GRETINA Detector Geometry

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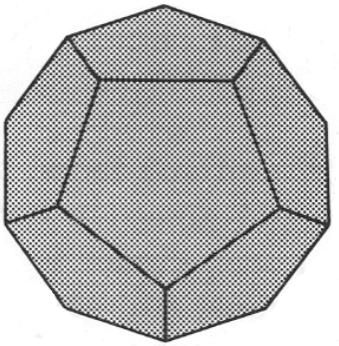
GRETINA Detector Working Group Meeting

March 2004

Outline:

- Possible tilings of the sphere
- Possible canning configurations
- Optimization of the crystal geometry



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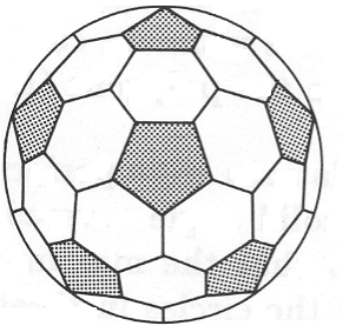

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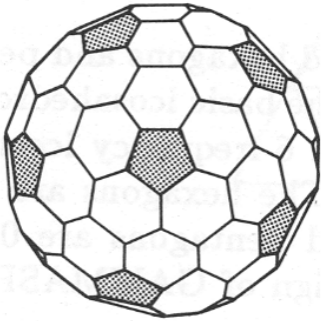

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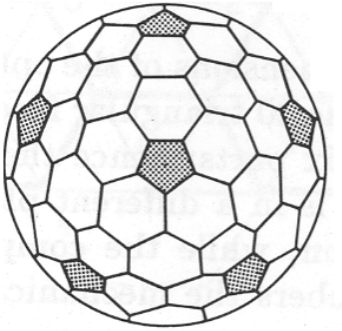

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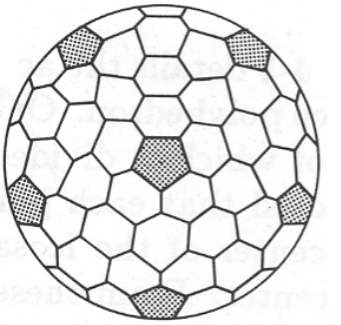

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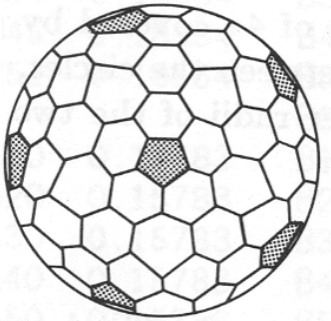

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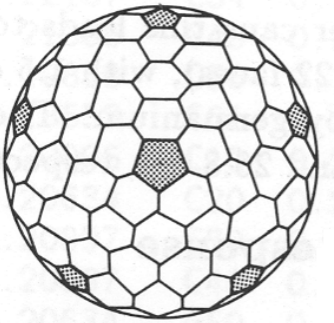

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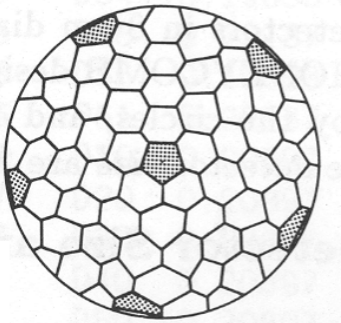

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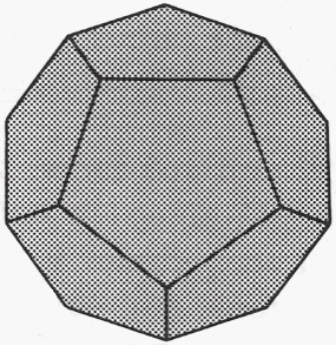

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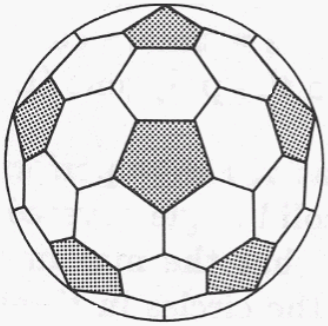

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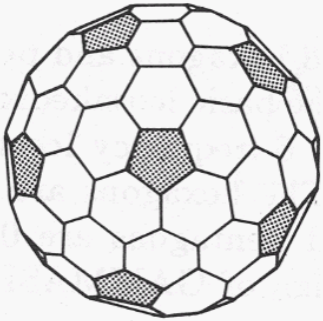

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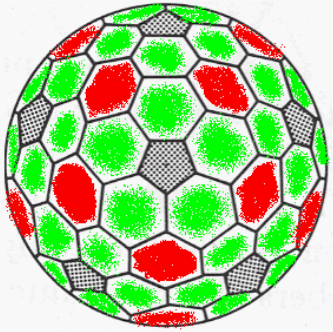

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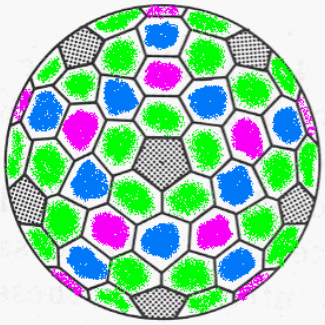

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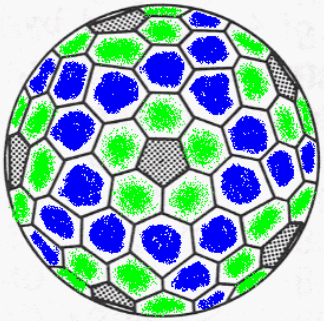

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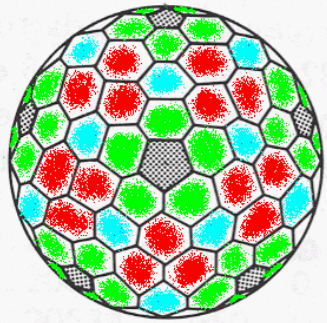

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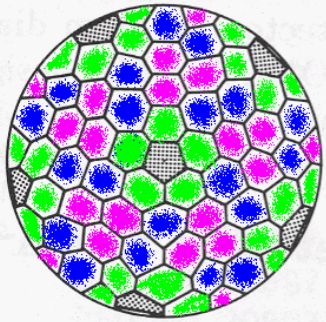

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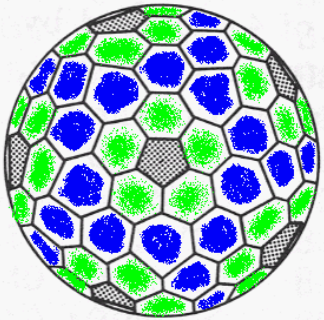

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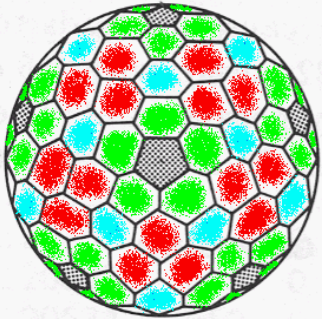

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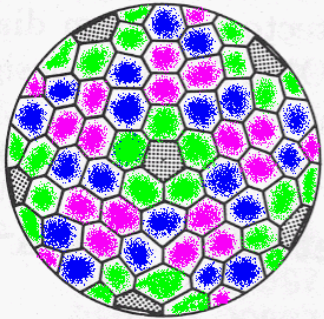

