



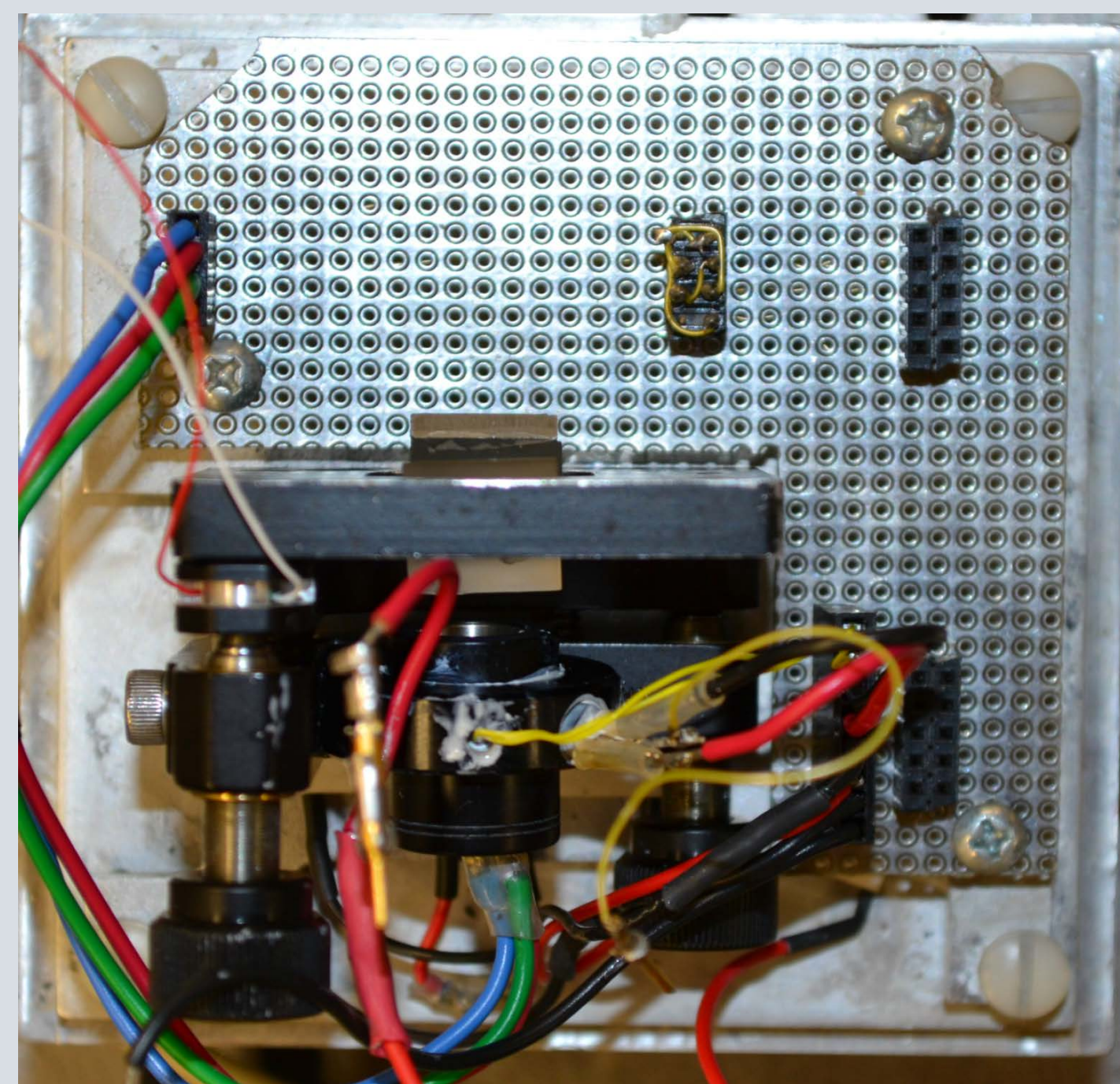
A New Design for a Tunable External Cavity Diode Laser

