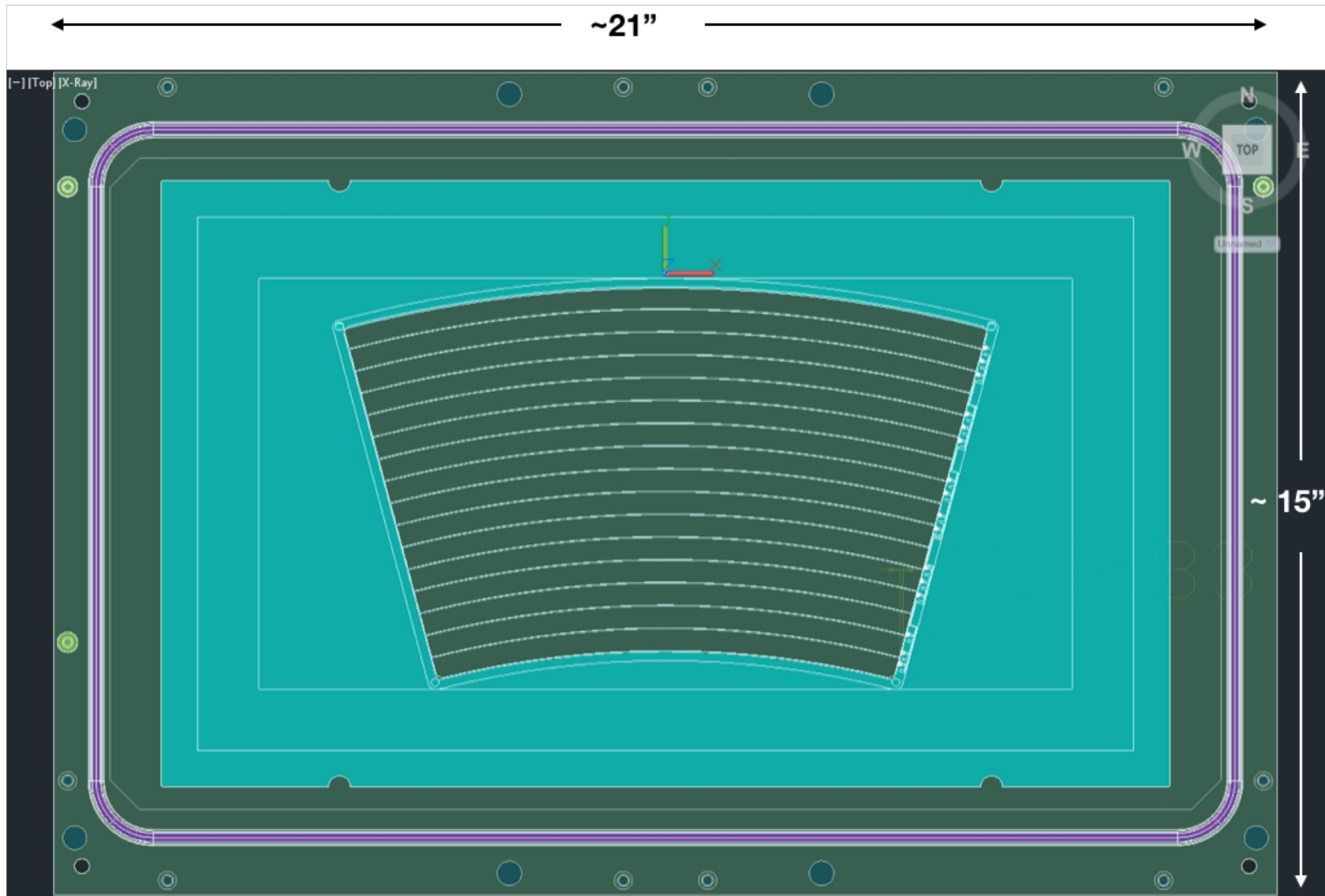


General Questions re: Foil production at CERN, and handling inside sPHENIX.

HV test box for R2 assuming foils are in optiguard frames



Very conceptual design Foil R2

In ALICE, foils are etched in Rui's shop on large sheets
OROC3 + IROC
OROC2 + OROC1

Resistors are soldered onto the sheets, and then
the foils are recleaned in Rui's shop.
The foils are rough cut locally, then "optiguard"
frames are installed around the edges.

Foils with optiguard frames are HV tested @ CERN. Bad foils returned directly to Rui.

