Translation

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News Release

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To Whom It May Concern

KOHOKU KOGYO CO., LTD.

1623, Takatsuki, Takatsuki-cho, Nagahama-shi, Shiga

Development of a 4-Core Fiber Optical Isolator for the Practical Application of Next-Generation Optical Submarine Repeaters

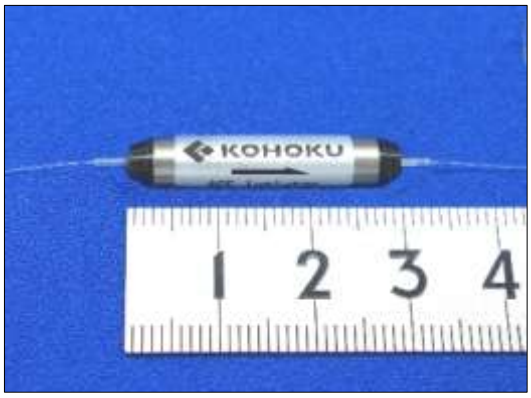
KOHOKU KOGYO CO., LTD. (Head Office: Nagahama-shi, Shiga; Representative: Futoshi Ishii), in collaboration with KDDI Research, Inc. (Fujimino-shi, Saitama; President and CEO: Hajime Nakamura), has developed an optical isolator for 4-core fiber (2) for the practical application of next-generation optical submarine repeaters (1).

Aiming to further increase the capacity of optical submarine cable systems, in recent years progress has been made in the development of space division multiplexing technology (4) using multi-core fiber, in which the optical fiber is made up of multiple cores (3). While various optical fiber amplifiers (5) using this technology have been developed up to now, it has been a challenge to both reduce the size of the optical isolators for multi-core fiber and suppress inter-core crosstalk (6). In addition, there have been few reports of stable operation in the practical use environments of submarine cable systems, such as with regard to wavelength and temperature.

In response to the performance requirements of next-generation optical submarine repeaters, which were revealed through simulations conducted by KDDI Research, KOHOKU KOGYO CO., LTD. has developed an optical isolator for 4-core fiber. The developed optical isolator for 4-core fiber has been reduced to φ5.5 × 29 mm, which is the same size as conventional optical isolators for single-core fiber, and the inter-core crosstalk has been suppressed to -50 dB or less. Furthermore, the optical characteristics at temperatures of -5 to +70°C and wavelengths of 1,525 to 1,570 nm are comparable to those of conventional optical isolators. These results are expected to lead to space-saving and larger-capacity optical amplifiers for multi-core fiber, which are currently under development, contributing to earlier practical application of next-generation optical submarine repeaters.

The two companies announced the results of their research at ECOC2023 (7), the world's largest international conference on optical communications (held from October 1 to 5, 2023).

<Photo of the newly developed optical isolator for 4-core fiber>



<Future outlook>

KOHOKU KOGYO CO., LTD. has been manufacturing and selling a variety of highly reliable optical components for optical submarine cables for many years. In order to meet the next generation of space division multiplexing technology using multi-core fiber, which is expected to dramatically expand the transmission capacity of optical submarine cables and reduce power consumption, we are currently developing new optical components such as fan-in/fan-out (8) and optical isolators for multi-core fiber, and we are planning to ship samples in 2024.

<Explanation of terms>

(1) Optical submarine repeater

Devices installed on long-distance optical submarine cables every few tens of kilometers that incorporate an optical fiber amplifier to amplify the signal light.

(2) Optical isolator

An optical component that allows light to pass in only one direction. They are built into optical submarine repeaters to suppress the destabilization of optical amplification caused by return light.

(3) Core

The path along which signal light propagates in an optical fiber. The use of multi-core fiber allows for higher spacial density for signal light, which is expected to increase transmission capacity compared to conventional single-core fiber.

(4) Space division multiplexing technology

Technology that increases the transmission capacity of optical communications by increasing the number of optical fiber cores housed in optical submarine cables, etc. In recent years, the development of space division multiplexing technology using multi-core fiber has been advancing.

(5) Optical fiber amplifier

A device that amplifies signals in the form of light through rare-earth-added optical fibers, and incorporates optical components such as optical isolators and WDM couplers.

(6) Inter-core crosstalk

An amount that represents the degree of signal light leakage between cores. When crosstalk is high, interference with adjacent cores occurs, which degrades signal quality and leads to a reduction in transmission capacity.

(7)ECOC2023

The 49th European Conference on Optical Communications. The title of this presentation was “Low-crosstalk Compact Optical Isolator for 4-core Fiber”, p13, ECOC2023.

(8) Fan-in/fan-out

An optical component that connects each core of a multi-core fiber to the core of a single-core fiber.

<Overview of KOHOKU KOGYO CO., LTD.>

KOHOKU KOGYO CO., LTD. was founded in 1959 as a manufacturer of lead terminals for aluminum electrolytic capacitors. In 2000, we entered into the optical components and devices business. Today, 53% of our sales are in the lead terminal business and 47% are in the optical components and devices business. In the optical components and devices business, we have a 50% market share in the optical isolator market for optical submarine cables, making us a leading company in this field. As a third growth business, we are progressing with the commercialization of high-purity quartz glass using the slurry casting method.

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