

# Characterization of Thermal Phase Shifters in a Silicon Photonics Process

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# Why Optical Switches?

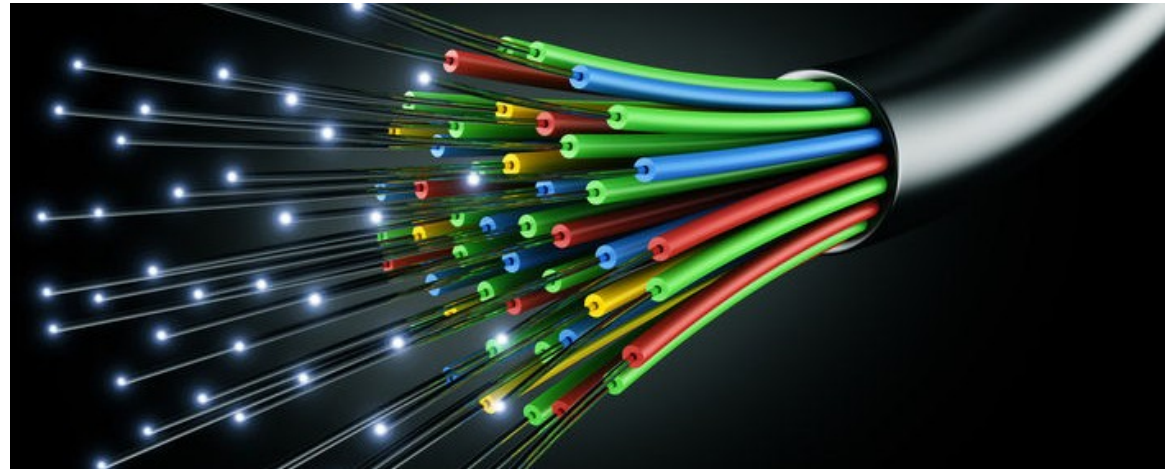


-Global data traffic is expected to increase by a factor of 4.5 from 11 EB ( $10^{18}$  bytes) per month in 2017 to 49 EB per month in 2020

[Cisco]

Optical fibers:

- Are faster than electronic cables
- Contain a larger bandwidth
- Are more energy-efficient



