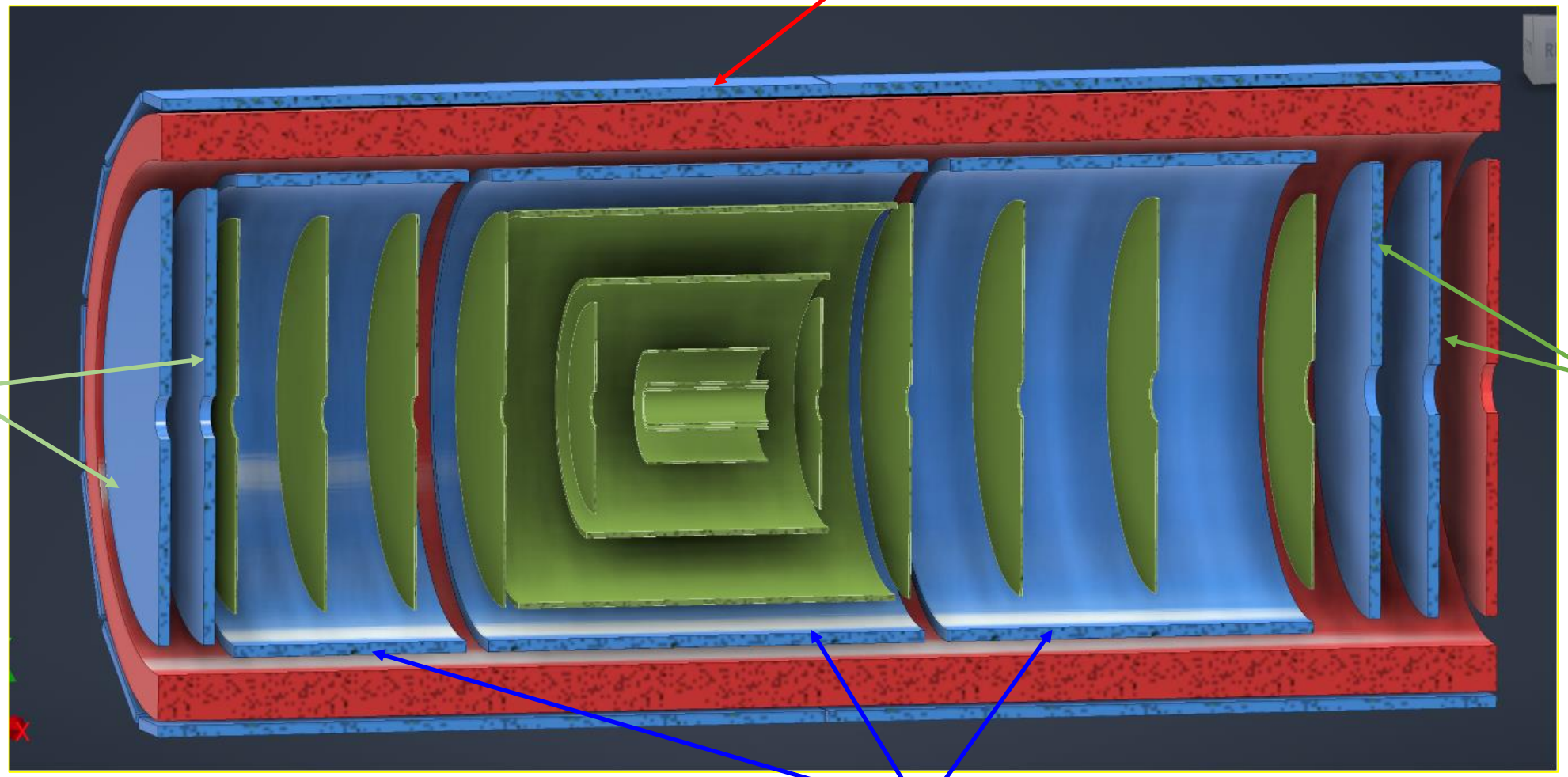
MPGD-DSC General Meeting

uRWELL-BOT designs options

Kondo Gnanvo - February 02, 2024

Overview of MPGD Trackers in ePIC

µRWELL Barrel Outer Tracker (µRWELL-BOT)



