(Some Ideas on) Tiling of Disks

Fitting rectangular sensors on round rings with different inner and outer diameters,

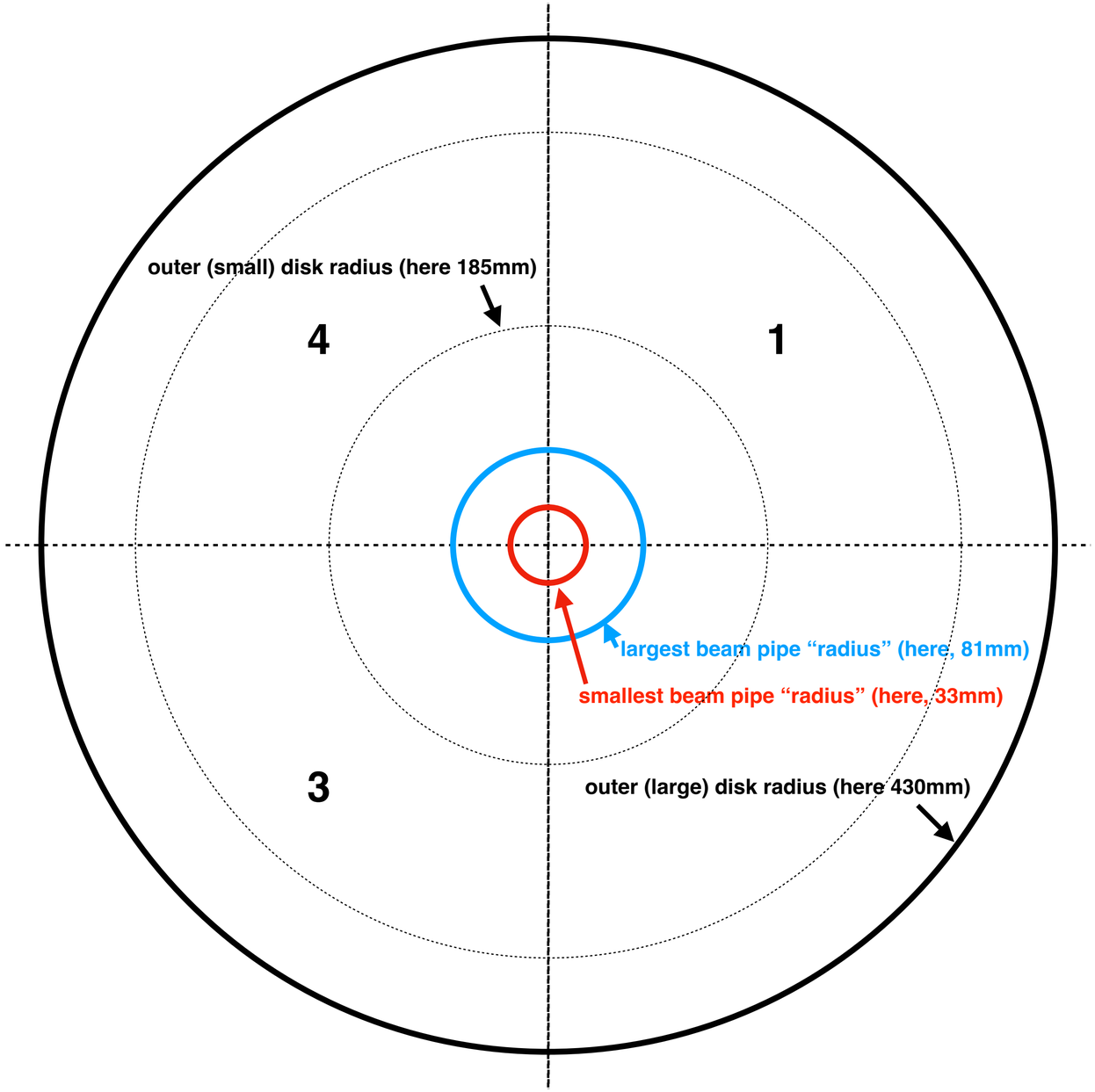
Camera-shutters or iris diaphragms will likely have too much material — not further considered here,

What follows builds on prior work by and discussions with Leo, Shujie, Walt, …; errors are my own, of course

Initial insight in how sensor stitching (and dicing) might look like — see e.g. Peter's talk earlier today,

In parts motived by a recent meeting with eRD111 colleagues — must start without full information.

Ernst Sichtermann
EIC Silicon Consortium Mtg.
April 25, 2022



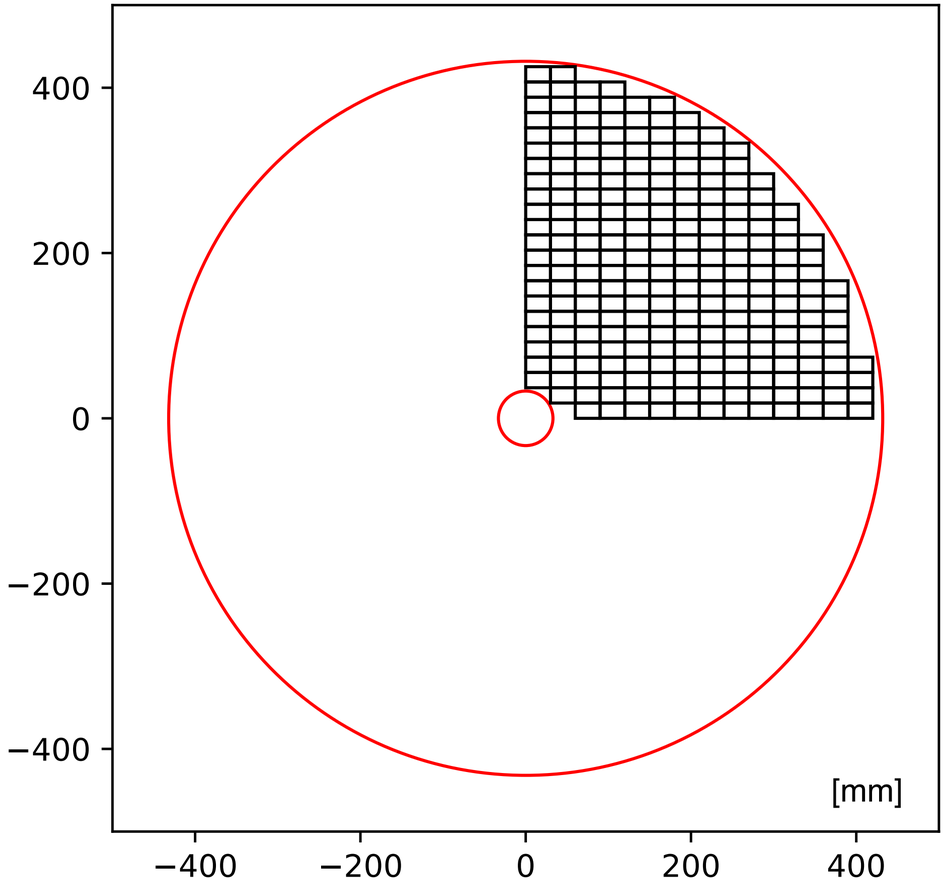
Preliminaries:

