AFTA

AFTA Telescope Information for ACW

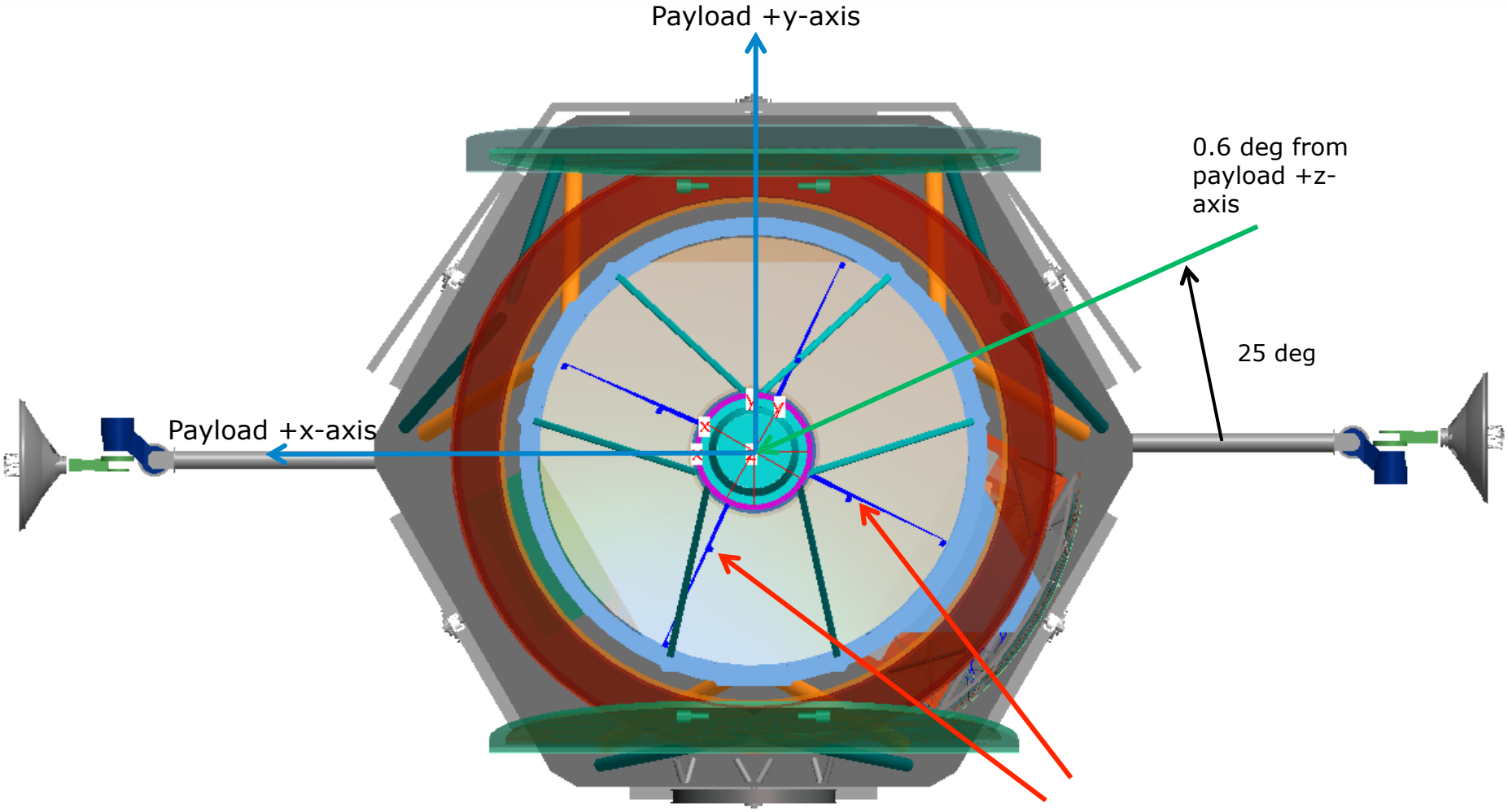
Summary

- This document provides a more detailed definition of the ATFA Telescope Pupil, as seen by the Coronagraph. This pupil description is fairly representative of the actual pupil, but is not exact.
- The pupil is generated from the proposed Cycle 4 optical prescription in which the center FOV of the Coronagraph is 0.6 degrees off-axis.
- Obscurations include the as-built clear aperture on the Primary Mirror, the "features" around the hole in the PM, the SM support tubes, and a representative SM Baffle.

