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HELLISH-VCSEL: A Hot Electron Laser

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Abstract: Hot Electron Light emission and Lasing In Semiconductor Heterostructures (HEL-LISH-1) is a novel hot electron surface emitter consisting of a GaAs QW on the n side of an $\text{Ga}_{1-x}\text{Al}_x\text{As}$ p-n junction. It utilises hot electron transport parallel to the junction plane. The injection of hot electron hole pairs into the QW is achieved via tunnelling and thermionic emission processes. Recently this structure has been modified by the incorporation of an upper and lower DBR defining a VCSEL (HELLISH-VCSEL). This has been shown to lase at room temperature with a Full Width at Half Maximum (FWHM) of 1.5 nm. In this work the operation of the device is demonstrated and compared to a conventional edge emitting QW laser. The emitted power is studied as a function of surface area. The spatial distribution of the light intensity over the surface of the device is also investigated.

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