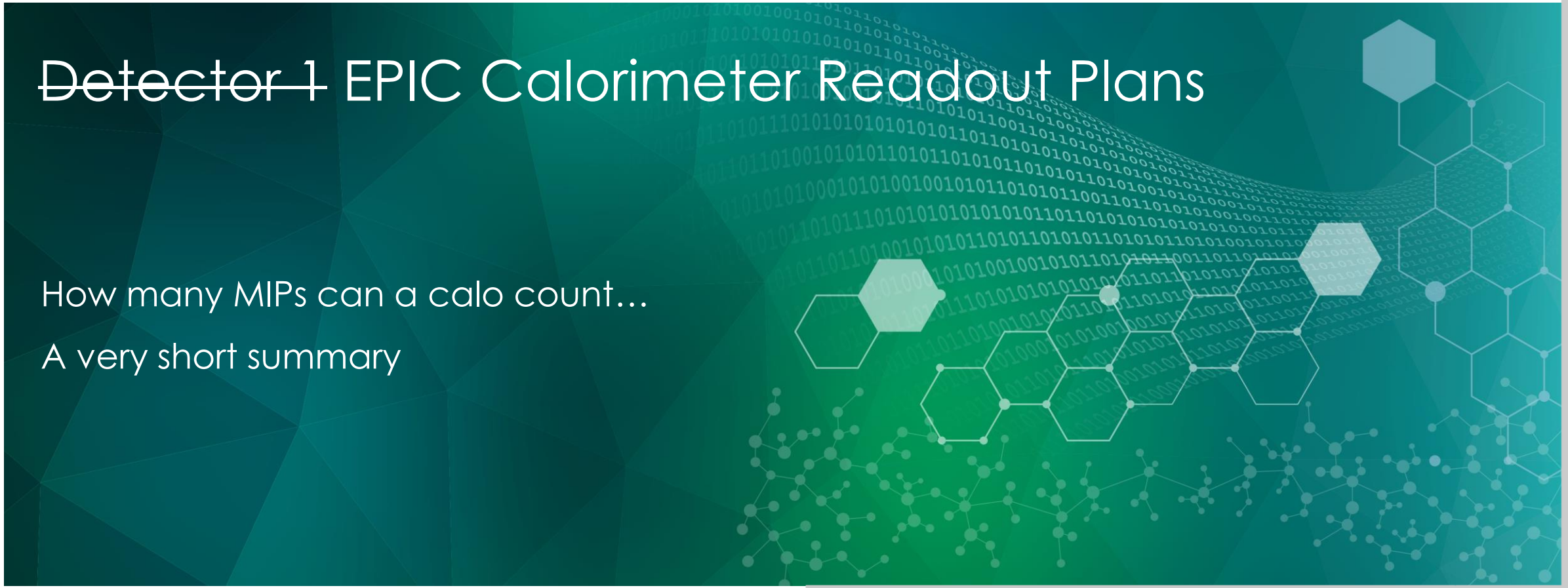
OAK RIDGE National Laboratory

~~Detector 1~~ EPIC Calorimeter Readout Plans

How many MIPs can a calo count…

A very short summary



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EPIC SiPM Calorimeter Readout

- Joint discussion between LFHCAL and pECAL proponents
- LFHCAL: plans to pursue testing with HGCROCs
  - "40MHz issue" might largely be a bookkeeping exercise
  - High density integration, low power, rad hard…
  - **Can it actually work**?
- pECAL: experience from STAR FCS
  - On-detector VFEE (shaping, preamp, SiPM bias control) designed by Gerard Visser
  - Off-detector digitizer board based on COTS ADC designed by our very own Tonko
  - **How to deal with cables**?
- Will present a more detailed overview once cornerstone requirements have been defined and more discussions have been had…

MIPs in the EPIC Forward Calorimeters

- LFHCAL: 7 longitudinal segments, 10 layers of 4mm plastic scintillator each
  - 1 MIP in single layer ~10 fired SiPM pixels
  - 15000px SiPM on 12bit ADC: 1ADC ~= 4px
  - Assume electronics noise <1ADC
  - SiPM dark noise high at single pixel level, but low at multi-pixel amplitudes, effectively <=1ADC (<10Hz of >2ADC dark noise per readout channel)
  - Single MIP in single layer: ~2.5 ADC, not visible (or on the very edge).
  - Single MIP in whole LFHCAL module: ~25ADC, easily visible
    - Single MIPs should be visible when striking through at least 3-4 layers per module
    - Need some simulations to look at hit distributions for actual muon trajectories
- pECAL: MIP deposit >> lower cell energy threshold
  - Not enough to identify MIP, but easy to see and include in PID likelihood

Summary

- No consensus yet, but excellent exchange of ideas and experiences on calo readout schemes
  - Hope to come up with a solution that can work for all SiPM calorimetry in EPIC
- MIPs in LFHCAL should not be an issue with any feasible readout
  - Need detector simulations for “realistic” study on hit distributions and resulting tagging efficiency
  - Similar reasoning should hold for barrel HCAL

Backup - LFHCAL