Notes

- Pupil obscuration due to the Secondary Mirror Baffle is based on the Cycle 3 optical prescription. A Cycle 4 SM Baffle is not yet available.
- All of the circular boundary conditions on the PM do not include the slight ellipticity due to the 0.6 deg FOV bias.
  - This includes the PM OD, PM ID, CA OD, CA ID, and each of the eight circular "features".
- The areas between the PM OD and CA OD, and the PM ID and CA ID may be assumed to be non-reflective. The former is blocked by the Forward Metering Structure (FMS) while the latter may be assumed to be masked.
- The interior of the circular "features" on the PM may be assumed to be masked and non-reflective.
- The SM Baffle is represented by a circle rather than an ellipse. However, it is shifted in the +y direction due to the approximately 2m height of the SM above the PM.
- The SM Support Tubes ("struts") are the same width, despite variations due to the 0.6 deg FOV bias.

Coronagraph Center FOV Input

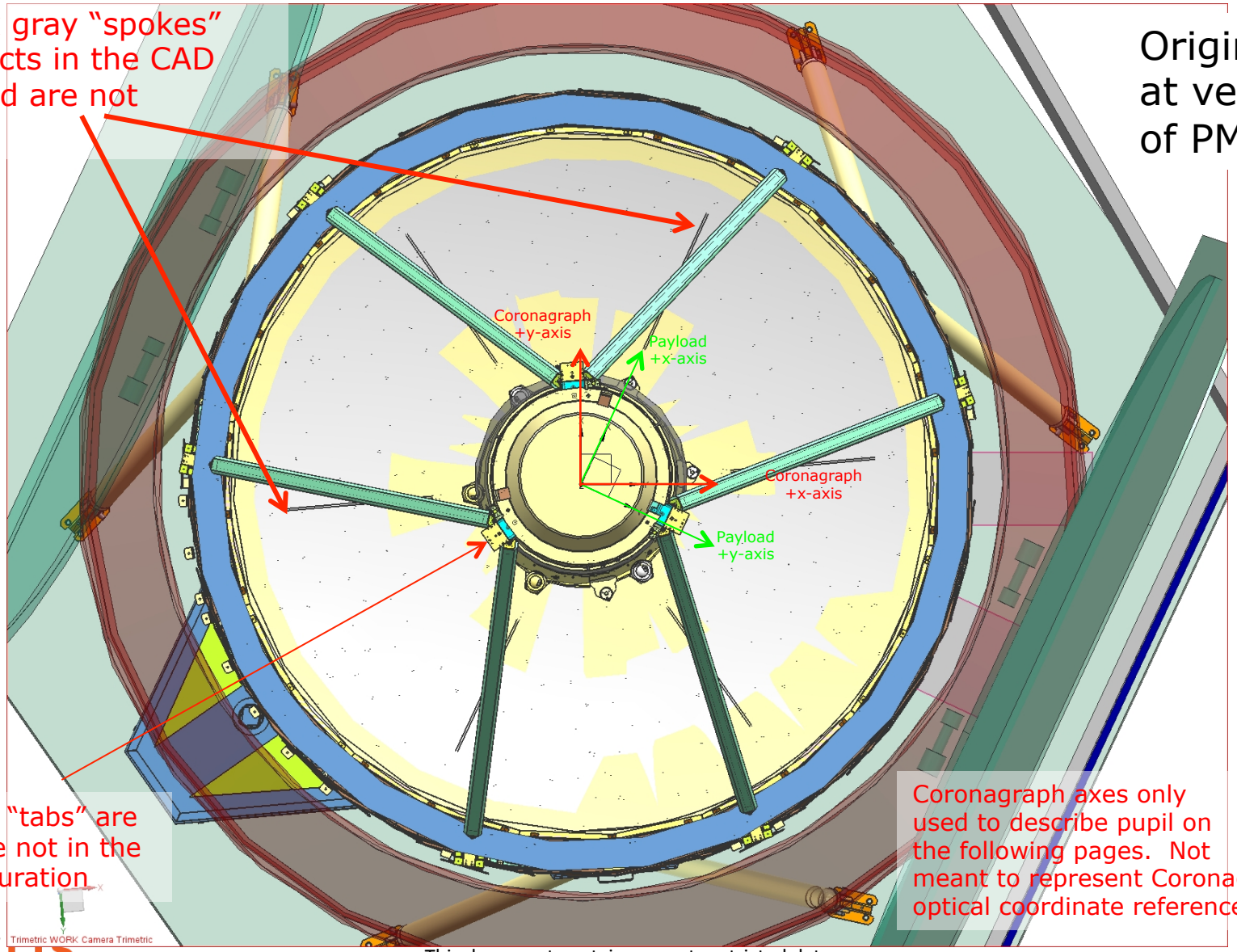


These four blue "spokes" are artifacts in the CAD model and are not physical.

View of telescope from center of incoming Coronagraph FOV

These six gray "spokes" are artifacts in the CAD model and are not physical.