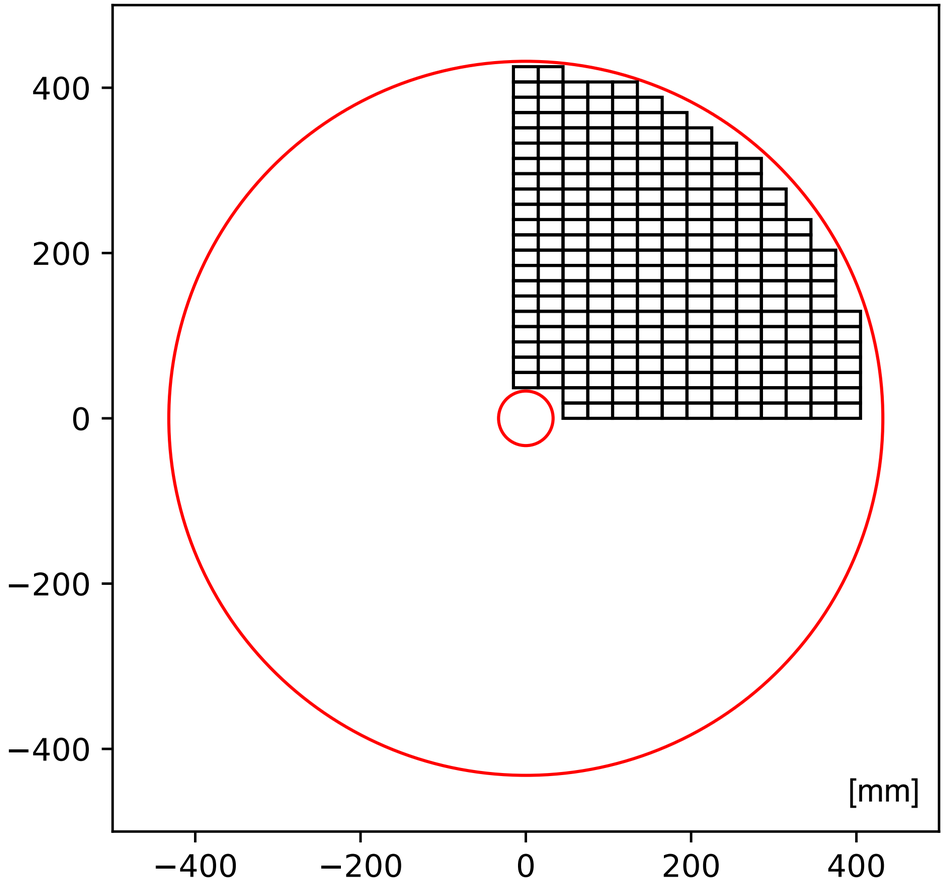
- Many not-so-well knowns;
  reticle and sensor sizes,
  beam pipe + aux.,
  …
- “*Too easy* to end up with *n* unique disk designs”,
- Beam pipe is simplified here with a circular envelope;
  refinement in progress, but no results today,
- Reticles are 18.5 x 30.0 mm (c.f. Peter’s talk) here;
  methods carry over to other sizes,

Initial considerations:

- Detector will (very) likely be constructed of halves,
- *Might* be beneficial to think in halves of halves;
  90 degree rotations
- Sensors of stitched reticles; necessary lengths and
  optimal lengths unknown
- Modules benefit from stitching and dicing; pattern
  is again to be figured out,
- Even naive modeling may help get us out of the
  conundrum of not having “all” information.

“Hole punchers”

