

Telecom Laser System Cooling

Design Goals and Constraints

- Fiber optics laser diode with 7 Watts heat load.
- Laser diode must be held at 35°C in 55°C ambient.
- Additional 20 Watts from two transistors to be cooled.

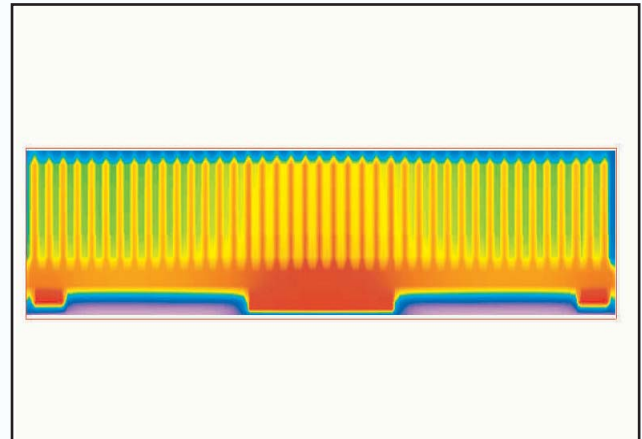


Figure 2: CFD analysis of the laser cooling system

Solution: Laser cooling system seen in Figure 1.



Figure 1: Laser Cooling System

For top performance of the fiber optics laser diode, the diode was required to maintain a temperature no higher than 35°C. However, the environment of the unit could reach temperatures as high as 55°C. To meet this goal, a thermoelectric cooler was needed. A thermoelectric cooler is a solid-state heat pump that relies on the Peltier effect. When a current is added to the thermoelectric cooler, it pumps heat from its cold side to its hot side. By pumping heat from its cold side, a thermoelectric cooler can maintain its cold side temperature lower than the temperature of the ambient.

By using a thermoelectric cooler, the temperature of the diode could be maintained below 35°C when the ambient was as high as 55°C. The heat load from the diode and thermoelectric cooler combined to over 30 Watts. A large bonded fin heat sink was used to dissipate the heat to the environment. By slightly enlarging the heat sink, it also connected with the transistors, and was able to cool them as well. Two low power fans provided the required airflow. A fan cage was designed both for protection and to integrate the entire thermal solution into a single unit.