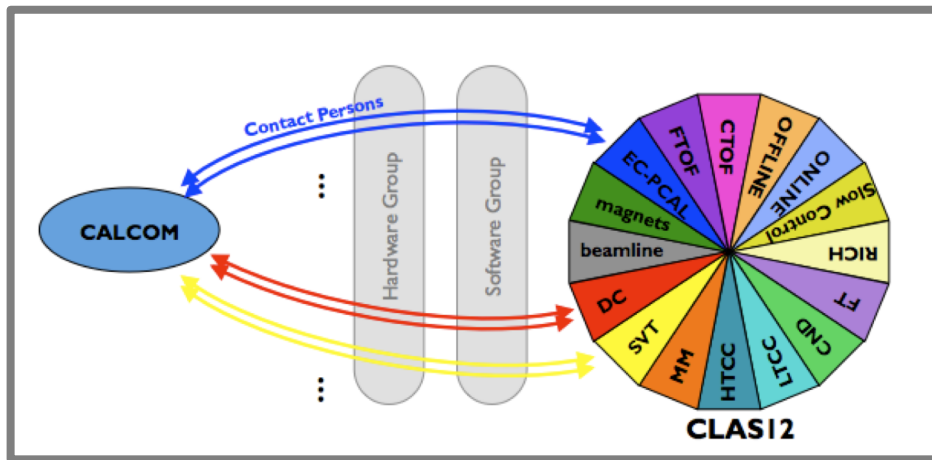


CALCOM Activities



Report:

- Calibration progress since March meeting
- Pass-2 calibration tasks
- Calibration suite review
- Online calibrations

daniel s. carman
CLAS collaboration Meeting
JUNE 1, 2021

"Pass-1" Calibration Priorities

Priority	Run Period	Run Range	Time Period
	RG-A F18	4763 - 5031	Feb. → Sep. 2020
	RG-B F19	11023 - 11301	Aug. → Oct. 20, 2020
	RG-A Spr19	6608 - 6783	May → Oct. 30, 2020
	RG-B Win20	11324 - 11571	Oct. → Dec. 2020
	RG-F Sum20	12389 - 12955	Oct. 2020 → Feb. 2020
1	RG-F W20	11582 - 12282	Oct. 2020 → Feb. 2020
2	RG-A Spr18	3029 - 4326	Nov. 2020 → Mar. 2021
3	Eng. Run	1960-2999	Feb. → Apr. 2021

Completed:

- RG-F Summer 2020 - pass-1 review
Apr. 14, 2021

Active:

- RG-F Winter 2020 - only RTPC work remains
- RG-A Spring 2018 - working on 3rd iteration; to be complete next month
- Eng. Run - calibrating selected runs

Goal: Complete all pass-1 related calibrations before starting pass-2 work

Pass-2 Calibration Work Tasks

1. Detector hardware status tables
2. DC pressure dependence
3. DC t_0 calibration
4. Study DC sector-dependent calibrations
5. CTOF hit position dependence
6. FT energy calibration
7. LTCC timing calibration
8. BMT Lorentz angle calibration

Pass-2 Calibration Work Tasks

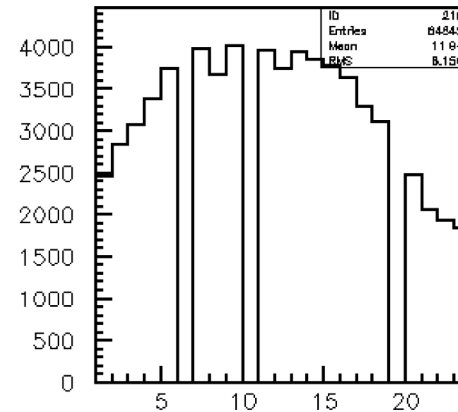
1. Detector hardware status tables: (testing still to be done)

- Conventions have been defined
- Most tables created in ccdb (working on creating/filling missing tables)

Convention - PMT-based detectors

Status	Definition
0	Fully functioning (PMT)
1	No ADC
2	No TDC
3	No ADC and no TDC (PMT is dead)
5	Any other hardware problem

