

Update: Thermal QA

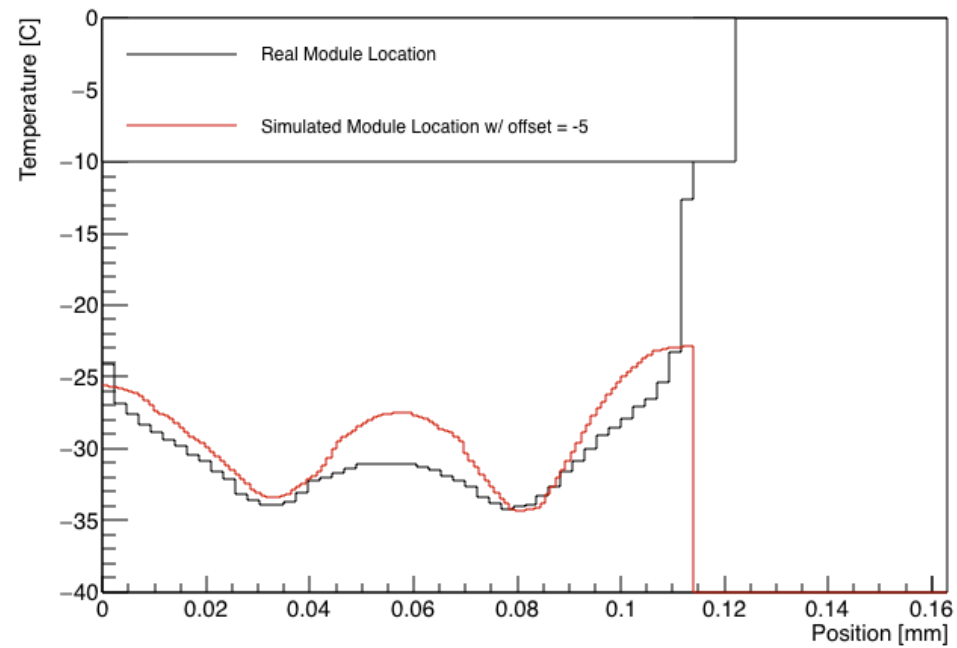
WILLIAM HEIDORN
IOWA STATE UNIVERSITY
ISU WEEKLY MEETING
AUG 15, 2018



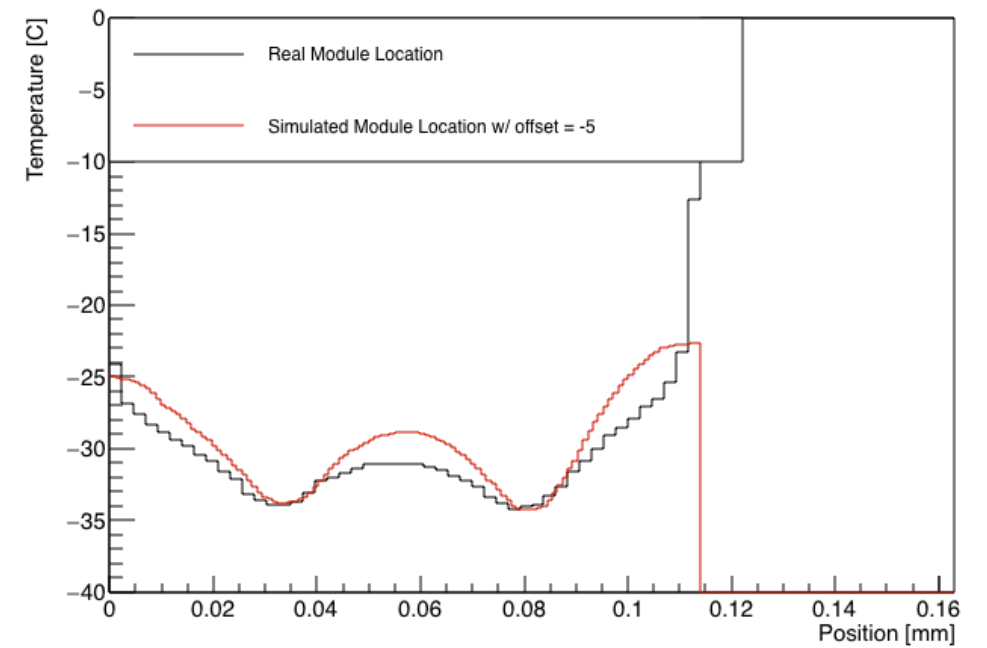
Since Last Time

- ▶ Testing second heating element
 - ▶ Outside Chiller: Heating element in the chiller no longer gave significant heat, though the element in the water outside the coolant heated the water a few C
 - ▶ In Reservoir: Slowed down the heating process significantly and after a half hour set to +40C the fluid temperature leveled off around 32C