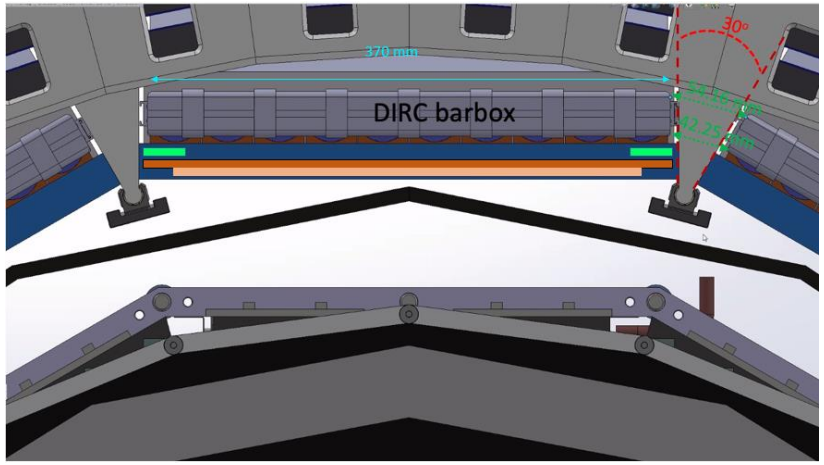
µRWELL End Cap Tracker (µRWELL-ECT)

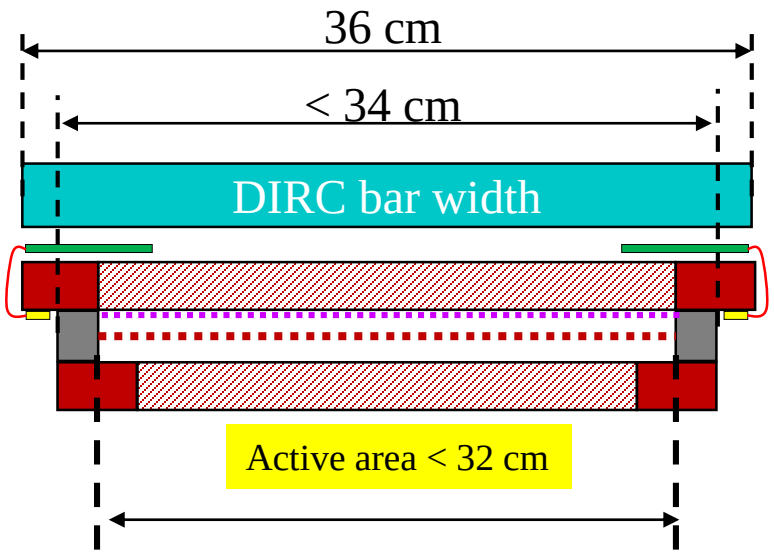
µRWELL End Cap Tracker (µRWELL-ECT)

Inner Cyl Micromegas Barrel Layer (CyMBaL)

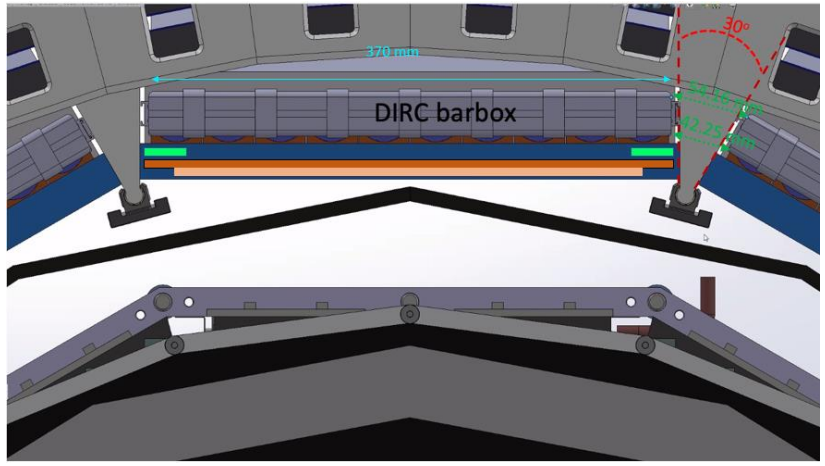
ePIC µRWELL design / integration issues: 3 available options