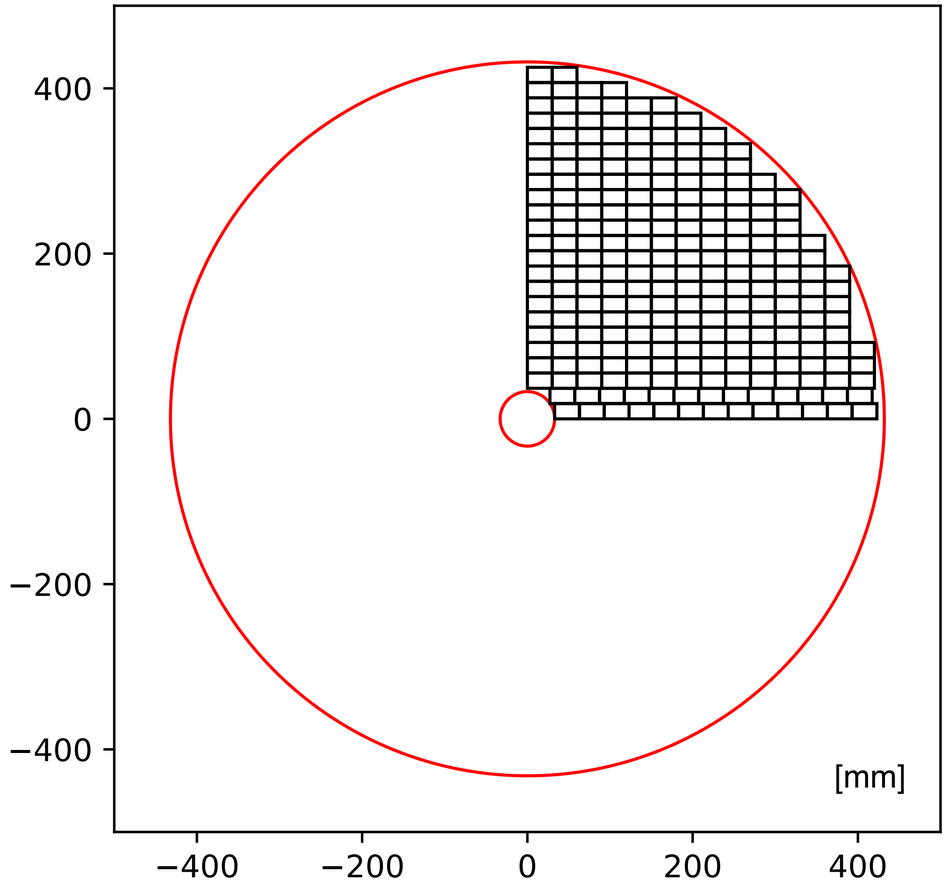


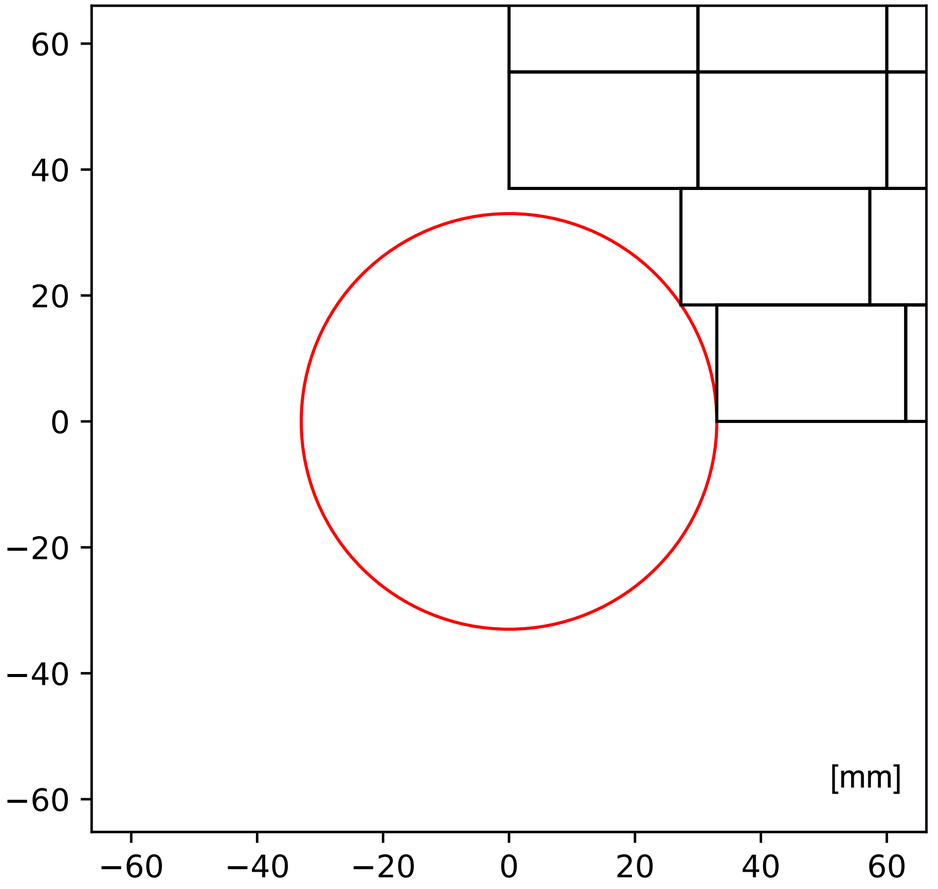


“Hole punchers” have a straightforward layout and serious acceptance issues (with a single reticle size),

By extension, similar will hold for disks constructed from staves.

“Single alignment”

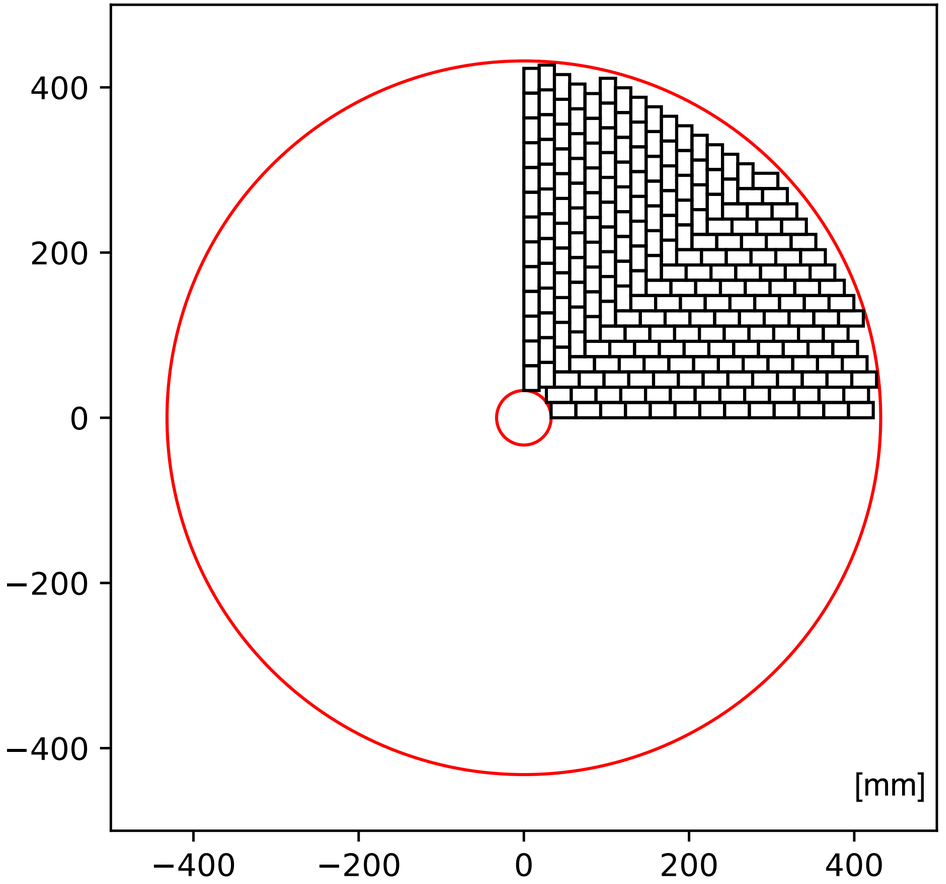


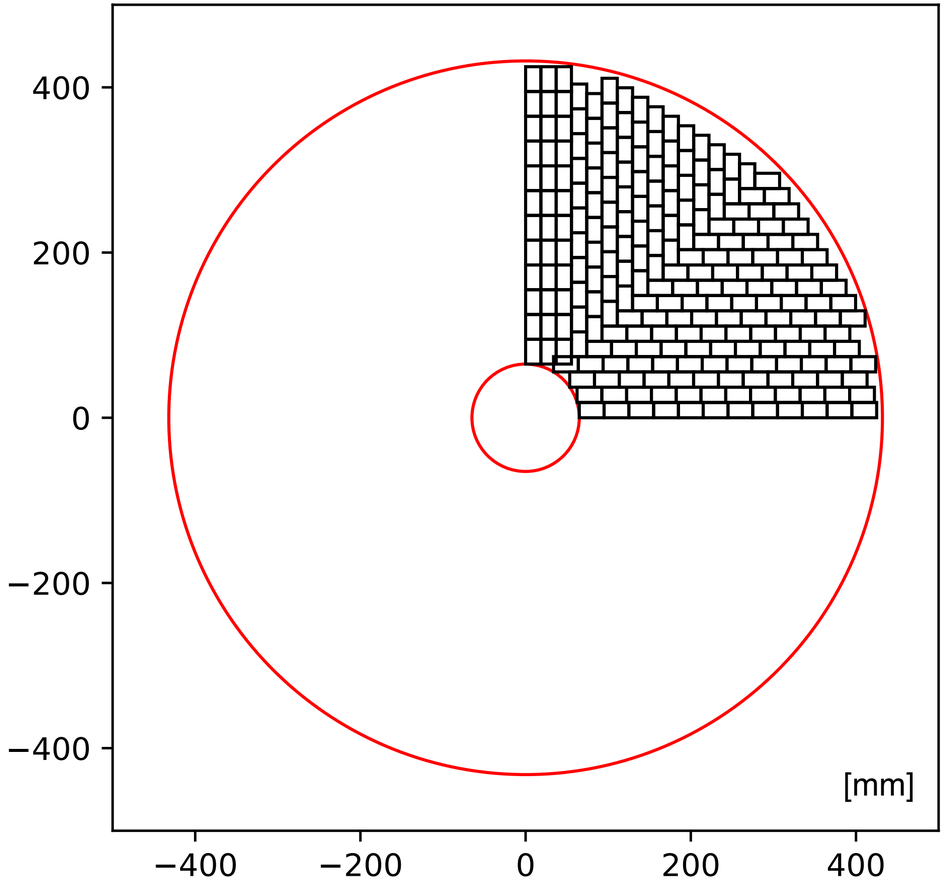


Single alignment, here horizontally, will somewhat improve the acceptance situation

Acceptance situation remains for the other coordinate, here vertical.

