Fiber Optics – Soon To Do Even More

The world has truly whetted its appetite when it comes to bandwidth, giving added impetus to the technical development of FO communication. At the same time the industry is looking for technical solutions to make more efficient use of the capacity of FO infrastructures. And that was the focus of the recent OFC Conference.

Every spring, experts from the FO world meet up in California for the Optical Fiber Communication Conference and Exposition/National Fiber Optic Engineers Conference (OFC/NFOEC). Around 12,000 experts from science and the ICT industry, including a team from the R&M technology development department, took part in this year’s OFC. There were heated debates on the “Next Generation” of Passive Optical Networks. NG-PON2 and NG-PON3 are already waiting in the wings as successors to XG-PON (see Connections No. 44, pages 8 and 30).

Trend toward hybrid solutions
In the long term, optical networks should not only be able to transmit 1 and 10 Gbit/s, but 40 Gbit/s. The OFC 2013 came to the conclusion that the trend is moving toward hybrid technology.

The solution: Time and Wavelength Division Multiplexed Passive Optical Networks (TWDM-PON).

The result would be an enormous increase in performance and extension of capacity in the access network or for the increase in performance and extension of capacity in the access network or for the capacity medium as the case may be. The innovative Multi Core and Few Mode Fibers presented by various engineers open up a whole world of fascinating possibilities. Multi Core Fiber (MCF) and Few Mode Fiber (FMF) support the next generation of transmission technology with Space Division Multiplexing (SDM) and it is expected that they will be able to transcend the physical limits of single-mode fibers.

They require tunable lasers and receivers because the ONU must be able to adjust independently to each correct downstream and upstream wavelength. State-of-the-art optical amplifiers would have to be used in Central Offices and Optical Line Terminals (OLT). The relevant technology is already being deployed in field trials.

One thing yet to be determined is wavelength allocation (Figure 2). Depending on the wavelength plan for TWDM-PON, individual applications such as XG-PON and RF Video Overlay would be blocked. But the system should also be backward-compatible to G-PON and XG-PON. At the end of the day, the result will probably be Dynamic Bandwidth & Wavelength Allocation, DBWA, that requires special algorithms. The TWDM-PON standards are due to be drawn up during the course of 2013.

Innovative fiber technology
Another interesting topic at the OFC was the conversion of single-mode to multimode fibers (SMF and MMF) for full duplex transmission. In virtually every cabling system, there are transitions between the two fiber types. An ideal scenario would be to simplify these transitions and avoid the necessary electro-optical conversion.

Researchers from Hewlett Packard presented a solution. They use a gradient index fiber as “interlink” or as conversion medium as the case may be. The coupling of the light signal into the basic mode of this GI-MM fiber enables the transition to MMF and vice versa.

In this way, a one-fiber infrastructure could be achieved which would be compatible to singlemode and multimode applications and could be used as a link between different fiber infrastructures.

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