

A tolerant coupling scheme for pigtailed laser diode module in active alignment process (Proceedings Paper)

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Paper Abstract

A laser diode transmitter packaged in a butterfly module is coupled into a single mode fiber using double small ball lenses. The process of alignment and fixing of all the components inside the module is performed in an active alignment procedure, where the laser diode is powered and the output power is continuously measured during the alignment process of all coupling components to determine the optimum positions for maximum coupling efficiency and then fixed in their holders and to the main substrate by laser welding technique using dual beam Nd:YAG laser welding. The double ball lenses coupling scheme found to be very effective in mode matching between laser diode and single mode fiber. The axial, lateral and angular 1dB misalignment tolerances are enhanced for the transformed laser mode field radii in both X and Y directions. The experimentally measured coupling efficiency of the proposed coupling system was around 75% with a relaxed working distance (separation of the coupling system from the fiber tip) in the range of (2-4mm) by optimizing the separation between the two lenses as well as the separation between the first lens and the facet of the laser diode. The experimental results match very well with those obtained theoretically by employing ABCD ray tracing matrix.

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