

(Brief) Thoughts on Calibration for HPS

Tim Nelson - **SLAC**

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Calibration and Conditions Data

Various data are needed to optimally reconstruct data:

 Tracker

 ECal

 Beamline

 ???



Key Questions

- 🔸 How do we determine calibration constants?
- 🔸 How often do we need to calibrate various systems?
- 🔸 How do we store calibration data?
- 🔸 How is calibration accessed during reconstruction?

Tracker Alignment

A variety of algorithms can be used to align silicon tracking detectors.

- Simple: iterative tracking, pull measurement and alignment estimation
- Sophisticated: simultaneous determination of track parameters and alignment.

Millipede (Blobel) <http://www.desy.de/~blobel/mptalks.html>

In general, 6 constants needed for each sensor (3 trans., 3 rot.): 120 total

- In practice, factorize the problem according to mechanical constraints: specifications should allow treatment of upper/lower halves as solid bodies
- In that case, full alignment constants will need to be determined only once
- A new set of 12 constants *will* need to be determined when tracker is moved

Tracker Alignment Data

Special datasets can be helpful:

🔺 Magnet on/off

🔺 Splash from BPMs or a thicker “alignment target”?

Additional questions to consider:

🔺 Will sensors be flat enough to avoid bow constants?

🔺 What will the global reference be and how will it be determined?



Other Tracker Calibration Data

The big three: Pedestals, Gains, Noise

- ❖ APV25 has internal calibration circuitry: magnitude, polarity and timing of calibration pulses are all programmable
- ❖ Assuming we have reasonable temperature stability for the APV25 chips, required frequency of calibration should be quite low
- ❖ Measure and store chip temperatures?
- ❖ Still a lot of constants: ~40000

For multi-peak readout, may need parameters describing the shaping curve.

- ❖ Two parameters per chip?



ECal

Straight from Maurik:

- 🔸 Timing (cable length effects): low-rate/cosmics data
- 🔸 Pedestals: rate dependency?
- 🔸 Gain (ADC/Energy): two-cluster π^0 trigger? fibers?
- 🔸 Thresholds and trigger tuning

How often do these need to be determined?

Are special runs required?



Beamline

- Beam position and slope
- Beam current and energy
- Magnet currents
- ???



Calibration Storage/Access

Icsim conditions data currently stored in simple text files:

Is this sufficient for test run?

🔸 Tracking of files/versions

🔸 Performance issues?

If not, what database system should be implemented?
(I believe there are many possibilities that are simple in java.)



Summary

- ❖ A significant amount of calibration data needs to be produced, stored and accessed: mostly tracker-related.
- ❖ We need to define calibration procedures to determine all of the required constants.
Some are obvious/easy, others not so much.
- ❖ Must determine what tools are needed for storage and access. Perhaps simple text files are adequate for test run.
- ❖ Set up collaborative confluence area for requirements?

