

Guinea-Pig

Simulating ILC-500GeV trains & Conversion of pairs.dat

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 - The ILC-500GeV parameters
 - Simulating ILC(UPGRADE)-500GeV trains
 - Converting pairs.dat
- 2 SiD simulation with SLIC
 - WIRED 4 event display
- 3 What next?

Guinea-Pig – acc.dat

ILC-500GeV parameters

- \$Accelerator parameters from Glen White
- Using his parameters for ILC-500GeV ($n_b=1312$) and ILCUPGRADE-500GeV ($n_b=2625$)

```
$ACCELERATOR:: ILC-500GeV
```

```
{energy=250.0;particles=2.0; beta_x=11.0;beta_y=0.48;emitt_x=10.0;emitt_y=0.035;sigma_z=300.0;  
f_rep=5.0;n_b=1312;charge_sign=-1;scale_step=1.0;waist_y=250;  
espread.1=0.00124;espread.2=0.0007;which_espread=3;}
```

```
$PARAMETERS:: par
```

```
{n_z=12;n_t=6;n_m=80000;cut_z=3.5*sigma_z.1;n_x=256;n_y=256; cut_x=4*sigma_x.1;cut_y=4*sigma_y.1;  
pair_ecut=1e-3;pair_q2=2;beam_size=1;grids=7;store_beam=1; do_pairs=1;track_pairs=1;store_pairs=1;  
do_photons=1;store_photons=1; do_hadrons=1;do_jets=1;do_coherent=1; electron_ratio=1;photon_ratio=1;  
do_ellos=1;do_espread=1; rndm_seed=100;}
```

Guinea-Pig – Simulations

Simulation time and resources

- Guinea-Pig can only simulate one bunch at a time → Restart GP for every bunch (in a train)
- `n_b` is only used for calculating the luminosities
- With the given parameters in the `acc.dat` file: simulation of 1 bunch \approx 5 minutes
→ 1 Train * 5 min = 1312 * 5 min = 4.5 days!

Guinea-Pig – Simulations

Simulation time and resources

- Wrote script that sends GP jobs to the DESY NAF batch system → Jobs are running in parallel
⇒ Simulation of 1 TRAIN \approx 1 hour!!
- PROPLEM with GP: no random seed set automatically (only rndm.save file gives information about the previously used seed to the next simulation)
- SOLVED: set random seed in the acc.dat file:
`rndm_seed=int(rand(time()));`

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Converting pairs.dat to HEPEvt and Stdhep

Available tools from CLIC group for converting Guinea-Pig output to HEPEvt and Stdhep

- pairs.dat to pairs.HEPEvt:

`https://svnweb.cern.ch/trac/clicdet/browser/trunk/Users/sailer/Scripts/PairsToHEPEvt`

- pairs.HEPEvt to pairs.stdhep:

`https://svnweb.cern.ch/trac/clicdet/browser/trunk/tools/HEPEvtStdhepConverter`

Wrote Python program that combines these two tools → two in one

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Converting pairs.dat to LCIO (or Stdhep)

Wrote Java program PairsToStdhepLCIO.java that converts pairs.dat to LCIO or Stdhep

- Choice (between LCIO and Stdhep) is made by giving output name + file format (.slcio or .stdhep) as argument to program
- Number of particles that are to be converted can be set, also as argument of the program
- Cuts can be applied for p_T and θ
- Converting pairs.dat with 198,044 particles to LCIO (without any cuts): ≈ 2.1 seconds!!
- Such a converted slcio file has a file size of ≈ 3.3 MB
($\rightarrow 1$ Train ≈ 4.3 GB)

```
USAGE:
>> java -cp bin:lib/* PairsToStdhepLCIO -i PATH/TO/input.dat -o output<.stdhep / .slcio> <more options>

Required Arguments:

-i:          <GuineaPig input dat file>
-o:          <output filename.stdhep / .slcio>

OPTIONS:

-h / --help:      Usage
-n:               <maximum number of particles that are to be converted>
-pl / --ptcut_low: <lower limit for pT in GeV>
-ph / --ptcut_high: <higher limit for pT in GeV>
-tl / --thetacut_low: <lower limit for theta in degree>
-th / --thetacut_high: <higher limit for theta in degree>

For example:
>> java -cp bin:lib/* PairsToStdhepLCIO -i pairs.dat -o pairs.slcio -n 3000 -pl 0.01 -ph 1 -tl 0.2 -th 30
```

