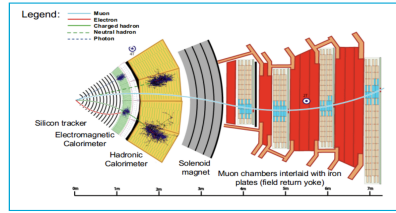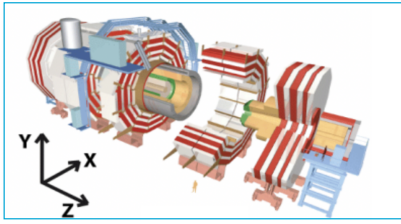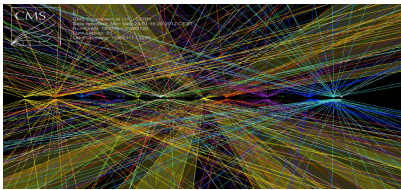# A new technique for the reconstruction of the interaction vertices inside the CMS detector at HL-LHC.
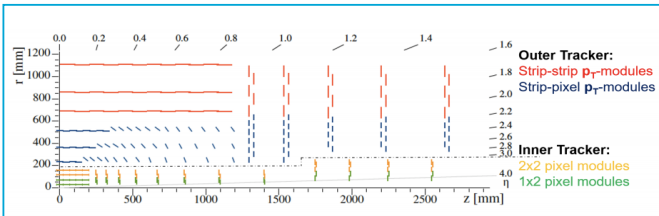

The CMS upgrade of the tracker will enable tracks to be reconstructed in time for their use in the L1 trigger


The figure shows an event with a large number of reconstructed vertices

The number of individual p-p collisions increases as the LHC ramps up its luminosity

- Layout of the CMS Tracker for HL-LHC. The origin of the figure corresponds to the p-p collision point
- This is a new design that will allow tracks to be reconstructed in hardware

- Tracks will be used in FPGAs to find Z postions of the hard interaction vertices

- Finding Z vertices enable the Level 1 trigger to reduce the event rates to a level suitable for the High Level Trigger processing farm (HLT)
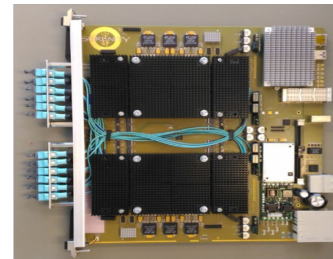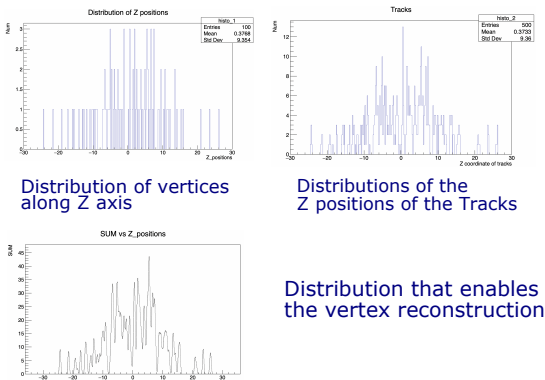

ATCA board with 2 FPGAs
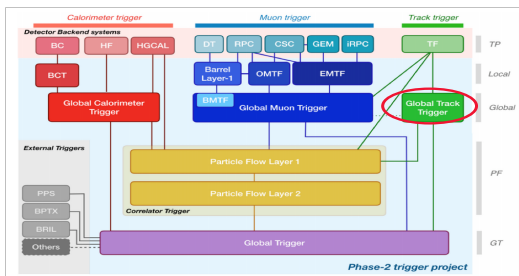
Level 1 Trigger

The vertex finding process will be done in the Global Track Trigger(GTT)

I am exploring the effectiveness of a simple algorithm that has the potential to take the track Z position resolution into account as a function of track pseudorapidity (the current algorithm in the trigger is not able to do this).

Example of 1 event with 100 Z vertices (5 tracks per vertex). This is a toy MC to explore the method.

Distribution of vertices along Z axis

Distributions of the Z positions of the Tracks

Distribution that enables the vertex reconstruction

Future Perspectives:

- I will explore the performance of a variety of algorithms from simple to complex NN ones

- I will choose what to use in the resources available in the hardware (i.e. FPGAs)

- I will do this using standalone simple concept approaches and then I will move to full simulations

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