Level 2 Trigger Overview

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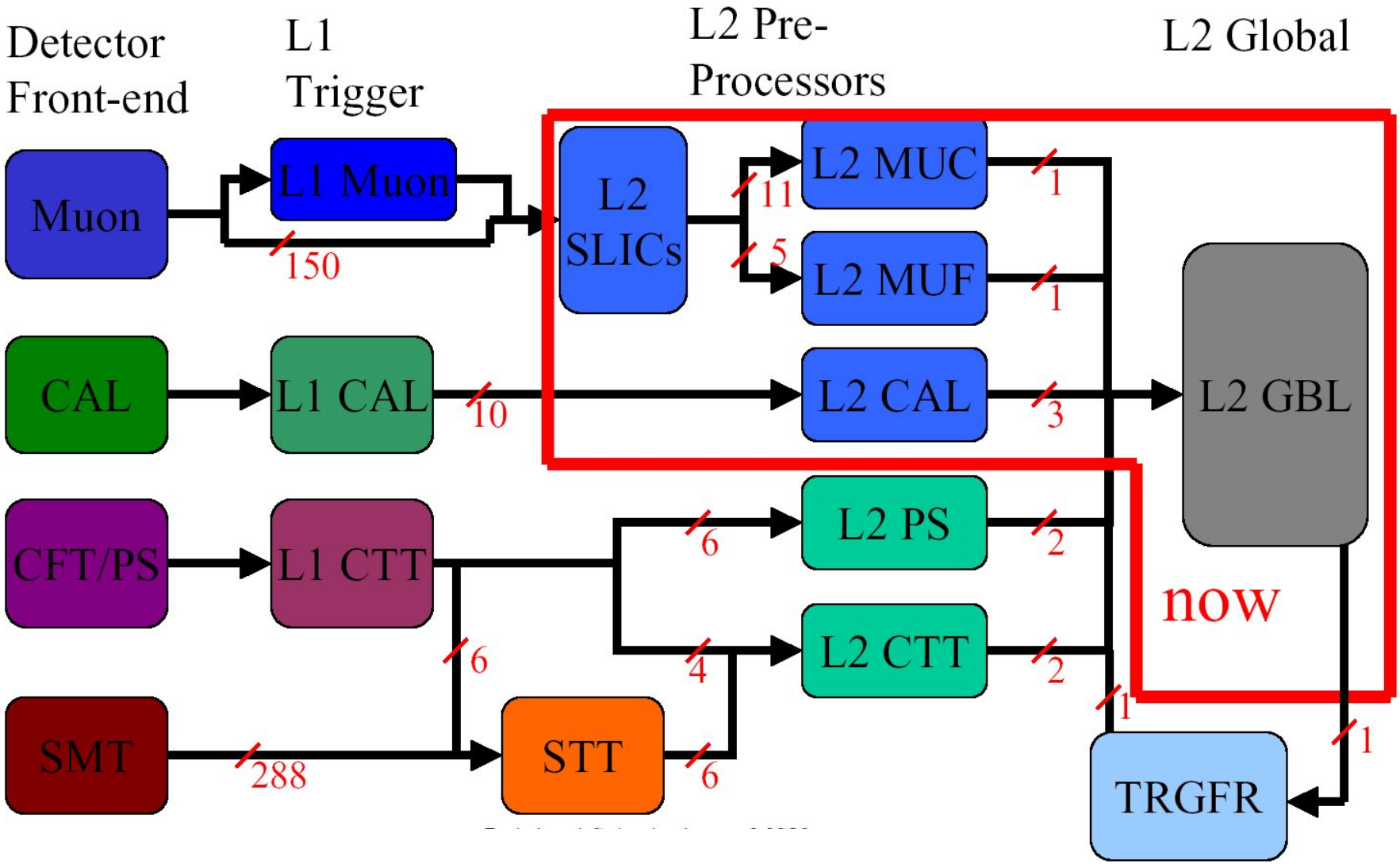
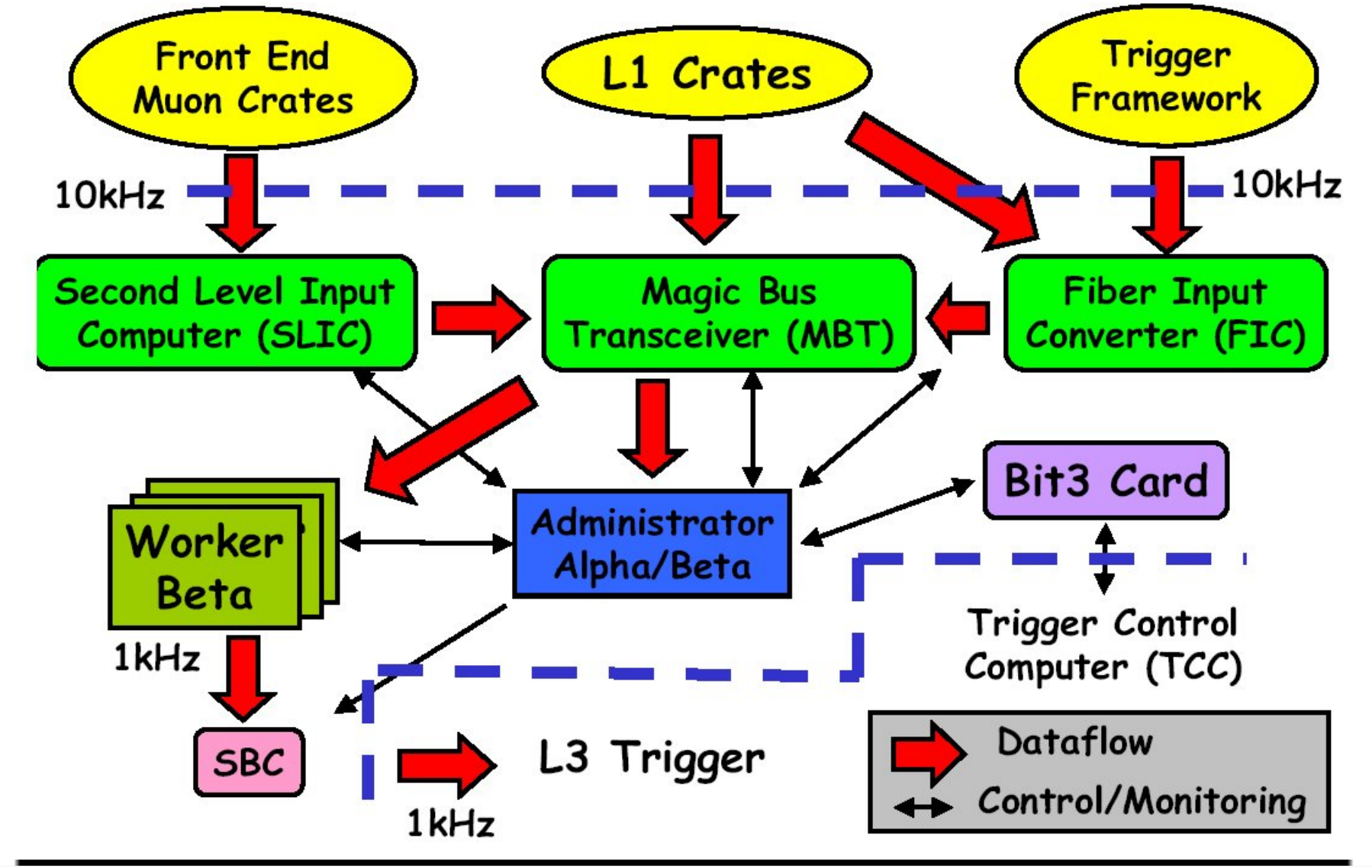
Outline

