Jet Calibration at HLT

Hadronic Calibration Workshop (Munich, May 06)
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Outline:

- Overview of the trigger
- Trigger versus Offline.
- Needs for the trigger.

Overview of the trigger

Hardware

LVL1 triggers on high p_T objects

- calorimeter cells and muon chambers
- Find high P_T e/γ/τ-jet-μ candidates
- identifies Regions of Interest
- latency 2.5 μs

Software

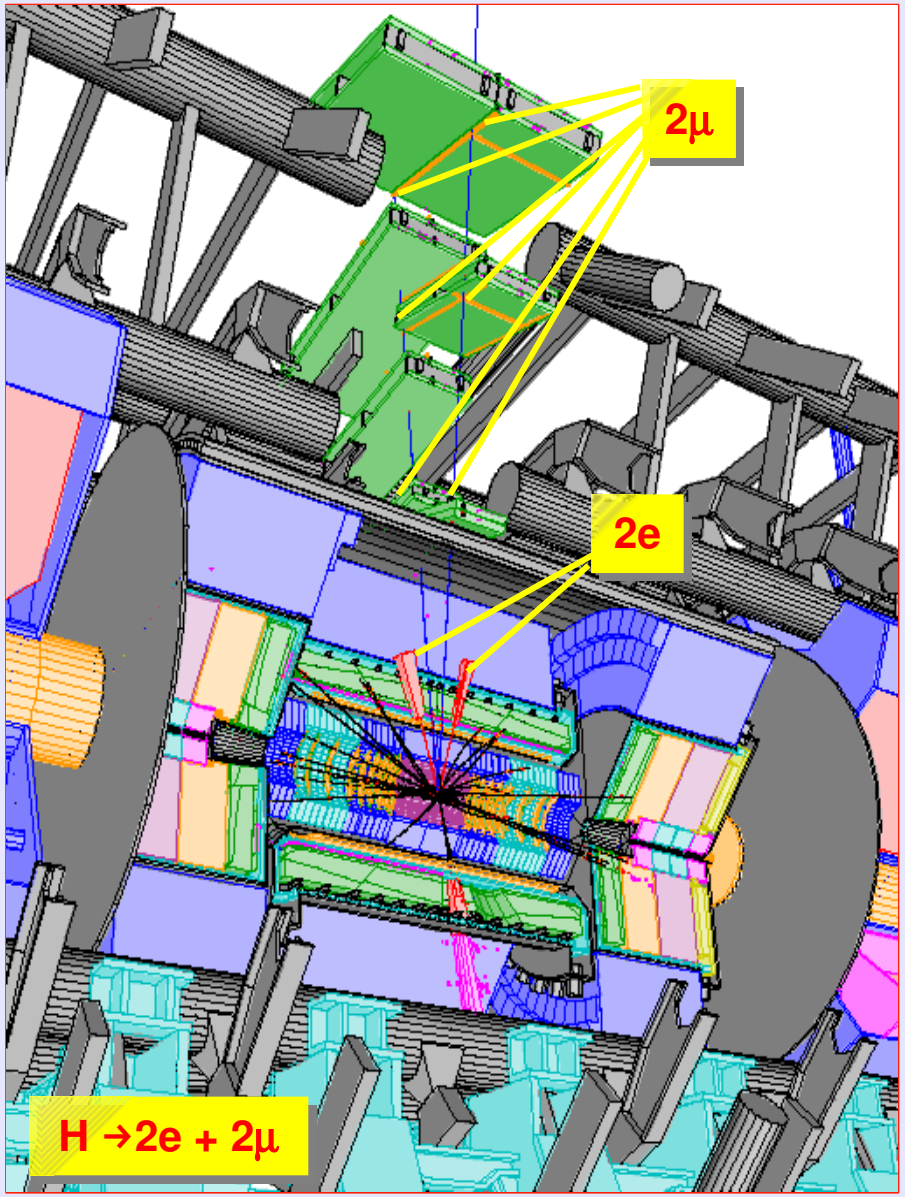
LVL2 uses Regions of Interest

- Seeded by LVL1
- Multi-threaded environment
- Full granularity
- average processing time ~10 ms

