Science & Technology Facilities Council

Status and thoughts on a first paper…

KURRI FFAG Collaboration Meeting

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First paper…

- Working title:

  'Characterisation of FFAG accelerators and beam studies at KURRI'

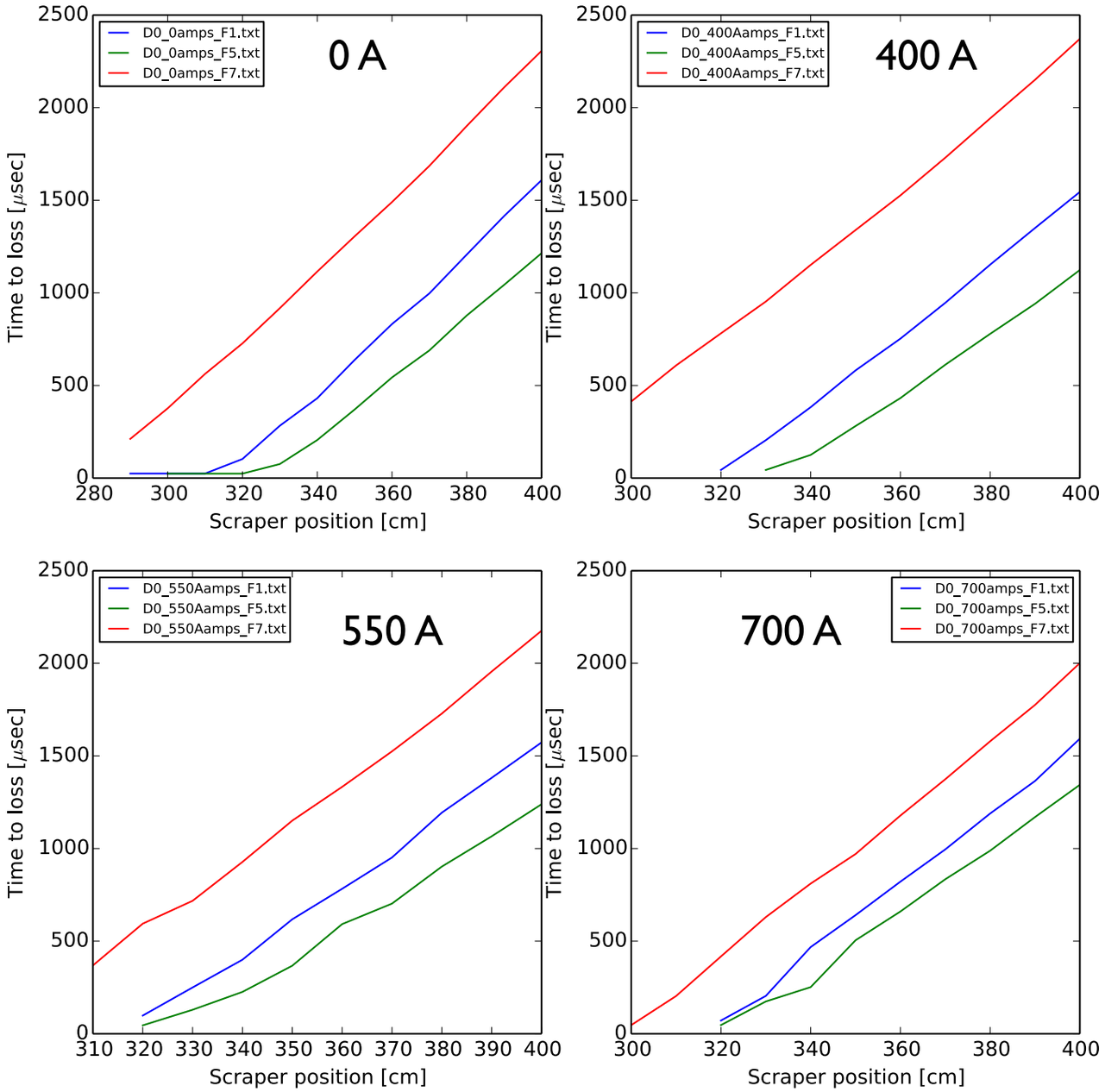
  The idea: many experimental methods and analysis methods to characterise FFAGs are different from synchrotrons/cyclotrons. If others are going to build/ use FFAGs it would be helpful to have a record of how to characterise a machine.

