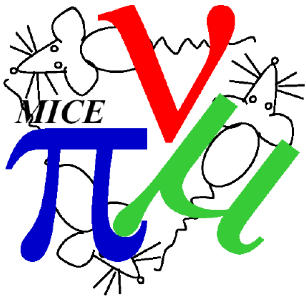
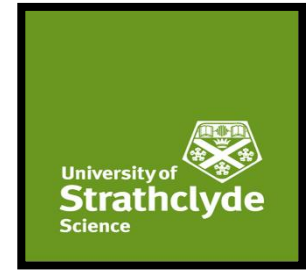


Alignment Tolerances

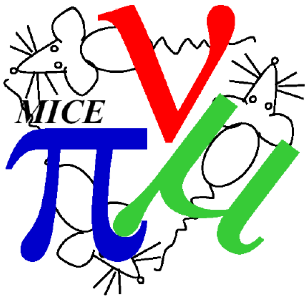
Alan Young
CM 45



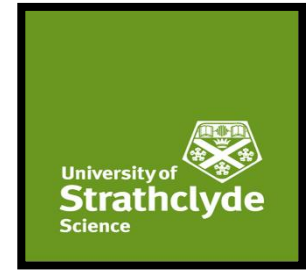
Objective



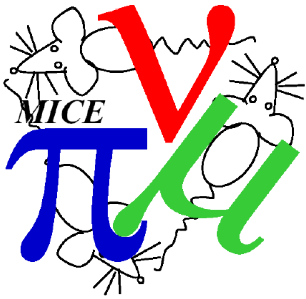
- Determine what the tolerances are for the MICE Demonstration of Ionisation Cooling lattice
- Interested in
 - Magnets
 - Absorbers and Windows
 - RF Cavities
- For Step IV the tolerances were 1mm/1mrad.



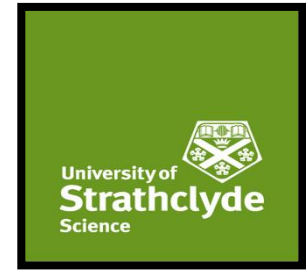
Beam



- 200MeV/c beam
- 10000 particles
- Transverse Distribution – Penn
 - ϵ_{\perp} : 6mm
 - β_{\perp} : 339.0mm
 - α_{\perp} : 0
- Longitudinal Distribution – Twiss
 - ϵ_l : 20mm
 - β_l : 11mm
 - α_l : 0.7



Model and Cuts

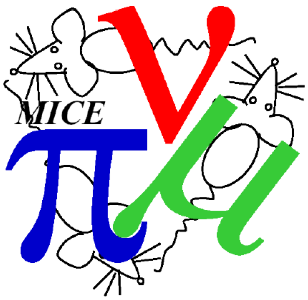


Model

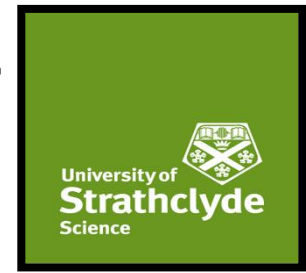
- Demonstration of Ionisation cooling model
Conf_cd_step_frozen_53_1_em_6.py

Hits removed from Simulation if

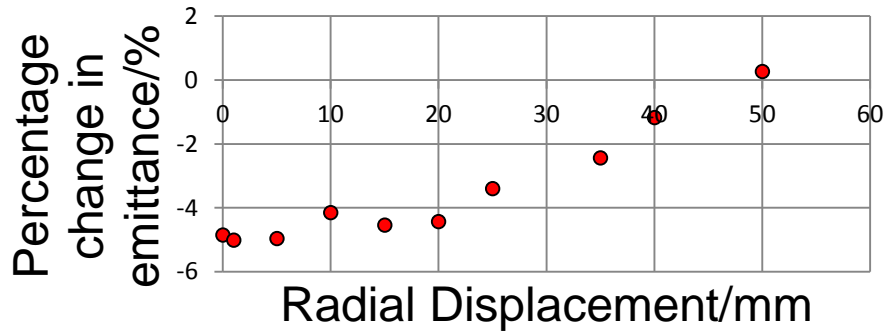
- Bunch Weight less than 10^{-9}
- Pid not equal to -13 (Muon)
- Radius in Upstream Spectrometer greater than 150mm
- Radius in Downstream Spectrometer greater than 150mm



