Software update

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DHCal Meeting at NIU
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DigiSim updates

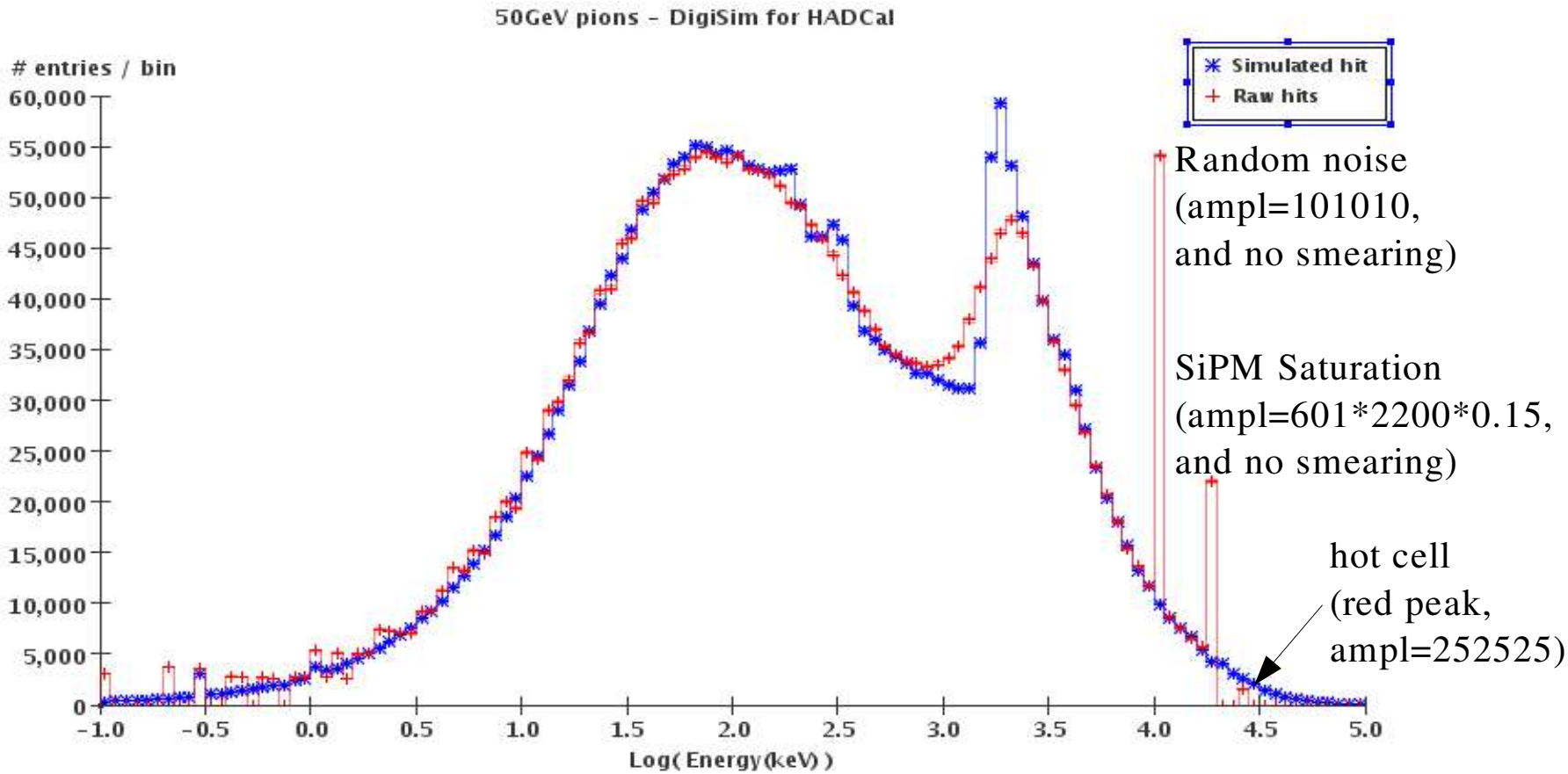
- New modifiers implemented:
  RandomNoise, HotCell, DeadCell, SiPMSaturation

```
# SiPM gain=601 with saturation at about 2200 incident photons
# SiPMSaturation parameters:          gainNom   linMax  timeNom  timeSig
HBSiPMSaturat    SiPMSaturation          601     2200       10        0

# RandomNoise parameters:   AmplNom  Sig  TimeNom  Sig  <N> sys be
HBRandomNoise   RandomNoise  101010   0    252525   0   30   3   0

# Hot cell parameters:      AmplNom  Sig  TimeNom  Sig      sys be lay the phi
HBHotCell       HotCell      252525   0    101010   0        3   0  12 123 345
HBDeadCellTest  HotCell      252525   0    101010   0        3   0  12  34  56

# Hot cell parameters:          sys   be   lay   the   phi
HBDeadCell      DeadCell        3    0    12    34    56
```

Where system: 2 = ECal, 3 = Hcal and barrel/endcap= 0,1,2 for barrel, ECN, ECS
Note: No validity check is being made for sys/be/lay/the/phi indices!!

