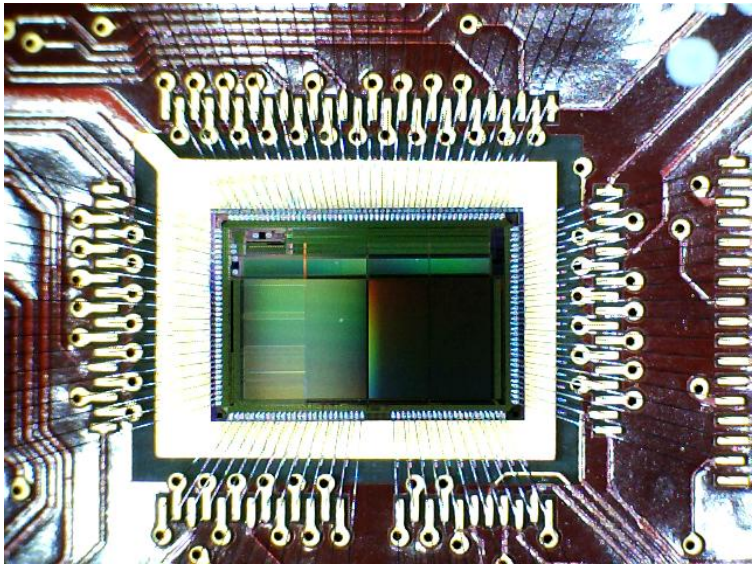
UK Programme

Adrian Bevan

- Outline:
  - Mechanics
  - Sensor Bench tests
  - 2012 Test beam plans



Mechanics

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- Filippo visited before the summer break to discuss plans to make a prototype of the interaction region by the end of 2013.
  - Discussion mainly focussed on the support cones and space frame assembly.
  - Detailed problem:
    - Space frame
      - CFRP Rings, tubes, assembly jigs
      - alignment jigs
    - Cones
      - CFRP
      - Faraday cage
      - cooling rings (with mounting buttons)

N.B. for now we plan to use up our old stock of epoxy resin based CFRP, would want to use a more rad hard cyanite-ester resin for the real thing.

Fred, John, Jag & Filippo

Can we increase cooling for L1/L2?

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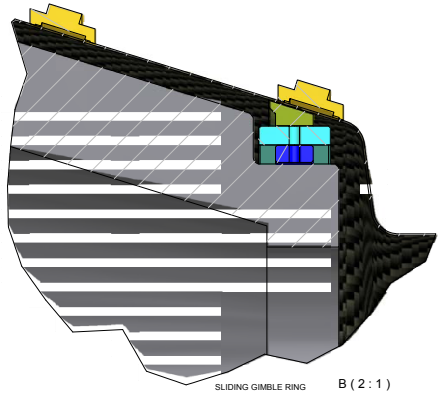
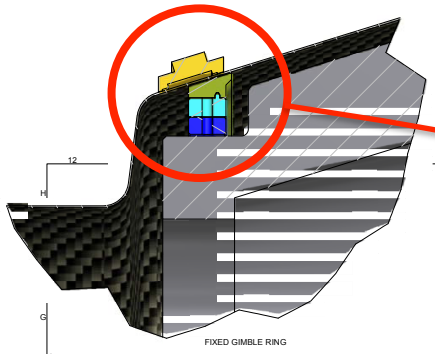
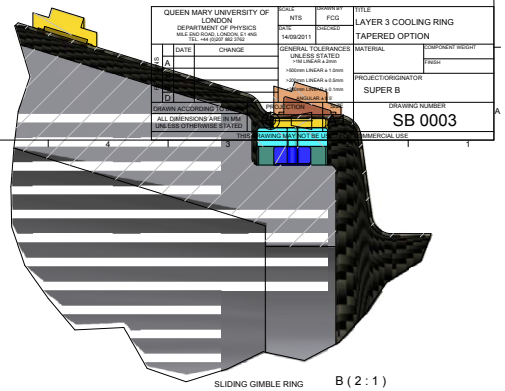
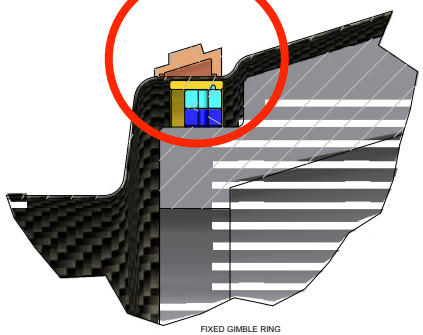
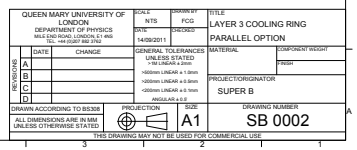








Same profile from the detector point of view, larger x-sectional area for coolant.

