

WP4 update

MANCHESTER
1824

OT Manchester

WP4 aims: look at Mechanical/Thermal/ Assembly issues

effort weighted to latter end of period

- Glue
- Assembly

Glue - About as sexy as insurance

But too late to start worrying when production faults start -

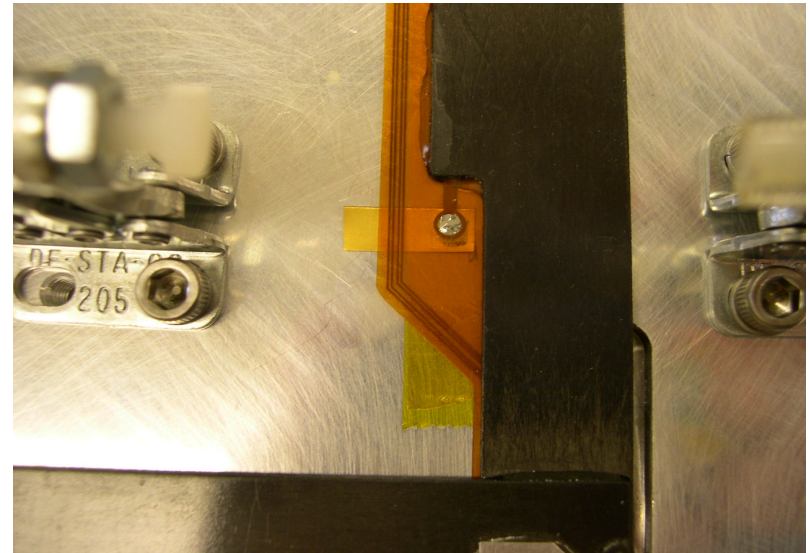
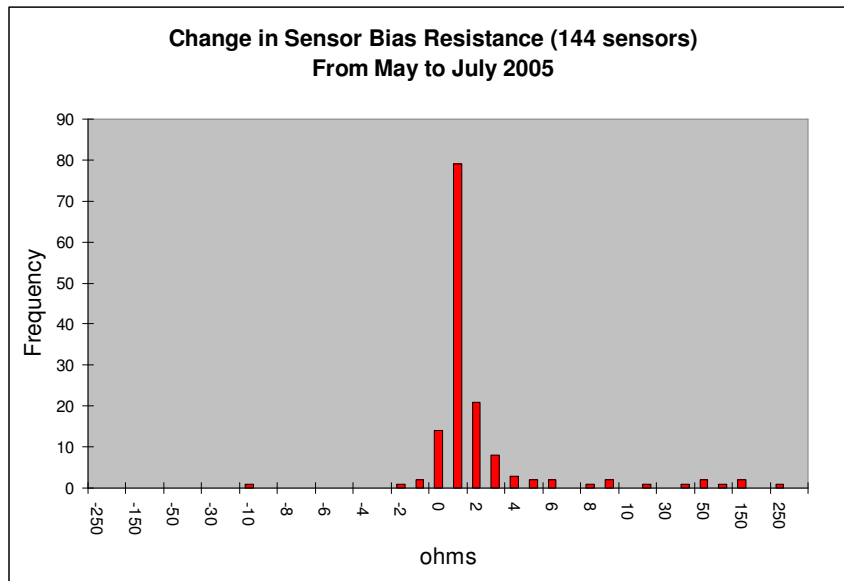
Are small no of faults the thin end of a long wedge?

Atlas Barrel - Peek module mounting Brackets glued
to Carbon Fibre cylinder

CMS Tracker modules - Conducting Glue Bias connection to
backplane

CMS tracker module glue problems

Tony Affolder, UCSB



Of 51 TOB modules built, we found 29 sensors with 1K to over 40M ohms higher than normal resistance in the bias connection.

