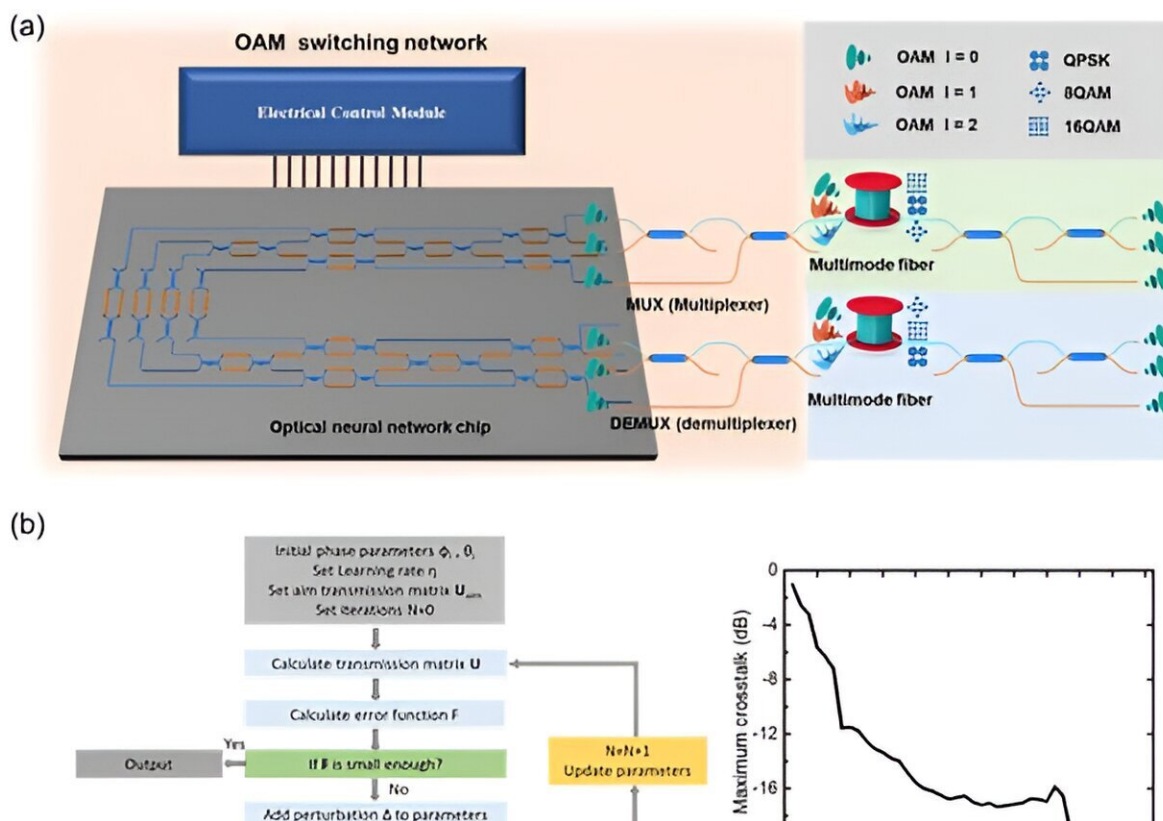


# Advanced orbital angular momentum mode switching in multimode fiber utilizing an optical neural network chip

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Working principle of the optical neural network chip for OAM mode switching. Credit: Zhengsen Ruan et al.

The rapid development of technologies such as the internet, mobile

communications, and artificial intelligence has dramatically increased the demand for high-capacity communication systems. Among various solutions, mode-division multiplexing (MDM) has emerged as a crucial technique, utilizing spatial modes like orbital angular momentum (OAM) to enhance communication capacity.

In a recent study, a team of scientists led by Professor Jian Wang from Huazhong University of Science and Technology introduced a flexible mode-switching system based on an optical neural network chip. This system is capable of switching between different OAM modes in a multimode fiber, a critical function for modern optical communication networks. The optical neural network chip provides the necessary flexibility, enabling arbitrary mode switching among the three OAM modes within the fiber.

The article was [published](#) in *Light: Advanced Manufacturing*.

The system also features an advanced gradient descent algorithm, which ensures that the crosstalk between channels remains below  $-18.7$  dB, thereby maintaining the integrity of the transmitted signals. This was demonstrated experimentally, where different modulation formats were successfully transmitted across various modes.

The introduction of this optical-neural-[network](#)-based mode-switching system marks a significant advancement in the field of optical communications, offering a practical solution for multimode fiber networks. The ability to achieve low-crosstalk mode switching paves the way for more efficient and flexible optical networks, capable of meeting the growing demands of modern communication systems.

**More information:** Zhengsen Ruan et al, Flexible orbital angular momentum mode switching in multimode fibre using an optical neural network chip, *Light: Advanced Manufacturing* (2024). [DOI](#):

[10.37188/lam.2024.040. www.light-am.com/article/doi/10.37188/lam.2024.023](https://www.light-am.com/article/doi/10.37188/lam.2024.023)

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