Ultra-narrow-linewidth, single-frequency distributed feedback waveguide laser in $Al_2O_3:Er^{3+}$ on silicon

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We report the realization and performance of a distributed feedback channel waveguide laser in erbium-doped aluminum oxide on a standard thermally oxidized silicon substrate. The diode-pumped continuous-wave laser demonstrated a threshold of 2.2 mW absorbed pump power and a maximum output power of more than 3 mW with a slope efficiency of 41.3% versus absorbed pump power. Single-longitudinal-mode and single-polarization operation was achieved with an emission linewidth of 1.70 ± 0.58 kHz (corresponding to a Q factor of 1.14×10^{11}), which was centered at a wavelength of 1545.2 nm.

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