

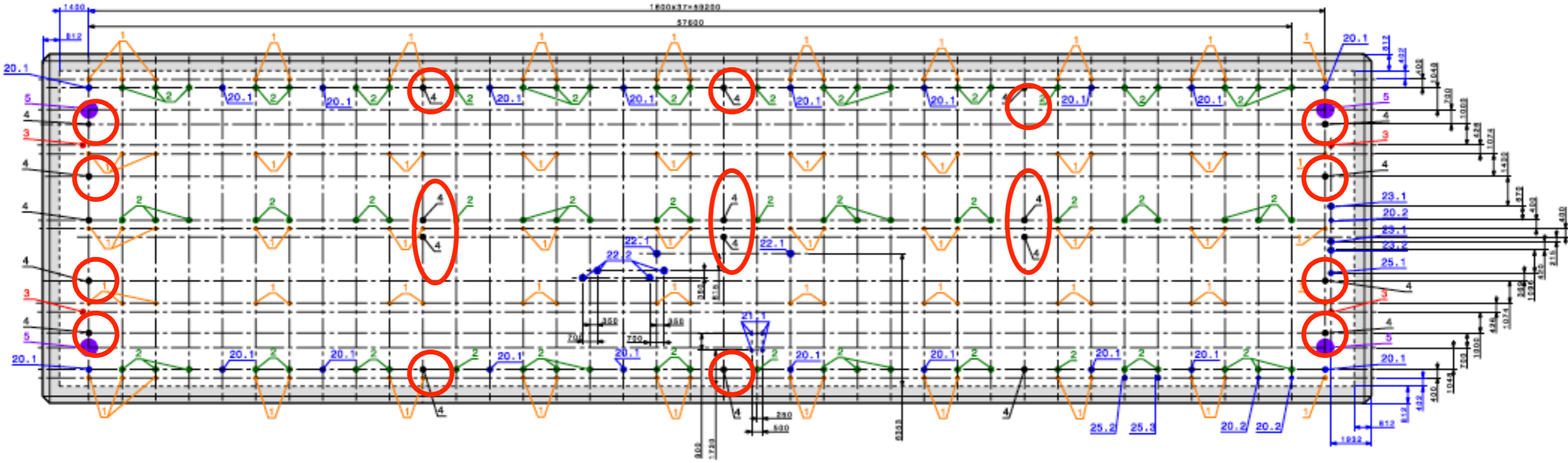
# Laser Alternatives

**José Maneira (LIP)**

DUNE Calibration Consortium Meeting  
June 11, 2019