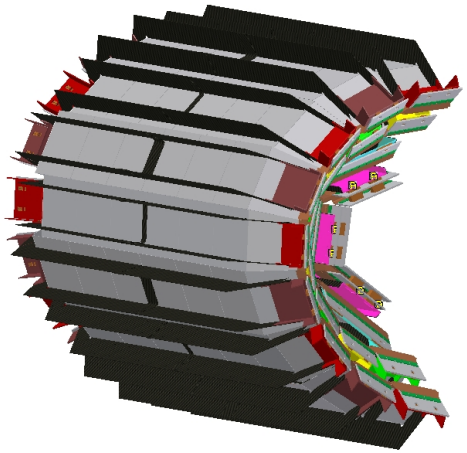


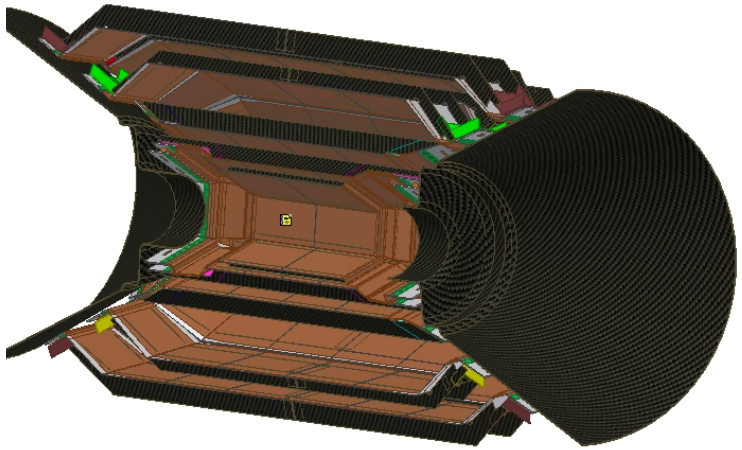
Fred

Splitting the support structure

Queen Mary University of London
Adrian Bevan

- Aim to use the logical split (vertically) through the SVT)





- Started to think about assembly of the cones and support frame relative to parts. Can either
  - Fix the cooling rings and build around them (using buttons as datums).
  - Build up structure from the inside out (starting with cones).

Fred

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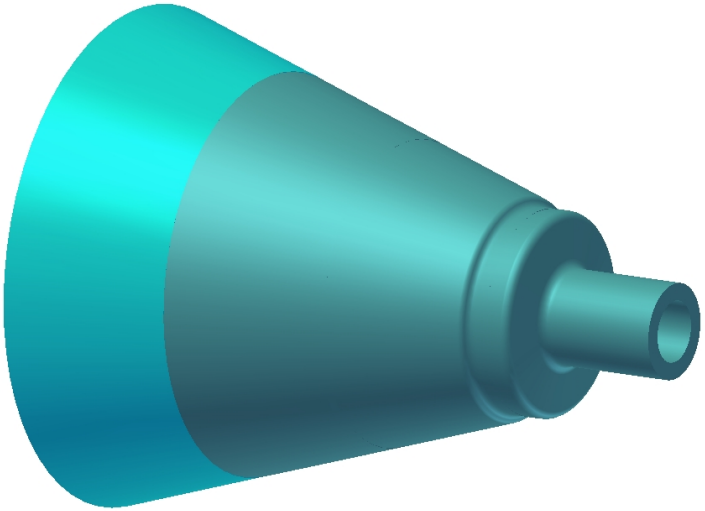
- Working on mould design for cones: aim to co-cure copper mesh into the cone surface to provide the faraday cage in a natural way.
  - Have mould resin ready to machine. Aim is to finish producing mould by the end of the year.



Cooling rings shown are basic model from Filippo.

Co-curing copper mesh to main part of the mould shown to work well on test sample.

Aim to push forward to finalise basic cone design before making mould.

Fred

Prototyping space-frame

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- Looking at various materials: **Foam Core or Solid?**

Foam Core

Advantages: Light weight, less material (possibly!)

Disadvantages: Is core material rad hard? Would need to run tests.
Requires extra material (pads) at fixed points due to thin walls.
Requires inserts where rings fit together (as above).
Edges will need to be sealed.

Solid Profile

Advantages: Very strong – could be lightened by machining.
Good mechanical contact at fixed points.
Rad hard.

