

IDER unit

“Advanced photonic devices for new-generation communication networks”

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M. Fujimura

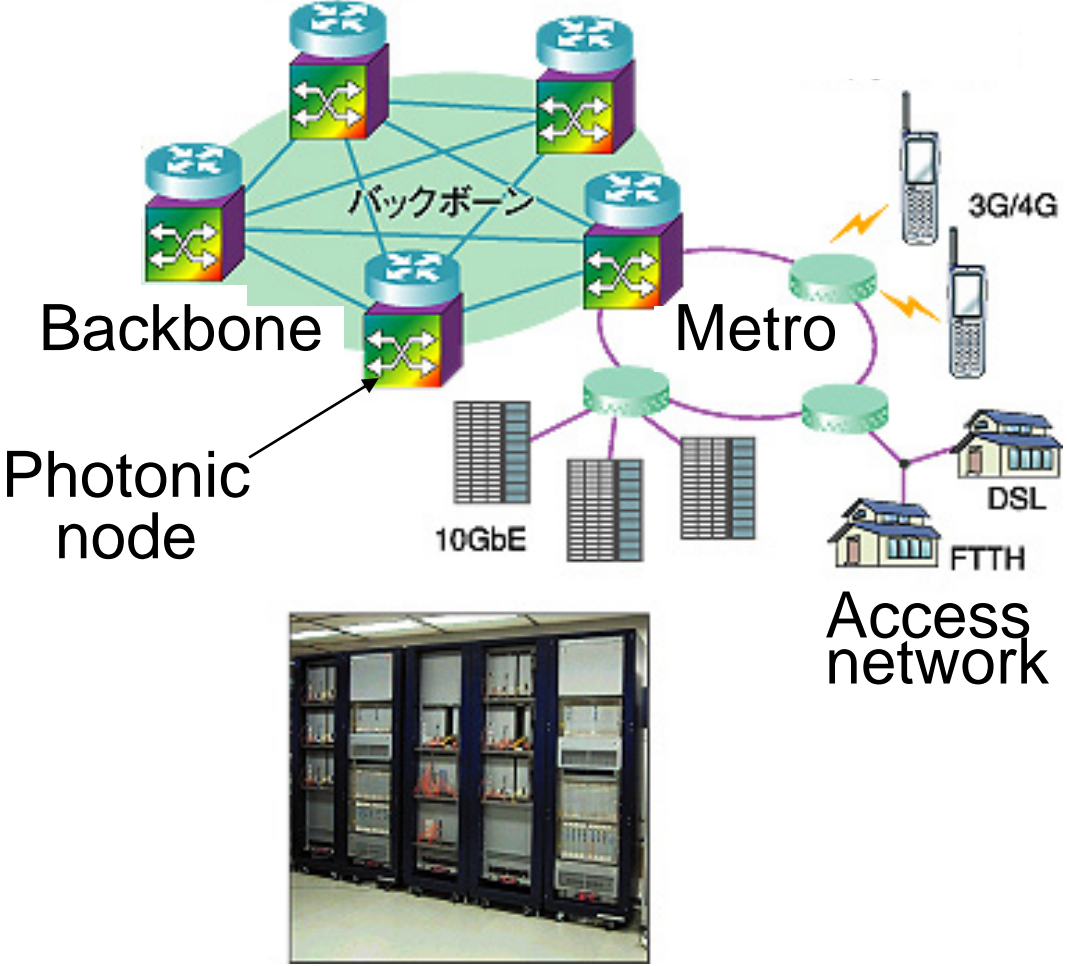
A. Maruta

M. Matsumoto

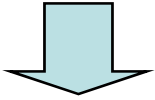
T. Higashino

Research Background

New-generation photonic network



Signal transmission
various format
various wavelength



urgent demand on
**versatile
photonic devices
and sub-systems**

- transparent
- high speed
- secure

Research Background

Optical communication

Network

- WDM
- TDM
- CDMA
- ROF

Sub-system

- transmitter
- repeater
- format conv.