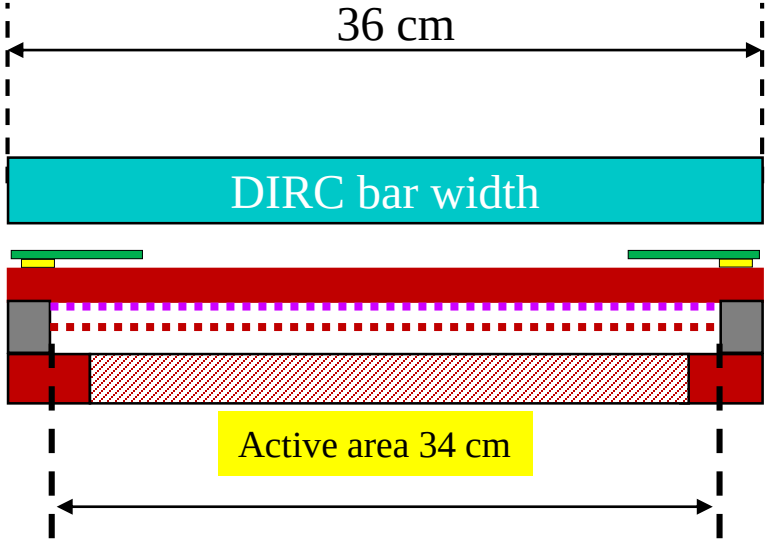
Option 1: Low mass (X/X_0 ~1%) & easy integration but low coverage