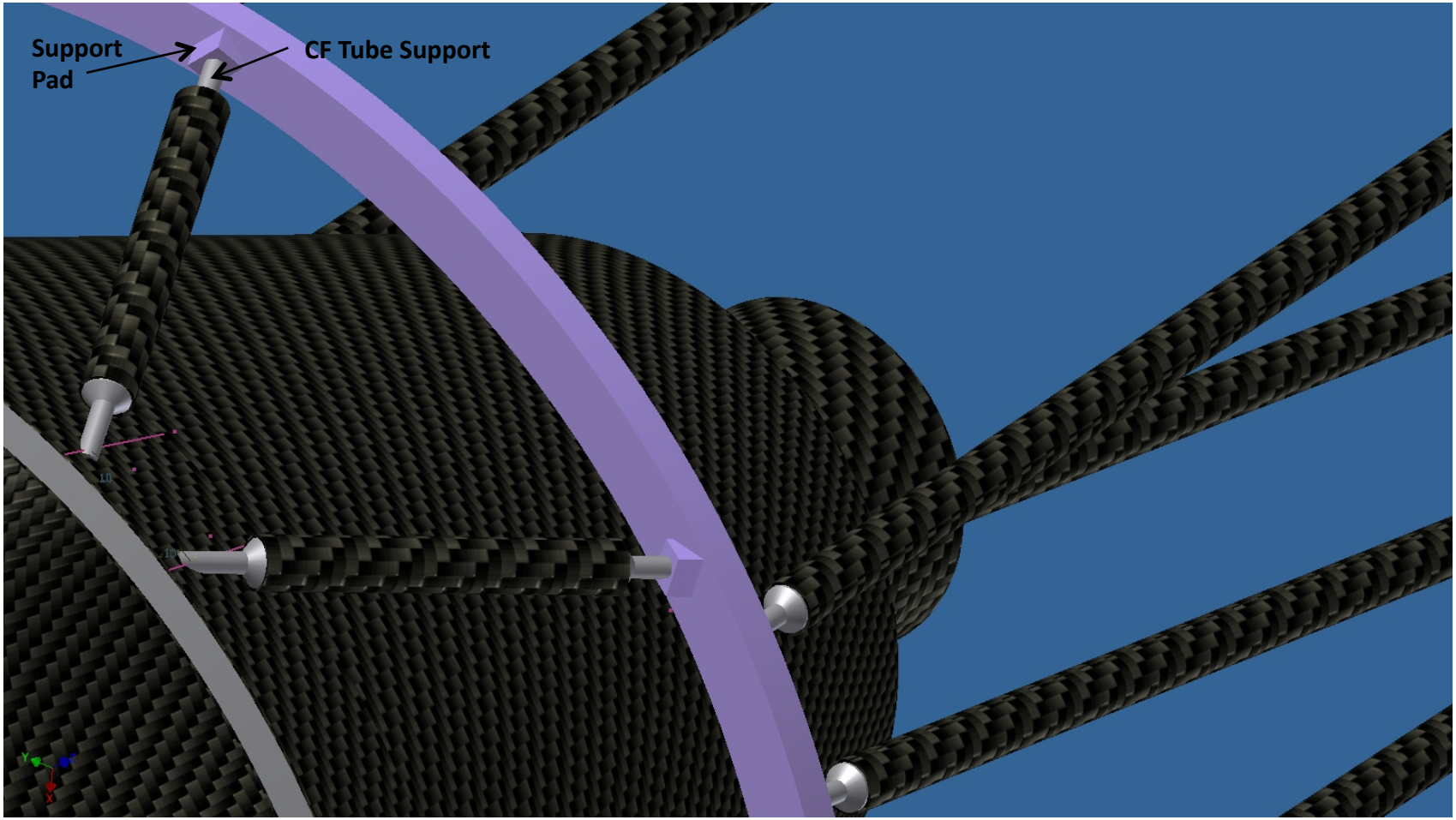
Disadvantages: Time consuming to build (approx 40 layers).
More material (possibly!)

- Initial aim to try making a solid ring of CFRP to machine as required.

John & Jag

Foam Core

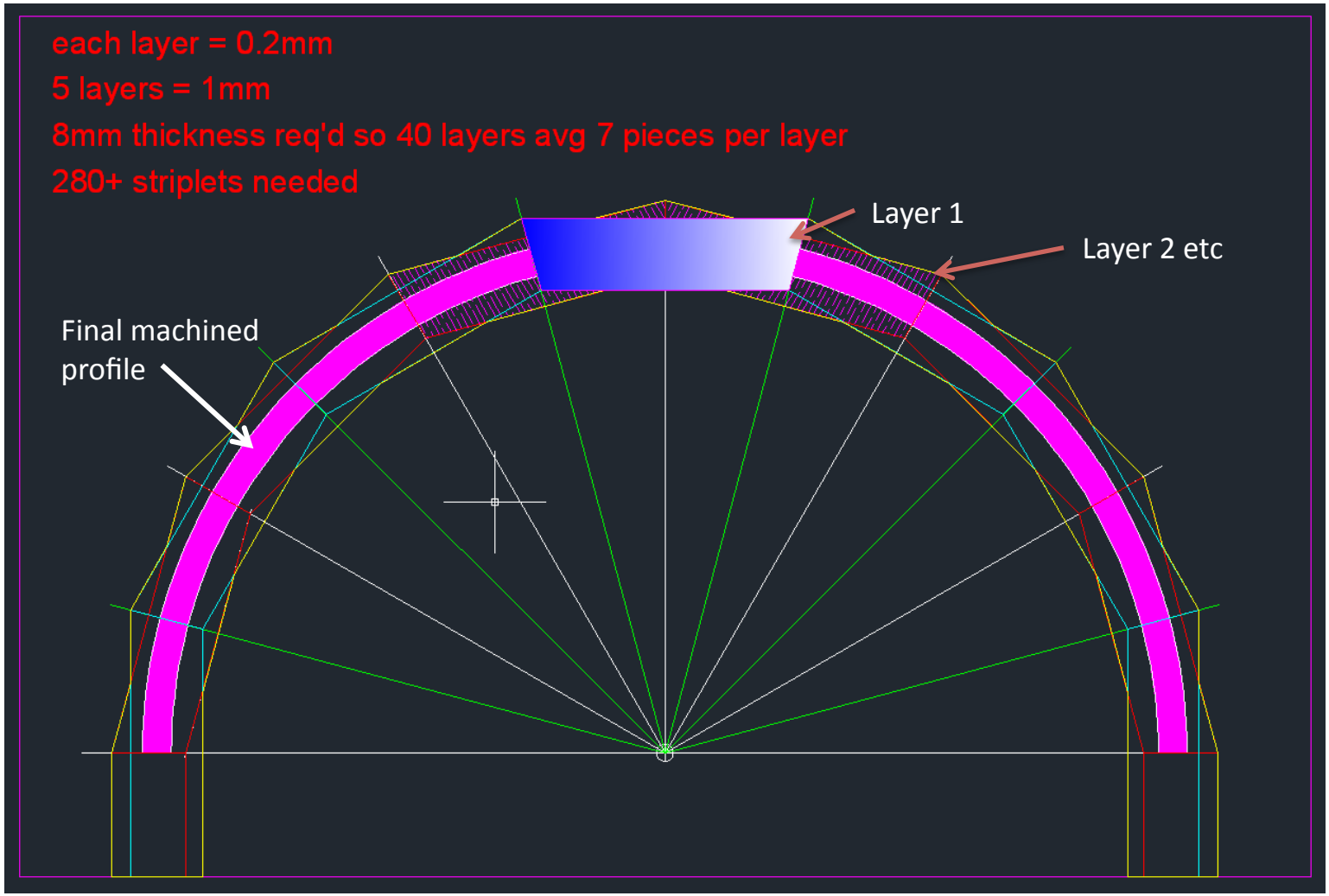
(showing additional support pads)