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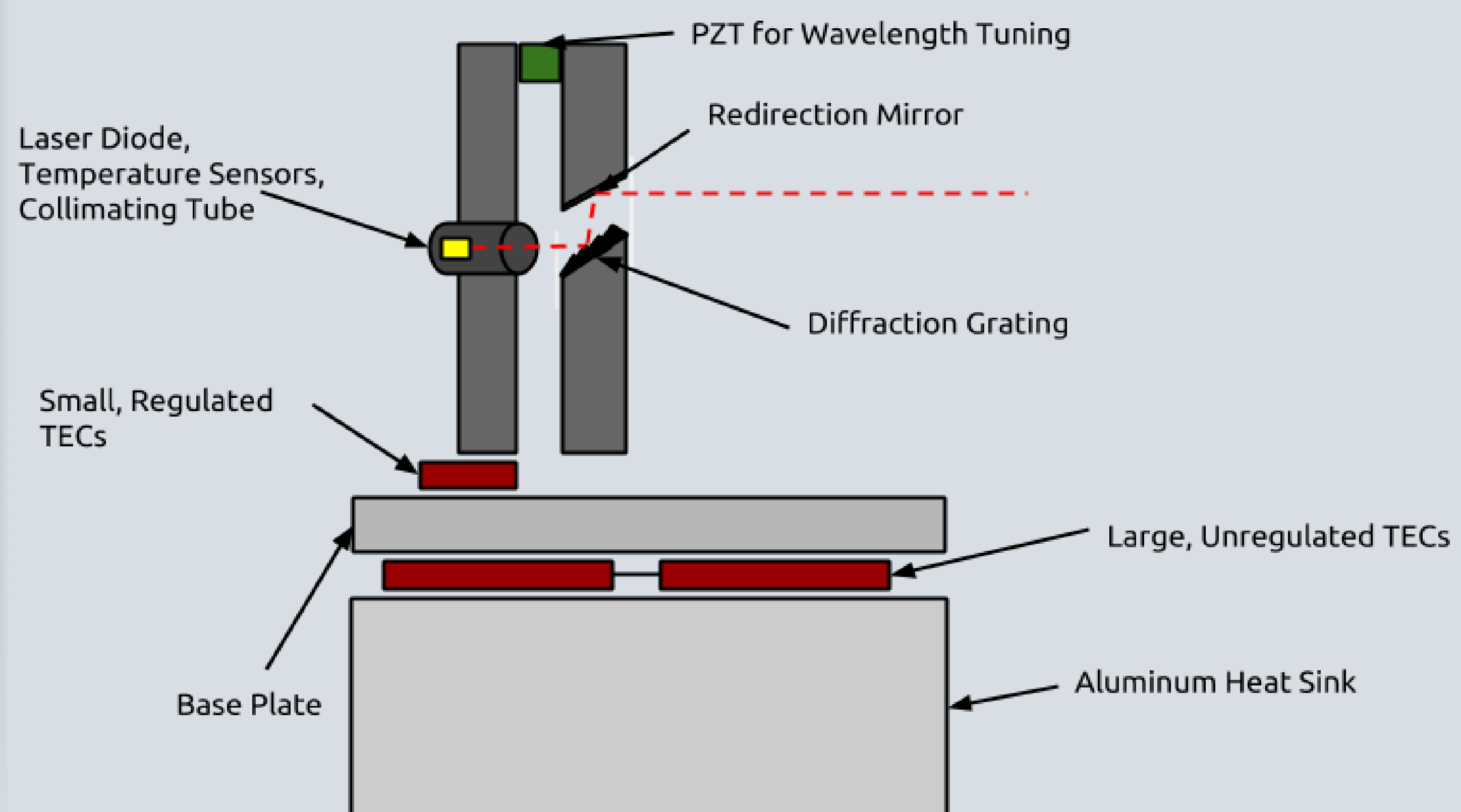
Abstract:

We have designed and built a robust tunable external cavity diode laser that is easily constructed from commercial components. It requires only minimal, low tolerance machining, allowing for increased streamlining and ease of construction. The design also allows for the most common types of laser diode packages, adding versatility.