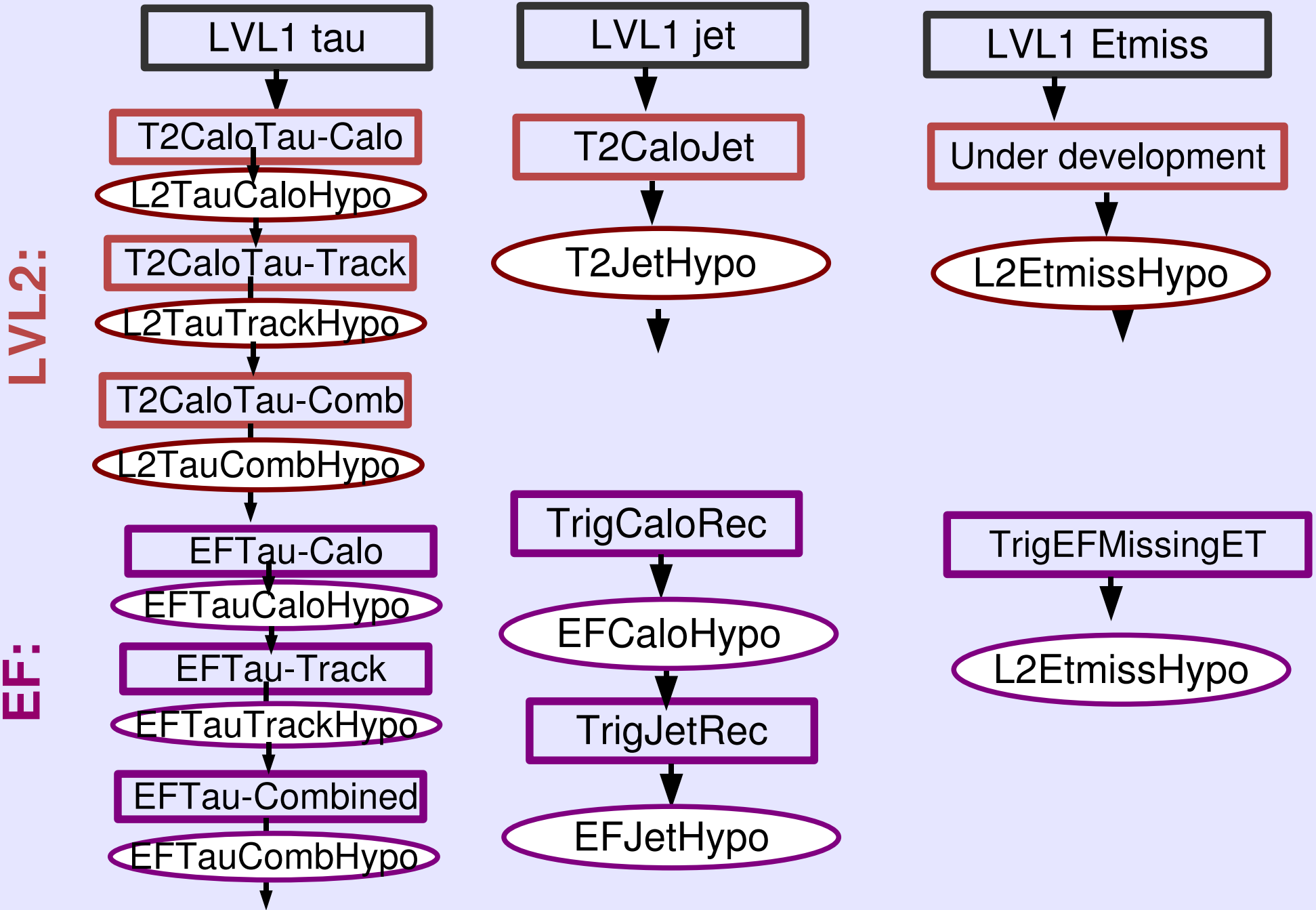
Software

Event Filter

- Seeded/Full event access
- Final calibration&alignment
- offline-like Algorithms O(1 s) procesing time