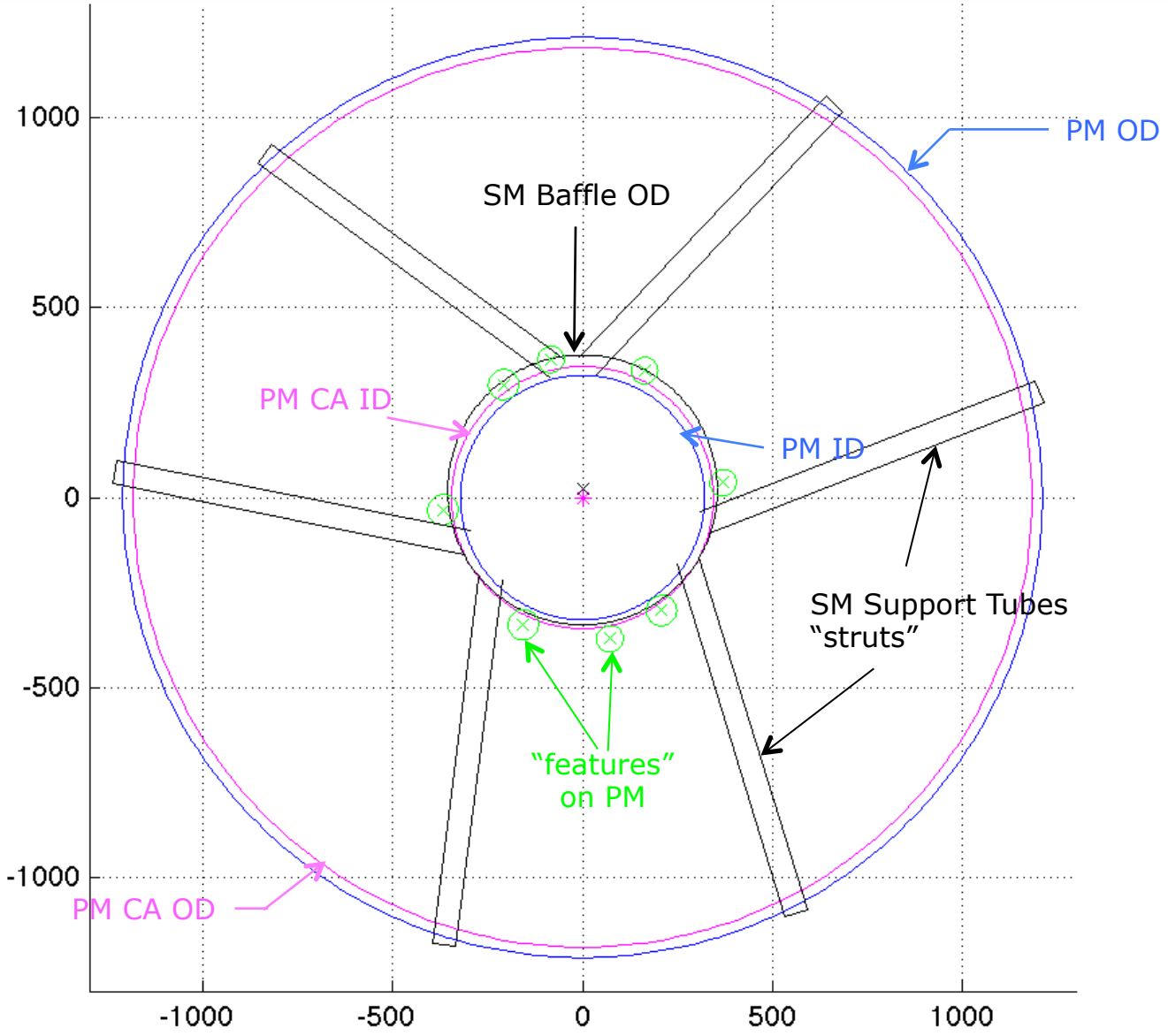
Origin is at vertex of PM



These three "tabs" are GSE and are not in the flight configuration

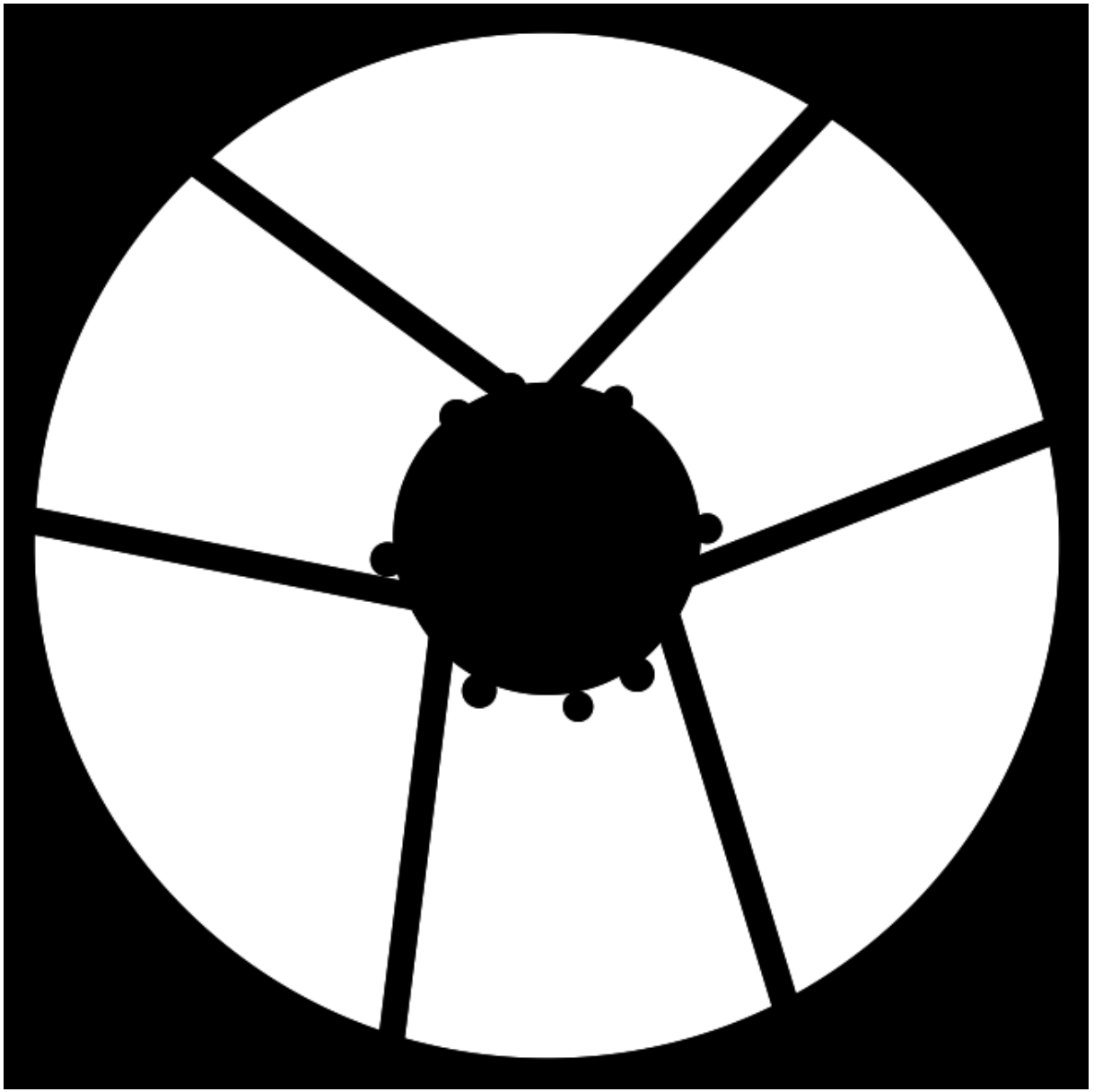
Coronagraph axes only used to describe pupil on the following pages. Not meant to represent Coronagraph optical coordinate reference frame

