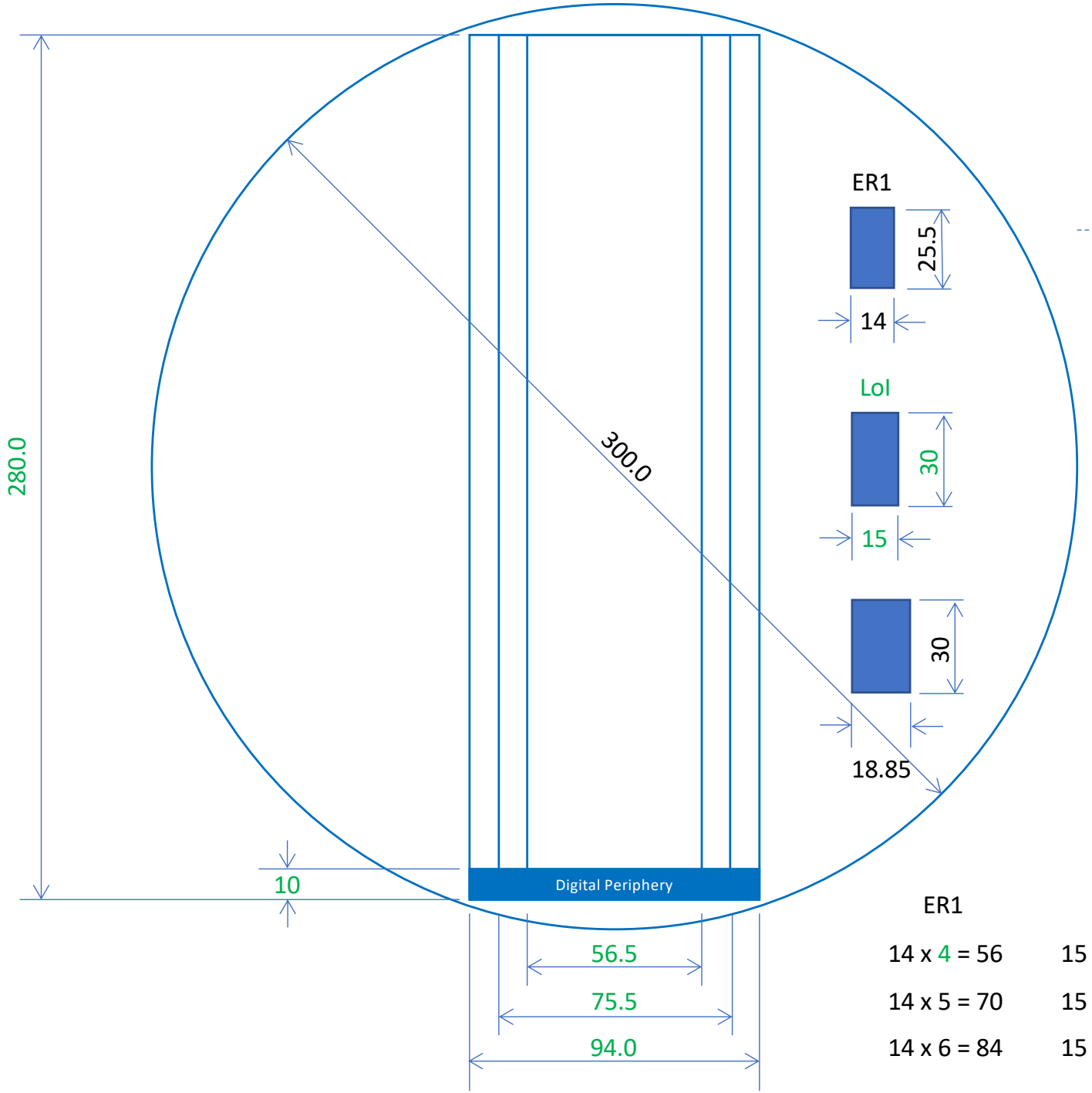
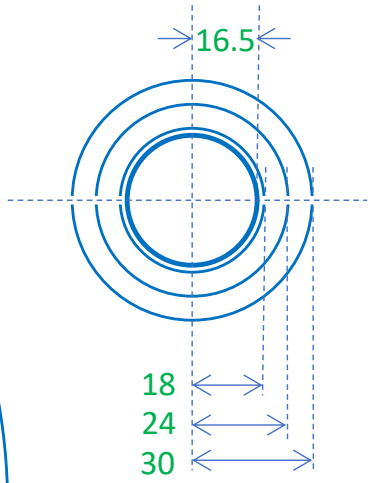
EIC Sensors – Vertex and Barrel

- ALICE ITS3 Sensors
  - Update on reticle size
- EIC Vertex Layers
  - Using ITS3 sensors
  - Option for EIC-specific sensors
- EIC Barrel Layers
  - Options for sensors maximising use of wafer
  - Implication for barrel layers
  - Proposed layout for the barrel layers

