

Simulation Overview

Zhiwen Zhao

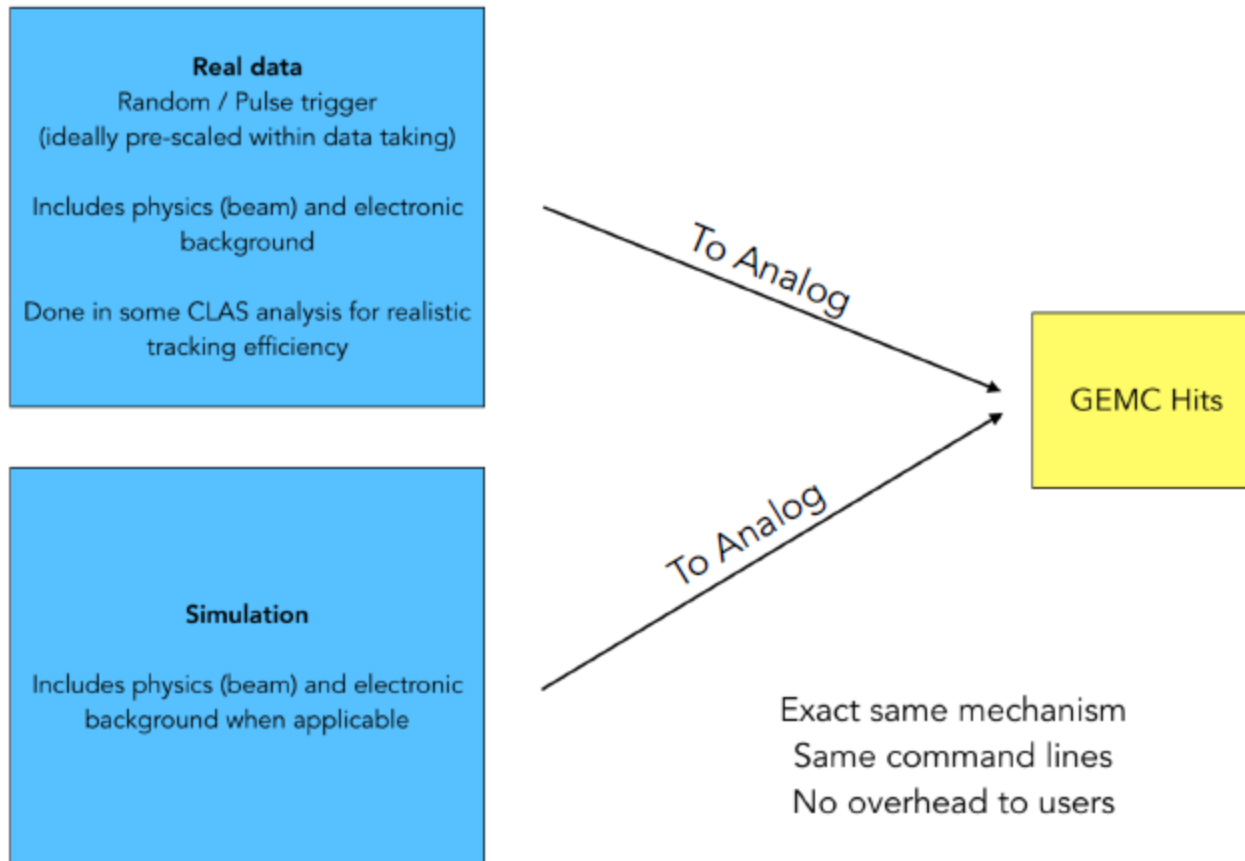
2018/6/8

Simulation Software status

- JLAB_VERSION=1.3 with Geant4.10.01.p03 and GEMC 2.3 used for PreCDR update in 2017, still production for now
- skip JLAB_VERSION=2.0 and 2.1 and start testing JLAB_VERSION=2.2 with Geant4.10.03.p02 and GEMC 2.6
 - CAD import
 - Fast MC mode
 - FADC output
 - Background merging (most interesting)
- GEMC 3.0 is under work
 - multithreading at event level
 - Hit process as plugin
 - Direct root output
 - <https://gemc.jlab.org/gemc/html/documentation/releases/roadmap.html>
- How current simulation will work with art? (Zhiwen, Ole)

