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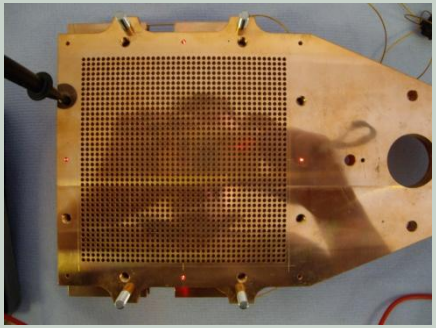
FETS Mechanical Engineering Update

by Peter Savage

25th August 2010

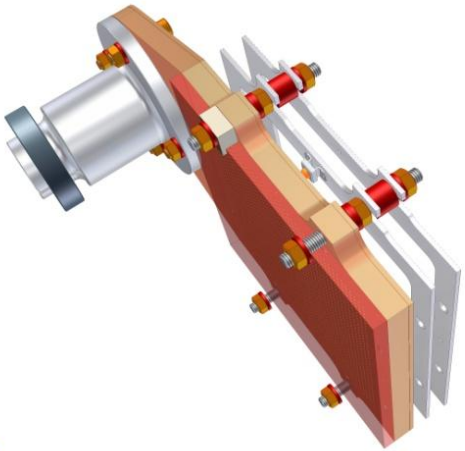


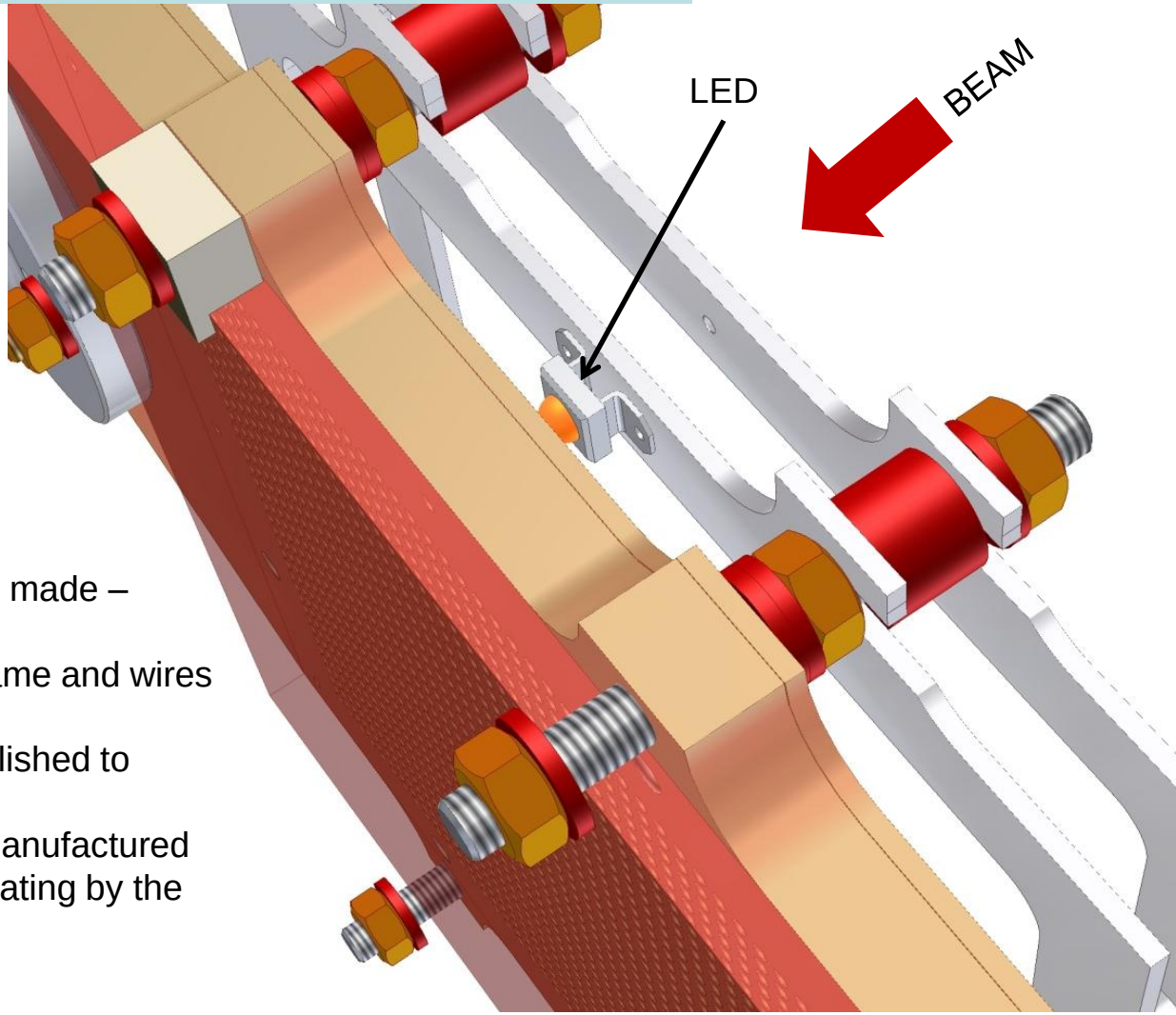
Two items to discuss...

1) Pepperpot Image Calibration System

2) RFQ Input / Output Flange Design

Pepperpot Image Calibration System





- 4 x LED mounting frames have been made –
  - 2 x copper and 2 x aluminium.
- LEDs (RS 616-3652) mounted to frame and wires connected.
- 2mm diameter glass rods cut and polished to length.
- Holder for sputter coater has been manufactured and fitted with glass rods ready for coating by the QOLS group.

