Numerical Investigation of Terahertz Emission Properties of Microring Difference-Frequency Resonators

We investigate the electromagnetic design of whispering gallery mode (WGM) terahertz (THz) resonators. Terahertz radiation is generated by difference-frequency mixing of two electrically pumped high-order near-infrared laser WGM's at room temperature in the active cavity. Due to the leaky nature of the low-order THz WGM, the generated radiation can be efficiently emitted into free space. The inherent high symmetry of the THz WGM prohibits efficient THz emission in the normal direction from the device. We investigate techniques based on concentric surface plasmon polariton gratings to break this symmetry by modification of the dielectric environment of the resonator, and demonstrate a fabrication-optimized structure based on a concentric grating design which efficiently couples the emitted radiation into a narrow, near-gaussian forward-propagating cone of well-defined linear or circular polarization.

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