SiWECal RawROOT to LCIO converter

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Updates

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Current SiWECal event building process

Currently the process of event building follows the next steps:

- ASCII files are converted into RawROOT files.
- RawROOT files are converted into ROOT with events built in it.

However the standard ILC Software uses the LCIO data format. Ideally the DAQ produces a binary file that it is directly converted into a LCIO file.

Currently the LCIO converter takes the RawROOT file as input.

Building and execution

The code will be in the *eventbuilding* folder of the SiWECal repository.

Building:

- source ${ILCSoftPath}/init_ilcsoft.sh (REQUIRED) (VERSION v02_02_02)
- run ./script/build.sh [Full]

Dependencies: CMake >= 2.6 and C++17
Produces an *app* folder with the executable *ECal_EventBuilding*.

Building and execution

The code will be in the *eventbuilding* folder of the SiWECal repository.

Running: *./app/ECal_EventBuilding –help* for a description of all options.
The only one required is the name of the RawROOT file.

```
hecgc@hecgc-GL62M-7REX [~/Physics/Repos/SiWECAL-TB-analysis/eventbuilding] (slboard_TB2021_ILCSoft) $ ./app/ECal_EventBuilding --help
Usage: ECal_EventBuilding [OPTION...] -i INPUTFILENAME
Program to convert the RawROOTFiles from SiWEcal Beam Test 2021

  -c, --comissioning_folder=COMFOLDER
                             Path to the comissioning folder
      --cob_positions_string=COBPOS
                             String of cob positions
  -i, --in_file_name=INFILENAME   Input file name
      --mapping_file=MAPFILE Mapping file name
      --mapping_file_cob=MAPFILECOB
                             Mapping file name for the cob layers
      --masked_file=MASKFILE Masked channels file name
      --mip_calibration_file=MIPFILE
                             Mip calibration file name
  -n, --max_entries=MAXENTRIES   Number of entries to process from the input
                             file
  -o, --out_file_name=OUTFILENAME
                             Output file name
      --out_col_name=OUTCOLNAME   Output collection name
      --pedestals_file=PEDFILE   Pedestals file name
  -t, --in_tree_name=INTREENAME   Input TTree name
  -w, --w_config=WCONFIG     WTF IS THIS
  -?, --help                 Give this help list
      --usage                Give a short usage message
  -V, --version              Print program version

Mandatory or optional arguments to long options are also mandatory or optional
for any corresponding short options.
```

Build algorithm

So far the event building algorithm is an adaptation to c++ of Jonas' code.

- Reading RawROOTFile
- BCID merging
- Pedestals subtraction
- Mip calibration
- Converting into LCCalorimeterHits
- Writing the LCIO File

LCIO output

LCIO File (default = TB_${RunNumber}.lcio)

- *LCHeader*
  - *RunNumber*
  - *detectorname* = *ECAL15Slabs_2021*
- *LCEvents*
  - *Eventnumber*
  - *BCID*
  - *Parameters*()
    - *Spill*
    - *Prev_BCID*
    - *Next_BCID*
    - *Sum_HG*
    - *Sum_Energy*
    - *NHit_Slab*
    - *NHit_Chip*

LCIO output

LCIO File (default = TB_${RunNumber}.lcio)

| |→ *LCCollection* (default = ECalEvents, type = CalorimeterHit)

| | |→ *Hit_Energy*

| | |→ Hit_X

| | |→ Hit_Y

| | |→ Hit_Z

| | |→ *CellIDEncoding* : "S:4;CP:4:CH:6;SC:4;IH:1;IM:1;IC:1"

$S = Hit\_Slab$ $CP = Hit\_Chip$ $CH = Hit\_Channel$ $SC = Chip\_Sca$
$IH = IsHit$ $IM = IsMasked$ $IC = IsCommissioned$ Two missing variables:

Hit_HG and *Hit_LG* due them being float values.
Possibility: store them in the Time and EnergyError variables.

Conclusion

Advantages:

- LCIO is the standard format of the ILC collaboration. Future events whith synchronization between different modules will use this common framework.
- Adapting prototype simulation analysis, in the context of ilcsoft framework, to beam test data will require simple changes of the processors.
- Access to all high level analysis processor already implement in ilcsoft.