ALICE – ITS3

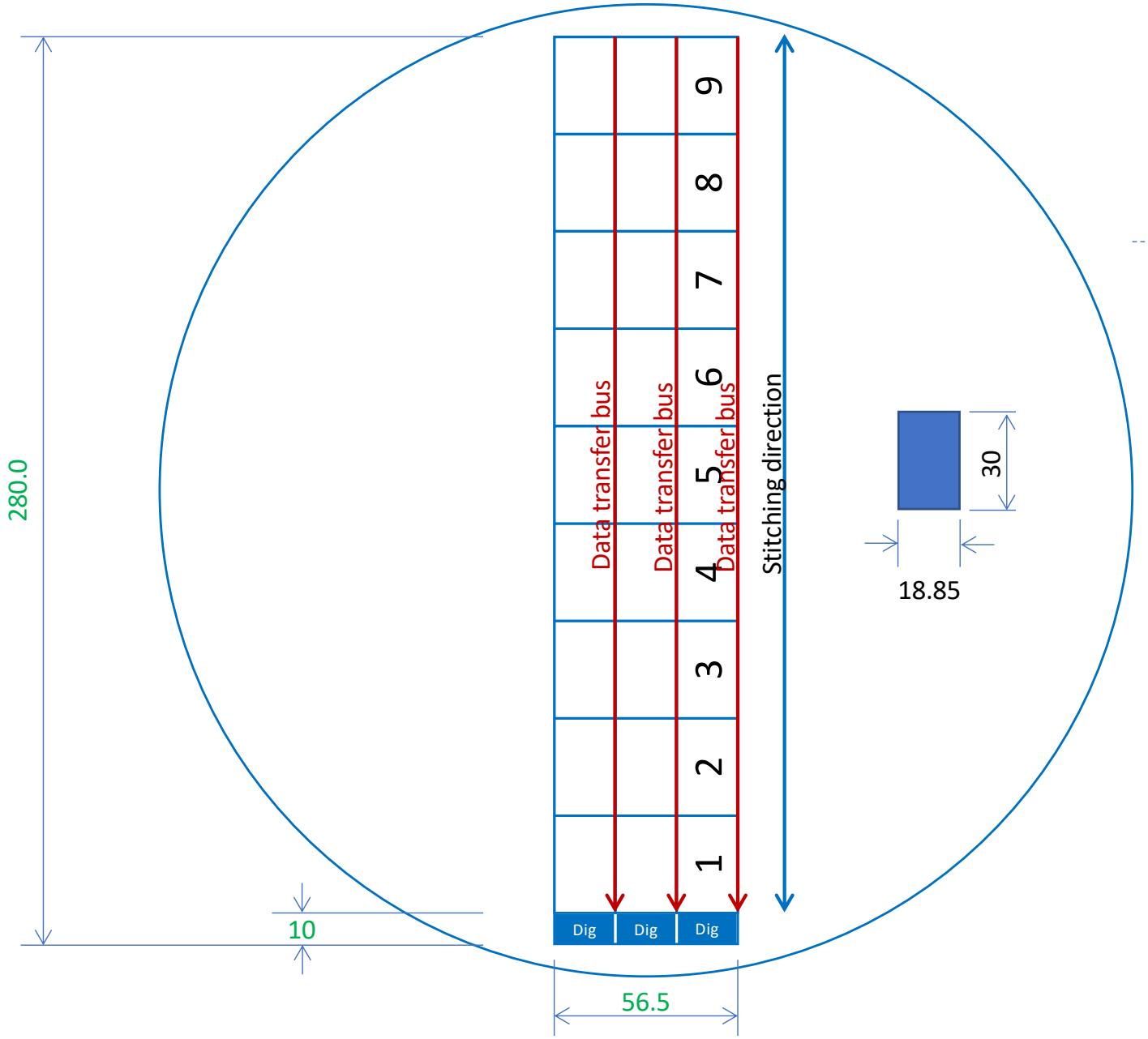


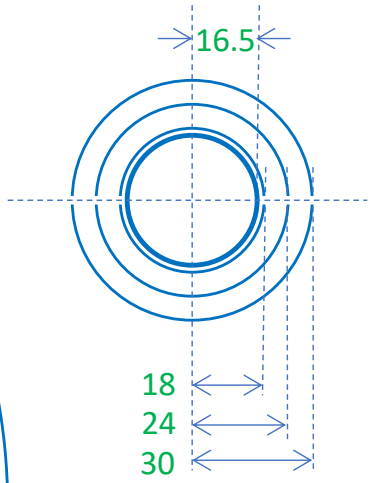


1:2 Scale
Dimensions are mm

ER1	LoI	
14 x 4 = 56	15 x 4 = 60	18.85 x 3 = 56.5
14 x 5 = 70	15 x 5 = 75	18.85 x 4 = 75.4
14 x 6 = 84	15 x 6 = 90	18.85 x 5 = 94.2

