

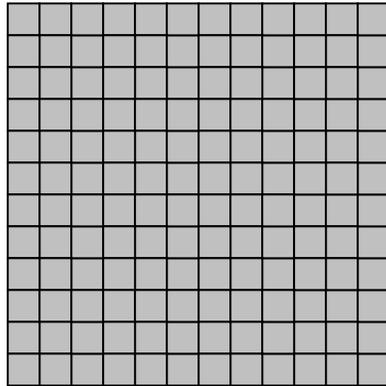
EMCal trigger options for the RXN detector

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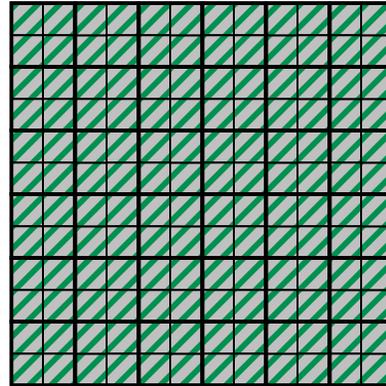
Ground Rule Assumptions

1. We are trying to make a min-bias trigger for use in low-energy A+A, and possibly p+p.
2. We are only considering the EMCal 2x2 tile sum trigger, since (i) it's much simpler, and (ii) its threshold is much, much lower than the 4x4 tile sum triggers.
3. We're restricted to one EMCal FEM.

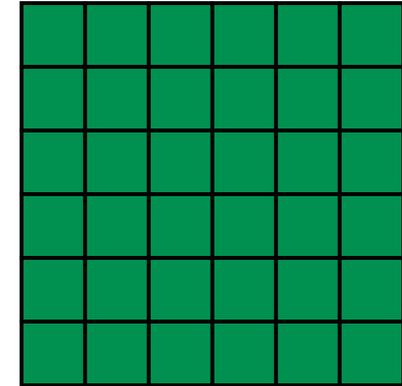
NB: We need to confirm with ERT expert that lowest useable 2x2 tile threshold *will* fire on *one* primary (not one MIP) from the vertex hitting one tile of the RXN.



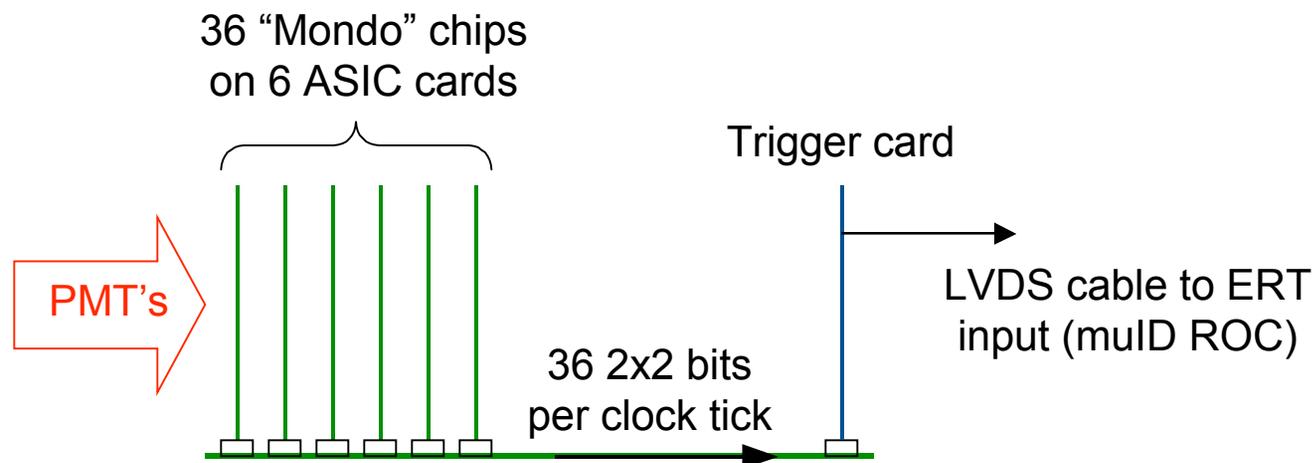
Each EMCAL FEM sees a 12x12 array of modules/PMT's.