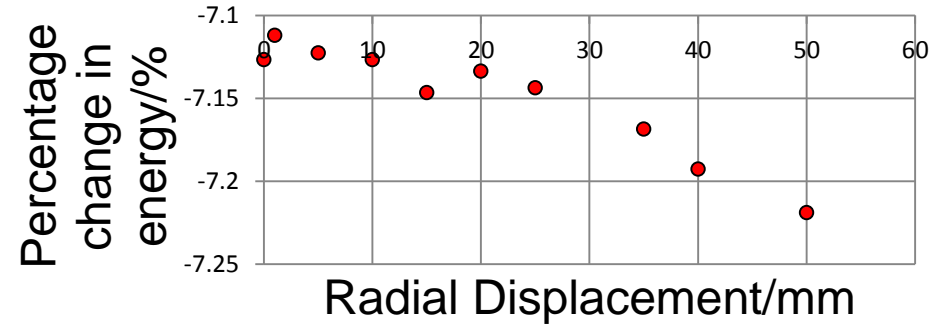
Upstream Spectrometer Radial Displacement



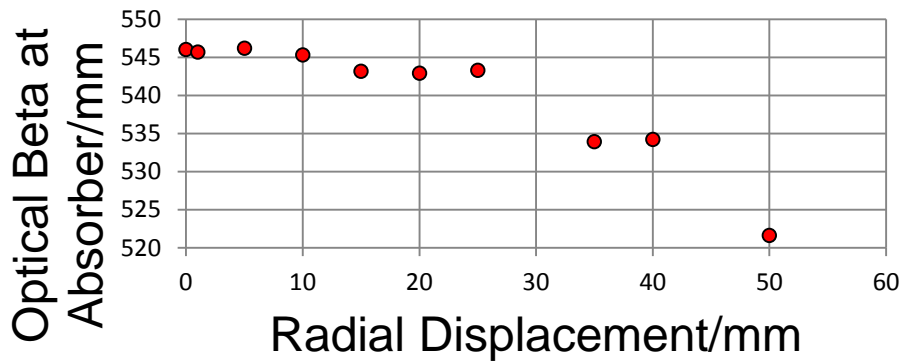
Percentage change in Emittance



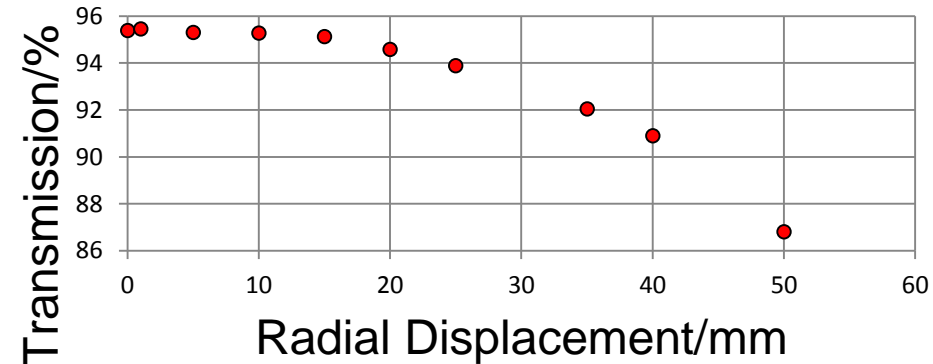
Percentage change in Energy