Question: Are these parameters appropriate? Any suggestions?

Comparing simulated and raw hits



Using the new modifiers

JAS3

File Edit View Tuple Loop LCD LCIO Window Help

digisim.slcio

DataSets

Welcome | LCSim Event

Run:0 Event: 1

Event
- TkrEndcapHits
- EcalEndcapHits
- VtxBarrHits
- HcalBarrRaw2sim
- HcalBarrHits
- HcalEndcapHits
- EcalBarrRaw2sim
- HcalEndcapRaw2sim
- EcalBarrRawHits
- EcalEndcapRaw2sim
- LumEndcapHits
- MuonBarrHits
- TkrBarrHits
- MCParticle
- HcalBarrRawHits
- EcalBarrHits
- HcalEndcapRawHits
- EcalEndcapRawHits
- MuonEndcapHits

Collection: HcalBarrRawHits size: 1587 flags: 28000000

CellID	Amplitude	TimeStamp
4838714450641285	622	23
7926632727708048	146653	6
7926628432740753	132	6
7926624137773458	25790	6
7926619842806163	127331	6
7610059278254467	3266	11
5014666375856512	4812	23
5304920265720198	423	26
10011603126714777	834	565
6615297607860624	101010	252525
5858949572067714	309	12
7478405645730180	1332	16
5401681583931799	3851	30
660415646269824	674	160
5111406219231618	2760	8
492727238132108	252525	101010
8234079371657609	101010	252525
7099391961727391	957	2104
3563444171178375	10	11
7917828044751250	11817	6
7917836634685840	11623	6
7917832339718545	3496	6
1206744076255649	2974	937
5164049633378691	25422	6

Analyzed 1 records in 232ms

11.9/67.9MB

Used Hcal barrel for testing new modifiers

DeadCell

HotCell

RandomNoise

Using JAS3 to look at output

JAS3

File Edit View Tuple Loop LCD LCIO Window Help

digisim.slcio

DataSets

Welcome | LCSim Event

Run:0 Event: 0

Event
- TkrEndcapHits
- EcalEndcapHits
- VtxBarrHits
- HcalBarrHits
- HcalBarrRaw2sim
- HcalEndcapHits
- EcalBarrRaw2sim
- HcalEndcapRaw2sim
- EcalBarrRawHits
- EcalEndcapRaw2sim
- LumEndcapHits
- MuonBarrHits
- TkrBarrHits
- MCParticle
- HcalBarrRawHits
- EcalBarrHits
- HcalEndcapRawHits
- EcalEndcapRawHits
- MuonEndcapHits