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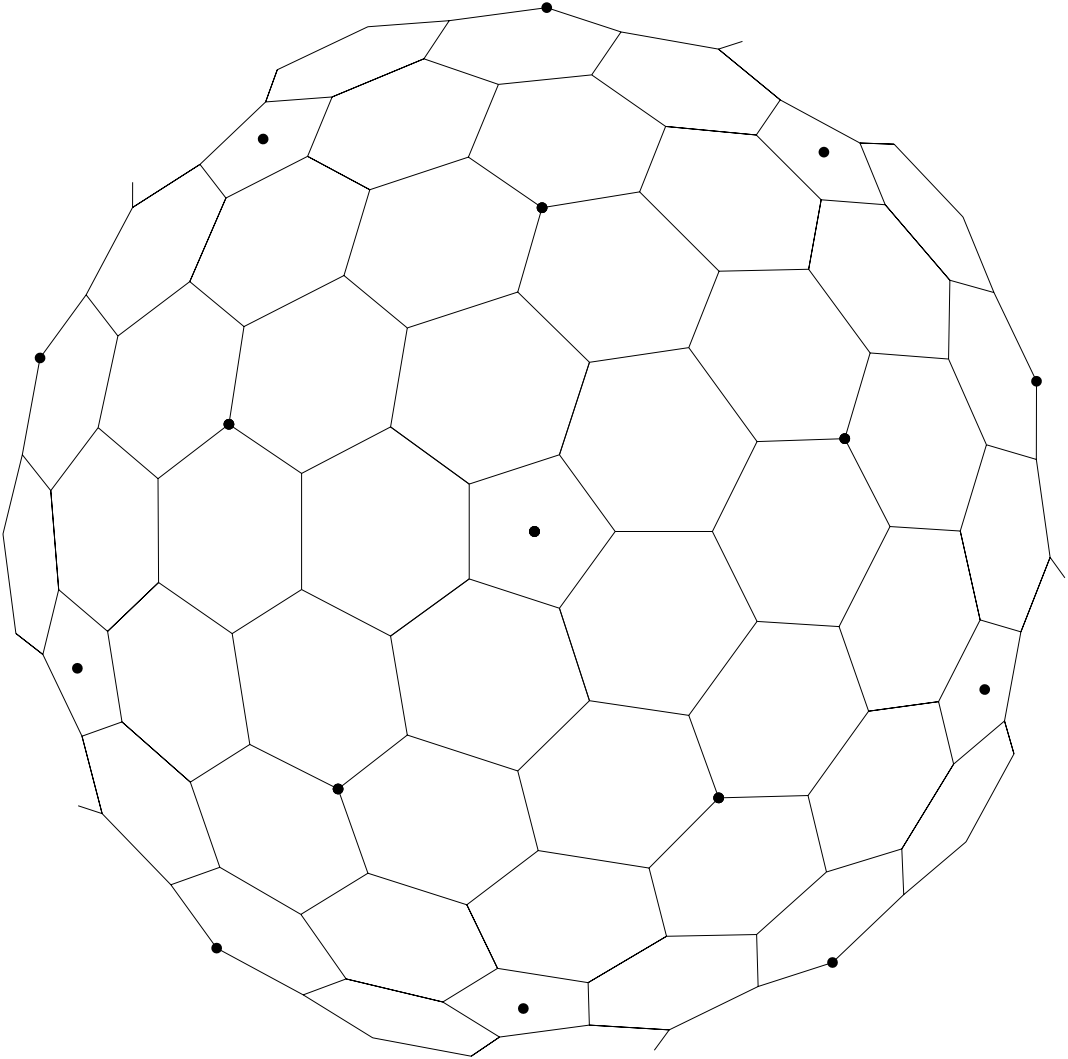

