

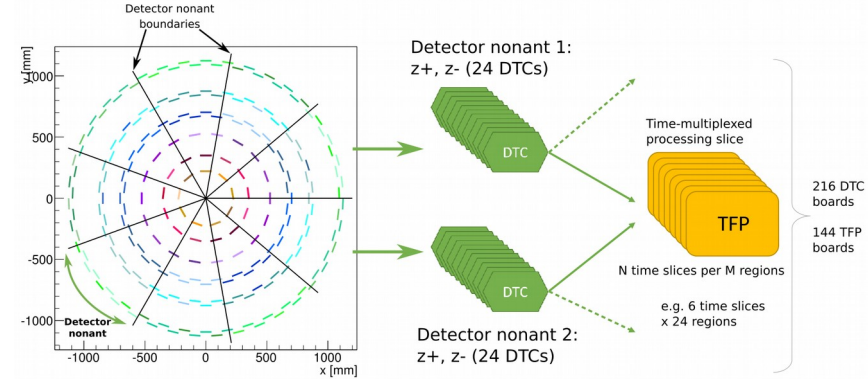
# Level-1 track finding with an all-FPGA system at CMS for the HL-LHC



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## Challenges

- Large data volume: about 10,000 stubs per bunch crossing (25 ns) with  $\langle \text{PU} \rangle = 140$ ; data bandwidth 20-40 Tbits/s
- Perform pattern recognition to associate stubs to tracks
- Fit stubs for track parameters
- Fast data processing: 12.5  $\mu\text{s}$  to make L1 trigger decision,  $\sim 4 \mu\text{s}$  of which is available for L1 track finding



## Summary

- L1 track trigger at HL-LHC necessary but also challenging
- Two all-FPGA approaches: Tracklet and TMTT
  - Highly parallelized tracking algorithms
  - Data organization  $\rightarrow$  pattern recognition  $\rightarrow$  track fitting  $\rightarrow$  duplicate removal
  - Both have demonstrated feasibility and good performance
- Efforts have started to merge the two approaches
  - Common infrastructure R&D

