



# *Recent Progress in DWDM and OTDM Technologies*

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*by T. Morioka (Session 6-WDM and DWDM)  
ITU-T Workshop on IP/Optical, Chitose, Japan, July 10, 2002*



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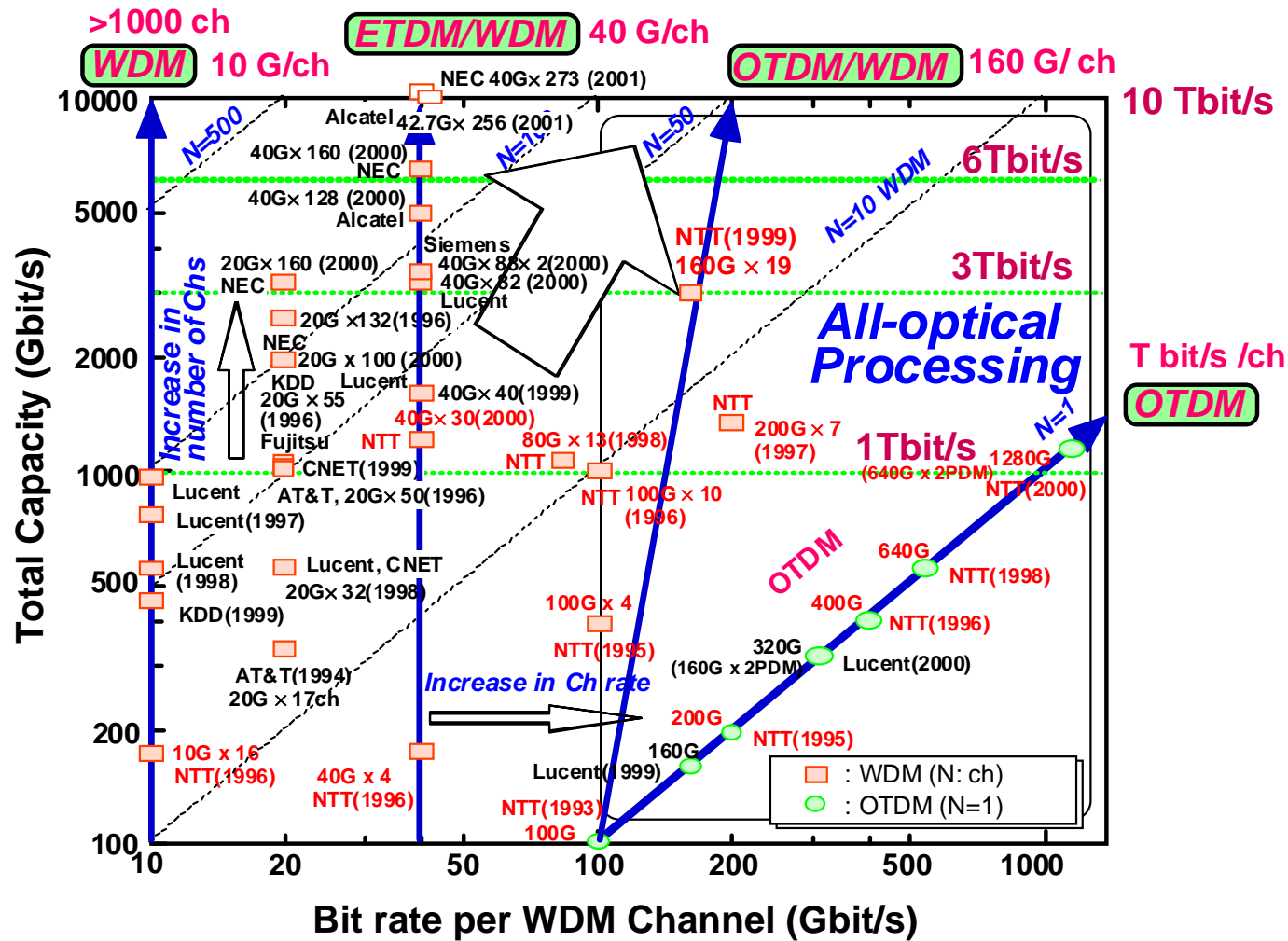


# Outline

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- ***Introduction***
- ***DWDM Optical Source***
- ***Large-capacity OTDM/WDM Transmission***
- ***Optical Signal Monitoring***
- ***Conclusion***