“Double alignment”

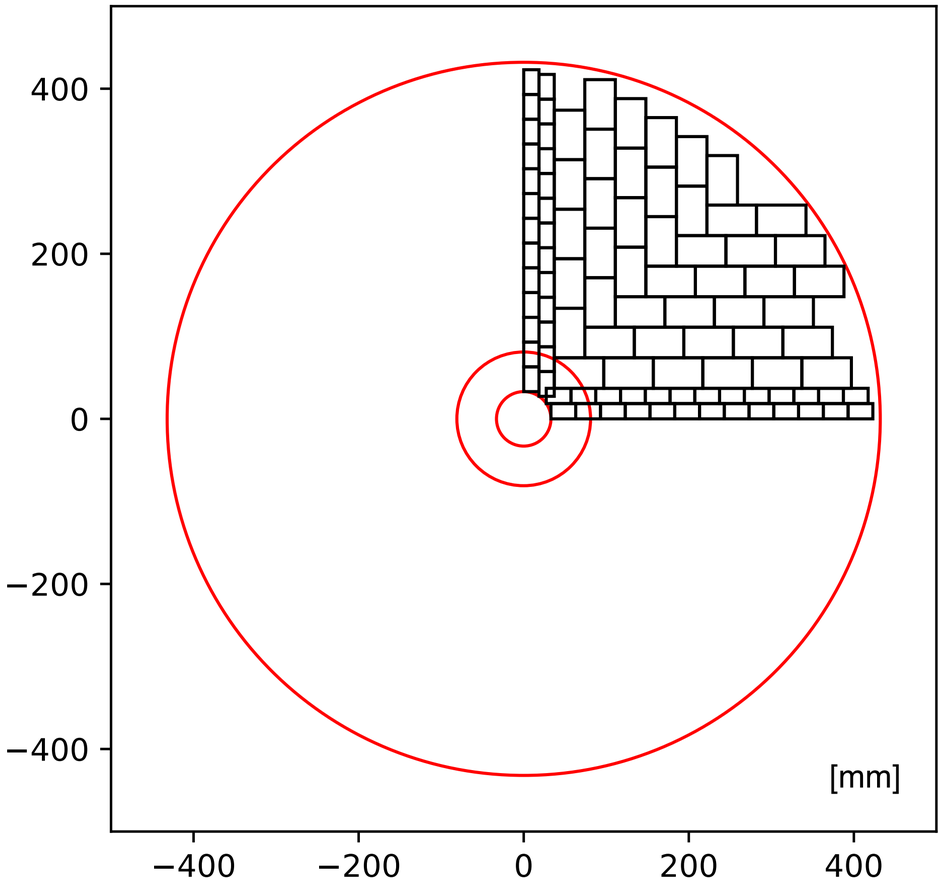


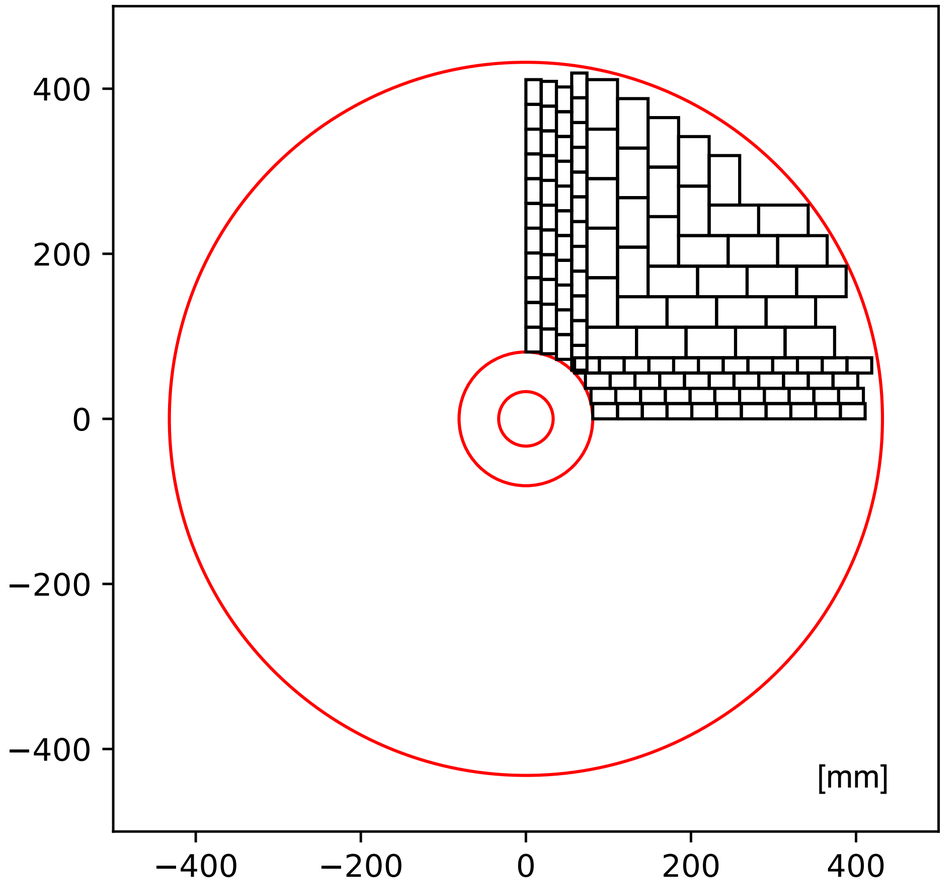


Double alignment at the inner radius can be layed-out with or without partial reticle overlap;

Extending this beyond the inner radius will result in a “herringbone” lay-out in the upper quadrant corners;

“Double alignment”

