

Test Report on Low-Loss Vertical-Cavity Surface-Emitting Laser



Overview

The Radiation Effects and Analysis Group (REAG) at NASA-GSFC has performed cobalt 60 and proton radiation testing on a variety of commercial VCSELs and VCSEL-based data links, and found them to be very robust in each case. 2 The Honeywell HFE-4080 ion implanted 850 nm. Vertical-cavity surface-emitting lasers (VCSELs) constitute an increasingly important alternative to edge-emitting laser diodes. Despite their low manufacturing costs, diffraction-limited, narrow-band emission and excellent modulation capability, VCSELs were only used for optical data transmission. Optical based data busses will have higher performance (e. Experience at NASA has shown that fiber optic busses also make integration of a spacecraft easier and more. on the application, a specific type of laser will be selected that is best able to meet the requirements of the end user. Some of these parameters might include high output power, wavelength selection, tunability, pulsed or continuous wave operation, power efficiency, and package size. Within the Vertical Cavity Surface Emitting Laser (VCSEL) technology has become an indispensable element in optical communication systems and optoelectronics due to its many advantages, and the unique characteristics of VCSELs, including vertical emission, high-speed operation, and low power consumption, have. In this chapter we will deal with major principles of vertical-cavity surface-emitting laser (VCSEL) operation. Basic device properties and generally applicable cavity design rules are introduced.



Article Content

Jul 17, 2025

Vertical Cavity Surface Emitting Laser technology: A comprehensive

In the last 2 years, significant advancements in vertical-cavity surface-emitting laser (VCSEL) technology were reported by researchers Jalal Sirwan Kareem and Yun Cheng Yang.

Jun 15, 2026

Modeling and simulation of vertical-cavity surface-emitting lasers

The software enables users to develop a fundamental understanding of the specific laser parameters and their limiting effects as well as the design of novel semiconductor structures, all of which are

Mar 08, 2026

Polarization-Stable Wavelength-Tunable Single-Mode

Vertical cavity surface emitting lasers (VCSELs) are high performance quality and low cost light sources in many optoelectronic components.

Sep 21, 2025

Static Properties of 980 nm Vertical Cavity Surface Emitting Lasers ...

We report on the design, fabrication, and characterization of the static properties of 980 nm MHCG VCSELs and compare their performance to that of conventional double distributed Bragg

Jan 15, 2026

1 Vertical-Cavity Surface-Emitting Laser: Introduction and Review

The surface-emitting laser is considered as one of the most important devices for optical interconnects, enabling ultra-parallel information transmission in lightwave and computer systems. In this chapter,

Nov 11, 2025

Reliability Analysis of Vertical Cavity Surface-Emitting Lasers Based ...

Due to the long life and high reliability of vertical cavity surface-emitting lasers, the performance degradation experiment cost is high, and the experiment cycle is long, because the

Dec 30, 2025

Long-Wavelength High-Contrast Grating Vertical-Cavity

Abstract and Figures A novel long-wavelength vertical-cavity surface-emitting laser (VCSEL) structure based on a subwavelength high-contrast grating

Dec 15, 2025

Vertical-Cavity Surface-Emitting Lasers: Large Signal Dynamics and ...

Abstract The GaAs-based vertical-cavity surface-emitting laser (VCSEL) is the standard light source in today's optical interconnects, due to its energy efficiency, low cost, and high speed already at low

Jan 18, 2026

Operating Principles of VCSELs

In this chapter we will deal with major principles of vertical-cavity surface-emitting laser (VCSEL) operation. Basic device properties and generally applicable cavity design rules are introduced.

Jan 15, 2026

Degradation Characteristics and Mechanism of High

The correlation between the degradation suggests that the loss of photoelectric performance and the fluctuation of low frequency noise

Apr 30, 2026

High-Beam-Quality Low-Resistance Vertical-Cavity

In this paper, by taking advantage of the excellent current transmission characteristics of graphene, what we believe to be a novel VCSEL

Oct 22, 2025

Vertical-Cavity Surface-Emitting Laser Diodes

This chapter discusses vertical-cavity surface-emitting laser (VCSEL) diodes. VCSEL becomes a key laser device in optical high-speed local area networks (LANs) by taking the

Nov 25, 2025

Numerical investigation of vertical-cavity surface-emitting lasers ...