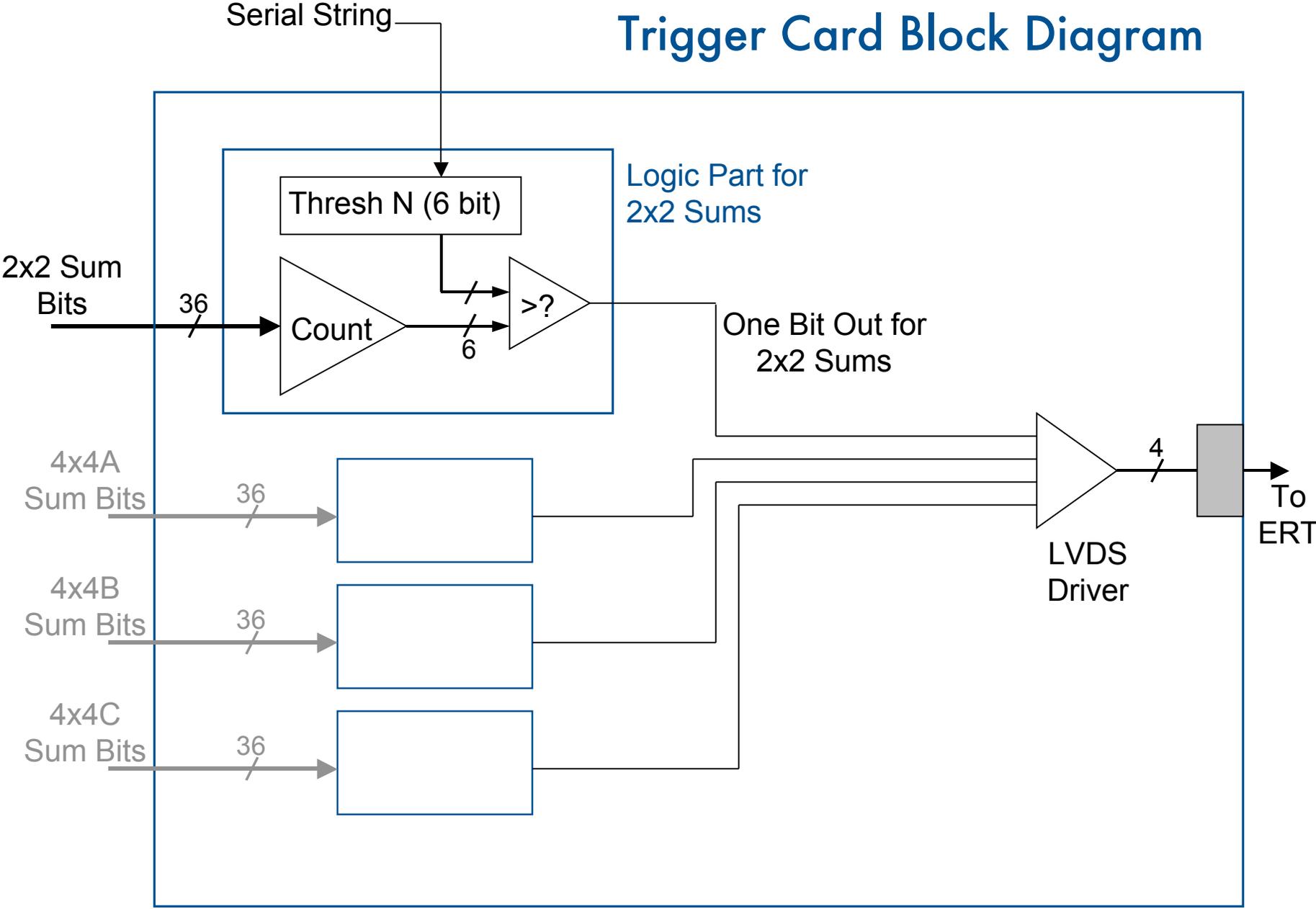
Analog signals from each 2x2 group of PMT's are added together.