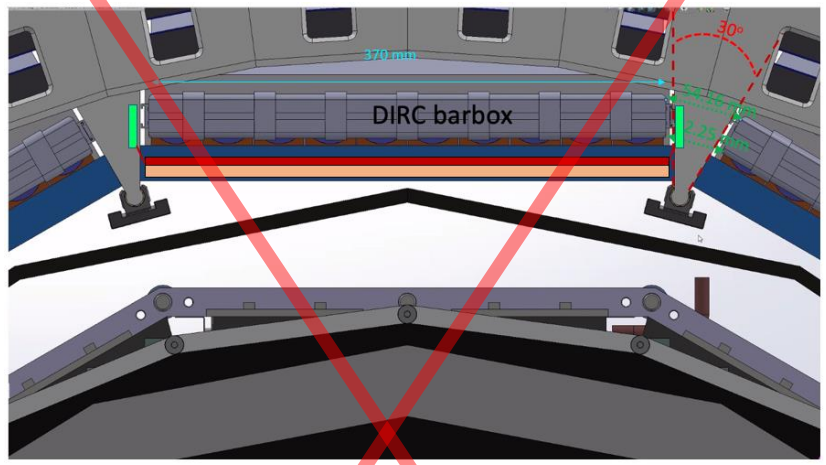


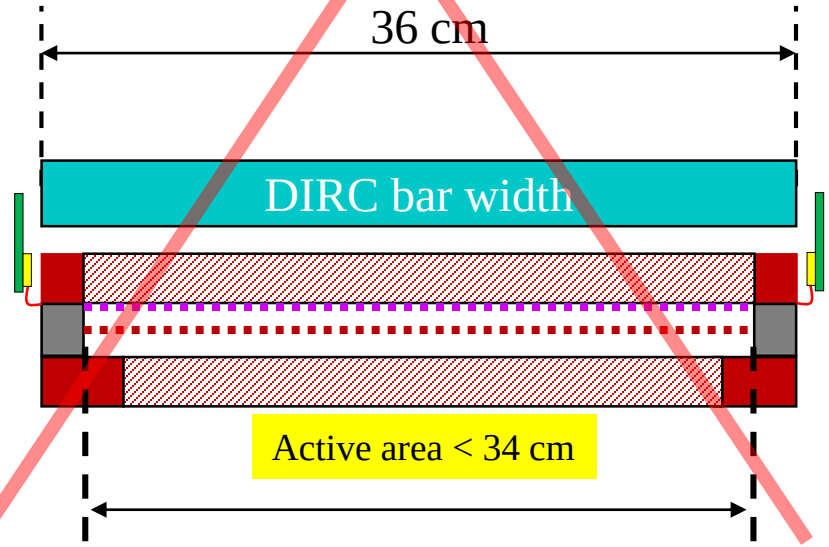
Option 2: Large coverage & easy integration but thickness (X/X_0 ~2%)





Option 3: Low mass (X/X_0 ~1%) & large coverage but integration nightmare





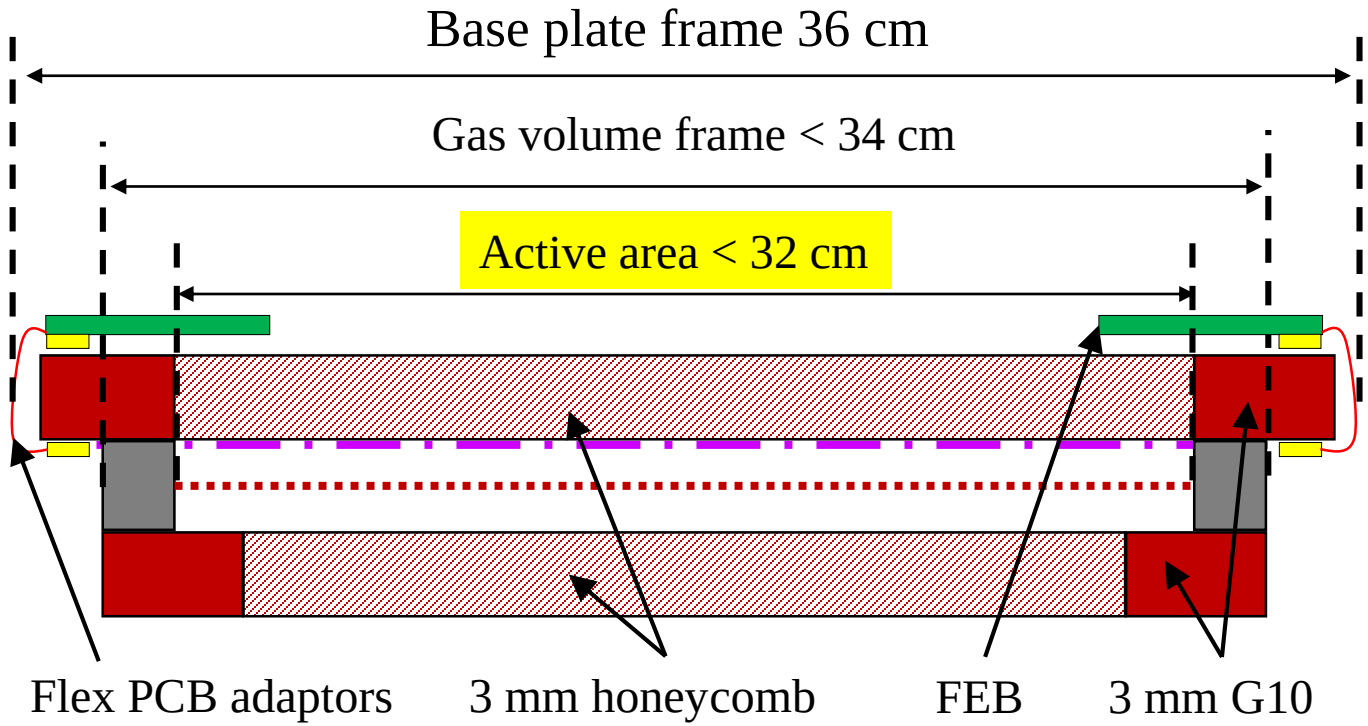
Option 1: Low mass ($X/X_0 \sim 1\%$) & easy integration **but** lower coverage

