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CALICE: Thermal, Mechanical and Assembly issues

What Manchester could contribute

UCL Wednesday 10th November 2004

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Manchester and Silicon

- Part of ATLAS SCT construction
- Thermal design: simulation and testing
- Assembly of 650 silicon modules
- Survey, I-V, readout tests
- Production database and QA

‘Challenges’ of CALICE build

- Testing detectors before assembly
  - Silicon characteristics
  - Identify and remember dead cells (if simulations show we are able to use “2nd quality Silicon”)
  - Do this in automatic or semiautomatic system (for prototype and for the full detector)

Challenges (contd)

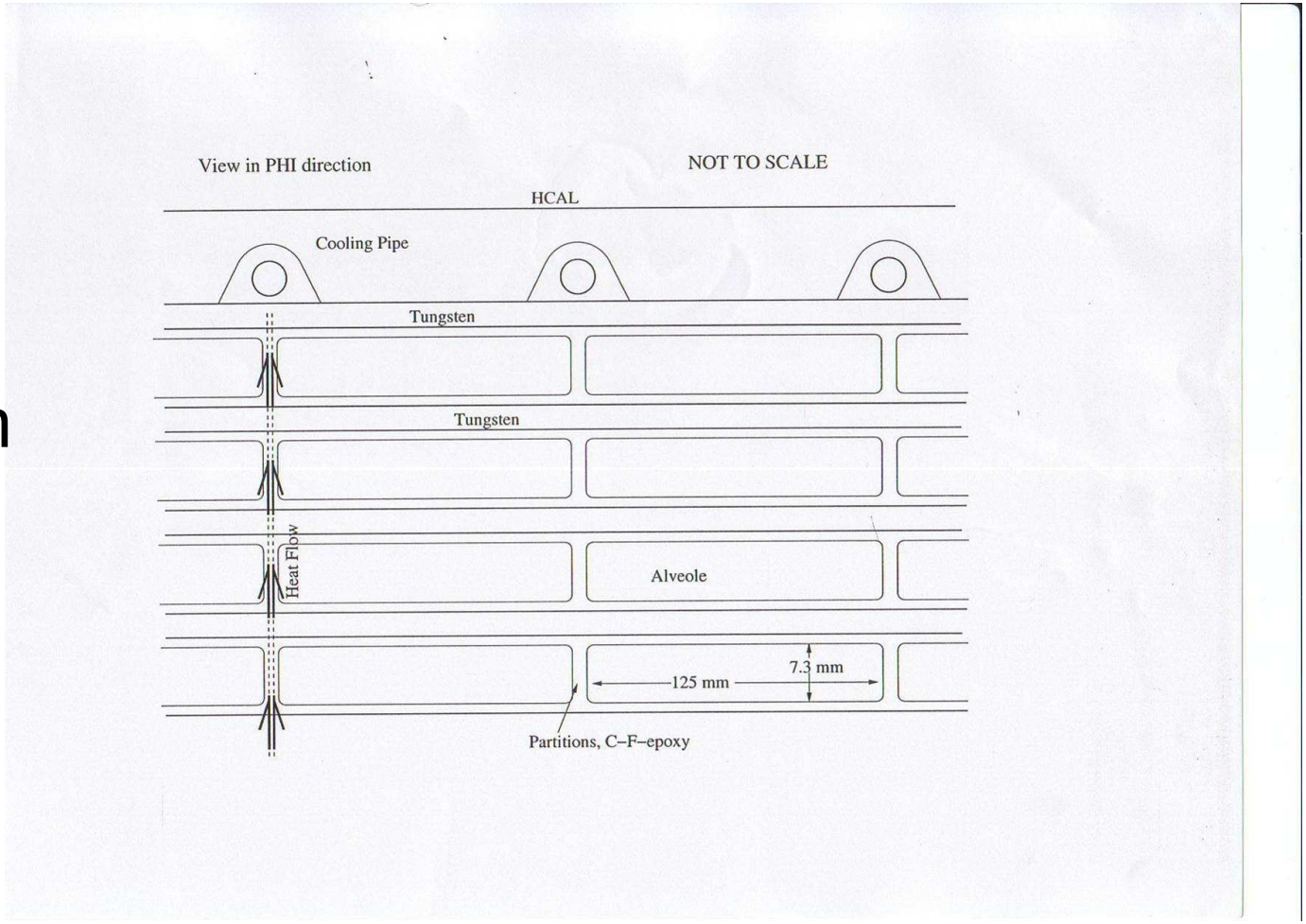
- Mount detectors on substrate
  - Check for flatness and mechanical tolerances
  - Know where the detectors are on the PCB
  - Know where the PCB is inside the module. Location pins?
  - Check connectors all made properly
- Check the Tungsten
  - Metal sheets: Flatness? Thickness?Exact size
- Macro assemble of complete module

