KURRI Experiment Planning
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1. RF Pattern Optimisation

- Optimise capture efficiency & phi_s with acceleration
- Compare constant k, variable k & other rf patterns directly
- Injection should be kept the same for the different RF programmes
- Significant improvement in efficiency seen by using theoretical k(r) needs confirming, this should improve efficiency further.
- If the rf frequency or voltage is not correct due to eg. inaccurate k-value, coherent oscillations in the bucket may be excited and result in beam loss.
- Using real time spectrum analyser to measure bunch shape - measure excitation of coherent signal in the bucket which should have harmonics of synchrotron oscillations, for several rf programmes (simulated k, measured k).

For a more detailed plan see Shinji's slides…

Setup required…

- Script to create waveform generator files (Shinji ?)
- Simulation work (Shinji has started)
- Other?

2. Longitudinal tomography

- Aim to make direct observation of match between rf programme and bunch

- This will need an RF bucket, captured beam and at least a few hundred turns to measure

- Setup/work needed prior to visit:

    - Longitudinal phase space code from S. Hancock (C. Prior & RAL team to get working)

    - Suzie & David to have a look at existing data (eg. from tune measurement without perturbation) and see if bunch monitor signals show synchr. osc.

3. Transverse coupling

- Ability to use large horizontal beams to mitigate space charge depends on how much coupling is present

- Method 1:

1. Ensure beam coming into the ring is as small as possible - how to measure this accurately?

    - **Question:** How do we establish the beam size? Can look at existing time-to-loss data (David K)

2. Use radial probe to scrape beam with acceleration and see decay (loss vs time) to measure beam size in horizontal.

3. Change radial probe position and see how this varies throughout acceleration cycle (does it decrease at some point due to coupling into vertical?).

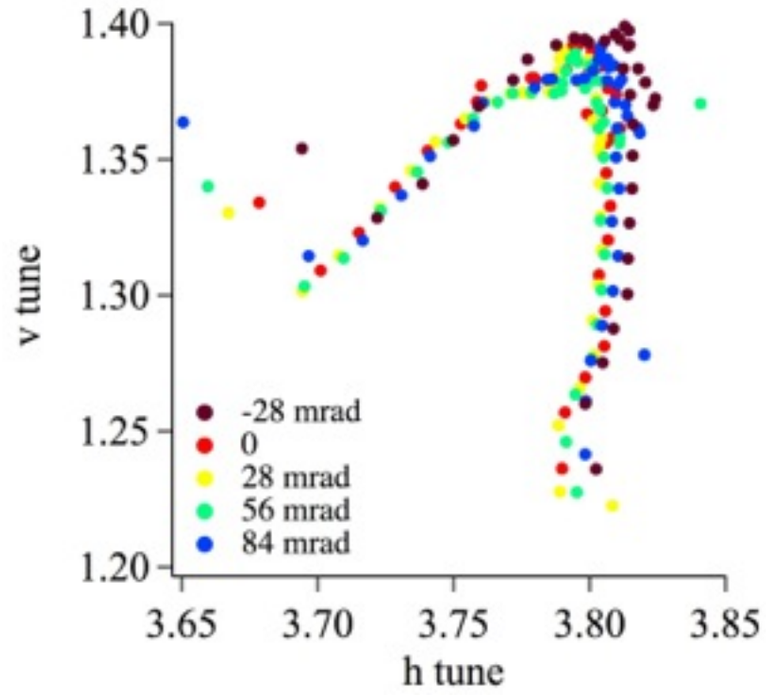
4. Now vary injection matching and re-measure to see if the result changes as a function of injection matching.

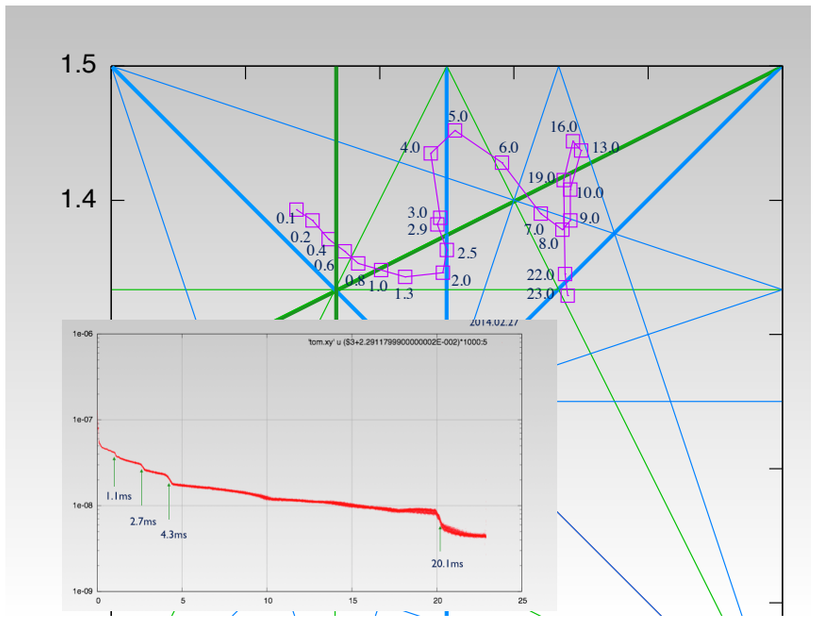
- Method 2 (to discuss)?

1. Ensure beam coming into the ring is as small as possible - as before
2. Use vertical scraper to look at beam loss
3. Adjust horizontal position/displacement at injection and see if this makes any difference to vertical

Question: can we use the vertical scraper?

4 .COD vs tune





- We need to understand if COD affects tune measurement - i.e. what are the ‘real’ tunes?

- Since we have same setup as before (one RF cavity), measure COD as before & measure tunes simultaneously at several momenta.
- Try to see some correlation between correction of COD and tune measurement

COD vs tune - method

1. Setup with corrector on, achieve full acceleration
2. Take radial probe COD measurement
3. Take flat-top tune measurement over full range
4. Repeat fro 1-3 for various corrector settings

Questions:

- can the radial probes, radial perturbation and movable horizontal BPM (Sakamoto-san's monitor) be in the ring at the same time?
- What is the maximum corrector setting at the moment?
- How long does a full tune measurement take?

Discussion

- Allocations: we have roughly 13 days of experimental time during this visit:

1. RF Pattern Optimisation - 4 days
2. Longitudinal tomography - 2-3 days
3. Transverse coupling - 3 days
4. COD vs tune - 3-4 days