Pepperpot Image Calibration System

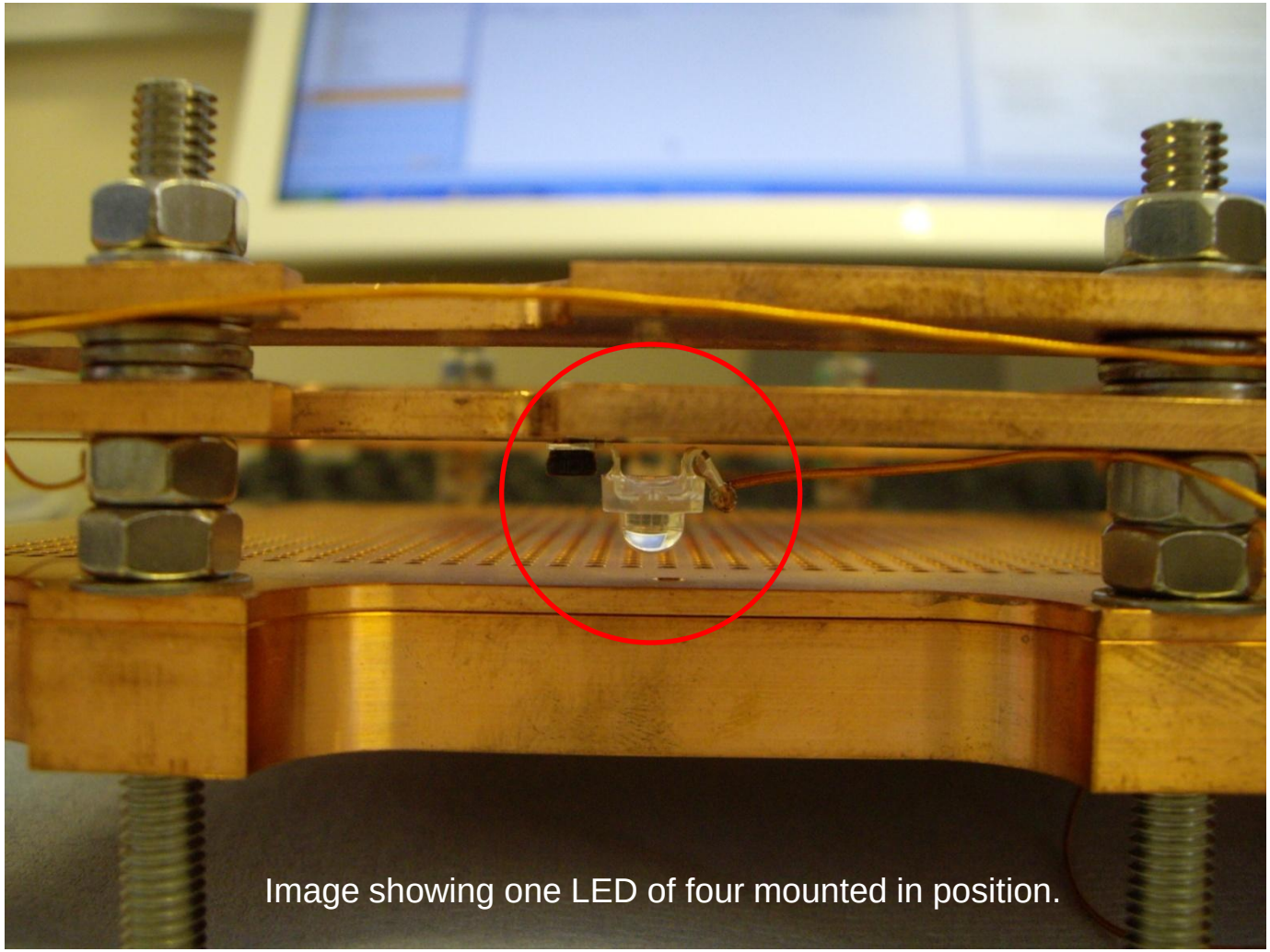
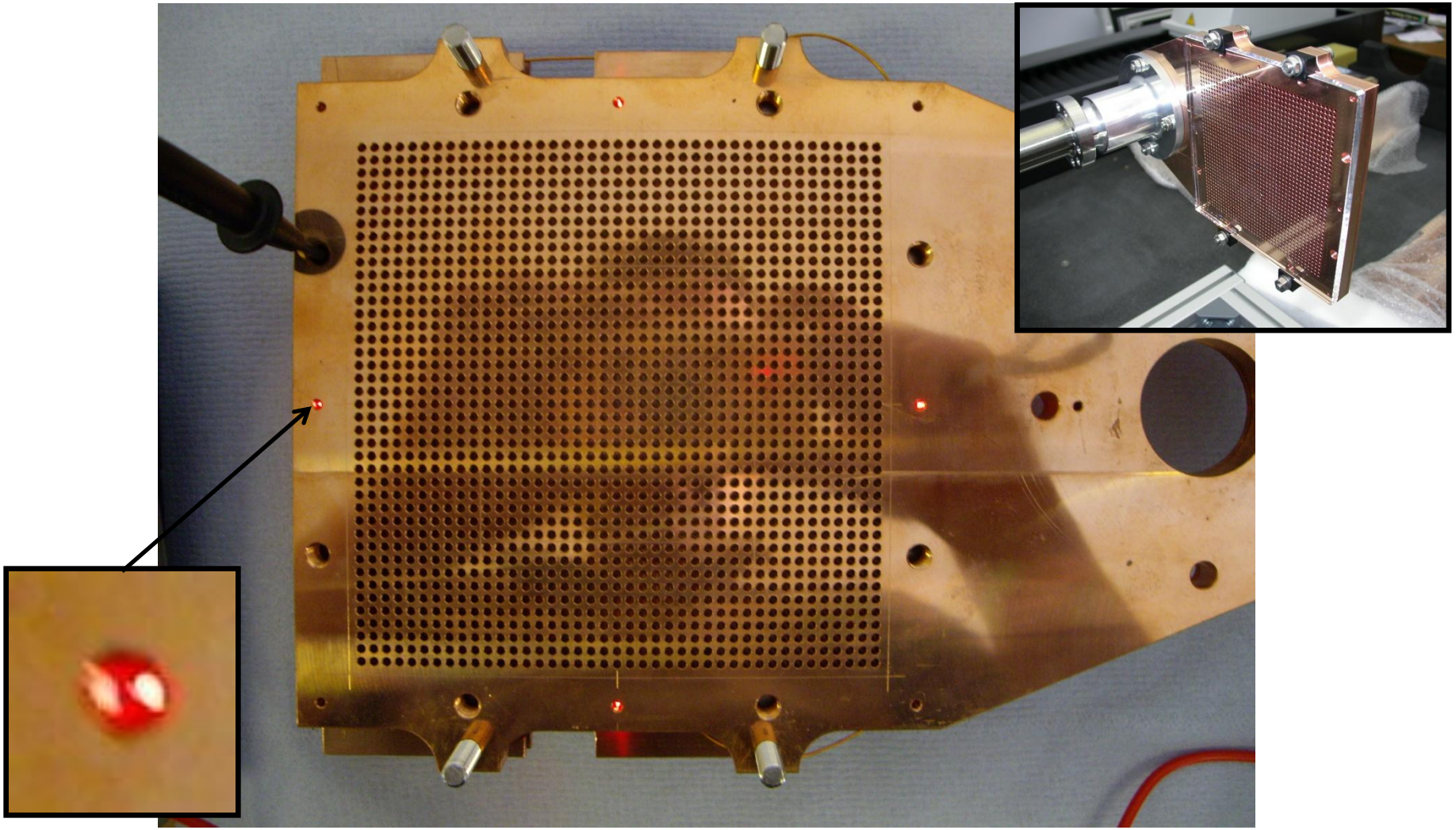


Image showing one LED of four mounted in position.