John

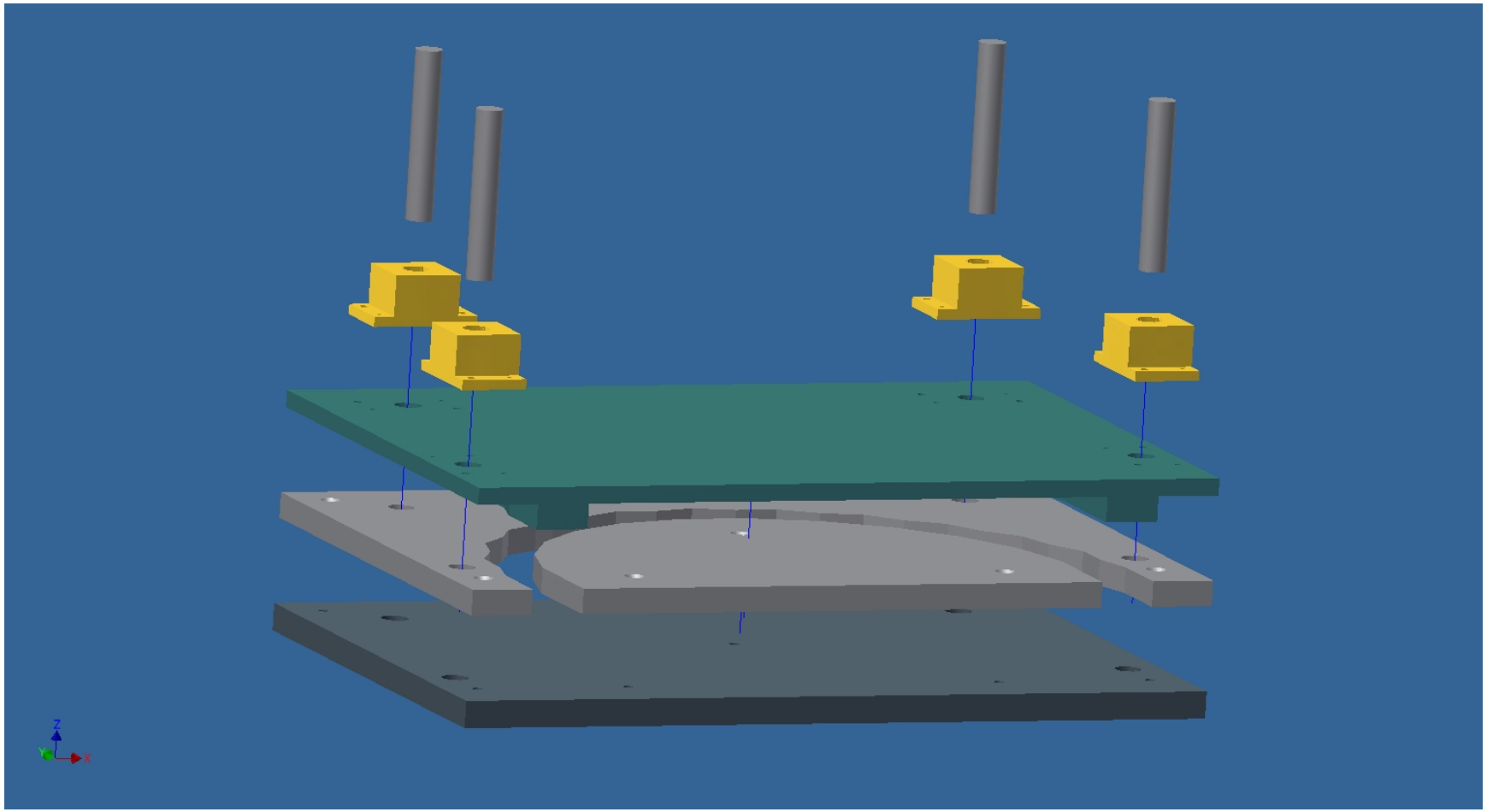
Solid Ring CF Lay-up Strategy

(alternating layers)



