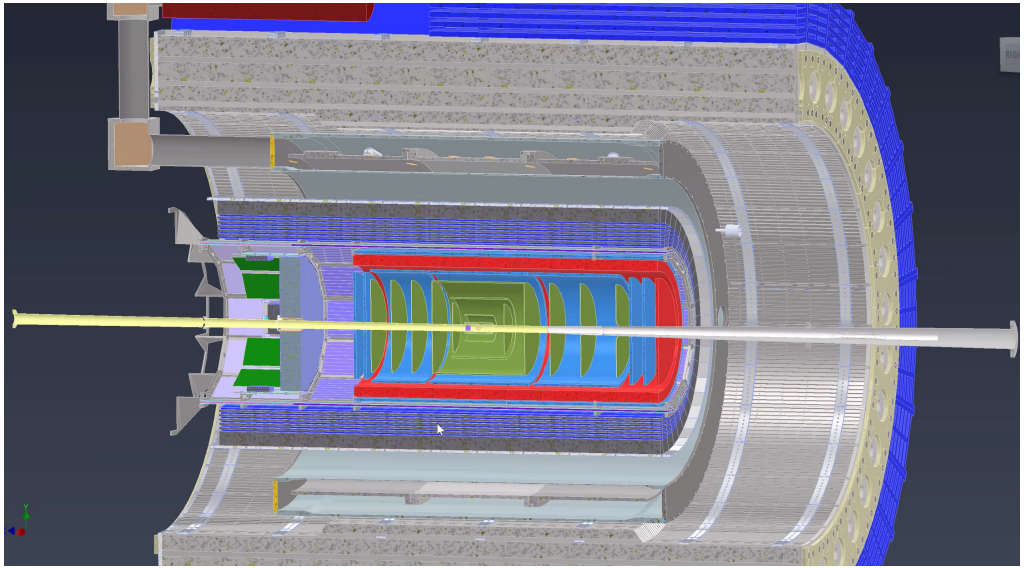


μ – Rwell detectors for the EPIC tracking at EIC

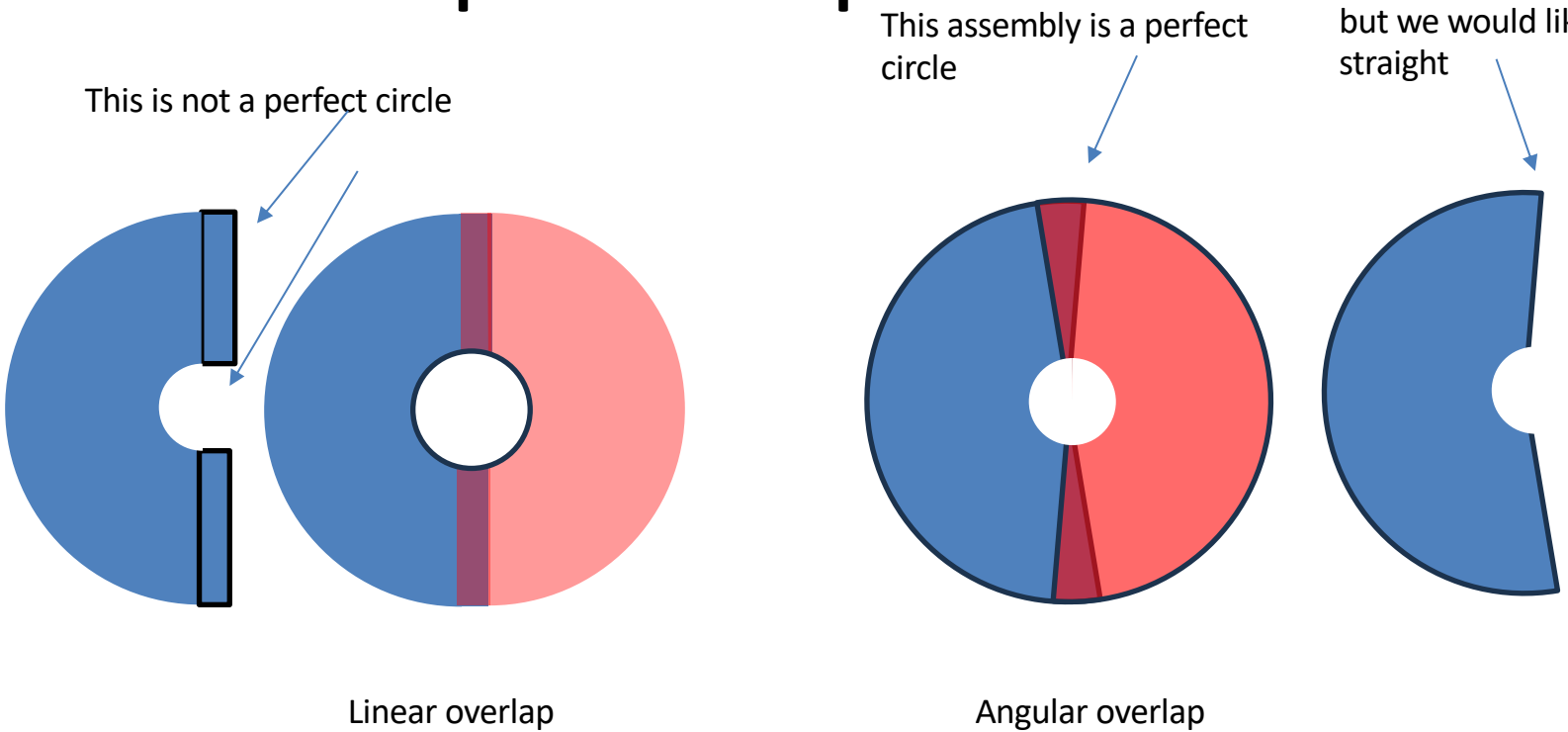
Update – February 15th 2024

Annalisa D'Angelo

University of Rome Tor Vergata & INFN Rome Tor Vergata Rome – Italy

