



Quantum-cascade laser reaches watt-level average powers

A 0.67-W average power for a room-temperature 5.9- μm -emitting quantum-cascade (QC) laser has been demonstrated by researchers at Northwestern University. The group aimed to reduce the devices' threshold current density and their dependence on temperature. They achieved this by increasing the conduction band offset of the heterostructure, lowering the doping in the injector region, and including a thick gold top-contact layer.

A double-channel ridge-waveguide QC structure was grown on an indium phosphide substrate, with compressive gallium indium arsenide and tensile aluminum indium arsenide making up the well and barrier materials. Ridge waveguides of 20-, 27-, and 40- μm widths were fabricated. The 5- μm -thick gold layer was deposited by electroplating; the layer helped remove heat. The cavity was 2 mm long. The threshold current density was 1.7 kA/cm^2 for the 20- μm -wide lasers, which operated at an average power of 0.224 W at a 56% duty cycle and 0.521 W at a 28% duty cycle. The 0.67-W average power was reached by the 40- μm -wide device operating at a 17% duty cycle. Contact Manijeh Razeghi at razeghi@ece.nwu.edu.