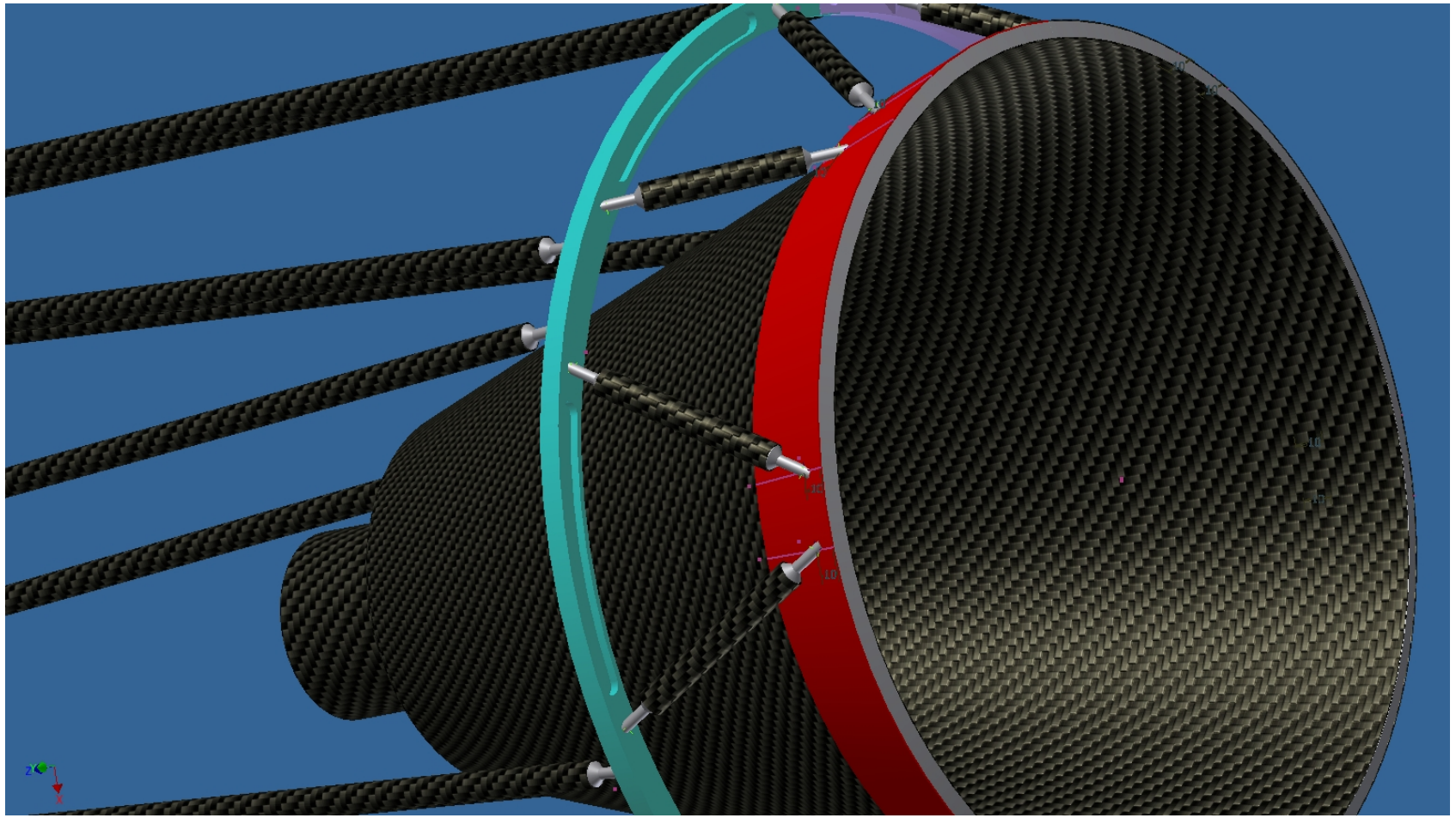
John

CF Lay-up Jig



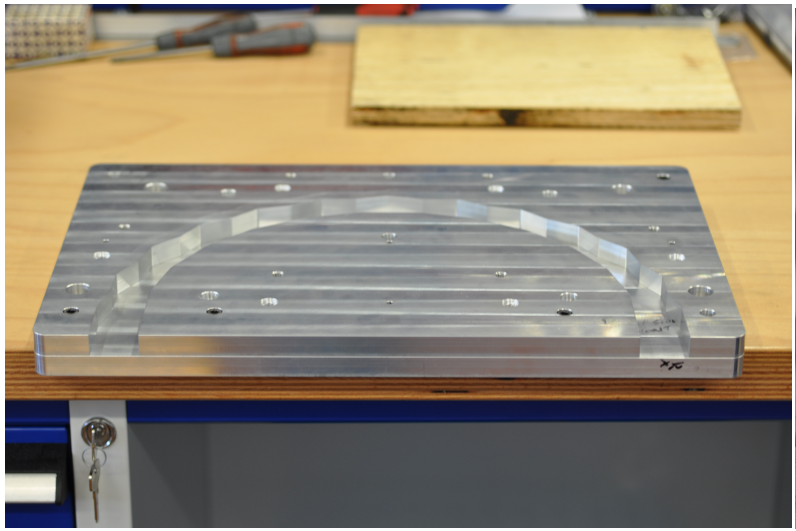
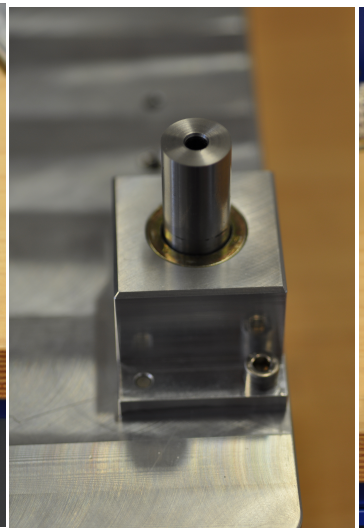
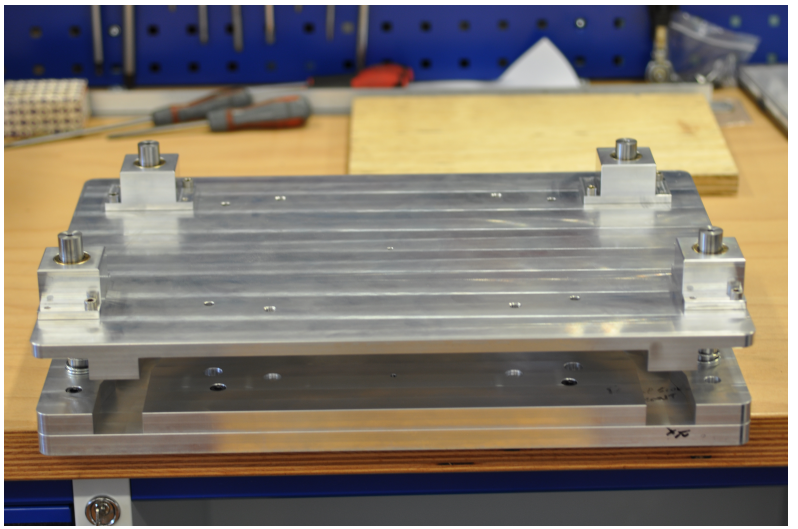
John

Solid CF Ring



John

- In the process of making jigs for the first solid ring prototypes

- Will need to finish off a few parts, and coat with Teflon before we can try making some samples.
- May require a bit of trial and error given we need to produce relatively thick CFRP parts & want uniform curing of the material.
- Using Amber Composites E722 twill (200g/m^2)
  - (our stock of prepreg is past its shelf life, so it is usable for prototypes, but not for a production part)

Support alignment frame

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- Initial rough concept for discussion:
  - Base the support around a long silver steel bar to form central axis of the detector for assembly purposes.
