

IEEE802.3 NG-EPON Study Group

Consideration of “NG-EPON and Legacy EPON Coexistence”

Akio Tajima

Green Platform Research Labs., NEC Corporation

Introduction

As IEEE Std 802.3-2012 described, 10G-EPON and GE-PON can coexist on the same ODN.

- Downstream: WDM
- Upstream: TDMA

NG-EPON is also required to coexist with legacy E-PON (GE-PON and/or 10G-EPON).

Project Objectives (1/2)

- » Support subscriber access networks using point-to-multipoint topologies on SM optical fiber
- » EPON PHY(s) to have a BER better than or equal to 10^{-12} at the MAC/PLS service interface
- » Provide physical layer specifications:
 - > for 1G-EPON supporting a downstream channel insertion loss of 29dB, compatible with PR(X)30 upstream channel insertion loss;
 - > for 1G-EPON supporting a split ratio of at least 1:64 at a distance of at least 20 km;
 - > for 10G-EPON, supporting a split ratio of at least 1:64 at a distance of at least 20 km;

Extended EPON Study Group, 802.3 Plenary meeting in Atlanta, GA, USA



Project Objectives (2/2)

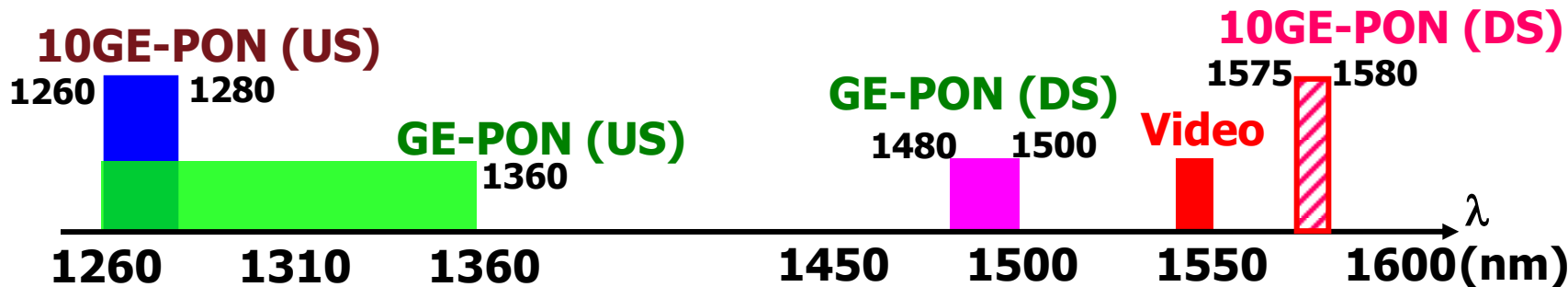
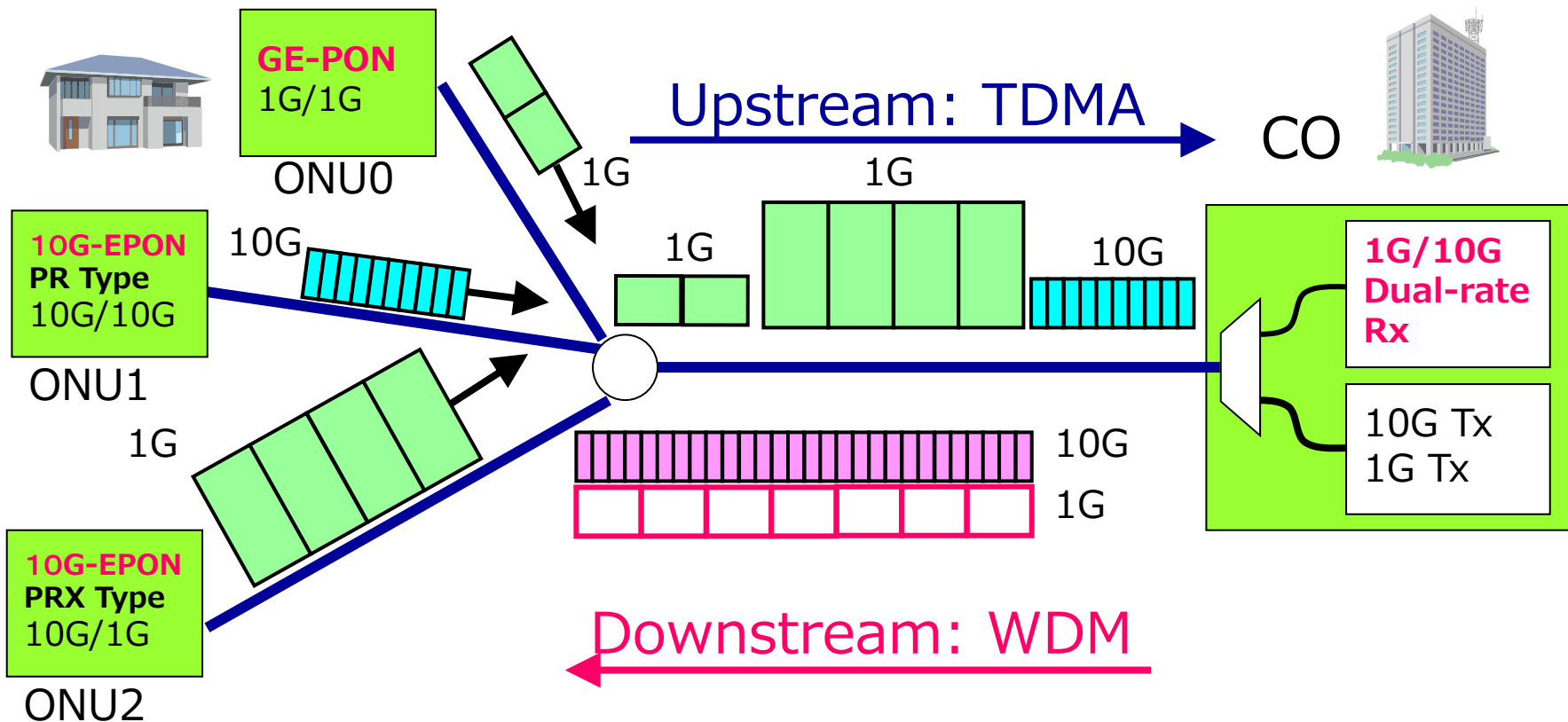
- » Changes to be confined to the PMD layer; PCS and MPCP are to be reused as is.
- » Maintain coexistence among 1G-EPON and 10G-EPON (i.e. support the same loss budget classes for 1G-EPON and 10G-EPON).

