PROBA 2 / DSLP Experiment

Geometry figures

S/C reference frame

- Spacecraft-body fixed frame (BOF) is the frame is defined as
  - BOF +X is pointing from the left to right panel (i.e. -X is towards Sun in observational mode)
  - BOF +Y is pointing from the back to front panel (i.e. -Y is in the flight direction in the orbital mode)
  - BOF +Z is pointing from the bottom to top panel
- The transformation from BOF to standard reference frames is provided by the Proba 2 SPICE kernels
- See Figure 1 for BOF illustration

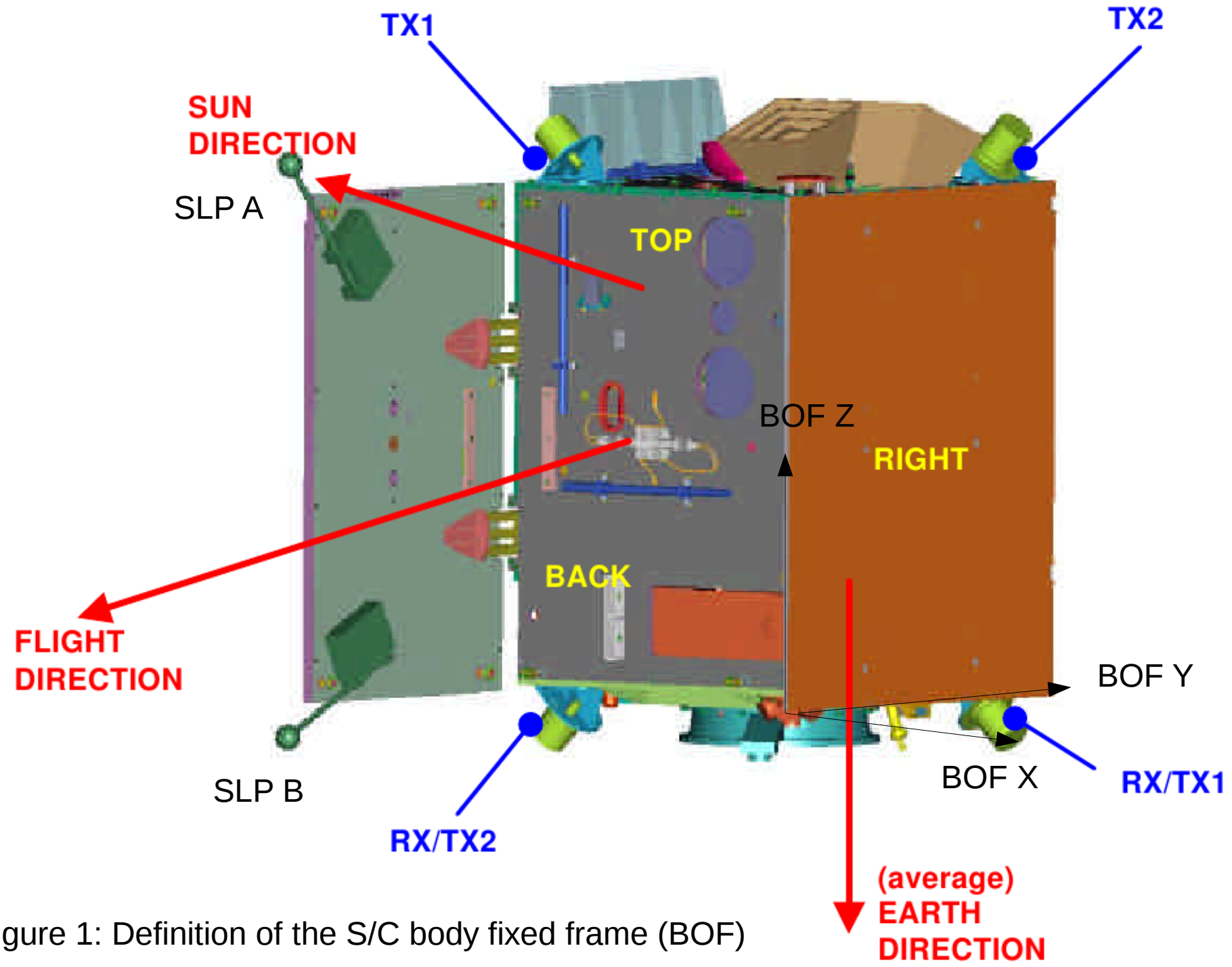
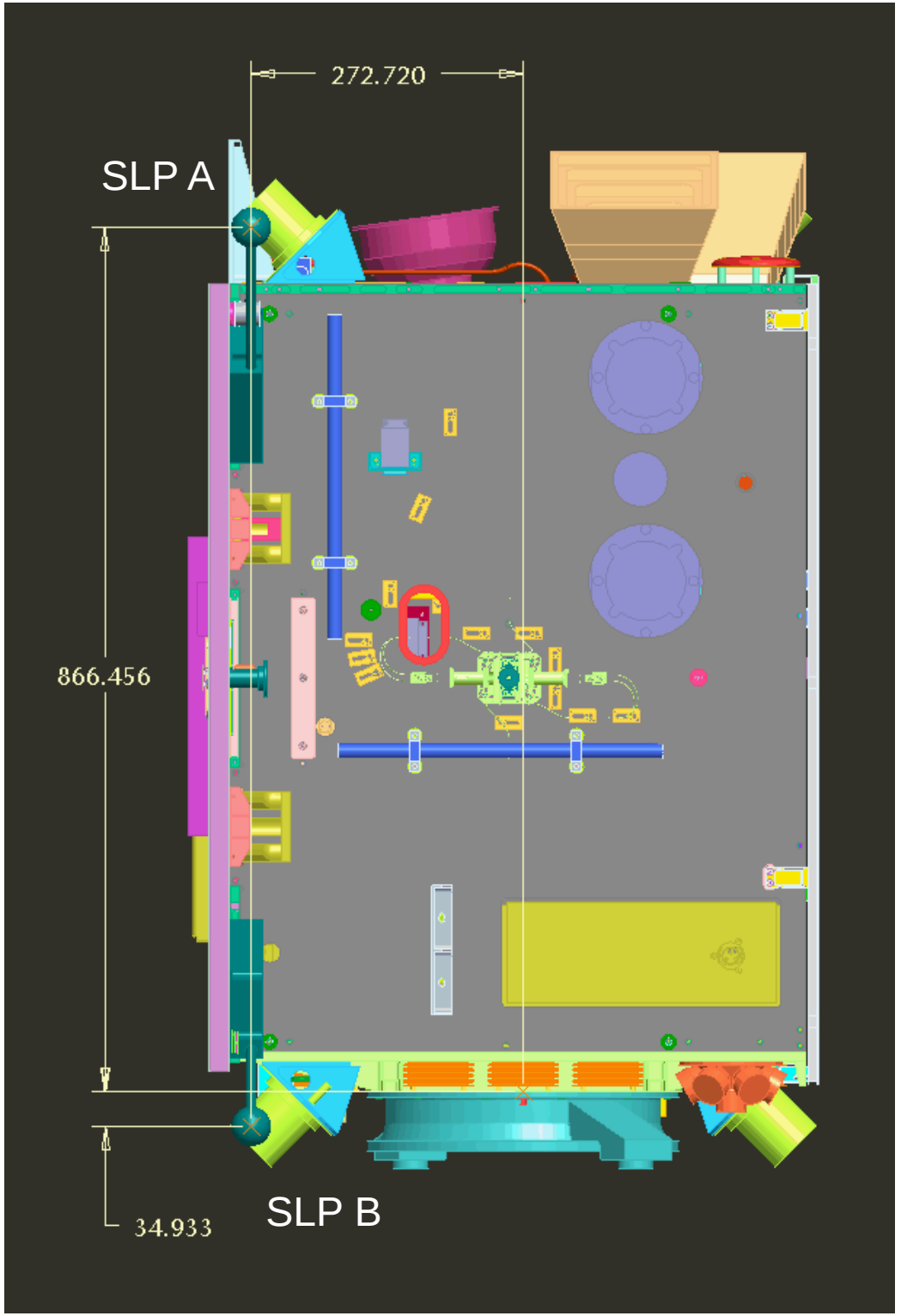