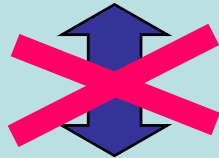
Device

- laser diode
- modulator
- detector
- wavelength
conv.

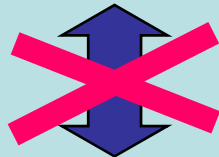
Research Background

Optical communication

Network



Sub-system



Device

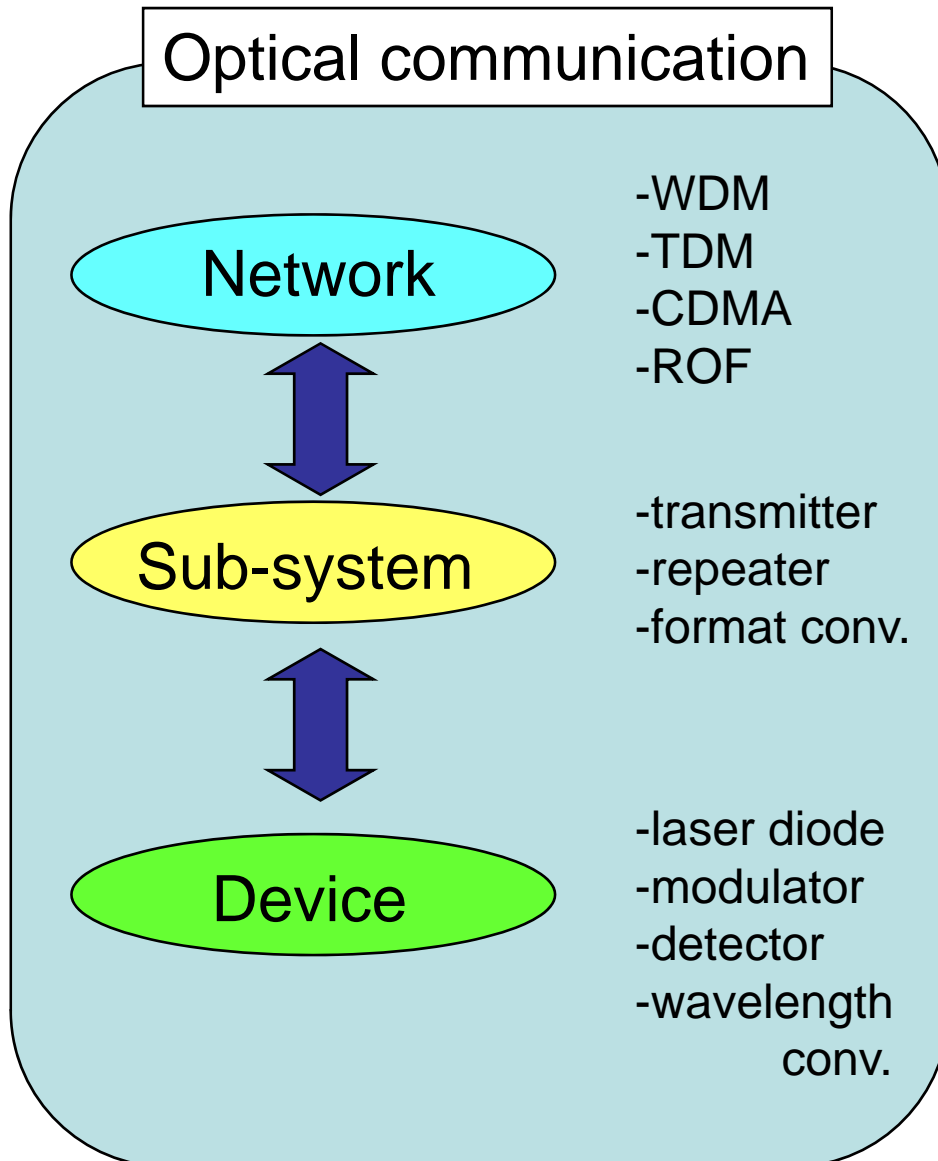
- WDM
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- transmitter
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- format conv.

