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| **Abstract:** |  |
| This paper represents the characteristic of Semiconductor Optical Amplifier (SOA) by  varying frequency of Vertical Cavity Surface Emitting Laser (VCSEL) which is used as a  source at the transmitter end and also injection current of SOA. It is observed that by  varying the injection current up to 1 ampere, maximum output power of 0.74935 watt can  be achieved at the frequency of VCSEL of 193.1 THz when the optical fiber length is 50  Km. By varying the frequency from 177 to 250 THz, maximum output power of 0.10551  watt can be obtained at 240 THz with injection current of 0.15 ampere. In this paper it  also observed that SOA can only operates in between the range of 0 to 1 ampere injection  current. At 0.042 ampere injection current we get the maximum quality factor of 5.34  with Good BER of 4.67e-8. | |