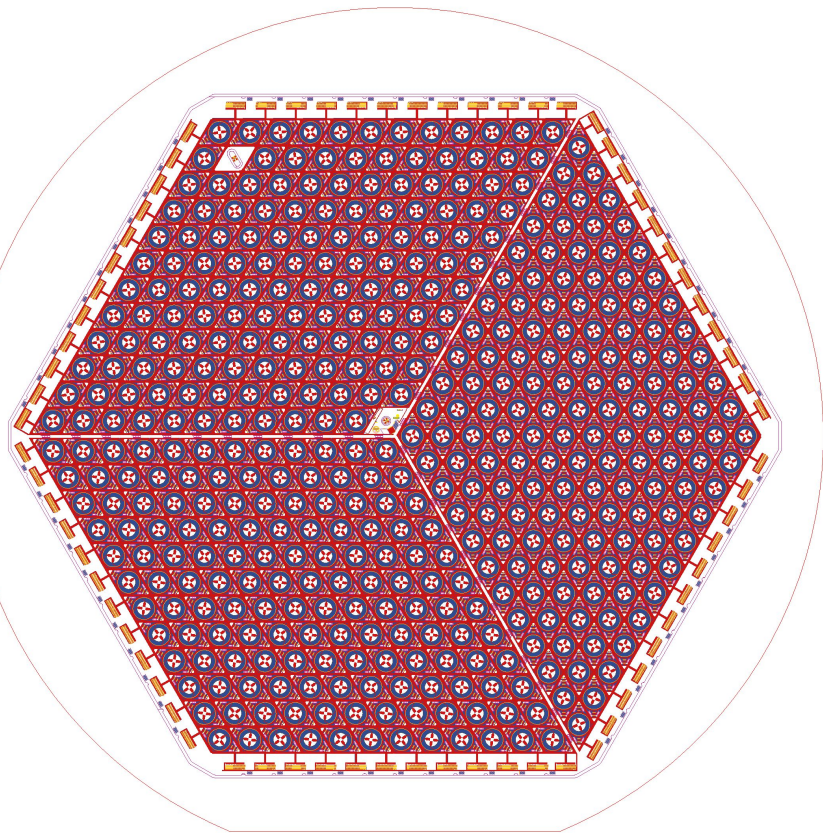


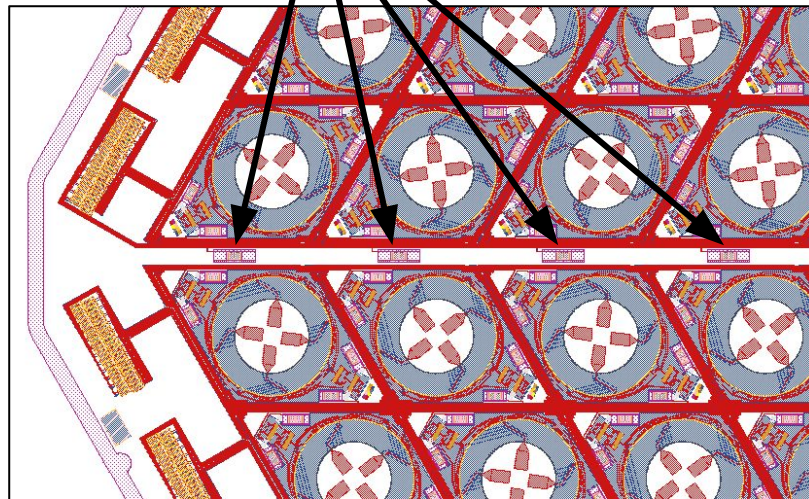
# NIST dark TESs

Shannon Duff  
CMB-S4 Detector Layout Workshop #1  
3/31/21

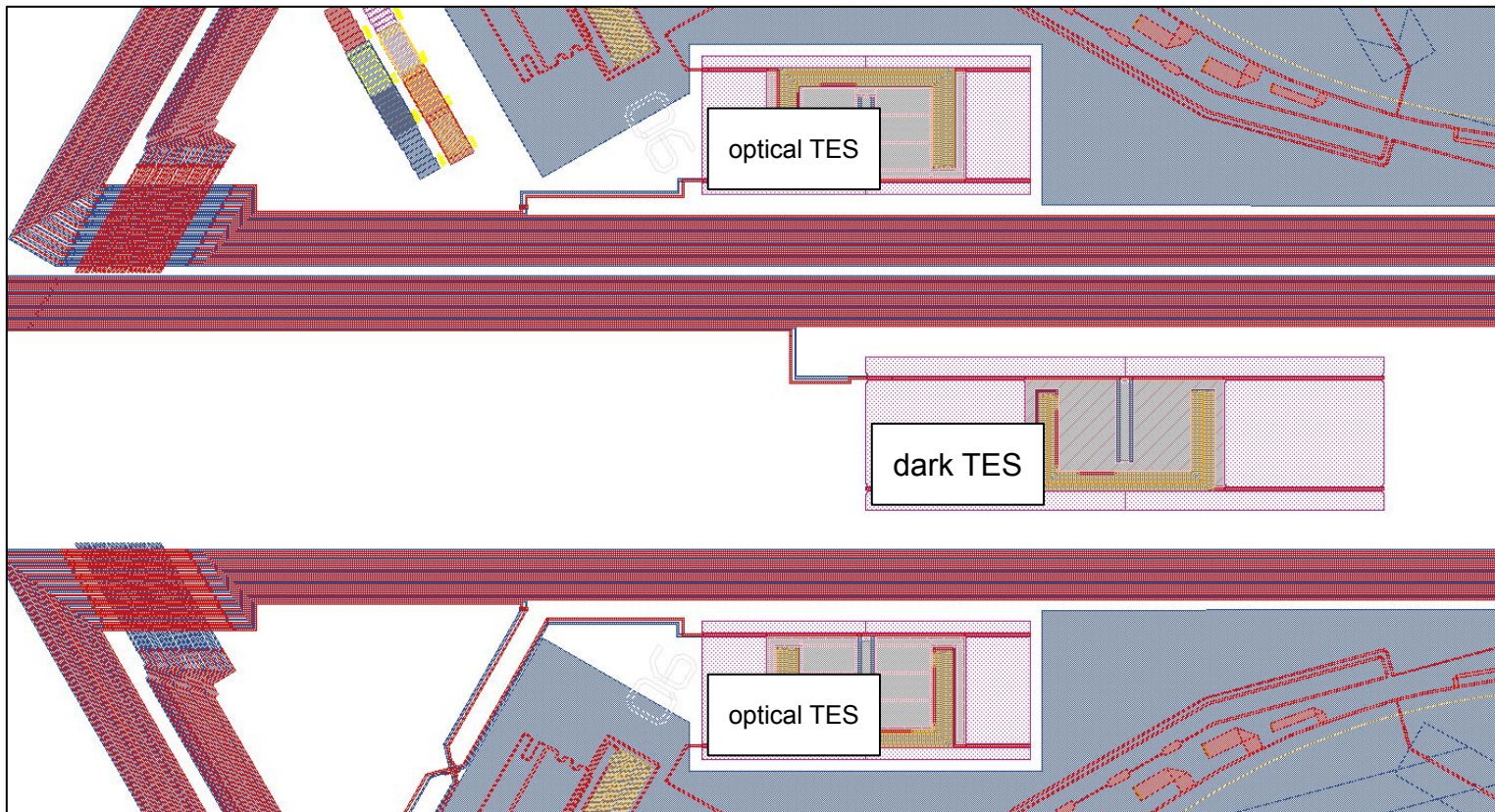
# Dark TESs in rhombus layout



- The gaps between each of the three large rhombus are ideal places for dark TESs
- For a  $12 \times 12 \times 3$  pixel array (432 - 2 total optical pixels), currently implement 36 dark TESs
  - One dark TES per column