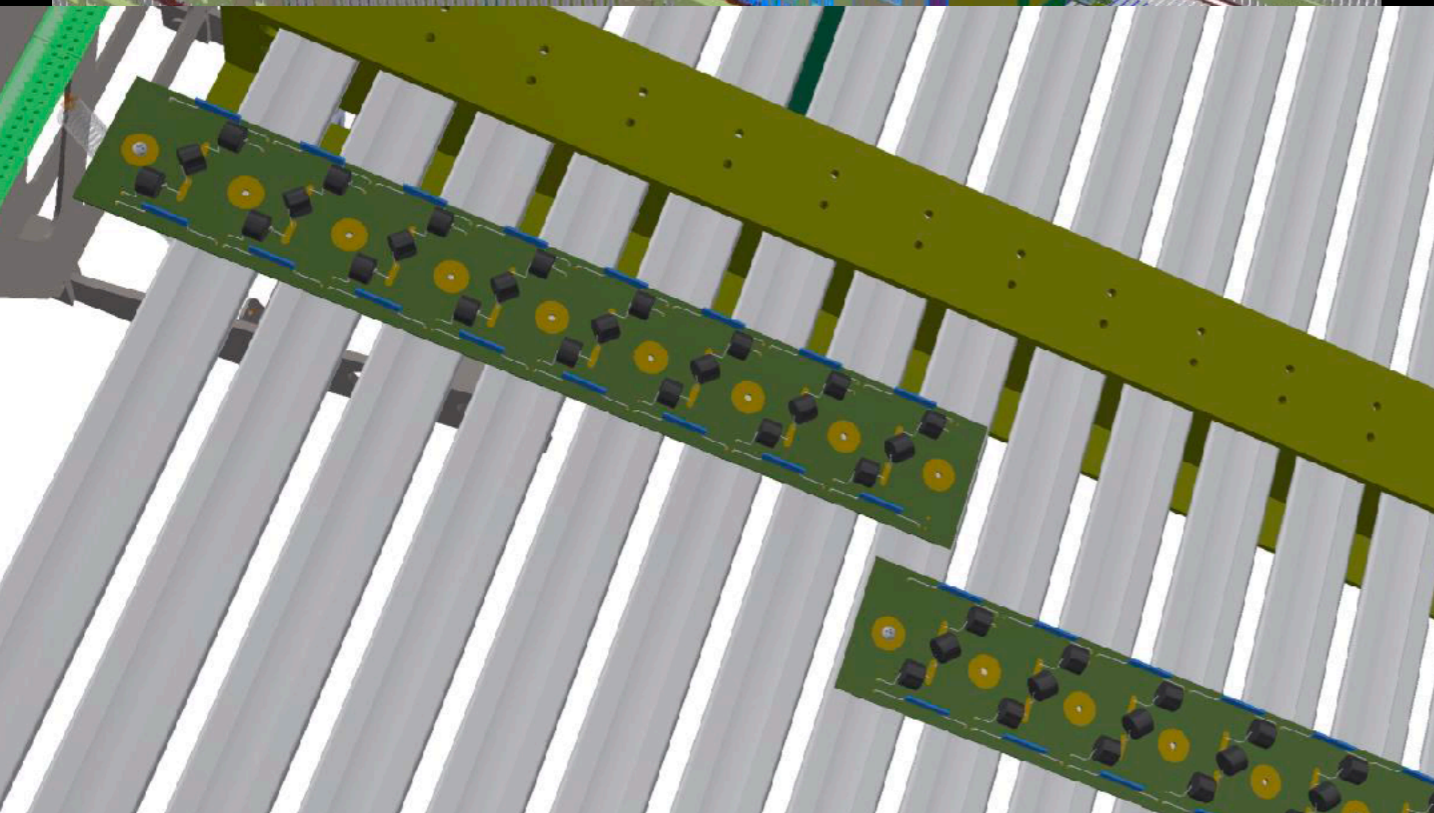
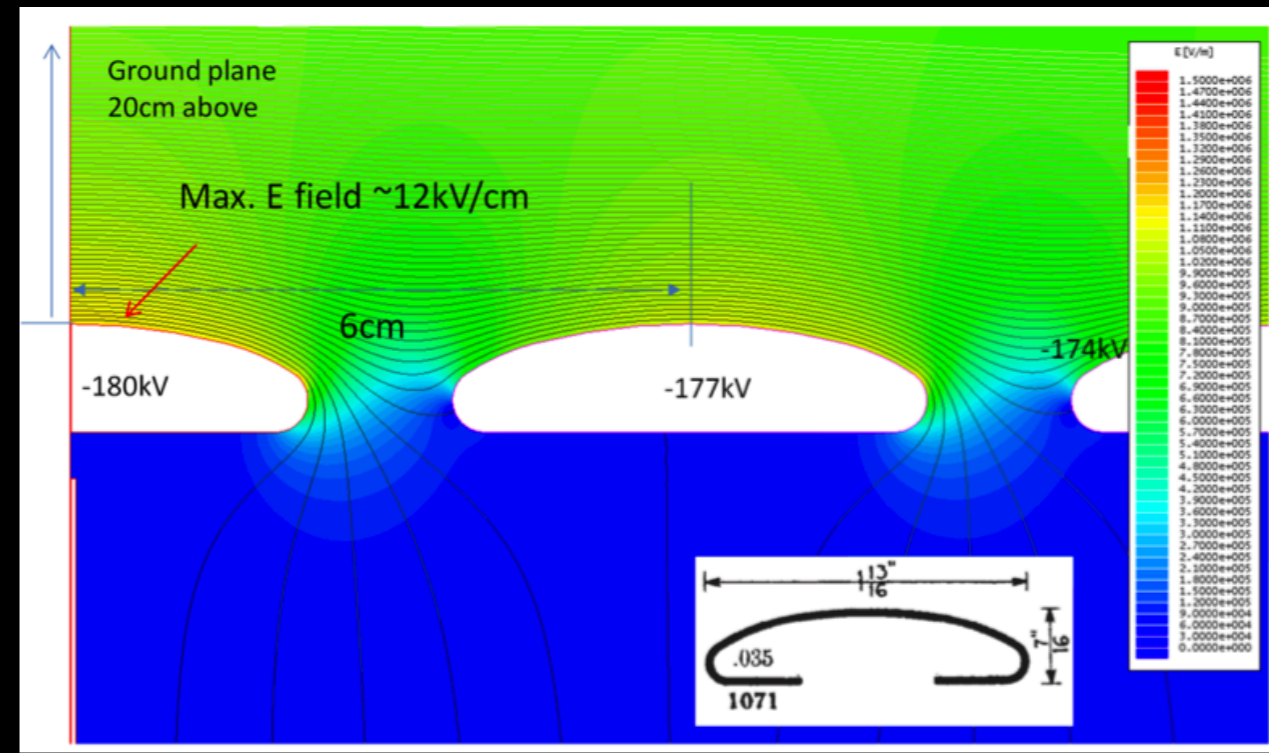
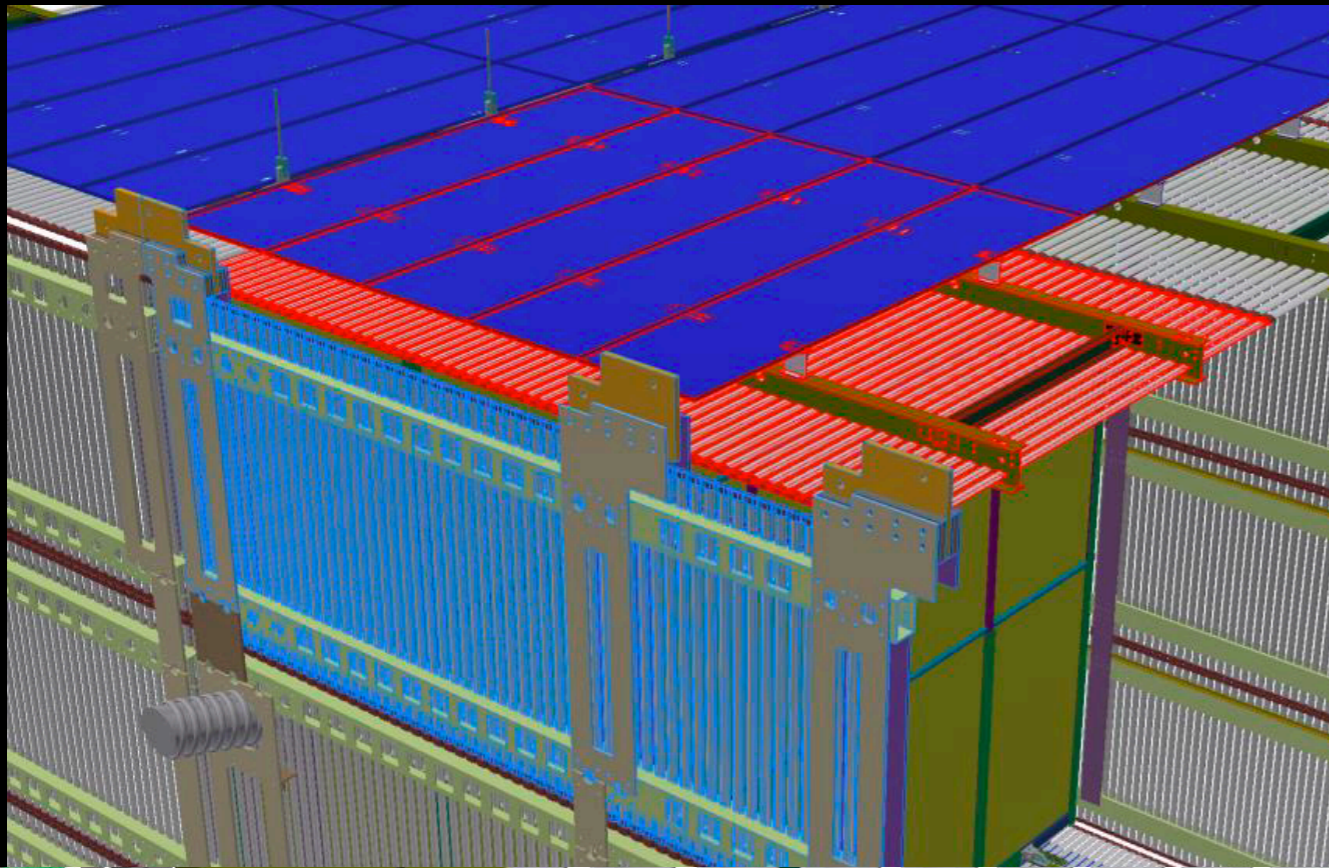
# Calibration Ports

