L1-3 Module Cold Tests

SLAC

Setup

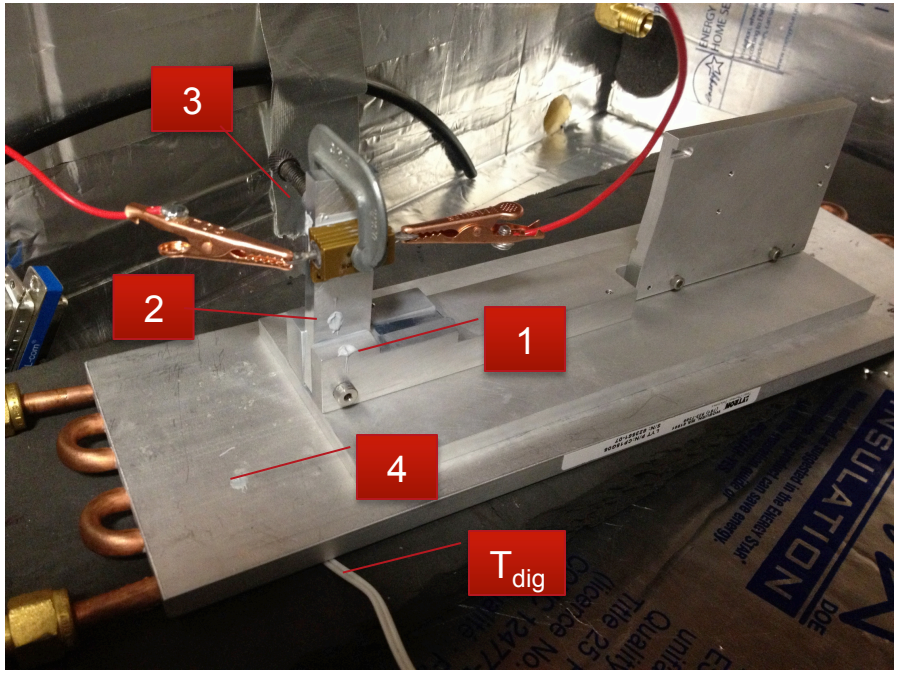
- Chiller set point: T=+8C
- RTD for measurements
- Thermal compound for better connection
- 10Ohm, <10W resistor

Power

- 10 Ohm resistor (<10W rating)
- Put 9.11W on the resistor

Thermal conductivity at joint

- Observe 0.4C/W



Point	1st meas.	2nd meas.
3	30	30
2	20	20
1	16.3	16.5
4	11.5	11.5
T_{dig}	10.2	10.6

For fun: thermal conductivity of compound
k=dq*t/(A*dT)
dq=9W, t=25e-6m,A=15x42mm2, dT=3.7K
⇒ k=0.1 W/mK (spec. at 2.5W/mK)

what?

For Al to compare:
dq=9W, t=0.02m,A=15x5mm2, dT=10K
⇒k=243W/mK (in the ball park)