for the EIC Collaboration

Endcap overlap scheme

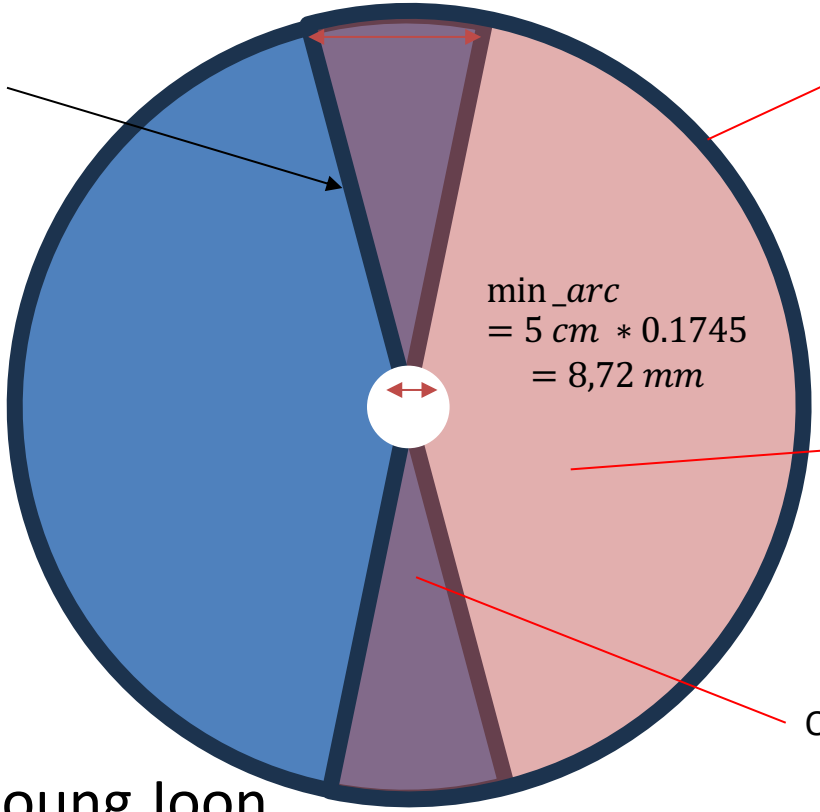


Radial overlap – by Soung Joon

10 degrees = 0.1745 rad

Max_$arc = 45\ cm\ * 0.1745 = 7.8\ cm$ (including frames)