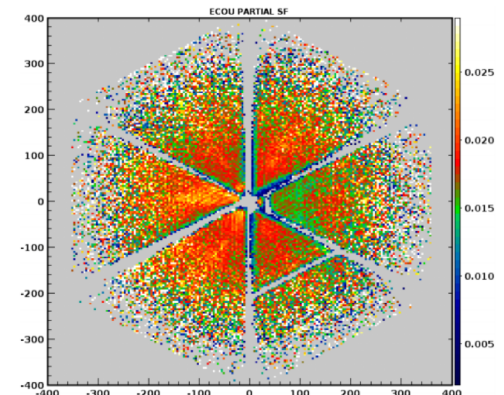
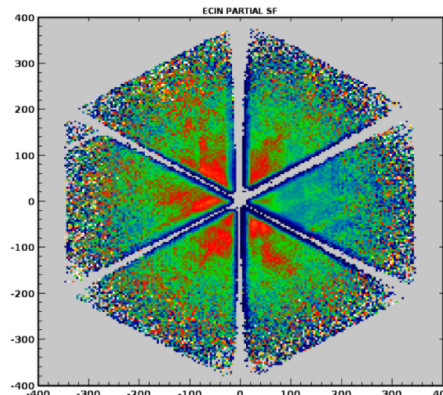
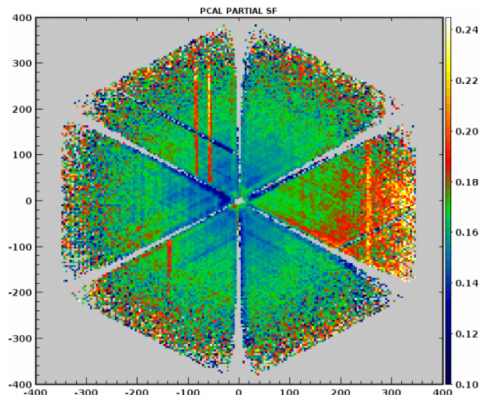
ccdb path: `/calibration/XXX/status`



FTOF

Paddle P1a S2

ECAL



Pass-2 Calibration Work Tasks

2. DC Pressure Dependence: (in place for RG-F calibration)

- Parameterize the DC calibration parameters for V_0 , V_{mid} , t_{max} , $delB$ vs. P_{atm}
- Run-by-run calibrations determined

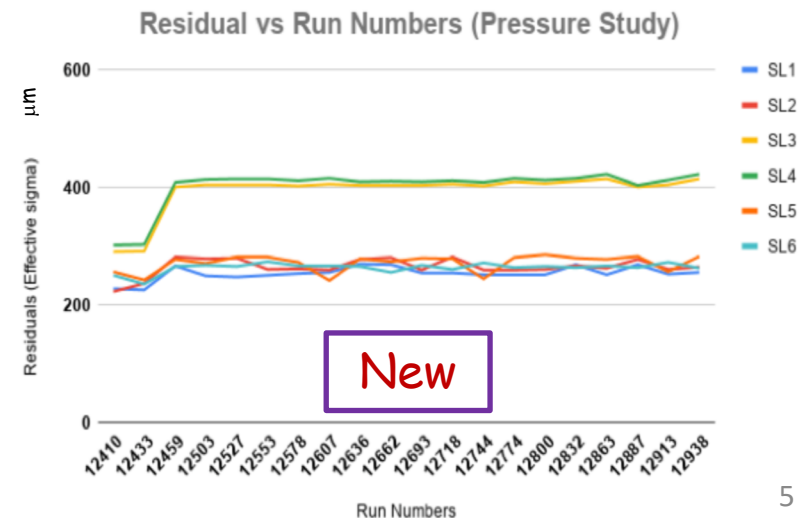
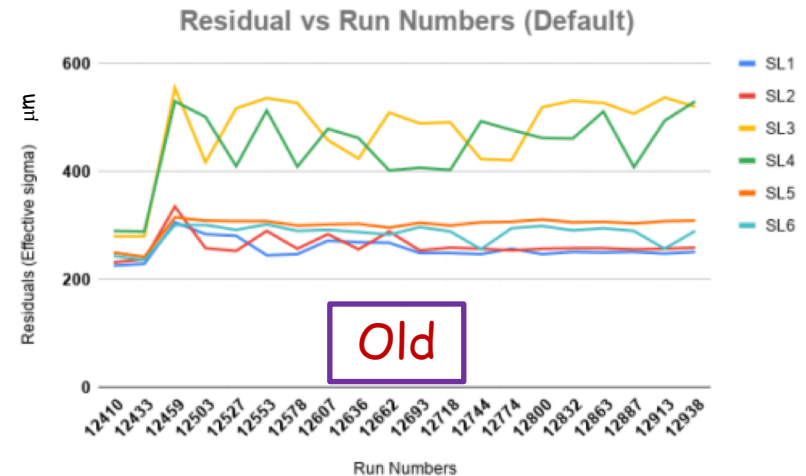
3. DC t_0 Calibration: (in progress)

