Thermal Characterization for COVID-19 Point of Care Testing Device

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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

APPARATUS USED FOR THERMAL TESTING

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

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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REFERENCES