- *Added strictly defined mixing procedures for the Tra-Duct 2902.*
- *Applied epoxy immediately before sensor placement.*
- *Switched to using Epotek 129-4 silver epoxy.*

Evidence problem is glue to sensor interface, not glue to gold pad

No effect -

eventually decided to wire bond as well

Literature search

Electronics industry experience

Other Experiments - small no of tried glues

Conducting Glues

Silver filled 2 part epoxy (no mass loss no voids)

Ag has high conductivity, Silver oxide conducts

realise conductivity $\sim 1/1000$ solid Ag -interconnecting particles

choose particle size , viscosity,,cure temp EPO-tek 4110

Areas of interest - resistance aging

Interface problems

oxide layer at Al/Ag interface

Production wafers old

CTE mismatch Si /PCB - glue flexible

Glass transition temp CTE change 50×10^{-6} to 150×10^{-6}

Corrosion/electro chemistry - Ok for N₂ atmosphere

Glue effects on wafer passivisation

Glue test set up

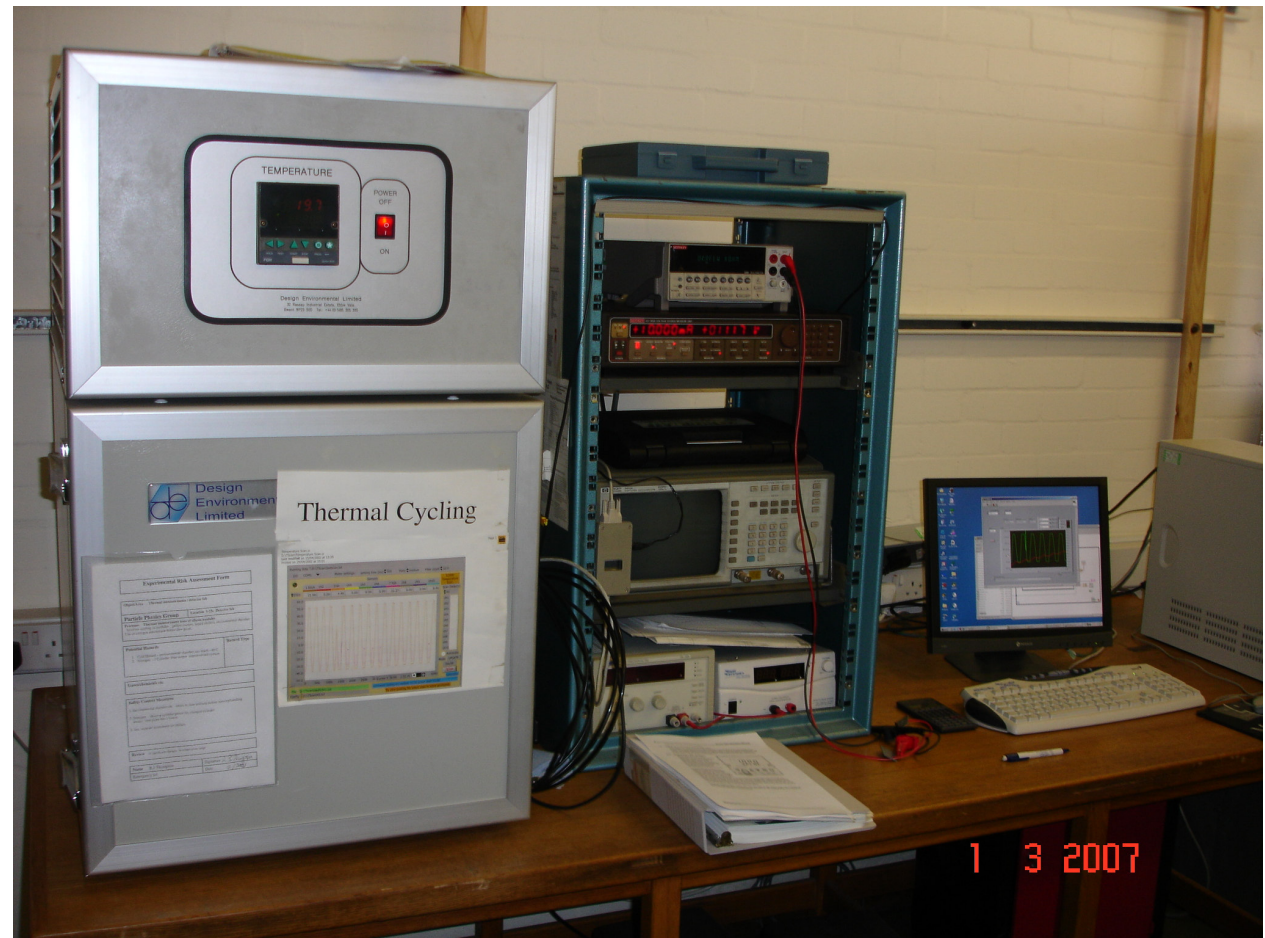
Programmable
Environmental chamber

Resistance
measurements either

Keithley 2000 DVM

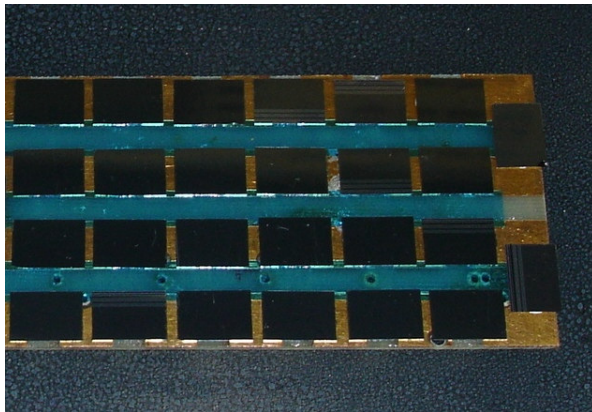
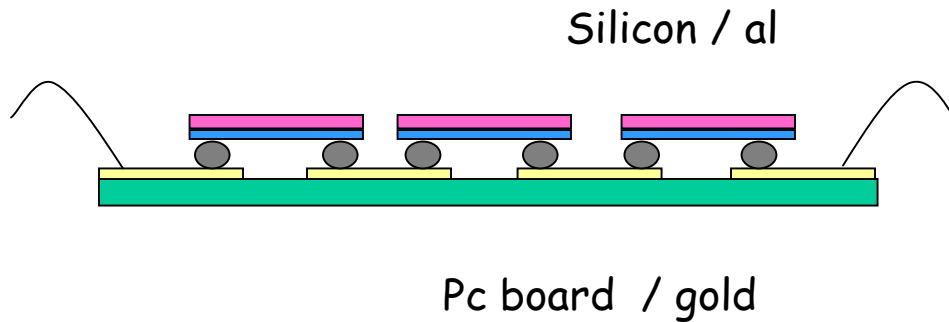
Keithley 236 SMU