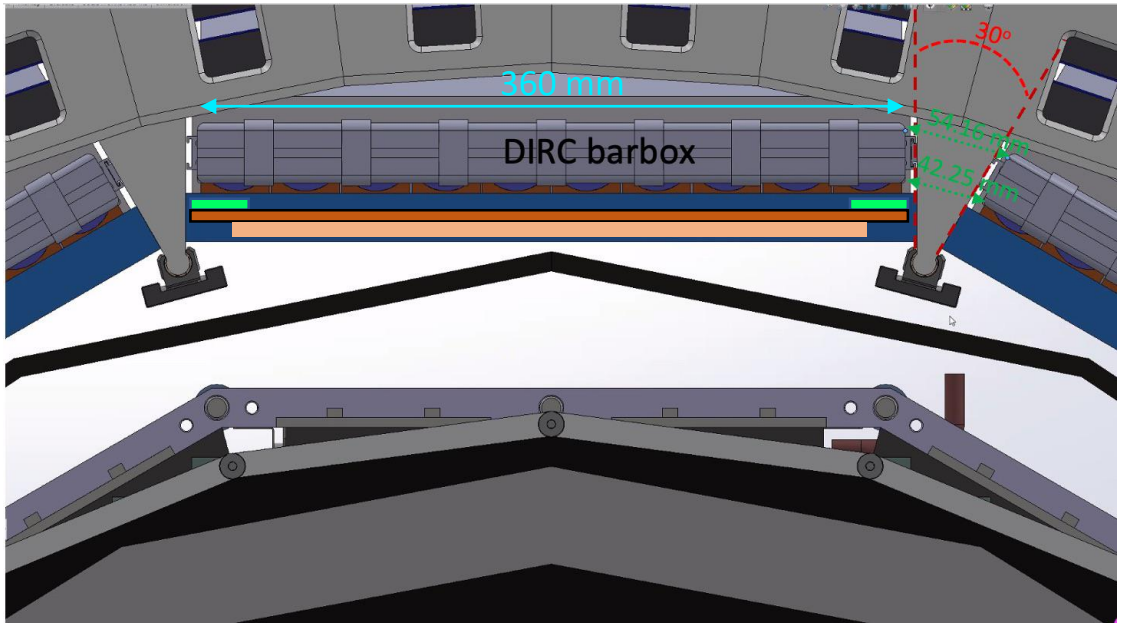
PROS

- Low mass (X/X0 ~1%): Honeycomb in both top and bottom layers of the detector
- Easy integration in ePIC ➔ fit the assigned envelop

CONS

- Limited coverage
- More space constraints in envelope ➔ No margin
  - Need support structures for the FEB
- Flex PCB connectors ➔ Cdet & signal quality concerns





