

# Aging Test of Laser Diodes and Laser Bars

## Aim

Qualification of Laser Diode Structure and Technology

## Task

Determination of Degradation Rates  $< 10^{-5}/h$  in aging tests at  $10^{\circ}\text{C} < T < 80^{\circ}\text{C}$  and  $t > 1000$  h

## Testequipment

- Capability to measure degradation rates below  $10^{-5} \text{ h}^{-1}$
- Current Control and Power Measurement with an accuracy better 1% within 1000 hours
- Test Chambers for the temperature range  $10^{\circ}\text{C} < T < 80^{\circ}\text{C}$  with an accuracy better 0.1 K
- Four different systems
  - long-term aging tests of laser diodes (App. 1 and 2)
  - burn-in tests of laser diodes (App. 3)
  - long-term aging tests of laser bars (App. 4)
- Computer controlled

## Future Developments

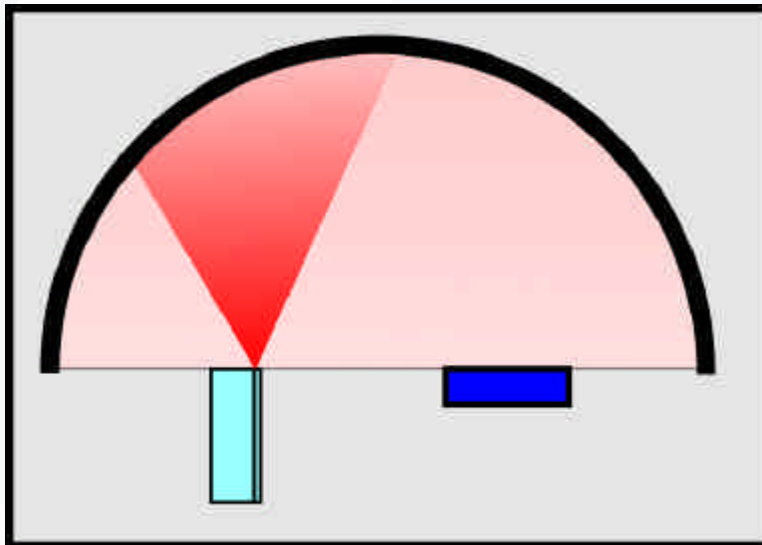
long-term aging with  $t > 10000$  h

## Testequipment I

### Apparatus 1

Geometrical Attenuation of the Laser Beam

**cyan**=diode laser, **blue**=detector

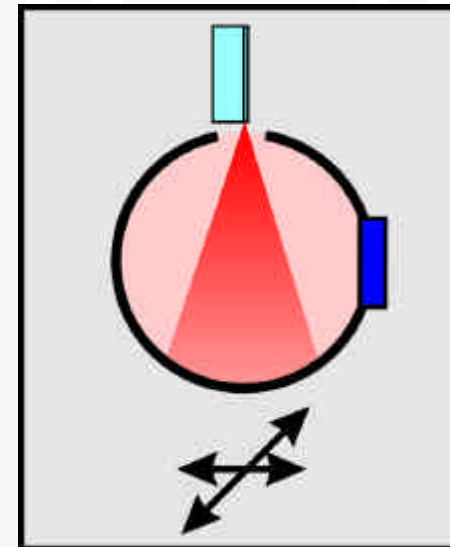


- 8 x closed LiTherm chambers (5 BA-LD's)
- 1 x closed LiTherm chamber (10 RW-LD's)
- Profile Laser Diode Drivers

### Apparatus 2

Geometrical Attenuation with a Calibrated Ulbricht Sphere with x-y-Positioning

**cyan**=diode laser, **blue**=detector



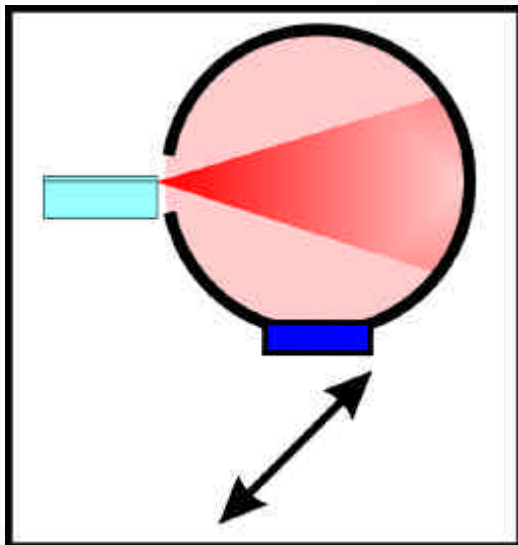
- closed Newport system
- 20 BA - LD's
- 20 RW - LD's

