

# OPTIMIZING THE CMS ECAL TRIGGER FOR RUN 3 OF THE CERN LHC

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Computational Physics Fall 2019

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# THE ELECTROMAGNETIC CALORIMETER

- Ecal detects electrons and photons produced by collisions in CMS at the CERN LHC
- Particles scintillate in  $\text{PbWO}_4$  crystals
- Scintillation light is collected by photodetectors
- Signal is amplified, shaped, and digitized

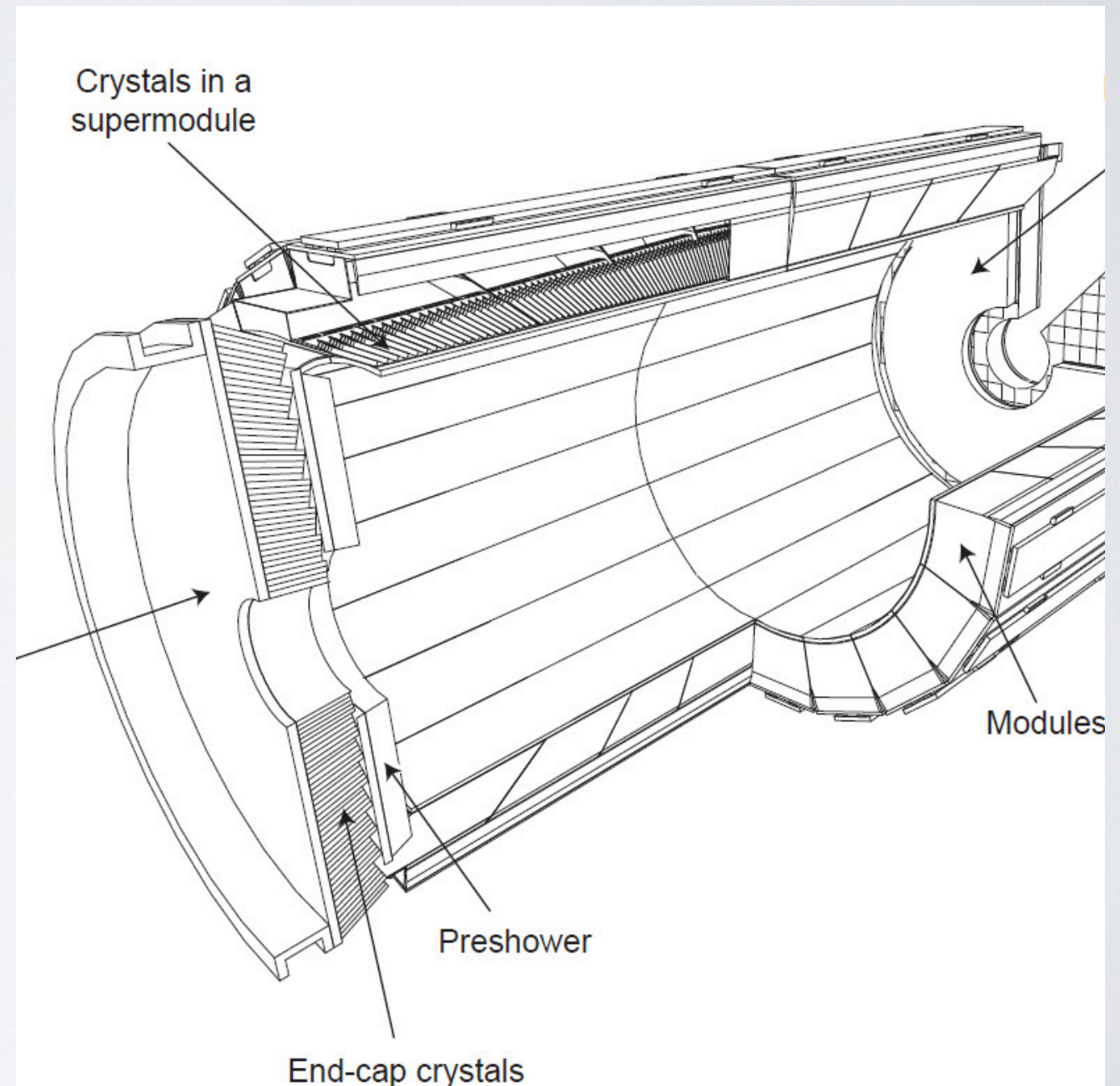


Image courtesy CMS Collaboration



# ENERGY RECONSTRUCTION OF SIGNALS

- Accurate & precise energy reconstruction is necessary for triggering
- For every window of 10 samples (taken every 25ns by onboard electronics), each sample is multiplied by an assigned weight for energy reconstruction
- Initial Run2 studies have shown that weights are not ideal and can be improved

