Forward Tracker Tilings: Simulation and Reality

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Tiling Requirements

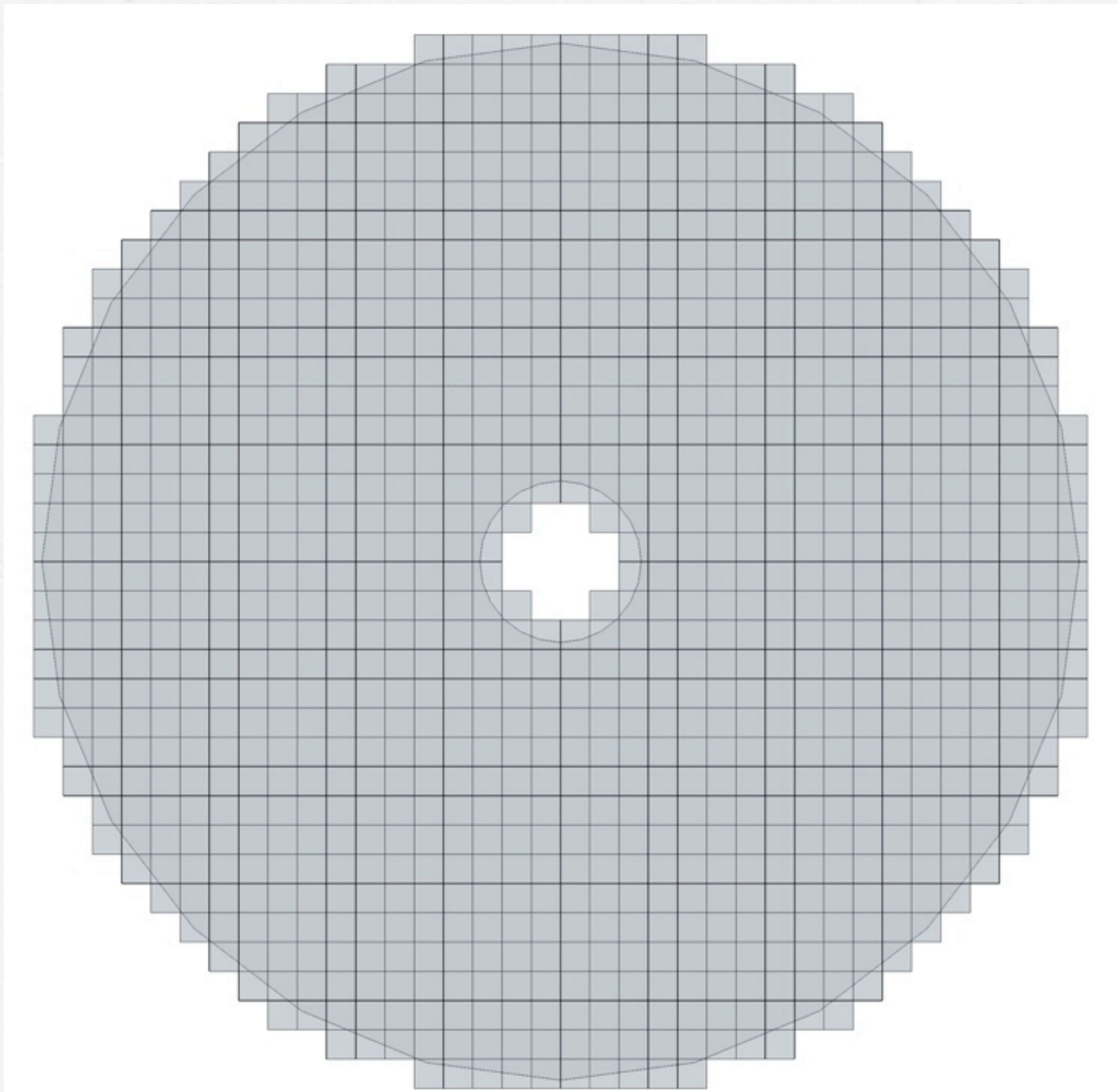
- For simulation, should be simple, generated from a few parameters, rather than an extensive lookup table
- Should span space of possible tilings we would consider building, allow testing of different reconstruction philosophies
- Must define both tiling and strip angles

