

Thermal Characterization for COVID-19 Point of Care Testing Device

Michael Esposito¹, Jennifer Blain Christen^{2, 3}, Cliff Anderson³, Sunil Rao², Andreas Spanias²
 [1] SenSIP REU Student, SOLS [2] School of ECEE [3] BEST Lab, Arizona State University

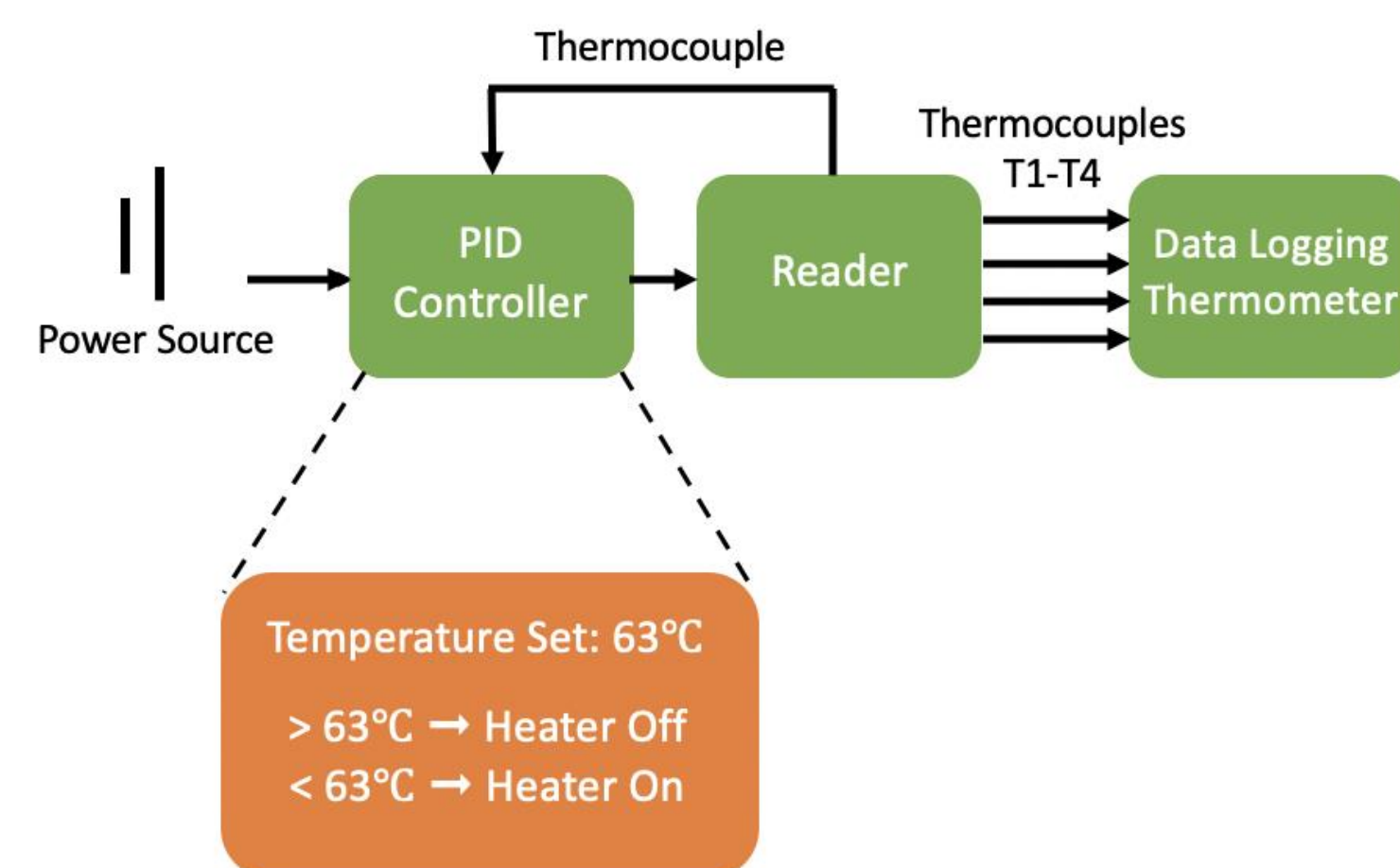
MOTIVATION

- ❑ Shortcomings of conventional saliva testing:
 - Time consuming (24-48 hours)
 - Expensive lab equipment required
- ❑ Thermal characterization and design [1] of point of care (PoC) reader is necessary:
 - Ensure proper DNA amplification by loop-mediated isothermal amplification (LAMP) [2]
 - Printed circuit board (PCB) component operation [3]