- L2 trigger system data flow and L2 trigger control
- L2 algorithms − three weeks ago
  - L2MUC, L2MUF, L2CAL and L2GBL (L2 global)
- L2 algorithms − now
  - L2CTT and L2PS
- Hardware upgrades
  - α vs. β comparison
  - schedules and plans
- Post−shutdown state of L2 trigger system

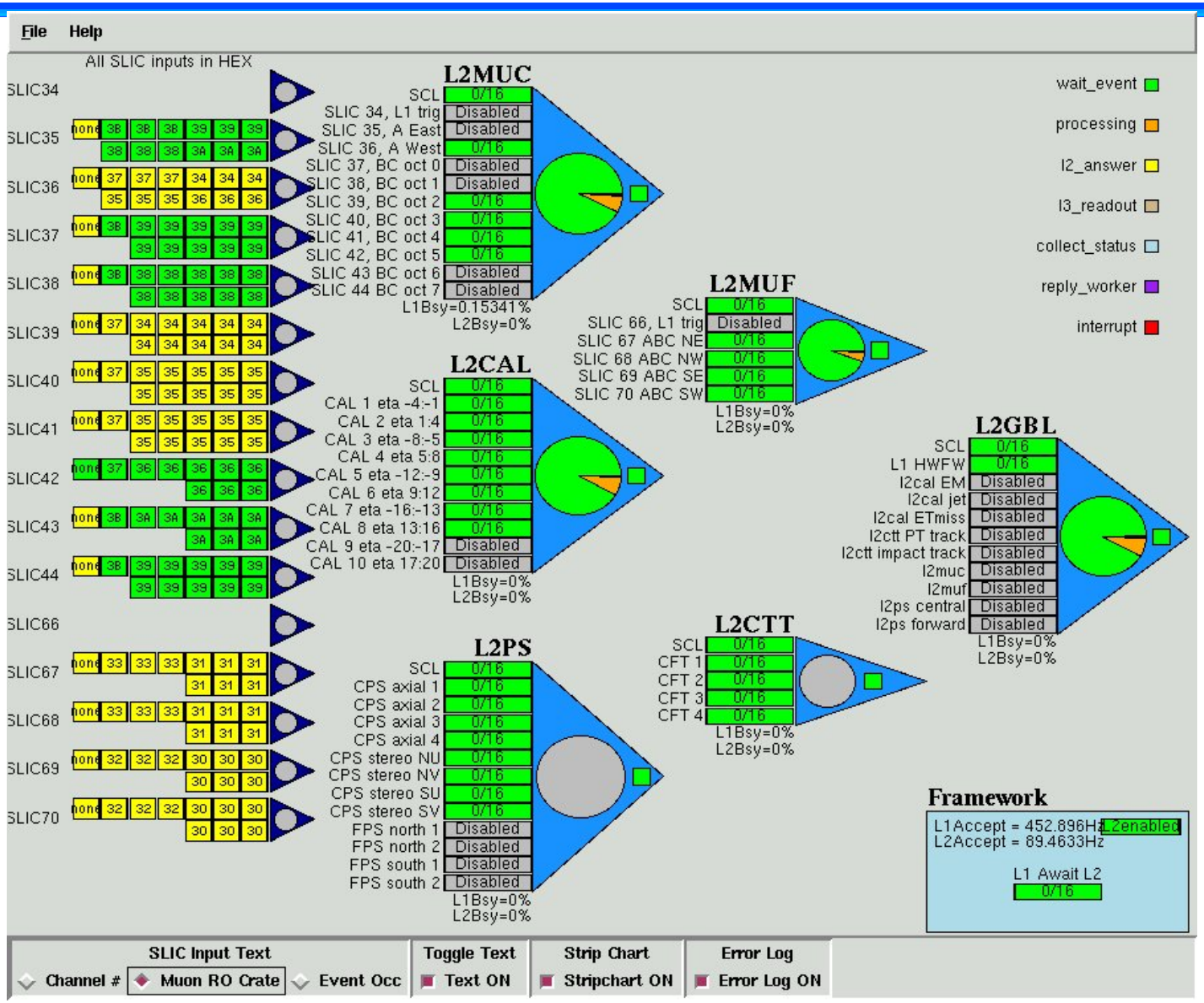
L2 Trigger Data Flow



Single L2 Crate



L2 Dataflow GUI



L2 Algorithms − three weeks ago

- **L2CAL:**
  - from L1 trigger seed towers forms jets (CALJET) and combines two EM towers into electrons (CALEM), and orders objects in descending order in ET