Foils then shipped away for "Advanced QA" – optical scans of all GEM holes
The step abandoned near end of ALICE project (no foils were ever rejected at this step)

Foils then sent to framing institutions.

Each institution worked with one specific GEM size. WSU was the IROC framing center.

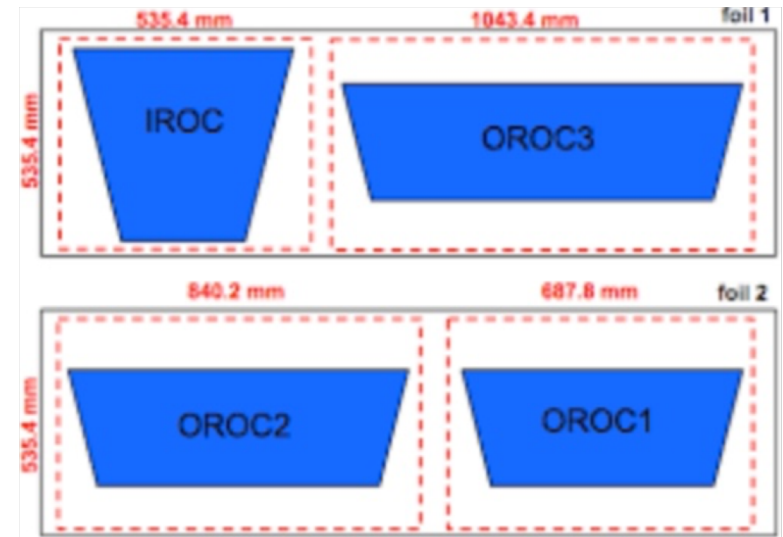
At framing center,

Foils are HV-tested, then framed, then HV-tested again.

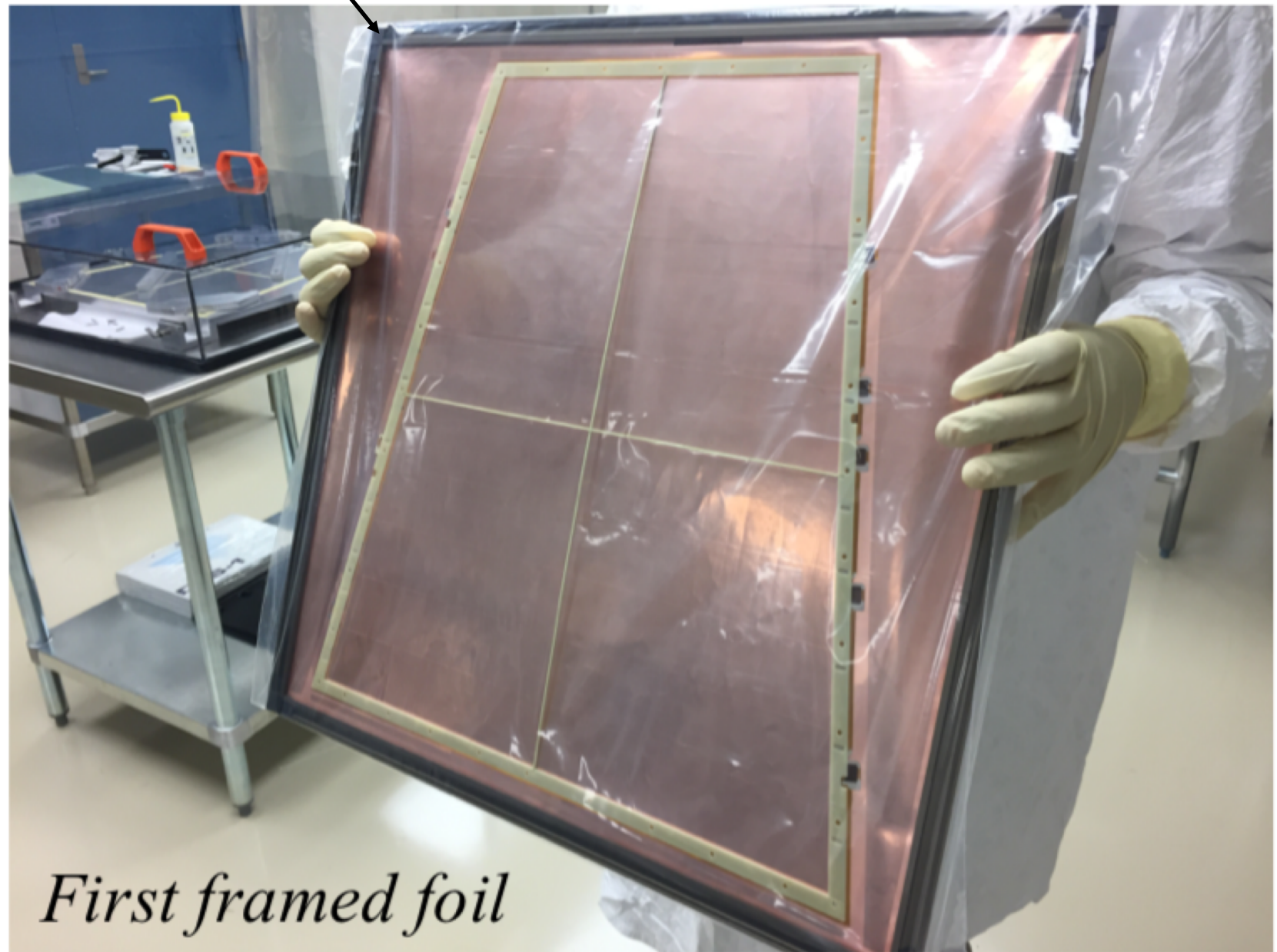
Gluing to frames: Stretch foil in a "DEK" frame first, then glue foil to frame with special fixture