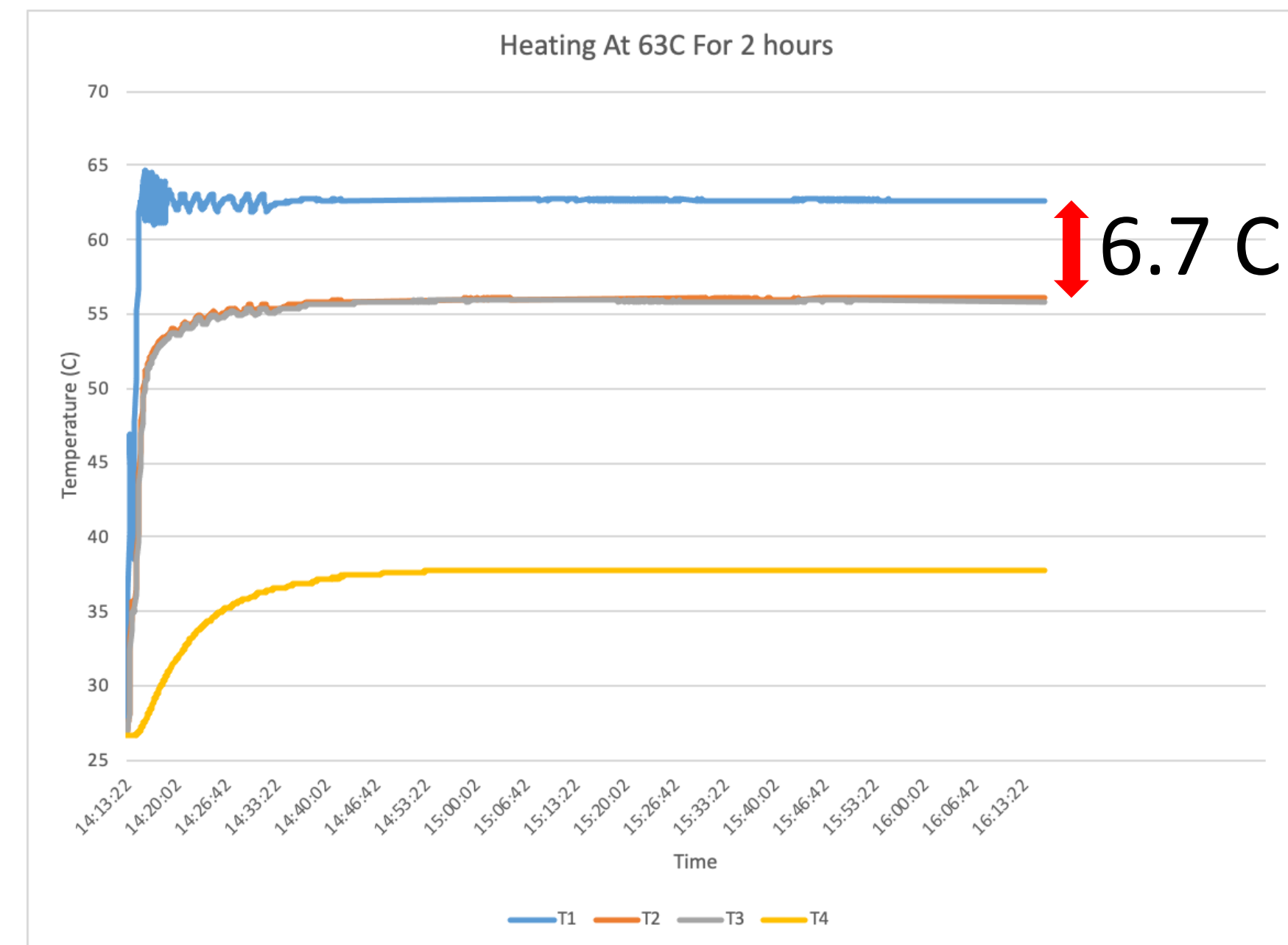
PROJECT AIM

- ❑ Obtain PoC device's thermal characteristics
- ❑ Ensure proper heating of reaction wells
- ❑ Determine discrepancies in heating
- ❑ Optimize thermal design of reader