  - some changes are being implemented:
    - more information will be sent to L2 global − separate EM fraction of the seed and neighbor, and send EM energy of the seed and total energy
    - L2 global will have more information about EM objects − complete information about EM towers
- **L2MUC and L2MUF:**
  - SLICs make segments combining muon hits and then the alpha makes muons and calculates μ−pT
- **L2GBL (l2 global):**
  - combines information from all workers and applies L2 cuts (runs tools and filters), but does not match yet

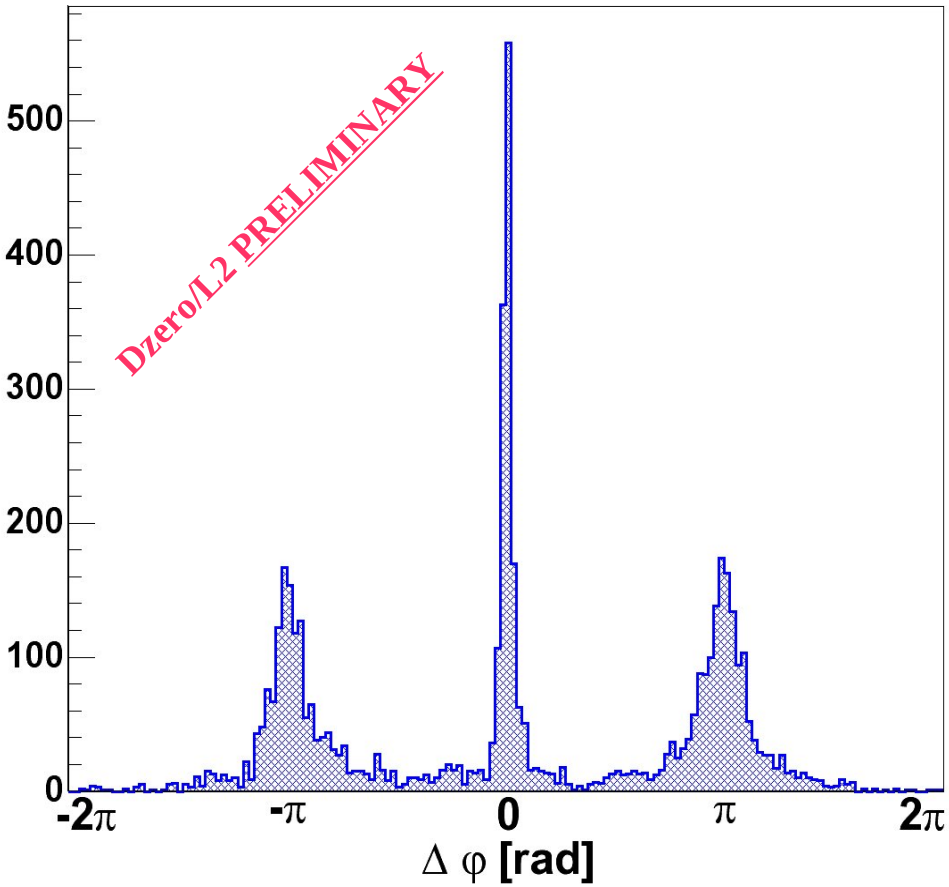
L2 Algorithms − NOW! (part I)