Background Merging

CLAS12 Note 2018-002

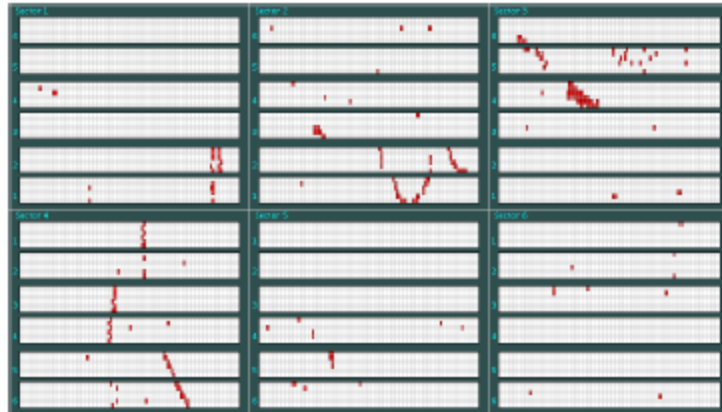


“To Analog”: custom program that converts ADC and TDC to Energy, Time, nphe

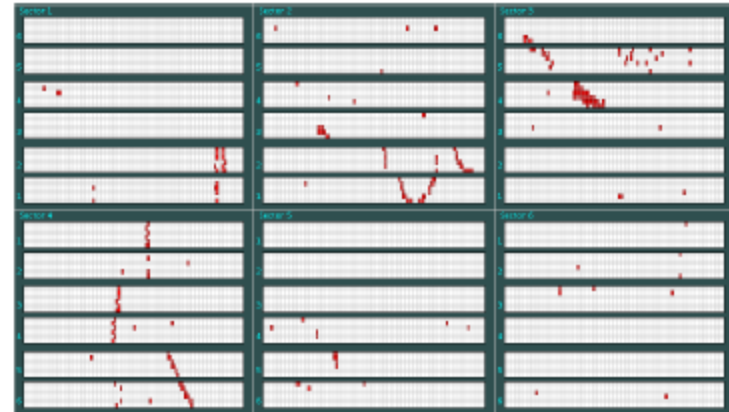
Background Merging

CLAS12 Note 2018-002

Data



GEMC



Software in Container

- Like virtual machine but with no overhead, run farm job, no installation, one image for any machine, **reproduce results**
- Build docker image and both docker and singularity can run it
- test release for both jlab_version 1.3 and 2.2.
https://hallaweb.jlab.org/wiki/index.php/Solid_container
- We are testing on window, mac, linux, ifarm, farm
Please help test more and we hope to release official version soon

From svn to github

svn location <https://jlabsvn.jlab.org/svnroot/solid/>

“testing” github organization including all repo <https://github.com/jlabsolid/>

Combined container and software release, to have **reproducible results**

All conversion and merge are done by "git svn" and "git subtree" with history use branches for devel and keep master as production version

event generator will have individual repo

for example "evgen_BHphoton" converted from svn "evgen/genTCS"

code running simulation, digitization simulation, analyzing simulation result are all under one repo "solid_gemc2", which is converted from svn "solid_gemc2"

digitization/gem from Weizhi's current GEM digitization

study/tracking from Weizhi's current tracking

We can add mrpc digitization and others

All code for individual subsystem, not closely linked to current simulation, should be in a separate repo

for example "subsystem_baffle" converted from svn "subsystem/baffle"

Event generator

- Done
 - hadron generator “solid_bggen” (halld “bggen” based) code improvement and bug fix (Ye Tian, Jixie Zhang)
 - Comparing solid_bggen and pi- rates from MARATHON pi0 rates (DVCS?)
 - SIDIS generator (Tianbo,Zhihong)
- Todo
 - Comparing solid_bggen and pi0 rates from DVCS (Ye Tian @Shandong U)
 - Internal and external radiative effects
 - check and compare inclusive ele generator “solid_inclusive_e” (Christy/Bosted+LHAPDF6) and “eicrate” (Seamus)
 - Finalize jpsi generator (Sylvester)