Projected Pupil Mask At Primary Mirror



AFTA

This pupil image is not export restricted.



Collecting Area

- Collecting Area PM within Clear Aperture (excluding struts, features, & SM baffle)
  - 4.03 sq meters
- Coronagraph Collecting Area (including struts, features, & SM baffle obscurations)
  - 3.67 sq meters
- Coronagraph pupil collecting area as percentage of CA
  - 91%

Pupil Features

- PM Physical Dimensions: (from CAD drawing)
  - OD: 2424.176 mm
  - ID: 642.620 mm
- PM Clear Aperture: (from CAD drawing)
  - OD: 2368.042 mm
  - ID: 690.118 mm
- SM Baffle:
  - OD: 710.822 mm
  - Center: [x, y] = [0, 21.3] mm

Pupil Features

- Large Circular Features:
  - 80 mm diameter
  - Centers located at:
    - R = 363.22mm, θ = 125 deg
    - R = 363.22mm, θ = -55 deg
    - R = 369.619mm, θ = -114.982 deg
    - R = 369.619mm, θ = -175.018 deg
- Small Circular Features:
  - 70 mm diameter
  - Centers located at:
    - R = 372.951mm, θ = 102.909 deg
    - R = 372.223mm, θ = 63.933 deg
    - R = 372.223mm, θ = 6.067 deg
    - R = 378.755mm, θ = -79.020 deg

Strut Obscuration in Rect Coordinates

- strut1
  - [-7.5291, 368.4]
  - [642.51, 1057.1]
  - [686.81, 1013.7]
  - [36.768, 325.02]
- strut2
  - [-87.239, 315.26]
  - [-855.92, 878.75]
  - [-820.01, 929.29]
  - [-51.323, 365.8]
- strut3
  - [-310.16, -148.93]
  - [-1239.1, 35.88]
  - [-1226.1, 96.502]
  - [-297.16, -88.306]
- strut4
  - [-211.42, -216.53]
  - [-334.2, -1181.2]
  - [-395.81, -1174.2]
  - [-273.02, -209.52]
- Strut5
  - [307.71, -158.01]
  - [591.68, -1086.7]
  - [532.08, -1103.8]
  - [248.11, -175.1]
- Strut6
  - [310.77, -37.602]
  - [1192.6, 307.63]
  - [1215.8, 250.15]
  - [333.99, -95.087]