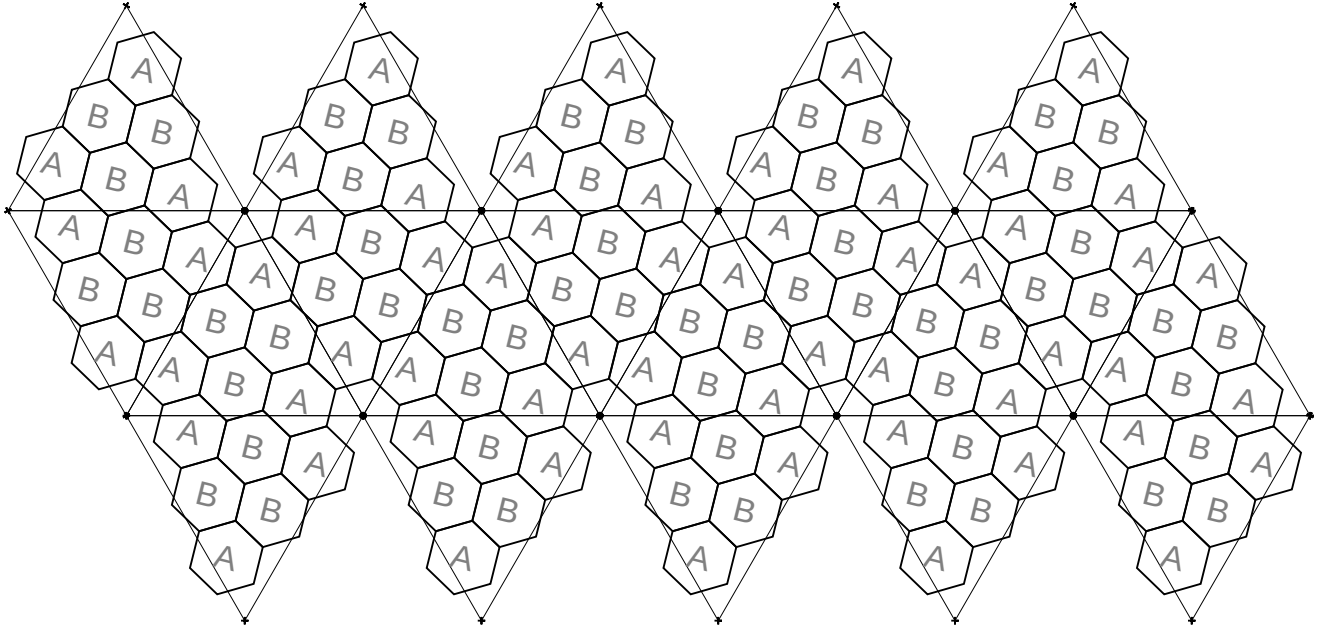
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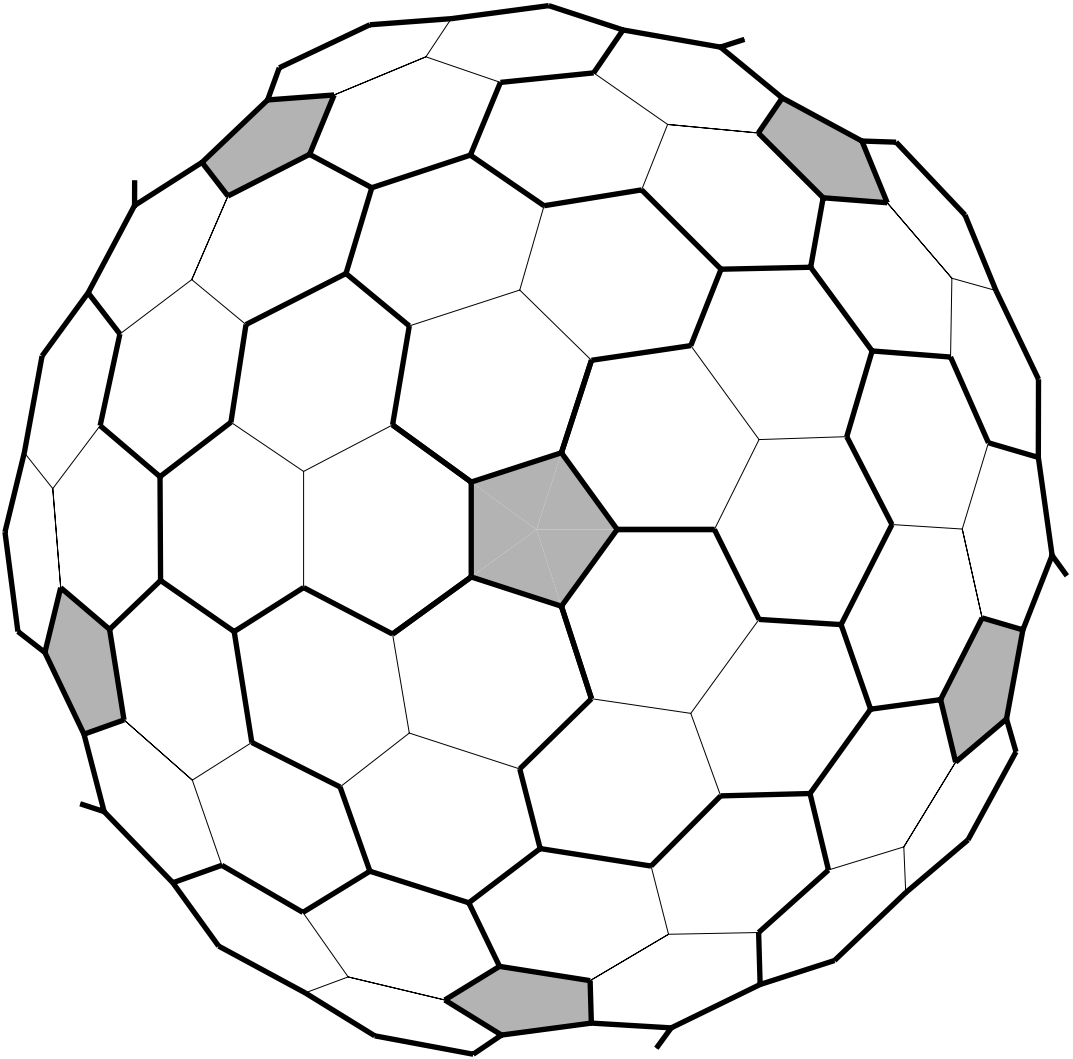
