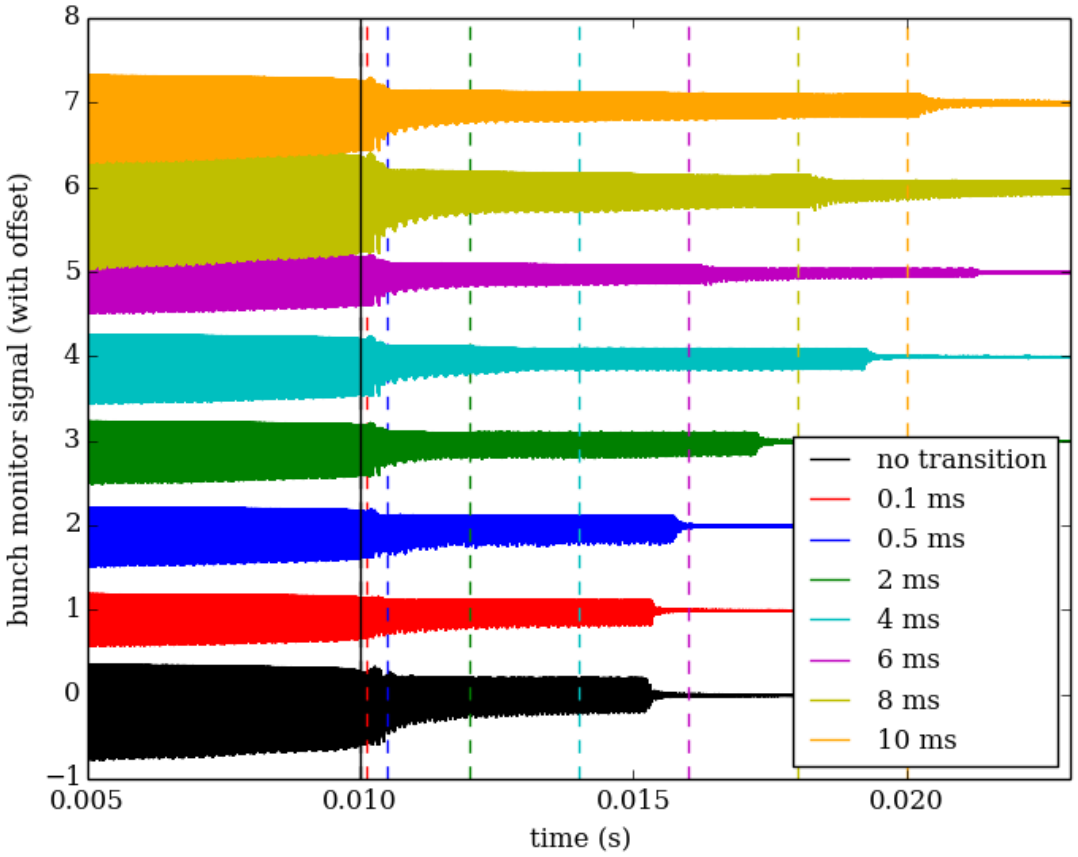
Adiabatic transition and constant bucket area experiments