Labview

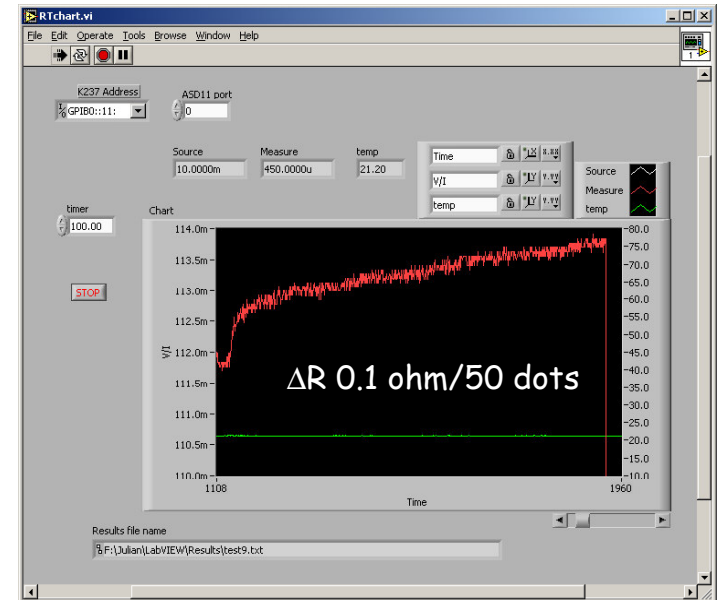


Glue robot

Resistance snake Tests



50 dots continuous monitoring



Ray Thompson

Calice meeting UCL 6 Mar 06

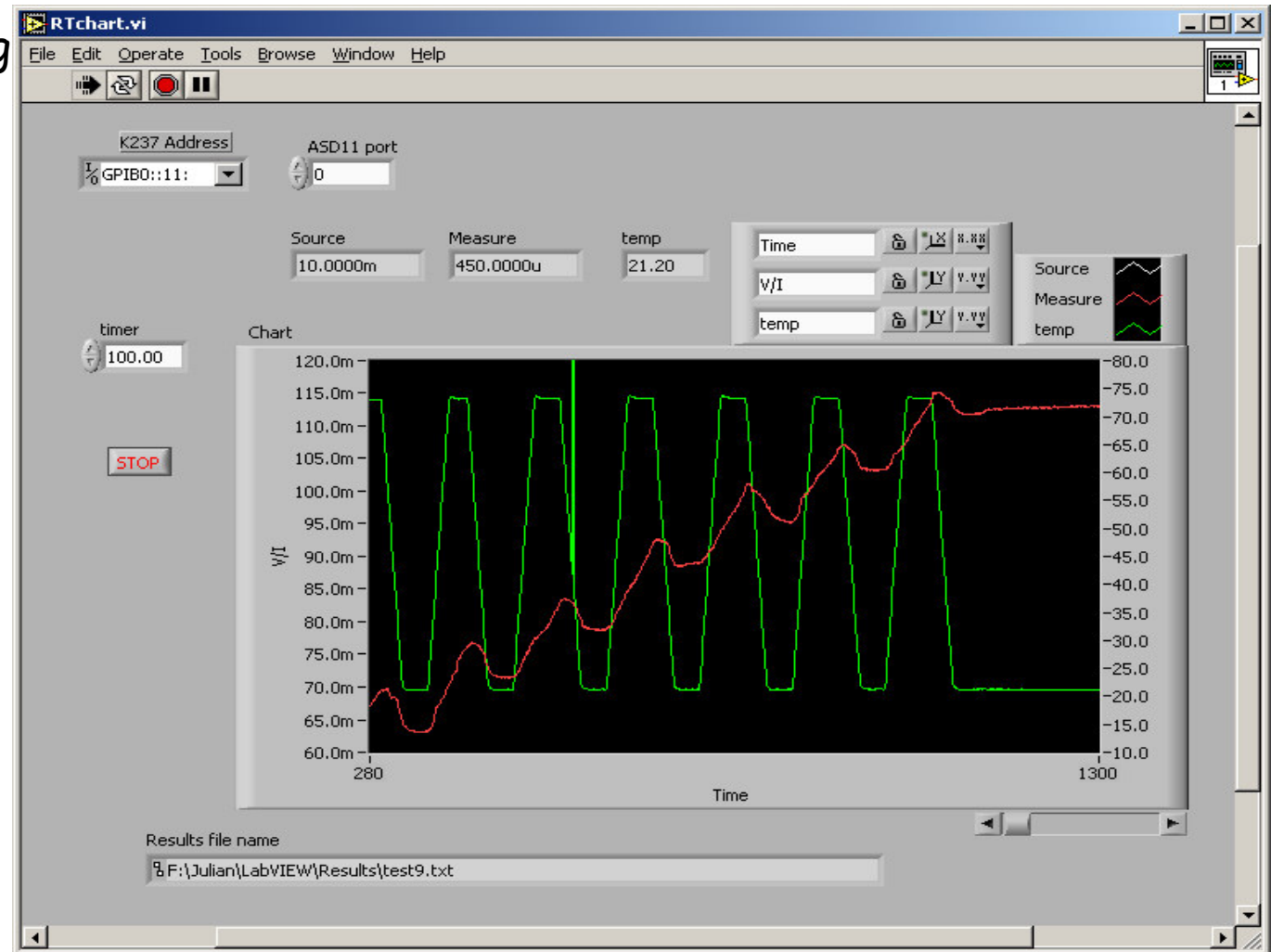
Temperature cycling

Temperature cycling

20-70 1 deg/ min

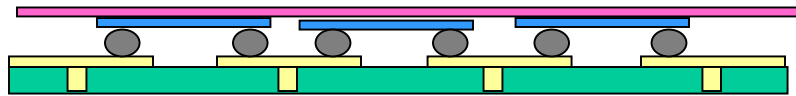
Upwards resistance
rise
Consistent with
silver temperature
coefficient

On contraction
Interfaces become
loose?