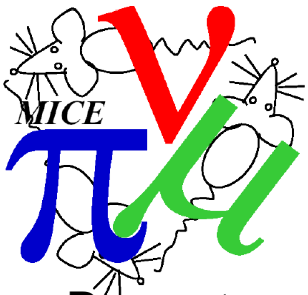


Optical Beta at Absorber

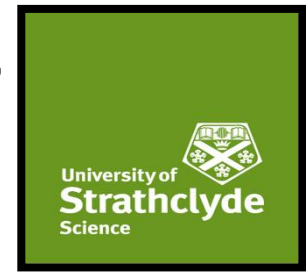


Transmission

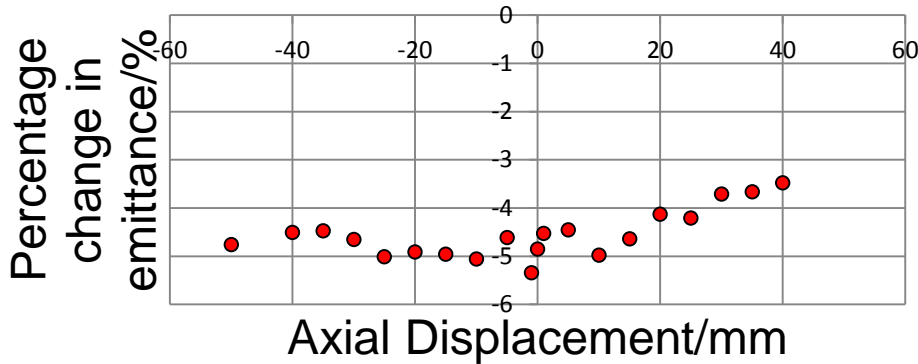




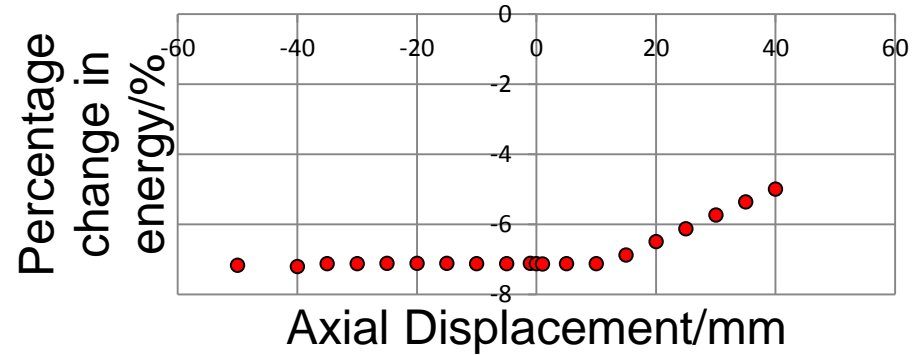
Upstream Spectrometer Axial Displacement



