Brief Article

The Author

1 Power Transfer Function

Microresonators have a Lorentzian power transfer function which is peaked at the resonant wavelength λ_{MR}. For optical signals carried on wavelength λ_s, the drop-port power transfer can be expressed as (1) and the through-port power transfer can be expressed as (2)[1]. When $k_e^2 + k_d^2 \gg k_p^2$, nearly full power transfer can be achieved at the peak resonance point, and the microresonator will exhibit a low insertion loss. Physical im- plementations show that the insertion loss of a microresonator can be practically lowered to 0.5 dB [42].

$$\frac{P_{drop}}{P_{in}} = \left(\frac{2k_e k_d}{k_e^2 + k_d^2 + k_p^2}\right)^2 \cdot \frac{\delta^2}{(\lambda_s - \lambda_{MR})^2 + \delta^2} \tag{1}$$

$$\frac{P_{through}}{P_{in}} = 1 - \frac{4k_e^2(k_d^2 + k_p^2)}{\left(k_e^2 + k_d^2 + k_p^2\right)^2} \cdot \frac{\delta^2}{(\lambda_s - \lambda_{MR})^2 + \delta^2} \tag{2}$$

$$k_e = k_d, k_e^2 = 43.36k_p^2 \tag{3}$$

2 Micro Resonator Router Power Model

A optical router consist of Micro resonators. The floorplan of MR router expressed as A, P, C. A_{ij} is the number of active MRs from port i to port j. P_{ij} is the number of passive MRs from port i to port j. C_{ij} is the number of crossing loss from port i to port j.

3 Active/Passive MR Optical Loss Model

The optical loss in MR mainly consist of active MR loss and passive MR loss. The lambda of VCSEL and the lambda of MR is sensitive to the temperature as .

$$L_{active} = 10log(\frac{P_{drop}}{P_{in}}) \tag{4}$$

$$L_{passive} = 10log(\frac{P_{thro}}{P_{in}}) \tag{5}$$

4 Router level Optical loss Model

Router level optical loss is different from the input port and output port. These factors decide the.numbers of active MRs and passive MRs which optical conducting. So the optical loss from port i to port j could be expressed as :

$$L_{ij} = A_{ij} \cdot L_{active} + P_{ij} \cdot L_{passive} + C_{ij} * L_c \tag{6}$$

5 Network level Optical loss Model

Network level Optical loss Model is decided by the all optical loss in router and L_w optical in wave guide. So the all optical loss in a whole path from source to the destination can be expressed as:

$$L(s,d) = \sum_{m=1}^{N} L_{ij}^{m} + L_{WG} \tag{7}$$

N is the number of all routers optical conducting from source to destination. i is the input port in m router and j is the output port in m router.