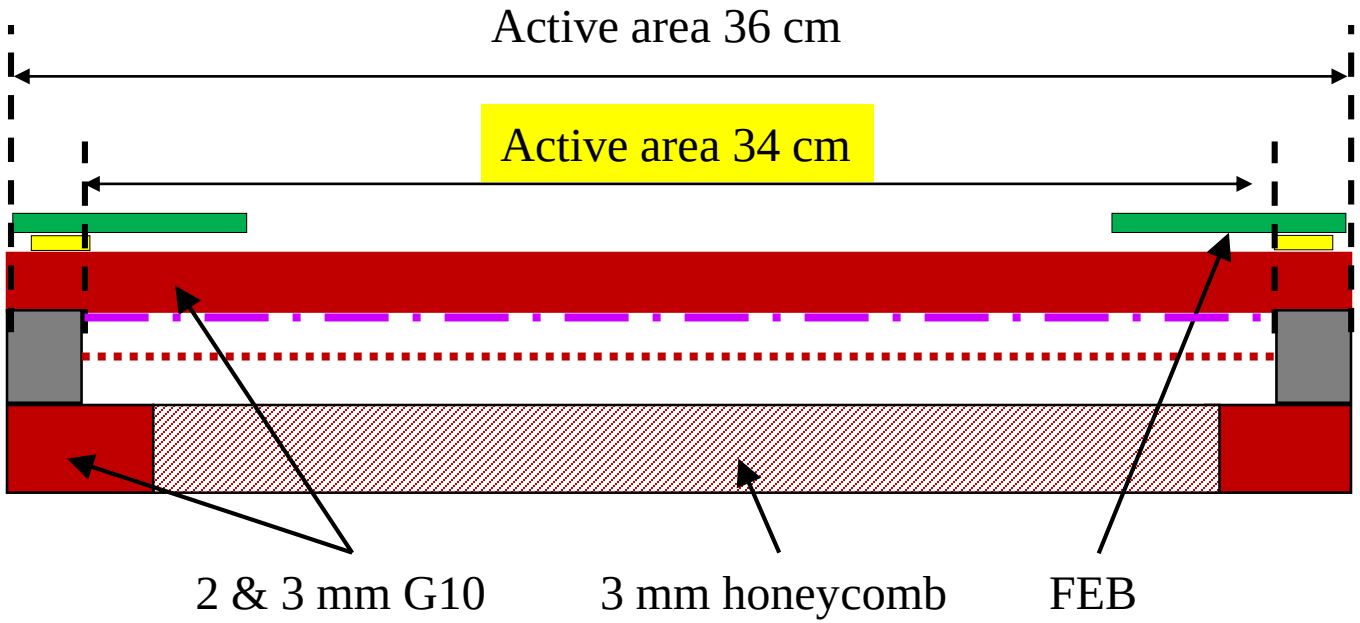
Option 2: Large coverage & easy integration **but** material thickness (X/X_0 ~ 2%)