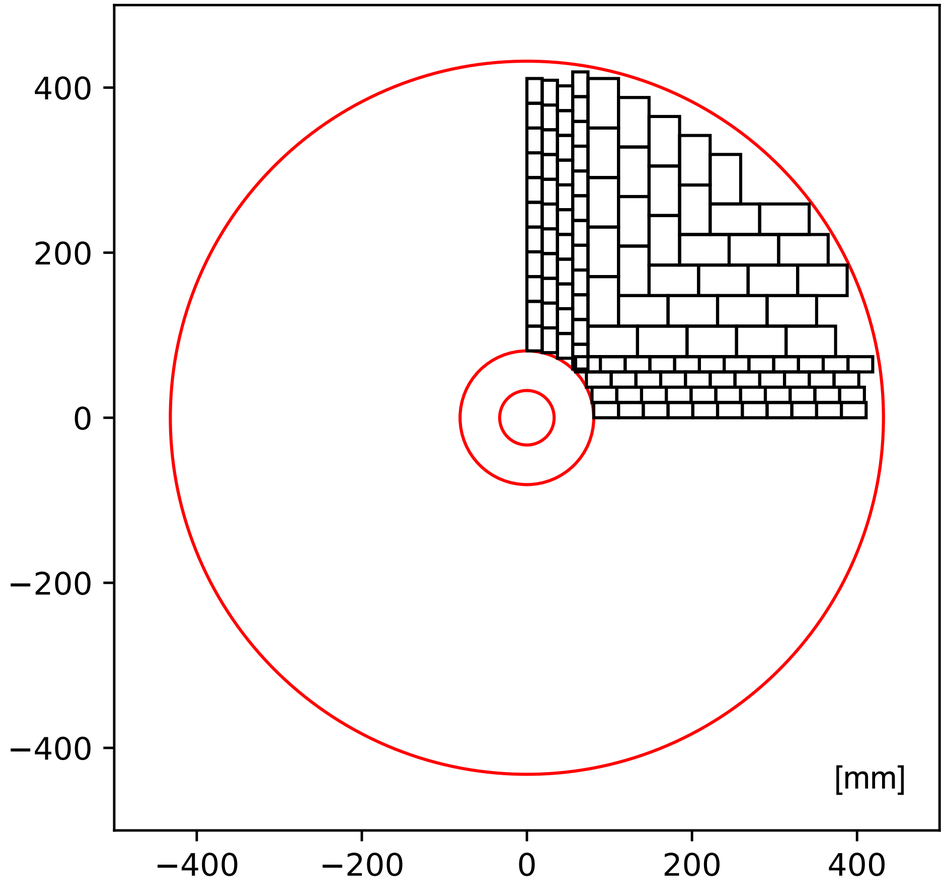


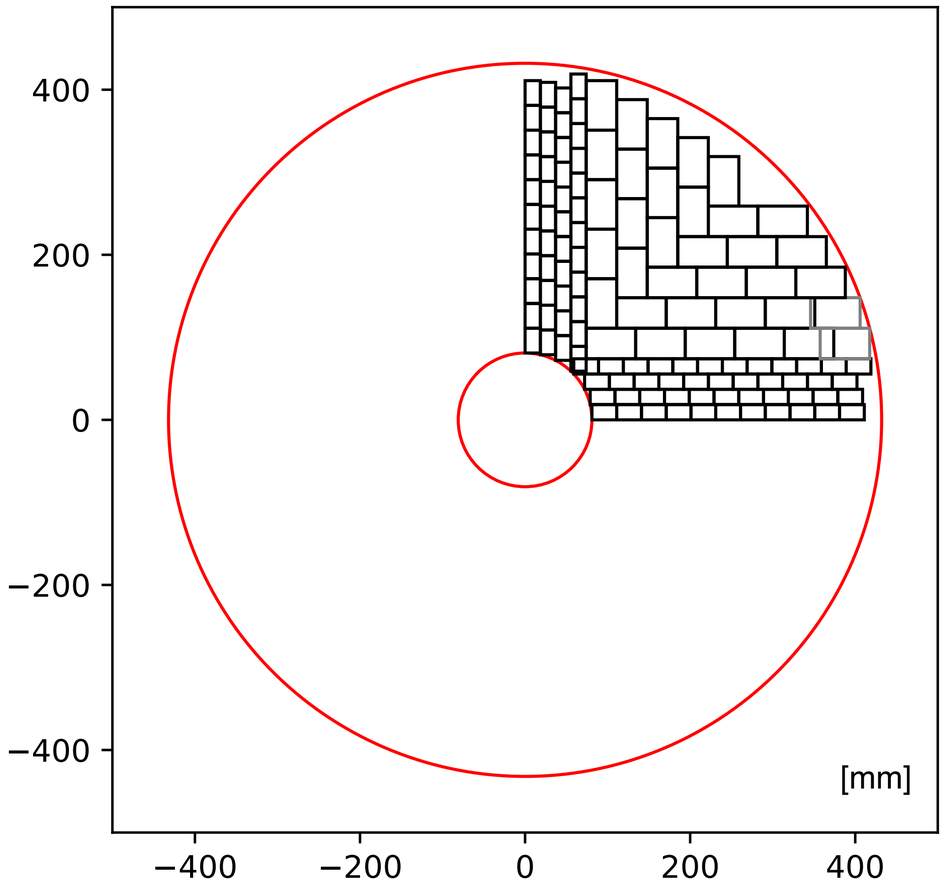


Double alignment at the inner radius can be layed-out with or without partial reticle overlap;

Extending this beyond the inner radius will result in a “herringbone” lay-out in the upper quadrant corners;

“Double alignment with overlap”

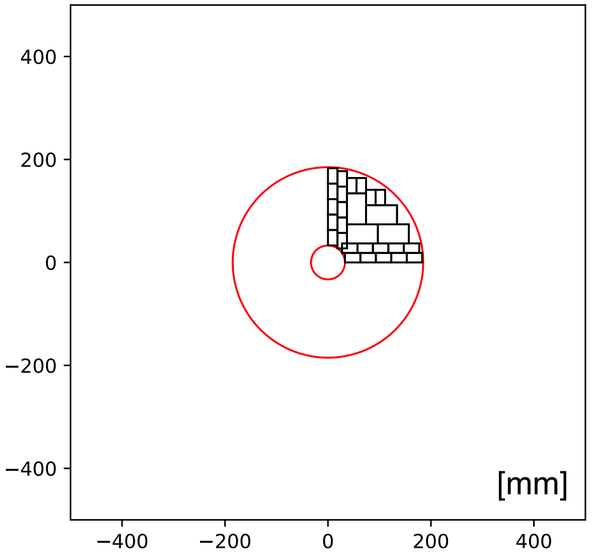


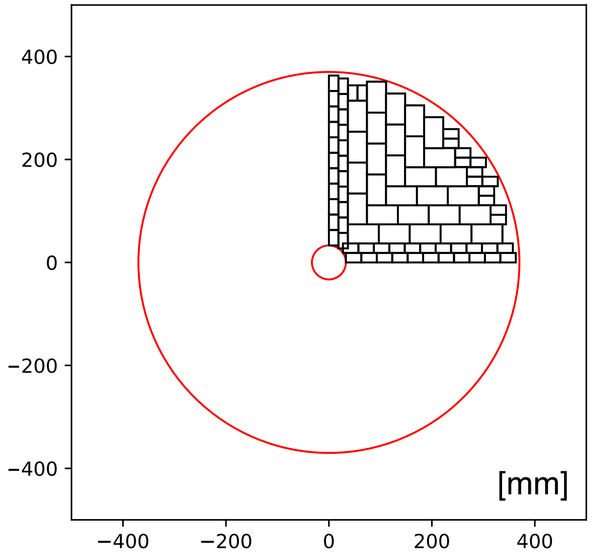


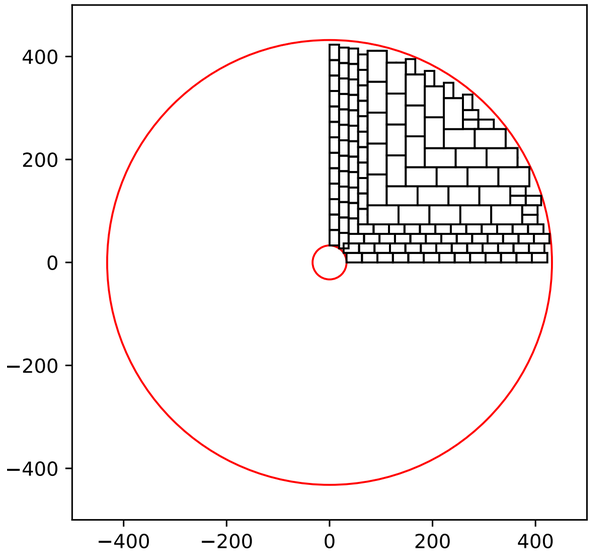
Double alignment at the inner radius can be layed-out with or without partial reticle overlap;

Outer radius acceptance can be handled by “filling in” or accepting “partial overlap.”