Further stages

Silicon wafer



Double sided Pc
Measure lots of pairs after cycling

Talking to Prague people
about availability of wafer samples

Duff wafers, Mechanicals,
Test structures at edges

Real stresses - info from steve on likely temperature distributions

Automated assembly

85/85 tests standard 85C /85RH aimed mainly at corrosion
problems

Finish off writeup of literature search

Test set Up taking data .
Continuing with Prague samples etc

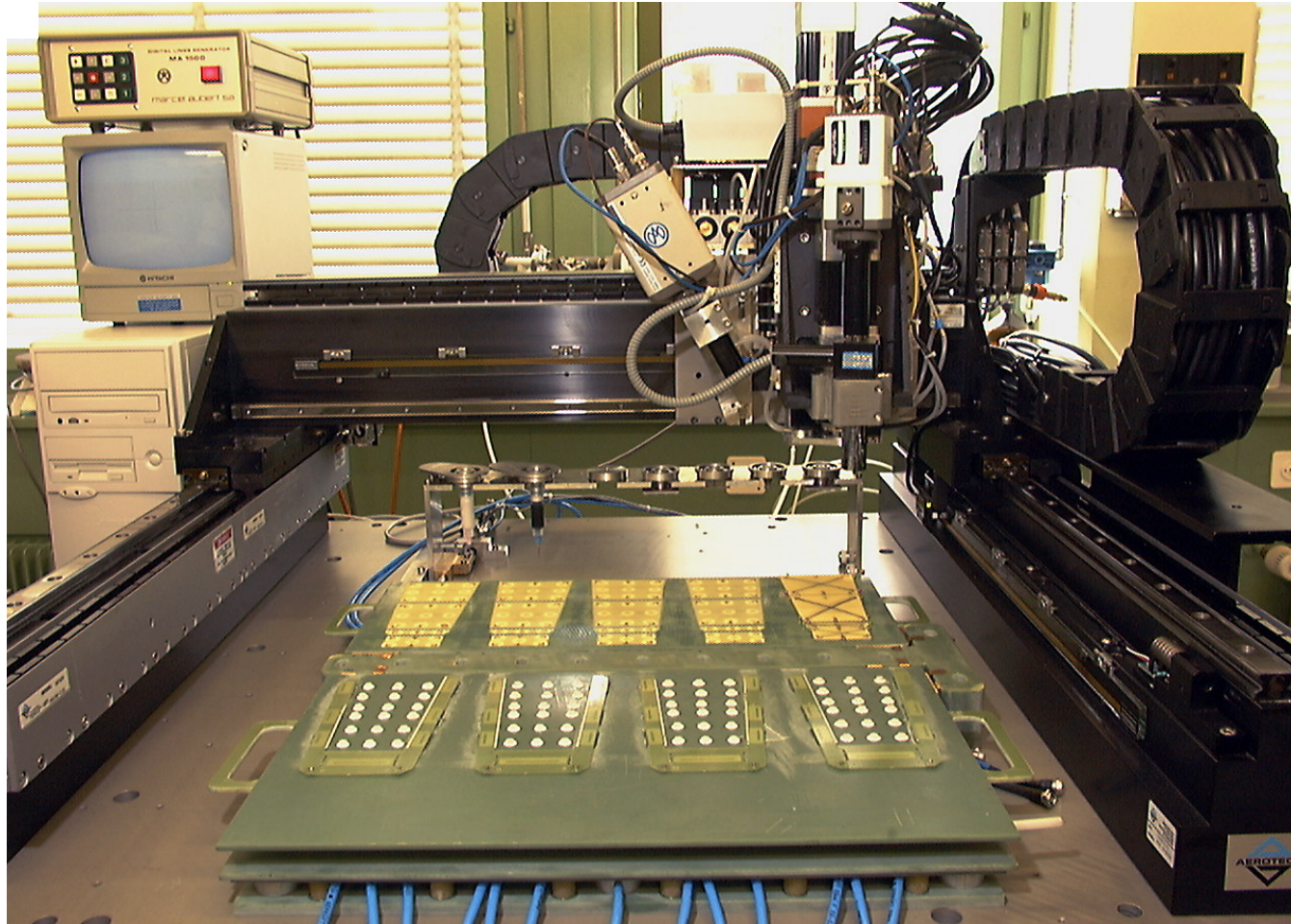
Interface stuff only meaningful with final objects -

Test Beam prototype - known dead channels?
Electronics - at what point does glue
resistance become noticable?

