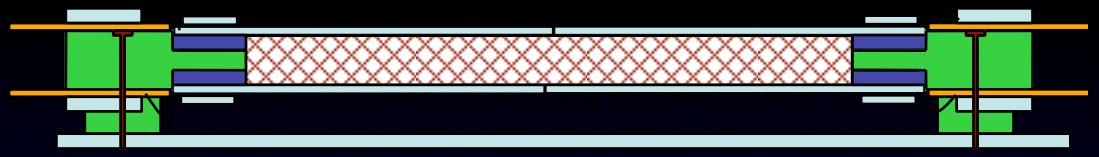
LCFI - WP6

Mechanical Studies

1. Research and develop mechanical support technologies
2. Research and develop module production methods
3. Produce detector global design
4. Study thermal and cooling aspects
   - *Feed back in to each other*
   - *Lead to full engineering design*

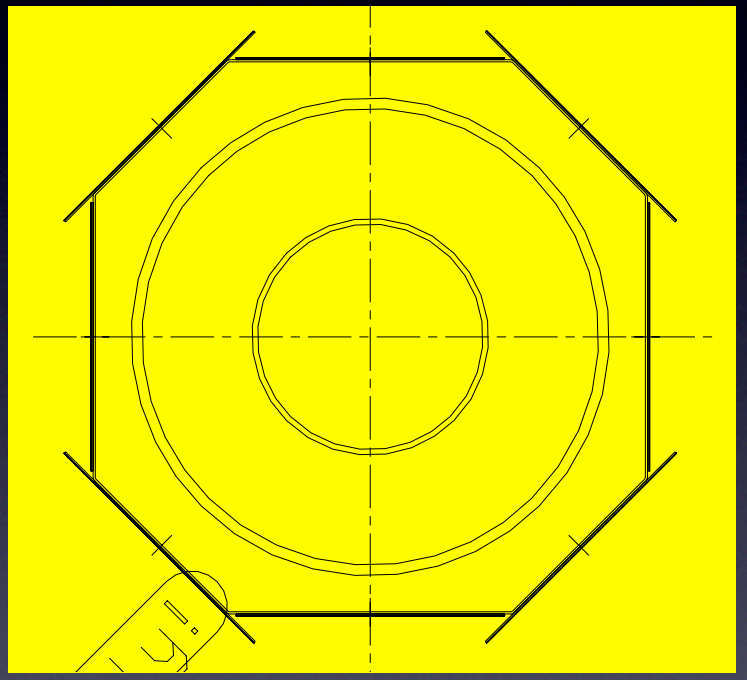
Technology R&D



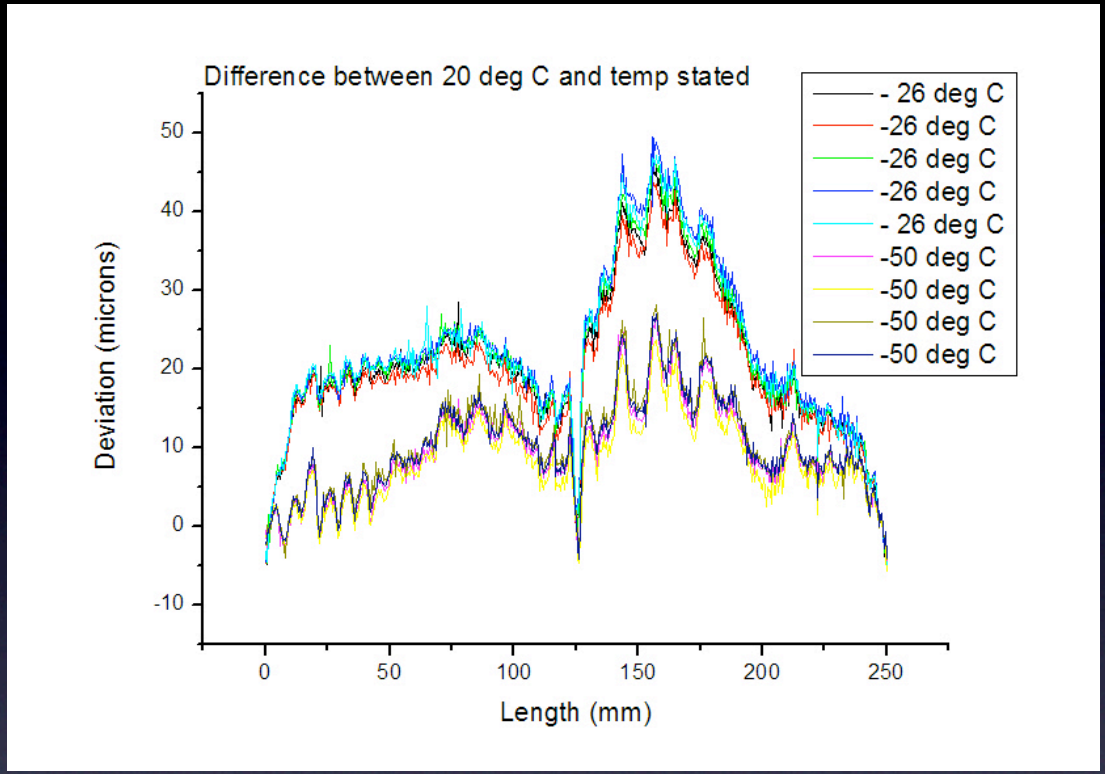
- Focus on RVC and SiC foam "ladders"
  - Attached to dissimilar bulkheads
- Other ladder options considered
  - Unsupported and beryllium rejected
  - Carbon fibre less promising than foams
- Look for novel solutions