Topics included:

- Measurement & correction of closed orbit distortion
- Orbit & dispersion matching at injection
- Measurement of k value and dispersion vs momentum
- Tune measurement with momentum
- Effects of stripping foil (energy loss)

Closed orbit distortion

Correction using corrector poles:

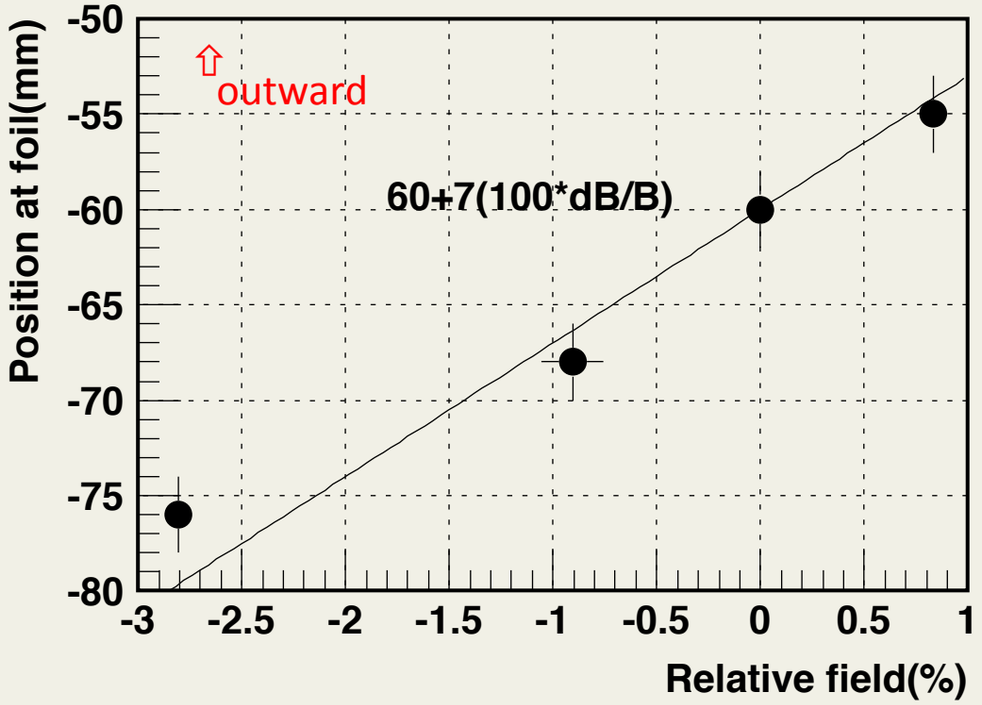


To do:

- Write up method
- Present in a more 'understandable' way
- Write down our thoughts on (unsuccessful) attempt to correct using D coils
- Discuss issues of cavity/field interaction