Description of all the conversion programs can be found here:
<https://wikis.bris.ac.uk/display/sid/Simulation+of+the+background+events+for+the+SiD+detector>

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Requests?

Guinea-Pig simulations can be easily done now.

Are there any requests for more simulations, for 250 GeV or 1 TeV?

Only question: Where shall the data be stored, so that they are accessible?

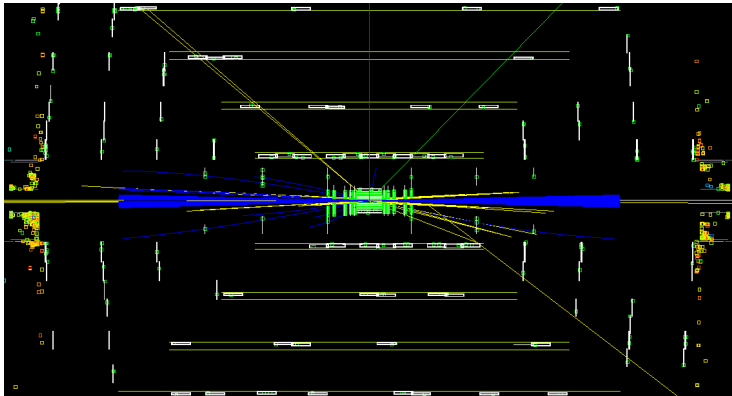
Using pairs.slcio as input to SLIC

- I used the sidloi3.lcdd geometry
- `slic -g sidloi3.lcdd -i pairs.slcio -m CrossingAngle.mac`

JAS3: full bunch crossing

Collections		
Name	Type	Size
BeamCalHits	org.lcsim.event.SimCalorimeterHit	141286
EcalBarrelHits	org.lcsim.event.SimCalorimeterHit	34
EcalEndcapHits	org.lcsim.event.SimCalorimeterHit	164
HcalBarrelHits	org.lcsim.event.SimCalorimeterHit	0
HcalEndcapHits	org.lcsim.event.SimCalorimeterHit	355
LumiCalHits	org.lcsim.event.SimCalorimeterHit	476
MCPParticle	org.lcsim.event.MCParticle	198465
MCPParticleEndPointEnergy	org.lcsim.event.GenericObject	1
MuonBarrelHits	org.lcsim.event.SimCalorimeterHit	0
MuonEndcapHits	org.lcsim.event.SimCalorimeterHit	3006
SiTrackerBarrelHits	org.lcsim.event.SimTrackerHit	751
SiTrackerEndcapHits	org.lcsim.event.SimTrackerHit	813
SiTrackerForwardHits	org.lcsim.event.SimTrackerHit	153
SiVertexBarrelHits	org.lcsim.event.SimTrackerHit	831
SiVertexEndcapHits	org.lcsim.event.SimTrackerHit	645

Rho-z view



Next plans

- Implementing additional command line argument for PairsToStdhepLCIO with which the event number can be set → merging single slcio files to one big file without merging all the events to one
- Map of calorimeter cell-IDs → which calo layer has how many hits? ...
- Simulating neutron background from beam dump → get to know MC program FLUKA
- Paper "Simulation of Neutron Backgrounds from the ILC Extraction Line Beam Dump" by Siva Darbha (SULI, SLAC), 2007

<http://www.slac.stanford.edu/cgi-wrap/getdoc/slac-tn-07-013.pdf>