HPS MC Overview **Tongtong Cao & Sarah Gaiser**

HPS Collaboration Meeting June 3rd - 5th, 2025

Updates for Job System in hps-mc

- For jobs at JLab, default OS is changed from "general" to "el9".
- Add an option for cleanup of work place at the end of jobs to fix issue of swif2 jobs at JLab:
 - be cleaned up at the end of swif2 jobs.
 - jobs to disable manually-output-copying and disable cleanup at the end of jobs.
 - enable_copy_output_files = False
 - enable_cleanup = False
 - The update does not affect other batch jobs.
- command.

- For jobs by swif2, output should be copied by swif2 system, instead of manually. So work place should not

- With the update, the config element [Job] in configuration file should include following setting for swif2

• Add a tool to copy local SQLite snapshot by Zhaozhong. The snapshot could be optionally set in hps-java

Updates for Generators in hps-mc by Sarah

• wab: MG5 generator in replacement of MG4



- tritrig: new setting for kinematic cuts
- ap: MG5 generator in replacement of MG4

New Tritrig Generator by Sarah



- Update setting for kinematic cuts. Especially, solve the issue that lower limit of pSum is high in the old generator.
- New generator looks to match better with data.



New ap Generator by Sarah # of generated events



• MG4 doesn't always generate all the requested events, while MG5 always generate all requested 10000 events

• A' events generated by MG4 and MG5 are distributed identically.



Updates for New OS Alma9 at JLab by Maurik

- hps-mc:
 - Maurik updated and installed hps-mc in new OS Alma9 at JLab.
 - Env setup: /group/hps/bin/hps-mc-env.sh (or hps-mc-env.csh for tcshell)
 - Job system installation: /group/hps/lib/python
 - Commands for EGS5, stdhep tools and Icio tools: /group/hps/bin
 - updates to integrate it into hps-mc.
 - All updates will be under a git branch FixJlab_Alma9 in hps-mc, specified for OS Alma9 at JLab.
- slic:
 - Maurik updated and installed slic in new OS Alma9 at JLab.
 - Source codes: /group/hps/hps_soft/slic
 - Env setup: /group/hps/bin/slic-env.sh
 - Command: /group/hps/bin/slic
- package for tritrig could run independently in the new OS at JLab, but need to be integrated into hps-mc.

- For madgraph, a standalone tritrig package with updates at "/w/hallb-scshelf2102/hps/maurik/physrun2021/TriTrig/test/tritrig_n" works at JLab. Need further

• In summary, all necessary packages/tools for HPS MC except MadGraph packages have been updated and installed in new OS at JLab. The updated MadGraph

- Workflow for MC Production
 - Production from generation to SLIC is taken at SLAC by Sarah.
 - Matthew copies slic files from SLAC to JLab.
 - Production from overlay with pulser data to reconstruction, as well as format conversion from slcio to root, is taken at JLab by Tongtong.
 - Matthew copies root files from JLab to SLAC.
- Two MC sample sets with overlaying pulser data for detectors V6 & V7 were produced.
- MC production was taken within one week for each sample set.
- Detailed information for 2021 MC production is in confluence pages (link of main page). \bullet

2021 MC Production

Samples for Detector V6

- JLab:
 - tritrig:
 - wab:
- SLAC:
 - tritrig (root): /sdf/data/hps/physics2021/mc/hpstr/tritrig_beam/pass_v6b
 - wab (root): /sdf/data/hps/physics2021/mc/hpstr/wab_beam/pass_v6b

slcio: /cache/hallb/hps/production/physics2021/mc/gen/tritrig/pass01/recon2/HPS_Run2021Pass1_template_v6 root: /cache/hallb/hps/production/physics2021/mc/gen/tritrig/pass01/hpstr2/HPS_Run2021Pass1_template_v6

slcio: /cache/hallb/hps/production/physics2021/mc/gen/wab/pass01/recon2/HPS_Run2021Pass1_template_v6 root: /cache/hallb/hps/production/physics2021/mc/gen/wab/pass01/hpstr2/HPS_Run2021Pass1_template_v6



Samples for Detector V7

- JLab:
 - rad:
 - slcio: /cache/hallb/hps/production/physics2021/mc/gen/rad/pass_v7/recon/HPS_Run2021Pass1_template_v7
 - root: /cache/hallb/hps/production/physics2021/mc/gen/rad/pass_v7/hpstr/HPS_Run2021Pass1_template_v7
 - tritrig:
 - slcio: /cache/hallb/hps/production/physics2021/mc/gen/tritrig/pass_v7/recon/HPS_Run2021Pass1_template_v7
 - root: /cache/hallb/hps/production/physics2021/mc/gen/tritrig/pass_v7/hpstr/HPS_Run2021Pass1_template_v7
 - wab:
 - slcio: /cache/hallb/hps/production/physics2021/mc/gen/wab/pass_v7/recon/HPS_Run2021Pass1_template_v7
 - root: /cache/hallb/hps/production/physics2021/mc/gen/wab/pass_v7/hpstr/HPS_Run2021Pass1_template_v7
 - ap (displaced; 120 MeV/c²)
 - slcio: /cache/hallb/hps/production/physics2021/mc/gen/ap/pass_v7/recon/HPS_Run2021Pass1_template_v7/120/displaced
 - root: /cache/hallb/hps/production/physics2021/mc/gen/ap/pass_v7/hpstr/HPS_Run2021Pass1_template_v7/120/displaced
- SLAC:
 - rad(root): /sdf/data/hps/physics2021/mc/hpstr/rad_pulser/pass_v7/HPS_Run2021Pass1_template_v7
 - tritrig(root): /sdf/data/hps/physics2021/mc/hpstr/tritrig_pulser/pass_v7/HPS_Run2021Pass1_template_v7
 - wab(root): /sdf/data/hps/physics2021/mc/hpstr/wab_pulser/pass_v7/HPS_Run2021Pass1_template_v7
 - ap(root): /sdf/data/hps/physics2021/mc/hpstr/ap_pulser/pass_v7/HPS_Run2021Pass1_template_v7
- Sarah had a talk for comparison between data and this pass of MC samples this morning.

CPU Time Cost for a Typical Job of Tritrig MC at JLab

MC step	Cost (sec)	
bundle of 5 tritrig files and filter	22.7	Requ
evio to Icio for pulser data	405.6	Ski
overlay	31.4	0ve
spacing	126.3	Sł
readout	596.3	
reconstruction	122.3	
hpstr	17.4	
Total	1332.0	

- the step for format conversion will be skipped.
- Sarah's test. Need to figure it out.

Note
ire at least 1 hodoscope hit; 8430 events after bundle and
ppable; Take conversion for all pulser data so that converte could be used repeatedly.
r 16k events per pulser-data file, which is enough to overla bundled tritrig files
cippable; update for no-spacing in readout is in progress by
1055 triggered events
1055 reconstructed events
Format conversion from slcio to root

• Pulser data are from 6 runs 14275, 14370, 14371, 14503, 14586, 14590. Totally, there are 2337 available files. Files after conversion are saved at /mss/hallb/hps/production/physics2021/mc/pulser. These files will be applied for future passes so that

• For no-spacing update in readout by Matt, small discrepancy was found between spacing and no-spacing readout systems by



Summary

- Wab, tritrig, and ap generation packages were updated by Sarah, and have been applied into MC production.
- 2021 MC production is smooth and efficient under collaboration of MC group.
- Thank Maurik for installation of MC softwares in Alma Linux 9 at ifarm.
- Majd is working on data analysis and simulation for $\phi \rightarrow K^+K^-$ (next talk).