ALICE – ITS3



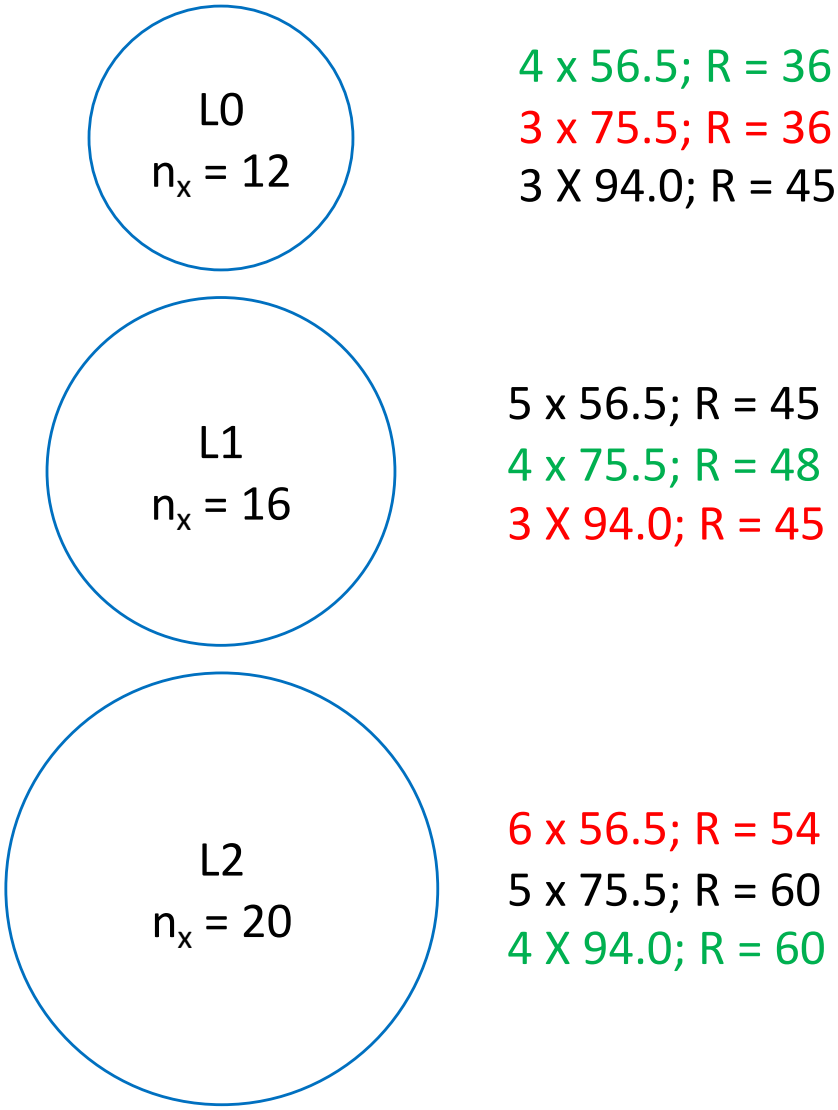


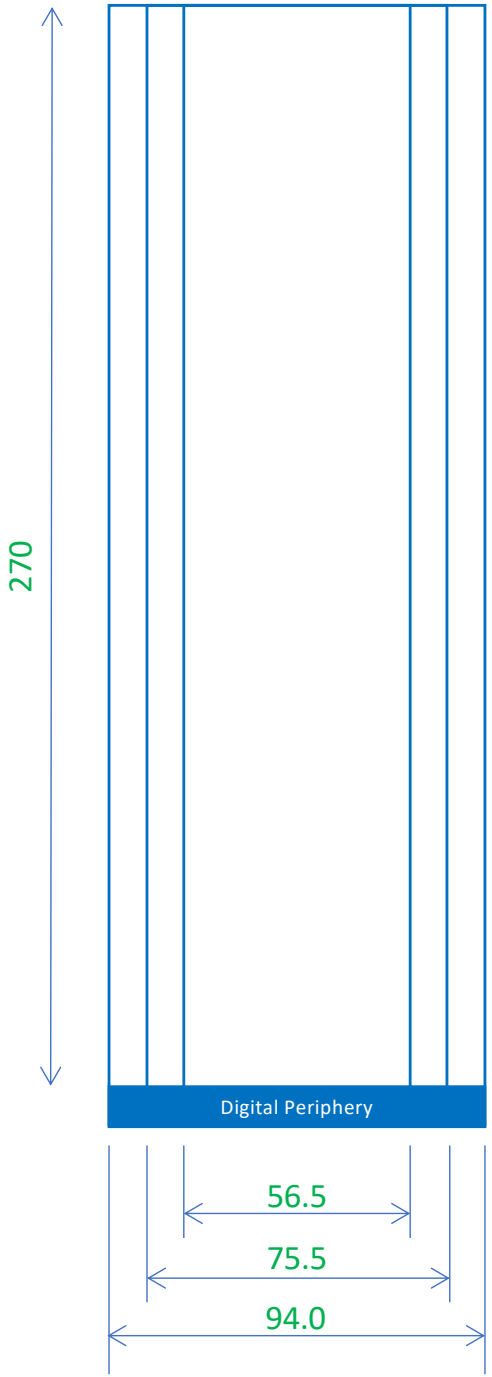
1:2 Scale
Dimensions are mm

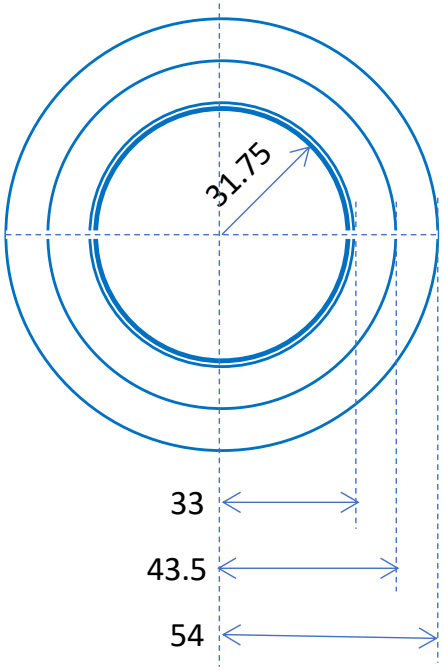
18.85 x 3 = 56.5
30.00 x 9 = 270.0

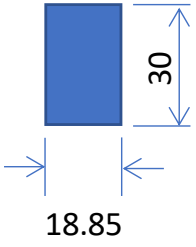
EIC – SVT

R: 1:2 Scale



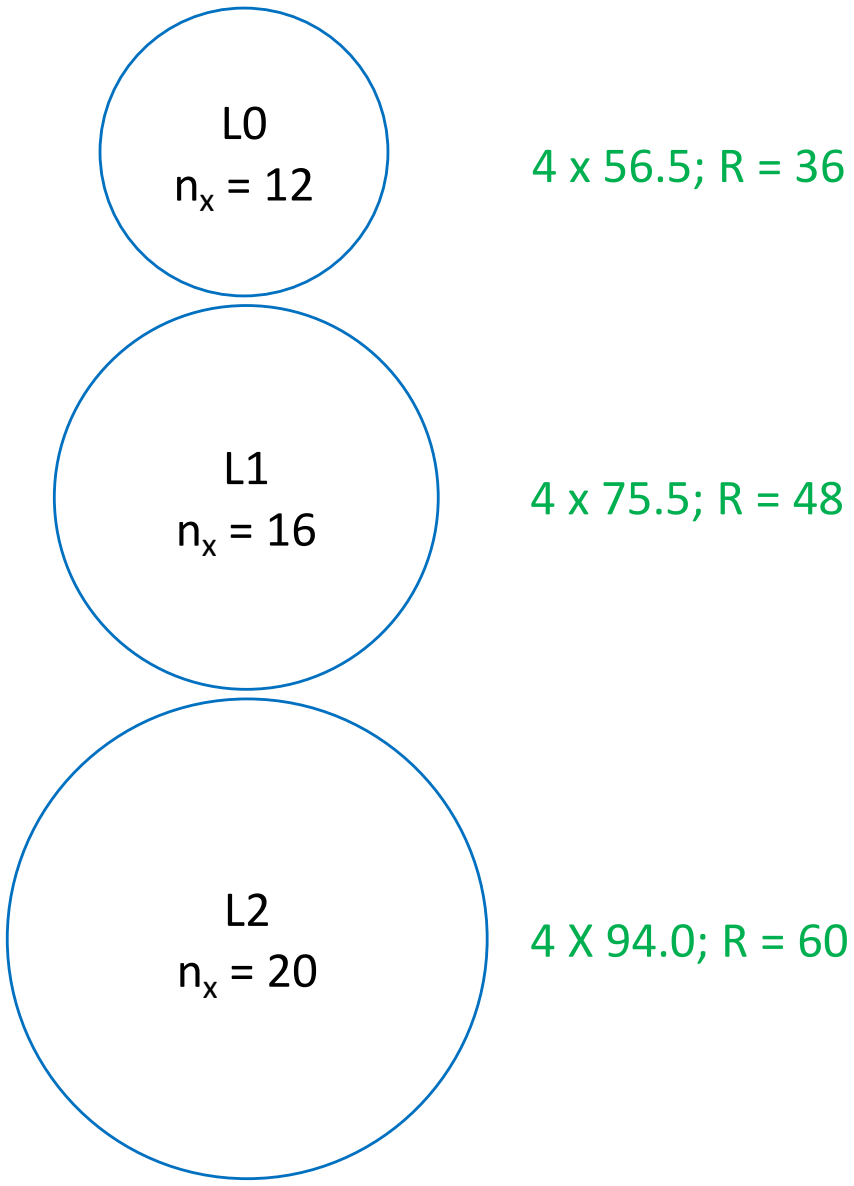