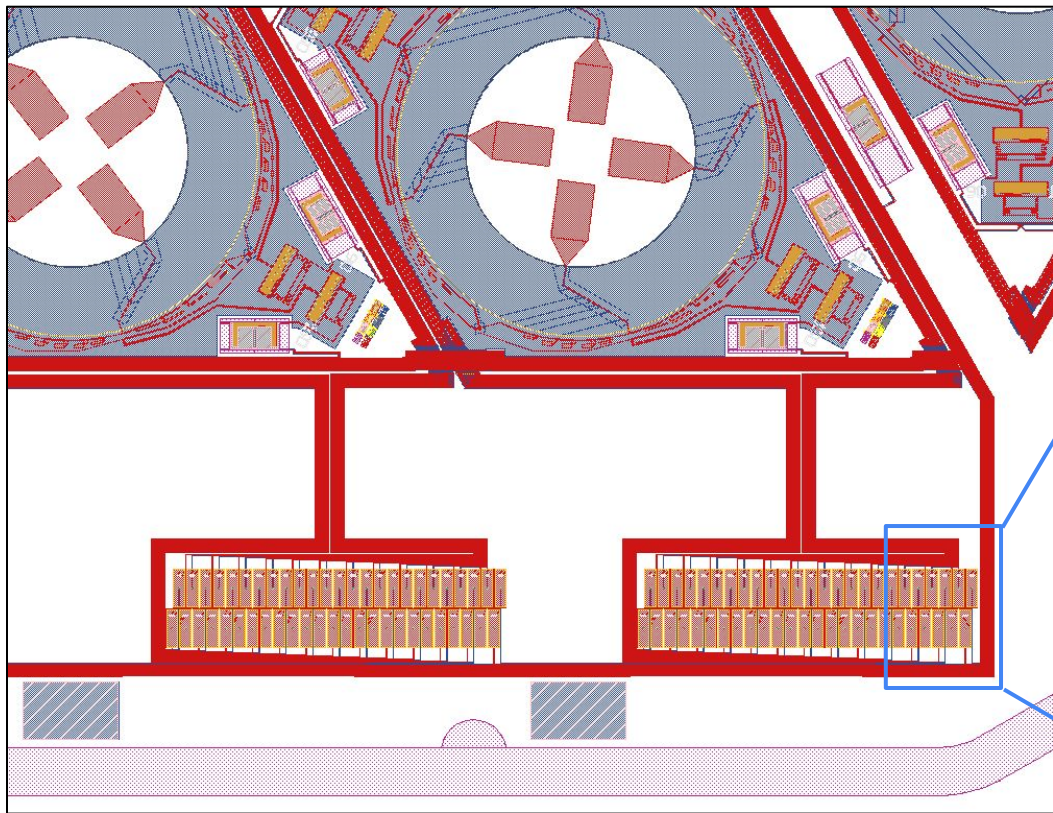


# Wiring for dark TESs

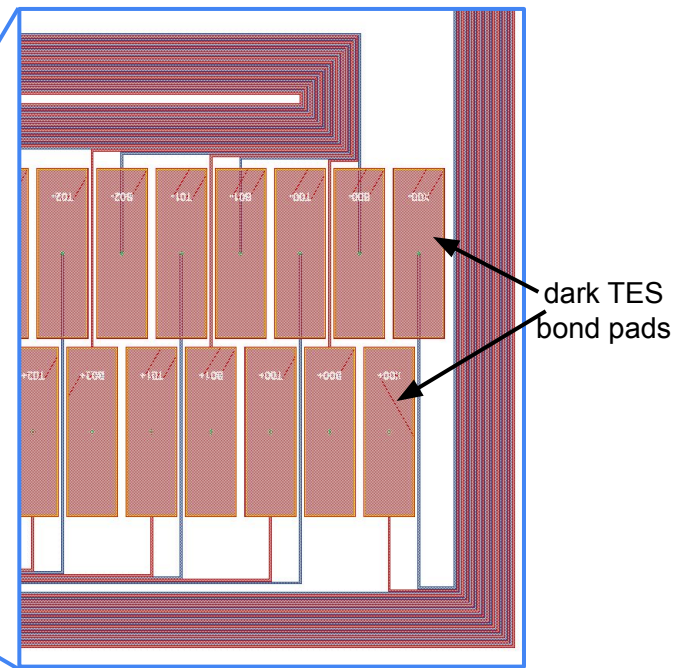


- Bias line bus for dark TESs is separate from bias line bus for optical TESs
- Dark TES is designed with lower  $P_{\text{sat}}$  than optical TES of same frequency band, enabling biasing at same point