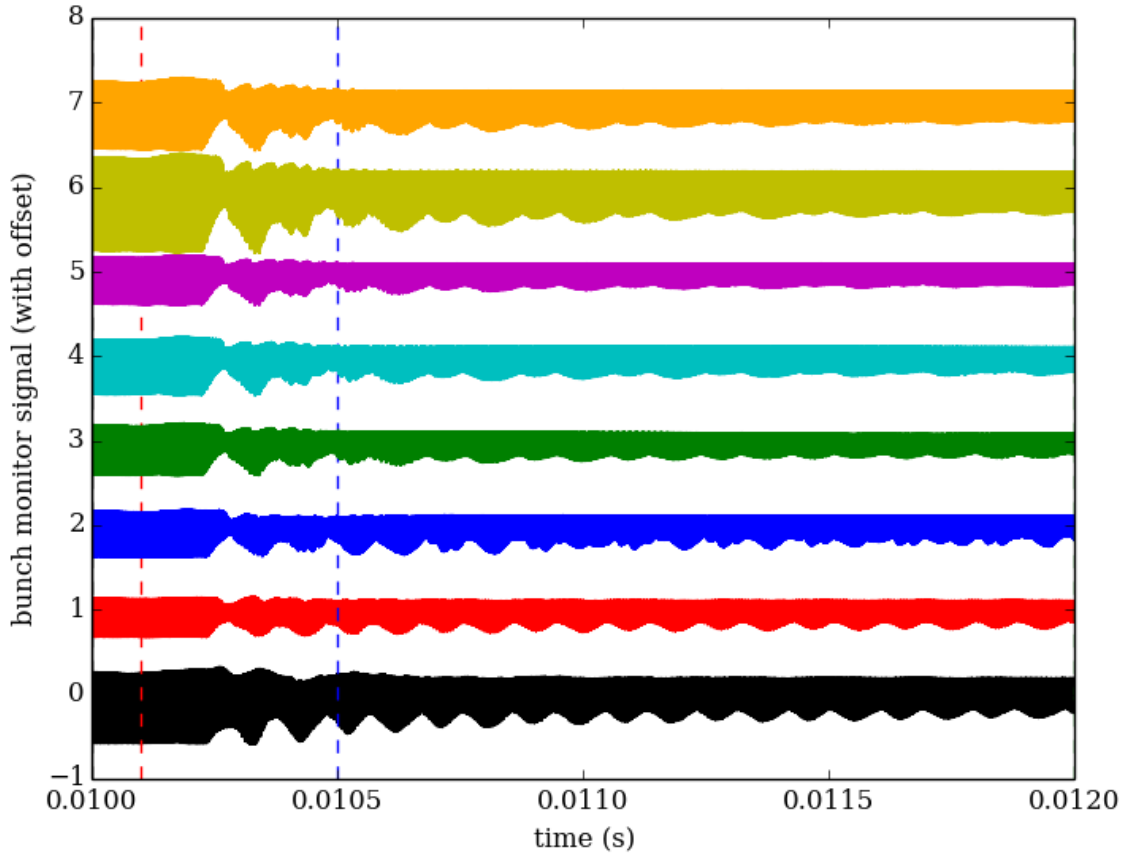
D. Kelliher (3/7/15)

Adiabatic transition to flat-top



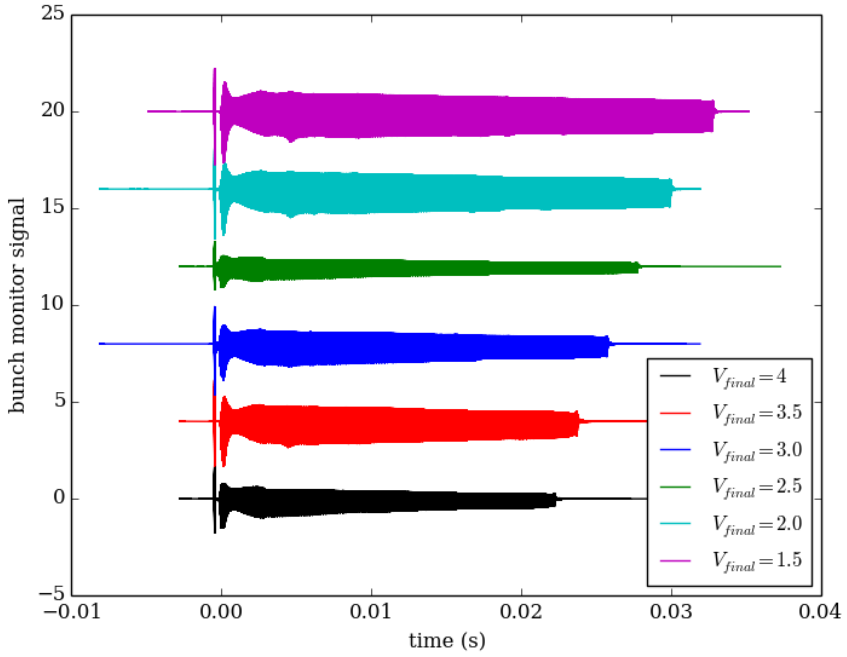
- Phi_s = 20, drops linearly to zero in transition region of variable duration from 10ms
- 5 ms flat top after transition

