HCal Calibrations

Status, plans, and open issues
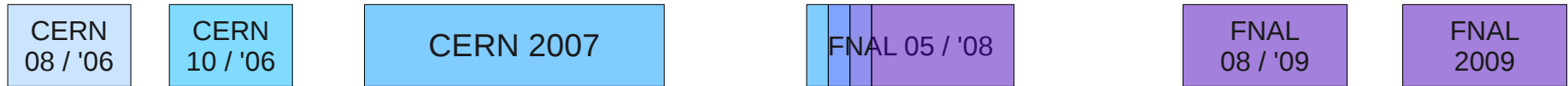
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HCal Main Mtg.

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Tool box status

- New version of **IntegratedHcalCalibrationProcessor** with auto temp. correction developed, tested, and released (calice_reco)

- Requires new storage and helper classes (calice_userlib)

- Update to CVS HEAD (tags to come...) for
    - calice_userlib
    - calice_reco
    - calice_run (for steering files)

- New web page for version dependencies:
  https://twiki.cern.ch/twiki/bin/view/CALICE/SoftwareVersions

- Beware of upstream dependency:

    – ilcsoft v01-06   plus   LCCD v00-05-pre   (waiting for ilcsoft v01-07)

    – appropriate ilcinstall script for CALICE on TWiki:
      https://twiki.cern.ch/twiki/bin/view/CALICE/SoftwareInstallation

Ingredients for hit reco

- New calibration scheme requires 4 calibration measurements:

  - A^0 - Mip calibrations per voltage setting

  - dA/dT - Mip temperature slopes for auto T correction

  - G^0 - dG/dT - Gain offsets and T-slopes per voltage setting

  - IC - intercalibration (universal set, averaged and cleaned)

- dA/dU - Mip voltage slopes for 'manual' extrapolation in case A^0 is not available for certain voltage setting

- Uncertainties on green inputs affect full calibrated amplitude, uncertainties on blue inputs only the saturation correction factor

- Alignment requires three steps
  - cell-to-module (blue-print)   - good
  - module-to-stack (layer and staggering)   - good for 0°
  - stack-to-world (movement and rotation)   - not good

TB periods

| CERN 08 / '06 | CERN 10 / '06 | CERN 2007 | FNAL 05 / '08 | FNAL 08 / '09 | FNAL 2009 |

- Changed color = (partially) changed voltage
  $\Rightarrow$ require at least 6 sets of Mip and Gain constants and slopes (IC does not change with voltage)

- Currently database status:
  - A^0 from CERN 2007, valid from 2006-09   !!! voltage !!!
  - dA/dT from CERN 2007, valid from 2006-09
  - G^0 from CERN 2007, valid from 2006-09   !!! voltage !!!
  - dG/dT from CERN 2007, valid from 2006-09
  - IC from CERN 2007 topped up with FNAL 2008, valid 2006-09

- Technically everything runs, <u>good for CERN 2007 only</u>

Extraction tools

- **Muon data fitting:**

    - A^0 fits on small set of muon runs established with some hands-on work. Fit quality checks to be automated

    - dA/dT has only been extracted once and never really been cross checked thoroughly

    - new diploma student from Prague: Boris Bulanek

- **Gain data fitting:**

    - Peak fits for individual gain runs available since long

    - Simultaneous G^0 and dG/dT fits on many gain runs established with some back-and-forth between different people

- **IC extraction for individual Pm/CmVCalibScans established, requires (manual) clean-up**

Alignment

- Need tracking to work before 'global' alignment, which is slowly improving

- Summer student at Hamburg to work on tools to align HCal-in-world and module-in-HCal using muon data

- Get reasonable constants for <u>all</u> periods

- Analyze as many muon runs as possible, at least one set per voltage setting. More automated tools necessary for 'mass production' and fit quality checks?

- Cross checks on dA/dT measurement (and dA/dU while at it) Re-fitting A^0 necessary (Gaussian vs. LanGau fit)?

- Cross check G^0 and dG/dT slope fits, quality criteria

- Closer look at IC - understand first principles rather than dubious selection of acceptable measurements

- Study influence of electronics (chip exchange)

- Documentation and tool repository