Extended EPON Study Group, 802.3 Plenary meeting in Atlanta, GA, USA



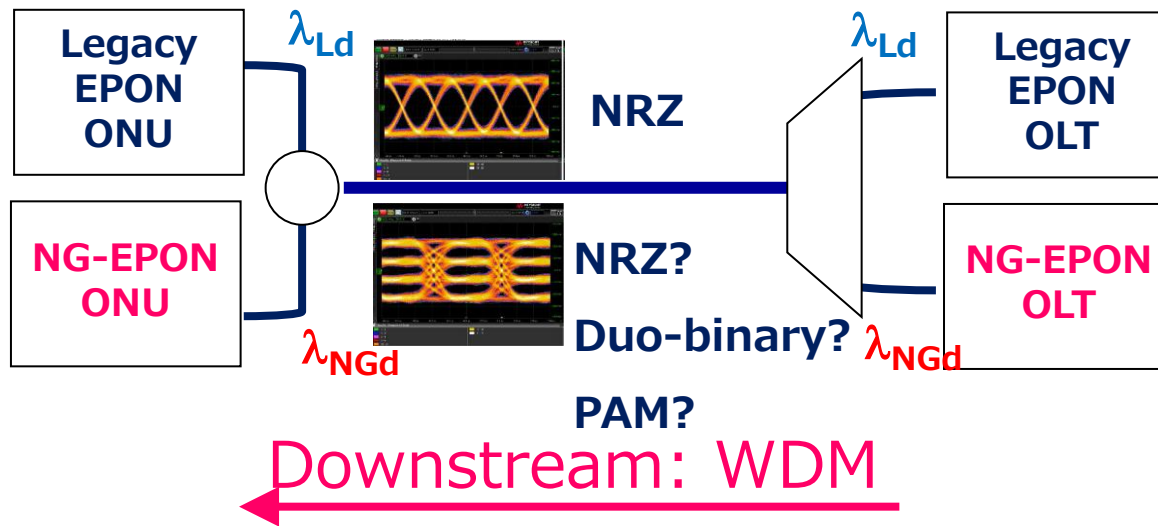
Extended EPON Objectives

Coexistence of 10G-EPON and GE-PON



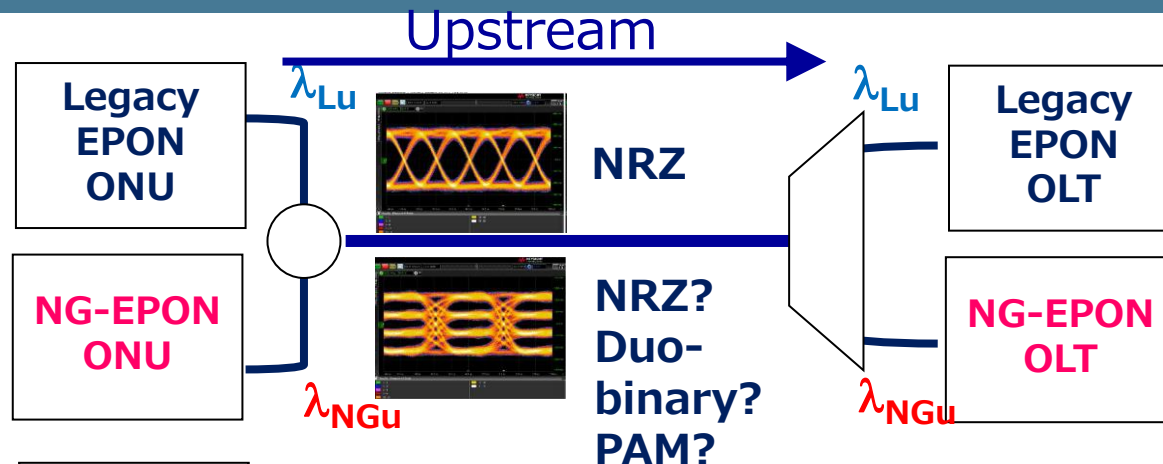
NG-EPON and Legacy EPON coexistence (Downstream)

In downstream, WDM technology will be used for coexistence as same as 10G-EPON.