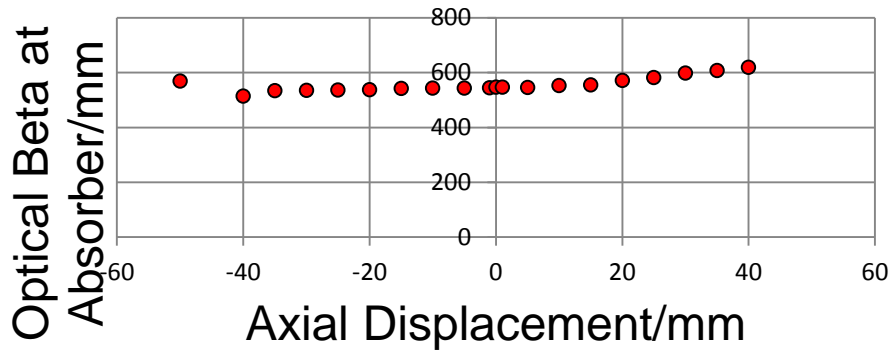
Percentage change in Emittance



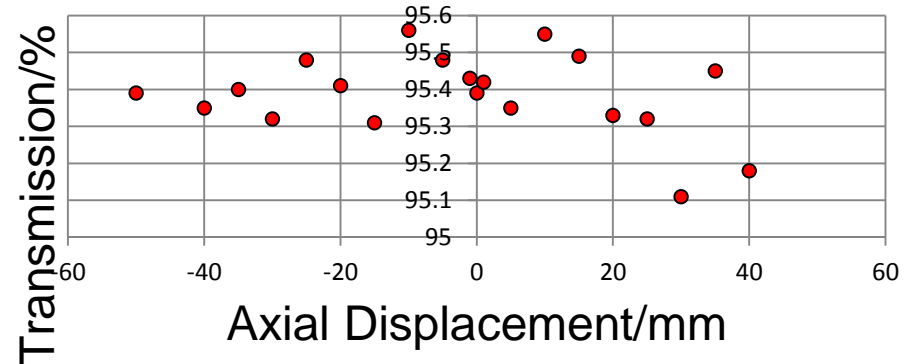
Percentage change in Energy

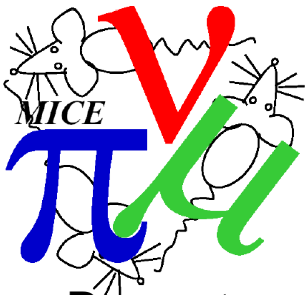


Optical Beta at Absorber

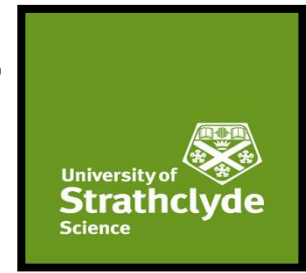


Transmission

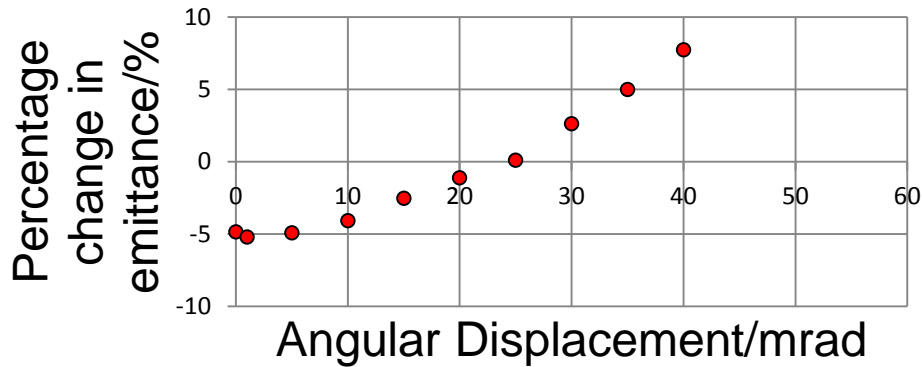




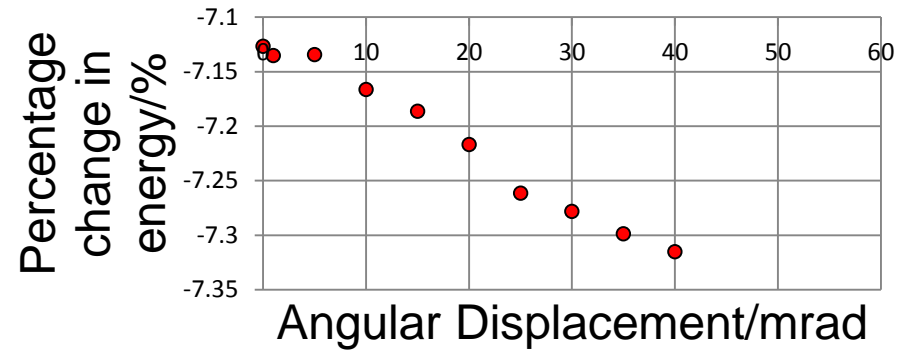
Upstream Spectrometer Angular Displacement