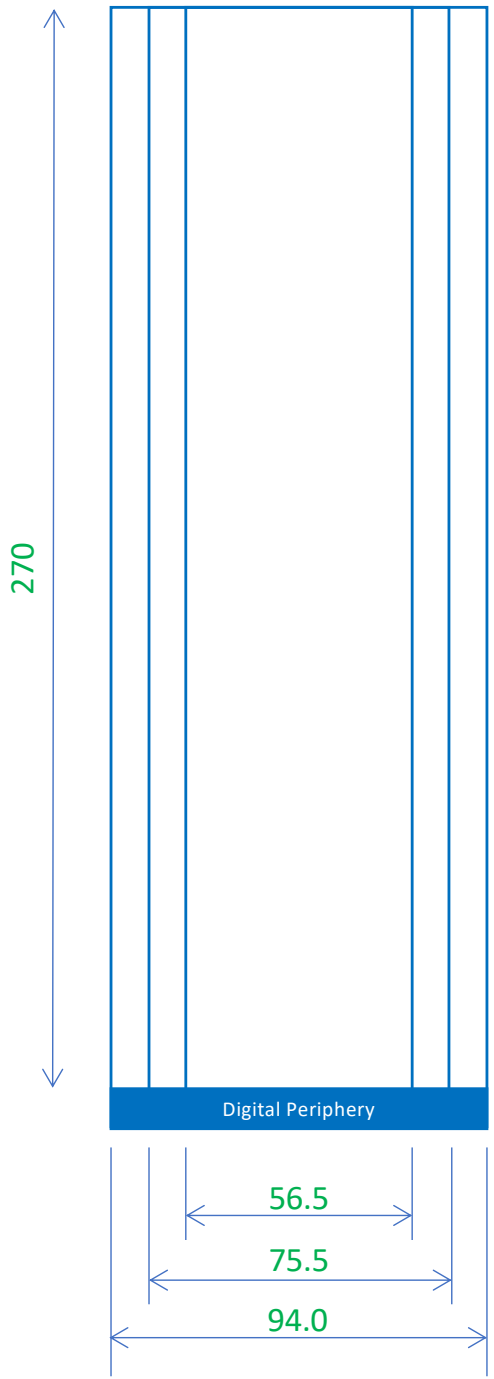


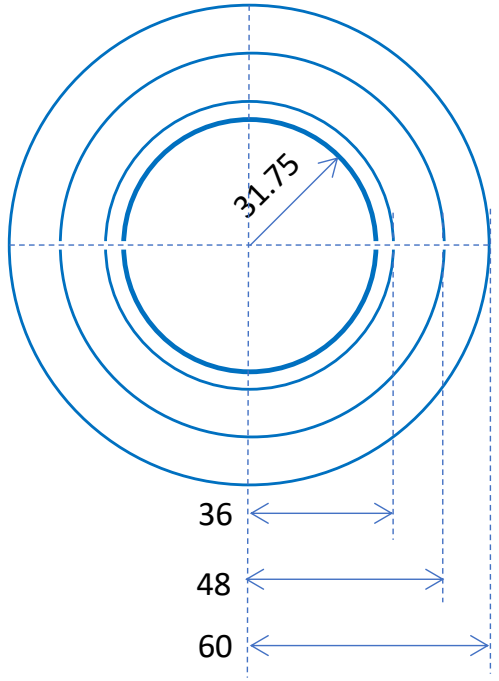


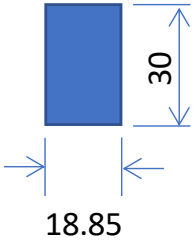
EIC – SVT

R: 1:2 Scale









EIC – SVT

R: 1:2 Scale

Sensor overlap = 4.7

L0
n_x = 12

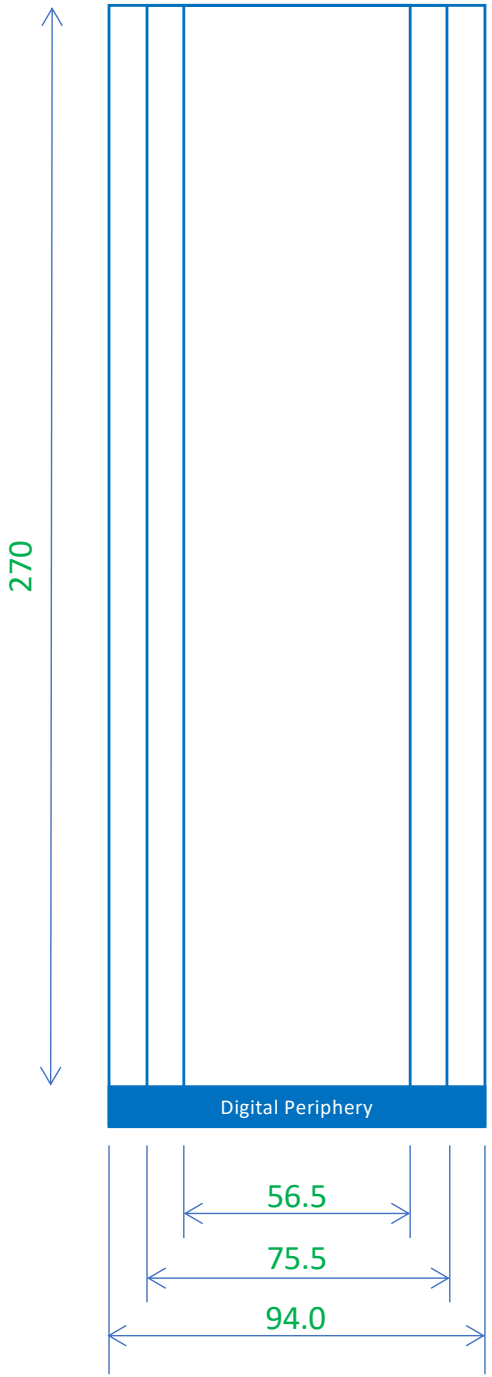
4 x 56.5; R = 33

