AugerPrime SD Offline software status

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AugerPrime software updates

★ SD Monitoring

★ SD simulation

★ SD reconstruction

★ How-To simulate and reconstruct

SD Monitoring

Auger monitoring page

Info for UUB station available in the **MonitUUB** table :
SD -> LS -> Monitoring -> MonitUUB -> choose the variable

Direct access to AugerPrime sub-arrays under : *SD -> Sub Array Monitoring*

Still missing (w.r.t. the **MonitCalib** table for UBs) but to be added *asap :*

- VEM charges & peaks

- baselines

- trigger rates

New variables to be added :

▸ MIP charge & peak
  however, those are not calculated at LocalStation level …

▸ in the **LongTerm** table, small showers related quantities
  (event rate, approximate inter-calibration factor, etc.)

Note that quantities related with dynode will not longer be present since only the anode is actually read and the amplification is purely electronic.

SD detector simulation

Framework already includes SSD and SPMT.

Simulation of CORSIKA showers in the Offline performed using the so-called **FAST** procedure:

- ✦ particles propagation and interaction simulated by GEANT4;

- ✦ propagation and interaction of secondary photons inside the WCD/SSD simulated with a custom code;

- ✦ validated through a FULL GEANT4 simulation mode.

FULL mode bug (i.e. large under-estimation of WCD PMTs signals in few % of simulated events) solved by the end of 2020.

Updated FAST simulation code **including the SPMT** just committed. *Further tests using (very) high energy showers are welcome !*

SSD simulation working both in FULL and FAST mode.

SD electronics simulation

Trigger simulation under revision :

✦ *David Nitz* is comparing triggers given by the UUB firmware with a custom C++ code (to be used to implement a corresponding code inside the Offline).

✦ *Darko Veberic* is validating the trigger algorithms applied on the down-sampled (from 120 MHz to 40 MHz) simulated traces;

When this issue will be solved, a first batch of simulated showers with complete AugerPrime stations should be produced.

SD reconstruction - event reading

CDASToOfflineConverter ready for UUB data

➡ missing LocalStation evaluation of VEM/MIP peak & charge and baselines, used as starting values for the *SdCalibrator* module.

Reconstruction of events with AugerPrime station must be performed using a dedicated *SdSSDDataReconstruction* application, including in particular the **SdEACalibrationFiller** code which :

* calculates raw values of VEM/MIP charges and baselines (to fill the missing LocalStation values) from muon histograms;

* fills the VEM peak with fixed values;

* sets *SetIsTubeOk* & *SetIsLowGainOk* values as true.

SD reconstruction

The ***SdCalibratorOG*** module is ready for UUB analysis with updated values to handle the different trace binning of 8.333 ns
(but *SdEACalibrationFiller* required until issue with LocalStation calibration is not solved, see talk by David Schmidt in the Offline/MC session - March 2021 OCM).

In general, machinery in place to calibrate stations and reconstruct events with both UB and UUB stations together (see talk by David Schmidt in the SD Foundation session - March 2021 OCM).

Inclusion of the SPMT in the SD reconstruction underway.

About the SSD :

- ⊙ slave to the WCD;

- ⊙ dedicated LDF finder (*ScintillatorLDFFinderKG*)
  —> **scintillator S1000** estimation in the reconstructed SD event.

How-To

Simulation (and reconstruction)

✓ UB + SSD
/trunk/Documentation/StandardApplications/SdSimulationReconstruction
using bootstrap_ssd.xml

➡ UUB + SPMT + SSD
/trunk/Documentation/StandardApplications/SdSimulationReconstructionUpgrade
updated values for VEM / MIP / β to be added *asap*

Data access —> Lyon (IRODs)

♣ */pauger/DataProd/v2r0/AugerSd/$year$/$month$/*   for **SD only** merged files

♣ */pauger/DataProd/v2r0/Auger/$year$/$month$/*   for **hybrid** merged files

Data reconstruction

✓ UB + SSD
/trunk/Documentation/ExampleApplications/SdSSDDataReconstruction
using bootstrap_SSDPreProd.xml

maybe this naming should be changed …

➡ UUB + SPMT + SSD
/trunk/Documentation/ExampleApplications/SdSSDDataReconstruction
using bootstrap_EA.xml, but SPMT still not present

Conclusions

✦ Monitoring site updated with UUB table

   ▸ Missing quantities (VEMs, trigger rates, etc.) will be added *asap*.

✦ Code ready for a complete AugerPrime simulation (FAST mode)

   ▸ UUB trigger simulation under validation

✦ Machinery ready for the reconstruction of events with UUB tanks

   ▸ inclusion of the SPMT underway