Each 2x2 sum is compared to a programmable threshold, yielding 36 trigger bits per FEM on each clock tick.

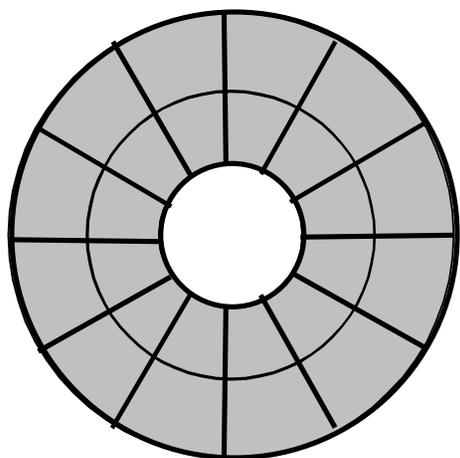


Trigger Card Block Diagram

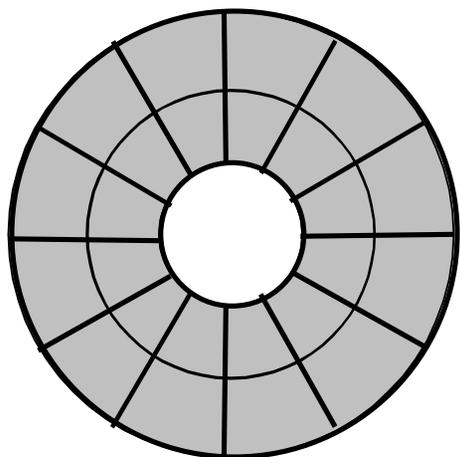