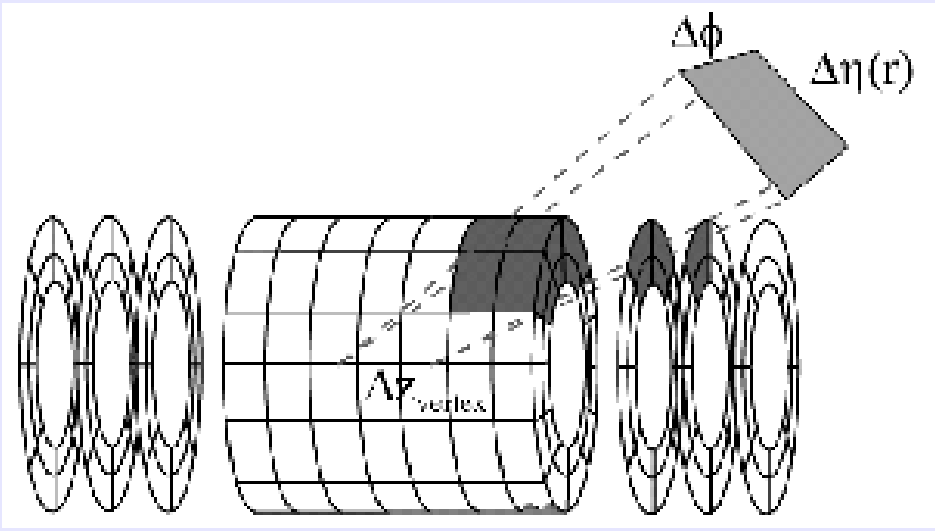
Overview of the Jet/Etmiss/Tau slice



Trigger versus Offline Jet Reconstruction

Trigger (in particular LVL2) environment different from offline:

- Strong timing constraints (LVL2: ~10 ms, EF: ~1 ms)
- Reliability: very important
  - Robustness against noise, different running conditions
- Multi-threaded environment in LVL2
- Hypothesis algorithms applied after each step:
  - Calibration may be needed before full jet reconstruction
- ROI guided approach:
  - small window reconstructed
  - For jets at LVL2:
    - $\Delta\eta \times \Delta\Phi = 0.7 \times 0.7$
    - R = 0.4 (cone radius)



Benefit from offline experience

Despite all the differences:

- Offline calibration experience can be very useful for HLT
  - Understanding problems, solutions
  - We will re-use software when possible

Offline calibration schemes.

- H1: use GeoModel.
  - Too heavy (LVL2)
- Pisa:
  - Too many constants (too heavy for LVL2)
- Sampling: preferred
  - Fewer constants (easier & faster)
  - More robust against noise.
  - Use RegionSelector to get sampling info.

