## High Power Laser diode reliability study - Objectives

The objective of this activity is to help optimize the qualification and screening of High Power laser Diodes (HPLDs) by studying the life time degradation mechanism in HPLDs.

In particular, two issues related to HPLDs are of particular concerns and envisaged to be the core of this activity, namely, COD (Catastrophic Optical Damage) and premature catastrophic failure in vacuum operating condition.

This activity is better led by a contractor with extensive Laser diode background and expert knowledge in semiconductor physics, in terms of research and development. Experience in planning and leading technological investigation is also a preferred quality.

## **Objective 1**

• COD is one of the main failure modes for HPLDs, and has a direct consequence on lifetime and reliability of laser diodes, hence all manufacturers test for COD threshold as part of their screening. The problem is complicated by the lack of unified test method amongst manufacturers and hence different COD threshold values can be obtained for any one laser diode, depending on the test method used! The COD test is also dependent on the thermal impedance of the assembly, pulse condition, etc. The test method recommended shall therefore be included in the Basic Specification for Laser diodes.

## **Objective 2**

• There is currently no data available in terms of COD threshold evolution under vacuum condition. COD threshold evolution under vacuum operation is therefore an important consideration and shall be investigated within this activity.

## **Objective 3**

• In many project related qualifications of HPLDs and especially during life testing, we are confronted with the devices failing in vacuum conditions, while the same devices from the same lot continue to perform well in air. Understanding of the underlying physical mechanisms responsible for HPLDs failure in vacuum is therefore needed.