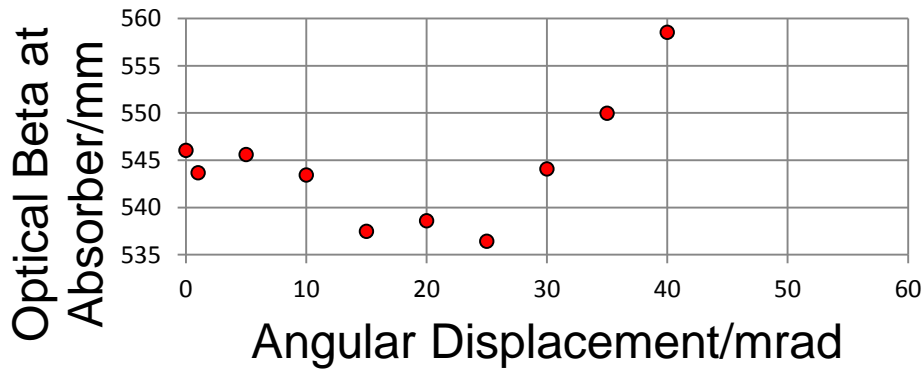
Percentage change in Emittance



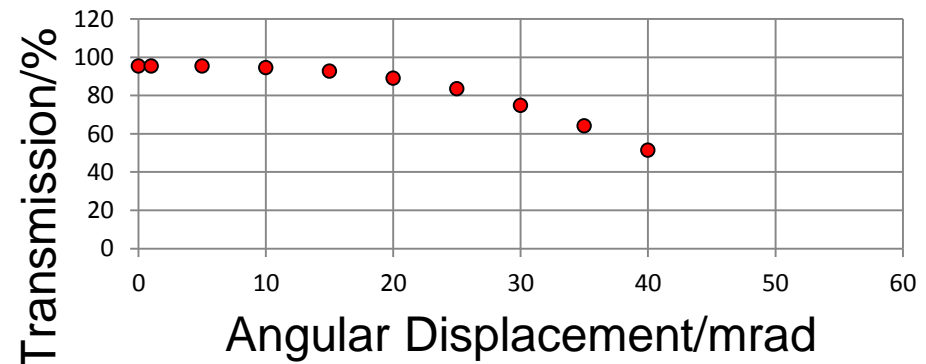
Percentage change in Energy

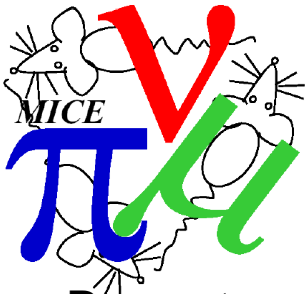


Optical Beta at Absorber

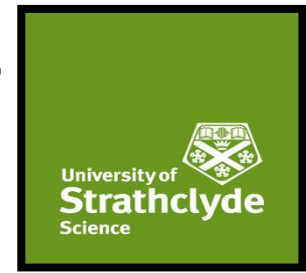


Transmission

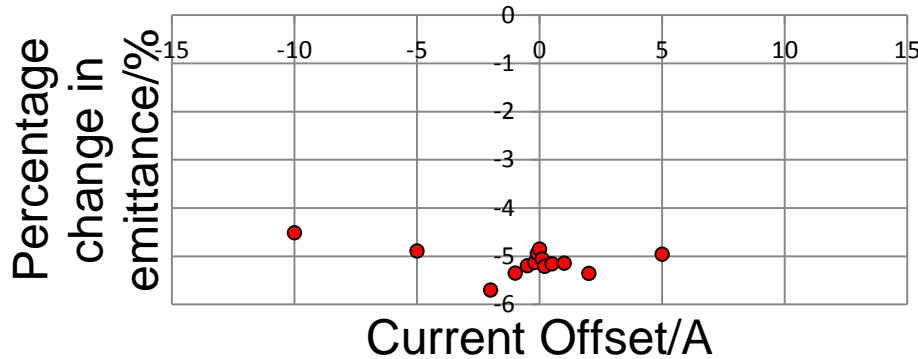




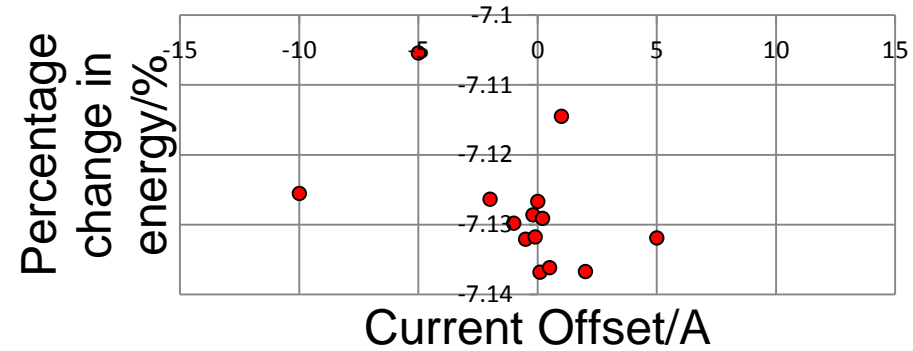
Upstream Spectrometer Centre Coil Current