Figure 1: Definition of the S/C body fixed frame (BOF)

SLP A/B in BOF

Units [mm]



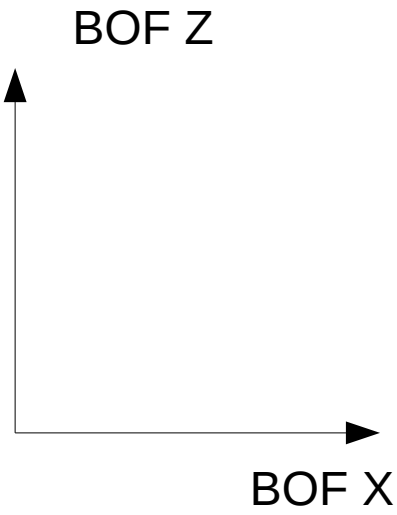


Figure 2: Position of DSLP sensors in the XZ BOF plane.

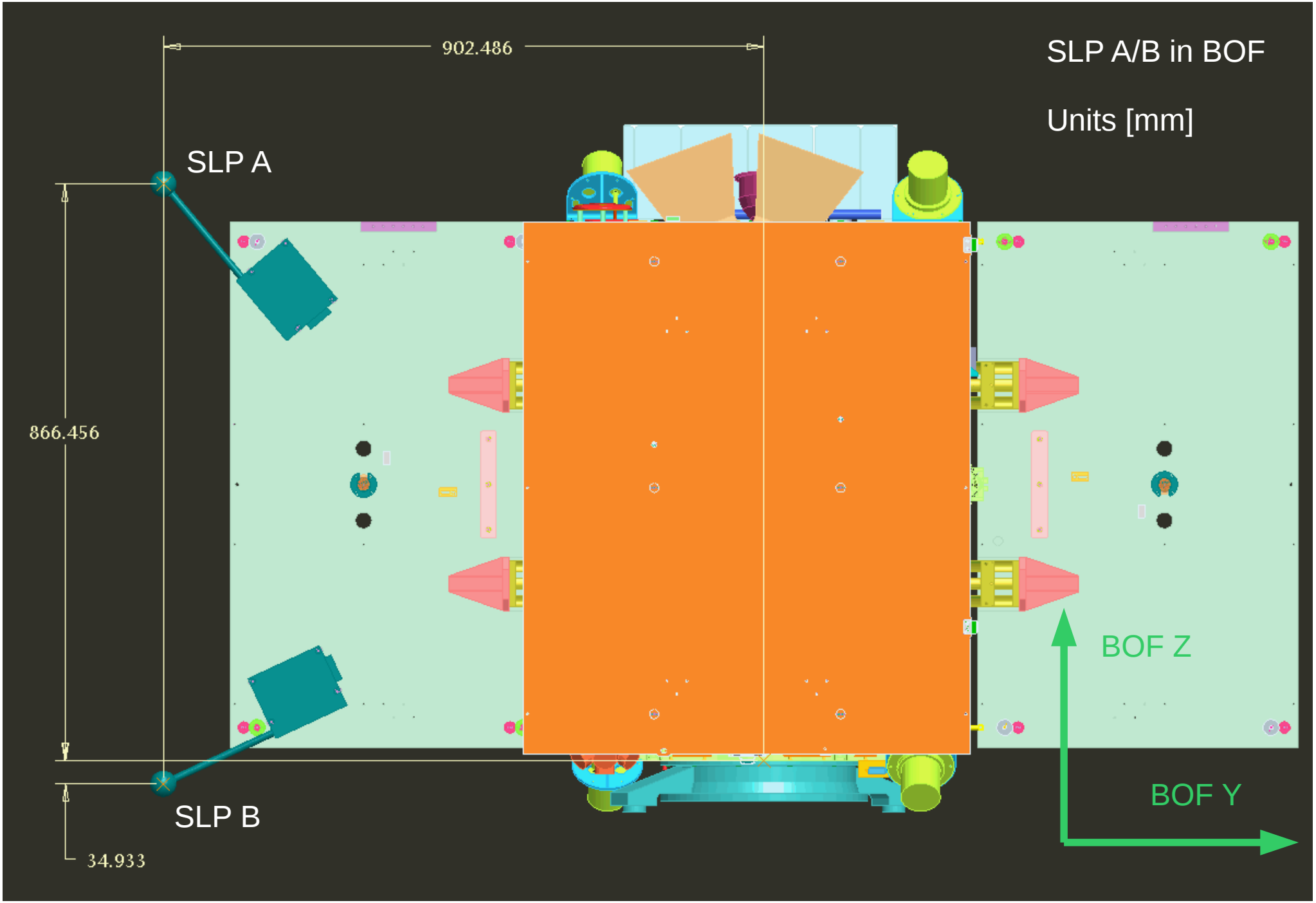


Figure 3: Position of the DLSP sensors in the YZ BOF plane.

Instrument reference frame

- The reference frame of each of the two DSLP sensors (SLPA/B) is defined as
  - SLPA/B X axes is identical to BOF X
  - SLPA/B Z axes is aligned with the sensor boom and points from the electronic box to the sensor
  - SLPA/B Y completes the right-hand system
- See Figures 4 and 5 for the SLPA and SLPB respectively