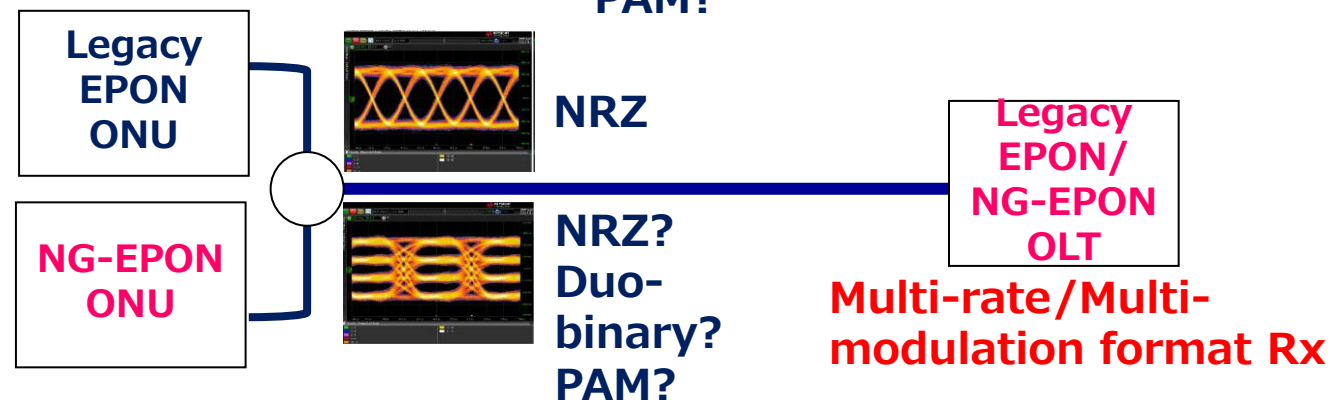


NG-EPON and Legacy EPON coexistence (Upstream)

