



Alignment



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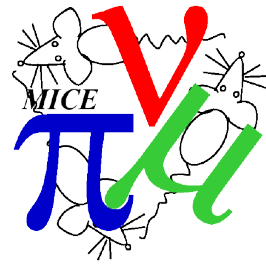


Tracker to Tracker Alignment

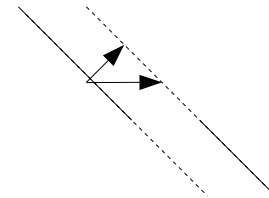


- Justification for statistical requirements
- Material budget
- Earth's magnetic field

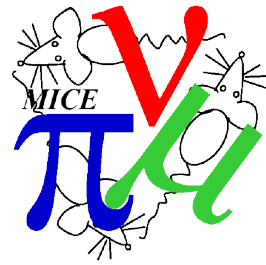
Plan of Attack



- Reconstruct straight tracks in upstream tracker
- Reconstruct straight tracks in downstream tracker
- Minimise the residual between them by making a rotation and translation of the **downstream tracker**
- Note A:
 - The axis from centre of upstream station of upstream tracker to downstream station is assumed
 - This defines the optical axis of all future measurements in MICE
- Note B:
 - It is not possible to uniquely define a 3D translation that maps a parallel vector upstream to a parallel vector downstream
 - Assume survey in z is correct
 - May be possible to revise with fields on?
 - I think 3D rotation is uniquely defined

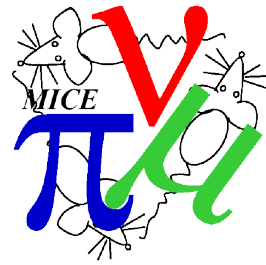


Plan of Attack (2)



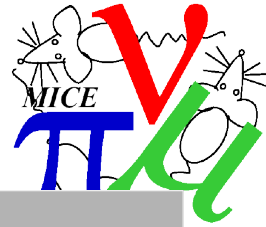
- Note C:
 - I assume tracker internal alignment is well known

Sources of error



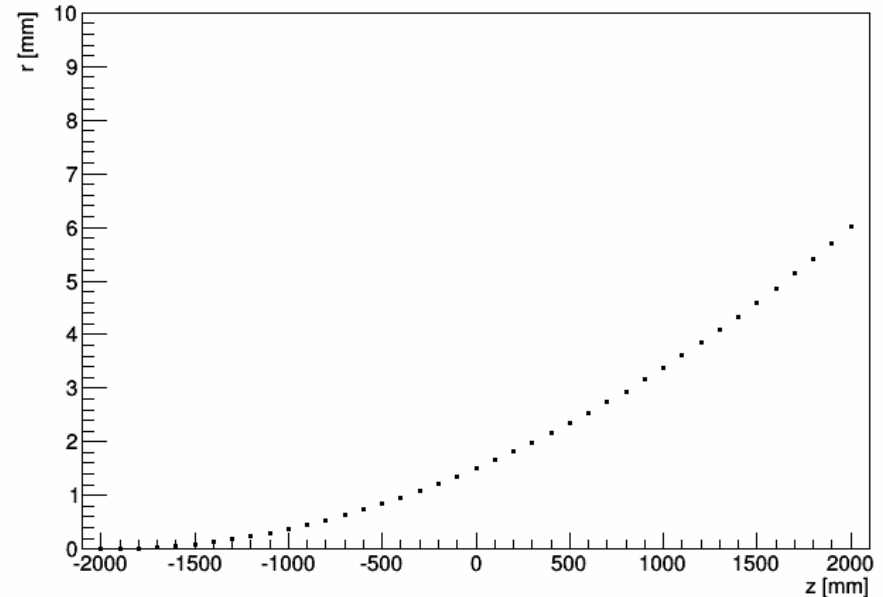
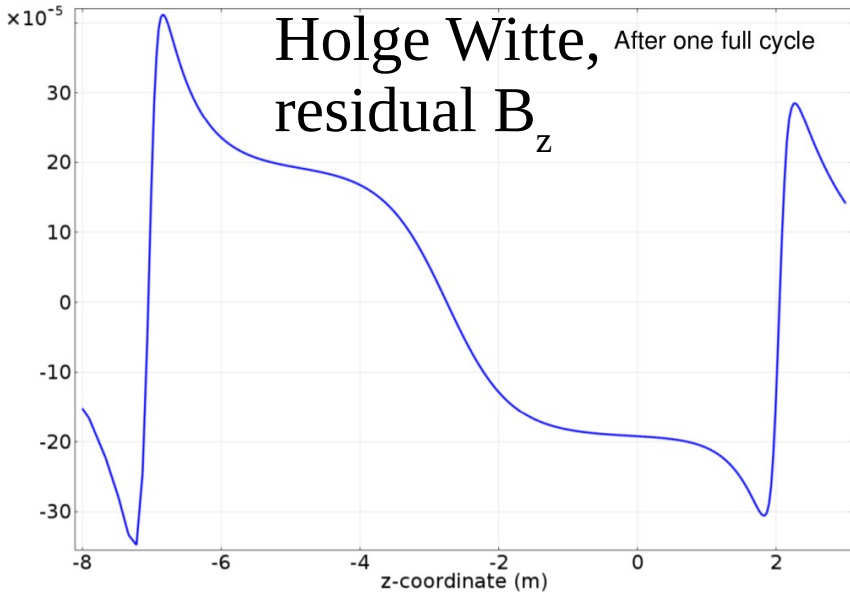
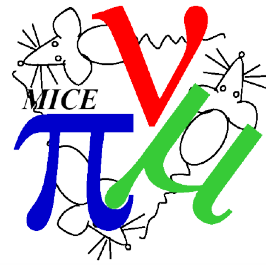
- Tracker position resolution
- Scattering in outer 4 planes of tracker affecting tracker measurement resolution
- Scattering in inner plan of tracker
- Materials in beamline
- Earth's magnetic field – oh yes!

Magnitude of errors



Source	Position	Momentum	Source
Tracker spatial	0.47 mm	0.	Tracker paper
Tracker scattering	24.9 mm	5.3 mrad	Carlisle thesis
Air	2.8 mm	1.2 mrad	PDG and drift
He window	10.8 mm	2.5 mrad	PDG and drift
Add in quadrature	27 mm	6.5 mrad	

Iron Stuff



- Effect of $5e-4$ transverse field gives $\sim 5-6$ mm transverse kick to the beam
 - Supported by back of envelope calculation
- Obviously a worst case
 - Guess too high estimate of transverse kick by factor 5