TCO side



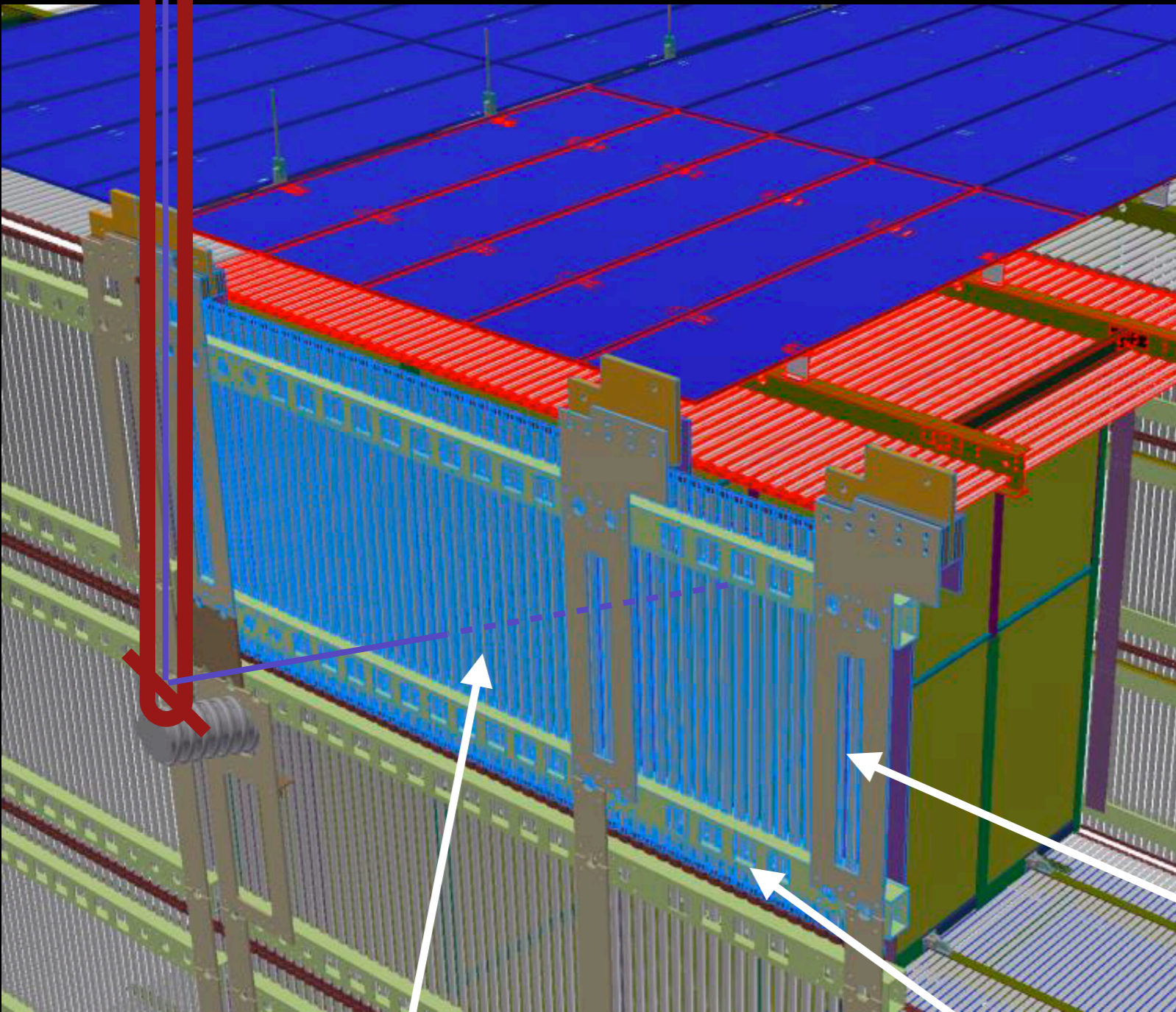
- Top TPC ports (4+4+4)
  - on top of TPC, at 3 different z positions
  - each at about 40 cm from closest APA
- End-wall ports (4 East, 4 West) are:
  - not on top of TPC, but 40 outwards
  - not close to APAs, but closer to mid-drift

# Field cage constraints



- Period 60 mm
  - Wide profiles: 46mm
  - Narrow gaps: 14 mm
  - max angle ~ 45 deg
- Ground plane
  - so can't be too far up