Framed IROC foils then sent to Yale for chamber assy and x-ray testing

Tested chambers then shipped back to CERN.



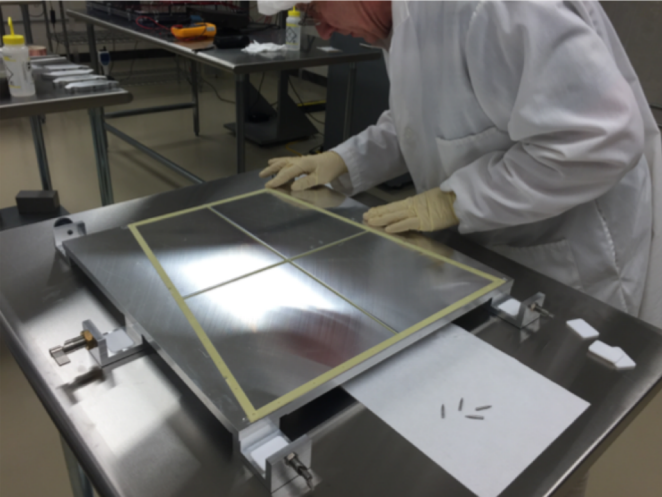
Optiguard frame



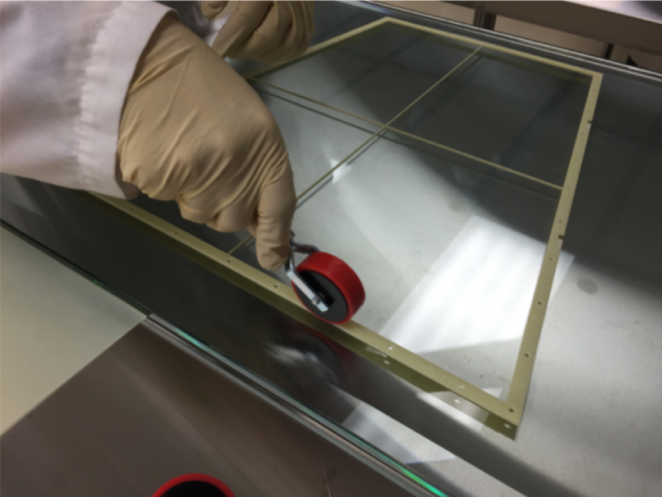
First framed foil

DEK frame (stretches foil)