  - Will need to mount cones accurately onto this, and build the space-frame with a combination of alignment and assembly jigs.
  - Ideally would like to be able to put this all under our new CMM (will be a tight fit).

Fred, John, Jag

Sensor bench tests

Adrian Bevan

- Concentrating on reference pixel tests initially
  - Basic functionality tests:
    - pedestals, noise, Fe55 and LED response
    - Gain determined from PTC scans
    - Prepared laser stage scan using RAL setup.
  - In progress: Debugging on chip ADC "Strixel" firmware at the moment.
  - The following slides are based on results from the collaboration shown by James Mylroie-Smith at Pixel 2012.

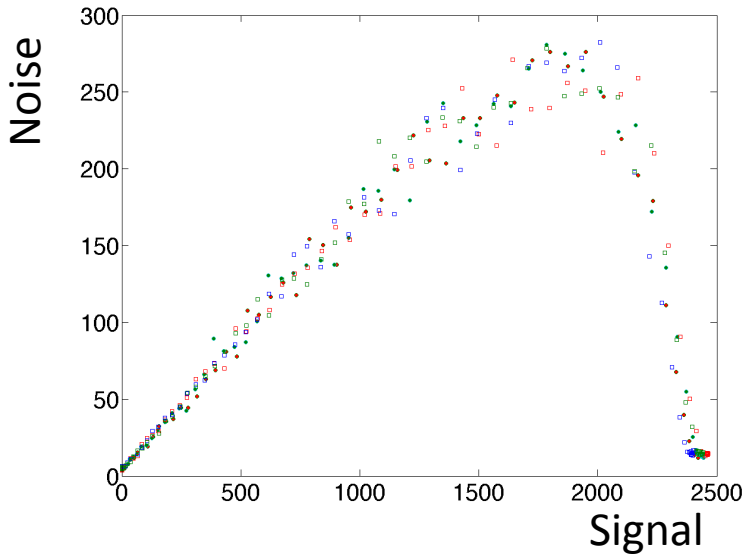
with James, Gianluca, Fergus + our Arachnid collaborators at Bristol, RAL and Daresbury