Option 0

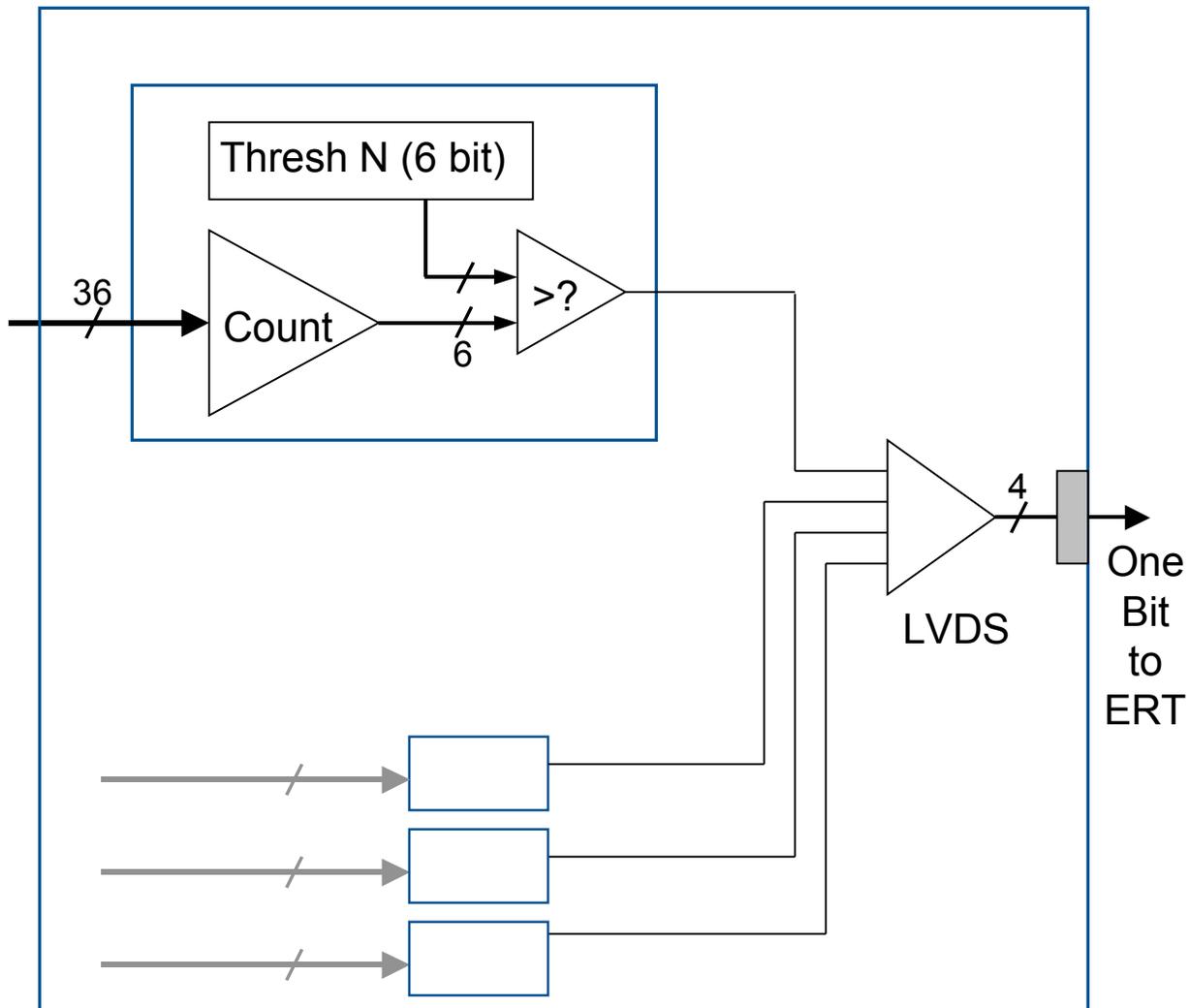
Group detector in pairs to make 24 radial slats, one into each 2x2 EMCal tile. Use existing trigger card; min-bias is effectively an OR over all 24 slats north and south.