- **L2CTT (1st new feature of the L2 trigger system):**
  - crate x25 is being read out since August 6, 2003, afternoon
  - the first run with L2CTT track information: 179759 !!!
- **Are studies of L2 tracks in progress ?**
  - ➔ **Physics groups !** Some **PRELIMINARY** studies and plots will follow
- **What does L2CTT do ?**
  - ➔ Using L1 track trigger information, L2CTT worker calculates L2 isolation and orders tracks descending in pT value. L2CTT is an extension of L1 passing to L2 global more refined information.
- **What can be L2CTT used for ?**
  - L2 global − match tracks with electrons AND use L2 isolation to form τ−triggers

➔L2CTT information has been available to everybody for almost one month already ...!

L2 CTT Data −L2 electrons and tracks

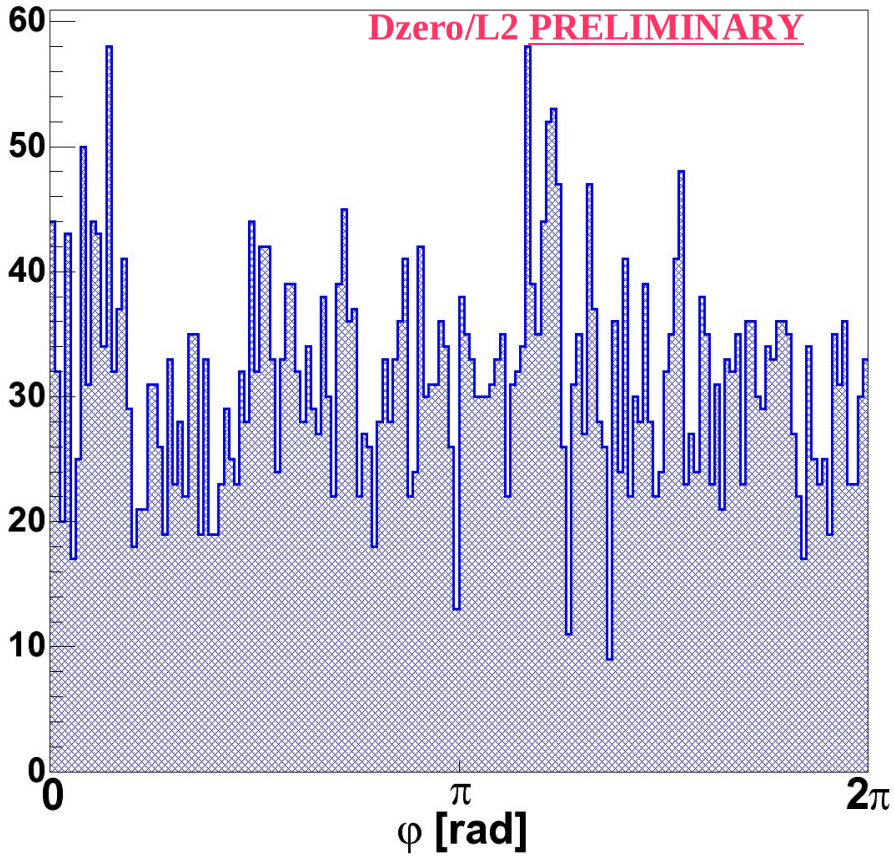
Δφ between L2 electron and all L2 tracks