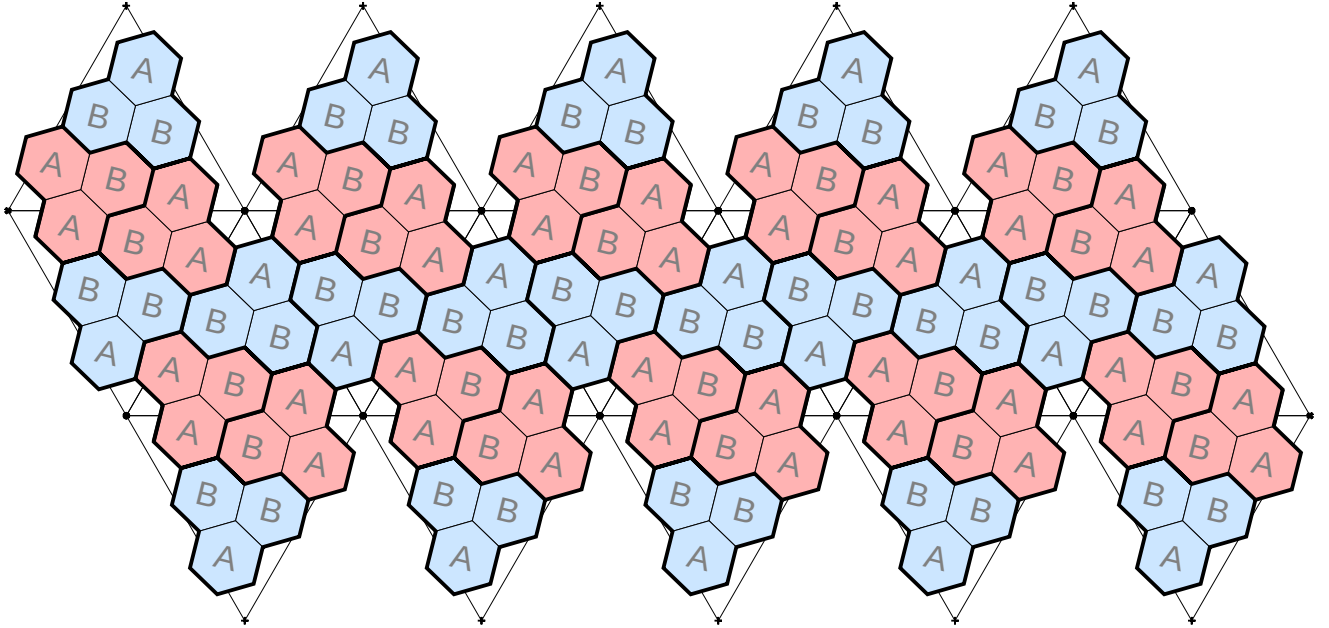
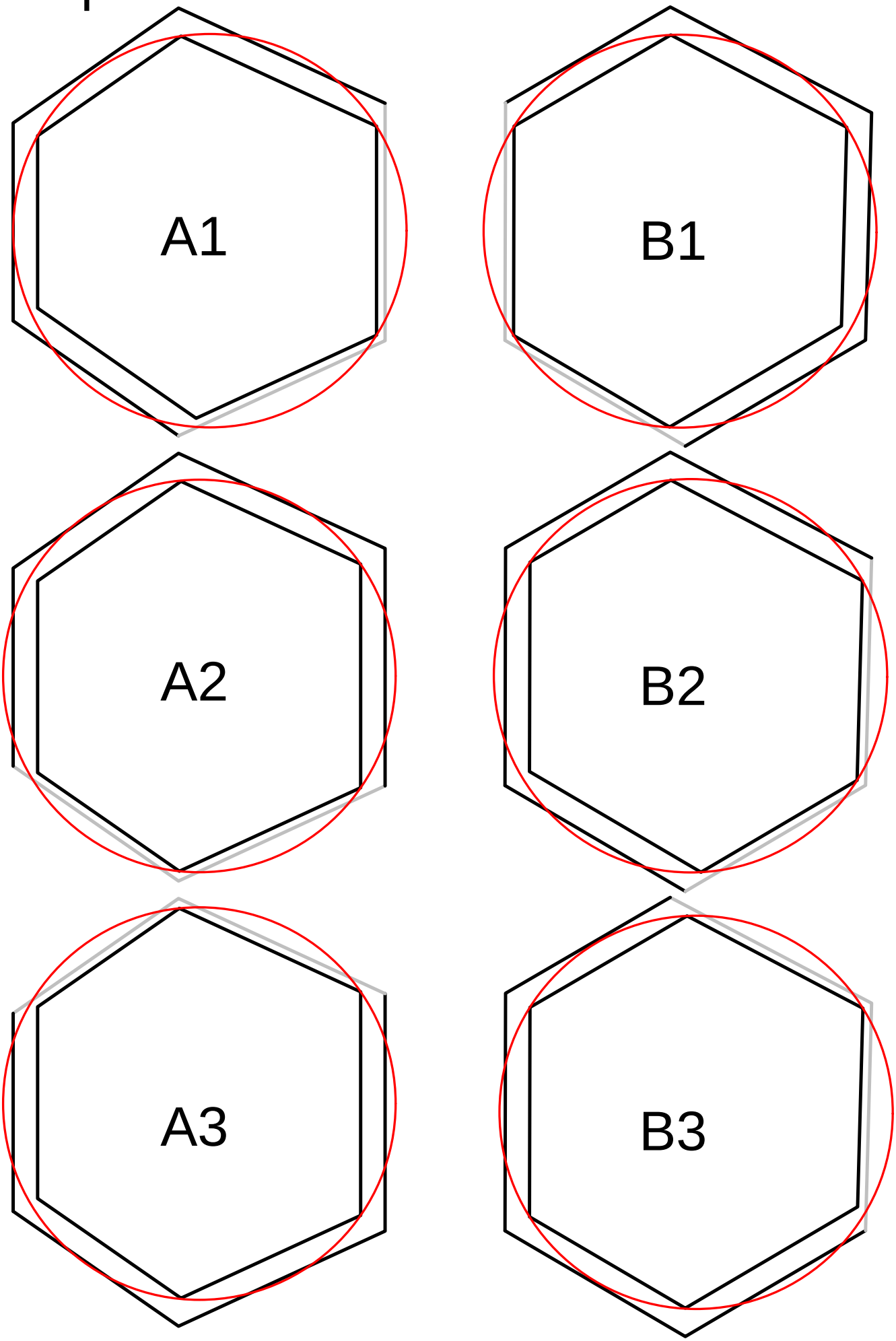
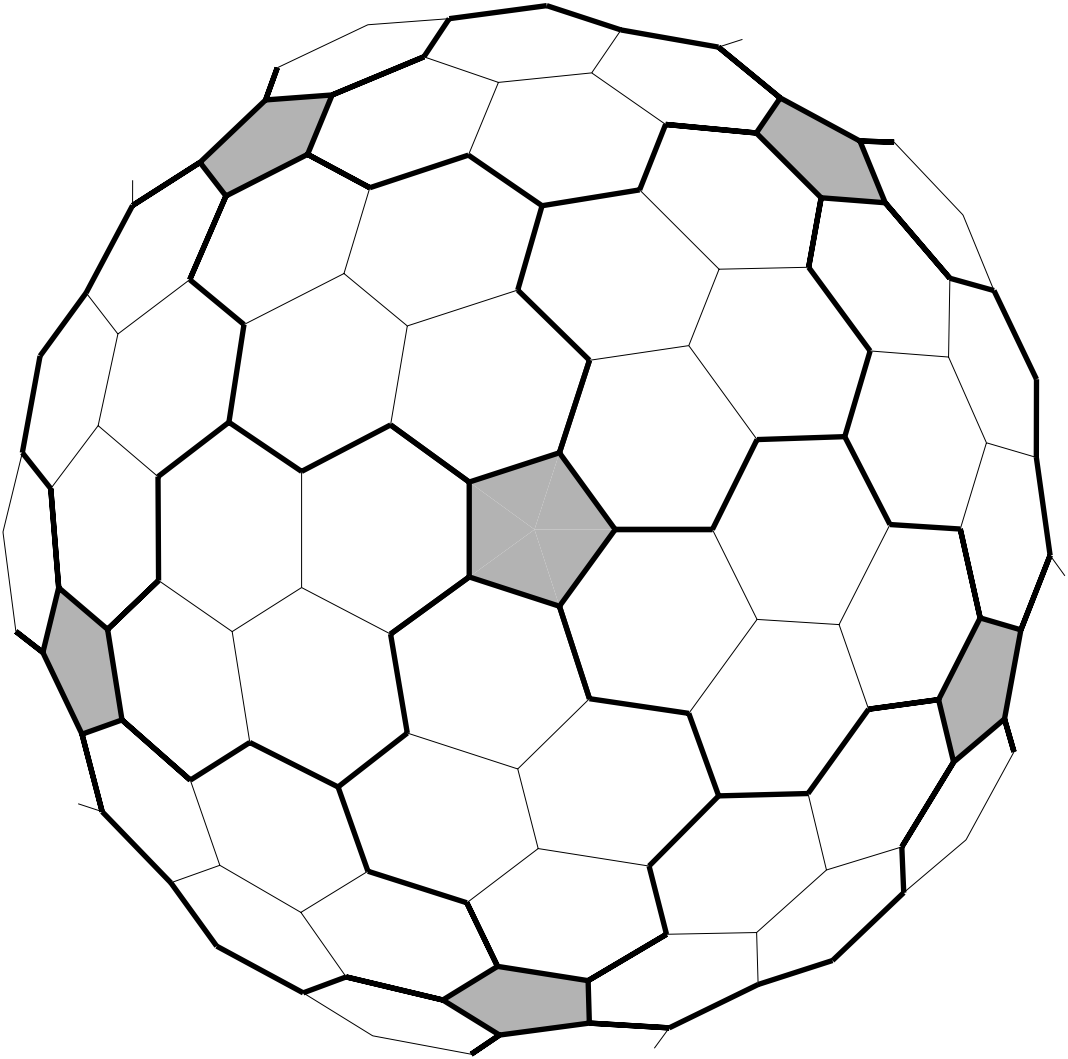
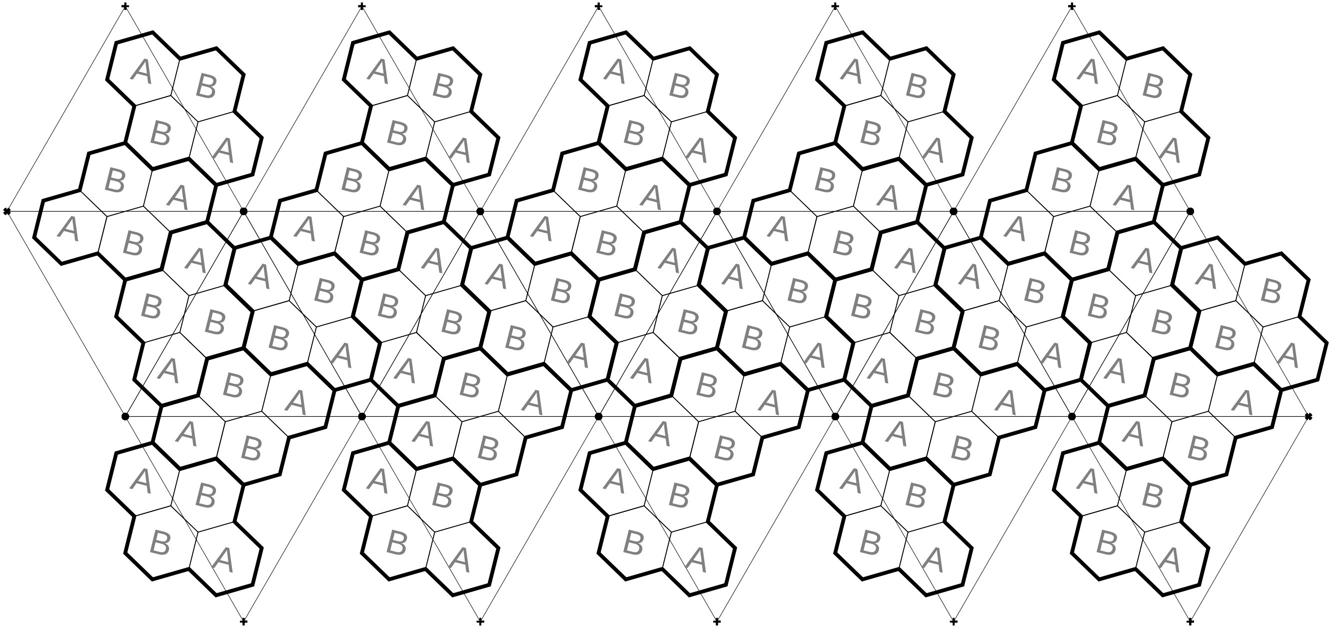