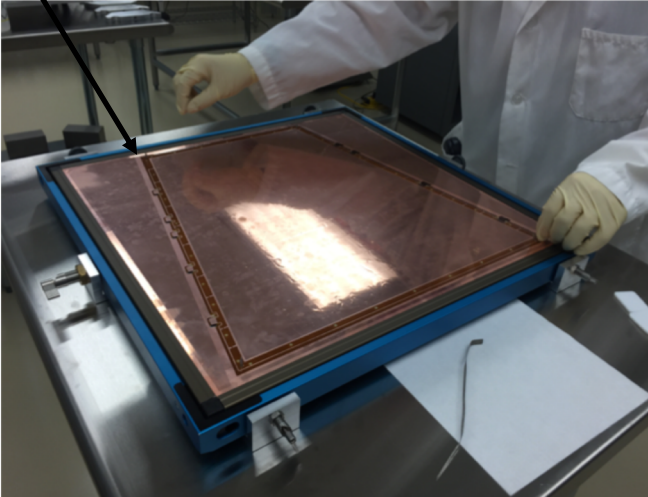
Frame in gluing fixture



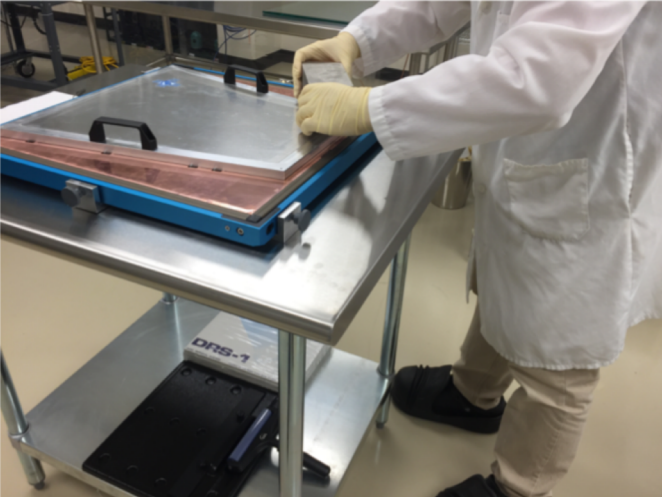
Using roller to apply glue



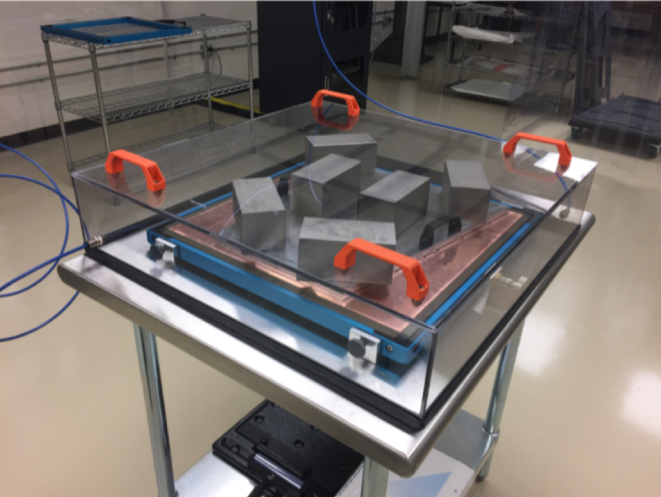
Foil in gluing fixture



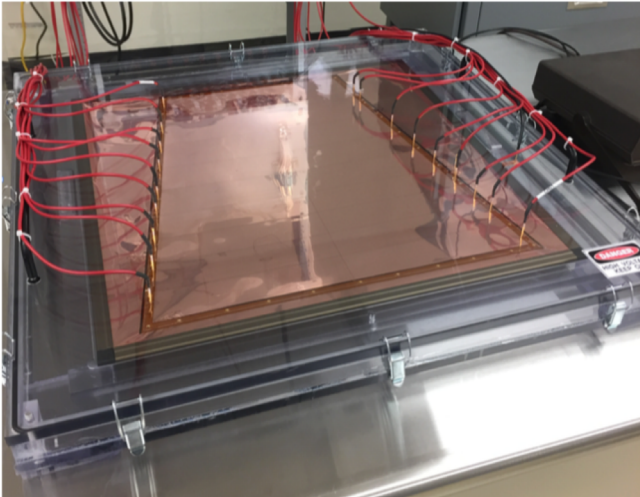
Pressure plate and SS bricks



Curing in dry atmosphere



HV testing



KEY QUESTION:

Must foils be stretched in a DEK frame while gluing to foils?

Gluing stretched is what WSU has been doing for ALICE. Is a requirement for sPHENIX?

Did PHENIX HBD, or sPHENIX TPC prototypes, stretch before gluing?

Implications if stretching individual foils a la ALICE:

Each sPHENIX foil size needs to have its own optiguard frame.

May be able to get these recycled from ALICE?

