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Abstract View Online

Intensity and spectral changes in terahertz quantum cascade lasers induced by the injection of near-infrared optical pulses

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Abstract

Terahertz quantum cascade lasers (THz-QCLs) have attracted much attention as possible carrier sources for ultra high-speed wireless communications in the future, which owes to their high output powers and the absence of relaxation oscillations in QCLs. We have recently reported a photogenerated carrier-based optical-to-THz modulation scheme for THz-QCLs [1]. In the presentation, the intensity and spectral changes in THz-QCLs induced by photo-injected carriers at low temperature will be discussed together with the relevant relaxation mechanisms for the injected carriers. Furthermore, to obtain a quantitative understanding of the rich phenomena by the optical injection, we developed a global simulation scheme applicable to a wide variety of optical excitation experiments on QCLs including strong excitation densities (Figure 1) [2]. With the most of internal parameters, e.g., electron temperatures, scattering times, gains, and waveguide loss, treated as spatiotemporal and carrier density-dependent, the rate equation was solved to obtain the number of photon in the cavity. The output power (converted from the number of photons using the time-varying reflectivity at the cavity facet) well reproduces the experimental results.

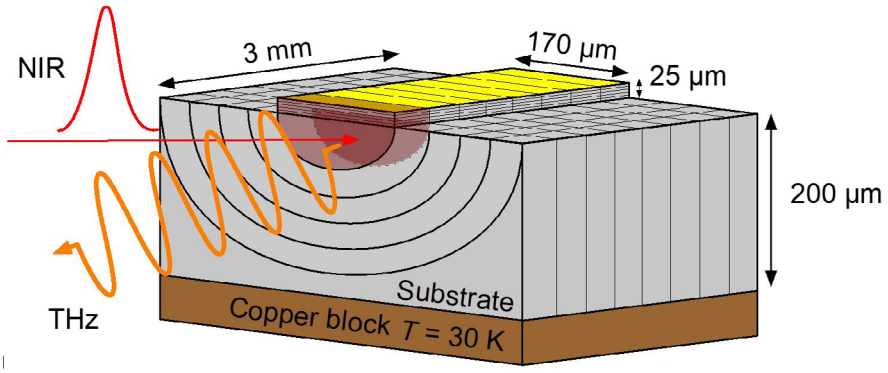

***Figure 1**. Model grid for the analysis of the optically excited QCL.*

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