Science & Technology Facilities Council

KURRI experiment and analysis meeting

S. Sheehy, RAL, 23/4/14

Status of experiments

0. PREPARATION & DIAGNOSTICS

Description:

Implementation of new bunch monitor amplifiers and calibration

Status:

Vertical double plate monitor used during experimental run. Horizontal plate monitor connected, but due to layout a sum/difference signal will not give a real position.

Analysis & follow-up required:

Check status of calibration for vertical BPM.

Hardware required for horizontal BPM to achieve full position readout.

1. LINAC MEASUREMENT (QUICK)

Description:

Measure beam quality from linac dp/p and beam size/emittance

Status:

M. Takabatake presented a lot of work on this done during her Masters. dp/p~0.01, sigma~12mm. Main ring FFT energy measurement 10.89±0.11MeV. From TOF measurement in injection line 10.76±0.13MeV. Also

Not re-performed in March due to expected time requirement.

Analysis & follow-up required:

There is a beam energy time-structure (energy decrease with time). SM suggested using a compensation pulse on top of the main RF to compensate beam loading.

2. VERTICAL ORBIT MATCHING

Description:

Match the vertical orbit using 3 steerers in injection line, using vertical double plate BPM to minimise vertical coherent oscillation

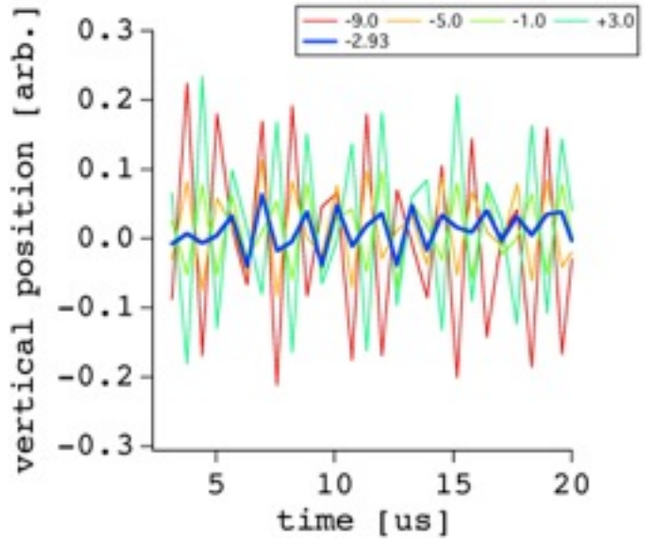


Figure from S. Machida, 24/3/14

Status:

Performed on 20/3/14 and again for more data on 24/3/14. (Data also used for vertical tune measurement). Showed empirical optimisation to be fairly successful.

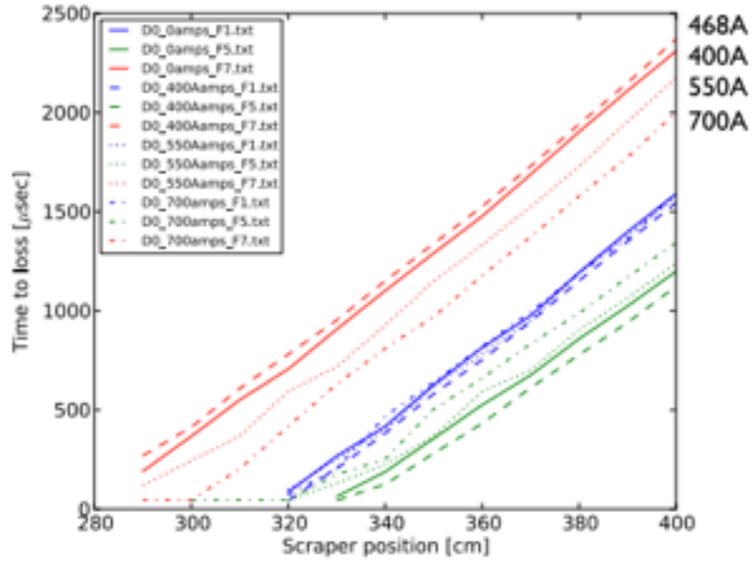
Analysis & follow-up required:

None for now.

3. CLOSED ORBIT DISTORTION CORRECTION

Description:

Optimisation of COD correction using main corrector & D pole coil



Status:

Experiments performed on 25/3/14-27/3/14.