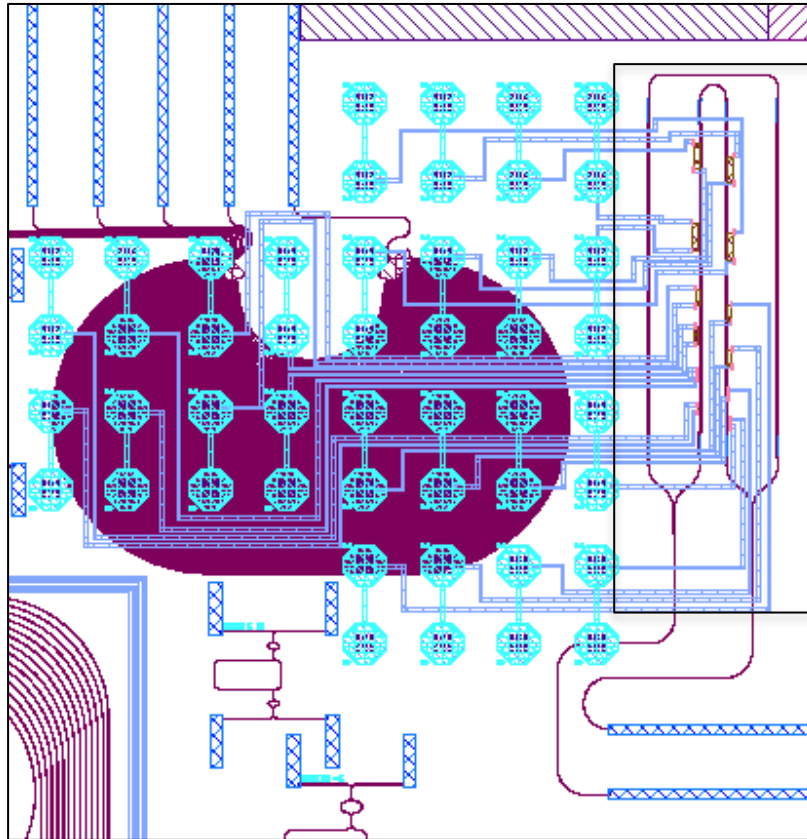
# Research Project Goals

Characterizing the efficiency of thermal phase shifters

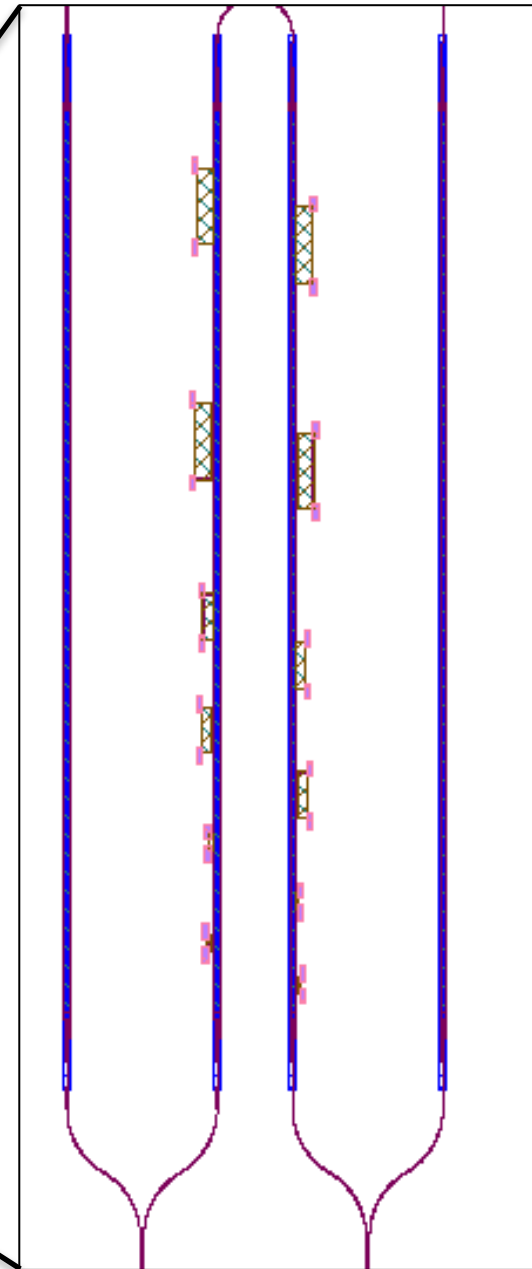
-Determine how much power is needed

Identify optimal heater structures

