

Ringer for Forward Electrons

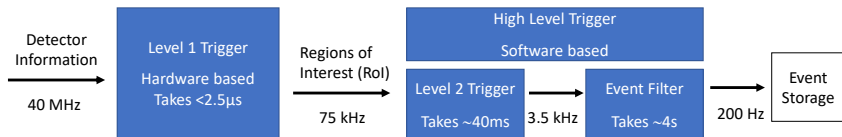
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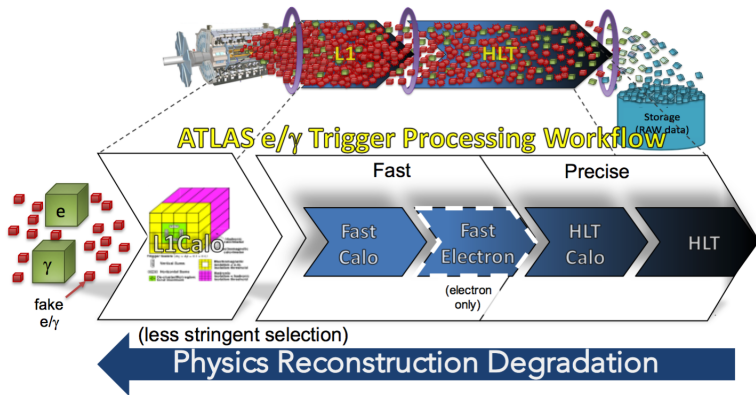
ATLAS Trigger

- The LHC's beam luminosity of $10^{34} \text{ cm}^{-2}\text{s}^{-1}$ results in 40 million bunch crossings with each about 20 collisions per second.
- This rate would fill the event storages in a short time.
- Therefore a trigger system is used to select events of interest.



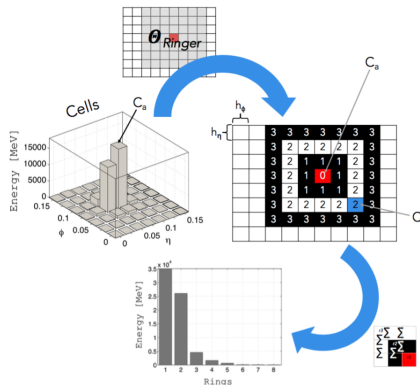
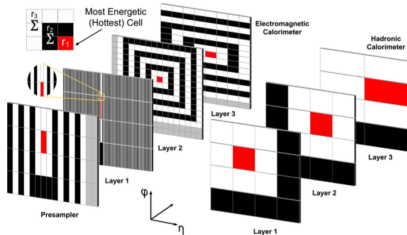
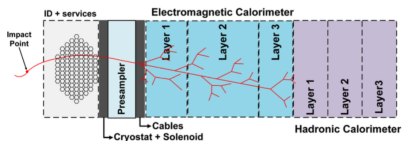
e/γ Trigger Processing Workflow

- The NeuralRinger algorithm has been introduced in 2017 in the Fast Calo step to reduce CPU demands.



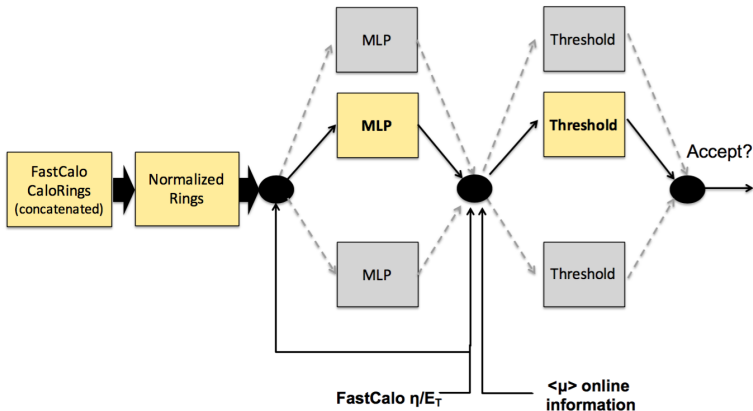
Ring Shapes and Ring Sums

- In the barrel region the ring building process covers the whole RoI resulting in 100 rings.
- The ring sums are the total energy depositions of each ring.



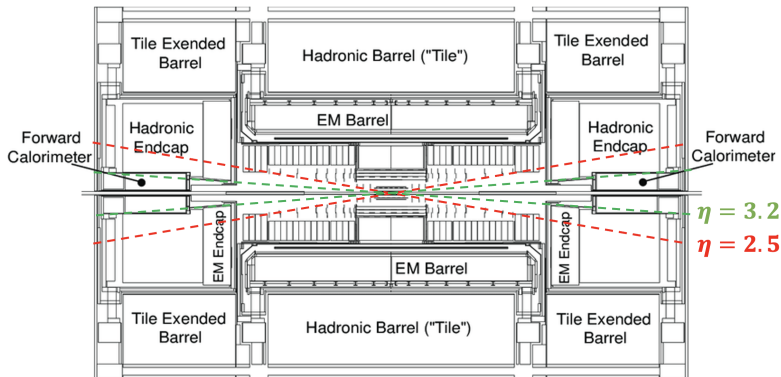
Processing Flow

- An ensemble of Multi Layer Perceptrons (MLPs) is trained with the informations from the rings to discriminate signal from background.
- The MLPs provide the discriminants for the trigger software.
- Using this technique it was possible to significantly reduce the CPU time and the rate of fake candidates that are passed on.



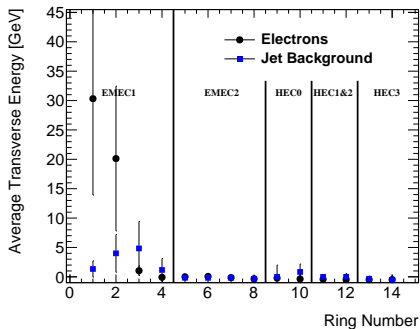
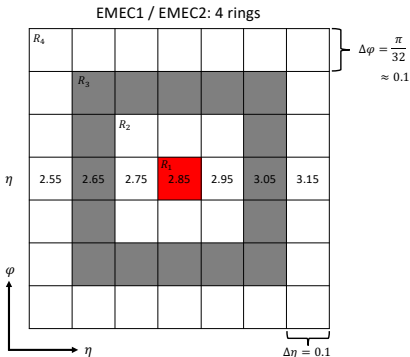
Moving to more Forward Regions

- To extend the NeuralRinger to more forward regions can improve analyses that are not only focused on the barrel.
- Especially studies of Drell-Yan processes could profit from that.
- However, these regions are more challenging due to reduced tracking information, lesser granularity and more inactive material.



Forward Ring Structure and Profile

- Due to the detector granularity of 0.1×0.1 in $\eta \times \phi$ it only makes sense to build 4 rings in the EMEC1 and EMEC2 layers.
- A difference in the ring sum profiles of signal and jet background can clearly be seen which indicates nice conditions for the neural network.



- Once we are sure that our background samples are well fit for our scenario, different neural network configurations can be trained.
- The best performing configurations will be selected and further studied.
- The trigger rates of its outputs can then be compared with previous ones.
- If they show good performances this can be used to improve the trigger.

Thank you!