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Widely-tuned room-temperature high power semiconductor THz sources

The terahertz (THz) spectral range (λ = 30 ~ 600 μm) is important for numerous applications in imaging, spectroscopy, and biological engineering. A compact, room temperature, tunable THz source is desirable for versatility and ease of integration. Despite the rapid development in THz quantum cascade lasers (QCLs), cryogenic cooling is still a necessity for these devices. The recent demonstration of THz sources based on intracavity difference-frequency generation (DFG) from mid-infrared (mid-IR) QCLs offers a room temperature solution. By applying an integrated dual-period distributed feedback (DFB) grating in the waveguide to purify the mid-IR spectra, the THz frequency can be lithographically tuned with different grating periods. Narrow linewidth, single mode emissions from 1 to 4.6 THz are obtained. The highest THz output power is 75 μW at a frequency of 3.4 THz. By further optimizing the phase matching scheme, waveguide geometry, and pump powers, mW-level THz powers should be achievable at room temperature.

Biography

Manijeh Razeghi is Walter P. Murphy Professor and Director of the Center for Quantum Devices. Her current research interest is in nanoscale optoelectronic quantum devices. She has authored or coauthored more than 1000 papers, more than 30 book chapters, and 16 books. She received the IBM Europe Science and Technology Prize in 1987, the Achievement Award from the SWE in 1995, the R.F. Bunshah Award in 2004 and many best paper awards. Razeghi is an elected fellow of SWE (1995), SPIE (2000), IEC (2003), OSA (2004), APS (2004) IOP (2005), IEEE (2005), and MRS (2008).

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