# End-wall limitations



Need to avoid pointing at APA and avoid shadow from all the HV system elements

vertical FC supports

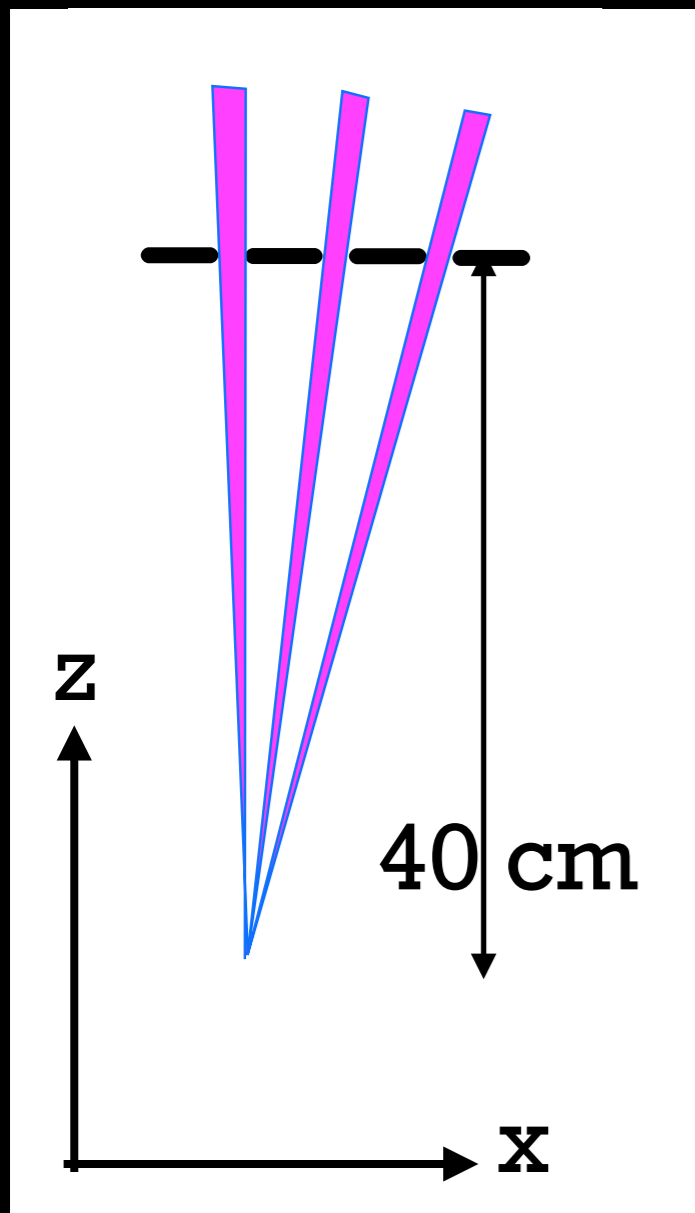
horizontal FC supports

vertical FC profiles

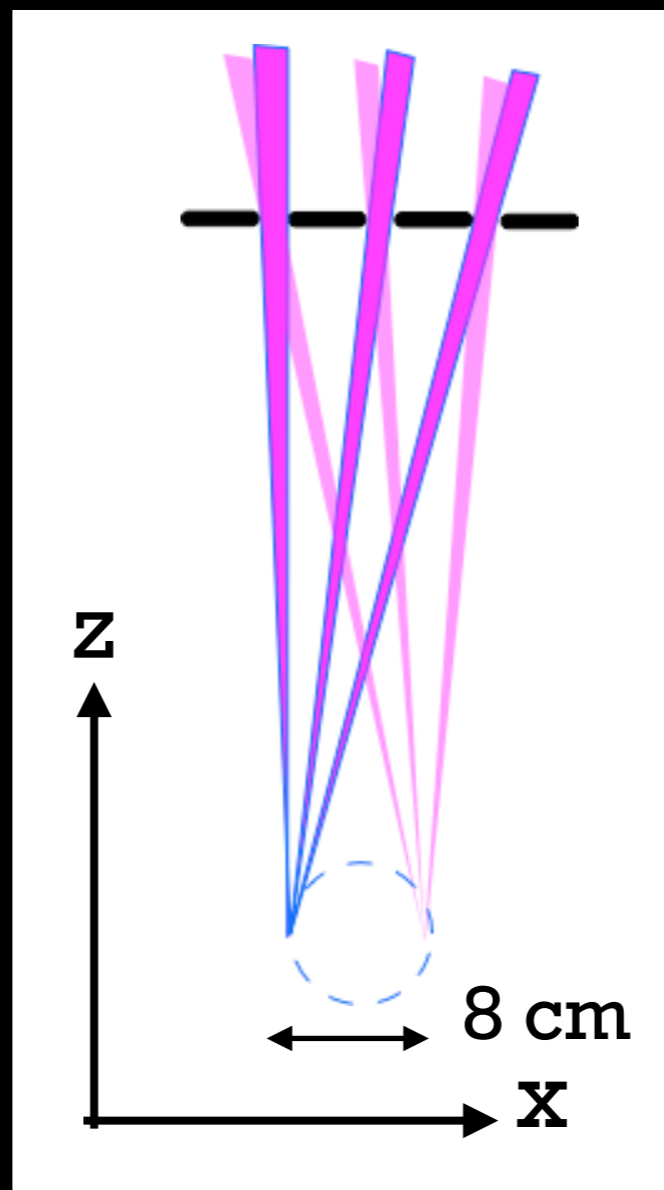
# Alternative 2

- Add another rotation degree of freedom so that the bottom mirror translates in a circular path.