A
B B
A B A
A B A
B B B B
A A B A
A B A
B B
A

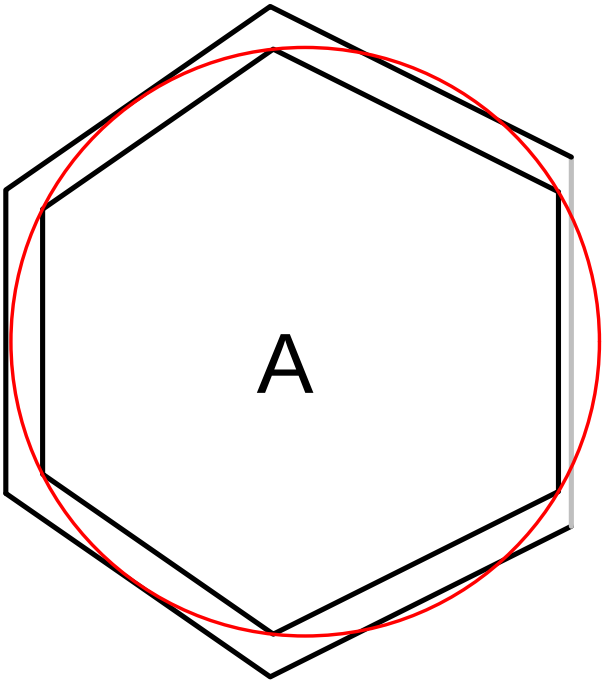
Triplet

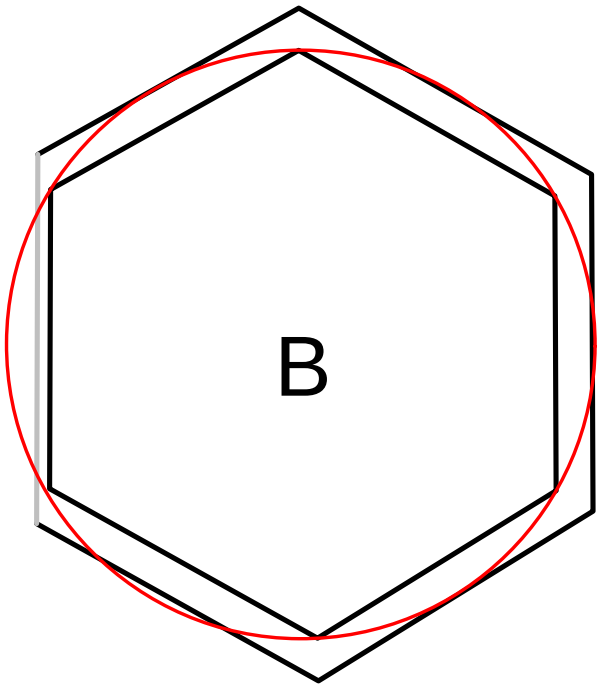




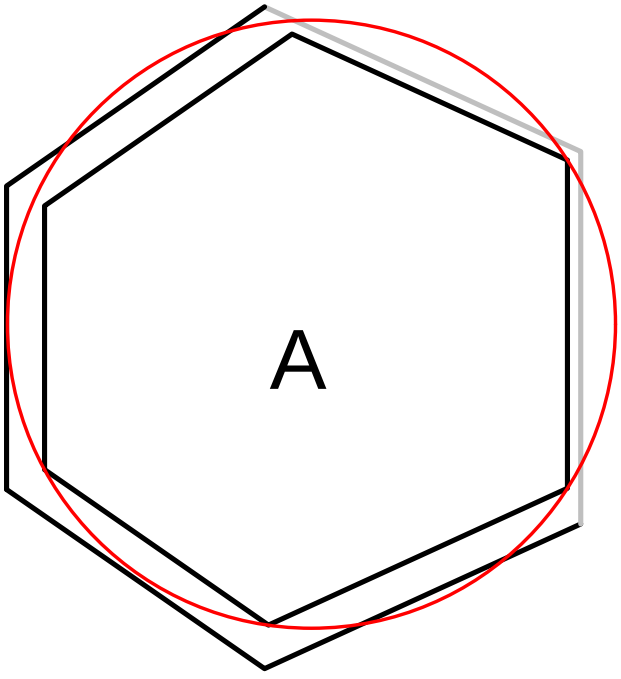


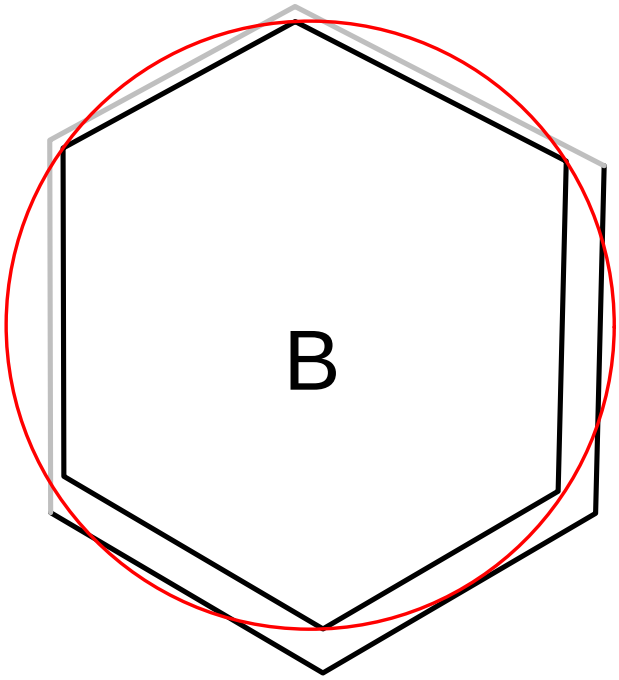
Doublet





Quadruplet





Optimization - Figure of Merit

The red circle is the “minimum exscribed circle”, the smallest circle that can be drawn around the hexagonal crystal shape.

If we set the radius of this circle to 4 cm, this then defines the distance from the target at which the crystal is no longer fully tapered.

The detector hexagons have been optimized for the *fraction of the hexagon area* relative to that of the minimum exscribed circle (or, more accurately, the largest of the circles for that cluster).

This forces the hexagons to be as regular as possible, and as close as possible to that same size.

Maximum value of hexagon/circle is 82.7%. (= $3\ r^2 \sin(60) / \pi\ r^2$)

We get values of 80.2 to 82.3%.