- Cable- and superlayer-dependent t_0 offsets
- Working on including a crate-level global time offset

4. Study DC sector-dependent calibrations (studies in progress)

- Current calibrations based on sector average
- Up to 20% variance in sector resolution

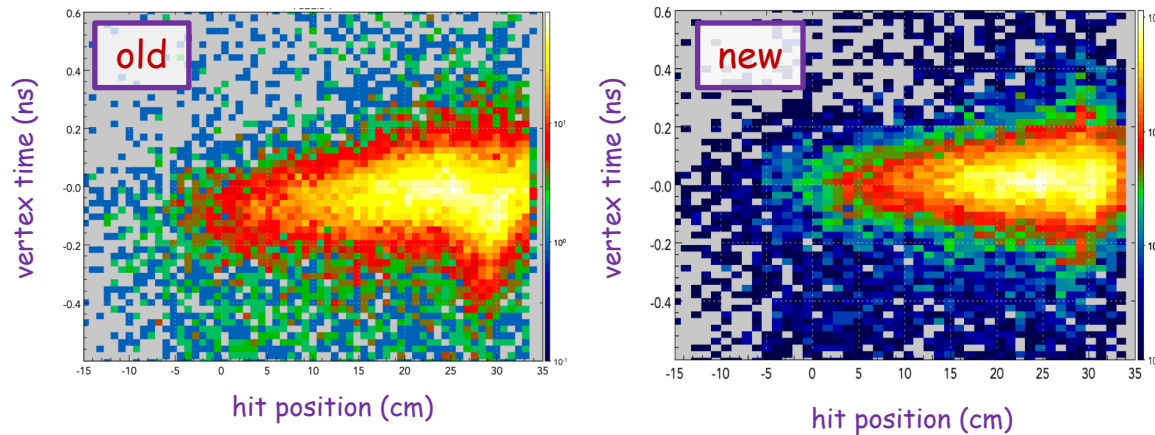
σ (microns): superlayer & sector dependence						
Superlayer	Sector					
	1	2	3	4	5	6
1	310	360	340	310	310	330
2	330	350	400*	340	330	340
3	320	330	340	330	330	320
4	340	350	360	360	350	330
5	330	330	340	330	330	330
6	340	340	350	330	340	340
All	330	350	360	340	330	340



Pass-2 Calibration Work Tasks

5. CTOF Hit Position Dependence: (validation in progress)

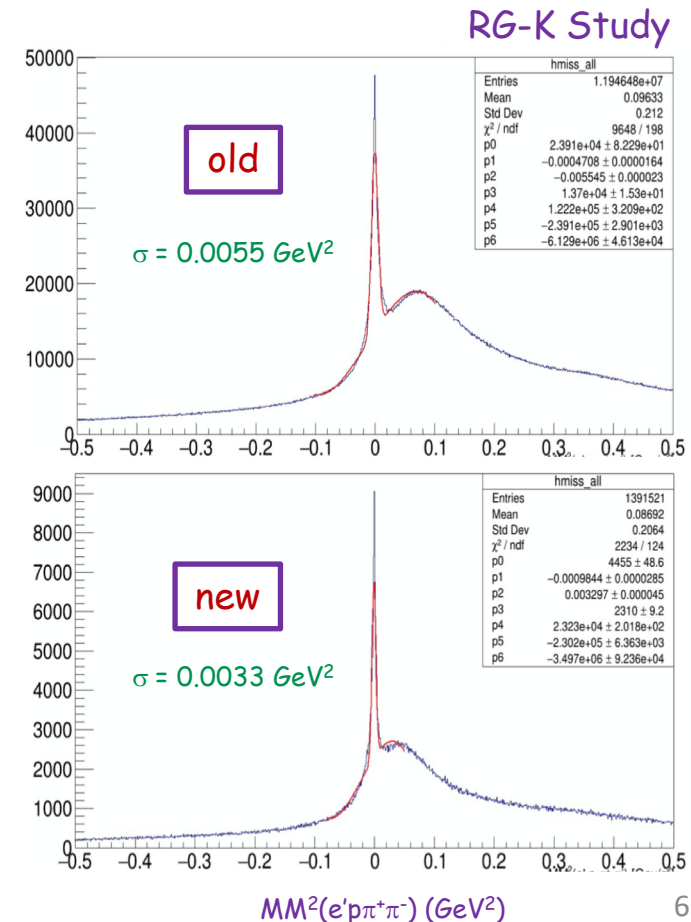
- Improving ad hoc hit position dependent time
- Suite updated - refining procedure



