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(54) **MULTI-WAVELENGTH LASER AND ROUTER WITH FAST SWITCHABLE OUTPUT PORTS AND WAVELENGTHS**

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(57) **ABSTRACT**

A multi-wavelength multi-port laser and router. By arranging a reflective facet at one end of the port-selection semiconductor optical amplifier and a partial reflector at one end of the wavelength-selection semiconductor optical amplifier, and cooperating with the intra-cavity wavelength router to form N×N optical resonant cavities, so that each optical resonant cavity can only emit the wavelength corresponding to the lowest round-trip loss between input and output ports. The extra-cavity wavelength router is mirrored with respect to the intra-cavity wavelength router, so that one or more wavelengths of light excited by any port-selection semiconductor optical amplifier can be transmitted from the corresponding output port of the extra-cavity wavelength router. The switching of the wavelength and output ports of the router is performed by on-off switching of the port-selection semiconductor optical amplifier and wavelength-selection semiconductor optical amplifier, and the switching time can be less than 1 ns.