



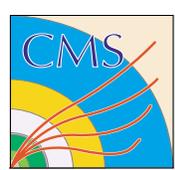
ORCA 4 - Calorimeter Trigger

New Features

- **Electron/Photon algorithm tuning**
 - Implementing some missing LUTs to provide η dependent energy calibration
 - ~Done - waiting for calibration (Chris Seez)
- **12x12 jets and τ trigger (see attached)**
 - Expect to be done by Feb. 10
- **HF algorithm**
 - Includes extension of missing E_T calculation to high η and jet counting (HF trigger tower over threshold) in +Z and -Z separately.
 - Third in my priority list - is this ok?

Missing Features

- **EE fine-grain bit definition**
 - In Teresa Monteiro's domain?
- **HB/HE MIP (fine-grain) bit implementation**
 - Maryland group?
 - Does muon group need this in ORCA 4?
- **HF trigger primitives (see attached)**
 - Initial version can be simple sums without signal handling and electronics details
 - A good place for someone to step in and help



ORCA 4 - Calorimeter Trigger

Programming Interface Changes

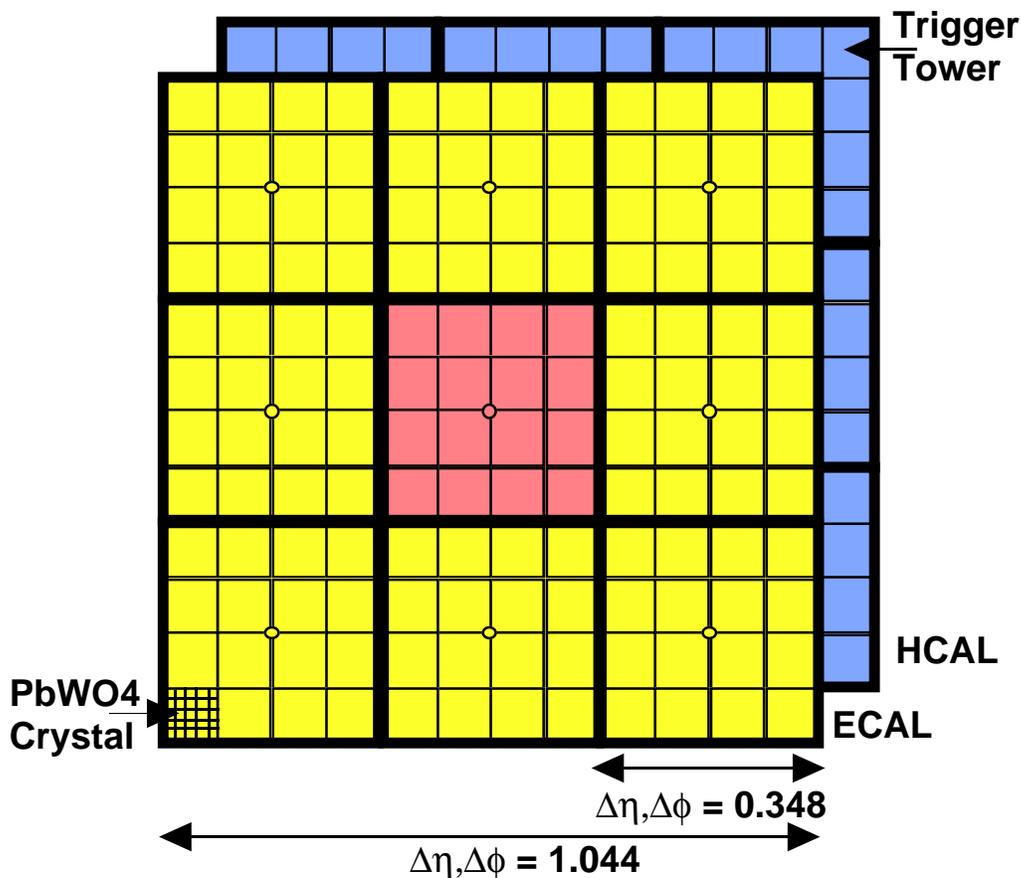
- **Added LazyObserver pattern consistent with muon trigger**
 - Users can migrate to new style
 - See `L1CaloTrigger/test/testL1CaloTrigger2.cpp`
- **Changed electron objects**
 - L1EMObject instead of L1Object
 - Provides more details of cuts fired
- **Added output objects**
 - Jet count for HB/HE (and HF soon)
 - Tau candidates