# Trends in Optical Transmission



by T. Morioka (Session 6-WDM and DWDM)  
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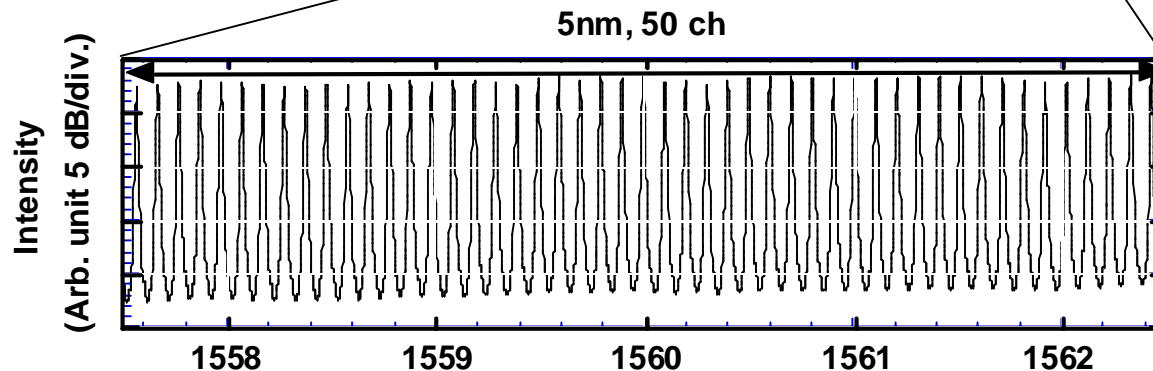
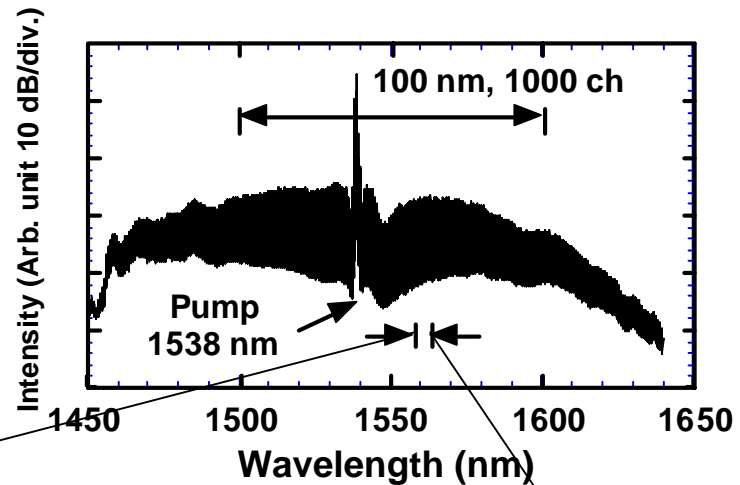
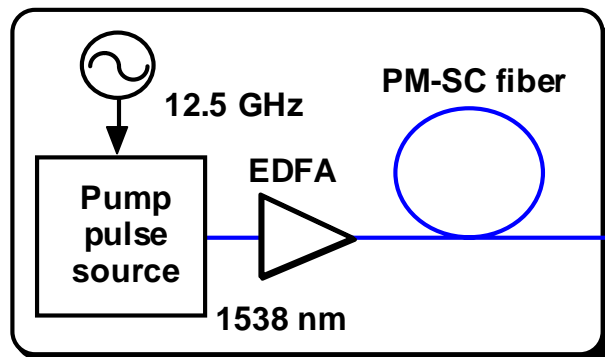
# DWDM Source(1)

*with accurate frequency spacing*

Takara et al., *Electron. Lett.*, vol. 36, pp. 2089-2090, 2000

## 12.5 GHz-spaced, 1000 ch Optical Carrier Source

**Optical Frequency Chain Generator**





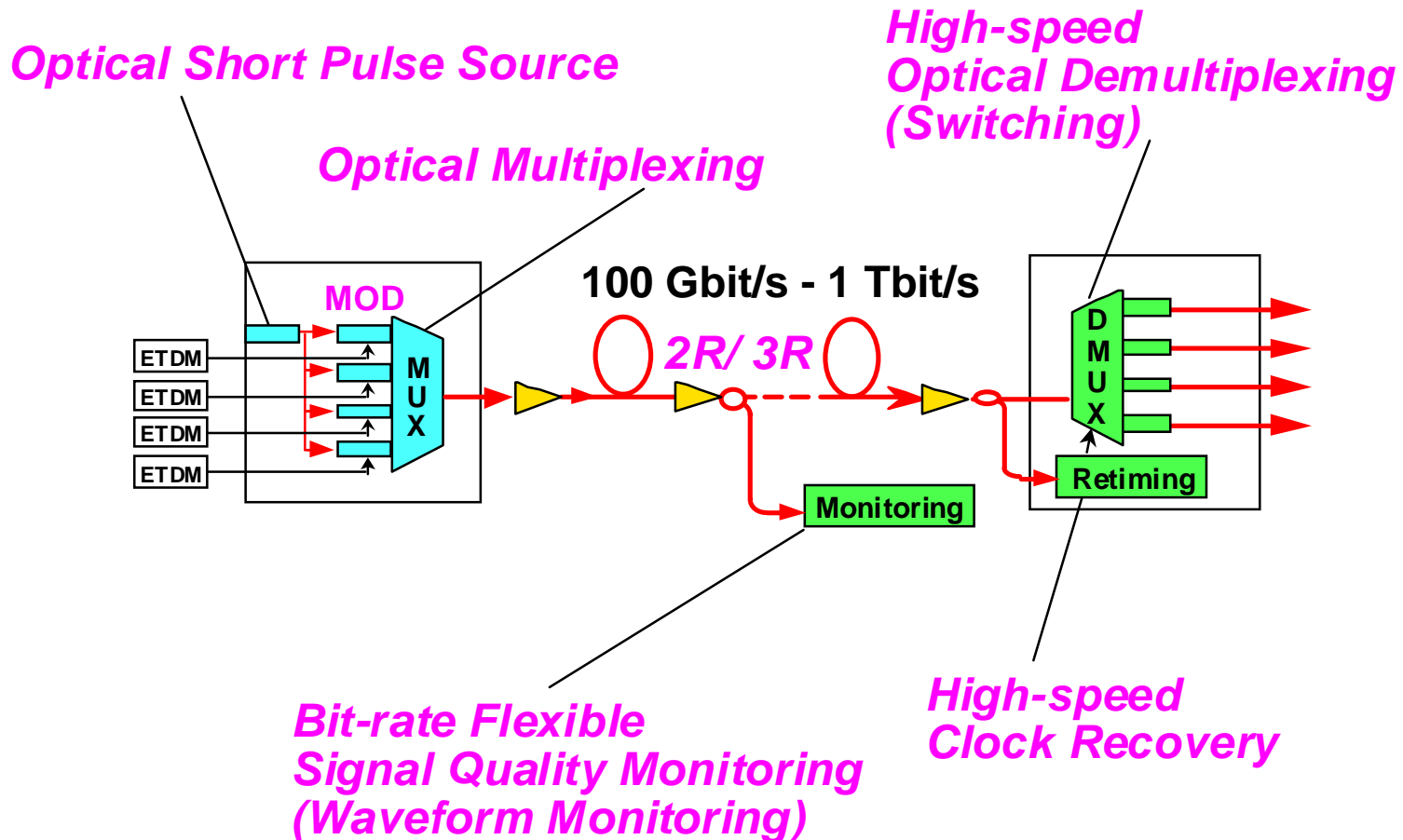
## DWDM Source(2)