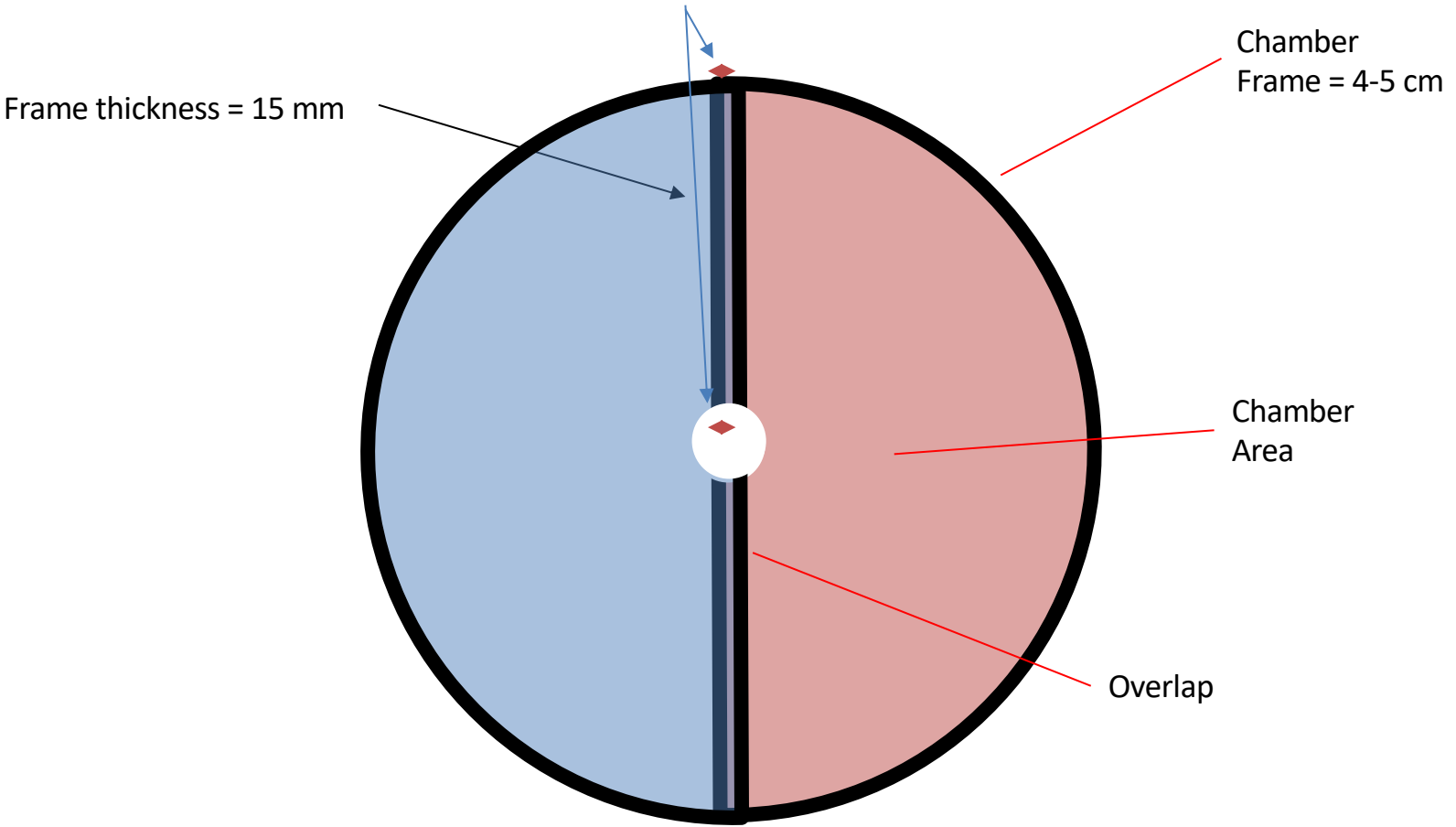
Overlap arc (free from frames) = 7.8 - 3 = 4.8 cm