Magnet

- Done
 - New magnet 3D field map (Jay)
 - NH3 target magnet field map fixed (Chao Gu)
- todo
 - Read new magnet 3D field map in simulation (Zhiwen)

Target

- Done
 - Detailed NH₃ target in simulation (Chao Gu)
- todo
 - He³ window collimator optimization (Zhiwen)

Baffle

- Done
 - Optimization study (Rich)
- todo
 - Recheck with new magnet (Rich)

EC

- Done
 - add scintillation (Birk) and fiber attenuation effect for shower and preshower (Zhiwen Zhao, Ye Tian)
 - Trigger function (Ye Tian)
 - Simulation for beam test (Ye Tian)
- Todo
 - comparing to test result (Ye Tian)
 - New layout for new magnet, LAEC layout (ANL)

GEM

- Done
 - digitization and tracking tested for wider time window of SAMPA chip for SIDIS He3 (Weizhi)
 - digitization and tracking note in docdb (Weizhi)
 - digitization for PVDIS with strip cut (Rich)
- Todo
 - Recheck PVDIS tracking
 - Optimize for SIDIS and JPsi setup
 - Add layout and dead area (UVa?)
 - Test SAMPA chip for other setup
 - Optimize digitization code
 - SIDIS NH3 tracking
 - Get Resolution with background for all setup with more variables

MRPC

- Done
 - digitization improved
- todo
 - Comparing to data
 - occupancy and rate study
 - Study trigger condition and trigger response

Sanghwa

SPD

- Done
 - More detailed digitization including light collection
 - add scintillation (Birk) effect
- todo
 - Comparing to data
 - occupancy and rate study
 - Study combined trigger response with MRPC

HGC

- Done
 - redesign optics for new magnet (Bo Yu,Zhiwen)
- todo
 - Study field effect
 - Background study

LGC

- Done
 - Optimize more forward angle for SIDIS
- Todo
 - More optimization for new magnet

overall

- Done
 - NH3 acceptance file with correct field map (Zhiwen)
- Todo
 - DAQ deadtime simulation
 - Trigger and background with new hadron generator output for all setup
 - Background merging and pileup for all detector
 - End-to-end simulation with all digitization

Priority (before DOE review)

- High

- Simulation with validated hadron generator (Zhiwen)
- SIDIS He3 trigger rates in coherent analysis with validated hadron generator (Ye Tian)
- Comparing solid_bggen and pi0 rates from DVCS (Ye Tian @Shandong U)

- Medium

- DAQ Deadtime (Alex)
- Background merging, pileup, adding time info, EC first (Ye Tian,Zhiwen)
- MRPC and SPD rate study (Sanghwa)
- Jpsi 2e and 3e trigger rate (Zhiwen)
- NH3 trigger rate (Chao)

if only 1FTE can be requested
(need discussion)

