Interfacing BDSIM with Placet: Wakefields & Collimators

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ILC LET Meeting

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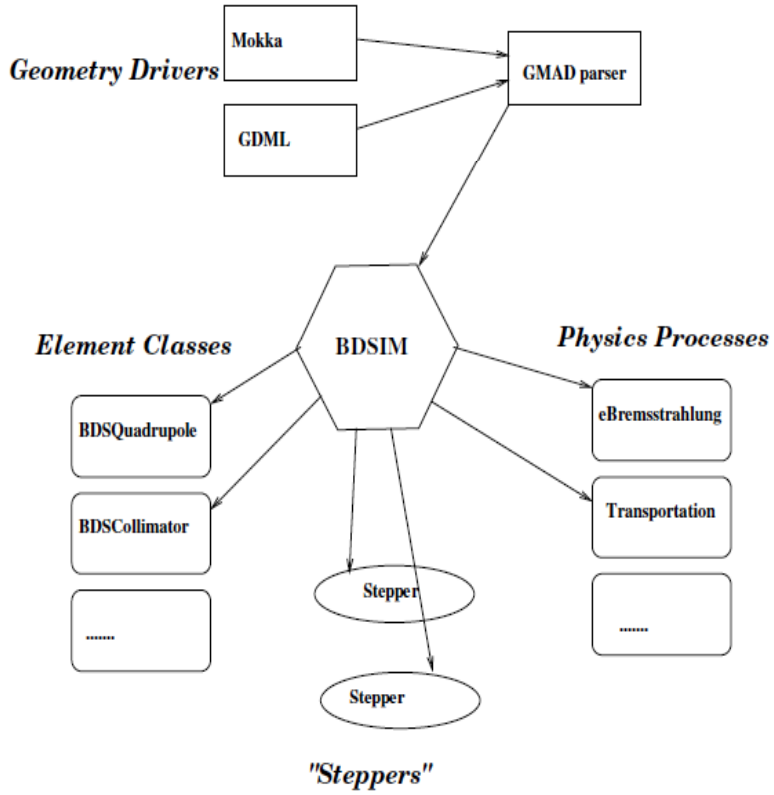
Intro

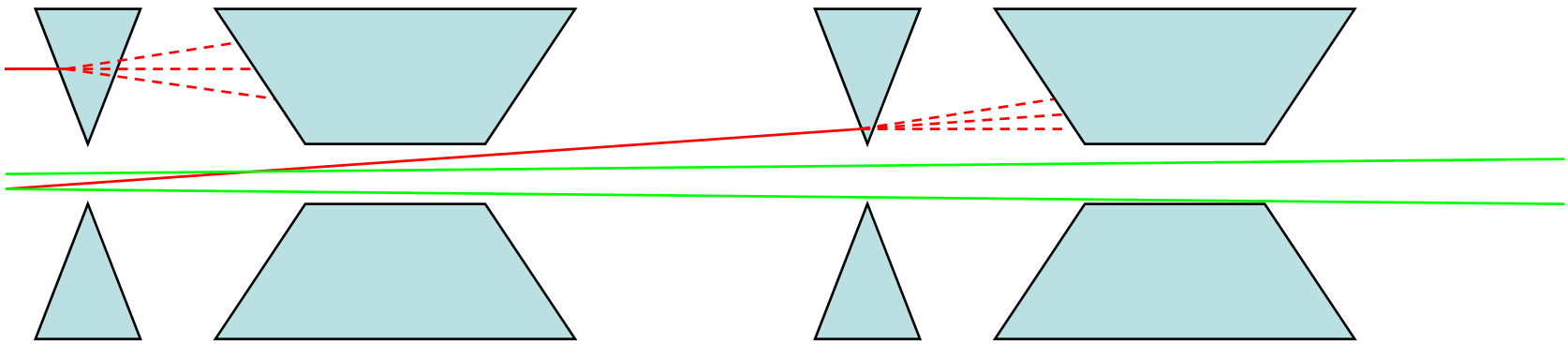
- Structure of BDSIM
- Halo and Wakefields
- BDSIM-Placet interface
- Status of
- Input examples
- Beam halo
- CLIC BDS
- Future developments

