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www.ilxlightwave.com
wavelength of 806 nm. The individual emitter width and spacing of this laser were 150 μm and 500 μm respectively. The laser was mounted on a water cooled ILX Lightwave LDM-4415 mount. An LDX-3600 laser diode driver was used to provide transient free current to the laser and stable temperature control was provided using a LDT-5948 thermoelectric temperature controller.

Optical power and wavelength were measured using an ILX Lightwave OMM-6810B Optical Multimeter and OMH-6722B Power/Wavehead. This instrument utilizes an integrating sphere, colored glass filters, and silicon photodiodes to simultaneously measure optical power and wavelength. While this technique provides rapid measurement, it is expensive and difficult to align. This application note describes a simple but effective measurement technique based on a scanned slit and measurement head capable of simultaneous measurement of optical power and wavelength.

Using a Power / Wavehead for Emitter Level Screening of High Power Laser Diode Bars

Emitter level screening has been shown to be an effective tool for testing high power laser diode bars and stacks. Measurement of individual emitter output power, wavelength, and polarization purity allows the identification of defective individual emitters and anomalous stress on the laser diode bar that may lead to degradation in overall laser performance and reduced reliability.

Previous techniques have relied on a near field imaging spectrometer for the measurement of optical power and wavelength. While this technique provides rapid measurement, it is expensive and difficult to align. This application note describes a simple but effective measurement technique based on a scanned slit and measurement head capable of simultaneous measurement of optical power and wavelength.

Experimental Setup

The experimental setup is shown in Figure 1. The laser tested was a 40 watt CS packaged laser diode bar with 19 emitters, a threshold current of 7.5 amps, and nominal lasing wavelength of 806 nm. The individual emitter width and spacing of this laser were 150 μm and 500 μm respectively. The laser was mounted on a water cooled ILX Lightwave LDM-4415 mount. An LDX-3600 laser diode driver was used to provide transient free current to the laser and stable temperature control was provided using a LDT-5948 thermoelectric temperature controller.
of the laser’s exit aperture while allowing easy alignment by reducing sensitivity to position perpendicular to the laser bar.

A small reflective aperture was placed in front of the lens to limit the light entering the lens/measurement head assembly. This reflective aperture also prevented light absorption and heating of the black surfaces of the assembly. The lens/measurement head assembly was mounted on a precision translation stage with 0.01 mm resolution.

A simple application program was written to control the instruments and collect measurement data.

Results

Figure 2 shows the results of a near field scan performed at 25°C, 40A drive current, and with a 0.01 mm step size. The optical output of each emitter is clearly resolved. The output of the emitter #5 is very low indicating a defective emitter. Wavelength “bow” is also clearly visible in the profile with the wavelength varying from about 804.8 nm at the right side of the array to a maximum of 806.7 nm in the center. Wavelength bow is due to the packaging induced stress caused by the mismatch in the coefficients of thermal expansion between the laser bar material and the CS package substrate. In addition to the overall bow in the wavelength profile, it can be seen that emitter #11 is blue shifted by approximately 0.4 nm, indicating potential facet damage.

It is possible to calibrate the wavelength shift in terms of temperature by performing a second scan at a different temperature. Wavelength measurements resulting from scans at 25°C and 30°C are shown together in Figure 3. Based on these results, the average wavelength shift with temperature is 0.71 nm for a 5°C shift in temperature, or 0.14 nm/°C. Using this value and the calculated range in wavelength of 1.85 nm at 25°C, it is straightforward to calculate that the temperature of the array varies 13.0°C from the center to the right side.

Summary

A simple technique has been described for measuring emitter-level optical power and wavelength in high power laser diode bars. The technique relies on the use of a scanned slit in conjunction with an ILX Lightwave OMM-6810B Optical Multimeter with OMH-6722B Power/Wavehead. This measurement technique can be used to identify defective emitters and anomalous stress that may lead to reduced reliability in laser diode bar assemblies.

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**Using a Power / Wavehead for Emitter Level Screening of High Power Laser Diode Bars**

By: Lawrence A. Johnson and Andrew Shull

Optical power and wavelength were measured using an ILX Lightwave OMM-6810B Optical Multimeter and OMH-6722B Power/Wavehead. This instrument utilizes an integrating sphere, colored glass filters, and silicon photodiodes to simultaneously measure optical power and wavelength at power levels up to 1 watt. Using this technique wavelength measurement with an accuracy of ±1.0 nm and resolution of 0.1 nm are readily obtained. In order to sample individual emitters, a 20 mm focal length lens was used to image the output facet of the laser with a 2.5 x magnification onto a 100 μm silt located in front of the entrance port of the ILX-6722B measurement head. Using a silt provides good spatial resolution along the axis.