

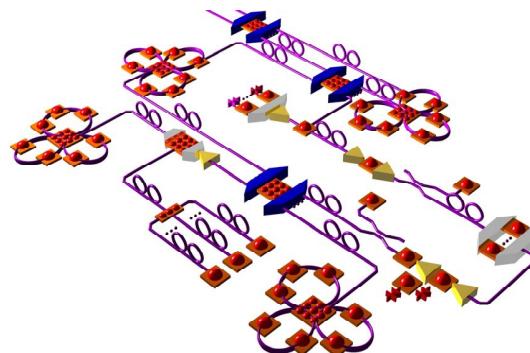
# MEMS Subsystems for Optical Networking

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Lightwave communication systems use fiber-optics to transport signals between nodes, and will use optical layer networking to optimally manage signal paths under normal and disrupted network conditions. Progress in both areas is driven by the shift from voice messaging to data communications and an exponential growth in capacity demands. New micromachine devices (MEMS) [1-10] are poised to significantly impact the advancement of both networking and transmission see figure 1.



**Figure 1 : Optical networks showing the application space for Micromachines as cross connects, add drop switches, dynamic spectral equalizers and variable attenuators**

The deployment of MEMS based optical cross connects [1-2] such as Lucent's LambdaRouter see figure 2, allow network flexibility in the optical domain and open the path to optical layer networking.



**Figure 2 : LambdaRouter™ 220 port duplex 3D MEMS beam steering optical crossconnect system**

Optical wavelength add-drop [3-5] switches are a key component in the emerging ultra long haul ( $>2000$ km) transmission systems and will expand the optical layer traffic management.

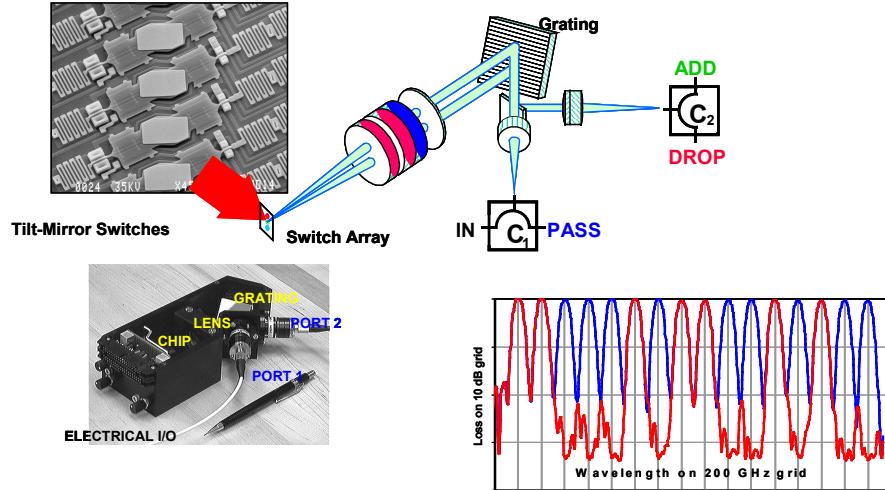


Figure 3 : MEMS based Optical add drop from ref4.

The conversion of the optical layer from one of static links to dynamic reconfigurable network will require that the optical transmission system characteristics are reconfigurable. Demonstrations of MEMS variable attenuators, optical spectrum equalizers [6-8] and dispersion compensators show [9] the potential for robust signal transport in such networks.

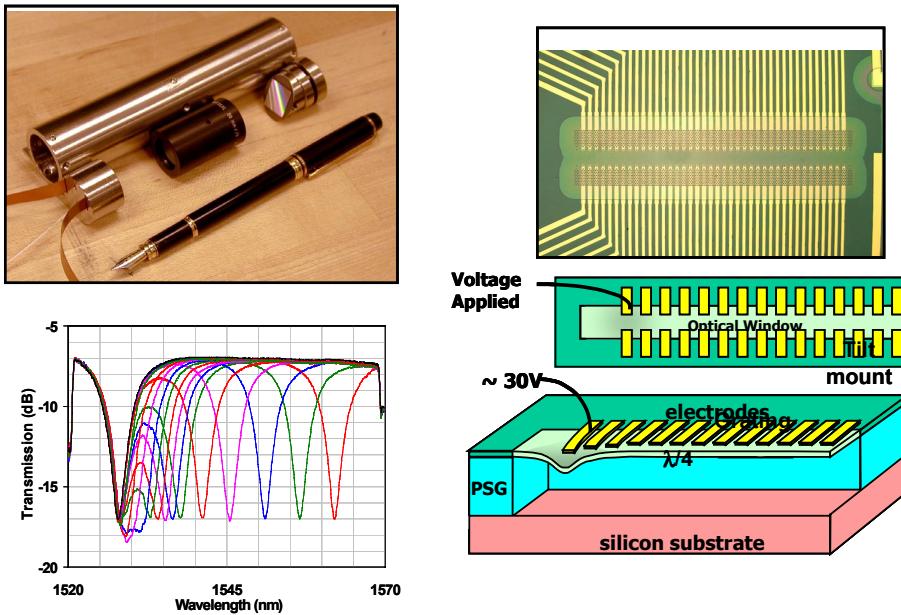


Figure 4 : MEMS based dynamic spectral equalizer from ref 8

MEMS components are notable for their small size, low cost, and flexible scalability. The imminent deployment of lightwave micromachines for transport and networking is expected as industry embraces the technology's maturity, capability, and economics.

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