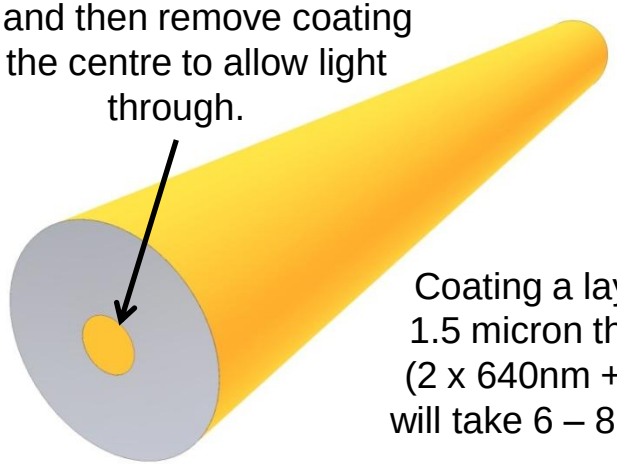
Pepperpot Image Calibration System



Hole diameter in W = 1.0mm. Hole diameter in Cu = 2.0mm

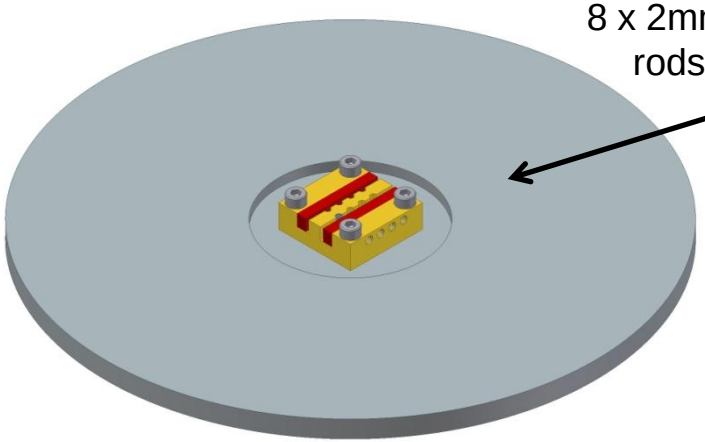
Pepperpot Image Calibration System

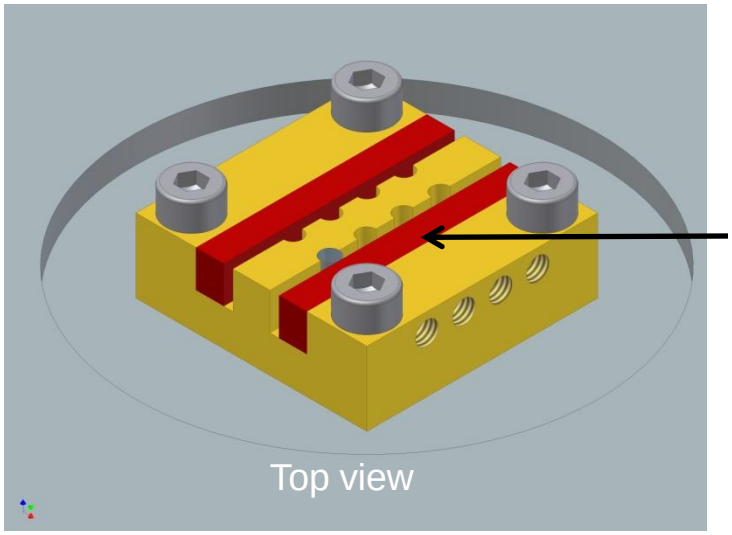
Goal is to coat end of glass rod and then remove coating at the centre to allow light through.



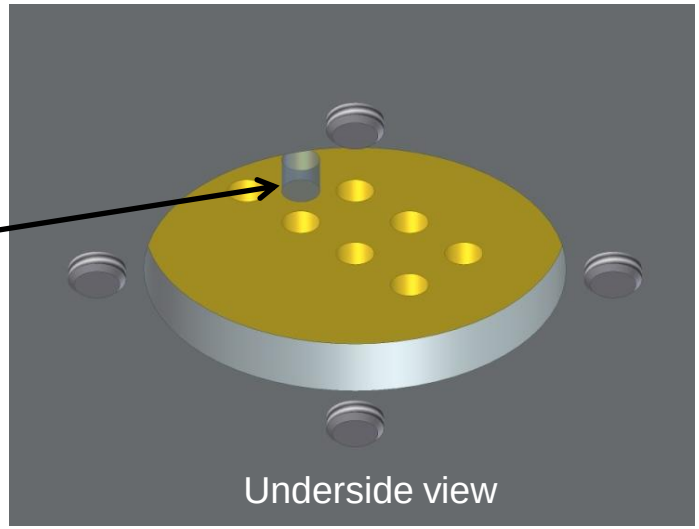
Coating a layer of 1.5 micron thick Al (2 x 640nm + a bit) will take 6 – 8 hours.

Sputter coater jig to hold 8 x 2mm diameter glass rods (temp 120^0C)





Glass rods poke through plate and are clamped in place.



