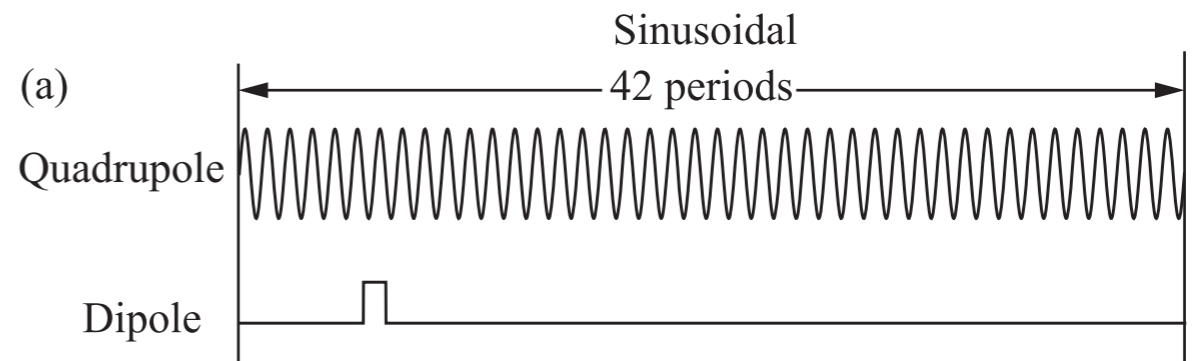
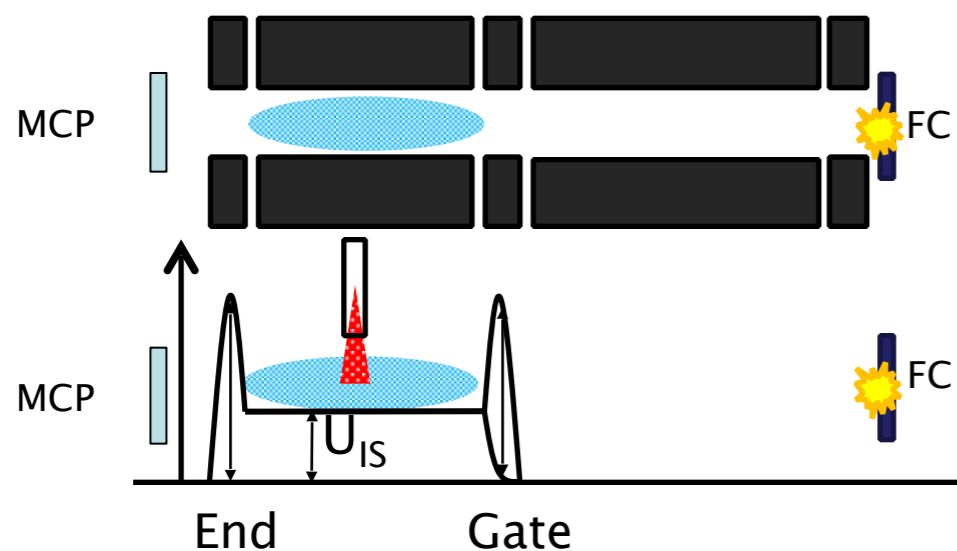


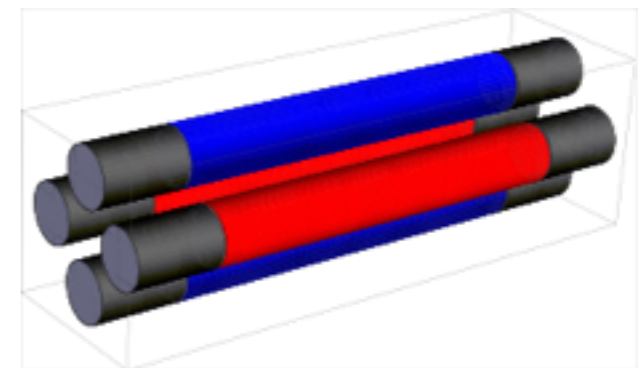
Paul Trap Collaboration with Hiroshima

A linear Paul Trap used to simulate a focussing channel in an accelerator, including space charge: **S-POD** (Simulator of Particle Orbit Dynamics)

