

# Proposal of Channel Enhancement by using Novel Advanced OAM Mode for Transmission on N-core MCF

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Towards transmission capacity increase of the optical fiber, although the study of spatial multiplexing method by the multi-core fiber (MCF) has been actively, in order to increase transmission capacity, we set the smaller basic moment angle than OAM (Orbital Angular Momentum) Mode, and call advanced OAM mode. There is a possibility that you can set the number of channels more than the number of cores by MCF transmission using the advanced OAM mode. Figure 1 show the advanced OAM mode transmission on the 6-core MCF. Considered to be multiplexing and demultiplexing by PHASAR device each mode of the advanced OAM at the input and output ends of the MCF, we have studied regarding phase device.

One of the important issue of mode demultiplexing is crosstalk. Figure 2 shows the Crosstalk of 6-core MCF with a-OAM mode as a function of max charge number by using PHASAR device. Given the fact that the signal mode crosstalk -4dB by MIMO technology is guaranteed, the maximum charge number on the available theory is 5, it is possible to 11 channel transmission at this time. This is equivalent to approximately two times the number of cores, for further transmission channel number increases, improvement in crosstalk is essential. Figure 3 shows the transmittance as a function of charge number for the case  $l_{max} = 5$ . In general, regarding array waveguide number of the AWG used in the wavelength division multiplexing, although it is about 100 pieces, array waveguide number in the transmission system that we propose is limited to the number of cores  $N$ . When array waveguide is less and the like 6, the crosstalk becomes worse due to a lack of phase information. The loss of -11.7 dB as is shown in Fig. 3 is caused by leak from array waveguide of mux PHASAR device when the light is separated to each cores. We are considering that this problems are design of PHASAR device and to add the phase information by the phase control as a solution, artificially increasing the number of array waveguide.

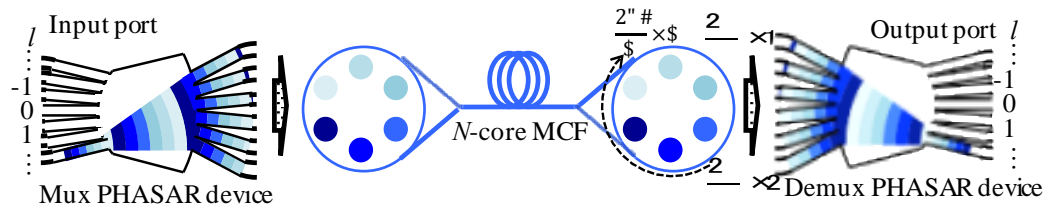


Fig. 1. Advanced OAM mode transmission on the 6-core MCF

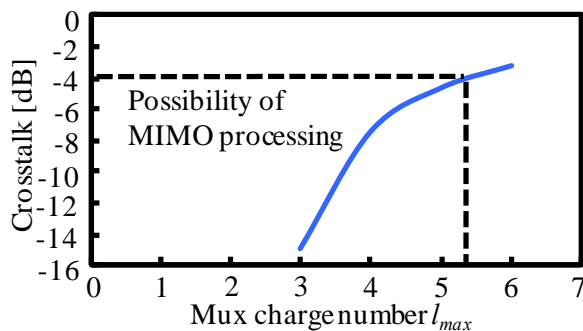
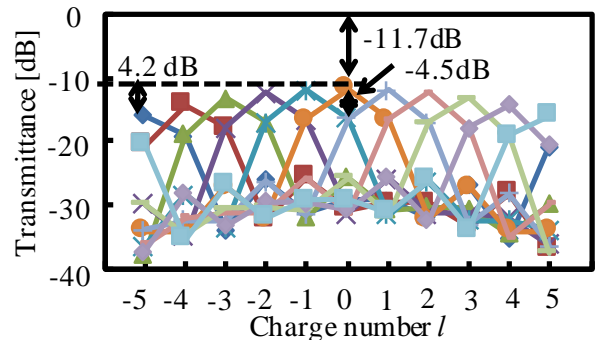


Fig. 2 Crosstalk of 6-core MCF with a-OAM mode as a function of max charge number by using PHASAR device.



Transmittance as a function of charge number (case  $l_{max} = 5$ ).

## Reference

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[2] R. Tanaka, et.al, OPE, 2014, 225, pp. 127-132