*with accurate frequency spacing*

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- GHz Spacing possible
- Optical frequency accuracy  $<10$  MHz  
(depends on the standard source)
- Channel spacing accuracy  $\ll 1$  KHz
- Channel spacing deviation  $<1$  Hz

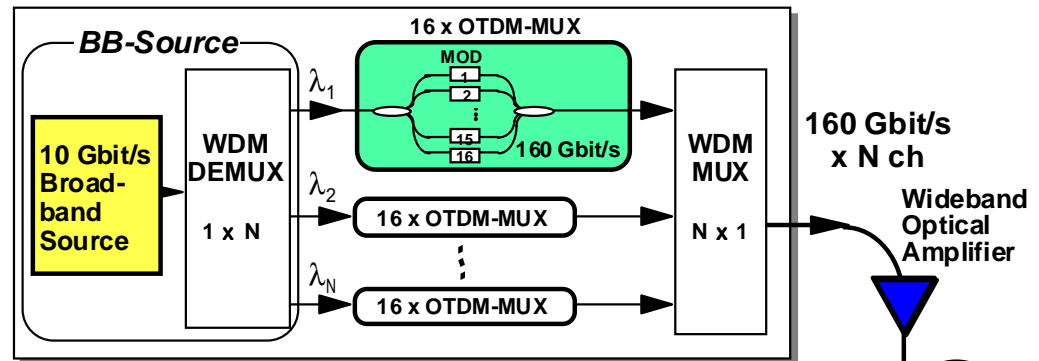
# Basic Components for OTDM Systems



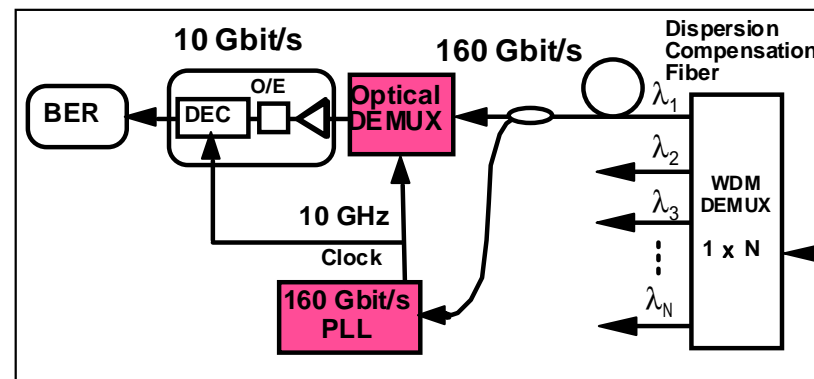
# Large-capacity OTDM/WDM Transmission

- **Broadband Sources**
- **Stable OTDM-MUX with WDM-DEMUX**
- **Wideband OA (>200 nm)**
- **Wideband DM (Dispersion Management)**
- **Stable DEMUX**

**Optical Transmitter (160 Gbit/s x N ch)**



**Optical Receiver**



# Optical Signal Monitoring

Takara et al., *Electron. Lett.*, vol. 32, pp. 1399-1400, 1996

## ■ Optical Sampling based on SFG