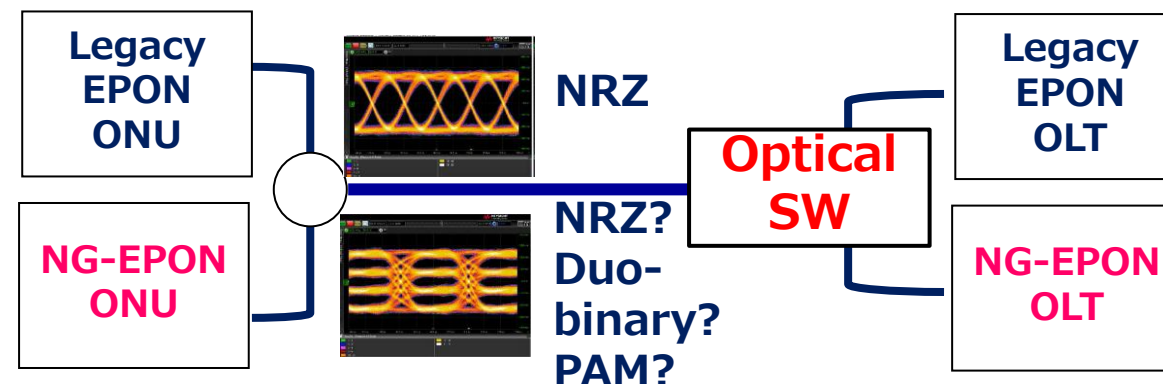
WDM



TDMA 1



TDMA 2

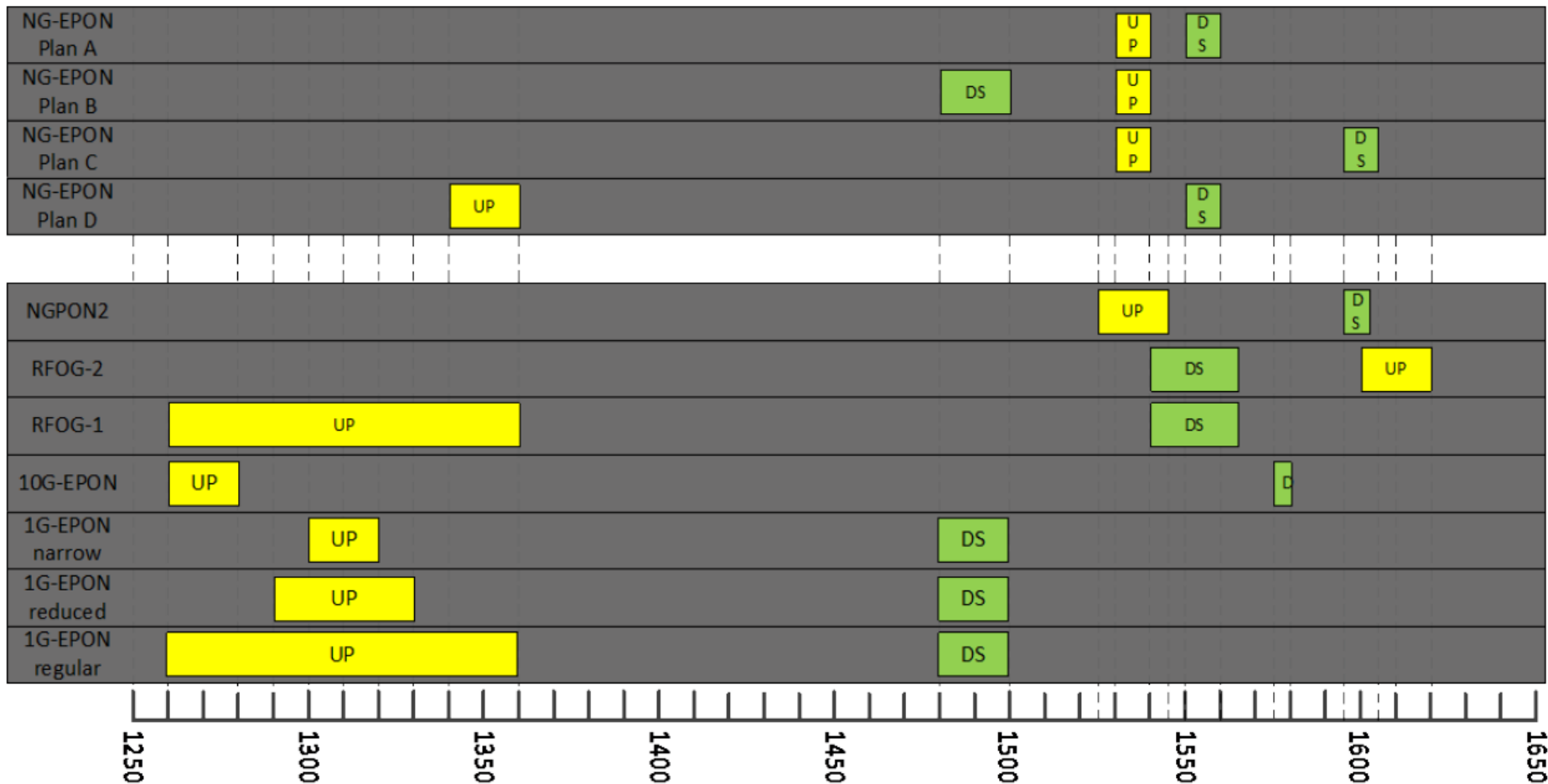


WDM vs. TDMA comparison table

| | WDM | TDM | |
|-------|--|--|--|
| | | Multi-rate Rx | Optical Switch |
| Pros. | <ul style="list-style-type: none"> • Mature • Modulation format/rate independent | <ul style="list-style-type: none"> • Wavelength free. | <ul style="list-style-type: none"> • Wavelength free. • Modulation format/rate independent |
| Cons. | <ul style="list-style-type: none"> • Wavelength allocation plan. | <ul style="list-style-type: none"> • Timing control (DBA). • Multi-rate (multi-modulation format) burst mode Rx. | <ul style="list-style-type: none"> • Timing control (DBA). • High-speed optical switch. |

Wavelength allocation plans

For WDM scenario, wavelength allocation plan is key issue.