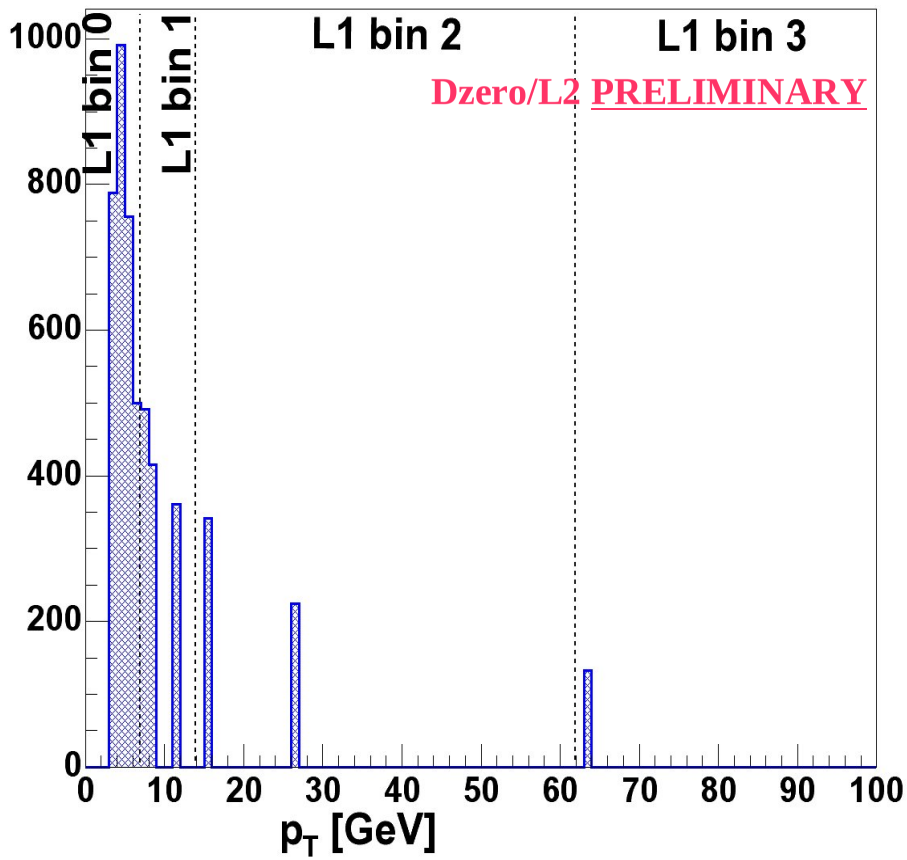
- L2 electron is L2 EM object with:
  - EM fraction greater than 0.9
  - ET larger than 20 GeV
  - and η from range (−2.5,2.5)
- L2 electrons are ordered according to ET and only the first one, with the highest ET, is matched with an L2 track