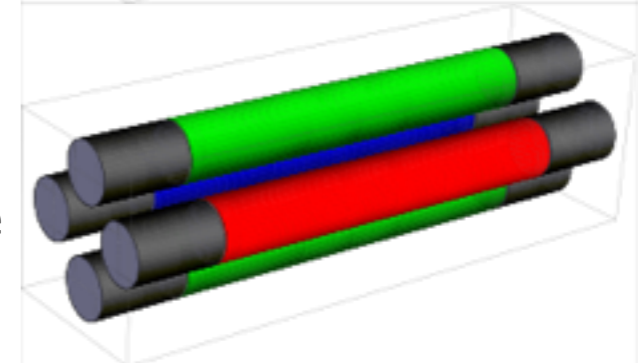


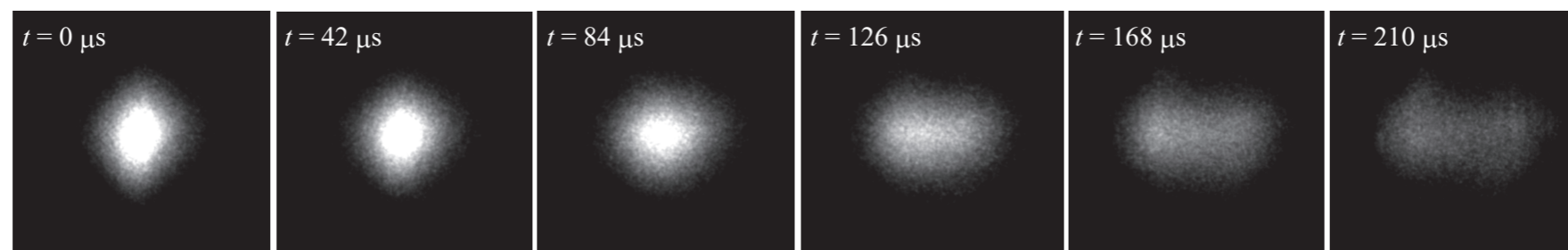
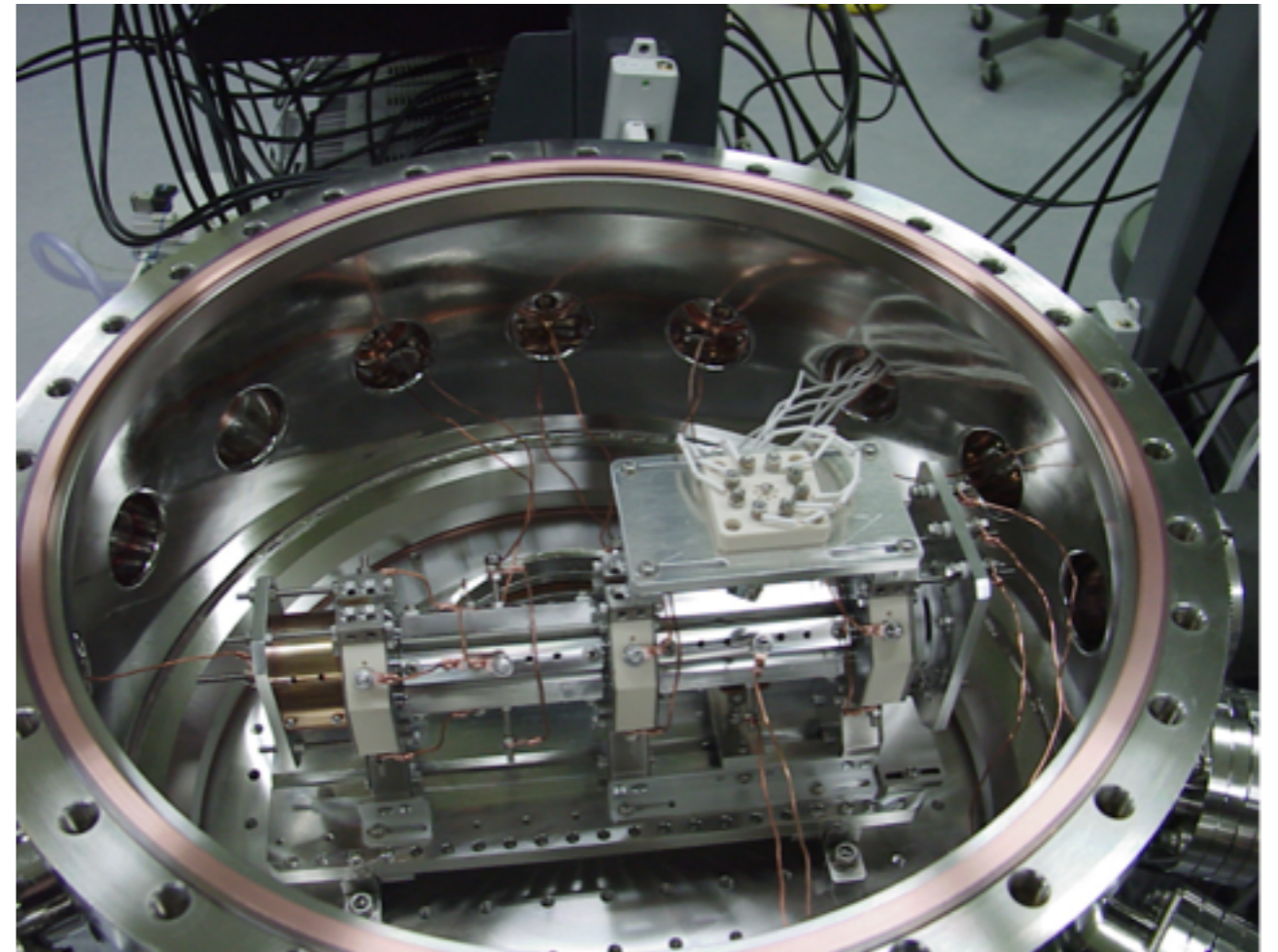