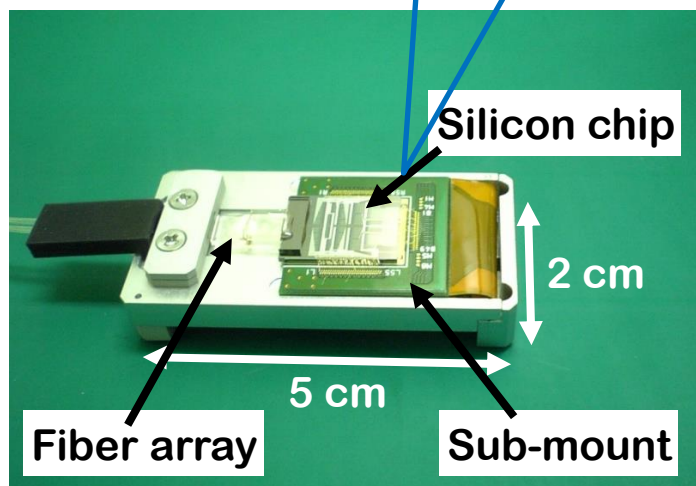
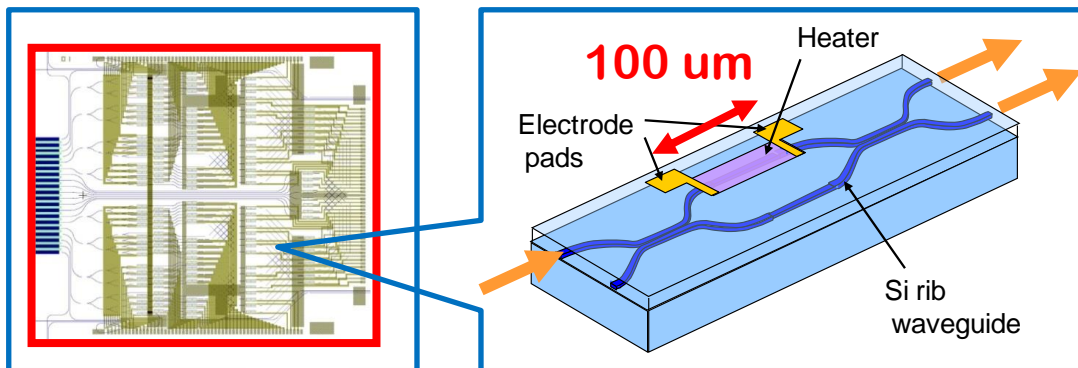


Spectrum allocation bands for optical access defined in IEEE Std 802.3, SCTE, and ITU-T

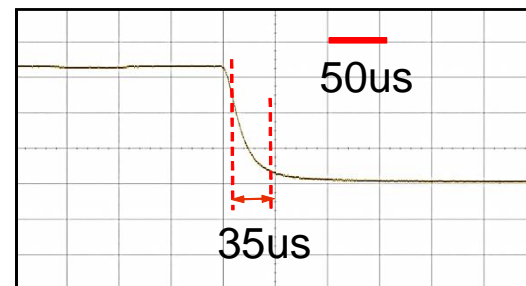
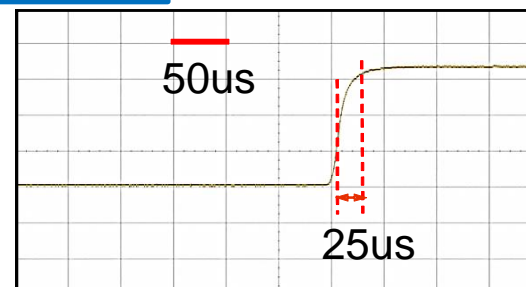
IEEE 802.3 Industry Connections Feasibility Assessment for the Next Generation of EPON, Mar., 2015

High-speed Si optical switch

Small size, high-speed Si optical switch



8 x 8 optical switch module



Fast response of Si TO switch element

A part of this work was supported by National Institute of Information and Communications Technology Japan.

Summary

- As NG-EPON is required to coexist with legacy EPON (GE-PON and/or 10G-EPON), coexistence will be described in Project Objectives.
- In downstream, WDM technology will be used for coexistence as same as 10G-EPON. In upstream, WDM and TDMA are candidate technologies.
- Since there are various options to realize coexistence, Objectives of NG-EPON should not limit to the specified technology.

 **Orchestrating** a brighter world

NEC