

Corporate

TDK develops world's first full-color laser control device for 4K smart glasses

- TDK successfully developed a full-color laser control device required for AR/VR smart glasses using lithium niobate (LiNbO₃) thin film
- Increases the color control speed by 10 times with voltage control enabled by lithium niobate thin film, compared to the conventional module's electric current control
- High-speed control enables video resolutions of 4K or higher
- In collaboration with QD Laser Co., Ltd., a video demonstration of direct retinal projection successfully demonstrated the functions of a lithium niobate thin-film device as an image device for AR/VR smart glasses

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TDK Corporation (TSE:6762) has successfully developed a full-color laser control device for 4K smart glasses using lithium niobate (LiNbO₃) thin film. The device will be demonstrated at CEATEC 2024, taking place from October 15-18, 2024 in Chiba, Japan.

The most significant feature of the smart glasses is the use of lithium niobate thin film enabling visible light control at speeds more than 10 times faster than conventional laser color control. Whereas conventional visible light lasers change color by controlling electrical current, the lithium niobate thin film does this by controlling voltage. As a result, it supports video resolutions of 4K or higher, which require high-speed control, while power consumption is expected to decrease.

A video demonstration was conducted in collaboration with QD Laser Co., Ltd. to validate functions for AR/VR smart glasses. The device was successfully combined with the direct retinal projection technology from QD Laser, confirming that a device using lithium niobate thin film can function as an imaging device.

At present, lithium niobate is garnering considerable attention in the field of long-distance high-speed optical communication such as Beyond 5G/6G, with many highlighting its applications with near-infrared light. But very few have considered its applications with visible light. In the development of full-color laser modules for AR/VR smart glasses, TDK focused on lithium niobate to break through future speed limitations of visible light lasers. Research and development have confirmed that it can control all three primary colors of light – red, green, and blue.

The thin film for this device is formed by a sputtering method, which has been cultivated over the years and is better for mass production, rather than the conventional method of bonding lithium niobate to a substrate using bulk material. By applying this proprietary technology, TDK manufactured and tested lithium niobate devices for the first time.

The results of this device development can be applied not only to video devices for AR/VR smart glasses but also in fields with significant future growth. More specifically, TDK is considering use in high-speed optical communication in data centers, which are experiencing a rapid expansion in data volumes due to DX and other factors, as well as high-speed optical wiring in generative AI, which requires technological development to improve performance in the future.

Glossary

- AR: Augmented Reality
- VR: Virtual Reality
- LiNbO₃: Lithium Niobate

Main features and benefits

- By using lithium niobate thin film, the limitations of conventional visible light lasers are overcome. It enables high-speed voltage control
- Using a modulating element made of lithium niobate thin film, a video demonstration of direct retinal drawing was successfully conducted

About TDK Corporation

TDK Corporation is a world leader in electronic solutions for the smart society based in Tokyo, Japan. Built on a foundation of material sciences mastery, TDK welcomes societal transformation by resolutely remaining at the forefront of technological evolution and deliberately “Attracting Tomorrow.” It was established in 1935 to commercialize ferrite, a key material in electronic and magnetic products. TDK’s comprehensive, innovation-driven portfolio features passive components such as ceramic, aluminum electrolytic and film capacitors, as well as magnetics, high-frequency, and piezo and protection devices. The product spectrum also includes sensors and sensor systems such as temperature and pressure, magnetic, and MEMS sensors. In addition, TDK provides power supplies and energy devices, magnetic heads and more. These products are marketed under the product brands TDK, EPCOS, InvenSense, Micronas, Tronics and TDK-Lambda. TDK focuses on demanding markets in automotive, industrial and consumer electronics, and information and communication technology. The company has a network of design and manufacturing locations and sales offices in Asia, Europe, and in North and South America. In fiscal 2024, TDK posted total sales of USD 14.6 billion and employed about 101,000 people worldwide.

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