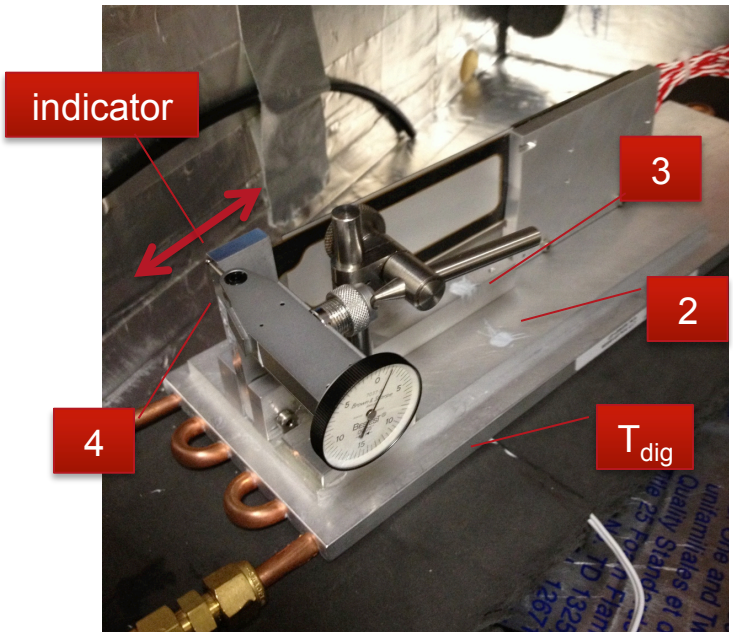
L1-3 Module Cold Flex Test

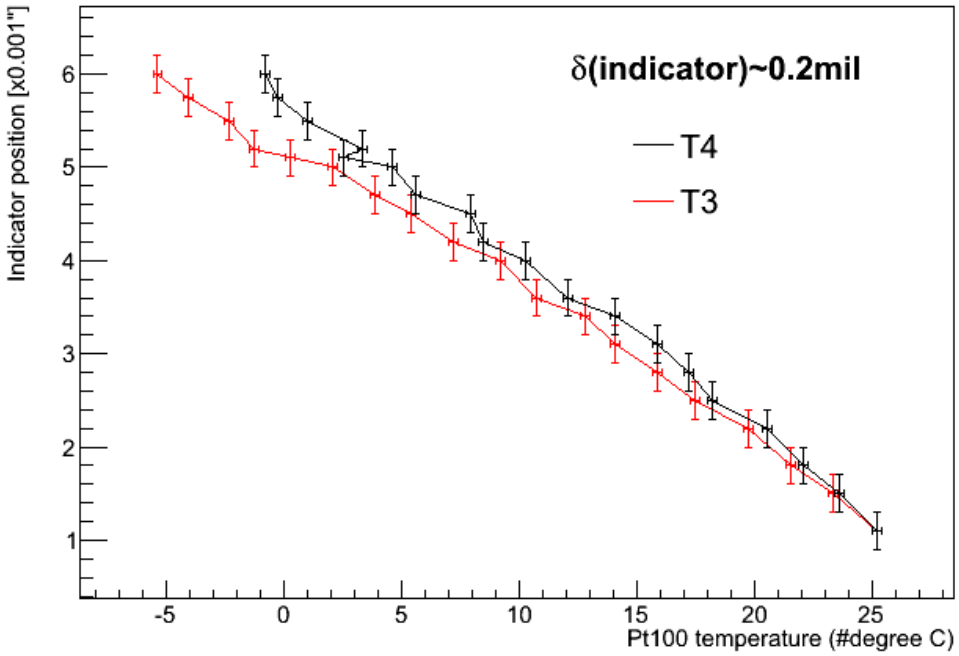
Setup

- Chiller between -12C and room temperature
- RTD (Pt100) for measurements
- Thermal compound for better connection
- Indicator with .5mil lines (σ~0.2mil)

Module

- Gimp module (single half-module)
- No power supplied to electronics





Thermal expansion of Al along module length (T3):
ΔL=24e-6[/C]*0.2[m]*(25.2—5.4)[C]=149μm
(CF has no expansion)

Expected indicator change:
(scaled from hinge (2.375/1.3125=1.81))
149μm*1.81=270μm=10.6mils
Much larger than measured?

Conclusion/Summary

SLAC

Module thermal conductivity

- Measure ~0.4C/W
- Good enough for heat load expected at joint for both L1-3 and L4-6 modules (~<100mW?)
- Caveats on th. Conductivity: think about studying this independently

Flexibility of spring tensioned joint

- Measure a 6mil flex over ~30C; expected a 10mil flex
- Caveats: indicator exposed to thermal expansion as well, not clear how it impacts result
- Repeatability: Observe dial stop 1.5mil from equilibrium after heating up again; redo tests after cleaning module

L1-3 Module Cold Flex Test

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