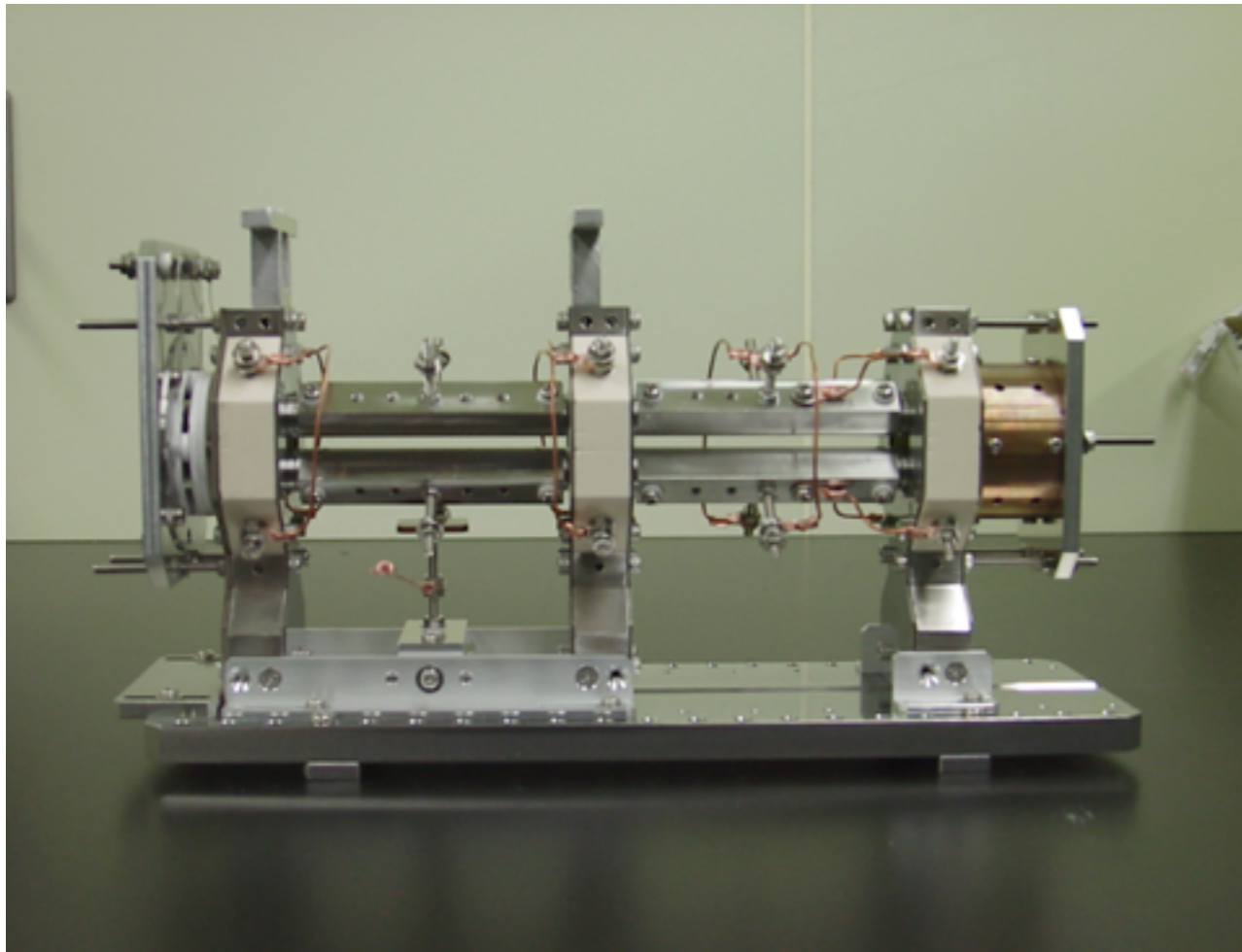
- ❖ Ar⁺ gas ionised by electron gun
- ❖ Trapped in a potential well
- ❖ 1 MHz confinement wave applied to quadrupole rods
- ❖ Add a perturbation wave (dipole)