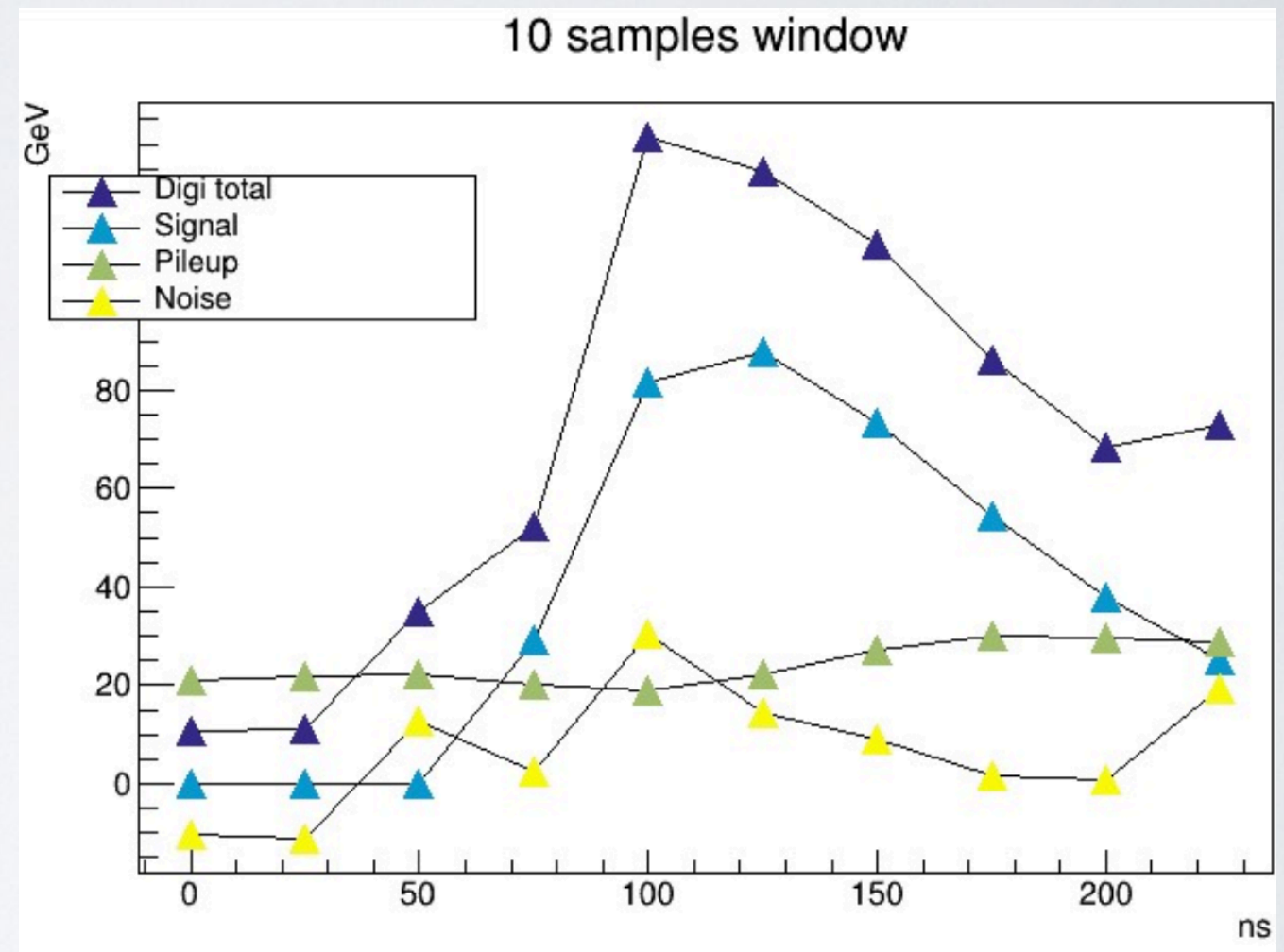


Image courtesy Abe Tishelman-Charny

# IMPORTANT TERMS

- Pileup: additional scintillation light from previous events
- Noise: random noise from the ECAL on-detector electronics
- Spikes: events where particles directly hit the on-detector EB electronics
- Bias: fractional difference between reconstructed energy and real energy
- MC: simulation of detector to model ECAL electronics



# METHOD FOR PROJECT

- Write a flexible plotter using ROOT/pyROOT to examine various parameters
- Use MC data generated with current and proposed weights to study parameters, specifically:
- Quantify how and where pileup affects bias by more
- Test currently unused features of the electronics like using a second set of weights to mitigate spikes and out of time pileup or adding a 6th weight (there are currently only 5)

QUESTIONS?