BDSIM Structure

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

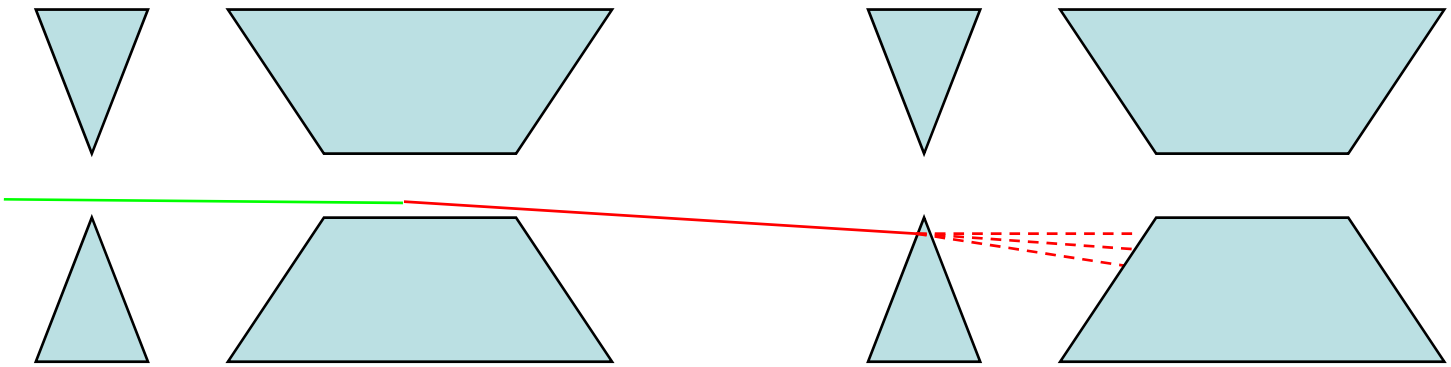


Halo Particles



- Off-momentum and large offset particles

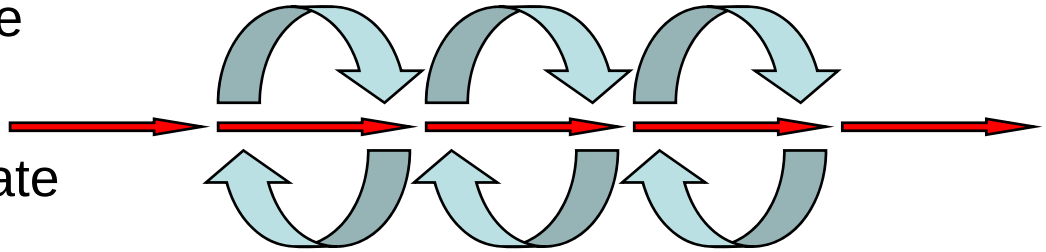
Wakefield-Induced Backgrounds



- Transverse wakefield kick
  - Previously uncollimated particles can be kicked into beam elements
    - Direct hits to FD and VX
    - Secondary particles from beampipe scattering