-Determine which design is the most efficient



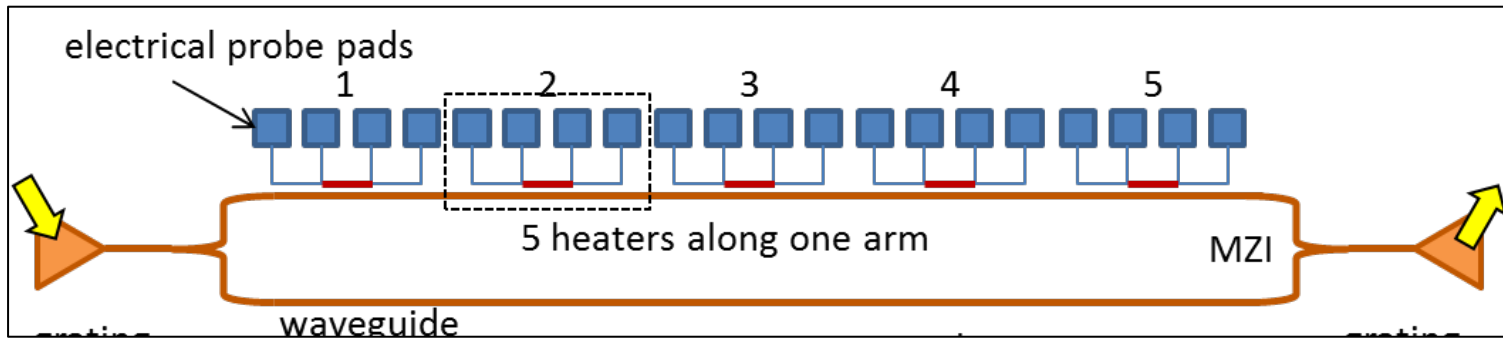
Structure of Device



Test Structure

# Measuring Resistance of Heaters

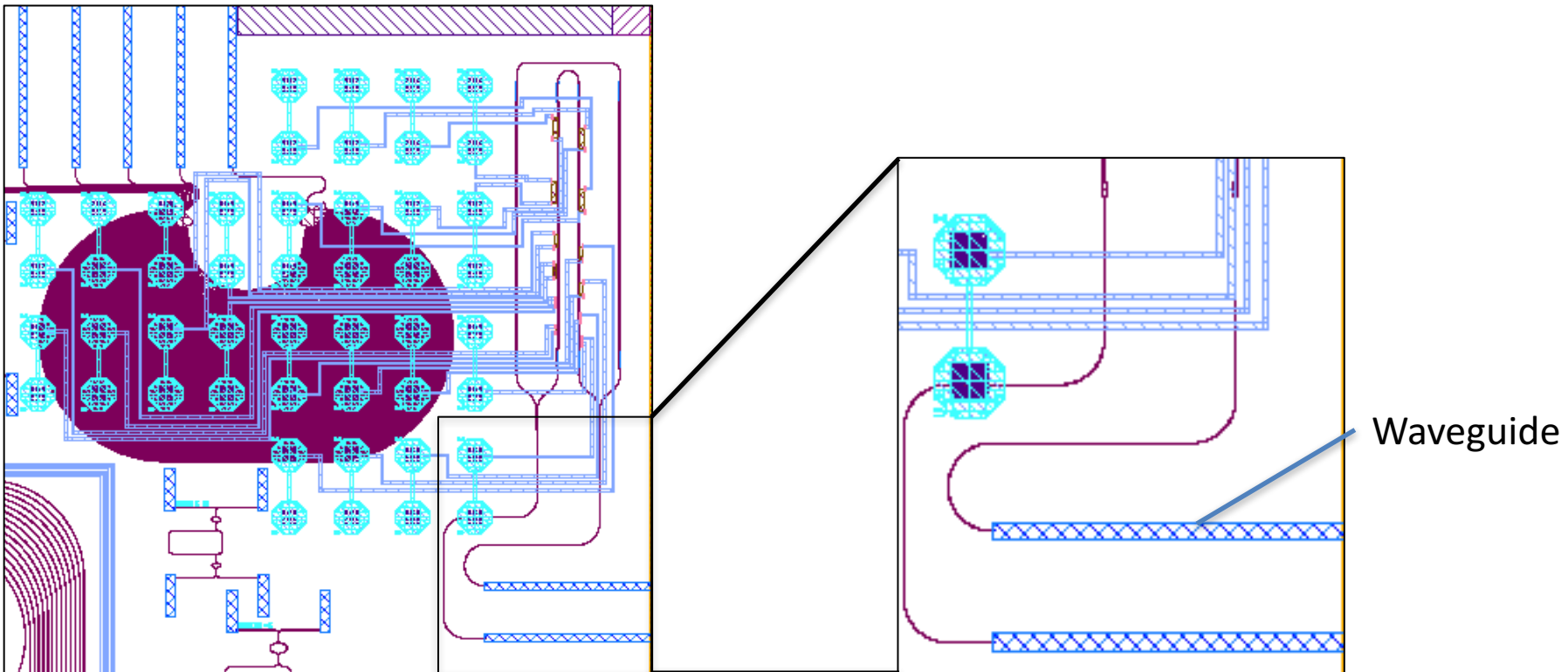
-Tuning efficiency



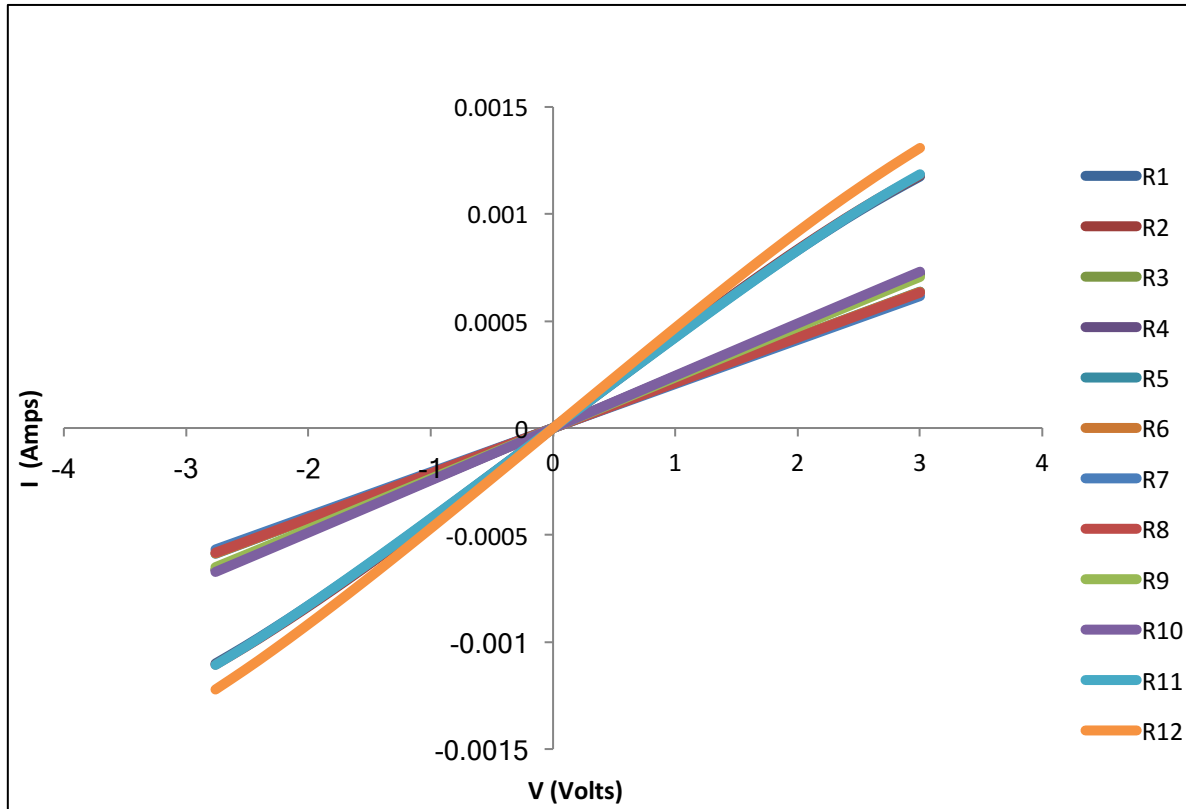
Masood, A., Pantouvaki, M., LePage, G., Verheyen, P., Van Campenhout, J., Absil, P., Van Thourhout, D. and Bogaerts, W. (2013). Comparison of heater architectures for thermal control of silicon circuits. *10<sup>th</sup> International Conference on Group IV Photonics*.