Baseline



Alternative



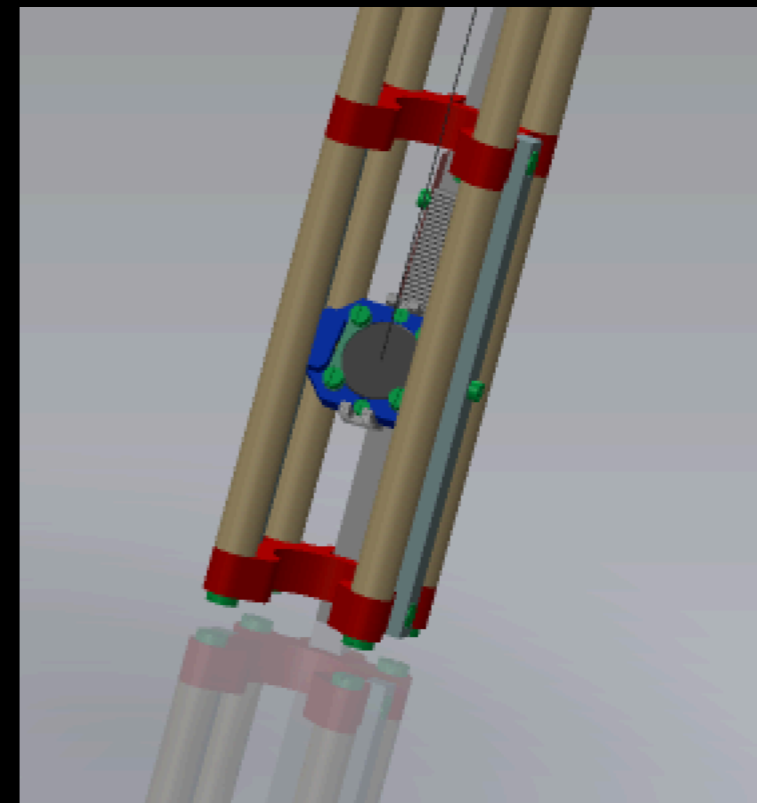
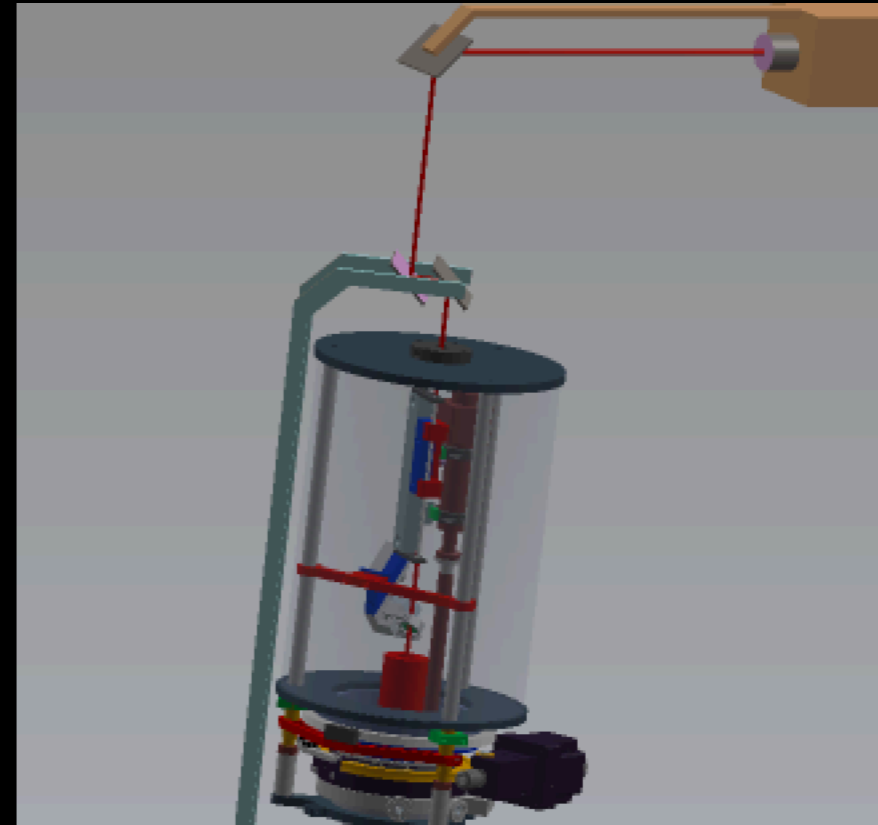
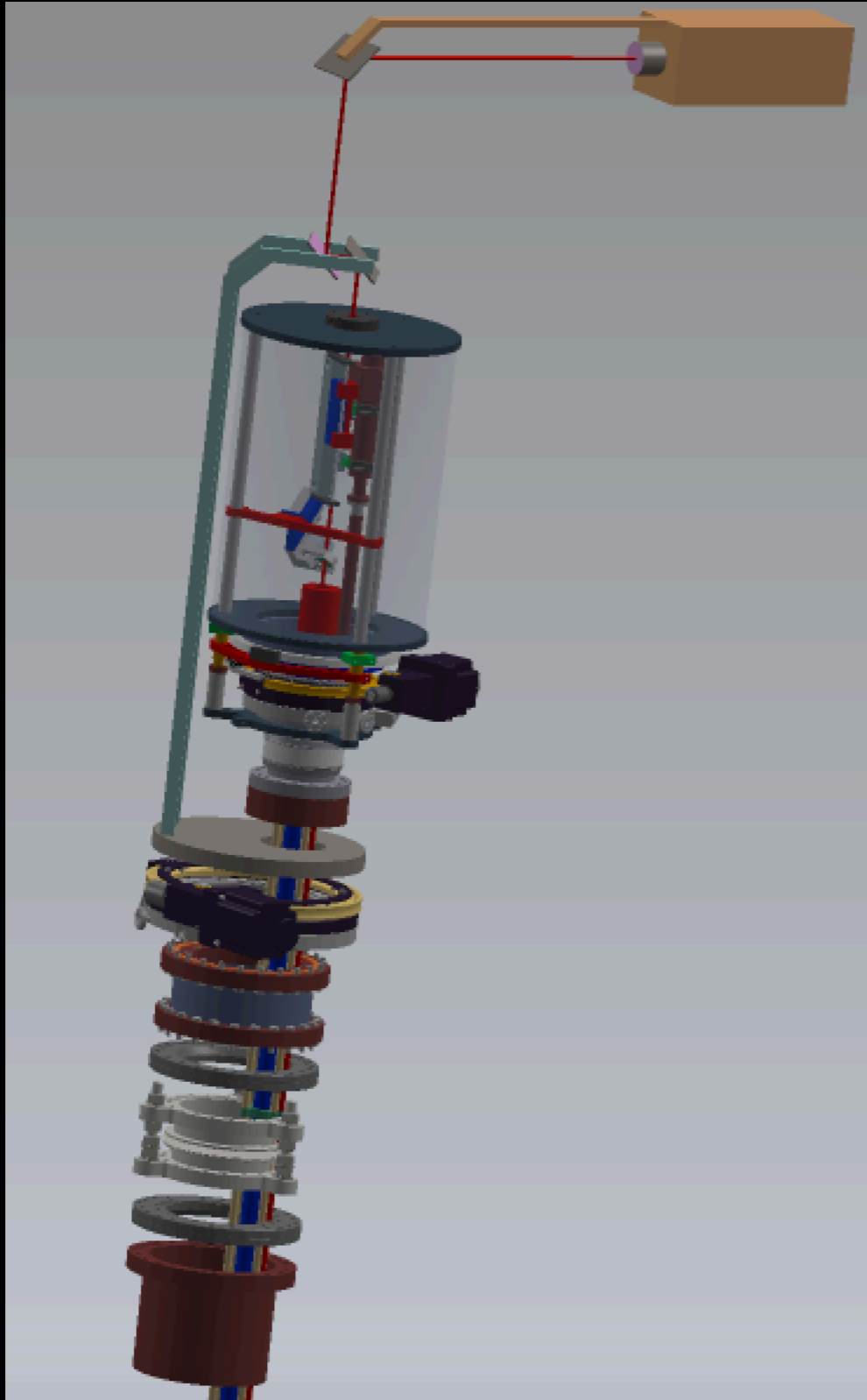
- Beam origin movable along  $x, z$
- Parallax causes different angular regions to be illuminated
- Working on detailed calculation of coverage

# Alternative

- How to achieve it?
  - Secondary rotary flange
  - Offset by  $\sim 4$  cm
  - 3 degrees of freedom
- Advantages
  - No penetration. Mechanical complication all outside cryostat