Collection: HcalBarrRaw2sim size:1264 flags:80000000

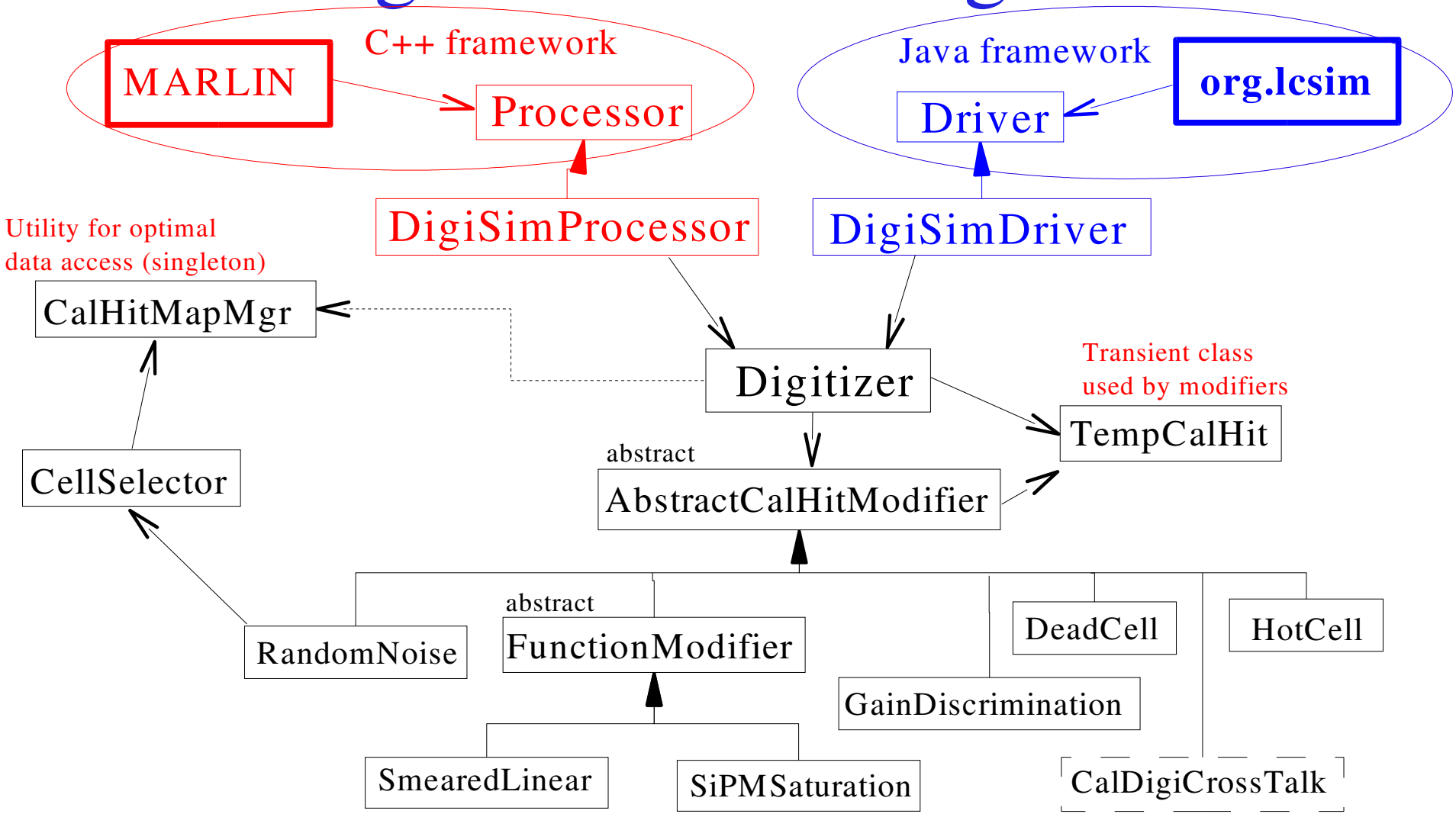
From	To	Weight
HcalBarrRawHits[2]	HcalBarrHits[421]	1.0000
HcalBarrRawHits[3]		1.0000
HcalBarrRawHits[4]	HcalBarrHits[697]	1.0000
HcalBarrRawHits[5]	HcalBarrHits[1198]	1.0000
HcalBarrRawHits[6]	HcalBarrHits[486]	1.0000
HcalBarrRawHits[7]	HcalBarrHits[1227]	1.0000
HcalBarrRawHits[8]	HcalBarrHits[511]	1.0000
HcalBarrRawHits[9]	HcalBarrHits[1075]	1.0000
HcalBarrRawHits[10]	HcalBarrHits[1066]	1.0000
HcalBarrRawHits[11]	HcalBarrHits[450]	1.0000
HcalBarrRawHits[12]	HcalBarrHits[918]	1.0000
HcalBarrRawHits[13]	HcalBarrHits[528]	1.0000
HcalBarrRawHits[14]	HcalBarrHits[638]	1.0000
HcalBarrRawHits[15]	HcalBarrHits[921]	1.0000
HcalBarrRawHits[16]	HcalBarrHits[719]	1.0000
HcalBarrRawHits[17]	HcalBarrHits[919]	1.0000
HcalBarrRawHits[18]	HcalBarrHits[770]	1.0000
HcalBarrRawHits[19]	HcalBarrHits[667]	1.0000
HcalBarrRawHits[20]	HcalBarrHits[594]	1.0000
HcalBarrRawHits[21]	HcalBarrHits[805]	1.0000
HcalBarrRawHits[22]	HcalBarrHits[578]	1.0000
HcalBarrRawHits[23]	HcalBarrHits[1031]	1.0000
HcalBarrRawHits[24]		1.0000
HcalBarrRawHits[25]	HcalBarrHits[57]	1.0000

Analyzed 1 records in 298ms

3.64/68.2MB

These are hits produced by RandomNoise or HotCell (no corresponding simulated hit)

DigiSim class diagrams



Software status report

Overall goal: detector optimization and PFA studies for Snowmass (August)

- org.lcsim: Official java framework for LCIO analysis
  - DigiSim port for java is complete!
    Next steps: noise, hot/dead channels, SiPM saturation (done)
    crosstalk modifiers (started)
  - Non-projective geometries
- PFA development
  - Cluster interface into clustering algorithms
    Superlayers (old) and neighborhood density (new)
  - Investigate existing tools for PFA integration
- LCDG4 maintenance
  - EMCal cell staggering (tests)
  - Multiple primary vertices (diagnostics)
  - Use of particle Gun (Andrew Hahn, Boulder)
- NP geometries into SLIC and LCCDD