# Aligning Optical Fiber

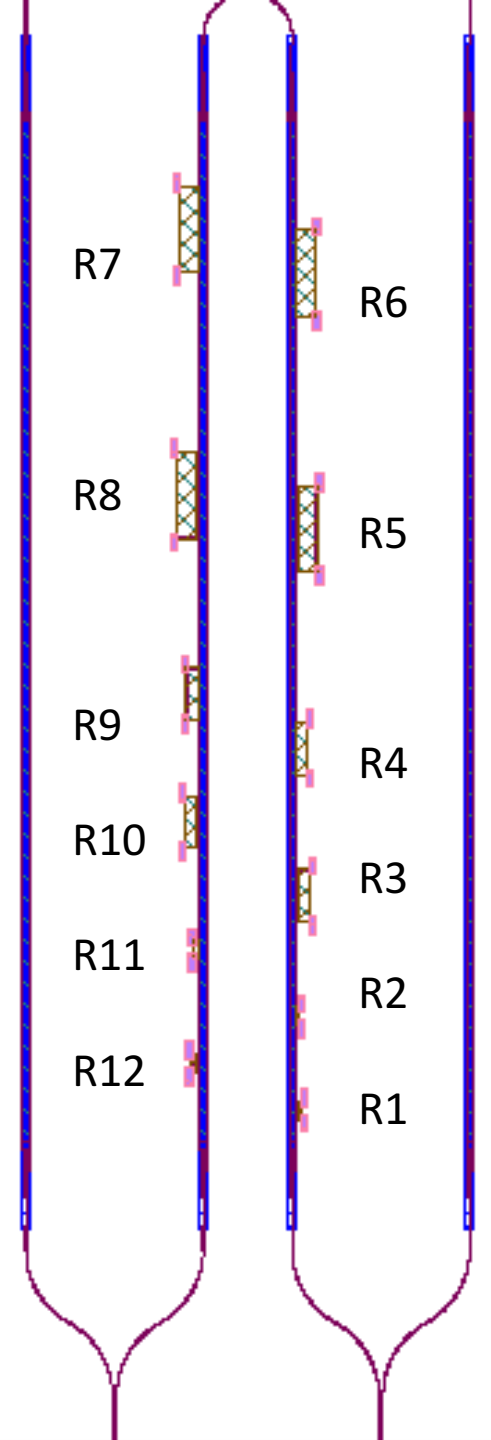
-Minimize optical loss



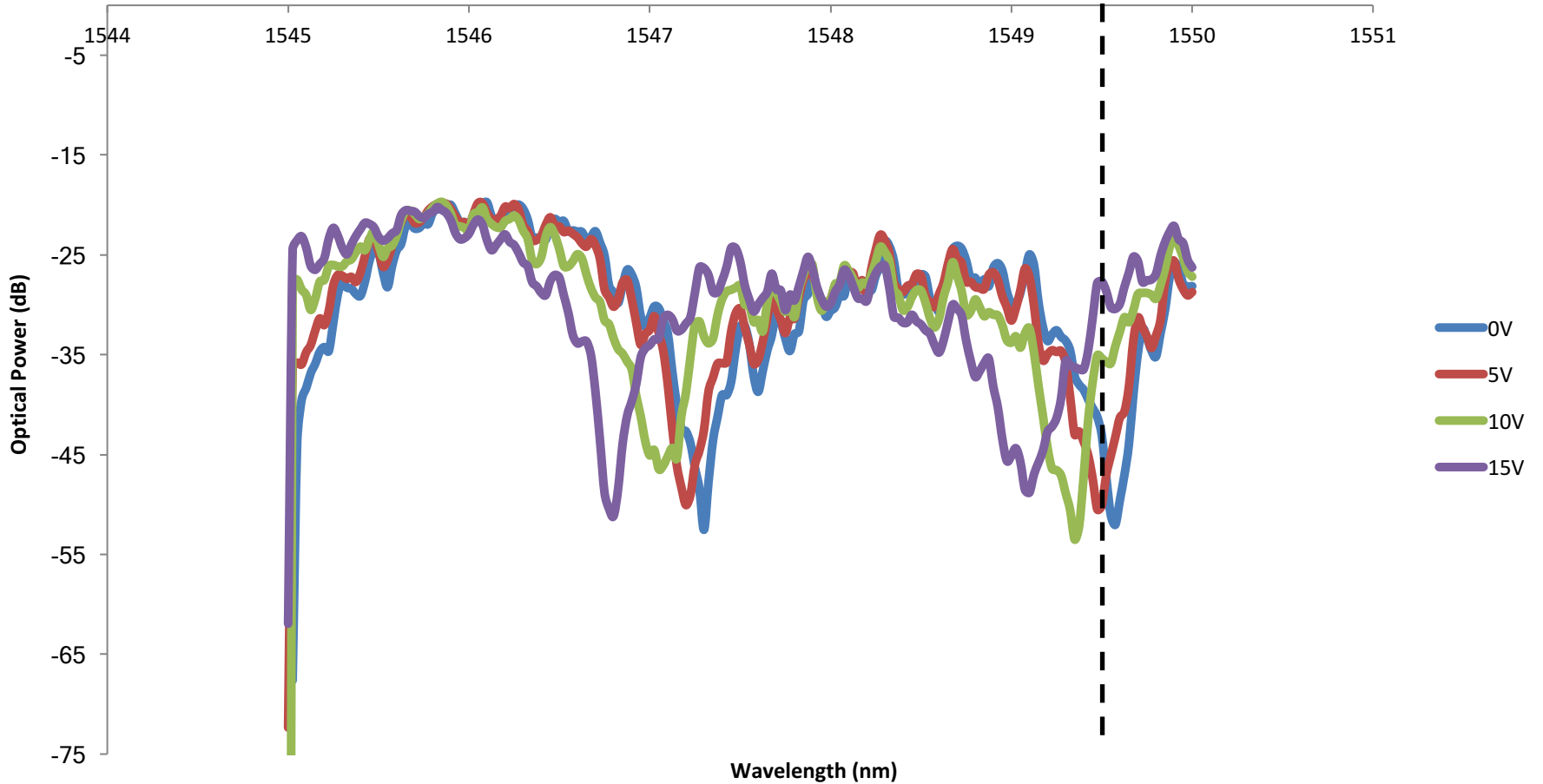
# Resistance Measurements



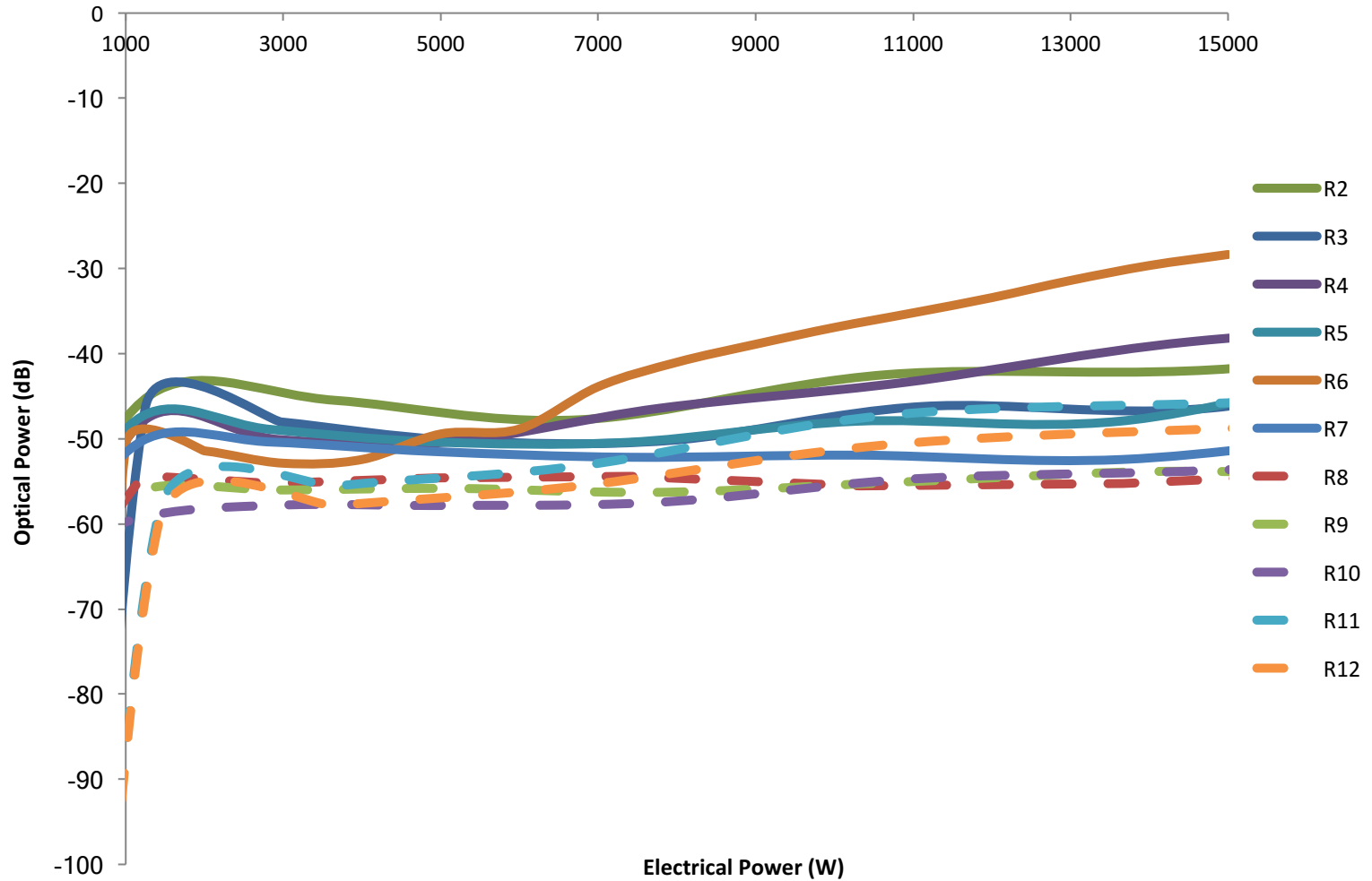
*Ohm's Law:  $V=IR$*



# Voltage Sweep from 0-5V for R3



# Heater Efficiency at 1549.5 nm





# Conclusions & Future work

- Smaller heater geometries tend to generate more heat, which is efficient for the switch.
- Continue to test heaters of varying dimensions in order to find optimal heater structure for optical switch

# Acknowledgements

Special thanks to my mentor, Takako Hirokawa for her guidance this summer as well as to my Faculty Advisor Professor Clint Schow for his support. I would also like to thank the IEE for funding my research.