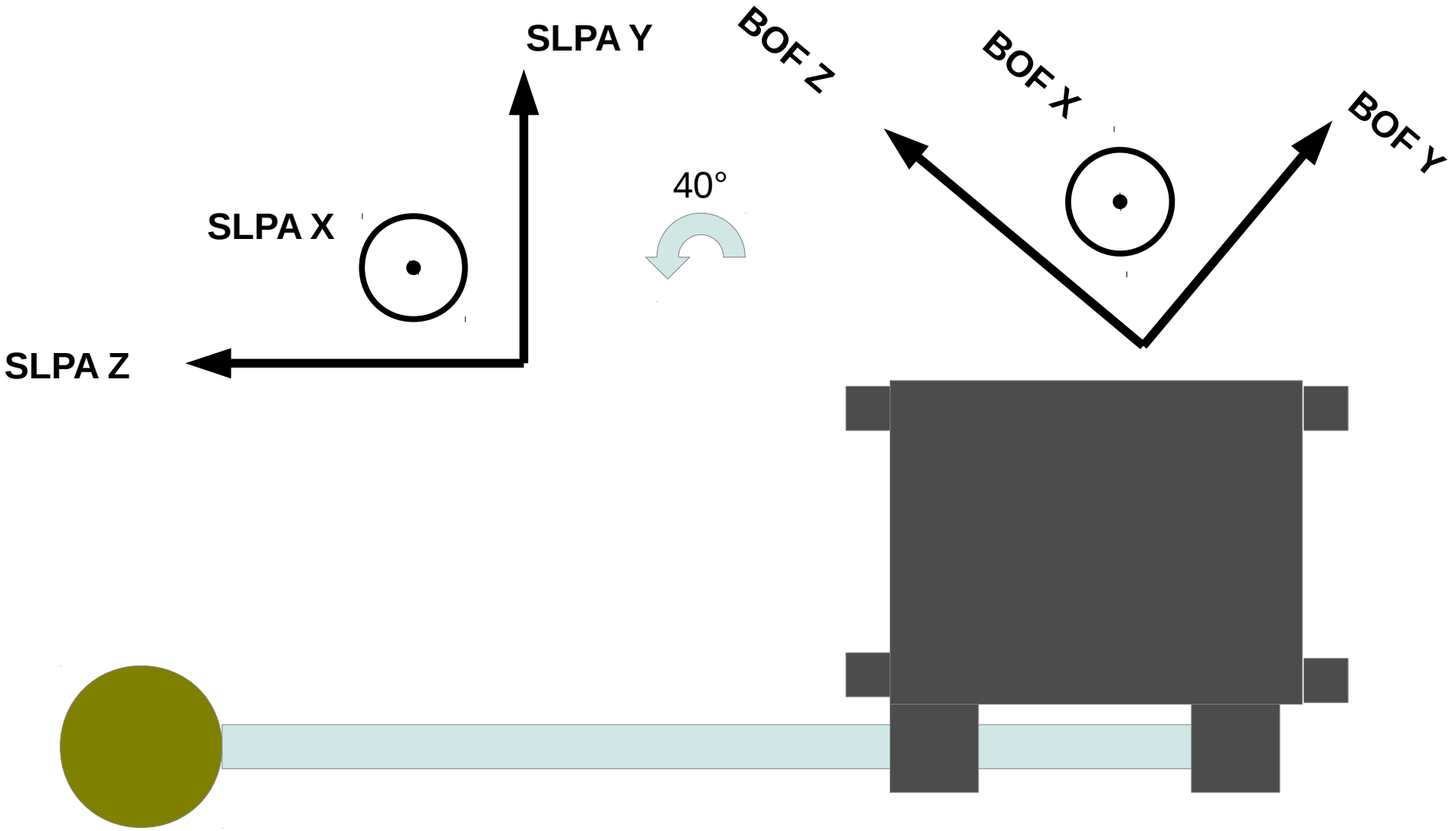


Figure 4: SLPA reference frame and its transformation to BOF

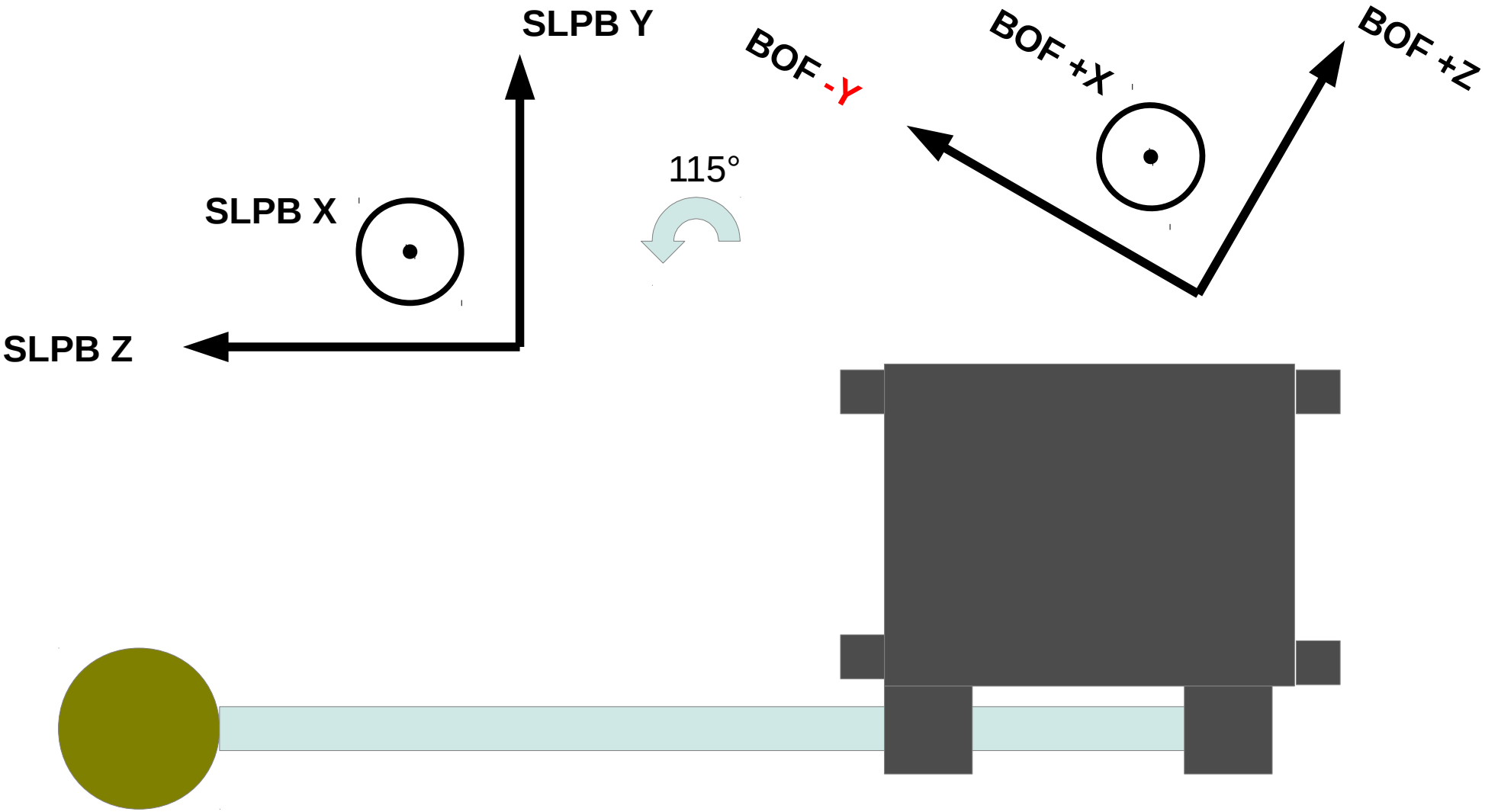


Figure 5: SLPB reference frame and its transformation to BOF

Segments reference frame

- The reference frame the SLP segments for each of the two DSLP sensors
  - SEG X axes points from Segment 2 to Segment 6
  - SEG Y axes points from Segment 1 to Segment 7
  - SEG Z completes the right-hand system (i.e. points to the Segment 4)
- See Figures 6 and 7 for the SLPA/B and SEG transformation and SEG illustration