Integral Structures

- Carbon Fibre Shells
  - Expertise at Liverpool (CDF Layer00)
  - Good results with 2-ply weave
  - Lower-mass material being sourced
- SiC Foam
  - SiC ladders glued to SiC bulkheads
  - Eliminate differential CTE
- All Silicon
  - "Thick" sensors glued along long edge
  - Collaborating with FNAL and Washington

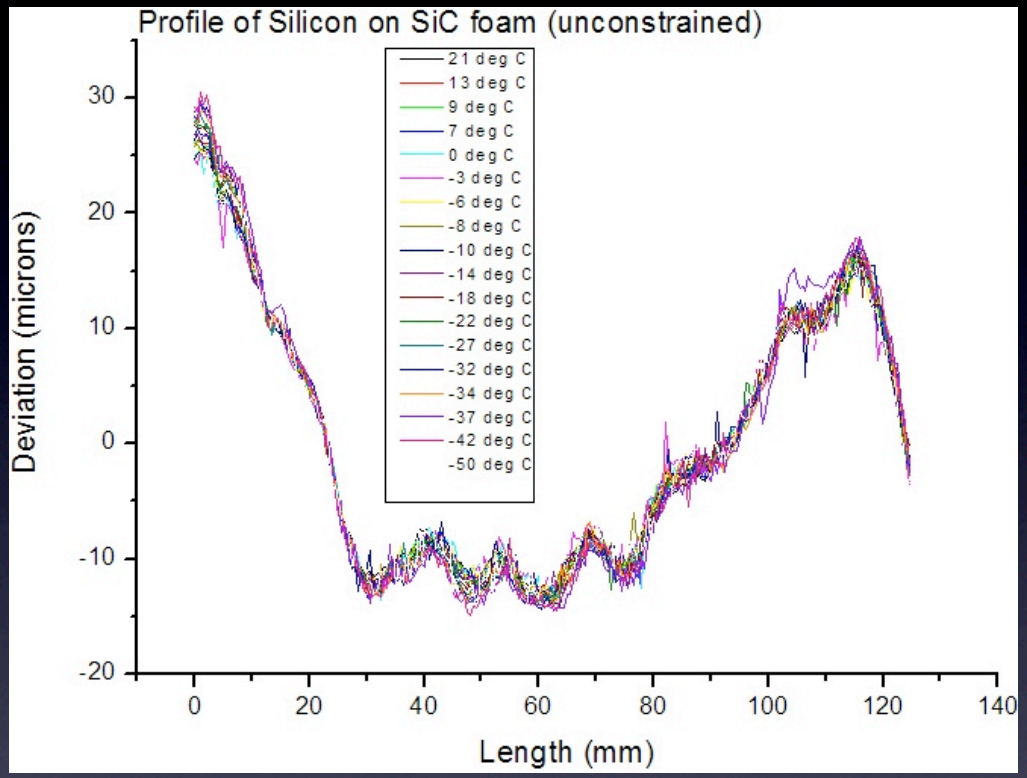


RVC Ladder



- Surveyed by laser
  - Highly reproducible results
  - Ladder deviation less than 50 microns
- Ultimate quality limited by fixtures