Miscelanea

- **Calorimeter - trigger tower geometrical mapping**
 - Still hardcoded in trigger section of code
 - Need access to ORCA geometry "database"
- **Persistency**
 - Expect trigger to be rerun
 - No manpower to work on this anyway
- **Parameter tuning**
 - Need to provide interface to tune parameters



New τ , jet, E_T algorithms



Primitives

- 4x4 E_T sums of ECAL and HCAL trigger towers
- τ veto bit set if number of active ECAL and HCAL trigger towers in 4x4 region ($E_T^{ECAL} > 2$ GeV or $E_T^{HCAL} > 4$ GeV) is greater than 2

Jet Algorithm (sliding window of 4x4)

- Jet E_T is given by the sum of 12x12 trigger towers overlapping sliding steps of 4x4 with the requirement that central 4x4 is greater than neighbors
- Jet candidates are sorted to find highest energy jets
- Count jets above threshold (Handle high jet multiplicity)

τ Algorithm (sliding window of 4x4)

- τ E_T is same as Jet E_T
- τ veto bit should be false in all nine 4x4 regions

Missing E_T

- 4x4 E_T is converted to E_x and E_y using LUT and added over all η .



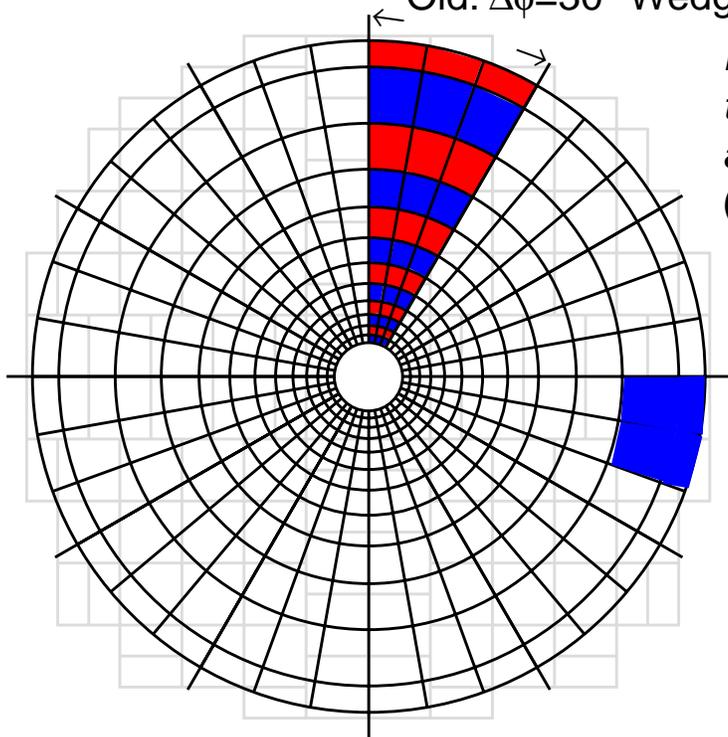
New HF-Trigger Tower Map

New: 2 CMS HF Calorimeters mapping onto 12 32-Channel Receiver Cards

Old: 2 CMS HF Calorimeters mapping onto 6 32-Channel Receiver Cards

Old: $\Delta\phi=30^\circ$ Wedge \Rightarrow half Receiver Card - 12 Channels

*Each Receiver Card handles two 30° Wedges, one forward and one backward at same ϕ (using **24** out of **32** available channels)*



New: $\Delta\phi=20^\circ$ Wedge \Rightarrow quarter Receiver Card - 6 Channels
*Each Receiver Card handles two 20° Wedges, one forward and one backward at same ϕ (using 12 out of **32** available channels)*

Readout segmentation: $36\phi \times 12\eta \times 2z \times 2F/B$

New Trigger Tower segmentation: $18f \times 6h \times 2F/B$

Old Trigger Tower segmentation: $12\phi \times 12\eta \times 2F/B$