Hall A DVCS analysis overview

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Workflow overview

Step 0: HRS and beamline calibration (t0 of wire chambers, optics, Cerenkov, BPMs, etc)

Pass 1: HRS data decoded and analyzed by C++/analyzer, calorimeter data decoded (no analysis)

Data filled in a tree with objects (not just leaves), in particular for the calorimeter
No more text files as 'databases' → Everything in mySQL database for later passes

Step 1: Waveform analysis optimization of parameters

Pass 2: Waveform analysis of calorimeter data

Waveform data dropped in the file, arrays of time and amplitudes filled in
(file size very reduced: all segments can be merged into a big but single file per run)

Step 2: Calorimeter calibration (as a function of run number, i.e. using pi0's to interpolate elastic coefficients)

Pass 3: Calorimeter analysis (cluster energies and times)

Crystal energies/times can be dropped to further reduced the ROOT tree

In addition to the ROOT tree with all information, 2 additional ntuples are output for final analysis:

- 1-cluster events: kpx, kpy, kpz, qx, qy, qz, xc, yc, mm2, vertex…
- 2-cluster events: same for each of the 2 clusters

All ntuples of a single kinematic setting can be merged into a single file for final analysis

Analysis database

MySQL database indexed by run number:

```
MariaDB [nps]> select * from CALO_geom_X0;
+----------------+--------+--------+------+---------------------+-------------------+---------+
| CALO_geom_X0_0 | minRun | maxRun | user | time                | Comment           | ValueId |
+----------------+--------+--------+------+---------------------+-------------------+---------+
|         32.445 |      0 | 999999 | user | 2019-04-10 17:51:04 | Pseudo Run Number |       1 |
|         32.445 |      0 | 999999 | user | 2019-04-16 17:11:17 | Pseudo Run Number |       2 |
|         31.695 |      0 | 999999 | user | 2019-12-11 11:23:38 | Pseudo Run Number |       3 |
+----------------+--------+--------+------+---------------------+-------------------+---------+
3 rows in set (0.02 sec)
```

Convention name for tables: SUBSYSTEM_type_variable

SUBSYSTEM={BEAM, HRS, CALO}
Type={geom, param, calib}
Variable={energy, yaw, coef_calib, etc}

Example of tables:

- BEAM_param_Energy
- HRS_geom_Momentum
- CALO_param_RefShape125
- CALO_calib_EnergyCalib
- CALO_calib_TimeOffset
- …

- jmysql server running at JLab
- ‘nps’ database exists already
- Accessible from interactive or batch jobs

C++/ROOT class to inteface with DB

TDVCSDB class (part of the DVCS software library)

```
TDVCSDB *db=new TDVCSDB(“dvcs”,”jmysql”,3306,”munoz”,””);

Double_t *caloangle=db->GetEntry_d(“CALO_geom_Yaw, 2052);
        //Returns an array with the caloangle for run 2052 (i.e. angle=caloangle[0])

Double_t *coef=db->GetEntry_d(“CALO_calib_EnergyCalib, 2052);
        //Returns an array with the calibration coefficients for run 2052 (i.e. coef[125] is the calibration coefficient of crystal 125 for run 2052)
```

TDVCSDB class can/should also be used to fill the database:

```
Double_t* val= new Double_t[1];
val[0]={400};

db->AddEntry_d("CALO_geom_Dist",1000,2000,val,"comment");
// Calorimeter distance set to 400 cm from run 1000 to run 2000 (both included)
```

- TDVCSDB can only add entries to a table (nothing is ever deleted to avoid errors)
- TDVCS::GetEntry will select the last entry made for the selected run number

Independent analysis tasks

- **QA:** run list of good runs for each kinematic setting
- **Luminosity/charge:** BCM calibrations & computation of a value for each run, corrected of DAQ deatime
- **Monte Carlo** simulations for acceptance computation

  (final files will account for dead crystals appropriately, i.e. proportionally to the time they were dead)
- **DIS analysis** for normalization ‘cross-check’

  (final analysis can be done after Pass-1 if QA and charge are available)

Title