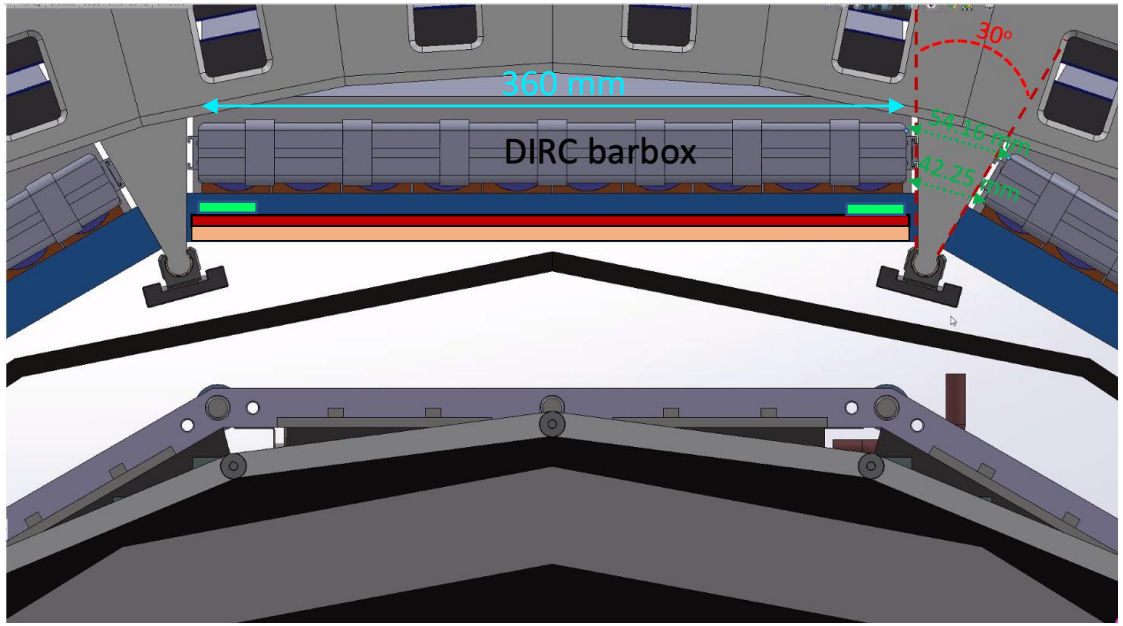
PROS

- Optimal coverage both in width
- Easy integration in ePIC ➔ fit the assigned envelop
- Direct FEB connection to detector base plate
- Self supported FEB & no need for flex PCB adapters ➔ more space in height
- Easy assembly ➔ more robust detector

CONS

- More material in active area: G10 base plate (1.6 – 2 mm) instead of honeycomb ➔ X/X_0 ~ 2%
- Space constraints in envelope ➔ but less than option 1 i.e., more space in height





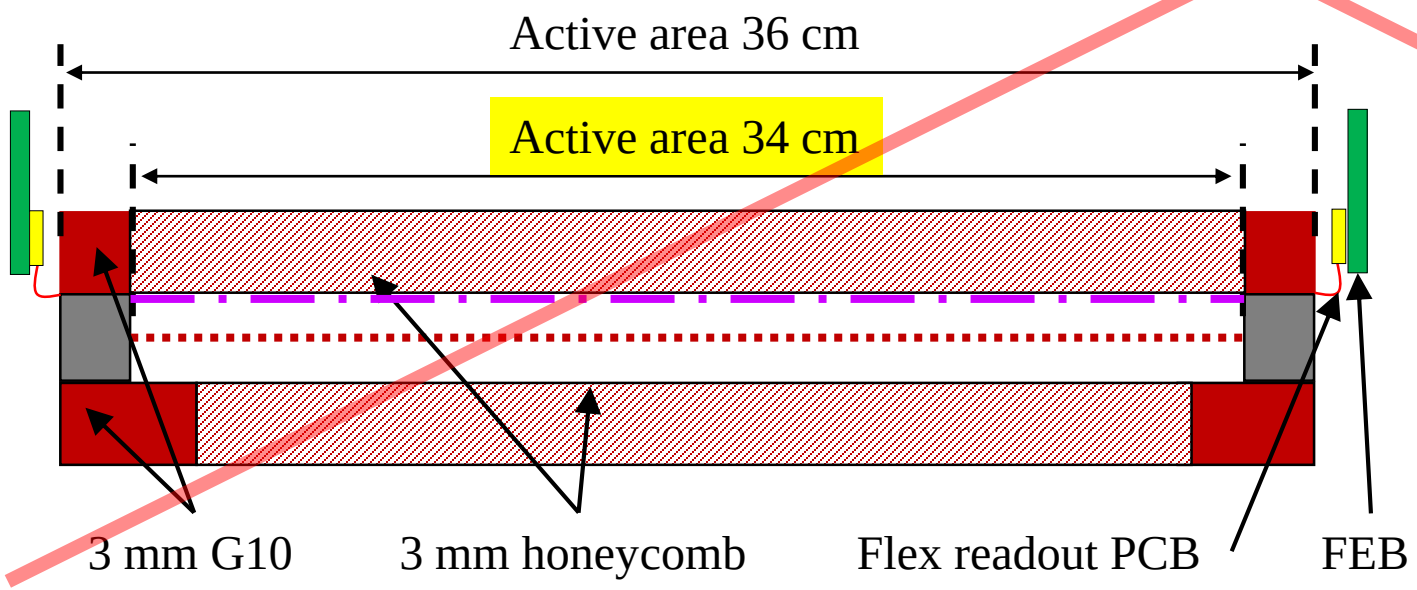
Option 3: Large coverage & Low mas **but** integration nightmare

