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InGaAs quantum well based dual-wavelength external cavity surface emitting laser for wideband tunable mid-infrared difference frequency generation

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Abstract:

A two-chip vertical external cavity surface emitting laser with dual-wavelength output is presented. The active region of gain chip 1, designed for 960 nm wavelength, is composed of 6 repeats of strain uncompensated $\text{In}_{0.185}\text{Ga}_{0.815}\text{As}/\text{GaAs}$ multiple quantum wells, and the active region of gain chip 2, targeted for 1100 nm emission, is consisted of 16 repeats of strain compensated $\text{In}_{0.26}\text{Ga}_{0.74}\text{As}/\text{GaAs}_{0.94}\text{P}_{0.06}$ multiple quantum wells. Two 1 mm thick uncoated fused silica birefringent filters are employed as the tuning elements, and the shorter wavelength can be tuned between 949 and 957 nm, while the longer wavelength can be changed from 1071 to 1106 nm by rotating the filters. The total intracavity power under dual-wavelength operation exceeds 36 W when the pump power is 10.5 W. For the use of intracavity different frequency generation, the wavelength tunability of down-converted mid-infrared radiation can cover a wavelength range from 6.7 to 9.0 μm .

Keywords:

external cavity surface emitting laser; dual-wavelength; tunable; mid-infrared; difference frequency generation

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