Optiguard frames (required for stretching) very convenient for foil handling

HV test box must be larger to accommodate optiguard frames

Raw material waste in Rui's shop? (cost significant or not?)

Each institute needs DEK frames (2k\$ each, modified by the company) & compressed air

Precision gluing fixtures needed (e.g. 0.5mm gap between foil and frame before pressing)

but foil alignment in 3D while gluing very precise and repeatable

DEK frames at WSU can handle R3, a smaller DEK frame could be used for other sizes

Alternate option 1

put all three sizes on a single sheet **and frame with stretching.**

minimizes wasted raw GEM material at CERN (cost significant?)

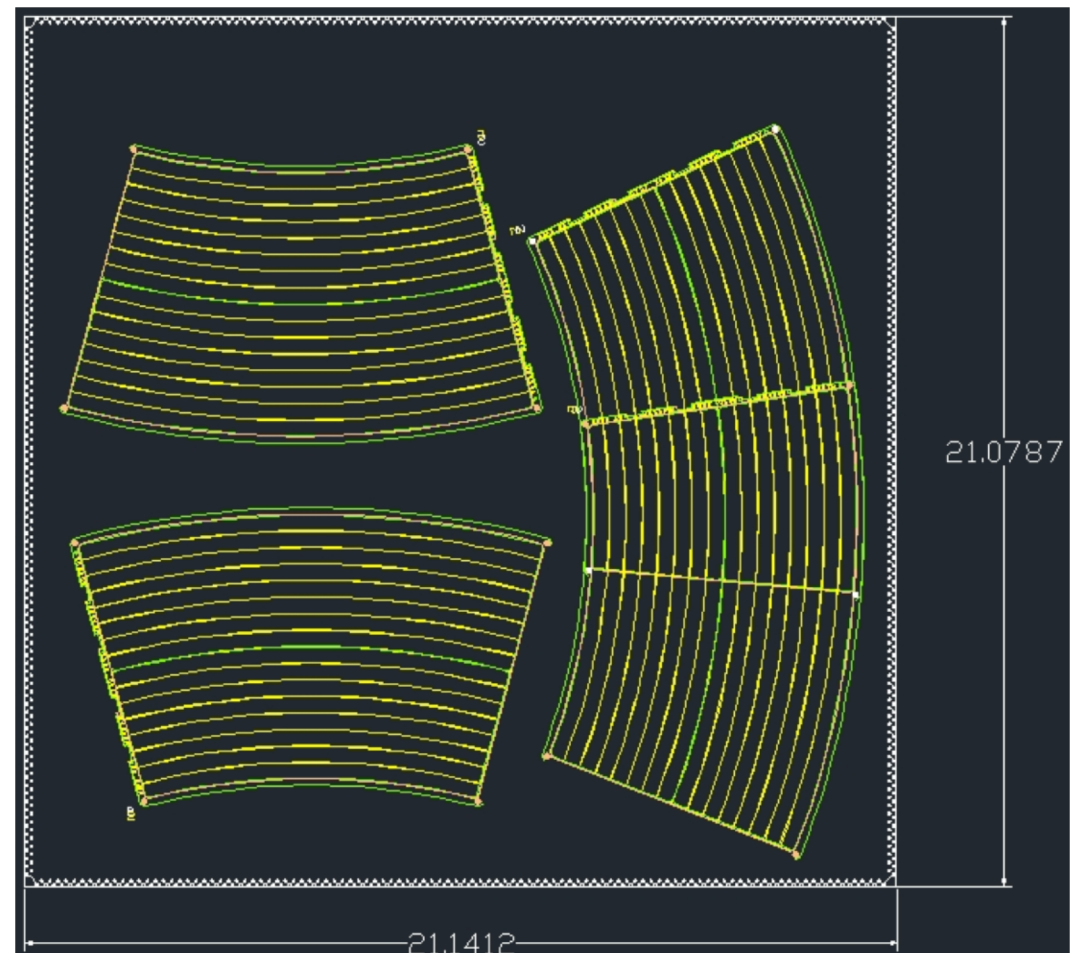
BUT - We are not confident about gluing and HV-testing such raw foils.

Would need 51 channels of picoammeter readout, or moving cables (mistakes)

Alignment during gluing unclear – would require a lot of QA

Breaks model where each framing institution does one foil size

HV tab not considered here



Alternate option 2

put all three sizes on a single sheet and frame **without stretching**.
minimizes wasted raw GEM material at CERN (cost significant?)