- laser diode
- modulator
- detector
- wavelength conv.

COMMUNICATION
BARRIERS

Purpose of our IDER unit



Break the barriers

upward

possible function
performance limit

downward

specifications

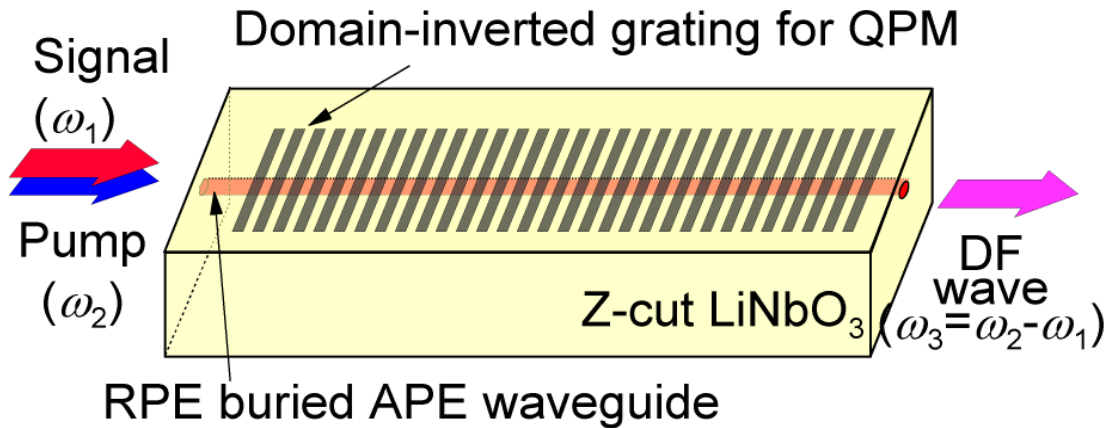
Development of
advanced photonic devices
and sub-systems optimized
on universal point of view.

Members of our IDER unit

Fujimura	LiNbO ₃ waveguide devices	Suhara
Maruta	SOA signal processing	
Miyoshi	Optical A/D conv. in fiber	Kitayama
Faisal	Transmission of optical signal	
Suresh	Mod. format conv. using SOA	
Matsumoto	Fiber signal processor	Inoue
Higashino	Radio-optic signal processing	
Tsukamoto	Remote localized antenna system	Komaki
Morioaka	Radio network	

Research activities of our IDER unit

LiNbO₃ waveguide difference frequency generation device

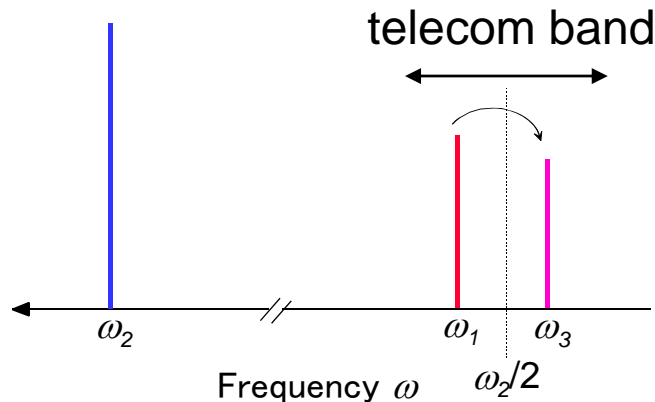


Nonlinear polarization:

$$P^{\omega_3} \propto d E^{\omega_1} E^{\omega_2}$$

- potential of high efficiency
- broad bandwidth for signal
- low noise
- conversion of multiple wavelength signal
- compact
- transparent