Figure 5: Segments in SLP A/B reference frame

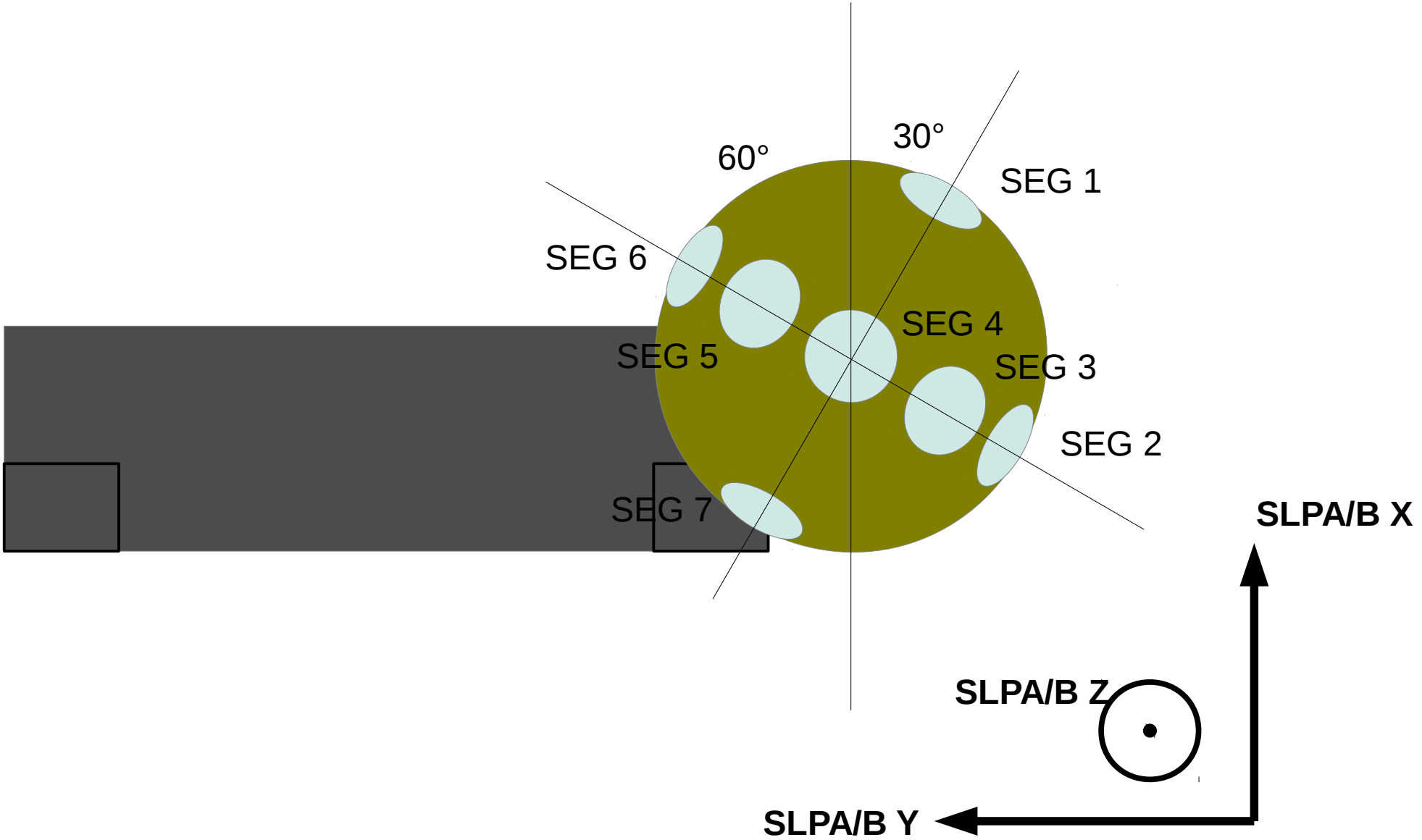
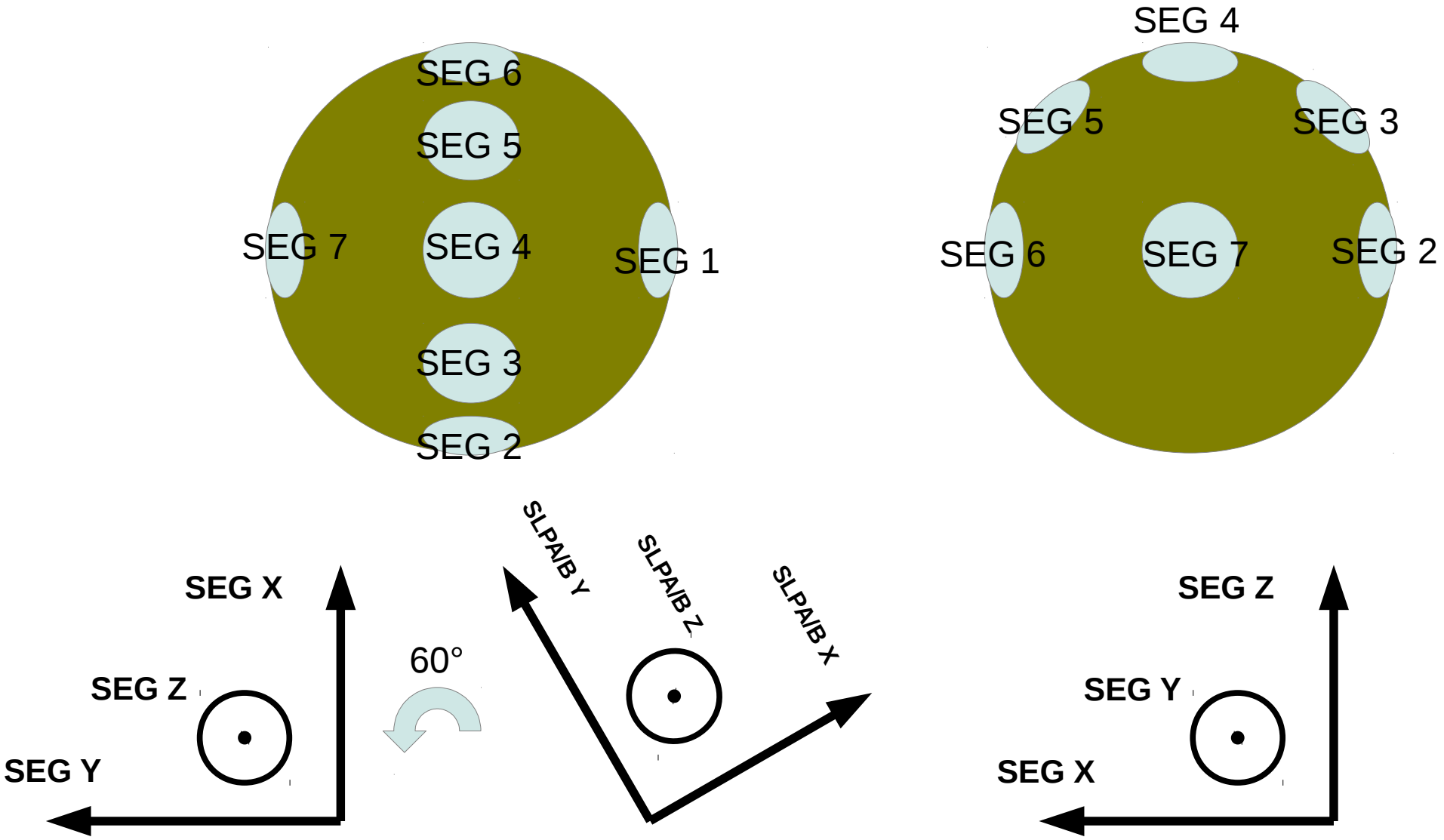