6. FT Energy Calibration: (validation in progress)

- Use of correct vertex position
- Improved leakage corrections
- Fixed issue with shower depth parameter
- Improved fits and convergence procedure
- Study remaining systematics

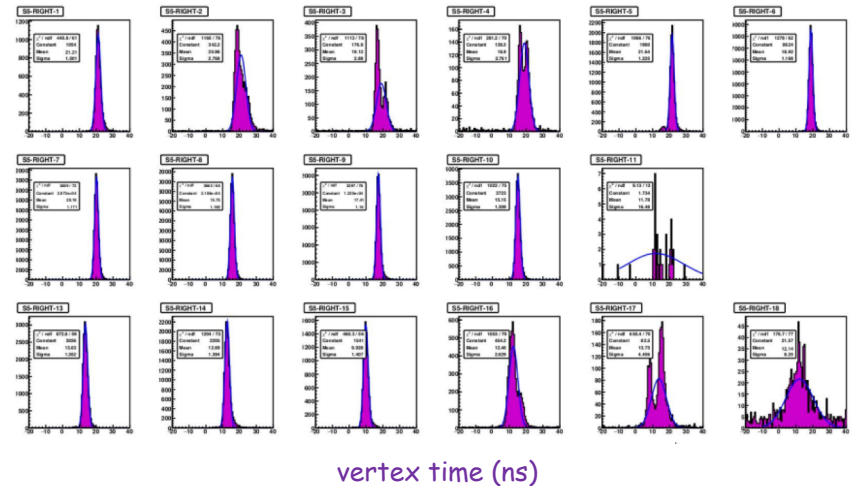
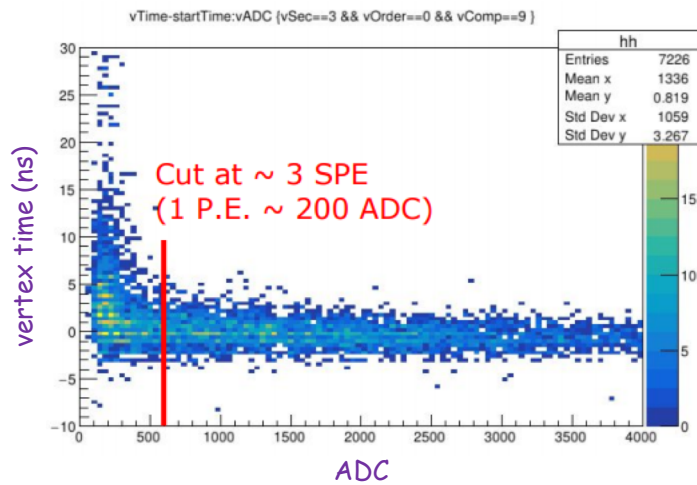
*RG-K improvement larger than expected for RG-A



Pass-2 Calibration Work Tasks

7. LTCC Timing Calibration: (implementation in progress)

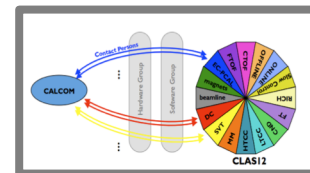
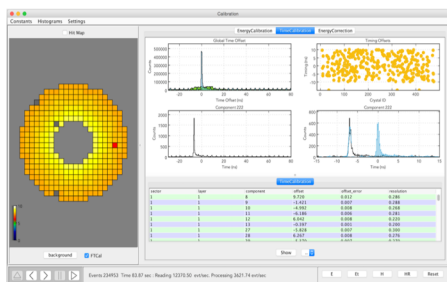
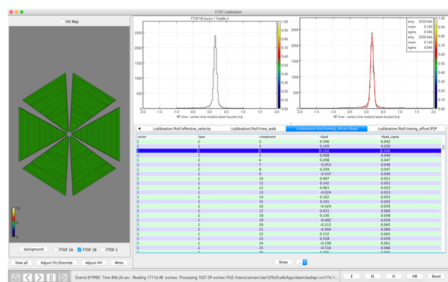
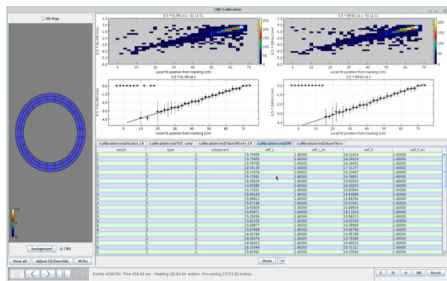
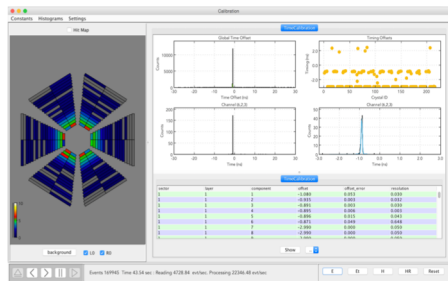
- Stand-alone code has been written for development
- Still need to implement into calibration suite