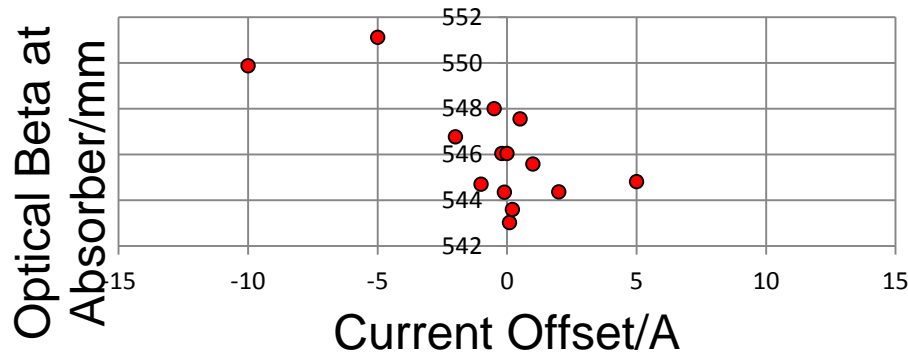
Percentage change in Emittance



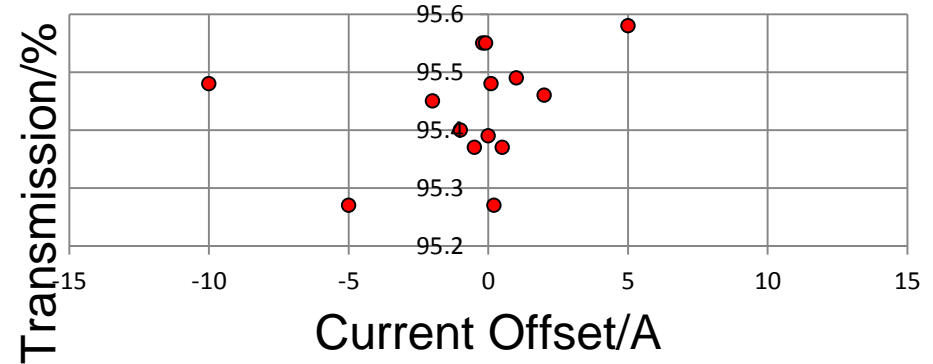
Percentage change in Energy

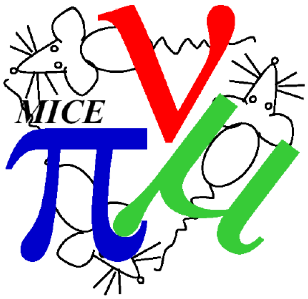


Optical Beta at Absorber

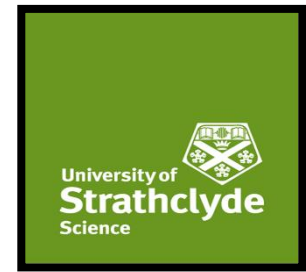


Transmission

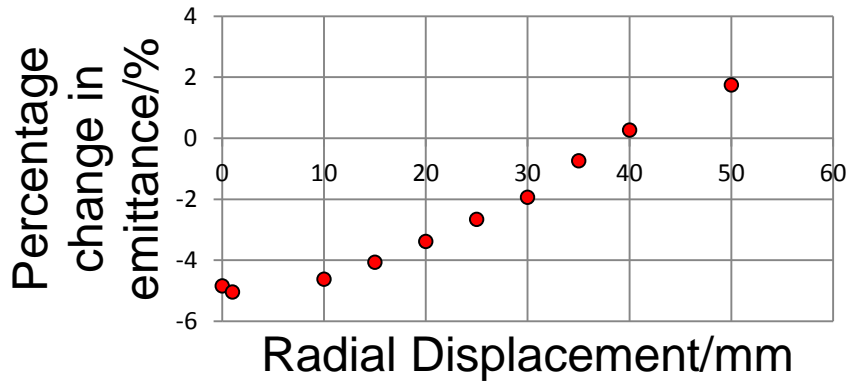




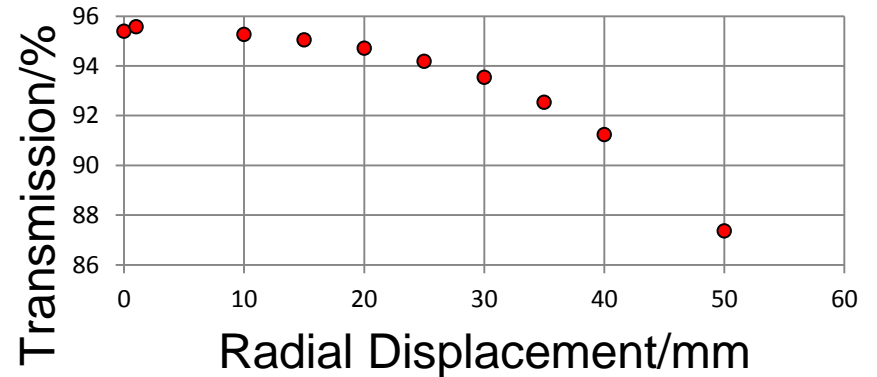
Upstream Focus Coil Physical Displacement



