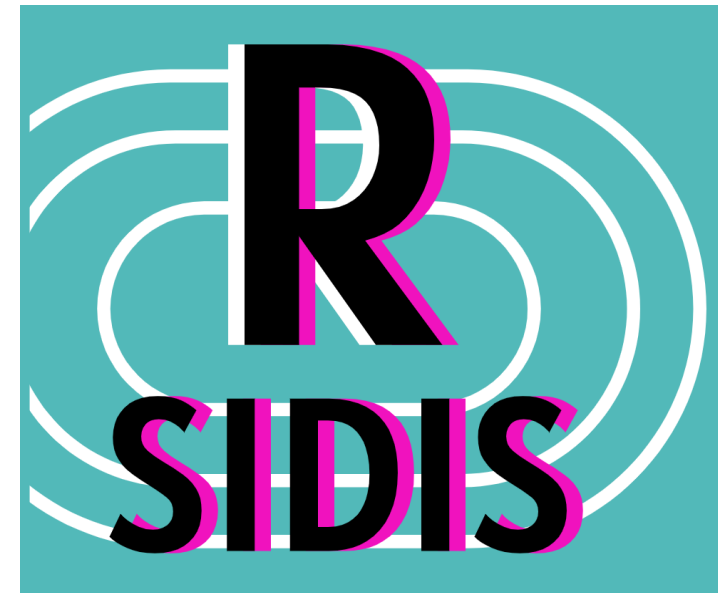# *R-SIDIS Analysis*

February 24, 2025

Topics:
1. Github stuff
2. hallc_replay directory structure
3. Scripts
4. Output

Setting up the analyzer on the cdaq machines

- R-SIDIS wiki:
  - https://hallcweb.jlab.org/wiki/index.php?title=R-SIDIS

- hcana and hallc_replay_rsidis:
  - https://hallcweb.jlab.org/wiki/index.php?title=Software_Setup
  - You'll need to connect to cdaql1 as cdaq through hallgw
  - You can also use the hallc-vdi to bypass hallgw
- There will be a main, online directory where the shift workers will do online analysis
- It will be important to have you own hallc_replay set up so that during the run you can do work (calibrations, time windows, make scripts, etc.) without modifying the online directory

Directory Structure

- MAPS: map files for detectors and DAQ
- CALIBRATION: scripts for detector calibrations
- DATFILES: matrix elements for HMS and SHMS reconstruction
- DEF-files: defines variables to include in root trees, histograms, cuts for quantities that can be included in report files
- TEMPLATES: define layout and quantities in report files
- DBASE: includes kinematics, pointers to calibration files
- PARAM: detector timing cuts, calibrations, geometry
- SCRIPTS: analysis scripts

DBASE

- standard.database
  - Points to kinematics file: standard.kinematics
  - Also points to parameter file "set" → if calibrations change over time, may need to have different sets of parameter files
- standard.kinematics
- *.param file(s)

PARAM and its (many) subdirectories

- GEN
  - gbeam.param $\rightarrow$ BPM and fast raster calibrations
- TRIG
  - thms.param/tshsms.param $\rightarrow$ trigger signal IDs and windows
  - tcoin.param $\rightarrow$ coincidence time windows, reference cuts
- HMS (SHMS)
  - GEN
    - hcana.param $\rightarrow$ some general stuff (pathlength) and the optics matrix
    - hmsflags.param $\rightarrow$ 0th order matrix elements, kinematic offsets
    - htracking.param $\rightarrow$ some tracking and efficiency calculation parameters
  - CER $\rightarrow$ hcer_calib.param, hcer_cuts.param, hcer_geom.param
  - CAL $\rightarrow$ hcal_Calib.param, hcal_cuts.param, hcal_geom.param
  - HODO $\rightarrow$ hhodo_calib.param, hhodo_cuts.param, hhodo_geom.param, hhodo_Vpcalib.param, hhodo_Twcalib.param
  - DC $\rightarrow$ hdc_calib.param, hdc_cuts.param, hdc_geom.param, hdc_tzero_per_wire.param
- SHMS has extra parametes for Noble Gas Cherenkov and Aerogel

DEF-files

- Defines variable to include in output (root trees and histograms)
- hstackana_production.def
  - mostly just histogram definitions
  - points to def files in subdirectories for each detector (CAL, CER, etc.)
  - also includes subdirectories for reconstruction (KIN, REACT, etc.)
- hstackana_production_all.def
  - points to def files in subdirectories for each detector (CAL, CER, etc.)
  - also includes subdirectories for reconstruction (KIN, REACT, etc.)
  - includes expanded set of quantities → useful for calibrations

SCRIPTS

- This is where the analysis scripts live
  - scripts for looking at spectrometers (tracks) and scalers
- HMS replay script overview
  - Define where to find the data files
  - Load in files (kinematics, parameter files, detector maps
  - Load in the "apparatus"
    - trigger apparatus
    - HMS
      - DC, hodoscope, Cherenkov, calorimeter
    - Beam
  - Load physics modules
    - tracking, kinematics calculations, efficiencies
  - Extras
    - epics info, scalers etc.
  - Define outputs (root file, report file, etc.)

Output

- ROOTfiles
- REPORT_OUTPUT

Things to try

- This is tougher because we don't have any data to look at yet
- Could try to look at cosmic data that Bill Henry is taking for LAD
    - Could try to manipulate report output templates
    - Modify or make new histograms
    - Change contents of root trees