- ▶ Need to get a lower resistance heating element. Original element has a resistance 35 Ohms, new element has a resistance of 65 Ohms, gives too high of a resistance to produce enough heat...
- ▶ FEA Analysis plots- I put in a temperature offset on these plots. I will send them to Graham today
- ▶ Impedance...

Without module offset
Module 13

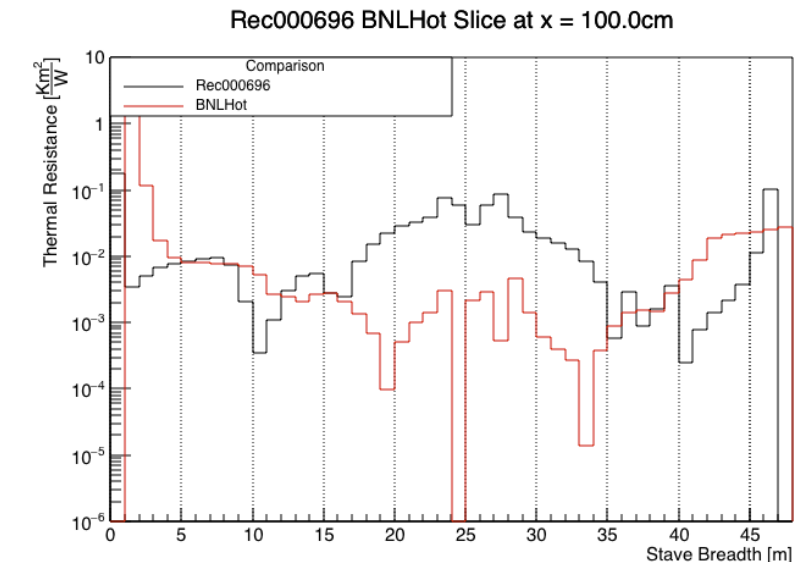
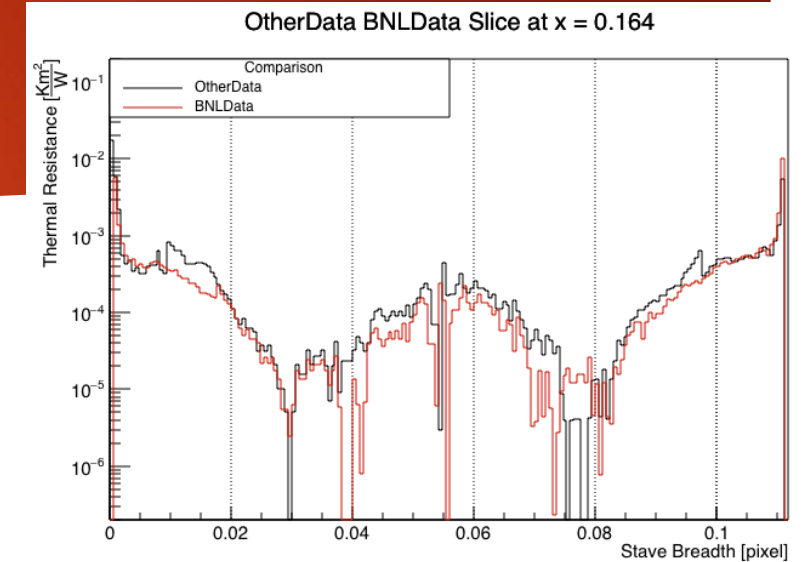