L2 CTT Data – L2 tracks

φ of all L2 tracks

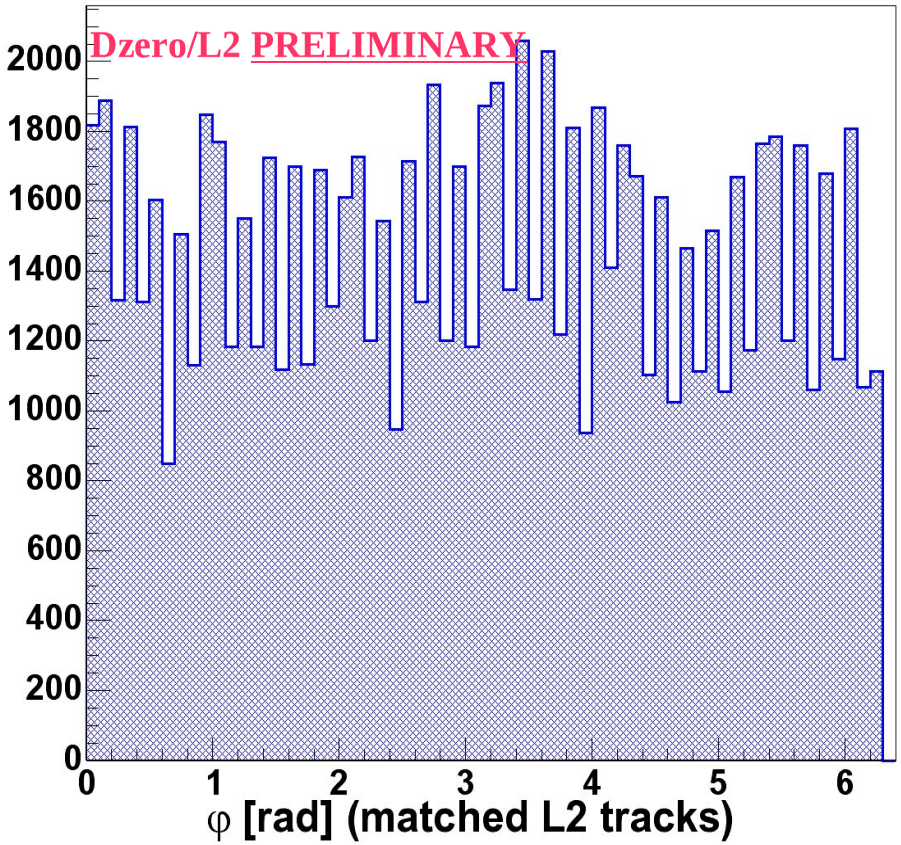


pT of all L2 tracks

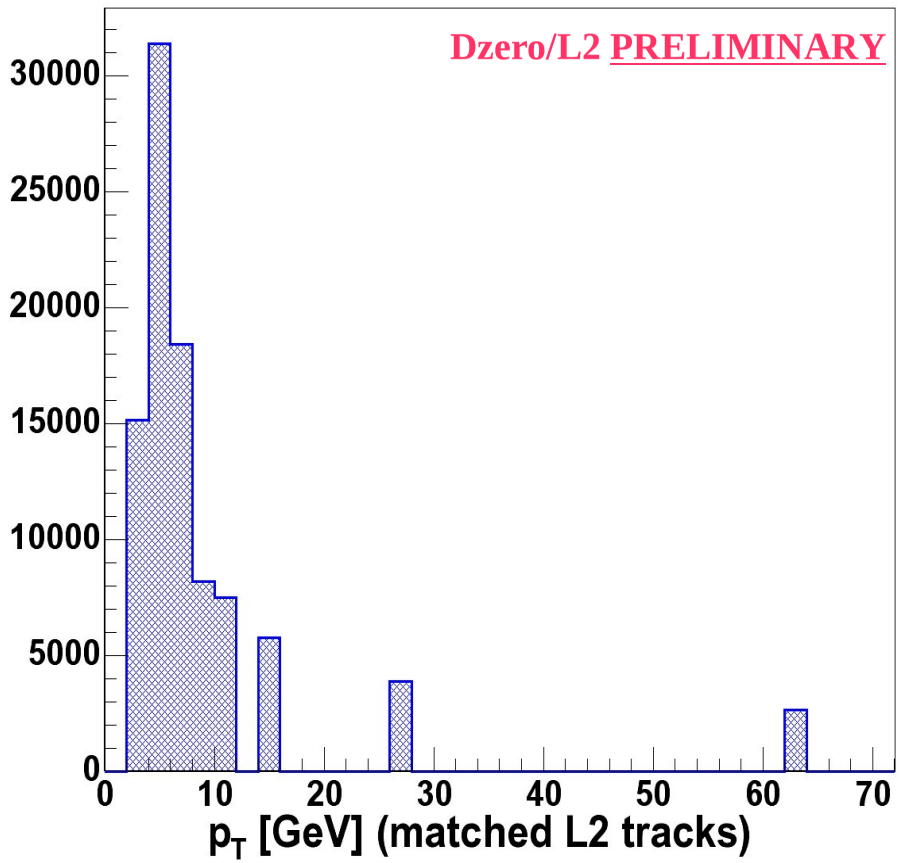


L2 CTT Data − matched L2 tracks

φ of L2 tracks matched to L2 electrons



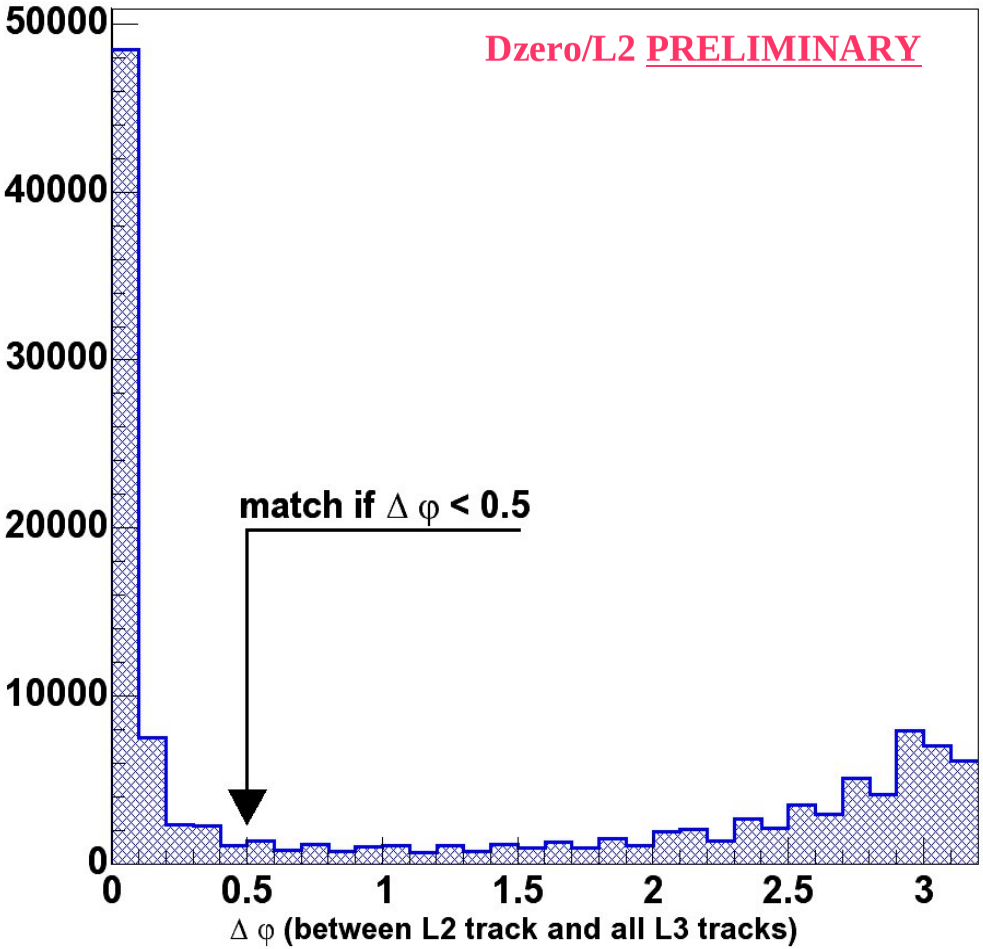
pT of L2 tracks matched to L2 electrons



L2 CTT Data − L2 and L3 tracks match

Δφ between L2 tracks and all L3 tracks

