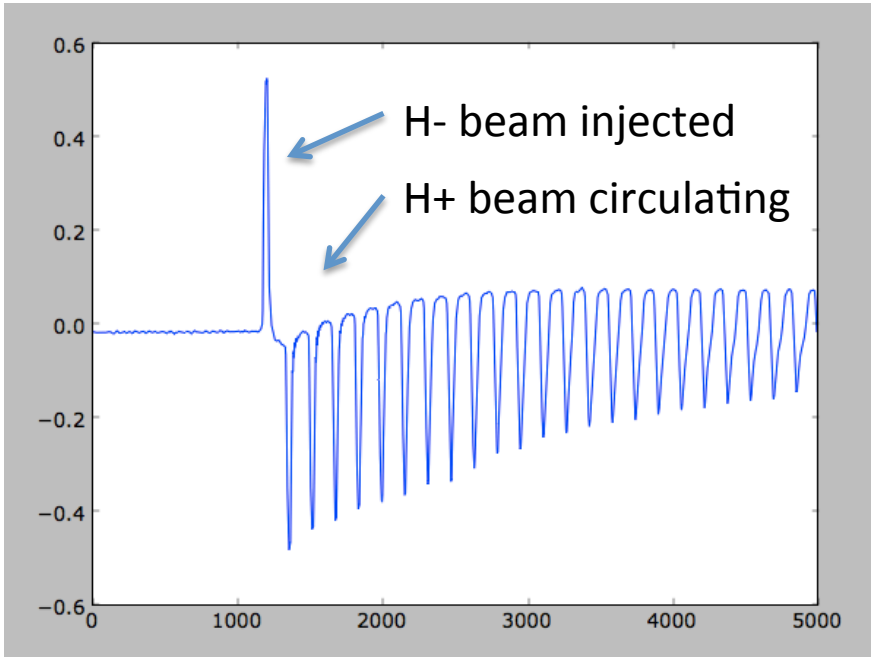
Bunch monitor signal integration

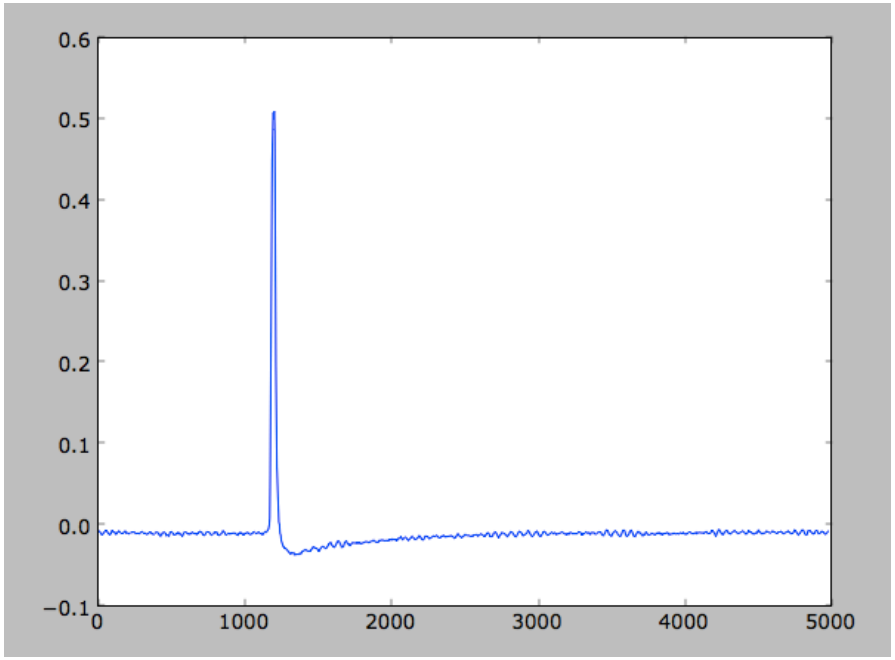
13/12/13

Intro

- Parallel bunch monitor (located after injection foil)
- Assume integral of each peak proportional to bunch charge.

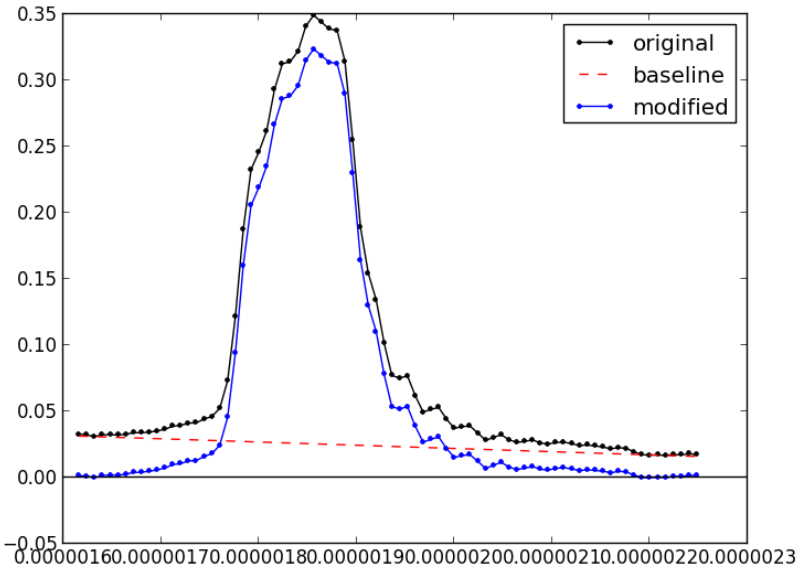
Figures from Suzie's presentation 13/11/13



