High Power InP-based Diode Lasers for Telecom Applications

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ABSTRACT

This paper summarizes the recent results [1-4} on the development of high power 1300-1550 nm ridge waveguide Fabry-Perot and distributed-feedback (DFB) lasers.

Improved performance of MOCVD grown InGaAsP/InP laser structures and optimization of ridge waveguide design made it possible to achieve 0.8-1 W CW output power level for single mode Fabry-Perot lasers. Despite the fact that the beam aspect ratio for discussed ridge lasers ($30^o \times 12^o$) is higher than that for buried devices, our modeling and experiments demonstrated that the fiber coupling efficiency about 70-80% could be routinely achieved using lensed fiber or simple lens pair. Fiber power of higher than 800 mW was displayed.

Utilizing similar epitaxial structures and device geometry, the DFB lasers with output power of 500 mW have been fabricated. Analysis of the laser spectral characteristics shows that among studied high power DFB lasers two groups can be defined. DFB lasers of the first group are the single frequency emitters with side-mode suppression increasing from 45 dB at low current up to 60 dB at maximum current. Devices from second group display multi-frequency spectra consisting of 4-8 longitudinal modes with mode spacing larger than that for Fabry-Perot lasers of the same cavity length. Both types of DFB lasers exhibit weak wavelength-temperature dependence and very low RIN values.

Fabry-Perot and both types of DFB lasers can be used as pump sources for Raman amplifiers operating in the 1300-1500 nm spectral range. The single-mode 1300 nm and 1550 nm DFB lasers operating in the 400-500 mW power range are very attractive for new generation of the cable television transmission and local communication systems.

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