Adiabatic transition to flat-top



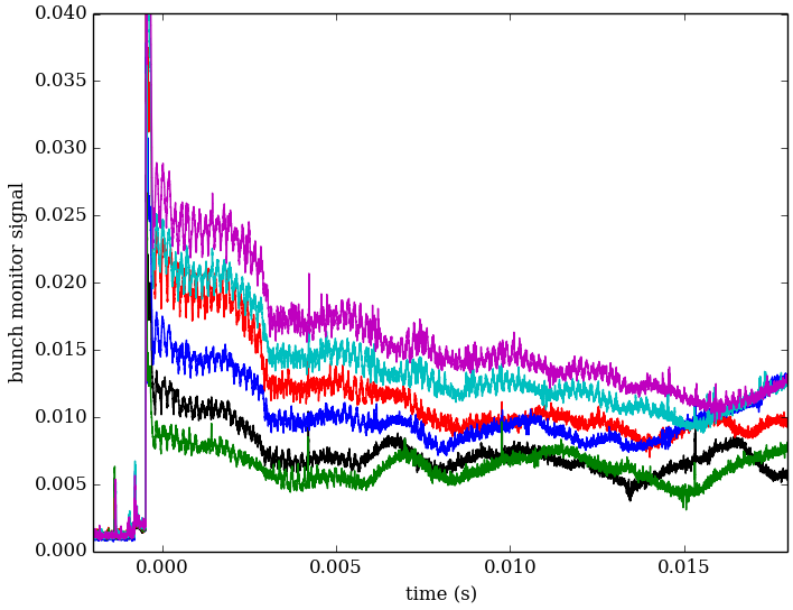
- Zoomed in view shows oscillations. Looks like synchrotron frequency (10 kHz).

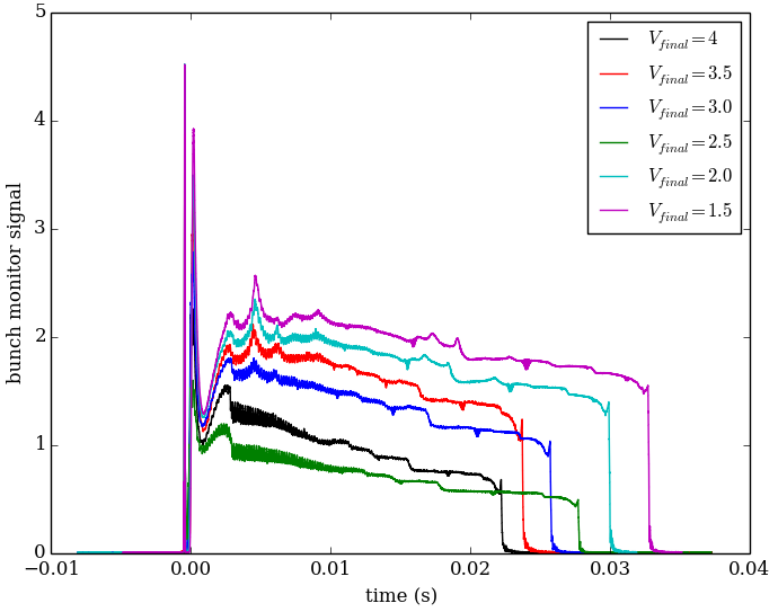
Bucket Area experiment: S12 data



- Note differing acceleration times to reach same final energy (100 MeV).
- Variation of amplitude of signal partly caused by fluctuations in the injected beam. Normalise using S7 data.