An Example

- Layer 5
  - $r_{inner} = 20.7$ cm
  - $r_{outer} = 125.0$ cm

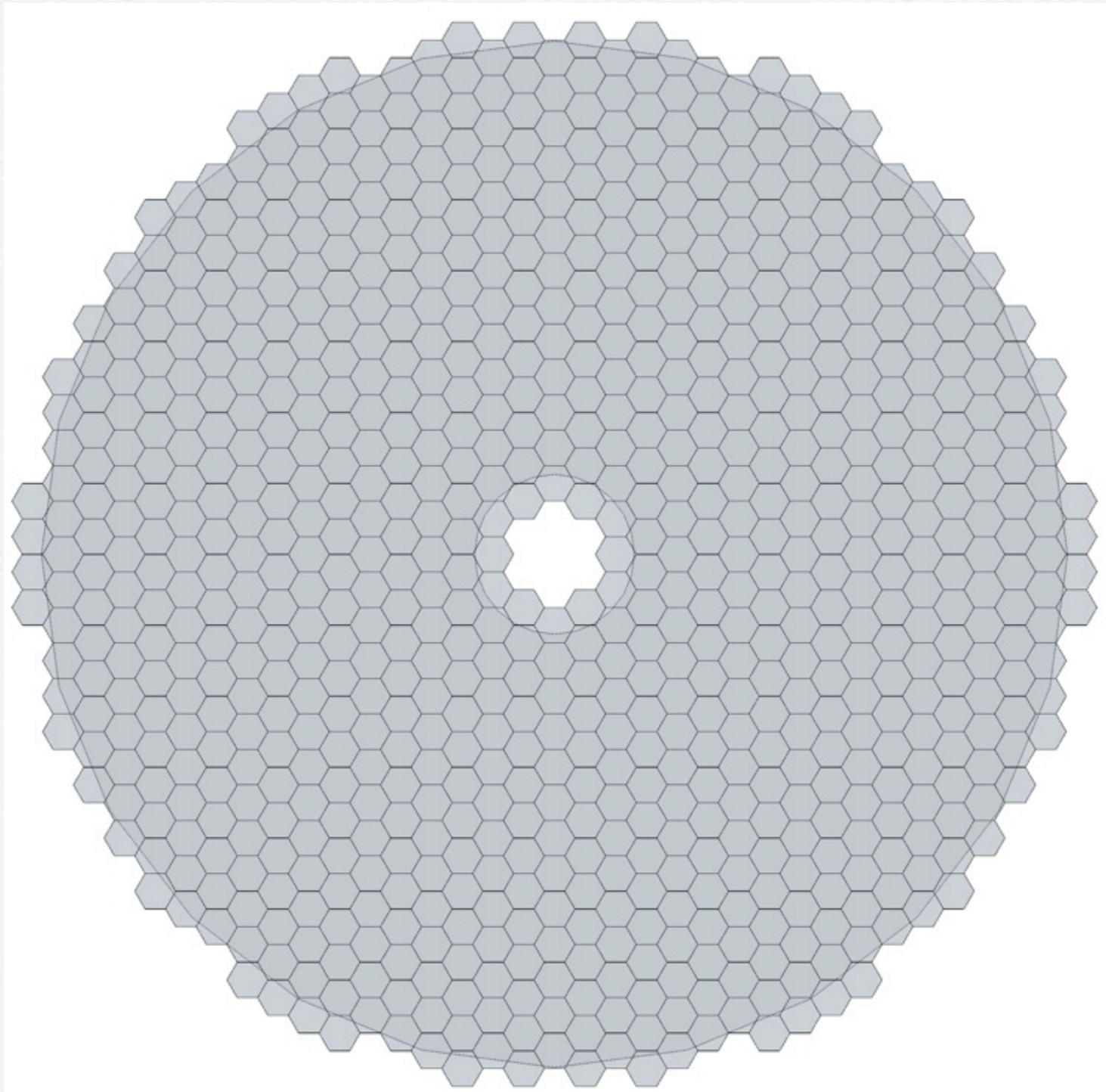
Squares

- ~10 cm linear dim.
- 90-degree stereo
- requires many small module types to avoid large dead regions