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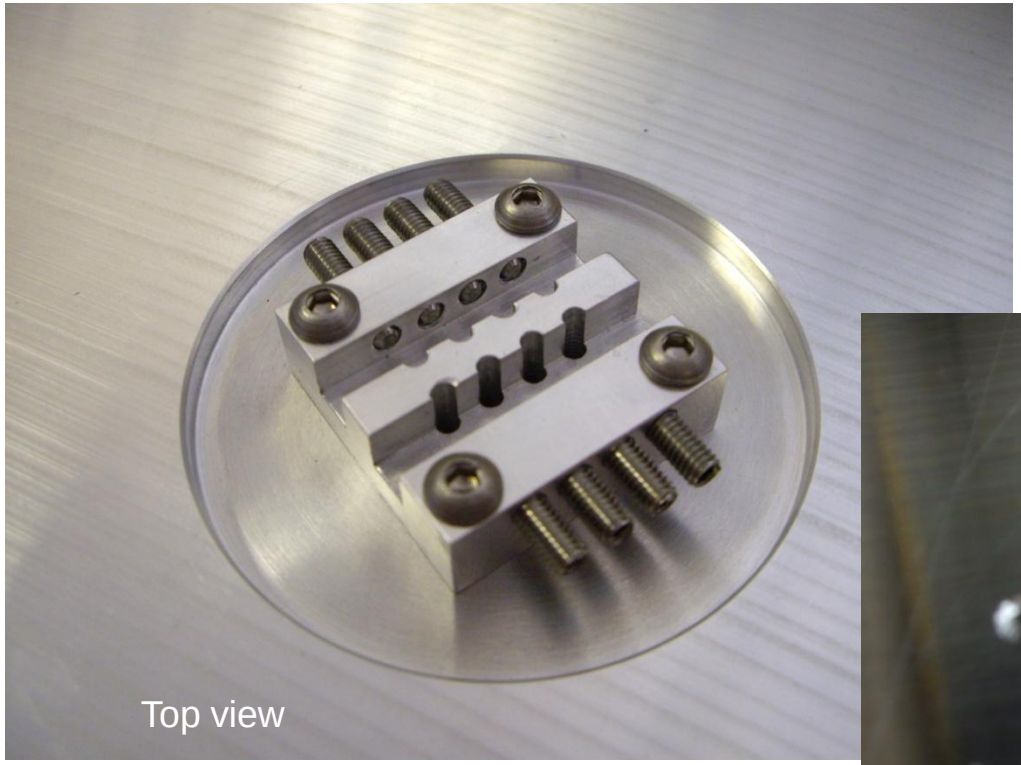
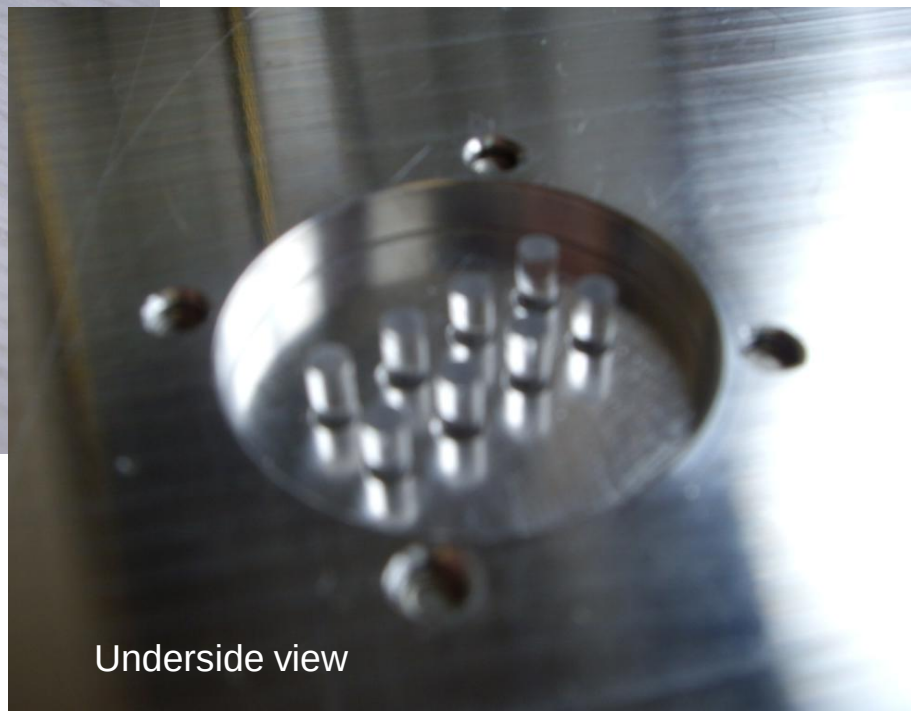
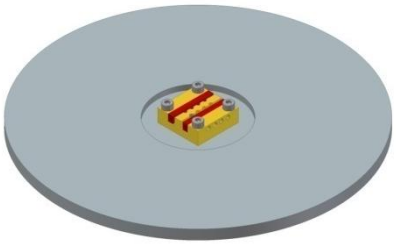


Jig has been manufactured.

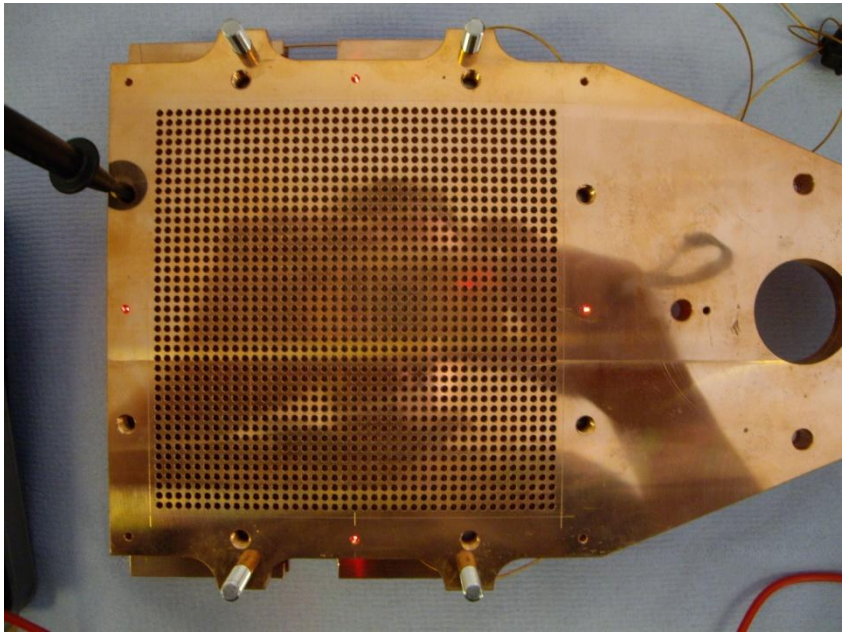




Pepperpot Image Calibration System

Still to do:

1) Coat the ends of the glass rods with aluminium (today).
2) Remove a 500 microns diameter spot of coating at the rod centre.
3) Wrap the rod in shim (0.05mm) and insert into holes.
4) Replace scintillator.
5) Fit wiring connectors.
6) Re-mount in vacuum vessel.
7) Test.
8) Hope LEDs survive!



Two items to discuss...