Disks with different inner and outer radii







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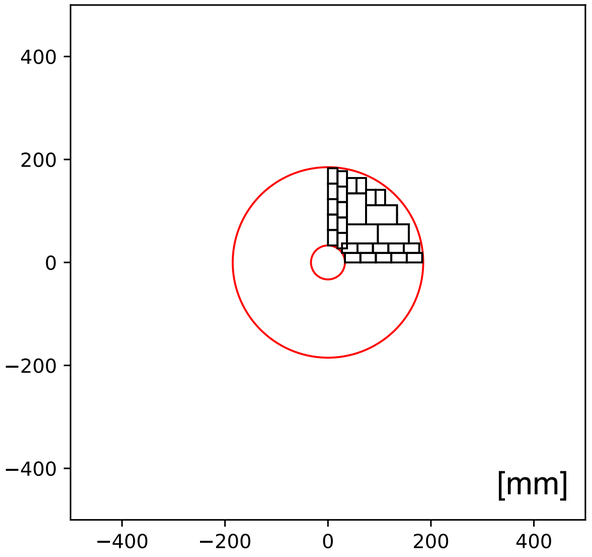

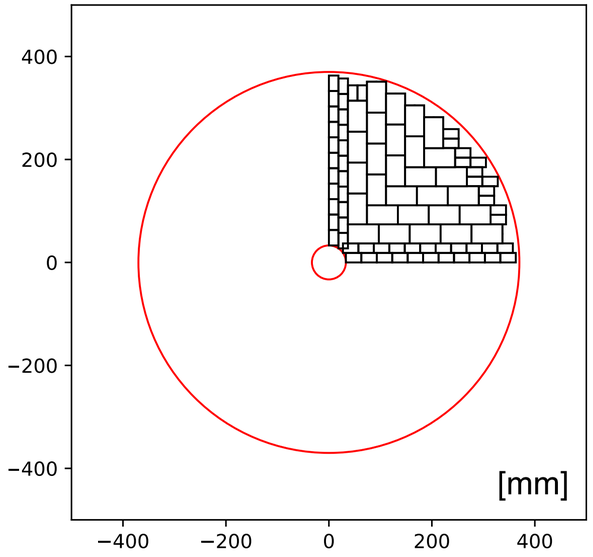

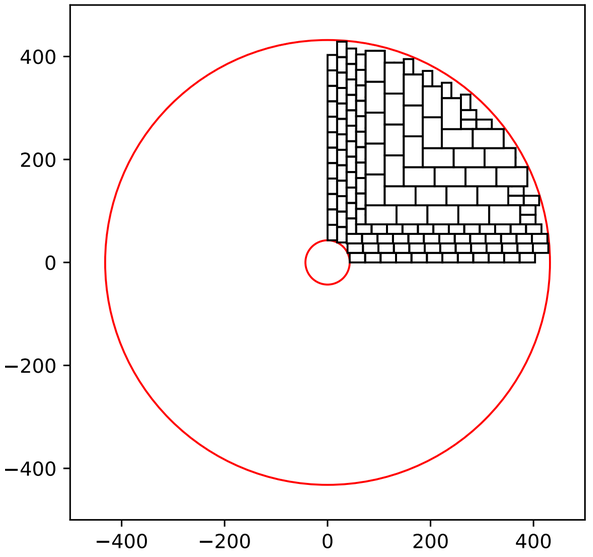

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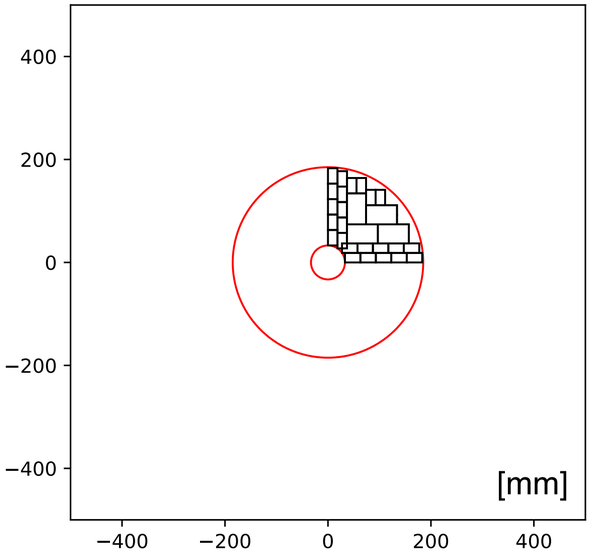

