Working with hallc_replay_XEM

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- This is designed to be a living document. People working on the replay will be notified to modifications of this document.
- This document will be available on the xem2wiki.
- Whenever working in the replay, it is recommended to open this to recall best practices.

Organization and Communication is Key

- Language is defined as words + syntax
  - We must come up with words to accurately describe what calibrations are doing in the replay
  - Kin1, kin2, pid1,def2, etc.
    - Make a list of terms describing kinematics, settings, etc. (dictionary)
  - Understand the syntax
    - THIS DOCUMENT and learning by doing!
- Common understanding of file names in hallc_replay_XEM
  - Need to understand when they're loaded into hcana.

Naming PARAM files

- Don't name PARAM files with the run number!
  - Add Comments using the ';' at the top of the PARAM file. This can include information on run, why calibration is needed, etc.
  - Add _fa22.param to the end for all new full experiment params.
- Follow the naming scheme outlined below:
  - <specLetter><detector>_calib_<setting>_fa22.param
    - Setting is vague, need LANGUAGE to define each experiment setting (kin1, pid3, etc.)
- Example:
  - pngcer_calib_lower_hv_fa22.param
    - Not a perfect <setting> name of "lower_hv", but this is a special case.
    - ***Update with more clear example in the future***

Common 'header' for SCRIPTS

- Allows for common gHcParms, abstracts detector apparatus out of the script.
  - gHcParms is global to hcana. Can define variables in script if needed. See <spec>_shared.h for syntax.
  - The spectrometer definition will be the same throughout the experiment
- Copy template SCRIPT to make new scripts for specific analysis tracks
  - Make DEF-files with specific variables / histograms of interest.
  - Make specific REPORT_OUTPUT if desired.
    - Defining CUTS is more complicated, but it can be done..

- <spec>_shared.h Located in SCRIPTS/<SPEC>/

Adding New SCRIPTS

- Added a commissioning directory for PID and HODO_CHECK.
- Add ROOTfiles and REPORT_OUTPUT directories where needed.
  - i.e. ROOTfiles/SHMS/COMMISSIONING/HODO_CHECK/etc..

gHcParms – Loading PARAM files

- The following have been split out of general_fa22.param
- These g_ctp_* definitions are in standard.database at the top

g_ctp_det_calib_filename: Kinematic specific calibrations! (Loaded after default_calibrations

g_ctp_bcm_calib_filename: Scaler BCM calibration defaults (different run periods, fa22,sp18, etc)

g_ctp_optic_filename: DATFILES/optics_file.dat, for different optics matices

g_ctp_map_filename: Detectors move SLOTS in cratemap

Etc...

```cpp
// Load global parameters
gHcParms->Define("gen_run_number", "Run Number", RunNumber);
gHcParms->AddString("g_ctp_database_filename", "DBASE/SHMS/standard.database");
gHcParms->Load(gHcParms->GetString("g_ctp_database_filename"), RunNumber);
gHcParms->Load(gHcParms->GetString("g_ctp_parm_filename"));
gHcParms->Load(gHcParms->GetString("g_ctp_kinematics_filename"), RunNumber);
gHcParms->Load(gHcParms->GetString("g_ctp_det_calib_filename"));
gHcParms->Load(gHcParms->GetString("g_ctp_bcm_calib_filename"));
gHcParms->Load(gHcParms->GetString("g_ctp_optics_filename"));
// Load parameters for SHMS trigger configuration
gHcParms->Load(gHcParms->GetString("g_ctp_trig_config_filename"));
// Load fadc debug parameters
gHcParms->Load("PARAM/SHMS/GEN/p_fadc_debug.param");
// Load BCM values
TString bcmParamFile = Form("PARAM/SHMS/BCM/bcmcurrent_%d.param", RunNumber);
bcmFile.open(bcmParamFile);
if (bcmFile.is_open()) gHcParms->Load(bcmParamFile);


// Load the Hall C detector map
gHcDetectorMap = new THcDetectorMap();
gHcDetectorMap->Load(gHcParms->GetString("g_ctp_map_filename"));
```

Default Detector Calibrations

- There is only supposed to be ONE default detector calibration file.
  - File loaded for all runs.
  - Specific calibrations for different kinematics are overwritten with the g_ctp_det_calib_filename variable!
    - The referenced calibration (PARAM) files live in DBASE/<SPEC>/DET/
      - This file '#include' kinematic specific calibrations (DCs, Calo, etc, CER, etc.)

- Coincidence DAQ shares some default calibrations
  - The Default COIN calibrations should be the same, but if they do change we can call the

If this happens we should call the default calibs:
    pngcer_calib_coin_fa22.param, etc.

- DON'T KEEP OLD CALIBRATIONS
  - VERSION CONTROL is used so we don't inadvertently use an old calibration for analysis.

```
1    ; SHMS default calibration parameter files
2    #include "PARAM/SHMS/NGCER/pngcer_calib_fa22.param"
3    #include "PARAM/SHMS/DC/pdc_calib_fa22.param"
4    #include "PARAM/SHMS/DC/pdc_tzero_per_wire_fa22.param"
5    #include "PARAM/SHMS/HGCER/phgcer_calib_fa22.param"
6    #include "PARAM/SHMS/AERO/paero_calib_fa22.param"
7    ;#include "PARAM/SHMS/CAL/pcal_calib_fa22.param"
8    #include "PARAM/SHMS/CAL/pcal_calib_fa22_Oct3_2022.param"
9    #include "PARAM/SHMS/HODO/phodo_TWcalib_fa22.param"
10   #include "PARAM/SHMS/HODO/phodo_Vpcalib_fa22.param"
```

Please communicate

- Don't take anything I said personally here, I am just trying to impart my experience working with the hallc_replay_XEM infrastructure.

- I will try and keep an eye on the commits and update this with additional information as running continues.

PLEASE KEEP MAKING CHANGES!!!
I would rather you break something or name something wrong than not add the thing to hallc_replay_XEM! We can always revert. Please, don't be afraid of doing it wrong, that is how we all learn.

Saving EVERYTHING for Posterity

- We need to start adding our output files to /cache.
  - A big problem we had during F2 running was the lack of documentation.

  - All calibrations and rootfiles, etc NEED to be saved to cache.
  - /cache/hallc/xem2/analysis.
    - I will update this with a directory structure and we can start adding things as they come in.
    - scp files from cdaq to your username under /cache/
    - CHANGE PERMISSIONS! chmod u-w <files>. We don't want to overwrite or delete these things.