North

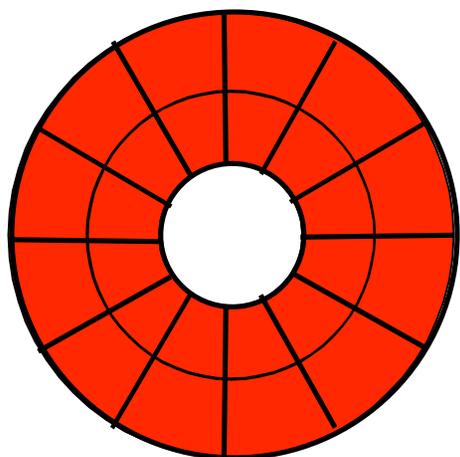


South

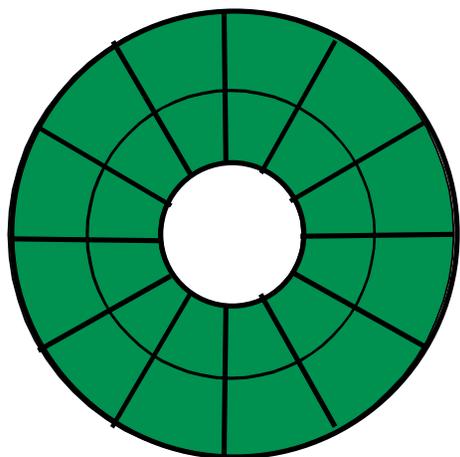


Option 1

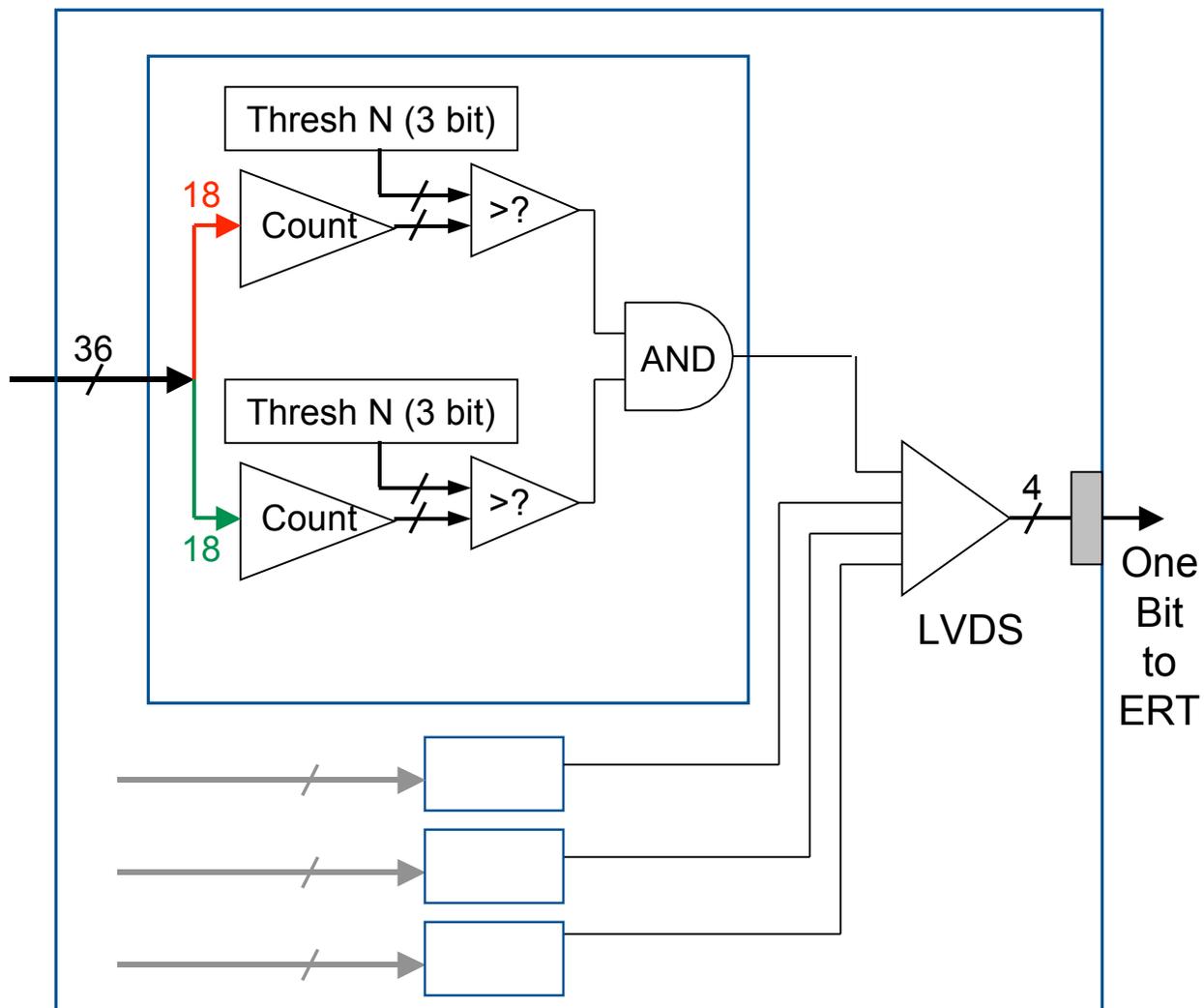
Reprogram trigger card to divide the 2x2 sum bits into two groups, and then generate their AND. Assign one half to North and one to South to allow NS coincidence trigger.