~~BUT - We are not confident about gluing and HV testing such raw foils.~~
~~would need 49 channels of picoammeter readout, or moving cables (mistakes)~~
~~Alignment during gluing unclear — would require a lot of QA~~
~~Breaks model where each framing institution does one foil size~~

Here, each size could be rough cut at CERN, and the different shapes sent to different framing sites

No DEK frames needed

Gluing fixture simply a flat surface
with alignment pins

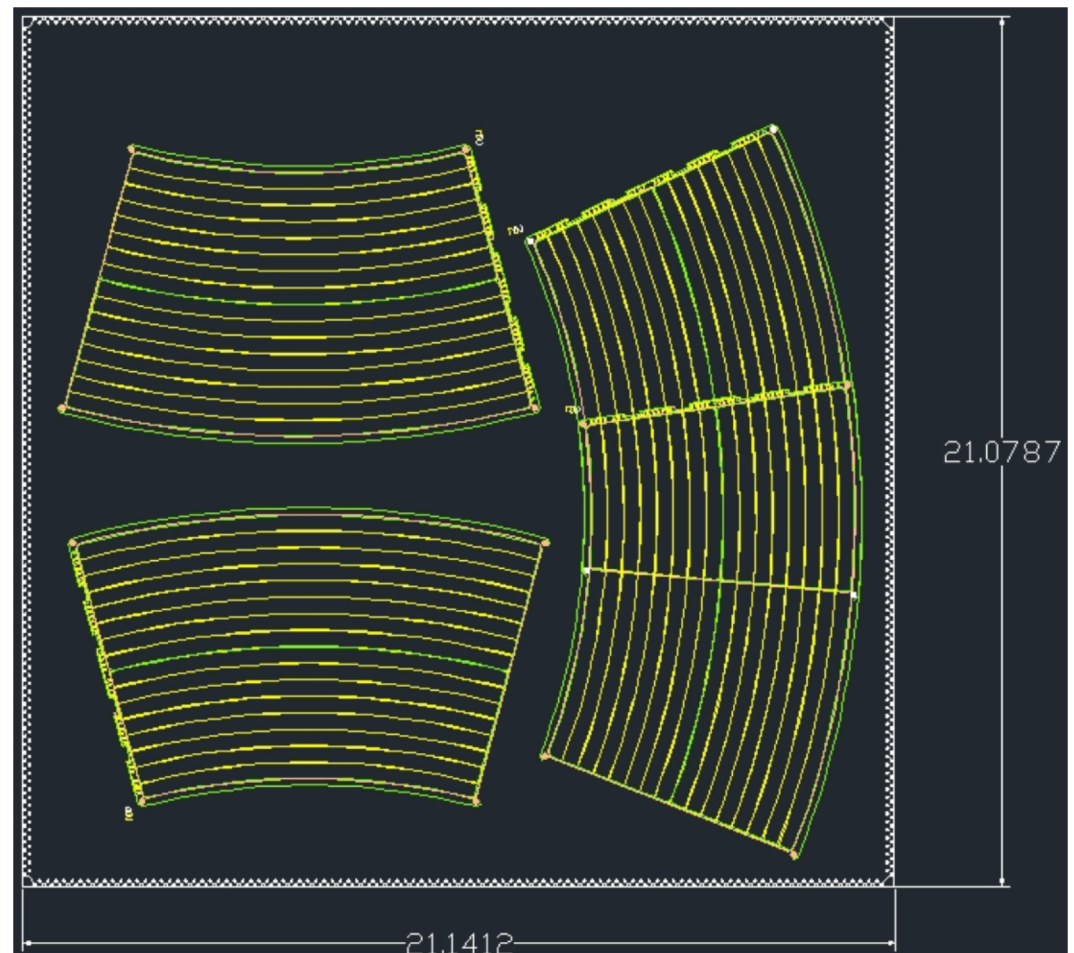
Gluing with foil below frame
(opposite order with stretching)

HV test box would be smaller

No optiguard frames possible.

Again, optiguard frames very convenient
for foil handling, and aid in alignment in
the HV test box!

HV tab not considered here



We need a decision a.s.a.p. – [Are we stretching or not?](#)

We cannot design HV test box or gluing fixture without this decision.

We have a finite time window where the relevant instrument design expertise is available (Fred).