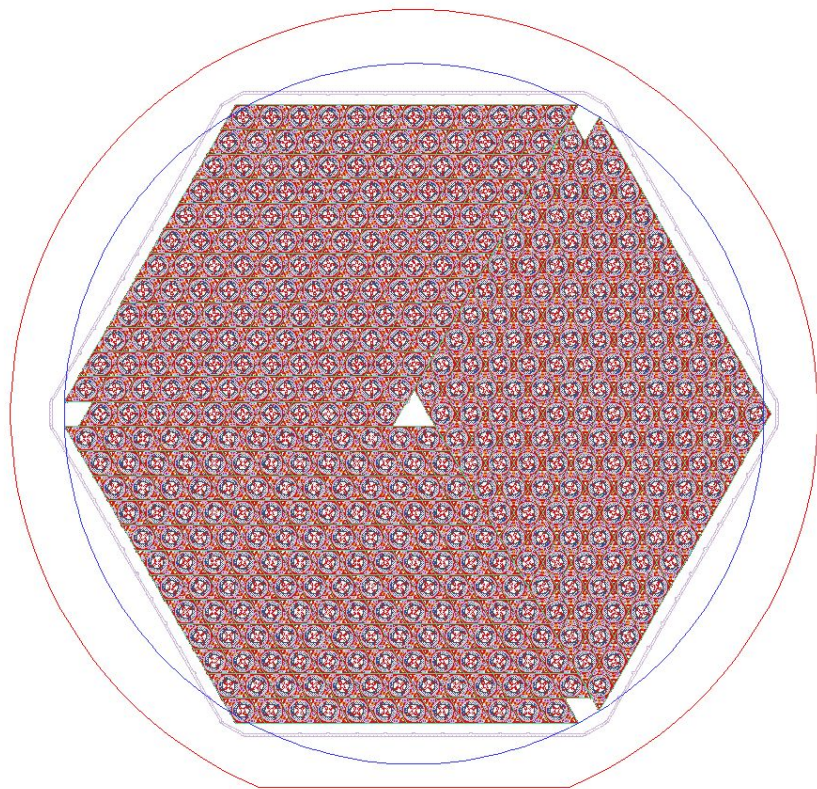
# Bond pads for dark TESs



- 3 of 6 edges have bond pad sets with 25 pairs
- 25th pair is for dark TES

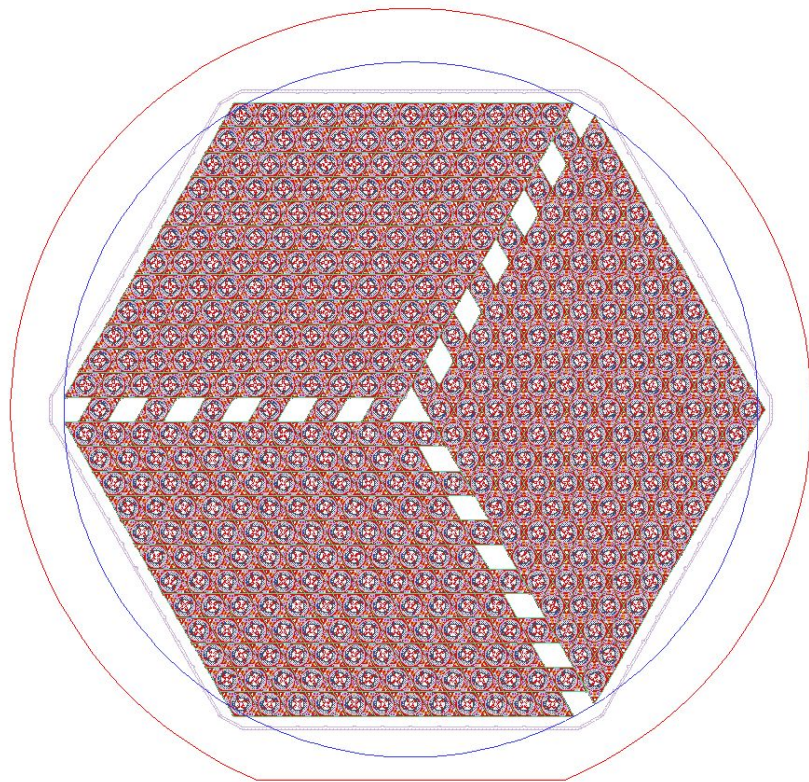


# Dark TESs in hex layout, idea 1



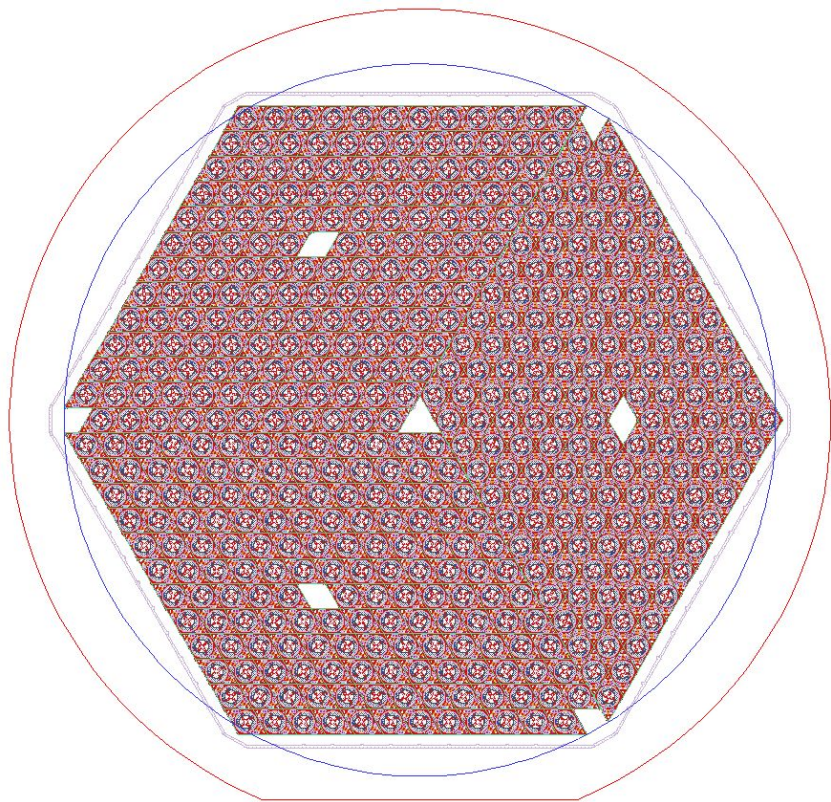
- Drop funny corner optical pixels, add dark pixels with dark TESs
  - Total optical pixels 468 - 3
- Consider utilizing one corner pixel for slot alignment feature, center region for pin alignment feature
- Allows for ~6-12 dark TESs depending on dimensions
- All dark TESs near edge

# Dark TESs in hex layout, idea 2



- Drop some number of radially placed optical pixels for dark pixels with dark TESs
  - Total optical pixels 468 - 18?
- Consider utilizing dark pixels for pin and slot alignment features
- Consider utilizing dark pixels for backshort posts
- Allows for up to 4x #pixels dark TESs
- Radial distribution of dark TESs

# Dark TESs in hex layout, idea 3



- Drop funny corner optical pixels and a few pixels closer to center, replace with dark pixels with dark TESs
  - Total optical pixels 468 - 6
- Consider utilizing corner dark pixel for slot alignment feature and center region for pin alignment feature
- Consider utilizing dark pixels for backshort posts?
- Allows for up to ~28 dark TESs depending on dimensions