Oxford Outer Pixel Mechanics Review, 2. Nov 2027:

Robert: A big thank you to Ashley and Alex for taking the time to show me the detailed assembly of a ladder, sharing time together in the evening 😊and scheduling the meeting & discussions afterwards including connecting with Adam from BrickKiln!

You gals/guys are great!

2-3:30PM

Matt presented: (see Matt's presentation)

-split rings & sepperate rings for l3 & l4

-Modified mounting to improve interposer connectivity- Matt removed pins and opened guide channel giving more freedom allowing more "Vertical" mounting (except for the last module in each ring)

-Free floating L4 flex interposer sandwich connection presented featuring M2 screw align interposer between FR4 plates. Standard nuts glued into bottom plate-

-Change to straight Hydras: That attach (90 deg Inlet into ring cavity integral with ring design (3d printed) Richard asks if Hydras could be round?: Not if we want flow in the largest crossection

-QC box improvements: layer 4 module in separate transportable enclosure that fits into qc box.

-Discussed flexible spring mounting vs temperature ramping to avoid module stresses & bending

-Cooling options (want slight cooling with blown Peltier style "Chiller") CTE issue investigation -carbon bending? (definite maybe -or control ramping temperatures).

-Transport case improvements: Had some cracked ladders where packing too many ladders may have been the main cause.

-Outer foil suggested: to better control helium through the OT: Concern is that it may trap the warm helium. Conclusion for now: -leave it leaky and open as the large ventig volume and cold magnet may contribute to cooling, or at least won't trap warm helium

General discussion:

-Discussed trying to extend the carbon stiffener even further (over the interposer pads) if at all possible. Robert/Joey will look at options for Vertex. V-tricky: Alex will

build one ladder with the newly designed & built design from BrickKiln. (It is unlikely that much more can be done prior to production for 2027.)

Robert voiced his ideal-world ladder support preferences:

1: ideally a fully self-supporting ladder including solid ends to which flexible mounts would decouple bending and thermal loads best if care is taken with LV and flexes.

2) Next best solution: Self-supporting ladder including solid ends, hard mounting one end, and flex mounting the other (each ladder end).

3) Retain the current design concept but bring the spring function back to life (now killed by stiff and packed cables): With independent rings for each layer, best would be to spring load each independently if possible.

- Just a mention: Worst option: Mounting current ladders/modules building accurate rings and aligning these via very precise jigs/tooling so we are certain of low interface tolerances. (So any bending/torquing from misalignment is at least held within tiny margins). This is notably bad for thermal deformation though (but arguably better than what we have now).

-All agreed that we improve cable stiffnesses & flex routing to reanimate the current concept as a minimum.

-Showed flexible silicone cables for LV: Richard proposed to solder them directly to twisted pair interface instead of the current screwed attachment (incorporating in-line connectors where needed between bus-bars in case hydras /brackets / other stuff obscure the bus-bar connection). Deemed a good idea!

-We consider changing the 6 mounting points for the OT rings to the beam pipe if needed.

-For smoother integration, Matt also proposed that the Tile detector may also benefit from a split-ring design allowing for more assembly flexibility & half shell assembly may benefit them with connectors -avoiding them or at least avoiding more mounting cycles. (Konrad, Frederik?)

-Joost finds it important that we schedule more time for Installation: catching & resolving more issues this time around.

-Liverpool & Oxford discussed remaining chips / QC issues & ladder production:

-all in approach building current yield ladders/modules with small likely improvements from gained experience from building,

-or step-by step: build the next ladder with stiffener mods, better clean room cleanliness, and see if other factors can be improved, initially slowing production pace, but more certainly increasing the yield. (3 ladders/wk when all is ironed out)

-Chip QC was touched upon -arriving students? Automation?

Regular integration meeting discussion: General consensus -too much overlap in current meetings & less meetings may be achieved with focus: Robert proposed alternating with another -Richard agreed that we may alternate with his cabling and installation meeting -and is flexible to move the date if need be. (Monday?)

Robert proposes integration every other week focused on 2027 integration tasks with a periodic meeting looking at post 2027 design and integration every 6-8 weeks.

Joost, Ashley, I, & others agree that a collaboration-wide “Mu3e Future” (beyond 2027) with a dedicated mechanics & integration meeting within, is needed several or more times a year. A kick-off right after beam time Nov/Dec would be ideal.