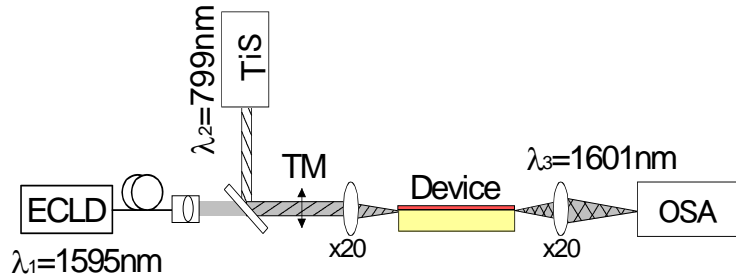
Wavelength conversion by DFG



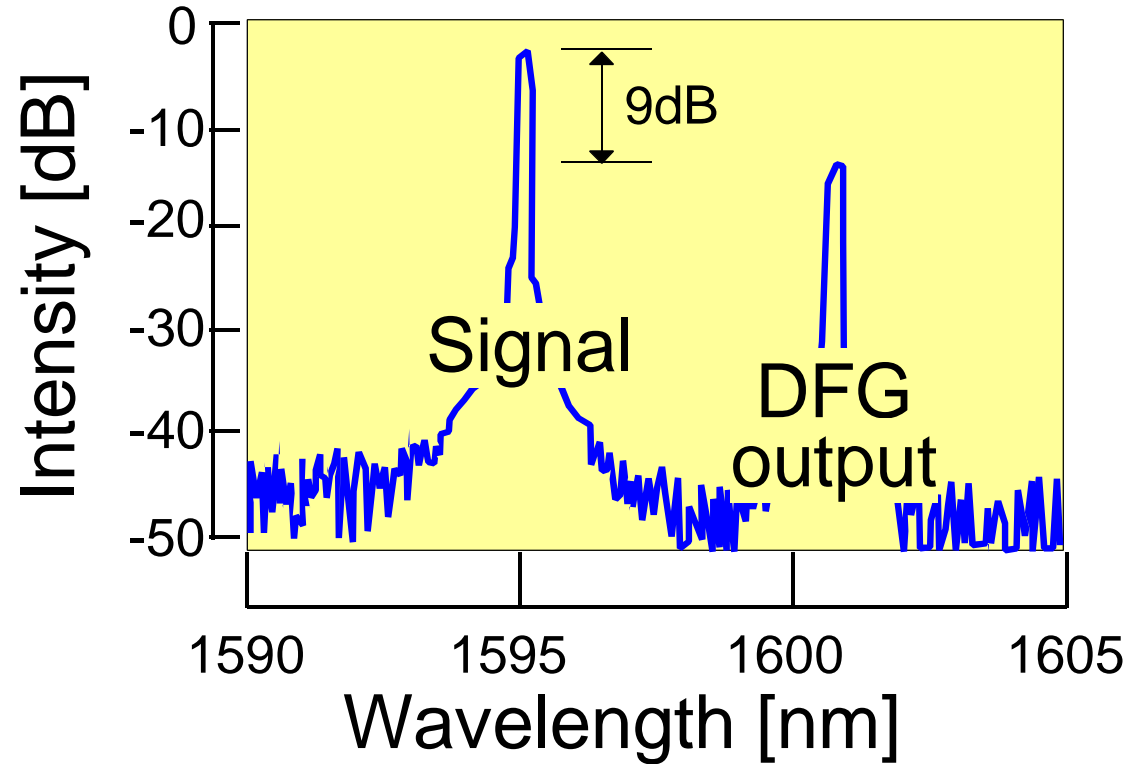
Application for future dense wavelength division multiplexing optical network

