1.6 Power dissipation in the DWDM-system.

Due to the need of very stable laser emission wavelengths, a precise temperature control of the laser cavity is needed. The laser wavelength will drift with changing temperature if the laser is not controlled. This means that the internal temperature of the laser must be kept at a constant level for all operation temperatures.

This is done through the use of a Peltier element placed within the laser package. The function of the Peltier element is to control the temperature in a similar way as a refrigerator. If the ambient temperature increases the Peltier element will cool the inside of the laser package to keep the temperature at a constant level. If the opposite is the case and the ambient temperature decreases, the Peltier element will heat the inside of the package to keep the internal temperature constant. The quantity of heat absorbed or produced is proportional to the current flowing through the contact. In practical terms this means that the current is proportional to the temperature difference between the ambient temperature and the desired temperature within the laser package.

If the ambient temperature is lower than the package temperature, the power dissipated will support the heating process of the device by increasing the ambient temperature. On the other hand, if the ambient temperature is much higher than the desired package temperature (about +22°C) it may cause the laser to malfunction. The current, which is proportional to the temperature difference, implies power dissipation and an increase of the ambient temperature.
This increased ambient temperature will again increase the current through the Peltier element in order to lower the internal package temperature. The increased current will make more power dissipate thereby increasing the ambient temperature, and so on.

To avoid this, proper ventilation of the DWDM-system is needed. In the case of a 16-channel installation a fan must be installed above the uppermost sub-rack frame. Below the lowest sub-rack frame it is recommended to have 1RU of free space to ensure good airflow through the sub-rack frames.

The operational temperature for the DWDM-system is 0°-40°C.