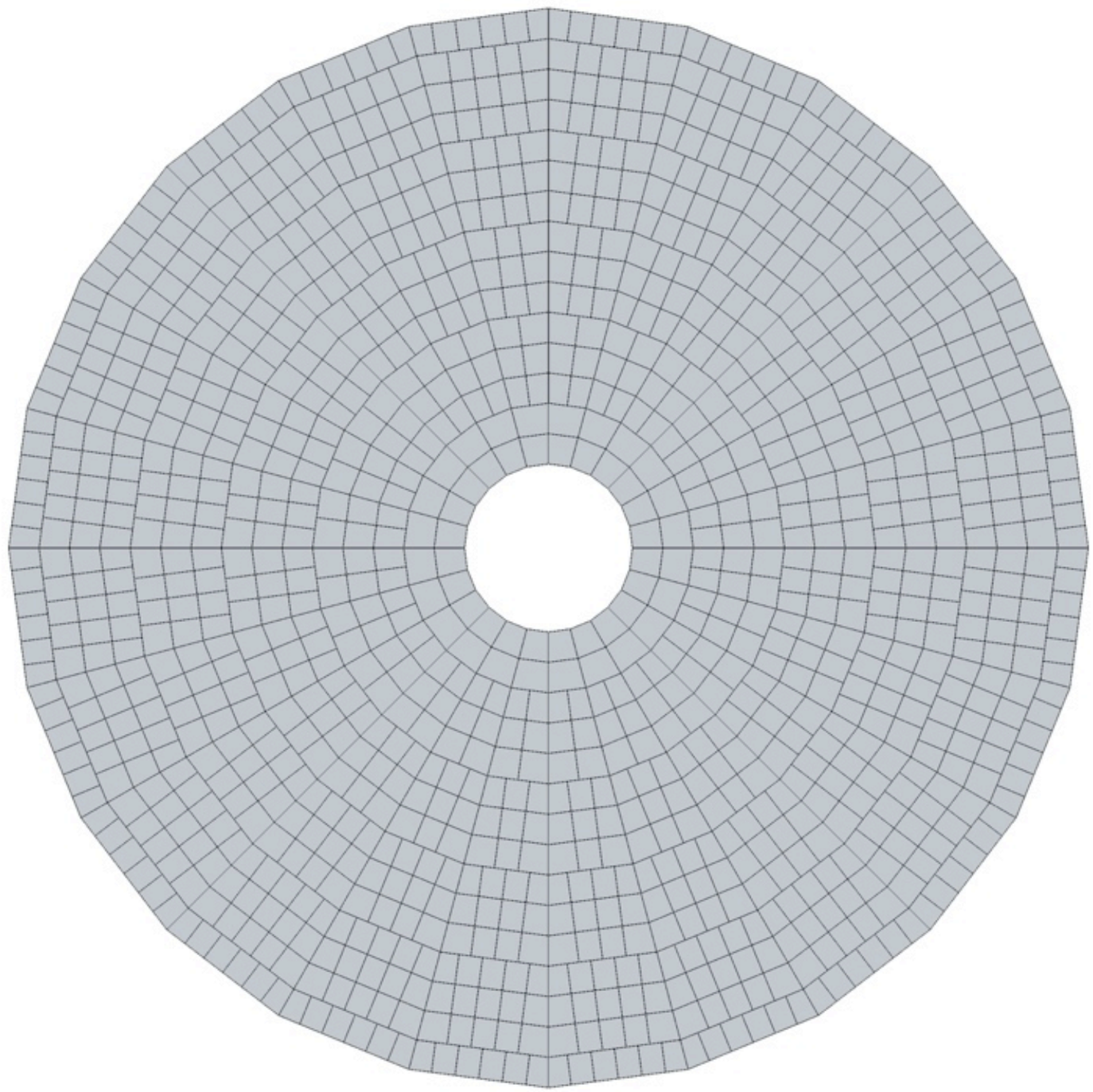
Hexagons

- ~10 cm linear dim.
- u-v-w
  - L1: uv
  - L2: vw
  - L3: wu
  - L4: uv
  - L5: vw
  - L6??
- requires many small odd-shaped modules to avoid large dead regions



Wedges

- ~10 cm linear dim.
- 6 sensor types
- 15-degree stereo
- single-sensor modules reasonable
- good coverage of annular region



Conclusions (Aug. 06)