Goals:

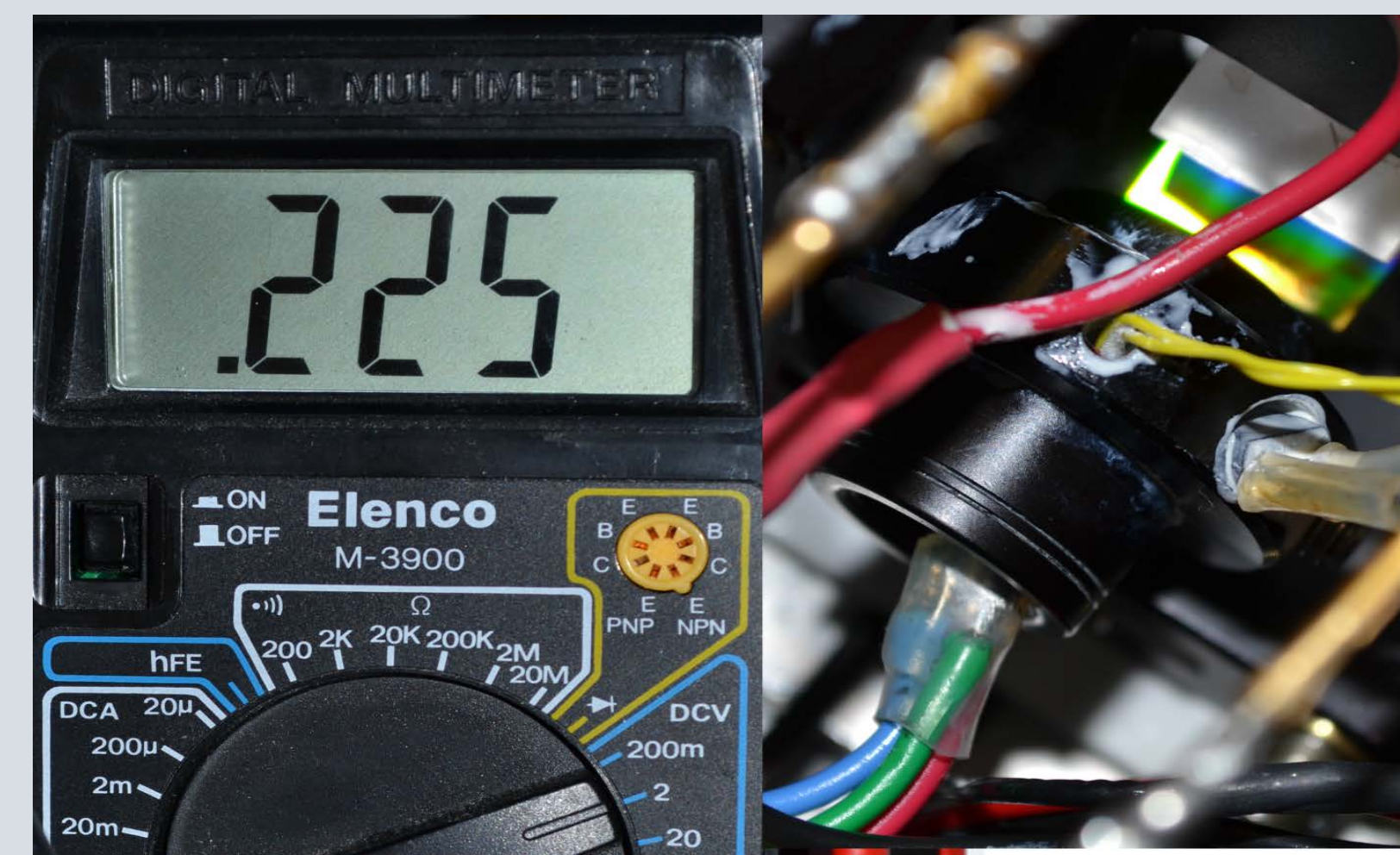
Purchasing commercial lasers costs significantly more than building them. Though many non-commercial designs exist, it is advantageous to produce one that can be made quite easily, with minimal machining, from a majority of commercial parts. Our goal was to make a design that not only met these specifications, but also was able to adapt to different configurations of laser diodes, allowing the same housing to be used for future lasers.