Thermal Issues

- Heat generated by electronics
- What about MAPS? How many watts?
- Can we put the preamps on the detector? Even if we can't, the electronics cooling needs doing properly.
- Heat flows away – thermal conductivity in Silicon, Tungsten and Carbon Fibre (non-isotropic). Cooling blocks/cooling pipes
- Studies using FLEXPDE package (we have experience and licence)

Heat flow through Tungsten and Carbon Fibre

Studies by Ian Duerdoth (previously shown). Could be continued



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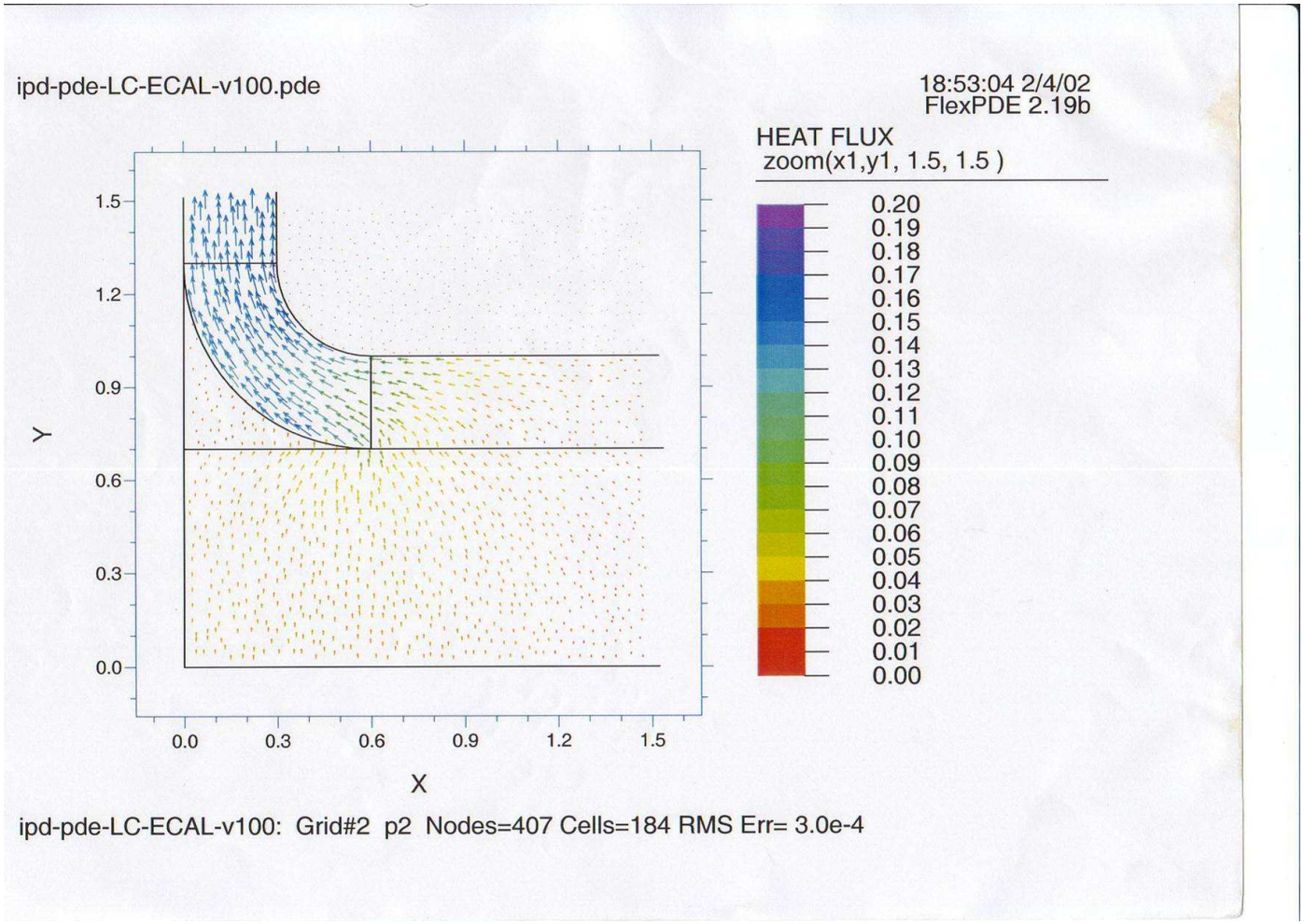
Heat Flow