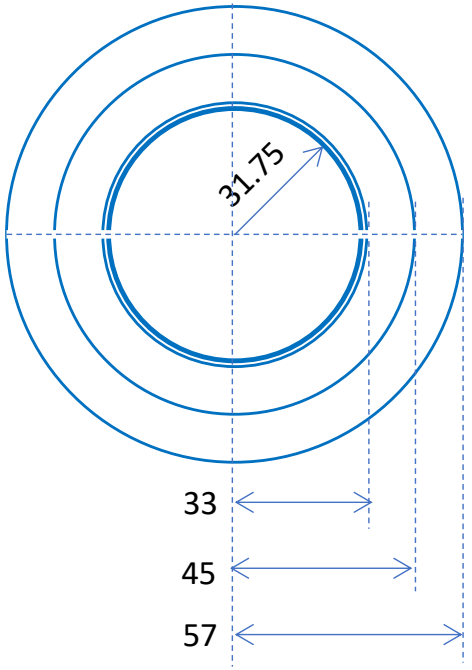
L1
n_x = 16

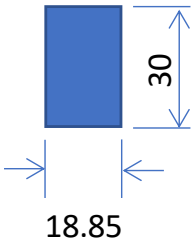
4 x 75.5; R = 45

L2
n_x = 20

4 X 94.0; R = 57

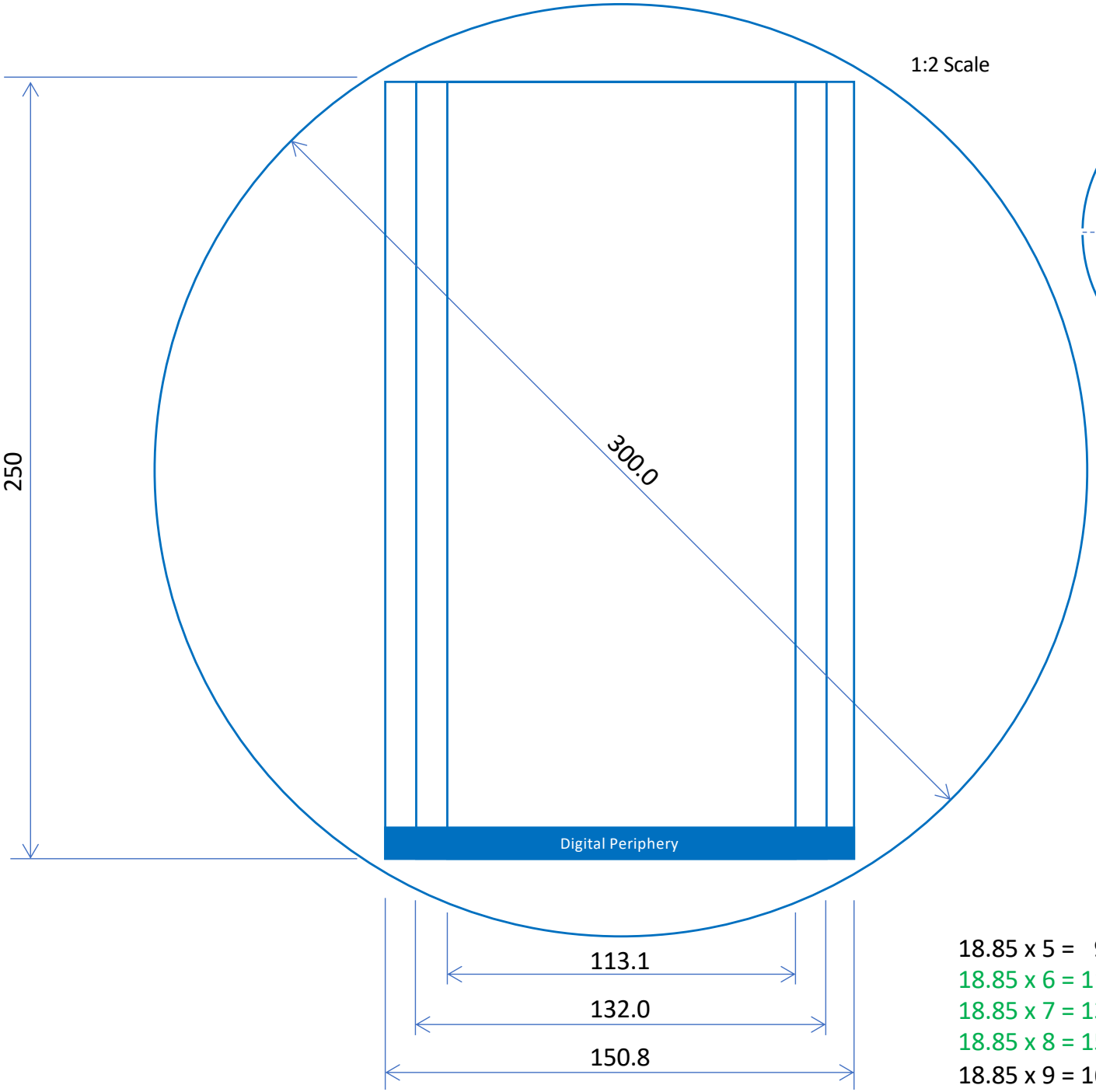




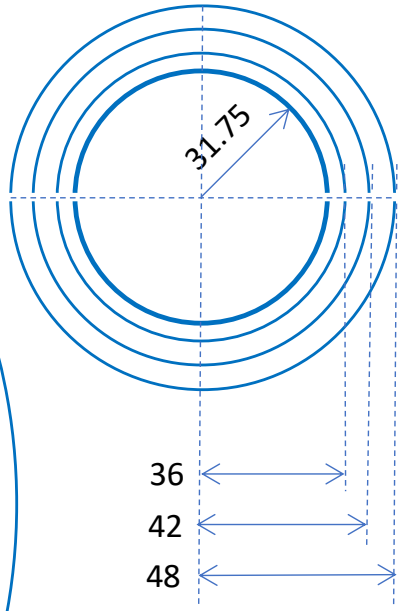


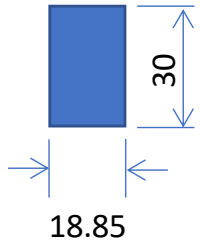
EIC – SVT

1:2 Scale



1:2 Scale