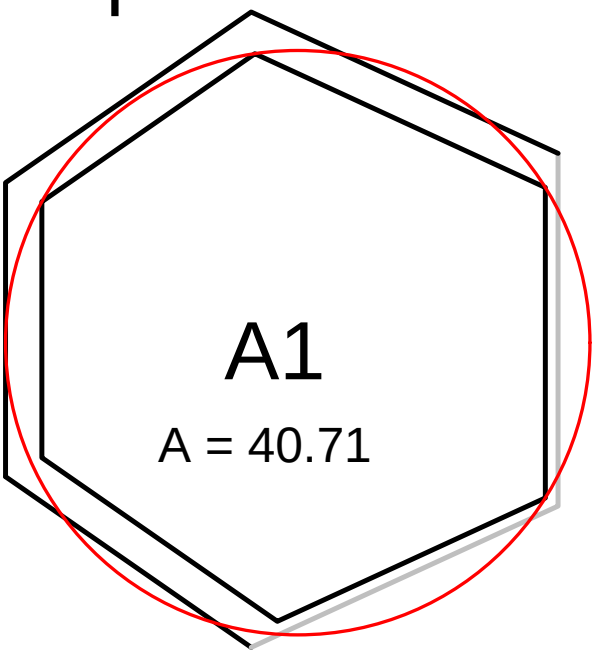
Optimization - Figure of Merit

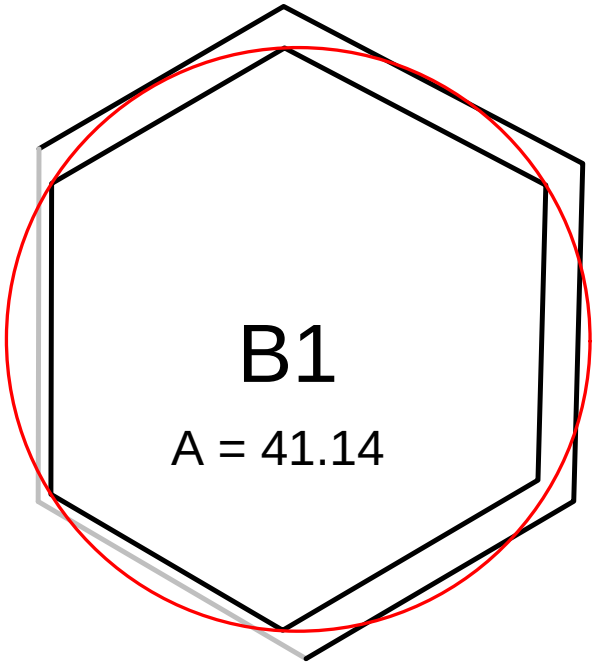
	Crystal/ can	Crystal/ circle	R(taper)
Quadruplet	81.8%	80.2%	22.2 cm
Triplet	80.6%	80.4%	22.5 cm
Doublet	78.6%	82.3%	22.9 cm
Maximum:		*82.7%*	

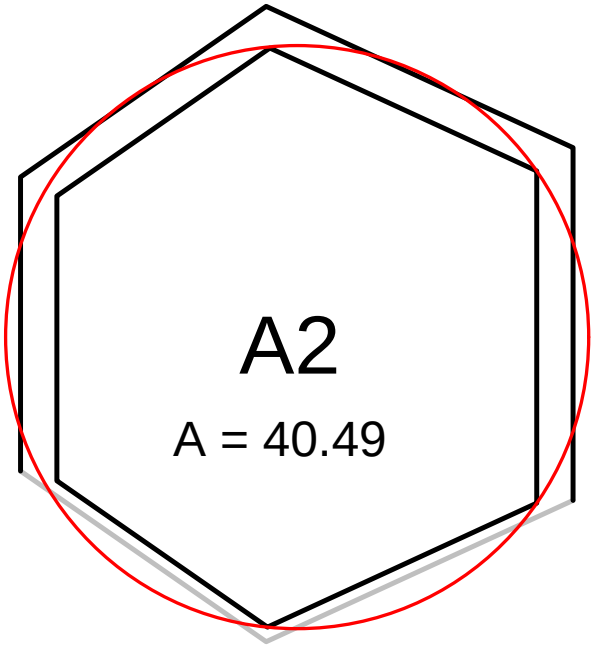
The pentagons take about **5.2%** of 4π in the current geometry.

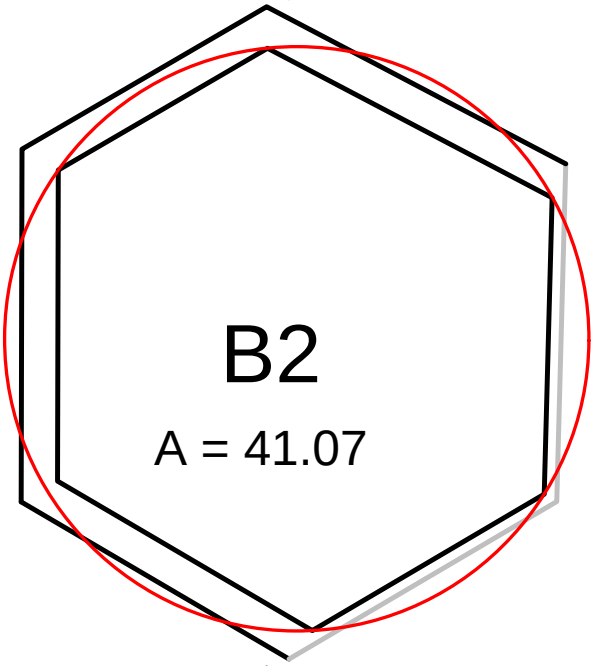
The size of the pentagons was not varied in this exercise.