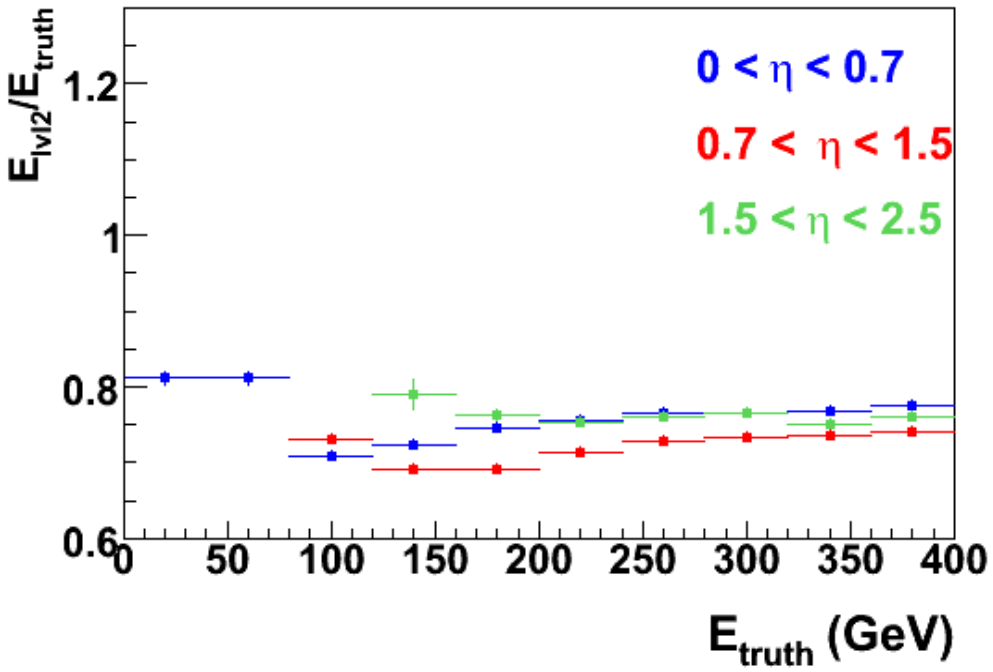
Jet Calibration at the EF

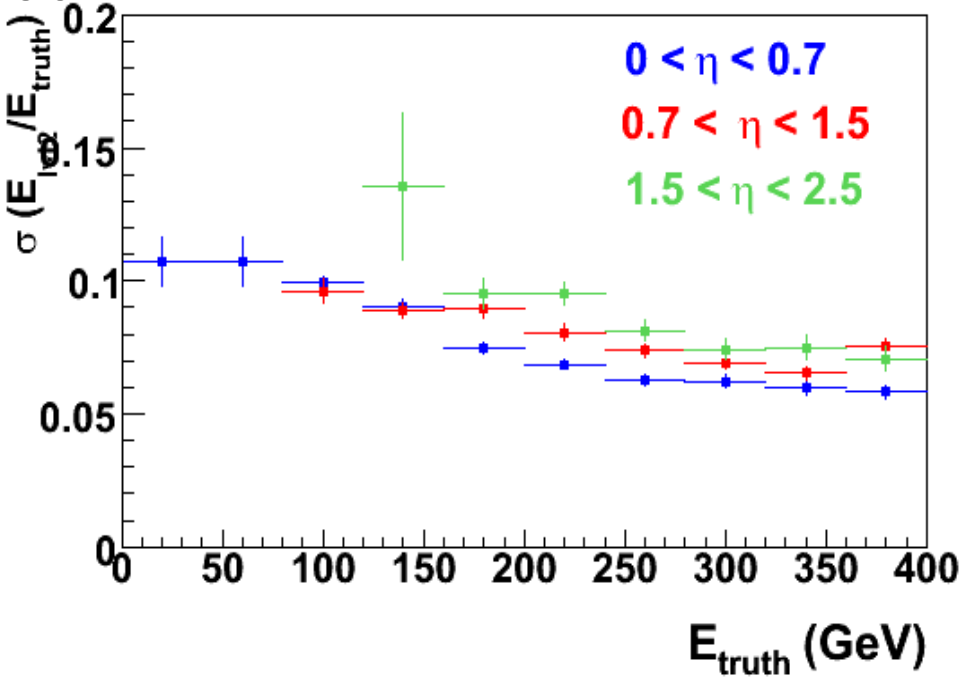
- Simpler situation:
  - Single-threaded environment
  - Larger time
  - Jet/Tau algorithms imported from offline:
    - Adapted to run in seeded mode
- Calibration tools could be imported from offline
  - Sampling method preferred.
- Calibration for missing E_T in the EF is still under discussion:
  - May not have time to unpack all cells

First look at the T2Jet's

- EM scale
- Rome data (part of J2, J4, J5)
- Cone radius = 0.4 (ROI size 0.7x0.7)
- MC-truth: cone algorithm with R=0.4 (from offline)
- Matching MC-truth – LVL2: $\Delta R<0.12$
- LVL1: $E_T > 20$ GeV
- Calibrated jets coming soon!

