Step V vs Step VI – Tentative presentation structure

(All suggestions / contributions welcome)

(Slide 1) Title Slide.

(Slide 2) Introduction.

- Introduce myself!
- Mention group at Strathclyde's involvement in the RF Physics / Engineering objectives. Also mention my first experience on MICE was working with the RF group on satisfying the 500kW TIARA deliverable (December).
- In 2014, now working with the analysis group on developing MAUS simulations to study / determine the viability of Step V vs Step VI in terms of the key MICE physics objectives and respective sensitivity of each stage to various factors.

(Slide 3) Structure of remainder of presentation.

(Slide 4) Motivation of work – Step V vs Step VI

- Inclusion of a partial return yoke in experimental specifications introduces issues of practicality for step V and VI. Optimum dimensions (length) of flux return plates different for each step, and modularisation of installation not really viable -> Potential solution is to pick either step V or VI and move straight to configuration.
- Need to determine which stage will fundamentally deliver on the MICE objectives, and whether the inclusion of an additional set of RF cavities and tertiary cooling cell for Step VI are absolutely necessary.
- Need to determine sensitivity of both configurations to various the geometrical tolerances / limitations of the experimental apparatus and adverse physical processes occurring over the length of the lattice.
- Must identify any uncertainties in measurements / diagnostics and the potential impact on Step V / VI (will they be compounded and unmanageable in Step VI).
- Fundamentally, we must determine the optimum operational parameters for each step -> discrete coil currents and polarity, relative driving phase of RF field (currently on-crest preferred) etc.
- Determine corresponding cooling performance, beam parameters etc. for each step.

(Slide 5) Key issues to be investigated

- Implementation of RF cavities in MAUS -> Electric field vector / accelerating gradient should vary across the cavities. Must consider issues of cavity alignment etc.
- Measurement of particle TOA relative to phase of RF field -> this is critical. Determination of RF phase via undersampling-based signal reconstruction in development at Strathclyde (Alex / Kevin). Need to identify any delays or uncertainties in TOF based time index for particle arrival at RF cavities. Scintillator

response time / delay? Temperature effects on coax lines? Particle straggling within cooling cells? *(already discussed at previous analysis meeting)*.

- Tracker reconstruction errors – must determine (using MAUS) the temporal accuracy of predicted particle TOA at first cavity. Determine reconstruction induced spread and assess impact on Step V / Step VI.
- …

(Slide 6) Definition of RF cavities in MAUS

- Proposed simulations and parametric analysis.

(Slide 7) Measurement of particle TOA at first RF cavity.

- Sources of error / uncertainty.
- Proposed MAUS simulations and critical assessment criteria for Steps V / VI.

(Slide 8) Tracker reconstruction analysis.

- Using a simulated beam in MAUS, determine accuracy of muon TOA prediction at first RF cavity using tracker reconstruction.
- Proposed MAUS simulations, and potential implications for Steps V / VI.

(Slide 9) MAUS simulations with Step I measured beam.

- Simulate sections of the Step I measured beam (M. Rayner/V. Blackmore) through the Step IV, V and VI cooling channels.
- Proposed suite of MAUS simulations.