



Science and
Technology
Facilities Council



VFFA simulation tools

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Motivation

- VFFA relatively new concept, no machine constructed yet.
- Independently built codes used to crosscheck results.
- Growing understanding of key lattice parameters for machine design.
- Need to develop tools on general FFA studies, in particular collective effects.

Constraints of FFAs

- Unique coupled optics in VFFAs.
- Importance of fringe fields in FFAs.
- Apart from very simple cases, MADX cannot reproduce FFA behaviour because of moving closed orbit.
- A compromise may be to track in step-wise code to find closed orbit and implement the orbit in MADX. Need to implement new elements in MADX.

VFFA in single particle codes

- S-code (S. Machida)
- OPAL (C. Rogers)
- FixField (J-B. Lagrange)
- Zgoubidoo (M. Vanwelde)

→ Similar results for closed orbits and tunes

Collective effects

- Very preliminary studies started (frozen SC).
 - No PIC simulation done yet.
 - Difficult to solve the SC potential in small rings. Probably easier for large rings.
 - Only SC considered so far, other collective effects not studied yet.
 - Large and asymmetric vacuum chamber.
 - Impedance seen by beam is time dependent.
 - Beam stacking stunt studied with collective effects yet.
- Urgent need to develop new tools to investigate collective effects in VFFAs.

Wish list

- Modify MADX to allow user to define element (e.g. FFA fringe field).
- Impedance model in a code which can be time dependent.