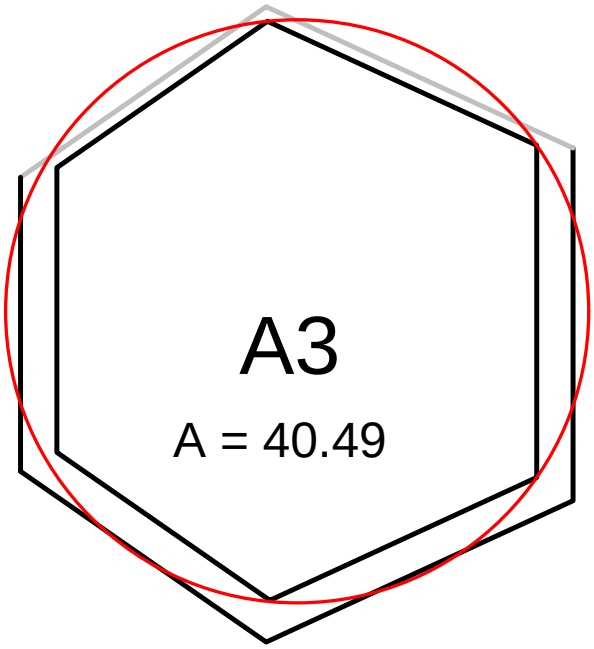
Triplet

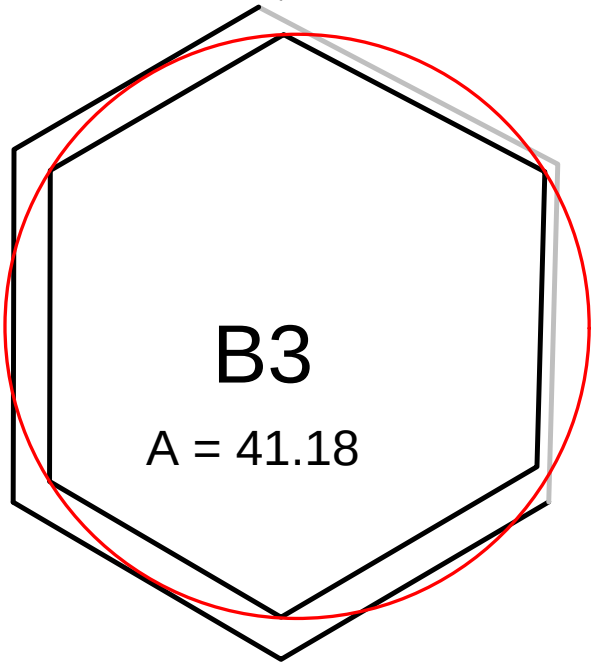




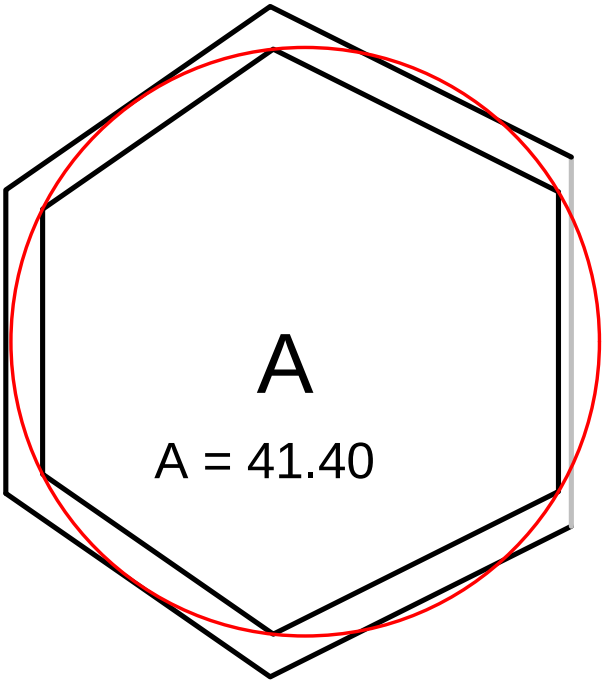


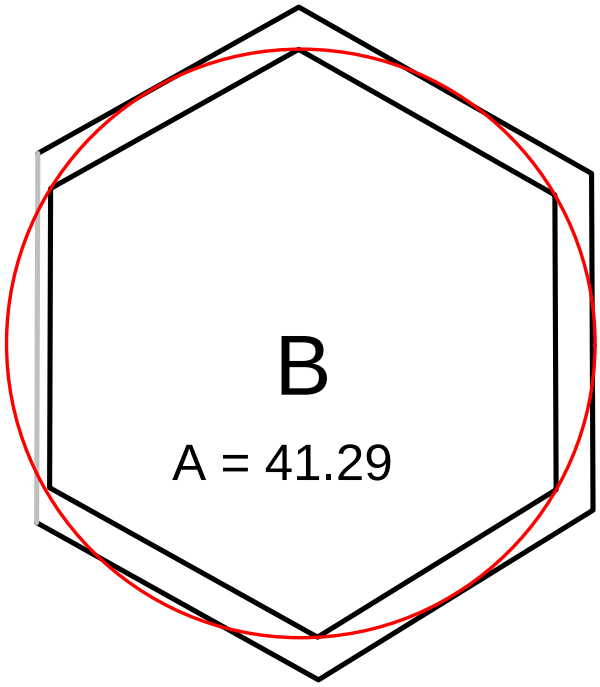




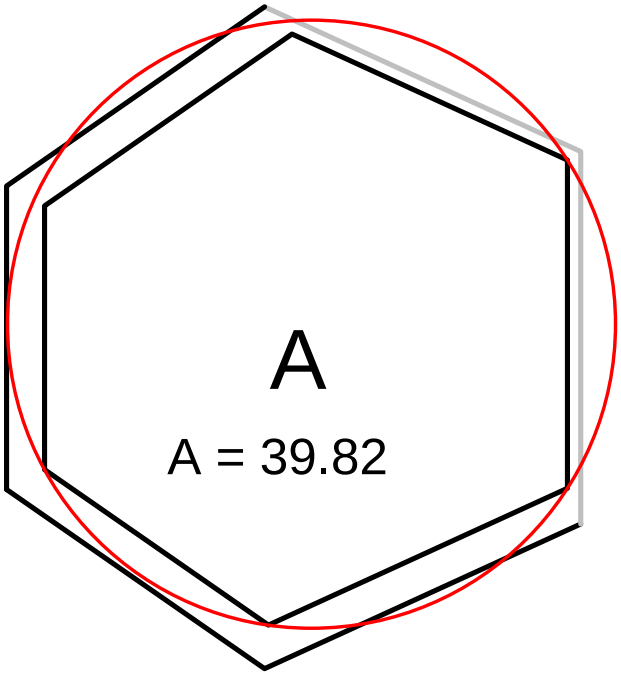


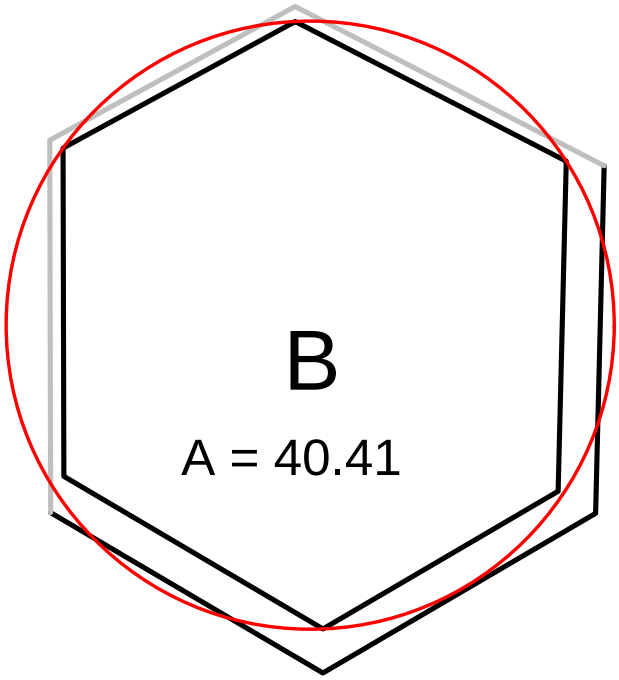
