KURRI FFAG MEETING 15/10/2015
Google+ hangout meeting

Attendees:
C Prior, C Rogers, D Kelliher, S Machida, S Sheehy, C Plostinar - RAL & Oxford
M Haj Tahar, F Meot, N Tsoupas - BNL
JB Lagrange - Imperial
Y Mori, Y Ishi, T Uesugi, Kevin & others (?) - KURRI
D Bruton - Huddersfield

Minutes:

1. Malek made a presentation and update about the discrepancy between betatron tunes in experiment and simulation.

- Comparison with experiment. 5% horizontal and 9% vertical discrepancy in tunes from experiment to simulation.
- Calculate the average scaling k factor dB/B/dR/R where B is averaged in azimuth.
- Field map is 1cm - keep in mind.
- Slide 5 scaling factors of F and D magnet are different.
- He looked at a hard edge model – there was some discussion about whether the hard edge model is sufficient. (Mori-san to discuss with F. Meot & M Haj Tahar).
- Two sources for the 'tune spread'. Some comes from the non-linear field (ie. amplitude dependent detuning) but then some of it comes from a false field variation from the grid size.

- How to remediate? Change D/F ratio to improve the rms tune variation in both planes. This would reduce the tune spread by 17% but this is insufficient. Can we add some kind of trim coils along the radius (like in cyclotrons) to play with F/D ratio with radius? Mori-san suggests that a patch on the edge should be more effective than a harmonic coils

Action: we need a future discussion (next meeting) on this after the update at FFAG'15 about modelling with different patch.

2. David K presented an update on COD measurements and analysis.

- Reviewed 2014 measurements of COD. Tries to match the measurements of the COD with he predictions of the COD if we have a "kick" just at the vicinity of the RF cavity.
- Previous measurements in 2014 were well matched to source (single rf cavity) and were also fairly well corrected with increasing corrector current, but these measurements only covered the lower end of the momentum range.
- In June 2015 we have 5 probe measurements. We took two measurements with 700A and 900A over a larger momentum range. There is a large increase in COD with momentum. We have reduced the

COD substantially at injection, but we had not previously observed this large increase in COD at large momentum.
- Estimates the change in "corrector COD". Seems to make sense.
- Looking at the error source, the F1 probe again doesn't fit the pattern produced by a single error at the cavity. For the 2015 data this is apparent even at injection. This implies the distortion kick increases with momentum.
- Question: Higher energy correction is reduced - because the 'leakage field is not uniform'. But we attempt to correct the COD with a dipole magnet…

3. Shinji outlined future experiment plans.

- New COD data has now been analysed. Need to look at longitudinal tomography data from 2015. Then we can plan new experiments in early 2016.

- Outlined plans for experiments early next year. Combining longitudinal parameter optimisation, hopefully find a better set of operating parameters.
- Tune excursion may come from patch and variation of k. We know there is a variation in k by design, but can we correct for it? We want to finish investigation of tune/patch early next year.

- Acceleration of asymmetrical emittance or measurement of H-V coupling? Key step towards high intensity operation to reduce space charge tune shift by making use of large acceptance in horizontal.

- Suggested some possible dates for a 3 week visit and asked for constraints from KURRI team. No constraints so far - CA experiment will not be carried out this fiscal year. Ishi-san says starting from 18th Jan would be best. We still need to also finish analysis of previous experiments, so will discuss dates again next meeting.

- Simulation plan also needs to be updated to incorporate discussions at FFAG'15.

Action: Suzie/Shinji to update simulation plan and circulate & discuss with Francois

Preparation for coupling experiments: plan some pre-experiment theoretical and simulation work. Who will do this? Malek/Francois?

Action: Discussion on coupling to agenda for next meeting (who will lead this?)

4. **Next meeting:** Tentatively arranged for 19th November. Suzie will sort out timings (as daylight savings changes for a few of us) and issue gmail invitations.

Further discussions/notes:

Question about matching at injection:
Malek - would it make sense to search for the matching conditions from the accelerated orbit rather than the 'closed orbit'? However, the difference of two is negligible, less than mm, and it is practically impossible to use one to the other.

There was discussion from Mori-san's suggestion to use a short bunch (no more than one turn) accelerated to top energy to optimising injection timing for minimal emittance growth. Mori-san suggested he wants to clarify if 1msec beam loss is due to longitudinal or transverse. Shinji suggests that simulation would also help with this. Topic may be of interest to D. Bruton and C. Rogers also.