With module offset (*simulated module 14*)
Module 13



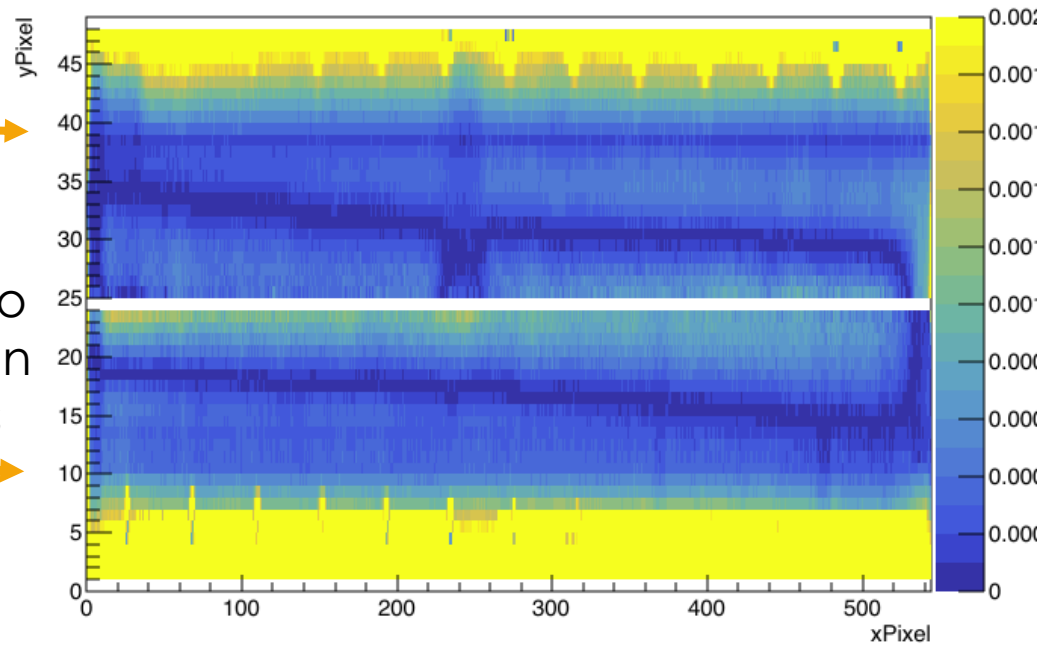
Comparisons between Impedance Codes

- ▶ Both codes do the same things. The differences are all from small details in my code trying to make the impedance map "better"
 - ▶ The h calculation
 - ▶ $h = \text{TotalSidePower} / \text{Sum}(T_{\text{amb}} - T_{\text{pixel}})$
 - ▶ Small differences due to different selection(not the problem)
 - ▶ The power maps
 - ▶ $P[x,y] = h * (T_{\text{amb}} - T_{\text{pixel}})$
 - ▶ $\text{CumulativePower}[x,y] = \text{Summed } P[x,y] \text{ to Pipes inward (likely culprit)}$
 - ▶ BNL-> Assumes pipe value and center
 - ▶ ISU-> Finds minimum and calls it the pipe and takes center from minima as center
 - ▶ Impedance
 - ▶ $\text{Dimp}[x,y] = (T_{\text{pixel}}[x,y] - T_{\text{pixel}}[x,y+1]) / (0.5 * (\text{CP}[x,y] + \text{CP}[x,y+1])) * \text{PixelConversions}$
 - ▶ BNL-> Does not average the cumulative power between pixels
 - ▶ Impedance has same problem as cumulative power due to the summing from pipes
- ▶ These differences explain how the BNL data could be almost identical while comparisons with our data were so different...



