

Planar Lightwave Circuit Technologies for Photonic Network Innovation

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This is my second contribution to the Strategies column. Three years ago, I wrote “For Further Innovation,” as the Executive Director of NTT Science and Core Technology Laboratory Group, an umbrella organization covering five laboratories including the Photonics Laboratories and the Basic Research Laboratories. In that article, I pointed out that, in addition to short-term NTT business contributions, those laboratories should perform advanced research intended to bloom from 5 to 10 years later and even allow work that might not bear fruit for 10 to 20 years.

One example is research on silica-based optical waveguides on a planar silicon substrate. That work was begun by the Basic Research Laboratories in the early 1980s and then handed over to the Photonics Laboratories. In the 1990s, research on integrated-optic arrayed-waveguide grating (AWG) multiplexers/demultiplexers bore fruit as NTT’s planar lightwave circuit (PLC) technology, which today has become an important pillar in the optical component business that supports commercial optical networks.

In my younger days in NTT Laboratories, I participated in the technological development of PLC, but I was also involved in the founding (in 1987) of Photonic Integration Research, Inc. (PIRI), a joint venture company in Ohio, USA, and its sell-off (in 2000) after it had succeeded. I was thus fortunate enough to see basic research on silica-based optical waveguides bloom into a range of PLC products on the world market.

In 1993, a PLC division was established in NTT Electronics Corporation (NEL). It has since grown into the largest of NEL’s business divisions. NEL was seriously affected by the collapse of the Internet bubble in North America, which peaked in 2001, but now PLC production is steadily increasing because of the take-off in demand for FTTH (fiber to the home) in Japan and the recovery in demand for metropolitan area network construction in North America. That sequence of events led to my transfer from NTT Lab-

oratories to NEL in July 2005, and I contribute this second article as Managing Director of NEL’s Technology Development Headquarters.

NEL has three main PLC product groups.

- 1) AWG multi/demultiplexers, which led to the success of PIRI in the context of the North American boom in WDM (wavelength division multiplexing) trunk network investment in the late 1990s.
- 2) $1 \times N$ optical splitters, which are indispensable to the construction of FTTH networks by NTT East and NTT West.
- 3) Thermo-optic switches, which are increasingly important in the construction of metropolitan area networks with reconfigurable optical add/drop multiplexer functions.

Further efforts to improve PLC products and advance PLC technology itself are not limited to NTT Laboratories and NEL, but are now proceeding through worldwide competition, in part created by the sale of PIRI in 2000. In this way, PLC technology, to which NTT Laboratories has been a leading contributor since the 1980s, can be expected to play an increasingly major role in future photonic network innovation throughout the world, including NTT’s own NGN (next generation network) concept. NEL is determined to shoulder an important part of that development effort in the future as a top PLC manufacturer.

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