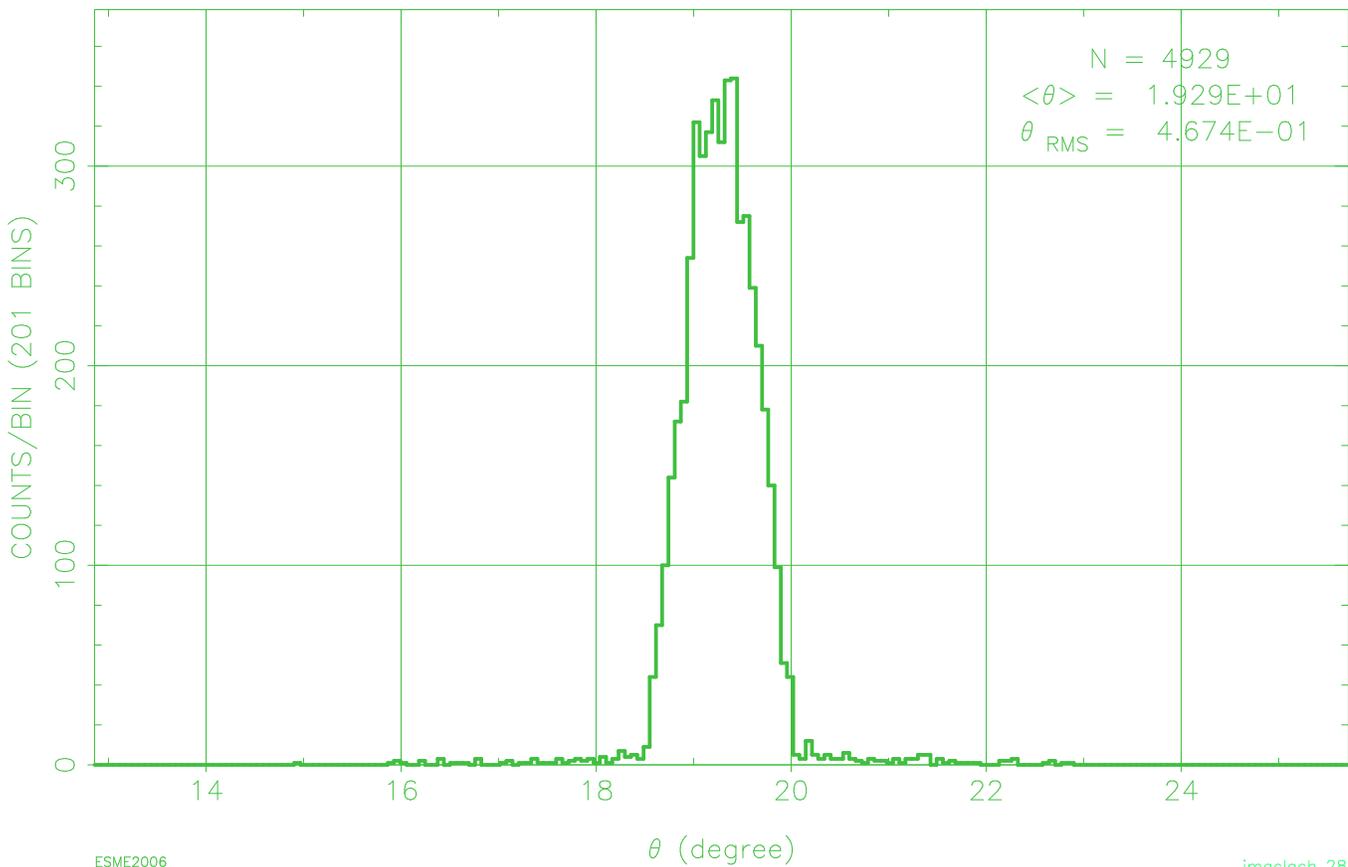


Bunch current (arbitrary units) vs. azimuth in the Recycler for the first bunch just before extraction

4σ width = 32 ns. The original Booster batch of $\sim 1.6\mu\text{s}$ extends from -25.714° to 25.714° .

Beam for g-2 expt

Iter 5970
6.650E-02 SEC



Bunch current (arbitrary units) vs. azimuth in the Recycler for the fourth bunch just before extraction

4σ width = 58 ns.