## Testequipment II

### Apparatus 3

Geometrical Attenuation with a Calibrated  
Ulbricht Sphere with x-Positioning

**cyan**=diode laser, **blue**=detector

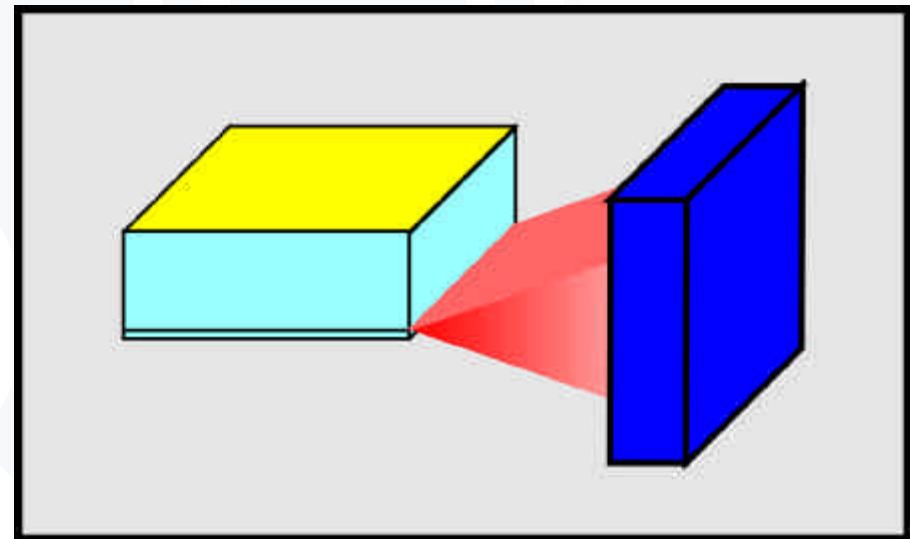


- open Burn-In System 60 BA - LD's

### Apparatus 4

High Power Detector - Laser Bar System

**cyan**=diode laser bar, **blue**=detector



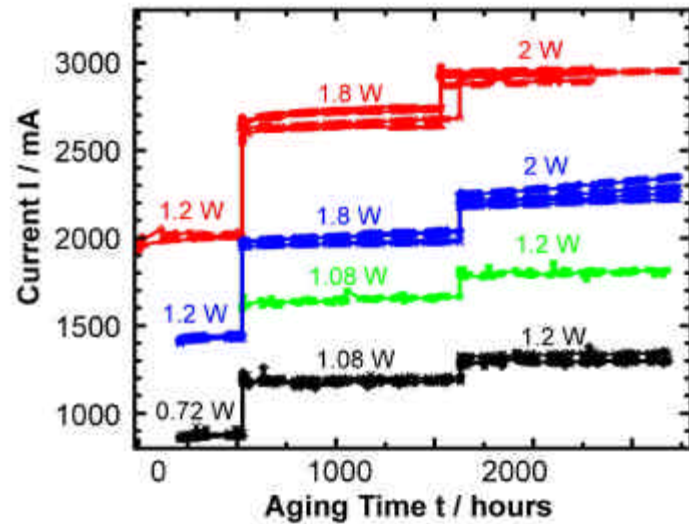
- 80 closed Tecom Chambers
- 65 Delta Electronica Drivers

## Examples I

### Aging Test on High Power Diode Lasers for the VIS

sample 651850,  $T = 25^\circ\text{C}$ ,  $\lambda = 732 \text{ nm}$ ,  
GaAsP/AlGaAs

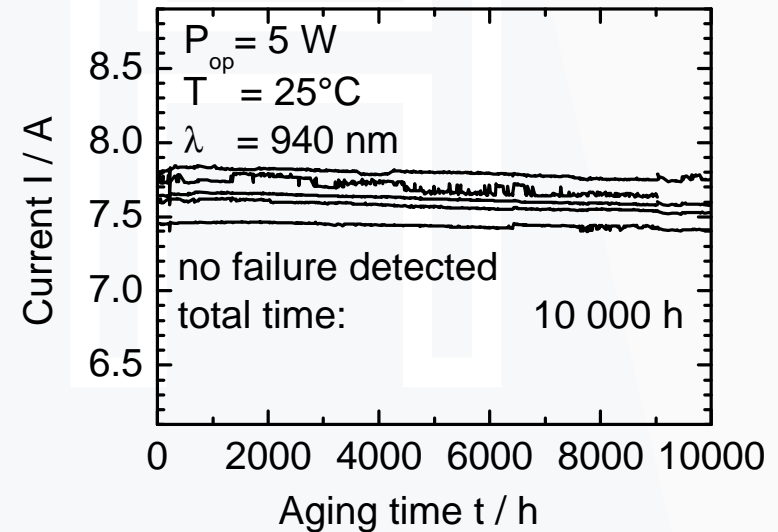
- red** - diode lasers 100 micrometer x 4 mm, rate  $0.9 \times 10^{-5}/\text{h}$
- blue** - diode lasers 100 micrometer x 2 mm, rate  $3.7 \times 10^{-5}/\text{h}$
- green** - diode lasers 60 micrometer x 4 mm, rate  $1.5 \times 10^{-5}/\text{h}$
- black** - diode lasers 60 micrometer x 2 mm, rate  $2.2 \times 10^{-5}/\text{h}$



### Aging Test on High Power Diode Lasers

$T = 25^\circ\text{C}$ ,  $\lambda = 940 \text{ nm}$

accelerated life test of 5 laser diodes



## Examples II

### Aging Test on Diode Laser Bars

$T = 25^{\circ}\text{C}$

Wave Length 940 nm; 19 Emitter; Width 100  $\mu\text{m}$ ; Cavity Length 1.5 mm; Filling Factor 30%;