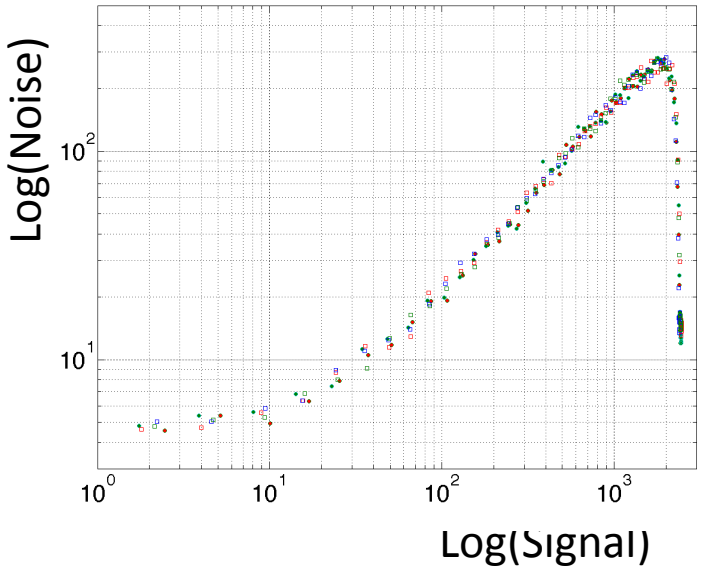
PTC Results

Adrian Bevan

Reference pixel results

- PTC performed using IR illumination
- Results show good uniformity across the pixels
- Gain ≈ 0.17 ADC/e
- Noise ≈ 12e
- Linear full well ≈ 11500e
- Maximum full well ≈ 14700e





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Noise vs Temperature

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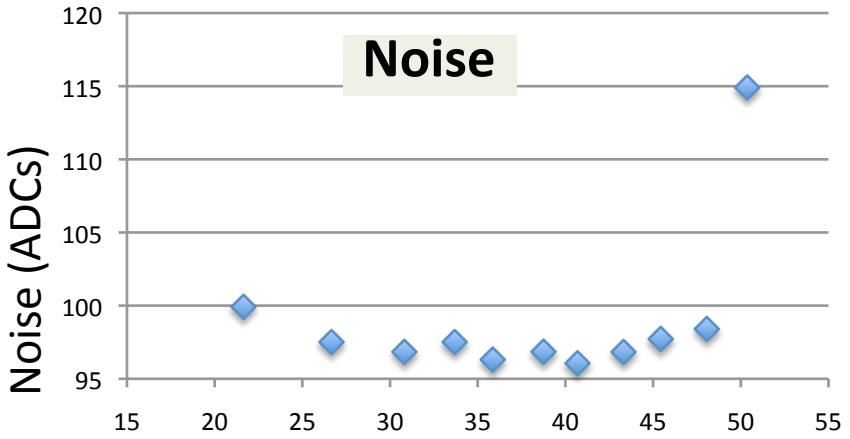
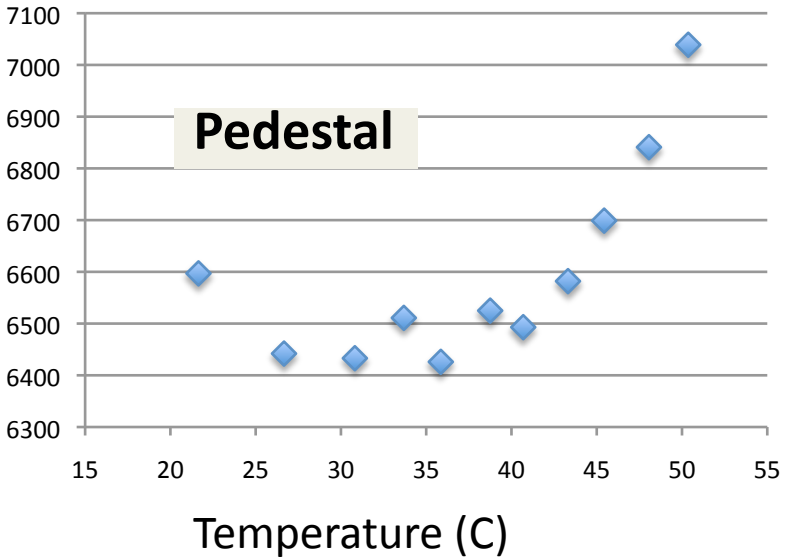
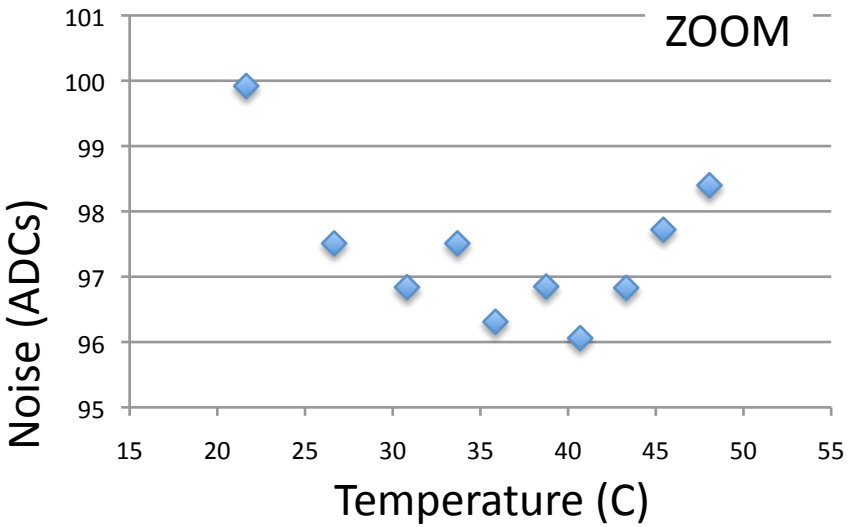
Reference pixel results