Too flat? Needs to be understood



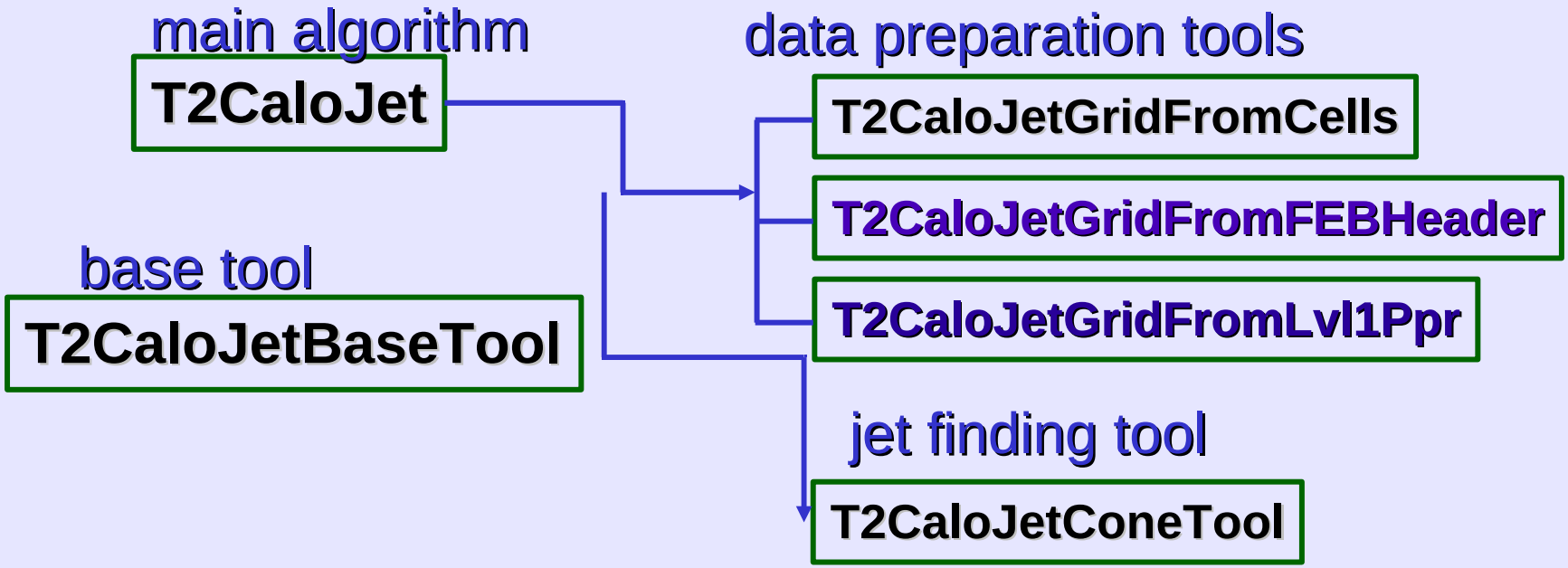


Conclusions

- The HLT Jet Calibration is taking off.
  - Still a long way to go.
- Event Filter calibration:
  - Simpler environment and longer time.
  - Possible to import offline tools.
- LVL2:
  - More complicated environment and shorter time.
  - Specialized tools needed.
- First steps:
  - Started to look at LVL2 reconstructed jets.
  - Adapted offline calibration tools to be used with LVL2 jets.
  - Use sampling method for first calibration studies.
  - First results expected soon!

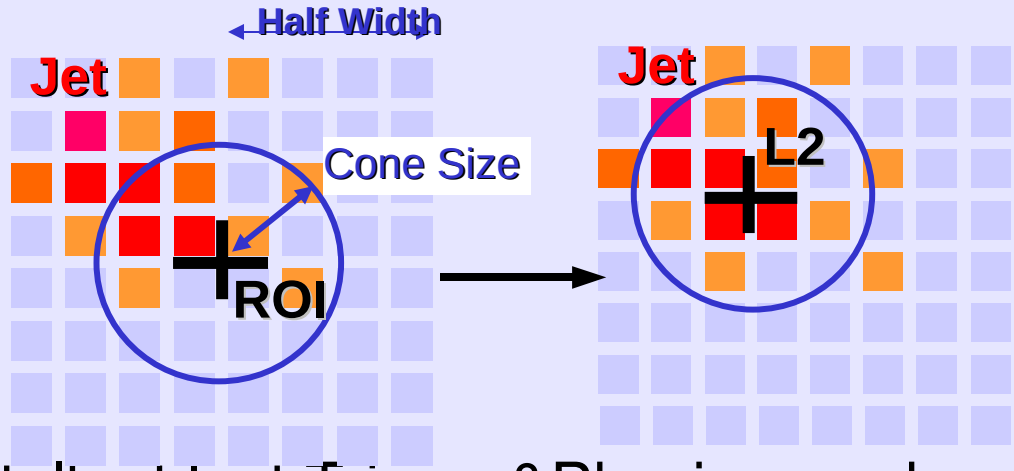
Backup

LVL2 Jet reconstruction



- Three data preparation schemes
- Calibration should be available for each scheme
- If possible the same calibration scheme should be used for missing E_T