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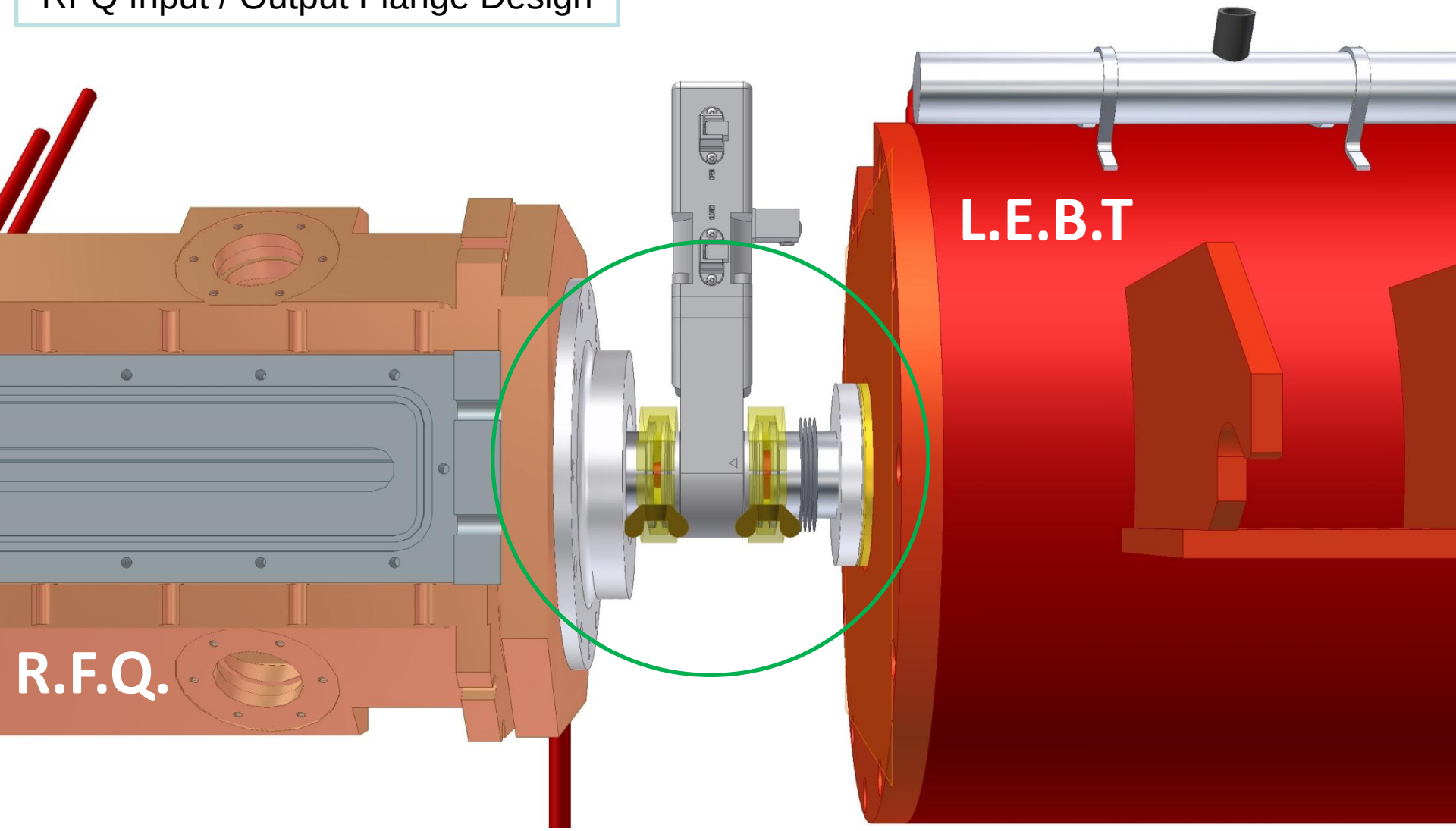
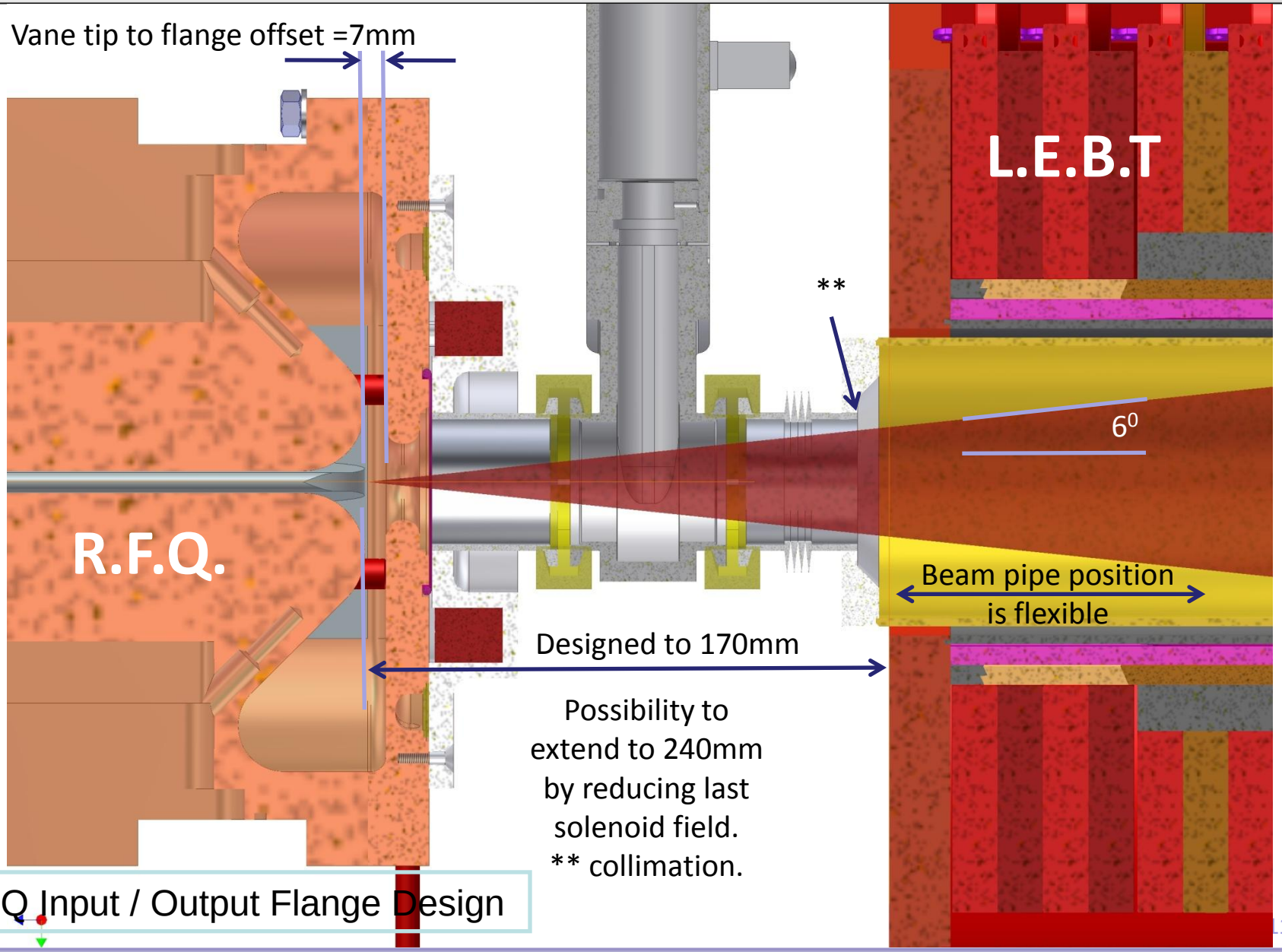
RFQ Input / Output Flange Design



