RAW data include

- Timestamps & Trigger number
- High- and low-gain ADC counts from 13 SCA memories (25 ns sampling) of all the channels in each readout chip (skiroc2CMS)
- TOA (Time-of-arrival) and TOT (time-over-threshold)

The RAW→DIGI step is referred to as "Unpacking"

DIGI data include

- High- and low-gain ADC counts assigned to the corresponding Detector IDs

DIGI

RAW

Sensors, DAQ chain

- Each channel is mapped to the cells of the sensors
- Each cell is identified by the "Detector ID"
- Layer numbers
- Sensor number in the layer
- 2-dimensional local coordinate of the cell
- Cell type identifier (indicate if a cell is a full hexagon, half-hexagon, etc)

 The DIGIs are used in the each cell in each run from signal develops

evaluation of the pedestal level of timestamp 0 or 1 before particle

- Evaluate the pedestal, When assigning estimated common mode (CM) energy to a detector ID, a choice must be made whether to noise → <u>Pedestal</u> use the high-gain or the low-gain subtraction & CM ADC counts → Gain switch <u>removal</u>
 - ADC-to-MIP conversion

Assigned energy deposited (originally in

Single MIPs can only be reconstructed

by removing CM noise on an event-

by-event basis for each cell type

ADC counts) in units of MIPs to the

corresponding Detector IDs

RECO

RecHits ADC, - Pedestal, - CM, $(ADC \rightarrow MIP)$

- Basic clustering is performed to simplify some higher-level analyses (energy response and resolution)
- For each layer, the energies in 1, 7, and 19cells centered around the one with the highest energy as well as the total energy in a given layer (not counting the half-hexagons and mouse bite cells at the sensor edges) are stored

Measurements of shower shapes, energy and position

- Reproduction of the longitudinal and transverse shower shapes over a wide range of energies
- To verify the GEANT simulation of the complete system that is used to evaluate its overall performance and tune the design of the final detector
- Position resolution
- Accurate measurements of the incidence position and direction of showers are key inputs to the particle-flow performance of the upgraded CMS detector

Precision timing with silicon diodes and

An important consideration for all detectors for HL-LHC operation is their intrinsic evaluation of the timing of signals, due to the need to mitigate the effects of in-time event pileup.