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| **Title:** | Enhancement of High Speed Performance of a VCSEL and Reduction of FM Noise | | | |
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| **Abstract:** |  |
| In this work, two methods of enhancing the bandwidth of a VCSEL have been presented keeping in mind the application of such a laser in high speed data transmission. Enhancement of bandwidth of a VCSEL has been evaluated by obtaining the modulation response through computation of transfer function for different values of frequency. The resonant frequency and the bandwidth of a VCSEL have been increased by increasing the confinement factor and this has been done by increasing the number of quantum wells in the active region and simultaneously by decreasing the length of the separate confinement (SCH) region. It has been observed that by increasing the number of quantum wells from 3 to 5 the value of confinement factor increases from 0.253 to 0.4216. As a result, the resonant frequency of the laser increases from 7.28 GHz to 9.41 GHz. On the other hand, for this increased value of the confinement factor the modulation bandwidth of the laser increases from 11.28 GHz to 14.58 GHz. In condition to this due to the increase of the confinement factor the output power of the laser increases. Due to this the resonant frequency and bandwidth are also found to increase. After computations using MATLAB simulator it has been observed that a maximum output power value of 0.646 mW is observed for a 5 number of quantum wells (computing value of confinement factor = 0.4216). At this value of maximum power a maximum resonant frequency of 9.14 GHz and a maximum bandwidth of 14.16 GHz are obtained. Further computations by varying the number of quantum wells show that by increasing the number of quantum wells frequency modulation (FM) noise decreases. Increasing the linewidth enhancement factor increases the FM noise of a VCSEL. | |