

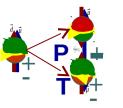


Spin Tracking for Precision Measurements

https://indico.cern.ch/event/368912/overview

Spin Tracking Code Evaluation Session Summary

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Motivation/Goal of the workshop

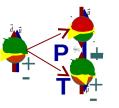


- To fulfill the requirements of the storage ring based EDM search, the following capabilities are essential:
 - Accurate description of all ring elements including electric field, fringe fields (spin behavior), magnetic focusing in cavity; electric dipole moment part of BMT-equation
 - Allowing various error inputs for systematics investigation.
 - Accurate implementation of RF spin manipulation elements.
 - Calculation of both orbital and spin motion with a high accuracy for over 10^9

orbital revolutions.

- Allowing multiple particle tracking for exploring IBS, cooling, as well as beam-beam effects.
- User friendly graphic interfaces for extracting physical information such as orbit, betatron tune, and spin tune from tracking data.
- Benchmarking

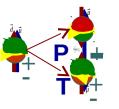
code	E elem	ExB elem.	Fringe field	Time varying field	RF cavity Incl. B field off axis	Error error algorithm	Longterm tracking speed	Longterm tracking accuracy
Seluck	У						<=1ms	
Martin	У							
BMad	Field map		Field map			Misalignment , field error(which order?)		
COSY- infinity	Field		Field map	Y if the symplecticity verified		Misalignment , field error(which order?)	28million partcles w. 1k pt	
ETeapot	У							
TSpink	n							
Zgoubi			Field map	У		Misalignment , field error(whic order?)	8 particles of 3 million turns	
PTC								



Other effects



- RF cavity off-axis B field on EDM systematics
- Collective effects
 - IBS
 - spin decoherence due to emittance growth?
 - direct effects on EDM systematics?
 - For pEDM, Beam-beam effect on orbit and spin
- Fringe field effects on detailed spin motion
 - Or is spin coherence time enough?
- Is it desire to have cooling?
 - If yes, then which one, e-cooling or SC, and their effects on spin motion







- First principle prediction
 - Check against theoretical expectations
- Against other codes
 - With the same setup
- Benchmarking against experimental results
 - COSY data: spin coherence time, stable spin direction measurement