DUAL BALL LENSES FOR RELAXED ALIGNMENT TOLERANCES IN PIGTAILING OF A LASER DIODE TRANSMITTER.

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Abstract:

In this paper a butterfly laser diode transmitter module is coupled into single mode fiber via dual small ball lenses, which are aligned and fixed during an active alignment process where the laser diode is powered and the output power is continuously measured to determine the optimum positions for maximum coupling efficiency and then fixed in their holder and to the main substrate by laser welding technique using Nd:Yag laser welding. The experimentally obtained coupling efficiency of the proposed coupling system was around 75% with relaxed axial, lateral and angular misalignment tolerances. The working distance (separation of the coupling system from the fiber tip) can be in the range between (1-4mm) at the optimum separation which give the module the desired axial tolerance to insert any optical component during the fiber attachment process, this range is a very relaxed axial tolerance comparing to the size of the module itself. It has been also found that there is an optimum distance between the two lenses at which the coupling efficiency is maximum with relaxed working distance. The experimental results match very well with those obtained theoretically by employing ABCD ray tracing matrix.

Keywords: Butterfly module, Laser welding, Coupling, Pigtailing, Ball lenses, misalignment tolerances.