Figure 6: Segments reference frame



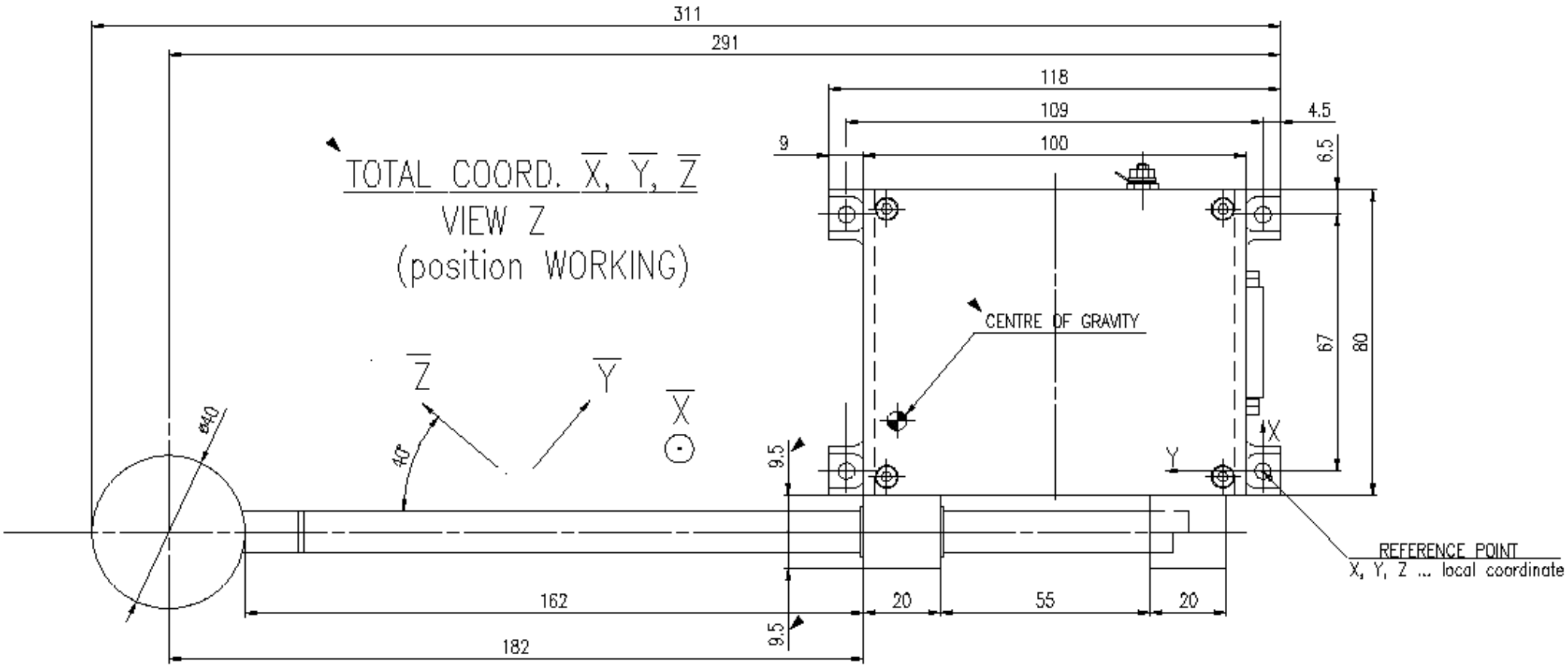
Segments normal vectors in SEG

- Segment 1 – (0,-1,0)
- Segment 2 – (-1,0,0)
- Segment 3 – (-sin(π/4),0,cos(π/4))
- Segment 4 – (0,0,1)
- Segment 5 – (sin(π/4),0,cos(π/4))
- Segment 6 – (1,0,0)
- Segment 7 – (0,1,0)

Coordinates transformation

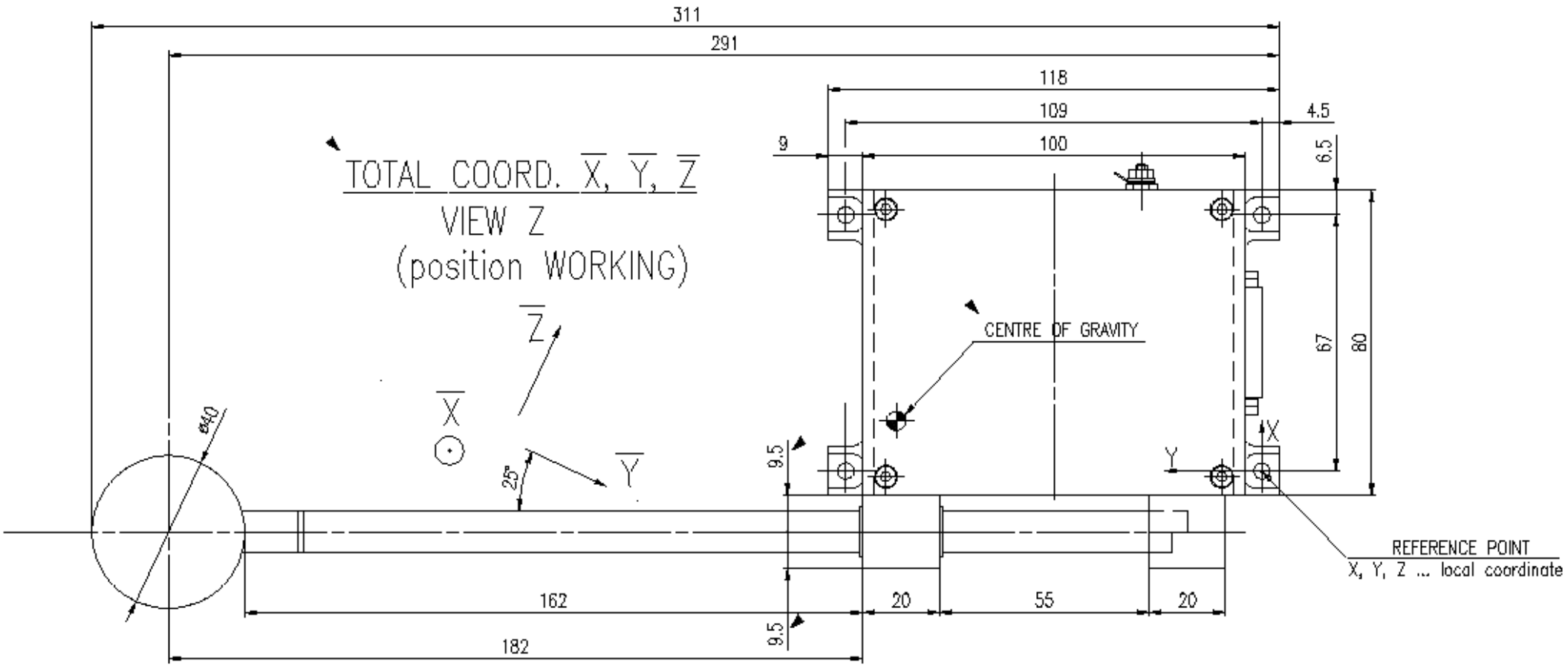
- SPICE → (r,v) in BOF
- BOF → SLP A/B frame = one axes rotation (BOFX)
- SLP A/B frame → Segments frame = one axes rotation (SLP A/B Z)
- Segments normal vectors → directional analysis wrt velocity or magnetic field

SLP A dimensions



- Rotation of BOF Z by -40 degrees around BOF X
- Sphere diameter 40 mm
- Boom length 162 mm

SLP B dimensions



Rotation of BOF Z by -115 degrees around BOF X