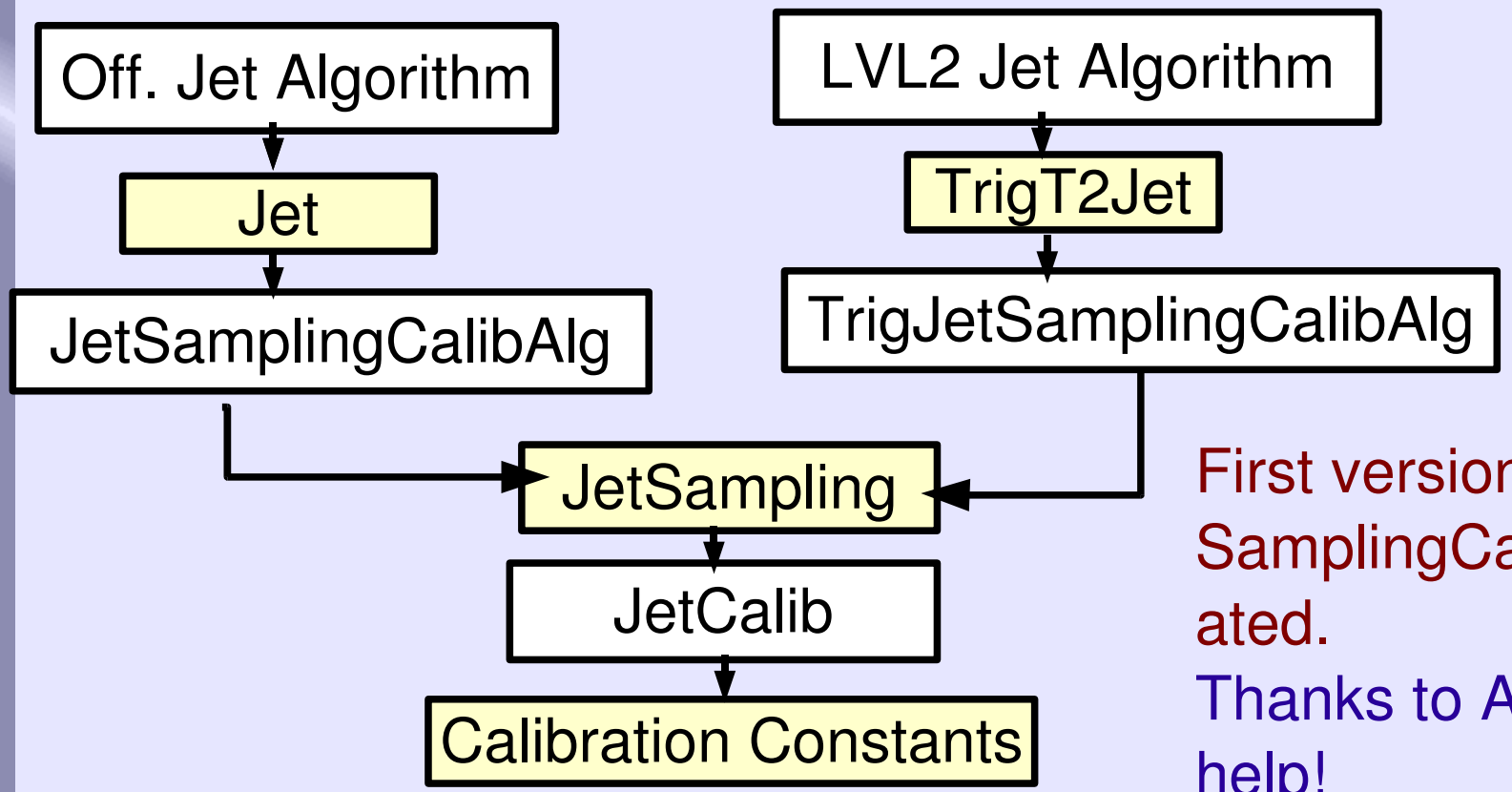
Iterative cone algorithm



See Osamu's talk at last Trigger&Physics week

LVL2 jet calibration

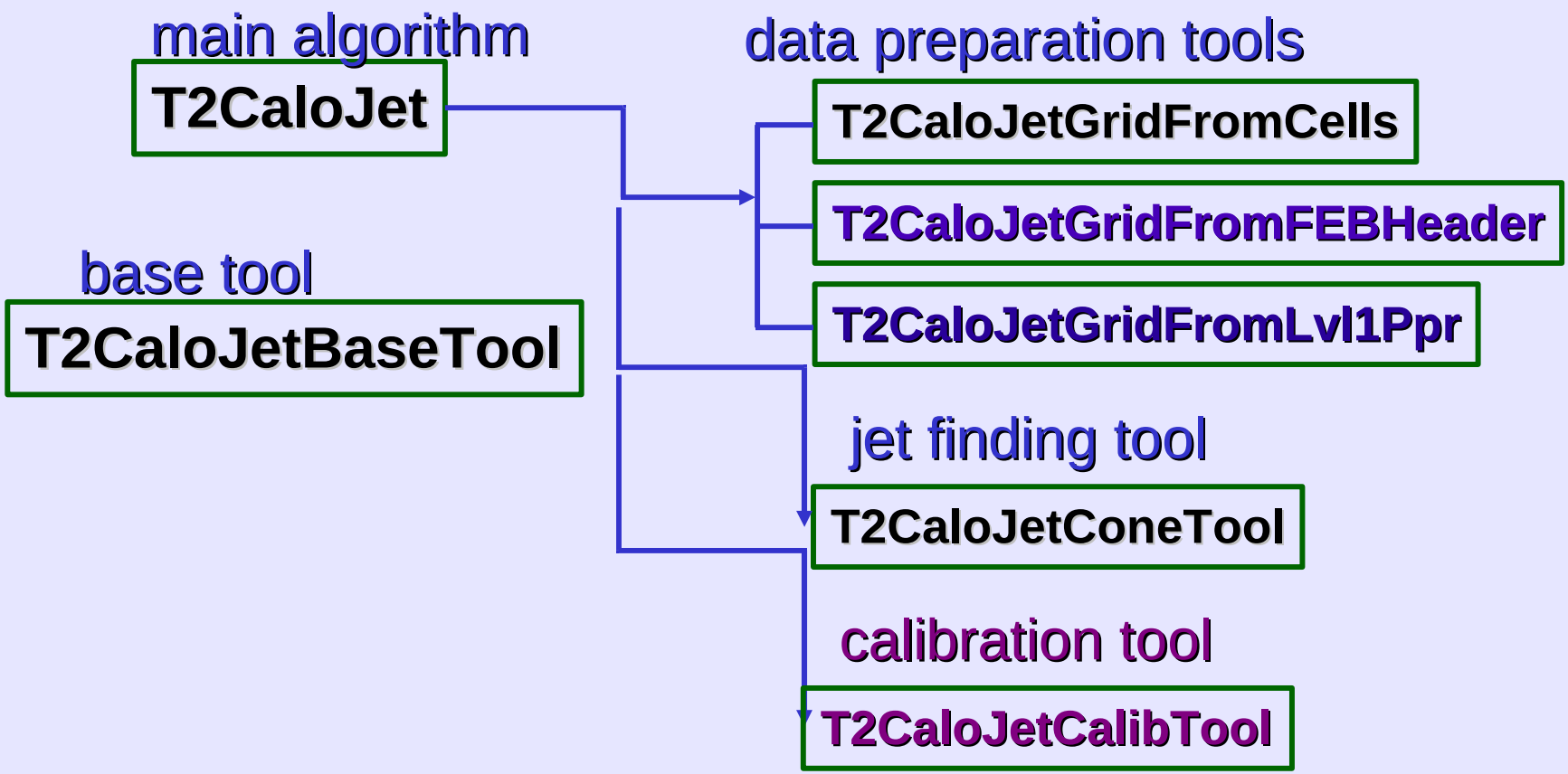
- Decided to use (as a first approach) JetCalib to extract the weights:
  - Loops on jets (JetSampling objects)
  - Extracts calibration information
  - Does the fits and gets the weights (H1, Pisa, Sampling).



First version of TrigJet-SamplingCalibAlg created.

Thanks to A. Gupta for his help!

Applying calibration constants



- Introduce a new tool.
- Use the same tools for taus.