- Model COD effects on dispersion & k value measurements

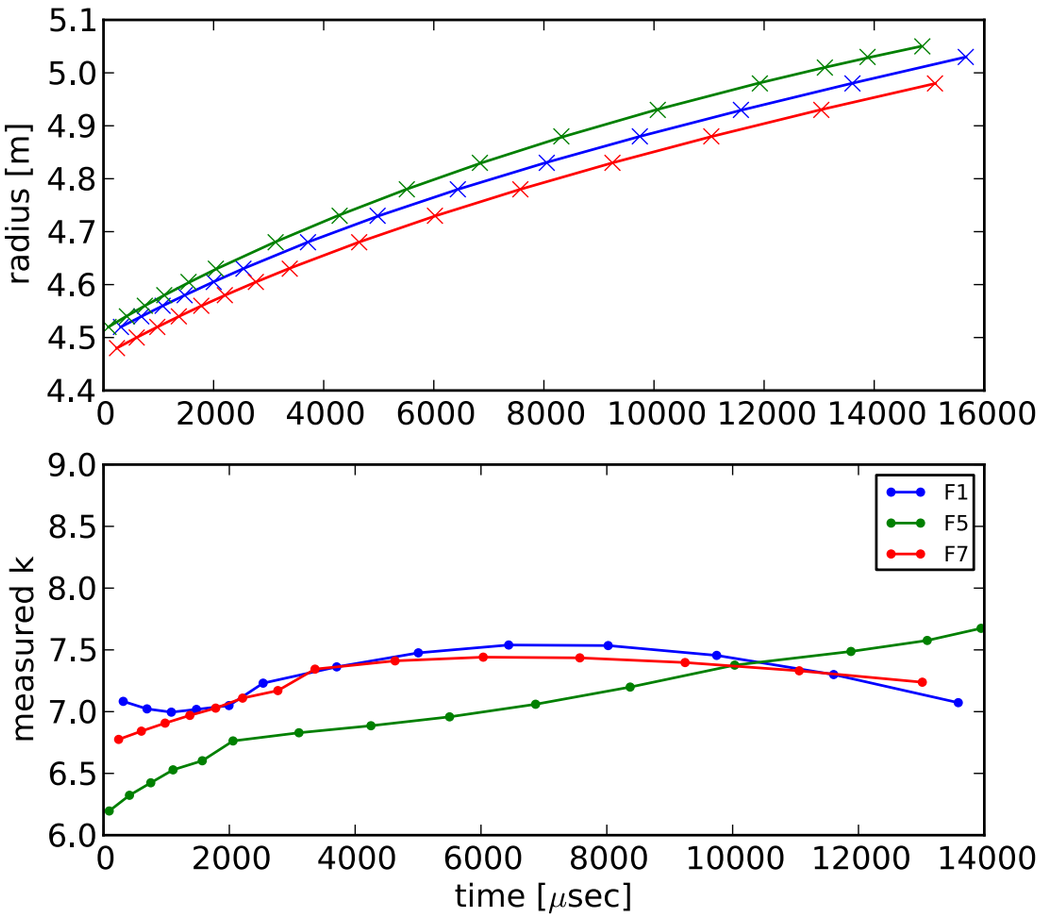
Orbit & dispersion matching at injection



To do:

- Complete analysis (see Ludovic's talk?)
- Write up method for dispersion measurement & matching attempts
- Write up method for orbit matching
- Include modelling (ZGOUBI, Ishi-san's model and TOSCA conversion) perhaps as appendix?

Field index, k, during acceleration



upper: radius vs time

lower: k value vs time

Data: 2013_03_31

Analysed probe data to find 'time to loss' for each radial step

$$k = \gamma^2 \frac{df / f}{dr / r} - (1 - \gamma^2)$$

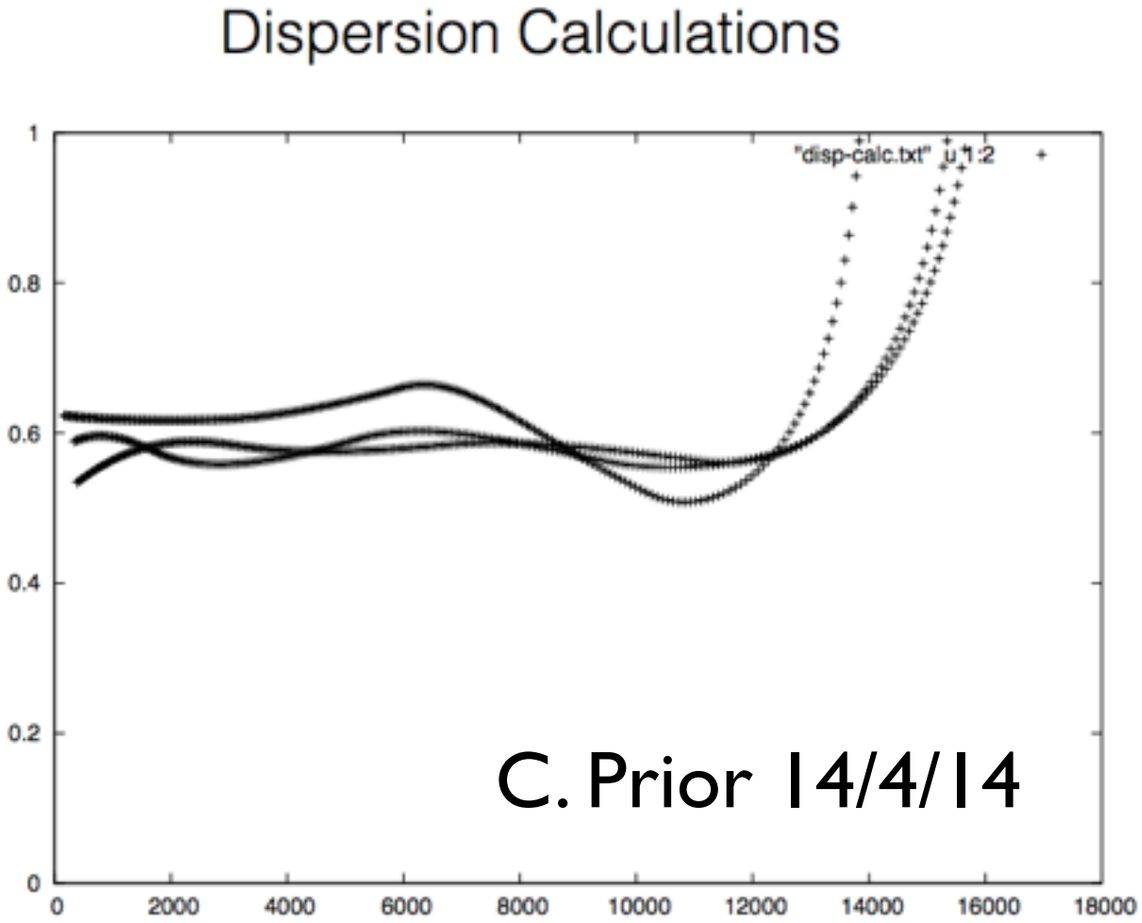
Note: Calculation uses the set frequency from RF programme (accurate) & to get gamma also uses the assumed E gain (not so accurate)