Doublet



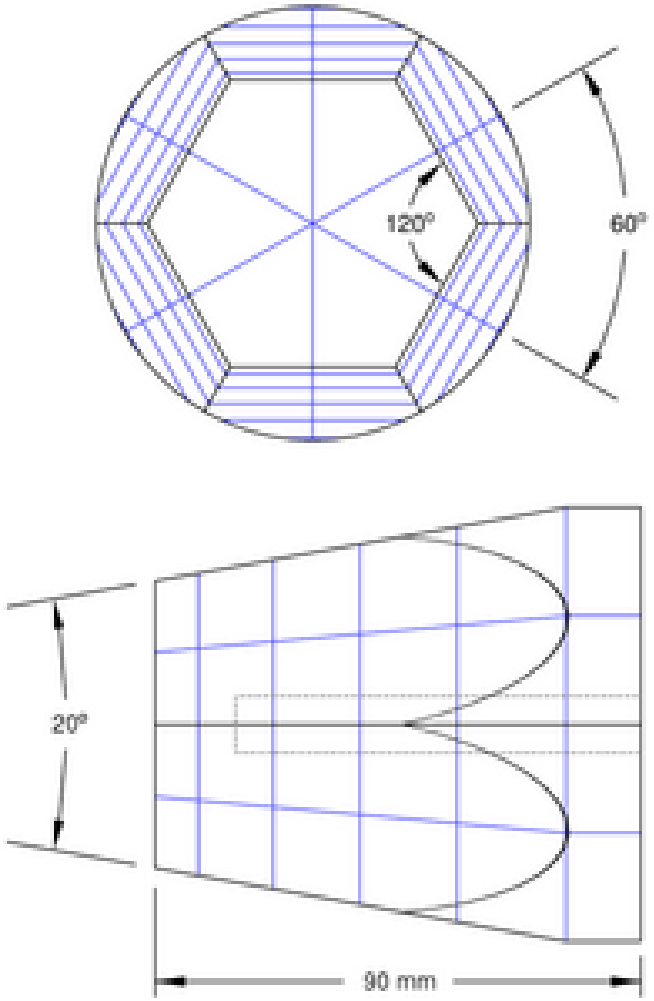


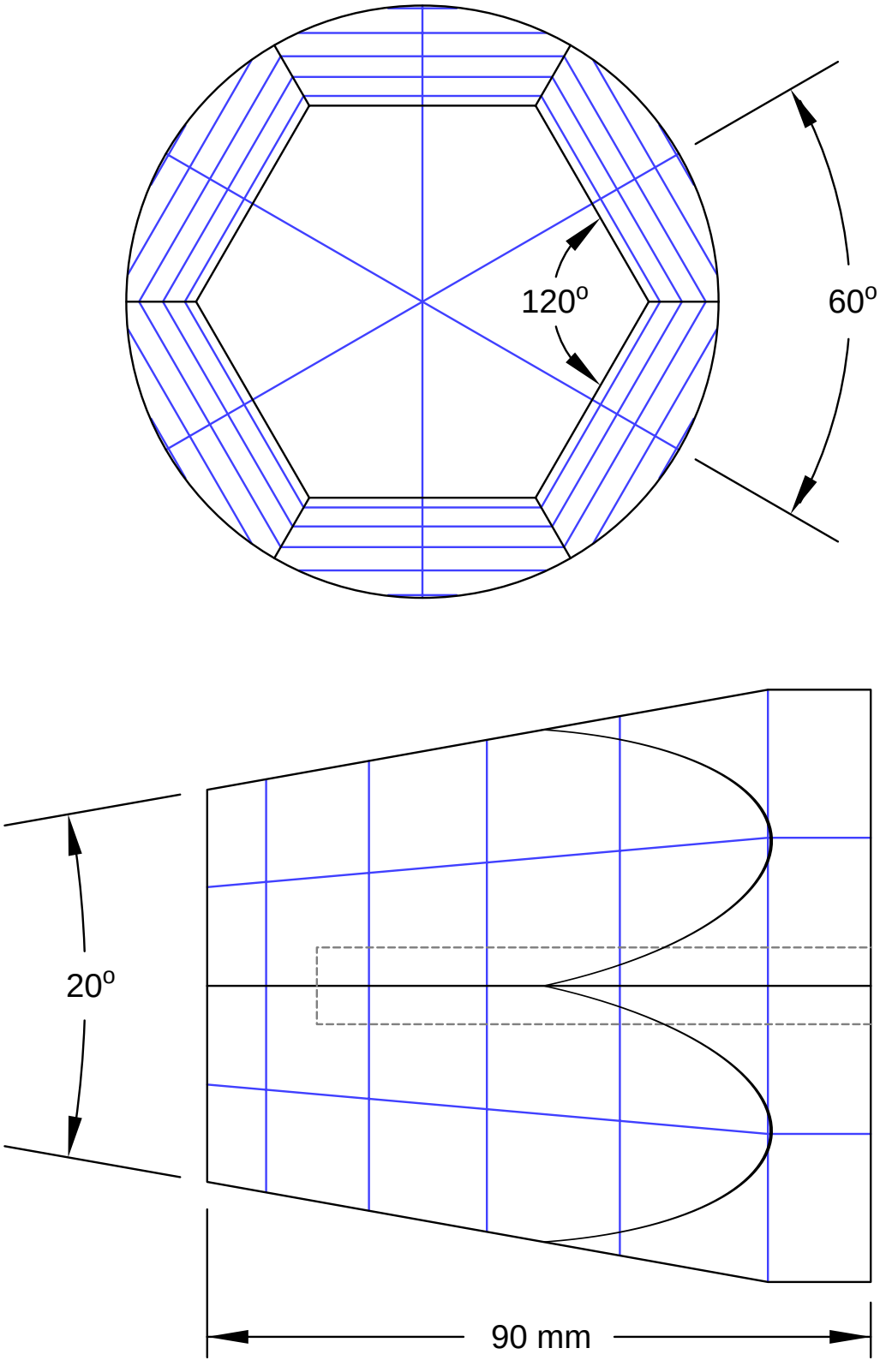
Quadruplet

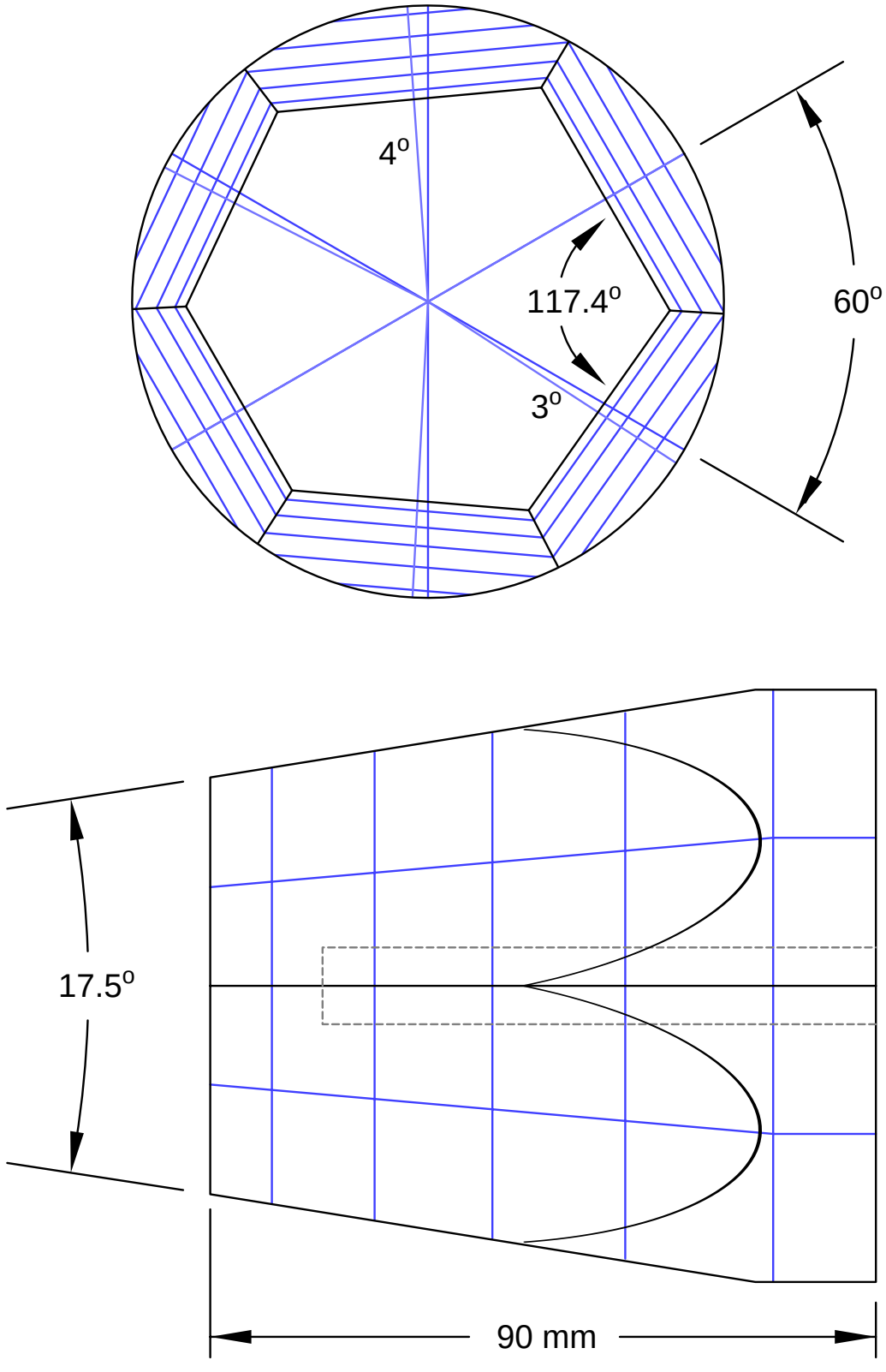




Prototype triplet cluster




120°
60°
20°
90 mm


4°
117.4°
3°
60°
17.5°
90 mm