- Need a small number of schemes that tile annular regions of endcaps with strips: these seem like a reasonable set

- Propose to use these as a starting point, probably beginning with squares, for their simplicity

(This assumed some kind of "virtual tiling" since we lacked infrastructure for realistic tracker geometries)

Needed Infrastructure

- With new geometry engine in place, have tools to do any realistic geometry with overlaps.
- Recent updates simplify Geomconverter code for new detectors by unifying conversion for both simulation and reconstruction
- Some new shapes required:
  - Trap, Trd recently added for wedges
  - Still need to add support for hexagons

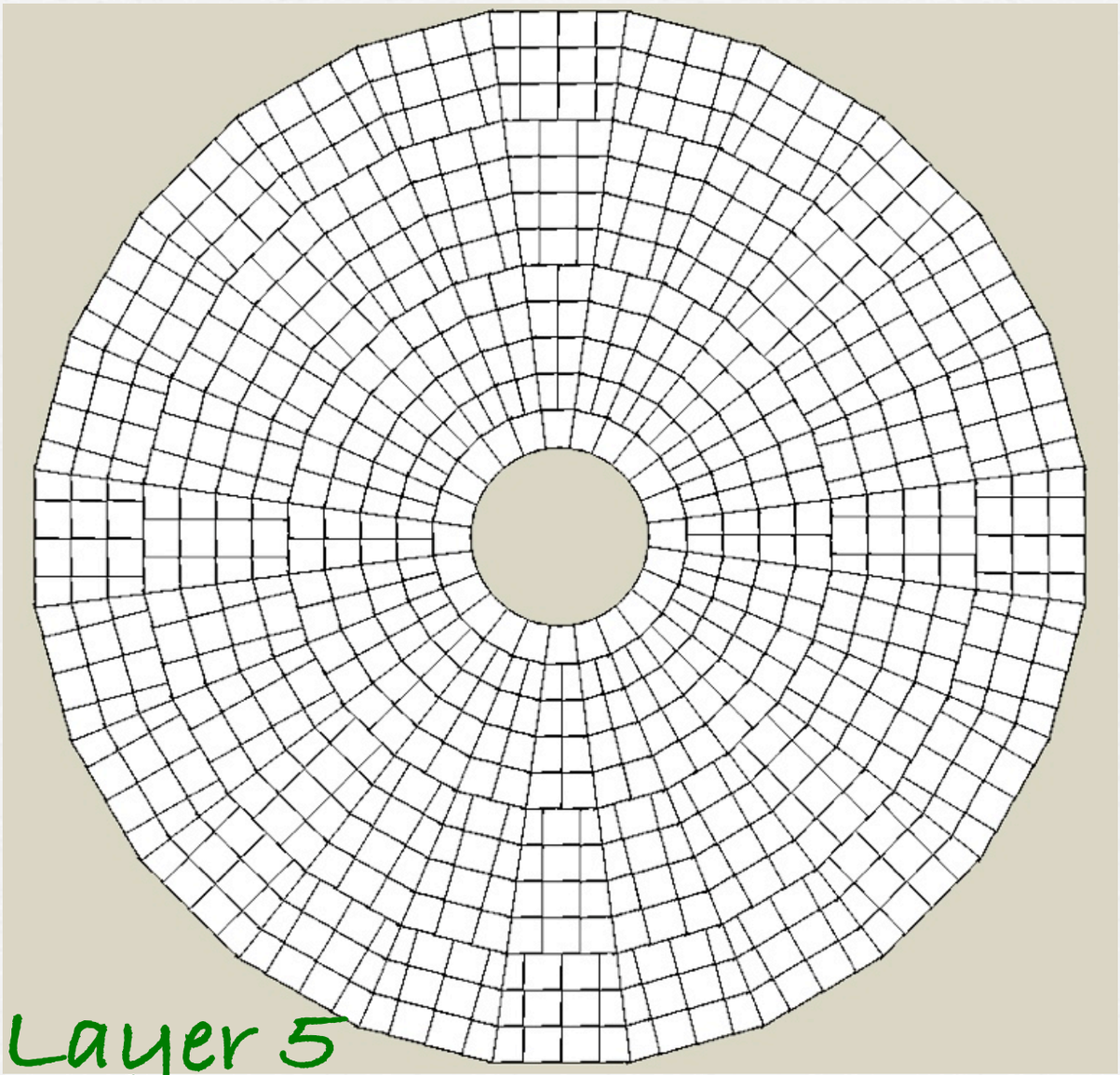
Where to Begin?