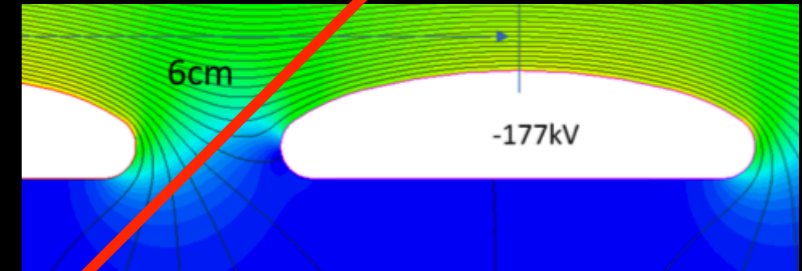


# Preliminary design

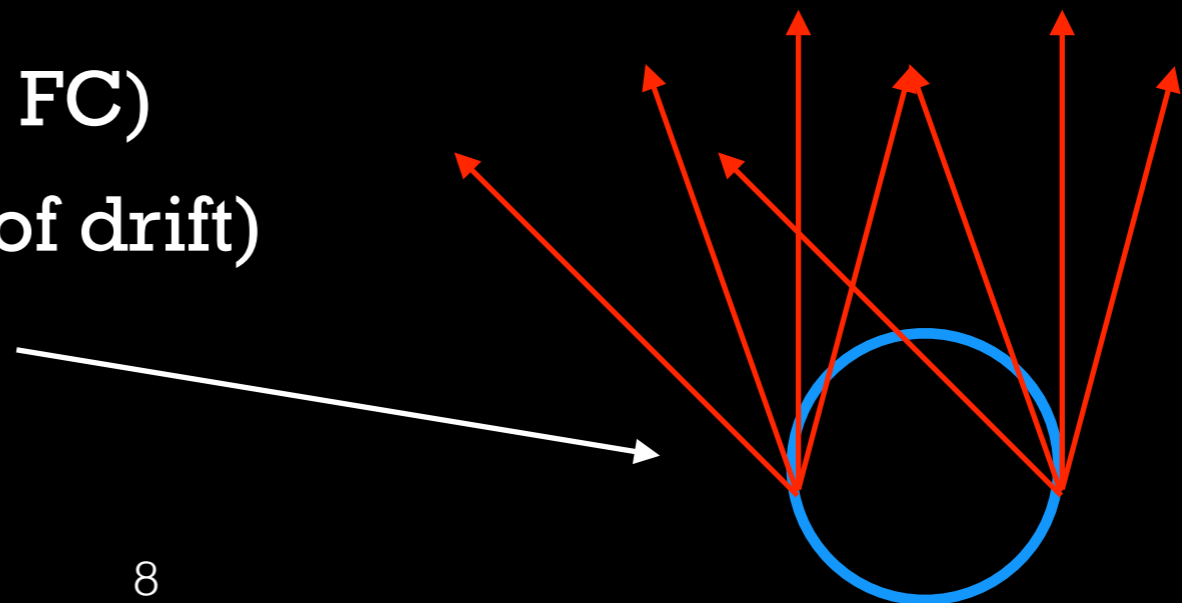


# 2D coverage calculations

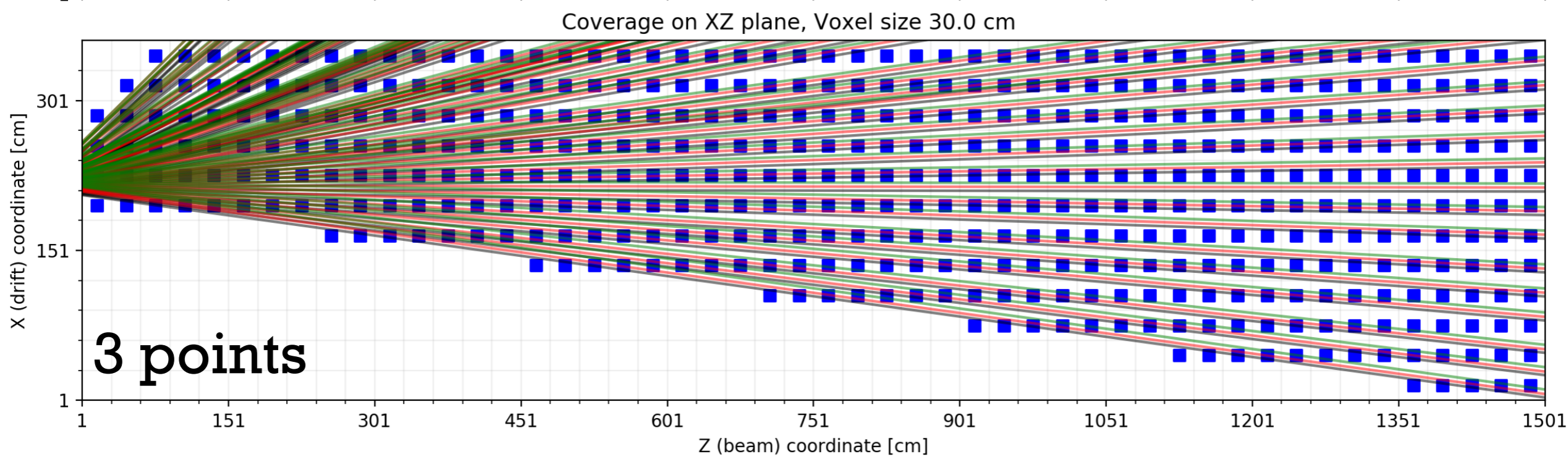
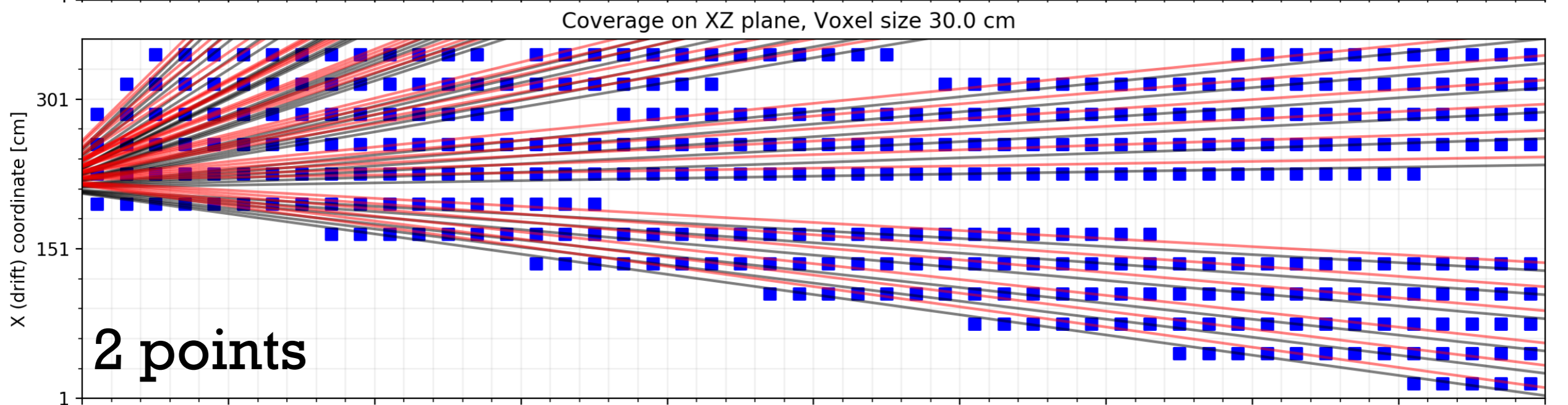
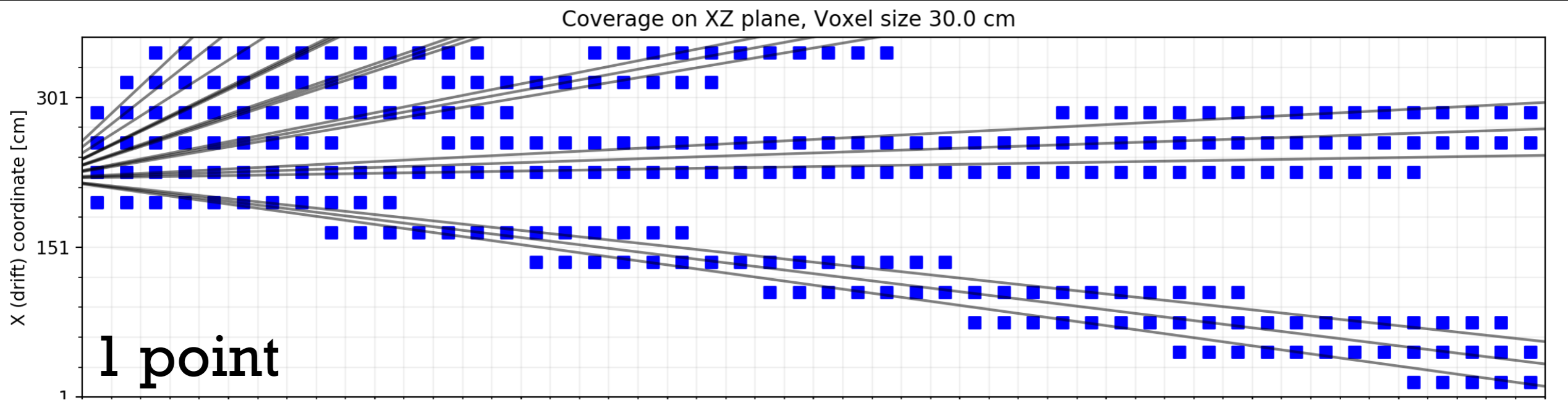
- For now: End-wall beams, XZ plane
- Blocking from vertical FC profiles
  - 4.6 cm wide, 1.4 cm gap
  - assuming max angle = 45 deg
  - (No shadow from horiz. supports)