BA experiment: S7 and S12 signal amplitudes

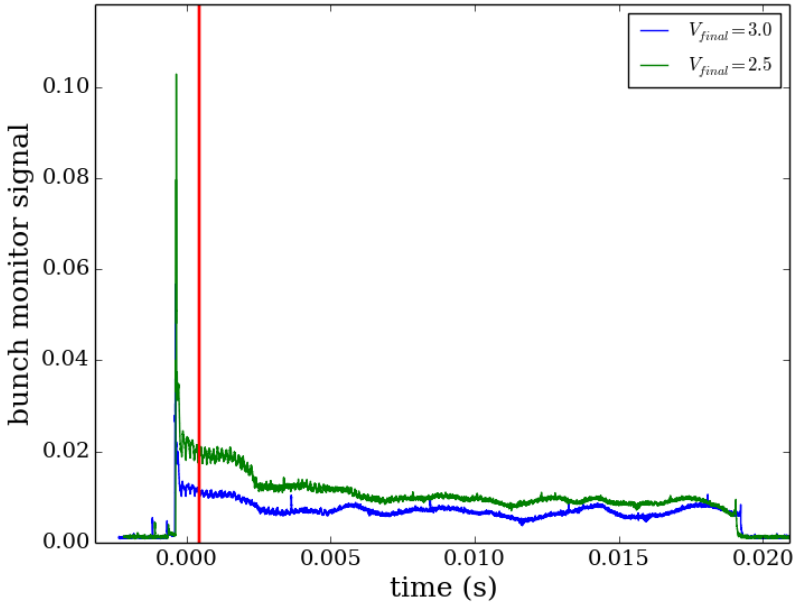


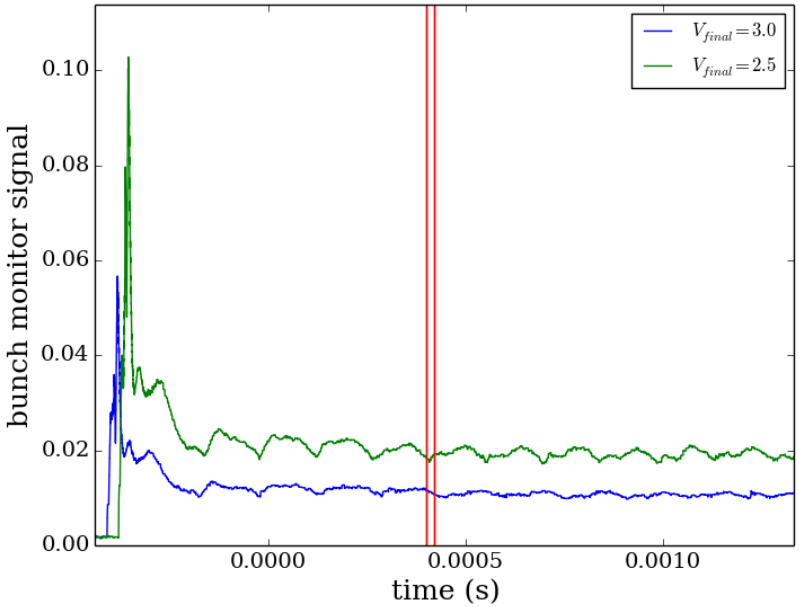


- S7 signal amplitudes calculated by taking the difference of max and min in a moving window. Window has a halfwidth of 100 time step.

- S12 signal amplitudes calculated in the same way.

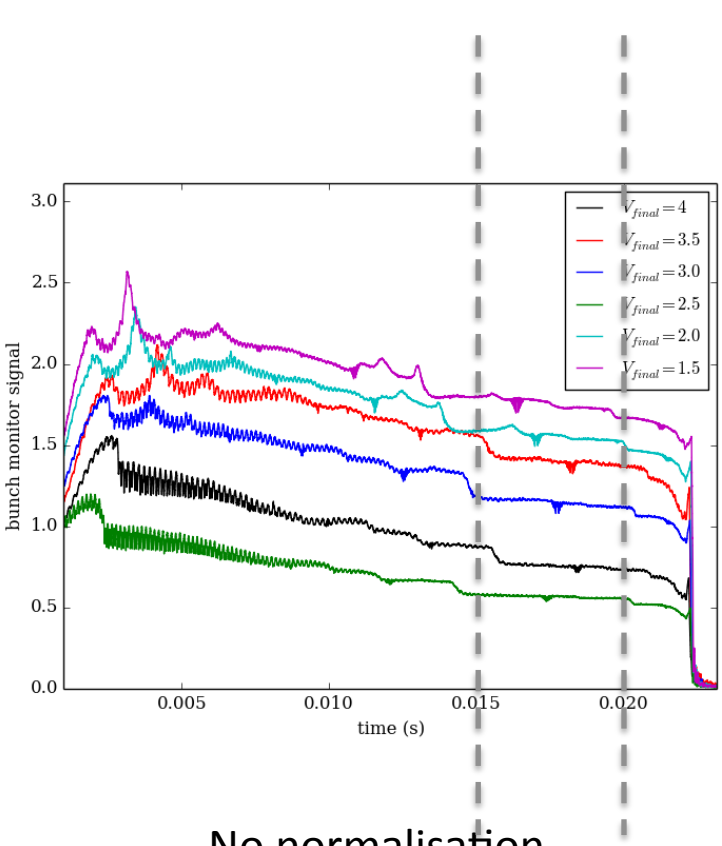
BA experiment: S7 and S12 signal amplitudes