Quadrupole mode



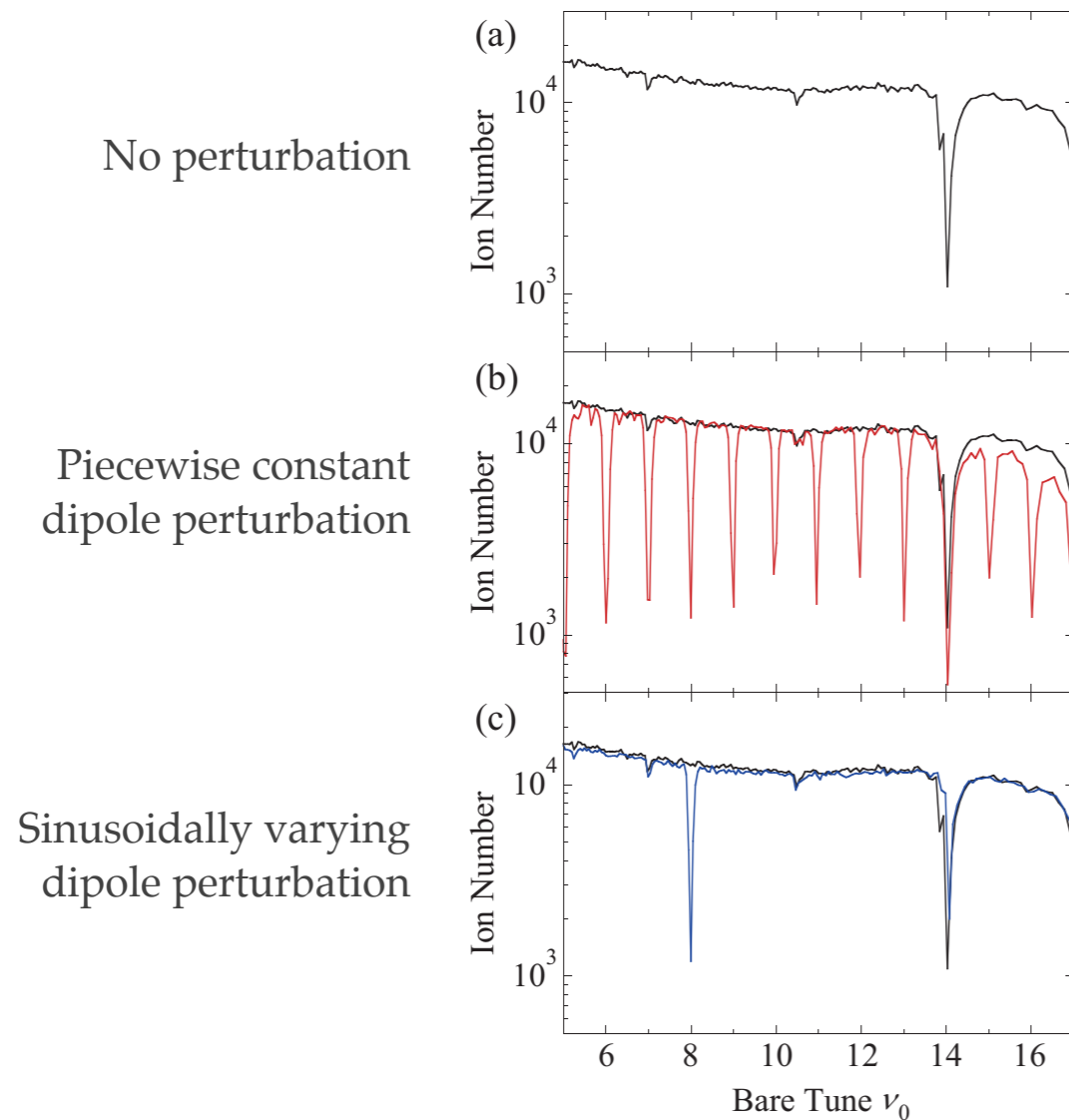
Dipole mode





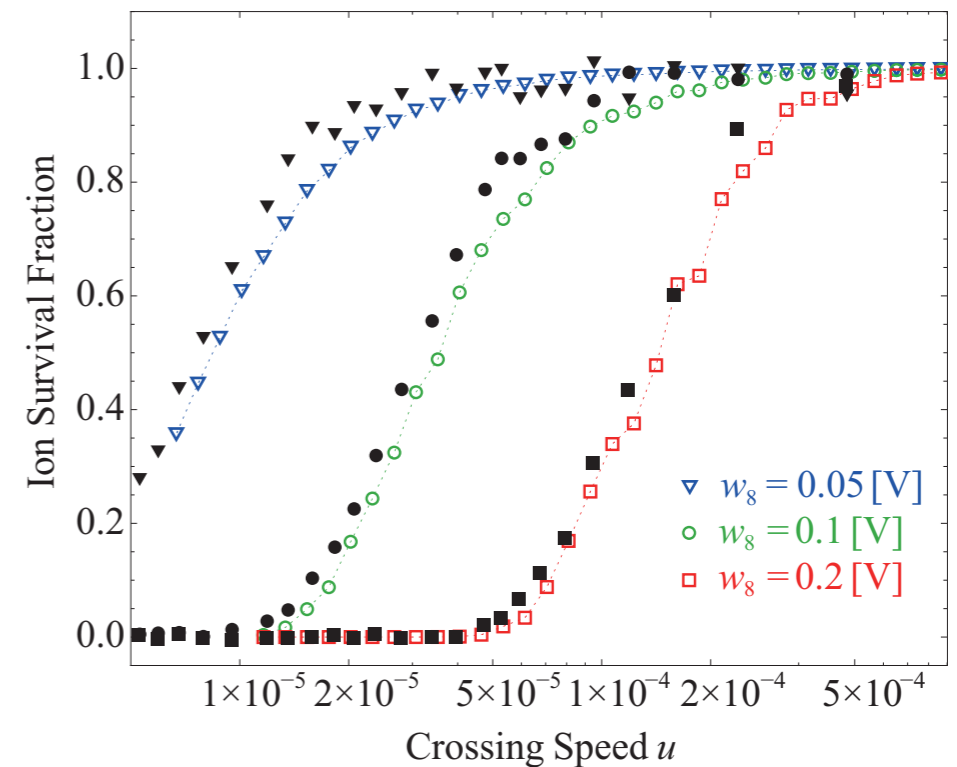
S-POD is a fast, flexible tool to study beam physics phenomena without an accelerator.

Resonance Crossing



Each point is a new 'run'

S. L. Sheehy, D. J. Kelliher, S. Machida, C. R. Prior et al, *Experimental studies of resonance crossing in linear non-scaling FFAGs with the S-POD plasma trap*, In Proc. International Particle Accelerator Conference 2013, pp.2675, Shanghai, China, 2013.



Beam survival for different resonance crossing speeds based on the EMMA lattice