Analysis & follow-up required:

D pole coil correction was unsuccessful, perhaps due to limited excitation current. Would need different power supply to implement.

Further thoughts will be required on COD correction and it's interplay with 'optimal' running conditions. (i.e. is it really not possible to optimally inject with the corrector pole at 700A? See later…)

4. DISPERSION MATCHING

Description:

Measure dispersion function at the foil, measure dispersion function in the ring, try to match the dispersion between transfer line and main ring.

Status:

Foil dispersion: experiments performed on

Ring dispersion: measured using COD correction data and RF programme

5. HORIZONTAL ORBIT MATCHING

Description:

Match the horizontal orbit at injection using steerers in the injection line to optimise circulating turns.

Status:

Experiments performed on 3/4 and 4/4/14 for 468A and 700A corrector settings. 700A we were unable to find optimal injection settings.

Analysis & follow-up required:

Data for 468A needs analysis (I think)

Higher corrector setting needs re-doing systematically making sure the beam is centred in the injection line (ramp quads to check if required).

More simulation is required of injection line to ring (Malek?)

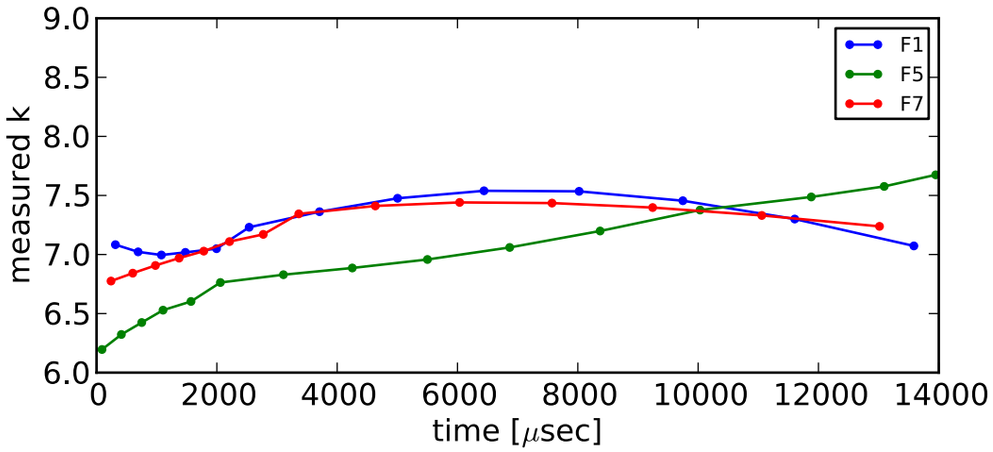
6. MEASURE REAL K(R)

Description:

Measure the ‘real’ k value with radius using time-to-loss method and applied RF programme.

Status:

Experiments performed on 31/3/14



Analysis & follow-up required:

Analysis is sensitive to a number of factors including the gamma (energy) value assumed at each step. Chris P, Uesugi-san and Suzie’s analysis all converged eventually (!). Values measured at ‘F5’ seem strange, can we do simulations which gives us the same result with COD?

7. RF OPTIMISATION

Description:

Implement ‘real’ k(r) pattern to optimise RF.

Status:

Not yet implemented

Analysis & follow-up required:

To be done.

8. TUNE MEASUREMENT

Description:

Tune measurement from injection to extraction in both planes to identify resonances of major loss points and compare to simulation.

Status:

Experiments performed throughout March visit for various working points & over some of the energy range RF flat-tops.

Horizontal tune measurement was limited by scope of RF mix-in method used, making it difficult to identify sidebands.

Analysis & follow-up required:

Some detailed analyses done with various methods by Kuriyama-san, Shinji, David and Chris R. Can we converge/consolidate?

Tune measurements with energy need to be re-performed over full energy range using horizontal RF pertubator instead.

9. FOIL ENERGY LOSS

Description:

Measure the energy loss due to the stripping foil. Compare the RF phase with beam time of flight as a function of RF voltage.

Status:

Experiments performed 4/4/14.

Analysis & follow-up required:

See Chris R's presentation.

To be discussed.

Planning…

- Many items have been completed (hooray!)
- A few were not possible due to time
- We learned a lot!
- Some analysis is still required (let's arrange that…)
- Further experiments to plan: RF stacking, optical function measurement and/or matching, horizontal painting, emittance growth.
- When should our next visit be, what will it look like?