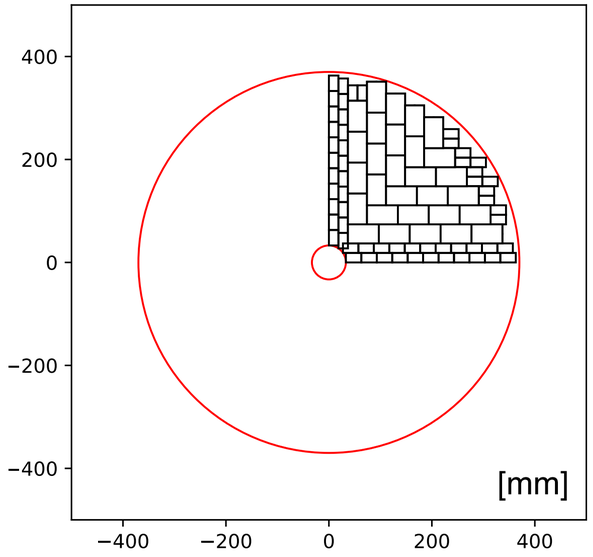

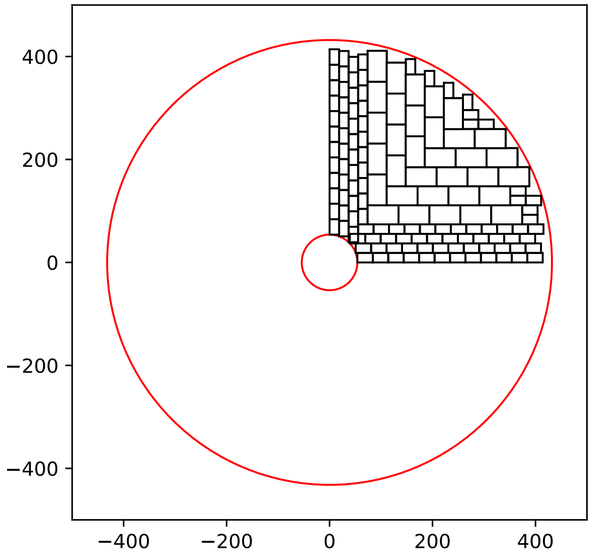

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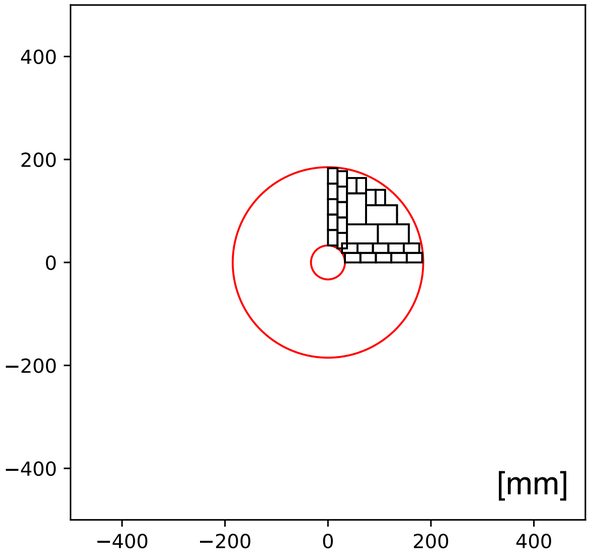

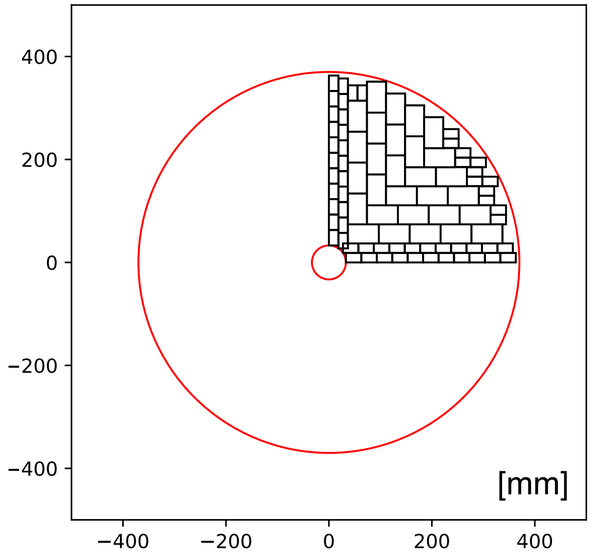

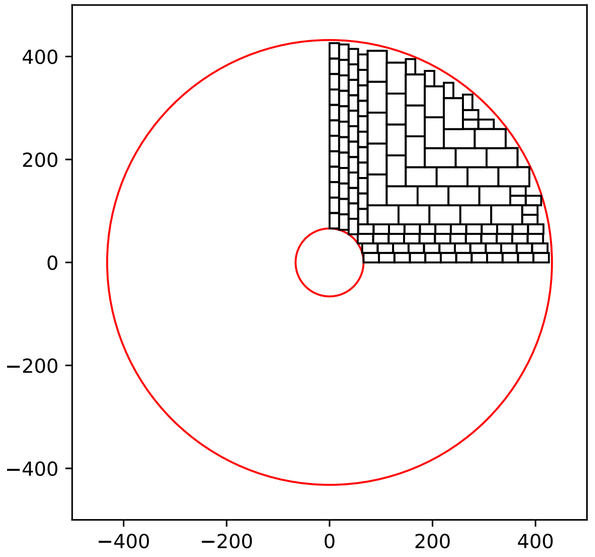

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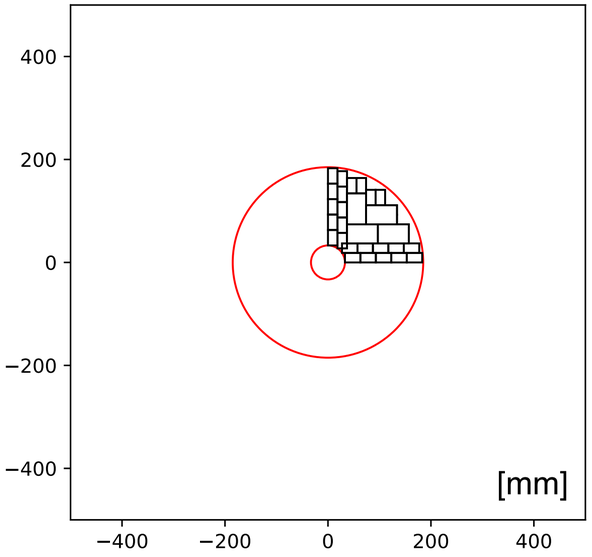
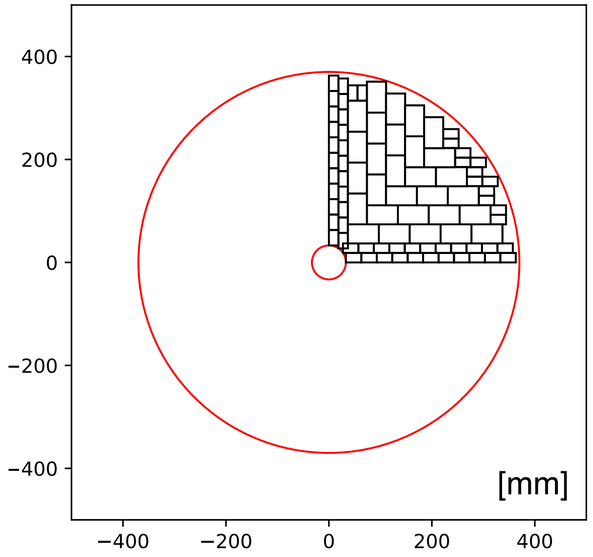
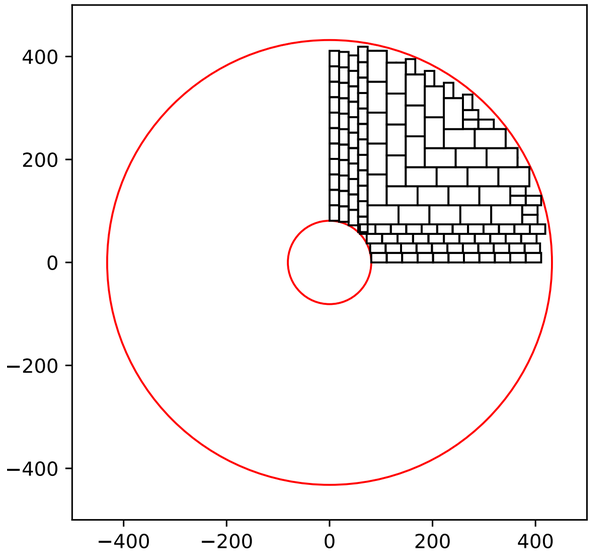
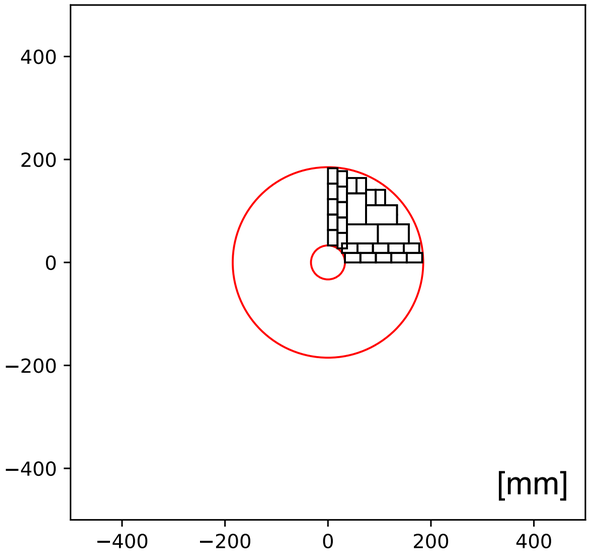