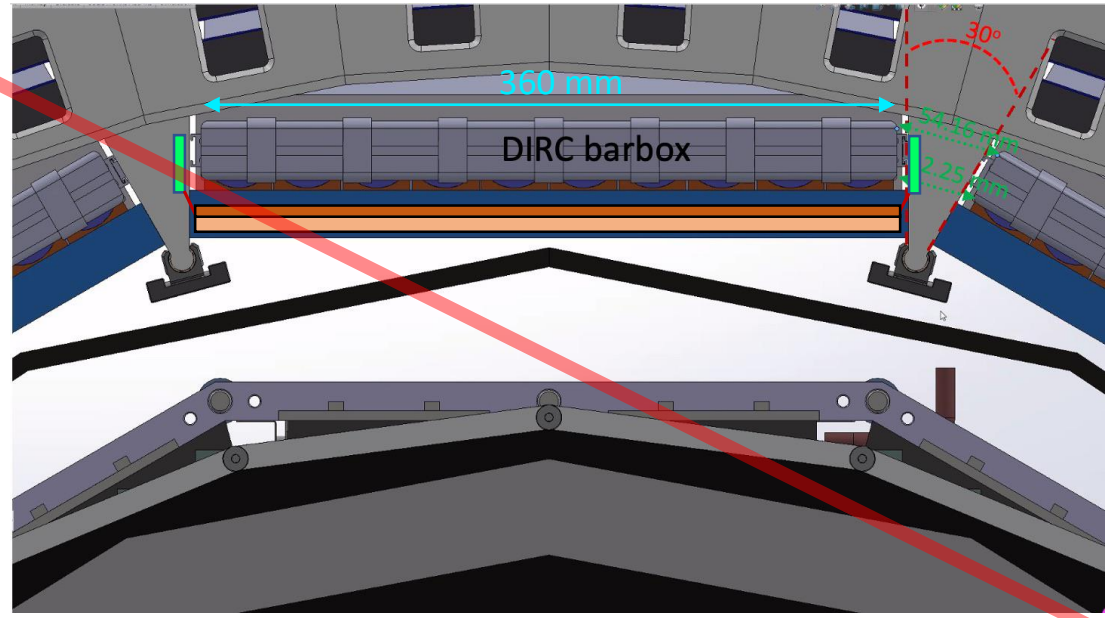
PROS

- Optimal coverage both in width
- More space in height of the detector envelop
- Low mass in active area
- No need for flex PCB adapters ➔ but connectors on flexible R/O layer
- More delicate detector assembly

CONS

- Integration nightmare ➔ FEB on the side supported by ECAL support structure
- Delicate / risk for FEB-to-detector connection ➔ flex R/O mounted connectors need bending
- **Integration really does not like this option**





Summary

1. Option 1 was the design starting point: Honeycomb in both top and bottom plates of the detector
   - Low material budget and everything mechanically contained in the envelop allocated in ePIC detector
   - But width in active area strongly reduced to less than 32 cm for a DIRC width of 36 ➔ limited acceptance

2. Option 3 is not at the moment acceptable
   - Also low mass detector with honeycomb in both plates
   - But we can not fit the readout electronics in the allocated envelop ➔ integration nightmare
   - This option will affect a revision of the whole DIRC support structure ➔ is a No-no

- Option 2 is the current preferred design option
  - Has the largest coverage (34 cm for DIRC 36 cm)
  - Probably the easiest for integration and detector fabrication ➔ electronics on the back of the chamber
  - Direct connection of FEB cards to the detector ➔ No need for flex adapter cables
  - Will require G10 plate instead of honeycomb as back plate of the detector ➔ more material (~2% X/Xo)
    - Still within the specifications we proposed from the beginning but we need to hear from simulation if this is of any concerns