Status of Mechanical Mockups and Tests

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Mechanical Design

Input from Prague when using springs:

- thermal contact might be problematic
- thermal grease might be to adhesive for gliding

➡ investigation to screw modules onto support

- thermal expansion of silicon very small ($\approx 20\,\mu$m for $\Delta T = 50\,^{\circ}$K)
- one support end fixed to beampipe, other end gliding along beampipe

Advantages

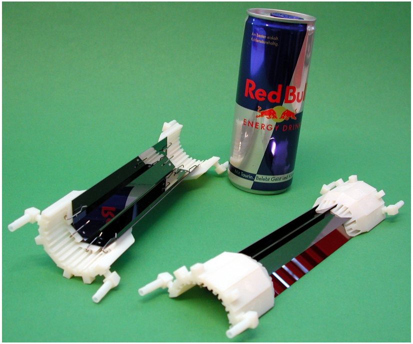
- good thermal support possible
- no relative movement between modules
- easier isolation between support and modules

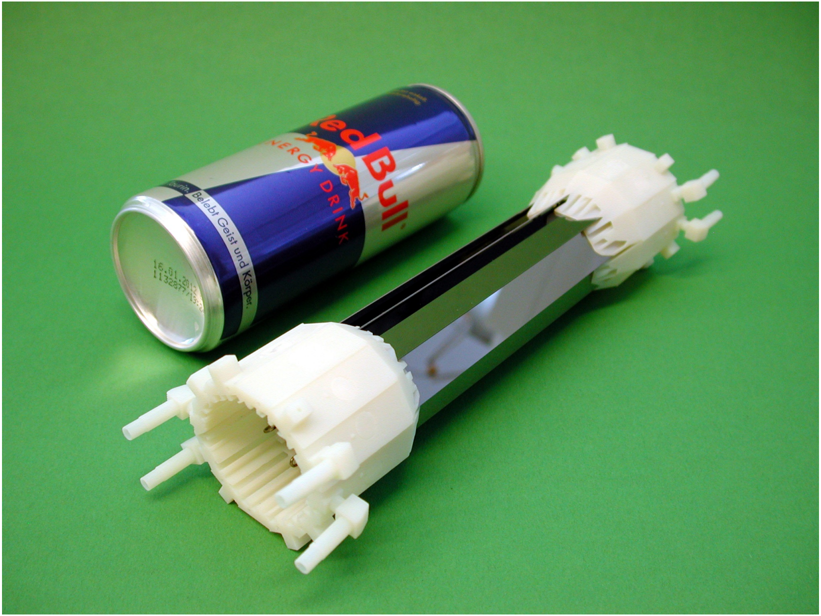
Issues

- stress on modules if not all are working
- electric discharge manufacturing not possible ➡ currently only steel possible

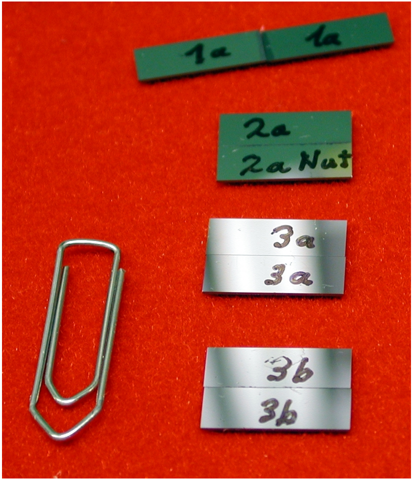
First Mechanical Mockup

- unthinned dummies avaiable
- first inner layer assembly successful




Belebt Geist und Körper.
DRINK

First glueing tests



- first face to face glueing tests started
- no estimates on stabilities yet, but very promising results, even without reinforcements
- first sketch for glueing of final modules under evaluation

Ideas on Thermal Mechanical Tests

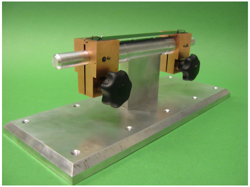
Planned tests include:

- movement of modules under thermal cycling using spring solution
- deformation/stress of modules using screwing solution
- stability of glueing

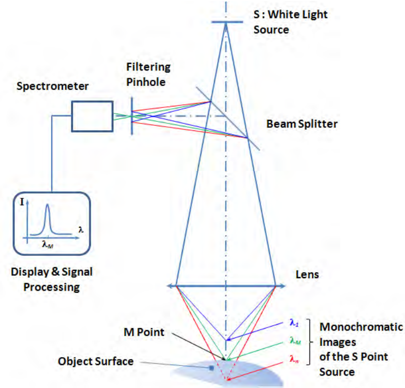
Suggested temperature range:

- $-10\,^{\circ}$C to $30\,^{\circ}$C normal usage
- $-30\,^{\circ}$C to $60\,^{\circ}$C maximal range

Required precision: $< 5\,\mu$m when measuring $\Delta T = 5\,^{\circ}$C steps



Confocal Chromatic Displacement Sensors



- contact free, optical measurement
- almost independent of material (specular, diffuse)
- high precision
- passive sensor, works in large temperature range (without condensation effects $-25\,^{\circ}$C to $120\,^{\circ}$C)

Promising, but...

- rather expensive
- maximum object slope $\approx 20^{\circ}$ for specular surfaces

Alternatives

Laser Triangulation

- should be cheaper
- works only with diffuse materials, otherwise maximal tilt is $< 0.1\,^\circ$
- specified temperature range of $0\,^\circ$C to $50\,^\circ$C,

Microscope and alignment structures

- measurement of deformations difficult
- microscope has to be installed in climate chamber

Conclusions

- new fixation scheme under evaluation
- first mechanical mockup well underway
- first glueing tests have started
  ⇨ surprisingly strong, even without reinforcement
- plans for module tests underway
  ⇨ Confocal Chromatic Displacement looks promising, but expensive