



# Near-infrared wafer-fused vertical-cavity surface-emitting lasers for HF detection

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<https://doi.org/10.1016/j.jqsrt.2014.05.010>

## Abstract

1310nm Wavelength VCSELs produce single mode emission in excess of 1mW in the temperature range of 20–70°C with a very low relative intensity noise of –148dB/Hz. These devices have a broad tuning range of ~50cm<sup>-1</sup> with variable temperature and current, which cover multiple absorption lines of methane, ammonia and hydrogen fluoride. With these VCSELs, we report optical absorption spectroscopy of several gases near 1310nm wavelength. In particular, we report for the first time detection of HF using the absorption line in the vicinity of 7568cm<sup>-1</sup> with an estimated low-pressure detection limit at the level of several ppm.