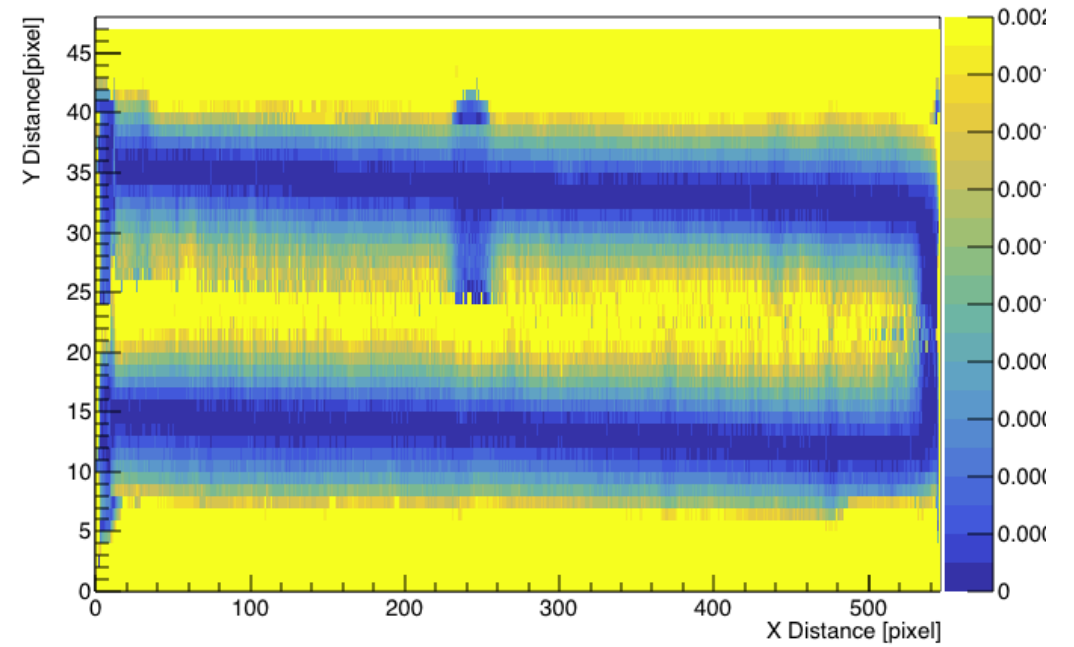
Impedance Plots

LoadedImp



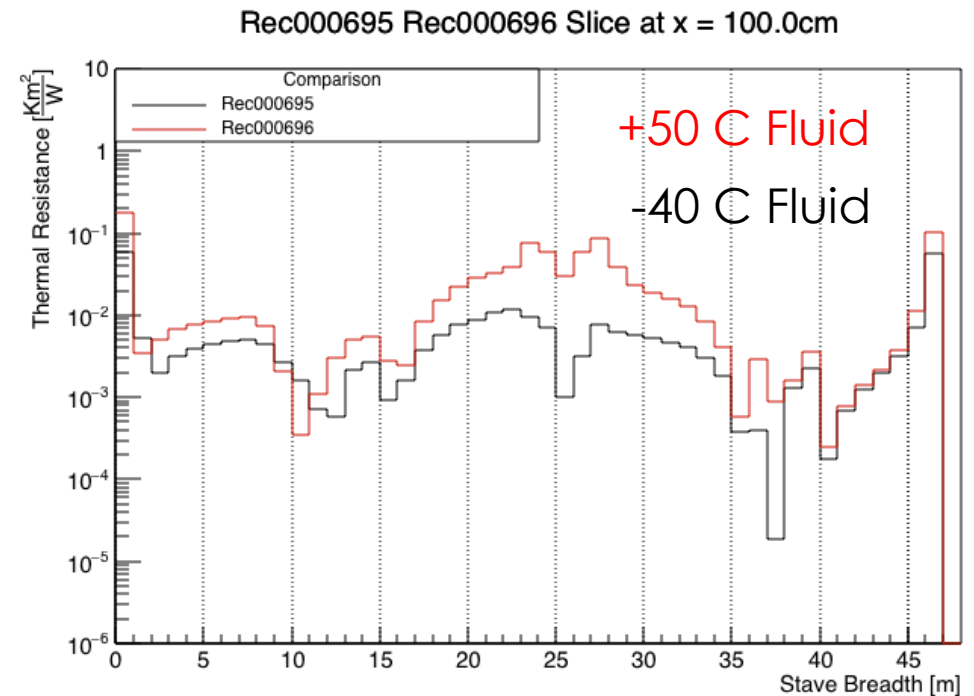
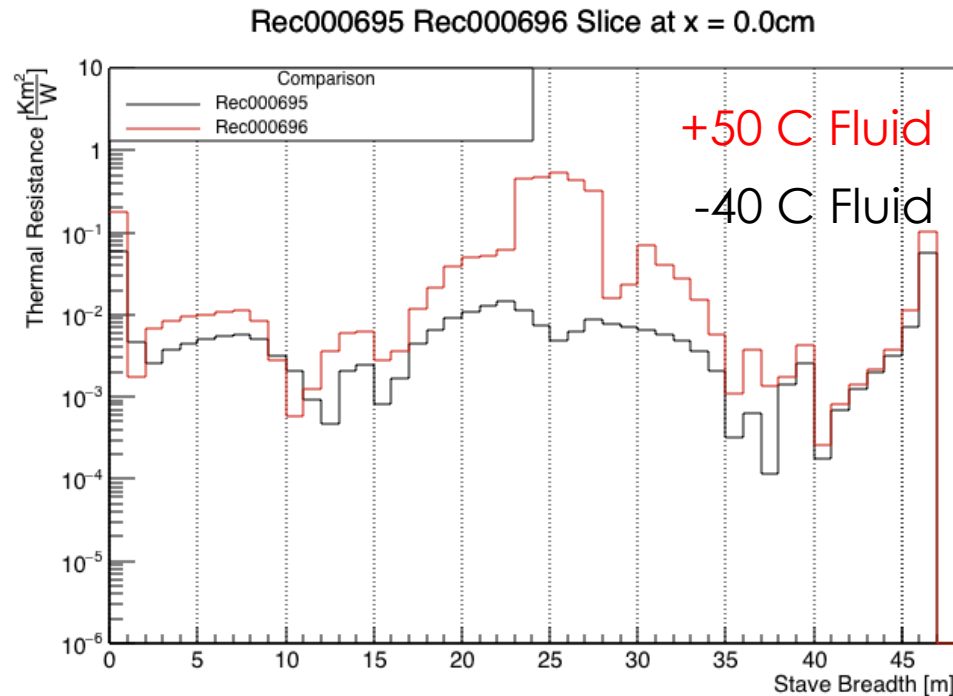
Artificial
ridges due to
pipe location
assumptions