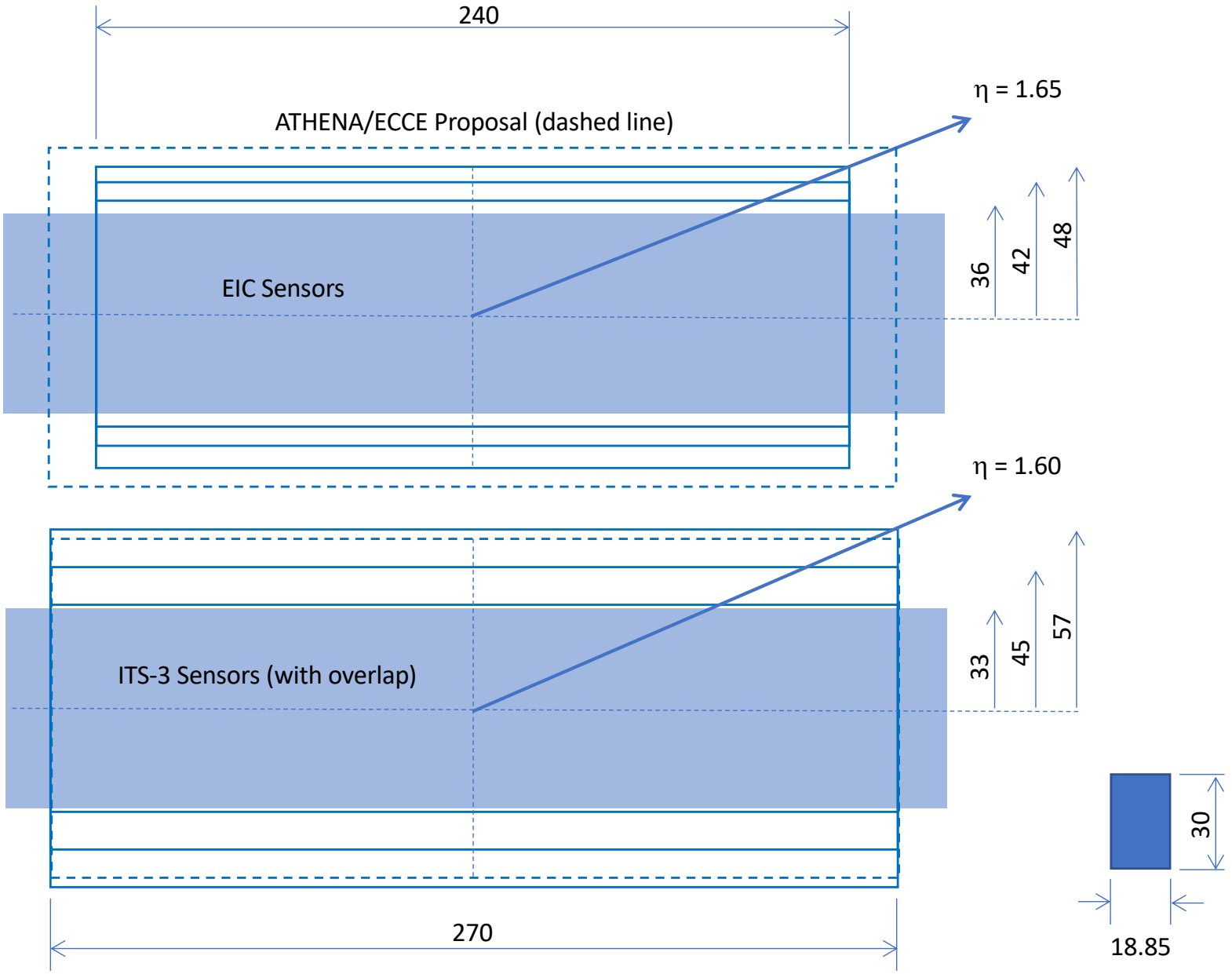




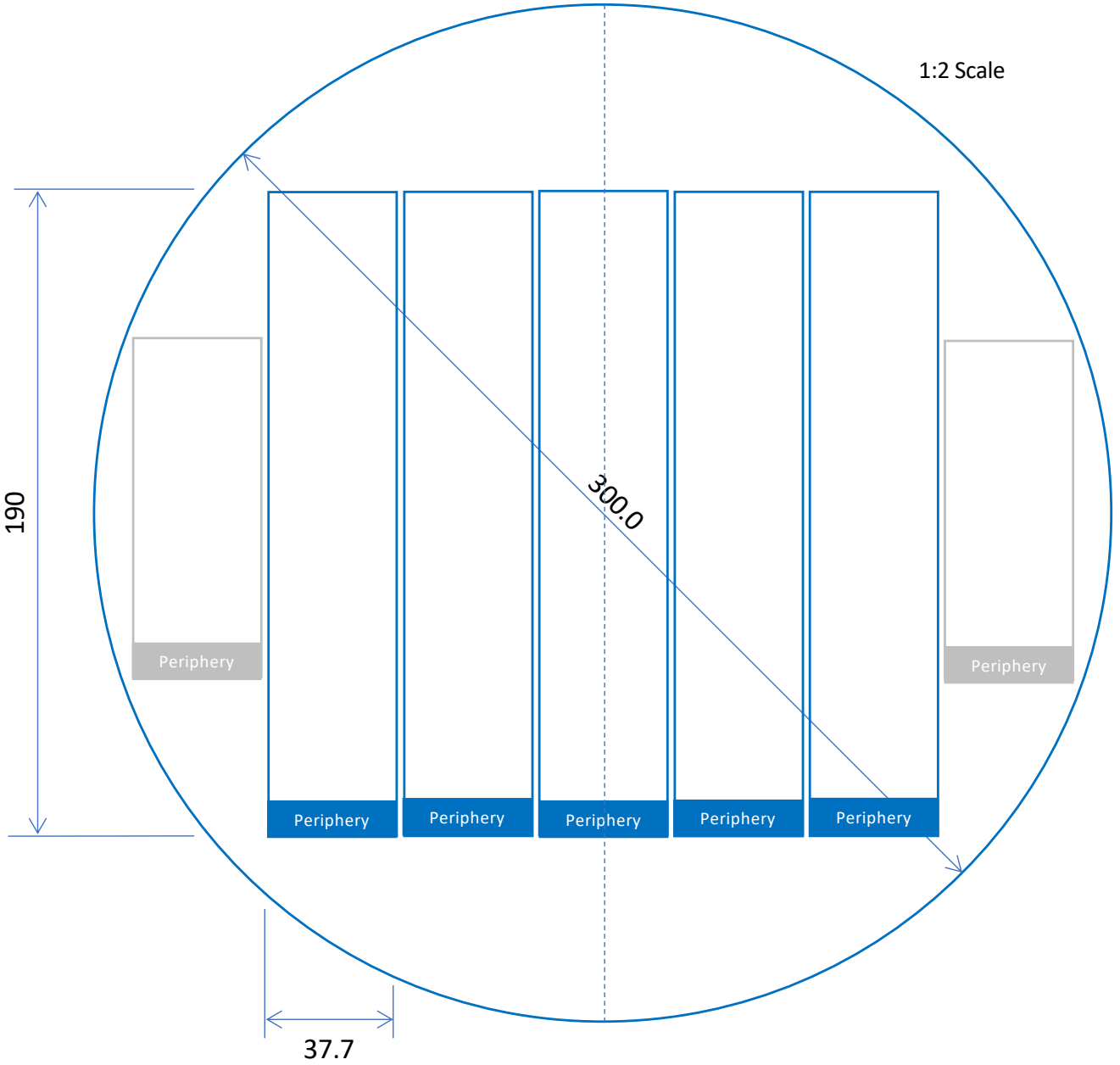
18.85 x 5 = 94.3; R = 30; 30 x 9 + 10; L = 280
18.85 x 6 = 113.1; R = 36; 30 x 8 + 10; L = 250
18.85 x 7 = 132.0; R = 42; 30 x 8 + 10; L = 250
18.85 x 8 = 150.8; R = 48; 30 x 8 + 10; L = 250
18.85 x 9 = 169.7; R = 54; 30 x 7 + 10; L = 220