North

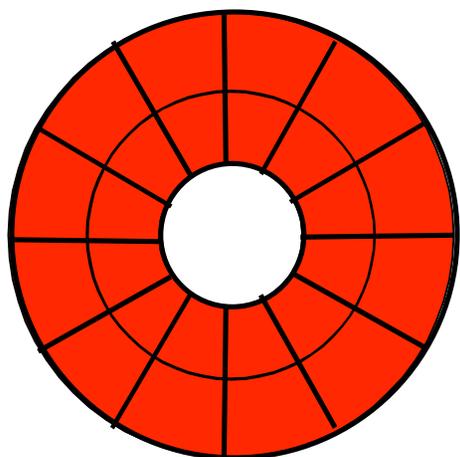


South

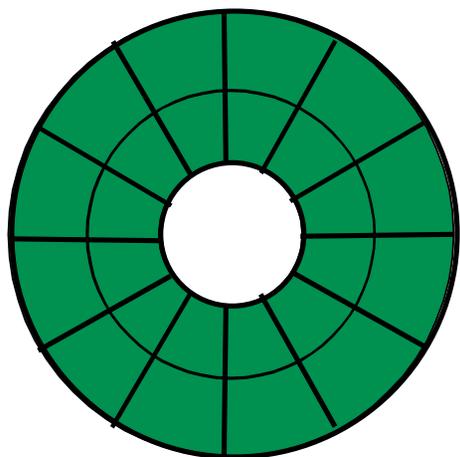


Option 2

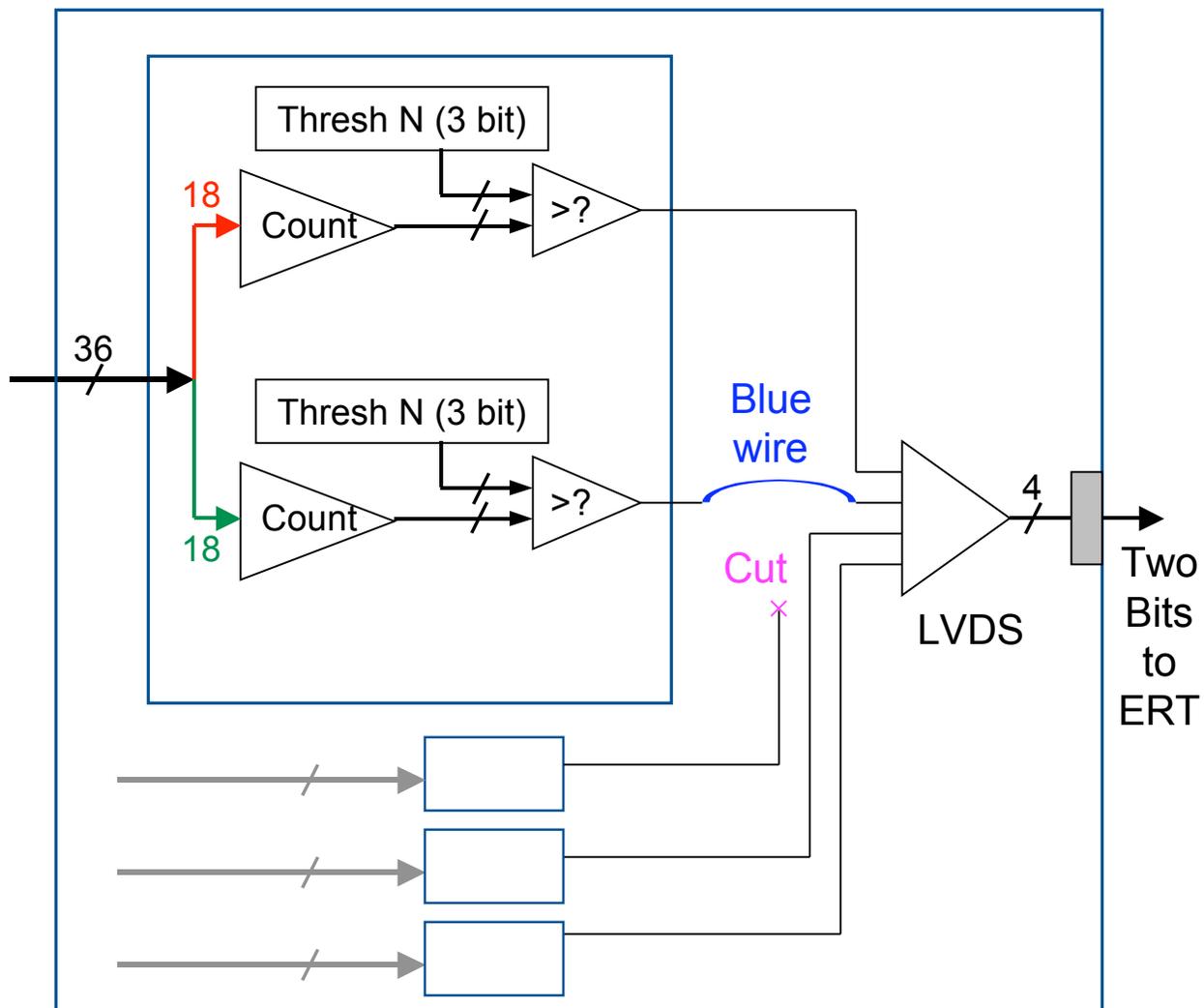
Reprogram trigger card to divide the 2x2 sum bits into two groups and output each group's comparison separately. Need to modify trigger card hardware to get two bits to ERT.