To do:

- Write up method
- Compare to models
- Discuss!

Dispersion in the ring with momentum

$$D = \frac{\Delta r}{dp / p}$$



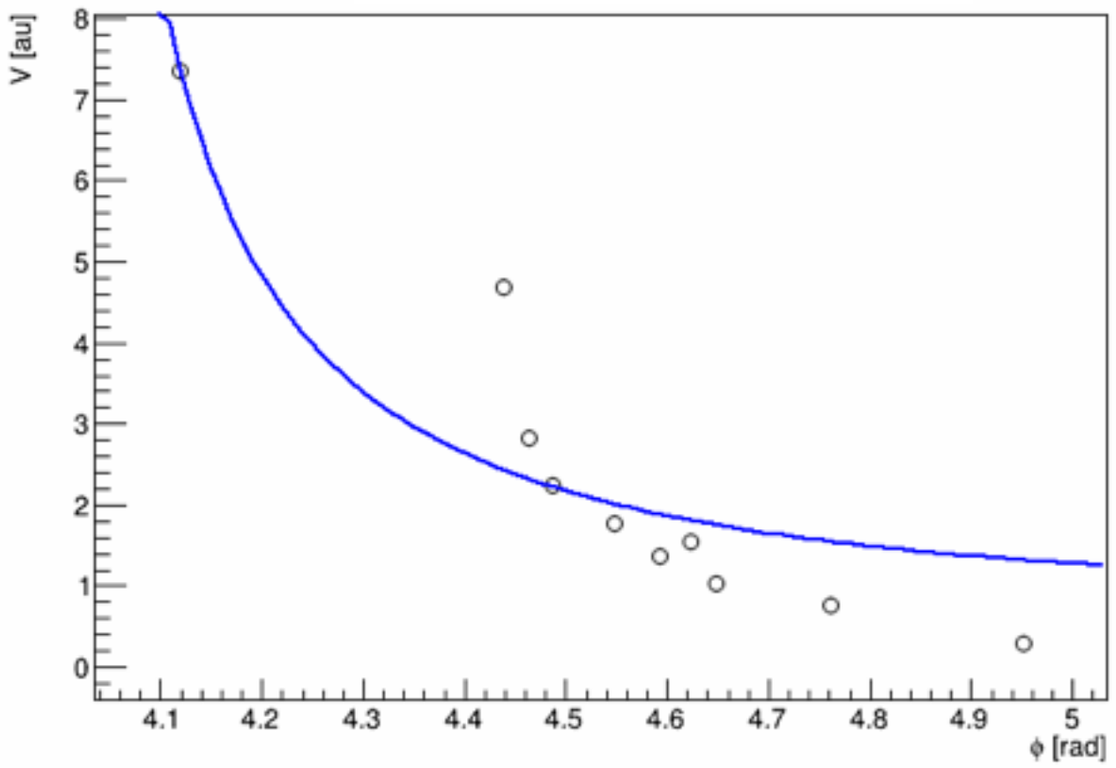
To do:

