

Wavelength Division Multiplexing Techniques Based on Cascaded Volume
Holographic Filters in LiNbO₃ Crystals with 90-degree Geometry

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Abstract

A two-channel demultiplexer with channel spacing 1nm and the bandwidth around 1nm is demonstrated. The demultiplexer device is established based on cascaded holographic filters. Each filter addresses a channel. Each filter is established by constructing a single volume holographic grating in a single LiNbO₃ crystal and it drops the light from a specific DWDM channel (wavelengths of ~1550nm) with 90-degree geometry. Volume holographic gratings in photorefractive material have been applied to demultiplexer devices in DWDM systems owing to the narrow spectral selectivity. However, when channel numbers in a volume hologram is increased, we have to store more holographic gratings in this recording medium. Thus, the diffraction efficiency of each channel will decrease because all the gratings share the dynamic range of the recording material. In our design, the dynamic range can be efficiently used and thus the diffraction intensities of each channel can be increased. In addition, the device could be compact owing to the 90-degree geometry. In this device, we can increase the channel number by cascading another different filter.