(also L3 tracks are required to have pT>3GeV)



- L3 tracks only from **PhTrk5** (L3 tracks with pT greater than 5 GeV requiring at least 10 hits in CFT or SMT)
- match L3 track to L2 track if |Δφ|<0.5 rad

$$\varepsilon = \frac{\text{matched L3 tracks}}{\text{all L3 tracks}}$$

~ 75−80% efficiency is in agreement with L1

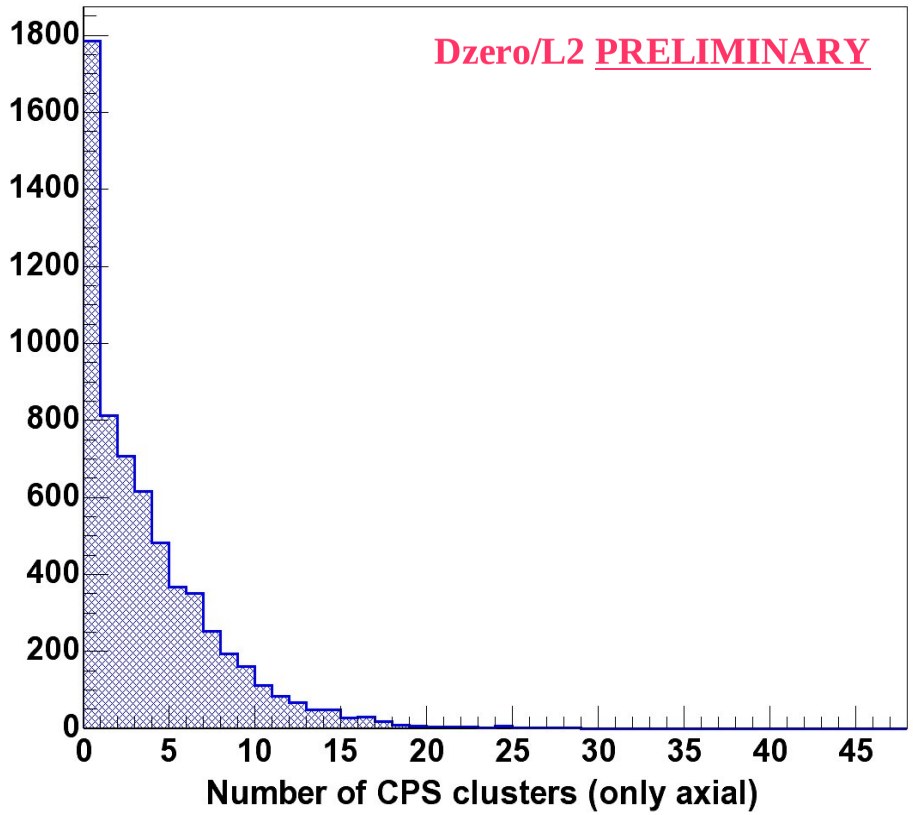
L2 Algorithms – NOW! (part II)