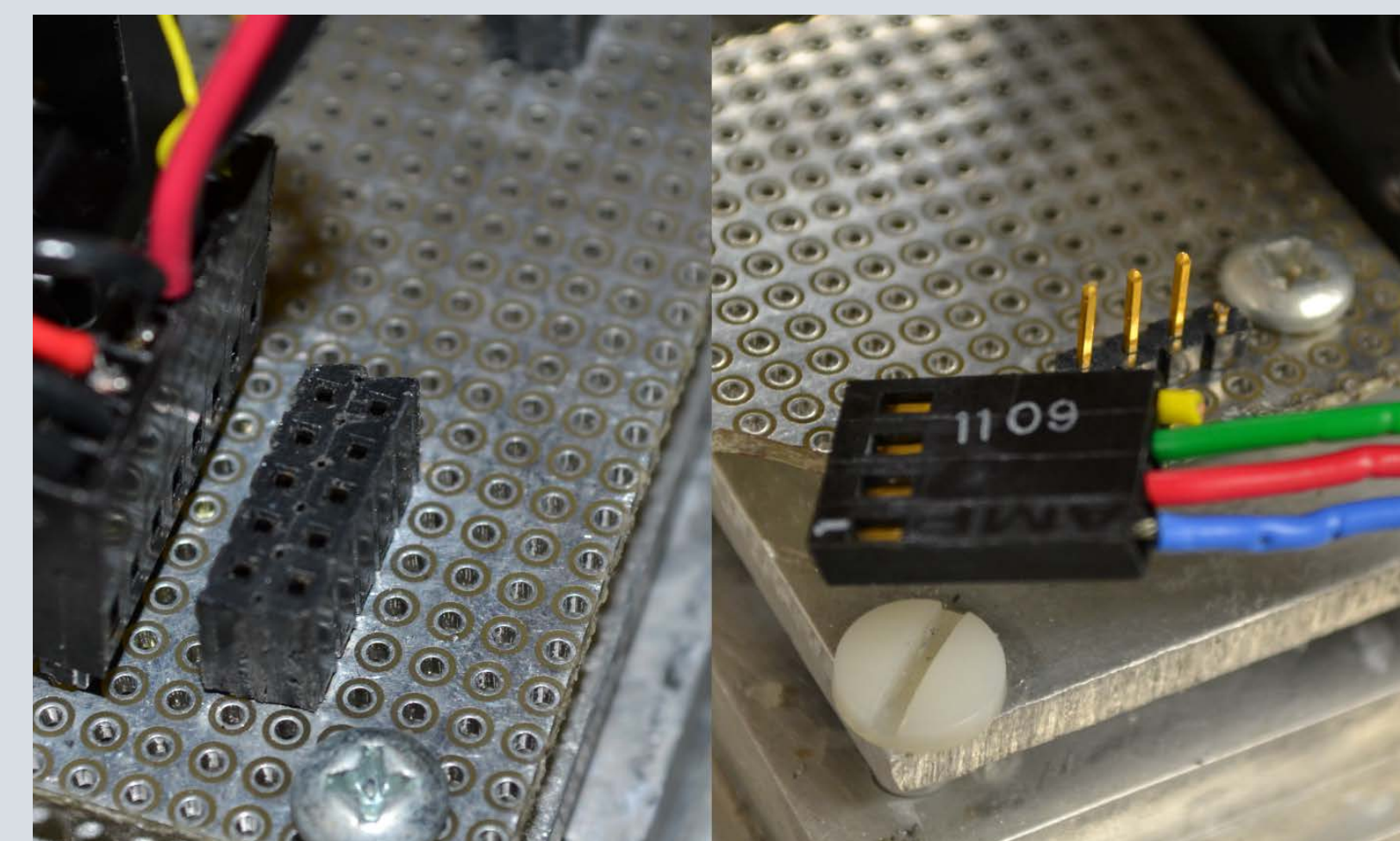
Diffraction grating is mounted on a modified commercial mirror mount. Grating-diode distance and angle are fine-controlled by a PZT to modulate wavelength.



Two small TECs, placed between the mirror mount and base plate, regulate the temperature of the diode. A thermistor provides feedback to a temperature controller. Two lower, unregulated TECs cool the device generally.



In addition to thermistor, diode ring contains a separate temperature sensor to produce a human-interpretable output.



Most components are connected to SIP sockets soldered to a circuit board mounted above the base plate.