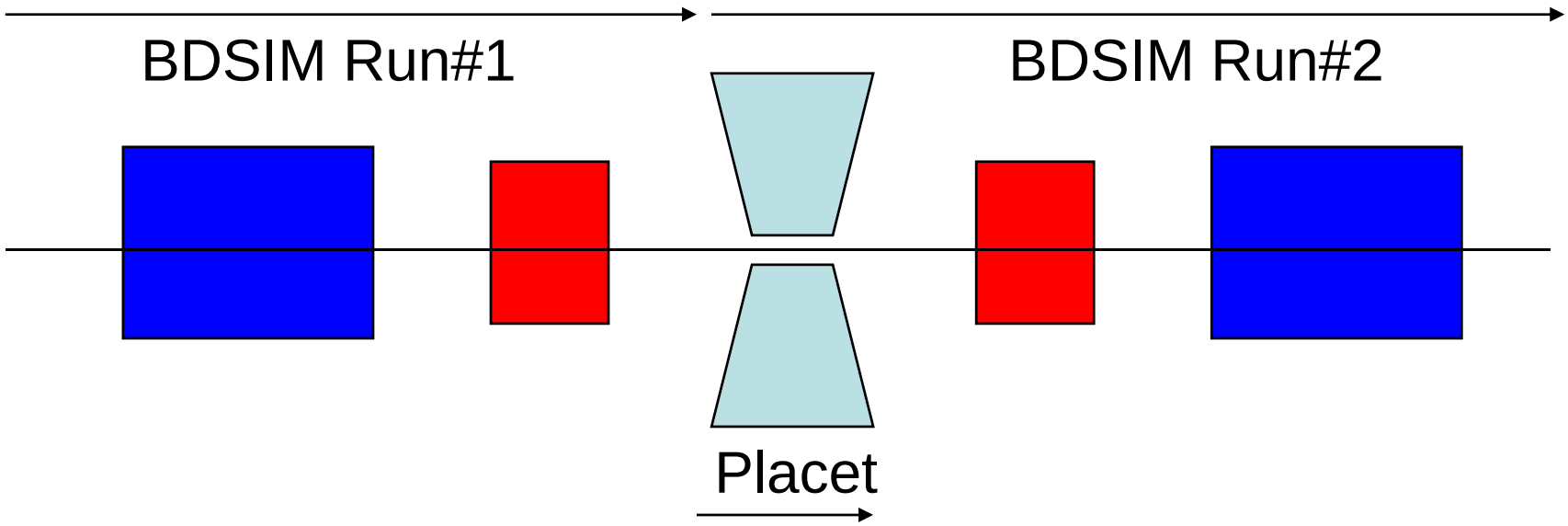
BDSIM-PLACET

- 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 appropiate kicks to BDSIM
- BDSIM restarts at held position and applies kicks
- Repeat through wakefield region and then continue standard tracking



Current Status

- Test lines working as planned
- Currently:
  - Tracks wakefield regions in PLACET
  - Applies kick to original bunch distribution
  - Retracks in BDSIM



Input files - Placet

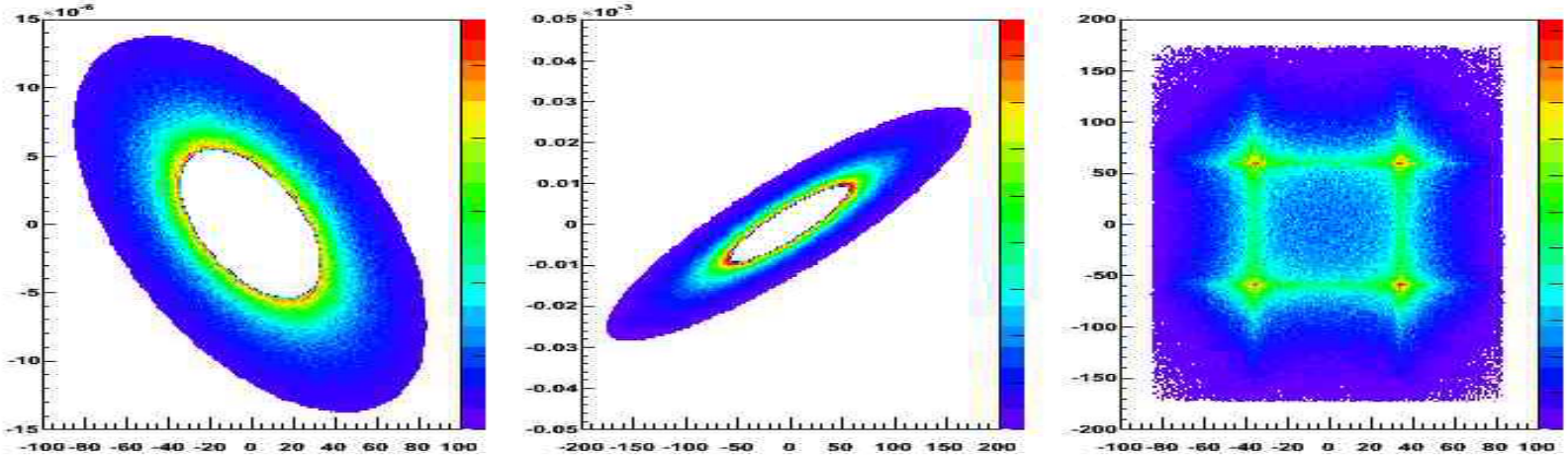
```
…

foreach line {positron electron} {
    BeamlineNew
    Girder
    set quad_synrad 1
    set sbend_synrad 1
    set mult_synrad 0
    set synrad 1
    set e_initial 1496.0
    set e0 $e_initial
    source $script_dir/bds.tcl
    ReferencePoint -sense -1
    TclCall -script "save_$line"
    BeamlineSet -name $line
}

…
```

```
…

Girder
Drift -name DMM2 -l 0.625
Girder
Drift -name COLL3ESP -l 0
Girder
TclCall -script read_halo
Collimator -name "ENGYSP" -horiz -in_height
    6.21e-3 -fin_height 3.51e-3 -width 25.4e-
    3 …
TclCall -script write_halo
Girder
Drift -name DMM2 -l 0.625

…
```

