Research and development of optical wireless communication network for the spread of undersea IoT

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The spread of information and communication terminals for seabed resource exploration and seafloor topography observation is essential for the future realization of a smart seabed space. In this laboratory, we propose the architecture considering the terminal arrangement for the **next-generation undersea optical wireless network**. The proposed undersea optical wireless network consists of two layers, a core network, and an access network. In the study of core networks, we study the optimum distance between relay terminals when connecting multiple relay terminals in a bus type. On the other hand, in research on access networks, we are focusing on various access technology, assuming multiple terminals. **Figure 1** shows a future image in which the communication traffic accommodated in the two networks understudy is transmitted to the data center via the optical fiber and processed as big data. **Figure 2** shows the system configurations when using a multi-wavelength light source and when using the same wavelength light source. One of the major features of the system that uses the same wavelength light source, which is the subject of our laboratory, is that one photodetector can receive signals transmitted from multiple optical wireless terminals simultaneously and efficiently. **Table 1** summarizes those advantages and disadvantages.

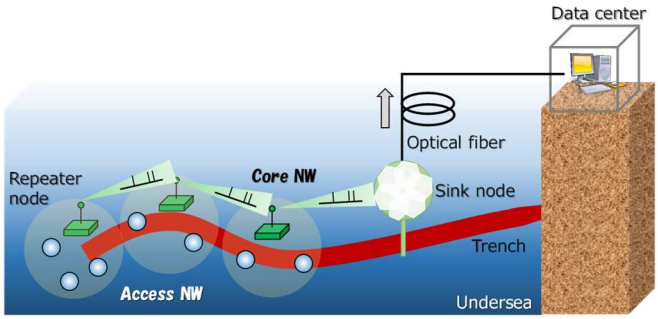
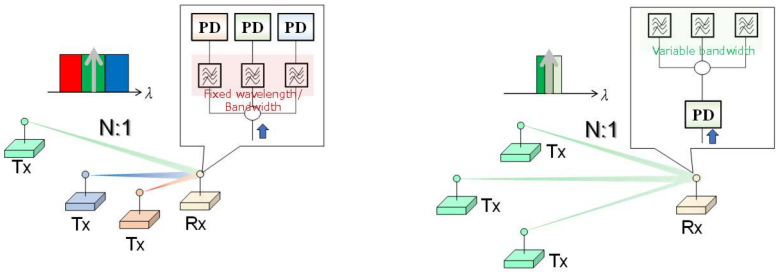


Fig. 1 Concept of undersea optical wireless network.



(a) (b)

Fig. 2 (a) Multiplexing using multi-wavelength light source, (b) Multiplexing using the same wavelength light source.

Table 1 Advantages and disadvantages of each system.

Multi-wavelength light source system	Same wavelength light source system
Large capacity transmission according to the number of wavelengths	Transmission capacity limited to one wavelength band
Different maximum reach for each wavelength	Low loss wavelength available for all wavelengths
Complex receiver configuration	Simple receiver configuration (Single PD)

【Reference】

Takahiro Kodama, Koki Arai, Kota Nagata, Kazuhiko Nakamura and Masanori Hanawa, “Underwater wireless optical access network with OFDM/SBMA system: Concept and demonstration,” *Proc. OECC/PSC*, WP4-B5, Fukuoka, Japan, July 2019.