Disadvantages:

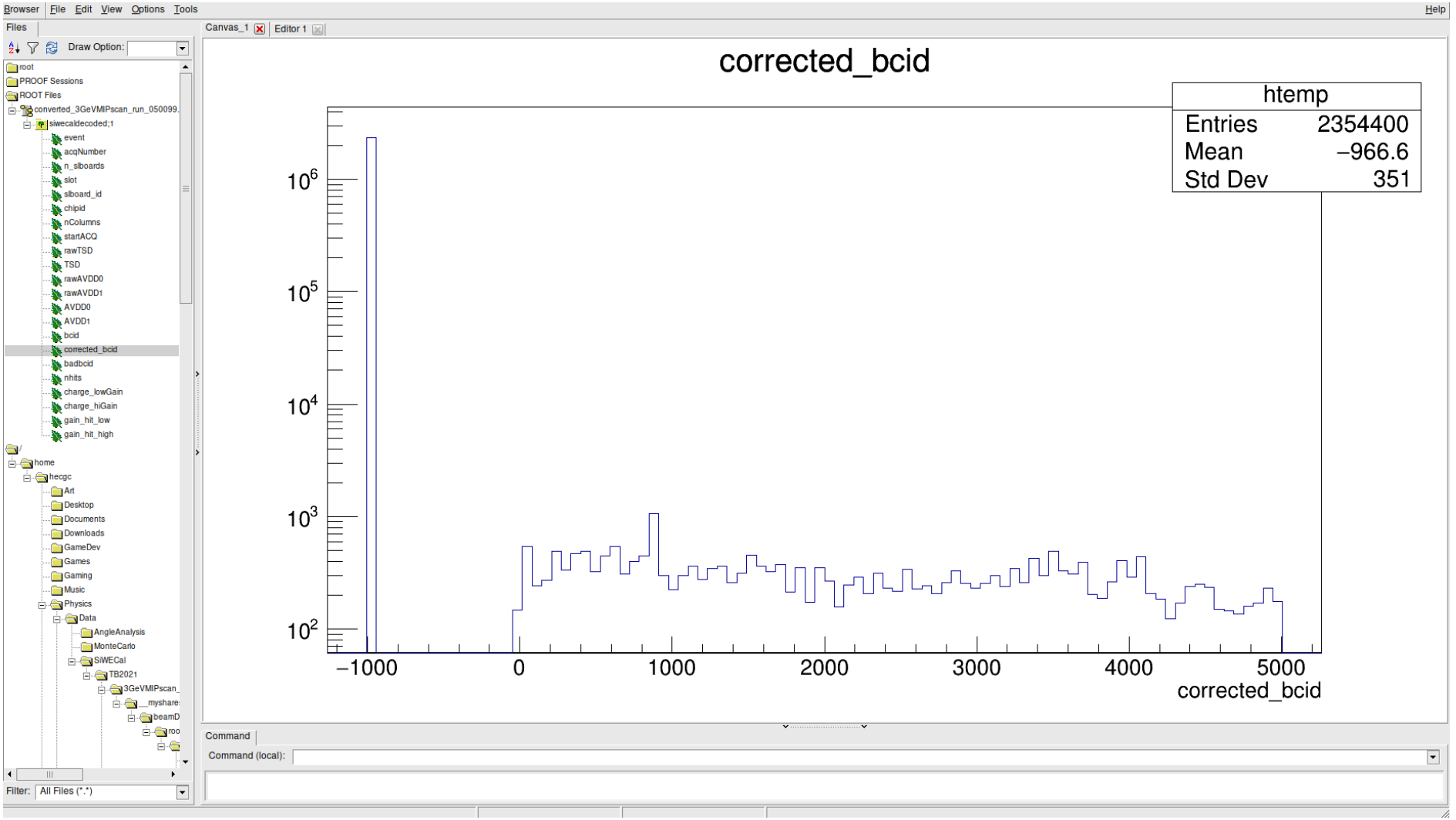
- Fast and testing analysis is cumbersome due to the setup of the Marlin Processors. Particularly for newcomers.
- LCIO files are usually heavier than simple ROOT files.

NEXT STEPS: Start the conversion chain from the ASCII file.

Once discussed modifications are completed the converter a pull request will be available in the SiWEcal repository.

Backup

RawROOT


Browser File Edit View Options Tools
Help
Files
Draw Option:
root
PROOF Sessions
ROOT Files
converted_3GeVMIPscan_run_050099.
siwecaldecoded;1
event
acqNumber
n_slboards
slot
slboard_id
chipid
nColumns
startACQ
rawTSD
TSD
rawAVDD0
rawAVDD1
AVDD0
AVDD1
bcid
corrected_bcid
badbcid
nhits
charge_lowGain
charge_hiGain
gain_hit_low
gain_hit_high
home
hecgc
Art
Desktop
Documents
Downloads
GameDev
Games
Gaming
Music
Physics
Data
AngleAnalysis
MonteCarlo
SiWECal
TB2021
3GeVMIPscan_
__myshare
beamD
roo
Filter: All Files (*.*)
Canvas_1
Editor 1
corrected_bcid
htemp
Entries 2354400
Mean −966.6
Std Dev 351
10^6
10^5
10^4
10^3
10^2
−1000
0
1000
2000
3000
4000
5000
corrected_bcid
Command
Command (local):