Input Files - BDSIM

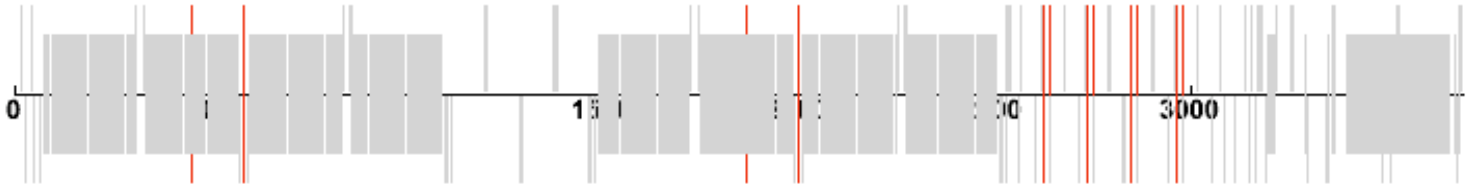
```
beam,   particle="e-",
        energy=250 * GeV,
        nparticles=1e+3,
        distrType="guineapig_slac",
        distrFile="/Users/spm/optics/CLIC/root/halo.dat";

include CLIC_common.gmad;
include CLIC_coll.gmad;
include CLIC_ff.gmad;

bds: line:=(mycolsys,eff1s);
use,period=bds;
sample,range=sextMark;
sample,range=endeff1;
dump,range=engyspMark;
dump,range=engyabm;

option,ngenerate=1000,backgroundScaleFactor=1e5,
synchRadOn=0,srTrackPhotons=0,srLowX=0.01,srLowGamE=0.01*eV,
turnInteractions=1,UseEMHadronic=0,physicsList="em_standard",fifo="/tmp/temp.dat";
```