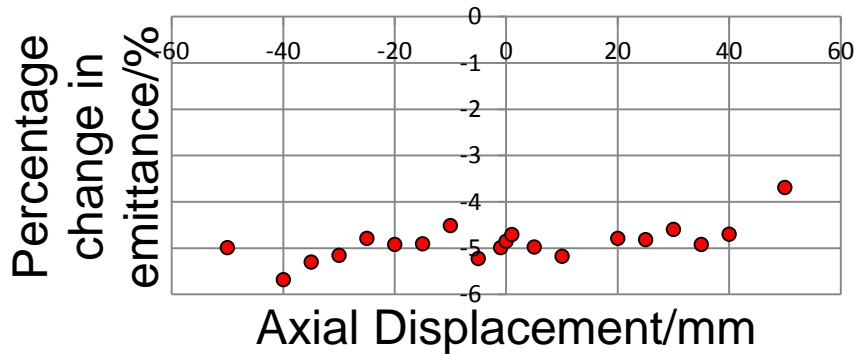
Percentage change in Emittance



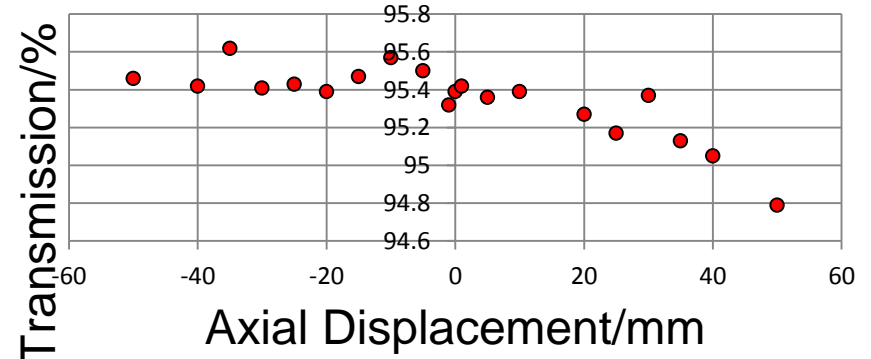
Transmission

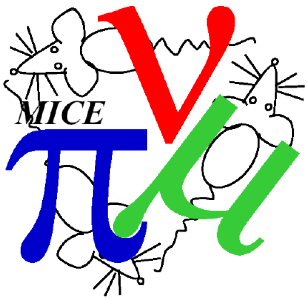


Percentage change in Emittance

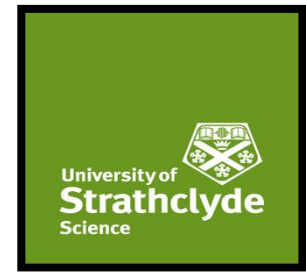


Transmission

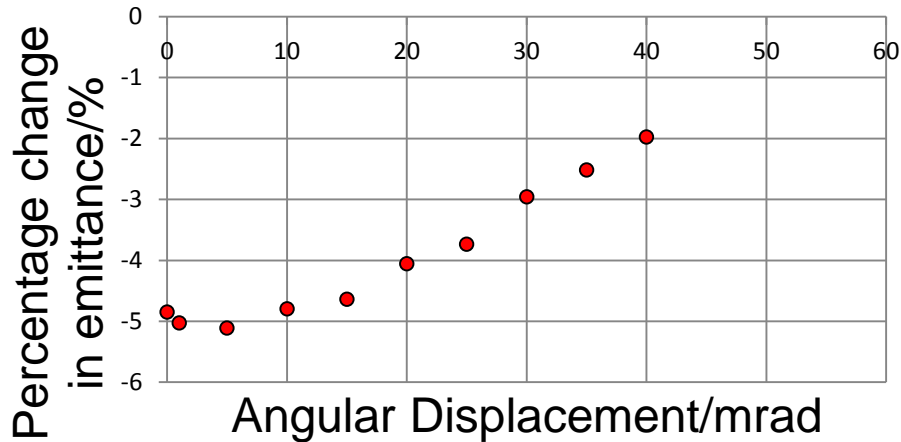




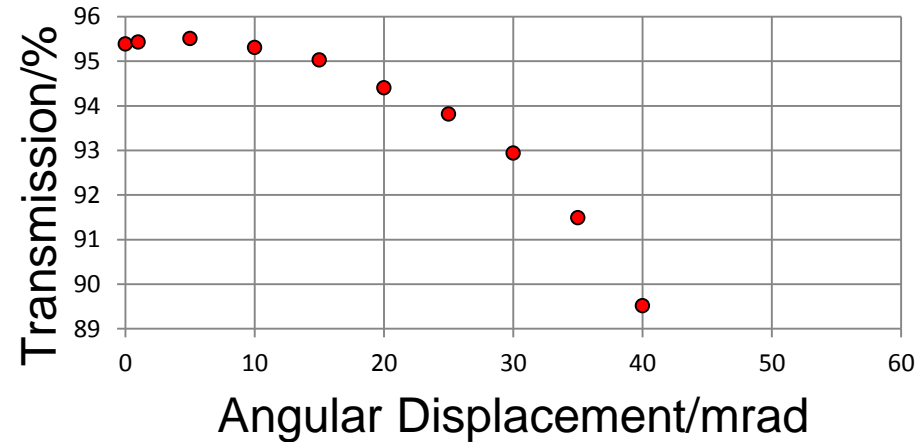
Upstream Focus Coil Physical Displacement

