The effects of bias currents on the turn-on delay characteristics of quantum well laser diodes are investigated using the equivalent circuit model derived from the rate equations. It is shown that the turn-on delay time and oscillation frequency have strong dependency on the bias currents.

Quantum Well (QW) Laser Diodes (LD) are high-speed high-bandwidth photonic devices that have gained significant interest for use in modern communication systems. The turn-on delay of these devices is critical for their performance and reliability. In this study, the turn-on delay characteristics of QW LDs are investigated using an equivalent circuit model derived from rate equations. It is shown that the turn-on delay time and oscillation frequency have a strong dependency on the bias currents.

In the context of quantum dot lasers, the turn-on delay is an important factor that affects the overall performance of the device. The study focuses on the investigation of the turn-on delay characteristics of QW LDs using an equivalent circuit model derived from rate equations. It is shown that the turn-on delay time and oscillation frequency have a strong dependency on the bias currents. This finding is significant for the design and optimization of high-speed photonic devices for use in modern communication systems.
신호를 가졌을 때 LD가 threshold에 도달하기 위해서 약 수백 pico초가 필요하다(그림 2). 또 바이어스 전류가 threshold보다 약간 클 때는 LD는 이미 lasing을 하기에 충분한 carrier가 있으므로 pulse 신호를 가졌을 때 지연시간이 수십 pico초로 줄어든다(그림 3). 바이어스 전류가 threshold보다 훨씬 클 때는 더욱 짧은 지연시간을 가지고 또한 on/off oscillation 주파수도 훨씬 커진다(그림 4). 그러므로 이때는 더 빠른 modulation을 할 수 있다. 자세한 관계식과 시뮬레이션에 이용한 parameter 그리고 carrier transport time의 변화에 따른 turn-on delay의 변화 등에 대해서는 workshop에서 발표할 예정이다.

참고문헌