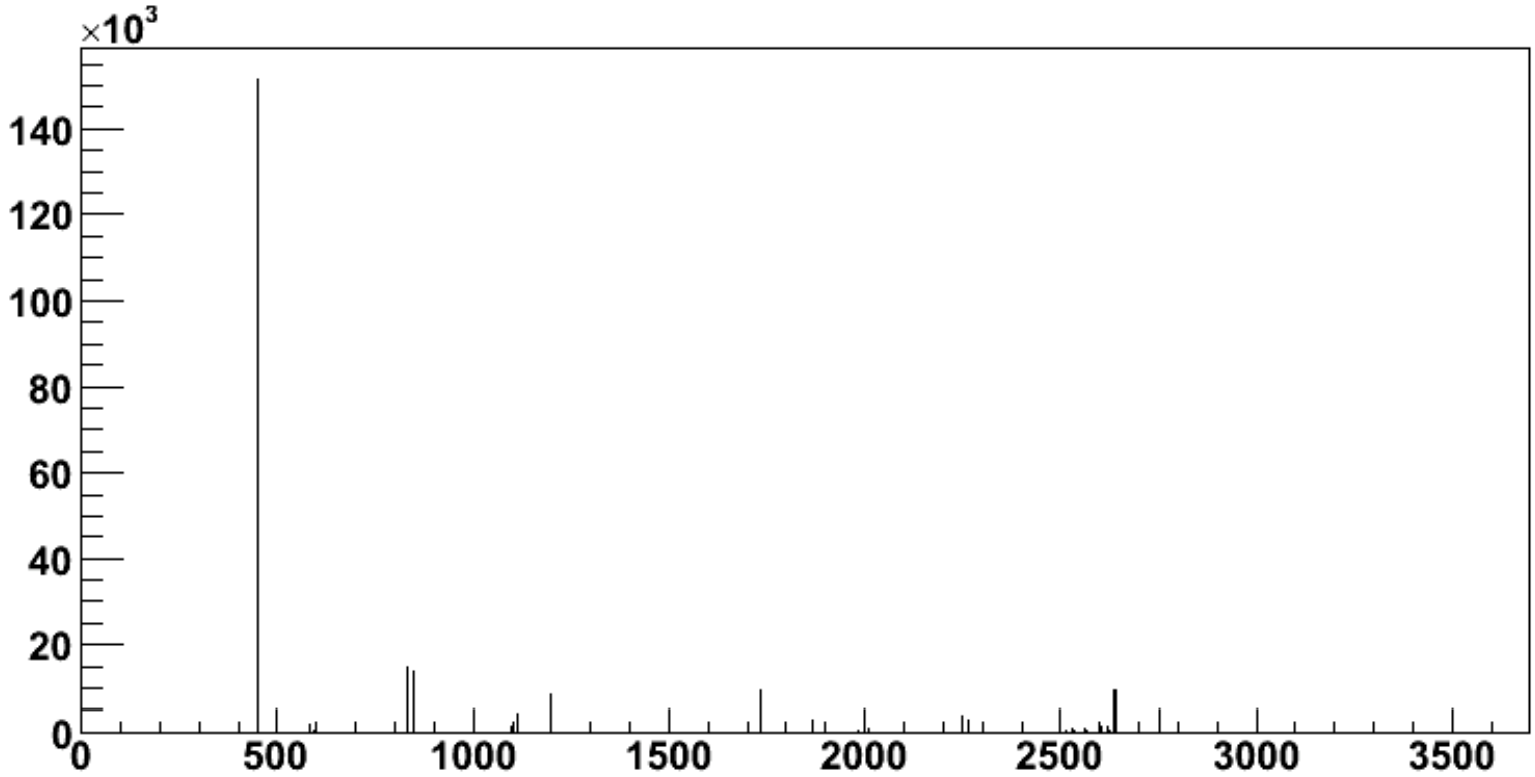
Halo Distribution



- 500,000 particles generated
  - 1000 tracked to reduce computation time for now!
- 1/r distribution in x,xp space
- A_x=[5.7-14.2]σ_x
- A_y=[54-162]σ_y
- cf: CLIC Note 555, CERN