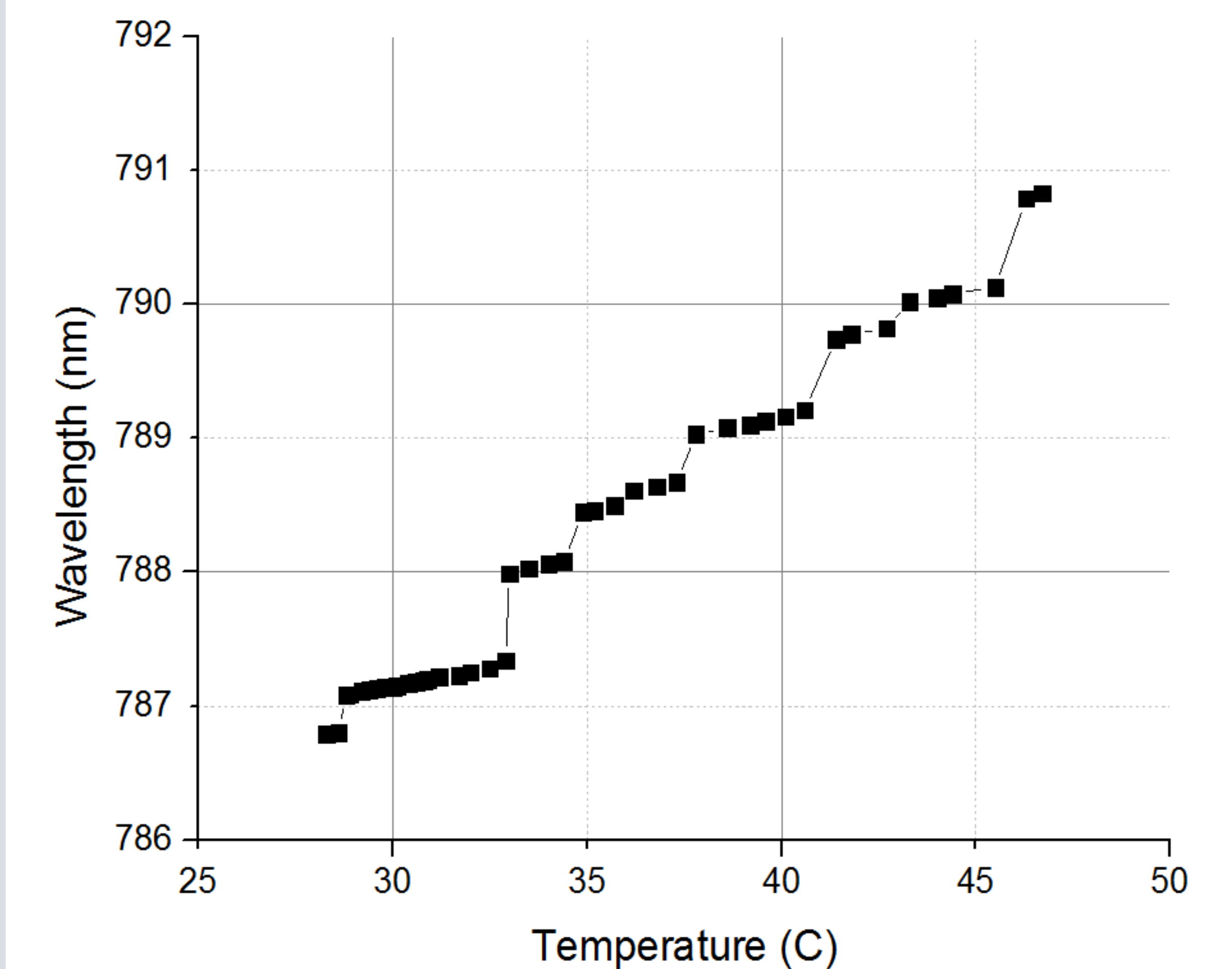


On-board SIP sockets are wired to DIP sockets, where DB-9 connectors are attached via ribbon cable. The DB-9s are "fed" by temperature and current controllers. The controllers are built around inexpensive commercial circuit modules.



To accommodate different diodes, "keys" are constructed and placed in an intermediary socket. The different keys correspond to different diode pinouts.

Plot of Wavelength as a Function of Temperature for 90mw 5.6mm Laser Diode



Features:

- Very simple design
- Only a small amount of machining required (all low tolerance)
- Adaptable for many different diodes
- Temperature is stable to < 1 millikelvin
- DIP/SIP headers allow easy disassembly-reassembly for troubleshooting and maintenance
- Additional mirror eliminates beam steering during wavelength tuning
- Works with commercial current & temperature control modules that are inexpensive and easy to use