- Re-plot from existing data sets…
- Write up method & analysis

- Model and try to understand COD effects on dispersion & k value measurements

Energy loss on foil

$$dW = V_0 r_c \sin(\phi_s + \phi_c)$$

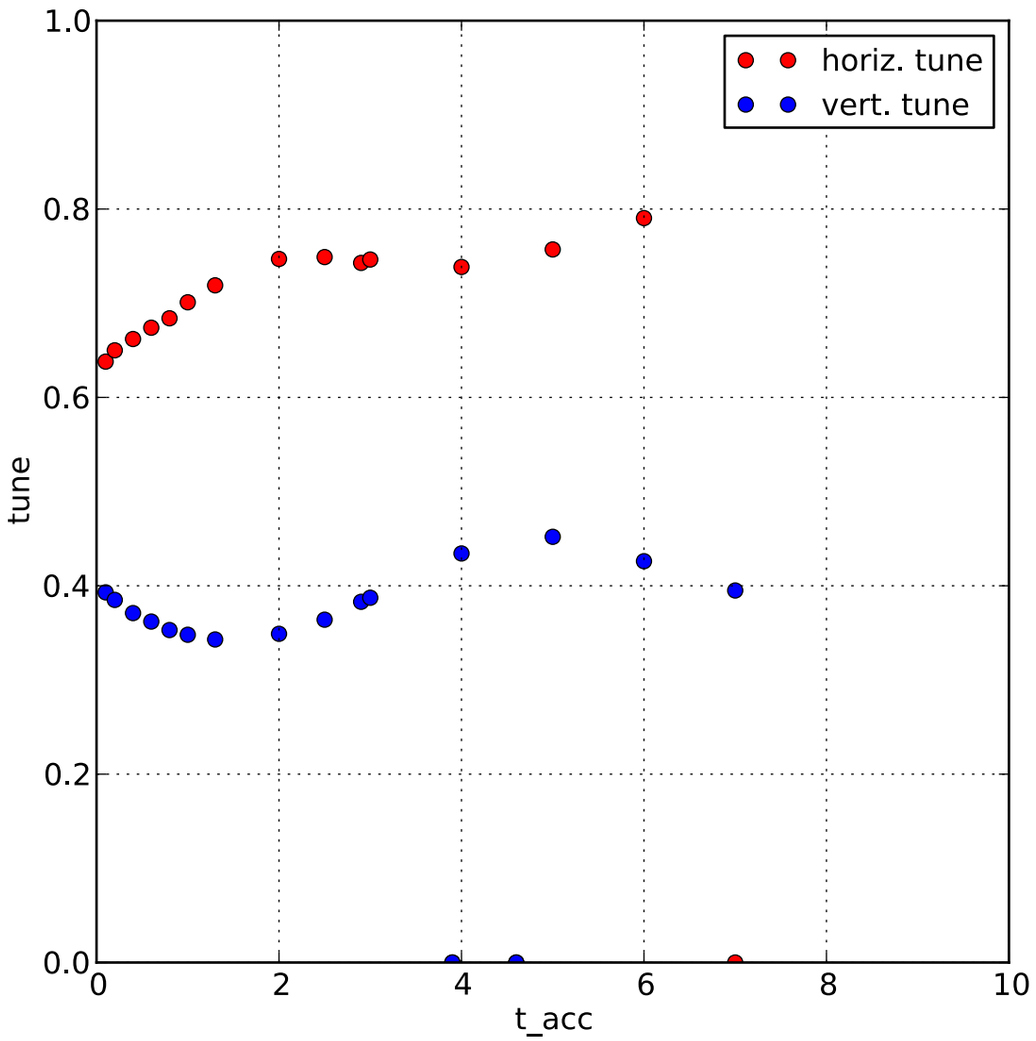


(example data)

To do:

- Continue analysis of June data
- Write up method
- Compare to model
- Discuss implications for future experiments

Tunes throughout acceleration



To do:

- Describe equipment & method
- Need to compare to losses during acceleration
- Plots vs momentum (if we assume RF programme…)
- Replot as nu_x vs nu_y with nearby resonances

data taken on 2/7/14
Using horizontal and vertical perturbators
Analysis done during experiment using real time spectrum analyser

Plan

- I am happy to make a ‘first attempt’ at writing up what we have.
  - I will be in contact for the bits I don’t know/understand…
- Then we can identify what is missing & assign tasks.