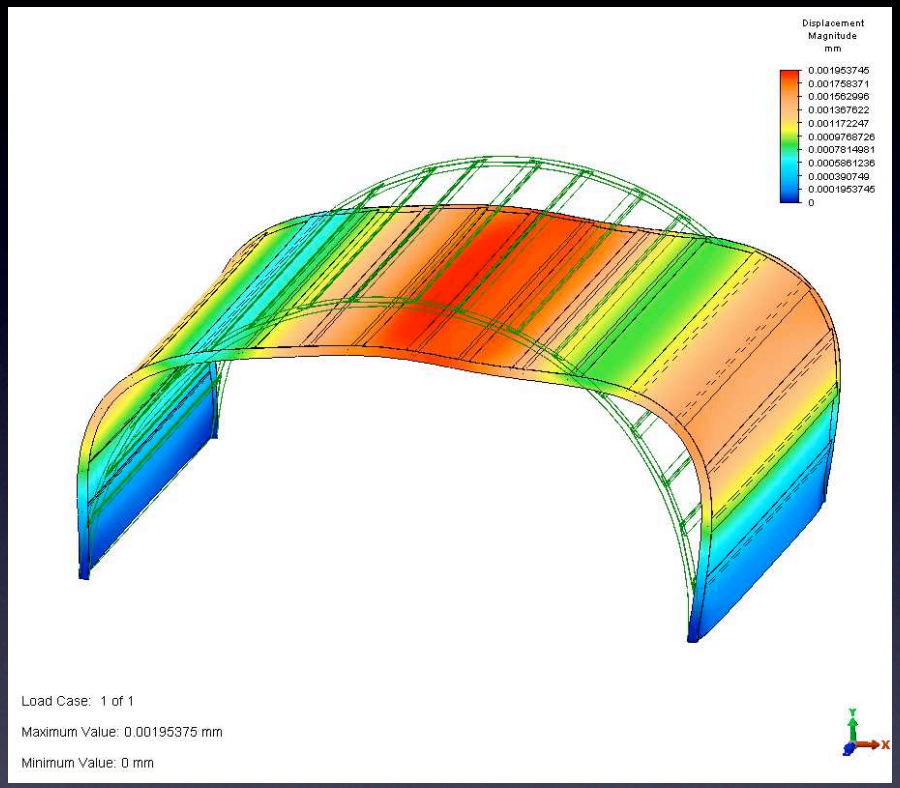
SiC Foam Ladder



- Processed SiC Foam
  - A fraction of initial shape left
  - 30% over material budget
- Minimally constrained
  - Eliminate stiction in mountings

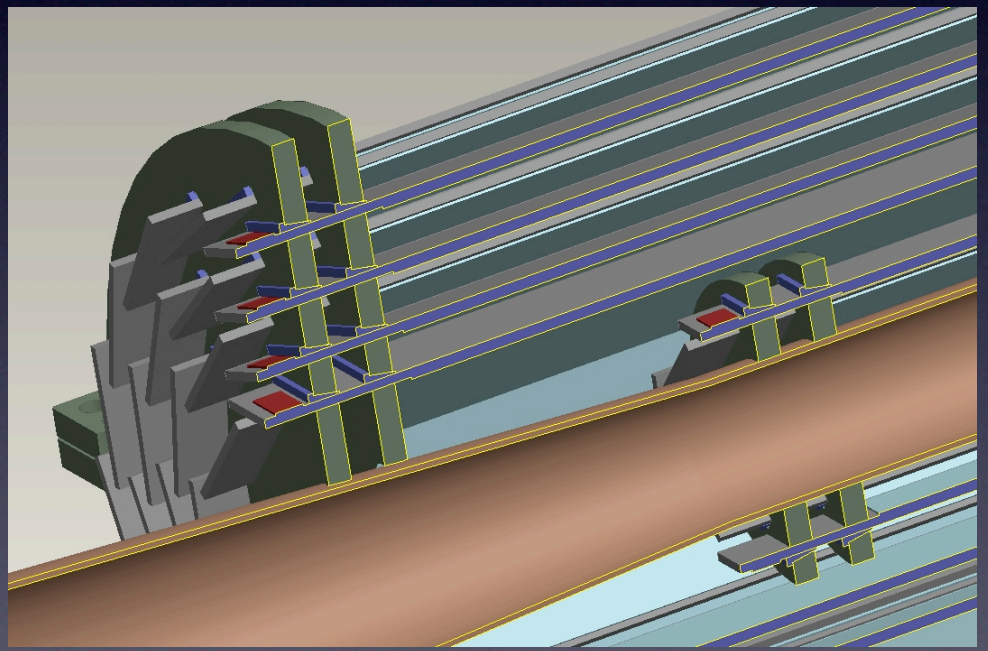
Negligible deformation over 70 degrees!

New Concepts



FEA model of all silicon structure

Preliminary design of integral SiC foam structure



Production R&D

- Thinned blank silicon from Aptek Inc
  - Approximately 20 microns thick
  - High yield, reasonably priced
- SiC Foam Production and Metrology
  - Successful tests of grinding with UK company
  - Promising for thinning below 1.5mm
  - Measure flatness with large, low-force touch probe
- New general-purpose fixturing developed
  - Ceramic foam vacuum chucks tested

Global Issues

- Studying cable forces
  - May dominate in all silicon design
  - Developing techniques for FEA
- Begun discussion of alignment
  - Need improvements in software
  - Required overlap will influence geometry
  - Techniques for cold survey during assembly
  - etc...

Future Plans

- Processing of SiC foam
  - Minimum thickness
  - Shaping
- Low mass carbon-fibre weave
- New fixtures for ladder assembly
- FEA/benchtop studies of cable forces
- Baseline integral SiC foam design
- Start to answer alignment questions