Thermal tests of ETL module components

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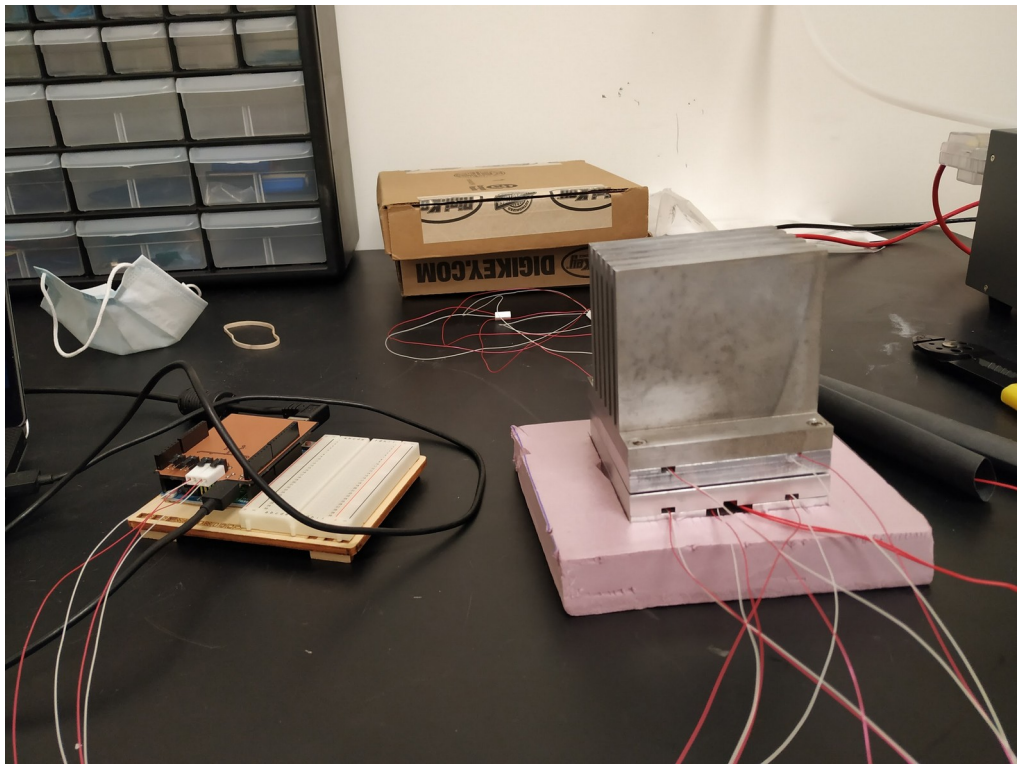
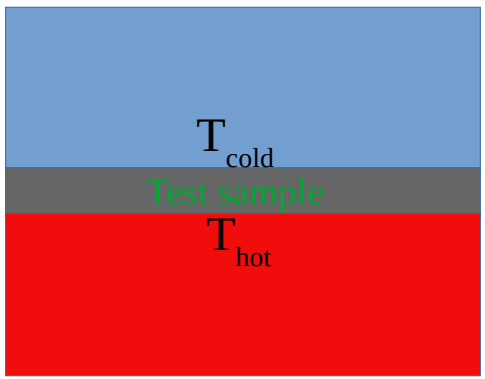
The Setup



Side view of the setup:

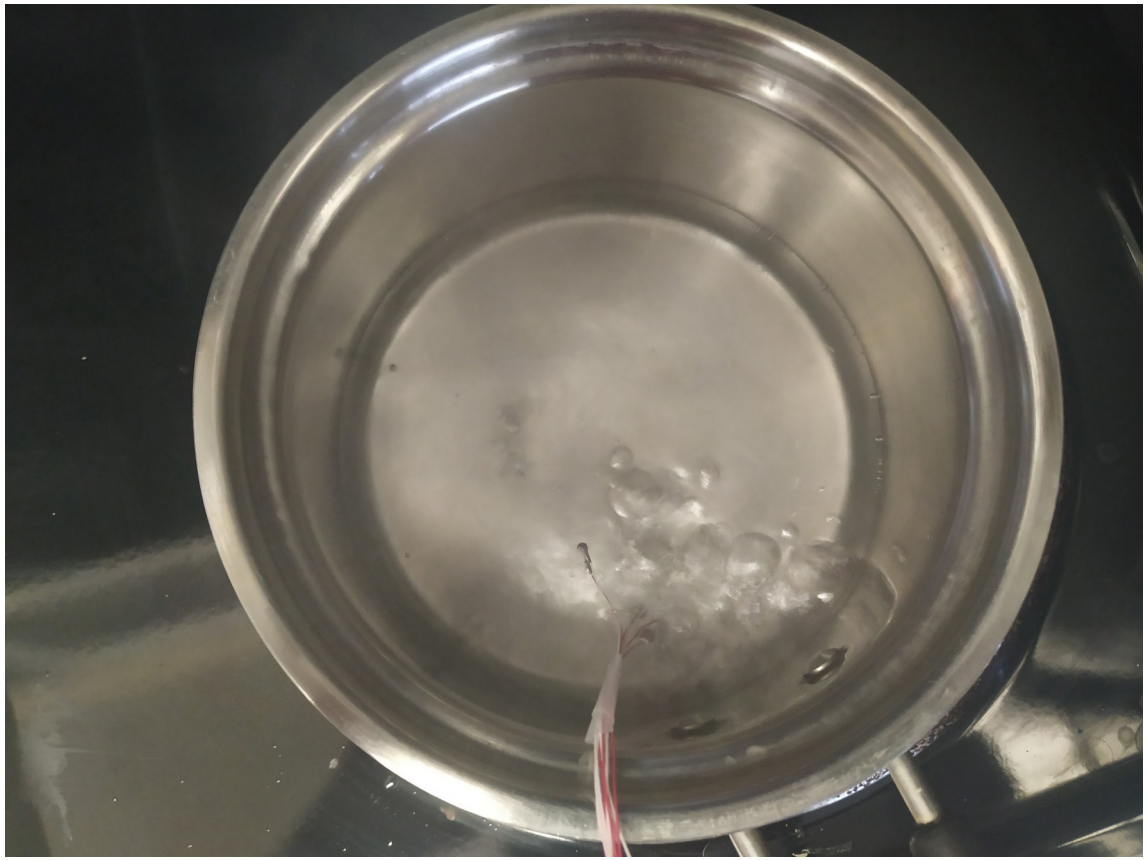


Thermal Conductivity:

$K = P*L/A(T_{hot}-T_{cold})$

P: Power (heat per unit time)
L: Thinkness of the sample
A: Area of the sample

Thermistor tolerance : Boiling Water Test



- Submerged the thermistors in distilled boiling water.
- Took measurement of the temperature every 2 mins using multiple sensors.
- The boiling point at our height: 98.7 C.