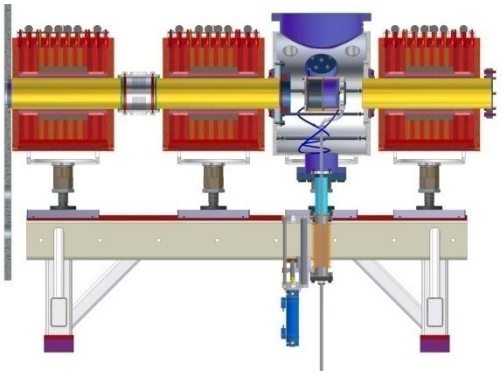


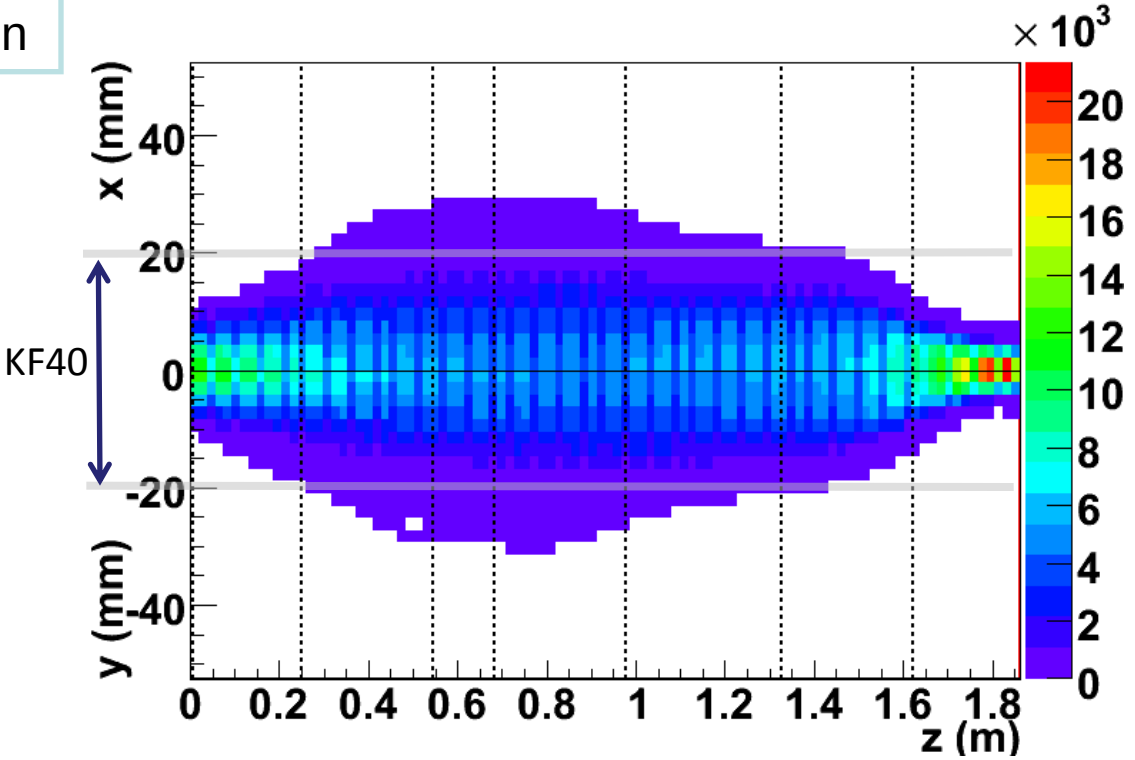
RFQ Input / Output Flange Design

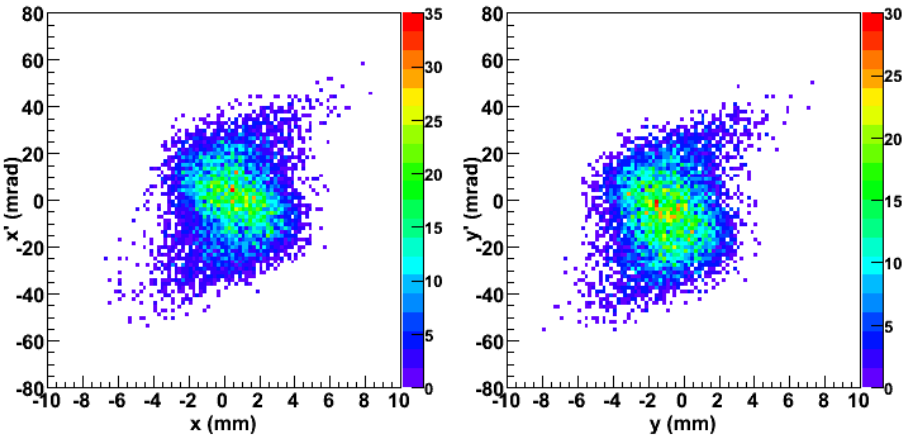
RFQ Input / Output Flange Design

Beam plots from John...

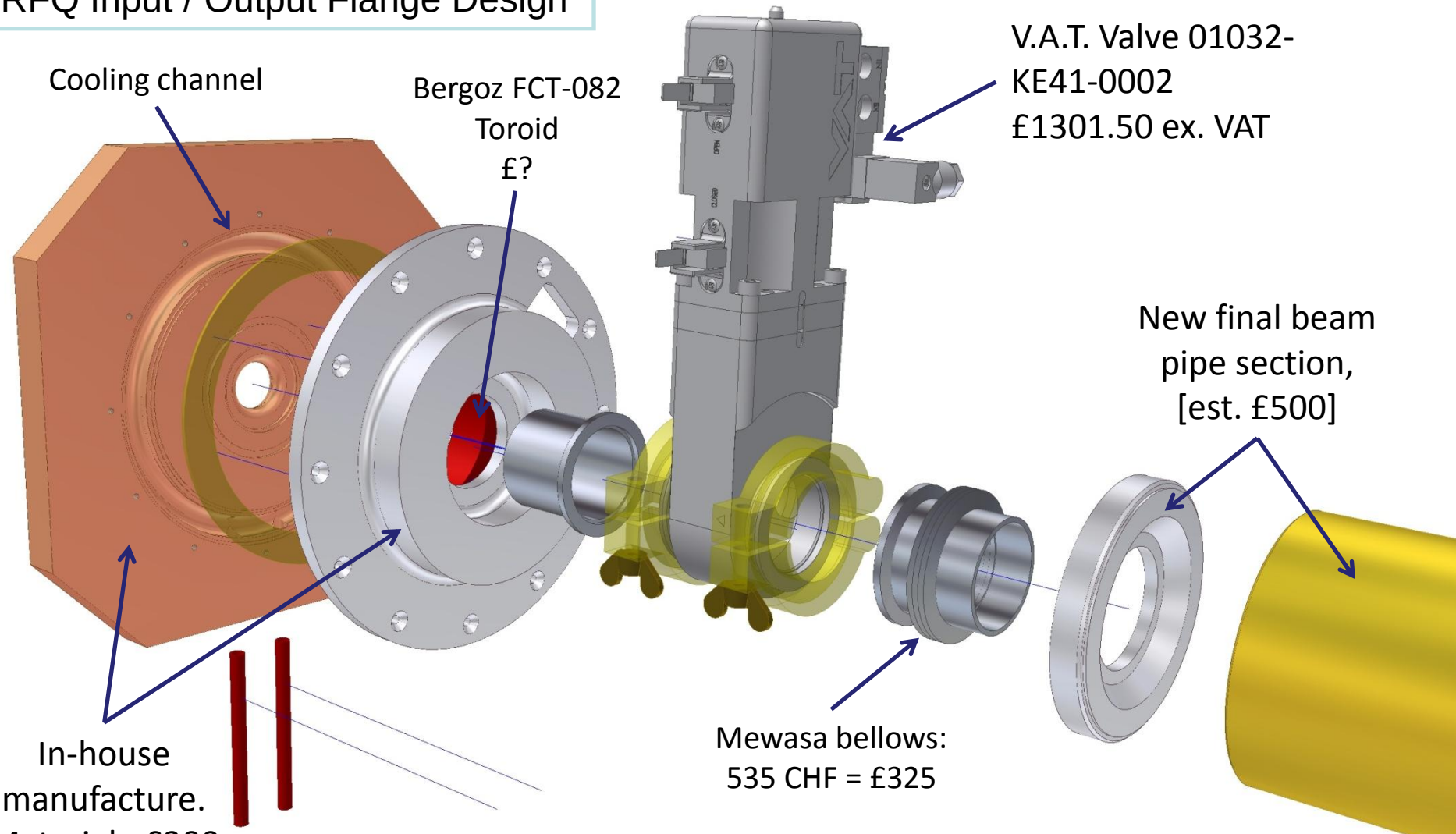
LEBT component	Length (mm)
Drift 1	250
Solenoid 1	310
Drift 2	135
Solenoid 2	310
Drift 3	350
Solenoid 3	310
Drift 4	170