CLIC BDS - BDSIM only

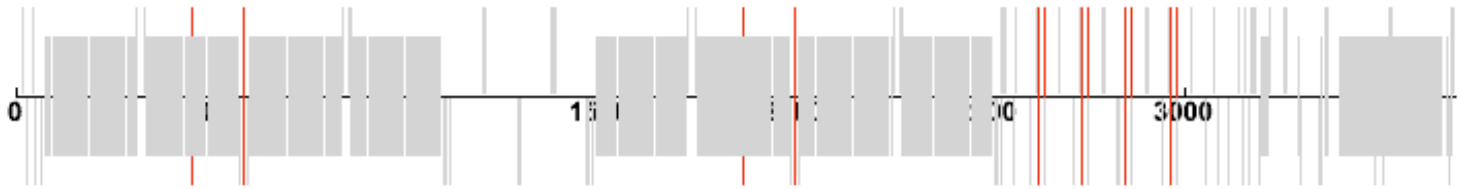


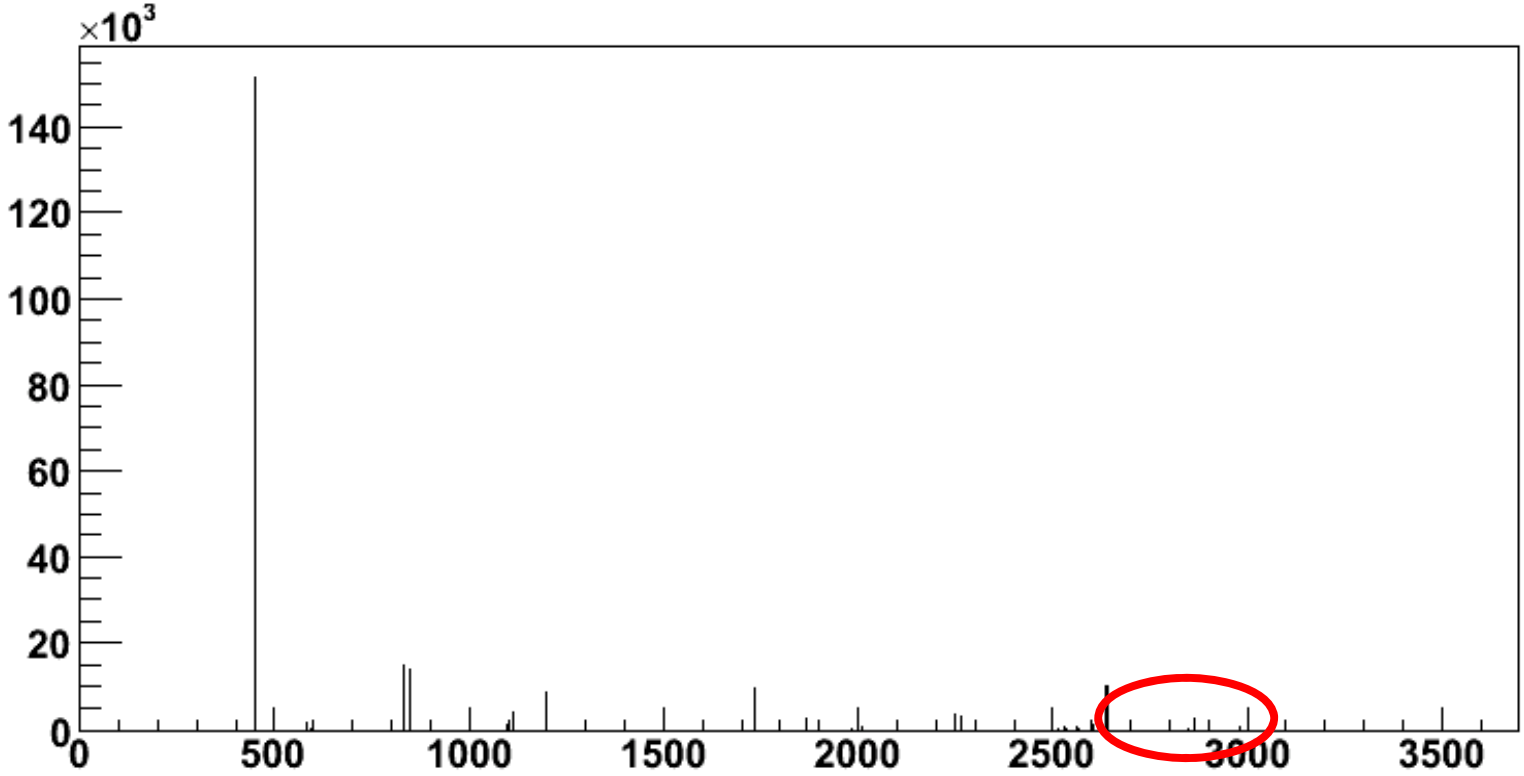


spm, Wed Nov 28 14:05:34 GMT 2007

BDSIM input file : CLICx.gmad

CLIC BDS - with Placet





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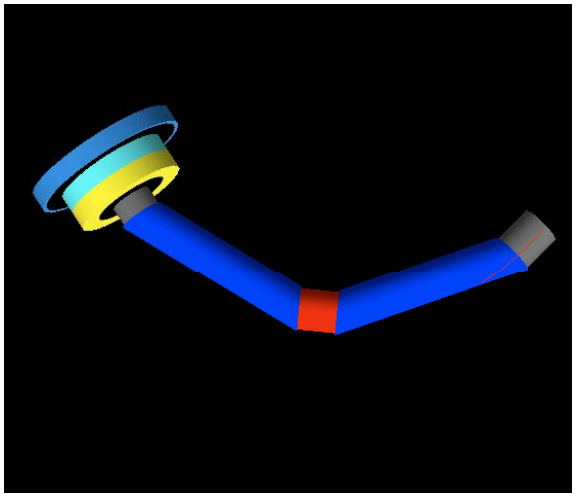
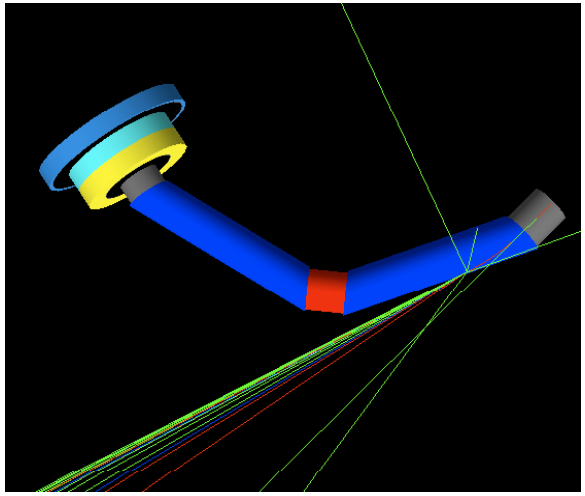
BDSIM input file : CLICx.gmad

Next Steps

- Track with secondaries
  - 250 GeV means lots of secondaries!



- Fix collimators?



- Run with ILC decks

Future Developments

- New stepper for collimators
  - BDSIM to do tracking in collimators, PLACET used to calculate kicks
  - Apply appropriate transverse kick to particle at centre of collimator region? Or half at beginning/half at end?