This paper presents the design and numerical simulation of vertical-cavity surface-emitting laser (VCSEL) incorporating a high-contrast grating (HCG) by using a three-dimensional (3-D) finite

Jan 09, 2026

Topological-cavity surface-emitting laser

Researchers demonstrate a topological-cavity surface-emitting laser with a 10 W peak power and sub-degree beam divergence at 1,550 nm wavelength. The system is also capable of

Jan 11, 2026

Vertical-Cavity Surface-Emitting Lasers with Improved Wide

Vertical-Cavity Surface-Emitting Lasers (name originating from the acronym LASER for light amplification by stimulated emission of radiation) are devices that produce light with both spatial and

Jul 05, 2025

Multi-junction cascaded vertical-cavity surface-emitting

This paper, combining modeling with experiments, demonstrates

Oct 11, 2025

Vertical External Cavity Surface Emitting Lasers (VECSELs):

The laser community is an interesting laser variant known as a VECSEL, or Vertical External Cavity Surface Emitting Laser. While not nearly as popular or well known as more common lasers like the

May 28, 2026

Vertical Cavity Surface Emitting Lasers (VCSELs):

Within the last 2 years Vertical Cavity Surface Emitting semiconductor Lasers (VCSELs) have emerged from the research laboratory into the commercial marketplace at Honeywell's MICROSWITCH Division.

Sep 20, 2025

Chapter 6 Reliability and Degradation of Vertical-Cavity Surface ...

6.1 Introduction The vertical-cavity surface-emitting laser (VCSEL) is a type of semiconductor laser that emits light out the top or bottom of the device, rather than in the plane of the device as previous

Oct 18, 2025

Vertical Cavity Surface Emitting Lasers (VCSELs):

Vertical Cavity Surface Emitting Lasers (VCSELs) are a key technology towards such a parallel optical interconnects solution. Some of their most remarkable features are monolithic 1D or 2D

Feb 09, 2026

Long-Wavelength High-Contrast Grating Vertical-Cavity Surface-Emitting ...

A novel long-wavelength vertical-cavity surface-emitting laser (VCSEL) structure based on a subwavelength high-contrast grating (HCG) as the output mirror has been realized.

Feb 06, 2026

Vertical Cavity Surface Emitting Lasers as Sources for Optical ...

Vertical Cavity Surface Emitting Lasers (VCSELs) having those attractive qualities has shown results to meet the next generation demands for optical communication sources.

Jan 26, 2026

Polarization-Stable Wavelength-Tunable Single-Mode

It provides all typical advantages of VCSELs over DFB or ring lasers, such as lower power budget, small footprint, low cost, easy mass production, and

Jun 15, 2026

Extended cavity surface-emitting semiconductor lasers

There is currently considerable interest in the development of a type of semiconductor laser that unites the desirable features of several different families of solid-state laser device. The

Jan 04, 2026

Vertical-Cavity Surface-Emitting Lasers XXVIII

We report high frequency (20-100 GHz range) optical field intensity oscillations in laterally-coupled-cavity verticalcavity surface-emitting lasers with several different techniques. The

Jun 11, 2026

Vertical Cavity Surface-Emitting Laser (VCSEL) Market

The Vertical Cavity Surface-Emitting Laser (VCSEL) Market, valued at USD 2.99B in 2026, is projected to reach USD 4.73B by 2030, growing at a 12.2% CAGR.

Apr 11, 2026

Antireflective vertical-cavity surface-emitting laser for LiDAR

Multijunction vertical-cavity surface-emitting lasers (VCSELs) have gained popularity in automotive LiDARs, yet achieving a divergence of less than 16° (D86) is difficult for conventional ...

Feb 23, 2026

Vertical-Cavity Surface-Emitting Lasers XXIX | (2025)

Vertical-cavity surface-emitting lasers (VCSELs) having a small aperture and operating in a single transverse mode (SM) are known to reach high relaxation oscillation frequencies of 30

May 09, 2026

Low-Noise, Single-Polarized, and High-Speed Vertical-Cavity Surface ...

A novel technique is demonstrated for suppressing the relative intensity noise (RIN) and enhancing the high-speed transmission performance of 850 nm vertical-cavity surface emitting lasers

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