THERMAL TESTING DESIGN

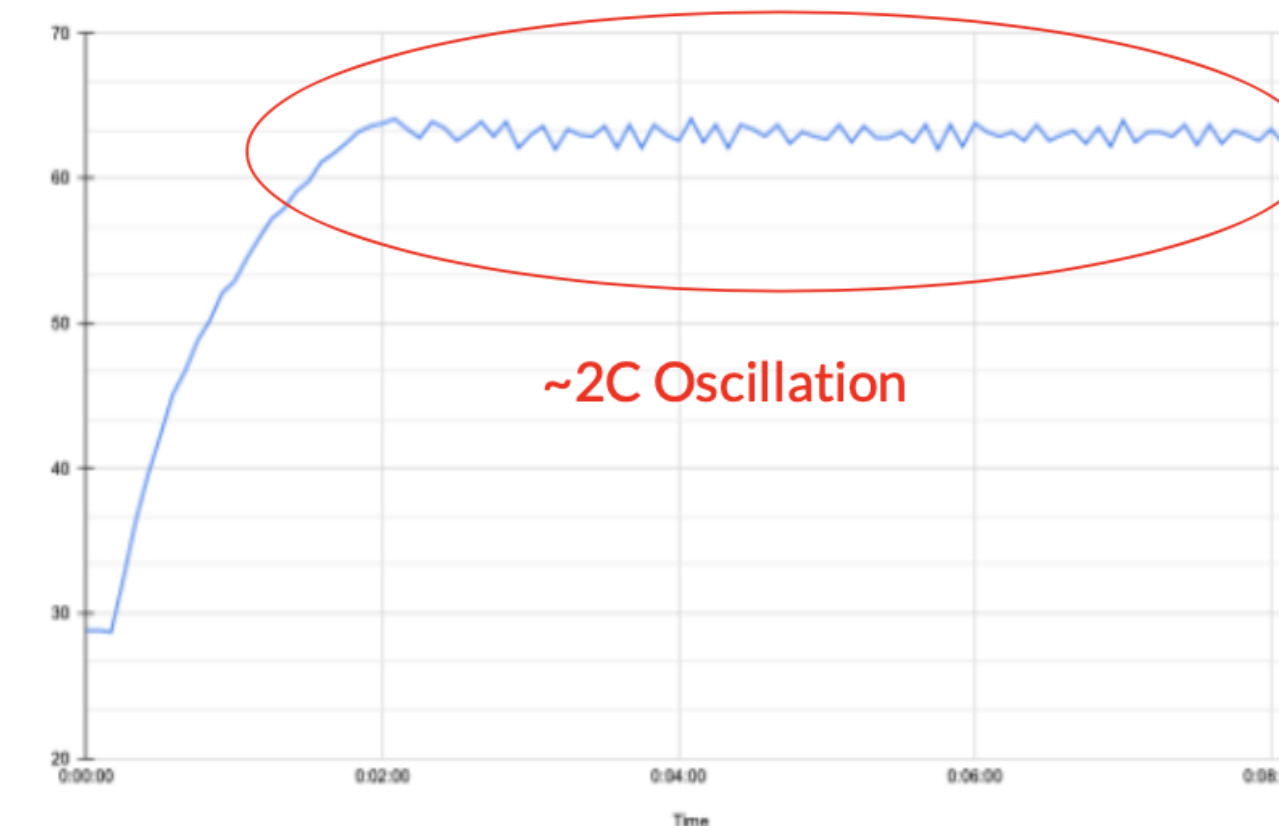


DISCREPANCY BETWEEN HEATER & WELL



OPTIMIZED PID TUNING

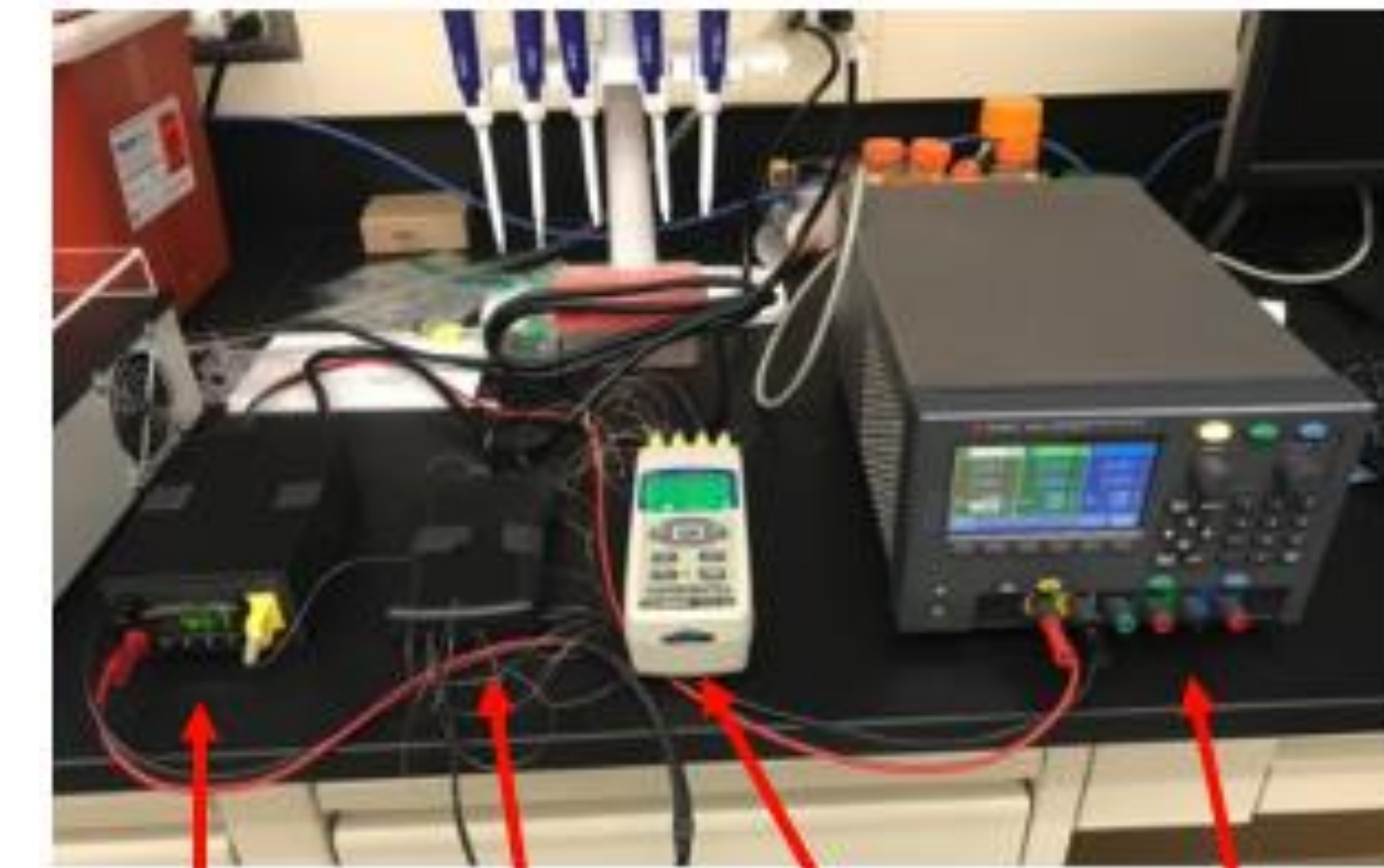
- ❑ Proportional, integral, derivative (PID) controller [4] tuning at the desired steady state temperature (65C in this case) reduced temperature oscillations when compared to tuning at other temperatures.



ACKNOWLEDGEMENTS

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APPARATUS USED FOR THERMAL TESTING



PID Controller Reader Thermometer Voltage Source

CONCLUSION

- ❑ Thermal characterization and design is necessary for accurate COVID-19 test results
- ❑ PoC device's thermal design can be optimized by calculating power dissipation, measuring temperature discrepancies, and altering internals of the reader

ONGOING & PLANNED WORK

- ❑ Run thermal tests using various microfluidic chips [5]
- ❑ Thermal testing for repeated cycles
- ❑ Redesign methods for thermal contact between chip and heat spreader
- ❑ Retrieve coefficients from PID controller for embedded temperature control in reader

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