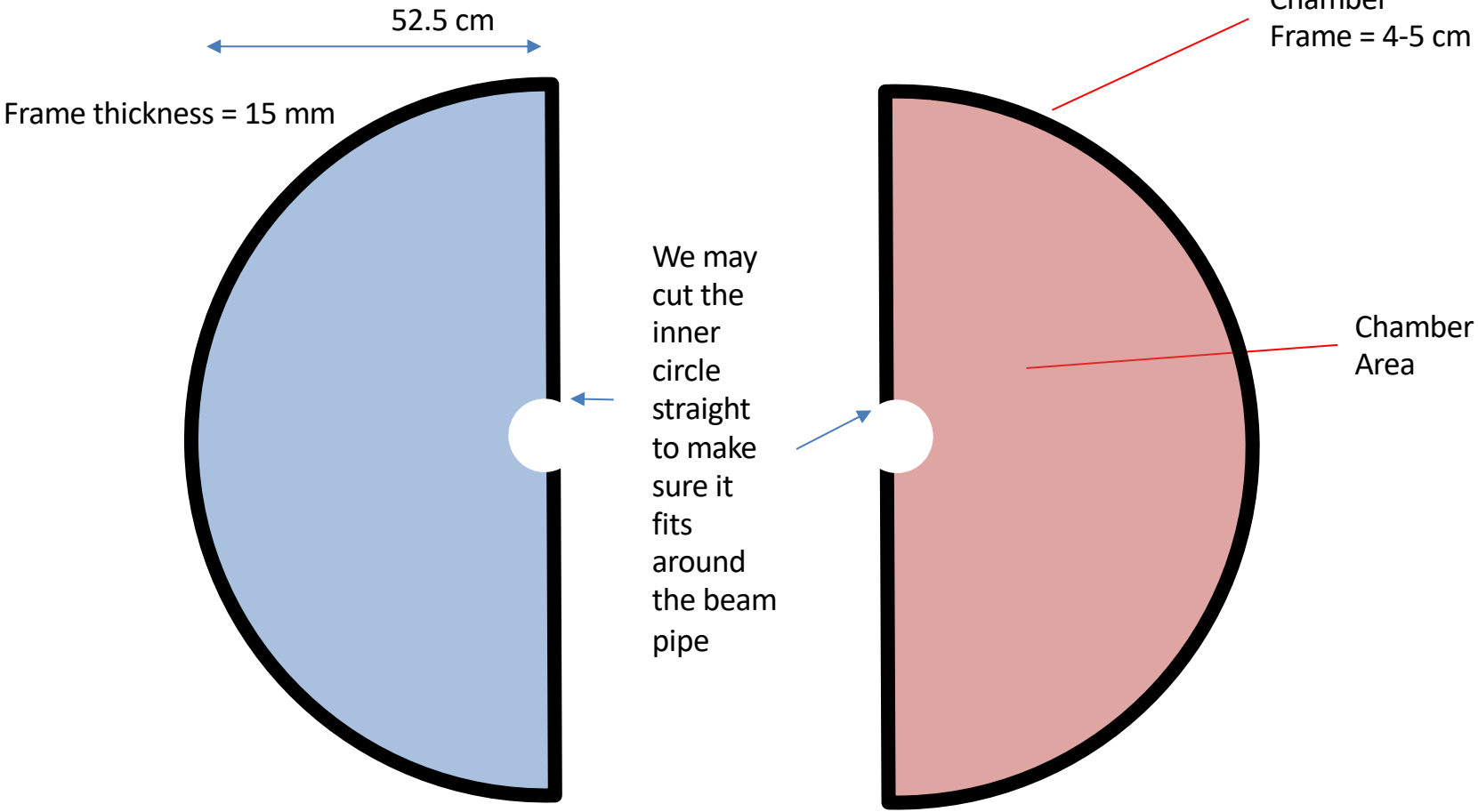
Radial overlap – by Soung Joon

Overlap thickness + frame = 3.5 cm → additional top angle = 4.45 deg

Overlap thickness (free from frames) = 2 cm



Radial overlap

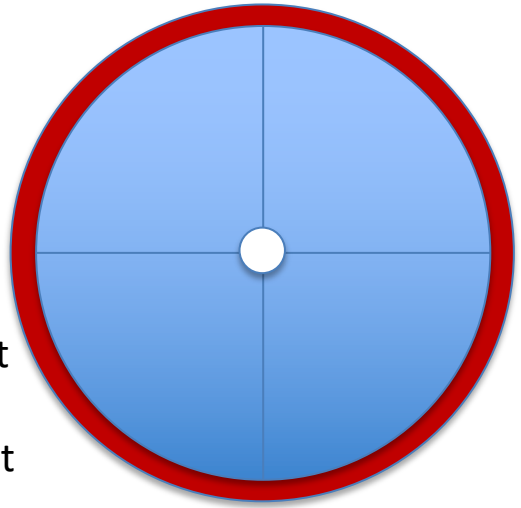


Geometry

Component	Sub-Component	WBS	Length (cm)	Inner Radius (cm)	Outer Radius (cm)	Offset from Center (cm)	Physical Start (cm)	Physical End (cm)	Volume (m^3)	Weight (kg)	Technology	Notes
HD MPGD 2			2.5	7.014	50	161	161	163.5	0.02	3.85414078		Weight: based on parametric estimate from SBS Gem Offset: measured from face nearest to interaction point
HD MPGD 1			2.5	7.014	50	148	148	150.5	0.02	3.85414078		Weight: based on parametric estimate from SBS Gem Offset: measured from face nearest to interaction point
LD MPGD 1			2.5	4.635	50	-110	-112.5	-110	0.02	3.89772228		Weight: based on parametric estimate from SBS Gem Offset: measured from face nearest to interaction point
LD MPGD 2			2.5	4.635	50	-120	-122.5	-120	0.02	3.89772228		Weight: based on parametric estimate from SBS Gem Offset: measured from face nearest to interaction point

