



BDSIM - Current Status and Future Plans

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- Structure of BDSIM
 - Element definition
 - Physics processes
- Visualisation
- Benchmarking
- Wakefields
- Beam Gas





BDSIM Structure

- Beamline objects implemented as classes
- Generate secondary particles from Geant4 physics processes
- Automatic tracking of secondaries



• PBS and GRID versions







- SQL or GMAD description allows for insertion of arbitrary definition of 3D beamlines and elements
- Also overlay arbitrary magnetic field descriptions







Transportation

- Separate steppers for each class
 - Analytical solutions where available
 - Runge-Kutta elsewhere
- Step size
 - If no physics processes transportation is between boundaries of logical volumes
 - For continuous processes, transportation is the same and particle energy is altered at end of step
 - For discrete processes, mean free path is determined by random Monte-Carlo trial





Benchmarking



Appleby et al, EPAC06

BDSIM - Status and Future





Wakefields

- BDSIM tracks single particles
 - Generates secondary particles
 - Cannot calculate wakefield kicks
- Placet tracks bunch slices
 - Calculates wakefield kicks
 - Cannot generate secondary particles

Combination: Ilya Agapov Andrea Latina Daniel Schulte (CERN)



Placet + BDSIM?



- Main beam tracking in BDSIM
- At collimators and spoilers bunch is held on stack
- Bunch is passed to Placet and tracked to calculate wakefield kicks
- Placet passes appropriate kicks to BDSIM
- BDSIM restarts at held position and applies kicks









- BDSIM reverts to GEANT-based tracking when material is nonvacuum
 - Introducing beam gas is a problem
- Several methods under investigation
 - Thin, dense beam gas plug?
 - Need to randomise location at each step of tracking
 - Large interactions file?
 - Many 4-vectors for gas molecules
 - Determine mean free path from gas density profile
- Need to avoid beam absorption losses
 - Replace interacting particle on stack with identical particle that has same initial parameters?







- BDSIM implements generation and fast tracking of secondary particles
- Beamline can be described in components using GMAD or as an whole 3D entity in Mokka/SQL
- Combining with Placet will allow wakefield kicks to be included
- Add beam gas interactions for full IR modelling