8. BMT Lorentz Angle Calibration: (implementation in progress)

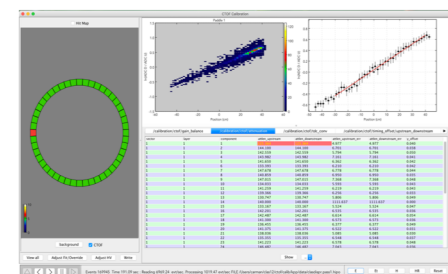
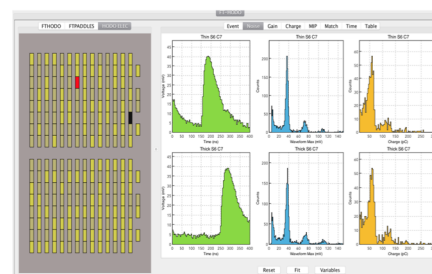
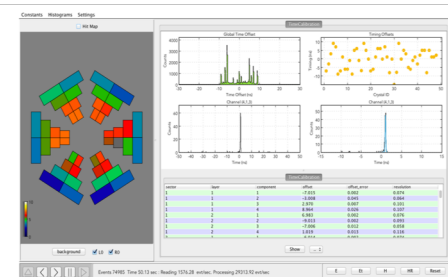
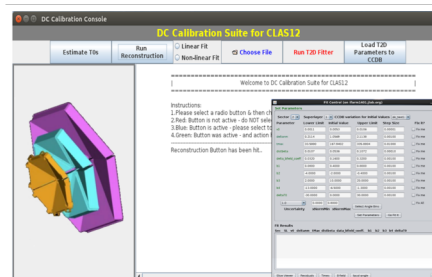
- Preparing HV tables for the Lorentz angle corrections

CLAS12 CALIBRATION SUITE REVIEW



- ECAL (5/21/21)
- FTOF (4/9/21)
- LTCC (4/16/21)
- DC
- RTPC
- HTCC (4/30/21)
- CTOF

- CND (5/28/21)
- BAND
- FT (5/14/21)
- SVT
- FMT/BMT
- RF
- Beam offset



"Pass-2" Calibrations

Before pass-2 cooking the data calibrations will have to be revisited:

- **Forward Detector:**
 - Forward tracking code updates
 - New magnetic field for torus
 - New DC alignment
 - Inclusion of FMT(?)
 - Updates to calibration algorithms
 - All calibrations to be reviewed as they are sensitive to these changes, but in many cases only minor "adjustments" are needed
- **Central Detector:**
 - New CVT tracking code
 - SVT/BMT alignment
 - Updates to calibration algorithms
 - These changes are significant $\Rightarrow$ calibrations will have to be redone

It is estimated that the re-calibration work before pass-2 will take less than half the time that it took to calibrate for pass-1 cooking

- **Note:** the order of the recalibrations for the Run Groups will need to be discussed (CCC + CALCOM) to set the order and the priorities

"Pseudo-Online" Detector Calibrations

Goal: complete all calibrations needed for pass-1 cooking within 6 months of the end of the run

- Start with RG-M this fall (Oct-Dec. 2021):
 - Ensure run conditions are set (trigger, DAQ, field settings) - *calibrations are sensitive to these settings*
 - Alignment runs must be taken early and analyzed to fix target positions and detector offsets - *calibrations are sensitive to these offsets*
 - Calibrate beam offset as needed - *calibrations are sensitive to the beam position*
 - Setup pass-0 monitoring to cook data and update timelines every 24-48 hrs (*in progress*)
 - Necessary calibration runs should be taken whenever conditions change
 - Analysis Coordinator and chef need to be in place and committed to the process through the run and 6 months afterward

Summary

- CALCOM working with Run Groups to complete all pass-1 calibrations over the next few months before moving to work for pass-2 calibrations.
- Focus in CALCOM has been on preparing for readiness for pass-2 calibrations:
 - Working through pass-2 calibration task list
 - Validating new codes and procedures
 - Reviewing calibration code suites
- Working to be ready for paradigm shift of calibrating online with the goal to complete calibrations for pass-1 within 6 months of data taking.