- Options for Endcap geometry:
  - 4 Quadrants vs **2 semi-circles**
  - (R,θ) readout vs **(X,Y)** vs (U,V)

50 cm external radius includes services
5÷ 7 cm internal hole



- Options for Readout strips:

➢ 1 mm strip read-out pitch

-> 500 x2 =1000 channels per sector per quadrant -> (4+4) =8 FEB/quadrant

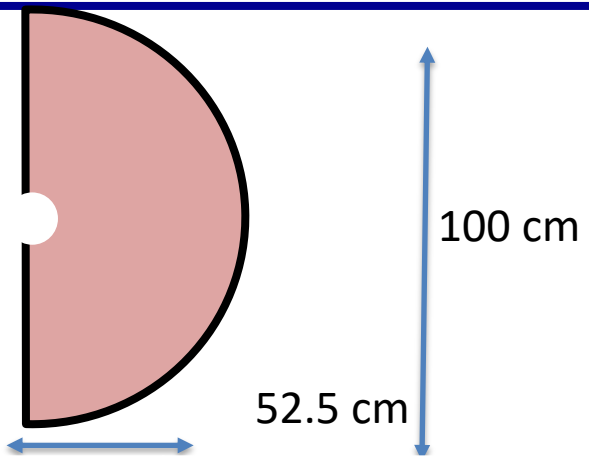
➢ 0.5 mm strip read-out pitch

-> 100X2=2000 channels per sector per quadrant -> (8+8) = 16 FEB/quadrant

Total of 32 FEB vs 64 FEB per disc

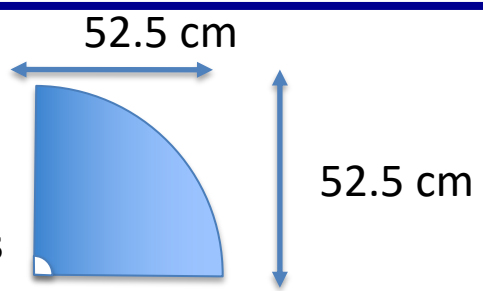
EIC Endcaps

2 semi-circles



PROs	CONs
One vertical/horizontal overlap only – less material	Larger detector surfaces are more difficult to handle.
The two endcaps may be rotated by 90° one respect to the other to recover overall symmetry	Longer strips: → Readout should be segmented into two sectors to avoid too long strips

4 Quadrants



PROs	CONs
Smaller dimensions are easier to handle	Two vertical and horizontal overlapping regions – more material
Each endcap is intrinsically symmetric	We need to study how to attach two quadrants in a semi-circle
Strips length are shorter	
GEM foils are easier to stretch	

Coordination

- The Roma Tor Vergata is sharing the tasks among the collaborators:
  - Elena and Alessia are in charge of setting up the mmdaq 3 SRS DAQ and to lead the set-up for the large area prototypes cosmics tests
  - Elena is working on the test beam data analysis using Corrywrekan framework
  - Mariangela and Lucilla are in charge of improving the endcap geometry and digitization in the ePIC simulation software
  - Rachele, Alessia and Bruno are interested in including the uRwell end cap detectors in the ePIC tracking
  - Roberto is our digital electronics expert.

- We are aiming at joining the LNF group for a test beam in Fall 2024. We would like to test 1D 10x10 GRwell, bot in a standard and a TPC mode read-out.

To do List

- Understand the Mechanical envelope available for uRwell endcaps - Seung joon
- Define the detector active area and final segmentation – try to start with semi-circles
- Servings & Cooling - Seung Joon, Electronic cables: Irakli Damien (Saclay)
- Geometrical Constraints on SALSA FEB?
- Read-out system definition
- Gap-size definition (with or without GEM foil)
- Material budget assessment (with/without GEM pre-amplifier)
- Detector geometry simulation Mariangela & Matt
- Detector response simulation Mariangela+ Roma group + Matt
- On-Line Calibration -> Alignment -> SVT/Tracking->TIC: survey/photogrammetry plans – targets to be installed?
- Stability against magnetic field forces (2 Tesla) (carbon fiber support)
- Mounting procedure and related constraints ?