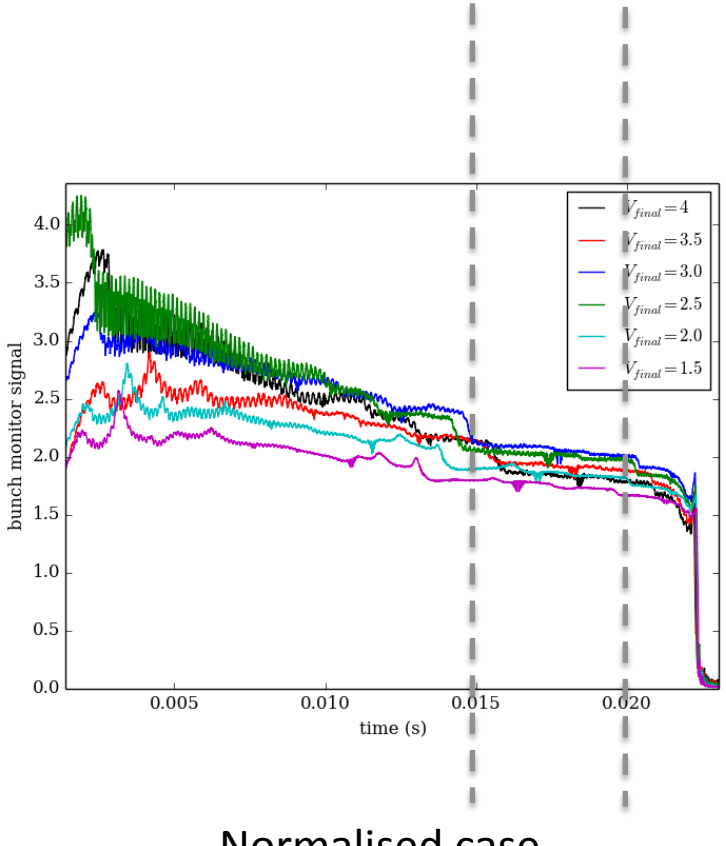


- Calculate mean S7 amplitude somewhere early in the signal. The level of the signal should, it is hoped, reflect the intensity of the injected beam rather than variations in the rf profile.
- Arbitrarily chose to average between red lines in figure.