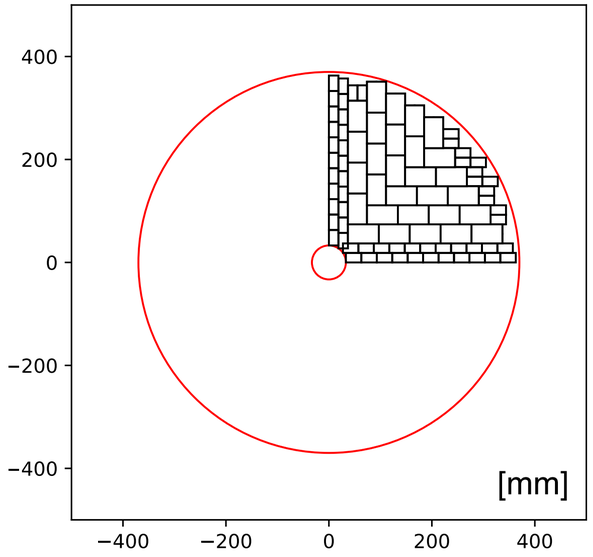


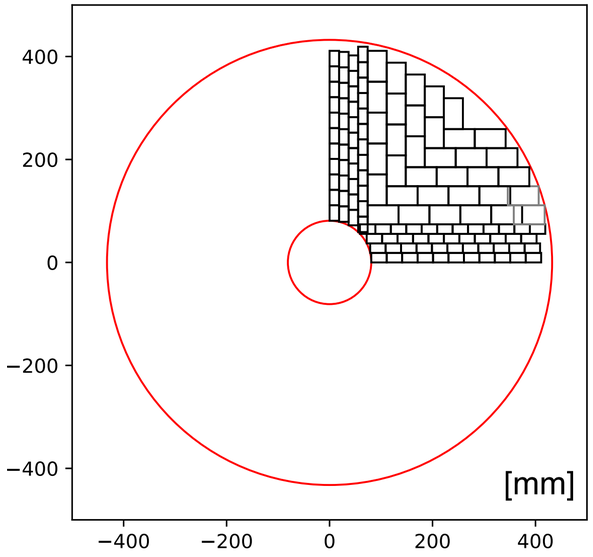


Note, in the animation of the past few slides, the upper corner of the quadrant for the large disks is identical

Disks with different inner and outer radii



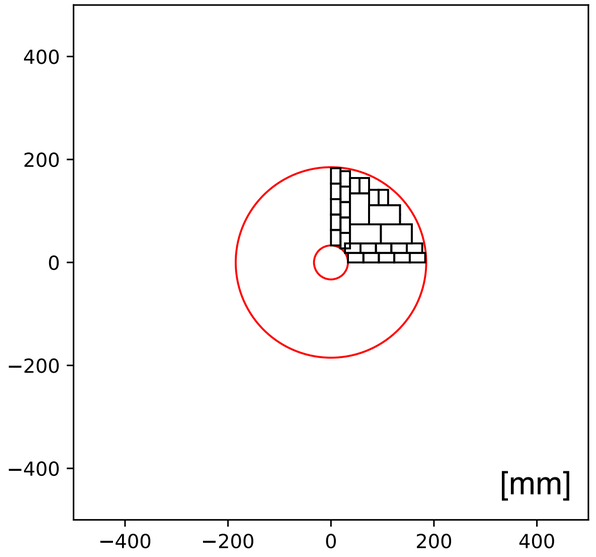


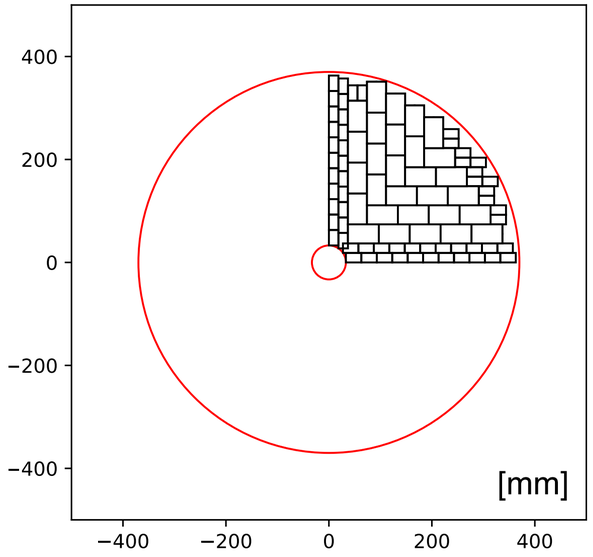


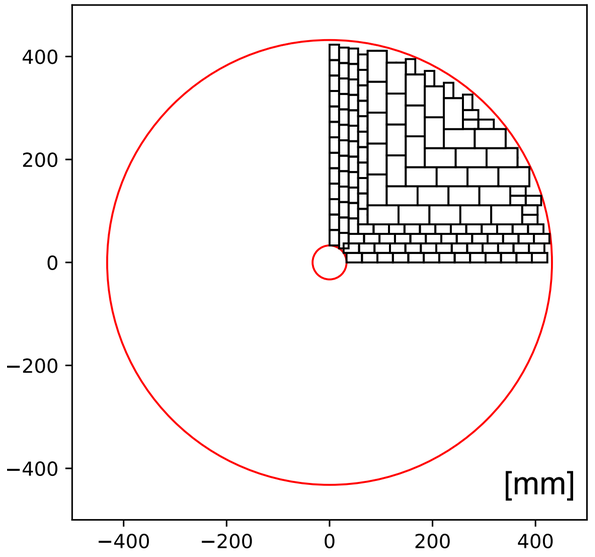
Note, in the animation of the past few slides, the upper corner of the quadrant for the large disks is identical

Filling in, or partial overlap, or a combination could address the acceptance at the outer radii.

Some Ideas on Tiling of Disks







- Maximum length for all disks is 14 reticles, which exceeds maximum on a wafer
can be layed-out as 9 + 4,
- A further counting exercise of (filled-in) lengths suggests that 1, 2, 3, 4, (5), and 9 are good stitching lengths,
- *Non-circular beam-pipe cross-section is a WIP*
- *X/X_0 model, heat load, yield model + layout ono wafer,*
- *And now for something "out there" - "bending at the inner and/or outer disk radii to further optimize acceptance?"*