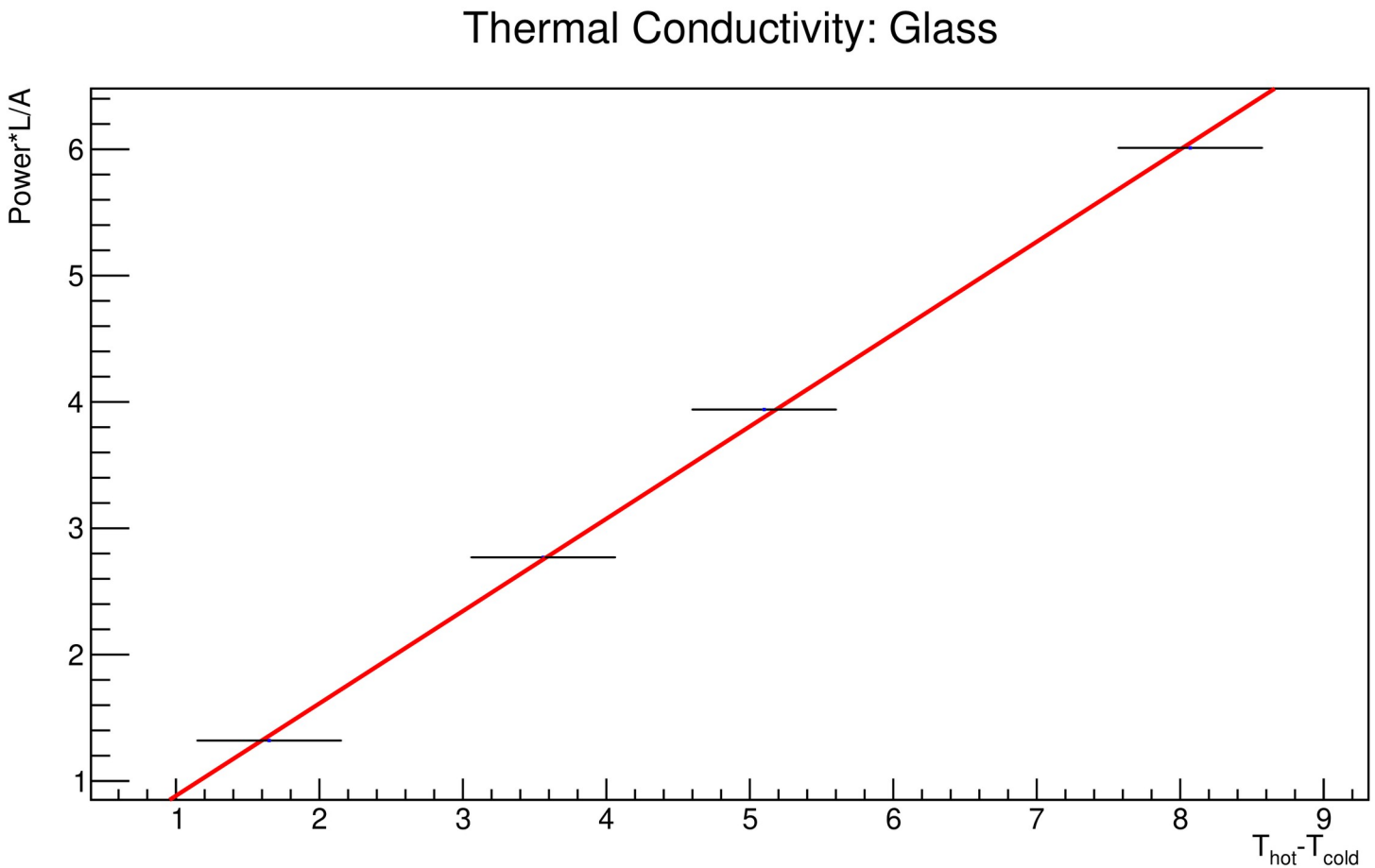
Boiling point measurement: 98.62 +- 0.52 C

Thermistor tolerance : Ice Bath Test

- Submerged the thermistors in ice bath of distilled water.
- Took measurement of the temperature every 2 mins using multiple sensors.
- The freezing point at our height: ~0 C.