Status of the LVL2 Jet Calibration algorithms

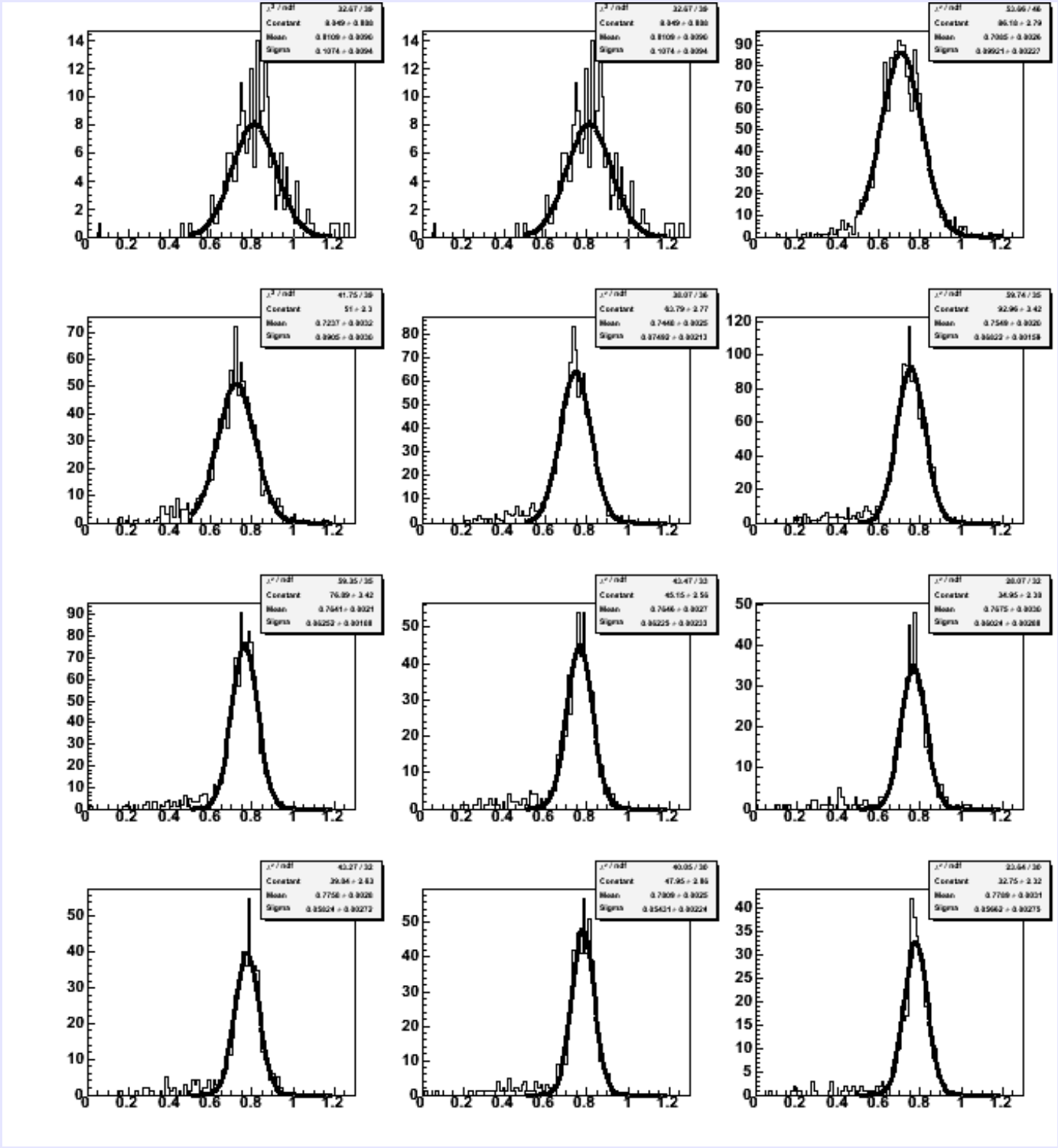
- T2JetCalibTool not implemented yet:
  - Tools for taus available now (thanks to C. Osuna)

- TrigJetSamplingCalibAlg:
  - implemented
  - being tested
- Production of AOD's with JetSampling objects from LVL2:
  - Done using the GRID
  - Rome data: ~ 1/4 of the J1-J8 data (11.0.41)
  - CSC data: to be done with 11.0.5
- First results on uncalibrated scale & resolution next slide
  - Calibrated plots expected soon

Next steps

- Obtain calibration constants.
- Timing constraints.
- Stability and robustness: tests with CSC data.
- Calibration constants in a Data Base?
  - Study the possibility.

Scale & resolution fits



Plots about LVL2 Jet reconstruction