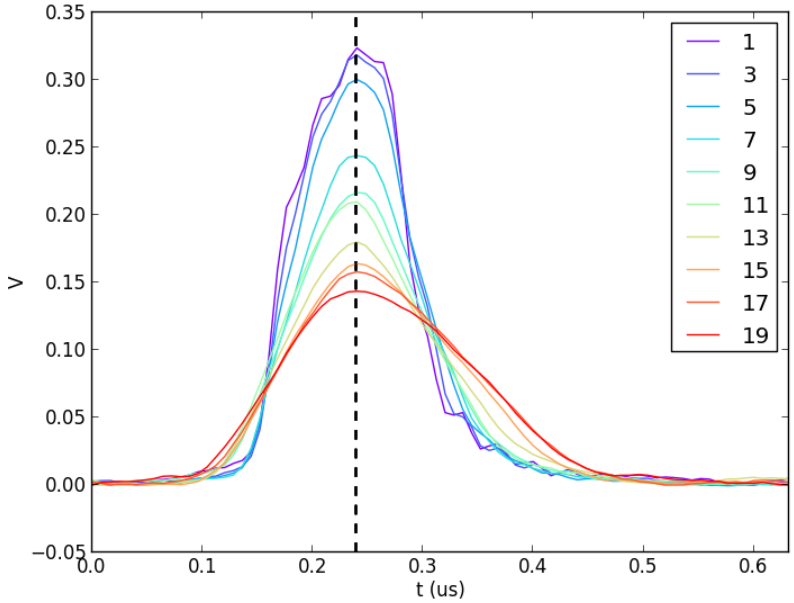


Signal preprocessing

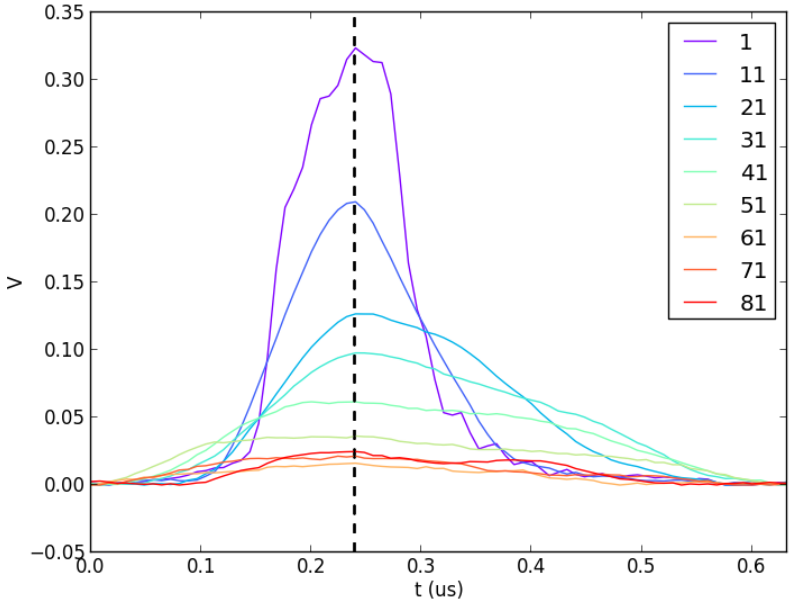
- Use Shinji's peak finding algorithm to find set of t_{peak}
- For every peak, isolate the signal for that turn, Seems t_{peak} – 30ns < t < t_{peak} + 50 ns is reasonable.
- Remove slow variation (slope) in signal by subtracting from each point a line that passes through the minima on both sides.