Freezing point measurement: 0.34 +- 0.19 C

Thermal Conductivity: Glass



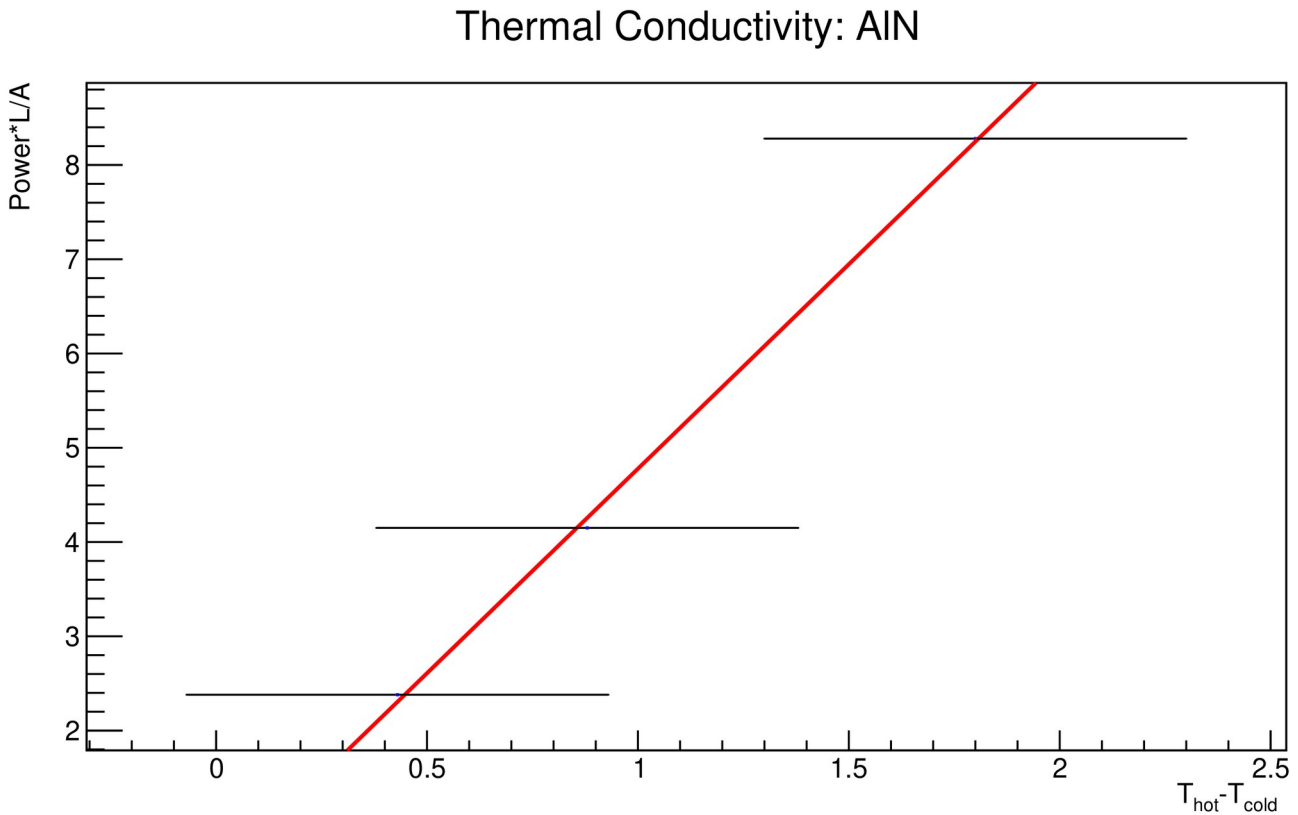
	VALUE	ERROR
p0	1.52072e-01	4.01351e-01
p1	7.30834e-01	7.77757e-02

taking 0.5 C as uncertainty in T_{hot} -T_{cold}

Measurement of Thermal Conductivity Glass: 0.73 $Wm^{-1}K^{-1}$

Actual value for ordinary glass ~ 0.8 $Wm^{-1}K^{-1}$

Thermal Conductivity: AlN



	VALUE	ERROR
p0	4.39744e-01	2.59623e+00
p1	4.33785e+00	2.19464e+00

taking 0.5 C as uncertainty in T_{hot} -T_{cold}

Measurement of Thermal Conductivity AlN:
4.3 $Wm^{-1}K^{-1}$

Actual value for AlN ceremic ~ 80-140 $Wm^{-1}K^{-1}$

Looking forward

- Current setup might not work for the high thermally conductive materials such as AlN.
- Purdue group has a slightly different more sophisticated setup that works for wide range of materials. here