- **L2PS (2nd new feature of the L2 trigger system):**
  - crate x25 was tested on Tuesday/Thursday and from Thursday (August 28) is also being read out
  - the first run will L2PS information is coming soon – so get **READY!**
- **What does L2PS do ?**
  - ➔ Using L1 information from DFES (U and V layers) and CTQD (X layer) boards it combines X, U and V hits to find η – reconstructs 3dim position of preshower clusters
  - ✗ only CPS information is available (and FPS is coming)
- **What can be L2PS used for ?**
  - L2 global – match tracks and cal EM objects with preshower clusters – new triggers

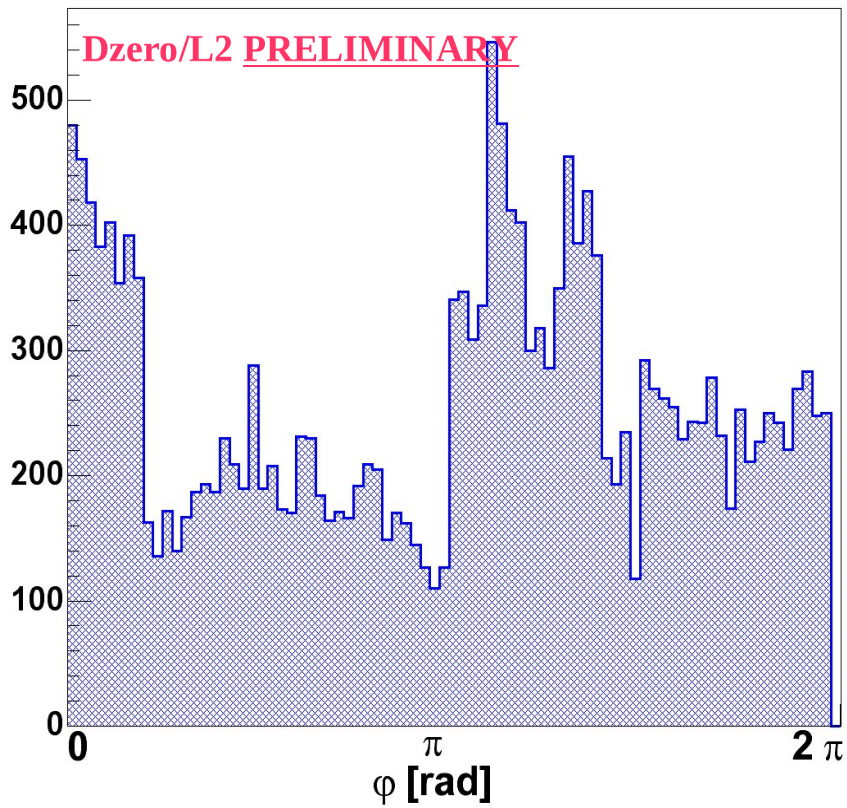
➔ L2 PS information is going to be available to everybody very soon ...! (wait for the upcoming store)

L2PS Data

Number of preshower clusters



φ of L2 preshower clusters



Hardware Upgrade – from α_s to β_s

- ... has been already started
  - ✔ L2CTT and L2PS crates run with β_s !
- But <u>why</u> upgrade ?
  - ✗ we have only ~10 trustworthy α_s from two production runs (24+12)
  - ✗ DZero base line design for RunIIa requires ~24 pieces (>10)
  - ✗ <u>not enough</u> to have administrator and worker in each crate, thus a software fix was necessary (Single α Crate)
  - ✗ α_s are slow ... upgrade is needed

Hardware Upgrade − new β_s

- Advantages of new β_s ?
  - ✔ were designed with goals:
    - low risk and plug−in hardware compatibility with α_s
    - minimal drain on commissioning effort
  - ✔ each β is basically single board computer (64−bit PCI interface chip, PCI card and two 1GHz PIII CPUs) with "custom" devices (9U cards)
  - ✔ it is possible to replace replace sbc = upgrades, and it's a commercial device = warranty service
  - ✔ <u>enough</u> pieces to have administrator and worker in each crate and easy implementation
  - ✔ β_s are <u>3−times faster</u> than α_s

Hardware Upgrade – first β

L2 Current Activities & Progress

- ... changes (improvements) in CALEM/CALJET algorithm
- ... integration process of software development between STT and L2CTT has been started
- ... commissioning processes:
  - of L2PS
  - of β_s
  - of STT
- And shutdown plans:
  - install β_s in all other crates, some additional cabling and multiple β_s in a crate (administrator+worker/workers)

Post−shutdown L2 Trigger

- ... will have all preprocessors in the online readout
- ... will have all L2 crates equipped with βs (instead of αs)
- ... will have new triggers ready − triggering on L2PS and L2CTT information (again − this needs YOU!!!)
- STT continues commissioning and when it is available it will replace L2CTT. Meanwhile, during the intermediate period STT and L2CTT will run simultaneously