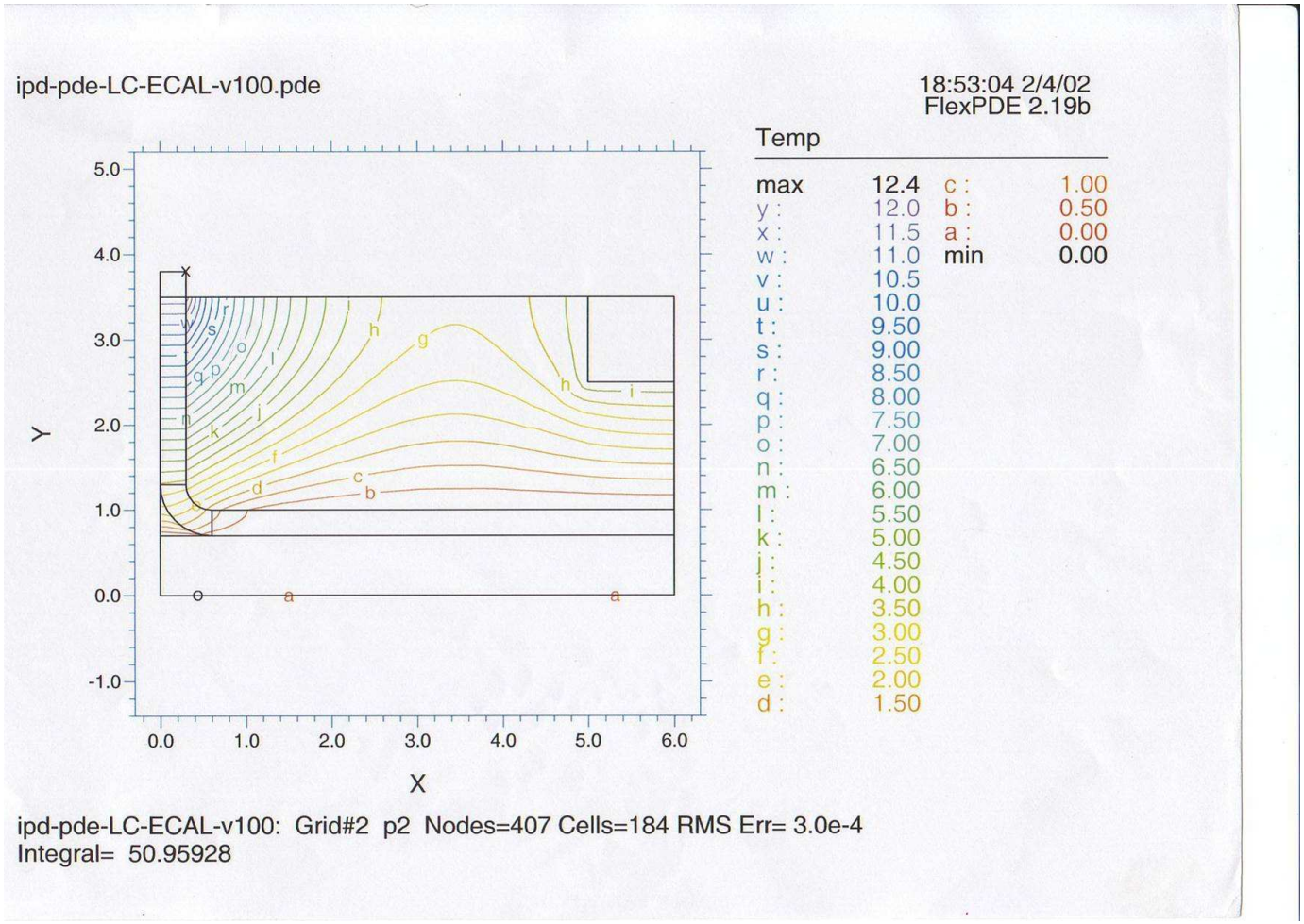
This is one corner.



Temperature

Isotherms. Various possible scenarios

Now we know the technology – can we ramp the electronics HV up and down with the beam structure?



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Conclusions

- These are only first thoughts
- Moving from concept to the real thing always raises lots of practical issues
- Manchester has long detector-building tradition and experience. We've been through this cycle many times and know what sort of problems to anticipate
- Anticipation and understanding can be crucial to success