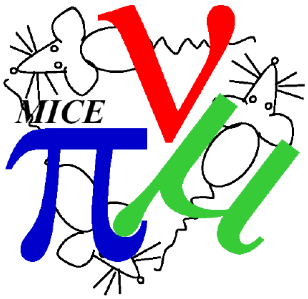


Percentage change in Emittance

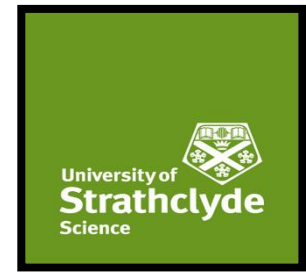


Transmission

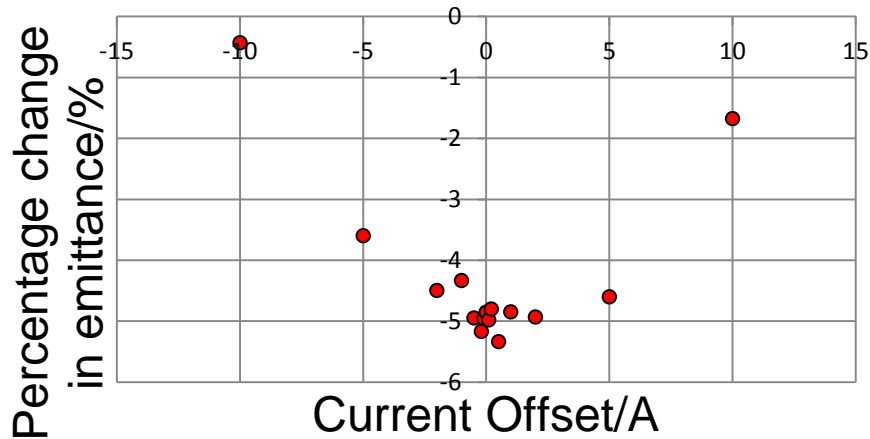




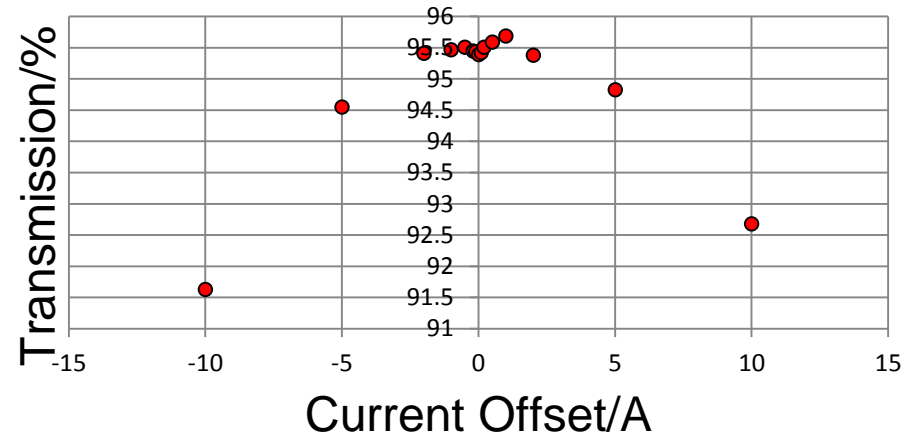
Upstream Focus Coil Current

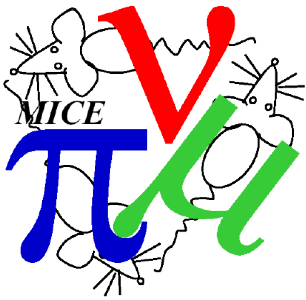


Percentage change in Emittance

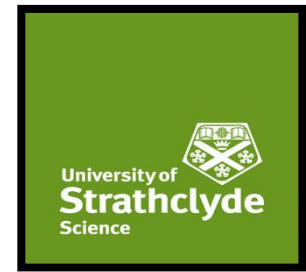


Transmission





Conclusions



- Simulations have been carried out of the physical displacement of the following
 - Upstream Spectrometer
 - Upstream Secondary Absorber
 - Upstream Cavity
 - Upstream Focus Coil
 - Absorber
 - Downstream Focus Coil
 - Downstream Cavity
 - Downstream Secondary Absorber
 - Downstream Spectrometer
- Simulations have been carried out with current varied in
 - All Spectrometer Magnets
 - Focus Coil Magnets
- Variation in results makes it difficult to see changes of the order of one percent, but can see general trend