K. Moriya,....S.L. Sheehy, D. J. Kelliher, S. Machida, C.R. Prior et al, *Experimental study of integer crossing in a non-scaling fixed field alternating gradient accelerator with a Paul ion trap*, PRST-AB 18, 03001 (2015)

RAL Paul Trap

- Funding from ASTeC secured for a linear Paul Trap apparatus at RAL.
- *Complementary* to the existing setup at Hiroshima and built in close collaboration.
- Eventual aim is to control non-linear trap components so as to understand non-linear phenomena and space charge effects.
- Possible studies: IOTA (FNAL), CERN PS (Multi-turn extraction, beam neutralisation), ISIS (space charge, resonances)

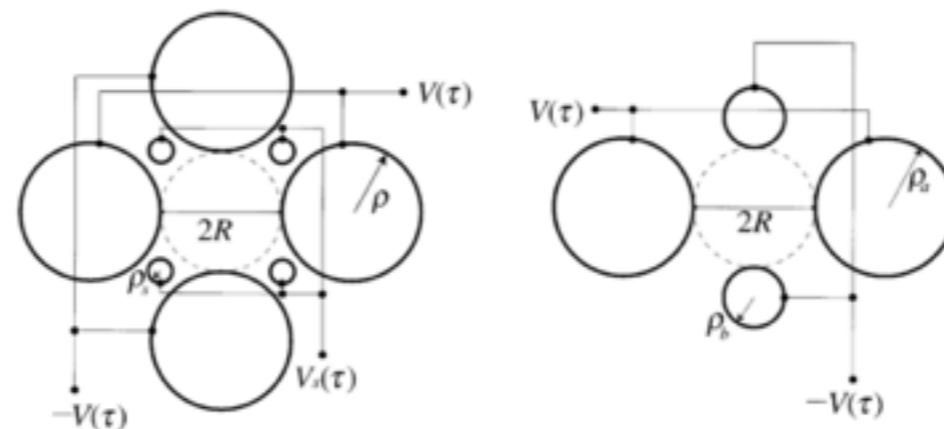


Fig. 6. Cross-sectional view of modified Paul traps.