S12 amplitudes – zoomed view



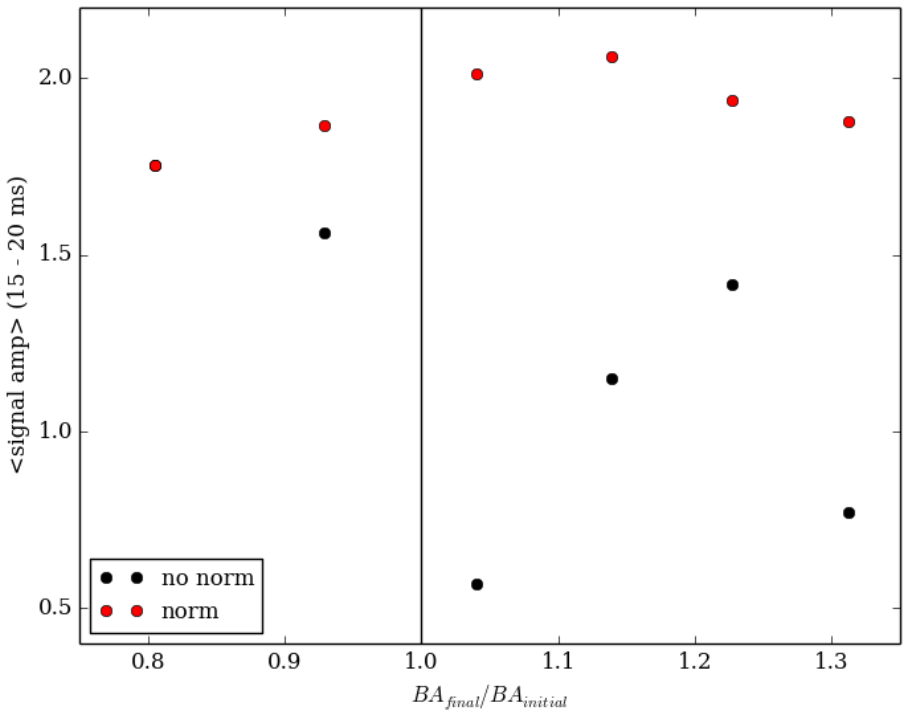
No normalisation



Normalised case.

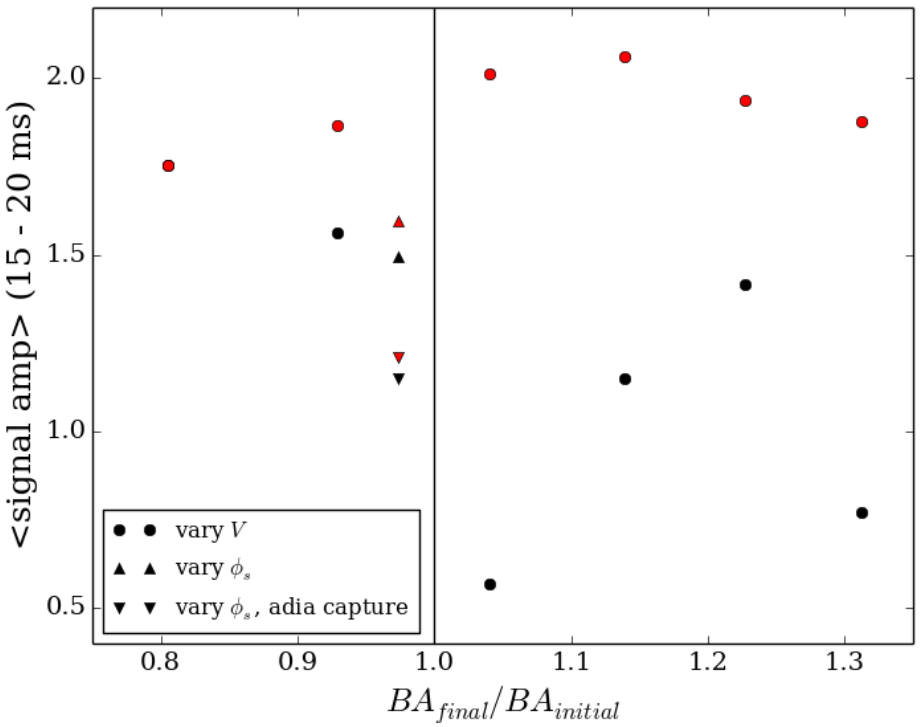
- As a crude measure of transmission, just take average of amplitude between 15 and 20 ms

Voltage scan result



- BA ratio from Shinji's script. Maximum ratio of 1.3 corresponds to maintaining 4V while 0.8 corresponds to the voltage decreasing from 4kV to 1.5V.
- Normalised data suggests maximum transmission with BA ratio between 1.04 and 1.14.

Adding ϕ_s variation cases



- We varied ϕ_s from 20 – 28 degrees in 19.5 ms to reach 100 MeV with constant BA.
- We also tried adding in adiabatic capture by increasing the voltage from 3kV to 4kV in the first 0.25ms and then increasing ϕ_s as before.

Comments during meeting

- To account for bunch lengthening, better to integrate under the curve when calculating intensity from S12 data.
- Actual ϕ_s may vary with the voltage. This means the bucket area may not vary as predicted assuming a constant ϕ_s.
- The rf waveform was saved – can check if amplitude decreased linearly as was programmed.