RFQ Input / Output Flange Design



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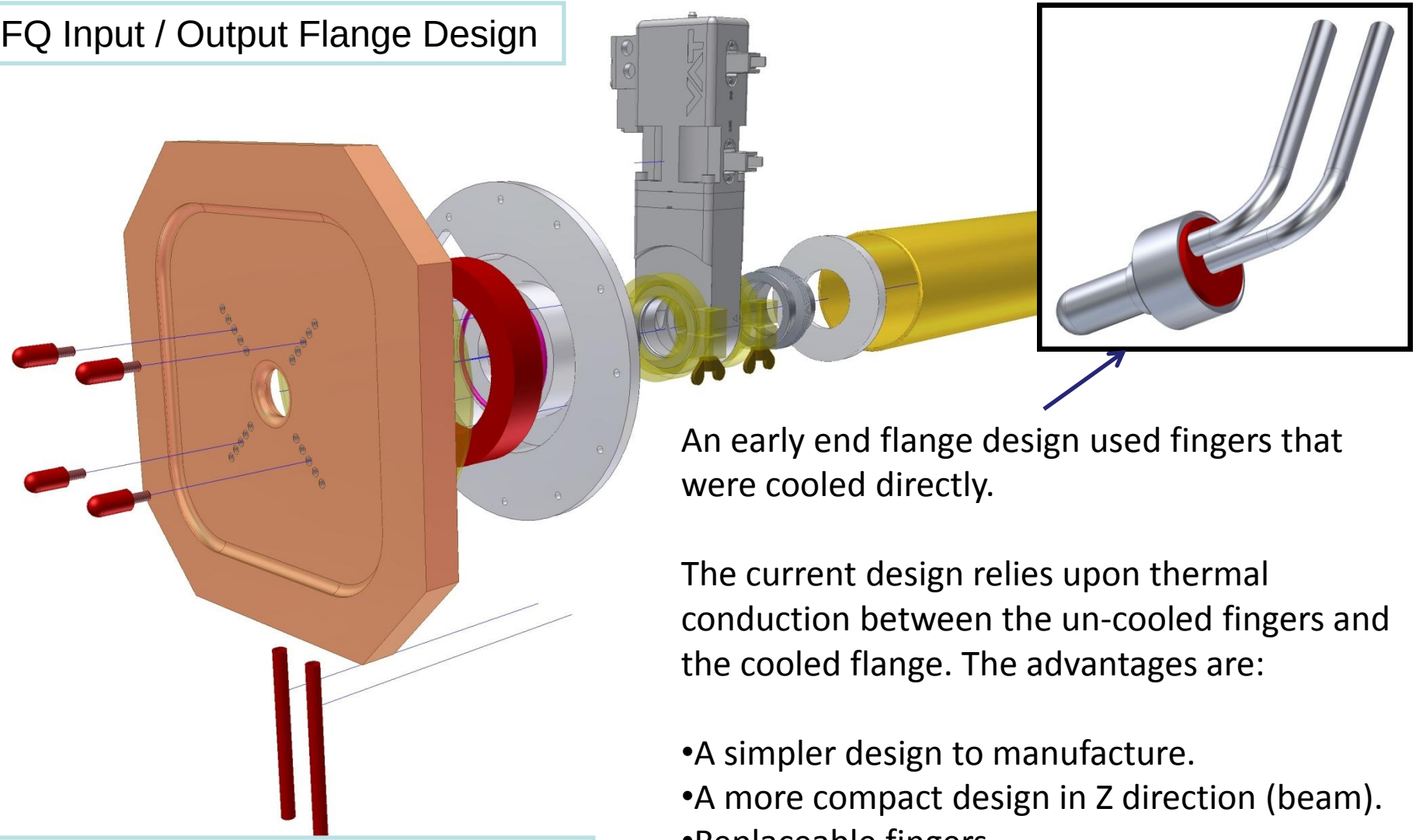


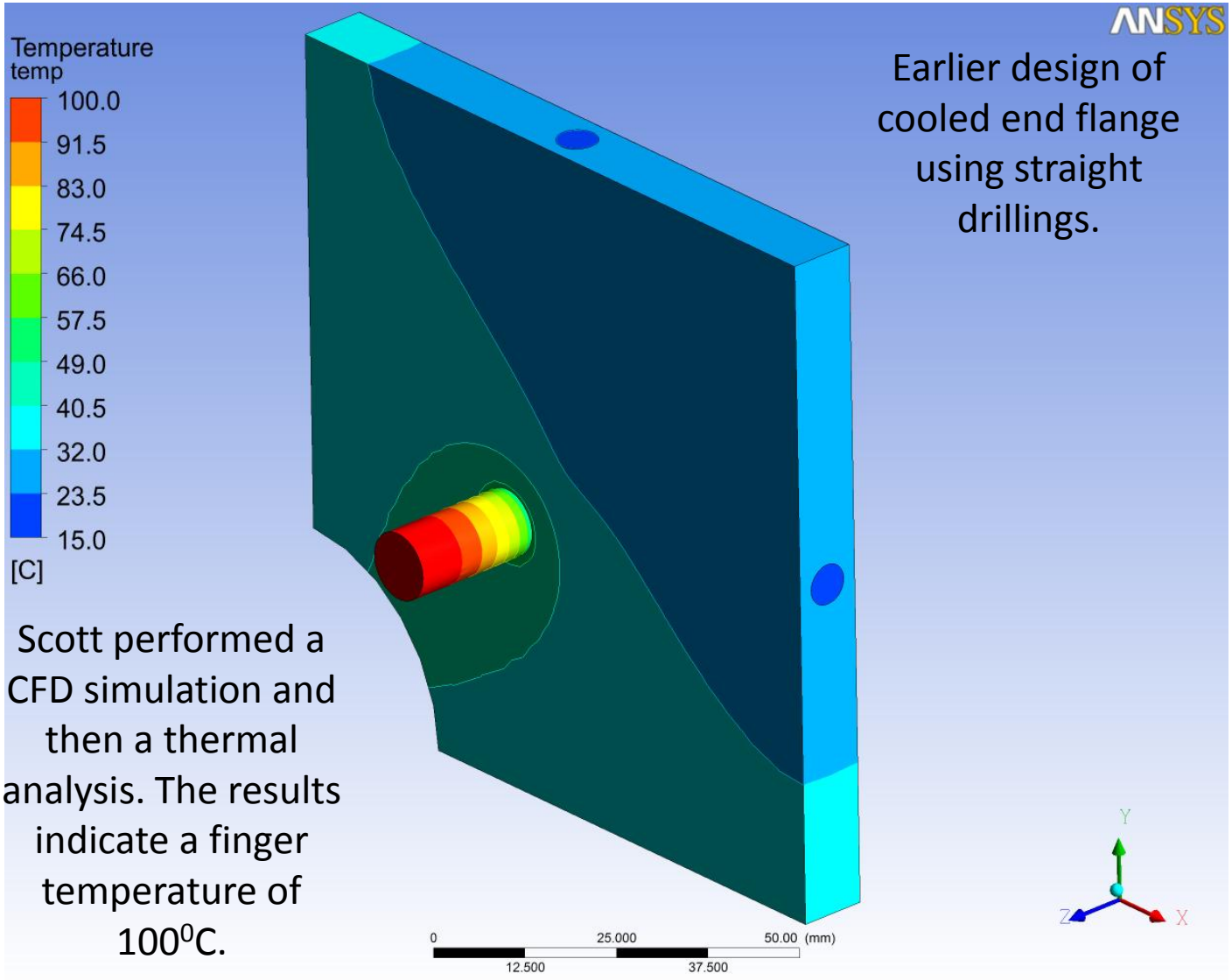
An early end flange design used fingers that were cooled directly.