Prepared signals



First 20 turns

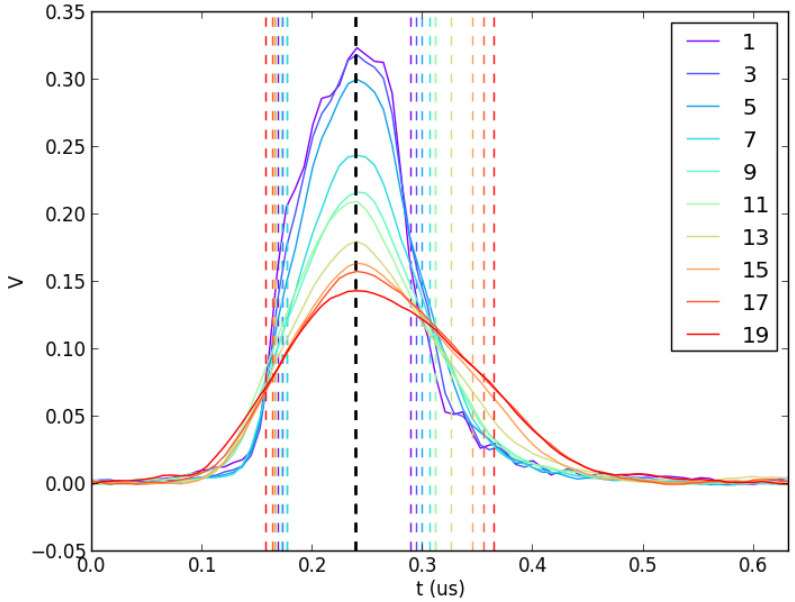


First 81 turns in 10 turn steps

Area calculation methods

- FWHM * width
- Integrate under curve by quadrature (scipy.interpolate.quadrature

- FWHM times indicated by dashed lines.
- Asymmetric bunch broadending

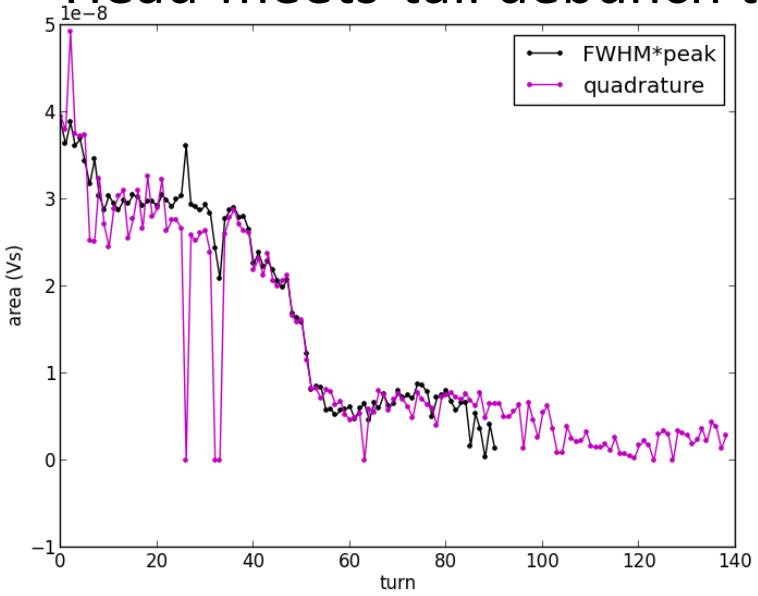


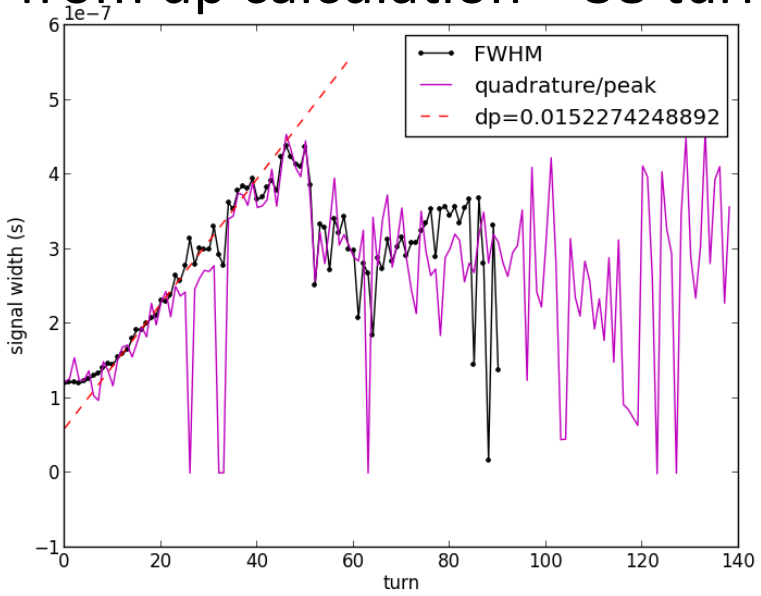
Example result 1 (data from 1/11/13)

- File: ~SortByDate/2013/11/13/1/?.csv (must check)
- Area decreases for the first few turns. Plateau for some time and then drops again
- Fit width vs turns in linear region to obtain dp (here we assume dp is fixed). Phase slip η from Zgoubi model at injection momentum.

$$dp = \frac{slope}{\eta T_0}$$

- Head-meets-tail debunch time from dp calculation = 38 turns





Example result 2 (data from 1/11/13)

- File: ~SortByDate/2013/11/13/1/double090.csv
- No decrease in area for first few turns in this case
- Debunch time from dp calculation = 32 turns
- Hints of rebunching in data? Signal is weak, could be in the noise.