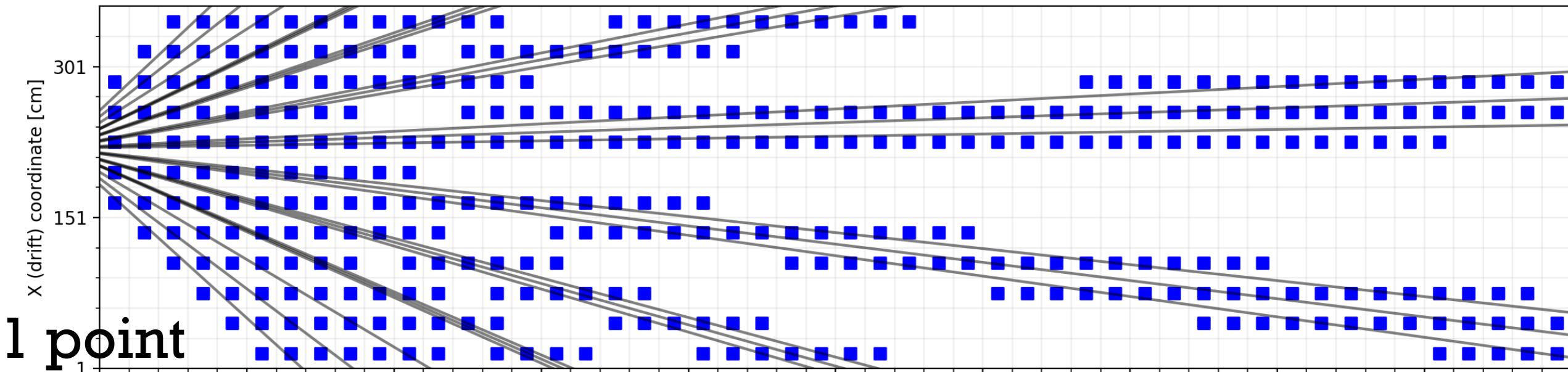
- Starting positions
  - Along a circle of radius 4 cm centered on
    - $Z = -40$  cm (outside FC)
    - $X = +216$  cm (60% of drift)
  - Example, 2 positions:



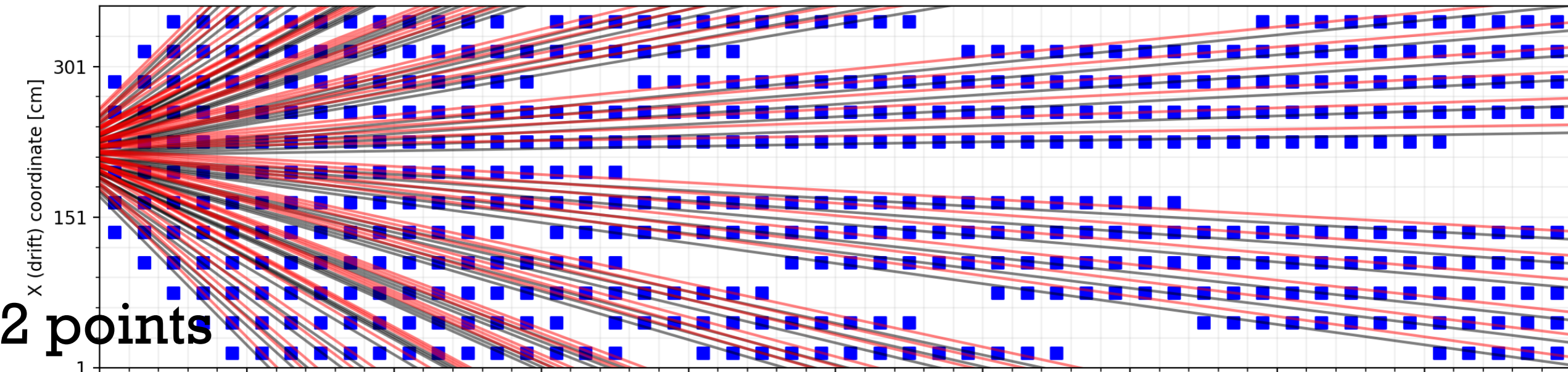




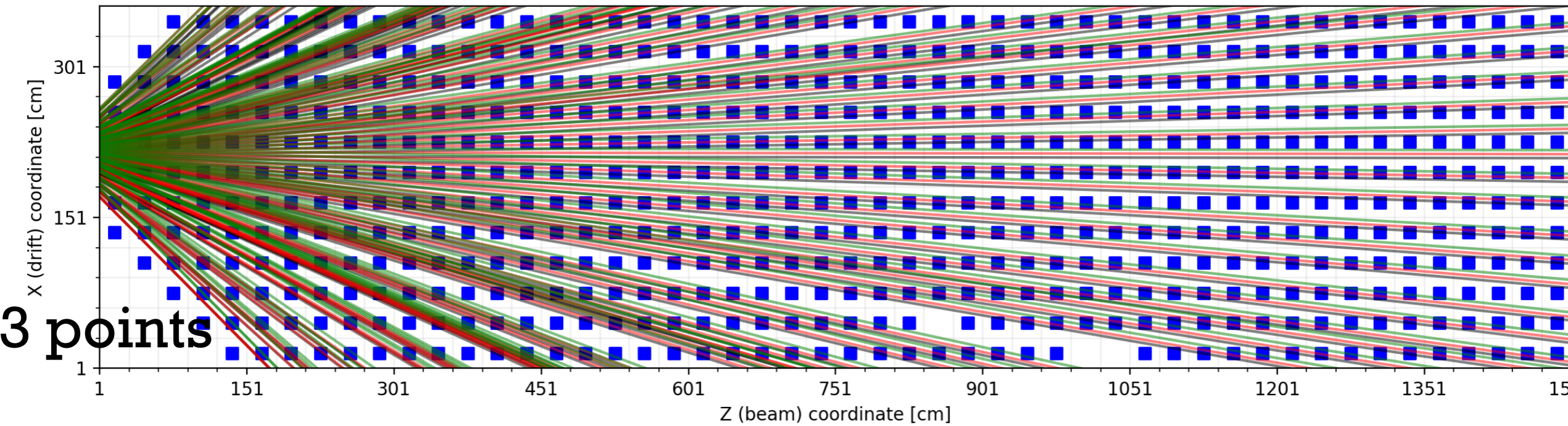
Coverage on XZ plane, Voxel size 30.0 cm



Coverage on XZ plane, Voxel size 30.0 cm



Coverage on XZ plane, Voxel size 30.0 cm



# Calculations of coverage

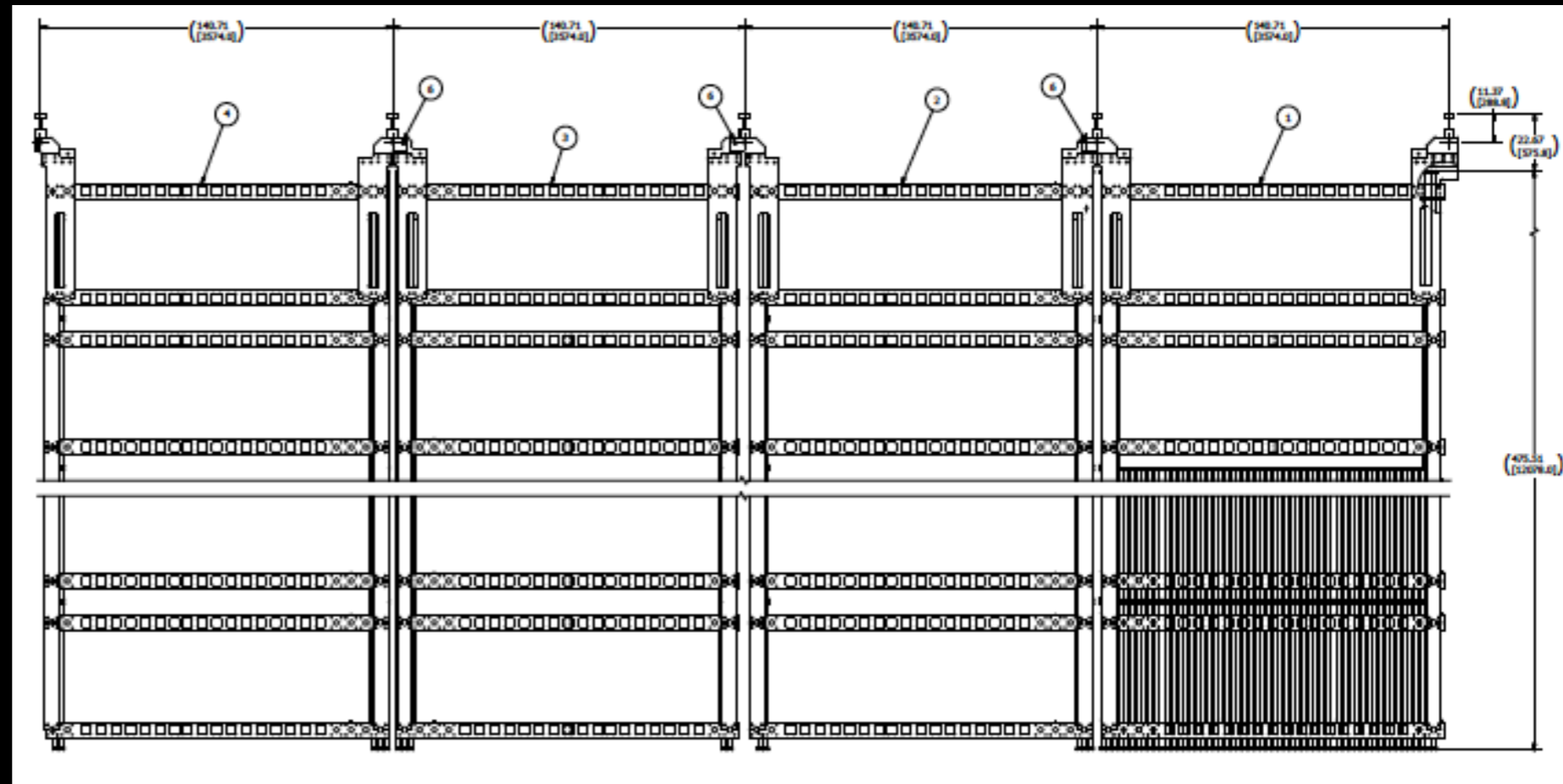
Caveat: only 2D

	Points	no APA	hit APA
Baseline design →	1	43%	57%
	2	61%	80%
Alternative will cover all the rest →	3	73%	97%

# To Do

- Calculate full 3D, including FC supports
- Do the same for top penetrations

**Outside**



**Blockage from  
FC supports**

**Inside**