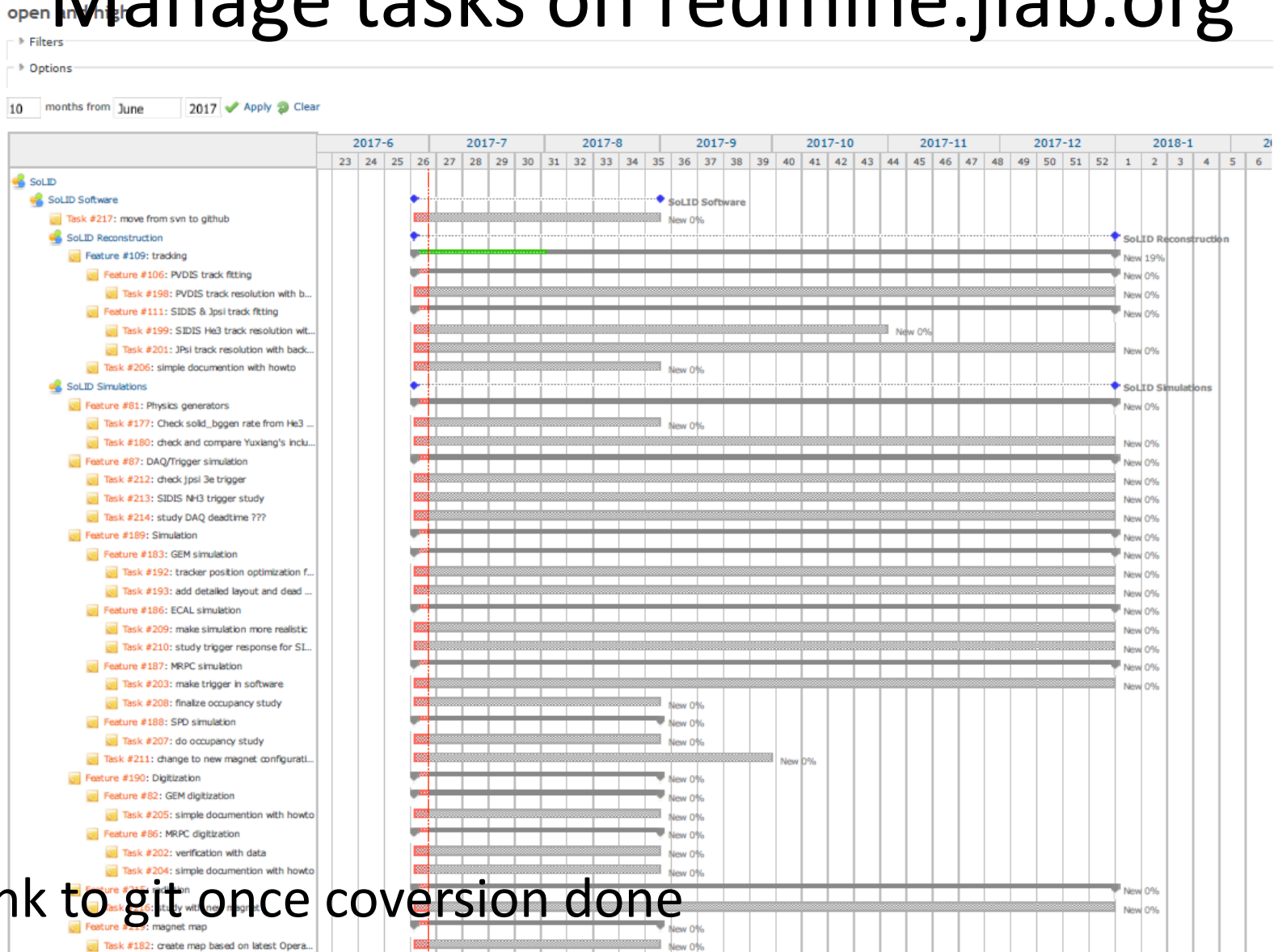
1. 0.25 simulation of Jpsi (trigger and physics)
2. 0.25 simulation of SIDIS He3 and NH3 (trigger and physics)
3. 0.25 tracking
4. 0.25 detector definition service and reconstruction in art

backup

Digitization and reconstruction

- Digitization (keep it independent of simulation)
 - MRPC and GEM digitization are most advanced, they are after simulation. For other detectors, we could do the same
 - In simulation, Cerenkov record photons, SPD and EC record energy deposition, then in digitization, convert Cerenkov,SPD,EC to number of p.e., unless it can't be separated
 - This would save a lot of simulation time
- Reconstruction
 - We have simple code to produce some plots and numbers
 - **Need to look into how to do it with art**
- Both
 - Keep code modular for different detector, algorithm and file format

Manage tasks on redmine.jlab.org



- Link to git once conversion done
- Moving all or part of wiki also?

Priority (after DOE review)

- Urgent
 - PVDIS baffle acceptance optimization with new magnet
 - LGC and HGC tuning for new location
- High
 - GEM simulation and tracking
- Medium
 - How current simulation will work with art?
(Zhiwen, Seamus, Ole)