The current design relies upon thermal conduction between the un-cooled fingers and the cooled flange. The advantages are:

- A simpler design to manufacture.
- A more compact design in Z direction (beam).
- Replaceable fingers.
- Repositionable fingers. QN: Do we want this?

But, can the fingers be sufficiently cooled indirectly?.....

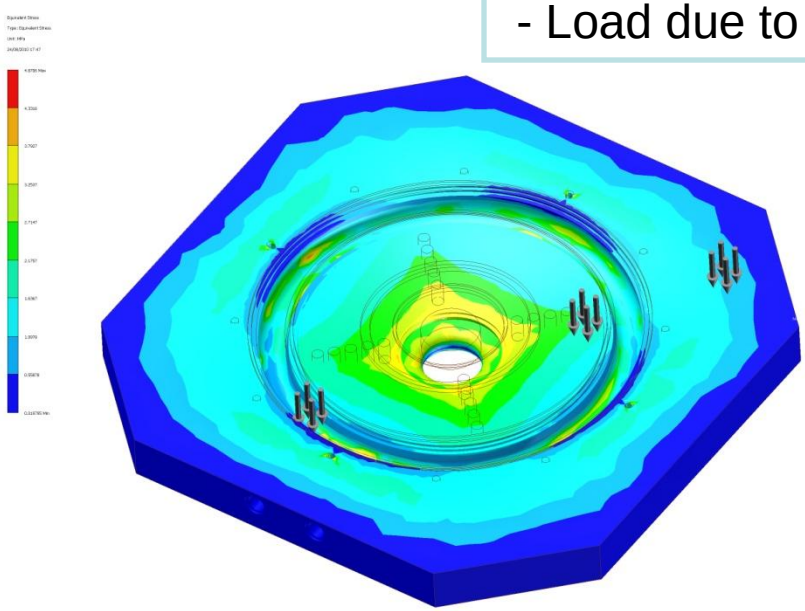
RFQ Input / Output Flange Design



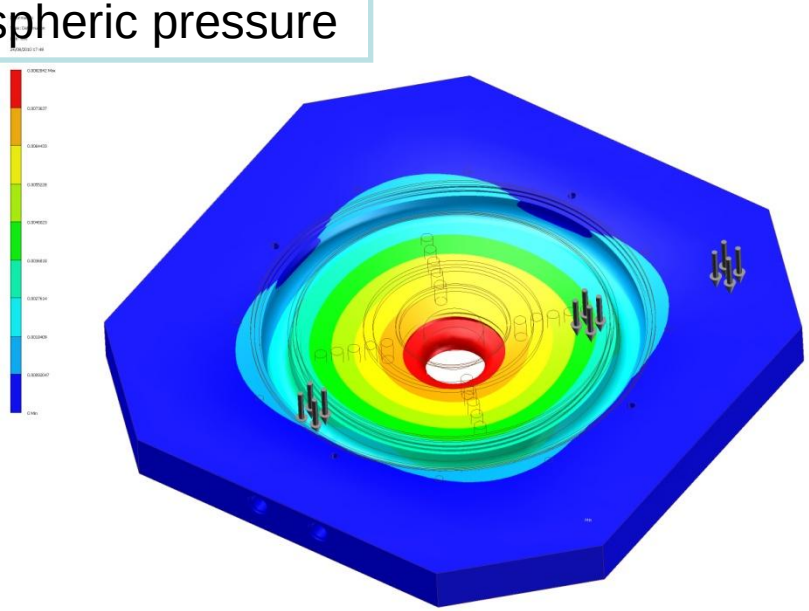
Earlier design of cooled end flange using straight drillings.

Scott performed a CFD simulation and then a thermal analysis. The results indicate a finger temperature of 100^0C.

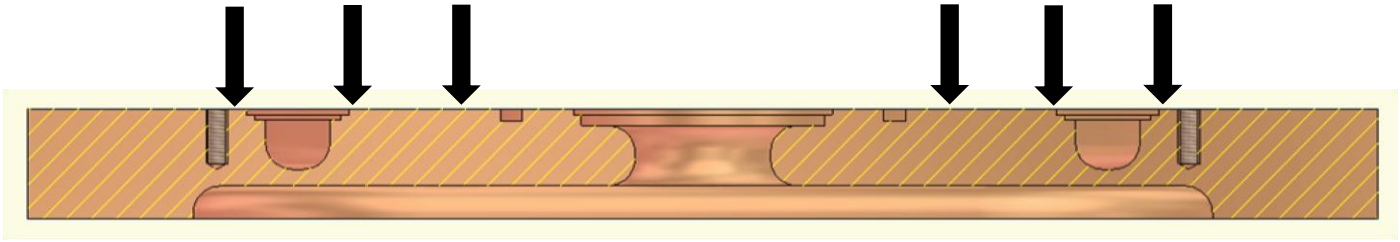
RFQ Input / Output Flange Design
- Load due to atmospheric pressure



Max. Equivalent stress = 5MPa



Deformation = 0.008mm



- Ultimate tensile strength (for Cu) = 220 Mpa
- Yield strength (for Cu) = 70MPa

RFQ Input / Output Flange Design Conclusions

•An end flange including a solenoid, vacuum valve and bellows will fit within the designed 170mm beam drift length.

•Initial thermal calculations confirm that the end flange can be cooled sufficiently to allow the use of screw-in Pi mode stabilising fingers. Need to check thermal performance of new circular cooling channel.

•The design can withstand the load due to atmospheric pressure and the deformation is not significant.

•The same design could be employed at the exit end of the RFQ.

Thank you.