Assembly concepts

- Start thinking about on pick and place techniques for assembling detector planks
- Don't reinvent the wheel
- Look at/ exploit existing stuff CMS/Atlas experience
- Generalised concept of a gantry with interchangeable tools
- pattern recognition software

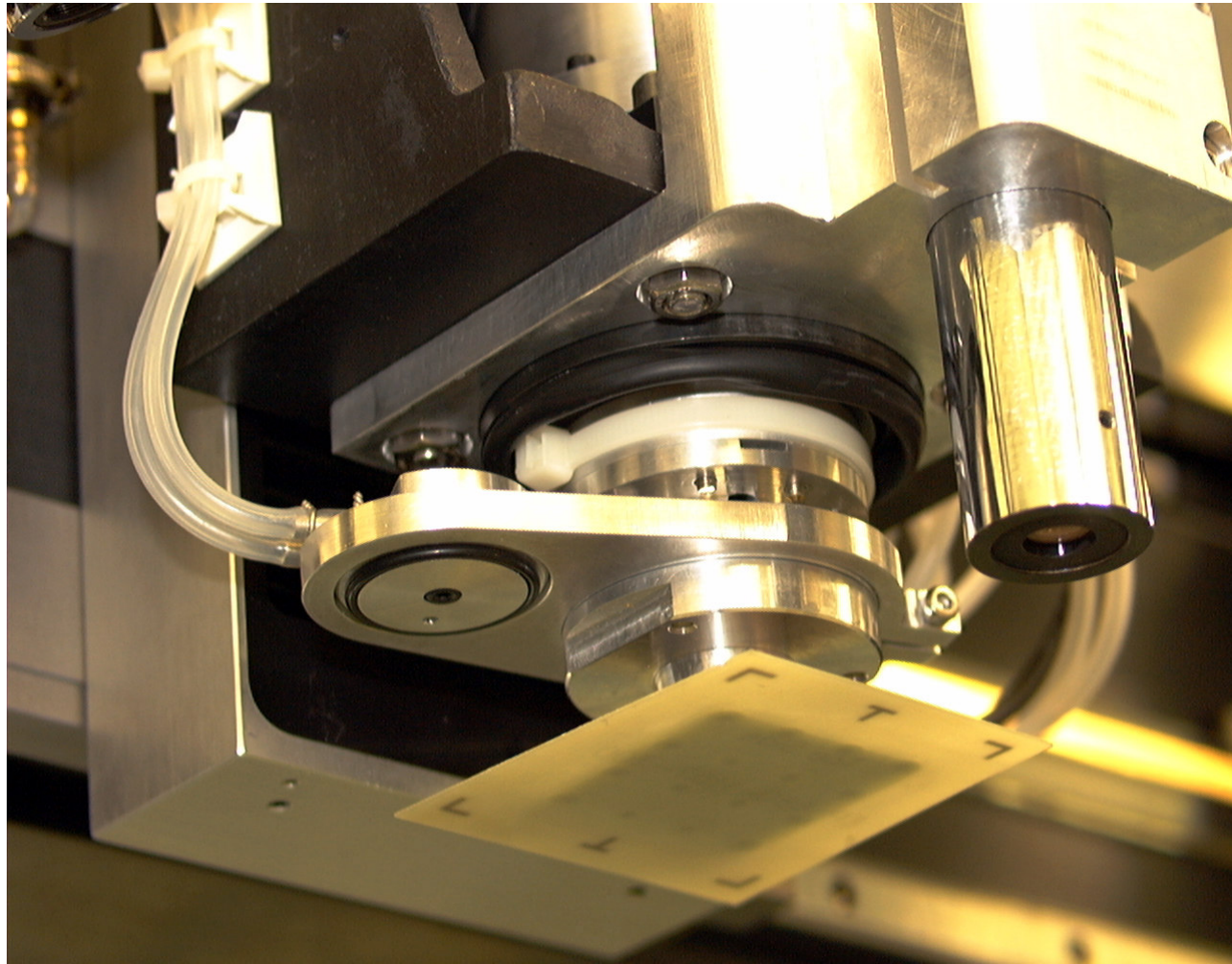
CMS tracker module assembly gantry



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Interchangeable
Vacuum pickup
tool



Ray Thompson

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