

## Fibre Bragg Grating Based WDM Optical Cross Connect (OXC)

### Introduction

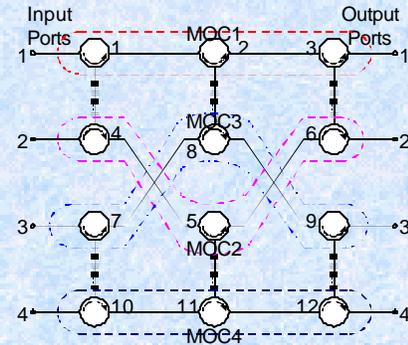
We are studying a number of fibre Bragg grating (FBG) based devices for DWDM applications. These include Er/Yb DFB and DBR fibre lasers, DWDM add/drop multiplexer and cross connect and EDFA gain equalization. One example application is the use of tunable FBGs for the implementation of DWDM optical cross connects (OXCs).

### Studies

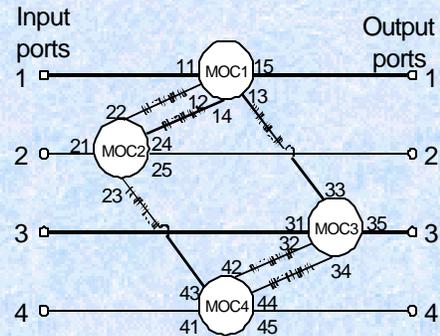
We proposed the use of tunable FBGs and multiport optical circulators for the implementation of rearrangeable DWDM OXCs. The scheme should reduce the number of circulator ports required and total insertion losses comparing with other circulator and FBG based schemes.

### Results and Discussion

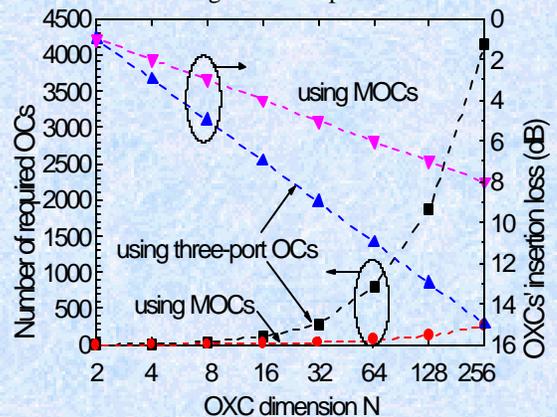
An  $N \times N$  ( $N = 2^n$ ) OXC module can be implemented based on three stage Clos network. The input stage and output stage are made up of  $2^{n-1}$  units of  $2 \times 2$  OXC modules. The middle stage contains two  $2^{n-1} \times 2^{n-1}$  modules. The total circulators' insertion loss and the number of circulators required are plotted out against the dimension of OXCs. For three port circulator implementation the insertion loss is  $(4n-2)L_{OC}$ . While for multiport circulator implementation the loss is reduced to  $2nL_{OC}$ . Where  $L_{OC}$  is the port to port loss of the circulator. For typical  $L_{OC}$  equal to 0.5dB. The insertion losses are almost reduced to half of the original values and much less circulators are required.



A 4x4 rearrangeable nonblocking OXC using twelve three-port optical circulators



OXC using four five-port MOCs.



Insertion losses of the OXCs and the required number of multiport optical circulators.

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