Mechanically, wedges are simplest

- easiest to provide full coverage
- barrel support concept extends naturally: squares and hexagons are very awkward to support from edges of tiles, requiring support elements glued to face of silicon

Detailed Wedge Design

- 6 sensor designs
- sensors fit within usable 134mm diameter of 6" wafer

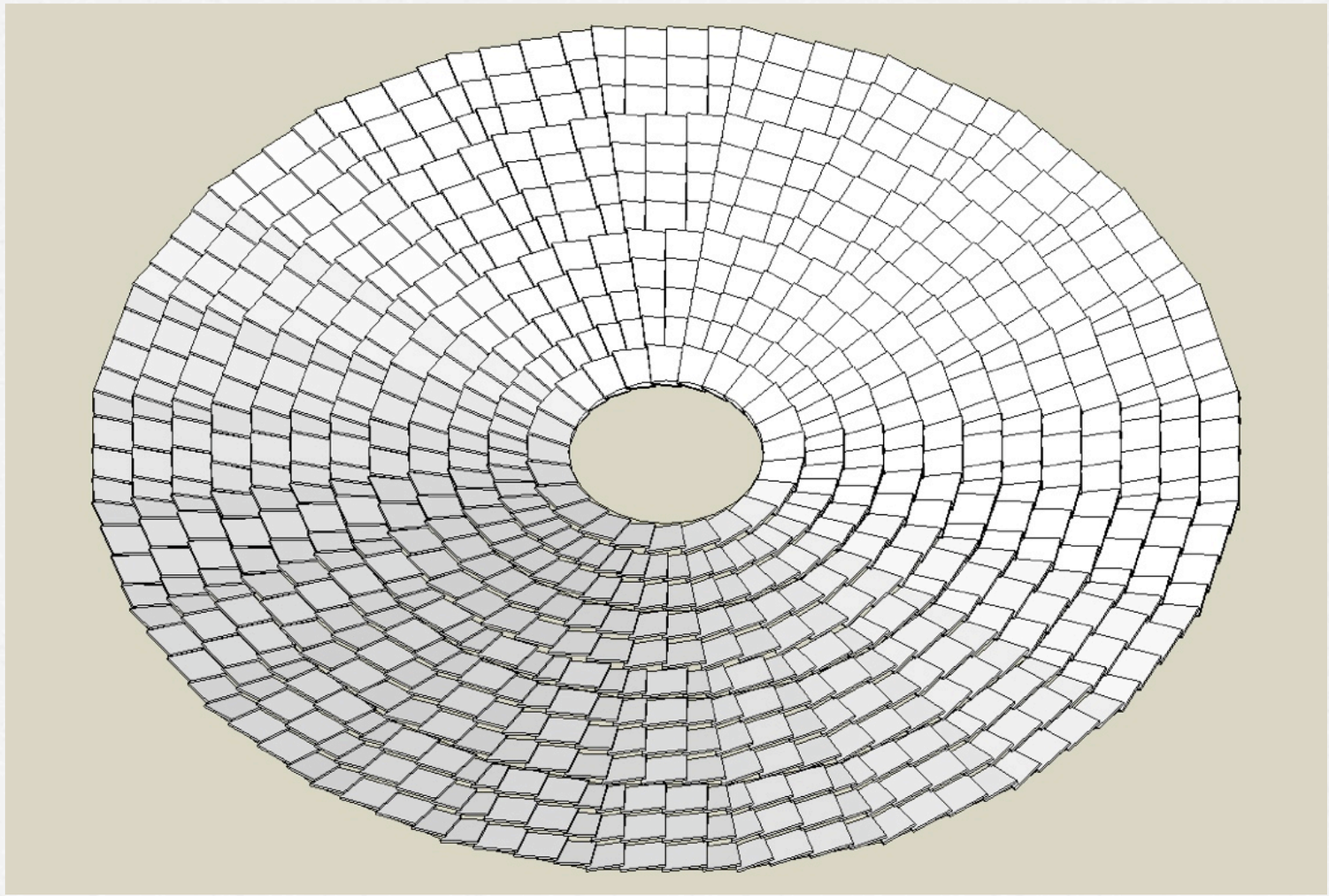


Layer 5

Detailed Wedge Design

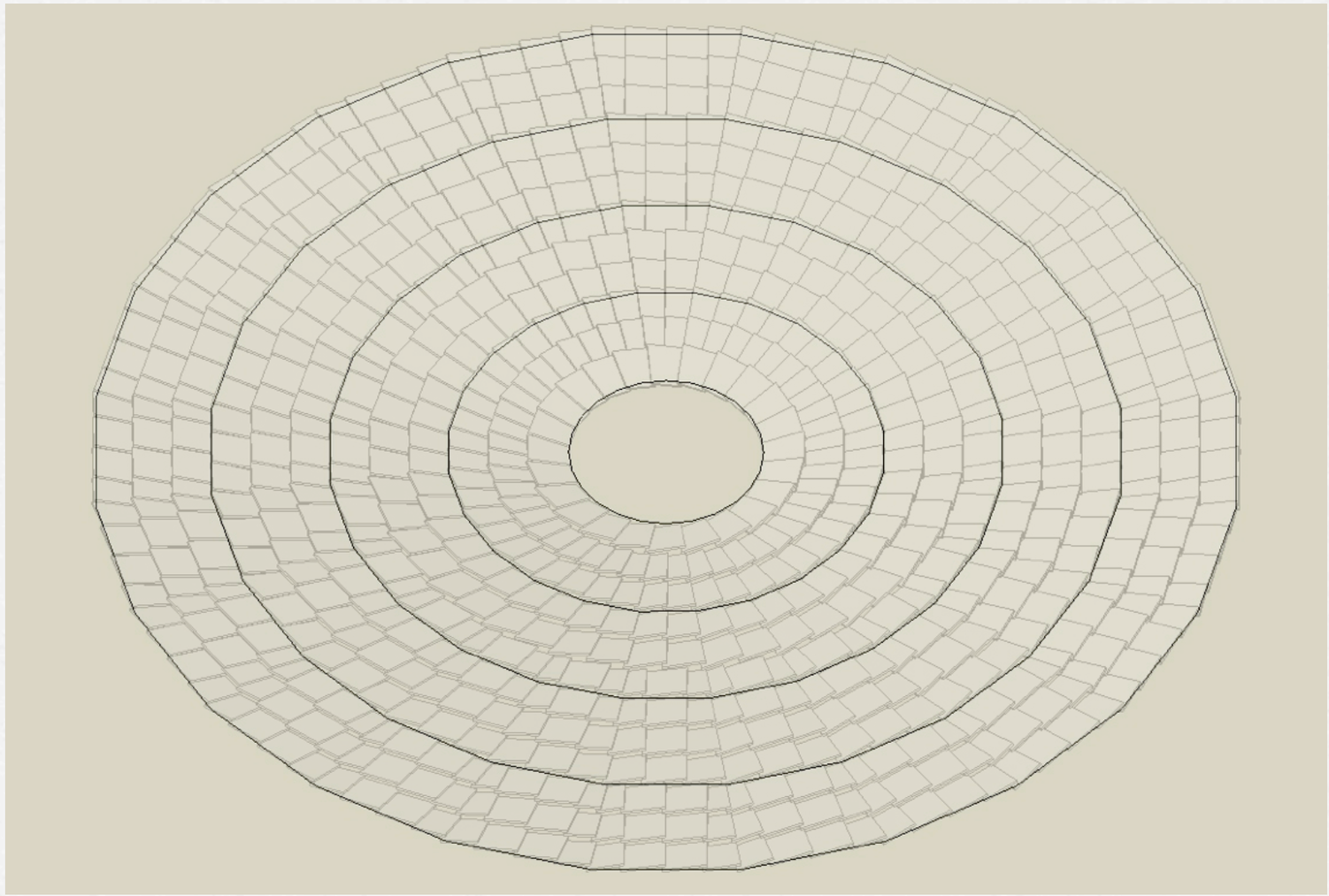
Similar to barrel

- similar modules
- Tilts allow for overlap
- same support concept

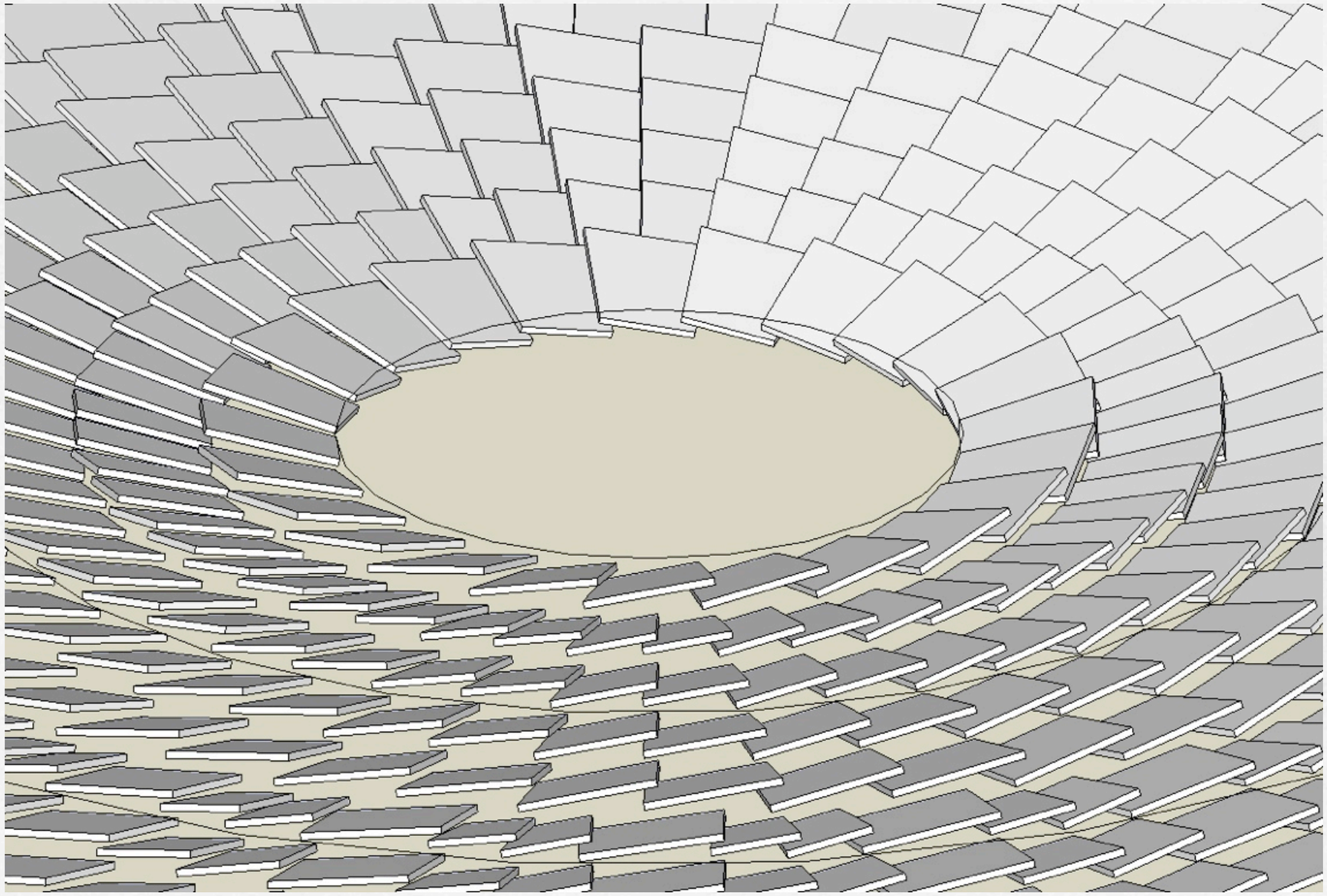


Detailed Wedge Design

Same modules work for all layers



Detailed Wedge Design



Summary

- Tools in place for generating detailed geometry, digitized charge deposition in silicon strips
- Additions to geometry made to support wedges, straw-man wedge design nearly complete.
- With Jeremy, plan to implement this design as soon as it is complete
- Must to decide on changes and compromises necessary to code squares and/or hexagons