North

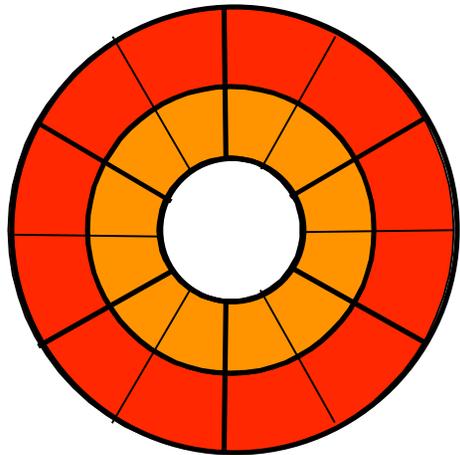


South

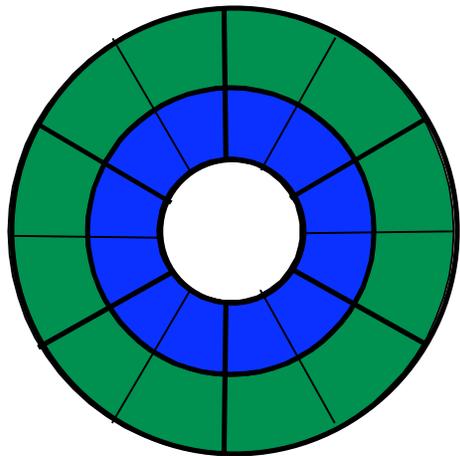


Option 3

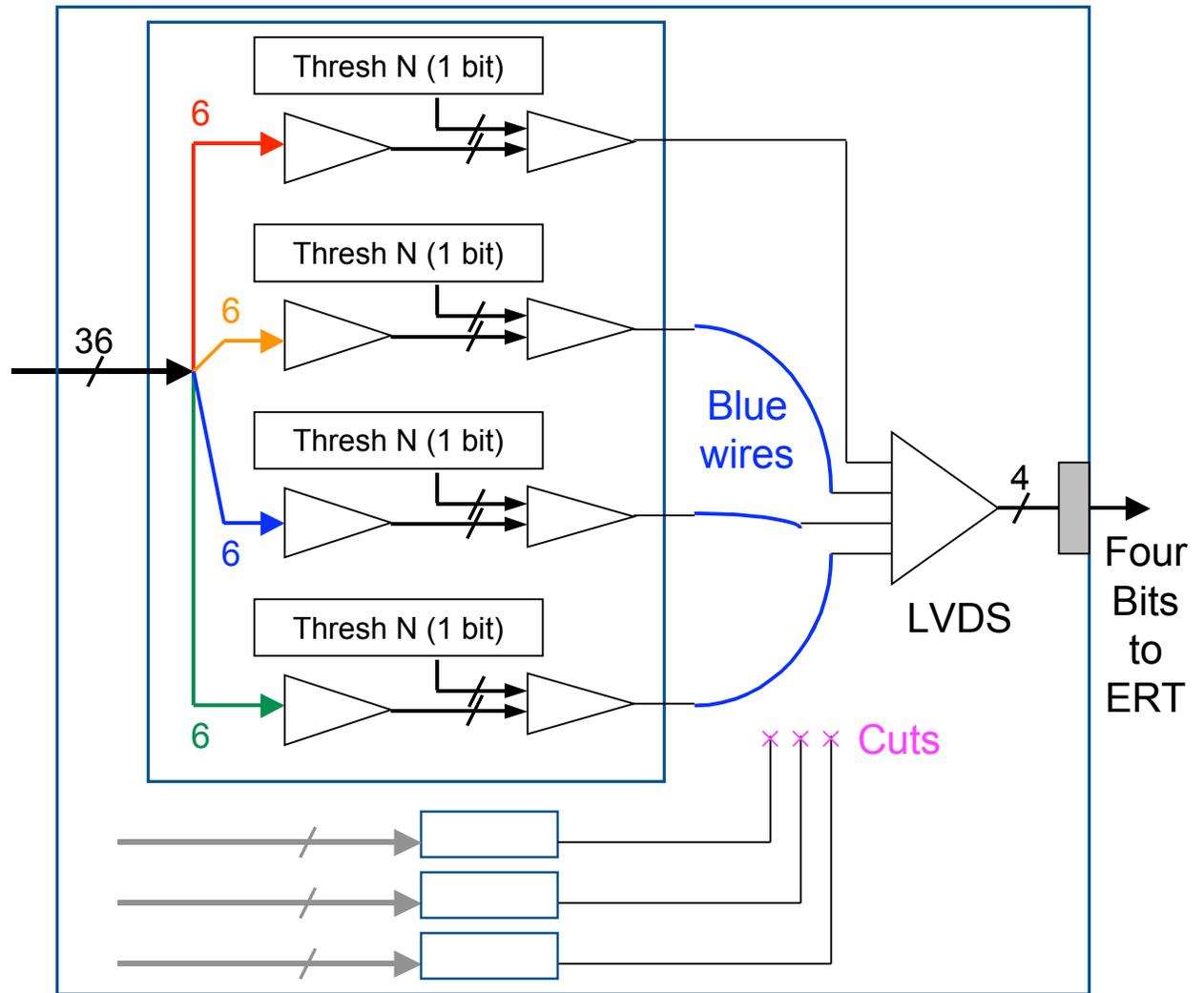
Reprogram trigger card to divide the 2x2 sum bits into four groups and output each group's comparison separately. Group detector elements into 6 pairs per inner/outer ring.



North



South



Comparison of options:

Advantages Drawbacks

Option 0: Needs no modification of existing system
Cannot distinguish North/South, Inner/Outer

Option 1: Can form N-S coincidence; no hardware modification
Need re-programming; relatively inflexible

Option 2: N,S send to ERT separately, somewhat more flexible
Need re-programming and hard-wire modification

Option 3: Maximum flexibility, [N/S] x [Inner/Outer] to ERT
Needs most re-programming and hard-wire work