- At 50C the noise becomes large.
- Increase in noise at 20C







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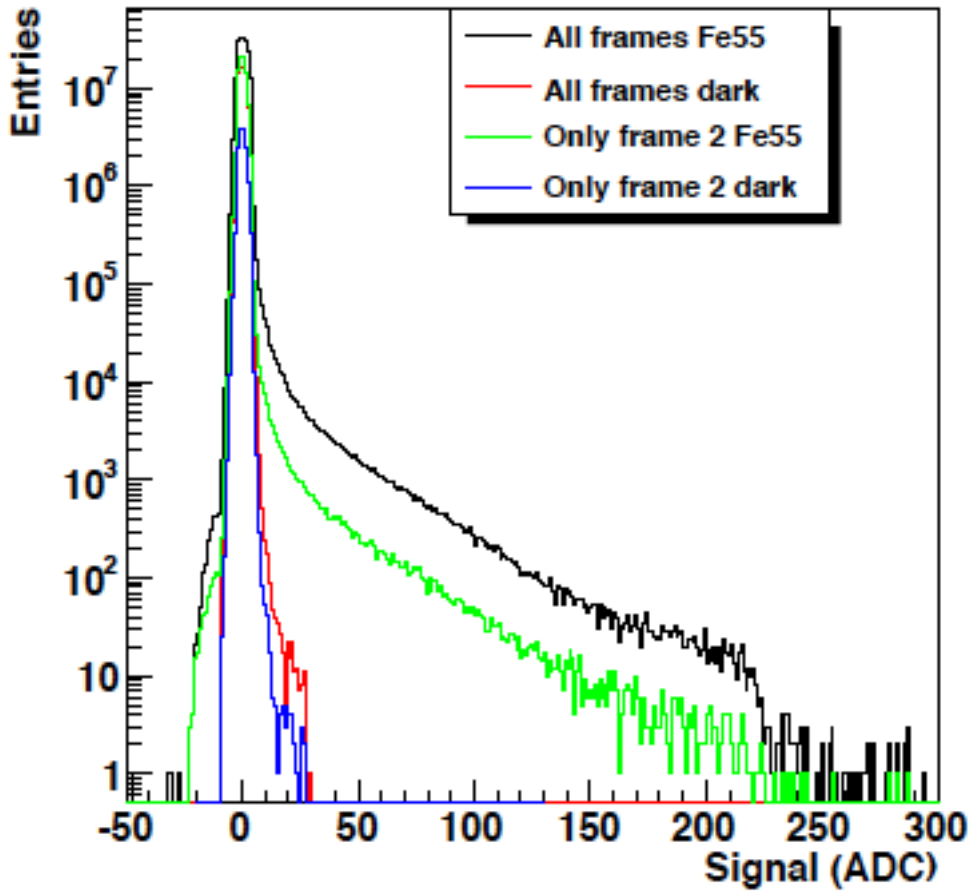
^{55}Fe

Reference pixel results

- There is a clear noise peak
- Fe55 spectrum shows a sharp cut-off at ~275(ADC counts)
- Consistent with noise and gain from PTC



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Test beam

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- CERN test beam at T4-H6 mid-November
  - Clarifying dates with regard to latest schedule.
  - Preparing for this: will have a stack of sensors with trigger in a stand alone system to simplify the setup.
  - Will perform pion beam irradiation of these sensors.
  - RAL group leading preparations for this.
    - Aim to have a lab based test of the setup in the coming month.

Summary

Adrian Bevan

- Clear plan forward on the mechanical side:
  - Some issues are well understood, and we can start prototyping.
  - Others: we're starting to try out ideas to determine the best way forward.

- Sensor testing:
  - First results are now available from Cherwell.
  - Reference pixels are behaving as expected, and we hope to be in a position to study the other pixel types soon.
  - Test beam plans progressing well.