DFG wavelength conversion experiments

Optical system

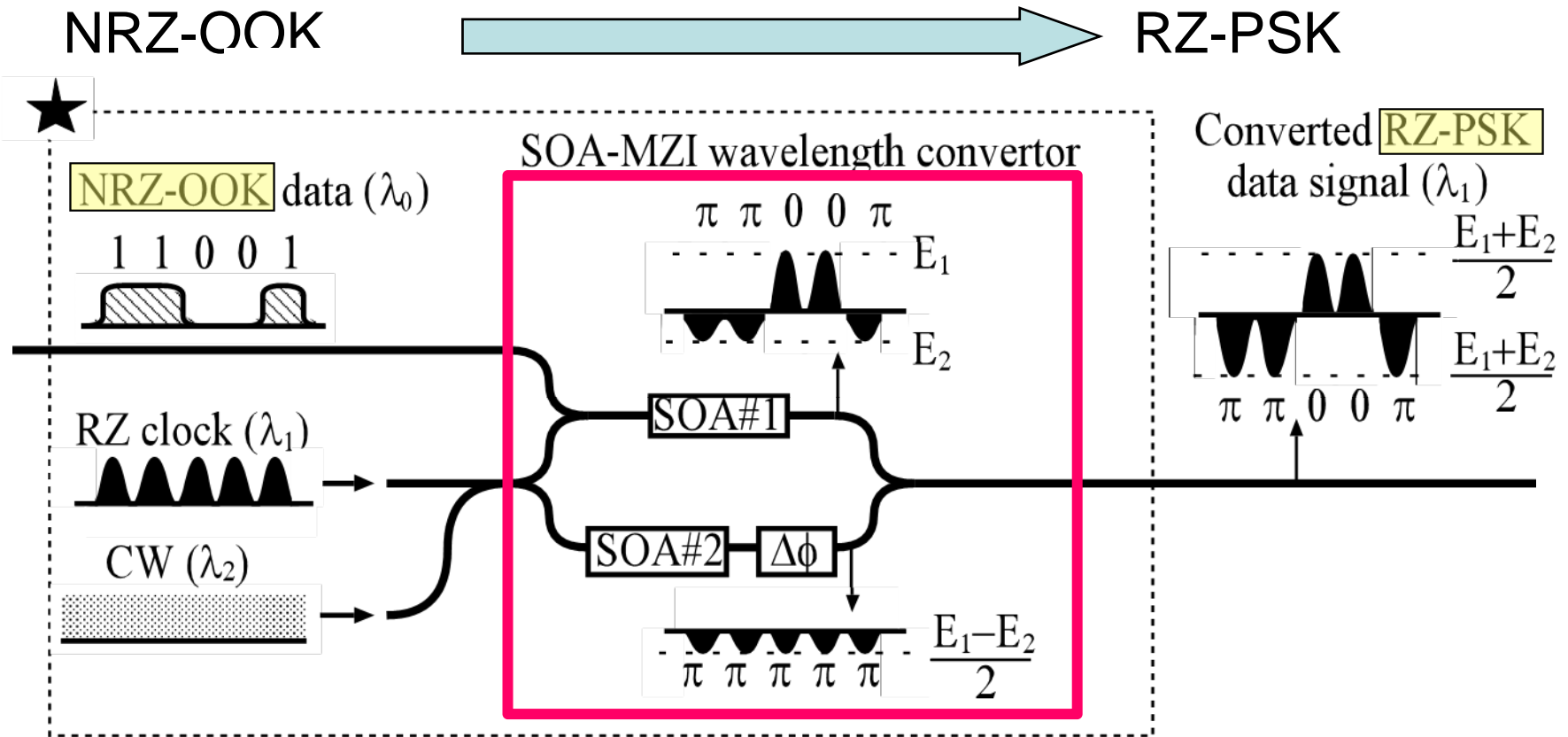


Spectrum of output waves ($P_2 = 12\text{mW}$)



0dB conversion is feasible for Pump power of $\sim 100\text{mW}$.

All optical modulation format conversion using SOA



SOA replacement with LiNbO₃ waveguide device?

Summary

Active research works in each sub-group
Information exchange at regular meeting
Organization of various meetings

2nd global seminar

17:30-18:30, Feb. 2nd

“Quasi-phasematched nonlinear-optic
devices for various application”

Prof. Martin M. Fejer
(Stanford Univ.)