

WAVELENGTH SHIFTER MODULE FOR OPTICAL FIBER ACCESS COMMUNICATIONS

This Optical Network Unit (ONU) for next-generation optical access networks (FTTH PONs) shifts the down-stream wavelength in the optical spectrum for remodulation at the Customer Premises and transmission in the up-stream direction.

The Challenge

The global challenge for Next-Generation Fiber-to-the-Home (FTTH) networks is to multiply the bandwidth capacity to the homes, up to GBit/s per home, by introducing the wavelength-division-multiplexing (WDM) in the Passive Optical Network (PON), thus making effective use of the huge optical spectrum of the optical fiber.

However, assigning a different wavelength to each home is complex in terms of volume production and provisioning. For all ONUs to be identical in a WDM network, an efficient solution is to generate all the optical wavelengths at the Central Office (CO) and send them to the ONUs to reuse them. So, the ONU just has to modulate it with the up-stream data and transmit. This can be done with a Reflective Semiconductor Optical Amplifier.

The problem in this arises as the signals transmitted through the fiber in both directions at the same wavelength interfere each other, because of Rayleigh back-scattering and reflections. The challenge is to avoid this impairment.

The Technology

The new ONU module reuses the down-stream wavelength and shifts it slightly in the optical spectrum to avoid the down/up spectral overlap, by means of an optical single-side band modulation governed by a radio-frequency tone. Next, the shifted wavelength is modulated with the up-stream data, and it is optically amplified for the optical transmission from the customer premises to the CO.

To perform these operations, the ONU is based on a combination of electro-optical devices as semiconductor optical amplifiers and electro-absorption modulators, arranged in dual Mach-Zehnder structure, with carrier suppression to avoid the spectral overlap.

Innovative advantages

- Enables efficient WDM PONs
- Wavelength-agnostic colorless ONU (identical ONUs).
- Cancellation of the Rayleigh-scattering effect in the transmission system.
- Cancellation of the effect of optical reflections in the transmission system.
- Implementable with integrated optics.
- Transparent to the bit rate and the code.
- Down-stream wavelength reuse for up-stream transmission in the same fiber and the same wavelength.

Current stage of development

Experimental set-up and validity tests passed. Partial results published at Journal of Light-wave Technology, vol 27, no. 17, pp. 3912-3918.

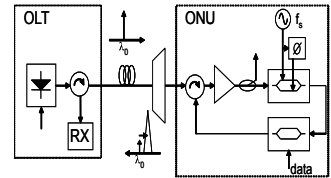
Applications and Target Market

- Broadband Telecom System Vendors
- Broadband Telecom Operators
- Semiconductor laser manufacturers
- Broadband Optical Communications networks: access, metropolitan, transport
- Fiber-to-the-Home networks
- Next Generation - Passive Optical Networks (NG-PON)

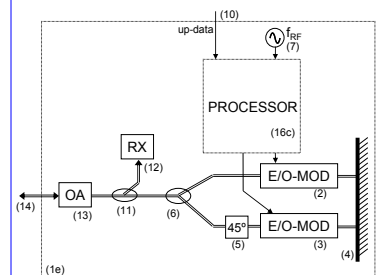
Reference number

MKT2013/0145_I

Colourless Optical Network Unit for WDM-PON FTTH (Fiber-to-the-Home) Networks



OPTICAL WAVELENGTH REUSE WITHOUT CROSSTALK AT THE FIBER NETWORK



ONU modulates the down-stream light after shifting it slightly in the optical spectrum, to avoid the bidirectional down/up crosstalk.

Business Opportunity

Technology available for licensing and technical cooperation

Patent Status

Priority application

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