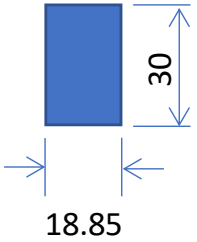
EIC – SVT

1:2 Scale



EIC – LAS
ATHENA L3

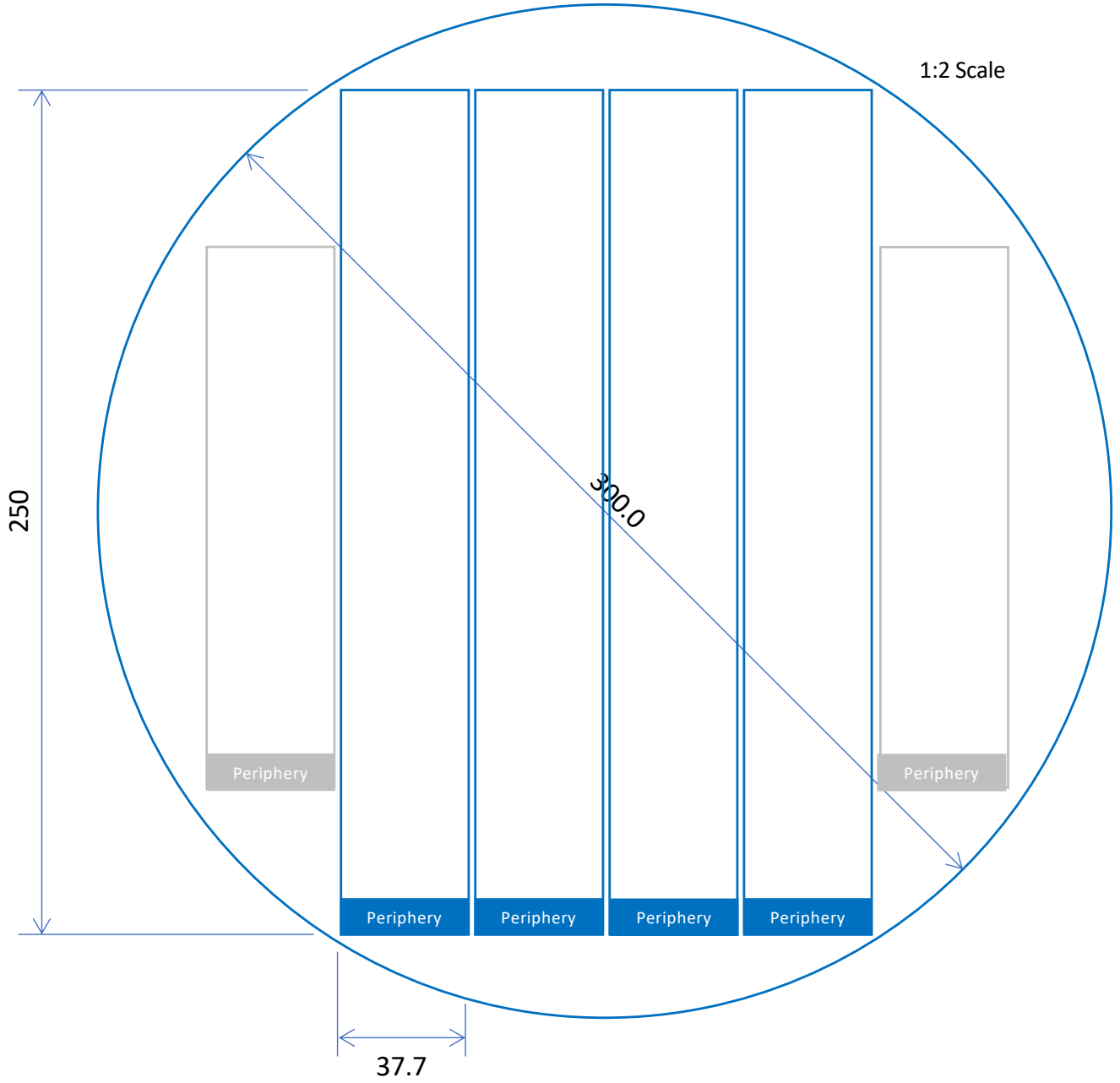


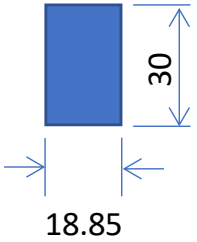


2 x 6 = 37.7 x 180
2 x 3 = 37.7 x 90

Usage
51%-61%

EIC – LAS
ATHENA L4

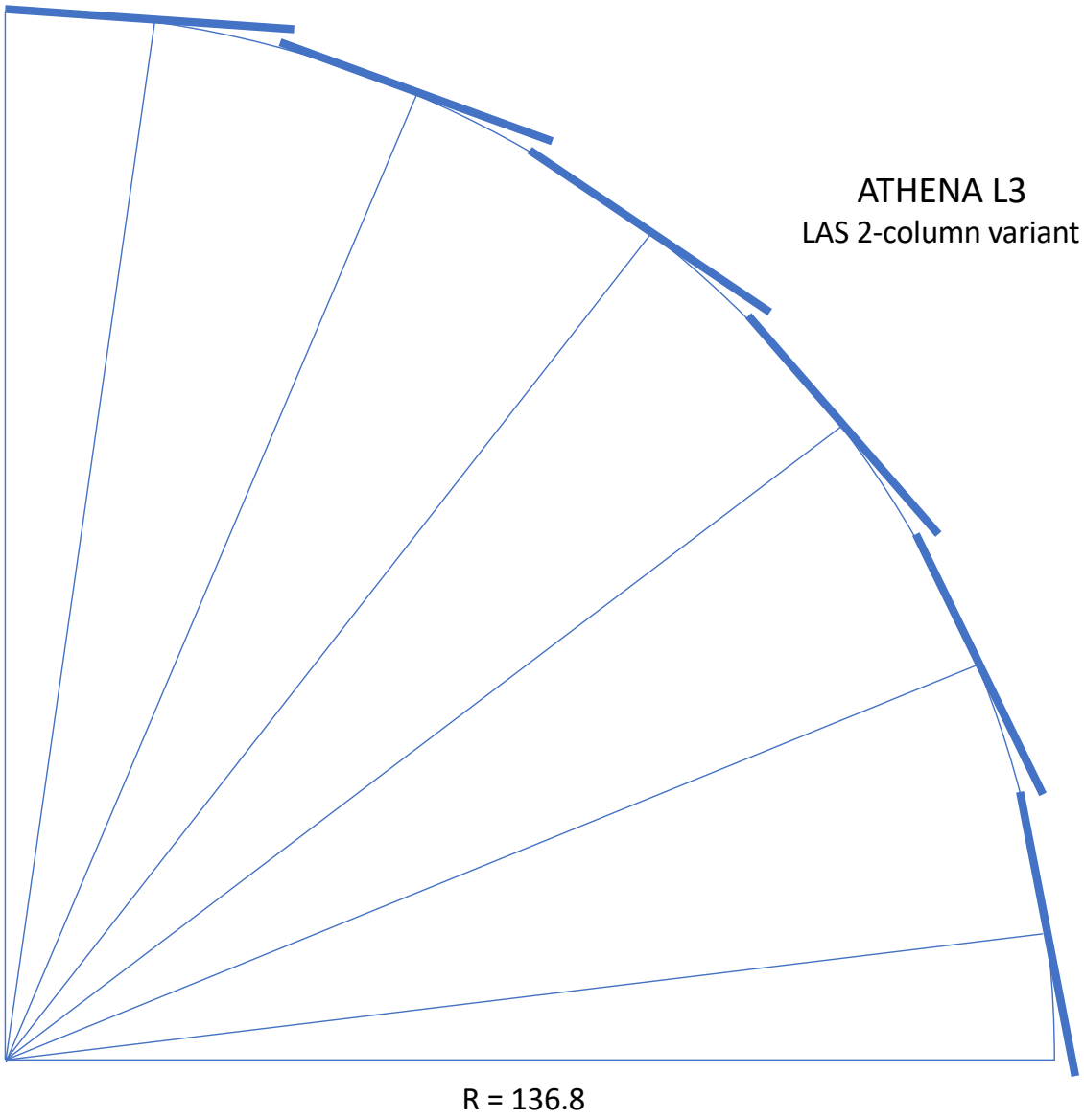




2 x 8 = 37.7 x 240
2 x 5 = 37.7 x 150

Usage
53%-70%

EIC – LAS



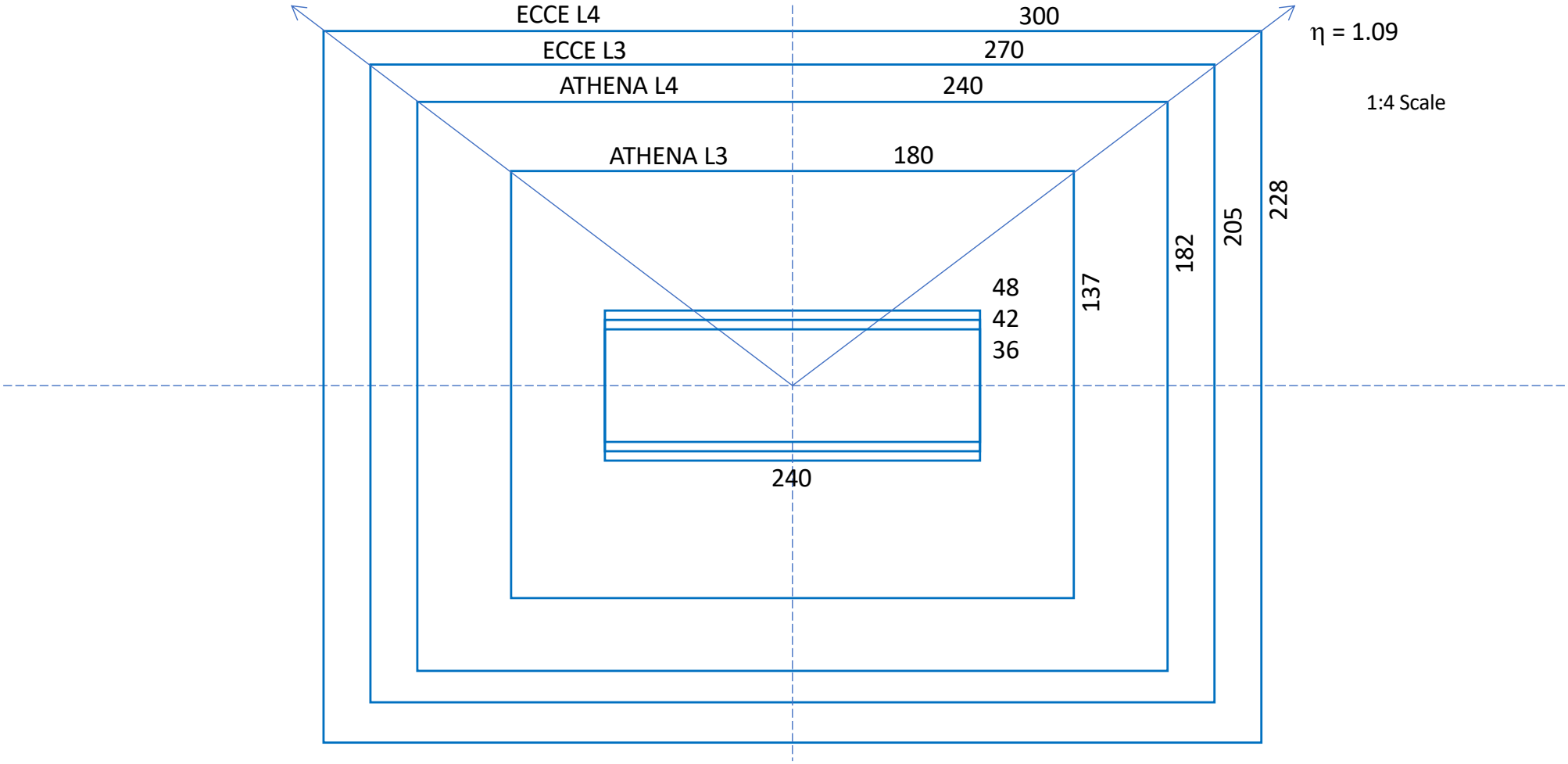
ATHENA L3
Target radius R = 133.4
Final radius R = 136.8
LAS form factor = 2 x 6
LAS per quadrant = 6
Tilt angle = 4 degrees

ATHENA L4
Target radius R = 179.6
Final radius R = 182.1
LAS form factor = 2 x 8
LAS per quadrant = 8
Tilt angle = 3 degrees

ECCE L3
Target radius R = 210.0
LAS form factor = 5 x 9
LAS per quadrant = 3.5
Final radius R = 204.8
LAS form factor = 2 x 9
LAS per quadrant = 9
Tilt angle = 2.5 degrees

ECCE L4
See next slide

EIC – LAS



Note: radii and lengths adjusted slightly to work with reticle size 18.85 x 30.00 mm^2
Length of vertex layers is made of one sensor read out at ONE end
Length of barrel layers is made of two sensors read out at BOTH ends
ATHENA L3 = 2 x 6 reticles (5 per wafer; usage = 51%; 48 LAS required; 10 wafers)
ATHENA L4 = 2 x 8 reticles (4 per wafer; usage = 53%; 64 LAS required; 16 wafers)
ECCE L3 = 2 x 9 reticles (2 per wafer; usage = 30%; 72 LAS required; 36 wafers)
ECCE L3 = 5 x 9 reticles (1 per wafer; usage = 37%; 32 LAS required; 32 wafers)
ECCE L4 = Length not achievable with two single-wafer sensors

Summary

- ALICE ITS3 sensors
  - Ideal reticle size for ITS3 is 18.85 x 30 mm^2
  - Likely to change (increase) to create some sensor overlap
  - EIC will use same reticle size as ITS3
    - We do not have the resources to redesign the “unit cell” containing the pixel matrix; this would lead to a significant increase in development time and cost
- EIC sensors for vertex and barrel layers
  - Options to vary number of “unit cells” per sensor
  - Has implications for the radii, length, material budget and cost
    - ECCE outer barrel layers requires more than two sensors; implying services must run along stave for the third sensor
  - Factor in estimates for the yield into the number of wafers needed
  - Starting to think about mechanical design