Rec000696 Impedance Map



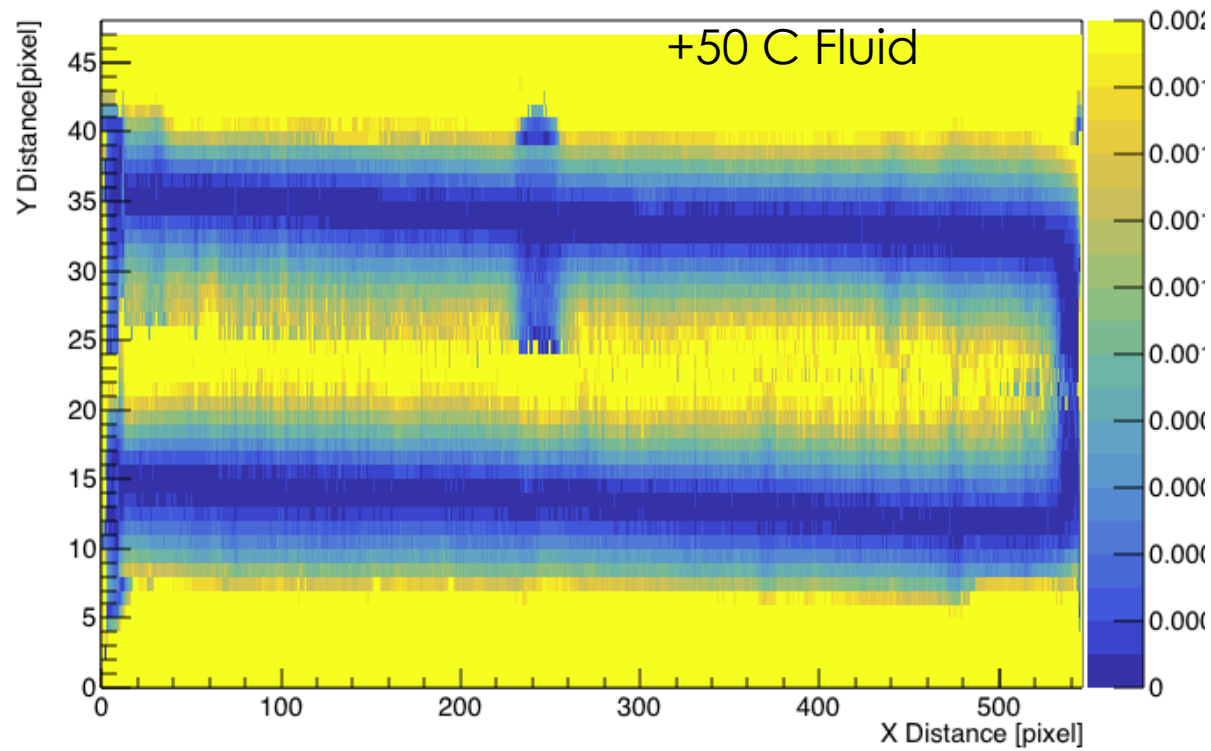
Impedance Code Improvements...

- ▶ Now that we know we are doing the correct thing, it is time to make comparisons between measurements of the same stave to see how reproducible they are between staves... Below are some preliminary results...



Imp Map Comparison

Rec000696 Impedance Map



Rec000695 Impedance Map

