Fiber optic switch port wavelength



Overview

Wavelength selective switching components are used in optical communications networks to route (switch) signals between optical fibres on a per-wavelength basis.

Key Takeaways

In a wavelength-selective switch (WSS), any incoming wavelength can be dynamically routed to any output port, unlike fixed demultiplexers where each wavelength is tied to a specific port.Wavelength-Selective Switching Overview

A WSS is a key component in WDM optical networks that allows per-wavelength routing of optical signals without physically separating each wavelength into individual fibers first . Incoming light is dispersed by a grating or prism-based system, and each wavelength is independently directed to one of the switch ports. This enables flexible, reconfigurable routing of multiple wavelengths from a single input fiber to multiple output fibers .

Port-to-Wavelength Mapping

Unlike a fixed demultiplexer, where each output port corresponds to a specific wavelength, a WSS allows any wavelength, group, or band of wavelengths to be assigned to any output port. This mapping can be dynamically changed via an electronic interface, providing network agility and enabling functions like optical add/drop multiplexing . For example, a 1x5 WSS can functionally replace over 150 discrete components, including demultiplexers, variable optical attenuators, and 1xN switches .

Technology and Implementation

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WSS devices use technologies such as MEMS (Micro-Electro-Mechanical Systems) or Liquid Crystal on Silicon (LCoS) to achieve precise wavelength routing . MEMS-based WSS can provide flexible channel spacing and integrated optical channel monitoring, while LCoS-based high-port-count WSS offer low-loss switching with flat filter functions suitable for cascading in metro, regional, and long-haul networks . The switching can also include attenuation control, allowing selective reduction of signal power per wavelength.

Practical Applications
• Reconfigurable Optical Add/Drop Multiplexers (ROADMs): WSS enables dynamic addition or removal of wavelengths at network nodes without manual patching .

• Network Agility: Any wavelength from an input fiber can be routed to any output fiber, supporting flexible traffic management and bandwidth sharing .

• Extinction Ratio and Signal Quality: WSS configurations can isolate single channels or interleave wavelengths across ports, ensuring minimal crosstalk and high signal integrity . In summary, fiber optic switch port wavelength assignment in WSS is dynamic and programmable, allowing any wavelength to be routed to any output port, which is a major advantage over fixed demultiplexers that have static port-to-wavelength relationships . This flexibility is essential for modern optical networks that require high scalability and reconfigurability.

Article Content

Wavelength selective switching

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Wavelength selective switching components are used in WDM optical communications networks to route (switch) signals between optical fibres on a per-wavelength basis.

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